

2000-03-14 Item 66 Aquatic Park Living Wall - Sound Barrier Options to Council, after CalTrans said Berkeley's plans for a terraced sound wall needed concrete piers and a retaining wall. Council voted unanimously to request further study. <https://www.sfgate.com/bayarea/article/alameda-county-berkeley-wants-scientists-to-2768417.php>



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COUNCIL ACTION

March 14, 2000

To: Honorable Mayor and
Members of the City Council

From: James Keene, *James Keene* City Manager

Subject: **AQUATIC PARK LIVING WALL SOUND BARRIER PROJECT
OPTIONS**

RECOMMENDATION

Select one of the following two options for proceeding with the Living Wall Sound Barrier Project, and direct staff to work with Caltrans and the Alameda County Congestion Management Agency¹ (CMA) in pursuing its preferred option:

1. The Council requests of the CMA and California Transportation Commission (CTC) a 20-month extension for the project so that Caltrans can, working with City staff, design an attractive-as-possible variation of its standard concrete masonry wall as an affordable alternative to the Living Wall. This approach could allow up to the full 5600 foot desired project length to be constructed for the \$3.54M in available project funding.
2. The Council requests of the CMA and CTC a 20-month extension for the project so that Caltrans and the City, working with a third party engineering firm, can identify a lower cost alternative Living Wall design. This approach would be viable only if initial analysis shows that at least 3100 feet of Living Wall (the minimum sound mitigation requirement) can be built with the \$3.54M in available funding and if Caltrans agrees with the findings of the third party. If initial analysis does not suggest significant cost savings are possible, Option One would be pursued.

¹ The Alameda County Congestion Management Agency (CMA), since January 1998, has managed funding of Caltrans projects within Alameda County in order to ensure timely use of transportation funds. CMA staff has been working closely with the City and Caltrans on this project for the past year.

Option Two would require Council to allocate approximately \$35,000 in funding for the third party engineering contract and \$20,000 for engineering staff costs to monitor the initial analysis and re-design process. This amount could be transferred from funding set aside for hydrology improvements at Aquatic Park with Council's approval. Additional staff time expenditures would be likely if this option were to be pursued to the fullest extent.

Under either option, the City must be prepared to request the project extension and provide a detailed project schedule to the CMA by the end of March 2000.

BACKGROUND

The purpose of this memo is to advise Council of design, funding and scheduling problems concerning the Aquatic Park Living Wall Sound Barrier project, and to outline City options for proceeding further with the project. This report is an update to the information report sent to Council September 28, 1999.

An analysis of the two options is presented at the end of this report following a presentation of relevant project information. Staff acknowledges that neither of the two options meets all of the City's original project goals and expectations.

Key project factors affecting the Council's selection of an option for proceeding with the project include the following:

1. Sound Protection Needed for Park: One of the top goals of the 1990 draft Aquatic Park Master Plan is to reduce I-80 freeway noise in Aquatic Park. With the widening of I-80 in the 1990s, the problem of freeway noise in the Park was made even more severe due to closer proximity and removal of a landscape buffer.
2. Legal Requirements: Caltrans is legally obligated to build only 3100 ft. of sound barrier, as this was the barrier length originally required as noise mitigation² for the I-80 widening project. In 1996, Caltrans informally agreed to build a 5600 foot standard wall or a Living Wall of equivalent cost. This agreement responded to the City's request that the barrier be lengthened to adequately mitigate freeway noise in the Park given the location of sensitive receptors along the entire length of the Park. Caltrans is not currently arguing against honoring this agreement, but it is important to note that construction of only 3100 ft. is legally and minimally required for the project as environmental mitigation.

² In 1984, the Final Environmental Impact Statement (FEIS) for the I-80 widening project required two segments of 12 foot high wall totaling 3100 feet to protect the rowing club and water ski club areas. In 1991 the FEIS analysis was reevaluated and the height was increased to 14 feet.

3. Project Budget: Currently, \$3.54M is budgeted for the project based on the cost of a 5600 ft. long standard concrete wall³. The CMA has indicated that it will not approve further project funding increases and takes the position that the City should provide any additional funding required for the project.
4. Project Cost Estimate: The current Caltrans cost estimate for the Living Wall project is \$9.5M for 4100 feet. At the same cost/ft. rate, a 5600 ft. Living Wall project would cost \$13M. A 3100 foot wall (the required minimum length) would cost \$7.4M.
5. Earlier Project Design and Cost Estimate: The current terraced "tree-structure" Living Wall design (see Attachment B) is based roughly on a 1996 City-developed design (see Attachment A). In 1996, it appeared to both City and Caltrans staff that a Living Wall could be constructed for roughly the cost of a standard concrete wall. Caltrans took on primary design responsibility in 1998, and in 1999 concluded that a continuous retaining wall and a series of double piles would be required to support the structure rather than an intermittent shallow foundation footing and retaining slope as earlier proposed. The piles alone account for approximately one third of the current project cost estimate. Caltrans staff consider pile construction necessary for seismic safety given soil conditions and have stated that earlier analysis to the contrary was incomplete and faulty. A geotechnical report recommending the piles was released in late January 2000. The project design includes two piles approximately every 11 feet to support the structure. The depth of the piles would be determined based on field conditions during construction but could range up to 50 feet. Earlier City analysis recognized that some settlement would occur due to liquefaction after an earthquake, but that it would not exceed an acceptable level and would not endanger lives. Throughout the last year, City staff strongly and consistently objected to the addition of both the piles and continuous retaining wall but alternative designs were not developed by Caltrans.
6. Project Design Deadline: The design delivery date for the project under Senate Bill 45 (SB45) requirements⁴ is March 1, 2000. Once the geotechnical report became available in January, re-design was not possible within the required design timeframe.
7. Potential Project Extension: In late January, Caltrans requested of the CMA that the project be removed from the County's share of the State Transportation Improvement Program (or STIP, the funding source for the project) until a mutually agreeable and affordable design can be identified by the City and Caltrans. Under this scenario, the project could be re-instated in the STIP in 2002 at the earliest. City staff considers

³ Caltrans increased funding to \$2.9M in 1996 based on the cost of a 5600 foot wall. The CMA then increased it again to \$3.54M in October 1999 based on an updated analysis of the cost for a 5600 foot standard concrete wall.

⁴ SB 45 became effective January 1998. In Alameda County, it designated the CMA to manage funding of Caltrans projects. The bill's purpose is to require timely project delivery for Caltrans projects under threat of losing project funding if project deadlines are not met. It does allow a one-time 20 month extension under special circumstances.

this a very risky approach in terms of protecting current funding levels and completing the project in a timely manner in order to protect the Park. Staff believes it is in the City's best interest to construct the project as soon as possible since the \$3.54 in existing funding is not inflation-protected. City staff therefore proposes requesting a one-time 20-month extension for the project, which is allowed under SB45. This request would be made through the CMA and CTC. A deciding CTC vote on the request would take place in June 2000, following a CMA Board vote in April. The CMA Technical Advisory Group (ACTAC) in January gave preliminary approval for this approach if the City, Caltrans and the CMA can agree on a project delivery schedule with time certain dates for reaching project milestones. The CTC could opt to grant a shorter extension or no extension at all, however it typically tends to concur with the recommendation of the CMA Board. The extension request and schedule need to be submitted to the CMA no later than early April. The extension and schedule are necessary under either of the two options recommended for Council consideration.

BACKGROUND AND ANALYSIS

Design and Cost

As the Council will recall, Caltrans is required to fund, design and construct the Aquatic Park Sound Barrier project as mitigation for widening I-80. The City Council rejected a conventional block wall design in 1993, and in 1996 approved a conceptual plan for a landscaped "Living Wall" design. Until 1997, the City was providing most design services for the project. Through consultants and an in-house engineer, the City conducted a constraints analysis, a public design process and an engineering analysis of alternative designs. The City also prepared schematic designs, and developed capital and maintenance cost estimates. The City stopped providing design services in late 1996 because Caltrans would not agree to signing a Cooperative Agreement so the City could be reimbursed for its expenditures⁵.

Since 1998, the City has been in the role of reviewing Caltrans proposals that are based on earlier City designs. The City provided Caltrans with its preferred design criteria in September 1998. In June 1999, the City agreed to the proposed Living Wall design provided a number of concerns were addressed, including elimination of piles and a continuous retaining wall. The project proposed in June (and currently) extends only 4100 feet rather than the requested 5600 feet. In shortening the length to avoid complicated design at either end, Caltrans proposed the north and south ends be constructed as separate projects in the future.

⁵ The City at various times investigated whether funding could be turned over by Caltrans to the City so it could either design and/or construct the project. Neither is apparently possible. Under State law, design work funded by Caltrans can only be conducted by Caltrans, and because construction would partly be on Caltrans right-of-way, Caltrans must manage construction.

In September, the CMA requested an engineering consultant, Nolte Engineering, evaluate the Caltrans cost estimate of \$9.5M for a 4100 foot wall in terms of materials costs. The analysis has not yet been completed. It is unlikely the cost estimate will be reduced drastically as the result of the evaluation, given that geotechnical assumptions and recommendations are not being re-evaluated and piles will therefore be considered a necessary part of the project.

In October 1999 a planting plan developed jointly by Caltrans and the City was approved by the City. In mid-January, staff received a revised set of plans and a response from Caltrans to a number of questions re. the design presented in October. City staff will prepare comments on these items in order to clarify to Caltrans its position on various design issues. As noted previously, in January, the City received a long anticipated geotechnical report. The report confirms Caltrans position that piles are required for the project and would be evaluated by third party engineers under Option Two.

Analysis of City Options

It is clear that the current 4100 foot long Living Wall project at a cost of \$9.5M is not financially viable given \$3.54M in available project funding. The required minimum length of 3100 ft. at the same \$2,317/ft. cost would total \$7.2M. An extended 5600 ft. project at the same rate would cost \$13M. Given the current high cost estimate, the City is faced with determining how best to proceed with the project to protect the Park. Staff proposes the following two options be considered by Council and a preferred approach be selected:

Option One:

The Council requests of the CMA and California Transportation Commission (CTC) a 20-month extension for the project so that Caltrans can, working with City staff, design an attractive-as-possible variation of its standard concrete masonry wall as an affordable alternative to the Living Wall. This approach could allow up to the full 5600 foot desired project length to be constructed for the \$3.54M in available project funding.

Analysis:

- This option would provide adequate sound protection for the Park.

- A standard concrete masonry unit wall would be less aesthetically pleasing than the Living Wall, primarily in terms of materials and height. Primarily for this reason, Council rejected a standard wall in favor of a Living Wall design in 1993. While a standard wall could be covered with vines on both sides, and planting could be established beside it on the Park side, the wall would potentially become a magnet for graffiti, would appear monolithic at 14 feet on the freeway side (and 18 ft. on the Park side due to a grade differential), and would not offer the visual interest or landscaped quality of a series of planted terraces that would vary in plant height, color and texture. On the Park side, Caltrans has indicated it would not build a sloped embankment next to the wall because it would not be

structurally necessary, so the City would likely have to fund a landscaped slope along the park edge of the wall to support plants along the edge and mitigate the towering effect of an 18 ft. high wall. Staff estimates a 5600 ft. long planted slope that is only 3 ft. in height adjacent to the wall on the Park side would minimally cost \$330,000.

- It is possible the standard design could be modified in terms of height (perhaps at the 10.5 ft. height proposed for the Living Wall rather than 14 ft. on the freeway side) but staff is not sure whether such a design would be approved by Caltrans and the Federal Highway Administration.

Option Two:

The Council requests of the CMA and CTC a 20-month extension for the project so that Caltrans and the City, working with a third party engineering firm, can identify a lower cost alternative Living Wall design. This approach would be viable only if initial analysis shows that at least 3100 feet of Living Wall (the minimum sound mitigation requirement) can be built with the \$3.54M in available funding and if Caltrans agrees with the findings of the third party. If initial analysis does not suggest significant cost savings are possible, Option One would be pursued.

Option Two would require Council to allocate approximately \$35,000 in funding for the third party engineering contract and \$20,000 for engineering staff costs to monitor the initial analysis and re-design process. This amount could be transferred from funding set aside for hydrology improvements at Aquatic Park with Council's approval. Additional staff time expenditures would be likely if this option were to be pursued to the fullest extent.

Analysis

- This option would potentially result in a barrier which adequately protects the Park from sound, is attractive, and increases habitat for birds and other wildlife in the Park. If successful, the project could meet the Council's project objectives as outlined in 1993 and 1996. However, this is a riskier, costlier and more time-consuming approach for the City.
- This approach would only be successful if initial analysis shows that the Living Wall project could be re-designed to reduce the cost of the project by more than 50% so that at least 3100 feet of Living Wall could be constructed for the \$3.54M in available funding. Ideally, the cost could be reduced even further so that a greater length of barrier could be constructed. It would take a cost reduction of 63% from the current estimate to allow 4100 ft. of Living Wall to be built for \$3.54M. This approach also requires that Caltrans support the initial analysis and re-design result and complete final design within the project budget and timeline.
- Under this approach, if initial analysis did not reveal that the cost of the project could be reduced enough to build 3100 ft. of Living Wall within available funding

levels, the City would then direct Caltrans to construct a standard concrete wall (Option One).

- Option Two requires the City expend its own funds on third party engineers to evaluate the geotechnical report, project constraints and project criteria and develop alternative lower cost designs. It would be essential to the success of this approach to have City engineering staff take an active role in monitoring the initial analysis and re-design process. Staff estimates an allocation of \$55,000 would cover both the third party engineering contract and in-house engineering staff costs.
- This approach would almost certainly require additional funding to reach the full desired project length. Grant funding through state and federal sources could be sought, but competition with other projects is formidable. The CMA has made it clear that no additional funding through the County STIP will be made available for the project.
- It is possible that the CTC may not agree to a project extension for this purpose given Caltrans' current cost estimates for the design and the need to reduce costs so dramatically.

Financial Impact

Option One:

This option would potentially require City or grant funding to achieve the full desired wall length. Alternatively, the City could opt to build only the length affordable within the available \$3.54M in which case there would be no financial impact beyond staff time dedicated to monitoring the project and possible costs associated with integrating the project into the Park environment through supplemental landscaping.

In terms of staff time, at a minimum, engineering staff time will be necessary to monitor the project. For one year, necessary dedicated engineering staff time is estimated to total \$15,000.

In terms of supplemental landscaping, the City would probably want to build a planted slope approximately 3 ft. in height adjacent to the wall on the Park side to soften the impact of the concrete block wall. While this feature is important to Park appearance, Caltrans has not considered it to be part of the project. If the City were to pay for it, staff estimates the cost for a 5600 ft. length of planted slope to be minimally \$330,000. A funding source for this potential cost has not been identified.

Option Two:

This option would minimally require the City to fund a preliminary third party engineering assessment to determine whether costs can be reduced to a significant level. If costs could not be reduced significantly, Option One would be pursued. If costs could be reduced significantly, the City would fund a third party engineering re-design of the project and would dedicate City engineering staff time to monitor the project until completed. Third party engineering work and engineering staff time, is estimated at \$55,000 (\$35,000 for consultant costs and \$20,000 for staff costs). A minority portion of this cost would be necessary to make a preliminary determination whether to pursue Option One or Option Two. Additional staff time expenditures would be likely if this option were pursued to the fullest extent.

This funding could be provided by transferring \$55,000 from the \$350,000 in funding set aside by the Council last year for hydrology improvements at the Park (Budget Code # 610-5850-450-7399).


Option Two would potentially require City or grant funding to achieve the desired length beyond what could be constructed with the available \$3.54M.

This approach could also require expenditure of \$330,000 for a planted slope next to the barrier on the Park side if Caltrans did not agree to make this feature part of the re-design. A source for this potential cost has not been identified.

Contact Persons

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Approved by:



 Lisa Caronna, Parks and Waterfront Director

ATTACHMENTS:

- A. 1996 Conceptually Approved Living Wall Project Extent and Cross-Section
- B. January 2000 Proposed Project Extent and Cross-Sections for the Living Wall and Green Wall

Council Selected Option #3

AQUATIC PARK NOISE BARRIERS OPTIONS

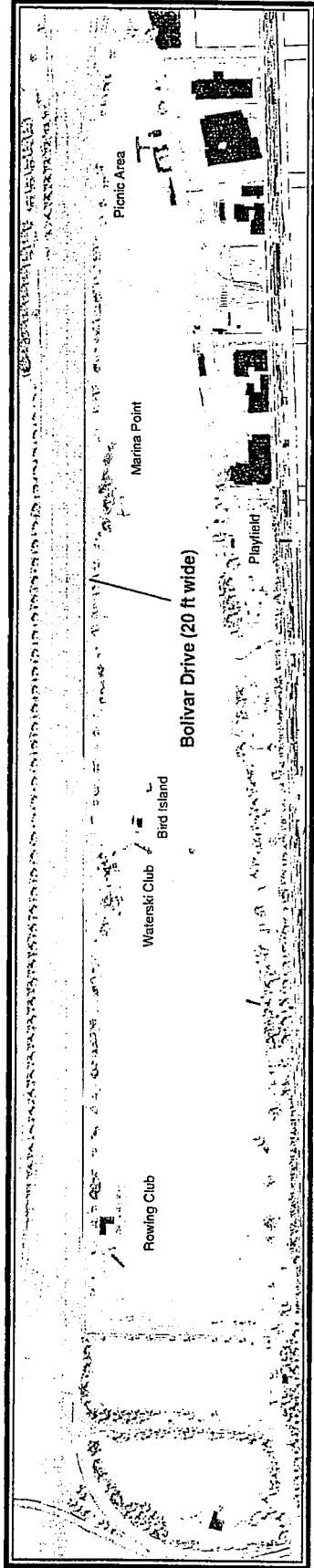
Aquatic Park in Berkeley has high noise levels due to its proximity to the I-80 freeway. As part of the freeway widening project, Federal funds were allocated for noise mitigation.

On July 13, 1993, Berkeley City Council rejected a Caltrans plan to construct standard concrete block soundwalls. The Council also directed City staff to develop alternative noise mitigation designs.

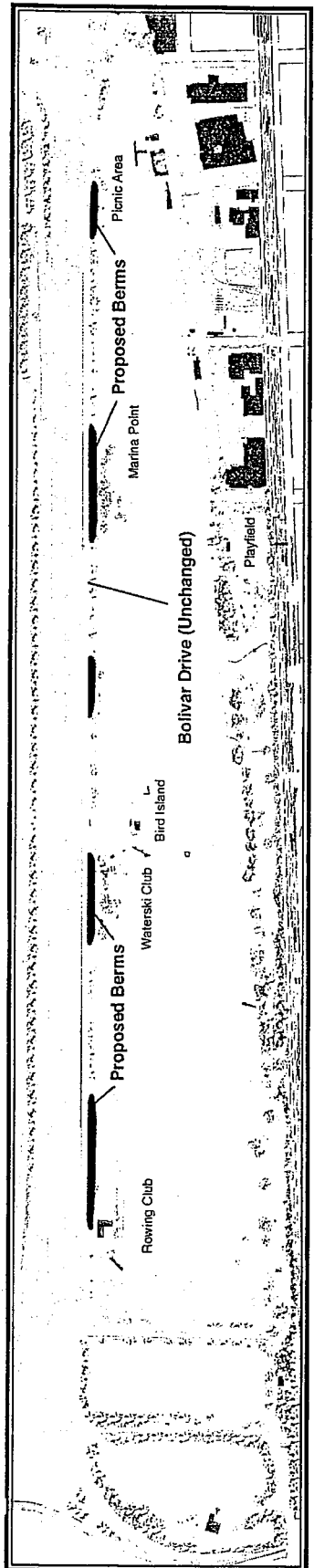
Option 1 rejects noise mitigation altogether. Under this plan, new replacement planting to screen the freeway from view would be installed to satisfy the requirements of the freeway project's Environmental Impact Report.

Option 2 involves constructing large earth berms in what are currently wider parking area sections of Bolivar Drive.

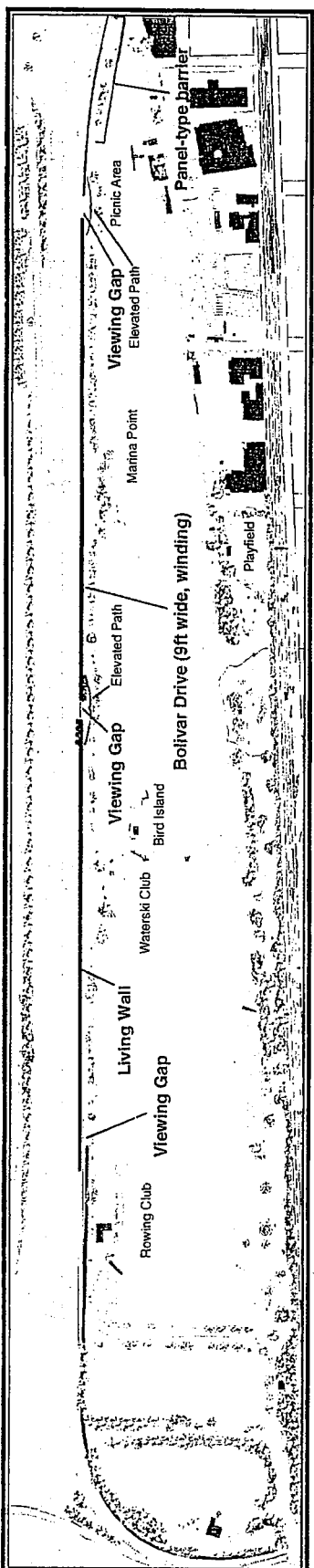
Option 3 is to create a "Living Wall" barrier along the entire park, and to realign Bolivar Drive into a narrower, winding roadway. Viewing opportunities are provided for motorists and park users at various locations by elevating the park pathway and by overlapping segments of the barrier.



1 D O N O T H I N G (E X I S T I N G P L A N)



2 I N T E R M I T T E N T B E R M S I N S I D E T H E P A R K



3 L I V I N G W A L L W I T H V I E W G A P S

1996 Project Extent

ATTACHMENT A

Council Selected Option #3

AQUATIC PARK NOISE BARRIERS OPTIONS

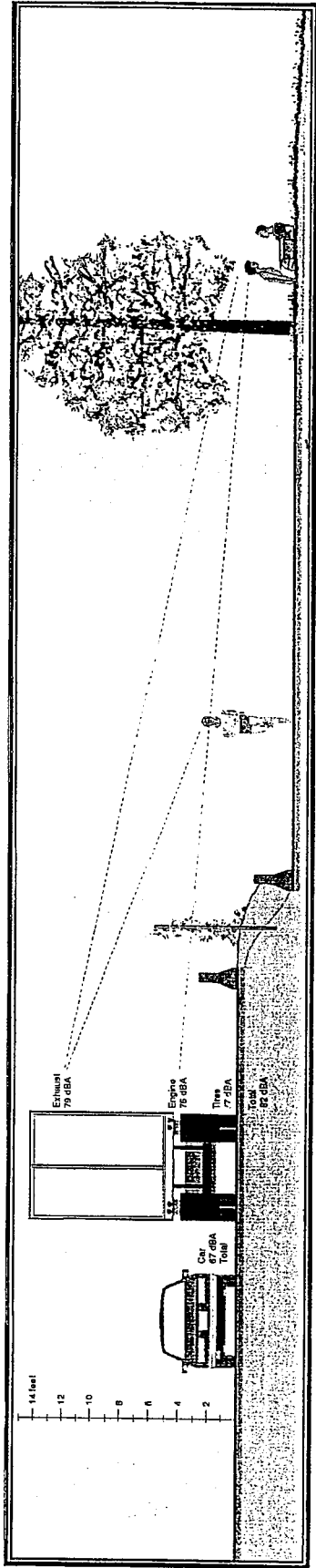
For a noise barrier to be effective, it must be both massive and tall enough to break the line-of-sight from the noise source to the receiver.

Noise sources include the tires, engine and exhaust pipes of vehicles. Heavy vehicles make the most noise, and truck exhaust stacks are a primary noise source from a barrier design standpoint*.

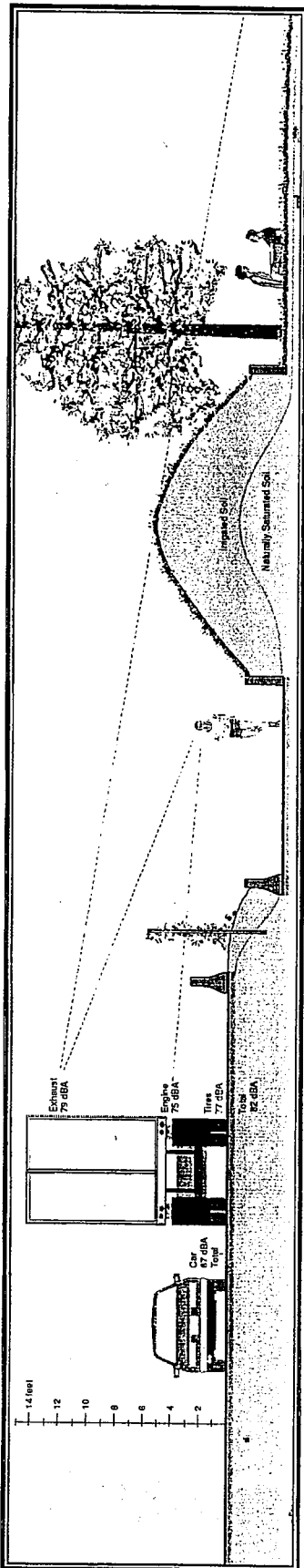
The screen vegetation in option 1 has some psychological, but no physical effectiveness as a noise barrier.

The natural earth berms in option 2 are very effective barriers, but require a lot of space and would need to be carefully landscaped for best effect.

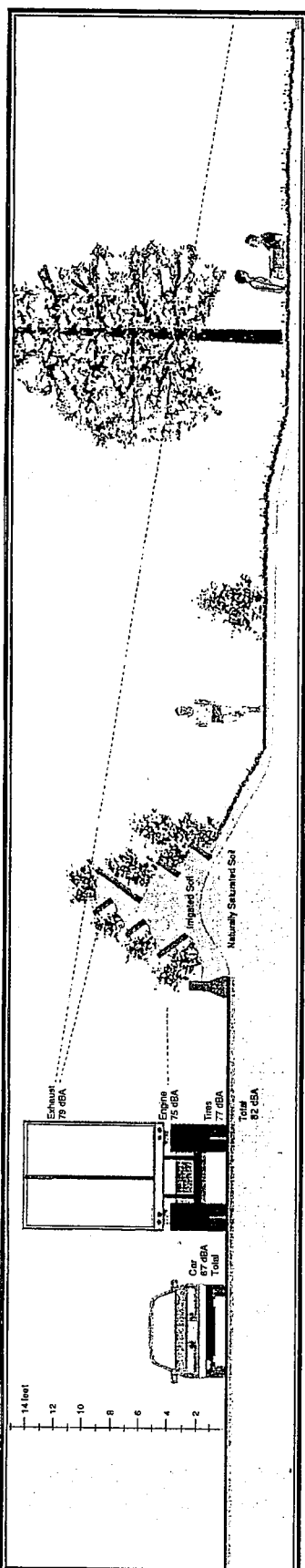
The proposed 'Living Wall' barrier is a very effective noise barrier because it is massive like an earth berm and far more noise-absorptive than a concrete wall. The earth retaining elements are angled downward to maximize planting space and to reflect noise into the planting beds. The heights of the beds are arranged to restrict freeway access, provide easy access for maintenance, and locate park side plants close to water-saturated soil.



1 D O N O T H I N G (E X I S T I N G P L A N)



2 I N T E R M I T T E N T B E R M S I N S I D E T H E P A R K



3 L I V I N G W A L L W I T H V I E W G A P S

* Information on freeway noise sources is from the California Dept

1996 Cross Section ATTACHMENT A

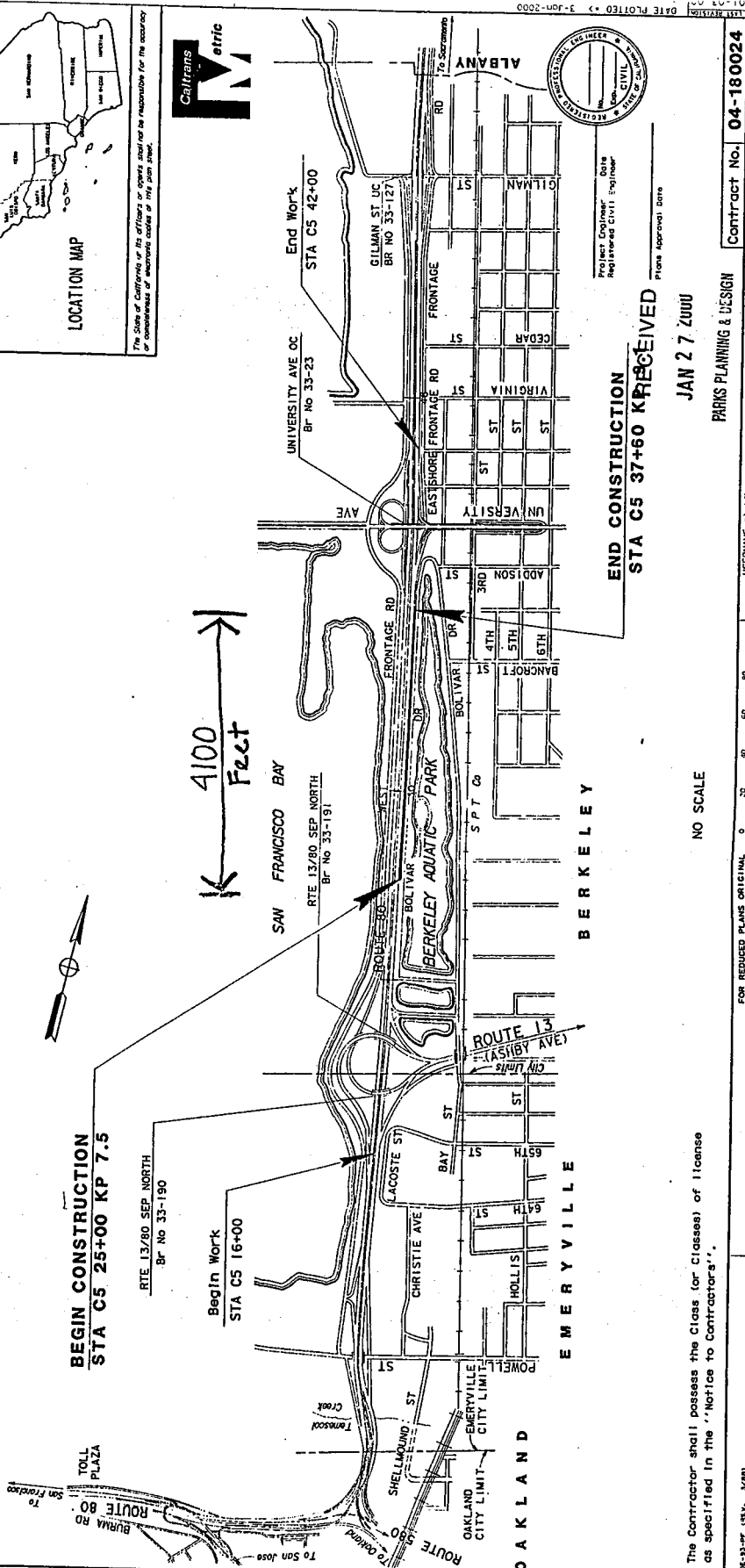
INDEX OF SHEETS

STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION PROJECT PLANS FOR CONSTRUCTION ON STATE HIGHWAY

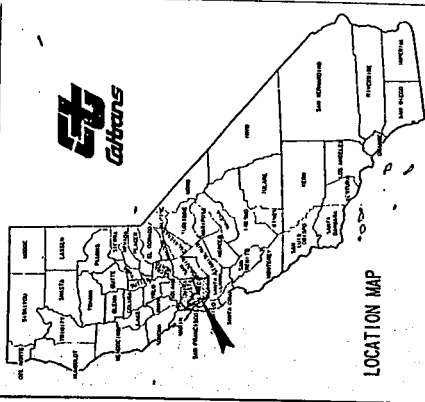
IN ALAMEDA COUNTY IN BERKELEY FROM 0.2 km EAST OF ROUTE 13 (ASHBY AVE) TO UNIVERSITY AVE OVERCROSSING

To be supplemented by Standard Plans dated July, 1999

**PRELIMINARY PLANS
SUBJECT TO REVISION**



LOCATION MAP



The State of California or its officers or agents shall not be responsible for the accuracy or completeness of information contained in this plan sheet.

DIST.	COUNTY	ROUTE	DATE	SCALE	SHEET
04	Alameda	80	7.5/9.1		

PROJECT ENGINEER DATE PROJECT WORKSHEET DATE	A. WOLNY	Y. FATHOLLAHI
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The Contractor shall possess the Class (or Classes) of license as specified in the 'Notice to Contractors'.

NO SCALE

**END CONSTRUCTION
STA C5 37+60 RECEIVED**

JAN 27 2001

PARKS PLANNING & DESIGN

Contract No. 04-180024

CU 04250 EA 180021

2000 Proposed Project Extent

ATTACHMENT B

