CITY OF SAN JOSE
CAPITAL OF SILICON VALLEY

Department of Transportation
HANS F. LARSEN, DIRECTOR

May 18, 2011

Mr. Dan Leavitt, Deputy Director
California High-Speed Rail Authority
925 L Street, Suite # 1425
Sacramento, CA 95814

Subject: Modified Tunnel Option for Downtown San José Area

Dear Mr. Leavitt,

The City of San José is a strong supporter of the California High-Speed Train (HST) project and its goals to improve mobility, protect the environment, enhance the economy and responsibly plan for the future. Also, San José is actively engaged in helping to develop the project in a manner that supports timely delivery of HST service for San José and the Bay Area, and in a manner that effectively manages and minimizes the environmental impacts of the project for the communities adjacent to the 20-mile HST route through San José.

As you know, the San José City Council has unanimously adopted the position to have two alignment options for the Downtown San José area included within the scope of the project EIR – we refer to these as the "best aerial" and "best tunnel" options. It is the City's goal to allow the public to review and compare a reasonable range of alternatives.

The purpose of this letter is to transmit to CHSRA staff, the City's proposal for a modified tunnel option for San José. Our intention is to share with CHSRA staff our thoughts on a viable tunnel design for San José and then to collaborate on refinements leading to the definition of a "best tunnel" option for further study as part of the HST project EIR. Our proposal was developed jointly with a group of community members (known as the San José HSR Community Coalition), and based on a close review of CHSRA's past analysis of a "deep tunnel" and a "shallow tunnel" option, as well as research into best practices of worldwide HST design. The following is a written summary of the key features of the modified tunnel option. Also attached are related exhibit maps and references that describe other projects that our proposal is based on.

Please note that the City of San José is equally interested in a defining the "best aerial" option for San José. In this regard we appreciate our collaborative partnership with CHSRA, in coordination with two Community Working Groups, to develop Visual Design Guidelines that serve to define the HST aerial option for the project EIR.

Proposal for Modified Tunnel Option for HST Design in Downtown San José Area

1. Optimizing the Downtown San José Underground Station (Diridon Station) with Respect to Alignment, Depth, and Construction Method

The past analysis of tunnel options and an underground station have focused on design concepts referred to as the "deep tunnel" and the "shallow tunnel." Both options were viewed by CHSRA staff as "impractical."

The deep tunnel station with a trackway depth of about 140 feet has the benefits of avoiding conflicts with the planned subway BART station, nearby freeway columns, Los Gatos Creek, and the existing LRT tunnel. However it would require mined station construction that was viewed to have a high cost and high construction risk due to soil conditions.

The shallow tunnel option with a trackway depth of about 60 feet had an overall lower cost and manageable construction risks, but created very significant issues relative to construction disruption, future development constraints, and impacts to the BART project.

In general, the past analysis of deep and shallow tunnel options and station locations have not produced solutions that are "practical" for CHSRA staff, nor are even "satisfactory" to the City. However, it is our perspective that key concerns with the tunnel station option are highly sensitive to the specific issues of location, depth and construction methods. Over the past few months, City officials and community members have worked to optimize a tunnel station concept that we believe is a viable option for further study, the details of which are discussed below.

a. Locate HST Station Tunnel at a "Medium-Depth" Below the Planned BART Station and Integrate the Design and Construction of Both Stations

The "medium depth" station concept has benefits of the "deep tunnel" option as it avoids conflicts with Route 280 freeway foundations, Los Gatos Creek and the nearby LRT tunnel. However, the cost and construction viability of the station is improved by integrating the design and construction of both the HST and BART stations. With an integrated design rather than the previously assumed independent design, we believe the HST trackway depth can be raised from the 140-foot depth estimated for the deep tunnel option to about a 100-foot depth. Further, the integrated implementation of both the HST and BART station has the benefits of improved passenger connectivity between HST and BART, cost efficiencies, reduced construction impacts, and sharing of construction staging sites.

It is noted that the City Council has adopted a position to seek early construction of the BART Station box at Diridon Station (estimated cost is about $200 million) in an effort to complete this construction work in advance of the full BART extension to Downtown San José, so as to facilitate near-term station area development opportunities. The advanced implementation of the underground BART station box could also support the integration concept for an underground HST station. This concept is similar to the approach taken in San Francisco for the Transbay Terminal project.

b. Align Underground Station to Minimize Physical and Construction Conflicts with Priority Development Areas

The past analysis of underground station locations has created local concerns about physical and construction impacts to prime development opportunities around the Diridon Station area (including a proposed Major League Baseball stadium) and to the operations of the HP Pavilion (one of the most active sports and entertainment facilities in the nation). We are proposing an underground station alignment (see Exhibit A) that optimizes connectivity with other transit facilities and minimizes impacts to existing developments and prime future development opportunities.

c. Use Worldwide Best Practices for Underground Station Construction

Managing the cost and construction impacts of an underground station is an important consideration, and we acknowledge the special challenges of underground construction in Downtown San José due to soft soil conditions and a high groundwater table. In our research of worldwide best practices for underground transit station construction, we believe there are examples of successful projects being built with similar conditions. The primary example that we urge CHSRA staff to consider is a transit station construction project in London, England, referred to as the Tottenham Court Road Station project. This station is currently under construction and is using a construction method that includes a combination of surface excavation and mining. The surface excavation areas are creatively integrated with plans for redevelopment of the sites for high value transit oriented development. For the San José Diridon Station area, three specific properties are identified to serve as the surface excavation sites, as shown on Exhibit A. Exhibit D provides references for further information about the Tottenham Court Road Station project.

2. <u>Reducing the Cost of Tunnel Construction</u>

A significant factor in the analysis concerning the practicality of a tunnel option relates to the relatively high cost for constructing tunnels and an underground station as compared to elevated structures and an aerial station. The reported cost difference between the San José aerial option and the tunnel options show a cost of 5 times more for a deep tunnel and 3.5 more for a shallow tunnel. Exhibit D provides references to cost comparison reports for worldwide HST projects that show a much lower cost difference in the order of 1.5 to 2 times more for tunnel options as compared to elevated viaducts. We have identified two opportunities in which the CHSRA's estimated costs for the San José tunnel option could be reduced. We request that the CHSRA evaluate these issues further.

a. Modify Assumptions for Tunnel Diameter from 35 Feet to 25 Feet

We understand the current CHSRA cost estimates for the San José tunnel are based on a tunnel diameter of 35 feet. This relatively large tunnel dimension is being used for planning purposes in order to maximize flexibility for the future selection of train equipment. However, using this conservative tunnel dimension leads to a significantly higher estimated cost for tunnel construction. Our research on modern HST systems indicates that tunnels are being built at diameters in the order of 25 feet. The reduction in the assumed tunnel diameter from 35 feet to 25 feet can lead to a significant reduction in the estimated costs of the tunnel option.

b. Evaluate Other Operational Strategies to Reduce Need for 4 Tracks (and 4 Tunnels) at Diridon Station

We understand the HST operating strategy is to have 4 trackways at Diridon Station. The purpose is to have 2 stopping tracks and two bypass tracks. Further, we understand that 90% of the trains are proposed to stop at Diridon Station and 10% of the trains are proposed to bypass the station. A significant cost component for a deep tunnel option (and likely for a medium depth tunnel option) is the proposed need for 4 full length tunnels due to the challenges of building a transition from 2 to 4 trackways underground. This essentially doubles the cost of a tunnel option in San José in order to accommodate 10% of the trains that bypass San José.

We request that the CHSRA evaluate other possible lower cost operational strategies that include: 1) operating a basic 2 trackway configuration in the greater Downtown area and locating bypass tracks in low cost and low impact areas, and 2) construction of a 3rd tunnel to use as a bypass track for two-way operations with a positive train control system to ensure safe operations. Exhibit D has reference materials indicating how other projects are addressing cost effectiveness and operating flexibility at HST stations using a 2-track system.

3. <u>Evaluating Optimal Location and Construction Method for the Southern Tunnel Portal</u>

The location of tunnel portals and the construction activity that occurs there has a significant influence on the cost and environmental compatibility of a tunnel option. In an effort to identify the best tunnel option for San José, there are outstanding issues that should be addressed at the proposed southern tunnel portal.

a. Consider Options to Locate Southern Tunnel Portal at Tamien, Curtner, or Monterey Highway

The proposed tunnel options developed by the CHSRA identify locating the south tunnel portal in the Tamien Station area. This location has raised questions related technical feasibility and environmental impact. Key concerns include proximity to Guadalupe River, impacts to cultural resources, construction compatibility with adjoining neighborhood, impacts to Caltrain service and UPRR freight during construction, and sufficiency of right-of-way (particularly if 4 tunnels are required). As an alternative to the Tamien area, we request consideration of extending the tunnel to a more suitable location along the rail corridor at either north of Curtner Avenue or northwest of Monterey Highway (see Exhibit C).

b. Locate all Tunnel Construction Operations at Northern Tunnel Portal

The southern tunnel portal options at Tamien and Curtner are located in close proximity to established neighborhoods. Potential construction impacts at these locations are of concern to the City and community. We request that CHSRA consider a tunnel construction method that manages all excavated materials and tunnel construction from the northern tunnel portal, and thereby avoiding construction staging operations and minimizing construction impacts near the southern tunnel portal. As shown in Exhibit C, the northern tunnel portal and construction staging areas should be located away from the Newhall neighborhood.

In summary, we believe the suggested tunnel design changes represented by the modified tunnel option make this a reasonable and practical alternative for full consideration in the HST project EIR. The modified tunnel option reduces or avoids past objections raised concerning a Downtown San José tunnel for issues concerning unsafe mining conditions, potential for ground settlement, possible groundwater infiltration, very high construction costs, surface disruption, and impacts to the BART project, freeway foundations, Los Gatos Creek, and development opportunities. Further, the modified tunnel option has many distinct advantages to the aerial option related visual and barrier impacts, noise, riparian impacts, development opportunities, and faster HST speeds and travel times.

Again, the adopted and unanimous position of the San José City Council is to have a full evaluation of a reasonable range of alternatives, as represented by a best aerial and best tunnel option in the HST project EIR.

In conclusion, we appreciate our continued collaboration with the CHSRA to define the best local and system-wide design for the HST project in San José. If you have any questions, please contact Ben Tripousis at (408) 975-3717.

HANS F. LARSEN
Director of Transportation

Attachments

Exhibit A – Diridon Station Area
Exhibit B – Downtown Area
Exhibit C – Tunnel Location Map and Optional Portal Locations
Exhibit D – Examples and Reference Materials for Underground Transit Stations and Tunnels.

The Exhibit A – Diridon Station Area Map can be located Under News & Announcements (Pdf called Exhibit A)

The Exhibit B – Downtown Area Map can be located Under News & Announcements (Pdf called Exhibit B)

The Exhibit C – Tunnel Location Map and Optional Portal Location Map can be located Under News & Announcements (Pdf called Exhibit C)

Exhibit D
May 2011

Examples and Reference Materials For Underground Transit Stations and Tunnels

1. **Underground Station Construction Methods in adverse soil conditions**
   http://www.crossrail.co.uk/route/stations/tottenham-court-road/design#content

   New construction methods developed in Europe show lowered construction risk and cost of underground stations. The above link documents one such project, the Tottenham Court Road Station, being built to bring the Crossrail regional rail service to a very dense sector of London. This new station will link two existing subways with Crossrail. The construction method minimizes surface impacts by concentrating excavation to only block-sized locations. Two blocks at each end of the station (and in the case for Diridon, three, including one at the center) are reserved for the excavation shafts. Once the excavation reaches the track depth, hand-mined tunnels join the shafts together via a horizontal cavern to form the station. Tottenham has similarities to Diridon Station as they both deal with poor soil conditions and high water tables. Upon completion of the underground station, the blocks are topped with development projects or the station head house. While the above example illustrates the underground station construction for a commuter rail service, the construction method can be applied to other underground facilities. Two other London tunnel projects, the existing HS1 and proposed HS2, will consider using this method to construct new underground stations.

2. **High Speed Rail Tunnel Diameters**
   http://www.ctta.org/FileUpload/ita/2009/papers/O-12/O-12-09.pdf

   Internal diameter of single-track tunnels depend on many factors, including train running speeds, the track type and the size of the train anticipated to serve the High Speed Train project. Most modern high-speed train systems in Europe have tunnel diameters in the range of 24 to 26 feet, significantly narrower and less costly than the 35 foot currently assumed in CAHSR cost estimates. Page 5 of the link above provides cost comparisons of tunnels by tunnel diameter.

3. **Two-Track High Speed Rail Stations**
http://webarchive.nationalarchives.gov.uk/+/http://www.dft.gov.uk/pgr/rail/pi/highspeedrail/lordmawhinneyreport/

http://webarchive.nationalarchives.gov.uk/+/http://www.dft.gov.uk/pgr/rail/pi/highspeedrail/lordmawhinneyreport/pdf/appendix3_12.pdf

High Speed Rail access planned for London-Heathrow Airport includes provisions for a two-track underground station. One option to be considered is an underground station with a two-track, edge platform configuration. Pages 32-34 of 52 on the second link, Section 3, gives a preliminary study of the relative scale and cost of a smaller station configuration at the London Heathrow Central Terminal.

4. **Cost Comparisons of High Speed Rail Tunnels and Elevated Viaducts**

BSL Management Consultants, "Comparison of High Speed Lines' CAPEX, Final report," Hamburg, November, 2009.
http://www.hs2.org.uk/assets/x/56773)

High Speed Two (HS2), "High Speed Rail, London to the West Midlands and Beyond, HS2 Cost and Risk Model," December 2009.
http://webarchive.nationalarchives.gov.uk/+/http://www.dft.gov.uk/pgr/rail/pi/highspeedrail/hs2ltd/riskmodel/pdf/report.pdf

Recent studies from Europe provide information on the differences in costs between the construction of tunnels and elevated viaducts. The data shows a smaller cost difference between elevated and underground options than currently estimated by CAHSR. The links above provide cost comparisons that help illustrate this. The first link outlines the analysis of investment costs over a variety of different activities and phases as found by the BSL Management Consultants' CAPEX Report. Page 78 of the CAPEX report provides a unit costs table by line type (tunnel, cut & cover, viaduct, etc.). The second link provides a summary of the costs associated with the HS2 work in the UK. Page 16, section 3.1.11, provides a unit rates table for several line types including twin-bored tunnel and viaducts.