

Emissions Characterization for a Community-Scale Risk Assessment

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ABSTRACT

Cumulative-type, risk-based assessments are increasing in popularity because regulating agencies are facing difficult questions from customers both internally and externally regarding the aggregate effects of exposure to multiple chemicals, from multiple pathways, and multiple facilities. Communities are asking the questions: Is the air that I breathe safe?, Is the water that I drink safe?, and Is the food that I eat safe? Appropriately designed Community-Scale Risk Assessment should be designed to answer these questions in a timely, cost-effective manner. The most quality critical component of a Community Scale Risk Assessment is emissions characterization. This paper discusses the methodologies utilized when conducting emissions characterization specific to a community-scale study, discusses various sources of emissions data, and introduces some emissions specific considerations that should be considered when interpreting risk or modeling study results.

INTRODUCTION

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 a Community-Scale Risk Assessment, the emissions characterization strategy emphasizes the use of facility-reported emissions data. Facility reported data can be obtained from federal and state regulatory emissions databases and through review of regulatory files, permit applications, and other related documents such as trial burn plans and reports.

The challenge of characterizing emissions for a Community-Scale Risk Assessment is compounded because the various sources of emissions information are not consistent with respect to data content, categorization, or format. This paper discusses available sources of emissions information including the strengths and limitations associated with specific datasets. Regulatory reporting requirements that focus on the mass of contaminants emitted from a source or a facility frequently do not provide the information needed for conducting source-specific air dispersion and risk modeling. For example, industrial facilities may report significant amounts (i.e., hundreds of tons per year) of air emissions to meet Clean Air Act (CAA) permitting requirements, but these emissions are often reported summed into broad groupings or categories (e.g., non-methane volatile organic compounds) that lack the necessary chemical speciation. In other instances, emissions data may be appropriately speciated, but lacking the detailed source specific data needed to generate accurate air modeling and risk assessment results

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 Resource Conservation Recovery Act (RCRA) or CAA. Additional data

gathering challenges that will be discussed include grandfathered or unpermitted facilities and emissions quantification of upset/maintenance emissions. As a result, characterizing emissions from such sources is generally limited and often relies upon estimates based on category-specific emissions factors.

Results of any modeling or risk assessment should always be evaluated alongside the emissions inventory inputs. The last part of the document focuses on several considerations that should be pursued prior to implementing and risk management decisions resulting from your Community-Scale Risk Assessment.

EMISSIONS CHARACTERIZATION METHODOLOGY

The approach for emissions characterization broadly 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 study objectives.

Additional factors to consider when characterizing emissions data is that your approach may need to (1) support the evaluation of 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, (3) support the calculation and tracking of risks generated, (4) allow for the aggregation of concentrations, and (5) be fully transparent and traceable through multiple exposure scenarios, for each contaminant, each pathway, and each source.

Emissions characterization for literally hundreds of sources located throughout the assessment area should:

- Ensure adequate data is available to support the air and risk modeling components of a Community-Scale Risk Assessment;
- Minimize the tracking and management of unnecessary data so that data management resources are not strained; and
- Support the flexible design of source and contaminant-specific risk evaluation, prioritization, and management.

Considering the objectives noted above, the emissions characterization component of the Community-Scale Risk Assessment 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 is often the most practical since it involves utilizing existing data sets; while saving resources that would be necessary to compile and manage extensive source-specific emissions data not already maintained in an agency database. On the other hand, limitations in these data sets may prevent sources or emissions from being included in a specific study (e.g., missing source parameters or lack of speciated emissions data) and may also diminish confidence in the results obtained.

As previously noted, characterization of emissions and physical parameters of each source are required information to support implementation of the air and risk modeling components of a Community-Scale Assessment. Therefore, the data requirements of modeling are unique and specific to each source type. For purposes of clarity, source type definitions are usually adopted for the a Community-Scale Assessment 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 source type definitions above is obvious and deserves brief attention. Emission sources are often referred to as “point” sources in regulatory reporting and databases. However, this terminology is usually avoided in a Community-Scale Assessment because it can be misleading in that 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 point source databases. Likewise, the CAA and associated regulatory programs organize HAP emissions based on defined source categories such as “major” and “area”. While the CAA source categorization, which is based on the combined mass of HAPs emitted from combined individual sources and/or a facility as a whole, may facilitate organization of information in a specific way useful under CAA programs, a Community-Scale Risk Assessment requires more resolution in the data.

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

Table 1. Source specific data input needed for modeling

	Stack Source	Fugitive Source	Mobile Source
Physical Characteristics	<ul style="list-style-type: none"> - 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] 	<ul style="list-style-type: none"> - Area [m²] - Release height [m] - Base elevation [m] - Location [NAD-83] 	<ul style="list-style-type: none"> - Area [m²] - Release height [m] - Base elevation [m] - Location [NAD-83]
Emissions Characteristics	<ul style="list-style-type: none"> - Contaminant CAS number and name - Speciated emission rate [g/s] 	<ul style="list-style-type: none"> - Contaminant CAS number and name - Speciated emission rate [g/s] 	<ul style="list-style-type: none"> - 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 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 generally utilized in a Community-Scale Risk Assessment to obtain emissions characterization information and data to support the air and risk modeling components.

AVAILABLE SOURCES OF EMISSIONS DATA

Community-Scale Risk Assessments focus on using available emissions databases to the fullest extent possible. However, available emissions databases require review to identify those data sources

that would provide applicable and useful data to meet the project objectives. Sources of emissions data that can be evaluated are listed in Table 2. Community-Scale Risk Assessments are generally built on a flexible, dynamic project platform so that as new or refined data becomes available it can be directly incorporated into the assessment to obtain revised risk estimates on nearly a real time basis. This approach satisfies goals of utilizing existing data sets, while also saving resources that would have otherwise been needed to collect and manage extensive source-specific emissions data not already maintained in an agency database.

Table 2. Potential Sources of Emissions Information

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

National Toxics Inventory (NTI)

The primary source of required emissions data and information needed to support a Community-Scale Risk Assessments is the NTI. The NTI is utilized because of its scope and completeness: it represents a significant effort to compile source-specific emissions data and emissions estimates in a model-ready format. Specific attributes of the NTI that facilitate its use to meet the goals and objectives of a Community-Scale Risk Assessment include:

- Contains the most recent emissions inventories and estimates on a national scale, facilitating its use across EPA regions and States;
- Reviewed by States, industry, and other federal agencies;
- Data is publicly available;
- Source-specific emissions data in a model-ready format;
- Emissions factors and allocations are well documented; and
- Significant effort is being invested to maintain and update emissions data.

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 Community-Scale Risk Assessments. 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.

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. The distinctions associated with how emission source data are reported and inventoried, also influences how emissions characterization is conducted specific to individual and grouped emission sources, as well as prioritization of emission sources, and even air and risk modeling.

Characterization of Individual Emission Sources

For purposes of a Community-Scale Risk Assessment, individual emission sources are characterized as follows:

Individual Sources - those sources—generally stack or fugitive sources—for which the available emissions inventories provide complete data sets for source-specific air dispersion and risk modeling. Data on individual sources is usually reported by the facility and are typically based on information developed during the permitting process, process measurements, or other production estimates.

The NTI usually incorporates state emissions inventories, when available. For example, in the state of Texas, the 1996 NTI incorporates the PSDB developed by TNRCC. 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.¹ Data reported to the Texas PSDB by facilities may be derived from emissions source monitoring or emissions estimates. The Texas PSDB source-specific data includes stack and fugitive source types that meet the CAA major source description described above. State inventories are often updated annually as opposed to the three year update of the NTI.

When utilizing state emissions inventories, care must be taken to understand the assumptions of that database. For example, 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. Also, the PSDB provides either “reported allowable”, “actual”, or both emissions data for sources. Although a Community-Scale Risk Assessment can by design accommodate any of various emissions scenarios (e.g., actual reported emissions, allowable reported emissions, permit limits, etc.), implications to results needs to be considered in study design.

Supplemental Emissions Data Sources

Supplemental data sources can also be accessed to verify and complete information reported in the NTI, or otherwise utilized during a Community-Scale Risk Assessment. Examples of supplemental data include RCRA hazardous waste files for those facilities and units that treat, store, or dispose of hazardous waste, Title V Table 1(a) forms for those facilities and sources that meet the major source requirements of the CAA, and the TRI.

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 a Community-Scale Risk Assessment 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 a Community-Scale Risk Assessment study area are reviewed to obtain relevant information.

Table 1(a) Forms

Under the Federal CAA, specific regulations for permitting major sources of air pollutants were promulgated, known as 'New Source Review'. For example, 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.

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 Questionnaire Package: RG-360.² 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).

Toxic Release Inventory (TRI)

Within a Community-Scale Risk Assessments, 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 state emission inventories 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. 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. For these reasons, TRI is used in a Community-Scale Risk Assessment only as an information source to help identify facilities with significant emissions within an Assessment Area.

Characterization of Grouped Emission Sources

For purposes of a Community-Scale Risk Assessment, 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 a Community-Scale Risk Assessment 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.

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 a Community-Scale Risk Assessment, the NTI county-level emission estimates require additional allocation. A Community-Scale Risk Assessment needs to further allocate NTI

county-level emission estimates for each subcategory to census tract-level emission estimates consistent with the Cumulative Exposure Project (CEP) allocation approach. 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.

CONSIDERATIONS REGARDING USE OF RESULTS

This section notes important considerations with regard to how the results of a Community-Scale Risk Assessment may be used to identify and prioritize risk management opportunities, evaluate permit conditions, or otherwise be used by regulatory agencies and facilities. The most significant limit to the usability of results is the lack of complete emissions characterization in the form of unidentified and unspiciated emissions data. Other considerations in addition to emissions characterization includes use of actual versus allowable emission rates, adjusting for process upsets and source location.

Because of the incomplete nature of many available emissions inventory data, it is reasonable to assume that modeling results, based on these inventories, underestimate risk and hazard impacts. Users of these results are cautioned to recognize these data gaps when risk management opportunities are identified and implemented.

Limits of Regulatory Reported Data

With regard to emissions of individual contaminants and the information necessary to assess risk impacts to individual receptors at the neighborhood level, the existing requirements for reporting emissions to state and federal emissions databases are not adequate to ensure that all significant emissions sources are being reported. Generally the regulatory reporting requirements were not developed with the specific focus of obtaining sufficient data to evaluate exposure to neighborhood receptors. However, comparing emissions records across regulatory reporting databases can provide insight into the nature of the inadequacies of emissions databases. For example, Table 3 compares the emissions data from the 1997 TRI and the 1997 Texas PSDB. Although the TRI was not designed to be a data repository for air dispersion and/or risk modeling data, the information in Table 3 does indicate a wide variance in the actual reported emissions across regulatory databases. The TNRCC emissions inventory program is acting to minimize these discrepancies—whether they are due to misinterpretation of the reporting requirements, typographical errors, or other factors—by sending a request to the reporting facilities, asking that they correct their reported emissions.

Table 3. Comparison of 1997 TRI and PSDB Data

Facility	Contaminant	TRI Air Emissions (Pounds)	PSDB Air Emissions (Pounds)
Ameripol Synpol Corp.	1,3-Butadiene	18,500	11,660
Carotex, Inc.	Benzene	0	9,106
Clark Port Arthur Pipeline	Benzene	0	4,984
DuPont Dow Elastomers	1,3-Butadiene	8,599	7,508
DuPont Beaumont Plant	Benzene	15,265	15,285
Fina Oil & Chemical Co.	Benzene	54,666	97,611
Huntsman Corp. - C4/O&O Plant	Benzene	1,570	45,436
	1,3-Butadiene	214,000	476,456
	Ethylene Oxide	52,000	89,002

Source: U.S. EPA 2000g; TNRCC 1999d

The following subsections describe specific aspects of regulatory reported data that effect the content and completeness of emissions characterization for the purpose of generating and using Community-Scale Risk Assessment results.

CAA Operating Permits

Under the CAA, an operating permit is required only for the construction of a new major sources or for the major modification of an existing source. A major source is one that emits more than 100 tons per year of a criteria pollutant, greater than 10 tons per year of a single HAP, or greater than 25 tons per year of a combination of HAPs. The CAA operating permit, also known as a Title V permit, documents actual and projected emissions and includes the required stack parameters for air and risk modeling. However, a complete inventory of emissions, even for major sources, is not required and, therefore, not available for inclusion into a Community-Scale Risk Assessment.

Sources emitting up to 100 tons per year of criteria pollutants, and up to 10 tons per year of HAPs, are not classified as major sources and are not required to get operating permits under the CAA. Therefore, some CAA sources (i.e. those with emissions of contaminants less than 10 tons per year, but in quantities that could contribute to risk) do not have regulatory requirements to provide emissions data for inclusion into the emissions databases, and thus are not available for evaluation in a Community-Scale Risk Assessment.

The collection of additional required data on source emissions is anticipated under the Title V operating permit program, which is in progress. Many source categories of interest to the Community-Scale Risk Assessment, such as refineries and chemical plants which may have hazardous air pollutant emissions, are required to submit Title V applications. However, subsequent review and approval may delay data availability. Permit application dates have been established based on emissions source category. Depending on the state and facility, detailed speciation of emissions may or may not be included in the Title V applications.

Risk managers should be aware that upcoming Title V permit applications for other source categories of interest may contain important and relevant information for emissions characterization and

risk modeling, although the availability of the data is dependent on the submittal date and regulatory review.

Grandfathered and Exempt Sources

Depending on state reporting requirements, emission sources that meet certain regulatory exemptions, including grandfathered status, are not always required to report emissions or to apply for an operating permit. For example, in the state of Texas and consistent with TNRCC (now TCEQ) emissions inventory requirements, all major sources are required to report emissions, regardless of permit status. However, prior to 1997, sufficient data did not exist to differentiate these emissions by the operating authority of the unit: grandfathered, exempt, or permitted. To correct this deficiency in the data, House Bill 3019 of the 75th Texas Legislature gave TNRCC the authority to request that all companies submitting an emissions inventory also update a survey form (Source Status Survey) documenting the operating status and permitting authority of all equipment on site.³ Although the emissions apportioning exercise is voluntary, the TNRCC reports excellent participation from the regulated community.

Additionally, TNRCC annually requests the voluntary participation in the emissions inventory survey of sources not requiring permits. These sources include CAA major sources that have not been modified (and do not require an operating permit) and grandfathered facilities (operating prior to 1972), in addition, Non-Major and Minor sources, including sources exempt from regulation under the CAA, are also requested to participate. The completeness of the Table 1(a) forms as part of the emissions inventory survey is dependent on the voluntary submittal of accurate data by these sources.

Emissions from these grandfathered or exempt sources may be significant from a risk perspective. For example, at the location of maximum risk modeled for a residential location in a Texas neighborhood, three grandfathered sources account for 45 percent of the adult cancer risk from 1,3-butadiene. This example illustrates the limitations presented by the absence of adequate emissions characterization data for grandfathered and exempt sources.

Regulated Contaminants

The CAA regulates a list of 188 HAPs. However, many contaminants that may pose significant risks are not included in the list of HAPs under the CAA, but are identified under other regulatory programs. For example, the Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities⁴ identifies over 200 contaminants of potential concern, and the State of Texas publishes a list of over 1800 contaminants that may have adverse effects on the exposed public. These additional contaminants not regulated under the CAA may contribute to aggregate risk. However, emissions data required to evaluate the impacts of these contaminants are not available due to a lack of regulatory requirements to provide these data under the CAA.

Upset/Maintenance Emissions

For communities adjacent to large facilities, emissions resulting from upsets and maintenance activities may predominate but are frequently under represented in the total inventory. All releases, above a certain reportable quantity, resulting from accidents and planned maintenance activities are required to be submitted to the federal National Response Center. Although initial reports are often gross estimates made by the facility prior to detailed mass balance determinations, the facilities are required to conduct these more detailed analyses and resubmit actual release data.

Because the majority of these emissions are exempt from specific permit limits, these emissions are often not quantified in annual emissions summaries. However, many states such as Texas are now requiring industry to report upset and maintenance conditions and emissions to specific databases.

Actual vs. Allowable Emissions Data

Reported actual emission rates constitute the primary source of emissions information, however the modeling of only actual emission rates may underestimate potential risk when sources known to be operating fail to submit actual emissions. In these cases the substitution of the allowable emission rates identified in facility permits may be utilized. Evaluating allowable emission rates, or substituting allowable emission rates for data gaps in reported actual emission rates, may be beneficial in considering risk management opportunities. Reviewing and utilizing allowable emissions rates also provides a better understanding the magnitude of uncertainty associated with underestimating potential risk by evaluating only actual, facility-reported emissions data. Modeling of allowable emissions for permitted sources within the assessment area may also provide risk managers with important information to better evaluate regional permitting effectiveness.

One significant limitation is that allowable emission rates are only available for permitted sources; a permitted allowable emission rate will not be available for grandfathered or exempt sources. As stated in the section above on grandfathered and exempt sources, grandfathered sources often contribute significant actual emissions and have been shown to drive risk results.

Source Location

Extra caution must be exercised in using source locations reported by facilities or extracted from digital emission inventories. Experience indicates that facilities typically use plant coordinates and latitude-longitude survey points for plant siting and operations. The requirement to report UTM coordinates for regulatory inventories is an unfamiliar practice for many facility personnel responsible for extracting and providing these data. Reviews of reported UTM coordinate locations with facility plot plans and digital data products frequently identify discrepancies. In addition to possible errors in conversion between plant and UTM coordinate systems, another potential source of error is that USGS 7.5 minute topographic maps are plotted in the NAD-27 coordinate system, rather than the more current NAD 83 coordinate system. Failure to document this coordinate system appropriately has resulted in documented errors in actual point locations of 200 meters in the north-south direction. As with location, another consideration should be the base elevations for all emission sources evaluated. Elevations should be verified or extracted using a USGS digital terrain database. Since elevation data correlates directly to a given location, the verification of emission source base elevation is done only after verification of the source location.

CONCLUSIONS

Emissions characterization is a critical component of a Community-Scale Risk Assessment. The primary source of data available for conducting such assessments are State and Federal emissions inventories generated from information supplied, many times on a voluntary basis, by industry or predicted using surrogates such as population or land use. Emission Inventories have been found to have several limitations with respect to utilization in a Community-Scale Risk Assessment, however this does not necessarily restrict their usefulness in achieving project objectives.

Design goals of a Community-Scale Risk Assessment are *fully* achieved only with input data of appropriate quality commensurate with the permitting or risk management decision being made. In most

cases, given the current availability of data, this will be realized – for more costly or controversial risk management or permitting decisions – not at the stage of using “readily available data,” but only after inclusion of site-specific additional information that results in refinement of the analysis specific to highest risk concerns and significant data gaps. However, the process of identifying significant risk concerns based on available data is the first and necessary step in effectively designing risk management solutions.

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KEYWORDS

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