**M E M O R A N D U M**

**TO:** SIP Inventory Preparers and EPA Regions

**FROM:** Inventory Guidance and Evaluation Section
INFO: (919) 541-2825

**DATE:** December 16, 1999

**SUBJECT:** VOC Emissions from Leaking Underground Storage Tanks

*This technical memorandum was prepared by Radian Corporation under contract to the Office of Air Quality Planning and Standards, US Environmental Protection Agency (EPA Contract No. 69-D0-0125). The objective of this work assignment is to provide technical consulting to state and local agencies preparing 1990 base year State Implementation Plan (SIP) emission inventories. The interim procedures outlined in this memorandum may not conform to future releases of EPA procedures and guidance. However, they are based on the best data available at this time.*

**INTRODUCTION AND PURPOSE:**

Several states have requested additional guidance in calculating emissions from Leaking Underground Storage Tanks (LUST's). Emission estimation methodologies for this category are not included in AP-42. The SIP inventory procedures manual suggests that site-specific data be compiled for each remediation activity as the basis for this area source category emission estimate. Because of the typically large number of LUSTs in any given area and the lack of State databases, emission estimation using a site-specific approach can be a formidable task. As a result, few agencies are devoting significant resources to emission categories such as LUST that are perceived to be small or insignificant contributors to their 1990 base year SIP emission inventories.

The purposes of this memorandum are to:

1) Present a simple approach for estimating Volatile Organic Carbon (VOC) emissions from remediations of leaking underground storage tanks;
2) Provide a recommended default emission rate for use where data are limited; and

3) Provide a set of default emission rates covering common ranges of soil excavation and gasoline contamination levels at LUST sites.

**BACKGROUND:**

Leaking underground storage tanks typically do not become quantifiable sources of volatile organic compound (VOC) air emissions until excavation and remediation efforts are initiated. Remediation efforts vary widely depending upon the type of contaminant, the magnitude of the leak and the extent of groundwater contamination, if any. In many cases where groundwater contamination is not apparent, the leaking tank and surrounding soil are removed and the soil is either placed in piles or evenly spread to allow volatilization of the contaminant. Excavation and piling is a very common practice in cases where the contaminant is highly volatile, such as gasoline.

**ESTIMATING LUST EMISSIONS:**

The following two-step approach can be used to approximate VOC emissions from leaking underground storage tanks for the purpose of developing base year area source estimates:

1) Identify the number of leaking underground storage tank remediations that were initiated during the base year ozone season.

2) Use an emission factor of 28 lbs VOC/day per event to estimate daily ozone season emissions.

The default emission rate is based on typical levels of gasoline contamination and quantities of soil removed and theoretical flux rate equations using summer temperatures. The default emission rate represents events with 50 $yd^3$ of soil removed and 10,000 ppmw of total petroleum hydrocarbons (TPH) or 500 $yd^3$ of soil removed and 1,000 ppmw of TPH. It was assumed that the contamination was unleaded gasoline. Hourly and daily emission rates from LUST remediation events change significantly with time. Emission rates during the first day are commonly 5 to 10 times higher than rates which occur 30 days after initial excavation. In other words, the flux rate from the pile is greatest immediately following excavation and decreases continuously until the volatile contamination has evaporated. The default emission rate discussed in this memorandum represents

the average daily ozone season emission rate for a typical remediation event initiated at the midpoint of the ozone season.

States that have detailed information on the amount of contamination and soil removed for each remediation event can use the attached table and figure to obtain a more precise emission rate that represents the size and contaminant concentrations associated with LUST remediation events in their specific area.

**EXAMPLE:**

In State XYZ's nonattainment area, Nowhere County, there were 57 remediations of leaking underground storage tanks initiated during the 1990 ozone season. Using the default approach, VOC emissions were estimated as follows:

$$\left( \frac{57\ remediations}{ozone\ season} \right) x \left( \frac{28\ lbs\ VOC}{remediation - day} \right) = \frac{1596\ lbs\ VOC}{ozone\ season\ day}$$

Table 1
Estimated VOC Emission Rates For Area Source LUST Remediations

| Project Size Quantity of Soil Removed ($yd^3$) | Gasoline Concentration in Soil as TPH (ppmw) | VOC Emission Rate (lbs/typical ozone season day)* |
|---|---|---|
| 50 | 100 | 0.3 |
| | 1,000 | 2.8 |
| | 10,000 | 28 |
| 500 | 100 | 2.8 |
| | 1,000 | 28 |
| | 10,000 | 280 |
| 1,500 | 100 | 8.4 |
| | 1,000 | 84 |
| | 10,000 | 840 |

*This value represents the average emission rate during the ozone season for an event initiated at the midpoint of the ozone season.

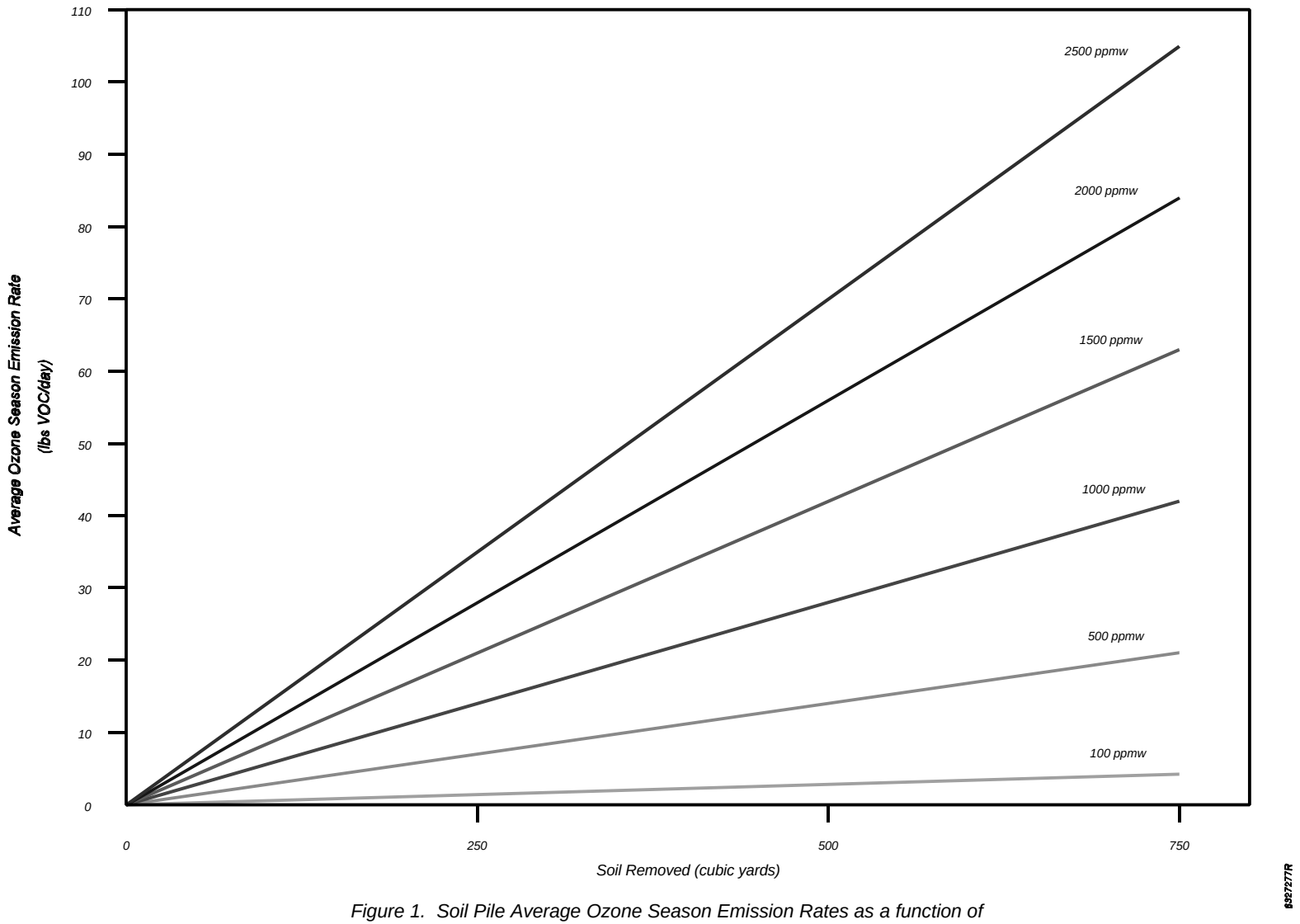


*Figure 1. Soil Pile Average Ozone Season Emission Rates as a function of Pile Size and Initial Gasoline Concentration*