HSRT/Alternative Technology Systems for Passenger and Freight

MEMO

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Subject: ***DRAFT Southern California Transportation and Logistics***

EXECUTIVE SUMMARY

Strategic Position and Challenges in Southern California

Southern California is the gateway to goods entering the United States and a key population, economic, and social center. The ability of goods and people to move efficiently within and through the region is of national and global economic importance. In the next 25 years, regional container traffic will triple, aviation activity will double, and population will increase by five million people. The capacity required to handle this volume far exceeds the limits of the existing systems. Further, a solution is needed to address the adverse impacts of the traditional truck and rail movement systems on the environment and human health. It is estimated that environmental and health related mitigation required by state and federal law will require major capital expenditures beyond the cost of capacity expansion.

Solution

The Southern California Association of Governments (SCAG) with the assistance of IBI Group has advanced a plan that can add capacity through a financially viable investment in logistics and surface transport technology that meets the environmental and health related performance requirements.

- Preliminary engineering shows that transportation demand can be met by introducing a High Speed Regional Transport (HSRT) system to handle container traffic, link regional airports, and serve commuting passengers.
- Business planning indicates that HSRT deployment and operation can be achieved through a self financing, investment-backed private initiative based on the system's financial performance.
  Financial performance of the HSRT would be further bolstered by value added in related components such as transit oriented real property development. The HSRT would be implemented by a private consortium within a legal/regulatory framework advanced by the public sector.
- A legal, institutional, and regulatory framework has been developed to implement HSRT financing, system delivery, and operations. Legislation has been passed by the California legislature allowing direct negotiations with private sector consortia to deliver and operate the HSRT. A Joint Powers Authority (JPA) agreement is currently in development between the Cities of Los Angeles, Ontario, West Covina, San Bernardino and SCAG. The purpose of the JPA is to create an authority to implement the project.

The paper that follows summarizes the operating, financial, and environmental performance of the HSRT system. Additionally, it details the legal/institutional/regulatory framework within which a private consortium would contract with the public sector to deliver and operate the HSRT.

Core Equity and Operational Leadership

Analyses carried out by SCAG and IBI Group indicate the potential success of the HSRT systems from an operational, financial, environmental, and institutional perspective. The application of the HSRT is based on the movement of containers (logistics and systems technology) to and from the San Pedro ports as well as the applications of the HSRT infrastructure to serve aviation system users (connecting and airport access passengers) and regional commuter usage between urban centers. Financial performance would be further bolstered by HSRT related real property development.

The work performed by SCAG and IBI Group indicates that the HSRT represents the opportunity for a mega-business venture in Southern California. This venture provides a very satisfactory return on equity within the context of long term growing and enhancing business performance. Additionally, the opportunity exists to introduce the HSRT technology to additional transportation and logistics systems worldwide.

What is now required is core equity leadership that would invest in the HSRT system, including obtaining control of the HSRT technology, and a goods movement/logistics operator that could lead the deployment and operation of the HSRT. A consortium can be formed that could then negotiate directly with the public sector to finance, design, construct, and operate the HSRT and related businesses.

1. INTRODUCTION

Southern California is a key economic and social center for the United States and the entire world. The region is home to over 18 million people and a source of economic, creative, and intellectual activity. The region's success is based, in part, by its global positioning as a gateway to the United States for people and goods movements. Phenomenal growth has resulted from the strategic location of the region and a comprehensive network of airports, seaports and roadways. But the limits of these legacy systems have been reached. Southern California is challenged to cope with meeting the demands today and the needs of the future. Further, these systems are not functioning in an environmentally sensitive manner. Unless major mitigation efforts are undertaken, the expansion of capacity for these current systems will not only be difficult physically but will occur with great impact to quality of life and public health.

The critical challenges of the movement system are summarized as follows:

- Goods Movement System: The SCAG region's goods movement system serves as the gateway for goods entering and leaving the nation. Regional container traffic is expected to triple by the year 2030 with rapidly increasing trade between North America and Asia. The goods movement system must dramatically expand its capacity in order to handle this increase. The goods movement challenge is amplified by the shortage of available land for ground-area expansion around the San Pedro Ports complex. The goods movement challenge is further amplified by the immediate need for mitigation of the environmental and health effects of the existing surface transport system. Such mitigation is expected to constitute a major addition to the cost of expanding capacity.

- Aviation System: The SCAG region aviation system is a major hub for domestic and international traffic, the majority of traffic being served by Los Angeles International Airport (LAX). Regional air traffic is expected to double by the year 2030. The aviation system must expand the capacity of its facilities in order to handle this increase. The core of the aviation challenge is the limited expansion capacity of LAX due to legally binding agreements with local stakeholders and limited available land for ground-area expansion.
- Surface Transport System: The SCAG region's surface transport system is characterized by congested highways with decreasing potential for further roadway expansion. Increases to surface movements cannot be handled without major investment in new surface transportation infrastructure. Although a significant amount of investment is being made to increase roadway

- capacity and provide more local transit options with light and heavy rail, the region as a whole remains unconnected with different activity centers functioning in an isolated manner.

The result of these challenges are manifested in increasing traffic congestion, adverse ecological impacts (in the form of air and other pollution), and strain on its aviation system and goods movement capacity. Inability to address these issues will result in severe environmental, economic, social and health impacts.

In addition, significant adverse community health and safety impacts are linked to air pollution from the Southern California goods movement system. Southern California's residents exposure to emissions related to goods movement and construction equipment (PM2.5) is more than 50% higher than the national average. This exposure has been linked to premature deaths, hospitalizations, asthma and lower respiratory symptoms, and decreased productivity. As goods movement activity increases, emissions and related adverse impacts will be further exacerbated. HSRT based goods movement can be an integral element of controlling the adverse effects of the goods movement system on the environment and human health. Relative to existing goods movement systems, the HSRT can provide greater throughput and reliability with near-zero emissions.

Successfully addressing the goods movement related challenges is crucial for the future of the region and the nation. The Southern California Association of Governments (SCAG), as the metropolitan planning organization for the six county region (Imperial, Los Angeles, Orange, Riverside, San Bernardino and Ventura), has been working for four decades with local governments, stakeholders, and partners to address these concerns. A plan is now emerging that has the potential to deal with these significant challenges at the regional scale. It is only at this level that the problems facing the Southern California can be addressed fully. To address these challenges, SCAG has advanced a vision of a regional movement systems based on the introduction of a high speed, high performance, environmentally sensitive regional transport system (HSRT).

The plan is constructed on three core components:

- Goods Movement / Logistics: Link the San Pedro Bay ports with an inland port facility via the high-speed, high-capacity link. This would provide capacity to handle containers relieving a major constraint to port expansion and facilitate efficient and environmentally sensitive goods handling in areas that have sufficient space outside of the urban areas.

- Aviation System: Create a direct and reliable link capable of connecting airports and urban centers. Continue use of LAX as a major hub and sharing demand with other regional airports such as Ontario International Airport (ONT), Palmdale Regional Airport (PMD) and San Bernardino International Airport (SBD) based on a high-speed connection via the HSRT. This would enable a higher level of service for airport access and connecting passengers, improved operation of the aviation system for passengers and airborne cargo, and optimize investment in aviation system infrastructure.

- Surface Transport System: Link urban activity centers throughout the region, serving the needs of commuters while reducing the number of private vehicles on the road mode. This would lead to reduced traffic congestion, enhanced accessibility between activity centers, as well as reduced air and noise pollution from automobiles. Additionally, enhanced accessibility at transit stations would enable intensification of land uses and thereby encourage more effective land use patterns.

Implementation and operation of the HSRT is being proposed on the basis of a business plan approach whereby it will be self financing based on the goods movement, aviation, and commuter operations. The net performance of the HSRT will be further bolstered by related development in real property. A business and institutional structure for the movement of goods, movement of people, and associated development patterns has been developed by SCAG to serve as the basis for implementation of the movement systems.

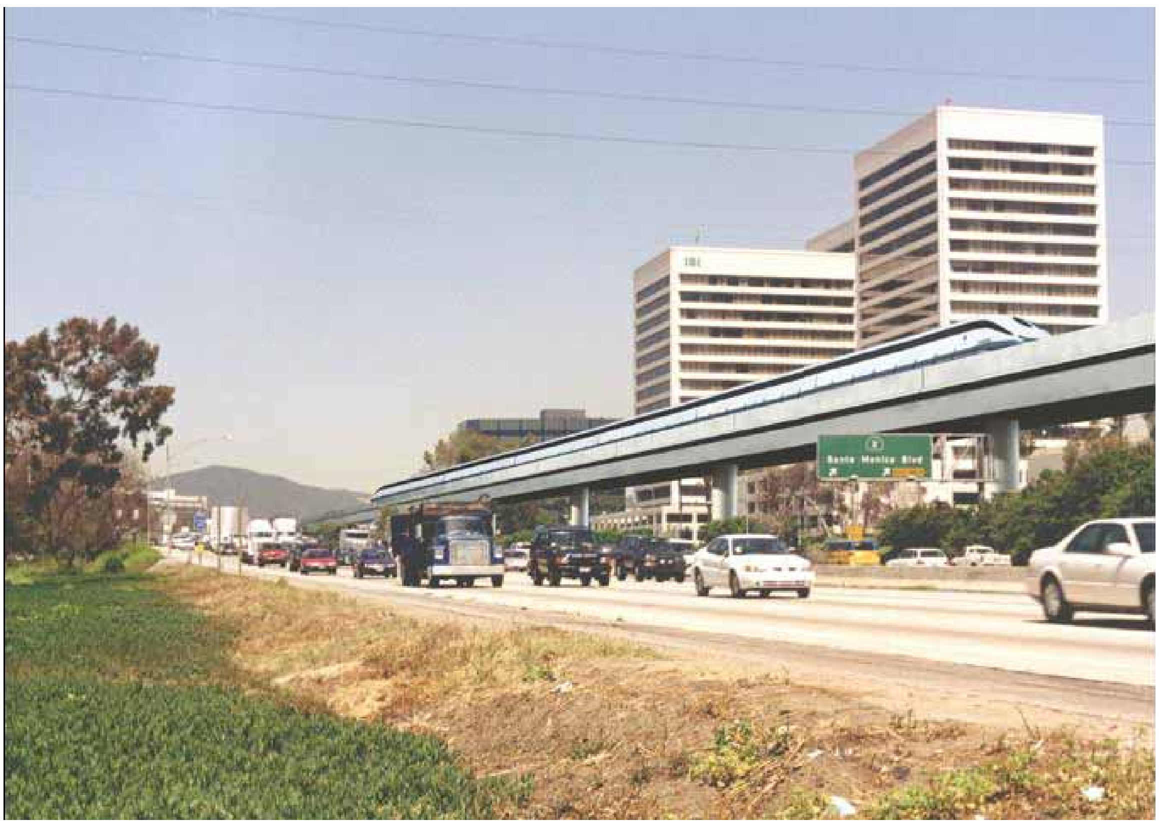
The results reached by SCAG’s business planning effort indicate that HSRT based systems goods and people movement can fulfill the objective of financial independence and feasibility. The essential parameters of the business plan are presented below.

2. HSRT SYSTEM

The HSRT is a fully elevated system built over existing public rights of way. It will be independent of roadway congestion and significantly enhance the capacity of existing transportation corridors to move people and goods in the region. The concept builds on the preliminary engineering and feasibility analysis completed by Lockheed Martin and IBI Group as part of the SCAG Maglev Deployment Program in 2006.

Figure 1 provides a picture of what the system may look like next to the freeway. A majority of the alignment will follow freeways, building within the freeway envelope while maintaining the existing travel lanes underneath. Columns will be used to support the guideway and look similar to existing freeway viaduct structures. The system will have the capability of moving both people and goods on the same guideway structure.

Figure 1. Simulation of HSRT System



The HSRT system comprises a long-term vision connecting the region’s ports, airports, and urban activity centers. The system can be constructed in multiple stages that can each be financially viable. The financial performance will be enhanced as the system is extended in connectivity throughout the region and the volume of users increases.

The core system will stretch initially between Los Angeles, San Bernardino and Riverside Counties. The HSRT system being proposed is shown in Figure 2.

Figure 2. SCAG Region HSRT System Map

Segments have been identified in different colors to help identify the pieces or phases of the project.

- o The initial operating segment (IOS) identified in red will be the first segment to be constructed. The IOS connects spans from West Los Angeles to Ontario Airport.

- o The Los Angeles International Airport (LAX) segment is identified in purple connects LAX to the IOS through a connection with West LA.

- o The segment going to Palmdale (PMD) is in orange. This segment connects areas in the North Los Angeles County with the IOS.

- o San Bernardino (SBD) is in green. This segment extends from the IOS to the San Bernardino and Riverside County areas.

- o San Pedro Ports (PORTS) segment is shown in light blue and connects the ports with the IOS.

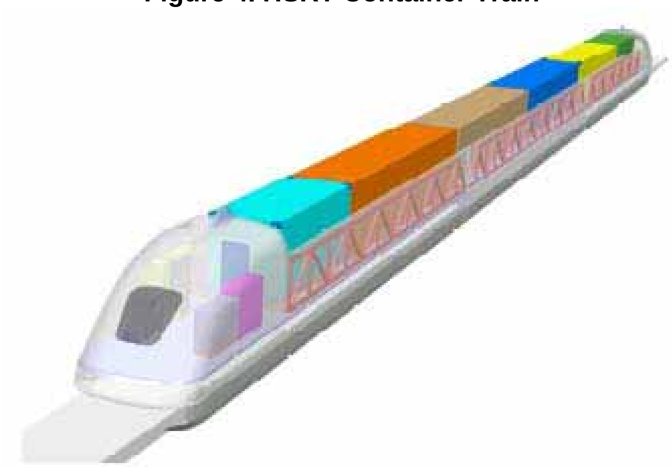
3. CORE COMPONENTS

3.1 *HSRT Based Goods Movement / Logistics*

HSRT container movement system will be to provide a high capacity, fast, efficient and environmentally sensitive method of moving the containers from the San Pedro Ports to an inland port facility in Palmdale and San Bernardino. The purpose of the inland port facilities is to augment the capacity and efficiency of the constrained operations in the limited San Pedro Ports complex. The HSRT system would provide a high-speed, high-capacity link without the environmental impacts of current goods movement options of trucks and trains.

The HSRT container movement system is capable of moving over 18,700 container trips per day, over 6.8 million container trips annually on a guideway infrastructure shared with the passenger system. Cargo trains will be a version of the passenger train designed specifically to handle cargo containers. Service will be interlaced between passenger intervals, effectively utilizing the available capacity of the system between passenger trains.

Figure 4. HSRT Container Train



The HSRT container movement system serves to add capacity to the goods movement system without directly competing with the existing truck and rail freight operators. The HSRT market segment would be ex-regional traffic (beyond the rocky mountains) that could effectively be served by an inland port facility.

The HSRT system is aimed to capture market share beyond the capacity of the existing goods movement system. Introduction of the HSRT is envisioned in a context of an expanded Alameda Corridor and expanded truckway infrastructure. This has been the subject of extensive work which has been detailed elsewhere and can be made available.

It is important to note that the cost of environmental mitigation with the HSRT is built in to the essential technology. Much work regarding expanding capacity to the existing road and rail infrastructure as been already carried out. Further work is needed to assess the full cost of environmental and health related mitigation.

3.2 *Aviation Travelers*

Today, Los Angeles Airport (LAX) serves as the prime regional hub serving 61 million annual passengers (MAP) in 2005. LAX currently serves 98.7% of all international air traffic in the region, over 60% domestic traffic, and 75% of all cargo traffic. Regional air traffic will more than double to 170 MAP by the year 2030. As air traffic volumes increase, LAX will not be able to serve as the sole prime hub.

- Legally binding agreements with local land owners limit LAX expansion to 78 MAP.
- The location of LAX within the main urban center makes acquisition of land, additional terminal facilities and runways in built-up urban areas prohibitively expensive. In contrast with LAX, other regional airports have underutilized terminal facilities, runways, and land for expansion.
- Passenger and goods movements to and from LAX suffer from severe ground access problems which can not be substantially solved by expanding the highway infrastructure around the airport.

Of necessity, other regional airports must be engaged to handle the increase in air traffic. Allocating air traffic throughout the region makes surface connectivity between airports necessary as no single hub will be handling the required mix of domestic and international flights. A fundamental strategy to connect the airports is therefore required.

This HSRT would optimally provide the required airport connectivity. A high-speed link between regional airports would allow otherwise independent airports to operate conceptually as single airport system with multiple remote terminals. The HSRT would enhance airport access and connections between regional airports by allowing passengers to bypass the congested highway network. It is envisioned that the HSRT would serve as the basis for a regional airport system and aviation system users would become a key component of HSRT passenger ridership.

Table 4 summarizes the level of aviation ridership forecasted for HSRT for each phase of the system. Representative horizon years are presented as ridership levels are expected to grow.

Table 4. Airport Access and Connecting Passenger HSRT Daily Ridership Forecast

Alignment	**Airport Related HSRT Daily Ridership Volumes**		
	Year 2014	**Year 2025**	**Year 2040**
IOS	6.9T	9.2T	11.3T
IOS+LAX	20.5T	27.4T	33.7T
IOS+LAX+PMD	30.2T	40.2T	49.6T
IOS+LAX+SBD	24.3T	32.3T	39.9T
IOS+LAX+PMD+SBD	33.8T	45.1T	55.5T

T- Thousands

Results indicate that airport activity on HSRT due to passenger access to airports and connecting between airports can amount to 24% of the total passenger activity on the system. As such, aviation system users make up a major component of HSRT passenger ridership revenue.

In addition to passengers paying for their usage of the HSRT, it is equitable and reasonable that the airport authorities and the airlines make a contribution to the HSRT. The contribution is based on the fact that the HSRT based aviation system makes possible growth in regional air traffic and allows for optimization of the existing airport facilities.

3.3 *Passengers Transport*

The SCAG region (particularly Los Angles and Orange Counties) regularly ranks as the most congested metropolitan region in the nation. The typical traveler in Los Angeles and Orange County experience 93 hours of delay, the highest among major metropolitan areas. A traveler in Riverside and San Bernardino Counties experiences a total of 55 hours of delay, the 9th highest. The total cost incurred due to congestion in the SCAG region was $12 billion in 2003, significantly higher than any other metropolitan region. Because the region's highway system is already functioning at near full capacity, expanding the highway infrastructure is unlikely to provide relief from congestion. Additionally, automobile related emissions are a major contributor to Southern California's growing environmental crisis. An environmentally sound solution to the surface transport crisis is therefore required.

The HSRT people movement system would effectively serve regional commuters. Linking the widely dispersed urban centers by rapid transit, the HSRT would: markedly reduce travel times, enhance accessibility, reduce traffic congestion, reduce air and noise pollution, reduce economic losses caused by delay, and enhance urban areas through increased interaction between urban centers. Analysis indicates that HSRT could serve 5 to 10% of the travel in the corridors that have an alignment.

The ridership forecast for HSRT is summarized in Table 5. Daily forecasts are shown for horizon years 2014, 2025 and 2040 as ridership levels are expected to grow over time.

Table 5. HSRT Daily Ridership Forecast

Alignment	Total HSRT Daily Ridership Volumes		
	Year 2014	Year 2025	Year 2040
IOS	49.2T	65.6T	80.8T
IOS+LAX	86.2T	115.0T	141.6T
IOS+LAX+PMD	153.8T	205.1T	252.6T
IOS+LAX+SBD	99.9T	133.1T	164.0T
IOS+LAX+PMD+SBD	167.3T	223.1T	274.9T

T- Thousands

4. PHASING

HSRT deployment can be completed in independent phases. An initial network of a limited number of sections can be independently viable. Value is maximized as the system is extended and usage maximized. A review of the phasing and HSRT route segments is presented below.

Initial Operating Segment (IOS)

The initial operating segment (IOS) is approximately 54 miles long and connects West Los Angeles to Ontario, with stations in West Los Angeles, Los Angeles Union Pacific Terminal (LAUPT or Union Station), West Covina, and Ontario Airport. The IOS also includes a maintenance facility at each end of the alignment. The Ontario maintenance facility would include the operations and control center, and handle primary maintenance and commissioning of the trains. The West Los Angeles facility would handle smaller maintenance and repair items. The total travel time between the West Los Angeles and Ontario Airport stations is forecast to be 33 minutes, with an average speed of about 100 mph including station dwell times. The top speed along the alignment is 250 mph, reached between the West Covina and Ontario Airport stations.

Los Angeles International Airport (LAX) Segment

This segment of the system would connect the West L.A. station to a station at LAX. The elevated guideway would run along the I-405 freeway and add about eight miles to the length of the HSRT system.

The connection would generate ridership from passengers traveling to and from LAX, and would provide connecting passenger access between LAX and ONT. The connection time between LAX and ONT will be less than 40 minutes.

Palmdale (PMD) Segment

The Palmdale segment would add three stations and about 70 miles to the HSRT alignment. The line would begin at the Los Angeles Union Pacific Terminal (LAUPT or Union Station) and travel along the I-5 freeway to a station in Burbank near Bob Hope International (BUR) airport. The alignment would continue along the I-5 to a station in Santa Clarita, and then follow the Antelope Valley Freeway (SR-14) to a station at PMD. The Palmdale extension would provide service to northern Los Angeles County and would generate significant ridership and light freight volume. Travel time from LAX to PMD on the HSRT system is forecast to be about 65 minutes.

San Bernardino Airport (SBD) Segment

The San Bernardino component would begin at the east end of the IOS alignment, and travel 19 miles along the I-10 freeway from the ONT station to a station at SBD. Access to SBD would extend passenger and light freight service into the Inland Empire, and combined with the LAX extension it would provide connecting passenger access between LAX, ONT, and SBD. Peak period travel time between LAX and SBD in the year 2030 is forecast to be about two and a half hours on the existing roadway network, or 52 minutes on the HSRT system.

San Pedro Ports Segment (PORTS)

The connection to the San Pedro Ports Complex would begin near dock at the ports and join up with the IOS at a point just east of LAUPT. This alignment runs north-south and is assumed to follow a route parallel to the I-710/Alameda Corridor. This segment is envisioned to provide heavy freight service only to maximize the capacity of the system to handle goods movement. Inland port facilities in Palmdale and San Bernardino are assumed to be in place for the system to connect to. Once it joins up with the IOS and other segments, the freight-only service will be interlaced between passenger service.

5. SYSTEM COSTS

System costs have been identified based on preliminary engineering analysis. The costs consist of capital cost for the building of the infrastructure and ongoing operations and maintenance (O&M) costs. The following discussion summarizes the cumulative costs for the HSRT system as each phase of the project is built. Cost is identified by phase to test each stage of the system. The test of viability is to see how the system performs as it grows and connects the region.

Capital Cost

The HSRT capital cost estimate includes the design, materials, and construction of the guideway, substructures, sound walls, retaining walls, station facilities, maintenance and operations facilities, communications, power substations, HSRT trains, right of way (ROW), roadway improvements, utility relocation, and traffic control during construction. The cost estimate also includes program implementation costs, environmental impact mitigation, and contingencies for management, construction, and mitigation.

The total capital cost estimates for each alignment are listed in Table 1.

Table 1. Capital Cost

Alignment	Capital Cost
IOS	$7,811 M
IOS+LAX	$8,959 M
IOS+LAX+PMD	$17,413 M
IOS+LAX+SBD	$10,996 M
IOS+LAX+PMD+SBD	$19,450 M
IOS+LAX+PMD+PORTS	$25,439 M
IOS+LAX+SBD+PORTS	$19,023 M
IOS+LAX+SBD+PORTS+PMD	$27,476 M
IOS+LAX+PMD+PORTS+SBD	$27,476 M

Total system costs, M – million

Operations and Maintenance (O&M)

The O&M cost estimate includes maintenance materials, energy consumption, and labor for maintenance of way, vehicle maintenance, marketing, ticketing, station services, administrative tasks, and management. The annual O&M cost estimates for each alignment are listed in Table 2.

Table 2. Annual Operations and Maintenance (O&M) Cost

Alignment	Annual O&M Cost
IOS	$73.4 M
IOS+LAX	$84.3 M
IOS+LAX+PMD	$173.0 M
IOS+LAX+SBD	$110.1 M
IOS+LAX+PMD+SBD	$198.8 M
IOS+LAX+PMD+PORTS	$384.1 M
IOS+LAX+SBD+PORTS	$295.8 M
IOS+LAX+SBD+PORTS+PMD*	$511.1 M
IOS+LAX+PMD+PORTS+SBD*	$597.6 M

Total system O&M costs, M – million

* Inland Port connection in SBD and PMD, resulting difference in O&M due to assumed traffic to each location.

6. CONTINGENCIES, PROGRAM IMPLEMENTATION AND ENVIRONMENTAL MITIGATION COSTS

It is important to note that the capital cost estimates include design and construction contingencies, program implementation costs and environmental mitigation costs. The estimates are a percentage of the overall cost estimate and are based on the industry standard for projects in the early stages of definition. Table 3 identifies the cost category and the corresponding contingencies used in the capital cost estimate.

Table 3. Project Contingencies

Item	Design/ Construction	Program Implementation	Environmental Impact Mitigation
Guideway	10%	30%	3%
Structures/Foundation/Tunnel	25%	30%	3%
Stations/Maintenance Facilities	25%	30%	3%
Communications/Signal/Power	25%	30%	3%
Vehicles*	10%	5%	0%
Right of Way	0%	0%	0%
Roadway/Utility/Traffic Control	25%	30%	3%

*The cost estimates used are those provided by Transrapid for Maglev freight vehicles. It is likely that the true cost of vehicle acquisition will be lower than estimated as maglev technology becomes more widely used. Additionally, other technologies can be expected to respond to a performance specification approach to bidding, thereby driving down the price through competition.

Design and Construction Contingency

A design contingency is included to account for unforeseen items or quantity fluctuations and variances in unit costs. The design contingency reflects the degree of risk associated with the level of engineering data available and design completion achieved for the various design elements. A construction contingency is also included to cover the cost of changes in scope or changed conditions that occur during construction. Typically a contingency of 25% is applied uniformly to all facilities and system costs.

The exceptions are the components that are to be manufactured in a control environment where unforeseen issues are less likely to occur. The guideway and vehicles are two such items. Their contingency has been reduced to 10%.

Program Implementation

Program implementation contingency covers the costs that will be expended in the course of building the project. They are comprised of eight components and amount to a total of 30%. The individual components are listed below.

- Program Design and Management
- Preliminary Engineering and Environmental Review
- Final Design
- Construction and procurement Management
- Agency Costs
- Agency Coordination
- Risk Management
- Testing and Pre-Revenue Operations

Environmental Impact Mitigation

Environmental impact mitigation can include a variety of costs such as traffic, noise and visual impact mitigation, landscaping and aesthetic treatments. Based on recent experience with similar capital projects in Southern California, these costs are assumed to be approximately 3% of construction costs.

7. FINANCIAL PERFORMANCE

The business plan approach for HSRT financing examines the ability of the system to pay for both operations and maintenance costs and the capital costs to build the system. The approach used in this analysis is to identify the passenger fares and the freight fees that would be needed to cover different rates of return on the investment. A range of internal rates of return (IRR) are examined that varies from 5% to 11%.

The focus of the examination is on the alignments that address the three components of aviation, goods movement and passenger transport needs of the region. Depending on the scenario, up to four airports are connected: LAX, ONT, PMD and SBD. The San Pedro Ports complex is connected with inland port facilities assumed in Palmdale, San Bernardino or both.

It is important to note that for the freight scenarios, it is assumed that the passenger system is in place and paid for by the passenger fares. The freight fees would cover the additional cost of building and operating an exclusive freight segment from LAUPT to the San Pedro Ports Complex, an extension of the system to the inland ports, and the cost of the freight trains. Both ridership fares and freight fees are in current day dollars.

Passenger and Freight Scenarios

Four alternatives are examined in the following summary. The alternative alignments correspond to the following:

- IOS+LAX+SBD+PORTS
- IOS+LAX+PMD+PORTS
- IOS+LAX+SBD+PORTS+PMD
- IOS+LAX+PMD+PORTS+SBD

IOS+LAX+SBD+PORTS correspond to the system that connects to a single inland port in San Bernardino from the San Pedro Ports. The service has the capacity to move 4.6 million container trips/year interlaced over passenger service to San Bernardino. Containers are assumed to be standard 40 foot long units. The passenger fare and freight fee needed to cover the different IRR is presented in Table 6 for this scenario.

Table 6. IOS+LAX+SBD+Ports Passenger and Freight Fees for Various Values of IRR

IRR	CPV	Average Passenger Fare	Freight Fee
5%	$23,571 M	$17.57	$306.92
7%	$22,817 M	$21.33	$351.94
9%	$22,256 M	$25.36	$399.02
11%	$21,830 M	$29.60	$447.40

Note: IRR – internal rate of return. The discount rate that corresponds to NPV = 0.
CPV – cost present value. The summation of the capital cost and discounted annual O&M costs over the 26 year time period.
NPV – net present value. The sum of the discounted costs and benefits over the 26 year horizon.
Freight Fee – fee charged for round trip transport of a 40-foot container between the San Pedro Ports Complex and a freight facility located in Colton near the San Bernardino Airport.

IOS+LAX+PMD+PORTS correspond to the system that connects to a single inland port in Palmdale from the San Pedro Ports. The service has the capacity to move 4.6 million container trips/year interlaced over passenger service to Palmdale. Containers are assumed to be standard 40 foot long units. Table 7 summarizes the results for this scenario.

Table 7. IOS+LAX+PMD+Ports Passenger and Freight Fees for Various Values of IRR

IRR	CPV	Average Passenger Fare	Freight Fee
5%	$31,345 M	$18.39	$317.84
7%	$30,366 M	$22.26	$362.90
9%	$29,637 M	$26.41	$410.02
11%	$29,084 M	$30.77	$458.40

Note:
IRR – internal rate of return. The discount rate that corresponds to NPV = 0.
CPV – cost present value. The summation of the capital cost and discounted annual O&M costs over the 26 year time period.
NPV – net present value. The sum of the discounted costs and benefits over the 26 year horizon.
Freight Fee – fee charged for round trip transport of a 40-foot container between the San Pedro Ports Complex and a freight facility located near the Palmdale Airport.

IOS+LAX+SBD+PORTS+PMD assume that two inland port facilities will be in operation with the primary facility in San Bernardino and a secondary facility in Palmdale. The operation would fully utilize the capacity of the freight-only San Pedro Ports segment of the HSRT system. The line connecting to the San Bernardino inland port would carry 4.6 million container trips/year. The secondary line would carry 2.2 million container trips/year to Palmdale. Differences in the freight fees between SBD and PMD are based on trip distances between the two locations and the port. This approach is used to facilitate comparison with current trucking costs, which vary based on the destination.

Table 8. IOS+LAX+SBD(4.6M)+PMD(2.2M)+Ports Fees for Various IRR

IRR	CPV	Average Passenger Fare	Freight Fee	
			PMD	SBD
5%	$35,334 M	$18.92	$264.10	$234.54
7%	$34,031 M	$22.90	$297.00	$263.76
9%	$33,062 M	$27.16	$331.42	$294.32
11%	$32,325 M	$31.64	$366.74	$325.68

Note:
IRR – internal rate of return. The discount rate that corresponds to NPV = 0.
CPV – cost present value. The summation of the capital cost and discounted annual O&M costs over the 26 year time period.
NPV – net present value. The sum of the discounted costs and benefits over the 26 year horizon.
Freight Fee – PMD fee charged for round trip transport of a 40-foot container between the San Pedro Ports Complex and a freight facility located near the Palmdale Airport. SBD fee charged for round trip transport of a 40-foot container between the San Pedro Ports Complex and a freight facility located near the San Bernardino Airport.

IOS+LAX+PMD+PORTS+SBD assume that two inland port facilities will be in operation with the primary facility in Palmdale and a secondary facility in San Bernardino. The operation would fully utilize the capacity of the freight-only San Pedro Ports segment of the HSRT system. The line connecting to the Palmdale inland port would carry 4.6 million container trips/year. The secondary line would carry 2.2 million container trips/year to San Bernardino. Differences in the freight fees between PMD and SBD are based on trip distances between the two locations and the port.

Table 9. IOS+LAX+PMD(4.6M)+SBD(2.2M)+Ports Fees for Various IRR

IRR	CPV	Average Passenger Fare	Freight Fee	
			PMD	SBD
5%	$36,665 M	$18.92	$279.66	$248.34
7%	$35,141 M	$22.90	$311.22	$276.38
9%	$34,008 M	$27.16	$344.24	$305.72
11%	$33,146 M	$31.64	$378.12	$335.80

8. FINANCIAL CONSIDERATIONS

True Container Revenue Potential

The rangeS of fees presented in the previous section are of the same order of magnitude of current drayage charges to Palmdale and San Bernardino, but somewhat higher depending on the internal rate of return. In the future, however, the price to move a container is expected to increase dramatically.

- In order to handle the increased capacity, major investments in truck infrastructure are required (on the order of ten billion dollars for new truckways and related infrastructure). The cost of this infrastructure will, of necessity, be capitalized into the price of moving a container.
- Besides the increases to capacity, major environmental and health related mitigation will be mandated by law. The cost of this mitigation will similarly be capitalized into the costs of expanding the infrastructure and ultimately into the price of moving containers.
-

While truck pricing will, of necessity, increase to cover the cost of this new infrastructure, the HSRT business parameters discussed above include the full cost of infrastructure including near-zero emissions.

Because rates for container movement by truck will increase dramatically, HSRT will become more cost competitive and provide room for increasing its rates.

Useful Life of the System

The analysis presented above uses a uses a horizon of 26 years. The useful life of the system (particularly the right-of-way and the infrastructure) is in fact greater than 26 years. Extending the analysis to represent the true useful life of the system improves its financial performance. Longer amortization periods of 40 or 60 years enable a decrease in passenger fares from 6% to 26% and freight fees from 3% to 17% depending on the IRR objective. The significance of the change is greatest in the amortization of 40 years as compared to 26. These reductions in passenger fares and freight fees will in turn make the HSRT more attractive to users and produce more overall revenue. The alignment IOS+LAX+SBD(4.6M)+PMD(2.2M) as presented in Table 8 above is used as a representative example of the effect of the longer horizon on CPV and fees.

26-Year Horizon: IOS+LAX+SBD(4.6M)+PMD(2.2M)+Ports Fees for Various IRR

IRR	CPV	Average Passenger Fare	Freight Fee	
			PMD	SBD
5%	$35,334 M	$18.92	$264.10	$234.54
7%	$34,031 M	$22.90	$297.00	$263.76
9%	$33,062 M	$27.16	$331.42	$294.32
11%	$32,325 M	$31.64	$366.74	$325.68

40-Year Horizon: IOS+LAX+SBD(4.6M)+PMD(2.2M)+Ports Fees for Various IRR

IRR	CPV	Average Passenger Fare	Freight Fee	
			PMD	SBD
5%	$36,757 M	$15.52	$238.80	$212.10
7%	$34,801 M	$19.96	$276.16	$245.26
9%	$33,485 M	$24.75	$314.96	$279.70
11%	$32,562 M	$29.72	$354.24	$314.60

60-Year Horizon: IOS+LAX+SBD(4.6M)+PMD(2.2M)+Ports Fees for Various IRR

IRR	CPV	Average Passenger Fare	Freight Fee	
			PMD	SBD
5%	$37,661 M	$13.96	$226.32	$201.00
7%	$35,162 M	$18.84	$267.86	$237.88
9%	$33,634 M	$24.00	$309.76	$275.10
11%	$32,625 M	$29.25	$351.18	$311.88

It should be noted that while the CPV increases marginally over the longer horizons, freight fees are significantly reduced.

Other Financial Considerations

There are considerations that have not been taken into account when calculating the system performance
and financial requirements. However, it is believed that the considerations presented below will significantly increase the performance and profitability of the HSRT system. These are summarized as:

- The first two phases of the freight system have excess capacity on both shared lines (to Palmdale and San Bernardino). This provides for addition of capacity with proportionately lower capital investment and, therefore, enhanced profitability of subsequent phases

- Operating Cost Phasing: For purposes of simplification of the above analysis, a constant figure for operating and maintenance costs based on operation of the HSRT at full capacity was used. In truth, operating costs would be lower until the HSRT container system is operating at full capacity. This offers additional savings that will add to the profitability of the system.

- Aviation System Contribution: The regional aviation system should make a contribution to the HSRT capital requirements in proportion to percent usage of the HSRT and cost savings achieved as detailed in the previous section. Analysis has identified approximately a 24% usage. The estimated aviation system contribution could range between one and four billion dollars. This could either reduce the CPV of the costs allowing for reduction of fees or alternatively enhance the internal rate of return by maintaining the same fee level. Using the 11% IRR for the 26 year horizon as representative, CPV could be reduced from $32.3M to a range of $28.3 to 31.3M. Alternatively, IRR could be improved from 11% to a range of 11.3% to 12.36%. These results are further bolstered if longer horizon years are used and a contribution from related value capture is considered.

- Related Development Value Capture Potential: The enhanced accessibility created by HSRT will increase land values and result in intensification of density and allow more effective land use planning consistent with the SCAG Compass 2% strategy. Significant value capture opportunities are expected for the system. The potential is estimated to add one to two billion dollars to the profitability of the HSRT system. This could either reduce the CPV of the costs allowing for a reduction of fees, as discussed above, or alternatively enhance the internal rate of return by maintaining the same fee level. Using the 11% IRR for the 26 year horizon as representative, CPV could be reduced from $32.3M to a range of $30.3 to 31.3M. Alternatively, IRR could be improved from 11% to a range of 11.3% to 11.6%. These results are further bolstered if longer horizon years are used and combined with an aviation contribution.

- Public Sources of Funds: Public subsidies are not necessary to for the system to be financially self-sustaining. However, HSRT environmental capabilities and capacity enhancements of the system, provide a major public benefit. As such, there is a policy basis for the public sector to assist by helping to reduce the level of risk assumed by the system proponent. Lowering the degree of risk assumed by the system proponent correspondingly lowers the required rates of return on equity and permit lower fees to be charged HSRT users. Public participation could therefore help to encourage use of an environmentally sound technology while simultaneously reducing the passenger fares and freight fees. Lowering user fees would not only increase competitiveness of the technology and its ultimate profitability, but would increase the percentage use of the environmentally sound technology which is a fundamental public benefit. This public assistance could take the form of pre-TIFIA loans, environmental mitigation funds, FTA New Starts and other loan/grant funding mechanisms intended for infrastructure and environmental mitigation enhancements.

Given the additional considerations, the likely result will be a system that can cover the operations and maintenance costs and over time repay the capital at a rate of return higher than 5% on money invested. In addition, several other points must be noted.

9. RISK ASSESSMENT

Technology

The success of the HSRT business venture hinges on the operational performance of the HSRT technology on a cost competitive basis and the ability of the system to capture the market forecasted for the system.

- HSRT Passenger System: A number of high-speed rail and maglev systems exist around the world demonstrating the capabilities of high-speed transport to connect activity centers. High speed rail has been in operation in Japan since 1964 and France in 1967. The first commercial maglev service has been in operation in Shanghai, China since 2003. These systems have demonstrated the ability to carry passengers very quickly and in a safe and efficient manner. Implementation of such a system in the California will further demonstrate the capabilities and reduce the technology risk.

- A number of high-speed rail and maglev systems exist around the world and connect to airports, demonstrating the effectiveness of such systems and integration with airports. Examples include Flytoget in Norway, TGV in France, Heathrow Express in England, Shanghai Airport Connection in China among others. These systems have proven the ability to link airports and rail systems into a seamless operation. Implementation of such a system in the United States will further demonstrate the capabilities and reduce the risk.

- HSRT Goods Movement System: A demonstration project that utilizes the HSRT concept to move freight containers will further reduce the risk associated with the proposal. Currently the Ports of Long Beach and Los Angeles are exploring the implementation of such a project to connect their pier areas with their near-dock facilities. Implementation of such a system will demonstrate the capabilities and reduce the risk.

Relative Risk

- Goods Movement: Major expansion of the region's goods movement handling capacity is required to meet the increase in cargo traffic. Growth in cargo traffic will outpace the capacity of the existing systems. Without such expansion, the system will suffer increasing inefficiencies and lead to deterioration of the business environment of the business and the nation.. HSRT goods movement system can be a strategic element in providing the increased capacity in conjunction with expanded truck and rail systems. Additionally, as the region moves to higher goods movement activity, the environmental mitigation requirements will also significantly increase. This will significantly raise the cost of using the traditional rail and road networks and enhance the competitiveness of alternative technologies.

- Aviation: The risk associated with the magnitude of aviation ridership levels is fairly low. Continued operation of LAX as a sole prime hub can not continue, activity of other regional airports must expand. Decentralized aviation operations will require a high speed and reliable transport mode independent of the roadway system. The HSRT system is the only system capable of linking airports within the region and allowing the aviation demand to be met for Southern California.

- Passenger: The risk associated with the magnitude of total ridership using the system is expected to be moderate to low as the forecast assume a capture of only 5-10% of the total travel in the corridor. There is a potential for ridership levels to be lower than forecasted if stations are not located where people want to go or access to the system is constrained. Adequate planning and design will be critical to achieving the level of ridership forecasted. With a well designed system, the percentage of capture can be higher as travel costs and congestion increase in the future. HSRT is cost competitive with the automobile with the ability to connect very long distances in a short amount of time. HSRT is envisioned to become increasingly competitive with road mode transportation as traffic congestion continues to worsen and the costs associated with operating private commercial vehicles continues to rise.

10. ENVIRONMENTAL CONSIDERATIONS

Health Impacts from Goods Movement Sources

Significant adverse community health and safety impacts are linked to air pollution from the Southern California goods movement system.

A recent CARB assessment of PM2.5 health effects shows a disproportionate exposure in the South Coast Air Basin relative to other parts of the state and to the rest of nation. The population-weighted exposure above the NAAQS is *82% of the state-wide exposure* and *52% of the national exposure*. The result has been:

- 5,400 premature deaths,
- 2,400 hospitalizations,
- 140,000 asthma and lower respiratory symptoms, and
- 980,000 lost work days.

The goods movement system, along with construction equipment, is a primary source of PM2.5 emissions. As goods movement activity increases, emissions and related adverse impacts will be further exacerbated. An emissions control plan is required to control goods movement related sources of pollution.

SCAG is leading an effort to develop a system-wide goods movement plan that supports PM2.5 and ozone attainment and maintenance. SCAG has recently advanced a vision of additional regional movement systems based on the introduction of HSRT. Relative to existing goods movement systems, the HSRT can provide greater throughput and reliability with near-zero emissions.

Environmental Impact Assessment

Inherent in HSRT technology is the capacity to operate with near-zero emissions. However, full environmental feasibility studies will need to be performed. Environmental impact assessment will be needed prior to the construction of the HSRT system. It is anticipated that the assessment will need to comply with both National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA). Preparation of a joint NEPA/CEQA document would address requirements for both the federal and State environmental policies. The purpose of an environmental document is to inform and disclose the issues and impacts of the project to decision makers, the affected general public and local agencies and organizations. Completion of the environmental document would clear the way to the construction of the HSRT system.

11. INSTITUTIONAL FRAMEWORK

The HSRT movement systems are being proposed on a private sector investment basis. Public capital and operating subsidies are not required. However, institutional and regulatory powers of the public sector are required.

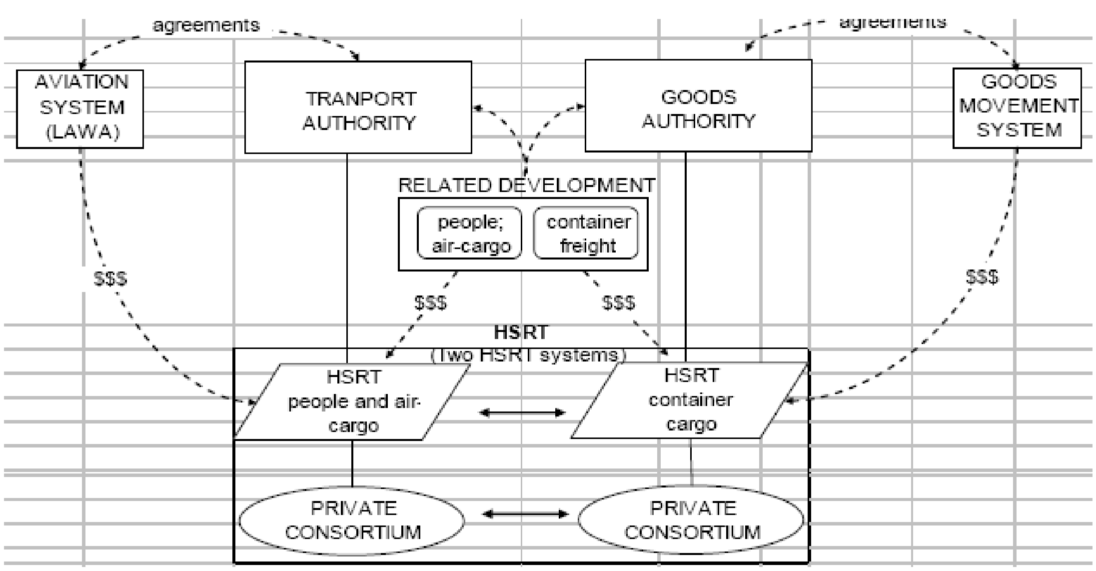
An institutional/regulatory structure has been considered to account for:

1. Flow of operating and capital funds required to achieve the business plan of self-financing
2. Public project leadership
3. Inter-agency institutional arrangements
4. Regulatory framework
5. Bidding the multiple components,
6. Deliver the system (Design, Build, Operate, and Maintain)

The essential characteristics of the business arrangements are as follows:

- Public leadership is required to conceive regional strategies, seed those ideas, and establish the contractual, regulatory, and institutional arrangements required to implement the HSRT. Legislation has been passed by the California legislature allowing direct negotiations with private sector consortia to deliver and operate the HSRT. A Joint Powers Authority (JPA) agreement is currently in development between the Cities of Los Angeles, Ontario, West Covina, San Bernardino and SCAG to create an authority to implement the project.
- A consortium made up of core equity leadership, a goods movement/logistics operator, and the technology rights to the system that would finance, design, construct, and operate the HSRT would negotiate directly with the public sector. This consortium would serve as the system proponent.
- The HSRT system proponent would enter into agreements with the lead agency of the aviation system (LAWA and other Airport Authorities in the region) regarding its contribution. Aviation contribution would be contingent upon the transport system meeting specified operating performance requirements.
- The HSRT system proponent would enter into agreements with the lead agency of the goods movement system regarding its contribution. The goods movement contribution would be contingent upon the transport system meeting specified performance requirements.

The essential concept of the institutional arrangements is represented in the following diagram:



12. CORE EQUITY AND OPERATIONAL LEADERSHIP

The opportunity now exists for a mega-business venture in Southern California which would deploy and operate the HSRT movement systems. The application of the HSRT is the movement of containers) to and from the San Pedro ports and application of the HSRT infrastructure to serve aviation system users and regional commuter usage between urban centers. System performance would be further bolstered by HSRT related real property development.

What is now required is core equity leadership that would invest in the HSRT system, including acquisition of the rights to the HSRT technology, and a goods movement/logistics operator that could lead the deployment and operation of the HSRT.

This venture provides a very satisfactory return on equity within the context of long term growing and enhancing business performance. Additionally, the opportunity exists to introduce the HSRT technology to additional transportation and logistics systems worldwide.

HSRT/Alternative Technology Systems for Passenger and Freight

Environmental Mitigation and Mobility Initiative

Environmental Mitigation and Mobility Initiative (EMMI) Project

The following is a synopsis, prepared by the Southern California Association of Governments, of a recent proposal submitted by American Maglev Technology to develop a regional high speed rail transport system.

American Maglev Technology (AMT), presents the following Environmental Mitigation and Mobility Initiative (EMMI) Project unsolicited proposal for submittal as a Public-Private Partnership. EMMI intends to provide the physical infrastructure to 1) accommodate the growth in containerized freight volume and its accompanying economic activity in the Southern California Association of Governments/ Los Angeles metropolitan area while relieving well-documented road congestion and severely negative health impacts and 2) leverage the current passenger and freight capacity of the current airport, seaport and road facilities by providing a seamless network connecting these nodes of activity.

The solutions company, EMMI Logistics Solutions, Inc. (the Company), will be created to design, finance, build and operate an electric transportation system utilizing licensed proprietary magnetic levitation (maglev) technology. Both people and freight containers will move through well studied, strategic routes throughout the region beginning with a strategic freight guideway with numerous opportunities for expansion. The plan calls for a build out in several accommodative phases. Completion through the final stage would eventually connect the seaports of Long Beach and Los Angeles at San Pedro Bay (SPB), Los Angeles and Ontario airports, downtown Los Angeles, the inland counties, Anaheim in Orange County, the high desert as well as interim destinations.

The maglev technology provided by AMT for the EMMI Project employs sophisticated, computer-controlled electromagnets that are used to provide lift (levitation), guidance (horizontal stability) and stabilization (vertical stability). Proprietary, automated, on-board controls constantly adjust these forces to maintain a frictionless air gap between the vehicle and the track while simultaneously controlling guidance and stabilization. The guideway design requires no moving or electronic parts, making it a relatively low cost, completely passive system component. Vehicle propulsion is provided by linear induction motors mounted on the chassis, which create electromagnetic energy waves that push against the top of the guideway and serve to drive the vehicle forward. Guideways are elevated an average of 33 feet above the ground, eliminating the need for grade crossings and signals. Support columns require a 5-foot diameter footprint, allowing for system construction within existing highway rights of way. These proprietary innovative design approaches facilitate construction, operation and maintenance of a safe, reliable and swift transport system.

Under the Project Plan, EMMI Logistics Solutions, Inc. will design, finance, build and operate an electric freight container transportation system, initially from San Pedro Bay ports to an Intermodal station off Interstate-710 five miles inland. Service will ramp to over 3 million twenty-foot equivalent units (teu) transported in the first operating year. Future phases for additional freight and passenger transport will be deployed beginning optimally in an additional year.

By 2012, this initiative, combined with direct intermodal rail shipments, will meet the total cargo transport demand. By 2030, the EMMI project will carry approx. 30 million teu’s from SPB ports throughout the region, including terminals in the Inland Empire and High Desert. The EMMI Project provides a grade-separated right-of-way to ensure fast and frequent transit. It includes all loading and unloading facilities, connected by a fixed guideway structure. The Project uses existing interstate rights-of-way along major interstate highways so that no land purchases are required. Because this project is financed by the private sector, environmental reviews will be expedited, and construction may commence in summer 2008.

The business plan presented by EMMI Logistics Solutions, Inc. is based on private sector investment. Public capital and operating subsidies are not required. ***The Company's strategic financial partners have reviewed the proposal and have expressed confidence that, upon clearing technical and environmental hurdles, they will procure sufficient financing in the capital markets.*** However, the Company will be subject to institutional and regulatory involvement of the public sector.

The Company relies on the public sector to establish the contractual, regulatory and institutional arrangements required to implement the Project. EMMI Logistics Solutions, Inc. will seek negotiations with an authority that may include by the Alameda Corridor Transportation Authority (ACTA), the new LA-Ontario Passenger Authority, the Ports of Los Angeles and Log Beach, and CALTRANS (California Department of Transportation) for franchising rights for the design, construction, implementation and operation of the Project. The Company expects to negotiate incentives, abatements, and support from the public sector including, but not limited to, training grants, business incentives, tax abatements, and other economic development issues as reasonable and customary. The Company also expects to enter into agreements with lead agencies in the freight and passenger movement sectors. The anticipated relationship considers the flow of operating and capital funds required to achieve the Company's self-achieving business plan, the role of public leadership in the Project, the necessity of inter-agency institutional arrangements, regulatory framework, and delivery of the system on a design, build, operate and maintain basis.

The Company's financial models, construction and cost schedules for each phase are included in the proposal. No environmental mitigation or land acquisition costs are included in the Project cost estimate.

The public sector must ensure that the anticipated demands for transportation services will in fact be available to the Company when the transportation facilities are completed and placed in service. Minimum contracts for container round-trip transport must be established in order to support financing activities. The public sector must also provide reasonable access to public rights of way at no cost to the Company for temporary and permanent construction of its transportation facilities. EMMI Logistics Solutions, Inc. will develop and operate the facilities created under the EMMI Project.

The risk assessment of the EMMI Project is twofold: technology risk and demand risk. The role of the government and other public sector partners is to manage the public policy risks. The role of the private sector partners of the Company is to provide business leadership and manage project risks. The Company takes the full project implementation risks.

The technology deployed under the Project Plan must prove to be operational and cost-effective in order for the Project to realize success. A number of high-speed rail and maglev systems currently exist, including a fully operational demonstration track of AMT technology in Powder Springs, GA. The system has undergone more than 12 months of full-scale testing, including speed, energy consumption, stability, and load tests simulating the weight of a full passenger cabin or a full-sized freight container. The system has passed all tests and meets all applicable safety standards and specifications for passenger and freight transport.

Although this particular technology has not yet been deployed on a commercial basis, a magnetic levitation system of like technology was deployed in Shanghai, China in 2003. To date, it has proven to deliver passengers quickly and safely, meeting all operational and safety specifications.

The demand risk of the EMMI Project is believed to be threefold: logistics, aviation, and passenger demand risk. Each of these risks is projected to be relatively low, according to prior SCAG studies.

Some of the conclusions are summarized below:

Growth of the cargo traffic at SPB Ports is projected to vastly outpace the capacity of existing systems. If such growth is stunted or miscalculated, the Project may not succeed as projected. However, current growth trends already show resultant increasing inefficiencies in existing systems, and as activity in the region increases, environmental mitigation requirements will increase, lessening the possibility of using traditional rail or expanding road networks.

Aviation demand is also expected to continue to rise, as LAX continues to outgrow its capacity as the regional hub. Other regional airports are preparing for expansion in order to share the operations at LAX, and creating a high-speed regional airport link seems to be the only solution to handle the demand. If the Project is denied access to critical existing rights-of-way, or if aviation traffic sharply declines due to unforeseen reasons, the Project may not perform as projected.

Current passenger forecasts along the examined corridors exceed the highly conservative minimum requirements of the EMMI Project by a factor of 15 to 20. However, should stations be inappropriately or inconveniently located at Santa Monica, Union Station, or West Covina, ridership of the passenger system could suffer. The Project will rely on its partners in the public and private sectors to adequately plan and design the placement of the stations, so that this risk is mitigated.