Alternatives for the NWP Corridor

White Paper No. 3

Gridlock on Highway 101 is the joker in the deck of cards that is life in the North Bay. Fortunately, Marin and Sonoma counties have a transportation ace up their sleeve: The two are lucky to possess the historic Northwestern Pacific railroad right-of-way. This long ribbon of property, owned by the taxpayers, runs directly through the heart of the major cities in both counties, generally paralleling Highway 101.

The old right-of-way is perfectly suited to improve our mobility, but it sits idle, waiting for us to breathe new life into it. Our task in the North Bay has been to identify the technology and type of transportation service that makes the most sense in that corridor. It should be appealing and effective to draw in riders. It should reduce congestion and air pollution. It should mesh with local planning aspirations. It should be practical, yet also inspirational. And it should be done for just a quarter-cent increase in the sales tax.

Finding the right fit for the corridor has been a part of SMART's mission since it was created in 2004. For a great variety of reasons, the technology chosen by SMART – a clean, self-propelled rail cars (called Diesel Multiple Units, or DMUs) running on a standard gauge track – easily makes the most sense. Reviewing some of the other options explains why:

Views of three different DMU trains

BART

Some have suggested that BART be extended to the North Bay, either across the Golden Gate Bridge or Richmond Bridge or via the Highway 37 corridor from Vallejo. Although that may be an attractive idea, its cost makes it out of the question in the foreseeable future. While the updated cost of the SMART rail project is approximately $6.3 million per mile, the cost of a metro system like BART would easily be more than $100 million per mile. The current estimate to extend BART to San Jose is running at $293 million per mile. With a capital cost of between $8 billion and $15 billion – and possibly even higher – a North Bay BART extension just can't be supported by the relatively small tax base available in Marin and Sonoma counties.

BART's costs are high for a variety of reasons. First, BART must be completely grade-separated. This means it cannot pass directly over a street, but must tunnel under or span over every intersection it passes. The SMART rail line includes 100 crossings, each of which would represent a major construction project for a BART extension. BART also requires an electric infrastructure and unique equipment that requires a lot of customization.

Not only would a BART extension be financially infeasible, but it runs contrary to both BART and regional plans. The recent 50-year Regional Rail Plan for the Bay Area, drafted by the Metropolitan Transportation Commission, BART and other Bay Area agencies, determined that BART will not go beyond its current slate of projects. BART will instead spend the next several decades becoming more of a traditional "metro" system focused on better serving the region's core. Moreover, even BART is now looking at using DMU vehicles on standard gauge rails for its current expansion projects in the East Bay.

Magnetic Levitation

Magnetic Levitation rail, known as "maglev," uses an electromagnetic force to move trains that rest on a thin cushion of air. Given its lack of friction, maglev's signature feature is an ability to travel at extremely high speeds that approach or even exceed 300 mph. But because a train in the SMART corridor would stop every 5 miles or so, the value of this incredible speed couldn't be fully utilized.

More importantly, a maglev system would be extremely expensive. The only high-speed maglev train in the world currently operating passenger service is a 19-mile line in Shanghai, China, that had a cost of $70 million per mile in 2004. A low-speed (60 mph) maglev, constructed near Nagoya, Japan, had a cost of $174 million per mile. The Japanese costs are more in line with a potential California project, given both the lower labor cost in China and the relative lack of transparency in the Chinese cost reporting. Recent cost estimates for maglev alternatives in other parts of the U.S. (including from Pittsburgh's downtown to its airport and from San Diego to Imperial County, CA) have ranged between $100 and $200 million per mile. Again, the proposed SMART train will cost just over $6 million per mile.

Maglev is expensive because, like BART, it must be entirely grade separated. It also has a costly electro-magnetic infrastructure and uses other relatively rare and complex technology. For the 70-mile SMART corridor, choosing maglev would mean a total project cost of about $7 billion to $14 billion. As with BART, there is simply not a large enough tax base in the North Bay to accommodate a project this expensive.

Monorail
Monorails are systems that run trains on single beams using an electric infrastructure located in the guideway. As such, they are a close cousin of "third-rail" metro systems like BART. Their primary advantages over a standard metro system are a less bulky aerial structure and a sleek modern look. The majority of monorails worldwide are very short lines located at amusement parks or zoos.

Like both BART and maglev trains, monorails must also be entirely grade separated, meaning they must span over or tunnel under streets. The combination of the need for total grade separation and an electric infrastructure makes this system quite expensive. The recently completed 4-mile monorail project in Las Vegas cost approximately $100 million per mile. For the SMART corridor, this would translate to about $7 billion. Again, the cost is simply too high for Marin and Sonoma counties.

Light Rail
Light rail is a term for a modern version of a streetcar, which operates on tracks and gets its power from an overhead wire. Light rail does not need to be grade separated and can cross over streets and even mix with traffic. Consequently, light rail is viewed as a cheaper alternative to metro systems like BART, while also providing more capacity and a more appealing ride than a bus. Light rail vehicles can be modern and sleek, or can be restored vintage streetcars.

Many cities around the world have versions of light rail. Systems in California include San Francisco's Muni Metro, the Los Angeles MTA's Gold Line, the San Diego Trolley, the Sacramento Blue and Gold lines and San Jose's VTA light rail.

Light rail costs today typically fall between $15 million and $50 million per mile. While this is much more down to earth than the BART, maglev or monorail costs, it is still considerably higher than the roughly $6 million per mile cost of the proposed SMART project. This is largely due to the cost of the infrastructure for the overhead wire, which is required for the light rail to function.

Perhaps more importantly, the SMART corridor would be a poor application for a streetcar. Light rail stations are typically spaced about ¼ to 1 mile apart and lines are usually less than 20 miles long. By contrast, SMART rail stations will be 5 miles apart on average, with a corridor that is 70 miles long. Top speeds for historic trolleys are about 45 mph, while top speeds for modern light rail vehicles are about 65 mph. These speeds are not a problem for a local system with frequent stops, but are too slow for the service in the SMART corridor, where service is planned to run at tops speeds of around 80 mph. Light rail is not the ideal fit for the NWP right-of-way.

Commuter Rail

Commuter rail is a term commonly used to describe rail that operates on standard gauge tracks, generally in longer corridors and usually with self-propelled vehicles. “Commuter” is a bit of a misnomer since these services are used for all sorts of trips, and not just going to work. Commuter rail, like light rail, does not need to be grade separated and can cross directly over streets. Commuter rail can also use self-propelled vehicles, which do not require an electric infrastructure. The ability to operate at grade with self propelled vehicles keeps capital costs relatively low.

All over the globe a pattern repeats itself: The hearts of major urban areas often have streetcars that can mix with traffic and, on a somewhat larger scale, metro systems that are completely separated from traffic. Some cities have both. However, to serve the periphery of a metropolitan area, most places use commuter rail, which typically operates on an even larger scale serving much longer corridors than metro systems.

The Bay Area fits this pattern. Within San Francisco proper there are the Muni cable cars, historic streetcars and light rail. Operating on a bigger scale is the BART metro system, which links the city to inner suburbs and the San Francisco airport. And finally, on an even bigger scale serving outlying areas, are the commuter rail systems such as the 81-mile Caltrain line (to Gilroy), the 170-mile Capitol Corridor (to Auburn) and the 86-mile Altamont Commuter Express (to Stockton). The stations on these lines are spaced about 3 to 10 miles apart.

One great advantage of commuter rail is the fact that it can be incrementally upgraded as funds become available. Electrification is an option for commuter rail, and could be for SMART down the road. Caltrain is planning to fully electrify its line to achieve some performance enhancements, such as improved acceleration. Grade separations, while not essential, can be added later on as desired and as funds become available.

This type of rail is clearly the right fit for the 70-mile NWP corridor. The Metropolitan Transportation Commission, our regional planning entity, agrees. Its 50-year plan for transit in the Bay Area envisions commuter rail in the SMART corridor – not some other technology. In fact, a series of commuter rail projects are planned for the Bay Area, and many others have been conceived. Ultimately, Marin and Sonoma counties could be connected to the Sonoma and Napa valleys, as well as the entire Bay Area, via a connection across the Highway 37 corridor.

MTC's 2007 Regional Rail Plan

DMUs

Commuter rail vehicles come in a variety of different flavors. The type that SMART is proposing is a clean DMU, or "diesel multiple unit."

Standard locomotives use a powerful engine to pull a series of non-powered cars. This is useful for systems that require many train cars, since they may need the power that a big engine can provide. However, for systems that have small train sizes (fewer than 4 cars), self-powered multiple unit vehicles are a great option.

With DMUs each car can have its own power and can be, in effect, a mini-engine. These trains do the best job of maximizing capacity, acceleration and flexibility, while minimizing cost in a system like the SMART corridor.

Multiple unit vehicles are common in Europe and are gaining popularity in the U.S. Caltrain is planning to use electric multiple unit vehicles (EMUs) when it electrifies its system. Meanwhile

BART is considering using DMU technology, rather than the more costly classic BART technology, for its extension to east Contra Costa County.

DMUs themselves also come in different types. One version is known as "heavy," while another known as "light" (not to be confused with "light rail"). Both of these vehicles would have extremely low emissions (see White Paper No. 6). SMART is evaluating the use of both of these vehicles (for more information about vehicles, see White Paper No. 5).

Non-rail alternatives

The Northwestern Pacific corridor's historic depots, rails, ballast, tunnels, trestles and signals, all of which can be seen today, are a reflection of its heritage as a railroad right-of-way. Some, however, have suggested that SMART should consider non-rail transportation alternatives for the corridor. Two notable suggestions are discussed below.

Dual Mode Vehicles

Some have acknowledged that rail makes the most sense in the corridor, but have suggested using a train that could also leave the tracks and behave like a bus. Such vehicles do exist, but are mainly in experimental stages. The chief application of these small vehicles is to serve small rail lines in Japan or Europe that only carry a few hundred passengers per day. Dual mode vehicles that can transition to operating like a bus are sufficient to meet peak demand on those lines.

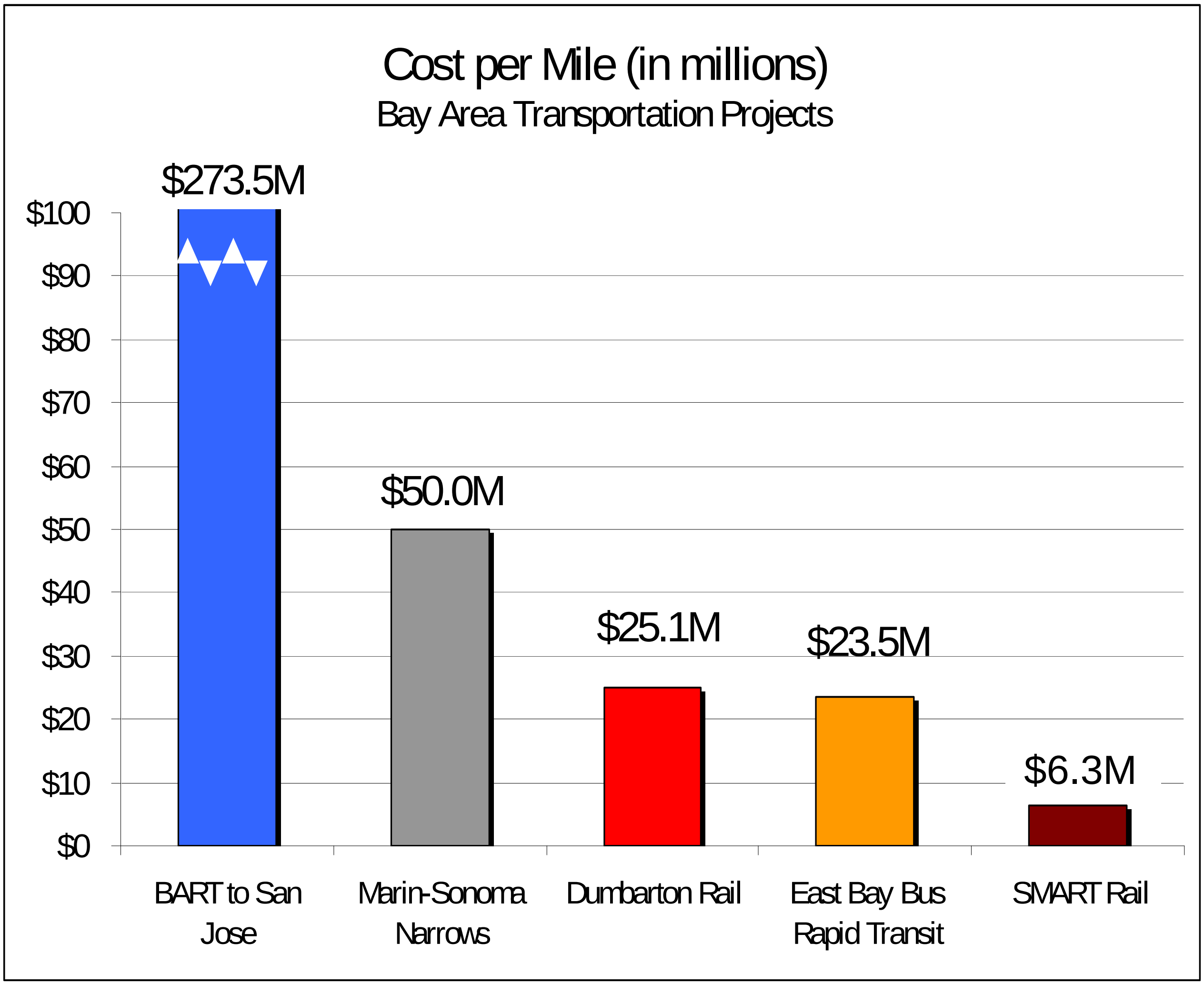
In the SMART corridor, however, it would take many more of these small vehicles to accommodate peak demand. Consequently, a series of these vehicles would need to follow one right after the next to adequately serve the projected number of patrons in the corridor, resulting in great labor inefficiency and greater operating costs. Moreover, these vehicles have lower top speeds than SMART's proposed rail vehicles, resulting in longer travel times that translate into lower ridership. Purchasing these types of vehicles instead of DMUs would not result in any tangible cost savings.

Paving the Tracks

One fairly frequent suggestion is that SMART "pave the tracks" to operate a busway in the right-of-way instead of rail. This is based on the erroneous assumption that a busway in the NWP right-of-way would deliver the same benefits as SMART but at a lower cost. In fact such a project would have fewer benefits, greater safety risks and a much higher price tag than the rail service proposed by SMART. For more detail on this concept, see White Paper No. 4.

Conclusion

The chart below compares the cost of several Bay Area transportation projects. At a cost of $6.3 million per mile ($440 million for 70 miles – est. 2008 revised cost), SMART is considerably cheaper per mile than: BART to San Jose ($4.7 billion for 19 miles), the Marin-Sonoma Narrows highway widening project ($800 million for 16 miles), the Dumbarton Rail Project ($515 million for 19 miles) and the Oakland-Berkeley "Intel" Bus Rapid Transit Project ($400 million for 17 miles).



SMART is a bargain compared with other types of transportation projects currently being planned in the Bay Area. Moreover, the technology selected by SMART is feasible, proven, very clean and appropriately scaled. It can provide an alternative to traffic congestion, reduce greenhouse gas emissions, improve air quality and strengthen the North Bay's transit network and bicycle infrastructure, and can be up and running in three to four years.

For more information about the SMART rail and trail project, go to www.sonomamarintrain.org or call SMART's information lines in Marin, 415-419-3510, or Sonoma, 707-583-2323.