Report No: 14-219a
Meeting Date: March 25, 2015

Alameda-Contra Costa Transit District

STAFF REPORT

TO: AC Transit Board of Directors

FROM: David J. Armijo, General Manager

SUBJECT: Bay Bridge Contraflow Lane Design Options

ACTION ITEM

RECOMMENDED ACTION(S):

Receive a presentation on the findings of the Core Capacity Transit Study Contraflow Lane options and authorize the Board President to sign and submit a request letter to the City of San Francisco regarding the development at 525 Harrison Street.

EXECUTIVE SUMMARY:

Through the Bay Area Core Capacity Transit Study, the Metropolitan Transportation Commission's (MTC) recently completed an analysis of design options for the exit ramp from a future Bay Bridge contraflow lane. The results of the analysis identify the potential conflict with a proposed development at 525 Harrison Street in San Francisco.

As a result of the details in this analysis, Staff is requesting that the President of the Board of Directors submit a letter to the City of San Francisco formally requesting that the developer accommodate for a future contraflow lane exit from the Bay Bridge.

BUDGETARY/FISCAL IMPACT:

There are no budgetary/fiscal impacts associated with this report.

BACKGROUND/RATIONALE:

In 2011, AC Transit sponsored a study in conjunction with the Transbay Joint Powers Authority (TJPA) that measured and analyzed projected congestion along the Bay Bridge Corridor. The study concluded that the Bay Bridge Corridor would reach points of congestion and travel demand that would:

- affect the performance of Transbay bus service and the future Transbay Transit Center
- approach maximum available capacity for all transportation modes
- impact the economic vitality of downtown San Francisco

This study was intended to be an initial step toward a more detailed study that would examine potential improvements to relieve congestion and increase capacity along the Bay Bridge

Corridor, particularly the implementation of a contraflow lane on the lower deck of the Bay Bridge.

In July of 2014, the AC Transit Board President submitted a letter to the San Francisco Planning Director requesting that the City work with the project sponsor for a development at 525 Harrison (at the foot of the Bay Bridge) to not preclude a Bay Bridge contraflow lane from future consideration.

At the same time, the Metropolitan Transportation Commission (MTC) was awarded a $1 million Transportation Investment Generating Economic Recovery (TIGER) Grant to go toward a $2 million Bay Area Core Capacity Transit Study. The purpose of the study is to analyze capital projects that would relieve congestion and increase capacity into Downtown San Francisco, including the Bay Bridge Corridor.

Under this study, MTC authorized its project consultant to examine conceptual design options for the San Francisco exit of a Bay Bridge contraflow lane to the Transbay Transit Center Bus Ramps. The consultant developed three options that have different impacts on the 525 Harrison development. Overall, the options would impact 94 to 970 square feet of the development property depending on the option. The design options and analysis are included in this report as Attachment 1.

Based on this analysis and the City of San Francisco's Transit First policies that prioritize transit infrastructure investment, Staff recommends that the Board of Directors authorize its president to submit a follow-up letter to the July 2014 letter that specifically requests that the San Francisco Planning Commission only approve a development at 525 Harrison that can accommodate the footprint of the contraflow lane off ramp. The hearings for the development are expected to start in the next month. Attached is a draft letter for the Board's consideration (see Attachment 2).

ADVANTAGES/DISADVANTAGES:

The advantage of submitting a letter is that AC Transit is formally on record with a request to have the developer coordinate with the City of San Francisco on a design that can accommodate the off-ramp of a future Bay Bridge contraflow lane. This should force the developer or the City to formally respond. In addition, the letter best exemplifies AC Transit's significance in providing regional transit service to San Francisco along with the need to make this service a priority due to its benefit to the region.

Staff could identify no disadvantages to submitting the letter since it is non-binding. If the developer and the City take the letter into consideration, MTC may be required to study the Bay Bridge contraflow lane concept sooner in order to further develop designs of the off-ramp in coordination with designs for 525 Harrison.

ALTERNATIVES ANALYSIS:

The Board could elect not to send a letter or have it come from staff. However, the letter is AC Transit's primary action to alter the developer's plans and should therefore, come from the

District's highest ranking official that represents the needs of East Bay commuters to San Francisco.

PRIOR RELEVANT BOARD ACTIONS/POLICIES:

SR 14-219: Letter to SF Planning Commission re: 525 Harrison Development

ATTACHMENTS:
1: Contraflow Lane Exit Design Options Memorandum
2: Draft Letter to City of San Francisco
3: PowerPoint Presentation

Executive Staff Approval:	Aida R. Asuncion, Interim Chief Planning, Engineering and Construction Officer
Reviewed by:	Denise C. Standridge, General Counsel
Prepared by:	Robert del Rosario, Director of Service Development

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Memorandum

ARUP

To	Carolyn Clevenger, Metropolitan Transportation Commission (MTC)	Date	February 27, 2015
Copies	Aidan Hughes	Reference number	240763/MVI
From	Anthony Bruzzone	File reference	4-05
Subject	CCTS Contraflow Lane - Design Options for the San Francisco Exit to the Transbay Bus Ramps		

Summary

As part of the Bay Area Core Capacity Transit Study, MTC requested Arup to investigate conceptual designs to connect the lower deck of the Bay Bridge into the Transbay Transit Center Bus Ramp system, allowing for the development of a morning "contraflow" bus lane.

The study was requested because of a pending development at 525 Harrison Street. This private development is adjacent to the Bay Bridge and the site was previously identified as necessary for the development of a contraflow lane. The objective of the study was to identify ramp design options that satisfy Caltrans highway and bridge design criteria, allow reasonable bus operations, and minimize impact to the proposed 16-story residential project at 525 Harrison.

We identified three conceptual options to make the identified connection – all meet Caltrans criteria and provide reasonable bus operation. All impact the 525 Harrison site to some degree.

The project is one of the many strategies that will be evaluated as part of the CCTS. Given the time-frame of discussions between the City of San Francisco and the developer of 525 Harrison, MTC was asked to identify potential designs for the contraflow project in order to understand the impacts development on the site would have on the feasibility of construction of the contraflow lane. The analysis is meant to inform the City of San Francisco and AC Transit, but is not meant as official support for advancing the contraflow lane project.

Contraflow Lane Background

The Core Capacity Request for Qualifications (RFQ) issued by MTC identifies the contraflow lane in the AM peak as a bus service and infrastructure improvement alternative for the Transbay Corridor.

Memorandum

A contraflow lane on Bay Bridge into San Francisco during the morning commute period was a future improvement strategy analyzed in the *Bay Bridge Corridor Congestion Study,* which was commissioned by AC Transit and the Transbay Joint Powers Authority. Arup was the lead author of the Study, which was completed in 2011. The study will evaluate many short-, medium- and long-term strategies for the Transbay corridor.

AC Transit sponsored the 2011 Study to assess whether current transit priority strategies on the Bay Bridge would continue to be effective, and if not, identify alternatives for continued transit travel time and reliability priority. The study findings were that the current priority system would not be effective in the future, and that a contraflow lane system would maintain future competitive bus travel times and reliability between the East Bay and the new Transbay Transit Center, given the expected worsening of traffic congestion.

The contraflow lane would comprise the number 1 ("fast") lane in the eastbound direction of I-80 across the entire length of both the West and East Spans during the morning commute period only. A movable "zipper" barrier would separate the contraflow lane from eastbound traffic. Figure 1 shows a cross-section of the existing West Span of the bridge and the contraflow lane on the lower deck. The contraflow lane could be operated as a transit/high-occupancy toll (HOT) facility or as a bus/truck facility. Access into the contraflow lane from I-80, I-580, I-880, and Grand Avenue on the East Bay side would occur via new access points upstream of the toll plaza. Figure 2 shows the extents of the overall contraflow physical improvements.

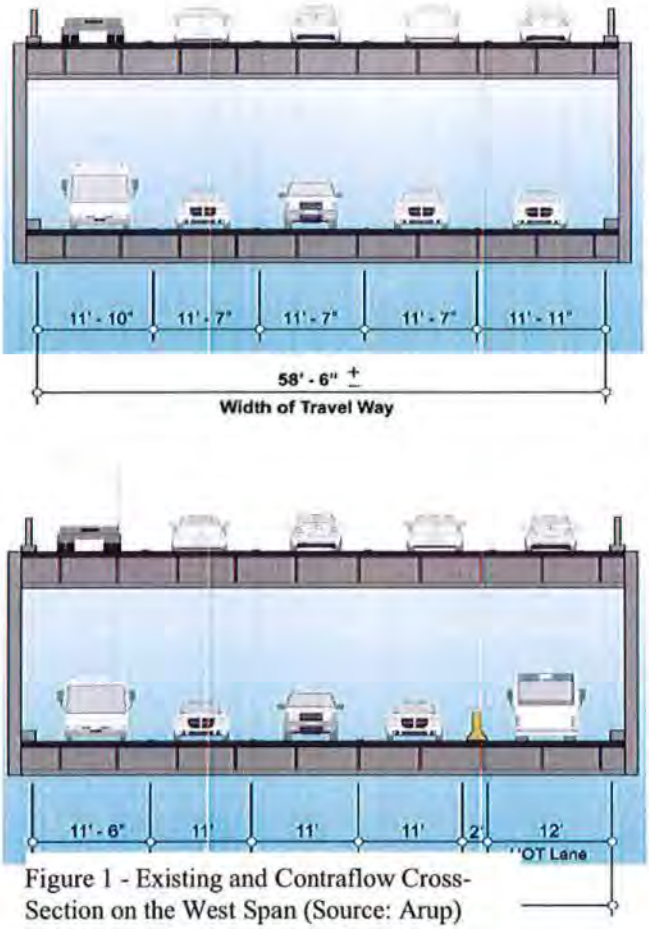


Figure 1 - Existing and Contraflow Cross-Section on the West Span (Source: Arup)

Bus egress from the contraflow lane on the San Francisco side of the bridge would occur from a new bus exit ramp that would connect to the Transbay Transit Center bus ramp, bridging the Essex Street ramp and allowing Essex Street to remain in service during contraflow hours. Other vehicles using the contraflow lane, either HOT automobiles or trucks, would use First Street as an exit ramp. This would require reversing the flow of First Street while the contraflow lane is operating.

The proposed bus exit ramp from the contraflow lane to the Transbay bus ramp needs to travel over the Essex Street on-ramp, but maintain adequate clearance under the Fremont off-ramp that exits the upper deck of the bridge. Figure 3 is a screenshot from the VISSIM traffic

microsimulation model used in the Congestion Study that illustrates the main components of the proposed exit.

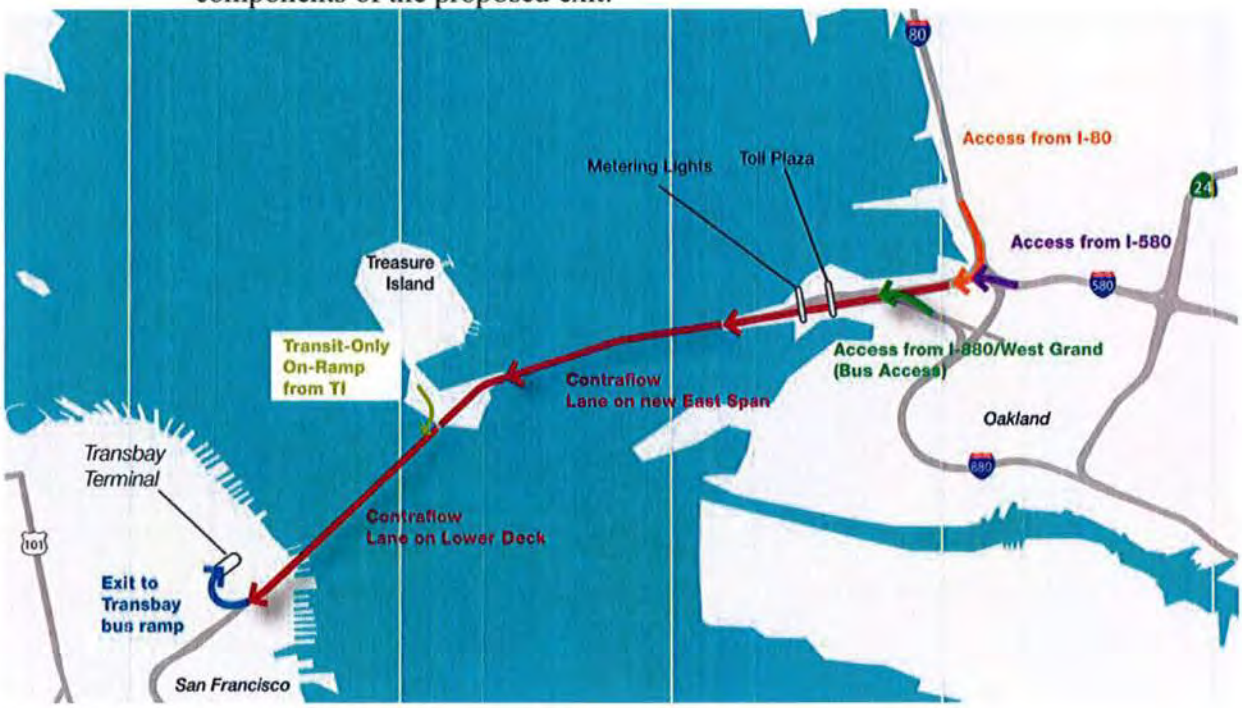
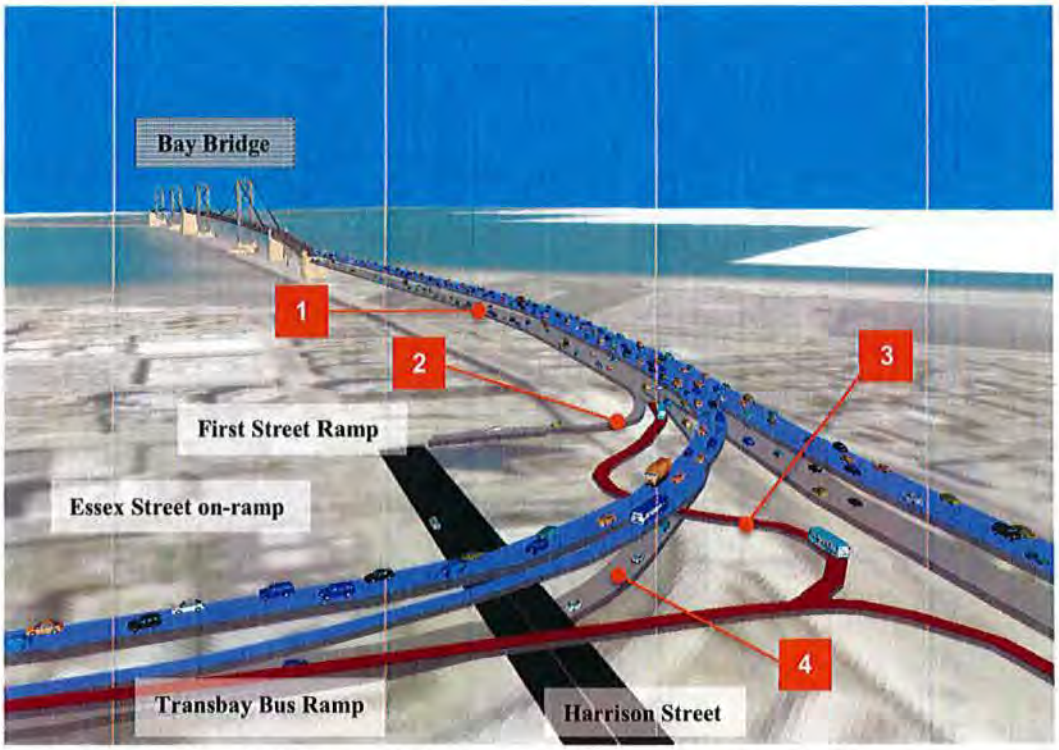


Figure 2 - Overall Extents of the Contraflow Project (Source: Arup)



1. Contraflow lane in No.1 lane on lower deck

2. HOT autos/trucks exit using First Street ramp (ramp reversed during the morning commute)

3. Proposed bus exit ramp connecting the contraflow lane to the Transbay bus ramp (travels over Essex and under the Fremont off-ramp)

4. Essex St on-ramp remains open

Figure 3 - Screenshot of the Proposed San Francisco Exit Point from the VISSIM Traffic Model (Source: Arup)

Design Methodology

The following describes the methodology for analyzing and designing the contraflow lane bus exit ramp options:

- **Data:** We utilized existing survey data and the latest CAD designs for the Transbay bus ramps in the analysis. This provided information on the Essex Street ramps, the Fremont off-ramps, and the TTC bus ramp system.
- **Field Inspection:** The Arup team walked the site on several occasions to take photos, discuss alignment alternatives, and observe the complexities of the study area.
- **Meetings with the 525 Harrison Developer:** Arup met with the developer Hines twice (Friday February 5th, Friday February 20th) to discuss the project and to show some of the initial design options. Hines provided PDF plans and renderings of their project, but did not provide any CAD plans of their site or their project.
- **Developed Design Criteria:** Arup developed a series of design criteria related to grades, vertical and horizontal curves, bus design speed, and vertical clearances. Cost and constructability impacts were also considered.
- **Design Process:** A standard engineering design process was utilized to generate the designs. The identified options represent a 1% to 5% design.

Design Options

Three alternatives for the San Francisco bus ramp exit were developed using standard design criteria from the Caltrans Design Manual, AASHTO, and other operating assumptions:

- The team agreed that the designs should avoid any impact to the columns on the West Approach and the Fremont off-ramp.
- All options impact 511 Harrison Street, currently an entertainment and event venue.

- Table 1 summarizes the design criteria used in generating ramp options presented in this report

Element	Standard Criteria	Source	Notes
Design Speed	20 mph	AASHTO §5.2 Table 5-1	Type of Terrain: Level, Urban Highway
Lane Width	12 ft desirable min for lane Additional breakdown width 8ft desirable min. Additional breakdown width 4ft min.	AASHTO §4.3 Lane Widths	
Roadway Longitudinal Grade, Level	0.3% min 6% max	HDM §204 Table 204.3 Urban Highways	
Roadway Longitudinal Grade, Rolling	0.3% min 7% max	HDM §204 Table 204.3 Urban Highways	
Roadway Cross Slope	1.5% to 2.0%	HDM §202	
Vertical Curvature K value (based on SSD)	Crest: 12 ft/% Sag: 26 ft/%	AASHTO 3-34 AASHTO 3-36; HDM §204	
Horizontal Curvature	Radius: 86 ft	AASHTO 3-25	
Superelevation	4% max 1.5% min;	HDM §202 Table 202.2 For drainage etc.	

Element	Standard Criteria	Source	Notes
Superelevation Rate	4% max	HDM §202 Table 202.2	
Sharpest curve with superelevation	500ft	HDM §202 Table 202.2	
Stopping Sight Distance	125 ft	HDM §201 Table 201.1	
Horizontal Clearance	2.0 ft	AASHTO §3.3.11 Table 3-30	
Vertical Clearance	16.5ft	HDM §309.2. 1) a)	

Table 1: Ramp Design Criteria

Another element considered in design is the proposed high-rise residential building located at 525 Harrison between First and Essex Streets. Figure 4 shows the site plan boundary and Figure 5 shows the parking level B1 and the ground level footprints.

Memorandum

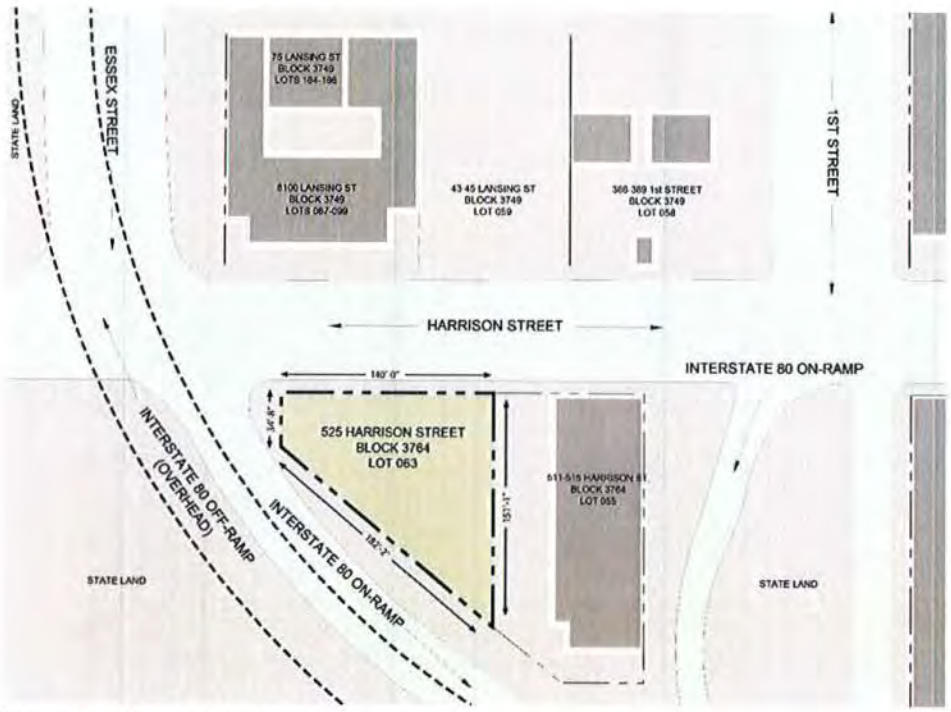


Figure 4 - 525 Harrison Site Plan Boundary

Figure 5 - 525 Harrison Parking Level B1 and Ground Level Building Footprint

The ramp design options can be evaluated based on the following suggested measures:

- **Adherence to Design Standards:** the design should conform to a 20 mph design speed and satisfy as many standards related to grades, vertical and horizontal curves, etc.

- **Conditions for the Bus Operators and Bus Riders:** minimize tight radii, grades, cross slopes, and the complexity of the curves for ease of bus maneuvers and more comfort for passengers;

- **Cost and Constructability:** the complexity of design and cost of the bridge structure over Essex Street is the main component, but the amount of required fill and other earthworks have also been considered. As stated previously, the team assumed that no existing columns should be impacted on the West Approach or the Fremont off-ramp.

- **Impact to 525 Harrison:** the amount of square feet into the building site each alignment option encroaches.

Option 1

The ramp Option 1 alignment and key dimensions are shown in plan view in Figure 6. An approximation of the Option 1 ramp vertical profile is illustrated in Figure 7. The Option 1 preliminary concept meets all design standards for a speed assumption of 20 mph, and assumes the ramp width to be 20 feet. It was assumed the bridge depth for the proposed ramp and Fremont ramp would be 5 feet and the road clearance for all structures would be 16 feet.

This option requires Essex Street to be lowered by approximately eight feet for the ramp to meet clearance requirements as it crosses above Essex Street and passes below the Fremont Street ramp. This will bring the Essex Street ramp to have an approximately flat grade (Essex Street currently has an estimated gradient of 5 percent) between Harrison and the contraflow ramp and then about a 7 percent grade from that point onto the bridge. The performance of Option 1 with respect to the evaluation criteria described previously in this memorandum is presented in Table 2 below:

Bus Travel Experience	Constructability	Impact on 525 Harrison
• Ramp curves have the tightest radii (sharpest turns) of all options • Ramp can achieve height needed to cross Essex Street and Fremont Street ramp with a 4 percent gradient (lowest of all proposed ramp options)	• Ramp has span length of approximately 81 feet as it crosses over Essex Street and under Fremont Street ramp • Requires Essex Street to be lowered by approximately 8 feet • Will require changes to TTC ramp/roadways to connect • Square bridge span	• Ramp clashes with a column of 525 Harrison • Ramp impacts 525 Harrison beyond the development's lower level area • Ramp impacts approximately 970 square feet per floor of 525 Harrison

Table 2: Option 1 Performance

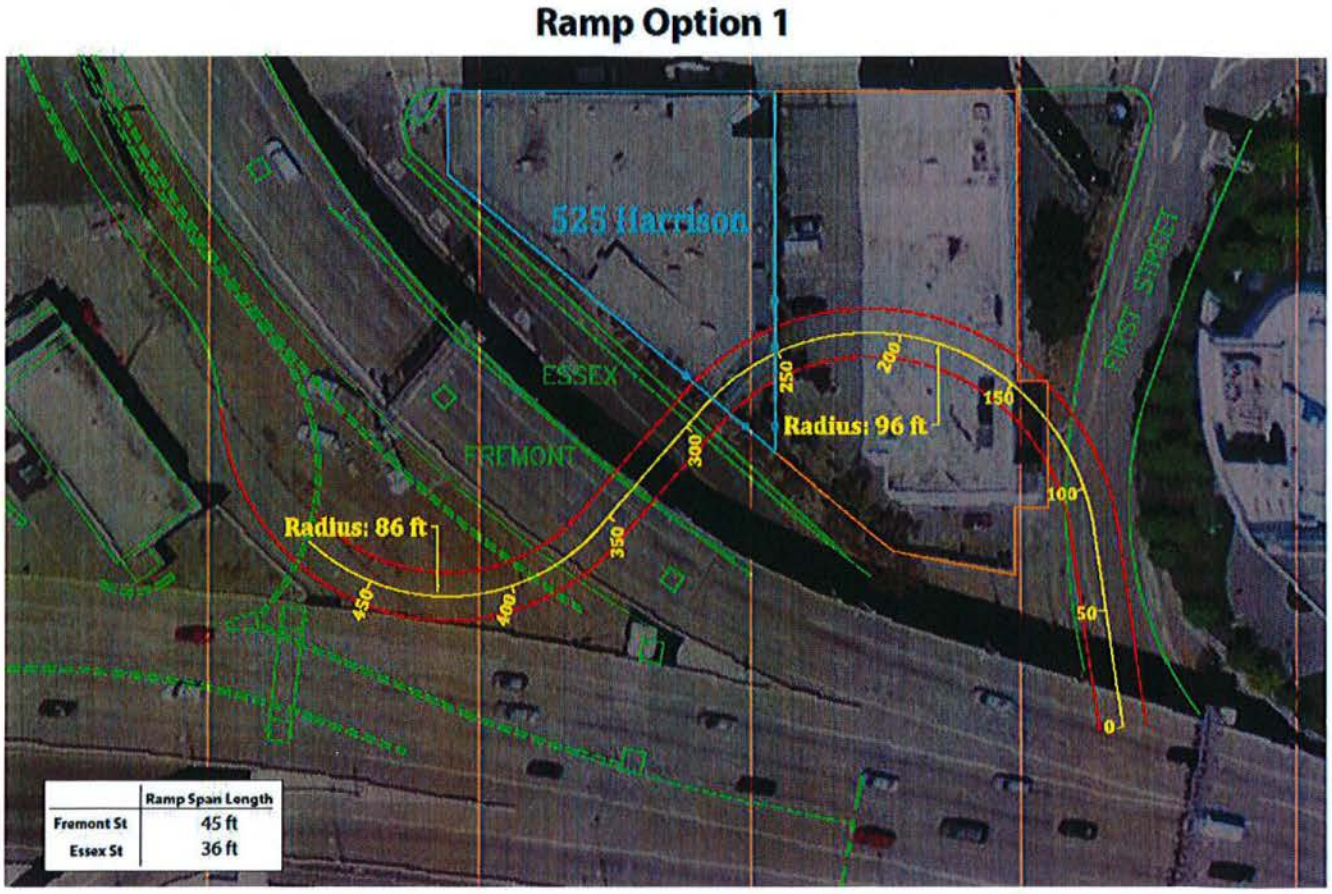


Figure 6: Option 1 Ramp Alignment

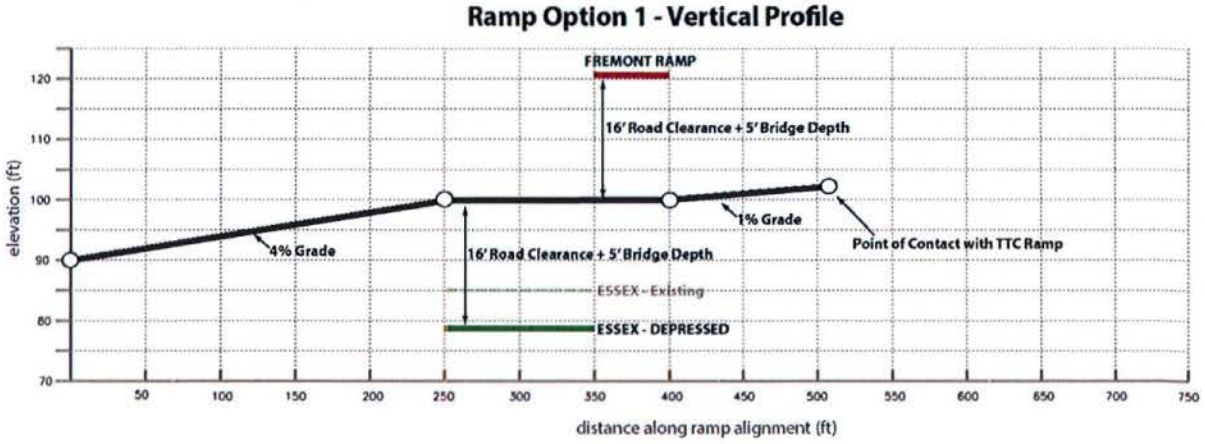


Figure 7: Option 1 Ramp Vertical Profile

Option 2

The Option 2 alignment and key dimensions are shown in plan view in Figure 8. An approximation of the Option 2 ramp vertical profile is illustrated in Figure 9. The Option 2 preliminary concept meets all design standards for a speed assumption of 20 mph, and assumes the ramp width to be 20 feet. It was assumed the bridge depth for the proposed ramp and Fremont ramp would be 5 feet and the road clearance for all structures would be 16 feet.

This option will require Essex Street to be lowered a little further than for Option 1. Essex Street would drop by approximately 10 feet for the Option 2 ramp to meet clearance requirements as it crosses above Essex Street and passes below the Fremont Street ramp. This will bring the Essex Street ramp to a -1 percent grade (Essex Street currently has an estimated gradient of 5 percent) between Harrison and the contraflow ramp and then about an 8 percent grade from that point onto the bridge. The performance of Option 2 with respect to the evaluation criteria described previously in this memorandum is presented in Table 3 below:

Bus Travel Experience	Constructability	Impact on 525 Harrison
• Ramp curves have larger radii than Option 1 (smoother turns) • Ramp can achieve height needed to cross Essex Street and Fremont Street ramp with a 5 percent gradient	• Ramp has span length of approximately 102 ft as it crosses Essex Street and Fremont Street ramp • Requires Essex Street to be lowered by 10 feet (slightly more than in Option 1) • Minor changes to TTC ramp/roadway to connect • Skewed bridge span.	• Ramp cuts corner of 525 Harrison, clashes with two columns • Ramp impacts 94 square feet per floor of 525 Harrison (the smallest impact of the proposed ramp options)

Table 3: Option 2 Performance

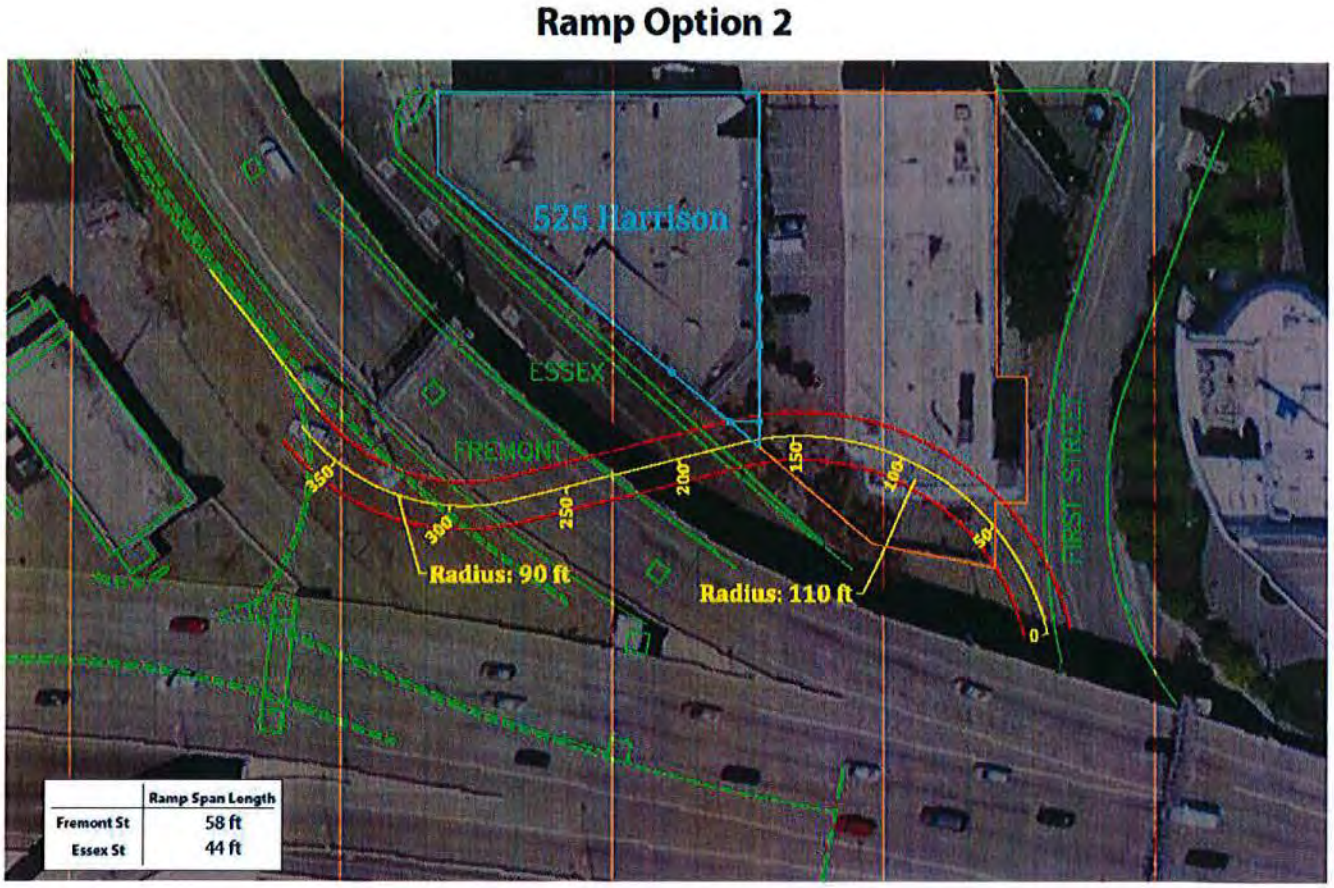


Figure 8: Option 2 Ramp Alignment

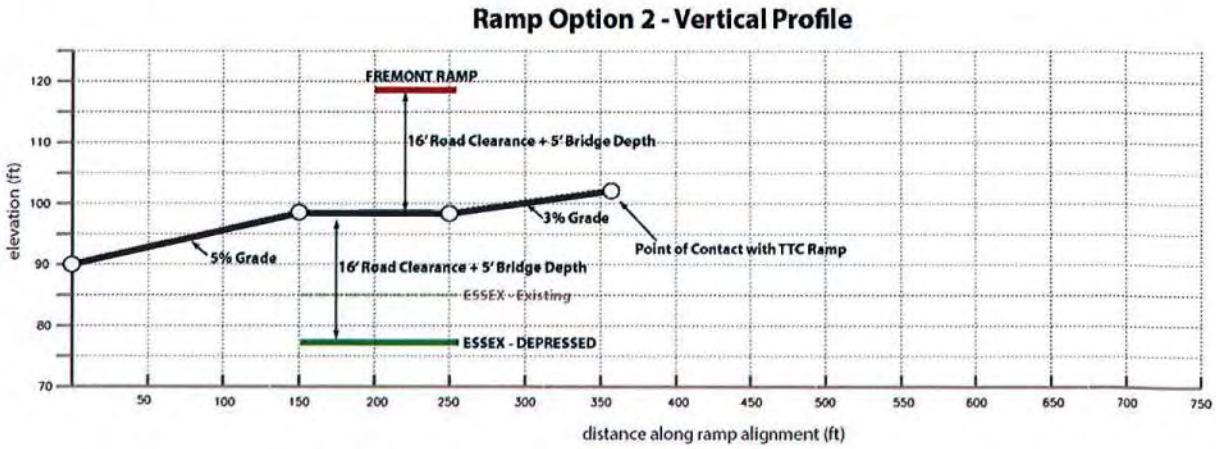


Figure 9: Option 2 Ramp Vertical Profile

Option 3

The ramp Option 3 alignment and key dimensions are shown in plan view in Figure 10. An approximation of the Option 3 ramp vertical profile is illustrated in Figure 11. The Option 3 preliminary concept meets all design standards for a speed assumption of 20 mph, and assumes the ramp width to be 20 feet. It was assumed the bridge depth for the proposed ramp and Fremont ramp would be 5 feet and the road clearance for all structures would be 16 feet.

This option will require Essex Street to be slightly more lowered than for Option 1. Essex Street would drop by approximately 10 feet for the Option 3 ramp to meet clearance requirements as it crosses above Essex Street and passes below the Fremont Street ramp. This will bring the Essex Street ramp to have a -1 percent grade (Essex Street currently has an estimated gradient of 5 percent) between Harrison and the contraflow ramp and then about an 8 percent grade from that point onto the bridge. The performance of Option 3 with respect to the evaluation criteria described previously in this memorandum is presented in Table 4 below:

Bus Travel Experience	Constructability	Impact on 525 Harrison
• Ramp has the largest curve radii (smoothest turns) of all proposed ramp options • Ramp can achieve height needed to cross Essex Street and Fremont Street ramp with a 3 percent gradient • 5% grade on 100ft curve to tie-in to the TTC connector loop will present a less comfortable ride for passengers.	• Ramp has span length of approximately 102 ft as it crosses Essex Street and Fremont Street ramp • Ramp is curved as it crosses Essex Street and Fremont Street ramp • Requires Essex Street to be lowered by 10 feet (slightly more than in Option 1) • Will require changes to TTC ramp/roadways to connect • Skewed bridge span (less than option 2)	• Avoids all columns of the 525 Harrison proposed building • Ramp impacts 680 square feet per floor of 525 Harrison

Table 4: Option 3 Performance

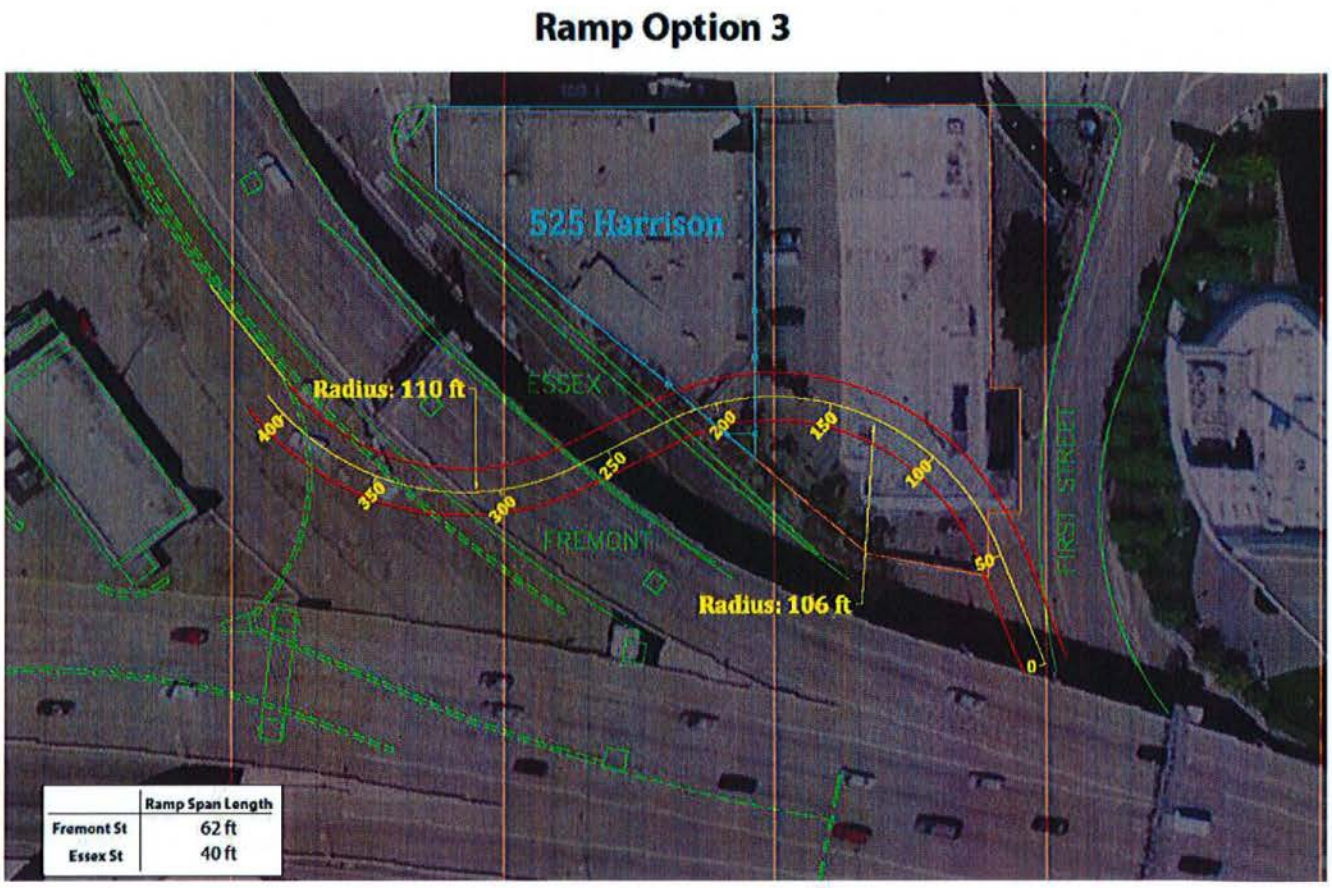


Figure 10: Option 3 Ramp Alignment

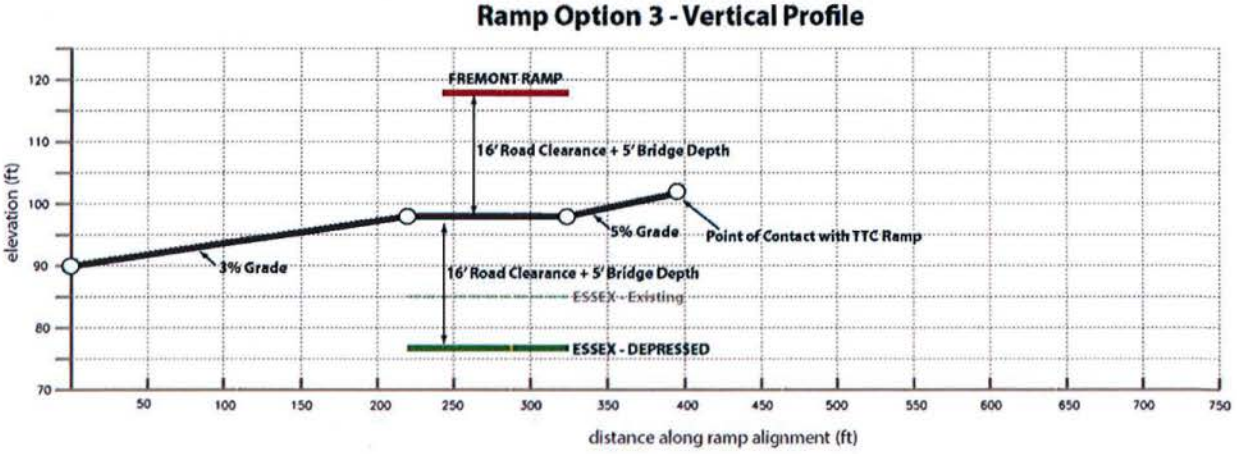


Figure 11: Option 3 Ramp Vertical Profile

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March 25, 2015

Mr. John S. Rahaim, Planning Director
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103-2479

RE: Case 2013.0159U; Project Address: 525 Harrison Street

Dear Mr. Rahaim,

As a follow-up to the letter written to you from former AC Transit Board President Greg Harper in July of 2014, I am writing on behalf of our Board of Directors to formally request that the City's approval of the residential condominium project at 525 Harrison Street be contingent upon accommodating the potential for a contraflow lane off-ramp exit. This exit would use a portion of the project site right-of-way.

Last month, the project consultant for the Metropolitan Transportation Commission's (MTC) Bay Area Core Capacity Transit Study completed an analysis of conceptual design options for the San Francisco exit of a future Bay Bridge contraflow lane to the Transbay Transit Center. This analysis examined three options with varying degrees of impact to the 525 Harrison project development site. Overall, the options would impact 94 to 970 square feet of the project site depending on the option. The findings support the feasibility of a development that can advance into design and construction while also accommodating the footprint of the contraflow lane off-ramp.

As stated in the previous letter, the potential for a Bay Bridge contraflow lane is critical to relieving traffic congestion, and improving throughput capacity and bus service reliability on the most important and most used corridor in the region. A previous study conducted by AC Transit shows that these issues will substantially worsen over the next decade without an improvement to the transit infrastructure. Given the immediate need, a contraflow lane would provide immediate congestion and capacity relief while MTC develops other long-term transit infrastructure improvements.

Based on these findings and the City's Transit First policies that prioritize transit infrastructure investment, I ask that the City's Planning Commission accept my request stated above on behalf of AC Transit and our thousands of Transbay bus riders. If granted, AC Transit, MTC and the

Transbay Joint Powers Authority can work with the City and the developer to refine our design options and incorporate a preferred option into the design of 525 Harrison.

Thank you for your consideration of AC Transit's request. Please contact Robert del Rosario, Director of Service Development, at 510.891.4734 should you have any questions or comments.

Sincerely,

H. E. Christian Peeples
Board President, AC Transit

cc: San Francisco Planning Commission
AC Transit Board of Directors
David Armijo, AC Transit General Manager

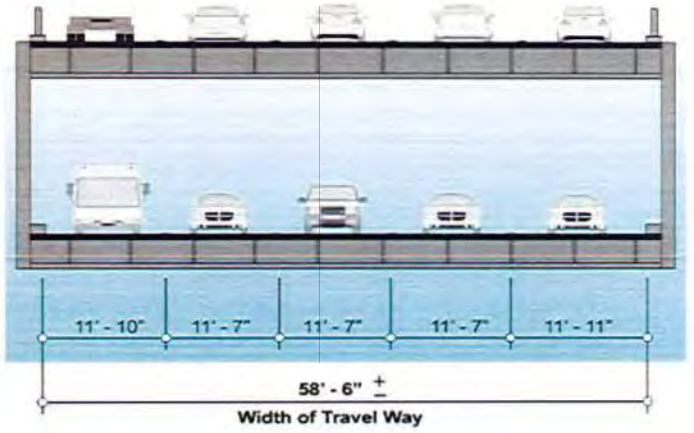
Design Options for the Contraflow Lane Exit to Transbay in San Francisco

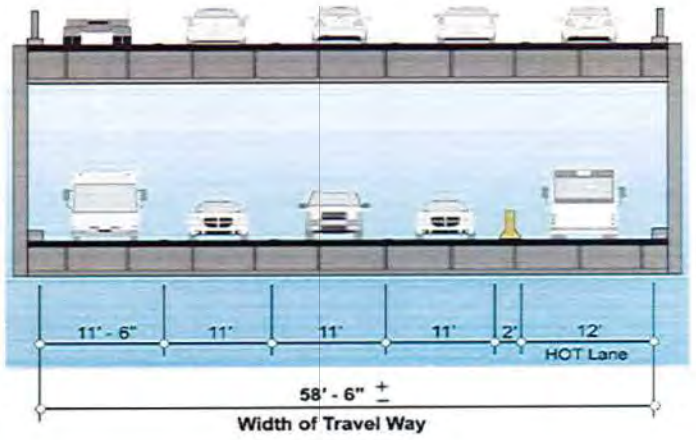
Bay Area Core Capacity Transit Study
Mike Iswalt, Arup

ARUP

Contraflow Lane Background

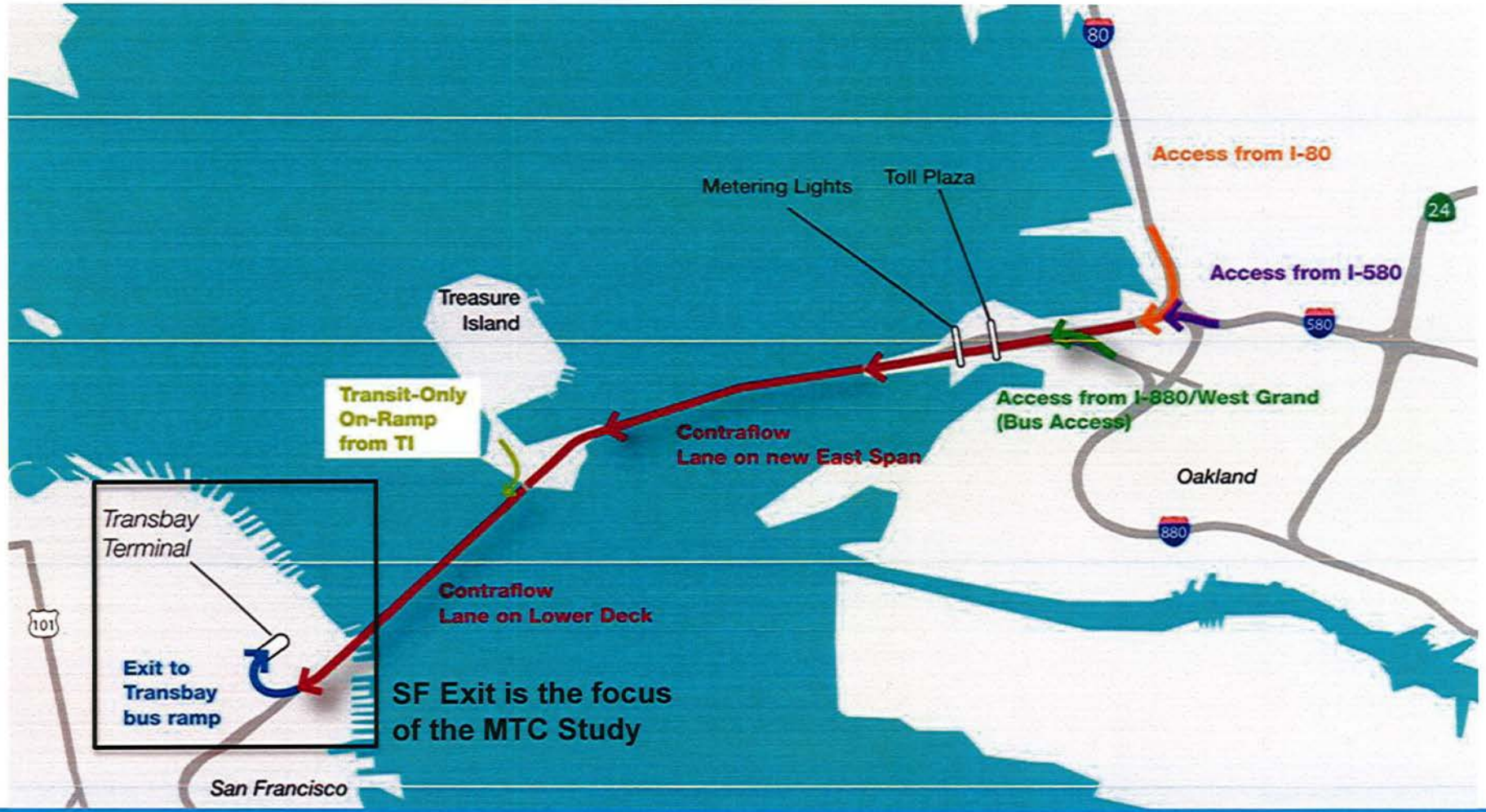
- AC Transit and TJPA commissioned the *Bay Bridge Corridor Congestion Study* in 2011
- Identified a contraflow lane as an improvement strategy
- Core Capacity RFQ identifies the contraflow lane as a bus service and infrastructure improvement in the AM





Contraflow Lane Background

- Extents of the contraflow lane (AM peak period only)



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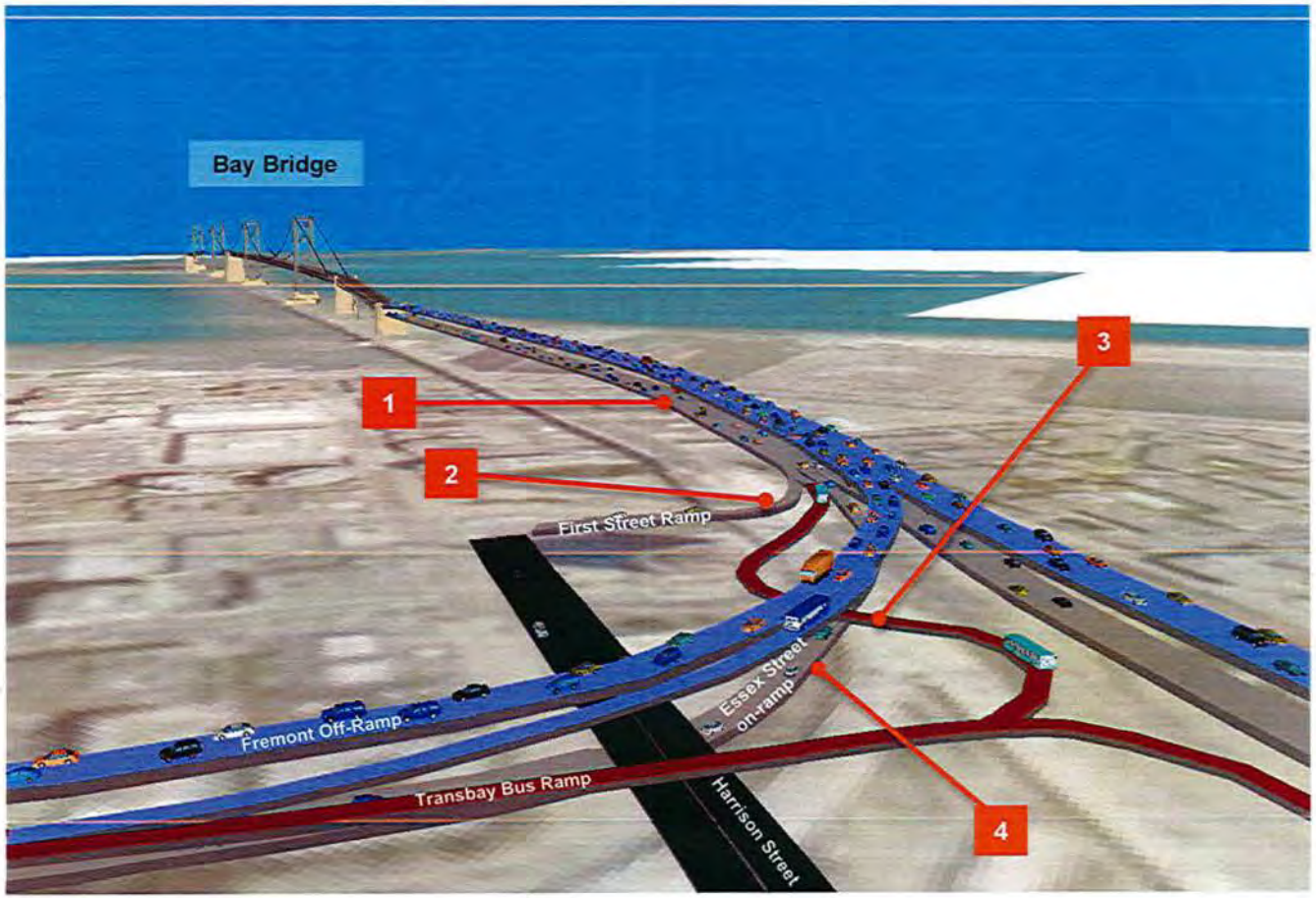
Contraflow Lane Background

- Contraflow exit ramp connection to the Transbay Bus Ramps



1. Contraflow lane in #1 lane on lower deck. Carries buses and potentially HOT autos/trucks.

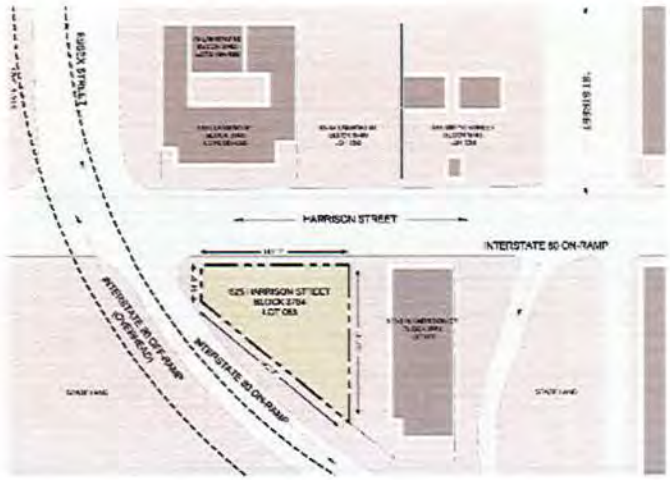
2. HOT autos/trucks exit using First Street (ramp reversed when contraflow is operational during the morning commute).

3. Proposed bus exit ramp connecting the contraflow lane to the Transbay bus ramp (must travel over Essex on-ramp and under Fremont off-ramp.

4. Essex on-ramp remains open, but must travel under the proposed bus ramp.

Core Capacity Contraflow Objectives

- Adherence to design standards
- Conditions for bus operators and riders
- Cost and constructability
- Minimize impact to proposed residential building at 525 Harrison



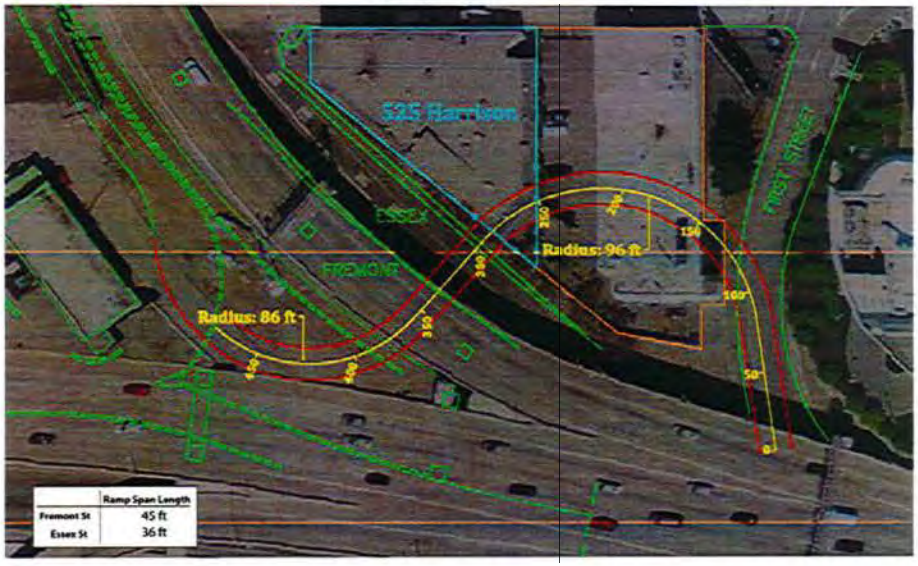
525 Harrison Site Boundary

525 Harrison Site Parking Level B1 and Ground Level

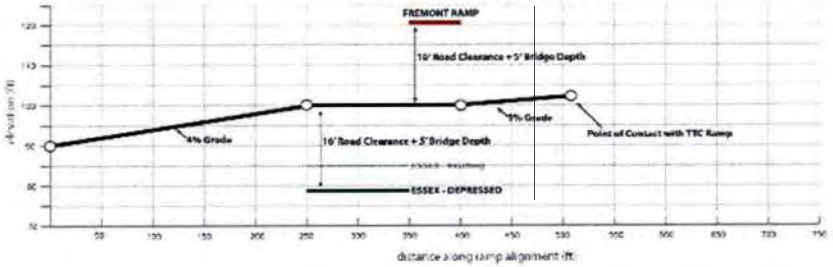
Option 1

- Lowest grades overall (4% and 1%) but tight radii
- Bridge is perpendicular (i.e., short)
- Biggest impact on the building

Ramp Option 1



Ramp Option 1 - Vertical Profile



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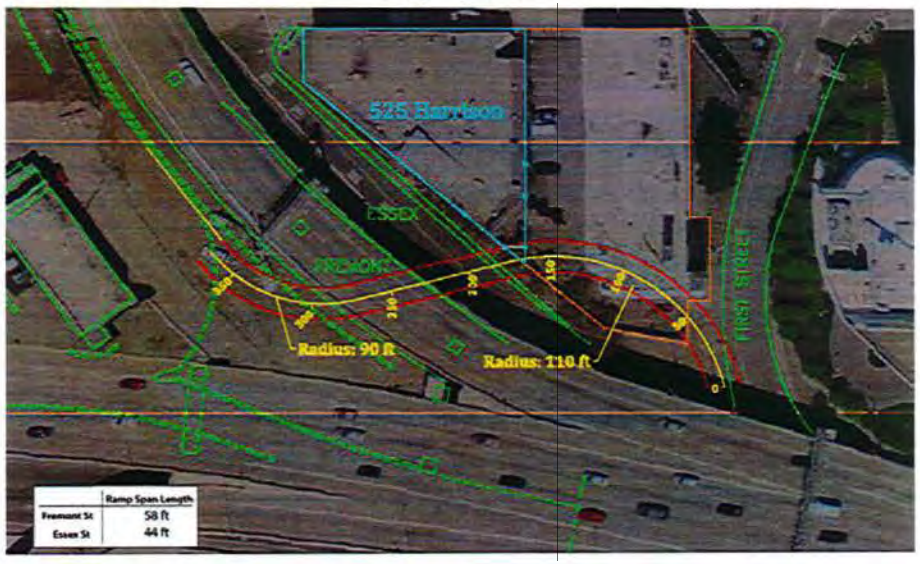
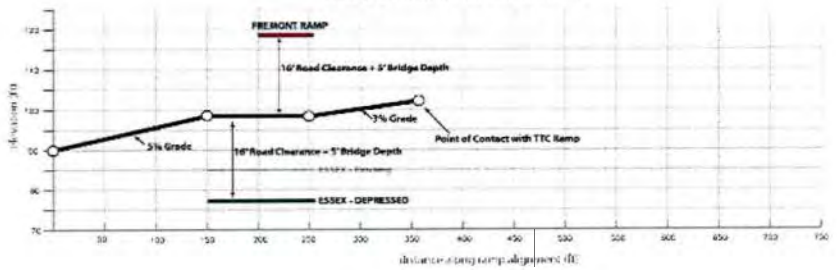
Option 2

- Steeper grades (5% and 3%) but larger radii
- Bridge is skewed with longest span
- Least impact on building area, but still conflicts with columns

Ramp Option 2



Ramp Option 2 - Vertical Profile



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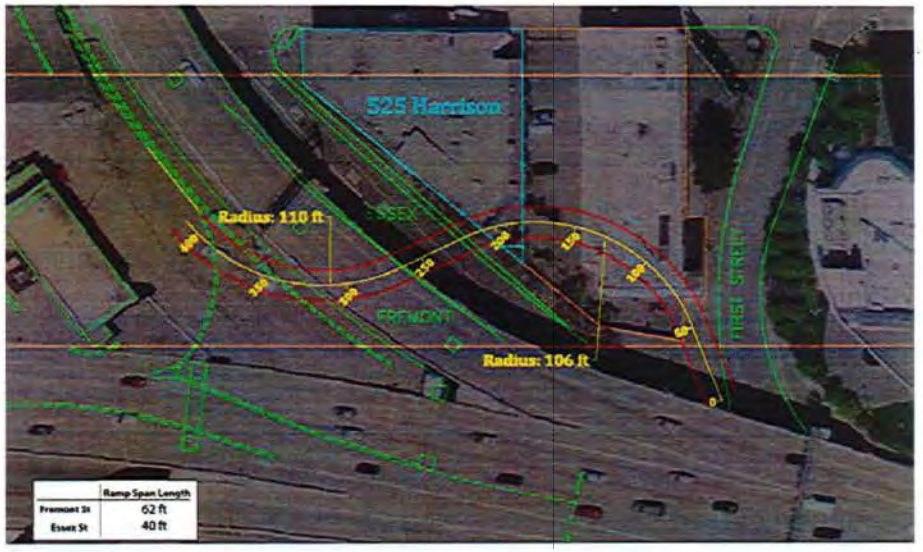
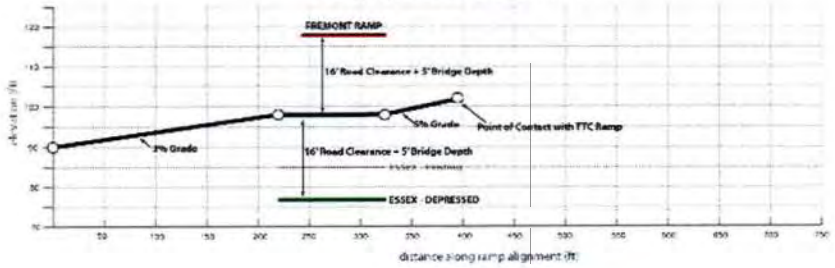
Option 3

- Hybrid of 1 and 2 (radii of curves are between 1 and 2)
- Grades similar to Option 2 (3% and 5%)
- Still impacts building but avoids columns

Ramp Option 3



Ramp Option 3 - Vertical Profile



ARUP

Conclusions

- Identified three conceptual options to make the connection
- All meet Caltrans criteria and provide reasonable bus operations
- All impact 525 Harrison to some degree
- Technical report and findings submitted to MTC