

APPENDIX D

BNSF Health Risk Assessment

⋮
⋮
⋮
⋮
⋮

Air Permitting Specialists
12247 Welch Road
Wilton, CA 95693
Phone 916.687.8352
Fax 916.687.7863
E-Mail: rkapahi@yahoo.com

Air Permitting Specialists

Technical Note

An Estimate of Health Risks Associated with the Operation of the BNSF Intermodal Facility

Stockton, California

August 7, 2006

Prepared for:
InSite Environmental, Inc.
6653 Embarcadero Drive
Suite Q
Stockton, California 95219

TABLE OF CONTENTS

| | |
|---|----|
| 1.0 INTRODUCTION | 2 |
| 2.0 ESTIMATE OF DIESEL PM | 5 |
| 2.1 Estimate of Current Emissions Identification of Odors | 5 |
| 2.2 Estimate of Future Emissions | 6 |
| 3.0 EXPOSURE ASSESSMENT | 8 |
| 4.0 RISK CHARACTERIZATION | 8 |
| 5.0 CONCLUSIONS | 11 |
| 6.0 REFERENCES | 12 |

1.0 INTRODUCTION

Air Permitting Specialists (APS) has been retained by InSite Environmental, Inc. to evaluate health risks associated with the operation of Burlington Northern Santa Fe (BNSF) intermodal facility in Stockton, California. This facility is located approximately 0.5 mile south of the proposed Mariposa Lakes housing development. The scope of the evaluation was limited to cancer health risks associated with emissions of diesel particulate from train locomotives at this facility.

BNSF operates an intermodal facility located at 6540 Arch Road in Stockton (Figure 1). The facility consists of two 7,000 foot strip tracks and three storage tracks. In the present context, "Intermodal" refers to the type of rail yard that transfers trailers and shipping containers from trucks to trains and vice versa. Unlike other yards that handle repairs, sort, assemble and re-fuel trains, most of the activity at an intermodal facility involves lifting and placing containers and trailers on flat bed trains (Figure 2). As a result, locomotive engines are used only on a limited extent.

The principal air pollution of concern from diesel locomotives is diesel particulate. To a much smaller degree, there would be diesel particulate emissions from trucks idling at or near the BNSF facility. This material is regulated as a toxic air contaminant by the California Air Resources Board (CARB) and by the San Joaquin Valley Air Pollution Control District. While there is substantial data on the emission rates of diesel particulate from locomotives, the exact number of locomotives, and the amount of time that these units are idling or passing through at the BNSF facility are currently not known. This Technical Note will be updated once locomotive activity data, population of locomotives, number of trucks, information on idling, etc. become available.

To establish some upper limits of diesel particulate emissions at the BNSF facility, APS staff reviewed the results of a comprehensive study (CARB Oct 2004) of the Union Pacific J. R. Davis yard in Roseville. This study quantified annual emission rates of diesel particulate on the basis of the volume and types of locomotives that visit the Roseville facility, amount of time that locomotive engines were idling, etc. As an approximation, the results of the CARB study were used to estimate emissions from the BNSF facility in Stockton.

This technical note consists of 4 main sections. Immediately follow this introduction, Section 2 describes the methodology for the estimate of annual diesel particulate emissions from the BNSF facility. Section 3 describes the procedure for estimating health risks associated with the emissions. The results of the risk analysis is presented in Section 4. The report concludes (Section 5) with a discussion of the findings and implication for development in the vicinity of the BNSF intermodal facility.

Figure 1
BNSF Intermodal Facility Location Map

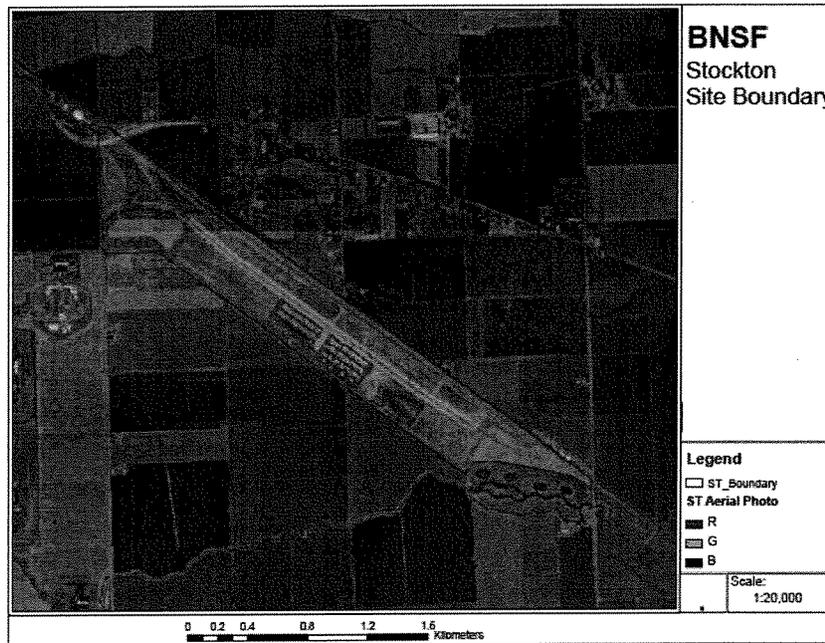
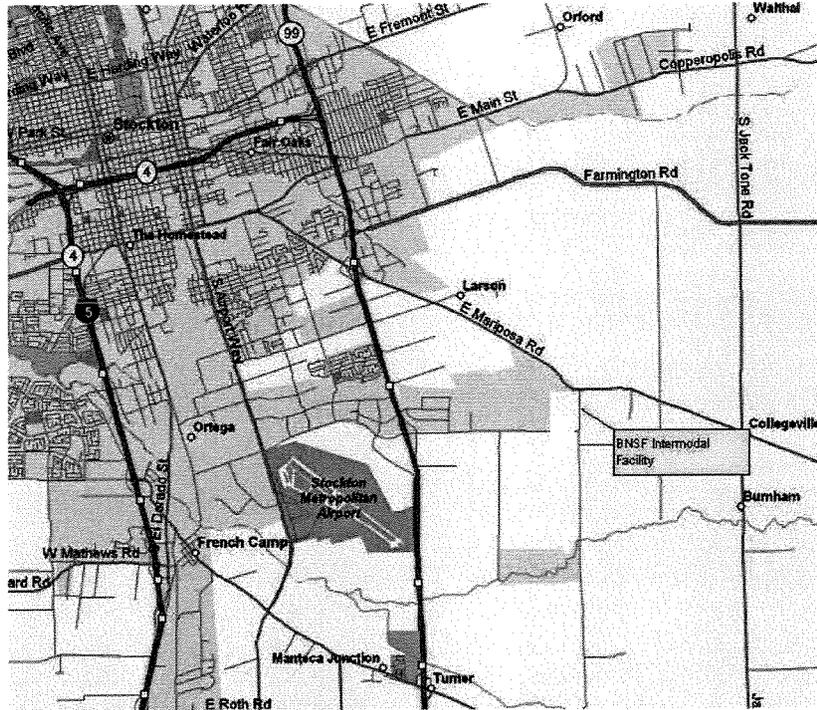
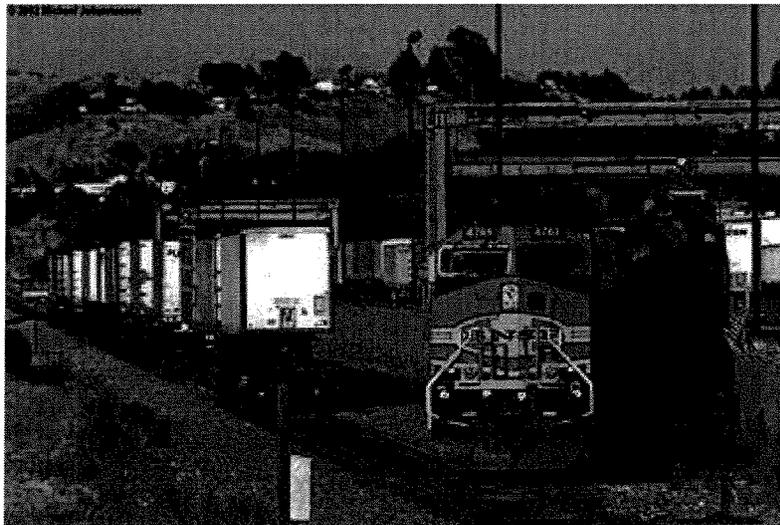


Figure 2
Typical Operations at an Intermodal Rail Facility
(Source: BNSF)



2.0 ESTIMATE OF DIESEL PM EMISSIONS

Diesel PM is a component of the exhaust released from the locomotives. The emission rates of diesel PM depend on the speed, notch setting, duration of each activity, including idling. APS has contacted BNSF to obtain data on locomotive activity. BNSF has requested that a formal request be made with details on the type of data required. APS is in the process of submitting this request to BNSF. Since detailed operating data are not currently available for the present study, emission data from the Union Pacific (UP) Rail yard in Roseville (Davis Yard) were reviewed and used to estimate current and future emissions from the BNSF facility.

2.1 Estimate of Current Emissions

In October 2004, CARB released a technical report that characterized the emissions and health risks associated with the Davis Yard operated by Union Pacific. This report presented extensive data on diesel PM emissions from various operations at the rail yard. The results of the CARB analysis indicated that approximately 25 tons of diesel PM were currently being released annually at the Davis Yard.

The Davis rail yard differs in size and operation from the BNSF intermodal yard in Stockton. For example, the Davis Yard handles 30,000 locomotives annually. Operations at the facility include maintenance, staging, fueling and assembling trains. Over 95% of all UP trains in Northern California pass through the Davis yard. All of these operations involve use of locomotives. In contrast, the BNSF facility is an intermodal yard where containers and truck trailers are loaded and unloaded onto flatbed rail cars. The loading and unloading process involves use of diesel engine powered mobile cranes (see Figure 2) instead of locomotives. According to BNSF, 250,000 containers and trailers are loaded and unloaded annually.

Since detailed activity data are not available for this study, activity at the BNSF yard was compared with activity at the Davis yard. The comparison is based on review of aerial photographs of the two facilities, area, length of tracks, type of rail yard (intermodal versus classification/maintenance yard). This approach allows us to establish an upper limit on the level of risk associated with the BNSF operations. Actual risk is expected to be lower than the upper limit presented in this report.

For the purposes of this evaluation, it was assumed that diesel PM emissions at the BNSF facility were between 5% to 10% of the diesel PM emissions at the J. R. Davis Yard. This translates to between 1.25 to 2.5 tons of diesel PM per year. It was assumed that 2.5 tons per year represents an upper limit of the diesel emissions from the BNSF facility. For this study, risk was estimated for two scenarios:

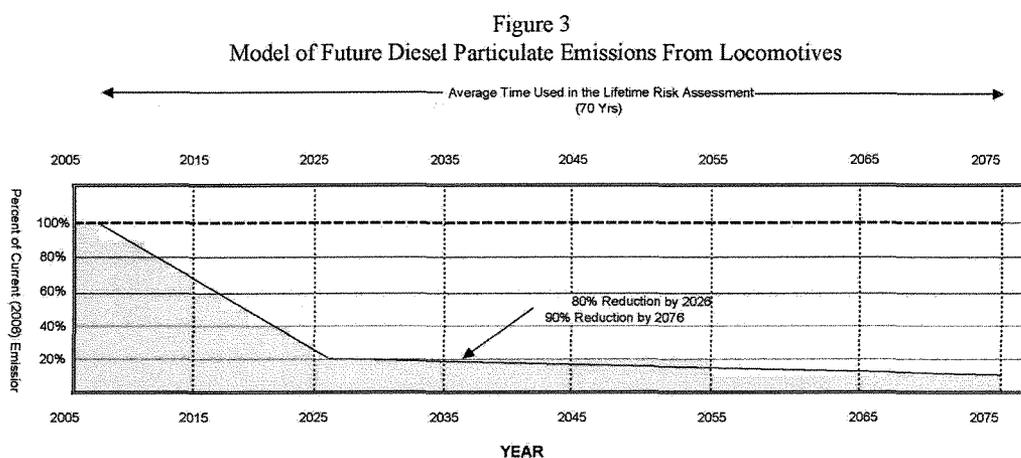
Scenario 1: Current Diesel PM Emissions = 1.25 tons/year (5% of UP's Davis Yard)

Scenario 2: Current Diesel PM Emissions = 2.5 tons/year (10% of UP's Davis Yard)

2.2 Future Diesel PM Emissions

Estimates of cancer risk require knowledge of exposure to diesel PM over a person's lifetime. Under Guidelines established by the California Office of Environmental Health Hazard Assessment (OEHHA), lifetime exposure is defined as exposure over 70 years. In the present context, this means that one needs to forecast annual emission rates from diesel locomotives over the next 70 years (2006 to 2076).

Both EPA and CARB have indicated that new requirements will stipulate that emissions from diesel locomotive be reduced by 80% over the next 20 years (by 2026). Further declines are expected beyond 20 years. The emission reduction profile used in this study is shown below.



Using this emission reduction profile, the average annual emission rates of diesel PM for Scenario 1 and 2 are summarized below.

| Scenario | Emissions | Average Emissions 2006 to 2076 (tons/year) |
|----------|-----------------------------|---|
| 1 | 10% of Davis Yard Emissions | 0.602 |
| 2 | 5% of Davis Yard Emissions | 0.301 |

Detailed calculation of the average annual emission rates is provided in the Appendix. The exposure assessment and risk calculations are based on the annual emission rates summarized above.

3.0 EXPOSURE ASSESSMENT

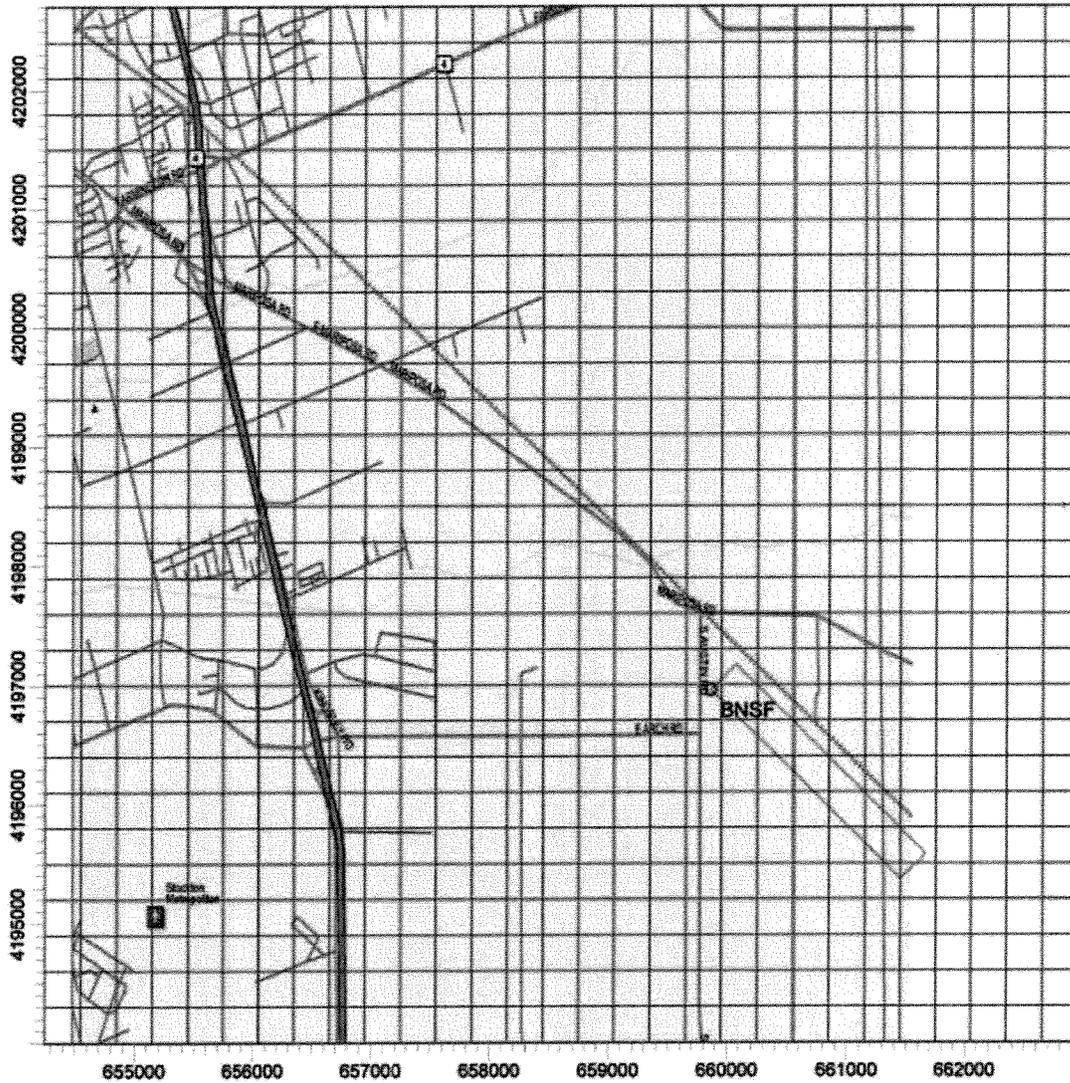
Cancer risk is related to the exposure concentration, for example in grams/cubic meter, of diesel PM. Exposure can occur via inhalation, ingestion and dermal pathways. For this study, we limit our analysis to the inhalation pathway.

The ambient air concentration of diesel PM at a given location depends on its distance from the BNSF yard, the emission rate of diesel PM and the local wind pattern. An air dispersion model was used to calculate the concentration of diesel PM in the vicinity of BNSF.

The EPA model, known as the Industrial Source Complex Model (ISCST3), was used to estimate the concentration of diesel PM. BNSF was modeled as a single area source. Concentrations were estimated every 100 meters in rectangular grid. The modeling grid, that extends to the Mariposa Lakes project and the area source are shown in Figure 4 (next page). The northwest corner of the area sources used to establish the extent of the area source is highlighted.

Figure 4
Layout of Modeling Grid Employing
UTM Coordinates

Modeling Domain Showing Grid Receptors



(Distances are in Meters)

Specific model inputs used to model the diesel PM are as follows:

| | |
|---------------------|--|
| Model | ISCST3 Version 02035 |
| Emission Source | Elevated Area Source |
| Release Height | 15 meters (49 feet) This height is based on review of data from the Davis yard |
| Rural/Urban Mode | Rural |
| Grid Resolution | 100 meters (328 feet) |
| Grid Extent | 3.5 km x 3.5 km (2.2 miles x 2.2 miles) |
| Number of Receptors | 900 |
| Regulatory Option | Option Used |
| Meteorological Data | 1 year of hourly 1976 from Stockton Total of 8,760 Hours Modeled. These data were obtained from SJVAPCD with their concurrence that they are appropriate for this study |
| Averaging Time | Annual |

The model was run using hourly wind data for 1 year and the highest annual concentration was calculated at each of the 900 receptors. These concentrations were used to calculate cancer risk. This is discussed in the next Section.

4.0 RISK CHARACTERIZATION

Risk characterization refers to the process of quantifying the risk associated with a given exposure to a toxic air pollutant. In the present study, we have focused on the inhalation pathway as the primary route of exposure. Therefore, risk characterization involves using the atmospheric concentration of diesel PM with toxicity data (diesel PM unit risk factor) to establish 70 year risk. The recommended unit risk factor (by CARB) is 3.0×10^{-04} . For example, if the concentration of diesel PM at a given receptor is 0.5 micrograms per cubic meter, then the cancer risk associated with this concentration is:

$$\begin{aligned} \text{Risk (70 year)} &= 0.5 \text{ micrograms/cubic meter} \times 3.0 \times 10^{-4} \text{ (micrograms/cubic meter)}^{-1} \\ &= 0.15 \times 10^{-4} \text{ cancers or 15 cancers per million.} \end{aligned}$$

The results of calculating the risk for Scenarios 1 and 2 is shown in Figures 5 and 6 respectively. The numbers on the contours indicate cancer risk per million. The results indicate that for both Scenarios 1 and 2, that maximum cancer risk of 10 in a million is limited to the immediate vicinity of the BNSF facility. At distances greater than 1,000 feet from the facility, the maximum cancer risk is less than 5 cancers per million for Scenario 1 and less than 2.5 cancers per million for Scenario 2. These risks will be updated as more site-specific operating data at the BNSF yard becomes available.

Figure 5
Spatial Variation of Cancer Risk (*per million*)
(Scenario 1)

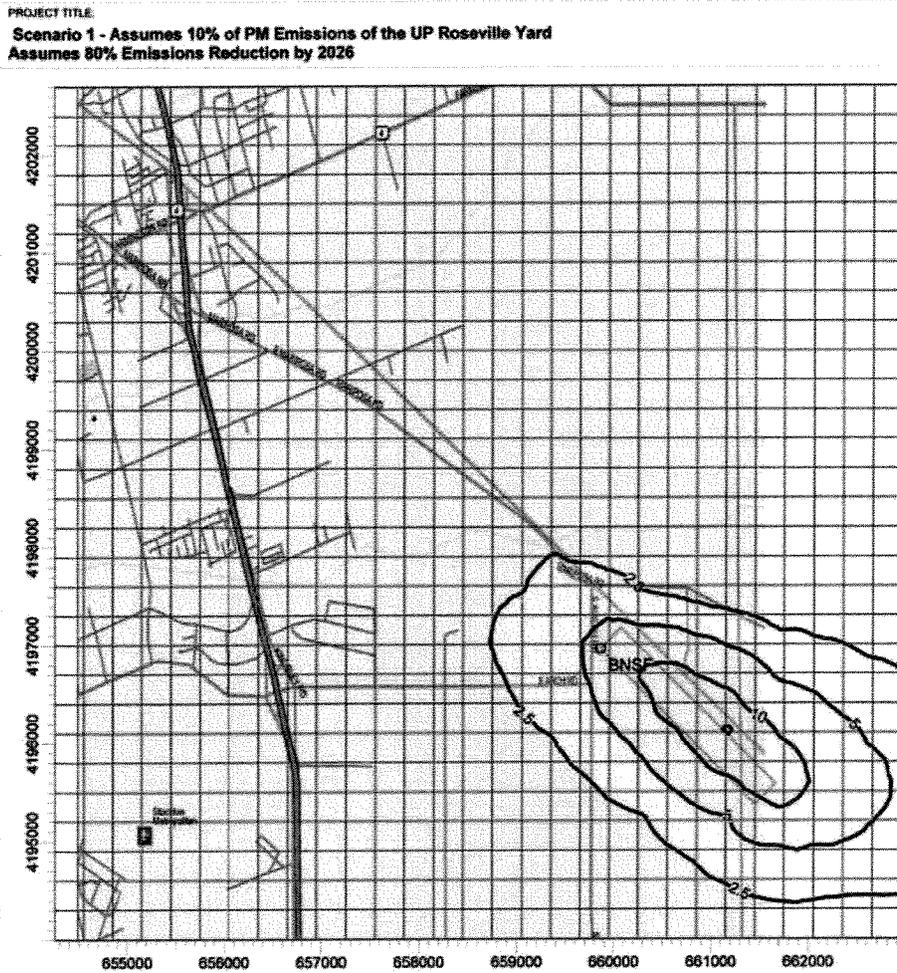
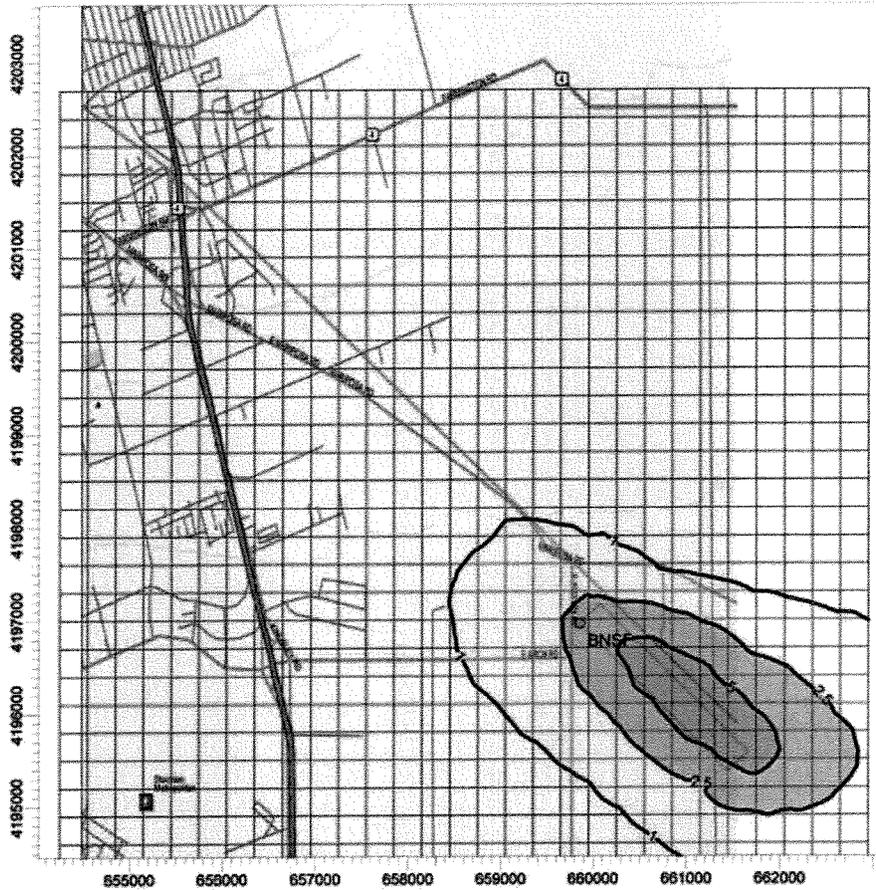


Figure 6
Spatial Variation of Cancer Risk (*per million*)
(Scenario 2)

Scenario 2 - Assumes 5% of PM Emissions of the UP Roseville Yard
Assumes 80% Emissions Reduction by 2026



5.0 CONCLUSIONS

Maximum lifetime cancer risk associated with the operation of BNSF Intermodal Rail Yard in Stockton is estimated to be 5 to less than 1 cancers per million. Given that risk above 10 cancers per million is considered significant, the risks associated with the BNSF operation are not considered significant.

The threshold of 10 cancers per million is noted in CARB's Risk Management Guidelines, The state's Proposition 65 (Safe Drinking Water Act) and SJVAPCD's CEQA Guidelines.

As noted previously, risk estimates presented in this report assume that emissions at BNSF are in the range of 5% to 10% of the emissions from the Union Pacific Rail Yard in Roseville. This assumption will be verified as actual operating data becomes available.

6.0 REFERENCES

CARB (2004) "Roseville Rail Yard Study" Stationary Source Division, California Air Resources Board, Sacramento, CA Available at www.arb.ca.gov

EPA (1995) "User's Guide for the Industrial Source Complex (ISC) Models", Environmental Protection Agency, Research Triangle Park, NC.

Turner, D.B., "Workbook of Atmospheric Dispersion Estimates", 2nd Edition, Lewis Publishers, Boca Raton, FL.

