7.0 AIR AND VAPOR MONITORING REQUIREMENTS

7.1 Introduction

Petroleum hydrocarbon vapors at storage tank and other release sites are a cause of concern for several reasons. Petroleum and petroleum vapors can migrate through the ground and create explosive conditions in structures and utilities. Also, prolonged exposure to non-explosive levels of petroleum vapors as well as inhaling petroleum-contaminated particulates can impact human health. Thus, the potential for impacts from vapors must be determined during the assessment and cleanup of a petroleum release site. See Standard Operating Procedure #1 in Appendix C for references containing information on vapor migration and factors affecting an air-monitoring program.

7.2 General Air Monitoring Requirements

7.2.1. Vapor Concerns Requiring Immediate Actions

If a release poses an immediate threat to human health or the environment, the responsible person must take immediate action. Situations that may require immediate action include vapors in buildings, vapors or free product in utilities, sudden/catastrophic release onto the ground surface or release to air from large overfills of tanks or accidents, releases from pressurized tanks. Refer to Chapter 3 for additional information regarding immediate actions that should be taken.

7.2.2 Tier 1 Assessment

During a Tier 1 assessment, identify the location, depth and construction of utilities, structures or other potential pathways and receptors on the property and immediately adjacent to the property. See Chapter 4 for additional information required during a Tier 1 assessment.

At this time, only a discussion of the potential risks is required. Screening or sampling is typically not required. However, when a definite vapor impact is identified or complaints of petroleum odors are reported during a site visit, these situations must be handled as an immediate action. See Chapter 3 for additional information regarding actions that should be taken.

7.2.3 Tier 2 Assessment

During a Tier 2 assessment the potential for vapor impacts must be verified. Refer to Chapter 4 Tier Assessment for additional information required during a Tier 2 assessment. Upon delineation of the extent of soil and groundwater contamination, all utilities and structures not identified during the Tier 1 assessment that are within the plume or a 1-block radius of the plume must be located. As necessary, collect site-specific information needed to run the RBCA program to determine potential vapor impacts to receptors (see Section 7.6).

7.2.3.1 Utilities or structures in contact with petroleum contaminated soil or ground water

If petroleum contaminated soil or ground water is present at concentrations that are suspected to be above state standards and in contact with a utility or structure, they must be field screened during Tier 2 assessment activities. Basements that may be impacted by the release must be checked for the presence of petroleum vapors, and the occupant of the property must be

contacted to determine if there have been petroleum vapors in the past. However, if the structure is a service station, especially if vehicle repair work is done; field screening may not be necessary. See Section 7.4 Specific Sampling Strategies for additional information on how to screen buildings (including interviewing occupants) and utilities.

a) If vapors are not detected during field screening, no samples will be required at this time. However, screening procedures should be reviewed and the field instrument should be checked to assure it is in proper working condition to confirm the non-detect sample results are appropriate. Site conditions should also be reviewed to determine whether they may be affecting the presence or absence of vapors. RBCA modeling may be required to determine future impacts (see Section 7.6).

b) If vapors are detected or were reported in the utility or structure, other potential sources of the vapors (cans of paint thinner in the basement, truck idling outside the door, runoff from the shop floor into the sewer drain, etc.) must be evaluated. If the vapors can reasonably be attributed to petroleum contamination or the source is unknown, air samples must be collected for laboratory analysis. Refer to Section 7.3 and Standard Operating Procedure 11 in Appendix C for general instructions for collecting air samples in buildings and utilities.

c) Compare results of sample analysis to action levels to determine if corrective action, monitoring, or additional assessment are required.

If sample concentrations exceed action levels, recommend corrective action/engineering controls. See Chapter 5.0 for a discussion of corrective action/engineering controls to mitigate vapors. In addition to the corrective action, the RBCA model may need to be run to determine a soil or ground water cleanup level. A vapor monitoring program may be needed prior to and during implementation of corrective action/engineering controls and to verify the actions have mitigated the problem.

If sample concentrations do not exceed action levels or are non-detect, or vapors have been reported in the past, begin an air monitoring program to verify contaminant concentrations or the absence of vapors. Sampling procedures should be reviewed and the sampling equipment should be checked to assure it is in proper working condition to confirm the non-detect sample results are appropriate. Site conditions should also be reviewed to determine whether they may be affecting the presence or absence of vapors. See Section 7.3 for general instructions for collecting air samples in buildings and utilities. Also, the RBCA model is required to assess the potential impacts to the receptor (See Section 7.6).

If the RBCA model predicts no potential impacts to the receptor, an air monitoring program may be required to confirm the model.

If the RBCA model predicts potential impacts to the receptor, the department will require corrective action or engineering controls to prevent impacts. Depending on site conditions and the recommended corrective action/engineering control, the department may also require an air monitoring program before, during, and after implementation of the selected remedy.

7.2.3.2 Utilities or structures not in contact with soil or ground water contamination.

If utilities or structures are present within the perimeter of the contaminant plume but not directly in contact with the contamination, or for utilities or structures outside the contaminant plume, but close enough to potentially become impacted in the future, the potential for impacts may be determined using the Tier 2 look-up tables (See Section 4.2.1) or the RBCA model, which ever is applicable.

If the Tier 2 look-up tables or the RBCA model predicts no potential impacts to the receptor, the department will not require additional assessment of the air pathway unless site conditions change.

If the Tier 2 look-up tables or the RBCA model predicts potential impacts to the receptor, the department will require corrective action or engineering controls to prevent impacts. Depending on site conditions and the recommended corrective action/engineering control, the department may also require an air monitoring program before, during, and after implementation of the selected remedy.

7.3 General Guidelines for an Air Monitoring Program

Implementation of a monitoring program for screening and sampling vapors depends on site conditions and the results of the Tier 2 look-up tables review or the RBCA model. After reviewing site conditions, the appropriate sampling or monitoring locations as well as the time of day, sampling duration and frequency of sampling will be determined.

Initial monitoring will normally consist of screening with direct reading equipment such as PIDs or detector tubes (See Standard Operating Procedure 11 in Appendix C). Collecting air samples for laboratory analysis may be required to validate or quantify the presence or absence of contaminant vapors. Typically, air samples will only be required if contamination is detected with the field instruments.

Generally, monitoring for vapors will be conducted quarterly before and during corrective action. Depending on site conditions, a site-specific monitoring schedule may be implemented after corrective action has been completed.

7.4 Specific Sampling Strategies

7.3.4 Vapors in utilities

Vapor levels may be determined using field instrumentation such as a photoionization detector (PID), flame ionization detector (FID) or detector tubes. Erratic responses may be a result of high organic vapor concentrations or conditions of elevated moisture. However, all readings must be reported along with the depth at which the information was collected. An explosivity or combustible gas meter may also be necessary to determine the Lower Explosive Limit (LEL). Be aware that if the LEL is suspected to be exceeded only a PID or an intrinsically safe FID should be used to screen the area.

The condition and type of storm and sanitary sewer lines can be very important since clay tile sewers or very old sewers with cracks or gaps can allow inflow of ground water. However, vapors can also migrate in the backfill of intact sewer lines or other utilities).

When conducting a utility vapor survey:

1. Use a photoionization detector (PID) to take vapor readings. Start at the manhole closest to the site. Work upstream and downstream to determine where product or vapors are entering, and the extent of the impacted area. "Crack" each cover first and take readings with an oxygen meter and PID. Repeat measurements at mid-depth and at the waste water level. If the results of the PID screening indicate that there is reason to believe the vapors are at explosive levels, screening must be done with an explosimeter.
2. Check the airflow direction in the utility. Direction of airflow may show the screening location is upgradient or downgradient from the source area and may provide information regarding dilution of vapors.
3. Water or sewage sample(s) may be necessary to determine whether vapors are due to the spill site or another source. Look for rainbow sheen and check for odors. If there is odor but no product, use a PID to conduct a jar/bag headspace analysis on the water or sewage sample.
4. Check all the incoming branches in the sewer or service connections, if possible. If odors are detected, continue upstream and downstream even if no product is present. Vapors may travel "upstream" from the source (especially in winter) and therefore may be misleading.
5. Check lift stations near the site.
6. If vapors are detected with field instruments, collect air samples for laboratory analysis.

A screening or sampling program should be designed so that screening and sampling are performed during optimal conditions, taking into account meteorological and/or site conditions, which would result in elevated concentrations. Field screening may be used to determine the necessary collection time and collection method to be used. Air samples must be collected using industry/EPA recommended techniques and sent to a laboratory for analysis (See SOP No. 11 in Appendix C).

7.4.2 Vapors in buildings

When conducting a vapor survey within a building, interviews with the building owner and/or occupant are required to determine the frequency and occurrence of petroleum odors.

1. Record names, addresses, and telephone numbers of building owners/occupants.
2. Check basements for petroleum vapors using both an explosimeter and a PID. Record time of day, outside weather conditions and duration of visit.
3. Check for vapors near basement sewer drains, near any cracks in the foundation and where utilities may enter the foundation. Carefully check for vapor pockets at covered sumps, building corners, crawl spaces, or in any area of poor air circulation. Describe sampling locations, including type of room (bedroom, den, garage, etc); height in the room and distances from significant structures in the room such as ceilings, hoods, vents, workbenches, chemical storage or use areas, doors or other large openings, etc.
4. Record type of heating, ventilation and air conditioning systems in the building. Describe general building airflow (e.g. was the building unoccupied and closed with no air circulation?). Determine whether air is used from inside the building or if outside air is brought in. Determine if potential sources of contaminants are located near an outside air source.

5. Describe other contaminants that may be present in the air because of normal building use (such as chemicals or solvents used for hobbies, freshly painted surfaces, cleaners, lawn care products, tobacco smoke etc.).
6. If vapors are detected with field instruments, collect air samples for laboratory analysis.

A screening or sampling program should be designed so that screening and sampling are performed during optimal conditions, taking into account meteorological and/or site conditions, which would result in elevated concentrations. Field screening may be used to determine the necessary collection time and collection method to be used. Air samples taken inside a building must be collected using industry/EPA recommended techniques and sent to a laboratory for analysis (see SOP No. 11 in Appendix C). Field screening may be used to determine the necessary collection time and collection method to be used.

7.5 Releases to Ambient Air

Examples of releases to air include; catastrophic releases such as large overfills of tanks or accidents, releases from pressurized tanks, volatilization from contamination on surface soil or surface water or air-borne particulates that may be hazardous or have absorbed contaminants. Also, air emissions from remediation systems should be designed to prevent the aesthetic quality of the surrounding area from being degraded.

During cleanups from surface releases, tank removals or remedial excavations, on-site cleanup personnel should be aware of the potential impacts to workers, employees, or the general public at the facility or in areas adjacent to the spill site.

7.6 Soil Gas or Soil Vapor Sampling

If vapors are reported in a residence or structure and petroleum contamination is not present near the structure, soil gas sampling along utility lines may be required to determine the source of vapors. See Chapter 4 regarding additional information on soil gas or soil vapor sampling.

7.7 Risk Based Corrective Action Modeling

The department will accept the use of the computer modeling system developed by Groundwater Services Inc., titled "Tier 1/Tier 2 RBCA Spreadsheet System". However, the original version 1.01 does not include baseline risk calculations for human exposure via soil or ground water volatilization to enclosed space and groundwater volatilization to ambient air exposure pathways. The latest version 1.2 does incorporate risk calculations for these pathways. Current owners of the original version can go to the Groundwater Services web page at https://www.gsienv.com/ and download a free updated version or call Groundwater Services at 713-522-6300. When modeling is used to determine a site-specific target level, the department will require that a list ofthe assumptions and values used be included in the report. Other models may also be accepted based on department approval.