



Intermodal Facility Study

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Introduction

This air impact assessment is provided to the Shafter Intermodal Rail Facility Team in support of the Trade Corridors Improvement Fund (TCIF) project nomination process. The purpose of the Shafter Intermodal Rail Facility (Intermodal Facility) is to reduce Heavy Heavy Duty Truck (HHDT) freight traffic in the San Joaquin Valley air basin, the Port of Los Angeles freight transportation corridor and the Port of Oakland freight transportation corridor.¹ A large number of port related goods are scheduled for delivery by HHDT to destinations within approximately 500 miles of the ports of Oakland and Los Angeles, including out-of-state markets. Selections of modes of freight transport are market-based. Purchasers of freight transportation are concerned with performance specification and value.² The Intermodal Facility provides a market-based mechanism to remove a portion of the HHDT freight traffic in the sensitive freight transport corridors, thereby relieving congestion and reducing air impacts.

Between 2000 and 2004 the amount of freight in the ports of Los Angeles and Oakland increased by 40% and freight traffic through the Port of Oakland alone increased at 5% per year.³ This trend is expected to increase, leading to a doubling of the traffic through the Port of Oakland by 2020.⁴ The Southern California Association of Governments (SCAG) estimated freight volumes would double or triple in the Los Angeles region over the next two decades. The Bay Area Metropolitan Transportation Commission projected that total cargo tonnage would double at the Port of Oakland between 2002 and 2020.

The Shafter Intermodal Facility will provide substantial regional air quality benefits while having a less than significant impact on sensitive receptors in the specific neighborhood of the facility. The Intermodal Facility provides the opportunity to remove heavy duty truck traffic from Interstate 5 and Highway 99 while increasing the efficiency of movement of goods related to import and export in California. The Intermodal Facility will optimize the in-valley use of containers for export thereby ensuring no wasted empty containers will be transported. The Intermodal Facility can immediately function once rail intermodal service is granted.

Executive Summary

Five critical questions are raised in the TRADE CORRIDORS IMPROVEMENT FUND (TCIF) PROJECT NOMINATIONS process:

1. *Does the project provide a regional air quality benefit?*
2. *Does the project increase the expected future level of polluting activity in specific neighborhoods or communities?*

¹ CalEPA, "Goods Movement Action Plan", 2007 , These corridors consisting of highway and rail are identified by the Regional Transportation Planning Agencies.

² Transportation Research Board of the National Academies, "Rail Freight Solutions to Roadway Congestion-Final Report and Guidebook", 2007

³ http://www.portofoakland/maritime/facts_cargo.asp

⁴ Between 2000 and 2004, the number of containers measured as twenty-foot equivalent units (TEU) increased by 40 percent at the Ports of Los Angeles and Long Beach. Between 1992 and 2006, traffic increased 5% annually from 1.3 to 2.4 million TEUs at the Port of Oakland. The data show that historically-based average projections may underestimate the future growth of imports through the port of Oakland. Relying on HHDT fleet-based controls, CARB currently projects progress toward attainment in all freight corridors. However the data indicates that the current increase in port related traffic will cause total HHDT emissions to outpace the CARB reductions. (DOE) It is anticipated that greater quantities of overseas freight will be routed through the port of Oakland to relieve some of the port of Los Angeles congestion. This increase in port related goods movement will add greater pressure on the air quality of the San Joaquin Valley Air Basin and the other freight corridors due to the increase in HHDT transport on Interstate 5, State Highway 99 and other major highways.

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3. Does project design avoid or mitigate any emission increases resulting from the increased activity?
4. Does a screening assessment show localized impacts?
5. Are there mitigation opportunities in the impacted area?

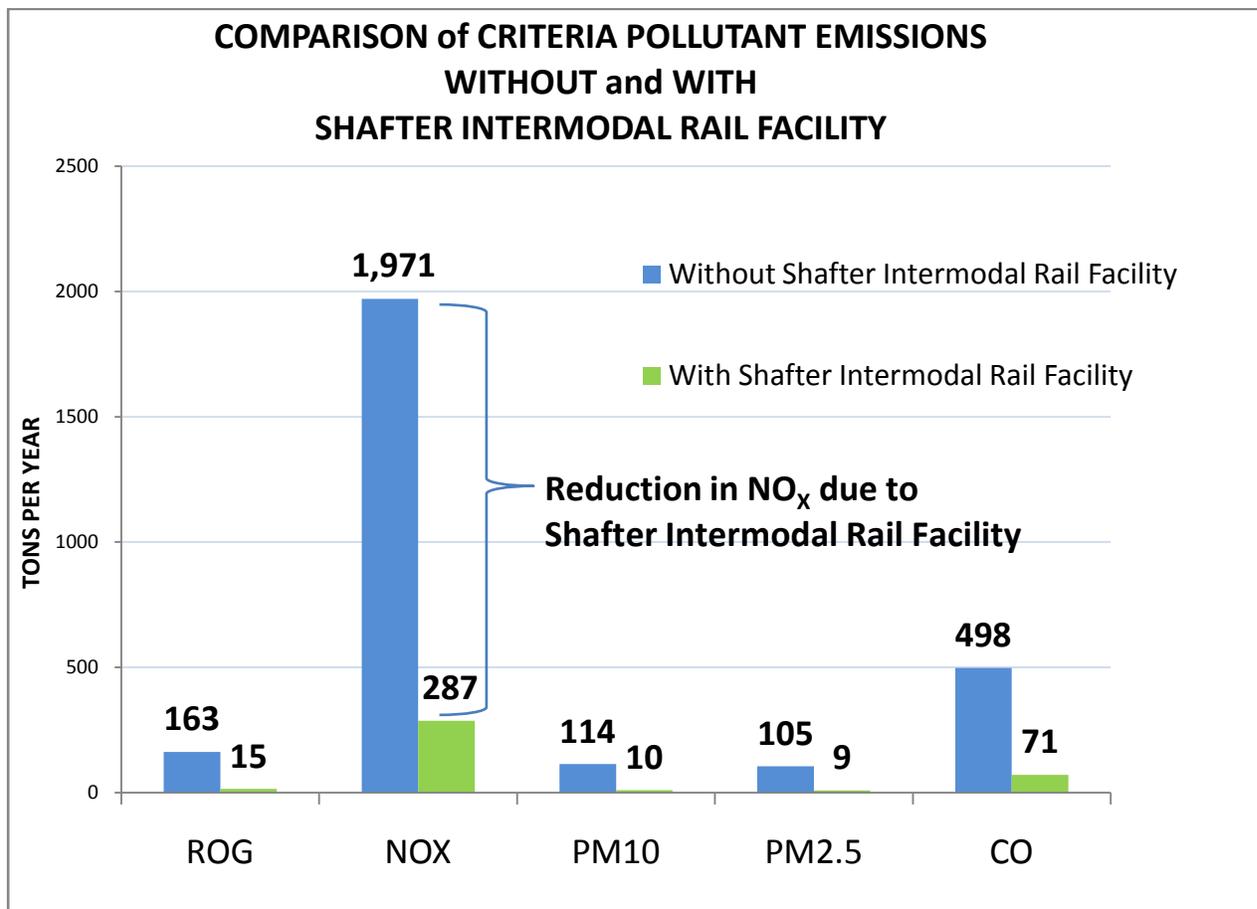
1. Does the Project Provide a Regional Air Quality Benefit?

Yes.

The Intermodal Facility will provide much needed regional air quality benefit to the San Joaquin Valley Basin which because of its unique geography its location relative to commercial traffic has never been able to achieve attainment with air quality standards. Additionally, the South Coast Air Basin and Oakland freight transportation corridor will see a reduction of pollutant inventories. The associated emission reductions are described below.

Criteria Pollutants

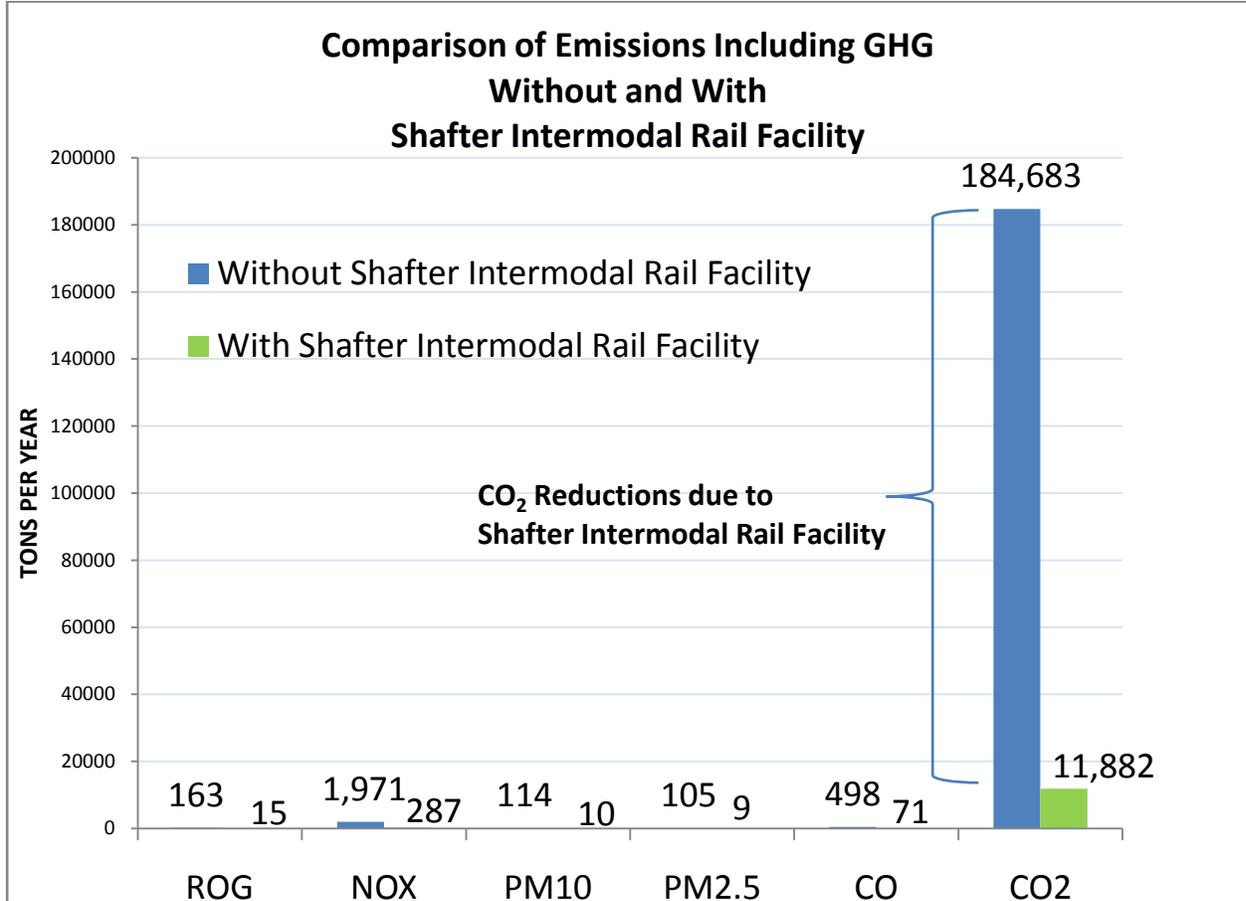
The criteria pollutant emission impacts of carrying the equivalent freight of 600 trucks of port goods truck on dedicated rail units in the Los Angeles and Oakland transportation corridors and the San Joaquin Valley Air Basin are shown in the figure below:



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Greenhouse Gases (GHG)

The reduction in greenhouse gases is even more significant than the criteria pollutants. Unlike tailpipe reductions which may trade criteria pollutant reductions against GHG emissions, the Intermodal Facility serves to reduce both criteria pollutants and GHG.



The state of California has recently adopted AB32 and has set targets for reductions of GHG to 1990 levels by 2020. Meanwhile, freight movement within 500 miles of the ports has increasingly become reliant on HHDTs due to the lack of available rail service for interstate freight with intermodal facilities. Data shows that trucks have become less fuel efficient on a per ton-mile basis, thereby increasing the amount of GHGs emitted per freight ton-mile.⁵ CARB's current Goods Movement Emissions Reduction Program does not consider GHGs; the figure above shows how the Intermodal Facility GHG reductions outweigh criteria pollutant reductions.⁶ The Intermodal Facility reductions could occur as early as 2008, without relying on technology breakthrough or implementation. CARB's emissions reduction program will serve to enhance the Intermodal Facility benefits.

⁵ Davies, J, et al. U.S. EPA-Office of Transportation and Air Quality, "Greenhouse Gas Emissions from Freight Trucks International Emissions Inventory Conference", 2007

⁶ CARB's "Goods Movement Emissions Reduction Program" focuses on criteria pollutants (tailpipe reductions). The HHDT (tailpipe) criteria pollutant emissions reductions from implementation of the CARB program would be 83% of the Intermodal Facility-based reductions by 2030. However, the current program provides no GHG reduction.

2. Does the project increase the expected future level of polluting activity in specific neighborhoods?

No.

The proposed project by its very nature provides mitigation for the regional emissions caused by port-related freight transport and by design is situated in a location where the community is protected from potential impacts related to local emissions increases.

The County of Kern and the City of Shafter considered the goods movement issues prior to 1996 at which time the concept was included in the EIR for the International Trade and Transportation Center (ITTC) Specific Plan and the Master Plan Negative Declaration (at the time the Intermodal Facility area was annexed to City of Shafter).⁷ The related air quality studies considered impacts from the full implementation of the ITTC, including the Intermodal Facility, without quantifying the offsetting benefit of removing the equivalent truckloads of freight. Therefore, there are no substantial changes to, or significant adverse impacts not covered or contemplated, in the CEQA documents.

The Intermodal Facility will be situated at the southern end of the San Joaquin Valley. The HHDT freight transportation emissions removed from the San Joaquin Valley Air Basin by the Intermodal Facility are primarily upwind of the City of Shafter. NO_x and other ozone precursors are a regional issue in the San Joaquin Valley. Removing any criteria pollutant emissions from the region directly benefits the communities near the Intermodal Facility. The local CO and Particulate Matter emissions from activities taking place on the Intermodal Facility have been reviewed and determined to be less than significant at the project boundary.

Greater utilization of the Intermodal Facility will further reduce adverse regional air quality impacts of current and future freight traffic on the neighborhoods and communities of Shafter without significant immediate offsite impacts.

3. Does the project design avoid or mitigate any emission increases resulting from the increased activity?

Yes.

The Intermodal Facility removes regional emissions of all criteria pollutants and GHGs and has a less than significant local impact. The Intermodal Facility by its very nature provides mitigation for the regional emissions in the San Joaquin Valley, this benefit extends to other affected transportation corridors.

The Intermodal Facility by land use restrictions is situated in a location where the community is protected from potential impacts related to Intermodal Facility-related local emissions. Furthermore, the facility will use state-of-the-art locomotives and handling equipment, funded by private sector interests. The Intermodal Facility will enhance current Air District plans to make Reasonable Further Progress toward attainment of both National Ambient Air Quality Standards and California Ambient Air Quality Standards while also helping California meet its AB 32 target of reducing GHG.

⁷ The annexation consisted of 1700 acres encompassing the ITTC and the adjacent agricultural areas designated for future industrial use.

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Greater utilization of the Intermodal Facility will further reduce adverse regional air quality impacts of current and future freight traffic on the neighborhoods and communities of Shafter without significant immediate offsite impacts.

4. Does a screening assessment show localized impacts?

No.

The Shafter Intermodal Facility will be situated in a remote area that is dedicated to industrial and agricultural facilities. The screening health risk analysis indicates a less than significant localized impact associated with the Intermodal Facility.

The land use restrictions of the Intermodal Facility will limit exposures and the ability for sensitive receptors to locate in proximity of the facility.⁸ The emissions from the facility will be limited to rail and truck loading/unloading and demurrage activities. The City's ability to limit local uses to only those that are compatible with industrial activities will limit exposure times and proximity of sensitive receptors. There will be no increases in emissions of freight transportation related activities in any local neighborhoods or communities.

The health risk analysis protocol interpolates the results of the detailed health risk analysis performed by the California Air Resources Board on the Roseville Rail Yard based on Diesel Particulate emissions impacts.⁹ This screening assessment assumes similar geometry and that the size of the trains is similar in both Roseville and the proposed Intermodal Facility.

A screening health risk assessment shows that the 70-year exposure health risk at the boundary of the Intermodal Facility would be approximately 4 in a million excess cancer risks.

5. Are there mitigation opportunities in the impacted area?

Yes.

The Intermodal Facility serves as a major mitigation to the current and future port-related HHDT freight impacts.

The Intermodal Facility can additionally provide numerous opportunities to enhance any public funds by leveraging private sector investments to apply state-of-the-art technologies to freight transportation. This could achieve significant additional emissions reductions on a voluntary basis.

The Intermodal Facility will provide a natural market-based collecting point for those HHDTs having a high in-valley use (delivering port goods to the valley consumer from the Intermodal Facility and delivery of local agricultural products to the Intermodal Facility for export from the Port of Oakland). This Intermodal Facility-based central point will provide synergies with the Air District's efforts to monitor and modernize the fleet of privately-owned trucks operating in the valley in accordance with the objectives of Prop 1B.

The Intermodal Facility is negotiating with the San Joaquin Valley Air Pollution Control District to enter into a Voluntary Emissions Reduction Agreement. This VERA would provide a mechanism to facilitate

⁸ An agricultural buffer is required by land use, Negative Declaration, SCH 98071113.

⁹ CARB-Stationary Source Division, Roseville Rail Yard Study, 2004.

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the contracting of privately funded emission reductions. Currently, the Air District has private funds available through several Voluntary Emissions Reduction Agreements. The Intermodal Facility could provide a commercial point-of-use clearinghouse for business-to-business arrangements to implement the Air District approved reductions. These reductions would be over and above those quantified in this preliminary assessment.

By providing an economic alternative for container management, the Intermodal Facility could serve as mitigation for a portion of the current impacts in the L.A. Basin by carrying an inventory of shipping containers at the Intermodal Facility. Private sector investment could grow the utilization of the container management opportunity to reduce current HHDT traffic for a greater pro rata benefit. In doing so, the Intermodal Facility will further reduce the need for truck travel into and out of the LA basin to retrieve shipping containers for valley products. Agricultural products shipped from valley farms south of Hanford, California will be able to readily ship to the Port of Oakland via unit trains as opposed to being trucked to the Port of L.A.

Discussion

Emissions Quantification

The I-5/SR99 highway complex is a major transportation corridor through a geographically and aerometrically constrained basin with high unemployment and poverty levels. The region experiences high concentrations truck traffic on Interstate Highway 5 and State Route 99 which are aligned with the prevailing air currents from approximately 1000 feet above ground level to the Valley floor, running the entire length of the valley.

For the purpose of this study the simplifying assumption is to treat the San Joaquin Valley Air Basin, South Coast Air Basin and the Port of Oakland freight corridor as closed units.¹⁰ This allows one to estimate relative inventory adjustments related to alternative means for intra valley transportation of goods and materials.

The California Air Resources Board has estimated that 70% of the Heavy Heavy Duty Truck emissions in the San Joaquin Valley are port related goods movement (both import and export).¹¹ CARB also estimated that 8% of the Port of Los Angeles' and 30% of the Port of Oakland's HHDT freight traffic passes through the San Joaquin Valley Air Basin. Export is largely dominated by agricultural goods from the San Joaquin Valley. Imports are primarily related to consumer goods that are warehoused for distribution to western U.S. and durable goods shipped directly from the ports to points of use.

The City of Shafter is located on the BNSF and UP rail system in the Southern San Joaquin Valley bounded on the east and west by SR99 and I5 respectively. The City proposes to consolidate the underutilized rail passing through their community with the HHDT freight activity in the region. The proposal is to create an intermodal facility which would shift the freight transported by 600 trucks per day to 2 unit trains per day to and from the ports of Oakland and Los Angeles. This study simply focuses on the impact of the replacement of 600 trucks per day with 2 trains per day including the Intermodal Facility emissions.

¹⁰ Limited transport out of the valley does occur. However, due to the surrounding terrain (i.e., mountains) the near ground level concentrations are maintained by meteorological conditions such as prevailing wind, inversion and lapse rate.

¹¹ CARB, "Proposed Emission Reduction Plan for Ports and Goods Movement in California", 2006 and EMFAC 2007

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The impact on pollutant inventory for HHDT as opposed to the Intermodal Facility is most pronounced in the reductions of GHG and NO_x. The Intermodal Facility reductions are primarily a function of efficiency. According to USEPA and DOE on a per mile-ton basis freight rail transport is currently 10 times more efficient than transport with HHDT. CARB-based NO_x reductions are driven by control technologies often at the expense of engine efficiency.

The proposed Intermodal Facility will provide a rail replacement for the most common mode of port related goods transportation, HHDT. The proposed Intermodal Facility will include: a rail yard, freight handling equipment, a container storage yard and warehousing. The initial planned facility will provide accommodation to handle the equivalent freight of 600 trucks per day. The comparative annual emissions impacts were calculated for 2008 only. For this preliminary study, no escalations or adjustments for technological change were considered essential to addressing the relative impact of removing the HHDT from the inventories for the Oakland, Los Angeles and San Joaquin Valley corridors. The 2008 year was selected as the start date of the Intermodal Facility operation since the facility can immediately function once intermodal rail service is provided.

Criteria Pollutants

Criteria pollutants for the HHDT were quantified for the year 2008 using EMFAC 2007. Rail emissions were quantified with OFFROAD 2007. The ton-mile travelled for the San Joaquin Valley was based on a 250 mile one-way length from the point at which either truck or train enters the valley air shed to the proposed Intermodal Facility. The ton-mile travelled for the Oakland transportation corridor was based on a 65 mile one-way length from the point at which either truck or train enters the air shed to or from the Port of Oakland. The ton-mile travelled for the South Coast Air Basin was based on a 93 mile one-way length from the point at which either truck or train enters the air shed to or from the Port of Los Angeles. Each train was assumed to carry the equivalent freight of 300 trucks. The Intermodal Facility was assumed to consist of 2 trains per day.

Criteria Pollutant Emissions (Tons Per Year)					
HDDT Emissions removed by Intermodal Facility	ROG	NO_x	CO	PM₁₀	PM_{2.5}
San Joaquin Valley	114	1371	325	82	75
Oakland	30	356	84	21	20
Los Angeles	19	244	89	11	10
Sub Total	163	1971	498	114	105
Source: EMFAC 2007 v.9.2					
Emissions added by Intermodal Facility	ROG	NO_x	CO	PM₁₀	PM_{2.5}
Intermodal Facility	2	32	6	1	1
Trains in San Joaquin Valley	10	191	49	6	6
Trains in Oakland	3	64	17	2	2
Trains in Los Angeles	n/a	n/a	n/a	n/a	n/a
Sub Total	15	287	71	10	9
Source: OFFROAD 2007					
Total Net Emissions due to Intermodal Facility	-148	-1684	-427	-104	-96

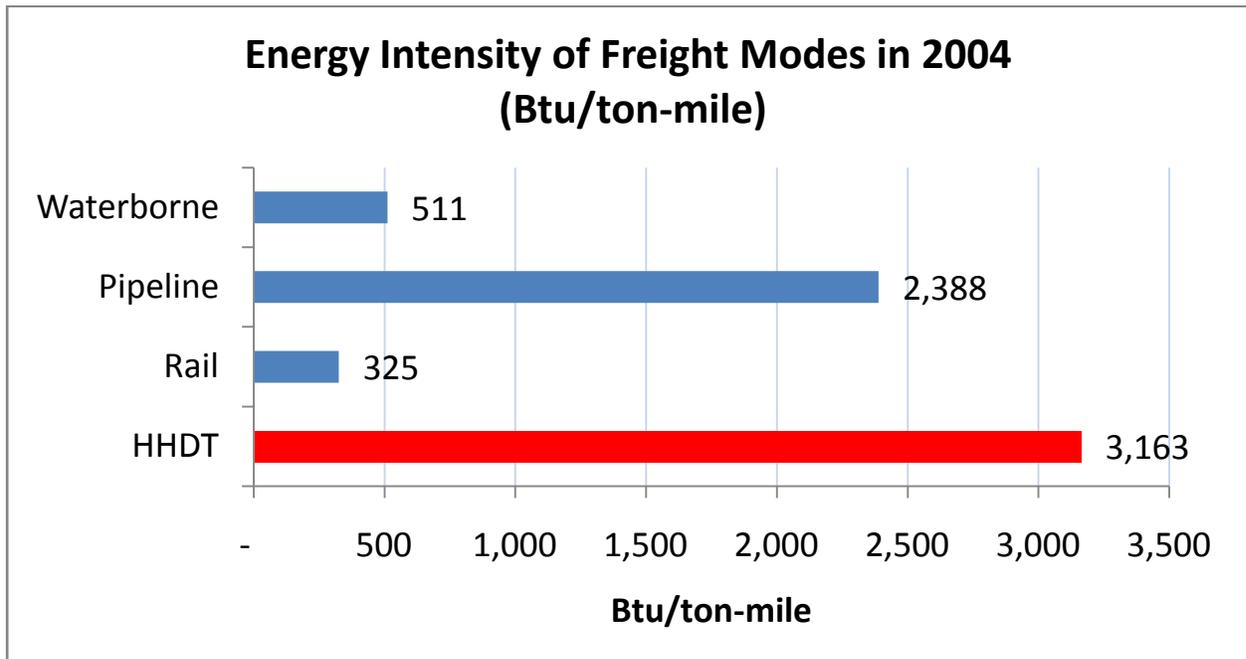
The primary criteria pollutant of concern (in order to reach attainment of the ozone standard) is NO_x. The NO_x emission reduction due to the implementation of the proposed Intermodal Facility is estimated to

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be 5 tons per day. This volume of emission reduction is currently not included in the State Implementation Plans. The implementation of the Intermodal Facility will assist the Air Districts in making Reasonable Further Progress toward attainment of the federal and state health-related standards.

Greenhouse Gases (GHG)

Fuel efficiency relates directly to generation of GHGs. U.S. EPA and Department of Energy (DOE) have studied the energy intensity of a variety of freight transportation modes. The data has been gathered and developed into emission estimating methods to evaluate the impact of each mode on greenhouse gas inventories. The figure below indicates the degree to which rail is 10 times more fuel efficient in transportation of freight than HHDT.



From: ICFI, "Greenhouse Gas Emissions from Freight Trucks", International Emissions Inventory Conference May 16, 2007

Criteria pollutant reductions on HHDT engines need to be considered in the context of fuel efficiency. Current trends indicate that tail pipe reductions create losses of power due to added backpressure and firing controls. This results in less efficient energy conversion in diesel cycle engines thereby increasing GHG emissions.¹² The analysis in this study did not penalize the HHDT alternative as far as increased GHG emissions for implementation of less energy efficient HHDT engines that may result from future criteria pollutant controls in the fleet. It has been estimated that the trend of decreasing fuel efficiency has been about 5% over the period from 1998 to 2004. This would then equate to a 5% increase in GHG emissions without traffic growth during the same period.¹³

¹² Davies, J, et al. U.S. EPA-Office of Transportation and Air Quality, "Greenhouse Gas Emissions from Freight Trucks International Emissions Inventory Conference", 2007

¹³ Ryan, T., Diesel Engine Alternatives, Southwest Research Institute, 2004

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For this preliminary study, the HHDT GHG emissions were estimated using EMFAC 2007 without any consideration given to reduced fuel efficiency.¹⁴ The rail GHG emissions were estimated using DOE methodology for distillate fuel.¹⁵

The table below indicates the volume of the GHGs as CO₂ equivalent emissions reduced by the implementation of the proposed Intermodal Facility.

Greenhouse Gas Emissions (CO₂ metric tons per year)	
Intermodal Facility Emissions	11,882
HDDT Emissions Removed by Intermodal Facility	-184,683
Net Emission Reduction due to Intermodal Facility	-172,801

The results show agreement with the USEPA/DOE estimates.

Health Risk Analysis

This screening health risk analysis was accomplished using the protocol established for other port and rail yard health risk analysis. The protocol prorates the results of the detailed health risk analysis performed by the California Air Resources Board on the Roseville Rail Yard based on Diesel Particulate emissions impacts.¹⁶ This screening assessment conservatively assumes that the proximity to sensitive receptors and the size of the trains is similar in both facilities (Roseville and the proposed Intermodal Facility). The results from the Roseville study were interpolated based on the ratio of the number of trains and adjusted for differences in yard activities at Roseville and the Intermodal Facility.

The land use restrictions of the area surrounding the Intermodal Facility will limit exposures and sensitive receptors. The emissions from the facility will be limited to rail and truck loading/unloading and demurrage activities. The City's ability to limit local uses to only those that are compatible with industrial and agricultural activities will limit exposure times and proximity of sensitive receptors.

The J. R. Davis Yard (rail yard or Yard) is a major full service rail yard in Roseville, California. The Yard is bounded by commercial, industrial, and residential properties. The Roseville study was based on 46,000 locomotives. The Roseville Yard was divided into the following areas: *Main Receiving Yard, Main Departure Yard, City Yard, Rock pile Yard, Northside Tracks, Mod/Search Building, Subway, Ready Tracks, Maintenance Shop, Staging Tracks, Hump and Trim Operation and Service Tracks.*

The Intermodal Facility will process 1500 locomotives per year and will not have a hump and trim operation.¹⁷ With the exception of the hump and trim area the maximum Roseville exposure was 100 in a million adjacent to the boundary. To be conservative, the 100 in a million risk value was not adjusted to reflect the fact that the Intermodal Facility will not have a rock pile area, subway or maintenance shop area.

The nearest Intermodal Facility-related receptor lies to the southwest, west of South Central Valley Highway and north of 7th Standard Road. Using the 70 year exposure risk of 100 in a million from the

¹⁴ For the Los Angeles portion of the HHDT emissions, the CO₂ was estimated by applying the EMFAC2007 ratio of NO_x to CO₂ to those HHDT NO_x emissions allocated to container traffic between the Port of Los Angeles and the San Joaquin Valley.

¹⁵ EPA Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2005, (April 2007), USEPA #430-R-07-002,

¹⁶ CARB-Stationary Source Division, Roseville Rail Yard Study, 2004.

¹⁷ Unlike the J.R. Davis Rail Yard, the Intermodal facility will not have a rock pile area, maintenance shop, subway or hump and trim area.

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Roseville study, the Intermodal Facility screening shows that the health risk at boundary of the Intermodal Facility would be approximately 4 in a million excess cancer risk which is less than commonly accepted standard, i.e., 10 in a million.

Alternatives to mitigate the freight impacts on the San Joaquin Air Basin

Limit the amount of goods diversion

This alternative would involve limitations being set on traffic slated to transit the San Joaquin Valley Air Basin based on attainment goals and the ability to absorb the emissions from the added fleet traffic. This alternative would have serious implications for the state economy as it would place a limit on the ability of the ports to manage import and export of goods. This alternative is not considered as a potential mitigation nor was it quantified in this study.

Levy fees on all goods entering the basin

This alternative would involve establishing use fees (tolls) for traffic that is scheduled to enter the San Joaquin Valley Air Basin; these fees could then be earmarked to mitigate the impacts of the added traffic-related emissions. Practices that are similar to this alternative are being implemented in New York and Oklahoma. However, this alternative was not considered as a potential mitigation nor was it quantified in this study.

Create an intermodal transfer that allows short haul rail to and from port regions to transit the sensitive basin with highly efficient and cleaner rail shipments using state of the art engines dedicated to the air basin.

The reality of commercial pressures and laws governing the transport of interstate goods will result in the continuation of growth in the amount of traffic through the San Joaquin Valley Basin. The amount of emissions related to increasing traffic will most likely exceed the reductions that may occur due to mandatory tail pipe emissions controls.¹⁸

The Intermodal Facility's unique circumstances provide an opportunity to mitigate without conflict with existing and planned laws. In fact, the development of the Intermodal Facility would be harmonious with the laws and would amplify the potential mitigations by extending the service to non-growth related traffic and allowing a means for private participation in a regional solution. Additional non-governmental business growth will be encouraged; private-sector jobs will be created in a region suffering from high unemployment.

This alternative as a mitigation to increased commercial traffic impacts in the San Joaquin Valley is the focus of this study.

¹⁸ The tail pipe emissions will be limited to new fleet vehicles that are domestically licensed. NAFTA vehicles may not comply with California emission limits.

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