

**Stakeholder Meeting #4 Minutes: Friday, August 21st, 2015**  
**State Route 37 Integrated Traffic, Infrastructure and Sea Level Rise Analysis**  
**Marin Humane Society, 171 Bel Marin Keys Blvd.**  
**Novato, California 94949**  
**10:00am – 12:00pm**

Attendees

**Welcome and Introductions – Fraser Shilling, UC Davis**

- Fraser Shilling welcomed everyone, gave a brief overview of the meeting and introduced Joy Villafranca, AECOM.

**Presentation – Joy Villafranca, AECOM Oakland, California**

- SR 37 Sea Level Rise Adaptation Engineering Concept Design & Cost Estimates
- Joy presented 44 slides, taking and answering questions as they arose.

*Please see complete slide presentation at the end of these minutes (Slides 1-44).*

Joy defined the reaches of Highway 37 **(Slide3)**

- Reach A – Hwy 101 to SR121
- Reach B – SR 121 to Mare Island
- Reach C – Mare Island to I80
- Reach A & B are the focus of this study; Reach C has a higher elevation and a moderate risk.

Conceptual Design Planning **(Slide 4)**

- Nearby utilities corridors include PG&E
- Adjacent transportation features include railroad tracks and transit corridors

The Conceptual Design Costs based on the Highway Design Manual and published Caltrans Cost Data Information, which is online. **(Slide 6 and 7)**

Reach B: SR 121 to Mare Island Existing Characteristics **(Slide 14)**

- OC stands for Overcrossing

Reach B: Sonoma Creek Bridge **(Slide 18)**

- The access road shown to the left of the bridge is a maintenance facility and PG&E transmission tower.

### Sea Level Design Criteria Alternative 1 (Levee) **(Slide 21)**

- The sheltered Reaches are areas protected by levees
- The exposed Reaches are not protected by levees
- Freeboard is the difference between the water level and the roadway.

Question: Why is the SLR only 3ft?

Answer: The SLR scenario that was selected was end of century mid-range estimate. This is at a conceptual level but can certainly be higher. The typical high range estimate at the end of the century is about 66". There is a little bit of freeboard built into that but a higher scenario could be used and be refined as we move farther into stages of the design.

### Alternative 1: Cross Section **(Slide 24)**

This is an elevated Roadway with an accommodation for a Class 1 Bikeway about 12' wide. Width values are from the standard guide that require certain widths from the Highway Design Manual.

Question: What is the existing width and what is the potential width?

Answer: The existing width would be about the same if you combined the median, shoulders and two lanes in each direction; about 110' – 112'. The proposed width would be about 126'.

### Alternative 1: Footprint Reach A **(Slide 25)**

Question: What is the dimension of fill on Alternative 1: Footprint Reach A?

Answer: Between 30' and 40'

Question: Is this in Caltrans ROW?

Answer: That is still to be determined because we don't have the exact alignment.

Question: Have you looked at the width and potential need for drainage?

Answer: Not in great detail but we did allow for drainage when we did the cost estimate.

### Alternative 1: Living Levee Concept **(Slide 27)**

Question: Reach A – currently levee protected. Would some of the assumption be that you would have something that dissipates wave action in a protected area because at some point it might not be protected? On either side of Black Point there is currently levee protection. Reach A is easier to picture because there is less wetland and it would sit on top of it. Reach B would have a living levee sitting on a previously living marsh – harder to picture. If you had this in Reach A, then what is the advantage? Is it because it might become unprotected?

Answer: Yes.

Question: How is the railroad track affected?

Answer: It has to be raised or moved to the south, depending on where the alignment would be. They run from SR 121 to almost Atherton Ave. so it would be about 3.5 miles. There is an existing levee system on Reach A that protects it but not from SLR. Current 100yr storm surge + SLR would overtop it.

Question: Does the RR act as levee in some portions?

Answer: Yes. The railroad runs parallel to Hwy 101 to Atherton Ave.

Alternative 1: Roadway on Levee Conceptual Cost Estimate **(Slide 28)**

- The Napa River Bridge will not be replaced for any of the 3 alternatives.

Question: Is the environmental mitigation cost rolled into the support cost?

Answer: Yes

Question: Estimate includes replacing existing bridges but does it include any considerations for new overpass interchanges, especially at SR 121?

Answer: Yes

Questions: Is the cost of \$300M - \$470M inclusive of /contingency and the soft cost?

Answer: Yes. The two estimates, order of magnitude include the soft costs. The basis for contingency is that it's likely that future costs will go up - we don't know when it would be built so its current estimate is that it will appreciate over time. Because there is such limited information in mapping; it is very dynamic and costs change with the detail of design. The contingency actually increases with changes.

Question: Is this a CPI inflator? No, it's not. It's an uncertainty inflator. This is if you built it now, right?

Answer: Yes. They go up. This is if we build it now. We should keep track of inflation cost over time and uncertainty associated with the process. We should keep them separate so we say which is which.

Alternative 2: Design Consideration Span Length vs. Bridge Structure Depth **(Slide 30)**

- The longer the span, the deeper your structure.
- A longer span and deep depth is more expensive, a shorter span with shorter depth is less expensive.

Alternative 2: Footprint Reach A **(Slide 31)**

- It costs a little more than the levee
- About 121' wide
- Provides the same features as the levee section other than the separation between the bikeway and the shoulder roadway is reduced.

Alternative 2: Footprint Reach B (Slide 32)

- For medium to long spans of 50' column to column, up to 120' to 150'
- Usually used when you have a clearance of at least 15', this type of structure is used.

Question: Because we don't know a lot about the depth to bedrock, how much does that change the cost? How much is the cost related to pier depth?

Answer: The deck costs more but the pier is 10% to 20% more if the pier depth is doubled.

Question: Caltrans currently has requirements for how storm water is managed off facilities and since there is a marsh under there, do you think those new requirements for storm water management would place a large additional cost on a structure like this to clean it up before it hits the ground?

Answer: Will have to look into that, don't really know the costs.

Question: What percentage of the total cost is the roadway and structures cost of the \$1B – \$2B because if you have a lower percentage but a higher base cost than your total support cost will be a lot higher.

Answer: The percentage of the base construction cost including the contingency review is about 75% of the capital costs.

Question: How much of the cost estimate looks into the removal of the pavement?

Answer: That is part of the contingency in there.

Question: Can you please explain the difference between Alternative 1 and 2 and between the bike lane and shoulder – is it a Class 1? How do you get a 17' shoulder?

Answer: There is a buffer, it's not a concrete barrier; it's a soft barrier which allows water to flow through rather than a solid barrier. There is a wider buffer on Alternative 1 compared to Alternative 2. For the 17' shoulder, the median requirements are from the Highway Design Manual. In the event that the road needed to be widened, you would be able to accommodate another lane and have a 5' wide shoulder.

Question: It is not related to emergency lane access?

Answer: No, it is for future widening.

Question: Two different concepts – Reach A is fill, Reach B is elevated causeway. Do you have to have both all the same for the entire length? Is there any economy associated with using less expensive techniques in Reach A than the raised elevation/causeway in Reach B?

Answer: The environmental impacts and footprint is less for Alternative 2 than Alternative 1.

Question: What change in cost do you see – is it proportional to the cross sectional width?

Answer: You have fewer impacts so you have less in terms of materials and fewer impacts if you are doing a levee option and also a causeway structure. Can't say what the percentage would be but would say it would be proportional.

Question: You assume the 3' SLR – when would be the time the current roadway becomes unusable?

Answer: There are segments of the levee system that become vulnerable in the 12" – 24" SLR change. It's hard to assign an exact time but somewhere between now and 2050.

Question: Assuming a minimum of 10 years for construction we should be safe by 2040?

Answer: We are making localized improvements to the existing levee system where the existing level is vulnerable which will buy you more time.

Question: What is the current plan from SMART?

Answer: SMART doesn't go on Hwy 37, it goes to Napa and Sonoma. SMART owns the track and connects to the national grid and elected officials are interested in passenger service in the future. In Reach A the tracks run parallel and Reach B the tracks go to the north toward Sonoma and wrap around towards Napa Junction. Have not looked at SLR.

Question: Will there be frontage road access for hunting club and birdwatching activities or will those be impacted?

Answer: Those access points would be impacted and how they would be connected still needs to be determined.

Question: What are the trade-offs ecologically of the two? Better hydrologically connection? Can you quantify benefits?

Answer: We are looking at that.

Alternative 3: Roadway on Piles – Concrete slab bridge causeway **(Slide 34)**

- 50' – 120' between columns, clearance of 10'-20'
- Is appropriate for shorter spans.
- Depth structure is less than Alternative 2.
- Footprint is similar to Reach A & B.
- Smaller columns but more of them.
- Less expensive than Alternative 2.

Question: Because of more piles than the pier, do the drilling costs change?

Answer: They are smaller and have fewer impacts.

Question: What is the total area that would be covered by the pilings?

Answer: We are looking at 42" wide columns with spans every 40'. Alternative 2 has a column width of 5.5' wide every 90'. Alternative 3 has more impacts to wetlands because of putting in more piles.

Remarks:

- Reach C – The Napa Bridge, the Bike/Pedestrian less than adequate – consider the costs for that.
- Strongly suggest getting environmental information and include that in next steps.

Question: Will the new bridges have bike lanes separated?

Answer: Yes, they will be separated by barriers – should have fully screened barriers.

Question: Will you look at other methods, try to dial in costs and sit down with engineering for a constructability review.

Answer: Yes, we will review that.

Question: Has the cost of doing nothing been reviewed? Pollution takes place sitting in traffic. There is no representation from commuters.

Answer: This is still being developed. The EIR will address those impacts. In the first phase of the project, we did look at potential noise and air quality impacts on communities, mostly on Reach C in Vallejo.

Remarks: This highway has not been improved since 1926.

Question: Has anyone looked at a no project alternative?

Answer: In a typical highway planning and retrofit project, we would be 10 years in front of anything actually happening now. We are pretty far before alternative examination and quantification unless our process goes a lot faster. We are setting the stage for how we compare alternatives, including no project alternatives.

Remark: It would be nice to see conceptual design of the intersections. Does the cost include acquisitions? I don't think Caltrans has enough ROW.

### **Discussion - Balancing the Various Constraints – Fraser Shilling, UC Davis**

- Funding
- Presence of Endangered Species Habitat
- Sea Level Rise
- Benefits of Different Structure Types
- Existing Corridor Access and Transit Possibilities

*Please see complete slide presentation at the end of these minutes (Slides 1-5).*

Question: The existing problem on Reach B needs to be fixed now. Why isn't it a priority?

Answer: People will start to notice as the Bay Bridge and other places hits the radar. Highway 37 will become less important.

Remark: The congestion from Hwy 37 is pushing traffic into Napa Valley. Because of the diversion, it is putting more of a strain on the existing infrastructure, it's a regional problem, not just a Hwy 37. It is a North Bay problem. It has to be put on a higher level.

Remark: We do have the Executive Director from Sonoma County Transportation Authority present. The Supervisors from four counties are meeting now to talk about Hwy 37. The political priorities seem to be funding and completing the narrows and Hwy 101 and capacity of 180. Hwy 37 comes in 2<sup>nd</sup> place to both those areas. It could be a private/public partnership as we move forward we are completing an MOU and talking about who might be the lead agency and how we move forward with Caltrans.

Remark: Also to add to the credit of this current effort, it really spurred the conversation between the four counties and prioritizing SLR.

Remark: I'm involved with Marin County, SLR coastal side. The price tag is enormous and we don't see anybody coming up with any good funding streams. The public is not interested in funding any highway expansion. We are going to be asking is this road essential to access and safety? You don't really need it. Many of the problems are caused by the Raceway was poor permitting. If you widen it, it will only fill up with traffic again. I think a 4-lane Reach B is not a good idea.

Remark: A scenario of "No Highway" was looked at – whether or not we put a causeway across, it does cause harm going across the marsh that we care about and there is the cost. Moving the traffic primarily to 80 & 580 was posed as an idea. Another was a tunnel which also has the same effect of removing the impact on the marsh. With competition from other sea level rise adaptive projects 10-20 years from now, it will be less of a priority. Most elected officials are not aware this process is going on – it has to be raised to a political level and we shouldn't wait to do that.

Remark: There are opportunities to elevate 37 by bundling the benefits. Long term estuary improvements to our delta. There is opportunity here, not just the highway but ecosystem restoration on par with Delta restoration projects. We need to band together as North Bay residents.

### **Discussion – Benefits of Different Structure Types – Fraser Shilling, UC Davis**

*Please see complete slide presentation at the end of these minutes (Slides 6-7).*

### **Discussion – Existing Corridor Access & Transit – Fraser Shilling, UC Davis**

*Please see complete slide presentation at the end of these minutes (Slides 8-12).*

Question: Options might be to look at the landscape scale. Is there some way of leapfrogging these concepts where you have structure where you need an aperture for water movement. Look at driving down GHG impacts by reducing the amount of concrete. Maybe it is 1 lane in each direction.

### **Highway 37 – AirSage Sample, 15 Highest Travel Flows (Slide 11)**

We are considering transit with a study done by AirSage. Solano County, Sonoma County and I'm sure Napa and Marin helped as well. They looked at the uses of the highway – who is going where as the basis for a future transit feasibility study to address the different modes and mobility uses of the highway. They found that there are a lot of sources of trips – these are the trip origins on an average weekday during the day using Highway 37.

Question: Necessity – how marsh/estuary would change over time with SLR. Would that type of wetland be around? It might be different habitat in the future with SLR.

Answer: The marsh dynamic is a huge moving target. It is part of this study. The previous study looked more at environmental issues.

Question: Is there an Alternative to remove the Highway?

Answer: Yes, and to realign the highway/traffic to I80.

Question: Storm water will be a huge impact. Future traffic needs. Instead of a 120' section you have 80' section. Will it be a part of the design element?

Answer: It will be looked at now since it has been brought up repeatedly. Another would be to have a free lane where you have 2 lanes in the commute direction and you alternate the use of the center lane. Exceptions to the Design Manual do occur with special circumstances. The first target would be the 17' for both extra lanes and that will take care of 24' right there. Two 12' wide extra lanes. There is a limit as to many versions we can look at due to time.

Remark: Look at Our Coast our Future (OCOF) website to plug in different scenarios.

### **Next Steps**

The next meeting will be held in December 2015 or January 2016.

Meeting adjourned at 12:05pm



# SR 37 Sea Level Rise Adaptation Engineering Concept Design & Cost Estimates

Joy Villafranca, PE  
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*Highway 37 Stewardship Study  
Stakeholder Meeting – Novato, CA  
August 21, 2015*

# Presentation Outline

- Study Area Reaches
- Conceptual Design Context
- Reach Characteristics and Constraints
- Conceptual Designs and Cost Estimates
- Key Design Findings
- Next Steps and Stakeholder Feedback

# SR 37 Study Area Reaches



# Conceptual Design Planning

- Evaluate existing reach characteristics
  - Alignment length
  - Topography / elevation
  - Bridges
  - Intersections / roadway connections
- Assess constraints
  - Nearby utility corridors
  - Adjacent transportation features

# Conceptual Design Engineering



- Considers:
  - Existing characteristics and constraints
  - Proposed future configurations (e.g., 4 lanes vs. 2 lanes)
  - Sea level rise, storm surge, and waves
  - Feasibility and constructability
  - Some environmental considerations



- Does not consider:
  - Exact future alignment location
  - Construction phasing or staging
  - Comprehensive environmental considerations

# Conceptual Design Cost Estimates

- Order-of-magnitude estimate
- Considers:
  - Construction items (e.g., pavement, barrier, fill, drainage, structure, lighting, striping)
  - Right-of-way and utilities
  - Environmental mitigation
  - Support costs (e.g., administration, planning, engineering, ROW, construction management)



# Conceptual Design Cost Estimates

- Basis of Estimates
  - Construction costs based on published Caltrans Cost Data information
  - Contingencies: Compensates for use of limited information, 30%-50% at this stage
  - Support costs: % of Construction Costs





# Reach Characteristics and Constraints



# Reach A: HWY 101 to SR 121

## Existing Characteristics

- Length  $\approx$ 7.1 miles
- 2 lanes in each direction
- 50-foot wide unpaved median separated by beam barrier
- 4 bridges: Novato Creek, Simonds Slough, Atherton Ave OC, Petaluma River
- 2 interchanges: HWY 101 and Atherton Ave
- 2 major at-grade intersections: Lakeville Rd and SR 121
- 3+ minor access road/driveway intersections

# Reach A: Intersection SR 37 & Lakeville Road



# Reach A: Petaluma Bridge



# Reach A: HWY 101 to SR 121

## Constraints

- Northwestern Pacific Railroad runs parallel to SR 37 between HWY 101 and Atherton Ave
- PG&E transmission line located  $\approx$  180 feet south of SR 37 between HWY 101 and Simonds Slough Bridge
- Utility poles located  $\approx$  20 feet north of SR 37 between Petaluma River Bridge and SR 121
- Truck pullout area east of Lakeville Road in each direction

# Reach A: Looking East Utility Polls and PG&E Towers



El Camino Real

# Reach B: SR 121 to Mare Island

## Existing Characteristics

- Length of reach  $\approx$  9.6 miles
- 1 lane in each direction
- 10-foot wide paved median separated by concrete barrier
- 4 bridges: Tolay Creek, Sonoma Creek, Walnut St OC, Napa River
- 1 interchange: Walnut St/Mare Island
- 2 at-grade intersections: Noble Road, Skaggs Island Road
- 6+ minor access road/driveway intersections including access to PG&E transmission station and trailheads

# Reach B: Looking West



# Reach B: SR 121 to Mare Island Constraints

- Northwestern Pacific Railroad crosses at-grade east of SR 121
- Utility poles:
  - 50' north between SR 121 and Sonoma Creek Bridge
  - 10 to 35 feet south between Skaggs Island Rd and Island No 1 intersection
- PG&E Transmission lines east and west of Sonoma Creek Bridge



# Reach B: Noble Road Intersection



# Reach B: Sonoma Creek Bridge





# Conceptual Designs and Cost Estimates

# Re-defining the HWY 37 Landscape



Bayou Lafourche, Louisiana

# Sea Level Rise Design Criteria Alternative 1 (Levee)

## Sheltered Reaches:

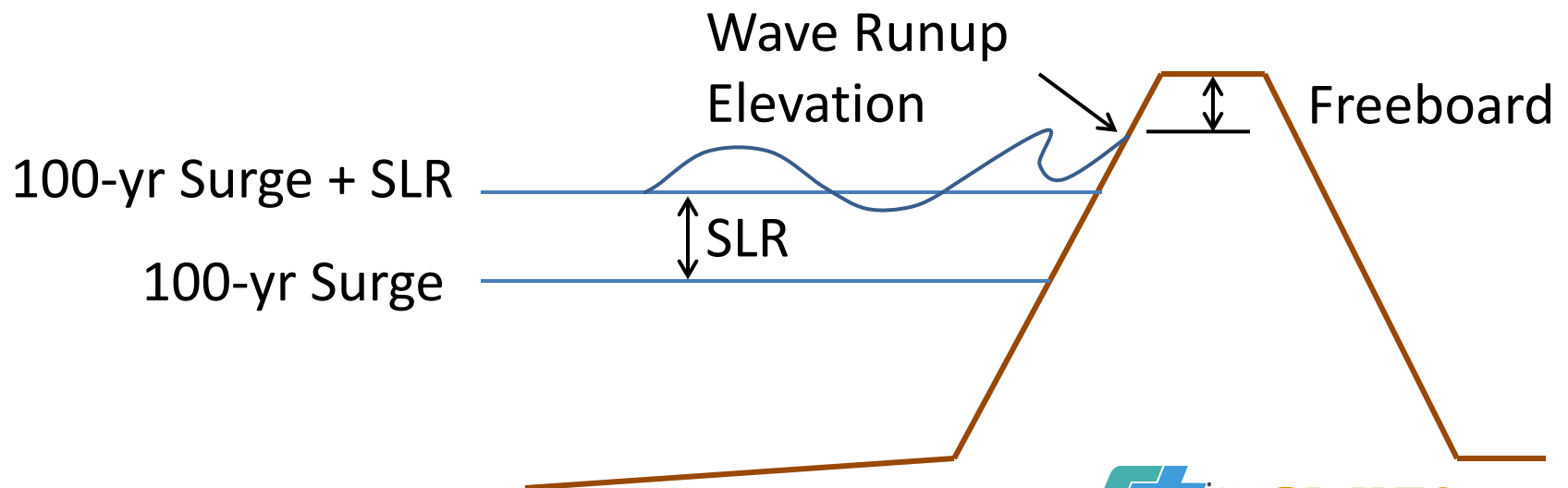
100-yr Storm Surge (10 ft NAVD88)

+ SLR (3 ft) + Freeboard (2 ft) = 15 ft NAVD88

## Exposed Reaches:

100-yr Storm Surge (10 ft NAVD88)

+ SLR (3 ft) + Wave Runup (3 ft) + Freeboard (1 ft) = 17 ft NAVD88



# Sea Level Rise Design Criteria Alternatives 2 & 3 (Elevated Structure)

## Sheltered Reaches:

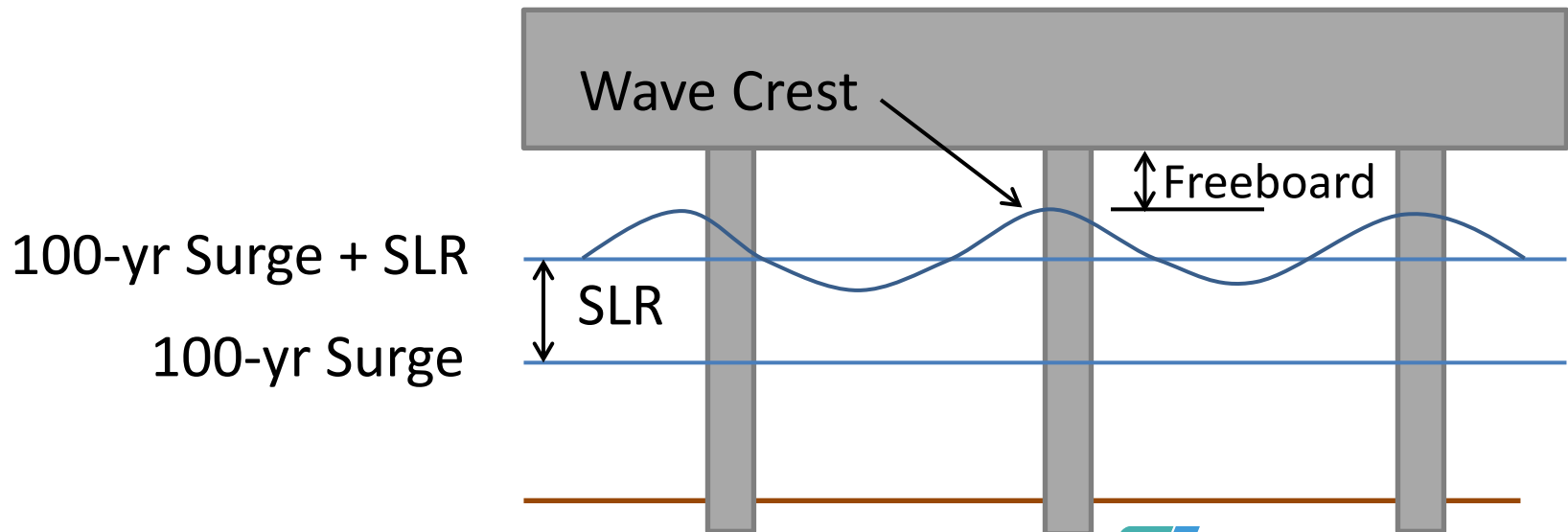
100-yr Storm Surge (10 ft NAVD88)

+ SLR (3 ft) + Freeboard (2 ft) = 15 ft NAVD88

## Exposed Reaches:

100-yr Storm Surge (10 ft NAVD88)

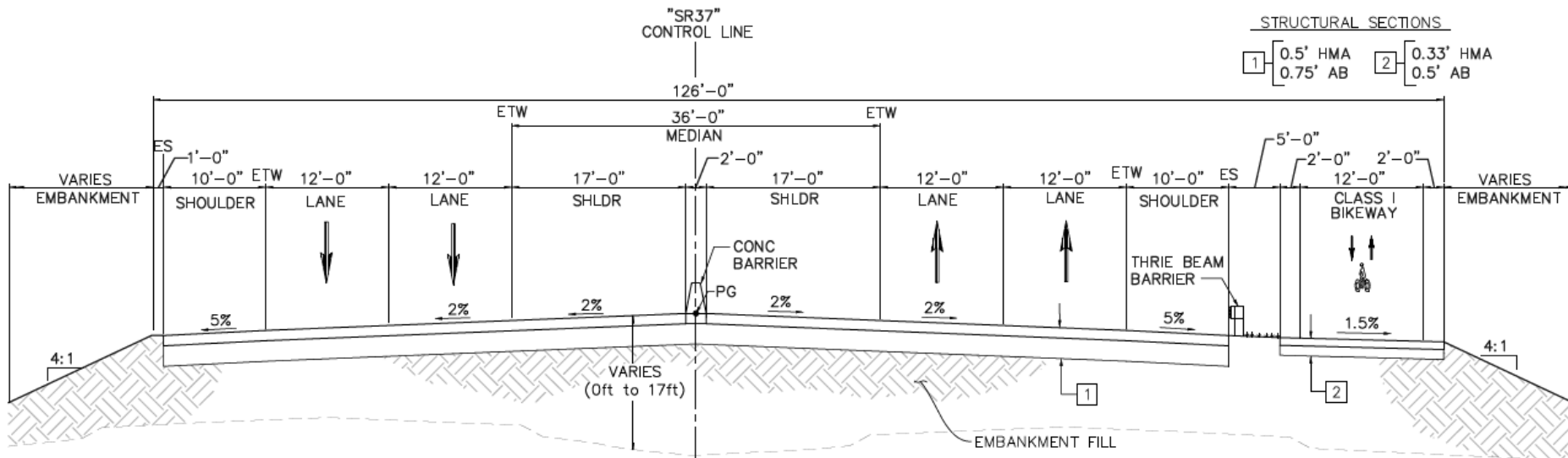
+ SLR (3 ft) + Wave Crest (3 ft) + Freeboard (1 ft) = 17 ft NAVD88



# Alternative 1: Roadway on Levee

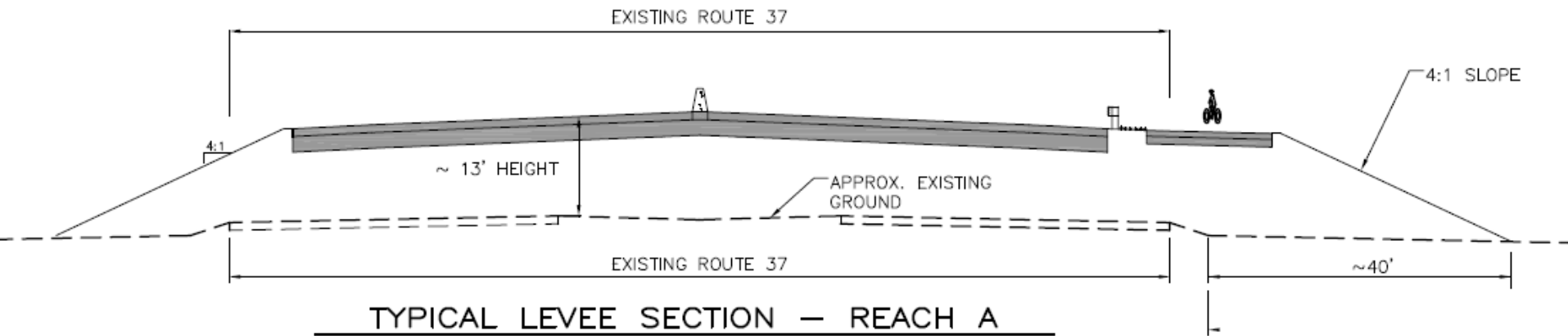


# Alternative 1: Cross Section

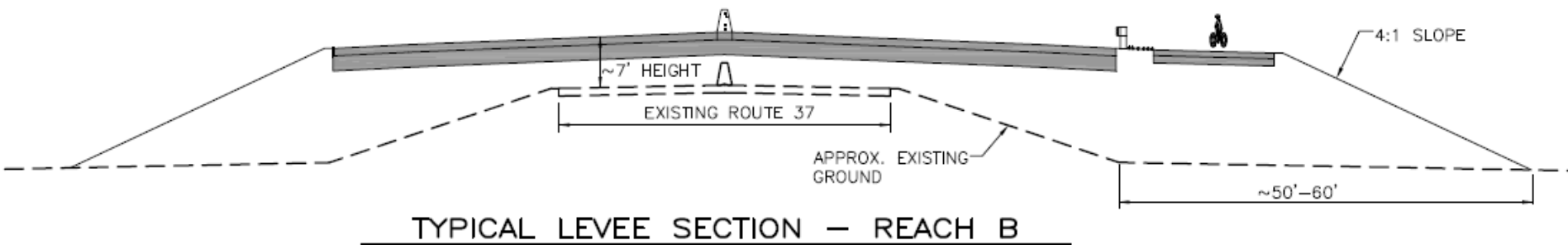




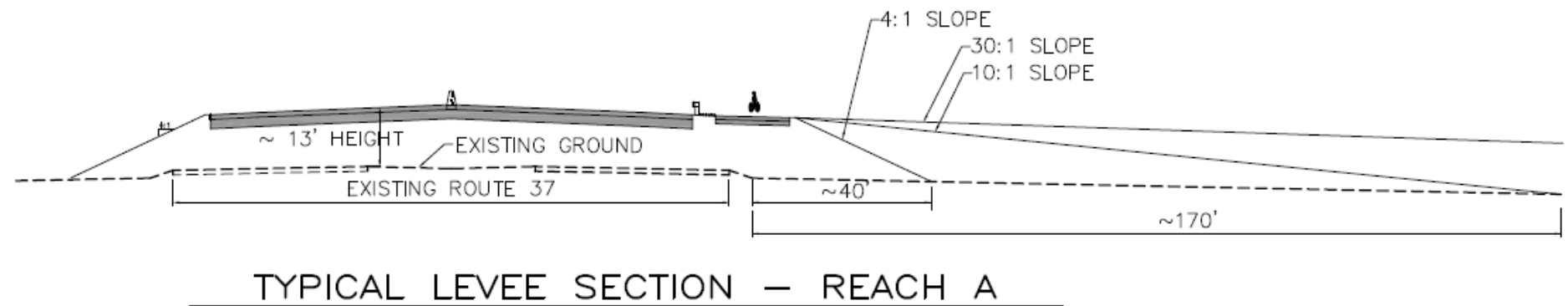
# Alternative 1: Footprint Reach A



# Alternative 1: Footprint Reach B



# Alternative 1: Living Levee Concept



Larger footprint to accommodate broader outboard slope for transitional and wetland habitat, as well as natural wave dissipation.

# Alternative 1: Roadway on Levee Conceptual Cost Estimate

- Reach A: \$300 Million
- Reach B: \$470 Million
- All existing bridges will be replaced
- Railroad tracks on Reach A will be relocated
- 40% Contingency on Roadway Construction
- 30% Contingency on Structures
- Support Costs are 50% of Roadway and Structures Construction Cost

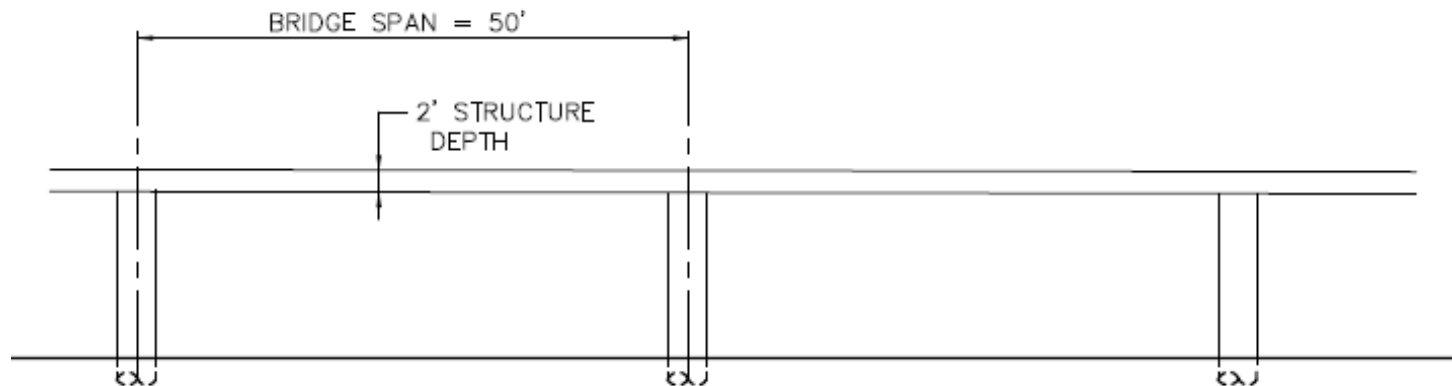
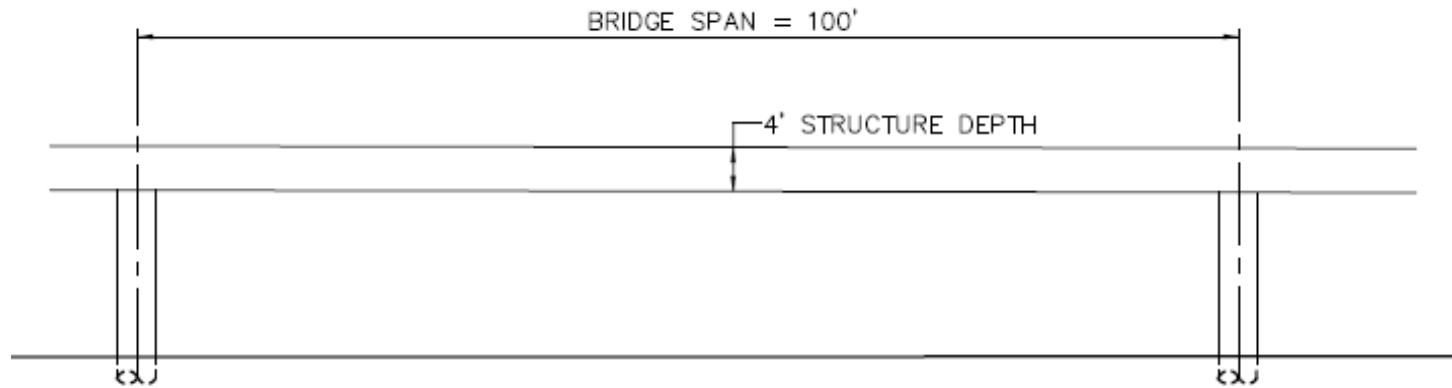
# Alternative 2: Roadway on Concrete Piers



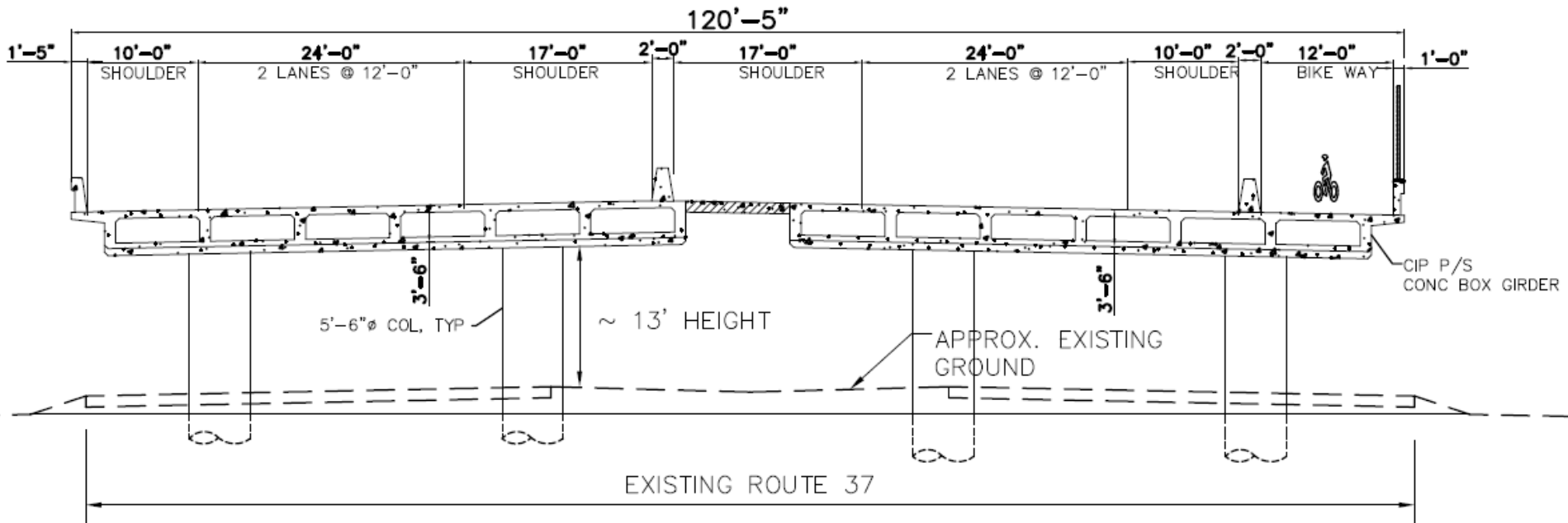
Concrete box girder bridge causeway

# Alternatives 2: Design Consideration

## Span Length vs. Bridge Structure Depth

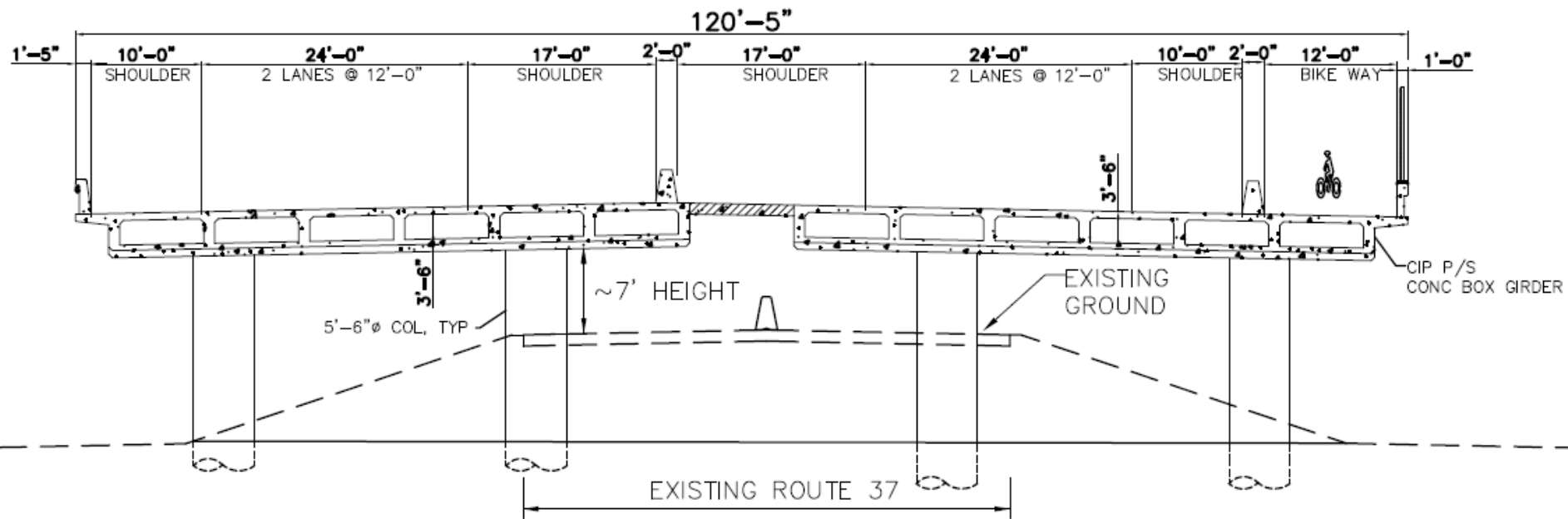


# Alternative 2: Footprint Reach A



TYPICAL ELEVATED STRUCTURE (BOX GIRDER)– REACH A

# Alternative 2: Footprint Reach B



TYPICAL ELEVATED STRUCTURE (BOX GIRDER) – REACH B



# Alternative 2: Roadway on Concrete Piers

## Conceptual Cost Estimate

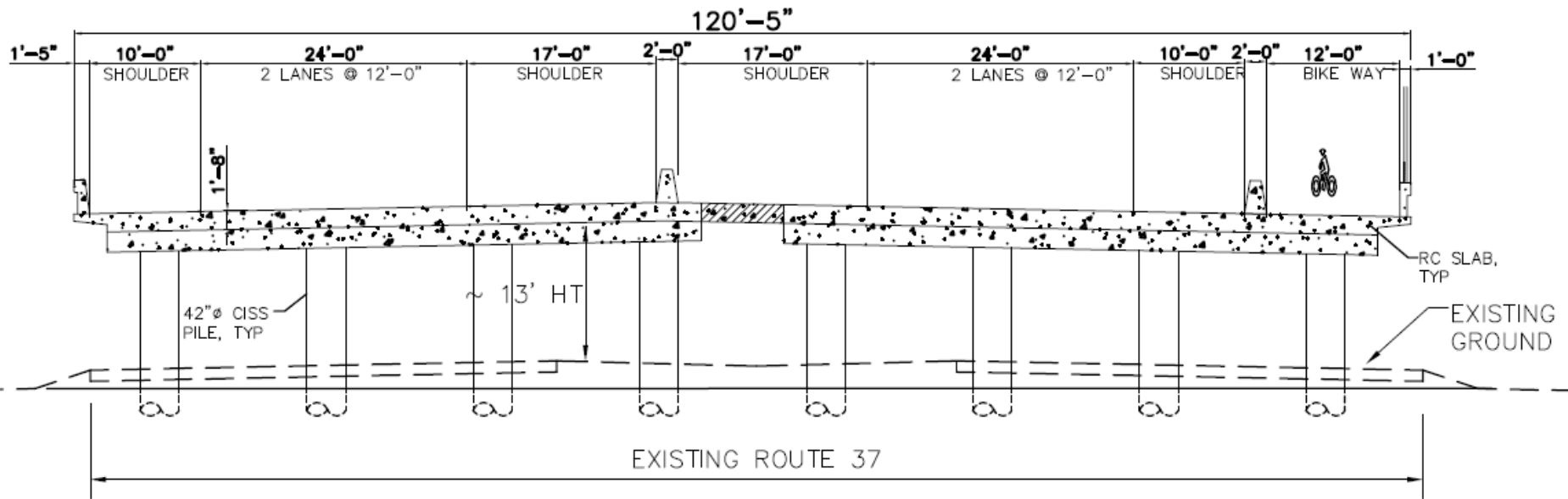
- Reach A: \$1.1 Billion
- Reach B: \$2.0 Billion
- 75% of Reach A will be on structure
- 95% of Reach B will be on structure
- All existing bridges will be replaced
- 40% Contingency on Roadway Construction
- 30% Contingency on Structures
- Support Costs are 40% of Roadway and Structures Construction Cost

# Alternative 3: Roadway on Piles



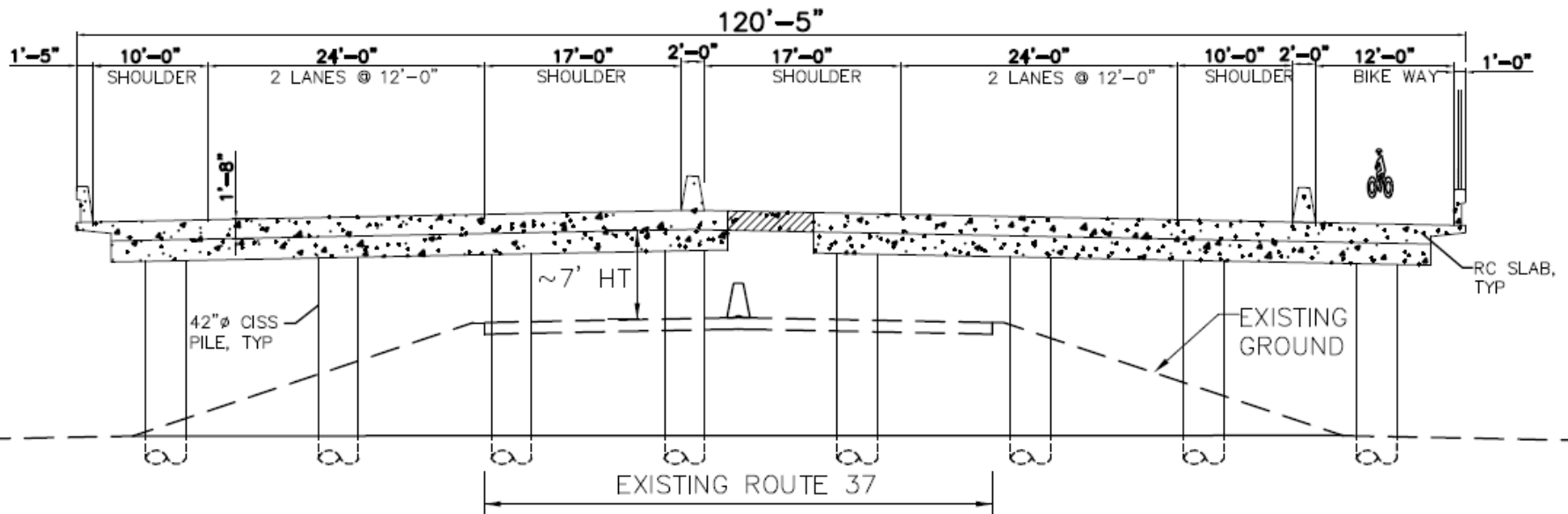
Concrete slab bridge causeway

# Alternative 3: Footprint



TYPICAL ROADWAY ON ELEVATED STRUCTURE (SLAB BRIDGE) –  
REACH A

# Alternative 3: Footprint Reach B




TYPICAL ROADWAY ON ELEVATED STRUCTURE (SLAB BRIDGE) —  
REACH B

# Alternative 3: Roadway on Piles

## Conceptual Cost Estimate

- Reach A: \$1.1 Billion
- Reach B: \$1.6 Billion
- 75% of Reach A will be on structure
- 95% of Reach B will be on structure
- All existing bridges will be replaced
- 40% Contingency on Roadway Construction
- 30% Contingency on Structures
- Support Costs are 40% of Roadway and Structures Construction Cost



# Key Conceptual Design Findings

101

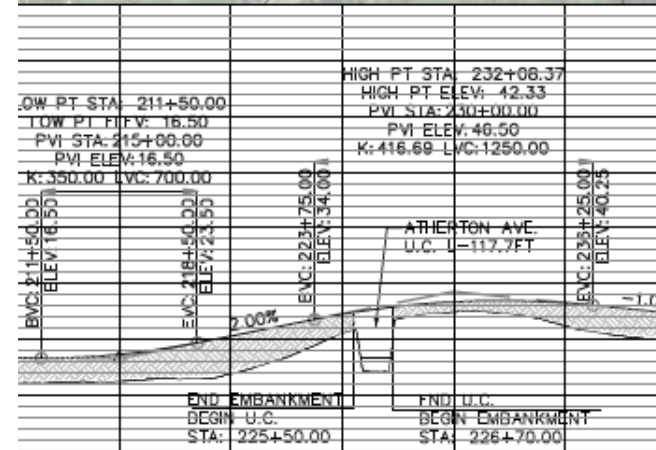
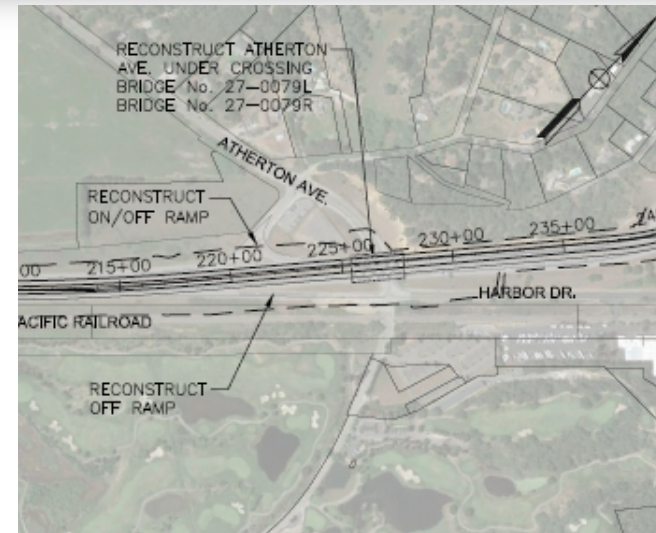
San Pablo Bay

80

# Reach A: HWY 101 to SR 121

## All Alternatives

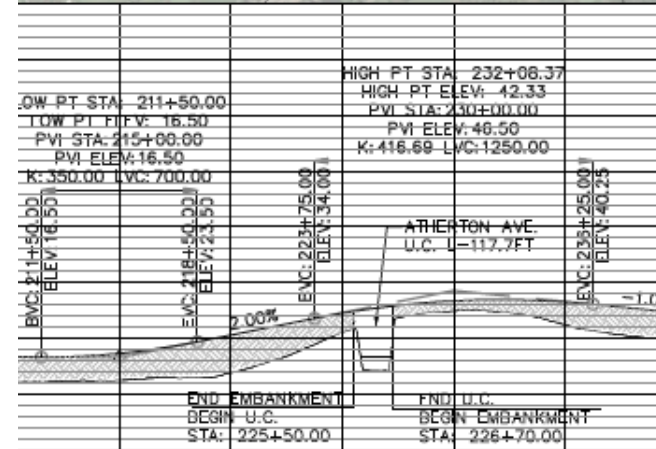
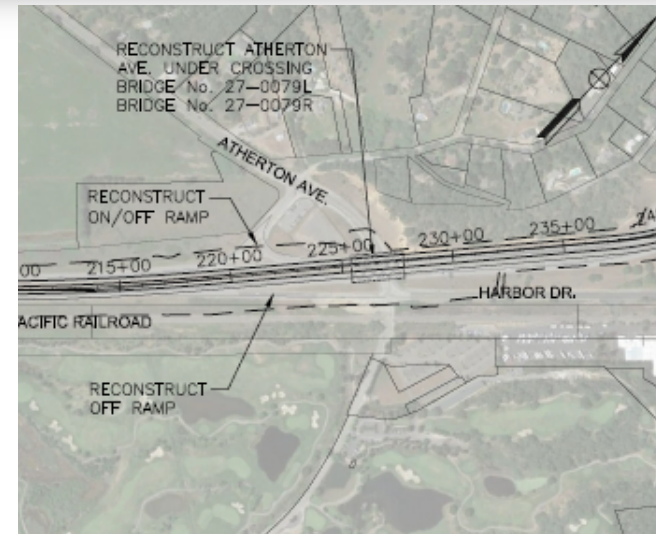
- Bridges
  - Replace Novato Creek, Simonds Slough, Atherton Ave Bridges
  - Widen or Reconstruct Petaluma Creek Bridge
- Intersections will require modifications if maintained
  - Lakeville Road, SR 121
  - Driveways and minor access roads



# Reach A: HWY 101 to SR 121

## All Alternatives

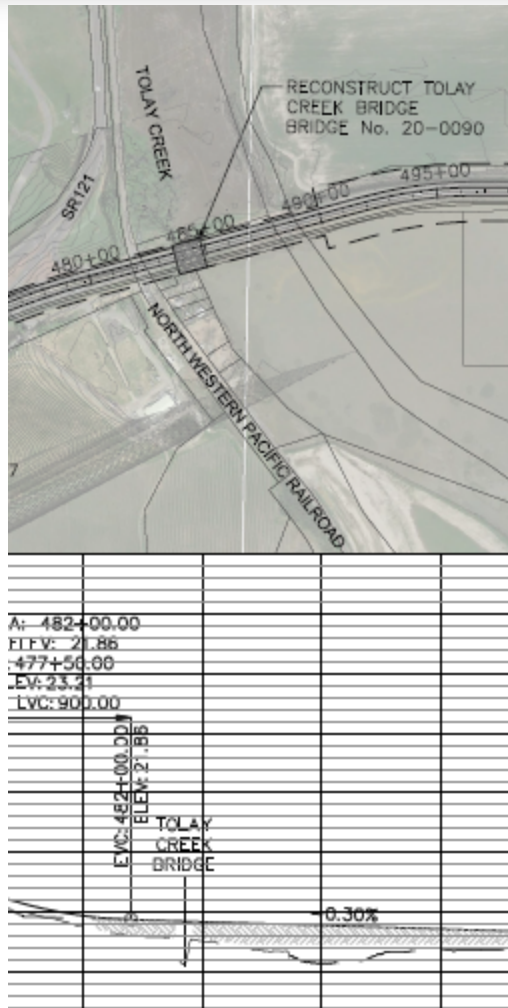
- Interchanges will require modifications of on/off ramps
- Railroad tracks may require re-alignment
- PG&E transmission lines and utility poles may require relocation





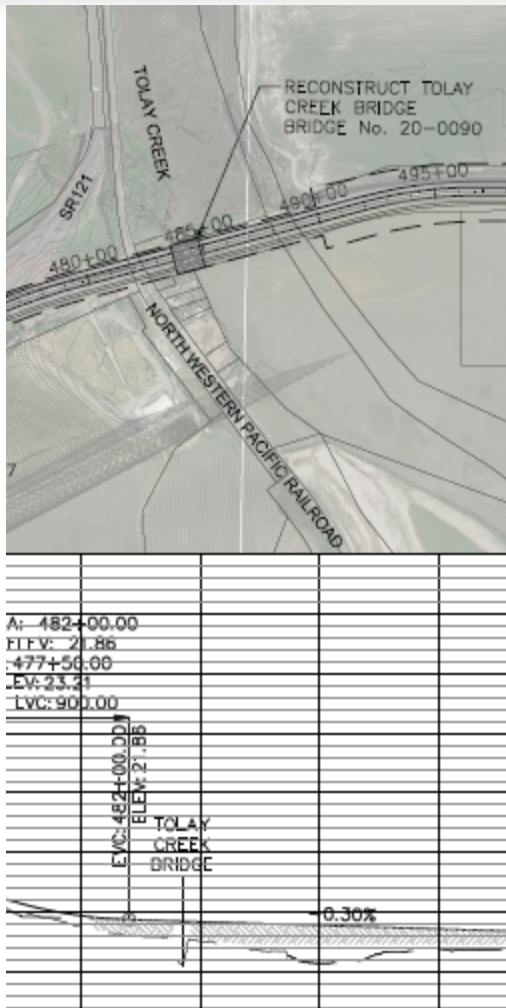
# Reach B: SR 121 to Mare Island

## All Alternatives



- Bridges
  - Replace Tolay Creek, Sonoma Creek, Walnut St OC
  - Modify west approach to Napa River Bridge
- Intersections will require modifications if maintained
  - Skaggs Island Road, Noble Road
  - Driveways and minor access roads including trailheads and maintenance roads

# Reach B: SR 121 to Mare Island All Alternatives



- Mare Island interchange will require modifications
  - Reconstruct west approach interchange ramps
  - Replacing Walnut Ave over crossing
- Railroad crossing east of SR 121 will need to be raised (or SR 37 raised higher)
- PG&E transmission lines and utility poles may require relocation

# Cost Estimate Comparison

| REACH | ALTERNATIVE |                         |                          |
|-------|-------------|-------------------------|--------------------------|
|       | 1 – Levee   | 2 - Box Girder Causeway | 3 - Slab Bridge Causeway |
| A     | \$300       | \$1,100                 | \$1,100                  |
| B     | \$470       | \$2,000                 | \$1,600                  |
| TOTAL | \$770       | \$3,100                 | \$2,700                  |

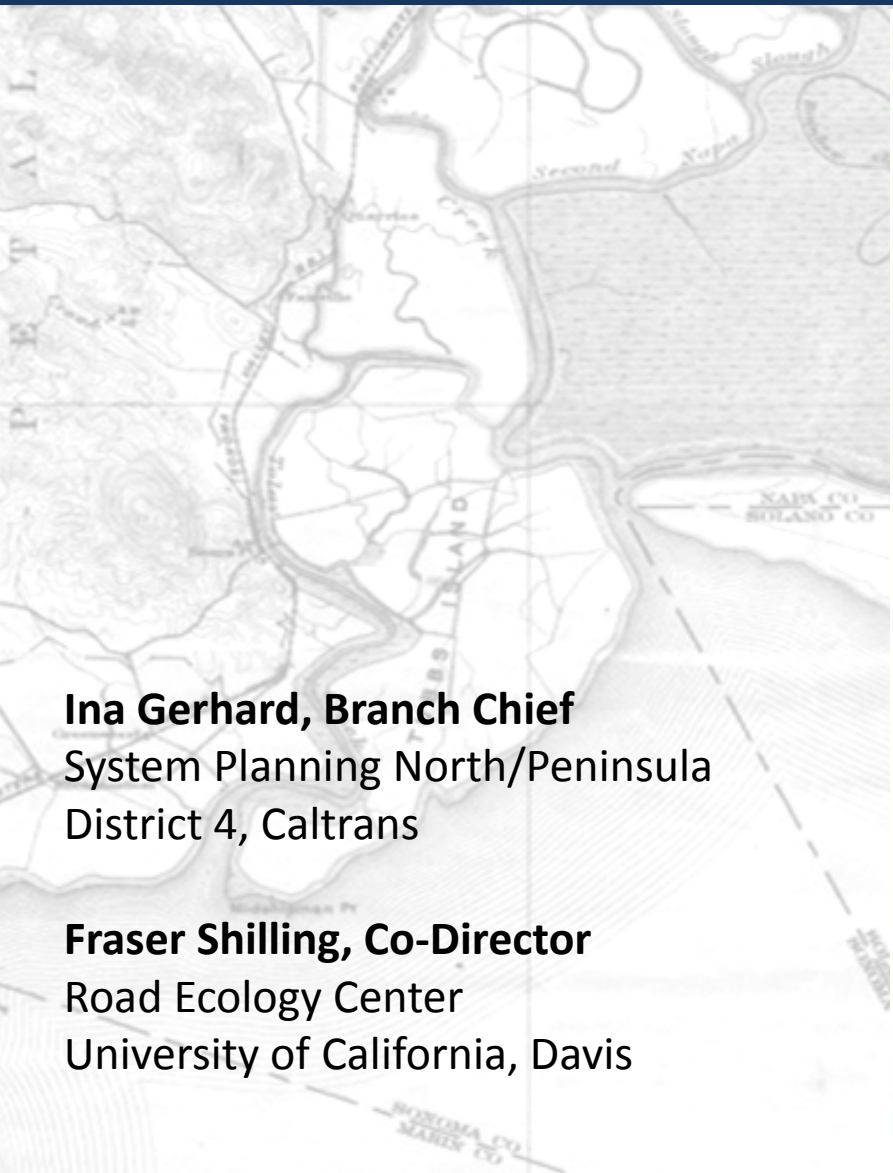
(\$ in millions)



# Next Steps and Stakeholder Feedback

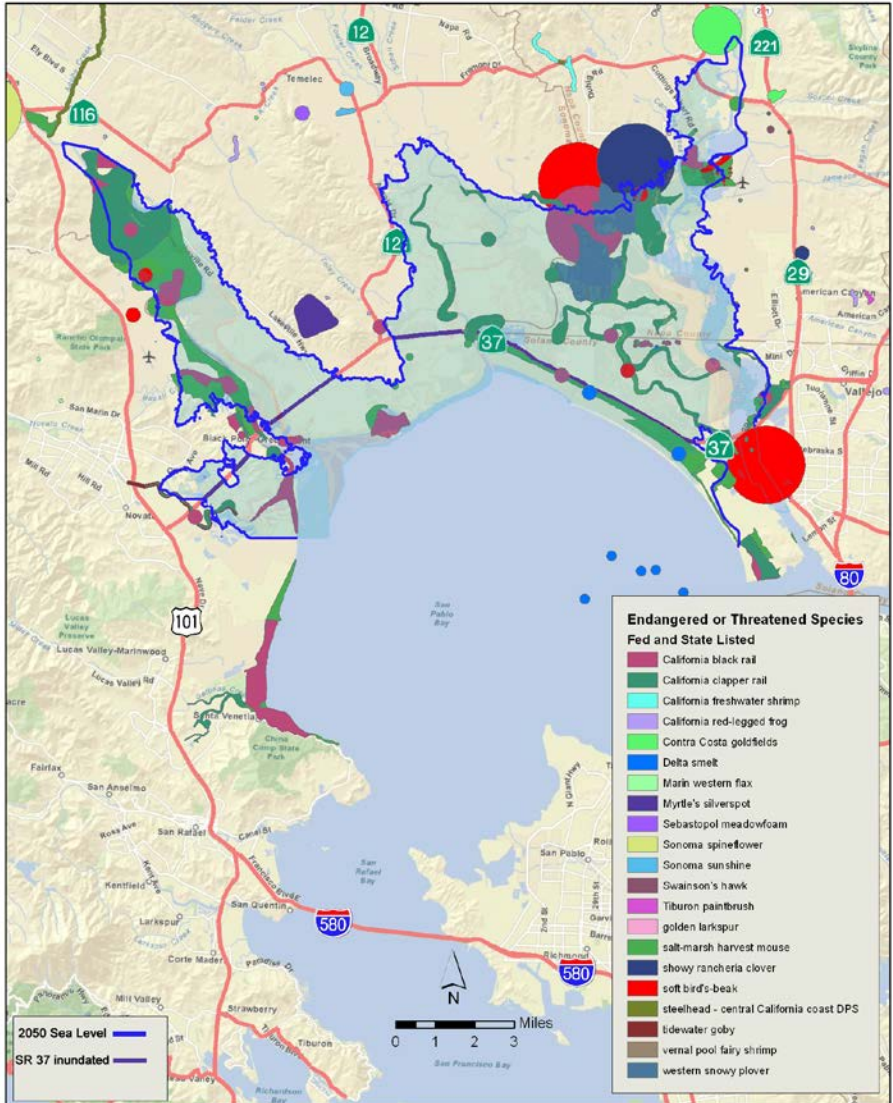
- Finalize elevated highway concept design plans
- Finalize order of magnitude cost estimates for each reach
- Prepare visualizations of selected alternatives

# State Route 37 Integrated Traffic, Infrastructure and Sea Level Rise Analysis



**Ina Gerhard, Branch Chief**  
 System Planning North/Peninsula  
 District 4, Caltrans

**Fraser Shilling, Co-Director**  
 Road Ecology Center  
 University of California, Davis



Listed Species Map

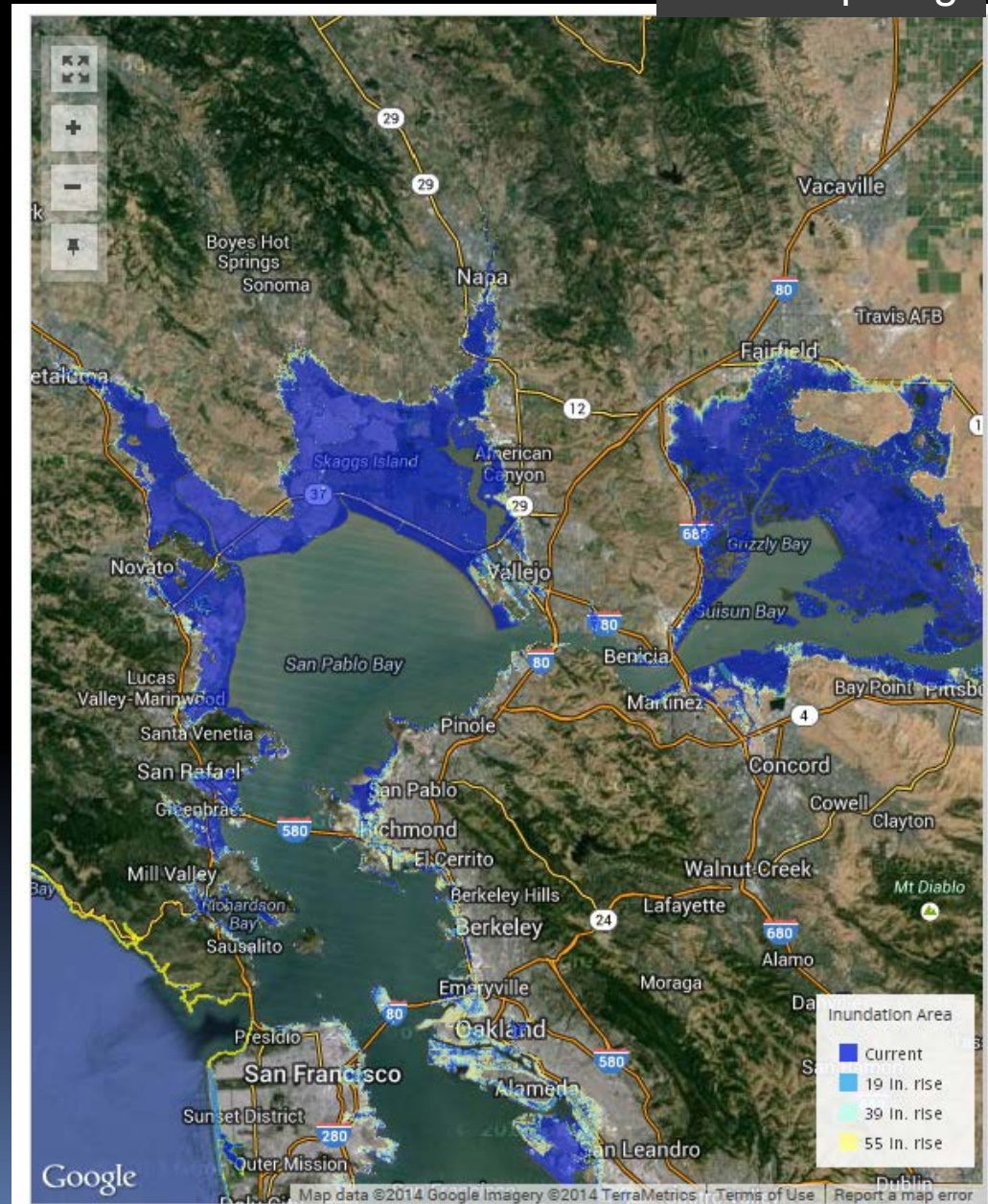
# Balancing Constraints

Funding

T&E Species

Sea Level Rise

State route 37 is possibly the most vulnerable of infrastructure in Bay Area. It also passes through extensive marshes and future marshes.

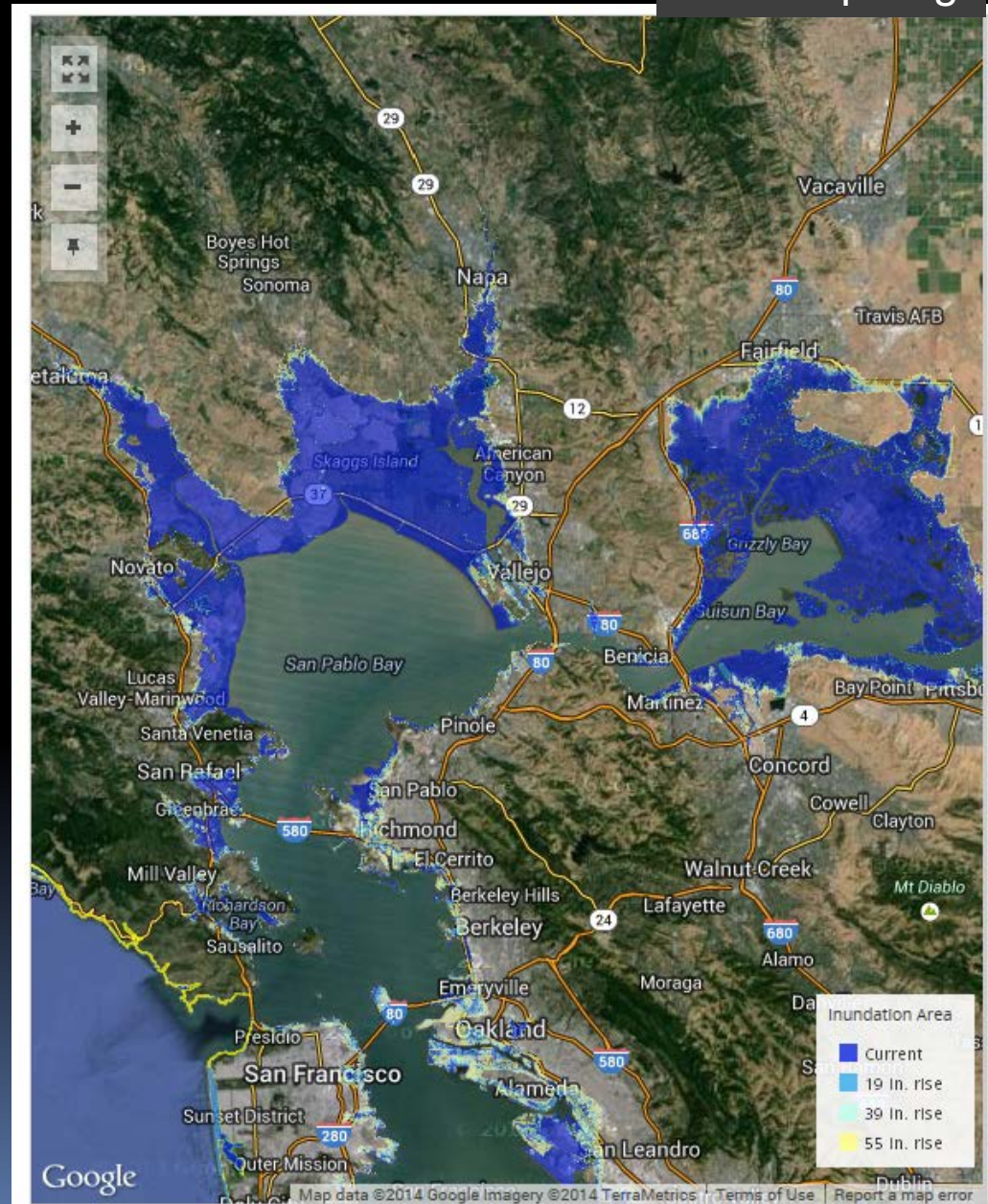


# Balancing Constraints

## Funding

State route 37 links communities regionally and inter-regionally  
It is eligible for multiple sources of funds

It may take \$1-2 billion to retrofit to be resilient and least-environmentally harmful

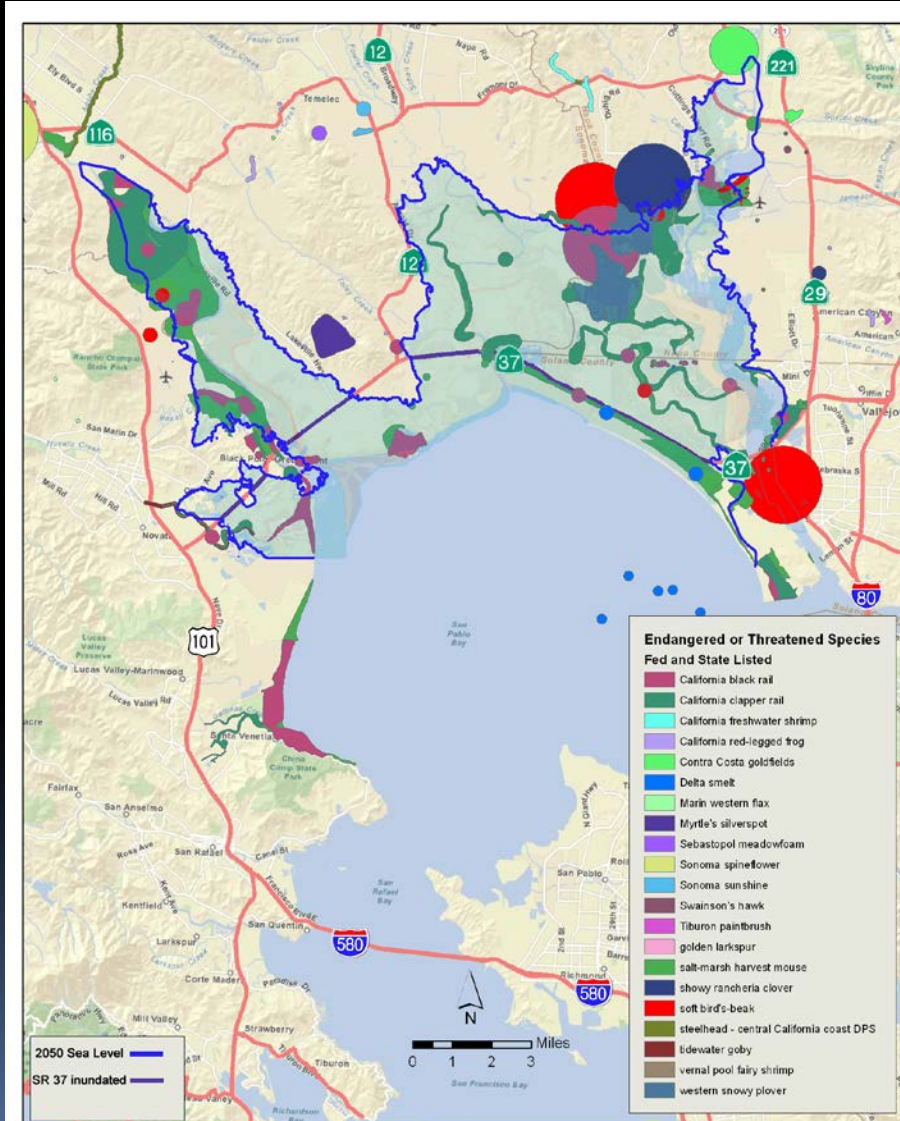


# Balancing Constraints

## T&E Species

State route 37 runs through extensive marshes that are natural, being restored, or that could be restored

It separates coastal and upland systems and its traffic is a source of wildlife mortality



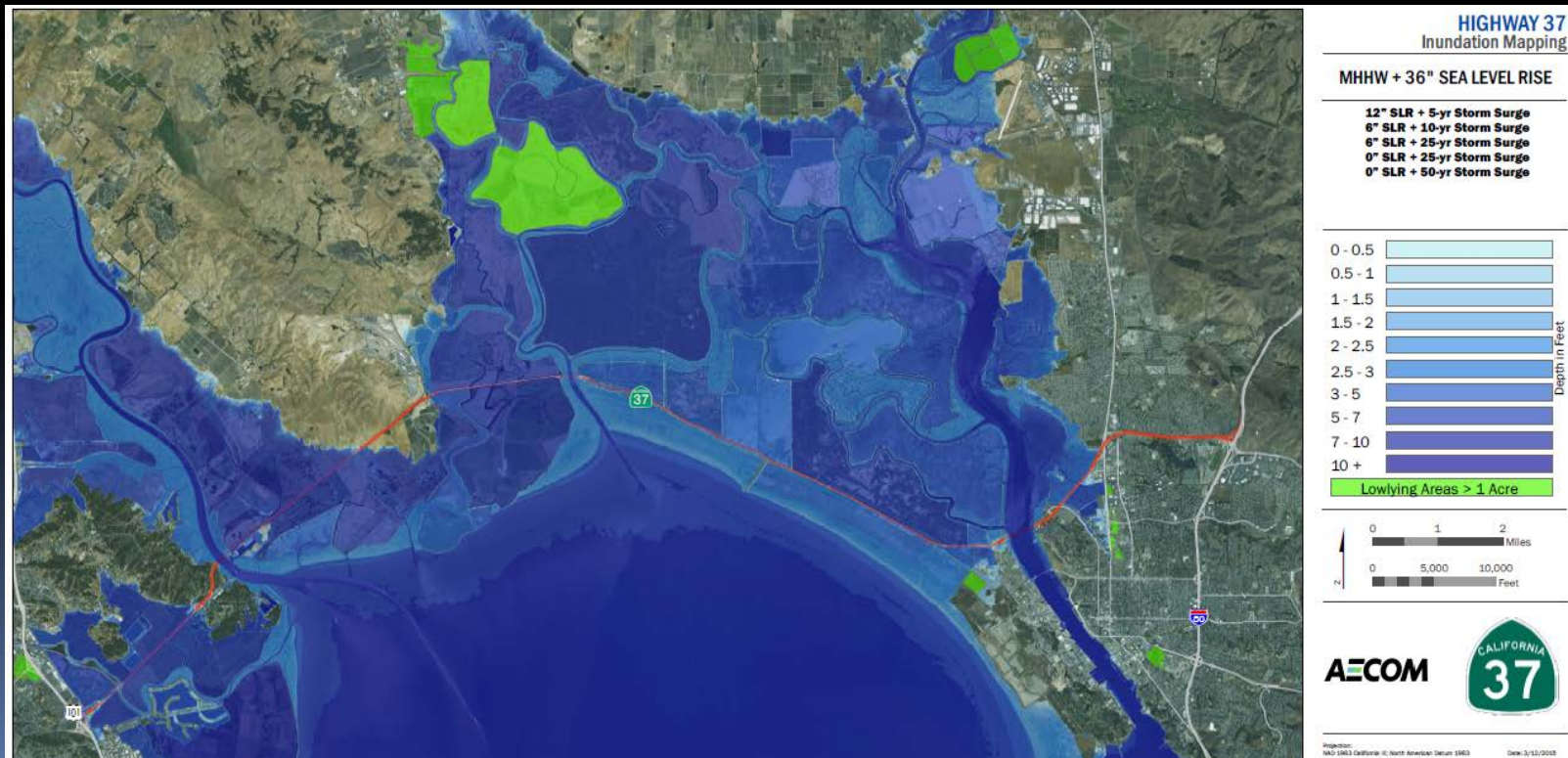
Listed Species Map



# Balancing Constraints

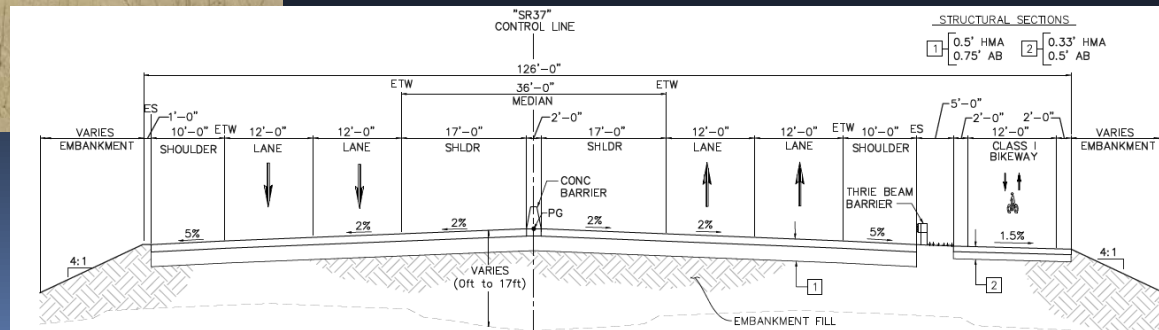
## Sea Level Rise

State route 37 is possibly the most vulnerable of infrastructure in Bay Area.



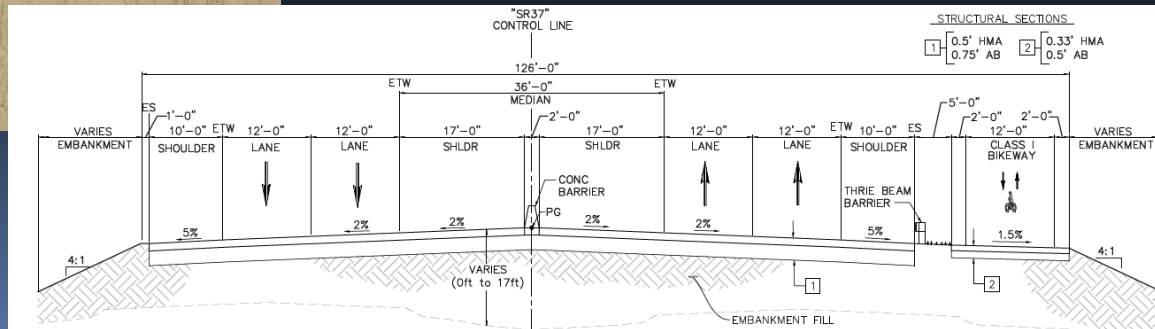
# Benefits of Different Structure Types

- Levee
- Causeway (over land)
- Bridge/causeway (over water)




# Benefits of Different Structure Types

- Cost
- Capacity
- Environmental/community benefits





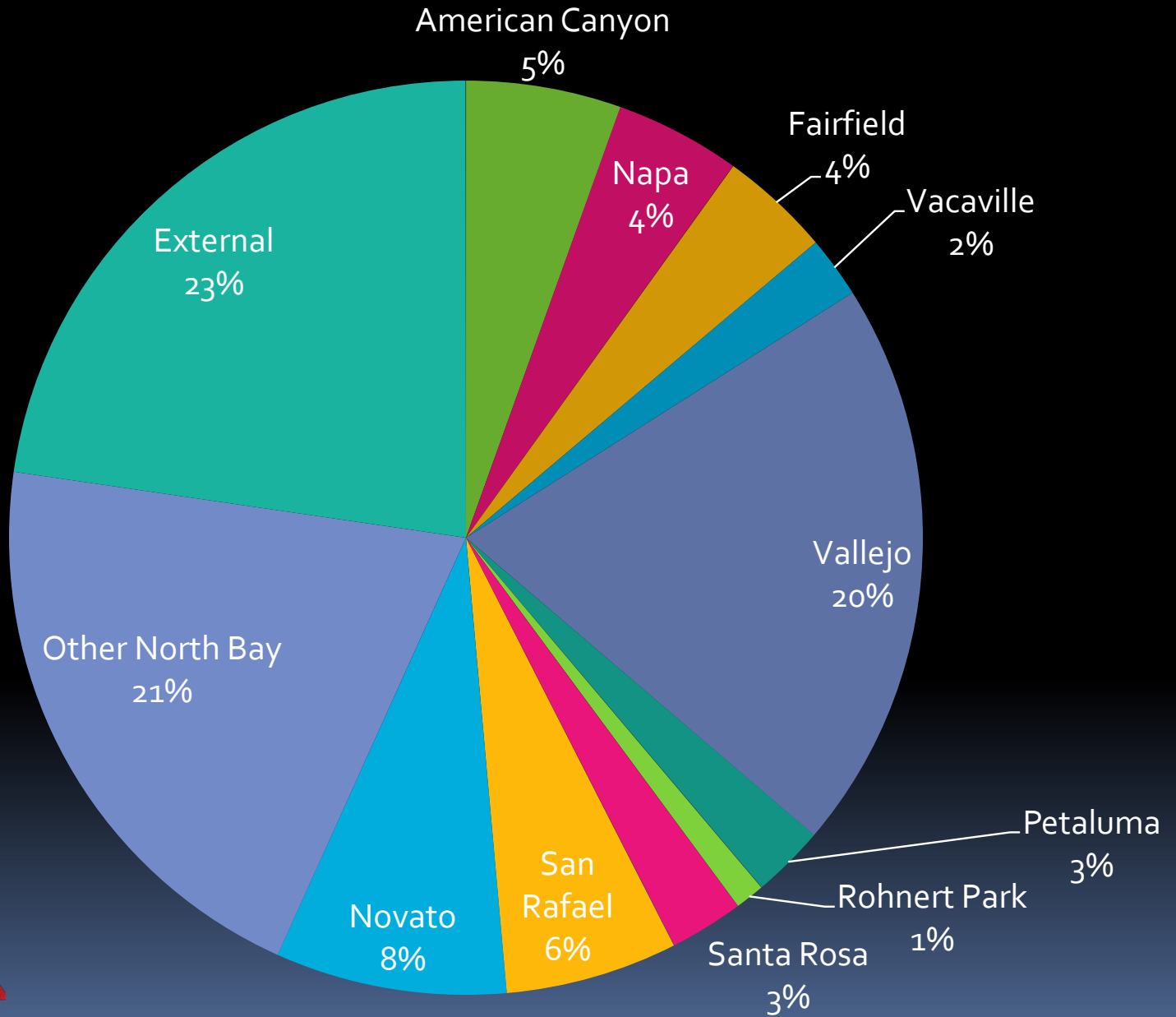
# Existing Corridor Access & Transit

- State highway links
  - Current use (AirSage study)
  - Bus, bicycle, trail ...
- 



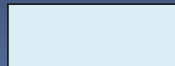
Analysis Zones:  
10 Cities  
4 Counties +  
External Zones

# Hwy 37 - Trip Origin Average Weekday (Sept. 2014)



# Highway 37 - AirSage Sample, 15 Highest Travel Flows

| Rank | ORIGIN                               | DESTINATION                          | ESTIMATED TRIPS |
|------|--------------------------------------|--------------------------------------|-----------------|
| 1    | East Bay                             | Vallejo                              | 2692            |
| 2    | Vallejo                              | East Bay                             | 2356            |
| 3    | Vallejo                              | American Canyon                      | 2225            |
| 4    | American Canyon                      | Vallejo                              | 1992            |
| 5    | Other Solano                         | Vallejo                              | 1803            |
| 6    | Southern Sonoma County/Sonoma Valley | Novato                               | 1703            |
| 7    | Vallejo                              | Other Solano                         | 1620            |
| 8    | Novato                               | Southern Sonoma County/Sonoma Valley | 1576            |
| 9    | Vallejo                              | Fairfield                            | 1389            |
| 10   | SF/Peninsula                         | Southern Sonoma County/Sonoma Valley | 1371            |
| 11   | Napa                                 | Vallejo                              | 1349            |
| 12   | Fairfield                            | Vallejo                              | 1251            |
| 13   | Southern Sonoma County/Sonoma Valley | Vallejo                              | 1220            |
| 14   | Southern Sonoma County/Sonoma Valley | East Bay                             | 1171            |
| 15   | East Bay                             | Southern Sonoma County/Sonoma Valley | 1160            |



Estimated travel occurs on 2 lane section of HWY 37 west of Mare Island.

# More Information

<http://hwy37.ucdavis.edu>

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