CITY OF MENLO PARK

City of Menlo Park

Report to City Council on Menlo Park Grade Separation & New Station Feasibility Study

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Prepared By:

BKF Engineers
540 Price Ave
Redwood City, CA 94063

REGISTERED PROFESSIONAL ENGINEER
DAVID P. EVANS
No. 21539
Exp. 9/30/05
CIVIL
STATE OF CALIFORNIA

Table of Contents

Section	Page
INTRODUCTION AND EXECUTIVE SUMMARY	1
A. PURPOSE AND BACKGROUND OF STUDY	2
1. Menlo Park's Interests	2
2. Railroad Strategic Planning and Operating System requirements	3
3. Menlo Park Station	4
B. GRADE SEPARATION ALTERNATIVES	5
1. Alternate 1. – Trench - Roadway at Existing Grade/ Lower Railroad Tracks	5
2. Alternate 2 – Overpass - Raise Roadway/ Railroad Track at Existing Grade	5
3. Alternate 3 – Underpass - Lower Roadway/ Railroad Track at Existing Grade	5
4. Alternate 4 – Split - Partially Lower Roadway/ Partially Raise Railroad Track	6
5. Alternative 5 - Partially Lower the Rails and Raise the Roadway	6
6. Alternative 6 - Raise the Rails and Keep the Roads At Grade.	6
C. ALTERNATIVE EVALUATIONS	6
1. Alternate 1. – Trench/ Lowering the tracks to the extent possible	6
2. Alternate 2 – Overpass/ Tracks remain at present elevation	7
3. Alternate 3 – Underpass/ Tracks remain at present elevation	8
4. Alternate 4 – Split/ Tracks partially raised	8
D. CONSTRUCTION ISSUES	10
E. TRAIN STATION DESIGN	11
F. NOISE EFFECTS	11
G. EFFECTS ON VEGETATION	12
H. FUNDING SOURCES	12
I. IMPORTANT QUESTIONS	12
J. CONCLUSIONS AND RECOMMENDATIONS	13
K. NEXT STEP	13

FIGURES

	Page
Figure 1- Underground Track Alternate	5
Figure 2 – Millbrae Avenue Grade Separation in Millbrae	5
Figure 3 – Jefferson Underpass in Redwood City	5
Figure 4 – Split Alternative. Holly Grade Separation in San Carlos	6
Figure 5 - Wall treatment Landscaping	9
Figure 6 – Holly and Old County Road Intersection in San Carlos	9
Figure 7 –Effect of Depot Relocation on Alma Street	10
Figure 8 - Shoofly location through Station if Depot is Relocated	10
Figure 9 - Shoofly location through Station if Depot is not Relocated	11
Figure 10 – San Carlos Station with Arched Openings under the Tracks	11

TABLES

	Page
Table 1 – Gate Downtime without Grade Separation	3

APPENDIXIES

Appendix A – Existing Conditions
Appendix B – Trench Alternate
Appendix C – Overpass Alternate
Appendix D – Underpass Alternate
Appendix E – Elevation Split Alternate
Appendix F- Preliminary Right-of-Way Maps

INTRODUCTION AND EXECUTIVE SUMMARY

Rail service has been operated through Menlo Park in the "Caltrain" corridor for approximately 130 years. In 1990, when the City last studied grade separations, there were 52 passenger trains and four freight operations per day through Menlo Park on the Caltrain line. Soon after the JPB (Peninsula Corridor Joint Powers Board) purchased the rail corridor between San Francisco and San Jose-Gilroy from the Southern Pacific Transportation Company (SPTCO), passenger rail service was increased to 66 passenger trains per day. The JPB has continued to make significant improvements to the corridor and improvements to the commuter service. Caltrain's ridership has grown significantly since the JPB assumed operation of the railroad. During the week, there are presently 76 commuter trains per day (8 trains per peak hour) in the rail corridor. In addition there are 4 late night freight operations plus occasional night operations for construction and maintenance purposes. Special train services are also available for special events, such as Giants games.

Beginning in 2004, Caltrain will begin operation of express trains on the Peninsula. These trains, commonly referred to as the 'Baby Bullet' Train. Northbound trains will start in San Jose, and will have three or four intermittent stops on its way to San Francisco. The intermediate stops have not been determined.

The City of Menlo Park has four at grade roadway crossings of the Caltrain line; Ravenswood Avenue, Oak Grove Avenue, Glenwood Avenue and Encinal Avenue. In 1990 the City authorized a study to investigate possible grade separated crossings at all four crossings. The study, titled, "*RAILROAD GRADE CROSSING AND SEPARATION ANALYSIS*", dated August, 1990 was prepared by De Leuw, Cather & Company. After reviewing the final report, the City Council determined that, principally due to the significant effects on the surrounding residences, businesses, public facilities and road circulation system, the grade separation scheme studied was impractical. The study, however, only looked at one way of separating roads from rails - keeping the railroad tracks at grade and lowering the roadway.

Due to, 1) the increased rail operations of the last decade and the prospect of more increases including Bullet Expresses trains, 2) community concerns for the safety of the crossings, 3) the disruption due to horn noise and crossing bells, 4) the disruption to emergency service response across the rail line, and 5) the inconveniences of blocked crossings as a result of increases in train traffic increased, on July 16, 2002 the City Council authorized the preparation of a study to evaluate alternative ways of creating safe grade separations in the City of Menlo Park. This report presents the results of those investigations.

Principal Study Findings

- The JPB's long range plan is to operate the Caltrain service with a number of local & express trains that will require a 4-track grade-separated system between San Jose and San Francisco. (Even if the JPB's interest was solely in expansion to a 4-track system, it is highly unlikely that the California Public Utilities Commission (PUC) would permit a four track crossing at grade..) These circumstances hold two important implications for Menlo Park. One is that grade separations are likely to be built in Menlo Park without any requirement of substantial City funding contribution toward their construction and without City government taking the lead to initiate the project development. The second is that the City has the choice of proactively planning the form of the future rail system through the center of the City, or it can simply wait and attempt to influence the design at such time as the Menlo Park segment becomes a priority for the JPB. (The City also has the choice of opposing development of grade separations and/or any additional rail trackage through Menlo Park.)

- Theoretically, there are six ways to grade separate the roadway crossings of the tracks: 1) leave the roads at grade and depress the tracks below the roadways, 2) leave the tracks at grade and elevate the roadways over the tracks, 3) leave the tracks at grade and depress the roadways beneath the tracks, 4) partially elevate the tracks and partially depress the roadways, 5) partially depress the tracks and partially elevate the roadways, or 6) leave the roadways at grade and elevate the tracks above the roadways. Of these, option "4", partially elevating the tracks and partially depressing the roadways appears the most feasible from considerations of community benefits and effects, constructability, right-of-way requirements and costs.

- A key consideration is that vertical clearance requirements are different, depending on whether the rails pass beneath the roadways or the roadways pass beneath the rails. When the roadways pass beneath, the vertical separation necessary between the running surface of the road and the top of the rails needs to be about 20 feet. Where the rails pass beneath the roadways, the necessary vertical separation between the surface of the road and the top of rails needs to be about 30 feet. This 10 foot differential makes it much more difficult to maintain linkages to nearby roadways and driveways and to avoid right-of-way takes in alternatives where the rails would pass beneath the roadways.

- Any scheme that involves changing the grade of the rails would involve construction of all four grade separations as a single project.

- A construction period of about two years would be required.

- Construction sequencing would be as follows:

  1) Temporary detour tracks or "shoofly" tracks will need to be built to maintain rail operations during the construction period, on the west of the existing rail line.

  2) Temporary roadway crossings will need to be built alongside the existing crossings.

  3) New structures will need to be built on the existing crossing alignments and fill placed to support the new tracks. (While rail operations continue on the shoofly tracks).

  4) When the new structures and the alterations to the mainline rail grade are complete, vehicle traffic will be shifted to the new structures on the original roadway alignments (with impaired vertical clearance).

5) The gaps in the mainline that provided the temporary roadway crossings will be filled in, rail operations will be shifted back to the new grade-separated mainline.

6) The temporary shoofly trackage will be removed.

7) One at a time, the grade separation structures will be finished out to full vertical clearance.

- The grade separation project would not involve any significant permanent right-of-way takes from private property owners.
- Developing the four track mainline and the temporary shoofly to maintain rail operations during its construction will necessitate some temporary construction easements on private property. These temporary easements will be of limited consequence.
- The construction of the new tracks will impact the existing Menlo Park Station. The former depot and rail freight buildings (now occupied by the Chamber of Commerce and the model railroaders respectively) are historic structures. If the structures can be relocated within the station complex, right-of-way needs in the station area would be minimal. However, if the buildings must be maintained on their exact locations, there will be significant right-of-way requirements during construction period and permanent consequences. In this case, the temporary shoofly to maintain rail operations would have to be in the block of Merrill Street between Santa Cruz and Oak Grove Avenues. This would result in the need to close Merrill Street to motor vehicle traffic for most of the construction period, with obvious consequences for local circulation and for businesses that depend on this Merrill Street frontage for access. Also, because the mainline trackage would need to be offset to the east to leave the depot building undisturbed at its present location, Alma Street would be need to be narrowed permanently between Ravenswood and Oak Grove, resulting in one way traffic in each direction without parking in that block.
- Construction of the widened rail line and the temporary shoofly trackage would potentially involve significant loss of mature trees in the corridor. Modern technology makes it possible to transplant or to uproot, store and replant large trees with a high rate of survival. This technology could allow a large number of existing trees to be preserved and thereby, to develop a project landscaped with a mature tree canopy immediately upon completion.
- Elevating the grade of the rails poses issues of privacy intrusion and view interruptions for persons living close to the trackway. To some extent, privacy issues can be offset by the mature tree plantings described above. The issue is largely a trade-off since those most directly impacted by the privacy/views issue are the same people who benefit most through the elimination of train horn and crossing warning bell noise.

A. *PURPOSE AND BACKGROUND OF STUDY*

1. Menlo Park's Interests

Key considerations for Menlo Park in undertaking this study are public safety while crossing the rail line, elimination of disturbance due to noise of train horns and crossing warning bells, avoidance of disruption and delay to emergency service crossings of the tracks, and elimination of the inconvenience of delays to pedestrians, bicyclists and motorists when the crossings are blocked for train passage.

The safety issue of the crossings is that accident frequency tends to be proportional to numbers of crossing conflicts between trains and people. Of particular concern is that, with increased train frequency, and especially with the introduction of high speed express services, the number of instances when a train in one direction passes almost immediately after passage of a train in the opposite direction increases. The problem with this is that people frequently enter the crossing as soon as the first train clears, unaware that a second train is closely approaching. Accident reports maintained by Department of Transportation indicate that there have been 6 train-involved incidents and 5 deaths that have occurred in the City of Menlo Park over the last 25 years. Although grade separations cannot eliminate the train-involved incidents of suicide or accidents resultant from deliberate trespassing on the rails, they can eliminate instances where accidents occur at grade crossings. (The alternates that raise or lower the tracks such as Alternates 1 and 4 would have the greatest likelihood of reducing trespassing.)

The train noise issue has several components: the noise of steel wheels on steel rails, the noise of heavy diesel engines, and the noise of train horns and crossing bell warnings. Of these, the train horn and crossing bell warnings are most disturbing to those living or working close to the trackway.

State and Federal codes require that the train horn be sounded in a continuous series of intermittent blasts for a quarter-mile on approach to each grade crossing. Given the spacing of Menlo Park's grade crossings and the nearest ones in adjacent communities to the north and south, this means that the trains are supposed to be sounding their horns almost continuously as they pass through Menlo Park. Train horns are required to emit sound at or above the 97 decibel level; prior to recent modifications, some of the trains operating on the Caltrain line had horns emitting sound at up to the 122 decibel level. On the current Caltrain schedule, there are late night passenger trains passing through Menlo Park, at 11:02 pm, 11:04 pm and 1:04 am. Early morning commuter trains pass through Menlo Park at 5:14, 5:47, 6:03, 6:20 and 6:42 am. In between, there are at least 4 late-night freight trains and may be one or more construction or maintenance "work trains". Residents living close to the line justifiably complain of train noise-related sleep disturbance issues.

It has become evident that it is unlikely for train horn and warning bell requirements at grade crossings to be relaxed, or for "quiet zones" to be established in the near future. The only way local officials can eliminate the train horn and crossing warning bell noise problem is by eliminating the grade crossings by grade separations.

When the trains cross existing roads, vehicular and pedestrian traffic is interrupted. This has two consequences. Emergency service response is delayed when it must cross the tracks and normal

traffic is delayed by congestion on the City streets.

The amount of time that the intersections are closed due to the trains, 'gate downtime' is amplified due to the location of the Menlo Park Train Station. As trains approach the station they are slowing to a stop, and as they leave, they need time to accelerate. This increases the length of time that the gates must remain down at Ravenswood Avenue, the highest traffic volume crossing and at Oak Grove Avenue. Also, at these two crossings, the gate "downstream" from the train's approach must close twice; once as the train approaches the station and again when the train leaves the station and actually proceeds through the crossing. **Table 1** indicates the total length of time per day that the intersections are blocked.

TABLE 1 – GATE DOWNTIME WITHOUT GRADE SEPARATION

Crossing Location	Year 2002 [1]		Year 2010 [2]		Percent Increase
	Per Day	Peak Hour	Per Day	Peak Hour	
Ravenswood Ave	98 min	10.3 min	148 min	15 min	47%
Oak Grove Ave	125 min	13.1 min	185 min	19 min	47%
Glenwood Ave	70 min	7.4 min	104 min	11 min	47%
Euclid Ave	65 min	6.8 min	95 min	10 min	47%

Note:

1. Existing 76 trains/day (8 trains per peak hour) includes Northbound (NB) and Southbound (SB) trains.
   For Ravenswood gate down times were measured at 50 seconds NB and 105 seconds SB.
   For Oak Grove gate down times were measured at 133 seconds NB and 64 seconds SB.
   For Glenwood gate down times were measured at 53 seconds NB and 58 seconds SB.
   For Encinal gate down times were measured at 40 seconds NB and 62 seconds SB.
   Measurements were taken on May 8, 2003 between 7:00 and 8:00 am.
2. Future 112 trains/day (12 trains during the peak hour) including NB and SB
3. The gate downtime delay does not include delay due to UPRR (Union Pacific Railroad) freight traffic.
4. It is worth noting that the peak times of gate downtime coincide with peak road traffic.

The 1990 DeLeuw study found that gate down time exceeded 60 minutes per weekday. Delays have increased by 50 -100% at some intersections in the past 13 years, with an approximate 50% increase expected in the next 7 years.

It should be clearly understood that grade separations will not increase traffic capacity of the street system in central Menlo Park to allow higher sustained rates of traffic flow through the center of the City. This is because the lane configurations at the key intersections that constitute the ultimate controlling limitation on capacity will not change. However, the grade separations will eliminate the worst momentary periods of congestion when gate-down conditions bottleneck intersections and the traffic surges after the gates reopen creating bottlenecks. The situation is compounded by the approach of a second train before the effects on traffic of the previous train have been dissipated.

2. Railroad Strategic Planning and Operating System requirements

Caltrain strategic planning envisions express trains, increased and expanded service frequency and the possibility of accommodating other interregional high speed service. To accommodate these operations, 4-track alignment in certain segments, and possibly along the whole corridor, will be required. It is a reasonable assumption, the California Public Utilities Commission (CPUC) would require that, in order to have four tracks, all crossings must be grade-separated. The JPB is currently engaged in preliminary engineering studies with several cities with the objective of developing an entirely grade separated right-of-way along the entire Peninsula Corridor. This means the JPB may need to implement grade separations in Menlo Park independent of any City initiative in the matter. A potentially beneficial consequence of this situation for Menlo Park is that the grade separations would likely be fully funded by a combination of local, state, and federal funding.

Express Service by 2004

The JPB will be implementing express trains between San Francisco and San Jose. Unlike the current peak period expresses that just skip occasional stops, the new expresses will have a very limited number of stops, and will be scheduled to bypass local trains on new tracks that are presently under construction in Brisbane, Redwood City and Sunnyvale allowing them to travel at higher speeds. These 'Baby Bullet' trains will reduce the travel time between San Jose and San Francisco by as much as half an hour, when the initial system is completed in 2004.

Continued Expansion of Caltrain Service

Continuing increase in service of both the express and local trains, will require more 4-track segments. Ultimate 4-track service will be needed for the entire Caltrain corridor.

Accommodating Other Regional Rail Service

The Dumbarton Connection (conversion of the old Southern Pacific rail trestle between Redwood City and Newark) is being proposed for use by a Caltrain-type commuter rail service. Proponents hope the system would be operational before 2010. The San Jose leg of the Dumbarton Connection would add three southbound trains in the am peak and three northbound trains in the pm peak on the Caltrain line through central Menlo Park.

Statewide High Speed Rail

It is possible a high speed rail line, which would connect San Francisco and Los Angeles could be built in the future. The California High Speed Rail Authority has already determined that, if service is established, it will share the center two tracks of a four track system with the Caltrain Baby Bullet in the JPB corridor. The decision to proceed with the statewide high speed rail (a bond election had been tentatively planned for November 2004, but may be deferred out of considerations relating to the economy) would advance the time when a grade separated, four track system throughout the Peninsula Corridor would be required and would increase the pool of funds available to add trackage and grade separations.

Electrification
Electrification of the Caltrain rail system is also being planned for as part of the JPB's Long Range Plan to improve service. Maintaining vertical clearance that allows for future electrification at locations where the tracks pass beneath roadways is a key geometric requirement for grade separations.

3. Menlo Park Station

Any grade separation plan that would involve a significant change in the elevation of the tracks, or any plan by the JPB to add more tracks through Menlo Park, would necessitate complete reconstruction of the Caltrain Station.

The Menlo Park Depot building at the train station (currently occupied by the Chamber of Commerce) and the former Railway Express shed (currently occupied by the model railroad club) are historic structures listed in the National Register of Historic Places. As such, the buildings are subject to state and federal codes, guidelines and regulations and are also the subject of a Preservation Covenant between the JPB and the South Bay Historical Railroad Society. Any alteration to the buildings must preserve or enhance historical values according to both State Public Resources code and the Preservation Covenant. Keeping the buildings in their present location would have significant negative effects on the surrounding road system, businesses and residences. As a result there will be a need to relocate the structures within the station site, which will help preserve the unique historic flavor of the existing station.

The JPB has recently completed a study of the Caltrain train station facilities needs for all stations in San Mateo County[1]. The JPB report is still in draft form, but will provide guidance on facilities needs when completed, should reconstruction of the station become necessary.

[1] San Mateo County Station Access Study Draft Report dated March 2003, prepared by Korve Engineering

B. *GRADE SEPARATION ALTERNATIVES*

This section reviews the feasibility of all six types of theoretically possible grade separation in the context of the conditions and constraints that exist in the Caltrain corridor through central Menlo Park.

1. Alternate 1. – Trench - Roadway at Existing Grade/ Lower Railroad Tracks

This alternative would attempt to place the tracks in a concrete lined trench through as much of the City as feasible, with the roadways crossing the trackway on structures as close to existing grade as practical. The vertical clearance required between the top of track and any overhead structure is 24 feet 6 inches, a height required to accommodate the height of the rail cars and to electrify the trains in the future. With approximately 5.5 feet of thickness needed for the structures that would support the road, there would be an approximate 30 foot differential between the elevation of the running surface of the road and the top of the rails. The railroad tracks and station platforms would be constructed at the elevation of the bottom of the trench. See **Appendix B.**

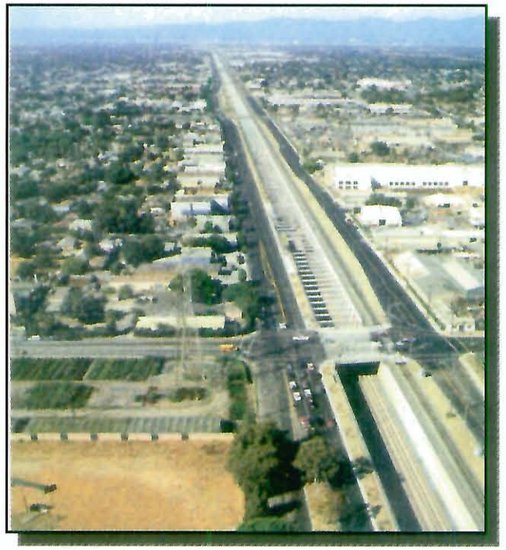


Figure 1- Underground Track Alternate

There are no instances of this type of grade separated crossing in the Bay Area that we are aware of. The Alameda Corridor Project in Southern California, see **Figure 1,** is an example of this type of railroad construction.

2. Alternate 2 – Overpass - Raise Roadway/ Railroad Track at Existing Grade

The overpass alternative would keep the railroad tracks at their current elevation and create raised structures that would ramp up over the tracks. The same vertical clearance and structural thickness requirements as in the proceeding alternative would prevail. This would result in a total structure height of about 30 feet – roughly the equivalent of a 3-story building. See **Appendix C**.

Examples of this type of crossing are the Millbrae Avenue crossing in the City of Millbrae and the San Antonio crossing in Mountain View. See **Figure 2**.

3. Alternate 3 – Underpass - Lower Roadway/ Railroad Track at Existing Grade

In this alternative, the railroad track would remain at grade and the roadways would be lowered to pass under the railroad tracks. Normal engineering practice is to provide a 15-foot clearance between the bottom of the railroad bridge structure and the pavement. With a typical 5-foot thickness for the bridge structure and trackway, the running surface of the road would be depressed a total of 20 feet beneath the existing elevation of the rails. See **Appendix D**.

Figure 2 – Millbrae Avenue Grade Separation in Millbrae

Nearby underpass crossing along the JPB right-of-way include Jefferson Ave in Redwood City, and at 5th Avenue, south of Redwood City, Page Mill Road and at University Avenue in Palo Alto. See **Figure 3.**

Figure 3 – Jefferson Underpass in Redwood City

4. Alternate 4 – Split - Partially Lower Roadway/ Partially Raise Railroad Track (Preferred Alternative)

This Alternative achieves separation between the roadway and the rail elevation with a combination of lowering the road and raising the tracks. This is similar to Alternate 3 in that the same 20-foot vertical clearance is maintained but the track is raised to accommodate part of the grade differential while the roadway is lowered to provide the remainder. The degree to which the tracks are raised and the road lowered can be varied as long as the 20-foot differential is maintained. At the preliminary evaluation level of this study, it appears that an optimum condition would be achieved if the roadways were lowered and the tracks raised in approximately 10 foot increments each. **See Appendix E**.

Examples of this type of grade separation are the Holly, Howard and Brittan grade separations in the City of San Carlos and the Harbor and Ralston grade separations in Belmont. See **Figure 4**.

Figure 4 – Split Alternative, Holly Grade Separation in San Carlos

5. Alternative 5 - Partially Lower the Rails and Raise the Roadway

In this option, because it is the rails that pass beneath the road, a 30-foot separation between the top of rail and the running surface of the road must be maintained. Although variations of how much of the elevation differential can be made up by raising the road versus by depressing the tracks are possible, this alternative tends to combine many of the worst effects, construction difficulties and cost consequences of Alternatives 1 and 2.

6. Alternative 6 - Raise the Rails and Keep the Roads At Grade.

In this option, the grade of the rails would be continuously elevated about 20 feet above the surface of the crossing street systems. Continuous elevated rail at this height would tend to raise the most broadly impact visual and privacy intrusion consequences of all the alternatives.

C. *ALTERNATIVE EVALUATIONS*

1. Alternate 1. – Trench/ Lowering the tracks to the extent possible

This alternative would install the railroad tracks in a concrete lined trench that would extend from the Town of Atherton on the north, to San Francisquito Creek on the south. To accommodate the total height differential required, the trench would need to be 30 feet deep where the rails pass beneath the roadways. See **Appendix C**. Rail systems can only change grade very gradually however. Caltrain design criteria (and typical rail design standards in general) limit the slope on the main line rail system to 1% and require large radius vertical curves to provide a smooth transition between grade changes. When these requirements are applied with the constraints that exist or may exist in Menlo Park, it becomes impossible to fully depress the railroad beneath the existing grade of the roadways. At the south City limit, the rails must cross San Francisquito Creek at the existing creek bank height - about 9 feet above the elevation of the roadway at the Ravenswood crossing. In order to keep San Franciquito Creek from spilling into Menlo Park, the bank elevation must be maintained.

In addition, at this point in the design, it would be prudent to design the Menlo Park Grade Separation without impacting, or spilling into the rail corridor in the Town of Atherton.. In order to develop a Menlo Park project and not directly involve Atherton, the tracks would need to be at the elevation of the existing tracks at the Atherton City Limit line. Because of the gentle (1%) maximum slopes and long transition curves required on the railroad, the tracks cannot be fully depressed to 30 foot vertical clearance through Menlo Park. Hence, the alternative would be in reality a split-level alignment (such as described in Alternative 6 above, with the roadways raised to provide the needed 30 foot clearance required for the trains. As a result Euclid would need to be raised 21 feet, Glenwood 12 feet, Oak Grove 11 feet, and Ravenswood would need to be raised 14 feet. As a result of the grade restrictions on the two ends of the project, Alternative 1, depressing the tracks and keeping the existing road crossings at grade, is not possible. This alternative would more closely resemble Alternative 6, partially lowering the tracks and partially raising the roads.

The concept of a depressed railroad suggests an absence of visual and physical barriers along the rail line. But this would not be the case. To prevent surface stormwater run-off from draining into the trackway, the walls of the trench will extended above grade be as much as 2 to 4-feet. In addition, a security fence would need to be constructed on both sides of the trench to a height of 10-12 feet to control access. As a consequence, except at street crossings, the depressed trackway would form a

significant continuous physical and visual barrier.

A significant problem with this alternative is stormwater that falls into the trackway. In contrast to the existing situation where stormwater that falls onto the trackway can be allowed to percolate into the soil or run off, stormwater that falls into a depressed trackway must be drained immediately (a pumping facility would be needed). Unfortunately, at present, there is no suitable facility in Menlo Park to drain or pump the stormwater to. In fact hydrologic studies indicate that, due to insufficient capacity in the existing city storm drain system, this area can expected to see flooding in major storm events. During major storm events there would likely be flooding of the trench that would shut down train service for an extended period of time on the Peninsula. This would be an unacceptable situation for Caltrain.

a. Existing roadways

All four road crossings would need to be raised to provide adequate clearance for the trains. This will require the existing roads and driveways that parallel the tracks to be ramped up to meet the new crossing elevations, but access would be maintained.

b. Railroad operations

Relocating the railroad tracks to a new underground alignment will require the construction of a shoofly and the relocation of the tracks to the underground alignment when work is complete.

c. Surrounding property owners

Due to the need to ramp up to cross over the tracks, access to some properties next to the road crossings will be disrupted.

d. Traffic circulation

Traffic circulation patterns would need to be modified to accommodate the ramping of the crossing roads.

e. Pedestrian traffic

In order to accommodate the raised crossing of the roads, there would need to be some realignment of existing sidewalks.

f. Train Station operation

The existing station operation will change significantly with a depressed railroad track. The station and parking will remain at street level but the platforms will need to be depressed at the track level; 14-feet below grade. Stairs, ramps, and elevators will provide access to the platforms.

g. Construction Issues

Because of the nature of the excavation, all of the utilities that cross, or closely parallel the trackway will need to be relocated – a significant cost and disruption.

2. Alternate 2 – Overpass/ Tracks remain at present elevation

This alternative will have the least impact on the railroad, but cause the greatest disruption to the community. Overpasses would need to start ramping up 550 to 650 feet away from the existing railroad tracks, and would meet existing ground an equivalent distance from the tracks on the opposite side. Because the rails would remain at their current grade, overpasses for the four crossings could be constructed one at a time and temporary shoofly trackage would not be needed during the construction period.

a. Existing roadways

The construction of an overpass will result in major disruptions to the traffic patterns along the railroad right-of-way. Using a design speed of 25 mph, and slopes of 8% on the ramp the impact on each of the roads would be:

Ravenswood Avenue will touch down 60 feet east of El Camino Real, which will require El Camino Real to be raised through the Ravenswood intersection, resulting in the businesses on the four corners of the intersection to be below the street grade. On the east side Ravenswood will touch down 200 feet west of Laurel Street.

Oak Grove Avenue will touch down at the centerline of El Camino Real on the west and at Laurel on the east side. Some minor regrading of Laurel Street will be required.

Glenwood Avenue will touch down just short of El Camino Real on the west and 60 feet past Laurel on the east side. Laurel Street will need to be raised slightly at the intersection.

Encinal Avenue will touch down 70 feet short of El Camino Real on the west and 200 feet east of Laurel on the east side. Laurel will either need to ramp up 7 feet to meet Euclid or it will need to be converted to a cul-de-sac.

Because the overpass alternatives involve a 30 foot elevation transition up and down, pedestrians and bicyclists may prove reluctant to use the overcrossings and attempt to cross the tracks at grade. . Even those bicyclists and pedestrians that do use the overcrossings are not particularly likely to regard them as improvements.

Since the overpass approaches will be high above the present road alignments, accessing to the roads and properties that feed off of Ravenswood, Oak Grave, Glenwood and Encinal, will no longer be accessible from these streets. See **Appendix C.** As a result properties where access is lost may need to be acquitted as part of the project. The land can be used to provide access to the new overpasses for the community impacted by the new crossings. Merrill and Alma will still be usable streets, but will not be as easily accessible as they are now.

b. Railroad operations

The railroad operations would be least impact by this alternative. The existing railroad lines could be shifted to the east and a second set of tracks constructed on the west alongside the existing tracks. This would provide the needed tracks without the need to construct a shoofly. (This is the only alternative that does not require the construction of a shoofly.)

c. Surrounding property owners

This alternative has the largest impact on the single and multi-family residence in the area. Approximately 20 single family homes, 5 apartment buildings and several businesses and office buildings would be affected by property takings or access alterations. Because of their height and length, the overpasses will also be highly obtrusive visual features, as high as a three-story commercial building and would have appearances that would be difficult to soften with landscape.

d. Traffic circulation

Traffic flow within the areas on either side of the railroad tracks would be significantly changed. Access to Merrill and Alma Streets would be via new roadways that would need to be constructed. The first at grade connections to the overcrossings would be at intersections with Laurel Street on the east and El Camino Real on the west.

e. Train Station operation

The Menlo Park Train Station will continue to occupy its current location. The overcrossings will require the station to be accessed via new roadways that would provide access to Merrill and Alma Streets. The station would remain pretty much unchanged on the west side but the easterly platform would need to be moved about 30 feet to the east, which will encroach into Alma Street.

3. Alternate 3 – Underpass/ Tracks remain at present elevation

This alternative would depress the road under the railroad tracks. The roads would ramp down at 5%, but due to the fact that the separation required between the top of rail and road surface is only 20-feet (rather than the 30-feet required for the overpass), the length of the depressed section of road will be less than the length required for the overpass. See **Appendix D**.

a. Existing roadways

The primary effects to the road system will be interruption to the existing road patterns and driveways near the tracks due to the depressed roads. The roads and driveways that presently connect to the roads being depressed will need to be significantly rerouted. For Alma and Merrill Streets, there is the possibility of connecting across Ravenswood at trackway elevation in Merrill's case, connecting to the parking lot of the Menlo Station commercial complex, not to a public street. During major storm events, some flooding of the underpasses is possible due to deficiencies in the City's existing storm drain collection system.

b. Railroad operations

Shoofly tracks would need to be constructed to detour the trains around the new bridge construction. Construction staging of this alternative will be difficult.

c. Surrounding property owners

Although there would be less property acquisition require than for the Overpass Alternate, significant property acquisition would still be needed. Businesses along Alma and Merrill would be less accessible.

d. Traffic circulation

If bridges were constructed to support Alma and Merrill across Ravenswood, a second Merrell bridge would be needed across Oak Grove. Merrill could then be connected to El Camino Real by extending Derry Lane and by acquiring right-of-way between the Corner Stone office building and retail shops south of Ravenswood. Alma would be cul-de-saced at Oak Grove or connected on a more easterly alignment that would require right-of–way acquisition. Access to Alma would be by way of Sherwood Way and Laurel Street, south of Burgess Park, or by a new roadway constructed across the Burgess Park property that would connect to Ravenswood in the vicinity of the Gate House.

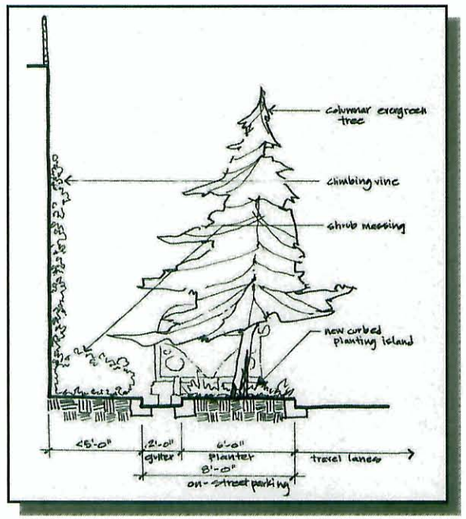
e. Train Station operation

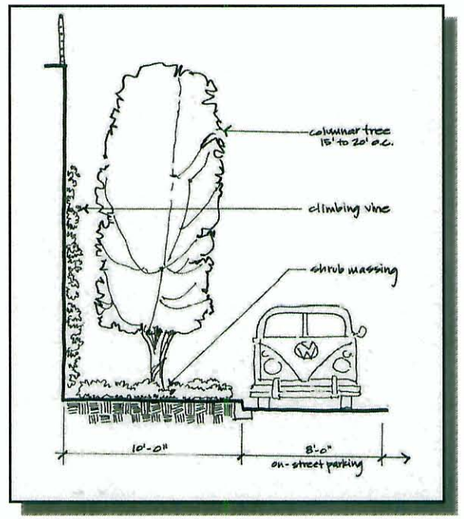
A shoofly track will need to be constructed to reroute the trains while the new railroad bridges are being constructed. The shoofly alignment will disrupt the current station site and, as with all other alternatives requiring temporary operating tracks during the construction period, would raise the issue of relocating the historic depot building within the station site. Once construction is complete, the station would appear similar to the present station. However the east platform will need to be moved east into Alma Street to allow for the additional two tracks.

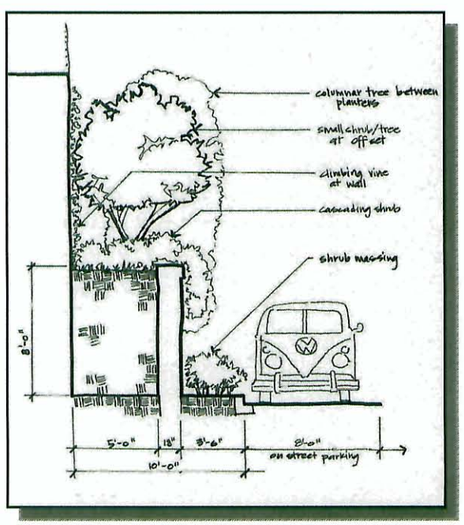
4. Alternate 4 – Split/ Tracks partially raised (Preferred Alternative)

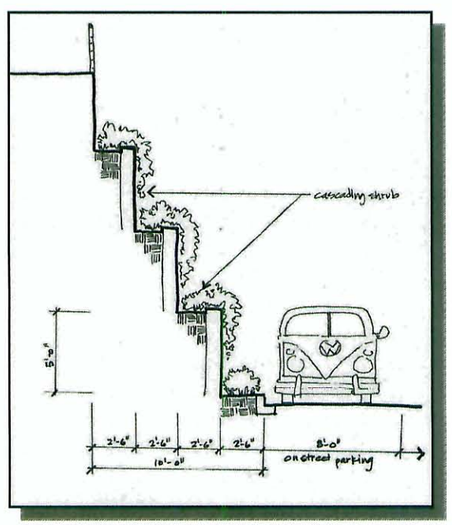
The Split Alternative would raise the railroad tracks while lowering the road. The separation required between the top of railroad tracks and the road pavement surface is 20-feet. Any combination of raising the racks and lowering the road that maintains this 20-foot differential is theoretically possible, i.e. the tracks could be raised 13-feet and the road lowered 7-feet, or the tracks could be raised 9-feet and the road lowered 11-feet. Based on preliminary studies, a nearly even raising of the track grade and lowering of the road grades appears to offer the best results. The higher the tracks are raised, the greater the visual effects and potential visual intrusions on privacy (potential for passengers in the trains to look into backyards of property along the right-of-way). During construction there will be a period of time when traffic will need to drive under the bridge structures with limited vertical clearance until the roadway can be lowered to its final elevation. The higher the tracks are raised, the greater the vertical clearance will be available during construction for the trucks and emergency vehicles.

In order to support the raised railroad tracks, it will be necessary to construct the new tracks on filled embankments and on structures at the road crossings and station area. Due to the limited right-of-way, the embankments will need to be contained with retaining walls. The height of the wall depends on the amount that the tracks are raised. Treatment of the retaining walls and structures, both in the finish









applied and the landscaping installed on and around them, will be critical to making the facility a visual asset rather than a visual barrier and intrusion. **Figure 5** indicated several landscape alternatives for the wall landscaping. Two or more of these landscape options may be appropriate to create a variety in the landscape patterns to breakup the linear appearance of the wall.

a. Existing roadways

By partially raising the tracks and lowering the road, the impact on the existing road patterns will be able to be maintained. Assuming that the tracks are raised 10-feet and the road lowered 10-feet, Alma, and Merrill Streets will be able to be ramped down to meet the grade of the new road alignments. Retaining walls, ranging in height from 3 to 4 foot will likely be needed to needed to support the properties on the east and west side of the tracks, but access to the parcels will be able to be maintained. **Figure 6** shows the intersection of Holly Street and Old County Road in San Carlos. The Holly Street overpass was constructed by lowering the road 10-feet and raising the railroad tracks 10-feet. The relationship of Holly to Old County Road is the same as the relationship of Ravenswood to Alma Street. The intersection was able to be lowered without having any significant impact on the adjacent properties. As with Alternate 3, some flooding of the underpasses is possible due to deficiencies in the City's existing storm drain collection system, during major storm events.

Figure 6 – Holly and Old County Road Intersection in San Carlos

b. Railroad operations

This alternative will require the construction of a shoofly so that the new embankment and new railroad tracks can be constructed.

c. Surrounding property owners

Properties directly adjacent to the railroad right-of-way will be affected by the raised tracks. The embankment will restrict the views people currently have across the tracks and, depending on the extent of landscaping provided, passengers in the trains may be able to see into back yards more than at present. Some residents have expressed concerns that the higher grade of the rails will cause the noise from the trains to be more noticeable or noticeable over a greater area. Recent studies performed by the JPB for the City of San Bruno Grade Separation project indicate that elimination of train horn noise and noise from crossing warning bells is a significant offsetting benefit.

d. Traffic circulation

If the tracks are raised and the road lowered roughly equal heights, the impact on traffic circulation would be minor as all present roadway connections and private property accesses would be maintained. The more the roadway underpasses are depressed and the less the grade of the tracks are raised, the greater the potential impact on traffic circulation.

e. Train Station operation

This alternative has the greatest impact on the train station. The station platforms need to be reconstructed at the elevation of the tracks. As a result, the platforms will need to be constructed on the raised fill or as part of the bridge structure. If the Depot building can not be relocated, it will be necessary to move the new railroad tracks further east, reducing the width of Alma Street to about 20-feet. If the Depot is moved, there would still be some encroachment on Alma, but it would have a width of about 45 feet. **Figure 7** shows the impact on Alma of the track alignment. The effects to Alma would also occur with all Alternatives.

Figure 7 –Effec of Depot Relocation on Alma Street

D. *CONSTRUCTION ISSUES*

Construction issues will vary depending on the alternative chosen. All alternatives, except the Overpass - Alternate 2, will require the construction of a shoofly track or detour to temporarily relocate the train during construction. Alternate 1 requires the tracks to be relocated in order to excavate for the trench, Alternate 3 requires track relocation to construct the new bridges to support the tracks, and Alternate 4 requires the tracks to be moved in order to construct the embankment fill for the raised railroad tracks.

The shoofly track will construct two new sets of tracks on the west side of the existing tracks. In several locations this will require the acquisition of temporary construction easements. **Appendix D** contains preliminary right-of-way maps that indicate where both temporary and permanent easements are anticipated. These maps are based on preliminary concept design and will change based upon the design alternative chosen and final design details. They do however; provide an indication of possible right-of-way and construction easement requirements.

A critical issue related to the "shoofly" trackage affecting both construction period and permanent right-of-way requirements is the question of whether the historic Depot Building can be relocated within the station complex. This issue effects businesses that depend on Merrill Street. If the Depot is not moved, Merrill Street will need to be closed between Oak Grove and Santa Cruz Avenues during most of the 2-year construction period. It also critically effects the permanent form of Alma Street in the block between Ravenswood and Oak Grove Avenues. If the Depot building cannot be relocated within the station complex, in order to provide sufficient room for the tracts, Alma would be narrowed to the width of a two way street without parking which would impact the businesses on the east side of Alma. If the Depot

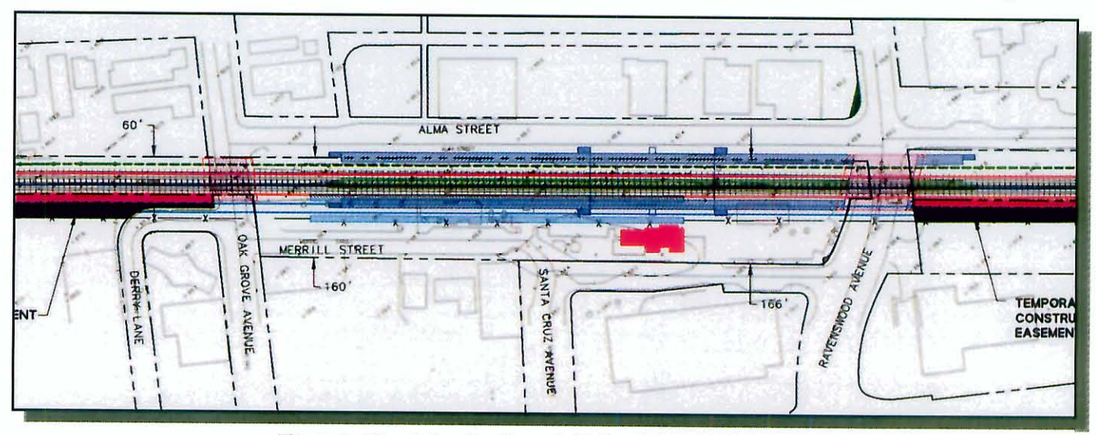


Figure 8 - Shoofly location through Station if Depot is Relocated

building can be relocated, the block of Merrill can remain open during the construction period and the block of Alma can have a width of 45 foot. At 45 feet, Alma would support two-way traffic and parking on both sides. **Figures 8 and 9** show how the tracks would be aligned, **Figure 8** with the Depot relocated, Merrill kept open during construction and Alma maintained at a width suitable for two-way operations; **Figure 9** with the Depot building maintained in its present location, Merrill closed during construction and Alma narrowed to a two-way width without parking. **Figure 7** illustrates the ultimate width of Alma Street with and without Depot building relocation. This issue affects all alternatives that require temporary operating trackage during the construction period. Only the roadway overpass alternative would not have such a requirement.

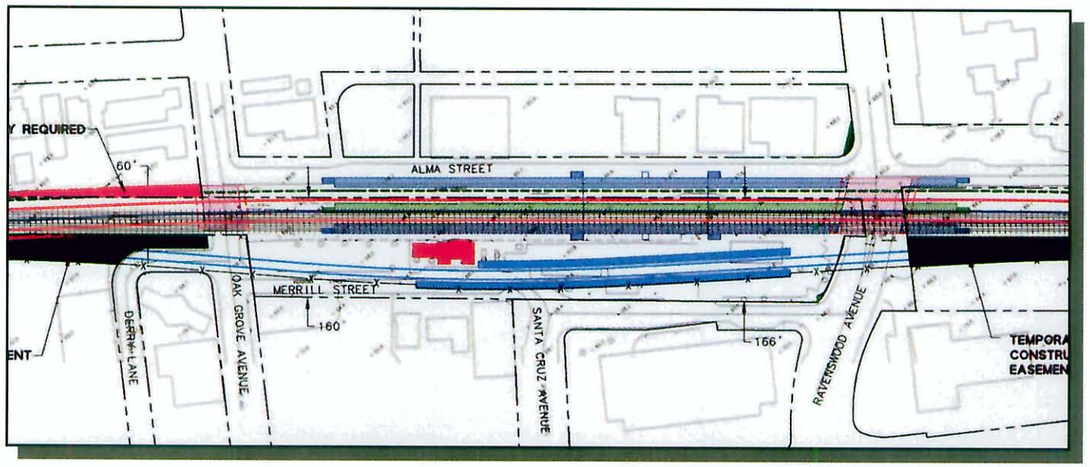


Figure 9 - Shoofly location through Station if Depot is not Relocated.

Utility relocation will be required for all alternates, however Alternate 2 will have the least impact on existing utilities. Construction for alternates will last about 2-3 years. During this time there will be some disruption of traffic flow with the need to provide detours to route traffic around construction. The Split - Alternate 4, may require some limits on the height of traffic able to drive under the bridge structures while they are under construction.

E. *TRAIN STATION DESIGN*

No detailed design study has been done for a new Menlo Park Station. However, if Alternative 4 is used, the trackway would be carried on an open viaduct involving a series of portals similar to the one pictured from San Carlos Station. See **Figure 10**. Such a design would completely open up the station area for flows of pedestrian traffic beneath the trackway between the foot of Santa Cruz Avenue and the Alma Street commercial frontage. It may even be possible to develop small shops and community amenities beneath the viaduct as part of the project. It is also anticipated that a suitably dignified site for preserving and enhancing the historic depot and freight buildings within the station complex can be developed.

The JPB has recently completed needs studies for all of its rail stations including Menlo Park. The study, which is still in draft form, indicated that by 2010, Menlo Park station will need some additional parking stalls. The extension of the train station platform across Ravenswood Avenue that is incorporated in the grade separation plans in all alternatives will allow for underutilized parking along Alma Street south of Ravenswood Avenue to be readily accessed by train station patrons.

Figure 10 – San Carlos Station with Arched Openings under the Tracks

F. *NOISE EFFECTS*

The JPB is presently working with the City of San Bruno in evaluating grade separations at three crossings. As a part of that process the JPB retained the engineering firm of Parsons to perform a study of the noise

and vibration that could be anticipated from the project. The following are excerpts from that report[2].

> "Results of the analysis revealed an overall operation noise reduction at first row residences along the proposed project corridor. The noise reduction is due to the elimination of the horn and gate bell noise with the grade separation. However, noise from train passby with grade separation at second and third row residences would be 1 to 2 dB higher than the existing levels (not including train horn or gate bell noise). Noise increases of less than 3 dBA are not noticeable in comparison to the substantial noise reduction due to the elimination of the train horn noise. The increase would only happen at the areas where the first row buildings are one-story structures. In areas where the first row buildings are two-stories, no increase in train passby noise levels are expected for the future elevated case. Even though there would be a slight increase in single passby noise levels, the average day-night noise level would not be higher than the existing noise levels due to other noise levels, such as airplane flyovers and I-380 traffic, in the project vicinity. The future noise levels with the grade-separation would not exceed FTA noise criteria in the project vicinity and because of the overall reduction in noise would be considered a positive improvement."

As can be seen from the Parsons report, the noise increase would be insignificant in comparison to the reduction in noise due to the elimination of the train horn and gate bell noise. It needs to be emphasized that the Parsons study was based on field measurements made in San Bruno and reflect the conditions that exist in that community. Due to site conditions that exist along the JPB right-of-way in San Bruno, the track was being raised as much as 20 feet at one location. Noise studies will need to be made in Menlo Park to determine the noise effects within the community. The Parson study does, however, give an indication of the effect of raising the tracks for a similar project to what is proposed in Alternate 4 for Menlo Park project.

G. *EFFECTS ON VEGETATION*

The construction of the shoofly track will require the removal of a large number of trees. Many of them are specimen trees that add character to the community. There are contractors that are capable of removing some of these trees, storing them and then replanting them, once construction is complete. The cost for removing, storing, and reinstalling trees is not insignificant but can be explored and incorporated into a future project.

Upon completion of the project trees, vines, and shrub would be planted along the walls to soften their harsh appearance.

H. *FUNDING SOURCES*

Funding for the grade separations, station and road improvements, could come from a variety of sources[3]. These include:

- Sales Tax Revenues Measure A funding
- State Public Utilities Commission – California State Aid for Railroads Grade Separations
- Traffic Congestion Relief Program
- State Transportation Improvement Program
- Federal Funding

I. *IMPORTANT QUESTIONS*

Initial findings of the grade separation feasibility study were presented to the citizens of Menlo Park at a public meeting in December of 2002 and at a special joint meeting of the Planning and Transportation Commissions in April, 2003. A number of salient questions and comments that were raised at those meetings and the responses to them are summarized here.

Why not close the rail crossing at Encinal Avenue and reduce the project cost and extent of construction?

The City could theoretically close the Encinal crossing and that would reduce project cost, reduce construction difficulty and ease traffic conditions during the construction period (presuming that Encinal would remain open and serve as a detour route during the construction period).

*However, Encinal carries approximately **4,800** trips per day across the tracks. As much as those residing along Encinal would like to eliminate most of that traffic from their street, those residing along Glenwood and Oak Grove would oppose having that extra traffic shifted to those streets (as most of it would be). Particularly since the project would be constructed with "outside" funds, there is no justification for Menlo Park to design the project in a way that shifts traffic burdens from one residential street to others of similar character.*

*Another consideration is that Menlo Park has only 4 street crossings of the Caltrain line over an **8,000** foot distance. From the perspectives of emergency service access across the tracks, operations during maintenance activities and maintenance of traffic and emergency services when there are incident-related closures or obstructions (such as traffic accidents) on one or more of the crossings, it is desirable for Menlo Park to retain all four of the track crossings it now has. Moreover, current peak period traffic congestion and level-of-service at the El Camino Real intersections with Glenwood and with Ravenswood are at or approaching tolerable limits. Shifting the traffic that now uses Encinal to these locations would create intolerable traffic conditions.*

Why doesn't the project put the rail line in a completely covered subsurface "tunnel"?

Completely burying the trains has appeal because it would seemingly eliminate noise, visual obstruction, barrier and privacy intrusion issues. However, a completely enclosed trackway would not be practical, nor could it be completely buried. Hence the trackway would remain a physical and visual barrier. As

[2] From Parsons Report titled, "Noise and Vibration Study Caltrain San Bruno Grade Separation Project, dated April 25, 2003.
[3] Peninsula Corridor Joint Powers Authority, (JPB)

previously described in the discussion of Alternative 1, the analysis shows that, because of the constraining need to cross San Francisquito Creek at bank grade, the tracks cannot be depressed quickly enough to have the vertical envelope of the trackway completely below grade at the crossings. Hence, even if the trackway were completely enclosed, there would still be a concrete box projecting about 6 feet above prevailing ground elevation across the entire City. Moreover, putting a "lid" on a depressed trackway would be problematic because of the added cost of the structure and the extensive ventilation system required inside the "tunnel" (because electrification of the Caltrain system may not take place before the grade separation project and because, even if the commuter operations are electrified, the freight operations are likely to continue to rely on diesel motive power.

Why add roadway capacity that will attract more traffic through central Menlo Park?

The project will not add traffic capacity that would attract significant traffic capacity through central Menlo Park. The number of traffic lanes on the crossings and at the key capacity constraining intersections such as El Camino - Ravenswood and El Camino - Valparaiso will remain the same. What the project will do for traffic is to eliminate the momentary congestion and delay that occurs when the crossing gates are closed and the congestion that results from traffic surges when the gates reopen after trains pass. The project will also prevent the current prevailing congestion conditions from becoming worse as numbers of train operations increase.

Conditions during the construction period will be intolerable!

Unquestionably, construction of a grade separation project would have disruptive effects. However, all of the crossings would remain open during the construction period and the construction staging and traffic maintenance plan should facilitate reasonably tolerable conditions throughout the construction period. Recent experiences during other grade separation projects in nearby communities along the Caltrain line demonstrate that the construction period need not be a paralyzing event.

Why Not Just Grade Separate the Roads From The Existing Two-Track System?

Why not just grade separate over the existing two tracks and ignore the idea of expansion to four tracks? The railroad owns the crossings and must grant encroachment permits and approve the design of any grade separation the City may wish to construct. Since the railroad's plan is now to ultimately have four tracks, it would neither approve nor financially participate in any grade separation proposal that would constrain or significantly complicate its ability to develop four tracks.

J. *CONCLUSIONS AND RECOMMENDATIONS*

There is no question that the demands for commuter rail service will grow in the future. The 'Baby Bullet' train will begin service next year creating more rail traffic through Menlo Park. Menlo Park will not be one of the stops for the Baby Bullet trains. As a result the trains will be going through the City at speeds of 70 to 80 mph. As a result, at-grade crossing will be more dangerous in the future. The California Public Utilities Commission is requiring that grade separations be installed wherever there are more than two sets of tracks at a crossing. To handle future demands, Caltrain plans call for an electrified, the installation of 4-tracks from San Jose and San Francisco.

In the future there is also the possibility of a high speed train between San Francisco and Los Angeles. The Peninsula Corridor has been designated as the preferred route for the proposed trains. If funding became available for the SF to LA high speed train, a major engineering contract would likely be awarded, and the amount of input that the City of Menlo Park would have in the design of a four track system through the City would likely be much more limited. If the Menlo Park precedes, at least though the preliminary design process, and makes a selection as to a preferred alternative, the City would be in a better position to direct future grade separation decisions.

K. *NEXT STEP*

1. Take no further action –shelve the project.

The Council can decide to take no further action on the grade separation project. In this case this report can be filed away for possible future reference.

2. Request that the JPB move forward with the grade separation project.

The council could decide on one of the four outlined alternative, and ask that the JPB proceed with developing a Project Study Report (PSR) that would describe in more detail the project and begin resolving the outstanding issues. Once the PSR is complete it would be presented to the Council for final approval, and assuming funding is available, the project could begin design.

3. Work with the JPB Planning Urban Design Report.

Work with the JPB to study how a new station/ grade separation project could enhance and fit into the fabric of the community.

APPENDIX A
Existing Conditions

APPENDIX A

Existing Conditions

This Appendix contains aerial photos and selected ground photos of the area that would be affected by the proposed grade separation project.

ALL VIEWS LOOKING SOUTH

PHOTO 1 – VIEW FROM ATHERTON TOWN LIMIT

PHOTO 3 – VIEW OF OAK GROVE AVENUE

PHOTO 5 – VIEW OF BURGESS PARK

PHOTO 2 – VIEW OF GLENWOOD AVENUE

PHOTO 4 – VIEW OF RAVENWOOD AVENUE

PHOTO 6 – VIEW OF SOUTHERN MENLO PARK

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San Carlos, CA 94070

CHIEF ENGINEER
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PENINSULA CORRIDOR JOINT POWERS BOARD

EXISTING SITE PHOTOS

CADD FILE NO	CADD DATE 06–04–03
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CONTRACT NO	MILEPOST
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COUNTY: SAN MATEO | CITY: MENLO PARK | CONTROL POINT:

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APPENDIX B

Trench Alternative.

APPENDIX B

Trench Alternate

This Appendix contains Plan and Profiles of showing the Trench Alternative where the train would run in a depressed alignment.

LEGEND

ELEVATED STREET

BRIDGE STRUCTURE

TRAFFIC CIRCULATION (GENERAL)

PROPERTY/BUILDING DIRECTLY AFFECTED

NOTE: OTHER IMPACTS NOT EVALUATED AT THIS TIME.

DEPRESSED TRACK

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MENLO PARK GRADE SEPARATION AND NEW STATION

DEPRESSED TRACK PLAN

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CITY: MENLO PARK
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LEGEND

ELEVATED STREET

BRIDGE STRUCTURE

TRAFFIC CIRCULATION (GENERAL)

PROPERTY/BUILDING DIRECTLY AFFECTED

NOTE: OTHER IMPACTS NOT EVALUATED AT THIS TIME.

DEPRESSED TRACK

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MENLO PARK GRADE SEPARATION AND NEW STATION

DEPRESSED TRACK PLAN

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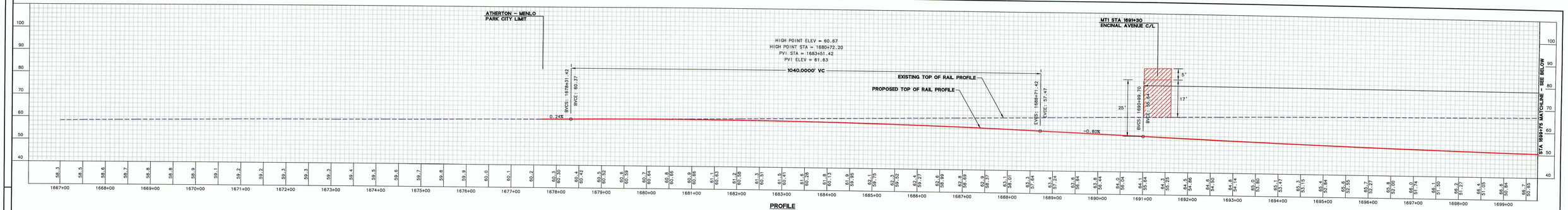

PROFILE

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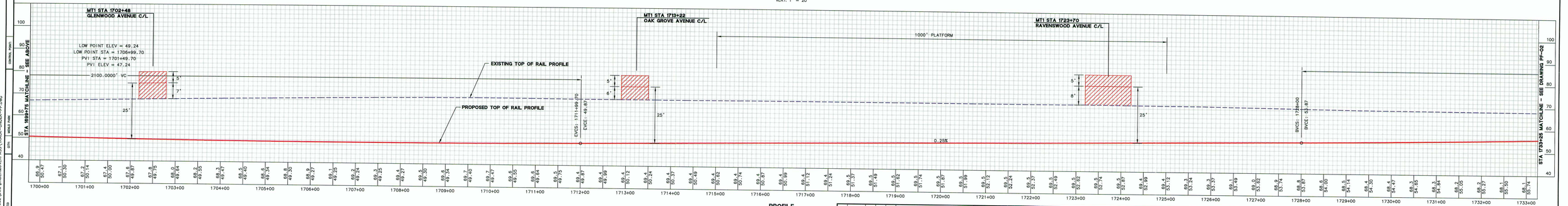

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MENLO PARK GRADE SEPARATION AND NEW STATION

DEPRESSED TRACK ALTERNATIVE
PROPOSED MAINLINE PROFILE

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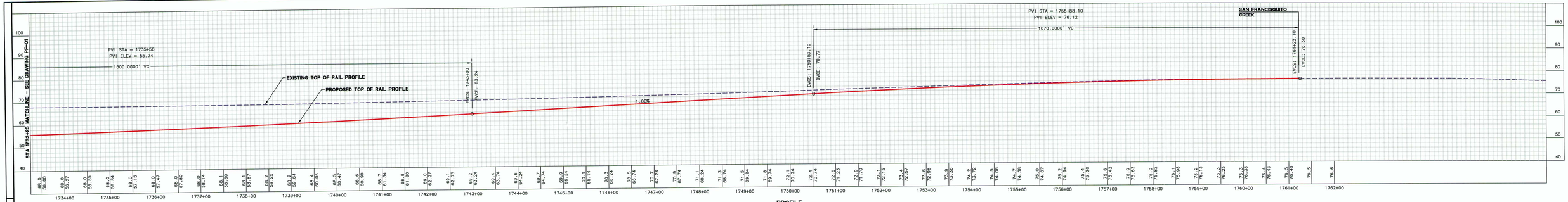

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MENLO PARK GRADE SEPARATION AND NEW STATION

DEPRESSED TRACK ALTERNATIVE
PROPOSED MAINLINE PROFILE

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CONTROL POINT

CITY: MENLO PARK

COUNTY: SAN MATEO

APPENDIX C
Overpass Alternative

APPENDIX C

Overpass Alternate

This Appendix contains Plan showing the Overpass Alternative. Train would remain at grade while the roadways would be ramped over the tracks.

LEGEND

ELEVATED STREET

BRIDGE STRUCTURE

TRAFFIC CIRCULATION (UNDER BRIDGE)

TRAFFIC CIRCULATION (GENERAL)

PROPERTY/BUILDING DIRECTLY AFFECTED

NOTE: OTHER IMPACTS NOT EVALUATED AT THIS TIME.

OVERPASS

REV	DATE	BY	SUB	APP	DESCRIPTION	REV	DATE	BY	SUB	APP	DESCRIPTION

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MENLO PARK GRADE SEPARATION AND NEW STATION

OVERPASS ALTERNATIVE PLAN
ENCINAL AVE AND GLENWOOD AVE

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SCALE 1"=200'	
CONTRACT NO	MILEPOST
DWG NO OP-01	REV / PAGE NO

COUNTY: SAN MATEO | CITY: MENLO PARK | CONTROL POINT:

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LEGEND

ELEVATED STREET

BRIDGE STRUCTURE

TRAFFIC CIRCULATION (UNDER BRIDGE)

TRAFFIC CIRCULATION (GENERAL)

PROPERTY/BUILDING DIRECTLY AFFECTED

NOTE: OTHER IMPACTS NOT EVALUATED AT THIS TIME.

OVERPASS

REV	DATE	BY	SUB	APP	DESCRIPTION	REV	DATE	BY	SUB	APP	DESCRIPTION

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PENINSULA CORRIDOR JOINT POWERS BOARD

MENLO PARK GRADE SEPARATION AND NEW STATION

OVERPASS ALTERNATIVE PLAN
OAKGROVE AVE AND RAVENSWOOD AVE

CADD FILE NO	CADD DATE
	06-04-03
SCALE 1"=200'	
CONTRACT NO	MILEPOST
DWG NO OP-02	REV / PAGE NO

COUNTY: SAN MATEO
CITY: MENLO PARK
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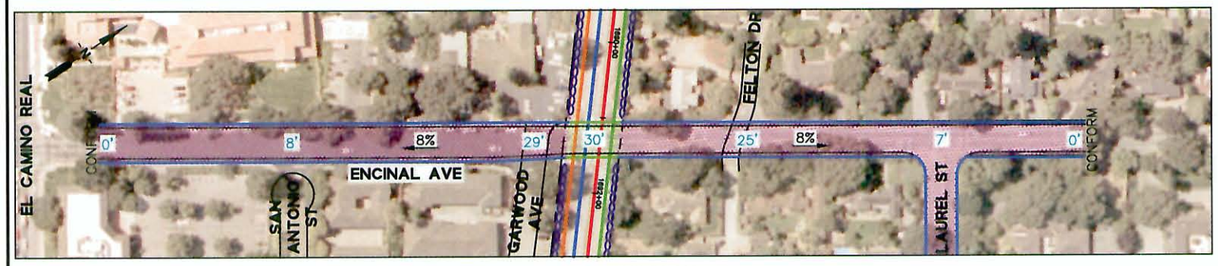
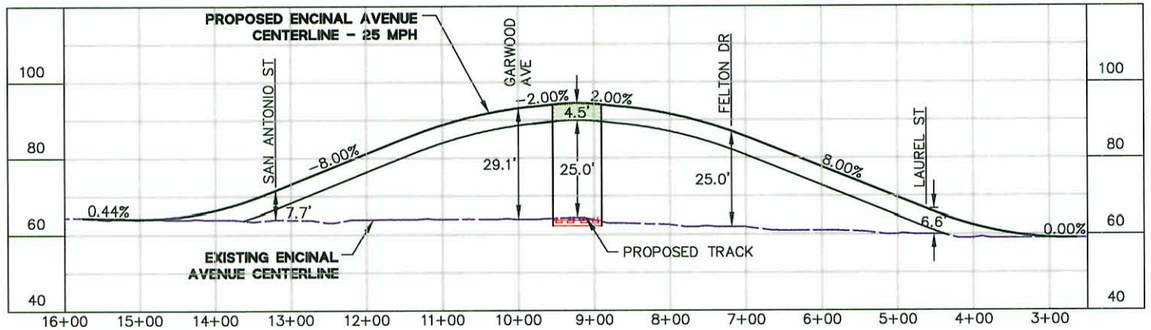
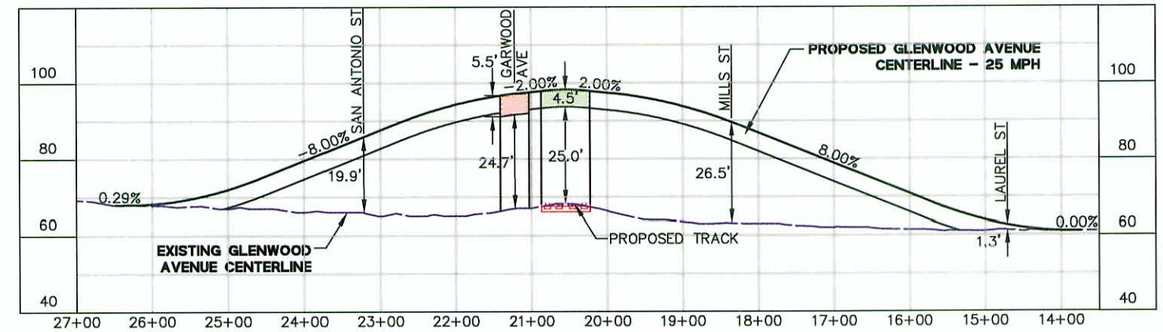


ENCINAL AVE PLAN
SCALE: 1" = 200'

GLENWOOD AVE PLAN
SCALE: 1" = 200'



ENCINAL AVE PROFILE
SCALE: HORI: 1" = 200'
VERT: 1" = 40'



GLENWOOD AVE PROFILE
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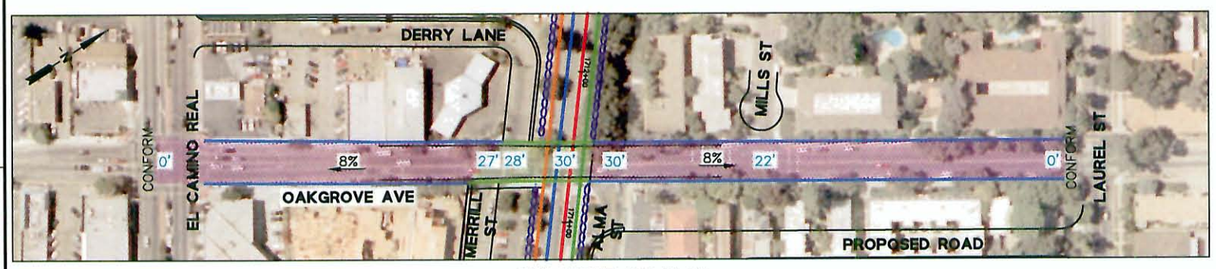
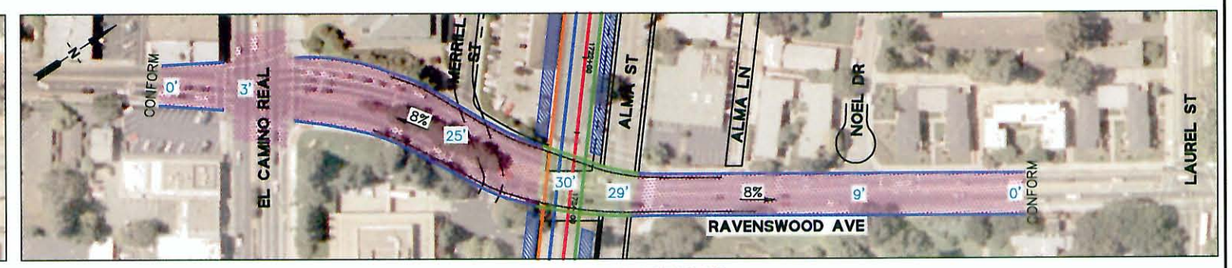
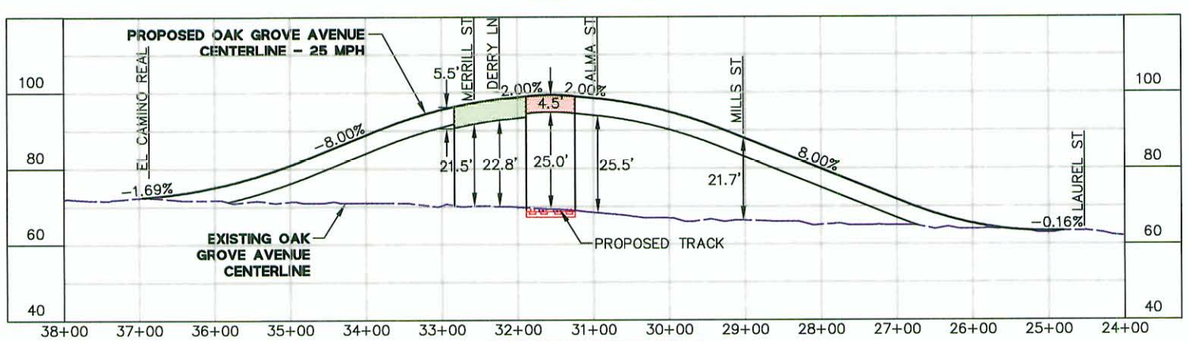
VERT: 1" = 40'



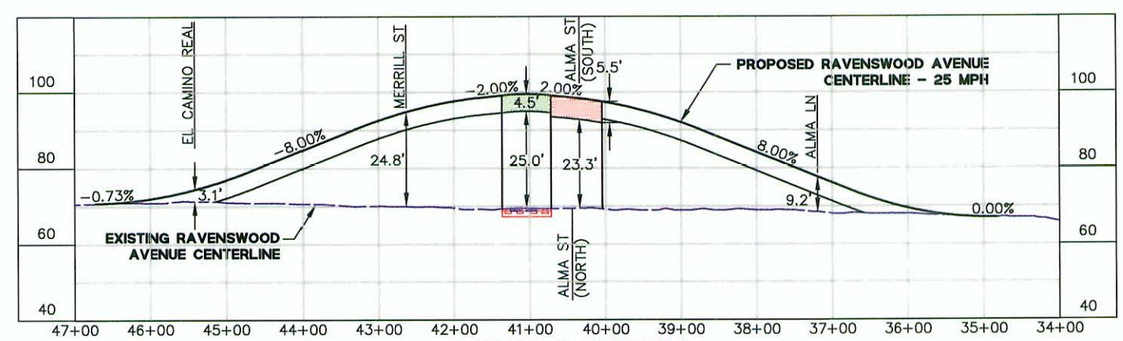
OAK GROVE AVE PLAN
SCALE: 1" = 200'



RAVENSWOOD AVE PLAN
SCALE: 1" = 200'



OAK GROVE AVE PROFILE
SCALE: HORI: 1" = 200'
VERT: 1" = 40'



RAVENSWOOD AVE PROFILE
SCALE: HORI: 1" = 200'
VERT: 1" = 40'

OVERPASS

REV	DATE	BY	SUB	APP	DESCRIPTION	REV	DATE	BY	SUB	APP	DESCRIPTION

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MENLO PARK GRADE SEPARATION AND NEW STATION

OVERPASS ALTERNATIVE PLAN AND PROFILE

CADD FILE NO	CADD DATE
	06-04-03
SCALE	
AS SHOWN	
CONTRACT NO	MILEPOST
DWG NO	REV / PAGE NO
OP-03	

CONTROL POINT:
CITY: MENLO PARK
COUNTY: SAN MATEO

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APPENDIX D
Underpass Alternative

APPENDIX D

Underpass Alternate

This Appendix contains Plan showing the Underpass Alternative. The train would remain at grade while the roadways would be ramped under the tracks.

LEGEND

DEPRESSED STREET

BRIDGE STRUCTURE

RETAINING WALL

TRAFFIC CIRCULATION (GENERAL)

TRAFFIC CIRCULATION (UNDER BRIDGE)

PROPERTY/BUILDING DIRECTLY AFFECTED

NOTE: OTHER IMPACTS NOT EVALUATED AT THIS TIME.

UNDERPASS

REV	DATE	BY	SUB	APP	DESCRIPTION	REV	DATE	BY	SUB	APP	DESCRIPTION

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MENLO PARK GRADE SEPARATION AND NEW STATION

UNDERPASS ALTERNATIVE PLAN
ENCINAL AVE AND GLENWOOD AVE

CADD FILE NO
CADD DATE 06-04-03
SCALE 1"=200'
CONTRACT NO
MILEPOST
DWG NO UP-01
REV
PAGE NO

COUNTY: SAN MATEO
CITY: MENLO PARK
CONTROL POINT:

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LEGEND

ELEVATED STREET

BRIDGE STRUCTURE

RETAINING WALL

TRAFFIC CIRCULATION (GENERAL)

TRAFFIC CIRCULATION (UNDER BRIDGE)

PROPERTY/BUILDING DIRECTLY AFFECTED

NOTE: OTHER IMPACTS NOT EVALUATED AT THIS TIME.

UNDERPASS

REV	DATE	BY	SUB	APP	DESCRIPTION	REV	DATE	BY	SUB	APP	DESCRIPTION

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MENLO PARK GRADE SEPARATION
AND NEW STATION

UNDERPASS ALTERNATIVE PLAN
OAKGROVE AVE AND RAVENSWOOD AVE

CADD FILE NO
CADD DATE 06-04-03
SCALE 1"=200'
CONTRACT NO
MILEPOST
DWG NO UP-02
REV
PAGE NO

COUNTY: SAN MATEO
CITY: MENLO PARK
CONTROL POINT:

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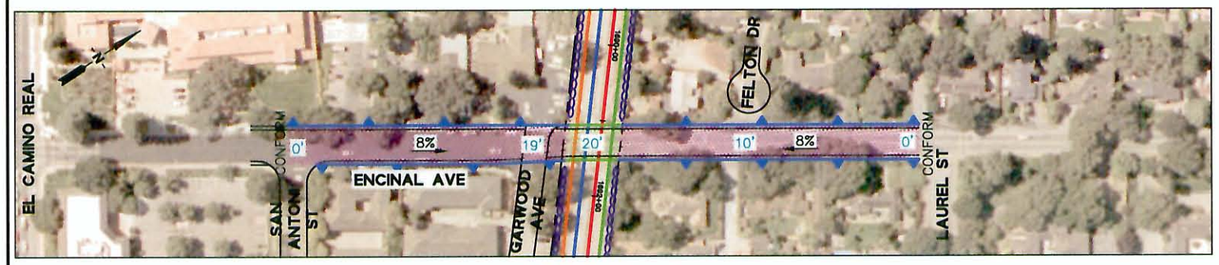
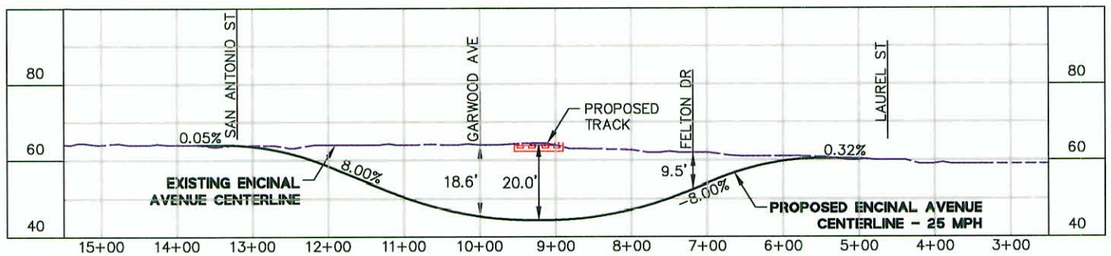
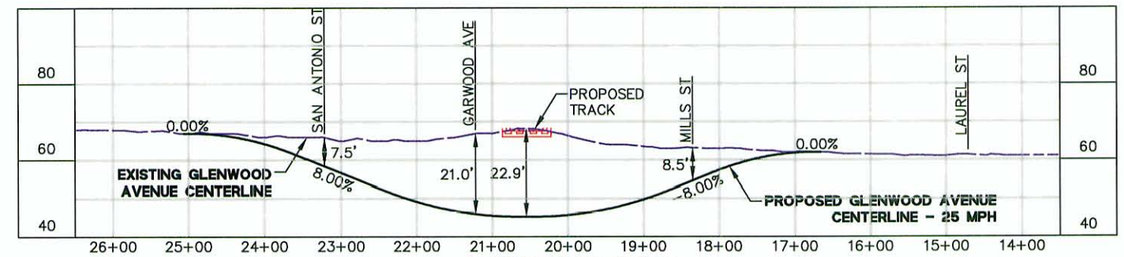


ENCINAL AVE PLAN
SCALE: 1" = 200'

GLENWOOD AVE PLAN
SCALE: 1" = 200'

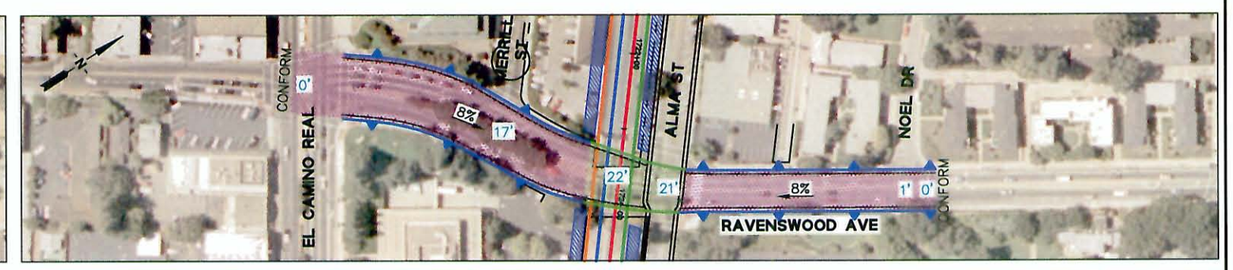


ENCINAL AVE PROFILE
SCALE: HORI: 1" = 200'
VERT: 1" = 40'

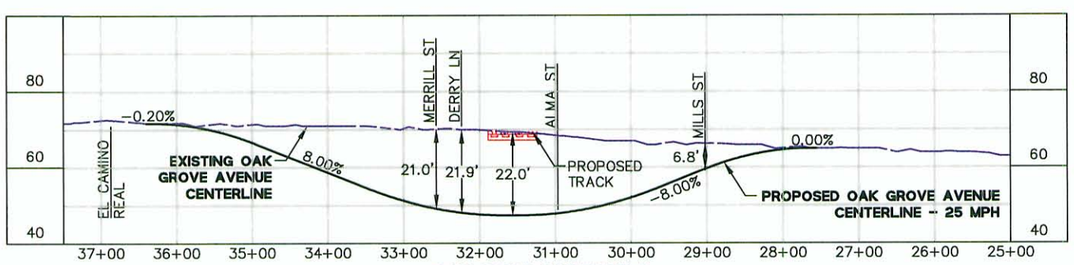


GLENWOOD AVE PROFILE
SCALE: HORI: 1" = 200'
VERT: 1" = 40'

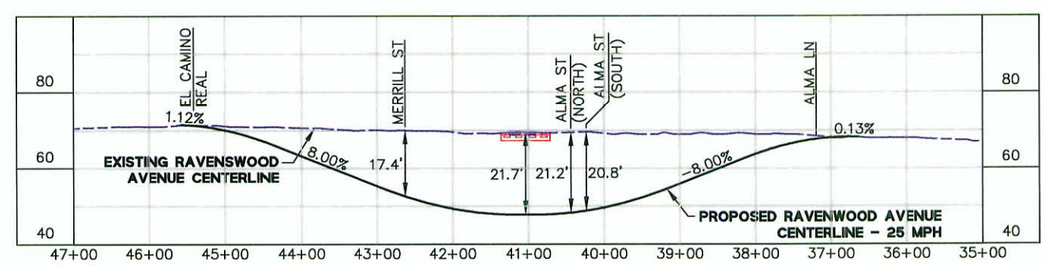
OAK GROVE AVE PLAN
SCALE: 1" = 200'



RAVENSWOOD AVE PLAN
SCALE: 1" = 200'



OAK GROVE AVE PROFILE
SCALE: HORI: 1" = 200'
VERT: 1" = 40'



RAVENSWOOD AVE PROFILE
SCALE: HORI: 1" = 200'
VERT: 1" = 40'

UNDERPASS

REV	DATE	BY	SUB	APP	DESCRIPTION	REV	DATE	BY	SUB	APP	DESCRIPTION

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MENLO PARK GRADE SEPARATION AND NEW STATION

UNDERPASS ALTERNATIVE PLAN AND PROFILE

CADD FILE NO	CADD DATE 06-04-03
SCALE AS SHOWN	
CONTRACT NO	MILEPOST
DWG NO UP-03	REV / PAGE NO

COUNTY: SAN MATEO | CITY: MENLO PARK | CONTROL POINT:

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APPENDIX E

Elevation Split Alternate

This Appendix contains Plan showing the Split Alternative. The train would partially raised on an embankment and the roadway lowered.

LEGEND

DEPRSSED STREET

BRIDGE STRUCTURE

RETAINING WALL

DEPRESSED STREET, ELEVATED TRACK

J:\ENG02\020032\DWG\UNDER&OVERPASS\STREET-HALF-PP.DWG

COUNTY: SAN MATEO | CITY: MENLO PARK | CONTROL POINT:

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MENLO PARK GRADE SEPARATION
AND NEW STATION
DEPRESSED STREET AND ELEVATED
TRACK ALTERNATIVE PLAN
ENCINAL AVE AND GLENWOOD AVE

CADD FILE NO	CADD DATE
	06-04-03
SCALE 1"=200'	
CONTRACT NO	MILEPOST
DWG NO GS-01	REV / PAGE NO

LEGEND

ELEVATED STREET

BRIDGE STRUCTURE

RETAINING WALL

DEPRESSED STREET, ELEVATED TRACK

REV	DATE	BY	SUB	APP	DESCRIPTION	REV	DATE	BY	SUB	APP	DESCRIPTION

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MENLO PARK GRADE SEPARATION
AND NEW STATION
DEPRESSED STREET AND ELEVATED
TRACK ALTERNATIVE PLAN
OAKGROVE AVE AND RAVENSWOOD AVE

CADD FILE NO	CADD DATE 06-04-03
SCALE 1"=200'	
CONTRACT NO	MILEPOST
DWG NO GS-02	REV / PAGE NO

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CITY: MENLO PARK
CONTROL POINT:

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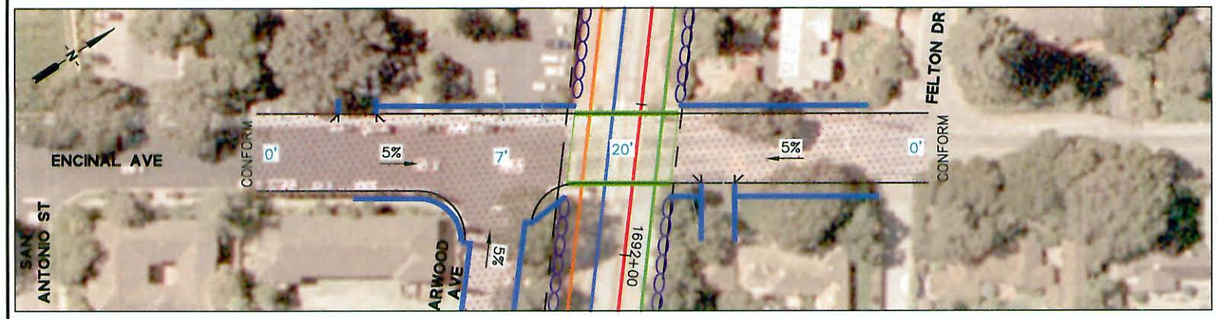
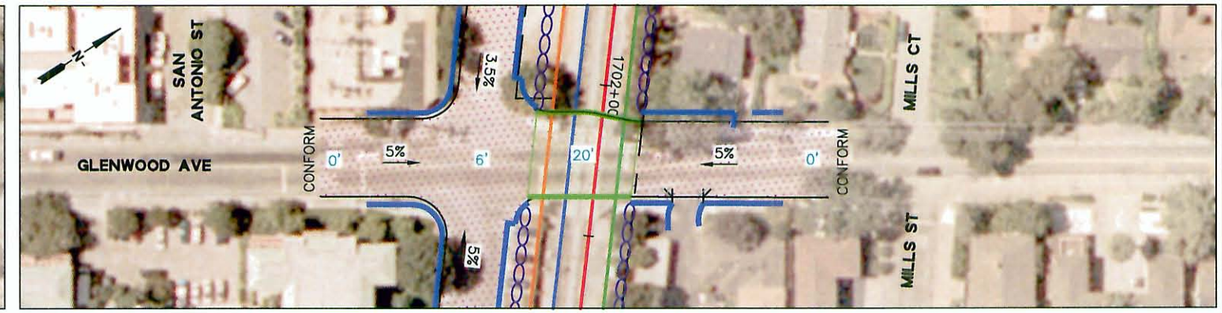
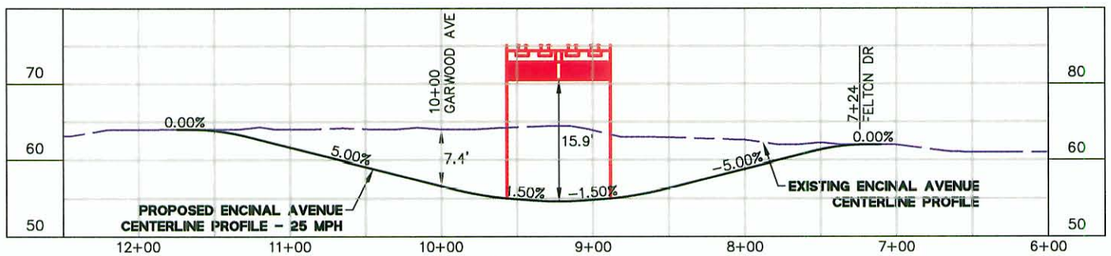


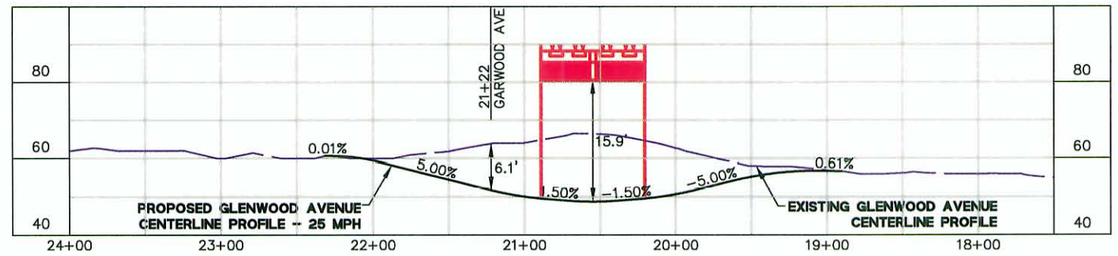
ENCINAL AVE PLAN
SCALE: 1" = 100'



GLENWOOD AVE PLAN
SCALE: 1" = 100'



ENCINAL AVE PROFILE
SCALE: HORI: 1" = 100'
VERT: 1" = 20'



GLENWOOD AVE PROFILE
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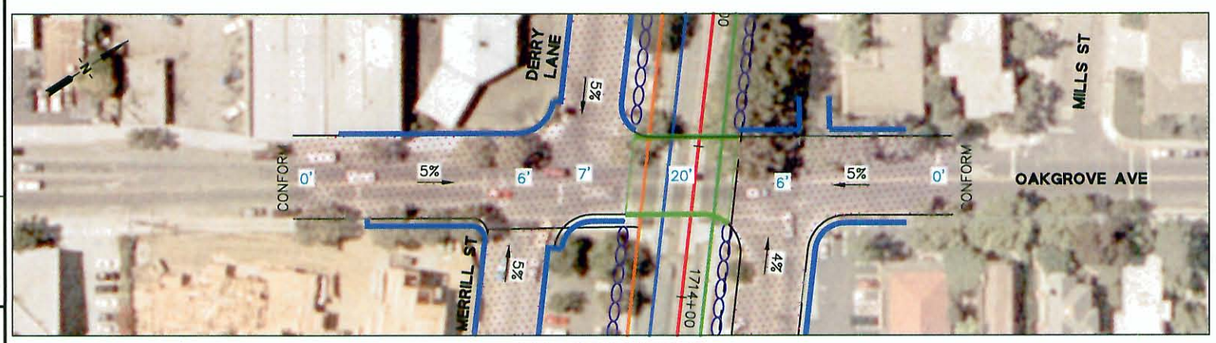
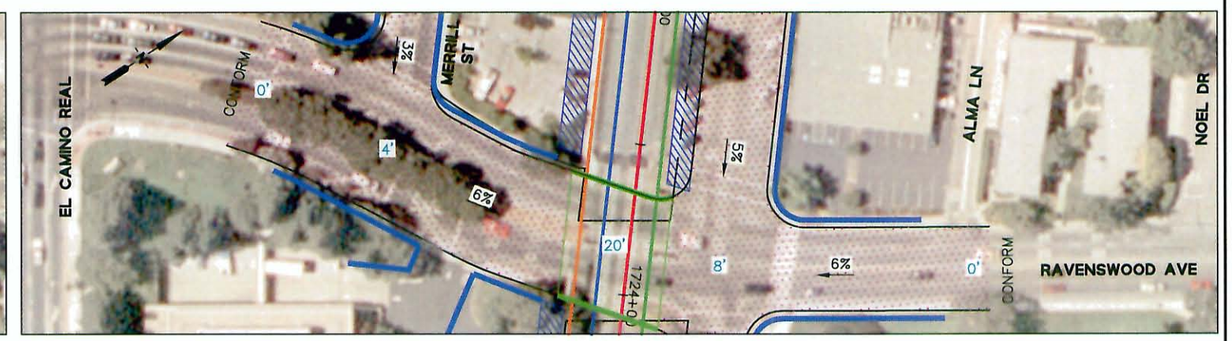
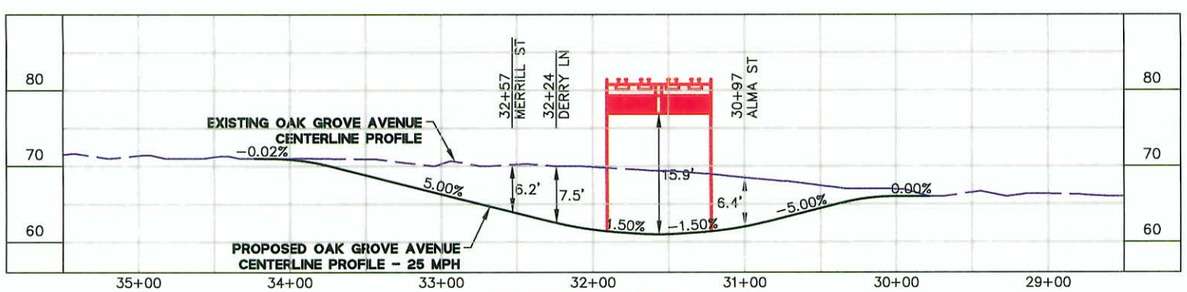
VERT: 1" = 20'



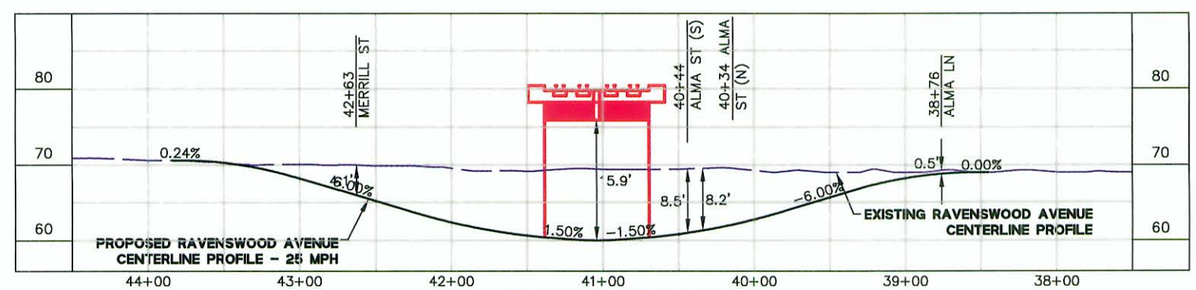
OAK GROVE AVE PLAN
SCALE: 1" = 100'



RAVENSWOOD AVE PLAN
SCALE: 1" = 100'



OAK GROVE AVE PROFILE
SCALE: HORI: 1" = 100'
VERT: 1" = 20'



RAVENSWOOD AVE PROFILE
SCALE: HORI: 1" = 100'
VERT: 1" = 20'

DEPRESSED STREET, ELEVATED TRACK

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AND NEW STATION
DEPRESSED STREET AND ELEVATED
TRACK PLAN AND PROFILE
PLAN AND PROFILE

CADD FILE NO	CADD DATE
	06-04-03
SCALE	
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CONTRACT NO	MILEPOST
DWG NO	REV / PAGE NO
GS-03	

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CITY: MENLO PARK
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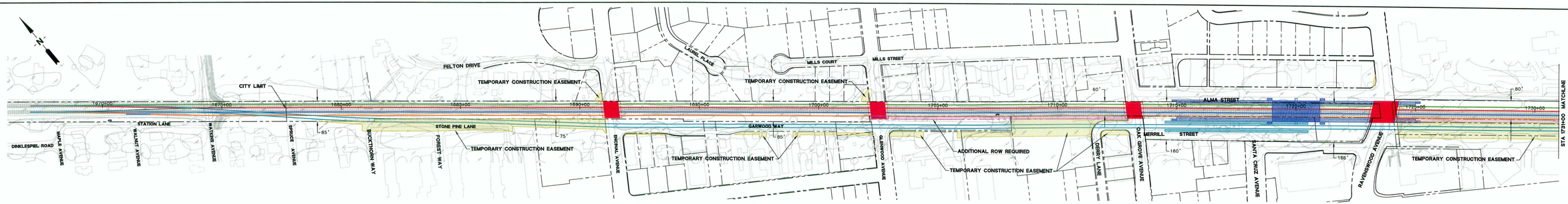
APPENDIX F
Prelim ROW Maps

APPENDIX F

Preliminary Right-of-Way Maps

This Appendix contains Preliminary Right-of Way maps for the project. These maps are intended to give an indication of where right-of-way may be needed and are subject to change based on the alternative selected and the final design requirements.

Areas shaded in Green are temporary easements needed for construction
Areas shaded in Red are needed for permanent easements.



LEGEND

- MT1
- MT2
- MT3
- MT4
- ST1 & ST2
- MSE WALL
- TEMPORARY MSE WALL
- CONSTRUCTION FENCE
- JPB RIGHT OF WAY
- CITY LIMIT
- LIMIT OF STREET GRADING
- BRIDGE AND FOUNDATION
- DEPOT CONCOURSE
- PROPOSED PLATFORM
- TEMPORARY PLATFORM
- TEMPORARY MODIFICATION TO EX. STREET
- TEMPORARY ACCESS
- ADDITIONAL RIGHT OF WAY REQUIRED
- TEMPORARY CONSTRUCTION EASEMENT

REV	DATE	BY	SUB	APP	DESCRIPTION	REV	DATE	BY	SUB	APP	DESCRIPTION

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RIGHT OF WAY MAP

CADD FILE NO
CADD DATE 06-04-03
SCALE 1"=200'
CONTRACT NO
MILEPOST
DWG NO RW-01
REV
PAGE NO

COUNTY: SAN MATEO
CITY: MENLO PARK
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