SAR 97-1

STRATEGIC ANALYSIS REPORT

I. TOPIC: Central Freeway Alternatives

II. INITIATED BY: Commissioner José Medina

III. INTRODUCTION: Purpose of Document

The purpose of this Strategic Analysis Report is to provide the SFCTA Board with a brief but comprehensive summary of background and analysis of transportation-related issues regarding Alternatives 1B, 3B, 8B, and 8/9 of the Central Freeway. As the name suggests, this Strategic Analysis Report, or SAR for short, is furthermore intended to highlight for the Board the strategic significance of these issues in areas of SFCTA jurisdiction, as well as to identify implications for future policy decisions by the Board in its capacity as administrator of Proposition B funds and as Congestion Management Agency (CMA) for San Francisco. Every effort was made to make this into a factual document, avoiding speculation, and leaving judgment to the reader. The document was designed to inform policy-level decision-making. Its abbreviated length (only 9 pages plus exhibits) is, therefore, an attempt to optimize its usefulness to Authority Board members. In pursuit of this goal, technical discussion has been condensed and only those facts are included which were deemed essential to outline the policy-level issues. Additional information is available from the sources cited, or by calling José Luis Moscovich, Director of Plans and Programs, at 557-6857.

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"SB 181, empowers the Board of Supervisors... to choose a locally preferred alternative for Caltrans to construct."

IV. BACKGROUND: Context - Relevant Previous Studies

The Central Freeway (Route 101) in San Francisco extends from the Route 80/101 interchange to the Hayes Valley neighborhood. The freeway is an elevated single-level steel viaduct that runs parallel to 13th Street between Route 80 and Mission Street. Until the recent demolition of the upper deck, a double-deck concrete structure ran the remaining length from Mission Street to its terminus at Oak and Fell Streets.

The Central Freeway was built in 1959 as part of a larger freeway system planned for the City, but much of that network was never built. It connects with I-80 to the east, providing access to the East Bay via the Bay Bridge, and leads to US Route 101 south, to the Peninsula. Originally, it was to connect to the Golden Gate Bridge. Before the Loma Prieta earthquake, the freeway terminated just west and north of the Civic Center area with ramps at Franklin/Gough Streets and Oak/Fell Streets.

The section of the freeway between the Fell/Oak ramps and the Franklin/Gough ramps was severely damaged by the Loma Prieta earthquake in 1989. The Franklin/Gough section was demolished in 1992 and Caltrans began seismic retrofit design for the remainder of the freeway. Following public hearings on the replacement of the freeway, the Board of Supervisors approved Resolution 541-92 in July 1992, which prohibited the construction of any new freeway ramps above ground north of Fell Street to replace the demolished sections of the Central Freeway. In 1995 the Statewide Seismic Peer Review Panel recommended that the upper deck be removed to reduce the risk of structural collapse in an earthquake. Caltrans closed the freeway between August and November 1996 and demolished the upper deck. When the much feared and expected traffic jams did not materialize during the closure, Mayor Brown requested that the Fell Street off-ramp remain closed, pending the City's selection of a preferred alternative for the replacement. In April 1997, alleging that there was pressure from increased traffic diverted to the US 101 corridor from the 19th Ave. reconstruction project, Caltrans reopened the Fell Street off-ramp.

The existing portion of the Central Freeway is not constructed to current seismic standards and requires either retrofit, reconstruction, or demolition. The current process, as outlined in SB 181, empowers the Board of Supervisors of the City and County of San Francisco to choose a locally preferred alternative for Caltrans to construct.

a. Central Freeway Citizens Advisory Task Force - Report of Recommendations

The Task Force was appointed by the Board of Supervisors to study alternatives for the Central Freeway and select a preferred alternative of traffic and transit improvements for the Central Freeway corridor, using the following criteria: a) minimize negative visual impacts; b) promote neighborhood cohesion; c) allow the maximum reclamation of freeway land for housing, open space, and neighborhood-serving commercial uses; d) allow for better management of all elements of the transportation system;

e) accommodate traffic circulation; and f) promote a healthy environment. In October 1995, the Task Force produced a Report of Recommendations selecting Alternative 8, with the option of a covered trench crossing under Page and Haight Streets or a surface boulevard on Octavia Street, as the preferred alternative. The option with the covered trench has since been dropped from consideration largely because Caltrans concluded that this option would have required acquisition of easements for the construction of retaining wall footings along the easterly right-of-way line from Page Street to Oak Street. Caltrans also determined that this option would have required extensive relocation of utilities in the below ground segments on Haight and Page Streets and that it posed unsafe stopping sight distances at the Oak and Fell Street exits. The option with Octavia Boulevard is now known as Alternative 8B.

[The Task Force recommended] "... Alternative 8, ... as the preferred alternative."

b. DPT's Central Freeway Areawide Traffic Study
This Caltrans-funded study was prepared for the Department of Parking and Traffic by Wilbur Smith Associates in November 1995. The purpose of the study was to select the City's preferred alternative for the future freeway and related traffic network. The study was conducted in conjunction with the Task Force's *Report of Recommendations* to provide an independent evaluation of the alternatives. The study evaluated nine alternatives, analyzing traffic impacts based on the following criteria: 1) traffic volumes on the Central Freeway and its ramps; 2) PM peak hour traffic volumes on study area arterials; 3) traffic crossing Market Street and its relationship to available capacity; and 4) freeway queuing characteristics. The study also evaluated the alternatives based on visual criteria, neighborhood cohesion, impacts on other modes, environmental impacts, and construction impacts. In this study, Alternative 3 provides a single-deck crossing of Market Street, descending underground and surfacing again near Oak Street. The study recommended Alternative 3 as the preferred alternative, citing the following reasons: 1) it would provide traffic functions similar to those provided by the freeway prior to Loma Prieta but it would be much more environmentally sensitive than the current and prior elevated structure; 2) traffic increases on city streets would be minimal and confined to the corridor of the current Freeway; 3) Construction and construction impacts would be confined to the current freeway corridor; 4) the primarily below-ground roadway would present a major improvement to the immediate environment of the freeway corridor north of Market Street; 5) a grade-separated crossing of Market Street would be maintained, reducing traffic on streets intersecting Market Street and not interfering with MUNI service on Market and Mission Streets; 6) a safer seismic structure could be created without involving the risks of rebuilding or retrofitting while maintaining traffic by requiring total reconstruction of the concrete section of the Freeway; and 7) Caltrans and the City could support this alternative, thereby speeding implementation and increasing the potential for full funding. With the exception of 1B, the alternatives analyzed as part of this study have since either been dropped from consideration or undergone modifications.

"The study recommended Alternative 3 as the preferred alternative... a single-deck crossing of Market Street, descending underground and surfacing again near Oak Street."

c. Systan's Central Freeway Evaluation Report This report was prepared for Caltrans by Systan, Inc. in May 1997. The report discusses the Transportation Management Plan (TMP) implemented during the closure of the freeway and provides details on the public information campaign to assist commuters, as well as on the focus groups and surveys conducted. During the freeway closure, the report states that 76% of the drivers used a different freeway ramp or route, while another 11% shifted entirely to surface streets. Only 2.2% of drivers switched to transit and 2.8% no longer made the trip they previously made on the freeway. The report identifies the streets in the vicinity of the Central Freeway, San Jose Ave-Guerrero St., 19th Avenue -Brotherhood Way, and I-280 as common detour routes that experienced increased traffic during the closure. The report concludes that the Central Freeway public information program worked well in informing drivers in advance of plans for closing the freeway and outlining their options when it closed. Drivers experimented with the available options and found enough alternative routes so that the traffic jams expected to accompany the closing never materialized. However, according to the report, the diverted traffic brought additional congestion, delays, and potentially more accidents to city streets in the vicinity of the freeway. The report states that former freeway users affected by the closure overwhelmingly favored reconstruction of the Fell and Oak Street ramps, and that while 31.4% of the residents living in the vicinity of the freeway asked to have it torn down, more than twice that many (68.6%) wanted to see it restored in one form or another.

"Drivers experimented with the available options and found enough alternative routes so that the traffic jams expected to accompany the closing never materialized."

d. Draft Environmental Assessment.
Caltrans prepared this report in April 1997 pursuant to 42 U.S.C.4332 (2)c. (National Environmental Protection Act - NEPA). The report identified Alternatives 1A, 1B, 8B, 10,

accurately predict how traffic would divert even using the most sophisticated modeling tools. More important to the discussion at hand are the relative differences in the performance of the different alternatives.

Construction cost and completion time data for all alternatives comes from Caltrans District 4. The SAR provided a reasonableness check on all figures and introduced a few adjustments. This topic is further discussed in sections V.E. and VI., below.

A.3 Analysis Process: The Authority's analysis process included an evaluation of the methods and results arrived at by Caltrans and DPT, and the necessary calculations to provide comparisons for Alternative 8/9, which had not been previously analyzed at the same level as the others. In addition, we made the necessary calculations to address the differences between Alternatives 3B-1 and 3B-2. The calculation of intersection Levels of Service (LOS) was completed using volume to capacity (v/c) ratios taking into account the summation of the largest volumes for conflicting movements. This simplified method, which is on a par with the one used by Caltrans and DPT, is adequate for a discussion of the relative differences between alternatives. Our analysis relied largely on actual data (i.e., traffic counts) as opposed to projections. Our approach assumed, consistent with City policy, that the main goal of the traffic analysis was to determine each alternative's ability to serve the *existing* traffic demand, and not necessarily to add new freeway capacity. It is well universally accepted in the traffic engineering profession that any extra capacity added will immediately be filled by the latent demand for automobile travel in the city. It is worth noting that our analysis assumptions are conservative. For example we used intersection capacities of 1,500 vehicles/hr., rather than the 1,800 or 1,900 that are usual in suburban locations, as a way to acknowledge the influence of bicycle and pedestrian conflicts, as well as frequent presence of transit vehicles in mixed traffic, which have the net effect of reducing vehicular capacity.

"Our analysis relied largely on actual data (i.e., traffic counts) as opposed to projections."

Transit service impacts were calculated using daily ridership statistics by route (from MUNI). We made a general assumption that the p.m. peak hour would carry 20 % of the total daily ridership for routes that operate all day, and 30% of total ridership for routes that operate only on a.m. and p.m. peak periods.

B. Alternatives

Figures 1 through 4 illustrate the four alternatives still being considered for the Central Freeway. (There are essentially four alternatives: 1B, 3B, 8B and 8/9, though we have considered two variations of alternative 3B: 4-lane and 6-lane boulevard). The descriptions below provide further details as well as a critical assessment (functional analysis) of the most significant features of each alternative relative to some key performance measures. Essentially, these four alternatives represent two different philosophies for addressing the travel demand needs in this corridor. One philosophy, espoused by Alternatives 1B and 3B, relies on a grade-separated crossing of Market Street. By relying on the bridge across Market, these alternatives provide a predictable travel path for drivers, and they also concentrate neighborhood traffic impacts at or near the gateway where the bridge touches down. At the other end of the spectrum, Alternative 8/9 aims at dispersing traffic impacts so that no single geographic area carries the bulk of the traffic impacts. It does so by adding on and off ramps, so that the freeway fans out into the urban fabric, rather than terminating in a single main gateway. The main objective of traffic dispersion: to lessen the impacts of freeway traffic crossing Market Street, are accomplished. The benefits of this alternative in terms of neighborhood impacts reduction are limited by the fact that Fell and Oak Streets are still, under all alternatives, the most logical choice for east/west travel from/to the Central Freeway area. Alternative 8B brings the freeway to the ground at Market Street, concentrating the traffic impacts at the intersection of Octavia and Market without the benefits of a grade-separated crossing of Market Street.

"One philosophy, espoused by Alternatives 1B and 3B, relies on a grade-separated crossing of Market Street... Alternative 8/9 aims at dispersing traffic impacts..."

Table 1 provides an overview of the main characteristics and performance evaluation of the alternatives. The following sections describe the alternatives and provide a functional assessment of each one.

Alternative 1B (Prop. H)**:** Developed by Caltrans, this alternative would retrofit and widen the existing lower deck of the Central Freeway, providing a 4-lane single deck structure from Mission Street to Oak and Fell Streets. From the intersection of Page and Octavia Streets to Oak and Fell Streets ramps, the structure would be replaced rather than retrofitted. The deck of the four-lane structure would be 23.77 meters (80') wide. It would be the same height as the existing 2-lane single deck structure. This alternative would not require any additional right of way acquisition. At approximately $67.6 million, this is the most expensive alternative of the four analyzed. It would also take the longest time (58 months) to complete (about 13 months longer than the quickest alternative). Completion times are lengthened, among other factors, by the nature of the work: a retrofit of an existing structure takes longer than building a new one. Taking into account

Alternative 8B: Developed by the Central Freeway Citizens' Advisory Task Force in conjunction with Caltrans, this alternative would provide a single deck 4-lane facility from Mission Street over the existing right of way to the south side of Market Street near the intersection of McCoppin Street and Elgin Park. The freeway would touch down at a signalized intersection at Market Street, serving as the main gateway to the Central Freeway. The new single deck would be 23.77 meters (80') wide. There would be no modifications to any of the ramps south of Market. North of Market, the right of way now occupied by the existing freeway structure would become a 4-lane boulevard, consisting of two northbound and two southbound lanes from the intersection Market and Octavia Streets to Fell Street. The existing two north-south lanes on Octavia Street would become one-way northbound traffic lanes from the intersection of Octavia and Market Streets to Oak Street, intended for local traffic use. A narrow island would separate the two lane local roadway from the four-lane roadway. This alternative would not require any additional right of way, it would cost $48.1 million and would require 45 months to complete. Considering the available $17.5 million in Emergency Relief funds, and potential land sales of $10.5 million, this alternative would have a $20.1 million funding shortfall.

> "The freeway would touch down at a signalized intersection at Market Street..."

Functional Analysis: This alternative, which was studied by Caltrans as part of the *Draft Environmental Assessment*, would have a noticeably different effect on traffic circulation than Alts. 1B and 3B. Our evaluation of the Caltrans analysis of Alt. 8B introduced an important adjustment: the Caltrans calculations used a capacity of 2500 veh./hr for the on/off ramp at Octavia and Market. We believe that the figure should be 1500 veh./hr plus 200 veh./hr for right turns. We proposed so because we believe that the demand for east-west traffic flow on Market Street, a General Plan-designated Transit Preferential Street with a significant amount of through traffic, needs to be balanced with the need for freeway-related traffic to cross Market Street. It would be inconsistent with City policy to maximize freeway capacity at the expense of Market Street. This would effectively reduce the number of vehicles that could exit/enter the freeway at Octavia and Market compared to the Fell/Oak ramps in Alt. 1B, and it would result in a noticeable increase in surface street traffic as freeway-related traffic uses other south of Market ramps to reach the Oak/Fell corridor. This would have some dispersal effects, separating the traffic that's headed north from the traffic that's headed west *before* it gets to the Hayes Valley area. This dispersion of freeway-related traffic would result in a reduction in localized neighborhood impacts compared to using the Oak/Fell ramps in Alt. 1B; however, there would still be high volumes on the Oak/Fell corridor. In the a.m. peak there would also be some traffic dispersion (e.g. shifting to South Van Ness and 10th Street on-ramps), but not a significant amount because the key bottleneck in the a.m. for outbound traffic is on the freeway itself (the connector to southbound US 101) not on the surface streets leading to the freeway. Our analysis indicates that this alternative would result in an average level of service of D in the key corridors in the study area (see Figure 7). Please note that for LOS calculations the boulevard is assumed to have 5 lanes, as described for Alt. 3B-2. Impacts to transit service would be higher than for the previous alternatives. This alternative would have the highest bicycle impacts (because it concentrates conflicts at the Market Street intersection, and higher pedestrian impacts than Alternatives 1B and 3B.

Alternative 8/9: Developed by the Association to Simplify Traffic and Abate Congestion (ASTAC), a neighborhood group, this alternative would end the northbound freeway mainline at Mission Street with a signalized three-lane off-ramp and begin the southbound mainline at Valencia Street with a two-lane signalized on-ramp. A new off-ramp at South Van Ness Avenue and a new on-ramp along Otis Street would be constructed. A new South Octavia Street between Market Street and Mission Street and a new Octavia Boulevard from Market Street to Fell Street would be developed. The new South Van Ness off-ramp would necessitate the taking of a traffic lane and a parking lane along 13th Street. The cost of this alternative is $44.9 million and it would require 48 months to complete. Taking into account the $17.5 million in Emergency Relief funds and an estimated $10.5 million in land sales revenue, this alternative has the smallest funding shortfall: $16.9 million. The variation of Alt. 8/9 originally analyzed by Caltrans included a new South Franklin Street allowing Mission Street off- ramp traffic to connect to Franklin Street. Caltrans estimated that the new South Franklin Street from Otis Street to Market Street would cost an additional $10 million for property acquisition, demolition, and construction of the new street. ASTAC made it clear during interviews conducted during the development of this SAR, that they do not support the construction of a South Franklin street. Our definition of 8B and our analysis reflect their latest proposal, without a South Franklin Street.

Functional Analysis: This alternative was analyzed only anecdotally by Caltrans. As requested by Commissioner Medina, Authority staff undertook the traffic analysis of this alternative to bring it to par with the level of information available for the others. Our analysis found that alternative 8/9 is the most different functionally from Alt. 1B because instead of concentrating freeway-traffic in one corridor (Oak/Fell Streets), it is designed to

> "Under Alt. 8/9 freeway-related traffic spends more time on city streets because all the ramps end south of Market Street."

source could be substantial and it is discussed separately for each alternative.

E. Trade-Off Analysis/ How to Interpret the Data

Traffic Handling Capacity: Although the freeway can at times act as a bottleneck, the traffic-handling capacity of all these alternatives is largely determined by the capacity of the street network. All alternatives can handle the traffic, but they do it with different localized impacts. Alternatives 1B and 3B create increased congestion around Oak/Fell/Laguna, and at Oak/Fell/Octavia respectively. Alternative 8B increases impacts at Octavia/Market and Octavia/Oak/Fell During the p.m. peak hour. During the p.m. peak hour Alternative 8/9 fills in the available capacity at most key intersections in the study area. Table 2 provides a look at level of service for all key corridors under the different alternatives, and provides a system-wide average as well. The corridor LOS is determined largely by the LOS at key intersections along each corridor.

"All alternatives can handle the traffic, but they do it with different localized impacts."

Table 3 shows the car-handling capacity of all alternatives, expressed in vehicles per hour for the p.m. peak hour (the worst case). This table is included to provide some perspective for the interpretation of system level of service information in Table 2 . Table 2 shows what appears to be an intuitive progression from Alt. 1B (best) to Alt. 8/9 (worst) in terms of average street level of service. While this interpretation is correct, it must be born in mind that the difference in capacity between these two alternatives is only 560 cars, or 15% of the total demand that we are trying to meet in the p.m. peak hour. As a reference, a single lane of an arterial like Van Ness or Gough can handle between 750 and 900 cars per hour. It must also be understood that the calculation of level of service is intended to provide a hierarchy or ranking of alternatives based of intersection performance. There is enough variation in daily traffic volumes and conditions on city streets and on the freeway to affect levels of service up or down. The estimates provided in Table 2 are within an error margin of one level of service (i.e., what our analysis shows as LOS C could be B or D, but it is unlikely that it would be A or E). Finally, it's very important to keep in mind that the impacts described in Table 1 apply to the p.m. peak hour only. The system performs much better under all alternatives during off-peak hours.

"...the difference in capacity between these two alternatives is only 560 cars, or 15% of the total demand..."

Transit Impacts: The information provided about transit service impacts must be regarded as a qualitative indication of potential impacts, not as an absolute benchmark. Generally, as system performance (i.e. LOS) declines, transit service would be affected since it operates in worse traffic. Impacts to individual routes will depend on actual service schedules and frequency.

Pedestrian and Bicycle Safety: Pedestrian and bicycle impacts were addressed qualitatively. The assumption is that increased traffic on city streets would result in a worsening of pedestrian and bicycle conflicts. It may be possible to ameliorate pedestrian and bicycle conflicts at key intersections, through the use of devices such as all-red signal phases, but the general level of analysis possible at this planning stage does not permit an accurate evaluation of these detailed operating options. In fact some of those are likely to be resolved only after the new facility is in place.

Construction Costs: Construction costs include engineering, demolition, construction and traffic system management (TSM) costs. Note that traffic management measures such as Traffic Control Officers are assumed to be funded only during the time that the project is being constructed. The LOS results shown assume no traffic management measures beyond the construction period. We believe that the figures presented are reasonable, and we have introduced relatively minor adjustments to the Caltrans estimates where warranted. However, planning level estimates presuppose a fairly generous margin of error (15 to 20% is not unusual), which can only be narrowed down through detailed design and engineering. For example, we believe there may be higher costs associated with keeping the freeway open during retrofit and expansion (in Alt. 1B), beyond the Caltrans estimates. It is also possible that value engineering of Alternative 8/9 may result in some cost reductions through better construction staging.

Completion Times: Figures for project completion times come from Caltrans District 4 and are reflected exactly as provided. It must be noted that in all cases about half of the time (between 24 and 28 months depending on the alternative) is accounted for by design, engineering and contractor selection tasks performed by Caltrans staff. Given the recent PECG decision by the California Supreme Court, which prevents Caltrans from contracting out work that can be performed by union engineers, Caltrans would be hard pressed to deliver this project any sooner than the time frames they have estimated, and it is likely that construction times may stretch even further as a result of understaffing in Caltrans

"As a turn-key contract, the Authority estimates that this project could be delivered in a much shorter time..."

VIII. AUTHORITY STAFF CREDITS

Maria Lombardo was responsible for all traffic analyses and graphics, with assistance from John Wilson, of The Wilson Engineering Company. David Chan contributed the background sections, was responsible for the research on costs and conducted the majority of the interviews with interested parties. Our interns Joe Castiglione and Andrew Koehly provided invaluable help with maps and LOS calculations.

Table 2

P.M. Peak Hour Level of Service (LOS) Along Key Corridors[1]

Corridor [2]	From/To	Alt. 1B	Alt. 3B	Alt. 8B	Alt. 8/9
Hayes	Gough to Larkin	C	D	D	D/E
Fell	Laguna to Polk/Market	D	C	C/D	C/D
Oak	Laguna to Franklin	C	D	D	D
Market	Laguna to Larkin/9th	C	C	D	E
Duboce	Market to Otis	D	D	D	D
Octavia	Fell to Market	C	D/E	D/E	D/E
Gough	Hayes to Mission	C	D	D	D/E
Franklin	Hayes to Market	C	C	C	C/D
Van Ness	Hayes to Division	C	D	D	E
	Average LOS	C	C/D[3]	D[3]	D/E[3]
		C	C[4]	D[4]	D/E[4]

Table 3

P.M. Peak Hour Central Freeway Off-Ramp Volumes[5]

	Alt. 1B	Alt. 3B	Alt. 8B	Alt. 8/9
Fell/Oak, Octavia, or Market off-ramp	2,700	2,050	1,700	
Mission of-ramp	1,130	1,370	1,370	1,700
13th St/So. Van Ness off-ramp	n/a	n/a	n/a	1,600
Total[6]	**3,830**	**3,420**	**3,070**	**3,300**

[1] Level of Service (LOS) is a measure of how well traffic flows. Values range from A(best - free flow) to F (worst - gridlock).
[2] LOS was calculated using a planning level approach based on intersection capacity, without the benefit of an iterative process for balancing intersections or optimizing the entire network.
[3] Assumes 6-lane Octavia Boulevard
[4] Assumes 4-lane Octavia Boulevard
[5] Assumes demand is same for all alternatives (pre-demolition levels)
[6] Using Alt. 1B as the baseline for comparison, all other alternatives would involve some traffic diversion to ramps beyond the study area. For example 9th street can absorb up to 400 additional cars before reaching pre-earthquake traffic levels.

Alternative 1B

Freeway ends at Fell and Oak Streets

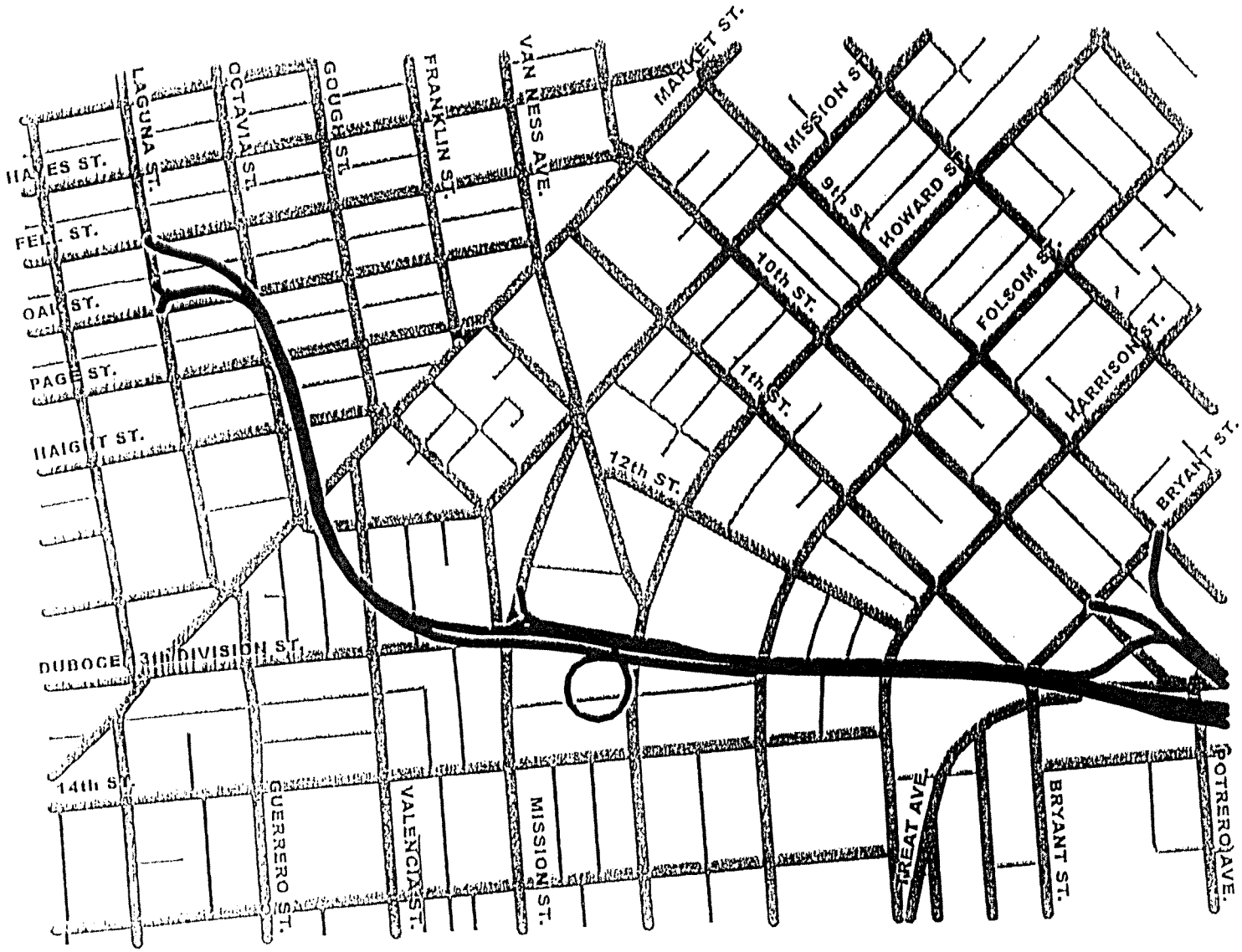

FIGURE 1

Source: SFCTA Transportation Analysis Database, Caltrans, Dept. of Public Works

Alternative 8B

Freeway ends at Market Street

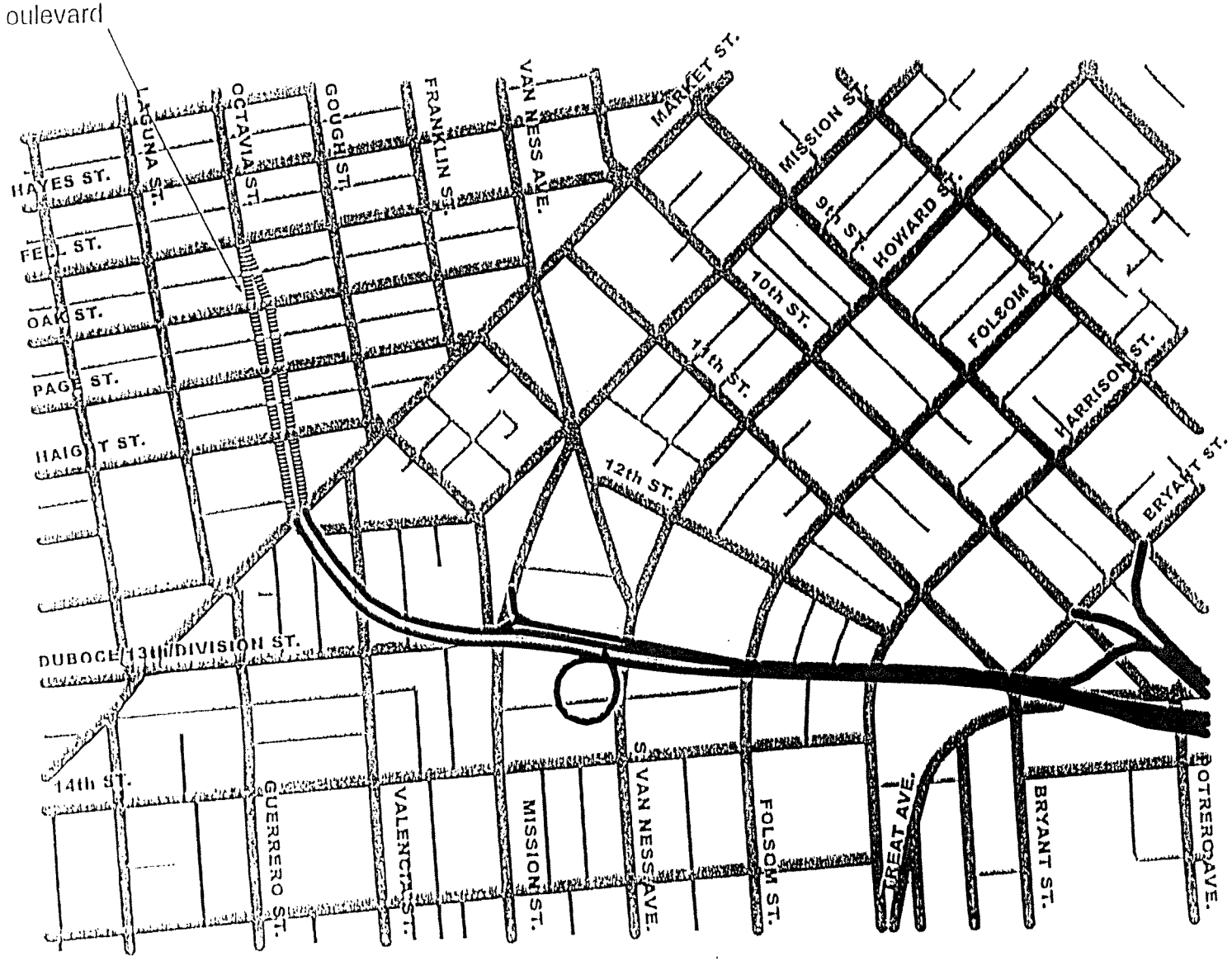

Figure 3

Database, Caltrans, Dept. of Public Works

Alternative 1B
Traffic Impacts Analysis

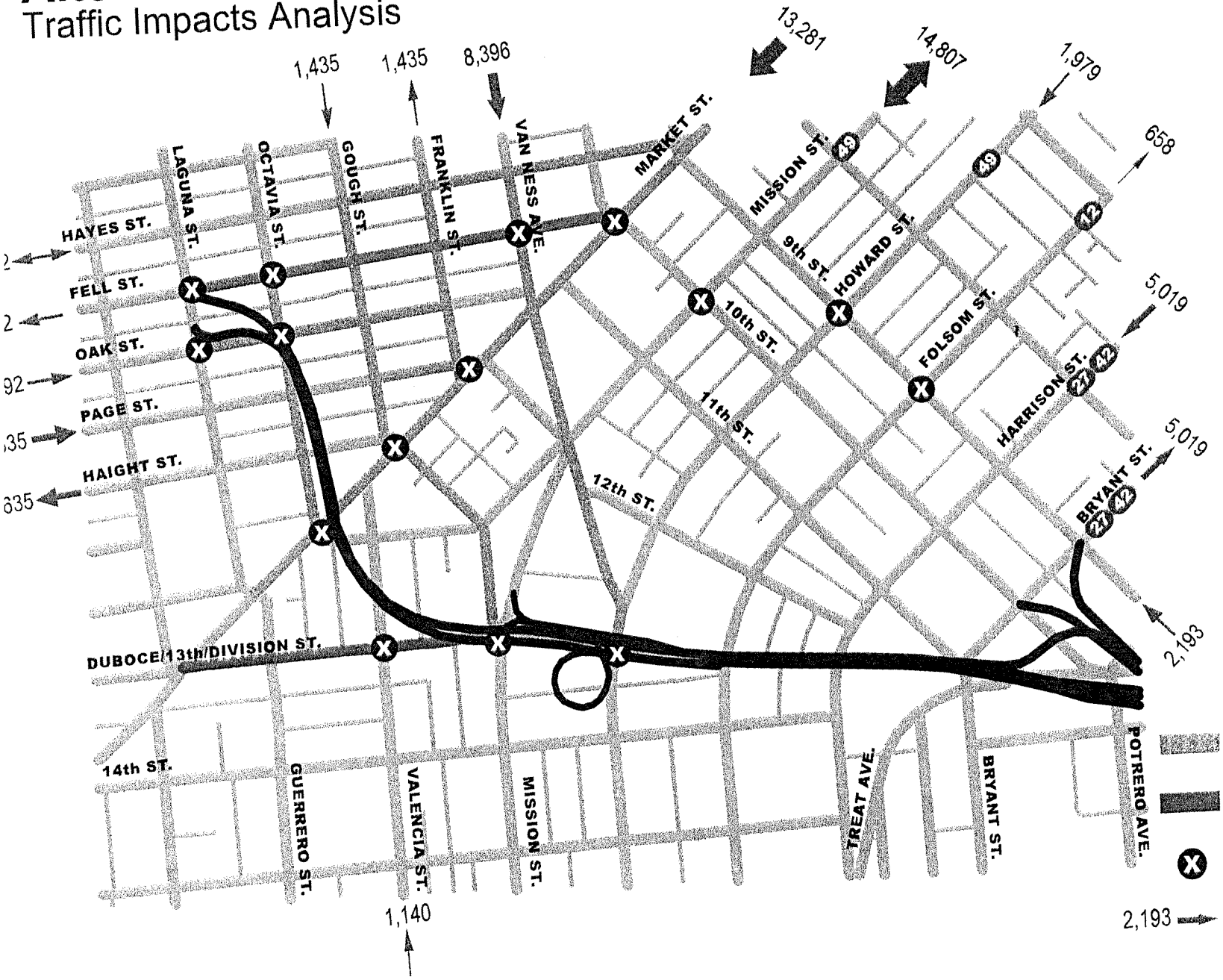

Figure 5

Source: SFCTA Transportation Analysis Database, DPT, Caltrans, MUNI, DPW

Alternative 8B
Traffic Impacts Analysis

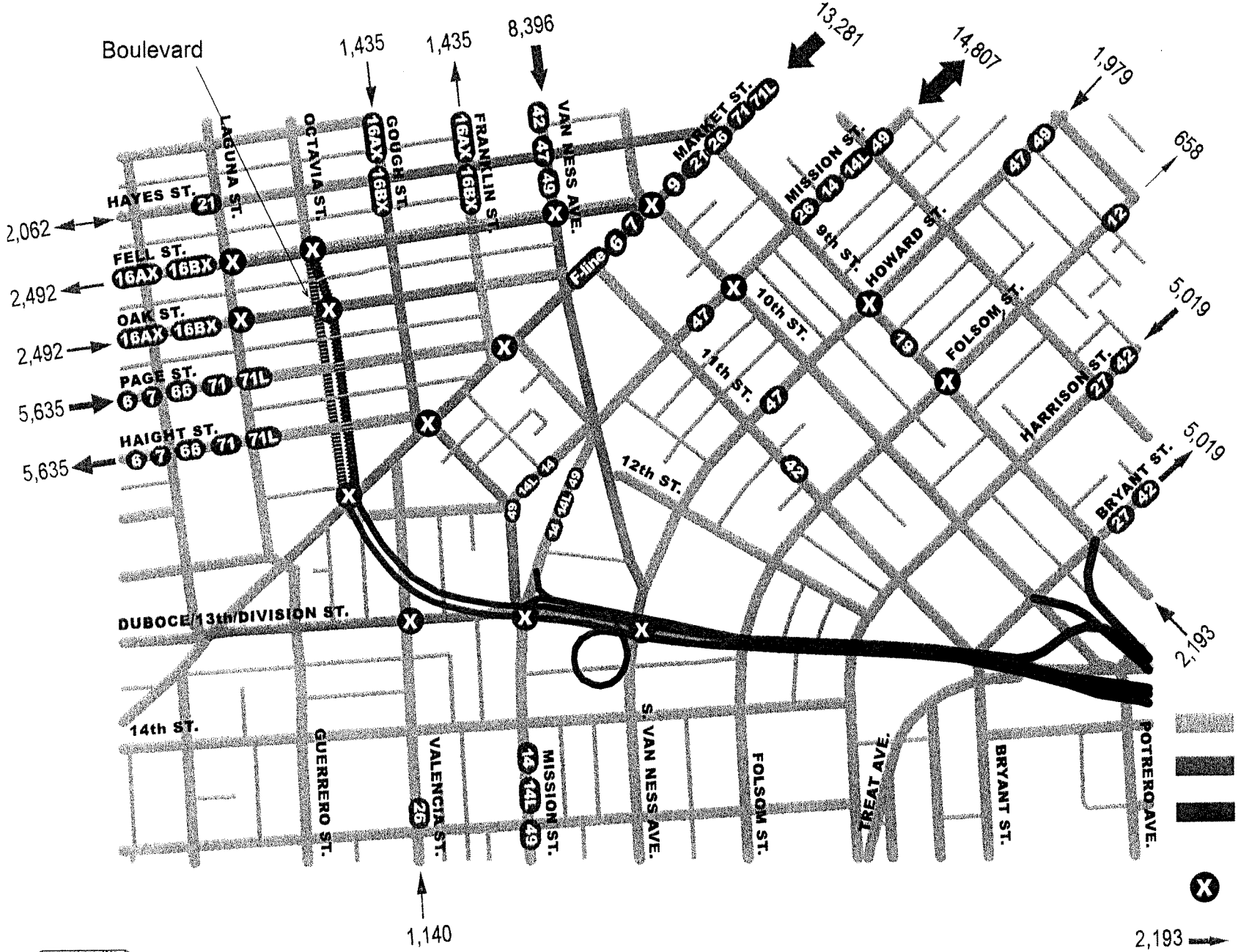

Figure 7

Source: SFCTA Transportation Analysis Database, DPT, Caltrans, MUNI, DPW