Chapter 3
Emissions Characterization

What's Covered in Chapter 3:

- Emission Source Types and Data Requirements to Conduct RAIMI Pilot Study
- Consideration of Available Emissions Data Sources
- Utilizing Emissions Data to Prioritize Sources to Be Modeled

Emissions characterization is the process of identifying emissions sources and collecting the necessary data on source and emission specific parameters so that air deposition and risk modeling can be performed. For the RAIMI Pilot Study, the emissions characterization strategy emphasizes the use of facility-reported emissions data. Facility reported data were obtained from federal and state regulatory emissions databases and also through review of regulatory files, permit applications, and other related documents such as trial burn plans and reports.

The challenge of characterizing emissions is compounded because the various sources of emissions information are not consistent with respect to data content, categorization, or format. Regulatory reporting requirements that focus on the mass of contaminants emitted from a source or a facility (e.g., Clean Air Act reporting requirements) do not necessarily translate into providing the type, detail, and quality of information needed for conducting source-specific air dispersion and risk modeling steps to support evaluation of protectiveness. For example, industrial facilities may report significant amounts (i.e., hundreds of tons per year) of air emissions to meet CAA permitting requirements. However, these emissions are often reported summed into broad groupings or categories (e.g., non-methane volatile organic compounds) that lack the necessary chemical speciation to allow quantitative consideration of potential impacts posed (see Section 6.2 for further discussions on the potential effect that this and other limitations of emission characterization may have on results and risk management considerations).

Also, while multiple regulatory emissions reporting requirements, and subsequently emissions databases, do exist, the union of these recordings do not provide coverage to confidently ensure that all of the significant sources are identified. Even when most significant sources are identified, they are often not categorized in a complete enough manner (i.e., lack speciated emissions and other source parameter

values) with which to generate accurate air modeling and risk modeling results. Emissions sources may go unreported, or the reporting of these emissions may not get incorporated into files or databases.

There are also challenges associated with characterizing emissions from sources emitting relatively small quantities of pollutants individually, and therefore, not subject to vigorous regulatory reporting requirements of RCRA or CAA. As a result, characterizing emissions from such sources is generally limited by the lack of source-specific data, and estimates based on category-specific emissions factors are required.

This chapter further describes how and from which data sources emissions information is compiled, and how emissions data is utilized in the air and risk modeling components of the RAIMI.

3.1 EMISSIONS CHARACTERIZATION APPROACH

The approach for emissions characterization focuses on (1) identifying the existence of potential emissions sources, and (2) obtaining the necessary emissions data to complete air and risk modeling components consistent with RAIMI Pilot Study objectives. Several RAIMI Pilot Study objectives, as presented in Section 1.2, require consideration with regard to emission characterization. Specific to emissions characterization is the need to (1) support a standardized and consistent means for the assessment and evaluation of potential risk and hazard from multiple emissions sources of multiple contaminants from multiple facilities, (2) provide the necessary levels of detail for risk-based source-specific prioritization and decision making, and (3) support the calculation and tracking of potential risks generated in a fully transparent fashion such that aggregate concentrations and potential cumulative risk levels are completely traceable to each contaminant, each pathway, and each source (i.e., tracking attribution to a level of resolution and traceability that serve as an asset to stakeholders needing to evaluate and implement source-specific decision making).

Considering the objectives noted above, the emissions characterization component of the RAIMI Pilot Study focuses on using several State and Federal emissions databases; which provide some or all of the required information in varying formats and of varying levels of completeness. This approach meets the design goals of utilizing existing data sets; while also saving resources that would have otherwise been needed to collect extensive source-specific emissions data not already available in database form. Additionally, reviews of regulatory files are conducted to obtain any usable information not reported in the regulatory databases.

As previously noted, characterization of emissions and physical parameters of each source are required information to support implementation of the air (Chapter 4) and risk modeling (Chapter 5) components. Therefore, the data requirements of modeling are unique and specific to each source type. For purposes of clarity, source type definitions that correspond to how a source is defined for the purposes of air modeling (not related to the amount of emissions) is the convention adopted for the RAIMI Pilot Study. These definitions are as follows:

- **Stack**: Stationary source of fixed size that is designed to vent vapors and/or particulates into ambient air and from which emissions may result in the release of contaminants into ambient air while the source is operated as intended (vents, flares, etc.). Stack sources are characterized for air modeling based on physical stack parameters (stack height, stack diameter, etc.) and operational conditions (stack temperature, stack exit velocity, etc.).

- **Fugitive**: Fugitive emissions sources are typically associated with the release of contaminants from leaks in equipment (tanks, valves, flanges, and other material handling or processing equipment), structures (landfills, surface impoundments, and historical spill areas), or releases coincidental to design function (for example, aerial application of pesticides). Fugitive sources are generally defined for air modeling by size characteristics such as area or volume.

- **Mobile**: Mobile sources include on-road vehicles (automobiles, trucks, buses), off-road vehicles (agricultural vehicles, recreational vehicles), other powered off-road sources (construction equipment, lawn mowers), and other transportation vehicles (aircraft, railroad locomotives, marine vessels, etc.). Mobile sources are generally defined for air modeling by distribution or location of use, source density, and unique mobile source characteristics specific to the area of concern.

The absence of certain commonly used terminology in the definitions above is intentional and deserves brief attention. Emission sources are often referred to as “point” sources in regulatory reporting schemes under the CAA (most available regulatory emissions databases have been constructed and maintained to support CAA initiatives). However, this terminology was avoided in the RAIMI Pilot Study because it can be inconsistent with how sources are defined for purposes of air dispersion modeling. For example, area sources (e.g., fugitives from process areas or surface water impoundments that are air modeled as areas or volumes versus points) can often be reported and inventoried within regulatory databases (e.g., NTI, TNRCC PSDB) as point sources, but air modeled as area sources. Additionally, reporting under the CAA often provides sources termed as “major” and “area” based on the combined mass of contaminants emitted from combined individual sources and/or a facility as a whole as opposed to individual units. While the CAA source categorization may be sufficient to support CAA programs, it does not meet the data quality requirements for accurate air and risk modeling or tracking of source-specific results.

The source-specific data needs for model input to conduct air and risk modeling are identified in Table 3-1. These data generally fall into two categories: physical characteristics and emissions characteristics.

TABLE 3-1

SOURCE-SPECIFIC EMISSIONS DATA NEEDS FOR MODEL INPUT

	Stack Source	Fugitive Source	Mobile Source
Physical Characteristics	- Stack height [m] - Base elevation [m] - Stack diameter [m] - Stack gas exit velocity [m/s] - Stack gas exit temp. [K] - Control device description - Location [NAD 83]	- Area [m^2] - Release height [m] - Base elevation [m] - Location [NAD-83]	- Area [m^2] - Release height [m] - Base elevation [m] - Location [NAD-83]
Emissions Characteristics	- Contaminant CAS number and name - Speciated emission rate [g/s]	- Contaminant CAS number and name - Speciated emission rate [g/s]	- Contaminant CAS number and name - Speciated emission rate [g/s]

Notes:

m	meters
m/s	meters/second
K	Kelvin
NAD-83	North American Datum 1983
g/s	grams/second
CAS	Chemical Abstract Service

For regulated stack and fugitive sources, values for various physical and emissions characteristics listed in Table 3-1 are generally compiled by the regulated facilities and reported to a designated State or Federal permitting authority. Depending on the specific regulatory reporting format and requirements, these emissions data may have been developed by the facility either through application of estimation methods or by measurement at the source. For exempt and grandfathered sources, the availability and completeness of data is highly variable among facilities, and may even be limited to the extent of not having sufficient information to identify that the source even exists. Data on emission sources not associated with regulated facilities, such as light commercial, residential, and mobile sources, are mostly available only in national inventories which group similar sources for the purposes of generating emissions estimates.

The following section overviews the available data sources utilized in the RAIMI Pilot Study to obtain emissions characterization information and data to support the air and risk modeling components.

3.2 EMISSIONS DATA USED IN THE RAIMI PILOT STUDY

Consistent with the approach for emissions characterization outlined in Section 3.1, the RAIMI Pilot Study focused on using available emissions databases to the fullest extent possible. Identified emissions databases require review to identify those data sources that provide applicable and useful data to meet project objectives. The specific data needs and quality of that data required to meet project objectives have been previously described in Section 3.1. Table 3-2 is a list of the sources of emissions data that have been evaluated against these standards.

TABLE 3-2

POTENTIAL SOURCES OF EMISSIONS INFORMATION

Source	Maintained/Administered By	Data Characteristics
National Toxics Inventory (NTI)	U.S. EPA	Digital
Toxic Release Inventory	U.S. EPA	Digital
Aerometric Information Retrieval System (AIRS)	U.S. EPA	Digital
RCRA Hazardous Waste Files	U.S. EPA and TNRCC	Hard copy
RCRA Information System	U.S. EPA	Digital
TNRCC Point-Source Database (PSDB)	TNRCC	Digital
New Source Review Permit Files	TNRCC	Hard copy
Title V Permit Applications Table 1(a) forms	TNRCC	Hard copy
Facility files and records	Facility	Hard copy

Of the data sources evaluated, the most comprehensive emissions database meeting data quality objectives include the TNRCC Point-Source Database (PSDB) for individual sources (see Section 3.2.1) and the National Toxics Inventory (NTI) for grouped emission sources (see Section 3.2.2). These databases represent a significant effort to compile source-specific emissions data and emissions estimates

in a model-ready format. While some limitations specific to use in the RAIMI Pilot Study do currently exist with the NTI, extensive efforts are underway by U.S. EPA to compile emissions data in a format and level of completeness that would benefit RAIMI Pilot Study objectives. Considering the flexible design of the RAIMI Pilot Study as a dynamic project platform, as new or refined data becomes available it can be directly incorporated into the assessment to obtain revised results on a real time basis. The following sections further describe these databases or other sources of emissions data utilized in the pilot project, as well as considerations regarding use of the data specific to RAIMI Pilot Study objectives.

3.2.1 TNRCC Point-Source Database

The primary source of required emissions data and information needed to support air and risk modeling of individual emission sources is the PSDB, which is generated and maintained by TNRCC. For purposes of the RAIMI Pilot Study, individual emission sources can generally be characterized as follows:

> ***Individual Sources*** - those sources–generally industrial stack or fugitive sources–for which the available emissions inventories provide complete data sets to support source-specific air dispersion and risk modeling. Individual sources are typically subject to regulatory reporting requirements, are usually reported by the facility, and are typically based on information developed during the permitting process, process measurements, or other production estimates.

The Texas PSDB is the repository for point source emissions inventory data, an annual survey of chemical plants, refineries, electric utility plants and other industrial sites that meet the reporting criteria in the TNRCC emissions inventory rule (Texas Register 1992). Data reported to the Texas PSDB by facilities may be derived from emissions source monitoring or emissions estimates. The Texas PSDB includes stack and fugitive source types that meet the CAA major source description described in the previous section. The PSDB contains source-specific values for the physical and emissions characteristics listed in Table 3-1. Additionally, a variety of other potentially pertinent source attributes (e.g., source classification code, source type, actual and allowable emission rates, etc.) are also provided.

For the RAIMI Pilot, the 1997 Texas PSDB was obtained directly from TNRCC to provide the most current emissions data (1997) available for use. In addition to the PSDB being the most current repository of emissions data for individual sources in the study area, the TNRCC personnel responsible for maintaining the PSDB are very knowledgeable regarding database content. Since the database is updated annually, these same experts are readily available to answer questions and direct a full understanding of its usability and limitations.

The TNRCC has compiled one of the most complete inventories of source emissions throughout the U.S., as acknowledged by NTI in integrating the Texas PSDB in its entirety (In the state of Texas, the 1996 NTI incorporates the 1995 and 1996 PSDB developed by TNRCC [U.S. EPA 1990a]). However, in using the Texas PSDB, two considerations are important. First, the PSDB does not directly account for process upset conditions with elevated emissions above the usual operating conditions of the emission sources. These upsets may contribute significant additional emissions into the air for certain processes and facilities with poor maintenance histories. Second, the PSDB provides either "reported allowable", "actual", or both emissions data for sources. Although the RAIMI Pilot Study can by design accommodate any of various emissions scenarios (e.g., actual reported emissions, allowable reported emissions, permit limits, etc.), only actual reported emissions were used to obtain results provided in Chapter 6. This is primarily because allowable values are not consistently reported for sources without permits (e.g., grandfathered, and exempt). While supplementing allowables into the RAIMI Pilot Study could be done to fill data gaps associated with missing actual values, development of additional methodology would be required to address inconsistencies, which are often source specific, with how allowables are reported. Section 6.2 further discusses these and other important risk management considerations regarding the effect Texas PSDB reporting requirements have on evaluating results respective to RAIMI Pilot Study objectives.

3.2.2 National Toxics Inventory

The primary source of required emissions data and information needed to support air and risk modeling of grouped emission sources is the NTI. For purposes of the RAIMI Pilot Study, grouped emission sources are characterized as follows:

> ***Grouped Sources*** - those stack, fugitive, and mobile sources for which multiple, but similar, sources are grouped and evaluated as a single combined source within a particular area with the speciated emissions rates for each individual source summed into a group emissions rate. Also, emission sources are often grouped to reduce the effort required to complete air dispersion and risk modeling. The NTI area and mobile source categories are an example of grouped emission sources.

Grouped emission sources typically are not subject to regulatory reporting requirements, and therefore, are mostly available only in national inventories which group similar sources for the purposes of generating emission estimates. The primary source of required emissions data and information needed to support air and risk modeling of grouped emission sources is the NTI database, specifically the NTI area and mobile source category databases. Although the stated objectives of the RAIMI Pilot Study are to

obtain results specific to individual sources (i.e., resolution of data to support source specific permitting and management decisions), emissions data are generally not readily available in state or federal databases for individual sources that do not contribute to CAA major source facility designations. Therefore, 1996 NTI area and mobile source category emissions estimates are utilized in the RAIMI Pilot Study to account for emission sources not reported on an individual basis.

The NTI was developed by U.S. EPA in response to the requirements of the CAA of 1990 and the Government Performance and Results Act of 1993. As a result of these statutes, EPA established the need for a more comprehensive HAP emissions inventory that the Agency can use to track progress over time in reducing HAPs in ambient air. The objective of the NTI is to be a model-ready emissions inventory for the performance of air dispersion and risk modeling. The database format was designed to be similar and compatible with the National Emissions Trends database. The original NTI was developed based on emissions estimates from 1993. The current version, based on 1996 emissions data and originally released in 1999, includes emissions data submitted by 36 States. To supplement the State-reported data, EPA included data gathered while developing MACT standards and data reported by facilities to the TRI.

The NTI segregates emissions into categories consisting of point sources, area sources, and mobile sources. This categorization represents how data are reported to and organized in the NTI (i.e., the NTI organizational scheme originates from the terminology and regulatory requirements of the CAA); it does not necessarily reflect the physical characteristics of the source as adopted for the RAIMI Pilot Study (see Section 3.1). For example, the NTI point source category may include a fugitive area, and the NTI area source category may actually include some stacks (for example dry cleaners, that have stacks, are grouped into area sources because they typically don't meet CAA reporting requirements). Therefore, placement of a source into a category under this scheme is not necessarily based on the physical characteristics of the source, but typically on the quantities of CAA regulated pollutants they emit and subsequently the regulatory definition they meet.

The NTI area source category is defined as "stationary sources of emissions that are too small and diffuse to be inventoried as individual sources; they are generally smaller in terms of the mass of contaminants emitted than major sources [CAA major source facility designation] and are often ubiquitous in developed areas"(U.S. EPA 2000c). The 1996 NTI area source category database includes 483 area source subcategories. Some examples of area emission source subcategories include auto body refinishing paint application, gasoline distribution (e.g., gas stations), perchloroethylene dry cleaning, surface coatings:

industrial maintenance, and publically owned treatment works (U.S. EPA 2000c).

The NTI mobile source categories are generally segregated into on-road, non-road, aircraft, commercial marine, and locomotive subcategories. On-road emission source subcategories are defined in 1996 NTI to include "all vehicles registered to use public roadways"(U.S. EPA 2000b). In general terms, on-road sources include automobiles, buses, and trucks; and are further classified into seven vehicle types. Non-road mobile source subcategories are defined in NTI to include "vehicles and equipment that normally are not operated on public roads to provide transportation" (U.S. EPA 1999g). Non-road source include lawn and garden equipment, logging equipment, construction equipment, airport service vehicles, agricultural equipment, and recreational equipment. Aircraft emission source subcategories are defined in NTI to include all "aircraft types used for public, private, and military purposes" (U.S. EPA 1999i); and are further classified into four main categories which include commercial, air taxis, general aviation, and military. Commercial marine source subcategories are defined in NTI to include "all boats and ships used either directly or indirectly in the conduct of commerce or military activity" (U.S. EPA 1999h). Locomotive emission source subcategories are defined in NTI as "railroad locomotives powered by diesel-electric engines" (U.S. EPA 1999h).

NTI area and mobile source category emissions are typically estimated using a "top-down" estimation method, which relies on the use of source-specific emission- and activity-factors. That is, national-, regional-, and state-level emissions estimates are allocated to a refined geographic area (i.e., county level) based on a specific allocation scheme (U.S. EPA 2000c). Emissions estimates for mobile source subcategories also utilize speciation data obtained from EPA's Trends Report (U.S. EPA 1998e). Where available, NTI prioritizes state and local agency submitted data, including emissions submitted for the state of Texas by TNRCC. Additional emission data were obtained from EPA's MACT program for those source categories regulated under MACT. Data were was also obtained from TRI for those source categories reporting emissions below the major source cutoff (i.e., specified by CAA for major source designation) and not accounted for using other data sources. Additional details of the 1996 area source category are documented in *Documentation for the 1996 Base Year National Toxics Inventory for Area Sources* (U.S. EPA 2000c).

As noted above, the NTI area and mobile source category emissions are provided on a county-level basis. To obtain grouped source emission estimates at a finer resolution (i.e., census tract or neighborhood) for the RAIMI Pilot Study, the NTI county-level emission estimates require additional allocation. The RAIMI Pilot Study further allocates NTI county-level emission estimates for each subcategory to census

tract-level emission estimates consistent with the CEP allocation approach (U.S. EPA 1999a). This approach proportions county-level emissions to census tract-level emissions based on an assigned subcategory specific surrogate for occurrence; typically land use, population, or a combination of both. For example, the NTI county-level emission estimates for lawn and garden equipment may be allocated to each census tract in proportion to the percentage of residential land area within the census tract to the percentage of residential land area within the county. The RAIMI approach then utilizes the emission estimates for each subcategory to conduct the prioritization steps (see Section 3.3.2) and subsequent risk modeling component (see Chapter 5).

3.2.3 Supplemental Emissions Data Sources

Supplemental data sources are also accessed to verify and complete information reported in the NTI, or otherwise utilized during the RAIMI Pilot Study. Examples of supplemental data include RCRA hazardous waste files for those facilities and units that treat, store, or dispose of hazardous waste, TNRCC Table 1(a) forms for those facilities and sources that meet the major source requirements of the CAA, and TRI.

3.2.3.1 RCRA Hazardous Waste Files

U.S. EPA and State RCRA Hazardous Waste Files may contain important emissions characterization information for sources at facilities that treat, store, or dispose of hazardous waste. Specific emissions units covered include hazardous waste combustion and ancillary equipment, and tanks and impoundments subject to RCRA Subpart AA, BB, and CC. Emissions data may also be available for units subject to RCRA Subpart X.

The most significant emissions data obtained from the RCRA files for the RAIMI Pilot Study has been for RCRA hazardous waste combustion units. The risk burn plan, trial burn report, and certification of compliance documentation typically include supporting information. The RCRA files for such facilities in the RAIMI Pilot Study area are reviewed to obtain relevant information.

3.2.3.2 Table 1(a) Forms

Under the Texas and Federal CAA, specific regulations for permitting major sources of air pollutants were promulgated, known as 'New Source Review'. Specifically in Texas, submittal of the Table 1(a)

form is required as part of the permit application for all permits to construct or modify a major stationary source that emits a regulated pollutant above the 'major' threshold amounts defined in the CAA regulations (VOCs, nitrogen oxides, carbon monoxide, sulfur dioxide, lead, and particulate matter less than 10 microns in diameter, and emissions of all HAPs listed in the CAA Section 112(b)). However, it should be noted that submittal of Table 1(a) forms is not required under Title V of the CAA specific to existing facilities. The Table 1(a) form identifies the regulated pollutants from a facility and other pertinent information on the emitting units for use in evaluating compliance with ambient standards using air dispersion models. For proposed new sources, the emissions data provides the maximum hourly and average annual emission rates to be incorporated into the air permit. For existing sources, the emissions data also includes actual emissions and permitted allowable maximum emissions.

In addition to the pollutants regulated under the Federal CAA, the State of Texas has identified over 1800 contaminants with potentially adverse health effects, as designated with Effects Screening Levels (ESL), which must be reported on the Table 1(a) submittal as part of the permit application. Also, TNRCC annually requests the voluntary participation in the emissions inventory survey (EIS) of sources not requiring permits. These sources include major sources that have not been modified and grandfathered facilities (operating prior to 1972). Non-major sources, including exempt sources, are also requested to participate. The completeness of the Table 1(a) as part of the EIS is dependent on the voluntary submittal of accurate data by facilities with these sources.

Specific to Texas, the data submitted (both required and voluntary) in the Table 1(a) forms is reviewed by the TNRCC permitting engineer prior to use in preparing the permit and inclusion in the State's digital emission inventory, the Texas PSDB. However, computations of emissions not required as a permit condition may not be subject to review by the State. TNRCC utilizes the Table 1(a) as a standardized submission of air emissions data and requests that the following data be provided:

- **Emission Point Discharge Parameters**
  - Geographic location of discharge in Universal Transverse Mercator (UTM) coordinates
  - Stack parameters (height, diameter, velocity, temperature)
  - Area parameters (length, width)

- **Air Contaminant Data**
  - Unique emission point number (EPN) and name (consistent with facility plot plan)
  - Chemical composition by speciated component
  - Air contaminant emission rate (maximum hourly and annual maximum)

As a final note regarding data reported in Table 1(a) forms, the TNRCC requires speciation data for 90 percent of the total volatile organic compounds for sources emitting at least 1 ton per year, or 0.1 ton per year of a HAP. This is a goal identified in the TNRCC Emissions Inventory Questionaire Package: RG-360 (TNRCC 1999b). In actuality, few facilities provide in the Table 1(a) form speciation of HAPs emissions data (e.g., typically provide emissions as VOC groupings) for sources reported in the current update to the 1997 PSDB. Even fewer facilities provide speciated data for sources of pollutants not listed in the CAA (188 HAPs), but which may still be of concern from an exposure perspective (e.g., the over 1800 pollutants the State of Texas has identified with potentially adverse health effects, as designated with ESLs).

3.2.3.3 Toxic Release Inventory (TRI)

Within the RAIMI Pilot Study, review of available emissions characterization information is used to better understand the minimum range of emissions from industrial sources–in terms of facilities, contaminants, and mass. In discussing EPA's TRI database and its potential applicability, it is important to note that major differences in data resolution exist between the TRI and PSDB due to these databases representing different regulatory programs with different objectives and emissions reporting requirements. While generalized databases that only report emissions on a facility wide basis, such as TRI data, can be useful as a gross index of emissions within the assessment area, for our purposes only emissions data reported at a resolution specific to individual sources, such as TNRCC's PSDB, can actually be used to support a quantitative assessment for accurately estimating risks on a localized level (also see Section 4.3.2). For example, use of TRI data in a quantitative assessment requires that very limiting assumptions be made regarding source location, type (e.g., stack or fugitive), and characteristics (e.g., stack sizes, fugitive area or volume, release height, etc.) that may severely compromise the confidence in obtained results (see Section 4.3.2). For these reasons, TRI is used in the RAIMI Pilot Study only as an information source to help identify facilities with significant emissions within the Port Neches Assessment Area. As discussed in Section 3.2, only emissions data meeting minimum resolution and completeness requirements can be included in the modeling to meet the design objectives in the RAIMI Pilot Study.

The TRI tracks facility-reported releases on an annual basis for facilities that, in addition to other criteria, manufacture or process more than 25,000 pounds or otherwise uses more than 10,000 pounds of any listed chemical during a calendar year. The TRI tracks multi-media releases of emissions from industrial facilities, but does not provide information regarding exposure or health impacts from a release. The TRI

can be used to obtain the total amounts of media-specific releases for those facilities in the assessment area that reported TRI releases via air emissions, surface water discharge, underground injection, and release to land (see Table 2-2). However, as noted above, the TRI is a generalized database that only reports emissions on a facility wide basis, without resolution specific to individual sources as required to support a quantitative assessment on a localized level.

3.3 EMISSION SOURCE PRIORITIZATION

To meet RAIMI Pilot Study objectives requires the rapid identification, characterization, and assessment of aggregate environmental exposures and subsequent risk management opportunities. To achieve this, a risk-based prioritization scheme was developed for both individual and grouped emission sources within the assessment area in order to organize which sources to air and risk model first (see Sections 3.3.1 and 3.3.2). This approach enables resources to be focused on the identification and assessment of the most significant emission sources–in terms of the potential to impact neighborhood receptors–first. In addition, and by design, emission sources of special interest, new sources, or sources with updated emissions data can also be readily incorporated into the air and risk modeling on an as needed basis.

As previously discussed, the reporting of emission data is normally a result of an emission source triggering a regulatory reporting requirement. Therefore, the assimilation and organization of emissions data into national databases is typically differentiated between detailed reported data for individual emission sources, and non-reported data for grouped emission sources. Emission source prioritization is approached through means that accommodate the differences between individual and grouped emissions source inventories.

3.3.1 Prioritization of Individual Emission Sources

In conducting a cumulative type assessment, the number of individual emission sources within even a small assessment area can typically be expected to be quite large (e.g., about 1,529 individual emission sources identified in the TNRCC PSDB for the Port Neches Assessment Area). Although modeling every source may be technically feasible, a prioritization scheme to organize which sources to air and risk model first can help focus resource expenditures on the generation and management of results pertinent to achieving project objectives. Organizing which sources to air and risk model first is directly related to study objectives. For example, if a study is designed to evaluate the emissions from a particular industrial source category, emissions may be prioritized based on mass emitted for sources classified under that

industry's correlating SIC code.

Specific to the Port Neches Pilot Study, a risk-based prioritization scheme enabled resources to be focused on the identification and assessment of the most significant emission sources–in terms of the potential to impact neighborhood receptors–first. Development of a risk-based prioritization relies on evaluation of several factors including; mass emitted, toxicity, and the relative proximity of emissions sources and receptor neighborhoods. For the Pilot Study, emission sources were prioritized first on a mass emitted basis. Prioritization, was then refined on the basis of toxicity and proximity of emissions sources and receptor neighborhoods (i.e., through air and risk modeling of prioritized groups).

Sources prioritized on the basis of mass, were air and risk modeled in small groups (typically 10 to 20 sources per iteration) to facilitate logistical management of the emissions and modeling. Managing the sources in small groups also provides a more timely consideration of risk management options. In addition, air and risk modeling of the highest priority sources allows the RAIMI Pilot Study to evaluate these impacts and to focus the subsequent evaluation as necessary based on developing exposure trends.

The prioritization objective is to identify for modeling, at a minimum, all emission sources that may potentially contribute to a risk level of concern when also considering the combined impacts from surrounding sources. The risk levels of concern adopted in the RAIMI Pilot Study for the Port Neches Assessment Area are based on historical regulatory concern levels, of which 10^{-5} for risk and 0.25 for hazard are consistent with the range of central values (Travis et al. 1987). Other studies, given other objectives, might identify different levels for prioritization or indication of risk concern. These risk and hazard levels are the same as those adopted in Chapter 6 as a basis to identify exposure concerns, and to facilitate presentation and discussion of results, and a discussion regarding the establishment of these levels for this purpose can be found in the introduction to Chapter 6. As such, use of these risk and hazard levels in the RAIMI Pilot Study should be viewed as a quantitative threshold for scope of analysis (i.e., which sources and associated mass of emitted contaminants potentially result in significant impacts and should be included in the modeling) and presentation of results.

Specific to the Port Neches Assessment Area and based solely on available emissions data, surprisingly most if not all significant findings of the RAIMI Pilot Study presented in Chapter 6 could be identified based on the prioritization and modeling of emission sources with greater than about 3 tons per year of a contaminant. However, because it is technically feasible and not relatively resource intensive to add additional sources once the project platform has been constructed, generally all sources with 1 ton or

more of a speciated contaminant were included (prioritization at this threshold of annual emissions resulted in about 113 of the 1,529 individual sources within the Port Neches Assessment Area being air and risk modeled). Not only does this provide increased certainty that risk concerns, at least those that are possible to identify based on available data, have indeed been identified, it also extends the data set for interpretation of risk trends between potential impacts and source characteristics. It is also important to note that the annual thresholds of emissions identified in the RAIMI Pilot Study are highly specific to the sources, contaminants, available emissions data, and locations of neighborhoods within the Port Neches Assessment Area (e.g., of the 1,526 individual emission sources identified in the PSDB, only about half provide speciated emissions of one or more contaminants with relative toxicities of concern from a risk perspective, and only about one third report values other than zero for actual emissions). Specifically, it should be expected that prioritization thresholds, in terms of annual mass of a contaminant emitted, for alternate assessment areas would not be the same as for the Port Neches Assessment Area.

Appendix ESC contains the emissions characterization information that supports the prioritization of individual emission sources specific to the RAIMI Pilot Study for the Port Neches Assessment Area. Discussion of air dispersion and risk modeling referenced in this section can be found in Chapters 4 and 5, respectively; with results presented in Chapter 6.

3.3.2 Prioritization of Grouped Emission Sources

A risk-based prioritization scheme can also be developed to focus resources on significant grouped emissions sources in terms of potential neighborhood risk impacts. As discussed in Section 3.2.2, emission estimates for grouped sources can be obtained from the NTI area and mobile source category databases. The NTI contains county-level emissions estimates that, for the purposes of meeting the resolution objectives of the RAIMI Pilot Study, require allocation to smaller geographical units (census tracts) using a surrogate (e.g., population, roadway miles, SIC-specific employment, etc.) for each grouped emission source subcategory (e.g., dry cleaners, gas distribution, gasoline engines, etc.) to be included in the air and risk modeling. However, allocation of emissions to each census tract within the assessment area for each grouped emission subcategory (there are a total of about 74 grouped emission subcategories inventoried for the Port Neches Assessment Area) using surrogates is a labor-intensive exercise and requires the use and management of large quantities of data and geographic coverage information. Although allocating emissions and modeling every grouped emission source subcategory inventoried for the assessment area may be technically feasible, a prioritization scheme or screening of the source subcategories, which is implemented prior to the allocation of emissions step, can help focus

resources during emission allocation, and subsequently, air and risk modeling. Specific to the Port Neches Pilot Study, a prioritization scheme enables resources to be focused on the identification and assessment of the most significant emission sources–in terms of the potential to impact neighborhood receptors–first.

RAIMI Pilot Study prioritization of grouped emission source subcategories incorporates Port Neches Assessment Area characteristics (i.e., census tract sizes, county-level emissions) to create a worst-case hypothetical emissions scenario as a basis for screening which source subcategories could potentially have emissions that result in impacts where risk might be considered problematic. Inversely, grouped source subcategories screened as not being a priority based on the worst-case emissions scenario, are not included in the subsequent steps of allocating county-level emissions to census tracts in preparation for conducting census tract specific air and risk modeling. Specific to the Port Neches Assessment Area, this prioritization approach reduced the number of grouped emission source subcategories (from a total of about 74 to 42 subcategories) that require emissions allocation to each census tract (Port Neches Assessment Area has 14 census tracts), and subsequent air and risk modeling. It should also be noted, that as with the results of air and risk modeling of grouped emission sources, the prioritization is subject to the accuracy of the emissions inventory used (see Section 3.2.2).

The general approach utilized in the RAIMI Pilot Study for prioritizing grouped emission sources subcategories is outlined in the following steps:

> ***Step 1:*** *Create worst-case hypothetical emissions scenario for Port Neches Assessment Area as a basis for screening source subcategories. For each grouped source subcategory, assume total contaminant-specific county-level emissions estimates to occur in the geographically smallest census tract in the Port Neches Assessment Area. For the worst-case hypothetical emissions scenario, conduct air and risk modeling (utilizing methodology and exposure scenario specifications provided in Chapters 4 and 5, respectively) specific to each grouped source subcategory inventoried for the assessment area.*

This step creates a worst-case hypothetical emissions scenario by assuming a subcategory emissions for the county as a whole to be impacting the smallest census tract within the assessment area. This approach conservatively screens the highest emissions density for each subcategory in the census tract with the highest receptor density. Based on results obtained from Step 1, source categories that exceed the grouped source (potential) risk and hazard prioritization levels of 10^{-5} and 0.25 for a single contaminant from all sources, respectively, are prioritized for emissions allocation to each census tract using surrogates, and subsequent air and risk modeling.

Therefore, because Step 1 represents a worst-case technique by utilizing the geographically smallest census tract in the assessment area, those grouped emission source subcategories that do not exceed the risk and hazard prioritization threshold for this census tract will not exceed those levels in any of the other census tracts (which since they are geographically larger, will have lower modeled impacts based on air modeling methodology grouped emission sources).

> ***Step 2:*** *For those grouped source subcategories prioritized in Step 1, allocate county-level emissions estimates to census tract-level emissions estimates for each census tract, utilizing the appropriate allocation scheme (i.e., land use, population, SIC employment). Conduct air and risk modeling (see Chapters 4 and 5) using census-tract level emissions estimates for each grouped emission subcategory.*

This step moves from the highest density emissions/highest density receptor case in Step 1, to a more plausible case where emissions estimates are allocated specific to each census tract in the assessment area. Emissions allocation to the individual census tracts is based on the representative proportion of the surrogate in the census tract to that in the county as a whole (see Section 3.2.2).

Completion of Step 2 achieves the stated objectives of the RAIMI Pilot Study. As further discussed in Chapter 6, these results include prioritization of grouped emission source subcategories based on potential risk, identification of the risk driving contaminants, and allocation of risk to specific grouped emission sources on a neighborhood level of resolution. Results presented in Chapter 6 specific to grouped emission sources within the Port Neches Assessment Area are obtained by completion of Step 2 without further refinement. Appendix PGS contains the emissions characterization information that supports the prioritization of grouped sources subcategories specific to the RAIMI Pilot Study for the Port Neches Assessment Area. Discussion of air dispersion and risk modeling referenced in this section can be found in Chapters 4 and 5, respectively; with results presented in Chapter 6.

Completion of the air and risk modeling above (Steps 1 and 2) generate useful results specific to focusing resources on grouped emission source subcategories and contaminants potentially posing the greatest risk. However, further refinement may be required to support risk management decisions. This refinement involves more accurately allocating emissions and modeling grouped sources specific to their actual geographic locations instead of assuming the weighted distribution across the census tract (see Sections 3.2.2 and 4.1.3). For example, modeling results from Step 2 indicate that significant emissions may be attributable to the grouped source subcategory “hospital sterilizers”, but impacts would be highly dependent on the actual locations of the specific sources. Therefore, local research identifies the location

of hospital sterilization facilities within the census tract, and these sources are modeled at their true locations. This refinement can be conducted within the RAIMI Pilot Study framework and is described in Step 3.

> ***Step 3:*** *For each grouped source subcategory prioritized in Step 2, determine the actual number (or representative area) and location within each census tract of the actual sources represented by the grouped source subcategory in the inventory. The grouped source emissions estimate (based on the appropriate surrogate) is proportionately allocated to each source based on the number of actual sources. The actual sources are then modeled as individual sources–not grouped sources–according to the procedures established in Chapters 4 and 5.*

Determination of the number and locations of the actual sources being represented as a grouped emission source subcategory can be facilitated by various methods, including drive-by surveys, Yellow Pages or other business directories, and review of facility SIC code or Dun & Bradstreet listings. Generally, a combination of these tools, as well as others, provide sufficient coverage to ensure that all source locations have been identified. Although Step 3 is more resource intensive, this level of analysis may be justified in some cases when risk management decisions require more confidence regarding the location and magnitude of potential impacts.