# APPENDICES

# Appendix A

## Source Material and Exceptions to the Definition of Hazardous Waste

# Contained-In Policy

federal register

Monday
November 30, 1998

## Part III

# Environmental Protection Agency

40 CFR Part 260, et al.

Hazardous Remediation Waste Management Requirements (HWIR-Media); Final Rule conditions. In contrast, prevention-oriented hazardous waste regulations are generally implemented independently by facility owner/operators through complying with national regulatory requirements.

### 2. LDRs, MTRs, and Permitting Raise Problems When Applied to Remediation Wastes

In the HWIR-media proposed rule, EPA identified the application of three RCRA requirements to remediation wastes as the biggest problems to address; Land Disposal Restrictions (LDRs), Minimum Technological Requirements (MTRs), and permitting.

The LDRs (which appear in 40 CFR part 268) generally prohibit land disposal (or "placement" in land-based units) of hazardous wastes until the wastes have met the applicable treatment standards. Often this placement is appropriate and desirable when managing remediation wastes to excavate them from their current locations, and temporarily store the wastes before on-site treatment, or to excavate the wastes and accumulate enough volume to ship off-site cost effectively. By not allowing temporary storage and accumulation in land-based units, the LDRs can be a strong disincentive to excavating and managing remediation waste. The staging pile provisions of today's final rule address this issue by allowing temporary storage and accumulation of remediation wastes in a staging pile without being subject to LDR.

Another example of the problems with LDRs in the cleanup scenario is that contaminated media are often physically quite different from as-generated process wastes. Contaminated soils often contain complex mixtures of multiple contaminants and are highly variable in their composition, handling, and treatability characteristics. For this reason, treating contaminated soils can be particularly complex, involving one or sometimes a series of custom-designed treatment systems. It can be very difficult to treat contaminated soils to the LDR treatment levels. The parts of the HWIR-media proposal that addressed this issue have been finalized in the LDR Phase IV rule (63 FR 28556 (May 26, 1998)).

The MTR requirements were designed as preventative standards for wastes generated through industrial processes. They were not designed for the remedial context. For example, under 40 CFR Subpart F, surface impoundments, waste piles, and land treatment units or landfills must have specific detection, compliance monitoring programs, and corrective action programs for potential groundwater contamination from the unit. These are appropriate preventative requirements for units managing process wastes. However, many cleanup actions involve short-term placement of remediation wastes into a waste pile, and all of these requirements may not be necessary. The staging piles provisions of today's rule address this issue by allowing the Director to determine appropriate design criteria for the staging pile based on the site-specific circumstances such as the concentration of the wastes to be placed in the unit and the length of time the unit will operate. EPA also explained in the preamble to the CAMU rule additional reasons why LDR and MTR requirements can be counterproductive when managing remediation waste as opposed to as-generated process wastes. To read about these additional reasons, see 58 FR 8658 (8659–8661)(February 16, 1993).

Finally, another area creating roadblocks is permitting. The time-consuming process for obtaining a RCRA permit can delay cleanups, thereby delaying the environmental and public health benefits of cleaning up a contaminated site. For example, the traditional RCRA permitting process requires the facility owner/operator to submit a great deal of information on activities at the facility to EPA or the State, and the permit must include terms and conditions to protect against any improper waste management practices over the long-term active life of an operating facility. Because of the large volume of information submitted, these permits are huge documents and approval often takes several years. However, in the remedial scenario, cleanup activities are generally a one-time project; once the cleanup is completed and the remediation waste is properly treated and disposed, then the activities are completed. Also, these activities are limited to addressing the contamination at the site, and therefore are often more limited in scope than the operating practices of a facility that is engaged in on-going waste treatment, storage and disposal. To overcome the limitations discussed above from traditional RCRA permits, the new Remedial Action Plans (RAPs) requirements in today's rule streamline the process for receiving a permit for treating, storing and disposing of remediation wastes, and require the facility owner/operator to submit significantly less information than for a traditional RCRA permit. However, the information submitted for a RAP application and RAP terms and conditions must be sufficient to ensure proper waste management of the remediation wastes involved during the life of the cleanup activities.

Furthermore, a facility seeking a traditional RCRA permit to manage remediation wastes on-site must investigate and cleanup their entire facility (facility-wide corrective action). This requirement can deter potential cleanups from happening at all. For instance, facility owners and operators may wish to clean up a small portion of their facility for any number of reasons, such as to avoid future liability, to free the property for sale or other uses, or because they simply wish to restore the environmental health of their property. However, they may not be willing to take on the burden of investigating and cleaning up their entire facility, when it is only a small portion they wish to voluntarily clean up, and they may be reluctant to conduct the cleanup under the RCRA corrective action program. Therefore, to encourage cleanups, under today's final rule, facilities that need a RCRA permit only to treat, store, or dispose of remediation wastes (remediation-only facilities) are not subject to the facility-wide corrective action requirement.

### B. How Has EPA Tried to Solve These Problems in the Past?

EPA has tried to solve these problems in the past through a series of regulations and policies; for example:

- The "Area of Contamination" (AOC) policy;
- The "contained-in" policy; and
- The regulations for Corrective Action Management Units (CAMUs), and temporary units.[1]

All of these regulations and policies help alleviate some of the problems facing cleanups, but none have completely solved these problems. (See the October 1997 report by the United States General Accounting Office, "Remediation Waste Requirements Can Increase the Time and Cost of Cleanups."[2])

The AOC policy allows important flexibility for activities done within a contiguous contaminated area. For example, hazardous remediation wastes may be consolidated or treated *in situ*

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[1] 61 FR 18780, 18782 (April 29, 1996), memorandum from Michael Shapiro, Director, Office of Solid Waste, Stephen D. Luftig, Director, Office of Emergency and Remedial Response, and Jerry Clifford, Director, Office of Site Remediation Enforcement, EPA to RCRA Branch Chiefs and CERCLA Regional Managers. (March 13, 1996); 55 FR 8666, 8758–8760 (March 8, 1990); and 58 FR 8658 (February 16, 1993).

[2] Hazardous Waste: Remediation Waste Requirements Can Increase the Time and Cost of Cleanups, U.S. General Accounting Office, GAO/RCED–98–4, October 1997.

within an AOC without triggering the LDRs or MTRs. However, the AOC policy does not address the permitting issues today's rule is addressing, nor does it address LDR and MTR for wastes removed from an AOC, or treated *ex situ.*

The contained-in policy defines when some contaminated media can be considered to no longer "contain" hazardous waste. When EPA or an authorized State determines that media do not "contain" hazardous waste, RCRA does not generally pose a barrier to remediation because permitting requirements, LDRs (generally), and MTRs do not apply to media that do not contain hazardous waste. However, the contained-in policy is limited to media only, and does not provide any flexibility for other remediation wastes, nor does it provide needed flexibility for highly concentrated media.

The CAMU and temporary unit rules provide much-needed flexibility for unit-specific standards at cleanup sites. CAMUs and temporary units are not subject to LDRs or MTRs. The requirements for these units are set on a site-specific basis, depending on site-specific factors such as the types of wastes being managed (for example, concentrations, volumes, other characteristics) and the period of time the unit will operate. However, CAMUs and temporary units do not address any of the permitting issues that cause problems for remediation wastes.

Because each of these regulations or policies is limited in solving the problems inherent to managing hazardous remediation waste under the RCRA Subtitle C system, EPA felt it was necessary to propose additional solutions.

### *C. How Did the Proposed Rule Attempt to Solve These Problems?*

EPA recognized a continuing need for further reforms than the regulations and policies discussed above had provided, and yet knew that these reforms would be controversial. In 1993, EPA convened a committee under the Federal Advisory Committee Act (FACA) to provide recommendations to EPA on how to make these reforms. The FACA Committee included representatives from environmental groups, regulated industry, the waste management industry, States, and EPA. The FACA Committee met numerous times between January 1993 and September 1994. EPA based the options in the April 29, 1996 HWIR-media proposal on the recommendations and discussions of the FACA Committee.

EPA presented several options for reforms in the HWIR-media proposal. EPA presented two comprehensive options (the Bright Line and the Unitary Approach), and requested comment on sub-options and issues within those comprehensive options.

#### 1. The "Bright Line" Approach for Contaminated Media

The first comprehensive option, which formed the basis for the proposed rule, was the "Bright Line" option. The Bright Line option would have been limited to "contaminated media" only. Contaminated media was defined to include soils, groundwater, and sediments, but not debris, nor other remediation wastes such as sludges. The Bright Line option got its name from a "line" dividing more highly contaminated media from less contaminated media. That Bright Line was a set of constituent-specific concentrations based on the risks from those constituents. Media found to contain constituents above these concentrations would have remained subject to Subtitle C management requirements (however, the proposal requested comment on some potential modifications to those requirements), and media containing constituents below the concentrations would have been eligible for a determination that it no longer "contained" hazardous waste, thereby generally removing it from Subtitle C jurisdiction.

The determinations of which media were and were not subject to Subtitle C requirements were to be documented in a Remediation Management Plan (RMP) approved by EPA or an authorized State. The RMP would have been an enforceable document that would also have included any requirements for managing media below the Bright Line, and would have served as a RCRA Subtitle C permit for treatment, storage or disposal of media above the Bright Line. The RMP process would have been more streamlined than that required for RCRA permits obtained under the current regulations, and also, at remediation-only facilities, would not have required 3004(u) and (v) facility-wide corrective action, as is required for all RCRA permits before today's rule.

#### 2. Other Options Within the "Bright Line" Approach

Other requirements that EPA proposed to modify were LDR treatment standards for soils that remained subject to Subtitle C requirements, standards applicable to on-site storage and/or treatment of cleanup wastes during the life of the cleanup, and State authorization requirements. New treatment standards would have applied to soils that remained subject to LDRs under the Bright Line approach. EPA also proposed a new unit called a "remediation pile." Remediation piles could have been used temporarily without triggering LDRs and MTRs, for the on-site treatment or storage of remediation wastes subject to Subtitle C. States picking up any revisions to their RCRA programs (the proposal was not limited to the revisions to remediation waste management programs) could have followed new streamlined authorization procedures. Also, EPA proposed to withdraw the CAMU regulations if the final HWIR-media rule would sufficiently replace the flexibility currently available under the CAMU rule.

Finally, EPA proposed excluding dredged materials from Subtitle C if they were managed under permits issued under the Clean Water Act (CWA) or Marine Protection Research and Sanctuaries Act (MPRSA).

#### 3. The "Unitary" Approach—An Alternative to the "Bright Line"

As an alternative to the Bright Line approach, EPA requested comment on the "Unitary Approach." The Unitary Approach excluded all remediation wastes (irrespective of the concentration of hazardous constituents in the waste and including non-media remediation wastes) managed under a Remedial Action Plan (RAP) (which was very similar to a RMP) from Subtitle C management requirements and made them subject to site-specific requirements in the RAP.

Again, EPA requested comment on the two main comprehensive options, the Bright Line and the Unitary Approach, and on all the sub-issues, such as the proposed elimination of CAMUs, and the new requirements for remediation piles, LDR, RMPs and RAPs, dredged materials, and State authorization.

### *D. What General Comments did EPA Receive About the Two Major Proposed Options?*

Some commenters supported the Bright Line option and thought it was appropriate to distinguish between highly contaminated media and media that were less contaminated, and to regulate them differently.

However, most commenters on the Bright Line option believed that the Bright Line would be too difficult to implement, and therefore should not be finalized. There were several elements of the Bright Line option that commenters were concerned about implementing. One concern was sampling to determine whether media was above or below the Bright Line.

Concentrations of contaminants in environmental media typically are not heterogeneous, and it is difficult to make assumptions about the concentrations of large areas of contamination without taking many samples.

Another concern was how to differentiate between media, debris, and other remediation wastes, such as sludges. Commenters stated that often these different types of remediation waste are all found at the same site and they will all need to be managed, and it would be unduly complicated to have to separate the different types of remediation wastes and manage them separately under separate regulatory requirements.

Also, commenters were concerned about the methodology that EPA used to determine the Bright Line levels themselves. EPA received many specific comments on the proposed Bright Line constituent specific numbers, as well as the choice of which constituents were assigned Bright Line numbers.

With regard to the Unitary Approach, many industry and State commenters supported the Unitary Approach, saying that the flexibility would greatly streamline cleanups and allow more appropriate decisions for managing remediation waste. These commenters emphasized that flexibility was needed so that States could develop cleanup programs with oversight and public participation requirements specific to the concerns, needs, and resources of individual States, and felt that the Unitary Approach most closely addressed those concerns. However, some commenters were concerned that the lack of any national requirements was too open-ended and would not guarantee protectiveness. Commenters were also concerned about the resources required for States and Regions to make site-specific determinations of the appropriate management requirements for remediation wastes at each different site.

Finally, commenters had many specific comments on the elements of these options such as RAPs and RMPs, remediation piles, LDRs, etc. Major comments and EPA's responses are summarized under those more specific sections of this preamble, and all comments are answered specifically in the "response to comments" document for today's rule.

### *E. What did EPA Decide to do After Considering Those Comments?*

EPA has decided to promulgate only selected elements of the HWIR-media proposal in today's rule, rather than go forward with a more comprehensive approach as proposed. EPA plans to complement the elements finalized today by leaving the CAMU regulations in place, rather than withdrawing these regulations as proposed.

Although EPA conducted a lengthy outreach process before developing the HWIR-media proposal and made every effort to balance the concerns and interests of various stakeholder groups, public comment on the proposal makes it clear that stakeholders fundamentally disagree on many remediation waste management issues.

EPA agreed with commenters' concerns that the Bright Line approach would be too difficult to implement, and that a Bright Line that would satisfy commenters who wanted the Bright Line levels to consist of very conservative levels would not sufficiently reform the system to remove the existing barriers to efficient, protective remediation waste management. EPA has concluded that pursuing broader regulatory reform would be a time- and resource-intensive process that would most likely result in a rule that would provoke additional years of litigation and associated uncertainty. This uncertainty would be detrimental to the program and have a negative effect on ongoing and future cleanups. Based on these conclusions, the Agency has decided not to finalize either the Bright Line or the Unitary Approach, and recognizes that a purely regulatory response will not solve all of the remediation waste management issues that HWIR-media was designed to solve.

While EPA believes the elements finalized today along with the retention of the CAMU rule, will improve remediation waste management and expedite cleanups, the Agency is also convinced that additional reform is needed to expedite the cleanup program, especially to provide greater flexibility for non-media remediation wastes like remedial sludges, address certain statutory permitting provisions, and more appropriate treatment requirements for remediation wastes (for example, treatment that focuses on "principal threats" rather than all underlying hazardous constituents). Therefore, the Agency continues to support appropriate, targeted legislation to address application of RCRA Subtitle C land disposal restrictions, minimum technological and permitting requirements to remediation waste and will continue to participate in discussions on potential legislation. If legislation is not forthcoming, the Agency may reexamine its approach to remediation waste regulation and may take additional administrative action.

The elements finalized in today's rule are:

- Streamlined permitting for treating, storing and disposing of remediation wastes generated at cleanup sites that, among other things, eliminates the requirement for facility-wide corrective action at remediation-only facilities;
- A variation on the proposed remediation piles, called staging piles, modified in response to public comments;
- A RCRA exclusion for dredged materials managed under Clean Water Act (CWA) or Marine Protection Research and Sanctuaries Act (MPRSA) permits; and
- Streamlined procedures for State authorization.

EPA also finalized, in a separate document (63 FR 28604 (May 26, 1998)), the LDR treatment standards specific to hazardous contaminated soil that were proposed in the HWIR-media proposal. EPA is deferring action on the Treatability Sample Exclusion Rule, that EPA requested comments on expanding in the HWIR-media proposal at 61 FR 18817.

EPA will withdraw all other portions of the proposal, such as the proposal under the Bright Line option to distinguish between lower- and higher-risk contaminated media and give regulatory agencies the flexibility to exempt lower-risk contaminated media from RCRA requirements, and the portion of the proposal that proposed to withdraw the CAMU rule.

Existing areas of flexibility for managing remediation waste, such as the contained-in and AOC policies, and site-specific land disposal restrictions treatability variances, continue to be available.

## III. Definitions Used in this Rule (§ 260.10)

Some terms defined in today's rule may be difficult to understand when discussed out of context of the rest of the rule; therefore, readers may wish to read the preamble sections on RAPs and staging piles before reading this section on definitions. To discuss related terms together in this preamble, discussion of the definitions is not in alphabetical order (which is how the terms appear in the rule language). The section discusses:

- First the revised definition of "corrective action management unit" or "CAMU," then
- The definition of "remediation waste," then
- "Remediation waste management site" and "facility," then
- "Staging pile," then finally,
- "Miscellaneous unit."

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

AUG 2 1 1998

OFFICE OF
SOLID WASTE AND EMERGENCY
RESPONSE

William R. Weissman
Piper & Marbury L.L.P.
1200 Nineteenth Street, N.W.
Washington, D.C. 20036-2430

Dear Mr. Weissman:

Thank you for your letter of May 11, 1998 and for meeting with us to discuss the Utility Solid Waste Activities Group's (USWAG's), Edison Electric Institute's (EEI's) and the American Gas Association's (AGA's) concerns regarding the effects the land disposal restrictions (LDR) treatment standards published on May 26, 1998 may have on cleanup of manufactured gas plant sites. Like you, we are interested in encouraging and facilitating cleanup of manufactured gas plant sites in a way that is both efficient, economical and protective of human health and the environment. Before addressing the specific concerns raised in your letter, we will review some of the general principles that govern application of RCRA to contaminated soil.

As you know, contaminated soil, of itself, is not hazardous waste and, generally, is not subject to regulation under RCRA. Contaminated soil can become subject to regulation under RCRA if the soil "contains" hazardous waste. EPA generally considers contaminated soil to contain hazardous waste: (1) when soil exhibits a characteristic of hazardous waste; and, (2) when soil is contaminated with hazardous constituents from listed hazardous waste above certain concentrations. 63 FR at 28617 (May 26, 1998).

If contaminated soil contains hazardous waste, then it is subject to all applicable RCRA requirements until the soil no longer contains hazardous waste (i.e., until the soil is decharacterized or, in the case of soil containing listed hazardous waste, until EPA or an authorized state determines that the soil no longer contains listed hazardous waste). In some circumstances, soil that no longer contains hazardous waste, while generally not subject to RCRA requirements, will remain subject to the land disposal restrictions. See 63 FR at 28618 (May 26, 1998) and other sources cited therein. This may be the case if contaminated soil from manufactured gas plants exhibits a hazardous characteristic when first generated (i.e., when first removed from the land) and is subsequently decharacterized. Note that if contaminated soil from manufactured gas plant sites does not exhibit a characteristic of hazardous waste or contain listed hazardous waste when first generated (i.e., when first removed from the land), then the soil is not subject to any RCRA requirements, including the land disposal restrictions. 63 FR 28618 (May

26, 1998)[1]

We understand that at some manufactured gas plant cleanup sites, soil is consolidated within an area of contamination prior to being removed from the land (i.e., generated). This practice, and the area of contamination policy generally, is not affected by the May 26, 1998 rulemaking. Contaminated soil may be consolidated within an area of contamination before it is removed from the land (i.e., generated); the determination as to whether the soil exhibits a characteristic of hazardous waste or contains listed hazardous waste may be made after such consolidation. The Agency's most recent guidance on the area of contamination policy is enclosed for your information.

We understand from our discussions that your concerns center around management of contaminated soil that exhibited a characteristic of hazardous waste when first generated but has subsequently been decharacterized. We will address two questions in this letter: (1) what are the Agency's rules and policies concerning land disposal of decharacterized wastes, including decharacterized contaminated soil and (2) when decharacterized contaminated soil remains subject to the land disposal restrictions, what requirements apply prior to land disposal.

## 1. What are the Agency's rules and policies concerning land disposal of decharacterized wastes, including decharacterized contaminated soil?

Decharacterized waste (and decharacterized contaminated soil) is not hazardous waste, and is generally not subject to the Subtitle C regulations. Nonetheless, as you are aware, under certain circumstances decharacterized wastes (and decharacterized contaminated soils) remain subject to LDR treatment requirements. See generally, Chemical Waste Management v. EPA, 976 F. 2d 2, 13-14 (D.C. Cir. 1992).

When decharacterized wastes (and decharacterized contaminated soils) remain subject to LDR treatment requirements (i.e., as explained above, when the soils exhibit a hazardous waste characteristic when removed from the land) they must meet applicable LDR treatment standards prior to land disposal, before they can be land disposed, (i.e., before they can be placed in a land disposal unit). RCRA 3004(k) defines land disposal to include, but not be limited to, any placement in a landfill, surface impoundment, waste pile, injection well, land treatment facility, salt dome formation, salt bed formation, or underground mine or cave. Furthermore, EPA has found, in other contexts, that open pits, flat or low walled concrete pads that do not effectively

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[1] The exception to this general rule is soil contaminated by listed hazardous waste when the listed hazardous waste is land disposed after the effective date of applicable LDR treatment requirements without meeting such applicable requirements. In this case, the contaminated soil would be subject to land disposal restriction treatment requirements regardless of whether it "contained" hazardous waste when first removed from the land unless there is a finding that hazardous constituent levels are sufficiently low so that threats to human health and the environment posed by land disposal of the soil are minimized. See 63 FR at 28618 (May 26, 1998). As we understand the conditions at most manufactured gas plant cleanup sites, we believe this case will seldom be presented during manufactured gas plant cleanups because soil at manufactured gas plant sites is not typically contaminated by listed hazardous waste.

contain hazardous wastes and hazardous constituents may constitute land disposal. See the enclosed letter from Sylvia Lowrance, U.S. EPA to Richard Wasserstrom dated October 29, 1992. However, EPA's longstanding view is that placement in tanks, containers, and containment buildings is not land disposal. See, e.g., 57 FR 37211 (August 18, 1992) (establishing standards for containment buildings). EPA has established design and operating requirements for tanks, containers and containment buildings used to treat and store hazardous waste. Clearly, units used for treatment or storage of decharacterized contaminated soil which meet these requirements would not be considered land disposal units and may be used to treat or store decharacterized contaminated soil without the approval of EPA or an authorized state. However, since decharacterized contaminated soil is no longer subject to regulation as hazardous waste (except, potentially, for land disposal treatment requirements), treatment and storage units used to manage decharacterized contaminated soil are not hazardous waste management units and do not have to be designed or operated in accordance with RCRA Subtitle C hazardous waste regulations or receive hazardous waste permits. If decharacterized contaminated soil will be treated or stored in a unit which is not a tank, container, or containment building, EPA or an authorized state should make a site-specific determination as to whether or not placement of decharacterized contaminated soil in the unit constitutes land disposal. In making such determinations, in addition to the mandatory consideration of the definition of land disposal in section 3004(k), EPA will consider (and recommends that authorized states similarly consider) the relevant requirements established by the Agency for tanks, containers, and containment buildings and, if these requirements are modified, whether the treatment or storage unit will prevent or control unacceptable releases of decharacterized contaminated soil and hazardous constituents to the environment. These determinations should be made in the context of your on-going MGP site cleanups and should be included in the public notices which are typically part of cleanup processes. We recognize that determinations about containment units will likely be made predominantly by authorized states and that due to site- and waste-specific variability containment units will have to accommodate the variety of conditions that may be presented during cleanup of MGP sites.

2. **When decharacterized contaminated soil remains subject to the land disposal restrictions, what requirements apply prior to land disposal ?**

When decharacterized contaminated soil remains subject to the land disposal restrictions, three types of requirements apply. First, the soil must be treated to meet applicable land disposal treatment standards prior to land disposal. Second, as discussed above, prior to land disposal the soil must be treated or stored in an appropriate type of unit (i.e., a unit that is not a land disposal unit). Third, to ensure that applicable land disposal treatment standards are met, certain tracking, paperwork and other requirements must be met.

**(a) Treatment to meet applicable land disposal treatment standards.** As just noted above, like any other material subject to the land disposal restrictions, decharacterized soils from MGP cleanup sites must be treated to meet applicable land disposal restriction treatment standards prior to land disposal. In the case of contaminated soils subject to the land disposal restrictions, generators may choose between meeting the universal treatment standard for the contaminating hazardous waste or meeting the alternative soil treatment standards. For decharacterized contaminated soils, meeting the universal treatment standard for the contaminating hazardous waste would require treatment of the formerly characteristic constituent and all underlying hazardous constituents to the universal treatment standards. Meeting the alternative soil treatment standards would require treatment of the formerly characteristic constituent and all underlying hazardous constituents to reduce constituent concentrations by 90 percent or to achieve ten times the universal treatment standard. Note that, as with any other material subject to the land disposal restrictions, contaminated soil may qualify for treatment variances under certain circumstances, see 40 CFR 268.44.

*(b) Storage and treatment prior to land disposal.* As discussed above, although decharacterized contaminated soil is not hazardous waste and, generally, is therefore not subject to RCRA Subtitle C requirements, because it remains subject to the land disposal restrictions, it must be stored and treated in appropriate units (i.e., units that are not land disposal units) until treatment standards are met.

**(c)Tracking, paperwork and other requirements.** If decharacterized contaminated soil is stored, the storage prohibition of RCRA 3004(j) generally applies. This means that the decharacterized contaminated soil can only be stored for the purpose of accumulating necessary quantities of hazardous wastes to facilitate proper recovery, treatment, or disposal. See 40 CFR 268.50.

For decharacterized contaminated soil, the reporting and record keeping requirements of 40 CFR 268.9 apply. For example, if characteristic soil from an MGP cleanup is decharacterized at the site where it was generated, then sent off-site for further treatment to achieve LDR standards in a thermal desorption unit, the generator of the contaminated soil must complete a one-time notification and certification. The one-time notification and certification provides a description of the soil as initially generated, including applicable hazardous waste codes, treatability groups, and underlying hazardous constituents. It also provides information about the facility which will receive, and treat, the decharacterized soil. Thus, in this example the generator of the contaminated soil would identify the facility operating the thermal desorption unit. A copy of the one time notification and certification must be placed in the generator's files and sent to the appropriate EPA region or authorized state. These requirements create a tracking system so EPA and authorized states can determine that materials subject to the land disposal restrictions arrive at the right place and are appropriately treated prior to land disposal.

Furthermore, the dilution prohibition of 40 CFR 268.3 applies to the decharacterized contaminated soil until applicable LDR treatment standards are achieved. As you are aware, dilution is normally prohibited as a means of achieving the LDR treatment standards, including for characteristic (and decharacterized) wastes. See Chemical Waste Management v. EPA, 976 F. 2d 2, 15-19 (D.C. Cir. 1992).

We understand that often decharacterized contaminated soils from MGP cleanup sites are returned to the utility's power plant and mixed with coal or other combustibles prior to burning in a utility boiler. The Agency does not consider this process a form of impermissible dilution. Mixing MGP waste with coal or other combustibles results in a physical change to the waste stream that makes the waste more amenable to combustion (which, in addition to being a type of energy recovery, is a form of treatment that destroys or removes the hazardous constituents), and thus facilitates proper treatment.

In addition to mixing with coal or other combustibles, other types of mixing or treatment of decharacterized contaminated soil may be permissible prior to final treatment, provided that these processes produce chemical or physical changes and do not merely (1) dilute the hazardous constituents into a larger volume of waste so as to lower the constituent concentration or (2) release excessive amounts of hazardous constituents to the air. If mixing or other pre-treatment is necessary to facilitate proper treatment (e.g., destruction or removal, such as burning in a boiler) in meeting the treatment standards then dilution is permissible. See 51 FR 40592 (November 7, 1986) and 53 FR 30911 (August 16, 1988).

Note that, in some instances, burning decharacterized contaminated soil mixed with coal in a utility boiler may implicate the Bevill amendment. As you are aware, EPA's position is that wastes which are covered by the Bevill amendment are not subject to LDR requirements. 40 CFR 268.1(b); see also Horsehead Resource Development Co. v. Browner, 16 F. 3d 1246, 1260-61 (D.C. Cir. 1994 ) (upholding EPA's position). Consequently, if decharacterized contaminated soil is burned in utility boilers along with coal and the resulting combustion ash is within the scope of the Bevill amendment, LDR standards do not have to be met for that ash, nor would the decharacterized contaminated soils be considered to be a prohibited waste. In this case, the only reporting and recordkeeping requirement required is a one-time notice kept in the facility's records. See 40 CFR 268.7 (a)(7).

We appreciate your patience with the Agency in responding to your concerns. If you need further assistance, please contact Rita Chow of my staff at (703) 308-6158.

Sincerely,

Elizabeth A. Cotsworth
Acting Director
Office of Solid Waste

Enclosure (2)

530-Z-98-001

federal register

Tuesday
May 26, 1998

## Part II

# Environmental Protection Agency

40 CFR Parts 148, 261, 266, 268, and 271

## Land Disposal Restrictions Phase IV: Final Rule Promulgating Treatment Standards for Metal Wastes and Mineral Processing Wastes; Mineral Processing Secondary Materials and Bevill Exclusion Issues; Treatment Standards for Hazardous Soils, and Exclusion of Recycled Wood Preserving Wastewaters; Final Rule

EPA also emphasizes that any dilution of a prohibited contaminated soil (or of a prohibited hazardous waste with soil) as a substitute for adequate treatment to achieve compliance with LDR treatment standards or to circumvent the effective date of an LDR prohibition is considered a type of impermissible dilution and is illegal. Therefore, any deliberate mixing of prohibited hazardous waste with soil in order to change its treatment classification (i.e., from waste to contaminated soil) is illegal. Existing regulations concerning impermissible dilution already make this point. See 40 CFR 268.3(a) and (b); see also 57 FR at 37243 (Aug. 18, 1992) (adopting the same principle for contaminated debris). The Agency expects that deliberate mixing of hazardous waste with soil (and vice versa) will be rare because such actions are clearly illegal and would subject generators to substantial fines and penalties, including criminal sanctions. In addition, the resulting mixture (hazardous waste impermissible diluted by soil) would continue to be subject to the LDRs for the original hazardous waste (i.e., generally, the universal treatment standards), so no benefit in terms of reduced treatment requirements would occur. The Agency took a similar approach when promulgating treatment standards specific to hazardous debris. See 57 FR at 37224 (August 18, 1992).

The Agency notes that the normal mixing of contaminated soil from various portions of a site that typically occurs during the course of remedial activities or in the course of normal earthmoving and grading activities is not considered intentional mixing of soil with non-media or prohibited soil with non-prohibited soil and, therefore, is not a type of impermissible dilution.

### *D. Seeking Treatment Variances Because the National Treatment Standard is Unachievable or Inappropriate*

Under existing regulations at 40 CFR 268.44, people may obtain a variance from a land disposal restriction treatment standard when a waste cannot be treated to the specified level or when a treatment standard may be inappropriate for the waste. With respect to contaminated soils, EPA has to this point presumed that a treatment variance would generally be needed because the LDR treatment standards developed for process wastes were either unachievable (generally applied to soil contaminated by metals) or inappropriate (generally applied to soil contaminated by organic constituents). See, for example, 55 FR 8760 (March 8, 1990); 58 FR 48092, 48125 (September 14, 1993); 61 FR 18805–18808, 18810–18812 (April 29, 1996); and, 61 FR 55717 (October 28, 1996). This presumption will no longer apply once today's soil treatment standards take effect. This is because today's standards were developed specifically for contaminated soils and are intended to specifically address the past difficulties associated with applying the treatment standards developed for process waste to contaminated soil.

This is not to say that treatment variances based on the "unachievable" or "inappropriate" prongs of the test are now unavailable for contaminated soils. For example, in some cases it may prove that even though an appropriate technology, suited to the soil matrix and constituents of concern was used, a particular soil cannot be treated to meet the soil treatment standards using a well-designed well-operated application of one of the technologies EPA considered in establishing the soil standards. In these types of cases, under existing regulations, the soil treatment standard would be considered "unachievable" and a treatment variance could be approved. In other cases, under existing regulations, application of the soil treatment standards might be "inappropriate" in that, for example, it would present unacceptable risks to on-site workers.

As noted earlier in today's preamble, alternative LDR treatment standards established through treatment variances must, according to 40 CFR 268.44(m), "minimize threats to human health and the environment posed by land disposal of the waste." In cases where an alternative treatment standard does not meet this requirement, a treatment variance will not be approved even though application of a technology more aggressive than the technologies on which the soil treatment standards are based might then be necessary. For example, in cases where the soil treatment standards cannot be achieved through application of a well-designed, well-operated application of one of the model soil treatment technologies and application of the model technology or other non-combustion technologies will not result in constituent concentrations that minimize threats, a variance would not be approved and combustion would be necessary. This is proper given that the soil treatment standards were not developed using the methodology typically used in the land disposal restriction program (i.e., application of the most aggressive treatment technology to the most difficult to treat waste), but, instead are designed to accommodate a variety of soil treatment technologies that are typically used during remediation. Variances for treatment of contaminated soil will be applied during the remedial context, where, as discussed in Section VII.B.3 of today's preamble, EPA and authorized states will typically have detailed information about the risks posed by specific hazardous constituents, direct and indirect exposure routes, risk pathways and human and environmental receptors. This information can be used to inform decisions about whether threats are minimized.

### *E. The Contained-In Policy*

The contained-in principle is the basis for EPA's longstanding interpretation regarding application of RCRA Subtitle C requirements to mixtures of contaminated media and hazardous wastes. Under the "contained-in" policy, EPA requires that soil (and other environmental media), although not wastes themselves, be managed as if they were hazardous waste if they contain hazardous waste or exhibit a characteristic of hazardous waste. See, for example, 53 FR 31138, 31148 (August 17, 1988) and 57 FR 21450, 21453 (May 20, 1992) (inadvertently citing 40 CFR 261(c)(2) instead of 40 CFR 261.3(d)(2)); see also Chemical Waste Management v. EPA, 869 F.2d 1526, 1539–40 (D.C. Cir. 1989) (upholding the contained-in principle as a reasonable interpretation of EPA regulations). In practice, EPA has applied the contained-in principle to refer to a process where a site-specific determination is made that concentrations of hazardous constituents in any given volume of environmental media are low enough to determine that the media does not "contain" hazardous waste. Typically, these so called "contained-in" determinations do not mean that no hazardous constituents are present in environmental media but simply that the concentrations of hazardous constituents present do not warrant management of the media as hazardous waste.[46] For contaminated soil, the result of "contained-in determinations" is that soil no longer "contains" a

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[46] Of course, as noted earlier, EPA or an authorized state could determine, at any time, that any given volume of environmental media did not contain (or no longer contained) any solid or hazardous waste (i.e., it's just media). These types of determinations might be made, for example, if concentrations of hazardous constituents fall below background levels, or are at non-detectable levels. Such a determination would terminate all RCRA Subtitle C requirements, including LDRs. See, September 15, 1995 letter from Michael Shapiro (EPA) to Peter Wright (Monsanto Company), making this finding, and 61 FR 18806 (April 29, 1996).

hazardous waste; however, as discussed above, the result is not automatically that soil no longer must comply with LDRs.

In order to preserve flexibility and because EPA believes legislative action is needed, the Agency has chosen, at this time, not to go forward with the portions of the September 14, 1993 or April 29, 1996 proposals that would have codified the contained-in policy for contaminated soils. The Agency continues to believe that legislation is needed to address application of certain RCRA subtitle C requirements to hazardous remediation waste, including contaminated soil. If legislation is not forthcoming, the Agency may, in the future, re-examine its position on the relationship of the contained-in policy to site-specific minimize threat determinations based on implementation experience and/or may choose to codify the contained-in policy for contaminated soil in a manner similar to that used to codify the contained-in policy for contaminated debris.

### 1. Current Guidance on Implementation of the Contained-in Policy

EPA has not, to date, issued definitive guidance to establish the concentrations at which contained-in determinations may be made. As noted above, decisions that media do not or no longer contain hazardous waste are typically made on a case-by-case basis considering the risks posed by the contaminated media. The Agency has advised that contained-in determinations be made using conservative, health-based levels derived assuming direct exposure pathways. 61 FR at 18795 (April 29, 1996) and other sources cited therein. A compilation of many of the Agency's statements on the contained-in policy has been placed in the docket for today's rulemaking.

The land disposal restriction treatment standards for contaminated soil promulgated today do not affect implementation of the contained-in policy. They are not considered, and should not be used, as de facto "contained-out" concentrations although, in some cases, it may be appropriate to determine that soil treated to the soil treatment standards no longer contains hazardous waste. Remediation project managers should continue to make contained-in decisions based on site-specific conditions and by onsidering the risks posed by any given ontaminated media.

### 2. Relationship of the Contained-In Policy to Site-Specific, Risk-Based Minimize Threat Determinations

As discussed above, the D.C. Circuit held in the Chemical Waste opinion that the RCRA Section 3004(m) obligation to minimize threats can continue even after a waste would no longer be identified as "hazardous." Chemical Waste Management v. EPA, 976 F.2d at 13–16. The Agency believes that it is prudent to apply the logic of the Chemical Waste opinion to contaminated soil. Therefore, when the contained-in policy is applied to soil that is already subject to a land disposal prohibition, the Agency is compelled to decide if a determination that soil does not or no longer "contains" hazardous waste is sufficient to determine that threats posed by subsequent land disposal of those soils have been minimized. As discussed earlier in today's preamble, EPA is not, at this time, able to make a generic finding that all contained-in determinations will automatically satisfy this standard. This is largely because, for reasons of needed administrative flexibility and because we believe legislation is needed, EPA has not codified standards for approving contained-in determinations and has not codified procedures for making such determinations. Absent such standards and procedures, the Agency cannot, at this time, make a generic finding that all contained-in determinations will result in constituent concentrations that also minimize threats within the meaning of RCRA Section 3004(m). These decisions, of course, could be made on a site-specific basis, by applying the standards and procedures for site-specific, risk-based minimize threat variances, promulgated today.

The regulations governing site-specific, risk-based minimize threat determinations promulgated today are, essentially, the same as the Agency's guidance for making contained-in determinations. See, for example, 61 FR 18795 (April 29, 1996) and other sources cited therein. That is, decisions should be made by considering the inherent risks posed by any given soil, assuming direct exposure (i.e., no post-land disposal controls) and applying conservative information to calculate risk. Therefore, the Agency expects that, in most cases, a determination that soils do not (or no longer) contain hazardous waste will equate with minimize threat levels and, therefore, encourages program implementors to combine contained-in determinations, as appropriate, with site-specific, risk-based minimize threat variances.

### *F. Relationship of Soil Treatment Standards to the Final HWIR-Media Rule*

In the April 29, 1996 HWIR-Media proposal, EPA proposed to establish a comprehensive alternative management regime for hazardous contaminated media, of which the treatment standards for contaminated soil would have been a small part. The HWIR-Media proposal discussed a number of options for comprehensive management standards for hazardous contaminated media.

Today's action resolves and finalizes the portion of the HWIR-Media proposal that addressed land disposal restriction treatment standards for contaminated soil. See 61 FR 18805–18814, April 29, 1996. Other portions of the proposal are not resolved by this action and will be addressed by EPA in future actions. EPA continues to emphasize that, while the soil-specific LDR treatment standards will improve contaminated soil management and expedite cleanups, the Agency also recognizes that additional reform is needed, especially for management of non-media remediation wastes like remedial sludges. The Agency will continue to participate in discussions on potential legislation to promote this additional needed reform.

## VIII. Improvements and Corrections to LDR Regulations

*Summary:* The regulated community has pointed out several examples of the LDR regulations that were unclear or had typographical errors. These sections are clarified and corrected below.

### *A. Typographical Error in Section 261.1(c)(10)*

A typographical error was found in the cross reference in the note in § 261.1(c)(10). The first Phase IV final rule ("Minirule," 62 FR 25998) said "They are covered under the exclusion from the definition of solid waste for shredded circuit boards being recycled (261.4(a)(13))." The correct cross reference is to "(261.4(a)(14)." This typographical error is corrected in this final rule.

### *B. Typographical Error in Section 268.4(a)(2)(ii) and (a)(2)(iii)*

These paragraphs have referred to § 268.8 for some time. Section 268.8 was where the so called "soft hammer" provisions were once found in the regulations. These provisions expired in 1990, and the provisions have been removed from the regulations; thus there is no need to continue to include references to § 268.8.

federal register

Monday
April 29, 1996

## Part II

# Environmental Protection Agency

40 CFR Part 260, et al.
Requirements for Management of Hazardous Contaminated Media; Proposed Rule

media would again become subject to Subtitle C regulation. Understanding the role of the Bright Line and the contained-in principle is essential to understanding how today's proposal would work. Both the contained-in principle and the Bright Line are explained below.

a. The contained-in principle in today's proposed rule background. The contained-in principle is the basis for EPA's longstanding policy regarding the application of RCRA Subtitle C requirements to mixtures of environmental media (e.g., soils, ground water, sediments) and hazardous wastes. This concept has been discussed previously in several Agency directives and in several RCRA rulemakings. (See, e.g., 58 FR 48092, 48127 (September 14, 1993)). In today's proposed rule the Agency is expanding this concept as the basis for allowing EPA or an authorized State to exempt certain contaminated media from the stringent, prevention-oriented RCRA regulations for hazardous waste management that previously would have applied.

The contained-in concept was originally developed to define the regulatory status of environmental media that are contaminated with hazardous wastes. The mixture rule at 40 CFR 261.3(a)(2)(iv) states that "a mixture of solid waste and one or more [listed] hazardous wastes" constitutes a listed waste itself (emphasis added). Similarly, the derived-from rule at 40 CFR 261.3(c)(2)(i) provides that "a solid waste generated from the treatment, storage, or disposal of a hazardous waste" is a hazardous waste (emphasis added).

Since media are not solid wastes, these rules do not apply to mixtures of media and hazardous wastes. However, two other regulations subject contaminated media to Subtitle C requirements. Under 40 CFR 261.3(c)(1) a "hazardous waste will remain a hazardous waste" unless and until certain specified events occur. Under 40 CFR 261.3(d)(2) a "waste which contains" a listed waste remains a hazardous waste until it is delisted. Together these regulations provide for continued regulation of hazardous wastes even after they are released to the environment and mingled with media.

The U.S. Court of Appeals for the District of Columbia Circuit upheld this interpretation of §§ 261.3(c)(1) and (d)(2) in *Chemical Waste Management Inc.* v. *EPA*, 869 F.2d 1526, 1538–40 (D.C. Cir. 1989), and EPA has explained the policy and its regulatory basis in numerous preambles and letters. (See 53 FR 31138, 31142, 31148 (Aug. 17, 1988); 57 FR 21450, 21453 (May 20, 1992) (inadvertently citing 40 CFR 261(c)(2) in lieu of § 261.3(d)(2)); memorandum from Marcia E. Williams, Director, EPA Office of Solid Waste, to Patrick Tobin, EPA Region IV (Nov. 15, 1986); letter from Jonathan Z. Cannon, EPA Acting Assistant Administrator, Office of Solid Waste and Emergency Response, to Thomas Jorling, Commissioner, New York Department of Environmental Conservation (June 19, 1989); and letter from Sylvia K. Lowrance, Director, EPA Office of Solid Waste, to John Ely, Enforcement Director, Virginia Department of Waste Management (Mar. 26, 1991). Under the contained-in policy, media contaminated with listed hazardous wastes are not wastes themselves, but they contain hazardous wastes and must therefore be managed as hazardous wastes until they no longer contain the waste. This concept is based on the idea that at some point (e.g., at some concentration of hazardous constituents) the media would no longer contain the hazardous waste, or be subject to RCRA Subtitle C regulations.

Because the regulations that serve as the basis for the contained-in policy are part of the "base" RCRA program that was in effect prior to 1984, the Agency has taken the position that EPA or the State agency authorized to administer the "base" RCRA regulations may determine whether media contain listed wastes. Decisions that media no longer contain listed hazardous wastes (or "contained-in" decisions) have typically been made on a case-by-case basis, according to the risks posed by the contaminated media. The Agency has not issued any definitive guidance or regulations for determining appropriate contained-in levels; however, EPA Regions and States have been advised that conservative, health-based levels derived from direct exposure pathways would clearly be acceptable as "contained-in" levels. (See memorandum from Sylvia K. Lowrance to Jeff Zelikson, Region IX, (January 24, 1989)). It has been the common practice of EPA and many States to specify conservative, risk-based levels calculated with standard conservative exposure assumptions (usually based on unrestricted access), or site-specific risk assessments.

With regard to mixtures of media and characteristic wastes, EPA has often stated that media are regulated under RCRA Subtitle C if they exhibit a hazardous waste characteristic. (See 57 FR 21450, 21453, (May 20, 1992)). But, since media generally are not wastes, they become regulated when they have been contaminated with solid or hazardous wastes and the resultant mixture exhibits a characteristic. EPA has also taken the position that contaminated media cease to be regulated as hazardous waste when sufficient quantities of hazardous constituents are removed so that the mixture ceases to exhibit a characteristic[8] (57 FR 21450, 21453, May 20, 1992).

The contained-in concept in today's proposed rule. One of the primary objectives of today's proposal is to remove lower risk contaminated media from Subtitle C jurisdiction so that more appropriate, site-specific management requirements can be specified by the overseeing Agency. For the purpose of this rulemaking EPA has chosen to use the contained-in concept as the basis for allowing these materials to be exempted from Subtitle C requirements. In formulating the proposal, the Agency considered alternative concepts that might be provided under the RCRA statute that would produce the same or similar exemption. Those concepts are discussed in section (VI)(A)(2) of this preamble.

Today's proposal would allow two separate regulatory regimes to be applied to the management of contaminated media under EPA or State-approved cleanups. For media determined to contain hazardous wastes, modified LDR treatment standards would apply, as would other applicable Subtitle C requirements. For media determined not to contain hazardous wastes, Subtitle C requirements would generally not apply, and the State or EPA would have considerable discretion in applying appropriate management standards.

The proposed rule would limit an overseeing agency's discretion to make site-specific decisions that media no longer contain wastes by specifying "Bright Line" concentration levels. Media that are contaminated below Bright Line concentrations would be eligible for contained-in decisions by the overseeing Agency. However, Bright Line concentrations would not constitute an automatic exemption from Subtitle C; rather, they would represent the concentration below which the State or EPA might determine that media do not contain hazardous waste.

As described below, EPA believes it would generally be acceptable to make a decision that media do not contain hazardous waste at the Bright Line concentrations specified in today's proposal. However, the proposed rule is

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[8] Recent developments under the RCRA land disposal restrictions (LDRs) may suggest a qualification to this latter point. (See discussion of LDRs in section (V)(C) of today's preamble.)

designed to provide for site-specific discretion in making such decisions. Thus, it is possible that some States might choose to specify—on a site-specific basis, more broadly as a matter of policy, or in regulations—contained-in levels that are lower (i.e., more stringent) than the Bright Line concentrations specified in today's proposal. Moreover, States can be more stringent than the Federal program, and adopt lower Bright Line concentrations.

In applying the contained-in concept, today's proposed rule does not distinguish between media that are contaminated with listed hazardous wastes, and media that exhibit a hazardous waste characteristic. In both cases, it is the concentration levels of the individual hazardous constituents in the media that determine how the media will be regulated under Part 269. The origin of the constituents (i.e., listed wastes or characteristic hazardous wastes) is irrelevant in comparing measured levels in the media with Bright Line concentrations and/or contained-in concentrations.

EPA sees no reason to apply the Bright Line concept differently to media contaminated with listed hazardous wastes and media that exhibit a hazardous characteristic. In either case the media could presumably be contaminated with the same types of hazardous constituents, at similar concentrations, that would present similar potential risks if mismanaged. Thus, applying these rules differently, depending on how the media came to be regulated as hazardous, would be unnecessary and artificial, and would further complicate how these rules would be implemented in the field.

EPA recognizes that today's rule could have the effect of excluding from Subtitle C regulation some media that until now have been considered hazardous—i.e., media that exhibit a hazardous waste characteristic, with constituent concentrations below the Bright Line and EPA or the State makes a determination that the media no longer contain hazardous waste (often based on protective management controls). However, EPA believes that there is no compelling environmental rationale for not including such media in Part 269 regulation. The risk presented even by characteristic wastes is dependent on site-specific circumstances. Therefore, because today's proposal would require the Director to impose any management controls on contaminated media that are necessary to protect human health and the environment, whether the media is contaminated with listed or characteristic waste is unimportant.

Under today's proposed rule, contained-in decisions would be documented in the site's approved Remediation Management Plan (RMP). If an approved RMP expires or is terminated, the provisions of today's proposal would no longer apply. Therefore, all contaminated media that are addressed in the RMP (i.e., media that are contaminated both above and below contained-in concentrations) would again prospectively be subject to the "base" Subtitle C regulations. For example, if a cleanup of contaminated soil was half completed when a RMP was terminated or expired, the half that was completed in compliance with the RMP while it was in effect, would continue to be considered to be in compliance. For example, if contaminated soil was determined not to contain hazardous waste, and was disposed of in a Subtitle D landfill according to the requirements of the RMP, that Subtitle D landfill would not be considered retroactively to have accepted hazardous wastes. The half of the cleanup that was not completed when the RMP was terminated or expired, however, would have to be completed prospectively in compliance with the non-Part 269 Subtitle C regulations.

Effect of contained-in decisions under today's rule. Once the overseeing Agency has made a decision that media with constituents at certain concentrations no longer contain hazardous wastes (i.e., "a contained-in decision"), the media would no longer be regulated as hazardous wastes under Federal RCRA regulations (§ 261.4(g) and § 269.4(a)).[9] The Agency requests comments, however, on whether the Agency should exempt the media instead, only if it were managed in compliance with the provisions of the RMP. The Agency did not propose this approach primarily because it could be unduly harsh, since any violation, no matter how minor, would result in a reversion to Subtitle C. However, this approach could be incorporated into RMPs on a case-by-case basis, where the Director could specify in the RMP the provision(s) who's violation would result in a reversion to Subtitle C regulation. (See discussion below).

A contained-in decision for wastes at a cleanup site would not, however, eliminate the Administrator's authority to require the owner/operator (or other responsible parties at sites not regulated by RCRA) to conduct remedial actions for media that do not contain hazardous wastes. Specifically, Federal cleanup authorities under RCRA section 3004(u) at TSDFs, section 7003, and CERCLA authorities, authorize the Agency to require cleanup of a broad spectrum of hazardous constituents and/or hazardous substances, however, the presence of hazardous waste(s) in media is not a requirement for exercising those authorities. Many State cleanup authorities have similar provisions.

Decision factors for contained-in decisions. Because the Agency does not want to constrain site-specific decision-making, today's proposed rule would not mandate specific factors for making contained-in decisions, but would allow the Director to base these decisions on appropriate site-specific factors. However, EPA requests comments on whether decision factors should be codified for making contained-in decisions. EPA believes that the Bright Line concentrations will generally be acceptable for contained-in decisions; however, decision factors could help authorities determine, on a site-specific basis, what types of management controls (see discussion below), if any, would make the Bright Line concentrations appropriate concentrations at which to make contained-in decisions. Decision factors could also aid in determining other appropriate levels at which to make contained-in decisions.

Given the multiplicity of different types of sites, EPA requests comments on what decision factors, if the Agency decided to include them in the final rule, would ensure consistent decision-making, and yet keep the process efficient and flexible. Although EPA does not believe it would be appropriate to do a risk assessment at every site, particularly if the cleanup is of a relatively simple nature, the Agency does believe that the following factors (adapted from the LDR proposal for hazardous soils) contain the types of information that may be appropriate (depending on the specific circumstances at a given site) to consider in making contained-in decisions:

—Media properties;
—Waste constituent properties (including solubility, mobility, toxicity, and interactive effects of constituents present that may affect these properties);
—Exposure potential (including potential for direct human contact, and potential for exposure of sensitive environmental receptors, and the

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[9] The Agency notes, however, that by explicitly providing in § 261.4 that decisions under Part 269 that media no longer contain hazardous waste are not subject to most Subtitle C regulations, EPA would not intend to affect in any way the authority of EPA and authorized States to make contained-in decisions outside of the HWIR-media context.

effect of any management controls which could lessen this potential);

—Surface and subsurface properties (including depth to groundwater, and properties of subsurface formations);

—Climatic conditions;

—Whether the media pose an unacceptable risk to human health and the environment; and

—Other site or waste-specific properties or conditions that may affect whether residual constituent concentrations will pose a threat to human health and the environment.

Most of these factors were proposed in the LDR proposal for hazardous soil (58 FR 48092, September 14, 1993) as decision factors that might be considered by the Director in making contained-in decisions. If the proposal for hazardous soil had been finalized, it would have codified the contained-in principle for hazardous soil. Today's suggested factors differ from those in the hazardous soil proposal in one significant respect. The Agency has determined that it may be appropriate, when assessing "exposure potential," to consider site-specific management controls imposed by the Director that limit potential exposures of human or environmental receptors to media. The Agency made this change because EPA believes that States overseeing cleanups might determine that media that would have traditionally been considered to contain hazardous waste (e.g., media that contained listed wastes and posed an unacceptable risk under traditional exposure scenarios) no longer presented a hazard (and thus did not contain "hazardous" waste), based on site-specific management controls imposed by the Director.

This position is based upon EPA's understanding that RCRA provides EPA and the States the discretion to determine that a waste need not be defined as "hazardous" where restrictions are placed on management such that no improper management could occur that might threaten human health or the environment. (See definition of hazardous waste at RCRA section 1004(5)(B)). The HWIR-waste proposal included a full discussion of the legal basis for this position. For the sake of clarity, it is repeated below (60 FR 66344–469, Dec. 21, 1995).

EPA's original approach to determining whether a waste should be listed as hazardous focused on the inherent chemical composition of the waste, and assumed that mismanagement would occur, causing people or organisms to come into contact with the waste's constituents. (See 45 FR 33084, 33113, (May 19, 1980)). Based on more than a decade of experience with waste management, EPA believes that it is inappropriate to assume that worst-case mismanagement will occur. Moreover, EPA does not believe that worst-case assumptions are compelled by statute.

In recent hazardous waste listing decisions, EPA identified some likely "mismanagement" scenarios that are reasonable for almost all wastewaters or non-wastewaters, and looked hard at available data to determine if any of these are unlikely for the specific wastes being considered, or if other scenarios are likely, given available information about current waste management practices. (See the Carbamates Listing Determination (60 FR 7824, February 9, 1995) and the Dyes and Pigments Proposed Listing Determination (59 FR 66072, December 22, 1994)). Further extending this logic, EPA believes that when a mismanagement scenario is not likely, or has been adequately addressed by other programs, the Agency need not consider the risk from that scenario in deciding whether to classify the waste as hazardous.

EPA believes that the definition of "hazardous waste" in RCRA section 1004(5) permits this approach to hazardous waste classification. Section 1004(5)(B) defines as "hazardous" any waste that may present a substantial present or potential hazard to human health or the environment "when improperly * * * managed." EPA reads this provision to allow it to determine the circumstances under which a waste may present a hazard and to regulate the waste only when those conditions occur. Support for this reading can be found by contrasting section 1004(5)(B) with section 1004(5)(A), which defines certain inherently dangerous wastes as "hazardous" no matter how they are managed. The legislative history of Subtitle C of RCRA also appears to support this interpretation, stating that "the basic thrust of this hazardous waste title is to identify what wastes are hazardous in what quantities, qualities, and concentrations, and the methods of disposal which may make such wastes hazardous." H. Rep. No. 94–1491, 94th Cong., 2d Sess.6 (1976), reprinted in, "A Legislative History of the Solid Waste Disposal Act, as Amended," Congressional Research Service, Vol.1, 567 (1991) (emphasis added).

EPA also believes that section 3001 gives it flexibility in order to consider the need to regulate as hazardous those wastes that are not managed in an unsafe manner (section 3001 requires that EPA decide, in determining whether to list or otherwise identify a waste as hazardous waste, whether a waste "should" be subject to the requirements of Subtitle C). EPA's existing regulatory standards for listing hazardous wastes reflect that flexibility by allowing specific consideration of a waste's potential for mismanagement. (See § 261.11(a)(3) (incorporating the language of RCRA section 1004(5)(B)) and § 261.11(c)(3)(vii) (requiring EPA to consider plausible types of mismanagement)). Where mismanagement of a waste is implausible, the listing regulations do not require EPA to classify a waste as hazardous, based on that mismanagement scenario.

Two decisions by the U.S. Court of Appeals for the District of Columbia Circuit provide potential support for the approach to defining hazardous waste. in *Edison Electric Institute* v. *EPA*, 2 F.3d 438, (D.C. Cir. 1993) the Court remanded EPA's RCRA Toxicity Characteristic ("TC") as applied to certain mineral processing wastes because the TC was based on modeling of disposal in a municipal solid waste landfill, yet EPA provided no evidence that such wastes were ever placed in municipal landfills or similar units. This suggests that the Court might approve a decision to exempt a waste from Subtitle C regulation if EPA were to find that mismanagement was unlikely to occur. In the same decision the Court upheld a temporary exemption from Subtitle C for petroleum-contaminated media because such materials are also subject to Underground Storage Tanks regulations under RCRA Subtitle I. The court considered the fact that the Subtitle I standards could prevent threats to human health and the environment to be an important factor supporting the exemption. *Id.* At 466. In *NRDC* v. *EPA*, 25 F.3d 1063 (D.C. Cir. 1994) the Court upheld EPA's finding that alternative management standards for used oil promulgated under section 3014 of RCRA reduced the risks of mismanagement and eliminated the need to list used oil destined for recycling. (The Court, however, did not consider arguments that taking management standards into account violated the statute because petitioners failed to raise that issue during the comment period.)

The Agency believes, therefore, that EPA and the States may consider site-specific management controls when making contained-in decisions pursuant to proposed Part 269. EPA believes that this approach is especially appropriate in the Part 269 context, because of the significant level of oversight generally given to cleanup actions. Management controls that are tailored to site-specific circumstances and imposed in enforceable documents, and State or EPA oversight of cleanup activities, would ensure that the site-specific management controls that the Director relied upon in making each contained-in decision would continue to be implemented. In addition (although EPA is not proposing to require it as a federal matter), States may want to consider making such contained-in decisions conditional; i.e., media would only be considered nonhazardous so long as they were managed in the manner considered by the Director in making the contained-in decision. Deviations (any, or specific ones) would result in a reversion to Subtitle C regulation.

EPA specifically requests comments on the following: (1) Should the Agency specify a list of criteria to consider; (2) should the Agency prepare decision factors as guidance; (3) should the Agency promulgate decision factors as part of the final rule; (4) are the above decision factors appropriate for making these decisions; (5) if so, should the criteria listed above be more or less specific regarding the conditions that would allow or preclude contained-in decisions; (6) are there other factors the Director should consider when making contained-in decisions, in addition to those listed above; and (7) should there be fewer factors to consider?

*b. Issues associated with hazardous debris.* When EPA promulgated land disposal treatment standards for hazardous debris, it also codified the contained-in principle for debris contaminated with listed hazardous waste. (See 57 FR 37194, 37221, (August 18, 1992)). At the time EPA codified the contained-in principle for hazardous debris, it was the Agency's practice to make contained-in decisions at "health-based,"[10] levels, thus a decision that debris no longer contain hazardous waste would clearly also constitute a "minimize threat" determination for purposes of RCRA section 3004(m). Therefore, contained-in decisions under 40 CFR 260.3(f)(3) also eliminate the duty to comply with the land disposal restriction requirements of 40 CFR Part 268. EPA requests comments on whether the contained-in principle codified for hazardous debris is adequate or whether the contained-in policy should be applied to debris in the same way today's proposed rule applies it to hazardous contaminated media. For example, should contained-in decisions for debris incorporate the Bright Line concept? If a Bright Line is established for debris, should it be the same as the Bright Line in today's proposed rule for hazardous contaminated media or would some other Bright Line values or methodology be more appropriate for debris? Are there issues associated with requiring that debris be tested to determine if it has constituent concentrations greater than Bright Line concentrations? Is testing routinely too complicated for debris matrices? Should contained-in decisions for debris be based on determinations made for media co-located with the debris (i.e., if debris were located in the same area as media that was determined not to contain hazardous wastes, should the debris be presumed not to contain hazardous wastes)? Similarly, if debris is located in the same area as media that have constituent concentrations less than Bright Line concentrations, should the debris be presumed to also be below the Bright Line?

Alternatively, should the Director be able to make contained-in decisions, as they are described in today's proposed rule, without application of the Bright Line to debris (as we are proposing for sediment? (See preamble (V)(A)(4)(c)). If allowed, should these contained-in decisions replace the existing contained-in decisions available for debris or should the existing contained-in decisions be maintained with non-Bright Line contained-in decisions (as discussed in today's proposed rules addressing sediments—see preamble (V)(A)(4)(c)) available for debris managed under a RMP? Are other combinations of the existing debris contained-in decision provisions and the contained-in decision provision for media in today's proposed rule appropriate?

While today's proposed rule does not include changes to the existing contained-in principle as applied to debris contaminated with listed hazardous waste, EPA could include revisions to the standard in response to public comment. Issues associated with hazardous debris and the possibility of including debris in the final Part 269 rules are also discussed in sections (V)(C)(10) and (V)(A)(2) of today's preamble.

*c. The Bright Line.* One of the key features of the "Harmonized Approach" developed through the FACA process was the concept of a "Bright Line." The Bright Line would divide contaminated media into two different categories, which would be subject to two different regulatory regimes. Although straightforward in concept, the Agency has found it challenging to establish a set of numbers to serve this purpose.

As conceived by the FACA Committee, and presented in Appendix A to today's proposal, the Bright Line is a set of constituent-specific, risk-based concentration levels. In agreeing on a Bright Line approach, the FACA Committee anticipated that a substantial proportion of contaminated media would fall below the Bright Line, and thus be eligible, at the Director's discretion, for flexible, site-specific requirements (non-Subtitle C) set by the overseeing Agency. At the same time, the FACA Committee agreed that the Bright Line should ensure that very highly contaminated media (traditionally considered "hot spots") be subject to uniform national protective standards (e.g., treatment). EPA believes that the Bright Line values presented in today's proposal are a reasonable attempt to balance both of these important objectives.

As originally conceived, the Bright Line was intended to represent in some manner the relative risk posed by contaminated media. Simply put, media contaminated above Bright Line concentrations should pose higher risks than media below the Bright Line under a given exposure scenario. Since the Bright Line is only an indicator of relative risk, the levels should not be interpreted as representing what is protective or "clean." The actual risk of any particular contaminated medium depends on the circumstances by which human or environmental receptors may be exposed to the medium. EPA wishes to emphasize that Bright Line concentrations are not cleanup levels. The Bright Line simply is a means of identifying which regulatory regime may be appropriate for the contaminated media at a cleanup site.

The Agency believes that the management of contaminated media would be conducted in a protective manner under either of the regulatory schemes that would be established by the rule. The underlying assumption is that managing contaminated media under the HWIR-media rule would eliminate significant exposures to humans or ecological receptors. This is because the overseeing agency's presence ensures that media will be managed in a way that directly addresses the risk posed by site-specific circumstances. Thus, protection of human health and the environment can be ensured by applying either the national standards for media that contain hazardous waste, or the site-specific standards specified by the overseeing agency for media, which the overseeing agency has determined do not contain hazardous waste, based on the proposed management standards

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[10] See memoranda discussed in section (V)(A)(4)(a) of today's preamble.

identified in the RMP. Thus, in establishing Bright Line concentrations, EPA finds it reasonable to consider the potential effect of different sets of Bright Line concentrations in terms of the proportional volumes of media that would fall above and below the Bright Line. EPA believes that unless a substantial amount of contaminated media are eligible for site-specific decision-making, the disincentives for clean-up will not be eliminated (therefore resulting in greater overall risk to human health and the environment).

Thus, EPA's goal was to develop Bright Line concentrations that would remove a significant amount of contaminated media from Subtitle C jurisdiction, while ensuring that "hot spots" would remain subject to mandatory national standards. In deciding how to determine such levels, the Agency considered several approaches that included selecting concentrations based solely on volume. This approach, however, was rejected because there was no way to account for the relative degree of risk posed by different constituents. In other words, because some constituents are more hazardous than others at the same concentration, a Bright Line based purely on volume would not account for this difference.

EPA, therefore, wanted to set Bright Line concentrations for different constituents at different levels in order to account for this variance in relative risk. In order to do this, EPA needed to consider a potential exposure scenario that would account for the difference in relative risk of these different constituents. Because risk occurs only when there is a chance of exposure, at least one set of exposure assumptions would be necessary to establish the Bright Line.

Since one of the goals of the Bright Line was to identify the most highly contaminated media, the FACA Committee recommended using $10^{-3}$ as a benchmark for setting the Bright Line. Therefore, the Bright Line values in Appendix A were based on a $10^{-3}$ risk level for carcinogenic constituents (using the assumptions described above), and a health index of 10 for non-carcinogens, (that is, 10 × the concentration at which adverse health effects occur) according to certain exposure assumptions. This approach is consistent with the Superfund Principle Threats concept which uses $10^{-3}$ as a factor to identify the principle threats at Superfund sites.

Describing the Bright Line theory was relatively easy compared with determining Bright Line concentrations for all media which would be subject to today's Part 269 proposal. Today's rule proposes to define soil, ground water, surface water, and sediments as media. However, the potential exposure assumptions that could be used to determine Bright Line concentrations vary for different types of media. Therefore, EPA established two sets of Bright Line values, one for soils, and one for ground water and surface water.

Today's proposed rule does not include Bright Line numbers for contaminated sediments. The amount of sediment that is classified as RCRA hazardous is very low. Thus, EPA proposes that site-specific contained-in decisions be made for hazardous contaminated sediments. The Agency requests comments on whether to develop a Bright Line specifically for contaminated sediments. The Agency also requests comments on whether it would be appropriate to use the Bright Line for soil for sediments.

Bright Line concentrations for soils. In setting the Bright Line for soils, EPA chose to use exposure scenarios and assumptions that were developed for the Superfund Soil Screening Levels (SSLs), because that effort used standard risk scenarios that have been widely used and accepted by the Agency (and by many States). The SSLs were developed for a purpose different from the Bright Line;[11] however, the exposure scenarios used in that effort are good indicators of relative risk for developing Bright Line values.

The SSLs are based on three human exposure scenarios; direct contact ingestion, inhalation, and drinking contaminated ground water. Each scenario is based on a specific set of assumptions for such things as body weight, frequency of exposure, daily intake rates, and other factors. The inhalation pathway also uses certain models to calculate wind dispersion and the uptake of airborne contaminants by human receptors.

Today's proposed Bright Line numbers for soils are based on only two of those human exposure scenarios—direct contact ingestion and inhalation. The Bright Line value for each constituent is based on whichever pathway yields the more conservative (i.e., lower) concentration. EPA recognizes that protection of ground water is one of RCRA's major goals and that many of the Subtitle C design and operating standards were developed to protect ground water resources. Therefore, EPA considered the possibility of using the ground water exposure pathway in setting Bright Line concentrations for soils. However, the migration of contaminants from soils to ground water is fundamentally site-specific, and influenced by a number of site-specific factors such as depth to ground water; soil porosity; carbon content and other soil characteristics; amount of rainfall; solubility of the contaminants; and numerous other site- and constituent-specific conditions. The Agency has found less variability in fate and transport potential for inhalation and ingestion exposures in residential settings.

EPA is reluctant to use a greatly simplified ground water model that would not take any site-specific or constituent-specific factors into account. In order to address concerns posed to ground water on a more appropriate site-specific basis, EPA prefers to allow for consideration of ground water risks in making site-specific decisions regarding either the contained-in decision and/or the site-specific management requirements. Given the overseeing Agency's discretion to determine these standards on a site-specific basis, and given that EPA believes that site-specific decisions are most appropriate for ground water risk decisions, the Agency has proposed that the ground water exposure pathway should not be considered in setting the national Bright Line values for soils. Finally, EPA proposes two considerations to overlay the soil Bright Line numbers. EPA proposes to cap the Bright Line values at 10,000 ppm, equivalent to 1% of the volume of the contaminated media. EPA believes that it is reasonable to classify media as highly contaminated if 1% of the volume of media is contaminated with a particular constituent. Therefore capping the Bright Line at 10,000 ppm is consistent with the intention that the Bright Line distinguish between highly contaminated and less contaminated media. The second cap on the soil Bright Line values is the saturation limit (Csat). EPA believes it is sound science to compare the concentrations developed through the inhalation and ingestion risk scenarios to the actual concentration that could physically saturate the soil. If the Csat was lower than the concentrations from the inhalation or ingestion scenarios, EPA set the Bright Line concentration at the Csat. For further details on specific assumptions and methodologies used to

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[11] Superfund Soil Screening Levels (SSLs) were developed as a screening tool to determine when further investigation is necessary at Superfund sites. Because the SSLs are intended to be conservative, and trigger investigation whenever prudent, they are set at a $10^{-6}$ level for carcinogens. For more information on SSLs, call David Cooper (703) 603-8763.

determine the Bright Line values for soils, see Appendix A–1.

The Agency also considered several alternatives for establishing exposure assumptions for soil Bright Line numbers. These alternatives are discussed below. Estimates of the impacts of each alternative (in terms of volumes of media exempted) are all based on a $10^{-3}$ risk for carcinogens, and a health index of 10 for non-carcinogens (that is 10× the concentration at which adverse health effects occur).

*Alternative #1*—Bright Line for soils based on inhalation, ingestion, and migration to ground water. In addition to inhalation and ingestion pathways, this alternative would use a generic model to derive soil levels that, given certain fate and transport assumptions, would result in transfer of contaminants in the soils to ground water at or below drinking water standards (i.e., maximum concentration levels, or MCL's). EPA did not choose this alternative primarily because of the site-specific variability of calculating ground water exposure scenarios (as discussed above). In addition, this approach would result in Bright Line numbers that were considerably lower than those in the proposed option. The Agency estimated that under this alternative, approximately 50 percent of contaminated media would fall below the Bright Line, compared to 70 to 75 percent under the proposed option.

*Alternative #2*—Bright Line for soils based on inhalation and ingestion pathways, with concentrations calculated on a site-specific basis for the soil-to-ground water pathway. This option would yield Bright Line numbers that would approximate more closely ground water risks for each site. However, it would have the disadvantage of requiring considerable data gathering and analysis simply to calculate Bright Line concentrations, and these concentrations would obviously differ from site to site. This contradicts the idea of the Bright Line as "bright"—i.e., an easily referenced set of numbers that can be applied in a standard fashion. However, since Bright Line numbers would vary widely across the range of cleanup sites, volume estimates for this alternative are not possible to calculate.

*Alternative #3*—Bright Line numbers for soils based on a multipathway analysis. Under this alternative, numerous exposure pathways would be considered for each constituent, and Bright Line concentrations would be set for the most conservative pathway (i.e., the pathway that resulted in the lowest concentration level). In some respects this approach would be consistent with the multipathway approach being used in the HWIR proposed rule for as-generated wastes (60 FR 66344–469, Dec. 21, 1995). However, the Bright Line is intended for a very different purpose than the "exit levels" being developed for that proposed rule. For instance, the exit levels in the HWIR-Waste rule (discussed in section (II)(B) of this preamble) generally assume that exited wastes will not be subject to any management requirements, whereas this proposal assumes that these wastes will be managed protectively under State/EPA oversight. In addition, the resulting Bright Line values would be much lower than those proposed today, thus much less media would be regulated "below the line."

Bright Line concentrations for ground water and surface water. Today's proposed rule also establishes Bright Line values specifically for contaminated ground water. (See Appendix A–2 and discussion below). As with contaminated soils, highly-concentrated, contaminated ground water would be subject to specific national management standards, while less-contaminated ground water could be managed according to site-specific requirements imposed by the State or EPA.

To set Bright Line concentrations for ground water and surface water (Appendix A–2), EPA used standard exposure assumptions for human ingestion of contaminated water. EPA believes that it is appropriate to use the same Bright Line values for surface water and ground water. And for the same reasons discussed above for soils, the Agency believes a multi-pathway approach, or "actual risk" approach is not necessary for setting Bright Line concentrations for ground water and surface water.

EPA has used the same philosophical approach for the ground water/surface water Bright Line as it has used for soils, by analyzing relative risk and relying on the oversight of authorized States or EPA to ensure that hazards are addressed on a site-specific basis. In addition, EPA used a 10,000 ppm cap for the ground water/surface water Bright Line, just as for the soil Bright Line. This is explained in the soil Bright Line section of the preamble. Finally, if the concentrations from the ingestion of contaminated water were below the detection limits for that constituent in water (the EQC), EPA set the Bright Line at the EQC. More details on the specific assumptions and methodologies used to determine these concentrations are included in Appendix A–2.

Issues common to both sets of Bright Line numbers. In developing today's proposed Bright Line concentrations, some stakeholders said that EPA would need to calculate a number of additional direct and indirect pathways to evaluate the relative risks of contaminated media completely. The stakeholders also said that the Agency would need to predict risks to ecological receptors (i.e., plants and animals) as well as human health risks. EPA, however, does not believe that evaluation of additional pathways is necessary. The pathways selected already provide a sufficient basis for distinguishing relatively lower-risk contaminated media from relatively higher-risk media. The evaluation of other pathways and receptors would be important and, in some cases, necessary if the Bright Line represented "safe" levels of contamination. As explained above, however, the Bright Line serves no such purpose. It merely identifies which of two regulatory schemes would apply to certain contaminated media. If site-specific factors demonstrate that a decision that media no longer contain hazardous wastes, would be inappropriate, then the overseeing agency has the discretion not to make such a determination.

Some stakeholders have voiced concerns about the land use assumptions that were used to set the Bright Line. The SSLs used residential land use assumptions; therefore, residential land use assumptions form the basis for the proposed Bright Line for soils. EPA recognizes that the residential land use assumptions that underlie the ingestion and inhalation exposure pathways used for today's Bright Line values for soil may be inappropriate for managing risks at many sites that would be subject to these HWIR-media regulations. However, since the purpose of using risk assessment to develop the Bright Line is to differentiate between the relative risks of constituents, and not to establish the risks posed at specific sites, either residential or industrial assumptions would have been equally appropriate. Since the Agency's residential risk assessment methodology is more developed than the industrial methodology, the Agency chose to use residential assumptions for developing the Bright Line. The Bright Line for ground water and surface water does not include assumptions about land use. (See discussion above).

Request for comment. EPA solicits comments on the approaches used to develop today's proposed Bright Lines. The Agency also requests comment on the alternatives described above, as well as any other possible approaches to developing the Bright Line.

In addition, EPA requests comments on whether it is necessary to have a Bright Line at all. If there were no Bright Line, all media would be eligible for contained-in decisions by the overseeing agency on a site-specific basis. Alternatively, the "unitary approach," discussed in section VI of this preamble, would eliminate the Bright Line, and instead would exempt all cleanup wastes managed under a RMP from Subtitle C requirements.

Technical methodology. As discussed above, the technical methodologies used in calculating Bright Line concentrations for soil ingestion and inhalation are those that were used to develop "soil screening levels" for contaminated sites (59 FR 67706, December 30, 1994). In the proposed soil screening level guidance, values for the soil-to-ground water pathway would generally be calculated with data derived from site-specific factors and conditions, although generic values for this pathway would be presented in situations where site-specific data were unavailable. These technical methods and formulae are available for review in the docket for this rulemaking, and in the docket for the soil screening level proposal since they support both rules.

EPA requests comments on the methods, formulae, and technical underpinnings used for this rulemaking. Comments could include information on particular constituents that could change proposed Bright Line concentrations, information that may be used to determine Bright Line numbers for constituents that currently do not have Bright Line numbers. Commenters should keep in mind that the Agency's objective is to provide regulatory relief by encouraging contaminated media with a lower degree of risk to exit from Subtitle C regulation—provided that adequate safeguards exist to protect human health and the environment.

EPA has often found it necessary to propose sets of risk-based numbers to address contaminated media, for example; Subpart S action levels, (55 FR 30798, July 27, 1990), Superfund Soil Screening Levels (see below), and today's proposed rule. Since the Agency's understanding of risk assessment and the science surrounding risk based numbers is constantly developing, EPA has realized that almost as soon as risk-based numbers are published, they can become outdated. As a very current example, today EPA is proposing Bright Line concentrations based, in part, on the Superfund Soil Screening Levels (EPA/9355.4–14FS, EPA/540/R–94/101 PB95-963529 (December 1994)). After today's proposed Bright Line concentrations were calculated, but before this proposal was published, some of the technical inputs used to calculate the Superfund Soil Screening levels were adjusted in response to public comments (e.g., volatilization factors, cancer slope factors, etc.). EPA did not have time to recalculate the Bright Line concentration before publishing them.

In response to this problem, EPA requests comment on alternatives to keep the Bright Line concentrations up-to-date with the most current Agency risk information and policies (e.g., adjustments to the Soil Screening levels,[12] changes in reference doses or cancer slope factors in the IRIS or HEAST databases). For purposes of comment on this proposal, EPA will update the Bright Line calculations and place them in the docket for this rule.

EPA believes it might be appropriate, instead of promulgating actual Bright Line concentrations in the final rule, to promulgate the methodology that could be used to develop constituent-specific concentrations, in Appendix A to this rule, and to provide guidance on appropriate sources for needed underlying risk-based information. EPA believes it might then be appropriate for States to update their lists of Bright Line concentrations on a regular basis, such as every six months, to remain current with developments in risk information. As an alternative, EPA believes it may be appropriate for States and/or EPA to calculate new Bright Line concentrations for each new RMP at the time it is proposed for public comment. In any case, the Bright Line concentrations being used under a RMP must be stated in the RMP, and available during public comment on the RMP. The Agency requests comment on these alternatives, and any other suggestions for keeping Bright Line concentrations up-to-date.

The Agency also recognizes the problems of trying to comply with a "moving target." A cleanup could be completed or underway using a certain set of Bright Line concentrations that could then change. EPA believes it might be appropriate to protect those past and on-going cleanup operations from the requirement to change course mid-way, or to revisit completed remediation waste management under a RMP which used outdated Bright Line concentrations. In the Superfund program, requirements that are revised or newly promulgated after the ROD is signed must be attained only when EPA determines that these requirements are ARARs and that they must be met to ensure that the remedy is protective (40 CFR 300.430(f)(1)(ii)(*1*)). Another alternative could be a shield such as is provided for RCRA permits in 40 CFR 270.4, which could specify that compliance with a RMP would equal compliance with RCRA. EPA requests comments on this protection issue, and how best to achieve it.

Relationship of the HWIR-media Bright Line to the HWIR-waste exit levels. As described earlier in this preamble (in section (IV)(C)) the objectives for the HWIR-waste exit levels and the HWIR-media Bright Line are different. The HWIR-waste exit levels are intended to identify levels of hazardous constituents that would pose no significant threat to human health or the environment regardless of how the waste was managed after it exited Subtitle C jurisdiction. The HWIR-media Bright Line levels are simply intended to distinguish between (1) contaminated media that are eligible to exit Subtitle C because it is likely that they can be managed safely under cleanup authorities outside of Subtitle C, and (2) media that contain so much contamination that Subtitle C management is warranted. Because of these different objectives, EPA developed the two proposals using different methodologies. For the soil Bright Line, HWIR-media used a calculation based on ingestion and inhalation of soil at $10^{-3}$ cancer risk, and a hazard index of 10 for non-carcinogens. For the non-wastewater HWIR-waste exit level (which is most readily comparable to the soil Bright Line), EPA used an analysis that evaluates exposures from multiple pathways to identify those pathways that may result in a $10^{-6}$ cancer risk and hazard index of 1 for non-carcinogens. EPA then selected the most limiting pathway, (most conservative), as the exit criteria. EPA believed that the HWIR-waste levels would be more conservative than the HWIR-media concentrations. However, upon a recent comparison of the two sets of numbers, some HWIR-waste exit levels are at higher concentrations (less conservative) than the HWIR-media Bright Line concentrations. In the comparison of those concentrations, EPA determined that for about 27% of the HWIR-media Bright Line concentrations of chemical constituents for soil, the HWIR-waste exit levels for non-wastewater were higher.

A similar result was found when EPA compared the HWIR-media

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[12] The Soil Screening Guidance has addressed this problem by publishing the *methodology* as the guidance itself, and only providing the actual concentrations as examples in the appendix to the guidance.

groundwater/surface water Bright Line concentrations to the HWIR-waste astewater exit levels. In that case, EPA sed direct ingestion of groundwater resulting in a cancer risk of $10^{-3}$ and hazard index of 10 for non-carcinogens to calculate the HWIR-media Bright Line. For the HWIR-waste wastewater exit level, EPA again analyzed multiple pathways to identify those that would result in a cancer risk of $10^{-6}$ and a hazard index of 1 for non-carcinogens and then selected the most limiting pathway as the exit criteria. For approximately 20% of the HWIR-media Bright Line concentrations for groundwater/surface water the HWIR-waste concentrations for wastewater were higher.

One of the practical concerns that arises from this difference in concentrations is this: if contaminated media is below the HWIR-waste exit levels, then that media is eligible for exit under that rulemaking just like any other hazardous waste. Therefore, if the HWIR-media rule specified that media at concentrations below the HWIR-waste exit levels were still "above the Bright Line" and not eligible for a contained-in determination, the two rules would be inconsistent. EPA recognizes that this inconsistency must be addressed before romulgation of these two final rules, nd requests comments on how to resolve this issue. A preliminary description of the primary differences in the methodologies follows.

One of the most significant differences between the HWIR-waste and the HWIR-media methodologies is that the HWIR-waste methodology was designed to calculate an acceptable concentration at which as-generated waste and treatment residuals could exit the Subtitle C system. A part of that methodology assumed that exited wastes might be managed in such a way as to contaminate soils and groundwater, and calculated the potential risk to receptors from the contaminated soil or groundwater. Therefore, the HWIR-waste analysis models fate and transport between the original waste and the contaminated media, assuming some loss of concentration due to many factors, such as: partitioning of constituents to air, soil, and water; losses of contaminant mass through biodegradation; bioaccumulation through the food chain; and volatilization, hydrolysis, and dispersion of contaminants during transport. The HWIR-media methodology begins at the point where oils and groundwater are already contaminated. Therefore, the HWIR-media Bright Line did not incorporate fate and transport considerations to calculate the Bright Line concentrations, but assumed the receptor was in direct contact with the contaminated media.

Specific comparison of soil Bright Line to non-wastewater exit levels. If contaminated soil were managed under the HWIR-waste proposal, the soil would be subject to the exit criteria for non-wastewaters. That is why EPA compared the soil Bright Line to the non-wastewaters exit level. For this analysis, the HWIR-media Bright Line for soil based on ingestion or inhalation was compared with the exit criterion for non-wastewater identified as the most limiting pathway (e.g., soil ingestion, fish ingestion) in the HWIR-waste proposal. Thus, the analysis was not necessarily a comparison of exit criteria and Bright Lines for similar exposure pathways.

The analysis indicated that for 27 of the HWIR-media Bright Line constituent concentrations for soil, the proposed Bright Line concentration was lower than the exit criterion for HWIR-wastes for non-wastewater. Of these constituents, six of the lower proposed Bright Line concentrations are lower because the HWIR-media number was intentionally "capped" at 10,000 parts per million. EPA decided to propose a 10,000 ppm cap, equivalent to 1% of the volume of the contaminated media, (as discussed above) because EPA believes that it is reasonable to classify media as highly contaminated if 1% of the volume of media is contaminated with a particular constituent. Therefore capping the Bright Line at 10,000 ppm is consistent with the intention that the Bright Line distinguish between highly contaminated and less contaminated media. The HWIR-waste proposal did not propose to cap the exit levels because it was not intended to differentiate wastes based on higher vs. lower concentration, but instead to differentiate based on risk factors.

For 12 of the 27 constituents, HWIR-media Bright Lines are established at soil saturation limits (Csat) that are less than the corresponding HWIR-waste exit level. EPA believes it is sound science for a rule establishing soil concentrations to compare the concentrations developed through the inhalation and ingestion risk scenarios to the actual concentration that could physically saturate the soil. If the Csat was lower than the concentrations from the inhalation or ingestion scenarios, EPA set the Bright Line concentration at the Csat. The HWIR-waste proposal (since it is proposed for as generated wastes, not soils) did not propose to cap the exit levels at the soil saturation limit.

For the other nine of the 27 constituents, differences in the results can be attributed to several factors related to the underlying assumptions of the methodologies used to calculate the criteria.[13] These include the fate and transport differences discussed above, and:

—Receptors. Although many of the exposure assumptions (e.g., exposure duration, exposure frequency, ingestion rate) are common to the analyses, there are still significant differences in the location of the receptors that will affect the exit criteria. The HWIR-media Bright Lines are based on an exposure scenario in which a resident lives directly on the contaminated media and ingests contaminated soil or inhales particulate and volatile emissions. The HWIR-waste exit levels consider several exposure scenarios; however, none are directly comparable to the HWIR-media exposure scenario. These exposure scenarios include an off-site resident, an adult off-site resident, a child off-site resident, an adult and child on-site 10 years after site closure, and an on-site worker.

—Sources. The HWIR-media Bright Lines for soil ingestion and inhalation exposure pathways are based solely on contaminated soils and assume that the soil is an infinite source. The HWIR-waste non-groundwater non-wastewater exposure pathways consider three sources: land application units, waste piles, and ash monofills. Waste piles and ash monofills are assumed to be infinite sources; however, the land application units are assumed to be finite sources. This assumption may result in higher (less conservative) exit criteria under HWIR-waste.

A comparison of the toxicity benchmarks indicates that the HWIR-media Bright Lines and the HWIR-waste exit levels generally start with the same toxicity benchmark (all but three chemicals for oral ingestion and all but four chemicals for inhalation use the same toxicity benchmarks). Thus, the apparent discrepancies in the criteria can be attributed to the significant differences in the fate and transport modeling of the chemicals in the HWIR-process waste analysis, the receptors evaluated, and assumptions related to the sources (as described above).

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[13] If the HWIR-media proposed Bright Line concentrations were updated to reflect the updated Soil Screening levels, as discussed above, two of these nine remaining constituents would have higher HWIR-media Bright Line concentrations than HWIR-waste exit levels.

Specific comparison of Groundwater/Surface Water Bright Line to wastewater exit levels. If contaminated groundwater were managed under the HWIR-waste proposal, the groundwater would be subject to the exit criteria for wastewaters. That is why EPA compared the groundwater/surface water Bright Line to the wastewaters exit level. For this analysis, the HWIR-media Bright Line for groundwater/surface water based on ingestion of groundwater was compared with two options for the exit criterion for wastewater for the HWIR-waste proposal, one based on toxicity benchmarks and one based on toxicity benchmarks and MCLs.

The analysis indicated that 38 constituents had higher proposed HWIR-waste exit criteria than proposed HWIR-media Bright Line concentrations.[14] For one of these 38 constituent, only the MCL option for the HWIR-waste exit level was higher. For four of the 38 constituents, only the toxicity benchmark only option for the HWIR-waste exit level was higher. None of these 38 constituents were affected by the HWIR-media 10,000 ppm cap, and there is not a saturation limit cap on the HWIR-media groundwater/surface water Bright Line.

Similar to the comparison of the HWIR-media soil Bright Line to the HWIR-waste non-wastewater exit levels, the HWIR-media groundwater/surface water Bright Line and the HWIR-waste wastewater exit levels use different methodologies, and therefore produce different results. Again, a key difference between the two sets of concentrations is the use of fate and transport modeling. The HWIR-waste proposal assumes some loss through fate and transport, whereas the HWIR-media methodology assumes direct ingestion of the contaminated groundwater (more details on the two methodologies can be found in the dockets for the two proposed rules).

Request for comments. Because of the above comparisons, EPA has determined that for some constituents, because the HWIR-media methodology was *more* conservative than the HWIR-waste methodology, that conservatism outweighed the fact that the HWIR-media risk target ($10^{-3}$ for limited pathways) was *less* conservative than the HWIR-waste risk target ($10^{-6}$ for multiple pathways). Therefore some of the HWIR-waste exit levels, which were intended to be more conservative overall than the HWIR-media Bright Line, are set at higher concentrations. As described above, EPA recognizes that these discrepancies must be resolved before promulgation of the two proposed rules. For further detail on the methodologies used to develop the HWIR-media Bright Line, Soil Screening Levels and the HWIR-waste exit levels, see the docket for the two proposed HWIR rules. EPA requests comments on how to resolve these issues.

### *B. Other Requirements Applicable to Management of Hazardous Contaminated Media*

#### 1. Applicability of Other Requirements—§ 269.10

The purpose of today's proposed rule would be to modify the identification, permitting, management, treatment, and disposal requirements for contaminated media. It is not intended to replace the entire scope of Subtitle C requirements as they relate to media. For that reason, many existing Subtitle C requirements would continue to apply to remedial actions conducted in accordance with this Part. Specifically, 40 CFR Parts 262–267 and 270 would continue to apply when complying with this Part, except as specifically replaced by the provisions of this Part. In addition, when treating media subject to LDRs according to the treatment standards in § 269.30, the following provisions of Part 268 would continue to apply: §§ 268.2–268.7 (definitions, dilution prohibition, surface impoundment treatment variance, case-by-case extensions, no migration petitions, and waste analysis and recordkeeping), § 268.44 (treatment variances), and § 268.50 (prohibition on storage). Again, the Agency does not intend to recreate all of the Subtitle C requirements, but in this case only replace certain requirements themselves as they relate to hazardous contaminated media.

#### 2. Intentional Contamination of Media Prohibited—§ 269.11

EPA recognizes that promulgation of standards for hazardous contaminated media that are less onerous than the requirements for hazardous waste may create incentives for mixing waste with soil or other media to render the waste subject to these provisions. The Agency expressly proposes to prohibit this behavior (§ 269.11).

EPA recognizes, however, that sometimes it is necessary to have some mixing of contaminated media for technical purposes to facilitate cleanup. That mixing is not the prohibited mixing referred to here. This prohibition specifically includes the intent to avoid regulation. If the intent of the mixing is to better comply with the regulations that would apply to the wastes prior to mixing, then it would not be prohibited under this clause. The Agency requests comments on whether further safeguards, in addition to this proposed provision and the civil and criminal enforcement authorities of RCRA, are needed to ensure that no attempts are made to mix wastes with media to take advantage of the reduced requirements of the proposed HWIR-media rule.

#### 3. Interstate Movement of Contaminated Media—§ 269.12

EPA recognizes that media that would be exempted under today's rule, but that previously would have been managed as hazardous wastes, would be transported to and through States that were not the overseeing agency for the remedial action that generated those media. Therefore, the Agency designed the interstate movement requirements of proposed § 269.12 to ensure that receiving (consignment) States—or States through which media would travel—could approve the designation that the media is not hazardous before they accepted the media for transport or disposal.

The default in these requirements is that the media must be managed as Subtitle C waste in the receiving or transporting State if the receiving or transporting State has not been notified of the designation as non-hazardous, or if the receiving or transporting State does not agree with the determination. Receiving and transporting States would also have to be authorized for this Part in order to approve these decisions in their States. If a receiving or transporting State agrees to the redesignation, then the media may be managed as non-hazardous.

EPA requests comments on these interstate movement requirements, specifically on any implementation concerns with this approach, and any suggestions to ease implementation. Several people have expressed concern about notifying the States through which the media would be transported, but not ultimately disposed. The Agency believes that it may be appropriate to limit notification requirements to the States ultimately receiving the media. EPA also feels that it would be necessary to limit the designation of media as non-hazardous only to States that are authorized for this Part. The Agency believes that this would be necessary because the authority to make these contained-in decisions is an integral element for authorization for this Part. EPA believes

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[14] If the HWIR-media proposed Bright Line concentrations were updated to reflect current updated risk information, as discussed above, two of these 38 constituents would have higher HWIR-media Bright Line concentrations than HWIR-waste exit levels.

**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**
WASHINGTON, D.C. 20460

FEB 27 1996

OFFICE OF
SOLID WASTE AND EMERGENCY
RESPONSE

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Niagara Falls, New York 14301

Dear Mr. Nebrich:

Thank you for your letter of November 14, 1995 regarding clarification of the "mixture rule," the "contained-in" policy, LDR issues, and "point of generation" for U096, (a,a,Dimethylbenzylhydroperoxide). The U096 waste itself is subject to the LDR requirements in 40 CFR Subpart 268.42 and must be treated by the methods specified. When wastes exhibiting a RCRA characteristic (such as U096) are mixed with a solid waste, if the resulting mixture does not exhibit the characteristic (in this case of reactivity), then the waste is not required to be disposed in a Subtitle C landfill, but can be disposed in a Subtitle D landfill. However, the waste is still subject to treatment by the methods specified in 40 CFR Subpart 268.42 (see 40 CFR Subpart 261.3(a)(2)(iii)).

If U096 waste was spilled on soil, the EPA or authorized State Agency overseeing the cleanup could determine whether the soil did or did not contain hazardous waste, based on the "contained-in" policy. EPA's "contained-in" policy does not specify levels at which "contained-in" determinations must be made. Those decisions are left to the discretion of the EPA or State program that is making the "contained-in" determination. Therefore, the "contained-in" policy does not require that the U096 be analytically non-detectable in order to be considered non-hazardous, although the EPA or State program could require that (or alternative levels) based on their discretion.

Issues similar to those you raised regarding contaminated soil were discussed in a September 15, 1995 letter that I wrote to Peter C. Wright of the Monsanto Company. That letter is attached. Also, these issues will be discussed more fully in an upcoming EPA proposed rulemaking "Requirements for Management of Hazardous Contaminated Media" commonly referred to as the Hazardous Waste Identification Rule for Contaminated Media or HWIR-media. We plan to publish that proposal in March, and I will forward a copy to you as soon as it is available. We suggest you look to the proposal's preamble discussion for guidance regarding the situation you describe in your letter. Of course, it should be noted that the requirements that apply to contaminated media could change when EPA finalizes that rulemaking.

Thank you for your concern about protecting the environment. I apologize for the delay in responding to your letter that was caused by the two government furloughs. Your staff may wish to contact Carolyn Hoskinson at (703) 308-8626, if you have any further questions.

Sincerely Yours,

Bruce R. Weddle

for Michael Shapiro, Director
Office of Solid Waste

Enclosures

cc:
Matt Hale, OSW/PSPD
Barbara Pace, OGC
RCRA Regional Branch Chiefs, Regions 1-10

WTS
WASTE TECHNOLOGY SERVICES INC.

Control to PSPD
cc 412
HWMD

November 14, 1995

Mr. Michael Shipiro, Director
Office of Solid Waste
Environmental Protection Agency
401 M Street, S. W.
Washington, DC 20460

Dear Mr. Shipiro:

I am requesting a clarification of the "mixture rule" and "contained-in" policy in regards to U096 (a,a,Dimethylbenzylhydroperoxide) and LDR issues. This material is listed for reactive (R) and as such when mixed with another solid waste would not be a hazardous waste if it did not meet the reactivity requirement in 40CFR261.23. If this material was spilled on soil, the "contained-in" policy kicks in. I understand that with this scenario the identification as a hazardous waste is different than the above scenario (mixture). That is, the U096 would have to be analytically non-detect to be considered as non-hazardous.

If my assumptions are correct, and correct me if I'm wrong, what is the Land Disposal Restrictions (LDR) ramifications? Does this material have to be CMBST under both scenarios? At what point is the "point of generation" under both scenarios.

If you should have any questions, please do not hesitate to call.

Very truly yours,

WASTE TECHNOLOGY SERVICES, INC.

received
11/21/95
MAS

T L Nebrich Jr.

T. L. Nebrich, Jr.
Technical Director

TLN/kjl

640 Park Place, Niagara Falls, New York, 14301
Telephone 716-282-4100 • Fax 716-282-6966

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

SEP 15 1995

Mr. Peter C. Wright
Monsanto Company
800 N. Lindbergh Boulevard
St. Louis, Missouri 63167

OFFICE OF
SOLID WASTE AND EMERGENCY
RESPONSE

Dear Mr. Wright,

I am writing in response to your letter of January 3, 1995, in which you requested clarification of the RCRA "contained-in" policy. In your letter you asked several specific questions regarding this policy, and we offer our responses below. It should be understood that these responses reflect the Agency's current interpretation of the contained-in concept; in the Hazardous Waste Identification Rule for Contaminated Media (HWIR-media), currently under development, we will be looking closely at the contained-in policy and other issues associated with contaminated media and will be addressing those issues through the rulemaking process.

**Question 1. Can a State determine whether or not soils which contained a listed hazardous waste, but were then treated to below health based concentrations, no longer contain the hazardous waste?**

The contained-in policy is intended to clarify the application of RCRA hazardous waste regulations to environmental media. As stated in previous guidance on this policy, contaminated media are not considered solid wastes in the sense of being abandoned, recycled, or inherently waste-like as those terms are defined in RCRA regulations. However, environmental media that contain listed hazardous wastes must be managed as hazardous wastes because--and only as long as--they contain listed waste(s)[1]. EPA Regions and authorized states may apply the contained-in policy to determine site-, media- and contaminant-specific levels, such that if the concentration of the hazardous constituents in the environmental media fall below these levels, the environmental media may be determined to no longer contain hazardous waste. Such "contained-in determinations" may be made before or after treatment of the contaminated environmental media and may include consideration of site-specific exposure pathways (e.g., potential for human exposure, soil permeability, depth to groundwater).

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[1] June 19, 1989 letter from Jonathan Cannon, Acting Assistant Administrator of EPA's Office of Solid Waste and Emergency Response to Thomas Jorling, Commissioner of the New York Department of Environmental Conservation.

**Question 2. Are soils that have been treated and then determined not to contain hazardous wastes still subject to the Land Disposal Restrictions (LDRs) Universal Treatment Standards (UTS) prior to land disposal?**

Yes. If contaminated environmental media are treated and then determined to no longer contain hazardous waste, the LDR treatment standards still must be complied with prior to land disposal. This means that the media would have to be treated to meet UTS or a treatability variance would have to be obtained[2]. Individuals who believe that the UTS are not appropriate for media containing solid waste are encouraged to work with their State regulatory agency and the appropriate EPA Regional Office to obtain a site-specific treatability variance under 40 CFR §268.44(h). EPA's policy is that site specific treatability variances are presumed to be appropriate for contaminated media. See 55 FR 8760 (March 8, 1990) For more information on site specific treatability variances granted in the context of environmental cleanup, please refer to the Superfund LDR Guides Numbered 6A and 6B, entitled, *Obtaining a Soil and Debris Treatability Variance for Remedial Actions* and *Obtaining a Solid and Debris Treatability Variance for Removal Actions*, respectively. For your convenience, copies of these guidance documents are enclosed.

Of course, if no land disposal will occur, the LDR treatment standards do not apply. Additionally, contaminated environmental media determined not to contain any waste (i.e., it's just media), would not be subject to any RCRA Subtitle C requirement, including the LDRs.

**Question 3. If groundwater that originally exhibited a hazardous characteristic is subsequently treated to below a State-determined contained-in level, would the ground water still be subject to the UTS requirements prior to land disposal?**

Yes. Once the LDR treatment standards attach to characteristic wastes, even if the characteristic is eliminated, the media remain subject to any applicable LDR treatment standards that have not been met through removal of the

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[2] Nothing in this letter is intended to affect the status of existing regulatory or statutory exclusions to the definition of solid or hazardous waste. Such provisions can prevent the duty to comply with LDRs from attaching in the first instance. See, e.g, RCRA § 1004(27) (exempting industrial point source discharges subject to Clean Water Act permits from the definition of solid waste). In addition, the Agency does not intend in this letter to expand the scope of activities that constitute land disposal and thus trigger LDR treatment requirements. For example, the Agency's positions that in situ treatment and movement of contaminated media within an area of contamination do not constitute land disposal remain unaffected. Similarly, this letter is not intended to affect any statutory or regulatory exclusions to the requirement to comply with LDRs (see e.g., RCRA § 3020(b)).

characteristic. As indicated in the Third Third decision, Chemical Waste Management v. U.S. EPA, 976 F.2d 2 (D.C. Cir. 1992), cert. denied, 1135 S.Ct 1961 (1993), elimination of the characteristic does not necessarily satisfy LDR requirements. If groundwater that exhibits a characteristic is treated prior to land disposal, it must be treated in accordance with applicable LDR treatment standards or pursuant to a treatability variance to meet LDR requirements. As discussed in our response to question 2, individuals who believe that the UTS are not appropriate to their contaminated media are encouraged to apply for a site specific treatability variance.

Of course, if no land disposal will occur, the LDR treatment standards do not apply. Additionally, ground water managed in accordance with one of the existing statutory or regulatory exclusions may not be subject to the LDR treatment standards even when land disposal will occur. For example, under RCRA § 3020(b), contaminated groundwater may be treated in accordance with a cleanup action and then reinjected into the aquifer from which it was withdrawn without meeting LDR treatment standards, provided the treatment substantially reduces the hazardous constituents prior to reinjection and the cleanup action will, upon completion, be sufficient to protect human health and the environment.

**Question 4. May a State that is authorized only for the base RCRA program make contained-in determinations, or does the State need to be authorized for the LDRs as well?**

In order to make contained-in determinations, a State must only be authorized for the part of the base program under which the waste of concern is identified as hazardous. For example, when determining whether or not a medium contains a particular characteristic waste, the State must be authorized for that characteristic. In the same manner, if the State wishes to determine whether or not a medium contains a particular listed waste, that State must be authorized for that particular waste listing. In regard to the two sites described in your letter, both Massachusetts and Texas are authorized for the base program under which the wastes you mentioned are identified as hazardous, and may, at their discretion, make the contained-in determinations you described.

**Question 5. Do contained-in determinations needed to be made under a RCRA permit, or can another mechanism be used?**

Authorized states and EPA regions may use any format or mechanism to document contained-in determinations. These mechanisms could include official agency correspondence, orders, and RCRA permits.

We hope this will be of assistance to you in applying the contained-in policy. If you have any further questions, please contact Elizabeth McManus, of my staff, at (703) 308-8657. In addition, please note that authorized states have their own regulations and policies which may be more stringent than federal regulations and policies. In authorized states, questions about application of the contained-in policy, including the interpretations put forth in this letter, should be referred to the appropriate state agency. In Texas, please contact Paul Lewis of the Texas Natural Resources Conservation Commission at (512) 239-2340; in Massachusetts, please contact John Carrigan of the Massachusetts Department of Environmental Protection at (617) 292-5584.

Sincerely,

Michael Shapiro

Michael Shapiro
Director, Office of Solid Waste

Enclosure

cc: Matt Hale, OSW, PSPD
David Bussard, OSW, CAD
Jim Berlow, OSW, WMD
Larry Starfield, OGC
Dawn Messier, OGC
Barbara Pace, OGC
Bruce Diamond, OECA, OSRE
US EPA Regional RCRA Branch Chiefs, Regions I - X
John Carrigan, State of Massachusetts
Susan Ferguson, State of Texas

Monsanto

LAW DEPARTMENT

Monsanto Company
800 N. Lindbergh Boulevard
St. Louis, Missouri 63167
Phone: (314) 694-1000

PETER C. WRIGHT
ENVIRONMENTAL ATTORNEY
(314) 694-8608

January 3, 1995

1/10/95
1/11/95

Mr. Michael Shapiro
United States Environmental Protection Agency
Office of Solid Waste and Emergency Response
401 M Street, S.W.
Washington, D.C. 20460

Re: Clarification of the Contained In Rule

Dear Mr. Shapiro:

This letter addresses an urgent issue that arises with the December 19 effective ate of he Phase II Land Disposal Restriction (LDR) rule. Your immediate attention and response is requested in order to avoid delay of planned remedial work that has been developed in concert with state authorities.

Monsanto Company has two plant sites that are planning to engage in remediation activities in the near term, which require confirmation of Monsanto's understanding of the operation of the contained in rule. More specifically, as will be described in detail below, these two sites have planned to implement remedial measures that will remove hazardous waste constituents from affected environmental media so that it is Monsanto's understanding (and that of the two RCRA authorized states) that the treated media will no longer "contain" a hazardous waste. The treated environmental media will likely contain traces of hazardous constituents after treatment, at concentrations below health based concentration limits established by the two states. We understand that once the media no longer contains the listed waste (as determined by the State agency) it no longer must be managed as a hazardous waste, i.e. subtitle C no longer applies and the media may be placed on the land without regard to the Land Disposal Restrictions Universal Treatment Standards (UTS). Do you concur? We also understand that a State authorized for the base program is empowered to make the contained-in determination without regard to the State's authorization status for the LDR program. Do you concur?

[illegible]

Overview of the Sites and Remediation Projects

The first plant site is located in Everett, Massachusetts, just north of the City of Boston. This long time chemical manufacturing facility was closed in November, 1992. Currently, the Everett site has been proceeding under the authority of the Massachusetts Contingency Plan (MCP) with proposed remediation scheduled for completion in 1997. In order for the Everett site to proceed on its cleanup schedule, the Agency's interpretation of the contained in rule is important, particularly as the site is currently under a Purchase and Sale Agreement for development as a shopping center with construction scheduled to begin in 1997. This development is critical to the local community because the shopping center will be a major element of Everett's tax base and a significant source of employment in the city.

Due to historic manufacturing operations, areas of the plant site have been contaminated with bis 2-ethyl hexyl phthalate (BEHP), naphthalene and phthalic anhydride still bottoms, materials which carry the RCRA hazardous waste codes U028, U165 and K024, respectively. Concentrations as high as 10,000 mg/kg of BEHP, 30,000 mg/kg of naphthalene, and 60,000 mg/kg of phthalic acid have been detected in soil samples collected at the site. The remediation plan that has been under development would involve the separation of some discreet waste materials, treatment of some soil in place, and excavation and treatment of some soil from hotspot areas with subsequent reuse of the treated soil on-site as backfill. These treatment methods would significantly reduce the concentration of hazardous constituents remaining in the soils. The Everett Plant has held discussions with the Massachusetts Department of Environmental Protection (DEP's) Bureau of Waste Prevention regarding the impact of RCRA regulations on the planned remediation strategy and has assumed that once the soil was remediated to meet health-based concentrations levels established by Massachusetts (a RCRA authorized state), that the soil no longer would contain hazardous waste and could be beneficially reused as backfill on-site with no further RCRA restrictions. The planned remediation strategy would satisfy the Massachusetts Bureau of Waste Site Cleanup Program requirements to achieve a Permanent Solution, addressing potential risks to human health and the environment and eliminate the potential for constituent migration. Attached is a copy of a DEP policy memorandum dated March 4, 1994 and a letter issued on the same date describing DEP's understanding of how it will apply the contained in rule to a particular remediation project.

The other Monsanto site is the Chocolate Bayou plant, located near Alvin, Texas. This is a large diversified chemical manufacturing site that has a RCRA permit, which includes a corrective action component that is administered by the Texas Natural Resource Conservation Commission (TNRCC). Texas is authorized for RCRA corrective action. The particular remediation project at issue, a program to pump, treat and reinject groundwater that has been contaminated by benzene, phenol and acetone, is not being conducted under RCRA permit, but rather these ctions are being undertaken proactively by Monsanto in consultation with the TNRCC. The plant applied for and has received a groundwater class V reinjection permit from TNRCC for this remedial project.

The groundwater at the point it is brought out of the ground is characteristically hazardous for benzene. The groundwater exhibited measured levels of benzene, phenol and acetone as high as 62 mg/l, 6 mg/l and 6 mg/l, respectively without any treatment. The air stripping treatment system to be installed has been designed to treat the groundwater so that the concentrations of benzene, phenol and acetone are no higher than 0.001 mg/l, 6 mg/l, and 2 mg/l respectively. This treatment of groundwater to these levels would mean that all three contaminants would be below the Texas Risk Reduction Rule Standard 2 Residential levels of 0.005 mg/l benzene, 21.9 mg/l phenol and 2.65 mg/l acetone. The phenol and the acetone would exceed the technology [incineration] based UTS wastewater standards of 0.039 mg/l for phenol and 0.28 mg/l for acetone. The phenol and the acetone are biodegradable organic chemicals and it is believed that the reinjection process will add oxygen to the affected groundwater, assisting in the biodegradation of the organic materials that are not removed by the treatment.

Neither site has considered applying for a Corrective Action Management Unit (CAMU). First, it was believed to be unnecessary to employ a CAMU because of the plan to treat contaminated media to meet health based levels. Second, the time, expense and effort on behalf of Monsanto and the state agencies to put in place the necessary RCRA permits and modifications makes the CAMU option not practical for a timely commencement of remediation activities.

## History of the Contained In Rule

Monsanto's understanding has been that treating affected environmental media to meet health based concentration levels that have been applied on a site specific basis by the respective authorized states would free the treated media from further RCRA regulation, including the application of any land disposal restrictions. Monsanto's understanding is based on EPA discussions of the contained in rule. Monsanto's understanding of EPA's position on the "contained in rule" is that it was an interpretative rule long before it was "codified" in rulemakings in the 1990s. EPA has stated that this view of the contained in rule was supported by the 1989 Chemical Waste Management decision. Chemical Waste Management v. EPA, 869 F.2d 1526, 1538 ftnt. 15 (D.C. Cir. 1989).

The contained in rule was first explained in a memorandum from Marcia Williams to Patrick Tobin dated November 13, 1986. That memorandum stated that "if groundwater is treated such that it no longer contains a hazardous waste, the groundwater would no longer be subject to regulation under Subtitle C of RCRA."

Subsequent memoranda and letters[1] expanded on the application of the contained in rule. These writings refined the concept that if contaminated environmental media was treated so that the levels of hazardous constituents that remained after treatment were below certain levels, which often have been set at health based levels, that EPA would consider that the affected media no longer "contained" a hazardous waste and so no longer was subject to regulation under RCRA Subtitle C. Monsanto is not certain that the contained in rule applies to a situation like what exists at the Chocolate Bayou plant where there are no listed, but only characteristic wastes involved. Yet Monsanto can see no reason why an exit level appropriate for media contaminated with listed waste would not also apply to media contaminated with a characteristic waste.

EPA also made it clear that an authorized RCRA state could determine what the contained in levels could be. EPA guidance to the states in making the contained in determinations has stressed the need to make the contained in determination on a site-specific basis, in accordance with the general State or Federal guidelines, or by means of a site specific risk assessment. It would appear that the Massachusetts regulations, 310 CMR 40.00 (the Massachusetts Contingency Plan) and the associated policy on the contained in rule and the TNRCC's Risk Reduction Rules provide precisely the kind of the decision making framework EPA requires that an authorized RCRA state use for making the contained in rule decision. It is only a requirement for a state to be authorized for the basic RCRA program to be able to make contained in determination, and it is not necessary for the state to be authorized for all or parts of the land disposal program.

The rulemakings "codifying" the contained in rule began with the reference in the Third Third rulemaking in which EPA "clarified" the treatment standards that would apply to soils that had been contaminated with listed waste. 53 Fed. Reg. 31138, 31142 (August 17, 1988). The contained in rule has been addressed in at least five other Federal Register notices.[2] The most involved discussion and greatest reliance on the contained in rule is found in the Contaminated Debris rulemaking. In the proposed rulemaking, EPA stated that debris which had been contaminated with hazardous waste would "no longer be a prohibited waste or a hazardous waste if it achieves levels which debris no longer 'contains' hazardous waste." 57 Fed. Reg. at 982. EPA further explained that the levels would be that at which the potential threat to human health and the environment had been

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[1] See e.g., Sylvia K. Lowrance to Jeff Zelkinson, January 24, 1989; Jonathan Cannon to Thomas Jorling, June 19, 1989 (authorized states can make determination on what the appropriate health based levels are at which media no longer "contains" a hazardous waste); Sylvia K. Lowrance to John Ely, March 20, 1991 (recommended that the state use a risk assessment approach to making contained in determinations) (The Massachusetts letter cites additional letters).

[2] See e.g., 56 Fed. Reg. 24456 (May 11, 1991); 57 Fed. Reg. 958, 961 (January 9, 1992); 57 Fed. Reg. 37194 (August 18, 1992); 58 Fed. Reg. 48092, 48096 (September 14, 1993) and 59 Fed. Reg. 47982, 47986 (September 19, 1994).

minimized. Id. at 985. In the final rulemaking, EPA explained that treated contaminated debris would be *considered to no longer "contain" a hazardous* waste, if the debris were treated so as to achieve health based concentrations based on considerations of site hydrology and exposure pathways. EPA summarized the regulatory effect of providing treatment to these levels by stating that "[d]ebris found not to contain hazardous waste (and not exhibiting a hazardous waste characteristic) would not be subject to further Subtitle C regulation, and so could be land disposed without further treatment." 57 Fed. Reg. at 37226 *(emphasis added)*.

The contained in rule has also been discussed in context of the rulemaking proposing land disposal restriction standards for soil and in the final UTS rulemaking. EPA stated "the primary function of a contained in determination has been to determine specific constituent concentrations at which the media at a specific site no longer 'contained' hazardous waste and thus would no longer be *subject to the management standards for hazardous waste*." 58 Fed. Reg. at 48127. EPA's discussion of the contained in rule and its relationship to the concept of minimized threat levels in these rulemakings is unclear to us. Yet it appears to us that a contained in determination based on a site specific determination satisfies any requirement to achieve minimized threat levels. If this is not EPA's position, then EPA has made a major change in policy for which no notice has been given, for which no rationale has been provided and which may mean that the work on the HWIR will be a complete waste of time. More to the point, if this interpretation about the affect of the contained in rule has changed it may bring to a halt the two remedial projects referenced above and undoubtedly countless other projects.

In order to avoid delay and unnecessary additional expense in connection with approving bids from remediation contractors, we request a prompt response. Monsanto would also like an opportunity to meet with the Agency at the Agency's convenience during January to address the matters raised in this letter.

We look forward to the Agency's urgent consideration and response on this important matter.

Very truly yours,

Peter C. Wright

cc: Barbara Pace, Esquire, EPA Office of General Counsel
Steven Silverman, Esquire, EPA
Richard Kinch, EPA

Mr. Thomas Powers, Acting Commissioner
Mr. John Carrigan
Mr. Brian Moran
Commonwealth of Massachusetts
Department of Environmental Protection
One Winter Street
Boston, Massachusetts 02108

Mr. Richard Chaplin
Commonwealth of Massachusetts
Department of Environmental Protection
10 Commerce Way
Woburn, Massachusetts 01801

Mr. Douglas Crist
Mr. Tom Jecha
Ms. Wendy Ruzacky
Texas Natural Resource Conservation Commission
P.O. Box 13087
Austin, Texas 78711-3087

Lowell Martin, Esquire, RCRA Corrective Action Project

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

FEB 17 1995

OFFICE OF
SOLID WASTE AND EMERGENCY
RESPONSE

MEMORANDUM

SUBJECT: P and U Listed Wastes and the Contained-in Policy

FROM: Devereaux Barnes, Director
Permits and State Programs Division, OSW

TO: Norm Niedergang, Director
Office of RCRA, Region V

Recently your staff contacted us in regard to the Agency's current RCRA contained-in policy as it applies to environmental media that contain P and U listed hazardous wastes. Since this question has been posed several times by other Regions, we would like to take this opportunity to articulate the Agency's position on this matter.

The RCRA contained-in policy applies to P and U listed wastes in the same manner as for other listed wastes. Although §261.33(d) specifies that contaminated soil and water generated from the cleanup of releases of P and U listed wastes must be managed as hazardous waste, such soil or water would not be considered "contaminated" in this particular context if the implementing agency determined that the media did not contain such a listed waste.

As you may know, the Office of Solid Waste is currently developing a new rulemaking--the HWIR Contaminated Media Rule--that will likely codify the contained-in concept in some detail. That rulemaking should hopefully resolve a number of the questions that are often asked regarding the current contained-in policy. Several of your staff are members of the HWIR-Media workgroup, and we will keep them apprised of any further developments regarding this concept.

If you have any questions, please contact Dave Fagan or Carolyn Hoskinson of my staff, at (703) 308-8620 and (703) 308-8626 respectively.

cc: J. Boyle
K. Pierard
B. Pace
T. Kaneen

SW - 026
Hugh Davis

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

MAR 22 1994

OFFICE OF
SOLID WASTE AND EMERGENCY RESPONSE

Mr. T. L. Nebrich, Jr.
Technical Director
Waste Technology Services, Inc.
640 Park Place
Niagara Falls, New York 14301

Dear Mr. Nebrich:

I am pleased to respond to your letter of January 10, 1994, in which you requested clarification of the Agency's "contained-in" policy. The specific question that you raise regards soil contaminated with a listed waste that is listed only because of its ignitability. You question whether the contaminated soil is still a hazardous waste when it is not ignitable. The example that you cite involves soil contaminated with U239. You also raise the same question for soils contaminated with other listed wastes (such as F003) that are listed solely for ignitability.

As you correctly state in your letter, under the "contained-in policy", the authorized state or EPA has the discretion to determine contaminant-specific health-based levels, such that if the concentrations of the hazardous waste constituents were below those levels, the media would no longer be considered to contain the waste. The health-based levels used in making contained-in determinations are made on a site-specific basis. EPA has codified the contained-in policy for contaminated debris (see 57 FR 37225, August 18, 1992).

In cases where the waste is listed only for ignitability, and the contaminated soil is not ignitable and does not exhibit any other characteristics, the contaminated soil may contain hazardous constituents and thereby contain the listed waste. The authorized state or EPA may establish health-based levels for any hazardous constituents present in the contaminated soil below which the contaminated soil would no longer contain the listed waste. For example, for a soil contaminated with F003 listed waste, the authorized state or EPA might establish contained-in determination levels for individual solvents as well for any metals that might be present. This interpretation is consistent with the delisting process for wastes that are listed solely because they exhibit a characteristic. To make a delisting determination, the Administrator may examine additional hazardous constituents other than those for which the waste was listed (260.22(c)(2)).

9441.1992(34)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OCT 15 1992

OFFICE OF
SOLID WASTE AND EMERGENCY RESPONSE

Mr. William L. Warren
Cohen, Shapiro, Polisher, Sheikman and Cohen
1009 Lenox Drive, Building Four
Lawrenceville, NJ 08648

Dear Mr. Warren:

I am pleased to respond to your letter of August 26, 1992, in which you requested clarification of several issues relating to the regulatory status of soils contaminated from releases of commercial chemical products.

The example outlined in your letter dealt specifically with leakage of carbon tetrachloride from a tank. Since the carbon tetrachloride has been "discarded" in this case, it would be identified as U-211 listed hazardous waste. The key question posed in your letter is whether the resulting contaminated soil is hazardous waste, and under what circumstances it would be subject to hazardous waste management requirements.

Under EPA's regulatory definition of hazardous waste in §261.3(c)(1), soils that contain hazardous wastes must be managed as if they were hazardous wastes until or unless they no longer contain the listed waste, exhibit a characteristic, or are delisted (see 57 Fed. Reg. 37225, Aug. 18, 1992). Under the "contained-in policy" the authorized State or EPA has the discretion to determine contaminant-specific health-based levels, such that if the concentrations of the hazardous waste constituents were below those levels the media would no longer be considered to contain the waste. This applies to "U" listed wastes, and other listed wastes. The health-based levels used in making contained-in determinations are established on a site-specific basis, in accordance with general State or Federal guidelines, or by means of a site specific risk assessment. This discretion is available to the State Administrator in an authorized State, or otherwise is vested in the EPA Regional Administrator.

In the example outlined in your letter, you state that the contaminant levels are below the State's remedial requirements. As such, it may be that the State would determine that the soils do not contain hazardous wastes. If such is the case, and

I hope that this has helped to clarify the issues that you have raised. If you have any further questions, please contact Hugh Davis at (703) 308-8633.

Sincerely,

Elizabeth Cotsworth

Michael Shapiro
Director, Office of Solid Waste

530-Z-93-010

federal register

Tuesday
August 18, 1992

## Part II

# Environmental Protection Agency

40 CFR Part 148 et al.

## Land Disposal Restrictions for Newly Listed Wastes and Hazardous Debris; Rule

**ENVIRONMENTAL PROTECTION AGENCY**

**40 CFR Parts 148, 260, 261, 262, 264, 265, 268, 270 and 271**

**[FRL-4132-4]**

**RIN 2050-AD36**

## Land Disposal Restrictions for Newly Listed Wastes and Hazardous Debris

**AGENCY:** Environmental Protection Agency (EPA).

**ACTION:** Final rule.

**SUMMARY:** The Environmental Protection Agency (EPA) is finalizing treatment standards under the land disposal restrictions (LDR) program for certain hazardous wastes listed after November 8, 1984, pursuant to a proposed consent decree filed with the District Court that established a promulgation date of June 1992 (*EDF* v. *Reilly*, Civ. No. 89–0598, D.D.C.). EPA is also finalizing revised treatment standards for debris contaminated with listed hazardous waste or debris that exhibits certain hazardous waste characteristics (hereinafter referred to as hazardous debris), and several revisions to previously promulgated standards and requirements. These actions are being taken as part of the RCRA Reform Initiative, and are expected to facilitate implementation of the LDR program.

**EFFECTIVE DATES:** This final rule is effective on June 30, 1992, except for §§ 148.17(a), 260.10, 261.3(c)(2)(ii)(C), 268.2, 268.5, 268.7, 268.9, 268.36(a), 268.40, 268.41, 268.42, 268.43, 268.45, 268.46, 268.50, 270.14, 270.42, 270.72, and 271.1, which are effective November 16, 1992; and §§ 262.34, 264.110, 264.111, 264.112, 264.140, 264.142, part 264 subpart DD, 265.110, 265.111, 265.112, 265.140, 265.142, 265.221, and part 265 subpart DD, which are effective February 18, 1993.

**ADDRESSES:** The official record for this ulemaking is identified as Docket umber F–92–CD2F–FFFFF, and is ocated in the EPA RCRA Docket, room 2427, 401 M Street SW., Washington, DC 0460. The docket is open from 9 a.m. to p.m., Monday through Friday, except on Federal holidays. The public must make an appointment to review docket materials by calling (202) 260–9327. A maximum of 100 pages from the docket may be copied at no cost. Additional copies cost $.15 per page.

**FOR FURTHER INFORMATION CONTACT:** For general information, contact the RCRA Hotline at (800) 424–9346 (toll free) or (703) 920–9810 locally. For information on treatment standards for newly listed wastes or hazardous debris, contact the Waste Treatment Branch, Office of Solid Waste (OS–322W), U.S. Environmental Protection Agency, 401 M St., SW., Washington, DC 20460, (703) 308–8434. For information on capacity determinations or national capacity variances, contact the Capacity Programs Branch, Office of Solid Waste (OS–321W), U.S. Environmental Protection Agency, 401 M Street, SW., Washington, DC 20460, (703) 308–8440.

**SUPPLEMENTARY INFORMATION:**

### Outline

## I. Background

### *A. Summary of the Hazardous and Solid Waste Amendments of 1984*

The Hazardous and Solid Waste Amendments (HSWA) to the Resource Conservation and Recovery Act (RCRA), enacted on November 8, 1984, allow hazardous wastes to be land disposed only if they satisfy either of two conditions: (1) They can either be treated, or otherwise satisfy, the requirement of section 3004(m), which provision requires EPA to set levels or methods of treatment, if any, which substantially diminish the toxicity of the waste or substantially reduce the likelihood of migration of hazardous constituents from the waste so that short-term and long-term threats to human health and the environment are minimized; or (2) they can be land disposed in units satisfying the so-called no-migration standard in sections 3004 (d)(1), (e)(1), and (g)(5). Land disposal includes any placement of hazardous waste in a landfill, surface impoundment, waste pile, injection well, land treatment facility, salt dome formation, salt bed formation, or underground mine or cave. RCRA section 3004(k).

EPA was required to promulgate land disposal prohibitions and treatment standards by May 8, 1990 for all wastes that were either listed or identified as hazardous at the time of the 1984 debris even if the equipment was used to treat wastes or wastewaters. The commenters are correct. A discarded pump or filter used to treat a waste is debris, but the waste pumped or filtered *is not debris.* Although some filtered or pumped waste will contaminate the pump or filter (indeed, that is the basis for subjecting the filter or pump to the treatment standards), the contaminated pump or filter will virtually always be comprised primarily of debris rather than waste and so would be classified as debris.

f. *Intact Containers Are Not Debris.* A number of commenters requested comment on the relationship between the proposed treatment standards for debris and the so-called empty container rule in § 261.7. That rule states in essence that with respect to containers holding hazardous waste, what is regulated is the hazardous waste in the container and not the container itself. Thus, empty containers are not regulated, and the hazardous wastes in nonempty containers are. An empty container is one from which all hazardous wastes have been removed using practices commonly utilized for waste removal, and in which not more than 2.5 centimeters of waste remains. (Slightly different tests apply to containers holding acutely hazardous wastes.)

Since containers are potentially a form of debris, there is a question whether either empty or nonempty containers are subject to the treatment standards for debris notwithstanding § 261.7. EPA is indicating in this rule that the debris treatment standards do not override the empty container rule, so that rule remains in effect. EPA is taking this step largely because it did not propose the issue for comment, and any fundamental changes to the empty container rule merit fuller public participation than afforded here. In addition, EPA has not fully studied the implications of making changes in the empty container rule to accommodate regulations under the land disposal prohibitions program.

Today's final rule thus indicates that intact containers are never considered to be debris, and thus would never be subject to treatment standards for debris. Intact containers are either empty or nonempty. If empty they are not subject to regulation, as provided by § 261.7(a)(1). If nonempty, the hazardous waste within the container is subject to the land disposal prohibitions (as well as the rest of subtitle C regulations). EPA also does not consider intact tanks to be debris, so that any hazardous wastes in tanks would be subject to the standards for those wastes, not (potentially) to treatment standards for debris.

It should be noted, however, that EPA is reading the empty container rule in § 261.7 to apply to intact containers. The Agency is doing so because the rule was clearly intended for devices that function as containers, not for crumpled drums that are not easily emptied by normal means. See § 261.7(b)(1)(i). Nonfunctional containers are more naturally classifiable as debris and the treatment standards adopted today are appropriate for such damaged containers being disposed.

By "intact container", the Agency means a container that can still function as a container. The Agency believes that a container that is unbroken and still retains at least 75% of its original holding capacity (i.e., has not been crushed more than 25%) is still intact. The Agency selected the 75% criterion because: (1) It is within a reasonable range of 50% to 90%; (2) selecting an original volume criterion on the high end of the range (e.g., 90%) would result in containers containing large quantities of waste being considered debris even though the containers could be readily separated from debris; and (3) selecting an original volume criterion on the low end of the range (e.g., 50%) would subject the waste in containers that have been severely crushed to the treatment standards for the waste. This would require removal of the waste from the container for treatment which may be impracticable for severely crushed containers.

Finally, it should be noted that by observing the empty container rule, EPA is creating a limited exception to the nonsegregation principle discussed above. In situations where intact containers are mixed with true debris (i.e., materials classified as debris under today's rule), the intact containers thus would have to be removed and managed separately.

The following example indicates how these principles would apply. At a remediation site, ruptured drums are discovered still containing some prohibited hazardous waste. Mixed in with these drums are other drums some of which are not significantly damaged or crumpled and all still contain prohibited hazardous wastes. All of these drums are going to be disposed of off site.

Under today's rule, the ruptured drums are debris (broken or ruptured containers are always debris if contaminated with prohibited waste) and cannot be land disposed until they are treated by one of the debris treatment methods. If hazardous waste is removed from the drum during treatment, the waste, like all treatment residues, is subject to the treatment standards for the prohibited waste. With respect to the unruptured drums, those that are intact (i.e., those that retain at least 75% of their original volume) are nonempty containers under § 261.7. The waste in these drums is subject to the treatment standards for the prohibited waste. Those that are not intact (i.e., those that retain less than 75% of their original volume) are debris.

2. Definition of Hazardous Debris

a. *Which Debris is Hazardous, and of this Debris, Which is Prohibited?* This rule applies only to debris that is subject to subtitle C regulation when it is generated. As EPA proposed, this means: (1) Debris that contains listed hazardous wastes (either on the debris surface, or in its interstices, such as pore structure); or (2) debris that exhibits a characteristic of hazardous. See 57 FR 983. To be prohibited, and hence subject to the treatment standards adopted today, the debris would have to be contaminated with listed wastes that are also prohibited, or exhibit a prohibited characteristic. Thus, only debris that is contaminated with a listed waste for which EPA has established a treatment standard, and debris exhibiting the characteristics of ignitability, corrosivity, reactivity, or EP toxicity (plus exhibiting the TC characteristic, since the debris must still be a hazardous waste) are subject to the treatment standards adopted today. (Most of these debris wastes, of course, are already prohibited by virtue of previous rulemakings; only debris contaminated exclusively with the newly listed wastes for which EPA is adopting treatment standards today would be newly prohibited under today's rule.)

b. *Codification of Contained in Principle for Debris.* In adopting the definition that debris containing listed hazardous waste is regulated under subtitle C, EPA is codifying the "contained in" principle, which has heretofore served as an interpretive gloss on the existing mixture and derived from rules. See 57 FR 983, *CMA v. EPA*, 869 F. 2d 1526 (D.C. Cir. 1989). As explained at proposal, *id.* at 986, the contained in concept will apply to both media and nonmedia debris (an approach with unanimous support in the public comments).

Furthermore, EPA is also codifying the corollary part of the contained in principle: That debris which no longer "contains" listed hazardous waste would no longer be subject to subtitle C regulation, provided that it does not exhibit any hazardous waste characteristic. This involves a case-by-case determination by EPA, made upon request, that debris does not contain hazardous waste at significant levels, taking into consideration such factors as site hydrogeology and potential exposure pathways, but excluding management practices.[21] Debris found not to contain hazardous waste (and not exhibiting a hazardous waste characteristic) would not be subject to further subtitle C regulation, and so could be land disposed without further treatment. In addition, these levels could be achieved by any form of treatment other than impermissible dilution, and thus need not result from application of the debris treatment methods adopted today. *Id.* at 983–84.

### 3. Relation of Today's Rule to the Hazardous Waste Identification Rule

On May 20, 1992, EPA proposed comprehensive revisions to the regulatory definition of hazardous waste, asking for comment on a series of options for redefining what a hazardous waste is. See 57 FR 21450. These rules could affect which debris is considered to be hazardous when it is generated (both through modifications to the hazardous waste definitions and the contained in principle), and so could affect both the definition of hazardous débris used in this rule, and possibly the extent such debris must be treated by prescribed methods of treatment. EPA has attempted to note in each of the sections below the potential overlap of this proposed rule on the rules adopted today.

Although the Hazardous Waste Identification Rule (HWIR) when promulgated will affect the definition of hazardous debris subject to today's treatment standards, the Agency believes that it is nonetheless appropriate to make the treatment standards effective immediately upon promulgation. The Agency does not believe that today's rule will place an unreasonable burden on generators of hazardous debris that may subsequently be determined by HWIR not to be hazardous because the Agency has provided a national, case-by-case capacity variance for hazardous debris that defers the effective date of today's treatment standards until May 8, 1993. By that time, the Agency believes that the final HWIR will be promulgated and the treatment of debris that HWIR determines is no longer hazardous will be precluded.

## *C. Treatment Standards for Hazardous Debris*

### 1. Overview

In this section, we discuss: (1) The treatment technologies proposed as BDAT; (2) the contaminants subject to treatment; (3) the debris treatment standards; (4) alternative LDR standard; (5) performance standards that must be met to ensure effective treatment and to comply with the BDAT standards; (6) contaminant restrictions for certain treatment methods; (7) use of treatment trains for multiple contaminants and debris types; (8) treatment of characteristic debris; (9) standards for debris that is inherently toxic (i.e., it fails the TC and EP for metal contamination because it is fabricated from a toxic metal); (10) relationship of TSCA PCB rules to today's rule; (11) relationship of existing agency standards for asbestos to today's rule; (12) special requirements for radioactive debris; and (13) implementation of treatment standards.

### 2. BDAT Debris Treatment Technologies

a. *Identification of BDAT Treatment Technologies.* The Agency considered a treatment technology to be "available" if the technology itself or the services of the technology are able to be purchased, and the technology substantially diminishes the toxicity of the waste or reduces the likelihood of migration of the waste's hazardous constituents. The technologies that the Agency has identified as best demonstrated available technologies (BDAT) have been used to treat hazardous debris at Superfund sites, to remove radioactive metals from debris, to treat debris-like material contaminated with compounds similar to one or more of the compounds in the debris contaminant categories or, based on engineering judgment, are applicable to debris.

The Agency considered a technology to be demonstrated for a particular waste if the technology currently is in commercial operation for treatment of the waste or constituent of interest or similar wastes or constituents of interest, including wastes not regulated under RCRA, such as PCBs and radioactive waste. The Agency identified demonstrated technologies either through a review of the literature in which current waste treatment practices were discussed, or through information provided by specific facilities currently treating the waste or similar wastes. EPA also considered as demonstrated technologies those used to separate or otherwise process chemicals and other materials which are similar to the waste or constituent of interest.

The Agency also reviewed the properties of debris which may directly affect the efficiency of treatment technologies. Debris characteristics which may affect the performance or effectiveness of treatment technologies to clean various types of debris include:

- Destructibility;
- Hardness and brittleness;
- Moisture content;
- Permeability;
- Size, homogeneity, and location (in situ versus ex situ);
- Surface texture; and
- Total organic carbon (TOC).

Under today's rule, the Agency has identified the following 17 treatment technologies as BDAT for hazardous debris:

- Extraction Technologies:
  - —Physical Extraction
    - —Abrasive blasting
    - —Scarification, grinding, and planing
    - —Spalling
    - —Vibratory finishing
    - —High pressure steam and water sprays
  - —Chemical Extraction
    - —Water washing and spraying
    - —Liquid phase solvent extraction
    - —Vapor phase solvent extraction
  - —Thermal Extraction
    - —High temperature metals recovery
    - —Thermal desorption
- Destruction Technologies
  - —Biodegradation
  - —Chemical oxidation
  - —Chemical reduction
  - —Thermal destruction
- Immobilization Technologies
  - —Macroencapsulation
  - —Microencapsulation
  - —Sealing

Summary descriptions of these technologies are presented in Appendix I of today's preamble and treatment performance standards for each technology are prescribed in Table I, § 268.45. Further, detailed information on the various treatment technologies is presented in the Hazardous Debris Final Rule Technical Support Document.

b. *Changes in Identification of BDAT Technologies From Proposal.* Based on public comment and the Agency's further evaluation, the Agency has determined that two debris treatment technologies proposed as BDAT—electropolishing and ultraviolet radiation—are not BDAT, and an additional technology not proposed as BDAT—high temperature metal recovery—is, in fact, BDAT for

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[21] We note that consideration of management practices for exclusion from subtitle C is being evaluated through the proposed Hazardous Waste Identification Rule discussed below in the text.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

MAR 26 1991

OFFICE OF
SOLID WASTE AND EMERGENCY RESPONSE

John E. Ely
Enforcement Director
Virginia Department of Waste Management
101 North 14th Street
Richmond, Virginia 23219

Dear Mr. Ely:

At the request of Carlyle C. Ring, Vice President and General Counsel of Atlantic Research Corporation, I am sending this letter to summarize the Agency's current position on the "contained-in" interpretative policy. It is my understanding, based upon Mr. Ring's letter, that there was some question as to whether the "contained-in" interpretative policy applies to all environmental media or only to ground water. Mr. Ring's letter also suggested that a letter from my Office would help resolve this matter. I hope this letter will answer this question and further clarify the policy. I have also enclosed, for your information, a memorandum from Jonathan Cannon to Thomas Jorling dated June 19, 1989. I hope that you will find these helpful.

The "contained-in" interpretation addresses environmental media (i.e., ground water, soil, and sediment) contaminated with RCRA listed hazardous waste. Our federal regulations at 40 CFR Part 261.3 identify hazardous wastes. Among other things, these regulations state that a solid waste mixed with a hazardous waste is a hazardous waste. However, these regulations generally do not specifically address environmental media, which are not solid wastes, mixed with listed hazardous waste. The Agency's position continues to be that mixtures of environmental media and listed hazardous waste (i.e., contaminated ground water, contaminated soil, and contaminated sediments) must be managed as if they were hazardous waste. This position is known as the "contained-in" policy. EPA's application of the "contained-in" policy to contaminated media was upheld by the D.C. Circuit Court of Appeals in Chemical Waste Management, Inc. v. U.S. EPA, 869 F.2d 1526 (D.C. Cir. 1989).

Consistent with this approach, the Agency further interprets the regulations to mean that environmental media contaminated with listed hazardous waste must be managed as if they were hazardous waste until the media no longer contain the listed hazardous waste (i.e., until decontaminated), or are delisted. To date, the Agency has not issued any definitive guidance as to when, or at what levels, environmental media contaminated with listed hazardous waste no longer contain that hazardous waste. Until such guidance is issued, the Regions or authorized States may determine these levels on a case-specific basis. However, as you know, States that are authorized to implement the RCRA hazardous waste program, as Virginia is, are not bound by EPA's interpretation of the Federal regulations. Although they usually follow Federal interpretations, authorized States may interpret their own regulations more strictly than EPA interprets the Federal regulations.

Related to making a determination as to when contaminated media no longer contains listed hazardous waste, we suggest that a risk assessment approach be used that addresses the public health and environmental impacts of hazardous constituents remaining in the treated soils. And as stated above, the authorized State could apply more stringent standards or criteria for contaminated environmental media than those recommended by the Federal EPA if the authorized state determined it to be appropriate. [Note: However, this approach does not apply to residuals from the treatment of listed hazardous waste or mixtures of solid waste with listed hazardous waste under our current regulations, which must be delisted.]

I hope that this letter will be helpful to you in establishing and implementing Virginia's hazardous waste policies on related issues. Should you have any questions concerning EPA's "contained-in" interpretative policy, please contact Steve Cochran, Acting Chief of the Waste Identification Branch, at (202) 382-4770.

Sincerely yours,

Sylvia K. Lowrance
Director
Office of Solid Waste

cc: C. Ring
D. Freedman

**Atlantic Research Corporation**

rlyle C. Ring, Jr.
Vice President and General Counsel

5390 Cherokee Avenue
Alexandria, Virginia 22312
(703) 642-4250

**Federal Express**

February 21, 1991

Mr. David Bussard
Characterization & Assessment Division
Solid Waste and Emergency Response
Environmental Protection Agency
401 M Street S.W.
Room SE240E
Washington, D.C. 20460

Re: Contained In Rule

Dear Mr. Bussard:

It is our understanding that the enclosed letter of Assistant Administrator Jonathan Z. Cannon of June 19, 1989 states the policy and position of the EPA that the "contained in" rule applies to ground water, soil and sediment.

We would hereby request that a letter be sent to the Virginia Department of Waste Management stating that the "contained in" rule of the enclosed Jorling letter applies to all environmental media. The letter should be sent to:

John E. Ely, Enforcement Director
Virginia Department of Waste Management
101 North 14th Street
Richmond, Virginia 23219.

It is our understanding that VDWM will accept such a letter indicating the EPA Headquarters policy as applicable to all media, including soil, in connection with a number of sites over which both EPA Region III and VDWM have jurisdiction. The letter also would assist in resolving issues relating to a site involving Atlantic Research Corporation (ARC).

Since the 1950's ARC has operated a manufacturing facility for solid propellant rocket motors in Gainesville, Virginia. Currently that plant is manufacturing rocket motors for the Tomahawk and Stinger missiles, among other DoD programs. During the 50's through 70's ARC, like other industrial users, did not handle solvents used for cleaning equipment and painting in the manner that they are now handled. Consequently, it was discovered in 1987 that there was limited soil and groundwater contamination by solvents at ARC's Gainesville facility. This was promptly reported to both VDWM and EPA Region III. A Consent Order under Section 3008 was entered into between Region III and ARC for study and cleanup.

ARC a subsidiary of Sequa Corporation

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

JUN 19 1989

Mr. Thomas C. Jorling
Commissioner
Department of Environmental Conservation
State of New York
Albany, New York 12233-1010

Dear Mr. Jorling:

I am writing in response to your letter of May 5, 1989, in which you ask numerous questions concerning the regulatory status, under the Resource Conservation and Recovery Act (RCRA), of environmental media (ground water, soil, and sediment) contaminated with RCRA-listed hazardous waste.

As you point out in your letter, it is correct that the Agency's "contained-in" interpretation is that contaminated environmental media must be managed <u>as if</u> they were hazardous wastes until they no longer contain the listed waste, or are delisted. This leads to the critical question of when an environmental medium contaminated by listed hazardous waste ceases to be a listed hazardous waste. In your letter, you discuss three possible answers (based on previous EPA positions and documents) which you believe address this question, and request the Agency to clarify its interpretation. Each of these is discussed below.

The first possible answer you cite would be that the contaminated media would be a hazardous waste unless and until it is delisted, based on the "mixture" and "derived-from" rules. As you correctly state in your letter, a waste that meets a listing description due to the application of either of these rules remains a listed hazardous waste until it is delisted. However, these two rules do not pertain to contaminated environmental media. Under our regulations, contaminated media are not considered solid wastes in the sense of being abandoned, recycled, or inherently waste-like as those terms are defined in the regulations. Therefore, contaminated environmental media cannot be considered a hazardous waste via the "mixture" rule (i.e., to have a hazardous waste mixture, a hazardous waste must be mixed with a <u>solid</u> waste per 40 CFR 261.3(a)(2)(iv)). Similarly, the "derived-from" rule does not apply to contaminated media. Our basis for stating that contaminated environmental media must be managed as hazardous wastes is that they "contain" listed hazardous waste. These environmental media must be managed as hazardous waste because, and only as long as, the "contain" a listed hazardous waste, (i.e., until decontaminat

The second possibility you mention is that environmental media contaminated with a RCRA listed waste no longer have to managed as a hazardous waste if the hazardous constituents ar completely removed by treatment. This is consistent with the Agency's "contained-in" interpretation and represents the Agency's current policy.

The third possibility you discuss comes from Sylvia Lowrance's January 24, 1989, memorandum that you cited in you letter. This memorandum indicates that OSW has not issued an definitive guidance as to when, or at what levels, environmen media contaminated with listed hazardous waste are no longer considered to contain that hazardous waste. It also states th until such definitive guidance is issued, the Regions may determine these levels on a case-specific basis. Where this determination involves an authorized State, such as New York, policy is that the State may also make such a determination.

Related to such a determination, you ask whether a risk assessment approach that addressed the public health and environmental impacts of hazardous constituents remaining in treatment residuals would be acceptable. This approach would acceptable for contaminated media provided you assumed a direct exposure scenario, but would not be acceptable for "derived-fr wastes under our current rules. Additionally, consistent with the statute, you could substitute more stringent standards or criteria for contaminated environmental media than those recommended by the Federal EPA if you determined it to be appropriate.

The Agency is currently involved in a rulemaking effort directed at setting *de minimis* levels for hazardous constituents below which eligible listed wastes, treatment residuals from those wastes, and environmental media contaminated with those listed wastes would no longer have to be managed as hazardous wastes. The approach being contemplated in the *De Minimis* program would be similar to that used in the proposed RCRA Clean Closure Guidance in terms of the exposure scenario (direct ingestion), the management scenario (not in a waste management unit), and the levels (primarily health-based).

Your final question related to whether the "remove and decontaminate" procedure set forth in the March 19, 1987 *Fede Register* preamble to the conforming regulations on closing surface impoundments applies when making complete removal determinations for soil. These procedures do apply when one chooses to clean close a hazardous waste surface impoundment b removing the waste. The preamble language states that the Age interprets the term "remove" and "decontaminate" to mean remov of all wastes, liners, and/or leachate (including ground water that pose a substantial present or potential threat to human health or the environment (52 FR 8706). Further discussion of these requirements is provided in a clarification notice published on March 28, 1988, (53 FR 1144) and in OSWER Policy Directive # 9476.00-18 on demonstrating equivalence of Part 26 clean closure with Part 264 requirements (copy enclosed).

I hope that this response will be helpful to you in establishing and implementing New York's hazardous waste polic on related issues. Should you have additional questions, plea contact Bob Dellinger, Chief of the Waste Characterization Bra at (202) 475-8551.

Sincerely yours,

Jonathan Z. Cannon
Acting Assistant Administratc

[illegible]

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
SOLID WASTE AND EMERGENCY RES

JAN 24 1989

**MEMORANDUM**

SUBJECT: Status of Contaminated Groundwater and Limitations on Disposal and Reuse

FROM: Sylvia K. Lowrance, Director Syl K. Low
Office of Solid Waste

TO: Jeff Zelikson, Director
Toxics and Waste Management Division
Region IX

In your memo of December 16, 1988 and the attached materials, you stated your understanding of the current policy on the classification of contaminated groundwater and described issues which have arisen in California regarding reuse of contaminated groundwater from a Superfund site.

You have accurately stated the effects of the "contained in" policy which governs situations such as the one you have described. Briefly, a contaminated groundwater which has been treated such that it no longer contains hazardous constituents, need not be considered to be a hazardous waste, and beneficial reuse of the water is permissible. We have not yet issued definitive guidance on levels below which the groundwater is no longer considered to contain hazardous wastes. Until such definitive guidance is issued, the Regions may determine these levels on a case-specific basis.

It is our expectation that ultimately the guidance on levels of hazardous wastes which may remain will mirror the levels in the De Minimis rule which is now under development by OSW. I know that Region IX has been participating in the Work Group discussions and reviews of this proposal and I urge you to continue this involvement.

In its present form, the De Minimis approach contemplates levels based on health-based standards (where available), assuming direct exposure. With respect to the constituents of concern at the Fairchild Superfund site -- trichloroethane

Pursuant to that Consent Order, as an approved interim measure, a pilot treatment unit was authorized using above ground bioaugmented soil venting. That pilot unit has been eminently successful, testing non-detect in three of the four soil piles. It is anticipated that further testing may show non-detect in the fourth pile. EPA Region III, applying the "contained in" rule, is prepared to authorize ARC to use the soil as clean fill on site.

VDWM asserts independent RCRA jurisdiction and has stated that it applies the "contained in" rule to groundwater only. VDWM, however, has also indicated that a letter from EPA headquarters stating that the "contained in" rule applies to all media would be accepted by VDWM as a basis for expanding the "contained in" rule to soil treatment.

Because the pilot study was a success, ARC, under the Corrective Measures Study, contemplates using the above-ground pilot study and similar technologies for remediation of soil on the Gainesville site. Obviously it would be of no merit to incur the substantial cost of such remediation if VDWM under the "mixture" and "derived from" rules, requires the treated soil to be hauled to a licensed disposal facility or requires delisting after treatment.

In the event you have any questions concerning this request or need further information we would like to have a meeting with you. Robert Stroud, who has cognizance of ARC's Consent Order with EPA Region III, would like to be included in any meeting. I will give you a call in a few days to see whether you can respond favorably to our request or whether a meeting would be appropriate.

I had had a conversation yesterday with Mike Tetruska of your office and he suggested that I should put my request in writing.

Sincerely,

Carlyle C. Ring

Carlyle C. Ring, Jr.

c.c. Robert Stroud
Michael Tetruska
Robert Greaves
John Ely
Patricia Tan

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

JAN 3 1989

**MEMORANDUM**

SUBJECT: Status of Personnel Protective Equipment as a RCRA Waste

FROM: Sylvia K. Lowrance, Director
Office of Solid Waste

TO: Timothy Fields, Jr., Director
Emergency Response Division

This memo is in response to your inquiry about our planned "de minimis" rule and about the status of personnel protective clothing and other debris in the interim.

The "de minimis" rule is intended to define levels of contamination below which wastes are not hazardous. In concept, this could apply to any type of material, including clothing and debris. However, there could be some difficulty in applying this approach to all of the materials of concern to you since test methods needed to determine the level of contamination may not be appropriate for all of the materials encountered. I have asked the staff responsible for developing the rule to consider this aspect of the "de minimis" determination as they proceed.

Until the time that a "de minimis" approach is available, there are several options for dealing with contaminated clothing and other similar debris.

Since clothing and the other materials of concern are not considered solid wastes, they can be dealt with through the "contained in" policy. That is, if the hazardous contaminant can be removed, the underlying material is no longer considered to be a hazardous waste and its disposal is not restricted. As you noted in your memo, this may not be appropriate in all situations, since it may generate large volumes of contaminated rinsate which must be treated before disposal.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Where it is impossible or impractical to remove the contamination, the materials must be treated in accordance with the applicable land disposal restriction (LDR) standards and other applicable requirements of Subtitle C. If the waste is one for which treatment standards have been set, the material must be treated to the applicable LDR levels, or a treatability variance must be granted. The determination of which option is more appropriate will depend on the nature of the underlying material and on the treatment methods available.

If the method of treatment necessary to meet the LDR treatment standards is inappropriate for the material in question, another method of treatment can be proposed through a treatability variance. Since the underlying materials vary greatly, it is not possible to give general guidance on what methods of treatment are appropriate in these circumstances. This decision must be made on a case by case basis.

If the waste in question is a soft hammer waste, as is the case in the situation described in the Region V memo which you attached, then the soft hammer provisions described in the August 17, 1988 Federal Register Notice on the First Third Final Rule should be followed. You should note that, although cost may be used to some extent in determining the practicability of treatment for soft hammer wastes, it is not a consideration in determining treatment for wastes which have standards in effect.

Finally, you cite the empty container rule as relevant here. While it is possible that the amount of hazardous waste remaining in a container could exceed that contained in clothing or other materials there is no "empty" rule for anything but containers, and that concept would not apply to the situations you have described.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

NOV 13 1986

OFFICE OF
SOLID WASTE AND EMERGENCY

**MEMORANDUM**

SUBJECT RCRA Regulatory Status of Contaminated Ground Water

FROM: Marcia E. Williams, Director
Office of Solid Waste

TO: Patrick Tobin, Director
Waste Management Division, Region IV

This is in response to your memorandum of September 18, 1986, regarding the regulatory status of ground water contaminated with hazardous waste leachate. To answer this question, one first has to determine the status of ground water. Under the regulations, ground water contained in the aquifer is not considered a solid waste, since it is not "discarded" in the sense of being abandoned, recycled, or inherently waste-like as those terms are defined in the regulations. See 40 CFR 261.2(a)-(d). Therefore, contaminated ground water cannot be considered a hazardous waste via the mixture rule (*i.e.*, to have a hazardous waste mixture, a hazardous *waste* must be mixed with a *solid waste*; see 40 CFR 261.3(a)(2)(iv)). Nevertheless, ground water contaminated with hazardous waste leachate is still subject to regulation since it *contains* a hazardous waste. Therefore the treatment, storage, or disposal of ground water contaminated with hazardous waste leachate must be handled *as if* the ground water itself were hazardous since hazardous waste 1/ leachate is subject to regulation under Subtitle C of RCRA. However, if the ground water is treated such that it no longer contains a hazardous waste, the ground water would no longer be subject to regulation under Subtitle C of RCRA.

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1/ This memo more precisely explains the position on ground water contamination presented in John Skinner's memo dated December 26, 1984.

Taking this interpretation and applying it to the example in your memorandum, the ground water containing a listed hazardous waste, once collected, is subject to regulation under the hazardous waste regulations. However, if as a result of treatment, the ground water no longer contains the hazardous waste leachate, the ground water would no longer be subject to the hazardous waste rules.

Your letter also raises the question of treatment of ground water within the context of corrective action. If the corrective action is taken at an interim status facility in compliance with a §3008(h) order, treatment can take place. We are considering the possibility of amending the regulations to clarify the relationship between corrective action and the reconstruction ban (§270.72(e)). More broadly, the Agency is currently examining the issue of whether permits should be required for any corrective actions. We are also developing rules for corrective action under RCRA §3004(u). Until this analysis is completed, if the corrective action takes place at a permitted facility, it can be handled as a permit modification.

Please feel free to call Matt Straus, of my staff, if you have any further questions; his telephone number is 475-8551 (FTS).

cc: Hazardous Waste Division Directors,
Regions I-III and V-X
Gene Lucero, OWPE
Lloyd Guerci, OWPE
Mark Greenwood, OGC
Steve Silverman, OGC

*U.S. Department of Energy* *Office of Environmental Policy and Assistance*
*RCRA Information Brrief* *EH-231-035/0693 (June 1993) (Subpart CC Update, June 1999)*

# The “Derived-from” Rule under the Resource Conservation and Recovery Act (RCRA)

*BACKGROUND:* Under the "Derived-from" rule, solid waste that is generated from the treatment, storage or disposal (TSD) of a hazardous waste is itself classified as a hazardous waste. Therefore, residues resulting from TSD activities including materials such as sludges, ash emission control dusts, leachate, or spill residues are considered hazardous wastes (with certain exceptions discussed below). This provision is based on the premise that any residues from treatment, storage or disposal of hazardous waste will contain hazardous constituents [40 CFR 261.3(c)(2)(i)]. Beyond "derived-from" considerations, treated hazardous waste also may be subject to prescribed ***waste determination procedures*** (e.g., RCRA Subpart CC) upon exiting the treatment process.

It should be noted that a December, 1991 court ruling remanded both the "Mixture" rule (see ref. 1) and the "Derived-from" rule to the Environmental Protection Agency (EPA), on the grounds that EPA did not allow for public comment on these rules prior to promulgation. On March 3, 1992 EPA reinstated the rules on an interim basis, and is currently developing a revised regulatory scheme for hazardous waste classification (see ref. 2)

*STATUTE:* The Resource Conservation and Recovery Act.

*REGULATIONS:* 40 CFR 261.3(c) & (d).

*REFERENCES:*

1. "The Mixture Rule Under RCRA," EH-231 Information Brief, EH-231-005/0991, September 1991
2. *Federal Register* Notice (57 *FR* 7628, 3/3/92)
3. *Federal Register* Notice (45 *FR* 33096, 5/19/80)
4. *Federal Register* Notice (56 *FR* 7197), February 21, 1991
5. *Obtaining Variances from the Treatment Standards of the RCRA Land Disposal Restrictions*, EH-231 Guidance Manual, EGD (RCRA)-001/0590, May 1990
6. *Federal Register* Notice (55 *FR* 22537), June 1, 1990

## What is a *hazardous waste* under RCRA?

A hazardous waste under RCRA is any solid waste that is not specifically excluded from the hazardous waste regulations, and that:

- ☐ is listed in one of four lists developed by EPA and contained in the *Code of Federal Regulations* (CFR) at 40 CFR 261.31-33 (a listed waste); and/or
- ☐ exhibits one or more of four characteristics identified at 40 CFR 261.21-24 -- *ignitability*, *corrosivity*, *reactivity*, and *toxicity* (a characteristic waste).

Furthermore, as stated in the background section above, under the “Derived-from” rule, solid waste that is generated from the treatment, storage or disposal of a hazardous waste is also classified as a hazardous waste.

## With respect to treatment of hazardous wastes, does the "Derived-from" rule only apply to the waste stream remaining after all treatment steps have been completed?

No. For example, if solvents are treated using filters to separate out solid fines, the solid fines and the used filters are hazardous wastes, as they both constitute a solid waste generated from treatment, storage or disposal of a hazardous waste.

## Does the "Derived-from" rule apply to materials reclaimed from non-hazardous solid wastes?

The “Derived-from” rule only applies to wastes derived from hazardous wastes. Materials that are reclaimed from non-hazardous solid wastes are not wastes if used beneficially. However, if the reclaimed material is burned for energy recovery or applied to the land in a manner constituting disposal (e.g., dust suppression) it is a solid waste [40 CFR 261.3(c)(2)(i)]. Because such a material burned for energy recovery or used in a manner constituting disposal is a solid waste, one must also consider the possibility that it may exhibit a characteristic of a hazardous waste, which would render it a hazardous waste as well.

## Are there exclusions from the "Derived-from" rule?

The regulation exempts wastes derived from the treatment of characteristic waste, provided they no longer exhibit the hazardous characteristic after treatment. It is important to note that wastes listed solely on the basis of their characteristic (e.g., F003 for ignitability) are not eligible for this exclusion because they are listed hazardous wastes. They would remain listed hazardous wastes after treatment, even if they no longer exhibit the characteristic. This differs from the mixture rule, in that wastes listed solely on the basis of exhibiting a characteristic are not hazardous if they are mixed with a non-hazardous solid waste, and thus rendered non-hazardous (see ref. 1).

Furthermore, the following four types of waste are not hazardous wastes under the "Derived-from" rule unless they exhibit a characteristic of a hazardous waste [40 CFR 261.3(c)(2)(ii)(A-C)]:

- ***Lime Stabilized Waste Pickle Liquor Sludge From the Iron and Steel Industry***—This applies only to the iron and steel industry, and only to those wastes treated by lime stabilization.
- ***Combustion Residuals***—Ordinarily, residue from burning of hazardous wastes are hazardous wastes under the "Derived-from" rule. However, if the combustion involves fossil fuel, or certain hazardous waste derived fuels, there may be exceptions to the rule. For example, combustion residuals of coal and other fossil fuels are exempt. This exclusion is also extended to combustion of certain fuels produced from petroleum industry wastes, petroleum coke, and iron and steel coke, and coal tar.
- ***K061, K062, and F006 Treatment Residuals***—This exclusion applies to non-wastewater residues, such as slag, resulting from high temperature metal recovery (HTMR) processing of certain listed wastes. Those wastes are:
    - K061 wastes (emission control dust/sludge from the primary production of steel in electric furnaces),
    - K062 wastes (spent pickle liquor generated by steel finishing operations of facilities within the iron and steel industries), and
    - F006 wastes (wastewater treatment sludges from certain electroplating operations).

  In order for this exclusion to apply, concentrations of hazardous constituents must not exceed levels identified in 40 CFR 261.3(c)(2)(ii)(C). Notification and certification requirements apply to all shipments of such wastes to subtitle D disposal units.

Finally, precipitation run-off from hazardous waste facilities is exempt from regulation. This is based on the presumption that precipitation run-off will not have had sufficient contact with the waste to solubilize hazardous constituents. However, *collected* run-off would be a solid waste, and could possibly be hazardous as well (see ref. 3).

### What is the "Bevill" exclusion, and how might it apply to "Derived-from" wastes?

The "Bevill" amendment exempts certain wastes specified under RCRA 3001(b)(3)(A)(i-iii) from regulation as RCRA hazardous wastes, under certain conditions. Those wastes are fly ash and bottom ash wastes, slag wastes and flue gas emission control wastes generated from combustion of coal or other fossil fuels, certain mining wastes, and cement kiln dust waste.

This exemption is in effect pending completion of an EPA report to Congress and a subsequent regulatory determination on whether this exemption is warranted. The report to Congress is required under RCRA Section 8002(a). The subsequent regulatory determination is required under RCRA Section 3001(b)(3)(C).

It is EPA's current position that the residues derived from the treatment of these wastes are themselves excluded from regulation, so long as treatment does not significantly change the character of the wastes as being "high volume/low hazard" wastes (see ref. 4).

### If the above exclusions do not apply to a "Derived-from" waste, is it possible to petition for an exemption from regulation?

If the treatment residues are derived from a listed waste, it is possible to apply for a delisting petition under 40 CFR 260.20 and 260.22 [40 CFR 261.3(d)]. However, a waste so excluded may still be a hazardous waste if found to exhibit a characteristic of a hazardous waste.

### If a hazardous waste is treated to meet Land Disposal Restrictions (LDR) treatment standards, can the treatment residues (i.e. the "Derived-from" wastes) be land disposed?

All wastes generated in the course of treatment are prohibited from land disposal unless they comply with the LDR treatment standards, or are otherwise exempted from the LDR requirements, either through a no-migration determination or an extension to the LDR effective date based on the lack of adequate capacity (i.e., national capacity variance or case-by-case extension). Thus, treatment residues that meet LDR treatment standards can be land disposed. It is also possible to petition EPA for a variance from the treatment standards (see ref. 5). However, it is EPA's position that since treatment standards are generally based on concentrated forms of a waste (i.e., the original waste), the residues from subsequent treatment should be easier to treat (see ref. 6).

***Questions of policy or questions requiring policy decisions will not be dealt with in EH-413 Information Briefs unless that policy has already been established through appropriate documentation. Please refer any questions concerning the subject material covered in this Information Brief to the RCRA/CERCLA Division, EH-413, (202) 586-6374.***

**U.S. Department of Energy** **Office of Environmental Guidance**

**RCRA Information Brief** **EH-231-005/0991 (September 1991) (Subpart CC Update, June 1999)**

# The Mixture Rule Under the Resource Conservation and Recovery Act

**BACKGROUND:** Under the Resource Conservation and Recovery Act (RCRA), wastes may be classified as hazardous wastes or solid (non-hazardous) wastes. Each classification of wastes has its own applicable handling requirements. In accordance with the definition of hazardous waste under RCRA, waste mixtures containing a hazardous and solid waste component are hazardous wastes, unless certain exceptions apply. Also, when determining whether ***Subpart CC air emission standards*** and handling requirements are applicable, it may be necessary to calculate the average volatile organic (VO) concentration for each hazardous waste stream at its point of waste origination ***prior to mixing***. The primary purpose of the RCRA waste mixture provisions are to ensure that the Subtitle C (hazardous waste) requirements are applied consistently to both hazardous wastes and waste mixtures. These provisions were intended to discourage the commingling of the hazardous wastes with non-hazardous solid wastes simply to avoid Subtitle C regulation.

**STATUTE:** Resource Conservation and Recovery Act

**REGULATIONS:** 40 CFR 148.1(d), 261.3, 264.1(f), 265.1084, 268.3, 268.41, and 268.44

**REFERENCES:**

1. "Obtaining Variances from the Treatment Standards of the RCRA Land Disposal Restrictions," EH-231 Guidance Manual, May 1990.
2. "Centralized Treatment Involving Dilution, Land Disposal Restrictions Third Third Scheduled Wastes," Final Rule, 55 FR 22666, June 1, 1990.
3. "RCRA Regulatory Status of Contaminated Groundwater EPA Memorandum," November 13, 1986.
4. "Applicability of Land Disposal Restrictions to RCRA and CERCLA Groundwater Treatment Reinjections," EH-231 Memorandum, March 28, 1990.
5. "Status of Personnel Protective Equipment as a RCRA Waste," EPA Memorandum, January 3,1989.

## What is a "Mixture"?

For the purposes of the "Mixture Rule," a mixture is any combination of a listed or characteristic hazardous waste and a non-hazardous solid waste.

## What is a "hazardous waste" under RCRA?

The RCRA regulatory framework identifies those solid wastes that must be managed as hazardous wastes. A solid waste is hazardous if it is not excluded from the hazardous waste regulations, and

- ❑ it is listed in one of three lists developed by EPA and contained in the Code of Federal Regulations (CFR) at 40 CFR 261.31-33 (a listed waste) or
- ❑ it exhibits one or more of four characteristics identified at 40 CFR 261.21-24 -- "ignitability," "corrosivity," "reactivity," and "toxicity" (a characteristic waste).

## Are mixtures regulated as hazardous wastes or non-hazardous solid wastes?

Mixtures of listed hazardous wastes and non-hazardous solid wastes are considered to be RCRA hazardous wastes [40 CFR 261.3(a)(2)(iv)]. Mixtures of a solid waste and a listed hazardous waste that is listed solely because it exhibits one or more of the characteristics of hazardous waste are hazardous wastes unless the resultant mixture no longer exhibits those characteristics [40 CFR 261.3(a)(2)(iii)]. Mixtures of characteristic wastes and non-hazardous wastes are hazardous wastes only if the mixture exhibits a characteristic of a hazardous waste [40 CFR 261.3(b)(3)].

## In cases where a mixture results in the waste no longer exhibiting a hazardous characteristic, is the mixing process itself regulated under RCRA

Provided the hazardous waste is not listed, or was listed solely because of its characteristic, the mixture is no longer a hazardous waste, but the mixing process would be regulated as a hazardous waste treatment process, unless the mixture occurs in a unit that specifically has been exempted from regulation (e.g., a totally enclosed treatment process or an elementary neutralization unit [40 CFR 264.1(f)(5) & (6)].

## Are there exceptions to the mixture rule?

Yes. Wastewaters containing certain listed hazardous wastes are not subject to the mixture rule, provided the wastewaters meet specific criteria. First, the mixture must consist of wastewater, the discharge of which is regulated under the Clean Water Act (CWA). Second, the wastewater mixture must contain one of the following:

- ☐ **Spent Solvents** specified in 40 CFR 261.3(a)(2)(iv)(A) & (B), if these solvents are not principle waste streams and are discharged in small quantities into wastewater for treatment. The referenced regulations specifying these solvents also impose certain limitations on the amounts that may be discharged.
- ☐ **Heat Exchanger Bundle Cleaning Sludge** from the petroleum refining industry (EPA Hazardous Waste Code K050). There are no limitations on the amount of this waste that may be added to the waste stream [40 CFR 261.3(a)(2)(iv)(C)].
- ☐ **Discarded Commercial Chemical Products** listed in 40 CFR 261.33 arising from *de minimis* losses from manufacturing operations in which the materials are produced or used as raw materials. There are no numerical limits on the amounts of commercial chemical products that can be added to the waste stream [40 CFR 261.3(a) (2)(iv)(D)].
- ☐ **Wastewaters Resulting from Laboratory Operations** containing toxic (T) wastes listed in Subpart D of Part 261. Limits on discharge into treatment systems are specified in 40 CFR 261.3(a)(2)(iv)(E).

[This exclusion does not apply to sludges generated by wastewater treatment that contain listed and/or characteristic waste (40 CFR 261.4(a)(2)]

## If the above exceptions do not apply to a waste, is it possible to petition for an exemption from regulation?

If the hazardous component of the mixture is a listed waste, it is possible to apply for a delisting petition under 40 CFR 260.20 and 260.22. Also, as stated above, if the waste was listed solely because it exhibits a characteristic, the mixture is not a hazardous waste if it no longer exhibits that characteristic [40 CFR 261.3(a)(2)(iii)].

## How do the Land Disposal Restrictions treatment standards apply to mixtures?

If the waste mixture has two or more applicable treatment standards for its constituents, then the most stringent standard applies to the mixture [40 CFR 268.41(b)]. It should be noted, however, that the land disposal restrictions do allow for a variance from the treatment standards, provided a petitioner demonstrates that the waste cannot be treated to the level specified in the rule (40 CFR 268.44) *(see ref. 1)*

## Do the Land Disposal Restrictions allow for dilution of wastes to meet treatment standards?

Dilution of wastes or waste treatment residues to achieve a treatment standard specified under the Land Disposal Restrictions, or to circumvent any of the prohibitions under the Land Disposal Restrictions, is prohibited. However, there are exceptions. Characteristic wastes, with the exception of wastes that are characteristic due to toxicity, may be exempt from the dilution prohibition under certain circumstances. Specifically, if such wastes are treated in:

- ☐ a treatment system permitted pursuant to Sect. 402 of the CWA or
- ☐ a treatment system meeting the waste pretreatment requirements under Sect. 307 of the CWA.

Treatment of non-toxic characteristic wastes in such systems is permissible unless a treatment method has been identified under the Land Disposal Restrictions as a treatment standard, in which case, that standard would apply [40 CFR 268.3)]. Furthermore, wastes discharged into an underground injection well subject to Safe Drinking Water Act regulations, which do not exhibit a hazardous characteristic at the point of discharge, are not subject to the dilution prohibition [40 CFR 148.1(d)(1) & (2)].

Aggregation is a prohibited form of dilution if the wastes are not treated, or are treated inappropriately, or if the waste is diluted so that it can be delisted under the above referenced delisting petition procedures. Aggregation is permitted in circumstances where all restricted wastes are amenable to the same form of treatment, and the treatment meets Best Demonstrated Available Technology (BDAT) standards *(see ref. 2)*.

## If an environmental medium such as soil or groundwater becomes contaminated (i.e., mixed) with a hazardous waste, is the contaminated medium subject to regulation as a hazardous waste?

By definition, contaminated media (soil, groundwater, and sediments) cannot be “mixtures” subject to the mixture rule. However, in accordance with EPA’s “contained-in” policy, such environmental media contaminated with hazardous wastes are regulated as hazardous wastes until such time as the medium is treated to remove the contaminant *(see ref. 3)*. This EPA policy, which is not codified into regulation, is based on the premise that hazardous wastes mixed with environmental media do not lose their hazardous properties. This policy also results in the potential applicability of the Land Disposal Restrictions to contaminated media during environmental restoration activities *(see ref. 4)*. It is important to note that in addition to environmental media, this policy extends to debris such as clothing and equipment that are contaminated with hazardous wastes *(see ref. 5)*.

***Questions of policy or questions requiring policy decisions will not be dealt with in EH-413 Information Briefs unless that policy has already been established through appropriate documentation. Please refer any questions concerning the subject material covered in this Information Brief to the RCRA/CERCLA Division, EH-413, (202) 586-6374.***

# Appendix B

## Chapter 9
## of
## *Operation, Maintenance & Management of Stormwater Management*

# Operation,
# Maintenance,
# & Management
# of
# Stormwater
# Management
# Systems

# Operation, Maintenance, and Management of Stormwater Management Systems

Produced by the:

**Watershed Management Institute, Inc.**
"Creating Practical Solutions for Complex Resource Challenges"

in cooperation with

**Office of Water**
**U. S. Environmental Protection Agency**
**Washington D.C.**

**August 1997**

# *Chapter 9*
# *Disposal of Stormwater Sediments*

## 1. OVERVIEW

Assuring that stormwater management systems will provide their desired benefits is no easy task. There are many challenges to overcome. The stormwater management system must be properly designed and constructed. The stormwater program's institutional framework must assure that periodic inspections occur during and after construction of the stormwater system, and that an operation and maintenance entity is clearly identified and legally responsible for the long term operation, maintenance, and management of the stormwater system.

Once these hurdles are cleared, new challenges arise. ***A growing concern, as more and more stormwater treatment systems are constructed, is how should the sediments that accumulate in them be disposed***. The stormwater pollutants that accumulate in the sediments are highly variable, but they often include several contaminants such as heavy metals, petroleum hydrocarbons, and other organic compounds, such as pesticides or solvents, which may be considered hazardous wastes.

***This chapter will discuss the applicability of federal and state solid and hazardous waste laws which may affect the proper disposal of stormwater sediments. It will also summarize data on stormwater sediments from the few studies which have been conducted to characterize them. Recommendations will be provided on whether stormwater sediments need to be characterized before disposal and what types of tests need to be conducted. Finally, recommendations will be made on how stormwater sediments should be safely disposed***.

### 1.1. Intended Readers

This chapter is intended primarily for:

- **Public Officials and Regulatory Personnel**, who need to be aware of the applicability of federal and state regulations which may apply to the disposal of stormwater sediments.

- **System Owners or Operators**, who need to know how to properly test and dispose of sediments which accumulate in their stormwater systems.

## 2. POTENTIALLY APPLICABLE LAWS AND REGULATIONS

Stormwater pollutants include a wide variety of substances that are deposited on pervious and impervious surfaces and then transported by the next rainfall. Additionally, especially in older urbanized areas, there are often connections to the stormwater system which should go to the sanitary sewer system. Consequently, a wide variety of contaminants that may be classified as hazardous or toxic may enter stormwater management systems. These contaminants include heavy metals, petroleum hydrocarbons, pesticides, and a wide variety of organic chemicals. ***Consequently, several federal and state laws and regulations may apply to the disposal of sediments which accumulate in stormwater systems or which are captured by street sweepers***.

Unfortunately, few state or local governments have established clear policies, guidance, or rules on disposal of stormwater sediments or the applicability of federal, state, or local laws and rules. Seldom do current laws, ordinances, rules, or guidelines governing solid waste handling and disposal address waste removed from stormwater systems. This ambiguity makes it difficult for public and private operators to comply with relevant laws and regulations in their stormwater management system maintenance programs. As a result of these unanswered handling and disposal questions, many stormwater management agencies have been discouraged from performing routine maintenance of stormwater systems.

This section will discuss laws and regulations that may be potentially applicable to stormwater system sediment disposal.

## 2.1. Federal Laws and Regulations

### A. Resource Conservation and Recovery Act of 1976 (RCRA)

RCRA requires generators of hazardous wastes to monitor and manage them in accordance with specified procedures. A solid waste may be considered a hazardous waste if it contains materials which are specifically listed in Sections 261.31 through 261.33 of 40 CFR or because it possesses any of four hazardous characteristics (ignitability, corrosivity, reactivity, or toxicity). In nearly all cases concerning stormwater sediments, the reason that they could be classified as hazardous wastes is because they contain listed chemicals rather than because the sediments are hazardous by characteristic. However, ***it is possible for stormwater sediments to be classified hazardous wastes because they exhibit toxicity. Stormwater sediments would exhibit toxicity if, using the Toxicity Characteristic Leaching Procedure (TCLP), the extract contains contaminant concentrations which exceed the limits listed in Table 1 of Section 261.24 of 40 CFR*** (See Table 9-3 for a partial listing of these limits).

Key aspects of RCRA and its implementing regulations which may affect stormwater sediment disposal include (Jones et. al., 1995):

- *The Mixture Rule*. RCRA regulations include lists of a number of chemicals and their by-products that are considered hazardous wastes when used and discarded (see Sections 261.31 through 261.33 of 40 CFR). Under the mixture rule, a mixture of any solid waste (including dirt) and the listed waste is considered by regulation to be a hazardous waste. Even small concentrations of a listed waste can render large volumes of material hazardous waste.

- *The Derived-From Rule*. If solid waste is considered hazardous waste, even if by operation of the mixture rule, then any residue from the treatment, storage, or disposal of the hazardous waste is also considered to be hazardous waste.

- *The Contained-In Policy*. Under existing EPA policy, environmental media, such as soil, water, or debris, that contain a hazardous waste must be handled as a hazardous waste.

- *The Nature of the Source Material.* Simply because a chemical listed in RCRA rules is detected in stormwater sediments does not make the sediments hazardous waste, even after discard. For example, if a spent halogenated solvent listed as hazardous waste is detected in stormwater sediments, the sediments would be hazardous waste under the mixture rule only if the source of the spent solvent contained more than ten percent of that solvent by volume.

The Mixture and Derived-From rules do not apply to stormwater sediments until they are removed from the BMP. Only then are the sediments considered to be discarded. It is the

Contained-In Policy, rather than the mixture or derived-from rules, that is most likely to bring stormwater sediments within the scope of RCRA regulations. A de minimis exception to the contained-in policy can be used on a site-specific basis. EPA must then demonstrate that contaminated media contain hazardous waste before applying RCRA requirements. It is likely that EPA will apply the Contained-In policy to stormwater sediments, but the policy, as applied to contaminated media, has not been adopted as a rule.

B. Federal Water Pollution Control Act - NPDES Regulations

Discharges of pollutants to waters of the United States or to certain master stormwater systems owned or operated by local government may require a NPDES permit from EPA or the state water quality agency. For example, these regulations would apply to discharges of vactor truck water to storm sewers.

## 2.2. State Laws and Regulations

The owner, operator, or responsible maintenance entity of a stormwater management system should request the stormwater permitting or program agency to provide information about the potential applicability of state or local laws and regulations to the disposal of stormwater system sediments. This request may not bring a quick or simple answer depending on how long the stormwater program has been in operation and whether this issue has been addressed.

***The laws and regulations in different states and local governments are going to vary considerably. Be sure to consult your appropriate local or state agency***. The following discussion will summarize how laws and rules in two states - Washington and Florida - address the issue of stormwater sediment disposal.

A. Washington State

The *Washington State Solid Waste Management Act (R.C.W. 70.95)* classifies solids collected from stormwater systems and street cleaning as solid wastes. The Act defines these wastes as street waste solids. Such wastes must be stored and handled according to relevant solid waste regulations.

One of the highest priorities of the Act is to encourage waste recycling over landfill disposal. Government agencies can frequently use street waste solids for fill or other uses permitted by local health departments. To be designated as street waste solids in Washington state, and avoid handling as a hazardous waste, contaminant concentrations in solids must not exceed the levels presented in Table 9-1.

If garbage, refuse, and other contaminants are removed from stormwater facility sediments, they may not even require handling as solid waste. Such solids must consist only of soil, sand, gravel, or sediment. However, these materials should not be used as residential topsoil or in locations where they could have contact with wetlands, surface waters, ground water, wells, or utility trenches.

The *Washington State Model Toxics Control Act (MTCA)* establishes waste contamination thresholds, above which materials must be handled as hazardous waste (see Table 9-2). ***The hazardous waste threshold of 200 milligrams per kilogram (mg/kg) total petroleum hydrocarbons (TPH) is particularly relevant to disposal of stormwater sediments***. Wastewater treatment plants typically set maximum influent pollutant concentration levels (see Table 9-2). These pretreatment standards are established to avoid disruption to plant operations by toxic substances and impacts to receiving waters by contaminants that the plant cannot adequately remove. ***The applicability of***

**TABLE 9-1. Maximum Contamination Limits for Street Waste Solids[1] in Washington State**

| Contaminant | Analytic Method | Max. Concentration (ppm)[2] |
|---|---|---|
| Heavy fuel hydrocarbons ($C_{24}$ -$C_{30}$) | EPA WTPH 418.1 | 2000 |
| Diesel ($C_{12}$-$C_{24}$) | EPA WTPH-D | 500 |
| Gasoline ($C_6$-$C_{12}$) | EPA WTPH-G | 250 |
| Benzene | EPA 8020 | 0.5 |
| Ethylbenzene | EPA 8020 | 20 |
| Toluene | EPA 8020 | 40 |
| Xylenes (total) | EPA 8020 | 20 |

[1] Solids collected from stormwater facility and street cleaning

[2] ppm = parts per million

**TABLE 9-2. Standards for Disposal of Wastes under TCLP[1], MTCA[2], and Pretreatment Standards[3] in Washington State.**

| Type of Waste/ Contaminant | Legal Standard | Maximum Concentration Limits |
|---|---|---|
| **Solids** | | |
| Lead | TCLP[1] | 5.0 mg/L = 100 mg/kg |
| TPH | MTCA[2] | 200 mg/kg |
| **Vactor Water** | | |
| Copper (daily average) | Pretreatment standards[3] | 2.00, 3.00 mg/L |
| Copper (grab maximum) | Pretreatment standards[3] | 8.00 mg/L |
| Lead (daily average) | Pretreatment standards[3] | 1.50, 2.00, 3.00 mg/L |
| Lead (grab maximum) | Pretreatment standards[3] | 4.00 mg/L |
| Zinc (daily average) | Pretreatment standards[3] | 1.50, 4.00, 5.00 mg/L |
| Zinc (grab maximum) | Pretreatment standards[3] | 10.00 mg/L |

[1] Toxic Characteristic Leaching Procedure (US Environmental Protection Agency)

[2] Model Toxics Control Act (enacted in Washington state)

[3] Pretreatment standards are from Lynnwood, Everett, and Seattle, WA.

**TABLE 9-3. Florida Criteria for Clean Soils, Rule 62-770, F.A.C.**

| Parameter | Max. Conc. TCLP (mg/l) | Max. Conc. (mg/kg)(1) | Parameter | Max. Conc. (mg/kg)(1) | Parameter | Max. Conc. (mg/kg)(1) |
|---|---|---|---|---|---|---|
| Arsenic | 5 | 0.8 | Benzene | 1.1 | PAHs | 2300 |
| Barium | 100 | 87000 | Toluene | 300 | TRPHs | 370 |
| Cadmium | 1 | 640 | Xylenes | 290 | MTBE | 350 |
| Chromium | 5 | 290 | Pyrene | 2200 | Anthracene | 19000 |
| Lead | 5 | 500 | Fluorene | 2100 | Naphthalene | 1000 |
| Mercury | 0.2 | 3.7 | Chrysene | 140 | Phenanthrene | 1900 |
| Selenium | 1 | 390 | Dibenzo(a,h)- | | Benzo(a)pyrene | 0.1 |
| Silver | 5 | 390 | anthracene | 0.1 | Benzo(a)anthracene | 1.4 |

(1) Values based on residential land use assumptions.

***these pretreatment standards is especially relevant to discharges of water collected by vactor trucks***.

B. State of Florida

Florida was the first state in the country to require the use of best management practices to treat stormwater from all new development. The adoption of Section 17-4.248, Florida Administrative Code (F.A.C.), in 1979, and the subsequent adoption of Chapter 17-25, F.A.C. (now 62-25), in 1981, along with the incorporation of stormwater treatment requirements into the Management and Storage of Surface Waters (MSSW) regulations of the water management districts has led to the construction of tens of thousands of BMPs throughout the state. These stormwater treatment practices are an essential component of the state's management programs to protect, maintain, or restore the quality of Florida's surface and ground waters.

In response to numerous questions concerning proper procedures for disposing of sediments which accumulate in stormwater BMPs, the Stormwater/Nonpoint Source Management Section at the Florida Department of Environmental Regulation published Guidelines for Sampling, Analyzing, and Disposing of Stormwater Sediments in November 1992. The guidelines outline biological, chemical, and toxicity leaching testing procedures which could be used to determine the characteristics of the stormwater sediments. The paper also outlines recommendations for disposal of the sediments after they have been characterized.

In developing these guidelines, staff coordinated with the staff in the Divisions of Waste Management and Water Facilities to assure compatibility with the rules and policies imposed by other Department programs. A major policy issue concerned which program's criteria to apply to stormwater sediments. Rules and criteria used by the following programs were reviewed and analyzed for applicability to disposal of stormwater sediments:

- Domestic wastewater residuals
- Solid waste management facilities
- Compost made from solid waste
- Soil thermal treatment facilities
- Interim soil cleanup goals
- Sediment quality assessment guidelines

Ultimately, the stormwater sediment disposal recommendations were based on the Waste Clean Up Program's "Clean Soil Criteria" found in Chapter 62-775, F.A.C. (Table 9-3).

The Florida Department of Environmental Protection currently is reevaluating the applicability of the limits of the various above programs to stormwater sediments. ***One of the major problems is the lack of consistency between programs and the apparent conflict between the values for allowable concentrations of metals in materials to be land-applied. One reason for the differences in allowable concentrations is that the assumed risk level varies depending on the program***. The Clean Soils Criteria were developed using a risk level of 1 x $10^{-6}$. The Residuals criteria also are based on a 1 x $10^{-6}$ incremental cancer risk goal for carcinogens, but use a 1 x $10^{-4}$ incremental cancer risk for non-carcinogens. EPA's proposed Bright Line concentrations were developed using a 1 x $10^{-3}$ risk factor.

## 3. CHARACTERISTICS OF STORMWATER SEDIMENTS AND WASTES

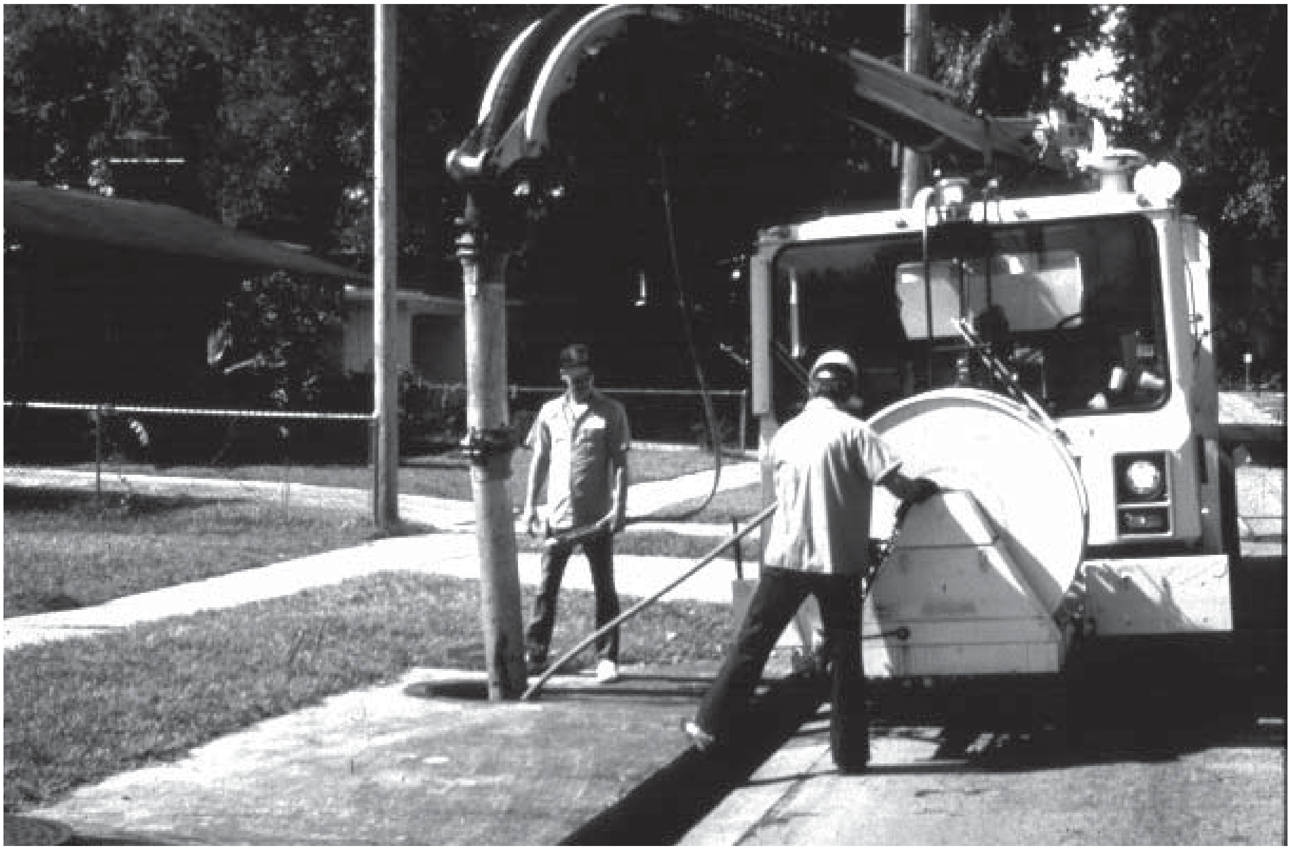
This section will present a summary of data, primarily from Washington and Florida, on the concentrations of different contaminants typically found in stormwater sediments and vactor water.

Preliminary studies have indicated that vactor wastes can surpass dangerous waste levels for several metals and petroleum hydrocarbons. ***A study by Herrera Environmental Consultants (1991) found that vactor truck sediments generally exceeded the Washington Model Toxics Control Act criteria for polyaromatic hydrocarbons (PAHs) and TPH. Concentrations of the most often detected compounds were greater in wastes from industrial areas than from residential and commercial areas***.

Disposal of decant water, the liquid fraction of storm facility wastes removed by vactor trucks, also poses risks to water quality. Decant water has the potential to carry solids, metals, toluene, xylenes, and volatile and semi-volatile compounds. Total suspended solids (TSS) are a principal pollutant in street waste liquids. Many contaminants, particularly metals, bind to fine particles, organic material, and clay particles. Total Kjedahl nitrogen is associated with particles in the 250 to 2000 micron size range. Total phosphorus and nitrate-nitrogen bind to particles smaller than 100 microns, but most nitrate-nitrogen is in solution. Liquids can also contain large numbers of fecal coliform bacteria. Toluene, xylene, and ethylbenzene are among the most frequently detected organic compounds in decant water. Table 9-4 presents pollutant ranges for street waste solids and liquids, as reported by Serdar (1993). Illicit dumping and property owner practices can greatly increase contaminant concentrations in stormwater management facilities.

**TABLE 9-5. Ranges of Pollutant Contamination in Washington State Catch Basin and Vactor Wastes, by Land Use** (from Jacobson, 1993).

**Type of Waste/** **Residential**
**Commercial** **Industrial**
**Highway**



**Vactor truck crew removing stormwater sediments and liquids from a catch basin.**

**TABLE 9-4. Ranges of Toxics and Other Materials Concentrations in Street Waste Solids and Liquids** (from Serdar, 1993)

| Substance | Concentration Ranges in Solids | Concentration Ranges in Liquids |
|---|---|---|
| Solids | 61 - 85% | - |
| Gravel fraction | 1 - 33% | - |
| Sand fraction | 57 - 90% | - |
| Silt fraction | 4 - 28% | - |
| Clay fraction | 0 - 3% | - |
| Fecal coliforms | - | 400 - 9000 MPN/100 mL |
| TSS | - | 265 - 111,000 mg/L |
| Settleable solids | - | 2 - 234 mL/L/hour |
| Dissolved solids (total) | - | 95 - 550 mg/L |
| Arsenic | Undetected - 24 mg/kg | 0.030 - 1.240 mg/L |
| Cadmium | 0.5 - 1.8 mg/kg | - |
| Chromium | 19 - 241 mg/kg | 0.013 - 1.81 mg/L |
| Copper | 18 - 560 mg/kg | 0.081 - 7.6 mg/L |
| Lead | 24 - 194 mg/kg | 0.255 - 13 mg/L |
| Mercury | 0.04 - 0.16 mg/kg | Undetected-0.022 mg/L |
| Nickel | 33 - 86 mg/kg | - |
| Zinc | 80 - 558 mg/kg | 0.401 - 18 mg/L |
| TPH | 0.040 - 4.600 mg/kg | - |
| PAHs (total) | 0.890 - 146 mg/kg | - |
| Toluene | - | 0.096 - 0.180 mg/L |
| Xylenes (total) | - | 0.020 - 0.360 mg/L |
| Phenol | - | 0.002 - 0.075 mg/L |

A paper produced by the Center for Urban Water Resources Management at the University of Washington collected and summarized data from Washington state research on catch basin and vactor waste contamination (Jacobson, 1993). The objective of the study was to determine any correlations between land uses and pollutant concentrations in storm facility wastes. Results of the study are presented in Tables 9-5 and 9-6.

Contamination levels in sediment wastes and vactor liquids from residential and commercial areas were quite similar. Solids and vactor liquids from industrial areas were generally significantly more polluted than those of residential and commercial areas. However, several commercial and industrial results overlapped, indicating that these two land uses sometimes have similar pollution potential.

***The Jacobson study concluded that stormwater system solids must be disposed of with caution because of high TPH concentrations***. Similar results were found in a 1995 analysis of vactor sediments that had been stockpiled at a maintenance yard in Bellevue, Washington. Although such wastes are probably not so contaminated that they require hazardous waste landfilling, they are too polluted for some standard landfills.

Although copper and lead concentrations in vactor water from residential and commercial areas were not high enough to cause concern, zinc frequently exceeded standards. ***Vactor***

| Contaminant | (ppm)[1] | (ppm)[1] | (ppm)[1] | (ppm)[1] |
|---|---|---|---|---|
| **Catch Basin Solids** | | | | |
| Copper | 20-126 | 18-117 | 165-456 | - |
| Lead | 101-636 | 95-1726 | 230-500 | - |
| Zinc | 174-336 | 165-997 | 228-455 | - |
| TPH | 499 | 52,400-60,000 | 5400 | - |
| **Vactor Sediments** | | | | |
| Copper | 24-28 | 36 | 88-229 | - |
| Lead | 69-92 | 91 | 109-175 | - |
| Zinc | 106-138 | 208 | 219-338 | - |
| TPH | 401-1293 | - | 2197 | 276 |
| **Vactor Water** | | | | |
| Copper | 0.120-0.933 | 0.265 | 1.481-3.418 | 5.456 |
| Lead | 0.600-1.300 | 0.510 | 3.835-5.775 | 28.478 |
| Zinc | 0.608-2.498 | 3.057 | 5.672-10.200 | 26.754 |
| TPH | 5.2 | - | 8.2 | 7.7 |

[1] ppm = parts per million (mg/kg for solids; mg/L for liquids)

**TABLE 9-6. Percentages of Washington State Catch Basin and Vactor Waste Samples Exceeding TCLP[1], MTCA[2], and Pretreatment[3] Standards, by Land Use** (from Jacobson, 1993).

| Type of Waste/ Contaminant (Legal Standard) | Residential % × No. of Samples | Commercial % × No. of Samples | Industrial % × No. of Samples | Highway % × No. of Samples |
|---|---|---|---|---|
| **Solids** | | | | |
| Lead (TCLP) | 43% × 35 | 60% × 35 | 71% × 21 | - |
| TPH (MTCA) | 78% × 14 | 100% × 5 | 80% × 5 | - |
| **Vactor Water**[3] | | | | |
| Copper (2.0 mg/L standard) | 0% × 11 | 0% × 4 | 50% × 12 | 44% × 9 |
| Copper (3.0 mg/L standard) | 0% × 11 | 0% × 4 | 25% × 12 | 44% × 9 |
| Copper (8.0 mg/L max. grab) | 0% × 11 | 0% × 4 | 17% × 12 | 22% × 9 |
| Lead (1.5 mg/L standard) | 9% × 11 | 0% × 4 | 100% × 12 | 89% × 9 |
| Lead (2.0 mg/L standard) | 9% × 11 | 0% × 4 | 92% × 12 | 78% × 9 |
| Lead (3.0 mg/L standard) | 0% × 11 | 0% × 4 | 75% × 12 | 78% × 9 |
| Lead (4.0 mg/L max. grab) | 0% × 11 | 0% × 4 | 50% × 12 | 78% × 9 |
| Zinc (1.5 mg/L standard) | 36% × 11 | 25% × 4 | 100% × 12 | 100% × 9 |
| Zinc (4.0 mg/L standard) | 27% × 11 | 25% × 4 | 92% × 12 | 78% × 9 |
| Zinc (5.0 mg/L standard) | 9% × 11 | 25% × 4 | 92% × 12 | 67% × 9 |
| Zinc (10.0 mg/L max. grab) | 0% × 11 | 0% × 4 | 25% × 12 | 55% × 9 |

[1] Toxic Characteristic Leaching Procedure (US EPA) [2] Model Toxic Control Act (enacted in Washington state) [3] Pretreatment standards are from Lynnwood, Everett, and Seattle, WA.

***water samples from industrial and highway areas frequently surpassed the highest wastewater treatment plant pretreatment standards for all three metals***. Thus, vactor liquids from these land uses would certainly require pretreatment before discharge to wastewater treatment plants.

Sediments collected from Tacoma, Washington catch basins one year after they were cleaned were significantly less contaminated than samples collected from the same catch basins before cleaning. ***These results strongly suggested that annual cleaning of catch basins helps to reduce contaminant levels in wastes***. By controlling contamination levels in catch basin wastes through regular cleaning, stormwater utilities could reduce hazardous waste disposal costs. Similar results are likely to be attained in larger treatment facilities, which can accumulate sediments over a longer periods than catch basins.

As part of the reevaluation of Florida's policy on the land application of solid wastes, including sediments from stormwater systems, Livingston and Cox (1995) summarized data from Florida stormwater investigations. A comprehensive review of the stormwater literature found 17 reports which included data on the concentrations of contaminants within stormwater system sediments. These investigations contained considerable data on concentrations of heavy metals and nutrients in stormwater sediments but relatively little data on organic contaminants such as petroleum hydrocarbons. More data were available on stormwater sediments from wet detention systems than from infiltration or filtration practices.

Table 9-7 summarizes the concentrations of heavy metals in stormwater sediments from different types of BMPs, while Table 9-8 summarizes the concentrations of heavy metals in the sediments of BMPs serving different land uses. The data in both tables are for surficial sediments - the top one inch. Five of the sites also included data from different layers of the stormwater sediments. ***As with the data from Washington state, the concentrations of heavy metals were highest in surficial layers, but diminished rapidly within the top eight inches of sediments***.

Livingston and Cox (1995) presented the following conclusions on the concentrations of contaminants in stormwater system sediments in Florida:

- Stormwater sediments, especially in the top one inch of sediment, can exceed Florida's Clean Soil Criteria for chromium and lead. The average chromium concentration in the top inch of sediments from wet detention systems (83.3 ug/g) and from dry swales (69.7 ug/g) exceeded the 50 mg/kg clean soil criterion. However, of the 430 samples from wet ponds, less than 20 percent had chromium concentrations above the clean soil criterion. In sediments from dry swales, chromium concentrations exceeded 50 mg/kg more frequently. All nine top layer samples and two of the 0-4 inch samples had chromium concentrations above this value. The average chromium concentration in the top inch of swale sediments was 69.7 mg/kg while the average in the 0-4 inch samples was 51.3 mg/kg.

- The average lead concentration in the top inch of sediments from a retention system, wet ponds, dry swales, wet swales, and roadside shoulders exceeded the 108 mg/kg clean soil criterion as did sediments collected by street sweepers. Sediment lead concentrations greater than this level were found in the sediments from seven wet ponds, all three dry swales, the lone wet swale, all four highway shoulder sites, and in one street sweeper investigation, one conducted in 1977 when leaded gas was still available. Even the deeper sediment layers exceeded the clean soil criteria for lead in the FDOT highway ponds (0-4 inch layers), and at both the East-West Expressway dry swales and the Interstate 4 wet swale (0-4 and 0-8 inch layers).

- Table 9-8 compares the levels of heavy metals in sediments from stormwater systems serving different land uses. Similar to

**TABLE 9-7. Comparison of Heavy Metal Concentrations (ug/g) in the Top One Inch of Sediments from Various Types of Stormwater Systems in Florida.**

| BMP | No. Obs/ Sites | Cd | Cr | Cu | Ni | Pb | Zn |
|---|---|---|---|---|---|---|---|
| Dry Retention Basin | 3/1 | 1.00 | 4.00 | 13.00 | NA | 200.00 | 100.00 |
| Wet Detention Basin | 430/21 | 3.60 | 83.30 | 25.60 | 13.10 | 227.00 | 150.30 |
| Grassed Swale - dry | 9/3 | 5.50 | 69.70 | 89.50 | 35.60 | 1060.0 | 497.30 |
| Grassed Swale - wet | 5/1 | 1.60 | 8.40 | 14.60 | 6.00 | 438.60 | 112.60 |
| Exfiltration Trench | 2/1 | 3.00 | 14.50 | 8.00 | NA | 80.00 | 80.00 |

**TABLE 9-8. Comparison of Heavy Metal Concentrations (ug/g) in the Top One Inch of Sediments from Florida Stormwater Systems Serving Various Land Uses.**

| Land Use | No. Obs./ Sites | Cd | Cr | Cu | Ni | Pb | Zn |
|---|---|---|---|---|---|---|---|
| SF Residential | 75/3 | 2.10 | 17.40 | 9.10 | 8.00 | 29.20 | 29.90 |
| MF Residential | 15/1 | 1.20 | 3.20 | 21.20 | 7.20 | 32.00 | 22.20 |
| Commercial | 17/4 | 2.30 | 14.20 | 26.30 | 6.40 | 110.20 | 150.90 |
| Mixed Com/Res. | 57/3 | 2.70 | 14.80 | 26.10 | 4.00 | 351.60 | 176.10 |
| Highways | 313/14 | 5.70 | 51.30 | 54.00 | 26.10 | 676.80 | 298.40 |

stormwater loadings, concentrations of trace metals in sediments increased with the intensity of the land use and the associated stormwater loadings. As expected, because of the characteristics of pollutants left on surfaces over which motor vehicles travel, sediments in BMPs capturing highway runoff have the highest concentrations of trace metals. The average chromium concentration in highway BMP sediments barely exceeds the clean soil criterion (51.3 mg/kg vs 50 mg/kg). However, the average lead concentration in sediments from BMPs serving highways (676.8), industrial (578), mixed commercial/residential (352),
and commercial (110.2) land uses exceeds the clean soil criterion for lead (108 mg/kg).

- Table 9-9 contains data allowing a comparison of heavy metal concentrations in three different layers of stormwater BMP sediments. As expected, concentrations decline as the loose surface sediment is combined with more consolidated deeper sediments. However, even in the samples compositing the top 0-8 inches of BMP sediments, lead concentrations in sediments from highway wet ponds and dry swales can exceed the clean soil criterion.

- A growing concern among ecologists is the effects of petroleum hydrocarbons and volatile organic compounds on the biota of water bodies receiving stormwater discharges. Unfortunately, few investigations have been undertaken to determine the ecological effects of these materials, which have become almost ubiquitous in the urban environment

Table 9-9. Concentrations of Heavy Metals (ug/g) in the top 1 inch, top 0-4 inches, and top 0-8 inches of Sediments from 6 Florida Stormwater Systems.

| | Land Use/Site Name/Reference | | | | | |
|---|---|---|---|---|---|---|
| Metal<br>(Sites/Obs.) | SF Res.<br>Essex Point<br>Harper 1988<br>(1/6) | MF Res.<br>Unknown<br>Harper 1988<br>(1/15) | SF Res.<br>Greenview<br>Yousef 1990<br>(1/48) | Comm. Hwy.<br>Int. Mkt. Pl.<br>Harper 1988<br>(1/4) | Hwy<br>FDOT Ponds<br>Yousef 1990<br>(9/161) | Swales<br>Harper 88<br>USGS 88<br>(3/9) |
| Cd | 1.6 | 1.2 | 2.3 | 2.9 | 15.0 | 5.5 |
| | 1.5 | 0.9 | 2.7 | 1.8 | 7.4 | 3.5 |
| | 1.5 | 0.3 | ND | 1.1 | ND | ND |
| Cr | 7.2 | 21.2 | 9.5 | 12.2 | 61.0 | 69.7 |
| | 5.8 | 9.8 | 8.7 | 11.3 | 28.5 | 51.3 |
| | 5.2 | 6.2 | ND | 8.9 | ND | ND |
| Cu | 9.0 | 3.2 | 11.8 | 6.8 | 28.0 | 89.5 |
| | 7.5 | 1.8 | 7.0 | 4.7 | 10.6 | 77.4 |
| | 7.3 | 1.4 | ND | 3.4 | ND | ND |
| Ni | 3.0 | 7.2 | 8.0 | 6.4 | 52.0 | 35.6 |
| | 2.5 | 3.8 | 4.7 | 5.1 | 33.9 | 20.9 |
| | 2.0 | 2.7 | ND | 6.3 | ND | ND |
| Pb | 13.8 | 32.0 | 34.2 | 46.0 | 374.0 | 1060 |
| | 11.2 | 14.0 | 17.7 | 31.5 | 141.9 | 653.5 |
| | 9.9 | 9.3 | ND | 22.8 | ND | ND |
| Zn | 11.6 | 22.2 | 31‘.0 | 127.0 | 161.0 | 497.3 |
| | 6.9 | 13.3 | 12.4 | 68.5 | 48.4 | 269.0 |
| | 5.7 | 10.4 | ND | 36.8 | ND | ND |

ND = Not determined for the soil profile listed due to insufficient data.

because of civilization’s reliance upon the motor vehicle. Additionally, very few investigations have determined the levels of volatile organic aromatics or petroleum hydrocarbons in stormwater BMP sediments. Only six Florida studies included measurements of these contaminants, with only the Lake Tuscawilla project in Ocala providing data that allows a comparison of stormwater sediment characteristics to the clean soil criteria. The levels of total recoverable petroleum hydrocarbons and the polynuclear aromatic hydrocarbons in sediments from Lake Tuscawilla greatly exceeded the clean soil criteria. The cause of these elevated levels is believed to be a leaking underground fuel tank. This required the City of Ocala to “treat” these sediments by spreading them in sludge drying beds, exposing them to light and oxygen.

- Another interesting observation can be made with respect to lead concentrations in the soil along the edges of highways. At the edge of the pavement and in a swale located 18 feet away from the pavement's edge, the lead concentrations greatly exceeded the clean soil criteria in the top two inches of soil. Does this mean that all soils adjacent to highways need to be cleaned up or disposed? Of course, this investigation was conducted back in 1978 before leaded gas had been eliminated, and the results should be different today.

- A key question that must be addressed is whether sediments taken from stormwater BMPs are a "hazardous waste" because of their toxicity? ***Based on Florida data, stormwater sediments generally are not toxic based on the results of TCLP tests. Not a single sample in the data base exceeded the TCLP limits that would cause stormwater sediments to be classified as a hazardous waste***.

To augment the information summarized above, the Florida Dept. of Environmental Protection Stormwater Section conducted additional sampling of stormwater sediments in late 1996. A primary goal of this effort was to obtain data on organic contaminants such as petroleum hydrocarbons and pesticides. Samples were collected from twelve different stormwater BMPs serving eight different land uses. A total of 102 samples were collected by 14 different local stormwater programs throughout the state of Florida.

Each sample was analyzed for physical characteristics and 128 pollutants including:
- Total solids
- Sediment grain size
- Total Organic Carbon
- Metals - As, Cd, Cr, Cu, Ni, Pb, Zn
- 26 Chlorinated pesticides and PCBs
- 34 Volatile Organics
- 60 Semivolatile PAHs, phthlates, phenols
- Total recoverable petroleum hydrocarbons

In addition, Toxicity Characteristic Leaching Procedure (TCLP) was conducted on sediments collected at 44 sites.

The results of this project confirm the results and recommendations of Livingston and Cox (1995). Notable results include (Cox et. al. 1997):

- Only about 10% of the 15,506 analyses performed resulted in levels above the laboratory minimum detection levels (MDL).

- Only 53 pollutants were found in detectable concentrations. Similar to previous studies, several traffic related metals (chromium, lead, and zinc) were found at all sites, while copper, cadmium, nickel, and arsenic were detected in samples at frequencies of 94%, 72%, 67%, and 64% respectively.

- Of the 35 organic compounds detected, only 8 were found in at least half of the 87 sites. These include total recoverable petroleum hydrocarbons (TRPH), chlordane, pyrene,benzo(b)fluoranthene, fluoranthene, chrysene, DDE-p,p', and benzo(a)pyrene.

- TRPH were found at 78 sites while the pesticide Chlordane was found at 71 sites (82%). Chlordane previously was widely used for termite control but was banned in 1989. While detectable levels of Chlordane would be expected in sediments from older stormwater BMPs, high concentrations also were found in sediments recently collected by street sweepers and catch basins.

- The NURP results found that only about 20% of stormwater samples had detectable levels of organic pollutants and that only four PAHs were found in more than 10% of the samples (EPA, 1983). However, these same four PAHs were found in 47 to 64% of the stormwater sediment samples. A total of 13 PAHs, 2 pesticides, 2 phthalates, and PCB

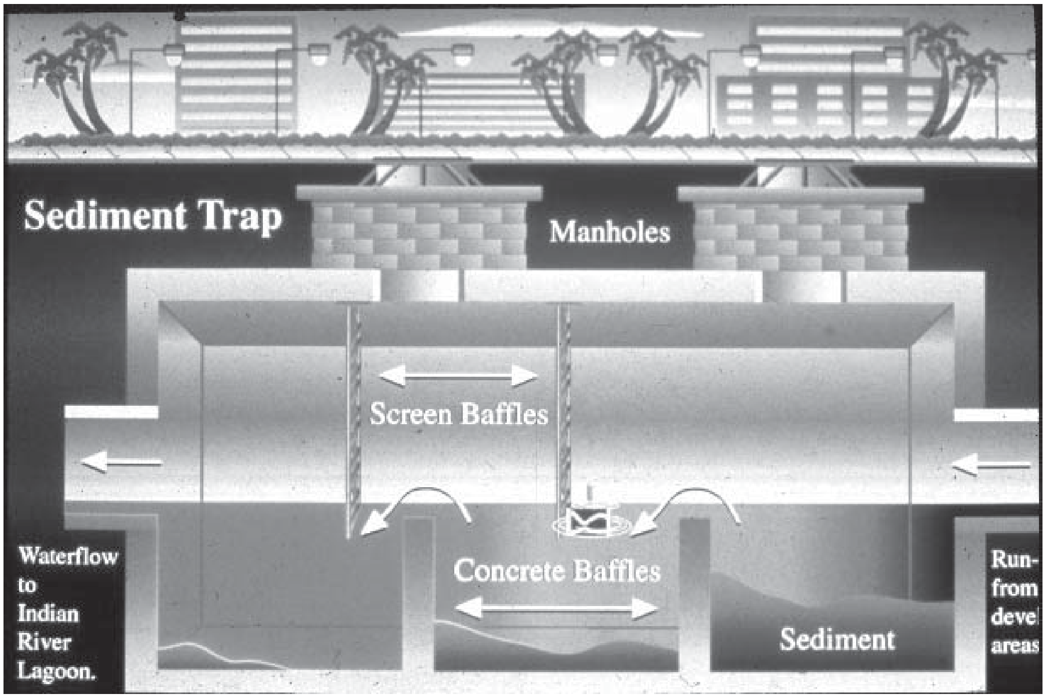
1260 were found in 10 percent of more of the sediment samples.

- Only 3 of the 36 organic pollutants tested for TCLP were detected at levels above the minimum detection limit. These included toluene, total xylenes, and m,p-cresols. None of the levels exceed RCRA levels.
- All four metals (As, Cd, Cr, Pb) tested for TCLP were detected in levels above the MDL. Only two lead samples from canals in South Florida exceeded TCLP levels for hazardous wastes.

### 3.1. Contaminants Levels in Sediments of Ultra-Urban BMPs

Confined sand filters and baffle boxes are two BMPs which often are used on highly impervious, land-limited sites. Because of their inherent design and limited storage volume, these two BMPs typically require frequent maintenance to remove accumulated sediments or clogged filter sand.

In a Seattle, Washington study to monitor the performance of a sand filter system, filter sand and sediment were analyzed for TCLP metals, copper, zinc, FOG, and TPH. ***After seven months of filter operation at a busy shipping facility, no sample came close to violating hazardous and dangerous waste standards for metals. However, TPH concentrations in settling chamber sediments greatly exceeded the Washington Model Toxics Control Act hazardous waste criterion of 200 mg/kg***. Results for the two monitored filters were close, 25,454 and 34,018 mg/kg, despite their divergent water quality conditions. None of the full sand cores closely approached the Model Toxics Control Act limit for TPH. However, the two most concentrated segments, taken from the 0 to 1.2 inch segment of the sand cores, did exceed the criterion.



**Baffle box used to retrofit stormwater systems along the Indian River Lagoon, Florida.**

As part of the Indian River Lagoon (Florida) National Estuary Program's efforts to reduce stormwater pollutant discharges to the lagoon, local governments have installed several three chambered baffle boxes. These are underground, "on-line" systems installed at the end of existing storm sewers before they discharge to the Indian River Lagoon. The treatment effectiveness of these baffle boxes was investigated by Royal and Vanderbleek (1994). They collected samples from each of the three chambers of a baffle box and analyzed them for heavy metals. The concentrations of all heavy metals were extremely low. This probably reflects the frequent pumping out of the baffle boxes. The boxes, which accumulated over 8,500 pounds of sediment in less than six month of operation, are cleaned out approximately every four months. The interval between pump outs has varied from one to six months.

## 4. RECOMMENDATIONS ON SEDIMENT TESTING

### 4.1. Storm Facility Solids and Liquid Waste Testing

Maintenance personnel should examine the appearance and odor of solids and liquids removed from stormwater BMPs to determine whether chemical analyses are necessary. Personnel should be alert to an especially oily appearance, coloration by antifreeze, or odors of gasoline, solvents, hydrogen sulfide, or other noxious substances. Hazardous waste will stain, corrode, or otherwise alter the look of catch basins. These characteristics could be signs of illicit dumping.

***Material from a contaminated catch basin should not be pumped into a vactor truck containing cleaner wastes. Mixing wastes of differing qualities could contaminate the whole load and make its disposal more difficult***. The suspected hazardous waste should be analyzed to determine the appropriate disposal method. Field test kits are available to detect petroleum and polyaromatic hydrocarbons.

***Maintenance workers should also note the land uses in the catchment of a stormwater facility. Stormwater sediments from industrial areas and highways are much more likely to exceed hazardous waste standards than those from residential and commercial areas***. Personnel should be particularly vigilant when any of the following activities are present in a catchment: electroplaters; industrial parks; vehicle repair facilities; wrecking yards; cemeteries; golf courses; pesticide blending and mixing areas; electrical vaults; hydraulic lift pumps; animal product handlers; and waste storage areas.

Characterization of stormwater facility wastes is a central feature of the Washington State Department of Transportation's (WSDOT) strategy to minimize waste disposal costs by using clean wastes in maintenance activities. WSDOT follows a two-step disposal process, consisting of interim and final disposal. In the interim stage, waste will be characterized to determine proper final disposal. Vactor waste will be placed a minimum of 100 feet from property boundaries, surface water bodies, and water supply wells. Following the decanting of vactor liquids, the solids are to be placed on impermeable surfaces surrounded by berms of straw bales or dirt. The piles will be covered by plastic or other impervious materials to minimize the amount of water that drains through the solids. Waste piles are not to exceed 100 cubic feet in volume. The dirtiest wastes will be segregated from those that are relatively cleaner. Wastes will be characterized by appearance, odor, and field test kits that detect total petroleum and polyaromatic hydrocarbons.

WSDOT will perform periodic laboratory analyses to confirm the results of the test kits. The ***selection of stormwater sediment pollutants for laboratory analysis depends on the***

***location of the facility and the initial characterization of the waste***. Sediments from stormwater systems in heavily urbanized and industrial catchments should be analyzed for petroleum hydrocarbons (TPH), FOG, toxic metals (*e.g.*, lead, zinc, copper, and cadmium), nutrients (*e.g.*, phosphorus), and, if appropriate, organic pesticides, which can accumulate on pond bottoms. ***The Washington Department of Ecology recommends that street waste solids be tested for chromium, TPH, and PAHs, the pollutants that are the most likely to exceed the criteria for street waste solids designation (i.e., acceptable for reuse)***. Vactor wastes collected by the WSDOT will be periodically analyzed for total metals, TCLP metals, TPH, gasoline, diesel, heavy fuel hydrocarbons, PAH, and benzene-toluene-ethyl benzene-xylene (BTEX).

### 4.2. Testing of the Sand Filter Medium and Accumulated Sediments

Key analytes to determine sediment and sand disposal requirements are fats, oils, and grease (FOG), TPH, and the TCLP and other metals. If TCLP metals concentrations in solids are reported in mg/kg, they can be compared to TCLP standards (defined in mg/L) by multiplying the TCLP standard by 20 to convert to mg/kg. This approximate equivalents method is used by the US EPA. The equivalents method implicitly assumes that the analytic method for determining metals concentrations in solids was followed precisely and that the metals were completely extracted. The presence of oil and grease in sediments can reduce extraction efficiency. Because the dilution factor of 20 is extremely conservative, samples found to exceed hazardous waste standards according to the equivalents method frequently do not exceed TCLP standards in reality.

## 5. RECOMMENDATIONS ON THE DISPOSAL OF STORMWATER SEDIMENTS

### 5.1. Waste Collection Considerations

A drawback to vactor trucks is that they can mix wastes that are relatively clean with those that are very dirty. An effective, but costly solution would be to have “clean” and “dirty” trucks. Alternatively, cleaning only facilities associated with a single type of land on a given vactor truck run would reduce the risk of mixing wastes with different contaminant levels. ***Because of their great potential to cause contamination, vactor wastes should never be mixed with street sweepings or debris from ditch cleaning***.

### 5.2. Disposal Methods

Guidelines are necessary, but generally do not exist, for disposing sediments from stormwater BMPs. The best programs now send them to lined municipal landfills unless they fail a “looks bad and smells bad” test. If wastes fail to pass this subjective test, they are treated as hazardous wastes and tested.

Reuse, recycling, and other non-landfill end solutions for stormwater sediments can help to reduce disposal costs. Many state solid waste laws, such as Washington's Solid Waste Management Act and its Model Toxics Control Act, give the highest priority to this waste handling strategy. When disposal of stormwater system wastes is necessary, they should be transported to lined landfills where they can be used for cover material or, if necessary, to hazardous waste disposal facilities.

In Washington state, some entrepreneurs have set up an incineration facility at an old, unused cement plant kiln to cook vactor wastes. This has been shown to be a cost-effective option when compared to landfilling the wastes.

Where only petroleum hydrocarbon contamination prevents the recycling of storm facility wastes, they could be bioremediated at an approved pit site. The WSDOT (1994) classifies treated soils as follows:

Class 1 Soils — These soils contain residual concentrations of petroleum contaminants at or below analytical detection limits. They are considered clean and can be used as fill for any project.

Class 2 Soils — These soils contain detectable levels of petroleum contaminants below the Cleanup Regulation Method A cleanup standard — 100 parts per million of TPH. Appropriate uses include fill or other uses that will not cause a threat to human or environmental health.

Class 3 Soils — These are soils with high levels of heavy hydrocarbons that may not meet cleanup standards even after treatment. Soils receiving adequate treatment should be able to meet the cleanup levels for light petroleum fractions. Those soils that cannot attain cleanup standards should be used at the original site or disposed of in an existing, permitted municipal landfill.

Class 1 soils can be used in the following applications: road and parking lot subgrade; road construction fill; street sweeping sand; pipe bedding, except for drinking water pipes; utility trench backfill, except for drinking water pipes; controlled density fill; fill in commercial and industrial zones; prefabricated concrete manufacturing; Portland cement manufacturing; asphalt manufacturing; daily cover or fill in permitted landfills, provided they are dewatered; or other end uses approved by local health departments. Street waste solids should not be reused for surface mining reclamation, in a wastewater disposal mound system, or as cover or fill in an inert demolition waste landfill.

### 5.3. Decant Water Disposal

Disposal of decant water picked up by vactor trucks is another important problem. Not only do storm drain liquids contain pollutants in their own right, but the vactoring process could further contaminate the water column by resuspending solids. Vactor trucks must decant water two or three times per day to make room for more solids. A common and practical method of decant water disposal is to drain it into catch basins in nonsensitive areas. Another practice is to discharge decant water into sanitary sewers. However, discharge of vactor waste into sanitary sewers may still allow pollutants to enter surface waters if treatment at the wastewater treatment plant is inadequate. Moreover, high toxics loadings can also upset biological processes at wastewater treatment plants.

The three options that have been suggested for managing decant water are (1) reducing the amount of liquids removed from storm facilities; (2) eliminating discharges in the field; and (3) using field settling sumps. There is a lack of data on the filtration of vactor liquids in the field, so this method is not recommended. Similarly, data on the treatment efficiencies or the maintenance safety of stormwater inserts and online filtration systems are not widely available.

Reducing the amount of liquids removed from stormwater facilities (option 1) would be accomplished by modifying vactor suction tubes to reduce the amount of liquid removed during cleaning. To eliminate field discharges (option 2), liquids are transported in vactor trucks with the solids and treated at decant stations. Decant station treatment techniques include (1) using drying pads and lagoons to eliminate all discharges; (2) gravity settling of solids and possible treatment with a coalescing plate oil/water separator, followed by discharge to a sanitary sewer; and (3) treatment with a sand or a sand/peat filter. One decant station design includes a 9-foot deep sump for the settling of solids from decant water. Solids are removed approximately every other day. Some cities dewater combined liquid and solid street wastes and filter the liquids before discharging to sanitary sewers.

The field sump method (option 3) would use gravity settling over 4 to 8 hours to reduce decant water contamination. The sump could be any type of detention or retention BMP. Sumps, vaults, and tanks are the most practical facilities for settling because they can be installed in a wide variety of locations, are easily maintained, and solids can be removed by vactor truck. A modified catch basin could also serve as a sump. Use of twin sumps would allow one to settle solids and drain while the other received new wastes.

The removal of solids from vactor liquids by settling has been found to occur at the following rates: 54% removed after 0.5 hour; 67% after 1 hour; 79% after 2 hours; 87% after 3 hours; 90% after 4 hours; and 97% after 8 hours. In five hours, the settling of 1750 pounds (795 kg) of solids from 1500 gallons (5678 liters) of water reduced pollutants by the following amounts: sediments -- 55 to 85%; chemical oxygen demand -- 11 to 54%; total organic carbon -- 6 to 35%; total phosphorus -- 4 to 50%; total nitrogen -- 2 to 61%; zinc -- 4 to 60%; and lead -- 31 to 83%.

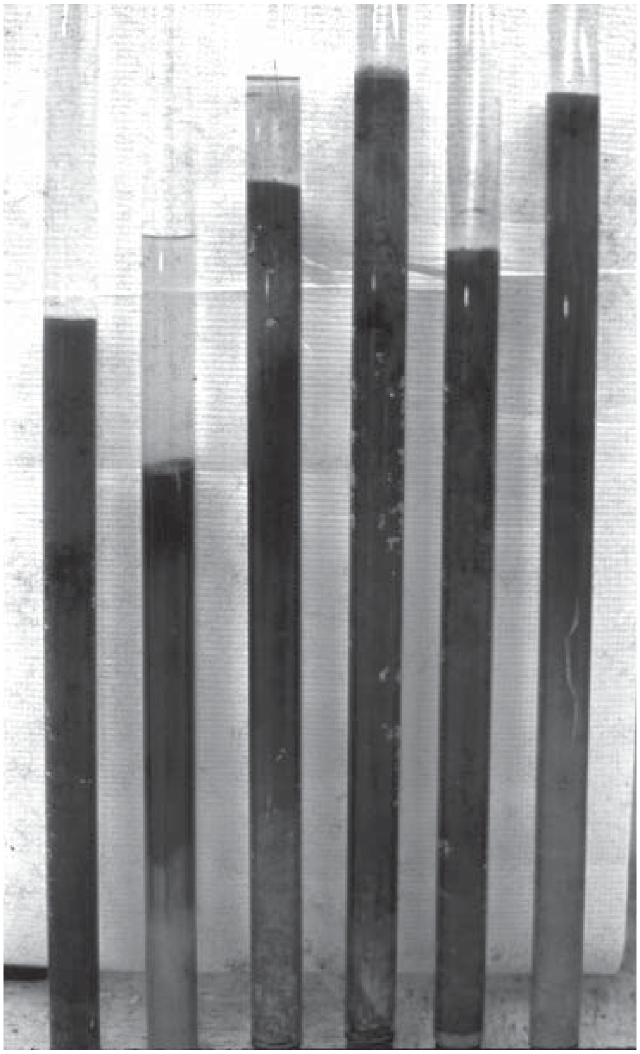
### 5.4. Sand Filter Waste Disposal Methods

The researchers in the Seattle sand filter monitoring study decided that settling chamber water could be drained through the sand bed instead of removed for off-site disposal when cleaning of the chamber became necessary. The rationale for this decision was that, because sand filters are flow-through systems, settling chamber water normally is treated by the sand bed anyway. Thus, disposal regulations do not directly affect the settling chamber water, provided that it is treated by the sand bed. However, when siphoning liquid out of the settling chamber, maintenance personnel should be careful not to resuspend sediments. Alterna-

**Settled vactor solids at Bellevue, WA. vactor decant station.**
**Photo courtesy of Ventilation Power Equipment, Inc. , Seattle.**

tively, if costs are not an objection and appropriate methods are available for disposal of the liquid and sediment, removing both materials simultaneously could reduce time and labor costs.

The variable sand core sampling results from the Seattle study created a dilemma about how to dispose of filter sand, when removal became necessary. Because inconsistencies in concentrations could make identifying the portions that are hazardous waste difficult, occasional disposal of the entire upper layer might be the best option. Maintenance should be fairly infrequent, only every few years, and generate a relatively small volume of waste (top few centimeters of the soil column). Bioremediation, the decomposition of organic molecules by microorganisms, has been well demonstrated for hazardous material and contaminated soil renovation. However, this technique needs to be assessed for use in stormwater sand filters. Full rejuvenation by bioremediation might not be possible when mineral solids cause the filter to clog.



**Sediments from stormwater discharges accumulated on the bottom of Megginnis Arm, Lake Jackson, in Florida before implementation of the state's stormwater treatment rules in 1982. Removal of sediments from water bodies and the restoration of water bodies is much more difficult and expensive than the implementation of BMPs and their proper maintenance.**

# Appendix C

## Jones *et al.* Published Papers

# CAN SEDIMENTS THAT ACCUMULATE IN STORMWATER BEST MANAGEMENT PRACTICES BE CLASSIFIED AS HAZARDOUS WASTES UNDER RCRA?

## A PRACTICAL REVIEW, WITH RECOMMENDATIONS, FOR ENGINEERS, LAWYERS, AND DRAINAGE FACILITY OWNERS[1]

**Jonathan Jones, P.E.[2]**
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Under what circumstances, if any, can sediments that accumulate in municipal and industrial "best management practices" ("BMPs") be classified as "hazardous waste," as defined by the Resource Conservation and Recovery Act ("RCRA")? Stormwater BMPs include such facilities as retention ("wet") ponds; detention ("dry") ponds; infiltration basins; buried concrete vaults; and created wetlands. This paper provides an overview and recommendations for an issue that will increasingly confront designers and owners of industrial and municipal stormwater management facilities. In brief, key findings are as follows:

1. Under certain circumstances, sediments that accumulate in either municipal or industrial facilities, when discarded, may be classified as hazardous waste.

2. Under current RCRA regulations, the "mixture" rule and "derived-from" rule can cause sediments with extremely low concentrations (barely above the detection limit) of one or more listed hazardous wastes to be classified as hazardous waste when those sediments are discarded. Perhaps of greater significance, under Environmental Protection Agency's ("EPA's") "contained-in" policy, environmental media (like water, soil, and sediment) that contain a listed hazardous waste must be handled as if a hazardous waste.

3. Many of the compounds specifically listed as hazardous waste under RCRA have been detected in municipal and industrial stormwater runoff. For example, chemical compounds that are commonly used for automobile maintenance (certain solvents, degreasers, hydraulic fluids, etc.) and yard care (selected herbicides, insecticides, fungicides and other pesticides) have been detected in stormwater runoff samples throughout the United States.

4. The chemicals of concern will mix with total suspended solids ("TSS") in the stormwater and a certain portion of these solids will "settle out" (be deposited) in the BMP. As will be discussed below, it is an open question as to when, if ever, such sediments become solid waste regulated under RCRA.

5. Simply because a chemical regulated by RCRA is detected in BMP sediments, *the sediments are not necessarily hazardous*. If, for example, a spent halogenated solvent listed as hazardous waste is detected in detention pond sediments, those sediments would be hazardous waste under the mixture rule only if the source of the spent solvent contained more than ten percent of that solvent by volume (40 CFR §261.31 (F001 wastes)). If a potential source is located, there must also be a way for precipitation/runoff to come into contact with the chemical. If no product containing greater than ten percent of the listed solvent is found, or if contact with precipitation/runoff (including via spills) is unlikely, the pond sediments would *not* be classified as hazardous waste per RCRA.

   The distinction between having one or more discernable "point" sources of hazardous waste (with suitable characteristics) versus no clearly defined sources with suitable characteristics is a critical one.

6. Municipal and industrial stormwater designers should specify an array of source control techniques to reduce the probability that RCRA-listed wastes will enter BMPs.

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[1] *Presented at the August, 1994 ASCE/Engineering Foundation/USEPA Conference in Crested Butte, Colorado entitled: "Stormwater NPDES Related Monitoring Needs."*

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7. Despite aggressive source control efforts, in most municipal and industrial settings, pollutants that are "listed" under RCRA will inevitably find their way into BMPs on occasion. This *must* be recognized and planned for, as should the fact that most BMPs will cause some sediment/pollutant deposition, thereby triggering the potential problem. It is not feasible to design facilities to allow listed hazardous compounds to assuredly pass through, nor would this be desirable from a receiving water impact perspective.

8. There are many ameliorating factors to which regulators may be receptive. For example, appropriate facility analysis may demonstrate that the sediments pose little risk to humans or to aquatic or terrestrial life forms. For BMPs that are "onstream" (in "waters of the state/United States"), it may be feasible to show that the sediment will not cause use impairment or lead to numeric stream standards violations. Lack of clearly defined hazardous waste sources can add considerable uncertainty to this process. (see No. 5, above).

   In short, there are logical arguments that can be offered as to why BMP sediments should not be classified as hazardous waste, even if there are detectable concentrations of hazardous chemicals within the sediments.

9. Ironically, certain federal and state regulations (under the Clean Water Act) call for the implementation of BMPs, which can create regulatory difficulties under RCRA. Stated another way: to comply with one regulation potentially opens the door for violation of another regulation.

10. Pending regulatory modifications and new legislation offer the potential to ameliorate this situation, which could otherwise impose a significant economic burden when viewed from a national perspective.

## THE BASIS FOR, NATURE AND IMPORTANCE OF STORMWATER BEST MANAGEMENT PRACTICES (BMPs)

Typical stormwater BMPs include, as examples:

- "Dry" detention ponds.
- "Wet" retention ponds.
- Artificial wetlands.
- Infiltration practices.
- Specially designed stormwater inlets.
- Grass-lined swales and other water quality conveyances that promote extended flow time, infiltration, and interaction of pollutants with channel vegetation.

Facilities of this kind are commonly installed as stormwater quantity and quality mitigation measures. When properly designed and operated, they can reduce peak rates of runoff from developed lands to predevelopment levels and can reduce pollutant loads in stormwater runoff. One common (and desirable) feature of these BMPs is that they promote the sedimentation and deposition of TSS that are commonly found in municipal and industrial stormwater runoff. For example, EPA has determined that the median concentration of TSS in "typical" urban runoff is 100 mg/L (EPA, 1983). Such references as Metropolitan Washington D.C. Council of Governments, 1992; California State Water Resources Control Board, 1993, and Urbonas and Stahre, 1993 indicate that BMPs can attain TSS removal efficiencies of 70 percent or higher.

The important aspect of TSS removal within BMPs (in terms of RCRA regulations) is that many of the chemical compounds regulated by RCRA tend to adsorb onto sediments. As noted by Urbonas and Stahre (1993): "Most pollutants appear to have strong affinity to TSS, and the removal of TSS will often remove many of the other pollutants found in urban stormwater." Therefore, BMPs accumulate in sediments within retention/detention ponds, wetlands, infiltration basins, etc. Proper maintenance practice indicates that sediments should be periodically removed to assure that the facilities properly function, maintain longevity and assure that facilities are attractive.

Historically, and in most instances, the disposal of sediments removed from BMPs has posed no special regulatory or legal difficulty. Instead, industries and municipalities have disposed of such sediments in the same way that they would any uncontaminated soil. Frequently, in fact, upon drying, the sediments have been mixed with other soil and reused as backfill on construction projects, or disposed of in conventional sanitary landfills.

To comply with local, state and federal mandates related to drainage and flood control and stormwater quality management, the past decade (and particularly the past two to three years) has been a period of rapid growth in the numbers and kinds of BMPs used. The 1987 Clean Water Act and the accompanying National Pollutant Discharge Elimination System ("NPDES") stormwater regulations (issued in 1991 and subsequent years) have prompted numerous industries, cities, counties, and businesses to implement BMPs. Those states with authority to administer the Clean Water Act (NPDES permits) have state regulations for runoff quality control. Most local governments have drainage and flood control regulations (which call for BMPs) and many have adopted localized stormwater quality and erosion/sediment control regulations. In short, at multiple levels, there is the necessity to construct BMPs to comply with regulations. In addition, standard civil engineering practice (ASCE and WEF, 1993) mandates the installation of stormwater control measures. Detention ponds, infiltration practices, grass-lined channels, etc., are common elements of nearly every drainage system.

## COMPOSITION OF STORMWATER RUNOFF

"Typical" stormwater runoff from urban areas contains a wide array of pollutants. Table 1 summarizes USEPA Priority Pollutants detected in urban runoff samples in the Denver area, according to the Denver Urban Runoff Program (Denver was one of the 26 cities that participated in the National Urban Runoff Program) (DRCOG, 1983).

Many chemicals in urban and industrial stormwater runoff are periodically detected which are RCRA-listed compounds. Excessive herbicide or pesticide use contributes toxic chemicals to the stormwater (California SWRCB, 1993). Household toxics such as oil/grease, paint, antifreeze, cleaner and solvents are widely used and may be improperly used, stored and disposed of which can lend to stormwater pollution (Berman et al., 1991). Atmospheric deposition contains appreciable quantities of pesticides and organic compounds (Novotny and Chesters, 1981). Other toxic pollutants occur through the use of products for de-icing and weed, rodent and insect control (Beaton et al., 1972) Hydrocarbons can come from spills, leaks or blow-off of motor lubrications, antifreeze, hydraulic fluid and asphalt surface leachate (Schueler, 1987). The City of Seattle (1989) found low concentrations of various EPA Priority Pollutants including pesticides, phenols, and polynuclear and polycyclic aromatic hydrocarbons.

In certain municipal and industrial settings, the probability of *detecting* RCRA-listed chemicals in stormwater runoff is significant. We emphasize the word *detect* because the detection limits for many RCRA-listed substances are measured in parts per billion. Practically, this can mean that a few tablespoons of a solvent in the runoff from a large industrial site will be detected by standard gas chromatograph/mass spectrometer ("GC/MS") lab methods. Consider the example of municipal or industrial vehicle equipment maintenance facilities. Even with good housekeeping practices and source controls in place, it is virtually inevitable that certain hydraulic fluids, degreasers, solvents and other RCRA-listed chemicals will sporadically come into contact with stormwater and that they will be detected in sediments in on-site BMPs, assuming that such sediments are monitored.

In larger municipal settings, the probability of RCRA-listed chemicals entering stormwater is high, because it is not practical to implement rigorous source control measures uniformly over vast areas. The benefit of increased dilution flow is not great enough to overcome the problem because detection levels for the relevant constituents are so low. Pesticides, particularly herbicides and insecticides, other chemicals commonly used by homeowners, the wide array of chemicals associated with automobiles and others can enter typical urban drainage systems at innumerable locations and, with appropriate monitoring, they will be detected.

In summary, municipal and industrial stormwater runoff can contain chemicals that are listed under RCRA as hazardous wastes. These chemicals will be found in sediments that accumulate in BMPs.

## EFFECTIVENESS OF BMP AT REMOVING SEDIMENTS/PARTICULATE MATTER THAT CONTAIN CHEMICALS OF CONCERN

Typical stormwater BMPs can be quite effective at pollutant removal via sedimentation (the settling out of particulate matter from the water column onto the bottom of the BMP, such that the particulate matter becomes a deposit).

Based upon the work of EPA (1983), Grizzard et al. (1982) and Whipple and Hunter (1982), extended dry detention ponds have been observed to remove 50 to 70 percent of TSS. The EPA (1983) reported that wet retention ponds could remove 60 to 90 percent of TSS. Monitoring of constructed wetlands in Florida (USGS, 1986) indicated a TSS removal efficiency of 41 percent. Modular block porous pavement (Schueler, 1987) can remove 80 to 90 percent of TSS. An excellent summary of TSS removal efficiencies for the most commonly utilized stormwater BMPs is provided on pages 105 through 112 of the Metropolitan Washington D.C. Council of Governments 1992 publication, *The Current Assessment of Urban Best Management Practices - Techniques for Reducing Non-Point Pollution in the Coastal Zone.*

Most of the RCRA-listed chemicals that have been detected in stormwater runoff can be associated with TSS; therefore, they are subject to sedimentation. This is why sediments in BMPs can contain RCRA-listed compounds.

## THE KEY RELEVANT ASPECTS OF RCRA

Congress passed the RCRA 42 USC §§6901-6991i to require generators of hazardous waste to manage those wastes from their creation to their ultimate disposal, i.e., "from cradle to grave." RCRA requires every American industry and municipality which generates hazardous wastes to monitor and manage hazardous wastes in accordance with specified procedures.

Wastes can be defined by RCRA as hazardous because they either: (1) have certain *characteristics* (ignitability, corrosivity, explosivity or toxicity) or (2) because they contain constituents specifically *listed* in RCRA regulations. In nearly all cases involving stormwater BMP sediments, the reason that such sediments would be classified as hazardous wastes is because they contain *listed* chemicals rather than because the sediments are hazardous by *characteristic*.

It is not feasible to review RCRA in detail within this paper, but the key aspects of that law and its accompanying regulations for this issue include the following:

- The Mixture Rule (40 CFR § 261.3(a)(2)(iv))

  RCRA regulations include lists of a number of chemicals and their by-products that are considered per se hazardous wastes when used and discarded. Under the mixture rule, a mixture of any solid waste (including such ordinary wastes as dirt, paper, rags or plastics) and the listed waste is considered by regulation to be a hazardous waste. Even small concentrations of a listed waste can render large volumes of material "hazardous waste," as that term is defined under RCRA.

- The Derived-From Rule (40 CFR §§261.3(c)(2)(i) and 261.3(d)(2))

  If solid waste is considered hazardous waste, even if by operation of the mixture rule, then any residue from the treatment, storage or disposal of the hazardous waste is also considered hazardous waste.

- The Contained-in Policy

Under existing EPA policy, environmental media -- such as soil or debris -- that "contain" a hazardous waste must be handled as if a hazardous waste. It is the contained-in policy, rather than the mixture or derived-from rules, that is most likely to bring BMP sediments within the scope of RCRA regulations. A de minimis exception to the contained-in principle can be made on a site-specific basis (57 FR 37194, August 18, 1992). EPA bears the burden of demonstrating that contaminated media do, in fact, contain hazardous waste before subjecting those media to the panoply of RCRA regulations. See, e.g., Chemical Waste Management v. EPA, 869 F.2d 1526, 1537-40 (D.C. Cir. 1989).

- The Nature of the Source Material

Simply because a chemical regulated by RCRA is detected in BMP sediments, *the sediments are not necessarily hazardous even after discarded*. If, for example, a spent halogenated solvent listed as hazardous waste is detected in detention pond sediments, those sediments would be hazardous waste under the mixture rule only if the source of the spent solvent contained more than ten percent of that solvent by volume (40 CFR §261.31 (F001 wastes)). If a potential source is located, there must also be a way for precipitation/runoff to come into contact with the chemical. If no product with greater than ten percent of the listed solvent is found, or if contact with precipitation/runoff (including via spills) is unlikely, the pond sediments would *not* be classified hazardous waste.

- Exceptions to the Definition of Hazardous Waste

There are numerous exceptions to the definition of hazardous waste, and these exceptions must be considered on a site-specific basis. For example, certain mining and mineral processing wastes -- known as Bevill wastes -- are not regulated by RCRA (40 CFR §§ 261.3(a)(2)(i) and 261.4(b)(7)). Also, waste waters containing certain listed wastes are not subject to RCRA regulations if those waste waters are discharged under an NPDES permit or are subject to pretreatment standards.

These examples make it clear that *the distinction between having one or more discernable, "point" sources of a hazardous waste (with suitable characteristics) versus no clearly defined sources with suitable characteristics is a critical one*. Convincing the relevant regulators that there are not definable sources with relevant characteristics is the responsibility of the facility owner.

The mixture and derived-from rules do not apply to BMP sediments until those sediments are removed from the BMP, for it is only then that the sediments are "discarded." See American Mining Congress v. EPA, 824 F.2d 1177, 1192-93 (D.C. Cir. 1987) ("AMC"). The D.C. Circuit's decision in AMC has been limited by later decisions of that same court addressing sludges in sediment ponds that are reprocessed by the metals industry. See American Petroleum Institute v. EPA, 906 F.2d 729 (D.C. Cir. 1990) ("API"); American Mining Congress v. EPA, 907 F.2d 1179 (D.C. Cir. 1990) ("AMC II"). In API and AMC II, the court upheld EPA regulations extending RCRA to sediments in process sediment ponds. No court has yet decided whether a similar extension of RCRA's scope could apply to sediments in ordinary BMPs.

The mixture and derived-from rules do not logically fit with in situ BMP sediments. EPA might, however, apply the contained-in policy to in situ BMP sediments. That policy, as applied to contaminated medium, is not yet a rule. EPA proposed a rule that would codify the contained-in policy (Land Disposal Restrictions ("LDRs") for Newly Identified and Listed Hazardous Wastes and Hazardous Soil, Proposed Rule, 58 FR 48092 (September 14, 1993)). EPA recently gave notice, however, that it intends to tie the codification of the contained-in policy to the promulgation of a hazardous waste identification rule that abandons the strict mixture and derived-from rules for a more flexible approach to identify hazardous wastes (Land Disposal Restrictions ("LDRs") for Newly Identified Hazardous Wastes and Hazardous Soil, Clarification, 59 FR 10778 (March 8, 1994)). The contained-in policy, as it now exists, could require that sediments of BMPs be managed as hazardous waste. Given the uncertainties of strict enforcement of a policy (as opposed to a rule) and EPA's intent to revise the regulatory framework in the foreseeable future, EPA may not wish to test the scope of its enforcement powers by seeking to regulate BMP sediments under RCRA.

If *water* stored in the BMP is regulated by an NPDES permit, RCRA may *not* apply to the water. Under all but the most unusual cases, RCRA will not supersede Clean Water Act jurisdiction over waters found in BMPs. Currently, however, sediments in stormwater facilities are a different matter and they may become subject to regulation under RCRA.

Detection limits and the distinction among the terms "practical quantitation limit" ("PQL"), "lower limit of detection" ("LLD"), "method detection limit" ("MDL") and others is critical on many issues involving RCRA. This subject is also beyond the scope of this document. This paper has simplified this subject greatly by indicating that measured concentrations are greater than the "detection limit."

## RECOMMENDATIONS TO REDUCE THE POTENTIAL PROBLEM

BMP designers and facility owners are advised to take the following steps to reduce the probability that sediments will be classified as hazardous waste under RCRA:

1. Take all steps reasonable to reduce the likelihood that chemicals listed as hazardous waste under RCRA will come into contact with precipitation or stormwater. These measures are well documented in the contemporary stormwater quality literature and they can include:

    a. Educating workers/public.

    b. Placing hazardous materials indoors or covering them.

    c. Connecting floor drains and sumps to the sanitary sewer rather than the drainage system.

    d. Inventorying hazardous chemicals on a regular basis and keeping track of their usage.

    e. Discouraging the use of hazardous chemicals and emphasizing replacement compounds that are not listed by RCRA.

    f. Formulating, implementing and regularly monitoring an aggressive spill control program.

2. In small drainage areas, the prospects for strictly controlling the kinds of chemicals that enter the drainage system are better than in larger areas with multiple property owners. This states the obvious; however, it is a point that merits emphasis. To provide an example, a vehicle maintenance facility that is three acres in size, and which receives no runoff from adjoining properties, should be able to implement rigorous source controls without difficulty. All work on vehicles can occur indoors. Floor drains and sumps should be connected to pretreatment facilities, which in turn would discharge to the sanitary sewer. Thoughtful drainage design decisions can be made. For example, vehicle parking areas can be separated from stormwater conveyances with vegetated "filter strips" and the conveyances can be lined with vegetation. Both of these practices will promote the interaction of chemicals of concern with vegetation and soils, and will also encourage infiltration.

3. To "localize" the problem, stormwater "pretreatment" facilities should be considered. For example, immediately upstream from a stormwater wetland, it may be feasible to install a sedimentation basin. Even with a retention time of as little as 15 minutes (where soil conditions are favorable), a significant fraction of the total sediment load can be removed from the stormwater prior to discharge into the wetland. This not only localizes sediments and the pollutants that adsorb to them, but also benefits the wetland and results in decreased long-term maintenance costs.

4. Adopt measures to reduce the quantity of sediment that will enter the BMP over time. The smaller the sediment load that accumulates, the less frequently the sediment has to be removed. This is of vital importance because RCRA in most instances becomes relevant *only* when sediments actually need to be removed. Rigorous erosion and sediment control practices, both during and after construction, are mandatory. Judicious use of sand during the winter months is necessary.

5. Thoughtfully evaluate BMP facility design characteristics and implement techniques that will enhance the likelihood of pollutant "loss" within the BMP. For example, incorporating fountains into retention ponds enhances the volatilization of many volatile and semi-volatile organic compounds that are listed by RCRA. Note, however, that a permit is required to treat a RCRA hazardous waste.

6. Designers are well advised to discuss potential problems with regulators and their clients from the outset of an assignment. By discussing potential problems with the BMP facility owner, professional liability is reduced and the owner and engineer can agree, in advance, on mitigation measures.

   Discussions with regulators are equally important. Generally, the authors recommend that the design engineer: (a) cite regulations that are forcing the implementation of stormwater BMPs in the first place (typically municipal or industrial NPDES regulations); (b) delineate the full range of functions that the BMP will fulfill (flood hazard reduction, stormwater quality management and others specific to the given facility); (c) describe structural and nonstructural measures that will be taken to reduce the probability that hazardous chemicals will enter the BMP; and (d) suggest a regulatory agreement, in advance, that will address the issue in a reasonable, cost-effective manner if and when the sediments do need to be removed, under the assumption that they contain one or more RCRA-listed chemicals.

   The nature of discussions with the BMP owner and regulators are highly specific to the circumstances at hand.

7. Intentionally oversize the sediment storage volume in the BMP. Instead of assuming that the BMP should have its sediments removed once every 5 to 10 years, assume that sediment removal should occur no more frequently than once every 20 to 30 years. This will be impractical and excessively expensive in certain instances, but in situations where additional sediment storage can be achieved economically, this step should be taken.

   It is essential to recognize that in most instances RCRA will not be triggered until sediments need to be removed from the BMP. Therefore, every reasonable step should be taken to avoid the need to remove sediments from stormwater facilities.

8. Where feasible, construct facilities that are "off-line" rather than "on-stream." This is certainly not a panacea, but at least off-line facilities are not subject to the criticism that stormwater facility sediments classified as hazardous waste by RCRA are located in "waters of the state/United States."

It will not always be feasible to avoid RCRA regulations by implementing the measures listed above. Furthermore, existing BMPs may contain sediments that have RCRA-listed chemicals in them *now*. When confronted with the knowledge that BMP sediments do contain RCRA-listed wastes, the facility owner and the designer should consider the following steps:

1. Conduct additional sampling to confirm the presence of the contaminants. Also, sample at multiple locations to assure adequate horizontal and vertical coverage. Critically analyze the data collected and determine if additional actions are required.

2. If the drainage area is small, thoroughly search the area for potential distinct sources of the chemical or chemicals that have been detected in the sediments. If distinct potential sources are noted, their ability to be transported into the stormwater BMP needs to be established.

Once potential sources are noted, their characteristics should be checked against the RCRA definition of hazardous waste (40 CFR Part 261) to assure that they are, in fact, RCRA-regulated wastes.

A thorough search of this kind is obviously feasible only in smaller drainage basins.

3. If the search for sources indicates that there are sources regulated by RCRA which have entered the stormwater facility sediments, actions should be immediately taken to assure that the chemical will not continue to be discharged into the stormwater drainage system.

   If no distinct source or sources with the requisite characteristics (as defined by RCRA) are located, this is very important information to be conveyed to the regulators. All other things being equal, RCRA-regulators will be less inclined to rigorously control "contaminated" sediments that have been affected by diffused sources rather than distinct sources with the requisite characteristics.

   The ideal outcome is to identify probable sources that do *not* comply with RCRA requirements. For example, if the trichlorethylene sources in a drainage area that are in contact with precipitation/runoff are less than 10 percent pure, the sediments should not be classified as hazardous wastes.

4. In many cases, a risk assessment will demonstrate that there is no practical risk posed to the public or other life forms by constituent levels within the sediments. This is important information to provide to the regulators because they can exercise a certain amount of judgment when evaluating regulatory options. If volatile or semi-volatile compounds are in the sediments, the risk assessment should account for the sediment dredging and disposal process, because these actions will normally cause substantial volatilization, thereby reducing the risk.

5. Evaluate modifications to the stormwater facility that will avoid the need to excavate the contaminated sediments. For example, it may be reasonable to raise a detention pond outlet structure, thereby increasing sediment storage space. This action could reduce the flood attenuation and water quality enhancement characteristics of the facility, but the reduction, if significant, can be offset with other BMPs in the basin.

6. There is some merit to the argument that the Clean Water Act (NPDES permitting program) forced the construction of stormwater BMPs that would not otherwise have been installed. Consequently, it is unfair to then come back with RCRA requirements for facilities that are functioning in exactly the manner that they were intended.

Irrespective of which of these options (or others) are implemented, the authors suggest that qualified, specialized legal counsel be obtained so that appropriate steps are taken.

## UNKNOWNS AND FUTURE CONSIDERATIONS

The subject of potential RCRA regulation of stormwater facility sediments is in its infancy and much is not known. Examples of major unknowns are as follows:

1. The authors are not sure how frequently stormwater BMP sediments actually contain RCRA-listed wastes with requisite characteristics. Common sense tells us that this could be a typical problem, but relevant data are presently lacking. The authors know of three industrial complexes in different states that are currently faced with this situation and that are proceeding under the assumption that the relevant sediments are subject to RCRA regulation.

2. Semantics and design decisions could play a key role in the future. For example, some might argue that "formal," structural BMPs are subject to RCRA regulation while "informal," less significant BMPs are not. Examples of "formal" facilities are wet ponds, dry ponds, artificial wetlands and infiltration basins. Examples of "informal" facilities are small swales and "porous" check dams. In any event,

the distinction among different kinds of BMPs, if any, relative to RCRA needs to be defined.

3. Most stormwater conveyance channels, including storm sewers, exhibit sediment deposition -- consequently, can they be regulated under RCRA?

4. The authors have not asked a representative sampling of regulators for their opinion on this issue. We also cannot speculate as to the probable posture of the regulators when it comes to this subject. We suspect that the reaction would be highly dependent upon the person asking the question and the person answering the question.

As of the summer of 1994, there are potential regulatory changes that could be very helpful relative to this situation. Also, RCRA is now in the reauthorization process, and there is the potential for language in the updated law which would specifically exempt stormwater BMPs from RCRA coverage. Important considerations include:

- Revisiting the Mixture and Derived-from Rules

In 1991, the United States Court of Appeals for the District of Columbia vacated EPA's mixture and derived-from rules (Shell Oil Company v. EPA, 950 F.2d 741 (D.C. Cir. 1991)). The Court vacated these rules only because EPA failed to follow appropriate notice and comment rulemaking procedures when promulgating the rules; the Court did not reach substantive challenges to these rules. After Shell Oil, EPA repromulgated the mixture and derived-from rules on an interim basis (57 Fed. Reg. 7,628 (March 3, 1992)). Thus, the mixture and derived-from rules are at present the law of the land. In the Bush Administration, EPA proposed a new "Hazardous Waste Identification Rule" ("HWIR") that would have abandoned the mixture rule in favor of concentration-based standards for hazardous wastes (57 FR 21450, May 20, 1992; 57 FR 7636 March 3, 1992). The Bush Administration abandoned this promising approach prior to the 1992 election, but the Clinton Administration has promised to pursue rulemaking that would replace the mixture and derived-from rules with a more reasonable rule defining hazardous waste. (It is also important to note that the DC Circuit's opinion affected only the federal mixture and derived-from rules. Many states have similar or identical rules. A recent court decision, however, invalidated a State's mixture rule based on Shell Oil). The benefits of the revision of these rules are likely to spill over to the contained-in policy and should relax the overly rigid regulation of contaminated environmental media.

- RCRA Reauthorization

RCRA is overdue for reauthorization, and Congress is likely to amend RCRA substantially when that reauthorization finally occurs. Early indications are that most of the action in RCRA reauthorization will be over the regulation of nonhazardous waste. Nonetheless, reauthorization will provide to Congress the opportunity to address the definition of hazardous waste, including the mixture and derived-from rules and the contained-in policy. If EPA promulgates replacement rules before reauthorization, Congress may well stay its hand on these issues.

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**TABLE 1**

EPA PRIORITY POLLUTANTS DETECTED IN COMPOSITE SAMPLES OF URBAN RUNOFF[1]

| Date Sampled | Monitoring Site | Metals | Pesticides | Volatile Compounds | Other |
|---|---|---|---|---|---|
| 5/28/81 | North Ave. | Copper (Nickel)<br>Lead<br>Selenium<br>Zinc | a- BHC<br>y- BHC | Chloroform | |
| 8/12/81 | North Ave. | Arsenic<br>Copper<br>Lead<br>Zinc | a- BHC<br>(y- BHC) | | Bis (2-Ethyl-hexyl)Phthalate<br>Cyanide |
| 5/28/81 | Asbury Park | Arsenic<br>Copper<br>Lead (Antimony)<br>Nickel<br>Selenium<br>Zinc | a- BHC | | Bis(2-Ethyl-hexyl)Phthalate |
| 5/28/81 | Villa Italia | Arsenic<br>Copper (Nickel)<br>Lead<br>Selenium<br>Zinc | a- BHC | | |
| 8/12/81 | Villa Italia | Arsenic<br>Chromium<br>Copper<br>Lead<br>Nickel<br>Zinc<br>(Cadimium) | a- BHC | Tetrachlorethylene<br>(Methylene Chloride) | Cyanide<br>Di-N Butyl Phthalate |
| 5/26/81 | Southglenn | Copper<br>Lead (Nickel)<br>Selenium<br>Zinc | a- BHC<br>(y- BHC) | (1,1,1, Trichlorethane) | |
| 8/13/81 | Southglenn | Arsenic<br>Copper<br>Lead<br>Selenium<br>Zinc | a- BHC<br>(y- BHC) | 1,1,1,-Trichlorethane | (Bis(2-Chloro-isoprophyl)Ether) |

[1] Additional pollutants detected in coinciding discrete sample are in parentheses.

Denver Regional Council of Governments ("DRCOG") *Urban Runoff Quality in the Denver Region*, 1983, Table 9, p. 33.

# BEWARE THE SEDIMENT SCARE

JONATHAN JONES

*Under the Resource Conservation and Recovery Act, sediments that accumulate in storm water may be classified as hazardous waste. Here's what to do to limit the risk.*

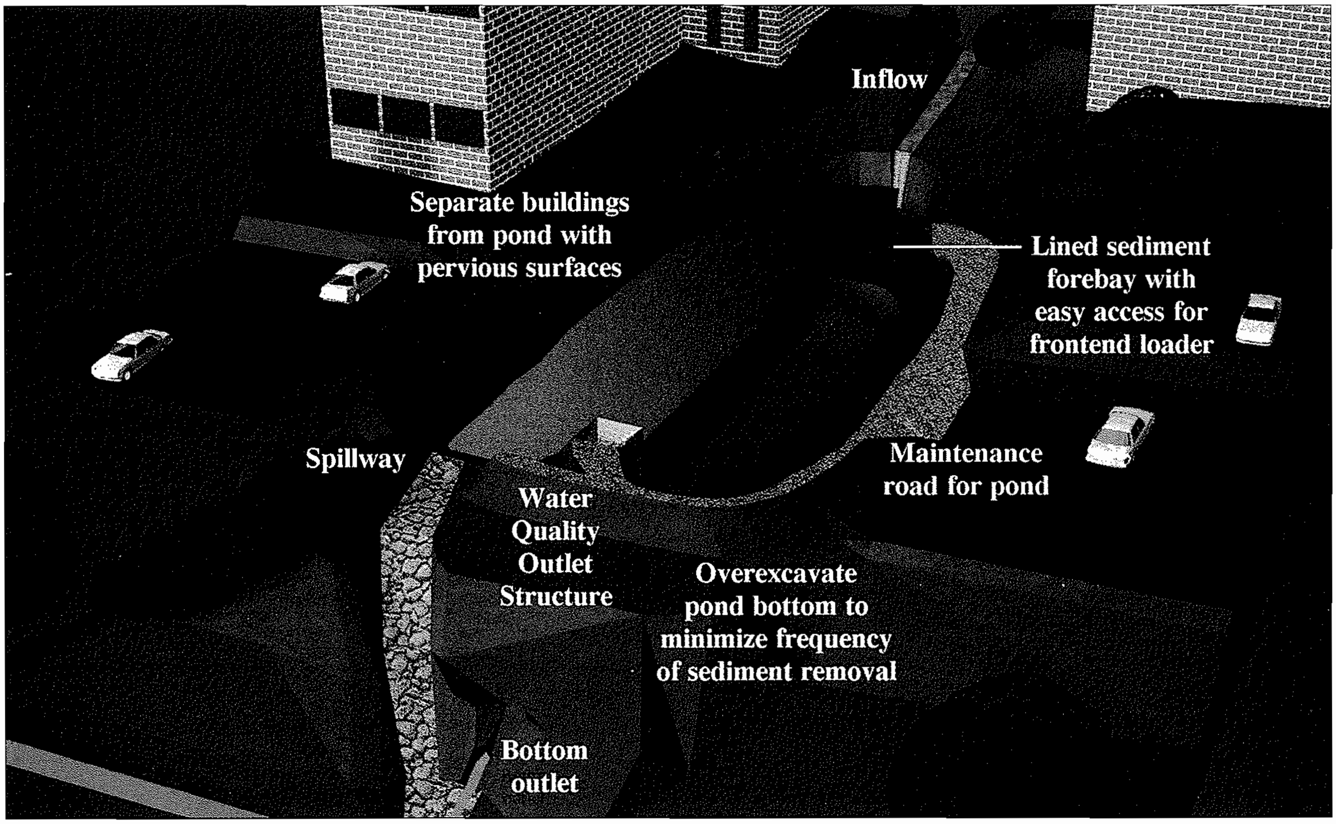
Your municipal or industrial storm-water facility meets best management practices (BMPS) as outlined by EPA, and is designed to meet requirements under the Clean Water Act and the accompanying National Pollutant Discharge Elimination System (NPDES). So it's protected from hazardous-waste sanctions, right? Maybe not. Because of the breadth and complexity of the Resource Conservation and Recovery Act (RCRA), a number of unusual and perhaps unintended regulatory consequences can arise. For instance, retention ponds, infiltration basins, buried concrete vaults, created wetlands and other facilities not intended to contain or manage hazardous wastes could be characterized or identified as hazardous-waste–treatment, –storage and –disposal facilities.

Under current RCRA regulations, the "mixture" and "derived-from" rules may cause sediments with extremely low concentrations (barely above the detection limit) of certain constituents to be classified as hazardous waste. The problem has been accentuated by EPA's "contained-in" policy, which dictates that any environmental media (such as water, soil and sediment) containing any amount of listed hazardous waste must be handled entirely as a hazardous waste.

In spite of aggressive source-control efforts at municipal and industrial settings, pollutants listed under RCRA (such as from vehicle/equipment maintenance and yard care) will inevitably find their way into BMP facilities. Designers and facility owners must recognize this and plan for it. There are several protective measures to consider:

- Take reasonable steps to reduce the likelihood that listed chemicals under RCRA will come into contact with precipitation or storm water. Educate workers and the public about the problem. Tell them to cover the hazardous materials or place them indoors. The owner of a 3 acre vehicle-maintenance facility, for example, which receives no runoff from adjoining properties, should be able to implement rigorous source controls with little difficulty. All work on vehicles can occur indoors. Floor drains and sumps can be connected to pretreatment facilities that discharge into the sanitary sewer. Parking areas can be separated from storm-water conveyances by vegetated "filter strips."
- Take inventory of hazardous chemicals on a regular basis and keep track of their use. Encourage the use of replacement compounds that are not listed by RCRA. Formulate, implement and regularly monitor an aggressive spill-control program.
- Consider installing storm-water–pretreatment facilities to localize the problem. For example, try installing a sedimentation basin immediately upstream from a storm-water wetland. Even with a short retention time, a significant fraction of the total sediment load can be removed from the storm water prior to its discharge into the wetland. This not only localizes sediments and the pollutants that adsorb them, but also benefits the receiving water (stream or wetland) and results in decreased long-term maintenance costs.
- Adopt measures to reduce the quantity of sediment that will enter the BMP over time. The smaller the accumulated sediment load, the less frequently it has to be removed. This is of vital importance because RCRA, in most instances, is relevant only when sediments actually need to be removed. Rigorous erosion and sediment-control practices and judicious use of sand during the winter months can make a big difference.
- Evaluate BMP facility design characteristics and implement techniques that will enhance the likelihood of pollutant loss within the BMP. The incorporation of fountains into retention ponds, for example, enhances the volatilization of many volatile and semi-volatile organic compounds listed by RCRA. However, a permit is required to treat an RCRA hazardous waste, and "treatment" is defined as any method, technique or process—including neutralization—designed to change the chemical, physical, or biological character or composition of a hazardous waste.
- Ensure that facility designers discuss potential problems with regulators and their clients prior to an assignment. Professional liability can be reduced and the owner and engineer can agree, in advance, on mitigation measures. Discussions with regulators are equally important. Designers should cite regulations that force the implementation of storm-water BMPS; delineate the full range of functions that the BMP will fulfill (flood hazard reduction, storm-water quality management and so on); describe structural and nonstructural measures to be taken to reduce the probability that hazardous chemicals will enter the BMP; and suggest a regulatory agreement, in advance, that will address the issue in a reasonable, cost-effective manner if and when the sediments must be removed.
- Design an oversized sediment storage volume in the BMP. Instead of assuming that the BMP should undergo sediment removal once every five to 10 years, assume that sediment removal should occur no more frequently than once every 20–30 years. This will be impractical and excessively expensive in certain instances, but feasible in situations where additional sediment storage can be achieved economically. Recognize that in most instances RCRA actions will not be triggered until sediments need to be removed from the BMP. So every reasonable step should be taken to avoid sediment removal.
- Construct facilities, where practical, that are "off-line" rather than "on-stream." This is certainly not a panacea, but at least the facility sediments will not be located in "wa-

*Reprinted from Civil Engineering, July 1995*



SEDIMENT FOREBAYS AND OTHER DESIGN TECHNIQUES CAN PROTECT FACILITIES FROM RCRA REGULATIONS.

ters of the state or the United States," which could be a complicating factor.

### AFTER THE FACT

Sediments in existing BMPs may already contain RCRA-listed chemicals. If that's the case, consider the following steps:

- Conduct additional sampling to confirm the presence of the contaminants. Sample at multiple locations to assure adequate horizontal and vertical coverage. Critically analyze the data collected and determine whether additional actions are required.
- If the drainage area is small, thoroughly search the area for the source of the chemicals that have been detected in the sediments. Once sources are found, check their waste characteristics against the RCRA definition of hazardous waste (40 CFR Part 261) to ensure the wastes are, in fact, RCRA-regulated wastes. A thorough search of this kind is obviously feasible only in smaller drainage basins.
- If the search indicates that RCRA-regulated wastes have mixed with the storm-water facility sediments, take immediate action to ensure that the chemical will not continue to be discharged into the storm-water drainage system. Simply because a chemical or constituent regulated by RCRA is detected in BMP sediments, however, does not necessarily render the sediment a hazardous waste. If, for example, a spent halogenated solvent listed as hazardous waste is detected in detention pond sediments, those sediments would be hazardous waste under the mixture rule only if the sources of the spent solvent contained more than 10% of that solvent by volume. If no product containing more than 10% of the listed solvent is found, or if contact with precipitation/runoff (including via spills) is unlikely, the pond sediments would not be classified as hazardous waste. The distinction between having one or more discernable point sources of hazardous waste (with suitable characteristics) vs. no clearly defined sources with suitable characteristics is a critical one.
- If a distinct source is not found, convey the information to the regulators. RCRA regulators will be less inclined to control sediments contaminated by diffused sources.
- Note that in many cases, a risk assessment will demonstrate that no practical risk is posed to the public or other life forms by constituent levels within the sediments. This is important information for the regulators because they can exercise some discretion in evaluating regulatory options. If volatile or semivolatile compounds are in the sediments, the risk assessment should account for the sediment dredging and disposal process, which will cause substantial volatilization and reduce the risk.
- Evaluate modifications to the storm-water facility that may help you avoid excavation of the contaminated sediments. Raising a detention pond outlet structure, for example, increases sediment storage space. Any actions of this kind need to be carefully evaluated, however, because they can have implications related to dam safety, flood attenuation and water-quality performance.

RCRA is undergoing reauthorization and there is a possibility that the updated law may exempt storm-water BMP facilities from RCRA coverage. Early indications, however, are that most RCRA changes will focus only on hazardous-waste definitions. It is prudent to be aware of the potential problem and take steps to limit the risks to BMPs that you design or operate. At times, it may be necessary to confer with qualified legal counsel.

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# BMPs and Hazardous Sediment

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UNDER what circumstances can sediments that accumulate in municipal and industrial facilities that meet best management practices (BMPs) be classified as hazardous waste, as defined by the federal Resource Conservation and Recovery Act of 1976 (RCRA), as amended? This question is asked with increasing frequency, and the potential consequences associated with any answer are significant. Because of the breadth and complexity of the RCRA program, a number of unusual and perhaps unintended regulatory consequences can arise. For instance, units or devices that may not have been intended to contain or manage hazardous wastes may suddenly be characterized or identified as hazardous waste treatment, storage, and disposal facilities.

Stormwater BMPs include such facilities as 1) retention ponds, 2) detention ponds, 3) infiltration basins, 4) buried concrete vaults, and 5) created wetlands. This article provides an overview of the issues involved and recommendations for resolution of an issue that will increasingly confront those who design and own industrial and municipal stormwater management facilities. In summary, key issues and findings include the following:

1. Under certain circumstances, sediments that accumulate in either municipal or industrial facilities may be classified as hazardous waste.

2. Under current federal RCRA regulations, the mixture and derived-from rules can cause sediments with extremely low concentrations (barely above the detection limit) of certain constituents to be classified as hazardous waste when those sediments are discarded. Perhaps of greater significance, under the EPA's "contained-in" policy, environmental media (e. g., water, soil, and sediments) that contain a listed hazardous waste must ordinarily be handled as if a hazardous waste.

3. Many of the compounds specifically listed as hazardous waste under RCRA have been detected in municipal and industrial stormwater runoff. For example, chemical compounds that are commonly used for automobile maintenance (certain solvents, degreasers, hydraulic fluids, etc.) and yard care (selected herbicides, insecticides, fungicides, and other pesticides) have been detected in stormwater runoff samples throughout the U.S.

4. The chemicals of concern will mix with TSS in the stormwater and a certain portion of these solids will settle out or become deposited in the BMP. It is an open question as to when, if ever, such sediments become solid waste regulated under RCRA.

5. Simply because a chemical or constituent regulated by RCRA is detected in BMP sediments does not necessarily render the sediments hazardous waste. If, for example, a spent halogenated solvent listed as hazardous waste is detected in detention pond sediments, those sediments would be hazardous waste under the mixture rule only if the source of the spent solvent contained more than ten percent of that solvent by volume. If a potential source is located, there must also be a way for precipitation/runoff to come into contact with the chemical. If no product containing greater than ten percent of the listed solvent is found, or if contact with precipitation/runoff (including via spills) is unlikely, the pond sediments would not be classified as hazardous waste.

The distinction between having one or more discernible point sources of hazardous waste (with suitable characteristics) versus no clearly defined sources with suitable characteristics is a critical one.

6. Municipal and industrial stormwater designers should specify an array of source control techniques to reduce the probability that RCRA wastes will enter BMPs.

7. Despite aggressive source control efforts, in most municipal and industrial settings, pollutants that are listed under RCRA may inevitably find their way into BMPs on occasion. This fact must be recognized and appropriately planned for and handled, as should the fact that most BMPs will cause some sediment/pollutant deposition, thereby triggering the potential problem. It is not feasible to design facilities to allow listed hazardous compounds to pass through, nor would this be desirable from a receiving water perspective.

8. There are many ameliorating factors to which regulators may be receptive. For example, appropriate facility analysis may demonstrate that the sediments pose little risk to humans or to aquatic or terrestrial life. For BMPs that are onstream, it may be feasible to show that the sediment will not cause use impairment or lead to numeric stream standards violations. Lack of clearly defined hazardous waste sources can add considerable uncertainty to this process.

9. Ironically, certain federal and state regulations (under the Clean Water Act) call for the implementation of BMPs, which can create regulatory difficulties under RCRA. Stated another way, compliance with one regulation potentially opens the door for violation of another regulation.

10. Pending regulatory modifications and new legislation offer the potential to ameliorate this situation, which could otherwise impose a significant economic burden when viewed from a national perspective.

The important aspect of TSS removal within BMPs (in terms of RCRA regulations) is that many of the chemical compounds regulated by RCRA tend to adsorb onto sediments. BMPs accumulate in sediments within retention/detention ponds, wetlands, infiltration basins, etc. Proper maintenance practice indicates that sediments should be periodically removed to assure that the facilities properly function, maintain longevity, and assure that facilities are attractive.

Historically, and in most instances, the disposal of sediments removed from BMPs has posed no special regulatory or legal difficulty. Instead, industries and municipalities have disposed of such sediments in the same way that they would any uncontaminated soil.

## *Composition of Stormwater Runoff*

Typical stormwater runoff from urban areas contains a wide array of pollutants. Table 1 summarizes constituent levels for selected contaminants, according to the Denver Urban Runoff Program. Denver was one of the 26 cities that participated in the National Urban Runoff Program. The pollutants shown in Table 1 are conventional, but stormwater runoff can also contain chemicals that are listed as hazardous wastes under RCRA.

In certain municipal and industrial settings, the probability of detecting RCRA-listed chemicals in stormwater runoff is significant. Consider the example of municipal or industrial vehicle equipment maintenance facilities. Even with good housekeeping practices and source controls in place, it is virtually inevitable that certain hydraulic fluids, degreasers, solvents, and other RCRA listed chemicals will sporadically come into contact with stormwater and that they will be detected in sediments in on-site BMPs, assuming that such sediments are monitored.

In larger municipal settings, the probability of RCRA-listed chemicals entering stormwater is high, because it is not practical to implement rigorous source control measures uniformly over vast areas. The benefit of increased dilution flow is not great enough to overcome the problem because detection levels for the relevant constituents are so low. Pesticides, particularly herbicides and insecticides, other chemicals commonly used by homeowners, the wide array of chemicals associated with automobiles, and many others can enter typical urban drainage systems at any number of locations. With appropriate monitoring and analysis, they will be detected.

In short, municipal and industrial stormwater runoff can contain chemicals that are considered listed hazardous wastes under RCRA. These chemicals will be found in sediments that accumulate in BMPs.

### Table 1—Average Mean Concentrations by Land Use

| | Land Use | | |
|---|---|---|---|
| Constituent | Residential (mg/L)[a] | Commercial (mg/L)[a] | Undeveloped (mg/L)[a] |
| Total Phosphors | 0.8 | 0.8 | 0.4 |
| Dissolved Phosphorus | 0.2 | 0.2 | 0.1 |
| Ortho Phosphorus | 0.3 | 0.3 | 0.1 |
| Total Nitrogen | 4.1 | 5.7 | 3.4 |
| Total Kjeldahl Nitrogen | 3.4 | 4.3 | 2.9 |
| Ammonia (as nitrogen) | 0.8 | 1.3 | 0.1 |
| Nitrate and Nitrite | 0.9 | 1.6 | 0.5 |
| Lead (Total)[b] | 0.3 | 0.2 | 0.1 |
| Zinc (Total)[b] | 0.3 | 0.4 | 0.1 |
| Copper (Total)[b] | 0.05 | 0.07 | 0.04 |
| Manganese (Total)[b] | 0.3 | 0.4 | 0.5 |
| Chemical Oxygen Demand | 194 | 260 | 72 |
| Total Organic Carbon | 39 | 56 | 26 |
| Dissolved Organic Carbon | 19 | 35 | 16 |
| Total Suspended Solids | 398 | 370 | 400 |

a. Concentrations of nitrogen species reported as nitrogen equivalent.

b. All metals reported as "totals" are the result of a total recoverable digestion method.

Source: Denver Regional Council of Governments, 1983.

## *Relevant Aspects of RCRA*

RCRA requires every American industry and municipality that generates hazardous wastes to monitor and manage hazardous wastes in accordance with specified procedures. In nearly all cases involving stormwater BMP sediments, the reason that such sediments could be classified as hazardous wastes is because they contain listed chemicals rather than because the sediments are hazardous by characteristic. It is not feasible to review RCRA in detail here, but the key aspects of the statute and its implementing regulations for this issue include:

♦The Mixture Rule. RCRA regulations include lists of a number of chemicals and their by-products that are considered per se hazardous wastes when used and discarded. Under the mixture rule, a mixture of any solid waste (including such ordinary wastes as dirt, paper, rags, or plastics) and the listed waste is considered by regulation to be a hazardous waste. Even small concentrations of a listed waste can render large volumes of material hazardous waste, as that term is defined under RCRA.

♦The Derived-From Rule. If solid waste is considered hazardous waste, even if by operation of the mixture rule, then any residue from the treatment, storage, or disposal of the hazardous waste is also considered hazardous waste.

♦The Contained-In Policy. Under existing EPA policy, environmental media, such as soil, water, or debris, that contain a hazardous waste must be handled as if a hazardous waste.

It is the contained-in policy, rather than the mixture or derived-from rules, that is most likely to bring BMP sediments within the scope of RCRA regulations. A de minimis exception to the contained-in principle can be utilized on a site-specific basis. EPA bears the burden of demonstrating that contaminated media do, in fact, contain hazardous waste before subjecting those media to the panoply of RCRA regulations.

♦The Nature of the Source Material. Simply because a chemical listed in the RCRA regulation is detected in BMP sediments does not render the sediments hazardous waste even after discard. If, for example, a spent halogenated solvent listed as hazardous waste is detected in detention pond sediments, those sediments would be hazardous waste under the mixture rule only if the source of the spent solvent contained more than ten percent of that solvent by volume. If a potential source is located, there must also be a way for precipitation/runoff to come into contact with the chemical. If no product with greater than ten percent of the listed solvent is found, or if contact with precipitation/runoff (including via spills) is unlikely, the pond sediments would not be classified as hazardous waste.

♦Exceptions to the Definition of Hazardous Waste. There are numerous exceptions to the definition of hazardous waste, and these exceptions must be considered on a site-specific basis. For example, certain mining and mineral processing wastes—known as "Bevill wastes"—are not regulated under Subtitle C of RCRA. Also, wastewaters containing certain listed wastes are not subject to RCRA regulations if those wastewaters are discharged under an NPDES permit or are subject to pretreatment standards. However, with regard to an NPDES permitted facility, only the point source discharge itself is excluded, not any upstream retention of wastewater or any sludge generated from the treatment of wastewater.

These examples make it clear that the distinction between having one or more discernible point sources of a hazardous waste (with suitable characteristics), versus no clearly defined sources with suitable characteristics, is a critical one. Convincing the relevant regulators that there are not definable sources with relevant characteristics is the responsibility of the facility owner.

The mixture and derived-from rules do not apply to BMP sediments until those sediments are removed from the BMP, because it is only then that the sediments are truly discarded.

The mixture and derived-from rules do not logically fit with in situ BMP sediments. However, EPA will likely apply the contained-in policy to in situ BMP sediments. That policy, as applied to contaminated media, is not yet a rule. EPA proposed in a rule to codify the contained-in policy. EPA recently provided notice, however, that it intends to tie the codification of the contained-in policy to the promulgation of a hazardous waste identification rule that abandons the strict mixture and derived from rules for a more flexible approach to identify hazardous wastes. The contained-in policy, as it now exists, could require sediments of BMPs to be managed as hazardous waste. Given the uncertainties associated with any attempted rigid enforcement of a policy, as opposed to a promulgated rule, and EPA's intention to revise the regulatory framework in the foreseeable future, EPA may not wish to test the scope of its enforcement authority by seeking to regulate BMP sediments under RCRA.

If water stored in the BMP is regulated by an NPDES permit, RCRA may not apply to the water. In all but the most unusual cases, RCRA will not supersede Clean Water Act jurisdiction over waters found in BMPs. Currently, however, sediments in stormwater facilities are a different matter and they may become subject to regulation under RCRA.

### Recommendations to Reduce The Potential Problem

BMP designers and facility owners are advised to consider the following steps to reduce the probability that sediments will be classified as hazardous waste under RCRA:

1. Take all reasonable steps to reduce the likelihood that chemicals listed as hazardous waste under RCRA will come into contact with precipitation or stormwater. These measures are well documented in contemporary literature on stormwater quality and include:

- Educate workers and the public.
- Place hazardous materials indoors or under cover.
- Connect floor drains and sumps to the sanitary sewer rather than to the drainage system.
- Inventory hazardous chemicals on a regular basis and track their usage:
- Discourage the use of hazardous chemicals and emphasize replacement compounds that are not listed by RCRA.
- Formulate, implement, and regularly monitor pursuant to an aggressive spill control program.

2. In small drainage areas, the prospects for strictly controlling the kinds of chemicals that enter the drainage system are better than those in larger areas with multiple property owners. Although this point states the obvious, it merits emphasis. To provide an example, a vehicle maintenance facility that is three acres in size, and which receives no runoff from adjoining properties, should be able to implement rigorous source controls without difficulty. All work on vehicles can occur indoors. Floor drains and sumps should be connected to pretreatment facilities, which in turn would discharge to the sanitary sewer.

Thoughtful drainage design decisions can be made. For example, vehicle parking areas can be separated from stormwater conveyances with vegetated filter strips and the conveyances can be lined with vegetation. These practices will promote the interaction of chemicals of concern with vegetation and soils, and will also encourage infiltration.

3. To localize the problem, stormwater pretreatment facilities should be considered. For example, immediately upstream from a stormwater wetland, it may be feasible to install a sedimentation basin. Even with a retention time of as little as 15 minutes (where soil conditions are favorable), a significant fraction of the total sediment load can be removed from the stormwater before discharge into the wetland. This not only localizes sediments and the pollutants that adsorb them, but also benefits the wetland and results in decreased long-term maintenance costs.

4. Adopt measures to reduce the quantity of sediment that will enter the BMP over time. The smaller the sediment load that accumulates, the less frequently the sediment has to be removed. This is important because RCRA in most instances becomes relevant only when sediments actually need to be removed.

Rigorous erosion and sediment control practices, both during and after construction, are mandatory. Judicious use of sand during the winter months is necessary.

5. Thoughtfully evaluate BMP facility design characteristics and implement techniques that will enhance the likelihood of pollutant loss within the BMP.

For example, incorporating fountains into retention ponds enhances the volatilization of many volatile and semi-volatile organic compounds that are listed by RCRA. Note, however, that a permit is required to treat a RCRA hazardous waste, and treatment is defined as any method, technique, or process, including neutralization, designed to change the chemical, physical, or biological character or composition of a hazardous waste.

6. Designers are well advised to discuss potential problems with regulators and their clients in advance of an assignment. By discussing potential problems with the BMP facility owner, professional liability is reduced and the owner and engineer can agree, in advance, on mitigation measures.

Discussions with regulators are equally important. Generally, the authors recommend that the design engineer do the following: a) cite regulations that are forcing the implementation of stormwater BMPs in the first place (typically municipal or industrial NPDES regulations); b) delineate the full range of functions that the BMP will fulfill (flood hazard reduction, stormwater quality management, and others specific to the given facility); c) describe structural and nonstructural measures that will be taken to reduce the probability that hazardous chemicals will enter the BMP; and d) suggest a regulatory agreement, in advance, that will address the issue in a reasonable, cost-effective manner if and when the sediments must be removed, under the assumption that they contain one or more RCRA-listed chemicals.

Discussions with the BMP owner and regulators will undoubtedly be highly specific to the circumstances involved.

7. Intentionally oversize the sediment storage volume in the BMP. Instead of assuming that the BMP should have its sediments removed once every 5 to 10 years, assume that sediment removal should occur no more frequently than once every 20 to 30 years. This will be impractical and excessively expensive in certain instances, but in situations where additional sediment storage can be achieved economically, this step should be taken.

It is essential to recognize that in most instances RCRA will not be triggered until sediments need to be removed from the BMP. Therefore, every reasonable step should be taken to avoid the need to remove sediments from stormwater facilities.

8. Where feasible, construct facilities that are off-line rather than on-stream.

This is certainly not a panacea, but at least off-line facilities are not subject to the criticism that stormwater facility sediments classified as hazardous waste by RCRA are located in waters of the state or United States.

It will not always be feasible to avoid RCRA regulations by implementing the measures listed above. Furthermore, existing BMPs may contain sediments that have RCRA-listed chemicals in them currently. When confronted with the knowledge that BMP sediments contain RCRA-listed wastes, the facility owner and the designer should consider the following steps:

1. Conduct additional sampling to confirm the presence of the contaminants. Also, sample at multiple locations to assure adequate horizontal and vertical coverage.

2. If the drainage area is small, thoroughly search the area for potential distinct sources of chemicals that have been detected in the sediments. If distinct potential sources are noted, their ability to be transported into the stormwater BMP must be established. Once potential sources are noted, their characteristics should be checked against the RCRA definition of hazardous waste to ensure they are, in fact, RCRA-regulated wastes. A thorough search of this kind is obviously feasible only in smaller drainage basins.

3. If the search for sources indicates that there are sources regulated by RCRA that have entered the stormwater facility sediments, actions should be immediately taken to assure that the chemical will not continue to be discharged into the stormwater drainage system.

If no distinct source with the requisite characteristics (as defined by RCRA) is located, this is very important information to be conveyed to the regulators. All other things being equal, RCRA regulators will be less inclined to rigorously control contaminated sediments that have been affected by diffused sources than distinct sources with the requisite characteristics.

The ideal outcome is to identify probable sources that do not comply with RCRA requirements. For example, if the trichlorethylene sources in a drainage area that are in contact with precipitation/runoff are less than ten percent pure, the sediments should not be classified as hazardous wastes.

4. In many cases, a risk assessment will demonstrate that no practical risk is posed to the public or other life forms by con-

stituent levels within the sediments. This is important information to provide to the regulators because they can exercise some judgment or discretion in evaluating regulatory options. If volatile or semi-volatile compounds are in the sediments, the risk assessment should account for the sediment dredging and disposal process, because these actions will normally cause substantial volatilization, thereby reducing the risk.

5. Evaluate modifications to the stormwater facility that will avoid the need to excavate the contaminated sediments. For example, it may be reasonable to raise a detention pond outlet structure, thereby increasing sediment storage space. This action could reduce the flood attenuation and water quality enhancement characteristics of the facility, but the reduction, if significant, can be offset with other BMPs in the basin.

6. There is some merit to the argument that the Clean Water Act (NPDES permitting program) forced the construction of stormwater BMPs that would not otherwise have been installed. Consequently, it is unfair to impose RCRA requirements for facilities that are functioning in precisely the manner intended. Irrespective of which option is implemented, qualified and specialized legal counsel should be retained so that appropriate steps are taken.

## *Future Considerations*

The subject of potential RCRA regulation of stormwater facility sediments is in its infancy and much is not known. Examples of major uncertainties are as follows:

1. The authors are not sure how frequently stormwater BMP sediments actually contain RCRA-listed wastes with requisite characteristics. Common sense tells us that this could be a typical problem, but relevant data are presently lacking.

2. Semantics and design decisions could play a key role in the future. For example, some might argue that formal, structural BMPs (wet ponds, dry ponds, artificial wetlands, and infiltration basins) are subject to RCRA regulation while informal, less significant BMPs (swales and porous check dams) are not. In any event, the distinction among different kinds of BMPs, if any, relative to RCRA needs to be defined.

3. Most stormwater conveyance channels, including storm sewers, exhibit sediment deposition; consequently, can they be regulated under RCRA?

4. The authors have not asked a representative sampling of regulators for their opinion on this issue. We also cannot speculate as to the probable posture of the regulators when it comes to this subject.

As of the summer of 1994, there are potential regulatory changes that could be very helpful relative to this situation. Also, RCRA is now in the reauthorization process, and there is the potential for language in the updated law that would specifically exempt stormwater BMPs from RCRA coverage. Important considerations include:

◆ Revisiting the Mixture and Derived-From Rules. In 1991, the United States Court of Appeals for the District of Columbia Circuit vacated EPA's mixture and derived-from rules (*Shell Oil Co. v. EPA*, 950 F.2d 741 (D.C. Cir. 1991)). The court vacated these rules because EPA failed to follow appropriate notice and comment rulemaking procedures prescribed by the Administrative Procedures Act when promulgating the rules. However, the court did not reach the substantive challenges to these rules.

After *Shell Oil*, EPA repromulgated the mixture and derived-from rules on an interim basis (57 FR 7628). Thus, according to EPA, the mixture and derived-from rules remain in effect. During the Bush Administration, EPA proposed a new Hazardous Waste Identification Rule that would have abandoned the mixture rule in favor of concentration-based standards for hazardous wastes (57 FR 21450; 57 FR 7636). The Administration abandoned this promising approach prior to the 1992 election, however. The Clinton Administration has promised to pursue rulemaking that would replace the mixture and derived-from rules with a more reasonable rule defining hazardous waste, but to date nothing has been promulgated. (It is also important to note that the D.C. Circuit Court's opinion in *Shell Oil* involved the federal mixture and derived-from rules. Many states have similar or identical rules, and it is unclear what effect, if any, the *Shell Oil* invalidation may have on these state counterpart rules. The trend is for courts to find the state mixture of derived from rule valid only when the state promulgated its rule based on an independent evaluation of the merits of that rule.

The benefits of the revision of these rules are likely to spill over to the contained-in policy and should relax the overly rigid regulation of contaminated environmental media.

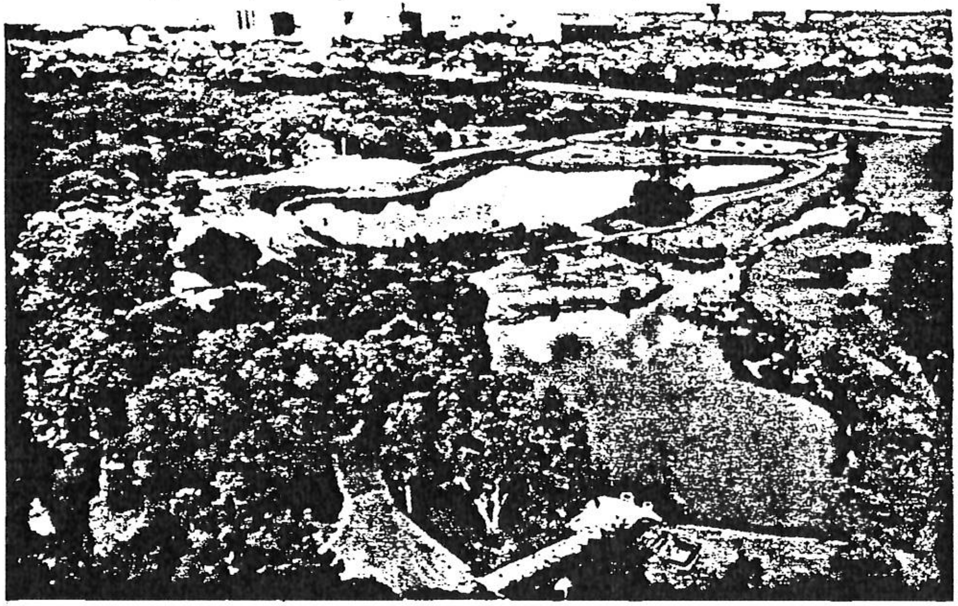
◆ RCRA Reauthorization. RCRA is overdue for reauthorization, and Congress is likely to amend RCRA substantially when that reauthorization finally occurs. Early indications are that most of the attention in RCRA reauthorization will focus on regulation of non-hazardous wastes. Nonetheless, reauthorization will give Congress the opportunity to address the definitions of solid and hazardous waste, along with the mixture and derived-from rules and the contained-in policy. If EPA promulgates replacement rules before reauthorization, Congress may very well avoid any discussion of these issues. □□□

# Stormwater Best Management Practices

## When is sediment considered hazardous?

*Jonathan Jones, Scot Anderson, John Fognani, F. Robert McGregor, and Timothy Axley*

In certain circumstances, sediments that accumulate in municipal and industrial stormwater quality treatment facilities can be classified as hazardous waste under the Resource Conservation and Recovery Act (RCRA) of 1976. The affected stormwater facilities include dry detention and wet retention ponds, infiltration basins, buried concrete vaults, created wetlands, stormwater inlets, grass-lined swales, and so forth.



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**Retention ponds, a type of stormwater facility used in urban areas, hold sediments that may, in some cases, be classified as hazardous waste.**

RCRA's "mixture" (40 *CFR* Section 261.3(a)(2)(iv)) and "derived-from" (40 *CFR* Sections 261.3(c)(2)(1) and 261.3(d)(2)) rules and the "contained-in" policy can cause sediments with extremely low hazardous constituent concentrations (barely above the detection limit) to be considered hazardous when they are removed. A mixture of any solid waste (including dirt, paper, rags, or plastics) and the listed waste is considered a hazardous waste. Even small concentrations of a listed waste can render large volumes of material hazardous waste. If solid waste is considered hazardous, even under the mixture rule, then any residue derived from the treatment, storage, or disposal of the hazardous waste also is considered hazardous waste. Under current EPA policy, environmental media, such as soil, water, or debris, that "contain" a hazardous waste must be handled as if they are hazardous waste. The "trigger" for RCRA action is the need to remove sediment from a stormwater facility because it is only then that the sediments are truly "discarded."

Some compounds listed as hazardous waste under RCRA, including certain solvents, degreasers, hydraulic fluids, herbicides, fungicides and pesticides, have been detected in municipal and industrial stormwater runoff (see Tables, pp. 36, 37, 40, 41). If a chemical or constituent regulated by RCRA is detected in stormwater facility sediments, the sediments are not necessarily considered hazardous waste. For example, if a spent halogenated solvent listed as hazardous waste is detected in detention pond sediments, those sediments would be hazardous waste under the mixture rule only if the source of the spent solvent contained more than 10% of that solvent by volume (40 *CFR* Section 261.31 [FOO1 wastes]). If a potential source is located, precipitation and runoff still must come into contact with the chemical. If no product containing more than 10% of the listed solvent is found, or if contact with precipitation and runoff (including via spills) is unlikely, sediments in the stormwater facility would not be classified as hazardous waste.

The distinction between having one or more discernible sources of hazardous waste (with suitable characteristics) and no clearly defined sources with suitable characteristics is a critical one. Relatively small industrial sites that have thorough inventories of hazardous wastes can identify the specific source of the RCRA-listed compound(s) in stormwater facility sediments. Facility owners must convince regulators that pollutant sources with relevant characteristics are not present.

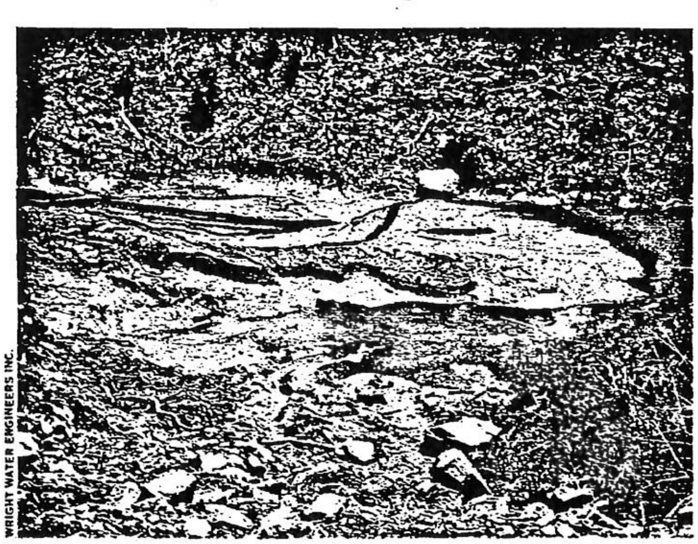
The probability of detecting RCRA-listed chemicals in stormwater runoff is significant in some industrial settings. Detection limits for many RCRA-listed substances are measured in parts per billion. A few tablespoons of a solvent in runoff from an industrial site can be measured by standard gas chromatography and mass spectrometry. Even with good housekeeping practices and source controls in place, a municipal or industrial vehicle equipment maintenance facility, for example, will inevitably have some hydraulic fluids, degreasers, and solvents that come into contact with stormwater. Assuming that sediments are monitored, the chemicals will be detected in onsite stormwater facilities.

**Urban Runoff Pollutants**

| Category | Specific measures |
|---|---|
| Solids | Settleable solids |
| | Total suspended solids |
| | Turbidity |
| Oxygen-demanding substances | Biochemical oxygen demand |
| | Chemical oxygen demand |
| | Total organic carbon |
| Phosphorus | Total phosphorus |
| | Soluble reactive phosphorus |
| | Biologically available phosphorus |
| Nitrogen | Total nitrogen |
| | Total Kjeldahl nitrogen (ammonia + organic) |
| | Ammonia-nitrogen |
| | Nitrate+nitrite-nitrogen |
| Metals | Copper, lead, zinc, cadmium, arsenic, nickel, chromium, mercury, selenium, silver |
| Pathogens | Fecal coliform bacteria |
| | Enterococcus bacteria |
| | Viruses |
| Petroleum hydrocarbons | Oil and grease |
| | Total petroleum hydrocarbons |
| Synthetic organics | Polynuclear aromatic hydrocarbons |
| | Phthalates |
| | Pesticides |
| | Polychlorinated biphenyls |
| | Solvents |

*Source: Fundamentals of Urban Runoff: Management, Technical and Institutional Issues*, 1994, by Horner, *et al.*

**Stormwater facility managers should plan for the removal of accumulated sediment.**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For larger municipal facilities, the probability of RCRA-listed chemicals entering stormwater is high because implementing source control measures uniformly over vast areas is impractical. The flow in these situations may not be great enough to dilute chemicals, because detection levels for the constituents are so low.

Stormwater facility managers should plan for RCRA-listed pollutants and the fact that most stormwater facilities require sediment removal. When properly designed and operated, stormwater facilities reduce peak rates of runoff from developed lands to predevelopment levels and can reduce pollutant concentrations. Stormwater facilities promote sedimentation and deposition of total suspended solids (TSS) that are typically found in municipal and industrial stormwater runoff.

Many of the chemical compounds regulated by RCRA tend to adsorb onto sediments. To ensure that stormwater facilities function properly, maintain longevity, and remain attractive, sediments should be removed periodically.

In most instances, industries and municipalities have disposed of sediments removed from stormwater facilities in the same way they would any uncontaminated soil: Dried sediments are mixed with other soil and used as backfill on construction projects or disposed in conventional sanitary landfills.

To comply with local, state, and federal mandates related to drainage, flood control, and stormwater quality management, the 1990s have been a period of rapid growth in the numbers and kinds of stormwater facilities used. States with authority to administer National Pollutant Discharge Elimination System (NPDES) permits have quality control regulations for runoff. Most local drainage and flood control rules require stormwater facilities; many also have adopted stormwater quality and erosion and sediment control regulations.

### Stormwater Facility Effectiveness

Typical stormwater facilities can remove pollutants when particulate matter settles out from the water column onto the bottom. This is known as sedimentation. In 1982, Randell et al. from the Virginia Polytechnic Institute in Blacksburg compared initial TSS concentrations with total removal rates at four settling times. The results are generally applicable for stormwater retention ponds that provide comparable settling times. For a residence time of only 2 hours and an initial TSS concentration of 200 mg/L, Randell measured a removal of nearly 65%. After increasing the residence time to 48 hours, the removal exceeded 90%.

Studies conducted during the last decade show that extended dry detention ponds can remove 50% to 70% of TSS, wet retention ponds can remove 60% to 90% of TSS, and constructed wetlands can remove more than 40% of TSS. Buried vaults, often used in high-density urban and industrial areas, also are effective at removing TSS. The Metropolitan Washington Council of Governments' 1992 publication, *The Current Assessment of Urban Best Management Practices — Techniques for Reducing Nonpoint Pollution in the Coastal Zone,* provides a summary of TSS removal efficiencies for the most commonly used stormwater facilities.

Exceptions to the definition of hazardous waste must be considered on a site-specific basis. Wastewater containing certain listed wastes is not subject to RCRA regulations if it is discharged under an NPDES permit or is subject to pretreatment standards. However, with regard to an NPDES-permitted facility, only the point source discharge itself is excluded, not any upstream retention of wastewater or sludge generated from the treatment of wastewater.

### Reducing the Problem

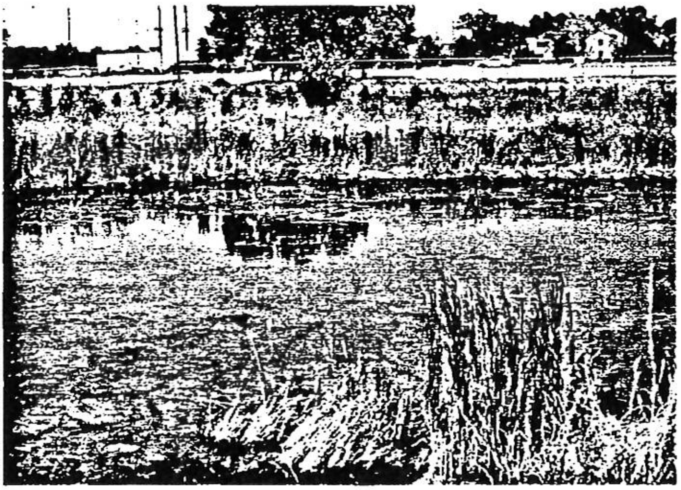
Stormwater facility designers and owners can take several steps to reduce the risk that sediments will be classified as hazardous waste.

To prevent or significantly reduce contact between RCRA-listed chemicals and precipitation or stormwater, facilities should educate their staffs, perform proper hazardous materials storage, design the appropriate sanitary sewer drainage, keep an accurate chemical inventory, and adopt pollution prevention and spill con-

**Most Frequently Detected Priority Pollutants in Nationwide Urban Runoff Program Samples**

| Inorganics | Organics |
|---|---|
| **Detected in 75% or more** | |
| 94% Lead<br>94% Zinc<br>91% Copper | none |
| **Detected in 50% to 74%** | |
| 58% Chromium<br>52% Arsenic | none |
| **Detected in 20% to 49%** | |
| 48% Cadmium<br>43% Nickel<br>23% Cyanides | 22% Bis(2-ethylhexyl) phthalate<br>20% a-Hexachlorocyclohexane |
| **Detected in 10% to 19%** | |
| 13% Antimony<br>12% Beryllium<br>11% Selenium | 19% a-Endosulfan<br>19% Pentachlorophenol¹<br>17% Chlordane¹<br>15% Lindane¹<br>Pyrene²<br>14% Phenol<br>12% Phenanthrene²<br>11% Dichloromethane<br>10% 4-Nitrophenol<br>10% Chrysene²<br>10% Fluoranthene² |

*1. Chlorinated hydrocarbon*
*2. Polynuclear aromatic hydrocarbon*
*Source: EPA, 1983 (NTIS #PB84 - 8552)*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**Sediment inflows are inevitable and must be anticipated.**

trol practices.

Small industrial or municipal facilities trying to control the kinds of chemicals entering their drainage systems have an advantage over larger ones by virtue of their size. Although this point states the obvious, it merits emphasis. For example, a vehicle maintenance facility that receives no runoff from adjoining properties can perform work indoors and connect floor drains and sumps to pretreatment facilities. Thoughtful drainage design decisions can be made — parking areas can be separated from stormwater conveyances with vegetated "filter strips," for example, and conveyances can be lined with vegetation.

To "localize" the problem, stormwater pretreatment facilities should be considered. A municipal or industrial plant could install a sedimentation basin immediately upstream from a stormwater wetland, which would help remove sediment from the stormwater before discharge to the wetland.

To reduce the quantity of sediment that will enter the stormwater facility over time, erosion and sediment control practices should be implemented during and after construction. If accumulation is minimized, sediment will have to be removed less frequently, thus reducing the potential for RCRA action. Limiting the use of sand during the winter and selecting alternative de-icers also can reduce the frequency of sediment removal.

To increase the likelihood of pollutant "loss" within a stormwater facility, facility owners and designers should consider techniques that enhance volatilization. For example, incorporating fountains into retention ponds can enhance the volatilization of certain RCRA-listed organic compounds. However, a permit is required to treat a RCRA hazardous waste, and *treatment* is defined as any method, technique, or process, including neutralization, designed to change the chemical, physical, or biological character or composition of a hazardous waste.

Designers should discuss this potential problem with their clients and regulators. Generally, the design engineer should cite regulations that are forcing the implementation of stormwater facilities, characterize the expected quality of the stormwater, describe structural and nonstructural measures that will be taken to reduce the probability that hazardous chemicals will enter the stormwater facility, and suggest a regulatory agreement that will address the problem if and when the sediments must be removed, assuming they contain one or more RCRA-listed chemicals. The owner and engineer can agree, in advance, on mitigation measures.

A designer should oversize the sediment storage volume in the stormwater facility to reduce the frequency of sediment removal. For example, instead of designing the stormwater facility so sediments must be removed once every 10 years, assume that sediment removal should occur no more frequently than once every 20 to 30 years. This strategy will be impractical and overly expensive in certain situations, but should be implemented where additional sediment storage can be achieved economically.

To avoid criticism that sediments classified as hazardous waste are in "waters of the state or United States," owners should construct facilities "off-line" (adjacent to a stream channel) rather than "on-stream," where feasible.

Implementing these measures will not always enable a stormwater facility owner or designer to avoid RCRA regulations. Furthermore, existing stormwater facilities already may contain sediments that have RCRA-listed chemicals. When confronted with the knowledge that stormwater facility sediments contain RCRA-listed wastes and after confirming that sediment removal must occur, the facility owner and designer should:

- conduct additional sampling (at multiple locations) to confirm the presence of the contaminants and analyze the data to determine if additional actions are required;
- if practical, thoroughly search the drainage area for potential sources of chemicals that have been detected in the sediments and establish a chemical's ability to be transported into the stormwater facility;
- check source chemical characteristics against the RCRA definition of hazardous waste to determine whether the chemicals are regulated by RCRA; and
- immediately ensure the chemical will not continue to be discharged into the stormwater

## Sampling Procedures for Pond Sediment

Certain procedures should be followed when sampling sediments that have accumulated in a stormwater facility, such as a wet pond, to determine whether they are likely to be classified as hazardous waste.

First, an owner must establish potential problem chemicals, such as certain metals or organic compounds, in the watershed. Field observations can offer valuable land use information; they should include a combination of walking and driving through the basin, depending on site size. Chemical use may be investigated through local regulatory agencies that can provide records on National Pollutant Discharge Elimination System permits and Resource Conservation Recovery Act hazardous waste generator permits. Community right-to-know groups have lists of companies that use chemicals of certain quantities and types. The nature of the drainage collection, conveyance, storage, and treatment system (if relevant) should be defined, with an emphasis on whether significant materials are likely to come into contact with runoff.

Once potential problem chemicals have been identified, the owner must define the number of samples needed to characterize the sediment. One approach for estimating the number of samples is described in EPA's "Representative Sampling Guidance" (August 1991). Ultimately the data quality objective is the controlling factor in estimating the sample number. Sampling distribution techniques, such as judgmental, systematic, and random, or a combination of these, may be employed to develop a sampling layout. Early coordination with regulators can be helpful.

When selecting the analytical test methods and a laboratory, the owner should use methods that identify chemicals with the potential to cause regulatory or health problems and could be hazardous in the drainage basin. A common test used for sediment evaluation is EPA Method 8260, a gas chromatograph-mass spectrometer test for volatile organic compounds found in shop degreasers and gasoline. EPA Method 8270, meanwhile, identifies semivolatile organic compounds, such as fuel oil, wood-preserving chemicals and certain insecticides. Laboratories vary by specialty, so owners must ensure the selected laboratory can complete the necessary tests.

The owner must select sampling equipment based on the water depth and the physical characteristics of the sediments. In general, the simplest sampling tool should be used. If sediments are to be sampled while water remains in the pond, a floating platform may be the safest way to sample. Coring devices and thin-walled tube samplers are available for collecting sediments. For dry pond sampling, owners may use hand-auguring or mechanical auguring techniques. Hydraulic probing devices are readily available on lightweight all-terrain vehicles.

Next, the owner should develop a grid of the pond that can be used to identify sample locations. Typically, a north-south and east-west grid is used for irregularly shaped ponds, and a long-axis and short-axis grid is used for rectangular ponds. If properly recorded, the grid can be reused for subsequent sampling efforts. Sampling location accuracy depends on site conditions: underwater, the accuracy may only be within a 10-m diameter, on a dry pond it may be within 10 cm.

The grid layout may be concentrated at the inlet side, especially if contaminants are adsorbed to sediments. The sample location distribution may appear skewed in plan view, but will be equally distributed based on actual sediment volume estimates at each location.

Equipment should be decontaminated before field use. Bottles should be supplied to the sampler with instruction from the laboratory about what container is suitable for each analysis and how much is needed to complete the analysis. Blanks should be used to increase the integrity of the sampling effort. At a minimum, a laboratory-prepared trip blank and a field-prepared blank should be analyzed for every cooler of samples and every 20 samples submitted to the laboratory, respectively.

Sampling collection should take into consideration variability in compaction resistance between sediment layers. The sampler may have to rely on recorded notes of change in resistance to differentiate between sediment strata. Each strata ultimately should be treated as a separate sample layer; however, the cost of sampling each differentiable layer can be minimized by choosing samples for compositing with volumes proportional to each sediment layer thickness. Sampling efforts should include collecting sediment at the base of the proposed excavation depth, which is typically the original pond bottom.

If laboratory results indicate hazardous waste is present in the pond sediment, an owner should determine if source research can remove it from that classification.

### Pollutants Typically Found on Streets

- Large-sized/biologically insignificant
  - Bulk cellulosic matter: tree limbs, twigs, leaves, shrubs, lumber, paper, cotton materials, rayon, cellophane.
  - Bulk metals and alloys of construction and containerization: steel, iron, aluminum, magnesium, copper and bronze, zinc, tin.
  - Fabric, packaging, and construction plastics.
  - Natural processed animal fibers
- Variable-sized/biologically insignificant
  - Soil conditioners
  - Basic soil constituents
  - Inorganic dustfalls from air pollutants
- Variable-sized/biologically nutritive/water-soluble
  - Natural and compounded fertilizers: nitrogen compounds, phosphates, potassium compounds, secondary growth elements.
  - De-icing compounds: sodium hexametaphosphate, urea, ammonium nitrate, potassium pyrophosphate.
  - Soluble air pollutants: sulfur oxides, nitrogen oxides, ash.
  - Phosphate-based detergents
  - Lawn and garden ash
- Variable-sized solids or solutions/biologically inhibiting/water- soluble
  - De-icing compounds: sodium chloride, calcium chloride, ferric ferrocyanide, sodium ferrocyanide, sodium chromate.
  - Air pollutants: carbon monoxide, sulfides, sulfites, nitrites, ozone.
  - Antifreeze compounds: diacetone alcohol, methanol, ethylene glycol.
  - Roadway hydrocarbons — some highly oxygenated bitumens
  - Water-base paint solutions
- Variable-sized/immiscible or suspendable/biologically inhibiting/water-insoluble
  - Vehicular and roadway hydrocarbons: oils, greases, tetraethyl lead and decomposition products, bitumens.
  - Hydraulic fluids: propylene glycol diricinoleate, trinitrobutylamine.
  - Water-insoluble air pollutants — hydrocarbons
  - Pesticide/herbicide carriers
- Variable-sized solids or solutions/biologically toxic/water-soluble
  - Common pesticides and herbicides: arsenic, copper, lead, thallium compounds, chloropicrin, dinitro-o-cresol, furfural, malathion, nicotine, phenol.
- Variable-sized solids, liquids, or suspensions/biologically toxic/water-insoluble
  - Common pesticides and herbicides: benzene hexachloride, chlordane, dichlorodiphenytrichloethane, dichloroethylene, dichloroethyl ether, 2-4-dichlorophenoxyacetic acid, dinitro-o-cresol, methoxychlor, parathion, tetramethylthiuram disulfide, toxaphene, trichloroethylene, dichlorobenzenes, pyrethrins, aldrin, dieldrin, organo-mercury compounds.
- Variable-sized culture media/biologically active/water-suspendable life forms
  - Animal excretions: fecal coliform, fecal streptococci, biological nutrient source.
  - Human excretions: fecal coliform, fecal streptococci, biological nutrient source.
  - Dead animals: fecal and nonfecal coliforms, fecal steptococci, biological nutrient source.
  - Vegetation — biological nutrient source
  - Food wastes — biological nutrient source
  - Soil — biological nutrient source

Source: EPA, 1972 (EPA-R2-73-283)

drainage system.

The ideal outcome is to identify probable sources that do not meet RCRA-listed chemical criteria. For example, if a trichlorethylene source in the drainage area and in contact with precipitation and runoff is less than 10% pure, the sediments should not be classified as hazardous waste.

A relatively simple risk assessment may demonstrate that the public or other life forms will not be harmed by constituent levels within the sediments. This is important information to provide to regulators because they can exercise some discretion in applying regulatory options. If volatile or semivolatile compounds are in the sediments, the risk assessment should account for the sediment dredging and disposal processes, because these actions typically will cause volatilization, thereby reducing the risk.

When sediment removal becomes necessary,

OCTOBER 1996

# WATER ENVIRONMENT & TECHNOLOGY

WATER ENVIRONMENT FEDERATION

## A KNOWN QUALITY

### DEFINING LABORATORY CRITERIA

- EPA's environmental indicators
- Salmon and sponges
- WEF annual award winners

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# Appendix D

# Sampling Protocol

# Sediment Sampling Protocol
## Prepared by Wright Water Engineers, Inc. (WWE) and the Urban Drainage and Flood Control District (UDFCD)

## Sampling Program

The objective of this program is to ascertain the disposition of sediments in the area served by the Urban Drainage and Flood Control District (UDFCD). It will allow for WWE and UDFCD to know which sediments in the region would be characterized as hazardous wastes under the Resource Conversation and Recovery Act of 1976. As sediment is the primary concern of this program the protocol will sample wet and dry detention ponds which are proximate to residential, commercial, and other sites in order to ascertain the disposition of a broad spectrum of sediments.

As with similar programs there are a variety of site safety considerations which must be taken into account. Such considerations are made and their accompanying procedures are put into place in order to assure that sampling personnel are protected from foreseeable hazards that may be encountered in the course of collecting and transporting samples. Such considerations and procedures can include (but are not limited to):

- Sampling shall occur in weather conditions conducive to maintaining the safety and well-being of sampling personnel.
- Prior to entering a site, primary and secondary routes of ingress and egress shall be identified and appropriate measures shall be taken in order to assure that safe ingress and egress may be assured
- Sampling personnel shall wear appropriate footwear in order to assure maximum traction. Where appropriate, sampling personnel shall also wear waterproof footwear.
- Sampling personnel shall always wear protective gloves while sampling.
- Sampling personnel shall wear appropriate eye protection in order to protect against splashes and/or flying debris.
- Respiratory protection may be considered on a site specific basis.
- Samples shall be stored in laboratory supplied containers and transported with all necessary care and caution.

Solid (sediment) samples will be collected at ten designated wet and dry deposition ponds and tested for the constituents listed in the attached proposal (Attachment A) which has been prepared in consultation with the relevant regulatory authorities as well as industry testing laboratories. Sampling locations have yet to be identified; however, during the collection of samples, the following information shall be collected:

- Time
- Date
- Location
- Weather Conditions
- Names of Person(s) Obtaining Sample
- General Observations
- Condition of Ponds
- Observations related to specific sample locations
- Photographs

## Testing

The testing laboratory will analyze the collected samples for the constituents listed in Attachment A and provide the subsequent analytical reports. The testing laboratory will provide sampling containers, labels, coolers (for transporting sampling containers) if necessary, and chain of custody documentation.

For the parameters to be tested, the testing laboratory has provided the testing protocol method references below. For more detailed information regarding testing methods, the testing laboratory can be contacted.

- Paint Filter: US Environmental Protection Agency, Method 9095
- TCLP Standard Extraction: US Environmental Protection Agency, Method SW1311
- TCLP VOC ZHE Extraction: US Environmental Protection Agency, Method SW1311
- TCLP RCRA Metals: US Environmental Protection Agency, Method 6010B/7471A
- TCLP Herbicides: US Environmental Protection Agency, Method 8151A
- TCLP Pesticides: US Environmental Protection Agency, Method 8081A
- TCLP Semi-Volatiles: US Environmental Protection Agency, Method 8270D
- TCLP Volatiles: US Environmental Protection Agency, Method 8260C
- PAHs: US Environmental Protection Agency, Method 8082A
- BTEX: US Environmental Protection Agency, Method 8260C
- Reactive Cyanide and Sulfide: US Environmental Protection Agency, Chapter 7.3

- Ignitability: US Environmental Protection Agency, Method 1010
- Corrosivity as pH: US Environmental Protection Agency, Method 9045

## **Procedure**

In order to assure sample integrity, the following procedures shall be observed:

- Samples shall be stored in containers provided to WWE/UDFCD by the sampling laboratory.
- When composite samples are collected, the sediment samples will be placed in a stainless steel, plastic, or other appropriate mixing bucket/collection device and mixed thoroughly to obtain a homogenous sample. The samples will then be placed in the sample containers provided by the testing laboratory.
- A stainless steel or plastic lab spoon will be used to transfer sediment samples from the mixing bucket/collection device to the sample containers provided by the testing laboratory.
- Homogenization will not be implemented if sample analysis includes volatile organics.

### Equipment Management

- Sample containers will be provided for each sampling location; sampling containers will not need to be decontaminated.
- The mixing bucket/collection device will be decontaminated after each use, or a new container that has been washed with deionized water will be utilized.
- Decontamination shall be conducted by washing tools with a mild soap or detergent, such as Alconox or its equivalent, rinsing them with deionized water and then wiping them with a clean towel.
- Tools and mixing bucket shall be stored and transported in a manner to prevent contamination.

### Preparation

- The necessary sampling and monitoring equipment will be obtained.
- Proper attire, including waders (if necessary), eye protection, latex gloves will be obtained prior to site visits.
- Sample containers for each site will be labeled and include a space to record the date, time, and sample identifier.
- Chain of custody documentation can be pre-prepared.
- If necessary, equipment will be decontaminated or pre-cleaned and inspected to ensure that it is in working order.
- A general site evaluation will be performed prior to site visits.

- Aerial mapping will be prepared to record specific sampling locations.
- Specific site characteristics including flow regime, basin characteristics, sediment characteristics, depth of the overlying aqueous layer, and extent and nature of contaminant will be considered prior to site selection. (Subbstrate particle size and organic content are directly related to water velocity and flow characteristics of a body of water. Contaminants are more likely to be concentrated in sediments typified by fine particle size and high organic content. This type of sediment is most likely to be collected from depositional zones in contrast coarse sediments with low organic content do not typically concentrate pollutants and are found in erosional zones.)

Sampling

- If taking a sample in a retention pond, person taking sample shall face upstream when wading into the pond. Sample shall be “scooped” in the upstream direction and along the bottom of the surface water body.
- Samples shall be taken as soon as is safe and practicable after inflow to the sample sites has occurred.
- A pre-cleaned, decontaminated stainless steel or plastic scoop or trowel will be used to collect samples.
- Collected samples will be placed in a pre-cleaned, decontaminated mixing bucket/collection device as specified above. The number and locations of grabs for each collected composite sample will be determined and recorded in the field.
- Protective latex gloves will be worn when taking sample.
- Person taking sample will stand downstream of and reach upstream.
- Sample bottles will be placed into a container/cooler (provided by the testing laboratory) immediately after collecting sample.
- Sample containers will be transported to laboratory as soon as feasible after the samples are collected.
- Samples and locations where samples are collected will be photographed during each field visit at the sample locations.
- WWE will be updated with field visit information and observations regularly and available for assistance at all times.
- All chain of custody reports, laboratory test result reports, field observation notes and records will be submitted to WWE and archived accordingly.

# Appendix E

# Sampling Site Observation Reports

SITE #1

# Urban Drainage & Flood Control District
# Sediment Data Collection Sheet

| | |
|---|---|
| Sample Date: 8/12/13 | Sample Time: 14:40 |
| Sampler(s): WONG | |

**Sample Location Description**

| | |
|---|---|
| BMP Name: Drypond | BMP Location: Grant Ranch Site #1 |

Weather Conditions: Sunny, 75 degrees

BMP Condition: Terrible Odor, layer of green algae on top

Sampling Locations: Forbay inlet, ~~micropoot~~, micropool

**Sediment Collection Information**

| | |
|---|---|
| Depth of Overlying Aqueous Layer: None | Sediment Sample Depth(s): top of sediment |
| Sample Collection Method: Shovel | # of Grab Samples in Composite: 2 |

**Sample Information**

Color: Black

Texture: Fine sediment, mucky, silty clay

Odor: Stinky

**Additional Comments**

Paint Filter, TCLP-Full,

SITE #2

# Urban Drainage & Flood Control District
## Sediment Data Collection Sheet

Sample Date: 8/12/2013

Sample Time: 9:45 AM

Sampler(s): WONG

### Sample Location Description

BMP Name: Wetpond

BMP Location: Sun/Oracle Site #2

Weather Conditions: Sunny. 70 degrees

BMP Condition: Odor

Sampling Locations: Inlet by south~~east~~ end of pond, & outfall riser

### Sediment Collection Information

Depth of Overlying Aqueous Layer: 1 foot

Sediment Sample Depth(s): surface of sediment

Sample Collection Method: Shovel

# of Grab Samples in Composite: 2

### Sample Information

Color: Browns/blacks/rusty color

Texture: Fines, clay, organic material

Odor: Stinky

### Additional Comments

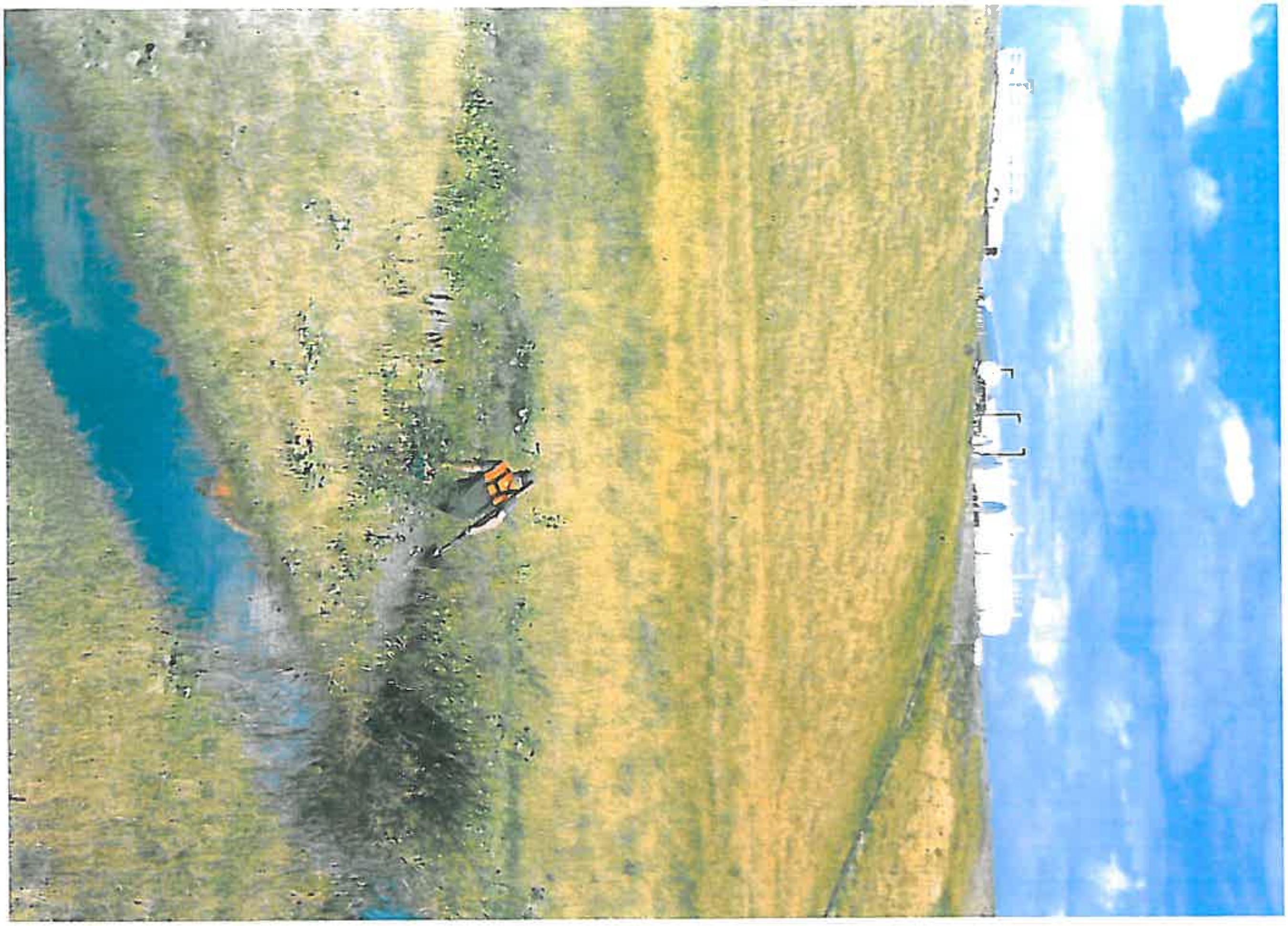
Testing: Paint Filter/TCLP/PAHs

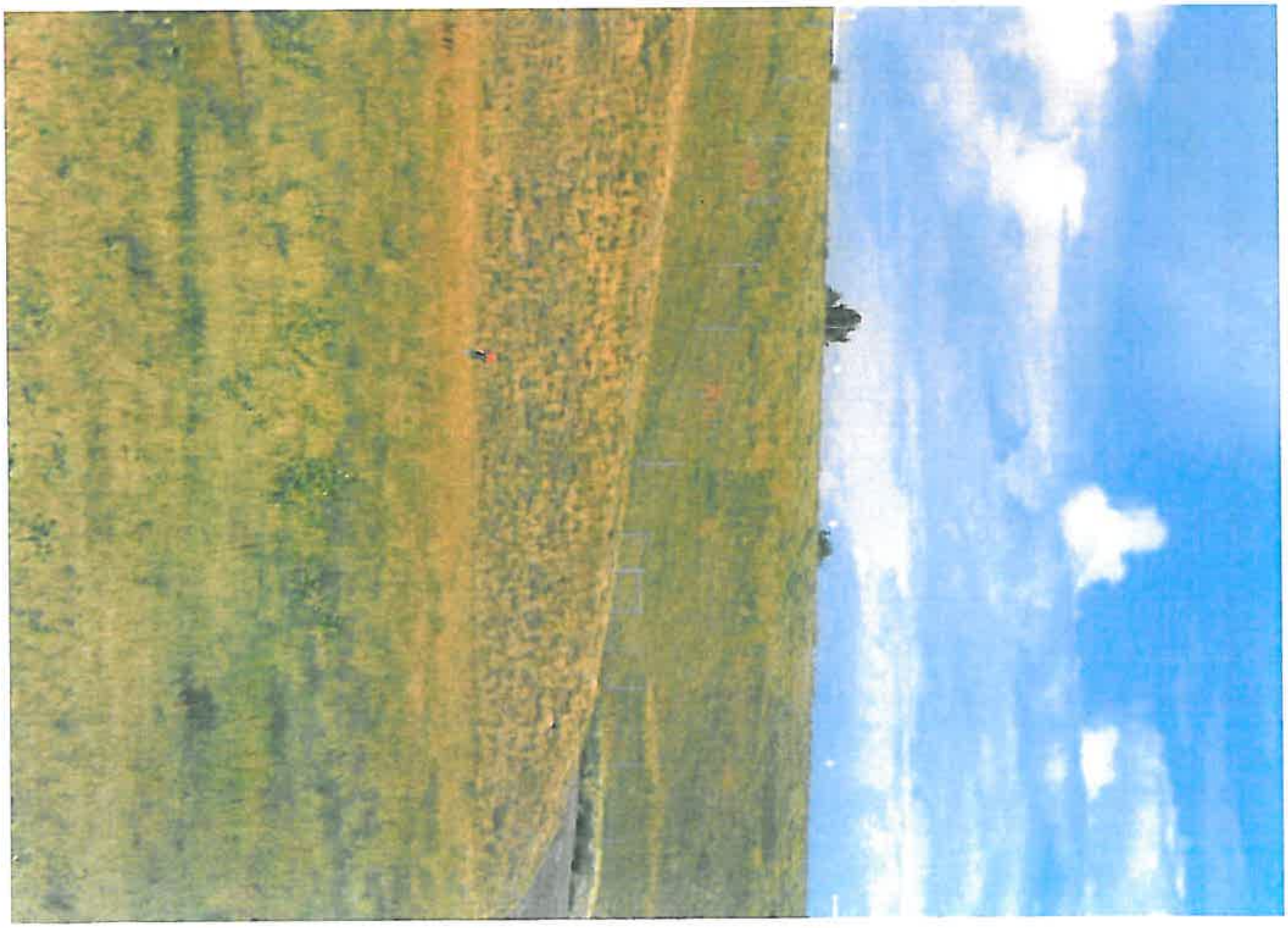
Site # 3 was deleted from the study.

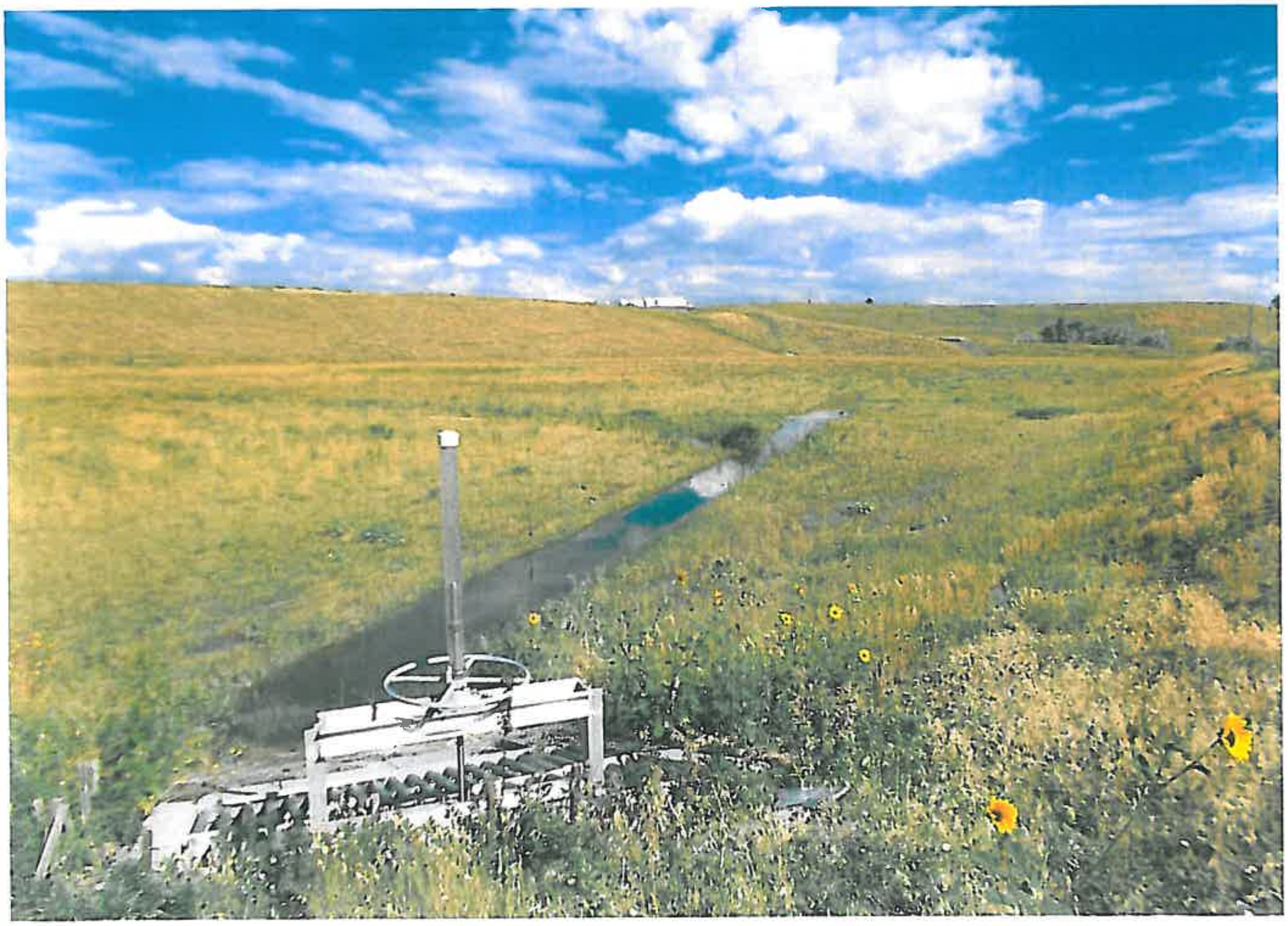
SITE #4

# Urban Drainage & Flood Control District
## Sediment Data Collection Sheet

| | |
|---|---|
| Sample Date: 8/13/13 | Sample Time: 9:45 AM |
| Sampler(s): WONG | |
| **Sample Location Description** | |
| BMP Name: Drypond | BMP Location: Site #4<br>Rocky Mtn. Metro Airport |
| Weather Conditions: Sunny, 70 degrees | |
| BMP Condition: Low flow channel full | |
| Sampling Locations: Pond floor<br>Outfall, channel, overbanks w/in detention pond | |
| **Sediment Collection Information** | |
| Depth of Overlying Aqueous Layer: 0 to 1 foot | Sediment Sample Depth(s): top of sediment |
| Sample Collection Method: Shovel | # of Grab Samples in Composite: 10 |
| **Sample Information** | |
| Color: Sandy Clay | |
| Texture: Greens, blacks, browns | |
| Odor: None | |
| **Additional Comments** | |
| Paint Filter, TCLP-Full, Reactivity/Ignitability/pH, BTEX, PAHs | |







SITE #5

# Urban Drainage & Flood Control District
# Sediment Data Collection Sheet

| | |
|---|---|
| Sample Date: 8/12/2013 | Sample Time: 10:30 AM |
| Sampler(s): WONG | |

## Sample Location Description

| | |
|---|---|
| BMP Name: Wetpond | BMP Location: Myers Res. 1 Site #5 |

Weather Conditions: Sunny, 70 degrees, some breeze

BMP Condition:

Sampling Locations: Outlet riser, pump station, inlet on south side

## Sediment Collection Information

| | |
|---|---|
| Depth of Overlying Aqueous Layer: 1 foot | Sediment Sample Depth(s): top of sed. layer |
| Sample Collection Method: Shovel | # of Grab Samples in Composite: 3 |

## Sample Information

Color: Brown, grayish

Texture: Clay (at inlet), sandy

Odor: None

## Additional Comments

Full TCLP, Paint Filter

SITE #6

# Urban Drainage & Flood Control District
# Sediment Data Collection Sheet

| | |
|---|---|
| Sample Date: 8/12/2013 | Sample Time: 11:00 AM |
| Sampler(s): WONG | |

**Sample Location Description**

| | |
|---|---|
| BMP Name: Wetpond | BMP Location: Meyers Res. 2 Site #6 |

Weather Conditions: Sunny, 75 degrees

BMP Condition: Odor, wetland vegetation

Sampling Locations: Forbay-esque, outlet

**Sediment Collection Information**

| | |
|---|---|
| Depth of Overlying Aqueous Layer: 6-in | Sediment Sample Depth(s): top of sediment |
| Sample Collection Method: Shovel | # of Grab Samples in Composite: 3 |

**Sample Information**

Color: dark (forbay), black (outlet)

Texture: sand (forbay), mucky (outlet)

Odor: Stinky, sulfur

**Additional Comments**

Paint Filter, TCLP - Full, Reactivity/Ignitability/pH

SITE #7

# Urban Drainage & Flood Control District
# Sediment Data Collection Sheet

Sample Date: 8/12/2013

Sample Time: 12:00 PM

Sampler(s): WONG

## Sample Location Description

BMP Name: Wetpond

BMP Location: Copeland Lake Site #7

Weather Conditions: Sunny, 80 degrees, breezy

BMP Condition: No odor

Sampling Locations: west side, 2 by outlets, 1 by inlet

## Sediment Collection Information

Depth of Overlying Aqueous Layer: 6-in to 1 foot

Sediment Sample Depth(s): top of sediment

Sample Collection Method: Shovel

# of Grab Samples in Composite: 3

## Sample Information

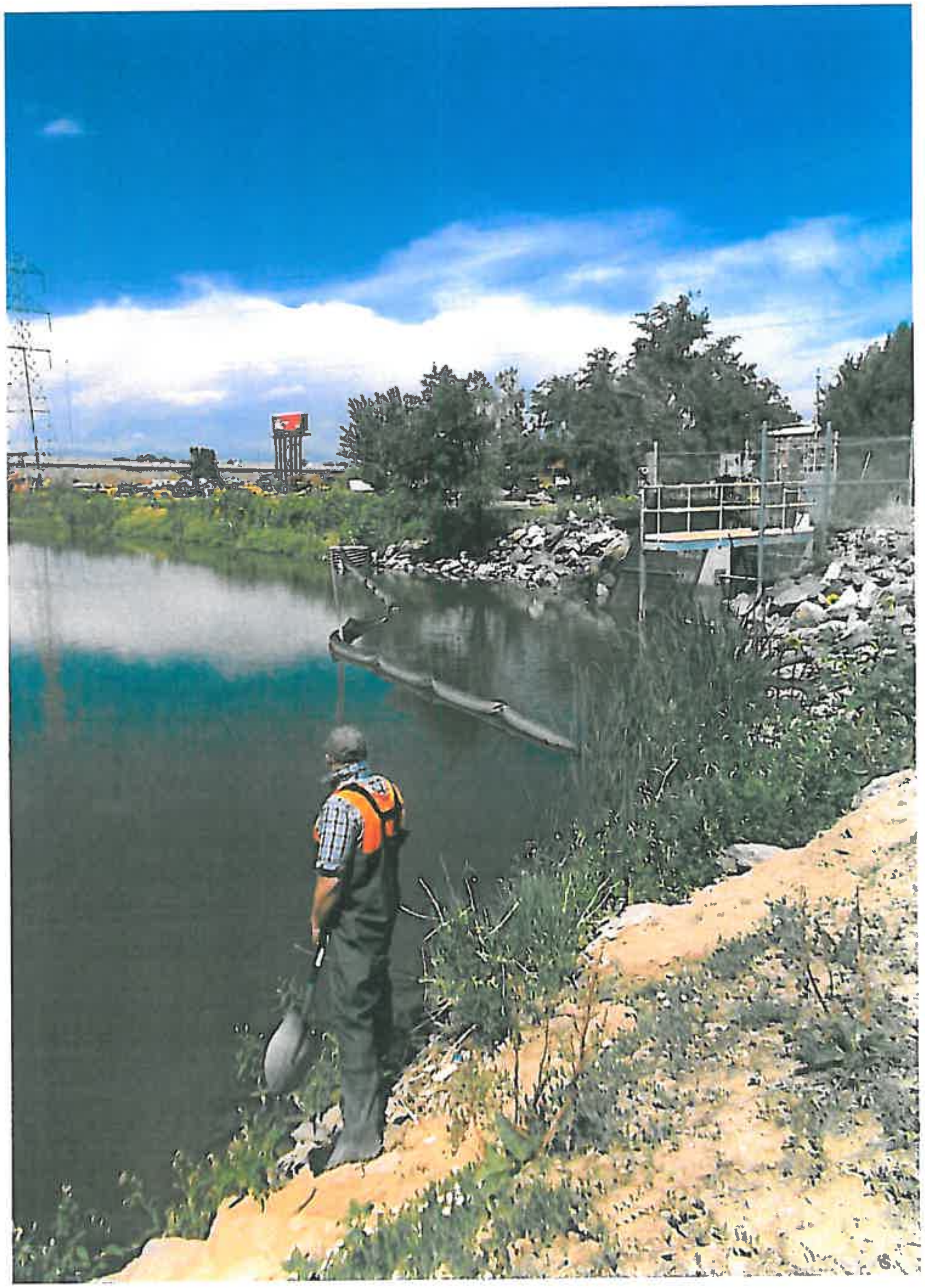
Color: Dark brown

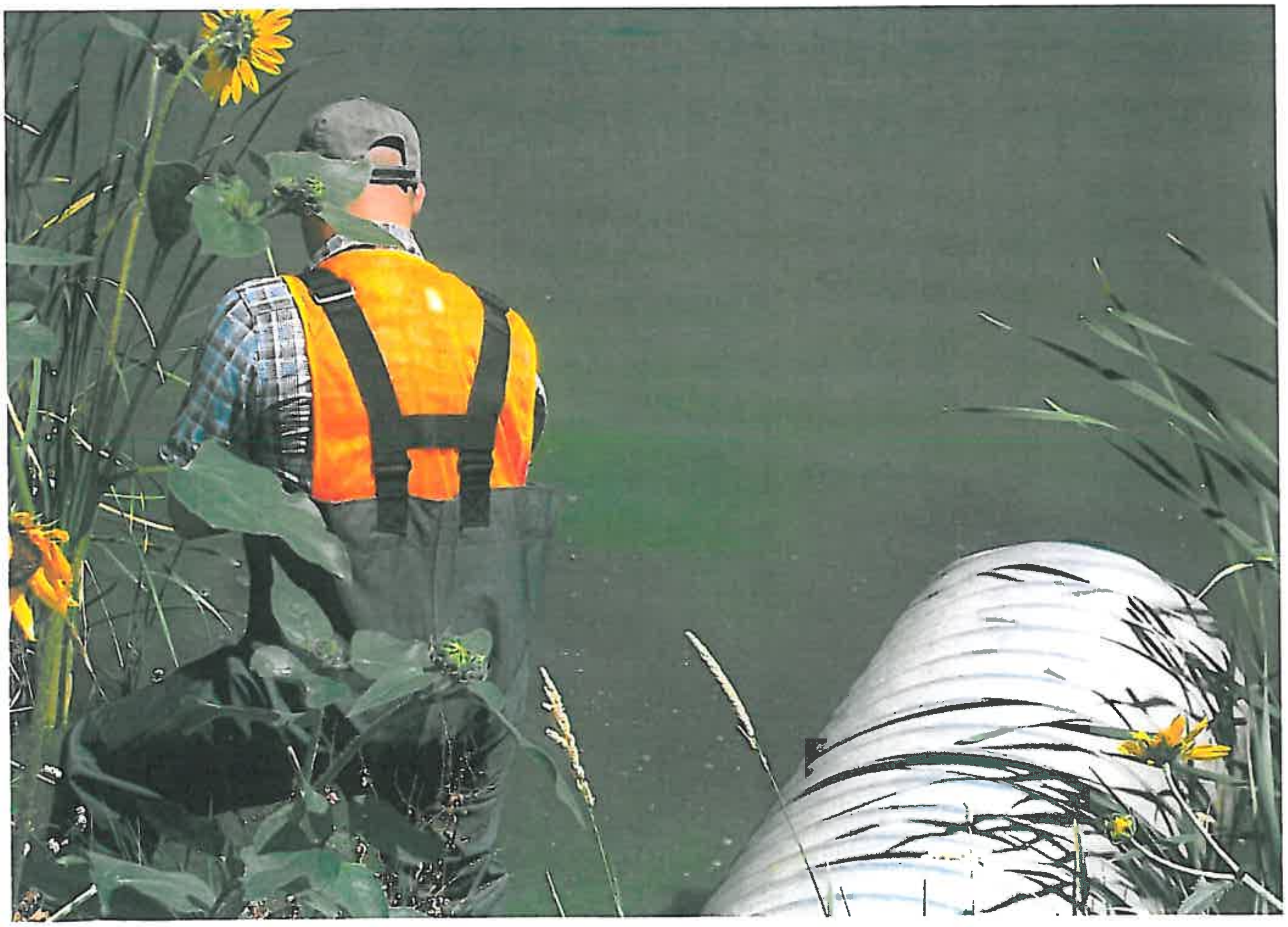
Texture: fines

Odor: None

## Additional Comments

Paint Filter, TCLP, Reactivity/Ignitability/pH, BTEX





Site # 8 was deleted from the study.

SITE # 9

# Urban Drainage & Flood Control District
# Sediment Data Collection Sheet

Sample Date: 8/12/2013

Sample Time: 13:30

Sampler(s): WONG

## Sample Location Description

BMP Name: Drypond

BMP Location: Fitzsimons & Peoria site #9

Weather Conditions: Sunny 70 degrees

BMP Condition: Sandy

Sampling Locations: Low-flow channel, downstream of 1st drop structure

## Sediment Collection Information

Depth of Overlying Aqueous Layer: 0 to 6-in

Sediment Sample Depth(s): top of sediment

Sample Collection Method: Shovel

# of Grab Samples in Composite: 3

## Sample Information

Color: Light brown w/ black silt on top

Texture: sandy (light brown), silt (black)

Odor: None

## Additional Comments

Paint Filter, TCLP-Full, BTEX

SITE #10

# Urban Drainage & Flood Control District
## Sediment Data Collection Sheet

| | |
|---|---|
| Sample Date: 8/13/2013 | Sample Time: 8:30 AM |
| Sampler(s): WONG | |

**Sample Location Description**

| | |
|---|---|
| BMP Name: Drypond | BMP Location: Site #10<br>26th & Wadsworth |

Weather Conditions: Sunny 85 degrees

BMP Condition: Outlet structure was clean/clear Good vegetation, low flow channel clean

Sampling Locations: Inlet to pond, middle of the detention basin

**Sediment Collection Information**

| | |
|---|---|
| Depth of Overlying Aqueous Layer: 2 feet | Sediment Sample Depth(s): top of sediment |
| Sample Collection Method: Shovel | # of Grab Samples in Composite: ~~10~~ 5 |

**Sample Information**

Color: Dark brown

Texture: silty, sandy

Odor: None

**Additional Comments**

Paint Filter, TCLP-Full, Reactivity/Ignitability/pH, PAHs

Water was in the low flow channel

SITE #11

# Urban Drainage & Flood Control District
## Sediment Data Collection Sheet

|  |  |
|---|---|
| Sample Date: 8/13/2013 | Sample Time: 11:00 AM |
| Sampler(s): WONG |  |

### Sample Location Description

|  |  |
|---|---|
| BMP Name: Drypond | BMP Location: Site #11<br>93rd & Washington |

Weather Conditions: Sunny. 70 degrees

BMP Condition:
Trench drain feeds pond
Stormwater comes from 7-11 gas station lot

Sampling Locations:
Near outlet, middle of pond, near inlet

### Sediment Collection Information

|  |  |
|---|---|
| Depth of Overlying Aqueous Layer: None | Sediment Sample Depth(s): top of sediment |
| Sample Collection Method: Shovel | # of Grab Samples in Composite: ~~8~~ 3 |

### Sample Information

Color: Dark brown, some lighter browns

Texture: Clay w/sand

Odor: Strong petroleum smell

### Additional Comments

Black color near the inlet from the gas station

Paint Filter, TCLP-Full, Reactivity/Ignitability/pH, BTEX, PAHs


300 N WASHINGTON

WASHINGTON

SITE #12

# Urban Drainage & Flood Control District
## Sediment Data Collection Sheet

| | |
|---|---|
| Sample Date: 8/12/13 | Sample Time: 15:10 |
| Sampler(s): WONG | |

**Sample Location Description**

| | |
|---|---|
| BMP Name: Drypond | BMP Location: Site #12 High & Buctel |

Weather Conditions: Sunny, 75 degrees

BMP Condition: Overgrown

Sampling Locations: Edge of pond, very small detention pond

**Sediment Collection Information**

| | |
|---|---|
| Depth of Overlying Aqueous Layer: 0 to 6-in | Sediment Sample Depth(s): top of sediment |
| Sample Collection Method: Shovel | # of Grab Samples in Composite: ~~8~~ 3 |

**Sample Information**

Color: Dark brown, lots of weeds

Texture: Lots of vegetation

Odor: None

**Additional Comments**

Overgrown wetland

Paint Filter, TCLP-Full, PAHs

# Appendix F

# Laboratory Test Results

# Herbicides

## Case Narrative

---

# Wright Water Engineers

## UDFCD Sediments -- 131013000

### Work Order Number: 1308210

1. This report consists of 10 leachates from soil samples. The samples were received intact by ALS on 08/13/2013. The samples were received at 8.0$^{o}$ Celsius.

2. These samples were extracted according to SW-846, 3rd Edition procedures. Specifically, the samples were processed through leaching procedures following the current revision of SOP 609 based on Method 1311. The leachates were then extracted using separatory funnels according to the current revision of SOP 664 based on Method 8151A.

3. The extracts were then analyzed using GC/ECD (electron capture detectors) with an RTX-CLPesticides capillary column according to the current revision of SOP 434 based on SW-846 Method 8151A. All positive results were then confirmed on an RTX-CLPesticides II column. Unless interferences were present, the quantitation of each analyte is the higher of the concentrations obtained from each column that met initial and continuing calibration criteria. Note that analyst raw data annotation may provide further clarification.

4. All initial and continuing calibration criteria were met.

5. The method blank associated with this project was below the MDL for all analytes.

6. All laboratory control sample and laboratory control sample duplicate recoveries and RPDs were within the acceptance criteria.

7. Sample 1308210-20 was designated as the quality control sample for this analysis.

   Similarity of matrix and therefore relevance of the QC results should not be automatically inferred for any sample other than the native sample selected for QC.

   All matrix spike recoveries were within acceptance criteria.

8. All samples were extracted and analyzed within the established holding times.

9. All surrogate recoveries were within acceptance criteria.

10. Manual integrations are performed when needed to provide consistent and defensible data following the guidelines in the current revision of SOP 939.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Mindy Norton
Mindy Norton
Organics Primary Data Reviewer

8/27/13
Date

Dan Shenemon
Organics Final Data Reviewer

08/27/13
Date

***ALS***
***Data Qualifier Flags***
***Chromatography and Mass Spectrometry***

| | |
|---|---|
| **U or ND:** | **This flag indicates that the compound was analyzed for but not detected.** |
| **J:** | **This flag indicates an estimated value. This flag is used as follows : (1) when estimating a concentration for tentatively identified compounds (TICs) where a 1:1 response is assumed; (2) when the mass spectral and retention time data indicate the presence of a compound that meets the volatile and semivolatile GC/MS identification criteria, and the result is less than the reporting limit (RL) but greater than the method detection limit (MDL); (3) when the data indicate the presence of a compound that meets the identification criteria, and the result is less than the RL but greater than the MDL; and (4) the reported value is estimated.** |
| **B:** | **This flag is used when the analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user. This flag shall be used for a tentatively identified compound (TIC) as well as for a positively identified target compound.** |
| **E:** | **This flag identifies compounds whose concentration exceeds the upper level of the calibration range.** |
| **A:** | **This flag indicates that a tentatively identified compound is a suspected aldol-condensation product.** |
| **X:** | **This flag indicates that the analyte was diluted below an accurate quantitation level.** |
| ***:** | **This flag indicates that a spike recovery is outside the control criteria.** |
| **+:** | **This flag indicates that the relative percent difference (RPD) exceeds the control criteria.** |

# ALS Environmental -- FC

## Sample Number(s) Cross-Reference Table

**OrderNum:** 1308210
**Client Name:** Wright Water Engineers
**Client Project Name:** UDFCD Sediments
**Client Project Number:** 131013000
**Client PO Number:**

| Client Sample Number | Lab Sample Number | COC Number | Matrix | Date Collected | Time Collected |
|---|---|---|---|---|---|
| Site #2 | 1308210-1 | | SOIL | 12-Aug-13 | 9:45 |
| Site #5 | 1308210-2 | | SOIL | 12-Aug-13 | 10:30 |
| Site #6 | 1308210-3 | | SOIL | 12-Aug-13 | 11:00 |
| Site #7 | 1308210-4 | | SOIL | 12-Aug-13 | 12:00 |
| Site #9 | 1308210-5 | | SOIL | 12-Aug-13 | 13:30 |
| Site #1 | 1308210-6 | | SOIL | 12-Aug-13 | 14:40 |
| Site #12 | 1308210-7 | | SOIL | 12-Aug-13 | 15:10 |
| Site #10 | 1308210-8 | | SOIL | 13-Aug-13 | 8:30 |
| Site #4 | 1308210-9 | | SOIL | 13-Aug-13 | 9:45 |
| Site #11 | 1308210-10 | | SOIL | 13-Aug-13 | 11:00 |
| Site #2 | 1308210-11 | | LEACHAT | 12-Aug-13 | 9:45 |
| Site #5 | 1308210-12 | | LEACHAT | 12-Aug-13 | 10:30 |
| Site #6 | 1308210-13 | | LEACHAT | 12-Aug-13 | 11:00 |
| Site #7 | 1308210-14 | | LEACHAT | 12-Aug-13 | 12:00 |
| Site #9 | 1308210-15 | | LEACHAT | 12-Aug-13 | 13:30 |
| Site #1 | 1308210-16 | | LEACHAT | 12-Aug-13 | 14:40 |
| Site #12 | 1308210-17 | | LEACHAT | 12-Aug-13 | 15:10 |
| Site #10 | 1308210-18 | | LEACHAT | 13-Aug-13 | 8:30 |
| Site #4 | 1308210-19 | | LEACHAT | 13-Aug-13 | 9:45 |
| Site #11 | 1308210-20 | | LEACHAT | 13-Aug-13 | 11:00 |
| Trip Blank | 1308210-21 | | WATER | 07-Aug-13 | |

**ALS Laboratory Group**
225 Commerce Drive, Fort Collins, Colorado 80524
TF: (800) 443-1511 PH: (970) 490-1511 FX: (970) 490-1522

# Chain-of-Custody

Form 202r8

| | | | | | |
|---|---|---|---|---|---|
| | | SAMPLER | | DATE | 8-13-13 |
| PROJECT NAME | UDFCD SEDIMENTS | SITE ID | | TURNAROUND | |
| PROJECT No. | 131 013 000 | EDD FORMAT | | | |
| | | PURCHASE ORDER | | | |
| COMPANY NAME | WRIGHT WATER ENGINEERS | BILL TO COMPANY | | | |
| SEND REPORT TO | ELIOT WONG | INVOICE ATTN TO | | | |
| ADDRESS | 2490 W. 26th AVE, #100A | ADDRESS | | | |
| CITY / STATE / ZIP | DENVER/CO/80211 | CITY / STATE / ZIP | | | |
| PHONE | 303 480 1700 | PHONE | | | |
| FAX | 303 480 1020 | FAX | | | |
| E-MAIL | ewong@wrightwater.com | E-MAIL | | | |

WORKORDER #: 1308210

PAGE 1 of 1

DISPOSAL [✓ By Lab] or Return to Client

| Lab ID | Field ID | Matrix | Sample Date | Sample Time | # Bottles | Pres. | QC | TCLP - FULL SUITE | PAINT FILTER | IGNITABILITY/REACTIVITY/PH | BTEX | PAHS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ① | Site #2 | S | 8/12/13 | 9:45AM | 3 | N/A | N/A ⑪ | X | X | | | X |
| ② | Site #5 | S | 8/12/13 | 10:30AM | 2 | N/A | N/A ⑫ | X | X | | | |
| ③ | Site #6 | S | 8/12/13 | 11:00AM | 3 | N/A | N/A ⑬ | X | X | X | | |
| ④ | Site #7 | S | 8/12/13 | 12:00PM | 4 | N/A | N/A ⑭ | X | X | X | X | |
| ⑤ | Site #9 | S | 8/12/13 | 13:30 | 3 | N/A | N/A ⑮ | X | X | | X | |
| ⑥ | Site #1 | S | 8/12/13 | 14:40 | 2 | N/A | N/A ⑯ | X | X | | | |
| ⑦ | Site #12 | S | 8/12/13 | 15:10 | 3 | N/A | N/A ⑰ | X | X | | | X |
| ⑧ | Site #10 | S | 8/13/13 | 8:30AM | 4 | N/A | N/A ⑱ | X | X | X | | X |
| ⑨ | Site #4 | S | 8/13/13 | 9:45AM | 5 | N/A | N/A ⑲ | X | X | X | X | X |
| ⑩ | Site #11 | S | 8/13/13 | 11:00AM | 5 | N/A | N/A ⑳ | X | X | X | X | X |

*Time Zone (Circle): EST CST [✓ MST] PST Matrix: O = oil [✓ S = soil] NS = non-soil solid W = water L = liquid E = extract F = filter

For metals or anions, please detail analytes below.

Comments:

(21) TB

QC PACKAGE (check below)
☐ LEVEL II (Standard QC)
☐ LEVEL III (Std QC + forms)
☐ LEVEL IV (Std QC + forms + raw data)
☐

| | SIGNATURE | PRINTED NAME | DATE | TIME |
|---|---|---|---|---|
| RELINQUISHED BY | Julia Traylor | Julia Traylor | 8/13/13 | 1420 |
| RECEIVED BY | | Lauren Schmitz | 8/13/13 | 1420 |
| RELINQUISHED BY | | | | |
| RECEIVED BY | | | | |
| RELINQUISHED BY | | | | |
| RECEIVED BY | | | | |

Preservative Key: 1-HCl 2-HNO3 3-H2SO4 4-NaOH 5-NaHSO4 7-Other 8-4 degrees C 9-5035

**ALS Environmental - Fort Collins**
**CONDITION OF SAMPLE UPON RECEIPT FORM**

Client: Wright Water Eng. Workorder No: 1308210
Project Manager: ARW Initials: UAS Date: 8/13/13

| | | | | |
|---|---|---|---|---|
| 1. | Does this project require any special handling in addition to standard ALS procedures? | | YES | [✓ NO] |
| 2. | Are custody seals on shipping containers intact? | NONE | [✓ YES] | NO |
| 3. | Are Custody seals on sample containers intact? | [✓ NONE] | YES | NO |
| 4. | Is there a COC (Chain-of-Custody) present or other representative documents? | | [✓ YES] | NO |
| 5. | Are the COC and bottle labels complete and legible? | | [✓ YES] | NO |
| 6. | Is the COC in agreement with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.) | | [✓ YES] | NO |
| 7. | Were airbills / shipping documents present and/or removable? | [✓ DROP OFF] | YES | NO |
| 8. | Are all aqueous samples requiring preservation preserved correctly? (excluding volatiles) | [✓ N/A] | YES | NO |
| 9. | Are all aqueous non-preserved samples pH 4-9? | [✓ N/A] | YES | NO |
| 10. | Is there sufficient sample for the requested analyses? | | [✓ YES] | NO |
| 11. | Were all samples placed in the proper containers for the requested analyses? | | [✓ YES] | NO |
| 12. | Are all samples within holding times for the requested analyses? | | [✓ YES] | NO |
| 13. | Were all sample containers received intact? (not broken or leaking, etc.) | | [✓ YES] | NO |
| 14. | Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) headspace free? Size of bubble: ____ < green pea ____ > green pea | N/A | [✓ YES] | NO |
| 15. | Do any water samples contain sediment? Amount<br>Amount of sediment: ____ dusting ____ moderate ____ heavy | N/A | YES | [✓ NO] |
| 16. | Were the samples shipped on ice? | | [✓ YES] | NO |
| 17. | Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: [✓ #2] #4 | RAD ONLY | YES | [✓ NO] |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Cooler #: | 1 | | | | | | | |
| Temperature (°C): | 8.0°C | | | | | | | |
| No. of custody seals on cooler: | 2 | | | | | | | |
| External µR/hr reading: | N/A | | | | | | | |
| Background µR/hr reading: | 10 | | | | | | | |

DOT Survey/ Acceptance Information

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? YES / NO / [✓ NA] (If no, see Form 008.)

**Additional Information:** PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16.

* Trip Blank not listed on COC. Added as 1308210-21.

If applicable, was the client contacted? YES / NO / [✓ NA] Contact: ____________ Date/Time: ____________

**Project Manager Signature / Date:** 8/13/13

*IR Gun #2: Oakton, SN 29922500201-0066
*IR Gun #4: Oakton, SN 2372220101-0002

Form 201r24.xls (06/04/2012)

Page 1 of 1

# Chlorinated Herbicides by GC/ECD

## Method SW8151A--Leachate

## Method Blank

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

---

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Lab ID:** | EX130815-11MB | **Sample Matrix:** | LEACHATE | **Prep Batch:** | EX130817-1 | **Sample Aliquot:** | 100 ml |
| | | **% Moisture:** | N/A | **QCBatchID:** | EX130817-1-1 | **Final Volume:** | 10 ml |
| | | **Date Collected:** | N/A | **Run ID:** | PT130820-11A | **Result Units:** | MG/L |
| **LEACH DATE:** | **8/15/2013** | **Date Extracted:** | 17-Aug-13 | **Cleanup:** | NONE | **Clean DF:** | 1 |
| | | **Date Analyzed:** | 20-Aug-13 | **Basis:** | N/A | | |
| | | **Prep Method:** | METHOD | **File Name:** | 04413.dat | | |

---

| CASNO | Target Analyte | DF | Result | RptLimit LOD/LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 94-75-7 | 2,4-D | 1 | 0.005 | 0.005 | U | |
| 93-72-1 | SILVEX | 1 | 0.0005 | 0.0005 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 19719-28-9 | 2,4-DICHLOROPHENYLACETIC ACID | 0.0173 | | 0.02 | 87 | 56 - 140 |

**Data Package ID:** *PT1308210-1*

# Chlorinated Herbicides by GC/ECD

## Method SW8151 Revision A--TCLP Leachate

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

| | |
|---|---|
| **Field ID:** | Site #2 |
| **Lab ID:** | 1308210-11 |

**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 12-Aug-13
**Date Extracted:** 17-Aug-13
**Date Analyzed:** 20-Aug-13
**Prep Method:** METHOD

**Prep Batch:** EX130817-1
**QCBatchID:** EX130817-1-1
**Run ID:** PT130820-11A
**Cleanup:** NONE
**Basis:** As Received
**File Name:** 04419.dat

**Analyst:** Dan Sheneman
**Sample Aliquot:** 100 ML
**Final Volume:** 10 ML
**Result Units:** MG/L
**Clean DF:** 1

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 94-75-7 | 2,4-D | 1 | 0.005 | 0.005 | U | |
| 93-72-1 | SILVEX | 1 | 0.0005 | 0.0005 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 19719-28-9 | 2,4-DICHLOROPHENYLACETIC ACID | 0.0181 | | 0.02 | 90 | 56 - 140 |

**Data Package ID:** *PT1308210-1*

# Chlorinated Herbicides by GC/ECD

## Method SW8151 Revision A--TCLP Leachate

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

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**Field ID:** Site #5
**Lab ID:** 1308210-12
**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 12-Aug-13
**Date Extracted:** 17-Aug-13
**Date Analyzed:** 20-Aug-13
**Prep Method:** METHOD

**Prep Batch:** EX130817-1
**QCBatchID:** EX130817-1-1
**Run ID:** PT130820-11A
**Cleanup:** NONE
**Basis:** As Received
**File Name:** 04420.dat

**Analyst:** Dan Sheneman
**Sample Aliquot:** 100 ML
**Final Volume:** 10 ML
**Result Units:** MG/L
**Clean DF:** 1

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 94-75-7 | 2,4-D | 1 | 0.005 | 0.005 | U | |
| 93-72-1 | SILVEX | 1 | 0.0005 | 0.0005 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 19719-28-9 | 2,4-DICHLOROPHENYLACETIC ACID | 0.0175 | | 0.02 | 88 | 56 - 140 |

**Data Package ID:** *PT1308210-1*

# Chlorinated Herbicides by GC/ECD

## Method SW8151 Revision A--TCLP Leachate

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

| | |
|---|---|
| **Field ID:** | Site #6 |
| **Lab ID:** | 1308210-13 |

**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 12-Aug-13
**Date Extracted:** 17-Aug-13
**Date Analyzed:** 20-Aug-13
**Prep Method:** METHOD

**Prep Batch:** EX130817-1
**QCBatchID:** EX130817-1-1
**Run ID:** PT130820-11A
**Cleanup:** NONE
**Basis:** As Received
**File Name:** 04421.dat

**Analyst:** Dan Sheneman
**Sample Aliquot:** 100 ML
**Final Volume:** 10 ML
**Result Units:** MG/L
**Clean DF:** 1

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 94-75-7 | 2,4-D | 1 | 0.005 | 0.005 | U | |
| 93-72-1 | SILVEX | 1 | 0.0005 | 0.0005 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 19719-28-9 | 2,4-DICHLOROPHENYLACETIC ACID | 0.0161 | | 0.02 | 81 | 56 - 140 |

**Data Package ID:** *PT1308210-1*

# Chlorinated Herbicides by GC/ECD

## Method SW8151 Revision A--TCLP Leachate

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

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| | |
|---|---|
| **Field ID:** | Site #7 |
| **Lab ID:** | 1308210-14 |

**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 12-Aug-13
**Date Extracted:** 17-Aug-13
**Date Analyzed:** 20-Aug-13
**Prep Method:** METHOD

**Prep Batch:** EX130817-1
**QCBatchID:** EX130817-1-1
**Run ID:** PT130820-11A
**Cleanup:** NONE
**Basis:** As Received
**File Name:** 04422.dat

**Analyst:** Dan Sheneman
**Sample Aliquot:** 100 ML
**Final Volume:** 10 ML
**Result Units:** MG/L
**Clean DF:** 1

---

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 94-75-7 | 2,4-D | 1 | 0.005 | 0.005 | U | |
| 93-72-1 | SILVEX | 1 | 0.0005 | 0.0005 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 19719-28-9 | 2,4-DICHLOROPHENYLACETIC ACID | 0.0159 | | 0.02 | 79 | 56 - 140 |

**Data Package ID:** *PT1308210-1*

# Chlorinated Herbicides by GC/ECD

## Method SW8151 Revision A--TCLP Leachate

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

| | |
|---|---|
| **Field ID:** | Site #9 |
| **Lab ID:** | 1308210-15 |

**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 12-Aug-13
**Date Extracted:** 17-Aug-13
**Date Analyzed:** 20-Aug-13
**Prep Method:** METHOD

**Prep Batch:** EX130817-1
**QCBatchID:** EX130817-1-1
**Run ID:** PT130820-11A
**Cleanup:** NONE
**Basis:** As Received
**File Name:** 04424.dat

**Analyst:** Dan Sheneman
**Sample Aliquot:** 100 ML
**Final Volume:** 10 ML
**Result Units:** MG/L
**Clean DF:** 1

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 94-75-7 | 2,4-D | 1 | 0.005 | 0.005 | U | |
| 93-72-1 | SILVEX | 1 | 0.0005 | 0.0005 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 19719-28-9 | 2,4-DICHLOROPHENYLACETIC ACID | 0.0189 | | 0.02 | 94 | 56 - 140 |

**Data Package ID:** *PT1308210-1*

# Chlorinated Herbicides by GC/ECD

## Method SW8151 Revision A--TCLP Leachate

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

| | |
|---|---|
| **Field ID:** | Site #1 |
| **Lab ID:** | 1308210-16 |

**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 12-Aug-13
**Date Extracted:** 17-Aug-13
**Date Analyzed:** 20-Aug-13
**Prep Method:** METHOD

**Prep Batch:** EX130817-1
**QCBatchID:** EX130817-1-1
**Run ID:** PT130820-11A
**Cleanup:** NONE
**Basis:** As Received
**File Name:** 04425.dat

**Analyst:** Dan Sheneman
**Sample Aliquot:** 100 ML
**Final Volume:** 10 ML
**Result Units:** MG/L
**Clean DF:** 1

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 94-75-7 | 2,4-D | 1 | 0.005 | 0.005 | U | |
| 93-72-1 | SILVEX | 1 | 0.0005 | 0.0005 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 19719-28-9 | 2,4-DICHLOROPHENYLACETIC ACID | 0.0167 | | 0.02 | 84 | 56 - 140 |

**Data Package ID:** *PT1308210-1*

# Chlorinated Herbicides by GC/ECD

## Method SW8151 Revision A--TCLP Leachate

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

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| | |
|---|---|
| **Field ID:** | Site #12 |
| **Lab ID:** | 1308210-17 |

**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 12-Aug-13
**Date Extracted:** 17-Aug-13
**Date Analyzed:** 20-Aug-13
**Prep Method:** METHOD

**Prep Batch:** EX130817-1
**QCBatchID:** EX130817-1-1
**Run ID:** PT130820-11A
**Cleanup:** NONE
**Basis:** As Received
**File Name:** 04426.dat

**Analyst:** Dan Sheneman
**Sample Aliquot:** 100 ML
**Final Volume:** 10 ML
**Result Units:** MG/L
**Clean DF:** 1

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 94-75-7 | 2,4-D | 1 | 0.005 | 0.005 | U | |
| 93-72-1 | SILVEX | 1 | 0.0005 | 0.0005 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 19719-28-9 | 2,4-DICHLOROPHENYLACETIC ACID | 0.0172 | | 0.02 | 86 | 56 - 140 |

**Data Package ID:** *PT1308210-1*

# Chlorinated Herbicides by GC/ECD

## Method SW8151 Revision A--TCLP Leachate

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

| | |
|---|---|
| **Field ID:** | Site #10 |
| **Lab ID:** | 1308210-18 |

**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 13-Aug-13
**Date Extracted:** 17-Aug-13
**Date Analyzed:** 20-Aug-13
**Prep Method:** METHOD

**Prep Batch:** EX130817-1
**QCBatchID:** EX130817-1-1
**Run ID:** PT130820-11A
**Cleanup:** NONE
**Basis:** As Received
**File Name:** 04427.dat

**Analyst:** Dan Sheneman
**Sample Aliquot:** 100 ML
**Final Volume:** 10 ML
**Result Units:** MG/L
**Clean DF:** 1

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 94-75-7 | 2,4-D | 1 | 0.005 | 0.005 | U | |
| 93-72-1 | SILVEX | 1 | 0.0005 | 0.0005 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 19719-28-9 | 2,4-DICHLOROPHENYLACETIC ACID | 0.0185 | | 0.02 | 92 | 56 - 140 |

**Data Package ID:** *PT1308210-1*

# Chlorinated Herbicides by GC/ECD

## Method SW8151 Revision A--TCLP Leachate

## Sample Results

**Lab Name:** **ALS Environmental -- FC**

**Work Order Number:** 1308210

**Client Name:** Wright Water Engineers

**ClientProject ID:** UDFCD Sediments 131013000

| | |
|---|---|
| **Field ID:** | Site #4 |
| **Lab ID:** | 1308210-19 |

**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 13-Aug-13
**Date Extracted:** 17-Aug-13
**Date Analyzed:** 21-Aug-13
**Prep Method:** METHOD

**Prep Batch:** EX130817-1
**QCBatchID:** EX130817-1-1
**Run ID:** PT130820-11A
**Cleanup:** NONE
**Basis:** As Received
**File Name:** 04428.dat

**Analyst:** Dan Sheneman
**Sample Aliquot:** 100 ML
**Final Volume:** 10 ML
**Result Units:** MG/L
**Clean DF:** 1

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 94-75-7 | 2,4-D | 1 | 0.005 | 0.005 | U | |
| 93-72-1 | SILVEX | 1 | 0.0005 | 0.0005 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 19719-28-9 | 2,4-DICHLOROPHENYLACETIC ACID | 0.0187 | | 0.02 | 94 | 56 - 140 |

**Data Package ID:** *PT1308210-1*

# Chlorinated Herbicides by GC/ECD

## Method SW8151 Revision A--TCLP Leachate

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

| | |
|---|---|
| **Field ID:** | Site #11 |
| **Lab ID:** | 1308210-20 |

**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 13-Aug-13
**Date Extracted:** 17-Aug-13
**Date Analyzed:** 21-Aug-13
**Prep Method:** METHOD

**Prep Batch:** EX130817-1
**QCBatchID:** EX130817-1-1
**Run ID:** PT130820-11A
**Cleanup:** NONE
**Basis:** As Received
**File Name:** 04429.dat

**Analyst:** Dan Sheneman
**Sample Aliquot:** 100 ML
**Final Volume:** 10 ML
**Result Units:** MG/L
**Clean DF:** 1

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 94-75-7 | 2,4-D | 1 | 0.005 | 0.005 | U | |
| 93-72-1 | SILVEX | 1 | 0.0005 | 0.0005 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 19719-28-9 | 2,4-DICHLOROPHENYLACETIC ACID | 0.0189 | | 0.02 | 95 | 56 - 140 |

**Data Package ID:** *PT1308210-1*

# Chlorinated Herbicides by GC/ECD

## Method SW8151A

## Laboratory Control Sample and Laboratory Control Sample Duplicate

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

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**Lab ID:** EX130817-1LCS

| | | | | | |
|---|---|---|---|---|---|
| **Sample Matrix:** | WATER | **Prep Batch:** | EX130817-1 | **Sample Aliquot:** | 1000 ml |
| **% Moisture:** | N/A | **QCBatchID:** | EX130817-1-1 | **Final Volume:** | 10 ml |
| **Date Collected:** | N/A | **Run ID:** | PT130820-11A | **Result Units:** | MG/L |
| **Date Extracted:** | 08/17/2013 | **Cleanup:** | NONE | **Clean DF:** | 1 |
| **Date Analyzed:** | 08/20/2013 | **Basis:** | N/A | | |
| **Prep Method:** | METHOD | **File Name:** | 04414.dat | | |

| CASNO | Target Analyte | Spike Added | LCS Result | Reporting Limit | Result Qualifier | LCS % Rec. | Control Limits |
|---|---|---|---|---|---|---|---|
| 94-75-7 | 2,4-D | 0.0025 | 0.00236 | 0.0005 | | 94 | 60 - 135% |
| 93-72-1 | SILVEX | 0.00025 | 0.000234 | 0.00005 | | 94 | 58 - 123% |

**Lab ID:** EX130817-1LCSD

| | | | | | |
|---|---|---|---|---|---|
| **Sample Matrix:** | WATER | **Prep Batch:** | EX130817-1 | **Sample Aliquot:** | 1000 ml |
| **% Moisture:** | N/A | **QCBatchID:** | EX130817-1-1 | **Final Volume:** | 10 ml |
| **Date Collected:** | N/A | **Run ID:** | PT130820-11A | **Result Units:** | MG/L |
| **Date Extracted:** | 08/17/2013 | **Cleanup:** | NONE | **Clean DF:** | 1 |
| **Date Analyzed:** | 08/20/2013 | **Basis:** | N/A | | |
| **Prep Method:** | METHOD | **File Name:** | 04415.dat | | |

| CASNO | Target Analyte | Spike Added | LCSD Result | Reporting Limit | Result Qualifier | LCSD % Rec. | RPD Limit | RPD |
|---|---|---|---|---|---|---|---|---|
| 94-75-7 | 2,4-D | 0.0025 | 0.00238 | 0.0005 | | 95 | 30 | 1 |
| 93-72-1 | SILVEX | 0.00025 | 0.000235 | 0.00005 | | 94 | 30 | 1 |

## Surrogate Recovery LCS/LCSD

| CASNO | Target Analyte | Spike Added | LCS % Rec. | LCS Flag | LCSD % Rec. | LCSD Flag | Control Limits |
|---|---|---|---|---|---|---|---|
| 19719-28-9 | 2,4-DICHLOROPHENYLACETIC ACID | 0.002 | 85 | | 88 | | 56 - 140 |

**Data Package ID:** *PT1308210-1*

# Chlorinated Herbicides by GC/ECD

## Method SW8151A

## Matrix Spike

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

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**Field ID:** Site #11
**LabID:** 1308210-20MS

**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 13-Aug-13
**Date Extracted:** 17-Aug-13
**Date Analyzed:** 21-Aug-13

**Prep Batch:** EX130817-1
**QCBatchID:** EX130817-1-1
**Run ID:** PT130820-11A
**Cleanup:** NONE
**Basis:** As Received

**Sample Aliquot:** 100 ml
**Final Volume:** 10 ml
**Result Units:** MG/L
**File Name:** 04430.dat

---

| CASNO | Target Analyte | Sample Result | Samp Qual | MS Result | MS Qual | Reporting Limit | Spike Added | MS % Rec. | Control Limits |
|---|---|---|---|---|---|---|---|---|---|
| 94-75-7 | 2,4-D | 0.005 | U | 0.0252 | | 0.005 | 0.025 | 101 | 60 - 135% |
| 93-72-1 | SILVEX | 0.0005 | U | 0.00258 | | 0.0005 | 0.0025 | 103 | 58 - 123% |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 19719-28-9 | 2,4-DICHLOROPHENYLACETIC ACID | 0.018 | | 0.02 | 90 | 56 - 140 |

**Data Package ID:** *PT1308210-1*

ALS Environmental

# Ignitability

## Case Narrative

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# Wright Water Engineers

## UDFCD Sediments -- 131013000

Work Order Number: 1308210

1. This report consists of 5 soil samples. The samples were received intact by ALS on 08/13/2013. The samples were received at 8.0° Celsius.
2. The samples were prepared and analyzed based on SW-846, 3rd Edition procedures; SW-1010; and the current revision of SOP 629.
3. All calibration check criteria were met.
4. A sample duplicate was prepared and analyzed with this batch.
5. If a sample did not ignite by 96.5° Celsius, then the sample was reported at 96.5° with a "U" flag.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Mindy Norton

Mindy Norton
Organics Primary Data Reviewer

8/16/13
Date

Brendon Howard
Organics Final Data Reviewer

8/21/13
Date

***ALS***
***Data Qualifier Flags***
***Chromatography and Mass Spectrometry***

| | |
|---|---|
| U or ND: | **This flag indicates that the compound was analyzed for but not detected.** |
| **J:** | **This flag indicates an estimated value. This flag is used as follows : (1) when estimating a concentration for tentatively identified compounds (TICs) where a 1:1 response is assumed; (2) when the mass spectral and retention time data indicate the presence of a compound that meets the volatile and semivolatile GC/MS identification criteria, and the result is less than the reporting limit (RL) but greater than the method detection limit (MDL); (3) when the data indicate the presence of a compound that meets the identification criteria, and the result is less than the RL but greater than the MDL; and (4) the reported value is estimated.** |
| **B:** | **This flag is used when the analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user. This flag shall be used for a tentatively identified compound (TIC) as well as for a positively identified target compound.** |
| **E:** | **This flag identifies compounds whose concentration exceeds the upper level of the calibration range.** |
| **A:** | **This flag indicates that a tentatively identified compound is a suspected aldol-condensation product.** |
| **X:** | **This flag indicates that the analyte was diluted below an accurate quantitation level.** |
| ***:** | **This flag indicates that a spike recovery is outside the control criteria.** |
| **+:** | **This flag indicates that the relative percent difference (RPD) exceeds the control criteria.** |

# ALS Environmental -- FC

## Sample Number(s) Cross-Reference Table

**OrderNum:** 1308210
**Client Name:** Wright Water Engineers
**Client Project Name:** UDFCD Sediments
**Client Project Number:** 131013000
**Client PO Number:**

| Client Sample Number | Lab Sample Number | COC Number | Matrix | Date Collected | Time Collected |
|---|---|---|---|---|---|
| Site #2 | 1308210-1 | | SOIL | 12-Aug-13 | 9:45 |
| Site #5 | 1308210-2 | | SOIL | 12-Aug-13 | 10:30 |
| Site #6 | 1308210-3 | | SOIL | 12-Aug-13 | 11:00 |
| Site #7 | 1308210-4 | | SOIL | 12-Aug-13 | 12:00 |
| Site #9 | 1308210-5 | | SOIL | 12-Aug-13 | 13:30 |
| Site #1 | 1308210-6 | | SOIL | 12-Aug-13 | 14:40 |
| Site #12 | 1308210-7 | | SOIL | 12-Aug-13 | 15:10 |
| Site #10 | 1308210-8 | | SOIL | 13-Aug-13 | 8:30 |
| Site #4 | 1308210-9 | | SOIL | 13-Aug-13 | 9:45 |
| Site #11 | 1308210-10 | | SOIL | 13-Aug-13 | 11:00 |
| Site #2 | 1308210-11 | | LEACHAT | 12-Aug-13 | 9:45 |
| Site #5 | 1308210-12 | | LEACHAT | 12-Aug-13 | 10:30 |
| Site #6 | 1308210-13 | | LEACHAT | 12-Aug-13 | 11:00 |
| Site #7 | 1308210-14 | | LEACHAT | 12-Aug-13 | 12:00 |
| Site #9 | 1308210-15 | | LEACHAT | 12-Aug-13 | 13:30 |
| Site #1 | 1308210-16 | | LEACHAT | 12-Aug-13 | 14:40 |
| Site #12 | 1308210-17 | | LEACHAT | 12-Aug-13 | 15:10 |
| Site #10 | 1308210-18 | | LEACHAT | 13-Aug-13 | 8:30 |
| Site #4 | 1308210-19 | | LEACHAT | 13-Aug-13 | 9:45 |
| Site #11 | 1308210-20 | | LEACHAT | 13-Aug-13 | 11:00 |
| Trip Blank | 1308210-21 | | WATER | 07-Aug-13 | |

**ALS Laboratory Group**

225 Commerce Drive, Fort Collins, Colorado 80524
TF: (800) 443-1511 PH: (970) 490-1511 FX: (970) 490-1522

# Chain-of-Custody

Form 202r8

| | |
|---|---|
| WORKORDER # | 1308210 |
| DATE | 8-13-13 |
| PAGE | 1 of 1 |
| TURNAROUND | |
| DISPOSAL | [✓ By Lab] or Return to Client |

| | | | |
|---|---|---|---|
| PROJECT NAME | UDFCD SEDIMENTS | SAMPLER | |
| PROJECT No. | 131 013000 | SITE ID | |
| | | EDD FORMAT | |
| | | PURCHASE ORDER | |
| COMPANY NAME | WRIGHT WATER ENGINEERS | BILL TO COMPANY | |
| SEND REPORT TO | ELIOT WONG | INVOICE ATTN TO | |
| ADDRESS | 2490 W. 26th AVE, #100A | ADDRESS | |
| CITY / STATE / ZIP | DENVER/CO/80211 | CITY / STATE / ZIP | |
| PHONE | 303 480 1700 | PHONE | |
| FAX | 303 480 1020 | FAX | |
| E-MAIL | ewong@wrightwater.com | E-MAIL | |

| Lab ID | Field ID | Matrix | Sample Date | Sample Time | # Bottles | Pres. | QC | TCLP - FULL SUITE | PAINT FILTER | IGNITABILITY/REACTIVITY/PH | BTEX | PAHS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ① | Site #2 | S | 8/12/13 | 9:45AM | 3 | N/A | N/A ⑪ | X | X | | | X |
| ② | Site #5 | S | 8/12/13 | 10:30AM | 2 | N/A | N/A ⑫ | X | X | | | |
| ③ | Site #6 | S | 8/12/13 | 11:00AM | 3 | N/A | N/A ⑬ | X | X | X | | |
| ④ | Site #7 | S | 8/12/13 | 12:00PM | 4 | N/A | N/A ⑭ | X | X | X | X | |
| ⑤ | Site #9 | S | 8/12/13 | 13:30 | 3 | N/A | N/A ⑮ | X | X | | X | |
| ⑥ | Site #1 | S | 8/12/13 | 14:40 | 2 | N/A | N/A ⑯ | X | X | | | |
| ⑦ | Site #12 | S | 8/12/13 | 15:10 | 3 | N/A | N/A ⑰ | X | X | | | X |
| ⑧ | Site #10 | S | 8/13/13 | 8:30AM | 4 | N/A | N/A ⑱ | X | X | X | | X |
| ⑨ | Site #4 | S | 8/13/13 | 9:45AM | 5 | N/A | N/A ⑲ | X | X | X | X | X |
| ⑩ | Site #11 | S | 8/13/13 | 11:00AM | 5 | N/A | N/A ⑳ | X | X | X | X | X |

*Time Zone (Circle): EST CST [✓ MST] PST Matrix: O = oil [✓ S = soil] NS = non-soil solid W = water L = liquid E = extract F = filter

**For metals or anions, please detail analytes below.**

Comments:

㉑ TB

| QC PACKAGE (check below) | |
|---|---|
| ☐ | LEVEL II (Standard QC) |
| ☐ | LEVEL III (Std QC + forms) |
| ☐ | LEVEL IV (Std QC + forms + raw data) |
| ☐ | |

Preservative Key: 1-HCl 2-HNO3 3-H2SO4 4-NaOH 5-NaHSO4 7-Other 8-4 degrees C 9-5035

| | SIGNATURE | PRINTED NAME | DATE | TIME |
|---|---|---|---|---|
| RELINQUISHED BY | Julia Traylor | Julia Traylor | 8/13/13 | 1420 |
| RECEIVED BY | | Lauren Schmitz | [illegible]13 | 1420 |
| RELINQUISHED BY | | | | |
| RECEIVED BY | | | | |
| RELINQUISHED BY | | | | |
| RECEIVED BY | | | | |

**ALS Environmental - Fort Collins**
**CONDITION OF SAMPLE UPON RECEIPT FORM**

Client: Wright Water Eng. Workorder No: 1308210
Project Manager: ARW Initials: UAS Date: 8/13/13

| | | | |
|---|---|---|---|
| 1. Does this project require any special handling in addition to standard ALS procedures? | | YES | [✓ NO] |
| 2. Are custody seals on shipping containers intact? | NONE | [✓ YES] | NO |
| 3. Are Custody seals on sample containers intact? | [✓ NONE] | YES | NO |
| 4. Is there a COC (Chain-of-Custody) present or other representative documents? | | [✓ YES] | NO |
| 5. Are the COC and bottle labels complete and legible? | | [✓ YES] | NO |
| 6. Is the COC in agreement with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.) | | [✓ YES] | NO |
| 7. Were airbills / shipping documents present and/or removable? | [✓ DROP OFF] | YES | NO |
| 8. Are all aqueous samples requiring preservation preserved correctly? (excluding volatiles) | [✓ N/A] | YES | NO |
| 9. Are all aqueous non-preserved samples pH 4-9? | [✓ N/A] | YES | NO |
| 10. Is there sufficient sample for the requested analyses? | | [✓ YES] | NO |
| 11. Were all samples placed in the proper containers for the requested analyses? | | [✓ YES] | NO |
| 12. Are all samples within holding times for the requested analyses? | | [✓ YES] | NO |
| 13. Were all sample containers received intact? (not broken or leaking, etc.) | | [✓ YES] | NO |
| 14. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) headspace free? Size of bubble: ____ < green pea ____ > green pea | N/A | [✓ YES] | NO |
| 15. Do any water samples contain sediment? Amount<br>Amount of sediment: ____ dusting ____ moderate ____ heavy | N/A | YES | [✓ NO] |
| 16. Were the samples shipped on ice? | | [✓ YES] | NO |
| 17. Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: [✓ #2] #4 | RAD ONLY | YES | [✓ NO] |

Cooler #: 1
Temperature (°C): 8.0°C
No. of custody seals on cooler: 2

DOT Survey/ Acceptance Information

External µR/hr reading: N/A
Background µR/hr reading: 10

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? YES / NO / [✓ NA] (If no, see Form 008.)

**Additional Information:** PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16.

* Trip Blank not listed on COC. Added as 1308210-21.

If applicable, was the client contacted? YES / NO / [✓ NA] Contact: ____________ Date/Time: ____________

**Project Manager Signature / Date:** 8/13/13

*IR Gun #2: Oakton, SN 29922500201-0066
*IR Gun #4: Oakton, SN 2372220101-0002

# IGNITABILITY

## Method SW1010 Revision A

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Client Name:** Wright Water Engineers
**Client Project ID:** UDFCD Sediments 131013000
**Work Order Number:** 1308210
**Reporting Basis:** As Received
**Prep Method:** NONE
**Analyst:** Brendon Howard

**Final Volume:** 1 CUP
**Matrix:** SOIL
**Result Units:** deg C

| Client Sample ID | Lab ID | Date Collected | Date Prepared | Date Analyzed | Percent Moisture | Dilution Factor | Result | RptLimit LOD/LOQ | Flag | Sample Aliquot |
|---|---|---|---|---|---|---|---|---|---|---|
| Site #6 | 1308210-3 | 08/12/2013 | 08/15/2013 | 08/15/2013 | N/A | 1 | 96 | 96 | U | 1 CUP |
| Site #7 | 1308210-4 | 08/12/2013 | 08/15/2013 | 08/15/2013 | N/A | 1 | 96 | 96 | U | 1 CUP |
| Site #10 | 1308210-8 | 08/13/2013 | 08/15/2013 | 08/15/2013 | N/A | 1 | 96 | 96 | U | 1 CUP |
| Site #4 | 1308210-9 | 08/13/2013 | 08/15/2013 | 08/15/2013 | N/A | 1 | 96 | 96 | U | 1 CUP |
| Site #11 | 1308210-10 | 08/13/2013 | 08/15/2013 | 08/15/2013 | N/A | 1 | 96 | 96 | U | 1 CUP |

**Comments:**

ND or U = Flashpoint was above 96.5 degrees celsius.

**Data Package ID:** *EX1308210-1*

# Ignitability

## Method SW1010

## Duplicate Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

| | |
|---|---|
| **Field ID:** | Site #11 |
| **Lab ID:** | 1308210-10D |

**Sample Matrix:** SOIL
**% Moisture:** N/A
**Date Collected:** 08/13/2013
**Date Extracted:** 08/15/2013
**Date Analyzed:** 08/15/2013

**Prep Batch:** EX130815-2
**QCBatchID:** EX130815-2-1
**Run ID:** EX130815-2A
**Cleanup:** NONE
**Basis:** As Received
**File Name:**

**Sample Aliquot:** 1 CUP
**Final Volume:** 1 CUP
**Result Units:** deg C
**Clean DF:** 1

| CASNO | Target Analyte | Sample Result | Samp Qual | Duplicate Result | Dup Qual | Reporting Limit | Dilution Factor | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|
| 10-36-6 | IGNITABILITY | 96 | U | 96.5 | U | 96.5 | 1 | | |

**Data Package ID:** *EX1308210-1*

# Inorganics

## Case Narrative

---

# Wright Water Engineers

## UDFCD Sediments -- 131013000

### Work Order Number: 1308210

1. This report consists of 5 soil samples.

2. The samples were received intact at 8.0° Celsius by ALS on 08/13/13.

3. The samples were carried through the vapor generation procedure for reactive cyanide and reactive sulfide as described in chapter seven of USEPA SW-846 (July 1985). EPA has formally withdrawn their guidance for this method, as it is likely to underestimate the sample's potential to liberate free cyanide and sulfide under waste management conditions. A copy of the EPA memo withdrawing the method guidance can be provided upon request.

   Released cyanide was determined colorimetrically according to Method 9014. Released sulfide was determined by iodometric titration according to Method 9030.

4. The samples were prepared for analysis based on SW-846, 3rd Edition procedures.

5. The samples were analyzed following SW-846 procedures for the current revisions of the following SOPs and methods:

| Analyte | Method | SOP # |
|---|---|---|
| Reactive cyanide | SW-846 Chap. 7, Sec. 3.1 | 1112 |
| Reactive sulfide | SW-846 Chap. 7, Sec. 3.2 | 1112 |
| pH | 9045D | 1126 |

6. All standards and solutions were used within their recommended shelf life.

7. The samples were prepared and analyzed within the established hold time for each analysis.

All in house quality control procedures were followed, as described below.

8. General quality control procedures.

- A preparation (method) blank and laboratory control sample (LCS) were prepared and analyzed with the samples in each applicable preparation batch.
- The method blank associated with each applicable batch was below the reporting limit for the requested analytes.
- All laboratory control sample criteria were met.
- All initial and continuing calibration blanks were below the reporting limit for the requested analyte.
- All initial and continuing calibration verifications were within the acceptance criteria for the requested analyte.

9. Matrix specific quality control procedures.

Sample 1308210-4 was designated as the quality control sample for the reactive cyanide and reactive sulfide analyses. Sample 1308210-3 was designated as the quality control sample for the pH analysis.

Similarity of matrix and therefore relevance of the QC results should not be automatically inferred for any sample other than the native sample selected for QC.

- A sample duplicate was prepared and analyzed with each batch. All guidance criteria for precision were met.

  For pH, the difference between the pH of the sample and its duplicate must be less than or equal to 0.5 pH units to be in control. RPD is not calculated for this analysis.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Megan Johnson

Megan Johnson
Inorganics Primary Data Reviewer

8/20/13
Date

Inorganics Final Data Reviewer

8/20/13
Date

## Inorganic Data Reporting Qualifiers

The following qualifiers are used by the laboratory when reporting results of inorganic analyses.

- Concentration qualifier -- If the analyte was analyzed for but not detected a “U” is entered.
- QC qualifier -- Specified entries and their meanings are as follows:

N - Spiked sample recovery not within control limits.

* - Duplicate analysis (relative percent difference) not within control limits.

Z - Calibration spike recovery not within control limits.

# ALS Environmental -- FC

## Sample Number(s) Cross-Reference Table

**OrderNum:** 1308210
**Client Name:** Wright Water Engineers
**Client Project Name:** UDFCD Sediments
**Client Project Number:** 131013000
**Client PO Number:**

| Client Sample Number | Lab Sample Number | COC Number | Matrix | Date Collected | Time Collected |
|---|---|---|---|---|---|
| Site #2 | 1308210-1 | | SOIL | 12-Aug-13 | 9:45 |
| Site #5 | 1308210-2 | | SOIL | 12-Aug-13 | 10:30 |
| Site #6 | 1308210-3 | | SOIL | 12-Aug-13 | 11:00 |
| Site #7 | 1308210-4 | | SOIL | 12-Aug-13 | 12:00 |
| Site #9 | 1308210-5 | | SOIL | 12-Aug-13 | 13:30 |
| Site #1 | 1308210-6 | | SOIL | 12-Aug-13 | 14:40 |
| Site #12 | 1308210-7 | | SOIL | 12-Aug-13 | 15:10 |
| Site #10 | 1308210-8 | | SOIL | 13-Aug-13 | 8:30 |
| Site #4 | 1308210-9 | | SOIL | 13-Aug-13 | 9:45 |
| Site #11 | 1308210-10 | | SOIL | 13-Aug-13 | 11:00 |
| Site #2 | 1308210-11 | | LEACHAT | 12-Aug-13 | 9:45 |
| Site #5 | 1308210-12 | | LEACHAT | 12-Aug-13 | 10:30 |
| Site #6 | 1308210-13 | | LEACHAT | 12-Aug-13 | 11:00 |
| Site #7 | 1308210-14 | | LEACHAT | 12-Aug-13 | 12:00 |
| Site #9 | 1308210-15 | | LEACHAT | 12-Aug-13 | 13:30 |
| Site #1 | 1308210-16 | | LEACHAT | 12-Aug-13 | 14:40 |
| Site #12 | 1308210-17 | | LEACHAT | 12-Aug-13 | 15:10 |
| Site #10 | 1308210-18 | | LEACHAT | 13-Aug-13 | 8:30 |
| Site #4 | 1308210-19 | | LEACHAT | 13-Aug-13 | 9:45 |
| Site #11 | 1308210-20 | | LEACHAT | 13-Aug-13 | 11:00 |
| Trip Blank | 1308210-21 | | WATER | 07-Aug-13 | |

**ALS Laboratory Group**

225 Commerce Drive, Fort Collins, Colorado 80524
TF: (800) 443-1511 PH: (970) 490-1511 FX: (970) 490-1522

# Chain-of-Custody

Form 202r8

| | | | |
|---|---|---|---|
| WORKORDER # | 1308210 | | |
| DATE | 8-13-13 | PAGE | 1 of 1 |
| TURNAROUND | | DISPOSAL | [✓ By Lab] or Return to Client |

| | | | |
|---|---|---|---|
| | | SAMPLER | |
| PROJECT NAME | UDFCD SEDIMENTS | SITE ID | |
| PROJECT No. | 131 013 000 | EDD FORMAT | |
| | | PURCHASE ORDER | |
| COMPANY NAME | WRIGHT WATER ENGINEERS | BILL TO COMPANY | |
| SEND REPORT TO | ELIOT WONG | INVOICE ATTN TO | |
| ADDRESS | 2490 W. 26th AVE, #100A | ADDRESS | |
| CITY / STATE / ZIP | DENVER / CO / 80211 | CITY / STATE / ZIP | |
| PHONE | 303 480 1700 | PHONE | |
| FAX | 303 480 1020 | FAX | |
| E-MAIL | ewong@wrightwater.com | E-MAIL | |

| Lab ID | Field ID | Matrix | Sample Date | Sample Time | # Bottles | Pres. | QC | TCLP - FULL SUITE | PAINT FILTER | IGNITABILITY / REACTIVITY / PH | BTEX | PAHS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ① | Site #2 | S | 8/12/13 | 9:45AM | 3 | N/A | N/A ⑪ | X | X | | | X |
| ② | Site #5 | S | 8/12/13 | 10:30AM | 2 | N/A | N/A ⑫ | X | X | | | |
| ③ | Site #6 | S | 8/12/13 | 11:00AM | 3 | N/A | N/A ⑬ | X | X | X | | |
| ④ | Site #7 | S | 8/12/13 | 12:00PM | 4 | N/A | N/A ⑭ | X | X | X | X | |
| ⑤ | Site #9 | S | 8/12/13 | 13:30 | 3 | N/A | N/A ⑮ | X | X | | X | |
| ⑥ | Site #1 | S | 8/12/13 | 14:40 | 2 | N/A | N/A ⑯ | X | X | | | |
| ⑦ | Site #12 | S | 8/12/13 | 15:10 | 3 | N/A | N/A ⑰ | X | X | | | X |
| ⑧ | Site #10 | S | 8/13/13 | 8:30AM | 4 | N/A | N/A ⑱ | X | X | X | | X |
| ⑨ | Site #4 | S | 8/13/13 | 9:45AM | 5 | N/A | N/A ⑲ | X | X | X | X | X |
| ⑩ | Site #11 | S | 8/13/13 | 11:00AM | 5 | N/A | N/A ⑳ | X | X | X | X | X |

*Time Zone (Circle): EST CST [✓ MST] PST Matrix: O = oil [✓ S = soil] NS = non-soil solid W = water L = liquid E = extract F = filter

**For metals or anions, please detail analytes below.**

**Comments:**

㉑ TB

| QC PACKAGE (check below) | |
|---|---|
| ☐ | LEVEL II (Standard QC) |
| ☐ | LEVEL III (Std QC + forms) |
| ☐ | LEVEL IV (Std QC + forms + raw data) |
| ☐ | |

**Preservative Key:** 1-HCl 2-HNO3 3-H2SO4 4-NaOH 5-NaHSO4 7-Other 8-4 degrees C 9-5035

| | SIGNATURE | PRINTED NAME | DATE | TIME |
|---|---|---|---|---|
| RELINQUISHED BY | Julia Traylor | Julia Traylor | 8/13/13 | 1420 |
| RECEIVED BY | | Lauren Schmitt | [illegible]13 | 1420 |
| RELINQUISHED BY | | | | |
| RECEIVED BY | | | | |
| RELINQUISHED BY | | | | |
| RECEIVED BY | | | | |

ALS

## ALS Environmental - Fort Collins
## CONDITION OF SAMPLE UPON RECEIPT FORM

Client: Wright Water Eng. Workorder No: 1308210

Project Manager: ARW Initials: LAS Date: 8/13/13

| | | | | |
|---|---|---|---|---|
| 1. | Does this project require any special handling in addition to standard ALS procedures? | | YES | [✓ NO] |
| 2. | Are custody seals on shipping containers intact? | NONE | [✓ YES] | NO |
| 3. | Are Custody seals on sample containers intact? | [✓ NONE] | YES | NO |
| 4. | Is there a COC (Chain-of-Custody) present or other representative documents? | | [✓ YES] | NO |
| 5. | Are the COC and bottle labels complete and legible? | | [✓ YES] | NO |
| 6. | Is the COC in agreement with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.) | | [✓ YES] | NO |
| 7. | Were airbills / shipping documents present and/or removable? | [✓ DROP OFF] | YES | NO |
| 8. | Are all aqueous samples requiring preservation preserved correctly? (excluding volatiles) | [✓ N/A] | YES | NO |
| 9. | Are all aqueous non-preserved samples pH 4-9? | [✓ N/A] | YES | NO |
| 10. | Is there sufficient sample for the requested analyses? | | [✓ YES] | NO |
| 11. | Were all samples placed in the proper containers for the requested analyses? | | [✓ YES] | NO |
| 12. | Are all samples within holding times for the requested analyses? | | [✓ YES] | NO |
| 13. | Were all sample containers received intact? (not broken or leaking, etc.) | | [✓ YES] | NO |
| 14. | Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) headspace free? Size of bubble: ____ < green pea ____ > green pea | N/A | [✓ YES] | NO |
| 15. | Do any water samples contain sediment? Amount<br>Amount of sediment: ____ dusting ____ moderate ____ heavy | N/A | YES | [✓ NO] |
| 16. | Were the samples shipped on ice? | | [✓ YES] | NO |
| 17. | Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: [✓ #2] #4 | RAD ONLY | YES | [✓ NO] |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Cooler #: | 1 | | | | | | | |
| Temperature (°C): | 8.0°C | | | | | | | |
| No. of custody seals on cooler: | 2 | | | | | | | |
| External µR/hr reading: | N/A | | | | | | | |
| Background µR/hr reading: | 10 | | | | | | | |

DOT Survey/ Acceptance Information

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? YES / NO / [✓ NA] (If no, see Form 008.)

**Additional Information:** PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16.

* Trip Blank not listed on COC. Added as 1308210-21.

If applicable, was the client contacted? YES / NO / [✓ NA] Contact: ____________ Date/Time: ____________

**Project Manager Signature / Date:** 8/13/13

*IR Gun #2: Oakton, SN 29922500201-0066
*IR Gun #4: Oakton, SN 2372220101-0002

Form 201r24.xls (06/04/2012)

# REACTIVE CYANIDE

## Method SW846_7.3.1

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Client Name:** Wright Water Engineers
**Client Project ID:** UDFCD Sediments 131013000
**Work Order Number:** 1308210
**Reporting Basis:** As Received
**Prep Method:** METHOD
**Analyst:** Dan Sheneman

**Final Volume:** 100 ml
**Matrix:** SOIL
**Result Units:** MG/KG

| Client Sample ID | Lab ID | Date Collected | Date Prepared | Date Analyzed | Percent Moisture | Dilution Factor | Result | RptLimit LOD/LOQ | Flag | Sample Aliquot |
|---|---|---|---|---|---|---|---|---|---|---|
| Site #6 | 1308210-3 | 08/12/2013 | 08/16/2013 | 08/20/2013 | N/A | 1 | 0.1 | 0.1 | U | 10 g |
| Site #7 | 1308210-4 | 08/12/2013 | 08/16/2013 | 08/20/2013 | N/A | 1 | 0.1 | 0.1 | U | 10 g |
| Site #10 | 1308210-8 | 08/13/2013 | 08/16/2013 | 08/20/2013 | N/A | 1 | 0.1 | 0.1 | U | 10 g |
| Site #4 | 1308210-9 | 08/13/2013 | 08/16/2013 | 08/20/2013 | N/A | 1 | 0.1 | 0.1 | U | 10 g |
| Site #11 | 1308210-10 | 08/13/2013 | 08/16/2013 | 08/20/2013 | N/A | 1 | 0.1 | 0.1 | U | 10 g |

**Comments:**

1. ND or U = Not Detected at or above the client requested detection limit.

**Data Package ID:** *cn1308210-1*

# REACTIVE SULFIDE

## Method SW846_7.3.2

## Sample Results

| | | | |
|---|---|---|---|
| **Lab Name:** | **ALS Environmental -- FC** | | |
| **Client Name:** | Wright Water Engineers | | |
| **Client Project ID:** | UDFCD Sediments 131013000 | | |
| **Work Order Number:** | 1308210 | **Final Volume:** | 100 ml |
| **Reporting Basis:** | As Received | **Matrix:** | SOIL |
| **Prep Method:** | METHOD | **Result Units:** | MG/KG |
| **Analyst:** | Jeffrey T. Lee | | |

| Client Sample ID | Lab ID | Date Collected | Date Prepared | Date Analyzed | Percent Moisture | Dilution Factor | Result | RptLimit LOD/LOQ | Flag | Sample Aliquot |
|---|---|---|---|---|---|---|---|---|---|---|
| Site #6 | 1308210-3 | 08/12/2013 | 08/20/2013 | 08/20/2013 | N/A | 1 | 50 | 50 | U | 5 g |
| Site #7 | 1308210-4 | 08/12/2013 | 08/20/2013 | 08/20/2013 | N/A | 1 | 50 | 50 | U | 5 g |
| Site #10 | 1308210-8 | 08/13/2013 | 08/20/2013 | 08/20/2013 | N/A | 1 | 50 | 50 | U | 5 g |
| Site #4 | 1308210-9 | 08/13/2013 | 08/20/2013 | 08/20/2013 | N/A | 1 | 50 | 50 | U | 5 g |
| Site #11 | 1308210-10 | 08/13/2013 | 08/20/2013 | 08/20/2013 | N/A | 1 | 50 | 50 | U | 5 g |

**Comments:**

1. ND or U = Not Detected at or above the client requested detection limit.

**Data Package ID:** *s1308210-1*

# Solid pH in water @25 Degrees Celsius

## Method SW9045 Revision D

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Client Name:** Wright Water Engineers
**Client Project ID:** UDFCD Sediments 131013000
**Work Order Number:** 1308210
**Reporting Basis:** As Received
**Prep Method:** METHOD
**Analyst:** Kristin L. Ratajczak

**Final Volume:** 20 ml
**Matrix:** SOIL
**Result Units:** pH

| Client Sample ID | Lab ID | Date Collected | Date Prepared | Date Analyzed | Percent Moisture | Dilution Factor | Result | RptLimit LOD/LOQ | Flag | Sample Aliquot |
|---|---|---|---|---|---|---|---|---|---|---|
| Site #6 | 1308210-3 | 08/12/2013 | 08/16/2013 | 08/16/2013 | N/A | 1 | 8.25 | 0.1 | | 20 g |
| Site #7 | 1308210-4 | 08/12/2013 | 08/16/2013 | 08/16/2013 | N/A | 1 | 7.48 | 0.1 | | 20 g |
| Site #10 | 1308210-8 | 08/13/2013 | 08/16/2013 | 08/16/2013 | N/A | 1 | 7.22 | 0.1 | | 20 g |
| Site #4 | 1308210-9 | 08/13/2013 | 08/16/2013 | 08/16/2013 | N/A | 1 | 8 | 0.1 | | 20 g |
| Site #11 | 1308210-10 | 08/13/2013 | 08/16/2013 | 08/16/2013 | N/A | 1 | 8.01 | 0.1 | | 20 g |

**Comments:**

1. ND or U = Not Detected at or above the client requested detection limit.

**Data Package ID:** *ph1308210-1*

# Reactive Cyanide

## Method SW846_7.3.1

## Method Blank

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

---

**Lab ID:** CN130816-1MB

**Sample Matrix:** SOIL
**% Moisture:** N/A
**Date Collected:** N/A
**Date Extracted:** 16-Aug-13
**Date Analyzed:** 20-Aug-13
**Prep Method:** METHOD

**Prep Batch:** CN130816-1
**QCBatchID:** CN130816-1-1
**Run ID:** CN130820-1A
**Cleanup:** NONE
**Basis:** N/A
**File Name:** Manual Entry

**Sample Aliquot:** 10 g
**Final Volume:** 100 ml
**Result Units:** MG/KG
**Clean DF:** 1

| CASNO | Target Analyte | DF | Result | RptLimit LOD/LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
|  | REACTIVE CYANIDE | 1 | 0.1 | 0.1 | U |  |

**Data Package ID:** *cn1308210-1*

# Reactive Cyanide

## Method SW846_7.3.1

## Laboratory Control Sample

|  |  |
|---|---|
| **Lab Name:** | **ALS Environmental -- FC** |
| **Work Order Number:** | 1308210 |
| **Client Name:** | Wright Water Engineers |
| **ClientProject ID:** | UDFCD Sediments 131013000 |

**Lab ID:** CN130816-1LCS

|  |  |  |  |  |  |
|---|---|---|---|---|---|
| **Sample Matrix:** | SOIL | **Prep Batch:** | CN130816-1 | **Sample Aliquot:** | 10 g |
| **% Moisture:** | N/A | **QCBatchID:** | CN130816-1-1 | **Final Volume:** | 100 ml |
| **Date Collected:** | N/A | **Run ID:** | CN130820-1A | **Result Units:** | MG/KG |
| **Date Extracted:** | 08/16/2013 | **Cleanup:** | NONE | **Clean DF:** | 1 |
| **Date Analyzed:** | 08/20/2013 | **Basis:** | N/A | | |
| **Prep Method:** | METHOD | **File Name:** | Manual Entry | | |

| CASNO | Target Analyte | Spike Added | LCS Result | Reporting Limit | Result Qualifier | LCS % Rec. | Control Limits |
|---|---|---|---|---|---|---|---|
| | REACTIVE CYANIDE | 1000 | 68.2 | 4 | | 7 | 5 - 30% |

**Data Package ID:** *cn1308210-1*

# Reactive Cyanide

## Method SW846_7.3.1

## Duplicate Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

---

**Field ID:** Site #7
**Lab ID:** 1308210-4D

**Sample Matrix:** SOIL
**% Moisture:** N/A
**Date Collected:** 08/12/2013
**Date Extracted:** 08/16/2013
**Date Analyzed:** 08/20/2013

**Prep Batch:** CN130816-1
**QCBatchID:** CN130816-1-1
**Run ID:** CN130820-1A
**Cleanup:** NONE
**Basis:** As Received
**File Name:** Manual Entry

**Sample Aliquot:** 10 g
**Final Volume:** 100 ml
**Result Units:** MG/KG
**Clean DF:** 1

| CASNO | Target Analyte | Sample Result | Samp Qual | Duplicate Result | Dup Qual | Reporting Limit | Dilution Factor | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|
| | REACTIVE CYANIDE | 0.1 | U | 0.1 | U | 0.1 | 1 | | 35 |

**Data Package ID:** *cn1308210-1*

# Reactive Sulfide

## Method SW846_7.3.2

## Method Blank

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

---

**Lab ID:** S130820-1MB

**Sample Matrix:** SOIL
**% Moisture:** N/A
**Date Collected:** N/A
**Date Extracted:** 20-Aug-13
**Date Analyzed:** 20-Aug-13
**Prep Method:** METHOD

**Prep Batch:** S130820-1
**QCBatchID:** S130820-1-1
**Run ID:** S130820-1A
**Cleanup:** NONE
**Basis:** N/A
**File Name:**

**Sample Aliquot:** 5 g
**Final Volume:** 100 ml
**Result Units:** MG/KG
**Clean DF:** 1

---

| CASNO | Target Analyte | DF | Result | RptLimit LOD/LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| | REACTIVE SULFIDE | 1 | 50 | 50 | U | |

**Data Package ID:** *s1308210-1*

# Reactive Sulfide

## Method SW846_7.3.2

## Laboratory Control Sample

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

**Lab ID:** S130820-1LCS

**Sample Matrix:** SOIL
**% Moisture:** N/A
**Date Collected:** N/A
**Date Extracted:** 08/20/2013
**Date Analyzed:** 08/20/2013
**Prep Method:** METHOD

**Prep Batch:** S130820-1
**QCBatchID:** S130820-1-1
**Run ID:** S130820-1A
**Cleanup:** NONE
**Basis:** N/A
**File Name:**

**Sample Aliquot:** 5 g
**Final Volume:** 100 ml
**Result Units:** MG/KG
**Clean DF:** 1

| CASNO | Target Analyte | Spike Added | LCS Result | Reporting Limit | Result Qualifier | LCS % Rec. | Control Limits |
|---|---|---|---|---|---|---|---|
|  | REACTIVE SULFIDE | 3560 | 1670 | 180 |  | 47 | 10 - 60% |

**Data Package ID:** *s1308210-1*

# Reactive Sulfide

## Method SW846_7.3.2

## Duplicate Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

---

**Field ID:** Site #7
**Lab ID:** 1308210-4D

**Sample Matrix:** SOIL
**% Moisture:** N/A
**Date Collected:** 08/12/2013
**Date Extracted:** 08/20/2013
**Date Analyzed:** 08/20/2013

**Prep Batch:** S130820-1
**QCBatchID:** S130820-1-1
**Run ID:** S130820-1A
**Cleanup:** NONE
**Basis:** As Received
**File Name:**

**Sample Aliquot:** 5 g
**Final Volume:** 100 ml
**Result Units:** MG/KG
**Clean DF:** 1

| CASNO | Target Analyte | Sample Result | Samp Qual | Duplicate Result | Dup Qual | Reporting Limit | Dilution Factor | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|
|  | REACTIVE SULFIDE | 50 | U | 50 | U | 50 | 1 |  | 35 |

**Data Package ID:** *s1308210-1*

# pH

## Method SW9045

## Duplicate Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

---

**Field ID:** Site #6
**Lab ID:** 1308210-3D

**Sample Matrix:** SOIL
**% Moisture:** N/A
**Date Collected:** 08/12/2013
**Date Extracted:** 08/16/2013
**Date Analyzed:** 08/16/2013

**Prep Batch:** PH130816-1
**QCBatchID:** PH130816-1-1
**Run ID:** pH130816-1A
**Cleanup:** NONE
**Basis:** As Received
**File Name:**

**Sample Aliquot:** 20 g
**Final Volume:** 20 ml
**Result Units:** pH
**Clean DF:** 1

| CASNO | Target Analyte | Sample Result | Samp Qual | Duplicate Result | Dup Qual | Reporting Limit | Dilution Factor | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|
| 10-29-7 | PH | 8.25 | | 8.37 | | 0.1 | 1 | | 0.5 |

**Data Package ID:** *ph1308210-1*

# Metals

## Case Narrative

---

# Wright Water Engineers

## UDFCD Sediments -- 131013000

### Work Order Number: 1308210

1. This report consists of 10 TCLP samples.

2. The samples were received intact at 8.0°C by ALS on 08/13/13.

3. The samples were prepared and analyzed based on SW-846, 3rd Edition procedures.

   The samples for TCLP analysis were processed through the TCLP leaching procedure based on method 1311. The leachates were then digested at a ten-fold dilution.

   For analysis by Trace ICP, the leachates were digested following method 3010A and the current revision of SOP 806.

   For analysis by Cold Vapor AA (CVAA), the leachates were digested following method 7470A and the current revision of SOP 812.

4. Analysis by Trace ICP followed method 6010B and the current revision of SOP 834. The analysis of silver was done by Trace ICP.

   Analysis by CVAA followed method 7470A and the current revision of SOP 812.

5. All standards and solutions are NIST traceable and were used within their recommended shelf life.

6. The samples were prepared and analyzed within the established hold times.

All in house quality control procedures were followed, as described below.

7. General quality control procedures.

- A preparation (method) blank and laboratory control sample were digested and analyzed with the samples in each digestion batch.
- The preparation (method) blank associated with each digestion batch was below the reporting limit for the requested analytes.
- All laboratory control sample criteria were met.
- All initial and continuing calibration blanks were below the reporting limit for the requested analytes.
- All initial and continuing calibration verifications were within the acceptance criteria for the requested analytes.
- The interference check samples and high standard readbacks associated with Method 6010B were within acceptance criteria.

8. Matrix specific quality control procedures.

   Sample 1308210-11 was designated as the quality control sample for each analysis.

   Similarity of matrix and therefore relevance of the QC results should not be automatically inferred for any sample other than the native sample selected for QC.

   - A matrix spike and matrix spike duplicate were digested and analyzed with each batch. All acceptance criteria for accuracy were met.
   - A sample duplicate and matrix spike duplicate were digested and analyzed with each batch. All acceptance criteria for precision were met.
   - A serial dilution was analyzed with the ICP batch. All acceptance criteria were met.

9. Sample dilutions were not required for the requested analyses.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Jill Latelle

Jill Latelle
Inorganics Primary Data Reviewer

8/20/13
Date

Inorganics Final Data Reviewer

8/20/13
Date

## Inorganic Data Reporting Qualifiers

The following qualifiers are used by the laboratory when reporting results of inorganic analyses.

- Result qualifier -- If the analyte was analyzed for but not detected a “U” is entered.

- QC qualifier -- Specified entries and their meanings are as follows:

E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.

M - Duplicate injection precision was not met.

N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.

Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.

* - Duplicate analysis (relative percent difference) not within control limits.

# ALS Environmental -- FC

## Sample Number(s) Cross-Reference Table

**OrderNum:** 1308210
**Client Name:** Wright Water Engineers
**Client Project Name:** UDFCD Sediments
**Client Project Number:** 131013000
**Client PO Number:**

| Client Sample Number | Lab Sample Number | COC Number | Matrix | Date Collected | Time Collected |
|---|---|---|---|---|---|
| Site #2 | 1308210-1 | | SOIL | 12-Aug-13 | 9:45 |
| Site #5 | 1308210-2 | | SOIL | 12-Aug-13 | 10:30 |
| Site #6 | 1308210-3 | | SOIL | 12-Aug-13 | 11:00 |
| Site #7 | 1308210-4 | | SOIL | 12-Aug-13 | 12:00 |
| Site #9 | 1308210-5 | | SOIL | 12-Aug-13 | 13:30 |
| Site #1 | 1308210-6 | | SOIL | 12-Aug-13 | 14:40 |
| Site #12 | 1308210-7 | | SOIL | 12-Aug-13 | 15:10 |
| Site #10 | 1308210-8 | | SOIL | 13-Aug-13 | 8:30 |
| Site #4 | 1308210-9 | | SOIL | 13-Aug-13 | 9:45 |
| Site #11 | 1308210-10 | | SOIL | 13-Aug-13 | 11:00 |
| Site #2 | 1308210-11 | | LEACHAT | 12-Aug-13 | 9:45 |
| Site #5 | 1308210-12 | | LEACHAT | 12-Aug-13 | 10:30 |
| Site #6 | 1308210-13 | | LEACHAT | 12-Aug-13 | 11:00 |
| Site #7 | 1308210-14 | | LEACHAT | 12-Aug-13 | 12:00 |
| Site #9 | 1308210-15 | | LEACHAT | 12-Aug-13 | 13:30 |
| Site #1 | 1308210-16 | | LEACHAT | 12-Aug-13 | 14:40 |
| Site #12 | 1308210-17 | | LEACHAT | 12-Aug-13 | 15:10 |
| Site #10 | 1308210-18 | | LEACHAT | 13-Aug-13 | 8:30 |
| Site #4 | 1308210-19 | | LEACHAT | 13-Aug-13 | 9:45 |
| Site #11 | 1308210-20 | | LEACHAT | 13-Aug-13 | 11:00 |
| Trip Blank | 1308210-21 | | WATER | 07-Aug-13 | |

**ALS Laboratory Group**

225 Commerce Drive, Fort Collins, Colorado 80524
TF: (800) 443-1511 PH: (970) 490-1511 FX: (970) 490-1522

# Chain-of-Custody

Form 202r8

WORKORDER #: 1308210

| | | | |
|---|---|---|---|
| | | SAMPLER | |
| PROJECT NAME | UDFCD SEDIMENTS | SITE ID | |
| PROJECT No. | 131 013 000 | EDD FORMAT | |
| | | PURCHASE ORDER | |
| COMPANY NAME | WRIGHT WATER ENGINEERS | BILL TO COMPANY | |
| SEND REPORT TO | ELIOT WONG | INVOICE ATTN TO | |
| ADDRESS | 2490 W. 26th AVE, #100A | ADDRESS | |
| CITY / STATE / ZIP | DENVER / CO / 80211 | CITY / STATE / ZIP | |
| PHONE | 303 480 1700 | PHONE | |
| FAX | 303 480 1020 | FAX | |
| E-MAIL | ewong@wrightwater.com | E-MAIL | |

DATE: 8-13-13
PAGE: 1 of 1
TURNAROUND:
DISPOSAL: [✓ By Lab] or Return to Client

| Lab ID | Field ID | Matrix | Sample Date | Sample Time | # Bottles | Pres. | QC | TCLP - FULL SUITE | PAINT FILTER | IGNITABILITY / REACTIVITY / PH | BTEX | PAHS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ① | Site #2 | S | 8/12/13 | 9:45AM | 3 | N/A | N/A ⑪ | X | X | | | X |
| ② | Site #5 | S | 8/12/13 | 10:30AM | 2 | N/A | N/A ⑫ | X | X | | | |
| ③ | Site #6 | S | 8/12/13 | 11:00AM | 3 | N/A | N/A ⑬ | X | X | X | | |
| ④ | Site #7 | S | 8/12/13 | 12:00PM | 4 | N/A | N/A ⑭ | X | X | X | X | |
| ⑤ | Site #9 | S | 8/12/13 | 13:30 | 3 | N/A | N/A ⑮ | X | X | | X | |
| ⑥ | Site #1 | S | 8/12/13 | 14:40 | 2 | N/A | N/A ⑯ | X | X | | | |
| ⑦ | Site #12 | S | 8/12/13 | 15:10 | 3 | N/A | N/A ⑰ | X | X | | | X |
| ⑧ | Site #10 | S | 8/13/13 | 8:30AM | 4 | N/A | N/A ⑱ | X | X | X | | X |
| ⑨ | Site #4 | S | 8/13/13 | 9:45AM | 5 | N/A | N/A ⑲ | X | X | X | X | X |
| ⑩ | Site #11 | S | 8/13/13 | 11:00AM | 5 | N/A | N/A ⑳ | X | X | X | X | X |

*Time Zone (Circle): EST CST [✓ MST] PST Matrix: O = oil [✓ S = soil] NS = non-soil solid W = water L = liquid E = extract F = filter

For metals or anions, please detail analytes below.

Comments:

㉑ TB

| QC PACKAGE (check below) | |
|---|---|
| ☐ | LEVEL II (Standard QC) |
| ☐ | LEVEL III (Std QC + forms) |
| ☐ | LEVEL IV (Std QC + forms + raw data) |
| ☐ | |

Preservative Key: 1-HCl 2-HNO3 3-H2SO4 4-NaOH 5-NaHSO4 7-Other 8-4 degrees C 9-5035

| | SIGNATURE | PRINTED NAME | DATE | TIME |
|---|---|---|---|---|
| RELINQUISHED BY | Julia Traylor | Julia Traylor | 8/13/13 | 1420 |
| RECEIVED BY | | Lauren Schmitz | [illegible]13 | 1420 |
| RELINQUISHED BY | | | | |
| RECEIVED BY | | | | |
| RELINQUISHED BY | | | | |
| RECEIVED BY | | | | |

**ALS Environmental - Fort Collins**

**CONDITION OF SAMPLE UPON RECEIPT FORM**

Client: Wright Water Eng. Workorder No: 1308210

Project Manager: ARW Initials: JAS Date: 8/13/13

| | | | |
|---|---|---|---|
| 1. Does this project require any special handling in addition to standard ALS procedures? | | YES | [✓ NO] |
| 2. Are custody seals on shipping containers intact? | NONE | [✓ YES] | NO |
| 3. Are Custody seals on sample containers intact? | [✓ NONE] | YES | NO |
| 4. Is there a COC (Chain-of-Custody) present or other representative documents? | | [✓ YES] | NO |
| 5. Are the COC and bottle labels complete and legible? | | [✓ YES] | NO |
| 6. Is the COC in agreement with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.) | | [✓ YES] | NO |
| 7. Were airbills / shipping documents present and/or removable? | [✓ DROP OFF] | YES | NO |
| 8. Are all aqueous samples requiring preservation preserved correctly? (excluding volatiles) | [✓ N/A] | YES | NO |
| 9. Are all aqueous non-preserved samples pH 4-9? | [✓ N/A] | YES | NO |
| 10. Is there sufficient sample for the requested analyses? | | [✓ YES] | NO |
| 11. Were all samples placed in the proper containers for the requested analyses? | | [✓ YES] | NO |
| 12. Are all samples within holding times for the requested analyses? | | [✓ YES] | NO |
| 13. Were all sample containers received intact? (not broken or leaking, etc.) | | [✓ YES] | NO |
| 14. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) headspace free? Size of bubble: ____ < green pea ____ > green pea | N/A | [✓ YES] | NO |
| 15. Do any water samples contain sediment? Amount<br>Amount of sediment: ____ dusting ____ moderate ____ heavy | N/A | YES | [✓ NO] |
| 16. Were the samples shipped on ice? | | [✓ YES] | NO |
| 17. Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: [✓ #2] #4 | RAD ONLY | YES | [✓ NO] |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Cooler #: | 1 | | | | | | | |
| Temperature (°C): | 8.0°C | | | | | | | |
| No. of custody seals on cooler: | 2 | | | | | | | |
| DOT Survey/ Acceptance Information — External µR/hr reading: | N/A | | | | | | | |
| Background µR/hr reading: | 10 | | | | | | | |

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? YES / NO / [✓ NA] (If no, see Form 008.)

**Additional Information:** PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16.

* Trip Blank not listed on COC. Added as 1308210-21.

If applicable, was the client contacted? YES / NO / [✓ NA] Contact: ____________ Date/Time: ____________

**Project Manager Signature / Date:** 8/13/13

*IR Gun #2: Oakton, SN 29922500201-0066
*IR Gun #4: Oakton, SN 2372220101-0002

Form 201r24.xls (06/04/2012)

Page 1 of 1

# TCLP ICP Metals

## Method SW6010 Revision B--TCLP Leachate

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

---

**Field ID:** Site #2
**Lab ID:** 1308210-11
**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 12-Aug-13
**Date Extracted:** 16-Aug-13
**Date Analyzed:** 19-Aug-13
**Prep Method:** SW3010 Rev A

**Prep Batch:** IP130816-2
**QCBatchID:** IP130816-2-1
**Run ID:** IT130819-2A1
**Cleanup:** NONE
**Basis:** As Received
**File Name:** 130819A.

**Analyst:** Steve Workman
**Sample Aliquot:** 5 G
**Final Volume:** 50 G
**Result Units:** MG/L
**Clean DF:** 1

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 7440-38-2 | ARSENIC | 1 | 0.1 | 0.1 | U | |
| 7440-39-3 | BARIUM | 1 | 1 | 1 | U | |
| 7440-43-9 | CADMIUM | 1 | 0.05 | 0.05 | U | |
| 7440-47-3 | CHROMIUM | 1 | 0.1 | 0.1 | U | |
| 7439-92-1 | LEAD | 1 | 0.03 | 0.03 | U | |
| 7782-49-2 | SELENIUM | 1 | 0.05 | 0.05 | U | |
| 7440-22-4 | SILVER | 1 | 0.1 | 0.1 | U | |

**Data Package ID:** *it1308210-1*

# TCLP ICP Metals

## Method SW6010 Revision B--TCLP Leachate

## Sample Results

**Lab Name:** **ALS Environmental -- FC**

**Work Order Number:** 1308210

**Client Name:** Wright Water Engineers

**ClientProject ID:** UDFCD Sediments 131013000

---

| | |
|---|---|
| **Field ID:** | Site #5 |
| **Lab ID:** | 1308210-12 |

**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 12-Aug-13
**Date Extracted:** 16-Aug-13
**Date Analyzed:** 19-Aug-13
**Prep Method:** SW3010 Rev A

**Prep Batch:** IP130816-2
**QCBatchID:** IP130816-2-1
**Run ID:** IT130819-2A1
**Cleanup:** NONE
**Basis:** As Received
**File Name:** 130819A.

**Analyst:** Steve Workman
**Sample Aliquot:** 5 G
**Final Volume:** 50 G
**Result Units:** MG/L
**Clean DF:** 1

---

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 7440-38-2 | ARSENIC | 1 | 0.1 | 0.1 | U | |
| 7440-39-3 | BARIUM | 1 | 1.6 | 1 | | |
| 7440-43-9 | CADMIUM | 1 | 0.05 | 0.05 | U | |
| 7440-47-3 | CHROMIUM | 1 | 0.1 | 0.1 | U | |
| 7439-92-1 | LEAD | 1 | 0.03 | 0.03 | U | |
| 7782-49-2 | SELENIUM | 1 | 0.1 | 0.05 | | |
| 7440-22-4 | SILVER | 1 | 0.1 | 0.1 | U | |

**Data Package ID:** *it1308210-1*

# TCLP ICP Metals

## Method SW6010 Revision B--TCLP Leachate

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

---

| | |
|---|---|
| **Field ID:** | Site #6 |
| **Lab ID:** | 1308210-13 |

**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 12-Aug-13
**Date Extracted:** 16-Aug-13
**Date Analyzed:** 19-Aug-13
**Prep Method:** SW3010 Rev A

**Prep Batch:** IP130816-2
**QCBatchID:** IP130816-2-1
**Run ID:** IT130819-2A1
**Cleanup:** NONE
**Basis:** As Received
**File Name:** 130819A.

**Analyst:** Steve Workman
**Sample Aliquot:** 5 G
**Final Volume:** 50 G
**Result Units:** MG/L
**Clean DF:** 1

---

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 7440-38-2 | ARSENIC | 1 | 0.1 | 0.1 | U | |
| 7440-39-3 | BARIUM | 1 | 1 | 1 | U | |
| 7440-43-9 | CADMIUM | 1 | 0.05 | 0.05 | U | |
| 7440-47-3 | CHROMIUM | 1 | 0.1 | 0.1 | U | |
| 7439-92-1 | LEAD | 1 | 0.03 | 0.03 | U | |
| 7782-49-2 | SELENIUM | 1 | 0.05 | 0.05 | U | |
| 7440-22-4 | SILVER | 1 | 0.1 | 0.1 | U | |

**Data Package ID:** *it1308210-1*

# TCLP ICP Metals

## Method SW6010 Revision B--TCLP Leachate

## Sample Results

| | |
|---|---|
| **Lab Name:** | **ALS Environmental -- FC** |
| **Work Order Number:** | 1308210 |
| **Client Name:** | Wright Water Engineers |
| **ClientProject ID:** | UDFCD Sediments 131013000 |

| | |
|---|---|
| **Field ID:** | Site #7 |
| **Lab ID:** | 1308210-14 |

**LEACH DATE: 8/15/2013**

| | | | | | |
|---|---|---|---|---|---|
| **Sample Matrix:** | LEACHATE | **Prep Batch:** | IP130816-2 | **Analyst:** | Steve Workman |
| **% Moisture:** | N/A | **QCBatchID:** | IP130816-2-1 | **Sample Aliquot:** | 5 G |
| **Date Collected:** | 12-Aug-13 | **Run ID:** | IT130819-2A1 | **Final Volume:** | 50 G |
| **Date Extracted:** | 16-Aug-13 | **Cleanup:** | NONE | **Result Units:** | MG/L |
| **Date Analyzed:** | 19-Aug-13 | **Basis:** | As Received | **Clean DF:** | 1 |
| **Prep Method:** | SW3010 Rev A | **File Name:** | 130819A. | | |

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 7440-38-2 | ARSENIC | 1 | 0.1 | 0.1 | U | |
| 7440-39-3 | BARIUM | 1 | 1 | 1 | U | |
| 7440-43-9 | CADMIUM | 1 | 0.05 | 0.05 | U | |
| 7440-47-3 | CHROMIUM | 1 | 0.1 | 0.1 | U | |
| 7439-92-1 | LEAD | 1 | 0.21 | 0.03 | | |
| 7782-49-2 | SELENIUM | 1 | 0.05 | 0.05 | U | |
| 7440-22-4 | SILVER | 1 | 0.1 | 0.1 | U | |

**Data Package ID:** *it1308210-1*

# TCLP ICP Metals

## Method SW6010 Revision B--TCLP Leachate

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

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**Field ID:** Site #9
**Lab ID:** 1308210-15
**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 12-Aug-13
**Date Extracted:** 16-Aug-13
**Date Analyzed:** 19-Aug-13
**Prep Method:** SW3010 Rev A

**Prep Batch:** IP130816-2
**QCBatchID:** IP130816-2-1
**Run ID:** IT130819-2A1
**Cleanup:** NONE
**Basis:** As Received
**File Name:** 130819A.

**Analyst:** Steve Workman
**Sample Aliquot:** 5 G
**Final Volume:** 50 G
**Result Units:** MG/L
**Clean DF:** 1

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 7440-38-2 | ARSENIC | 1 | 0.1 | 0.1 | U | |
| 7440-39-3 | BARIUM | 1 | 1 | 1 | U | |
| 7440-43-9 | CADMIUM | 1 | 0.05 | 0.05 | U | |
| 7440-47-3 | CHROMIUM | 1 | 0.1 | 0.1 | U | |
| 7439-92-1 | LEAD | 1 | 0.03 | 0.03 | U | |
| 7782-49-2 | SELENIUM | 1 | 0.05 | 0.05 | U | |
| 7440-22-4 | SILVER | 1 | 0.1 | 0.1 | U | |

**Data Package ID:** *it1308210-1*

# TCLP ICP Metals

## Method SW6010 Revision B--TCLP Leachate

## Sample Results

**Lab Name:** **ALS Environmental -- FC**

**Work Order Number:** 1308210

**Client Name:** Wright Water Engineers

**ClientProject ID:** UDFCD Sediments 131013000

---

**Field ID:** Site #1

**Lab ID:** 1308210-16

**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 12-Aug-13
**Date Extracted:** 16-Aug-13
**Date Analyzed:** 19-Aug-13
**Prep Method:** SW3010 Rev A

**Prep Batch:** IP130816-2
**QCBatchID:** IP130816-2-1
**Run ID:** IT130819-2A1
**Cleanup:** NONE
**Basis:** As Received
**File Name:** 130819A.

**Analyst:** Steve Workman
**Sample Aliquot:** 5 G
**Final Volume:** 50 G
**Result Units:** MG/L
**Clean DF:** 1

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 7440-38-2 | ARSENIC | 1 | 0.1 | 0.1 | U | |
| 7440-39-3 | BARIUM | 1 | 1 | 1 | U | |
| 7440-43-9 | CADMIUM | 1 | 0.05 | 0.05 | U | |
| 7440-47-3 | CHROMIUM | 1 | 0.1 | 0.1 | U | |
| 7439-92-1 | LEAD | 1 | 0.03 | 0.03 | U | |
| 7782-49-2 | SELENIUM | 1 | 0.05 | 0.05 | U | |
| 7440-22-4 | SILVER | 1 | 0.1 | 0.1 | U | |

**Data Package ID:** *it1308210-1*

# TCLP ICP Metals

## Method SW6010 Revision B--TCLP Leachate

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

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| | |
|---|---|
| **Field ID:** | Site #12 |
| **Lab ID:** | 1308210-17 |

**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 12-Aug-13
**Date Extracted:** 16-Aug-13
**Date Analyzed:** 19-Aug-13
**Prep Method:** SW3010 Rev A

**Prep Batch:** IP130816-2
**QCBatchID:** IP130816-2-1
**Run ID:** IT130819-2A1
**Cleanup:** NONE
**Basis:** As Received
**File Name:** 130819A.

**Analyst:** Steve Workman
**Sample Aliquot:** 5 G
**Final Volume:** 50 G
**Result Units:** MG/L
**Clean DF:** 1

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 7440-38-2 | ARSENIC | 1 | 0.1 | 0.1 | U | |
| 7440-39-3 | BARIUM | 1 | 1 | 1 | U | |
| 7440-43-9 | CADMIUM | 1 | 0.05 | 0.05 | U | |
| 7440-47-3 | CHROMIUM | 1 | 0.1 | 0.1 | U | |
| 7439-92-1 | LEAD | 1 | 0.03 | 0.03 | U | |
| 7782-49-2 | SELENIUM | 1 | 0.05 | 0.05 | U | |
| 7440-22-4 | SILVER | 1 | 0.1 | 0.1 | U | |

**Data Package ID:** *it1308210-1*

# TCLP ICP Metals

## Method SW6010 Revision B--TCLP Leachate

## Sample Results

**Lab Name:** **ALS Environmental -- FC**

**Work Order Number:** 1308210

**Client Name:** Wright Water Engineers

**ClientProject ID:** UDFCD Sediments 131013000

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**Field ID:** Site #10

**Lab ID:** 1308210-18

**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 13-Aug-13
**Date Extracted:** 16-Aug-13
**Date Analyzed:** 19-Aug-13
**Prep Method:** SW3010 Rev A

**Prep Batch:** IP130816-2
**QCBatchID:** IP130816-2-1
**Run ID:** IT130819-2A1
**Cleanup:** NONE
**Basis:** As Received
**File Name:** 130819A.

**Analyst:** Steve Workman
**Sample Aliquot:** 5 G
**Final Volume:** 50 G
**Result Units:** MG/L
**Clean DF:** 1

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 7440-38-2 | ARSENIC | 1 | 0.1 | 0.1 | U | |
| 7440-39-3 | BARIUM | 1 | 1 | 1 | U | |
| 7440-43-9 | CADMIUM | 1 | 0.05 | 0.05 | U | |
| 7440-47-3 | CHROMIUM | 1 | 0.1 | 0.1 | U | |
| 7439-92-1 | LEAD | 1 | 0.12 | 0.03 | | |
| 7782-49-2 | SELENIUM | 1 | 0.05 | 0.05 | | |
| 7440-22-4 | SILVER | 1 | 0.1 | 0.1 | U | |

**Data Package ID:** *it1308210-1*

# TCLP ICP Metals

## Method SW6010 Revision B--TCLP Leachate

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

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**Field ID:** Site #4
**Lab ID:** 1308210-19
**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 13-Aug-13
**Date Extracted:** 16-Aug-13
**Date Analyzed:** 19-Aug-13
**Prep Method:** SW3010 Rev A

**Prep Batch:** IP130816-2
**QCBatchID:** IP130816-2-1
**Run ID:** IT130819-2A1
**Cleanup:** NONE
**Basis:** As Received
**File Name:** 130819A.

**Analyst:** Steve Workman
**Sample Aliquot:** 5 G
**Final Volume:** 50 G
**Result Units:** MG/L
**Clean DF:** 1

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 7440-38-2 | ARSENIC | 1 | 0.1 | 0.1 | U | |
| 7440-39-3 | BARIUM | 1 | 1 | 1 | U | |
| 7440-43-9 | CADMIUM | 1 | 0.05 | 0.05 | U | |
| 7440-47-3 | CHROMIUM | 1 | 0.1 | 0.1 | U | |
| 7439-92-1 | LEAD | 1 | 0.03 | 0.03 | U | |
| 7782-49-2 | SELENIUM | 1 | 0.05 | 0.05 | U | |
| 7440-22-4 | SILVER | 1 | 0.1 | 0.1 | U | |

**Data Package ID:** *it1308210-1*

# TCLP ICP Metals

## Method SW6010 Revision B--TCLP Leachate

## Sample Results

**Lab Name:** **ALS Environmental -- FC**

**Work Order Number:** 1308210

**Client Name:** Wright Water Engineers

**ClientProject ID:** UDFCD Sediments 131013000

| | |
|---|---|
| **Field ID:** | Site #11 |
| **Lab ID:** | 1308210-20 |

**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 13-Aug-13
**Date Extracted:** 16-Aug-13
**Date Analyzed:** 19-Aug-13
**Prep Method:** SW3010 Rev A

**Prep Batch:** IP130816-2
**QCBatchID:** IP130816-2-1
**Run ID:** IT130819-2A1
**Cleanup:** NONE
**Basis:** As Received
**File Name:** 130819A.

**Analyst:** Steve Workman
**Sample Aliquot:** 5 G
**Final Volume:** 50 G
**Result Units:** MG/L
**Clean DF:** 1

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 7440-38-2 | ARSENIC | 1 | 0.1 | 0.1 | U | |
| 7440-39-3 | BARIUM | 1 | 1 | 1 | | |
| 7440-43-9 | CADMIUM | 1 | 0.05 | 0.05 | U | |
| 7440-47-3 | CHROMIUM | 1 | 0.1 | 0.1 | U | |
| 7439-92-1 | LEAD | 1 | 0.03 | 0.03 | U | |
| 7782-49-2 | SELENIUM | 1 | 0.05 | 0.05 | U | |
| 7440-22-4 | SILVER | 1 | 0.1 | 0.1 | U | |

**Data Package ID:** *it1308210-1*

# TCLP MERCURY

## Method SW7470 Revision A

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Client Name:** Wright Water Engineers
**Client Project ID:** UDFCD Sediments 131013000
**Work Order Number:** 1308210
**Reporting Basis:** As Received
**Prep Method:** METHOD
**Analyst:** Brent A. Stanfield

**Final Volume:** 20 ml
**Matrix:** LEACHATE
**Result Units:** MG/L

| Client Sample ID | Lab ID | Date Collected | Date Prepared | Date Analyzed | Percent Moisture | Dilution Factor | Result | RptLimit LOD/LOQ | Flag | Sample Aliquot |
|---|---|---|---|---|---|---|---|---|---|---|
| Site #2 | 1308210-11 | 08/12/2013 | 08/16/2013 | 08/19/2013 | N/A | 1 | 0.002 | 0.002 | U | 2 g |
| Site #5 | 1308210-12 | 08/12/2013 | 08/16/2013 | 08/19/2013 | N/A | 1 | 0.002 | 0.002 | U | 2 g |
| Site #6 | 1308210-13 | 08/12/2013 | 08/16/2013 | 08/19/2013 | N/A | 1 | 0.002 | 0.002 | U | 2 g |
| Site #7 | 1308210-14 | 08/12/2013 | 08/16/2013 | 08/19/2013 | N/A | 1 | 0.002 | 0.002 | U | 2 g |
| Site #9 | 1308210-15 | 08/12/2013 | 08/16/2013 | 08/19/2013 | N/A | 1 | 0.002 | 0.002 | U | 2 g |
| Site #1 | 1308210-16 | 08/12/2013 | 08/16/2013 | 08/19/2013 | N/A | 1 | 0.002 | 0.002 | U | 2 g |
| Site #12 | 1308210-17 | 08/12/2013 | 08/16/2013 | 08/19/2013 | N/A | 1 | 0.002 | 0.002 | U | 2 g |
| Site #10 | 1308210-18 | 08/13/2013 | 08/16/2013 | 08/19/2013 | N/A | 1 | 0.002 | 0.002 | U | 2 g |
| Site #4 | 1308210-19 | 08/13/2013 | 08/16/2013 | 08/19/2013 | N/A | 1 | 0.002 | 0.002 | U | 2 g |
| Site #11 | 1308210-20 | 08/13/2013 | 08/16/2013 | 08/19/2013 | N/A | 1 | 0.002 | 0.002 | U | 2 g |

### Comments:

1. ND or U = Not Detected at or above the client requested detection limit.

**Data Package ID:** *hg1308210-1*

# ICP Metals

## Method SW6010B--Leachate
## Method Blank

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

---

**Lab ID:** EX130815-11MB

**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** N/A
**Date Extracted:** 16-Aug-13
**Date Analyzed:** 19-Aug-13
**Prep Method:** SW3010 Rev A

**Prep Batch:** IP130816-2
**QCBatchID:** IP130816-2-1
**Run ID:** IT130819-2A1
**Cleanup:** NONE
**Basis:** N/A
**File Name:** 130819A.

**Sample Aliquot:** 5 g
**Final Volume:** 50 g
**Result Units:** MG/L
**Clean DF:** 1

---

| CASNO | Target Analyte | DF | Result | RptLimit LOD/LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 7440-38-2 | ARSENIC | 1 | 0.1 | 0.1 | U | |
| 7440-39-3 | BARIUM | 1 | 1 | 1 | U | |
| 7440-43-9 | CADMIUM | 1 | 0.05 | 0.05 | U | |
| 7440-47-3 | CHROMIUM | 1 | 0.1 | 0.1 | U | |
| 7439-92-1 | LEAD | 1 | 0.03 | 0.03 | U | |
| 7782-49-2 | SELENIUM | 1 | 0.05 | 0.05 | U | |
| 7440-22-4 | SILVER | 1 | 0.1 | 0.1 | U | |

**Data Package ID:** *it1308210-1*

# ICP Metals

## Method SW6010B--Leachate
## Laboratory Control Sample

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

| | | | |
|---|---|---|---|
| **Lab ID:** EX130815-11LCS | **Sample Matrix:** LEACHATE | **Prep Batch:** IP130816-2 | **Sample Aliquot:** 5 g |
| | **% Moisture:** N/A | **QCBatchID:** IP130816-2-1 | **Final Volume:** 50 g |
| | **Date Collected:** N/A | **Run ID:** IT130819-2A1 | **Result Units:** MG/L |
| **LEACH DATE: 8/15/2013** | **Date Extracted:** 08/16/2013 | **Cleanup:** NONE | **Clean DF:** 1 |
| | **Date Analyzed:** 08/19/2013 | **Basis:** N/A | |
| | **Prep Method:** SW3010A | **File Name:** 130819A. | |

| CASNO | Target Analyte | Spike Added | LCS Result | Reporting Limit | Result Qualifier | LCS % Rec. | Control Limits |
|---|---|---|---|---|---|---|---|
| 7440-38-2 | ARSENIC | 10 | 9.95 | 0.1 | | 100 | 80 - 120% |
| 7440-39-3 | BARIUM | 10 | 10.3 | 1 | | 103 | 80 - 120% |
| 7440-43-9 | CADMIUM | 0.5 | 0.505 | 0.05 | | 101 | 80 - 120% |
| 7440-47-3 | CHROMIUM | 2 | 1.99 | 0.1 | | 99 | 80 - 120% |
| 7439-92-1 | LEAD | 5 | 4.82 | 0.03 | | 96 | 80 - 120% |
| 7782-49-2 | SELENIUM | 20 | 18.4 | 0.05 | | 92 | 80 - 120% |
| 7440-22-4 | SILVER | 1 | 1 | 0.1 | | 100 | 80 - 120% |

**Data Package ID:** *it1308210-1*

# ICP Metals

## Method SW6010B--Leachate
## Matrix Spike And Matrix Spike Duplicate

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Field ID:** | Site #2 | **Sample Matrix:** | LEACHATE | **Prep Batch:** | IP130816-2 | **Sample Aliquot:** | 5 g |
| **LabID:** | 1308210-11MS | **% Moisture:** | N/A | **QCBatchID:** | IP130816-2-1 | **Final Volume:** | 50 g |
| | | **Date Collected:** | 12-Aug-13 | **Run ID:** | IT130819-2A1 | **Result Units:** | MG/L |
| **LEACH DATE:** | **8/15/2013** | **Date Extracted:** | 16-Aug-13 | **Cleanup:** | NONE | **File Name:** | 130819A. |
| | | **Date Analyzed:** | 19-Aug-13 | **Basis:** | As Received | | |
| | | **Prep Method:** | SW3010 Rev A | | | | |

| CASNO | Target Analyte | Sample Result | Samp Qual | MS Result | MS Qual | Reporting Limit | Spike Added | MS % Rec. | Control Limits |
|---|---|---|---|---|---|---|---|---|---|
| 7440-38-2 | ARSENIC | 0.1 | U | 10 | | 0.1 | 10 | 100 | 80 - 120% |
| 7440-39-3 | BARIUM | 1 | U | 10.7 | | 1 | 10 | 107 | 80 - 120% |
| 7440-43-9 | CADMIUM | 0.05 | U | 0.506 | | 0.05 | 0.5 | 101 | 80 - 120% |
| 7440-47-3 | CHROMIUM | 0.1 | U | 1.98 | | 0.1 | 2 | 99 | 80 - 120% |
| 7439-92-1 | LEAD | 0.03 | U | 4.79 | | 0.03 | 5 | 96 | 80 - 120% |
| 7782-49-2 | SELENIUM | 0.05 | U | 18.2 | | 0.05 | 20 | 91 | 80 - 120% |
| 7440-22-4 | SILVER | 0.1 | U | 0.992 | | 0.1 | 1 | 99 | 80 - 120% |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Field ID:** | Site #2 | **Sample Matrix:** | LEACHATE | **Prep Batch:** | IP130816-2 | **Sample Aliquot:** | 5 g |
| **LabID:** | 1308210-11MSD | **% Moisture:** | N/A | **QCBatchID:** | IP130816-2-1 | **Final Volume:** | 50 g |
| | | **Date Collected:** | 12-Aug-13 | **Run ID:** | IT130819-2A1 | **Result Units:** | MG/L |
| **LEACH DATE:** | **8/15/2013** | **Date Extracted:** | 16-Aug-13 | **Cleanup:** | NONE | **File Name:** | 130819A. |
| | | **Date Analyzed:** | 19-Aug-13 | **Basis:** | As Received | | |
| | | **Prep Method:** | SW3010 Rev A | | | | |

| CASNO | Target Analyte | MSD Result | MSD Qual | Spike Added | MSD % Rec. | Reporting Limit | RPD Limit | RPD |
|---|---|---|---|---|---|---|---|---|
| 7440-38-2 | ARSENIC | 10 | | 10 | 100 | 0.1 | 20 | 0 |
| 7440-39-3 | BARIUM | 10.7 | | 10 | 107 | 1 | 20 | 0 |
| 7440-43-9 | CADMIUM | 0.513 | | 0.5 | 103 | 0.05 | 20 | 1 |
| 7440-47-3 | CHROMIUM | 1.97 | | 2 | 99 | 0.1 | 20 | 0 |
| 7439-92-1 | LEAD | 4.83 | | 5 | 97 | 0.03 | 20 | 1 |
| 7782-49-2 | SELENIUM | 18.5 | | 20 | 93 | 0.05 | 20 | 2 |
| 7440-22-4 | SILVER | 0.994 | | 1 | 99 | 0.1 | 20 | 0 |

**Data Package ID:** *it1308210-1*

# Mercury

## Method SW7470A--Leachate

## Method Blank

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

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| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Lab ID:** EX130815-11MB | **Sample Matrix:** LEACHATE | **Prep Batch:** HG130816-1 | **Sample Aliquot:** 2 g |
| | **% Moisture:** N/A | **QCBatchID:** HG130816-1-1 | **Final Volume:** 20 ml |
| | **Date Collected:** N/A | **Run ID:** HG130819-1A1 | **Result Units:** MG/L |
| **LEACH DATE: 8/15/2013** | **Date Extracted:** 16-Aug-13 | **Cleanup:** NONE | **Clean DF:** 1 |
| | **Date Analyzed:** 19-Aug-13 | **Basis:** N/A | |
| | **Prep Method:** METHOD | **File Name:** HG130819-1 | |

| CASNO | Target Analyte | DF | Result | RptLimit LOD/LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 7439-97-6 | MERCURY | 1 | 0.002 | 0.002 | U | |

**Data Package ID:** *hg1308210-1*

# Mercury

## Method SW7470A--Leachate

## Laboratory Control Sample

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

---

**Lab ID:** EX130815-11LCS

**LEACH DATE: 8/15/2013**

| | | | | | |
|---|---|---|---|---|---|
| **Sample Matrix:** | LEACHATE | **Prep Batch:** | HG130816-1 | **Sample Aliquot:** | 2 g |
| **% Moisture:** | N/A | **QCBatchID:** | HG130816-1-1 | **Final Volume:** | 20 ml |
| **Date Collected:** | N/A | **Run ID:** | HG130819-1A1 | **Result Units:** | MG/L |
| **Date Extracted:** | 08/16/2013 | **Cleanup:** | NONE | **Clean DF:** | 1 |
| **Date Analyzed:** | 08/19/2013 | **Basis:** | N/A | | |
| **Prep Method:** | METHOD | **File Name:** | HG130819-1 | | |

| CASNO | Target Analyte | Spike Added | LCS Result | Reporting Limit | Result Qualifier | LCS % Rec. | Control Limits |
|---|---|---|---|---|---|---|---|
| 7439-97-6 | MERCURY | 0.01 | 0.0104 | 0.002 | | 104 | 80 - 120% |

**Data Package ID:** *hg1308210-1*

# Mercury

## Method SW7470A--Leachate

## Matrix Spike And Matrix Spike Duplicate

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

**Field ID:** Site #2
**LabID:** 1308210-11MS

**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 12-Aug-13
**Date Extracted:** 16-Aug-13
**Date Analyzed:** 19-Aug-13
**Prep Method:** METHOD

**Prep Batch:** HG130816-1
**QCBatchID:** HG130816-1-1
**Run ID:** HG130819-1A1
**Cleanup:** NONE
**Basis:** As Received

**Sample Aliquot:** 2 g
**Final Volume:** 20 ml
**Result Units:** MG/L
**File Name:** HG130819-1

| CASNO | Target Analyte | Sample Result | Samp Qual | MS Result | MS Qual | Reporting Limit | Spike Added | MS % Rec. | Control Limits |
|---|---|---|---|---|---|---|---|---|---|
| 7439-97-6 | MERCURY | 0.002 | U | 0.0209 | | 0.002 | 0.02 | 104 | 80 - 120% |

**Field ID:** Site #2
**LabID:** 1308210-11MSD

**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 12-Aug-13
**Date Extracted:** 16-Aug-13
**Date Analyzed:** 19-Aug-13
**Prep Method:** METHOD

**Prep Batch:** HG130816-1
**QCBatchID:** HG130816-1-1
**Run ID:** HG130819-1A1
**Cleanup:** NONE
**Basis:** As Received

**Sample Aliquot:** 2 g
**Final Volume:** 20 ml
**Result Units:** MG/L
**File Name:** HG130819-1

| CASNO | Target Analyte | MSD Result | MSD Qual | Spike Added | MSD % Rec. | Reporting Limit | RPD Limit | RPD |
|---|---|---|---|---|---|---|---|---|
| 7439-97-6 | MERCURY | 0.0209 | | 0.02 | 104 | 0.002 | 20 | 0 |

**Data Package ID:** *hg1308210-1*

# Pesticides

## Case Narrative

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# Wright Water Engineers

## UDFCD Sediments -- 131013000

### Work Order Number: 1308210

1. This report consists of 10 leachates from soil samples. The samples were received intact by ALS on 08/13/2013. The samples were received at 8.0$^{o}$ Celsius.

2. These samples were extracted and analyzed according to SW-846, 3rd Edition procedures. Specifically, the samples were processed through leaching procedures following the current revision of SOP 609 based on Method 1311. The leachates were then extracted using continuous liquid-liquid extractors, according to the current revision of SOP 617 based on Method 3520C.

3. The extracts were then analyzed using GC/ECD (electron capture detectors) with a RTX-440 capillary column according to the current revision of SOP 402 based on Method 8081A. All positive results were then confirmed on a RTX-CLPesticides II column. Unless interferences were present, the quantitation of each analyte is the higher of the concentrations obtained from each column that met initial and continuing calibration criteria. Note that analyst raw data annotation may provide further clarification.

4. The breakdown for endrin and 4,4'-DDT met acceptance criteria.

5. All initial and continuing calibration criteria were met.

6. The method blank associated with this project was below the MDL for all analytes.

7. All laboratory control sample and laboratory control sample duplicate recoveries and RPDs were within the acceptance criteria.

8. Sample 1308210-14 was designated as the quality control sample for this analysis.

   Similarity of matrix and therefore relevance of the QC results should not be automatically inferred for any sample other than the native sample selected for QC.

All matrix spike recoveries were within acceptance criteria.

9. All samples were extracted and analyzed within the established holding times.

10. All surrogate recoveries were within acceptable limits with the following exceptions:

| Surrogate | Sample | Direction |
|---|---|---|
| Decachlorobiphenyl | LCSD | High |

It is the practice of ALS to evaluate the recovery of both surrogates in samples and associated quality control samples, but to control on only one of the two surrogates for this test.

11. Manual integrations are performed when needed to provide consistent and defensible data following the guidelines in the current revision of SOP 939.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Mindy Norton

Mindy Norton
Organics Primary Data Reviewer

8/27/13
Date

Dan Sheneman

Organics Final Data Reviewer

08/27/13
Date

*ALS*
*Data Qualifier Flags*
*Chromatography and Mass Spectrometry*

| | |
|---|---|
| U or ND: | **This flag indicates that the compound was analyzed for but not detected.** |
| **J:** | **This flag indicates an estimated value. This flag is used as follows : (1) when estimating a concentration for tentatively identified compounds (TICs) where a 1:1 response is assumed; (2) when the mass spectral and retention time data indicate the presence of a compound that meets the volatile and semivolatile GC/MS identification criteria, and the result is less than the reporting limit (RL) but greater than the method detection limit (MDL); (3) when the data indicate the presence of a compound that meets the identification criteria, and the result is less than the RL but greater than the MDL; and (4) the reported value is estimated.** |
| B: | **This flag is used when the analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user. This flag shall be used for a tentatively identified compound (TIC) as well as for a positively identified target compound.** |
| E: | **This flag identifies compounds whose concentration exceeds the upper level of the calibration range.** |
| A: | **This flag indicates that a tentatively identified compound is a suspected aldol-condensation product.** |
| X: | **This flag indicates that the analyte was diluted below an accurate quantitation level.** |
| ***:** | **This flag indicates that a spike recovery is outside the control criteria.** |
| **+:** | **This flag indicates that the relative percent difference (RPD) exceeds the control criteria.** |

# ALS Environmental -- FC

## Sample Number(s) Cross-Reference Table

**OrderNum:** 1308210
**Client Name:** Wright Water Engineers
**Client Project Name:** UDFCD Sediments
**Client Project Number:** 131013000
**Client PO Number:**

| Client Sample Number | Lab Sample Number | COC Number | Matrix | Date Collected | Time Collected |
|---|---|---|---|---|---|
| Site #2 | 1308210-1 | | SOIL | 12-Aug-13 | 9:45 |
| Site #5 | 1308210-2 | | SOIL | 12-Aug-13 | 10:30 |
| Site #6 | 1308210-3 | | SOIL | 12-Aug-13 | 11:00 |
| Site #7 | 1308210-4 | | SOIL | 12-Aug-13 | 12:00 |
| Site #9 | 1308210-5 | | SOIL | 12-Aug-13 | 13:30 |
| Site #1 | 1308210-6 | | SOIL | 12-Aug-13 | 14:40 |
| Site #12 | 1308210-7 | | SOIL | 12-Aug-13 | 15:10 |
| Site #10 | 1308210-8 | | SOIL | 13-Aug-13 | 8:30 |
| Site #4 | 1308210-9 | | SOIL | 13-Aug-13 | 9:45 |
| Site #11 | 1308210-10 | | SOIL | 13-Aug-13 | 11:00 |
| Site #2 | 1308210-11 | | LEACHAT | 12-Aug-13 | 9:45 |
| Site #5 | 1308210-12 | | LEACHAT | 12-Aug-13 | 10:30 |
| Site #6 | 1308210-13 | | LEACHAT | 12-Aug-13 | 11:00 |
| Site #7 | 1308210-14 | | LEACHAT | 12-Aug-13 | 12:00 |
| Site #9 | 1308210-15 | | LEACHAT | 12-Aug-13 | 13:30 |
| Site #1 | 1308210-16 | | LEACHAT | 12-Aug-13 | 14:40 |
| Site #12 | 1308210-17 | | LEACHAT | 12-Aug-13 | 15:10 |
| Site #10 | 1308210-18 | | LEACHAT | 13-Aug-13 | 8:30 |
| Site #4 | 1308210-19 | | LEACHAT | 13-Aug-13 | 9:45 |
| Site #11 | 1308210-20 | | LEACHAT | 13-Aug-13 | 11:00 |
| Trip Blank | 1308210-21 | | WATER | 07-Aug-13 | |

**ALS Laboratory Group**

225 Commerce Drive, Fort Collins, Colorado 80524
TF: (800) 443-1511 PH: (970) 490-1511 FX: (970) 490-1522

# Chain-of-Custody

Form 202r8

WORKORDER #: 1308210

| | | | |
|---|---|---|---|
| | | SAMPLER | |
| PROJECT NAME | UDFCD SEDIMENTS | SITE ID | |
| PROJECT No. | 131 013 000 | EDD FORMAT | |
| | | PURCHASE ORDER | |
| COMPANY NAME | WRIGHT WATER ENGINEERS | BILL TO COMPANY | |
| SEND REPORT TO | ELIOT WONG | INVOICE ATTN TO | |
| ADDRESS | 2490 W. 26th AVE, #100A | ADDRESS | |
| CITY / STATE / ZIP | DENVER / CO / 80211 | CITY / STATE / ZIP | |
| PHONE | 303 480 1700 | PHONE | |
| FAX | 303 480 1020 | FAX | |
| E-MAIL | ewong@wrightwater.com | E-MAIL | |

DATE: 8-13-13

TURNAROUND:

PAGE: 1 of 1

DISPOSAL: [✓ By Lab] or Return to Client

| Lab ID | Field ID | Matrix | Sample Date | Sample Time | # Bottles | Pres. | QC | TCLP - FULL SUITE | PAINT FILTER | IGNITABILITY / REACTIVITY / PH | BTEX | PAHS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ① | Site #2 | S | 8/12/13 | 9:45AM | 3 | N/A | N/A ⑪ | X | X | | | X |
| ② | Site #5 | S | 8/12/13 | 10:30AM | 2 | N/A | N/A ⑫ | X | X | | | |
| ③ | Site #6 | S | 8/12/13 | 11:00AM | 3 | N/A | N/A ⑬ | X | X | X | | |
| ④ | Site #7 | S | 8/12/13 | 12:00PM | 4 | N/A | N/A ⑭ | X | X | X | X | |
| ⑤ | Site #9 | S | 8/12/13 | 13:30 | 3 | N/A | N/A ⑮ | X | X | | X | |
| ⑥ | Site #1 | S | 8/12/13 | 14:40 | 2 | N/A | N/A ⑯ | X | X | | | |
| ⑦ | Site #12 | S | 8/12/13 | 15:10 | 3 | N/A | N/A ⑰ | X | X | | | X |
| ⑧ | Site #10 | S | 8/13/13 | 8:30AM | 4 | N/A | N/A ⑱ | X | X | X | | X |
| ⑨ | Site #4 | S | 8/13/13 | 9:45AM | 5 | N/A | N/A ⑲ | X | X | X | X | X |
| ⑩ | Site #11 | S | 8/13/13 | 11:00AM | 5 | N/A | N/A ⑳ | X | X | X | X | X |

*Time Zone (Circle): EST CST [✓ MST] PST Matrix: O = oil [✓ S = soil] NS = non-soil solid W = water L = liquid E = extract F = filter

For metals or anions, please detail analytes below.

Comments:

㉑ TB

QC PACKAGE (check below)
- ☐ LEVEL II (Standard QC)
- ☐ LEVEL III (Std QC + forms)
- ☐ LEVEL IV (Std QC + forms + raw data)

| | SIGNATURE | PRINTED NAME | DATE | TIME |
|---|---|---|---|---|
| RELINQUISHED BY | Julia Traylor | Julia Traylor | 8/13/13 | 1420 |
| RECEIVED BY | | Lauren Schmitz | 8/[illegible]/13 | 1420 |
| RELINQUISHED BY | | | | |
| RECEIVED BY | | | | |
| RELINQUISHED BY | | | | |
| RECEIVED BY | | | | |

Preservative Key: 1-HCl 2-HNO3 3-H2SO4 4-NaOH 5-NaHSO4 7-Other 8-4 degrees C 9-5035

**ALS Environmental - Fort Collins**
**CONDITION OF SAMPLE UPON RECEIPT FORM**

Client: Wright Water Eng. Workorder No: 1308210
Project Manager: ARW Initials: JAS Date: 8/13/13

| | | | |
|---|---|---|---|
| 1. Does this project require any special handling in addition to standard ALS procedures? | | YES | [✓ NO] |
| 2. Are custody seals on shipping containers intact? | NONE | [✓ YES] | NO |
| 3. Are Custody seals on sample containers intact? | [✓ NONE] | YES | NO |
| 4. Is there a COC (Chain-of-Custody) present or other representative documents? | | [✓ YES] | NO |
| 5. Are the COC and bottle labels complete and legible? | | [✓ YES] | NO |
| 6. Is the COC in agreement with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.) | | [✓ YES] | NO |
| 7. Were airbills / shipping documents present and/or removable? | [✓ DROP OFF] | YES | NO |
| 8. Are all aqueous samples requiring preservation preserved correctly? (excluding volatiles) | [✓ N/A] | YES | NO |
| 9. Are all aqueous non-preserved samples pH 4-9? | [✓ N/A] | YES | NO |
| 10. Is there sufficient sample for the requested analyses? | | [✓ YES] | NO |
| 11. Were all samples placed in the proper containers for the requested analyses? | | [✓ YES] | NO |
| 12. Are all samples within holding times for the requested analyses? | | [✓ YES] | NO |
| 13. Were all sample containers received intact? (not broken or leaking, etc.) | | [✓ YES] | NO |
| 14. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) headspace free? Size of bubble: ____ < green pea ____ > green pea | N/A | [✓ YES] | NO |
| 15. Do any water samples contain sediment? Amount<br>Amount of sediment: ____ dusting ____ moderate ____ heavy | N/A | YES | [✓ NO] |
| 16. Were the samples shipped on ice? | | [✓ YES] | NO |
| 17. Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: [✓ #2] #4 | RAD ONLY | YES | [✓ NO] |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Cooler #: | 1 | | | | | | | |
| Temperature (°C): | 8.0°C | | | | | | | |
| No. of custody seals on cooler: | 2 | | | | | | | |
| External µR/hr reading: | N/A | | | | | | | |
| Background µR/hr reading: | 10 | | | | | | | |

DOT Survey/ Acceptance Information

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? YES / NO / [✓ NA] (If no, see Form 008.)

**Additional Information:** PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16.

* Trip Blank not listed on COC. Added as 1308210-21.

If applicable, was the client contacted? YES / NO / [✓ NA] Contact: ______________ Date/Time: ______________

**Project Manager Signature / Date:** 8/13/13

*IR Gun #2: Oakton, SN 29922500201-0066
*IR Gun #4: Oakton, SN 2372220101-0002

Form 201r24.xls (06/04/2012)

Page 1 of 1

# Organochlorine Pesticides

## Method SW8081B--Leachate

## Method Blank

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

---

**Lab ID:** EX130815-11MB

**LEACH DATE: 8/15/2013**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Sample Matrix:** | LEACHATE | **Prep Batch:** | EX130819-7 | **Sample Aliquot:** | 100 ml |
| **% Moisture:** | N/A | **QCBatchID:** | EX130819-7-4 | **Final Volume:** | 10 ml |
| **Date Collected:** | N/A | **Run ID:** | PT130821-10 | **Result Units:** | MG/L |
| **Date Extracted:** | 19-Aug-13 | **Cleanup:** | NONE | **Clean DF:** | 1 |
| **Date Analyzed:** | 21-Aug-13 | **Basis:** | N/A | | |
| **Prep Method:** | SW3520 Rev C | **File Name:** | 05068.dat | | |

---

| CASNO | Target Analyte | DF | Result | RptLimit LOD/LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 58-89-9 | GAMMA-BHC (LINDANE) | 1 | 0.0005 | 0.0005 | U | |
| 76-44-8 | HEPTACHLOR | 1 | 0.0005 | 0.0005 | U | |
| 1024-57-3 | HEPTACHLOR EPOXIDE | 1 | 0.0005 | 0.0005 | U | |
| 5103-74-2 | GAMMA-CHLORDANE | 1 | 0.0005 | 0.0005 | U | |
| 5103-71-9 | ALPHA-CHLORDANE | 1 | 0.0005 | 0.0005 | U | |
| 72-20-8 | ENDRIN | 1 | 0.0005 | 0.0005 | U | |
| 72-43-5 | METHOXYCHLOR | 1 | 0.0025 | 0.0025 | U | |
| 8001-35-2 | TOXAPHENE | 1 | 0.025 | 0.025 | U | |
| 12789-03-6 | CHLORDANE | 1 | 0.01 | 0.01 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 2051-24-3 | DECACHLOROBIPHENYL | 0.00479 | | 0.005 | 96 | 10 - 110 |
| 877-09-8 | TETRACHLORO-M-XYLENE | 0.00495 | | 0.005 | 99 | 57 - 128 |

**Data Package ID:** *PT1308210-2*

# Organochlorine Pesticides

## Method SW8081 Revision B--TCLP Leachate

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

|  |  |
|---|---|
| **Field ID:** | Site #2 |
| **Lab ID:** | 1308210-11 |

**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 12-Aug-13
**Date Extracted:** 19-Aug-13
**Date Analyzed:** 21-Aug-13
**Prep Method:** SW3520 Rev C

**Prep Batch:** EX130819-7
**QCBatchID:** EX130819-7-4
**Run ID:** PT130821-10
**Cleanup:** NONE
**Basis:** As Received
**File Name:** 05057.dat

**Analyst:** Dan Sheneman
**Sample Aliquot:** 100 ML
**Final Volume:** 10 ML
**Result Units:** MG/L
**Clean DF:** 1

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 58-89-9 | GAMMA-BHC (LINDANE) | 1 | 0.0005 | 0.0005 | U | |
| 76-44-8 | HEPTACHLOR | 1 | 0.0005 | 0.0005 | U | |
| 1024-57-3 | HEPTACHLOR EPOXIDE | 1 | 0.0005 | 0.0005 | U | |
| 5103-74-2 | GAMMA-CHLORDANE | 1 | 0.0005 | 0.0005 | U | |
| 5103-71-9 | ALPHA-CHLORDANE | 1 | 0.0005 | 0.0005 | U | |
| 72-20-8 | ENDRIN | 1 | 0.0005 | 0.0005 | U | |
| 72-43-5 | METHOXYCHLOR | 1 | 0.0025 | 0.0025 | U | |
| 8001-35-2 | TOXAPHENE | 1 | 0.025 | 0.025 | U | |
| 12789-03-6 | CHLORDANE | 1 | 0.01 | 0.01 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 2051-24-3 | DECACHLOROBIPHENYL | 0.00515 | | 0.005 | 103 | 10 - 110 |
| 877-09-8 | TETRACHLORO-M-XYLENE | 0.00514 | | 0.005 | 103 | 57 - 128 |

**Data Package ID:** *PT1308210-2*

# Organochlorine Pesticides

## Method SW8081 Revision B--TCLP Leachate

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

---

| | |
|---|---|
| **Field ID:** | Site #5 |
| **Lab ID:** | 1308210-12 |

**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 12-Aug-13
**Date Extracted:** 19-Aug-13
**Date Analyzed:** 21-Aug-13
**Prep Method:** SW3520 Rev C

**Prep Batch:** EX130819-7
**QCBatchID:** EX130819-7-4
**Run ID:** PT130821-10
**Cleanup:** NONE
**Basis:** As Received
**File Name:** 05058.dat

**Analyst:** Dan Sheneman
**Sample Aliquot:** 100 ML
**Final Volume:** 10 ML
**Result Units:** MG/L
**Clean DF:** 1

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 58-89-9 | GAMMA-BHC (LINDANE) | 1 | 0.0005 | 0.0005 | U | |
| 76-44-8 | HEPTACHLOR | 1 | 0.0005 | 0.0005 | U | |
| 1024-57-3 | HEPTACHLOR EPOXIDE | 1 | 0.0005 | 0.0005 | U | |
| 5103-74-2 | GAMMA-CHLORDANE | 1 | 0.0005 | 0.0005 | U | |
| 5103-71-9 | ALPHA-CHLORDANE | 1 | 0.0005 | 0.0005 | U | |
| 72-20-8 | ENDRIN | 1 | 0.0005 | 0.0005 | U | |
| 72-43-5 | METHOXYCHLOR | 1 | 0.0025 | 0.0025 | U | |
| 8001-35-2 | TOXAPHENE | 1 | 0.025 | 0.025 | U | |
| 12789-03-6 | CHLORDANE | 1 | 0.01 | 0.01 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 2051-24-3 | DECACHLOROBIPHENYL | 0.00458 | | 0.005 | 92 | 10 - 110 |
| 877-09-8 | TETRACHLORO-M-XYLENE | 0.00474 | | 0.005 | 95 | 57 - 128 |

**Data Package ID:** *PT1308210-2*

# Organochlorine Pesticides

## Method SW8081 Revision B--TCLP Leachate

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

**Field ID:** Site #6
**Lab ID:** 1308210-13
**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 12-Aug-13
**Date Extracted:** 19-Aug-13
**Date Analyzed:** 21-Aug-13
**Prep Method:** SW3520 Rev C

**Prep Batch:** EX130819-7
**QCBatchID:** EX130819-7-4
**Run ID:** PT130821-10
**Cleanup:** NONE
**Basis:** As Received
**File Name:** 05059.dat

**Analyst:** Dan Sheneman
**Sample Aliquot:** 100 ML
**Final Volume:** 10 ML
**Result Units:** MG/L
**Clean DF:** 1

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 58-89-9 | GAMMA-BHC (LINDANE) | 1 | 0.0005 | 0.0005 | U | |
| 76-44-8 | HEPTACHLOR | 1 | 0.0005 | 0.0005 | U | |
| 1024-57-3 | HEPTACHLOR EPOXIDE | 1 | 0.0005 | 0.0005 | U | |
| 5103-74-2 | GAMMA-CHLORDANE | 1 | 0.0005 | 0.0005 | U | |
| 5103-71-9 | ALPHA-CHLORDANE | 1 | 0.0005 | 0.0005 | U | |
| 72-20-8 | ENDRIN | 1 | 0.0005 | 0.0005 | U | |
| 72-43-5 | METHOXYCHLOR | 1 | 0.0025 | 0.0025 | U | |
| 8001-35-2 | TOXAPHENE | 1 | 0.025 | 0.025 | U | |
| 12789-03-6 | CHLORDANE | 1 | 0.01 | 0.01 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 2051-24-3 | DECACHLOROBIPHENYL | 0.00463 | | 0.005 | 93 | 10 - 110 |
| 877-09-8 | TETRACHLORO-M-XYLENE | 0.00506 | | 0.005 | 101 | 57 - 128 |

**Data Package ID:** *PT1308210-2*

# Organochlorine Pesticides

## Method SW8081 Revision B--TCLP Leachate

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

---

| | |
|---|---|
| **Field ID:** | Site #7 |
| **Lab ID:** | 1308210-14 |

**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 12-Aug-13
**Date Extracted:** 19-Aug-13
**Date Analyzed:** 21-Aug-13
**Prep Method:** SW3520 Rev C

**Prep Batch:** EX130819-7
**QCBatchID:** EX130819-7-4
**Run ID:** PT130821-10
**Cleanup:** NONE
**Basis:** As Received
**File Name:** 05060.dat

**Analyst:** Dan Sheneman
**Sample Aliquot:** 100 ML
**Final Volume:** 10 ML
**Result Units:** MG/L
**Clean DF:** 1

---

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 58-89-9 | GAMMA-BHC (LINDANE) | 1 | 0.0005 | 0.0005 | U | |
| 76-44-8 | HEPTACHLOR | 1 | 0.0005 | 0.0005 | U | |
| 1024-57-3 | HEPTACHLOR EPOXIDE | 1 | 0.0005 | 0.0005 | U | |
| 5103-74-2 | GAMMA-CHLORDANE | 1 | 0.0005 | 0.0005 | U | |
| 5103-71-9 | ALPHA-CHLORDANE | 1 | 0.0005 | 0.0005 | U | |
| 72-20-8 | ENDRIN | 1 | 0.0005 | 0.0005 | U | |
| 72-43-5 | METHOXYCHLOR | 1 | 0.0025 | 0.0025 | U | |
| 8001-35-2 | TOXAPHENE | 1 | 0.025 | 0.025 | U | |
| 12789-03-6 | CHLORDANE | 1 | 0.01 | 0.01 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 2051-24-3 | DECACHLOROBIPHENYL | 0.00473 | | 0.005 | 95 | 10 - 110 |
| 877-09-8 | TETRACHLORO-M-XYLENE | 0.00491 | | 0.005 | 98 | 57 - 128 |

**Data Package ID:** *PT1308210-2*

# Organochlorine Pesticides

## Method SW8081 Revision B--TCLP Leachate

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

**Field ID:** Site #9
**Lab ID:** 1308210-15
**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 12-Aug-13
**Date Extracted:** 19-Aug-13
**Date Analyzed:** 21-Aug-13
**Prep Method:** SW3520 Rev C

**Prep Batch:** EX130819-7
**QCBatchID:** EX130819-7-4
**Run ID:** PT130821-10
**Cleanup:** NONE
**Basis:** As Received
**File Name:** 05062.dat

**Analyst:** Dan Sheneman
**Sample Aliquot:** 100 ML
**Final Volume:** 10 ML
**Result Units:** MG/L
**Clean DF:** 1

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 58-89-9 | GAMMA-BHC (LINDANE) | 1 | 0.0005 | 0.0005 | U | |
| 76-44-8 | HEPTACHLOR | 1 | 0.0005 | 0.0005 | U | |
| 1024-57-3 | HEPTACHLOR EPOXIDE | 1 | 0.0005 | 0.0005 | U | |
| 5103-74-2 | GAMMA-CHLORDANE | 1 | 0.0005 | 0.0005 | U | |
| 5103-71-9 | ALPHA-CHLORDANE | 1 | 0.0005 | 0.0005 | U | |
| 72-20-8 | ENDRIN | 1 | 0.0005 | 0.0005 | U | |
| 72-43-5 | METHOXYCHLOR | 1 | 0.0025 | 0.0025 | U | |
| 8001-35-2 | TOXAPHENE | 1 | 0.025 | 0.025 | U | |
| 12789-03-6 | CHLORDANE | 1 | 0.01 | 0.01 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 2051-24-3 | DECACHLOROBIPHENYL | 0.00477 | | 0.005 | 95 | 10 - 110 |
| 877-09-8 | TETRACHLORO-M-XYLENE | 0.00496 | | 0.005 | 99 | 57 - 128 |

**Data Package ID:** *PT1308210-2*

# Organochlorine Pesticides

## Method SW8081 Revision B--TCLP Leachate

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

| | |
|---|---|
| **Field ID:** | Site #1 |
| **Lab ID:** | 1308210-16 |

**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 12-Aug-13
**Date Extracted:** 19-Aug-13
**Date Analyzed:** 21-Aug-13
**Prep Method:** SW3520 Rev C

**Prep Batch:** EX130819-7
**QCBatchID:** EX130819-7-4
**Run ID:** PT130821-10
**Cleanup:** NONE
**Basis:** As Received
**File Name:** 05063.dat

**Analyst:** Dan Sheneman
**Sample Aliquot:** 100 ML
**Final Volume:** 10 ML
**Result Units:** MG/L
**Clean DF:** 1

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 58-89-9 | GAMMA-BHC (LINDANE) | 1 | 0.0005 | 0.0005 | U | |
| 76-44-8 | HEPTACHLOR | 1 | 0.0005 | 0.0005 | U | |
| 1024-57-3 | HEPTACHLOR EPOXIDE | 1 | 0.0005 | 0.0005 | U | |
| 5103-74-2 | GAMMA-CHLORDANE | 1 | 0.0005 | 0.0005 | U | |
| 5103-71-9 | ALPHA-CHLORDANE | 1 | 0.0005 | 0.0005 | U | |
| 72-20-8 | ENDRIN | 1 | 0.0005 | 0.0005 | U | |
| 72-43-5 | METHOXYCHLOR | 1 | 0.0025 | 0.0025 | U | |
| 8001-35-2 | TOXAPHENE | 1 | 0.025 | 0.025 | U | |
| 12789-03-6 | CHLORDANE | 1 | 0.01 | 0.01 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 2051-24-3 | DECACHLOROBIPHENYL | 0.00381 | | 0.005 | 76 | 10 - 110 |
| 877-09-8 | TETRACHLORO-M-XYLENE | 0.00466 | | 0.005 | 93 | 57 - 128 |

**Data Package ID:** *PT1308210-2*

# Organochlorine Pesticides

## Method SW8081 Revision B--TCLP Leachate

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

| | |
|---|---|
| **Field ID:** | Site #12 |
| **Lab ID:** | 1308210-17 |

**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 12-Aug-13
**Date Extracted:** 19-Aug-13
**Date Analyzed:** 21-Aug-13
**Prep Method:** SW3520 Rev C

**Prep Batch:** EX130819-7
**QCBatchID:** EX130819-7-4
**Run ID:** PT130821-10
**Cleanup:** NONE
**Basis:** As Received
**File Name:** 05064.dat

**Analyst:** Dan Sheneman
**Sample Aliquot:** 100 ML
**Final Volume:** 10 ML
**Result Units:** MG/L
**Clean DF:** 1

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 58-89-9 | GAMMA-BHC (LINDANE) | 1 | 0.0005 | 0.0005 | U | |
| 76-44-8 | HEPTACHLOR | 1 | 0.0005 | 0.0005 | U | |
| 1024-57-3 | HEPTACHLOR EPOXIDE | 1 | 0.0005 | 0.0005 | U | |
| 5103-74-2 | GAMMA-CHLORDANE | 1 | 0.0005 | 0.0005 | U | |
| 5103-71-9 | ALPHA-CHLORDANE | 1 | 0.0005 | 0.0005 | U | |
| 72-20-8 | ENDRIN | 1 | 0.0005 | 0.0005 | U | |
| 72-43-5 | METHOXYCHLOR | 1 | 0.0025 | 0.0025 | U | |
| 8001-35-2 | TOXAPHENE | 1 | 0.025 | 0.025 | U | |
| 12789-03-6 | CHLORDANE | 1 | 0.01 | 0.01 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 2051-24-3 | DECACHLOROBIPHENYL | 0.00475 | | 0.005 | 95 | 10 - 110 |
| 877-09-8 | TETRACHLORO-M-XYLENE | 0.00493 | | 0.005 | 99 | 57 - 128 |

**Data Package ID:** *PT1308210-2*

# Organochlorine Pesticides

## Method SW8081 Revision B--TCLP Leachate

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

**Field ID:** Site #10
**Lab ID:** 1308210-18
**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 13-Aug-13
**Date Extracted:** 19-Aug-13
**Date Analyzed:** 21-Aug-13
**Prep Method:** SW3520 Rev C

**Prep Batch:** EX130819-7
**QCBatchID:** EX130819-7-4
**Run ID:** PT130821-10
**Cleanup:** NONE
**Basis:** As Received
**File Name:** 05065.dat

**Analyst:** Dan Sheneman
**Sample Aliquot:** 100 ML
**Final Volume:** 10 ML
**Result Units:** MG/L
**Clean DF:** 1

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 58-89-9 | GAMMA-BHC (LINDANE) | 1 | 0.0005 | 0.0005 | U | |
| 76-44-8 | HEPTACHLOR | 1 | 0.0005 | 0.0005 | U | |
| 1024-57-3 | HEPTACHLOR EPOXIDE | 1 | 0.0005 | 0.0005 | U | |
| 5103-74-2 | GAMMA-CHLORDANE | 1 | 0.0005 | 0.0005 | U | |
| 5103-71-9 | ALPHA-CHLORDANE | 1 | 0.0005 | 0.0005 | U | |
| 72-20-8 | ENDRIN | 1 | 0.0005 | 0.0005 | U | |
| 72-43-5 | METHOXYCHLOR | 1 | 0.0025 | 0.0025 | U | |
| 8001-35-2 | TOXAPHENE | 1 | 0.025 | 0.025 | U | |
| 12789-03-6 | CHLORDANE | 1 | 0.01 | 0.01 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 2051-24-3 | DECACHLOROBIPHENYL | 0.00505 | | 0.005 | 101 | 10 - 110 |
| 877-09-8 | TETRACHLORO-M-XYLENE | 0.0049 | | 0.005 | 98 | 57 - 128 |

**Data Package ID:** *PT1308210-2*

# Organochlorine Pesticides

## Method SW8081 Revision B--TCLP Leachate

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

---

| | |
|---|---|
| **Field ID:** | Site #4 |
| **Lab ID:** | 1308210-19 |

**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 13-Aug-13
**Date Extracted:** 19-Aug-13
**Date Analyzed:** 21-Aug-13
**Prep Method:** SW3520 Rev C

**Prep Batch:** EX130819-7
**QCBatchID:** EX130819-7-4
**Run ID:** PT130821-10
**Cleanup:** NONE
**Basis:** As Received
**File Name:** 05066.dat

**Analyst:** Dan Sheneman
**Sample Aliquot:** 100 ML
**Final Volume:** 10 ML
**Result Units:** MG/L
**Clean DF:** 1

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| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 58-89-9 | GAMMA-BHC (LINDANE) | 1 | 0.0005 | 0.0005 | U | |
| 76-44-8 | HEPTACHLOR | 1 | 0.0005 | 0.0005 | U | |
| 1024-57-3 | HEPTACHLOR EPOXIDE | 1 | 0.0005 | 0.0005 | U | |
| 5103-74-2 | GAMMA-CHLORDANE | 1 | 0.0005 | 0.0005 | U | |
| 5103-71-9 | ALPHA-CHLORDANE | 1 | 0.0005 | 0.0005 | U | |
| 72-20-8 | ENDRIN | 1 | 0.0005 | 0.0005 | U | |
| 72-43-5 | METHOXYCHLOR | 1 | 0.0025 | 0.0025 | U | |
| 8001-35-2 | TOXAPHENE | 1 | 0.025 | 0.025 | U | |
| 12789-03-6 | CHLORDANE | 1 | 0.01 | 0.01 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 2051-24-3 | DECACHLOROBIPHENYL | 0.00448 | | 0.005 | 90 | 10 - 110 |
| 877-09-8 | TETRACHLORO-M-XYLENE | 0.00465 | | 0.005 | 93 | 57 - 128 |

**Data Package ID:** *PT1308210-2*

# Organochlorine Pesticides

## Method SW8081 Revision B--TCLP Leachate

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

| | |
|---|---|
| **Field ID:** | Site #11 |
| **Lab ID:** | 1308210-20 |

**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 13-Aug-13
**Date Extracted:** 19-Aug-13
**Date Analyzed:** 21-Aug-13
**Prep Method:** SW3520 Rev C

**Prep Batch:** EX130819-7
**QCBatchID:** EX130819-7-4
**Run ID:** PT130821-10
**Cleanup:** NONE
**Basis:** As Received
**File Name:** 05067.dat

**Analyst:** Dan Sheneman
**Sample Aliquot:** 100 ML
**Final Volume:** 10 ML
**Result Units:** MG/L
**Clean DF:** 1

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 58-89-9 | GAMMA-BHC (LINDANE) | 1 | 0.0005 | 0.0005 | U | |
| 76-44-8 | HEPTACHLOR | 1 | 0.0005 | 0.0005 | U | |
| 1024-57-3 | HEPTACHLOR EPOXIDE | 1 | 0.0005 | 0.0005 | U | |
| 5103-74-2 | GAMMA-CHLORDANE | 1 | 0.0005 | 0.0005 | U | |
| 5103-71-9 | ALPHA-CHLORDANE | 1 | 0.0005 | 0.0005 | U | |
| 72-20-8 | ENDRIN | 1 | 0.0005 | 0.0005 | U | |
| 72-43-5 | METHOXYCHLOR | 1 | 0.0025 | 0.0025 | U | |
| 8001-35-2 | TOXAPHENE | 1 | 0.025 | 0.025 | U | |
| 12789-03-6 | CHLORDANE | 1 | 0.01 | 0.01 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 2051-24-3 | DECACHLOROBIPHENYL | 0.00459 | | 0.005 | 92 | 10 - 110 |
| 877-09-8 | TETRACHLORO-M-XYLENE | 0.00517 | | 0.005 | 103 | 57 - 128 |

**Data Package ID:** *PT1308210-2*

# Organochlorine Pesticides

## Method SW8081B

## Laboratory Control Sample and Laboratory Control Sample Duplicate

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

**Lab ID:** EX130819-7LCS

| | | | | | |
|---|---|---|---|---|---|
| **Sample Matrix:** | WATER | **Prep Batch:** | EX130819-7 | **Sample Aliquot:** | 1000 ml |
| **% Moisture:** | N/A | **QCBatchID:** | EX130819-7-4 | **Final Volume:** | 10 ml |
| **Date Collected:** | N/A | **Run ID:** | PT130821-10 | **Result Units:** | MG/L |
| **Date Extracted:** | 08/19/2013 | **Cleanup:** | NONE | **Clean DF:** | 1 |
| **Date Analyzed:** | 08/21/2013 | **Basis:** | N/A | | |
| **Prep Method:** | SW3520C | **File Name:** | 05046.dat | | |

| CASNO | Target Analyte | Spike Added | LCS Result | Reporting Limit | Result Qualifier | LCS % Rec. | Control Limits |
|---|---|---|---|---|---|---|---|
| 58-89-9 | GAMMA-BHC (LINDANE) | 0.0004 | 0.000392 | 0.00005 | | 98 | 75 - 129% |
| 76-44-8 | HEPTACHLOR | 0.0004 | 0.000357 | 0.00005 | | 89 | 65 - 131% |
| 1024-57-3 | HEPTACHLOR EPOXIDE | 0.0004 | 0.000389 | 0.00005 | | 97 | 70 - 132% |
| 5103-74-2 | GAMMA-CHLORDANE | 0.0004 | 0.000386 | 0.00005 | | 97 | 71 - 129% |
| 5103-71-9 | ALPHA-CHLORDANE | 0.0004 | 0.000385 | 0.00005 | | 96 | 73 - 130% |
| 72-20-8 | ENDRIN | 0.0004 | 0.000373 | 0.00005 | | 93 | 53 - 135% |
| 72-43-5 | METHOXYCHLOR | 0.0004 | 0.000411 | 0.00025 | | 103 | 49 - 153% |

**Lab ID:** EX130819-7LCSD

| | | | | | |
|---|---|---|---|---|---|
| **Sample Matrix:** | WATER | **Prep Batch:** | EX130819-7 | **Sample Aliquot:** | 1000 ml |
| **% Moisture:** | N/A | **QCBatchID:** | EX130819-7-4 | **Final Volume:** | 10 ml |
| **Date Collected:** | N/A | **Run ID:** | PT130821-10 | **Result Units:** | MG/L |
| **Date Extracted:** | 08/19/2013 | **Cleanup:** | NONE | **Clean DF:** | 1 |
| **Date Analyzed:** | 08/21/2013 | **Basis:** | N/A | | |
| **Prep Method:** | SW3520C | **File Name:** | 05047.dat | | |

| CASNO | Target Analyte | Spike Added | LCSD Result | Reporting Limit | Result Qualifier | LCSD % Rec. | RPD Limit | RPD |
|---|---|---|---|---|---|---|---|---|
| 58-89-9 | GAMMA-BHC (LINDANE) | 0.0004 | 0.000461 | 0.00005 | | 115 | 30 | 16 |
| 76-44-8 | HEPTACHLOR | 0.0004 | 0.000418 | 0.00005 | | 105 | 30 | 16 |
| 1024-57-3 | HEPTACHLOR EPOXIDE | 0.0004 | 0.000471 | 0.00005 | | 118 | 30 | 19 |
| 5103-74-2 | GAMMA-CHLORDANE | 0.0004 | 0.00047 | 0.00005 | | 118 | 30 | 20 |
| 5103-71-9 | ALPHA-CHLORDANE | 0.0004 | 0.000469 | 0.00005 | | 117 | 30 | 20 |
| 72-20-8 | ENDRIN | 0.0004 | 0.000502 | 0.00005 | | 125 | 30 | 30 |
| 72-43-5 | METHOXYCHLOR | 0.0004 | 0.000534 | 0.00025 | | 133 | 30 | 26 |

**Data Package ID:** *PT1308210-2*

# Organochlorine Pesticides

## Method SW8081B

## Laboratory Control Sample and Laboratory Control Sample Duplicate

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

---

### Surrogate Recovery LCS/LCSD

| CASNO | Target Analyte | Spike Added | LCS % Rec. | LCS Flag | LCSD % Rec. | LCSD Flag | Control Limits |
|---|---|---|---|---|---|---|---|
| 2051-24-3 | DECACHLOROBIPHENYL | 0.0005 | 90 | | 116 | * | 10 - 110 |
| 877-09-8 | TETRACHLORO-M-XYLENE | 0.0005 | 83 | | 95 | | 57 - 128 |

**Data Package ID:** *PT1308210-2*

# Organochlorine Pesticides

## Method SW8081B

## Matrix Spike

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

| | |
|---|---|
| **Field ID:** | Site #7 |
| **LabID:** | 1308210-14MS |

**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 12-Aug-13
**Date Extracted:** 19-Aug-13
**Date Analyzed:** 21-Aug-13

**Prep Batch:** EX130819-7
**QCBatchID:** EX130819-7-4
**Run ID:** PT130821-10
**Cleanup:** NONE
**Basis:** As Received

**Sample Aliquot:** 100 ml
**Final Volume:** 10 ml
**Result Units:** MG/L
**File Name:** 05061.dat

| CASNO | Target Analyte | Sample Result | Samp Qual | MS Result | MS Qual | Reporting Limit | Spike Added | MS % Rec. | Control Limits |
|---|---|---|---|---|---|---|---|---|---|
| 58-89-9 | GAMMA-BHC (LINDANE) | 0.0005 | U | 0.00446 | | 0.0005 | 0.004 | 111 | 75 - 129% |
| 76-44-8 | HEPTACHLOR | 0.0005 | U | 0.00418 | | 0.0005 | 0.004 | 105 | 65 - 131% |
| 1024-57-3 | HEPTACHLOR EPOXIDE | 0.0005 | U | 0.00433 | | 0.0005 | 0.004 | 108 | 70 - 132% |
| 5103-74-2 | GAMMA-CHLORDANE | 0.0005 | U | 0.00432 | | 0.0005 | 0.004 | 108 | 71 - 129% |
| 5103-71-9 | ALPHA-CHLORDANE | 0.0005 | U | 0.00428 | | 0.0005 | 0.004 | 107 | 73 - 130% |
| 72-20-8 | ENDRIN | 0.0005 | U | 0.00453 | | 0.0005 | 0.004 | 113 | 53 - 135% |
| 72-43-5 | METHOXYCHLOR | 0.0025 | U | 0.00447 | | 0.0025 | 0.004 | 112 | 49 - 153% |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 2051-24-3 | DECACHLOROBIPHENYL | 0.00458 | | 0.005 | 92 | 10 - 110 |
| 877-09-8 | TETRACHLORO-M-XYLENE | 0.00511 | | 0.005 | 102 | 57 - 128 |

**Data Package ID:** *PT1308210-2*

# Paint Filter

## Case Narrative

---

## Wright Water Engineers

UDFCD Sediments -- 131013000

Work Order Number: 1308210

1. This report consists of 10 soil samples. The samples were received intact by ALS on 08/13/13. The samples were received at 8.0° Celsius.
2. The samples were prepared and analyzed based on SW-846, 3rd Edition procedures, SW-9095 and the current revision of SOP 658.
3. A duplicate was prepared and analyzed with this batch.
4. If a sample does not yield free liquid through the filter apparatus, then the sample will be reported with a "0" for a result with a "U" flag. If a sample does yield free liquid through the filter apparatus, then the sample will be reported with a "1" for a result without a flag. Any particulate matter passing through the filter is defined as free liquid by the method.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Mindy Norton
Mindy Norton
Organics Primary Data Reviewer

8/27/13
Date

Brendon Howard
Organics Final Data Reviewer

8/27/13
Date

*ALS*
*Data Qualifier Flags*
*Chromatography and Mass Spectrometry*

| | |
|---|---|
| U or ND: | **This flag indicates that the compound was analyzed for but not detected.** |
| **J:** | **This flag indicates an estimated value. This flag is used as follows : (1) when estimating a concentration for tentatively identified compounds (TICs) where a 1:1 response is assumed; (2) when the mass spectral and retention time data indicate the presence of a compound that meets the volatile and semivolatile GC/MS identification criteria, and the result is less than the reporting limit (RL) but greater than the method detection limit (MDL); (3) when the data indicate the presence of a compound that meets the identification criteria, and the result is less than the RL but greater than the MDL; and (4) the reported value is estimated.** |
| **B:** | **This flag is used when the analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user. This flag shall be used for a tentatively identified compound (TIC) as well as for a positively identified target compound.** |
| E: | **This flag identifies compounds whose concentration exceeds the upper level of the calibration range.** |
| A: | **This flag indicates that a tentatively identified compound is a suspected aldol-condensation product.** |
| X: | **This flag indicates that the analyte was diluted below an accurate quantitation level.** |
| ***:** | **This flag indicates that a spike recovery is outside the control criteria.** |
| **+:** | **This flag indicates that the relative percent difference (RPD) exceeds the control criteria.** |

# ALS Environmental -- FC

## Sample Number(s) Cross-Reference Table

**OrderNum:** 1308210
**Client Name:** Wright Water Engineers
**Client Project Name:** UDFCD Sediments
**Client Project Number:** 131013000
**Client PO Number:**

| Client Sample Number | Lab Sample Number | COC Number | Matrix | Date Collected | Time Collected |
|---|---|---|---|---|---|
| Site #2 | 1308210-1 | | SOIL | 12-Aug-13 | 9:45 |
| Site #5 | 1308210-2 | | SOIL | 12-Aug-13 | 10:30 |
| Site #6 | 1308210-3 | | SOIL | 12-Aug-13 | 11:00 |
| Site #7 | 1308210-4 | | SOIL | 12-Aug-13 | 12:00 |
| Site #9 | 1308210-5 | | SOIL | 12-Aug-13 | 13:30 |
| Site #1 | 1308210-6 | | SOIL | 12-Aug-13 | 14:40 |
| Site #12 | 1308210-7 | | SOIL | 12-Aug-13 | 15:10 |
| Site #10 | 1308210-8 | | SOIL | 13-Aug-13 | 8:30 |
| Site #4 | 1308210-9 | | SOIL | 13-Aug-13 | 9:45 |
| Site #11 | 1308210-10 | | SOIL | 13-Aug-13 | 11:00 |
| Site #2 | 1308210-11 | | LEACHAT | 12-Aug-13 | 9:45 |
| Site #5 | 1308210-12 | | LEACHAT | 12-Aug-13 | 10:30 |
| Site #6 | 1308210-13 | | LEACHAT | 12-Aug-13 | 11:00 |
| Site #7 | 1308210-14 | | LEACHAT | 12-Aug-13 | 12:00 |
| Site #9 | 1308210-15 | | LEACHAT | 12-Aug-13 | 13:30 |
| Site #1 | 1308210-16 | | LEACHAT | 12-Aug-13 | 14:40 |
| Site #12 | 1308210-17 | | LEACHAT | 12-Aug-13 | 15:10 |
| Site #10 | 1308210-18 | | LEACHAT | 13-Aug-13 | 8:30 |
| Site #4 | 1308210-19 | | LEACHAT | 13-Aug-13 | 9:45 |
| Site #11 | 1308210-20 | | LEACHAT | 13-Aug-13 | 11:00 |
| Trip Blank | 1308210-21 | | WATER | 07-Aug-13 | |

**ALS Laboratory Group**

225 Commerce Drive, Fort Collins, Colorado 80524
TF: (800) 443-1511 PH: (970) 490-1511 FX: (970) 490-1522

# Chain-of-Custody

Form 202r8

WORKORDER #: 1308210

| | | | |
|---|---|---|---|
| | | SAMPLER | |
| PROJECT NAME | UDFCD SEDIMENTS | SITE ID | |
| PROJECT No. | 131 013 000 | EDD FORMAT | |
| | | PURCHASE ORDER | |
| COMPANY NAME | WRIGHT WATER ENGINEERS | BILL TO COMPANY | |
| SEND REPORT TO | ELIOT WONG | INVOICE ATTN TO | |
| ADDRESS | 2490 W. 26th AVE, #100A | ADDRESS | |
| CITY / STATE / ZIP | DENVER / CO / 80211 | CITY / STATE / ZIP | |
| PHONE | 303 480 1700 | PHONE | |
| FAX | 303 480 1020 | FAX | |
| E-MAIL | ewong@wrightwater.com | E-MAIL | |

DATE: 8-13-13

TURNAROUND:

PAGE: 1 of 1

DISPOSAL: [✓ By Lab] or Return to Client

| Lab ID | Field ID | Matrix | Sample Date | Sample Time | # Bottles | Pres. | QC | TCLP - FULL SUITE | PAINT FILTER | IGNITABILITY / REACTIVITY / PH | BTEX | PAHS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ① | Site #2 | S | 8/12/13 | 9:45AM | 3 | N/A | N/A ⑪ | X | X | | | X |
| ② | Site #5 | S | 8/12/13 | 10:30AM | 2 | N/A | N/A ⑫ | X | X | | | |
| ③ | Site #6 | S | 8/12/13 | 11:00AM | 3 | N/A | N/A ⑬ | X | X | X | | |
| ④ | Site #7 | S | 8/12/13 | 12:00PM | 4 | N/A | N/A ⑭ | X | X | X | X | |
| ⑤ | Site #9 | S | 8/12/13 | 13:30 | 3 | N/A | N/A ⑮ | X | X | | X | |
| ⑥ | Site #1 | S | 8/12/13 | 14:40 | 2 | N/A | N/A ⑯ | X | X | | | |
| ⑦ | Site #12 | S | 8/12/13 | 15:10 | 3 | N/A | N/A ⑰ | X | X | | | X |
| ⑧ | Site #10 | S | 8/13/13 | 8:30AM | 4 | N/A | N/A ⑱ | X | X | X | | X |
| ⑨ | Site #4 | S | 8/13/13 | 9:45AM | 5 | N/A | N/A ⑲ | X | X | X | X | X |
| ⑩ | Site #11 | S | 8/13/13 | 11:00AM | 5 | N/A | N/A ⑳ | X | X | X | X | X |

*Time Zone (Circle): EST CST [✓ MST] PST Matrix: O = oil [✓ S = soil] NS = non-soil solid W = water L = liquid E = extract F = filter

For metals or anions, please detail analytes below.

Comments:

(21) TB

| QC PACKAGE (check below) | |
|---|---|
| ☐ | LEVEL II (Standard QC) |
| ☐ | LEVEL III (Std QC + forms) |
| ☐ | LEVEL IV (Std QC + forms + raw data) |
| ☐ | |

Preservative Key: 1-HCl 2-HNO3 3-H2SO4 4-NaOH 5-NaHSO4 7-Other 8-4 degrees C 9-5035

| | SIGNATURE | PRINTED NAME | DATE | TIME |
|---|---|---|---|---|
| RELINQUISHED BY | | Julia Traylor | 8/13/13 | 1420 |
| RECEIVED BY | | Lauren Schmitz | [illegible]/13 | 1420 |
| RELINQUISHED BY | | | | |
| RECEIVED BY | | | | |
| RELINQUISHED BY | | | | |
| RECEIVED BY | | | | |

## ALS Environmental - Fort Collins
## CONDITION OF SAMPLE UPON RECEIPT FORM

Client: Wright Water Eng.
Workorder No: 1308210
Project Manager: ARW
Initials: IAS
Date: 8/13/13

| | | | |
|---|---|---|---|
| 1. Does this project require any special handling in addition to standard ALS procedures? | | YES | [✓ NO] |
| 2. Are custody seals on shipping containers intact? | NONE | [✓ YES] | NO |
| 3. Are Custody seals on sample containers intact? | [✓ NONE] | YES | NO |
| 4. Is there a COC (Chain-of-Custody) present or other representative documents? | | [✓ YES] | NO |
| 5. Are the COC and bottle labels complete and legible? | | [✓ YES] | NO |
| 6. Is the COC in agreement with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.) | | [✓ YES] | NO |
| 7. Were airbills / shipping documents present and/or removable? | [✓ DROP OFF] | YES | NO |
| 8. Are all aqueous samples requiring preservation preserved correctly? (excluding volatiles) | [✓ N/A] | YES | NO |
| 9. Are all aqueous non-preserved samples pH 4-9? | [✓ N/A] | YES | NO |
| 10. Is there sufficient sample for the requested analyses? | | [✓ YES] | NO |
| 11. Were all samples placed in the proper containers for the requested analyses? | | [✓ YES] | NO |
| 12. Are all samples within holding times for the requested analyses? | | [✓ YES] | NO |
| 13. Were all sample containers received intact? (not broken or leaking, etc.) | | [✓ YES] | NO |
| 14. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) headspace free? Size of bubble: ____ < green pea ____ > green pea | N/A | [✓ YES] | NO |
| 15. Do any water samples contain sediment? Amount<br>Amount of sediment: ____ dusting ____ moderate ____ heavy | N/A | YES | [✓ NO] |
| 16. Were the samples shipped on ice? | | [✓ YES] | NO |
| 17. Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: [✓ #2] #4 | RAD ONLY | YES | [✓ NO] |

Cooler #: 1
Temperature (°C): 8.0°C
No. of custody seals on cooler: 2
DOT Survey/ Acceptance Information
External µR/hr reading: N/A
Background µR/hr reading: 10
Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? YES / NO / [✓ NA] (If no, see Form 008.)

**Additional Information:** PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16.

* Trip Blank not listed on COC. Added as 1308210-21.

If applicable, was the client contacted? YES / NO / [✓ NA] Contact: ____ Date/Time: ____

**Project Manager Signature / Date:** 8/13/13

*IR Gun #2: Oakton, SN 29922500201-0066
*IR Gun #4: Oakton, SN 2372220101-0002

Form 201r24.xls (06/04/2012)

# PAINT FILTER TEST

## Method SW9095 Revision A

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Client Name:** Wright Water Engineers
**Client Project ID:** UDFCD Sediments 131013000
**Work Order Number:** 1308210
**Reporting Basis:** Dry Weight
**Prep Method:** NONE
**Analyst:** Brendon Howard

**Final Volume:** 0 ml
**Matrix:** SOIL
**Result Units:** NU

| Client Sample ID | Lab ID | Date Collected | Date Prepared | Date Analyzed | Percent Moisture | Dilution Factor | Result | RptLimit LOD/LOQ | Flag | Sample Aliquot |
|---|---|---|---|---|---|---|---|---|---|---|
| Site #2 | 1308210-1 | 08/12/2013 | 08/22/2013 | 08/22/2013 | N/A | 1 | 0 |  | U | 106.55 g |
| Site #5 | 1308210-2 | 08/12/2013 | 08/22/2013 | 08/22/2013 | N/A | 1 | 0 |  | U | 110.84 g |
| Site #6 | 1308210-3 | 08/12/2013 | 08/22/2013 | 08/22/2013 | N/A | 1 | 1 |  |  | 128.76 g |
| Site #7 | 1308210-4 | 08/12/2013 | 08/22/2013 | 08/22/2013 | N/A | 1 | 0 |  | U | 121.94 g |
| Site #9 | 1308210-5 | 08/12/2013 | 08/22/2013 | 08/22/2013 | N/A | 1 | 0 |  | U | 112.72 g |
| Site #1 | 1308210-6 | 08/12/2013 | 08/22/2013 | 08/22/2013 | N/A | 1 | 0 |  | U | 113.69 g |
| Site #12 | 1308210-7 | 08/12/2013 | 08/22/2013 | 08/22/2013 | N/A | 1 | 1 |  |  | 120.49 g |
| Site #10 | 1308210-8 | 08/13/2013 | 08/22/2013 | 08/22/2013 | N/A | 1 | 1 |  |  | 115.02 g |
| Site #4 | 1308210-9 | 08/13/2013 | 08/22/2013 | 08/22/2013 | N/A | 1 | 0 |  | U | 121.32 g |
| Site #11 | 1308210-10 | 08/13/2013 | 08/22/2013 | 08/22/2013 | N/A | 1 | 0 |  | U | 140.11 g |

**Comments:**

1. ND or U = Not Detected at or above the client requested detection limit.

**Data Package ID:** *EX1308210-2*

# Method SW9095
# Duplicate Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

**Field ID:** Site #10
**Lab ID:** 1308210-8D

**Sample Matrix:** SOIL
**% Moisture:** N/A
**Date Collected:** 08/13/2013
**Date Extracted:** 08/22/2013
**Date Analyzed:** 08/22/2013

**Prep Batch:** EX130822-8
**QCBatchID:** EX130822-8-1
**Run ID:** EX130822-8A
**Cleanup:** NONE
**Basis:** Dry Weight
**File Name:**

**Sample Aliquot:** 113.28 g
**Final Volume:** 8 ml
**Result Units:** NU
**Clean DF:** 1

| CASNO | Target Analyte | Sample Result | Samp Qual | Duplicate Result | Dup Qual | Reporting Limit | Dilution Factor | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|
|  | PAINT FILTER TEST | 1 |  | 1 |  |  | 1 |  |  |

**Data Package ID:** *EX1308210-2*

# GC/MS Semivolatiles

## Case Narrative

---

## Wright Water Engineers

### UDFCD Sediments -- 131013000

Work Order Number: 1308210

1. This report consists of 5 soil samples and 10 TCLP leachates. These samples were received intact at 8.0°C by ALS on 08/13/13.

2. These samples were prepared and analyzed according to SW-846, 3rd Edition procedures. Specifically:

   The soil samples were extracted using soxhlet procedures according to SW-846 Method 3540C, utilizing the current revision of SOP 625. These extracts were then processed using GPC cleanup according to the current revision of SOP 641 based on Method 3640A in an attempt to remove potential interferences.

   The soil samples were tumbled according to SW-846 Method 1311, utilizing the current revision of SOP 609. This TCLP leachate was then extracted using continuous liquid-liquid extractors according to Method 3520C following the current revision of SOP 617.

3. The extracts were analyzed using GC/MS with a DB-5MS capillary column according to the current revision of SOP 506 based on SW-846 Method 8270D. All positive results were quantitated against the initial calibration standards using the internal standard technique. The identification of positive results was achieved by a comparison of the retention time and mass spectrum of the sample versus the daily calibration standard.

4. All initial calibration criteria were met. If average response factors were used in the initial calibration, %RSD was ≤20%. If linear or higher order regression calibrations were used in the initial calibration, the coefficient of determination ($r^2$) ≥0.99.

5. All initial calibration standards are verified by comparing a second source standard initial calibration verification (ICV) against the calibration curve. All target compounds in the second source verification had a %D ≤30%.

6. All compounds in each of the daily (continuing) calibration verifications were within 20%D.

7. All method blank criteria were met.

8. All laboratory control sample and laboratory control sample duplicate recoveries and RPDs were within the acceptance criteria.

9. Samples 1308210-10 & -11 were designated as the quality control samples for this analysis. Similarity of matrix and therefore relevance of the QC results should not be automatically inferred for any sample other than the native sample selected for QC. All matrix spike and matrix spike duplicate recoveries and RPDs were within acceptance criteria with the following exceptions:

| Spiked Compound | QC Sample | Direction |
|---|---|---|
| Indeno(1,2,3-cd)pyrene | 1308210-10MS & 1308210-10MSD | Low |
| Dibenzo(a,h)anthracene | 1308210-10MS & 1308210-10MSD | Low |
| Benzo(g,h,i)perylene | 1308210-10MS & 1308210-10MSD | Low |
| Several Compounds | 1308210-10MSD | Low |

The recoveries of these compounds in the laboratory control sample and laboratory control sample duplicate were within control limits, which suggest the outliers in the matrix spikes may have been due to matrix effects, so no further action was taken.

10. The samples were extracted and analyzed within the established holding times.

11. All surrogate recoveries were within acceptance criteria with the following exception:

| Surrogate | Sample | Direction |
|---|---|---|
| Terphenyl-$D_{14}$ | 1308210-10 | High |

This sample was also used for the matrix spike and matrix spike duplicate. Terphenyl-$d_{14}$ was trending high in the spikes, which suggest matrix effects are present in the sample. Re-extraction was not required.

12. All internal standard recoveries were within acceptance criteria with the following exception:

| Internal Standard | Sample | Direction |
|---|---|---|
| Perylene-$D_{12}$ | 1308210-8, -10, -10MS & -10MSD | Low |

Re-analysis of sample 1308210-8 confirmed the original result. This suggests that the outliers were due to matrix effects. No further action was taken.

Sample 1308210-10 was also used for the matrix spike and matrix spike duplicate. The spikes also contained internal standards outside the acceptance criteria, which suggest matrix effects are present in the sample. Further re-analyses were not required.

13. Manual integrations are performed when needed to provide consistent and defensible data following the guidelines in the current revision of SOP 939.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Emily Lyons

Emily Lyons
Organics Primary Data Reviewer

8/23/13
Date

Organics Final Data Reviewer

August 23, 2013
Date

*ALS*
*Data Qualifier Flags*
*Chromatography and Mass Spectrometry*

| | |
|---|---|
| **U or ND:** | **This flag indicates that the compound was analyzed for but not detected.** |
| **J:** | **This flag indicates an estimated value. This flag is used as follows: (1) when estimating a concentration for tentatively identified compounds (TICs) where a 1:1 response is assumed; (2) when the mass spectral and retention time data indicate the presence of a compound that meets the volatile and semivolatile GC/MS identification criteria, and the result is less than the reporting limit (RL) but greater than the method detection limit (MDL); (3) when the retention time data indicate the presence of a compound that meets the GC identification criteria, and the result is less than the RL but greater than the MDL; and (4) the reported value is estimated.** |
| **B:** | **This flag is used when the analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user. This flag shall be used for a tentatively identified compound (TIC) as well as for a positively identified target compound.** |
| **E:** | **This flag identifies compounds whose concentration exceeds the upper level of the calibration range.** |
| **A:** | **This flag indicates that a tentatively identified compound is a suspected aldol-condensation product.** |
| **X:** | **This flag indicates that the analyte was diluted below an accurate quantitation level.** |
| ***:** | **This flag indicates that a spike recovery is equal to or outside the control criteria used.** |
| **+:** | **This flag indicates that the relative percent difference (RPD) equals or exceeds the control criteria.** |

# ALS Environmental -- FC

## Sample Number(s) Cross-Reference Table

**OrderNum:** 1308210
**Client Name:** Wright Water Engineers
**Client Project Name:** UDFCD Sediments
**Client Project Number:** 131013000
**Client PO Number:**

| Client Sample Number | Lab Sample Number | COC Number | Matrix | Date Collected | Time Collected |
|---|---|---|---|---|---|
| Site #2 | 1308210-1 | | SOIL | 12-Aug-13 | 9:45 |
| Site #5 | 1308210-2 | | SOIL | 12-Aug-13 | 10:30 |
| Site #6 | 1308210-3 | | SOIL | 12-Aug-13 | 11:00 |
| Site #7 | 1308210-4 | | SOIL | 12-Aug-13 | 12:00 |
| Site #9 | 1308210-5 | | SOIL | 12-Aug-13 | 13:30 |
| Site #1 | 1308210-6 | | SOIL | 12-Aug-13 | 14:40 |
| Site #12 | 1308210-7 | | SOIL | 12-Aug-13 | 15:10 |
| Site #10 | 1308210-8 | | SOIL | 13-Aug-13 | 8:30 |
| Site #4 | 1308210-9 | | SOIL | 13-Aug-13 | 9:45 |
| Site #11 | 1308210-10 | | SOIL | 13-Aug-13 | 11:00 |
| Site #2 | 1308210-11 | | LEACHAT | 12-Aug-13 | 9:45 |
| Site #5 | 1308210-12 | | LEACHAT | 12-Aug-13 | 10:30 |
| Site #6 | 1308210-13 | | LEACHAT | 12-Aug-13 | 11:00 |
| Site #7 | 1308210-14 | | LEACHAT | 12-Aug-13 | 12:00 |
| Site #9 | 1308210-15 | | LEACHAT | 12-Aug-13 | 13:30 |
| Site #1 | 1308210-16 | | LEACHAT | 12-Aug-13 | 14:40 |
| Site #12 | 1308210-17 | | LEACHAT | 12-Aug-13 | 15:10 |
| Site #10 | 1308210-18 | | LEACHAT | 13-Aug-13 | 8:30 |
| Site #4 | 1308210-19 | | LEACHAT | 13-Aug-13 | 9:45 |
| Site #11 | 1308210-20 | | LEACHAT | 13-Aug-13 | 11:00 |
| Trip Blank | 1308210-21 | | WATER | 07-Aug-13 | |

**ALS Laboratory Group**

225 Commerce Drive, Fort Collins, Colorado 80524
TF: (800) 443-1511 PH: (970) 490-1511 FX: (970) 490-1522

# Chain-of-Custody

Form 202r8

| | |
|---|---|
| WORKORDER # | 1308210 |
| DATE | 8-13-13 |
| PAGE | 1 of 1 |
| TURNAROUND | |
| DISPOSAL | [✓ By Lab] or Return to Client |

| | | | |
|---|---|---|---|
| | | SAMPLER | |
| PROJECT NAME | UDFCD SEDIMENTS | SITE ID | |
| PROJECT No. | 131 013 000 | EDD FORMAT | |
| | | PURCHASE ORDER | |
| COMPANY NAME | WRIGHT WATER ENGINEERS | BILL TO COMPANY | |
| SEND REPORT TO | ELIOT WONG | INVOICE ATTN TO | |
| ADDRESS | 2490 W. 26th AVE, #100A | ADDRESS | |
| CITY / STATE / ZIP | DENVER / CO / 80211 | CITY / STATE / ZIP | |
| PHONE | 303 480 1700 | PHONE | |
| FAX | 303 480 1020 | FAX | |
| E-MAIL | ewong@wrightwater.com | E-MAIL | |

| Lab ID | Field ID | Matrix | Sample Date | Sample Time | # Bottles | Pres. | QC | TCLP - FULL SUITE | PAINT FILTER | IGNITABILITY/REACTIVITY/PH | BTEX | PAHS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ① | Site #2 | S | 8/12/13 | 9:45AM | 3 | N/A | N/A ⑪ | X | X | | | X |
| ② | Site #5 | S | 8/12/13 | 10:30AM | 2 | N/A | N/A ⑫ | X | X | | | |
| ③ | Site #6 | S | 8/12/13 | 11:00AM | 3 | N/A | N/A ⑬ | X | X | X | | |
| ④ | Site #7 | S | 8/12/13 | 12:00PM | 4 | N/A | N/A ⑭ | X | X | X | X | |
| ⑤ | Site #9 | S | 8/12/13 | 13:30 | 3 | N/A | N/A ⑮ | X | X | | X | |
| ⑥ | Site #1 | S | 8/12/13 | 14:40 | 2 | N/A | N/A ⑯ | X | X | | | |
| ⑦ | Site #12 | S | 8/12/13 | 15:10 | 3 | N/A | N/A ⑰ | X | X | | | X |
| ⑧ | Site #10 | S | 8/13/13 | 8:30AM | 4 | N/A | N/A ⑱ | X | X | X | | X |
| ⑨ | Site #4 | S | 8/13/13 | 9:45AM | 5 | N/A | N/A ⑲ | X | X | X | X | X |
| ⑩ | Site #11 | S | 8/13/13 | 11:00AM | 5 | N/A | N/A ⑳ | X | X | X | X | X |

*Time Zone (Circle): EST CST [✓ MST] PST Matrix: O = oil [✓ S = soil] NS = non-soil solid W = water L = liquid E = extract F = filter

**For metals or anions, please detail analytes below.**

Comments:

㉑ TB

| QC PACKAGE (check below) | |
|---|---|
| ☐ | LEVEL II (Standard QC) |
| ☐ | LEVEL III (Std QC + forms) |
| ☐ | LEVEL IV (Std QC + forms + raw data) |
| ☐ | |

Preservative Key: 1-HCl 2-HNO3 3-H2SO4 4-NaOH 5-NaHSO4 7-Other 8-4 degrees C 9-5035

| | SIGNATURE | PRINTED NAME | DATE | TIME |
|---|---|---|---|---|
| RELINQUISHED BY | Julia Traylor | Julia Traylor | 8/13/13 | 1420 |
| RECEIVED BY | | Lauren Schmitt | 8/[illegible]/13 | 1420 |
| RELINQUISHED BY | | | | |
| RECEIVED BY | | | | |
| RELINQUISHED BY | | | | |
| RECEIVED BY | | | | |

## ALS Environmental - Fort Collins
## CONDITION OF SAMPLE UPON RECEIPT FORM

Client: Wright Water Eng. Workorder No: 1308210

Project Manager: ARW Initials: UAS Date: 8/13/13

| | | | | |
|---|---|---|---|---|
| 1. | Does this project require any special handling in addition to standard ALS procedures? | | YES | [✓ NO] |
| 2. | Are custody seals on shipping containers intact? | NONE | [✓ YES] | NO |
| 3. | Are Custody seals on sample containers intact? | [✓ NONE] | YES | NO |
| 4. | Is there a COC (Chain-of-Custody) present or other representative documents? | | [✓ YES] | NO |
| 5. | Are the COC and bottle labels complete and legible? | | [✓ YES] | NO |
| 6. | Is the COC in agreement with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.) | | [✓ YES] | NO |
| 7. | Were airbills / shipping documents present and/or removable? | [✓ DROP OFF] | YES | NO |
| 8. | Are all aqueous samples requiring preservation preserved correctly? (excluding volatiles) | [✓ N/A] | YES | NO |
| 9. | Are all aqueous non-preserved samples pH 4-9? | [✓ N/A] | YES | NO |
| 10. | Is there sufficient sample for the requested analyses? | | [✓ YES] | NO |
| 11. | Were all samples placed in the proper containers for the requested analyses? | | [✓ YES] | NO |
| 12. | Are all samples within holding times for the requested analyses? | | [✓ YES] | NO |
| 13. | Were all sample containers received intact? (not broken or leaking, etc.) | | [✓ YES] | NO |
| 14. | Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) headspace free? Size of bubble: ____ < green pea ____ > green pea | N/A | [✓ YES] | NO |
| 15. | Do any water samples contain sediment? Amount<br>Amount of sediment: ____ dusting ____ moderate ____ heavy | N/A | YES | [✓ NO] |
| 16. | Were the samples shipped on ice? | | [✓ YES] | NO |
| 17. | Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: [✓ #2] #4 | RAD ONLY | YES | [✓ NO] |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Cooler #: | 1 | | | | | | | |
| Temperature (°C): | 8.0°C | | | | | | | |
| No. of custody seals on cooler: | 2 | | | | | | | |
| DOT Survey/ Acceptance Information — External µR/hr reading: | N/A | | | | | | | |
| Background µR/hr reading: | 10 | | | | | | | |

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? YES / NO / [✓ NA] (If no, see Form 008.)

**Additional Information:** PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16.

* Trip Blank not listed on COC. Added as 1308210-21.

If applicable, was the client contacted? YES / NO / [✓ NA] Contact: ____________ Date/Time: ________

**Project Manager Signature / Date:** 8/13/13

*IR Gun #2: Oakton, SN 29922500201-0066
*IR Gun #4: Oakton, SN 2372220101-0002

Form 201r24.xls (06/04/2012)

Page 1 of 1

# GC/MS Semi-volatiles

## Method SW8270D--Leachate

## Method Blank

| | |
|---|---|
| **Lab Name:** | **ALS Environmental -- FC** |
| **Work Order Number:** | 1308210 |
| **Client Name:** | Wright Water Engineers |
| **ClientProject ID:** | UDFCD Sediments 131013000 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Lab ID:** EX130815-11MB | | **Sample Matrix:** | LEACHATE | **Prep Batch:** | EX130816-4 | **Sample Aliquot:** | 100 ml |
| | | **% Moisture:** | N/A | **QCBatchID:** | EX130816-4-1 | **Final Volume:** | 1 ml |
| | | **Date Collected:** | N/A | **Run ID:** | SV130820-2 | **Result Units:** | MG/L |
| **LEACH DATE: 8/15/2013** | | **Date Extracted:** | 16-Aug-13 | **Cleanup:** | NONE | **Clean DF:** | 1 |
| | | **Date Analyzed:** | 20-Aug-13 | **Basis:** | N/A | | |
| | | **Prep Method:** | SW3520 Rev C | **File Name:** | P17294 | | |

| CASNO | Target Analyte | DF | Result | RptLimit LOD/LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 110-86-1 | PYRIDINE | 1 | 0.1 | 0.1 | U | |
| 106-46-7 | 1,4-DICHLOROBENZENE | 1 | 0.1 | 0.1 | U | |
| 95-48-7 | 2-METHYLPHENOL | 1 | 0.1 | 0.1 | U | |
| 108-39-4 | 3+4-METHYLPHENOL | 1 | 0.1 | 0.1 | U | |
| 67-72-1 | HEXACHLOROETHANE | 1 | 0.1 | 0.1 | U | |
| 98-95-3 | NITROBENZENE | 1 | 0.1 | 0.1 | U | |
| 87-68-3 | HEXACHLOROBUTADIENE | 1 | 0.1 | 0.1 | U | |
| 88-06-2 | 2,4,6-TRICHLOROPHENOL | 1 | 0.1 | 0.1 | U | |
| 95-95-4 | 2,4,5-TRICHLOROPHENOL | 1 | 0.1 | 0.1 | U | |
| 121-14-2 | 2,4-DINITROTOLUENE | 1 | 0.1 | 0.1 | U | |
| 118-74-1 | HEXACHLOROBENZENE | 1 | 0.1 | 0.1 | U | |
| 87-86-5 | PENTACHLOROPHENOL | 1 | 0.2 | 0.2 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 118-79-6 | 2,4,6-TRIBROMOPHENOL | 0.645 | | 0.75 | 86 | 42 - 117 |
| 321-60-8 | 2-FLUOROBIPHENYL | 0.469 | | 0.5 | 94 | 55 - 108 |
| 367-12-4 | 2-FLUOROPHENOL | 0.61 | | 0.75 | 81 | 46 - 105 |
| 4165-60-0 | NITROBENZENE-D5 | 0.437 | | 0.5 | 87 | 53 - 111 |
| 4165-62-2 | PHENOL-D5 | 0.624 | | 0.75 | 83 | 50 - 109 |
| 1718-51-0 | TERPHENYL-D14 | 0.5 | | 0.5 | 100 | 34 - 139 |

**Data Package ID:** *SV1308210-1*

# GC/MS Semi-volatiles

## Method SW8270D

## Method Blank

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

---

**Lab ID:** EX130816-6MB

| | | | | | |
|---|---|---|---|---|---|
| **Sample Matrix:** | SOIL | **Prep Batch:** | EX130816-6 | **Sample Aliquot:** | 30 g |
| **% Moisture:** | N/A | **QCBatchID:** | EX130816-6-1 | **Final Volume:** | 1 ml |
| **Date Collected:** | N/A | **Run ID:** | SV130821-2 | **Result Units:** | UG/KG |
| **Date Extracted:** | 16-Aug-13 | **Cleanup:** | SW3640 | **Clean DF:** | 1 |
| **Date Analyzed:** | 21-Aug-13 | **Basis:** | N/A | | |
| **Prep Method:** | SW3540 Rev C | **File Name:** | P17313 | | |

| CASNO | Target Analyte | DF | Result | RptLimit LOD/LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 91-20-3 | NAPHTHALENE | 1 | 330 | 330 | U | |
| 91-57-6 | 2-METHYLNAPHTHALENE | 1 | 330 | 330 | U | |
| 208-96-8 | ACENAPHTHYLENE | 1 | 330 | 330 | U | |
| 83-32-9 | ACENAPHTHENE | 1 | 330 | 330 | U | |
| 86-73-7 | FLUORENE | 1 | 330 | 330 | U | |
| 85-01-8 | PHENANTHRENE | 1 | 330 | 330 | U | |
| 120-12-7 | ANTHRACENE | 1 | 330 | 330 | U | |
| 206-44-0 | FLUORANTHENE | 1 | 330 | 330 | U | |
| 129-00-0 | PYRENE | 1 | 330 | 330 | U | |
| 56-55-3 | BENZO(A)ANTHRACENE | 1 | 330 | 330 | U | |
| 218-01-9 | CHRYSENE | 1 | 330 | 330 | U | |
| 205-99-2 | BENZO(B)FLUORANTHENE | 1 | 330 | 330 | U | |
| 207-08-9 | BENZO(K)FLUORANTHENE | 1 | 330 | 330 | U | |
| 50-32-8 | BENZO(A)PYRENE | 1 | 330 | 330 | U | |
| 193-39-5 | INDENO(1,2,3-CD)PYRENE | 1 | 330 | 330 | U | |
| 53-70-3 | DIBENZO(A,H)ANTHRACENE | 1 | 330 | 330 | U | |
| 191-24-2 | BENZO(G,H,I)PERYLENE | 1 | 330 | 330 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 321-60-8 | 2-FLUOROBIPHENYL | 1090 | | 1670 | 66 | 41 - 111 |
| 4165-60-0 | NITROBENZENE-D5 | 978 | | 1670 | 59 | 32 - 110 |
| 1718-51-0 | TERPHENYL-D14 | 1630 | | 1670 | 98 | 23 - 159 |

**Data Package ID:** *SV1308210-1*

# GC/MS Semi-volatiles

## Method SW8270 Revision D

## Sample Results

|  |  |
|---|---|
| **Lab Name:** | **ALS Environmental -- FC** |
| **Work Order Number:** | 1308210 |
| **Client Name:** | Wright Water Engineers |
| **ClientProject ID:** | UDFCD Sediments 131013000 |

|  |  |  |  |  |  |  |  |
|---|---|---|---|---|---|---|---|
| **Field ID:** | Site #2 | **Sample Matrix:** | SOIL | **Prep Batch:** | EX130816-6 | **Analyst:** | Joe Kostelnik |
| **Lab ID:** | 1308210-1 | **% Moisture:** | 37.8 | **QCBatchID:** | EX130816-6-1 | **Sample Aliquot:** | 30.43 G |
|  |  | **Date Collected:** | 12-Aug-13 | **Run ID:** | SV130821-2 | **Final Volume:** | 1 ML |
|  |  | **Date Extracted:** | 16-Aug-13 | **Cleanup:** | SW3640 | **Result Units:** | UG/KG |
|  |  | **Date Analyzed:** | 21-Aug-13 | **Basis:** | Dry Weight | **Clean DF:** | 1 |
|  |  | **Prep Method:** | SW3540 Rev C | **File Name:** | P17316 |  |  |

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 91-20-3 | NAPHTHALENE | 1 | 530 | 530 | U |  |
| 91-57-6 | 2-METHYLNAPHTHALENE | 1 | 530 | 530 | U |  |
| 208-96-8 | ACENAPHTHYLENE | 1 | 530 | 530 | U |  |
| 83-32-9 | ACENAPHTHENE | 1 | 530 | 530 | U |  |
| 86-73-7 | FLUORENE | 1 | 530 | 530 | U |  |
| 85-01-8 | PHENANTHRENE | 1 | 530 | 530 | U |  |
| 120-12-7 | ANTHRACENE | 1 | 530 | 530 | U |  |
| 206-44-0 | FLUORANTHENE | 1 | 530 | 530 | U |  |
| 129-00-0 | PYRENE | 1 | 530 | 530 | U |  |
| 56-55-3 | BENZO(A)ANTHRACENE | 1 | 530 | 530 | U |  |
| 218-01-9 | CHRYSENE | 1 | 530 | 530 | U |  |
| 205-99-2 | BENZO(B)FLUORANTHENE | 1 | 530 | 530 | U |  |
| 207-08-9 | BENZO(K)FLUORANTHENE | 1 | 530 | 530 | U |  |
| 50-32-8 | BENZO(A)PYRENE | 1 | 530 | 530 | U |  |
| 193-39-5 | INDENO(1,2,3-CD)PYRENE | 1 | 530 | 530 | U |  |
| 53-70-3 | DIBENZO(A,H)ANTHRACENE | 1 | 530 | 530 | U |  |
| 191-24-2 | BENZO(G,H,I)PERYLENE | 1 | 530 | 530 | U |  |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 321-60-8 | 2-FLUOROBIPHENYL | 1710 |  | 2640 | 65 | 41 - 111 |
| 4165-60-0 | NITROBENZENE-D5 | 1510 |  | 2640 | 57 | 32 - 110 |
| 1718-51-0 | TERPHENYL-D14 | 2180 |  | 2640 | 82 | 23 - 159 |

**Data Package ID:** *SV1308210-1*

# GC/MS Semi-volatiles

## Method SW8270 Revision D

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

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**Field ID:** Site #12
**Lab ID:** 1308210-7

**Sample Matrix:** SOIL
**% Moisture:** 63.3
**Date Collected:** 12-Aug-13
**Date Extracted:** 16-Aug-13
**Date Analyzed:** 21-Aug-13
**Prep Method:** SW3540 Rev C

**Prep Batch:** EX130816-6
**QCBatchID:** EX130816-6-1
**Run ID:** SV130821-2
**Cleanup:** SW3640
**Basis:** Dry Weight
**File Name:** P17317

**Analyst:** Joe Kostelnik
**Sample Aliquot:** 30.56 G
**Final Volume:** 1 ML
**Result Units:** UG/KG
**Clean DF:** 1

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 91-20-3 | NAPHTHALENE | 1 | 890 | 890 | U | |
| 91-57-6 | 2-METHYLNAPHTHALENE | 1 | 890 | 890 | U | |
| 208-96-8 | ACENAPHTHYLENE | 1 | 890 | 890 | U | |
| 83-32-9 | ACENAPHTHENE | 1 | 890 | 890 | U | |
| 86-73-7 | FLUORENE | 1 | 890 | 890 | U | |
| 85-01-8 | PHENANTHRENE | 1 | 390 | 890 | J | |
| 120-12-7 | ANTHRACENE | 1 | 890 | 890 | U | |
| 206-44-0 | FLUORANTHENE | 1 | 790 | 890 | J | |
| 129-00-0 | PYRENE | 1 | 750 | 890 | J | |
| 56-55-3 | BENZO(A)ANTHRACENE | 1 | 340 | 890 | J | |
| 218-01-9 | CHRYSENE | 1 | 410 | 890 | J | |
| 205-99-2 | BENZO(B)FLUORANTHENE | 1 | 610 | 890 | J | |
| 207-08-9 | BENZO(K)FLUORANTHENE | 1 | 280 | 890 | J | |
| 50-32-8 | BENZO(A)PYRENE | 1 | 390 | 890 | J | |
| 193-39-5 | INDENO(1,2,3-CD)PYRENE | 1 | 890 | 890 | U | |
| 53-70-3 | DIBENZO(A,H)ANTHRACENE | 1 | 890 | 890 | U | |
| 191-24-2 | BENZO(G,H,I)PERYLENE | 1 | 890 | 890 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 321-60-8 | 2-FLUOROBIPHENYL | 3190 | | 4460 | 71 | 41 - 111 |
| 4165-60-0 | NITROBENZENE-D5 | 2520 | | 4460 | 57 | 32 - 110 |
| 1718-51-0 | TERPHENYL-D14 | 3800 | | 4460 | 85 | 23 - 159 |

**Data Package ID:** *SV1308210-1*

# GC/MS Semi-volatiles

## Method SW8270 Revision D

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

**Field ID:** Site #10
**Lab ID:** 1308210-8

**Sample Matrix:** SOIL
**% Moisture:** 51.3
**Date Collected:** 13-Aug-13
**Date Extracted:** 16-Aug-13
**Date Analyzed:** 21-Aug-13
**Prep Method:** SW3540 Rev C

**Prep Batch:** EX130816-6
**QCBatchID:** EX130816-6-1
**Run ID:** SV130821-2
**Cleanup:** SW3640
**Basis:** Dry Weight
**File Name:** P17319

**Analyst:** Joe Kostelnik
**Sample Aliquot:** 30.12 G
**Final Volume:** 1 ML
**Result Units:** UG/KG
**Clean DF:** 1

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 91-20-3 | NAPHTHALENE | 1 | 680 | 680 | U | |
| 91-57-6 | 2-METHYLNAPHTHALENE | 1 | 680 | 680 | U | |
| 208-96-8 | ACENAPHTHYLENE | 1 | 680 | 680 | U | |
| 83-32-9 | ACENAPHTHENE | 1 | 680 | 680 | U | |
| 86-73-7 | FLUORENE | 1 | 680 | 680 | U | |
| 85-01-8 | PHENANTHRENE | 1 | 600 | 680 | J | |
| 120-12-7 | ANTHRACENE | 1 | 680 | 680 | U | |
| 206-44-0 | FLUORANTHENE | 1 | 1900 | 680 | | |
| 129-00-0 | PYRENE | 1 | 1900 | 680 | | |
| 56-55-3 | BENZO(A)ANTHRACENE | 1 | 800 | 680 | | |
| 218-01-9 | CHRYSENE | 1 | 1000 | 680 | | |
| 205-99-2 | BENZO(B)FLUORANTHENE | 1 | 2000 | 680 | | |
| 207-08-9 | BENZO(K)FLUORANTHENE | 1 | 810 | 680 | | |
| 50-32-8 | BENZO(A)PYRENE | 1 | 950 | 680 | | |
| 193-39-5 | INDENO(1,2,3-CD)PYRENE | 1 | 350 | 680 | J | |
| 53-70-3 | DIBENZO(A,H)ANTHRACENE | 1 | 680 | 680 | U | |
| 191-24-2 | BENZO(G,H,I)PERYLENE | 1 | 350 | 680 | J | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 321-60-8 | 2-FLUOROBIPHENYL | 2390 | | 3410 | 70 | 41 - 111 |
| 4165-60-0 | NITROBENZENE-D5 | 2100 | | 3410 | 62 | 32 - 110 |
| 1718-51-0 | TERPHENYL-D14 | 3290 | | 3410 | 97 | 23 - 159 |

**Data Package ID:** *SV1308210-1*

# GC/MS Semi-volatiles

## Method SW8270 Revision D

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

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| | |
|---|---|
| **Field ID:** | Site #4 |
| **Lab ID:** | 1308210-9 |

**Sample Matrix:** SOIL
**% Moisture:** 34.1
**Date Collected:** 13-Aug-13
**Date Extracted:** 16-Aug-13
**Date Analyzed:** 21-Aug-13
**Prep Method:** SW3540 Rev C

**Prep Batch:** EX130816-6
**QCBatchID:** EX130816-6-1
**Run ID:** SV130821-2
**Cleanup:** SW3640
**Basis:** Dry Weight
**File Name:** P17318

**Analyst:** Joe Kostelnik
**Sample Aliquot:** 30.34 G
**Final Volume:** 1 ML
**Result Units:** UG/KG
**Clean DF:** 1

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| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 91-20-3 | NAPHTHALENE | 1 | 500 | 500 | U | |
| 91-57-6 | 2-METHYLNAPHTHALENE | 1 | 500 | 500 | U | |
| 208-96-8 | ACENAPHTHYLENE | 1 | 500 | 500 | U | |
| 83-32-9 | ACENAPHTHENE | 1 | 500 | 500 | U | |
| 86-73-7 | FLUORENE | 1 | 500 | 500 | U | |
| 85-01-8 | PHENANTHRENE | 1 | 500 | 500 | U | |
| 120-12-7 | ANTHRACENE | 1 | 500 | 500 | U | |
| 206-44-0 | FLUORANTHENE | 1 | 150 | 500 | J | |
| 129-00-0 | PYRENE | 1 | 500 | 500 | U | |
| 56-55-3 | BENZO(A)ANTHRACENE | 1 | 500 | 500 | U | |
| 218-01-9 | CHRYSENE | 1 | 500 | 500 | U | |
| 205-99-2 | BENZO(B)FLUORANTHENE | 1 | 210 | 500 | J | |
| 207-08-9 | BENZO(K)FLUORANTHENE | 1 | 500 | 500 | U | |
| 50-32-8 | BENZO(A)PYRENE | 1 | 500 | 500 | U | |
| 193-39-5 | INDENO(1,2,3-CD)PYRENE | 1 | 500 | 500 | U | |
| 53-70-3 | DIBENZO(A,H)ANTHRACENE | 1 | 500 | 500 | U | |
| 191-24-2 | BENZO(G,H,I)PERYLENE | 1 | 500 | 500 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 321-60-8 | 2-FLUOROBIPHENYL | 1650 | | 2500 | 66 | 41 - 111 |
| 4165-60-0 | NITROBENZENE-D5 | 1180 | | 2500 | 47 | 32 - 110 |
| 1718-51-0 | TERPHENYL-D14 | 2100 | | 2500 | 84 | 23 - 159 |

**Data Package ID:** *SV1308210-1*

# GC/MS Semi-volatiles

## Method SW8270 Revision D

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

| | |
|---|---|
| **Field ID:** | Site #11 |
| **Lab ID:** | 1308210-10 |

**Sample Matrix:** SOIL
**% Moisture:** 33.0
**Date Collected:** 13-Aug-13
**Date Extracted:** 16-Aug-13
**Date Analyzed:** 21-Aug-13
**Prep Method:** SW3540 Rev C

**Prep Batch:** EX130816-6
**QCBatchID:** EX130816-6-1
**Run ID:** SV130821-2
**Cleanup:** SW3640
**Basis:** Dry Weight
**File Name:** P17321

**Analyst:** Joe Kostelnik
**Sample Aliquot:** 30.22 G
**Final Volume:** 1 ML
**Result Units:** UG/KG
**Clean DF:** 1

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 91-20-3 | NAPHTHALENE | 1 | 490 | 490 | U | |
| 91-57-6 | 2-METHYLNAPHTHALENE | 1 | 490 | 490 | U | |
| 208-96-8 | ACENAPHTHYLENE | 1 | 490 | 490 | U | |
| 83-32-9 | ACENAPHTHENE | 1 | 490 | 490 | U | |
| 86-73-7 | FLUORENE | 1 | 490 | 490 | U | |
| 85-01-8 | PHENANTHRENE | 1 | 490 | 490 | U | |
| 120-12-7 | ANTHRACENE | 1 | 490 | 490 | U | |
| 206-44-0 | FLUORANTHENE | 1 | 430 | 490 | J | |
| 129-00-0 | PYRENE | 1 | 790 | 490 | | |
| 56-55-3 | BENZO(A)ANTHRACENE | 1 | 170 | 490 | J | |
| 218-01-9 | CHRYSENE | 1 | 320 | 490 | J | |
| 205-99-2 | BENZO(B)FLUORANTHENE | 1 | 770 | 490 | | |
| 207-08-9 | BENZO(K)FLUORANTHENE | 1 | 310 | 490 | J | |
| 50-32-8 | BENZO(A)PYRENE | 1 | 260 | 490 | J | |
| 193-39-5 | INDENO(1,2,3-CD)PYRENE | 1 | 320 | 490 | J | |
| 53-70-3 | DIBENZO(A,H)ANTHRACENE | 1 | 490 | 490 | U | |
| 191-24-2 | BENZO(G,H,I)PERYLENE | 1 | 450 | 490 | J | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 321-60-8 | 2-FLUOROBIPHENYL | 2180 | | 2470 | 88 | 41 - 111 |
| 4165-60-0 | NITROBENZENE-D5 | 1890 | | 2470 | 77 | 32 - 110 |
| 1718-51-0 | TERPHENYL-D14 | 4490 | * | 2470 | 182 | 23 - 159 |

**Data Package ID:** *SV1308210-1*

# GC/MS Semi-volatiles

## Method SW8270 Revision D--TCLP Leachate

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

**Field ID:** Site #2
**Lab ID:** 1308210-11
**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 12-Aug-13
**Date Extracted:** 16-Aug-13
**Date Analyzed:** 20-Aug-13
**Prep Method:** SW3520 Rev C

**Prep Batch:** EX130816-4
**QCBatchID:** EX130816-4-1
**Run ID:** SV130820-2
**Cleanup:** NONE
**Basis:** As Received
**File Name:** P17299

**Analyst:** Joe Kostelnik
**Sample Aliquot:** 100 ML
**Final Volume:** 1 ML
**Result Units:** MG/L
**Clean DF:** 1

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 110-86-1 | PYRIDINE | 1 | 0.1 | 0.1 | U | |
| 106-46-7 | 1,4-DICHLOROBENZENE | 1 | 0.1 | 0.1 | U | |
| 95-48-7 | 2-METHYLPHENOL | 1 | 0.1 | 0.1 | U | |
| 108-39-4 | 3+4-METHYLPHENOL | 1 | 0.1 | 0.1 | U | |
| 67-72-1 | HEXACHLOROETHANE | 1 | 0.1 | 0.1 | U | |
| 98-95-3 | NITROBENZENE | 1 | 0.1 | 0.1 | U | |
| 87-68-3 | HEXACHLOROBUTADIENE | 1 | 0.1 | 0.1 | U | |
| 88-06-2 | 2,4,6-TRICHLOROPHENOL | 1 | 0.1 | 0.1 | U | |
| 95-95-4 | 2,4,5-TRICHLOROPHENOL | 1 | 0.1 | 0.1 | U | |
| 121-14-2 | 2,4-DINITROTOLUENE | 1 | 0.1 | 0.1 | U | |
| 118-74-1 | HEXACHLOROBENZENE | 1 | 0.1 | 0.1 | U | |
| 87-86-5 | PENTACHLOROPHENOL | 1 | 0.2 | 0.2 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 118-79-6 | 2,4,6-TRIBROMOPHENOL | 0.702 | | 0.75 | 94 | 42 - 117 |
| 321-60-8 | 2-FLUOROBIPHENYL | 0.48 | | 0.5 | 96 | 55 - 108 |
| 367-12-4 | 2-FLUOROPHENOL | 0.638 | | 0.75 | 85 | 46 - 105 |
| 4165-60-0 | NITROBENZENE-D5 | 0.461 | | 0.5 | 92 | 53 - 111 |
| 4165-62-2 | PHENOL-D5 | 0.663 | | 0.75 | 88 | 50 - 109 |
| 1718-51-0 | TERPHENYL-D14 | 0.525 | | 0.5 | 105 | 34 - 139 |

**Data Package ID:** *SV1308210-1*

# GC/MS Semi-volatiles

## Method SW8270 Revision D--TCLP Leachate

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

| | |
|---|---|
| **Field ID:** | Site #5 |
| **Lab ID:** | 1308210-12 |

**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 12-Aug-13
**Date Extracted:** 16-Aug-13
**Date Analyzed:** 20-Aug-13
**Prep Method:** SW3520 Rev C

**Prep Batch:** EX130816-4
**QCBatchID:** EX130816-4-1
**Run ID:** SV130820-2
**Cleanup:** NONE
**Basis:** As Received
**File Name:** P17301

**Analyst:** Joe Kostelnik
**Sample Aliquot:** 100 ML
**Final Volume:** 1 ML
**Result Units:** MG/L
**Clean DF:** 1

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 110-86-1 | PYRIDINE | 1 | 0.1 | 0.1 | U | |
| 106-46-7 | 1,4-DICHLOROBENZENE | 1 | 0.1 | 0.1 | U | |
| 95-48-7 | 2-METHYLPHENOL | 1 | 0.1 | 0.1 | U | |
| 108-39-4 | 3+4-METHYLPHENOL | 1 | 0.1 | 0.1 | U | |
| 67-72-1 | HEXACHLOROETHANE | 1 | 0.1 | 0.1 | U | |
| 98-95-3 | NITROBENZENE | 1 | 0.1 | 0.1 | U | |
| 87-68-3 | HEXACHLOROBUTADIENE | 1 | 0.1 | 0.1 | U | |
| 88-06-2 | 2,4,6-TRICHLOROPHENOL | 1 | 0.1 | 0.1 | U | |
| 95-95-4 | 2,4,5-TRICHLOROPHENOL | 1 | 0.1 | 0.1 | U | |
| 121-14-2 | 2,4-DINITROTOLUENE | 1 | 0.1 | 0.1 | U | |
| 118-74-1 | HEXACHLOROBENZENE | 1 | 0.1 | 0.1 | U | |
| 87-86-5 | PENTACHLOROPHENOL | 1 | 0.2 | 0.2 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 118-79-6 | 2,4,6-TRIBROMOPHENOL | 0.671 | | 0.75 | 89 | 42 - 117 |
| 321-60-8 | 2-FLUOROBIPHENYL | 0.488 | | 0.5 | 98 | 55 - 108 |
| 367-12-4 | 2-FLUOROPHENOL | 0.63 | | 0.75 | 84 | 46 - 105 |
| 4165-60-0 | NITROBENZENE-D5 | 0.46 | | 0.5 | 92 | 53 - 111 |
| 4165-62-2 | PHENOL-D5 | 0.651 | | 0.75 | 87 | 50 - 109 |
| 1718-51-0 | TERPHENYL-D14 | 0.514 | | 0.5 | 103 | 34 - 139 |

**Data Package ID:** *SV1308210-1*

# GC/MS Semi-volatiles

## Method SW8270 Revision D--TCLP Leachate

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

| | |
|---|---|
| **Field ID:** | Site #6 |
| **Lab ID:** | 1308210-13 |

**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 12-Aug-13
**Date Extracted:** 16-Aug-13
**Date Analyzed:** 20-Aug-13
**Prep Method:** SW3520 Rev C

**Prep Batch:** EX130816-4
**QCBatchID:** EX130816-4-1
**Run ID:** SV130820-2
**Cleanup:** NONE
**Basis:** As Received
**File Name:** P17302

**Analyst:** Joe Kostelnik
**Sample Aliquot:** 100 ML
**Final Volume:** 1 ML
**Result Units:** MG/L
**Clean DF:** 1

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 110-86-1 | PYRIDINE | 1 | 0.1 | 0.1 | U | |
| 106-46-7 | 1,4-DICHLOROBENZENE | 1 | 0.1 | 0.1 | U | |
| 95-48-7 | 2-METHYLPHENOL | 1 | 0.1 | 0.1 | U | |
| 108-39-4 | 3+4-METHYLPHENOL | 1 | 0.1 | 0.1 | U | |
| 67-72-1 | HEXACHLOROETHANE | 1 | 0.1 | 0.1 | U | |
| 98-95-3 | NITROBENZENE | 1 | 0.1 | 0.1 | U | |
| 87-68-3 | HEXACHLOROBUTADIENE | 1 | 0.1 | 0.1 | U | |
| 88-06-2 | 2,4,6-TRICHLOROPHENOL | 1 | 0.1 | 0.1 | U | |
| 95-95-4 | 2,4,5-TRICHLOROPHENOL | 1 | 0.1 | 0.1 | U | |
| 121-14-2 | 2,4-DINITROTOLUENE | 1 | 0.1 | 0.1 | U | |
| 118-74-1 | HEXACHLOROBENZENE | 1 | 0.1 | 0.1 | U | |
| 87-86-5 | PENTACHLOROPHENOL | 1 | 0.2 | 0.2 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 118-79-6 | 2,4,6-TRIBROMOPHENOL | 0.626 | | 0.75 | 84 | 42 - 117 |
| 321-60-8 | 2-FLUOROBIPHENYL | 0.454 | | 0.5 | 91 | 55 - 108 |
| 367-12-4 | 2-FLUOROPHENOL | 0.586 | | 0.75 | 78 | 46 - 105 |
| 4165-60-0 | NITROBENZENE-D5 | 0.432 | | 0.5 | 86 | 53 - 111 |
| 4165-62-2 | PHENOL-D5 | 0.614 | | 0.75 | 82 | 50 - 109 |
| 1718-51-0 | TERPHENYL-D14 | 0.494 | | 0.5 | 99 | 34 - 139 |

**Data Package ID:** *SV1308210-1*

# GC/MS Semi-volatiles

## Method SW8270 Revision D--TCLP Leachate

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

| | |
|---|---|
| **Field ID:** | Site #7 |
| **Lab ID:** | 1308210-14 |

**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 12-Aug-13
**Date Extracted:** 16-Aug-13
**Date Analyzed:** 20-Aug-13
**Prep Method:** SW3520 Rev C

**Prep Batch:** EX130816-4
**QCBatchID:** EX130816-4-1
**Run ID:** SV130820-2
**Cleanup:** NONE
**Basis:** As Received
**File Name:** P17303

**Analyst:** Joe Kostelnik
**Sample Aliquot:** 100 ML
**Final Volume:** 1 ML
**Result Units:** MG/L
**Clean DF:** 1

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 110-86-1 | PYRIDINE | 1 | 0.1 | 0.1 | U | |
| 106-46-7 | 1,4-DICHLOROBENZENE | 1 | 0.1 | 0.1 | U | |
| 95-48-7 | 2-METHYLPHENOL | 1 | 0.1 | 0.1 | U | |
| 108-39-4 | 3+4-METHYLPHENOL | 1 | 0.1 | 0.1 | U | |
| 67-72-1 | HEXACHLOROETHANE | 1 | 0.1 | 0.1 | U | |
| 98-95-3 | NITROBENZENE | 1 | 0.1 | 0.1 | U | |
| 87-68-3 | HEXACHLOROBUTADIENE | 1 | 0.1 | 0.1 | U | |
| 88-06-2 | 2,4,6-TRICHLOROPHENOL | 1 | 0.1 | 0.1 | U | |
| 95-95-4 | 2,4,5-TRICHLOROPHENOL | 1 | 0.1 | 0.1 | U | |
| 121-14-2 | 2,4-DINITROTOLUENE | 1 | 0.1 | 0.1 | U | |
| 118-74-1 | HEXACHLOROBENZENE | 1 | 0.1 | 0.1 | U | |
| 87-86-5 | PENTACHLOROPHENOL | 1 | 0.2 | 0.2 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 118-79-6 | 2,4,6-TRIBROMOPHENOL | 0.67 | | 0.75 | 89 | 42 - 117 |
| 321-60-8 | 2-FLUOROBIPHENYL | 0.456 | | 0.5 | 91 | 55 - 108 |
| 367-12-4 | 2-FLUOROPHENOL | 0.599 | | 0.75 | 80 | 46 - 105 |
| 4165-60-0 | NITROBENZENE-D5 | 0.432 | | 0.5 | 86 | 53 - 111 |
| 4165-62-2 | PHENOL-D5 | 0.621 | | 0.75 | 83 | 50 - 109 |
| 1718-51-0 | TERPHENYL-D14 | 0.513 | | 0.5 | 103 | 34 - 139 |

**Data Package ID:** *SV1308210-1*

# GC/MS Semi-volatiles

## Method SW8270 Revision D--TCLP Leachate

## Sample Results

**Lab Name:** **ALS Environmental -- FC**

**Work Order Number:** 1308210

**Client Name:** Wright Water Engineers

**ClientProject ID:** UDFCD Sediments 131013000

|  |  |
|---|---|
| **Field ID:** | Site #9 |
| **Lab ID:** | 1308210-15 |

**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 12-Aug-13
**Date Extracted:** 16-Aug-13
**Date Analyzed:** 20-Aug-13
**Prep Method:** SW3520 Rev C

**Prep Batch:** EX130816-4
**QCBatchID:** EX130816-4-1
**Run ID:** SV130820-2
**Cleanup:** NONE
**Basis:** As Received
**File Name:** P17304

**Analyst:** Joe Kostelnik
**Sample Aliquot:** 100 ML
**Final Volume:** 1 ML
**Result Units:** MG/L
**Clean DF:** 1

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 110-86-1 | PYRIDINE | 1 | 0.1 | 0.1 | U |  |
| 106-46-7 | 1,4-DICHLOROBENZENE | 1 | 0.1 | 0.1 | U |  |
| 95-48-7 | 2-METHYLPHENOL | 1 | 0.1 | 0.1 | U |  |
| 108-39-4 | 3+4-METHYLPHENOL | 1 | 0.1 | 0.1 | U |  |
| 67-72-1 | HEXACHLOROETHANE | 1 | 0.1 | 0.1 | U |  |
| 98-95-3 | NITROBENZENE | 1 | 0.1 | 0.1 | U |  |
| 87-68-3 | HEXACHLOROBUTADIENE | 1 | 0.1 | 0.1 | U |  |
| 88-06-2 | 2,4,6-TRICHLOROPHENOL | 1 | 0.1 | 0.1 | U |  |
| 95-95-4 | 2,4,5-TRICHLOROPHENOL | 1 | 0.1 | 0.1 | U |  |
| 121-14-2 | 2,4-DINITROTOLUENE | 1 | 0.1 | 0.1 | U |  |
| 118-74-1 | HEXACHLOROBENZENE | 1 | 0.1 | 0.1 | U |  |
| 87-86-5 | PENTACHLOROPHENOL | 1 | 0.2 | 0.2 | U |  |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 118-79-6 | 2,4,6-TRIBROMOPHENOL | 0.659 |  | 0.75 | 88 | 42 - 117 |
| 321-60-8 | 2-FLUOROBIPHENYL | 0.472 |  | 0.5 | 94 | 55 - 108 |
| 367-12-4 | 2-FLUOROPHENOL | 0.627 |  | 0.75 | 84 | 46 - 105 |
| 4165-60-0 | NITROBENZENE-D5 | 0.452 |  | 0.5 | 90 | 53 - 111 |
| 4165-62-2 | PHENOL-D5 | 0.647 |  | 0.75 | 86 | 50 - 109 |
| 1718-51-0 | TERPHENYL-D14 | 0.492 |  | 0.5 | 98 | 34 - 139 |

**Data Package ID:** *SV1308210-1*

# GC/MS Semi-volatiles

## Method SW8270 Revision D--TCLP Leachate

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

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| | |
|---|---|
| **Field ID:** | Site #1 |
| **Lab ID:** | 1308210-16 |

**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 12-Aug-13
**Date Extracted:** 16-Aug-13
**Date Analyzed:** 20-Aug-13
**Prep Method:** SW3520 Rev C

**Prep Batch:** EX130816-4
**QCBatchID:** EX130816-4-1
**Run ID:** SV130820-2
**Cleanup:** NONE
**Basis:** As Received
**File Name:** P17305

**Analyst:** Joe Kostelnik
**Sample Aliquot:** 100 ML
**Final Volume:** 1 ML
**Result Units:** MG/L
**Clean DF:** 1

---

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 110-86-1 | PYRIDINE | 1 | 0.1 | 0.1 | U | |
| 106-46-7 | 1,4-DICHLOROBENZENE | 1 | 0.1 | 0.1 | U | |
| 95-48-7 | 2-METHYLPHENOL | 1 | 0.1 | 0.1 | U | |
| 108-39-4 | 3+4-METHYLPHENOL | 1 | 0.1 | 0.1 | U | |
| 67-72-1 | HEXACHLOROETHANE | 1 | 0.1 | 0.1 | U | |
| 98-95-3 | NITROBENZENE | 1 | 0.1 | 0.1 | U | |
| 87-68-3 | HEXACHLOROBUTADIENE | 1 | 0.1 | 0.1 | U | |
| 88-06-2 | 2,4,6-TRICHLOROPHENOL | 1 | 0.1 | 0.1 | U | |
| 95-95-4 | 2,4,5-TRICHLOROPHENOL | 1 | 0.1 | 0.1 | U | |
| 121-14-2 | 2,4-DINITROTOLUENE | 1 | 0.1 | 0.1 | U | |
| 118-74-1 | HEXACHLOROBENZENE | 1 | 0.1 | 0.1 | U | |
| 87-86-5 | PENTACHLOROPHENOL | 1 | 0.2 | 0.2 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 118-79-6 | 2,4,6-TRIBROMOPHENOL | 0.685 | | 0.75 | 91 | 42 - 117 |
| 321-60-8 | 2-FLUOROBIPHENYL | 0.475 | | 0.5 | 95 | 55 - 108 |
| 367-12-4 | 2-FLUOROPHENOL | 0.644 | | 0.75 | 86 | 46 - 105 |
| 4165-60-0 | NITROBENZENE-D5 | 0.455 | | 0.5 | 91 | 53 - 111 |
| 4165-62-2 | PHENOL-D5 | 0.654 | | 0.75 | 87 | 50 - 109 |
| 1718-51-0 | TERPHENYL-D14 | 0.53 | | 0.5 | 106 | 34 - 139 |

**Data Package ID:** *SV1308210-1*

# GC/MS Semi-volatiles

## Method SW8270 Revision D--TCLP Leachate

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

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**Field ID:** Site #12
**Lab ID:** 1308210-17
**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 12-Aug-13
**Date Extracted:** 16-Aug-13
**Date Analyzed:** 20-Aug-13
**Prep Method:** SW3520 Rev C

**Prep Batch:** EX130816-4
**QCBatchID:** EX130816-4-1
**Run ID:** SV130820-2
**Cleanup:** NONE
**Basis:** As Received
**File Name:** P17306

**Analyst:** Joe Kostelnik
**Sample Aliquot:** 100 ML
**Final Volume:** 1 ML
**Result Units:** MG/L
**Clean DF:** 1

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 110-86-1 | PYRIDINE | 1 | 0.1 | 0.1 | U | |
| 106-46-7 | 1,4-DICHLOROBENZENE | 1 | 0.1 | 0.1 | U | |
| 95-48-7 | 2-METHYLPHENOL | 1 | 0.1 | 0.1 | U | |
| 108-39-4 | 3+4-METHYLPHENOL | 1 | 0.1 | 0.1 | U | |
| 67-72-1 | HEXACHLOROETHANE | 1 | 0.1 | 0.1 | U | |
| 98-95-3 | NITROBENZENE | 1 | 0.1 | 0.1 | U | |
| 87-68-3 | HEXACHLOROBUTADIENE | 1 | 0.1 | 0.1 | U | |
| 88-06-2 | 2,4,6-TRICHLOROPHENOL | 1 | 0.1 | 0.1 | U | |
| 95-95-4 | 2,4,5-TRICHLOROPHENOL | 1 | 0.1 | 0.1 | U | |
| 121-14-2 | 2,4-DINITROTOLUENE | 1 | 0.1 | 0.1 | U | |
| 118-74-1 | HEXACHLOROBENZENE | 1 | 0.1 | 0.1 | U | |
| 87-86-5 | PENTACHLOROPHENOL | 1 | 0.2 | 0.2 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 118-79-6 | 2,4,6-TRIBROMOPHENOL | 0.68 | | 0.75 | 91 | 42 - 117 |
| 321-60-8 | 2-FLUOROBIPHENYL | 0.47 | | 0.5 | 94 | 55 - 108 |
| 367-12-4 | 2-FLUOROPHENOL | 0.641 | | 0.75 | 85 | 46 - 105 |
| 4165-60-0 | NITROBENZENE-D5 | 0.459 | | 0.5 | 92 | 53 - 111 |
| 4165-62-2 | PHENOL-D5 | 0.65 | | 0.75 | 87 | 50 - 109 |
| 1718-51-0 | TERPHENYL-D14 | 0.499 | | 0.5 | 100 | 34 - 139 |

**Data Package ID:** *SV1308210-1*

# GC/MS Semi-volatiles

## Method SW8270 Revision D--TCLP Leachate
## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

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**Field ID:** Site #10
**Lab ID:** 1308210-18
**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 13-Aug-13
**Date Extracted:** 16-Aug-13
**Date Analyzed:** 20-Aug-13
**Prep Method:** SW3520 Rev C

**Prep Batch:** EX130816-4
**QCBatchID:** EX130816-4-1
**Run ID:** SV130820-2
**Cleanup:** NONE
**Basis:** As Received
**File Name:** P17307

**Analyst:** Joe Kostelnik
**Sample Aliquot:** 100 ML
**Final Volume:** 1 ML
**Result Units:** MG/L
**Clean DF:** 1

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 110-86-1 | PYRIDINE | 1 | 0.1 | 0.1 | U | |
| 106-46-7 | 1,4-DICHLOROBENZENE | 1 | 0.1 | 0.1 | U | |
| 95-48-7 | 2-METHYLPHENOL | 1 | 0.1 | 0.1 | U | |
| 108-39-4 | 3+4-METHYLPHENOL | 1 | 0.1 | 0.1 | U | |
| 67-72-1 | HEXACHLOROETHANE | 1 | 0.1 | 0.1 | U | |
| 98-95-3 | NITROBENZENE | 1 | 0.1 | 0.1 | U | |
| 87-68-3 | HEXACHLOROBUTADIENE | 1 | 0.1 | 0.1 | U | |
| 88-06-2 | 2,4,6-TRICHLOROPHENOL | 1 | 0.1 | 0.1 | U | |
| 95-95-4 | 2,4,5-TRICHLOROPHENOL | 1 | 0.1 | 0.1 | U | |
| 121-14-2 | 2,4-DINITROTOLUENE | 1 | 0.1 | 0.1 | U | |
| 118-74-1 | HEXACHLOROBENZENE | 1 | 0.1 | 0.1 | U | |
| 87-86-5 | PENTACHLOROPHENOL | 1 | 0.2 | 0.2 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 118-79-6 | 2,4,6-TRIBROMOPHENOL | 0.643 | | 0.75 | 86 | 42 - 117 |
| 321-60-8 | 2-FLUOROBIPHENYL | 0.442 | | 0.5 | 88 | 55 - 108 |
| 367-12-4 | 2-FLUOROPHENOL | 0.624 | | 0.75 | 83 | 46 - 105 |
| 4165-60-0 | NITROBENZENE-D5 | 0.441 | | 0.5 | 88 | 53 - 111 |
| 4165-62-2 | PHENOL-D5 | 0.632 | | 0.75 | 84 | 50 - 109 |
| 1718-51-0 | TERPHENYL-D14 | 0.476 | | 0.5 | 95 | 34 - 139 |

**Data Package ID:** *SV1308210-1*

# GC/MS Semi-volatiles

## Method SW8270 Revision D--TCLP Leachate

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

|  |  |
|---|---|
| **Field ID:** | Site #4 |
| **Lab ID:** | 1308210-19 |

**LEACH DATE: 8/15/2013**

|  |  |  |  |  |  |
|---|---|---|---|---|---|
| **Sample Matrix:** | LEACHATE | **Prep Batch:** | EX130816-4 | **Analyst:** | Joe Kostelnik |
| **% Moisture:** | N/A | **QCBatchID:** | EX130816-4-1 | **Sample Aliquot:** | 100 ML |
| **Date Collected:** | 13-Aug-13 | **Run ID:** | SV130820-2 | **Final Volume:** | 1 ML |
| **Date Extracted:** | 16-Aug-13 | **Cleanup:** | NONE | **Result Units:** | MG/L |
| **Date Analyzed:** | 20-Aug-13 | **Basis:** | As Received | **Clean DF:** | 1 |
| **Prep Method:** | SW3520 Rev C | **File Name:** | P17308 |  |  |

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 110-86-1 | PYRIDINE | 1 | 0.1 | 0.1 | U |  |
| 106-46-7 | 1,4-DICHLOROBENZENE | 1 | 0.1 | 0.1 | U |  |
| 95-48-7 | 2-METHYLPHENOL | 1 | 0.1 | 0.1 | U |  |
| 108-39-4 | 3+4-METHYLPHENOL | 1 | 0.1 | 0.1 | U |  |
| 67-72-1 | HEXACHLOROETHANE | 1 | 0.1 | 0.1 | U |  |
| 98-95-3 | NITROBENZENE | 1 | 0.1 | 0.1 | U |  |
| 87-68-3 | HEXACHLOROBUTADIENE | 1 | 0.1 | 0.1 | U |  |
| 88-06-2 | 2,4,6-TRICHLOROPHENOL | 1 | 0.1 | 0.1 | U |  |
| 95-95-4 | 2,4,5-TRICHLOROPHENOL | 1 | 0.1 | 0.1 | U |  |
| 121-14-2 | 2,4-DINITROTOLUENE | 1 | 0.1 | 0.1 | U |  |
| 118-74-1 | HEXACHLOROBENZENE | 1 | 0.1 | 0.1 | U |  |
| 87-86-5 | PENTACHLOROPHENOL | 1 | 0.2 | 0.2 | U |  |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 118-79-6 | 2,4,6-TRIBROMOPHENOL | 0.699 |  | 0.75 | 93 | 42 - 117 |
| 321-60-8 | 2-FLUOROBIPHENYL | 0.465 |  | 0.5 | 93 | 55 - 108 |
| 367-12-4 | 2-FLUOROPHENOL | 0.642 |  | 0.75 | 86 | 46 - 105 |
| 4165-60-0 | NITROBENZENE-D5 | 0.462 |  | 0.5 | 92 | 53 - 111 |
| 4165-62-2 | PHENOL-D5 | 0.67 |  | 0.75 | 89 | 50 - 109 |
| 1718-51-0 | TERPHENYL-D14 | 0.507 |  | 0.5 | 101 | 34 - 139 |

**Data Package ID:** *SV1308210-1*

# GC/MS Semi-volatiles

## Method SW8270 Revision D--TCLP Leachate
## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

|  |  |
|---|---|
| **Field ID:** | Site #11 |
| **Lab ID:** | 1308210-20 |

**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 13-Aug-13
**Date Extracted:** 16-Aug-13
**Date Analyzed:** 20-Aug-13
**Prep Method:** SW3520 Rev C

**Prep Batch:** EX130816-4
**QCBatchID:** EX130816-4-1
**Run ID:** SV130820-2
**Cleanup:** NONE
**Basis:** As Received
**File Name:** P17309

**Analyst:** Joe Kostelnik
**Sample Aliquot:** 100 ML
**Final Volume:** 1 ML
**Result Units:** MG/L
**Clean DF:** 1

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 110-86-1 | PYRIDINE | 1 | 0.1 | 0.1 | U |  |
| 106-46-7 | 1,4-DICHLOROBENZENE | 1 | 0.1 | 0.1 | U |  |
| 95-48-7 | 2-METHYLPHENOL | 1 | 0.1 | 0.1 | U |  |
| 108-39-4 | 3+4-METHYLPHENOL | 1 | 0.1 | 0.1 | U |  |
| 67-72-1 | HEXACHLOROETHANE | 1 | 0.1 | 0.1 | U |  |
| 98-95-3 | NITROBENZENE | 1 | 0.1 | 0.1 | U |  |
| 87-68-3 | HEXACHLOROBUTADIENE | 1 | 0.1 | 0.1 | U |  |
| 88-06-2 | 2,4,6-TRICHLOROPHENOL | 1 | 0.1 | 0.1 | U |  |
| 95-95-4 | 2,4,5-TRICHLOROPHENOL | 1 | 0.1 | 0.1 | U |  |
| 121-14-2 | 2,4-DINITROTOLUENE | 1 | 0.1 | 0.1 | U |  |
| 118-74-1 | HEXACHLOROBENZENE | 1 | 0.1 | 0.1 | U |  |
| 87-86-5 | PENTACHLOROPHENOL | 1 | 0.2 | 0.2 | U |  |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 118-79-6 | 2,4,6-TRIBROMOPHENOL | 0.676 |  | 0.75 | 90 | 42 - 117 |
| 321-60-8 | 2-FLUOROBIPHENYL | 0.476 |  | 0.5 | 95 | 55 - 108 |
| 367-12-4 | 2-FLUOROPHENOL | 0.642 |  | 0.75 | 86 | 46 - 105 |
| 4165-60-0 | NITROBENZENE-D5 | 0.482 |  | 0.5 | 96 | 53 - 111 |
| 4165-62-2 | PHENOL-D5 | 0.661 |  | 0.75 | 88 | 50 - 109 |
| 1718-51-0 | TERPHENYL-D14 | 0.489 |  | 0.5 | 98 | 34 - 139 |

**Data Package ID:** *SV1308210-1*

# GC/MS Semi-volatiles

## Method SW8270D

## Laboratory Control Sample and Laboratory Control Sample Duplicate

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

**Lab ID:** EX130816-4LCS

**Sample Matrix:** WATER
**% Moisture:** N/A
**Date Collected:** N/A
**Date Extracted:** 08/16/2013
**Date Analyzed:** 08/20/2013
**Prep Method:** SW3520C

**Prep Batch:** EX130816-4
**QCBatchID:** EX130816-4-1
**Run ID:** SV130820-2
**Cleanup:** NONE
**Basis:** N/A
**File Name:** P17295

**Sample Aliquot:** 1000 ml
**Final Volume:** 1 ml
**Result Units:** MG/L
**Clean DF:** 1

| CASNO | Target Analyte | Spike Added | LCS Result | Reporting Limit | Result Qualifier | LCS % Rec. | Control Limits |
|---|---|---|---|---|---|---|---|
| 110-86-1 | PYRIDINE | 0.05 | 0.033 | 0.01 | | 66 | 10 - 101% |
| 106-46-7 | 1,4-DICHLOROBENZENE | 0.05 | 0.0432 | 0.01 | | 86 | 54 - 94% |
| 95-48-7 | 2-METHYLPHENOL | 0.1 | 0.0843 | 0.01 | | 84 | 63 - 103% |
| 108-39-4 | 3+4-METHYLPHENOL | 0.2 | 0.148 | 0.01 | E | 74 | 54 - 106% |
| 67-72-1 | HEXACHLOROETHANE | 0.05 | 0.0384 | 0.01 | | 77 | 47 - 95% |
| 98-95-3 | NITROBENZENE | 0.05 | 0.0432 | 0.01 | | 86 | 36 - 107% |
| 87-68-3 | HEXACHLOROBUTADIENE | 0.05 | 0.0452 | 0.01 | | 90 | 43 - 93% |
| 88-06-2 | 2,4,6-TRICHLOROPHENOL | 0.1 | 0.0877 | 0.01 | | 88 | 61 - 110% |
| 95-95-4 | 2,4,5-TRICHLOROPHENOL | 0.1 | 0.0873 | 0.01 | | 87 | 62 - 109% |
| 121-14-2 | 2,4-DINITROTOLUENE | 0.05 | 0.0443 | 0.01 | | 89 | 46 - 114% |
| 118-74-1 | HEXACHLOROBENZENE | 0.05 | 0.0292 | 0.01 | | 58 | 48 - 115% |
| 87-86-5 | PENTACHLOROPHENOL | 0.1 | 0.0858 | 0.02 | | 86 | 40 - 114% |

**Data Package ID:** *SV1308210-1*

# GC/MS Semi-volatiles

## Method SW8270D

## Laboratory Control Sample and Laboratory Control Sample Duplicate

**Lab Name:** **ALS Environmental -- FC**

**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

**Lab ID:** EX130816-4LCSD

| | | | | | |
|---|---|---|---|---|---|
| **Sample Matrix:** | WATER | **Prep Batch:** | EX130816-4 | **Sample Aliquot:** | 1000 ml |
| **% Moisture:** | N/A | **QCBatchID:** | EX130816-4-1 | **Final Volume:** | 1 ml |
| **Date Collected:** | N/A | **Run ID:** | SV130820-2 | **Result Units:** | MG/L |
| **Date Extracted:** | 08/16/2013 | **Cleanup:** | NONE | **Clean DF:** | 1 |
| **Date Analyzed:** | 08/20/2013 | **Basis:** | N/A | | |
| **Prep Method:** | SW3520C | **File Name:** | P17296 | | |

| CASNO | Target Analyte | Spike Added | LCSD Result | Reporting Limit | Result Qualifier | LCSD % Rec. | RPD Limit | RPD |
|---|---|---|---|---|---|---|---|---|
| 110-86-1 | PYRIDINE | 0.05 | 0.0264 | 0.01 | | 53 | 50 | 22 |
| 106-46-7 | 1,4-DICHLOROBENZENE | 0.05 | 0.041 | 0.01 | | 82 | 50 | 5 |
| 95-48-7 | 2-METHYLPHENOL | 0.1 | 0.08 | 0.01 | | 80 | 50 | 5 |
| 108-39-4 | 3+4-METHYLPHENOL | 0.2 | 0.142 | 0.01 | E | 71 | 50 | 4 |
| 67-72-1 | HEXACHLOROETHANE | 0.05 | 0.0357 | 0.01 | | 71 | 50 | 7 |
| 98-95-3 | NITROBENZENE | 0.05 | 0.0406 | 0.01 | | 81 | 50 | 6 |
| 87-68-3 | HEXACHLOROBUTADIENE | 0.05 | 0.043 | 0.01 | | 86 | 50 | 5 |
| 88-06-2 | 2,4,6-TRICHLOROPHENOL | 0.1 | 0.0843 | 0.01 | | 84 | 50 | 4 |
| 95-95-4 | 2,4,5-TRICHLOROPHENOL | 0.1 | 0.0835 | 0.01 | | 83 | 50 | 4 |
| 121-14-2 | 2,4-DINITROTOLUENE | 0.05 | 0.0427 | 0.01 | | 85 | 50 | 4 |
| 118-74-1 | HEXACHLOROBENZENE | 0.05 | 0.0288 | 0.01 | | 58 | 50 | 1 |
| 87-86-5 | PENTACHLOROPHENOL | 0.1 | 0.0803 | 0.02 | | 80 | 50 | 7 |

## Surrogate Recovery LCS/LCSD

| CASNO | Target Analyte | Spike Added | LCS % Rec. | LCS Flag | LCSD % Rec. | LCSD Flag | Control Limits |
|---|---|---|---|---|---|---|---|
| 118-79-6 | 2,4,6-TRIBROMOPHENOL | 0.075 | 99 | | 95 | | 42 - 117 |
| 321-60-8 | 2-FLUOROBIPHENYL | 0.05 | 92 | | 89 | | 55 - 108 |
| 367-12-4 | 2-FLUOROPHENOL | 0.075 | 86 | | 80 | | 46 - 105 |
| 4165-60-0 | NITROBENZENE-D5 | 0.05 | 86 | | 83 | | 53 - 111 |
| 4165-62-2 | PHENOL-D5 | 0.075 | 87 | | 83 | | 50 - 109 |
| 1718-51-0 | TERPHENYL-D14 | 0.05 | 103 | | 100 | | 34 - 139 |

**Data Package ID:** *SV1308210-1*

# GC/MS Semi-volatiles

## Method SW8270D

## Laboratory Control Sample and Laboratory Control Sample Duplicate

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

**Lab ID:** EX130816-6LCS

**Sample Matrix:** SOIL
**% Moisture:** N/A
**Date Collected:** N/A
**Date Extracted:** 08/16/2013
**Date Analyzed:** 08/21/2013
**Prep Method:** SW3540C

**Prep Batch:** EX130816-6
**QCBatchID:** EX130816-6-1
**Run ID:** SV130821-2
**Cleanup:** SW3640
**Basis:** N/A
**File Name:** P17314

**Sample Aliquot:** 30 g
**Final Volume:** 1 ml
**Result Units:** UG/KG
**Clean DF:** 1

| CASNO | Target Analyte | Spike Added | LCS Result | Reporting Limit | Result Qualifier | LCS % Rec. | Control Limits |
|---|---|---|---|---|---|---|---|
| 91-20-3 | NAPHTHALENE | 2000 | 1200 | 333 | | 60 | 47 - 97% |
| 91-57-6 | 2-METHYLNAPHTHALENE | 2000 | 1270 | 333 | | 64 | 51 - 99% |
| 208-96-8 | ACENAPHTHYLENE | 2000 | 1470 | 333 | | 73 | 60 - 109% |
| 83-32-9 | ACENAPHTHENE | 2000 | 1390 | 333 | | 70 | 47 - 110% |
| 86-73-7 | FLUORENE | 2000 | 1600 | 333 | | 80 | 65 - 106% |
| 85-01-8 | PHENANTHRENE | 2000 | 1650 | 333 | | 83 | 66 - 107% |
| 120-12-7 | ANTHRACENE | 2000 | 1590 | 333 | | 80 | 65 - 108% |
| 206-44-0 | FLUORANTHENE | 2000 | 1740 | 333 | | 87 | 64 - 109% |
| 129-00-0 | PYRENE | 2000 | 1830 | 333 | | 91 | 48 - 118% |
| 56-55-3 | BENZO(A)ANTHRACENE | 2000 | 1710 | 333 | | 85 | 64 - 107% |
| 218-01-9 | CHRYSENE | 2000 | 1740 | 333 | | 87 | 65 - 108% |
| 205-99-2 | BENZO(B)FLUORANTHENE | 2000 | 1650 | 333 | | 83 | 60 - 111% |
| 207-08-9 | BENZO(K)FLUORANTHENE | 2000 | 1610 | 333 | | 81 | 62 - 111% |
| 50-32-8 | BENZO(A)PYRENE | 2000 | 1630 | 333 | | 81 | 63 - 109% |
| 193-39-5 | INDENO(1,2,3-CD)PYRENE | 2000 | 1810 | 333 | | 90 | 55 - 117% |
| 53-70-3 | DIBENZO(A,H)ANTHRACENE | 2000 | 1750 | 333 | | 87 | 55 - 120% |
| 191-24-2 | BENZO(G,H,I)PERYLENE | 2000 | 1700 | 333 | | 85 | 37 - 123% |

**Data Package ID:** *SV1308210-1*

# GC/MS Semi-volatiles

## Method SW8270D

## Laboratory Control Sample and Laboratory Control Sample Duplicate

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

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**Lab ID:** EX130816-6LCSD

**Sample Matrix:** SOIL
**% Moisture:** N/A
**Date Collected:** N/A
**Date Extracted:** 08/16/2013
**Date Analyzed:** 08/21/2013
**Prep Method:** SW3540C

**Prep Batch:** EX130816-6
**QCBatchID:** EX130816-6-1
**Run ID:** SV130821-2
**Cleanup:** SW3640
**Basis:** N/A
**File Name:** P17315

**Sample Aliquot:** 30 g
**Final Volume:** 1 ml
**Result Units:** UG/KG
**Clean DF:** 1

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| CASNO | Target Analyte | Spike Added | LCSD Result | Reporting Limit | Result Qualifier | LCSD % Rec. | RPD Limit | RPD |
|---|---|---|---|---|---|---|---|---|
| 91-20-3 | NAPHTHALENE | 2000 | 1270 | 333 | | 64 | 30 | 6 |
| 91-57-6 | 2-METHYLNAPHTHALENE | 2000 | 1330 | 333 | | 67 | 30 | 5 |
| 208-96-8 | ACENAPHTHYLENE | 2000 | 1520 | 333 | | 76 | 30 | 3 |
| 83-32-9 | ACENAPHTHENE | 2000 | 1460 | 333 | | 73 | 30 | 4 |
| 86-73-7 | FLUORENE | 2000 | 1640 | 333 | | 82 | 30 | 3 |
| 85-01-8 | PHENANTHRENE | 2000 | 1700 | 333 | | 85 | 30 | 3 |
| 120-12-7 | ANTHRACENE | 2000 | 1590 | 333 | | 80 | 30 | 0 |
| 206-44-0 | FLUORANTHENE | 2000 | 1780 | 333 | | 89 | 30 | 2 |
| 129-00-0 | PYRENE | 2000 | 1810 | 333 | | 91 | 30 | 1 |
| 56-55-3 | BENZO(A)ANTHRACENE | 2000 | 1720 | 333 | | 86 | 30 | 0 |
| 218-01-9 | CHRYSENE | 2000 | 1740 | 333 | | 87 | 30 | 0 |
| 205-99-2 | BENZO(B)FLUORANTHENE | 2000 | 1660 | 333 | | 83 | 30 | 0 |
| 207-08-9 | BENZO(K)FLUORANTHENE | 2000 | 1640 | 333 | | 82 | 30 | 2 |
| 50-32-8 | BENZO(A)PYRENE | 2000 | 1650 | 333 | | 83 | 30 | 2 |
| 193-39-5 | INDENO(1,2,3-CD)PYRENE | 2000 | 1730 | 333 | | 87 | 30 | 4 |
| 53-70-3 | DIBENZO(A,H)ANTHRACENE | 2000 | 1680 | 333 | | 84 | 30 | 4 |
| 191-24-2 | BENZO(G,H,I)PERYLENE | 2000 | 1580 | 333 | | 79 | 30 | 7 |

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## Surrogate Recovery LCS/LCSD

| CASNO | Target Analyte | Spike Added | LCS % Rec. | LCS Flag | LCSD % Rec. | LCSD Flag | Control Limits |
|---|---|---|---|---|---|---|---|
| 321-60-8 | 2-FLUOROBIPHENYL | 1670 | 72 | | 75 | | 41 - 111 |
| 4165-60-0 | NITROBENZENE-D5 | 1670 | 58 | | 61 | | 32 - 110 |
| 1718-51-0 | TERPHENYL-D14 | 1670 | 91 | | 90 | | 23 - 159 |

**Data Package ID:** *SV1308210-1*

# GC/MS Semi-volatiles

## Method SW8270D

## Matrix Spike And Matrix Spike Duplicate

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

| | |
|---|---|
| **Field ID:** | Site #11 |
| **LabID:** | 1308210-10MS |

**Sample Matrix:** SOIL
**% Moisture:** 33.0
**Date Collected:** 13-Aug-13
**Date Extracted:** 16-Aug-13
**Date Analyzed:** 21-Aug-13
**Prep Method:** SW3540 Rev C

**Prep Batch:** EX130816-6
**QCBatchID:** EX130816-6-1
**Run ID:** SV130821-2
**Cleanup:** SW3640
**Basis:** Dry Weight

**Sample Aliquot:** 30.67 g
**Final Volume:** 1 ml
**Result Units:** UG/KG
**File Name:** P17322

| CASNO | Target Analyte | Sample Result | Samp Qual | MS Result | MS Qual | Reporting Limit | Spike Added | MS % Rec. | Control Limits |
|---|---|---|---|---|---|---|---|---|---|
| 91-20-3 | NAPHTHALENE | 490 | U | 2020 | | 487 | 2920 | 69 | 47 - 97% |
| 91-57-6 | 2-METHYLNAPHTHALENE | 490 | U | 2120 | | 487 | 2920 | 73 | 51 - 99% |
| 208-96-8 | ACENAPHTHYLENE | 490 | U | 2170 | | 487 | 2920 | 74 | 60 - 109% |
| 83-32-9 | ACENAPHTHENE | 490 | U | 2070 | | 487 | 2920 | 71 | 47 - 110% |
| 86-73-7 | FLUORENE | 490 | U | 2360 | | 487 | 2920 | 81 | 65 - 106% |
| 85-01-8 | PHENANTHRENE | 490 | U | 2290 | | 487 | 2920 | 78 | 66 - 107% |
| 120-12-7 | ANTHRACENE | 490 | U | 2180 | | 487 | 2920 | 75 | 65 - 108% |
| 206-44-0 | FLUORANTHENE | 430 | J | 2320 | | 487 | 2920 | 65 | 64 - 109% |
| 129-00-0 | PYRENE | 790 | | 3970 | | 487 | 2920 | 109 | 48 - 118% |
| 56-55-3 | BENZO(A)ANTHRACENE | 170 | J | 2320 | | 487 | 2920 | 74 | 64 - 107% |
| 218-01-9 | CHRYSENE | 320 | J | 2560 | | 487 | 2920 | 77 | 65 - 108% |
| 205-99-2 | BENZO(B)FLUORANTHENE | 770 | | 3320 | | 487 | 2920 | 88 | 60 - 111% |
| 207-08-9 | BENZO(K)FLUORANTHENE | 310 | J | 3040 | | 487 | 2920 | 94 | 62 - 111% |
| 50-32-8 | BENZO(A)PYRENE | 260 | J | 2260 | | 487 | 2920 | 69 | 63 - 109% |
| 193-39-5 | INDENO(1,2,3-CD)PYRENE | 320 | J | 1600 | * | 487 | 2920 | 44 | 55 - 117% |
| 53-70-3 | DIBENZO(A,H)ANTHRACENE | 490 | U | 1480 | * | 487 | 2920 | 51 | 55 - 120% |
| 191-24-2 | BENZO(G,H,I)PERYLENE | 450 | J | 1470 | * | 487 | 2920 | 35 | 37 - 123% |

**Data Package ID:** *SV1308210-1*

# GC/MS Semi-volatiles

## Method SW8270D

## Matrix Spike And Matrix Spike Duplicate

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

| | |
|---|---|
| **Field ID:** | Site #11 |
| **LabID:** | 1308210-10MSD |

**Sample Matrix:** SOIL
**% Moisture:** 33.0
**Date Collected:** 13-Aug-13
**Date Extracted:** 16-Aug-13
**Date Analyzed:** 21-Aug-13
**Prep Method:** SW3540 Rev C

**Prep Batch:** EX130816-6
**QCBatchID:** EX130816-6-1
**Run ID:** SV130821-2
**Cleanup:** SW3640
**Basis:** Dry Weight

**Sample Aliquot:** 30.5 g
**Final Volume:** 1 ml
**Result Units:** UG/KG
**File Name:** P17323

| CASNO | Target Analyte | MSD Result | MSD Qual | Spike Added | MSD % Rec. | Reporting Limit | RPD Limit | RPD |
|---|---|---|---|---|---|---|---|---|
| 91-20-3 | NAPHTHALENE | 1560 | | 2940 | 53 | 489 | 30 | 26 |
| 91-57-6 | 2-METHYLNAPHTHALENE | 1630 | | 2940 | 56 | 489 | 30 | 26 |
| 208-96-8 | ACENAPHTHYLENE | 1700 | * | 2940 | 58 | 489 | 30 | 24 |
| 83-32-9 | ACENAPHTHENE | 1630 | | 2940 | 56 | 489 | 30 | 24 |
| 86-73-7 | FLUORENE | 1900 | | 2940 | 65 | 489 | 30 | 21 |
| 85-01-8 | PHENANTHRENE | 1910 | * | 2940 | 65 | 489 | 30 | 18 |
| 120-12-7 | ANTHRACENE | 1820 | * | 2940 | 62 | 489 | 30 | 18 |
| 206-44-0 | FLUORANTHENE | 2020 | * | 2940 | 54 | 489 | 30 | 14 |
| 129-00-0 | PYRENE | 3200 | | 2940 | 82 | 489 | 30 | 22 |
| 56-55-3 | BENZO(A)ANTHRACENE | 1850 | * | 2940 | 57 | 489 | 30 | 22 |
| 218-01-9 | CHRYSENE | 2140 | * | 2940 | 62 | 489 | 30 | 18 |
| 205-99-2 | BENZO(B)FLUORANTHENE | 2570 | | 2940 | 61 | 489 | 30 | 26 |
| 207-08-9 | BENZO(K)FLUORANTHENE | 2390 | | 2940 | 71 | 489 | 30 | 24 |
| 50-32-8 | BENZO(A)PYRENE | 1850 | * | 2940 | 54 | 489 | 30 | 20 |
| 193-39-5 | INDENO(1,2,3-CD)PYRENE | 1550 | * | 2940 | 42 | 489 | 30 | 3 |
| 53-70-3 | DIBENZO(A,H)ANTHRACENE | 1440 | * | 2940 | 49 | 489 | 30 | 3 |
| 191-24-2 | BENZO(G,H,I)PERYLENE | 1460 | * | 2940 | 34 | 489 | 30 | 0 |

## Surrogate Recovery MS/MSD

| CASNO | Target Analyte | Spike Added | MS % Rec. | MS Flag | MSD % Rec. | MSD Flag | Control Limits |
|---|---|---|---|---|---|---|---|
| 321-60-8 | 2-FLUOROBIPHENYL | 2430 | 76 | | 58 | | 41 - 111 |
| 4165-60-0 | NITROBENZENE-D5 | 2430 | 66 | | 50 | | 32 - 110 |
| 1718-51-0 | TERPHENYL-D14 | 2430 | 133 | | 102 | | 23 - 159 |

**Data Package ID:** *SV1308210-1*

# GC/MS Semi-volatiles

## Method SW8270D

## Matrix Spike

| | |
|---|---|
| **Lab Name:** | **ALS Environmental -- FC** |
| **Work Order Number:** | 1308210 |
| **Client Name:** | Wright Water Engineers |
| **ClientProject ID:** | UDFCD Sediments 131013000 |

| | |
|---|---|
| **Field ID:** | Site #2 |
| **LabID:** | 1308210-11MS |

**LEACH DATE: 8/15/2013**

| | | | | | |
|---|---|---|---|---|---|
| **Sample Matrix:** | LEACHATE | **Prep Batch:** | EX130816-4 | **Sample Aliquot:** | 100 ml |
| **% Moisture:** | N/A | **QCBatchID:** | EX130816-4-1 | **Final Volume:** | 1 ml |
| **Date Collected:** | 12-Aug-13 | **Run ID:** | SV130820-2 | **Result Units:** | MG/L |
| **Date Extracted:** | 16-Aug-13 | **Cleanup:** | NONE | **File Name:** | P17300 |
| **Date Analyzed:** | 20-Aug-13 | **Basis:** | As Received | | |

| CASNO | Target Analyte | Sample Result | Samp Qual | MS Result | MS Qual | Reporting Limit | Spike Added | MS % Rec. | Control Limits |
|---|---|---|---|---|---|---|---|---|---|
| 110-86-1 | PYRIDINE | 0.1 | U | 0.318 | | 0.1 | 0.5 | 64 | 10 - 101% |
| 106-46-7 | 1,4-DICHLOROBENZENE | 0.1 | U | 0.419 | | 0.1 | 0.5 | 84 | 54 - 94% |
| 95-48-7 | 2-METHYLPHENOL | 0.1 | U | 0.809 | | 0.1 | 1 | 81 | 63 - 103% |
| 108-39-4 | 3+4-METHYLPHENOL | 0.1 | U | 1.43 | E | 0.1 | 2 | 71 | 54 - 106% |
| 67-72-1 | HEXACHLOROETHANE | 0.1 | U | 0.381 | | 0.1 | 0.5 | 76 | 47 - 95% |
| 98-95-3 | NITROBENZENE | 0.1 | U | 0.404 | | 0.1 | 0.5 | 81 | 36 - 107% |
| 87-68-3 | HEXACHLOROBUTADIENE | 0.1 | U | 0.435 | | 0.1 | 0.5 | 87 | 43 - 93% |
| 88-06-2 | 2,4,6-TRICHLOROPHENOL | 0.1 | U | 0.836 | | 0.1 | 1 | 84 | 61 - 110% |
| 95-95-4 | 2,4,5-TRICHLOROPHENOL | 0.1 | U | 0.834 | | 0.1 | 1 | 83 | 62 - 109% |
| 121-14-2 | 2,4-DINITROTOLUENE | 0.1 | U | 0.419 | | 0.1 | 0.5 | 84 | 46 - 114% |
| 118-74-1 | HEXACHLOROBENZENE | 0.1 | U | 0.288 | | 0.1 | 0.5 | 58 | 48 - 115% |
| 87-86-5 | PENTACHLOROPHENOL | 0.2 | U | 0.879 | | 0.2 | 1 | 88 | 40 - 114% |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 118-79-6 | 2,4,6-TRIBROMOPHENOL | 0.722 | | 0.75 | 96 | 42 - 117 |
| 321-60-8 | 2-FLUOROBIPHENYL | 0.433 | | 0.5 | 87 | 55 - 108 |
| 367-12-4 | 2-FLUOROPHENOL | 0.622 | | 0.75 | 83 | 46 - 105 |
| 4165-60-0 | NITROBENZENE-D5 | 0.416 | | 0.5 | 83 | 53 - 111 |
| 4165-62-2 | PHENOL-D5 | 0.639 | | 0.75 | 85 | 50 - 109 |
| 1718-51-0 | TERPHENYL-D14 | 0.479 | | 0.5 | 96 | 34 - 139 |

**Data Package ID:** *SV1308210-1*

ALS Environmental

# GC/MS Volatiles

## Case Narrative

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# Wright Water Engineers

## UDFCD Sediments -- 131013000

### Work Order Number: 1308210

1. This report consists of 1 water sample, 4 soil samples and 10 TCLP ZHE leachates from soil samples. The samples were received intact at 8.0°C by ALS on 08/13/13. The water and leachate samples were free of headspace prior to analysis. The water sample had a pH < 2 at the time of analysis.

2. These samples were prepared according to SW-846, 3rd Edition procedures. Specifically:

   The water sample was prepared using purge and trap procedures based on Method 5030C.

   The soil samples were prepared using a heated purge based on Method 5035A.

   The leachate samples were prepared according to the current revision of SOP 608 based on Method 1311 and then analyzed using purge and trap procedures based on Method 5030C.

3. The samples were analyzed using GC/MS with an RTX-624, RTX-VMS, or equivalent capillary column according to the current revision of SOP 525 based on SW-846 Method 8260. All positive results were quantitated against the initial calibration standards using the internal standard technique. The identification of positive results was achieved by a comparison of the retention time and mass spectrum of the sample versus the daily calibration standard.

4. All initial calibration criteria were met.

5. All initial calibrations are verified by comparing a second source standard calibration verification (ICV) against the calibration curve. All criteria for initial calibration verification were met.

6. All compounds in the continuing calibration verification had a %D of less than 20% with the exception of vinyl chloride which washigh on 08/16/13. This compound was not detected in the associated samples.

7. Methylene chloride, acetone and 2-butanone are common laboratory contaminants. In order to minimize the levels of these compounds detected in the gc/ms analysis, ALS has designated its volatile laboratory as a restricted access area. In addition, the laboratory has been equipped with a dedicated, air intake and exhaust system that operates under positive pressure in order to minimize cross contamination of these compounds. Due to fluctuations in ambient laboratory conditions, reported sample values for common laboratory contaminants may be due to lab contamination even if the compound in question is not detected in the associated method blank. All method blank criteria were met.

8. All laboratory control sample and laboratory control sample duplicate recoveries and RPDs were within the acceptance criteria with the following exceptions:

| Spiked Compound | QC Sample | Direction |
|---|---|---|
| All Compounds | VL130813-2LCS &<br>VL130813-2LCSD | RPD |
| Vinyl Chloride | VL130816-2LCS | High |
| Trichloroethene | VL130816-2LCSD | High |

Since the recoveries for the compounds in the laboratory control sample and laboratory control sample duplicate on 08/13/13 were within control limits, with only the RPD exceeding acceptance criteria, quantitations of target compounds were not compromised. No further action was taken.

The high recoveries of vinyl chloride and trichloroethene suggest that the quantitations of target analytes may be biased high. These analytes were not detected above the reporting limit in the associated samples. The reporting limits are defensible because the elevated recovery demonstrates an increase in sensitivity. No further action was taken.

9. Since a sample from this order number was not the selected quality control (QC) sample, matrix specific QC results are not included in this report.

10. The samples were analyzed within the established holding time.

11. All surrogate recoveries were within acceptance criteria.

12. All internal standard recoveries were within acceptance criteria with the following exception:

| Internal Standard | Sample | Direction |
|---|---|---|
| 1,4-Dichlorobenzene-d4 | 1308210-10 | High |

The sample was re-analyzed to evaluate whether the original outlier was due to matrix effects or laboratory performance. The re-analysis also had internal standards outside the control limits, which suggests the presence of matrix effects. No further action was taken.

13. It is a standard ALS practice that all leachates are analyzed at a dilution. All client-requested reporting limits were met. The reporting limits have been adjusted accordingly.

14. Manual integrations are performed when needed to provide consistent and defensible data following the guidelines in the current revision of SOP 939.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Emily Lyons

Emily Lyons
Organics Primary Data Reviewer

8/22/13
Date

Organics Final Data Reviewer

08/22/13
Date

***ALS***
***Data Qualifier Flags***
***Chromatography and Mass Spectrometry***

| | |
|---|---|
| **U or ND:** | **This flag indicates that the compound was analyzed for but not detected.** |
| **J:** | **This flag indicates an estimated value. This flag is used as follows : (1) when estimating a concentration for tentatively identified compounds (TICs) where a 1:1 response is assumed; (2) when the mass spectral and retention time data indicate the presence of a compound that meets the volatile and semivolatile GC/MS identification criteria, and the result is less than the reporting limit (RL) but greater than the method detection limit (MDL); (3) when the retention time data indicate the presence of a compound that meets the GC identification criteria, and the result is less than the RL but greater than the MDL; and (4) the reported value is estimated.** |
| **B:** | **This flag is used when the analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user. This flag shall be used for a tentatively identified compound (TIC) as well as for a positively identified target compound.** |
| **E:** | **This flag identifies compounds whose concentration exceeds the upper level of the calibration range.** |
| **A:** | **This flag indicates that a tentatively identified compound is a suspected aldol-condensation product.** |
| **X:** | **This flag indicates that the analyte was diluted below an accurate quantitation level.** |
| ***:** | **This flag indicates that a spike recovery is equal to or outside the control criteria used.** |
| **+:** | **This flag indicates that the relative percent difference (RPD) equals or exceeds the control criteria.** |

# ALS Environmental -- FC

## Sample Number(s) Cross-Reference Table

**OrderNum:** 1308210
**Client Name:** Wright Water Engineers
**Client Project Name:** UDFCD Sediments
**Client Project Number:** 131013000
**Client PO Number:**

| Client Sample Number | Lab Sample Number | COC Number | Matrix | Date Collected | Time Collected |
|---|---|---|---|---|---|
| Site #2 | 1308210-1 | | SOIL | 12-Aug-13 | 9:45 |
| Site #5 | 1308210-2 | | SOIL | 12-Aug-13 | 10:30 |
| Site #6 | 1308210-3 | | SOIL | 12-Aug-13 | 11:00 |
| Site #7 | 1308210-4 | | SOIL | 12-Aug-13 | 12:00 |
| Site #9 | 1308210-5 | | SOIL | 12-Aug-13 | 13:30 |
| Site #1 | 1308210-6 | | SOIL | 12-Aug-13 | 14:40 |
| Site #12 | 1308210-7 | | SOIL | 12-Aug-13 | 15:10 |
| Site #10 | 1308210-8 | | SOIL | 13-Aug-13 | 8:30 |
| Site #4 | 1308210-9 | | SOIL | 13-Aug-13 | 9:45 |
| Site #11 | 1308210-10 | | SOIL | 13-Aug-13 | 11:00 |
| Site #2 | 1308210-11 | | LEACHAT | 12-Aug-13 | 9:45 |
| Site #5 | 1308210-12 | | LEACHAT | 12-Aug-13 | 10:30 |
| Site #6 | 1308210-13 | | LEACHAT | 12-Aug-13 | 11:00 |
| Site #7 | 1308210-14 | | LEACHAT | 12-Aug-13 | 12:00 |
| Site #9 | 1308210-15 | | LEACHAT | 12-Aug-13 | 13:30 |
| Site #1 | 1308210-16 | | LEACHAT | 12-Aug-13 | 14:40 |
| Site #12 | 1308210-17 | | LEACHAT | 12-Aug-13 | 15:10 |
| Site #10 | 1308210-18 | | LEACHAT | 13-Aug-13 | 8:30 |
| Site #4 | 1308210-19 | | LEACHAT | 13-Aug-13 | 9:45 |
| Site #11 | 1308210-20 | | LEACHAT | 13-Aug-13 | 11:00 |
| Trip Blank | 1308210-21 | | WATER | 07-Aug-13 | |

## ALS Laboratory Group

225 Commerce Drive, Fort Collins, Colorado 80524
TF: (800) 443-1511 PH: (970) 490-1511 FX: (970) 490-1522

## Chain-of-Custody

Form 202r8

WORKORDER #: 1308210

| | | | |
|---|---|---|---|
| PROJECT NAME | UDFCD SEDIMENTS | SAMPLER | |
| PROJECT No. | 131 013000 | SITE ID | |
| | | EDD FORMAT | |
| | | PURCHASE ORDER | |
| COMPANY NAME | WRIGHT WATER ENGINEERS | BILL TO COMPANY | |
| SEND REPORT TO | ELIOT WONG | INVOICE ATTN TO | |
| ADDRESS | 2490 W. 26th AVE, #100A | ADDRESS | |
| CITY / STATE / ZIP | DENVER/CO/80211 | CITY / STATE / ZIP | |
| PHONE | 303 480 1700 | PHONE | |
| FAX | 303 480 1020 | FAX | |
| E-MAIL | ewong@wrightwater.com | E-MAIL | |

DATE: 8-13-13
PAGE: 1 of 1
TURNAROUND:
DISPOSAL: [✓ By Lab] or Return to Client

| Lab ID | Field ID | Matrix | Sample Date | Sample Time | # Bottles | Pres. | QC | TCLP - FULL SUITE | PAINT FILTER | IGNITABILITY/REACTIVITY/PH | BTEX | PAHS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ① | Site #2 | S | 8/12/13 | 9:45AM | 3 | N/A | N/A ⑪ | X | X | | | X |
| ② | Site #5 | S | 8/12/13 | 10:30AM | 2 | N/A | N/A ⑫ | X | X | | | |
| ③ | Site #6 | S | 8/12/13 | 11:00AM | 3 | N/A | N/A ⑬ | X | X | X | | |
| ④ | Site #7 | S | 8/12/13 | 12:00PM | 4 | N/A | N/A ⑭ | X | X | X | X | |
| ⑤ | Site #9 | S | 8/12/13 | 13:30 | 3 | N/A | N/A ⑮ | X | X | | X | |
| ⑥ | Site #1 | S | 8/12/13 | 14:40 | 2 | N/A | N/A ⑯ | X | X | | | |
| ⑦ | Site #12 | S | 8/12/13 | 15:10 | 3 | N/A | N/A ⑰ | X | X | | | X |
| ⑧ | Site #10 | S | 8/13/13 | 8:30AM | 4 | N/A | N/A ⑱ | X | X | X | | X |
| ⑨ | Site #4 | S | 8/13/13 | 9:45AM | 5 | N/A | N/A ⑲ | X | X | X | X | X |
| ⑩ | Site #11 | S | 8/13/13 | 11:00AM | 5 | N/A | N/A ⑳ | X | X | X | X | X |

*Time Zone (Circle): EST CST [✓ MST] PST Matrix: O = oil [✓ S = soil] NS = non-soil solid W = water L = liquid E = extract F = filter

For metals or anions, please detail analytes below.

Comments:

㉑ TB

| QC PACKAGE (check below) | |
|---|---|
| ☐ | LEVEL II (Standard QC) |
| ☐ | LEVEL III (Std QC + forms) |
| ☐ | LEVEL IV (Std QC + forms + raw data) |
| ☐ | |

Preservative Key: 1-HCl 2-HNO3 3-H2SO4 4-NaOH 5-NaHSO4 7-Other 8-4 degrees C 9-5035

| | SIGNATURE | PRINTED NAME | DATE | TIME |
|---|---|---|---|---|
| RELINQUISHED BY | | Julia Traylor | 8/13/13 | 1420 |
| RECEIVED BY | | Lauren Schmitz | 8/13/13 | 1420 |
| RELINQUISHED BY | | | | |
| RECEIVED BY | | | | |
| RELINQUISHED BY | | | | |
| RECEIVED BY | | | | |

**ALS Environmental - Fort Collins**
**CONDITION OF SAMPLE UPON RECEIPT FORM**

Client: Wright Water Eng. Workorder No: 1308210

Project Manager: ARW Initials: UAS Date: 8/13/13

| | | | |
|---|---|---|---|
| 1. Does this project require any special handling in addition to standard ALS procedures? | | YES | [✓ NO] |
| 2. Are custody seals on shipping containers intact? | NONE | [✓ YES] | NO |
| 3. Are Custody seals on sample containers intact? | [✓ NONE] | YES | NO |
| 4. Is there a COC (Chain-of-Custody) present or other representative documents? | | [✓ YES] | NO |
| 5. Are the COC and bottle labels complete and legible? | | [✓ YES] | NO |
| 6. Is the COC in agreement with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.) | | [✓ YES] | NO |
| 7. Were airbills / shipping documents present and/or removable? | [✓ DROP OFF] | YES | NO |
| 8. Are all aqueous samples requiring preservation preserved correctly? (excluding volatiles) | [✓ N/A] | YES | NO |
| 9. Are all aqueous non-preserved samples pH 4-9? | [✓ N/A] | YES | NO |
| 10. Is there sufficient sample for the requested analyses? | | [✓ YES] | NO |
| 11. Were all samples placed in the proper containers for the requested analyses? | | [✓ YES] | NO |
| 12. Are all samples within holding times for the requested analyses? | | [✓ YES] | NO |
| 13. Were all sample containers received intact? (not broken or leaking, etc.) | | [✓ YES] | NO |
| 14. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) headspace free? Size of bubble: ____ < green pea ____ > green pea | N/A | [✓ YES] | NO |
| 15. Do any water samples contain sediment? Amount<br>Amount of sediment: ____ dusting ____ moderate ____heavy | N/A | YES | [✓ NO] |
| 16. Were the samples shipped on ice? | | [✓ YES] | NO |
| 17. Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: [✓ #2] #4 | RAD ONLY | YES | [✓ NO] |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Cooler #: | 1 | | | | | | | |
| Temperature (°C): | 8.0°C | | | | | | | |
| No. of custody seals on cooler: | 2 | | | | | | | |
| DOT Survey/ Acceptance Information — External µR/hr reading: | N/A | | | | | | | |
| Background µR/hr reading: | 10 | | | | | | | |

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? YES / NO / [✓ NA] (If no, see Form 008.)

**Additional Information:** PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16.

* Trip Blank not listed on COC. Added as 1308210-21.

If applicable, was the client contacted? YES / NO / [✓ NA] Contact: ______________ Date/Time: ______________

**Project Manager Signature / Date:** 8/13/13

*IR Gun #2: Oakton, SN 29922500201-0066
*IR Gun #4: Oakton, SN 2372220101-0002

Form 201r24.xls (06/04/2012)

Page 1 of 1

# GC/MS Volatiles

## Method SW8260_25C

## Method Blank

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

---

**Lab ID:** VL130813-2MB

| | | | | | |
|---|---|---|---|---|---|
| **Sample Matrix:** | WATER | **Prep Batch:** | VL130813-2 | **Sample Aliquot:** | 10 ml |
| **% Moisture:** | N/A | **QCBatchID:** | VL130813-2-4 | **Final Volume:** | 10 ml |
| **Date Collected:** | N/A | **Run ID:** | VL130813-2A | **Result Units:** | UG/L |
| **Date Extracted:** | 13-Aug-13 | **Cleanup:** | NONE | **Clean DF:** | 1 |
| **Date Analyzed:** | 13-Aug-13 | **Basis:** | N/A | | |
| **Prep Method:** | SW5030 Rev C | **File Name:** | B82662 | | |

| CASNO | Target Analyte | DF | Result | RptLimit LOD/LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 71-43-2 | BENZENE | 1 | 1 | 1 | U | |
| 100-41-4 | ETHYLBENZENE | 1 | 1 | 1 | U | |
| 136777-61-2 | M+P-XYLENE | 1 | 1 | 1 | U | |
| 95-47-6 | O-XYLENE | 1 | 1 | 1 | U | |
| 108-88-3 | TOLUENE | 1 | 1 | 1 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 460-00-4 | 4-BROMOFLUOROBENZENE | 25 | | 25 | 100 | 85 - 115 |
| 1868-53-7 | DIBROMOFLUOROMETHANE | 26 | | 25 | 104 | 84 - 118 |
| 2037-26-5 | TOLUENE-D8 | 24.9 | | 25 | 100 | 85 - 115 |

**Data Package ID:** *VL1308210-1*

# GC/MS Volatiles

## Method SW8260C

## Method Blank

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

**Lab ID:** VL130814-2MB

**Sample Matrix:** SOIL
**% Moisture:** N/A
**Date Collected:** N/A
**Date Extracted:** 14-Aug-13
**Date Analyzed:** 14-Aug-13
**Prep Method:** SW5035 Rev A

**Prep Batch:** VL130814-2
**QCBatchID:** VL130814-2-2
**Run ID:** VL130814-2A
**Cleanup:** NONE
**Basis:** N/A
**File Name:** B82717

**Sample Aliquot:** 5 g
**Final Volume:** 5 ml
**Result Units:** UG/KG
**Clean DF:** 1

| CASNO | Target Analyte | DF | Result | RptLimit LOD/LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 71-43-2 | BENZENE | 1 | 5 | 5 | U | |
| 108-88-3 | TOLUENE | 1 | 5 | 5 | U | |
| 100-41-4 | ETHYLBENZENE | 1 | 5 | 5 | U | |
| 136777-61-2 | M+P-XYLENE | 1 | 5 | 5 | U | |
| 95-47-6 | O-XYLENE | 1 | 5 | 5 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 460-00-4 | 4-BROMOFLUOROBENZENE | 47.7 | | 50 | 95 | 52 - 151 |
| 1868-53-7 | DIBROMOFLUOROMETHANE | 47.2 | | 50 | 94 | 61 - 134 |
| 2037-26-5 | TOLUENE-D8 | 51.1 | | 50 | 102 | 57 - 135 |

**Data Package ID:** *VL1308210-1*

# GC/MS Volatiles

## Method SW8260C

## Method Blank

**Lab Name:** **ALS Environmental -- FC**

**Work Order Number:** 1308210

**Client Name:** Wright Water Engineers

**ClientProject ID:** UDFCD Sediments 131013000

---

**Lab ID:** VL130815-2MB

| | | | | | |
|---|---|---|---|---|---|
| **Sample Matrix:** | SOIL | **Prep Batch:** | VL130815-2 | **Sample Aliquot:** | 5 g |
| **% Moisture:** | N/A | **QCBatchID:** | VL130815-2-1 | **Final Volume:** | 5 ml |
| **Date Collected:** | N/A | **Run ID:** | VL130815-2A | **Result Units:** | UG/KG |
| **Date Extracted:** | 15-Aug-13 | **Cleanup:** | NONE | **Clean DF:** | 1 |
| **Date Analyzed:** | 15-Aug-13 | **Basis:** | N/A | | |
| **Prep Method:** | SW5035 Rev A | **File Name:** | B82757 | | |

| CASNO | Target Analyte | DF | Result | RptLimit LOD/LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 71-43-2 | BENZENE | 1 | 5 | 5 | U | |
| 108-88-3 | TOLUENE | 1 | 5 | 5 | U | |
| 100-41-4 | ETHYLBENZENE | 1 | 5 | 5 | U | |
| 136777-61-2 | M+P-XYLENE | 1 | 5 | 5 | U | |
| 95-47-6 | O-XYLENE | 1 | 5 | 5 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 460-00-4 | 4-BROMOFLUOROBENZENE | 48.3 | | 50 | 97 | 52 - 151 |
| 1868-53-7 | DIBROMOFLUOROMETHANE | 47.3 | | 50 | 95 | 61 - 134 |
| 2037-26-5 | TOLUENE-D8 | 52.4 | | 50 | 105 | 57 - 135 |

**Data Package ID:** *VL1308210-1*

# GC/MS Volatiles

## Method SW8260_25C--Leachate

## Method Blank

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

**Lab ID:** EX130815-8MB

**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** N/A
**Date Extracted:** 16-Aug-13
**Date Analyzed:** 16-Aug-13
**Prep Method:** SW5030 Rev C

**Prep Batch:** VL130816-2
**QCBatchID:** VL130816-2-1
**Run ID:** VL130816-2A
**Cleanup:** NONE
**Basis:** N/A
**File Name:** B82800

**Sample Aliquot:** 10 ml
**Final Volume:** 10 ml
**Result Units:** MG/L
**Clean DF:** 1

| CASNO | Target Analyte | DF | Result | RptLimit LOD/LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 75-01-4 | VINYL CHLORIDE | 10 | 0.01 | 0.01 | U | |
| 75-35-4 | 1,1-DICHLOROETHENE | 10 | 0.01 | 0.01 | U | |
| 78-93-3 | 2-BUTANONE | 10 | 0.1 | 0.1 | U | |
| 67-66-3 | CHLOROFORM | 10 | 0.01 | 0.01 | U | |
| 56-23-5 | CARBON TETRACHLORIDE | 10 | 0.01 | 0.01 | U | |
| 107-06-2 | 1,2-DICHLOROETHANE | 10 | 0.01 | 0.01 | U | |
| 71-43-2 | BENZENE | 10 | 0.01 | 0.01 | U | |
| 79-01-6 | TRICHLOROETHENE | 10 | 0.01 | 0.01 | U | |
| 127-18-4 | TETRACHLOROETHENE | 10 | 0.01 | 0.01 | U | |
| 108-90-7 | CHLOROBENZENE | 10 | 0.01 | 0.01 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 460-00-4 | 4-BROMOFLUOROBENZENE | 0.252 | | 0.25 | 101 | 85 - 115 |
| 1868-53-7 | DIBROMOFLUOROMETHANE | 0.249 | | 0.25 | 99 | 84 - 118 |
| 2037-26-5 | TOLUENE-D8 | 0.253 | | 0.25 | 101 | 85 - 115 |

**Data Package ID:** *VL1308210-1*

# GC/MS Volatiles

## Method SW8260_25C

## Method Blank

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

---

**Lab ID:** VL130816-2MB

| | | | | | |
|---|---|---|---|---|---|
| **Sample Matrix:** | WATER | **Prep Batch:** | VL130816-2 | **Sample Aliquot:** | 10 ml |
| **% Moisture:** | N/A | **QCBatchID:** | VL130816-2-1 | **Final Volume:** | 10 ml |
| **Date Collected:** | N/A | **Run ID:** | VL130816-2A | **Result Units:** | MG/L |
| **Date Extracted:** | 16-Aug-13 | **Cleanup:** | NONE | **Clean DF:** | 1 |
| **Date Analyzed:** | 16-Aug-13 | **Basis:** | N/A | | |
| **Prep Method:** | SW5030 Rev C | **File Name:** | B82799 | | |

| CASNO | Target Analyte | DF | Result | RptLimit LOD/LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 75-01-4 | VINYL CHLORIDE | 1 | 0.001 | 0.001 | U | |
| 75-35-4 | 1,1-DICHLOROETHENE | 1 | 0.001 | 0.001 | U | |
| 78-93-3 | 2-BUTANONE | 1 | 0.01 | 0.01 | U | |
| 67-66-3 | CHLOROFORM | 1 | 0.001 | 0.001 | U | |
| 56-23-5 | CARBON TETRACHLORIDE | 1 | 0.001 | 0.001 | U | |
| 107-06-2 | 1,2-DICHLOROETHANE | 1 | 0.001 | 0.001 | U | |
| 71-43-2 | BENZENE | 1 | 0.001 | 0.001 | U | |
| 79-01-6 | TRICHLOROETHENE | 1 | 0.001 | 0.001 | U | |
| 127-18-4 | TETRACHLOROETHENE | 1 | 0.001 | 0.001 | U | |
| 108-90-7 | CHLOROBENZENE | 1 | 0.001 | 0.001 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 460-00-4 | 4-BROMOFLUOROBENZENE | 0.0258 | | 0.025 | 103 | 85 - 115 |
| 1868-53-7 | DIBROMOFLUOROMETHANE | 0.0255 | | 0.025 | 102 | 84 - 118 |
| 2037-26-5 | TOLUENE-D8 | 0.0248 | | 0.025 | 99 | 85 - 115 |

**Data Package ID:** *VL1308210-1*

# GC/MS Volatiles

## Method SW8260 Revision C

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

---

**Field ID:** Site #7
**Lab ID:** 1308210-4

**Sample Matrix:** SOIL
**% Moisture:** 28.0
**Date Collected:** 12-Aug-13
**Date Extracted:** 14-Aug-13
**Date Analyzed:** 15-Aug-13
**Prep Method:** SW5035 Rev A

**Prep Batch:** VL130814-2
**QCBatchID:** VL130814-2-2
**Run ID:** VL130814-2A
**Cleanup:** NONE
**Basis:** Dry Weight
**File Name:** B82742

**Analyst:** Steven D. White
**Sample Aliquot:** 5.8 G
**Final Volume:** 5 ML
**Result Units:** UG/KG
**Clean DF:** 1

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 71-43-2 | BENZENE | 1 | 6 | 6 | U | |
| 108-88-3 | TOLUENE | 1 | 6 | 6 | U | |
| 100-41-4 | ETHYLBENZENE | 1 | 6 | 6 | U | |
| 136777-61-2 | M+P-XYLENE | 1 | 6 | 6 | U | |
| 95-47-6 | O-XYLENE | 1 | 6 | 6 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 460-00-4 | 4-BROMOFLUOROBENZENE | 53.1 | | 59.8 | 89 | 52 - 151 |
| 1868-53-7 | DIBROMOFLUOROMETHANE | 57.7 | | 59.8 | 96 | 61 - 134 |
| 2037-26-5 | TOLUENE-D8 | 64.9 | | 59.8 | 108 | 57 - 135 |

**Data Package ID:** *VL1308210-1*

# GC/MS Volatiles

## Method SW8260 Revision C

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

---

**Field ID:** Site #9
**Lab ID:** 1308210-5

**Sample Matrix:** SOIL
**% Moisture:** 17.8
**Date Collected:** 12-Aug-13
**Date Extracted:** 14-Aug-13
**Date Analyzed:** 15-Aug-13
**Prep Method:** SW5035 Rev A

**Prep Batch:** VL130814-2
**QCBatchID:** VL130814-2-2
**Run ID:** VL130814-2A
**Cleanup:** NONE
**Basis:** Dry Weight
**File Name:** B82743

**Analyst:** Steven D. White
**Sample Aliquot:** 6.1 G
**Final Volume:** 5 ML
**Result Units:** UG/KG
**Clean DF:** 1

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 71-43-2 | BENZENE | 1 | 5 | 5 | U | |
| 108-88-3 | TOLUENE | 1 | 5 | 5 | U | |
| 100-41-4 | ETHYLBENZENE | 1 | 5 | 5 | U | |
| 136777-61-2 | M+P-XYLENE | 1 | 5 | 5 | U | |
| 95-47-6 | O-XYLENE | 1 | 5 | 5 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 460-00-4 | 4-BROMOFLUOROBENZENE | 48.3 | | 49.9 | 97 | 52 - 151 |
| 1868-53-7 | DIBROMOFLUOROMETHANE | 47.1 | | 49.9 | 94 | 61 - 134 |
| 2037-26-5 | TOLUENE-D8 | 51.4 | | 49.9 | 103 | 57 - 135 |

**Data Package ID:** *VL1308210-1*

# GC/MS Volatiles

## Method SW8260 Revision C

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

---

| | |
|---|---|
| **Field ID:** | Site #4 |
| **Lab ID:** | 1308210-9 |

**Sample Matrix:** SOIL
**% Moisture:** 34.1
**Date Collected:** 13-Aug-13
**Date Extracted:** 15-Aug-13
**Date Analyzed:** 15-Aug-13
**Prep Method:** SW5035 Rev A

**Prep Batch:** VL130815-2
**QCBatchID:** VL130815-2-1
**Run ID:** VL130815-2A
**Cleanup:** NONE
**Basis:** Dry Weight
**File Name:** B82759

**Analyst:** Steven D. White
**Sample Aliquot:** 6.21 G
**Final Volume:** 5 ML
**Result Units:** UG/KG
**Clean DF:** 1

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 71-43-2 | BENZENE | 1 | 6.1 | 6.1 | U | |
| 108-88-3 | TOLUENE | 1 | 6.1 | 6.1 | U | |
| 100-41-4 | ETHYLBENZENE | 1 | 6.1 | 6.1 | U | |
| 136777-61-2 | M+P-XYLENE | 1 | 6.1 | 6.1 | U | |
| 95-47-6 | O-XYLENE | 1 | 6.1 | 6.1 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 460-00-4 | 4-BROMOFLUOROBENZENE | 55.4 | | 61.1 | 91 | 52 - 151 |
| 1868-53-7 | DIBROMOFLUOROMETHANE | 56.6 | | 61.1 | 93 | 61 - 134 |
| 2037-26-5 | TOLUENE-D8 | 65.2 | | 61.1 | 107 | 57 - 135 |

**Data Package ID:** *VL1308210-1*

# GC/MS Volatiles

## Method SW8260 Revision C

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

|  |  |
|---|---|
| **Field ID:** | Site #11 |
| **Lab ID:** | 1308210-10 |

**Sample Matrix:** SOIL
**% Moisture:** 33.0
**Date Collected:** 13-Aug-13
**Date Extracted:** 15-Aug-13
**Date Analyzed:** 15-Aug-13
**Prep Method:** SW5035 Rev A

**Prep Batch:** VL130815-2
**QCBatchID:** VL130815-2-1
**Run ID:** VL130815-2A
**Cleanup:** NONE
**Basis:** Dry Weight
**File Name:** B82774

**Analyst:** Steven D. White
**Sample Aliquot:** 5.36 G
**Final Volume:** 5 ML
**Result Units:** UG/KG
**Clean DF:** 1

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 71-43-2 | BENZENE | 1 | 7 | 7 | U |  |
| 108-88-3 | TOLUENE | 1 | 7 | 7 | U |  |
| 100-41-4 | ETHYLBENZENE | 1 | 7 | 7 | U |  |
| 136777-61-2 | M+P-XYLENE | 1 | 7 | 7 | U |  |
| 95-47-6 | O-XYLENE | 1 | 7 | 7 | U |  |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 460-00-4 | 4-BROMOFLUOROBENZENE | 54.9 |  | 69.6 | 79 | 52 - 151 |
| 1868-53-7 | DIBROMOFLUOROMETHANE | 67.7 |  | 69.6 | 97 | 61 - 134 |
| 2037-26-5 | TOLUENE-D8 | 86.2 |  | 69.6 | 124 | 57 - 135 |

**Data Package ID:** *VL1308210-1*

# GC/MS Volatiles

## Method SW8260_25 Revision C--TCLP Leachate
## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

---

**Field ID:** Site #2
**Lab ID:** 1308210-11
**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 12-Aug-13
**Date Extracted:** 16-Aug-13
**Date Analyzed:** 16-Aug-13
**Prep Method:** SW5030 Rev C

**Prep Batch:** VL130816-2
**QCBatchID:** VL130816-2-1
**Run ID:** VL130816-2A
**Cleanup:** NONE
**Basis:** As Received
**File Name:** B82801

**Analyst:** Steven D. White
**Sample Aliquot:** 10 ML
**Final Volume:** 10 ML
**Result Units:** MG/L
**Clean DF:** 1

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 75-01-4 | VINYL CHLORIDE | 10 | 0.01 | 0.01 | U | |
| 75-35-4 | 1,1-DICHLOROETHENE | 10 | 0.01 | 0.01 | U | |
| 78-93-3 | 2-BUTANONE | 10 | 0.1 | 0.1 | U | |
| 67-66-3 | CHLOROFORM | 10 | 0.01 | 0.01 | U | |
| 56-23-5 | CARBON TETRACHLORIDE | 10 | 0.01 | 0.01 | U | |
| 107-06-2 | 1,2-DICHLOROETHANE | 10 | 0.01 | 0.01 | U | |
| 71-43-2 | BENZENE | 10 | 0.01 | 0.01 | U | |
| 79-01-6 | TRICHLOROETHENE | 10 | 0.01 | 0.01 | U | |
| 127-18-4 | TETRACHLOROETHENE | 10 | 0.01 | 0.01 | U | |
| 108-90-7 | CHLOROBENZENE | 10 | 0.01 | 0.01 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 460-00-4 | 4-BROMOFLUOROBENZENE | 0.253 | | 0.25 | 101 | 85 - 115 |
| 1868-53-7 | DIBROMOFLUOROMETHANE | 0.242 | | 0.25 | 97 | 84 - 118 |
| 2037-26-5 | TOLUENE-D8 | 0.254 | | 0.25 | 102 | 85 - 115 |

**Data Package ID:** *VL1308210-1*

# GC/MS Volatiles

## Method SW8260_25 Revision C--TCLP Leachate

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

**Field ID:** Site #5
**Lab ID:** 1308210-12
**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 12-Aug-13
**Date Extracted:** 16-Aug-13
**Date Analyzed:** 16-Aug-13
**Prep Method:** SW5030 Rev C

**Prep Batch:** VL130816-2
**QCBatchID:** VL130816-2-1
**Run ID:** VL130816-2A
**Cleanup:** NONE
**Basis:** As Received
**File Name:** B82802

**Analyst:** Steven D. White
**Sample Aliquot:** 10 ML
**Final Volume:** 10 ML
**Result Units:** MG/L
**Clean DF:** 1

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 75-01-4 | VINYL CHLORIDE | 10 | 0.01 | 0.01 | U | |
| 75-35-4 | 1,1-DICHLOROETHENE | 10 | 0.01 | 0.01 | U | |
| 78-93-3 | 2-BUTANONE | 10 | 0.1 | 0.1 | U | |
| 67-66-3 | CHLOROFORM | 10 | 0.01 | 0.01 | U | |
| 56-23-5 | CARBON TETRACHLORIDE | 10 | 0.01 | 0.01 | U | |
| 107-06-2 | 1,2-DICHLOROETHANE | 10 | 0.01 | 0.01 | U | |
| 71-43-2 | BENZENE | 10 | 0.01 | 0.01 | U | |
| 79-01-6 | TRICHLOROETHENE | 10 | 0.01 | 0.01 | U | |
| 127-18-4 | TETRACHLOROETHENE | 10 | 0.01 | 0.01 | U | |
| 108-90-7 | CHLOROBENZENE | 10 | 0.01 | 0.01 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 460-00-4 | 4-BROMOFLUOROBENZENE | 0.248 | | 0.25 | 99 | 85 - 115 |
| 1868-53-7 | DIBROMOFLUOROMETHANE | 0.242 | | 0.25 | 97 | 84 - 118 |
| 2037-26-5 | TOLUENE-D8 | 0.252 | | 0.25 | 101 | 85 - 115 |

**Data Package ID:** *VL1308210-1*

# GC/MS Volatiles

## Method SW8260_25 Revision C--TCLP Leachate

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

**Field ID:** Site #6
**Lab ID:** 1308210-13
**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 12-Aug-13
**Date Extracted:** 16-Aug-13
**Date Analyzed:** 16-Aug-13
**Prep Method:** SW5030 Rev C

**Prep Batch:** VL130816-2
**QCBatchID:** VL130816-2-1
**Run ID:** VL130816-2A
**Cleanup:** NONE
**Basis:** As Received
**File Name:** B82803

**Analyst:** Steven D. White
**Sample Aliquot:** 10 ML
**Final Volume:** 10 ML
**Result Units:** MG/L
**Clean DF:** 1

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 75-01-4 | VINYL CHLORIDE | 10 | 0.01 | 0.01 | U | |
| 75-35-4 | 1,1-DICHLOROETHENE | 10 | 0.01 | 0.01 | U | |
| 78-93-3 | 2-BUTANONE | 10 | 0.1 | 0.1 | U | |
| 67-66-3 | CHLOROFORM | 10 | 0.01 | 0.01 | U | |
| 56-23-5 | CARBON TETRACHLORIDE | 10 | 0.01 | 0.01 | U | |
| 107-06-2 | 1,2-DICHLOROETHANE | 10 | 0.01 | 0.01 | U | |
| 71-43-2 | BENZENE | 10 | 0.01 | 0.01 | U | |
| 79-01-6 | TRICHLOROETHENE | 10 | 0.01 | 0.01 | U | |
| 127-18-4 | TETRACHLOROETHENE | 10 | 0.01 | 0.01 | U | |
| 108-90-7 | CHLOROBENZENE | 10 | 0.01 | 0.01 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 460-00-4 | 4-BROMOFLUOROBENZENE | 0.25 | | 0.25 | 100 | 85 - 115 |
| 1868-53-7 | DIBROMOFLUOROMETHANE | 0.244 | | 0.25 | 97 | 84 - 118 |
| 2037-26-5 | TOLUENE-D8 | 0.253 | | 0.25 | 101 | 85 - 115 |

**Data Package ID:** *VL1308210-1*

# GC/MS Volatiles

## Method SW8260_25 Revision C--TCLP Leachate

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

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**Field ID:** Site #7
**Lab ID:** 1308210-14
**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 12-Aug-13
**Date Extracted:** 16-Aug-13
**Date Analyzed:** 16-Aug-13
**Prep Method:** SW5030 Rev C

**Prep Batch:** VL130816-2
**QCBatchID:** VL130816-2-1
**Run ID:** VL130816-2A
**Cleanup:** NONE
**Basis:** As Received
**File Name:** B82804

**Analyst:** Steven D. White
**Sample Aliquot:** 10 ML
**Final Volume:** 10 ML
**Result Units:** MG/L
**Clean DF:** 1

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| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 75-01-4 | VINYL CHLORIDE | 10 | 0.01 | 0.01 | U | |
| 75-35-4 | 1,1-DICHLOROETHENE | 10 | 0.01 | 0.01 | U | |
| 78-93-3 | 2-BUTANONE | 10 | 0.1 | 0.1 | U | |
| 67-66-3 | CHLOROFORM | 10 | 0.01 | 0.01 | U | |
| 56-23-5 | CARBON TETRACHLORIDE | 10 | 0.01 | 0.01 | U | |
| 107-06-2 | 1,2-DICHLOROETHANE | 10 | 0.01 | 0.01 | U | |
| 71-43-2 | BENZENE | 10 | 0.01 | 0.01 | U | |
| 79-01-6 | TRICHLOROETHENE | 10 | 0.01 | 0.01 | U | |
| 127-18-4 | TETRACHLOROETHENE | 10 | 0.01 | 0.01 | U | |
| 108-90-7 | CHLOROBENZENE | 10 | 0.01 | 0.01 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 460-00-4 | 4-BROMOFLUOROBENZENE | 0.249 | | 0.25 | 100 | 85 - 115 |
| 1868-53-7 | DIBROMOFLUOROMETHANE | 0.246 | | 0.25 | 98 | 84 - 118 |
| 2037-26-5 | TOLUENE-D8 | 0.253 | | 0.25 | 101 | 85 - 115 |

**Data Package ID:** *VL1308210-1*

# GC/MS Volatiles

## Method SW8260_25 Revision C--TCLP Leachate
## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

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**Field ID:** Site #9
**Lab ID:** 1308210-15
**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 12-Aug-13
**Date Extracted:** 16-Aug-13
**Date Analyzed:** 16-Aug-13
**Prep Method:** SW5030 Rev C

**Prep Batch:** VL130816-2
**QCBatchID:** VL130816-2-1
**Run ID:** VL130816-2A
**Cleanup:** NONE
**Basis:** As Received
**File Name:** B82805

**Analyst:** Steven D. White
**Sample Aliquot:** 10 ML
**Final Volume:** 10 ML
**Result Units:** MG/L
**Clean DF:** 1

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 75-01-4 | VINYL CHLORIDE | 10 | 0.01 | 0.01 | U | |
| 75-35-4 | 1,1-DICHLOROETHENE | 10 | 0.01 | 0.01 | U | |
| 78-93-3 | 2-BUTANONE | 10 | 0.1 | 0.1 | U | |
| 67-66-3 | CHLOROFORM | 10 | 0.01 | 0.01 | U | |
| 56-23-5 | CARBON TETRACHLORIDE | 10 | 0.01 | 0.01 | U | |
| 107-06-2 | 1,2-DICHLOROETHANE | 10 | 0.01 | 0.01 | U | |
| 71-43-2 | BENZENE | 10 | 0.01 | 0.01 | U | |
| 79-01-6 | TRICHLOROETHENE | 10 | 0.01 | 0.01 | U | |
| 127-18-4 | TETRACHLOROETHENE | 10 | 0.01 | 0.01 | U | |
| 108-90-7 | CHLOROBENZENE | 10 | 0.01 | 0.01 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 460-00-4 | 4-BROMOFLUOROBENZENE | 0.249 | | 0.25 | 100 | 85 - 115 |
| 1868-53-7 | DIBROMOFLUOROMETHANE | 0.245 | | 0.25 | 98 | 84 - 118 |
| 2037-26-5 | TOLUENE-D8 | 0.253 | | 0.25 | 101 | 85 - 115 |

**Data Package ID:** *VL1308210-1*

# GC/MS Volatiles

## Method SW8260_25 Revision C--TCLP Leachate
## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

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**Field ID:** Site #1
**Lab ID:** 1308210-16
**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 12-Aug-13
**Date Extracted:** 16-Aug-13
**Date Analyzed:** 16-Aug-13
**Prep Method:** SW5030 Rev C

**Prep Batch:** VL130816-2
**QCBatchID:** VL130816-2-1
**Run ID:** VL130816-2A
**Cleanup:** NONE
**Basis:** As Received
**File Name:** B82806

**Analyst:** Steven D. White
**Sample Aliquot:** 10 ML
**Final Volume:** 10 ML
**Result Units:** MG/L
**Clean DF:** 1

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 75-01-4 | VINYL CHLORIDE | 10 | 0.01 | 0.01 | U | |
| 75-35-4 | 1,1-DICHLOROETHENE | 10 | 0.01 | 0.01 | U | |
| 78-93-3 | 2-BUTANONE | 10 | 0.1 | 0.1 | U | |
| 67-66-3 | CHLOROFORM | 10 | 0.01 | 0.01 | U | |
| 56-23-5 | CARBON TETRACHLORIDE | 10 | 0.01 | 0.01 | U | |
| 107-06-2 | 1,2-DICHLOROETHANE | 10 | 0.01 | 0.01 | U | |
| 71-43-2 | BENZENE | 10 | 0.01 | 0.01 | U | |
| 79-01-6 | TRICHLOROETHENE | 10 | 0.01 | 0.01 | U | |
| 127-18-4 | TETRACHLOROETHENE | 10 | 0.01 | 0.01 | U | |
| 108-90-7 | CHLOROBENZENE | 10 | 0.01 | 0.01 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 460-00-4 | 4-BROMOFLUOROBENZENE | 0.245 | | 0.25 | 98 | 85 - 115 |
| 1868-53-7 | DIBROMOFLUOROMETHANE | 0.243 | | 0.25 | 97 | 84 - 118 |
| 2037-26-5 | TOLUENE-D8 | 0.251 | | 0.25 | 100 | 85 - 115 |

**Data Package ID:** *VL1308210-1*

# GC/MS Volatiles

## Method SW8260_25 Revision C--TCLP Leachate

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

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**Field ID:** Site #12
**Lab ID:** 1308210-17
**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 12-Aug-13
**Date Extracted:** 16-Aug-13
**Date Analyzed:** 16-Aug-13
**Prep Method:** SW5030 Rev C

**Prep Batch:** VL130816-2
**QCBatchID:** VL130816-2-1
**Run ID:** VL130816-2A
**Cleanup:** NONE
**Basis:** As Received
**File Name:** B82807

**Analyst:** Steven D. White
**Sample Aliquot:** 10 ML
**Final Volume:** 10 ML
**Result Units:** MG/L
**Clean DF:** 1

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| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 75-01-4 | VINYL CHLORIDE | 10 | 0.01 | 0.01 | U | |
| 75-35-4 | 1,1-DICHLOROETHENE | 10 | 0.01 | 0.01 | U | |
| 78-93-3 | 2-BUTANONE | 10 | 0.1 | 0.1 | U | |
| 67-66-3 | CHLOROFORM | 10 | 0.01 | 0.01 | U | |
| 56-23-5 | CARBON TETRACHLORIDE | 10 | 0.01 | 0.01 | U | |
| 107-06-2 | 1,2-DICHLOROETHANE | 10 | 0.01 | 0.01 | U | |
| 71-43-2 | BENZENE | 10 | 0.01 | 0.01 | U | |
| 79-01-6 | TRICHLOROETHENE | 10 | 0.01 | 0.01 | U | |
| 127-18-4 | TETRACHLOROETHENE | 10 | 0.01 | 0.01 | U | |
| 108-90-7 | CHLOROBENZENE | 10 | 0.01 | 0.01 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 460-00-4 | 4-BROMOFLUOROBENZENE | 0.25 | | 0.25 | 100 | 85 - 115 |
| 1868-53-7 | DIBROMOFLUOROMETHANE | 0.245 | | 0.25 | 98 | 84 - 118 |
| 2037-26-5 | TOLUENE-D8 | 0.25 | | 0.25 | 100 | 85 - 115 |

**Data Package ID:** *VL1308210-1*

# GC/MS Volatiles

## Method SW8260_25 Revision C--TCLP Leachate

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

| | |
|---|---|
| **Field ID:** | Site #10 |
| **Lab ID:** | 1308210-18 |

**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 13-Aug-13
**Date Extracted:** 16-Aug-13
**Date Analyzed:** 16-Aug-13
**Prep Method:** SW5030 Rev C

**Prep Batch:** VL130816-2
**QCBatchID:** VL130816-2-1
**Run ID:** VL130816-2A
**Cleanup:** NONE
**Basis:** As Received
**File Name:** B82808

**Analyst:** Steven D. White
**Sample Aliquot:** 10 ML
**Final Volume:** 10 ML
**Result Units:** MG/L
**Clean DF:** 1

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 75-01-4 | VINYL CHLORIDE | 10 | 0.01 | 0.01 | U | |
| 75-35-4 | 1,1-DICHLOROETHENE | 10 | 0.01 | 0.01 | U | |
| 78-93-3 | 2-BUTANONE | 10 | 0.1 | 0.1 | U | |
| 67-66-3 | CHLOROFORM | 10 | 0.01 | 0.01 | U | |
| 56-23-5 | CARBON TETRACHLORIDE | 10 | 0.01 | 0.01 | U | |
| 107-06-2 | 1,2-DICHLOROETHANE | 10 | 0.01 | 0.01 | U | |
| 71-43-2 | BENZENE | 10 | 0.01 | 0.01 | U | |
| 79-01-6 | TRICHLOROETHENE | 10 | 0.01 | 0.01 | U | |
| 127-18-4 | TETRACHLOROETHENE | 10 | 0.01 | 0.01 | U | |
| 108-90-7 | CHLOROBENZENE | 10 | 0.01 | 0.01 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 460-00-4 | 4-BROMOFLUOROBENZENE | 0.243 | | 0.25 | 97 | 85 - 115 |
| 1868-53-7 | DIBROMOFLUOROMETHANE | 0.242 | | 0.25 | 97 | 84 - 118 |
| 2037-26-5 | TOLUENE-D8 | 0.249 | | 0.25 | 100 | 85 - 115 |

**Data Package ID:** *VL1308210-1*

# GC/MS Volatiles

## Method SW8260_25 Revision C--TCLP Leachate

## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

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| | |
|---|---|
| **Field ID:** | Site #4 |
| **Lab ID:** | 1308210-19 |

**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 13-Aug-13
**Date Extracted:** 16-Aug-13
**Date Analyzed:** 16-Aug-13
**Prep Method:** SW5030 Rev C

**Prep Batch:** VL130816-2
**QCBatchID:** VL130816-2-1
**Run ID:** VL130816-2A
**Cleanup:** NONE
**Basis:** As Received
**File Name:** B82809

**Analyst:** Steven D. White
**Sample Aliquot:** 10 ML
**Final Volume:** 10 ML
**Result Units:** MG/L
**Clean DF:** 1

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| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 75-01-4 | VINYL CHLORIDE | 10 | 0.01 | 0.01 | U | |
| 75-35-4 | 1,1-DICHLOROETHENE | 10 | 0.01 | 0.01 | U | |
| 78-93-3 | 2-BUTANONE | 10 | 0.1 | 0.1 | U | |
| 67-66-3 | CHLOROFORM | 10 | 0.01 | 0.01 | U | |
| 56-23-5 | CARBON TETRACHLORIDE | 10 | 0.01 | 0.01 | U | |
| 107-06-2 | 1,2-DICHLOROETHANE | 10 | 0.01 | 0.01 | U | |
| 71-43-2 | BENZENE | 10 | 0.01 | 0.01 | U | |
| 79-01-6 | TRICHLOROETHENE | 10 | 0.01 | 0.01 | U | |
| 127-18-4 | TETRACHLOROETHENE | 10 | 0.01 | 0.01 | U | |
| 108-90-7 | CHLOROBENZENE | 10 | 0.01 | 0.01 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 460-00-4 | 4-BROMOFLUOROBENZENE | 0.243 | | 0.25 | 97 | 85 - 115 |
| 1868-53-7 | DIBROMOFLUOROMETHANE | 0.246 | | 0.25 | 98 | 84 - 118 |
| 2037-26-5 | TOLUENE-D8 | 0.247 | | 0.25 | 99 | 85 - 115 |

**Data Package ID:** *VL1308210-1*

# GC/MS Volatiles

## Method SW8260_25 Revision C--TCLP Leachate
## Sample Results

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

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**Field ID:** Site #11
**Lab ID:** 1308210-20
**LEACH DATE: 8/15/2013**

**Sample Matrix:** LEACHATE
**% Moisture:** N/A
**Date Collected:** 13-Aug-13
**Date Extracted:** 16-Aug-13
**Date Analyzed:** 16-Aug-13
**Prep Method:** SW5030 Rev C

**Prep Batch:** VL130816-2
**QCBatchID:** VL130816-2-1
**Run ID:** VL130816-2A
**Cleanup:** NONE
**Basis:** As Received
**File Name:** B82810

**Analyst:** Steven D. White
**Sample Aliquot:** 10 ML
**Final Volume:** 10 ML
**Result Units:** MG/L
**Clean DF:** 1

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 75-01-4 | VINYL CHLORIDE | 10 | 0.01 | 0.01 | U | |
| 75-35-4 | 1,1-DICHLOROETHENE | 10 | 0.01 | 0.01 | U | |
| 78-93-3 | 2-BUTANONE | 10 | 0.1 | 0.1 | U | |
| 67-66-3 | CHLOROFORM | 10 | 0.01 | 0.01 | U | |
| 56-23-5 | CARBON TETRACHLORIDE | 10 | 0.01 | 0.01 | U | |
| 107-06-2 | 1,2-DICHLOROETHANE | 10 | 0.01 | 0.01 | U | |
| 71-43-2 | BENZENE | 10 | 0.01 | 0.01 | U | |
| 79-01-6 | TRICHLOROETHENE | 10 | 0.01 | 0.01 | U | |
| 127-18-4 | TETRACHLOROETHENE | 10 | 0.01 | 0.01 | U | |
| 108-90-7 | CHLOROBENZENE | 10 | 0.01 | 0.01 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 460-00-4 | 4-BROMOFLUOROBENZENE | 0.247 | | 0.25 | 99 | 85 - 115 |
| 1868-53-7 | DIBROMOFLUOROMETHANE | 0.247 | | 0.25 | 99 | 84 - 118 |
| 2037-26-5 | TOLUENE-D8 | 0.254 | | 0.25 | 102 | 85 - 115 |

**Data Package ID:** *VL1308210-1*

# GC/MS Volatiles

## Method SW8260_25 Revision C

## Sample Results

**Lab Name:** **ALS Environmental -- FC**

**Work Order Number:** 1308210

**Client Name:** Wright Water Engineers

**ClientProject ID:** UDFCD Sediments 131013000

| | |
|---|---|
| **Field ID:** | Trip Blank |
| **Lab ID:** | 1308210-21 |

**Sample Matrix:** WATER
**% Moisture:** N/A
**Date Collected:** 07-Aug-13
**Date Extracted:** 13-Aug-13
**Date Analyzed:** 13-Aug-13
**Prep Method:** SW5030 Rev C

**Prep Batch:** VL130813-2
**QCBatchID:** VL130813-2-4
**Run ID:** VL130813-2A
**Cleanup:** NONE
**Basis:** As Received
**File Name:** B82687

**Analyst:** Steven D. White
**Sample Aliquot:** 10 ML
**Final Volume:** 10 ML
**Result Units:** UG/L
**Clean DF:** 1

| CASNO | Target Analyte | Dilution Factor | Result | RptLimit\ LOD\LOQ | Result Qualifier | EPA Qualifier |
|---|---|---|---|---|---|---|
| 71-43-2 | BENZENE | 1 | 1 | 1 | U | |
| 100-41-4 | ETHYLBENZENE | 1 | 1 | 1 | U | |
| 136777-61-2 | M+P-XYLENE | 1 | 1 | 1 | U | |
| 95-47-6 | O-XYLENE | 1 | 1 | 1 | U | |
| 108-88-3 | TOLUENE | 1 | 1 | 1 | U | |

## Surrogate Recovery

| CASNO | Surrogate Analyte | Result | Flag | Spike Amount | Percent Recovery | Control Limits |
|---|---|---|---|---|---|---|
| 460-00-4 | 4-BROMOFLUOROBENZENE | 25 | | 25 | 100 | 85 - 115 |
| 1868-53-7 | DIBROMOFLUOROMETHANE | 23.8 | | 25 | 95 | 84 - 118 |
| 2037-26-5 | TOLUENE-D8 | 26 | | 25 | 104 | 85 - 115 |

**Data Package ID:** *VL1308210-1*

# GC/MS Volatiles

## Method SW8260_25C

## Laboratory Control Sample and Laboratory Control Sample Duplicate

**Lab Name:** ALS Environmental -- FC
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

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**Lab ID:** VL130813-2LCS

**Sample Matrix:** WATER
**% Moisture:** N/A
**Date Collected:** N/A
**Date Extracted:** 08/13/2013
**Date Analyzed:** 08/13/2013
**Prep Method:** SW5030C

**Prep Batch:** VL130813-2
**QCBatchID:** VL130813-2-4
**Run ID:** VL130813-2A
**Cleanup:** NONE
**Basis:** N/A
**File Name:** B82659

**Sample Aliquot:** 10 ml
**Final Volume:** 10 ml
**Result Units:** UG/L
**Clean DF:** 1

| CASNO | Target Analyte | Spike Added | LCS Result | Reporting Limit | Result Qualifier | LCS % Rec. | Control Limits |
|---|---|---|---|---|---|---|---|
| 71-43-2 | BENZENE | 10 | 11.1 | 1 | | 111 | 83 - 117% |
| 100-41-4 | ETHYLBENZENE | 10 | 10.7 | 1 | | 107 | 81 - 113% |
| 136777-61- | M+P-XYLENE | 20 | 21.7 | 1 | | 108 | 82 - 115% |
| 95-47-6 | O-XYLENE | 10 | 11.1 | 1 | | 111 | 81 - 115% |
| 108-88-3 | TOLUENE | 10 | 10.9 | 1 | | 109 | 82 - 113% |

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**Lab ID:** VL130813-2LCSD

**Sample Matrix:** WATER
**% Moisture:** N/A
**Date Collected:** N/A
**Date Extracted:** 08/13/2013
**Date Analyzed:** 08/13/2013
**Prep Method:** SW5030C

**Prep Batch:** VL130813-2
**QCBatchID:** VL130813-2-4
**Run ID:** VL130813-2A
**Cleanup:** NONE
**Basis:** N/A
**File Name:** B82660

**Sample Aliquot:** 10 ml
**Final Volume:** 10 ml
**Result Units:** UG/L
**Clean DF:** 1

| CASNO | Target Analyte | Spike Added | LCSD Result | Reporting Limit | Result Qualifier | LCSD % Rec. | RPD Limit | RPD |
|---|---|---|---|---|---|---|---|---|
| 71-43-2 | BENZENE | 10 | 8.84 | 1 | + | 88 | 20 | 23 |
| 100-41-4 | ETHYLBENZENE | 10 | 8.51 | 1 | + | 85 | 20 | 23 |
| 136777-61- | M+P-XYLENE | 20 | 17 | 1 | + | 85 | 20 | 24 |
| 95-47-6 | O-XYLENE | 10 | 8.5 | 1 | + | 85 | 20 | 26 |
| 108-88-3 | TOLUENE | 10 | 8.5 | 1 | + | 85 | 20 | 25 |

**Data Package ID:** *VL1308210-1*

# GC/MS Volatiles

## Method SW8260_25C

## Laboratory Control Sample and Laboratory Control Sample Duplicate

**Lab Name:** **ALS Environmental -- FC**

**Work Order Number:** 1308210

**Client Name:** Wright Water Engineers

**ClientProject ID:** UDFCD Sediments 131013000

### Surrogate Recovery LCS/LCSD

| CASNO | Target Analyte | Spike Added | LCS % Rec. | LCS Flag | LCSD % Rec. | LCSD Flag | Control Limits |
|---|---|---|---|---|---|---|---|
| 460-00-4 | 4-BROMOFLUOROBENZENE | 25 | 99 |  | 102 |  | 85 - 115 |
| 1868-53-7 | DIBROMOFLUOROMETHANE | 25 | 98 |  | 103 |  | 84 - 118 |
| 2037-26-5 | TOLUENE-D8 | 25 | 102 |  | 99 |  | 85 - 115 |

**Data Package ID:** *VL1308210-1*

# GC/MS Volatiles

## Method SW8260C

## Laboratory Control Sample and Laboratory Control Sample Duplicate

**Lab Name:** **ALS Environmental -- FC**

**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

---

**Lab ID:** VL130814-2LCS

| | | | | | |
|---|---|---|---|---|---|
| **Sample Matrix:** | SOIL | **Prep Batch:** | VL130814-2 | **Sample Aliquot:** | 5 g |
| **% Moisture:** | N/A | **QCBatchID:** | VL130814-2-2 | **Final Volume:** | 5 ml |
| **Date Collected:** | N/A | **Run ID:** | VL130814-2A | **Result Units:** | UG/KG |
| **Date Extracted:** | 08/14/2013 | **Cleanup:** | NONE | **Clean DF:** | 1 |
| **Date Analyzed:** | 08/14/2013 | **Basis:** | N/A | | |
| **Prep Method:** | SW5035A | **File Name:** | B82715 | | |

| CASNO | Target Analyte | Spike Added | LCS Result | Reporting Limit | Result Qualifier | LCS % Rec. | Control Limits |
|---|---|---|---|---|---|---|---|
| 71-43-2 | BENZENE | 40 | 42.2 | 5 | | 105 | 73 - 126% |
| 108-88-3 | TOLUENE | 40 | 43.9 | 5 | | 110 | 71 - 127% |
| 100-41-4 | ETHYLBENZENE | 40 | 43 | 5 | | 107 | 74 - 127% |
| 136777-61- | M+P-XYLENE | 80 | 88.3 | 5 | | 110 | 79 - 126% |
| 95-47-6 | O-XYLENE | 40 | 44 | 5 | | 110 | 77 - 125% |

**Lab ID:** VL130814-2LCSD

| | | | | | |
|---|---|---|---|---|---|
| **Sample Matrix:** | SOIL | **Prep Batch:** | VL130814-2 | **Sample Aliquot:** | 5 g |
| **% Moisture:** | N/A | **QCBatchID:** | VL130814-2-2 | **Final Volume:** | 5 ml |
| **Date Collected:** | N/A | **Run ID:** | VL130814-2A | **Result Units:** | UG/KG |
| **Date Extracted:** | 08/14/2013 | **Cleanup:** | NONE | **Clean DF:** | 1 |
| **Date Analyzed:** | 08/14/2013 | **Basis:** | N/A | | |
| **Prep Method:** | SW5035A | **File Name:** | B82716 | | |

| CASNO | Target Analyte | Spike Added | LCSD Result | Reporting Limit | Result Qualifier | LCSD % Rec. | RPD Limit | RPD |
|---|---|---|---|---|---|---|---|---|
| 71-43-2 | BENZENE | 40 | 43.1 | 5 | | 108 | 30 | 2 |
| 108-88-3 | TOLUENE | 40 | 45 | 5 | | 112 | 30 | 2 |
| 100-41-4 | ETHYLBENZENE | 40 | 44 | 5 | | 110 | 30 | 2 |
| 136777-61- | M+P-XYLENE | 80 | 89.8 | 5 | | 112 | 30 | 2 |
| 95-47-6 | O-XYLENE | 40 | 45.2 | 5 | | 113 | 30 | 3 |

**Data Package ID:** *VL1308210-1*

# GC/MS Volatiles

## Method SW8260C

## Laboratory Control Sample and Laboratory Control Sample Duplicate

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

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## Surrogate Recovery LCS/LCSD

| CASNO | Target Analyte | Spike Added | LCS % Rec. | LCS Flag | LCSD % Rec. | LCSD Flag | Control Limits |
|---|---|---|---|---|---|---|---|
| 460-00-4 | 4-BROMOFLUOROBENZENE | 50 | 100 | | 98 | | 52 - 151 |
| 1868-53-7 | DIBROMOFLUOROMETHANE | 50 | 97 | | 95 | | 61 - 134 |
| 2037-26-5 | TOLUENE-D8 | 50 | 102 | | 103 | | 57 - 135 |

**Data Package ID:** *VL1308210-1*

# GC/MS Volatiles

## Method SW8260C

## Laboratory Control Sample and Laboratory Control Sample Duplicate

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

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**Lab ID:** VL130815-2LCS

**Sample Matrix:** SOIL
**% Moisture:** N/A
**Date Collected:** N/A
**Date Extracted:** 08/15/2013
**Date Analyzed:** 08/15/2013
**Prep Method:** SW5035A

**Prep Batch:** VL130815-2
**QCBatchID:** VL130815-2-1
**Run ID:** VL130815-2A
**Cleanup:** NONE
**Basis:** N/A
**File Name:** B82755

**Sample Aliquot:** 5 g
**Final Volume:** 5 ml
**Result Units:** UG/KG
**Clean DF:** 1

| CASNO | Target Analyte | Spike Added | LCS Result | Reporting Limit | Result Qualifier | LCS % Rec. | Control Limits |
|---|---|---|---|---|---|---|---|
| 71-43-2 | BENZENE | 40 | 38.8 | 5 | | 97 | 73 - 126% |
| 108-88-3 | TOLUENE | 40 | 40.1 | 5 | | 100 | 71 - 127% |
| 100-41-4 | ETHYLBENZENE | 40 | 39.7 | 5 | | 99 | 74 - 127% |
| 136777-61- | M+P-XYLENE | 80 | 79.9 | 5 | | 100 | 79 - 126% |
| 95-47-6 | O-XYLENE | 40 | 39.7 | 5 | | 99 | 77 - 125% |

---

**Lab ID:** VL130815-2LCSD

**Sample Matrix:** SOIL
**% Moisture:** N/A
**Date Collected:** N/A
**Date Extracted:** 08/15/2013
**Date Analyzed:** 08/15/2013
**Prep Method:** SW5035A

**Prep Batch:** VL130815-2
**QCBatchID:** VL130815-2-1
**Run ID:** VL130815-2A
**Cleanup:** NONE
**Basis:** N/A
**File Name:** B82756

**Sample Aliquot:** 5 g
**Final Volume:** 5 ml
**Result Units:** UG/KG
**Clean DF:** 1

| CASNO | Target Analyte | Spike Added | LCSD Result | Reporting Limit | Result Qualifier | LCSD % Rec. | RPD Limit | RPD |
|---|---|---|---|---|---|---|---|---|
| 71-43-2 | BENZENE | 40 | 38.3 | 5 | | 96 | 30 | 1 |
| 108-88-3 | TOLUENE | 40 | 39.2 | 5 | | 98 | 30 | 2 |
| 100-41-4 | ETHYLBENZENE | 40 | 38.4 | 5 | | 96 | 30 | 3 |
| 136777-61- | M+P-XYLENE | 80 | 78.6 | 5 | | 98 | 30 | 2 |
| 95-47-6 | O-XYLENE | 40 | 38.7 | 5 | | 97 | 30 | 3 |

**Data Package ID:** *VL1308210-1*

# GC/MS Volatiles

## Method SW8260C

## Laboratory Control Sample and Laboratory Control Sample Duplicate

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

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### Surrogate Recovery LCS/LCSD

| CASNO | Target Analyte | Spike Added | LCS % Rec. | LCS Flag | LCSD % Rec. | LCSD Flag | Control Limits |
|---|---|---|---|---|---|---|---|
| 460-00-4 | 4-BROMOFLUOROBENZENE | 50 | 101 | | 98 | | 52 - 151 |
| 1868-53-7 | DIBROMOFLUOROMETHANE | 50 | 97 | | 96 | | 61 - 134 |
| 2037-26-5 | TOLUENE-D8 | 50 | 103 | | 101 | | 57 - 135 |

# GC/MS Volatiles

## Method SW8260_25C

## Laboratory Control Sample and Laboratory Control Sample Duplicate

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

**Lab ID:** VL130816-2LCS

| | | | | | |
|---|---|---|---|---|---|
| **Sample Matrix:** | WATER | **Prep Batch:** | VL130816-2 | **Sample Aliquot:** | 10 ml |
| **% Moisture:** | N/A | **QCBatchID:** | VL130816-2-1 | **Final Volume:** | 10 ml |
| **Date Collected:** | N/A | **Run ID:** | VL130816-2A | **Result Units:** | MG/L |
| **Date Extracted:** | 08/16/2013 | **Cleanup:** | NONE | **Clean DF:** | 1 |
| **Date Analyzed:** | 08/16/2013 | **Basis:** | N/A | | |
| **Prep Method:** | SW5030C | **File Name:** | B82796 | | |

| CASNO | Target Analyte | Spike Added | LCS Result | Reporting Limit | Result Qualifier | LCS % Rec. | Control Limits |
|---|---|---|---|---|---|---|---|
| 75-01-4 | VINYL CHLORIDE | 0.01 | 0.0125 | 0.001 | * | 125 | 72 - 123% |
| 75-35-4 | 1,1-DICHLOROETHENE | 0.01 | 0.011 | 0.001 | | 110 | 77 - 119% |
| 78-93-3 | 2-BUTANONE | 0.04 | 0.0431 | 0.01 | | 108 | 70 - 135% |
| 67-66-3 | CHLOROFORM | 0.01 | 0.011 | 0.001 | | 110 | 82 - 119% |
| 56-23-5 | CARBON TETRACHLORIDE | 0.01 | 0.0105 | 0.001 | | 105 | 77 - 122% |
| 107-06-2 | 1,2-DICHLOROETHANE | 0.01 | 0.0107 | 0.001 | | 107 | 74 - 128% |
| 71-43-2 | BENZENE | 0.01 | 0.0112 | 0.001 | | 112 | 83 - 117% |
| 79-01-6 | TRICHLOROETHENE | 0.01 | 0.0117 | 0.001 | | 117 | 83 - 117% |
| 127-18-4 | TETRACHLOROETHENE | 0.01 | 0.0105 | 0.001 | | 105 | 84 - 117% |
| 108-90-7 | CHLOROBENZENE | 0.01 | 0.0109 | 0.001 | | 109 | 81 - 113% |

**Data Package ID:** *VL1308210-1*

# GC/MS Volatiles

## Method SW8260_25C

## Laboratory Control Sample and Laboratory Control Sample Duplicate

**Lab Name:** **ALS Environmental -- FC**
**Work Order Number:** 1308210
**Client Name:** Wright Water Engineers
**ClientProject ID:** UDFCD Sediments 131013000

**Lab ID:** VL130816-2LCSD

**Sample Matrix:** WATER
**% Moisture:** N/A
**Date Collected:** N/A
**Date Extracted:** 08/16/2013
**Date Analyzed:** 08/16/2013
**Prep Method:** SW5030C

**Prep Batch:** VL130816-2
**QCBatchID:** VL130816-2-1
**Run ID:** VL130816-2A
**Cleanup:** NONE
**Basis:** N/A
**File Name:** B82797

**Sample Aliquot:** 10 ml
**Final Volume:** 10 ml
**Result Units:** MG/L
**Clean DF:** 1

| CASNO | Target Analyte | Spike Added | LCSD Result | Reporting Limit | Result Qualifier | LCSD % Rec. | RPD Limit | RPD |
|---|---|---|---|---|---|---|---|---|
| 75-01-4 | VINYL CHLORIDE | 0.01 | 0.012 | 0.001 | | 120 | 20 | 4 |
| 75-35-4 | 1,1-DICHLOROETHENE | 0.01 | 0.0109 | 0.001 | | 109 | 20 | 1 |
| 78-93-3 | 2-BUTANONE | 0.04 | 0.0426 | 0.01 | | 106 | 30 | 1 |
| 67-66-3 | CHLOROFORM | 0.01 | 0.0109 | 0.001 | | 109 | 20 | 1 |
| 56-23-5 | CARBON TETRACHLORIDE | 0.01 | 0.0104 | 0.001 | | 104 | 20 | 1 |
| 107-06-2 | 1,2-DICHLOROETHANE | 0.01 | 0.0107 | 0.001 | | 107 | 20 | 0 |
| 71-43-2 | BENZENE | 0.01 | 0.0111 | 0.001 | | 111 | 20 | 1 |
| 79-01-6 | TRICHLOROETHENE | 0.01 | 0.0118 | 0.001 | * | 118 | 20 | 1 |
| 127-18-4 | TETRACHLOROETHENE | 0.01 | 0.0106 | 0.001 | | 106 | 20 | 1 |
| 108-90-7 | CHLOROBENZENE | 0.01 | 0.0112 | 0.001 | | 112 | 20 | 3 |

## Surrogate Recovery LCS/LCSD

| CASNO | Target Analyte | Spike Added | LCS % Rec. | LCS Flag | LCSD % Rec. | LCSD Flag | Control Limits |
|---|---|---|---|---|---|---|---|
| 460-00-4 | 4-BROMOFLUOROBENZENE | 0.025 | 101 | | 102 | | 85 - 115 |
| 1868-53-7 | DIBROMOFLUOROMETHANE | 0.025 | 101 | | 98 | | 84 - 118 |
| 2037-26-5 | TOLUENE-D8 | 0.025 | 101 | | 102 | | 85 - 115 |

**Data Package ID:** *VL1308210-1*