Valero Crude by Rail Project
Public Comments received
April 18-19, 2016

Commenter	Date Received
Organizations	
Safe Fuel and Energy Resources California	19-Apr-16
Applicant	
Chris Howe	18-Apr-16
Individual Comments	
Marilyn Bardet	19-Apr-16
Marilyn Bardet	19-Apr-16
Chez Hiro	19-Apr-16
Kathy Kerridge	19-Apr-16
Bob Livesay	19-Apr-16
Deborah Lyons	19-Apr-16
Eleanor Prouty	19-Apr-16
Bea Reynolds	19-Apr-16
Nancy Rothstein	19-Apr-16
Pat Toth-Smith	19-Apr-16
Bart Sullivan	19-Apr-16
Donna Wapner	19-Apr-16
Idential Comments	
Public Comment re Valero Crude by Rail Project- Appeal Application No. 16PLN-00009	
Marcia Flannery	19-Apr-16
Diane Yee	19-Apr-16

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APR 19 2016
CITY OF BENICIA
COMMUNITY DEVELOPMENT

Amy Million

From: Rita Chavez <chavezr@adamsbroadwell.com>
Sent: Monday, April 18, 2016 3:50 PM
To: Elizabeth Patterson; Mark Hughes; Tom Campbell; Alan Schwartzman; Christina Strawbridge
Cc: 'ddean@ci.benicia.ca.us'; Amy Million; Rachael E. Koss
Subject: Valero Crude by Rail Project (12PLN-00063) (1 of 3 emails)
Attachments: 3111-023rc - Response to 4-12-16 Staff Report.pdf; Fox Letter Response Radis ESA 4-18-16.pdf; Cashen Response and exhibit.pdf

Follow Up Flag: Flag for follow up
Flag Status: Flagged

On behalf of Safe Fuel and Energy Resources California, attached please find Ms. Koss' letter of today's date and attachments. The original is being hand delivered today. A second and third email will follow that includes the exhibits to Dr. Fox's response. Please contact ***Rachael Koss*** directly if you have any questions.

Thank you.

Regards,

Rita

Rita I. Chavez
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April 18, 2016

BY EMAIL AND HAND DELIVERY

Honorable Mayor Patterson
and City Council Members
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Re: Valero Crude by Rail Project (12PLN-00063)

Dear Honorable Mayor Patterson and City Council Members:

We are writing on behalf of Safe Fuel and Energy Resources California ("SAFER California") to provide additional information for the City Council's consideration of Valero's appeal of the Planning Commission's unanimous decision to deny the Use Permit Application for the Valero Crude by Rail Project. On April 4, 2016, we submitted comments on Valero's appeal and we provided additional information regarding the Project's significant impacts both within and outside the refinery boundary. Our comments included analyses from refinery expert Dr. Phyllis Fox and biologist Scott Cashen.

On April 12, 2016, City staff issued its report for tonight's City Council hearing on Valero's appeal. Staff's report and attachments include responses to our April 4, 2016 comment letter. We reviewed the report with Dr. Fox and Mr. Cashen, and we conclude that it does not remedy the Final Environmental Impact Report's numerous errors and omissions identified in our comments. Attached are Dr. Fox's and Mr. Cashen's responses to the staff report.[1] In short, Dr. Fox and Mr. Cashen conclude:

[1] **Attachment A**: Letter from Phyllis Fox to Rachael Koss re: Review of Responses to Fox April 4, 2016 Comments on Valero's Appeal of Planning Commission's Denial of Valero Crude-by-Rail Project, April 18, 2016; **Attachment B**: Letter from Scott Cashen to Rachael Koss re: Comments on the Valero Benicia Crude by Rail Project, April 18, 2016.

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- Project operation within the refinery boundary would result in a significant air quality impact from emissions of reactive organic gases ("ROG") from crude storage tanks.

- Project operation within the refinery boundary would result in a significant air quality impact from railcar fugitive ROG emissions.

- Project operation would result in significant acute and chronic health impacts from benzene present in railcar fugitive ROG emissions.

- An accident from Project operation within the refinery boundary would result in a significant, unmitigated impact to public health and safety from on-site hazards, including injury and death.

- Project operation within the refinery boundary would result in a significant, unmitigated impact from exacerbating flooding conditions.

- Project operation within the refinery boundary would result in significant, unmitigated impacts to birds and other wildlife.

Therefore, we urge the City Council to deny Valero's appeal.

Sincerely,

Rachael E. Koss

REK:ric

cc: Donald Dean, Chair, Planning Commission ddean@ci.benicia.ca.us
Amy Million, Principal Planner amillion@ci.benicia.ca.us

3111-023rc

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ATTACHMENT A

Phyllis Fox
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April 18, 2016

Rachael Koss
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Re: Review of Responses to Fox April 4, 2016 Comments on Valero's Appeal of Planning Commission's Denial of Valero Crude-by-Rail Project

Dear Ms. Koss:

As you requested, I have reviewed the letters by MRS[1] and ESA[2] that respond to my 4/4/16 Comments on Valero's Appeal of Planning Commission's Denial of the Valero Crude-by-Rail Project.[3] The MRS and ESA responses are notable for their lack of support for numerous assertions. With few exceptions, they present no supporting calculations nor citations to specific pages in the EIR, reports, or web links. Thus, they present no new evidence and fail to respond to my comments.

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[1] Letter from Steven R. Radis, MRS, to Amy Million, City of Benicia, Re: Response to Comments on Valero Crude-by-Rail Project, April 12, 2016 (4/12/16 Radis Letter); Available at: https://legistarweb-production.s3.amazonaws.com/uploads/attachment/pdf/8773/Attachment_3-_MRS_Response_Letter_to_Fox_Comments.pdf.

[2] Memorandum from Tim Rimpo, Janna Scott, and Cory Barringhaus, ESA, to Amy Million, City of Benicia, Re: Response to Comments of Phyllis Fox, April 11, 2016 (4/11/16 ESA Letter); Available at: https://legistarweb-production.s3.amazonaws.com/uploads/attachment/pdf/8773/Attachment_3-_MRS_Response_Letter_to_Fox_Comments.pdf.

[3] Phyllis Fox, Comments on Valero's Appeal of Planning Commission's Denial of Valero Crude-by-Rail Project, April 4, 2016 (4/4/16 Fox Letter), pdf 49-140 (w/out exhibits); Available at: http://www.ci.benicia.ca.us/vertical/sites/%7BF991A639-AAED-4E1A-9735-86EA195E2C8D%7D/uploads/Public_Comments_Submitted_April_4-5_2016.pdf.

I. ON-SITE HAZARDS (MRS)

A. Accidents At Crude Unloading Terminals

Mr. Radis uses incident information from the Pipeline and Hazardous Materials Safety Administration (PHMSA) to conclude that "accident history at rail crude oil unloading facilities is almost the polar opposite" of the scenarios that I described. He further asserts that accidents at crude oil unloading facilities are "quite rare."[4] The support for these claims is 2000 to 2015 PHMSA data for "rail crude oil unloading facilities." However, the supporting data or a specific citation where the data could be found are not provided. I was unable to confirm Mr. Radis' claim with publicly available data on the PHMSA website. Regardless, Mr. Radis' argument is misleading and incorrect as explained below.

1. Private Rail Terminals Are Exempt from PHSMA Reporting

Incidents need only be reported to PHMSA during "transportation" by a rail carrier.[5] Thus, incidents during unloading operations at a private (non-railroad) terminal, such as the Valero terminal, are not reported to PHSMA:

> *"Unloading operations. Incidents that occur or are discovered while a consignee is unloading a hazardous material from a transport vehicle or bulk packaging after the carrier has delivered the material are not required to be reported because these incidents occur after transportation has ended. Incidents that occur while the carrier that delivered the hazardous material is observing or participating in unloading operations must be reported because the carrier is deemed to be in possession of the hazardous material at that point; thus, these incidents occur during transportation. For these incidents, the carrier must complete the report."*[6]

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[4] 4/12/16 Radis Letter, pp. 1-3.

[5] See reporting requirements at 49 CFR 171.15, 49 CFR 171.16 and 49 CFR 225.09.

[6] PHSMA, Guide for Preparing Hazardous Materials Incidents Reports, January 2004, p. 1; Available at: http://www.phmsa.dot.gov/pv_obj_cache/pv_obj_id_E48DC74FFC5E921568E9E899FA06C94EA17B4200/filename/reporting_instructions_rev.pdf.

Similar language is present in the PHSMA Guide for loading operations. Therefore, the data that Mr. Radis relied on to assert that accidents at crude oil unloading facilities are "quite rare" and that "accident history at rail crude oil unloading facilities is almost the polar opposite" of the scenarios that I described is based on a database that does not include any data from private rail unloading terminals such as the proposed Valero terminal. The majority of the crude-by-rail terminals are privately owned.

2. The PHSMA Incident Data Are Unreliable

The PHSMA website includes a data quality assessment report that confirms that PHMSA incident reports are very incomplete and miss most incidents, including those "outside transportation" (such as during loading and unloading), and that there are otherwise major problems with incident reports that PHMSA does receive:

> *"Missing data often compromises our ability to draw useful conclusions. A 2007 review estimated we are missing 60-90% of the hazmat incidents that occur.*
> *[...]*
> *Our "peripheral vision" is limited too: for several "invisible risks" (e.g., gas pipeline master meter operators or failures of DOT packages "outside transportation"), we have little/no risk data."*[7]

Elsewhere, this data quality report explains that:

> *"There are several "invisible risks" (within our statutory authority but not necessarily regulated) where we have little/no risk data – for example:*
>
> - *Bulk loading and unloading of rail tank cars"*[8]

And with respect to "hazmat bulk loading/unloading analysis" PHSMA explains:

> - *"**We lack data on one of the central risks** – unloading of rail cars at fixed facilities – because our reporting requirements for hazmat incidents are limited to events that occur "in transportation." [...]*

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[7] Rick Kowalewski, PHMSA, A Data Quality Assessment. Evaluating the Major Safety Data Programs for Pipeline and Hazardous Materials Safety, November 10, 2009, pp. 1-2. ; Available at: http://www.phmsa.dot.gov/pv_obj_cache/pv_obj_id_BA1B26D970823D0EF3A2A5BE71A5E0DF4B691800/filename/DQA%20Report.pdf.

[8] Kowalewski, p. C-4.

- *We have large uncertainty in our conclusions because of substantial underreporting of hazmat incidents, and failure codes which cannot be used to nail down the transport phase during which a failure occurred. Some large effects were due to a small number of companies reporting, suggesting missing data."*[9]

Thus, it is not surprising that Mr. Radis concluded that accidents at crude oil unloading facilities are "quite rare" and don't include the types of accidents I indicated could occur. He relied on a data base that doesn't report accidents at the type of facility Valero proposes to build. There are many other problems with Mr. Radis' analysis, outlined below.

3. The Scope of Review Is Misleading and Inadequate

Mr. Radis relies on only the last 15 years of PHSMA data for crude oil rail unloading facilities to support his proclamations. This time period is far too short and the facility type far too narrow to estimate the probability and consequences of accidents over the lifetime of the proposed Valero terminal.

First, the proposed unloading terminal is unique due to its location adjacent to the refinery tank farm immediately west of the rail spur and unloading racks (West Tank Farm), Sulphur Springs Creek, and commercial properties along East Channel Road in the Benicia Industrial Park. The new rail spur and unloading rack are parallel to the existing Valero Refinery West Tank Farm, sandwiched between the West Tank Farm on the west and Sulphur Springs Creek on the east. The closest tank in the existing West Tank Farm is only 45 feet away from the arriving tracks and loading racks, separated from the tanks by only a 20-foot wide service road and the tank farm berm, which will be moved closer to the tanks to make room for the Project.[10]

Further, the rail-imported crude oil will be transported through a pipeline that runs through the West Tank Farm to the "Crude Tank Farm," located over 7,000 feet southwest of the unloading racks, adjacent to a residential neighborhood. Finally, the site is located in a "regulatory floodway" and in an area of high earthquake-induced shaking.

This juxtaposition of facilities, dangerous natural conditions, and nearby sensitive receptors renders the proposed site much more dangerous than typical

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[9] Kowalewski, p. D-4 (**emphasis** in original).

[10] See photographs 1-13 in Land Use Application.

terminals. The co-location of the West Tank Farm and unloading terminal coupled with these natural hazards significantly increases the probabilities, types, and magnitudes of accidents that can occur at the rail terminal due to chain reactions that involve multiple facilities.

The co-location of the West Tank Farm and unloading terminal is double jeopardy. An accident in the adjacent West Tank Farm, which includes LPG spheres, could trigger accidents at the unloading facility via vapor clouds that ignite at the unloading terminal, causing multiple unloading rail cars to discharge their contents. As a result, the 30,000 gallon capacity (one railcar of crude) of the underground containment sump would be exceeded and so would other safety features. Even if the capacity of the sump were not exceeded, a large spill of highly volatile Bakken crude on a hot summer day, triggered by a tank BLEVE, could form a vapor cloud at the terminal that could ignite, creating a fireball that would damage adjacent railcars and their transfer hoses. Alternatively, an accident at the terminal could engulf tanks in the West Tank Farm, triggering a much larger accident than caused by the terminal in isolation. Similar accidents have been reported elsewhere.[11]

Similarly, accidents at the Crude Tank Farm, where the rail-imported crude oil will be stored, could release vapors that would engulf adjacent tanks and nearby crude oil and LPG railcars, setting off chain reactions.[12] Alternatively, a major earthquake could disconnect the railcars from the loading rack or tip over numerous railcars, spilling their contents and releasing vapor clouds. Emergency response systems would likely be unavailable due to widespread power outages.

Thus, narrowly focusing only on crude oil unloading facilities (which are not even included in the PHSMA database) as in Mr. Radis' 4/12/16 Letter misleads as to the probability and consequences of accidents. Tank accidents, including for LPG spheres in the West Tank Farm, as well as conventional unloading accidents and

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[11] See, *e.g.*, Lees, Table A1.5, #468: PEMEX LPG Terminal, Mexico City; (An 8-inch pipe between a sphere and a series of cylinders ruptured. LPG was released for about 5-10 minutes, forming a vapor cloud that drifted to a flare stack. It ignited, causing a violent ground shock. A number of ground fires occurred. About 15 minutes after the initial release the first BLEVE occurred. For the next hour and a half there followed a series of BLEVEs as the LPG vessels violently exploded. 500 individuals were killed and the terminal was destroyed.) See: http://www.hse.gov.uk/comah/sragtech/casepemex84.htm.

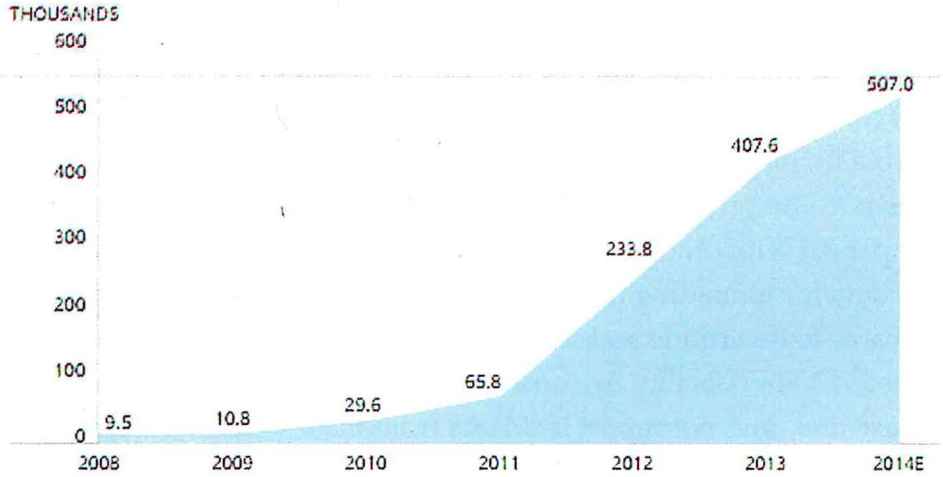
[12] See, *e.g.*, Lees, Table A1.5, #305: Philadelphia Crude Oil Tank Farm. (Hydrocarbon vapors released during loading of overfilling of crude oil into an internal floating roof tank ignited outside of the tank and followed the vapor back into tank, causing fire at the tank's vents and explosions, which spread to adjacent tanks and other nearby equipment. There were 8 deaths and 2 injuries.)

supporting arrival and departure railspurs, should have been considered in determining accident probabilities and consequences.

Second, a very long and broad record is required to establish worst-case accident scenarios and probabilities for the lifetime of the facility. Sizeable crude oil transport in 50 to 100 car unit trains is a new phenomenon. Historically, crude oil has been transported by pipeline, ship, and tanker truck. Historically, crude oil transported by train was uncommon and generally only in "manifest" or "mixed" trains carrying crude oil interspersed with other commodities in box cars, hoppers, etc. Thus, relevant accident data for unloading two 50-car unit trains of crude oil every day is very scarce, far too scarce to determine accident probabilities and consequences over the lifetime of the proposed Valero facility by considering only crude oil unloading terminal incidents in database that does not report incidents from these terminals.

Third, sizeable shipments of crude oil in unit trains started only around 2011, in response to new shale crude discoveries in the midcontinent that were not connected to market by pipeline. This is demonstrated by Figure 1, which shows a dramatic rise in crude oil shipped by rail, starting around 2011. Mr. Radis relies on statistics for the 15 year period 2000 to 2015, which misleads because only 4 years out of this 15-year record included significant unit train crude transport and unloading. Four years of data is simply inadequate to determine accident probabilities for a terminal that will operate for at least 30 years.

Figure 1: Originated Class I Carloads of Crude Oil, 2008-



2014.[13]

Fourth, Mr. Radis restricted the population considered to just "rail crude oil unloading facilities." This is far too narrow to estimate the range of likely potential spill volumes and accident types at rail terminals because, as demonstrated in Figure 1, shipping crude by rail to unloading facilities is very new, starting only around 2011. Further, there are very few dedicated unit-train crude oil terminals with long-term operating histories from which to draw accident conclusions.[14] Most are new and thus would not experience the types of accidents that might occur as the proposed facility ages. Finally, restricting the population to crude oil rail terminals ignores the rail spur, adjacent tanks farm, crude oil storage facilities, connecting pipeline and other infrastructure.

It is standard procedure to extrapolate from similar facilities when there is inadequate data to establish accident probabilities for a narrowly defined, specific type of facility, as here. Thus, accident statistics for all terminal operations, including loading and unloading all flammable liquid products, as well as tank farms and pipelines, should have been considered for a substantially longer period of record. Lees' seminal *Loss Prevention in the Process Industries* includes a summary of case

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[13] Oliver Wyman, Ten Questions on Crude-by-Rail Risks, 2015; Available at: http://www.oliverwyman.com/content/dam/oliver-wyman/global/en/2015/feb/ten-questions-on-crude-by-rail-risks.pdf. See also: Annual Rail Traffic Data; Available at: https://www.aar.org/pages/freight-rail-traffic-data.aspx.

[14] Crude-by-Rail Facilities Map; Available at: https://www.bnsf.com/customers/oil-gas/interactive-map/pdfs/BNSF-OG-Overview-Map.pdf. See also: tp://priceofoil.org/rail-map/.

histories of "some major accidents in the process industries."[15] This summary identifies many examples of "major" accidents at loading terminals and adjacent facilities, comparable to those that I identified as possible at the Project site in my comments. Other major accidents at unloading terminals are documented on the National Transportation Safety Board website.[16]

B. The EIR's Quantitative Risk Assessment for On-Site Hazard Impacts Is Incomplete and Not Supported

My 4/4/16 comment letter addressed only on-site impacts. The MRS response concatenates the on-site and off-site QRA. The off-site QRA is generally much better supported in the record than the on-site QRA, which is unsupported.

The MRS letter includes numerous general assertions as to methodologies, scenarios, and assumptions that were evaluated in the EIR. However, none of these assertions are supported with citations to page numbers in the EIR or elsewhere in the record where the information can be found. Further, these assertions are "generalized" and not project- or site-specific and thus cannot be used to support the EIR's on-site hazard analysis and the risk profiles used to determine significance. Some examples, presented as the page number from the 4/12/16 Radis letter, followed by my summary response in **bold**, include the following:

- Radis, p. 2: The QRA followed recommended PHMSA and other methodologies. **The on-site QRA was performed with models that the QRA claims are confidential. None of the supporting calculations and specific methodologies are disclosed in the record.**

- Radis, p. 4: "The QRA considered the adverse consequences of a derailment and tank car failure, but given the low probability of this scenario, it was not a significant contributor to societal risk." **The EIR does not include any support for societal risk from on-site accidents for any accident scenario, including derailment and tank car failure.**[17]

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[15] Dr Sam Mannan, Lees' Loss Prevention in the Process Industries: Hazard Identification, Assessment and Control, Fourth Edition, 2012, Appendix 1, Table A1.5.

[16] See, *e.g.*, NTSB, Hazardous Materials Release from Railroad Tank Car with Subsequent Fire at Riverview, Michigan, July 14, 2001; Available at: https://app.ntsb.gov/doclib/reports/2002/HZM0201.pdf.

[17] The referenced "societal risk" is the unsupported "risk profiles" in RDEIR Figure 5-3. The EIR contains no support for these risk profiles, as explained in my 4/4/16 comments, Comment IV.A.3 and IV.B. The

- Radis, p. 5: "...the QRA did include the risk of spills into the berm area surrounding the tanks, as well as the thermal radiation hazards that could result from a pool fire at the tank farm." **As discussed below, the EIR does not include any analysis of the risk of spills in the berms surrounding the tanks where the rail-imported crude oil would be stored.**

- Radis, p. 5/6: Ignition sources are generally discussed in response to my comment that they are not disclosed. **The EIR does not identify the specific ignition sources and probabilities used to calculate the accident frequencies used in the risk profiles in RDEIR Figure 5-3. The general discussion does not fill this gap.**

The EIR determined the significance of accidents using "risk profiles". These risk profiles plot the frequency of the worst-case accident on the y-axis versus the number of injuries and fatalities on the x-axis.[18] These risk profiles are unsupported in the record. They simply appear. The EIR, the responses to Public Record Act (PRA) requests, and the responses to comments do not disclose how the accident frequencies on the y-axes of the risk profiles or the number of injuries and fatalities on the x-axes were determined. In other words, the on-site QRA's significance determination is unsupported.

My review of the EIR, PRA responses, and other materials indicates that most assertions in response to my 4/4/16 comments are unsupported and/or demonstrably and factually incorrect. The key step in the accident analyses -- assigning significance based on risk profiles -- is missing from the record. The public shouldn't have to piece together the hazard analysis from obscure clues spread throughout the record and guess what the missing parts might be. The EIR should clearly disclose all assumptions and present all calculations that support the risk profiles in one coherent place. It does not. The EIR fails as an informational document.

4/12/16 Radis letter does not addresses my comments, but rather asserts the analysis is there, without citing it. The analysis is missing from the EIR.

[18] RDEIR, Figure 5-3.

C. Tank Accidents Were Not Evaluated

I commented that accidents at the tanks that would store rail-imported crude were not included in the QRA.[19] This is a significant omission because the tank farm that will store the rail-imported crude is very close to a residential neighborhood[20] and the Robert Semple Elementary School,[21] which are in the "blast zone."

First, Mr. Radis asserts that the tanks that would store rail-imported crude oil are "existing" and thus "are considered as part of the CEQA baseline and are already in crude oil service."[22] This is wrong. Existing permit limits do not establish the CEQA baseline, but rather actual conditions. As explained in my previous comments, in the baseline, these tanks stored heavy low vapor pressure crudes, which would be much less likely to ignite and cause an accident than the highly volatile rail-imported crudes, which have much higher vapor pressures.[23] The EIR must evaluate the increase in probability and consequences of an accident at these tanks relative to the baseline crudes. The EIR and the various responses to comments and PRA requests do not include any accident analyses for these tanks (Tanks 1701-1708).

Second, Mr. Radis asserts that "the QRA did include the risk of spills into the berm area surrounding the tanks", without specifying which tanks (there are many adjacent to the proposed terminal) ..."as well as the thermal radiation hazards that could result from a pool fire at the tank farm."[24] However, he fails to point to a specific page of the EIR where these analyses may be found. My search of the EIR fails to identify any analysis of spills into the tank berm area or pool fires at the tank farm where the rail-imported crude oil would be stored.

Rather, the 4/12/16 Radis letter includes Figure 1, presumably to support this claim. This figure was also provided in response to SAFER California's March 10, 2016 PRA request. It shows the "blast zone" for the same accident, presented as a series of concentric circles centered around six different accident locations, including four within the tank farm immediately west of the Project site (Figure 1b).

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[19] 4/4/16 Fox Comments, pp. 57-61.

[20] 4/4/16 Fox Comments, p. 27 and Figure 5.

[21] 4/4/16 Fox Comments, pp. 28-29 and Figure 6.

[22] 4/12/16 Radis Letter, p. 5.

[23] 4/4/16 Fox Comments, Table 1.

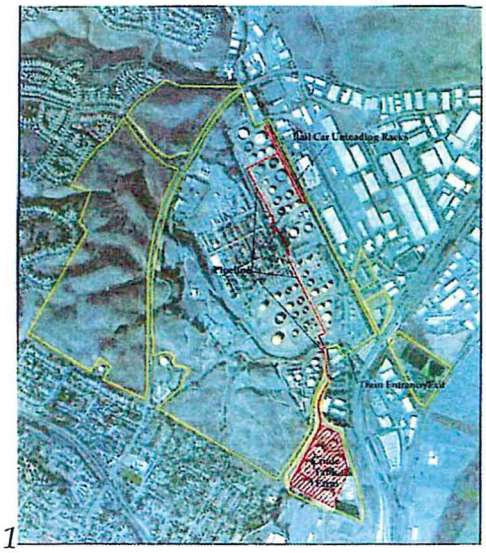
[24] 4/12/16 Radis Letter, p. 5.

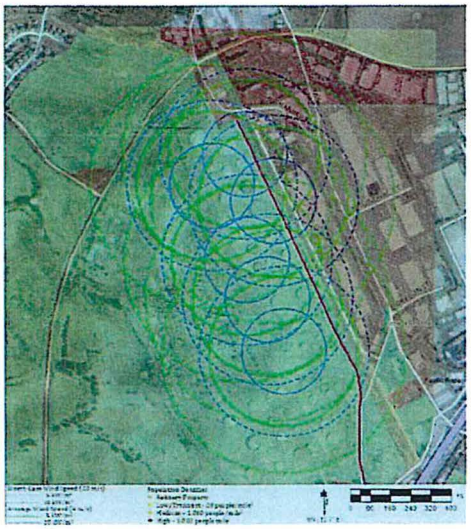
However, none of these four tank locations are near those where the rail-imported crude oil would be stored (Tanks 1701-1708). The tanks that would store rail-imported crude (1701-1708) are southwest of the area shown on Radis Figure 1, reproduced below as Figure 2b. This unanalyzed release point is the closest to residential and other sensitive receptors, as shown in Figure 1 of my 4/4/16 comments, reproduced below as Figure 2a. The tank farm that would actually store the rail-imported crude oil was not analyzed in the EIR or in subsequently submitted responses to PRA requests. If it had been, off-site impacts would have been significant due to the proximity of sensitive receptors and the higher population density of residential areas.

Mr. Radis' Figure 1 simply moves the worst-case, on-site accident to different locations, without considering the changing conditions at those locations that would affect accident consequences. For example, an accident at a tank in the West Tank Farm could engulf several adjacent tanks, including LPG spheres, resulting in much greater consequences than the spill of 240,000 gallons of crude oil in the middle of the unloading rack. Thus, moving the worst-case rail spur accident centroid around in the West Tank Farm without performing a site-specific QRA for the specific impacted tanks is not relevant and does not constitute a tank accident analysis.

Figure 2: Comparison of Tank Release Points Modeled in Radis Figure 1 with Tanks that Would Store Rail-Imported Crude Oil (red crosshatched area Fig. 2a).

(2a) 4/4/16 Fox Comments, Figure 1 *(2b) 4/14/15 Radis Figure*





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Finally, it is important to note that Radis Figure 1 (Fig. 2b above) was not included in the EIR and was submitted in response to a PRA request addressed in the

3/30/16 Radis letter.[25] The record contains no support for this figure nor discussion of its implications. My inspection of this figure indicates that it just moves the hazard zones for the same worst-case accident around the site and West Tank Farm, in an effort to support the selected location for the worst-case accident. However, the figure fails to include the true worst-case location, the actual tank farm where the crude oil would be stored, the red cross-hatched area in Figure 2a, located only 1,000 feet from a residential neighborhood. Further, if the worst case on-site accident occurred in the West Tank Farm, it could have much more severe consequences than the assumed on-site worst-case accident, located in the middle of the unloading rack, due to proximity of adjacent tanks.

D. Safety Features Will Not Prevent Accidents

The 4/12/16 Radis Letter relies on unloading rack safety features to mitigate impacts of accidents.[26] However, these safety features only mitigate spills within the unloading rack area that are less than 30,000 gallons (about one railcar).[27] Spills at the tank farm and along the rail line outside of the unloading racks would not be controlled by these safety features. Further, spilled Bakken and other highly volatile crudes could form a vapor cloud before the spilled crude reaches the sump, which could ignite before built-in safety features shutdown. Finally, during a natural disaster, such as an earthquake, power outages would likely occur, resulting in the failure of electrically activated safety features, such as the SCADA system.

E. The Worst-Case Accident Location Was Not Selected

The EIR assumes the worst-case accident would occur in the southern one third of the loading rack. However, I commented that if the accident occurred elsewhere, such as at the northern end of the loading rack or in the Crude Tank Farm where rail-imported crude will be stored, consequences would be greater due to proximity of residential areas. I further noted the EIR includes no justification for selecting the center

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[25] Letter from Steven R. Radis, MRS, to Amy Million, Benicia, Re: Public Records Act Request for the Valero Crude by Rail Project, March 30, 2016 (3/30/16 Radis Letter).

[26] 4/12/16 Radis Letter, pp. 4 ("The unloading facility is designed to drain any spilled oil away from the rail cars and to minimize the potential for flammable vapors to be released…"), 5 ("..safety features that are part of the proposed project to minimize the hazards associated with the unloading facility and adjacent refinery tanks and equipment.").

[27] RDEIR, pdf 327.

of the loading rack as the location for the worst-case accident.[28] Figure 2b above is not justification because it fails to consider site-specific conditions at each location.

The Radis response characterizes my comment as "disingenuous" because I had access to his map showing different release points. My comments acknowledge this map and include it as Figure 29. However, this map does not address my comments, which relate to the fact that the EIR and this map do not include two additional accident sites that I pointed to in my comments: (1) the northern end of the loading rack and (2) the West Tank Farm. The Radis response ignores the West Tank Farm where rail-imported crude oil would be stored, which is the worst case location for the selected accident scenario.

The Radis response also argues that an accident at the northern end of the loading rack would be precluded by facility design.[29] However, this is clearly wrong. *First*, the worst-case accident involves a spill of 240,000 gallons (8 rail cars).[30] The containment sump at the unloading rack is designed to contain only 30,000 gallons. *Second*, the EIR concluded the location of the worst-case accident was in the middle of the loading rack, which would include the same facility design. Thus, if facility design does not control an accident in the middle of the loading rack (the EIR case), an accident a little further north, but still within the loading rack, also would not be controlled.

In other words, Mr. Radis has contradicted himself. He first asserts the worst-case accident would occur in the middle of the loading rack, where he does not claim the facility design mitigates the impact. He then asserts, when I propose a location at the northern end of the same loading rack, that facility design would mitigate the significant impacts of the very same worst-case scenario. He can't have it both ways.

F. Mitigation for Other Rail Traffic at the Site Is Not Enforceable

Mr. Radis asserts that there is no potential for interaction of Project trains and facilities with the LPG and coke rail cars because "there would be no simultaneous use of the tracks."[31] However, this does not preclude the presence of parked railcars of LPG awaiting shipment that could be involved in accidents involving chain reactions. Further, the EIR does not include restrictions on simultaneous use of the tracks as a mitigation measure. The EIR must be revised to include "no simultaneous use of tracks

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[28] 4/4/16 Fox Comments, Comment IV.F.4, p. 74.

[29] 4/12/16 Radis Letter, p. 6.

[30] RDEIR, p. 2-94.

[31] 4/12/16 Radis Letter, p. 7.

by other commodities", or the hazard analysis must be revised to consider the interactions.

II. ON-SITE ROG EMISSIONS (ESA)

The EIR failed to evaluate two major on-site sources of ROG emissions: (1) railcar fugitive emissions and (2) tank emissions. The responses to my 4/12/16 comments do not address the deficiencies.

A. On-Site Fugitive ROG Emissions from Railcars Are Significant

The ESA letter asserts that "[t]he Revised DEIR and FEIR include emission estimates for rail car tanker fugitive ROG emissions (see Revised DEIR Appendix A)."[32] The RDEIR contains an unsupported and erroneous estimate of railcar fugitive emissions from seven uprail air districts. The BAAQMD and the proposed Valero Terminal are excluded.[33] I estimated on-site ROG emissions from railcars. The EIR does not include any estimate for these emissions.

B. Crude Oil Storage Tanks ROG Emission Are Significant

The ESA letter asserts that as the Project does not include any changes to the Refinery's existing permits, there would not be any increase in tank ROG emissions.[34] This is wrong.

First, the baseline for determining an increase in emission under CEQA is the actual emissions at the time environmental review begins, not permit limits.

Second, the subject permit does not contain any ROG emission limits or vapor pressure limits, which could be used to estimate ROG emissions. While BAAQMD Regulation 8, Rule 5 prohibits storing crudes with a true vapor pressure (TVP) equal to or greater than 11 psia in external floating roof tanks, without certain modifications, the EIR discloses that the subject crudes could have TVPs ranging up to 13 psia.[35] Further, no monitoring for ROG or vapor pressure is required in the subject permits. Thus, even the upper limit of 11 psia for an unmodified tank is unenforceable as a practical matter.

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[32] 4/12/16 ESA Letter, p. 1.

[33] RDEIR, pp. A-3 to A-14.

[34] 4/11/16 ESA Letter, pp. 1-2.

[35] 4/11/16 Fox Comments, pp. 19-20.

C. On-Site TAC Emissions from Railcars Result In Significant Health Impacts

The ESA letter asserts that I used "different estimates of ROG evaporative emissions from storage tanks and railcar unloading than those documented and analyzed in the EIR" to assert significant health impacts from benzene.[36] This is incorrect.

I did not estimate benzene emissions from storage tanks and railcar unloading. Rather, I estimated benzene emissions from railcar fugitive emissions, an entirely separate source. The EIR does not include any estimate of benzene emissions from railcar fugitive emissions or tanks. Thus, there is no methodological issue. The EIR failed to evaluate benzene emissions from on-site railcar fugitive emissions.

III. FLOODING IMPACTS (ESA)

My previous comments show that, based on substantial evidence (including calculations), flooding impacts are significant. The responses cite to various places in the DEIR, RDEIR, and FEIR where flooding impacts are discussed. I reviewed and considered these and other references to flooding in the EIR when drafting my 4/4/16 comments. However, as explained in my previous comments, these citations refer to unsupported assertions which lack supporting citations, analyses, and calculations. Unsupported assertions are not substantial evidence. The ESA response does not cure this defect by providing substantial evidence, but simply repeats the unsupported assertions in the EIR, except as discussed below.

A. The Project Could Increase Flooding

The EIR's qualitative and unsupported analysis of flooding focuses on "structures" (aboveground facilities associated with the loading terminal, e.g., the racks, pump, pipeline) within the flood zone and ignores the trains. See, for example, the first, second, and last complete paragraphs on page 3 of the 4/11/16 ESA Letter. See also the assertion: "The impact analysis is correctly focused on permanent structures that could redirect flows during a flood event."[37]

I demonstrated by calculation and other analysis that the presence of up to three 50-car unit trains on site would block the passage of flood flows, acting like a dam and occupying volume that flood flows would otherwise use to dissipate. I estimated total

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[36] 4/11/16 ESA Letter, p. 2.
[37] 4/11/16 ESA Letter, p. 5.

on-site train weight would be at least 10,646 tons, so they would not wash away, but could tip over. I further estimated that these trains would displace 48% of the volume otherwise available for flood flows at the yard and 29% of the volume at the loading racks. This would cause an increase in elevation of floodwater upstream of the Project site and cause floodwaters to spread out to the east (as the West Tank Farm berm blocks the floodwaters on the west), penetrating further into the Benicia Industrial Park. Thus, the on-site trains themselves have the potential to aggravate flooding in nearby areas, which is a significant impact under CEQA that was not disclosed in the EIR. [38]

The ESA letter responds that flooding is not an issue because: (1) the rail cars would be evacuated before the floodwaters arrive; (2) the railcar wheels are 24 inches in diameter so, presumably, the water would flow under them; and (3) any flooding would be contained on the west side of Sulphur Springs Creek due to elevation differences. None of these assertions is supported with substantial evidence, and they are factually wrong.

1. <u>The Rail Cars Could Not Be Evacuated Fast Enough to Avoid Significant Impacts from Increased Flooding</u>

The response asserts that floods at the Project site would not tip over railcars as shown in my Figure 32 because "railcars could be moved off-site to higher ground and their arrivals and departures rescheduled to avoid and minimize flood related risks based on weather predictions."[39] It asserts that adequate advance warning would be available because "[s]evere flash flooding and related hurricane precursors that resulted in the Texas derailment [...] are decidedly unanticipated in the Project area [...] No evidence has been presented suggesting that flood waters would rise so quickly in the area as to preclude a responsible response to potential risk including removing trains from harm's way."[40]

(a) Advance Flood Warning May Not Occur

There are local situations in which floodwaters would rise before the trains could be evacuated, resulting in tipped-over railcars. If the tipped-over railcars occurred during a flooding event, flooding would be aggravated, resulting in a significant impact not disclosed in the EIR. If the tipped-over railcars occurred during a flooding event, such as an earthquake, released crude oil could result in a vapor cloud explosion or

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[38] 4/4/16 Fox Comments, pp. 79-85.

[39] 4/11/16 ESA Letter, p. 5.

[40] 4/11/16 ESA Letter, p. 5.

BLEVE, leading to much more severe accidents than disclosed in the EIR as well as complicating any effort to move railcars offsite.

First, Lake Herman, which is upstream of the Project site on Sulphur Springs Creek, is in the "High" flood hazard category.[41] This means it is a dam where failure or misoperation will probably cause loss of human life.[42] The dam could fail unexpectedly from natural causes, such as an earthquake or from structural failure . While the probability for these events may be low, they are not zero. In these situations, there would no advance warning and thus no time to remove the railcars from the site. Further, emergency warning systems may not be operating due to local power outages.

Second, the type of weather events that knocked over the Texas railcars and which have also occurred in Benicia[43] and may occur more frequently at the Project site in the future, have not been typical of either location historically[44]. Storm events have been changing due to global climate change. In general, more severe weather is forecast for the future. Thus, the EIR must consider that flash floods, with little advance warning, could occur over the lifetime of the Project, aggravating flooding at adjacent properties.

(b) Evacuation to Higher Ground May Not Be Feasible

The EIR did not identify the location of higher ground, identify the route(s) to higher ground, or explain how long it would take to move the railcars to higher ground. All of this information should be identified in an emergency evacuation plan that should be required as flood mitigation.

First, railcars could not be instantly removed from the site in the event of a flood emergency, such as earthquake-induced or other failure of the 100-year old Herman dam. There could be up to three 50-car unit trains on site at the time of the flood warning. The railcars at the loading rack would have to be disconnected from the rack, assembled into a unit train(s), and moved offsite at 3 mi/hr with on-site staff for normal

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[41] Solano County Emergency Operations Plan, Flood and Tsunami Annex, March 2012; Available at: https://www.solanocounty.com/civicax/filebank/blobdload.aspx?BlobID=13276.

[42] National Inventory of Dams Data Status; April 20, 2003; Available at: https://cryptome.org/eyeball/sfb/sfb-eyeball.htm.

[43] JB Davis, City Opens Emergency Operations Center to Coordinate Efforts to Combat Flooding, Benicia, CA, December 2, 2012; Available at: http://patch.com/california/benicia/watch-rain-water-overflow-at-east-n-and-east-second-street.

[44] Al Gore, The Case for Optimism on Climate Change, February 2015, TDE2016; Available at: http://www.ted.com/talks/al_gore_the_case_for_optimism_on_climate_change#t-137484.

operations. Empty rail cars on the siding also would have to be assembled into a unit train(s) with available staff and moved off site. This would take at least 4 hours, perhaps longer, as it would occur under emergency conditions.[45] Further, advance warning of floods is frequently as short as 2 hours, particularly for the cloudburst type of storm typical of the area.[46] Thus, it is plausible that flood waters could reach the site before trains could be moved to higher ground.

Second, the EIR failed to identify the routes that would be taken to avoid floodwaters and where the higher ground is located. The ESA letter mentions that about 500 linear feet southwest of Bayshore Road is in an area of minimal flooding or Zone X.[47] However, 500 linear feet is not adequate to store three 50-car unit trains, which would be about 5,000 feet long.[48]

Third, in the event of a flood emergency, other local rail unloading/loading facilities in the floodplain, *e.g.*, auto staging area in the Benicia Railyard, straddling the lower end of Sulphur Springs Creek, would also have to evacuate. This would create congestion and delay.

Fourth, available local tracks that could be used to reach higher ground may also be flooded, preventing escape. The southern track of the UP Mainline runs parallel with and close to the Bay shore. This southern track is used to access the refinery. East of Sulphur Springs Creek, the southern track of the UP Mainline is very low lying, at an elevation of only 1 ft crossing Lake Herman Road. East of Lake Herman Road, the northern and southern tracks of the UP Mainline converge and traverse Suisun marshland. The rail line in this area is already subject to unstable ground and flooding. The unstable ground can cause "dips" in the track, at which trains must slow down.[49]

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[45] 4/4/16 Fox Comments, p. 4; Santa Maria FEIR, Table 2.5.

[46] Solano County Emergency Operations Plan, Flood and Tsunami Annex, March 2012; Available at: https://www.solanocounty.com/civicax/filebank/blobdload.aspx?BlobID=13276.

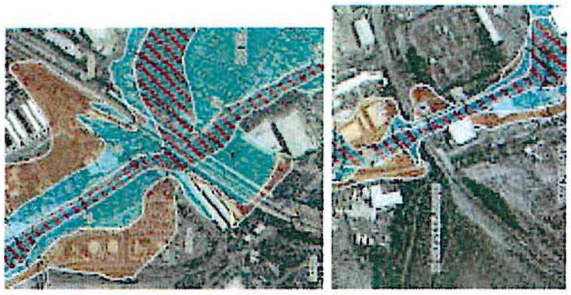
[47] 4/11/16 ESA Letter, p. 3.

[48] RDEIR, p. 2-28 (two train lengths are about 3,300 feet).

[49] Solano Rail Facilities Plan Update, July 8, 2015, p. 53 ("The lower track location at Lake Herman Road is at 1ft elevation and likely impacted by future sea level rise (see section 3.3). This was not a major consideration or concern at the time of the previous rail facilities plan 20 years ago, but is a significant issue now and in the future."), p. 96 ("One key area for delays is in the Suisun Marsh between Cordelia Road and Benicia. This area is subject to unstable ground and flooding. The unstable ground can cause "dips" in the track, at which trains must slow down, while flooding presents obvious obstacles to train movements, as well as expensive repairs. Potential improvements in this area include subgrade/ground improvements to reduce raising the track above the level of flooding."), p. 97 (The rail tracks crossing Suisun Marsh wetlands area are likely to be impacted by sea level rise. Soil subsidence in the wetlands is an additional concern and is the cause for much of the current UPRR railroad track maintenance in the

The excerpts from FEMA Panel 634 in Figure 2 show that rail lines leading into and out of the Project site would also likely be flooded.

Figure 2. Excerpts of FEMA Panel 634, 1/12/2015.



Fifth, if the trains were evacuated under emergency flooding conditions, this could put motorists stranded at railway crossings or workers trapped in buildings, such as the Ironworkers Union Local 378 on Bayshore Road, while the trains passed, at significant risk of death or injury from rising floodwaters. The EIR did not consider these significant secondary impacts of evacuating the trains.

2. Railcar Wheel Diameter Will Not Prevent Increased Flooding

The ESA flooding response relies on an email from the City's Public Works Director to conclude flooding impacts are not significant: "The FEMA Flood Insurance Rate Map Panel 634 shows the area of Industrial Way Between Bayshore Road east of Sulphur Spring Creek and West Channel Road as 'one AO (Depth 2).' I assume that the [crude by rail] tankers will park in this area parallel to Industrial Way. Since the rail car wheels are probably 24 inches in diameter, I do not see much risk."[50] Thus, the EIR assumed flood flows would pass under the railcars, which would not result in increased flooding in surrounding areas.[51]

First, what does "not..much risk" mean? If it means some risk, then the EIR must evaluate it.

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wetland area to maintain a level surface for the tracks. Inundation of the tracks is likely to occur with sea level rise, and temporary flooding of the tracks may occur with a storm tide."); Available at: http://www.sta.ca.gov/docManager/1000005509/Solano%20Rail%20Facilities%20Plan%20Update.pdf.

[50] 4/11/16 ESA Letter, p. 3.

[51] 4/11/16 ESA Letter, p. 5 ("Nonetheless, even if rail cars were located on-site during a flood event, they would not substantially impeded flows as water could travel underneath and between cars, ,i.e., the rail cars would not act like an impenetrable dam or wall to flood flows in any way similar to the photographs shown.").

Second, this is true only if the flood elevation is less than 24 inches. However, the West Tank Farm berm is 8 feet tall. The design basis is unknown, but is likely the hundred year flood elevation, to protect the tanks from flooding. Thus, while flood flows under 24 inches could theoretically pass mostly unimpeded[52] beneath the railcars, much deeper flood flows would not. They would be blocked by the railcars. Thus, the railcars would block flood flows as I estimated in my comments,[53] which properly excluded the distance between the tank car and the ground. The volume occupied by the railcars would increase flooding elsewhere, including in the Benicia Industrial Park. This is a significant impact that must be mitigated.

Third, as flood waters rise, the force of the water against the railcars would tip them over, as shown in Figure 32 of my 4/4/16 comments. The tipped-over railcar would continue to displace the entire volume of the unit trains. This would increase flooding elsewhere, including in the Benicia Industrial Park.

3. Flooding Would Not Be Contained on the East Side of Sulphur Springs Creek

The 4/11/16 ESA letter asserts, again based on an email from the City's Public Director, that the Project site is at a higher elevation than East Channel Road by up to 10 feet, so any flooding would be contained on the west side of Sulphur Springs Creek.[54] A topographical map was not produced to confirm this conclusion. Moreover, it is inconsistent with the FEMA Flood Insurance Rate Map, which shows the regulatory floodway extends to the West Tank Farm berm along most of the Project site, except at the northern and southern ends. See Figure 3.

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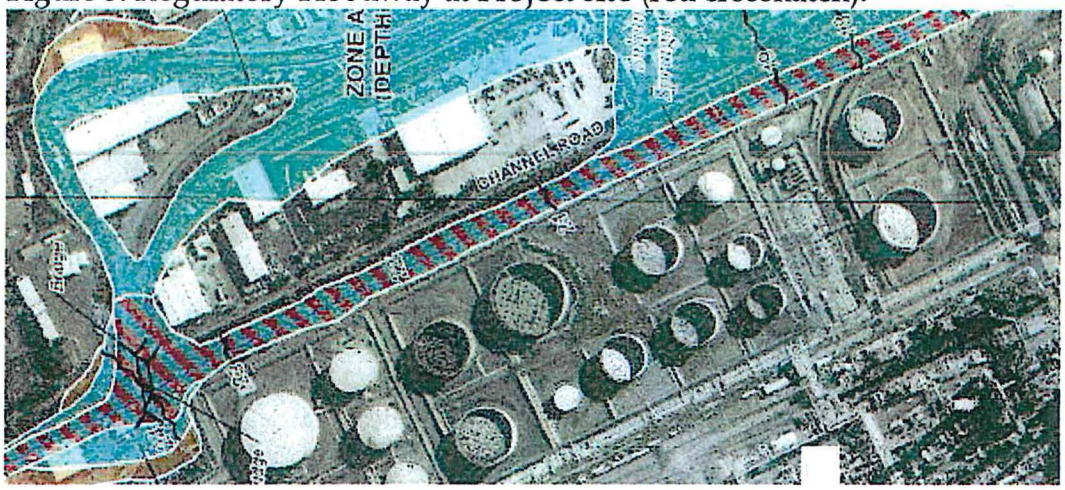
[52] Accumulated debris that would accumulate around the wheels and protrusions would block some of the flow.

[53] 4/4/16 Fox Comments, Comment V.B. See volume calculation in footnote 274, which is based only on the volume of the railcar and does not include the 24 inches between the rail and the bottom of the tank.

[54] 4/11/16 ESA Letter, pp. 3-4.

Figure 3. Regulatory Floodway at Project site (red crosshatch).



This is also inconsistent with the statement elsewhere on p. 4 of the ESA Letter that "...the unloading rack area would be located within a 100-year flood zone is acknowledged and evaluated [in the EIR]."[55] If the unloading rack is within the 100-year floodplain, as shown in Figure 3, flooding is not contained on the west side of Sulphur Springs Creek, but rather rises above the elevation of the Project site. The height of the West Tank Farm berm, 8 feet, suggests a significant rise.

The excerpt from the email fails to disclose floodwater depth along the Project site, which would have been much more useful than land surface elevations. Figure 3.

4. Mitigation Is Not Required

The response first argues that "it is logical to assume that the delivery of crude oil trains to the Project site would be temporarily halted during a flood even to prevent damage to the rail cars."[56] However, rather than requiring this as mitigation, the response goes on to assert that the impact is not significant and no mitigation is required. It further asserts that "it is wholly appropriate to expect that professionals will exercise a reasonable duty of care in carrying out their official duties..."[57] Professional expectations are not valid CEQA mitigation because they are not enforceable. Further, professional judgement during emergencies can, and often are, compromised by the resulting chaos.

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[55] 4/11/16 ESA Letter, p. 4.

[56] 4/11/16 ESA Letter, p. 5.

[57] 4/11/16 ESA Letter, p. 5.

The EIR fails to lay out a plan that would be followed for evacuating the site in an emergency. Relying on "professional judgement" in an emergency is a recipe for disaster. The EIR should require an evacuation plan and require that it be reviewed by on-site employees in annual training.

In sum, the MRS and ESA letters fail to address my 4/4/16 comments and present no new information or analyses. The Project as proposed in the EIR will result in significant on-site air quality impacts from railcar and storage tank ROG emissions; significant chronic and acute health impacts due to benzene present in on-site railcar ROG fugitive emissions; significant off-site impacts (death and injuries) from on-site accidents; and significant off-site flooding impacts from on-site railcars that would occupy floodplain volume.

Phyllis Fox

ATTACHMENT B

April 18, 2016

Ms. Rachael E. Koss
Adams Broadwell Joseph & Cardozo
601 Gateway Boulevard, Suite 1000
South San Francisco, CA 94080

Subject: Comments on the Valero Benicia Crude by Rail Project

Dear Ms. Koss:

I submitted a comment letter (dated March 28, 2016) describing biological resource issues associated with the Final Environmental Impact Report ("FEIR") and other environmental documents prepared by the City of Benicia ("City") for the Valero Benicia Crude by Rail Project ("Project"). The comment letter established my professional qualifications and described the actions I took to evaluate the FEIR and underlying analyses. I incorporate my previous comments by reference.

My previous comment letter discussed the following issues:

1. The FEIR failed to properly analyze the effects of night lighting and human activity on wildlife occupying Sulphur Springs Creek, including wildlife that use the creek as a movement corridor.
2. The FEIR failed to incorporate a mitigation and monitoring program that would ensure impacts to wildlife movement in the Sulphur Springs Creek corridor are mitigated to a less than significant level.
3. The FEIR failed to disclose and properly analyze the effects of Project noise on wildlife.
4. The FEIR failed to disclose and analyze adverse effects to biological resources due to chronic exposure to contaminants, even without a spill or accident.
5. The FEIR failed to consider impacts of on-site accidents to Sulphur Springs Creek and its riparian corridor, marshes, and biota.
6. The FEIR failed to incorporate adequate mitigation measures for spills and accidents that could occur at the rail spur and unloading facility. Mitigation measures that would reduce adverse effects on biological resources from a spill or accident on Valero property are feasible and not preempted by federal law.
7. The "nesting bird" mitigation measure incorporated into the FEIR is insufficient to avoid and minimize significant impacts to nesting birds protected under the Migratory Bird Treaty Act and other state and federal regulations.

On April 12, 2016, City Staff issued a report that responded to various questions and issues related to the Project. Staff's report does not resolve, or provide specific responses to, the issues raised in my previous comment letter. The Project's impacts on biological resources remain significant and unmitigated.

Ecological Value of Sulphur Springs Creek, Suisun Marsh, and Suisun Bay

Sulphur Springs Creek provides habitat for numerous special-status species. In addition, it provides one of the last remaining corridors of aquatic and riparian habitat between Suisun Marsh (and Bay) and open space to the north of the Project site.[1] As described in the Suisun Marsh Preservation Act of 1977 ("Act"), Suisun Marsh represents a unique and irreplaceable resource to the people of the state and nation. The Act states:

> The Legislature hereby finds and declares that the Suisun Marsh, consisting of approximately 55,000 acres of marshland and 30,000 acres of bays and sloughs, and comprising almost 10 per cent of the remaining natural wetlands in California, plays an important role in providing wintering habitat for waterfowl of the Pacific Flyway; that during years of drought the area becomes particularly important to waterfowl by virtue of its large expanse of aquatic habitat and the scarcity of such habitat elsewhere; that the area provides critical habitat for other wildlife forms, including such endangered, rare, or unique species as the peregrine falcon, white-tailed kite, golden eagle, California clapper rail, black rail, salt-marsh harvest mouse, and Suisun shrew; that the existence of this wide variety of wildlife is due to the relatively large expanse of unbroken native habitat and the diversity of vegetation and aquatic conditions that prevail in the marsh; that man is an integral part of the present marsh ecosystem and, to a significant extent, exercises control over the widespread presence of water and the abundant source of waterfowl foods; that the Suisun Marsh represents a unique and irreplaceable resource to the people of the state and nation; that future residential, commercial, and industrial developments could adversely affect the wildlife value of the area; and that it is the policy of the state to preserve and protect resources of this nature for the enjoyment of the current and succeeding generations...The Suisun Marsh is located where the salt water of the Pacific Ocean and the fresh water of the Sacramento and San Joaquin River Delta meet and mix; and because of its location, the marsh provides a transition zone between salt and fresh water habitats, creating a unique diversity of fish and wildlife habitats.[2]

Sulphur Springs Creek is located immediately adjacent to the proposed rail spur and unloading rack. Because Sulphur Springs Creek flows into Suisun Marsh, any effects to the creek would also affect the marsh. As described in my previous comment letter, the FEIR fails to incorporate mitigation to protect the ecological values of Sulphur Springs Creek, and thus, the ecological resources of Suisun Marsh.

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[1] James Associates, Inc. 2012. Benicia, Vine Hill, and Fairfield South 7.5-minute quadrangles [topographic maps]. MacTopos 3.0 georeferenced for MacGPS Pro.

[2] *California Public Resources Code 29000-29612.*

The Suisun Marsh Preservation Act of 1977 was enacted "to preserve the integrity and assure continued wildlife use" of the Suisun Marsh.[3] Based on my independent review, it is my professional opinion that the proposed Project is inconsistent with the intent of the Act.

Further, City Council's Resolution No. 04-50 states that "...it is the policy of the City Council...that California Environmental Quality Act documents prepared for any project within the Suisun Marsh region that propose mitigation measures other than avoidance will not be acceptable for Council certification."[4] The Project is within the Suisun Marsh region. Yet, the FEIR includes mitigation measures other than avoidance for the Project's significant impacts to birds and other wildlife in the Sulphur Springs Creek riparian corridor. Therefore, the Project is inconsistent with Resolution No. 04-50.

Sincerely,

Scott Cashen, M.S.
Senior Biologist

[3] *Ibid.*

[4] City Council of the City of Benicia Resolution No. 04-50, p. 3, par. 4.

RESOLUTION NO. 04-50

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF BENICIA AFFIRMING SUPPORT FOR AN INTERMODAL TRANSPORTATION STATION AND DIRECTING COMPLETION OF ADDITIONAL TRANSPORTATION AND PLANNING STUDIES AND THE PREPARATION OF THE CAPITAL IMPROVEMENT PLAN BENEFITING THE COMMUNITY

WHEREAS, the Benicia General Plan Goal 2.17 sets City policy to provide an efficient, reliable, and convenient transit system, and includes policies and programs to improve inter-modal coordination of transit services and, coordination of transit services and trip reduction efforts with other agencies, provision of intercity bus service to Vallejo and Fairfield, coordination of transit planning with the Contra Costa Transportation Authority and Solano county, and coordination of future mass transit planning with all other regional efforts; and

WHEREAS, General Plan Goal 2.18 encourages the provision of convenient rail service to Benicia and includes programs to consider mixed use, commercial and industrial uses that complement the transportation station, and to plan for convenient auto and transit access to and auto parking at the transportation station to encourage its use; and

WHEREAS, the City has received funding from STA to assess Benicia's transportation needs over the next ten years and has interest in pursuing Transportation for Livable Cities funding to assess opportunities for mixed use land use planning supportive of an Intermodal Transportation Station; and

WHEREAS, the voters of Benicia on November 4, 2003 resoundingly supported Measure K, an initiative to prohibit uses requiring urban facilities or services beyond the Urban Growth Boundary Line, to protect Sky Valley as agricultural and open space, and to prevent urban sprawl and maintain the open space that separates the communities of Benicia, Vallejo, and Fairfield; and

WHEREAS, a future intermodal transportation station to be successful should be planned fully within the established Urban Growth Boundary and should consist of mixed uses of commercial and compact urban development, and needs to be walkable, have an efficient location with development that balance the need for adequate density to support convenient transit service within the scale of the adjacent community; and

WHEREAS, an intermodal transportation station should have a direct benefit to the residents of Benicia as set forth in the General Plan goals, policies and programs. No City funds should be spent or obligated for regional transportation capital projects without such demonstrated benefit; and

WHEREAS, the General Plan states that the marshlands of Suisun Bay provide habitat of particular importance to wildlife including special-status species such as, but not limited to, the Suisun song sparrow, salt marsh yellowthroat, Suisun shrew, California clapper rail, and for many of these species, the upper limits of the marshland and the remaining adjacent upland habitat are essential retreats during extreme high tides, and the General Plan therefore calls for the protection of adequate buffers to ensure the preservation of sufficient retreat habitat essential to maintaining the value of the marshlands; and

WHEREAS, because of the habitat, ecological and environmental values associated with the Suisun Marsh wetlands, including but not limited to, water quality, significant direct and indirect environmental impacts should be minimized; and

WHEREAS, Benicia General Plan Goal 2.19 promotes a regional (San Francisco, Oakland, Alameda) and local (Martinez, Port Costa, and Crockett) ferry service; and

WHEREAS, a City-sponsored survey of residents in 2001 determined what issues were of greatest concern to residents, and more than 86 percent of those questioned said ferry service was key to them; and

WHEREAS, the City is at various stages of considering other major capital improvement projects such as a new police station, upgrades to the water distribution and storm drain systems, and a community center; and

WHEREAS, biennial preparation of a multi-year capital improvement plan in coordination with adoption of the City's two-year budget will help ensure efficient expenditure of pubic funds relating to the subjects addressed in the general plan pursuant to Government Code sections 65400 and 66000 *et. seq*.

NOW, THEREFORE, BE IT RESOLVED THAT the City Council of the City of Benicia hereby resolves that:

1. The City Council finds and declares that it is in the best interest of the City and its residents to support an intermodal transportation station based on comprehensive planning in coordination with staff preparation for adoption by the City Council the Benicia Capital Improvement Plan consistent with the General Plan and its overarching goal of sustainable development; and

2. The City Council further finds and declares that broad-based, public participation is necessary in the Intermodal Transportation Station siting and planning and the formulation of the Capital Improvement Plan; and

3. The Capital Improvement Plan shall be prepared in conformance with the provisions of Public Resources Code section 21000 *et. seq.* including but not limited to the following State policies:

(a) Develop and maintain a high-quality environment now and in the future, and the all action necessary to protect, rehabilitate, and enhance the environmental quality of the state.

(b) Take all action necessary to provide the people of this state with clean air and water, enjoyment of aesthetic, natural, scenic, and historic environmental qualities, and freedom from excessive noise.

(c) Prevent the elimination of fish or wildlife species due to man's [sic] activities, insure that fish and wildlife populations do not drop below self-perpetuating levels, and preserve for future generations representations of all plant and animal communities and examples of the major periods of California history.

(d) Ensure that the long-term protection of the environment, consistent with the provision of a decent home and suitable living environment for every California, shall be the guiding criterion in public decisions.

(e) Create and maintain conditions under which man [sic] and nature can exist in productive harmony to fulfill the social and economic requirements of present and future generations.

(f) Require governmental agencies at al levels to develop standards and procedures necessary to protect environmental quality.

(g) Require governmental agencies at all levels to consider qualitative factors as well as economic and technical factors and long-term benefits and costs, in addition to short-term benefits and costs and to consider alternatives to proposed actions affecting the environment,

prior to the expenditure by the City of Benicia of federal, state, regional, local or City funds for new studies, environmental assessment or construction of the intermodal transportation project at the currently proposed site except for the studies referenced in the City Manager's report may be completed. The Short-Range Transportation Plan shall be completed and reimbursement for eligible project related expenses shall be received before the consultant for the EIR/EIS is directed to complete the final EIR. Such funds may be spend prior to the completion of the Capital Improvement Plan to analyze alternative sites if necessary; and

4. The City Council declares it is the policy of the City Council of the City of Benicia that avoidance shall henceforth be the only acceptable mitigation measure for significant direct and indirect environmental impacts that may result from any project within the Suisun Marsh Management Zone, and that California Environmental Quality Act documents prepared for any project within the Suisun Marsh region that propose mitigation measures other than avoidance will not be acceptable for Council certification.

*****

On motion of Vice Mayor **Patterson**, seconded by Council Member **Smith**, the above Resolution is introduced and passed by the City Council of the City of Benicia at a regular meeting of the Council held on the 6th day of April 2004 and adopted by the following vote:

Ayes: **Council Members Campbell, Patterson and Smith**

Noes: **Council Member Whitney and Mayor Messina**

Absent: **None**

Steve Messina, Mayor

Attest:

Lisa Wolfe, City Clerk

EXHIBIT 1

CRUDE-BY-RAIL FACILITIES MAP

Western Canada Existing Facilities

Altex
Fort McMurray, AB
Service: Unit Train
Contact: Kyle Van Koughnett
Phone: 403-817-2082
kyle.vankoughnett@altex-energy.com

Altex
Lashburn, SK
Service: Unit Train
Contact: Kyle Van Koughnett
Phone: 403-817-2082
kyle.vankoughnett@altex-energy.com

Canexus
Bruderheim, AB
Service: Unit Train
Contact: Orson Ross
Phone: 403-571-7814
orson.ross@canexus.ca

Crescent Point
Stoughton, SK
Service: Unit Train
Contact: Ryan Manitowich
Phone: 403-693-6075
rmanitowich@crescentpointenergy.com

Gibson Energy & USD
Hardisty, AB
Service: Unit Train
Contact: Craig Wilford
Phone: 403-206-4172
craig.wilford@gibsons.com

Keyera
Cheechum, AB
Service: Unit Train
Contact: Reception
Phone: 403-205-8300

Pembina
Scotford, AB
Service: Unit Train
Contact: Lisa Albertson
Phone: 403-231-7549
lalbertson@pembina.com

Torq Transloading
Unity, SK
Service: Unit Train
Contact: Steve Smith
Phone: 403-561-4667
ssmith@torqtransloading.com

Tundra & Enbridge
Cromer, MB
Service: Unit Train
Contact: Leslie Gray
leslie.gray@tundraoilandgas.com

Western Canada In Development Facilities

Altex
Reno, AB
Service: Unit Train
Contact: Kyle Van Koughnett
Phone: 403-817-2082
kyle.vankoughnett@altex-energy.com

Crescent Point
Dollard, SK
Service: Unit Train
Contact: Ryan Manitowich
Phone: 403-693-6075
rmanitowich@crescentpointenergy.com

Gibson Energy
Edmonton, AB
Service: Unit Train
Contact: Craig Wilford
Phone: 403-206-4172
craig.wilford@gibsons.com

Keyera
Edmonton, AB
Service: Unit Train
Contact: Reception
Phone: 403-205-8300

Kinder Morgan & Imperial
Edmonton, AB
Service: Unit and Manifest Train
Contact: Chris Ilife
Phone: 403-514-6479
chris_Iliffe@kindermorgan.com

Predator
High Prairie, AB
Service: Unit Train
Contact: Jarvis Williams
Phone: 403-719-0499
jarvis.williams@predatoroil.com

Torq Transloading
Kerrobert, SK
Service: Unit Train
Contact: Steve Smith
Phone: 403-561-4667
ssmith@torqtransloading.com

Williston Basin/Bakken Existing Facilities

Bakken Oil Express
Eland, ND
Service: Unit Train
Contact: Mark Freed
Phone: 720-458-1261
mfreed@boemidstream.com

Basin Transload
Republic, ND
Service: Unit and Manifest Train
Contact: Blaine Mosby
Phone: 406-670-0923
bmosby@basintransload.com

Crestwood
Epping, ND
Service: Unit Train
Contact: Brian Freed
Phone: 214-621-9021
bfreed@inergyservices.com

Enbridge
Berthold, ND
Service: Unit Train
Contact: Bryan Boaz
Phone: 832-214-9013
bryan.boaz@enbridge.com

Enserco
Gascoyne, ND
Service: Unit Train
Contact: Chris Duke
Phone: 303-566-3418
chris.duke@enserco.com

EOG
Stanley, ND
Service: Unit Train
Contact: Tom Garrison
Phone: 817-347-2726
tom_garrison@eogresources.com

Great Northern Midstream
Fryburg, ND
Service: Unit Train
Contact: Steve Griesser
Phone: 713-800-7994
sgreisser@bakkenlink.com

Hess
Tioga, ND
Service: Unit Train
Contact: Wynne Harvey
Phone: 713-609-4974
wharvey@hess.com

High Sierra
Dickinson, ND
Service: Manifest Train
Contact: Ken Klein
Phone: 720-384-6459
kklein@highsierraenergy.com

Musket
Dore, ND
Service: Unit Train
Contact: Doug Lumry
Phone: 405-302-6785
doug.lumry@musketcorp.com

North Dakota Port Services
Minot, ND
Service: Manifest Train
Contact: Greg Johnson
Phone: 701-852-7678
gjohnson@ndportservices.com

Northstar Transload
E. Fairview, ND
Service: Unit Train
Contact: Mark Hetherington
Phone: 832-663-5847
mhetherington@nstenergy.com

Plains
Manitou, ND
Service: Unit Train
Contact: Alvin Anderson
Phone: 713-993-5726
azanderson@paalp.com

Red River Supply
Williston, ND
Service: Manifest Train
Contact: Mike Crocker
Phone: 701-770-6334
mikec@redriversupply.us

Source Energy Solutions
Berthold, ND
Service: Manifest Train
Contact: Joe Jackson
Phone: 214-299-9118
jjackson@sandsourceservices.com

Savage Services
Trenton, ND
Service: Unit and Manifest Train
Contact: Phillip Hoskins
Phone: 801-944-6546
philliphoskins@savageservices.com

Williston Basin/Bakken In Development Facilities

Ceres
Northgate, Saskatchewan, Canada
Service: Unit Train
Contact: Christian Varela
Phone: 701-667-2201
christian.varela@bnsf.com

Phillips 66
Palermo, ND
Service: Unit
Contact: Erin Alves
Phone: 817-593-6953
erin.alves@bnsf.com

Denver/Niobrara/ Powder River Basin Existing Facilities

Casper Crude to Rail
Casper, WY
Service: Unit Train
Contact: Steve Magness
Phone: 405-535-6077
smagness@cogentenergysolutions.com

Casper Logistics Hub
Bishop, WY
Service: Manifest Train
Contact: Ed Kelsey
Phone: 307-857-2401
ekelsey@wyoming.com

Cheyenne Rail Hub
Speer, WY
Service: Unit Train
Contact: Steve Magness
Phone: 405-535-6077
smagness@cogentenergysolutions.com

Eighty-Eight Oil
Ft. Laramie, WY
Service: Unit Train
Contact: Elliot Apland
Phone: 303-357-2370
elliot.apland@truecos.com

Genesis Energy
Bill, WY
Service: Unit Train
Contact: Dwayne Morley
Phone: 713-860-2536
dwayne.morley@genlp.com

Meritage Midstream
Wright, WY
Service: Unit Train
Contact: Trevin Hogg
Phone: 303-854-9563
thogg@meritagemidstream.com

Musket
Windsor, CO
Service: Unit & Manifest Train
Contact: Doug Lumry
Phone: 405-302-6785
doug.lumry@musketcorp.com

Plains
Tampa, CO
Service: Unit Train
Contact: Alvin Anderson
Phone: 713-993-5726
azanderson@paalp.com

Powder River Basin Industrial
Douglas, WY
Service: Unit Train
Contact: Chris Duke
Phone: 303-566-3418
chris.duke@enserco.com

Tiger Transfer
Upton, WY
Service: Unit Train
Contact: Tom Barritt
Phone: 307-468-2600
tombarritt@rtconnect.net

Permian Basin Existing Facilities

Ironhorse
Artesia, NM
Service: Unit and Manifest Train
Contact: Khory Ramage
Phone: 575-308-1906
khoryr@ironhorsepermianbasin.com

Mercuria
Brownfield, TX
Service: Unit Train
Contact: Rodney Hilt
Phone: 720-214-6212
rhilt@mercuria.com

Murex
Carlsbad, NM
Service: Unit Train
Contact: Phil Dalton
Phone: 281-973-9232
pdalton@murexltd.com

Permian Basin In Development Facilities

Rangeland
Loving, NM
Service: Unit Train
Contact: Pat McGannon
Phone: 281-566-3008
pat@rgldenergy.com

Thoreau Industrial Park
Thoreau, NM
Service: Unit Train
Contact: John Sawicki
Phone: 817-867-6222
john.sawicki@bnsf.com

Anadarko Basin/ Granite Wash, Woodford, Mississippian Lime Existing Facilities

Enbridge
Kings Mill, TX
Service: Manifest Train
Contact: Omar Leon
Phone: 832-214-1669
omar.leon@enbridge.com

Mercuria
Borger, TX
Service: Manifest Train
Contact: Lance Inwood
Phone: 316-253-1469
linwood@mercuria.com

Watco
Midwest City, OK
Service: Manifest Train
Contact: John Edwards
Phone: 623-764-5270
jedwards@watcocompanies.com

Watco
Stroud, OK
Service: Unit Train
Contact: John Edwards
Phone: 623-764-5270
jedwards@watcocompanies.com

WB Johnston
Enid, OK
Service: Manifest Train
Contact: Melissa Meibergen
Phone: 580-402-1939
melissa@wbjohnstongrain.com

WB Johnston
Shattuck, OK
Service: Manifest Train
Contact: Melissa Meibergen
Phone: 580-402-1939
melissa@wbjohnstongrain.com

Eagle Ford Existing Facilities

Murex
Hondo, TX
Service: Unit and Manifest Train
Contact: Phil Dalton
Phone: 281-973-9232
pdalton@murexltd.com

Mid Continent Existing Facilities

EOG
Stroud, OK
Service: Unit Train
Contact: Tom Garrison
Phone: 817-347-2726
tom_garrison@eogresources.com

Gateway Terminals
Sauget, IL
Service: Unit Train
Contact: Marshall Bockman
Phone: 618-215-7335
mbockman@gatewayterminalsllc.com

Hoffman Transportation
Lorenzo, IL
Service: Manifest Train
Contact: Veronica Shields
Phone: 708-924-6730
veronica.shields@bnsf.com

Marquis
Hayti, MO
Service: Unit Train
Contact: Alex Marquis
Phone: 815-925-7300
alexmarquis@marquisenergy.com

Mid Continent In Development Facilities

Omega
Hartford, IL
Service: Unit Train
Contact: John Sawicki
Phone: 817-867-6222
john.sawicki@bnsf.com

Sovereign Development
Ardmore, OK
Service: Unit Train
Contact: John Sawicki
Phone: 817-867-6222
john.sawicki@bnsf.com

West Coast Existing Facilities

Delta Trading LP
Bakersfield, CA
Service: Manifest Train
Contact: Rob McElroy
Phone: 661-834-5560
rmcelroy@deltatradinglp.com

Kern Oil
Bakersfield, CA
Service: Manifest Train
Contact: Scott Mitchell
Phone: 661-282-2631
smitchell@kernoil.com

Kinder Morgan
Richmond, CA
Service: Unit Train
Contact: Matt Tobin
Phone: 713-369-8480
matthew_tobin@kindermorgan.com

Plains
Levee, CA
Service: Unit Train
Contact: Alvin Anderson
Phone: 713-993-5726
azanderson@paalp.com

SAV Patriot Rail
Sacramento, CA
Service: Manifest Train
Contact: Jim Koscielniak
Phone: 720-556-7322
james.koscielniak@patriotrail.com

West Coast In Development Facilities

Alon
Mopeco, CA
Service: Unit Train
Contact: Erin Alves
Phone: 817-593-6953
erin.alves@bnsf.com

Targa
Stockton, CA
Service: Unit Train
Contact: Rebekah Thomas
Phone: 817-867-6259
rebekah.thomas@bnsf.com

WesPac Energy
Pittsburg, CA
Service: Unit Train
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Pacific Northwest Existing Facilities

BP
Arco, WA
Service: Unit Train
Contact: Dennis Onken
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dennis.onken@bp.com

Global Terminal
Port Westward, OR
Service: Unit Train
Contact: Jack Rudnicki
Phone: 610-649-1445
jack.rudnicki@bnsf.com

Targa
Tacoma, WA
Service: Unit and Manifest Train
Contact: Troy Goodman
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tgoodman@targaresources.com

Tesoro
Fidalgo, WA
Service: Unit and Manifest Train
Contact: Bob Gilbert
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robert.l.gilbert@tsocorp.com

US Oil
Tacoma, WA
Service: Unit and Manifest Train
Contact: Cameron Proudfoot
Phone: 253-680-3243
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Pacific Northwest In Development Facilities

Phillips 66
Ferndale, WA
Service: Unit Train
Contact: Erin Alves
Phone: 817-593-6953
erin.alves@bnsf.com

Nustar
Port of Vancouver, WA
Service: Unit Train
Contact: Kevin Ghassemi
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Savage Services
Port of Vancouver, WA
Service: Unit Train
Contact: Phillip Hoskins
Phone: 801-944-6546
philliphoskins@savageservices.com

Shell
Anacortes, WA
Service: Unit Train
Contact: Tracy Taylor
Phone: 281-203-5908
tracy.taylor@bnsf.com

USD
Port of Grays Harbor, WA
Service: Unit Train
Contact: Kevin Laborne
Phone: 562-799-5572
klaborne@us-dev.com

Gulf Coast Existing Facilities

Canal Refining
Lacassine, LA
Service: Manifest Train
Contact: Bob McKee
Phone: 337-824-2500
robert.mckee@canalrefining.com

Citgo
Lake Charles, LA
Service: Manifest Train
Contact: Kathleen Seleny
Phone: 281-203-5906
kathleen.seleny@bnsf.com

GT Omniport
Port Arthur, TX
Service: Unit Train
Contact: Beau Maida
Phone: 409-767-4166
b.maida@gtomniport.com

Genesis Energy
Walnut Hill, FL
Service: Unit Train
Contact: Ryan Sims
Phone: 713-860-2521
ryan.sims@genlp.com

Jefferson Refinery
Port of Beaumont, TX
Service: Unit Train
Contact: Max Gonzales
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mgonzales@jeffcorefinery.com

Mercuria
Greensport, TX
Service: Unit Train
Contact: Tim Holan
Phone: 832-209-2435
tholan@mercuria.com

Murex
New Orleans, LA
Service: Unit Train
Contact: Phil Dalton
Phone: 281-973-9232
pdalton@murexltd.com

Sunoco Logistics
Nederland, TX
Service: Unit Train
Contact: Jack Rudnicki
Phone: 610-649-1445
jack.rudnicki@bnsf.com

Texas International Terminals
Galveston, TX
Service: Unit Train
Contact: Bill Bevers
Phone: 409-762-5400
bbevers@titerminals.com

Valero
W Port Arthur, TX
Service: Unit Train
Contact: Kevin Ghassemi
Phone: 817-593-6964
kevin.ghassemi@bnsf.com

Gulf Coast In Development Facilities

Genesis Energy
Raceland, LA
Service: Unit Train
Contact: Ryan Sims
Phone: 713-860-2521
ryan.sims@genlp.com

Texas Deepwater
Houston, TX
Service: Unit Train
Contact: Ernie Cockrell
Phone: 713-209-7440
edcockrell@cockrell.com

East Coast Existing Facilities

Buckeye
Perth Amboy, NJ
Service: Unit Train
Contact: Jack Rudnicki
Phone: 610-649-1445
jack.rudnicki@bnsf.com

Buckeye Partners
Albany, NY
Service: Unit Train
Contact: Jack Rudnicki
Phone: 610-649-1445
jack.rudnicki@bnsf.com

Eddystone Rail
Eddystone, PA
Service: Unit Train
Contact: Jack Rudnicki
Phone: 610-649-1445
jack.rudnicki@bnsf.com

Global Companies
Albany, NY
Service: Unit Train
Contact: Jack Rudnicki
Phone: 610-649-1445
jack.rudnicki@bnsf.com

Irving Oil
St. John, NB (CAN)
Service: Unit Train
Contact: Ali Sanjari
Phone: 403-770-5790
ali.sanjari@irvingoil.com

PBF Energy
Delaware City, DE
Service: Unit and Manifest Train
Contact: Jack Rudnicki
Phone: 610-649-1445
jack.rudnicki@bnsf.com

PES
Philadelphia, PA
Service: Unit Train
Contact: Jack Rudnicki
Phone: 610-649-1445
jack.rudnicki@bnsf.com

Phillips 66
Linden, NJ
Service: Unit Train
Contact: Jack Rudnicki
Phone: 610-649-1445
jack.rudnicki@bnsf.com

Plains
Amoco, VA
Service: Unit Train
Contact: Alvin Anderson
Phone: 713-993-5726
azanderson@paalp.com

Suncor
Montreal, PQ
Service: Unit Train
Contact: Steve Nelson
Phone: 403-296-3047
snelson@suncor.com

Sunoco Logistics
Westville, NJ
Service: Unit Train
Contact: Jack Rudnicki
Phone: 610-649-1445
jack.rudnicki@bnsf.com

Valero
St Romauld, PQ
Service: Unit Train
Contact: Kevin Ghassemi
Phone: 817-593-6964
kevin.ghassemi@bnsf.com

Solano County Emergency Operations Plan

Flood and Tsunami Annex

March 2012

Solano County
Office of Emergency Services
530 Clay Street
Fairfield, CA 94533
707.784.1600

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Quick Guide 1 – EOC Flood/Tsunami Response Checklist

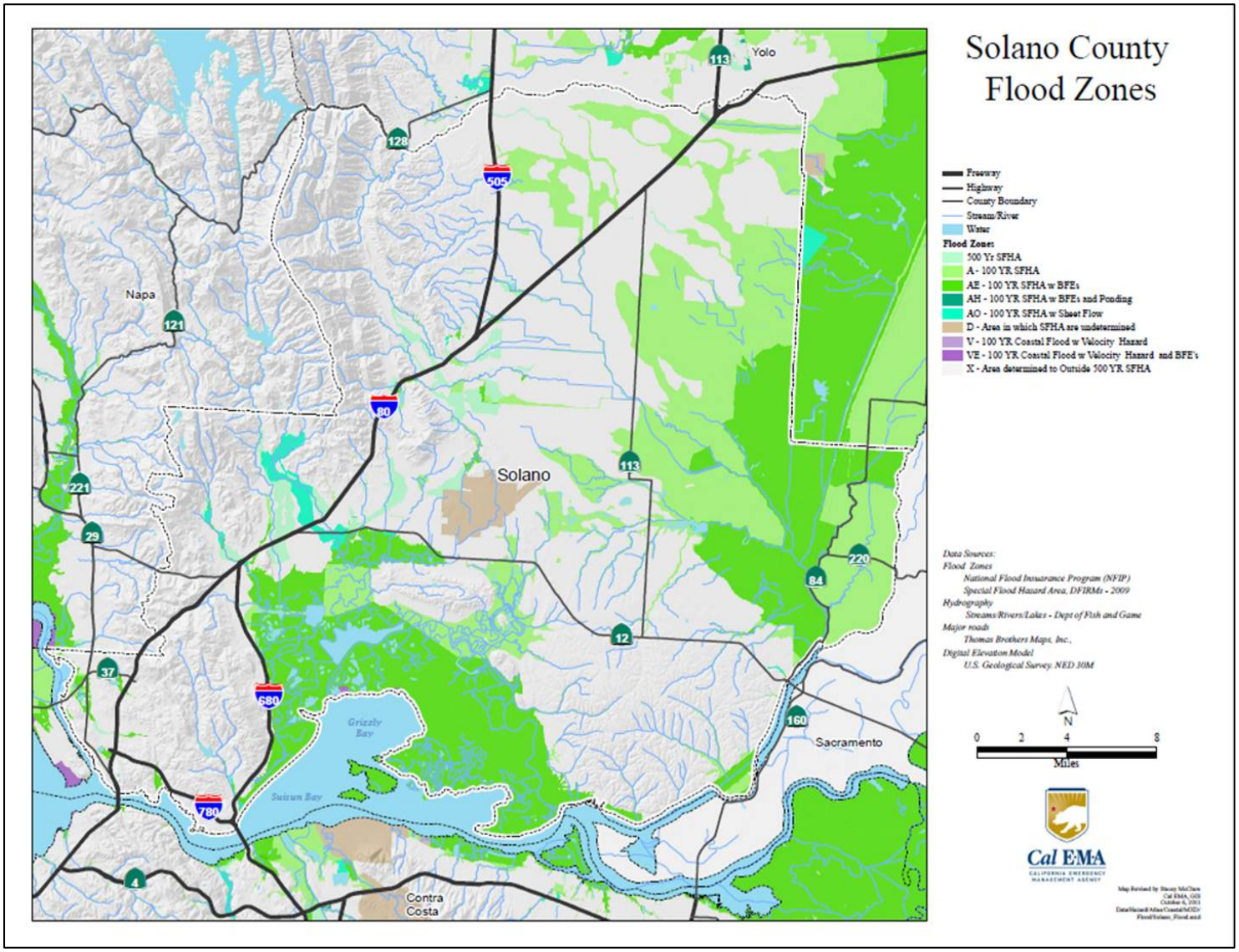
Flood/Tsunami Immediate Actions Checklist
☐ Activate the Emergency Operations Center (EOC) at Level One (Minimum), including the following positions and sections: • Office of Emergency Services (OES) Manager • Emergency Operations Center (EOC) Liaison • Public Information Officer (PIO) • Section Chiefs (Operations, Planning, Logistics, Finance (as needed)) • Fire and Law Mutual Aid Coordinators (as needed) • State and Federal Liaisons (as needed)
☐ Establish situational awareness and ensure field units communicate frequent updates to the EOC.
☐ Provide public warning or notification, including the appropriate protective actions.
☐ Manage media and crisis communications in coordination with State and Federal PIOs.
☐ Provide information to County Departments as to the threat, potential severity and areas affected required.
☐ Prepare to receive or render mutual aid and utilize all established Memorandums of Understanding (MOUs)/Mutual Aid Agreements (MAAs).
☐ Advise Departments to report action being planned or taken, and anticipated deficiencies in critical emergency resources.
☐ Mobilize, allocate, and position personnel and materials.
☐ Restore or activate essential facilities and systems.

Flood/Tsunami Immediate Actions Checklist

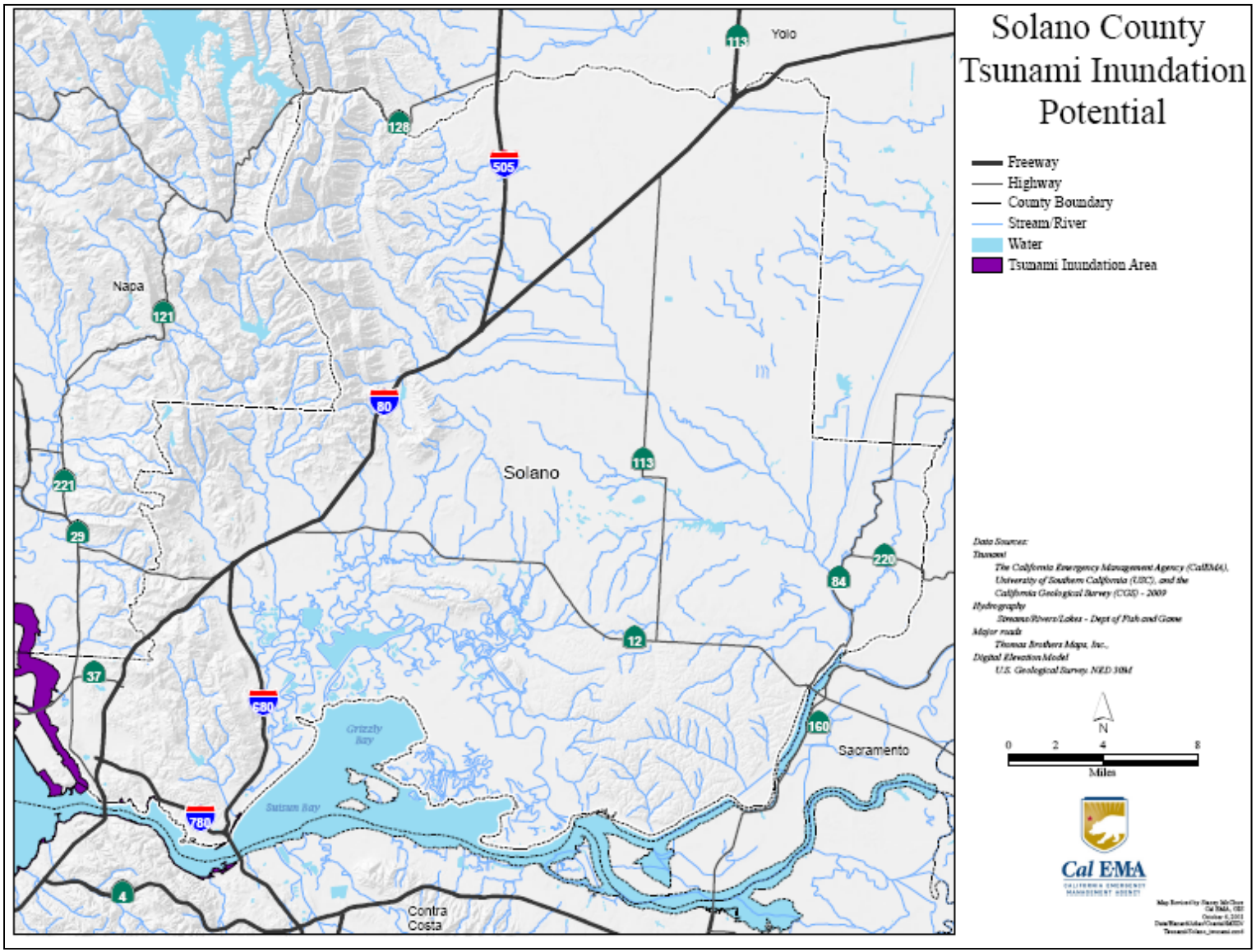
- ☐ Document flood damage to the following as required by the Natural Disaster Assistance Act (NDAA):
  - ☐ Public buildings
  - ☐ Levees
  - ☐ Flood control works
  - ☐ Irrigation works
  - ☐ County roads
  - ☐ City streets
  - ☐ Bridges
  - ☐ Other public works

- ☐ For Federal Emergency Management Agency (FEMA) programs, document damages sustained to the following:
  - ☐ Roads
  - ☐ Water control facilities
  - ☐ Public buildings & equipment
  - ☐ Certain private non-profit facilities
  - ☐ Public utilities
  - ☐ Facilities under construction
  - ☐ Recreational and park facilities
  - ☐ Educational institutions

Quick Reference 1 - Flood Hazards Map



Quick Reference 2 – Tsunami Hazards Map



1.0 Introduction

1.1 Purpose

This annex is intended to provide flood hazard specific information for the planning and response needs generated by the flood and tsunami hazards in Solano County, including the regulatory response details that apply to flooding. It is designed as a guide for a coordinated community-wide process to facilitate mitigation, preparedness, response and recovery to flooding and tsunamis for County departments and agencies in cooperation with cities, businesses, non-governmental organizations and citizens.

1.2 Scope

Flood hazard emergency planning involves preparing for realistic flood hazards and is based upon an operational picture that includes historic information, relevant hydrologic considerations, planned engineering events, and resource availability. This annex has been developed to address the needs of unincorporated Solano County regarding the issues of flooding and coordination linkages with cities in the Solano County Operational Area.

According to the California Emergency Management Agency (Cal EMA), there is minimal tsunami hazard in Solano County. Any tsunami preparedness and response efforts can utilize preparedness and response efforts for flood hazards, including public education programs, warning, evacuation and other measures. According to information developed by the Association of Bay Area Governments (ABAG) developed in 2010, there are 10 Health Care facilities, 22 Schools, 53 Critical Facilities and 87 Bridges and Interchanges in either the 500-yr Flood Plain or Other Concern (Zone X500) or the 100-yr Flood Plain (Zone V or Zone A). There are no Health Care Facilities, Schools, Critical Facilities or Bridges and Interchanges in the Tsunami Hazard Zone in the County.

This annex provides the following information:

- Quick References to Solano County Flood and Tsunami Hazard Maps
- Specific Solano County agency responsibilities
- Operational concepts for warning and emergency response
- General information about flood control and flood fighting in Solano County.

1.3 Policy

It is the policy of the County to develop plans and procedures to address flood hazards that affect the citizens in the unincorporated areas of Solano County, as well as Solano County facilities and infrastructure. It is further the policy of the County to cooperate with the cities in the Solano County Operational Area to reduce the threat of flooding and flood damages to public and private property, and to prepare for flood response and recovery operations if needed.

2.0 Authorities and References

Federal

- Public Law 93-288 (The Stafford Act)
- Public Law 84-99 (U.S. Army Corps of Engineers-flood fighting)
- Public Law 108-361 (Bureau of Reclamation)
- Public Law 107-310 (National Dam Safety and Security Act of 2002)
- National Incident Management System (NIMS)

California

- California Emergency Services Act, California Gov. Code, Sections 8550-8668
- State of California Emergency Plan
- Standardized Emergency Management System (SEMS)
- California Natural Disaster Assistance Act. Section 128, California Water Code (California Department of Water Resources - flood fighting)
- California Dam Safety Act-Division 3 of the Water Code
- State, Title 19, Public Safety, Division 2 (Office of Emergency Services), Chapter 2 (Emergencies and Major Disaster), Subchapter 4 (Dam Inundation Mapping Procedures) of the California Code of Regulations
- California State Building Code-California Code of Regulations, Title 24
- California Water Code, Section 8370
- California Public Resources Code, Section 21060.3

Solano County

- Solano County Emergency Operations Plan (EOP)
- Solano County Hazard Mitigation Plan 2010 Update
- Association of Bay Area Governments (ABAG), Solano County Water Agency Annex & Solano Irrigation District Annex
- San Francisco Bay Area, Regional Emergency Coordination Plan
- Solano County Land Use Planning Regulations
- RD MOAs for flood and levee emergency response
- Solano County Water Agency (SCWA) Flood Hazard Information
- SCWA Integrated Regional Water Management Plan (IRWMP)

3.0 Assumptions and Considerations

3.1 Planning Assumptions

Certain assumptions can be made for the County flooding risk and hazards. These assumptions lay the foundation for this Annex and the *Solano County Emergency Operations Plan* associated with conducting emergency management operations in preparation for, response to and recovery from major flood emergencies:

- Flood emergencies or disasters are most likely to occur in the fall, winter and spring due to heavy rains, melting snow and spring run-off.
- Major flood emergencies or disasters may pose serious threats to public health, property, the environment, and the local economy.
- Flood warning is provided through a variety of means, such as National Weather Service (NWS) announcements, National Oceanic & Atmospheric Administration (NOAA) radio, standard radio and television Emergency Alert System (EAS) bulletins. These actions help inform citizens about flood threats or actual flooding conditions.
- Flood warning is provided by Solano County Water Agency.
- Major flood emergencies or disasters may require a multi-jurisdictional response with cities in the Solano County Operational Area and neighboring counties.
- In flood emergencies or disasters, the Standardized Emergency Management System (SEMS) and National Incident Management System (NIMS) will be implemented by responding agencies, and expanded as necessary.
- Solano County is primarily responsible for emergency actions in the County unincorporated area and will commit all available resources to save lives, minimize injury to persons and minimize property damage.
- Major flood emergencies or disasters may overburden local resources and necessitate mutual aid from neighboring jurisdictions.
- Major flood emergencies or disasters may generate widespread public and media interest. Working relations with the media should be maintained to facilitate emergency public information and warning.
- A major flood emergency or disaster may require extended commitments of the County personnel and resources; subsequently, Continuity of Operations of County services must be maintained.
- Solano County supports the National Flood Insurance Program (NFIP) as directed by the Federal Emergency Management Agency (FEMA)

3.2 Flood Planning Considerations

This Annex addresses the following flood planning considerations:

- Loss of life, injury and property damage from flooding can be reduced by timely warning and appropriate reaction by emergency response agencies.
- Solano County may request a State of Emergency in order to apply for funds under California's Natural Disaster Assistance Act (NDAA) program.
- Large-scale flooding may qualify for declaration of a Local Emergency and a State of Emergency proclamation. Such flooding may also qualify for a Presidential Federal Emergency declaration.

4.0 Roles and Responsibilities

4.1 Overview

Flooding presents a threat to not only people and property in designated floodplains, but also to the overall economy and quality of life in the County. Listed below are County departments and entities that have a role during a flood response.

4.2 Solano County

4.2.1 Resource Management Department, Public Works Division

The Resource Management Department is responsible for flood plain management activities in Solano County. Their Public Works Division provides flood-fighting assistance, such as sandbagging, and river, creek, or stream bed debris clearance.

4.2.2 Solano County Water Agency

The Solano County Water Agency (SCWA) is a wholesale water agency serving all of Solano County. The agency receives its water from the Solano Project (Lake Berryessa) and the Solano Water Project (SWP). Member agencies of SCWA include the cities of Benicia, Dixon, Fairfield, Rio Vista, Suisun City, Vacaville, and Vallejo. Solano Irrigation District (SID), Maine Prairie Water District, and Reclamation District No. 2068 are also members. The boundary of SCWA does not always follow watershed boundaries. For example, the watershed of Lake Berryessa is in Napa County, with a small section in Solano, and the dam in Yolo, Solano and Napa Counties.

For flood management purposes, there are areas in Napa County that drain into Solano County, such as Putah Creek.[1] The agency has a flood control function and through its website provides information concerning water supply and flood control in Solano County.

SCWA has a flood warning system in place for the creeks and tributaries. It also has a dam inundation warning coordinated with the Federal Bureau of Reclamation (Reclamation). SCWA joins in with a host of Federal Agencies (e.g., National Weather Service and National Oceanic and Atmospheric Administration), State and Local (e.g., Solano OES) in providing flood and tsunami warnings.

4.2.3 Local Reclamation Districts

Local Reclamation Districts (RD), such as RD No. 2068 have the primary day-to-day responsibility for the integrity, improvement, operations, and maintenance of their flood control infrastructure, such as levees and water supply facilities in the County. During flood emergencies, a RD is generally the organizer of levee patrols in high-hazard situations and may have material and some equipment available for conducting flood fights and established communications protocols for informing the Solano County OES.

[1] California Delta Levee Emergency Management Phase One Report

4.2.3 Department of General Services

The Department of General Services (DGS) is responsible for managing County buildings and overseeing utility usage in the County. During a major flood response and recovery, DGS will be needed to bring vital utilities such as sewer, water and power back online. A representative from DGS will have a seat in the EOC in the Public Works Unit within the Engineering Branch in the Operations Section. County utility representative will work with the private utility companies to coordinate restoration efforts.

4.2.4 Office of Emergency Services

The County Office of Emergency Services (OES) will take the lead role in flood operations to support the Incident Commander and field operations by managing the EOC.

4.3 Non-Government/Non-Profit/Voluntary Organizations

The County EOC will coordinate the needs for voluntary organizations through the Solano County Voluntary Organizations Active in Disasters (VOAD). A representative from the Solano County VOAD (typically American Red Cross) will have a seat in the County EOC and will be the point of contact to communicate with a large array of voluntary organizations.

American Red Cross. The American Red Cross (ARC) is a volunteer-led, humanitarian organization that provides emergency assistance, disaster relief, and education worldwide. Officially sanctioned by the U.S. Congress under Title 36 of the United States Code, Section 30013, ARC provides disaster relief focused on victims and immediate emergency needs and provides shelter, food, and health and mental health services. As an emergency support agency, ARC does not engage in these first responder activities; however, ARC feeds emergency workers, such as flood fight responders, and handles inquiries from victims outside the disaster area.[2] The ARC, Solano County Chapter will be responsible for the sheltering and feeding of any evacuees or homeless due to flooding. An ARC representative in the EOC will have a seat in the Care and Shelter Unit within the Logistics Section of the EOC to provide a point of contact for shelter operations.

4.4 State and Federal Entities

4.4.1 California Emergency Management Agency

The California Emergency Management Agency's (Cal EMA's) mission is to oversee the State's ability to respond to emergencies that threaten lives, property, and the environment. Government Code § 8587, gives them the authority to coordinate the emergency activities of State agencies and to delegate power for response once local resources are exhausted. CalEMA supports local emergency operations through the respective CalEMA Regions. The County reports to the California Coastal Region. A local emergency declaration must be declared by the Solano Operational Area and its members to request assistance from the State. Once assistance is requested, a Cal EMA

[2] Ibid.

representative will support the County from their position in the Regional EOC (REOC). The REOC in turn will coordinate with the State Operations Center as needed.

4.4.2 California Department of Water Resources – Flood Management

The California Department of Water Resources (DWR) Division of Flood Management's mission is to prevent the loss of life and reduce property damage caused by floods. DWR has been developing detailed topographic data for a very large portion of the Central Valley including portions of the County for floodplain mapping purposes. To coordinate response efforts, DWR has established the *Enhanced Delta Emergency Preparedness and Response Program*. The program incorporates existing assets and develops new capabilities to form a more comprehensive and effective emergency response plan in the Delta. As part of the response program, DWR has initiated the following activities:

- Preparing Emergency Operations Plans and Public Outreach Plans
- Establishing program updates for internal and external partner facilities
- Developing plans and building flood fight material for transfer areas
- Purchasing and pre-deploying flood response materials
- Providing flood fight training and multi-agency disaster exercises.[3]

4.4.3 Federal Emergency Management Agency

The primary purpose of FEMA is to coordinate the response to a disaster that has overwhelmed the resources of local and state authorities. The Governor of California must proclaim a state of emergency and formally request FEMA and federal government assistance to respond to disaster in the Delta from the President. FEMA's Region IX, Operations Section in Oakland, CA works closely with Cal EMA to deliver federal assistance in support of local and state response efforts. Region IX has a Regional Response Coordination Center (RRCC) that serves as the federal government's emergency coordination center for the Delta region. Within the RRCC, the Watch Center provides situational awareness for the entire Region IX area of responsibility. The Watch Center is a 24-Hour, seven-Day-Per-Week function that maintains SA of incidences and provides FEMA Headquarters and Region IX with information on resource coordination to local, state, and federal agencies. The Region IX Watch Center also provides coordination with critical infrastructure providers like PG&E and monitors power grid sustainability and local power outages.[4]

4.4.4 U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers (USACE) flood disaster assistance program supplements and supports State and local interests upon their request for assistance to the federal Government. USACE is authorized to provide flood emergency response assistance relative to:

[3] Ibid.
[4] Ibid.

- Emergency Operations, Flood Fight Assistance (Technical and Direct Assistance)
- Rehabilitation of Damaged Flood Control Projects
- Advance Measures (Technical and Direct Assistance)

When flood conditions exceed, or are predicted to exceed, the response capability of levee maintaining and/or reclamation districts and local and state governments, USACE has the authority under Public Law (P.L.) 84-99 to provide emergency flood response assistance without further specific authorization of Congress. USACE can furnish assistance for flood emergency preparation, flood fighting, and the repair or rehabilitation of flood control works threatened or destroyed by flood. USACE assistance may also include providing flood fight personnel for technical advice and equipment, such as sandbags, plastic sheeting, pumps, or other materials. In the event of imminent threat of catastrophic flooding, USACE may provide equipment to protect against substantial loss of life and property.[5]

4.4.5 U.S. Coast Guard

The Captain of the Port (COTP) for U.S. Coast Guard's (USCG's) Sector San Francisco oversees marine activities in an Area of Responsibility (AOR) that covers most of Northern California. Within this AOR, the COTP is responsible for the maritime safety of its navigable waters, the maintenance of the aids to navigation within them, and the prevention of marine pollution. The latter is part of the USCG's marine environmental protection mission. During incidents that impact these waters, including the entire San Francisco Bay, the Delta region including Solano County and its major navigable tributaries the COTP serves as the Federal On-Scene Coordinator. USCG can provide search and rescue (SAR) capabilities and spill response for oil and hazardous material throughout the Delta region as part of its response efforts.

4.5 Private Sector- Construction/Equipment Companies

Construction and/or large equipment companies may be needed during flood response and recovery efforts. Every effort should be taken to secure Memorandums of Understanding (MOUs) to have pre-arranged agreements with equipment companies to provide resources during a disaster response. Any signed MOUs should be included as references to this annex. A list of some levee repair contractors is found in Appendix B.

[5] Ibid.

4.6 Role and Responsibility Reference Matrix

The table below shows the various flood operations functions and the departments or organizations with a primary role or supporting role.

Roles and Responsibilities Table In support Flood and Tsunami Response Operations														
P= Primary ***S= Secondary*** **Cooperating Agency**	**Prevention**	**Planning and Preparedness**	**Public Information and Outreach**	**Monitoring and Situational Awareness**	**Alerting and Warning**	**Activation of DOCs**	**Flood Plain Management**	**Levee Patrols**	**Flood Fight Operations**	**Evacuations**	**Care and Shelter**	**Critical Infrastructure Protection**	**Recovery**	**After Action Reporting**
County Administrator	S	S					S			S	S		P	S
Office of Emergency Services	P	P	P	P	P	S	S	S	S	S	S	S	S	P
Sheriff's Office	S	S								S			S	S
General Services	S	S								P			S	S
Resource Management	P	P	P				P				S	S	S	S
Public Works Division	S	S							P			S	S	S
American Red Cross	S	S									P		S	S
Solano County Water Agency	P	P	P	P	P							S	S	S
Reclamation Districts	S	S						P	P			P	S	S
Levee Maintaining Agencies	S	S						P	P			P	S	S

5.0 Concept of Operations

5.1 Preparedness

Significant, damaging flood events occur in portions of the County approximately every five to ten years. Warnings are usually given several hours to a few days before such floods. Prevention efforts, such as evacuation and last minute sandbagging then lessens the flood's impact. There are dams in the County which, if breached, may cause flooding in the County. These susceptible dams include the dams at Lake Madigan, Lake Curry, and Lake Frey.

Projected inundation areas and the severity of inundation are shown on maps maintained by the California DWR. Flood Insurance Rate Maps, compiled by and maintained by FEMA. Although insurance cannot reduce the impact of a disaster, it does spread that impact over a larger group of people over a longer period of time. Some insurance programs are private, and some, such as the Federal flood insurance program, are government funded. Insurance programs may have construction standards that must be met before insurance is sold. Flood preparedness is one of the specific hazards in Solano County that is emphasized throughout the calendar year.

5.1.1 Planning

The County Office of Emergency Services (OES) coordinates emergency planning efforts through development and maintenance of the *Solano County Emergency Operations Plan* and supporting annexes, procedures and appendices. OES has identified a Core Planning Team of senior leadership and agency representatives to coordinate planning efforts.

5.1.2 Training and Exercises

The County OES coordinates all hazards training and exercises on an ongoing basis to test and validate emergency policy plans and procedures. At least once a year such training and exercises shall focus on flood hazards and flooding.

5.2 Response

5.2.1 Response Considerations

To make sound flood fight decisions during a flood event, decision makers should have a clear operational picture of flood control infrastructure and the effects of flood fight decisions on a local and regional scale. The operational picture includes:

- Hydraulic features, such as dams, lakes, rivers, sloughs, and deep-water channels
- Flood control infrastructure, such as levees, pump stations, diversion points, and return drains
- Flood history, historic flood elevations, and historic levee breaches
- Points of vulnerability in flood control infrastructure
- Topography and elevation of critical infrastructure
- Threat recognition based upon high-water marks and water velocity

The amount of water flowing through the hydraulic system in the Delta as well as Solano County is determined by environmental conditions, natural events, and manmade

infrastructure. An extensive system of dams, levees, overflow weirs, pumping plants, and flood control bypass channels strategically located on the Sacramento and San Joaquin rivers has been established to protect the Delta region and the County from flooding. These facilities control floodwaters by regulating the amount of water passing through a particular reach of each river. It is import for the local emergency managers to have both an understanding of standard emergency management procedures and in-depth knowledge of the Delta's conveyance system, especially the levee infrastructure. The County maintains or has access to several drainage pump stations, at least one land-based emergency berm, and one levee gravity drain[6]. SCWA has developed a Strategic Plan in the event of a flood emergency in Solano County. The plan is a subset of the IRWMP.

5.2.2 Flooding Notification Strategies for the Public

National Weather Service (NWS). The NWS provides notification releases to media outlets and to public agencies. They use standard terminology for watches and warnings:

- ***Flash Flood Watch*** means it is possible that rain will cause flash flooding in specified areas.
- ***Flash Flood Warning*** means flash flooding is either imminent or is occurring.
- ***Flood Watch*** means long term flooding is possible in specified areas.
- ***Flood Warning*** means long term flooding is either imminent or is occurring.

Solano County Water Agency. The SCWA has a flood warning system in place for Solano County creeks and tributaries, and a dam inundation warning coordinated with the Bureau of Reclamation. Initial information concerning flooding may contain only limited details, requiring close coordination between OES and the SCWA for updated information as it becomes available. The level of response and activation will depend upon the likely severity of the flood. Precautionary activations of a DOC or the EOC may be necessary if detailed information is not available.

The SCWA posts information on their web site www.scwa2.com, and provides a 24-hour a day recorded telephone message [707.455.1115] with current information concerning flood and flood possibilities. They also put out a press release in coordination with the County OES in preparation for, or in the event of a major storm. OES can in turn release directed warning to people in the potential flood risk area using their City Watch (reverse 9-1-1) system.

5.2.3 Tsunami Notification Strategies for the Public

There are four levels of tsunami alerts that are issued by the West Coast/Alaska Tsunami Warning Center:

- ***Tsunami Warning*** means a potential tsunami with significant widespread inundation is imminent or expected.

[6] Ibid.

- ***Tsunami Advisory*** means there is the threat of a potential tsunami which may produce strong currents or waves dangerous to those in or near the water.
- ***Tsunami Watch*** is issued to alert emergency management officials and the public of an event which may later impact the watch area.
- ***Tsunami Information Statement*** is issued to inform emergency management officials and the public that an earthquake has occurred, or that a tsunami warning, watch or advisory has been issued for another section of the ocean.

Tsunami preparedness and response efforts can utilize preparedness and response efforts for flood hazards, including public education programs, warning, evacuation and other measures.

5.3 Dam Safety

Dam owners and operators are responsible for notifying downstream communities at risk. The County is responsible for evacuation warnings in unincorporated areas and cities have the responsibility for evacuation of the public within their boundaries. The owner/operators of dams that impact Solano County are listed in Sections 5.3.1 and 5.3.2.

5.3.1 Solano County Dams

The dams listed in the following table are referenced in the National Inventory of Dams.

Solano County Dams *Hazard Category designations are as follows: H: High, S: Significant and L: Low.*				
Name	**Community**	**River**	**Owner**	**Hazard Category**
Fleming Hill No. 2	Vallejo	Napa River Tributary	City Of Vallejo	**H**
Lake Chabot	Vallejo	Blue Rock Springs Creek	City Of Vallejo	**H**
Lake Herman	Benicia	Sulphur Springs Creek	City Of Benicia	**H**
Lake Frey	Cordelia	Wild Horse Creek	City Of Vallejo	**H**
Lake Madigan	Cordelia	Wild Horse Creek	City Of Vallejo	**H**
Summit Reservoir	Vallejo	Off Stream	City Of Vallejo	**H**
Swanzy Lake	Vallejo	Carquinez Strait Tributary	City Of Vallejo	**H**
Terminal		Green Valley Os	Bureau of Reclamation	**H**
Bascherini	Vacaville	Ulatis Creek Tributary	Solano Irrigation District	S
Detention Pond A		Off Stream	City Of Dixon	S
Giles	Allendale	Sweeney Creek Tributary	Robert & Jean Brown	S
Green Valley Lake	Rockville	Dug Road Gulch	John Newmeyer & Green Val Ranch	S
Lagoon Valley County Park	Vacaville	Laguna Creek Tributary	City Of Vacaville	S

Solano County Dams *Hazard Category designations are as follows: H: High, S: Significant and L: Low.*				
Name	**Community**	**River**	**Owner**	**Hazard Category**
Lynch Canyon	Cordelia	North Fork Lynch Creek	Solano Land Trust	S
Montezuma			Montezuma Wetlands	S
Municipal	Mankas Corner	Suisun Creek	City Of Suisun	S
Pennsylvania Creek	Fairfield	Pennsylvania Creek	City Of Fairfield	S
Pond 2B	Benicia	Suisun Bay Tributary	International Technology Corp	S
Dickson Hill	Fairfield	Off stream	City Of Fairfield	L
Maine Prairie 3		Ulatis Creek	Maine Prairie Water District	L
Putah Diversion	Winters	Putah Creek	Bureau of Reclamation	L
Terminal South Dike		Green Valley Os	Bureau of Reclamation	L

5.3.2 Dams Located Outside Solano County That Have Potential Inundation Impacts

The dams listed in the following table are referenced in the National Inventory of Dams.

Dams Located Outside Solano County That Have Potential Inundation Impacts					
Name	**County**	**Community**	**River**	**Owner**	**Hazard Category**
Folsom	Sacramento	Folsom	American River	Bureau of Reclamation	H
Lake Curry	Napa	Fairfield	Gordon Valley Creek	City Of Vallejo	H
Monticello	Yolo	Sacramento	Putah Creek	Bureau of Reclamation	H
New Melons	Calaveras/ Tuolumne	Knights Ferry	Stanislaus River	Bureau of Reclamation	H
Nimbus	Sacramento	Fair Oaks	American River	Bureau of Reclamation	H
Olson	Napa	Palo Cedro	Ledgewood Creek	Robert Egan	S

5.4 Flood Threat Operations

5.4.1 Phases of Operations

Considering that flood events can usually be predicted and advanced warning can be given, this annex may be implemented in phases as outlined below:

Normal Preparedness

County Departments having emergency responsibilities assigned in this Annex prepare their own operating procedures and checklists for a flood emergency that include coordination strategies with other departments and jurisdictions.

Increased Readiness
When conditions exist which could result in an "emergency," the County OES will evaluate information, decide upon necessary action and initiate appropriate response including but not limited to alerting key personnel, assuring readiness of resources, and preparing to move resources to the threatened area.

Emergency Preparedness
When a potential flood situation is a matter of "when" rather than "if," the County OES will implement the following actions:

1. Provide public warning or notification as is required.
2. Open the County EOC as necessary.
3. Provide information to County Departments as to the threat, potential severity and areas affected.
4. Advise Departments to report action being planned or taken, and anticipated deficiencies in critical emergency resources.
5. Prepare to receive or render mutual aid.
6. Keep Departments are promptly notified of any changes.

Emergency Phase
When flooding occurs, the County emergency organization will be mobilized as required to cope with the specific situation with operations focused on the following priorities:

1. Develop Situational Awareness
2. Activate the EOC
3. Mobilize, allocate, and position personnel and materials
4. Protect, control, and allocate vital resources
5. Restore or activate essential facilities and systems

The California DWR and RD/Levee Maintaining Agency response are important functions that will be coordinated through the County EOC. When local resources are committed to the maximum and additional materials and/or personnel are required to control or alleviate the emergency, a request of mutual aid will be initiated through the EOC.

5.4.2 Flood Damage/Safety Assessment

Flood Damage/Safety Assessment is the basis for determining the need to request state and/or federal operational and financial assistance. Under the Solano Operational Area Emergency Operations Center's Standard Operating Procedures, an Initial Damage Estimate is developed during the emergency response phase to support a request for a Governor's proclamation and for the State to request a presidential declaration.

For the County, the detailed damage/safety assessment will be completed by the Solano County Department of Resource Management, building officials in coordination with the County OES, and other applicable County Departments.

The Engineering Branch/Department of each jurisdiction in the Operational Area will complete a damage assessment. The administrative and operational divisions of special

districts will, in most cases, complete the damage assessment for their respective areas of responsibility.

5.4.3 Documentation

Documentation is the key to recovering eligible emergency response and recovery costs. Damage assessment documentation will be critical in establishing the basis for eligibility of disaster assistance programs. Under the State Natural Disaster Assistance Act (NDAA), documentation is required for any flood damage sustained to the following:

- Public buildings
- Levees
- Flood control works
- Irrigation works
- County roads
- City streets
- Bridges
- Other public works

Under federal disaster assistance programs, documentation must be obtained regarding flood damages sustained to:

- Roads
- Water control facilities
- Public buildings and related equipment
- Public utilities
- Facilities under construction
- Recreational and park facilities
- Educational institutions
- Certain private non-profit facilities

Flood debris removal and flood emergency response costs incurred by the affected entities should also be documented for cost recovery purposes under the federal programs. It will be the responsibility of the County, jurisdictions, and special districts to collect documentation of these damages and submit them to the Recovery Manager for their jurisdiction. Special districts not within a city, should submit documentation to the County Recovery Manager.

The documenting information should include the location and extent of damage, and estimates of costs for: debris removal, emergency work, and repairing or replacing damaged facilities to a non-vulnerable and mitigated condition. The cost of compliance with building codes for new construction, repair, and restoration will also be documented. The cost of improving facilities may be provided under federal mitigation programs.

Documentation is the key to recovering expenditures related to emergency response and recovery operations. For each jurisdiction and special district, documentation must begin at the field response level and continue throughout the operation of their Emergency Operations Center as the disaster unfolds.

5.5 Recovery

Governmental assistance could be required and may be needed for an extended period. Recovery activities would include:

- Removal of debris.
- Clearance of roadways.
- Demolition of unsafe structures.
- Re-establishment of public services and utilities.
- Provision of care and welfare for the affected population including, as required, temporary housing for displaced persons.
- Care of animals and disposal of carcasses.

Each Department will take actions to address identified recovery needs. The Recovery Stage has three major objectives:

- Reinstatement of family autonomy and the provision of essential public services.
- Completion of permanent restoration of public property, along with reinstatement of public services.
- Performance of research to uncover residual hazards, to advance knowledge of disaster phenomena, and to provide information to improve future emergency operations.

These objectives may be overlapping but the needs will be treated in the following priorities:

- Alleviation - Reestablish essential public utility services, sewage, drainage, and drinking water and reestablishing basic services to include roads, utilities, schools, and medical facilities.
- Rehabilitation - Start full restoration of public facilities. Work with the USACE and FEMA as appropriate in damage survey reports and recovery activities.

Appendix A: Acronyms

ABAG	Association of Bay Area Governments
AOR	Area of Responsibility
ARC	American Red Cross
Cal EMA	California Emergency Management Agency
COTP	Captain of the Port
DGS	Department of General Services
DOC	Department Operations Center
DWR	Department of Water Resources (California)
EAS	Emergency Alert System
EOC	Emergency Operations Center
EOP	Emergency Operations Plan
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
IRWMP	Integrated Regional Water Management Plan
MAA	Mutual Aid Agreement
MOU	Memorandum of Understanding
NDAA	Natural Disaster Assistance Act
NFIP	National Flood Insurance Program
NIMS	National Incident Management System
NOAA	National Oceanographic and Atmospheric Administration
NWS	National Weather Service
OES	Office of Emergency Services
PIO	Public Information Office
RD	Reclamation District
REOC	Regional Emergency Operations Center (Coastal Region)
RRCC	Regional Response Coordination Center (FEMA)
SCWA	Solano County Water Agency
SEMS	Standardized Emergency Management System
SID	Solano Irrigation District
SWP	Solano Water Project
USACE	US Army Corps of Engineers
USCG	US Coast Guard
VOAD	Volunteer Organizations Active in Disaster

Appendix B: ABAG 2010 – Critical Facilities in Flood Hazard Zones

Solano County TOTAL FEMA Flood Zones Critical Facilities Exposure, 2010				
	Total Number	Minimal or Undetermined Flood Hazard	500-yr Flood Plain or Other Concern (Zone X500)	100-yr Flood Plain (Zone V or Zone A)
HEALTH CARE FACILITIES:	45	35	9	1
Hospital	6	4	2	0
Long-Term Care Facility	11	10	1	0
Primary Care or Specialty Clinic	17	13	4	0
Home Health Agency or Hospice	11	8	2	1
SCHOOLS:	139	117	19	3
K-12	110	94	13	3
Continuation High School or Other	27	21	6	0
College or University	2	2	0	0
CRITICAL FACILITIES:	328	275	34	19
City-Owned	249	211	27	11
County-Owned	11	5	6	0
Owned by Special Districts	68	59	1	8
BRIDGES AND INTERCHANGES:	342	255	31	56
Locally-Owned	179	115	25	39
State-Owned	163	140	6	17

Sources:

- Association of Bay Area Governments, 2010.
- Health care facilities are based on a list of licensed facilities from the California Office of Statewide Health Planning and Development.
- K-12 schools, colleges, and universities are based on a combination of addresses from Thomas Bros. and the individual facilities.
- Critical facilities were identified by the local jurisdictions. City-owned and county-owned facilities were identified for all cities and counties in the Bay Area. Thirty water, transit, fire and other special districts are included as well, but this should not be considered a complete count of special district facilities.
- It's not always clear whether an agency is part of the city or county government or an independent special district. Agencies with dedicated functions (e.g. PUC) are included in the city-owned or county-owned totals if they are a department of the city or county. Otherwise they are considered a special district.

Appendix C: ABAG 2010 – Critical Facilities in Tsunami Hazard Zones

Solano County TOTAL Tsunami Critical Facilities Exposure, 2010			
	Total Number	Not In Threat Area	Within Threat Area
HEALTH CARE FACILITIES:	45	45	0
Hospital	6	6	0
Long-Term Care Facility	11	11	0
Primary Care or Specialty Clinic	17	17	0
Home Health Agency or Hospice	11	11	0
SCHOOLS:	139	139	0
K-12	110	110	0
Continuation High School or Other	27	27	0
College or University	2	2	0
CRITICAL FACILITIES:	328	328	0
City-Owned	249	249	0
County-Owned	11	11	0
Owned by Special Districts	68	68	0
BRIDGES AND INTERCHANGES:	342	342	0
Locally-Owned	179	179	0
State-Owned	163	163	0

Source:

- Association of Bay Area Governments, 2010.
- Health care facilities are based on a list of licensed facilities from the California Office of Statewide Health Planning and Development.
- K-12 schools, colleges, and universities are based on a combination of addresses from Thomas Bros. and the individual facilities.
- Critical facilities were identified by the local jurisdictions. City-owned and county-owned facilities were identified for all cities and counties in the Bay Area. Thirty water, transit, fire and other special districts are included as well, but this should not be considered a complete count of special district facilities.
- It's not always clear whether an agency is part of the city or county government or an independent special district. Agencies with dedicated functions (e.g. PUCs) are included in the city-owned or county-owned totals if they are a department of the city or county. Otherwise they are considered a special district.

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20 April 2003. One of the Eyeball series.
Source of photos and maps: Mapquest.com

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http://crunch.tec.army.mil/nid/webpages/nid.cfm

National Inventory of Dams Data Status

- *September 2002* - NID Web Site re-opened to all users.
- *October 2001* - NID Web Site restricted to government (.mil, .gov, .fed.us domains) users.

Introduction

With the National Dam Inspection Act (P.L. 92-367) of 1972, Congress authorized the U.S. Army Corps of Engineers (USACE) to inventory dams located in the United States. The Water Resources Development Act of 1986 (P.L 99-662) authorized USACE to maintain and periodically publish an updated National Inventory of Dams (NID). The Water Resources Development Act of 1996 (P.L. 104-303), Section 215, re-authorized periodic update of the NID by USACE, and continued a funding mechanism.

The current NID is the result of this evolutionary process. The USACE continues to work closely with the Association of State Dam Safety Officials (ASDSO), FEMA, and other state and federal agencies to update and publish the NID. The success of the NID maintenance and publication program can be attributed to the cooperative participation of the 50 states and Puerto Rico (as facilitated by ASDSO), and 17 federal agencies, who provide information on approximately 77,000 dams currently in the NID.

The Interagency Committee on Dam Safety (ICODS) created a subcommitee to advise USACE on the update o f the NID. The NID Subcommittee provides guidance and recommendations concerning the data elements, format, and publication media for the NID. Its membership consists of representatives of non-federal and federal agencies who participate in the NID.

A web-enabled version of the 1998-1999 NID update was posted to the Internet in January 1999. For this update, nineteen new fields of information were added to the NID. This new information is necessary to assess dam characteristics, and more effectively and appropriately allocate federal resources for dam safety programs. The addition of these fields in the NID required eight new fields in the states' National Inventory of Dams Data (NATDAM) input file for incorporation into the NID (federal agencies must submit an additional eleven fields in their databases). Participants are continuing to work to improve completeness and accuracy for all data fields in the NID. Updated data received by USACE is posted quarterly to the on-line database.

The Corps of Engineers and ASDSO are continuously improving the process of inventory data collection and transmission by the states and federal agencies to take advantage of current PC computers, software and the Internet. Software tools have been recently developed to improve the process of managing, inputting, and transmitting NID data. User training for the states and federal agencies on these software tools is starting in March 2001.

Note that the objectives of the program to update the NID are the same as those stated in the 1989 manual *ASDSO National Inventory of Dams Methodology*:

- Update the Dam Inventory data with information from the states and federal agencies.
- Foster state self-sufficiency through assistance for states to maintain and update their own inventory systems, and transfer the information to the National Inventory.
- Obtain participation of all states in the National Inventory.
- Maintain state control of information they submit.

Points of Contact:

Technical Assistance:

U.S. Army Topographic Engineering Center
CEERD-TR-A, ATTN: National Inventory of Dams
7701 Telegraph Rd.
Alexandria, VA 22315
rd1@tec.army.mil

General Dam Information:

Association of State Dam Safety Officials
450 Old Vine Street, 2nd Floor
Lexington, KY 40507
info@damsafety.org

National Inventory of Dams Inclusion Criteria

A dam is included in the National Inventory of Dams if:

1) It is a High or Significant hazard potential class dam or,

2) It is a Low Hazard potential class dam that exceeds 25 feet in height AND 15 acre-feet storage or,

3) It is a Low Hazard potential class dam that exceeds 50 acre-feet storage AND 6 feet height.

For defintions of hazard, please use data dictionary:

Downstream Hazard Potential

Code indicating the potential hazard to the downstream area resulting from failure or misoperation of the dam or facilities:

L for Low;
S for Significant;
H for High.

Definitions, as accepted by the Interagency Committee on Dam Safety, are as follows:

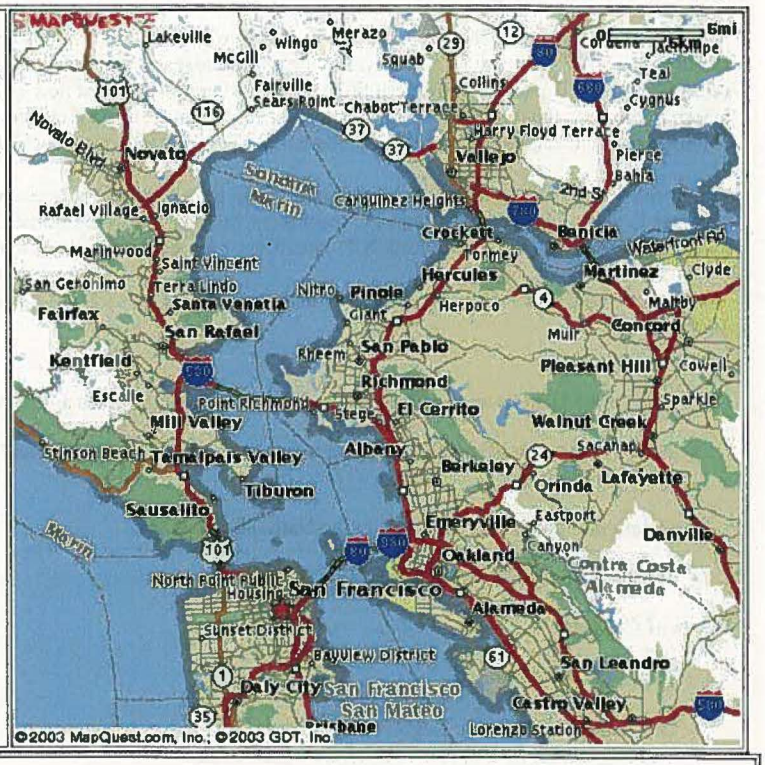
1. LOW HAZARD POTENTIAL -- Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

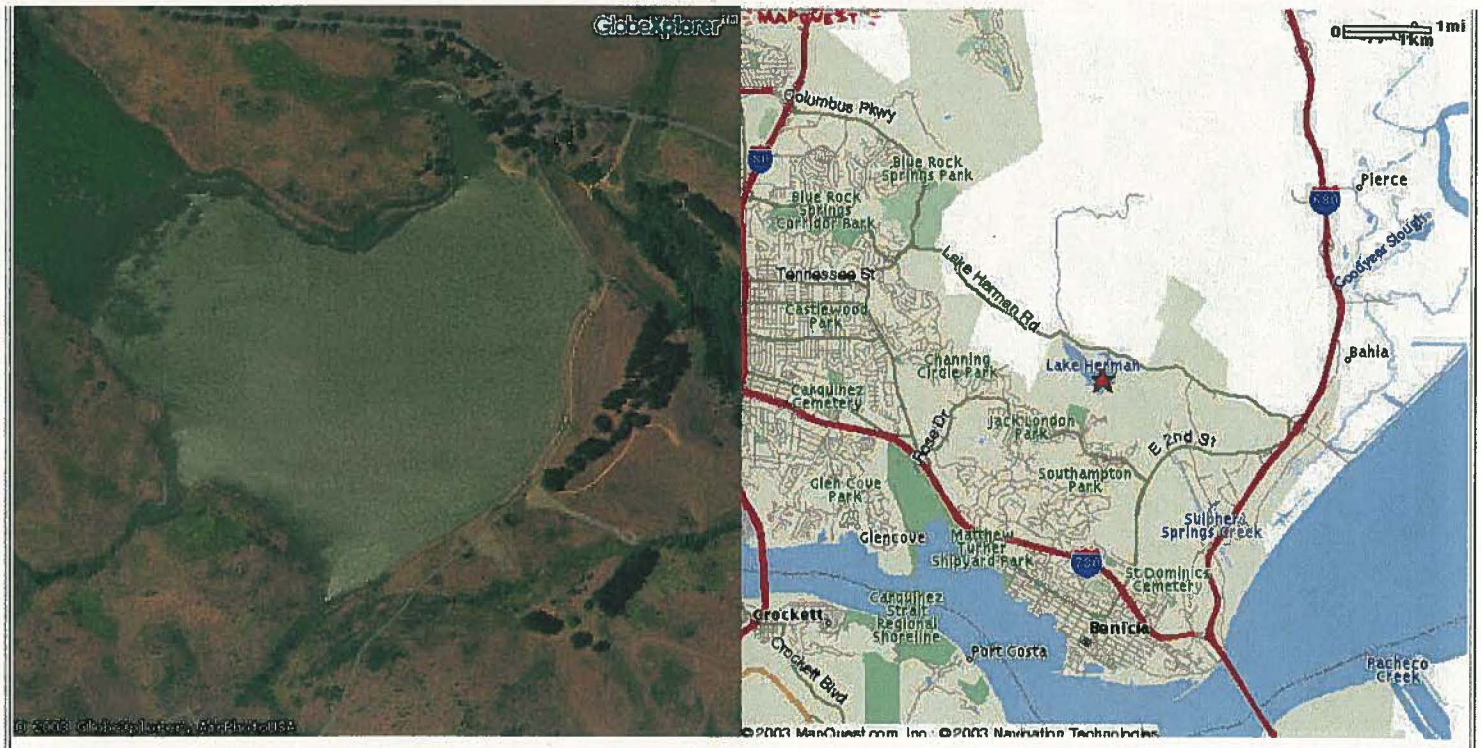
2. SIGNIFICANT HAZARD POTENTIAL -- Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environment damage, disruption of lifeline facilities, or impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

3. HIGH HAZARD POTENTIAL -- Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

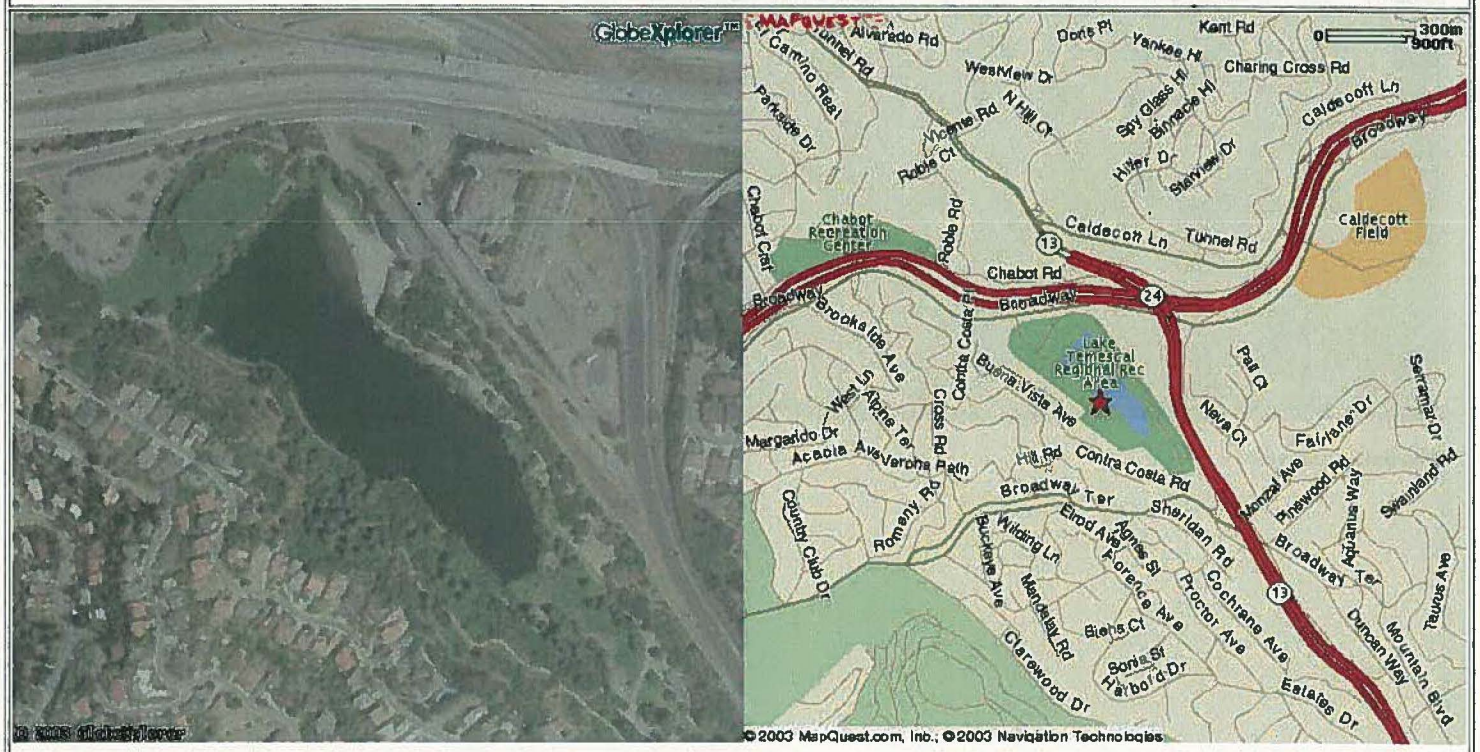
High hazard dams shown are designated by the US Army Corps of Engineers on the National Inventory of Dams database.

Eyeballing the High Hazard Dams of San Francisco Bay

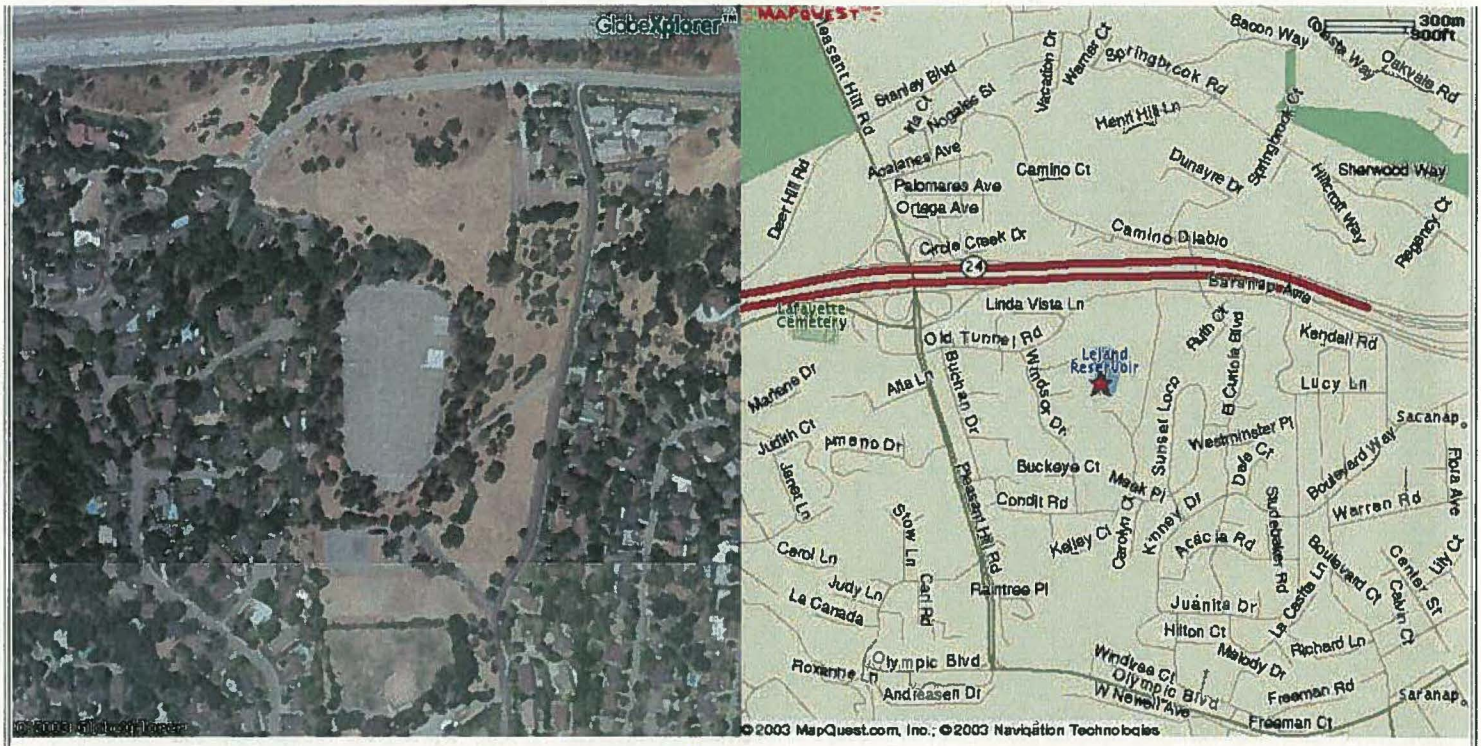




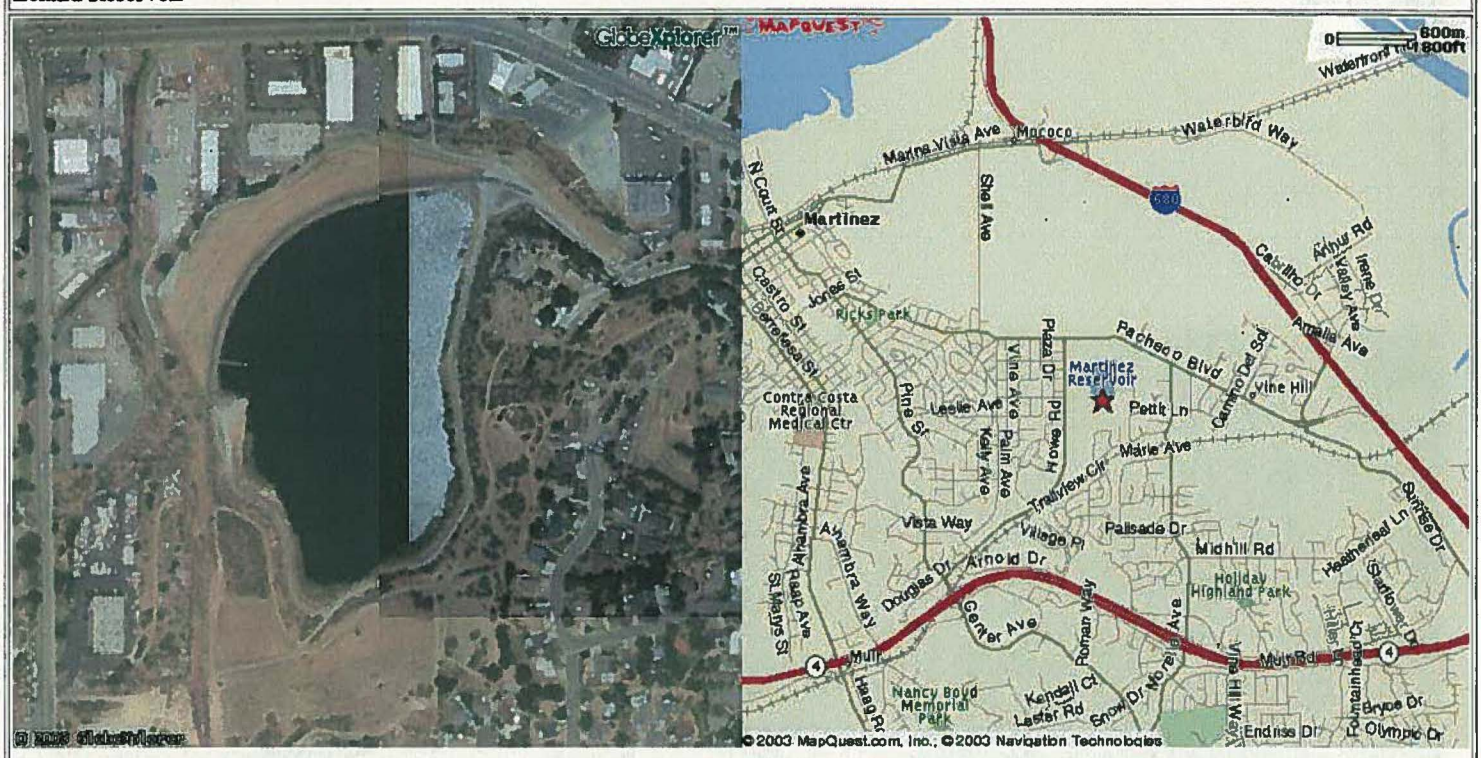
Lake Herman



Lake Temescal



Leland Reservoir



Martinez Reservoir

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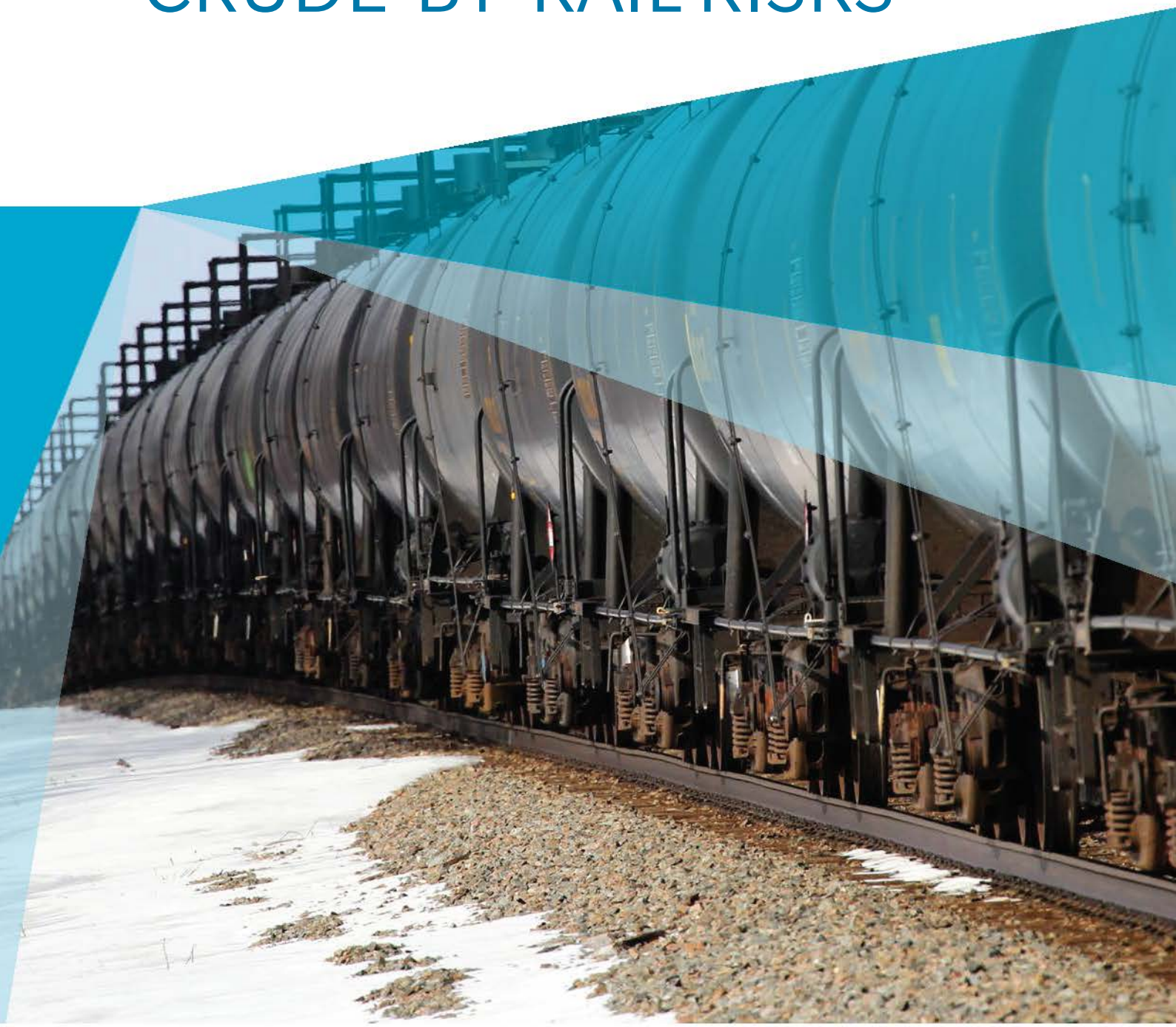
RAIL | ENERGY

For Environmental Health and Safety Leaders

TEN QUESTIONS ON CRUDE-BY-RAIL RISKS



MARSH & McLENNAN COMPANIES

Over the past 18 months, the transportation of crude oil by rail has been increasingly in the spotlight, due to more than a half-dozen incidents involving cars carrying Bakken crude. Much is being done to improve the safety profile of crude oil transport: Regulators in the US and Canada have issued or will soon issue comprehensive new safety rules; railroads have introduced new operating practices; and design standards for new tank cars are being updated. In addition, the North Dakota Industrial Commission (NDIC) recently issued new regulations, effective April 1, 2015, that will require additional processing steps to reduce the volatility of North Dakota crude oil.

In the midst of these rapid changes, senior executives and boards of oil companies have realized the need to better understand the evolving risks they face when shipping crude oil by rail – be they operational, strategic, financial, or reputational. To that end, Oliver Wyman believes that there are ten questions that oil company decision makers must ask and answer surrounding the transport of crude oil by rail. While not all of the issues addressed by these questions are within shipper control, understanding them is critical to illuminate potential operational, financial, and reputational risks and liabilities.

1. DO I KNOW THE PROPERTIES OF WHAT I AM SHIPPING?

All crude oil is not alike. After the Lac Megantic disaster in July 2013, regulators began asking whether there was something different about Bakken (North Dakota) crude. Testing determined that this oil contains more volatile elements and is more flammable than crude from other regions. When this oil is not classified or labeled properly (as was the case at Lac Megantic), the risks of an adverse incident are greatly magnified.

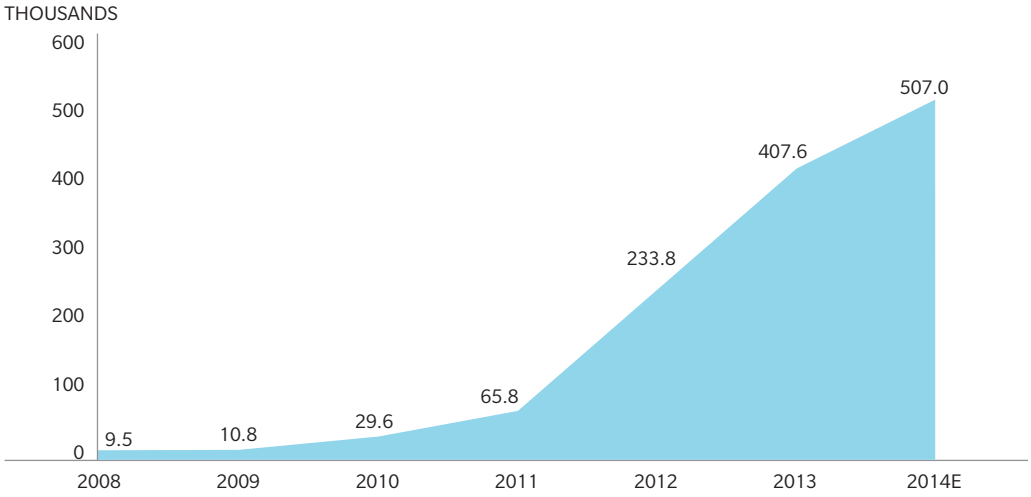
Shippers are directly responsible for the proper classification and characterization of the commodities they ship:

- Classification relates to assigning the proper hazard class and "packing group," which refers to the packaging and handling requirements of the material, based on the degree of danger it presents. Packing Group I represents the highest danger, II medium, and III minor. Currently, all Class III crude oil, including that from the Bakken, falls into Packing Group I or II, under a US DOT Emergency Order.
- Characterization is a complete description of the properties of the material during the entire transportation cycle. In the case of crude oil, this includes corrosivity, vapor pressure, dissolved gas content, specific gravity at loading and reference temperatures, and the presence and concentration of specific compounds, such as sulfur.

Crude oil transported by rail is often derived from different sources and then blended, complicating proper classification and characterization. The Pipeline and Hazardous Materials Safety Administration (PHMSA) has pointed out the shortcomings of relying on information in Safety Data Sheets (SDS), which might include generic and outdated information about the specific material to be transported. Beginning in April 2015, for example, producers will need to ensure they update material properties for Bakken crude processed under the new NDIC regulations.

In addition, proposed new PHMSA rules call for a testing program for mined gases and liquids, which if it comes to pass will be the responsibility of oil and gas producers.

Exhibit 1: Originated Class I Carloads of Crude Oil, 2008-2014



Source: Association of American Railroads. Note: 2014 estimate based on three quarters of data.

2. ARE MATERIAL HAZARDS PROPERLY LABELED AND COMMUNICATED?

Shippers communicate material hazards to all parties involved in the transport chain (including loading/unloading) through shipping papers, package marking and labeling, and vehicle placarding. Product characteristics and hazards also must be properly communicated to employees and readily available for emergency response situations.

In particular, in the event of a derailment, correct labeling of shipments is critical to guide first responder decisions on how to manage an incident – including spill response, firefighting, and evacuation. Recent Canadian and proposed US regulations include steps to improve the quality of information being provided to first responders. Proper labeling is also a strong indication that the shipper is aware of, and diligent about, complying with regulations and carrier rules in loading and shipping hazardous materials.

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3. DO I HAVE/WILL I HAVE THE RIGHT TANK CARS FOR WHAT I SHIP?

Much attention has been focused on the design of the railcars used to haul crude oil and on the need for shippers to assign tank cars appropriately based on crude oil characteristics. This task will be complicated by changing regulations for tank cars. A broad set of proposed options for tank car design are now under consideration, with the goal of increasing puncture resistance, providing thermal protection to survive a pool fire, and protecting top fittings and bottom outlets during a derailment, thus reducing or delaying the release of flammable liquids.

Not only will updated US regulations (which are expected to be finalized in early 2015) impact new cars, but all existing tank cars that haul crude oil and ethanol would need to be retrofitted to meet the new standards. Tank cars not meeting the new specifications would not be authorized to carry shipments in Packing Group I after October 1, 2017, and all tank cars that do not meet the new standards would have to be removed from high-hazard flammable train (HHFT) service within 5 years. In addition, Canada plans to ban all older, unmodified tank cars from its rail lines after May 1, 2017.

The end result of these changes is that tank cars for highly volatile crude and ethanol may be in short supply for some time to come. According to one estimate, some 130,000 existing tank cars will likely need to be retrofitted, while the remainder of the fleet, due to age and condition, will probably be diverted to other services or retired. Car builders will be stretched thin to both build new replacement tank cars and modify existing ones in the time allotted.

4. ARE MY LOADING AND UNLOADING OPERATIONS BEING DONE SAFELY BY COMPETENT EMPLOYEES/CONTRACTORS?

Terminal loading/unloading operations represent a high level of risk and liability for oil producers. In the best case, a terminal is a highly engineered facility with the latest technology, and operated by well-trained professionals. But in reality, terminals can vary tremendously and not all meet this ideal.

Proper loading/unloading operations should be ensured through regular reviews of all operational and training procedures from a safety and risk management perspective. Are procedures adequate for the risks, including weather and other operating conditions? Do they account for differences in product temperatures, pressures, and other key characteristics? Is training sufficient for emergency response situations?

On the loading end of the process, over/under loading of railcars is a significant issue, since there are currently multiple types of tank cars in service handling crude oil. Cars have different load limits and tare weights, depending on their trucks and other equipment.

While overloading places excessive stress on the car and its fittings, for dynamic stability – as well as economic reasons – cars do need to be loaded with as much product as possible. Underloading leaves void spaces that can allow lading movement (sloshing); this will impact car movement in curves and train handling during acceleration and braking. Excessive dynamic forces can cause derailments. Extra void space also allows for more vapor accumulation. And vapors are composed of the more volatile components of the lading and thus make a car more susceptible to ignition and explosion in the event of an accident.

5. ARE MY RAILCARS PROPERLY INSPECTED AND MAINTAINED?

With the exception of 5,000 new tank cars that BNSF has on order, railroads generally do not own the tank cars used in crude oil service. Most such cars are owned or leased by shippers. Thus while railroads must inspect cars before accepting them for transport, program inspection and maintenance activities are the responsibility of the owner/lessee. For crude oil, the inspection and maintenance program is complicated by the variable properties of the product, which can corrode surfaces at different rates. Severe corrosion on crude oil tank cars has been noted on the internal surfaces of the tank, man-way covers, and valves fittings.

Regulations specify the intervals for required inspections and recertification of tank cars. Make sure these intervals are respected. Then go one step further and have your loading crews keep an eye out for anything which does not look normal and for areas exhibiting signs of corrosion. If there is a doubt, do not load the car and have it thoroughly inspected prior to its next loading.

6. WHERE IS MY CRUDE OIL GOING – AND HOW WILL IT BE ROUTED?

Making an informed decision about where to ship crude requires an understanding of how rail routing decisions are made and the associated risks (see next question). As it is, there can be a good deal of variability in how a crude oil shipment is routed and who handles it along the way.

For the majority of crude shipment miles, tank cars travel on major railroads, known as "Class I's," which have well defined operating, maintenance, and safety procedures. If a single Class I does not own or have rights to operate on a portion of the routing, it will hand off the cars to a second Class I, known as an "interchange." Trains also may have to travel a short distance over short line or terminal railroads at either end of the main line to reach loading/unloading terminals. Such short line railroads generally do not have to meet the same rigorous standards for track and equipment as the Class I's.

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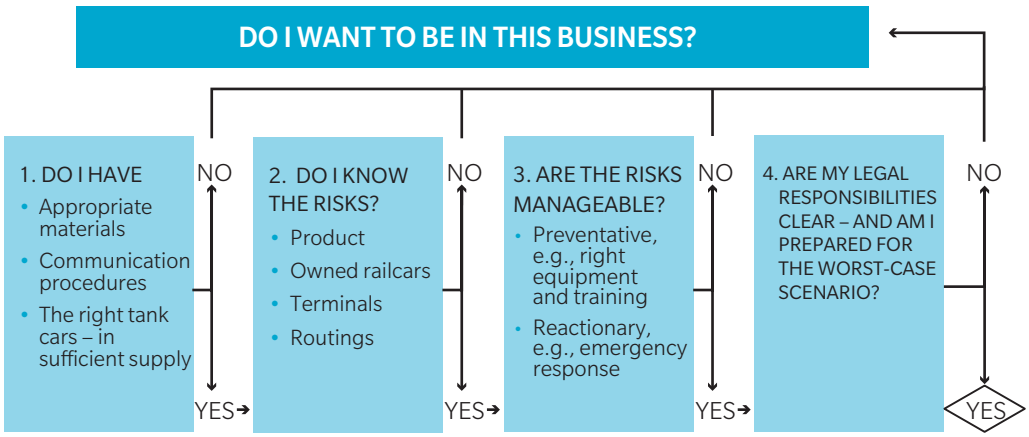
In addition, while the number of train accidents per year in general is low and has been improving for both Class I and regional/short line railroads, our analysis of rail accident reporting shows a higher rate of incidences/accidents for short lines than for the Class I carriers.

Another critical aspect that impacts routing is the number of cars of crude oil being shipped on a single train. Many of the more stringent operating regulations and practices related to crude oil only impact shipments of 20 or more carloads of Class III flammable liquids. Thus there are additional risks for crude oil cars that move in smaller blocks and are mixed in with other cargo. These risks are associated with handling at classification yards and additional time in transit.

Exhibit 2: Decision Tree For Moving Crude Oil By Rail



7. DO I KNOW THE RISK FACTORS FOR ROUTINGS?

Risk factors for routings will be different of course for lines that pass through urban centers versus those that are routed primarily through rural areas. Terminal placement will also determine if a crude oil train must pass through dense population areas. With the exception of interchange decisions made at the time of contracting, shippers do not have control over how their railcars are routed, but it is worth knowing ahead of time what risks a route might impose, particularly in the event of a derailment or collision.

For a number of years, railroads have been required to follow a special protocol to determine the safest routing for certain hazardous materials. Crude oil was not originally on this list, but the PHMSA's proposed regulations would require the hazmat protocol to be applied for all trains carrying 20 or more carloads of crude oil.

The hazmat protocol requires a railroad to collect data related to 27 different routing factors for each proposed trip (such as network, operating, and train characteristics). The carrier then must select a route based on the findings of a route analysis, which is conducted using a computerized Federal Railroad Administration route risk evaluation system. The goal of the route analysis is to minimize environmental and population exposure, and so it considers a range of trade-offs, including distance, the presence of highly populated areas, environmental concerns, historical accident/incident rates, and other factors.

In addition, the rail industry has implemented a 50 mph speed limit for trains carrying 20 or more cars of crude oil and further restricts the speed to a maximum 40 mph when those cars include at least one older DOT-111 tank car and are operating within one of the 46 high threat urban areas designated by the Department of Homeland Security.

8. DO I HAVE PROPER EMERGENCY RESPONSE PROCEDURES IN PLACE?

According to the Association of American Railroads, "Emergency responders have control of railroad accidents in which hazardous materials are spilled, but railroads provide the resources for mitigating the accident." But the shipper (who most likely owns/leases the cars), also should have its own emergency response plans. The oil company's incident command structure should match that of railroads and regulators. There may be a need to work with responders and local municipalities to provide data on the material being shipped. Communication, authority and accountability issues need to be defined, practiced, and executed.

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9. DO I UNDERSTAND MY RESPONSIBILITIES AND LIABILITIES IN CASE OF AN ACCIDENT?

Traditionally, freight railroads were responsible for goods until delivery, under "common carrier" rules. But now most goods move under negotiated contracts, and responsibility for cargo and property damage or personal injuries may not be spelled out. As a result, plaintiff attorneys are showing an increasing willingness to go after brokers and shippers to obtain compensation.[1]

Shippers of Canadian crude into the US must also consider the legal ramifications of routings that cover two countries. How will your liabilities change depending on your location and the location of the incident? Further, liability rules in both countries may undergo revision as fallout from the Lac Megantic disaster, which exposed shortcomings in rail liability coverage and insurance.[2]

Has your legal team reviewed all contracts with supply chain partners to understand what might be your firm's residual responsibilities and liabilities in case of an accident? Do you know the financial strength and insurance coverage of those supply chain partners? Also, bear in mind that failure to exercise proper diligence in the testing, loading, labeling, or declaration of product may expose a shipper to direct liability in the event of an accident – as well as failure to maintain railcars to the proper standard. Finally, what is the risk to the company's brand and reputation as a result of being party to an incident?

10. CAN I VERIFY THE ANSWERS TO QUESTIONS 1 THROUGH 9?

Ronald Reagan famously said "trust, but verify" in relation to Russian disarmament. The same is true for crude by rail safety – shippers need to ensure there are audit and verification protocols in place to ensure optimal risk management along the entire crude by rail transport chain. Some audit requirements fall squarely on the oil companies. Others must be managed and influenced through third parties. In addition, crude by rail activities should be part of your overall emergency response drilling protocol. These can range from tabletop drills that focus on scenario evaluation, to full scale drills that require the cooperation of multiple stakeholders.

In summary, crude by rail is not new – for either the oil industry or the railroads. Railing of crude actually started back in 1889, when Rockefeller built his first refinery on the shores of Lake Michigan. But the consequences of mishandling crude by rail have increased dramatically, putting every involved firm's "license to operate" at stake. Knowing the answers to the above questions can help your company avoid a world of trouble and harm.

1 "Transportation Liability: Busting Seven Common Myths," Lisa Terry, *Inbound Logistics*, January, 2013.

2 "Who pays – liability and compensation in a post Lac-Megantic world," K. Joseph Spears, *Canadian Sailings*, March 31, 2014.

For more information, please contact your account representative or:

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OLIVER WYMAN'S ENERGY PRACTICE

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BNSF

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OLIVER WYMAN

Health and Safety Executive
HSE

PEMEX LPG Terminal, Mexico City, Mexico. 19th November 1984

Accident summary

At approximately 05:35 hours on 19 November 1984 a major fire and a series of catastrophic explosions occurred at the government owned and operated PEMEX LPG Terminal at San Juan Ixhuatepec, Mexico City. As a consequence of these events some 500 individuals were killed and the terminal destroyed.

Three refineries supplied the facility with LPG on a daily basis. The plant was being filled from a refinery 400 km away, as on the previous day it had become almost empty. Two large spheres and 48 cylindrical vessels were filled to 90% and 4 smaller spheres to 50% full.

A drop in pressure was noticed in the control room and also at a pipeline pumping station. An 8-inch pipe between a sphere and a series of cylinders had ruptured. Unfortunately the operators could not identify the cause of the pressure drop. The release of LPG continued for about 5-10 minutes when the gas cloud, estimated at 200 m x 150 m x 2 m high, drifted to a flare stack. It ignited, causing violent ground shock. A number of ground fires occurred. Workers on the plant now tried to deal with the escape taking various action. At a late stage somebody pressed the emergency shut down button.

About fifteen minutes after the initial release the first BLEVE occurred. For the next hour and a half there followed a series of BLEVEs as the LPG vessels violently exploded. LPG was said to rain down and surfaces covered in the liquid were set alight. The explosions were recorded on a seismograph at the University of Mexico.

Failings in technical measures

- The total destruction of the terminal occurred because there was a failure of the overall basis of safety which included the layout of the plant and emergency isolation features
- Plant Layout[1]: positioning of the vessels
- Isolation[2]: emergency isolation means

- The terminal's fire water system was disabled in the initial blast. Also the water spray systems were inadequate.
- Active / Passive Fire Protection[3]: survivability of critical systems, insulation thickness, water deluge
- The installation of a more effective gas detection and emergency isolation system could have averted the incident. The plant had no gas detection system and therefore when the emergency isolation was initiated it was probably too late.
- Leak / Gas Detection[4]: gas detection
- Hindering the arrival of the emergency services was the traffic chaos, which built up as local residents sought to escape the area.
- Emergency Response / Spill Control[5]: site emergency plan, access of emergency vehicles

References

Lees, F.P., 'Loss Prevention in the Process Industries – Hazard Identification, Assessment and Control', Volume 3, Appendix 4, Butterworth Heinemann, ISBN 0 7506 1547 8, 1996.

Marsh and McLennan, 'Large Property Damage Losses in the Hydrocarbon-Chemical Industries a thirty-year Review', 16th Edition, Marsh and McLennan Protection Consultants, 1995.

Link URLs in this page

1. Plant Layout
   http://www.hse.gov.uk/comah/sragtech/techmeasplantlay.htm
2. Isolation
   http://www.hse.gov.uk/comah/sragtech/techmeasisolatio.htm
3. Active / Passive Fire Protection
   http://www.hse.gov.uk/comah/sragtech/techmeasfire.htm
4. Leak / Gas Detection
   http://www.hse.gov.uk/comah/sragtech/techmeasleakgas.htm

5. Emergency Response / Spill Control
   http://www.hse.gov.uk/comah/sragtech/techmeasspill.htm

A Data Quality Assessment

Evaluating the major safety data programs for pipeline and hazardous materials safety

November 10, 2009

Prepared by Rick Kowalewski
Senior Policy Advisor
Pipeline and Hazardous Materials Safety Administration
U.S. Department of Transportation

A Data Quality Assessment

Evaluating the Major Safety Data Programs for Pipeline and Hazardous Materials Safety

November 10, 2009

Objectives and scope of the evaluation: The purpose of this data quality assessment is to ensure our safety data provide a sound basis for risk-based decision making. The assessment focused on the major data collection programs we use to assess and manage risk in the pipeline and hazardous materials safety programs. These data collection programs—together with shared, professional experience—comprise the core of our knowledge base about systems and program performance. The data are used by PHMSA, states, communities, other agencies, researchers, the private sector (companies and trade associations), and the general public.

Background: In the 2008 safety culture survey, only 46% of PHMSA employees agreed that "*our available safety data is useful for decision making*." More recent concerns about the quality of our safety data have amplified the need for assessing data quality, but this assessment was really begun as an outgrowth of PHMSA's 2007-2011 strategic plan (the first of four general strategies was focused on data-driven risk management), and DOT's Information Quality Guidelines—which recommend periodic reviews of mission-critical data systems.

All data systems have error, and errors tend to accumulate through the development and operating cycle of a data program. We examined the life cycle of incident, activity, and exposure data from the definition of requirements for information through system design and data collection/processing to the interpretation and use of analytical results. The aim was to identify the major sources of error in the data or its use—as a basis for continuous improvement in our programs.

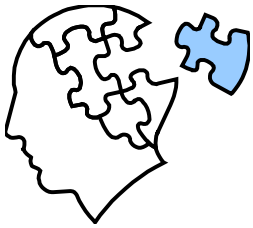
We recognize that there are some significant efforts underway to address many of the data quality issues outlined in this report. We can't judge the likely outcomes of all these ongoing efforts (our evaluation didn't probe them deeply). But we believe that many of the findings from this assessment could be used to inform, reinforce, redirect, or extend the scope of these efforts; and that this assessment can provide a useful baseline for evaluating the results of these efforts.

Overview of the results:

Data gaps limit our ability to analyze risks.

Missing data often compromises our ability to draw useful conclusions. A 2007 review estimated we are missing 60-90% of the hazmat incidents that occur. Incident reports in both programs are often missing some important data, including a higher number of "other/unknown" causes for the most serious incidents—exactly where we need good data most. Reporting lags (months, or years in some cases) compromise our performance reporting and time series analyses. But more serious are gaps in the scope of the data we collect. Our failure data focuses at the top of a much larger pyramid, and

small numbers make it difficult to detect meaningful trends. We are missing information about many of the precursors to larger failures—leading indicators that could help reduce risk.



Our "peripheral vision" is limited too: for several "invisible risks" (e.g., gas pipeline master meter operators or failures of DOT packages "outside transportation"), we have little/no risk data. Lacking data, we can't quantify or address these risks effectively. We have limited data on risk exposure to help us understand failure rates or trends. At the same time, we collect very little useful data from our own inspections and investigations—which could provide our primary *sensory information* on what's going on and our primary *feedback loop* on where things have not worked. At the root of all these issues: *We haven't thought through what we need to know in a systematic way*. As a result, we often don't have the data we need to understand risk, while we don't use much of the data we collect.

We don't have a good conceptual model for understanding failures.

We don't capture the chain of failures—especially the root causes—that typically are associated with significant incidents. We don't capture all the latent conditions, circumstances and interactions that might reveal hidden explanations. We can't use incident data effectively to focus our inspections because we don't capture failure data in a form that is very useful for inspections. And we don't capture inspection deficiencies in a way that allows us to connect latent conditions to later failures. The relationship between conditions (or processes) and outcomes goes to the heart of regulation. With weak data on both sides of the equation, we might be hampered in our ability to impact outcomes by regulating processes.

Errors and biases in the data contribute to a misleading picture.

In practice, the quality of our data reviews and edit checking is mixed. Underreporting and blank data fields are more serious than just *reducing the numbers*. It appears likely the reports and data we get are *not representative* of all the incidents that actually occur. When data gaps are not random, it can be misleading to draw general conclusions from the data we have.

We rely heavily on the regulated industry to help us acquire information. This is convenient, and goes directly to the source. It also introduces a natural, inherent bias in the data we collect. Our accident investigations have shown some significant differences between what the company reports and an objective view of these events. Our processes do not effectively reconcile these discrepancies. There is a historical understanding that the data we get from industry is "their" data. Even when we know (or believe) their data to be wrong, we don't modify our data until we get revised reports from the companies—which can result in releasing and using bad data for months or years after an incident.

We don't regularly monitor data quality indicators. We invest substantial resources in improving the accuracy of our data. But we do not track error rates or how much our efforts *change* the quality of our data. We could be over-investing in report-level accuracy compared to the more general problems with data gaps, concepts, and analysis of the data.

Analytical gaps limit our ability to direct safety programs effectively.

Today, we have limited organizational capacity and focus for risk analysis; and almost no capacity for program evaluation. These should provide the *primary intelligence function* for interpreting the data we get on systems, program effectiveness, and failures; and turning it into useful program information. These gaps are increasingly important as we achieve diminishing returns in our safety programs. More importantly, these evaluation processes are usually the drivers for a wide range of other processes aimed at ensuring high quality data.

Over the years, we have assumed our programs are effective (or not effective) with no clear analytical basis for that assumption. We modify or develop new programs without a systematic evaluation of what we have now, or a plan to collect data to evaluate the impact of changes. We monitor key safety outcomes, but we have limited understanding of the safety trends we are seeing, and little data or analyses that might be used to identify emerging risks or leading indicators of safety. As a result, we don't use our performance measures to drive our programs. Our regulatory evaluations generally begin too late in the process to affect decision making. Our inspection targeting models combine judgment and data in ways that can degrade the quality of the original data. Good data, with clear predictive value, can be overwhelmed by less-important data variables. Our grant allocation models use risk data or performance data, but not both in a direct way. To target resources effectively, we need information about where the risk is *and* what works in reducing risk.

Our approach to analysis is uneven and is not guided by a strategic view. We sometimes frame our questions about risk in very general ways, leading to analytical results or tabulations that are disappointing and not very useful for decision making. We do not have any standard practices in presenting the results of our analyses. Some of our analyses highlight the limitations of the data and methods; many don't. We rarely quantify the uncertainty in our analyses, and the uncertainty is often large—which could undermine the basis for important program decisions. Because of these analytical gaps, we often make program decisions without good analytical input.

Much of the data we release are difficult to use.

Data will never be perfect, but those using it have to know its imperfections; otherwise, misleading conclusions can lead to poor decisions. We release data without documentation to help analyze it, and our own tabulations and analyses are often misleading. Good metadata would include how the data are collected, what the data elements mean, how the reporting has changed over time, and where there are known data quality issues. We have no data documentation for our major safety data systems beyond simple record layouts. For pipeline incidents, we don't release narrative descriptions of the incident, which are often the most useful information for analysis. And often the data we have are difficult to integrate across data systems when they lack common identifiers or common data architecture.

Our tabulations and graphics reflect a wide range of practices. The pipeline safety website demonstrates good practices in every aspect addressed in the Information Quality Guidelines. Hazmat safety tabulations, by comparison, are missing many key elements of good presentation. Some of our

statistical tabulations normalize the data, and some don't. The data summaries we publish do not differentiate public vs. occupational (or private sector) risk—providing a misleading view of public risk. Generally we have no standard, pre-dissemination review process for the statistics we release.

We're missing some key skills.

We lack some of the analytical skills/expertise needed to focus our data collection. While our compliance program is aimed at influencing company behavior, we have no social/behavioral scientist positions to help guide our efforts. Our regulatory evaluations estimate costs and benefits of alternative approaches, but we have no economist positions to guide the work. Many of our hazmat accident investigators have no training in root cause analysis. Our use of established statistical methods is generally weak—reflecting a broader lack of analytical capacity—and we have little expertise in presenting quantitative information effectively. We have almost no professional experience in the specialized discipline of program evaluation, and no positions requiring these skills.

While many efforts are underway to address data quality, these skill gaps could seriously limit our ability to think through what we really need to know, fill all the important data gaps, develop good conceptual models of failures, build a strong analytical capability, and provide data that are well-organized and easy to use for analysis.

General methodology:

The evaluation concentrated on periodic reports (pipeline annual reports, hazardous materials registrations) and event-driven reports (particularly incidents, inspections and investigations)—and the basic questions that need to be answered from these data. The general approach we followed was to evaluate the extent to which our data programs follow DOT's Information Quality Guidelines, identify the sources of error and other potential quality problems in the data, and assess the utility of the data for decision making.

Our overall strategy was to be *comprehensive*, not *exhaustive*. We aimed to keep a high level view of the problem, to maintain a perspective on the relative importance of the data quality issues we face. In general, we looked at the larger context of the *decisions* that need to be made using the data, and how errors in data collection and analysis could ultimately affect these decisions.

The evidence *we considered:*

- We reviewed previous studies to identify data issues; existing documentation on our data systems; and some of the literature on data quality, risk management, and safety regulatory programs.
- We interviewed analysts and managers—including the executive leadership for each operating program—to get their perspectives on information needs and known data issues.
- We reviewed several recent program analyses to get a sense of the important data limitations and their causes, and we examined a sample of internal reports from inspections and accident investigations.
- We evaluated reporting forms and instructions, and tested incident reporting.
- We reviewed publicly-available micro-data releases, and evaluated published data and statistics on the PHMSA website.
- We also analyzed the data directly, including more in-depth analysis of selected data quality issues.

The attached *Findings* provide the core of this report—a summary of the evidence considered, with a discussion of some of the likely causes and implications. Draft findings were reviewed by the program managers for factual accuracy; their comments and suggestions have been considered and largely addressed in the final report. The Associate Administrators for both programs and the Chief Information Officer acknowledged the general validity of the findings. In fact, many of the issues were identified by program directors and staff independently—before this assessment, and as input into it.

Some options for improving our data and analyses:

In our judgment, we should not try to fix every problem identified here in a near-term action plan. Instead, we recommend a step-wise approach to improving data quality—focused on structural changes, not specific solutions that are limited to the data problems we can indentify today. The aim would be to build an engine that can drive continuous improvement in our data, re-setting priorities along the way, in a way that is sustainable. To do this, here are several elements/options we might consider:

- *Build our analytical capacity* (especially hazmat risk evaluation, broad program evaluation, and data quality analysis)—with multi-disciplinary expertise. This should include economists, social and behavioral scientists, statisticians, engineers, and professional evaluators. Clearly there are alternatives in the level and timing of resource investment, organizational placement of functions and positions, and the degree of centralization that should be considered.

- *Develop an analytical agenda* (draft attached) to guide our work/priorities in answering the most pressing questions. Set aside some resources to simply explore the data for trends. We could certainly do more to analyze the data we've already got, as we learn how to make the data better.

- *Expand our accident/failure investigation programs* to develop better data on the causes and circumstances of safety failures. Develop criteria, guidance, and training for conducting failure investigations; and review processes for making use of the information. Give the program an organizational home—to focus the application of knowledge and data broadly from accidents to decision making. Consider redirecting resources from inspections as needed to do this.

- *Explore options for re-casting our inspections* to put more emphasis on learning about the organizations and systems we regulate, identifying safety issues and deficiencies—apart from whether they are compliance issues—identifying good practices, and capturing more data on these systems and processes. This could range from putting more of what we find in the form of data to a broader change in how we conduct inspections. As a first step, program logic modeling could help clarify the assumptions we're making and the linkages between our activities and outcomes.

- *Make the data our own*. Reduce/limit the reporting burden for incidents to a few key pieces of information we need, and follow up with our own investigations of more significant failures to develop good data on causes and circumstances. We might, instead, retain the current reporting systems with greater levels of review of the data, and/or supplement the data with our own. However, in any event we need to better address the inherent biases in industry reporting and disseminate data that are clear and easy to use.

- *Expand our collection of failure data* beyond reportable incidents and beyond the currently-regulated community. Identify all the gaps we can, and try to fill them in to get at least some risk data on the "invisible risks" we know about. Each risk area probably needs to be considered on its own, given that the costs and benefits of acquiring data on them will be context-dependent.

- *Require analytical input* for all major policy, program, and rulemaking initiatives—*before* we decide on our approach. How we go about this, of course, must take into account the analytical capacity we have at the time. But we also need to keep in mind the general principle: *using data is the best way to improve it*.

- *Develop priorities for targeted data quality analyses*, including clarifying key concepts (failures, etc.) and adding the chain of events in our data, developing data profiles and metadata to release with our safety data, developing a common model for Federal/State inspection data, and initiating a targeted evaluation study of hazmat incident under-reporting. A good conceptual model for failures might be the highest priority here. We might use the ongoing program logic modeling (in pipeline safety) as one input, but developing a strong data model probably requires some intensive research to make it really useful.

- *Develop/establish a governance structure* to clarify authorities and responsibilities for data quality, including the key issues of data ownership and maintenance.

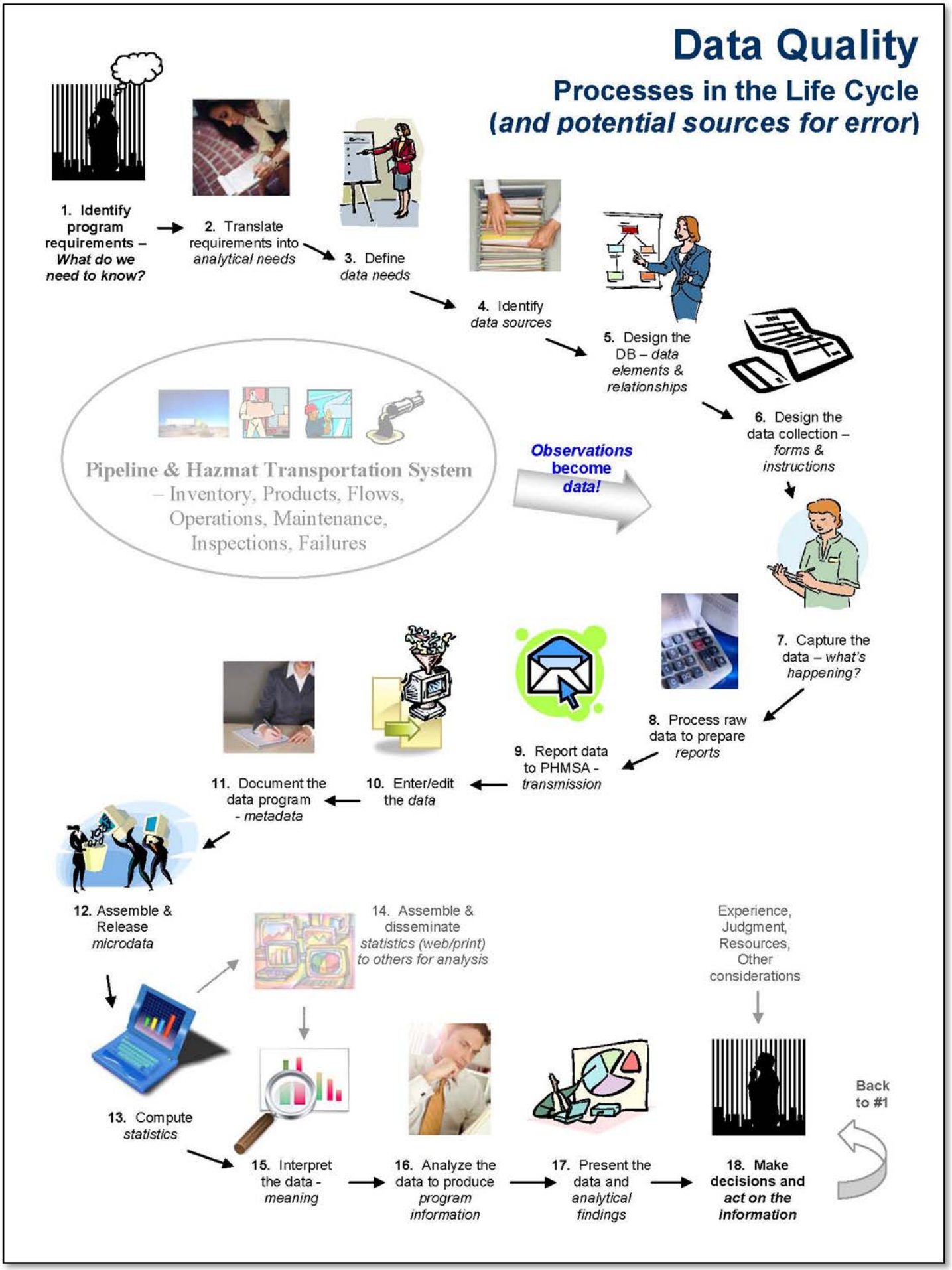
A concluding observation: We recognize that data quality has a cost, and there is no such thing as perfect data. We also recognize that data and analysis are part of a larger picture in managing and carrying out an effective safety program. Addressing the data quality issues identified in this assessment might require further research and evaluation in some areas; it certainly will require careful evaluation of the options and tradeoffs—in resources, organization, processes, and technology.

Respectfully submitted November 10, 2009

Rick Kowalewski
Senior Policy Advisor
Pipeline and Hazardous Materials Safety Administration

Attachments:

A. Data quality – processes in the life cycle
B. A summary of data quality risks
C. Findings
D. Information sources
E. A summary of data quality issues from recent analyses
F. A summary of past reviews of our data programs
G. A draft analytical agenda


Data Quality
Processes in the Life Cycle
(and potential sources for error)
1. Identify program requirements – What do we need to know?
2. Translate requirements into analytical needs
3. Define data needs
4. Identify data sources
5. Design the DB – data elements & relationships
6. Design the data collection – forms & instructions
7. Capture the data – what's happening?
8. Process raw data to prepare reports
9. Report data to PHMSA - transmission
10. Enter/edit the data
11. Document the data program - metadata
12. Assemble & Release microdata
13. Compute statistics
14. Assemble & disseminate statistics (web/print) to others for analysis
15. Interpret the data - meaning
16. Analyze the data to produce program information
17. Present the data and analytical findings
18. Make decisions and act on the information
Experience, Judgment, Resources, Other considerations
Back to #1
Pipeline & Hazmat Transportation System
– Inventory, Products, Flows, Operations, Maintenance, Inspections, Failures
Observations become data!

Data Quality Assessment - A Summary of Risks

November 2009

"**Risk**" is defined here as the risk of error in the data or its use. The "**degree of risk**" is a judgment based on the cumulative evidence from the data quality assessment. Processes with "**higher risk**" reflect specific, significant weaknesses that suggest relatively greater impact on the use of the data in decision making. Each of these is addressed in the Findings section of the assessment.

	Processes in the life cycle of data quality	DOT's Information Quality Guidelines	Who is responsible for the process?	Common sources of error	Primary Effects	Possible results of errors	Relative Degree of Risk: Hazmat Safety Data	Relative Degree of Risk: Pipeline Safety Data
Getting the concepts right …								
1	Identifying program requirements: *What do we need to know?*	2.1 Data system objectives	Decision makers	Requirements not defined, or too vague to be useful.	Relevance, Completeness	Invisible risks; no basis for program assumptions.	***Higher Risk***	***Higher Risk***
2	Translating requirements into *analytical needs*	2.2 Data requirements (empirical indicators)	Pgm analysts	Analytical questions not formulated, overly focused on current programs.	Relevance	No analytical framework for data reqmts; important program questions can't be answered.	***Higher Risk***	***Higher Risk***
Design …								
3	Defining *data needs*	2.2 Data requirements (data needs)	Pgm analysts	Missing key data (e.g., contributing causes)	Completeness	Data gaps - Important questions can't be answered, or are answered incorrectly.	*Medium Risk*	*Medium Risk*
4	Identify *data sources*	2.3 Methods to acquire data; 2.4 Sources of data	Statisticians, DB developers	Alternative data sources not adequately considered to meet quality needs	Accuracy	Biases in data reporting, inconsistency in data concepts, inefficient collection	***Higher Risk***	***Higher Risk***
5	Designing the data base - *data elements and relationships*	2.5 Data collection design	DB developers	Lack of standards; DB does not reflect or accommodate important relationships.	Comparability, Utility	Data not consistent, and can't be integrated; analytical results may be misleading.	***Higher Risk***	***Higher Risk***
6	Designing the data collection - *forms and instructions*	3.1 Data collection operations	Statisticians, DB developers	Forms/instructions are unclear; scope of data collection is incomplete.	Accuracy, Completeness	Miscommunication - Reported data might not reflect what is intended.	*Lower Risk*	*Lower Risk*
Measurement …								
7	Capturing the data - *What's happening?*	3.1 Data collection operations	Operators, inspectors, investigators	Errors in judgment or measurement, gaps in knowledge, biases.	Accuracy, Completeness	Incorrect data are reported and used in subsequent analyses; information gaps.	***Higher Risk***	***Higher Risk***
8	Processing raw data to prepare *reports*	3.1 Data collection operations	Operators, inspectors, investigators	Errors in transcribing or processing the data; under-reporting.	Completeness, Accuracy	Analyses are based on biased, incomplete, or inaccurate data.	***Higher Risk***	*Lower Risk*
9	Reporting data to PHMSA - *transmission*	3.1 Data collection operations	Operators	Low response rates, duplicate reporting.	Accuracy, Completeness	Statistical analyses are biased, may be invalid.	*Lower Risk*	*Lower Risk*
Processing …								
10	Entering/editing the data - *quality control*	3.2 Missing data avoidance; 4.1 Data editing and coding; 4.2 Handling missing data	DB mgrs	Invalid entries or incomplete data not caught.	Accuracy, Completeness	Incorrect/incomplete data are not fixed at last best opportunity.	*Lower Risk*	*Lower Risk*
11	Documenting the data program - *metadata*	5.3 Source and accuracy statements	Data system owners	Missing or poor documentation.	Utility	Analysts don't understand the limitations of the data; results go beyond the data.	*Medium Risk*	*Medium Risk*
12	Assembling & releasing *microdata*	5.2 Micro data releases; 5.4 Pre-dissemination reviews	DB mgrs	Processing errors, problems with comparability of data over time.	Accuracy, Comparability	Data are misinterpreted.	*Medium Risk*	*Medium Risk*
13	Computing *statistics*	4.3 Production of estimates and projections	DB mgrs, Analytical groups	Not addressing uncertainty or known data limitations, or normalizing data for comparison.	Comparability, Utility	Statistics are misleading and misused.	*Medium Risk*	*Lower Risk*
14	Assemble & disseminate *statistics*	5.1 Publications and disseminated summaries; 5.4 Pre-dissemination reviews	DB mgrs	Presentation is confusing, incomplete, or misleading.	Comparability, Utility	Statistics are misleading and misused.	*Lower Risk*	*Lower Risk*
Interpretation …								
15	Interpreting the data - *deriving meaning*	4.4 Data analysis and interpretation	Analysts (govt and public)	Wrong data are used, data are misinterpreted, or stakeholders are not consulted.	Utility	Decisions are not grounded in the data, or don't consider multiple perspectives.	***Higher Risk***	*Medium Risk*
16	Analyzing the data to produce *program information*	4.4 Data analysis and interpretation	Analysts (govt and public)	Analysis focuses on the wrong issues, or uses inappropriate methods.	Relevance, Utility	Analytical results are wrong, misleading, or irrelevant to program decisions.	***Higher Risk***	*Medium Risk*
17	Presenting the data and *analytical findings*	5.1 Publications and disseminated summaries	Analysts (govt and public)	Presentation is confusing or misleading.	Utility	Decision makers cannot use the results of analysis for decisions.	***Higher Risk***	*Medium Risk*
Use …								
18	Using data - Making decisions and *acting on the information*	[Not addressed specifically in the guidelines.]	Decision makers	Data are not valued or demanded; misunderstanding limits use of the information.	Relevance, Utility	Decisions are not grounded in the data, or conflict with the data.	***Higher Risk***	***Higher Risk***

Attachment B to the Data Quality Assessment

Findings from the Data Quality Assessment

November 10, 2009

Evaluating Data Quality:

This review is intended to be a broad data quality assessment to ensure our safety data provide a sound basis for risk-based decision making. The assessment focused on the major data collection programs we use to assess and manage risk in the pipeline and hazardous materials safety programs. These data collection programs—together with shared, professional experience—comprise the core of our knowledge base about systems and program performance. The data are used by PHMSA, states, communities, other agencies, researchers, the private sector (companies and trade associations), and the general public.

The DOT Information Quality Guidelines (*Guidelines*) suggest periodic assessments of data quality to assess sources of possible error and other potential quality problems in the data—ultimately to help data system owners improve data quality. The *Guidelines* also suggest more targeted evaluation studies to evaluate particular aspects of data quality—periodically, when analysis of the data reveals a significant problem, and especially after a major system redesign.

> *The two characteristics most likely to distinguish safe organizations from less safe ones are, firstly, top-level commitment and, secondly, the possession of an adequate safety information system.*
>
> *- Managing the Risks of Organizational Accidents (James Reason, 1997)*

For this evaluation, we identified 18 processes affecting data quality (attachment A). Each of these presents an opportunity for error in the data or its use, and *errors tend to accumulate* through the life cycle. The findings from the assessment trace this sequence of 18 processes to help identify risks.

The risks for introducing error appear to be concentrated in the early and later stages in this life cycle. From our review, the higher risks are most evident in identifying program requirements; translating requirements into analytical needs; identifying data sources; designing the data base; capturing the data; interpreting, analyzing, and presenting the data; and using the data.

Considerable work to improve data quality is ongoing. We recognized this at the outset, but we did not evaluate the design or likely effectiveness of these efforts. We examined existing processes, the resulting data, and challenges in using the data today. This establishes a baseline to help evaluate the results from any of these efforts in the future.

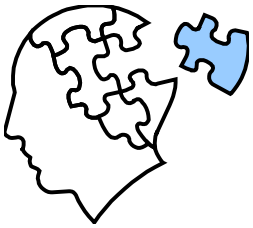
- *The pipeline safety program has invested considerable resources and effort* to document and address known data quality issues. A Data Team was chartered in 2007 to improve the quality of pipeline safety data. By December 2007, it had documented 13 pages of known problems and was soliciting input on other areas. The program has developed regional review teams for incident data, created and staffed a Performance Evaluation Group with six professional analysts, staffed

each region with accident investigators, developed a rulemaking to modify data reporting and new forms and instructions for data collection, and completed a year-long effort to validate seven years of enforcement data. The pipeline safety program has advanced its risk modeling, developed new procedures for investigations, and started development of program logic models for all of its programs to help identify information requirements. Still, some significant challenges remain.

- *The hazmat safety program has made more limited progress* in evaluating or addressing data quality issues. The program added three new analyst positions over the past two years, but has not otherwise allocated substantial resources for reviewing or modifying its data collections. One project under the Hazardous Materials Cooperative Research Program – *Incident Data for Root Cause Analysis* – produced disappointing results in the first draft. However, the hazmat safety program has developed systems for identifying missing reports and data errors. And it has invested considerable resources in development of the Hazmat Intelligence Portal (HIP) as a data warehouse for hazmat safety data, with a suite of tools for presenting data summaries—that has been well-received by data users in both pipeline and hazmat safety programs.

- *The IT program review addressed data quality in a general way*, and recommended establishing a data governance structure as a high priority for the agency. The CIO has begun the process of developing a data governance structure, and developed a broader Data Management and IT Modernization roadmap to support data quality improvements.

Identifying program requirements—*what do we need to know*?



Safety data need to be, above all, *relevant* to the needs of decision makers in managing and executing their programs. This means getting the concepts right from the outset. Information needs should drive our analyses, which in turn should drive our data collection. When requirements are not well-defined or too vague to be useful, important questions ultimately can't be answered with the data we have. In fact, we found that many of the data quality problems we see today might be traced back ultimately to shortcomings in defining what we need to know.

The DOT Information Quality Guidelines (*Guidelines*) suggest that data system objectives should be written in terms of the questions that need to be answered by the data, traceable to user needs, updated in partnership with key users and stakeholders, documented, and made available to the public. We found some strengths in identifying program requirements, and several shortcomings.

- *We have no comprehensive requirements documents for our safety data collections.* We have very detailed requirements for our *systems*, but not in terms of the *information needs* of the programs. We have a series of Federal Register Notices explaining *changes* in our data collections and providing very general objectives for the information collected on each form, but no basic outline of our overall requirements and how they fit together. The lack of documentation means that much of the history—why we're doing things the way we're doing them—is in a few people's

heads, scattered among many different papers, or lost. That creates significant challenges in interpreting the data in our analyses. It also reflects a deeper problem …

- *We haven't thought through what we need to know in a systematic way*. Some past efforts attempted to apply some structure to the definition of information needs; some of these were not completed, and others were overtaken by growth (requirements "creep") in what people wanted from the data systems. Managers, major users, and system owners have substantial difficulty re-constructing or describing data requirements in common terms, and in terms of questions that need to be answered—often by several different users. Our data programs *generally* address safety, but decision makers express frustration with their ability to get useful information from the data. Many who are deeply involved in our data collections and analysis believe this gap is one of the core challenges to improving data quality.

- *At a strategic level, we can probably distill three basic things we need to know* to manage our safety programs effectively:

  1. *Where is the safety risk (probability, consequences, and exposure)?*
  2. *Where are the critical points where we might address risk effectively?*
  3. *What really works in reducing risk?*

  At a more operational level, we need to determine—among other things—how and why things fail, why some failures result in more serious consequences than others, what to regulate, how to regulate (or otherwise intervene), how to target our resources, who to inspect and how frequently, where to focus our efforts, how much to penalize non-compliance, whether our programs are having the intended effect, and which programs work best in what situations.

- *We have tended to concentrate more of our efforts on risk evaluation than program evaluation.* This is probably a common emphasis for safety programs, but there is a hidden hazard: "The most common failures in problem solving stem from the tendency to leap straight to action" (Sparrow, 2000). Understanding risks, even in great detail, might be futile if the program interventions we apply are ineffective. More regulations, more inspections, more training, more procedures, etc. could even be counterproductive in some cases. The discipline of program evaluation can serve as a feedback loop to help discover flaws in design or implementation of our programs, identify external factors and unintended effects, and help assess the value and impacts of a program. Today, we do not have any significant capability for program evaluation in the agency. This means we are operating with limited information to answer the third strategic question—*what really works in reducing risk?*

> *The most common failures in problem solving stem from the tendency to leap straight to action.*
>
> *- The Regulatory Craft (Sparrow, 2000)*

- *We have a growing understanding of safety culture* and the upstream organizational processes and circumstances that lead to failures. Over the past two years, the agency has taken a lead role in working with the pipeline industry and other agencies to explore safety culture and its relationship

with process safety. We *know* we need to know more about this. But our questions still reflect an early stage in the learning process, with considerable work to do before we can connect safety culture with our data systems.

- *We have relatively strong history of tracking safety outcome indicators* that are tied directly to DOT's strategic goals. At a very high level, we have invested considerable effort over the years to developing and refining the concepts driving our performance measures—which we use in guiding priorities for the agency, justifying budget requests, and reporting to Congress. However, we have already recognized some significant shortcomings in these indicators (discussed later in the findings), and we have made limited progress beyond monitoring these indicators.

> **Building a High-Performing Government:**
>
> A reformed performance improvement and analysis framework will switch the focus from grading programs as successful or unsuccessful to requiring agency leaders to set priority goals, demonstrate progress in achieving goals, and explain performance trends.
>
> - *Analytical Perspectives*
> Budget of the U.S. Government, FY 2010

- *We have limited understanding of the safety trends we are seeing*. When our safety indicators reflect unexpected trends or emerging problems, we know we need to understand *why*, but we do not have a well-developed analytical program to help us answer the question. This is a significant gap in view of the overall scheme of performance management, which is focused on setting goals, demonstrating progress*, and explaining performance trends* (FY2010 Budget: *Analytical Perspectives*; and PHMSA Strategic Plan: *How We'll Manage Our Work*).

- *There are several "invisible risks"* (within our statutory authority but not necessarily regulated) where we have little/no risk data—for example:
  - LNG facility incidents (exempt from incident reporting, subject to change in a proposed rule),
  - hazmat incidents in the maritime mode (particularly in intermodal containers),
  - certain low stress pipelines in rural areas,
  - bulk loading and unloading of rail tank cars,
  - non-jurisdictional failures that are tied to jurisdictional pipeline systems,
  - exclusion of state/local governments (e.g., highway maintenance) from one-call reporting,
  - failures of DOT packages, cylinders, or containers "outside transportation,"
  - tank truck wetlines (not coded),
  - gas pipeline master meter operators,
  - LP gas systems,
  - hazmat response preparedness and effectiveness,
  - greenhouse gas emissions (all releases) from pipelines,
  - environmental effects from hazmat releases, and
  - hazardous "materials of trade."

> **Invisible risks** … are non-self-revealing problems—issues that either by conscious design or by a quirk of their nature are not adequately represented in the organization's process workloads. These problems do not present themselves; if an agency wants to control them, they must first deliberately uncover them.
>
> **The heart of the analytic challenge** for invisible risks is to help agencies avoid the circularity trap, in which they fish in the same parts of the river day after day because that is where they caught fish before.
>
> - *The Regulatory Craft* (Sparrow, 2000)

In some cases, we have explicitly exempted certain operations from reporting; in other cases, we might not have fully considered the potential risks or the benefits of casting more widely for failure data so we can understand the risks before a big accident occurs. Lacking good data on these risks, we can't quantify the risks or address them effectively.

- *Our regulatory evaluations generally begin too late in the process to affect decision making.* We appear to have reasonably good estimates of the costs and benefits of our preferred approach in rulemaking. In both of our operating programs, we have engaged strong contract support and we have an iterative process to develop and review regulatory evaluations as outlined in OMB requirements. This tells us generally whether our intended approach is economically-viable—as one element of the decision process. However, generally we have developed rulemaking proposals *before* we had a good estimate of costs and benefits, or a real understanding of the *alternatives* that might address the risks. The proposals have become the preferred alternative by default. Across several rulemakings in both programs, our regulatory evaluations have served to justify the decisions we have made rather than as an input into the decision making process. Both operating programs have recognized this gap, and have acknowledged the need to demand earlier input into the process.

- *We don't know what our rules cost or what benefit the public gets* because we don't assess the *actual* costs and benefits after implementation. Section 610 of the Regulatory Flexibility Act requires agencies to review certain regulations within ten years of their adoption. But the scope of this requirement is limited, and in practice our evaluations under Section 610 are limited. At the same time, this might be one of the easiest kinds of program evaluation we could do; we have a clear "before" picture and estimates of what we expected to happen. Retrospective analysis could help us redirect programs where we found unexpected consequences, refine our estimates for future benefit-cost analysis, and generally better understand what's happening in the regulated industry.

- *We sometimes frame our questions about risk in overly general ways* (e.g., "we need to find out everything we can about the risks …"). This approach can lead to "slicing and dicing" the data, producing analytical results or simple tabulations that are disappointing and not very useful for decision making. Some extensive compilations of hazmat statistics and some targeted analyses of particular hazmat risks reflect this problem. The common theme seems to be this: decision makers often aren't sure exactly what they need to know about a problem until they begin to explore it. This can be perceived as a "bring me a rock" approach, which seems inefficient. It actually reflects *a shortcoming in our analytical capacity*.

> *The objective is not to produce research; it is to produce insight with a view to action.*
>
> *- The Regulatory Craft (Sparrow, 2000)*

An analytical-deliberative approach to risk evaluation requires a partnership between decision makers and analysts to help formulate the questions in a way that they can be analyzed effectively (*Understanding Risk*, NRC Committee, 2000).

- *Over the years, we have assumed most of our programs are effective (or not effective) with no clear analytical basis for that assumption*, and—from recent evaluations—substantial evidence that some of our assumptions were wrong. Of course, program managers have a strong advocacy role for their programs, and conventional wisdom exerts a strong pull. At the same time, there are strong incentives in government to change our processes and create new initiatives.

  Well-run programs reflect a curiosity—even a skepticism—about program effectiveness that can drive continuous improvement while tempering the impulse to abandon existing programs without understanding their value. There is certainly a growing awareness of this need within the agency. But our resources and capability for credible program evaluation still lag. This also presents a risk at the front end as we undertake new initiatives ...

- *When we design/implement new programs, we build-in limited capabilities for evaluation*. We often pilot test new approaches to assess workability, and build in data collection to assess implementation. These can provide useful checkpoints. But generally we do not build in the performance measures and data collection we would need to evaluate effectiveness and impacts.

  The hazmat safety program uses re-inspections to re-assess compliance. The pipeline integrity management program uses inspection and other data to track implementation. But neither of our inspection programs includes, for example, a random component (like comprehensive IRS audits). The principal value of random audits is that they provide information about types of non-compliance that existing targeting strategies miss (Sparrow, 2000). Generally, we are not anticipating this sort of program evaluation.

- *We lack some of the analytical skills/expertise needed to focus our data collection.* For example, our compliance program fundamentally is aimed at influencing *company behavior*, but we have no social/behavioral scientist positions in the agency to help guide our efforts (and particularly our data collection). Our regulatory evaluations are aimed at evaluating the costs and benefits of alternative approaches, while we have no economist positions to guide/evaluate the work of contractors or provide feedback into our data collection. We have almost no professional experience in the specialized discipline of program evaluation, and no positions requiring these program evaluation skills.

Translating requirements into *analytical needs*:

No data system can answer directly the program questions we might ask—that is a function best done by program analysts who understand how to gather relevant data, interpret the data to provide meaning, analyze the data to produce program information, and present the data and analytical findings for use in decision making. This suggests an important translation function that needs to be in place in order to clarify the concepts and get the right data in the first place. Without it, we have no analytical framework for developing data requirements, and the resulting data are unlikely to be useful in answering important program questions.

The *Guidelines* suggest translating basic information requirements into indicators that need to be measured. But the more general need here is to bridge the gap between general information requirements and detailed data requirements. This is a critical process in the life cycle of data quality. At the same time, we have been lacking a core analytical capability for many years, so there is effectively little communication between decision makers and data collectors.

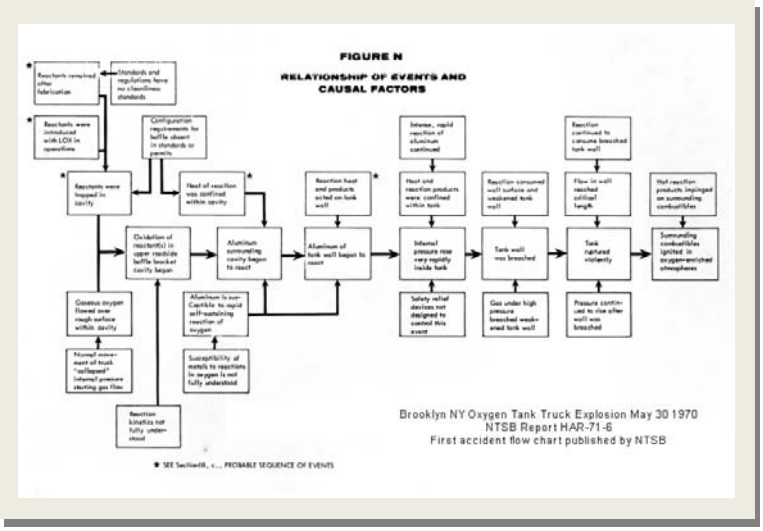
- *The requirements documents that we have for our information systems are far too complex* for managers to understand their significance, and they don't really bridge the information needs to data needs; they generally address only system performance requirements. In system development, we tend to go from broad outlines of need straight to data base design.

- *Our data systems don't provide a place to capture all the latent conditions that lead to accidents.* Social science research over the last 30 years has highlighted the depth of interactions between human and organizational factors that contribute to major accidents. In *Managing the Risks of Organizational Accidents (1997),* James Reason explains:

  > *"Latent conditions are to technological organizations what resident pathogens are to the human body. Like pathogens, latent conditions—such as poor design, gaps in supervision, undetected manufacturing defects or maintenance failures, unworkable procedures, clumsy automation, shortfalls in training, less than adequate tools and equipment—may be present for years before they combine with local circumstances and active failures to penetrate the system's many layers of defenses. Latent conditions are always present in complex systems."*

  In fact, we often look for and *find* these latent conditions in the course of our business. But we don't convert them into *data* at the point of an incident investigation or inspection.

- *We don't have a good conceptual model for understanding failures.* We don't capture *the chain* of failures, including especially the root causes, that typically are associated with any accident or incident; we don't capture all the relevant circumstances and interactions that might (through statistical analysis) reveal hidden explanations; we don't capture inspection deficiencies in a way that would allow us to tie together our inspections and accident investigations—by getting at common explanations for failures. Most analyses struggle with the data to find patterns and meaning, but they are severely limited by the basic conceptual models.



The risk literature provides several possible models to consider. In *Barriers and Accident Prevention*, for example, Erik Hollnagel describes three of these models—sequential, epidemiological, and systemic accident models—and discusses their relative value in helping to understand failures with a view to action. Without a complete picture of causes and circumstances, we don't understand the full extent of the problems (e.g., human error, corrosion, etc.) or the interrelationships of causes, and we have greater difficulty identifying critical control points and targeting the risks effectively. The solution to this is not at all trivial, and might include both data structure and narrative. But this is probably a major risk in our data quality, with potentially broad implications.

- *Our primary outcome measures do not really reflect changes in risk over time*. The numbers are now too small to find meaningful patterns in the data. We must also deal with the natural tension between the need to monitor outcomes and the desire to attribute outcomes to what we do. We have begun work to make better use of our data—to identify risk factors that might be used to better monitor risk, but performance measurement "presents formidable intellectual challenges that have never been solved in a way that provides clear guidance to practitioners" (Sparrow, 2000).

> *Outcome data provide an unreliable indication of a system's intrinsic safety.*
>
> *This is especially the case when the number of adverse events has fallen to some low asymptotic value around which small fluctuations … are more noise than signal.*
>
> *- Managing the Risks of Organizational Accidents, Reason (1997)*

- *We have little data that might be used to identify emerging risks or leading indicators* of performance. Incidents are often considered to be lagging indicators, in the sense that they tell us what has already happened, while people want to understand what is likely to happen in the future so we can target these risks effectively. This might include a turning point in company performance or investment, a new risk from new materials or processes, or a change in external factors affecting the systems.

  It's a significant challenge to anticipate these risks. One of the tools we have is situational awareness—watching carefully for trends and using professional judgment to focus attention. For this to work well, it's important that we translate *individual* learning into *group* learning (by sharing lessons learned, which we do), and ultimately into *organizational* learning (by turning judgment into data where possible, which we don't really do in any systematic way now). With both failure data and risk exposure data, a set of statistical indicators might provide early warning of risks that could help in managing program priorities.

- *We have limited data on risk exposure*, making it very difficult to identify and evaluate relative risks. NTSB, in its report on *Transportation Safety Databases* (September 2002), highlighted the need for exposure data in understanding risk. Exposure data can be useful also in helping to forecast changes in risk, and comparing safety across modes. In pipeline safety, we have some exposure data with the identification of high consequence areas, but some challenges in matching product

throughput with location. For hazmat safety, better commodity flow data—including route information—could be helpful especially for response planning.

- *We don't have a good way (yet) to characterize low-probability, high-consequence risks.* Many kinds of risks we can see in our incident data over a baseline of about 20 years. They occur with enough frequency to allow us to estimate future frequency with some confidence. We can't do this with Low Probability High Consequence (LPHC) events; by definition, they are infrequent. More importantly, we simply don't accept any realistic probability of a *very* high consequence failure. This is a key area where the standard risk model does not work for us, and where historical data cannot provide an adequate baseline.

  While we recognize this problem generally, our analyses often mischaracterize LPHC risks by projecting directly from incident histories. Some recent regulatory evaluations provide some examples of how we might do this better. We need to identify outliers in the data (e.g., the consequences of Hurricane Katrina in 2005) and spread out the effects of these over a longer period of time, and we need to estimate the probability and consequences of events we can envision but that *don't* appear in the data, and add these into our analyses.

Defining *data needs*:

Data collection is expensive. We cannot collect all of the data we might ever want or need, so we need a systematic process for prioritizing what we will collect—tied to our analytical needs. We have a lot of experience in developing and refining our data needs (despite the lack of clear analytical needs). In practice, this has become largely an incremental approach to modifying the data we already collect.

Data needs should include requirements for accuracy, timeliness, comparability, etc. Errors at this stage of the process can result in significant data gaps or, conversely, significant costs that are not justified.

- *Our failure data focuses on the top layer of a much larger pyramid*—we record 60 excavation damage incidents/year while operators record over 100,000 excavation-caused leaks on pipelines; we have data on fewer than 100 lithium battery failures aboard aircraft over 17 years, while these batteries spend a miniscule fraction of their lives aboard aircraft (i.e., there must be thousands of battery failures); we record 17,000 hazmat incidents/year while most hazmat spends a small fraction of its life in the transportation system; we have no data on close calls (or near-misses), which are believed to represent from 10-to-1,000 failures for every one injury incident.

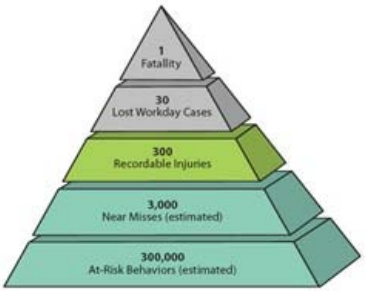


Figure 1 - From ConocoPhillips Marine (2003)

  Small numbers make it difficult to detect meaningful trends or prove the effectiveness of our programs. At the same time, we are missing information about many of the precursors to larger failures. Other safety agencies (FAA, Coast Guard) have recognized the value of near-miss reporting systems and expanded collection of failure data, including the possibility of finding out *what prevented* many failures from becoming more serious incidents. There can be a significant

costs and challenges in expanding our data collections, and there are important differences in the operating environment in different modes that need to be taken into account. But there are also potentially valuable opportunities in expanding the scope of the data we consider in risk evaluation.

- *Our incident reporting criteria are not based on an analytical accuracy requirement.* We use different incident reporting criteria across our programs without a clear *requirements*-based rationale for the difference. Both programs average about 10-20 deaths per year, but we collect 17,000 incident reports for hazmat and fewer than 1,000 reports for pipelines, based on independently-developed reporting criteria. For hazmat incidents, any unintentional release must be reported; for pipeline incidents, reporting requirements are based on the amount released (5 gallons or more) or severity of consequences (death, injury, damage >$50,000). From an analytical view, we need enough data to determine patterns in risk with reasonable confidence—an accuracy standard that should drive our choices for data collection.

  This issue is complicated considerably by other data accuracy issues (discussed in other findings), including significant underreporting of some incidents, bias in reporting from the regulated industry, changes in the dollar value of lost product from pipelines, and weak coding schemes that don't help us answer the most critical questions. Both programs are in the process of reviewing the reporting criteria in ways that might bring them more in line with each other, but these other issues need to be addressed as well.

- *We don't capture some of the most important incident consequences in a useful way.* For example, we distinguish the severity of injuries based on in-patient hospitalization, but this is not sufficient to estimate the potential benefits of new programs in our regulatory evaluations. We collect data on estimated costs associated with property damage and emergency response, but (for liquid pipelines) this has been limited to costs reimbursed by the operator; this limitation, in fact, is inconsistent with the basic reporting criteria, and results in an underestimate of total damages. The problem would be corrected with new reporting forms that have been proposed, but even so we will have a data comparability issue with the data we have collected through 2009.

- *We don't capture consistent data on some key risk factors like fire/explosion.* For hazmat incidents, we require reporting (with some key gaps, described previously) for every unintentional release. For each of these releases, we ask for information on the presence of fire or explosion. And from an analysis of these data using conditional probabilities, we have found that in the highway mode, the presence of fire alone increases the probability of death or major injury by a factor of 340-to-1 (34,000 percent). This is an astonishing number, and potentially very useful in targeting intervention strategies. We can't do this same analysis effectively for pipeline safety, because we

Conditional Probabilities of death or major injury, given two risk factors

Highway Mode	Ignition	No Ignition
Gas Dispersion	16.67 %	1.70 %
No Gas Dispersion	22.60 %	0.07 %

don't capture the first condition—a release—or the second condition—a fire—consistently. The reporting criteria for pipeline incidents depend on the consequences, which of course are affected by the presence of fire/explosion in the first place.

- *Our treatment of the human element is particularly ambiguous as a causal factor in incidents*. The human error literature provides ample evidence that human error itself is not a useful way to characterize cause. Nearly every failure can be traced to human error at some level. At the same time, there are always other factors and circumstances like time and operational pressures, organizational culture, system design, clarity of procedures, etc.

> *The adaptability and flexibility of human work is the reason for its efficiency. At the same time it is also the reason for the failures that occur, although it is never the cause of the failures.*
>
> *-Barriers and Accident Prevention (Erik Hollnagel, 2004)*

In the pipeline safety program, incorrect operation is one of eight cause codes, and (according to the instructions for reporting) it can include human error or faulty procedures; at least two other cause codes (excavation damage and other outside force damage) might also involve human error, although the data won't show this further level of detail. In the hazmat safety program, human error is one of 37 cause codes, but the concept is embedded in several other codes (e.g., improper preparation, inadequate preparation, inadequate training, overfilled) that suggest individual fault. Over-attribution to the human element can lead to program interventions (like more training) that do not address the root cause of failure.

- *Reporting lags inhibit the effective use of some of our data.* The key safety indicators we track in the annual Performance and Accountability Report to Congress require estimates in October for the previous fiscal year. But we routinely revise and add to our hazmat incident data for months, and on a trickle basis up to several years, after any reporting period. Recent research conducted by program staff has shown that about 10% of the serious hazmat incidents are reported more than four months after the incident. In pipeline safety, annual reports from pipeline operators do not coincide with our planning annual pipeline inspections. Incident reports can be updated many months after the incident occurred (and many months after better information is available). Our own enforcement data can lag for months as a case is processed. In both programs, we have not developed a timeliness requirement and applied it to our data collection and forecasting.

Identifying *data sources*:

If existing data can be found that address (or, with some modification, could address) our data needs, this is usually the most efficient approach to getting data. But we also need to consider the quality, timeliness, comparability, relevance, and utility of the data we might get. And if we use existing sources of data, we need to make sure we have common identifiers (like company ID, for example) to integrate the data with our own data systems. We need to understand the potential biases in data reporting, and the consistency of the concepts (e.g., *what is a shipper*?, or a *failure*?).

The *Guidelines* suggest casting the net widely to consider possible sources of data and processes for collecting it after we have identified data needs. In general, we consider other potential sources of data, but in practice we generally default to the way we have always done it.

- *Most of our data collection relies on third-party reporting from regulated companies.* This is convenient, and it goes directly to the source. It also introduces *serious biases and gaps* in the data we collect. Despite the best intentions and professionalism, the regulated industry has an institutional bias (and probably a liability aversion) in determining the causes, circumstances, and consequences of failures. Accident investigations—the limited number that we do—have shown some significant differences between what a company reports and an objective view of these events. Reports from companies also reflect large numbers of blanks and "unknown" data, particularly in the most serious cases—exactly where it is most critical that we have good data. Our collection of system data (as in the annual reports from pipeline operators) is further constrained by the need to minimize reporting burden on the industry, so much of the data are aggregated to a level that cannot be used in risk evaluation. An alternative approach—collecting much of the data ourselves in the course of our inspections or investigations—has been discussed but never evaluated fully.

  We have ample authority to collect data directly as part of our inspections or accident investigations, but many in the organization see data collection as a distraction from more important safety oversight activities. There is also an ownership issue with the data …

- *There is a historical understanding that the data we get from industry is "their" data.* Even when we believe (or know) data to be wrong, we don't modify our data until we get revised reports from the company. Even now, as we recognize the need for more accurate information, we generally *augment* the data with our own information rather than modifying the basic data in our system. This practice, however, creates ambiguity in the data that analysts might use, expand the opportunity for misinterpretation, and doesn't really solve the problem.

Autonomy and Independence as Constraints on the Regulatory Process

Regulators, for their part, attempt to penetrate the boundaries of the regulated organizations by requesting certain kinds of information and by making periodic site visits. But these strategies can only provide isolated glimpses of the organization's activities. Size, complexity, the peculiarities of organizational jargon, the rapid development of technology and, on occasions, deliberate obfuscation all combine to make it difficult for the regulator to gain a comprehensive and in-depth view of the way in which an organization really conducts its business …

In an effort to work around these obstacles, regulators tend to become dependent upon the regulated organizations to help them acquire and interpret information. Such interdependence can undermine the regulatory process in various ways …

- Managing the Risks of Organizational Accidents (Reason, 1997)

The data we disseminate for analysis should reflect our best understanding of reality. We can certainly keep a separate file of reports that have been submitted by companies if anyone wants to see those (under FOIA or otherwise), but we should differentiate *reported* data from *agency* data and encourage analysts to use agency data that we can vouch for. We don't need to disseminate a data base of reported data; those data do not meet DOT's information quality guidelines.

- *Our own independent accident investigations are very limited in number and scope*. We have completed 19 investigations (about 3%) of the 664 reported pipeline incidents in 2008, and about 40 (or 0.5%) of the 8,000 reported hazmat incidents over a six month period in 2009. More generally, the information we get from our investigations is not converted into data that could be used for statistical analysis or engineering reference. We often collect more data during the course of an investigation than we require in the incident report from an operator, but this information does not get entered into any data base. It appears to be collected primarily for enforcement purposes related to individual companies, not to build our knowledge base. Hazmat investigation reports, in particular, are almost indistinguishable from inspection reports—both use the same form, and both are focused on the identification of violations. The incident is simply a *trigger* for an inspection.

- *Our processes do not effectively reconcile discrepancies between our investigation reports and the accident reports submitted by operators.* The discrepancies can be significant. In one case, a pipeline operator reported $0 damage (and that is what we showed in our data); the investigator reported lost product, a fire, and an estimated $588,000 in property damage, but the data base was not updated or corrected until 9 months after the incident. In other cases, the data base was not updated to reflect design pressure, operating pressure at the time of the accident, or year of installation—from the more detailed investigation reports. These discrepancies are just from a cursory review of the 10 most recently closed cases.

- *We have difficulty integrating data* from police and fire department reports, reports to the National Response Center, data from CDC, and many other systems. We can't easily use the data from most other data systems because we lack common identifiers (in many cases), and many of these external systems are not sufficiently transparent to allow us to understand their limitations. These are common problems in safety programs government-wide, and data integration is often encouraged as one of the best ways to leverage resources. But we still don't know about all the relevant systems that might be out there; we regularly find other systems through serendipitous interactions with other agencies and organizations.

Designing the DB—*data elements and relationships*:

A strong data architecture—defining standards for data elements; what values are allowable; how data elements, records, and files relate to one another—is the first technical step in creating a *useful* data base for analysis. One of the biggest challenges in data base design is ensuring consistency or comparability of data, especially with changes over time or with data that are collected through different systems. Comparisons are the essence of measurement and analysis. Good standards can help provide the basis for comparability.

The IT program review completed in 2008 identified a series of projects to strengthen our information architecture, including the need for a data architecture and management plan and a strong technical architecture. This was aimed at helping overcome many shortcomings in our data.

- *We often have built new data systems to meet pressing requirements without a view toward integration* of these systems with our existing data. The pipeline safety state grants program has a self-contained application and data base for state pipeline safety activities; it was not built with the same data architecture as the system we use for Federal pipeline safety activities. Data bases for pipeline safety integrity management inspections and the hazmat information center illustrate the development of prototypes that have become production systems, without a common data taxonomy and with non-standard technologies and tools. As a result, these data bases have sometimes proven difficult to reconcile/use with other safety data. There are legitimate program needs for rapid solutions that cannot always be met with existing data systems. But there is a missing data architecture that could provide the basis for standardization and smooth integration.

> *The most valuable database will be the database of databases, which will grow as analysts accumulate knowledge from a variety of sources …*
>
> *- The Regulatory Craft (Sparrow, 2000)*

- *We cannot accurately and consistently identify companies*—companies often use multiple IDs for different purposes; entities change through mergers, acquisitions, and partnerships; and companies might be related through several corporate layers. We have limited mechanisms in place to track company relationships or changes over time. As a result, we can't measure operator performance consistently or target our resources most effectively based on comparative risks; performance histories are sometimes fragmented.

  The proposed "One-Rule" in pipeline safety includes an attempt to resolve this issue for pipeline operators, but there is not yet a corresponding effort to address it for hazmat shippers and carriers. The Hazmat Intelligence Portal, for example, returns 165 companies from a search on "UPS." As a result, performance histories can be fragmented and misleading. We have incomplete data on shippers, because the hazmat registration program was not designed to capture all shippers (many/most are exempt). For motor carriers, in particular, there is an even broader problem of multiple DOT numbers issued to the same company—limiting our ability to assess the fitness of operators from FMCSA safety data.

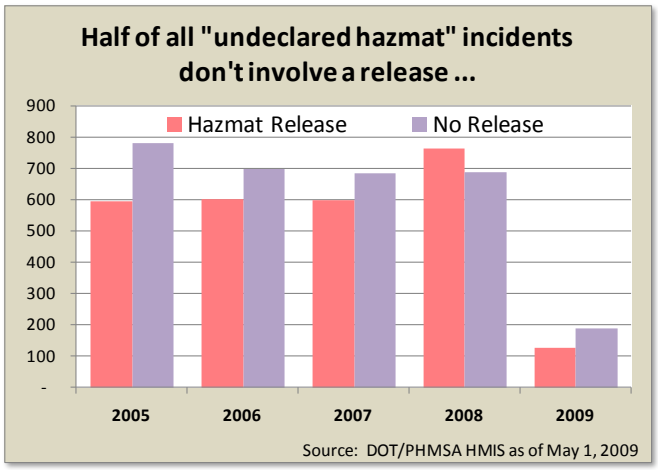
- *Inspection deficiencies are not captured in a way that can be tied to the causes of incidents/failures.* Deficiencies are coded to capture the regulation that was violated; they are reflections of *non-compliance only*, and we don't collect data on other safety weaknesses (e.g., all the kinds of latent defects and safety culture issues identified previously). Incidents are coded to capture the component that failed and the general cause of the failure; there is no direct data connection with the regulations or non-compliance. "Without an ability to connect process indicators (safety deficiencies) with outcome indicators (failures), we have limited ability to impact outcomes by regulating processes" (Von Hermann, 2007).

- *Incident cause codes cannot deal effectively with multiple failures or sequences of failures.* Hazmat incident reports permit entry of multiple cause codes, but these are not tied to what failed, how it

failed, or in what sequence; they are simply listed, and often in duplicate within a single record. Pipeline incident reports permit only a single primary cause with one additional level of explanatory codes (e.g., corrosion – internal or external).

- *Hazmat incident data can include multiple records for each incident.* In cases where an incident involved different commodities or multiple tank cars, the incident data base includes a separate record for each release. Given the design of HMIS and technology limitations when it was developed, this was probably a reasonable compromise to make sure we got data for each failure. But it can result in misleading tabulations or analyses if an analyst is not familiar with the way records relate to incidents. There are alternative data base designs that might be explored, and/or better metadata might be provided for analysis.

- *Hazmat incident data are compromised by the inclusion of some violations that are not "incidents" in the common understanding of the term.* In 2005, incident reporting criteria were modified to include the discovery of undeclared hazmat. These now comprise about 8% of the total reported incidents in our data base, although about half of these do not indicate a release of hazmat or any other criteria for incident reporting—no deaths, injuries, property damage, fire, explosion, evacuation, closure of a transportation artery, or any other consequences. The inclusion of these data here increase the potential for error and misleading conclusions in conducting safety analysis.



- *We don't capture data from states in a form that is comparable to the federal program*—limiting our ability to evaluate the effectiveness of state pipeline safety programs or operators and systems that are inspected by states. States use our data systems when they are acting as interstate agents for pipeline safety, but this represents a small fraction of their work. They do not report their inspections of intrastate gas pipeline operators with any detail (they report the number of inspections conducted). As a result, we have very limited information about the condition of 80% of the national pipeline system—where about 80% of the incidents involving death/injury occur.

Designing the data collection—*forms and instructions*:

The forms and instructions for capturing data provide the outline of what we expect, a visual reflection of the logic, and interpretations to help clarify what we want. Good data collection instruments help minimize errors and missing data by making the process easy. They are communication tools that can have a high, direct impact on the quality of data.

Data collection methods need to be appropriate to the complexity and size of the data collection, data requirements, and the amount of time available. The *Guidelines* suggest electronic reporting where possible, logical sequencing of the data, minimal need for calculations or conversions by the reporting source, clearly posted procedures, and tracking processes. This stage of data quality is one where we have invested considerable time/attention, and have fairly good systems set up.

- *Reporting forms and instructions are generally clear, logically organized, and posted online*. The PHMSA website clearly points visitors to the reporting forms. The forms appear to walk through the data we have asked for in a logical sequence.

- *Electronic reporting has increased significantly, and helps automate edit checking*. About 50% of hazmat registrations and incidents are reported online; another 40% of hazmat incident reports are provided in machine-readable form. Most pipeline incident reports are filed online (about 95% for hazardous liquid, 65% for gas transmission, and 40% for gas distribution pipelines), and we have proposed mandatory electronic reporting. In both programs, we also use these same systems for entering data from paper forms, to take advantage of the built-in edit checking.

- *Summary data on pipeline systems (in the annual reports from operators) requires aggregation* of detailed data—generally asking for the total number of pipeline miles with certain characteristics (e.g., by year of installation, coating, cathodic protection, diameter, onshore/offshore, miles inspected, etc.). Aggregation reduces the volume of reported data dramatically, but introduces opportunity for error and—more importantly—sacrifices the ability to see combinations (e.g., coated, cathodically-protected, installed in the 1970s) that might be useful in evaluating relative risk. As a result, we do not have exposure data at the same level of resolution that we capture in incident reports. Getting these data through GIS systems, which many companies maintain, might provide the cross-sectional data that would be most useful.

- *We have limited processes for tracking the status of reports*. Pipeline incident reports can be filed as original, supplemental, or final, but there is no requirement that reports ever be finalized (and some companies have refused to do so) and no tickler to track this. For more significant incidents, regional review teams follow up with the operator to address potential errors in incident reports that are flagged in our edit checks; a system tracks the review process, but there are some inconsistencies across regions in how this is used. Hazmat incident reports can also be filed as an original or update, but there is no followup tracking after the first report is filed. Hazmat registration includes followup in subsequent years, but this is used only for the purpose of generating reminder letters, not tracking submission.

Capturing the data—*what's happening*?

At some point, observations become data. Ideally, the data reflect accurately what is really happening. In practice, there are all sorts of things that can go wrong at this stage—

errors (or omissions) in measurement, misunderstanding and biases affecting what we observe, memory failures, missing evidence, errors in communication, etc. We are relying on people here, and people are notoriously poor witnesses. Company procedures can add another layer.

The *Guidelines* suggest formal training for observers. Where our own inspectors or investigators are collecting information, we provide some fairly extensive training in how to look for things. But most of our data come from third-party observers (or collectors)—mostly from the regulated industry—and this presents some special challenges.

- *There is a natural, inherent bias in reporting from the regulated industry.* When most failures result from multiple causes and operators are asked to report one, or when the primary cause is ambiguous, it would be natural to report the failures of others or natural forces first. When legal liability is at issue, it would be natural for operators to be more cautious in reporting "facts" when they can choose "unknown" or leave a data field blank. It would also be natural for operators to choose the low end of an estimate of a release and the high end of an estimate of recovery. These would not be not false reports, but they might not be objective representations either. We have very little research to help estimate the extent or magnitude of reporting bias, but some clear indicators that it exists.

- *Even when we do accident investigations, we generally do not develop the root causes of these failures*—despite extensive training (in the pipeline safety program, particularly) in root cause investigations. In reviewing the ten most recent investigation reports for each program, only one (an investigation of multiple hazmat incidents) provided any insight or conclusions on the root causes of failures.

- *We capture only limited data from our inspections.* During the course of an inspection, we might observe many things worth commenting on but not rising to the level of a violation—maintenance issues, clarity of records, concerns about training, etc. This presents a useful opportunity to build a broader performance profile, to capture the kinds of little failures that sometimes lead to bigger failures, even to help create leading indicators or a body of good practices. But—except for Integrity Management inspections—we don't capture the broad range of inspection findings as data. We haven't set up our data systems to create a home for the data. As a result, we have limited ability to rank operator or system performance from our inspection data.

- *Inspections also present an opportunity to capture more data on the systems we regulate*. The annual reports from pipeline operators provide only very aggregate information on their systems, with no information on any cross-section of pipe. During our inspections, we often have this information available to us, and we could use it to build a more detailed system profile for risk evaluation.

Processing raw data to prepare *reports*:

Processing raw data and preparing reports might appear to be simple, straightforward steps with limited opportunity for problems. But when we rely on the regulated industry for so much of our data, there is

a decision point here with some substantial consequences—by choice (or omission), much of the data we should get is not compiled into reports and sent to us. This creates significant data gaps. And when the missing data is not random, these gaps can create a substantial bias in the data affecting the basic reliability of our estimates and the soundness of our safety decisions.

- *Incidents might be substantially under-reported*—preliminary analysis of hazmat incidents suggests we might be missing 60-90% of all reportable incidents. Some of these missing reports might be the result of a lack of knowledge about the reporting requirements (these tend to be smaller companies); some might be the result of a decision to avoid reporting. The effect is the same. The most troubling aspect of this is that the missing incidents appear to be *different in kind* (different patterns of causes, circumstances, consequences, etc.) from the reported incidents, so projecting from what we know might be giving us a *distorted* picture, as well as an incomplete one. We believe we have much higher reliability of reporting for pipeline incidents—since pipeline operators comprise a much smaller, identified universe—but we don't have an analytical basis to demonstrate this.

Incident reports are often missing important data. A significant number of reports indicate *Other/Unknown* causes—and the prevalence of these causes is higher for the most serious incidents—exactly the cases where we need complete and accurate data most. Program staff suggest that concerns about legal liability could be motivating operators to limit their reporting in these cases. But here the missing data are not random. So the resulting data and the patterns we might find in our analyses are likely to be biased and misleading.

An analysis of blanks in our pipeline safety accident data shows that over half of the fields where we are expecting data included at least some blanks. We are missing 2.3% of all generally-expected data, and 6.8% of all conditionally-required data (e.g., if "Other", explain). Many of the blanks might simply reflect a lack of available information; they might reflect difficulty understanding what we're asking for; and in some cases, they might reflect zero values (e.g., no property damages). But our data don't differentiate between "unknown" values and "zero" values. Part of the problem here is that we don't have enough information to help analysts interpret the data we get.

- *Late incident reports compromise our performance reporting and time series analyses* for hazmat safety. In past years, our annual performance report to Congress has included multiple revisions to prior year hazmat data, and our monthly reports to agency leadership typically include revised data for up to (and sometimes more than) a year. The data are never considered final. This results in chronic underestimates of recent risk data.

- *We're missing an unknown number of pipeline safety-related condition reports* because we have exempted the reporting of any safety-related condition that is corrected by repair or replacement in accordance with the applicable safety standards before the deadline for filing the report. That makes sense if the purpose of the report is to identify problems where we might want to intervene to correct the situation. It seriously limits the value of the report as a window into safety weaknesses we might need to know about. We don't know what we're missing.

Reporting data to PHMSA—*transmission*:

Getting data to us is a small step in the overall process, and one that generally doesn't affect the accuracy of the information. We continue to receive some paper reports, by mail and fax. But electronic filing is increasing substantially, so it should be getting easier to transmit reports. Still, there are at least two minor data quality issues associated with transmission of data.

- *Electronic filing requires manual entry of data.* Many larger companies have their own systems for capturing failure data, but we do not yet have XML processes for accepting pipeline safety data directly (we do for hazardous materials safety). As a result, companies must manually transcribe and submit the same data to PHMSA in another form. This increases the opportunity for error, and imposes a reporting burden that might be reduced with a technical fix.

- *Paper reports are commonly mailed to the agency*—probably with substantial delay (and an unknown risk of loss) associated with the X-ray process for our incoming mail.

Entering/editing the data—*quality control*:

Data editing is probably the most familiar step in managing data quality—the one that many people think of first in any discussion of quality. Edit checks are certainly important, and they are relatively easy to develop and implement. This can help control the entry of invalid data (e.g., text in numeric fields, numbers outside the possible range, mismatches between county and state, formatting errors). It can also help reduce missing data by flagging blanks and/or missing reports.

The *Guidelines* suggest a checking process to reduce missing reports, identification of critical/required data fields and follow up on these missing data, development of standard coding schemes for data, separate values to distinguish zeroes from unknown information (not blanks for both), an automated editing process to reduce errors, and publication of editing statistics. To deal with missing data, the *Guidelines* suggest adjusting the data with weights or imputation to reduce bias in the data, and analysis of the effects of missing data.

- *We make limited use of other data sources to help reduce under-reporting.* The hazmat safety program regularly screens media reports, complaints, information from emergency responders, and reports to the National Response Center to identify potentially unreported incidents. In 2005, for example, this process found an additional nine fatal incidents—75% more than were reported to PHMS directly. However, this created an anomaly in the data for 2005, and followup on these incidents was suspended for several years as a result. There is no corresponding program in pipeline safety. Reporting from pipeline operators is believed to be more reliable, since it is a much more concentrated industry, but a review like this could help quantify the reliability of reporting (and is suggested in the *Guidelines*).

- *Both operating programs have developed edit checking procedures to reduce blanks and errors.* Hazmat incident reports are run through an automated edit process to detect some kinds of basic errors, and flagged items for the more serious cases (involving death, injury, or evacuation) are

followed up by phone to verify the data. Hazmat registrations are processed directly by Wachovia Bank (which also processes registration fees); we have no information on their quality controls. Pipeline incident reports are run through a separate automated edit process to detect errors and flag them for review by region review teams and follow up with operators.

- *In practice, the quality of edit checking is mixed*. To test online reporting of a hazmat incident, we input several clear errors or inconsistencies that were caught and some that were not; found some areas where the valid entries were not accepted; and encountered some error messages that were difficult (or impossible) to correct. The interface was reasonably clear, although many terms and acronyms might require reference to the instructions, and error messages were not shown alongside the data in error. Individually, these issues appear to be relatively minor; collectively, they seem to add to the burden of reporting and tend to compromise the quality of data we get.

- *Our edit checks don't address all of the missing data.* An analysis of blanks in pipeline safety accident reports from 2002-2009 found that many fields were blank in at least some reports. Blanks present an interpretation problem for the analyst. Not counting these reports assumes that the remaining reports are a representative sample, and that might not be the case.

- *Our data bases generally do not distinguish zero values from unknown values*, because we don't usually get that information from the reporting source.

- *Our data include a large fraction of "other/unknown" values for incident cause*, particularly in more serious incidents—exactly the cases where we most need good data. In many/most cases, we get amplifying information about "other" values, which could be used (and have been used) to distill new codes. The prevalence of unknown values might be reduced with increased investigations.

- *We do not make any adjustments to the data to account for missing data.* For these kinds of data, where we expect 100% reporting, it probably does not make sense to impute missing values. But it might be very useful to evaluate the extent and effects of missing data. The results could be used to help target data collection improvements, and to help analysts understand the limitations of the data.

- *We don't consistently and promptly reconcile our data* with the [presumably better] information we obtain through investigations—including NTSB's or our own. One of the major hazmat incidents over the past 10 years—a rail accident at McDona, TX in 2004—resulted in $5.7 million in property damage, according to NTSB's report on the incident; our data base shows $0 in property damage. In one of three pipeline safety investigation reports reviewed as part of this assessment, the investigating officer found $588,000 in property damage; the operator reported none, and our data base showed none for nine months.

- *We don't regularly monitor data quality indicators*. It is arguable whether the number of blanks we see in the data is a "good" sign (so few) or a "bad" sign (so many). The more important point is that we are not regularly measuring this and evaluating the overall accuracy of the data we have. We invest substantial resources in improving the accuracy of our data (particularly with region

reviews in pipeline safety, and generally with all of our edit checking). But we do not track or publish statistics from our edit checking, and we don't retain this information for analysis. From a management perspective, it would be helpful to know how much these efforts *change* the quality of our data. We could be over-investing in report-level accuracy compared to the more general problems with data gaps.

Documenting the data program—*metadata*:

Data documentation provides the "instruction manual" for analysts to help interpret and use data correctly. Analysts need information about how the data are collected, what the data elements mean, how the reporting has changed over time, how the data have been edited, and where there are known data quality issues. Without this documentation, there is a high risk that analysts will develop misleading results and that different analysts will get different answers to the same question. Comparisons over time might be invalid. The wrong data might be used. Conclusions might extend substantially beyond the data—misleading decision makers about what the data really tell us.

The *Guidelines* suggest publishing source and accuracy statements for major data systems, and providing detailed file information to accompany data releases.

- *We have no metadata for our major safety data systems beyond simple record layouts* and a description of data details for our safety performance measures. Internally, we rely on institutional knowledge about our data systems, but there are many instances where we have discovered—through peer review, often much later—errors in our analysis because we did not account for the peculiarities in our data collections. The risk for analysts outside the agency (public users of our data) is probably much greater. In peer reviewing a proposed journal article recently, I found extensive errors in the assumptions about our hazmat incident data. Metadata might not prevent this, but it would reduce the risk.

Assembling and releasing *microdata*:

Public dissemination of our data is important in many ways—it provides an authoritative source for public research on safety issues, it makes our program operations more transparent for public oversight and participation, it provides information others can use to make safety-related decisions, and it can lead to corrections which improve the quality of our data. All of these help us leverage our own resources and can make government programs work better.

The *Guidelines* suggest releasing microdata (essentially record-level data) in many accessible formats, accompanied by data documentation (metadata), a clear description of revision information, and a contact point to facilitate feedback.

- *We update the data we release at regular intervals*—daily for hazmat incidents, monthly for pipeline incidents, and annually for pipeline annual reports. This frequency appears to be adequate for most analytical purposes, given the reporting frequencies and lags, and we produce special data

files where we need more timely data for internal analysis. The process for controlling data releases is incorporated into the normal data entry/editing processes—i.e., when the data are considered "good" they are entered into the data base and that triggers release to the public with minimal additional checking.

- *We do not provide data documentation* beyond the data collection forms, instructions, reporting criteria in regulation, and record layout. We have not developed detailed metadata (described previously). Where we have information—for example, changes in reporting over time, estimates of underreporting, supplementary guidance we have given to operators—we have no mechanism for including this with our microdata releases.

- *We provide limited information on data revisions*—for hazmat incidents, we provide the date of the report or update, but we do not flag changes since a previous report. For pipeline incidents we do not provide any information about revisions to the data. This lack of information presents a common problem of competing findings. Analysts can refer to the data-date as a way of clarifying the scope and limitations of their analysis, but without any indication of what has changed when, other analysts would find it difficult to replicate an analysis without a same-day copy of the data.

- *We handle narrative text inconsistently.* Analysts often find the narrative text to be the single most useful source of information about an incident. It was critical in our own recent risk evaluations of wetlines and lithium batteries, and it would be equally useful to others to replicate our analysis or to evaluate other risks. For hazmat incident reports, we remove personally-identifiable information before releasing the data, but otherwise include the narrative description of events in the data we release. In contrast, we remove all narrative text from pipeline incident reports before releasing the data; the data program manager refers to previous advice from counsel for this decision to withhold the information.

- *We could make our data easier to use and help avoid analytical errors* by adding more computed variables in the data set. For example, we might add the total number of fatalities, injuries, and property damage for hazmat incidents (we've seen analyses that misinterpret these data). We could tag TIH materials or any other useful grouping of commodities. For data comparability, we might differentiate which pipeline incidents meet the quantitative reporting criteria vs. those that are submitted because they are significant "in the judgment of the operator." There are undoubtedly many other areas where we might improve the data for analysis before we release it. To some extent this is tied to the direction we take on the *data ownership* issue described earlier.

Computing *statistics*:

Agencies usually are the first to tabulate statistics from their own data, and these tabulations are widely viewed as authoritative sources of data in their own right. Tabulations provide an opportunity to highlight the things we believe are important. This can include, for example, information about the scope and extent of the regulated industry, the causes and

consequences of accidents, and the results of enforcement actions. However, there is at least one special pitfall in tabulating these seemingly straightforward statistics.

We have to compare *apples to apples*. Anytime we are looking for trends over time, we need to adjust the data for inflation, changes in reporting criteria, seasonal patterns, or other similar changes that would prevent an accurate comparison. This is often called "normalizing" the data—to make the data comparable. We should use normalized data, generally, in tabulations, graphs, analyses, or presentations of data when we are trying to show trends over time.

- *Some of our statistical tabulations normalize the data, and some don't.* Tabulations of pipeline safety incidents (posted on our website) provide a particularly good example of how to normalize the data for comparability. By contrast, tabulations of hazmat safety incidents (posted on our website and in the Hazmat Intelligence Portal) do not adjust for changes in reporting criteria (which occurred in 2005), inflationary effects on dollar damages over time, seasonal patterns by month, or incomplete data for a year. As a result, the hazmat tabulations can be misleading.

Assembling and disseminating *statistics*:

We disseminate statistics through the PHMSA website, in publications, and in various forums like public meetings and conferences or workshops. Ideally, the process for assembling and disseminating these statistics would provide enough controls to give us (and others) some confidence that people will interpret them correctly.

The *Guidelines* provide some detailed suggestions for organizing, formatting, labeling, citing, footnoting, and documenting the statistics we release. They also suggest a process for pre-dissemination reviews to help ensure that publications and summaries meet minimal levels of quality.

- *The Pipeline Safety website demonstrates good practices in every aspect addressed in the Guidelines.* On the pipeline safety website, the presentation of incident data is clear, well-organized, and internally consistent. It includes complete source references for others to duplicate the results, good labeling of graphics and tables, appropriate footnotes to clarify the data, and explanations for outlier data. This appears to be a good example of how to do it right.

- *Hazmat safety tabulations, by comparison, are missing many key elements of good presentation.* At the Hazmat Safety website and in the Hazmat Intelligence Portal, the choice of graphics is often poorly suited to the data, and much of the labeling and other documentation are missing. As a result, the data are generally confusing, and the tables and graphics cannot be replicated easily from the data.

- *We have no standard, pre-dissemination review process for the statistics we release.* Each release is managed independently. There is a process for pre-dissemination review of the incident tabulations on the Pipeline Safety website, but this is not extended to other disseminations.

- *Most of the statistics we publish—in tables and graphics—are 508-compliant*; there are limited exceptions in some graphics and pdf files that are not. These have been identified previously by the CIO, who is working with the program to resolve the issues.

- *The data summaries we publish do not differentiate public vs. occupational (or private sector) risk*. We aggregate deaths/injuries affecting the general public *together* with those affecting workers and emergency responders, and we aggregate spills and dollar damages affecting company property with those affecting the general public or rights of way. But the risks are different, and risk exposure is different. Aggregating the data can be useful in some analyses, but it can also present a misleading picture of public risk.

> **A Public View:** *Public vs. Industrial Risk*
>
> **People usually want to know what *their* risk is.** The general public faces certain kinds of risks from pipelines and hazardous materials; industrial workers face other kinds of risks. Adding these together can be misleading. Risk exposures are different, people's knowledge of the risks is different, and the interventions are sometimes different.
>
> *- Evaluating Risk (Feb 2008)*

Interpreting the data—*deriving meaning*:

It's often said that statistics don't lie … but they can be interpreted many ways, and not all of them are useful or objective reflections of reality. It is the analyst's job to derive meaning from the data.

The *Guidelines* suggest involving other concerned parties in complex analyses, starting with the questions that need to be answered (rather than showing all data results from a collection), taking into account how the data were collected and the stability of the underlying processes, and using established statistical methods to distinguish information from uncertainty. In many ways, this echoes the recommendations in *Understanding Risk (2002)*, which suggested an analytic-deliberative process for identifying the questions and helping to guide the analytical effort in the first place.

- *We don't typically involve others (i.e., affected stakeholders) in our hazmat risk evaluations*. We commonly invite others to review/comment on our analyses in draft form, but that isn't the same as involving others at the outset—helping to define the questions, shape the evaluation design and even the choice of measures. The risk here is that our approach can complicate the deliberation process by failing to incorporate others' perspectives from the beginning. This might be more an issue for the hazmat safety program, since the issues can involve so many stakeholders (shippers, carriers, many regulators, public interests) with different perspectives. The National Research Council Committee on Risk Characterization was clear: *"Science alone can never be an adequate basis for a risk decision … risk decisions are, ultimately, public policy choices."* There usually isn't a *right* answer about risk.

- *We often use reported data as though it accurately reflected what actually occurred* – even in the face of contrary evidence. Our regulatory evaluations, for example, summarize our incident data (number of incidents, causes, and consequences) without accounting for missing data or potential biases in the data. This likely underestimates the potential benefits of our rulemaking, and might

result in poor assumptions about the causes and circumstances of failures. By this point in the process, however, it can be a major challenge to go beyond the data we have.

- *Incidents present a tempting—but misleading—measure of failures.* In the past, we have projected some conclusions about risk based on *all*-incidents when we were in fact much more concerned about the safety consequences affecting people (the Secretary's safety goal is aimed explicitly at reducing deaths and injuries). Several analyses have shown that the patterns of causes, circumstances, and consequences for all-incidents are different from those for more serious incidents. More recent studies and performance measures generally make this distinction, and the pipeline safety website highlights the differences. The hazmat safety program has focused more narrowly on serious incidents, but even that definition includes a mixed collection of outcomes that is not tied analytically to the risk of death or injury.

- *Interpreting the data is substantially complicated by the lack of metadata*. Many of the analyses using our data (some we've done, some others have done) have used the wrong data, or have not accounted for changes or known limitations in the data. Fortunately, all of these errors were discovered before the analyses were completed. What we don't know is what we didn't find. Without good metadata, the probability is high that the data have been misinterpreted frequently.

- *Pipelines reflect considerably more stable processes than hazmat transportation.* Pipelines carry essentially the same commodities they carried 20 years ago, and much of the infrastructure in place today was in place then. Changes in risk management approaches might be evolving more rapidly, but the same is probably true for hazmat transportation. At the same time, hazmat transportation involves changes in the technology of what is shipped (e.g., lithium batteries), and in how it is shipped (packaging, four different modes of transportation, etc.). This means that comparisons over time are probably much more challenging with hazmat.

- *Our use of established statistical methods is generally weak—reflecting a broader lack of analytical capacity.* Few of our analyses address uncertainty in any systematic way, even though it is a very large factor in many cases. Few analyses address potential bias or missing data, and very few (if any) have used imputation to compensate for missing data. Analyses much more frequently use averages than distributions, numbers rather than rates, and rolling averages instead of time series models. This is largely just a reflection of the expertise we have. But it can result in misleading conclusions, and our conclusions may lack credibility.

- *Compilations of data that are not driven by a decision need are of limited value*. For example, an analysis of the HMIS data base in June 2005 provided hundreds of tables and graphs, providing breakouts of incident data by mode, year, month, state, hazard class, amount released, causes, amount of damage, and various combinations of these factors. However, most of the data presented all-incidents, when the program focus is on more serious consequences; there was no accounting for underreporting or potential bias in the data; the problem of multiple causes was not addressed; and the graphics (pie charts and bar charts, with no particular sequence in the data) generally obscured seasonal and other potentially important patterns. "Slicing and dicing" the data does not make for good, useful analysis.

Analyzing the data to produce *program information*:

Good analysis can compensate for many of the shortcomings in data quality at earlier stages in the process. At the same time, poorly-planned and poorly-conducted analysis can introduce new errors that degrade the quality of the data, distort our picture of reality, mislead decision makers, and result in unjustified confidence in what we "know."

This stage of the life cycle in data quality brings us nearly full-circle back to the first step—identifying program requirements (*what do we need to know?*). In a well-defined program, we might even already have a picture in mind of what the program information might look like, or at least hypotheses that we could test, as we undertake the analysis. When we lack good program requirements, it is often the analyst that determines (or guesses) what someone else needs to know.

The *Guidelines* suggest a project plan before beginning all but the most simple analyses, with review of the plan by subject matter experts and data analysis experts to help ensure an appropriate focus and methods. Our *Strategic Plan* aims to make good use of information to help reduce risk, and specifically directs that we build a standing analytical capability to strengthen our understanding of risk based on sound data. We are moving in this direction. But we cannot yet claim to have sound data or a strong analytical capability to help guide decision making.

- *Recent analyses have identified many shortcomings in our data*. In a review of about a dozen recent analyses and the data quality issues discovered in the process, we noted lots of missing data, insufficient data models, difficulty in integrating data from multiple sources, data that are difficult to use, and gaps in how we manage data collection (See attached *Data Quality Issues from Recent Analyses*.) More fundamentally, these analyses reflected some big gaps in our analytical capacity.

- *Our approach to analysis is uneven and is not guided by a strategic view*. The pipeline safety program has substantially advanced its analytical capacity over the past two years through the Performance Evaluation Group (PEG). This group was created as a multi-disciplinary team of statisticians, engineers, program analysts, and other research specialties to help bring new insights to the program. By comparison, the hazmat safety program is just beginning to develop a core analytical capacity. Both analytical programs, however, appear to be somewhat disconnected from the needs of the program leadership. Their work is largely self-directed. There is no agreed-upon analytical agenda to guide their work or their priorities.

- *Each of our analyses generally is developed without a project plan*. In one case (an analysis of the risks of carrying flammable liquids by air), the analysis was preceded by development of hypotheses and an approach to testing them. Few other analyses have followed this model.

- *Our risk models use data; they are not data-driven*. In fact, they combine judgment and data in ways that can degrade the quality of the original data.

For example, one part of the Pipeline Inspection and Prioritization Programs (PIPP) was reviewed in 2008 as part of the Inspection Integration initiative—to explore whether we could develop a better data-driven model. The results demonstrated that the core risk model in PIPP tended to underestimate some risks and overestimate others. The review also showed that *a single variable* (recent incidents) within the model was better at predicting risk than the sum of all 10-12 weighted variables combined in the model. The *best* data were overwhelmed by about ten less-important data variables.

The hazmat strategy for prioritizing inspections (and other field activities) is broader in its scope (it prioritizes companies as well as kinds of activities), but similarly lacks an analytical basis for weighting different risk factors. Risk factors are identified through judgment, and weighted by judgment. The pipeline risk model is the subject of continuing research to improve it, and a new model might be released soon; the hazmat model is not (yet) subject to a similar, rigorous review.

The Pipeline Inspection and Prioritization Program (PIPP-1) is used with other information to help set scheduling priorities for standard inspections.	**The National Business Strategy for Hazmat** is used to prioritize field activities based on risk.
How it works: PIPP is a data-based model using 10-12 data variables (like past accidents) that are transformed into nine indexes, which are added together for an overall risk score. The variables were selected using expert judgment, and the transformations that determine the weight for each variable also used expert judgment.	**How it works:** The NBS rank-orders 15 different activities—including several kinds of inspections, investigations, and outreach—and groups these into 5 priority categories based on judgment. Accident/incident investigations, failure analysis, and complaints are judged to be the maximum priority.
Some limitations: *Data*-weighting has been demonstrated to be superior to *judgment*-weighting in predicting future risk, and many of the PIPP-1 variables cannot be correlated with operator risk. PIPP-1 is only 1/5 factors in scheduling inspections; all are judgment-based.	**Some limitations:** None of the criteria for prioritizing activities have been tied analytically (and quantitatively) to differences in risk. High accident frequency, for example, is rated a medium priority, although this has been shown to provide the strongest indicator for pipeline safety.

Presenting the data and *analytical findings*:

In a compelling (and chilling) review of the space shuttle Challenger accident, Edward Tufte has shown that engineers had all the information they needed to demonstrate the risk of launch the night before Challenger exploded, but that their *presentation* of the data was fatally flawed. Presentation is often critical in how others understand what the analyst found. It can also expose weaknesses in the analysis—if it can't be clearly communicated, we have to ask if the analysis is adequate.

The *Guidelines* provide some general direction for organizing information, presenting graphics and tabulations, and describing limitations of the data and the analysis. They also suggest development and use of a style manual.

- *We do not have (or follow) any standard practices in presenting the results of our analyses*. Reports, including graphics and tabulations, are developed by many different groups within the agency, with varying degrees of skill and experience in presenting data.

- *Some of our analyses highlight the limitations of the data and methods; many don't*. The Data Details for the agency's principal performance measures provides probably the most extensive example of a discussion of the limitations of each measure, although even these do not address every limitation. Some of our analyses do not address limitations at all.

- *We rarely quantify the uncertainty in our analyses*, and the uncertainty is often large—which could seriously undermine the basis for important program decisions. This is basic in statistical methods. In some draft regulatory evaluations, we have estimated costs and benefits through many successive computations (each with assumptions) to find a single point estimate without addressing the cumulative error that this might introduce. In these cases, we are presenting conclusions for decision makers without addressing the degree of confidence we have in those conclusions.

Dealing with Uncertainty: *Point Estimates vs. Ranges*

Decision makers need *estimates* of risk. There is no value in waiting for certainty because we'll never achieve it. At the same time, it is often very misleading to provide a point estimate and nothing more. At worst, it could lead to the wrong decisions in cases where it is important to avoid certain scenarios.

- *Evaluating Risk* (Feb. 2008)

- *We have little expertise in presenting quantitative information effectively*. Even professional statisticians—whose livelihood is all about data—often lack the more specialized skill in presenting data for decision making. But it can make all the difference between effective and ineffective *use* of data. We also generally lack the technology and tools to present data effectively, and we make limited use of peer review to help compensate for these gaps.

Using Data – Making decisions and *acting on the information*:

The decision making process brings us to the end-point of data quality, although it is clearly beyond the direct scope of the Data Quality Act and the *Guidelines* published under the Act. This last step is included here because—to some extent—every other step presumes it, and because a gap or error here can make all of the other quality processes moot. The results of our analyses need to be *received and understood* in order to be useful. And we have set the standard ourselves for making decisions based on good data.

The agency's strategic plan envisions a risk-based, data-driven organization where we *use data to help drive program priorities, improve our ability to detect emerging risks and target/focus our prevention activities, and evaluate the effectiveness of our programs to help improve them as a means of reducing risk*. We recognized in the plan that this requires sound data and a strong analytical capability. This does not mean using data *alone* to make decisions; there are many other legitimate factors that go into public policy. It means inquiring, exploring the data, piecing together the best picture we can with the data that are available, demanding analytical input, and being able to explain how the data were used in the decision making process. So we strive to be a data-driven organization, even as we fall short in some ways.

- *We often make program decisions and use data to support them*, rather than demanding data as input for our decision making.
    - We don't use regulatory evaluations to drive our regulatory approach. We routinely have developed an analysis of alternatives *after* we decided on the preferred approach.
    - We don't use safety data to prioritize the regulatory agenda, because we don't have any estimates of the likely costs or benefits at this stage in the process.
    - We modify or develop new programs generally without a systematic evaluation of what we have now, and we don't create baselines or build program evaluation or measures of success into the new program design.
    - We can't use incident data effectively to focus our inspections—to zero in on what to inspect when we get there—because we don't capture failure data from incidents in a form that is very useful for inspections.

> *If those responsible for controlling risks lack the analytic fabric to disaggregate the overall problem into actionable projects, then they cannot work on them intelligently; nobody will know what to do tomorrow—except to do the same things they did yesterday.*
>
> *- The Regulatory Craft (Sparrow, 2000)*

- *We don't use our performance measures to drive our programs*. This might seem like the most basic, high-level use of data in a risk-based, data-driven organization—to start with the key measures of success, set goals, and drive our operations toward achieving our goals. But we don't really do that.

  For many years, our pipeline safety program used the number of incidents as its principal safety performance measure; at the same time, it redirected its efforts in a major way toward integrity management—which was based on the premise that certain kinds of incidents were more important. The IM program *could not have been derived* from our goals at the time; it was, in fact, inconsistent with our goals, but we pursued it anyway because we knew intuitively that it was focused on the right thing.

  The hazmat safety program for many years has used the number of serious incidents as its principal safety performance measure, even though it too reflects a mix of conditions. If we were to actually use this measure to drive our programs, it would suggest a focus on all bulk releases, which constitute about 2/3 of all serious incidents. But there are other risk factors like fire, explosion, and gas dispersion that we can show are much more important factors leading to death or major injury.

- *We don't combine/use both risk and performance data to allocate grants to states.* Both programs administer grant programs to states to help reduce safety risk. The hazmat allocation formula includes several risk-related variables to help target the greatest risks; the pipeline allocation formula does not address comparative risk. On the other hand, the pipeline formula adjusts grant

allocations based on a review of several performance factors; the hazmat formula does not address differences in performance or capability (i.e., need). To target resources effectively, we need information about where the risk is *and* what works in reducing risk.

- *We don't use much of the data we collect.* This is a judgment—a hypothesis that is fairly widely shared and that should probably be explored more fully. Some data might be critical in a future analysis even if we have never used it before. But some of the contrasts between what we collect and what we need are stark – we collect (just in case?) information on manufacturer, model and size of a pump that failed, but we don't have information on the mode or causes of the failure.

- *This might be viewed as a chicken/egg problem*. As a practical matter, we often make decisions without data input because we have substantial shortcomings in our data systems and analytical capacity. These shortcomings, in turn, reflect a lack of analysis and use. However, it's widely acknowledged in the statistical community that the best way to improve data is to use it. Statistical agencies develop strong analytical programs to help understand the data, demonstrate appropriate uses of the data, and provide feedback for improving it. The value of that model probably applies equally to any data program.

Some limitations of the evaluation:

This evaluation is intended to be reasonably comprehensive, as outlined in the *Guidelines* for conducting data quality assessments. This required ranging widely into the processes that might affect the quality and use of safety data. At the same time, this wide range limited the depth we could address in the evaluation. Some of the more significant limitations of the evaluation:

- The assessment does not cover all of our safety data. It generally addresses our incident/failure data more extensively than our system/exposure data, and it does not address in any significant way our mapping data, or the data systems we use to manage headquarters activities (like special permit processing).

- The assessment does not address all the known uses of our safety data. We concentrated more on programs with significant investment of resources—including rulemaking, inspection, investigations, enforcement, and risk evaluations—and did not address use of the data for managing training and outreach programs, or research and development, for example.

- In many areas, the findings are based on a sample of the evidence. For example, we conducted an analysis of blanks in the hazardous liquid pipeline incident data, but not in other sectors; we filed a hazmat incident report to test the online system of reporting and editing, but did not file a pipeline incident report; we sampled the most recent ten inspection and incident reports from each program. We tried to be careful not to overreach the findings beyond the evidence we considered unless we also had evidence that the sample was reasonably representative.

- We did not get input from external users of our data, beyond what we generally know from recent experience. The *Guidelines* suggest getting input from external users, but we believed we needed

to limit the assessment at this point because of time/resource limitations. This might be an important part of the next data quality assessment, and/or part of any followup analyses of specific data quality issues.

- To some extent, the data and processes we evaluated in this assessment have been a moving target, as many initiatives have been underway to improve data quality. This includes (in the pipeline safety program) building logic models to help understand information needs, extensive changes proposed in incident reporting criteria and forms, development of new risk models for targeting inspections, development of new processes and data collection for incident investigations, and examination of the organizational roles and responsibilities for data. We did not fully evaluate these ongoing initiatives to assess the likely outcomes.

- There is always some subjectivity in evaluating programs. We used the *Guidelines* and several other widely-used references to help establish criteria to evaluate against. But judging the seriousness of each weakness inevitably required some judgment as well. To help minimize the risks associated with these judgments, we included many experts in data quality on the review team, we considered the judgments of others in the interview process, we considered the general values suggested in the literature, and we provided opportunity for program review of all draft findings to help ensure factual accuracy and reasonable characterization of the issues. We also included some peer review of the draft report by data and evaluation experts in FRA and FMCSA.

Information Sources used in the Data Quality Assessment

Legislation

1. *Paperwork Reduction Act of 1995* (44 U.S.C. 3504 (e)(3)).
2. *Data Quality Act* – Section 515 of the Consolidated Appropriations Act of 2001.

Guidelines

3. *Guidelines for Ensuring and Maximizing the Quality, Objectivity, Utility, and Integrity of Information Disseminated by Federal Agencies* – OMB (2001).
4. *Secretary's Policy Statement on Information Quality* – DOT (August 2002).
5. *The Department of Transportation's Information Dissemination Quality Guidelines* (2002) - http://docketsinfo.dot.gov/ombfinal092502.pdf.
6. *Updated Principles for Risk Analysis* - OMB Memorandum M-07-24, September 19, 2007.
7. *PHMSA Strategic Plan 2007-2011* (Aug. 2007).
8. *Evaluating Risk: A Working Paper for Pipeline and Hazardous Materials Safety Programs* - Pipeline and Hazardous Materials Safety Administration (February 8, 2008).
9. *Principles and Practices for a Federal Statistical Agency* - National Research Council, Committee on National Statistics (Fourth Edition).
10. *Analytical Perspectives, Budget of the U.S.* – Office of Management and Budget (FY 2010).
11. *Increased Emphasis on Program Evaluations* – OMB Memorandum M-10-01 (October 7, 2009).

Risk/Evaluation Literature

12. *Managing the Risks of Organizational Accidents* – James Reason (1997).
13. *Understanding Risk: Informing Decisions in a Democratic Society* – National Research Council, Committee on Risk Characterization (1996).
14. *The Regulatory Craft* – Malcolm K. Sparrow (2000).
15. *Barriers and Accident Prevention* – Erik Hollnagel (2004).
16. *Managing the Unexpected* – Karl E. Weick and Kathleen M. Sutcliffe (2007).

17. *An Evaluation Roadmap for a More Effective Government* – American Evaluation Association, Policy Task Force (February 2009).

18. *Data-Driven Risk Models Could Help Target Pipeline Safety Inspections* – BTS Special Report (July 2008).

19. *Visual Explanations: Images and Quantities, Evidence and Narrative* – Edward Tufte (Feb. 1997).

20. *Handbook of Practical Program Evaluation* – Wholey, Hatry, and Newcomer (Ed., 2004).

21. *Increasing Evaluation Use Among Policymakers Through Performance Measurement* – Mohan, Tikoo, Capela, and Bernstein in New Directions for Evaluation (Winter 2006).

22. *Missing Data* – McKnight, McKnight, Sidani and Figueredo (2007).

Data/Statistical compilations

23. *Hazmat incident statistics*: http://www.phmsa.dot.gov/hazmat/library/data-stats/incidents

24. *Pipeline data and statistics*: http://www.phmsa.dot.gov/pipeline/library/data-stats

25. *Analysis of Hazardous Materials Information System Database: An Interim Analysis* – PHMSA (June 2005).

Past Reviews of our Data

26. *Pipeline Safety and Security: Federal Programs* – Congressional Research Service Report for Congress (Jan. 5, 2007)

27. *Using or Creating Incident Databases for Natural Gas Transmission Pipelines (A Guideline)* – Report of Study Group 3.4 from the 23rd World Gas Conference (June 2006).

28. *Integrity Threats to Hazardous Liquid Pipelines* – Inspector General Report AV-2006-071 (Sep. 18, 2006).

29. *New Risk Assessment Program Could Help Evaluate Inspection Cycle* – GAO Report RCED-89-107 (March 1989).

30. *The Office of Pipeline Safety Is Changing How It Oversees the Pipeline Industry* – GAO Report RCD-00-128 (May 2000).

31. *Information Strategy Needed for Hazardous Materials* – GAO Report IMTEC-91-50 (Sep. 1991).

32. *Estimating the Extent of Under-reporting of Hazmat Incidents* – Preliminary Findings (May 11, 2007).

33. PHMSA IT Program Review (2008).

34. *Safety Incidents on Natural Gas Distribution Systems: Understanding the Hazards* – Allegro Energy Consulting Report for Office of Pipeline Safety (April 2005).

35. *The U*.S. Oil Pipeline Industry's Safety Performance - Allegro Energy Consulting Report for Association of Oil Pipelines and the API Pipeline Committee (Feb. 2003).

36. *Data-Driven Risk Models Could Help Target Pipeline Safety Inspections* – BTS Special Report (Kowalewski and Young, July 2008).

Program and Data Systems Documentation

37. *The Pipeline Inspection Priority Program used by the Office of Pipeline Safety* (1994).

38. *National Business Strategy* – PHMSA Office of Hazardous Materials Enforcement (Feb. 2008).

39. *Intermodal Hazardous Materials Intelligence Portal, Functional Requirements Document* – DOT (March 23, 2007).

40. Hazardous Materials Information System (HMIS) Requirements Definition – PHMSA Office of Hazardous Materials Safety (rev. May 19, 2000).

41. *Safety Monitoring and Reporting Tool (SMART), System Requirements Document* – Office of Pipeline Safety (April 15, 2004).

42. *Safety Monitoring & Reporting Tool (SMART) Implementation Strategy* – Office of Pipeline Safety (rev. May 9, 2006).

Data Quality Issues from Recent Analyses

Hazmat Bulk loading/Unloading Analysis (March 23, 2007)

- **We lack data on one of the central risks**—unloading of rail tank cars at fixed facilities—because our reporting requirements for hazmat incidents are limited to events that occur "in transportation."

- **The causes and circumstances of serious hazmat incidents are different from all hazmat incidents**. Breakouts by mode, transportation phase, and cause all showed different patterns, which means that an analysis of all-incidents is not representative of the smaller subset with more serious consequences. This presents a small-numbers issue too—an analysis of serious incidents is subject to greater uncertainty.

- **Our failure codes do not point to the transportation phase at which a failure occurred.** This analysis was focused on loading and unloading, but many of the in-transit incidents also could be traced to failures during loading (e.g., over-pressurization, failure to tighten couplings, etc.). However, many of the codes for *what* failed, *how* it failed, and *why* it failed were inconclusive with respect to the key variable of phase.

- **We have large uncertainty in our conclusions** because of substantial underreporting of hazmat incidents, and failure codes which cannot be used to nail down the transport phase during which a failure occurred. Some large effects were due to a small number of companies reporting, suggesting missing data.

- **The number of incidents is a little ambiguous** since the data base contains separate records for each shipment/commodity/tank involved. For some analytical purposes, this is helpful; for others, it might appear to inflate the number of incidents by a small percentage.

- **Long reporting lags mean that recent-year data might be incomplete.** For analyses aimed at breaking out percentages, this is less of a problem than when we compare numbers over time.

Pipeline Safety Risk Modeling for Inspection Integration (2007)

- **Risk scores from PIPP don't correlate with actual risk of incidents** because the variables and weighting were determined by judgment, instead of by the data. PIPP predicts future risk better than random sampling, but some of the individual variables used in PIPP (like past accidents) are a better predictor than the more complex PIPP algorithm. That means that PIPP is degrading the quality of the input data by combining good data with much weaker variables.

- **We have limited ability to rank operator performance from our inspection data,** because—except for Integrity Management inspections—we don't capture inspection findings

(deficiencies) as data. We record only those few deficiencies that rise to the level of a notice of probable violation.

- **We can't combine many risk variables** (like age and corrosion protection) to assess inherent pipe risk because exposure data (from annual reports) doesn't include combinations of characteristics like we have for incidents.
- **Many of the risks we assign to operators are outdated** by as much as a year because we don't have a mechanism for tracking changes in operator, when pipelines change hands, etc. between annual reports.
- **Some of the annual report and incident data are unusable** in our risk model because operators file incident reports under OPIDs with no annual report.
- **The data we collect on systems, inspections, and incidents appear to provide little value** in identifying risk factors for targeting inspections.

Hazmat Inspection Prioritization: National Business Strategy (Feb. 2008)

- **We can highlight high *risk* but not high *risk rates*** because we don't have exposure data to normalize incidents and deficiencies.
- **We can't identify risk factors except by expert judgment** because we lack exposure data, and sufficient incident data, to draw correlations.

Performance and Accountability Report (FY 2008)

- **We were unable to say definitively how risk has changed** because the number of incidents fluctuates annually apart from real, underlying changes in risk, and we have no indicator of risk.
- **We were stuck using old measures** that we replaced internally two years ago because the performance system discourages experimentation and rapid improvement.
- **Our performance projections were very preliminary** and we revised data for several past years (again) because we use CY measures in a FY report, we have a significant reporting lag, and we never call a report "final."
- **Our performance trends might be substantially biased** (for hazmat) because we have significant under-reporting (estimated up to 90%).
- **Our reported performance is binary (met/not met)** without accounting for uncertainty because the performance system emphasizes accountability over learning.

Low Stress Pipelines and Gathering Lines Rule

- **We can't estimate the potential benefits** for gathering lines because we have no data on exposure (mileage) or safety (incidents).
- **We have very uncertain estimates of the benefits** for low stress pipelines because we have no data of our own on exposure or safety, and we have to combine eight separate estimates to compute benefits.
- **Our estimates are misleading** with respect to the policy choices because they do not show the range of uncertainty; we have limited capacity to do this.

Lithium Battery Risk Analysis

- **We can't (yet) quantify most of the risk factors** we have identified because we lack exposure data and incident data on most variables.
- **The analysis relies on very limited failure data.** Any given lithium battery spends a vanishingly small fraction of its life aboard an aircraft; but the failure data we have is constrained to just aircraft incidents.

Pipeline Safety State Grant Allocation

- **We can't use incidents** directly as an indicator of relative risk because there are so few incidents in individual states each year.
- **We have difficulty using mileage** to allocate grants by risk because we don't capture gas transmission mileage by state.
- **We have limited information on other risk factors** (e.g., geography) because we don't capture data on these factors.

Organizational Assessment Monitoring (Monthly Updates)

- **We can't say (with any confidence) where we stand** on our performance re: hazmat risk because the number of hazmat incidents keeps changing over time - the data are not final for years.
- **Monthly updates are labor-intensive** and prone to error because monitoring requires extensive, manual pre-processing to trim records, add computed variables, and aggregate across sectors.
- **Adverse trends (Spills in HCAs, Undeclared hazmat incidents) can be misleading** because our measures mix together data without a clean, unifying concept of risk.

Tank Truck Wetline Incidents

- **We can't easily distinguish wetline incidents** because our coding scheme for hazmat incidents doesn't address them specifically. Determining which incidents were caused by wetline failure required extensive, manual review of incident reports, including narrative descriptions.
- **We aren't capturing all wetline incidents** because carriers tend to underreport hazmat incidents generally.

Analysis of Undeclared Hazmat Incidents (May 4, 2009)

- **Reported incidents are misleading, since half of the reports are not "incidents"** in the traditional sense. They are simply discoveries of undeclared hazmat somewhere in the transportation system, with no release of product, no deaths or injuries, no evacuations, no closure of roads, and no other consequences which would trigger reporting of an incident. These were brought under the incident reporting system in 2005 when we simply changed the reporting criteria—effectively redefining an "incident" to include these particular findings of non-compliance.

Analysis of Serious Hazmat Incidents (May 28, 2009)

- **The criteria for "serious" hazmat incidents reflects a mixed collection of outcomes.** Most (over 60%) of the serious incidents are "serious" only because they involved a bulk release—with no other serious consequences; this dominates the measure.
- **The criteria do not reflect some of the most important risk factors** that make death/major injury more likely. Fire, explosion, and gas dispersion, for example, are all more significant risk factors than bulk release.
- **The causes and circumstances of serious incidents are different from death/injury incidents**, so focusing on serious incidents could divert our attention from the most important safety interventions.
- **Three of the criteria for serious incidents reflect *positive* actions people take** (evacuations, road closures, alterations of a flight plan) to limit safety consequences.
- **All of the criteria for serious incidents are weighted equally**, even though it's fairly obvious that we don't value the consequences or risks equally in how we manage the program.

Distribution Integrity Management Program – Data Group Final Report (Undated)

- **The causes of incidents and leaks were both limited to a small set of cause categories.** The categories were changed in 2004 (new causes added to incident reports), but this made leak causes different from incident causes.
- **Inconsistent reporting**—over-reporting of incidents involving property damage and inconsistent classification of leak severity—limited the analysis.
- **Missing data**—no annual report data on master meter or LPG operations, no data on leaks removed (by material), and insufficient incident detail to determine whether excess flow valves would have mitigated an incident—limited the analysis.
- **We have insufficient incident/failure data by state** to provide meaningful baseline performance measures for operators or for individual states. Most operators and many states experience zero distribution incidents in a typical year.

Safety Incidents on Natural Gas Distribution Systems: Understanding the Hazards (April 2005)

- **Narrative description of the incident** is needed to reclassify older incidents into the new cause categories. Some (especially older) cases fall into cause categories which are too general to allow for effective analysis.
- **Greater detail on incidents** (through the PPTS data) was needed to get a finer understanding of the role of different hazards and issues impacting public safety. The conventional wisdom that most gas distribution incidents are caused by outside force damage was correct, but it was based on cause categories that are too broad to allow development of effective strategies for performance improvement.
- **Ambiguous reporting instructions** for data collected from 1999-2003 limited reporting of certain incidents (fire first) based on a narrow definition of "facilities." This presents a comparability issue today.
- **There is inconsistent reporting** of incidents that involve facilities outside PHMSA jurisdiction, so data cannot be compared state-to-state or utility-to-utility. The inconsistency also obscures the real picture of failures.

Past Reviews of our Data Programs:

Several evaluations over the past ten years have examined quality issues with PHMSA's safety data. Each of these was examined to get perspective on the issues that have been identified previously.

- **A cross-modal team evaluated DOT's Hazardous Materials program** in 1999, and in the process offered several observations and recommendations for data analysis and improvement. The team found that DOT's hazmat safety programs were hampered by a lack of sufficient, reliable, and timely information; that our data systems did not contain adequate information on hazmat shippers and carriers; and that DOT did not have reliable hazmat flow estimates. The report recommended that BTS evaluate existing hazmat data bases and identify additional data needs.

- **The Bureau of Transportation Statistics (BTS) assessed the quality of data** in PHMSA's Hazardous Materials Information System (HMIS) in 2002. BTS' assessment profiled the 6 data bases in HMIS from written documentation and interviews concerning data processing, analyzed the data against published tabulations, and assessed the system against the six major attributes of data quality published by BTS: relevance, completeness, quality, timeliness, comparability, and utility. The system was judged strong in utility and adequate in all other areas. BTS offered eight recommendations for improving quality.

- **The National Transportation Safety Board (NTSB) reviewed transportation safety data bases** in 2002 to evaluate data quality issues. This study generally advocated a data-driven approach (like the one used by CDC) that is grounded in the science of epidemiology—consisting of surveillance, identification of risk factors, and development and evaluation of prevention strategies. NTSB surveyed its past data recommendations, concluded that the Board's ability to study important safety issues is often affected by poor data quality, and recommended development of better safety exposure data to help evaluate risk and safety interventions.

- **PHMSA conducted an IT program review** in 2008 to identify business and technology performance gaps that might inhibit the achievement of our safety mission objectives. The review proposed a series of projects to strengthen PHMSA's information architecture in four general areas: *data governance* (to develop common standards, processes, and procedures); *data architecture and management*; *organization* (roles and responsibilities, rules of engagement); and *technical architecture*.

A Draft Analytical Agenda for PHMSA

November 2009

Program Evaluation

Program evaluation is a systematic study of the logic, design, implementation, and effectiveness of a program—what works (in addressing safety risks) and why. It provides evidence that can be used to compare alternative approaches, guide program development and decision making, identify unintended effects, redirect programs that are not working as expected, and identify effective practices. There are several important questions we need to answer with program evaluation:

1. **Do our risk models target the highest risks?**

   We target inspections to focus resources on the highest risks. Our risk models use data from incidents, previous inspections, and other sources but the weighting of risk factors is based largely on judgment. There is some evidence—from recent reviews of risk models—that data-weighting could be superior to judgment-weighting in identifying companies or systems with the highest risk. We invest considerable resources in inspections of the regulated community, so the value of a good risk model could be high. We might explore the potential for transferring the knowledge from pipeline safety modeling to hazmat safety, and also consider extending the work in pipeline safety to better focus on specific risks. We should include a broader review of the risk models used by others to help identify good practices.

2. **Do our enforcement actions have the intended effect?**

   The program is designed to achieve correction and deterrence, but we believe that these results might be limited by the lack of timeliness in our enforcement action, the offsetting benefits of non-compliance, the limited use of enforcement as a tool to fix the problems we find during our inspections, and limited awareness by others of their exposure. In the hazmat safety program, the sheer numbers of companies to inspect presents a significant obstacle to effective deterrence. If correction is enhanced by our enforcement actions, we should see improved safety performance (fewer accidents, lesser consequences) in those companies. What would we expect to see if deterrence was working? We might estimate the value and extent of non-compliance, and compare that to the penalty for non-compliance, as a first cut threshold for effective deterrence.

3. **Could our inspections be re-oriented to collect better data on latent safety conditions?**

   Social science research over the last 30 years has highlighted the depth of interactions between human and organizational factors that contribute to major accidents. Our data systems reflect [almost] none of these advances. Latent conditions—such as poor design, gaps in supervision, undetected manufacturing defects or maintenance failures, unworkable procedures, clumsy automation, shortfalls in training, less than adequate tools and equipment—are *always* present in complex systems. We don't have data on latent conditions at the point of an incident, nor at the point of inspection. What is the opportunity to re-orient our inspections to collect such data, and what might be some of the unintended consequences of doing so?

4. Could we get all the incident data we need from our own investigations?

We rely on industry reporting for our incident data. But the regulated industry has an institutional bias in determining the causes, circumstances, and consequences of failures. Accident investigations—the limited number that we do—have shown some significant differences between what a company reports and an objective view of these events. Reports from companies also reflect large numbers of blanks and "unknown" data, particularly in the most serious cases—exactly where it is most critical that we have good data. There are about 700 pipeline incidents and 17,000 hazmat incidents reported each year. If we investigated all incidents above some threshold, could we reduce industry reporting to a simple notification or postcard, and develop the data we needed ourselves?

5. How could we measure strong safety culture in companies?

We have a growing understanding of safety culture and the upstream organizational processes and circumstances that lead to failures—especially the kinds of process failures that can have catastrophic consequences. Over the past two years, the agency has taken a lead role in working with the pipeline industry and other agencies to explore safety culture and its relationship with process safety. We *know* we need to know more about this. But our questions still reflect an early stage in the learning process, and so far they remain disconnected from our data systems.

6. How can we better measure the overall changes in safety risk over time?

At a very high level, we have invested considerable effort over the years to developing and refining the concepts driving our performance measures—which we use in guiding priorities for the agency, justifying budget requests, and reporting to Congress. However, we have already recognized some significant shortcomings—our primary outcome measures do not really reflect changes in risk over time. The numbers are now too small to draw meaningful conclusions about the trends, or to disaggregate the data to find meaningful patterns. We must also deal with the natural tension between the need to monitor outcomes and the desire to attribute outcomes to what we do.

7. Monthly monitoring of agency performance—how can we better explain the trends?

We need to track progress in the key metrics in our Organizational Assessment, and investigate unusual patterns to understand what's happening and why, and to redirect our programs if needed. We have limited understanding of the safety trends we are seeing. Understanding the trends requires disaggregation of the data, but the data are often very "thin." We need to explore other approaches.

8. What are the actual costs and benefits of the rules we have published?

We don't know what our rules cost or what benefit the public gets because we don't assess the *actual* costs and benefits after implementation. This might be one of the easiest kinds of program evaluation we could do; we have a clear "before" picture and estimates of what we expected to happen. Retrospective analysis could help us redirect programs where we found unexpected consequences, refine our estimates for future benefit-cost analysis, and generally better understand what's happening in the regulated industry.

9. **Allocation model for State grants—how should we combine risk and performance data?**

   We don't combine/use both risk and performance data to allocate grants to states. Both programs administer grant programs to states to help reduce safety risk. The hazmat allocation formula includes several risk-related variables to help target the greatest risks; the pipeline allocation formula does not address comparative risk. On the other hand, the pipeline formula adjusts grant allocations based on a review of several performance factors; the hazmat formula does not address differences in performance or capability (i.e., need). To target resources effectively, we need information about where the risk is *and* what works in reducing risk.

10. **What is the value of a "statistical injury?"**

    Our regulatory evaluations frequently require that we monetize deaths and injuries; we have an accepted range for the value of a statistical life (VSL) from OST, but we do not have a consistent and supportable value for injuries. There are other models (e.g., NHTSA's analysis for crash-related injuries) we might use as a starting point. Since the nature of the injuries might be different for pipeline vs. hazmat, we might also end up with different values across our programs, but we should consider a consistent approach in our analysis.

Risk Evaluation

Risk evaluation is a systematic assessment of safety risks to help us understand the scope, magnitude, and nature of the problem we are trying to address with federal interventions. It requires analysis of technologies, operating practices, and failures to help focus our efforts on the most significant risks and on the root causes of failures. There are several important questions we need to answer with risk evaluation:

1. **What is the underlying risk of low probability high consequence (LPHC) accidents?**

   We need to better estimate the risk of low probability high consequence (LPHC) events—the kind of risk that is potentially hidden when we simply focus on the recent historical record. There is evidence that the public cares disproportionately about this kind of risk, and it probably presents a greater strategic risk for the agency as well. We need to identify outliers in the data (e.g., the consequences of Hurricane Katrina in 2005) and spread out the effects of these over a longer period of time, and we need to estimate the probability and consequences of risks that *don't* appear in the data and add these into our analyses. We might approach this through a broader failure mode and effects analysis, or through review of incidents to find areas where simple luck prevented more serious consequences.

2. **How is risk exposure changing over time?**

   Our performance measures track the negative consequences of pipeline and hazmat transportation, but we lack good data on some of the changes in risk exposure that would help provide context for deaths, injuries, etc. Exposure measures are often used to *normalize* data. One measure that would be useful to have is ton-miles—to help draw comparisons across freight modes of transportation. Ton-mile estimates for hazmat are limited to the five-year Commodity Flow Survey with a 2-year time lag; it

would be more useful to have annual data. Estimates for pipelines were developed by BTS several years ago but rest on some key assumptions that should be validated or revised.

3. **Leading indicators—how can we detect increasing risk or emerging risks in advance of failure?**

   Failures are lagging indicators—they tell us about problems after the fact. In some ways, past accidents can be used to help predict future accidents, but we also need better indicators of emerging risks and other conditions that might provide early warning signals of increasing risk. Safety investment, safety culture, financial health, etc. might provide useful early warning signals.

4. **Risk vs. outcomes—what are the key risk factors?**

   The number of incidents involving death or major injury is small, and annual variations often do not reflect real changes in risk. To take better advantage of the data we have, we need to identify the most important risk factors—those conditions/circumstances that increase the likelihood that an incident will result in death or major injury. This should be a data-driven analysis, demonstrating the significance of a risk factor with conditional probabilities, and using these results to weight all incidents based on their *potential* for serious consequences (regardless of actual consequences). Weighted risk measures like this could help smooth out annual variations in the data, help explain the trends in the most serious incidents, and provide clues to the risk factors we might target for program intervention.

5. **Undeclared hazmat—how much risk is this really?**

   In 2005, incident reporting criteria were modified to include the discovery of undeclared hazmat. These now comprise about 8% of the total reported incidents in our data base, although about half of these do not indicate a release of hazmat or any other criteria for incident reporting—no deaths, injuries, property damage, fire, explosion, evacuation, closure of a transportation artery, or any other consequences. The inclusion of these data here increase the potential for error and misleading conclusions in conducting safety analysis. We need to explore undeclared hazmat more deeply—especially looking at the problem of underreporting, and the nature of the risk. One potential new program we might look at is for voluntary reporting of leaks involving undeclared hazmat at the receiving end of a shipment.

6. **What is the public risk from pipelines and hazmat vs. releases industrial/occupational risk?**

   The data summaries we publish do not differentiate public vs. occupational (or private sector) risk. We aggregate deaths/injuries affecting the general public together with those affecting workers, and we aggregate spills and dollar damages affecting company property with those affecting the general public or rights of way. The risks are different, and risk exposure is different. Aggregating data can be useful in some analyses, but it can also present a misleading picture of public risk.

7. **What is the extent/consequence of greenhouse gas emissions from pipelines?**

   About 2% of the natural gas carried through pipelines is reported as “unaccounted for” due to metering error, leaks, accidents, and intentional releases associated with maintenance. It’s not clear

how much of this is actually released into the atmosphere, but the question is an important one to answer in the context of global warming. Methane is a greenhouse gas, with much greater warming potential that carbon dioxide—it is more 25 times more potent than CO2 over the long term (100 years) and 72 times more potent over the short term (20 years). EPA's estimates of methane emissions from pipelines are somewhat less than the "losses" reported to PHMSA, but neither agency has reliable estimates.

8. **What is the basic information we need to assess risks outside our current regulations?**

   There are several "invisible risks" (within our statutory authority but not necessarily regulated) where we have little/no risk data—for example: non-jurisdictional failures that are tied to jurisdictional pipeline systems; failures of DOT packages, cylinders, or containers "outside transportation" generally; gas pipeline master meter operators, or hazardous "materials of trade." In some cases, we have explicitly exempted certain operations from reporting; in other cases, we might not have fully considered the potential risks or the benefits of casting more widely for failure data so we can understand the risks before a big accident occurs. Lacking good data on these "invisible risks", we can't quantify the risks or address them effectively. What is the scope/magnitude of these kinds of risks, and what would we need to know to assess the relative risks?

Data Evaluation

Data evaluation is an analysis of data quality issues to help ensure the relevance, accuracy, completeness, comparability, timeliness, and utility of data to support effective decision making. It provides a basis for developing the data profiles or metadata that analysts need to understand the limitations of the data, and a basis for continuous improvement in data quality. There are several important questions we need to answer with data evaluation:

1. **What do we need to know about safety failures?**

   We don't have a good conceptual model for understanding failures. We don't capture *the chain* of failures, including especially the root causes, that typically are associated with any accident or incident; we don't capture all the relevant circumstances that might (through statistical analysis) reveal hidden causes; we don't capture inspection deficiencies in a way that would allow us to tie together our inspections and accident investigations. Most analyses struggle with the data to find patterns and meaning, but they are severely limited by the basic conceptual models. Without a complete picture of causes and circumstances, we don't understand the full extent of the problems (e.g., human error, corrosion, etc.) or the interrelationships of causes, and we have greater difficulty identifying critical control points and targeting the risks effectively.

2. **What is the likely extent of underreporting hazmat incidents?**

   Preliminary analysis of hazmat incidents suggests we might be missing 60-90% of all reportable incidents. Some of these missing reports might be the result of a lack of knowledge about the reporting requirements (these tend to be smaller companies); some might be the result of a decision

to avoid reporting. The effect is the same. The most troubling aspect of this is that the missing incidents appear to be *different in kind* (different patterns of causes, circumstances, consequences, etc.) from the reported incidents, so projecting from what we know might be giving us a *distorted* picture, as well as an incomplete one.

3. **What is the scope/magnitude of the problem in identifying companies?**

We cannot accurately and consistently identify companies—companies often use multiple IDs for different purposes; entities change through mergers, acquisitions, and partnerships; and companies might be related through several corporate layers. We have limited mechanisms in place to track company relationships or changes over time. As a result, we can't measure operator performance consistently or target our resources most effectively based on comparative risks; performance histories are sometimes fragmented. The proposed "One-Rule" in pipeline safety includes an attempt to resolve this issue for pipeline operators, but there is not yet a corresponding effort to address it for hazmat shippers and carriers. The Hazmat Intelligence Portal, for example, returns 165 companies from a search on "UPS." As a result, performance histories can be fragmented and misleading. We have incomplete data on shippers, because the hazmat registration program was not designed to capture all shippers (many/most are exempt).

4. **Are there significant opportunities to leverage data from other sources?**

We have difficulty integrating data from police and fire department reports, reports to the National Response Center, data from CDC, and many other systems. We can't easily use the data from most other data systems because we lack common identifiers (in many cases), and many of these external systems are not sufficiently transparent to allow us to understand their limitations. These are common problems in safety programs government-wide, and data integration is often encouraged as one of the best ways to leverage resources.

5. **How might we collect comparable data for both federal and state programs?**

We don't capture data from states in a form that is comparable to the federal program—limiting our ability to evaluate the effectiveness of state pipeline safety programs or operators and systems that are inspected by states. States use our data systems when they are acting as interstate agents for pipeline safety, but this represents a small fraction of their work. They do not report their inspections of intrastate gas pipeline operators with any detail (they report the number of inspections conducted). As a result, we have very limited information about the condition of 80% of the national pipeline system—where about 80% of the incidents involving death/injury occur.

6. **What can our edit checking processes tell us about the quality of the resulting data?**

We do not publish editing statistics, and we don't retain editing information for analysis. For hazmat incidents we use editing information to grade contractor performance, but there are no flags in any of our data bases to indicate where we commonly see errors. But tracking the areas where people have problems reporting accurate data could help identify areas of potential problems in the coding schemes and the resulting data we get.

7. What do analysts need to know about our data to avoid misinterpretation or misuse?

Without good metadata, the probability is high that the data have been misinterpreted frequently. We have no metadata for our major safety data systems beyond simple record layouts and a description of data details for our safety performance measures. Internally, we rely on institutional knowledge about our data systems, but there are many instances where we have discovered—through peer review, often much later—errors in our analysis because we did not account for the peculiarities in our data collections. The risk for analysts outside the agency (public users of our data) is probably much greater. Metadata might not prevent this, but it would reduce the risk.

8. How can we make narrative data more useful for analysis?

Analysts often find the narrative text to be the single most useful source of information about an incident. It was critical in our own recent risk evaluations of wetlines and lithium batteries, and it would be equally useful to others to replicate our analysis or to evaluate other risks. For hazmat incident reports, we remove personally-identifiable information before releasing the data, but otherwise include the narrative description of events in the data we release. In contrast, we remove all narrative text from pipeline incident reports before releasing the data.

U.S. Department
of Transportation

**Pipeline and
Hazardous Materials
Safety Administration**

Guide for Preparing Hazardous Materials Incidents Reports

Revised January 2004
Supersedes Previous Edition

U.S. Department
of Transportation

**Pipeline and
Hazardous Materials
Safety Administration**

Hazardous Materials Incident Reporting

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Overview

Hazardous Materials Incident Report

Department of Transportation Form F 5800.1

What Federal Regulation Requires Me To Submit the Report?

The Hazardous Materials Regulations (HMR; 49 CFR Parts 171-180) require certain types of incidents be reported to the Pipeline and Hazardous Materials Safety Administration (PHMSA). Section 171.15 of the HMR requires an immediate telephonic report (within 12 hours) of certain types of hazardous materials incidents. Section 171.16 requires a written report for certain types of hazardous materials incidents within 30 days of the incident, and a follow-up written report within one year of the incident, based on certain circumstances. Each type of report is explained below. (The full text of these sections is at the end of the instructions.)

What is the Purpose of the Report?

The information you are providing in this report is fundamental to hazardous material transportation risk analysis and risk management by government and industry. It allows us to better understand the causes and consequences of hazardous material transportation incidents. The data is used to identify trends and provide basic program performance measures. It helps to demonstrate the effectiveness of existing regulations and to identify areas where changes should be considered. It also assists all parties, including industry segments and individual companies, to understand the types and frequencies of incidents, what can go wrong, and possible measures that would prevent their recurrence. Your accurate and complete description of incidents can make a significant contribution to continual safety improvement through better regulations, cooperative partnerships, and individual efforts.

Who Must Complete the Report?

Any person in possession of a hazardous material during transportation, including loading, unloading and storage incidental to transportation, must report to the Department of Transportation (DOT) if certain conditions are met. This means that when the conditions apply for completing the report, the entity having physical control of the shipment is responsible for filling out and filing DOT Form F 5800.1. Generally, the entity having physical control of the shipment during transportation will be the carrier. For incidents that occur when a hazardous material is stored temporarily during transportation, the entity in physical possession of the shipment may be a warehouse or similar storage facility.

Loading operations. Incidents that occur while a shipper is loading a hazardous material onto a transport vehicle or into a bulk packaging, such as a cargo tank, portable tank, or rail tank car, before the carrier arrives at the facility to pick up the shipment are not required to be reported because these incidents occur prior to the onset of transportation in commerce. Incidents that occur while the carrier that will be transporting the hazardous material is observing or participating in loading operations must be reported because the carrier is deemed to be in possession of the hazardous material at that point; thus, these incidents occur during transportation. For these incidents, the carrier must complete the report.

Unloading operations. Incidents that occur or are discovered while a consignee is unloading a hazardous material from a transport vehicle or bulk packaging after the carrier has delivered the material are not required to be reported because these incidents occur after transportation has ended. Incidents that occur while the carrier that delivered the hazardous material is observing or participating in unloading operations must be reported because the carrier is deemed to be in possession of the hazardous material at that point; thus, these incidents occur during transportation. For these incidents, the carrier must complete the report.

What Definitions Should I Know in Order to Complete the Report?

In order to accurately complete the report, you should be familiar with the following terms. A complete list of definitions is contained in § 171.8.

Bulk packaging—a packaging, other than a vessel or a barge, including a transport vehicle or freight container, in which hazardous materials are loaded with no intermediate form of containment and that has:

(1) A maximum capacity greater than 450 liters (119 gallons) as a receptacle for a liquid;
(2) A maximum net mass greater than 400 kilograms (822 pounds) and a maximum capacity greater than 450 liters (119 gallons) as a receptacle for a solid; or
(3) A water capacity greater than 454 kilograms (1,000 pounds) as a receptacle for a gas as defined in § 173.115.

Cargo tank—a bulk packaging that is:

(1) A tank intended primarily for the carriage of liquids or gases and includes appurtenances, reinforcements, fittings, and closures;
(2) Permanently attached to or forms a part of a motor vehicle, or is not permanently attached to a motor vehicle but which, by reason of its size, construction, or attachment to a motor vehicle, is loaded or unloaded without being removed from the motor vehicle; and
(3) Not fabricated under a specification for cylinders, intermediate bulk containers, multi-unit tank car tanks, portable tanks, or tank cars.

Hazardous material—a substance or material that has been determined to be capable of posing an unreasonable risk to health, safety, and property when transported in commerce, and that has been so designated. The term includes hazardous substances, hazardous wastes, marine pollutants, elevated temperature materials, materials designated as hazardous under the provisions of § 172.101, the Hazardous Materials Table (HMT), and materials that meet the defining criteria for hazard classes and divisions in Part 173.

Hazardous substance—a material, including its mixtures and solutions, that—

(1) Is listed in Appendix A to § 172.101;
(2) Is in a quantity, in one package, which equals or exceeds the reportable quantity (RQ) listed in Appendix A to § 172.101; and

Table 1 Reportable Quantities.

RQ pounds (kilograms)	Concentration by Weight	
	Percent	PPM
5000 (2270)	10	100,000
1000 (454)	2	20,000
100 (45.4)	0.2	2,000
10 (4.54)	0.02	200
1 (0.454)	0.002	20

(3) When in a mixture or solution—
  (i) For radionuclides, conforms to paragraph 7 of Appendix A to § 172.101.
  (ii) For other than radionclides, is in a concentration by weight which equals or exceeds the concentration corresponding to the RQ of the material, as shown in Table 1.

The term *hazardous substance* does not include petroleum, including crude oil or any fraction thereof which is not otherwise specifically listed or designated as a hazardous substance in Appendix A to § 172.101, and the term does not include natural gas, natural gas liquids, liquefied natural gas, or synthetic gas useable for fuel (or mixtures of natural gas and such synthetic gas).

Hazardous waste—any material that is subject to the Hazardous Waste Manifest Requirements of the U.S. Environmental Protection Agency specified in 40 CFR Part 262.

Loading incidental to movement —loading by carrier personnel or in the presence of carrier personnel of packaged or containerized hazardous material onto a transport vehicle, aircraft, or vessel for the purpose of transporting it, including the loading, blocking, and bracing of a hazardous materials package in a freight container or transport vehicle, and segregating a hazardous material in a freight container or transport vehicle from incompatible cargo. For a bulk packaging, *loading incidental to movement* means filling the packaging with a hazardous material for the purpose of transporting it. *Loading incidental to movement* includes transloading.

Marine pollutant—a material that is listed in Appendix B to § 172.101 (also see § 171.4) and, when in a solution or mixture of one or more marine pollutants, is packaged in a concentration that equals or exceeds:

(1) Ten percent by weight of the solution or mixture for materials listed in Appendix B; or
(2) One percent by weight of the solution or mixture for materials that are identified as severe marine pollutants in Appendix B.

Movement—the physical transfer of a hazardous material from one geographic location to another by rail car, aircraft, motor vehicle, or vessel.

Storage incidental to movement— storage of a transport vehicle, freight container, or package containing a hazardous material by any person between the time that a carrier takes physical possession of the hazardous material for the purpose of transporting it until the package containing the hazardous material is physically delivered to its destination.

Transloading—the transfer of a hazardous material from one bulk packaging to another bulk packaging, from a bulk packaging to a non-bulk packaging, or from a non-bulk packaging to a bulk packaging for the purpose of continuing the movement of the hazardous material in commerce.

Transportation—the movement of property and loading, unloading, or storage incidental to that movement.

Undeclared hazardous material—a hazardous material that is:

(1) Subject to any of the hazard communication requirements in subparts C (Shipping Papers), D (Marking), E (Labeling), and F (Placarding) of Part 172 of this subchapter, or an alternative marking requirement in Part 173 of this subchapter (such as §§ 173.4(a)(10) and 173.6(c)); and
(2) Offered for transportation in commerce without any visible indication to the person accepting the hazardous material for transportation that a hazardous material is present, on either an accompanying shipping document, or the outside of a transport vehicle, freight container, or package.

Unintentional release—the escape of a hazardous material from a package on an occasion not anticipated or planned. This includes releases resulting from collision, package failures, human error, criminal activity, negligence, improper packing, or unusual conditions such as the operation of pressure relief devices as a result of overpressurization, overfill, or fire exposure. It does not include releases, such as venting of packages, where allowed, and the operational discharge of contents from packages.

Unloading incidental to movement—removing a packaged or containerized hazardous material from a transport vehicle, aircraft, or vessel, or, for a bulk packaging, emptying a hazardous material from the bulk packaging after the hazardous material has been delivered to the consignee when performed by carrier personnel or in the presence of carrier personnel.

Additionally, for purposes of reporting on this form, the following definitions apply:

Lading retention system—a lading retention system consists of those items or equipment that provide containment of hazardous materials at some point during transportation, including loading and unloading. The cargo tank shell, associated piping, and valves are an example of a lading retention system. Dents or damage to a tank requiring repair to an accident protection system guarding the tank are examples of incidents that must be reported. Paint chips and scratches to either the tank or the accident protection system are examples of incidents that do not require reporting.

Major transportation artery—a highway, main road or secondary road but not a side street or dirt road. In the case of rail, any rail line except a rail spur.

When Must I Submit a Written Report (DOT Form F 5800.1)?

Under § 171.16, you must submit a written report within 30 days after any of the following:

- An incident that was reported by telephonic notice under § 171.15;
- An unintentional release (see definitions) of a hazardous material during transportation including loading, unloading and temporary storage related to transportation;
- A hazardous waste is released;

Table 2 Examples to Clarify When to Report Structural Damage to a Specification Cargo Tank.

Incident Report Required	No Incident Report Required
Damage to an outlet valve that affects seating and requires replacement.	Handle broken or knocked off valve - but otherwise undamaged.
Serious damage that, if worse, could have resulted in the loss of the contents of the cargo tank. Damage to outlet lines that contain hazardous materials during transportation is in this category.	Serious damage that, even if worse, would not have resulted in the loss of the contents of the cargo tank. Damage to outlet lines that are normally not charged during transportation is in this category.
Cargo tank damage that requires professional inspection or recertification to ensure it is capable of meeting requirements.	Minor damage that obviously will not affect continuation of the cargo tank in service.
Cargo tank damage that requires immediate or subsequent repair because of questions about cargo tank integrity.	Cargo tank damage that requires repair for cosmetic reasons only.

- An undeclared shipment with no release is discovered; or
- A specification cargo tank 1,000 gallons or greater containing any hazardous materials that—
  (1) Received structural damage to the lading retention system or damage that requires repair to a system intended to protect the lading retention system, and
  (2) Did not have a release.

To clarify the requirement for a report based on structural damage to a specification cargo tank, Table 2 illustrates some examples.

When Is a Report Not Required?

You are not required to report a release of a hazardous material if **ALL** of the following apply:

- The shipment is not being offered for transportation or being transported by air;
- None of the criteria in § 171.15(a) applies;
- The material is not a hazardous waste;
- The material is properly classed as an ORM-D, or a Packing Group III material in Class or Division 3, 4, 5, 6.1, 8, or 9;
- Each package has a capacity of less than 20 liters (5.2 gallons) for liquids or less than 30 kg (66 pounds) for solids;
- The total aggregate release is less than 20 liters (5.2 gallons) for liquids or less than 30 kg (66 pounds) for solids;
- The material does not meet the definition of an undeclared hazardous material in § 171.8; and
- The shipment is an undeclared material discovered in an air passenger's checked or carry-on baggage during the airport screening process.

Also, you are not required to report releases of minimal amounts of material (i.e., a pint or less) released from the manual operation of seals of pumps, compressors, or valves, during the connecting or disconnecting of loading and unloading lines, or, for materials for which venting is authorized, from vents, provided these releases do not result in property damage or trigger any of the telephonic notifications requirements found in § 171.15.

When Must I Make a Telephonic Report?

Under § 171.15, you must provide **telephone notice within 12 hours** after the incident occurs when one of the following conditions occurs during the course of transportation and is a direct result of the hazardous material:

- A person is killed;
- A person receives an injury requiring admittance to a hospital;
- The general public is evacuated for one hour or more;
- One or more major transportation arteries or facilities are closed for one hour or more;
- The operational flight plan or routine of an aircraft is altered;
- Fire, breakage, spillage or suspected radioactive contamination occurs involving a radioactive material;
- Fire, breakage, spillage or suspected contamination occurs involving an infectious substance other than a diagnostic specimen or regulated medical waste;
- There is a release of a marine pollutant in a quantity exceeding 450 liters (119) gallons for liquids or 400 kilograms (882 pounds) for solids; or
- A situation exists of such a nature that in the judgment of the person in possession of the hazardous material, it should be reported to DOT's National Response Center (NRC) even though it does not meet the above criteria.

You may decide that the situation should be reported even though it does not meet any of the above criteria. Make sure that you request the NRC report number when you make your telephonic report.

What Telephone Number Do I Call to Make an Immediate Notification of a Hazardous Materials Incident?

You must call 800-424-8802 (toll-free) or 202-267-2675 (toll call) to make a telephonic incident report. This is the number to the NRC.

This call must be made within 12 hours of the events that trigger this requirement. If the incident involves an infectious substance, you may notify the Director, Center for Disease Control and Prevention (CDC), U.S. Public Health Service, Atlanta, Georgia, toll free at 800-232-0124. If a discrepancy of a shipment intended for air is discovered following its acceptance aboard aircraft, notify the nearest Federal Aviation Administration Civil Aviation Security Office as soon as practical.

How Long Do I Have to Submit the Written Report?

You must submit your written report within **30 days of discovery of the incident,** § 171.16(a).

Am I Required to Update the Information in the Report?

Yes. You must use DOT Form F 5800.1 and check the "A supplemental (follow-up) report" box on question #2 to provide additional information after the initial report. You are required to provide updates for up to one year after the initial filing if more information is gained or new developments arise concerning the following, for example:

- A death results from injuries caused by a hazardous material;
- The person responsible for preparing the original report learns that there is a misidentification of hazardous material or package information;
- Damage or loss or related costs that were not known at the time the report was filed become known; or
- Revised estimates of damages, losses, and related costs result in a change of $25,000 or more, or 10% of the original cost estimates, whichever is greater, even if the original estimate was under $500.

How and Where Do I Submit My Completed Report?

- You can mail paper copies of the report to the Information Systems Manager, U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Office of Hazardous Materials Safety, PHH-63, Washington, DC 20590-0001; or
- You can submit the report on-line at http://hazmat.dot.gov.

How Long Must I Keep a Copy of the Report?

You must keep a copy of each report or an electronic image of the report for two years after the date you submit it to PHMSA (§ 171.16(b)(3)).

Where Must I Keep a Copy of the Report?

The report must be accessible through your company's principal place(s) of business. You must be able to make the report available upon request to authorized representatives or a special agent of the Department within 24 hours of such a request (§ 171.16(b)(3)).

How Can I Get a Blank Copy of the DOT Form F 5800.1?

There are a variety of sources for obtaining the DOT Form F 5800.1. Please note that you are allowed to make unlimited photocopies of the form and distribute them.

- You may obtain limited copies of the form from the Information Systems Manager at the above address.
- You may download a copy of the form from our website at http://hazmat.dot.gov/spills.htm
- Our Fax on Demand service has copies of the instructions and the form. Call 800-467-4922 and choose the Fax on Demand option #2.

How Long Does It Take To Complete the Report?

PHMSA anticipates that it will take you approximately 1.6 hours to complete this report. This estimate includes the time it will take you to review the instructions, search your existing data sources for information, gather the required data, and complete and review the report.

How Can I Comment on the Length of Time Needed to Complete the Report or on the Amount of Information Required in the Report?

You can send your comments on the report, and any suggestions you have for reducing the amount of time needed to complete the report, to the following address:

(1) Information Systems Manager, U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Office of Hazardous Materials Safety, PHH-63, Washington, DC 20590-0001.

Please verify that your information is accurate. Although the required information is generally available at the time of the incident, you may need to do some additional investigation in order to obtain all of the facts pertaining to deaths, injuries or damage amounts. If you submit complete and accurate information at the time you file the report, it will decrease the chance of your having to supply missing information to DOT at a later date. PHMSA may follow up on incomplete forms.

Instructions

Completing DOT Form F 5800.1

Please print. Fill in all applicable blanks accurately to the best of your ability.

Part I: Report Type

(1) *This is to report:* Check the box that describes why you are filling out this form. This will normally be "A) A hazardous material incident." If you are reporting an undeclared shipment with no release, check the corresponding box, "B)." If you are reporting an incident involving a cargo tank motor vehicle containing a hazardous material that received structural damage to the lading retention system that may affect its ability to retain lading but does not release a hazardous material, check that appropriate box, "C)."

(2) *Indicate what type of report this is:* If this is an initial report, check the "initial report" box. If this is a follow-up to a previous report, check the "A supplemental (follow-up) report" box. If you are using additional pages, check the "Additional Pages" box.

Part II: General Incident Information

(3), (4) Date *& Time of Incident:* Enter the date and time the incident occurred. If you do not know the actual date and time, give the date and time you discovered the incident. Use 24-hour time for the incident time (e.g., "2400" for midnight, "1200" for noon, "0747" for 7:47 a.m., "2115" for 9:15 p.m.).

(5) *Enter National Response Center Report Number:* If this incident was reported to the NRC, fill in the report number NRC assigned to the incident.

(6) *If you submitted a report to another Federal DOT agency, enter the agency and report number:* If you were required to fill out a report for another federal agency such as the Federal Railroad Administration (FRA) or the Federal Motor Carrier Safety Administration (FMCSA) for this incident, please include the agency and report number. This will facilitate our combination of information.

(7) *Location of Incident:* Enter the geographic location of the incident (city, county, state, and zip code). If you do not know the actual location where the incident occurred, give the location where it was discovered. If the incident occurred at an airport or rail yard, include the name of the facility. If the incident occurred on a body of water, include the name and/or river mile. If you do not know the street address, or if the incident occurred on a highway, include a description such as "On I-70, mile marker 240."

(8) *Mode of Transportation:* Enter the code that corresponds to the mode of transportation in which the incident occurred or was discovered. If the incident occurred or was discovered in an in-transit storage area (e.g., a terminal or warehouse), check the box that corresponds to the mode by which the package was last transported.

(9) *Transportation Phase:* Enter the code that describes where the incident occurred in the transportation system. In transit means the incident occurred or was first discovered while the package was in the process of being transported. In-transit storage is storage incidental to transportation, such as at a terminal waiting for the next leg of transportation.

(10) *Carrier/Reporter:* Provide the name, street address, Federal DOT number (if applicable), and hazmat registration number of the carrier or the entity who is reporting the incident (if other than a carrier). The entity in physical possession of the material when the incident occurred or was discovered must report the incident.

(11) *Shipper/Offeror:* Enter the information about the person or entity that originally offered for transportation the material or package involved in the incident.

(12) *Origin:* Enter the origin of the shipment if the address is different than the shipper/offeror information entered in item #11.

(13) *Destination:* Enter the final destination of the shipment involved in the incident.

(14) through (19):

Hazardous Material Description: Enter the proper shipping name, technical or trade name, hazard class or division, ID number, packing group, and amount of material released. All of this information, except the amount of material released, can be found on the shipping papers that accompany the shipment, § 172.202. When indicating the amount of material released, include units of measurements (e.g.: 115 gallons, 69 tons).

(20) *Was the material shipped as a hazardous waste?* Check the "Yes" box if the material meets the definition of a hazardous waste in § 171.8 (requires an EPA Uniform Hazardous Waste Manifest). Include the EPA Manifest number.

(21) *Is this a Toxic by Inhalation (TIH) material?* If the material involved in the incident meets the definition of a Toxic by inhalation material in § 173.132, check the "Yes" box and enter the Hazard Zone in the space provided.

(22) *Was the material shipped under an Exemption, Approval, or Competent Authority Certificate?* If the shipment was shipped under an exemption, an approval, or a Competent Authority Certificate, check the "Yes" box and provide the appropriate assigned number.

(23) *Was this an undeclared hazardous materials shipment?* If this material was not indicated in any way to be a hazardous material even though it was required to be described as such on a shipping paper, or if the material would normally be excepted from the shipping paper requirements (such as a small quantity material) and does not have the required markings, it is considered an undeclared hazardous material shipment. Check the appropriate box.

Table 3 Non-bulk and IBC Packaging Identification Codes.

Non-Bulk Packaging		
Outer Packaging		
Type	**Material**	**Head Type**
1 Drum	A Steel	1 Non-removable
2 Wooden Barrel	B Aluminum	2 Removable
3 Jerrican	C Natural Wood	
4 Box	D Plywood	
5 Bag	F Reconstituted Wood	
6 Composite Packaging	G Fiberboard	
7 Pressure receptacle	H Plastic	
	L Textile	
	M Paper, multiwall	
	N Metal other than Steel or aluminum	
	P Glass, porcelain, or stoneware	
Inner Packaging		
1 Bottle	A Metal (any type)	
2 Can	B Glass, Porcelain, or stoneware	
3 Box	C Plastic	
4 Bag	D Fiberboard or cardboard	
5 Cylinder	E Wood (any type)	
IBC Packaging Identification Codes		
Material of Construction		
1 Metal	3 Composite	5 Wooden
2 Plastic	4 Fiberboard	6 Flexible

Part III: Packaging Information

(24) *Packaging Type:* Check the box that corresponds to the type of packaging involved in the incident. If more than one packaging type was involved in an incident, reproduce Part III of the form and fill out this section for each of the packaging types. For example, if three different packaging types were involved in an incident, fill out a separate Part III for each packaging type. If the type of packaging is not represented, check the "Other" box and enter a brief description such as "non-specification bulk bin."

(25) *Enter the appropriate failure codes (found at the end of the instructions):* Enter the codes that describe what failed on the packaging, how the packaging failed, and the cause(s) of the failure. Be sure to enter the codes from the list that corresponds to the particular packaging types checked above (#24). Enter the most important failure point in line 1. If there is a second failure point, enter in line 2. If there are more than two failure points, provide additional information in this format in Part VI. The following explains the content of each line:

What Failed: You can enter up to 2 "What Failed" codes to describe the part of the packaging that fails and was the immediate cause of the release. Often, on a simple packaging, only one code will be required. On more complex packaging, additional entries will help identify where that failure occurred. The first entry should designate the specific point of failure, followed by entries that help identify where that failure occurred. For instance, a deteriorated gasket on a pipe flange on the liquid line would have failure code 121 for gasket entered first and failure code 118 for flange entered second.

How Failed: Enter the "Failure" code that describes how the corresponding part of the packaging failed. The primary way the packaging failed should be entered first.

Cause(s) of Failure: Enter the "Cause of Failure" code that describes what caused the corresponding part of the packaging to fail in the way it did. The most probable or fundamental cause of failure should be entered first.

If none of the codes on the list fit exactly, use the closest match and provide additional detail in Part VI. Also, if you believe a better set of codes would be more descriptive of what failed, how it failed, and the causes of failure, suggest them in Part VII.

(26a) *Provide the complete packaging identification markings, if available:* Every specification packaging, UN or DOT, has a packaging identification printed or stamped on it or on a plate attached to the packaging. Examples are provided on the form.

(26b) *For Non-bulk, IBC, or non-specification packaging:* Only fill out 26b if the marking is incomplete, destroyed, or unknown. Fill in the Outer and Inner packaging type and Material of Construction information, as appropriate. If the packaging is non-bulk or Intermediate Bulk Container (IBC), use the codes in Table 3 to enter the number or letter that applies for either non-bulk or IBC packaging. For non-bulk, IBC or non-specification packaging provide a *description* of the packaging in the space(s) provided.

(27) *Describe the package capacity and the quantity:* Enter the total capacity of the inner and outer package. Also enter the actual amount of hazardous material that was shipped in the package, the number of packages in the shipment, and the number of packages that failed. Please include the units of measurement (liter, gallons, pounds, cubic feet, etc.)

(28) *Provide package construction and test information, as appropriate:* In the case of Non-bulk packagings

or IBCs enter the name of the packaging manufacturer or the symbol of the manufacturer *only if* complete identification markings were not provided in #26b. Enter the date of manufacture and the serial number, if applicable. Enter the last test date if the packaging requires periodic testing. Also include the design pressure, shell thickness, head thickness, and service pressure if the failed packagings are of the type indicated in parenthesis after each question. If the packaging contained a valve, or other device that failed and resulted in a hazardous material release, enter the valve or device type, manufacturer (if present and legible), and model number (if present and legible).

(29) *If the package is for Radioactive Materials, complete the following:* Complete this question *only* if a radioactive material was involved. Indicate the packaging category, the packaging certification, certification number, and which nuclides were present, the transportation index (TI), activity of the nuclides, and the criticality safety index.

Part IV: Consequences

(30) *Result of Incident:* Check all boxes that describe what occurred during the incident or as a result of the incident. For example, in a situation where a truckload of 55 gallon drums of corrosive liquids overturns resulting in a release that contaminates a nearby wetlands and stream the boxes "Spillage," "Material Entered Waterway/Storm Sewer," and "Environmental Damage" may apply.

(31) *Emergency Response:* Check all boxes that correspond with any emergency response and cleanup crews that participated in resolving the incident. If a fire crew, EMS, or police unit responded to the incident, include the report number.

(32) *Damages:* You are required to provide information on estimated damages if your damages exceed $500.00. This figure includes the cost of the material lost, property damage, vehicle damage, response costs, and clean-up costs. If you do not know these amounts at the time you complete the report, or the actual costs are revised by more than $25,000, you must submit a follow-up report after you determine the amounts. The following definitions explain each of the costs:

Material Loss: Enter the value of material released and unrecoverable. Base this entry on the amount of material released multiplied by the unit value (e.g., price per gallon or price per pound) as listed on the shipper's invoice. If the invoice is not available, estimate the cost per unit using the shipper's basis.

Carrier Damage: Enter the total value of damage incurred by the carrier. Major components include costs to repair the damaged vehicle and costs resulting from damage to cargo. If the vehicle is declared "totaled," enter the insured value of the vehicle. This entry should not include damage to other property or to vehicles owned by other persons.

Property Damage: Enter the total value of costs resulting from damage to the property of others involved in the incident. These include: repair and replacement costs of other vehicles; repair and replacement costs to buildings and other fixed facilities; and restoration of open land beyond decontamination and cleanup.

Response Cost: Enter the total value of response costs. Response costs are those costs incurred immediately after the incident, and include local emergency response from police and fire departments and emergency response teams, as well as costs incurred by the responsible party. Response costs also include costs to contain the hazardous material released.

Remediation/Cleanup Cost: Enter the total value of the cost to cleanup and remediate the site. Cleanup costs are those costs incurred to collect, transport, and ultimately dispose of all material collected during the response phase. Remediation costs are those costs incurred to restore the incident scene to its pre-incident state, and could include excavation, disposal and replacement of contaminated soil, pumping, treatment and re-injection of contaminated groundwater, or absorption and disposal of hazardous material released into surface water.

(33a) *Did the hazardous material cause or contribute to a human fatality?* If a person was fatally injured by contact with the hazardous material or its vapors or by a fire or explosion that resulted from the hazardous material, check the "Yes" box and enter the number of fatalities that resulted directly from the hazardous material.

(33b) W*ere there human fatalities that did not result from the hazardous material?* If the fatalities were not caused directly by the hazardous material, check the "Yes" box and enter the number of fatalities. An example: if a passenger car collided with a cargo tank carrying gasoline and the automobile driver was killed due to the collision, then the fatality was *not* caused by the hazardous material released. If, however, the accident resulted in the release of gasoline from the cargo tank and a resulting fire killed the automobile driver, then the fatality *was* caused by the hazardous material.

(34) *Did the hazardous material cause or contribute to a personal injury?* If a person was injured by contact with the hazardous material or its vapors or by a fire or explosion that resulted from the hazardous material, check the "Yes" box and enter the number of persons injured by the hazardous material.

Hospitalized means *admitted* to a medical facility, not treated and released from a facility, such as a hospital emergency room, where the person was never admitted to the hospital proper. Non-hospitalized individuals are those who may have received attention from medical personnel on-site or at a facility (including hospital emergency room), but were not admitted to a medical facility. Indicate the number of injured employees,emergency responders (firefighters, police, medics, etc.) and members of the general public.

(35) *Did the hazardous material cause or contribute to an evacuation?* If the incident required the evacuation or removal of persons from a specific area because of possible or actual contact with the hazardous materials involved in the incident, check the "Yes" box. Separately specify the numbers of individuals from the general public evacuated and number of employees of the facility or workers in the area that were evacuated. Also provide the total number of individuals evacuated. Indicate the duration of the evacuation (in hours).

(36) *Was a transportation artery or facility closed?* If a road or transportation facility was closed due to the incident, check the "Yes" box and indicate the duration (in hours) here.

(37) *Was the material involved in a crash or derailment?* Check the "Yes" box if a hazardous material was involved in a crash or derailment. Provide the estimated speed and weather conditions at the time of the crash, such as rain, blowing snow, sleet, iced roadway, sun glare, fog, dry pavement, high winds, etc. Indicate if the vehicle overturned or left the roadway or track.

Part V: Air Incident Information

This section is for incidents with packagings transported or intended for transportation by aircraft. If your packaging was not transported or intended to be transported by air, skip this section.

(38) *Was the shipment on a passenger aircraft?* Indicate whether the shipment in question was on a commercial passenger aircraft. If so, indicate if the material was tendered (accepted for shipment) as cargo, or was located in a passenger's baggage, either in the cabin or baggage compartment.

(39) *Where did the incident occur or where was the incident discovered?* Indicate where in the course of transportation the incident occurred or was discovered.

(40) *What phase(s) had the shipment already undergone prior to the incident?* Check all boxes that describe the transportation phases the shipment went through before the incident occurred or was discovered.

Part VI: Description of Events and Packaging Failure

Please describe the events involved in the incident to provide us with a better understanding of the incident. Include information that has not been collected elsewhere on this form, and include special scenarios, outstanding circumstances, or other information that provides a complete picture of the incident. Describe the sequence of events that led to the incident, the package failure (if any) and actions taken at the time of discovery. Submit photographs and diagrams when necessary for clarification. You may continue on additional sheets if necessary.

Part VII: Recommendations/ Actions Taken to Prevent Future Incidents

Recommendations may be preliminary in nature, may suggest actions by other parties, and may be subject to further investigation, refinement, acceptance, or rejection. Often, it may be beyond the ability of the preparer to offer recommendations, but where such recommendations can be made they have the potential of resulting in important improvements with safety benefits. For instance, such information can help companies identify common problems and alert the DOT to the need for additional measures such as outreach or broad training needs. This information can also help support regulatory changes.

Part VIII: Contact Information

Provide the name, title, telephone number, fax number, business name and address, hazmat registration number and email address of the contact person at your company who can answer questions about the information provided on this form. Make sure to check the box that describes the function of your firm: carrier, shipper, facility owner/operator, or other. If "Other" is checked, describe the function.

Failure Codes for All Packaging Types—Complete List

Code	What Failed
101	Air Inlet
102	Auxiliary Valve
103	Basic Material
104	Body
105	Bolts or Nuts
106	Bottom Outlet Valve
107	Check Valve
108	Chime
109	Closure (e.g., Cap, Top, or Plug)
110	Cover
111	Cylinder Neck or Shoulder
112	Cylinder Sidewall - Near Base
113	Cylinder Sidewall - Other
114	Cylinder Valve
115	Discharge Valve or Coupling
116	Excess Flow Valve
117	Fill Hole
118	Flange
119	Frangible Disc
120	Fusible Pressure Relief Device or Element
121	Gasket
122	Gauging Device
123	Heater Coil
124	High Level Sensor
125	Hose
126	Hose Adaptor or Coupling
127	Inlet (Loading) Valve
128	Inner Packaging
129	Inner Receptacle
130	Lifting Feature
131	Lifting Lug
132	Liner
133	Liquid Line
134	Liquid Valve
135	Loading or Unloading Lines
136	Locking Bar
137	Manway or Dome Cover
138	Mounting Studs
139	O-Ring or Seals
140	Outer Frame
141	Piping or Fittings
142	Piping Shear Section
143	Pressure Relief Valve or Device - Non-Reclosing
144	Pressure Relief Valve or Device -Reclosing
145	Remote Control Device
146	Sample Line
147	Stub Sill (Tank Car)
148	Sump
149	Tank Head
150	Tank Shell
151	Thermometer Well
152	Threaded Connection
153	Vacuum Relief Valve
154	Valve Body
155	Valve Seat
156	Valve Spring
157	Valve Stem
158	Vapor Valve
159	Vent
160	Washout
161	Weld or Seam

Code	How Failed
301	Abraded
302	Bent
303	Burst or Ruptured
304	Cracked
305	Crushed
306	Failed to Operate
307	Gouged or Cut
308	Leaked
309	Punctured
310	Ripped or Torn
311	Structural
312	Torn Off or Damaged
313	Vented

Code	Cause(s) of Failure
501	Abrasion
502	Broken Component or Device
503	Commodity Self-ignition
504	Commodity Polymerization
505	Conveyer or Material Handling Equipment Mishap
506	Corrosion - Exterior
507	Corrosion - Interior
508	Defective Component or Device
509	Derailment
510	Deterioration or Aging
511	Dropped
512	Fire, Temperature, or Heat
513	Forklift Accident
514	Freezing
515	Human Error
516	Impact with Sharp or Protruding Object (e.g., nails)
517	Improper Preparation for Transportation
518	Inadequate Accident Damage Protection
519	Inadequate Blocking and Bracing
520	Inadequate Maintenance
521	Inadequate Preparation for Transportation
522	Inadequate Procedures
523	Inadequate Training
524	Incompatible Product
525	Incorrectly Sized Component or Device
526	Loose Closure, Component, or Device
527	Misaligned Material, Component, or Device
528	Missing Component or Device
529	Overfilled
530	Over-pressurized
531	Rollover Accident
532	Stub Sill Separation from Tank (Tank Cars)
533	Threads Worn or Cross Threaded
534	Too Much Weight on Package
535	Valve Open
536	Vandalism
537	Vehicular Crash or Accident Damage
538	Water Damage

Failure Codes by Packaging Type General Non-bulk and IBCs

Code	What Failed
103	Basic Material
104	Body
105	Bolts or Nuts
108	Chime
109	Closure (e.g., Cap, Top, or Plug)
110	Cover
119	Frangible Disc
120	Fusible Pressure Relief Device or Element
121	Gasket
125	Hose
128	Inner Packaging
129	Inner Receptacle
130	Lifting Feature
132	Liner
140	Outer Frame
143	Pressure Relief Valve or Device - Non-Reclosing
144	Pressure Relief Valve or Device - Reclosing
161	Weld or Seam

Code	How Failed
301	Abraded
302	Bent
303	Burst or Ruptured
304	Cracked
305	Crushed
306	Failed to Operate
307	Gouged or Cut
308	Leaked
309	Punctured
310	Ripped or Torn
311	Structural
312	Torn Off or Damaged
313	Vented

Code	Cause(s) of Failure
501	Abrasion
503	Commodity Self-ignition
504	Commodity Polymerization
505	Conveyer or Material Handling Equipment Mishap
506	Corrosion - Exterior
507	Corrosion - Interior
508	Defective Component or Device
510	Deterioration or Aging
511	Dropped
513	Forklift Accident
514	Freezing
515	Human Error
516	Impact with Sharp or Protruding Object (e.g., nails)
517	Improper Preparation for Transportation
521	Inadequate Preparation for Transportation
522	Inadequate Procedures
523	Inadequate Training
529	Overfilled
530	Overpressurized
534	Too Much Weight on Package
535	Valve Open
536	Vandalism
537	Vehicular Crash or Accident Damage
538	Water Damage

Failure Codes by Packaging Type (continued)

Cylinders

Code	What Failed
111	Cylinder Neck or Shoulder
112	Cylinder Sidewall - Near Base
113	Cylinder Sidewall - Other
114	Cylinder Valve
119	Frangible Disc
120	Fusible Pressure Relief Device or Element
122	Gauging Device
132	Liner
143	Pressure Relief Valve or Device - Non-Reclosing
144	Pressure Relief Valve or Device - Reclosing
161	Weld or Seam

Code	How Failed
301	Abraded
303	Burst or Ruptured
304	Cracked
306	Failed to Operate
307	Gouged or Cut
308	Leaked
309	Punctured
313	Vented

Code	Cause(s) of Failure
501	Abrasion
502	Broken Component or Device
503	Commodity Self-ignition
504	Commodity Polymerization
505	Conveyer or Material Handling Equipment Mishap
506	Corrosion - Exterior
507	Corrosion - Interior
508	Defective Component or Device
510	Deterioration or Aging
512	Fire, Temperature, or Heat
513	Forklift Accident
514	Freezing
515	Human Error
516	Impact with Sharp or Protruding Object (e.g., nails)
517	Improper Preparation for Transportation
519	Inadequate Blocking and Bracing
520	Inadequate Maintenance
521	Inadequate Preparation for Transportation
522	Inadequate Procedures
523	Inadequate Training
524	Incompatible Product
525	Incorrectly Sized Component or Device
526	Loose Closure, Component, or Device
527	Misaligned Material, Component, or Device
528	Missing Component or Device
529	Overfilled
530	Over-pressurized
535	Valve Open
536	Vandalism
537	Vehicular Crash or Accident Damage

Portable Tanks

Code	What Failed
105	Bolts or Nuts
106	Bottom Outlet Valve
107	Check Valve
108	Chime
109	Closure (e.g., Cap, Top, or Plug)
110	Cover
119	Frangible Disc
120	Fusible Pressure Relief Device or Element
121	Gasket
122	Gauging Device
125	Hose
127	Inlet (Loading) Valve
131	Lifting Lug
132	Liner
135	Loading or Unloading Lines
137	Manway or Dome Cover
140	Outer Frame
141	Piping or Fittings
143	Pressure Relief Valve or Device - Non-Reclosing
144	Pressure Relief Valve or Device - Reclosing
152	Threaded Connection
153	Vacuum Relief Valve
161	Weld or Seam

Code	How Failed
301	Abraded
302	Bent
303	Burst or Ruptured
304	Cracked
305	Crushed
306	Failed to Operate
307	Gouged or Cut
308	Leaked
309	Punctured
310	Ripped or Torn
312	Torn Off or Damaged
313	Vented

Code	Cause(s) of Failure
501	Abrasion
502	Broken Component or Device
503	Commodity Self-ignition
504	Commodity Polymerization
505	Conveyer or Material Handling Equipment Mishap
506	Corrosion – Exterior
507	Corrosion – Interior
508	Defective Component or Device
509	Derailment
510	Deterioration or Aging
511	Dropped
512	Fire, Temperature, or Heat
514	Freezing
515	Human Error
517	Improper Preparation for Transportation
520	Inadequate Maintenance
521	Inadequate Preparation for Transportation
522	Inadequate Procedures
523	Inadequate Training
524	Incompatible Product
525	Incorrectly Sized Component or Device
526	Loose Closure, Component, or Device
527	Misaligned Material, Component, or Device
528	Missing Component or Device
529	Overfilled
530	Overpressurized
531	Rollover Accident
536	Vandalism
537	Vehicular Crash or Accident Damage

Bulk Tank Vehicles—Cargo Tank Motor Vehicles (CTMV) and Tank Cars

Code	What Failed
101	Air Inlet
105	Bolts or Nuts
106	Bottom Outlet Valve
107	Check Valve
110	Cover
115	Discharge Valve or Coupling
116	Excess Flow Valve
117	Fill Hole
118	Flange
119	Frangible Disc
120	Fusible Pressure Relief Device or Element
121	Gasket
122	Gauging Device
123	Heater Coil
124	High Level Sensor
125	Hose
126	Hose Adaptor or Coupling
127	Inlet (Loading) Valve
131	Lifting Lug
132	Liner
133	Liquid Line
134	Liquid Valve
135	Loading or Unloading Lines
136	Locking Bar
137	Manway or Dome Cover
138	Mounting Studs
139	O-Ring or Seals
141	Piping or Fittings
142	Piping Shear Section
143	Pressure Relief Valve or Device - Non-Reclosing
144	Pressure Relief Valve or Device - Reclosing
145	Remote Control Device
146	Sample Line
147	Stub Sill (Tank Car)
148	Sump
149	Tank Head
150	Tank Shell
151	Thermometer Well
152	Threaded Connection
153	Vacuum Relief Valve
154	Valve Body
155	Valve Seat
156	Valve Spring
157	Valve Stem
158	Vapor Valve
159	Vent
160	Washout
161	Weld or Seam

Code	How Failed
301	Abraded
302	Bent
303	Burst or Ruptured
304	Cracked
305	Crushed
306	Failed to Operate
307	Gouged or Cut
308	Leaked
309	Punctured
310	Ripped or Torn
311	Structural
312	Torn Off or Damaged
313	Vented

Code	Cause(s) of Failure
501	Abrasion
502	Broken Component or Device
503	Commodity Self-ignition
504	Commodity Polymerization

(Continued on next page)

Failure Codes by Packaging Type

Bulk Tank Vehicles—Cargo Tank Motor Vehicles (CTMV) and Tank Cars

Code	Cause(s) of Failure
505	Conveyer or Material Handling Equipment Mishap
506	Corrosion - Exterior
507	Corrosion - Interior
508	Defective Component or Device
509	Derailment
510	Deterioration or Aging
511	Dropped
512	Fire, Temperature, or Heat
515	Human Error
517	Improper Preparation for Transportation
518	Inadequate Accident Damage Protection
519	Inadequate Blocking and Bracing
520	Inadequate Maintenance
521	Inadequate Preparation for Transportation
522	Inadequate Procedures
523	Inadequate Training
524	Incompatible Product
525	Incorrectly Sized Component or Device
526	Loose Closure, Component, or Device
527	Misaligned Material, Component, or Device
528	Missing Component or Device
529	Overfilled
530	Overpressurized
531	Rollover Accident
532	Stub Sill Separation from Tank (Tank Cars)
533	Threads Worn or Cross Threaded
536	Vandalism
537	Vehicular Crash or Accident Damage

Incident Reporting Requirements

§ 171.15 Immediate notice of certain hazardous materials incidents.

(a) General. As soon as practical but no later than 12 hours after the occurrence of any incident described in paragraph (b) of this section, each person in physical possession of the hazardous material must provide notice by telephone to the National Response Center (NRC) on 800-424-8802 (toll free) or 202-267-2675 (toll call). Notice involving an infectious substance (etiologic agent) may be given to the Director, Centers for Disease Control and Prevention (CDC), U.S. Public Health Service, Atlanta, Ga., 800-232-0124 (toll free), in place of notice to the NRC. Each notice must include the following information:

(1) Name of reporter;

(2) Name and address of person represented by reporter;

(3) Phone number where reporter can be contacted;

(4) Date, time, and location of incident;

(5) The extent of injury, if any;

(6) Class or division, proper shipping name, and quantity of hazardous materials involved, if such information is available; and

(7) Type of incident and nature of hazardous material involvement and whether a continuing danger to life exists at the scene.

(b) Reportable Incident. A telephone report is required whenever any of the following occurs during the course of transportation in commerce (including loading, unloading, and temporary storage):

(1) As a direct result of a hazardous material—

(i) A person is killed;

(ii) A person receives an injury requiring admittance to a hospital;

(iii) The general public is evacuated for one hour or more;

(iv) A major transportation artery or facility is closed or shut down for one hour or more; or

(v) The operational flight pattern or routine of an aircraft is altered;

(2) Fire, breakage, spillage, or suspected radioactive contamination occurs involving a radioactive material (see also § 176.48 of this subchapter);

(3) Fire, breakage, spillage, or suspected contamination occurs involving an infectious substance other than a diagnostic specimen or regulated medical waste;

(4) A release of a marine pollutant occurs in a quantity exceeding 450 L (119 gallons) for a liquid or 400 kg (882 pounds) for a solid; or

(5) A situation exists of such a nature (e.g., a continuing danger to life exists at the scene of the incident) that, in the judgment of the person in possession of the hazardous material, it should be reported to the NRC even though it does not meet the criteria of paragraph (b) (1), (2), (3) or (4) of this section.

(c) Written report. Each person making a report under this section must also make the report required by § 171.16 of this Subpart.

Note to § 171.15: Under 40 CFR 302.6, EPA requires persons in charge of facilities (including transport vehicles, vessels, and aircraft) to report any release of a hazardous substance in a quantity equal to or greater than its reportable quantity, as soon as that person has knowledge of the release, to DOT's National Response Center at (toll-free) 800-424-8802 or (toll) 202-267-2675.

§ 171.16 Detailed hazardous materials incident reports.

(a) General. Each person in physical possession of a hazardous material at the time that any of the following incidents occurs during transportation (including loading, unloading, and temporary storage) must submit a Hazardous Materials Incident Report on DOT Form F 5800.1 (01-2004) within 30 days of discovery of the incident:

(1) Any of the circumstances set forth in § 171.15(b);

(2) An unintentional release of a hazardous material or the discharge of any quantity of hazardous waste;

(3) A specification cargo tank with a capacity of 1,000 gallons or greater containing any hazardous material suffers structural damage to the lading retention system or damage that requires repair to a system intended to protect the lading retention system, even if there is no release of hazardous material; or

(4) An undeclared hazardous material is discovered.

(b) Providing and retaining copies of the report. Each person reporting under this section must—

(1) Submit a written Hazardous Materials Incident Report to the Information Systems Manager, PHH-63, Pipeline and Hazardous Materials Safety, Department of Transportation, Washington, DC 20590-0001, or an electronic Hazardous Material Incident Report to the Information System Manager, PHH-63, Pipeline and Hazardous Materials Safety Administration, Department of Transportation, Washington, DC 20590-0001 at http://hazmat.dot.gov;

(2) For an incident involving transportation by aircraft, submit a written or electronic copy of the Hazardous Materials Incident Report to the FAA Security Field Office nearest the location of the incident; and

(3) Retain a written or electronic copy of the Hazardous Materials Incident Report for a period of two years at the reporting person's principal place of business. If the written or electronic Hazardous Materials Incident Report is maintained at other than the reporting person's principal place of business, the report must be made available at the reporting person's principal place of business within 24 hours of a request for the report by an authorized representative or special agent of the Department of Transportation.

(c) Updating the incident report. A Hazardous Materials Incident Report must be updated within one year of the date of occurrence of the incident whenever:

(1) A death results from injury caused by a hazardous material;

(2) There was a misidentification of the hazardous material or packaging information on a prior incident report;

(3) Damage, loss or related cost that was not known when the initial incident report was filed becomes known; or

(4) Damage, loss, or related cost changes by $25,000 or more, or 10% of the prior total estimate, whichever is greater.

(d) Exceptions. Unless a telephone report is required under the provisions of § 171.15 of this part, the requirements of paragraphs (a), (b), and (c) of this section do not apply to the following incidents:

(1) A release of a minimal amount of material from—

(i) a vent, for materials for which venting is authorized;

(ii) the routine operation of a seal, pump, compressor, or valve; or

(iii) connection or disconnection of loading or unloading lines, provided that the release does not result in property damage.

(2) An unintentional release of hazardous material when:

(i) The material is properly classed as—

(A) ORM-D; or

(B) a Packing Group III material in Class or Division 3, 4, 5, 6.1, 8, or 9;

(ii) Each packaging has a capacity of less than 20 liters (5.2 gallons) for liquids or less than 30 kg (66 pounds) for solids;

(iii) The total aggregate release is less than 20 liters (5.2 gallons) for liquids or less than 30 kg (66 pounds) for solids; and

(iv) The material is not—

(A) offered for transportation or transported by aircraft,

(B) a hazardous waste, or

(C) an undeclared hazardous material.

(3) An undeclared hazardous material discovered in an air passenger's checked or carry-on baggage during the airport screening process. (For discrepancy reporting by carriers, see § 175.31 of this subchapter.)

U.S. Department of Transportation
Pipeline and
Hazardous Materials
Safety Administration

Hazardous Materials Incident Report

Form Approval OMB No. 2137-0039

According to the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 2137-0039. The filling out of this information is mandatory and will take 96 minutes to complete .

INSTRUCTIONS: Submit this report to the Information Systems Manager, U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Office of Hazardous Materials Safety, PHH-63, Washington, D.C. 20590-0001. If space provided for any item is inadequate, use a seperate sheet of paper, identifying the entry number being completed. Copies of this form and instructions can be obtained from the Office of Hazardous Materials Website at http://hazmat.dot.gov. If you have any questions, you can contact the Hazardous Materials Information Center at 1-800-HMR-4922 (1-800-467-4922) or online at http://hazmat.dot.gov.

PART I - REPORT TYPE

1. This is to report: ☐ **A)** A hazardous material incident ☐ **B)** An undeclared shipment with no release

☐ **C)** A specification cargo tank 1,000 gallons or greater containing any hazardous materials that (1) received structural damage to the lading retention system or damage that requires repair to a system intended to protect the lading retention system and (2) did not have a release.

2. Indicate whether this is: ☐ An initial report ☐ A supplemental (follow-up) report ☐ Additional Pages

PART II - GENERAL INCIDENT INFORMATION

3. Date of Incident: _____ **4.** Time of Incident (use 24-hour time): _____

5. Enter National Response Center Report Number (if applicable): _____

6. If you submitted a report to another Federal DOT agency, enter the agency and report number: _____

7. Location of Incident: City: _____ County: _____ State: _____ ZIP Code (if known): _____

Street Address/Mile Marker/Yardname/Airport/Body of Water/River Mile _____

8. Mode of Transportation ☐ Air ☐ Highway ☐ Rail ☐ Water

9. Transportation Phase ☐ In Transit ☐ Loading ☐ Unloading ☐ In Transit Storage

10. Carrier/Reporter
Name _____
Street _____
City _____ State _____ ZIP Code _____
Federal DOT ID Number _____ Hazmat Registration Number _____

11. Shipper/Offeror
Name _____
Street _____
City _____ State _____ ZIP Code _____
Waybill/Shipping Paper _____ Hazmat Registration Number _____

12. Origin (if different from shipper address)
Street _____
City _____ State _____ ZIP Code _____

13. Destination
Street _____
City _____ State _____ ZIP Code _____

14. Proper Shipping Name of Hazardous Material: _____

15. Technical/Trade Name: _____

16. Hazardous Class/ Division: _____ **17.** Identification Number: _____ (e.g., UN2764, NA 2020) **18.** Packing Group: _____ (if applicable) **19.** Quantity Released: _____ (Include Measurement Units)

20. Was the material shipped as a hazardous waste? ☐ Yes ☐ No If yes, provide the EPA Manifest Number: _____

21. Is this a Toxic by Inhalation (TIH) material? ☐ Yes ☐ No If yes, provide the Hazard Zone: _____

22. Was the material shipped under an Exemption, Approval, or Competent Authority Certificate? ☐ Yes ☐ No

If yes, provide the Exemption, Approval, or CA number: _____

23. Was this an undeclared hazardous materials shipment? ☐ Yes ☐ No

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PART III - PACKAGING INFORMATION

24. Check Packaging Type (check only one - if more than one, list type of packaging, copy Part III, and complete for each type:

☐ Non-bulk ☐ IBC ☐ Cargo tank Motor Vehicle (CTMV) ☐ Tank Car

☐ Cylinder ☐ RAM ☐ Portable Tank ☐ Other _____

25. See instructions and enter the appropriate failure codes found at the end of the instructions. Be sure to enter the codes from the list that corresponds to the particular packaging type checked above. Enter the number of codes as appropriate to describe the incident. Enter the most important failure point in line 1. If there are more than two failure points, provide in this format in Part VI.

1. What Failed: ____ ____ ____ How Failed: ____ ____ ____ Causes of Failure: ____ ____ ____

2. What Failed: ____ ____ ____ How Failed: ____ ____ ____ Causes of Failure: ____ ____ ____

26a. Provide the packaging identification markings, if available.

Identification Markings: _____

(Examples: 1A1/Y1.4/150/92/USA/RB/93/RL, UN31H1/Y0493/USA/M9339/10800/1200, DOT - 105A - 100W (RAIL), DOT 406 (HIGHWAY), DOT 51, DOT 3-A)

26b. For Non-bulk, IBC, or non-specification packaging, if identification markings are incomplete or unavailable, see instructions and complete the following:

Single Package or Outer Packaging:

Packaging Type: _____

Material of Construction: _____

Head Type (Drums only): ☐ Removable ☐ Non - Removable

Single Package or Inner Packaging (if any):

Packaging Type: _____

Material of Construction: _____

27. Describe the package capacity and the quantity:

Single Package or Outer Packaging:

Package Capacity: _____

Amount in Package: _____

Number in Shipment: _____

Number Failed: _____

Single Package or Inner Packaging (if any):

Package Capacity: _____

Amount in Package: _____

Number in Shipment: _____

Number Failed: _____

28. Provide packaging construction and test information, as appropriate:

Manufacturer: _____ Manufacture Date: _____

Serial Number: _____ Last Test Date: _____

Material of Construction: _____ (if Tank Car, CTMV, Portable Tank, or Cylinder)

Design Pressure: _____ (if Tank Car, CTMV, Portable Tank)

Shell Thickness: _____ (if Tank Car, CTMV, Portable Tank)

Head Thickness: _____ (if Tank Car, CTMV)

Service Pressure: _____ (if Cylinder)

If valve or device failed:

Type: _____ Manufacturer: _____ (if present and legible) Model: _____ (if present and legible)

29. If the packaging is for Radioactive Materials, complete the following:

Packaging Category: ☐ Type A ☐ Type B ☐ Type C ☐ Excepted ☐ Industrial

Packaging Certification: ☐ Self Certified ☐ U.S. Certification Certification Number _____

Nuclide(s) Present: _____ Transport Index: _____

Activity: _____ Critical Safety Index: _____

PART IV - CONSEQUENCES

30. Result of Incident (check all that apply): ☐ Spillage ☐ Fire ☐ Explosion ☐ Material Entered Waterway/Storm Sewer ☐ Vapor (Gas) Dispersion ☐ Environmental Damage ☐ No Release

31. Emergency Response : The following entities responded to the incident: (Check all that apply)

☐ Fire/EMS Report # _____ ☐ Police Report # _____ ☐ In-house cleanup ☐ Other Cleanup

32. Damages: Was the total damage cost more than $500? ☐ Yes ☐ No

If yes, enter the following information: If no, go to question 33.

Material Loss: $ _____ Carrier Damage: $ _____ Property Damage: $ _____ Response Cost: $ _____ Remediation/Cleanup Cost: $ _____

(See damage definitions in the instructions)

33a. Did the hazardous material cause or contribute to a human fatality? ☐ Yes ☐ No

If yes, enter the number of fatalities resulting from the hazardous material:

Fatalities: Employees _____ Responders _____ General Public _____

33b. Were there human fatalities that did not result from the hazardous material? ☐ Yes ☐ No If yes, how many? _____

34. Did the hazardous material cause or contribute to personal injury? ☐ Yes ☐ No

If yes, enter the number of injuries resulting from the hazardous material:

Hospitalized (Admitted Only): Employees _____ Responders _____ General Public _____

Non-Hospitalized: Employees _____ Responders _____ General Public _____

(e.g.: On site frst aid or Emergency Room observation and release)

35. Did the hazardous material cause or contribute to an evacuation? ☐ Yes ☐ No

If yes, provide the following information:

Total number of general public evacuated _____ Total number of employees evacuated _____ Total Evacuated _____

Duration of the evacuation _____ (hours)

36. Was a major transportation artery or facility closed? ☐ Yes ☐ No If yes, how many? _____ (hours)

37. Was the material involved in a crash or derailment? ☐ Yes ☐ No

If yes, provide the following information: Estimated speed (mph): _____ Weather conditions: _____

Vehicle overturn? ☐ Yes ☐ No

Vehicle left roadway/track? ☐ Yes ☐ No

PART V - AIR INCIDENT INFORMATION (please refer to § 175.31 to report a discrepancy for air shipments)

38. Was the shipment on a passenger aircraft? ☐ Yes ☐ No

If yes, was it tendered as cargo, or as passenger baggage?

☐ Cargo ☐ Passenger baggage

39. Where did the incident occur (if unknown, check the appropriate box for the location where the incident was discovered)?

☐ Air carrier cargo facility ☐ Sort center ☐ Baggage area

☐ By surface to/from airport ☐ During flight ☐ During loading/unloading of aircraft

40. What phase(s) had the shipment already undergone prior to the incident? (Check all that apply)

☐ Shipment had not been transported ☐ Transported by air (first flight) ☐ Transport by air (subsequent flights)

☐ Initial transport by highway to cargo facility ☐ Transfer at sort center/cargo facility

PART VI - DESCRIPTION OF EVENTS & PACKAGE FAILURE

Describe the sequence of events that led to the incident and the actions taken at the time it was discovered. Describe the package failure, including the size and location of holes, cracks, etc. Photographs and diagrams should be submitted if needed for clarif cation. Estimate the duration of the release, if possible. Describe what was done to mitigate the effects of the release. Continue on additional sheets if necessary.

PART VII - RECOMMENDATIONS/ACTIONS TAKEN TO PREVENT RECURRENCE

Where you are able to do so, suggest or describe changes (such as additional training, use of better packaging, or improved operating procedures) to help prevent recurrence. Provide recommendations for improvement to hazardous materials transportation beyond the control of your individual company. Continue on additional sheets if necessary.

PART VIII- CONTACT INFORMATION

Contact's Name (Type or Print): _____ Telephone Number: ( ) _____

Contact's Title: _____ Fax Number: ( ) _____

Business Name and Address: _____ Hazmat Registration Number (if not already provided):

_____ _____

E-mail Address: _____ Date: _____

Preparer is: ☐ Carrier ☐ Shipper ☐ Facility ☐ Other _____

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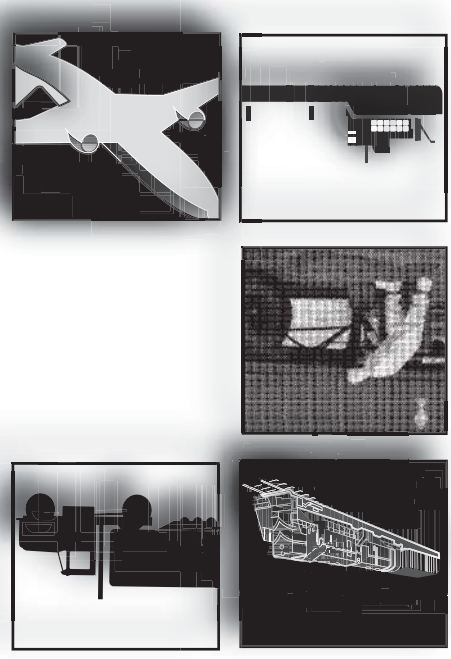

HAZARDOUS MATERIALS INCIDENT REPORTING AND REQUIREMENTS

EFFECTIVE JANUARY 1, 2005

U.S. Department
of Transportation

**Pipeline and
Hazardous Materials
Safety Administration**

400 Seventh Street, S.W.
Washington, DC 20590

FIRST-CLASS MAIL
POSTAGE & FEES PAID
PIPELINE AND HAZARDOUS
MATERIALS SAFTEY
ADMINISTRATION
PERMIT NO. G-126

EO Essential Oil Products Everyone Lo...
~~$10.99~~
$5.79
Shop Now
Shop Now
Shop Now

LATEST» Kindle Fire, Propane Grill, Portable Chargers: Monday's Top Deals (http://patch.com/california/benicia/s/fpczo/kindle-fire-propane-grill-portable-chargers-mondays-top-deals)

Watch: Rain Water Overflow at East N and East Second Street

City opens Emergency Operations Center to coordinate efforts to combat flooding.

Benicia, CA

By JB DAVIS (Patch Staff) - (http://patch.com/users/jb-davis-2) December 2, 2012 8:57 pm ET

6

Below is a summary of current road closures and flooding issues:

Park & Industrial is closed at that intersection.

Park & Bayshore intersection is also closed.

East E blocks 200-500 are closed.

300 East H storm drain is impacted, and Public Works crews are watching that location.

300-400 East I is closed.

East 2nd, by E Street parking lot, has flooding.

600 West K - PW crews are also monitoring that location.

EXHIBIT 2

Solano Transportation Authority

Solano Rail Facilities Plan Update

Menzies & McCrossan LLC

transportation / strategy / facilitation

with

RailPros

Nancy Whelan Consulting
Hughes Environmental Consultants
Professional Engineering & Survey

July 8th 2015

FINAL PLAN

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INTRODUCTION

The consultant team for the Solano Rail Facilities Plan Update 2015 was charged with five technical tasks:

Task 1. Demand for Freight Rail

Task 2. Capitol Corridor - Review and Update the 1995 Plan

Task 3. Rail Infrastructure and Safety

Task 4. Napa-Solano Rail Connections

Task 5. Final Solano Rail Facilities Plan Update

Each task was originally presented in an individual technical memorandum.

The Plan Update involved reviewing several previous source documents and, where appropriate and feasible, updating these for the current plan:

- The 1995 Solano Rail Facilities Plan
- The 2012 Solano Rail Crossings Study
- The 2003 Napa-Solano Passenger Rail Study

The Plan Update looks ten years ahead. The short-medium term outlook of the plan reflects the desire by the sponsoring agencies to identify improvements that are reasonable, realistic and potentially eligible for funding within known programs. There are also developments impacting the rail facilities of Solano County and investments in facilities that will be more likely to occur beyond the 10-year horizon. These are identified where relevant throughout the document.

Other relevant planning efforts were also underway concurrent with the update of this plan. These included:

- Regional Goods Movement Study (sponsored by MTC)
- Priority Development Area (PDA) plans, most of which where just being initiated while this plan was being prepared.

Where appropriate, the rail facilities plan team coordinated their assumptions with these broader regional efforts.

This plan represents the consolidation of the technical memos. Background data for the technical memos is presented in the appendix.

Solano Rail Facilities Plan Update

Chapter 1

DEMAND for FREIGHT RAIL

1 DEMAND FOR FREIGHT RAIL

1.1 BACKGROUND TO FREIGHT RAIL DEMAND

This is the first of the technical tasks in the Plan Update. Its purpose is to describe the demand for freight rail, to determine whether current facilities are adequate for that demand and determine the requirements for enhancements or expansion of freight rail capacity in Solano County.

The capacity of the core freight rail network is also shared extensively with passenger services in the County. Therefore, in this chapter the potential facility improvements relate primarily to future freight demand needs. The passenger and infrastructure chapters include the comprehensive list of improvements. Since there is some overlap with the update to the Napa-Solano passenger study, connecting freight rail services to Napa County are also referenced in this chapter.

The horizon for the freight rail demand task, as for the plan as a whole – is 10 years, i.e. 2025.

Methodology

The methodology employed a multi-step process to determine the potential demand for rail infrastructure facilities:

- **Step 1**: Identify current and future 10-year activity from current freight rail served businesses (RSBs)[1]
- **Step 2**: Identify former RSBs with unused/mothballed freight rail connections that could be reactivated
- **Step 3:** Identify locations for future RSBs that are zoned for rail-appropriate industrial uses (manufacturing and rail-served distribution, primarily) either located trackside or with a potential for near connection to the network
- **Step 4**: Overlay the current, former and future RSB level of rail demand at a site level with published industry forecasts for the commodities that currently travel by rail within the County
- **Step 5**: Compare the demand picture developed in steps 1 through 4 demand with current facility and network capacity and identify major bottlenecks/pinch points within the current and committed rail infrastructure

It should be noted that for reasons of commercial privacy, the consultant team used industry and current County rail infrastructure knowledge, operator contacts, site visits, and input from individual planning and business interests on future development sites to develop an aggregate picture of capacity across the Solano freight rail network. Individual business site-level data will not be published.

1.2 CURRENT FREIGHT RAIL NETWORK IN SOLANO COUNTY

There are three freight operators in Solano County (and for the purposes of the Plan Update, one in Napa County):

[1] The term rail served business (RSB) is used here in place of the traditional industry term “shipper” so that the rail plan can capture not only current businesses shipping both inbound and outbound by rail, but former or currently dormant businesses that have (and could again) ship freight by rail.

Class I:
Union Pacific Railroad
Shortline:
California Northern Railroad
Napa Valley Railroad

These are summarized on Map A: Solano County Freight Rail Network.

1.2.1 Class I

Union Pacific Railroad

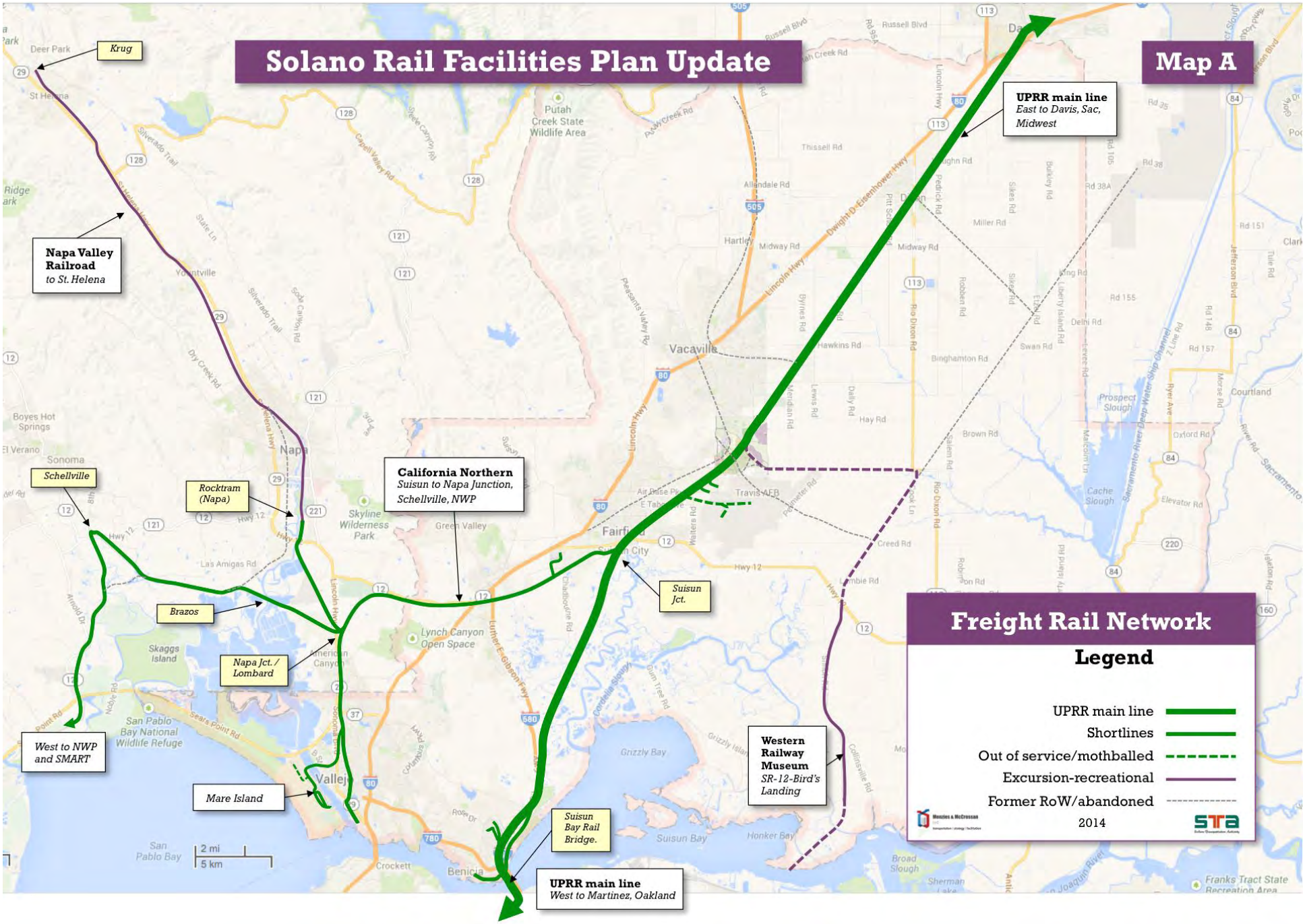
Union Pacific Railroad (UPRR) provides the majority of freight rail service in Solano County, both in terms of traffic volume and miles of rail line (41 out of 55 main line track miles). Headquartered in Omaha, Nebraska, UPRR's rail network extends to 23 states. Construction of today's route through Solano County commenced in the late 1870s by the California Pacific Railroad and was completed by the Central Pacific Railroad, which eventually became part of the Southern Pacific. In 1996, Southern Pacific was merged into the Union Pacific. UPRR operates approximately 41 miles of route in Solano County, with most of their main line comprised of two parallel, closely spaced tracks. UPRR's route through Solano County provides the most direct access linking the Port of Oakland with eastern destinations.

From the south, UPRR's route through Solano County begins, at the Solano/Contra Costa county line in the middle of the Carquinez Strait. UPRR owns and operates the nearly 1-mile long Benicia Railroad Bridge, which includes a lift span to allow vessel traffic to pass. With tracks over 70 feet above the water level, one UPRR track employs a low-grade route, paralleling I-680, as it descends toward the prevailing ground level north of Benicia Industrial Park (this is the track on the viaduct adjacent to I-680 just north of the Benicia Bridge).

This track is generally used for heavy freight trains destined for Oakland, since it is easier for heavy freight trains to climb the gentler grade. The other track is descends from the bridge much more steeply and also provides access to the Benicia Industrial Park, AmPORTS, and Valero refinery..

From Benicia, the UPRR route extends northward across the Suisun marshland before reaching the City of Suisun City, where the junction with the rail line to Vallejo, Napa, and Sonoma (operated by California Northern Railroad) is located. Several industries are located along the railroad at Suisun City and the western edge of Fairfield, with Anheuser Busch (a division of AB InBev), the Sheldon United propane distribution facility and Amcor Plastics. Through Suisun City and Fairfield, there are only four at-grade crossings: Cordelia Road, Sunset Avenue, East Tabor Avenue, and Peabody Road.

North of Suisun City, near the Peabody Road grade crossing (site of a proposed grade separation and new station for the Capitol Corridor Joint Powers Authority (CCJPA), the UPRR route passes by the Tolenas Industrial Park, site of 8 current and 2 former rail served businesses.


Solano Rail Facilities Plan Update
Map A
Krug
Napa Valley Railroad
to St. Helena
UPRR main line
East to Davis, Sac, Midwest
Schellville
Rocktram (Napa)
California Northern
Suisun to Napa Junction, Schellville, NWP
Suisun Jct.
Brazos
Napa Jct. / Lombard
West to NWP and SMART
Mare Island
Suisun Bay Rail Bridge.
UPRR main line
West to Martinez, Oakland
Western Railway Museum
SR-12-Bird's Landing
Freight Rail Network
Legend
UPRR main line
Shortlines
Out of service/mothballed
Excursion-recreational
Former RoW/abandoned
2014
2 mi
5 km

Just north of Peabody Road, near the Cannon Road crossing, is the junction with the branch line (former Sacramento Northern) owned by the Western Railway Museum (WRM). This line currently has no freight traffic, although WRM runs its own maintenance-of-way trains at the more active eastern end of the line (south of SR-12).

Continuing towards Sacramento, the railroad extends northeasterly through a predominantly agricultural area, along the south edge of the City of Vacaville, through the unincorporated community of Elmira, and through the City of Dixon. Beyond Dixon, it crosses Putah Creek on a long, low steel bridge before leaving Solano County and entering Yolo County. Between Vacaville and the Yolo County line, UPRR has 19 rural at-grade crossings, all equipped with active warning devices and gates.

1.2.2 Shortlines

California Northern Railroad

The California Northern Railroad (CFNR) is a shortline based in Napa Junction and owned by the holding company Genesee and Wyoming (G&W), which is headquartered in Jacksonville, Florida. CFNR provides service between the City of Suisun City (the junction with UPRR), the City of American Canyon, Lombard (near American Canyon), the City of Napa, and the City of Vallejo. Together, these lines comprise approximately 27 route miles of railroad. CFNR's route from Suisun City includes the Thomasson Tunnel under Cordelia Hill, a bridge over Interstate 80, and a steep grade in both directions through American Canyon, roughly paralleling Highway 12. Historically, the grade through American Canyon was an operating constraint, requiring extra locomotives for anything but short trains. At the western side of American Canyon is the Napa Junction. CFNR also operates railroads between Davis and Tehama and between Tracy and Los Banos.

Napa Junction is the confluence of the route to Suisun City, the route that extends westward to Lombard and Brazos Junction, the interchange with the Northwestern Pacific Railroad (NWP). This is also the junction with the CFNR route northward approximately 7 miles, through the former Napa Pipe factory, and to the interchange with the Napa Valley Railway (operator of the Napa Valley Wine Train) at Rocktram in Napa. CFNR also operates the route between Lombard and Schellville, although CFNR has assigned operating rights to this segment to the NWP; thus, interchange between NWP and CFNR is effected at Lombard.

The line southward from Napa junction extends through 20 at-grade crossings and through a residential area, to the former General Mills site, which is proposed for future industrial development. A second line, previously operated by Mare Island Rail Service (MIRS), extends from the intersection of Sereno Drive and Broadway, through commercial and residential areas, across the Mare Island Strait on a lift bridge (shared with auto traffic) and onto Mare Island, the grounds of the former Navy Base. The former Navy Base trackage on Mare Island is largely located in roadways and features sharp curves to various spur tracks. The City, which has a track use agreement with CFNR, controls the track from Sereno Drive and Broadway to just inside Mare Island.

Note that Napa Junction, American Canyon, Lombard, and Napa, as well as the entirety of the territory served by the Northwestern Pacific Railroad and Napa Valley Railway are all outside of Solano County; however, these other railroads have their only connection to the "outside world" via the CFNR and the junction with UPRR. Via agreements with other railroads, UPRR, and CFNR, customers on Mare Island can receive service from/to nearly any rail-served shipper in the US, Canada, or Mexico.

Napa Valley Railroad

The Napa Valley Railroad (NVRR) operates approximately 19 miles from their interchange with the CFNR along the Napa River (at Rocktram) northward to St. Helena. The southern 2 miles of the railroad extend northward through Napa and under Highway 29. The majority of the railroad is immediately west of Highway 29, though the northernmost 4 mile section (at St. Helena) is along the east side of the Highway.

The railroad has many grade crossings – every public and private road that has an intersection along Highway 29 has a grade crossing with the railroad immediately adjacent to the intersection. Note that while NVRR is entirely in Napa County, its rail access to the rest of the nation's rail network is via the CFNR and UPRR through Solano County.

1.3 RAIL SERVED BUSINESS (RSB) FACILITIES

1.3.1 How Rail Served Businesses (RSBs) are typically served

A brief explanation all how these businesses are served will help in understanding of the potential need for new facilities as patterns of demand change over the 10-year period of the Plan Update.

Unit trains are comprised entirely of goods shipped from a single origin to a single destination. Automobiles, for example, move in unit trains, with the origin being the factory in the Midwest and the destination being the AmPORTS facility at Benicia. Unit trains avoid intermediate switching and are thus very efficient, thereby allowing railroads to offer a premium service to customers.

Manifest trains move carload traffic in small groups of railcars, generally on the order of 1 to 10 cars at a time, in trains comprised of many different types of railcars. Each railcar or group of railcars within a manifest train may have a different destination. The individual carloads are gathered together at one location (a switching yard) until sufficiently large groups comprise an entire train. The time required to assemble a train is dependent upon the volume and timing of loaded railcars offered by multiple shippers.

Once a full train of cars is available, it is dispatched to a location – typically another large railyard – on the route to the destination of most of the cars in the train. At that railyard the cars are sorted into smaller groups for local delivery, or for assemblage into another train for forwarding to their final destination. Carload traffic traveling in manifest trains requires more time to reach its destination compared to unit train service.

1.4 INDIVIDUAL RAIL SERVED BUSINESS (RSB) FACILITIES PROFILES

The full list of current and recently served (since 2000) former RSBs (from East to West across the County) is shown in Fig. 1.

Map B summarizes current RSB facilities, both active and inactive.

Following the table is a summary profile of each of the major rail served businesses (RSBs) in Solano County, outlining the diversity of enterprises that use rail and the locations where they are concentrated.

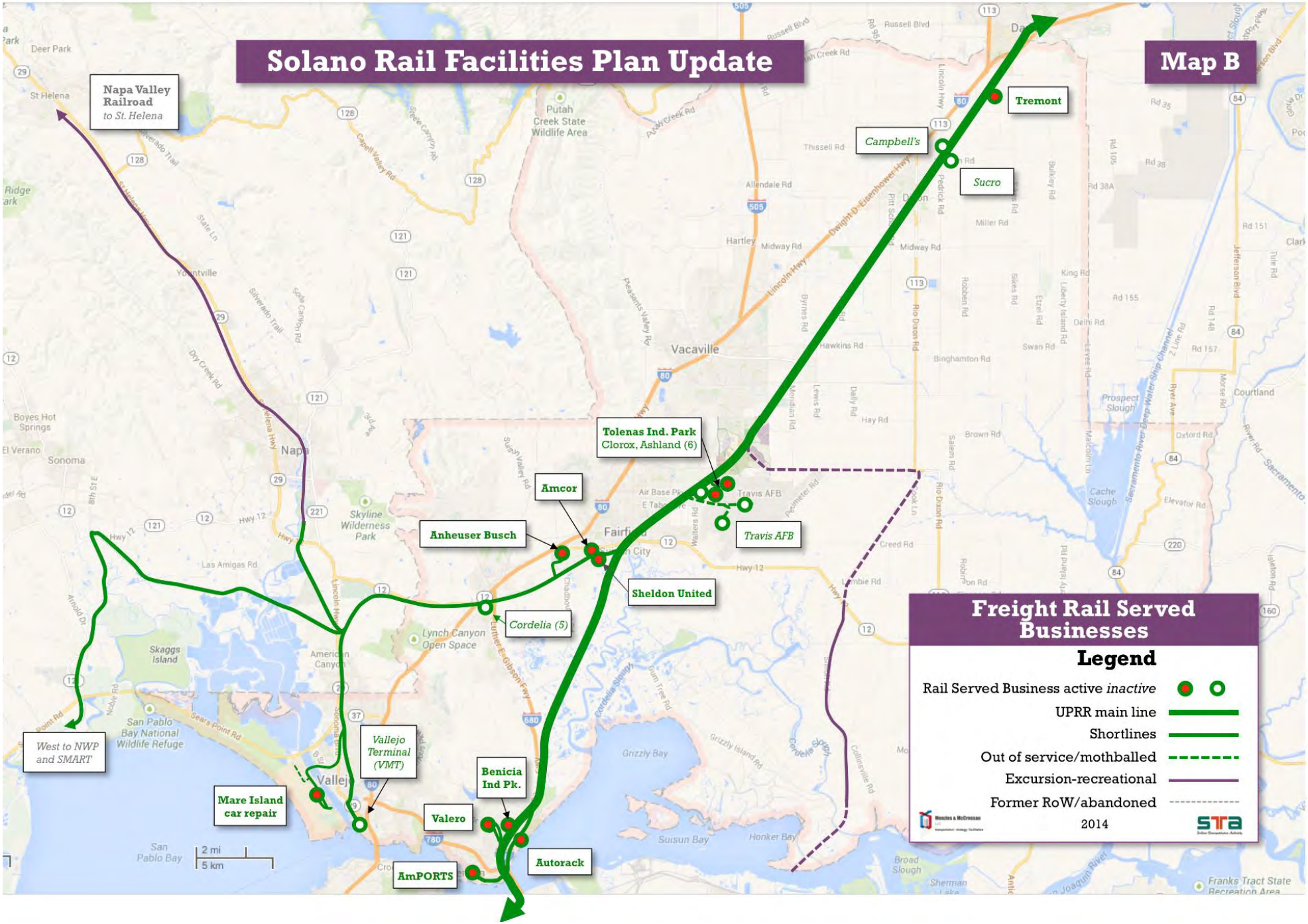

Solano Rail Facilities Plan Update
Map B
Napa Valley Railroad
to St. Helena
Tremont
Campbell's
Sucro
Tolenas Ind. Park
Clorox, Ashland (6)
Amcor
Anheuser Busch
Sheldon United
Travis AFB
Cordelia (5)
Vallejo Terminal (VMT)
Benicia Ind Pk.
Valero
Autorack
AmPORTS
Mare Island car repair
West to NWP and SMART
Freight Rail Served Businesses
Legend
Rail Served Business active inactive
UPRR main line
Shortlines
Out of service/mothballed
Excursion-recreational
Former RoW/abandoned
2014
2 mi
5 km

Figure 1 Solano County Rail Served Businesses (RSBs) Summary 2015 (listed East-West)

RSB Name	Active/ *inactive / future*	RSB Rail Facility Jurisdiction	Inbound / Outbound Primary	Primary Rail Traffic / Commodity
Tremont Supply Co (Dixon)	✓ **active**	Solano Co/ Dixon	outbound	ag product
Campbell Soup Supply Co	*inactive*	*Solano Co/ Dixon*	outbound	*food/bev product*
Sucro-Dixon	*inactive*	*Solano Co/ Dixon*	outbound	ag product
Tolenas Bus Park Clorox	✓ **active**	Fairfield	outbound	bulk liquid chemical
Tolenas Bus Park Ball Metal Beverage	✓ **active**	Fairfield	outbound	bev container
Tolenas Bus Park Macro Plastics	✓ **active**	Fairfield	outbound	plastic raw materials
Tolenas Bus Park Goodyear	✓ **active**	Fairfield	outbound	rubber product materials
Tolenas Bus Park Nexeo Solutions	✓ **active**	Fairfield	outbound	bulk liquid chemical
Tolenas Bus Park Sunpol Resins	✓ **active**	Fairfield	outbound	bulk liquid chemical
Tolenas Bus Park Compu-Tech Lumber	✓ **active**	Fairfield	inbound	dim lumber
Tolenas Bus Park Frank-Lin Distillers	✓ **active**	Fairfield	inbound	beverage product
Tolenas Bus Park Rexam	*inactive*	*Fairfield*	inbound	*bev container*
Travis AFB	*inactive*	*Fairfield*	inbound	*avgas/DOD*
Anheuser Busch	✓ **active**	Fairfield	inbound	beverage production supply
Sheldon United Terminal	✓ **active**	Fairfield	inbound	propane
Amcor Rigid Plastics	*inactive*	*Fairfield*	inbound	*plastic raw materials*
Jensen Precast Building Systems (fmr Fibrebond)	*inactive*	*Fairfield*	*n.a.*	*n.a.*
West Cordelia (North bay Auto Auction)	*inactive*	*Fairfield*	*n.a.*	*n.a.*
West Cordelia (White Cap Construction Supply)	*inactive*	*Fairfield*	*n.a.*	*n.a.*
West Cordelia (fmr. Glass Pak)	*inactive*	*Fairfield*	*n.a.*	*n.a.*
West Cordelia (Dependable Plastics)	*inactive*	*Fairfield*	*n.a.*	*n.a.*
Valero Benicia	✓ **active**	Benicia	inbound	refined petroleum products
Benicia Ind Park Terminal Biagi Bros	✓ **active**	Benicia	inbound	beverage product
Benicia Ind Park Coca-Cola Enterprises Inc.	✓ **active**	Benicia	inbound	beverage product
AmPORTS Auto rack	✓ **active**	Benicia	inbound	finished autos
AmPORTS Benicia Port Terminal	✓ **active**	Benicia	inbound	petroleum feedstocks
Vallejo Mare Island Terminal	✓ **active**	Vallejo	inbound	railcars
Vallejo Marine Terminal	*inactive/ future*	*Vallejo*	*future outbound*	*grain (future cement product)*

Benicia: Valero Refining

Valero is one of the largest industries in Solano County and also one of the largest users of rail service. Some feedstock and some refined products are transported to and from the refinery by rail, mostly in railroad tank cars, on a daily basis. Note that the vast majority of the feedstock is crude oil. Ships that dock at a dedicated wharf in Benicia currently transport this crude. The tracks accessing Valero are well off the main line, providing the opportunity for switching service uninterrupted by main line trains. Valero has a proposal to shift its crude oil traffic volume to rail: this is considered in more detail in section 1.6.

Image: Google 2014

Benicia: AmPORTS

AmPORTS is the operating entity for the automobile terminal at Benicia. This facility consists of dock space, vehicle inspection and preparation areas, vehicle storage space, and areas for loading vehicles onto railcars. AmPORTS is the distribution hub for Ford and Chrysler vehicles, and is also the receiving port for imported Toyota vehicles. Domestic automobiles arrive by railcar and are generally transported to Northern California by truck. Imported vehicles are received from ships and transported to inland destinations by truck (for Northern California destinations) or railcar (for destinations throughout the western US).

The level of rail service to the AmPORTS facility is dictated by the demand for automobiles and, in the case of autos handled by both ship and rail, also by ship schedules. Benicia competes with other West Coast locations for automobile imports, and volumes can rise and fall based on contract status. Benicia is, for example, currently the beneficiary of imports that have been switched from the Port of Richmond, lifting current automobile volumes 20% over the past three years. However, when shipped by rail, automobiles are always moved in unit trains consisting exclusively of auto carrier cars. Like Valero, the tracks serving AmPORTS are located well away from the main line, providing the opportunity for switching service uninterrupted by main line trains.

Image: Google 2014

Benicia Industrial Park

Benicia Industrial Park caters to distribution and transloading needs for several firms, mainly in the beverage/bottling sector. Biagi Brothers is a trucking and transload firm located in the Benicia Industrial Park. They receive beer and wine deliveries from Mexico via railcar and transload those goods into trucks for delivery to regional distribution centers or wholesale or retailer warehouses. Railcar deliveries to Biagi Brothers are in boxcars, with frequent service to their location. Biagi Brothers is located well away from the main line, and thus can be switched uninterrupted.

Other occasional customers at the industrial park include Bruni Glass packaging, one of the larger suppliers of glass for the Northern California wineries, and Coca-Cola bottling. Many more warehouse facilities in the industrial park have rail connection but the needs of customers change with turnover in tenancy.

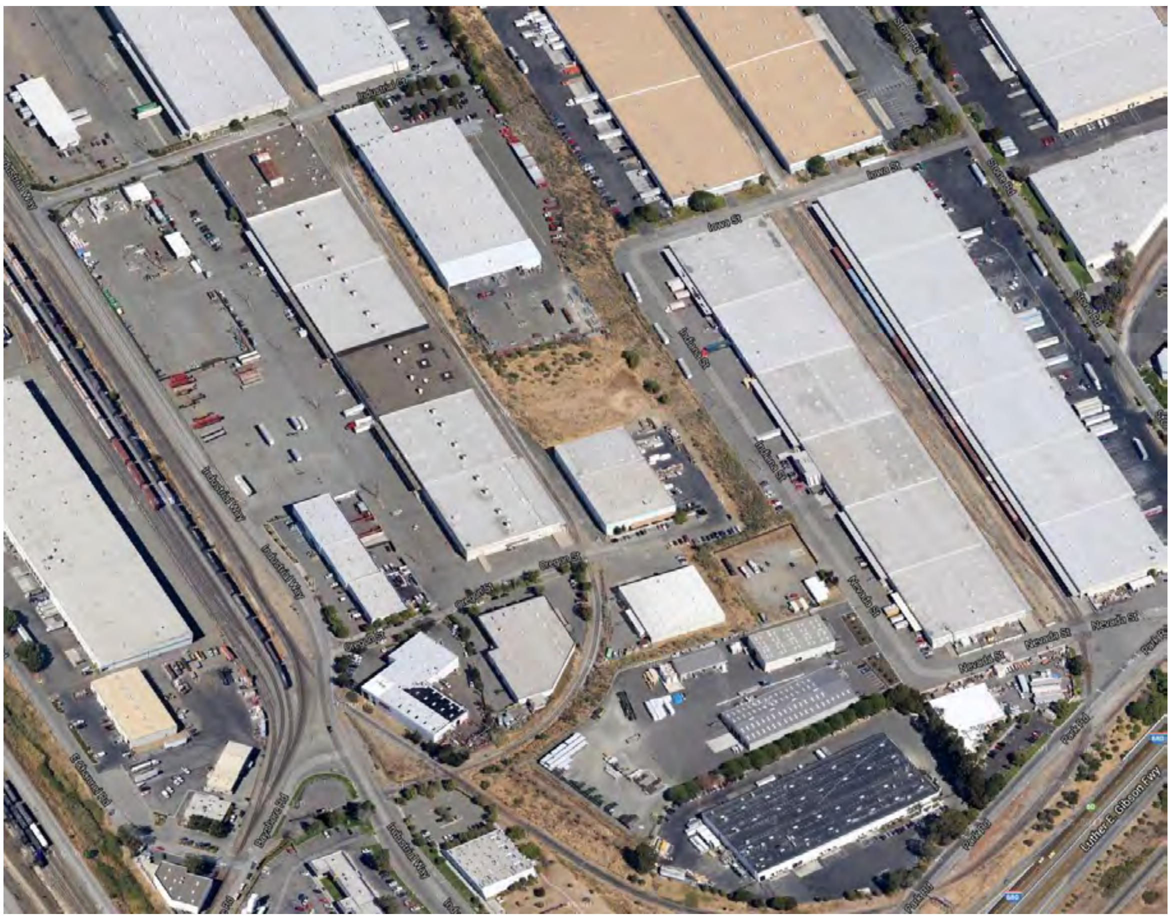


Image: Google 2014

Fairfield: Anheuser Busch

Anheuser Busch is a major shipper and receiver of goods by rail. Inbound traffic includes grains for brewing in covered hopper cars and packaging (i.e., bottles, cans, or kegs), generally in boxcars. Outbound traffic is primarily boxcar loads of beer. Traffic is handled in manifest trains. Even though they are close to the Union Pacific main line at Suisun City, the California Northern Railroad serves Anheuser Busch daily.

Image: Google 2014

Fairfield: Sheldon United

The Sheldon United terminal is a propane distributor. They receive tank cars of propane, which is then distributed via local delivery trucks throughout the region. These tank cars arrive in carload lots. There is no outbound traffic. Like Anheuser Busch, California Northern serves Sheldon Oil.

Image: Google 2014

Fairfield: Tolenas Industrial Park

Tolenas Industrial Park is a group of industries on the north side of Fairfield located along a switching track adjacent to the Union Pacific main line. By having a separate switching track, many of the rail switching activities in the industrial park present less interruption to main line operation (and the switching operations themselves are interrupted less frequently by main line traffic). All rail traffic at the Tolenas Industrial Park is carload rather than unit train.

Rail-served industries at Tolenas include:

- Clorox, which receives inbound cars of raw materials
- Ball Corporation, which receives inbound raw materials
- Macro Plastics, which receives plastic pellets in covered hopper cars
- Ashland Distribution Company, which receives raw materials in tank cars and distributes specialty chemicals
- Frank-Lin Distillers
- Goodyear Tire, which receives raw materials in covered hopper cars
- Compu-Tech Lumber, which has received lumber products via flatcar

Image: Google 2014

Dixon: Campbell's Soup / Dixon Canning

Campbell's Soup has shipped carloads of tomato paste by rail sporadically in the last few years, though it is believed they have not shipped via rail recently. Campbell's Soup is located directly on the main line, meaning that any switching at this location has to compete with main line traffic.

Image: Google 2014

Dixon: Tremont Seed

Tremont Seed receives carloads of inbound raw materials which are used to manufacture fertilizer products for the agricultural industry. Like Campbell's Soup, Tremont Seed is located directly on the main line, meaning that any switching at this location has to compete with main line traffic.

Image: Google 2014

1.5 CURRENT FREIGHT RAIL ACTIVITY IN SOLANO

A summary of the current levels of scheduled freight service can be found in Map C.

Since scheduled and unscheduled moves vary on a week-to-week basis and some commodities (e.g. propane) have some seasonality, these are currently expressed in a range. Local network moves by shortline operators are current estimates.

1.5.1 Class I

Union Pacific Railroad

Union Pacific is the main freight carrier in Solano County. They operate *approximately* 15-25 trains per day on their double-track main line extending from the Contra Costa County line, in the middle of the Carquinez Straight near Benicia, to the Yolo County line near Davis. Most freight trains are through trains, operating to (or from) the Port of Oakland as unit trains of containers.

While the majority of freight to and from Oakland is containerized, there are several manifest trains carrying all types of traffic to or from the Oakland area, as well. There are manifest trains stopping in Solano County to interchange (the railroad term for exchanging cars with connecting railroads) cars with the California Northern and to pick up or drop off cars at Benicia Industrial Park.

Note that the freight activity on the UPRR main line is in addition to the 4 Amtrak long distance trains and 30 Capitol Corridor trains currently operating through Solano County. In addition, on selected dates in the winter an excursion train operates between Oakland and Reno.

1.5.2 Shortlines

California Northern Railroad

California Northern Railroad (CFNR) serves a host of industries west of Fairfield, including connections with other carriers: the Northwestern Pacific Railroad, the former Mare Island Rail Service, and the Napa Valley Railroad. In addition, CFNR serves a host of industries in Fairfield, Lombard, and Napa.

CFNR operates daily switching engines at Fairfield, and offers service three to five days per week to Napa Junction, Lombard, Napa, and to connecting carriers. CFNR interchanges cars almost daily in a manifest train with Union Pacific Railroad; UPRR receives from the originating shippers or forwards them to their destinations.

While not a major shipper, Alstom is the only current customer on Mare Island. Alstom repairs passenger railcars, chiefly the fleet of double-deck cars for the Capitol Corridor and San Joaquin services. Alstom receives cars one at a time for overhaul, with the schedule highly dependent upon the passenger providers' equipment rotations. Service is infrequent, with cars arriving or departing at the rate of a few per month (at most) and connects to California Northern in Vallejo, which in turn connects with Union Pacific, which provides access to the Amtrak maintenance and storage yard in Oakland.

Northwestern Pacific Railroad

Northwestern Pacific Railroad (NWP) handles grain and lumber traffic as far north as Windsor in Sonoma County. NWP also currently handles some construction materials for the Sonoma-Marin Area Rail Transit (SMART) project. They rely on the California Northern to handle traffic between

Lombard (near Napa Junction) and the Union Pacific at Suisun. Current traffic is a few manifest trains per month.

Napa Valley Railroad

The Napa Valley Railroad handles very little freight traffic. The vast majority of their traffic is oriented towards the tourist market in the Napa Valley. While passenger service is operated on a daily basis, only a few, if any, freight cars are handled each year. Any freight traffic to or from the Napa Valley Railroad would pass through Solano County on the Union Pacific and California Northern railroads.

Figure 2 summarizes the estimated current level of regular freight service to the RSBs.

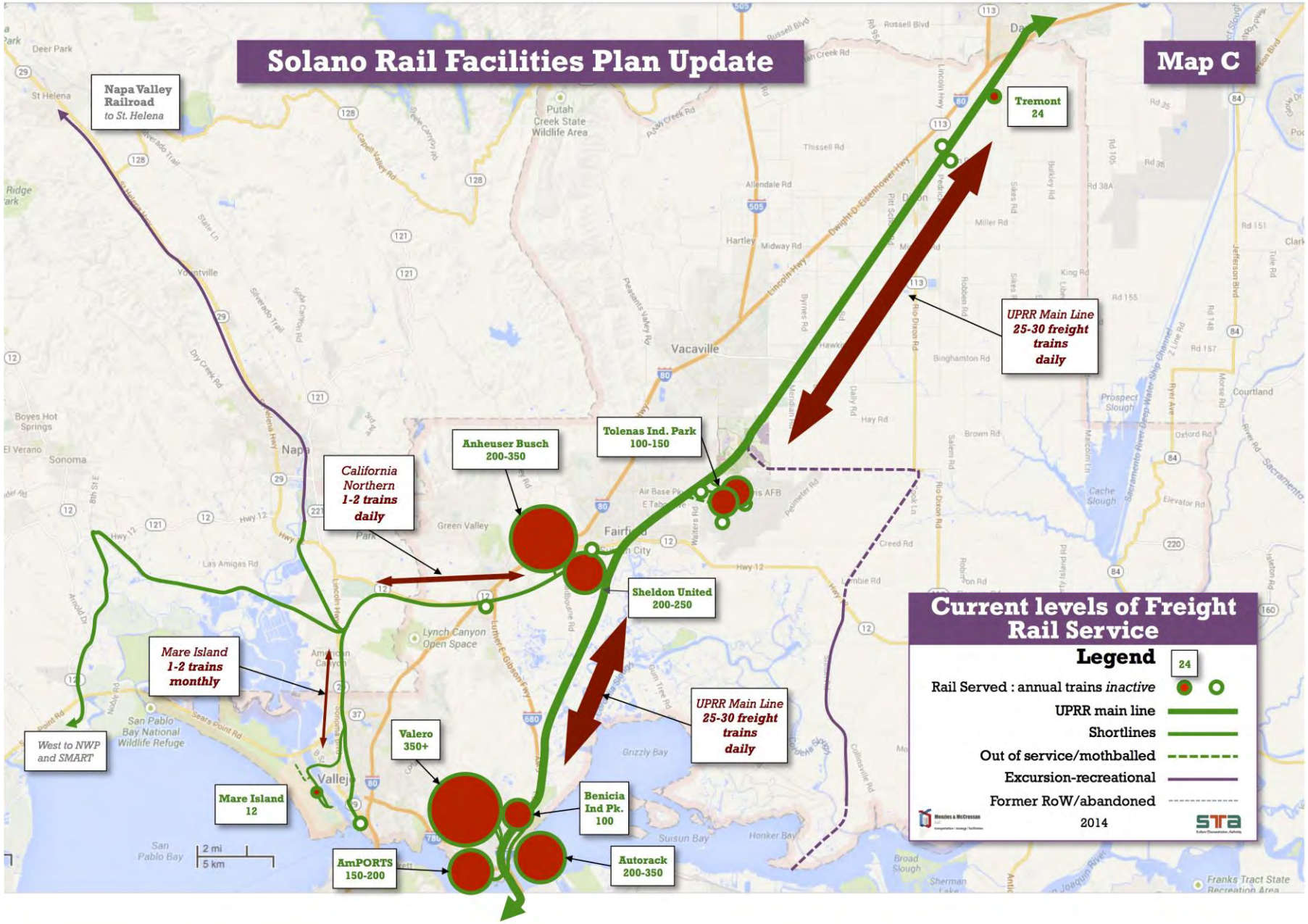
Figure 2 Estimated Current Level Of Regular Freight Service to RSBs

RSB Name	Active/ *inactive / future*	RSB Rail Facility Jurisdiction	Inbound / Outbound Primary	Primary Rail Traffic / Commodity	Typical Annual Rail Delivery Frequency
Tremont Supply Co (Dixon)	✓ active	Solano Co/ Dixon	outbound	ag product	24
Tolenas Bus Park Clorox	✓ active	Fairfield	outbound	bulk liquid chemical	150
Tolenas Bus Park Ball Metal Beverage	✓ active	Fairfield	outbound	bev container	100
Tolenas Bus Park Macro Plastics	✓ active	Fairfield	outbound	plastic raw materials	100
Tolenas Bus Park Goodyear	✓ active	Fairfield	outbound	rubber product materials	100
Tolenas Bus Park Nexeo Solutions	✓ active	Fairfield	outbound	bulk liquid chemical	100
Tolenas Bus Park Sunpol Resins	✓ active	Fairfield	outbound	bulk liquid chemical	100
Tolenas Bus Park Compu-Tech Lumber	✓ active	Fairfield	inbound	dim lumber	50
Tolenas Bus Park Frank-Lin Distillers	✓ active	Fairfield	inbound	beverage product	100
Anheuser Busch	✓ active	Fairfield	inbound	beverage production supply	300
Sheldon United Terminal	✓ active	Fairfield	inbound	propane	240
Valero Benicia	✓ active	Benicia	inbound	refined petroleum products	400
Benicia Ind Park Terminal Biagi Bros	✓ active	Benicia	inbound	beverage product	100
Benicia Ind Park Coca-Cola Enterprises Inc.	✓ active	Benicia	inbound	beverage product	100
AmPORTS Auto rack	✓ active	Benicia	inbound	finished autos	300
AmPORTS Benicia Port Terminal	✓ active	Benicia	inbound	petroleum feedstocks	200
Vallejo Mare Island Terminal	✓ active	Vallejo	inbound	railcars	12

Notes:

1) These have been aggregated up from daily/weekly/several times per week service to produce annual totals.

2) For commercial confidentiality and practical reasons, the final Solano Rail Facilities Plan Update does not include specific carload counts or operational patterns to specific customers. Both are considered proprietary information, can change at short notice and are subject to the vagaries of the shipper's respective industries.


Solano Rail Facilities Plan Update
Map C
Napa Valley Railroad to St. Helena
Tremont 24
UPRR Main Line 25-30 freight trains daily
Tolenas Ind. Park 100-150
Anheuser Busch 200-350
California Northern 1-2 trains daily
Sheldon United 200-250
Mare Island 1-2 trains monthly
UPRR Main Line 25-30 freight trains daily
West to NWP and SMART
Valero 350+
Mare Island 12
Benicia Ind Pk. 100
AmPORTS 150-200
Autorack 200-350
Current levels of Freight Rail Service
Legend
24
Rail Served : annual trains inactive
UPRR main line
Shortlines
Out of service/mothballed
Excursion-recreational
Former RoW/abandoned
2014
2 mi
5 km

1.6 FUTURE DEMAND FOR RAIL SERVICE

1.6.1 Key Rail Commodities in Solano and Trends

There are five primary groups of rail commodities in Solano County. For the purposes of planning the need for rail facilities, these can be grouped into two categories, each of which has different trajectories for growth in the 10-year period of the plan:

A) Solano rail commodities that closely track growth in the overall domestic economy:

- Beverage container manufacturing (primarily plastics)
- Liquid bulk chemicals (non-crude)
- Beverage production supplies
- Construction supplies

B) Solano rail commodities that will track the shift in domestic oil refining sources:

- Crude Oil by Rail (CBR)

Solano rail commodities that closely track growth in the overall domestic economy:

The first group has industry forecasts that show growth in the 2 - 4% annual range over the plan period*. Of course, actual requirements for supply of product to RSBs in Solano County are highly individual to each location, but these will serve as a guideline for the order of magnitude range of growth anticipated.

Even within the upper end of the range for all of these products (or even beyond if volumes work to double over the decade), the level of demand for these commodities is likely to remain within the scale current level of service provided through current facilities – i.e. carload rather than new trainload-level demand.

This is because current RSB sites in Solano, based on a review from 2014 data, appear to be operating between 30%and 60% of current capacity, some considerably lower.

Crude Oil by Rail (CBR)

There has been a widely publicized growth in demand for crude oil by rail (CBR), reflecting a replacement by domestic supply of all formerly imported crude oil.

The rates of growth in CBR vary widely across the country based on the source of domestic crude, refining needs and frequent fluctuations in prices – all of these factors will have a bearing on the level of demand for CBR locally.

Commodity growth trends are less relevant to the Solano picture for this commodity than the stated intent by the sole destination for CBR, the Valero refinery in Benicia. Valero has indicated that rail deliveries of Canadian crude would offset the more costly crude that currently arrives at these refineries via marine vessel from Alaska and overseas sources. As of the preparation date of the Plan Update[2], the proposed CBR is understood to be originating in Canada but may also originate from sources in the Midwest.

[2] Data in the Plan Update as of March 2015

Valero is planning an expansion to receive crude feedstock by rail. Currently, an Environmental Impact Report is being prepared pursuant to the California Environmental Quality Act (CEQA). The City of Benicia has not yet taken action on Valero's request to modify their facility to accept the additional train traffic[3]. Based on information in the EIR project description, it appears that Valero is considering accepting as much as 70,000 barrels a day by rail (approximately 50-100 additional cars) which can be accommodated on two 50-car trains (sized to the terminal facilities or less likely, one 100 car train per day of crude oil.

The rail routing into the plant has yet to be determined: if coming north across the Benicia Railroad Bridge, the daily train would make less than one mile of its trip within the County. If coming west from the Davis direction via Roseville, the train would make a 40-mile transit through the County to the refinery, through Dixon, Vacaville, Fairfield, Suisun and Benicia.

CBR has been the subject of much discussion in relation to safety. The regulation of these trains is jurisdictionally outside the authority of Solano County or Solano Transportation Authority. The consultants noted during the course of the Plan Update, several potential measures to address concerns about the safety of these shipments.

At the California level, an Assembly Bill 380 sponsored by Assemblyman Roger Dickinson and approved by the Governor late 2014, addressed the current arrangement whereby railroads were not required to share future oil train schedules with first responders ahead of time (although they did meet requests for information from wayside jurisdictions). AB 380 requires that railroads shipping crude oil provide state and local emergency officials with information about oil and hazardous materials that may be shipped through their jurisdictions. It also requires carriers, when shipping Bakken crude oil, to provide the state with information about the volume of oil and timing of the shipment ahead of time and also provide the state with copies of the carrier's hazmat emergency response plan.

At a Federal level, US Department of Transportation in late 2014 issued a Notice of Potential Rulemaking (NPRM) on the subject, which among other requirements for CBR trains (defined as 20 or more cars) would:

- Propose new standards for tank cars constructed after October 1, 2015, retrofitting of the existing industry standard DOT111 cars and retiring those which are not enhanced
- Impose a 40-mph speed restriction on CBR trains in most areas
- Evaluate a 30-mph speed restriction for CBR cars/trains that do not comply with new enhanced braking requirements
- Require trains containing one million gallons of Bakken crude oil to notify State Emergency Response Commissions (SERCs) or other appropriate state delegated entities about the operation of these trains through their States
- Require carriers to perform a routing analysis for CBR that would consider 27 safety and security factors and select a route based on findings

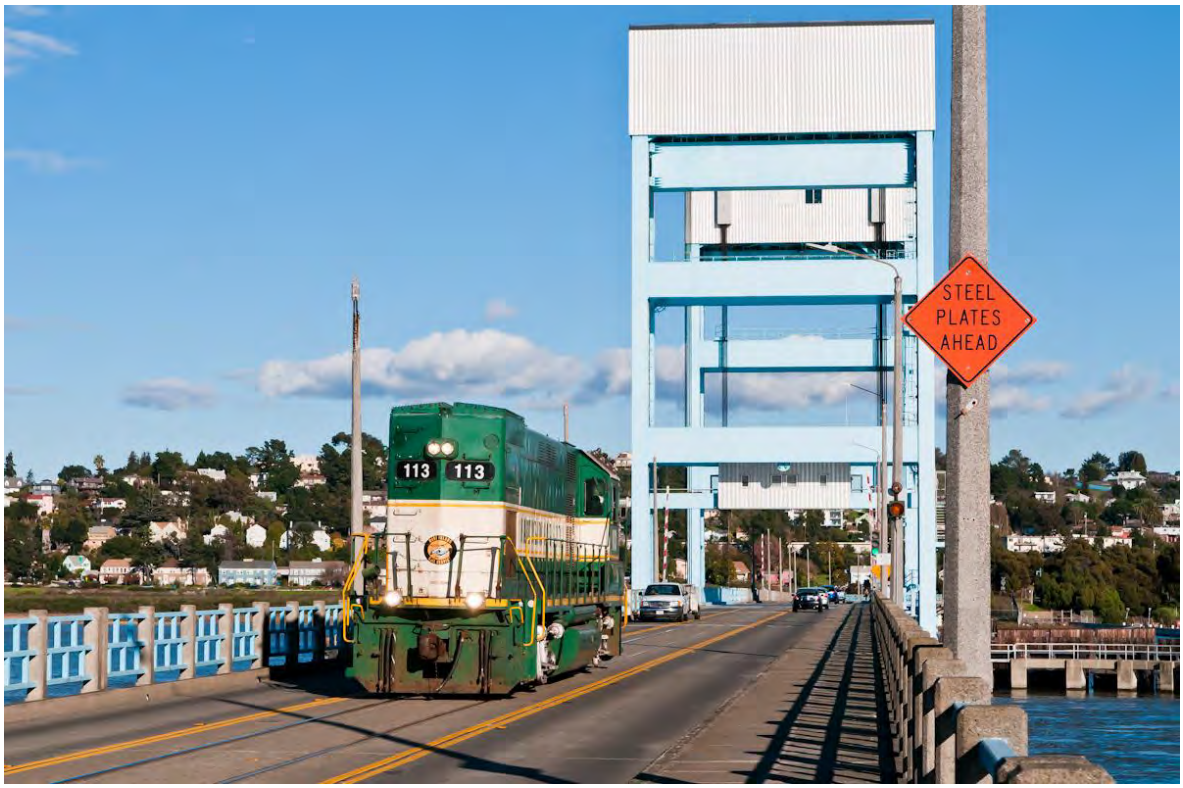
[3] As of the plan preparation (March 2015), the City of Benicia has indicated that a Recirculated Draft EIR for public comment was anticipated June 30, 2015

1.6.2 Former Rail Served Businesses (RSBs)

The major former rail-served businesses in Solano County include:

Mare Island

The Navy's presence at Mare Island was the main generator of the types of freight traffic that would employ rail service – heavy, bulk items traveling long distances. For the Navy, this traffic was comprised of raw and fabricated steel products. The potential for a large rail shipper on the Island is dependent upon a large manufacturing facility locating there. The remaining traffic would be occasional scrap metal from ship breaking operations. There have been discussions of establishing an industrial park or bulk handling facility on the north side of the island.


STEEL
PLATES
AHEAD
113
113

Railroad Ave
Main Ave
Waterfront Ave
Mare Island Causeway

Travis Air Force Base

Travis Air Force Base is a major facility for the USAF Air Mobility Command and had a rail connection for bulk items on the western side of the base, crossing at Walters Rd., but the connection with Union Pacific was severed at least 7 years ago. Travis currently serves as a base for cargo and military passenger aircraft, and has the largest throughput of both in the United States.

Equipment that could be handled by rail for air deployment is typically staged at an Army base located near an air base (rather than loaded on trains for transport to an air base and subsequent loading on planes). Although bulk liquid (aviation fuel, for example) is often well suited to rail in its volume, weight and length of rail haul characteristics, the type of military equipment handled by rail (tanks, munitions) is not typically conducive to air transport unless a rapid deployment situation is necessary.

Several decades ago, additional rail service to the base was made via the former Sacramento Northern route (now owned by the Western Railway Museum, as described in this report), crossing the North Gate road, with a live connection to the UPRR main line. The consultant is in ongoing discussions with Travis AFB staff to confirm the potential for future cargo by rail potential and for reactivating the former rail connection.

Cordelia former RSBs

There are four former RSB locations in south Cordelia, all of which have private sidings intact on both sides of W. Cordelia Rd., but which have changed activity/ownership since they were served by rail:

- North Bay Auto Auction
- White Cap Construction Supply
- Glass Pak (former)
- Dependable Plastics

It has been some years since these were rail-served, and not considered likely, given their current activity profiles, to be returning to rail in the near future.

General Mills (Vallejo Marine Terminal)

The General Mills flour mill at Vallejo was a major receiver of grain products. It has since closed and some of the facilities and equipment have been demolished or auctioned off. Vallejo Marine Terminal, LLC, purchased most of the property and leases a portion of the property from the City.

The new property owners have proposed to rebuild the bulkhead and improve the site, and have leased a portion of the site to Orcem California, LLC, a building materials manufacturer. Orcem would use the terminal facility to receive raw cement admixture material by ship, process it, and ship it out by truck and rail to cement makers. Depending upon demand of the product, this could generate substantial rail traffic.

The proposal currently in the environmental review process envisages up to 50 car trains four times per week or 10,400 carloads annually. This operation, a substantial boost to the viability of this segment of the local rail network, is still within the overall level of traffic which the line has accommodated in past decades.

Napa Pipe

While not technically in Solano County, the Napa Pipe plant was a major rail shipper. Some inbound steel arrived by rail, and significant outbound pipe departed – often in unit trains as frequently as weekly. Several of the main structures at Napa Pipe have been demolished, and there

is little opportunity for this facility to manufacture steel pipe, though it could conceivably be re-purposed for freight rail, if demand warranted maintaining the connection.

1.6.3 Potential New Rail Served Business (RSB) Sites

Factors in identifying future RSB sites:

Although much of Solano County has suitable frontage to the UPRR mainline, in practice there are three major considerations which factor into identifying future RSBs:

Land Use/Zoning Designation

Given the rural nature of large parts of the County, there are many other potential sites that could be suitable for rail served businesses. Flat sites with extensive frontage along railroad tracks and access to roadways and utilities are the main candidates. However, land use regulations and development policies (most notably the Solano Orderly Growth Initiative, which prohibits urban-scale development in the unincorporated County) are a major factor in determining whether these sites are ultimately suitable for rail served businesses. With this in mind, sites that are currently or likely to be designated for rail-served industrial use have been included in this assessment.

Rail Traffic Thresholds Service Providers

Another major factor in determining whether a site is suitable for a rail served business is the quantity of traffic it would generate for the serving railroad. Generally, businesses located along a busy mainline (such as UPRR's main line) would need to generate dozens or hundreds of carloads – the equivalent of several unit trains – each month in order for the economics of establishing a new rail connection to be viable (the economics are often related to the engineering parameters of the connection to the main line).

Conversely, shortlines (such as California Northern) are able to cost-effectively serve much smaller enterprises, though the minimum shipping volume is often still on the order of a few cars per week or per month in order to justify a new service. Several of the current RSBs served by CFNR are currently at the lower end of this threshold.

Typical Rail-suited Commodities

Examples of typical industries that can be effectively served by rail (if located in close enough proximity to a rail line) and could be candidates for Solano County include grain storage and distribution facilities, fertilizer distribution facilities, cement distribution facilities, petroleum or ethanol products facilities, plastics manufacturing facilities, and manufacturing facilities that require high volumes of inbound raw materials.

There are, therefore four potential future locations for large scale freight rail service that have been included in the plan assessments to date, shown on Map D:

1) Vallejo Marine Terminal

As mentioned, the proposed Vallejo Marine Terminal facility, with alternative cement material manufacturer Orcem California as one of the main tenants, could be the most well advanced significant new rail served business in Solano County, potentially generating over 10,000 annual railcars outbound (inbound materials would arrive by ship, train and truck). The project has not received discretionary approval from the City of Vallejo as of the date of this report.

2) Fairfield General Plan Areas 6A and 6B

Some 300 acres of potential rail-served industrial use have been designated in the updated Fairfield General Plan and Fairfield-Vacaville Station Specific Plan, identified as Plan Areas 6A and 6B. Both are likely suitable for the small number of larger rail users – either manufacturing are rail-linked distribution facilities.

3) Cordelia Road, Fairfield (adjacent to Anheuser Busch)

The 43-acre "Buzz Oates Development" site at the Cordelia Road/Hale Ranch Road intersection adjacent to the southern boundary of the Busch plant and the California Northern line has been identified, with the potential for direct access from the Busch spur.

4) Dixon-Unincorporated County

There may be additional sites that could be suitable for rail served businesses, assuming land use patterns are supportive of industrial uses. Solano Economic Development Corporation (EDC) has considered the potential for a 700-acre area (currently used for agriculture) northeast of Dixon in the I-80-Vaughan Road/Tremont Rd/railroad triangle being zoned to support agricultural-related industries in the 2008 Solano General Plan (see Appendix 2). In order for this site to be conducive to rail-served businesses, track connections and configurations would need to be identified, based on likely interest from manufacturing or distribution operators.

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Solano Rail Facilities Plan Update

Map D

1.7 FREIGHT CAPACITY BOTTLENECKS AND NEEDS

1.7.1 Current Bottlenecks

Freight bottlenecks often occur at locations where trains slow down due to curves or grades. There are none of these in Solano County. The steepest grade is in American Canyon, on the California Northern line. However, since that railroad typically only handles short trains and speed is not a key factor, it does not represent a major bottleneck. The descent from the Suisun Bay Bridge is short and is normally only used for “downhill” trains, with “uphill” trains employing the other track which has a much gentler grade (and which has much less effect on train movement).

However, the low-grade track does feature several curves and a trestle that limits speeds for the fastest trains (including passenger trains).

Suisun Bay Bridge

The bridge itself can be an operational bottleneck when ship traffic requires that the moveable span be lifted. Since ship traffic has the right-of-way, trains must wait until vessel traffic has passed. (At this location, a sophisticated signal system prevents trains from approaching the bridge when it is in its open position.) Typically the duration of the open lift span is 10-15 minutes for a ship passing which, given the volumes of freight and passenger traffic, can have an impact on the fluidity and reliability of rail movements across both sides of the bridge.

Tolenas Industrial Park

The industrial park’s switching activity is another bottleneck. Due to the current track configuration, some of that switching may affect main line operations. However, it is the consultant’s understanding that the proposed improvements associated with the new Fairfield-Vacaville train station will alleviate many, if not all, of the remaining issues by lengthening the switching tracks. This will provide space for entire trains switching in the Industrial Park to exit the main line.

Suisun Junction

To the extent that some switching may occur on the main line, the junction at Suisun with the California Northern can also be a bottleneck. This could be alleviated by providing more storage space for trains to exit the main line, or possibly by providing more space for switching along the California Northern route.

This ability of trains to completely exit the main line while switching is a benefit for rail served businesses, present and future, located along the Union Pacific. When the engineering conditions are such that a train can completely exit the main line, through freight and passenger trains can pass uninterrupted.

Davis Station Curve

Although just outside Solano County, the curve at Davis train station is also a bottleneck for freight trains, since they slow down while traversing the curve. However, eliminating the bottleneck would likely require re-routing freight traffic around Davis on a new alignment (possibly extending into Solano County), and would likely be uneconomical.

1.7.2 Future Bottlenecks (10-year outlook)

Suisun Marsh

Because Union Pacific's route through Solano County is relatively flat and has few curves, there may be areas which are candidates for higher passenger train speeds. Since the Suisun Marsh is a long section with no stations and a single, broad curve, there may be a time in the future when this becomes a candidate section for faster passenger train speeds. To allow passenger trains to overtake slower passenger or freight trains, an additional track may be necessary. Although in many areas of the County this would present few significant challenges, the environmental sensitivity of the Suisun Marsh could pose permitting problems that may ultimately constrain capacity.

Suisun Bay Bridge

The Suisun Bay Bridge (as discussed previously) will also continue to be a bottleneck into the future. Resolving the boat traffic issue may necessitate a higher bridge, which would come at great expense.

Vallejo Marine Terminal

The proposed bulk import facility at Vallejo Marine Terminal may also be subject to bottlenecks, since the route to the Terminal passes through a residential area with many grade crossings. Unit trains operating slowly through this area could cause intermittent roadway traffic congestion as they pass or are switched. However, this would likely not be a major issue for roadway traffic unless rail freight traffic was frequent. These unit trains could also encounter slow operation through American Canyon due to the steep grade; however, since there is no rail congestion in this area, a single slow freight train would not affect grade crossings or other rail traffic.

Mare Island Causeway

Another potential bottleneck is the Mare Island Causeway lift bridge crossing the Mare Island Strait. The loading capacity of this structure is not known, and it could present challenges if frequent, heavy loads were operated. The trackage shared with roadway traffic on the bridge as well as on the streets of Mare Island could also create conflicts between trains and motorists. This would likely not be a problem if train operations are infrequent, but if more frequent operations or longer trains were considered this could pose a challenge. Future development of housing and commercial/industrial uses on Mare Island could also increase auto traffic using the bridge, further exacerbating congestion.

These bottlenecks are assessed further in the infrastructure and safety section (chapter 4) of the Plan Update.

Map E provides an overview of these current and potential freight rail network bottlenecks in the County, based on a 10-year outlook.

1.8 INITIAL CONCLUSIONS: KEY FREIGHT RAIL CAPACITY ENHANCEMENT NEEDS

Our Initial conclusions are organized within the three major levels of the Solano County freight rail network. They are focused on the freight rail capacity enhancement needs which have emerged from the foregoing analysis and the team's industry experience, both locally in these rail corridors and nationally. These may be modified or augmented when the overlay of passenger service needs is conducted in subsequent tasks of the Plan Update. These should be regarded as preliminary conclusions.

1.8.1 The Current Mainline Network

Infrastructure was built for service levels considerably above current demand – in the pre-2009 Great Recession era, this section of the mainline was carrying as many as 40 freight trains a day. Presently the range current level of freight service is typically 15-25 freight trains per day through Solano. Regularly scheduled passenger services currently *exceed* the number of scheduled freight moves through Solano County, meaning that, at least during daytime, passenger services actually predominate on the mainline.

Looking ahead 10 years in Solano, there are many unknowns, which include:

- The growth trends and choices by the Class I Railroads of routing of port-generated /Northern California intermodal traffic
- Frequently changing origin locations and mode choices for major growth commodities (especially petrochemicals/CBR)
- Any future renegotiations to add passenger slots on the mainline above the current CCJPA agreement

Many of these passenger-freight mainline 10-year capacity considerations are items to be considered in subsequent tasks, but for the purposes of this Task 3 assessment, the following appears possible:

- Freight train numbers may have not recovered to pre-recession levels, and it is unclear when or even if they will within the 10-year horizon.
- Depending on shippers' schedule needs, there are potentially slots available for *all* of the anticipated major growth on mainline-served freight demand in Solano i.e.
    - A daily full CBR train serving Valero
    - Several Busch-scale production facilities in the three potential Fairfield sites (unlikely even to total a daily trainload)
    - Several large production facilities to be designated in the unincorporated County east of Dixon

A single medium-sized plant generating a dozen cars a week would unlikely sustain the costs of a new mainline connection. A plant or group of facilities receiving a dozen cars per day (or perhaps a train every few days) may sustain the costs of such a connection.

However, the establishment of major customers served directly from the mainline at any of these three designated areas might be handled with existing infrastructure *if* the switching operations were configured properly, with extended sidings to remove all local rail traffic from the mainline, as is being developed for Tolenas as part of the Fairfield-Vacaville station project.

1.8.2 Shortline Facilities

California Northern currently interchanges around 24,000 cars annually with UPRR: this is less than half of the level of the mid-1990s to 2000's and reflects that:

The shortline business base in Northern California has been contracting (even before the Great Recession) and the business market for carload rail is a challenging one: with a few exceptions, shippers' traffic needs have decreased, not increased

- Even with a 10-year look ahead, based on known development sites (North Mare Island and the Orcem Vallejo Marine Terminal (VMT) project, which is forecasting 50,000 annual carloads), the results yield traffic levels below where they were when the Navy was operating at Mare Island and General Mills had regular service to Vallejo. The VMT project could, however, reactivate and secure the future of freight rail infrastructure that could otherwise be vulnerable to closure.
- Several customers have been lost to rail, e.g. all of the Cordelia area customers together with Napa Pipe and former sugar beet growers in northeast Solano County. They have mostly changed ownership, or through lack of overall competitiveness in their respective industries, the rail-linked sites have abandoned manufacturing/distribution and are unlikely to return to rail.

1.8.3 RSB Facilities

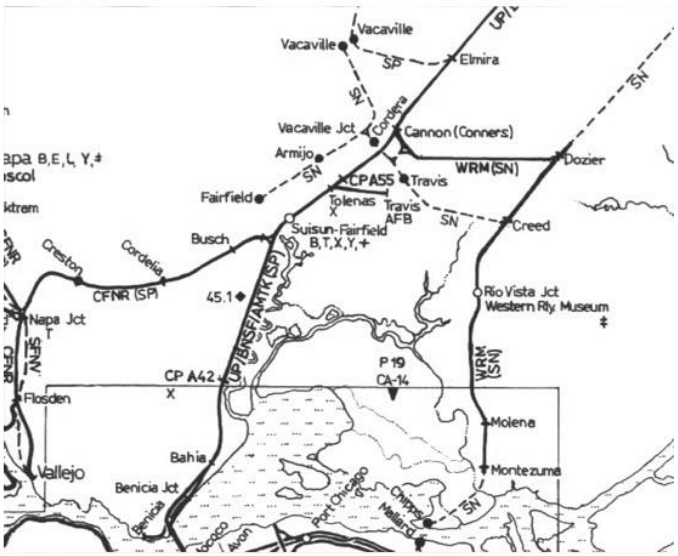
Our review of current capacity of the RSB-level and utilization based on multiple 2014 local observation/site visits shows the current utilization of private sidings is generally in the 30- 60% range). The former RSBs identified in this document that become rail shippers again are unlikely to generate a need for major rail infrastructure facilities investment beyond their own sites, since shortline and mainline capacity appears adequate to absorb all of their former traffic.

Figure 3 Estimated RSB Facility Utilization 2014

RSB Name	Active/ *inactive / future*	RSB Rail Facility Jurisdiction	Primary Rail Traffic / Commodity	Typical Annual Rail Delivery Frequency 2015	Est. RSB Facility utilization 2015
Tremont Supply Co (Dixon)	✓ active	Solano Co	ag product	24	50%
Potential Development Area East	*future*	*Solano Co/ Dixon*	*TBD*	-	*0%*
Campbell Soup Supply Co	*inactive*	*Dixon/Solano Co*	*food/bev product*	-	*0%*
Sucro-Dixon	*inactive*	*Dixon/Solano Co*	*ag product*	-	*0%*
Tolenas Bus Park Clorox	✓ active	Fairfield	bulk liquid chemical	150	60%
Tolenas Bus Park Ball Metal Beverage	✓ active	Fairfield	bev container	100	40%
Tolenas Bus Park Macro Plastics	✓ active	Fairfield	plastic raw materials	100	40%
Tolenas Bus Park Goodyear	✓ active	Fairfield	rubber product materials	100	50%
Tolenas Bus Park Nexeo Solutions	✓ active	Fairfield	bulk liquid chemical	100	40%
Tolenas Bus Park Sunpol Resins	✓ active	Fairfield	bulk liquid chemical	100	60%
Tolenas Bus Park Compu-Tech Lumber	✓ active	Fairfield	dim lumber	50	20%
Tolenas Bus Park Frank-Lin Distillers	✓ active	Fairfield	beverage product	100	60%
Travis AFB	*inactive*	*Fairfield*	*avgas/DOD*	-	*0%*
Anheuser Busch	✓ active	Fairfield	beverage production supply	300	60%
Sheldon United Terminal	✓ active	Fairfield	propane	240	70%
Amcor Rigid Plastics	✓ active	Fairfield	plastic raw materials	100	0%
Tolenas Bus Park Rexam	*inactive*	*Fairfield*	*bev container*	-	*0%*
Jensen Precast Building Systems (fmr Fibrebond)	*inactive*	*Fairfield*	*n.a.*	-	*0%*
West Cordelia (North bay Auto Auction)	*inactive*	*Fairfield*	*n.a.*	-	*0%*
West Cordelia (White Cap Construction Supply)	*inactive*	*Fairfield*	*n.a.*	-	*0%*
West Cordelia (fmr. Glass Pak)	*inactive*	*Fairfield*	*n.a.*	-	*0%*
West Cordelia (Dependable Plastics)	*inactive*	*Fairfield*	*n.a.*	-	*0%*
Future Plan Area 6 A	*future*	*Fairfield*	*TBD*	-	*0%*
Future Plan Area 6 B	*future*	*Fairfield*	*TBD*	-	*0%*
Valero Benicia*	✓ active	Benicia	refined petroleum products	400	70%
Benicia Ind Park Terminal Biagi Bros	✓ active	Benicia	beverage product	100	50%
Benicia Ind Park Coca-Cola Enterprises Inc.	✓ active	Benicia	beverage product	100	30%
AmPORTS Auto rack	✓ active	Benicia	finished autos	300	80%
AmPORTS Benicia Port Terminal	✓ active	Benicia	petroleum feedstocks	200	70%
Vallejo Mare Island Terminal	✓ active	Vallejo	railcars	12	10%
Vallejo Marine Terminal	*inactive/ future*	*Vallejo*	*grain (future cement product)*	-	*0%*

Solano Rail Facilities Plan Update
Map E
Napa Valley Railroad
to St. Helena
Tremont
Davis Curve
Outside County
Tolenas Ind Park
Main line switching rail congestion (station project will alleviate)
Suisun Junction
Main line switching rail congestion
Tolenas Ind. Park
Clorox, Ashland (6)
Anheuser Busch
Sheldon United
Mare Island Causeway
Shared roadway-trackage
West to NWP and SMART
Mare Island car repair
Vallejo
VMT project: grade crossing congestion
Benicia Ind Pk.
Valero
AmPORTS
Autorack
Suisun Marsh
long term speed improvements environmentally constrained
Suisun Bridge
lift span delays
Current and Potential Freight Rail Bottlenecks
Legend
Rail Served Business active inactive
UPRR main line
Shortlines
Out of service/mothballed
Excursion-recreational
Bottleneck today / Future
2 mi
5 km

Solano Rail Facilities Plan Update



Chapter 2

CAPITOL CORRIDOR:

REVIEW AND UPDATE OF 1995 PLAN

2 CAPITOL CORRIDOR - REVIEW AND UPDATE OF 1995 PLAN

2.1 INTRODUCTION

This chapter summarizes the assumptions and potential for passenger service in Solano County at the 10-year horizon of the Plan Update – i.e. operations in 2024–25. The rail infrastructure of the County serves both freight and passenger needs: indeed on the mainline, the level of passenger service has grown over the past 20 years to the point that freight and passenger trains are roughly equal in number.

These assumptions provide the foundation for the following elements of the task and plan outputs:

- Operational analysis of shared passenger/freight rail capacity
- Determining the connecting level of transit service needs
- Assessing parking requirements for Solano passenger stations
- Assessing the adequacy of bike and pedestrian access to stations served by Capitol Corridor trains (in the subsequent Safety task as part of the final plan)

Taken together with the subsequent Sea Level Rise and Safety tasks in Sections 3.2 and 3.3, this chapter provides a foundation for the future list of infrastructure improvements, cost estimates and potential funding and implementation content of the final Plan Update.

2.2 EXISTING CONDITIONS, PLANS, AND POLICIES

Existing conditions, reference station area planning documents and growth assumptions are contained in the Appendix.

2.3 STATION LOCATIONS

2.3.1 Current Solano Passenger Rail Service

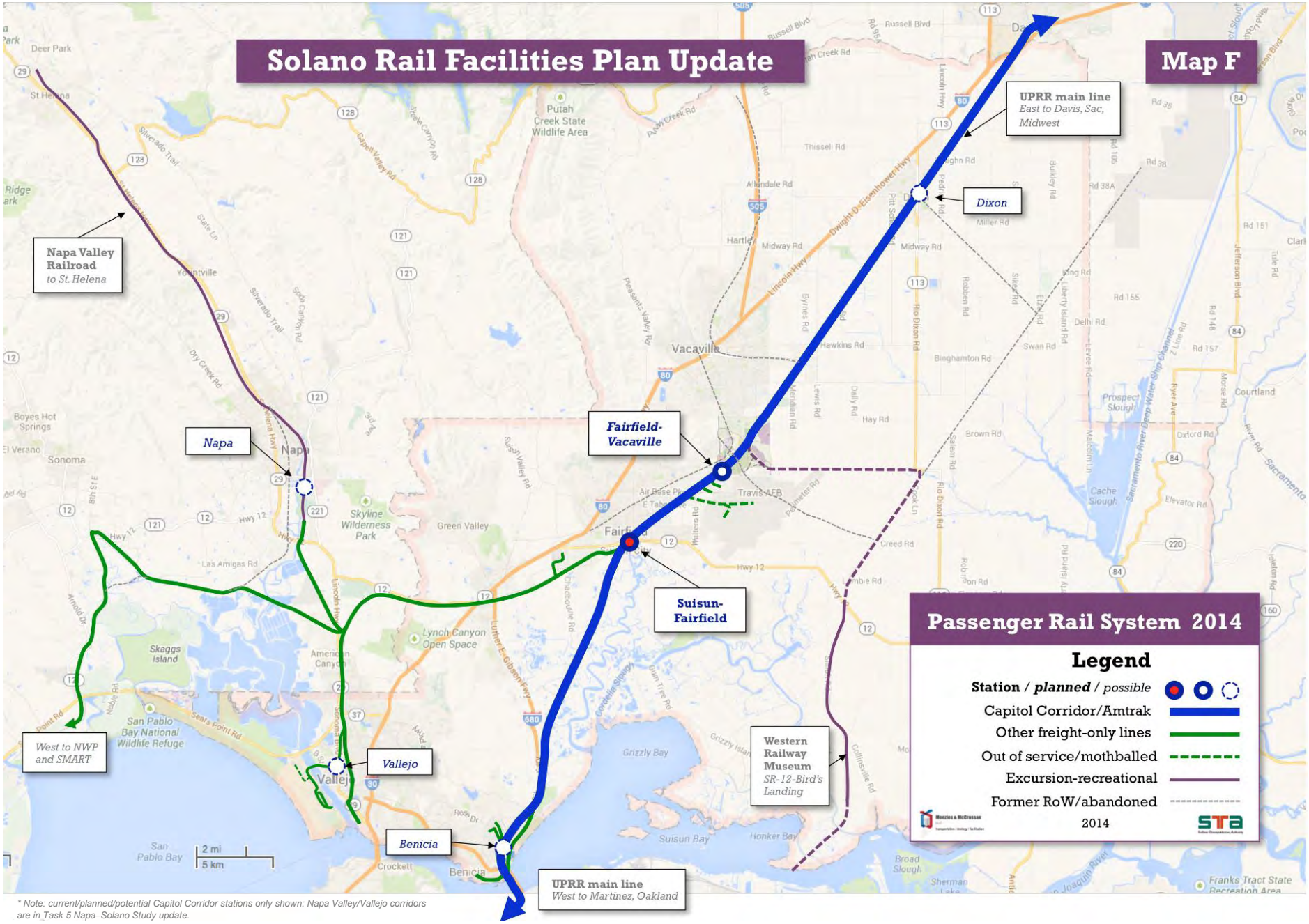
(Map F)

2.3.1.1 Capitol Corridor Service

Currently there is one station with regular passenger service in the county (see Map F), Suisun-Fairfield, with 196,000 users annually in FY13[4]. The station is served by all Capitol Corridor trains both eastbound serving destinations from Davis east to Sacramento (and ultimately Auburn), and westbound to Oakland and other Bay Area destinations, ultimately San Jose (see Map F):

[4] CCJPA/Amtrak data for the year 2013-14

Map F: Passenger Rail System 2014



* Note: current/planned/potential Capitol Corridor stations only shown: Napa Valley/Vallejo corridors are in Task 5 Napa–Solano Study update.

Figure 4 Current Level of Capitol Corridor Service: Suisun-Fairfield Station

Direction of Travel	Weekdays	*Weekends/ Holidays:*
Level of service:		
Westbound	15 trains	*11 trains*
Eastbound	15 trains	*11 trains*
Span of service:		
Westbound	5:09am-9:49pm	*6:19am-9:49pm*
Eastbound	6:33am-11:13pm	*8:28am-11:23pm*

2.3.1.2 Amtrak Long Distance and other passenger services

In addition to Capitol Corridor trains there are also four daily Amtrak long distance trains (serving the Bay Area to Chicago and Seattle to Southern California routes), which pass through Fairfield-Suisun and do not currently stop in the County. The nearest station stops by the Amtrak long-distance services are in Martinez and Davis. (See Appendix for current schedules).

There is also an additional winter-only service (Sierra Scenic Snow Train on weekends and midweek Reno Fun Train) that runs during ski season between Emeryville and Reno, which makes stops in both directions at Suisun-Fairfield.

The County's sole station stop was established in 1991, when Capitol Corridor service began, and has been served by additional services on every occasion that these have been expanded.

2.3.2 Current Station Facility: Suisun-Fairfield Station

Staffing: The Suisun-Fairfield (SUI) station is currently not staffed by Amtrak/CCJPA, but is staffed by STA commute consultant customer service representatives. Most of the smaller stations on the Capitol Corridor, with the exception of the terminal stations and some larger cities, are unstaffed. The station has *Quicktrak* ticket vending machines available.

The station has a modern depot building, rehabilitated from a 100-year old station structure, and offering passenger waiting and restroom services. A café in the passenger waiting area is staffed during commute hours. The station is the highest used stop on the corridor that is unstaffed. As of early 2015, Suisun City and STA have developed and funded a plan to upgrade the station, with construction work scheduled to commence in the summer of 2015.

Parking: There are approximately 300 spaces in the park and ride lot at Main Street//Lotz Way, with additional on street parking.

Bike and pedestrian access is via Main Street and Railroad Ave. Access to downtown Fairfield is currently via a pedestrian bridge crossing the tracks under SR-12 to Union Ave.

Connecting transit service: The station is served by local Fairfield and Suisun Transit (FAST) and SolanoExpress with two FAST routes connecting all trains (not a timed transfer) with local route destinations in Fairfield and Suisun City: Route 5 operates on 30 minute frequency 6am-7pm and some Route 7 services on school days. SolanoExpress Route 90 connects the station with the Fairfield Transit Center and destinations west to El Cerrito Del Norte BART.

Napa Vine Transit makes seven weekday stops at the station on its Route 21 service to Napa. Both Greyhound (west to Oakland/Vallejo and east to Sacramento/Reno) and Delta Breeze (to Rio Vista/Isleton) make non-timed transfer stops at the station.

2.3.3 Planned Station: Fairfield-Vacaville (FFV) Intermodal Station

In addition to the current station, a second station 5 miles to the east at the Peabody Road crossing of the Union Pacific Railroad main line, is in the final stages of design, with construction scheduled to begin in 2015 and revenue service scheduled to occur 2017.

The station components are as follows:

Rail Side:

- Unstaffed passenger platform 800 ft. long, 43 ft. wide
- Grade separated pedestrian access via pedestrian under crossing
- Passenger waiting building with designated space for food vending or service
- Public address system and real-time train arrival monitors
- *Quicktrak* ticket vending machines

Land Side:

- Parking for approximately 350 vehicles in the near-term (The City plans to construct a multi-story parking structure when parking demand increases).
- Transit access via curbside facilities accommodating up to 6x40' vehicles
- Pickup and drop-off curb space accommodating 10 vehicles
- Passenger bike lockers

2.4 CURRENT CAPITOL CORRIDOR JOINT POWERS AUTHORITY STATION STOP CRITERIA

In order to clarify the criteria guiding the establishment of new stations on the corridor, the governing body for Capitol Corridor services Capitol Corridor Joint Powers Authority (CCJPA) has developed a set of physical design, funding and operating requirements that have to be satisfied in order for a station stop to be considered.

In February 2006, the CCJPA Board adopted a set of principles to guide the development of an updated set of CCJPA policies on stations served by Capitol Corridor trains and the extensions and expansion of

Capitol Corridor train service and train stations. Originally developed in 1998, these were revised in June 2006 by the Board and are shown in Figure 5.

The criteria as they relate to additional stations are grouped around three primary principles – 1) Station Standards, 2) The Station Funding Plan and 3) Support of The Host Railroad – and are summarized in Figure 5.

The current criteria have been developed against the background of several key factors:

a) Operational ownership

Capitol Corridor is effectively a tenant operating services on the host railroad – Union Pacific's – tracks, via a trackage rights agreement. The host railroad therefore shares its freight train capacity with passenger trains: any additional stops or changes to the schedule have to be considered carefully alongside their schedule needs and priorities. There is currently an effective ceiling of 30 trains (15 round trips) per day within the current agreement.

b) The need to balance new passenger needs with schedule and performance impacts

Existing station stops and passengers using them should not be adversely affected by the addition of new stops. Any new station proposal has to quantify the negative effects on schedule, on-time performance and corridor-wide end-to-end running times, and means of mitigating those effects (if this is possible).

Minimum numbers of boardings (10 boardings/alightings per train in the first 6 months or service) generated by new stations are also therefore part of the current criteria (Suisun-Fairfield station significantly exceeds this minimum, serving almost 600 passengers daily).

c) Physical design considerations

Although most stations are served on the corridor solely by Capitol Corridor trains, designs also have to conform to Amtrak's station standards at a minimum.

Since track capacity is limited to the current number of trains within the agreement with Union Pacific, additional capacity for future growth is initially being accommodated by the future addition of longer trains.

Train lengthening has already been happening during the course of the past decade, and in the future the standard train length is anticipated to be 8 cars. The current train length varies but is typically 4-5 cars. Therefore all future stations should be able to accommodate this length of platform (700'), ideally on tangent (straight) track.

At locations where the platform configuration has *through* passenger or freight trains serving a boarding face – either an island platform or side platforms – safe pedestrian access typically requires grade separation – under or over the tracks. Modern ADA access requirements and physical setback distances for pedestrians to safely clear structures on the platform while trains are passing through the station are also resulting in more generous widths for platforms than would have traditionally been the case in the pre-ADA era.

Circumstances vary station by station, but these are the primary physical considerations and they impose a more extensive physical footprint for a planned new station than in the pre-2006 era.

Note that these are criteria established for the approval of potential stations in principle, within current design standards, and not a prescriptive design template for every new station, or a guarantee that a station will be approved. Ultimately, the station project has to meet all the criteria and be approved by Union Pacific Railroad (UPRR), the host railroad.

Other Criteria

In addition there are other CCJPA policies that relate to new stations but are not necessarily part of the in-principle approval requirements. For example, there has been an increased use of bicycles accessing the Capitol Corridor trains which has resulted in demand for on-board and station bike storage exceeding previous design capacity for bikes.

This is a common experience of commuter rail systems throughout the country over the past decade; demand for bike access has been growing faster on the Capitol Corridor then on the rest of the State-supported system (recent passenger surveys also show higher than corridor average bike mode of access within Solano, as discussed below in section 2.9). CCJPA has developed a set of principles for bicycle access which focus primarily on improving on-board train provision, but which are likely to mean additional secure bicycle storage capacity at stations – bike lockers, locked bike parking - than in previously approved stations.

Additional CCJPA policies were adopted at the time of the 2006 revision to station policy (see Appendix A) that are related to expansion of service within the corridor, extension of service outside the corridor limits, and policy for retention of train service to current stations, none of which currently directly impact Solano County.

2.5 POTENTIAL SOLANO-SPECIFIC STATION CRITERIA

The planned Fairfield-Vacaville station met all of the current Capitol Corridor station criteria at the time it was proposed. In addition, prior to seeking station approval, the STA helped secure funding for off-site track improvements that improved overall system on-time performance, in anticipation of the potential for impacts to on-time performance when the new station comes on line. The Capitol Corridor system has benefitted from these improvements for years as the new train station and its on-site improvements were designed, funded and initiated.

Final approval of the Fairfield-Vacaville station still required extensive additional mitigating measures and analysis, as shown below. These improvements were incorporated into the City of Fairfield Specific Plan for the train station and surrounding area, and will be completed before the new train station is opened. Those improvements are:

- The construction of additional siding facilities for freight trains serving the Tolenas Industrial Park in Fairfield.
- Grade separation of Peabody Road to accommodate the station tracks and pedestrian undercrossing access to the platform.

The process of identifying and implementing off-site and on-site improvements demonstrates that, for any potential future stations on the Capitol Corridor system, meeting all of the basic criteria is therefore not a

guarantee of station stop approval.

These are significant additional investments required to secure a successful and well-integrated new station stop to the Capitol Corridor, but they also represent a very high cost threshold for cities considering new stations, and an order of magnitude greater than "legacy stations" from the earlier 20th century passenger era or even stations approved as recently as the early 1990s in the Southern Pacific era.

Looking ahead to potential future stations, Solano has an opportunity in the 2014 Rail Facilities Plan Update to establish its own criteria, reflect local conditions and demonstrate community support, but with a clear understanding of the much higher cost thresholds for establishing new stations today than for previous rounds of station approvals.

There have also been changes in policy and regional funding requirements for local jurisdictions seeking support for new stations. In addition to the overall higher cost threshold for station sponsors, the expected commitment by local jurisdictions to transit supportive development has been formalized by the Metropolitan Transportation Commission (MTC), the federally designated Metropolitan Planning Organization (MPO) through the MTC-required Priority Development Area and Station Area planning process since the 2006 policies were adopted.

Since CCJPA and the host railroad ultimately determine whether any station stop will be approved, it makes sense to integrate any local criteria with the baseline established by CCJPA. The Solano-specific “Match and Refine” criteria (Fig. 6) therefore incorporate the approved CCJPA polices and:

- Allow local Solano jurisdictions to establish their own priorities within these in terms of amenities, readiness for future expansion and phasing
- Expand the CCJPA criteria to require specific commitments by local jurisdictions to land-side improvements in the areas of multimodal access (auto, transit bike, walk), parking provision and safety measures
- Define consistent local connecting transit service/”last mile” commitments
- Establish requirements for fully determining both capital and operations and maintenance costs and needed funding for new station facilities
- Ensure that proposed Solano stations are consistent with the regional planning and funding requirements, by requiring them to conform to the regional PDA/Station Area Plan process (and in so doing update the methodologies for determining multimodal access improvements for the station from the descriptions in the 2006 policy)

In short, *Match and Refine* criteria would reflect a likely higher level of long-term commitment and likely greater overall cost commitment by the local jurisdictions in order to increase the likelihood of additional stations in Solano County.

Figure 5 Summary of Current Station Stop Criteria

3 Principles	Criteria	Item	Notes
Meet Station Standards	**Ridership**	Min daily average ridership projections of 10 boardings / alightings per train within the first 6 months of CCJPA train service	Several current stations served on the Corridor do not meet this requirement
	Design Criteria	Platforms will be a minimum of 700 ft. in length and 8 inches above top-of-rail (any deviations or exemptions require approval by host railroad and/or CCJPA/Amtrak)	Replaces previous policy of 400 ft. min length, with impacts on several projects planned prior to policy change (e.g. Dixon)
		Goal of having stations separated by a minimum of 5 miles	
		Design will provide access to platforms so that passengers never cross a mainline track (e.g., grade separated access to island platform, station-only track not used by freight trains)	Grade separation requirement brings major design safety improvements but significant costs
	Multi Modal Access	An intermodal transit connection plan must be developed by the station project sponsor that may include joint ticketing or transit transfer with the CCJPA trains	Current policy allows wide latitude for local connecting transit agencies
		Requirements for parking based upon a parking study prepared by project sponsor that will consider: ADA compliance, non-motorized vehicle access, current and future adjacent land uses, baseline (and future) ridership projections, transit and carpool/drop-off connectivity, transit-orientated development plans	Requirements will likely be influenced by priority development area (PDA) plans underway since policy was adopted
		Secure storage bike racks/lockers will be provided at platforms or inside station passenger waiting areas	CCJPA bike plan developed since 2006 has enhanced bike emphasis
	Passenger Amenities	Canopy shelters to provide seating for 12 people and accommodate 2 wheelchairs with capacity to add more shelters to meet future demand	Amtrak's station design guidelines also apply
		Ticket vending machines(s) and associated communication equipment provided at platforms (under canopy) or inside passenger waiting areas	Amtrak's station design guidelines also apply
		Passenger Information Display System (PIDS) provided at platforms and inside station passenger waiting areas, based on CCJPA design specs	Amtrak's station design guidelines also apply
	Safety & Security	Install security cameras on platforms, waiting areas, station facilities, and parking areas with the connecting communication system to be developed as part of design plans	Amtrak's station design guidelines also apply
		Emergency call boxes will be provided, at a minimum, at all unstaffed stations	Amtrak's station design guidelines also apply
		Local law enforcement agency will patrol and inspect station and parking facilities	Requires long-term local jurisdiction financial commitment
		Bomb-resistant trash receptacles will be provided at platforms and inside station passenger waiting areas	Amtrak's station design guidelines also apply
Have Support of Host Railroad	**Railroad Approval**	Coordination/approval of station design plans with "host" railroad	For Solano County this effectively means the support of Union Pacific Railroad at all stages of the process
Funding Plan	**Funding**	Project Sponsor has to provide a complete Funding Plan	

Figure 6 Proposed Solano-Specific Station Criteria

Match and Refine CCJPA Criteria

Criteria	Item	Notes
Ridership	Min daily average ridership projections of 10 boardings / alightings per train for **weekday services** within the first 6 months of CCJPA train service	Better reflects the commute oriented trips made by Solano riders
	Any additional station projects will, if necessary, mitigate the schedule impacts of additional stops in order to maintain overall Capitol Corridor-wide travel times.	Ensures that riders at existing station stops are not adversely affected by new station stops on the Corridor.
Design Criteria	Platforms will be a minimum of 700 ft. in length and 8 inches above top-of-rail (any deviations or exemptions require approval by host railroad and/or CCJPA/Amtrak)	Matches CCJPA criteria
	Goal of having stations separated by a minimum of 5 miles	Potential Dixon and Lake Herman Benicia locations meet this criterion
	Design will provide access to platforms so that passengers never cross a mainline track for both side and island platforms. Station-only tracks not used by freight trains are exempt from this provision	Clarifies ambiguity in current policy and minimizes unnecessary large-scale capital costs
Multi Modal Access	Project Sponsors will develop Station Area or Priority Development Area Plans (PDAs) as appropriate, within a half-mile radius of the station, with a clear identification of the number of existing and planned housing units and jobs, market demand analysis, affordable housing, multi-modal connectivity including pedestrian-friendly design standards, strategies to ensure ADA accessibility, parking demand analysis, infrastructure development, implementation plan and financing strategies	Aligns Solano station planning efforts with current local and MPO standards
	Requirements for parking and non-motorized access will be established by the project sponsor undertaking a multimodal access study utilizing CCJPA-approved ridership forecasts and assumptions in the Station Area Plan or PDA as appropriate	Ensures consistency in ridership forecasts for a local station within the overall rail system.Gives project sponsor/local jurisdiction more control over multimodal access requirements for their station
	An intermodal transit connection service plan will be developed by the station project sponsor that will guarantee local transit connections or equivalent "last-mile" provision meeting all trains serving Solano stations	Refines current policy to guarantee local transit connectivity
	Secure storage bike racks/lockers will be provided at platforms or inside station passenger waiting areas	Matches CCJPA criteria
Passenger Amenities	Canopy shelters to provide seating for 12 people and accommodate 2 wheelchairs with capacity to add more shelters to meet future demand	Matches CCJPA criteria
	Ticket vending machines(s) and associated communication equipment provided at platforms (under canopy) or inside passenger waiting areas	Matches CCJPA criteria
	Passenger Information Display System (PIDS) provided at platforms and inside station passenger waiting areas, based on CCJPA design specs	Matches CCJPA criteria
Safety & Security	Install security cameras on platforms, waiting areas, station facilities, and parking areas with the connecting communication system to be developed as part of design plans	Matches CCJPA criteria
	Emergency call boxes will be provided, at a minimum, at all unstaffed stations	Matches CCJPA criteria
	Local law enforcement agency will patrol and inspect station and parking facilities	Matches CCJPA criteria
	Bomb-resistant trash receptacles will be provided at platforms and inside station passenger waiting areas	Matches CCJPA criteria
Railroad Approval	Coordination/approval of station design plans with "host" railroad	Matches CCJPA criteria
	Establish station location memorandum of understanding (MOU) with host railroad and CCJPA before proceeding to detailed design	Refines current criteria to establish station location in principle prior to commitment of substantial design or preconstruction resources
Funding	Project Sponsor has to provide a complete Funding Plan, identifying capital costs for initial operating facility, future long-term expansion cost and operating and maintenance plan, including mid-life upgrades for lifecycle of the facility	Refines the funding plan requirement to identify specifically out front and long-term capital costs, as well as commitment by the project sponsor to maintain the station facility.Note that the PDA/ Station area plans will clarify funding/financing strategies

Figure 7 CCJPA Station and Service Policy, 2006

PRINCIPLES FOR REVISED POLICIES ON STATIONS AND TRAIN SERVICE
CAPITOL CORRIDOR JOINT POWERS AUTHORITY
(January 2006)

POLICY FOR NEW STATION

- Update level of train service (24 weekday, 18 weekend) and number of stations served (16)
- Maintain current criteria and add/update the following new standards:
  - Minimum daily average ridership projections of ten (10) boarding or alightings per train within the first six (6) months of CCJPA train service to the new station.
  - Canopy shelters to provide seating for twelve (12) people (and accommodate two (2) wheelchairs) with capacity to add more shelters to meet future demand
  - Coordination/approval of station design plans with "host" railroad
  - Local law enforcement agency will patrol and inspect station and parking facilities
  - Install security cameras on platforms, waiting areas, station facilities, and parking areas with the connecting communication system to be developed as part of design plans
  - Design will provide access to platforms so that passengers never cross a mainline track (e.g., grade separated access to island platform, station-only track not used by freight trains)
  - Platforms will be a minimum of 700 feet in length and eight (8) inches top-of-rail (any deviations or exemptions will require approval by host railroad and/or CCJPA/Amtrak)
  - Emergency call boxes will be provided, at a minimum, at all unstaffed stations
  - Passenger Information Display System (PIDS) real time electronic message signs will be provided at platforms and inside station passenger waiting areas, based on CCJPA design specifications
  - Bomb-resistant trash receptacles will be provided at platforms and inside station passenger waiting areas
  - Ticket vending machines(s) and associated communication equipment will be provided at either platforms (under the canopy) or inside station passenger waiting areas
  - An intermodal transit connection plan must be developed by the station project sponsor that may include joint ticketing or transit transfer with the CCJPA trains
  - Requirements for parking spaces will be based upon a parking study prepared by the project sponsor that will consider ADA compliance, non-motorized vehicle access, current and future adjacent land uses, baseline (and future) ridership projections, transit and carpool/drop-off connectivity, transit-orientated development plans
  - Secure storage bike racks/lockers will be provided at platforms or inside station passenger waiting areas

POLICY FOR RETENTION OF TRAIN SERVICE TO STATIONS

- Update the minimal ridership standards for continued CCJPA train service to station as follows:
  - Minimum daily average of ten (10) boarding or alightings per train within the first six (6) months of CCJPA train service to the new station
  - Minimum daily average of twelve (12) boarding or alightings per train within two years of CCJPA train service
  - Minimum daily average of fifteen (15) boarding or alightings per train within third year of CCJPA train service
- Develop marketing and operating plans to bring trains back to a station where service had been discontinued

EXPANSION OF SERVICE WITHIN CORRIDOR

- Update standards for trains that are managed by CCJPA for service within corridor (i.e., Regional Rail):
  - Ridership and revenues must be reviewed and approved by CCJPA
  - Any financial operating costs (expenses net of revenues) including any CCJPA management or administrative costs and additional rail equipment must be provided by service sponsor(s)
  - Net cost per train-mile (TM) must be equal to/lower than the current CCJPA train service net costs per TM
  - System operating (or farebox) ratio must be equal to/greater than the current CCJPA train system operating ratio

EXTENSION OF TRAIN SERVICE

- Any extension of CCJPA train service outside the Auburn-Sacramento-Oakland-San Jose corridor shall not drain resources that would prevent the CCJPA from implementing its core service expansion goals for the corridor pursuant to the *Vision Plan*
- Extensions of CCJPA train service outside the corridor shall not denigrate the core CCJPA train service, including but not limited to on-time performance and financial performance (e.g., operating costs, farebox ratio)
- Any financial operating costs (expenses net of revenues) including any CCJPA management or administrative costs and additional rail equipment must be provided by service extension sponsor(s)

ADOPTED FEBRUARY 15, 2006

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2.6 FUTURE CAPITOL CORRIDOR/AMTRAK STATIONS

The Solano-specific station policy in Appendix 3 was adopted by the STA Board during the course of the Plan development.

The Plan has articulated a Solano county-level enhancement of existing adopted CCJPA policies governing the requirements for new stations to be served by Capitol Corridor trains.

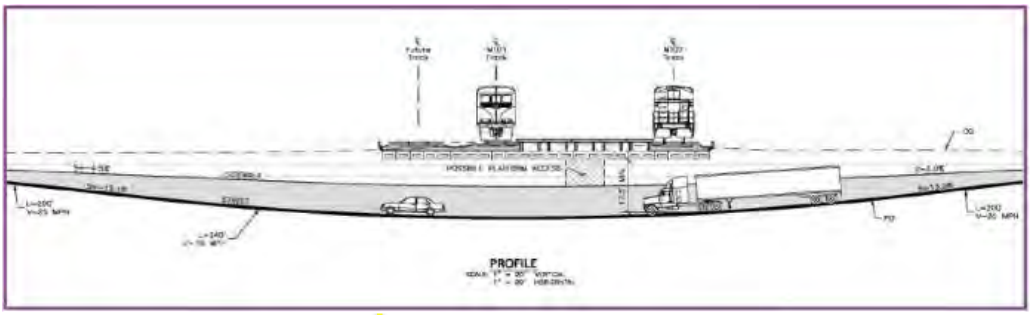
The original 1995 Solano rail plan identified several options for developing additional stations serving Dixon and Benicia. These locations included six sites in these cities. In the intervening years, several significant changes and local investments mean that this broad list should now be narrowed accordingly:

2.6.1 Dixon: Major Changes since 1995

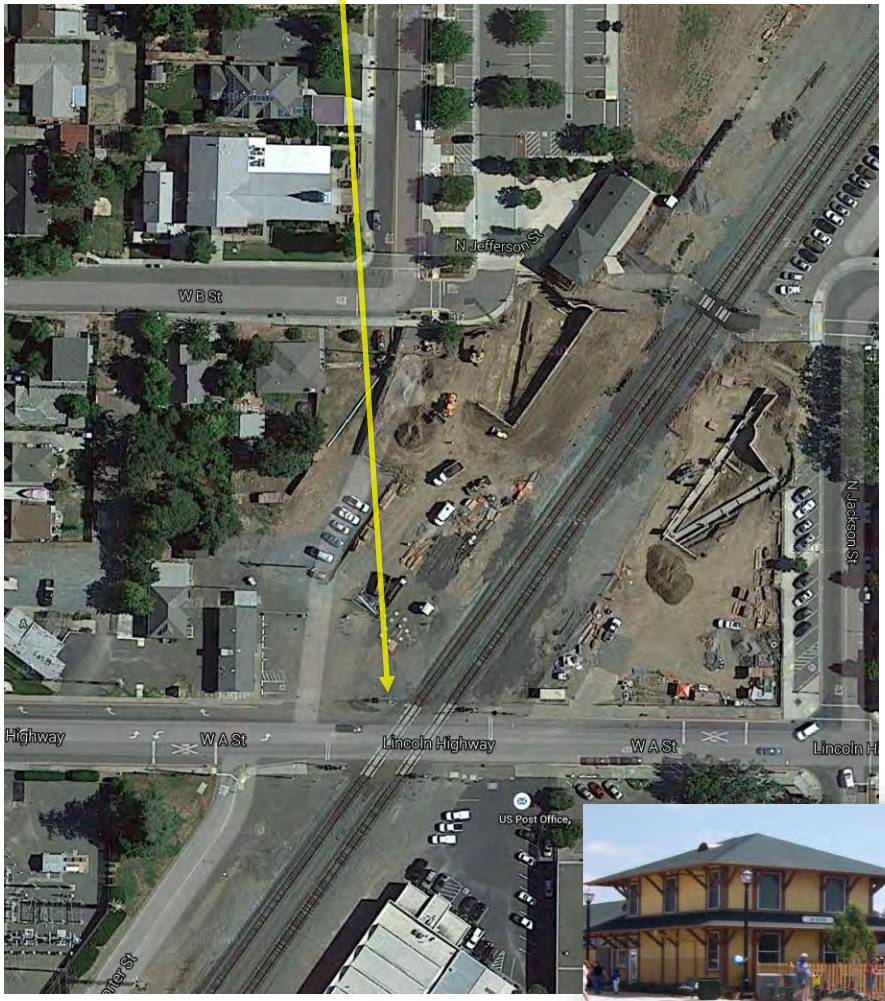
- Substantial investment has been made by local agencies at the downtown Dixon station location (see Fig. 8), including:
    - A 140-space park and ride lot for a future station, including electric vehicle power charging station
    - A classic downtown depot building capable of handling all future passenger needs
    - The elimination of a major safety concern by grade separation of the West B Street grade crossing at the downtown station location under the tracks, with physical capacity for a future center island platform access via the undercrossing
- In addition, concerns expressed by the operator and railroad owner over proximity of the potential downtown station platform adjacent to the City's major thoroughfare, have been considered by the City: a concept design of a grade separation of the A Street crossing of the tracks, (one of the stated requirements of the railroad for establishing a stop at the downtown location) has been prepared, indicating that a horizontal and vertical alignment is feasible (although not without major impacts to the downtown).

- Figure 8 portrays the City's concept for an A Street undercrossing.

Figure 8 Dixon A Street Undercrossing Concept



(City of Dixon/STA)



2.6.2 Benicia: Major Changes since 1995

- Both the railroad and passenger operators are concerned about train movement reliability and delays at the Benicia narrows imposed by ship traffic through the existing movable span rail bridge. They are actively exploring alternatives for a high-level passenger only crossing. Although such a major project would be a very long-term project (well beyond the 10-year Plan horizon), it would by necessity bypass any of the downtown Benicia locations reviewed in the 1995 plan.
- In addition, the Capitol Corridor station criteria adopted since the 1995 plan was prepared require a minimum of 5 mile station spacing and proximity to the Martinez station would eliminate all but the Lake Herman Road location.

The lower track location at Lake Herman Road is at 1ft elevation and likely impacted by future sea level rise (see section 3.3). This was not a major consideration or concern at the time of the previous rail facilities plan 20 years ago, but is a significant issue now and in the future.

There are no other locations on the UPRR main line in Solano County that could be considered for future passenger rail service at this time. Of the two locations identified in the 1995 Plan, the Dixon location is the recommended facility for longer-term service if additional Capitol Corridor stops in Solano County are to be considered.

The Dixon location should be carried forward for consideration when the Solano Rail Facilities Plan is next updated, a task anticipated for the timeframe of 2020 to 2025.

2.7 RIDERSHIP POTENTIAL

2.7.1 1995 Rail Plan Ridership and Current Ridership Comparison

Major changes have occurred since the 1995 Rail Plan was prepared. Most significant is the five-fold growth in service levels of Capitol Corridor Service.

For comparison, the present-day ridership by station is shown alongside the similar-year forecast made in 1995 in Figure 9. The 1995 plan made some assumptions about service frequency that differ from actual provision. For example, the 1995 plan ridership forecast was developed with both limited stop express service and overlay of more comprehensive stopping service.

Today's ridership reflects service that stops at all stations, with a frequency (30 daily trains today) somewhat less than the maximum service that was projected in the earlier plan for 2015 (up to 38 daily trains).

Figure 9 Current Ridership vs.1995 Plan Projection

Solano Stations: Current and 1995 plan forecast

95 plan assumed 38 trains daily FFV, 18 trains other stations 2015: 30 actual trains daily

Year	Benicia, CA	Suisun-Fairfield, CA (SUI)	Fairfield-Vacaville, CA (FFV)	Dixon, CA	Solano Total
2015 Forecast ('95 plan)	*400*	*900*	*1,200*	*450*	*2,950*
2015 Actual	**-**	**730**	**-**	**-**	**730**

2.7.2 Current Ridership Summary

Figure 10 shows current Solano major origins and destinations for a typical month (late spring, when there are fewer seasonal variations) in 2014.

Figure 10 Solano Passenger Rail Primary Origins/Destinations 2014

April 2014

Origin-Destination Table

Orig	ARN	RLN	RSV	SAC	DAV	SUI	MTZ	RIC	BKY	EMY	OKJ	OAC	HAY	FMT	GAC	SJC	Grand Total:
ARN			4	394	45	29	64	73	13	142	44	1			0		808
RLN	1			370	102	11	40	34	11	74	39	11		0	0		682
RSV	2			240	242	64	55	63	38	218	58	10					980
SAC	247	367	195		2562	2319	5453	4622	1760	8233	3518	968	614	971	746	2327	33934
DAV	43	100	225	2599		526	1989	2324	2159	3203	1289	310	140	332	361	665	15955
SUI	28	17	64	2185	546		743	520	549	1347	675	154	36	51	74	154	6989
MTZ	53	40	107	4883	1845	782		216	177	426	177	23	26	6	118	172	9028
RIC	49	26	67	4397	2092	585	173		6	55	27	6	4	16	214	80	7791
BKY	28	11	45	1820	2119	517	184	8		18	98		20	26	644	508	6046
EMY	138	65	230	7927	3102	1415	450	62	30		164	18	43	270	551	695	15142
OKJ	42	38	93	3539	1268	712	166	32	45	72		21	60	23	1006	1057	8153
OAC		10	10	911	263	125	16	3	1	22	62			3	362	271	2059
HAY	5		4	612	119	45	19	3	22	33	61				466	123	1512
FMT	1	2	2	1001	296	51	4	15	39	284	45	2	1		52	54	1847
GAC	4		7	779	381	79	115	190	635	540	1007	382	486	90		7	4320
SCC				211	138	9	27	19	118	175	162	101	13	15	3	7	897
SJC	5	0	17	2709	658	158	203	118	577	751	1241	352	150	60	10		6657
Grand Total:	646	676	1070	34577	15778	7427	9701	8302	6180	15593	8667	2359	1593	1863	4607	6120	122800

SUI= Suisun-Fairfield station

2.7.3 Forecast Ridership: Model and Methodology

To establish station-specific forecasts for the current Solano Rail Facilities Plan Update, the study team utilized an approach, endorsed by STA and CCJPA staff, which used the California state rail model forecast runs as the foundation of the passenger volume forecasts. The advantages of this approach are that it:

- Ensures consistency with other corridor-wide station ridership forecasts
- Avoids the use of off-model single station direct demand forecasts that could be perceived as “advocacy efforts” by individual jurisdictions, rather than objective corridor-wide forecasts
- Provides a common countywide baseline of growth assumptions by individual jurisdiction,

reflected in State Department of Finance forecasts

- Takes account of adjacent station ridership impacts from Solano current/future stations (the adjacency effect)

2.7.4 Forecast Ridership: Current and Future 10-year

Using outputs from the state rail model used by both CCJPA staff and Caltrans division of rail, the following ridership was generated, using a lower and upper range approach to generate outputs.

Several Priority Development Area (PDA) planning efforts were commencing during the preparation of the Plan Update. Those in the SUI and FFV station areas had not yet generated detailed numbers of units in parcels within each station shed, but overall targets for each were available and applied. Against this background such, the ridership numbers for both stations could be considered conservative, and an indicative range, rather than an absolute target ceiling for planning purposes.

Current station services are assumed for both the SUI and FFV stations, although CCJPA is discussing the potential of adding future express train service that could only access one station in Solano County.

This approach used the following assumptions to adapt the original state rail model data:

Lower level of range: direct application of California Department of Finance (DoF) growth assumptions by jurisdiction to 2024/25, plus Plan Bay Area growth assumptions for each jurisdiction.

Upper level of range: overlay of PDA and Station Area Plan (SAP) total residential target numbers, on the DoF assumptions. Note: commercial floor space numbers were not yet available from the PDA studies. A single major trip generator such as a large single-site employer, healthcare facility or education campus could generate further trips beyond those shown.

For both lower and upper level estimates, the assumptions used are described in Appendix 4.

Figure 11 Solano Stations Ridership Projection

Year	Suisun-Fairfield, CA (SUI)		Fairfield-Vacaville, CA (FFV)		Solano Total	
	Low	High	Low	High	Low	High
Actual FY 2013	196,000		-		196,000	
2018	106,700	139,600	113,800	137,500	220,600	277,000
2024	121,800	206,200	145,300	186,600	267,100	392,800

Low: DoF based growth + Fairfield, Suisun Cities PBA growth

High: DoF based growth+ Fairfield SAP/PDA, Suisun PDA

Solano Stations 2-hr peak ridership: Current and 1995 plan forecast

1995 plan assumed 38 trains daily FFV, 18 trains other stations 2015: 30 actual trains daily

Year	Suisun-Fairfield, CA (SUI)	Fairfield-Vacaville, CA (FFV)	Dixon, CA	Solano Total
2015 Forecast (1995 plan)	*135*	*180*	*68*	*383*
2015 Actual	**110**	**-**	**-**	**110**
*2024 Forecast (2015 plan)**	***108***	***101***	*75*	*284*

* high end of 2015 plan forecast range; 2-hr peak uses Amtrak 2013 stations guidelines methodology

Solano Stations average daily passenger on/offs per train

1995 plan assumed 38 trains daily FFV, 18 trains other stations 2015: 30 actual trains daily

Year	Suisun-Fairfield, CA (SUI)	Fairfield-Vacaville, CA (FFV)	Dixon, CA	Solano average
2015 Forecast (1995 plan)	*28*	*32*	*25*	*28*
2015 Actual	**23**	**-**	**-**	*23*
*2024 Forecast (2015 plan)**	***24***	***23***	*16*	*21*

* high end of 2015 plan forecast range; 2-hr peak assumes max 40-min headways per CCJPA agreement

It is clear from these tables that the Fairfield-Vacaville station may initially draw some passengers from the Suisun-Fairfield station, but that both stations will be viable and continue to meet both the STA and CCJPA station requirements of a minimum average daily ridership projection of 10 boardings/lightings per train, based on typical peak hour derivations from daily ridership totals. Future residential growth nearby both stations has a substantial beneficial impact on their adjacent stations' ridership growth.

The Dixon station did not have a base ridership projection available within the state rail model

and therefore could not be subject to the forecast methodology used for SUI and FFV. An alternative off-model approach was used which took the 1995 Solano Rail Plan forecast, discounted ridership for level of rail service and 1995 vs. 2015 actual data, and projected ten years ahead.

Based on this off-model projection, a future Dixon station would appear to have ridership considerably below SUI and FFV, but would likely meet the minimum boarding requirements in CCJPA stations policy, at least in the peak. However, Dixon would need to be incorporated into a formal state rail model run in order for a consistent picture of ridership to be developed alongside the FFV and SUI stations.

2.7.5 Inter-county ridership

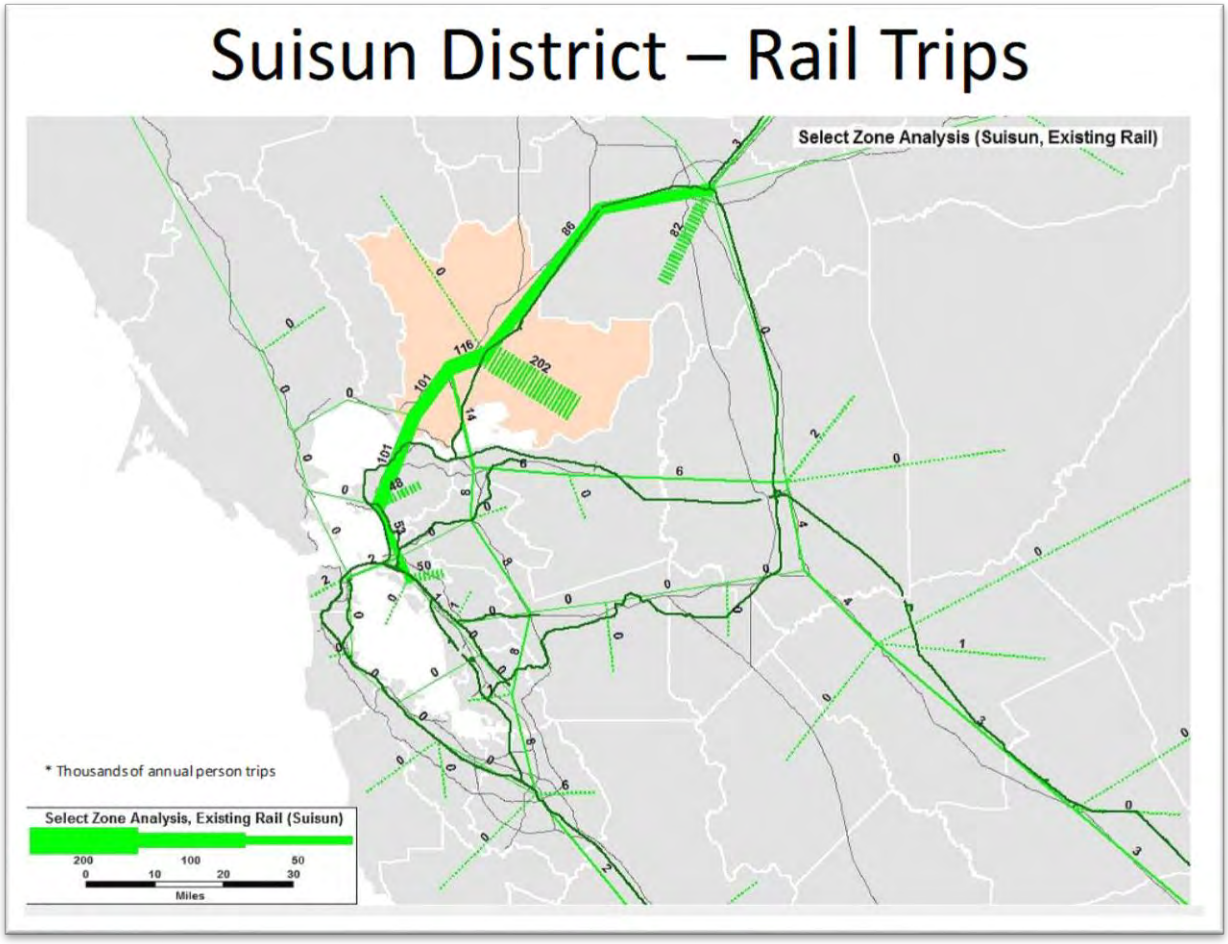
During the latter stages of the preparation of this technical memorandum, the consultant team and STA staff were fortunate to have access to a new state level travel demand modeling effort being led by the California State Transportation Agency (CalSTA).

Although in its development stages, it provided a useful inter-county level of travel volume on the current major travel corridors. Within these overall trips by all modes, a breakout by the rail mode has been developed. Although this is at a relatively course grained level currently (for example Solano County is treated as a single district ("Suisun").

This modeling effort promises additional resources in planning the future characterization of investments in the intercity rail network. The modeling assumptions and methodology are summarized in Appendix 5.

These indicate that rail currently has approximately 2.6% share of the travel market in the Sacramento - Bay Area corridor. Summary of results are shown in Figure 12.

Figure 12 CalSTA Draft Model Results: Rail Mode Share for Solano County



2.8 RAILROAD OPERATIONS

2.8.1 Passenger Service and Freight Railroads: Background

Freight Railroads' perspective on long-term capacity is a critical factor in shaping the level of passenger service within the current landlord-tenant operating arrangement:

- Their primary revenue source is freight movement, not passenger service
- They take the "long view" of their enterprise
- They recognize that investments and commitments (e.g. agreeing to accommodate passenger service) last for decades and can constrain their capacity and operational flexibility far into the future
- This, despite the fact that they cannot predict freight traffic far ahead (typically, not far beyond the current business cycle).

Capacity, Costs and Agreements:

- Railroads are informed by examples where changes in freight demand mean they wish they had the capacity they signed away just a few years ago:
    - Metrolink, Los Angeles
    - Metra, Chicago
    - (even the California corridors)
- Most of the "cheap" capacity has already been built
- Freight railroads don't want to have passenger operators build the less expensive projects only to leave the remaining (expensive) projects to be built by the railroads

2.8.2 Passenger Service on UPRR: Current and Future 10-year level of service

Based on review with CCJPA staff, the following assumptions for passenger service were established, based on the Capitol Corridor/UPRR agreement ceiling. This agreement is the critical foundation for future planning of passenger trains serving Solano County within the 10-year plan horizon:

- Weekday daily trains: 30 trains/15 round trips with Solano County (Sacramento-Oakland)
- 20 daily trains (10 round trips) extending to Roseville
- 22 daily trains (10 round trips) extending to San Jose
- Span of service (Solano stations) 5 AM to 11PM
- Peak period headways: 40 minutes

Such clearly defined operating framework was not in place when the 1995 Solano Rail Plan was prepared. As such, both the 1995 study and subsequent planning efforts explored additional service options, which are now infeasible within this operating framework for the Plan's 10-year horizon.

These included regional rail overlay service between Dixon and Auburn, service extensions to Reno, local East Bay overlay service on the Martinez-Oakland segment and other similar concepts.

Figures 13-16 provide a potential schedule for Capitol Corridor service developed for extended services at the current year.

It shows station stops for both Suisun-Fairfield and Fairfield-Vacaville.

Appendix 6 shows the current (Spring 2015) service schedule for comparison.

Comparison with the future service shows broadly the current level of service but the following enhancements:

- Reduction in overall corridor running times of the order of 5-10 minutes
- Maintenance in overall running times within the County with the addition of the Fairfield-Vacaville station
- Additional service extensions at the western and eastern ends of the corridor to Roseville and San Jose respectively

While these do not directly increase level of service for both the current Suisun-Fairfield (SUI) and Fairfield-Vacaville (FFV) stations, they do provide significant enhancements in regional connections by train from both stations to the current destinations and also to those beyond Oakland and Sacramento.

The subsequent ridership forecasts demonstrate the value of these additional regional extensions in service with passenger growth to destinations beyond the current core Oakland-Sacramento corridor, with an additional almost 200,000 annually, approximately 10,000 of these to Solano.

Figure 13 Capitol Corridor Potential Schedule with FFV and SUI stops (Weekdays) Westbound

Train number			521	523	525	527	529	531	533	535	537	541	543	545	547	549	551
Days of operation*	Mi		M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F
Auburn, CA	0	Dp					6:30 AM				ARN Bus		ARN Bus			ARN Bus	ARN Bus
Rocklin, CA	14	Dp					6:53 AM				RLN Bus		RLN Bus			RLN Bus	RLN Bus
Roseville, CA	18	Dp		4:58 AM	5:48 AM	6:28 AM	7:03 AM			9:38 AM	11:38 AM		3:03 PM		5:08 PM	6:38 PM	8:38 PM
Sacramento, CA	35	Ar		5:27 AM	6:17 AM	6:57 AM	7:32 AM			10:07 AM	12:07 PM		3:32 PM		5:37 PM	7:07 PM	9:07 PM
		Dp	4:30 AM	5:30 AM	6:20 AM	7:00 AM	7:35 AM	8:20 AM	10:00 AM	10:10 AM	12:10 PM	2:10 PM	3:35 PM	4:40 PM	5:40 PM	7:10 PM	9:10 PM
Davis, CA	49	Dp	4:45 AM	5:45 AM	6:35 AM	7:15 AM	7:50 AM	8:35 AM	10:15 AM	10:25 AM	12:25 PM	2:25 PM	3:50 PM	4:55 PM	5:55 PM	7:25 PM	9:25 PM
Fairfield-Vacaville, CA	71	Dp	5:05 AM	6:05 AM	6:55 AM	7:35 AM	8:10 AM	8:55 AM	10:35 AM	10:45 AM	12:45 PM	2:45 PM	4:10 PM	5:15 PM	6:15 PM	7:45 PM	9:45 PM
Suisun-Fairfield, CA	75	Dp	5:11 AM	6:11 AM	7:01 AM	7:41 AM	8:16 AM	9:01 AM	10:41 AM	10:51 AM	12:51 PM	2:51 PM	4:16 PM	5:21 PM	6:21 PM	7:51 PM	9:51 PM
Martinez, CA	93	Dp	5:30 AM	6:30 AM	7:20 AM	8:00 AM	8:35 AM	9:20 AM	11:00 AM	11:10 AM	1:10 PM	3:10 PM	4:35 PM	5:40 PM	6:40 PM	8:10 PM	10:10 PM
Richmond, CA	112	Dp	5:55 AM	6:55 AM	7:45 AM	8:25 AM	9:00 AM	9:45 AM	11:25 AM	11:35 AM	1:35 PM	3:35 PM	5:00 PM	6:05 PM	7:05 PM	8:35 PM	10:35 PM
Berkeley, CA	118	Dp	6:02 AM	7:02 AM	7:52 AM	8:32 AM	9:07 AM	9:52 AM	11:32 AM	11:42 AM	1:42 PM	3:42 PM	5:07 PM	6:12 PM	7:12 PM	8:42 PM	10:42 PM
Emeryville, CA	120	Ar	6:08 AM	7:08 AM	7:58 AM	8:38 AM	9:13 AM	9:58 AM	11:38 AM	11:48 AM	1:48 PM	3:48 PM	5:13 PM	6:18 PM	7:18 PM	8:48 PM	10:48 PM
		Dp	6:10 AM	7:10 AM	8:00 AM	8:40 AM	9:15 AM	10:00 AM	11:40 AM	11:50 AM	1:50 PM	3:50 PM	5:15 PM	6:20 PM	7:20 PM	8:50 PM	10:50 PM
Oakland, CA (Jack London Square)	125	Ar	6:21 AM	7:21 AM	8:11 AM	8:51 AM	9:33 AM	10:11 AM	11:58 AM	12:01 PM	2:01 PM	4:01 PM	5:26 PM	6:38 PM	7:31 PM	9:01 PM	11:08 PM
		Dp	6:23 AM	7:23 AM	8:13 AM	8:53 AM		10:13 AM		12:03 PM	2:03 PM	4:03 PM	5:28 PM		7:33 PM	9:03 PM	
Oakland Coliseum, CA	130	Dp	6:32 AM	7:32 AM	8:22 AM	9:02 AM	9:40 AM	10:22 AM	12:05 PM	12:12 PM	2:12 PM	4:12 PM	5:40 PM		7:44 PM	9:12 PM	
Hayward, CA	138	Dp	6:43 AM	7:43 AM	8:32 AM	9:13 AM		10:33 AM		12:23 PM	2:23 AM	4:23 PM	5:52 PM		7:59 PM	9:24 PM	
Fremont-Centerville, CA	150	Dp	6:59 AM	7:59 AM	8:48 AM	9:29 AM		10:49 AM		12:39 PM	2:39 PM	4:39 PM	6:09 PM		8:17 PM	9:50 PM	
Santa Clara, CA (Great America)	161	Dp	7:16 AM	8:16 AM	9:05 AM	9:46 AM		11:06 AM		12:56 PM	2:56 PM	4:56 PM	6:27 PM		8:34 PM	10:07 PM	
Santa Clara, CA (University)	165	Dp	7:24 AM	8:24 AM	9:13 AM	9:54 AM		11:14 AM		1:04 PM	3:04 PM	5:04 PM	6:35 PM		8:42 PM	10:15 PM	
San Jose, CA	168	Ar	7:38 AM	8:38 AM	9:27 AM	10:13 AM		11:28 AM		1:18 PM	3:18 PM	5:11 PM	6:48 PM		8:58 PM	10:29 PM	

*Except public holidays, when service follows weekend schedule

Figure 14 Capitol Corridor Potential Schedule with FFV and SUI stops (Weekdays) Eastbound

Train number			520	522	524	526	528	530	532	534	536	538	540	542	544	546	548
Days of operation*	Mi		M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F
San Jose, CA		Dp		5:20 AM	6:40 AM		9:05 AM	10:56 AM	12:20 PM	1:40 PM		3:10 PM	3:40 PM	4:20 PM	5:50 PM	7:15 PM	
Santa Clara, CA (University)	74	Dp		5:26 AM	6:46 AM		9:11 AM	11:02 AM	12:26 PM	1:46 PM		3:16 PM	3:46 PM	4:26 PM	5:56 PM	7:21 PM	
Santa Clara, CA (Great America)	78	Dp		5:34 AM	6:54 AM		9:19 AM	11:10 AM	12:34 PM	1:54 PM		3:24 PM	3:54 PM	4:34 PM	6:04 PM	7:29 PM	
Fremont-Centerville, CA	89	Dp		5:51A	7:11 AM		9:38 AM	11:29 AM	12:51 PM	2:13 PM		3:43 PM	4:13 PM	4:51 PM	6:21 PM	7:46 PM	
Hayward, CA	101	Dp		6:06 AM	7:26 AM		9:54 AM	11:45 AM	1:06 PM	2:29 PM		3:59 PM	4:29 PM	5:06 PM	6:36 PM	8:01 PM	
Oakland Coliseum, CA	109	Dp		6:16 AM	7:36 AM	8:55	10:04 AM	11:55 AM	1:16 PM	2:39 PM		4:09 PM	4:39 PM	5:16 PM	6:46 PM	8:11 PM	
Oakland, CA (Jack London Square)	114	Ar		6:23 AM	7:43 AM	9:03 AM	10:13 AM	12:13 PM	1:23 PM	2:48 PM		4:18 PM	4:48 PM	5:23 PM	6:53 PM	8:18 PM	
		Dp	5:25 AM	6:25 AM	7:45 AM	9:15 AM	10:15 AM	12:15 PM	1:25 PM	2:50 PM	3:30 PM	4:20 PM	4:50 PM	5:30 PM	6:55 PM	8:20 PM	9:25 PM
Emeryville, CA	119	Ar	5:33 AM	6:33 AM	7:53 AM	9:23 AM	10:23 AM	12:23 PM	1:33 PM	2:58 PM	3:38 PM	4:28 PM	4:58 PM	5:38 PM	7:03 PM	8:28 PM	9:33 PM
		Dp	5:35 AM	6:35 AM	7:55 AM	9:25 AM	10:25 AM	12:25 PM	1:35 PM	3:00 PM	3:40 PM	4:30 PM	5:00 PM		7:05 PM	8:30 PM	9:45 PM
Berkeley, CA	121	Dp	5:39 AM	6:39 AM	7:59 AM	9:29 AM	10:29 AM	12:29 PM	1:39 PM	3:04 PM	3:44 PM	4:34 PM	5:04 PM	5:49 PM	7:09 PM	8:34 PM	9:49 PM
Richmond, CA	127	Dp	5:47 AM	6:47 AM	8:07 AM	9:37 AM	10:37 AM	12:37 PM	1:47 PM	3:12 PM	3:52 PM	4:42 PM	5:12 PM	5:57 PM	7:17 PM	8:42 PM	9:57 PM
Martinez, CA	146	Dp	6:14 AM	7:14 AM	8:34 AM	10:04 AM	11:04 AM	1:04 PM	2:14 PM	3:39 PM	4:19 PM	5:09 PM	5:39 PM	6:24 PM	7:44 PM	9:09 PM	10:24 PM
Suisun-Fairfield, CA	164	Dp	6:33 AM	7:33 AM	8:53 AM	10:23 AM	11:23 AM	1:23 PM	2:33 PM	3:58 PM	4:38 PM	5:28 PM	5:58 PM	6:43 PM	8:03 PM	9:27 PM	10:43 PM
Fairfield-Vacaville, CA	168	Dp	6:39 AM	7:39 AM	8:59 AM	10:29 AM	11:29 AM	1:29 PM	2:39 PM	4:04 PM	4:44 PM	5:34 PM	6:04 PM	6:49 PM	8:09 PM	9:33 PM	10:49 PM
Davis, CA	190	Dp	6:57 AM	7:57 AM	9:17 AM	10:47 AM	11:47 AM	1:47 PM	2:57 PM	4:22 PM	5:02 PM	5:52 PM	6:22 PM	7:07 PM	8:27 PM	9:52 PM	11:07 PM
Sacramento, CA	204	Ar	7:23 AM	8:10 AM	9:31 AM	11:13 AM	12:01 PM	2:13 PM	3:11 PM	4:36 PM	5:22 PM	6:06 PM	6:36 PM	7:21 PM	8:53 PM	10:28 PM	11:21 PM
		Dp		8:13 AM			12:04 PM		3:14 PM	4:39 PM	5:25 PM	6:09 PM	6:39 PM	7:24 PM			11:24 PM
Roseville, CA	221	Dp		8:42 AM			12:39 PM		3:49 PM	5:14 PM	5:48 PM	6:44 PM	7:14 PM	7:59 PM			11:59 PM
Rocklin, CA	225	Dp			RLN Bus		RLN Bus		RLN Bus		5:56 PM		RLN Bus	RLN Bus	RLN Bus		
Auburn, CA	239	Ar			ARN Bus		ARN Bus		ARN Bus		6:30 PM		ARN Bus	ARN Bus	ARN Bus		

*Except public holidays, when service follows weekend schedule

Figure 15 Capitol Corridor Potential Schedule with FFV and SUI stops (Weekends/Holidays) Westbound

Train number / Days of operation*	Mi		723 SaSu	727 SaSu	729 SaSu	733 SaSu	737 SaSu	741 SaSu	743 SaSu	745 SaSu	747 SaSu	749 SaSu	751 SaSu
Auburn, CA	0	Dp			8:05 AM		ARN Bus		ARN Bus				RN Bus
Rocklin, CA	14	Dp			8:28 AM		RLN Bus		RLN Bus				RLN Bus
Roseville, CA	18	Dp		7:08 AM	8:37 AM	10:08 AM	11:38 AM		3:03P		5:08P		8:38P
Sacramento, CA	35	Ar		7:37 AM	9:07 AM	10:37 AM	12:07 PM		3:32P		5:37P		9:07P
		Dp	5:40 AM	7:40 AM	9:10 AM	10:40 AM	12:10 PM	2:15 PM	3:35 PM	4:40 PM	5:40 PM	7:10 PM	9:10 PM
Davis, CA	49	Dp	5:55 AM	7:55 AM	9:25 AM	10:55 AM	12:25 PM	2:30 PM	3:50 PM	4:55 PM	5:55 PM	7:25 PM	9:25 PM
Fairfield-Vacaville, CA	71	Dp	6:15 AM	8:15 AM	9:45 AM	11:15 AM	12:45 PM	2:50 PM	4:10 PM	5:15 PM	6:15 PM	7:45 PM	9:45 PM
Suisun-Fairfield, CA	75	Dp	6:21 AM	8:21 AM	9:51 AM	11:21 AM	12:51 PM	2:56 PM	4:16 PM	5:21 PM	6:21 PM	7:51 PM	9:51 PM
Martinez, CA	93	Dp	6:40 AM	8:40 AM	10:10 AM	11:40 AM	1:10 PM	3:15 PM	4:35 PM	5:40 PM	6:40 PM	8:10 PM	10:10 PM
Richmond, CA	112	Dp	7:05 AM	9:05 AM	10:35 AM	12:05 PM	1:35 PM	3:40 PM	5:00 PM	6:05 PM	7:05 PM	8:35 PM	10:35 PM
Berkeley, CA	118	Dp	7:12 AM	9:12 AM	10:42 AM	12:12 PM	1:42 PM	3:47 PM	5:07 PM	6:12 PM	7:12 PM	8:42 PM	10:42 PM
Emeryville, CA	120	Ar	7:18 AM	9:18 AM	10:48 AM	12:18 PM	1:48 PM	3:53 PM	5:13 PM	6:18 PM	7:18 PM	8:48 PM	10:48 PM
		Dp	7:20 AM	9:20 AM	10:50 AM	12:20 PM	1:50 PM	3:55 PM	5:15 PM	6:20 PM	7:20 PM	8:50 PM	10:50 PM
Oakland, CA (Jack London Square)	125	Ar	7:31 AM	9:31 AM	11:01 AM	12:31 PM	2:01 PM	4:06 PM	5:26 PM	6:38 PM	7:31 PM	9:01 PM	11:01 PM
		Dp	7:33 AM	9:33 AM	11:03 AM	12:33 PM	2:03 PM	4:08 PM	5:28 PM		7:33 PM	9:03 PM	11:03 PM
Oakland Coliseum, CA	130	Dp	7:42 AM	9:42 AM	11:12 AM	12:42 PM	2:12 PM	4:17 PM	5:40 PM		7:42 PM	9:12 PM	11:12 PM
Hayward, CA	138	Dp	7:53 AM	9:53 AM	11:23 AM	12:53 PM	2:23 PM	4:28 PM	5:52 PM		7:53 PM	9:23 PM	11:23 PM
Fremont-Centerville, CA	150	Dp	8:09 AM	10:09 AM	11:39 AM	1:09 PM	2:39 PM	4:44 PM	6:07 PM		8:09 PM	9:39 PM	11:39 PM
Santa Clara, CA (Great America)	161	Dp	8:26 AM	10:26 AM	11:56 AM	1:26 PM	2:56 PM	5:01 PM	6:27 PM		8:26 PM	9:56 PM	11:56 PM
Santa Clara, CA (University)	165	Dp	8:34 AM	10:34 AM	12:04 PM	1:34 PM	3:04 PM	5:09 PM	6:35 PM		8:34 PM	10:04 PM	12:04 PM
San Jose, CA	168	Ar	8:48 AM	10:48 AM	12:18 PM	1:48 PM	3:18 PM	5:23 PM	6:48 PM		8:48 PM	10:18 PM	12:18 PM

Figure 16 Capitol Corridor Potential Schedule with FFV and SUI stops (Weekends/Holidays) Eastbound

Train number / Days of operation*	Mi		720 SaSu	724 SaSu	728 SaSu	732 SaSu	734 SaSu	736 SaSu	738 SaSu	742 SaSu	744 SaSu	746 SaSu	748 SaSu
San Jose, CA		Dp	6:15 AM	7:50 AM	9:50 AM		12:50 PM	2:20 AM	3:20 PM	4:25 PM	5:50 PM	6:50 PM	7:50 PM
Santa Clara, CA (University)	74	Dp	6:21 AM	7:56 AM	9:56 AM		12:56 PM	2:26 PM	3:26 PM	4:31 PM	5:56 PM	6:56 PM	7:56 PM
Santa Clara, CA (Great America)	78	Dp	6:29 AM	8:04 AM	10:04 AM		1:04 PM	2:34 PM	3:34 PM	4:39 PM	6:04 PM	7:04 PM	8:04 PM
Fremont-Centerville, CA	89	Dp	6:46 AM	8:21 AM	10:21 AM		1:21 PM	2:51 PM	3:51 PM	4:56 PM	6:21 PM	7:21 PM	8:21 PM
Hayward, CA	101	Dp	7:01 AM	8:36 AM	10:36 AM		1:36 PM	3:06 PM	4:06 PM	5:11 PM	6:36 PM	7:36 PM	8:36 PM
Oakland Coliseum, CA	109	Dp	7:11 AM	8:46 AM	10:46 AM		1:46 PM	3:16 PM	4:16 PM	5:21 PM	6:46 PM	7:46 PM	8:46 PM
Oakland, CA (Jack London Square)	114	Ar	7:18 AM	8:53 AM	10:53 AM		1:53 PM	3:23 PM	4:23 PM	5:28 PM	6:53 PM	7:53 PM	8:53 PM
		Dp	7:20 AM	8:55 AM	10:55 AM	12:25 PM	1:55 PM	3:25 PM	4:25 PM	5:30 PM	6:55 PM	7:55 PM	8:55 PM
Emeryville, CA	119	Ar	7:28 AM	9:03 AM	11:03 AM	12:33 PM	2:03 PM	3:33 PM	4:33 PM	5:38 PM	7:03 PM	8:03 PM	9:03 PM
		Dp	7:30 AM	9:05 AM	11:05 AM	12:35 PM	2:05 PM	3:35 PM	4:35 PM	5:40 PM	7:05 PM	8:05 PM	9:05 PM
Berkeley, CA	121	Dp	7:34 AM	9:09 AM	11:09 AM	12:39 PM	2:09 PM	3:39 PM	4:39 PM	5:44 PM	7:09 PM	8:09 PM	9:09 PM
Richmond, CA	127	Dp	7:42 AM	9:17 AM	11:17 AM	12:47 PM	2:17 PM	3:47 PM	4:47 PM	5:52 PM	7:17 PM	8:17 PM	9:17 PM
Martinez, CA	146	Dp	8:09 AM	9:44 AM	11:44 AM	1:14 PM	2:44 PM	4:14 PM	5:14 PM	6:19 PM	7:44 PM	8:44 PM	9:44 PM
Suisun-Fairfield, CA	164	Dp	8:28 AM	10:03 AM	12:03 PM	1:33 PM	3:03 PM	4:33 PM	5:33 PM	6:38 PM	8:03 PM	9:03 PM	10:03 PM
Fairfield-Vacaville, CA	168	Dp	8:34 AM	10:09 AM	12:09 PM	1:39 PM	3:09 PM	4:39 PM	5:39 PM	6:44 PM	8:09 PM	9:09 PM	10:09 PM
Davis, CA	190	Dp	8:52 AM	10:27 AM	12:27 PM	1:57 PM	3:27 PM	4:57 PM	5:57 PM	7:02 PM	8:27 PM	9:27 PM	10:27 PM
Sacramento, CA	204	Ar	9:18 AM	10:41 AM	12:41 PM	2:23 PM	3:41 PM	5:26 PM	6:11 PM	7:22 PM	8:41 PM	9:41 PM	10:58 PM
		Dp	Bus	10:44 AM	12:44 PM		3:44 PM		6:14 PM	7:25 PM	8:44 PM	9:44 PM	
Roseville, CA	221	Dp	RSV Bus	11:19 AM	1:19 PM		4:19 PM		6:49 PM	7:48 PM	9:19 PM	10:19 PM	
Rocklin, CA	225	Dp	RLN Bus		RLN Bus		RLN Bus			7:56 PM			
Auburn, CA	239	Ar	ARN Bus		ARN Bus		ARN Bus			8:33 PM			

2.8.3 Amtrak Long Distance Services

The four daily long distance Amtrak services connecting the Bay Area with destinations north to Seattle, south to Los Angeles (Trains 11/14, Coast Starlight) and east to Reno and Chicago (Trains 5/6 California Zephyr) do not currently serve Solano communities directly. The county is one of largest service areas (by population) on those routes without a station stop.

Ridership on these four trains with origins or destinations within Solano is not easily defined. The consultant however had access to recent Amtrak data and this includes passengers with origins and destinations on connecting with these services. The leisure market is a significant element of patronage on the services: their schedules and routings attract domestic and overseas visitors with less travel time sensitivity than intercity/commuter passengers on Capitol Corridor (scheduled timing has 12 hour travel time between the Bay Area and Los Angeles, for example). There is also much greater seasonal variation in ridership on Capitol Corridor service.

These services are less schedule-critical than Capitol Corridor, with significant recovery time built in to schedules along their route. There are additional service features of these trains that are not offered on Capitol Corridor: for example, checked baggage service (where stations are staffed) sleeper accommodations and full service dining.

No state model-based ridership forecast was available for these Amtrak routes making a stop in Solano. However, given the current consistent use of the Suisun-Fairfield as a station for seasonal privately run leisure trains to the Reno area, it is likely that some leisure passengers could be added to the current patronage which of these four trains from Solano. Since the stations would operate as a limited service unstaffed locations for the services - like other stations in Northern California such as Roseville and Chico little marginal cost is anticipated to make a regular stop in Solano.

Stops still must meet Amtrak's Station Program and Planning and design guidelines (updated mid-2013). Platform length could be an issue if the 1200' length required in the guidelines were adhered to, although many shorter platforms are grandfathered into such service stops. A stop for both services either at SUI or FFV in future could likely be accommodated in the schedule as an Amtrak Category 3/4 unstaffed "caretaker/shelter" station (with ridership in the 20 to 100,000 passengers annually, shared with existing commuter/intercity rail). Solano communities would need to assess the benefits of advocating for a stop.

In a positive development after the Plan Update was underway, Amtrak trains 11/14 are likely to receive an upgrade in the form of a new business class service onboard, likely to debut sometime during fiscal year 2016. For the first time, a dedicated business class product will be available and provide a potentially attractive direct option for business travelers. For some regional destinations to and from Solano, the service may provide a relatively time competitive option at certain times of the day that currently are not served by Capitol Corridor e.g. San Jose/Salinas in the am peak direction (although on-time performance may be an issue).

Together with the primary leisure markets served by these trains, the new business class product reinforces the value of these trains and the need to consider a stop at either Suisun or the new Fairfield-Vacaville station.

2.9 TRANSIT AND STATION CONNECTIVITY

2.9.1 Serving Intercity Rail Stations

The "first mile/last mile" issue associated with passenger rail can prove to be the most difficult one. That is, are the ways that a train rider gets to and from the station attractive enough to motivate them to use the system? And, if parking at the station is unconstrained or the land uses around the station are oriented toward auto access, will the rider ultimately choose his private auto as his or her first mile/last mile solution?

These are the issues that are being faced with the development of the future Fairfield-Vacaville (FFV station). While it is possible to provide transit to the station to address the first mile/last mile question, fixed-route transit service may be cost prohibitive unless it is designed to serve additional uses or as deviations from existing routes. Additionally, if parking remains available and plentiful at both the FFV and SUI stations, those with a choice will likely continue to drive unless the transit option is fast, reliable and reasonably priced.

In suburban areas, it is not uncommon for rail stations to be located in sparsely developed areas that are difficult to effectively or efficiently serve with fixed-route bus transit service. Often these areas undergo major land use changes over time; but, serving them prior to development is the challenge.

Does the transit operator initiate an attractive alternative to accessing the train station upon station opening, realizing that it may be inefficient and costly unless other land uses can support the service? Or, does the transit operator phase in fixed-route services over time as development patterns change? And, unless operating revenues for these services are directly tied to the station development, funds for service operation may be more effective in areas where development patterns render better ridership. These are the challenges facing rail station development and the bus operators serving the current Suisun-Fairfield and proposed Fairfield-Vacaville stations and any future stations.

2.9.2 Current Station Access

Currently, the Suisun-Fairfield station is served by two local Fairfield and Suisun Transit (FAST) routes that provide a connection to the station as well as to local route destinations in Fairfield and Suisun City: Route 5 operates on 30 minute frequency from 6am-7pm, and some Route 7 service is provided on school days. Additionally, SolanoExpress Route 90 connects the stations to destinations west, terminating at El Cerrito Del Norte BART.

Based on rider surveys conducted over the last several years, access to the Suisun-Fairfield station is predominantly by drive-alone vehicle. It represents the largest share of riders: 37% to 67% for both on/off activity. This is slightly lower than the countywide mode split estimates of 72%[5]. Another 14% to 30% of riders are dropped off or picked up at the station in private autos. Bus access to the Suisun-Fairfield station is currently between 2%-4% of the riders surveyed in July 2014. This is only slightly lower than the countywide multimodal split for transit (5%).

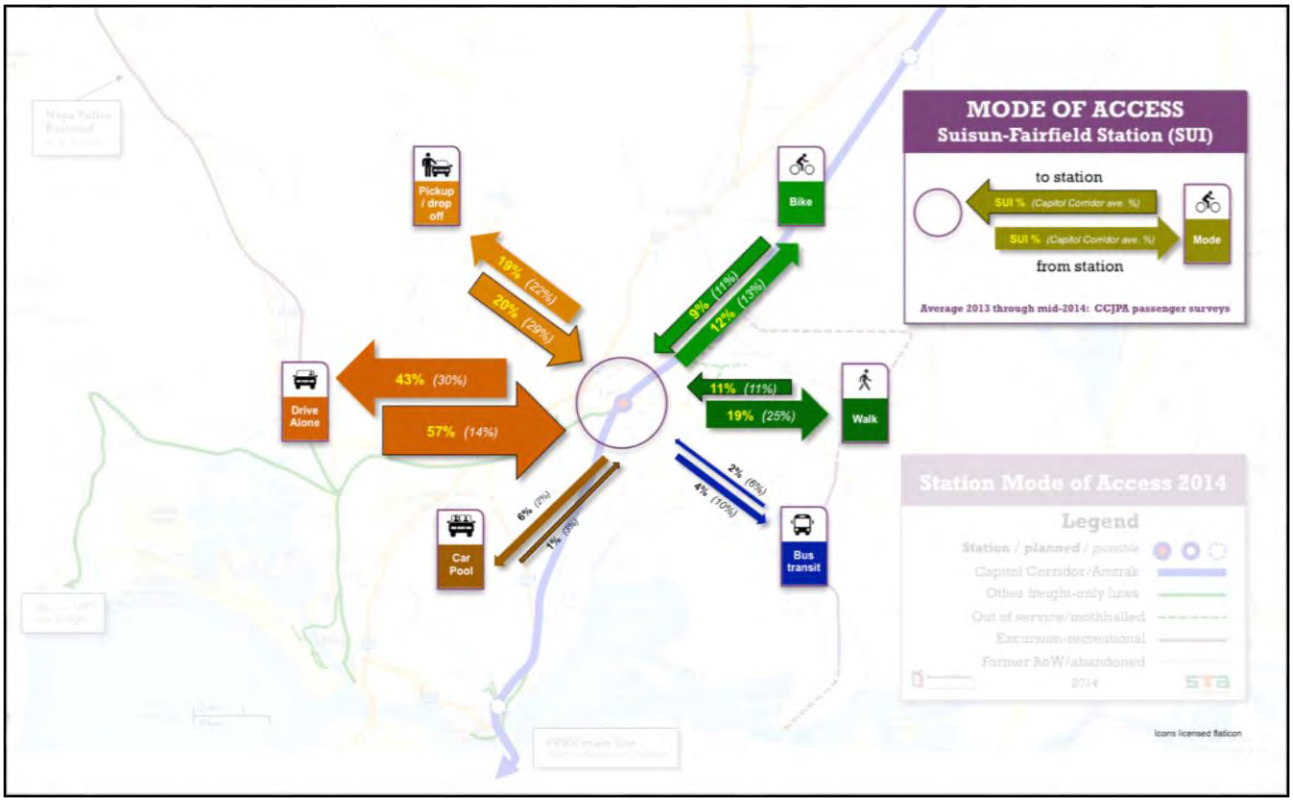
[5] Solano County Congestion Management Plan Dec. 2013 p. 42

However, bike access is significantly higher at this station than the county as a whole (7%-13% compared to 4% for the county). Walk access is almost three times higher than the countywide average (between 12% - 18% compared to 4% for the county). This is due to Suisun City's recent success in completing several bicycle and pedestrian access projects that connect the community to the station and downtown. Figure 17 presents the mode access for three years.

Figure 17 Mode of Access for Suisun-Fairfield Station (SUI)

Mode of access		Drive alone		Auto dropoff /		Carpool		Taxi		Bike		Walk		Bus transit	
		To train (ON)	From train (OFF)	To train (ON)	From train (OFF)	To train (ON)	From train (OFF)	To train (ON)	From train (OFF)	To train (ON)	From train (OFF)	To train (ON)	From train (OFF)	To train (ON)	From train (OFF)
Suisun-Fairfield, CA (SUI)	(Jan 2013)	*58%*	*46%*	*22%*	*13%*	*1%*	*7%*	*2%*	*0%*	*7%*	*11%*	*12%*	*20%*	*0%*	*5%*
	(Jul 2013)	*47%*	*46%*	*24%*	*13%*	*1%*	*8%*	*8%*		*13%*	*11%*	*8%*	*20%*	*2%*	*5%*
	(Jul 2014)	*67%*	*37%*	*14%*	*30%*	*2%*	*2%*	*3%*	*1%*	*7%*	*13%*	*12%*	*18%*	*4%*	*2%*

Source: CCJPA/Corey, Canapary & Galanis



2.9.3 Future 10-year Fairfield-Vacaville Station Connection Needs

Current train ridership at the Suisun-Fairfield station is approximately 200,000 boardings annually. Based on projections, it is assumed that additional system level boardings would be attributed to the new Fairfield-Vacaville station of between 86,000 and 190,000 annually. This increase, combined with existing rail ridership, includes approximately 900 to 1,300 total weekday boardings, and between 150 and 200 weekend boardings. These ridership figures assume that every train stops at both stations.

To support pedestrian and bike access, the Fairfield-Vacaville station is envisioned to have improvements that will assist in achieving mode split numbers that are already being achieved at the Suisun-Fairfield station (Fig.17). Additionally, it is anticipated that the parking supply at the FFV will be unconstrained with a 350 space near-term lot that is planned for expansion based on demand.

Fairfield and Vacaville have partnered together to support the FFV Intermodal Station. FAST staff is developing a plan for a new local bus route (Route 9) to serve the new transportation center. Currently in concept for possible implementation before the train station opens, the new route could start at the Intermodal Station, operate south along Walters Road serving anew Wal-Mart at Highway 12 and then travel west to the existing train station in Suisun City. The new Route 9 would connect to other local bus routes at Huntington transfer point (Routes 2 and 4), along Walters Road (Route 6), and at the Suisun-Fairfield Train Station (Route 5). The new Route 9, operating every 60 minutes Monday through Saturday, would add about 40,000 new riders and 4,000 vehicle revenue hours annually to the local bus system.

While the bus service could be initiated prior to the opening of the station, the full route cannot be contemplated before construction of the new Intermodal Station is complete. Additionally, operation of any new service is contingent upon additional operating funds and possibly the acquisition of two new buses if needed.

As shown in Figure 19, costs for this service would be approximately $400,000 per year in FY 2015-16, rising to approximately $500,000 per year in ten years. This annual operating cost does not include any increases to the ADA paratransit service costs, as the addition of Route 9 would not significantly expand FAST's geographic coverage. The operating cost does not include the cost of new buses. According to FAST's 2013 Short Range Transit Plan, FAST's existing local bus fleet "will likely be sufficient to support existing local services plus the planned local service expansion"[6] which includes Route 9.

In an attempt to determine other bus connectivity improvements that could be made at FFV, projections for bus ridership at the station in 2015 were developed assuming that every train operated to both SUI and FFV. Two bus ridership scenarios were modeled: bus ridership using the current mode share of 4% that is realized at the Suisun-Fairfield station; and bus ridership that doubles the current mode share to 8%. Figure 18 presents the weekday totals, which include an average annual and daily estimate using the Low and High projections.

[6] Short Range Transit Plan, Fairfield and Suisun Transit, August 20, 2013, p. 58.

Figure 18 2015 Bus Ridership Projections at FFV and SUI

RAIL RIDERSHIP (RANGE):

Solano Stations Ridership: 2024

SCENARIO 1: All Train Station Stops

STATION										Trains/headways		
		Monthly		***Daily***				Annual		Weekday		Weekends /Holidays
Ridership Range:		**Lower**	***Upper***	**Lower**	***Upper***	**Lower**	***Upper***	**Lower**	***Upper***	**Daily Total**	**Peak hrs (7:00-9:00)**	
				Weekday		***Weekend***						
	Mi									30 (15 R/t)	max 40 min h/w	22 (11r/t (h/w: n.a)
Suisun-Fairfield, CA (SUI)	**75**	10,200	17,200	**412**	**697**	**63**	**107**	121,800	*206,200*	30 (15 R/t)	max 40 min h/w	22 (11r/t (h/w: n.a)
Fairfield-Vacaville, CA (FFV)	**71**	12,100	15,600	**491**	**631**	**76**	**97**	145,300	*186,600*	30 (15 R/t)	max 40 min h/w	22 (11r/t (h/w: n.a)

BUS RIDERSHIP (RANGE):

	2025 Bus Ridership at Current Mode Share (4%)						**2025 Bus Ridership at Double Current Mode Share (8%)**					
Station	**Annual**		**Weekday**		**Weekend**		**Annual**		**Weekday**		**Weekend**	
	Low	***High***	***Low***	***High***	***Low***	***High***	***Low***	***High***	***Low***	***High***	***Low***	***High***
Suisun-Fairfield, CA (SUI)	*4.872*	*8,248*	*16*	*28*	*3*	*4*	*9,744*	*16,496*	*33*	*56*	*5*	*9*
Fairfield-Vacaville, CA (FFV)	4,720	7,440	16	25	2	8	9,440	14,880	32	50	5	8
Average (FFV)	6,638		23		5		13,276		45		7	

The analysis highlights potentially low transit ridership anticipated in 2025, even when doubling the mode share currently experienced at the SUI station.

The greatest challenge to initiating fixed-route bus service to serve rail stations located in sparsely populated areas is the anticipated daily ridership. Even when using a mode share of 8%—which is double the existing SUI station—service would only render 41 daily passengers in 2025. While the FAST Route 9 is intending on serving the station at completion if funds were made available, it is planned to operate in other corridors where ridership is anticipated such as the Wal-Mart and other areas along the route.

2.9.4 Financing And Implementation

2.9.4.1 Operating Costs: Connecting Transit Service

Figure 19 provides annual operating cost estimates for the connecting transportation services discussed in Section 2.9.

The key assumptions underlying these cost estimates are as follows:

- Hourly operating costs are based on the Solano County transit operators' 2013 Short Range Transit Plan financial projections, with 3 percent annual escalation for FY 2022-23 and FY 2023-24.
- The number of annual passenger trips was derived from the projected ridership for the new rail service and the current transit modal split at the Suisun-Fairfield station.

The costs per vehicle hour listed above are based on the agency's total operating costs. In some cases, the agency's marginal cost to add service to the rail stations may be less than the amounts shown above. However, we cannot accurately predict the marginal cost of future additional service at this time, as this calculation is dependent on the particular service profiles for each agency at the time of service delivery.

Specifics regarding providing connective transit service to the Fairfield/Vacaville Intermodal Station are recommended to be evaluated as part of FAST's Short Range Transit Plan (SRTP) update scheduled for 2015.

Figure 19 Annual Operating Cost Estimates for Connecting Transportation Services: SUI and FFV

Fixed Route Transit Service		FY 2014-15	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23	FY 2023-24
Route 9											
	Annual Vehicle Revenue Hours	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000
	FAST Local Cost/Vehicle Hour	$ 96.14	$ 99.02	$ 101.99	$ 105.05	$ 108.20	$ 111.45	$ 114.79	$ 118.24	$ 121.79	$ 125.44
	Estimated Annual Operating Cost	$ 384,560	$ 396,080	$ 407,960	$ 420,200	$ 432,800	$ 445,800	$ 459,160	$ 472,960	$ 487,149	$ 501,763
Bus Bridge											

2.9.4.2 Capital Cost Potential Funding Sources

In order to undertake the full cost benefit analysis that would assist policymakers to make decisions on pursuit of projects, the improvements in this Plan Update would require both engineering validation and detailed rail operations modeling, both of which are outside the scope of this plan. There are relatively well-established sources for railroad infrastructure and passenger facility improvements.

A variety of local, regional, State and Federal funding sources may be available to fund the capital improvements included in this study. The following table summarizes the existing sources for which the different types of improvements may be eligible. The applicability of these funds to the recommended projects will depend upon numerous factors, including the local and regional funding priorities, as well as the timing of the project's construction and availability of the funding source.

In addition to the existing sources of funds, there may be opportunities to develop new funding streams for the longer-term projects. These may include a toll, a local sales tax measure and Cap and Trade funds.

Figure 20 provides a summary of these sources and their current availability.

Figure 20 Railroad Infrastructure Capital Improvements Potential Funding Sources

Source	Description	Comments
Passenger Rail Station Improvements		
California Transportation Development Act (TDA) / State Transit Assistance (STA)	Revenue generated by quarter-cent sales tax in each County (TDA) and sales tax on diesel fuel (STA). Funds are allocated by formula to transit operators for operating and capital uses.	
State Transportation Improvement Program (STIP) / Regional Transportation Improvement Program (RTIP)	The STIP is a multi-year capital improvement program of transportation projects on and off the State Highway System, funded with revenues from the State Highway Account and other funding sources. The STIP is composed of two sub-elements: the Regional Transportation Improvement Program (RTIP) (developed by MTC and County CMAs) and the Interregional Transportation Improvement Program (ITIP) (developed by Caltrans).	These funds are at historic lows and are generally fully programmed through the 5-year STIP horizon year.
California Cap and Trade: Transit and Intercity Rail Capital Program	The Transit and Intercity Rail Capital Program is a statewide competitive program to fund capital and operational improvements to modernize California's transit systems and reduce emissions of greenhouse gases. The California State Transportation Agency (CalSTA) is responsible for the overall administration of the program, including project evaluation and the development of a program of projects. MTC does not have a formal role with the program, but has provided guidance to focus the Bay Area's list of projects in line with adopted regional policy and funding commitments. MTC has indicated its preference to fund Core Capacity Challenge Grant projects in the initial funding cycle.	MTC has indicated support for future funding cycles to prioritize other large regional priority projects.

California Cap and Trade: Transit Operating and Efficiency Program	Funds are to be distributed by a formula that provides 40% to core capacity transit operators (AC Transit, BART, and SFMTA) and 60% to the remaining transit operators, based 50% on total ridership, 25% on low-income ridership and 25% on minority ridership. Funding is subject to each operator submitting qualifying projects for funding through a competitive selection process.	
California Active Transportation Program (ATP)	In September 2013, Governor Brown signed Senate Bill 99 and Assembly Bill 101 into law, creating the Active Transportation Program (ATP). The ATP consolidated federal and state funding sources including the Bicycle Transportation Account and Transportation Alternatives Program, into one program. It is anticipated that $125 million will be available annually for projects that promote active transportation. 60% of the revenues will be managed by the state (including the 10% for small urban and rural area competitive program) and 40% is administered by MTC.	Bike and/or pedestrian related improvements to or adjacent to the stations may be eligible for ATP funding. Pedestrian grade separation projects may also be eligible.
Regional OneBayArea Grant Program (OBAG)	MTC's OBAG Program was developed to address California's climate law. The program integrates multiple funding sources under one allocation approach. Each county CMA may program OBAG funds to projects that meet the eligibility requirements of any one of the following seven transportation improvement categories: Local Streets and Roads Preservation, Bicycle and Pedestrian Improvements, Transportation for Livable Communities, Safe Routes to School, Priority Conservation Areas, Regional Planning, and Bus and Rail Transit Rehabilitation. Rewards counties that plan for and produce affordable housing. MTC receives federal funding for local programming under the OBAG program through the State from federal surface transportation legislation. This includes Surface Transportation Program (STP), Congestion Mitigation and Air Quality Improvement (CMAQ) and Transportation Alternatives (TA) Program funds. Other funding sources include Cap and Trade, Regional Transportation Improvement Program (RTIP), and Transportation Fund for Clean Air (TFCA) funding.	

Regional Bridge Tolls	Revenue generated from tolls on Bay Area bridges funds capital and operating projects that mitigate and relieve traffic congestion on the bridges.	
Solano Regional Transportation Impact Fees (RTIF)	RTIF is a multi-jurisdiction fee intended to cover a portion of the costs for new transportation facilities required to serve new development within the County. Solano County began collecting the RTIF on February 3, 2014. Based on the RTIF Expenditure Plan developed by the STA, a total of 5% of the total RTIF revenue is to be dedicated towards transit projects under Package 6- Express Bus Transit Centers and Train Stations and 5% is dedicated to Unincorporated County Roads under Package 7. The remaining balance of the RTIF (90%) will be returned to each RTIF District from which it was generated.	
Grade Crossing Improvements		
California Grade Separation Program (Section 190)	The Section 190 Grade Separation Program is authorized by Section 190 of the Streets and Highways Code. This competitive grant program provides $15 million each year to local agencies for the construction of grade separation projects. The program is jointly administered by the California Public Utilities Commission (CPUC) and the California Department of Transportation (Caltrans). Local agencies submit project applications to the CPUC. The CPUC develops a priority list of projects. Projects must be on the priority list to receive funding.	Proposition 1B's Highway-Railroad Crossing Safety Account (HRCSA) included $250 million additional funding for the Section 190 grade separation program. As of June 2013, approximately $37 million had not yet been appropriated.

Federal Highway-Rail Grade Crossing Program (Section 130)	Under the Section 130 program, $220 million in annual funding is set-aside from the Highway Safety Improvement Program (HSIP) apportionment for the Highway-Rail Grade Crossing Program. The program provides funds for the elimination of hazards at railway-highway crossings. The funds are apportioned to States by formula. The Section 130 program funds are eligible for projects at all public crossings including roadways, bike trails and pedestrian paths. Fifty percent of a State's apportionment is dedicated for the installation of protective devices at crossings. The remainder of the funds apportionment can be used for any hazard elimination project, including protective devices.	Caltrans administers Section 130 funds. Projects must be on the California Public Utilities Commission (CPUC) Section 130 priority list to be eligible for funding under this program.
Federal Railroad Administration (FRA) Railroad Development Grant Opportunities	Notices of Funding Availability (NOFA) issued periodically to fund various FRA project focus areas. FY14 NOFA issued for intercity passenger rail grade crossing improvement projects, Positive Train Control (PTC) implementation projects, and Passenger Rail Corridor Investment Plan (PRCIP) projects, both state and multistate FRA-led corridor planning for passenger rail networks.	FY14 NOFA based on FY14 appropriation and unspent balances from other programs. Focused on smaller projects – although no formal cap, federal guidance in FY 14 suggests projects proposed under $3 million dollars.
Rail Infrastructure Capacity Enhancements		
California Cap and Trade: Goods Movement	Goods movement investments fall into two categories: (1) projects focused on improving the efficiency of the movement of goods within and through the region, and (2) mitigation projects that reduce the associated environmental impacts on local communities.	
Federal Railroad Rehabilitation & Improvement Financing Program (RRIF)	The RRIF program provides direct loans and loan guarantees to finance development of railroad infrastructure. The funding may be used to: • Acquire, improve, or rehabilitate intermodal or rail equipment or facilities, including track, components of track, bridges, yards, buildings and shops; • Refinance outstanding debt incurred for the purposes listed above; and • Develop or establish new intermodal or railroad facilities. Direct loans can fund up to 100% of a railroad project with repayment periods of up to 35 years and interest rates equal to the cost of borrowing to the government.	Eligible borrowers include railroads, state and local governments, government-sponsored authorities and corporations, joint ventures that include at least one railroad, and limited option freight shippers who intend to construct a new rail connection.

Federal Railroad Administration (FRA) Capital Assistance to States - Intercity Passenger Rail Service project grants	Financial assistance to fund capital improvements (and related planning activities) necessary to support improved or new intercity passenger rail service	Assistance to states (therefore would be channeled through state division of rail) can be used to develop projects, programs and planning, including Intercity Passenger Rail service, and will provide tangible and measurable benefits, such as on-time performance improvements, travel-time reductions and higher service frequencies resulting in increased ridership. Planning work for the Suisun-Fairfield island platform and track improvements project could potentially fit this program (focused on time performance and travel time benefits). However, obligations are relatively small annually - $3.2 million FY 13, $11 million in FY 14 and anticipated $6.2 million in FY 15.
Federal Transportation Infrastructure Finance and Innovation Act (TIFIA)	The TIFIA program provides credit assistance for qualified projects of regional and national significance. Eligible applicants include state and local governments, transit agencies, railroad companies, special authorities, special districts, and private entities. The TIFIA credit program is designed to fill market gaps and leverage substantial private co-investment by providing supplemental and subordinate capital. The TIFIA credit program offers three distinct types of financial assistance: **s**ecured (direct) loans, loan guarantees, and standby letters of credit.	Major requirements include a capital cost of at least $50 million (or 33.3 percent of a state's annual apportionment of Federal-aid funds, whichever is less) or $15 million in the case of ITS. TIFIA credit assistance is limited to a maximum of 33 percent of the total eligible project costs. Senior debt must be rated investment grade. The project also must be supported in whole or in part from user charges or other non-Federal dedicated funding sources and be included in the state's transportation plan.

Solano Rail Facilities Plan Update

Chapter 3

REPORT ON RAIL INFRASTRUCTURE AND SAFETY

3 REPORT ON RAIL INFRASTRUCTURE AND SAFETY

3.1 THROUGHPUT, CAPACITY, AND FUTURE NEEDS

3.1.1 Current Needs

In general, the capacity for freight trains (absent other traffic) in Solano County is adequate. However, to allow increased passenger service, to improve passenger train reliability, or to decrease passenger train travel times, infrastructure improvements would be necessary. The identification of specific improvements and the resulting benefits is a negotiated process between the passenger operators (i.e., CCJPA and Amtrak) and the host freight railroad (in this case, Union Pacific). The following discussion addresses the nature of capacity constraints and several conceptual improvements.

Most main line trackage in Solano County is suitable for relatively high speeds, on the order of 79 miles per hour (mph) for passenger trains and 60-70 mph for freight trains. In order to maximize throughput, the areas where trains slow down are thus the most likely candidates for capacity improvements. In these areas, all train – both freight and passenger – must reduce speeds if the train ahead slows or stops. Because of the federal requirements for the way railroad signal systems are configured, trains following one another must be spaced very far apart, and thus when a train slows down, the effects ripple through the system. This is compounded by the fact that trains require long distances to slow down and to accelerate.

It is important to note that although potential funding sources were identified in chapter 2, none are proposed for the throughput and capacity projects identified below. In addition, the total time savings for passenger rail service, and therefore impact on passenger rail ridership, have not been modeled using the standard statewide rail model. This precludes the development of full cost to benefit analysis that would help inform decision makers whether or not they should pursue these projects.

3.1.2 Potential Projects – Near Term Horizon

To maintain existing passenger train frequencies, little additional infrastructure is necessary. However, there are infrastructure improvements that could improve reliability. The near term horizon refers to projects which could be completed – or could have a sufficient portion of the work accomplished – within approximately 10 years.

One key area for delays is in the Suisun Marsh between Cordelia Road and Benicia. This area is subject to unstable ground and flooding. The unstable ground can cause “dips” in the track, at which trains must slow down, while flooding presents obvious obstacles to train movements, as well as expensive repairs. Potential improvements in this area include subgrade/ground improvements to reduce raising the track above the level of flooding.

The nature of ground improvements would need to be determined by geotechnical studies, but may include reinforcing and widening embankments with rocks, or possibly stabilizing soils with soil cement or lime injections. These approaches could require environmental analysis.

Raising the track would require widening the embankment, as well as modifications to existing bridges. Like subgrade improvements, such efforts would require environmental permitting. If the embankment were raised and widened, an access road should be added in order to allow

maintenance access with road vehicles, rather than from rail-mounted maintenance vehicles (the rail mounted vehicles consume capacity just as a slow or stopped train does).

Another project, which would result in significant reliability improvements, would be to reconfigure the narrow center platform at Suisun City station to match the configuration of the new Fairfield-Vacaville station. When trains stop at the narrow center platform at Suisun City, train traffic on the track between the center platform and the station is halted. This impacts capacity. The solution is a center platform with grade separated access.

Likewise, at Suisun City, some freight switching occurs along the main line; this could be moved off the main line by extending the freight tracks, or adding a freight bypass, possibly extending as far as the proposed freight bypass at the new Fairfield-Vacaville station.

To plan for future capacity expansion in conjunction with a larger suite of projects, a third main track may be necessary through parts of Solano County. Although this is likely beyond the 10-year horizon, early steps that can be taken to facilitate this would be to establish conceptual footprints and to acquire wetland mitigation credits ahead of time.

Near Benicia, three projects could improve reliability. The first would be to add a second track underneath the Suisun Bay Bridge, around the narrow spit of land, parallel to the road that leads to the AmPORTS facility. The second would be to add a siding off the main line (near the Sulphur Springs viaduct). The third would be to connect the existing Benicia siding to the Benicia Industrial Park.

By adding a second track under the Suisun Bay Bridge, a new, long track on which trains could arrive or depart from the main line without having to wait for switching operations to clear the existing single track would be created. This could also reduce the amount of time trains use the main line for switching trains between the Benicia Siding and the Industrial Park.

By adding a siding along the main line near the viaduct, additional capacity would be available for trains waiting when the bridge is raised, and it would offer dispatchers more flexibility to stage and sort trains if multiple trains were waiting when the bridge was raised.

By connecting the existing Benicia siding to the Benicia Industrial Park switching area, the number of trips switch engines would make on the mainline (to access cars stored on the siding) would be reduced.

Lastly, Solano County offers one of the longest stretches of straight track along the entire route between Sacramento and Oakland in the area between Vacaville and Dixon. Moreover, this section of track is in an area that appears to have relatively few environmental challenges. As such, there is an opportunity to construct a third track in this area: this 3rd track could increase overall capacity, and also serve as a place to “sort” higher speed trains from slower-speed trains without forcing any trains to stop. The actual benefits from this project would need to be identified: there is not an easy way to establish an exact performance improvement without analyzing a much larger portion of the railroad and talking with UPRR and CCJPA.

3.1.3 Potential Projects – Long Term Horizon

There are several key projects that would likely occur over a longer term (i.e., greater than 10 years) horizon. Several of these also involve cooperation with adjacent counties, since they are large enough to span multiple jurisdictions.

The first among the long-term projects would be realignment of the curve at Davis, which, although outside of Solano County, may require realignment of the tracks reaching into Solano County. This

could also be part of a project to upgrade the station and eliminate the existing narrow center platform, as well as projects to improve roadway connectivity across the railroad right of way with new bridges or tunnels.

Another major project would be replacement or upgrade of the Suisun Bay Bridge, half of which is located in Solano County. The bridge is a key constraint, since it opens on a schedule not controlled or generally known in advance by the rail operators to allow ship traffic to pass. During this time, all rail traffic is halted. Replacement of this bridge would be a major project, likely costing hundreds of millions of dollars.

Many of the projects identified as “near term projects” could also be expanded, or developed in a phased basis, such that they extend beyond the 10-year threshold. Examples include the ground improvements or track raises in the Suisun Marsh: for these projects, preliminary engineering and permitting could occur along with initial construction activities on the most critical sections, in the 10-year horizon, while full completion could linger beyond 10 years (or as funds are available).

CCJPA is also developing a long-term “Vision Plan” to guide long-term infrastructure investment in the corridor between Oakland and Sacramento/Roseville. This plan may evaluate at higher speeds or even dedicated passenger tracks. As details of this plan are developed, they can supplement the information herein.

3.1.4 Project Priorities

The following list identifies a possible prioritization strategy for near-term projects. Further discussion and confirmation of these priorities should occur in conjunction with the CCJPA and Union Pacific Railroad. Note that conceptual costs are not based upon any preliminary engineering; they are based on similar projects and the team’s knowledge of the area.

1. Establish center platform at Suisun City and construct freight-switching track (preliminary engineering to develop an estimate, funding identification. and permitting could occur immediately; if funding were available, construction could commence within 10 years). Order of magnitude costs would be approximately $20-$40 million.
2. Suisun Marsh ground improvements, embankment widening (preliminary engineering and permitting could begin immediately; initial construction could begin as soon as funds were available and yield immediate results by remediating the least stable sections). Conceptual costs could be on the order of $15-$50 million.
3. Benicia improvements to reduce switching on the main line and allow additional dispatching flexibility (some of these projects could be designed, permitted, and completed within 10 years). Order of magnitude costs would be approximately $10-$25 million.
4. Solano County third main track. The benefits of this project would need to be confirmed. Order of magnitude costs would be approximately $40-$60 million.

Note that many of the safety improvement projects listed in the following section could also be undertaken in the 10-year time frame.

Prioritization of long-term projects is more challenging, since they involve entities and agencies outside Solano County and the priorities amongst agencies must align in order to progress these efforts.

1. The Davis curve realignment, extending into Solano County, would be a project yielding large benefits, but at high costs and being possibly disruptive to the City of Davis. In the absence of an engineering study, costs are difficult to estimate, since there are multiple alternatives, each of which would have distinctly different cost structure. It is conceivable that the order of magnitude cost could be up to $100 million.
2. The Suisun Bay Bridge upgrades to reduce bridge delays would be extremely expensive. Without understanding the various alternatives and the goals of each alternative, it is not advisable to provide order of magnitude costs.

3.2 SAFETY

3.2.1 Key Safety Findings of Previous Studies

Two studies were used to analyze previous safety concerns at rail crossings in Solano County: (1) 2003 Napa/Solano Passenger/Freight Rail Study Final Report which was prepared for the Solano Transportation Authority and the Napa County Transportation Planning Agency and (2) 2011 Final Rail Crossing Inventory and Improvement Plan which was prepared for the Solano Transportation Authority and the Capital Corridor Joint Powers Authority.

The 2003 Napa/Solano Passenger/Freight Rail Study Final Report concentrated on the required improvements to develop passenger rail transportation on several of the existing lines in Napa and Solano Counties. The report covers all elements of a comprehensive new-start public rail transportation plan, route and equipment selection, station characteristics, capital improvement costs, potential passenger and freight improvements, and environmental impacts. In terms of safety, the report covered the conditions of the current at-grade crossings, and potential improvements along four of the existing mainlines throughout Napa and Solano Counties (primarily Napa County).

The 2003 existing rail study area in Solano County consisted of the Vallejo Branch on the Martinez Subdivision rail line running from Mare Island towards the Napa Junction and the Schellville Branch on the Martinez Subdivision running out of the Napa Junction towards Suisun City/Fairfield through American Canyon. These two branches run in both Napa and Solano Counties, but 70% of the total track (roughly 20 miles) runs through Solano County. The tracks along these two branches were reported as having poor track conditions due to low track speeds, which allow the line to operate under Federal Railroad Administration (FRA) Class II Track Standards.

The upgrade to FRA Class III Standards, required for the proposed commuter rail service, would require the entire track structure including rail, ties, and ballast to be replaced along with turnouts and at-grade crossings along the line. It was also recommended that a signal system be installed for passenger rail to provide further safety improvements. In terms of crossings, the structures along the route were found to be in relatively good condition and would only need minor repairs to bring to the standard needed for passenger rail. One bridge was found to be in need of replacement (the Napa River bridge) and scheduled for replacement as part of an Army Corps of Engineers / flood control project. 35 Private and public at-grade crossings exist for the study area in Solano County. These crossings were determined to all need replacement of crossing surfaces, an upgrade (extending) of warning circuits for the higher commuter train speeds, and replacement of old and outdated crossing equipment.

The 2011 Final Rail Crossing Inventory and Improvement Plan concentrated on providing an inventory of all rail crossings in Solano County, identifying and listing which of those crossings are considered a priority due to impacts on vehicle and pedestrian safety and recommending improvements to increase safety. As part of the study, 221 crossings were identified throughout the county. Of these crossings 107 had Department of Transportation (DOT) Grade Crossings Inventory numbers, 50 were unidentified public crossings, 17 were unidentified private crossings, and 47 were non-road crossings (drainages, creeks, and pipelines). There were also 15 grade separated crossings, 5 pedestrian-only crossings, 39 crossings where there is no vehicular traffic (excluding pedestrian only and grade separated), and 15 crossings that currently have no railroad service, which left roughly 147 open at-grade crossings in the County of Solano. The report also listed accident data for all the crossings from Jan 1, 2000. 26 accidents were reported in this period, 5 of which had injuries and 10 of which had fatalities.

Using the data listed above, the report then listed 5 areas of concern and potential mitigations:

- The first area was the City of Dixon downtown, from North 1st Street/SR 113 to A Street where an underground pedestrian crossing was proposed to replace the B-street pedestrian crossing and a grade separation was proposed for A Street. The West B Street pedestrian under crossing was completed by STA and the City of Dixon in 2014.
- The second area was the Peabody Road crossing in the City of Fairfield, which has the highest peak traffic volume of all the crossings in the county with 5,600 peak hour trips. There is a plan to build a new grade-separation as part of the future Jepson Parkway Project that will take traffic off of Peabody road, also the Fairfield-Vacaville train station will include building a grade-separated crossing of Peabody road to carry both auto and bicycle/pedestrian traffic.
- The third area was City of Fairfield and City of Suisun City, from East Tabor Avenue to the SR 12 Overcrossing, where a pedestrian crossing is recommended at Blossom Drive.
- The fourth was the City of Vallejo, along Broadway Street north of Sereno Drive, which is in an area that may be developed. Improvements that may impact the rail crossing in that area will need to be monitored.
- The fifth was other locations of concern based on high levels of traffic congestion which included North 1st St in Dixon, East Tabor Ave in Fairfield, Sunset Avenue in Suisun City, and North Gate Road in the unincorporated county. The fifth area also included areas of concern if traffic were to increase in the coming years in Vallejo, which included Mini Drive, Tennessee Street, Solano Avenue, Curtola Parkway, 5th Street, Sonoma Blvd., Wilson Avenue, the Mare Island Causeway, and Railroad Avenue on Mare Island.

Both studies provide in-depth information regarding the existing track, structures, and at-grade crossings in the County of Solano.

3.2.2 Updated and Prioritized Safety Projects

To update the prioritized safety projects for the County of Solano, consultant team members RailPros started by doing an inventory of all crossings throughout the County of Solano. Using the 2003 Napa/Solano Passenger/ Freight Rail Study Final Report, the 2011 Final Rail Crossing Inventory, and current California Public Utility Commission (CPUC) Rail Crossing List, an updated list of public crossings for the County of Solano was developed. Inventory reports and Accident Data from the FRA database were gathered and relevant data was used to help prioritize the crossings. Much of the traffic data shown in the 2011 Final Rail Crossing Summary was outdated, so current traffic data was requested from the cities of Fairfield, Vacaville, Suisun City, and Vallejo, and the County of Solano. All inventories of equipment were verified as well and some additional crossing information was provided by the roadway authorities.

From this data, it was determined that crossings along the Montezuma and Vacaville Branches on the Feather River Subdivision operating in the County under the Western Railway Museum, which runs exhibition lines at most 4 times a day and a maximum speed of 20 mph, could be eliminated as priority crossings due to low rail volumes and train speeds. It was also determined that crossings operated by California Northern (CN) mainly in Vallejo were not considered priority as the

current train traffic along the line is only upwards of 10 trains per day and a maximum speed of 25 mph. These crossings, however, have potential to become high priority if the rail traffic increases, which is a possibility and should therefore be monitored and reevaluated if the traffic on these lines does increase. It was also determined that crossings with no accidents would not be included as a priority crossing.

Figure 21 lists 23 crossings that met the established priority criteria. Most of these crossings are located along the UPRR Mainline that runs NE-SW through the County. The remaining crossings are along the line from the old General Mills waterfront property, as this line has been identified as having potential for freight growth in the near future and should therefore be monitored closely.

To further prioritize the crossings, accident data, including year and type, traffic volumes, train volumes, and train speed were taken into account. Other specific data, such as pedestrian use and recent improvements as well as other concerns that are not normally tracked were considered based on information provided by the cities (and County, for unincorporated areas) that had jurisdiction over the crossings. Several crossings were high priority, but were not made a priority on this list as they are receiving or have recently received improvements. These crossings include Peabody Road and Sunset Avenue. Based on the analysis, the following 7 crossings are considered highest priority for future improvements. They are, from northeast to southwest: Pedrick Road in Dixon, 1st Street in Dixon, A Street in Dixon, Fry Road in Vacaville, Canon Road in Fairfield, and E. Tabor Avenue in Fairfield. The crossings are listed below from highest priority to lowest.

A. E. Tabor Avenue, Fairfield, CA

E. Tabor Avenue is a crossing with higher than average auto traffic, high train traffic and high train speeds. The crossing had many issues with autos driving around gates in the past, and had medians installed, which have mitigated that issue. Based on recent discussions with the City, there are current issues with students crossing the tracks to get to and from a middle and elementary school. The school district currently provides a crossing guard to assist the students traverse the crossing and stay clear of the motorist right of way, but no sidewalk or other pedestrian improvements have been implemented. It is recommended that sidewalks be extended to the crossing to allow students to safely move over the grade crossing. This basic improvement proposed would cost roughly $60,000.

This project is also identified in the STA's Safe Routes to School plan, with a wider range of sidewalk, grade crossing, bus stop and street improvements connecting to the schools, at a higher project cost ($600,000-$1 million).

B. 1st Street, Dixon, CA

1st Street is a skewed crossing with high auto traffic and moderate train volume where 2 of the 3 accidents that have occurred since 1976 have involved pedestrians. The grade crossing separates a nearby school from a mainly residential area and a school crossing exists just south of the crossing. 1st street grade crossing currently has no sidewalk or pedestrian improvements, which would be recommended at this crossing based on accident data and the speed of trains (70 mph) as they move over the crossing. To install the necessary mitigations would cost roughly $20,000.

C. Canon Road, Fairfield, CA

Canon Road is a crossing with high train traffic, high train speeds, moderate auto traffic and a short storage space. The adjacent 3-way intersection is stop controlled with roughly 40 feet of storage space. 4 of the 5 accidents that happened at this crossing since 1976 have involved vehicles stopped on the crossing. This crossing would be a candidate for either a pre-signal or at the very least, short storage signage to help prevent users from stopping on the tracks. To install a presignal and upgrade the intersection to be a signalized intersection would cost roughly $200,000. Short storage signage would cost roughly $500. Any increases to the railroad signal timing would be at an additional cost. This crossing is planned for elimination with the realignment of Canon Road as part of the implementation of the Fairfield Train Station Specific Plan.

D. Midway Road, Unincorporated County of Solano, CA

Midway Road crossing is a low auto traffic crossing with high speed and moderate levels of train traffic. It is also the crossing with the most recent accident (2014). The adjacent 3-way intersection is stop controlled in the west and north directions with roughly 100 feet of storage space that is on a curve. Of the 3 accidents that occurred, 2 involved vehicles stopped on the tracks. It is therefore recommended that a pre-signal, or at the very least short storage signage, be installed at the crossing. To install a presignal and upgrade the intersection to be a signalized intersection would cost roughly $150,000. Short storage signage would cost roughly $500. Any increases to the RR signal timing would be at an additional cost.

E. Fry Road, Vacaville, CA

Fry Road crossing is a low volume but high-speed auto traffic crossing with high-speed train traffic and moderate rail traffic. All 3 of the accidents at this crossing have been because of vehicle drive-arounds. It is therefore recommended that medians be installed at the crossing to help prevent vehicles driving around gates. Installing medians at this crossing would cost roughly $20,000.

F. A Street, Dixon, CA

A Street has been a crossing of concern since the 2011 Final Rail Crossing Inventory was written. While there are few recent accidents at the crossing, eastbound queuing is a significant issue and traffic counts are high enough that it is a good candidate for a queue cutter traffic signal. A Street has also been a candidate for a grade separation per the 2011 Final Rail Crossing Inventory. While a grade crossing would eliminate the queuing issue, until the grade separation is complete, queuing will still be an issue. The crossing may also be impacted such that the crossing will have lower peak traffic levels and therefore less queuing once the Parkway Boulevard Grade Separation is complete. Therefore, it is recommended that a queue cutter be installed until a grade separation is implemented. To install a queue cutter would cost roughly $150,000. Any increases to the RR signal timing would be at an additional cost.

G. Pedrick Road, Dixon, CA

Pedrick Road Crossing is a crossing that is recommended for monitoring. It is a skewed crossing with moderate daily auto traffic and fairly low train volume. It is used primarily by locals as a side street and is used heavily by trucks during the harvest months, which makes for a large seasonal peak in traffic that is not necessarily shown in the average daily

traffic (ADT) counts. Because of this, it is recommended that more current traffic data be determined including vehicle mix. The crossing has had past issues with drive-arounds and currently has no medians. If peak traffic levels and vehicle usage show that this crossing is a high risk crossing, the crossing should be reevaluated for further improvements, including the installation of medians.

H. Pierce Lane, Unincorporated County of Solano, CA

Pierce Lane Crossing is a crossing that is recommended for monitoring. Although there has only been one accident at the crossing in 2007, the accident involved a truck getting stuck on the crossing. The consultants were unable to get updated traffic counts for this crossing and the latest counts from 1988 show 200 vehicles using this crossing. The crossing has a significant hump and leads into a boat yard. The roadway approaching the crossing is posted with “flooded” signage with adjacent water levels close to the road elevation. It would be good to have more current traffic data, including vehicle mix. If trucks are regular crossing users, additional signage should be installed to warn motorists of the geometric constraints.

These recommendations are based on the most current data available and are subject to change based on changes in traffic that may come into effect due to the current Peabody Road grade separation, the future Parkway Boulevard grade crossing, and if freight rail increases are implemented along the line operated by CFNR leading to the old General Mills waterfront property.

Figure 21 (four pages): Solano County Railroad Public Grade Crossings Prioritization Summary

Solano County Railroad Public Grade Crossings Prioritization Summary[1]

(Crossings listed from North to South)

Crossing Number	Road Name	City	Total Accidents	Accident Date(s)	Most Recent Accident	ADT (year)	Trains per day	Train Speed (mph)	Owner	Recent Improvements	Notes	2015 Priority Ranking
751241L	Old Davis Road	Unincorporated County	2	2001 1978	Truck drove around/thru gate	462 (2003)	18	70	UPRR	-	Skewed crossing, no median.	-
751246V	Tremont Road	Unincorporated County	1	2005	Truck-Trailor drove around/thru gate	3121 (2000)	18	70	UPRR	-	Skewed crossing, no median.	-
751248J	**Pedrick Road**	**Dixon, CA**	**2**	**1987 1976**	**Car drove around/thru gate**	**3146 (2008) w/ seasonal peak**	**18**	**70**	**UPRR**	**-**	**Skewed crossing. Used primarily by locals as a side street with considerably more use during harvest seasons (June to October). No median.**	**F**
751250K	**First Street**	**Dixon, CA**	**3**	**2009 2001 1980**	**Pedestrian struck while on crossing**	**14247 (2007)**	**18**	**70**	**UPRR**	**Section 130 Nominated**	**Skewed Crossing. Sidewalk not continuous on either side of the street at crossing. School Zone nearby.**	**B**
751253F	**A Street**	**Dixon, CA**	**2**	**1990 1982**	**Pedestrian struck while stopped on tracks**	**5227 (2008)**	**18**	**70**	**UPRR**	**-**	**Signalized intersection 650' east (1st Street) and 325' west of crossing (Adams St). AM Peak Hour EB Queuing from 1st Street intersection to the crossing. Traffic expected to be reduced by 25% with completion of Parkway Boulevard Grade Separation Project in 2 years. City reported significant increase in traffic in last 5 years.**	**G**
751254M	Pitt School Road	Dixon, CA	3	2005 1980 1980	Abandonded car stopped on crossing was struck.	400 (2009)	18	70	UPRR	–	2-way stop controlled adjacent intersection. Short storage space for NB traffic. Traffic expected to decrease after completion of Parkway Boulevard Grade Separation Project (2 years). Note: 10 years since last accident and 400 ADT.	

[1]Crossings with no accident history (per FRA database) and crossings from the Western Railway Museum have been omitted from this summary
All Active Crossings

Solano County Railroad Public Grade Crossings Prioritization Summary[1]

(Crossings listed from North to South)

Crossing Number	Road Name	City	Total Accidents	Accident Date(s)	Most Recent Accident	ADT (year)	Trains per day	Train Speed (mph)	Owner	Recent Improvements	Notes	2015 Priority Ranking
751255U	**Midway Road**	**Unincorporated County**	**3**	**2014 2007 1992**	**Unoccupied car was struck.**	**2082 (2014)**	**18**	**70**	**UPRR**	**-**	**WB traffic Stop controlled 100' west of crossing. Possible queuing issues (past accidents have been vehicles stopped on tracks). Queuing expected to be reduced after completion of Parkway Boulevard Grade Separation Project (3 years).**	**D**
751256B	Batavia Road	Unincorporated County	1	1998	Car did not stop at crossing	200 (1988)	18	70	UPRR	-	Skewed Crossing	
751259W	Lewis Road	Unincorporated County	1	1988	Vehicle drove around gates	400 (1988)	18	70	UPRR	-	Skewed Crossing	
751260R	Hawkins Road	Unincorporated County	1	1977	Car stalled on crossing.	200 (1988)	18	70	UPRR	-	Skewed Crossing	
751288G	Elmira Road	Elmira, CA	1	2013	Unoccupied car struck. Car was stuck on crossing and driver abandoned car.	1270 (2012)	18	70	UPRR	-	California Pacific Road 40' to the west (CA Pacific Rd Stop Controlled) and A Street Crossing 200' to the east (4-way stop).	-
751289N	**Fry Road**	**Vacaville, CA**	**3**	**2008 2004 1993**	**Train was struck by truck that drove around/thru gate**	**2950 (2011)**	**18**	**60**	**UPRR**	**-**	**All accidents have involved vehicles going around gates.**	**E**
751291P	**Canon Road**	**Fairfield, CA**	**5**	**2011 2007 2002 2001 1992**	**Tractor-Trailer fouling the crossing was struck while stopped at crossing.**	**4472 (2013)**	**43**	**60**	**UPRR**	**-**	**Short staged crossing, with 40' of clear storage distance between tracks and intersection limit line. Crossing used by trucks that foul track when stopped at limit line.**	**C**
751292W	Peabody Road	Fairfield, CA	6	2014 2000 1990 1986 1986 1976	Train struck car that drove around/thru gate	21684 (2013)	41	60	UPRR	Grade Separation (Planned 2016 Completion)	Grade separation underway. School crossing 500 ft south of crossing for housing development north of crossing (about 2 miles away from school). Highest ADT of studied crossings.	-

[1]Crossings with no accident history (per FRA database) and crossings from the Western Railway Museum have been omitted from this summary
All Active Crossings

Solano County Railroad Public Grade Crossings Prioritization Summary[1]

(Crossings listed from North to South)

Crossing Number	Road Name	City	Total Accidents	Accident Date(s)	Most Recent Accident	ADT (year)	Trains per day	Train Speed (mph)	Owner	Recent Improvements	Notes	2015 Priority Ranking
751294K	**E Tabor Avenue**	**Fairfield, CA**	**7**	**2010 2006 2001 1999 1987 1982 1982**	**Train struck car that drove around/thru gate**	**8351 (2013)**	**41**	**60**	**UPRR**	**Median**	**Median now exists at crossing (built between 2011-2014). School children go into the street to traverse the crossing. Due to safety concerns, a crossing guard walks the school children across the tracks everyday.**	**A**
751295S	Sunset Avenue	Suisun City, CA	3	2007 2007 1986	Train struck pedestrian on bicycle.	14902 (2013)	41	60	UPRR	Median, Sidewalk	Skewed crossing. Medians and ped improvements installed (2009).	-
751298M	Cordelia Street	Suisun City, CA	1	1994	Car moved over crossing and struck train.	1200 (1988)	18	65	UPRR	-	Skewed Crossing. Spur track crossing 650' to the west.	-
751494U	**Pierce Lane**	**Unincorporated County**	**1**	**2007**	**Truck stuck on crossing.**	**200 (1988)**	**43**	**79**	**UPRR**	**-**	**Humped crossing leading into boat yard (dead end); roadway posted with flooded signage with adjacent water level close to road elevation.**	**H**
751465J	Sereno Drive	Vallejo, CA	1	1976	Car struck by train while crossing .	7000 (1988)	8	20	CFNR	-	No median at crossing. Two-way left turn runs through middle of crossing . Signalized intersections 150' to the east and 425' to the west. RR Gate arms missing in Google Earth photos.	-
751466R	Redwood Street	Vallejo, CA	4	1999 1986 1986 1978	Van stopped while fouling the tracks and was struck by train.	17700 (1995)	8	20	CFNR	-	Signalized intersection 140' east of crossing.	-
751467X	Valle Vista Avenue	Vallejo, CA	3	1990 1979 1978	Car stopped on crossing and was struck by train.	6000 (1995)	8	20	CFNR	-	Crossing less than 20 ft from signalized intersection at Broadway. EB Vehicles Stop upstream of the crossing at RR Limit line.	-
751474H	Georgia Street	Vallejo, CA	1	1978	Car stalled on crossing and was struck by train.	9000 (1988)	8	15	CFNR	-	Signalized intersections 375' to the east and 475' to the west. Raised median stops well short of the median.	-

[1]Crossings with no accident history (per FRA database) and crossings from the Western Railway Museum have been omitted from this summary
All Active Crossings

Solano County Railroad Public Grade Crossings Prioritization Summary[1]

(Crossings listed from North to South)

Crossing Number	Road Name	City	Total Accidents	Accident Date(s)	Most Recent Accident	ADT (year)	Trains per day	Train Speed (mph)	Owner	Recent Improvements	Notes	2015 Priority Ranking
751476W	Solano Avenue	Vallejo, CA	1	1977	Car did not stop at crossing and was struck by train.	4100 (1988)	10	15	CFNR	-	5 Way Signalized intersection 250' west of crossing. Baseball field and large park directly east of Crossing and residential area directly west).	-

[1]Crossings with no accident history (per FRA database) and crossings from the Western Railway Museum have been omitted from this summary

All Active Crossings

3.3 SEA LEVEL RISE

3.3.1 Current Sea Level Rise Policy Background in Solano

The U.S Army Corps of Engineers in 2009 addressed sea level rise in the Engineer Circular (EC) 1165-2-211 (2009) "Incorporating Sea-Level Change (SLC) Considerations in Civil Works Programs," which requires that impacts to coastal and estuarine zones caused by sea-level change must be considered in all phases of Civil Works programs, including rail infrastructure improvements.

In October 2011, the San Francisco Bay Conservation and Development Commission (BCDC) amended the San Francisco Bay Plan to address sea level rise and to deal more broadly with climate change. The Solano Rail Facilities Plan Area is within Map 3 (Suisun Bay and Marsh Map) of the Bay Plan and the amendments and policies apply to the Solano Rail Facilities Rail Plan area. Update includes a review of BCDC new policies regarding any prioritized projects located in the Suisun Marsh Local Protection Plan and elsewhere that may be affected by sea level rise.

Water levels in San Francisco Bay have risen several inches over the past century and are expected to continue to rise (http://www.bcdc.ca.gov/proposed_bay_plan/faqs.shtml). The BCDC Bay Plan report contains maps showing that low-lying land around the Bay may be vulnerable to sea level rise over the next century.

The San Francisco Bay Plan contains the policies that the BCDC uses to determine whether permit applications can be approved for projects within the Commission's jurisdiction, which consists of the Bay, salt ponds, managed wetlands, certain waterways and land within 100 feet of the Bay. BCDC keeps the San Francisco Bay Plan up to date by amending it to deal with new information and new issues, including the new climate change and SLC information.

The new policies and amendments have been approved by the State Office of Administrative Law and the National Oceanic and Atmospheric Administration (NOAA) and are now being applied by BCDC. The new policies also call for the formulation of a regional sea level rise adaptation strategy to protect critical shoreline development and natural ecosystems.

BCDC Bay Plan amendments do not increase BCDC's regulatory jurisdiction or authority. The new climate change policies will be applied by the Commission within its existing jurisdiction using its current regulatory authority. State law explicitly states that the policies are advisory only beyond the Commission's regulatory jurisdiction.

Solano County's General Plan required development of Sea Level Rise Strategic Plan (SLRSP) (http://www.co.solano.ca.us/bosagenda/MG48143/AS48207/AS48236/AS48237/AI49605/DO49773/DO_49773.pdf) and Climate Action Plan for Solano County. These documents were prepared and adopted by the County in 2011. The SLRSP defines three primary objectives: (1) investigate the potential effects of SLR on Solano County, (2) identify properties and resources susceptible to SLR in order to prioritize management strategies, and (3) develop protection and adaptation strategies to meet the County's and region's goals. Adaptive measures for railways in the SLRSP include (page 4-5):

- Protection – Reinforce and raise levees, create buffers
- Adaptation – Design and upgrade rail lines to tolerate periodic flooding and possible long-term inundation (i.e., storm water drainage, elevation of railway, relocation to higher ground, into protected infrastructure corridor)

- Planning – Collaborate with the Union Pacific Railroad, Amtrak, and other applicable transportation agencies to upgrade/reroute the railway through Suisun Marsh.

3.3.2 Solano Rail Infrastructure and Sea Level Rise

The sea level rise is expected as a result of climate change affecting crucial passenger train features, such as railroad tracks and stations in Solano County. Even a small amount of sea level rise associated with storms, high winds, waves, and high tide has the potential to cause flooding in low lying areas along the route.

Current flooding risks occur in many areas along the Capitol Corridor route in Solano County and the frequency of storms is expected to increase in the future due to climate change. STA recognizes that planning for sea level rise needs to begin as part of the Solano Rail Facilities Plan Update, at the ten-year horizon of the Plan Update.

UPRR owns and maintains tracks and levees in Solano County. Solano passenger rail facilities infrastructure improvements will be implemented by the UPRR. CCJPA may want to develop and adopt a formal data sharing agreement with Union Pacific to fill in information gaps in railroad assets (tracks, signal system, bridges), in existing conditions, and in maintenance records. Knowledge of Union Pacific's infrastructure improvement plans would also be helpful in understanding the vulnerabilities of the railroad features to sea level rise.

3.3.3 Passenger Rail Operations and Sea Level Rise in Solano

Capitol Corridor passenger operations include railroad tracks at grade, railroad signal system, railroad bridges, stations, and a maintenance facility in West Oakland, which is outside of the STA area. The following passenger rail operations are vulnerable to sea level rise for the following reasons:

- The railroad system is fixed, interconnected, and lacks redundancy. If one section of rail in the region is compromised, the whole system will be compromised.
- The functionality of the railroad tracks depends upon the signal system; impacts of disruptions to the signal system range from train delays to entire shutdown of the route, depending on the number of disruptions to the signal system at one time.
- CCJPA Suisun-Fairfield station is physically vulnerable to sea level rise due to location and reliance upon external power.
- The complex ownership and management structure for CCJPA system may complicate planning processes.
- There is a lack of public information about railroad infrastructure owned by UPRR (tracks, signal system, and bridges), and there is currently no formal information sharing agreement between Union Pacific and CCJPA regarding infrastructure improvements associated with sea level rise.

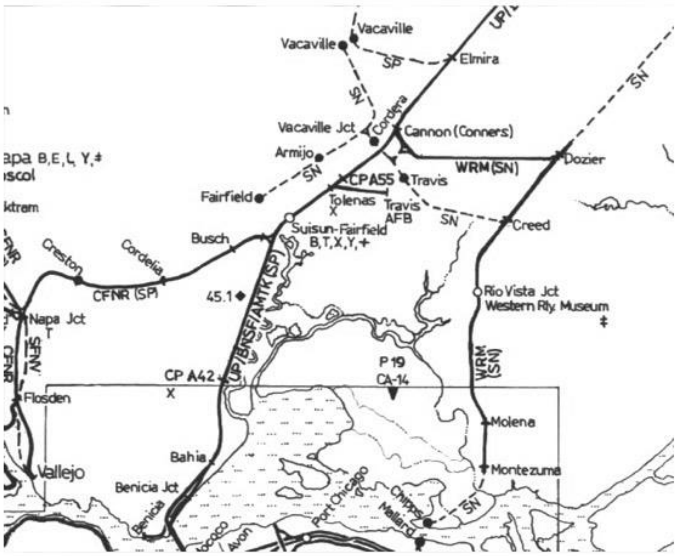
The majority of the rail tracks in Solano County are located in the northern portion of the Suisun Marsh. The area is primarily open and natural, and overall there is minimal human activity surrounding the tracks in the wetlands. As the rail tracks approach north toward Suisun-Fairfield station in Suisun City, land use becomes urban.

The rail tracks crossing Suisun Marsh wetlands area are likely to be impacted by sea level rise. Soil subsidence in the wetlands is an additional concern and is the cause for much of the current UPRR railroad track maintenance in the wetland area to maintain a level surface for the tracks. Inundation of the tracks is likely to occur with sea level rise, and temporary flooding of the tracks may occur with a storm tide.

The Suisun-Fairfield station may be vulnerable to disruption if road access from Suisun City is flooded by future sea level rise. Key station access roads have the potential to be impacted by sea level rise. The Suisun-Fairfield station is not situated adjacent to any surface bodies of water and is less than a half-mile north of the Suisun Slough in Suisun.

As discussed in the Sea Level Rise Vulnerability Assessment prepared by CCJPA (August 21, 2014), other environmental concerns associated with sea level rise in Solano County may include petroleum, currently being transferred in pipelines belonging to Kinder Morgan (the pipelines often located within the Union Pacific right-of-way), and destabilization of railroad embankments could cause distortion and rupture of the pipelines. Relocation and repair of the railroad infrastructure may need to take into account the presence of the pipelines and other underground utilities, potentially requiring relocation of the lines within the right-of-way. Increasing the height of the railroad embankment can cause additional forces on the underground pipelines, which could lead to rupture. Petroleum also has high mobilization potential in floodwater. Creosote is used to protect railroad ties. Creosote has medium mobilization potential in floodwater if exposed for an extended period of time. Air quality could decrease due to increased exhaust from cars during road congestion, which is expected to occur if CCJPA trains experience major disruptions and potential passengers are forced to drive rather than take the train.

Solano Rail Facilities Plan Update



Chapter 4

NAPA-SOLANO RAIL CONNECTIONS UPDATE

4 NAPA-SOLANO RAIL CONNECTIONS UPDATE

4.1 BACKGROUND NAPA-SOLANO 2003 STUDY

Figure 22 provides an overview of the routes that were explored for passenger and freight service potential in the original Napa-Solano connections study of 2003.

The three routes comprise the current operations of California Northern shortline in Solano County between Cordelia Junction, Napa Junction and Vallejo plus the Napa Valley Railroad (NVRR) wine train, which extends north from the former Napa pipe site (at Rocktram) to the Krug winery, north of St. Helena.

The original study concluded that passenger services on all three segments would be expensive to deliver with limited ridership, given the relatively small local population and trip volumes, especially by commuters. Financially, they did not compare well with other commuter rail startup projects which have been funded.

Highway 29 is the major travel artery serving the valley, with major seasonal peaks in congestion levels driven by visitor numbers. The ridership forecasts in the 2003 study, founded on industry best practice and knowledge of 1990s rail startups, showed limited potential for significant mode shift, or positive impact on the SR-29 congestion.

However, because of the assumptions that the service be resident/commute-driven with scope for some daytime visitor travel, the service concept was not focused on visitors rather than commuters as the core market: therefore the opportunity for significantly impacting the peak travel season by capturing significant numbers of visitor trips remained unrealized in the 2003 study. This is a very different rail service concept from the traditional publicly funded commuter rail startup.

Freight rail potential was also seen as somewhat limited (surveys of shippers showed some potential but that that would be well below even the historical levels of rail freight on the route) in spite of the growing wine industry located along the rail corridor.

Modern logistics operations have moved away from small carload-level of shipments, which historically would have moved by rail in the Napa Valley, and today require trucking to a consolidated rail distribution facility. Freight activity was also seen to be highly dependent to the fortunes of the Napa Pipe steel plant (which has since ceased operation).

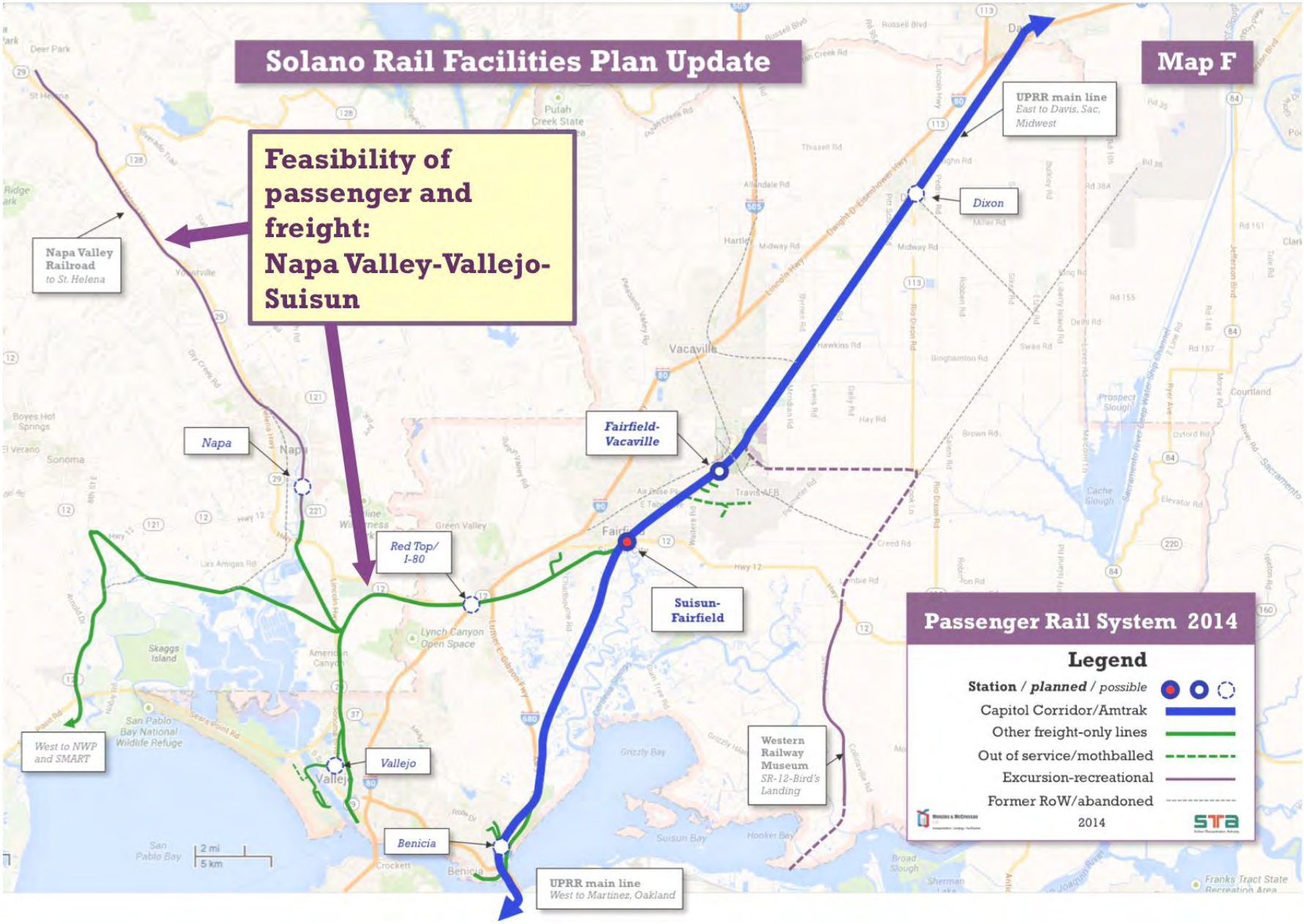
4.2 APPROACH TO THE UPDATE

This update to the 2003 study used available resources and data to revisit key elements of the study. Resources were not available to undertake primary engineering assessments or new ridership forecasts. Rather, the focus was to identify what has changed in:

- **Ridership**
- **Infrastructure**
- **Operations**

The goal was to answer the question: in the intervening 12 years, have the fundamentals changed enough to move the needle on feasibility?

Figure 22 2003 Napa-Solano Connections Study Rail Routes



4.3 RIDERSHIP DEMAND REVISITED

In reviewing ridership in the original 2003 study, the following were observed:

Original Findings

- Commuter ridership did not exceed 2,000 daily on any corridor
- Commute ridership was highly directional 80:20 (little reverse commute)
- Visitor ridership in Vallejo-Napa Valley had an estimated 139,000 annual trips (with visitor service off-peak focused)
- A reopening of the Calistoga extension generated <75 peak period trips (a significant finding, even before infrastructure is considered)

What's Changed

- Population and employment growth in corridor markets have not been revised upward significantly since 2003: there is barely a 5% variation in growth forecasts at the time of the original study and today
- The Napa Pipe Development will add 2,100+ new residents at a new transit oriented development (TOD): although significant, this still likely translates into <250 daily additional rail boardings
- Visitor numbers have continued to grow significantly, now just over 3 million annually[7]
- Ridership on NVRR already exceeds the forecast level of the 2003 study, (with only 2 daily trains), even though it does not directly connect visitors with the major tourist destination of 81% of visitors[8], the wineries
- Traffic conditions on parallel SR-29 and I-80 corridors have not improved
- Although commute ridership would be supported by stronger regional goals (through Plan Bay Area efforts) for integration of land use and transportation than 12 years ago, low-growth policies put an effective ceiling on local commute potential in the corridor

Have changes moved the needle on feasibility?

- Commuter ridership findings from original study are still sound
- Limited rail service frequency likely constrained forecast slightly but not to a significant degree
- Visitor potential was based around utilizing off-peak commute service capacity rather than truly integrated visitor travel needs

The low level of ridership combined with relatively high costs contributed to generally poor levels of financial performance. Both operating costs and growth rates were updated to present-day levels to ensure that some of these original assumptions on operating costs and potential ceilings to ridership where still valid.

Figure 23 summarizes ridership on the three main service segments in the original study, with costs

[7] Napa CVVB

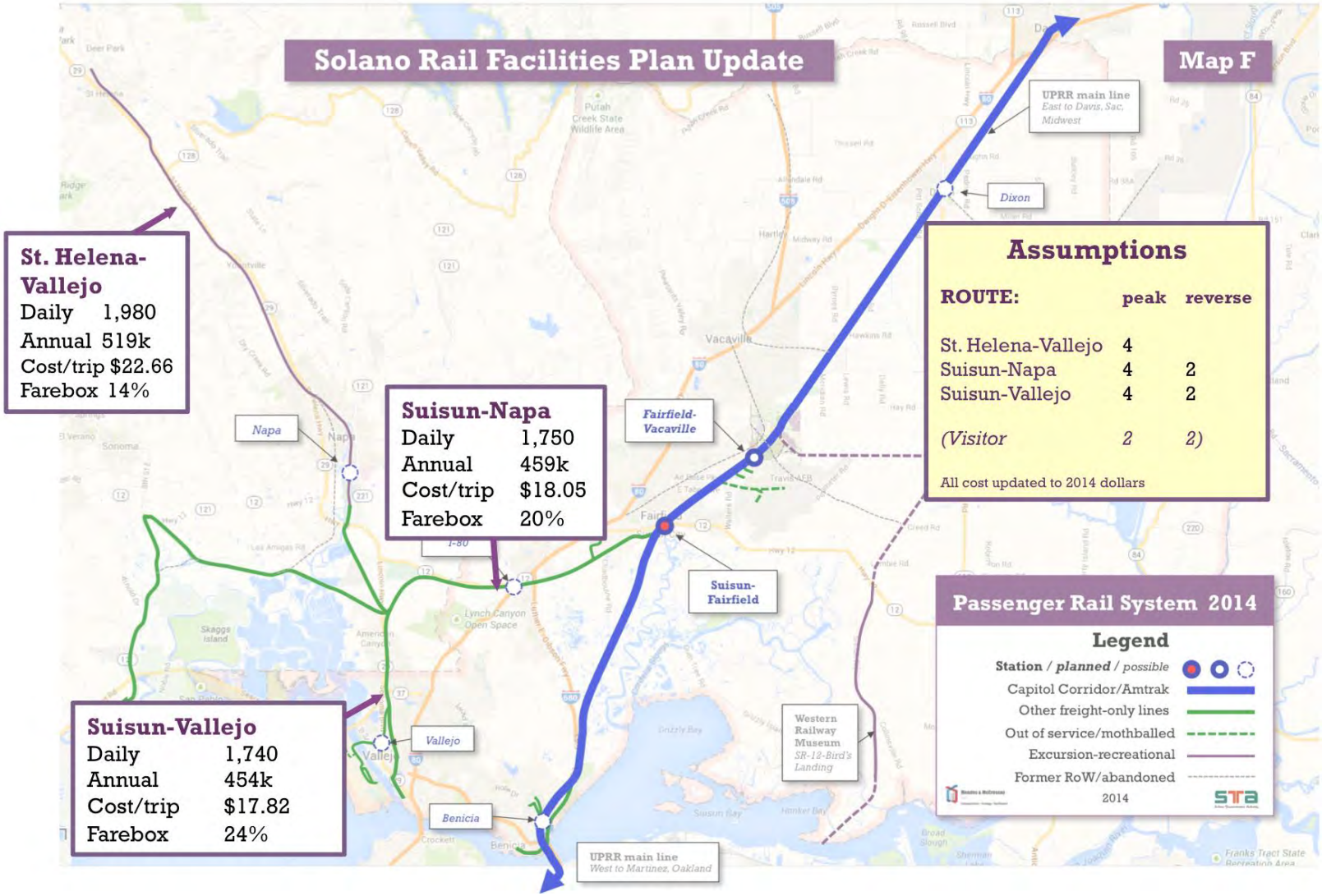
[8] VNV 2012-13 Survey

in updated (2014) operating dollars. Operating cost escalation in the transit industry has been significantly outpacing general inflation since 2003, especially in the Bay Area. The reasons for this cost escalation have been the subject of extensive research elsewhere, and there are differences of interpretation on the causes.

Nevertheless the updating of costs reinforces the original findings in relation to passenger operations: the relatively low farebox recovery of all three services in the 2003 study (Figure 23) would render these uncompetitive candidates for regional funding of new public rail service (by comparison, the three services' farebox recovery was found to be one third to a half of current Capitol Corridor service, for example).

Figure 23 Napa-Solano 2003 Ridership Projections and Updated Costs

Recap: Commute Ridership/Cost per trip (2003 Study)



4.4 RAILROAD INFRASTRUCTURE REVISITED

Original Findings

- All routes and both services are technically feasible, with no rail engineering flaws to delivering service.
- Rail capital costs $120 million for routes (incl. $25 million to Suisun) in 2014 dollars
- Bypass around Napa Pipe alone was required: $29 million
- Restoring abandoned segment to Calistoga: up to $140 million
- 12 stations totaled $21 million: intermodal and basic options were considered
- Vallejo Ferry terminal connection from north via Mare Island Causeway approach

Figure 25 summarizes the original capital cost improvements, updated to 2014 dollars. Although the average cost per mile was not high, the cost of dedicated rolling stock and major structures generated a significant cost burden for the three proposed service segments, given the small level of operating revenue (itself a function of low commute ridership and limited growth, as discussed in section 4.3).

What's Changed

- Major rail improvement projects have been constructed since 2003: Trancas Bridge over Hwy 29, Oxbow Bridge, Napa Station improvements (see Fig 26)
- There is now no need to bypass the Napa Pipe site: with the new TOD project, this location is now a destination and future generator of rail trips.
- Any Krug-Calistoga reopening is even less likely with current land ownership
- Operating and maintenance inflation has outpaced even construction costs growth
- Station costs for basic startup have grown (for conventional project delivery), and given the potential Vallejo Marine terminal freight project, a southern passenger terminus on existing tracks would likely be at the Badge and Pass location
- South approach to Vallejo Ferry terminal is a possibility to be considered with reverse approach from the Vallejo Marine Terminal

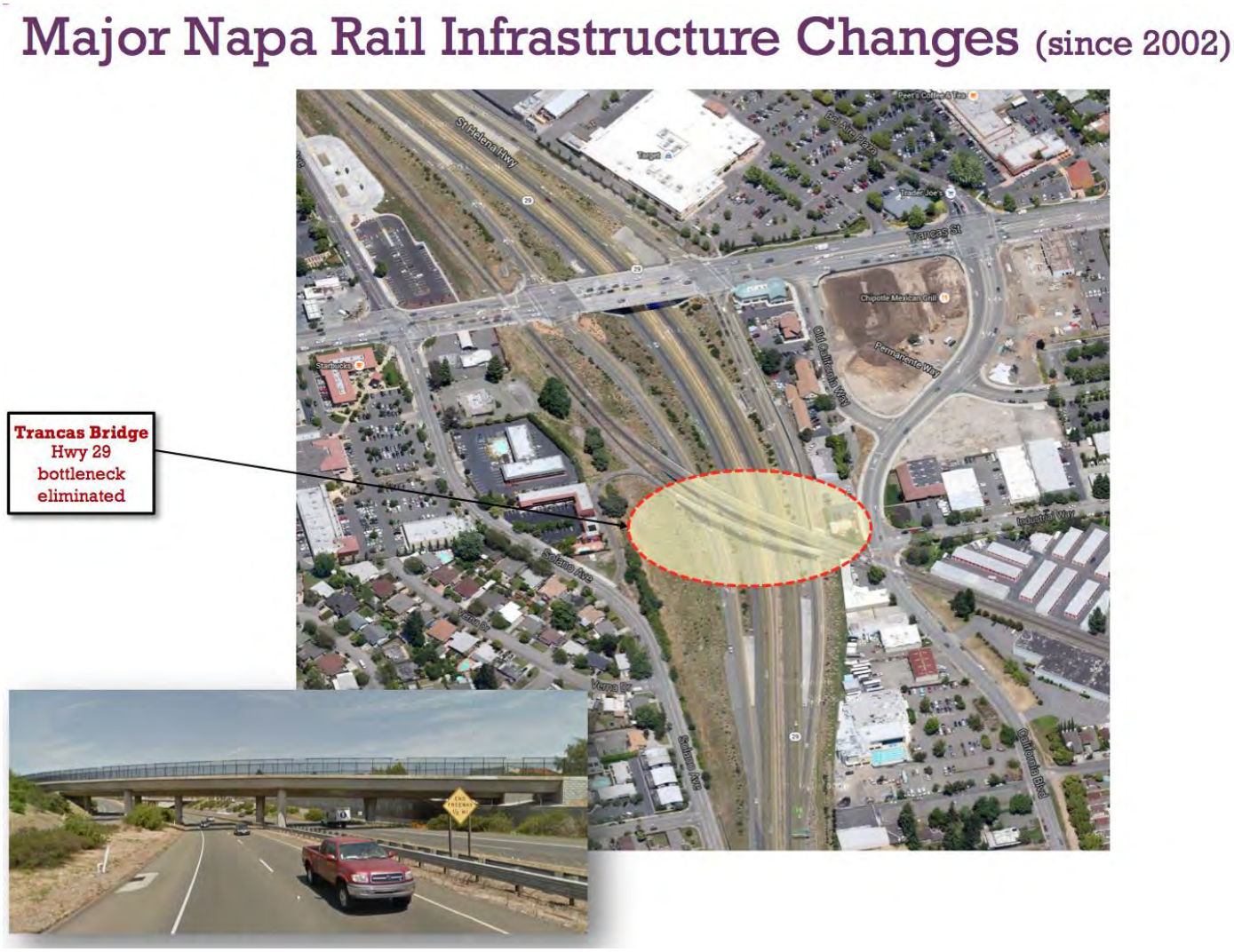
The most significant change: In 2002-3, UPRR was in early stages of new ownership/operation. During the course of this update, it was apparent that the owner is highly unlikely now to support Suisun-Vallejo services on CFNR that impacts its main line. No physical connection for passenger service is therefore likely to be approved at Cordelia-Suisun.

Figure 26 summarizes the major infrastructure changes on the rail corridor that have occurred since 2003 study.

Have changes moved the needle on feasibility?

- Major projects completed have removed $30+ million of costs
- Napa Pipe Development moves from a negative to a positive overall

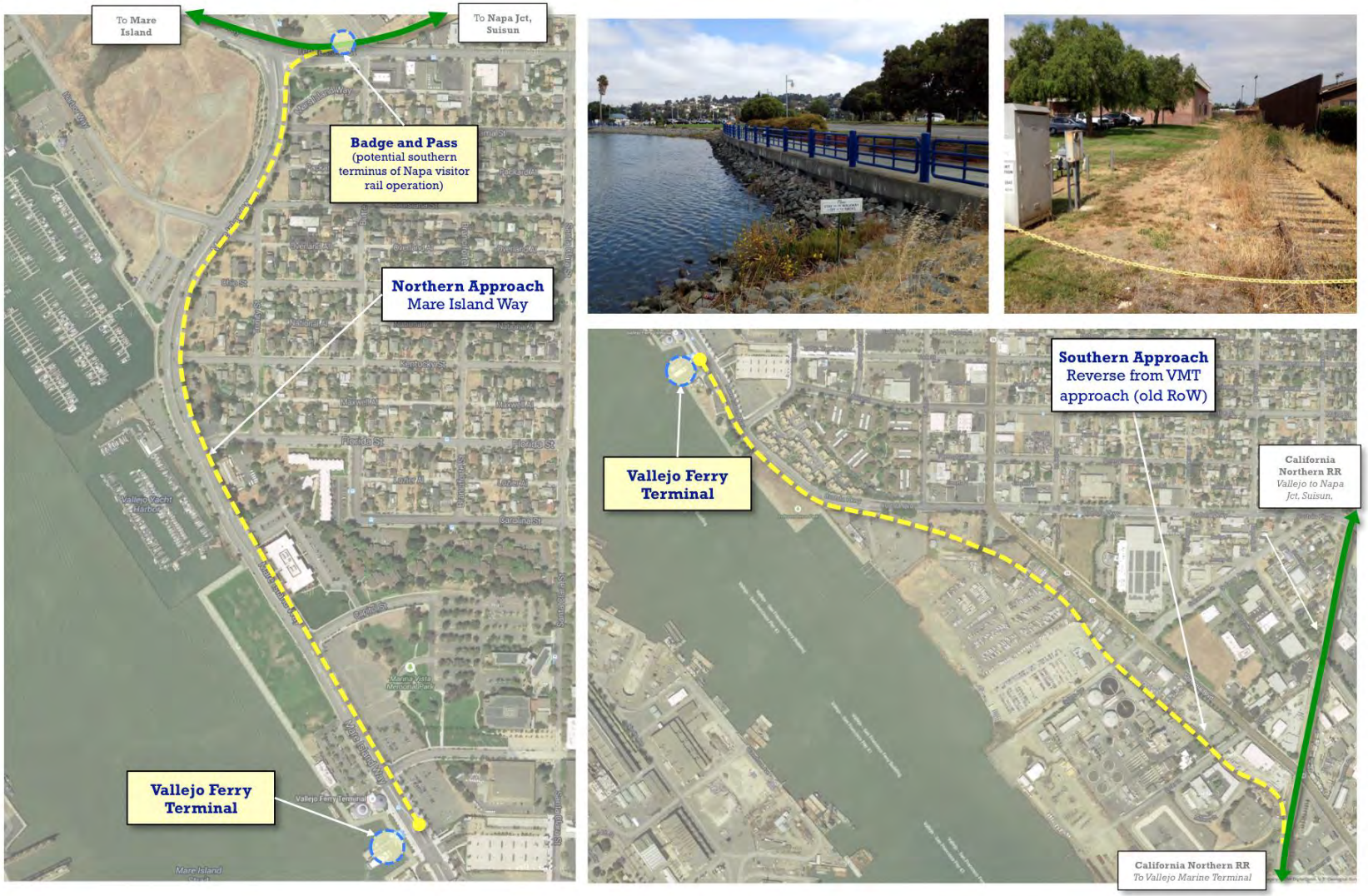
- Cost burdens still require significantly more ridership than original study assumptions



Oxbow Bridge
New structure and station facility

Figure 24 Vallejo Ferry Rail Connection Options

Vallejo Ferry rail connections: options



Recap: Napa-Solano Rail Costs (2003 Study)

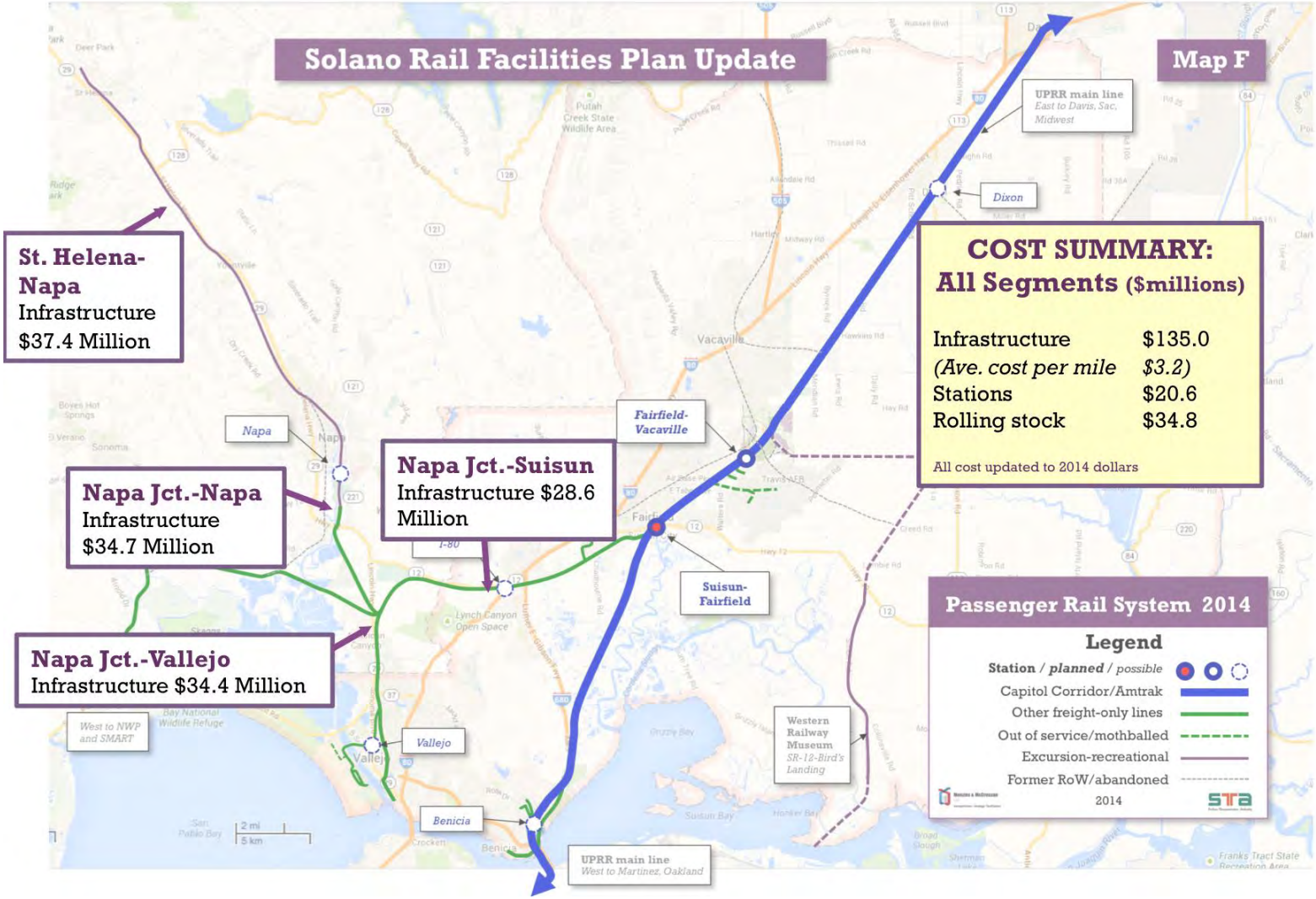


Figure 25 Napa-Solano Capital Costs Updated

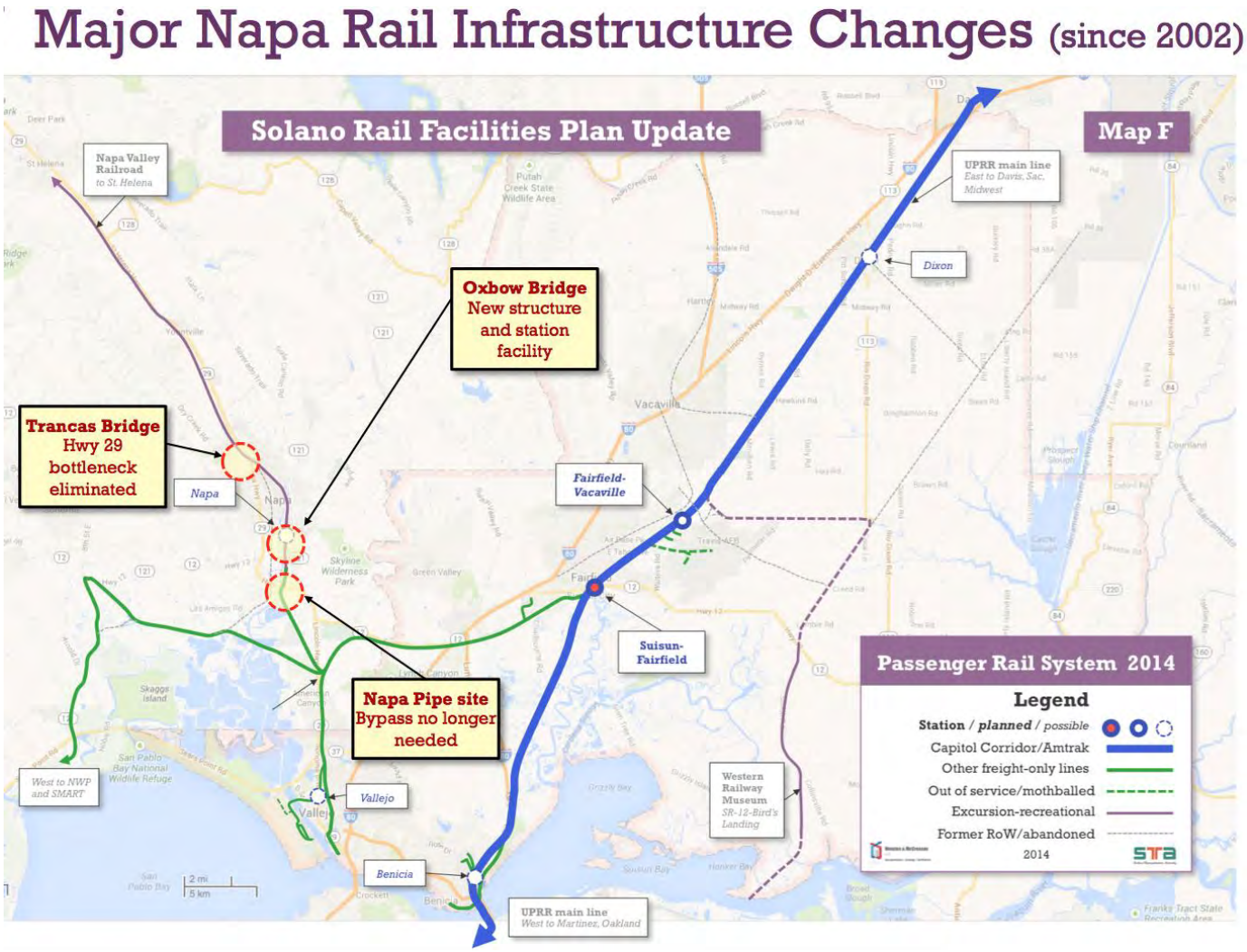


Figure 26 Napa-Solano Major Infrastructure Changes

4.5 PASSENGER OPERATIONS REVISITED

Original Assumptions

- Limited Service with peak-period 60-minute frequency on some routes.
- Off-peak had minimal or no service
- Two daily visitor-oriented services
- 45 mph average speeds
- Passenger station potential ranged for:
    - Key stations at Napa/Vallejo/St Helena
    - Frequently spaced (12+) small stations at every activity node
- Equipment based on heavy diesel multiple unit (DMU) railcars to meet the need for FRA-approved interoperability with freight operations
- The rail service was at a level that would make support transit shuttles a challenge to sustain

What's Changed

- Napa Valley freight rail potential remains limited, given current distribution practices. Freight operations are not a major impediment to 2003 and current passenger rail potential
- The minimal level of freight movements means that the FRA-compliant DMU equipment is less likely to be prerequisite for a future passenger rail service: freight/passenger temporal separation, even with a reestablished freight facility at the Vallejo Marine terminal, appears possible
- Concepts of delivering frequent service levels on startup are more commonplace than in the early 2000's and can promote more immediate ridership growth and mode shift
- Rail startups in region have created more competition for funding: compared with 2002-3, metropolitan planning authority (MPO) and federally routed funds for new rail projects bring even stronger accountability and an expectation of high utilization of expensive rail assets. In this environment, a project with minimal or no public funding requirement has a greater chance of success than a conventional publicly funded startup.
- Passenger (excursion) service has been run over Napa Junction route for first time in decades: during 2013 and 2014, Capitol Corridor excursion trains ran to the Sears Point Raceway on two weekends, in a highly successful trial
- The private sector has recently expressed interest in an expanded visitor train operation along the entire Napa Vallejo corridor which incorporates:
    - Self-propelled DMU trains, lighter and less expensive than those considered during the 2002-03 study (operating bidirectional rather than locomotive-hauled

cars as in the current wine train operation)

- Temporal separation of passenger and freight operations to ensure that light DMUs can be used
- Station stops with a small footprint like those considered in the 2002-03 study, at a minimum serving St. Helena, Napa, Napa Pipe TOD/College and Vallejo

Have changes moved the needle on feasibility?

- Shift to more accountability and operational efficiency makes original assumptions less feasible
- Newer DMU equipment offers more cost effective options (with freight separation)
- Private sector sponsorship of passenger rail in the Napa Valley, with their alternative delivery options, now offers greater cost effectiveness and control of service

4.6 CONCLUSIONS

This update supports the conclusions previously reached, that conventional commuter rail service, using public delivery and funding for startup would face viability challenges on all three routes.

However, as of 2015, there are potential private sector ventures underway to expand recreational trains to more of the corridor, with more frequent service, that may offer general public passenger service in the long-term. These would be purely private ventures without the direct financial support of the local public agencies.

Given the current interest by private sector parties to develop a Napa Valley passenger operation service, this update describes conclusions and potential next steps for the local public agencies rather than specific recommendations for the Solano component of the plan.

Conclusions and next steps under the three components of the update are as follows:

RIDERSHIP DEMAND:

- Commuter market: remains marginal (Napa Pipe TOD development adds some, beyond the 2003 study base) in a conventional operation
- Future commuter growth will be constrained by slow growth policies on the corridor
- The short and long-term visitor market is very healthy, and barely tapped by the current Wine Train operation
- The visitor rail market is the primary foundation of the rail corridor's viability, and the commuter market can be served concurrently with appropriate service

Next Steps for local jurisdictions:

- Consider the rail corridor as integral part of PDA concept, even without active passenger service
- Support passenger service development with flexibility in VINE service mission and delivery
- Vallejo Ferry connection: stay active in determining future service flexibility with WETA (for example, small vessels allow more frequent sailing and support denser rail service)

- Support (via Napa CVB) private efforts to coordinate visitor packages with expanded visitor rail service
- Support seasonal excursion rail to Sears Point (precedent-setting, and opens the possibility of future Sonoma-Marin connection in the long-term)

RAILROAD INFRASTRUCTURE:

- Major structures have been delivered since 2003 – a very favorable foundation for future service, all delivered at public expense
- Track upgrades for 50 mph passenger operation relatively inexpensive
- Choice of rail equipment drives passenger and freight separation/integration
- Vallejo Ferry Terminal connection requires shared RoW if from the northern approach on Mare Island Way: street running trains are less common than in the past and often perceived to generate conflicts with traffic.
- Funding and Implementation: if privately led, needs for local public funds may be minimal or zero.

Next Steps for local jurisdictions:

Local agencies' role dependent on whether a service would be public (unlikely) or (more likely) privately led:

- Future Vine Trail and local improvements should facilitate restart of passenger rail
- Approval of freight rail projects (Marine Terminal) would not likely prejudice future passenger rail
    - Consider fast-track approvals for private sector-led development of the Napa Valley corridor rail service
- Support safe routing and operation of downtown Vallejo rail connection to ferry terminal (an alternative shuttle connection for the ¾ mile between the ferry terminal and the northern connection at the Causeway/Badge and Pass site could impose a significant transfer penalty and handicap a passenger operation)

PASSENGER OPERATION:

The conventional commuter rail startup model will remain infeasible and have low regional funding competitiveness

- Current NVRR specialized operation leaves major visitor volumes untapped
- At 300 trips/day, potential benefit of relieving Hwy 29 visitor traffic volumes and congestion remain unrealized
- Commuter rail service needs are limited and shouldn't drive or shape a passenger operation
- Frequent all-day service key to serving visitors, and as a benefit, commuters
- A lower-cost service model is key to feasibility

Public and Private rail interests intersect uniquely in the Napa Valley

Next Steps

Local Jurisdictions should:

- Support integrated approach to the entire Napa-Vallejo rail corridor, regardless of ownership
- Support passenger rail service development with flexibility in future VINE transit mission and delivery
- Continue to support freight rail in Vallejo: freight can be accommodated, can coexist with passenger rail and assures basic maintenance of the rail infrastructure

Solano Rail Facilities Plan Update

Chapter 5

CONCLUSIONS AND RECOMMENDATIONS

5 CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS

5.1.1 Freight Demand Needs: Future 10-year

- Freight train numbers may have not recovered to pre-recession levels, and it is unclear when or even if they will within the 10-year horizon.
- Depending on shippers' schedule needs, there are potentially slots available for *all* of the anticipated major growth on mainline-served freight demand in Solano i.e.
    - A daily full crude by rail (CBR) train serving Valero
    - Several Busch-scale production facilities in the three potential Fairfield sites (unlikely even to total a daily trainload)
    - Several large production facilities to be designated in the unincorporated County east of Dixon

5.1.2 Passenger Service Development: Future 10-year

Service levels:

- Within the 10-year horizon, service levels will remain broadly the same, at 30 trains daily.
- However, expansion of CCJPA service beyond the current Oakland-Sacramento core of the corridor will mean that significant additional regional trips will be available from Solano stations within the Plan's 10-year horizon to destinations on the western Oakland-San Jose segment and the Sacramento-Roseville eastern segment.
- Previous concepts of additional regional overlay service in the county (such as Dixon to Auburn) that had been considered in previous plans during the past 20 years are unlikely to be feasible within the 10 year horizon: the current agreement precludes expansion beyond the current ceiling of 30 daily trains and headways of more than 40 minutes within peak periods.
- The CCJPA will continue as the primary forum for Solano jurisdictions to advocate for passenger rail service to their communities. As service levels and station concepts evolve beyond the 10-year horizon, Solano communities should actively prioritize their future investments at a county level, in order to gain most from the competitive funding and policy environment. This is especially important after new service commences at the second (FFV) station, likely in 2018, while communities in other counties may advocate for reduction in station stops in the Corridor overall.
- The four daily long distance Amtrak services connecting the Bay Area with destinations north to Seattle, south to Los Angeles and east to Reno and Chicago do not currently serve Solano communities directly. As one of the largest service areas (by population) on those routes without a station stop, Solano should consider advocating for a Solano stop at SUI or FFV by these trains: these services that are less schedule-critical than Capitol Corridor, and may be accommodated. They have ridership potential for leisure travelers (including Solano's gateway role to the Napa Valley), Travis personnel and their families, and

business travelers using business class product on the Coast Starlight service. Because long distance trains may have longer dwell times at station stops at some locations than a Capitol Corridor train, additional main line capacity may be necessary if these trains were to stop in Solano County.

Travel time improvements:

- Speed and Reliability improvements will be the primary gains in service quality envisaged within the Plan 10-year horizon.
- Overall, improvements in end-to-end corridor travel times (Auburn/Roseville and San Jose end points) can be expected in the order of 10-15 minutes.
- Travel time improvements within Solano County will be in the order of 5 minutes eastbound and westbound from both SUI and FFV stations.

Station provision:

- Within the 10-year horizon of the plan, two stations will serve the county – the existing SUI station and the new FFV station, likely to commence service around 2018.
- Both stations will be conventional CCJPA facilities, with parking to meet forecast demand within the 10-year horizon, opportunities for local transit connections and improved bike and pedestrian access.
- Neither station facility will be staffed by Amtrak (although SUI currently has STA commute consultant customer service representatives during the morning commute). Checked baggage service will not be provided, even if long-distance Amtrak service does make calls in future at the stations in the 10-year horizon.

Local station connections:

- Reliable and seamless local connections for transferring transit passengers, bike users and pedestrians will remain essential to the success for growth in utilization of both SUI and the future FFV stations.
- However, based on no one mode of access data, the majority of trips to and from the station are still likely to occur by automobile.
- Both the SUI and FFV will have parking provision that appears relatively unconstrained during the 10-year plan horizon.
- SUI station provision parking will likely remain shared with the parking lot for commuters on the SR-12 corridor. FFV parking provision in the first phase appears adequate to meet demand within the plan horizon.
- Both parking facilities serving the stations are proposed to remain free for users. The absence of user charge or any demand management system will likely limit the potential for mode of access to shift significantly to alternative modes (although the bike access mode has grown significantly in recent years).
- Without constraints on capacity management of parking demand at the stations, substantial costs may be incurred in serving a relatively small proportion of riders with dedicated

connecting local transit service. Should the local station sponsors wish to actively manage modal shift in access to the stations, some capacity and demand management would likely be required.

- The significant growth in a long-term mixed-use development around the FFV and SUI stations will, however, generate more pedestrian and bicycle trips to the station even above the currently substantial levels.

Policies for future stations:

The Plan has articulated a Solano County-level enhancement of existing adopted CCJPA policies governing the requirements for new stations to be served by Capitol Corridor trains.

The Solano-specific station policy was adopted by the STA Board during the course of the plan development and included in Appendix 3.

In summary, the Solano stations policy:

- Matches the physical design and minimum ridership standards set by the CCJPA Board

- Refines the requirements to tie future approval of stations to completed PDA/station area plans, complete funding packages and approval in principle with the infrastructure owners (primarily Union Pacific Railroad) and CCJPA, via a memorandum of understanding, prior to any substantive design effort being expended by the sponsoring city.

- Only one of the two additional locations identified in the original 1995 Solano rail plan, Dixon (downtown), is proposed to be carried forward within the current plan, although its ability to meet the Solano station criteria means that their development is likely to be beyond the current plan 10-year horizon. Because of concerns about potential ridership, location and ability to meet CCJPA and Solano station criteria, the Benicia (Lake Herman) location is not recommended for future re-evaluation.

Growing Ridership

- Overall ridership growth in the order of 10-20% can be expected within the 10-year horizon.
- The opening of an additional station at Fairfield-Vacaville will likely add up to 15-20% to the total ridership within the county.
- Although the new FFV station may initially share some of the catchment of the current SUI station, growing mixed-use development in the immediate vicinity of both stations will lift ridership levels overall beyond their current totals at each location.
- Depending on the final assumptions in the priority development area (PDA) plan effort for both Suisun (SUI) and the Fairfield-Vacaville (FFV) station area, growth could be at the upper end of this range.
- Full buildout to the FFV station will likely enhance ridership significantly beyond this level, including a substantial walk-shed. Most of this growth will likely be beyond the 10-year horizon

Infrastructure requirements: 10-year horizon

Improvements to corridor infrastructure required to achieve both the eastern and western extensions to intercity service and travel time improvements will mainly be located outside Solano County and include:

3rd Main Track between Sacramento and Roseville

Additional capacity and running time reductions between Oakland and San Jose.

Ongoing capitalized maintenance to maintain reliability to CCJPA's high standards.

CCJPA is investigating the potential effects of sea level rise on its operations (considered in a separate chapter of the plan). An internal CCJPA study is underway to determine the scope of the issue. Once complete, the scope of potential mitigations can be better identified.

Within the county, minor improvements required to maintain these faster schedules will include:

Ongoing Capitalized Maintenance – approx. $1-3 million/year

Positive Train Control (PTC) – installed as part of a larger, system wide program on most Union Pacific main lines to improve overall operations safety

This project is underway, with the majority of the costs borne by UPRR. The PTC project may set the stage, in the future, for discussion with the railroad and regulatory agencies about higher top speeds along the corridor. If realized, these higher speeds could result in 1-2 minute running time reductions within Solano County alone.

Improvements in the vicinity of Bahia to promote fluid freight switching

Depending upon the suite of improvements, the order of magnitude costs could range from $1 million to $20 million (not currently programmed by CCJPA).

Ground improvements in the Suisun Marsh area

Depending upon the geotechnical remediation approach, scope contemplated, and permitting constraints, this could be a $20-$100 million project, possibly performed in conjunction with a program addressing sea level rise.

Infrastructure needs and opportunities: beyond the 10-year Plan horizon

Although beyond the horizon year of the Rail Plan Update, significant infrastructure enhancement concepts are currently being considered as part of vision efforts for the Capitol Corridor. These could reconfigure CCJPA service in the long-term, increasing the total daily trains beyond the current 30 weekday trains and the 40-minute peak period headways. Some may have implications for Solano's very long-term (25+ years ahead) service levels and station locations. These may include:

- Purchase of new right of way
- Partially new alignments potentially revitalizing the former Sacramento Northern line that may ease the service constraints currently imposed by UPRR trackage agreements
- Benicia Narrows high-level rail crossing by-passing downtown Benicia

5.2 RECOMMENDATIONS

Service levels:

Solano jurisdictions, coordinated by STA, should establish a passenger rail service and stations priority program to determine the county's focus in station openings and future infrastructure investment on Capitol Corridor.

The cities served by the Suisun-Fairfield and Fairfield-Vacaville stations should determine the benefits and costs of establishing a station stop for the four daily Amtrak long distance services, and when agreed, advocate the appropriate station stop via STA, with Amtrak for the additional daily trains.

Travel time improvements:

Upgrades to the Bahia viaduct could result in increased speeds and a reduction in travel time.

Additional infrastructure to allow freight trains to conduct switching operation off the main line at Benicia Industrial Park could improve reliability and possibly result in a modest reduction in scheduled running time.

Ground improvements in the vicinity of the Suisun Marsh to stabilize the soils and possibly reduce the frequency of temporary speed restrictions and improve reliability. The feasibility and extent of such work would need to be investigated, possibly in conjunction with infrastructure considerations of sea level rise.

Station improvements

Within the 10-year horizon, station capacity is adequate for forecast growth. Towards the end of the 10-year horizon and beyond, two enhancement projects should be revisited:

Suisun-Fairfield station: center island platform, related track improvements and grade separated pedestrian access to eliminate current hold-out arrangements and improve service reliability.

Fairfield-Vacaville station: replacement of planned surface lot with future parking structure to enable station adjacent development to proceed (it should be noted that the current surface lot proposed is adequate for 10-year needs).

Future Dixon station: grade separation of A street crossing (assumes that other CCJPA/Solano policy station policy criteria are met, including MOU/intent with railroad). A major project, which would be a precursor to future station opening, beyond the 10-year horizon of the plan.

Policies for future stations

Future stations will be guided by, and adhere to, the CCJPA stations policy and the Solano specific station policy adopted October 2014. Based on the criteria, after the future Fairfield-Vacaville station is open, Dixon will be the next prioritized station for Solano County.

In the light of a Benicia train station not being pursued within the 10-year timeline of the plan, STA, with local jurisdictions, consider water taxi service between Benicia and Martinez to connect residents to the Martinez Amtrak Station.

Local station connections

Station transit connections to rail service will remain the responsibility CCJPA's local transit partners in the County. Although the goal will be to provide seamless transfer for all trains that stop in the county, local providers will determine the level of service, transfer policy based on their priorities and measures of cost effectiveness.

Accommodating Growing Ridership

The second station in the county at Fairfield-Vacaville will meet the near-term growth potential: its early opening is key to the success of growing rail ridership and delivery of a successful station area development program. There is not a currently committed date for opening. Additional passenger equipment may be necessary to accommodate increased ridership; in conjunction with other agencies, the state has already begun the process of acquiring additional rolling stock. Strengthening train length is the most cost-effective way of delivering capacity quickly, in the absence of the ability to increase the frequency of trains.

Infrastructure safety enhancements: 10-year horizon:

Based on the safety analysis undertaken, multiple crossing improvements are recommended, prioritized as follows:

A. E. Tabor Avenue, Fairfield, CA

B. 1st Street, Dixon, CA

C. Canon Road, Fairfield, CA

D. Midway Road, Unincorporated County of Solano, CA

E. Fry Road, Vacaville, CA

F. A Street, Dixon, CA

G. Pedrick Road, Dixon, CA

H. Pierce Lane, Unincorporated County of Solano, CA

Rail Infrastructure capacity enhancements: 10-year horizon:

Ongoing Capitalized Maintenance (approx. $1-3 million/year)

Positive Train Control (PTC) – installed as part of a larger, system-wide program on most Union Pacific main lines to improve overall operations safety.

This project is underway, with the majority of the costs borne by UPRR. The PTC project may set the stage, in the future, for discussion with Union Pacific and regulatory agencies about higher top speeds along the corridor. If realized, these higher speeds could result in 1-2 minute running time reductions within Solano County alone.

Local jurisdictions in Solano County should monitor the status of out-of-use-tracks and regard the formal STB Rail Abandonment process as a last resort, in order to secure the use by freight rail of potentially reconnected Rail Served Business sites identified in the Rail Plan

Improvements in the vicinity of Bahia to promote fluid freight switching.

Depending upon the suite of improvements, the order of magnitude costs could range from $1 million to $20 million (not currently programmed by CCJPA).

Ground improvements in the Suisun Marsh area.

Depending upon the geotechnical remediation approach, scope contemplated, and permitting constraints, this could be a $20-$100 million project, possibly performed in conjunction with a program addressing sea level rise.

STA will revisit sea level rise and under-track soil conditions in vulnerable areas at the next plan update (since these do not impact rail infrastructure or operations in the immediate ten year horizon of the plan).

The Plan Recommendations are summarized in Figure 27. Indicative costs are allocated to each, and a lead agency for the project. Secondary agencies are not shown, but each project is likely to have several funding partners.

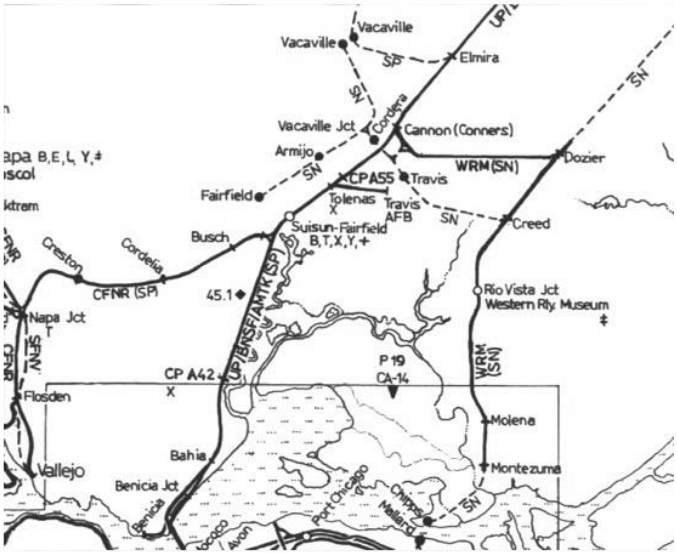
Figure 27 Solano Rail Facilities Plan Recommendations Summary Table

Solano Rail Facilities Plan Update 2015

Plan Recommendations Summary

Topic	Recommendation	Benefit	Cost ($000)	Target Year	Lead Agency
Station improvements	**Suisun-Fairfield station: center island platform, related track improvements and grade separated pedestrian access to eliminate current hold out arrangements**	Eliminate current hold out arrangements and improve passenger safety service reliability.	$ 20,000	2020	City of Suisun City/STA
	Fairfield-Vacaville station: replacement of planned 300 space surface lot with future parking structure	Enable station adjacent development to proceed, supporting use of station	$ 12,000	2025	Cities of Fairfield & Vacaville
	Future Dixon station: grade separation of A street crossing (assumes that other CCJPA/Solano station policy criteria are met, including MOU/intent with railroad).	Precursor to future station opening, beyond the 10-year horizon of the plan	$ 25,000	2025+	City of Dixon/STA
	Benicia: STA, with local jurisdictions, consider water taxi service between Benicia and Martinez to connect to Martinez Amtrak Station	With Benicia train station not being pursued within the 10 yr timeline of the plan, connects Bencia residents to the nearest Amtrak station	TBD	TBD	STA/City of Benicia
Local station connections	**Local providers will determine the level of service, transfer policy based on their priorities and measures of cost effectiveness**	Provides clarity in level of connecting service to both SUI and FFV stations	$ -	2018	Cities, FAST, CityCoach
Passenger service levels	**Establish a passenger rail service and stations priority program to determine the county's focus in station openings and future infrastructure investment**	Provides clear framework for directing investment in the county on rail service / stations	-	2016	STA
	Determine the benefits and costs of establishing a station stop for the four daily Amtrak long distance services	Serves growing leisure, base personnel and business travelers. Reinforces Solano gateway role to Napa Valley	$ 10	2018	Cities of Fairfield/ Suisun City
Accommodating growing ridership	**Establish target date for near term Fairfield-Vacaville station opening**	Key to the success of growing rail ridership and delivery of a successful station area development program	$ -	2015	City of Fairfield/STA
	Additional passenger equipment to strengthen train length, deliver passenger capacity	The most cost-effective way of delivering capacity quickly	$ -	2017	CCJPA/State
Infrastructure safety enhancements	***Crossing improvements prioritized as follows:***				
	A. E. Tabor Avenue, Fairfield, CA	Safer crossing for peds/vehicles	$ 600	2016	Fairfield
	B. 1st Street, Dixon	Safer crossing for peds/vehicles	$ 20	2016	Dixon
	C.Canon Road, Fairfield	Safer crossing for peds/vehicles	$ 200	2017	Fairfield
	D. Midway Road, Solano Co.	Safer crossing for peds/vehicles	$ 150	2018	Solano Co.
	E. Fry Road, Vacaville, CA	Safer crossing for peds/vehicles	$ 20	2018	Vacaville
	F. A Street, Dixon	Safer crossing for peds/vehicles	$ 150	2018	Dixon
	G.Pedrick Road, Dixon, CA (monitor only)	Safer crossing for peds/vehicles	$ -	annual	Dixon
	H. Pierce Lane, Solano Co., CA (monitor)	Safer crossing for peds/vehicles	$ -	annual	Solano Co.
Rail infrastructure capacity enhancements	**Positive Train Control (PTC)**	Higher top speeds on corridor that could result in 1-2 minute running time reductions within Solano	TBD	2015 (mandate)	UPRR/CCJPA
	Upgrades to the Bahia viaduct	Increased speeds and a reduction in travel time within Solano	TBD	2025	UPRR/CCJPA
	Additional infrastructure to allow freight trains to conduct switching operation off the main line at Benicia Industrial Park /Bahia	Promotes fluid freight switching, improves reliability and possible reduction in scheduled running time	$ 20,000	2020	UPRR/CCJPA
	Ground improvements in the vicinity of the Suisun Marsh to stabilize the soils	Reduces the frequency of temporary speed restrictions and improves reliability	$ 50,000	2020	UPRR/CCJPA
	Ongoing Capitalized Maintenance (annual)	Maintains state of good repair	$ 3,000	annual	CCJPA/STA

Solano Rail Facilities Plan Update



APPENDICES

1 APPENDIX: COMMUNITY IMPACTS SUMMARY

With additional data available from potential rail-served businesses (RSBs) returning to rail and future RSB site development assumptions, a 10-year growth in traffic on the rail network in Solano was developed, broken out by the individual jurisdictions.

Key commodity annual growth factors were applied to current rail served business, to produce a growth in rail movements by site for 2025. Based on the work of the consultant team and knowledge of the industries is concerned, this is regarded the most likely growth scenario (Scenario A).

Freight rail and truck equivalents

The secondary "high growth" alternative (scenario B) was developed, as shown in Figure 28. in this scenario an optimistic set of assumptions was applied: in addition to the commodity-based growth factors applied to the conventional scenario, all of the current mothballed facilities were assumed to revert to appropriate uses (manufacturing/distribution as appropriate), with typical levels of freight rail activity for plants of their size. In addition, all the current and prospective development locations in the Fairfield and Dixon/unincorporated county areas were assumed to accommodate RSB's with a similar scale and profile to those currently in the county. The resultant high-growth scenario would see freight rail traffic back at the levels last seen in the early 1970s.

The high growth scenario did not assume the location of a single large rail-served new heavy manufacturing facility that could push this level of traffic well above even the high-growth scenario shown.

These indicators were reviewed to produce a community impacts summary, covering the following indicators:

- ***Change in overall train movements within each jurisdiction***
- ***Truck equivalent movements that the current and 10-year growth in rail traffic would translate to if they were to travel by road in Solano[9] .***

It should also be noted that some or all of the future growth in rail would most likely *only* be conveyed by that mode, such as crude oil by rail and related petroleum products currently shipped by rail at the port of Benicia: the consultant team therefore did not include any those movements in the truck equivalent calculations.

Nevertheless, the truck equivalent data provide some measure all the benefit of having an adequate rail infrastructure in Solano County to accommodate future traffic growth by these commodities and to these locations.

Conclusions:

- With the exception of crude oil by rail, currently rail traffic movements for existing rail-served businesses are expected to be relatively slow growing in the 10-year horizon.
- Major unknowns which could significantly change this picture positively would include:

[9] Expressed as truck movement numbers, rather than vehicle-miles-traveled on individual routings, since data on site-level commodity origins and destinations was not available.

- Reestablishing rail connections to Travis AFB
- Establishment of rail served businesses is at the five rail connected locations (currently mothballed) in the West Cordelia area on California Northern
- Development of the major rail linked opportunity locations east of Dixon
- Development of the major industry sites identified in the City of Fairfield
- Combined, new rail served site development/reconnections could increase rail traffic in the county movements back to their level historically (1970s) or approximately double their current volume, a significant potential reduction in truck movements

- Even without factoring in 10-year growth rules or new development sites, existing rail services contribute significantly to reducing both truck movements on the county and state highway network as quantified in Figure 28.

Employment benefits

Another measure of the value of freight rail to Solano communities is the level of employment generated by rail served businesses (RSBs). The consultant team used data from the Solano Economic Development Corporation (EDC) to develop a picture of the total employment at rail served businesses (RSBs) in the County[10].

The results show almost 2,300 employees in Solano County working in these locations. This is not to assume that these jobs are all entirely dependent on available freight rail service: nevertheless, the availability of rail service is a factor in business decisions to locate and maintain their presence in Solano County.

These results are summarized in Figure 29.

[10] Businesses recently served/with mothballed rail facilities also in this total. Travis AFB, with 14,000+ employees, is excluded.

Figure 28 Community Impacts Summary by jurisdiction, Solano County: truck equivalent movements

RSB Name	Active/ inactive / future	RSB Rail Facility Jurisdiction	Truck equivalents 2015	Truck equivalents 2015 by jurisdiction		Truck equivalents 2025	Truck equivalents 2025 by jurisdiction		Truck equivalents 2025 (high growth)	Truck equivalents 2025 by jurisdiction (high growth)	
Tremont Supply Co (Dixon)	✓ active	Solano Co	730	Solano Co	730	981	Solano Co	981	1,081	Solano Co	13,241
Potential Development Area East	*future*	*Solano Co/Dixon*	-			-			*12,160*		
Campbell Soup Supply Co	*inactive*	*Dixon/Solano Co*	-	*Dixon/Solano Co*	-	-	*Dixon/Solano Co*	-	*547*	*Dixon/Solano Co*	1,094
Sucro-Dixon	*inactive*	*Dixon/Solano Co*	-			-			*547*		
Tolenas Bus Park Clorox	✓ active	Fairfield	6,840	Fairfield	49,742	10,130	Fairfield	74,054	10,130	Fairfield	105,112
Tolenas Bus Park Ball Metal Beverage	✓ active	Fairfield	2,660			4,331			4,331		
Tolenas Bus Park Macro Plastics	✓ active	Fairfield	1,900			3,094			2,814		
Tolenas Bus Park Goodyear	✓ active	Fairfield	1,900			3,094			2,814		
Tolenas Bus Park Nexeo Solutions	✓ active	Fairfield	2,280			3,377			3,377		
Tolenas Bus Park Sunpol Resins	✓ active	Fairfield	3,040			4,502			4,503		
Tolenas Bus Park Compu-Tech Lumber	✓ active	Fairfield	570			695			695		
Tolenas Bus Park Frank-Lin Distillers	✓ active	Fairfield	4,560			6,753			6,753		
Travis AFB	*inactive*	*Fairfield*	-			-			*9,120*		
Anheuser Busch	✓ active	Fairfield	18,240			27,013			27,013		
Sheldon United Terminal	✓ active	Fairfield	5,472			7,355			8,104		
Amcor Rigid Plastics	✓ active	Fairfield	2,280			3,712			2,280		
Tolenas Bus Park Rexam	*inactive*	*Fairfield*	-			-			*2,280*		
Jensen Precast Building Systems (fmr Fibrebond)	*inactive*	*Fairfield*	-			-			*2,280*		
West Cordelia (North bay Auto Auction)	*inactive*	*Fairfield*	-			-			*1,140*		
West Cordelia (White Cap Construction Supply)	*inactive*	*Fairfield*	-			-			*1,520*		
West Cordelia (fmr. Glass Pak)	*inactive*	*Fairfield*	-			-			*2,280*		
West Cordelia (Dependable Plastics)	*inactive*	*Fairfield*	-			-			*1,520*		
Future Plan Area 6 A	*future*	*Fairfield*	-			-			*3,040*		
Future Plan Area 6 B	*future*	*Fairfield*	-			-			*9,120*		
Valero Benicia*	✓ active	Benicia	-	Benicia	32,680	-	Benicia	64,742	-	Benicia	64,742
Benicia Ind Park Terminal Biagi Bros	✓ active	Benicia	3,800			5,628			5,628		
Benicia Ind Park Coca-Cola Enterprises Inc.	✓ active	Benicia	1,520			2,251			2,251		
AmPORTS Auto rack	✓ active	Benicia	27,360			40,519			40,519		
AmPORTS Benicia Port Terminal	✓ active	Benicia	-			16,344			16,344		
Vallejo Mare Island Terminal	✓ active	Vallejo	182	Vallejo	182	222	Vallejo	4,782	760	Vallejo	5,320
Vallejo Marine Terminal	*inactive/ future*	*Vallejo*	-			*4,560*			*4,560*		

* note: petroleum products at Benicia refinery / port are not included in the truck equivalent movements as these have no practical alternative to rail at these volumes

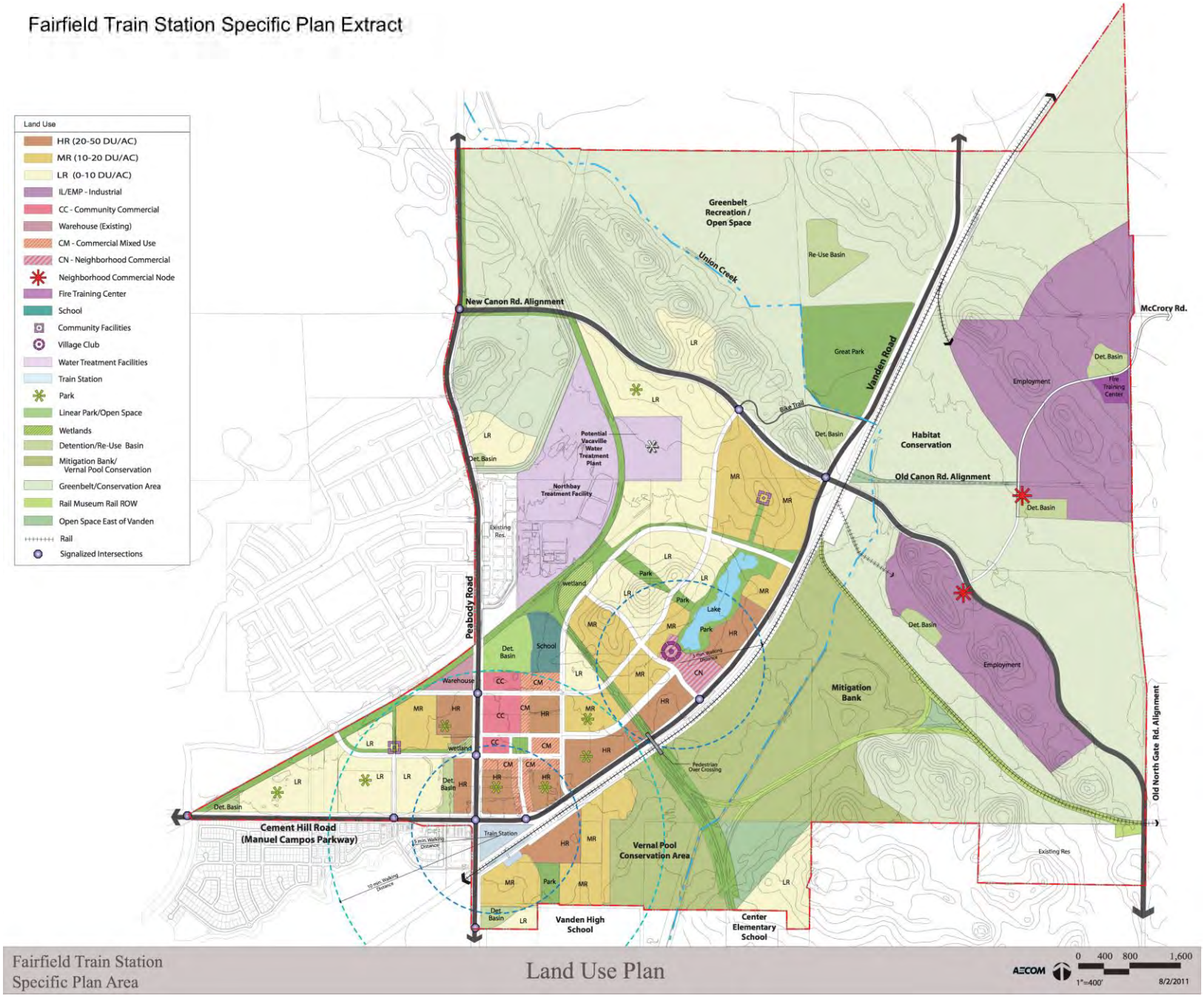
Annual growth rate assumptions (ave. 2015-2025)	
Beverage	4%
Food	3%
Petroleum	3%
Chemicals	4%
Plastics	5%
Lumber	2%
Cement	5%
Distrib	6%
Automotive	4%
Ag	2%

Figure 29 Community Impacts Summary by jurisdiction, Solano County: employment

RSB Name	Active/ *inactive / future*	RSB Rail Facility Jurisdiction	Employment 2013	Employment 2014 by jurisdiction	
Tremont Supply Co (Dixon)	✓ active	Solano Co	20	Solano Co	20
Potential Development Area East	*future*	*Solano Co/Dixon*	-		
Campbell Soup Supply Co	*inactive*	*Dixon/Solano Co*	*225*	*Dixon/Solano Co*	245
Sucro-Dixon	*inactive*	*Dixon/Solano Co*	*20*		
Tolenas Bus Park Clorox	✓ active	Fairfield	131	Fairfield (excl. Travis)	1,266
Tolenas Bus Park Ball Metal Beverage	✓ active	Fairfield	140		
Tolenas Bus Park Macro Plastics	✓ active	Fairfield	38		
Tolenas Bus Park Goodyear	✓ active	Fairfield	35		
Tolenas Bus Park Nexeo Solutions	✓ active	Fairfield	25		
Tolenas Bus Park Sunpol Resins	✓ active	Fairfield	20		
Tolenas Bus Park Compu-Tech Lumber	✓ active	Fairfield	-		
Tolenas Bus Park Frank-Lin Distillers	✓ active	Fairfield	160		
Travis AFB	*inactive*	*Fairfield*	*14,353*		
Anheuser Busch	✓ active	Fairfield	302		
Sheldon United Terminal	✓ active	Fairfield	12		
Amcor Rigid Plastics	✓ active	Fairfield	150		
Tolenas Bus Park Rexam	*inactive*	*Fairfield*	*95*		
Jensen Precast Building Systems (fmr Fibrebond)	*inactive*	*Fairfield*	-		
West Cordelia (North bay Auto Auction)	*inactive*	*Fairfield*	*15*		
West Cordelia (White Cap Construction Supply)	*inactive*	*Fairfield*	*30*		
West Cordelia (fmr. Glass Pak)	*inactive*	*Fairfield*	*60*		
West Cordelia (Dependable Plastics)	*inactive*	*Fairfield*	*53*		
Future Plan Area 6 A	*future*	*Fairfield*	-		
Future Plan Area 6 B	*future*	*Fairfield*	-		
Valero Benicia*	✓ active	Benicia	500	Benicia	765
Benicia Ind Park Terminal Biagi Bros	✓ active	Benicia	37		
Benicia Ind Park Coca-Cola Enterprises Inc.	✓ active	Benicia	120		
AmPORTS Autorack	✓ active	Benicia	86		
AmPORTS Benicia Port Terminal	✓ active	Benicia	22		
Vallejo Mare Island Terminal	✓ active	Vallejo	15	Vallejo	15
Vallejo Marine Terminal	*inactive/ future*	*Vallejo*	-		

2 APPENDIX: EXISTING CONDITIONS, PLANS, AND POLICIES

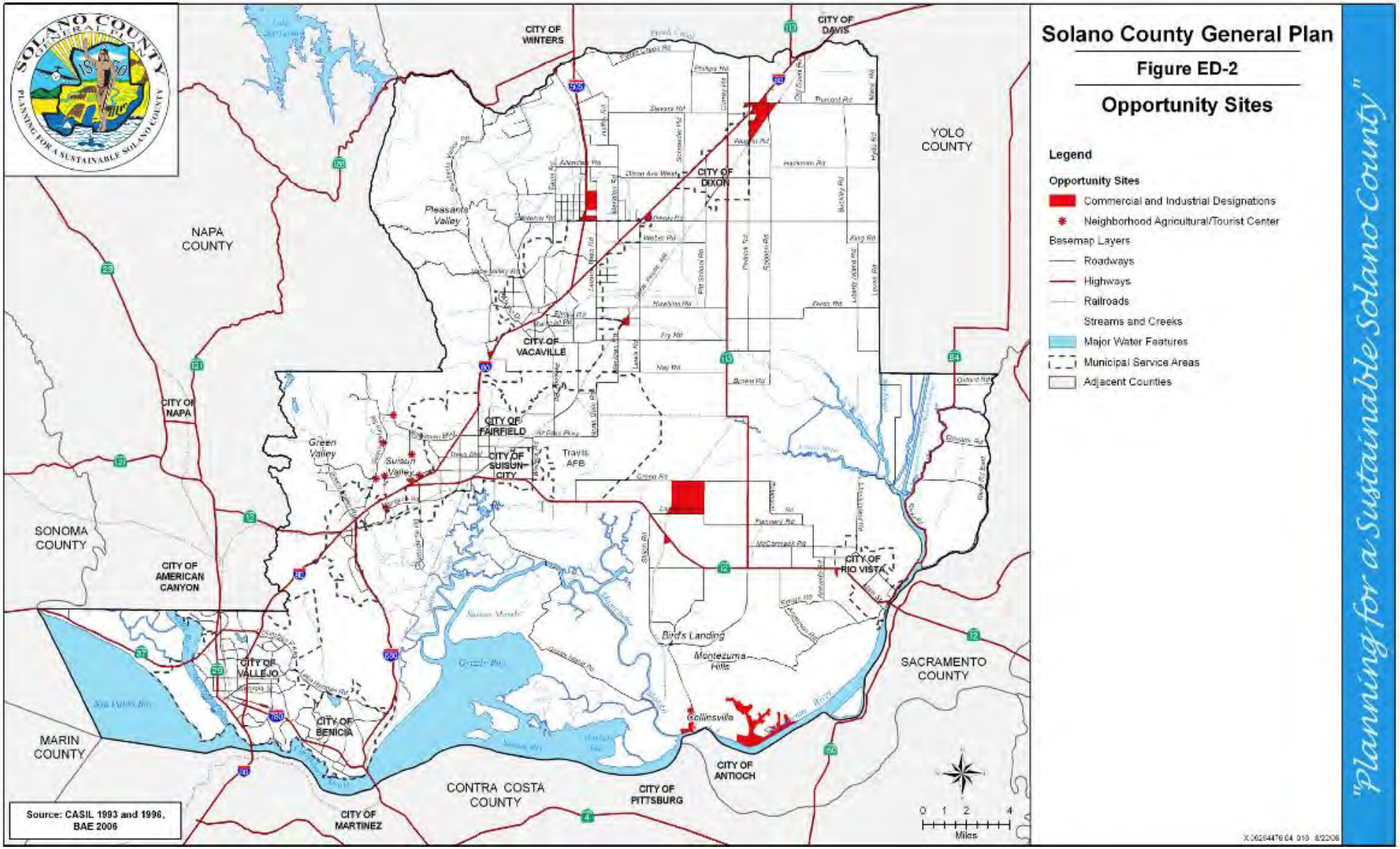
Fairfield Train Station Specific Plan Extract



Fairfield Train Station Specific Plan Area

Land Use Plan

AECOM 0 400 800 1,600 1"=400' 8/2/2011


Solano County General Plan
Figure ED-2
Opportunity Sites
Legend
Opportunity Sites
Commercial and Industrial Designations
Neighborhood Agricultural/Tourist Center
Basemap Layers
Roadways
Highways
Railroads
Streams and Creeks
Major Water Features
Municipal Service Areas
Adjacent Counties
CITY OF WINTERS
CITY OF DAVIS
YOLO COUNTY
CITY OF DIXON
Pleasants Valley
NAPA COUNTY
CITY OF VACAVILLE
CITY OF NAPA
CITY OF FAIRFIELD
Green Valley
Suisun Valley
CITY OF SUISUN CITY
Travis AFB
SONOMA COUNTY
CITY OF AMERICAN CANYON
CITY OF RIO VISTA
Bird's Landing
Montezuma Hills
SACRAMENTO COUNTY
CITY OF VALLEJO
CITY OF BENICIA
Collinsville
MARIN COUNTY
CITY OF ANTIOCH
CONTRA COSTA COUNTY
CITY OF PITTSBURG
CITY OF MARTINEZ
Source: CASIL 1993 and 1996, BAE 2006
0 1 2 4
Miles
"Planning for a Sustainable Solano County"

3 APPENDIX: SOLANO STATIONS POLICY (STA Board Item October 2014)

Agenda Item 9.E
October 8, 2014

Solano Transportation Authority

DATE: September 29, 2014
TO: STA Board
FROM: Sofia Recalde, Associate Planner
RE: Solano Rail Facilities Plan Update

Background:
In March 2014, the STA began work on the Solano Rail Facilities Plan update with assistance from a consultant team led by Menzies & McCrossan. The objectives of the plan are to:

- Evaluate the demand for freight facilities in Solano County;
- Update the 1995 Rail Facilities Plan and examine the potential for new rail stations on the Capitol Corridor line and for improving ridership and service at existing and planned rail stations;
- Consider investment opportunities to improve safety and throughput, and to combat the effects of sea-level rise; and
- Evaluate the potential for Napa-Solano passenger rail connections.

The purpose is to develop a plan that can assist STA and local jurisdictions in making policies and local land use decisions to support future passenger and freight rail activity. The Plan has a projected 10-year life horizon.

A Rail Technical Advisory Committee (RTAC) was established to provide input and feedback as elements of the Plan are developed. The RTAC consists of Planning and Public Works staff from cities whose boundaries contain rail facilities, as well as representatives from Napa County Transportation and Planning Agency (NCTPA), Capitol Corridor Joint Powers Authority (CCJPA) and Solano Economic Development Corporation (Solano EDC). Since the beginning of this Plan, the RTAC has met twice and intends to meet monthly starting in July until the conclusion of this Plan in December 2014.

Discussion:
Capitol Corridor Update
The potential for additional rail stops along the Capitol Corridor is the current task being addressed by this Plan. The DRAFT technical memo (Attachment A) describes the current CCJPA criteria for new rail stations and proposes Solano-specific criteria to help guide decision-making and funding for future passenger stations in Solano County.

CCJPA updated its policies for new train stations in 2006, well after the original Solano's 1995 Rail Facilities Plan was completed. These policies include minimum station standards for ridership, station platform length, accessibility, passenger amenities, and safety and security, as well as having the support of the UPRR and a funding plan. The memo acknowledges that even if a city's proposal meets CCJPA criteria, CCJPA may require additional measures in order to maintain total travel time, system-wide ridership, on-time performance, etc.

The suggested Solano specific criteria incorporate CCJPA policies and establish requirements to ensure transit connectivity, accessibility, capital and operations/maintenance funding plan to support a new facility, and that the new rail stations are consistent with regional planning and funding requirements.

On September 24, 2014, the TAC forwarded a recommendation to the STA Board to adopt the Solano-Specific Station Criteria as described in Attachment A.

Fiscal Impact:
None.

Recommendation:
Adopt the proposed Solano-Specific Station Criteria as shown on Page 10 in Attachment A.

Attachment:
A. Memo: Potential Passenger Station Criteria in Solano County

CCJPA Current (2006) New Station Policy Criteria

3 Principles	Criteria	Item	Notes
Meet Station Standards	**Ridership**	Min daily average ridership projections of 10 boardings / alightings per train within the first 6 months of CCJPA train service	Several current stations served on the Corridor do not meet this requirement
	Design Criteria	Platforms will be a minimum of 700 ft. in length and 8 inches above top-of-rail (any deviations or exemptions require approval by host railroad and/or CCJPA/Amtrak)	Replaces previous policy of 400 ft. min length, with impacts on several projects planned prior to policy change (e.g. Dixon)
		Goal of having stations separated by a minimum of 5 miles	
		Design will provide access to platforms so that passengers never cross a mainline track (e.g., grade separated access to island platform, station-only track not used by freight trains)	Grade separation requirement brings major design safety improvements but significant costs
	Multi Modal Access	An intermodal transit connection plan must be developed by the station project sponsor that may include joint ticketing or transit transfer with the CCJPA trains	Current policy allows wide latitude for local connecting transit agencies
		Requirements for parking based upon a parking study prepared by project sponsor that will consider: ADA compliance, non-motorized vehicle access, current and future adjacent land uses, baseline (and future) ridership projections, transit and carpool/drop-off connectivity, transit-orientated development plans	Requirements will likely be influenced by priority development area (PDA) plans underway since policy was adopted
		Secure storage bike racks/lockers will be provided at platforms or inside station passenger waiting areas	CCJPA bike plan developed since 2006 has enhanced bike emphasis
	Passenger Amenities	Canopy shelters to provide seating for 12 people and accommodate 2 wheelchairs with capacity to add more shelters to meet future demand	Amtrak's station design guidelines also apply
		Ticket vending machines(s) and associated communication equipment provided at platforms (under canopy) or inside passenger waiting areas	Amtrak's station design guidelines also apply
		Passenger Information Display System (PIDS) provided at platforms and inside station passenger waiting areas, based on CCJPA design specs	Amtrak's station design guidelines also apply
	Safety & Security	Install security cameras on platforms, waiting areas, station facilities, and parking areas with the connecting communication system to be developed as part of design plans	Amtrak's station design guidelines also apply
		Emergency call boxes will be provided, at a minimum, at all unstaffed stations	Amtrak's station design guidelines also apply
		Local law enforcement agency will patrol and inspect station and parking facilities	Requires long-term local jurisdiction financial commitment
		Bomb-resistant trash receptacles will be provided at platforms and inside station passenger waiting areas	Amtrak's station design guidelines also apply
Have Support of Host Railroad	**Railroad Approval**	Coordination/approval of station design plans with "host" railroad	For Solano County this effectively means the support of Union Pacific Railroad at all stages of the process
Funding Plan	**Funding**	Project Sponsor has to provide a complete Funding Plan	

Solano-Specific Potential Station Criteria

Match and Refine CCJPA Criteria

Criteria	Item	Notes
Ridership	Min daily average ridership projections of 10 boardings / alightings per train for **weekday services** within the first 6 months of CCJPA train service	Better reflects the commute oriented trips made by Solano riders
	Any additional station projects will, if necessary, mitigate the schedule impacts of additional stops in order to maintain overall Capitol Corridor-wide travel times.	Ensures that riders at existing station stops are not adversely affected by new station stops on the Corridor.
Design Criteria	Platforms will be a minimum of 700 ft. in length and 8 inches above top-of-rail (any deviations or exemptions require approval by host railroad and/or CCJPA/Amtrak)	Matches CCJPA criteria
	Goal of having stations separated by a minimum of 5 miles	Potential Dixon and Lake Herman Benicia locations meet this criterion
	Design will provide access to platforms so that passengers never cross a mainline track for both side and island platforms. Station-only tracks not used by freight trains are exempt from this provision	Clarifies ambiguity in current policy and minimizes unnecessary large-scale capital costs
Multi Modal Access	Project Sponsors will develop Station Area or Priority Development Area Plans (PDAs) as appropriate, within a half-mile radius of the station, with a clear identification of the number of existing and planned housing units and jobs, market demand analysis, affordable housing, multi-modal connectivity including pedestrian-friendly design standards, strategies to ensure ADA accessibility, parking demand analysis, infrastructure development, implementation plan and financing strategies	Aligns Solano station planning efforts with current local and MPO standards
	Requirements for parking and non-motorized access will be established by the project sponsor undertaking a multimodal access study utilizing CCJPA-approved ridership forecasts and assumptions in the Station Area Plan or PDA as appropriate	Ensures consistency in ridership forecasts for a local station within the overall rail system.Gives project sponsor/local jurisdiction more control over multimodal access requirements for their station
	An intermodal transit connection service plan will be developed by the station project sponsor that will guarantee local transit connections or equivalent "last-mile" provision meeting all trains serving Solano stations	Refines current policy to guarantee local transit connectivity
	Secure storage bike racks/lockers will be provided at platforms or inside station passenger waiting areas	Matches CCJPA criteria
Passenger Amenities	Canopy shelters to provide seating for 12 people and accommodate 2 wheelchairs with capacity to add more shelters to meet future demand	Matches CCJPA criteria
	Ticket vending machines(s) and associated communication equipment provided at platforms (under canopy) or inside passenger waiting areas	Matches CCJPA criteria
	Passenger Information Display System (PIDS) provided at platforms and inside station passenger waiting areas, based on CCJPA design specs	Matches CCJPA criteria
Safety & Security	Install security cameras on platforms, waiting areas, station facilities, and parking areas with the connecting communication system to be developed as part of design plans	Matches CCJPA criteria
	Emergency call boxes will be provided, at a minimum, at all unstaffed stations	Matches CCJPA criteria
	Local law enforcement agency will patrol and inspect station and parking facilities	Matches CCJPA criteria
	Bomb-resistant trash receptacles will be provided at platforms and inside station passenger waiting areas	Matches CCJPA criteria
Railroad Approval	Coordination/approval of station design plans with "host" railroad	Matches CCJPA criteria
	Establish station location memorandum of understanding (MOU) with host railroad and CCJPA before proceeding to detailed design	Refines current criteria to establish station location in principle prior to commitment of substantial design or preconstruction resources
Funding	Project Sponsor has to provide a complete Funding Plan, identifying capital costs for initial operating facility, future long-term expansion cost and operating and maintenance plan, including mid-life upgrades for lifecycle of the facility	Refines the funding plan requirement to identify specifically out front and long-term capital costs, as well as commitment by the project sponsor to maintain the station facility.Note that the PDA/ Station area plans will clarify funding/financing strategies

PRINCIPLES FOR REVISED POLICIES ON STATIONS AND TRAIN SERVICE
CAPITOL CORRIDOR JOINT POWERS AUTHORITY
(January 2006)

POLICY FOR NEW STATION

- Update level of train service (24 weekday, 18 weekend) and number of stations served (16)
- Maintain current criteria and add/update the following new standards:
  - Minimum daily average ridership projections of ten (10) boarding or alightings per train within the first six (6) months of CCJPA train service to the new station.
  - Canopy shelters to provide seating for twelve (12) people (and accommodate two (2) wheelchairs) with capacity to add more shelters to meet future demand
  - Coordination/approval of station design plans with "host" railroad
  - Local law enforcement agency will patrol and inspect station and parking facilities
  - Install security cameras on platforms, waiting areas, station facilities, and parking areas with the connecting communication system to be developed as part of design plans
  - Design will provide access to platforms so that passengers never cross a mainline track (e.g., grade separated access to island platform, station-only track not used by freight trains)
  - Platforms will be a minimum of 700 feet in length and eight (8) inches top-of-rail (any deviations or exemptions will require approval by host railroad and/or CCJPA/Amtrak)
  - Emergency call boxes will be provided, at a minimum, at all unstaffed stations
  - Passenger Information Display System (PIDS) real time electronic message signs will be provided at platforms and inside station passenger waiting areas, based on CCJPA design specifications
  - Bomb-resistant trash receptacles will be provided at platforms and inside station passenger waiting areas
  - Ticket vending machines(s) and associated communication equipment will be provided at either platforms (under the canopy) or inside station passenger waiting areas
  - An intermodal transit connection plan must be developed by the station project sponsor that may include joint ticketing or transit transfer with the CCJPA trains
  - Requirements for parking spaces will be based upon a parking study prepared by the project sponsor that will consider ADA compliance, non-motorized vehicle access, current and future adjacent land uses, baseline (and future) ridership projections, transit and carpool/drop-off connectivity, transit-orientated development plans
  - Secure storage bike racks/lockers will be provided at platforms or inside station passenger waiting areas

POLICY FOR RETENTION OF TRAIN SERVICE TO STATIONS

- Update the minimal ridership standards for continued CCJPA train service to station as follows:
  - Minimum daily average of ten (10) boarding or alightings per train within the first six (6) months of CCJPA train service to the new station
  - Minimum daily average of twelve (12) boarding or alightings per train within two years of CCJPA train service
  - Minimum daily average of fifteen (15) boarding or alightings per train within third year of CCJPA train service
- Develop marketing and operating plans to bring trains back to a station where service had been discontinued

EXPANSION OF SERVICE WITHIN CORRIDOR

- Update standards for trains that are managed by CCJPA for service within corridor (i.e., Regional Rail):
  - Ridership and revenues must be reviewed and approved by CCJPA
  - Any financial operating costs (expenses net of revenues) including any CCJPA management or administrative costs and additional rail equipment must be provided by service sponsor(s)
  - Net cost per train-mile (TM) must be equal to/lower than the current CCJPA train service net costs per TM
  - System operating (or farebox) ratio must be equal to/greater than the current CCJPA train system operating ratio

EXTENSION OF TRAIN SERVICE

- Any extension of CCJPA train service outside the Auburn-Sacramento-Oakland-San Jose corridor shall not drain resources that would prevent the CCJPA from implementing its core service expansion goals for the corridor pursuant to the *Vision Plan*
- Extensions of CCJPA train service outside the corridor shall not denigrate the core CCJPA train service, including but not limited to on-time performance and financial performance (e.g., operating costs, farebox ratio)
- Any financial operating costs (expenses net of revenues) including any CCJPA management or administrative costs and additional rail equipment must be provided by service extension sponsor(s)

ADOPTED FEBRUARY 15, 2006

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4 APPENDIX: STATION RIDERSHIP FORECAST ASSUMPTIONS

Solano Stations Ridership Growth Assumptions

Plan Bay Area Growth Factors

Year	Suisun		Fairfield		Vacaville	
	Households	Employment	Households	Employment	Households	Employment
2014	9,077	3,224	35,673	40,701	31,567	30,932
2018	9,630	3,730	39,850	45,600	33,240	34,890
2024	10,180	4,230	44,020	50,510	34,910	38,860
2040	10,490	4,520	46,410	53,310	35,860	41,120
2010-40	18%	47%	35%	36%	15%	38%

Solano Stations Ridership Growth Assumptions

Growth Factors (Plan Bay Area)

Year	Suisun PDA		Fairfield PDA		Vacaville	
	Households	Employment	Households	Employment	Households	Employment
2014	1,176	1,114	388	456	31,567	30,932
2018	1,460	1,360	980	690	33,240	34,890
2024	2,050	1,870	1,880	1,030	34,910	38,860
2040	2,160	1,960	6,050	2,650	35,860	41,120

Forecast: Upper Range growth+ Fairfield SAP/PDA, Suisun PDA

PDA:	Suisun PDA		Fairfield PDA	
Year	Households	Employment	Households	Employment
	Net New	Net New	Net New	Net New
2024	963	828	1,490	693

Market Analysis Purpose

- Identify growth opportunities for increasing rail market share and corresponding rail services
  - Total travel demand (across all modes between origins and destinations)
  - Existing travel patterns for intercity and commuter rail riders
- Design conceptual networks, including identification of options for connecting corridors and service level targets to address potential markets
- Utilize market-based network alternatives to analyze infrastructure constraints

DRAFT – For Discussion Purposes Onl

CALIFORNIA STATE TRANSPORTATION AGENCY

Data Sources

- **California State Travel Demand Model (CSTDM)**
  - 2010 Base Year
  - 2012/13 California Household Travel Survey
  - Auto trips
  - External auto trips
  - Transit, bike and walk trips
- **FRA 2010 CONNECT tool**
  - Local Air Trips to capture internal and external air market
- **Existing Rail Ridership**
  - Amtrak - San Joaquins, Capitol Corridor, Surfliner (includes thruway bus connections)
  - ACE
  - Caltrain
  - COASTER
  - Metrolink
  - Does not include Metrolink transfers or transfers between services

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CALIFORNIA STATE TRANSPORTATION AGENCY

Methodology

- Aggregate TAZs to Districts
  - Centered around rail station groupings
  - Additional zones to divide non-rail served areas of the state
- O-D matrices by districts for all trips and rail trips

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Rail Stations by District

District Name	Existing Rail Stations
San Francisco	San Francisco, 22nd St., Bayshore
San Mateo	South San Francisco, San Bruno, Milbrae, Broadway, Burlingame, San Mateo
Palo Alto	Mountain View, Hayward Park, Hillsdale, Belmont, San Carlos, Redwood City, Atherton, Menlo Park, Palo Alto, California Ave, San Antonio
San Jose	San Jose, Santa Clara/Great America, Sunnyvale, Santa Clara, Lawrence, Tamien, Capitol, Blossom Hill
Fremont	Fremont/Centerville
Hayward	Hayward
Alameda	Oakland, Emeryville
Richmond	Berkeley, Martinez, Richmond
Delta	Antioch
Suisun	Suisun/Fairfield
Sacramento	Davis, Sacramento
Shasta	Redding, Dunsmuir, Marysville, Chico
Placer	Auburn, Roseville, Rocklin
Colfax	Colfax, Truckee
Stockton	Lodi, Stockton, Lathrop
Tracy	Tracy
Livermore	Livermore, Pleasanton, Vasco Rd
Gilroy	Morgan Hill, Gilroy, San Martin
Salinas	Salinas
Modesto	Modesto, Turlock/Denair

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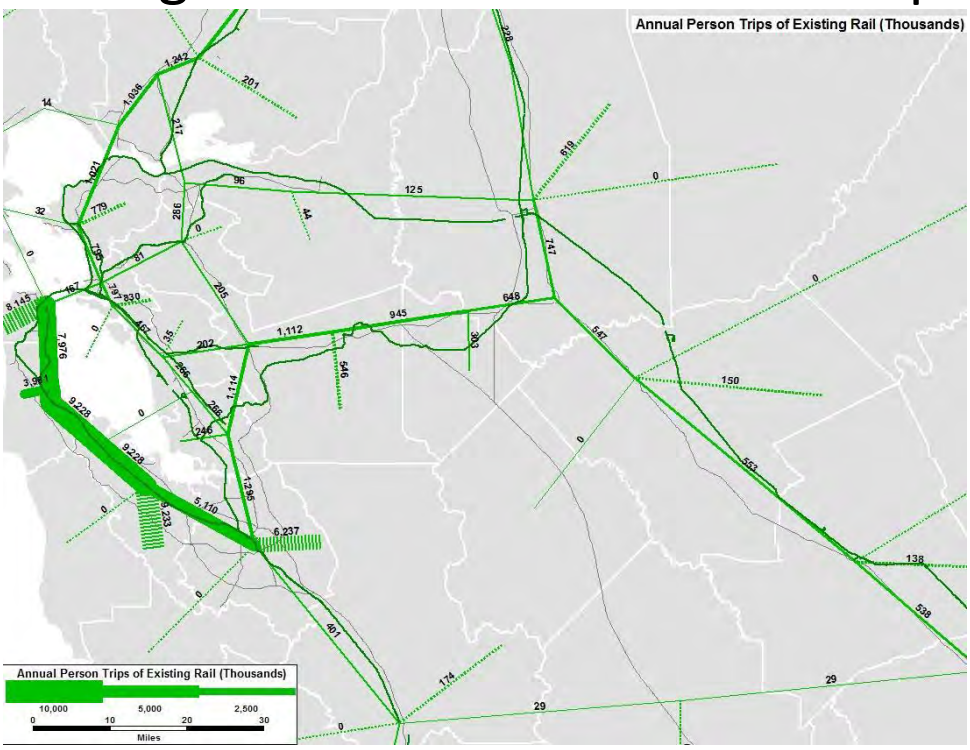
Existing Interdistrict Rail Travel - Trips



Existing Rail Travel – Mode Share

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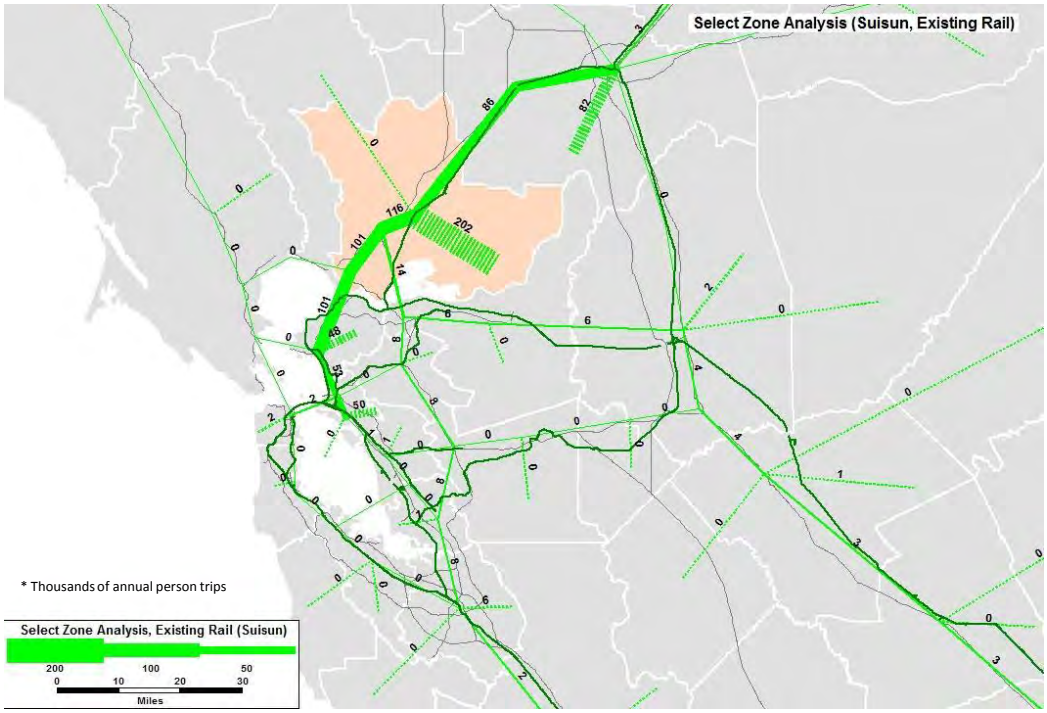
Suisun District – Rail Trips



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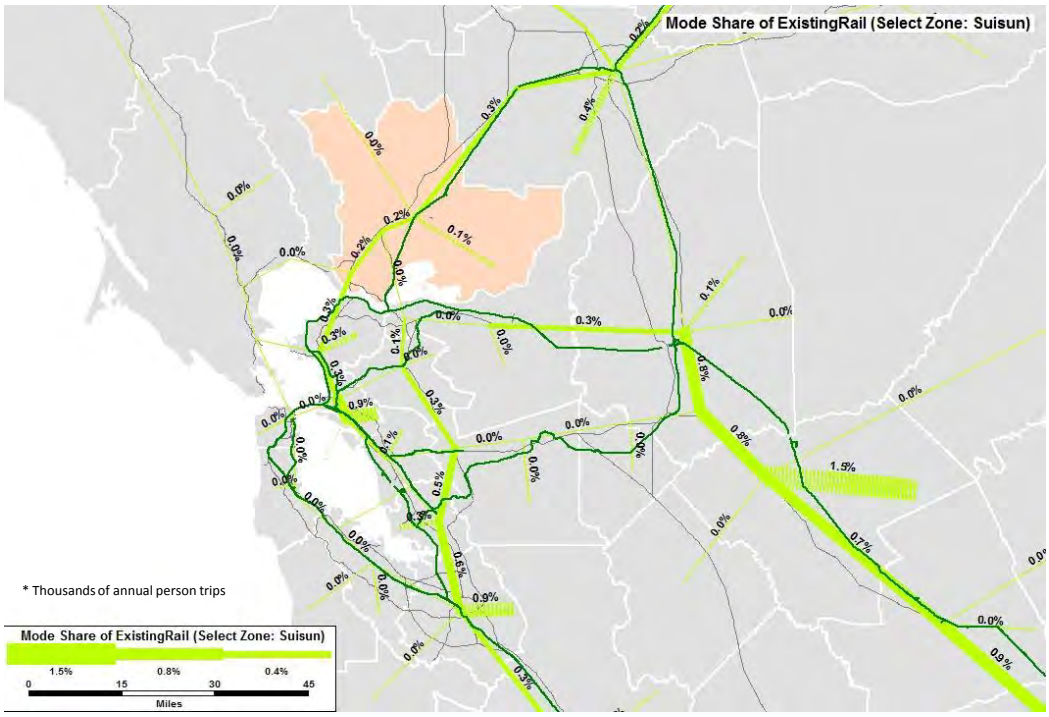
Suisun District – Rail Mode Share



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6 APPENDIX: CURRENT (MARCH 2015) CAPITOL CORRIDOR SCHEDULE

WEEKDAYS: Westbound — Auburn-Sacramento-Emeryville/San Francisco-Oakland-San Jose

CODE		TRAIN:	521	523	525	527	529	531	711	533	535	537	541	713	543	545	715	547	549	717	551
COX	**Colfax**	Depart							SAN JOAQUIN			10:00a		SAN JOAQUIN	1:25p		SAN JOAQUIN		4:45p	SAN JOAQUIN	
ARN	**Auburn/Conheim**	Depart					6:30a					10:30a			1:55p				5:10p		
RLN	**Rocklin**	Depart					6:53a					10:45a			2:10p				5:15p		
RSV	**Roseville**	Depart		4:35a	5:25a		7:03a					11:00a			2:25p				5:40p		
SAC	**Sacramento** Ⓐ	Arrive		5:20a	6:05a		7:32a					11:55a			3:20p				6:15p		
		Depart	4:30a	5:30a	6:20a	7:00a	7:40a	8:20a	▼	9:20a	10:10a	12:10p	2:10p	▼	3:35p	4:40p	▼	5:40p	6:50p	▼	9:10p
DAV	**Davis**	Depart	4:45a	5:45a	6:35a	7:15a	7:55a	8:35a	Through Train from Bakersfield	9:35a	10:25a	12:25p	2:25p	Through Train from Bakersfield	3:50p	4:55p	Through Train from Bakersfield	5:55p	7:05p	Through Train from Bakersfield	9:25p
SUI	**Suisun/Fairfield**	Depart	5:09a	6:09a	6:59a	7:39a	8:19a	8:59a		9:59a	10:49a	12:49p	2:49p		4:14p	5:19p		6:19p	7:29p		9:49p
MTZ	**Martinez** Ⓑ	Depart	5:30a	6:30a	7:20a	8:00a	8:40a	9:20a	10:03a	10:20a	11:10a	1:10p	3:10p	3:19p	4:35p	5:40p	6:28p	6:40p	7:50p	8:56p	10:10p
RIC	**Richmond–BART** 2	Depart	5:55a	6:55a	7:45a	8:25a	9:05a	9:45a	10:28a	10:45a	11:35a	1:35p	3:35p	3:44p	5:00p	6:05p	6:53p	7:05p	8:15p	9:22p	10:35p
BKY	**Berkeley**	Depart	6:02a	7:02a	7:52a	8:32a	9:12a	9:52a	No Stop	10:52a	11:42a	1:42p	3:42p	No Stop	5:07p	6:12p	No Stop	7:12p	8:22p	No Stop	10:42p
EMY	**Emeryville**	Depart	6:10a	7:10a	8:00a	8:40a	9:20a	10:00a	ⓓ10:48a	11:00a	11:50a	1:50p	3:50p	ⓓ4:03p	5:15p	6:20p	ⓓ7:13p	7:20p	8:30p	ⓓ9:43p	10:50p
OKJ	**Oakland Jack London**	Arrive	6:21a	7:21a	ⓓ8:18a	8:51a	9:38a	ⓓ10:18a	11:00a	ⓓ11:18a	12:01p	2:01p	4:08p	4:15p	5:26p	6:38p	7:25p	7:31p	ⓓ8:48p	9:55p	11:08p
		Depart	6:23a	7:23a		8:53a					12:03p	2:03p			5:28p			7:33p			
OAC	**Oakland Coliseum–BART** 2	Depart	6:32a	7:32a	8:25a	9:02a		10:25a		11:25a	12:12p	2:12p			5:40p			7:44p	8:55p		
HAY	**Hayward**	Depart	6:43a	7:43a		9:13a					12:23p	2:23p			5:52p			7:59p	No Stop		
FMT	**Fremont/Centerville**	Depart	6:59a	7:59a		9:29a					12:39p	2:39p			6:09p			8:17p	No Stop		
GAC	**Santa Clara/Great America**	Depart	7:16a	8:16a		9:46a					12:56p	2:56p			6:27p			8:34p	No Stop		
SCC	**Santa Clara/University**	Depart	7:24a	8:24a		9:54a					1:04p	3:04p			6:35p			8:42p	No Stop		
SJC	**San Jose** 1 Ⓒ	Arrive	7:38a	8:38a		10:13a					1:18p	3:18p			6:48p			8:58p	11:55p	Connect from 549 to bus at Emeryville	

WEEKDAYS: Eastbound

San Jose-Oakland-Emeryville/San Francisco-Sacramento-Auburn

CODE	STATION	TRAIN:	BUS # 3802*	520	522	712	524	526	714	528	530	716	532	534	536	538	540	542	718	544	546	548
SJC	San Jose 1 C	Depart	THIS IS A BUS-ONLY ROUTE*			SAN JOAQUIN	6:40a		SAN JOAQUIN	9:05a			12:20p			3:10p		4:20p	SAN JOAQUIN	5:50p	7:15p	
SCC	Santa Clara University	Depart					6:46a			9:11a			12:26p			3:16p		4:26p		5:56p	7:21p	
GAC	Santa Clara-Great America	Depart					6:54a			9:19a			12:34p			3:24p		4:34p		6:04p	7:29p	
FMT	Fremont-Centerville	Depart					7:11a			9:38a			12:51p			3:43p		4:51p		6:21p	7:46p	
HAY	Hayward	Depart					7:26a			9:54a			1:06p			3:59p		5:06p		6:36p	8:01p	
OAC	Oakland Coliseum–BART 2	Depart					7:36a	8:55a		10:04a			1:16p			4:09p		5:16p		6:46p	8:11p	9:55p
OKJ	Oakland Jack London	Arrive					7:43a	9:03a		10:13a			1:23p			4:18p		5:23p		6:53p	8:18p	10:03p
		Depart		5:25a	6:25a	7:30a	7:45a	9:15a	10:05a	10:15a	12:15p	1:15p	1:25p	2:50p	3:30p	4:20p	4:50p	5:30p	5:50p	6:55p	8:20p	10:05p
EMY	Emeryville	Depart		5:35a	6:35a	7:40a	7:55a	9:25a	10:15a	10:25a	12:25p	1:25p	1:35p	3:00p	3:40p	4:30p	5:00p	5:45p	6:00p	7:05p	8:30p	10:15p
BKY	Berkeley	Depart		5:39a	6:39a	No Stop	7:59a	9:29a	No Stop	10:29a	12:29p	No Stop	1:39p	3:04p	3:44p	4:34p	5:04p	5:49p	No Stop	7:09p	8:34p	10:19p
RIC	Richmond–BART 2	Depart		5:47a	6:47a	7:49a	8:07a	9:37a	10:24a	10:37a	12:37p	1:34p	1:47p	3:12p	3:52p	4:42p	5:12p	5:57p	6:09p	7:17p	8:42p	10:27p
MTZ	Martinez B	Depart	4:45a	6:14a	7:14a	8:19a	8:34a	10:04a	10:54a	11:04a	1:04p	2:04p	2:14p	3:39p	4:19p	5:09p	5:39p	6:24p	6:39p	7:44p	9:09p	10:54p
SUI	Suisun/Fairfield	Depart	5:15a	6:33a	7:33a	Through Train to Bakersfield ▼	8:53a	10:23a	Through Train to Bakersfield ▼	11:23a	1:23p	Through Train to Bakersfield ▼	2:33p	3:58p	4:38p	5:28p	5:58p	6:43p	Through Train to Bakersfield ▼	8:03p	9:27p	11:13p
DAV	Davis	Depart	5:55a	6:57a	7:57a		9:17a	10:47a		11:47a	1:47p		2:57p	4:22p	5:02p	5:52p	6:22p	7:07p		8:27p	9:52p	11:37p
SAC	Sacramento A	Arrive	6:25a	7:23a	8:23a		9:48a	11:13a		12:18p	2:13p		3:28p	4:48p	5:22p	6:23p	6:48p	7:38p		8:58p	10:28p	12:03a
		Depart	🚌				10:15a			1:00p			4:00p		5:25p		L7:00p	L7:50p		L9:10p		
RSV	Roseville	Depart					D10:45a			D1:30p			D4:30p		5:48p		D7:30p	D8:20p		D9:40p		
RLN	Rocklin	Depart					D11:00a			D1:45p			D4:45p		5:56p		D7:45p	D8:35p		D9:55p		
ARN	Auburn/Conheim	Depart					D11:25a			D2:00p			D5:10p		6:30p		D8:00p	D8:50p		D10:10p		
COX	Colfax	Arrive					D11:40a 🚌			D2:15p 🚌			D5:25p 🚌				🚌	🚌		🚌		

WEEKENDS/HOLIDAYS: Westbound

Auburn-Sacramento-Emeryville/SF-Oakland-San Jose

CODE	STATION	TRAIN:	723	727	711	729	733	737	741	713	743	745	715	747	749	717	751
					SAN JOAQUIN					SAN JOAQUIN			SAN JOAQUIN			SAN JOAQUIN	
COX	Colfax	Depart						10:00a			1:25p				4:20p		
ARN	Auburn/Conheim	Depart				8:10a		10:30a			1:55p				4:50p		
RLN	Rocklin	Depart				8:33a		10:45a			2:10p				5:05p		
RSV	Roseville	Depart		5:25a		8:43a		11:00a			2:25p				5:20p		
SAC	Sacramento (A)	Arrive		6:05a		9:12a		11:55a			3:20p				6:15p		
		Depart	5:50a	8:10a	Through Train from Bakersfield	9:15a	10:40a	12:10p	2:10p	Through Train from Bakersfield	3:55p	4:40p	Through Train from Bakersfield	5:40p	7:10p	Through Train from Bakersfield	9:10p
DAV	Davis	Depart	6:05a	8:25a		9:30a	10:55a	12:25p	2:25p		4:10p	4:55p		5:55p	7:25p		9:25p
SUI	Suisun/Fairfield	Depart	6:29a	8:49a		9:54a	11:19a	12:49p	2:49p		4:34p	5:19p		6:19p	7:49p		9:49p
MTZ	Martinez (B)	Depart	6:50a	9:10a	10:03a	10:15a	11:40a	1:10p	3:10p	3:19p	4:55p	5:40p	6:28p	6:40p	8:10p	8:56p	10:10p
RIC	Richmond–BART 2	Depart	7:15a	9:35a	10:28a	10:40a	12:05p	1:35p	3:35p	3:44p	5:20p	6:05p	6:53p	7:05p	8:35p	9:22p	10:35p
BKY	Berkeley	Depart	7:22a	9:42a	No Stop	10:47a	12:12p	1:42p	3:42p	No Stop	5:27p	6:12p	No Stop	7:12p	8:42p	No Stop	10:42p
EMY	Emeryville	Depart	7:30a	9:50a	ⓓ10:48a	10:55a	12:20p	1:50p	3:50p	ⓓ4:03p	5:35p	6:20p	ⓓ7:13p	7:20p	8:50p	ⓓ9:43p	10:50p
OKJ	Oakland Jack London	Arrive	7:41a	10:01a	11:00a	11:06a	ⓓ12:38p	2:01p	4:01p	4:15p	5:46p	6:38p	7:25p	7:31p	9:08p	9:55p	11:08p
		Depart	7:43a	10:03a		11:08a		2:03p	4:03p		5:48p			7:33p	10:00p		
OAC	Oakland Coliseum–BART 2	Depart	7:52a	10:12a		11:17a	12:45p	2:12p	4:12p		6:00p			7:42p	No Stop		
HAY	Hayward	Depart	8:03a	10:23a		11:28a		2:23p	4:23p		6:12p			7:53p	No Stop		
FMT	Fremont/Centerville	Depart	8:19a	10:39a		11:44a		2:39p	4:39p		6:27p			8:09p	No Stop		
GAC	Santa Clara/Great America	Depart	8:36a	10:56a		12:01p		2:56p	4:56p		6:47p			8:26p	No Stop		
SCC	Santa Clara/University	Depart	8:44a	11:04a		12:09p		3:04p	5:04p		6:55p			8:34p	No Stop		
SJC	San Jose 1 (C)	Arrive	8:58a	11:18a		12:23p		3:18p	5:18p		7:08p			8:48p	11:55p		

WEEKENDS/HOLIDAYS: Eastbound

San Jose-Oakland-Emeryville/SF-Sacramento-Auburn

CODE	STATION	TRAIN:	720	712	724	714	728	732	716	734	736	738	742	718	744	746	748
SJC	San Jose 1 C	Depart		SAN JOAQUIN	7:50a	SAN JOAQUIN	10:10a		SAN JOAQUIN	12:50p		3:40p	5:10p	SAN JOAQUIN	6:05p		9:10p
SCC	Santa Clara/University	Depart			7:56a		10:16a			12:56p		3:46p	5:16p		6:11p		9:16p
GAC	Santa Clara/Great America	Depart			8:04a		10:24a			1:04p		3:54p	5:24p		6:19p		9:24p
FMT	Fremont/Centerville	Depart			8:21a		10:41a			1:21p		4:11p	5:41p		6:36p		9:41p
HAY	Hayward	Depart			8:36a		10:56a			1:36p		4:26p	5:56p		6:51p		9:56p
OAC	Oakland Coliseum-BART 2	Depart			8:46a		11:06a			1:46p		4:36p	6:06p		7:01p		10:06p
OKJ	Oakland Jack London	Arrive			8:53a		11:13a			1:53p		4:43p	6:13p		7:08p		10:13p
		Depart	7:50a	7:30a	8:55a	10:05a	11:15a	12:25p	1:15p	1:55p	3:25p	4:45p	6:20p	5:50p	7:10p	7:55p	10:15p
EMY	Emeryville	Depart	8:00a	7:40a	9:05a	10:15a	11:25a	12:35p	1:25p	2:05p	3:35p	4:55p	6:30p	6:00p	7:20p	8:05p	10:25p
BKY	Berkeley	Depart	8:04a	No Stop	9:09a	No Stop	11:29a	12:39p	No Stop	2:09p	3:39p	4:59p	6:34p	No Stop	7:24p	8:09p	10:29p
RIC	Richmond-BART 2	Depart	8:12a	7:49a	9:17a	10:24a	11:37a	12:47p	1:34p	2:17p	3:47p	5:07p	6:42p	6:09p	7:32p	8:17p	10:37p
MTZ	Martinez B	Depart	8:39a	8:19a	9:44a	10:54a	12:04p	1:14p	2:04p	2:44p	4:14p	5:34p	7:09p	6:39p	7:59p	8:44p	11:04p
SUI	Suisun/Fairfield	Depart	8:58a	Through Train to Bakersfield	10:03a	Through Train to Bakersfield	12:23p	1:33p	Through Train to Bakersfield	3:03p	4:33p	5:53p	7:28p	Through Train to Bakersfield	8:18p	9:03p	11:23p
DAV	Davis	Depart	9:22a		10:27a		12:47p	1:57p		3:27p	4:57p	6:17p	7:52p		8:42p	9:27p	11:47p
SAC	Sacramento A	Arrive	9:48a		10:58a		1:18p	2:23p		3:58p	5:23p	6:48p	8:12p		9:13p	9:53p	12:18a
		Depart	10:15a				1:30p			4:10p			8:15p				
RSV	Roseville	Depart	@10:45a				@2:00p			@4:40p			8:38p				
RLN	Rocklin	Depart	@11:00a				@2:15p			@4:55p			8:46p				
ARN	Auburn/Conheim	Depart	@11:25a				@2:30p			@5:20p			9:23p				
COX	Colfax	Arrive	@11:40a				@2:45p			@5:35p							

VALERO

RECEIVED
APR 18 2016
CITY OF BENICIA
COMMUNITY DEVELOPMENT

April 18, 2016

Ms. Amy Million
City Planner
City of Benicia
250 East L Street
Benicia, CA 94510

Dear Ms. Million:

Below are answers to certain questions posed by City council members during the recent appeal hearings on the Valero Benicia Refinery's Crude by Rail project. These are intended to supplement the answers provided in the City's staff report dated April 12, 2016 related to Tank Car Standards. We continue to work with UPRR on answers to the questions related to questions asked about Railroad Operations, Track Rights and Rail Safety.

Question 1. Confirmation on Valero's commitment to use 1232 tank cars. (AS)

Response provided in April 12, 2016 staff report.

Question 2. How do we know when it is feasible for Valero to upgrade to the better tank cars? When and how is that commitment done? (EP)

Valero is committed to comply with all regulatory requirements for the safe transport of crude oil by rail to Benicia. As a further demonstration of the company's commitment to the safe transport of crude oil by rail, Valero has continued to upgrade its fleet of rail road tank cars including tank cars that would be used in the Benicia project. Tank car jackets are a key component of the upgraded DOT 117 and DOT 117R standards. In its current crude oil fleet, Valero utilizes only jacketed CPC-1232 cars. This is well ahead of the federal compliance deadline for ending the use of all non-jacketed CPC-1232 cars in crude oil service by April 1, 2020.

As noted below, Valero has committed to use tank cars that meet or exceed the standard as defined by the American Association of Railroads as a CPC-1232 Tank Car Specification.

Benicia Refinery • Valero Refining Company - California
3400 East Second Street • Benicia, California 94510-1097 • Telephone (707) 745-7011 • Facsimile (707) 745-7514

Question 3. Would Valero commit to better tanks cars (117R and/or 117J) if they are available before they are required to? (MH)

As noted above, many of Valero's tank cars are jacketed CPC-1232s. Use of these cars in crude oil service is well ahead of the federal compliance deadline for ending the use of all non-jacketed CPC-1232 cars by April 1, 2020. Valero would commit to use these jacketed CPC-1232 cars before we are required to but cannot commit to use only DOT 117/117R/117J cars.

Questions 4. When will those cars will be available? (MH/EP)

If and when the Valero Benicia Refinery Crude by Rail project ("CBR Project") receives all necessary governmental approvals and begins operation, Valero will ensure that jacketed CPC-1232 cars are utilized.

Question 5. How much crude does a tank car hold? (AS)

A tank car holds approximately 600 - 700 barrels of crude oil depending on the tank volume of the car, the allowable gross railcar weight of the shipping lane and the density of the product.

Sincerely,

Christopher W. Howe

Christopher W. Howe
Director, Health, Safety, Environment &
Governmental Affairs

CWH:mto

Fw: Ed Ruszel's Point of Order

RECEIVED
APR 19 2016
CITY OF BENICIA
COMMUNITY DEVELOPMENT

Amy Million

Reply all |

To: Teresa Olson; ... ...

Tue 4/19/2016 1:31 PM

Inbox

Action Items

Thank you

From: Marilyn Bardet <mjbardet@comcast.net>
Sent: Tuesday, April 19, 2016 1:24:55 PM
To: Christina Ratcliffe
Cc: Elizabeth Patterson; Mark Hughes; Christina Strawbridge; aschwatzman@ci.benicia.ca.us; Tom Campbell; Heather McLaughlin; Brad Kilger; Amy Million; Roger Straw; Jack Ruszel; john47bunch@gmail.com; Ed Ruszel
Subject: Re: Ed Ruszel's Point of Order

Hello Christina,

I echo Ed Ruszel's concern that information provided by Fehr & Peers in a power point presentation last night at 11 pm, after public comment was closed, disadvantaged the public and opened up the traffic study's can-of-worms to new information. The traffic study failed to identify and evaluate conditions at rush hour – about which councilmember Campbell asked "why?" – considering that Project-related trains could foreseeably be passing through Park Rd RR crossing on cyclic occasions during rush hour (morning or evening) when UP's Project train scheduling doesn't allow for that avoidance.

What is the effect of all the Project trains' and other manifest freight trains' switching operations on refinery property? What are the scenarios that would affect traffic at Park Rd and Bayshore Rd, and for the industrial park generally? The FEIR does not evaluate the foreseeable logistics of rail operations within Valero property on both existing and proposed new rail spurs, nor the potential effect on traffic under varied conditions, including during rush hour and other potential accident conditions.

As Ed has explained, at any given time two Project trains, each on site at the refinery, readying to move to and from the rail offloading racks (Phyllis Fox's latest letter says there could be 3 on site at a given time), could conflict with manifest freight train movements on Valero property's rail spur that leads through the refinery to the park's other rail spurs along Industrial Way.

The FEIR and traffic study do not discuss this kind of scenario in relation to train movement and vehicular traffic, let alone at rush hour: UP operated manifest freight trains, some with tank cars carrying flammable LPG, etc., that may be held up, needing to be sidelined, when two Project-related trains are delayed on site. Under such circumstances, how would the freight train get to the side spurs along Industrial Way that are only accessed through Valero's on site rail spur?

These kinds of scenarios should be examined closely and evaluated, including by touring the park, since imagining them in the absence of clear diagrams and maps in the EIR makes evaluation of traffic impacts owing to train movements highly confusing for decision-makers and the public.

Additionally, Phyllis Fox's latest comment letter resoundingly rebutts MRS and ESA's qualitative risk analysis and their responses to her April 4th comment letter – a thoroughly researched 89 page analysis of foreseeable "worst case" scenarios that the Project poses.

For example, apropos Ed's concerns, the Fox letter of April 18th points to cumulative impacts associated to the location of the rail racks in the vicinity of parked tank cars loaded with LPG, ethanol, etc, on site in the vicinity of new and existing rail spurs. The Fox letter of April 4th addresses the inherent dangers of the 7 or 8 crude storage tanks ("West Tank Farm" – to be used for storing Project-related volatile crudes), in close proximity to LPG, (propane, butane) "spheres", with that tank farm within 1,000 ft of residential neighborhoods, thus creating the potential for *the* worst case scenario event —vapor cloud explosion with domino effects. . .unanalyzed by the FEIR.

Where is the evacuation plan for road traffic and rail traffic in the industrial park in the case of catastrophic event?

Cumulatively, the inherent intensified risk of a catastrophic event happening as a result of this Project, if it is approved, is a matter of WHEN not IF.

It's unfathomable how anyone with an ounce of integrity could say "the EIR is outstanding."

"Location, location, location" – the realtors' mantra is more haunting than ever.

Please submit these comments into the record in anticipation of tonight's final hearing.

Thank you,

Marilyn Bardet
333 East K Street

On Apr 19, 2016, at 11:17 AM, Ed Ruszel <eruszel@ruszelwoodworks.com> wrote:

Valero Crude By Rail Project
Valero Appeal to the City Council
April 18th, 2016

I am writing to add to the public record my concerns about **New** information that was presented to the Council, after the close of the public comments.

The discussion regarding traffic and rail movement was extremely important as the written documents do not cover the subjects in any great detail.

It was very distressing to see representatives of Fehr and Peers not just be given the opportunity to answer questions from the Council but then be given the time to present a prepared Power Point Presentation at 11:00pm!
On top of that, Chris Howe of Valero was able to crowd the mic without a request from the Council to add comments regarding upgrades to switches and how it would help "other than Project" related train traffic.

I feel very strongly that this is substantial new information, that should have been more thoroughly addressed early on in the DEIR, RDEIR, and FEIR.
The public is at a disadvantage in not being able to consider this new information and then make verbal comment when appropriate.

As you may know, I have been very diligent in my review of the Transportation and Traffic sections of this project and believe that public comment should be reopened to address this most important subject.

If the council deny' s Valero's appeal my concerns are mute. A delay of the hearing for a determination by the STB would reopen the door for additional public comment, and the Transportation and Traffic review would be one of the most affected issues.

Sincerely
Ed Ruszel

Teresa Olson

From: Amy Million
Sent: Tuesday, April 19, 2016 1:52 PM
To: Teresa Olson
Subject: Fw: Ed Ruszel's Point of Order

RECEIVED
APR 19 2016
CITY OF BENICIA
COMMUNITY DEVELOPMENT

From: Marilyn Bardet <mjbardet@comcast.net>
Sent: Tuesday, April 19, 2016 1:50 PM
To: Christina Ratcliffe
Cc: Elizabeth Patterson; Mark Hughes; Christina Strawbridge; Alan Schwartzman; Tom Campbell; Heather McLaughlin; Brad Kilger; Amy Million; Roger Straw; Jack Ruszel; john47bunch@gmail.com; Ed Ruszel
Subject: Fwd: Ed Ruszel's Point of Order

Christina,

In reference to statements I made in previous message regarding the uses of existing rail spur that runs on Valero property: that rail spur is a linear "dead end" used for allowing freight trains to access other rail spurs in the park. Presumably, some of those trains would be sidelining tanker cars of ethanol and LPG at the refinery. All this needed to be spelled out and analysed in the FEIR and as related to traffic impacts.

Please include this addendum to my previous email comment.

Thank you,

Marilyn

Begin forwarded message:

From: Marilyn Bardet <mjbardet@comcast.net>
Subject: Re: Ed Ruszel's Point of Order
Date: April 19, 2016 at 1:24:55 PM PDT
To: Christina Ratcliffe <cratcliffe@ci.benicia.ca.us>
Cc: Elizabeth Patterson <epatterson@ci.benicia.ca.us>, Mark Hughes <mhughes@ci.benicia.ca.us>, cstrawbridge@ci.benicia.ca.us, aschwatzman@ci.benicia.ca.us, tcampbell@ci.benicia.ca.us, Heather McLaughlin <HMcLaughlin@ci.benicia.ca.us>, Brad Kilger <BKilger@ci.benicia.ca.us>, Amy Million <AMillion@ci.benicia.ca.us>, Roger Straw <rogrmail@gmail.com>, Jack Ruszel <Jruszel@ruszelwoodworks.com>, john47bunch@gmail.com, Ed Ruszel <eruszel@ruszelwoodworks.com>

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Sincerely
Ed Ruszel

Amy Million

RECEIVED
APR 19 2016
CITY OF BENICIA
COMMUNITY DEVELOPMENT

From: Kate Gibbs
Sent: Tuesday, April 19, 2016 9:06 AM
To: Amy Million; Teresa Olson; Alan Schwartzman; Christina Strawbridge; Elizabeth Patterson; Mark Hughes; Mark Hughes; Tom Campbell
Cc: Heather McLaughlin
Subject: Vote No Call from yesterday

Chez Hiro left a message yesterday at 4:21 p.m. regarding CBR. He urges Council to vote "no".

Kate Gibbs
Deputy City Clerk
City of Benicia
(707) 746-4228

Amy Million

RECEIVED
APR 19 2016
CITY OF BENICIA
COMMUNITY DEVELOPMENT

From: Christina Ratcliffe
Sent: Monday, April 18, 2016 3:34 PM
To: Teresa Olson; Amy Million
Subject: FW: Please read Dr. Fox's report before your vote

Follow Up Flag: Flag for follow up
Flag Status: Flagged

FYI

Christina
Christina Ratcliffe, AICP
City of Benicia
Community Development Director
707-746-4277

From: Heather McLaughlin
Sent: Monday, April 18, 2016 3:25 PM
To: Amy Million; Bradley R. Hogin; Brad Kilger; Christina Ratcliffe; Janna Scott; Cory Barringhaus
Subject: FW: Please read Dr. Fox's report before your vote

FYI

From: Elizabeth Patterson [mailto:elopato29@gmail.com]
Sent: Monday, April 18, 2016 2:19 PM
To: Heather McLaughlin <HMclaughlin@ci.benicia.ca.us>
Subject: Fwd: Please read Dr. Fox's report before your vote

Not sure if your got this.

Elizabeth Patterson
Mayor
707.746.5668
ELOPATO@ELIZABETHPATTERSON.COM
www.elizabethformayor.com

After the final 'no', there comes a 'yes' and on that yes, the future world depends"

Begin forwarded message:

From: Kathy Kerridge <kkerridge@sbcglobal.net>

Subject: Please read Dr. Fox's report before your vote
Date: April 18, 2016 at 9:28:31 AM PDT
To: Elizabeth Patterson <elopato29@gmail.com>, Mark Hughes <mhughes@ci.benicia.ca.us>, Alan Schwartzman <aschwartzman@ci.benicia.ca.us>, Christina Strawbridge <cstrawbridge@ci.benicia.ca.us>, Tom Campbell <tcampbell@ci.benicia.ca.us>
Reply-To: Kathy Kerridge <kkerridge@sbcglobal.net>

Dear Mayor and Council members,
I know you have been inundated with materials to read regarding Crude by Rail. Please make it a point to read the report by Dr. Phyllis Fox. http://beniciaindependent.com/wp-content/uploads/2016/04/Comments-Fox-City-Council-Appeal-FINAL-3-30-16-1.pdf Please pay special attention to p.27 on.
Here is her summary:

- Significant on-site emissions of reactive organic gases (ROG) from railcar fugitives;
- Significant on-site ROG emissions from change in service of existing crude oil storage tanks;
- Significant cancer, chronic, and acute health impacts from benzene emitted from railcar fugitives;
- Significant off-site injury and fatality impacts from on-site accidents;
- Significant off-site flooding impacts from on-site infrastructure and railcars; and
- Significant off-site injury and fatality impacts from on-site accidents caused by seismic shaking.

Thus, the EIR must be revised to disclose these impacts, impose all feasible mitigation, and be recirculated.
In a nutshell, increased air pollution, particularly from Benzene, a carcinogen; an accident in the refinery could devastate the industrial park, the Hill Crest neighborhood or Lansing Circle; increased flooding of the industrial park from the project.
Don't risk our citie's future. Vote no.
Kathy Kerridge

Teresa Olson

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From: livesay04@earthlink.net
Sent: Tuesday, April 19, 2016 7:51 AM
To: Heather McLaughlin
Subject: Valero

Good Morning Heather; Long night. A couple of questions. Council member Strawbridge asked if an extension was granted and a new EIR or even just A few tweets was needed would Valero pick up the cost. There was no answer. Second if the council agrees with the planning commissions 6/0 vote and Valero files a law suit who pays the legal fees and who would Valero file against.. I guess I am asking just what is the financial liability of the city on this issue. I did hear a lawyer from a national group tell the council that all the area groups are behind the city and I assume would be taking part in the defense and I assume also the cost. That seems as threat to the council on their vote. Maybe I hear too much and make a big deal out of it. But I did think that lawyer was being very political. Another words we have your back.. Vote against Valero, we are here to protect the city. Please advise. Thank you. Bob Livesay

Reject Valero's dangerous oil trains project

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Deborah Lyons <bounce@list.credoaction.com>

Mon 4/18/2016 7:10 PM

To: Amy Million <AMillion@ci.benicia.ca.us>;

Valero's outrageous proposal to build an oil trains terminal at its refinery in Benicia threatens the health and safety of people all along the rail route.

If approved by the Benicia City Council, the terminal would exacerbate local air pollution in Benicia and in communities along the rail route, expose those communities to the catastrophic danger of an oil train derailment and explosion, and fuel the climate crisis by encouraging fracking and tar sands extraction.

I urge the Planning Commission and the City Council to reject Valero's dangerous plan.

Deborah Lyons
Benicia, CA

Amy Million

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From: Eleanor Prouty <epbandbiz@att.net>
Sent: Monday, April 18, 2016 4:31 PM
To: Amy Million
Subject: Business Item 16A on City Council's Agenda - Valero Appeal of Planning Commission

Follow Up Flag: Flag for follow up
Flag Status: Flagged

To: Amy Million for the Benicia City Council
Community Development Department
250 East L Street
Benicia, CA 94510

From: Eleanor Prouty
508 Laurel Court
Benicia, CA 94510

I am writing to add my comments to the record before the end of the Council's public hearing on this important decision. I am not able to attend the full hearing this evening.

I commented with specifics about my objections to the Valero proposal and the Draft EIR during the Planning Commission process. Those comments have been echoed by many others and I was relieved that the Planning Commission voted unanimously to deny the permit to Valero.

On the recommendations before the Council, I fully support #1 - deny the request for extension and #2, uphold the Planning Council decision. First, Valero's request for a legal opinion on a key issue of jurisdiction at this point in the process is insulting. They have taken up a huge amount of time and energy from our city staff, volunteer commissioners, and interested residents. If they believe there is a pre-emption issue they should have let that guide their prior actions. Our City Council cannot wait for Valero to explore this strategy before making a decision.

The Planning Council devoted much time, care and analysis to address this important proposal from a major Benicia employer, and to consider the local, statewide and national attention and comments that came in to them. Any City Council member who was paying attention during that process, as I hope all were, would have seen the detailed work that went into the decision. The Council members should of course fully review the records from that process, and the public comments that have come directly to them. I believe that review will show the Council that they should uphold the Planning Council's decision, and I urge every Council member to do so.

Thank you.

Amy Million

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From: Bea Reynolds <breycas@comcast.net>
Sent: Monday, April 18, 2016 5:23 PM
To: Elizabeth Patterson; Mark Hughes; Alan Schwartzman; Tom Campbell; Andrew Nowshadi; Elizabeth Patterson; Elizabeth Patterson
Cc: Christina Strawbridge; Amy Million
Subject: PLEASE !

Follow Up Flag: Flag for follow up
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Dear Mayor Elizabeth Patterson and City Council Members Tom Campbell, Mark Hughes, Alan Schwartzman, Christina Strawbridge Principal Planner Amy Million City of Benicia California

With the flurry of recent substantiated technical reports, and professional opinions on the environmental degradations and catastrophic effects which would be caused by Valero Crude by Rail Proposal.....
With all of our Benicia residents' statements and petitions concerning safety, air-quality impacts, and quality of life....
With all the testimonials of the regional "up-line" neighbors' whose lives and safety of their communities would be impacted....
With all the recent legal opinions topped by California Attorney General's recent submittal....
And knowing that all eyes are focused on you for your guidance and vote – please vote to uphold the Planning Commission's denial of use permit, and say no to the delaying tactics put forth by Valero.

To quote from Dr. Phyllis Fox most recent submittal:

> "...**The Project as proposed in the EIR will result in significant on-site air quality impacts from railcar and storage tank ROG emissions;**
> **significant chronic and acute health impacts due to benzene present in on-site railcar ROG fugitive emissions;**
> **significant off-site impacts (death and injuries) from on-site accidents; and significant off-site flooding impacts from on-site railcars that would occupy floodplain volume.**

Please put this whole matter to rest once and for all....honor the Planning Commission's vote to deny Valero the use permit to go forward with the Crude by Rail Proposal.

Bea Reynolds
Safety Engineer/Consultant
707-372-3591 cell
breycas@comcast.net

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Amy Million

From: nancyrothsteinphoto@gmail.com on behalf of Nancy Rothstein <nancy@nancyrothstein.com>
Sent: Monday, April 18, 2016 6:03 PM
To: Amy Million
Subject: Comment for the record - Valero Crude By Rail

Follow Up Flag: Flag for follow up
Flag Status: Flagged

To whom it may concern:

I want to express my opposition to the Crude by Rail proposal.

Thank you for your time!

Nancy Rothstein
873 Oxford Way
Benicia CA 94510

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April 19, 2016
Pat Toth-Smith
Benicia Resident

Dear Hon Mayor and Members of the City Council,

This letter is in response to Bradley R. Hogin's memorandum letter dated April 18, 2016 where he responds to the Attorney Generals letter of April 14, 2016.

I am stating the obvious after reading Hogin's letter, all of the cases that Hogan references: *Winchester Case*, *Alexandria* Case, *Babylon Case, and the West Palm Beach* Case in his argument against Kamela Harris' rulings**, were on existing rail spurs and not cases related to the permitting of new rail spurs on private property.** These two issues seem like "**Apples and Oranges**" to me, which are clearly not the same fruit, just as these two issues are not the same.

What Hogin's memo letter does tell us, with the cases he cited, that if these rail spurs are built there will be no further permitting or municipal input into what can happen on the new rail spurs. One possible scenario could be more volatile crudes and tar sands coming in then what was cited in the FEIR and the permitting process, and being exported out through our port.

So, please consider my concerns when making your decisions… I do not want to see our lovely town turn into a large storage facility and export hub for domestic fracked crudes going to overseas countries from the interior of the US.

Sincerely Yours, Pat Toth-Smith

Amy Million

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From: C. Bart Sullivan <patenthelp@yahoo.com>
Sent: Tuesday, April 19, 2016 7:21 AM
To: Elizabeth Patterson; Mark Hughes; Tom Campbell; Alan Schwartzman; Christina Strawbridge; Heather McLaughlin
Cc: Amy Million
Subject: Questions

Follow Up Flag: Flag for follow up
Flag Status: Flagged

Dear Honorable Mayor Patterson, City Council, and Staff,

I am not sure if I can submit other comments for the record, but I had some questions about last night's meeting and I am not sure how to get them answered.

1. It is my understanding Attorneys are suppose to provide their client with both sides of the argument to let the client make informed choices. If that is the case, why has Mr. Hogan only presented one side of the ancillary preemption argument? For example, last night when questioned, Mr. Hogan said that he was not saying that the council could not deny the project, but then did not explain how the council could deny the project without invoking preemption issues. It is frustrating for me to see Mr. Hogan only point to and expound on non-precedent lower court decisions which indicate the council must approve the project under preemption without mentioning higher court decisions that may be used to deny the project. As litigation is sure to happen whether the council denies or approves the project, shouldn't Mr. Hogan have provided the council and staff with advice, case law, and plan on how to proceed with defending either choice?

2. Since it appears that the staff would like to move on to other pressing matters, I am bewildered why the choice of litigation has not been discussed? While litigation may be expensive, since it can free up time for staff to be concerned with other matters, why is litigation not a logical choice, especially in light of the fact that last night other attorneys vowed to help the city?

3. After hearing Valero's rebuttal last night, I am still confused as to why Valero cannot contract with the city to mitigate issues? For example, when questioned about whether the crude oil can be made safer for delivery, Valero essentially responded that they don't control what they are buying. That makes no sense, while there will be a cost to add such a safety additive, as Valero is the the buyer, they can contract to add additives to what they are buying.

4. Why can't Valero make design changes to the project such as using pipelines to deliver the oil, add overpasses to Bayshore road to alleviate traffic issues, increase containment for oil spillage in case of a spill when the crude is offloaded from the rail cars, build structures above the transloading facility to capture fugitive emissions, build blast walls to deflect any potential blast away from the city and other structures within the refinery. I just don't understand why Valero with its available resources cannot step in and mitigate these and many more issues?

Sincerely,

Bart Sullivan

Amy Million

From: Donna Wapner <dwapner@sbcglobal.net>
Sent: Tuesday, April 19, 2016 7:29 AM
To: Amy Million
Subject: Comments at last nights meeting

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Follow Up Flag: Flag for follow up
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Monday, April 18

Mayor Patterson and Members of the Benicia City Council,

My name is Donna Wapner. I am a 16-year resident of Benicia, a public health educator and advocate, and someone who wants to urge you, to deny both Valero's request for a delay, deny their appeal, and let stand the Benicia Planning Commission's unanimous vote to deny Valero's Use Permit for Crude by Rail because it is a danger to the health, safety and welfare of Benicia and uprail communities.

There are enough significant local, onsite hazardous impacts to allow this Council to deny a permit. All you need do is take a look at Dr. Fox's April 4th letter stating numerous local concerns related to Valero's appeal or to her rebuttal dated today to recognize many of the local health and safety concerns that are still not addressed adequately. I will not take my 5 minutes to restate all the evidence presented in her rebuttal letter today or other material presented by experts, lawyers, and other elected officials on the negative impacts, and I won't even spend my time commenting on Valero's latest appeal to reduce their tax bill which if approved would cost the City general fund an additional $3 million per year.

I do find it interesting however, that Mr. Radis of MRS (Marine Research Specialists) – in a letter that is in your packet tonight uses incident information from the Pipeline and Hazardous Materials Safety Administration (PHSMA) to conclude that accidents at crude oil unloading facilities are "quite rare." when in fact that agency stated itself that incidents need only be reported to them by a rail carrier if something happens during "transportation" – and they do not consider loading and unloading incidents by a private consignee (companies like Valero) to be included in incident report filings. They go on to say that they have little or no risk data on bulk loading and unloading of rail tank cars – and in their own review of their 2007 data, they estimated they were missing 60 – 90% of all the hazmat incidents that did occur. Somehow, I find it difficult to understand why city consultants would continue to use such flawed data to assert a rebuttal at this point in our knowledge and discussions on this subject.

This is only one example of my concerns related to city consultants and consulting lawyers that keep providing city staff with information of support for this proposal despite mounting evidence to the contrary. Another document in your packet tonight is the 2013 City Attorney recommendation for a significant increase of funds for the contract of services with Bradley Hogin of Woodruff, Spradlin & Smart. One of the many statements in that document that support them as a good choice says that "They have handled challenges to federal, state, and local environmental regulations in the areas of air quality, water quality, and oil production." (Which comes straight from their website). But all you have to do is look at their website under examples of Environmental Law Counseling and Litigation Matters and you will see that when you look at the 9 examples listed, that most of them are defending or supporting property owners, cities, oil industry trade associations, or school districts who were trying to reduce their responsibility related to questioned environmental impact reports, cost recovery related to environmental damages, reduction of environmental regulations that impact corporate operations, or defending those charged with negligence related to environmental impacts . In other words, most of their experience is examples of practicing Anti-Environmental Law – not Environmental Law.

Benicia city staff has concluded that the Project's benefits do not outweigh its significant and unavoidable environmental impacts. However, they have been advised by the cities consulting attorneys that federal preemption prohibits Benicia from considering the Project's rail-related impacts in determining whether to approve the Project. They have asserted the Benicia is "legally prohibited" from denying the Project based on rail-related impacts disclosed in the Revised Draft EIR. Last week alone you received a letter from Attorney General Kamala Harris stating that is not the case. As many others have stated, the "Federal preemption does not apply because Valero's Project involves constructing ancillary refinery infrastructure over which Union Pacific, the actual rail carrier, will maintain no ownership or operational control and over which the STB has no jurisdiction."

Lastly, you have another document in tonight's packet from Christopher Barkan, a professor at the University of Illinois. He states that every year since 2010 there have been over 100 train derailments with at least one hazmat car in the train, sometimes more than

20 that involved crude oil trains, and at least 2 each year where the derailments that involved crude oil trains resulted in Fire/Explosions. Imagine if a derailment happened due to an earthquake in Benicia, or in the Valero yards next to other highly combustible things – it could start a deadly chain reaction of devastation not only at Valero, but also in our town.

Personally, I have to state publicly that if our city ends up supporting this mal-advised proposal, I will eventual look for somewhere else to live. I expect to sometimes win and sometimes lose when it comes to political directions and local politics, but ethically I cannot be part of a community that has willingly decided to approve a project that is unnecessary and WILL in time have grave negative consequences to our environment and to our community's health. I am not the only resident who feels this way – just look at The Solano County Realtors Advisory - they believe property values will fall in Benicia as people make other choices of places to live. I know I will.

You are being asked to determine if there is merit to approving Valero's appeal. There is plenty of evidence to say "No to Crude by Rail" for the health and safety of Benicians, for the health and safety of thousands of other Californians, and for the health and safety of our future generations (in Benicia and beyond). You have solid data to support this decision. Now you must also have the moral courage to stand against the consultants you have hired (which needs to be a topic for another day), the city staff that has been unfortunately heeding their advice, and a major industry who has exerted a lot of pressure on a different outcome.

The planning commission has already made the decision to not approve this project, you need only stand by their decision. We are counting on each and everyone of you to make the choice that puts our health and safety first. As Kamala Harris stated, "For Benicia to Turn a Blind Eye to the most serious of the Project's environmental impacts, merely because they flow from federally-regulated rail operations, would be contrary to both state and federal law." She continues "Valero's assertion that the Planning Commission's action was illegal is without merit." Please heed her advice – for all our sakes.

Sincerely,

Donna Wapner

Public Comment re Valero Crude by Rail Project - Appeal Application No. 16PLN-00009

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KnowWho Services <noreply@knowwho.services>

Mon 4/18/2016 5:15 PM

To: Amy Million <AMillion@ci.benicia.ca.us>;

Dear Benicia City Council,

I'm writing to urge the Benicia City Council to back the Planning Commission's unanimous decision to reject Valero's proposal to transport explosive crude oil by rail through California communities to its refinery in Benicia, and to reject Valero's attempts to delay a final decision on this project.

The Planning Commission rightfully rejected this dangerous project because it "would be detrimental to the public health, safety, or welfare" of Benicians and communities along the oil train routes. The project's impacts include increased air pollution from refinery emissions (which could disproportionately affect low-income communities and communities of color) and oil spills during the offloading process (which could harm the Sulphur Springs Creek riparian corridor).

Furthermore, increases in the transportation of crude by rail has corresponded with an alarming increase in the number of derailments, spills, and explosions. More than five million Californians live in the blast zones of oil train routes, and this project would significantly increase the number of unsafe oil trains rolling through our communities.

As Attorney General Kamala Harris pointed out, the U.S. Department of Transportation found that rail shipments of highly volatile crude oil represent an "'imminent hazard," such that a "substantial likelihood that death, serious illness, severe personal injury, or a substantial endangerment to health, property, or the environment may occur." I agree with regulators, elected officials, local residents, nurses, and the the many thousands of Californians who have sounded the alarm about the unacceptable risks posed by this project.

For these reasons, I again urge the City Council to reject Valero's oil train project, as well as its attempts to delay resolution of this issue.

Thank you for your consideration.

Sincerely,

Marcia Flannery
363 40th St
Oakland, CA 94609-
marciaflannery@gmail.com
(510) 923-1293

Public Comment re Valero Crude by Rail Project - Appeal Application No. 16PLN-00009

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KnowWho Services <noreply@knowwho.services>

Tue 4/19/2016 11:04 AM

To: Amy Million <AMillion@ci.benicia.ca.us>;

Dear Benicia City Council,

I'm writing to urge the Benicia City Council to back the Planning Commission's unanimous decision to reject Valero's proposal to transport explosive crude oil by rail through California communities to its refinery in Benicia, and to reject Valero's attempts to delay a final decision on this project.

The Planning Commission rightfully rejected this dangerous project because it "would be detrimental to the public health, safety, or welfare" of Benicians and communities along the oil train routes. The project's impacts include increased air pollution from refinery emissions (which could disproportionately affect low-income communities and communities of color) and oil spills during the offloading process (which could harm the Sulphur Springs Creek riparian corridor).

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For these reasons, I again urge the City Council to reject Valero's oil train project, as well as its attempts to delay resolution of this issue.

Thank you for your consideration.

Sincerely,

Dianne Yee
394 12th St Apt 3F
Oakland, CA 94607-
citymau5@yahoo.com
(510) 394-2933