Texas Natural Resource Conservation Commission

INTEROFFICE MEMORANDUM

To: Interested Parties **Date:** August 12, 2002

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Air Permits Division
Office of Permitting, Remediation & Registration

Subject: Air Dispersion Modeling for Dockside Marine Vessels and Related Activities

I. Introduction

This memo discusses air dispersion modeling guidelines and techniques developed for sources of or relating to dockside marine emissions. It addresses the following topics: source characterization; receptor placement; impacts evaluation; post-processing of model predictions; and ambient air monitoring. While this guidance should apply to most projects, it may not apply to all due to such factors as source location, operation and configuration, toxicity, or existing air quality. Please consult with the ADMT staff before modeling as all projects undergo case-by-case review.

In addition, this memo reflects several significant changes from the draft documents. These changes were in response to stakeholder and staff comments and are summarized at the end of the memo.

II. Guidance Documents

The basic guidance documents used in air dispersion modeling are the TNRCC's *Air Quality Modeling Guidelines (*RG-25) and the *Modeling and Effects Review Applicability* (RG-324) technical guidance package and the Environmental Protection Agency's *Guideline on Air Quality Models.* This memo will be updated as new procedures or techniques are developed, and it will be superceded by the next version of the TNRCC *Air Quality Modeling Guidelines* when it is published.

The *Modeling and Effects Review Applicability* technical guidance package provides a flow chart that can be used to determine what level of effects review is required and whether air dispersion modeling is needed. The flow chart guidance applies to the review of non criteria pollutants for all applicants.

If modeling is required, the *Air Quality Modeling Guidelines* document is used to conduct the modeling analysis. Screening or refined modeling can be used as appropriate. At a minimum, all project-related sources must be modeled using maximum allowable emission rates. If a sitewide evaluation is required, then all sources of emissions of the constituent of concern, including those from other permit, permit-by-rule and grandfathered sources must be modeled.

III. Source Characterization

It is important that the applicant completely and accurately describes the operating factors and conditions of the facilities undergoing permit review. The following is a list of the type of factors that must be considered before source emissions can be characterized and model parameters developed.

Operation or Process Limitations

If the facilities do not operate continuously, the following factors should be addressed in the permit application:

- *Operational scenarios*: The applicant should provide worst-case and reasonable-case operational scenarios, and discuss how likely it would be for the worst-case scenario to occur. In addition, the applicant should describe the operational processes in enough detail to justify all source type characterizations. For example, for a blasting operation, the applicant should provide the minimum and maximum size of a blasting area and the details of how the blasting operation will be conducted. That is, the applicant should describe such operational factors as whether the operation will be done manually or by machine; on a single side at a time or multiple sides; or on one level at a set height or multiple levels with a varying height.

- *Hours of operation*: For each facility under permit review, the applicant should identify the hours of operation.

    - *Time-of-day or seasonal restrictions*: If the hours of operation are less than 8760 hours per year, the applicant should provide any time-of-day or seasonal restrictions; and whether the emissions are the same for each hour or if they are reduced for some hours.

- *Type of emissions*: If the emissions are not continuous, the applicant should identify any batch process or a process that must occur before another process can occur. In addition, the applicant should include the frequency and duration of the emissions, for example, one hour out of every three hours or one hour per day.

    - *Simultaneous emission*s: If the emissions are not continuous, the applicant should identify all facilities that could be operated simultaneously. For example, for a site with coating and blasting facilities, indoor coating and outdoor blasting could occur at the same time.

- *Emission rates*: Short-term emissions for a single specific source often vary significantly with time because of such factors as fluctuations in process operating conditions; control device operating conditions; type of raw materials being handled or processed; and ambient conditions. The applicant should provide the basis used to determine the maximum allowable emission rate

request. For example, is the rate based on the potential for a single spike during an hour, or are the emissions uniform throughout an hour? Or, are the emissions linked to wind speed, such as wind-generated emissions originating from a standing stockpile?

- *Environmental limitations*: Some emission rates are based on environmental factors. The applicant should discuss any environmental factors that could limit operations such as wind speed or direction; ambient temperature; or humidity.

- *Controls*: The applicant should describe any management practice controls that will be used in addition to controls that must be used to meet best available control technology requirements, such as shrouds, bunkers, or fixed enclosures. In addition to any emission credit allowed by the staff, the use of partial or full obstructions to airflow will affect the way a fugitive emission is characterized for input into the air dispersion model. The characterization will depend on factors such as the height of release; height of the enclosure; particle size; and the duration of the operation. For example, if shrouds will be used to contain emissions from the outdoor blasting or painting of small equipment, the characterization will be different if two shrouds are used compared to the use of four. The height of release that will be used in the model for the two-sided shroud will be lower than the height of release for a four-sided shroud. In addition, if the permit reviewer did not consider particle size in the development of the emission rate, the modeled emission rate might be reduced to account for lower expected emissions due to impact with all sides of the shroud and release of emissions at the top of the shroud.

- *Particle size and particle-size distribution*: Since the air dispersion model assumes that the pollutant is a non-reactive gas of approximately 20 microns or less, the applicant should provide data on particle size and particle-size distribution for particulate that is much larger than 20 microns, if available. This information will be used to set the emission rate, which is usually based on a particle size of 50 microns and less. In addition, the applicant has the option of setting the model to account for deposition and plume depletion, based on the particle size used to set the emission rate, which should lower overall concentrations and reduce the predicted number of exceedances of a concentration of concern. While the predicted impacts will be more representative, there may not be a significant difference in predicted concentrations unless the majority of particles are well above 20 microns. In addition, site-specific meteorological parameters must be developed, and the model will take much longer to run.

Source Types

From an air dispersion modeling perspective, most emissions from marine and related activities are usually classified as fugitive releases. That is, they are not collected and emitted through a stack. Sources of these emissions can be treated as pseudo-points; volumes; or areas, as applicable. The following is a brief discussion of each source type:

- *Point*: For this source type, such as a vent pipe, use the actual stack diameter, exit gas velocity, and exit gas temperature in the modeling demonstration. Use the actual height of release unless the height of release varies due to the operational process. In those cases, use the average height of

release. For example, if a vent pipe is located on the deck of a marine vessel, the height of the top of the pipe will vary during the loading or unloading process, as the vessel rises or falls in the water. Therefore, determine an average height of release and use that height in the model.

- *Pseudo-point*: For this source type, emissions are treated as if they are released from a stack. Default parameters for stack diameter, exit gas temperature, and exit velocity are used to prevent the stack plume from having any buoyancy or momentum flux. Examples of sources that might be treated as pseudo-points are individual pipe connections; flanges; small vents and ducts (a few feet in diameter); small stockpiles; and covered, obstructed, or horizontal stacks.

- *Volume*: There are two basic types of volume sources: surface-based and elevated. Emissions are usually considered to be released from a volume source if the emissions can be considered to occur over a certain area and within a certain depth of space. In addition, the volume source is assumed to be neutrally buoyant; that is, a volume source has no associated plume rise. Some examples of volume sources are roads, stockpiles, buildings, and large piping, coating, blasting, marine, barge, and mechanical activities.

  The important parameters used to characterize volume sources are location, height of release, and initial horizontal and vertical dimensions. In order to determine the applicable dispersion parameters, the length of the side of the volume source, the vertical height of the source, and whether the source is on or adjacent to a structure or building must be identified. The process to determine volume source parameters can be challenging. While the staff can provide general guidance, most characterizations are made on a case-by-case basis. In addition, several characterizations for the same source type could be appropriate depending upon the potential impact of building and other structures and meteorological conditions.

- *Area*: Pollutants from area sources are usually emitted at or near ground level and also emitted homogeneously from the area. Emissions from area sources are assumed to have no plume rise, although for some operational processes, such as outdoor paint drying, there may be initial vertical dispersion to consider. The emission “rate” is unique for an area source in that emissions are entered in units of mass per unit time per unit area–an emission flux rather than a rate.

  The important parameters used to characterize area sources are location, geometry, and relative height. The area source may be a rectangle, circle, or polygon. If the source is not at ground level, then a height of release must be entered into the model. If the release height is greater than about 10 meters, the Environmental Protection Agency (EPA) suggests that the emissions should probably be modeled as a volume source. In addition, the area source algorithm allows the calculation of concentrations within the area.

Equivalency of Source Types

There is no direct equivalency or relationship between the types of sources. Many factors must be considered to determine if a source characterization is conservative or representative. A conservative characterization is one that will result in a higher concentration than a representative characterization

would in a specific area of concern. In addition, a conservative concentration would not be expected to occur based on actual operation of the permitted facility. In general, the applicant should use the SCREEN model to determine whether a characterization would be conservative and under what meteorological conditions. This information will make the processes of model result clarification or post-processing of modeled predictions easier. The most important factors to consider when choosing a source characterization include:

- *Type of compliance demonstration*: National Ambient Air Quality Standards (NAAQS), Prevention of Significant Deterioration (PSD) Increment, and state property line standard compliance demonstrations are directly related to the highest concentrations predicted in ambient air. For these demonstrations, a characterization does not have to be representative if it results in a conservative prediction. However, for an Effects Review, the type of receptor and magnitude and frequency of exposure must be considered. Therefore, a source should be characterized in the most representative way to ensure that the Effects Review is based on realistic data, and to prevent costly or unnecessary process changes.

- Distance from the source to the property line or area of concern: At great distance (on the order of thousands of feet), and other factors such as height of release being equal, source type is not as important as when the distance to a property line or area of concern is short. At great distance, predicted concentrations will begin to converge as horizontal and vertical dispersion parameters increase and differences between them for a given source type decrease. However, for short distances there can be significant differences between horizontal and vertical dispersion parameters and thus between predicted concentrations of different source types.

- *Height of release*: The height of release from a stack is obvious. The height of release from a fugitive source may not be obvious and is important because the height of release for a fugitive source is the plume centerline and the height of maximum concentration. With no plume rise, the maximum concentration in the plume will stay at the same height and concentrations can only reach the ground through vertical dispersion. For a pseudo-point and usually any point within an area, there is no initial vertical dispersion; however, a volume source has initial dispersion. Therefore, a volume source with the same level of emissions as a pseudo-point source can have a greater impact than a pseudo-point source within short distances because the plume reaches the ground more quickly.

- *Shape of a non-point source*: The shape of a non-point source will directly affect the model's prediction of the magnitude and location of maximum concentrations. In addition, the predicted frequency of occurrence will also be affected. Therefore, it would not be appropriate to represent the base of a long and narrow source of emissions as a single equivalent square, unless there were other mitigating factors such as great distance from the source to the property line or receptors of concern. Either multiple volumes, single area, or several areas may be an appropriate choice. Keep in mind that a justification for any choice of source type based on the specific factors for the project is required.

IV. Receptor Placement

Property line and receptor grid points

The primary difference between reviews for state and federal standards and effects review is the determination of impact on a specific type of exposed receptor. For state and federal reviews, the maximum concentration predicted to occur in ambient air is compared to the applicable threshold value or standard. To accomplish the effects reviews, model receptor grid points are placed at and beyond the property line at a sufficient distance to demonstrate protectiveness—usually defined as a predicted concentration less than an Effects Screening Level (ESL).
The property line is the start of ambient air. The basis for this procedure is derived from the definition of net ground-level concentration in the Title 30 Texas Administrative Code, Section 101.1 (64). In most cases, the property line is well defined and all sources of emissions are on property. However for some activities, such as marine loading, sources may be located off-property and emitting directly into ambient air. For these cases, the following guidance for determining the points of evaluation is appropriate for the technical review process, and applies whether the analysis is for a standard or ESL—with one exception. The legislature enacted Section 382.065 in the Health and Safety Code [House Bill (HB) 3040] for shipyard facilities. This section exempts shipbuilding or ship repair operations from modeling and effects review for non criteria pollutants over coastal waters. Therefore, for these facilities, the following guidance only applies to reviews concerning criteria pollutants. For non criteria pollutants, no receptors are required over water.

Off-property receptors over water

There are three basic approaches that could be used to determine where receptors should be placed when a source is located off-property in ambient air. These could be used individually or in combination. These distances would apply for technical review purposes only. The applicant must still comply with all the Agency's rules and regulations.

- *Set distance*: A fixed distance for modeled receptor grid points of 25 meters is normally used for low-level fugitive-type emissions and for emissions from stacks that could be affected by downwash. The points start at the property line and extend from about 100-200 meters before the suggested grid spacing changes. If the activity is located off-property in the water, the source of emissions is considered to be part of the property during actual operations. Since the general public would not be present at the source, receptors should be placed starting at a distance 25 meters from the edge of the source instead of on the actual property line.

- *Controlled or restricted distance*: There are two general distance limit scenarios.

  - Controlled: If the applicant can limit access to an area near the source of emissions for the duration of the operation such that the general public and off-site workers would not be exposed, the modeled receptor grid points could begin at the edge of the control area as well

as on the property line in the uncontrolled areas. Use of buoys would be an example of a way to limit access.

- Restricted: If the applicant can show that access is restricted, the modeled receptor grid points could begin at the edge of the restricted area as well as on the property line in the unrestricted areas. For the purposes of modeling and effects review, a restricted area is accessible only to the applicant's employees, including personnel associated with marine vessel operations. If other individuals have access to the area, then the area is not restricted, and receptors would be placed in the area. Examples of restricted areas could be a coastal easement agreement with the General Land Office that allows the applicant to restrict access, or any other authority that allows the applicant to post signs that prohibit access to anyone other than the applicant's personnel. The applicant should provide documentation for restricted areas, including specific coordinates and any applicable specified conditions for the area, to the permit reviewer. Note that a restricted area could be a water area, shore area, or both.

- *Model limitation distance*: There is another consideration, in addition to the set or controlled distance consideration. The model may not be able to calculate a concentration immediately adjacent to the source. In that case, the modeled receptor grid points should begin at the closest point that the model can calculate a concentration from the source at or beyond 25 meters from the edge of the source. The distance of the grid points from the edge of the source would be linked to
the limiting algorithm in the model. This distance could be a minimum of one meter for a point, pseudo-point, or an area source to about 47 meters from the center of a volume source with about a 91-meter base.

Note: The model's limitation is not related to a "property line" but to an algorithm in the model. Therefore, there may be sources that are located on a property at a distance that would prevent the model from calculating a concentration on a property line or on a grid receptor placed on a land location off the property.

Following are some receptor placement examples

Receptor Placement Example 1: Consider a site that has emissions from a stack on a ship that is moored at a dock in the water off the actual property of the applicant. Receptors should be placed starting at a distance of 25 meters from the edge of the ship in the water and out a sufficient distance to record the highest predicted concentrations and to demonstrate that concentrations are declining with distance.

Receptor Placement Example 2: Consider a site that conducts blasting operations in two locations at a site: a dock, located in the water off the applicant's actual property; and, outside a building located in the center of the property. Operations are such that the permit reviewer determines that PM_{10} (a criteria pollutant) should be evaluated per HB3040. During blasting at the dock, the applicant can control access out to a distance of 40 meters over water from all sides of the ship. For the controlled area, receptors should be placed at the start of the area. Normal receptor placement procedures would be used for the

property-line receptors over land, and away from the controlled area over the water. Receptors over both land and water should extend out a sufficient distance to record the highest predicted concentrations and to demonstrate that concentrations are declining with distance.

If the dock and building operations can occur at the same time, then the controlled area for the dock operation will drive the creation of the receptor grid over water. However, if the operations can occur independently, and the area near the dock will not be controlled during operations at the building, then a separate model run may be required for this scenario depending on factors such as the amount of emissions and distance from the water. In this case, the receptors should start at the property line and extend directly over water.

Receptor Placement Example 3: Consider a site where the applicant unloads container ships at a dock. Assume that the width of the ship is 20 meters. In addition, assume that the operation can be represented by a volume created by the movement of a multiple scoop conveyor lifting material out of a compartment and onto another conveyor. The length and width of the volume are 16 meters based on the size of the compartment. With no other adjustments to the initial dimensions, receptors over water could be placed starting at a distance of about 9 meters from the center of the volume. However, since this distance is less than 25 meters from the edge of the ship, the greater distance should be used.
In this case, the receptors over water would begin at a distance of 45 meters from the dock (25 meters from the edge of the ship) and should continue out a sufficient distance over the water to record the highest predicted concentrations and to demonstrate that concentrations are declining. Normal receptor placement would be used for the property-line receptors away from the water. If the distance from the center of the volume to a non-water property line is less than 9 meters, the receptors over land would start at 9 meters from the center of the volume.

V. Impacts Evaluation

The type of compliance demonstration determines the impacts evaluation. Predicted concentrations are either compared to standards or ESLs. During the review process, the staff will evaluate predicted concentrations from an air dispersion model in light of the limitations of the model, as applicable. Additional effort may be required to determine the significance of a predicted concentration based on a technical limitation of the model or the amount and cause of a suspected over prediction. The staff will evaluate a model's prediction using all available technical factors to determine expected compliance but they will not attempt to quantify model uncertainty.

Model results clarification

Occasionally, modeled predictions are not representative because of engineering assumptions or technical limitations of the model. In those cases, if staff judge impacts as unacceptable, quantifying or qualifying those factors that caused the over prediction can lead to a clarification of the results. A sampling of these factors include—but is not limited to—continuity of emissions; particle size and distribution; fugitive

emissions; fixed obstructions to air flow; and environmental limitations on a process. Following are some of the factors that the staff could consider during the impacts evaluation. While quantitative factors may not be available currently, subjective factors based on technical judgement and experience are still appropriate for use in the review process to estimate the likelihood of occurrence of predicted concentrations. Applicants can assist the staff by providing data to quantify or develop factors that are listed below:

- *Continuous emissions (8760 hours per year)*.
  - Does the rate allow for any downtime?
  - Is there a built-in factor to allow for potential spikes?
  - What has been the historical ratio of actual to allowable emissions and could actual emissions ever be expected to equal allowable emissions?

- *Noncontinuous emissions (< 8760 hours per year)*.
  - Are there time-of-day restrictions? Was the model set to account for them?
  - Are there seasonal restrictions? Was the model set to account for them?
  - Are emissions limited but could occur during any hour?
  - Do emissions occur for an entire hour? If so, what is the longest duration? If not, what is the time period?

- *Particle size and particle-size distribution (if not included in the model)*: The model may over predict concentrations based on the assumptions that particle size is small and molecular weight is not a factor because the pollutant is assumed to be well-mixed with air. In addition, the model does not remove mass from the plume as the plume moves from the source downwind toward a receptor. Other than site-specific data entered into the model, there are currently no available factors to reduce concentrations to account for deposition (includes gravitational settling) and plume depletion.

- *Fugitive emissions*: Particulate and VOC emissions from sources such as roads, storage piles and tanks, blasting, coating and barge loading are assumed to have little-to-no buoyancy or momentum flux associated with their plumes. Therefore, the model keeps the plume center line at the height of release no matter how far downwind the plume is transported. The model also assumes that the plume is reflected at the ground to maintain the assumption that the plume is infinite. If the winds are greater than about 3 miles per hour (mph) [1.3 meters per second (m/s)], it is unlikely that the plume center line from these types of sources would hover at the height of release, such as the case with calm winds. In addition, the model does not directly consider the effect of plume meander, and the model's algorithms for dispersion underestimate the affect of horizontal and vertical dispersion under stable conditions. Therefore, the model would over predict concentrations downwind. To mitigate these conservative assumptions used in the model, we have developed an adjustment factor, based on the assumptions used to develop the model, that can be used in the modeling demonstration.

- Modeling Fugitive Sources Only

  - Multiply the emission rate by 0.6 for each fugitive source and enter the result into the model; or,

  - Enter the actual emission rate for each fugitive source into the model. Multiply the predicted concentration by 0.6.

- Modeling Mixed Sources

  - Multiply the emission rate by 0.6 for each fugitive source and enter the result into the model; and,

  - Enter the actual emission rate for all other source types into the model.

- *Fixed obstructions to air flow*: Transport of plumes is affected by disruptions in air flow generated in the vicinity of buildings and structures that cause disturbances to air flow. The computer model does not "see" the building entered into the model to disrupt air flow. Instead, building parameters are entered and algorithms are used to simulate downwash effects. This technique leads to transport of low-level or surface releases through, over, and along structures which could cause the model to over predict concentrations in certain downwind directions.

- *Environmental limitations*

  - Determine if emission rates were based on a worst-case temperature and the model predicts unacceptable concentrations during time periods or seasons when that temperature would be unlikely to occur. For example, a tank emission rate based on the maximum summer temperature would lead to unacceptable concentrations in the winter.

  - Determine if emission rates were based on a worst-case assumption such as 100 percent saturations and the model predicts unacceptable concentrations during time periods when the assumption may not be valid. For example, a degassing operation assumption that would keep 100 percent saturation after a hold was cleaned in 1 hour for a 3-hour averaging period.

  - Determine if there is a wind speed when an operation could not occur. For example, outdoor painting may not be possible when wind speeds exceed 15 mph.

  - Determine if there is a wind direction when an operation could not occur. For example, outdoor painting in one area may not be possible when the wind blows toward another outdoor paint area.

  - Determine if there is a temperature or humidity restriction. For example, outdoor painting may be possible only during day time hours because of humidity restrictions at night that would

prevent paint from drying effectively. Or, there may be an operation that cannot take place during periods of extreme hot or cold temperatures.

Estimating the likelihood of exceedance in the review process

Exceedances of an ESL or standard at a model receptor grid point are linked to two independent events: operation of a source at the maximum allowable emission rate and occurrence of worst-case meteorology. Assuming that the operation is constant, the probability of occurrence of the meteorological condition would be the controlling factor. This assumption is conservative as no emissions can be emitted at the maximum allowable rate from a source continuously over a year. In addition, the maximum emissions must be released at the same time as the worst-case meteorology occurs. There are several technical approaches that can be taken to quantify the likelihood of exceedances.

- *Limited use of probability for continuous operations*: If the number of exceedances is very low, staff may deem that predicted concentrations are allowable based on a full review of all site-specific and clarifying factors, including the magnitude of exceedances. For example, a predicted magnitude of exceedances of six times the ESL is more likely to be deemed allowable if it is associated with a predicted frequency of exceedances of one hour per year than if it were predicted to occur 100 hours per year.

- *Adjusting predicted frequency of exceedances for noncontinuous operations*: If the process under review is not continuous, the predicted frequency of exceedances can be adjusted based on the probability of operation; that is, the number of hours of operation by the modeled hours. Multiply this factor times the predicted number of exceedances to obtain the likely number of exceedances.
  For example, if the source could operate 100 hours per year, the probability of operation would be 100 hours divided by 8760 hours or 0.01. If the number of exceedances predicted for an entire year was 200, the likely number of exceedances would be expected to be 2 (0.01 X 200 = 2). The lowest number of predicted exceedances cannot be less than 1 because the meteorological data are hourly values.

  For multiple emission points, the process is more complicated and involves an analysis of all sources. We must evaluate the relationship between the continuous and intermittent sources. In addition, representations made in this part of the analysis may be included as special conditions in the permit. Example, time-of-day restriction, limited number of hours of operation per year, or other factors used to define the noncontinuous sources.

Post-processing of modeled predictions

In many cases, there are post-processing options that can be used to clarify model calculations. The following are several factors that we consider: enclosures or obstructions to air flow; light winds, and downwash. There may be other approaches; obtain Air Dispersion Modeling Team review and comment on any approach before using it:

- *Partial Enclosures or Obstructions*: Since the computer model does not "see" a fixed obstruction, the following techniques can be used to obtain more representative concentrations for fugitive emissions. Consider the size and orientation of the obstruction and the height of release of the fugitive emissions to determine the appropriate adjustment. Keep in mind that in the "real world" the wind, as it is deflected by the obstruction, will transport a small percentage of the emissions to receptors down wind of the obstruction. Also, remember that models are tools. We will not attempt to quantify these percentages with set values but use our judgement to estimate impacts on a case-by-case basis.

  - *Ground-level or near ground level fugitive emissions*: In general, eliminate all concentrations predicted by a flow vector that would transport emissions "through" an adjacent obstruction toward a receptor of concern. The determination of flow vectors and whether a source is adjacent to an obstruction is made on a case-by-case basis. For example, if a door is on the south side and in the center of a building that is oriented in an east-west direction, or if blasting or painting is occurring on the south side and in the center of a structure oriented in an east-west direction, eliminate all concentrations predicted from the source when flow vectors would pass through the obstruction. In this case, eliminate concentrations from flow vectors from about 280 through 080 degrees. For different orientations, find the flow vectors by drawing a line from the center of the source to within about 10 degrees of the each edge of the obstruction.

  - *Elevated fugitive emissions*: The release and transport of elevated fugitive emissions must be evaluated on a case-by-case basis. At a minimum, the following factors would be considered: distance of the source from the obstruction and the amount of the plume that could be transported downwind past the obstruction.

  - *Light winds and downwash*: Under stable conditions, if the winds are less than approximately 6 mph (3 m/s), it is unlikely that the downwash effect will be significant. It may be appropriate to identify those cases and either rerun the model without downwash at the receptors of concern with the applicable meteorological parameters from the first run, or remove them from the plot file and use a spreadsheet to identify maximum concentrations and locations. If the initial dispersion of a volume source was enhanced due to a building or equivalent structure, the unenhanced dispersion parameters should be used.

VI. Ambient Air Monitoring

Occasionally, modeling predictions suggest that emissions from a site or individual source of emissions could cause or contribute to a condition of air pollution. In those cases, the use of ambient monitoring data in the technical review process may be an option to supplement modeled predictions. If existing, representative monitoring data are not available, the applicant can conduct a monitoring demonstration. The monitoring demonstration must be conducted before a permit is issued to ensure that permit conditions and allowable emissions are protective. In limited cases, a permit may be issued for the facility but a provision is added that prohibits a specific operation until a monitoring demonstration has been conducted and evaluated by the staff.

If the applicant chooses to monitor, the permit reviewer should be contacted to arrange a meeting. The permit reviewer will convene a team consisting of representatives from the air dispersion modeling team, TARA, Monitoring Operations, the applicable region, and any other applicable agency staff. The staff will determine whether monitored data from an existing network can be used in the permitting process. Or, if a network does not exist, the staff will help the applicant determine whether monitoring is technically feasible for the constituent of concern. If it is, the applicant should consider the following issues, at a minimum, to develop a monitoring strategy:

- *Amount and type of monitoring*: This is decided on a case-by-case basis and would depend on such factors as air constituents and associated effects of concern; types and locations of sources; source parameters and operating hours; meteorology; location of sensitive receptors; and location of other sources of the constituent. For example, several weeks of data may be sufficient for evaluating the impact of emissions of an acute toxicant, but several months to a year of data may be necessary for evaluating long-term exposure to a chronic toxicant.

- *Monitoring method*: The method must be an approved method or a generally accepted alternate or modified method. In addition, the applicant must keep track of production and operations during the monitoring period and note any unusual occurrences that would invalidate the data, such as truck traffic, within the exclusionary boundary around a particulate monitor.

- *Siting of monitors*: Monitors must be sited to obtain concentrations and meteorological data that are representative. For example, for short-term monitoring to be representative, the concentrations obtained must result from significant sources emitting at near maximum operating conditions and under near worst-case meteorological conditions. More than one ambient and meteorological monitor may be required.

- *Significant sources of emissions monitored*: These sources are the ones that cause the highest concentrations or cause high concentrations frequently. In certain cases, there may be many sources on the site but only one or two whose resulting concentrations drive the effects review. That is, they either have the largest emissions; stack parameters that cause the highest concentrations or the most frequent exceedances of the ESL; or are located near a property line or sensitive receptor. Therefore, it is these sources that the applicant should ensure are represented.

In addition, if significant sources are separated by more than about 100 meters, representative samples should be obtained from each source or source grouping as applicable.

- *Determination of significant sources of emissions*: Significant sources can be determined by engineering judgment or by a culpability analysis using the ISC model. An analysis based on modeling results can identify such information as culpable sources; magnitude of concentrations; frequency of occurrence at different multiples of an ESL; location of worst-case concentrations; and meteorological parameters by time of day.

- Upwind and downwind ambient air monitors: Multiple monitors may be needed for a property line or effects review if there are other sources of the constituent in the local area. In addition, upwind and downwind meteorological monitors may be needed to account for changes in wind speed and direction in cases where there are large distances between emission points and property lines; for large distances from emission points to the monitor; or for geographic features that could affect air flow.

The monitoring plan must be in accordance with *EPA Requirements for Quality Assurance Project Plans* (QA/R5) (EPA/240/B-01/003), and be designed to acquire monitoring data that represents, as closely as possible, worst-case operating conditions. The staff will consider siting limitations, such as power and security constraints, as well as the location of sensitive receptors and off-property sources of the same constituent during the review of the monitoring plan.

VII. Significant Changes from the Last Draft

Following is a list of significant changes made to the document since the last draft:

- Source types. Provided clarifying remarks for pseudo-point, volume, and area source characterizations.

- Equivalency of source types. Clarified the meaning of “conservative” and suggested the use of the SCREEN model to determine whether a characterization would result in a prediction of a conservative concentration. Enhanced the discussion on release height and the shape of a non-point source.
- Off-property receptors over water. Changed Receptor Placement Example 3.

- Fugitive emissions. Provided a single fugitive adjustment factor and a procedure on how to apply it. See the March 6, 2002 memo: Modeling Adjustment Factor for Fugitive Emissions on the Air Permits Division section of the agency’s website.

- Post-processing of modeled predictions. Clarified the section on partial enclosures or obstructions and light winds and downwash.

- Ambient air monitoring. Corrected EPA's quality assurance document title and identification number.

- Sections on volume and area source characterization. Removed information on how to characterize volume and area sources. These sections did not have enough detail nor enough examples. Most of the projects we reviewed after the draft guidance was released were too complex for the general guidance and additional refinement was required on a case-by-case basis. As time and resources allow, we plan to develop a comprehensive guidance document with that will contain numerous examples to assist with the case-by-case choice of source characterization and development of dispersion parameters.