ROADWASTE MANAGEMENT:
A Tool for Developing District Plans

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ROADWASTE MANAGEMENT:
A Tool for Developing District Plans

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16. Abstract

The Oregon Department of Transportation (ODOT) conducted a study to examine roadwaste management options. Phase 1 consisted of a thorough review of regulations and standards, roadwaste characterization, current management practices, and new technology. Phase 2 researched promising alternatives and gathered data in field trials. This report documents the efforts of Phase 3, providing guidance to ODOT maintenance personnel on the protective and cost effective management of roadwaste materials.

Roadwaste categories are identified and risk is assessed. Identifying and separating differing roadwastes allows more ready management while requiring less frequent analysis. District-level baseline waste characterizations help identify the most appropriate management methods to address actual risks. Recommended practices address testing, "hot" load separation, mainstream roadwaste, and wet waste management. Ready reuse is available for some materials. Other materials require simple treatment. More contaminated materials may require a significant investment in treatment or ongoing tracking unless a conservative management option is selected; e.g., disposal in a permitted landfill.

A statewide plan cannot account for all of the varying circumstances and environmental conditions in the state; District-level plans are needed. This guide supports the development of District-level roadwaste management plans by providing an understanding of the roadwaste types and associated risks, what an overall roadwaste plan must address, and details on specific workable options.

The ODOT Research Group plans to support the development of several District Roadwaste Management Plans, both by sponsoring training on the use of this guide and offering support for plan development. The recommendations provided in this guide coupled with further work by ODOT Districts developing roadwaste plans may lead to negotiations with environmental regulatory agencies leading to formal adoption of roadwaste Best Management Practices.

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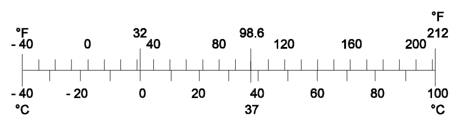
SI* (MODERN METRIC) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
		AREA		
in^2	square inches	645.2	millimeters squared	mm^2
ft^2	square feet	0.093	meters squared	m^2
yd^2	square yards	0.836	meters squared	m^2
ac	acres	0.405	hectares	ha
mi^2	square miles	2.59	kilometers squared	km^2
		VOLUME		
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.028	meters cubed	m^3
yd^3	cubic yards	0.765	meters cubed	m^3
NOTE: Volumes greater than 1000 L shall be shown in m^3.				
		MASS		
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams	Mg
		TEMPERATURE (exact)		
°F	Fahrenheit temperature	5(F-32)/9	Celsius temperature	°C

APPROXIMATE CONVERSIONS FROM SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
Mm	millimeters	0.039	inches	in
M	meters	3.28	feet	ft
M	meters	1.09	yards	yd
Km	kilometers	0.621	miles	mi
		AREA		
Mm^2	millimeters squared	0.0016	square inches	in^2
m^2	meters squared	10.764	square feet	ft^2
Ha	hectares	2.47	acres	ac
km^2	kilometers squared	0.386	square miles	mi^2
		VOLUME		
ML	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m^3	meters cubed	35.315	cubic feet	ft^3
m^3	meters cubed	1.308	cubic yards	yd^3
		MASS		
G	grams	0.035	ounces	oz
Kg	kilograms	2.205	pounds	lb
Mg	megagrams	1.102	short tons (2000 lb)	T
		TEMPERATURE (exact)		
°C	Celsius temperature	1.8 + 32	Fahrenheit	°F



* SI is the symbol for the International System of Measurement (4-7-94 jbp)

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We would like to recognize the City of Portland for its work in composting sweepings, and for its work recovering winter road sand, gravel, and clean dirt. We would like to thank Katie Bretsch, who actively partnered with us in an examination of vactor waste technologies. Katie's work with thermal treaters has provided a ready treatment option for more heavily contaminated ultra-urban and high-traffic area roadwastes, a better option and significantly less expensive than taking the waste to a landfill. Ms. Bretsch has led the City's efforts towards characterizing urban stormwater sump, catch basin, and sediment retention pond wastes, and developing improved methods in managing a vactor waste dewatering facility – valuable for the City and any other agency or company tasked with managing urban center stormwater sediments.

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EXECUTIVE SUMMARY

Introduction

This report summarizes the third phase of the Oregon Department of Transportation (ODOT) Roadwaste Research Project. The Roadwaste Research Project was developed to investigate cost effective and efficient methods ODOT might use to better manage roadwaste materials. Many roadwaste management methods were investigated and evaluated, both for their effectiveness in protecting the environment and their efficiency in terms of cost and ease to implement. While data collection and pollutant analysis have been a part of this project, reported in **ODOT Roadwaste Field Trials** (*Ghezzi 2000*), the focus of the research has been to identify roadwaste management practices that are practical, effective, and protective of the environment.

This report attempts to present the research information collected thus far in such a way that it can be used by ODOT maintenance personnel to better understand roadwaste management rules and options. This report recommends a methodology for formulating an effective district roadwaste management plan and recommends methods to manage the plan; however, the information presented is not intended as an agency-wide plan for roadwaste management. Hopefully, the information presented here will be helpful to ODOT Maintenance Managers in identifying and implementing methods to efficiently manage their roadwaste that are acceptable to environmental regulators.

Background

ODOT maintains and operates over 7,000 miles of roadways in Oregon. In managing this system, ODOT's maintenance activities generate large amounts of dirt, litter, or roadwaste debris. Sweeping roadway surfaces, picking up litter, clearing vegetation, cleaning highway drainage systems, and clearing landslides from roadways are all ODOT activities that generate roadwaste. In the past ODOT has stockpiled or disposed much of this roadwaste at maintenance yards, back lots, or along highway right-of-way. Now, with growing amounts of waste material, increasing highway traffic and pollution, less available land, and stricter environmental regulations, ODOT can no longer stockpile or dispose of this roadwaste without considering the environmental risks and impacts.

The Oregon Department of Environmental Quality (DEQ) is the regulatory agency in Oregon that oversees waste management. DEQ requires ODOT to manage its roadwaste according to various Federal and State waste rules developed to protect people's health and the environment. While these rules are protective, meeting them through conventional waste management methods is not always efficient or affordable. Managing ODOT roadwaste using conventional methods calls for solid waste to go to landfills and liquid waste to sewage treatment plants. Just separating roadwaste into liquid and solid portions using conventional methodologies can be extremely difficult and expensive. Waste is often required to undergo expensive testing or sorting prior to disposal. Disposal of all ODOT solid waste in Oregon landfills would be impractical, inefficient and cost prohibitive. Landfills and sewerage hookups are not readily available for ODOT roadwaste disposal in many areas of Oregon.

The ODOT Roadwaste Research Project

For three years ODOT has been working with DEQ and various agencies concerned with highway operations to identify more efficient and effective ways to manage roadwaste materials. This research has included three phases. The first phase was a literature review, which identified current roadwaste issues and problems across the country and summarized the most effective methods yet developed to manage this special waste stream. Phase 1 findings are documented in the report **Roadwaste: Issues and Options** (*Collins 1998*).

The second phase of the project pursued some of the more promising roadwaste management methods identified in Phase 1, with implementation and testing in the field. ODOT worked with local highway agencies in the Portland area to develop methods that would efficiently reuse or dispose of roadwaste generated from local urban roads. Field trials were conducted to collect data on pollutant levels associated with various roadwastes and disposal methods. Phase 2 findings are documented in **ODOT Roadwaste Field Trials** (*Ghezzi 2000*).

The *Roadwaste Management* Report

This report reflects the third phase of the research project. Here, the authors summarize the findings of the research project and offer recommendations on how ODOT Districts can use this information to better manage roadwaste materials.

The major findings of ODOT's Roadwaste Project can be summarized quickly:

- Levels of pollutants and trash found in roadwaste will vary widely.
- Roadwaste pollutant levels reflect highway traffic counts and surrounding land uses.
- Roadwaste does not classify as a "hazardous waste" (except for the very rare spill or illegal dumping incident).
- Roadwaste must be properly managed to address environmental risk.
- Efficient roadwaste management will require a variety of waste management methods.
- To comply with waste regulations will cost additional ODOT maintenance dollars.
- Partnering with local agencies will save resources, and risks are minimal.
- Efficient management of ODOT roadwaste will require District level planning.

Roadwaste Management expands on these findings. This document is aimed specifically at ODOT District Maintenance offices. First, it defines the roadwastes that ODOT collects and discusses environmental risks associated with each. Then, using the **Roadwaste Management Flowchart** (**Chapter 4**), it offers a planning process that can be used to manage these materials. Finally, it presents specific waste treatment and disposal options and discusses sorting, reuse, and recycling options.

The authors recognize that this manual will not adequately address all ODOT roadwaste disposal needs. The manual does summarize, however, the most current available information on roadwaste management.

Future Efforts

This document is the first step in the development of an ODOT roadwaste management program. A successful roadwaste program will require participation by many people, both within and outside of ODOT. It will require ODOT managers and District maintenance workers to build on the basic information presented here to develop their own waste management programs and solutions. It will mean involvement with local highway departments and public works agencies. And it will require negotiating approval of ODOT roadwaste management practices with the various government agencies that regulate the management of these materials.

LIST OF ACRONYMS AND TERMS

ADT	Average Daily Traffic [average number of trips per day on a given roadway]
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes [a type of laboratory test]
BMPs	Best Management Practices
CALTRANS	California Department of Transportation
CPAH	Carcinogenic Polyaromatic Hydrocarbon
DEQ	Oregon Department of Environmental Quality
DOE	Washington Department of Ecology
EPA	Environmental Protection Agency
MnDOT	Minnesota Department of Transportation
ND	Non-detect [a laboratory test result]
NPDES	National Pollutant Discharge Elimination System [a water quality permit]
NWTPH	Northwest Total Petroleum Hydrocarbon [a laboratory test]
NWTPH-Dx	Northwest Total Petroleum Hydrocarbon - Diesel extended [a laboratory test]
ODOT	Oregon Department of Transportation
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PNA	Polynuclear Aromatic [*see* PAH]
POTW	Publicly Owned Treatment Works [e.g. a WWTP]
ppm	Parts Per Million [*often expressed in* mg/kg *or* mg/L]
ppb	Parts Per Billion
SoClean	Soil Cleanup Table [DEQ threshold values for required cleanups]
STP	Sewage Treatment Plant [also called a WWTP]
TAC	Technical Advisory Committee [part of the ODOT Research process]
TCLP	Toxicity Characteristic Leaching Procedure [a laboratory test]
TPH	Total Petroleum Hydrocarbons [a laboratory test]
TPH-D	Total Petroleum Hydrocarbons in the Diesel range [a laboratory test]
TPH-G	Total Petroleum Hydrocarbons in the Gasoline range [a laboratory test]
TPH-HCID	Total Petroleum Hydrocarbon Identification [a laboratory test for ranges]
TSS	Total Suspended Solids [a laboratory test]
USA	Unified Sewerage Agency [of Washington County, Oregpn]
UST	Underground Storage Tank
WsDOT	Washington Department of Transportation
WWTP	Wastewater Treatment Plant

Vactor This term originates from a brand of vacuum eductor truck manufactured by Vactor® Manufacturing, Inc. Streator, IL. The term is used generically in this document to refer to eductor trucks in general and also to the waste materials extracted by them (e.g. "vactor waste").

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1.0 INTRODUCTION

1.1 HOW TO USE THIS DOCUMENT

Roadwaste Management presents the general findings of a three-year investigation by the Oregon Department of Transportation (ODOT) into the management of roadwaste materials. If you perform maintenance work on Oregon roadways and generate materials such as street sweepings, catch basin or sump clean-out materials, brush cuttings or general highway debris, this manual is intended to help you understand how to properly manage these materials. This manual will help you characterize the roadwastes that your District generates by type, source, toxicity, and amount. It discusses environmental concerns and regulations associated with the different types of roadwastes and offers different methods you can use to dispose or recycle these materials. Roadwaste Management is designed as an aid to help ODOT Maintenance develop methods to effectively and efficiently manage their roadwaste materials.

The roadwaste management guidance offered here is not intended as an ODOT management plan, policy, or procedure. Rather, it is information that may be useful in developing new, environmentally responsible methods to manage ODOT roadwaste. ODOT Research has worked hard to present the findings of this project in a format that will help ODOT managers and Maintenance workers develop their own roadwaste management plans if they choose to do so. While this project points out the benefits of roadwaste management plans, it also recognizes implementation of an ODOT roadwaste management program is beyond the scope of a research project.

1.2 RECOMMENDATIONS

This research has focused on identifying waste management methods that are safe, efficient, and economical, and that meet the intent of the Oregon Department of Environmental Quality (DEQ) waste management rules. The project investigated many roadwaste management alternatives and considered both the benefits and the drawbacks of these methods. After discussing the environmental risks posed by the specific roadwastes your District collects and the waste regulations you must comply with, this manual presents many waste management methods that may be appropriate for your roadwaste material. The methods you choose should take into account the geography, partnership opportunities and other resources available in your District.

The ODOT Roadwaste Research project has limited resources available for a fourth phase. If a Phase 4 is developed, it will support ODOT Maintenance Managers and District workers in developing roadwaste management plans for a few priority ODOT Districts. Technical support and training could be offered along with additional pollutant testing to further define roadwaste risks and appropriate management options.

1.3 DOES YOUR DISTRICT NEED A ROADWASTE PLAN?

If you currently manage or dispose of roadwaste materials, it is likely you already know whether or not you need to develop more in-depth roadwaste management plans. Many ODOT Districts have long ago run out of good disposal sites for slide debris, sweepings, or catch basin clean-out materials. If your District contains a large urban center (population over 100,000) it is likely that you have already considered formalizing a plan for the typically contaminated urban roadwaste you manage. If your District collects large quantities of slide debris or ditching material, you may have already begun trying to identify locations where non-contaminated materials can be placed without negatively impacting wetlands or endangered species habitat.

ODOT is already aware that more detailed roadwaste management plans are needed for some of its Districts. In the Portland area, sweepings are now routinely screened for trash and litter before they are stockpiled. This practice has been shown to be more acceptable to DEQ and more environmentally protective than old stockpiling methods. ODOT Region 2 has recently completed a "Disposal Site Study" that identifies appropriate locations to place landslide debris and certain roadwaste materials.

Roadwaste can pose human exposure risks, contaminate sites and groundwater, and create problems in stormwater runoff. Developing plans that define how ODOT will manage these materials will help achieve compliance with environmental regulations and control costs. While some waste management methods will be applicable to all ODOT roadwaste, ODOT Districts vary widely in types of roadwaste collected, volumes, contaminant levels, roads, environmental concerns, and available resources. Waste management plans that work for the Portland area may not work for Bend, or even for another urban center in the Willamette valley, such as Eugene. For this reason some roadwaste management methods may apply across the state, while others may serve best for individual ODOT Districts.

1.4 COST SAVINGS AND SHARED FACILITIES

Sharing roadwaste management facilities among public agencies could result in substantial cost savings. Concerns have been raised, however, that sharing roadwaste facilities may incur too high a liability risk for hazardous materials. The concern is that ODOT clean waste could be mixed with another agency's hazardous waste. Proper management and disposal of hazardous waste is the responsibility of the generator, and ODOT could conceivably incur responsibility and large costs for managing someone else's hazardous waste. In reality, however, hazardous waste liability risks are very low with roadwaste.

The City of Portland, with several trucks cleaning sumps and catch basins full-time, encounters a suspect waste load on the average of once per year. This happens in cleaning public drainage systems considerably more contaminated than those found on ODOT highways. Only once, since the City has been tracking and testing these wastes, have unusually contaminated materials been misplaced. Even at that, the mishap resulted in one batch of mixed dewatering vactor waste[1]

[1] "Vactor waste" is so named after a brand of eductor truck made by Vactor Manufacturing, Inc., commonly used to vacuum out catch basins, sumps and storm sewer lines.

being managed on-site as a special waste, and even this load did not test out as hazardous waste. The City of Portland has found that identification of suspect loads is most likely to occur at discharge to the dewatering facility. Facilities should have the capability to isolate suspect loads, allowing time for testing and possible separate management. With a proper hot load identification procedure in place, risk of cross-contamination and mismanagement is minimal.

Findings to date indicate that roadwaste is an excellent candidate for shared waste management, and there are many examples of shared facilities working well. Washington DOT has given out several construction grants of $250,000 for local public works agencies to construct shared dewatering facilities. The local agency then staffs and maintains the facility. Separate bays allow WSDOT to dump, dry, and then remove the solids for reuse. Washington's King County facility has a shared dewatering facility, with different haulers responsible for the solids in their bays; all the wastewater is plumbed through pre-treatment to sanitary sewer. Lane County, the City of Springfield, and the City of Eugene partnered on a dewatering facility; they share the same dewatering pads and have not had any problems with hot loads in their three years of operation. Information on the positive experience of Clark County's vactor facility, open to the public, is reported in **ODOT Roadwaste Field Trials** (*Ghezzi 2000*). With its widespread operations, if ODOT decides to de-water on capital-cost-intensive pads, shared facilities may simply become a fact of life.

Many other partnering opportunities exist beyond dewatering facilities. Composting has had limited success; screening trash is possible; the City of Portland has a shared road sand and gravel recovery operation. Clean fill sites and cooperation in siting permitted roadwaste landfills are among other obvious candidates. You can also manage roadwaste and solve other problems at the same time; for example, a dewatering operation could also manage the muddy wastewater from a truck wash station.

A look at shared facilities would not be complete without discussing the advantages when roadwaste management facilities are sited at or near solid waste management facilities or sewage treatment plants. There are many examples. The City of Portland sited a dewatering facility on a main line at a pump station. The Lane County-Eugene-Springfield partnership sited their dewatering station at an existing solid waste transfer station, which has reaped the obvious benefits. Unified Sewerage Agency (Washington County, Oregon) sited their dewatering pad at their Rock Creek Wastewater Treatment Plant. Each situation provides distinct advantages. Partnering with waste management professionals can ease your burden.

Roadwaste volumes are on the increase. Given high capital investment and oversight costs, it's natural to develop meaningful partnerships, share facilities, and save money.

1.5 DEVELOPING BEST MANAGEMENT PRACTICES (BMPs)

Public works agencies want workable roadwaste disposal solutions that comply with environmental regulations and minimize impacts to the environment. In presenting roadwaste management options, this guide has identified and addressed pertinent roadwaste regulations and environmental issues. DEQ has participated on the Roadwaste Technical Advisory Committee throughout the research project, and ODOT has sought DEQ's input on the initial findings, the trials, and on this guide.

Many of the roadwaste management options presented here have had very limited (if any) implementation trials. While many of the options appear promising, more field trials and monitoring by ODOT Maintenance workers will be needed before ODOT knows if they are actually effective. It is hoped that ODOT District Maintenance Offices will pursue and further develop roadwaste disposal options presented here to determine if in fact they are effective BMPs.

Once BMP effectiveness is better defined, ODOT will be better equipped to negotiate compliance issues with the many regulators that oversee the management of roadwaste materials. As stated above, DEQ oversees much of Oregon's waste management activities, but many other agencies regulate these activities as well, such as National Marine Fisheries Service (NMFS), Oregon Department of Fish & Wildlife (ODF&W), and the Army Corps of Engineers, as well as local governments. Developing a full blown ODOT roadwaste BMP program that meets all environmental regulations will require much more work by ODOT both in terms of better defining BMPs and negotiating with environmental regulators.

2.0 ASSESSING YOUR DISTRICT'S ROADWASTE

Roadwaste covers a broad range of materials with a broad range of environmental risks. Knowing the characteristics and volumes of the waste your District collects will help you select management methods that most efficiently address actual environmental risk. Storing low risk roadwastes separate from more contaminated or trashy waste makes reuse easier and will help control management costs.

2.1 WHAT TYPES OF ROADWASTE DOES YOUR DISTRICT COLLECT?

There are many different types of roadwaste, each with different levels of environmental concern. The more you know about the roadwaste your District generates and how it can impact the environment, the better equipped you will be to manage it safely and efficiently. You will find that one of the most efficient roadwaste management tools you have is sorting your roadwaste. Non-contaminated landslide debris does not face nearly the number of environmental concerns as highly contaminated urban catch basin waste. It makes good environmental and financial sense to manage these waste materials separately. This section defines the different types of roadwaste and introduce basic information on pollutants and environmental concerns associated with each.

Roadwaste materials generally share the same contaminants of concern – bacteria, litter, sharps (glass, needles, etc.), chemicals from spills or illegal dumping, gasoline, oil, heavy metals. Figure 2.1 shows the trash collected in a dewatered vactor waste sample.

Figure 2.1: Trash in dewatered vactor waste. Photo by Katie Bretsch, 1999.

These are all typical highway contaminants that require special management to protect human health and the environment. While much of ODOT roadwaste may be contaminated, contamination levels will vary widely. Some roadwaste you collect will be entirely free of contamination and can be managed as clean fill. The key to managing your roadwaste efficiently and saving on disposal costs will be knowing when it is dirty, when it is clean, and when it is mildly contaminated.

The **District Roadwaste Assessment Worksheet** on page 9 (Figure 2.2) will help you begin to sort your roadwaste by type, source, volume, toxicity, and trash content. This gudie will discuss worksheet terms and why they are important in the following section. Understanding roadwaste sorting is extremely important in selecting roadwaste management methods.

2.1.1 Roadwaste Types and Risk

There is a lot of common sense involved with sorting roadwaste and determining the environmental risk associated with it. Many roadwaste pollutants are easily detectable. You can see the litter and trash in your roadwaste piles. You will be able to see or smell many chemical pollutants as well. Look for the sheen of oil or grease. Often you can smell oil in old sweeping piles even if you can't see it. Watch for odd colors, stains, discoloration, chemical smells. These are all are obvious clues that your roadwaste is contaminated and has a high environmental risk associated with it.

Sometimes roadwaste pollutants and the health and environmental risks associated with them will be obvious. But some pollutants can only be detected through chemical testing. Often, even if you know oil or grease is present, it will take laboratory testing to determine if levels are toxic. Detecting heavy metals will require laboratory testing.

Determining risk is key in knowing what disposal options you have. If your waste is full of trash, smells of oil and gasoline, it has a high toxic risk and reuse options are limited. You may save money and headaches by hauling high-risk waste to the dump and being done with it. But some material you collect will be of medium risk. You may be able to screen out trash and store it in an appropriate spot while toxic hydrocarbons (present from gasoline or oil contamination) break down. This material may be appropriate for shoulder repair or patching holes under proper circumstances. Some roadwaste, such as landslide debris, has no (or low) toxic risk and can be used as clean fill. Your main concern with "clean" waste will be finding an environmentally appropriate location for final placement where it will not erode or impact a wetland.

Listed below are the basic roadwaste types and environmental risks associated with them. These are also summarized in Figure 2.3 on page 10. High, medium and low risk are defined later.

2.1.2 Stormwater System Residuals: Catch Basin, Sump and Line Cleanout

"Vactor waste" is so named after a brand of eductor truck commonly used to vacuum out catch basins, sumps and storm sewer lines[2]. On average, vactor waste is the most contaminated type of roadwaste with the highest environmental risk. There are some obvious factors you should

[2] Vactor® Manufacturing, Inc., 1621 South Illinois Street, Streator, IL 61364

consider that will increase risk of toxic contamination (which will be common to all roadwaste). Generally, the more silts or fine particles present, the higher the chance of contamination. Dead-end sumps will be more contaminated than catch basins, since catch basins let a lot of fine material pass through them. The higher the traffic count or average daily traffic (ADT), the higher the contamination levels. Wastes from more frequently cleaned sumps (or catch basins) can be expected to be cleaner.

Because vactor waste contains water, there is an increased risk for runoff and ground infiltration. Infiltration of contaminated water through porous gravel, sand, and fractured bedrock may threaten groundwater. Without contact of oxygen and sunlight, contaminants do not readily degrade. The fine particles in vactor waste are easily suspended in runoff and can dramatically impact stream health – both immediately and in the long term. Fines can carry high levels of contaminants and themselves pose threats, e.g., clogging fish gills and burying spawning beds. This wastewater requires special management and cannot be returned to the storm drain system or disposed on land without a DEQ permit.

2.1.3 Sweepings

Sweeper trucks remove dirt and debris from the highway system. Contaminant concentrations in sweepings are usually lower than those found in vactor waste, but even relatively clean sweepings can contain toxins and require careful management. The risks posed by these materials are similar to vactor wastes. Wastewater collected with wet road materials has many of the same concerns as vactor truck wastewater. Sweeper loads full of fallen leaves and other organic materials may be better managed by composting than by classic waste disposal – ODOT Region 1 has conducted very successful composting trials with sweepings. See the roadwaste research project's Phase 2 report, **ODOT Roadwaste Field Trials** (*Ghezzi 2000*).

2.1.4 Sweepings: Winter Road Sand Subcategory

Quick pick up of winter road sand on urban streets can reduce toxic pollutants and result in net direct cost savings. Road sand quickly removed from roads after a thaw may be ready for reuse as is, or it may require a screening step to remove trash and/or to drop out the more contaminated and less useful fines. The recycled sand replaces new product that would otherwise have to be purchased, and recycling results in less waste to manage. Use of anti-icing and de-icing agents may reduce the need for road sand application.

2.1.5 Ditching Spoils

Not enough is known about ditching spoils yet to properly assess contaminant levels. Those collected from ditches draining high ADT roads in urban areas have had contaminant levels as high as those found in vactor wastes. ODOT ditchings from some rural areas have tested completely clean. This said, rural ditch material has, on rare occasions, tested at high levels for heavy oils or other contaminants. Contaminant levels in ditching spoils will vary widely, depending on cleaning methods, water flow, traffic count, and surrounding land use. It is expected that in most cases, ODOT will be able to manage rural ditchings from low-ADT roads as clean fill.

2.1.6 Sediment Pond Cleanout

Roadway sediment ponds are becoming more commonplace. These ponds detain roadway runoff, dropping out contaminated fines. These ponds can also contain spills. The volume of sediment pond clean-out waste is expected to increase dramatically over time. Limited contaminant data on ODOT Interstate 84 sediment cleanout shows levels similar to catch basin and sump waste, in very similar material. The greater likelihood of impacts from spills means that testing should include a wider variety of chemical constituents.

2.1.7 Other Vac Cleanout Waste: Scuppers, Bridge Culverts, etc.

Bridge culvert cleanout normally produces rock and trash and very little fine material. Bridge scuppers will capture only well-washed rock and gravels. Since these wastes pose no real risk, you do not need to test them. Free from trash, they are ready for immediate reuse. You may also collect clean, well-washed rock in your maintenance of other stormwater facilities. Other vactor cleanout waste in your District might have unique characteristics and deserve separate management under its own category.

2.1.8 Landscape Cuttings: Greenwaste

ODOT crews can collect high volumes of organic matter during road projects or as a result of slides. In the fall, leaves can accumulate on roadways and in right-of-ways. Taken together, waste organic materials are termed “greenwaste.” Burial is not permitted. Buried organic matter can release toxic nitrates to groundwater. In addition, as vegetative matter decomposes it reduces significantly in volume, resulting in major settling issues on the ground surface – a problem shared to a lesser degree with sweepings and vactor wastes. Composting is the best alternative for clean greenwaste. Region 1 uses its own compost made from greenwaste and sweepings to replace commercially purchased growing media for use along some highways. If your District’s greenwaste volumes are low, hauling to a commercial composter might be a better option.

2.1.9 Construction Site Soils And Slide Debris

Slide debris and construction site soils and slurries not impacted by road oils or heavy organic loads should be managed as clean fill. Greenwaste should be removed for composting. Care should be taken in storage and placement of these materials. Review of **Chapter 10, *Storage Considerations*** and **Chapter 12, *Final Disposition of Roadwaste Solids*** is helpful when evaluating environmentally sound options for managing significant volumes of these and similarly uncontaminated materials.

After establishing which roadwaste types your District’s waste collects, the next step is to figure out how much of each waste you collect and track these volumes.

(COPY FOR USE)

District Roadwaste Assessment Worksheet

[See reverse for common toxicity levels seen by waste type/source.]

Type of Material	*Source (area, ADT, subtype)*	*Volume (cu. yds or tons/year)*	*Toxicity/Risk*	*Trash?*
Vactor Waste • Catchment, Sump and Line Cleanout			High Med Low	Yes No
			High Med Low	Yes No
			High Med Low	Yes No
			High Med Low	Yes No
			High Med Low	Yes No
			High Med Low	Yes No
• Stormwater Sediment Pond Cleanout			High Med Low	Yes No
			High Med Low	Yes No
			High Med Low	Yes No
• Other Vactor Cleanouts (bridge culverts, etc.)			High Med Low	Yes No
			High Med Low	Yes No
			High Med Low	Yes No
Sweepings			High Med Low	Yes No
			High Med Low	Yes No
			High Med Low	Yes No
			High Med Low	Yes No
• Winter Road Sand			High Med Low	Yes No
			High Med Low	Yes No
			High Med Low	Yes No
Landscape Cuttings (Green or Brush)			High Med Low	Yes No
			High Med Low	Yes No
			High Med Low	Yes No
Ditching Spoils			High Med Low	Yes No
			High Med Low	Yes No
			High Med Low	Yes No
			High Med Low	Yes No
Construction Site Soils and Slide Debris			High Med Low	Yes No
			High Med Low	Yes No
			High Med Low	Yes No
			High Med Low	Yes No

[7/2000 version: JC/JM]

Figure 2.2: District Roadwaste Assessment Worksheet

ODOT Highway-Generated Waste

Waste	Toxicity/Risk	Compliance issues	Management Examples
Vactor Waste • **Catchment Cleanout** • **Sediment Ponds** • **Bridge Culverts**	**High** (in urban areas). Typically the most contaminated roadwaste. Hydrocarbons and metals are common. Historical pollutants can be present. **Low to High** Depending on factors such as ADT, land-use, maintenance schedules, etc. **Low** (if content of silt or fine soils is low).	Vactor waste must be separated into liquids and solids prior to disposal. Each waste must be disposed of separately. Many waste disposal rules apply. ODOT Environmental and DEQ can offer guidance. Even free of toxins, litter, and trash, vactor waste requires proper placing and erosion control.	• Develop alternative disposal options such as bioremediation or composting. • Pursue alternative decanting techniques (retrofit sewerage manholes for liquid field disposal, treat vactor slurries with flocculent, etc.). • Partner with other agencies and share waste disposal facilities. • Construct ODOT decant facilities that separate vactor waste into liquids and solids. Landfill solids and dispose liquids to sewer.
Sweepings • **Winter Sand**	**Low to High** Litter and sharps will be obvious. Hydrocarbons and metals are a concern. Urban sweepings usually test high in toxin levels. **Low** (with quick pick up). Less time on roadway reduces litter and toxins.	Similar to vactor solids in risk and environmental concerns. Testing may be needed to determine toxin levels. Litter and trash must be disposed of at permitted waste facilities.	• Test, characterize, and sort for reuse. • Develop re-use options: compost, shoulder repair, fill, concrete, etc. (remove trash by screening). • Develop and permit disposal sites (partnering). • Thermal treatment (incinerator). • Landfill.
Ditching Spoils	**Low to Medium** Generally risk is low but urban ditchings have tested positive for toxins (hydrocarbons, metals, historical pollutants, chemical dumping, etc).	Storage sites must be suitable (protect wetlands and streams). Clean soil is a pollutant if it is not contained (erosion control).	• Use as fill material in appropriate locations. • Partner in give-away programs if material is suitable (agriculture, construction, etc.). • Develop and permit disposal sites.
Landscape Cuttings	**Low** Nitrogen, bacteria, and other pollutants associated with the break down of organic material can be considered toxic pollutants.	Landscape debris must be disposed at permitted facilities. Composting is allowed but may require a permit. Odor, vector control, and public perception are concerns.	• Keep landscape debris separate from other waste and dispose appropriately. • Composting. • Burning (only allowed at limited locations). • Chipping/Mulching.
Construction Soils and Slide Debris	**Low** Toxins can sometimes be a concern (fuel spills, septic waste, excessive vegetation, etc.)	Similar to Ditching Spoils in risks and concerns. Storage sites must be suitable. Material must be contained.	• Use as fill or construction material if appropriate (rock fall or sound berms, general fill, etc.). • Develop give-away programs with partners. • Develop and permit disposal sites.

Figure 2.3: Environmental risks of highway-generated waste

2.2 ASSESSING VOLUMES

How many tons of debris do you sweep up annually? How many tons of vactor waste do you collect? Do you sweep up a lot of leaves? Do you pick up a large volume of road sand? Unless you have been keeping careful records, you may find it necessary to track roadwaste generation over a season or two to come up with a good estimate on the amount of each roadwaste your District generates. You can use the **District Roadwaste Assessment Worksheet** (page 9) to track volumes. Keep in mind that waste levels will increase as time goes on.

There are a number of ways you can calculate the amount of roadwaste you generate. You can count truck loads or vactor loads. You can estimate the size of your waste piles. Ultimately you are interested in obtaining a number that gives the amount of each specific waste that you generate. Since most commercial landfills or incinerators will charge you by the amount of material you deliver, it will be important to know how many tons or yards you generate to calculate disposal costs. Eventually you will want other cost information as well: e.g. how many catch basins you clean, pipes you unclog, how far you haul your waste, etc. (Sample disposal cost calculations are included in **Appendix A**.) But for now, focus on estimating how much and what type of material you generate.

Creating and maintaining sub-categories should help you to manage your District's roadwaste more efficiently. Sub-category wastes often merit a separate, less conservative and less costly management methods. For example, a significant portion of your vactor truck waste may not be related to storm drain clean out. Material from construction sites, slides, and low-ADT (under 30,000) roads are all expected to produce cleaner materials, relatively free of oils or other contaminants from the road. Estimating separate volumes for cleaner and dirtier materials will help you when deciding on appropriate management options. Assessing actual toxicity for the waste sub-types you collect is more complex.

2.3 WHAT IF MY VOLUMES ARE LOW?

In a District that collects little in the way of roadwaste, investing time and effort to develop custom solutions for managing this waste may not be cost effective. While this manual recommends you remain open to more efficient and environmentally sound waste management options, using simple and straightforward waste management practices will likely meet District needs and minimize cost if your volumes are low. Hauling all your waste to the landfill may be your easiest and cheapest waste management alternative. Assessing where a break in cost occurs can be difficult. With generation of any substantial volume of gravel or road sand, screening trash from your material will likely provide you with some ready reuse options, saving both on disposal costs and purchase of raw materials. Composting leaves and grass can also bring savings.

2.4 BASELINE PRACTICES FOR EFFECTIVE AND PROTECTIVE MANAGEMENT

After assessing your different roadwastes for amount, toxicity, trash composition and physical characteristics, you can decide if you would rather manage your wastes conservatively or develop your own District-level waste management plan. Either way, you will decide on a management strategy that fits the conditions in your District.

A set of general guidelines – "Baseline Conservative Roadwaste Management Practices" – is included in **Appendix B**. Use of these guidelines offers a straightforward and conservative management method, especially appropriate for high priority wastes in low waste generation areas.

Managing waste conservatively means adopting waste evaluation and segregation procedures for potentially hot loads (see **Chapter 5** for a discussion of good work practices), managing wastewater to sanitary sewers, and managing contaminated solids (storm sewer system vac wastes, sweepings, ditching spoils, and trash) to permitted landfills. If you take all your roadwaste to a DEQ-permitted landfill, the only remaining task is testing potentially hot loads.

Practices such as screening out trash, reuse of road sand and gravels, and composting might fill out the rest of your needs in a conservative approach to roadwaste management. These Baseline Practices are not complete methods in themselves. Referencing field decanting, dewatering, water disposal, storage, and other options presented here will help you to round out your procedures.

You may find that costs associated with these generic guidelines drive you to look into developing a baseline waste characterization for your District's roadwastes and adoption of more efficient options on a case-by-case basis. As you adopt new management methods to reduce costs and set procedures for crews, you may decide to formalize these procedures into a District Plan.

3.0 USING ENVIRONMENTAL RULES TO ASSESS RISK

There is not room enough in this report for a complete discussion of all the environmental regulations that may impact roadwaste management. In addition, while many rules apply, the environmental regulations offer little in terms of specific guidance on how to manage roadwaste. Instead, environmental regulations will be used to provide a framework for the issues of risk and toxicity. DEQ (Department of Environmental Quality) is Oregon's primary waste regulator. This guide will introduce you to DEQ's major waste regulations and their impact on the roadwastes you manage. If your waste management plans address the requirements discussed here, it is likely that your operations will satisfy the concerns of DEQ. Most of these regulations are referenced again in the discussion of specific roadwaste management options in coming chapters.[3]

3.1 HAZARDOUS WASTE RULES

DEQ rules require that you determine whether your wastes are classified as "hazardous," as defined by the types or amounts of contaminants they contain. The Roadwaste Research Project has reviewed large volumes of roadwaste pollutant characterization data. Roadwaste has often been found to be contaminated with petroleum compounds and heavy metals – benzene and lead being the most common hazardous pollutants. But even these pollutants have never been detected in high enough quantities to reach the hazardous waste thresholds. Benzene has never been seen above detection limits. Lead has been the only heavy metal to approach hazardous waste thresholds; but even sump materials loaded with lead from the leaded gas era have not been found to contain enough to be classified as hazardous waste.

The record is clear: unless contaminated by a spill of toxic materials, roadwaste has never tested as hazardous waste. This "knowledge of process waste determination" defines normal roadwaste as non-hazardous. Once in a while, you may run into material that you suspect is hazardous. These suspect materials will require careful and separate management; they will require testing and a record of laboratory results. But only very rarely will you encounter hazardous waste in your day-to-day road maintenance operations. For two years the City of Portland has been aggressively cleaning their sumps without encountering a load that tested as "hazardous waste." Hazardous waste determinations, waste thresholds, testing, and management is discussed in more detail in **Chapter 5, *Identifying and Managing Hot Loads***.

If your roadwaste falls outside the formal definition of hazardous waste, do you have anything left to worry about? You bet. **Just because run of the mill roadwaste doesn't classify as hazardous waste doesn't mean it's free from dangerous pollutants. It may not glow in the dark, but that does not mean it's benign.** Many roadwastes, while not "hazardous," do contain

[3] For a List of Pertinent State and Federal Environmental Regulations see **Appendix C**. For more discussion of pertinent regulations, refer to *Roadwaste: Issues and Options*, Chapter 2 "Regulatory Issues."

pollutants that test above “cleanup” levels. This level of contamination is significant, and mismanagement of the roadwaste can pose risks to human health and the environment.

3.2 CLEANUP PROGRAM RULES

DEQ “cleanup levels” define specific pollutants and the concentrations at which they become a significant risk to the environment and human health. Assessing pollutant health risks is different than determining whether or not a waste contaminated with a pollutant can be placed into the environment. Waste that exceeds a pollutant cleanup level can be recycled or reused as long it is managed appropriately.

Cleanup levels provide important guidelines to efficiently assess health risks. There is enough data on roadwaste contaminants to identify the troublemakers:

- Carcinogenic Polyaromatic Hydrocarbons (CPAHs)
- Heavy Metals (Lead and Arsenic)

In the wide range of oddball contaminants found in roadwaste, CPAHs and heavy metals are the only consistent problem pollutants associated with this material.

3.2.1 Carcinogenic Polyaromatic Hydrocarbons (CPAHs)

Carcinogenic Polyaromatic Hydrocarbons (CPAHs) turn out to be the real risk-driver for most roadwastes. In fact, if it weren’t for CPAHs (heavy, multi-ringed hydrocarbons rarely found in nature), roadwaste management would be relatively simple. CPAHs come from many sources, but are mainly the product of incomplete combustion of petroleum compounds.

Table 3.1 presents the levels for CPAHs allowable at cleanup sites. These values are given in “mg/Kg.” Milligrams per Kilogram (mg/Kg) is how many thousandths of a gram of a substance are present in 1,000 total grams. This is roughly equivalent to how many molecules of constituent are present in every million molecules of the material being tested. These values are often stated as “parts per million” (ppm). As you can see from the chart, it doesn’t take much of any of the seven carcinogenic PAHs to present a significant health risk.

Table 3.1: Regulatory Thresholds for CPAHs (values given in mg/Kg = ppm)

Carcinogenic PAHs	DEQ SoClean Industrial Cleanup Level	DEQ SoClean Residential Cleanup Level	EPA Region IX Industrial Cleanup Standard (PRG)	EPA Region IX Residential Cleanup Standard (PRG)
Benzo(a)anthracene	1.0	0.1	2.6	0.61
Benzo(a)pyrene	1.0	0.1	0.26	0.061
Benzo(b)fluoranthene	1.0	0.1	2.6	0.61
Benzo(k)fluoranthene	1.0	0.1	26	6.1
Chrysene	1.0	0.1	7.2	7.2
Dibenzo(a,h)anthracene	1.0	0.1	0.26	0.061
Indeno(1,2,3-cd)pyrene	1.0	0.1	2.6	0.61

DEQ published the "SoClean" numbers as an early assessment of toxicity. EPA later published the PRGs (Preliminary Remediation Goals). The PRGs better assess actual risk, reducing the allowable concentration levels for more toxic CPAHs and allowing greater concentrations for less toxic CPAHs. DEQ uses PRGs for assessing risk and recommends them for evaluating risk in roadwaste. It should be noted that further guidance on assessing risk from CPAHs is under development.

Risk assessment of contaminants depends on exposure pathways. Since CPAHs are virtually insoluble, human exposure is through physical contact, with dust being another concern. Keeping the material in place, out of human contact, is important. Since CPAHs do not readily degrade, DEQ may require long-term tracking for roadwaste placed into the environment. Many cleanup sites now have deed restrictions with contaminated materials tracked by a DEQ Solid Waste Permit. These permits address not only CPAHs but other hydrocarbons and metals as well and are intended to protect groundwater and the surrounding environment. **Chapter 10**, ***Storage Considerations***, will discuss further how to minimize the risk of human contact with these toxic pollutants and how to keep them from migrating.

CPAH concentration in roadwaste varies greatly. If you plan to reuse your roadwaste or place it somewhere other than a landfill, you will need to know its CPAH levels. Rather than testing every roadwaste batch, it is likely ODOT will be allowed to base reuse decisions on baseline waste characterization levels for different types of roadwaste.

3.2.2 Heavy Metals

Heavy metals are also found in roadwaste, but they are rarely observed above industrial cleanup levels (Table 3.2). They are most likely to present a concern in vactor waste, sweepings, and ditching spoils. Again, evaluating concentration levels is the first step in assessing risk.

Table 3.2: Selected Heavy Metals from Oregon DEQ's Soil Cleanup Table (mg/kg = ppm)

Selected Heavy Metals	Maximum Residential Cleanup Level	Maximum Industrial Cleanup Level	Acceptable Leachate Concentration Level (mg/l)
Arsenic	0.4	3	0.004
Cadmium	100	1,000	0.5
Chromium	1,000	1,500	10 (total)
Copper	10,000	80,000	100
Lead	200	2,000	2
Mercury	80	600	0.2
Silver	1,500	10,000	5

Heavy metals do not "treat out", break down, or disappear over time. They are in your waste to stay unless you physically remove them. Your main concern with metals will be isolating and containing them where their impact to the environment will be limited. It should be mentioned that biosolids (cooked-out sewage treatment plant sludge) applied as fertilizer, are allowed lower cleanup standards. This is because the material is used beneficially, only in controlled amounts, and is kept at or near the ground surface.

Leachate concentrations are lower than total concentrations because they address the amount of soluble contaminant in water. The pollutant is being released or mobilized under a whole different set of conditions. Values are expressed as mg/l or milligram per liter. Since a liter of water is one kilogram of water, you again have "parts per million." Leachate tests will be discussed further in **Chapters 5** and **6**.

Background levels of arsenic in areas around Portland often exceed the cleanup table values. ODOT would not be expected to limit placement of materials to below natural background levels. Metals are usually present in roadwaste below residential cleanup thresholds. Besides arsenic (As), the only cleanup metal that has tested above residential cleanup levels with any consistency is lead (Pb). For arsenic, more testing is needed outside Northwest Oregon to determine whether its presence is due to highway contaminants.

The heavy metal cleanup levels given above consider human health risks associated with direct contact with metal contaminants. These numbers also consider health risks associated with the release of these heavy metal pollutants to the groundwater table. Groundwater is pumped for private and municipal drinking water and, like surface water, is a protected resource in Oregon. The mobility of heavy metal contaminants is dependent on various conditions. Greater soil porosity, the presence of water in the soil system, and lower pH conditions all tend to mobilize heavy metals. The more acid the soil, the greater the potential mobility. In Eastern Oregon, with low rainfalls and arid grasslands, soil pH is often high, which will precipitate heavy metals, fixing them in the soil. In Western Oregon, soil conditions are more acidic, largely due to the presence of organic acids common to rain forest and high organic growth conditions.

Lead – and perhaps arsenic – is a significant risk-driver, but is unlikely to limit roadwaste reuse if material is properly isolated and contained and reuse is limited to industrial or highway settings away from public access.

3.2.3 Total Petroleum Hydrocarbons (TPH)

Total Petroleum Hydrocarbon (TPH) concentrations were at one time thought to be the major risk-driver for roadwaste. They are a factor but not a significant long-term problem, since TPH will "treat out" or break down over time with exposure to light, air, and the biological activity common in most soils. Still, TPH contaminated materials are a risk and should be managed without release to the environment.

The UST Cleanup program "matrix" cleanup levels are presented in Table 3.3. If you meet the concentration level applicable to the given site conditions (Level 1, 2, or 3 defines site conditions such as depth to groundwater, water use, and rainfall), cleanup is approved without further action. TPH observed in roadwaste is in the heavy diesel through heavy oil range. TPH thresholds for gasoline are included for completeness and to show the relative risk and toxicity of those lighter and more mobile compounds.

Table 3.3: DEQ's UST Matrix for Petroleum Hydrocarbon Cleanup (values in ppm)

PETROLEUM FRACTION	LEVEL 1	LEVEL 2	LEVEL 3
Gasoline	40	80	130
Diesel	100	500	1000

(Oregon DEQ, January 1995)

CPAHs are a consistent risk factor for roadwastes that contain heavy petroleum fractions (high TPH values), with CPAH being the main concern (as discussed above). Lighter hydrocarbons, such as benzene, with greater mobility and greater toxicity, are not normally found in roadwaste (except in a petroleum spill event). DEQ has approved TPH concentrations in the heavy oil range up to 10,000 ppm as long as specific toxic hydrocarbons or other associated pollutants do not pose a risk. The key to controlling risk is controlling exposure pathways and limiting the release of a toxic pollutant into the environment. When you consider roadwaste management methods, think about how you will limit exposure to and contain the toxic pollutants such as hydrocarbons commonly associated with your roadwaste.

The ODOT Phase 1 report **Roadwaste: Issues and Options**, clearly shows how roadwaste TPH test results are consistently magnified due to the presence of natural organic matter. Since simple TPH constituents "treat out" and can be difficult to detect due to interference from natural organics, letting them "treat out" naturally while containing runoff and preventing groundwater infiltration responsibly addresses the potential risk from TPH. As discussed in **Chapter 13, *Final Disposition Options***, by employing simple and effective management methods, you can address the risks presented by simple petroleum contaminants.

3.2.4 Rare Contaminants

It is likely that sometimes your roadwaste will contain rare or odd toxic pollutants such as pesticides, industrial solvents, bacteria or human and animal waste. These toxic pollutants are present because they have migrated onto ODOT roads from adjacent property, or they are the result of a one-time polluting event such as a spill or an illicit dumping. Unless these pollutants are physically obvious, you may not always know they are present. By routinely inspecting your roadwaste for signs of hazardous materials, being aware of local activities that could generate pollutants, and doing a minimum amount of pollutant characterization testing, chances of significant toxic pollutants slipping past you are extremely rare.

Be aware of the land use adjacent to the highways you maintain. If you are in an area that has been historically used for industrial activities that generated toxic pollutants, chances are those pollutants will be bound up in local soils and end up in some of your highway catch basins. In the Portland area ODOT has seen elevated metals and solvents in sweeping and catch basin waste that was collected from roads that cut through historically industrial areas. In rural areas, agricultural chemicals or animal waste may be carried by runoff or eroding soils and end up in highway drainage systems. High bacteria levels from animal waste can be a problem in ODOT stormwater ponds during warm summer weather in both urban and rural areas because ponds are used by ducks and other wildlife.

Try to be aware of chronic problem pollutants found in your District. You may want to test for some of the more exotic contaminants when you characterize your roadwaste's pollutant levels if you suspect their presence. Always be on the look out for odd smells, colors, or other contaminant signs such as vegetation kills in your ditch lines. Your local ODOT HAZMAT Coordinator is a good resource here and can advise you further on specific contaminants that you are likely to find in your District. Pollutant characterization testing will be further discussed in **Chapters 3** and **5**.

3.2.5 A Note On PCBs

Similar to the hazardous waste regulations, Toxic Substances Control Act regulations apply in cases where polychlorinated biphenyl (PCB) oils from a blown transformer impact an area of sweepings or are carried into a catch basin. PCBs are more commonly an issue in cities than along rural highways. In Oregon, the U.S. Environmental Protection Agency (EPA) directly regulates PCBs. PCB issues are examined further in **Chapter 6, *Identifying and Managing Hot Loads***. Allowable levels for PCBs and testing for PCBs and other contaminants are addressed in detail in **Chapter 5, *Establishing District-Level Baseline Waste Characterizations***.

3.2.6 A Rough and Ready Method for Assessing Risk (High, Medium, Low)

The toxicity numbers presented in Tables 3.1, 3.2 and 3.3 above can be helpful in assessing health risks associated with your material and how you plan to reuse it. Sweepings that exceed residential "cleanup levels" may not be appropriate for reuse in areas where pedestrians will be present. But these same sweepings may be appropriate for shoulder rebuilding along the freeway where public access is limited – especially if placed where sweepings can be isolated and contained and where pollutant migration is not an issue. The following summarizes the risk ratings listed on the **District Roadwaste Assessment Worksheet**.

- High: Exceeds industrial cleanup standards or is directly impacted by a spill of petroleum or another toxic substance

- Medium: Exceeds only residential cleanup standards

- Low: Less than residential cleanup standards and tests below 1000 ppm total petroleum hydrocarbon (TPH)

This simple cut at a toxicity assessment helps clarify the risks presented by the roadwastes you collect. Figure 2.2 on the reverse of the **District Roadwaste Assessment Worksheet** provides a rough cut at levels of concern for a variety of wastes and sources. Actual contaminant levels can vary greatly, however. Even tests from the same sump or catch basin can vary. It is expected that if you are placing roadwaste material in the environment you will want to periodically run tests to characterize pollutant levels associated with your specific wastes.

Once you are comfortable knowing the typical pollutant levels or range of levels associated with your material, you will have a better understanding of the environmental risk associated with it. The **Roadwaste Assessment Worksheet** gives you a place to record your baseline data, but these risks may increase or decrease depending on what you find through your own testing and the development of further sub-categories (e.g., "ditching spoils from high ADT roads"). DEQ's cleanup levels can help in defining sub-categories of roadwaste.

If you are aware of additional factors in your material's toxicity – such as impacts from a spill, an industrial release or a transformer blowout – realize this waste may be more toxic, and characterization of the waste is outside the scope of this simple risk analysis scheme.

3.2.7 Most of the Contaminants are Concentrated in the Fines

In assessing comparative risk, it is important to know that most contaminants of concern will concentrate in the fine soil and silt particles of your roadwaste. Contaminants will usually bond to the outside of particles. The more surface area, the more bonding sites there are. The same weight of clay has a million times more surface area and bonding sites than gravel. Gravel and rock will test clean unless impacted by some kind of spill. **If contaminants are present, they will be in the clays, silts and finer sands.**

3.3 SOLID WASTE RULES

Solid waste rules are a significant driver in roadwaste management. Both state and local officials actively regulate solid waste. Solid waste rules define what solid waste is and how it should be managed. DEQ's definition of solid waste is found in Oregon Administrative Rule (OAR) 340-93-8:

> *"Solid Waste" means all useless or discarded putrescible[4] and non-putrescible materials, including but not limited to garbage, rubbish, refuse, ashes, paper and cardboard, sewage sludge, septic tank and cesspool pumpings or other sludge, useless or discarded commercial, industrial, demolition or construction materials, discarded vehicles or parts thereof, discarded home and industrial appliances, manure, vegetable or animal solid and semi-solid materials, dead animals and infectious waste. The term does not include:*
>
> *(a) Hazardous waste as defined in ORS 466.005;*
> *(b) Materials used for fertilizer, soil conditioning, humus restoration, or for other productive purposes or which are salvageable for these purposes and are used on land in agricultural operations and the growing or harvesting of crops and the raising of fowls or animals, provided that the materials are used at or below agronomic application rates.*

A lot can be learned from a brief examination of this definition. Most importantly, if something is a "productive" material, product management rules apply rather than waste management rules. Screening to remove trash is a natural first step in processing your roadwaste to remove waste from "productive" roadwaste material. As stated earlier, DEQ is *very* clear on the question of trash: **non-recycled trash** is waste and **must go to a permitted landfill.** Except for metal pulled out for scrap and other recycled materials, all trash should go to the landfill.

Other than this, no firm guidelines have been established to assess whether roadwaste is a waste or a productive material. DEQ recognizes some materials as clean fill (clean dirt, rock, concrete,

[4] DEQ covers both "putrescible" and "non-putrescible" wastes in the definition, wanting to capture all garbage, that which will readily degrade with organic action and that which will not.

and weathered aggregate asphalt). Clean fill faces little regulatory scrutiny provided that it is used in a manner that does not impact wetlands adversely or threaten waters of the state, and that local fill regulations are observed. Other roadwaste materials have not been approved for reuse and will face regulatory scrutiny. ODOT has identified many possible ***Reuse Options*** (see **Chapter 13** for further discussion) and has considered their environmental risks.

DEQ regulates disposal but also can regulate solid waste treatment and interim storage facilities. DEQ issues a variety of permits for various waste treatment facilities. Even ODOT screening operations where trash is screened from collected winter road sand or sweepings may be considered a solid waste treatment facility by DEQ. While having to obtain waste treatment permits is not the end of the world, ODOT can help alleviate the need for them by implementing Best Management Practices now, before roadwaste management methods are required due to environmental impacts or public concern.

Mismanaged roadwaste will drive state and local solid waste regulators to develop further roadwaste rules. Public complaints and perceptions are important and have influenced DEQ to take action on waste management issues in the past. For example, piles of petroleum-contaminated soil from gas station cleanup operations were visible to the public and known to be contaminated. Public complaints drove state and local solid waste regulators to take independent action to eliminate those piles. Complaints can drive regulators to take action on roadwaste piles, as well. Screening, piling and sorting roadwaste is not visually attractive and should be conducted away from the general public. Expect unsightly waste piles and bad odors to generate public complaints.

Material used (or planned for use) to grow crops is exempted from the definition of solid waste. While this exemption does not apply to roadside cover, it does apply to material placed on farms as soil amendments or fertilizer when applied at or below agronomic rates. This condition means that the farmer has to make use of all the nutrients or other qualities he is looking for in the material, and not just heap it onto his farm for purposes of fill or disposal.

Solid waste rules also allow ODOT the option to dispose of roadwaste in a DEQ-permitted landfill. However, waste must be dry before it can be landfilled (i.e., a representative sample will not pass liquid through a paint filter). This means dewatering is required prior to landfilling typical sump and catch basin vactor waste. Sediment collected from pipes, ponds and ditches must be relatively dry before taking it to a landfill. Landfilling waste slurry is not allowed. Separating roadwastes into liquids and solids is one of the more difficult and expensive waste management tasks facing ODOT. (Techniques for ***Dewatering Solids*** are the subject of **Chapter 9**.)

Site-specific fill permits and Letter Authorizations are also possible under DEQ's solid waste rules. A DEQ Solid Waste Landfill permit or Letter Authorization is needed each time non-cleanfill is placed somewhere other than in an approved landfill. The City of Salem has a DEQ permit for landfilling its roadwaste. Their fill location is in a low area with actual groundwater contact. Regulations have stiffened since they sited this fill. Permit renewal and oversight fees, and groundwater monitoring requirements have increased costs dramatically. Siting a roadwaste landfill is not a bad idea under the right circumstances, and will be reviewed as a **Disposal Option** in **Chapter 13**. Since Letter Authorizations are given on a one-time only, site-by-site basis and cost $500, they will not serve as a workable roadwaste management solution except in rare situations.

Some roadwaste may be appropriate for use as alternate daily cover at landfills. DEQ has stated its willingness to approve roadwaste as alternate daily cover, but most landfills have sufficient sources for daily cover already, and some are charging at or near regular rates for this material anyway. Still, this is an important option that could offer substantial cost savings over other forms of management in the right situation. (See **Disposal Options** in **Chapter 13** for more information on *Use as Daily Cover*.)

Local solid waste regulations (as well as the DEQ rules) may also apply to your roadwaste. In the Portland area, Metro is the public agency in charge of waste management. Metro is considering reducing fees for placing roadwaste in the Hillsboro Landfill (the largest in the Portland local area) to encourage proper management of roadwaste material. Metro is also considering further rules to regulate mismanagement of local roadwaste (by both public and private parties). This could result in more expensive management costs for the roadwaste that is not conservatively managed and sent to the local landfill.

Greenwaste is a separate category of solid waste and is best managed by composting (although some greenwaste may be burned in rural counties and under emergency conditions – see **Section 3.5 AIR QUALITY RULES**, below). Composting regulations were adopted in 1999 to address odor and runoff issues, and to set standards to prevent fires – all issues that have haunted composting sites, which often operate on a shoestring budget. Metro, Clackamas County, and DEQ are all currently implementing requirements for composting facilities. Site-specific composting permits are now required for any operation over 25 tons per year, which means composting on any significant scale. Metro and DEQ permitting requirements are carbon copies. Clackamas County has additional siting requirements. These permits assist composters by setting forth clear facility and operation requirements. While these permits will add cost to composting operations, the technical assistance that is provided by regulators should be well worth the fees.

Solid waste management requirements were originally developed to prevent the spread of disease from human contact, vector issues (flies, birds, rats, etc., in contact with garbage and spreading disease), and impact to surface water. Only later did solid waste efforts take on the role of preventing impacts to groundwater to preserve drinking water sources.

As you can see from this discussion, a key aspect to the whole roadwaste problem is that regulations are applied or drafted after sufficient concerns have been raised. Now that roadwaste management is coming under greater scrutiny, it is important that ODOT act promptly to help set a workable standard for these materials in Oregon.

3.4 WATER QUALITY RULES

Substances beyond those listed in the cleanup regulations can impact groundwater and surface water. Nutrients, organic matter, trace metals, suspended clays – all of which can be beneficial on land – often present serious threats to aquatic life. Microorganisms breaking down an overload of natural organic matter (e.g., leaves, brush clippings, food waste, etc.) can use up the dissolved oxygen; then all the fish and oxygen-breathing aquatic life dies. Oil sheens can prevent oxygen from dissolving into surface water, creating another cause of fish kills. Fish are extremely susceptible to dissolved metals, herbicides and pesticides. The presence of bacteria is another concern, presenting a threat in the aquatic environment, and warranting the use of gloves and good hygiene practices by maintenance workers. Some risks to the aquatic environment are associated with the physical characteristics of roadwaste, such as the presence of fine clay and silt particles that can easily be suspended in water.

For these reasons storing your material or placing it where it will <u>not</u> migrate is important. If you are using roadwaste for highway shoulder repair (even if it is low risk/clean fill), the fact that it could be carried by surface water runoff to ditches and streams is a real concern. Proper storage techniques will be discussed further in **Chapter 11, *Storage Considerations*.**

DEQ Water Quality Rules limit the discharge of any water that might be associated with your roadwaste. This includes both the stormwater runoff coming from your stored roadwaste piles and the stormwater that you collect with your vactor truck when you clean out storm drains and catch basins. National Pollutant Discharge Elimination System (NPDES) rules require that stormwater runoff from roadwaste piles should be managed through Best Management Practices (BMPs) to reduce pollutant loads. This means that erosion control measures must be put in place when storing roadwaste piles, and roadwaste should only be placed where it will not negatively impact the quality of surface waters.

Industrial wastewater discharge rules limit water discharges from vactor trucks and prohibit discharging contaminated vactor decant back into the storm drain system from which it was collected. Field discharge of vactor water is discussed as a management method below. Because vactor water is defined as process wastewater, it is likely that DEQ WPCF infiltration permits will be required for any vactor management methods that involve field decanting (unless it can be shown these liquids are not contaminated with sediment and other pollutants).

Even discharging vactor liquids to sanitary systems will require some level of compliance with wastewater regulators. Sewage treatment plants have sanitary sewer pretreatment standards that limit the amount of toxic pollutants allowed to be discharged to their systems. Metals, total suspended solids (TSS), biological oxygen demand (BOD), and acidity/alkalinity (pH) are a few examples of highway stormwater pollutant parameters that sewage treatment facility operators may wish to limit through permit regulations.

Infiltrating low-risk vactor liquids into the ground is also discussed in a future chapter as a management method. Again, it is likely that appropriate permits will need to be obtained for treatment of this “gray” water. Contamination of groundwater is a concern and, as already pointed out, there are established pollutant limits that may restrict infiltration activities.

3.5 AIR QUALITY RULES

Air quality regulations only marginally impact roadwaste management. In some areas of the state, open burning of waste is allowed. Statewide prohibitions exist for burning trash, petroleum-contaminated materials, and wet garbage. Waste disposal fires that release dense, black smoke are also prohibited. Open burning is prohibited in and around most population centers, and it is often prohibited due to air conditions and fire risk. Contact DEQ Open Burning Specialists, local fire departments and the State Fire Marshall's Office for more information. DEQ regulates wind-blown debris. Dust control is a major issue east of the Cascades, and contaminants carried away on windblown dust can present a risk of contamination. Thermal treatment of petroleum contaminated soil (PCS) and incineration are activities requiring a DEQ Air Contaminant Discharge Permit. Commercial PCS thermal remediators are listed in **Appendix D**.

3.6 OTHER PERTINENT REGULATIONS

This chapter has focused on DEQ and federal EPA environmental regulations to assess risks to the public and the environment from management of roadwaste materials. Other regulations do impact roadwaste management. The Occupational Safety and Health Administration (OSHA) regulates worker safety, and of course there are worker safety issues related to contaminants, sharps hazards, infectious wastes, and general equipment use. ODOT's existing worker safety program should address these concerns, with equipment training and personal protective equipment training. The management methods recommended later in this report include use of flocculent to reduce suspended particles. Some flocculents are easily airborne and use of a dust mask is recommended during addition of dry flocculent to a load. Additional information on worker safety and roadwaste can be found in Snohomish County's vactor waste acceptance procedures (see **Appendix E**). The Phase 2 report, **ODOT Roadwaste Field Trials**, includes worker safety procedures developed by the City of Portland's vactor program. As mentioned above, the National Marine Fisheries Service, the Army Corps of Engineers and local agencies can and do also regulate fill sites and releases impacting wetlands. The general discussion in this chapter should sufficiently familiarize you with the requirements to be able to select the most efficient option to address the risks presented by each type of roadwaste you manage.

4.0 AN OVERVIEW OF ROADWASTE MANAGEMENT

In **Chapter 2** you read about typical roadwastes and their associated risks. You learned how to use the **District Roadwaste Assessment Worksheet** to assess your District's roadwastes in terms of type, source, toxicity, and trash content, and to track the volume of each waste you collect. You learned that identifying meaningful sub-categories should allow for more efficient management. In **Chapter 3** you were briefed on the regulations that apply to managing roadwastes and their associated risks. This chapter introduces another tool, the **Roadwaste Management Flowchart**. The flowchart provides a ready means for understanding roadwaste management "from cradle to grave."

4.1 HOW TO USE THE ROADWASTE MANAGEMENT FLOWCHART

The **Roadwaste Management Flowchart** (Figure 4.1) is an operational workflow diagram. It lays out the kinds of work practices required to manage specific risks *as you encounter them in the process of actually handling roadwaste.* Starting at the top with a specific roadwaste in mind, the questions will lead you through the boxes to the operational concerns specific to managing that particular waste. Each label with a number and ***bold italics*** corresponds to a later chapter detailing <u>waste management options</u> to address that specific operational need. The goal is to provide your District with a specific, step-by-step method to manage these risks.

The various waste management options are presented starting with **Chapter 7**. These chapters begin with a general discussion of the concern being addressed (e.g. storage considerations in **Chapter 11**). Following the general discussion, recommended techniques are detailed in one-page descriptions, each concluding with a summary of risk and regulatory requirements. The overview of each waste management option covers situations statewide. Each option discusses the hurdles you need to clear for its use in the field. Working a given waste management option into daily maintenance procedures is left up to individual Districts. Conservative options are presented for managing risks associated with contaminated and problem wastes. Less costly and equally protective options are provided for cleaner materials. While the most significant options are listed in each box in Figure 4.1, more ideas can be found in each chapter.

The flowchart begins by asking if the waste in question is a "hot" or suspect load. ODOT Maintenance crews encounter some strange situations. On very rare occasions they may encounter something that needs to be drummed off as a hazardous waste or otherwise managed outside normal procedures. Mixing a suspect load with normal roadwaste is a bad idea in any case. **Chapter 6** walks you through practices for ***Identifying and Managing Hot Loads***. **Chapter 5, *Establishing District-Level Baseline Waste Characterizations***, gets to the heart of the matter: knowing what you have is essential to achieving protective *and efficient* management. **Chapter 7, *Sorting and Collecting***, emphasizes the principle that keeping different wastes separate will promote efficient management. It also discusses several improved collection methods that might be effective in your District, including immediate and protective reuse of uncontaminated wet roadwaste materials.

The center of the flowchart walks you down through wet load and water management. **Chapter 8** discusses ***Field Decanting*** options for protectively managing wastewater collected with roadwaste while in the field. **Chapter 9** discusses the thorny problem of ***Dewatering Solids***. **Chapter 10** discusses ***Wastewater Management*** and water reuse options.

Managing roadwaste solids picks up on the right side of the flowchart. **Chapter 11, *Storage Considerations***, addresses the real problems encountered in storing roadwaste at ODOT yards and other properties. ***Ready Reuse Options***, **Chapter 12**, details simple methods for reusing clean materials. **Chapter 13, *Final Disposition of Roadwaste Solids***, details many reuse, treatment, and disposal options.

The goal is to help you identify options that most efficiently address all the different risks and problems incumbent with managing the variety of roadwastes your District collects. Concentrating your efforts on a short list of options from each box of the flowchart can help you develop a short list of procedures covering most of the situations you encounter in your District, leaving you in better shape to implement a plan for managing roadwaste in your District.

4.2 NOTES ON NEW TECHNIQUES

Some of the specific, one-page waste management options presented are not currently used to manage roadwaste. Some methods were tested in field trials, some saw bench-scale tests, and some are just supported by a thorough understanding of how this material works. The new techniques are presented because they offer the hope of significant cost savings over waste management techniques currently used, while also achieving compliance with rules and appropriately managing short- and long-term risk. ODOT Districts that invest effort into trying new techniques can help the agency build its knowledge base and benefit by the experience.

You may have a solution that this guide does not cover that works better in your District. Innovation and partnership with other agencies can lead to more efficient management. The principles discussed under the different options provide good information that will help you determine whether the idea you have in mind is efficient and protective for that waste. Agreements with companies that can use roadwaste as feedstock in their production can yield significant cost savings. Such agreements are usually best pursued on the local level, since manufacturer specifications vary and transportation costs can be significant. In any case, the authors hope that new information will be shared between Regions and that much more efficient and streamlined management procedures will be achieved over time.

Roadwaste Management Flowchart

(You collected it, now what do you do with it?)

6. Identifying and Managing Hot Loads (Pg. 37)
Is this a hot or suspect load?
Yes No

- Segregate the waste.
- Prevent exposure - water, air, soil.
- Store in closed containers.
- Run appropriate lab tests.
- ◆ Identification, Storage and Management

Is it hazardous waste?
Yes No

If "Yes" - Do Not Manage as Roadwaste! Contact HAZMAT Team!

If "No" - Write up profile.
If waste tests within normal baseline parameters, it's no longer hot or suspect. If outside normal, select a conservative waste management method.

5. Establish Baseline Roadwaste Characteristics (Pg. 29)
- Lab Methods
- Evaluating the Analysis

Does your District have a baseline waste characterization for this material?
Yes No

See **Appendix B** for ***Conservative Roadwaste Management Practices*** (sanitary sewer & landfill)

7. Sorting & Collection (Pg. 45)
Separate roadwaste by:
- Contaminant level
- Particle size
- Trash content
- Organic matter content
- Water content
- ◆ Ready Reuse: Wet vactor sludge

Does it need dewatering?
Yes No

12. Ready Reuse Options (Pg. 93)
- Waste segregation and sorting increases chances for reuse.
- Screen to size and for trash.
- Less fines = Less contaminants.
- Dispose of trash at the landfill.

- ◆ Reuse of Clean Fill
- ◆ Rock and Gravel Reuse
- ◆ Winter Road Sand Reuse

8. Field Decanting Options (Pg. 51)
- Do not dispose into storm drain.
- ◆ High-flow Sewers
- ◆ Fixed Decant Station
- ◆ Mobile Decant Station
- ◆ Flocculent Use
- ◆ Tank Dewatering
- ◆ Rural Area Infiltration

11. Storage Considerations (Pg. 89)
Stockpiled Wastes

Visibility, access, security, cross-contamination, controlling runoff, preventing site contamination.

9. Dewatering Solids (Pg. 71)
- ◆ Pad Dewatering
- ◆ Filter Box Dewatering
- ◆ Pond Dewatering
- ◆ Wet Treatment Technologies: flocculent improves dewatering performance.

Water Solids

10. Wastewater Management (Pg. 81)
- Sanitary Sewer Use
- Meeting Pretreatment Requirements
- ◆ Water Reuse Options
- ◆ Evaporation Ponds for Stormwater (possible in Eastern Oregon)

13. Final Disposition Options (Pg. 101)

Reuse Options
- ◆ Rockfall and Noise Berm
- ◆ Top Dressing/Soil Amendment for Roadway Median/Infield & Agriculture
- ◆ Poor Grade Fill
- ◆ Cement & Asphalt Production

Treatment Options
- ◆ Composting
- ◆ Thermal Treatment
- ◆ Passive Bioremediation
- ◆ Active Bioremediation
- ◆ Phytoremediation: Cover Crops
- ◆ Soil Washing

Disposal Options
- ◆ Municipal Landfill (Reuse as Daily Cover)
- ◆ Siting Roadwaste Landfills
- ◆ Assessing Old Stockpile/Disposal Sites

Flowchart Notes

Bold, Italics, and Color indicate the chapters that follow. Diamonds (◆) indicate major roadwaste management options discussed in that chapter.

The key for roadwaste management is to choose management methods that are both protective and efficient for each type of waste your district collects. Characterizing your district's roadwaste types and sub-categories will promote more efficient and protective management. This report presents options applicable to a wide variety of materials and contaminant levels.

Construction site materials and slide debris may be managed as clean fill unless the material is known or suspected to be contaminated or substantial organic matter is present.

Figure 4.1: Roadwaste Management Flowchart

5.0 ESTABLISHING BASELINE ROADWASTE CHARACTERIZATIONS

The reuse methods recommended in this guide rely on adequate waste characterizations. Using the **District Roadwaste Assessment Worksheet** and running the right laboratory tests will help you develop and establish meaningful characterizations for your District's roadwaste categories. Baseline contaminant levels should be established for each waste that is not disposed at a permitted landfill. Exceptions are clean, reusable materials not contaminated with trash, including gravel, rock, winter road sand, and clean fill materials from construction projects and slides. In addition, clean organic matter may be composted without testing. Testing can help you establish that the reuse of roadwaste is legitimate and protective.

5.1 WHAT TO TEST FOR

As discussed in Section 3.2 **CLEANUP PROGRAM RULES**, contaminants of concern in roadwaste solids are surprisingly consistent. Testing should focus on the seven carcinogenic polyaromatic hydrocarbons (CPAHs) and heavy metals.

The seven carcinogenic PAHs are part of the usual total semi-volatile scan available from most labs. You will need a detection limit down to 0.01 ppm to evaluate risk against accepted cleanup thresholds. You can use the normal range of volatiles and semi-volatiles scans to help evaluate potentially hot loads.

Total petroleum hydrocarbons (TPH) test results do not give you information sufficient to assess risk. Matrix interference from natural organic matter in most roadwaste skews TPH results, since the test simply counts all hydrogen-carbon bonds, not just those in the heavy oils and diesel fractions you are trying to detect. The TPH test is thus a blunt screening tool for roadwaste, most appropriate for examining impacts from petroleum spills. The authors recommend its use in roadwaste testing only as a gross characterization tool.

As a general rule, higher TPH numbers for heavy oil and diesel fractions mean higher concentrations of PAHs, also. Roadwaste exceeding 1,000 ppm for TPH should not be managed as low-risk material. Simple aeration has reduced roadwaste TPH levels dramatically in tests conducted by Washington State University (See **Roadwaste: Issues and Options**). Using proper storage techniques, allowing the TPH to "cook out" before reusing it is a simple **Treatment Option** examined in **Chapter 12**.

5.1.1 Leachate Tests

The Toxic Characteristic Leachate Procedure (TCLP) test is required for hazardous waste determinations. Normal roadwaste has not tested as hazardous waste, so leachable metals data is mainly useful when examining leachate concentrations to help determine whether reuse is protective. The total metals test mentioned above is less expensive and should provide data sufficient to make determinations for roadwaste reuse, handling and disposal. TCLP tests conditions mimic the acidic environment of a landfill. The Synthetic Precipitation Leaching Test (SPLT; EPA Method 1312) is more appropriate for assessing risk when material is planned for placement into the environment rather than into a landfill. Table 1 of DEQ's SoClean Rules lists safe leachate levels. These numbers are used to assess risk when concentration levels for constituents of concern exceed total allowable levels.

5.1.2 A Note On PCBs

While PCBs are more commonly an issue in cities than along rural highways, PCB oils from a blown transformer can impact sweepings or be carried into a catch basin. Oregon DEQ uses a variety of sources for establishing PCB cleanup levels (Table 4.1).

Table 4.1: PCB Cleanup Levels (values are given in mg/Kg [equivalent to ppm])

	SoClean Industrial Cleanup Level	SoClean Residential Cleanup Level	EPA Region IX Industrial Cleanup Standard (PRG)	EPA Region IX Residential Cleanup Standard (PRG)
PCBs	0.7	0.08	1.3	0.2

PCBs are normal constituents in the semi-volatile scans recommended above, often noted as "aroclors." While PCBs are a class of chemicals with a varying levels of toxicity, they are examined generically to ease assessment of risk. Initial baseline testing should include PCBs as part of the standard semi-volatile scan. Any roadwaste suspected to be impacted by a release of PCBs should also be tested. Numbers vary, but the EPA Region IX numbers are viewed as protective. The DEQ "SoClean" numbers were published first; they are now viewed as overly conservative. Other numbers allowing higher levels of PCB contamination are available, but these require complicated, site-by-site risk assessments that would cost too much for managing roadwaste at different locations.

5.1.3 Other Contaminants of Concern

Residues from the release of petroleum, solvents and paint wastes (including benzene, toluene, xylenes, chlorinated compounds, acetone, methyl ethyl ketone and other chemicals) have also been found in roadwaste. The standard semi-volatile scan should pick up most of these constituents. Lab results may be compared to the allowable levels in the DEQ's *Soil Cleanup Manual*. (The "Soil Cleanup" reference tables are reprinted in **Appendix F**.) Most often, the presence of these compounds has been traced back to a spill event, an inappropriate industrial or commercial discharge, or from cross-contamination of roadwaste with non-roadwaste hazardous wastes.

5.1.4 Testing Wastewater

Much data has been collected on stormwater contaminants. Following the recommendations in **Chapter 11, *Storage Considerations***, and following sound reuse options which employ these principles should protect stormwater runoff from contaminants. Research shows that metals and petroleum compounds in vactor liquids are almost all fixed to suspended solids. Discharge of wastewater to the storm sewer system is not likely to be allowed without further development of new methods that will more efficiently remove contaminated suspended solids. Even with that, substantial additional analysis for pollutants is likely to be required. Figure 5.1 shows a decant sample being taken from an eductor truck.

Figure 5.1: Water sample taken from eductor truck.
Photo by Katie Bretsch, 2000.

Total lead (Pb) values are the big driver for sanitary sewer discharge. In most sewer districts, total lead concentrations in significant industrial discharges is limited to 1.5 ppm. This numerical standard applies to total discharges of over 25,000 gallons per month to a sanitary sewer system from a source, and may be enforced, even on lower discharges, at the discretion of the sewerage authority. Settling, flocculation or filtering can separate the liquid and solid fractions. Low levels of dissolved metals remain after settling of solids, mainly due to the fine clays that will not settle out of suspension. Twenty-four hour settling has been accepted by some sewerage agencies as a Best Management Practice meeting sanitary sewer pretreatment requirements. The authors recommend adoption of field decanting practices that protect sanitary sewers from excess solids and lead. With such practices in place, you should be able to negotiate the elimination of required ongoing laboratory tests.

5.2 ESTABLISHING BASELINE WASTE CHARACTERIZATIONS

To establish characteristic pollutant baseline levels for roadwastes, test for what you know you are likely to find. For baselines, you should test for semi-volatiles using a “lower detection limit” of 0.01 ppm to capture information necessary to evaluate the main source of risk: the seven carcinogenic polyaromatic hydrocarbons (CPAHs). Total metals testing should be run for lead, arsenic, cadmium, and chromium with a lower detection limit of 1.0 ppm.

5.2.1 How to Capture Complete Sample Data

It is likely that some laboratory testing will be required to establish District-level baselines for the different types of roadwaste you collect. It will be important to capture what you are analyzing! The **Roadwaste Field Sample Tracking Form** (Figure 5.1) is provided to help you track all pertinent information. This information will also be useful for statewide waste characterizations and studies of waste from high- and low-traffic roads. Copies of completed Field Sample Tracking Forms should be kept on file with your Region HAZMAT Coordinator, who can make that information available for analysis to support roadwaste characterization by ODOT statewide.

5.2.2 How Many Tests are Required

Testing goes hand-in-hand with waste management methods. Where wide variation in test results exist, that fall outside of protective reuse levels, further laboratory tests will be required to establish baselines for use. Of course, risk assessment is a complicated process. You want to know whether risks posed by the contaminants in a particular roadwaste are protectively managed under the method you have selected. If some test results on the type of waste under consideration fall outside of what you can conservatively assess as being protective, you can choose a more conservative management method. Or you can run more tests to be sure that you can safely manage the waste in question under the selected method. It may also be easier overall management to use the data to establish sub-categories.

5.2.3 Managing the High Cost of Laboratory Tests

Having thoroughly researched the issue, you will know the contaminants of concern. Others probably will not. Some will even think that normal roadwaste could be “hazardous waste.” You may find waste management companies and regulators all over the map on what they want you to test for. If you are not careful, costs for testing can exceed costs for treatment or disposal.

Establishing a sound baseline waste characterization frees you from ongoing tests, except for the rare suspect load or to create waste sub-categories to allow for more efficient waste management. Ongoing testing should be very limited. When sanitary sewer pretreatment cannot be held to a standard addressed solely by BMPs, ongoing water tests may be required. When testing is required by DEQ for thermal treatment, negotiation with the treater and DEQ permit writers may provide an alternative to expensive tests for known quantities.

Using ODOT's Materials Lab in Salem for these analyses makes good sense. Collection and transport can present significant costs, however. If your own staff is able to store and transport samples, this can reduce costs significantly. Litmus paper can be used to assess the pH level in the field to determine the corrosivity of a suspect load. In any case, working with your Region HAZMAT Coordinator may help reduce the costs associated with testing. One way to reduce costs is to run a lot of the same tests at the same time. If you contract out your lab work, other Districts may be interested in using the same lab.

5.2.4 Your District's Waste Sub-Categories

Testing may reveal additional sub-categories. For example, a rural highway that you find generates virtually clean sweepings may prompt you to examine wastes from similar roads. These clean sweepings could be managed separately from waste you collect in more heavily populated areas. Contaminant levels may vary. Waste from each applicable sub-category should be tested several times to establish a baseline contaminant level, helping you decide on the best overall management method for that material. Unless you collect very little roadwaste and take it all to a permitted landfill, you should find that laboratory testing pays over adopting more conservative options for your District's roadwaste.

5.2.5 Roadway Stormwater Sediment and Spill Detention Ponds

Roadway sediment ponds are becoming more commonplace. These ponds detain roadway runoff, dropping out contaminated fines. These ponds can also contain spills. The volume of sediment pond cleanout waste is expected to increase dramatically for ODOT over time. Limited contaminant data on ODOT's Interstate 84 sediment cleanout shows levels similar to catch basin and sump waste, in very similar material. The greater likelihood of impacts from spills means that testing should include a wider variety of chemical constituents for every load until better information can be gathered statewide. The same tests used to establish a baseline – volatiles and semi-volatiles, and heavy metals – should be run on each pond cleanout event.

5.2.6 Roadwaste Contaminant Levels in Urban vs. Rural Areas

Besides lower volumes, the main difference expected in low-ADT (Average Daily Traffic) rural areas is low toxicity and trash levels in waste. The few test results of ODOT roadwaste outside urban areas show lower contaminant levels, but little else can be stated at this point. By running laboratory tests and assessing your wastes against cleanup standards, you can properly evaluate which management option is appropriate. You can expect that low-ADT roads will produce cleaner materials. Having more information statewide on high- and low-ADT roads will help ODOT staff working with Districts on development of roadwaste management plans.

Roadwaste Field Sample Tracking Form

Sample Number: Date Sampled:

Material type: ___ Sweepings
___ Vactor Waste
___ Stockpile (Approx. date first collected: ______________)
___ Soil surface below old stockpile site
___ Other: ___________________________________

Describe the material:

Was this a Potentially Hot Load sample? ___ Yes ___ No
Observations:

Date roadwaste was first collected: _____________________
Location Collected: __________________________________ ADT: ____________________

Road Surface Type: ___Asphalt ___Concrete ___Mixed ___Other: ______________________
Land Use: ___Rural ___Farm ___Urban ___Industrial ___Other: _______________________

If this sample was collected from sweepings or vactor waste, when was the area last previously cleaned?

Test Parameters/Results:

Total CPAHs: _____________
Total TPH (Dx w/Acid cleanup): __________
Total Lead: _____________
Total Arsenic: _____________
Total Cadmium: _____________

Liquid Analysis:

Dissolved Lead: _____________
TSS: _____________

Additional Parameters/Results:

TCLP Metals: ___________________
pH: ___________________

Other: ________________________________

Other: ________________________________

Other: ________________________________

Other: ________________________________

PLEASE RETAIN A COPY OF THIS COMPLETED FORM FOR THE DISTRICT'S RECORDS

Figure 5.2: Roadwaste Sample Tracking Form

6.0 IDENTIFYING AND MANAGING HOT LOADS

It is important to identify potentially hot loads before collection. Minimizing toxic waste exposure hazards to your crews and managing hazardous waste in accordance with DEQ requirements are important issues. You must have workers trained to address the hazards they are likely to encounter and have procedures in place that insure you can meet “cradle to grave” responsibility for the hazardous waste you will encounter. It is also important to note that only very rarely will potentially hot loads actually prove to be hazardous waste. The major issue is screening out unusual wastes and preventing them from contaminating the roadwaste you normally collect. After carefully establishing baselines for your District roadwastes and selecting management methods that address the risks from these materials, you want a procedure that will protect you from the unexpected and not throw your plans for a loop.

Gross measurements such as odor, color and consistency are important identifiers in the field. Simple field tests such as pH can provide valuable information to trained staff. The waste acceptance procedure developed at Snohomish County’s Vactor Waste facility provides good information on waste screening applicable in the field. (A copy of this procedure is included in **Appendix E**.)

Identifying and segregating potentially hot loads requires training and experience. Hazards must be managed correctly, but you cannot afford to test every load. Initial procedures should reflect the knowledge of field crews and the availability of hazardous materials coordinators, test equipment, and reference materials. For instance, some CALTRANS (California Department of Transportation) districts sweep around areas of known spills or oily discoloration, returning with a trained staff and a truck designated to pick up these potentially problem wastes for separate management. Field procedures for waste screening and collection should undergo further development as more information on initial field indicators and sampling results are captured as part of the record. Field observations should be recorded on the **Roadwaste Field Sample Tracking Form.**

6.1 HOW TO CONDUCT A HAZARDOUS DETERMINATION

The first step in managing suspect waste is to determination whether it is a hazardous waste. All classes of generators except households face this basic requirement.[5] Conducting a hazardous waste determination follows a procedure.

First, you determine whether the waste is ignitable, corrosive, or reactive. The standard for ignitability is whether the material will fail a flash point test at or below 140° F. Wastes that smell strongly of solvents or gasoline are likely candidates to be ignitable waste. Most laboratories can run this standard analysis. The standards for corrosivity are simple pH tests for

[5] The Phase 1 report discusses some of the major requirements facing the three different hazardous waste generator categories.

acids and bases. Wastes testing below pH 2.0 or above pH 12.5 are corrosive hazardous wastes. Reactive wastes include rare DOT oxidizers and explosives.

Next, you determine whether the waste is "listed hazardous waste." Many spent solvents and commercial chemical products are listed wastes. Wastes contaminated from spills of pesticides, herbicides, rodenticides and fungicides are Oregon listed hazardous wastes. The question of listed wastes can be complicated, with F-listed, U-listed, and acutely toxic P-listed wastes. This is a good area to involve a waste management professional. Written guidance is available from DEQ on conducting hazardous waste determinations.[6]

6.1.1 Testing and Regulatory Thresholds

Most of the time you will not know what was spilled. With no Material Safety Data Sheet (MSDS) in front of you, testing may be necessary. Table 5.1 provides a list of selected hazardous waste toxic characteristics. Each characteristic toxic hazardous waste exceeds a concentration-based threshold under the Toxic Characteristic Leachate Procedure (TCLP) test method.

Table 5.1: Selected Toxic Hazardous Wastes (Values are mg/Kg [ppm])[7]

Hazardous Waste Code	"TCLP TOXIC Characteristics"	Regulatory Threshold
D004	Arsenic	5.0
D005	Barium	100.0
D006	Cadmium	1.0
D007	Chromium	5.0
D008	Lead	5.0
D009	Mercury	0.2
D010	Selenium	1.0
D011	Silver	5.0
D018	Benzene	0.5
D019	Carbon tetrachloride	0.5
D021	Chlorobenzene	100.0
D035	Methyl ethyl ketone ("MEK")	200.0
D037	Pentachlorophenol ("penta")	100.0
D039	Tetrachloroethylene ("perc")	0.7
D040	Trichloroethylene ("TCE")	0.5
D043	Vinyl chloride	0.2

Waste codes D004 through D011 are the heavy metals. D012 through D017 are specific banned pesticides rarely encountered and not included on the chart. Carbon-based chemicals, largely solvents, make up the rest of the total 38 toxic characteristics. The threshold for benzene is very low. Historically, roadwaste has not tested above this threshold except for loads directly impacted by gasoline spills. TCE and perc (also seen under their alternate chemical names "trichloroethylene" and "tetrachloroethylene") were included on the chart because they are still used by many shops as a constituent in parts cleaning solution or rattle can solvents. Perc is also used by most dry cleaners. MEK is a solvent used commonly in paints and paint cleanup. "Penta" is a common preservative from the wood products industry. As you can see, industry

[6] The best reference on hazardous waste determinations is DEQ's *Small Quantity Generator Handbook*.
[7] mg/Kg and ppm values are discussed in **Chapter 1** under ***CLEANUP RULES***.

nicknames for chemicals can add to the confusion, and different scientific names are often used for the same chemical. Care and knowledge is often required to ferret out which chemicals are which.

Under the "TCLP" test method, a representative sample of a solid is placed in a 20:1 acid bath and the leachate is tested for total concentration. This 20 to 1 dilution means that total metals can often get you enough information to conduct a hazardous waste determination. As an example, if a solid sample contained 90 ppm lead, it could only leach out 90/20 or 4.5 ppm TCLP lead. Since the TCLP is a leachate test to determine what will leach out of waste in the acid environment of a municipal solid waste landfill, TCLP values apply to solids only. The thresholds apply as totals for liquids. Liquid wastes are filtered and analyzed using totals, not benefiting from the dilution factor that applies to solids.

Basically, when stuff looks bad and smells bad, it probably is bad. Quarantine the waste. Keep it sealed in a sound container. Unless you know what you have, label the container "materials to be tested" and send samples to the lab.

6.2 MANAGING SUSPECT LOADS

Until you know more, suspect loads should be managed as potentially hazardous waste.

1. Do not mix potentially "hot" loads with other wastes. And if vactoring, use as little water as possible to adequately clean out the material since it all must be managed separately from mainstream roadwaste. Special equipment might be used; if not, then special procedures should be used to decontaminate equipment and to manage decontamination wastes as potentially hazardous. Washing out vactor trucks or other equipment directly to the sanitary sewer may avoid generation of more potentially hazardous waste. In some circumstances, contracting waste pick-up to a qualified hazardous waste contractor could be a good idea.

2. Immediately manage the waste in sealed containers, separate from other wastes, out of the weather. Place containers in an area that is often inspected, on an impermeable surface allowing adequate aisle space to check containers for leaks. Only workers having the proper training and exercising appropriate caution should manage these wastes.

3. Immediately label the containers as waste awaiting sample results to complete the hazardous waste determination; record the date the waste was first picked up (generated) on the containers and the date that a sample was submitted for analysis.

4. Conduct a hazardous waste determination. Send samples promptly to a laboratory for analysis. Testing can include "TCLP" metals, volatiles and semi-volatiles, pH, flash point, or specific other tests as events direct. In some cases, spillers or industrial dischargers can be identified; or sometimes the odd odors or colors are found to be the result of natural organisms (e.g., iron bacteria leaving an orange slime). In these cases the waste can be characterized without laboratory testing.

5. Strict rules apply to hazardous waste management, and knowledge of the hazardous waste regulations is required to manage it correctly. ODOT HAZMAT Coordinators can assist you

with obtaining DEQ hazardous waste ID numbers, labeling, arranging for shipping, filling out hazardous waste manifests and Land Disposal Restriction forms, filing annual reports, drawing up contingency plans, etc.

6. If a load of roadwaste tests as hazardous waste and the contamination is clearly the result of illegal dumping, a DEQ relief form should be filed.[8] While ODOT is required to accept responsibility for all waste on its properties (unless the offending party is clearly identified and agrees to manage it correctly), filing an exception report can be important. More stringent requirements and fees apply to generators exceeding 100 kg of hazardous waste in any one-month period – well under one 55-gallon drum. ODOT can legitimately seek relief from many of these requirements.

Different timetables apply to different levels of waste generation: 90-day storage is allowed for Large Quantity Generators (>2,200 lbs. of waste in any calendar month); 180-day storage is allowed for Small Quantity Generators (>220 lbs. in a month). Waste collected on roads may also trigger additional requirements for other hazardous wastes that an ODOT Maintenance Yard could be generating. The regulations are aimed at getting suspect loads characterized and evaluating facility-wide compliance as soon as possible.

Manage the waste as appropriate. If analysis shows that contaminant levels are consistent with normal roadwastes, the waste can be managed with normal roadwaste as desired. If elevated levels of heavy metals or other contaminants are present but do not trigger hazardous waste levels, an assessment should be made whether to manage the waste apart from normal roadwaste. In any case, the method selected must be protective of human health and the environment. *Further specific requirements applicable to management of hazardous waste are beyond the scope of this research project.*

6.3 A NOTE REGARDING PCBs

Similar to the Resource Conservation and Recovery Act (RCRA) which established hazardous waste law, Toxic Substances Control Act (TSCA) regulations apply in cases where PCB oils from a blown transformer impact an area of sweepings or are carried into a catch basin. PCBs are more commonly an issue in cities than along rural highways. In Oregon, the U.S. Environmental Protection Agency (EPA) directly regulates PCBs. Allowable levels for PCBs and testing for PCBs and other contaminants is addressed in detail in **Chapter 5, *Establishing District-Level Baseline Waste Characterizations***.

6.4 ADDITIONAL RESOURCES

In the Portland area, Metro has a program offering free field screening and pickup of illegally dumped hazardous waste. The waste must be properly containerized. To meet its DEQ permitting requirements, Metro can only accept waste that could likely have been generated by a conditionally exempt generator. DEQ and Metro can help with this determination. DEQ can also

[8] DEQ's *Abandoned Hazardous Waste* fact sheet and exemption form are attached in the Regulatory Section of the Appendix in ODOT's Phase 1 roadwaste research report, *Roadwaste: Issues and Options*.

investigate to determine whether the generator can be identified. To contact the Metro Hazardous Waste Program, telephone Jim Quinn, Program Supervisor, at (503) 797-1662.

Hiring a hazardous waste contractor is an option especially valuable in managing hazardous waste through disposal, or in areas with little available support from ODOT HAZMAT staff. As with hiring a waste management service, DEQ will hold the generator (ODOT) responsible for proper identification and management of hazardous waste through permanent disposal.

DEQ offers free hazardous waste technical assistance from most local offices, or call toll free: 1-800-452-4011 for the main DEQ switchboard in Portland. You can get help over the phone, or you can request a visit to your shop, or find out about hazardous waste classes for yourself or your staff. In special circumstances, such as one-time spill events and wastes resulting from illegal dumping, DEQ has often granted formal exemptions from some of the major planning requirements in response to legitimate generator requests.

HOT LOAD MANAGEMENT IN BRIEF: Identification, Storage and Management

Discussion

Some waste collected along highways may be suspected of being hazardous waste and require special management in closed containers. Until a hazardous waste characterization is done, suspect waste should be handled as hazardous waste. Proper training and protection is essential when dealing with hazardous or potentially hazardous materials. ***If you suspect a collected roadwaste material to be hazardous, contact your Region HAZMAT coordinator who can assist with the following procedures.***

Identification

- **Crews in the field should be trained to identify potentially "hot" loads.**
  Snohomish County has adopted waste acceptance procedures for their shared vactor waste dewatering facility. These procedures, reprinted in the **Appendix E**, offer good guidance for practical field screening procedures, also.

Storage

- **Seal suspect waste in closed drums or tanks.**
  Secondary containment and/or interior storage are recommended.
- **Label sealed containers.**
  Mark your containers "Waste Awaiting Analysis" with the collection date.
- **Prevent further contamination.**
  Prevent contact with other materials, unpaved surfaces, or the open environment.
- **Store containers appropriately.**
  Containers should be out of the weather (rain, cold and direct sun), away from public access, but in an area where they can be inspected weekly. Proper aisle space eases inspection.

Management and Disposal

- **Identify hazardous materials present.**
  Your local HAZMAT coordinator or a private lab can test samples to analyze roadwaste for suspected hazardous materials and contaminant levels. If the source of suspected hazardous materials (e.g., spill residues) is known, lab work may be unnecessary. Label stored hazardous waste once it is identified.
- **Handle and dispose of hazardous material appropriately.**
  If your roadwaste is determined to be hazardous, its disposal should managed by your Region HAZMAT Coordinator. If the waste tests within normal parameters, it may be handled with similar roadwastes you already manage.

Contact your Region HAZMAT Coordinator for further information on hazardous waste determination and management. Record field observations and other pertinent data on your **Roadwaste Field Sample Tracking Form**. Forward lab results with the Tracking Form to Jeff Moore, ODOT Region 1, for use by ODOT statewide.

Ongoing Risk

Risk starts when a suspected hazardous load is not respected and is improperly managed.

7.0 SORTING AND COLLECTING

Developing an efficient roadwaste management program will require sorting of roadwaste materials. It is not efficient to manage or dispose of all roadwaste material in the same way. Contaminated vactor waste should be managed separately and disposed of differently than "clean" landslide debris. Highly contaminated sweepings collected from urban freeways may require disposal at a local landfill, while it may make sense to stockpile and reuse the "clean" sweepings that are collected from low-ADT roads. By sorting your roadwaste you will be able to reduce the amount of waste material you generate and manage and process it more efficiently.

7.1 SORTING PARAMETERS

There are any number of ways you can sort your roadwaste material to improve disposal efficiency. Keep in mind that waste management methods will ultimately decide how you will want to sort. If you plan on taking all your roadwaste material to the landfill, there is not much point in sorting. If you develop alternative uses or alternative disposal sites for your roadwaste, you will want to sort your waste by both its physical characteristics and the environmental risks associated with it. Separating greenwaste for compost and screening sanding material for reuse are examples of how sorting can reduce the amount of waste you produce and cut landfill disposal costs. Time and money spent on sorting will quickly pay for itself if the sorting results in significantly reducing the amount of roadwaste material that needs to go to a landfill.

Listed below are sorting parameters to consider:

- **Contaminant Level**

  With a minimum amount of pollutant characterization lab testing and field observation you will be able to estimate contaminant levels and toxic risks associated with your roadwaste before you collect it. You can collect and sort your material in the roadwaste management process for high, medium, and low environmental risk. If toxic pollutant risk is high for a roadwaste and you plan to send it to a landfill, there is no need for screening, stockpiling, or any other reuse processing methods. If it is known which highway locations produce high-risk toxic roadwaste, collection of roadwaste from these locations can be scheduled for the same time, and the waste can be processed and managed in the same way. Keep in mind that there is a risk of cross-contamination with your roadwaste. If you mix "clean" landslide debris with high-risk sweepings, your landslide debris will no longer be considered "clean." DEQ regulations address mixing clean materials with dirty ones to dilute contaminant levels.

- **Particle Size**

  As stated earlier, particle size will also affect pollutant levels. It may be possible for you to sort roadwaste materials by size. If you can sort coarse gravel or rock from contaminated fine sand, silt, or clay, it will save you in disposal costs. In almost all cases, coarse material will have a low toxic risk associated with it and will be considered clean fill. This is why cleaning used highway sanding material can be economical if coarser sands can be recovered through an efficient cleaning process.

- **Trash Content**

  Trash is waste. Unless it is sorted for recycling, it must be landfilled. If you are collecting road sweepings, ditchings, and catchment clean out materials that are all high in trash content but medium to low in pollutants and toxic risk, it may be cost effective to treat all these wastes together as one waste. The various roadwastes can all be screened together to remove trash, and then, as long as toxic pollutant levels are low enough, they can be stored or placed for reuse. (See **Chapter 13*, Final Disposition of Roadwaste Solids***.)

- **Organic Content**

  Organic matter should be composted or disposed of appropriately. You may be able to sort roadwaste material into high and low organic content as you collect it. For example, if you separate landslide debris that contains trees and root wads from landslide debris that is just rock and soil, you will eliminate screening for half your material and save cost.

- **Water Content**

  Wet roadwaste is extremely difficult to manage. Wet slurries cannot be disposed of at a solid waste landfill. Dewatering fine silts and clays can be an extremely complicated and an expensive process. Water in wet roadwaste can be very difficult to contain. Also, when managing wet roadwaste it is extremely important to consider toxic risks. Managing toxins in a liquid slurry is considerably more difficult than managing the same toxins in dry material. Since extra care is needed to protect ground water and surface water from pollutants, it is important to manage wet roadwaste using different methods than those used for dry roadwaste. (See **Chapter 9*, Dewatering Solids*** and **Chapter 10*, Wastewater Management***.)

7.2 REDUCING WASTE MANAGEMENT COST

The parameters by which you sort your waste will depend on the specific roadwaste your highways generate and the waste management methods you have available in your local area. The intent of sorting is to either reduce the amount of waste material you must dispose of, or to eliminate steps in the waste management process. If your District generates large volumes of marginally contaminated roadwaste, it may be cost effective to increase steps in your management process to reduce waste volume (sorting, screening, stockpiling, etc.). If your District generates large volumes of high-risk roadwaste, you may be better off reducing your management steps and focusing on making your disposal process more efficient. You may be able to improve disposal efficiency by partnering with other waste generators to share hauling costs, incinerating rather than landfilling, or contracting out specific management tasks (such as dewatering your waste slurries).

7.3 COLLECTION METHODS

How you collect roadwaste material should be considered as part of your roadwaste sorting process. As stated above, you will be able to sort your waste materials more efficiently if you consider the environmental risks before you collect it. For example, you can expect waste collected from sumps on high-ADT highways in industrial land use areas to have high contaminant levels. This waste will likely be required to go to a landfill or an incinerator. Don't mix this "dirty" vactor waste with low-risk "clean" vactor waste (collected from catch basins in a rural area on a low-ADT road), unless you are planning on landfilling or incinerating all your vactor waste anyway. Consider how often you sweep or vactor and how that affects pollutant loads. Sumps cleaned once a year will likely contain less toxic pollutants than sumps cleaned once every 5 years. How often you clean your sumps can make the difference between managing high-risk waste and clean fill material. In this way collection methods can actually reduce the amount of waste you manage.

It is important to consider environmental risk throughout the roadwaste management and collection process. In some instances you may choose to avoid collection of certain roadwaste material entirely. Sweeping is a good example. Some agencies sweep around areas of known spills or oily discoloration, and return with a truck designated to pick up these potentially problem wastes for separate management. CALTRANS Districts track their highway spills and manage sweepings from spill locations separately. By collecting high-risk sweepings as a separate waste stream, cross-contamination is avoided and special management costs are kept to a minimum.

In contrast, sweeping collection might be avoided for completely opposite reasons. Road sweeping is sometimes required on highways where there is little or no litter, ADT is low and pollutant contaminants are of little concern. Under these conditions sweepings generated could be considered clean fill. Along roadsides without ditches or threat of transport to surface water, you may choose to sidecast your sweepings and reduce the total amount of roadwaste material you collect and manage. Even with clean fill, keep in mind that containment, erosion, and sediment loads are environmental risk factors. (This manual addresses storage and containment issues in **Chapter 11**.) Your Region Environmentalist or Hazardous Material coordinator can offer assistance in assessing environmental risks and issues associated with how you collect or manage your roadwaste. ODOT manuals on erosion control and maintenance BMPs to protect water quality may also be helpful.

7.4 READY REUSE

Sorting clean material from waste is one of the most efficient ways to reduce waste management disposal costs. If material is clean, the only concern is finding an appropriate location to place or store it. As many ODOT Districts already know, finding an appropriate spot to place large volumes of material can be extremely difficult. ODOT Region 2 has recently completed a "Disposal Site Study" that attempts to identify appropriate locations for the storage or disposal of roadwaste debris. Whether your material is clean or dirty you will have to place it in a location where it will not have negative environmental impacts and it will not incur high management costs.

As you collect your roadwaste, consider how it will be stored, treated, or permanently placed. This will have a bearing on everything from identifying appropriate storage areas to determining how you will choose to transport the material you collect. Your most efficient management methods will separate clean materials from waste (sometimes even before you collect them) and then place materials in a final location, while moving and treating them with as few steps as possible. Through sorting and collecting techniques alone you may be able to create efficient ready reuse options for much of your District's roadwaste.

READY REUSE OPTION: Reuse of Uncontaminated Vactor Sludge and Water

Discussion

Vactor waste consistently tests higher in contaminant levels than any other roadwaste. There are some instances, however, when vactor waste has low or no pollutant contamination. This occurs when vactor trucks are used to clean bridge scuppers or drains that contain only very coarse rock or gravel. The amount of fine silts, sands, or soils in many drains can sometimes be non-existent. There may be a specific set of catch basins that are cleaned so often that there is no build up of contaminated dirt and silt. Vactor waste may be collected from low-ADT rural roads where there are no toxic pollutant contaminants present.

If you have characterized your vactor waste and you are comfortable that it is in fact "clean," you may be able to find an appropriate spot where this waste can be field decanted and disposed of as slurry. Some DOTs have identified dry freeway medians or bermed areas adjacent to highways appropriate for this purpose. If you have an area that is dry, that will contain the slurry, and that is appropriate to fill with vactor material, you may be able to negotiate with environmental regulators to use it for this purpose.

Issues to Consider

Containment and protection of surface and ground water will be your biggest concern with this disposal method. It is difficult to contain liquid slurry and keep it out of drainage ditches and off of low ground, where surface waters can carry it away. Ground water infiltration and contamination are also concerns if any pollutants are present. Finding an appropriate location for this type of disposal is difficult. In addition to human safety and environmental risks, equipment access also needs to be considered. Migration of materials off of ODOT property will be a concern, and a site large enough to accept more than one or two vactor loads of material will be needed. At a minimum, DEQ will have to be consulted to approve the disposal site, and a disposal permit may be required. Still, processing and disposing this waste can be very expensive, so it may be well worth the time and effort to develop or locate an appropriate location for field decanting and filling with this material.

Ongoing Risks

Pollutant contamination and migration of material will always be a risk with this disposal method. While it is rare, toxic pollutants can slip through a screening process and thus be placed immediately into an open environment. Liability for site contamination would be an issue.

Vactor slurries usually contain high quantities of suspended solids. Placing this material where these suspended fine soils and silts can be carried to surface waters can be harmful to watershed health and is not allowed under environmental regulations. Because liquid slurries are difficult to contain, migration and erosion of these fine soils could be an ongoing risk and concern.

8.0 FIELD DECANTING OPTIONS

8.1 INTRODUCTION

In days past, public works agencies cleaning out catch basins or sumps poured off the liquid fraction back into the stormwater system. This is no longer allowed. DEQ and other environmental regulators now view the water collected from storm drain clean-out as wastewater rather than stormwater. Any discharge of wastewater into the environment requires a location-specific permit. (NOTE: This discussion also applies to any water collected in sweepings, ditching spoils, etc.)

Many public works agencies haul storm drain clean-out wastewater back to their solids de-watering station. This has proven to be a burden to already busy crews, adding long hauling times on highways or through busy city streets. “Vac” trucks clean out only two or three drains before filling up. Frequent hauling of heavy vac truck loads filled mostly with water beats down roads unnecessarily and poses a traffic hazard. In addition, dumping excess water into the de-watering area extends de-watering times and mobilizes settled sediment.

Substantial savings can be achieved by decanting water in the field. Snohomish County (Washington) has observed a two-to-three times increase in vac truck and crew efficiency using advanced field decanting methods. Besides offering savings in road maintenance costs, increased ability to clean out storm drains should directly benefit the environment. Such a benefit is worth noting when discussing new techniques with environmental regulators.

This chapter examines the following options for field decanting:

- Field Decant to High Flow Sanitary Sewer Lines
- Siting Fixed Field Decant Stations
- Mobile Field Decant Options
- Flocculent Use in Field Decanting
- Decanting to Tanks
- Eductor Truck Retrofit for Decanting
- Rural Decant Options
- Water Reuse Options
- Alternatives for Further Investigation

Discharges into sanitary sewers requires local agency approval. Meeting sanitary sewer pretreatment standards, however, can present a hurdle. The federal pretreatment standard applies when effluent discharge exceeds 25,000 gallons per day.[9] Otherwise, Best Management Practices (BMPs) approved by the local sewerage agency can take the place of the pretreatment

[9] Telephone conversation with Chuck Hopkins, DEQ Pretreatment Coordinator, February 17, 2000.

standards. Twenty-four hour settling is a standard accepted by some sewerage agencies as a BMP. BMPs are preferable to avoid the cost of ongoing chemical analysis required to assess compliance with the fixed standard.

Sewerage agencies that clean sumps know field decanting leads to more sumps cleaned in a given time period. Some approve discharge to high-flow sewers, realizing a substantial net environmental benefit. One agency reports problems even with 24-hour settling, finding exceedances of the federal lead (Pb) standard; this problem may be tied to cleaning out sump materials pre-dating the ban on leaded gasoline. Field decanting under approved BMPs benefits road maintenance departments and yields net environmental benefits in increased catch basin clean-out, thereby reducing contaminants discharged to streams through the storm sewer system, and reduces the amount of diesel fuel burned.

The main environmental concern is to insure that these contaminants do not impact the waters of Oregon, both surface water and groundwater. Reducing the risk of site contamination is also a significant concern. Environmental issues driving field decanting options include the following:

- **Total Suspended Solids** can degrade vision in the water environment, clog fish gills, and destroy rocky spawning beds with a silt and clay cover.

- **Biological and Chemical Oxygen Demand** (BOD & COD): in processing high BOD and COD wastes, micro-organisms use up oxygen fish need to breath.

- Excess **Nutrients** encourage algae blooms, obscure visibility, etc.

- **Bacteria** (usually assessed using fecal coliform levels) can be a source of disease.

- **Metals** often present toxicity problems to aquatic organisms.

- **Petroleum:** besides toxicity, a sheen may prevent oxygen from dissolving into water and from being absorbed into the gills of fish or other organisms.

- **Carcinogenic PAHs**, **Pesticides**, and potential contaminants, such as **PCBs**, may cause cancer, developmental, and reproductive problems in humans and wildlife.

The contaminants in storm drain clean-out liquids are almost all adsorbed onto the surfaces of clay particles and organic materials suspended in the liquid. Dissolved contaminants are minor and never observed above pretreatment limits, except for isolated hot loads. Thus the big problem is getting out the suspended solids, which has proven difficult. Finer particles do not settle readily even in retention ponds; in vac trucks, the material is a slurry.

ODOT field trials have shown that flocculent can settle out suspended solids very quickly. The problem then is settling and getting the water off the vac truck without re-entraining the solids. Options using flocculent are new and present exciting opportunities to attain compliance while operating with substantially increased efficiency. Findings on vac truck design and retrofit options to ready flocculent use are presented below.

Finally, not all water carried in vac trucks is contaminated. For example, slide debris or construction stormwater pond clean-out may contain no toxic substancess. High suspended solids and potential for biological oxygen demand and nutrient release require careful management. Clean water may be directly applied to ODOT-controlled areas or on farms, given that a reasonable setback distance (about50 ft) from any drain or ditch line is maintained. Similar situations of no contaminant impact may be found in some rural settings, though care is necessary to establish a baseline for such wastewaters prior to approving ready reuse. (See the **Chapter 10, *Wastewater Management*** for a full discussion.)

FIELD DECANTING OPTION: Field Decant to High Flow Sanitary Sewer Lines

Discussion

Besides contaminant issues, pouring off vac truck liquids to sanitary sewers can increase clogging due to high solids content. The City of Eugene, City of Springfield and Lane County have partnered to more efficiently manage storm sewer system wastes. A major piece of their plan is designation of points on high flow sewer lines for vac truck decanting. They have decided to make storm drain clean-out as efficient as possible, while minimizing solids discharge to sanitary sewers as much as practicable. Before this decision, the City of Springfield had stopped cleaning catch basins, letting the solids flush through to streams, since they did not have the vac trucks and crew time available to do their cleaning and haul water and solids to a central solids de-watering facility.

Issues to Consider

Sanitary sewer pretreatment requirements can be a significant hurdle. Cities can impose standards on vac truck decanting, sometimes requiring laboratory tests, even when the threshold for application of federal standards is not exceeded. In Lane County, agencies charged with cleaning out storm drains also operate the sewers. The parties have made the decision to operate under BMPs instead of the using optional federal pretreatment guidelines; this partnership group built a de-watering facility at a Lane County solid waste transfer station. Work with sewerage agencies to develop an understanding of mutual goals should aid with more ready use of sanitary sewers for field decanting.

Ongoing Risk

With reasonable precautions to identify and segregate potentially hot loads, responsible liquid decanting to high flow sewer lines should eliminate liability issues. In *very* small communities, discharge into the sanitary sewer system may push total flow limits or lead to BOD or TSS levels in excess of wastewater treatment plant capacity. Analysis has shown that only in very small communities could contaminant levels in biosolids (municipal sludge) be impacted in significant figures from field decanting.

FIELD DECANTING OPTION: Fixed Field Decanting Stations

Discussion

Unified Sewerage Agency (USA) of Washington County has established nine permanent field decanting stations which provide a minimum of 24-hour settling through three sequenced settling chambers prior to release into the sanitary sewer system. USA regularly maintains these units by removing accumulated solids. Their design provides for ready access for vac truck lines to the settling chambers. Use of a station is limited to several dumps per day to allow adequate settling time. An example of this type of facility is shown in Figure 8.1.

Figure 8.1: Decant running off of newly dumped vactor waste at City of Portland sediment dewatering facility. Photo by Katie Bretsch, 1999.

Issues to Consider

Cost per unit can be a deciding factor. (USA's designs are available in **Roadwaste: Issues and Options**.) Given the widespread nature of highway storm drain clean-out efforts, and limited access to sanitary sewers, siting fixed field decanting stations may not work for ODOT. ODOT Districts may want to negotiate with other agencies for use of their fixed facilities, possibly helping other agencies site field decanting stations in areas heavily used by ODOT. Addressing differences in vac truck design may be necessary to avoid excess spillage.

Ongoing Risk

Besides keeping field decanting facility areas clean, access is an important issue – both limiting public access for safety and limiting the chance of illegal dumping of hazardous loads. Responsibility for the solids accumulated in shared facilities must be negotiated.

FIELD DECANTING OPTION: Mobile Field Decanting Options

Discussion

For ODOT, mobile field decanting technologies may prove more useful than siting its own fixed stations since ODOT operations are so much more spread out. Local agencies could make good use of this flexible approach, too. Field decanting technologies may meet sanitary sewer pretreatment standards and in some cases can yield water clean enough for limited reuse. Without these technologies, ODOT crews might be required to haul water back to central solids dewatering stations, meaning a lot more road time and a lot less cleaned out per vactor truck run.

Mobile decanting still requires disposal of decanted water, meaning direct discharge to a sanitary sewer, transport to a sanitary sewer, or other use of this water (see Rural Decant Options and Water Reuse Options below). Initial findings in **ODOT Roadwaste Field Trials** support further investigation of both filter box and filter sock mobile field decanting technologies.

Issues to Consider

The use of filter media for vactor solids de-watering has so far met with limited success due to fines clogging the filter pores, usually slowing water flow to a crawl. Solids suspended in the water can be minimized, however, with settling or flocculation. Flo-Trend from Texas manufactures dewatering boxes with filter surfaces all along the bottom and sides of the box. (See **Roadwaste: Issues and Options** for more information on Flo-Trends boxes.) Filter boxes should provide much quicker dewatering than a traditional pad, even more so with a design to allow water to escape from the sides as well as the bottom. A metal box to capture liquids surrounds an interior filter box.

Optional use of a vacuum pump attached to an effluent port can increase draw. Filter socks for effluent polishing offers a similar technology. What makes these technologies really exciting is their use in conjunction with flocculent (see next option for more on this). Delta Pollution Control has showed that the filter sock technology can work using their flocculent. This finding is surprising since it is easy for these mesh filters to clog with the fines. Flocculated vac truck liquids contain far less solids. Trials using flocculent supported the idea that the fines are bound with larger particles, thus reducing filter fabric clogging, making filter technologies more workable under field conditions. (See **ODOT Roadwaste Field Trials** for information.)

Field decanting may require retrofit of vactor trucks to allow more ready removal of liquids (see Eductor Truck Retrofit for Decanting below). Filter boxes combined might also find use in construction site stormwater treatment and during slide repair work.

There is evidence that mobile decanting can achieve more than efficient management of vactor water in the field. Filter boxes may also prove the best way for many Districts to de-water their solids right in the field. (See Solids Dewatering Options below.)

Ongoing Risk

Outside of sloppy work practices or failure to characterize hot loads, liability issues are minimal. Access by the public must be limited as a public safety precaution, to prevent illegal dumping, and to protect equipment.

FIELD DECANTING OPTION: Flocculent Use in Field Decanting

Discussion

Traditional chemical flocculents work by dropping charged dissolved molecules from suspension; but limited field trials with chemical type flocculent did not point to further investigation there. Traditional flocculents commonly in use in sewage treatment did not work well, either; these products created a "goo" that did not efficiently drop solids. These products are used most commonly in conjunction with filter belt presses, machines that are expensive to maintain and would be eaten up by the sand and grit loads common in vac wastes.

Snohomish County worked with Delta Pollution Control of Everett, Washington, in developing a flocculent specifically designed to drop suspended solids from vac truck wastes. Their work has been very successful. The performance of Delta Pollution Control's VGT 2000 series flocculents far exceeded every other flocculent in ODOT field trials.

Delta Pollution Control created two flocculents for Snohomish County: a fish friendly flocculent and a quick-acting flocculent. The County's goal was to meet standards for direct discharge from vac trucks back into storm drains, seeking to achieve maximum field decanting efficiency and to meet the need for decanting outside areas that were sewered. Their investigations mainly centered on making the fish friendly flocculent work. Snohomish County received tentative approval from the Washington Department of Ecology to discharge vac liquids into storm drains as a test program. Without a definitive acceptance of this process from the Department of Ecology, however, Snohomish County has abandoned that effort. (See Alternative Field Decanting Methods, below for further discussion.)

Issues to Consider

ODOT's research recommends the use of the quick-acting flocculent and effluent disposal into sanitary sewers. Delta Pollution Control's product is especially useful as part of an overall vac waste management program, allowing more ready use of filter technology in the field, and substantially reducing expensive capital costs for suspended solids removal common to currently designed de-watering facilities. The main issue in using the flocculent in the field is adequate mixing. **ODOT Roadwaste Field Trials** discusses these issues in further detail. When added dry to the vactor truck, the flocculent was found to cake on the rear hatch. **ODOT Roadwaste Field Trials** discusses vactor truck retrofit ideas to increase the workability of using flocculent in trucks. When used in vactor trucks, the flocculent should be in a wet slurry. When treating a large batch of water, a mixer, static mixing chamber with water flow-through, or pump may be required to achieve the desired effect.

Ongoing Risk

Environmental liability is assessed as minimal. Not everything is known about this product, however. While the flocculent mixed in small quantities in vactor solids is not thought to present issues, consideration should be given to subsequent thermal treatment or other options resulting in waste reuse. Personnel working with the recommended flocculent are advised to use dust masks to avoid inhalation hazards.

FIELD DECANTING OPTION: Decanting to Tanks

Discussion

Tanks can be used in mobile field decanting or permanent site decanting operations. Again, you can run into problems moving the water from the top of the load into the tank. The problem is that vactor designs tend to draw the solids off rather than draw water. A floating pump inside the truck is one possible solution. (Vactor truck retrofit is discussed in **ODOT Roadwaste Field Trials**.)

Issues to Consider

Some Baker Tanks are designed with an internal screen and a hard bottom. This design allows for removal of solids from the water. They can also be fitted with a pump to increase draw. Vibration may increase throughput, also. Again, loads flocculated with Delta Pollution Control's VGT flocculent are expected to have less fines in the decanted water, meaning less clogging of filters. Also, early findings have indicated that water appears to drain much faster through a mat of flocculated fines. If you have additional uses in your District for tanks, working out the kinks to use them for field decanting could make them a good investment.

Field decanting into filter boxes can work for field dewatering, as well. Getting the solids out of a tank without returning it to a slurry can be a problem, however.

Ongoing Risks

Getting material into and out of these tanks is a key issue. Spills can be a problem and must be controlled. At a minimum, vac truck retrofitting appears necessary to make this option workable in the field.

FIELD DECANTING OPTION: Eductor Truck Retrofit for Decanting

Discussion

Pulling off the water fraction from an eductor (or "vac") truck can be difficult. Most of the units are not designed for field decanting. Most often, water is decanted by cracking the seal on the back hatch. Even allowing for settling, this method tends to release more of slurry than desired. During the ODOT Roadwaste Management Phase 2 trials, a camel truck designed with onboard filtration was tested. Effluent discharge was too slow for some observers. This trial was conducted without flocculent, which might have aided dramatically in reducing decanting times. It is unknown whether this technology is workable in the field.

Issues to Consider

Most vac trucks are designed to pump off the bottom of the load and to tip for dumping out of the rear hatch, as shown in Figure 8.2. Since the solids are heavier, floating pumps have been built in some units. Even with a floating pump, assessing when free liquids have been removed and solids are being pumped is not straightforward. Flocculent use can dramatically increase separation between solids and liquids, but getting the flocculent to mix thoroughly in the truck can be tricky. One possible truck retrofit is to add an on-board flocculated filtering step to polish effluent, pumping off the top of the load to an on-board mixer and decanting effluent through a filter sock. Vac truck retrofitting most often will come down to a financial decision. Is it more cost efficient in your District's roadwaste management plan to use more crew and equipment time to transport these liquids or to retrofit trucks and use field decanting equipment? Cost data and evaluation methods are provided in **Appendix A**.

Ongoing Risk

Minimal to none; however, design considerations must be assessed carefully in making changes to these powerful systems. Many valuable ideas on retrofitting are presented in **ODOT Roadwaste Field Trials** (*Ghezzi 2000*).

Figure 8.2: A vactor truck finishes dumping a load of sump and catch basin sediment. Photo by Katie Bretsch, 1999.

FIELD DECANTING OPTION: Rural Decanting

Discussion

Some CALTRANS districts have identified some freeway infields and other specified locations for field decanting. CALTRANS has not observed negative impacts or environmental contamination of its selected areas. In site selection, care must be taken to prevent runoff into storm drains, prevent public access, and insure that the wastewater does not have ready contact with groundwater. Public perception and visual values are also important issues.

Issues to Consider

In Oregon, wastewater can be discharged to ground surface only under a site-specific DEQ Water Pollution Control Facility permit.[10] Given that siting issues must be addressed, permitting does offer DEQ review for environmental concerns. In Eastern Oregon, decanting to ponds might prove workable due to very high evapotranspiration rates. (Evaporation ponds are discussed in detail as a Wastewater Management option in **Chapter 10**.) DEQ is unlikely to approve field decanting to the ground surface where access to a sanitary sewer system is available. Use of dry wells for field decanting is prohibited.

Ongoing Risk

Site contamination is a key issue. The less contaminated the load, the more workable this option becomes. What is the immediate substrate – are you releasing water over fractured basalt or soils heavy with clay? Review of existing sites for dry wells and other contamination issues (perhaps resulting from overuse) may require attention. The use of selected vegetative cover can offer significant rewards in addressing ongoing risk and in remediating existing surface contamination from metals or polyaromatic hydrocarbons (PAHs) and other petroleum constituents. Species of mulberry have been especially effective at reducing carcinogenic PAH concentrations within the root zone and should be considered as site cover for impacted surface areas.

[10] See Oregon Administrative Rule [OAR] 340-45-0014. Conversations with Robert Baumgartner, DEQ Northwest Region Water Quality Manager, February 2000.

FIELD DECANTING OPTION: Alternative Field Decanting Methods

Discussion

This chapter presents many different methods. As ODOT managers review these options and as maintenance crews use these techniques, many more ideas are certain to arise. The principles set forth in the evaluation of existing methods should be pertinent to new ideas, as well. Using tanks or mobile ponds to contain effluent are other possibilities. Vac truck design can impact the workability of some options; retrofit would be required to make most tank use workable for most situations. **Chapter 10, *Wastewater Management,*** discusses water reuse options important to field decanting, which should be reviewed prior to selecting a final field decanting strategy.

Considering Decanting back into the Storm Sewer System:

Needs in rural areas or in construction site stormwater management may point to further work in discharge of flocculent-treated effluent into the storm drain system. This option is still early in its development, and workability and regulatory hurdles need to be cleared prior to using it in the field. Most flocculents change the pH (acidity) of the water treated. Some flocculents introduce contaminants toxic to life in streams. Most flocculents developed to remove suspended solids from wastewater are virtually impossible to remove without some kind of filtration.

As mentioned earlier, Snohomish County worked with Delta Pollution Control and created a "fish friendly" flocculent to treat field decant to standards acceptable for discharge back into the storm drain. This flocculent efficiently drops out most of the suspended solids, which hold 90+% of the contaminants, avoids pH changes and toxic chemicals, and drops out of solution quickly in the field. Snohomish County has approval on a trial basis to do field decanting to storm sewers using this product.

The main workability issue is how to efficiently remove the water from the truck without re-entraining solids. Retrofitting vac trucks get the water off the top of the load is a possibility, but how do you tell when you are getting down to the solids? This option needs more work in the field to insure development of a procedure to minimize release of solids. The main regulatory issue with this option is that this decanted water is wastewater. Without an exception written into the rules, each discharge point would require a separate DEQ permit. Discussions with DEQ's Water Quality program would be required for even trial use of this method. Use of this method may substantially benefit construction site stormwater management, again with DEQ involvement.

Ongoing Risk

The guidelines established in this chapter provide a sound basis for assessing the risks of managing wastewater in the field. Both regulatory and workability issues must be examined when assessing new methods. Consult environmental and health professionals when assessing unclear variables.

9.0 DEWATERING SOLIDS

Dewatering wet roadwaste is one of the more difficult tasks you face in managing roadwaste. This chapter will focus on stormwater system residuals from catch basins, sumps and stormwater ponds. However, the principles discussed here and in **Chapter 10, *Wastewater Management***, apply equally to water collected during wet weather sweeping. Immediate placement of uncontaminated wet materials was discussed in **Chapter 7, *Sorting and Collecting***. Managing water from uncontaminated materials was discussed there and will be discussed specifically in **Chapter 10**. The following options will be addressed here:

- Pad Dewatering
- Filter Box Dewatering
- Pond Dewatering
- Wet Treatment Technologies

Whatever dewatering technology is selected, managing water used to clean out vactor trucks separately from the loads collected should shorten dewatering times significantly.

9.1 DEWATERING CONSIDERATIONS AND USING FLOCCULENT TO IMPROVE PERFORMANCE

A lot of work goes into designing dewatering facilities to remove suspended fines from wastewater to meet pretreatment requirements. Some of the suspended solids will never drop out; heavier fines clog lines and add to facility maintenance costs. High capital costs have been incurred to build long, sloped runs into some dewatering pad facilities in the hope of removing these clays. These efforts have met very limited success; even when effective, new loads can just re-entrain the fines that drop out of earlier loads.

Use of flocculent was discussed in depth in **Chapter 8, *Field Decanting Options***. Delta Pollution Control VGT flocculents have been found to have great potential in reducing suspended solid content of water decanted from vactor trucks. Flocculent also can help with dewatering, improving the workability of new and existing options. Dewatering times on flocculated loads are expected to be substantially shorter for two main reasons: 1) proper equipment allows wastewater to be decanted from vactor trucks before solids are dumped; 2) fines are bound by the flocculent, allowing pore spaces in the solids to more quickly release water. Flocculent provides many advantages and suffers few disadvantages. Operational advantages, both in the field and at permanent facilities, make wide trial use of flocculent easy to recommend. Flocculating vactor loads can also make the dewatering process easier and more cost efficient. Operational advantages should be weighed against product cost and other disadvantages when developing a roadwaste management plan. Worker exposure to dust should be handled using appropriate dust masks during addition of material or mixing into slurry material.

DEWATERING OPTION: Pad Dewatering

Discussion

ODOT Roadwaste Research Project staff have visited many dewatering pad facilities in the Northwest. **Roadwaste: Issues and Options** (*Collins 1998*) and **Management of Stormwater Facility Maintenance Residuals** (*Lenhart 1998*) both devoted ample space to discussing pad dewatering. You are encouraged to consult these documents for designs and a deeper discussion of this common technology.

Issues to Consider

Almost every dewatering pad facility has problems. Problems at most facilities include:

- Getting the suspended solids (fines) to efficiently drop out of solution
- Reducing dewatering times for more efficient throughput per pad
- Introducing new, wet batches adds water to drying batches
- Vactor truck wash-out water can add more water
- Managing the material is difficult

The most successful facilities have been adjacent to sewage treatment plants. Unified Sewerage Agency (USA) of Washington County runs a simple dewatering pad on an asphalt lot at their facility. They decant water from vactor trucks: a) into the sanitary sewer after settling in the unit overnight; or b) through a chambered field decanting station (see **Fixed Field Decant Stations** in **Chapter 9**); thereby dumping less water on their pad. Marion County Public Works Department operates a small, inexpensive pad with three in-line underground tanks to settle solids; they discharge water into the adjacent municipal sewage treatment lagoon. The Lane County/ Eugene/Springfield facility operates at a solid waste transfer station. This makes waste hauling easier. They have tried many fixes on their pad and with their wastewater system to get the fines to drop out of suspension with limited success. They collect wastewater in an underground storage tank, and the line to that tank has to be flushed frequently. Their design includes a high roof to allow vactor trucks under it. They have found, however, that the roof could be eliminated, since rainwater blows under the roof, anyway.

Considerations in pad dewatering include capital costs, wastewater management, and siting of facilities. Washington DOT needed dewatering facilities, but their far-flung operations meant that siting and operating many of their own expensive facilities (averaging ~$250,000 per facility) was impractical. So, WSDOT developed a grant program, paying the capital costs for rights to use locally-owned and operated facilities. WSDOT has funded many local agency facilities in Washington. Running a dewatering pad in conjunction with a truck wash/decanting station could be more cost efficient, and should substantially decrease pad dewatering times, since pretreatment issues for both could be handled at the same time.

Ongoing Risks

Little to none. Siting issues and public access issues must be addressed. Of course, all operations should take place on a sealed concrete slab. All wastewater must be managed appropriately. Liabilities of shared facilities are discussed in **Chapter 2**; largely, this is a perception issue since procedures exist that substantially minimize exposure to liability.

DEWATERING OPTION: Filter Box Dewatering

Discussion

As discussed in the last chapter, mobile field decanting and dewatering stations are especially appropriate for ODOT's widely spaced operations. Instead of transporting heavy loads of vactor waste along highways or siting multiple dewatering facilities, using filter boxes for dewatering can increase vactor crew efficiency while achieving compliance with the environmental rules. The efficiency achieved in crew times can be weighed against the initial cost and transport of roll-off or wheeled filter boxes.

Issues to Consider

Filter boxes are designed to capture solids and allow water to flow through the mesh. The idea is to promote more ready dewatering across an entire mesh floor. Since past practice has seen filters either letting through too much of the solids or simply clogging tight with the fines, it is assumed that flocculent should be used to control fines and speed dewatering times. The ODOT Roadwaste Research project first saw effective use of filter boxes at New York City's Department of Environmental Protection.[11] DEP uses clam shells to remove trash from their catch basins rather than a vactor truck. They use Flo-Trend filter boxes and have quick, one-day drying times, disposing of the dry material with their trash. Figure 9.1 shows decant running off of newly dumped vactor waste at the City of Portland sediment dewatering facility.

Figure 9.1: Flow Trends dewatering box (filter box). Photo by Katie Bretsch, 2000.

[11] Jim Lenhart of Stormwater Management first examined this for Management of Stormwater Facility Maintenance Residuals (*Lenhart 1998*).

The City of Portland and ODOT trials were conducted with a Flo-Trend box. The effluent ran clear after the initial flush. Dewatering, however, took several weeks. Again, adding vacuum pumps, vibration to help flow through the screen, or using flocculent in the loads could help hasten dewatering. In bench-scale mesh tests, the Delta Pollution Control flocculent prevented clogging; the sludge stayed in place, the effluent was clear after first flush, and dewatering was a lot faster than anticipated. (See **ODOT Roadwaste Field Trials** for more information on these tests.)

Transport and dumping of dewatered loads is easy with roll-off containers – a huge advantage over using a front loader to push around material on a pad and to load trucks. Operators of many pad dewatering facilities spend a lot of staff time just moving around the waste they generate. Less handling means more savings. A hurdle must be cleared with loading solids into filter boxes in the field. At a permanent facility, boxes can positioned for easy dumping.

Ongoing Risks

Public access is of course an issue for these huge containers of contaminated mud. Workability problems can lead to spills, an additional burden that could pose an environmental liability. Wastewater discharge must be managed in accordance with environmental regulations, meaning either to a sanitary sewer or to the ground surface at an approved site under a DEQ WPCF (Water Pollution Control Facility) permit.

DEWATERING OPTION: Pond Dewatering

Discussion
Evaporation ponds can be difficult to manage. High Biological Oxygen Demand (BOD) and the presence of nutrients and bacteria can create high odor problems due to anaerobic conditions. Not all of the suspended solids will drop out of suspension. The settled material would also need further dewatering, since ponds of any size can take a long time to dry out. This option is probably not workable in rainy climates.

Issues to Consider
This option is primarily presented for use in Oregon's more arid climates. There, the dry season combined with fairly shallow ponds can do the intensive work of dewatering for you, providing a practical technology with high potential for cost savings. The authors recommend sealed cement or asphalt ponds, since clay liners are difficult to keep sealed with the ongoing removal of solids and potential for cracking in dry periods. These ponds should be sited away from areas subject to flash floods, and they should be designed to contain any influx of stormwater.

Ongoing Risks
Windblown dust can present problems, especially if the waste material is contaminated. Correct wastewater management practices should be observed, preventing release to soils and surface waters and into the subsurface. In some areas of Eastern Oregon, cracks in the basalt can lead to direct losses of contaminants to lower aquifers, which are often tapped as drinking water sources. (Note: roadwaste contaminants do not decompose readily in subsurface conditions.) Control of site access is again an issue, both for safety and to prevent illegal dumping. Odor issues should be addressed. Siting these ponds away from view of roads and away from residences should lessen burdens. Siting them at a solid waste landfill or transfer station could solve many problems at once.

WET TREATMENT OPTION: Wet Treatment Technologies

Discussion

Designs for aqueous treatment of roadwaste contaminants have been developed. Bioremediation could use aerobic or anaerobic microbes, though addition of oxygen and use of the faster aerobic organisms seems more feasible. Most existing dewatering pad facilities could be retrofitted to allow wet treatment of contaminants. Introduction of oxygen is easily achieved by actively introducing air over many points through tubes, as in a fish tank. A wet bioremediation facility would require a much more knowledgeable and active staff than for a simple treatment technology like soil aeration, due to the sensitivity of aqueous microorganisms and the need for quick turnover rates. Time for treatment would add a few weeks over current pad dewatering times.

Issues to Consider

Capital and staffing costs are important considerations; wet bioremediation technology requires significant investment and active staffing. Most importantly, it must be determined if the treatment will help make the material more ready for reuse. If the untreated material has ready reuses or if wet treatment costs will exceed high temperature thermal treatment, this technology may not be worth pursuing. Destruction of simple petroleum compounds can be achieved by simple aeration, and Total Petroleum Hydrocarbon (TPH) levels are not a big risk driver. Bioremediation will not treat metals, and it is unlikely that chemical treatment to remove metals from slurry could be workable for roadwaste. So any meaningful wet treatment must focus on aggressive breakdown of Carcinogenic Polyaromatic Hydrocarbons (CPAHs), the biggest risk driver for roadwaste and a major concern in urban and high-ADT stormwater sediments.

Some microorganisms are designed to work in high-CPAH concentration environments, and they will not readily break down CPAHs at lower concentrations that still pose concerns. Other microorganisms are good at reducing CPAH concentrations to very low levels, but they die when exposed to high contaminant levels. You would need an organism or set or organisms that could reduce CPAH concentrations below levels of concern. Incidental treatment of normal petroleum constituents is common with organisms that treat CPAHs. If this method could achieve cost efficiency, maintain facility throughput at sufficient levels, and find ready reuse for resulting materials, wet treatment of CPAHs from high-risk vactor waste could prove to be a better solution than currently used vactor waste treatment technologies. (**Treatment Options** are discussed further in **Chapter 13**.)

Ongoing Risks

There is little to no additional risk in designing a vactor pad or other slurry containment or dewatering unit for aqueous treatment of roadwaste contaminants. The issue boils down to investment and effort in overseeing the facility. If a local agency wanted to invest in this technology and ODOT expected to collect substantial amounts of the higher risk types of vactor waste in the area, it would be reasonable to help fund the project to have a ready option for treating this waste. Cost considerations would likely be the most important driver in ODOT’s decision to participate.

10.0 WASTEWATER MANAGEMENT

Wastewater liquids comprise only a very small and specialized portion of ODOT roadwaste, but wastewater management is extremely important when discussing the disposal of roadwaste materials. This is because of the high cost and technical difficulties associated with managing this special highway waste. Vactor slurries are ODOT's primary source of highway wastewater. Managing and disposing of vactor slurries is a new practice for ODOT, and the agency is still struggling with developing efficient ways to manage this waste, especially separating liquids from solids. Disposal of vactor wastewater is primarily an urban issue. As stormwater treatment facilities become more common, as new equipment such as the wet sweeper appears, and as more maintenance yards eliminate surface water discharges, it is expected that managing highway wastewater will become more of a widespread issue.

DEQ considers water collected or generated from the cleaning of highways and highway storm systems to be wastewater instead of site stormwater. Once vacuumed into a truck, because it is defined as waste, this water cannot be disposed back into a storm drain system. DEQ requires that wastewater be disposed to sanitary sewer systems. If access to a sanitary system is not possible, DEQ will require development of an appropriate alternative disposal method. Alternative disposal methods will involve wastewater treatment or containment of toxic pollutants and may require additional disposal permits.

10.1 ENVIRONMENTAL CONCERNS

Environmental risks associated with vactor wastewater have already been discussed in previous chapters. Of primary concern are the toxic pollutants that can contaminate soil, groundwater, and surface waters. Fine sediment is also of particular concern with this waste, not only for the pollutants that commonly attach to them, but also for the negative effect they can have smothering plants, fish, and productive soils, both in waterways and on the ground.

10.2 DECANTING AND WASTEWATER DISPOSAL

There are a number of methods that can be considered to manage or dispose of roadwaste vactor slurry. This chapter will concentrate on disposal of the water portion of this special waste. Obviously, methods used to dispose vactor wastewater will depend somewhat on the methods chosen to manage the entire vactor load. Field decanting of vactor slurries at appropriate locations, use of flocculent, and field discharging of vactor truck liquids to sanitary sewer systems have already been discussed, and all encompass wastewater discharge.

The majority of contaminated vactor wastes generated by ODOT is from urban highway drainage systems. While some of this vactor wastewater can possibly be managed through collection and sorting techniques, ODOT should assume that sewage disposal will be required for at least some of this waste. Once wastewater has been separated from the solid portion of a vactor load, discharging to a sanitary sewer system is fairly straightforward. There are still concerns, however, associated with discharging vactor wastewater even to a sanitary sewer system.

10.3 SEWERAGE SYSTEM DISPOSAL

Since DEQ has stipulated that liquid wastes from vactoring storm sewers cannot be placed back into storm sewers, the sanitary sewer should be used for disposal of this wastewater whenever possible. Sanitary sewer disposal poses several different concerns. The wastewater treatment plant (WWTP) must be able to meet discharge limits set by DEQ. To operate efficiently, wastewater must fit within certain parameters. Wastewater must not have excessive levels of dissolved metals or certain other contaminants that may pass through untreated or pose problems in application or disposal of WWTP biosolids (sludge). If wastewater entering a WWTP contains high levels of chemicals or metals that can kill the microorganisms which process sewage, then sewage will pass through the plant virtually untreated. In high volumes, compared to a WWTP's size, concentrated wastes may place oxygen demands (required to support intense biological activity) that are difficult to meet. Trash and sediments can clog sewer lines. To meet the various concerns, sanitary sewers impose pretreatment limits on discharges to their systems.

Sanitary sewer systems also require that wastewater not be excessively caustic, and not contain concentrations of contaminants that may escape their system or pose toxic hazards for their workers. Gasoline and other volatile compounds can pose explosion hazards in sewers. Vactor liquids normally do not pose any of these hazards, since the contaminants are limited to some heavy metals and heavier, non-volatile petroleum fractions. Potentially "hot" loads, however, may merit testing prior to release of liquids to the sanitary sewer. Sanitary sewer pretreatment requirements may vary. For example, the City of Salem is concerned over copper due to high background levels of copper in its water source. A small, community WWTP might be challenged by the biological oxygen demand (BOD) from a large volume of vactor liquids, and special care should be taken to meet these needs.

Huge volumes of rainfall can overwhelm a WWTP, resulting in an untreated discharge called a "by-pass," and sewerage authorities are working to keep rainfall separate from sanitary systems. If ODOT sites a waste management facility, the local sanitary sewerage authority may require that rainfall onto open storage areas be kept separate from the sanitary sewer system. Similarly, concern should be exercised to determine whether the waste management facilities that accept ODOT wastes have addressed leachate and runoff concerns.

10.4 MEETING PRETREATMENT REQUIREMENTS

Vactor decant may be a small waste stream with limited impacts on the huge volume of wastewater going into most municipal WWTPs; but if this argument were allowed for every industry, sanitary sewers would soon be overwhelmed. Still, some leniency may be allowed for a small amount of vactor liquids. Laboratory tests have shown that a large majority of the contaminants in vactor wastes are tightly adsorbed to particulate matter suspended in the liquid. Pretreatment requirements can normally be met by elimination of suspended solids from the wastes by 24-hour detention to allow for settling. (Oils able to form a heavy sheen would also merit removal prior to disposal into the sanitary sewer.) In a 1996 study, the City of Eugene Public Works Department stated:

> *A total of 123 samples of liquids and solids were taken…. It is apparent that levels of certain heavy metals were near or exceeded the wastewater regulatory limits prior to any pretreatment. Analysis indicated that allowing the waste liquids to settle for just 24 hours in the sedimentation basins produced a significant decrease in the levels of total metals. (Eugene Public Works, 1996)*

The Unified Sewerage Agency (USA) of Washington County has taken this approach. With needs for vactor decant extending beyond city limits to areas not served by high-flow sewers, USA has constructed three field decanting stations that do allow for 24-hour settling. Their design allows for a maximum of three vactor loads per day.[12] USA has scheduled the construction of six more field decanting stations over the next two years. USA has worked out agreements with other jurisdictions to allow use of their field decanting stations. (USA's field decanting station designs can be found in the Appendix to **Roadwaste: Issues and Options**.) The City of Eugene has since met their concern over sedimentation of sewers by allowing field decanting of vactor liquids at designated points in high-flow sewers. The City of Springfield also joined in this area-wide effort by designating several high-flow sewer discharge points.

A vactor truck flocculent study released by Snohomish County Public Works reported interesting results, already discussed in **Chapters 8** and **9**. Sanitary sewers are traditionally the lowest cost alternative for waste disposal and offer a positive model for partnering. It is important to most forms of efficient roadwaste management to have ready access to sanitary sewers for the disposal of wastewater.

10.5 ALTERNATIVE WASTEWATER MANAGEMENT OPTIONS

In some instances, it may be appropriate to consider alternatives to discharging wastewater into a sanitary sewer system. Sewer hookups may not be available; or permission to discharge may not be granted, even though you know with certainty that your vactor liquids are not contaminated. Keep in mind that disposal methods for vactor waste are still evolving and many new methods are under development.

For example, very high pollutant removal has been achieved using flocculent and filters on vactor truck waste. This finding is significant since this method could prove to be cost effective in removing pollutants, allowing decanting of clean water directly from the vactor truck while in the field, possibly even back into a stormwater system. Considerable work will be required before it is known whether this evolving management method can be successful and cost effective. This chapter presents the following alternative wastewater management options:[13]

- Evaporation Ponds (possible in Central and Eastern Oregon)
- Water Reuse

[12] See Appendix E in *Roadwaste: Issues and Options*: "Report on Selected Oregon Decant Facilities."
[13] Decanting vac truck liquids onto ODOT-controlled areas was discussed in the Field Decanting Options (see Alternative Field Decanting). That discussion *also* applies to wastewater collected from sweepers and other methods relying on ground surface infiltration.

STORMWATER OPTION: Use of Evaporation Ponds

Discussion

In remote areas where sewerage hook up is not available and approval for use of conventional drain fields is not inappropriate, evaporation ponds can be a good wastewater disposal option. Several ODOT maintenance yards have already considered installation of these facilities for treatment and containment of vehicle wash water. These facilities do have limitations; it is doubtful they would be appropriate in geographic areas with high rainfall; but they may prove useful for disposal operations in the eastern half of the state. Vactor wastewater evaporation ponds could work well in conjunction with treating wastewater generated by other maintenance activities.

Issues to Consider

Ponds may need to be lined with visqueen or geo-membrane fabric to hold contaminants. A clay liner or asphalt or concrete surface could be necessary in some situations where ready transport to groundwater is a concern. Solids removal and dust control should be considered when siting a decant pond, and long term maintenance of the pond needs to be considered early in the design process. High ground water tables can also be a concern, with both infiltration and "floating" of the pond being issues. Because these would be engineered and constructed facilities requiring long term maintenance, cost effectiveness will be a concern. Figure 10.1 shows an example of a mobile pond set up in Portland.

Figure 10.1: Mobile pond

Ongoing Risks

Eliminating infiltration of contaminated liquids and protection of groundwater are probably the biggest ongoing risks associated with evaporation ponds. In some situations, build up of toxic volatile pollutants such as gasoline could be a concern. If facilities are properly designed and maintained, these risks should be minimal. Design your facility so that eventual cleanout of sludge can be handled in a manner that does not compromise the liner. In many situations, this could mean laying down an asphalt or concrete surface.

WASTEWATER OPTION: Water Reuse Options

Discussion

Reuse of water collected in sweepers and vactor trucks presents an exciting alternative to disposal. If toxic contaminants are present or suspected, most reuse options will obviously not be appropriate. But there are situations where vactor wastes are not contaminated and there could be an opportunity to reuse water, solids, or both. If you are reusing "clean" vactor slurry, separating liquids from solids will only be necessary if it is required for the chosen reuse alternative. Some of the alternatives listed below may require a gross separation of liquids from solids (achieved through simple settling) but removing all suspended solids will not be necessary for many reuse options.

Issues to Consider

Water reuse is not just about finding alternate disposal sites for your "clean" vactor slurries. There are instances where vactor water reuse can be of real value. Some reuse examples are listed below:

Dust Control – In managing dust for erosion control fines are present anyway, so the suspended fines contained in vactor wastewater in most situations will not be of high concern. However, applying water with suspended fines would be inappropriate on impervious surfaces. Contaminant levels also need to be addressed before these liquids can be used for dust suppression.

Watering Compost – Especially in dry weather, composting requires the application of water. Mixing vactor slurry into compost piles could provide moisture and actually improve the quality of compost, depending on what vactor solids are present. Contaminants are of great concern, but depending on ultimate use of the compost, low level contamination might be acceptable. Compost used for plantings along urban freeways is not required to be entirely free of all hydrocarbon contaminants.

Agricultural Use – While this use would be limited by both geographic location and vactor material, some vactor loads could conceivably have some agricultural value. ODOT maintenance has given roadwaste materials away to farmers in the past, and under proper circumstances this practice may be appropriate for some types of vactor waste. Again, contaminants would be a concern as would appropriate use and placement of material (impacts to wetlands, cut and fill laws, endangered species, etc.).

Gray Water Use at Maintenance Facilities – Again, use of contaminated wastewater would not be appropriate, but if water with suspended solids were stockpiled in holding ponds or tanks it could possibly be used for such things as landscape watering, dust control, or fire control.

Ongoing Risk

Toxic contaminants are especially a concern in water reuse because in a water medium they are much more mobile, raising the likelihood of site contamination and runoff. High bacteria levels not normally present in solid wastes are more common in roadwaste liquids. Because suspended solids are considered a pollutant, containment and placement of fine silts and clays can be an issue with roadwaste liquids. Negative impacts to groundwater and surface water is of high concern.

11.0 STORAGE CONSIDERATIONS

11.1 DISCUSSION

Accumulated roadwastes are often stockpiled before or during treatment, reuse or disposal. Roadwaste can vary widely in its composition (toxicity, pollutant levels, soil type, trash content, etc.). Thus, appropriate stockpile locations and containment methods will vary accordingly.

Pollutant containment is the biggest concern when stockpiling roadwaste. Open stockpiles allow exposure to air, sunlight, and rain and encourage composting and the breakdown of hydrocarbons (oil or grease). Open stockpiles, however, can also lead to erosion and migration of pollutants if runoff is not contained properly. When stockpiling roadwaste, consider its composition (pollutants, trash and fines), how and where it will be stockpiled, and when and where your roadwaste will ultimately be disposed.

Check with your Region Environmentalist or local DEQ office if you are unsure whether the roadwaste and your stockpiling practices are safe for the environment.

11.2 ISSUES TO CONSIDER

Do you want to stockpile roadwaste? Questions to consider:

- **Is your roadwaste appropriate for stockpiling?**
  Check the Roadwaste Management Flowchart and "Characterizing Your Waste".
- **What are your long and short-term plans (benefits vs. costs)?**
  If you are stockpiling to avoid immediate disposal costs, consider the long-term storage costs: disposal and hauling, and potential environmental liability including site assessment and potential cleanup.
- **Can you efficiently manage your stockpiles?**
  Are you stockpiling to batch haul to the dump or are you planning to reuse this material (as fill or top-dressing)? To reduce hauling and management costs, can you transport your roadwaste where you ultimately want it to go, instead? Do you have staff trained and with sufficient time to oversee protective management of your stockpiles? Can you collaborate with another local DOT or other partners in stockpiling, reuse, or disposal efforts?

Content of Roadwaste Stockpiles

- **Screen roadwaste with a high trash content. Dispose of trash appropriately.**
  If trash is stored, a solid waste management permit from Oregon DEQ is required.
- **Maintain segregation between wastes.**
  Landslide debris and many ditching spoils may be clean fill. Don't make them "dirty" by mixing with catch basin sludge or by storing them where stormwater runoff from a dirty

pile will contaminate them. Only mix wastes intentionally! Insure the distinct separation of your stockpiled wastes, unless you are sure you will manage them in the same manner later.

- **Rock is cleaner than dirt (sorting your material may facilitate reuse).**
  In similar loads, fine sediment, dirt, rotten leaves, etc., are more highly contaminated than rock and coarse sands (due to surface area for bonding – clays have a million times more bonding surface area per mass than gravels). The cleaner your stockpile, the more options you have for storage and reuse.
- **If it looks bad, smells bad, throw it away.**
  The intent of a roadwaste management plan is to reduce, reuse, and recycle appropriate wastes. Stockpiling can be used to reduce handling costs through practices like batch hauling and batch testing. If your roadwaste is full of hypodermic needles, paper trash, food, broken glass, large amounts of black oil, grease, etc., it is probably not worth the risk or effort it will take to stockpile it (and it is against DEQ regulations). Consider sealed box containers for this material and management by a local waste agency, or haul it directly to a permitted landfill.

Locating a stockpile site

- **Be certain that you control the land at the stockpile site you are using.**
  Is the stockpile located on ODOT right of way? Is there a chance the stockpile might erode, allowing contaminant migration onto adjacent property or into state waters? Could adjacent property be negatively impacted by the stockpile?
- **Limit public access and visibility.**
  Even uncontaminated piles can be ugly and smell bad. Locate your stockpiles where they will be unobtrusive to the public and will not generate complaints. Visible and accessible roadwaste stockpiles also attract illicit dumping.
- **Locate your stockpiles where problems will be promptly noticed.**
  Erosion, bad odors, problems with wildlife, etc. can be addressed quickly if your stockpile is seen by workers regularly and inspected frequently.
- **Allow for quick and easy access by authorized personnel.**
  Provide ample room to maneuver large equipment and move your stockpile.
- **Do not locate stockpiles on wet spots, slopes, or unstable ground.**
  Inappropriate placement of roadwaste can lead to contamination or erosion problems.
- **Do not stockpile roadwaste on gravel surfaces and open ground.**
  If you are storing material contaminated with fuel, oil, grease, fertilizer, pesticides, etc., your stockpile will need to be lined or located on an impermeable surface (asphalt or concrete). Storage of any roadwaste on gravels, sand, or over fractured basalt substrates (a common geological feature in Eastern Oregon) encourages ready migration of contaminants to the subsurface. Groundwater impacts are especially expensive to remediate.
- **Do not locate stockpile sites near open waterways.**
  Allow at least a 50-foot setback from any body of water. Avoid floodplains.

Storage and Containment

- **Select an appropriate storage system for your waste.**

Open stockpiles encourage composting and breakdown of hydrocarbons (oil and grease), but wind and rain can erode open stockpiles. Appropriate coverings include plastic, tarps, sand sheds, and enclosed buildings. GM barrier lined with geo-fabric or plastic sheeting can make a good temporary roadwaste storage bay if located appropriately.

- **Minimize erosion and stormwater runoff.**
  If your storage site is in the open without cover, detention and treatment of stormwater will normally be required. Suspended fines in runoff can be difficult to treat. Do not expect detention ponds to be adequate to remove these fines. Design your storage to reduce risk of contamination of site stormwater. If your storage practices are impacting runoff, contain your stormwater and review appropriate technologies for treatment and management.
- **Protect the stockpile site (and adjacent area) from contamination.**
  Stormwater can pick up pollutants as it flows through your stockpile and contaminate nearby waterways, adjacent stockpiles, underlying soils or groundwater. Pollutants include metals, hydrocarbons, pesticides, trash, bacteria, nutrients (nitrogen or fertilizer) etc. Fine silts, soils, and sand are also considered pollutants if they are deposited in adjacent waterways. Line your stockpile site with an impermeable membrane (geo-textile, plastic sheeting, fine clay, etc.), or place your roadwaste on asphalt or concrete if you suspect pollutants are present.

11.3 ONGOING RISK

The risks identified above are moderate and do require management. While contaminated runoff impacting state waters is usually the main concern, operation of a non-permitted solid waste landfill and site contamination issues are also significant concerns. Screening roadwaste for potentially “hot” loads will reduce the likelihood of site-specific impacts, though care in storage is essential in limiting environmental liability.

Various roadwaste stockpile sites have been cited for environmental non-compliance in the past. In assessing old roadwaste storage in former gravel pits, Washington DOT found sufficient evidence of potential environmental liability to decide to dig out all of this waste and dispose of it at permitted landfills. Washington Department of Ecology is investigating one former WSDOT pit fill site, finding groundwater contamination at the regulatory cleanup threshold. WSDOT is monitoring the groundwater. Impacts at this site are from contaminants present in normal roadwaste.

12.0 READY REUSE OPTIONS

12.1 INTRODUCTION

Your goal is to manage the materials you collect from roadways efficiently and protectively. The ready reuse options presented here can help accomplish this goal for some materials. These ideas were introduced in **Chapter 2**, where you assessed the waste your District collects. This chapter presents the following options:

- Reuse of Clean Fill
- Rock and Gravel Reuse
- Winter Road Sand Reuse

You can readily manage these materials as "product" rather than as "waste." This assertion relies on two important facts:

1. Clean dirt and rock is clean to begin with. Note that DEQ accepts only clean dirt, rock, brick, concrete, and weathered aggregate asphalt as clean fill. To use anything else as fill requires a special exemption from DEQ.

2. All of the common roadwaste contaminants adhere to the surface of particles. The surface area per weight of rock, gravel and coarse road sand is very low compared to the comparably huge surface area in the same weight of silt or clay particles. Research has shown that particles the size of coarse sand and above do not carry appreciable levels of contaminants except in the obvious cases of a direct spill of a toxic substance.

Following the proposed guidelines, reuse of the selected materials is safe and relatively easy. Maintaining separation is the key to ready reuse. If crews mix together sweepings, dirt from a construction site, winter road sand, rock and gravel in the same loads or the same storage pile, you no longer have readily reusable materials and some sweepings. You have a mess on your hands. You might be able to make an effective argument in support of use of the contents of this mixed waste pile for some specific reuse as a product, but why not take the easy route? Keeping separate the different materials you collect will ease reuse and, if necessary, should minimize disposal costs.

Region 1 uses screening to separate the trash from its sweepings. The same units can use two screens to recover winter road sand, one to remove trash, the one below to capture the road sand and let pass the finer particles. Contaminated fines might be managed with sweepings; non-contaminated material (never in contact with road grime) could be managed with clean fill. In drier loads, it may be possible to use an air knife unit to remove trash and fines (see **ODOT Roadwaste Field Trials** for more on this technology). Trash has few options besides landfilling. Little of the trash you collect will be readily recyclable. Where possible, recycling efforts including recovery of scrap metal is encouraged, though. Leaves and brush can be composted (see **Composting Option**).

The last detail is to always use proper storage techniques. Review the principles set out in **Chapter 11, *Storage Considerations*** and use diligence. Prevent runoff problems associated with fines. Site and groundwater contamination should be non-issues with these materials. Insure readily reusable materials are managed separately and your District waste management will be in good shape.

READY REUSE OPTION: Reuse of Clean Fill

Discussion
Local agencies (city and county governments) regulate fill activities. A local fill permit is usually required. Filling in wetlands is prohibited without a permit from the Oregon Division of State Lands and the U.S. Army Corps of Engineers, with DEQ review. Again, open storage of clean materials should follow the guidelines set forth under the **Chapter 11,** ***Storage Considerations***.

Issues to Consider
The primary issue is correct identification. Materials collected from roadways are normally impacted with road grime contaminants and trash. A large quantity of plant materials is often present in slide and land-clearing debris. Contaminated materials and materials impacted by trash or natural organic wastes cannot be used as clean fill. Problems associated with contaminated materials are obvious, but why can't clean brush go into fill? The problem is two-fold. First, plant materials release nitrates. In fill situations, these nitrates contribute to nitrate contamination of groundwater – a significant problem, especially in farming communities and mill towns. Second, when plant materials decompose, they substantially reduce in volume, creating settling problems on the ground surface. Studies of some sweepings used as utility trench backfill in Massachusetts show a reduction in volume of up to 15%. The backfill is now mounded up, with the expectation that the organic matter will degrade and the fill will settle with time.

Use of clean fill by farmers is reasonable. ODOT has been cited, however, when its ditching spoils were improperly managed on farms, resulting in release of mud to a stream and placement of material in wetlands. Gifting clean materials may or may not carry extended liability. It is appropriate to get a signed statement of intended reuse and plan for storage before releasing clean fill. As with storage, a 50' setback from all water bodies and wetlands is recommended for placement on non-ODOT properties.

Ongoing Risk
Proper identification of materials as clean fill will ready them for use. There is no appreciable environmental risk in reuse of clean fill if proper storage and fill practices are observed. Use of correct storage procedures will prevent cross-contamination and runoff problems. Follow all local fill rules. Observe standard precautions when considering whether the physical characteristics of the material match your intended purpose.

READY REUSE OPTION: Rock and Gravel Reuse

Discussion

If the rock and gravel you collect maintaining roads has not been impacted by a toxic substance spill, contains few or no fines, and has no trash, it qualifies as clean fill. It is ready for reuse. Manage it as a "product" rather than a "waste."

Issues to Consider

Use proper storage practices to control stormwater runoff. Control of fines is the concern: the fines are where the contaminants are concentrated, and the fines themselves present environmental concerns (see Field Decanting Options). If a significant amount of silt- or clay-sized particles is present in the gravel and rock you collect, you may have to screen out the fines prior to reuse or long-term storage. You could also look to sand washing as an option to clean out fines. (See **Winter Road Sand Reuse** on the next page.) Manage contaminated fines with sweepings or with vac waste. You may manage uncontaminated fines that have never had contact with road grime in with your clean fill.

In some cases, hand pulling trash and recyclables such as scrap metal may be more workable than screening. Separating trash out with an air knife may be another option, but be careful with windblown dust. The trash must go to a DEQ-permitted landfill.

Ongoing Risk

As we've emphasized throughout, only the presence of fines and trash, or direct impacts from release of petroleum or another toxic substance, would bring up questions of environmental risk for gravel and rock.

READY REUSE OPTION: Winter Road Sand Reuse

Discussion

The major challenge in reusing winter road sand is getting it off the road quickly after the thaw. Beat down, it isn’t useful as road sand. And the more it gets beat down, the harder it is to process out the fines and the trash. Left in place for more than a few days after a thaw, depending on traffic, it probably will require processing for reuse as road sand. Much more than a week to ten days, and processing may no longer be a realistic option.

Issues to Consider

Trommel screens can be used to screen out trash and fines. ODOT Region 1 uses a Reed Screen-All to screen for trash. The unit is capable of screening out trash, catching winter road sand, and letting the fines drop out. Trash must be taken to a DEQ permitted landfill. You can manage the fines in with your sweepings or storm drain vac waste.

Sand washing is an option used by some agencies. The idea is to remove the fines, not only leaving you with a more useable product, but removing the vast majority of the contaminant load and suspended solids. Of course, wastewater should be routed to sanitary sewer unless discharged to the surface under a DEQ permit. Sand washing may be an easier option if you have ready access to a field decant station, a vac waste dewatering station, or a truck wash station. Use of an approved evaporation pond may be workable for Eastern Oregon, and unlikely in Western Oregon due to poor evaporation rates. Discharge of wastewater loaded with suspended solids is not attractive for many sewerage agencies, but with 24-hour settling or use of a flocculent, sand washing wastewater should be okay to release to sanitary sewers.

Another method to consider is to not generate the winter road sand to begin with. Deicing and anti-icing chemicals are appropriate for many areas. When calculating the cost of using these compounds, you should take into account not only the savings from road sand purchase and application, but also the costs of sweeping up and managing waste road sand.

Ongoing Risk

Again, besides trash content, the major issue is the fines. If you can remove road sand promptly, it should be intact and ready for reuse with minimal if any processing required. If processing is required, use proper storage practices to minimize risk (see Storage Considerations) and manage all solid and liquid wastes responsibly.

13.0 FINAL DISPOSITION OF ROADWASTE SOLIDS: Reuse, Treatment And Disposal Options

13.1 INTRODUCTION

As a transportation agency, ODOT is required to accept long-term liability for the wastes it collects from highway maintenance. Only in cases such as a reported spill incident can the responsibility for waste management be placed on another party. Liability for environmental impacts from the wastes ODOT collects is unending; it is "cradle to grave." The challenge is to substantially limit risk and liability while not incurring undue cost.

13.1.1 Two major choices for managing roadwaste solids: Reuse or Disposal.

The key to reuse is viewing roadwaste as something of value rather than as something to discard – *as a potential product rather than a waste*. If you have efficient and protective methods to manage roadwaste as *productive material*, stringent waste management regulations may not apply. Rather than paying tipping fees for disposal, the product is used to replace materials you might otherwise need to purchase. Reuse also reduces the burden on expensive and difficult-to-site landfills.

For a reuse option to work, it must protect human health and the environment while reducing your total cost for managing the waste. Almost all reuse options will require laboratory tests, at least sufficient to establish baseline levels of contamination, and some may require long-term tracking of reuse sites. The costs of these activities should be assessed prior to deciding on a final disposition method.

Disposal of solid waste requires a DEQ permit. Only clean soil materials, weathered asphalt and concrete can be used as fill material without first obtaining a permit. Long-term storage, such as stockpiling, will be seen as disposal unless it can be shown to state and local environmental agencies that you are treating or storing for eventual legitimate reuse. Making sure you aren't storing loads full of trash is a good first step towards establishing credibility with regulators. Many ODOT Maintenance operations now routinely screen loads for trash.

If your District generates any significant volumes of roadwaste, tipping fees at a DEQ-permitted solid waste landfill can add up fast. Tipping fees range from about $20 to $60 per ton. In ODOT Region 1, the cost would add up to $750,000 per year for sweepings alone.[14] The benefits of disposal in a permitted landfill – virtually eliminating future liability (site and groundwater contamination, and runoff issues) and no required laboratory testing except for questionable

[14] See Julee Reynolds' study "ODOT Region 1 Roadwaste Screening Report," in *Roadwaste: Issues & Options*, Appendix C (*Collins 1998*).

loads – will likely be outweighed by high costs. High disposal costs lead transportation and public works agencies to seek workable reuse options.

13.2 REUSE OPTIONS

Finding efficient and legitimate reuses for roadwaste is important to keep costs down. **Chapter 12, *Ready Reuse Options***, discusses clean fill, winter road sand reuse, and managing gravel and rock. Besides screening for trash and keeping an eye out for impacts from spills and releases, no treatment or tracking of these clean materials was recommended. Most direct reuse options examined below do require additional handling and/or tracking. Various treatment methods are presented in the next section that can make your roadwaste ready for reuse. This section covers the following reuse options:

- Rock Fall Berms and Noise Barriers
- Use as Soil Amendment (freeway infields/median or agricultural use)
- Poor Grade Utility Trench Fill
- Highway Shoulder Repair
- Asphalt or Cement or Pre-fab Concrete Manufacture

Remember that raw contaminant levels and cleanup thresholds are not the deciding factors in assessing reuse options. The deciding factor is whether that option represents a beneficial reuse that allows you to efficiently manage the risks posed by the material. Appropriate reuse addresses more than risk from contaminants, however; it finds a good fit for the material. You do not want your roadwaste showing up in schoolyards, even if it tests below residential cleanup levels. Nonetheless, testing above industrial cleanup levels would not prohibit legitimate and protective reuse. As discussed earlier, untreated roadwaste has poor drainage characteristics and a poor compaction rating. Sweepings, vac wastes, etc. have a high organic component that will decompose, leading to settling, sinkholes and cracking. Thus untreated reuse of these materials is **not** recommended as construction site fill, or under roads or parking lots. High temperature thermal treatment, which burns off the organic materials along with the contaminants, can make fill options workable, though.

Long-term tracking and monitoring of reuse sites may be required. DEQ initially planned to require a disposal permit for ODOT’s rock fall berms of roadwaste along I-205 at Rocky Butte. Later, DEQ was less certain that a disposal permit was required, since they found that the material had been screened for trash and tested for contaminants. DEQ review may be required for any use that looks like fill or long-term storage or treatment, at least until a more formal position can be reached on acceptable reuse options for some roadwastes as productive materials. (Tracking placement by deed restrictions was also discussed in **Chapter 1** under CLEANUP RULES.) Compliance issues are examined more specifically under each reuse option presented below.

REUSE OPTION: Rock Fall Berm or Noise Barrier Construction

Discussion

Marginally contaminated roadwaste might be suitable for use as berm material. Issues listed under "Storage in Stockpiles" in **Chapter 10** should be considered. ODOT Region 1, District 2B, constructed a berm of roadwaste and landslide debris at the base of Rocky Butte in the City of Portland to prevent rock fall from reaching the I-205 freeway (Figure 13.1). Runoff from this area is contained and infiltrates into the ground through a level grassy area. There is no ready access for human contact. Sampling shows contaminant levels in the berm to be well below industrial cleanup thresholds. The berm and berm water runoff have been routinely sampled to assess contamination risks and to monitor the natural bio-degradation of petroleum contaminants.

Figure 13.1: Clean roadwaste used as berm material

Issues to Consider

- **Remove trash.**
  Solid waste rules require that trash be removed prior to legitimate reuse.
- **Limit public access.**
  Place barriers on ODOT-controlled property, so it is inaccessible to foot traffic.
- **Contain or treat stormwater runoff.**
  Monitor for pollutants to insure they do not escape into runoff or into accessible areas of the property.
- **Limit contaminant levels to below DEQ's industrial cleanup thresholds.**
- **Mixture with uncontaminated materials will reduce contaminant concentration.**
  Roadwaste testing below the industrial cleanup standard might be mixed with clean fill or clean slide debris to reduce site contamination risks. Clean material can also be used to cap and contain material with low but significant contaminant concentrations. Any mixture of clean materials with contaminated materials, however, runs the risk of creating more contaminated materials.
- **Plant and/or mulch berms.**
  Limit erosion and control dust.
- **Encourage biological treatment of contaminants with open air and plantings.**
  You may also choose plants for on-site phytoremediation (see TREATMENT OPTIONS below).

Ongoing Risk

The risk associated with using roadwaste for berms is low to moderate. With restricted public contact and controlled stormwater runoff, risk is dependent on contaminant concentration, site and soil characteristics, and future site use. Long-term tracking and monitoring of reuse sites is appropriate. Your local ODOT Region Environmentalist or DEQ representative can help assess proper placement and long term management of these berms.

REUSE OPTION: Use as Soil Amendment

Discussion

The key elements are risk and cost. Use of roadwaste as soil amendment reduces costs substantially, and can even offset costs of purchasing new product. Risk can be effectively controlled by choice in placement. Most roadwaste has decent drainage characteristics, plentiful nutrients, and good water retention, with a good mix of particle sizes appropriate as an effective growing media. So, after the usual screening for trash, limited use of roadwaste as a soil amendment appears fairly feasible. However, any placement of contaminated material into the environment must be closely scrutinized.

Issues to Consider

In Oregon, agricultural reuse for growing crops would exempt the material from the definition of solid waste, since materials for legitimate farm use are exempt from regulation by DEQ. However, the impacts of such reuse could be regulated by DEQ: stormwater runoff, site contamination, filling or contaminating wetlands, or windblown dust. ODOT has been cited for giving materials to farmers for use as cropland soil amendment, which were subsequently used as wetland fill or allowed to run off uncontrolled into waters of the state. Widespread or inappropriate reuse might lead to local or statewide efforts to control placement. Allowing contaminated or even uncontaminated waste-like materials to be managed outside ODOT control is a risk.

Washington DOT (WSDOT) mixes vac waste with wood chips for an effective growing medium. WSDOT uses it in freeway infields and medians. WSDOT tracks placement and conducts regular tests to track contaminants. The basic premise of WSDOT’s reuse is the control of risk. They manage vac sludge as a product where risk of exposure is very low and risk of transport is minimized. It is placed over existing soil or clay, not over quickly draining sand or gravels. The wood, serving to improve the growing media, also fixes metals and petroleum compounds.

Simple treatment by aeration has been observed to substantially reduce petroleum concentrations. The expected reduction of simple compounds prior to reuse will limit risk of transport. Heavier and harder-to-treat compounds are less mobile. With runoff issues controlled during placement and good vegetative cover, the problem becomes long-term tracking. Drying the vac sludge is not essential, as plantings do require moisture.

Ongoing Risk

To pursue reuse of roadwaste as a soil amendment, the District needs to know the characteristics of the material. Placement of a product that would result in surface concentrations above industrial cleanup levels would be difficult to support. When allowing reuse of untreated roadwaste on land out of ODOT control, a contract with the landowner is recommended, limiting placement to cropland, with a significant setback from any water conveyance, state water, or wetland. A simple site review by qualified ODOT staff is recommended. Any material released should be at most only marginally contaminated, i.e. having a baseline waste characterization below industrial cleanup standards. To encourage further aeration and reduce chance for movement to the subsurface, placement should be limited to within two feet of ground surface. In addition, limit placement to areas with little or no chance of human exposure.

REUSE OPTION: Poor Grade Utility Trench Fill

Discussion

Massachusetts allows use of sweepings as poor grade utility fill. They term it “poor grade fill” because it has a poor compaction rating, quickly loses volume, has poor drainage characteristics for use as fill, and is marginally contaminated. Still, use as fill over utility lines is workable and can be protective. They do note that the trench must be mounded up to allow for a substantial volume reduction in the fill material. Otherwise, the utility line will start to look like a shallow ditch and will accumulate runoff. Massachusetts does not allow reuse of catch basin vac waste as fill, judging it to be too contaminated.

Issues to Consider

Given the known problems with use of roadwaste under paved surfaces, placement is only recommended under open ground. What makes this option work well is that the material is not placed in concentration, so overall site impacts are not likely.

Ongoing Risk

Limited reuse as poor grade utility fill away from ready human contact should not present significant risks. The use should be limited to commercial or industrial properties and agency-controlled, limited access areas. An uncontaminated soil trench cap can further limit potential exposure. Tracking placement of materials below industrial cleanup levels or on ODOT-controlled, limited access areas should not be necessary. With a baseline contamination level established for your vac waste, you may find reuse of it as poor grade utility fill, also.

Be careful to not stockpile roadwaste for reuses that may never materialize; this reuse may be more appropriate for public works agencies with greater need for utility trench fill. Again, screening for trash will likely be required prior to reuse.

REUSE OPTION: Highway Shoulder Repair

Discussion

As in the discussion of Poor Grade Utility Trench Fill (previous page), a load of sweepings or vactor waste can substantially reduce in volume with time. Its high organic matter content reduces in volume as it decomposes. This substantial reduction in volume is coupled with very poor compaction ratings for sweepings and vactor waste. If these materials are used as highway shoulder fill, they could be a source for soft shoulder problems in the future.

Issues to Consider

Since most highway shoulders drop off into ditches, water quality issues will be another important factor limiting reuse of sweepings and vactor waste in many locations. Only material free of trash, low in organic matter, and low in contaminant concentration would be a good candidate. Clean dirt and rock from construction or slide areas could be used; as always, care should be taken to prevent erosion of freshly placed materials into the drainage system.

Ongoing Risk

Concerns over ready loss of contaminants, organic matter, and fine sediments to roadside drainage ditches are big a limiting factor. Potential for public access is another issue limiting use of more highly contaminated materials. It is important to limit material used for highway shoulder repair to relatively clean materials with good compaction ratings.

REUSE OPTION: Asphalt, Cement or Pre-fab Concrete Manufacture

Discussion

Asphalt and cement manufacturers can use fines or sand-sized feedstock from a variety of sources. Asphalt plants need dry materials free of trash and they can use petroleum-contaminated soils. They tend to avoid materials with any significant organic matter content, however.

Cement manufacturers process their feedstock in a kiln, creating sand-sized particles for cement production. Cement kilns operate at extremely high temperatures; any organic matter present burns and as such adds fuel to the fire, which can create serious upset conditions if not anticipated. Cement kilns need to know the percent of organic matter present in their feedstock. La Forge (previously, Holnam), a cement manufacturer in Washington state, specifies that vactor waste be free of oversized materials and debris, and tested for the eight TCLP metals to insure they are not accepting hazardous waste. Each manufacturer will impose its own conditions on acceptance.

Issues to Consider

Consistent supply of consistent material is the key. Water content, trash content, organic matter content, particle size, and amounts are all important factors. As a supplier, you must be able to deliver product to meet the manufacturer's schedule. Your District's schedule in collecting wastes should be considered, as well as your capacity to safely store roadwaste materials you know will go for reuse. Sweepings that have "cooked out" (i.e. composted) might make better asphalt feedstock, and might supply a more consistent organic matter percentage for cement production. Testing requirements might be waived after you can show that you can bring in a consistent product.

Although it takes planning and effort to get your roadwaste into a manufacturing process, it can pay off. Using your more contaminated and problematic material (which poses higher disposal or management costs) as feedstock could yield substantial savings. The basic issue of consistency should be pursued in developing good partnership opportunities and long-term business arrangements. Transportation costs should be factored into any plans for use as feedstock, and hauling distance could limit the applicability of some business opportunities. This said, shipment to distant manufacturers could potentially be more cost effective than disposal. ODOT is a big purchaser of asphalt and concrete. This puts you in a good negotiating position to get your roadwaste into reuse. Materials contracts might reasonably specify that a minimum percentage of acceptable roadwaste materials be used as feedstock.

Ongoing Risk

Long-term risks are little to none. The high temperatures in cement kilns destroy the PAHs and TPH fractions. Heavy metals are bound into the cement and are unlikely to pose a concern at the concentrations present. Heavy metals do have the potential to be a concern, however, in the disposal of cement mixer wash-out water; this question may deserve study, although cement manufacturers currently use many other materials with higher metals concentrations as feedstock. PAHs do not pose a risk in asphalt, and asphalt uses petroleum as a binder, anyway. Heavy metals content in waste asphalt should not prove to be a significant concern.

13.3 TREATMENT OPTIONS

Treatment is more cost effective than disposal if the treatment costs (testing, hauling, managing, permits, treating, and tracking) are less than or equal to the disposal expenses plus the cost of buying the product new. This section covers the following treatment options:

- Composting (greenwaste and mixed)
- Thermal Treatment
- Passive Bioremediation (simple aeration)
- Active Bioremediation (enhanced methods)
- Phytoremediation (using plants to treat out contaminants)
- Soil Washing
- Evaluating New Options (See DISPOSAL OPTIONS for Reuse as Landfill Daily Cover)

TREATMENT OPTION: Composting

Discussion

Composting can use a variety of materials as feedstock. Composting your own leaves and grass ("greenwaste") can bring savings over hauling the material to a commercial composter, especially if you use the compost to replace growing media now purchased elsewhere. For efficient composting, some brush may require chipping, and thick, woody wastes may require tub grinding. Reuse of wood chips and making wood available for home use may be workable, also. Washington DOT recycles their vactor sludge into a growing media by mixing it with wood chips.

Issues to Consider

Composting of non-greenwaste materials is also possible. The City of Portland has been composting greenwaste and sweepings for several years and evaluating their efforts under a DEQ and EPA solid waste recycling grant. They have encountered good success and their report is expected out soon. Commercial composters have had a lot less success composting sweepings and have found even less success with vactor sludge.

The first problem you will encounter in composting sweepings is removing the trash and sharps (hypodermic needles and glass). Cigarette butts are prevalent and particularly hard to screen out. Dan Dobson at Great Western Sweepings in Tualatin, Oregon, has worked out a dual screening system that seems to work well.

The next problem is when to add the sweepings in with the greenwaste. Conventional wisdom has been that active composting will help treat petroleum constituents in roadwaste, so you should combine sweepings and greenwaste before composting. Dr. Ervin Hinden from Washington State University showed that roadwaste is biologically active enough to "cook out" on its own.[15] Roadwaste does not need the turning that normal compost does, since it has a much lower oxygen demand. Treatment studies have also shown that petroleum compounds can bind with organic matter; no longer bio-available, they don't treat out, they just hide out. Thus, composting sweepings separately will break down the petroleum compounds. However, it is good to know that woody waste and compost are useful because they can fix both metals and carcinogenic PAHs, preventing them from escaping into the surrounding environment.

Ongoing Risk

DEQ requires permits for compost operations exceeding 25 tons of input per year. There are benefits to obtaining a permit: DEQ can help solve site stormwater issues and provide you with technical assistance to ensure a good product. You will need to know how to avoid hot spot fires and also how to not end up with a stinking mess. The City of Portland study mentioned above may result in a better understanding of risks associated with composting. The use of composted material on lands outside of ODOT control is not recommended except for designated farm use (see Use as Soil Amendment). Although composting requires significant time and expense, the challenges are manageable and, in the right areas, the results will be well worth the effort.

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[15] *Management of Hazardous Waste from Highway Maintenance Operations* (WSU/Washington DOT 1993)

TREATMENT OPTION: Thermal Treatment

Discussion

Thermal treatment is often used to destroy the gasoline and diesel petroleum fractions in soil collected from underground storage tank cleanups. Gas and diesel can be removed at relatively low temperatures. However, the gasoline and diesel fractions do not pose the most significant risk for management of common roadwastes. The low-temperature thermal desorption technology used by mobile soil burners does not destroy the major risks – carcinogenic PAHs and heavy metals. Therefore, low temperature thermal treatment is not especially useful for roadwaste. High-temperature thermal remediation (exceeding 650° F) appears to volatilize a significant portion of the CPAHs, substantially reducing the concentrations of the most significant contaminant. Volatilized contaminants not immediately destroyed are burned off at temperatures above 1,200° F in an afterburner.

Issues to Consider

The City of Portland takes their vac waste to TPST's high-temperature thermal desorption facility in North Portland. Prior to thermal desorption, the material is screened for trash, as shown in Figure 13.2. Water content needs to be 30% or less; this can be achieved by mixing with other batches. Treatment of CPAH-contaminated batches has shown that this technology can remove these compounds. United Soil Recycling of Woodburn runs a special batch treatment process, cooking soil in an envelope for a week or more. Heated pile technology is expected to work as long as the material can effectively be stacked with the heating pipes. They also have treated batches of CPAH-contaminated soil.

Figure 13.2: Drum screening equipment for screening trash prior to thermal desorbtion, TPST Facility in North Portland. Photo by Katie Bretsch, 1999.

High-temperature thermal treatment normally results in a sterile product, with all of the organic contaminants and vegetative matter destroyed. The compaction rating of the product is sufficient for use as construction fill. With no organic materials, there is nothing to degrade. The material, however, is no longer suited for use as a growing medium.

Pre-testing is currently required for each batch of waste processed in a high-temperature thermal desorption unit. These pre-testing regimens are required in the Air Contaminant Discharge permits issued by DEQ. Tests include TCLP heavy metals. The facility cannot accept roadwaste with a contaminant level so high that it qualifies as a hazardous waste. If high-temperature thermal treatment is commonly used to treat roadwaste in the future, a District might show that its roadwaste has never exceeded the limits. ODOT and the burner could negotiate with DEQ for a permit amendment to avoid or substantially reduce the costs of ongoing laboratory analysis. These units are not garbage incinerators, but a minimal level of trash content may be allowable.

Ongoing Risk

This is a relatively conservative technology most appropriate for urban and high-ADT vac waste, but it may be appropriate for other roadwastes, as well. The City of Portland has netted $15 per ton cost savings over using Metro area landfills. DEQ recommends post-testing for leachable heavy metals and CPAH concentrations until testing shows that they would not exceed residential cleanup levels and thus could be safely reused as fill. Little to no environmental risk is expected from roadwaste that has undergone high-temperature thermal treatment if adequate treatment standards are maintained.

TREATMENT OPTION: Passive Bioremediation (Simple Aeration)

Discussion

Bioremediation is a treatment method that allows natural microorganisms to break down contaminants. These "bugs" can eat petroleum, using it for energy, releasing carbon dioxide and water (same as humans breathe out). Bioremediation cannot be used to "treat out" heavy metals, however. They either stay in place or are taken up in the microorganism and pose about the same risk. The term "passive bioremediation" means the microbes already present do their work, without steps taken to enhance their activity. In cleanup parlance, this is often termed "natural attenuation." As noted above and documented in **Roadwaste: Issues and Options**, roadwaste piles left alone to naturally bio-remediate have had little or no detectable total petroleum hydrocarbons (TPH) in as little as six months.

Issues to Consider

Reducing diesel and heavy oil fractions does not eliminate the major risks associated with physical contact with roadwaste. The heavy metals and most of the CPAHs are still present. They are tightly bound into the material, however, and not readily transported to groundwater or surface water. In reducing TPH concentrations substantially, the most mobile and highest concentration contaminants are removed from the equation, making placement away from ready access much more workable. Uses for passive bioremediation include preparation for direct reuse (e.g. in noise barriers or rock fall berms), reduction of active decomposition and preparation for landfilling in a roadwaste landfill. DEQ can regulate treatment of solid waste, and may require permits for passive bioremediation sites. DEQ involvement may not be a negative, since the permitting costs are offset by the technical assistance provided by regulators. In the process of dealing with regulators it is important to make sure that the requirements they impose address actual risks.

Ongoing Risk

Significant risks must still be addressed after passive bioremediation. CPAHs and heavy metals are still present. The organic matter should be degraded enough, however, that release of nitrogen compounds to the subsurface is minimized. See **Chapter 10, *Storage Considerations*** above for runoff control procedures. Breakdown of organic matter releases organic acids, reducing pH. Lower pH environments can mobilize heavy metals. The same process can happen with composting roadwaste. Take care to minimize, control, monitor and/or treat stormwater runoff from all storage and treatment areas.

TREATMENT OPTION: Active Bioremediation

Discussion
Active bioremediation enhances the effects seen in passive bioremediation. It is more than letting air, sunlight, and the natural microorganisms present do their work. Active bioremediation technologies include the use of "super-bugs," additional nutrients to help feed the microbes, surfactants that release bound contaminants, and chemicals that help break down complex chemicals or that provide chemical sources of oxygen. Peroxides can break down complex carbon chains, in some cases making them more ready food for existing microbe populations, as well as introducing needed oxygen.

Issues to Consider
The main emphasis in "super-bug" production has been in treating petroleum-contaminated soils from underground storage tank cleanup sites. These lighter petroleum compounds are not a concern in roadwaste. The nutrients and microbe populations in roadwaste are usually quite capable of dealing with the normal petroleum fraction (see Passive Bioremediation, above). Thus, using a product designed to break down gas and diesel fractions as a roadwaste treatment technology can be a waste of time and money.

The microbes found in roadwaste are of hardy varieties. Some of the specialized microorganisms introduced to treat complex carbon compounds do not compete well with natural microbes. Special conditions may be required, including the following: the presence of special nutrients or chemicals to enhance or kick-start biological activity; a certain temperature range perhaps found only during special times of the year; or a tight pH soil acidity range. Liming agents and other pH adjusters can be used to create an environment better suited to the microbes you are using. Nutrients may be needed.

Aqueous bioremediation is discussed in dewatering facility design (see Wet Treatment Technologies). Oxygen introduced into the slurry allows the waste to be treated aerobically. Bioremediation with anaerobic organisms is also sometimes feasible but usually takes much longer. The basic notion of wet treatment is the same as for dry treatment: introduce a consortium of microbes to treat petroleum and CPAHs, turning these compounds into carbon dioxide and water. Surfactants may be required. Wet treatment as a part of a general dewatering process may be affordable in volume if a vactor pad dewatering facility is designed to hold and treat wet vactor waste, then de-water in the same cell.

Overall, active bioremediation is considered an expensive option practical for only a small percentage of roadwaste. Placement of treated materials depends on the success in reducing CPAH concentrations. Of course, heavy metals will not be removed. If heavy metals are present in high concentrations, they could limit potential reuse and may point you towards landfilling that waste.

Ongoing Risk
Active bioremediation of roadwaste should focus on destruction of the CPAHs. Several samples should be run through a lab after treatment to establish that the treatment was successful.

TREATMENT OPTION: Phytoremediation

Discussion

Phytoremediation involves using plants to treat contaminants. Work has been done to isolate plant species that are good at removing or destroying certain types of contaminants. For the heavy metals in roadwaste, planting a variety of grass that is known for its high uptake of lead could result in a crop of grass high in lead content. The grass could either be disposed or, if high enough in lead content, be sent to a smelter to recover the lead. Lead values as high as one percent by weight have been observed in grass, as rich as in some commercial ores.

Issues to Consider

The main use for phytoremediation in addressing roadwaste is planting opportunities along highways. While metals are a risk driver, carcinogenic PAHs are the main risk driver. Besides CPAHs in roadwaste, you can expect that high-traffic roadway corridors may increase in CPAHs over time, due to the incomplete combustion of petroleum fuels. Mulberry bushes have been shown to break down CPAHs in the rhyzosphere (the biologically active root zone). Using plantings could be valuable both in treating roadwaste contaminants and as cover crops for roadwaste reuse sites. Using the right plants can also provide a defense against the build-up of CPAHs expected along high traffic corridors.

Ongoing Risk

The use of plants to reduce contaminants works! Reductions have been observed in the field. Since roadway maintenance practices require planting cover crops, consider selecting cover crops that will reduce contaminant levels and act as a defense against future contamination.

TREATMENT OPTION: Soil Washing

Discussion

Soil washing removes contaminants from problem soils by rinsing. The main problem in using this technology for roadwaste is that metals and heavy hydrocarbons are adsorbed onto the surface of particles and will not readily dissolve into water. The goal is removal of the more highly contaminated fine particles from roadwaste, leaving the larger particle size fractions ready for reuse. (The wastewater would then need to be treated and the contaminated fines managed conservatively.) It may be possible to find a way to release all the contaminants into the rinsate, leaving clean dirt and contaminated water, which could be treated separately.

Issues to Consider

Removing fines creates a secondary problem: effectively managing the wastewater. Besides evaporating the water in large ponds (only effective in drier parts of the state or in midsummer), there is no simple technology to de-water the lighter suspended fines.

An aggressive surfactant may be able to break the bonds holding the contaminants to the roadwaste. However, these soaps or chemical agents themselves can be a problem. Lowering the pH of a roadwaste slurry could dissolve heavy metals into solution. Then the water could be chemically treated, flocculating out the metals. This would be an intensive process, however, and would not address the main risk driver (CPAHs). Thus acid release approaches do not appear workable. Removal of the liquid without entraining fines is difficult.

Field trials on this treatment method have not been conducted, so it is not known how applicable soil washing is for roadwaste management. You may find a surfactant that will release heavy petroleum compounds and metals into solution for removal and recovery and does not pose environmental harm in the resultant product. It is not clear, however, whether this technology will prove workable. In theory soil washing could remove heavy metals and petroleum contaminants, leaving benign materials.

Ongoing Risk

There are too many variables to provide an overall evaluation of risk. If an effective release agent is found that does not itself contaminate the product, this might prove a good overall solution. The wastewater must be managed carefully, requiring a sealed system. Products resulting from any new treatment process would require laboratory tests to evaluate risk. DEQ would likely consider product from this process as waste unless ODOT has a use for it and/or it was no longer contaminated. As always, correct placement of clean product eliminates impacts to stormwater runoff.

13.4 DISPOSAL OPTIONS

A DEQ Solid Waste Facility Permit is required prior to disposal of solid waste. An adequate screening process will help insure that you are managing regular solid waste and pulling aside anything that characterizes as "hazardous waste" for special management (outside the scope of this report). Identifying what can be managed as clean fill and finding efficient reuse options should substantially reduce your disposal needs. The remainder is solid waste, which must be managed in accordance with DEQ solid waste management regulations.

Disposal in a DEQ-permitted, municipal solid waste landfill is expected to virtually eliminate any future liability. That can be a significant advantage to you. Landfills cannot accept liquids or wetter sediments, however. Costs for disposal at permitted landfills can vary widely.

Siting and obtaining a DEQ permit for a publicly-owned roadwaste landfill may be a better option if volumes are high and a good site is available. It is recommended that a roadwaste landfill be lined to prevent ready release of contaminants. Sharing costs and sharing liabilities with other government agencies is reasonable.

It is important to reconsider past practices. Disposal of roadwaste that does not classify as clean fill should not go to unlined construction and demolition (C&D) landfill. Many former sand or gravel pits operating as clean fill landfills are accepting roadwaste. The porous matrix of sand and gravel and the ready access to the water table at these sites makes them inappropriate for use as roadwaste landfills. Some sites have virtually injected contaminants into the subsurface by placing roadwaste in direct contact with the groundwater table. Problems in other states with old, unlined fills, are leading them to clear their roadwaste out of burial sites. Washington DOT is conducting site assessments and characterizing stockpiles of roadwaste, examining the potential for harm. When assessing your District's stockpiles, consider the necessities of removal or permitting and the potential for reuse.

Local governments can impose fees on management of solid wastes. Discussions with Roy Brower, Metro Solid Waste Manager, indicate that Metro will likely reduce their solid waste management fee for roadwaste materials disposed at Hillsboro Landfill. A reduction of $5 to $15 per ton from the current disposal charge may be in the works.

DEQ also has the authority to impose permitting requirements on solid waste treatment sites and transfer stations. Agencies and companies managing roadwaste should do their best to properly manage as much as they can as productive materials, using proper storage techniques. The remaining waste (from screening and other processing steps) should be promptly disposed. Local governments also have the authority to manage other aspects of roadwaste processing and may choose to do so if local problems are observed.

This section examines the following disposal options in more detail:

- Permitted Solid Waste Landfill (including use as Daily Cover)
- Permitted Roadwaste Landfill
- Review of Existing Un-permitted Stockpile and Disposal Sites

DISPOSAL OPTION: Permitted Solid Waste Landfill

Discussion

DEQ-permitted solid waste landfills are a sound, traditional waste management alternative. A local landfill could be your best option for small amounts of more highly contaminated wastes. Trash must be landfilled or recycled. Landfilling avoids costly laboratory tests and oversight. However, tipping fees for can be costly. An ODOT cost study estimated disposal of Region 1 sweepings at Hillsboro Landfill at nearly $844,000 per year for 12,700 tons.[16] This includes a $60 per ton disposal fee and $750,000 in hauling fees.

Landfills are permitted to accept wastes within specified toxicity parameters and manage those risks well. Most Oregon landfills are limited to 50,000 parts per million of total petroleum hydrocarbons (TPH), never a problem with roadwaste except in spill events. Landfill managers question unfamiliar waste, sometimes requiring tests. Testing normal roadwaste prior to placement in a DEQ-permitted solid waste landfill is not necessary and should be avoided if your District has a screening process in place to identify suspect loads. Informed DEQ Solid Waste officials may be able to help if testing arises as an issue. Landfills cannot receive liquids for fill. Dewatering vactor sludge presents a real challenge. When is it a solid and when is it a liquid? DEQ-permitted landfills use the "paint filter test" to make this determination: if liquid from a representative sample drips through a paint filter, you've got a liquid.

Issues to Consider

- **Avoid Unnecessary Laboratory Costs**
  Establish a good working relationship with your local landfill to avoid useless tests.
- **Use for Daily Cover**
  Landfills use daily cover to minimize odor, cover trash, and prevent the spread of bacteria by birds, insects and animals. Daily cover can be accepted at reduced rates or even at no charge. Incidental trash content may not be an issue. Recently, with the glut of available high-quality daily cover in the Portland Metro area, daily cover at Hillsboro landfill has received no reduction from the normal disposal rate. Some landfills accept petroleum-contaminated soils from underground storage tank (UST) cleanup sites as alternate daily cover. UST soils are exempt from the benzene hazardous waste characteristic rule and are often accepted at reduced rates. Demand is a key issue.
- **Consider Cost Savings**
  Landfilling can avoid screening, sorting, laboratory testing, and stockpiling costs.

Ongoing Risk

There is no significant risk associated with disposal of roadwaste at a permitted solid waste landfill. Landfills provide an advantage over many other longer-term management and reuse options. There is always the potential for rules to grow more stringent and for new chemicals of concern to be identified. Landfill disposal will avoid such unidentified problems. Disposal in a permitted landfill is considered completely protective under DEQ regulations.

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[16] See "ODOT Region 1 Roadwaste Screening Report" by Julee Reynolds, published in *Roadwaste: Issues and Options,* Appendix C (*Collins/ODOT 1998*).

DISPOSAL OPTION: Permitted Roadwaste Landfills

Discussion

Any permitted waste disposal site in Oregon must obtain a DEQ permit. Compliance fees are required. Landfill closure practices must be observed, perhaps including groundwater monitoring. A permitted roadwaste disposal site is a perfectly legitimate risk management option. Standard roadwaste contaminants, especially CPAHs, are relatively immobile, making roadwaste an excellent candidate for landfilling.

Issues to Consider

Site conditions are the most critical factor. Besides controlling public access to prevent illegal dumping and accidental contact, the potential for release to the groundwater table is the most important factor. Composting of materials with any active organic component is recommended. When microbes eat natural organic matter, they release carbon dioxide and water. They also often produce ammonia and nitrates, which, if not released as gas, can contaminate groundwater. Since organic acids can mobilize heavy metals into solution, pH should be monitored and adjusted if problems are observed.

Siting is also and issue. Besides a DEQ permit, you will need local land use approval. Public hearings on landfills can be a breeze or they can be contentious. DEQ Solid Waste officials can help you through this process. Truck traffic and road conditions can come out as the public's most significant concern. You should select sites in areas that are unlikely to have even perceived impacts to local citizens or the environment, such as industrial areas or areas not planned for residential development.

Shared facilities are a valuable option. Working with local transportation and public works departments and/or with existing public fill sites can cut costs for everyone involved and provide sites around the state to better meet ODOT's needs. The goal is to achieve protective and cost effective risk management. Operating at high volumes, costs of disposal at permitted roadwaste landfills are likely to be much lower than regular solid waste tipping fees.

Ongoing Risk

This option deserves serious attention, especially for those that handle more contaminated, urban center wastes. Design is the key. Landfill design is a civil engineering specialty. Hydrogeologists support the engineers with expertise in groundwater modeling and transport analysis of contaminants in the subsurface. Clay liners are often recommended, and other technologies such as geo-membrane textiles and leachate collection and treatment are possible. Acceptance procedures should be observed. If a roadwaste landfill can be sited by an existing landfill, siting problems will lessen, waste acceptance procedures can be handled by experienced personnel, site monitoring could all be part of the existing permit, and concerns over shared facilities would be reduced. Current cleanfill operations may be interested in taking on a DEQ permit for a cell of roadwaste on top of a good clay base high above the water table. Discussions with Farmington Landfill have included the idea of running a dewatering operation or composting of organically active materials prior to landfilling.

DISPOSAL OPTION: Review of Unpermitted Stockpile and Disposal Sites

Discussion

Past practices may have left you with unsorted materials at maintenance yards that require attention. The basic problems go hand in hand: risk assessment and compliance. Contaminants leaching out of a pile can significantly impact the maintenance yard, requiring evaluation not only of the materials themselves, but also the underlying soils and or even the groundwater. Prompt evaluation of old stockpile sites would help limit the potential impacts from contaminated materials, thus limiting ODOT's environmental liability. Clean fill materials aside, DEQ is interested that any material not managed as a useful product be handled in compliance with waste management standards. These factors compel Districts to review their stockpiles.

Issues to Consider

Special note should be made for existing waste piles: if waste screening methods were not in place to identify and segregate potentially "hot loads," materials impacted by spills may have been collected and stored. Conducting adequate hazardous waste determinations on such waste piles may require testing for a wider variety of chemicals, at least until more is known about stockpile contents. Review **Chapter 5, *Identifying and Managing Hot Loads***, and contact your District HAZMAT Team when you encounter suspect wastes.

Washington DOT has found it necessary to remove the roadwaste from most of their old fill sites. Using abandoned sand and gravel quarries for roadwaste fill sites has led to problems with site and groundwater contamination. Petroleum fractions have been observed above cleanup thresholds in some locations, and there are also risks of metals or nitrate contamination of groundwater.

At a minimum, you should know where the waste is stockpiled in your District and seek to limit impacts to water quality. Surface water runoff and ready pathways to groundwater should be adequately controlled and prevented. Waste should never be placed in a wetland area, in a drainage area, or in contact with groundwater – seasonal or otherwise.

Ongoing Risk

Without knowing the locations of old stockpile sites or the contaminants present, it is not possible to fully evaluate the potential impact this liability may have on your operations in the future. In summary, the steps you will need to take in managing the roadwaste you may have currently stockpiled or disposed of in your District are as follows:

1. Identify and track your roadwaste disposal sites.
2. Characterize these stockpiles: productive material, contaminants, trash content, etc.
3. Find legitimate reuses for the productive material.
4. Obtain a DEQ permit for each permanent disposal site.
5. Dispose of the remainder of the material appropriately.
6. Assess the site for impacts of contaminants and clean it up to protective levels.

APPENDICES

APPENDIX A: ESTIMATING COSTS FOR ROADWASTE MANAGEMENT

APPENDIX B: BASELINE CONSERVATIVE ROADWASTE MANAGEMENT PRACTICES

APPENDIX C: LIST OF PERTINENT STATE AND FEDERAL ENVIRONMENTAL REGULATIONS

APPENDIX D: LIST OF PETROLEUM CONTAMINATED SOIL LANDFILLS AND HIGH TEMPERATURE THERMAL TREATERS IN OREGON

APPENDIX E: "SNOHOMISH COUNTY VACTOR DEWATERING SITE WASTE ACCEPTANCE PROCEDURE"

APPENDIX F: OREGON SOIL CLEANUP TABLE from the *Soil Cleanup Manual*, Oregon Department of Environmental Quality, April 1994 (Appendix G)

APPENDIX A: ESTIMATING COSTS FOR ROADWASTE MANAGEMENT

ESTIMATING COSTS FOR ROADWASTE MANAGEMENT

Sample Cost Analysis: Screening ODOT Sweepings in Portland

Included below is a cost analysis that was done in 1996 for screening ODOT street sweepings in the Portland metro area. The analysis was done to estimate cost savings that might result from screening litter and debris out of dirty sweepings that would otherwise be disposed at a local Portland landfill. There are changes that would be made to this cost analysis if it were done today. For one, chemical contamination concerns might be more heavily weighted in light of sampling that has been done over the last four years. The estimate does present some example parameters that Districts may want to consider when estimating efficiency and costs associated with roadwaste. Because active roadwaste management is a new practice, the parameters that need to be considered in calculating disposal costs are still being defined.

Central to determining disposal options and estimating costs is characterizing the type, risk, and amount of roadwaste generated (see "Roadwaste Worksheet," Figure 2.2, page 9). Through characterization, ODOT Districts can better define their roadwaste management options. A maintenance office that manages largely "clean" fill in the form of landslide debris and ditchings will presumably have more management options and lower disposal costs than one that manages contaminated urban sweepings and urban vactor waste.

It is hoped that ODOT urban Districts will be able to reduce some disposal costs by simply sorting roadwaste into "clean" and "dirty" materials. Sorting will require additional ODOT resources: additional laboratory tests for pollutant characterization and development of sorting methods. If testing and sorting costs exceed simple disposal costs, it may be more cost efficient to landfill all District waste without ever investigating other options. Landfilling is a very real possibility considering the high cost of labor and pollutant testing (lab analysis may run as high as $700 per sample). However, roadwaste characterization costs should decrease over time. Information gathered regarding roadwaste disposal and roadwaste risks can be shared among ODOT Districts and other highway agencies. Once short-term waste characterization tasks are accomplished, long term waste management savings should become more apparent.

Research has already shown that real cost savings can be seen through changing waste management methods. Screening litter can make some types of roadwaste "clean", allowing roadwaste to be used for beneficial uses. Sound and rock fall protection berms have already been presented as low cost alternatives to landfills. ODOT Districts may want to review the roadwaste cost information that they track now so that more accurate cost projections can be done in the future. Some ODOT Maintenance Offices currently record hours spent operating sweeping or vactor equipment; cost associated with equipment maintenance; number of loads of vactor; or sweeper waste collected. This type of information, along with information related to waste characterization (type of waste, where it is generated, risk, litter content), should eventually give maintenance the parameters that will be needed to make accurate long term cost projections.

SOLID WASTE DISPOSAL[*] Revised 12/3/96

To bring ODOT, Region 1, into environmental compliance with regard to solid waste disposal (street sweepings) would cost **$844,883.00** if all material were hauled to a permitted landfill facility.
Implementation of the proposed solutions #1 & #3 would result in a cost saving of **$800,000.00** +/- in Region 1 during the first year of implementation. Future savings would be higher or lower based on the amount of material generated.

Problem/Background
ODOT has recently been faced with recriminations and citations from the Department of Environmental Quality concerning the disposal and stockpiling of materials (street sweepings and vactor wastes) generated through operation and maintenance of ODOT facilities.

- ODOT is currently stockpiling and disposing of material that is legally defined as solid waste and is required by law to go to permitted landfills.
- Stockpiled material (sweepings, gravel, etc.) has been placed at inappropriate places (adjacent to streams, wetlands, etc.)
- ODOT can legally store only "clean" materials at designated storage sites. (Clean material is litter free and contains levels of oils, grease, metals, organics, etc. that are below RCRA thresholds.)

In order to achieve environmental compliance and avoid future citations, ODOT will need to correct the listed conditions. There is currently only one legal solution to correct the street sweepings disposal issue facing ODOT. Under DEQ rules, all street sweepings, as picked up off the road, are required to go to a permitted landfill. ODOT, Region 1, produced 7,750 cubic yards of street sweepings material in 1995. Currently disposal fees are $58.00 per ton. The cost for disposal of the solid waste generated from street sweeping during 1995, if taken to a landfill would be $844,883.00 (including hauling costs). Calculations below:

<u>Sweeping Material Disposal Cost</u>
1 cy. sweepings = 3,300 lbs. +/-
7,750 cy. X 3,300 lbs. = 25,575,000 lbs.
25,575,000 ÷ 2,000 = 12,787 tons
12,787 x $58.00 = **$741,675.00**

<u>Sweeping Material Hauling Costs</u>
District 2A - $ 17,072.00
District 2B - $ 18,158.40
District 2C - <u>$ 67,977.60</u>
$103,208.00

[*] Cost analysis prepared by Julee Reynolds (ODOT) to document cost savings generated by screening street sweepings in the Portland area. This analysis was also included in the Phase I *Roadwaste Research Report* (Collins 1998)

Concerns
Disposal of untreated street sweepings under DEQ guidelines is a state wide issue. Under current financial constraints, ODOT can not afford to dispose of its street sweepings as directed by DEQ.

Solutions

1. Generate less material . Implement "Quick Hit" Best Management Practices as out lined in "White Paper" on Sidecast Sweeping and Plowing, September 1996.

2. Street sweepings can be screened to remove "noticeable quantities" of litter and visually inspected during the screening process for noticeable quantities of oils/fuels. Once "noticeable quantities" of litter (misc. debris) is removed, street sweepings are then considered "clean fill" and do not have to be disposed of at a permitted landfill.

Oregon Administrative Rules (OAR) 340-93 define "clean fill" as exempt from regulation as solid waste.

DEFINITION: 340-93-030 "Clean Fill" means material consisting of soil, rock, concrete, brick, building block, tile, or asphalt paving, which do not contain contaminants which could adversely impact the waters of the State or public health.

Excerpted from a memo from DEQ to Jeff Moore, dated April 4, 1996; "Sweepings that contain noticeable quantities of litter are not clean", "Checking for litter and oils/fuels can be visual."

ODOT owns ten "shakers" that are currently used for sorting/sizing crushed rock. By screening with 3/4" mesh, street sweepings can successfully be screened to meet DEQ standards. A "shaker" can screen approximately 200 cubic yards of material per hour. The shaker takes 4 people 2 hours to set up and requires oversize load permits to move.

3. Purchase and use "Read Screen-All" to remove miscellaneous debris. The "Read Screen All" is a portable, self powered screening machine that can screen materials ranging from wet top soil to large crushed rock. This machine can screen approximately 125 cubic yards of material per hour, and can be operated by one person with a loader. Technical data is attached.

Cost Calculations for Screening Street Sweepings

Calculations are based on Region 1's 1995 figures for street sweepings generated.

<u>ODOT OWNED SHAKER</u>
Shaker Set Up Costs
4 people @ $22.04 hr. X 2 hr. = $176.32

Screening Process Costs

Shaker rental	$20.00 hr.	
Loader	$ 6.50 hr.	
Loader operator	$20.04 hr.	
Laborer	$17.00 hr.	
Street sweepings	7,750 cy.	7,750
Shaker screening rate	200 cy. per hr.	÷ 200
		38.75 hours

Set up cost	2.00 hr. x $88.16 =	$176.32
Shaker rental	38.75 hr. x $20.00 =	$775.00
Loader rental	38.75 hr. x $6.50 =	$251.87
Loader operator	38.75 hr. x $22.04 =	$854.05
Laborer	38.75 hr. x $17.00 =	$658.75
		$2,715.99

"READ SCREEN-ALL" MACHINE
Purchase cost $43,000.00 - $63,000.00 (1 time purchase)

MATERIAL SCREENING COSTS
Loader rental $6.50 hr.
Loader operator $22.04 hr.

Street sweepings 7,750 cy.	7,750
Screening rate 125 cy. per hr.	÷ 125
	62 hours

Screen-All set up	1 hr. x $22.04 =	$ 22.04
10 yd. Dump Truck	1 hr. x $ 9.00 =	$ 9.00
Loader rental	62 hr. x $6.50 =	$ 403.00
Loader operator	62 hr. x $22.04 =	$1,366.48
		$1,800.52

MISCELLANEOUS DEBRIS DISPOSAL COSTS

Disposal fee	$55.00 ton
20 yard dump box rental	$155.00 mo.
Dump box hauling	$100.00 per load

Misc. debris = 5% of total street sweepings (in cubic yards)
Misc. debris = 75 lbs. per cy.

388 cy misc. debris x 75 lbs. = 29,100 lbs ÷2,000 = 14.5 tons

Disposal fee	14.5 tons x $55.00 = $797.50
Dump box rental	Free with hauling
Dump box hauling	$100.00 x 20 loads = $2,000.00
	$2,797.50

Sweepings Hauling Cost Estimates by Section are available.
SWEEPINGS HAULING COSTS BY SECTION (Based on estimates by section supervisors.)

District 2A

Clatskanine to Hillsboro		500 cy = 50 loads
Miles	125 RT	
Time	5 hours x $22.04 =	$110.20
Equip.	5 hours x $9.00 =	$ 45.00
		$155.20 per load
		x 50 loads
		$7,760.00

Sylvan to Hillsboro 500 cy = 50 loads
Miles 20 RT
Time 2 hours
Equip 2 hours
Total $3104.00

Manning to Hillsboro 200 cy = 20 loads
Miles 120 RT
Time 5 hours
Equip 5 hours
Total $3,104.00

Baldock to Hillsboro 500 cy =50 loads
Miles 20 RT
Time 2 hours
Equip 2 hours
Total $3,104.00

District 2A Total $17,072.00

District 2B
East Portland to Hillsboro 500 cy = 50 loads
Miles 60 RT
Time 3 hours
Equip 3 hours
Total $4,656.00

North Portland to Hillsboro 1200 cy =120 loads
Miles 50 RT
Time 3 hours

Equip 3 hours
Total $11,174.40

Milwaukie to Hillsboro 250 cy = 25 loads
Miles 60 RT
Time 3 hours
Equip 3 hours
Total $2,328.00

District 2B Total $18,158.40

District 2C

Estacada to Hillsboro 50 cy = 5 loads
Miles 90
Time 5 hours
Equip. 5 hours
Total $776.00

Government Camp to Hillsboro 50 cy - 5 loads
Miles 160
Time 8 hours
Equip 8 hours
Total $1,241.60

Sandy to Hillsboro 1000 cy =100 loads
Miles 90
Time 4 hours
Equip. 4 hours
Total $12,416.00

Cascade Locks to The Dalles 2500 cy = 250 loads
Miles 160
Time 6 hours
Equip. 6 hours
Total $46,560.00

Parkdale to The Dalles 500 cy = 50 loads
Miles 140
Time 5 hours
Equip 5 hours
Total $7,760.00

District 2C Total $67,977.60

APPENDIX B: BASELINE CONSERVATIVE ROADWASTE MANAGEMENT PROCEDURES

BASELINE CONSERVATIVE ROADWASTE MANAGEMENT PROCEDURES

Sweepings

- Screen regular sweepings, disposing trash and litter only at DEQ-permitted landfills.

- Store materials such that rainfall will not cause any runoff. (Contaminated runoff could impact other areas on site, wetlands, or surface waters.) Store sweepings to minimize the potential for site impacts from roadwaste contaminants. Storage on an impermeable surface with leachate collection and/or protection from rainfall is preferable. Tarps may be used for cover, or berms or retention ponds may be used to contain runoff.

- Winter road sand may be collected and reused once screened and sized. If sand washing is required to remove excess fines, minimize site impacts, collect the fine particles, and prevent runoff. (Pretreatment by settling or flocculation then permitted discharge to sanitary sewer is a sound practice).

- Most roadwaste is very poor fill, tending to have poor compaction ratings, and reduces in volume substantially as organic matter decomposes.

- Storage, processing and reuse of materials other than road sand and clean fill may require a DEQ solid waste permit. Composting over 25 tons per year requires a site-specific DEQ permit.

- Screened materials collected from areas known to have low impacts from roadwaste contaminants may be screened for trash and used as poor grade fill in ODOT-owned and controlled areas; negotiations planned with DEQ should provide guidelines. During storage and processing, fines should not be allowed to become airborne.

- Sidecasting of minimally contaminated sweepings onto non-ditched shoulders can be appropriate if these roadsides are not adjacent to surface waters, wetlands, or stormwater management systems with discharge to surface waters, wetlands or the subsurface.

Vactor Waste

- Liquid fractions may not be disposed back into stormwater catch basins or collection systems that discharge to surface waters, wetlands, or the subsurface unless. Instead, these liquids should be disposed, after approval is obtained, to a sanitary sewer.

- Sanitary sewers may require placement of vactor truck decant water only into high flow sewers or only after 24 hours to settle out the suspended solids.

- Where sanitary sewers are not available, ODOT HAZMAT may identify ODOT-owned areas where public access is limited for field decanting of vactor liquids under a DEQ WPCF permit.

- Sites for land application of decant water should be free of runoff concerns and able to hold petroleum contaminants in the top layer of soil to insure the best chance for treatment, with controls preventing public access. Overuse should be avoided to prevent build up of contaminants.

- The discussion above regarding sweepings applies to vactor solids, as well, although vactor solids tend to have slightly more elevated concentrations of contaminants. This is especially true of vactor solids generated from the clean out of sumps.

- Being harder to screen for trash and with less ready reuse options, vactor solids are a good candidate for disposal at a permitted landfill. An agreement to provide this material for use as landfill daily cover can substantially reduce disposal costs. All waste disposed at permitted landfills must be dry enough to pass the "paint filter test" and may face other requirements.

- Some local agencies have invested in dewatering facilities and may be open to partnering.

Further Notes

- Potentially hot loads merit special attention. Districts should have procedures for **Identifying and Managing Hot Loads** (see above). Manage normal roadwaste separately from suspect loads.

- Construction site and slide debris free of trash and vegetation may be managed as clean fill. Review existing roadwaste disposal and stockpile sites to assess liability and compliance issues.

- Codifying District procedures implementing these practices or identification of more workable practices may provide drivers leading to a more formal District-level roadwaste management plan.

APPENDIX C: LIST OF PERTINENT STATE AND FEDERAL ENVIRONMENTAL REGULATIONS

LIST OF PERTINENT STATE AND FEDERAL ENVIRONMENTAL REGULATIONS

SOLID WASTE

Federal

40 CFR 257, 258, and 259
Rules for Solid Waste Landfills

40 CFR 258.28

State of Oregon

OAR 340 Divisions 93-97
Oregon Solid Waste Regulations

ORS 459.205 – ORS 459.350
Solid Waste Management (Disposal Sites)

OAR 340-93-030
Waste can not contain contaminants that would adversely impact waters of the state or public health

OAR 340-93-040
Waste can not be stored or stockpiled

OAR 340-96-0024 through -0028
Composting

WATER QUALITY

Federal

40 CFR Part 122.26
National Pollution Discharge Elimination System (NPDES) program discharge Requirements enforced by the DEQ

State of Oregon

ORS 468B.025(1)
Wastes cannot be placed where they will negatively impact state waterways

CUT AND FILL

State of Oregon

ORS 196.800 through 196.990
Removal and Fill Statute

OAR 141 Division 85
Issuance and Enforcement of Removal and Fill Permits

OAR 141-85-05
Exemptions and conditions to be met by highway maintenance

HAZARDOUS MATERIALS

Federal

Resource Conservation and Recovery Act (RCRA) of 1976
Management of hazardous waste

Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CRCLA)
Hazardous material clean up and liability

40 CFR Parts 260-266,268,270-72, and 279
Hazardous material management

State of Oregon

ORS 459/459a
Hazardous waste requirements are included waste management rules

OAR 340 Divisions 101 and 102
Identification and management of hazardous waste

Notes on Sources:

CFR = Code of Federal Regulations
ORS = Oregon Revised Statute (laws adopted by the Oregon Legislature)
OAR = Oregon Administrative Rule (rules adopted by agencies to enforce laws)

These laws and regulations can be accessed on the Internet at the following addresses:

Notes on Stormwater Erosion Control:

ORS 468 B. 025 – Enforcement Action $10,000/day
ORS 468.943 – Criminal Negligence $25,000 or one year in prison
ORS 468.946 – Knowingly discharge, Class B Felony, $200,000/10years in prison

APPENDIX D: LIST OF PETROLEUM-CONTAMINATED SOIL LANDFILLS AND HIGH-TEMPERATURE THERMAL TREATERS IN OREGON

Petroleum-Contaminated Soils (PCS) Approved Landfills

DEQ approvals given as of September 1998 to receive petroleum-contaminated soils:

Name of Site	Tons per Year Limit	Location	Phone Number
Baker Landfill	950 (5% = 350 TPY)	Baker (Baker Co. PCS Only)	(541) 523-2626
Burns-Hines Landfill	350	Burns-Hines	(541) 573-6441
Coffin Butte Landfill	50,000 (BMP)	Corvallis	(541) 745-7144
Columbia Ridge Landfill	100,000 (BMP)	Arlington	(503) 493-7825
Crook County Landfill	1,000	Prineville	(541) 447-2398
Finley Buttes Landfill	Unlimited (BMP)	Boardman	(503) 288-7844
Fox Hill Landfill	750 (5% = 750 TPY)	La Grande	(541) 963-5459
Hillsboro Landfill	50,000 (BMP)	Hillsboro	(503) 640-9427
Klamath Falls Landfill	10,000	Klamath Falls	(541) 883-4696
Knott Landfill	15,000 (BMP)	Bend	(541) 317-3163
Lake County Landfill	900	Lakeview	(541) 947-6003
Lytle Boulevard Landfill	75 (5% = 200 TPY)	Ontario	(541) 473-5186
Riverbend Landfill	150,000 (BMP)	McMinnville	(503) 472-8788
Roseburg Landfill	2,500	Roseburg	(541) 440-4270
Short Mountain Landfill	25,000	Eugene	(541) 682-4120
South Stage Landfill	5,000	Medford	(541) 779-4161
Wasco Landfill	10,000 (BMP)	The Dalles	(541) 296-4082

BMP = best management practices
TPY = tons per year

PCS Thermal Treatment Facilities

DEQ approvals given as of September 1998 to receive petroleum-contaminated soils:

Name of Site	Location	Phone number
1. Copeland Paving	Grants Pass	(541) 476-4441
2. TPS Technologies Inc. (was Oregon Hydrocarbon)	Portland	(503) 735-9525
3. United Soil Recycling (was PEMCO and Marion Co. Soil Recycling)	Woodburn	(503) 672-0285

APPENDIX E: SNOHOMISH COUNTY WASTE ACCEPTANCE PROCEDURE

LOAD CHARACTERIZATION PROCEDURE

A. Customer Identification (*known)

These are loads received from *known governmental agencies and established customers. *Known means a documented history of bringing in consistently treatable loads. Such agencies or customers now includes, but is not necessarily limited in the future to: Snohomish County Roads, Snohomish County Solid Waste, Snohomish County Surface Water, Washington State Department of Transportation and Snohomish County Cities and Towns.

B. Customer identification (private sector)

These are loads received from all customers other than "*known customers."

1. All new customers will need to apply for credit customer status with Snohomish County Department of Finance including appropriate bonding to become a part of the automated weighing, ticketing and billing system prior to using the facility. There will be no cash or check customers permitted to dump at the facility as all transactions will be done on the facility computer with pre-approved accounts only.

2. Application forms to be submitted to the Snohomish County Department of Finance for Attachment of Funds (Attachment A), Solid Waste Cash Bond (Attachment B) and Solid Waste Division Dump Fee Bond (Attachment C).

3. All customers, other than "*Known Customers" as defined in Section A, will be permitted to dump their vactor grit wastes on a pre-scheduled appointment time only. The vactor facility will be open Monday through Friday from 8:00 am to 3:00 pm, except normal County designated holidays. Appointments must be arranged in advance by calling facility operations at (206) 668-7862.

C. Testing, Acceptance and Processing

Loads received from all customers, private sector loads and "*Known Customers" as defined in Section A, will be subject to the same operational handling procedures, as outlined below:

1. All loads will be subject to a visual and odor screening by the facility operator.

PHYSICAL OBSERVATIONS FOR FIELD TESTING OF VACTOR GRIT

a. Be alert as the water is dumped from a customer vactor load. Careful sight and odor observations will be made on each load. Any one of the below observations is cause for field testing of the load or rejection.

1. Sight Observations

    a. Look for a sheen, petroleum globules or an oil slick on the water.

    b. Water that is dark brown, reddish or brownish black may be suspect for oxidized metals.

2. Smell Observations

    a. Smell for an odor of gasoline, solvent, fuel oil or any strong petroleum smell.

    b. Smell for noxious chemical odors.

    c. Any smell of septage must be tested or rejected.

Caution! Do not subject yourself to any excessive exposure to odors or vapors from any chemical! Use your sense of smell carefully, as overexposure can cause harm to your body.

2. All loads will be subject to field testing on a random basis or if the operator suspects that the load may be contaminated because of screening or origin.

3. Most solids will be decanted and then handled as a reusable commodity or solid waste. The long-term goal is to reuse the vactor solids in accordance with a policy approved by the Snohomish Health District.

4. Liquids, dumped before weighing solids, will not be field tested unless the operator observes obvious serious contamination. Most liquids will go directly to the waste water treatment facility.

5. If the operator's observation determines the vactor solid load is questionable, the operator will inform the driver to pull aside while field testing is performed on the water/solid load sample.

6. Three field tests on solids will be performed. Failure of any one of these tests is cause for the operator to reject the load.

    a. Conductivity (> 5,000 μ mho / cm) limit for load rejection. This test is an indicator for high metals content.

    b. pH (< 5 or > 10) limits for load rejection. This test is for strong acids and bases.

    c. TPH-D (limits yet to be determined, but probably > 10,000 ppm TPH) This test is for total petroleum hydrocarbons.

7 Loads that do not pass field testing for contamination will be rejected by this facility.

8. Rejected loads will not be allowed to dump any solids. The operator will carefully record in the log book all information pertaining to the rejected load including operator observations, origin of the vactor waste and field test results.

9. If the load is rejected, the operator will inform the driver of other options. These options include having the load tested by an analytical laboratory for proof that the load is not hazardous or taking the load to a private hazardous waste disposal center. The operator will inform the driver that the Snohomish Health District and other appropriate regulatory agencies will be immediately informed of the contaminated load.

10. Any previously rejected load that can pass minimum standards for vactor waste acceptance, after being tested by an approved analytical laboratory, will be accepted after submission of written proof.

11. All customers will receive a load transaction ticket and will pay the flat charge of $31.10/visit for dumping their liquid and for administrative costs, even if solids are not dumped.

12. In addition to the flat fee, a tip fee of $56.50/ton will be charged to customers delivering solids.

13. The Snohomish County Solid Waste Management Division and it's appointed vactor decant facility operator reserve the right to require any customers delivering vactor waste loads to the facility to do an appropriate laboratory waste characterization test on any vactor load. The purpose of this test is for waste characterization, as addressed in "Policy Statement Regarding Street Waste Solids Recycling and Disposal" (Snohomish Health District, 1-1-95) or in Washington State Dangerous Waste Regulations (WAC 173.303). The results of this test will be submitted, in writing, to the County's facility operator and also shared with the Snohomish Health District.

APPENDIX F: OREGON SOIL CLEANUP TABLE from the *Soil Cleanup Manual*, Oregon Department of Environmental Quality, April 1994 (Appendix G)

OREGON SOIL CLEANUP TABLE
from the *Soil Cleanup Manual*, Oregon Department of Environmental Quality, April 1994 (Appendix G)

OAR 340-122-0045
Numerical Soil Cleanup Levels

This rule provides cleanup levels for hazardous substances in soil only. Remedial actions under this rule are subject to the public participation requirements provided under ORS 465.320 and OAR 340-122-0100. A remedial action may be proposed under this rule if the criteria of sections (1) through (5) of this rule would be satisfied.

(1) The characterization of the hazardous substances and the facility has been conducted in a manner acceptable to the Department.

(2) The characterization has determined:

(a) The number and the nature of the contaminants of concern;

(b) The contaminants of concern exist in soil only;

(c) All contaminants of concern are listed on the soil cleanup table;

(d) The source(s) of the contaminants of concern;

(e) The vertical and horizontal extent of the contaminants of concern; and

(f) The depth to groundwater.

(3) The responsible party can demonstrate to the Department that upon completion of the remedial action the total excess cancer risk will not exceed 1 x 10-5, and the hazard index for non-carcinogens with similar critical endpoints will not exceed one:

(a) Risks are presumed to be additive for carcinogens and for non-carcinogens with similar critical endpoints. The cleanup levels in Table 1 and Appendix 1 must be prorated downward when the substances have similar critical endpoints to keep the total site risk below the prescribed levels;

(b) In determining whether a site with multiple contaminants of concern will be accepted for remedial action under this rule the Department will consider the following:

(A) Detected concentrations;

(B) Toxicity and critical endpoints;

(C) Frequency of detection;

(D) Mobility;

(E) Persistence;

(F) Bioaccumulation potential; and

(G) Degradation products.

(4) No contaminants of concern at the facility will adversely affect surface water based upon consideration of:

(a) Distance to the surface water;

(b) Containment of the contaminants of concern;

(c) Surface soil permeability;

(d) Maximum two-year, 24-hour precipitation event;

(e) Proximity of flood plain(s);

(f) Terrain slope;

(g) Vegetative cover; and

(h) Hydrological connections between groundwater and surface water.

(5) No contaminants of concern at the facility will adversely affect sensitive environments based upon consideration of:

(a) Distance to the sensitive environment;

(b) Surface soil permeability and erodibility;

(c) Vegetative cover; and

(d) Transport media.

(6) If all the criteria in sections (1), (2), (3), (4) and (5) of this rule are met, the responsible party may propose a remedial action which uses Table 1 and Appendix 1 to determine the appropriate cleanup levels. All remedial actions under this rule must meet the appropriate Soil Cleanup Level for volatiles, semi-volatiles or pesticides or the appropriate Leachate Concentration for inorganics as contained in Table 1 unless the responsible party can demonstrate by one of the following methods that groundwater will not be adversely affected or that the cleanup level is below background or the practical quantitation level (PQL) and a higher residual concentration than the appropriate level in Table 1:

(a) The responsible party can demonstrate with a sampling methodology acceptable to the Department that the leachate concentrations from representative site samples contaminated with volatiles, semi-volatiles, or pesticides do not exceed the Leachate Reference Concentrations in Appendix 1. (For inorganic compounds, the responsible party must always conduct a leaching test, and the resultant leachate must not exceed the Leachate Concentration in Table 1.) The responsible party may perform the Synthetic Precipitation Leaching Procedure (SPLP; EPA Method 1312), the Toxicity Characteristic Leaching Procedure (TCLP; EPA Method 1311) or other Department approved procedures to estimate potential leaching of contamination at the site. In no case may the residual contamination exceed the Maximum Allowable Soil Concentrations in Appendix 1 as specified in section (7) of this rule;

(b) The responsible party can demonstrate with a Department-approved fate and transport model and with default and/or site-specific data approved by the Department that residual soil concentrations will not result in contaminant concentrations in the groundwater which exceed the Groundwater Reference Concentrations listed in Appendix 1. This demonstration must consider factors such as type/nature of contaminants; source quantity; quantity of contaminated soils; clay content; soil pH; redox potential; chemical and physical properties of the contaminants including toxicity and mobility; net precipitation; subsurface hydraulic conductivity; vertical depth to groundwater; degradation products; and naturally occurring background levels. In no case may the residual contamination exceed the Maximum Allowable Soil Concentrations in Appendix 1 as specified in section (7) of this rule; or

(c) The responsible party can demonstrate that the soil cleanup level for the contaminant of concern is at or below the background level for compounds that occur naturally. The responsible party may in a manner acceptable to the Department determine the representative background concentration and clean up to that level; or

(d) The responsible party can demonstrate that the soil cleanup level is below the practical quantitation level (PQL) for the contaminant of concern. The responsible party may in a manner acceptable to the Department and according to "Test Methods for Evaluating Solid Waste, SW-846, 3rd Edition," U.S. EPA, 1986 (including methods as approved in 54 FR 40260 40269, 9/29/89 and 55 FR 8948-8950, 3/9/90) determine the proper PQL and remediate until the residual contamination meets the PQL level; or

(e) The responsible party can elect to opt out of this rule and perform a remedial investigation, risk assessment, or feasibility study under OAR 340-122-0080 through 340-122-0085.

(7) If leaching to groundwater is not the pathway of concern or if the responsible party demonstrates that groundwater will not be adversely affected by performing the appropriate leaching test or fate and transport model, the residual soil contamination shall not exceed the Residential Maximum Allowable Soil Concentration in Appendix 1 unless the site meets the industrial criteria and the responsible party proposes to meet the Industrial Maximum Allowable Soil Concentration. If the responsible party proposes to meet the Industrial Maximum Allowable Soil Concentration, the facility must meet all the following additional criteria:

(a) The facility is planned and zoned for industrial use; and

(b) Appropriate institutional controls (e.g., deed restrictions, restrictive covenants, Environmental Hazard Notice) will be in force; and

(c) Uses of the facility and uses and zoning of properties within 100 meters of the contaminated area are industrial uses or are other uses where the Department concurs that the exposure is limited and thus does not warrant application of the residential standard.

(8) Proposed remedial actions under this section are not required to include the feasibility study in OAR 340-122-0085 except as provided in subsection (6)(e) of this rule. Only remedial technologies that have been proven to be effective in reaching the cleanup levels shall be approved.

(9) This rule, including the numerical cleanup levels and the procedures and standards set forth in this rule, is not intended to be construed or applied as applicable or relevant and appropriate requirements under Section 121(d) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980, 42 U.S.C. § 9621.

(10) If the responsible party has adequately characterized the site and achieved the appropriate cleanup levels or made appropriate demonstrations as described in sections (6) and (7) of this rule, the Department will issue a written determination that the cleanup is complete subject to any Department finding based on new information that the cleanup as performed is not protective of public health, safety or welfare, or the environment.

Soil Cleanup Table
(OAR 340-122-045)

NOTE:
This table provides cleanup levels expressed as soil concentrations or leachate concentrations for hazardous substances contained in soil only. he responsible party may propose a remedial action under this rule if the responsible party meets the criteria (1) through (5) below:
(1) The characterization has been conducted in a manner acceptable to the Department. (See OAR 340-122-045(1).)
(2) The characterization has determined the source, extent, number and nature or the contaminants, and these contaminants are in soil only. (See 340-122-045(2).)
(3) Upon completion of the remedial action, the residual contamination in soil will not pose a total excess risk of greater than $1x10^{-5}$ for carcinogens or a hazard index of 1 for non-carcinogens with similar critical endpoints. (See 340-122-045(3).)
(4) No contaminants of concern at the facility will adversely affect surface water. (See 340-12-045(4).)
(5) No contaminants of concern at the facility will adversely affect sensitive environments. (See 340-122-045(5).)
The cleanup levels in this table represent a per contaminant risk ($1x10^{-6}$ excess cancer risk or a hazard quotient of 1 for non-carcinogens) under specified exposure scenarios. These soil cleanup levels must be pro-rated downward when multiple non-carcinogenic substances have similar critical endpoints or multiple carcinogenic substances would result in a total excess site risk greater than $1x10^{-5}$.

	HAZARDOUS SUBSTANCE	SOIL CLEANUP LEVEL (mg/kg)	ADVERSE HEALTH EFFECT	PATHWAY
	A. VOLATILES			
1	Acrylonitrile	0.0001	*cancer*	*a,**
2	Benzene	0.1	*cancer*	*a*
3	Bromodichloromethane	0.01	*cancer*	*a*
4	Bromoform	0.3	*cancer*	*a*
5	Bromomethane	60	*noncancer 1*	*a*
6	Carbon tetrachloride	0.2	*cancer*	*a*
7	Chlorobenzene	50	*noncancer 2,3*	*a*
8	Chlorodibromomethane	10	*noncancer 3*	*a*
9	Chloroform	0.4	*cancer*	*a*
10	Dichloroethylene, 1,1-	0.01	*cancer*	*b*
11	Dichloroethylene-cis 1,2-	4	*noncancer 4*	*a*
12	Dichloroethylene-trans 1,2-	5	*noncancer 3*	*a*
13	Ethylbenzene	100	*noncancer 5*	*a*
14	Ethylene dichloride	0.008	*cancer*	*a*
15	Formaldehyde	4	*cancer*	*a,**
16	Hexachlorobenzene	0.4	*cancer*	*c,**
17	Methylene chloride	0.1	*cancer*	*a*
18	Tetrachloroethylene	0.3	*cancer*	*a*
19	Toluene	80	*noncancer 6,7*	*a*
20	Trichloroethane,1,1,1-	9	*noncancer 3*	*a*
21	Trichloroethane,1,1,2-	0.08	*noncancer 3*	*a*
22	Trichloroethylene	0.4	*cancer*	*a*
23	Trichlorofluoromethane	1,000	*noncancer 8*	*d*
24	Vinyl chloride	0.008	*cancer*	*a,**
25	Xylenes	800	*noncancer 7*	*a*
	B. SEMI-VOLATILES			
26	Acenaphthene	2,000	*noncancer 3*	*a*
27	Anthracene	20,000	++	*a*

	HAZARDOUS SUBSTANCE	SOIL CLEANUP LEVEL (mg/kg)	ADVERSE HEALTH EFFECT	PATHWAY
28	Benzidine	0.0000009	*cancer*	*a,**
29	Benzo(a)anthracene	0.1	*cancer*	*c,e*
30	Benzo(a)pyrene	0.1	*cancer*	*c*
31	Benzo(b)fluoranthene	0.1	*cancer*	*c,e*
32	Benzo(k)fluoranthene	0.1	*cancer*	*c,e*
33	Bis(2-ethylhexyl)phthalate	4	*cancer*	*a*
34	Chrysene	0.1	*cancer*	*c,e*
35	Di-n-propylnitrosamine	0.00003	*cancer*	*a,**
36	Dibenzo(a,h)anthracene	0.1	*cancer*	*c,e*
37	Dichlorobenzidine,3,3-	0.05	*cancer*	*a,**
38	Dichloroethyl ether	0.0002	*cancer*	*a,**
39	Dinitrotoluene 2,6-	0.002	*cancer*	*a,**
40	Diphenylnitrosamine	2	*cancer*	*a*
41	Fluoranthene	8,000	*noncancer 2,3,4*	*a*
42	Fluorene	2,000	*noncancer 4*	*a*
43	Hexachloroethane	100	*noncancer 2*	*a*
44	Indeno(1,2,3-cd)pyrene	0.1	*cancer*	*c,e*
45	Naphthalene	30	*noncancer 9*	*a*
46	Pentachlorophenol	5	*cancer*	*a*
47	Polychlorinated biphenyls	0.08	*cancer*	*c,f*
48	Pyrene	6,000	*noncancer 2*	*a*
49	Trichlorophenol,2,4,6-	2	*cancer*	*a*
	C. PESTICIDES			
50	Aldrin	0.04	*cancer*	*c*
51	BHC-alpha	0.008	*cancer*	*a*
52	Chlordane	0.5	*cancer*	*c*
53	D, 2,4-	0.3	*noncancer 2,3,4*	*a,**
54	DDD,4,4-	3	*cancer*	*c*
55	DDE,4,4-	2	*cancer*	*c*
56	DDT, 4,4-	2	*cancer*	*c*
57	Dieldrin	0.001	*cancer*	*a,**
58	Endosulfan(alpha-beta)	0.0006	*noncancer 2*	*a,**
59	Endrin	0.05	*noncancer 3,7*	*a*
60	Heptachlor	0.0002	*cancer*	*a,**
61	Heptachlor epoxide	0.0003	*cancer*	*a,**
62	Lindane	0.03	*noncancer 2,3*	*a*
63	MCPA	100	*noncancer 2,3*	*g*
64	Toxaphene	0.01	*cancer*	*a,**

NOTE:
The cleanup levels for the following compounds are expressed as leachate concentrations. For these compounds, the responsible party must conduct both a leaching test (as specified in 340-122-045(6)(a)) and a totals analysis (a soil concentration). To complete an adequate cleanup, the resulting leachate must not exceed the Leachate Concentration and the totals analysis cannot exceed the appropriate Maximum Allowable Soil Concentration as specified in Appendix 1.

	HAZARDOUS SUBSTANCE	SOIL CLEANUP LEVEL (mg/kg)	ADVERSE HEALTH EFFECT	PATHWAY
	D. INORGANICS			
65	Arsenic	0.004	*cancer*	*h*
66	Barium	100	*noncancer 5*	*i*
67	Beryllium	0.002	*cancer*	*h,**
68	Cadmium	0.5	*noncancer*	*i*
69	Chromium (total)	10	*noncancer 3*	*i*
70	Copper	100	*noncancer 1*	*i*
71	Cyanide	20	*noncancer 7,9,10*	*j*
72	Lead	2	*noncancer*	*k*
73	Manganese	400	*noncancer 11*	*l*
74	Mercury	0.2	*noncancer 2,7*	*i*
75	Nickel	10	*noncancer 9*	*j*
76	Silver	5	*noncancer 12*	*i*

Footnotes:

(a) Concentration is based on potential leaching to groundwater
(b) Based on volatile inhalation and an excess cancer risk of 1 in a million (1E-06)
(c) Concentration is based on incidental soil ingestion and an excess cancer risk of 1 in a million (1E-06)
(d) Based on volatile inhalation and a hazard quotient equal to 1.
(e) Based on the potency of Benzo(a)pyrene
(f) Based on the potency of PCB 1260
(g) Concentration is based on incidental soil ingestion and a hazard quotient equal to 1
(h) Leachate concentration is derived from a concentration that is based on water ingestion and an excess cancer risk of 1 in a million (1E-06)
(i) Leachate concentration is derived from the drinking water maximum contaminant level
(j) Leachate concentration is derived from the proposed drinking water maximum contaminant level
(k) Leachate concentration is derived from the action level for lead
(l) Leachate concentration is derived from a concentration that is based on water ingestion and a hazard hazard quotient equal to 1
(m) Concentration is derived from the ground water reference concentration , soil cleanup levels shall not exceed the appropriate maximum allowable soil concentration in Appendix 1.
(*) Practical quantitation limit may be a concern (see OAR 340-122-045 (6)(d))

Adverse Health Effects:

(cancer)-cancer
(noncancer 1)-adverse gastrointestinal effects
(noncancer 2)-adverse kidney effects
(noncancer 3)-adverse liver effects
(noncancer 4)-adverse blood effects
(noncancer 5)-adverse developmental effects
(noncancer 6)-adverse nasal effects
(noncancer 7)-adverse central nervous effects
(noncancer 8)-decreased survival and tissue defects
(noncancer 9)-weight loss
(noncancer 10)-adverse thyroid effects
(noncancer 11)-adverse respiratory and behavioral effects
(noncancer 12)-adverse skin effects
(++) No observed effects noted