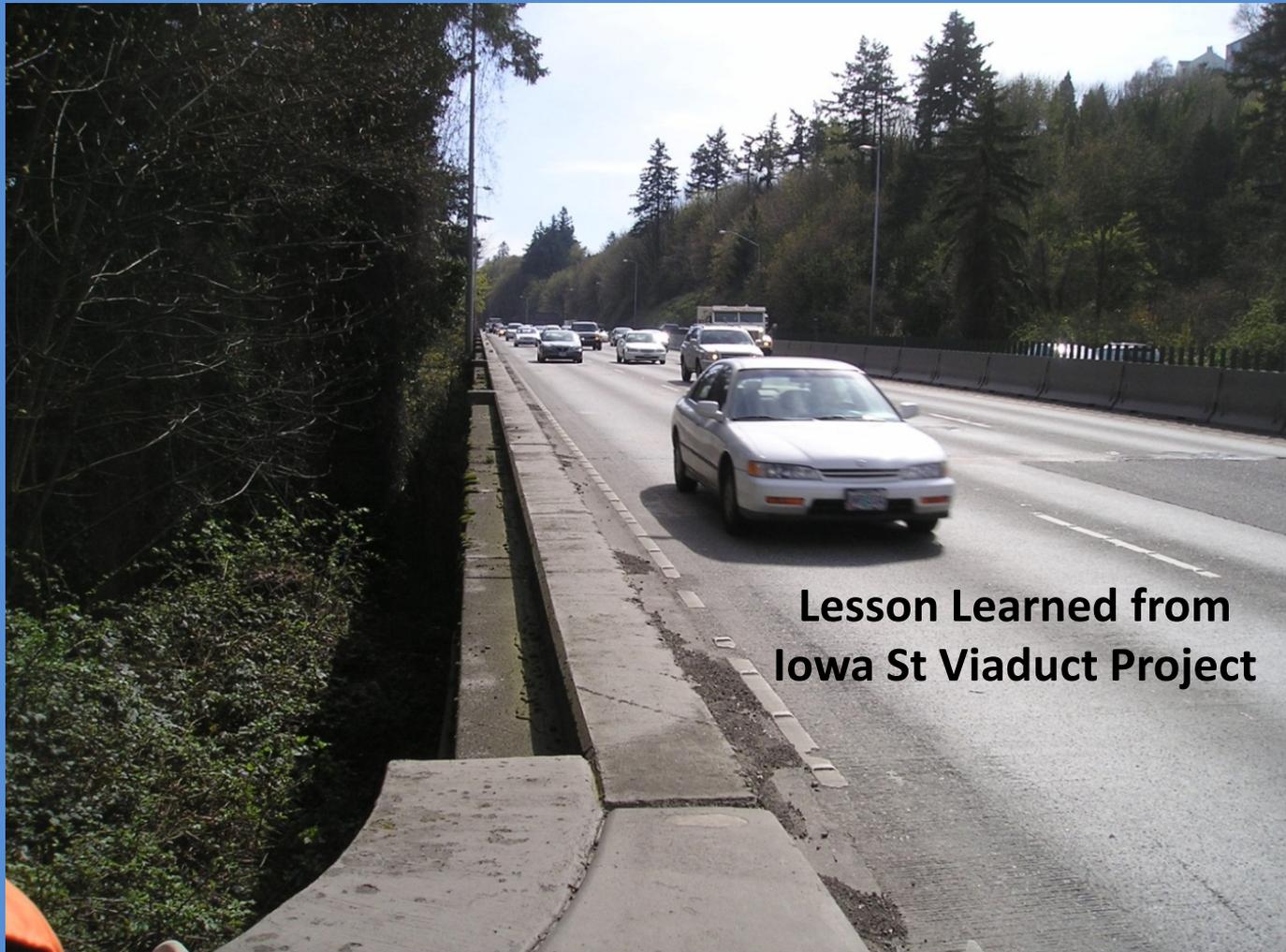


Contaminated Soil on Highway Shoulders



**Lesson Learned from
Iowa St Viaduct Project**

Most of the topsoil bordering Region 1 highways is not in good condition.



On 8 out of 10 projects it does not meet DEQ clean fill standards.

Region 1 has been actively investigating road shoulder soil contamination since the Iowa Street project.



Prior to 2010, we did not suspect the road shoulders were contaminated. It was all assumed to be clean. (Except areas of known spills.)

The Iowa St project made us aware of DEQ's clean fill guidelines, which they take seriously.



Since 2010, hundreds of samples have been collected from dozens of projects and analyzed for contaminants likely to be found along highway right of way.

Increasing frequency of occurrence

- Gasoline (never present)
- Volatile organic compounds (BTEX)
- Diesel
- Pesticides
- PCBs
- Heavy Oil (almost always)
- Polynuclear aromatic hydrocarbons
- Metals (always present)

One sample could be analyzed for 12 different metals and over 75 organic compounds. **

The contaminant that shows up most often at elevated concentrations and causes the most concern is.....



Lead

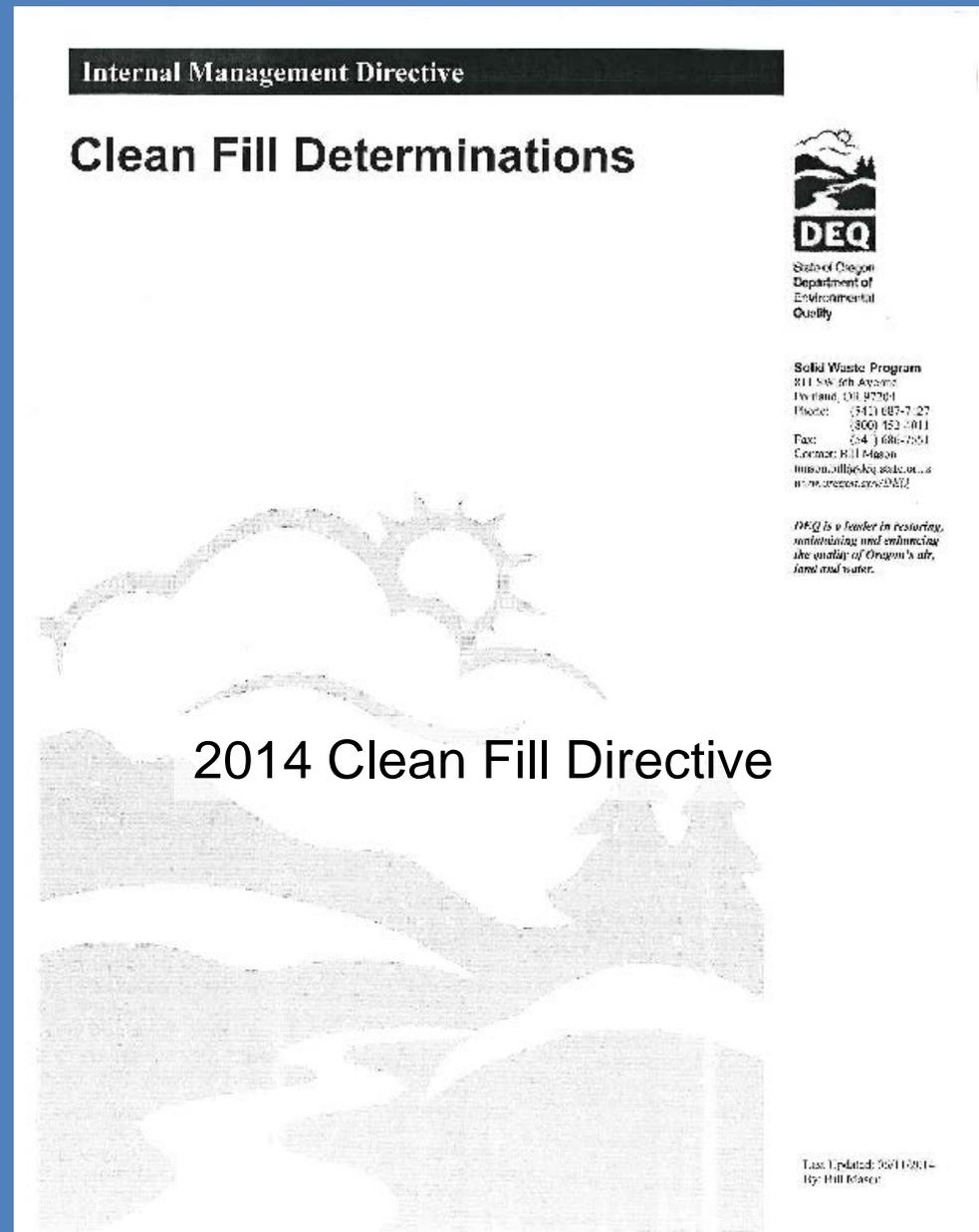


The DEQ's most recent clean fill directive lists the maximum allowable limits for 31 inorganic metals and metal compounds and over 560 organic compounds.

The clean fill limits are either established background levels or DEQ residential cleanup levels.

When a limit is exceeded, the soil cannot be considered clean fill and becomes subject to DEQ's solid waste regulations. \$\$\$\$

The directive seems to get revised every 12 months. The list gets longer and the limits can change. *





“If it can’t be used in a playground it’s not clean fill.”

DEQ Action Levels for Lead

28 ppm

Clean fill limit

(DEQ background level for Portland)

On highway shoulders, most lead concentrations in surface soil fall in the 28 to 400 ppm lead range.

400 ppm

Residential cleanup level

5% of samples exceed 400 ppm.

800 ppm

Occupational cleanup level

1% of samples exceed 800 ppm.

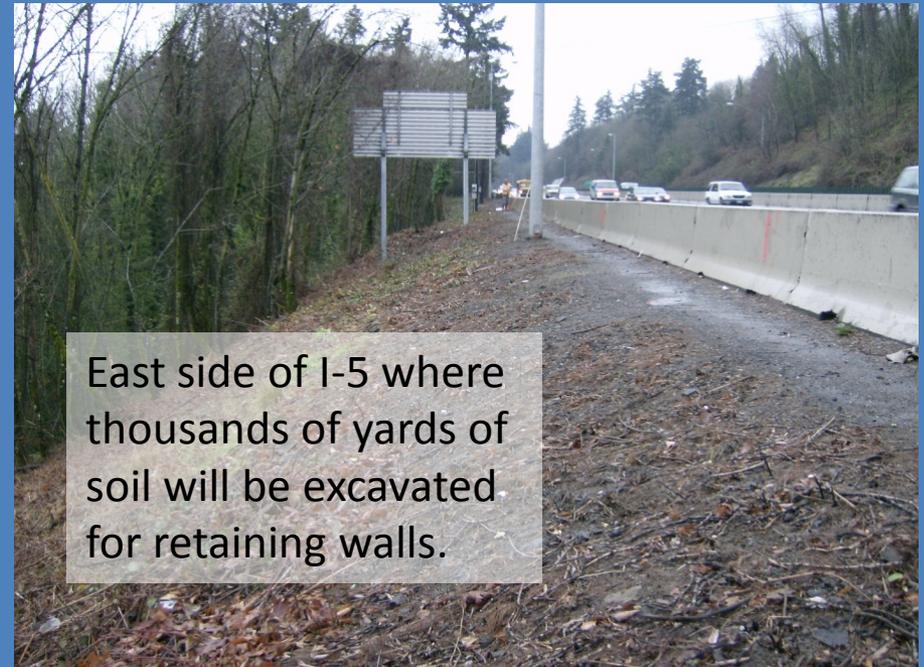
The highest soil lead concentration detected in Region 1 so far is...



**8,000 ppm beneath
Iowa Street Viaduct**

Lead Results – Iowa Street

Iowa Street 2010		
Results in PPM		
Soil Type	Depth (inches)	Total Lead
Sandy Gravel	0	72.3
Sandy Gravel	0	206
Sandy Gravel	0	107
Sandy Gravel	6	211
Sandy Gravel	6	464
Sandy Gravel	6	40.3
Brown Silt	6	56.3
Brown Silt	12	41.8
Brown Silt	12	14.3
Brown Silt	12	9.39
DEQ CFSL		28



East side of I-5 where thousands of yards of soil will be excavated for retaining walls.

Seven samples collected from depths of 0 and 6 inches contained an average of 165 ppm lead. *

Three samples from 12 inches contained an average of 21 ppm lead.

Test Pit Samples

Sources of Lead



Leaded gasoline – 1920s to 1996 in USA.

Banned for its cumulative neurotoxicity and damaging effect on catalytic converters. Still used in aviation gas.

Other lead sources:

Used engine oil, tire balance weights, paint, waste incinerators.



How much of the road shoulder is impacted by high lead concentrations? What's the lateral and vertical extent?



Oregon 99W median at
Fischer Road

**1973, Archives of Environmental Contamination and Toxicology,
“Lead Content of Soils Along Chicago’s Eisenhower and Loop-Terminal
Expressways” (Kahn, Coello, and Saleem)**

LEAD CONTENT OF SOILS ALONG CHICAGO’S
EISENHOWER AND LOOP-TERMINAL EXPRESSWAYS

M. A. Q. KHAN and W. F. COELLO
Department of Biological Sciences
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The lead content of soils along Chicago’s two expressways, the Chicago Loop-terminal Expressway and the Eisenhower Expressway, have been determined in various seasons of the year and at various distances from the roadway. The concentration of lead in soils along the Chicago Loop-terminal Expressway and adjoining city streets show positive correlation (correlation coefficient = 0.988) with the average traffic volume near the sampling sites during the same season. The levels of lead in soils along the Eisenhower Expressway, at the same site, vary with the season; the lead levels are the least during fall and winter and they increase during spring and attain peak values during summer. This seasonal variation in the lead levels is similar to the seasonal variations in average monthly traffic volumes on the expressway. The soil contains as much as 7,600 parts per million of lead (micrograms per gram of dried soil) up to 45 feet and 900 parts per million up to 150 feet from the Eisenhower Expressway. There is a need to investigate the contamination of human beings that live or work in buildings within these distances from the expressways and wider buffer zones need to be provided along future expressways.

Authors found lead concentrations up to 7,600 ppm 45 feet from a downtown expressway and up to 900 ppm at a distance of 150 feet. The authors said-

“There is a need to investigate the contamination of human beings that live or work in buildings within these distances from the expressways and wider buffer zones need to be provided in the future.”

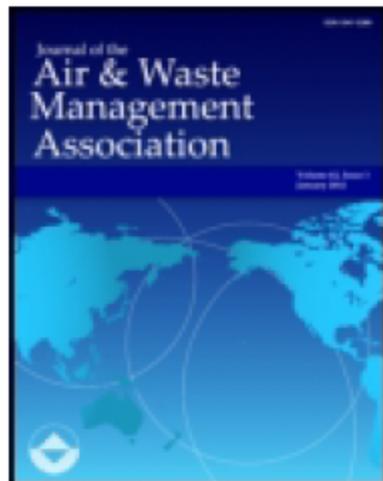
**1976, Journal of the Air Pollution Control Association,
“Lead Contamination of the Roadside Ecosystem”
(William H. Smith, Yale University)**

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Lead Contamination of the Roadside Ecosystem

William H. Smith ^a

^a Yale University

Published online: 13 Mar 2012.

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To link to this article: <http://dx.doi.org/10.1080/00022470.1976.10470310>

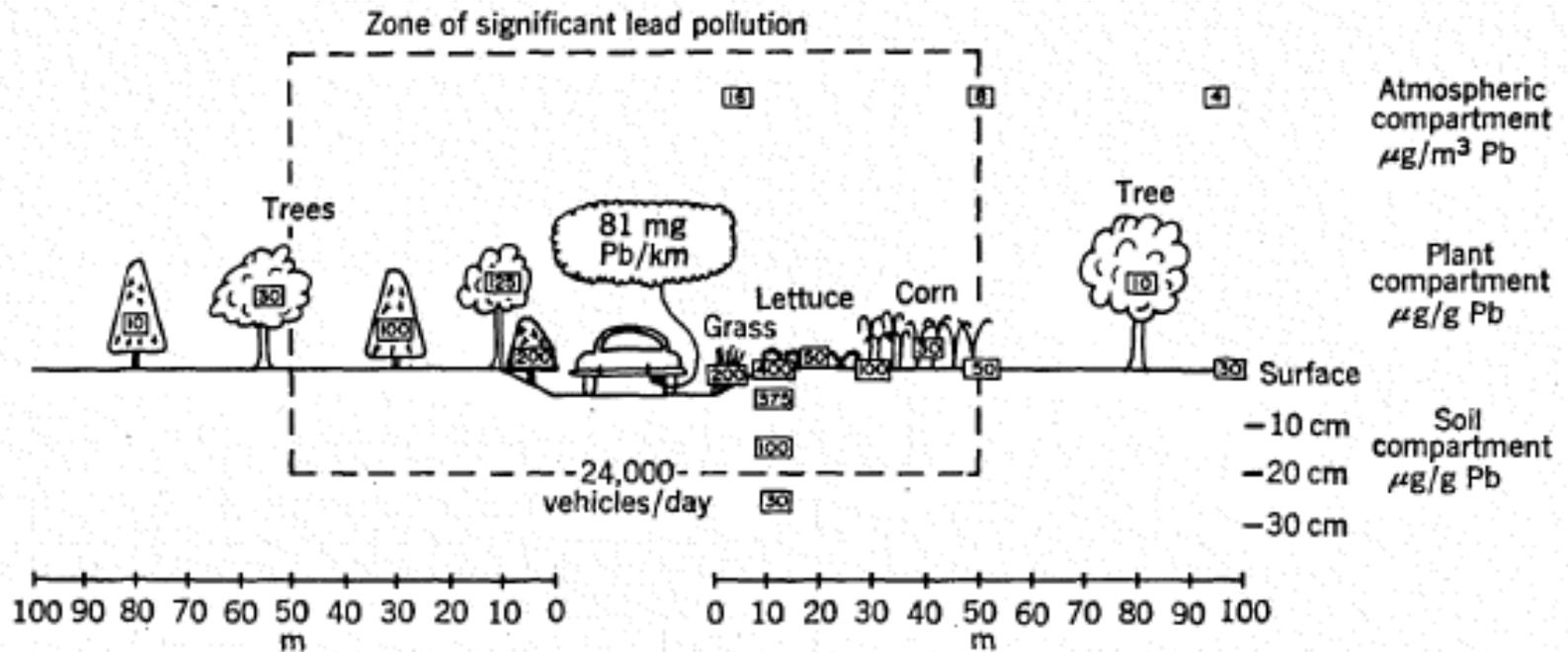


Figure 1. Compartmentalization of automotive exhaust lead in the atmospheric, vegetative and soil components of a hypothetical roadside ecosystem bisected by a roadway averaging 24,000 vehicles per day.

Based on studies done in 10 states, Australia and England, Smith concluded that highways with 24,000 vehicles per day could expect lead contamination extending up to 170 feet from edge of pavement and up to 1 foot deep.

What is the financial impact to ODOT?

Landfill disposal of non-clean soil is expensive. One acre of topsoil contaminated to a depth of 12 inches is approximately 2,400 tons. At a rate of \$75/ton, the disposal fee would be \$180,000.



ODOT prefers to re-use non-clean soil as fill within the right-of-way.



Halsey Street SWLA Disposal Site
(Disposal site used for two ODOT projects)

Obtain Solid Waste Letter of Authorization permit from DEQ.

Demonstrate there are no adverse impacts to the environment and groundwater at the disposal site. Obtain approval from local jurisdiction.

Cap with clean fill.

ODOT has over a dozen SWLA sites in Region 1 dating back to the 1990s.

Fischer Road, 2014



Top 12 inches of soil was determined to be non-clean. The total volume of non-clean soil was 2,000 CY.



Non-clean soil was disposed in right-of-way on OR 217 for \$20/CY or approximately \$11/ton.

ODOT has issued a directive for how to handle non-clean soil.

'Management of Surface Soils Removed Within ODOT Operational Right-of-Way'

OREGON DEPARTMENT OF TRANSPORTATION TECHNICAL SERVICES				
GEO-ENVIRONMENTAL SECTION DIRECTIVE				
TITLE Management of Surface Soils Removed Within ODOT Operational Right of Way	FINAL NUMBER GE14-01(D)	EFFECTIVE DATE 05/17/2014	VALIDATION DATE	SUPERSEDES
WEB LINK http://www.oregon.gov/ODOT/14W/TTTCI/SE/2014/EnviroTechnicalGuidance.aspx	APPROVED SIGNATURE Original signed by: Susan Haupt GEO - Environmental Section Manager			
TOPIC/PROGRAM Surface Soils				

PURPOSE

Assessment of excavated surface soils adjacent to ODOT's highways has indicated that such soils might contain contaminants. The purpose of this Directive is to provide direction for managing surface soil excavated from within ODOT's operational right of way.

GUIDANCE

This technical directive provides options for managing surface soil, when removal is required for construction purposes. This directive does not require soil removal; it only addresses how to manage soil that must be removed for construction purposes. Maintenance policy for materials management is covered by the ODOT Maintenance EMS program and the Blue Book. Therefore, maintenance projects are not included in this directive.

DEFINITIONS

DEQ - Oregon Department of Environmental Quality
ENV 16-01 - ODOT Hazardous Materials and Wastes Policy
ENV 16-02 - ODOT Contaminated Site Management Policy
ODOT Maintenance EMS - Most recent version of the "ODOT Maintenance Yards Environmental Management System (EMS) Policy and Procedures Manual"
Blue Book - Most recent version of the "ODOT Routine Road Maintenance: Water Quality and Habitat Guide Best Management Practices."

BACKGROUND/REFERENCE

Limited sampling of surface soils adjacent to state highways has identified the presence of contaminants that exceed DEQ's clean fill guidance values in the top 1.5 feet. Contaminant levels are generally low enough to not require cleanup if the soils remain undisturbed. However, excavated soils that exceed clean fill levels must be managed per OAR 340-093.

GE14-01(D)
5/17/2014
Page 1 of 2

EXPLANATION

Based on available sampling results and knowledge of process, soils greater than 1.5 feet below grade or soils under paving (which provides a low permeability cap) can continue to be managed as clean fill and made the property of the contractor.

Management Options for soils excavated from 0 to 1.5 feet below grade adjacent to highways:

- Reuse soil within ODOT operating ROW (testing not required)
- If placing excess material off ODOT right of way, obtain land owner approval and DEQ permit to reuse the soil off-site (characterize the excess material as it would be generated by typical excavation methods, i.e. as a single bulk material).
- Dispose at a municipal solid waste landfill or a permitted construction and demolition landfill (testing likely required, unless landfill will accept existing ODOT data).
- Work with DEQ to develop other project-specific reuse or disposal options.

These management options only apply to excavated surface soils with no known point source of contamination (e.g. from a spill, adjacent industrial land use or adjacent HazMat storage). For specific point sources, a HazMat investigation must be conducted and project specific management requirements developed in accordance with ODOT Policy ENV 16-02.

RESPONSIBILITIES

ODOT Project Leader or ODOT Local Agency Liaison: Responsible for ensuring that project teams are informed of this directive at project initiation.

Region HazMat Coordinator and designated HazMat staff: Responsible for providing technical assistance, determining the sampling and management options and responsible for working with DEQ on project-specific management options. Inform Statewide HazMat program lead of discussions with regulatory agencies.

The Statewide HazMat Program Lead: Responsible for updating this directive as information becomes available and for working with DEQ on developing statewide soil management options.

ACTION REQUIRED

This Directive is to be applied to projects that have plans, specs and estimates (PS&E) submittal dates on or after October 27th, 2014.

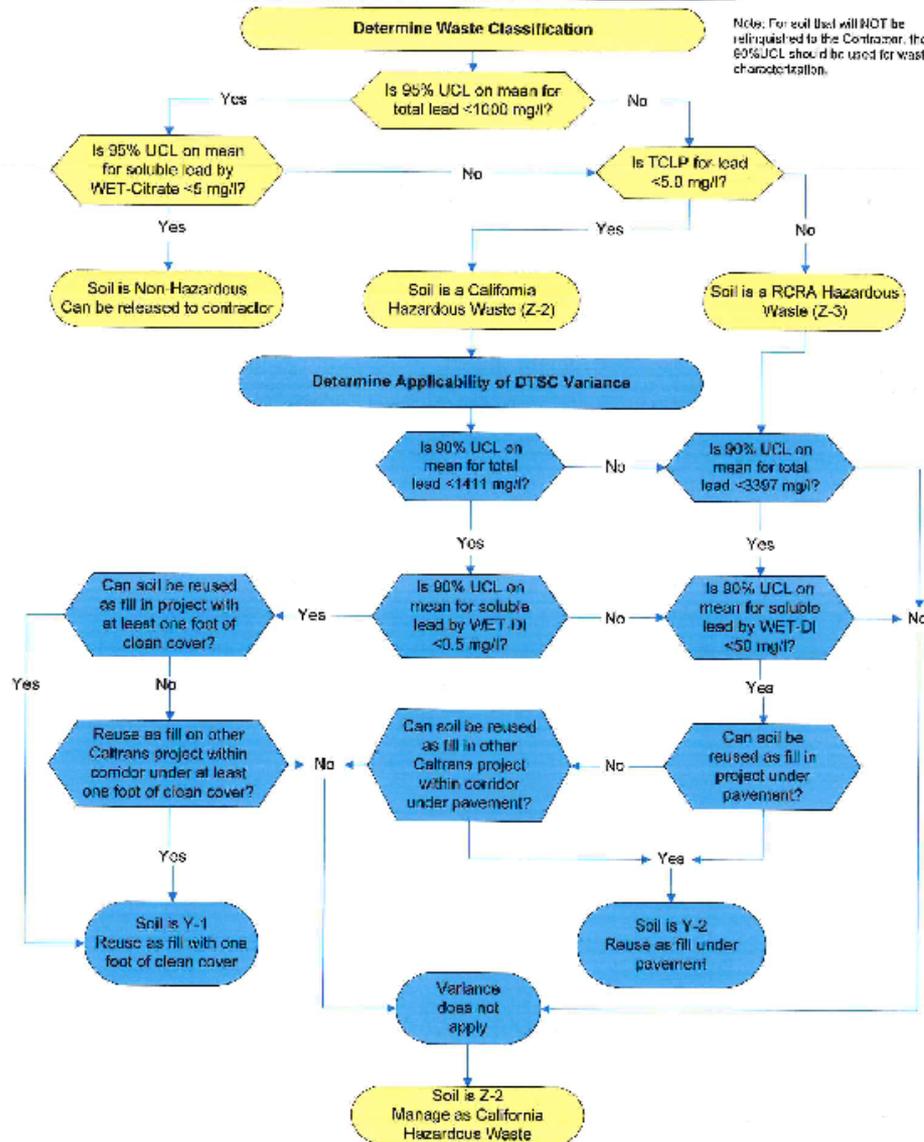
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GE14-01(D)
5/17/2014
Page 2 of 2

The directive says topsoil from 0 to 1.5 feet below grade adjacent to highways should be considered contaminated and can be re-used within the right-of-way without testing. DEQ has not objected to this directive.

Figure 1: ADL-Impacted Soils Management Flow Chart



ODOT is not alone.

Caltrans is aware of a lead problem on their highways.

Caltrans reuses lead contaminated soil in the right-of-way under a variance issued by the Department of Toxic Substances Control.

Caltrans flow chart for management of lead impacted soil.