# NEVADA DIVISION OF ENVIRONMENTAL PROTECTION
# BUREAU OF AIR POLLUTION CONTROL

## SUPPORT INFORMATION
## FOR
## CLASS III SOURCE INVENTORY & MODELING ASSESSMENT

Purpose

The Class III source permitting program is intended to simplify and streamline the permitting process for small sources of air pollution that would otherwise be required to obtain a Class II operating permit. The Class III source permitting program is also designed to be more economical for small sources. In order to accomplish this tasks, the Nevada Bureau of Air Pollution Control (NBAPC) was required to make generalized assumptions regarding the type and design of the sources that may participate in this program. This support document is intended to provide the assumptions and criteria utilized to support the Class III (Small Sources) operating permit program. All conclusions drawn are believed to be based on representative emissions of typical source types and on worst-case modeling conditions.

Emissions

The applicability of the Class III source permitting program is proposed to be at 5 ST/yr or less of PM10, NOx, SO2, CO, VOC and $H_2S$ (any single emission or combination of emissions). There is also an applicability of lead at 1000 lb/yr or less (the insignificant activity threshold defined in NAC 445B.288.3(m)). Since the applicability of the program sets the maximum emission levels, there is no need to determine individual emissions for typical systems. As such, emissions for modeling will be based on the 5 ST/yr maximum for PM10, NOx, SO2, CO, VOC or $H_2S$. It is also assumed that a maximum operating hours limitation of 16 hours per day and 365 days per year (5840 hours per year) will provide adequate operational flexibility for small sources while attempting to minimize the short-term modeling impacts. Using these assumptions, a short-term average emission 1.71 lb/hr (0.02157 g/s) was used as input to the model. A summary of these assumptions is contained in Table 1.

**Table 1 - Representative Inventory for Small Source Registration.**

| Unit # | Description | Type | Operating Hours | | Emissions: | | | Stack Info: | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Daily | Annual | Lb/hr | ST/yr | g/s | Height (ft) | Diam (ft) | Velocity | Flow (acfm) |
| 1 | Combustion Source (Boiler) | point | 16 | 5840 | 1.71 | 5 | 0.2157 | 15 | 0.67 | | 1800 |
| | | | | | | | | | | | |
| 2 | Sand & Gravel | volume | 16 | 5840 | 1.71 | 5 | 0.2157 | 10 | $\sigma_y$=31.9 | $\sigma_z$=1.42 | |
| | | | | | | | | | (225 ft) | (10 ft) | |

Modelling

The NBAPC utilized the EPA approved ISCST3 dispersion model to form the modeling analyses. One of the fundamental factors that affect the ability to streamline the Class III application process is the lack of a requirement for the applicant to specifically demonstrate compliance with the ambient air quality standards. In addition, rather that NBAPC accepting the burden (and the additional necessary time) to model each application for compliance with the ambient air quality standards, NBAPC has attempted to demonstrate in advance, through a generic modeling analysis, that a Class III source will not violate an ambient air quality standard. A review of NBAPC's database for potential source types that may be applicable revealed approximately 70 currently permitted sources that would meet the Class III criteria. The majority of these sources fall into 3 general source types: 1) combustion sources (boilers, reciprocating IC engines etc), 2) concrete batch plant sources, and 3) sand and gravel operations. There are several factors that serve to complicate a generic modeling study to support Class III operating permits. The two most significant factors are as follows:

1) Since it is impossible to determine in advance the specific location of all Class III sources, utilizing specific, representative, meteorological data is not appropriate. A significant quantity of site-specific data sets representing a representative cross section of source locations would be required to determine with reasonable certainty that the variability of the site-specific meteorological conditions did not adversely affect the model results. NBAPC does not have an adequate supply of meteorological data sets to reasonably determine compliance with the ambient air quality standards.

2) In addition, it is impossible to know in advance the specific emission unit mix and controls that comprise each Class III source.

To adequately address the meteorological data concern NBAPC used a generic worst-case meteorological set that is based on the meteorological data contained in the EPA approved SCREEN3 model and formatted for input to the ISCST3 model. This screening meteorological data set typically results in significantly greater modeled impacts when compared to a site-specific data set in a rural setting. This ensures a relative safety margin in the determined impacts while allowing for the variability of a generic location.

To address the emission unit mix NBAPC examined the list of potential source types that may qualify for a Class III source operating permit. As indicated above, the majority of the source mix falls in two general modeling categories: 1) heated stack sources, and 2) relatively low level, non-stack (i.e. process fugitive) sources. As a result, NBAPC performed two different model runs based on these two general categories. Since the emission assumptions for these two categories have already been identified above, for modeling purposes all that remains is to identify the plume characteristics that reflect each category type. Table 1 indicates the assumptions made for the stack/plume characteristics. As can be seen, a relatively low stack release is presumed for the heated stack sources. This tends to provide greater concentrations closer to the stack and is therefore worst-case.

Non-stack sources (sand & gravel), however, were modeled as volume sources. The volume source algorithms in the ISCST model are used to model non-stack releases from a variety of industrial sources, such as building roof monitors, multiple vents, and conveyor belts. This model source type was used because it is difficult to represent an undetermined emission unit mix as a series of stack type source emissions with unknown stack parameters. Essentially, the ISCST model treats a volume source as a "cloud" of emissions representative of the industrial source. Figure 1 contains an excerpt of the ISCST users guide that discusses volume sources As such, an important factor to model volume sources is the initial plume volume, identified in the model as $\sigma_y$ and $\sigma_z$ (in meters). This volume is calculated by determining the initial lateral and vertical dimensions of the plume above the volume source (Table 2). For this modeling exercise NBAPC assumed a general source configuration that was approximately 225 feet (68.58 meters) long (including dump feeders, conveyors and crushers and screens and storage piles). Since this length represents the lateral dimension of the plume, in this case $\sigma_y$ is determined by dividing 2.15 into 225 feet (68.58 $\div$2.15 meters). Similarly, NBAPC assumed a general plume height dimension of 10 feet (3.05 meters). The vertical dimension of the plume, $\sigma_z$, was then determined by dividing 2.15 into 10 feet (3.05 $\div$2.15 meters).



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**TABLE 2 - Summary Of Suggested Procedures For Estimating Initial Lateral Dimensions $s_{yo}$ And Initial Vertical Dimensions $s_{zo}$ For Volume And Line Sources**

| Type of Source | Procedure for Obtaining Initial Dimension |
|---|---|
| (a) Initial Lateral Dimensions ($s_{yo}$) | |
| Single Volume Source | $s_{yo}$ = length of side divided by 4.3 |
| Line Source Represented by Adjacent Volume Sources (see Figure 18(a) in Volume II) | $s_{yo}$ = length of side divided by 2.15 |
| Line Source Represented by Separated Volume Sources (see Figure 18(b) in Volume II) | $s_{yo}$ = center to center distance divided by 2.15 |
| (b) Initial Vertical Dimensions ($s_{zo}$) | |
| Surface-Based Source (he - 0) | $s_{zo}$ = vertical dimension of source divided by 2.15 |
| Elevated Source ($h_e > 0$) on or Adjacent to a Building | $s_{zo}$ = building height divided by 2.15 |
| Elevated Source ($h_e > 0$) not on or Adjacent to a Building | $s_{zo}$ = vertical dimension of source divided by 4.3 |

**Figure 1**

Excerpted from Volume II, ISC3 User's Guide:

1.2.2 The Short-Term Volume Source Model

The ISC models use a virtual point source algorithm to model the effects of volume sources, which means that an imaginary or virtual point source is located at a certain distance upwind of the volume source (called the virtual distance) to account for the initial size of the volume source plume...

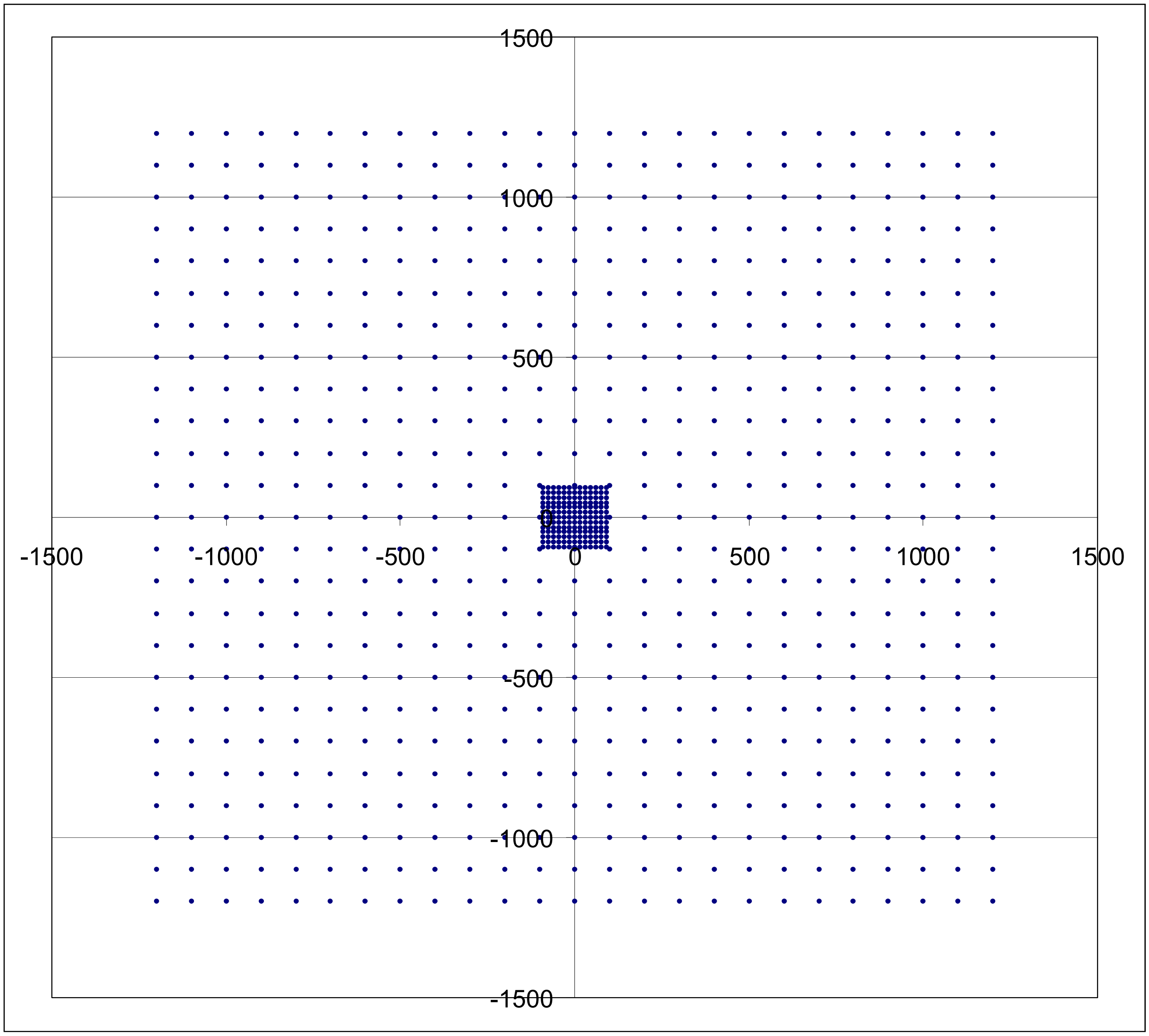
There are two types of volume sources: surface-based sources, which may also be modeled as area sources, and elevated sources. An example of a surface-based source is a surface rail line. The effective emission height $h_e$ for a surface-based source is usually set equal to zero. An example of an elevated source is an elevated rail line with an effective emission height he set equal to the height of the rail line. If the volume source is elevated, the user assigns the effective emission height $h_e$, i.e., there is no plume rise associated with volume sources. The user also assigns initial lateral ($F_{yo}$) and vertical ($F_{zo}$) dimensions for the volume source. Lateral (xy) and vertical (xz) virtual distances are added to the actual downwind distance x for the Fy and Fz calculations. The virtual distances are calculated from solutions to the sigma equations as is done for point sources with building downwash.

The volume source model is used to simulate the effects of emissions from sources such as building roof monitors and for line sources (for example, conveyor belts and rail lines). The north-south and east-west dimensions of each volume source used in the model must be the same. Table 3.1 of Volume I summarizes the general procedures suggested for estimating initial lateral ($F_{yo}$) and vertical ($F_{zo}$) dimensions for single volume sources and for multiple volume sources used to represent a line source. In the case of a long and narrow line source such as a rail line, it may not be practical to divide the source into N volume sources, where N is given by the length of the line source divided by its width. The user can obtain an approximate representation of the line source by placing a smaller number of volume sources at equal intervals along the line source. In general, the spacing between individual volume sources should not be greater than twice the width of the line source. However, a larger spacing can be used if the ratio of the minimum source-receptor separation and the spacing between individual volume sources is greater than about 3. In these cases, concentrations calculated using fewer than N volume sources to represent the line source converge to the concentrations calculated using N volume sources to represent the line source as long as sufficient volume sources are used to preserve the horizontal geometry of the line source.

Receptors

Because specific site information is not known, it is difficult to determine the distance to any excluded property due to access restrictions. Therefore, NBAPC used two receptor grids to model the impacts from the hypothetical sand and gravel source. The first grid is a finely spaced cartesian grid centered on the source with 50 foot receptor separation out to a total of 300 feet. The second grid is a coarser grid beginning at 100 meters (328 feet) with 100 meter spacing out to a total of 1200 meters from the source. Figure 2 depicts the receptor grid.

**Figure 2**



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Model Results

The ISCST model predicted compliance with all ambient standards on each respective averaging period and are as follows:

| Pollutant | Averaging Period | Modeled Impact µg/m$^3$ | Ambient Standard µg/m$^3$ |
|---|---|---|---|
| Stack Source: | | | |
| $PM_{10}$ | 24 hour | 70.4 | 150 |
| | Annual | 2.7 | 50 |
| $NO_x$ | Annual | 2.7 | 100 |
| SO2 | 3 hour | 96.2 | 1200 |
| | 24 hour | 70.4 | 365 |
| | Annual | 2.7 | 80 |
| CO | 1 hour | 99.1 | 40,000 |
| | 8 hour | 88.7 | 10,000 |
| $H_2S$ | 1 hour | 99.1 | 112 |
| Volume Source: | | | |
| $PM_{10}$ | 24 hour | 136.2 | 150 |
| | Annual | 18.8 | 50 |

Summaries of the model results are contained in Attachment 1. NBAPC has developed background concentrations for $PM_{10}$ only. The background concentrations are 10.2 µg/m$^3$ for a 24 hour average and 9.0 µg/m$^3$ for an annual average and are based on monitoring data performed near Ely, Nevada.

Conclusions

Based on the above information and the conservancy in the modeling methods and assumptions, NBAPC concludes that, generally, small stationary sources with potentials to emit less than or equal to 5 Tons per year of PM10, NOx, SO2, CO, VOC and $H_2S$ will not cause violations of the respective Nevada ambient air quality standards.



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