REALIZING THE AIR QUALITY BENEFITS OF PORT INFRASTRUCTURE PROJECTS

A Case Study of the Alameda Corridor
In mid-1980’s, growing concern that Southern California Port future throughput capacity constraints would come from infrastructure limitations

1984 SCAG Rail Access study concluded that port growth would impact adjacent communities

The $2.4 billion Alameda Corridor was one of first infrastructure projects built to address congestion outside the Ports
ALAMEDA CORRIDOR DESCRIPTION

- Below grade corridor runs from POLB/POLA to downtown LA rail yard
- Consolidated several pre-existing rail lines
ALAMEDA CORRIDOR ROUTE

Primarily along Alameda and the former Southern Pacific Branch Right of Way
CHANGES IN REGULATORY OPINION OVER TIME

- Originally listed as control measure in the 1991 SCAQMD AQMP/SIP
- Wilmington/San Pedro residents increasingly concerned about diesel exhaust
- SCAQMD currently sponsoring legislation to impose pollution tariff on freight hauled by locomotive
STUDY OBJECTIVES

- Educate the public on air quality principles
- Quantify the cumulative benefits of the Corridor
- Quantify the future benefits of the Corridor
- Demonstrate the benefits of Corridor transportation versus trucks on regional freeways
NEED FOR CHANGE IN PERSPECTIVE

- Should not attempt to regulate infrastructure improvement projects as you would stationary sources
- Must consider the element of “time” (intermittent versus continuous source)
- The mobile nature of freight means market forces can influence transport behavior and subsequent air emission profiles
AIR QUALITY BENEFITS OF THE ALAMEDA CORRIDOR

- Consolidation of pre-existing rail lines
- Vehicle Delay Elimination
CONSOLIDATION OF PRE-EXISTING RAIL LINES

- More direct route to downtown railyard
- Below grade design allow reduces travel time from 2 hours to 45 minutes
- Benefits calculated by multiplying daily power consumption by corresponding emission factors derived by actual locomotive duty cycles for on and off-Corridor transport
Regional Train Routes in the SCAB

- Indicates Segments Used for Alameda Corridor Routing
## CORRIDOR EMISSIONS REDUCTIONS
### BENEFITS FROM RAIL EFFICIENCY (tons/year)

<table>
<thead>
<tr>
<th>Year</th>
<th>ROG</th>
<th>CO</th>
<th>NOx</th>
<th>PM10</th>
<th>SOx</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002 Null*</td>
<td>28</td>
<td>32</td>
<td>878</td>
<td>22</td>
<td>46</td>
</tr>
<tr>
<td>2002 Project*</td>
<td>19</td>
<td>25</td>
<td>677</td>
<td>14</td>
<td>42</td>
</tr>
<tr>
<td><strong>2002 Benefits</strong>*</td>
<td><strong>9 (-22.0%)</strong></td>
<td><strong>7 (-15.8%)</strong></td>
<td><strong>201 (-16.3%)</strong></td>
<td><strong>8 (-25.2%)</strong></td>
<td><strong>4 (-6.6%)</strong></td>
</tr>
<tr>
<td>2003 Null</td>
<td>40</td>
<td>47</td>
<td>1265</td>
<td>31</td>
<td>67</td>
</tr>
<tr>
<td>2003 Project</td>
<td>28</td>
<td>36</td>
<td>977</td>
<td>20</td>
<td>61</td>
</tr>
<tr>
<td><strong>2003 Benefits</strong></td>
<td><strong>12 (-30.9%)</strong></td>
<td><strong>10 (-22.0%)</strong></td>
<td><strong>288 (-22.8%)</strong></td>
<td><strong>11 (-35.1%)</strong></td>
<td><strong>6 (-9.3%)</strong></td>
</tr>
<tr>
<td>2004 Null</td>
<td>44</td>
<td>51</td>
<td>1392</td>
<td>34</td>
<td>74</td>
</tr>
<tr>
<td>2004 Project</td>
<td>31</td>
<td>40</td>
<td>1074</td>
<td>22</td>
<td>67</td>
</tr>
<tr>
<td><strong>2004 Benefits</strong></td>
<td><strong>14 (-30.6%)</strong></td>
<td><strong>11 (-21.8%)</strong></td>
<td><strong>317 (-22.8%)</strong></td>
<td><strong>12 (-35.1%)</strong></td>
<td><strong>7 (-8.9%)</strong></td>
</tr>
<tr>
<td><strong>Cumulative Benefits</strong></td>
<td><strong>35</strong></td>
<td><strong>28</strong></td>
<td><strong>806</strong></td>
<td><strong>31</strong></td>
<td><strong>17</strong></td>
</tr>
</tbody>
</table>

*Benefits start in April 2002 with opening of the new Corridor and are not annualized.*
VEHICLE DELAY ELIMINATION BENEFITS

- At grade crossings along pre-existing lines
- Along Corridor through elimination of grade crossings
CALCULATION METHODOLOGY FOR VEHICLE DELAY ELIMINATION

- Used regional traffic flow model to predict number of vehicles queued and delay times per intersection
- Idling emissions then calculated from CARB EMFAC profiles for vehicle years 2002, 2003 and 2004
CORRIDOR EMISSION REDUCTION BENEFITS FROM TRAFFIC DELAY ELIMINATION *(tons/year)*

<table>
<thead>
<tr>
<th>Year</th>
<th>ROG</th>
<th>CO</th>
<th>NOx</th>
<th>PM10</th>
<th>SOx</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002*</td>
<td>77</td>
<td>815</td>
<td>123</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>2003</td>
<td>72</td>
<td>768</td>
<td>119</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>2004</td>
<td>70</td>
<td>760</td>
<td>121</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Cumulative</td>
<td>219</td>
<td>2,343</td>
<td>363</td>
<td>18</td>
<td>3</td>
</tr>
</tbody>
</table>

*Benefits start in April 2002 with opening of the new Corridor and are not annualized. The emission reduction associated with elimination of traffic delay is 93% for every pollutant.*
OVERALL EMISSION REDUCTIONS 2002*-2004
(tons/year)

<table>
<thead>
<tr>
<th>Benefits</th>
<th>ROG</th>
<th>CO</th>
<th>NOx</th>
<th>PM10</th>
<th>SOx</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rail Efficiency</td>
<td>35</td>
<td>28</td>
<td>806</td>
<td>31</td>
<td>17</td>
</tr>
<tr>
<td>Traffic Delay Elimination</td>
<td>219</td>
<td>2,343</td>
<td>363</td>
<td>18</td>
<td>3</td>
</tr>
<tr>
<td>Cumulative</td>
<td>254</td>
<td>2371</td>
<td>1169</td>
<td>49</td>
<td>20</td>
</tr>
<tr>
<td>Annualized Emission Reduction</td>
<td>84.40%</td>
<td>92.20%</td>
<td>44.60%</td>
<td>56.20%</td>
<td>21.70%</td>
</tr>
</tbody>
</table>

*Benefits start in April 2002 with opening of the new Corridor and are not annualized.
FUTURE CORRIDOR BENEFITS

- Evaluation years - 2005 and 2012
- Evaluated both Null (no Corridor) and Project scenarios
- Primary difference is avoided truck trips
- Port-specific truck fleet emission factors (modified CARB EMFAC) utilized
2005 NULL AND PROJECT SCENARIOS

- **2005 NULL** – *pre-existing rail lines reach their capacity and all additional freight would be trucked to downtown rail yard for transport to Cajon Summit or Beaumont Pass*

- **2005 PROJECT** – *actual train projections for Alameda Corridor*
2005 NULL SCENARIO - Average: 44 trains per day, 3 train equivalents to downtown

Trucks loaded onto rail cars

- BNSF
- UP
- SP

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April 29, 2005
Dr. Margaret Lobnitz, Weston Solutions, Inc.
### BASIN-WIDE EMISSION REDUCTION BENEFITS FROM RAIL EFFICIENCY IN 2005 (tons/year)*

<table>
<thead>
<tr>
<th>SCENARIO</th>
<th>ROG</th>
<th>CO</th>
<th>NOx</th>
<th>PM</th>
<th>SOx</th>
</tr>
</thead>
<tbody>
<tr>
<td>NULL</td>
<td>162</td>
<td>237</td>
<td>4872</td>
<td>115</td>
<td>268</td>
</tr>
<tr>
<td>CORRIDOR</td>
<td>142</td>
<td>195</td>
<td>4467</td>
<td>100</td>
<td>262</td>
</tr>
<tr>
<td>Net Change</td>
<td>20 (-12.5%)</td>
<td>42 (-17.8%)</td>
<td>405 (-8.3%)</td>
<td>15 (-13%)</td>
<td>6 (-2.4%)</td>
</tr>
</tbody>
</table>

*Includes truck equivalent emissions from Ports to downtown Los Angeles for Null Scenario*
2012 NULL AND PROJECT SCENARIOS

- **2012** – additional controls on both trucks and locomotives

- **NULL** - downtown rail yard is maxed out; excess freight is trucked from Ports to Cajon Summit or Beaumont Pass

- **PROJECT** - expanded near dock and on dock rail facilities within Ports adds additional rail traffic onto Corridor
2012 NULL SCENARIO - Average: 44 trains per day, 22 train equivalents to Cajon/Beaumont

22 Train - equivalents: Trucks from Ports to Cajon Summit (104 mi.) or Beaumont Pass (113 mi.)
2012 PROJECT SCENARIO - Average: 66 Trains per day
BASIN-WIDE EMISSION REDUCTION BENEFITS FROM RAIL EFFICIENCY IN 2012 *(tons/year)*

<table>
<thead>
<tr>
<th>SCENARIO</th>
<th>ROG</th>
<th>CO</th>
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<th>PM</th>
<th>SOx</th>
</tr>
</thead>
<tbody>
<tr>
<td>NULL</td>
<td>332</td>
<td>1513</td>
<td>6253</td>
<td>155</td>
<td>7</td>
</tr>
<tr>
<td>CORRIDOR</td>
<td>165</td>
<td>823</td>
<td>3017</td>
<td>110</td>
<td>3</td>
</tr>
<tr>
<td>Net Change</td>
<td>167 (-50.4%)</td>
<td>690 (-45.6%)</td>
<td>3236 (-51.7%)</td>
<td>45 (-29.1%)</td>
<td>4 (-59.0%)</td>
</tr>
</tbody>
</table>

* Includes truck equivalent emissions for Null Scenario
TRADEOFF ASSESSMENT METHODOLOGY

- Projected emission profile of trucks and locomotives traveling from Ports through Inland Empire
- Evaluated on a yearly basis (lbs of pollutant/TEU) from 2002 to 2012
- Profiles account for implementation of pollution control measures on both source types
FUTURE TRADEOFFS

TRUCK EMISSIONS

VS.

LOCOMOTIVE EMISSIONS
Emissions profile over time decreases more dramatically for locomotives than trucks; 2.5 to 5 times more efficient (on pollutant basis) to transport by train than by truck.
Both sources show reductions over time; 2.5 to 3 times more efficient to transport by train than by truck.
IMPORTANCE OF POLLUTION CONTROL MEASURE IMPLEMENTATION TIMING

- Variety of measures proposed to control emissions from both locomotives and trucks (including tariffs)
- If rail becomes prohibitively expensive compared to truck transport, a corresponding shift to truck transport will occur naturally
- This shift could cause an increase in regional emissions even though the regulatory intent was opposite
- “Timing is everything”
OTHER ENVIRONMENTAL BENEFITS OF THE ALAMEDA CORRIDOR

- PM reduction benefits translate into decreased cancer risk
- Below grade configuration of Corridor and grade separations reduce hazardous materials release risk (> 10 X pre-existing routes)
- Faster emergency response times, increased ridership on bus and passenger rail lines
SUMMARY OF RESULTS

- Corridor air quality benefits are realized through shorter routes, faster transit times and elimination of vehicle delay.
- Benefits are sustained in future years even as truck emission profiles improve.
- Other environmental benefits include reduced cancer risk and risk of hazardous materials release, and mass transit improvements along Corridor.
CONCLUSIONS

- Port infrastructure projects are a good thing for both commerce and the environment
- Benefits can be quantified (with a creative approach)
- Our job is to educate public/regulatory community regarding how to make informed decisions about improving air quality