



## **Recommended Concepts for Improved Regional Connectivity**

On September 25, 2019, the Airport Connectivity Subcommittee is being presented with the Airport Connectivity Analysis (Attachment 1). The Analysis provides a detailed description of each concept and evaluates the concepts against criteria developed by the Airport Connectivity Subcommittee. The Airport Connectivity Subcommittee will be asked to recommend that the

#### Action: Approve

The Board of Directors is asked to approve the recommendation of the Airport Connectivity Subcommittee.

Board of Directors approve the conceptual transportation solutions included in the Analysis for further study and environmental review.

#### **Next Steps**

Should the Board of Directors approve the recommendation, staff would begin community outreach on the various concepts leading to the selection by the Board of Directors of a locally preferred alternative to be carried forward into the environmental review process, pursuant to both the California Environmental Quality Act and the National Environmental Policy Act.

#### Hasan Ikhrata, Executive Director

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Attachment:	1. September 25, 2019: Airport Connectivity Subcommittee Agenda Item No. 3

## **SANDAG** Airport Connectivity Subcommittee

Item: **3** 

September 25, 2019

Action: Recommend

## **Recommended Concepts for Improved Regional Airport Connectivity**

#### Overview

On December 7, 2018, the SANDAG Board of Directors established the Airport Connectivity Subcommittee to lead discussions and explore options for how best to build consensus around transportation solutions for improved connectivity to the San Diego International Airport for generations to come. On December 21, 2018, the Board of Directors allocated \$1 million to develop and analyze conceptual transportation solutions including the potential for a Central Mobility Hub – a location where

Action Requested: Recommend

The Subcommittee is asked to recommend that the SANDAG Board of Directors approve the conceptual transportation solutions included in the Airport Connectivity Analysis for further study and environmental analysis.

multiple modes of transportation options converge to provide convenient connections for people to access the San Diego International Airport and other regional destinations.

#### **Key Considerations**

Over the past nine months, the Subcommittee met to discuss conceptual transportation solutions. Four primary concepts were developed:

- **Concept 1** A Central Mobility Hub at Naval Information Warfare Systems Command (NAVWAR), including a multimodal transportation center with a high-frequency automated people mover (APM) service to a transit-ready area located between San Diego International Airport Terminals 1 and 2. Concept 1 assumes a non-stop, high-speed service to the airport via a one-mile tunnel.
- **Concept 2** A Central Mobility Hub as described in Concept 1, but instead of a tunnel, service to San Diego International Airport would be provided via a 3.6-mile surface/elevated APM route along Pacific Highway, Laurel Street, and Harbor Drive with intermediate stops at the airport Rental Car Center and the planned development at Harbor Island East Basin.
- Concept 3 A Central Mobility Hub at the planned Intermodal Transit Center, which includes a
  multimodal transportation center with numerous connections to regional transit lines, high-frequency
  APM service to San Diego International Airport, and an airport-like curb drop-off for auto-based travelers.
  An APM station would provide service to the airport via a 2.6-mile surface/elevated route along Pacific
  Highway, Laurel Street, and Harbor Drive, with intermediate stops at the airport Rental Car Center and
  planned development at Harbor Island East Basin.
- **Concepts 4a and 4b** include an extension of the Trolley system to the planned San Diego International Airport transit station with an intermediate stop at the planned development at Harbor Island East Basin.

The attached Airport Connectivity Analysis describes each concept in more detail and evaluates the concepts against evaluation criteria developed by the Airport Connectivity Subcommittee. The evaluation criteria are:

- 1. Passenger convenience and ridership
- 2. Reduced congestion related to San Diego International Airport access
- 3. Reduced greenhouse gas emissions and vehicle miles traveled
- 4. Feasibility
- 5. Cost
- 6. Economic benefit

#### Next Steps

Should the SANDAG Board of Directors approve moving forward with further study, staff would begin community outreach on the various concepts and continue work leading to the selection by the SANDAG Board of Directors of a locally preferred alternative to be carried forward into the environmental review process, pursuant to both the California Environmental Quality Act and the National Environmental Policy Act.

#### Hasan Ikhrata, Executive Director

Key Staff Contact:Coleen Clementson (619) 699-1944, coleen.clementson@sandag.orgAttachment:1. Airport Connectivity Analysis



# Airport Connectivity Analysis

EVALUATION OF CONCEPTS FOR IMPROVED TRANSIT AND ROADWAY CONNECTIVITY TO SAN DIEGO INTERNATIONAL AIRPORT



#### RELEASE DATE: SEPTEMBER 19, 2019

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#### **1. Executive Summary**

Many world-class cities have transportation systems that provide seamless, direct, and guality transit connections between their airports and their downtown metropolitan areas. These systems provide guick, convenient options to access the airport using mass transit. The systems could connect directly to multimodal hubs that supply passenger amenities such as baggage handling services, airport information and display boards, remote ticketing services, and even airport security should those facilities be available. For example, from John F. Kennedy International Airport, a passenger can easily take the AirTrain JFK elevated people mover to connect to the New York City subway system. Newark Liberty International Airport is connected directly to an AirTrain Newark monorail, which connects to the regional rail system. From the Miami International Airport, travelers can access the Metrorail Orange Line and connect to the Tri-Rail System at an airport intermodal facility. From the world's busiest airport in Atlanta, Georgia – Hartsfield-Jackson Atlanta International Airport travelers can access the Atlanta subway system and the Metro Atlanta Rapid Transit Authority. Such transit connections can also be found at Minneapolis – Saint Paul International Airport, Chicago's O'Hare International Airport, and Denver International Airport. Both San Francisco International Airport and Oakland International Airport connect directly to the Bay Area Rapid Transit. Finally, Los Angeles World Airports anticipates the completion of an automated people mover (APM) to connect Los Angeles International Airport to the LA Metro regional rail system by 2023.

As the San Diego County Regional Airport Authority (Airport Authority) is planning to modernize San Diego International Airport's Terminal 1, now is the time for the San Diego region to seize the opportunity to modernize the transportation system with a direct transit connection to its airport.

San Diego International Airport is the busiest single-runway airport in the nation and has established itself as a major economic engine for the region. The airport is preparing for the modernization of its facilities to accommodate an anticipated increase of 16 million annual passengers by 2050, which will total an estimated 40 million passengers annually. Improving connectivity to the airport has been one of the region's biggest challenges throughout the past several decades. The Airport Authority is poised to join the ranks of other forward-looking airports that offer passengers and visitors cleaner, environmentally-friendly ways to avoid traffic and connect to the regional transit system.

Today, the San Diego Association of Governments (SANDAG) is advancing the region's airport connectivity plans following months of collaboration with regional partners. SANDAG has long served as the forum for regional decision-making and is governed by a Board of Directors composed of mayors, councilmembers, and county supervisors from each of the region's 19 local governments. SANDAG works to build consensus; develop strategic transportation plans; obtain and allocate resources; plan, design, engineer, and construct public transportation; and provide information on a broad range of topics pertinent to the region's quality of life. As a key component of its regional transportation plans over the last decade, SANDAG has identified concepts for airport connectivity at an Intermodal Transportation Center (ITC) located near the airport. For several decades, local agencies have worked diligently—but often in a siloed or segmented way—to develop their own potential improvement plans. Without a regional effort, a comprehensive plan to connect the San Diego International Airport to the region's rail transit system has not been achieved.

Last year, San Diego Mayor Kevin Faulconer gathered the leaders of the Metropolitan Transit System (MTS), Port of San Diego, Airport Authority, and Caltrans to challenge them to solve the airport connectivity problem once and for all. Mayor Faulconer, stressing the urgency of this problem, asked SANDAG to lead the effort. SANDAG Chairman Steve Vaus established the Airport Connectivity Subcommittee shortly thereafter. Over the last nine months, SANDAG led a collaborative process with planners, engineers, data modelers, legal, government relations, and communication staffers from SANDAG, City of San Diego, County of San Diego, MTS, North County Transit District (NCTD), Port of San Diego, Airport Authority, and Caltrans District 11. The inter-agency teams discussed multiple scenarios, briefed agency leaders, conducted research, modeled transportation options, and presented findings to the Airport Connectivity Subcommittee, which resulted in the four concepts that are presented in this Airport Connectivity Analysis.

Through SANDAG's leadership, the effort has advanced, and the region has earned an unprecedented commitment from local agencies to work together to develop a world-class transportation connection to San Diego International Airport. On July 2, 2019, the Airport Authority announced it is preserving land for a future transit connection at San Diego International Airport. In addition, the Airport Authority announced that through its efforts, the airlines have agreed to allow the Airport Authority to spend over \$500 million to improve airport connectivity. The Airport Authority also pledged it will work with the Federal Aviation Administration (FAA) to obtain authorization to use these funds for both on and off-airport transportation improvements.

The Airport Connectivity Subcommittee has identified feasible concepts for a transit connection to the San Diego International Airport.

- Concepts 1 and 2 feature a Central Mobility Hub at Naval Information Warfare Systems Command (NAVWAR), which includes a multimodal transportation center with Amtrak and COASTER services, regional transit lines, and a high-frequency APM service. Concept 1 assumes a nonstop, high-speed APM service to San Diego International Airport via a one-mile-long tunnel route. Concept 2 assumes a high-speed APM service via a 3.6-mile-long surface level and elevated route along Pacific Highway, Laurel Street, and Harbor Drive with intermediate stops at the consolidated Rental Car Center and a future planned Port of San Diego development at Harbor Island East Basin.
- Concept 3 includes a Central Mobility Hub, which has a multimodal transportation center with connections to regional transit lines. Amtrak and COASTER operators have indicated reluctance to stop at the Concept 3 Central Mobility Hub given its proximity to Old Town Transit Center and Santa Fe Depot, which warrants further discussion and service planning. This Central Mobility Hub would include a high-frequency APM service and an airport-like curb experience for auto-based travelers. The APM would provide service to San Diego International Airport via a 2.6-mile-long surface level and elevated route along Pacific Highway, Laurel Street, and Harbor Drive, with intermediate stops at the consolidated Rental Car Center and planned Port of San Diego development at Harbor Island East Basin.
- Concepts 4a and 4b include an extension of the Trolley system to the planned San Diego International Airport transit station with an intermediate stop at the planned Port of San Diego development at Harbor Island East Basin.

The report is structured to describe the airport transit connection Concepts 1 through 4 in greater detail, as well as the goals and evaluation criteria agreed to by the Airport Connectivity Subcommittee, and the initial analysis and findings. While the preliminary analysis demonstrates that all proposed concepts would achieve the defined goals, the concepts vary in terms of performance, benefits, and risks. SANDAG has outlined the pros, cons, risks, and rewards associated with Concepts 1 through 4, and recognizes that additional public outreach should be conducted. Additional modeling, engineering analysis, concept development, and cost estimating are still required to help decision makers select the best concept for the San Diego region. Nevertheless, what is clear is that doing nothing is not an option. It is time to establish a robust airport transit connection to address anticipated growth and congestion, meet environmental mandates, and address the mobility needs of airport travelers for generations to come.

Initial analysis demonstrates that all concepts require complementary roadway improvements to key airport access roadways. Early analysis also shows that a Central Mobility Hub at NAVWAR has the greatest potential to provide increased transit access in the region and renders the greatest potential ridership. The mobility hub at NAVWAR can be designed to accommodate sufficient space for convenient pick-up and drop-off facilities and has the greatest potential to divert a significant amount of traffic away from key airport access roadways with complementary traffic management policies. Additionally, whether in a tunnel, elevated, or at-grade, a high-frequency APM appears to be a leading technology solution to connect people within and between airport facilities and the regional rail system. APM systems can be found in 46 airports around the world. They have the greatest ability to match passenger demand with greater efficiency and state-of-the-art technology. APM systems operate without drivers or station attendants, typically travel on guideways on narrower spans than traditional rail services. They use smaller vehicles, each capable of carrying standing passengers while also providing airport passenger amenities, such as level boarding, wide doors, and space for luggage. They also operate at high frequencies that allow passengers to arrive at their aircraft gates faster and with less stress. A Trolley connection to the airport also has potential to provide improved transit connectivity and is feasible to design and engineer. The Trolley system is familiar to regional travelers, yet frequency of service, passenger convenience, and curb space at existing stations may be limited.

This report details how Concepts 1 through 4 initially range in terms of passenger convenience and user experience, ridership, and ability to provide increased transit access, travel time to and from San Diego International Airport, and how congestion around the airport can be reduced. The report details how vehicle miles traveled (VMT) and greenhouse gas (GHG) emissions could be reduced through Concepts 1 through 4, and explores feasibility, cost, and secondary economic benefits for each concept. The evaluation of the analyzed airport connectivity concepts is shown in Figure 6-1 at the end of this report.

SANDAG and stakeholder partners are committed to continuing to work together to improve transit access to the San Diego International Airport and develop a world-class transportation system that enhances the passenger experience and addresses anticipated severe congestion on key airport access roads. This report outlines the next steps to providing the Board and other key decision makers with more refined analysis on project concepts so that a locally preferred alternative can be selected to move forward into the environmental review phase. SANDAG will work with all agency partners to coordinate and provide feedback on technical analyses and policy assumptions that involve airport connectivity and other's planning jurisdictions.

## 2. Background and Context

## 2.1 Travel Behavior in the Study Area

To help identify airport connector project options, SANDAG assessed overall project concept benefits based on both a macro and micro level, looking at both the regional context and the near-airport transportation system. This section is intended to describe the existing airport area context, transportation network, current roadway and freeway access routes, existing mode share, and provide an overview of other key considerations about travel behavior to and from San Diego International Airport.

The study area is located in the central portion of the region as shown in Figure 2-1. The study area itself is generally bound by I-8, I-5, Downtown San Diego, and San Diego Bay, as shown in Figure 2-2.

#### Figure 2-1: Study Area Location



Figure 2-2: Project Study Area



#### 2.1.a Regional Travel Demand to San Diego International Airport

The San Diego region contains seven sub-regional areas, known as metropolitan statistical areas. Figure 2-3 shows these areas and the portion of regional trips to the San Diego International Airport that they represent.

#### 2.1.b Existing Transportation Mode Share to San Diego International Airport

Today, the vast majority of trips to the San Diego International Airport (approximately 99%) occur via private auto-based modes that use the freeway and roadway system, similar to what is observed throughout the San Diego Region.

Table 2-1 shows the primary transportation modes used to access San Diego International Airport.



Figure 2-3: Regional Trips to San Diego International Airport by Metropolitan Statistical Areas

Table 2-1: Transportation Mode to San Diego International Airport, 2018

Access Mode	Mode Share	Access Mode	Total Mode Share
Private Autos and Rental Cars	59%	All Private Auto Modes	99%
Transportation Network Companies (TNCs) and Taxis	32%		
Private Shuttles	8%		
Transit	1%	Transit	1%
Total Mode Share	100%		100%

#### Source: Airport Authority

#### 2.1.c Transit Access to San Diego International Airport

Current and planned transit services include:

- Local Bus: MTS Route 992 operates between Downtown San Diego and San Diego International Airport via Broadway, Santa Fe Depot, and Harbor Drive.
- **Trolley (Light Rail):** The MTS Green Line Trolley serves Middletown Station, which is a short but inconvenient walk to San Diego International Airport's free on-airport bus serving the terminals and consolidated Rental Car Center. The pedestrian facilities are not easily navigated given the steep grades and narrow sidewalks. By 2022, the MTS Blue Line Trolley is also planned to run on the same corridor and serve the Middletown Station.
- **Future Shuttle from Old Town Transit Center:** A new bus route connecting Old Town Transit Center to San Diego International Airport is currently under development by the Airport Authority in partnership with MTS. It is planned to open in 2020.

#### 2.1.d Key Airport Access Roadways

Today, residents, airport employees, and visitors rely primarily on automobiles to reach the airport terminals. There are limited access routes to and from the airport for auto-based traffic. Key airport access roadways include:

- **Harbor Drive:** An arterial roadway with three lanes in each direction that provides the only access route to the San Diego International Airport terminals. Harbor Drive connects to Downtown San Diego to the east and Point Loma to the west.
- Hawthorn Street/Grape Street: These are one-way streets with three lanes in each direction that collect airport traffic to and from the south. Hawthorn and Grape streets connect to I-5 to the east and Harbor Drive to the west.
- Kettner Boulevard/India Street: These are one-way streets with three lanes in each direction that collect airport traffic to and from the north. Kettner Boulevard/India Street connect to I-5 to the north and Laurel Street to the south.

- **Laurel Street:** An east-west roadway with two lanes in each direction that collects airport traffic from the north via the Kettner Boulevard/India Street couplet and collects local traffic from the east. Laurel Street connects to Uptown to the east and Harbor Drive to the west.
- **Pacific Highway:** An arterial roadway with three lanes in each direction that provides connectivity between Downtown San Diego and neighborhoods to the north.

Additional details of the roadway and freeway system can be seen in Figure 2-2. As shown in Figure 2-4, 43% of traffic comes from the south via I-5. A total of 36% comes from the north via I-5. Local traffic makes up the remaining 21%. As shown in Figure 2-4, a total of 83% of trips to San Diego International Airport use the ten-lane (five inbound and five outbound lanes) system formed by Laurel Street, Hawthorn Street, and Grape Street. Another 8% of the trips come from Downtown San Diego via Harbor Drive, resulting in a total of 91% of all airport traffic converging at Harbor Drive near the U.S. Coast Guard Station as shown in Figure 2-6.

Figure 2-4: Traffic Patterns to and from Airport





Figure 2-5: I-15 Corridor Access to Airport

While the majority of airport users reside north of the airport (see Figure 2-3) airport users along the I-15 corridor predominantly use the SR 163 connection to I-5 to access the airport. As shown in Figure 2-5, the SR 163 connection to I-5 is the most direct route to and from the airport for those who live along the I-15 corridor. This is why the highest percentage (43%) of traffic comes from the south via I-5.



Figure 2-6: Roadway Access to and from Airport

Note: Colored lines and arrows represent traffic flow.

Given the relatively low current transit mode share, maintaining adequate roadway access to San Diego International Airport remains an important objective. In addition to a focus on airport access, the City of San Diego is working to reduce traffic in the Little Italy neighborhood by shifting airport traffic off the Grape/Hawthorn streets couplet (Figure 2-6). The Airport Authority is working alongside SANDAG and other partner agencies on long-term concepts to repurpose Laurel Street so it can serve as the airport's priority roadway between Pacific Highway and the airport (see Figure 2-7). This would be accomplished by providing a three-lane entry road from Laurel Street parallel to Harbor Drive to and from the airport. The entry road would be for airport use and Harbor Drive would serve all waterfront and other uses. It would focus airport traffic onto Laurel Street and away from Harbor Drive freeing up roadway capacity on Harbor Drive for the creation of a "the next great waterfront" as envisioned by the Port of San Diego, one concept of which is shown in Figure 2-8. Shifting traffic away from Harbor Drive would allow for space to be repurposed for pedestrian, bikeway, transit, and recreational uses for an improved waterfront experience. The challenge becomes how to get traffic from the Pacific Highway and Laurel Street intersection to I-5 as efficiently as possible. Developing an efficient roadway access plan in and around the airport is a complex challenge considering the many varied goals.



Figure 2-7: Airport Priority Roadway

Note: Colored lines and arrows represent traffic flow on both Harbor Drive and the on-airport roadway.



Figure 2-8: Harbor Drive Waterfront Vision

Source: Integrated Planning Port Master Plan Update, February 25, 2019, Port of San Diego

#### 2.1.e Projected Growth and Travel Conditions

Growth in the region's population and economy is projected to lead to major increases in travel demand at San Diego International Airport, with over 67% more passengers expected in 2050 than in 2018 (see Table 2-2). Without alternative options to reach the airport, the vast majority of passengers will continue to use auto-based modes, leading to heavy congestion on key airport access roadways. This level of traffic would overwhelm the roadway system at peak times, causing major congestion and delays. With the expected traffic increases and without alternative options to reach the airport, key airport access roadways would begin to experience gridlock conditions. This would result in significant delays during peak hours when most air travelers need to reach their flights.

	Annual Passengers	Daily Traffic on Harbor Drive
2018	24 million	95,000
2050	40 million	132,000 (No Build Scenario)
Growth, 2018–2050	67%	39%

Table 2-2: Existing and Projected Travel Demand at San Diego International Airport

Sources: SAN Air Traffic Reports, SAN Airport Development Plan Draft EIR, SANDAG Series 13 Regional Travel Model 2.2 Past Studies to Address Airport Access

San Diego has long desired to improve overall access to San Diego International Airport, to improve transit mode share, and connect the airport to the regional rail system. Yet, some key challenges must be addressed before these goals can be reached. First, MTS Bus Route 992, which is the main bus service to the airport's two terminals, is currently a local route that lacks any priority measures. Moreover, there is no direct pedestrian connection between an on-airport Rental Car Center shuttle and the MTS Middletown Trolley Station that stops a few hundred feet away. The sidewalks connecting the MTS Trolley station and Rental Car Center are not currently Americans with Disabilities Act accessible, have a significant grade change, and can be confusing for pedestrians even with wayfinding signage. Further, the existing transit options do not operate during all airport employee shifts to adequately support the airport employee population.

Given that multiple transit corridors are in proximity and can feasibly connect to San Diego International Airport, numerous planning studies regarding appropriate ground access projects have been initiated by various agencies, including the Airport Authority, Port of San Diego, Caltrans District 11, SANDAG, and the City of San Diego. Since 1982, these studies have been conducted in an effort to improve access conditions and transit connectivity at the airport:

- North Harbor Drive Multimodal Study (2018)
- Downtown to Airport Skyway Feasibility Study (2018)
- Airport Development Plan Draft EIR (2018)
- Uptown Community Plan (2016)
- Downtown San Diego Mobility Plan (2016)
- San Diego International Airport Transit Plan (2016)
- I-5 Ramps SANDAG (2016)
- San Diego Forward: The Regional Plan (2015)
- Mid-Coast Corridor Transportation Impacts and Mitigation Report (2014)
- City of San Diego Traffic Signal Communications Master Plan (2014)
- San Diego Airport Multimodal Accessibility Plan (AMAP) (2012)
- Airport Intermodal Transit Center Study Phase 1 Final Report (2010)
- Destination Lindbergh (2009)
- Airport Master Plan (2008)
- Central Interstate 5 Corridor Study (2003)
- Point Loma / Airport Trolley Extension Study (1982)

While many of these studies have focused on each individual agency's jurisdiction and have provided recommendations for segments of critical transportation corridors servicing San Diego International Airport, collectively they have not presented a fully integrated transit airport access strategy for the region. Moreover, among many reasons, these recommendations have not advanced due to lack of a shared vision by stakeholders, a lack of funding, and a lack of available right-of-way.

#### 2.2 Regional Agency Development Proposals

#### 2.2.a Airport Authority Proposed Airport Development Plan

Since 1928, the San Diego International Airport has served the region's commercial air travel and has grown into a major international airport now serving 22 million passengers each year. San Diego International Airport has established itself as a major regional economic engine and is the busiest single-runway airport in the nation. Notwithstanding past failed efforts to relocate, the airport has successfully accommodated the region's commercial air travel and has made significant investment to modernize and maximize airport facilities.

In 2018, the Airport Authority released the Airport Development Plan (ADP) defining the master plan for San Diego International Airport, as part of the continued commitment to deliver world-class passenger experience and to meet existing and anticipated future passenger activity. Future forecasts project that the airport's passenger activity will increase to 40 million annually by 2050. Now, the Airport Authority is preparing an Environmental Impact Report (EIR) pursuant to the California Environmental Quality Act to modernize Terminal 1 by 2026. The Airport Authority also proposes to develop a new on-airport entry roadway from westbound Laurel Street and North Harbor Drive for vehicles coming to the airport from the east in addition to developing a new multi-use bicycle and pedestrian path along the north side of North Harbor Drive to reduce traffic on North Harbor Drive. Buses to and from the airport Rental Car Center would be removed from Harbor Drive and routed exclusively through the new on-airport entry and link road. Separate arriving and departing passenger traffic, with an elevated departures roadway and curbside check-in would be expanded. Parking immediately adjacent to the redeveloped Terminal 1 would be expanded. Airfield improvements would include realignment of Taxiway B and a new Taxiway A to allow more efficient flow for aircraft taxiing operations.

As part of the ADP, the Airport Authority has announced a landmark pact on its transportation infrastructure investment. On July 2, 2019, the Airport Authority announced it reached a new ten-year agreement with its airline partners for a major investment in transportation infrastructure to help alleviate traffic congestion and improve access to the San Diego International Airport. This agreement outlines \$350 million for on- and potentially off-airport transportation infrastructure. These funds could potentially be used for an on-airport transit station and a transit connection to the existing regional transit system. The agreement also outlines an additional \$165 million for on- and off-airport access improvement plans, including an on-airport entry road connecting from Laurel Street and Harbor Drive and the construction of a bicycle path. Additionally, the airport is preserving right-of-way for a multimodal mobility corridor to serve *Rapid* Bus, Trolley, or an APM system that can also potentially serve Harbor Island redevelopment projects being considered by the Port of San Diego.

The agreement enables partnership with other regional agencies to improve access to the airport through transportation and transit projects.

#### 2.2.b Port of San Diego Proposed Master Plan

For the past few years, the Port of San Diego has prepared a comprehensive integrated planning initiative to update their Port Master Plan, which is similar to a general plan for a city or county. The effort spans 6,000 acres of water and land on and around San Diego Bay in the cities of San Diego, National City, Chula Vista, Imperial Beach, and Coronado. As a blueprint for development, it is intended to create certainty for developers and community members by codifying a vision for how future projects will fulfill public goals. In the summer of 2019, the Port of San Diego released a discussion draft of the updated Port Master Plan for public review. In order to create the "next great waterfront," it is anticipated that the updated Port Master Plan will result in additional development and changes to the roadway system. Harbor Drive is a key element of the "next great waterfront" vision. Both the Airport Authority and the Port of San Diego are working in collaboration to deliver access and circulation plans that are complementary and preserve the opportunity for future transit connections to the airport.

#### 2.2.c City of San Diego Downtown Mobility Plan

In 2016, the City of San Diego adopted their Downtown Mobility Plan. The Downtown Mobility Plan emphasizes the development of active transportation networks and the improvement of the walking and biking environments, as these modes are not as advanced as transit and auto networks in terms of safe, quality facilities. The Downtown Mobility Plan provides for an integrated transportation network of greenways, sidewalks, bikeways, transit services, roadways, and freeways that provides for the safety of all travelers – including the elderly, youth, and disabled – both within Downtown and to surrounding communities. It is designed to encourage a transportation network that provides convenient access to valuable community resources such as employment centers, parks and the waterfront, cultural and entertainment attractions, and civic uses. It is a transportation network that supports community health and well-being, promotes a strong economy, and builds social capital.

#### 2.2.d Navy Region Southwest Old Town Campus

Navy Region Southwest is dedicated to creating a more modern and efficient workspace on the Naval Base Point Loma Old Town Campus (OTC) to better meet the mission requirements of NAVWAR. Navy Region Southwest and NAVWAR desire to create modern facilities for the 5,000 engineers, scientists, and staff located at OTC. The 72-acre OTC site is located at I-5 and Old Town Avenue, a short distance from San Diego International Airport. On July 10, 2019, SANDAG and Navy Region Southwest signed a Memorandum of Understanding (MOU) enabling a collaborative process to explore concepts for the revitalization of the OTC property, including the possibility of a Central Mobility Hub with a direct connection to the airport. While the MOU does not commit either to a course of action, the agreement allows for collaboration and begins the planning process so both SANDAG and the Navy can work together with the community and stakeholder agencies to evaluate concepts.

#### 2.2.e San Diego Metropolitan Transit System

Several of the previous studies which identified transportation connection improvements in and around the airport had recommended MTS Route 992 to the airport be converted into a high frequency, limited stop, bus *Rapid* service. In spring 2019, MTS kicked off Elevate SD 2020, an effort to develop new mobility solutions by engaging the community to help identify projects and priorities that can shape a potential funding measure being considered by the MTS Board of Directors for 2020. The Elevate SD 2020 values include providing better access to employment and educational opportunities, improving access for seniors and people with disabilities, and seeking out opportunities for long term high-investment infrastructure improvements. In early spring 2019, MTS released results of a poll in which more than two thirds of respondents identified a transit connection to the airport as a high priority for a potential funding measure to address. MTS has since studied concepts to extend the Trolley to San Diego International Airport and has collaborated with SANDAG to include their concepts and preliminary analysis in this report.

#### 2.2.f Caltrans District 11

In 2016, Caltrans District 11 and SANDAG collaborated on a project study report evaluating connections via I-5 connector ramps to provide direct and convenient access to regional activity centers such as the San Diego International Airport. While such studies have not yet progressed beyond the initial concepts, Caltrans has worked in coordination with SANDAG, Airport Authority, Port of San Diego, and City of San Diego to continue to explore and develop feasible freeway access improvements that serve the airport and the region at large.

#### 2.2.g SANDAG

On February 22, 2019, the Board approved an action plan to develop a bold new vision for San Diego Forward: The 2021 Regional Plan (2021 Regional Plan). The action plan seeks to transform the way people and goods move throughout the San Diego region by providing compelling alternatives to driving. This innovative plan for a transportation system strives to get people where they need to go quickly, meet or exceed state climate goals, and support local jurisdictions' achievements of climate action plan goals using proven and developing technologies. This new vision for the future will build on the significant public input received so far, as well as ensure social equity, sustainability, supporting land use and housing, and economic opportunities. Completion of the 2021 Regional Plan is anticipated in late 2021. As part of the 2021 Regional Plan, SANDAG plans to include transit connections to San Diego International Airport as outlined in this Airport Connectivity Analysis.

#### 2.3 SANDAG Airport Connectivity Subcommittee

On December 21, 2018, the Board approved the draft charter and membership for the Airport Connectivity Subcommittee, a temporary subcommittee, advisory in nature, to identify future transportation solutions for improved transit and road connectivity to the San Diego International Airport. The purpose of the Airport Connectivity Subcommittee is to lead discussions and explore options for how best to build consensus around transportation solutions for improved connectivity to the airport for generations to come.

The work of the Airport Connectivity Subcommittee will conclude upon adoption of a preferred transportation solution by the Board. SANDAG Chair and Poway Mayor Steve Vaus serves as the Chair of the Airport Connectivity Subcommittee. Members of the subcommittee were appointed by the Chair and include Board members from the following organizations: SANDAG, City of San Diego, County of San Diego, MTS, NCTD, Port of San Diego, Airport Authority, and Caltrans District 11.

At its first meeting on January 3, 2019, the Subcommittee reviewed the schedules for the development of the 2021 Regional Plan, Airport Development Plan Environmental Impact Report, and Port Master Plan update. The subcommittee also discussed the need for interagency collaboration, reviewed airport connectivity studies completed to date, and discussed innovative solutions for improving airport connectivity. To provide technical input, an interagency project team was formed compromising agency staff and consultant experts in planning, engineering, transportation modeling, finance, government relations, communications, and law. The Board allocated \$1 million toward the expenses related to the study of concepts.

## 3. Airport Connectivity Subcommittee Goals and Objectives

The Board set the primary goal for the Airport Connectivity Subcommittee to identify future transportation solutions for improved transit and roadway connectivity to the airport. Based on the Board's definition of success, the following objectives were identified:

- 1. Create a Central Mobility Hub with regional connections to the airport. The Central Mobility Hub should bring multiple modes of transportation to a central location where, with one transfer, intercity rail, commuter rail, Trolley, bus, and micro-mobility can connect to the airport. The Central Mobility Hub should have the ability to accommodate future mobility shifts for generations to come.
- 2. New direct transit connection to and from the airport. San Diego International Airport should join other airports in the country that have a direct and efficient transit connection to their regional rail and transit systems.
- **3.** More direct, convenient access for auto traffic to and from the airport. A roadway modification plan should be developed to avoid future gridlock on key airport access roadways and accommodate safer, more complete streets inclusive of pedestrian and bike facilities.
- **4. Improving Laurel Street to serve as a primary access roadway.** A roadway modification plan should be developed to convert Laurel Street into the airport priority roadway. Given the space limitations, it is critical to identify ways to enhance Laurel Street to address congestion, improve the overall roadway network, and enhance the passenger experience.
- 5. Harbor Drive to be converted into the next great waterfront street with dedicated transit lanes. A roadway modification plan should be developed to reduce traffic on Harbor Drive so space along Harbor Drive can be converted to waterfront uses. Plans include dedicated transit lanes, enhanced pedestrian and bicycle facilities, and improved curb amenities.
- **6.** Reduce airport traffic on Grape and Hawthorn streets. Grape and Hawthorn are two local constrained streets in the City of San Diego's Little Italy neighborhood that experience heavy traffic volumes, mostly due to airport traffic. To implement the City of San Diego's Downtown Mobility Plan elements, traffic on Grape and Hawthorn streets should be reduced to enable safer, more pedestrianand bicycle-friendly amenities.
- 7. Maintain Pacific Highway for local auto traffic and active transportation solutions. As a local roadway, included in the City of San Diego's Downtown Mobility Plan, Pacific Highway should include enhanced bicycle and pedestrian improvements.

The Airport Connectivity Analysis also should advance regional goals of reducing environmentally harmful emissions, increasing social equity, encouraging community engagement, and promoting economic development opportunities in the San Diego region.

## 4. Airport Connection Concepts

#### 4.1 Identification and Screening of Early Concepts

On January 18, 2019, and on February 8, 2019, SANDAG issued Requests for Information to garner ideas from the marketplace for improved airport connectivity and ideas for a Central Mobility Hub. SANDAG received many ideas for APM systems, transportation systems management, demand management technologies, pricing strategies, operating systems, vehicle technologies, roadway and freeway modifications, land use, and Central Mobility Hub concepts.

SANDAG, with help from the interagency working group, evaluated this wide range of technologies and early concepts, seeking the best solutions for improved airport connectivity. The technologies and early concepts for improving airport connectivity can be categorized into four main areas:

- APM or similar technologies
- Transportation Systems Management and Transportation Demand Management (TSM/TDM) and related technologies
- Central Mobility Hub and land use solutions
- Roadway, freeway, and transit routing options

APM technologies are similar to manually operated technologies, like the Trolley, except that they operate with an automated train control system. APM systems are centrally controlled with no in-vehicle drivers. For day-to-day operations, the APM systems can operate at shorter (more frequent) headways and can travel on steeper and narrower guideways than manually operated systems. For the purposes of this study, APM on fixed-guideway (track) with level-floor vehicles are assumed. These types of APM systems are used at many airports throughout the country and world. A Trolley connection to the airport was also evaluated.

Numerous TSM/TDM solutions and related technologies were evaluated including: information network architecture solutions, fleet monitoring and management technologies, data analytics solutions, train control systems, advanced transportation demand management technologies, dynamic pricing and tolling technologies, incentive-based mobile applications, traffic signal control and management systems, parking-management technologies, curb-management technologies, pedestrian safety technologies, and integrated payment systems. An Airport Connectivity Think Tank Workshop was held on March 6, 2019, focusing on the application of TSM/TDM and related technologies for improved airport connectivity. Assuming limitations for an expanded freeway and roadway network and the possibility of a Central Mobility Hub to provide an auxiliary location for passenger pick-up and drop-off, for the purpose of this study, future strategies to relieve congestion on key airport roads associated with airport-related traffic will be carried forth for further study.

Several Central Mobility Hub and land use concepts were evaluated including relocating the airport terminals from the south side of the airport to the north side to provide greater proximity to existing transit, roadway, and freeway infrastructure. The Airport Authority previously analyzed this concept and determined there is insufficient space on the north side of the airport to accommodate the terminals and critical airport operational infrastructure. Concepts for locating a Central Mobility Hub at the Old Town Transit Center or Santa Fe Depot have been screened out as there is insufficient space to accommodate Central Mobility Hub requirements at these locations. There is limited ability to expand the Old Town Transit Center as it is surrounded by state park lands and roadway infrastructure including overhead I-5 bridge structures. Santa Fe Depot is surrounded by high density land uses including residential high-rise towers. Concepts for repurposing land use from NAVWAR to Laurel Street and across tidelands are beyond the scope of this study. The two most promising sites for the location of a Central Mobility Hub are at the NAVWAR and ITC locations.

Numerous ideas for roadway and freeway modifications were considered. These ideas included undergrounding I-5 and reconstructing the I-5/I-8/Pacific Highway freeway and roadway system. These are considered too costly and impactful to the surrounding community. The concept of connecting Pacific Highway to I-5 to and from the north, shown in Figure 4-1, was determined to be costly, require large amounts of private property acquisition, and potentially create high levels of congestion on local streets, especially at the Pacific Highway and Laurel Street intersection. This concept also would have limited utility and it would only serve traffic to and from the north, while the majority of airport traffic comes to and from the south, as discussed in Section 2.1.d.

Figure 4-1: Freeway Connectors from Pacific Highway to I-5



Another suggestion was to create a shallow tunnel system of roadways to and from the airport for improved connectivity. This concept was not carried forward due to cost, impacts to the community, and design and construction challenges. It would be expensive and challenging to construct in the soils made up of bay fill and around the airport from the surface level to roughly 40 feet deep (see Figure 4-2). Nevertheless, the concept for a deep tunnel to connect the Central Mobility Hub to the airport was carried forward based on preliminary analysis as soil conditions are more favorable below 40 feet deep.

Other suggestions for an APM connection around the west side of the airport to connect Point Loma/Liberty Station communities to the airport were not carried forward due to the expected low ridership potential due to the lower land use intensities in these areas. An APM connection around the east side of the airport would capture passengers from the Rental Car Center and the future planned

Figure 4-2: Soil Characteristics In and Around San Diego International Airport



development at Harbor Island East Basin and is seen as more viable and cost-effective solution and does not prohibit the possibility of future extension around the west side of the airport.

Suggestions for connecting to the existing Trolley system were narrowed to two locations: the existing Trolley bridge over Laurel Street and connecting at the trench under Grape and Hawthorn streets.

#### 4.2 San Diego International Airport Connector Concepts

Working collaboratively with the Airport Connectivity Subcommittee, the interagency working group, and subject matter experts, four concepts were defined to achieve the following:

- Improve transit access to and from the airport
- Minimize travel time to and from the airport
- Reduce congestion related to airport access
- Reduce GHG emissions and VMT
- To be feasible, constructible, and cost effective
- Improve transit user experience and convenience

Over several months, these concepts and corresponding assumptions were developed and refined by SANDAG with input from the various agencies. In order to achieve the objectives of reducing traffic in Little Italy and to reduce traffic on Harbor Drive so Harbor Drive can be repurposed for waterfront uses, the following roadway and freeway elements common to each concept include:

- Convert Laurel Street to an airport-priority roadway between Pacific Highway and the airport as envisioned in the Airport Development Plan to remove airport traffic from Harbor Drive (see Figure 2-7).
- Repurpose Harbor Drive from six lanes to four lanes with dedicated transit lanes and bikeway lanes from Harbor Island Drive to the Convention Center in support of the Port Master Plan Update and waterfront vision (Figure 2-8).
- Widen Laurel Street between Pacific Highway and I-5, providing the most direct route from the airportpriority roadway to I-5.
- Construct new I-5 freeway ramp connections to Laurel Street, supporting a direct connection from I-5 to Laurel Street and the airport-priority roadway.
- Remove I-5 freeway ramp connections to Grape and Hawthorn streets to reduce traffic in Little Italy.

In addition to the common roadway and freeway elements for the concepts, the following redevelopment assumptions for the NAVWAR site were included:

- Approximately 3,500 residential units
- 250 hotel rooms
- 300,000 square feet of community-serving commercial
- 1.7 million square feet of office to accommodate Navy uses

Additionally, Concept 3 assumes redevelopment of the ITC site with approximately 1,400 residential units, 330 hotel rooms, and 460,000 square feet of office uses.

Concept 1 – Central Mobility Hub at NAVWAR with Tunnel APM Connection to Airport





Concept 1 features the Central Mobility Hub at NAVWAR, which would be a multimodal transportation center with high-frequency APM service to the airport, numerous connections to regional transit lines, and an airport-like curb experience for auto-based travelers (see Figures 4-4 and 4-5). The 72-acre NAVWAR site is located between Pacific Highway and I-5, just south of the Old Town Transit Center.

A central station "Great Room" with views of San Diego Bay would be the centerpiece of the Central Mobility Hub, see Figures 4-6 and 4-7. Transportation functions would be spread across multiple levels. Multi-level roadways—like those at the San Diego International Airport's Terminal 2 and other major airports—would separate arrivals and departures (Figures 4-8 and 4-9). Auto access would be available from Pacific Highway or via a new direct access ramp on I-5. A new I-5 interchange at Hortensia Street would replace the existing Old Town Avenue interchange, providing additional auto access to the Central Mobility Hub (via Pacific Highway) and the Old Town community. Pedestrian and bike access between the Central Mobility Hub and Old Town would also be provided by a bridge and/or tunnel across I-5.

The Central Mobility Hub lower levels would provide ample curb space for ground transportation connections including private auto, TNC/taxi, airport shuttles, and other passenger pick-up and drop-off services. A wide array of transit services relocated from Old Town Transit Center would converge at the Central Mobility Hub to provide the region's best access to local and *Rapid* buses, the San Diego Trolley, COASTER, and Amtrak.

Concept 1 assumes that approximately 80 feet below ground level would be an APM station with nonstop, high-speed service to the airport via a one-mile tunnel route. The APM vehicles would provide level boarding from the platform with wide doors and adequate room for passengers with luggage. The two-minute APM service frequency would offer an average wait time of just one minute on the platform, plus an in-vehicle travel time of two minutes between the Central Mobility Hub and the San Diego International Airport transit station located within walking distance between Terminals 1 and 2.



Figure 4-4: Central Mobility Hub Curb Experience Concept (View 1)



Figure 4-5: Central Mobility Hub Curb Experience Concept (View 2)

Figure 4-6: Central Mobility Hub Great Room Concept (looking west)





Figure 4-7: Central Mobility Hub Great Room Concept (looking east)

Figure 4-8: Central Mobility Hub Multi-Level Roadway System Concept (View 1)





Figure 4-9: Central Mobility Hub Multi-Level Roadway System Concept (View 2)

Concept 2 – Central Mobility Hub at NAVWAR with At-Grade and Elevated APM Connection to Airport



Figure 4-10: Concept 2

Like Concept 1, Concept 2 features the Central Mobility Hub at NAVWAR as a multimodal transportation center with high-frequency APM service to the airport, numerous connections to regional transit lines, and an airport-like curb experience for auto-based travelers. The 72-acre NAVWAR site is located between Pacific Highway and I-5, just south of the Old Town Transit Center.

A central great room with views of San Diego Bay would be the centerpiece of the Central Mobility Hub, with transportation functions spread across multiple levels. Dual-level roadways—like those at the San Diego International Airport's Terminal 2 and other major airports—would separate arrivals and departures, with auto access available from Pacific Highway or via a new direct access ramp (DAR) on I-5. A new I-5 interchange at Hortensia Street would replace the existing Old Town Avenue interchange, providing additional auto access to the Central Mobility Hub (via Pacific Highway) and the Old Town community. Pedestrian and bike access between the Central Mobility Hub and Old Town also would be provided by a bridge and/or tunnel across I-5.

The Central Mobility Hub lower levels would provide ample curb space for ground transportation connections including TNCs/taxis, airport shuttles, and passenger pick-up and drop-off. A wide array of transit services relocated from Old Town Transit Center would converge at the Central Mobility Hub to provide the region's best access to local and *Rapid* buses, the San Diego Trolley, COASTER, and Amtrak. In Concept 2, a surface or elevated APM station would provide service to the airport via a 3.6-mile surface/elevated route roughly along Pacific Highway, Laurel Street, and Harbor Drive, with intermediate stops at the Rental Car Center and the planned development at Harbor Island East Basin. The APM vehicles would provide level boarding from the platform with wide doors and adequate room for passengers with luggage. The two-minute APM service frequency would offer an average wait time of just one minute on the platform, plus an in-vehicle travel time of eight minutes between the Central Mobility Hub and the San Diego International Airport transit station located walking distance between Terminals 1 and 2.

3. Central Mobility Hub at ITC Concept Central Mobility Hub and at-grade and elevated people mover to Airport OLD TOWN stations Airport transit-ready area freeway connection to Central Mobiltiy Hub HIDWAY DA freeway interchange modifications (Washington St.) other freeway/roadway modifications PACIFIC HWY BARNETT AVE PARK BLVD LAUREL ST AVE AUREL ST 6TH HAWTHORN ST GRAPE ST HARBOR ISLAND DR

Concept 3 – Central Mobility Hub at ITC with At-Grade and Elevated APM Connection to Airport Figure 4-11: Concept 3

The Central Mobility Hub at the planned ITC site would be a multimodal transportation center with highfrequency APM service to the airport, numerous connections to regional transit lines, and an airport-like curb experience for auto-based travelers. The 13-acre ITC site is located across Pacific Highway from the Rental Car Center, just west of I-5 roughly between Washington and Vine streets.

The Central Mobility Hub lower levels would provide ample curb space for ground transportation connections including TNCs/taxis, airport shuttles, and passenger pick-up and drop-off. Transit services including the San Diego Trolley and local and *Rapid* buses would provide connections at the Central Mobility Hub, with the existing Washington Street and Middletown Trolley stations combined into one station at the Central Mobility Hub.

In Concept 3, COASTER and Amtrak trains are not expected to add an additional stop at the Central Mobility Hub. An APM station would provide service to the airport via a 2.6-mile surface/elevated route roughly along Pacific Highway, Laurel Street, and Harbor Drive, with intermediate stops at the San Diego International Airport Rental Car Center and the planned development at Harbor Island East Basin. The APM vehicles would provide level boarding from the platform with wide doors and adequate room for passengers with luggage. The two-minute APM service frequency would offer an average wait time of just one minute on the platform, plus an in-vehicle travel time of seven minutes between the Central Mobility Hub and the San Diego International Airport transit station located walking distance between Terminals 1 and 2.

#### Concept 4a – Trolley Connection to Airport at Laurel Street

Figure 4-12: Concept 4a





#### Concept 4b – Trolley Connection to Grape Street - Hawthorn Street

Figure 4-13: Concept 4b

Concepts 4a and 4b both feature an extension of the Trolley light-rail system to the planned San Diego International Airport transit station located walking distance between Terminals 1 and 2. The new track would be a spur extending west from the existing Trolley corridor and would include an additional station at Harbor Island East Basin providing transit access to this planned development. Unlike Concepts 1 through 3, Concepts 4a and 4b would not include a new Central Mobility Hub nor sufficient curb space to accommodate the anticipated airport pick-up and drop-off traffic.

The new alignment would branch from the existing Trolley corridor either via aerial structure near Laurel Street (Concept 4a) or via trench/tunnel below Grape and Hawthorn streets (Concept 4b). In Concept 4a, the aerial structure would continue along the Laurel Street corridor and cross to the south side of Harbor Drive, transitioning to a surface alignment as it approaches the Harbor Island East Basin station. In Concept 4b, the tunnel alignment below Grape and Hawthorn streets would emerge via a portal on the south side of Harbor Drive.

Once on Harbor Drive, both alignments would utilize the planned space for enhanced transit service envisioned in the Port Master Plan Update, the result of a planned repurposing of the roadway from six traffic lanes to four. After serving Harbor Island East Basin, the Trolley alignment would then rise back to an elevated structure to cross Harbor Drive and terminate at the San Diego International Airport transit station. To operate the service, MTS would create a new Trolley line extending north to Old Town Transit Center and south to Santa Fe Depot and the 12th & Imperial Transit Center, including all existing intermediate stops. This would provide numerous connections to regional and local transit, including the Trolley, *Rapid* and local buses, and COASTER and Amtrak rail services. Due to capacity constraints on the existing Trolley corridor, the service would operate on a 15-minute service frequency, resulting in an average platform wait time of 7.5 minutes. The in-vehicle travel time would be 5.5 minutes from Santa Fe Depot, 9.5 minutes from Old Town Transit Center, and 12.5 minutes from the 12th & Imperial Transit Center.

#### 5. Evaluation Criteria

This evaluation of the concepts outlined in Section 4 uses seven key evaluation criteria:

- Passenger Convenience and Ridership. The benefit created in terms of increased transit ridership and overall passenger convenience is an important factor for determining ridership potential. Information on transit ridership is presented in terms of new daily riders and a shift from auto-based travel to transit. New daily riders are an important measure as this is the basis used for funding eligibility by the Federal Transit Administration. In general, the attractiveness of transit is directly influenced by passenger convenience factors, such as user experience, travel time, access to transit, and walk distance.
- Reduce Congestion Related to Airport Access. This is about improvements to regional transit and auto access to the airport. The focus is on identifying and creating transit options that are as or more competitive than driving a personal vehicle to the airport. It also looks to reduce congestion on local streets related to airport access.
- **3. Reduce GHG Emissions and VMT.** Goals in this criterion include reducing GHG emissions and congestion by encouraging energy efficient alternative transportation modes and meeting state emissions mandates and stakeholder climate action plans with a specific focus on airport travelers.
- **4. Feasibility.** This criterion focuses on constructability, regulatory agency permitting factors, geotechnical and seismic issues, the cooperation of the Navy for use of Naval Base Point Loma (NAVWAR) lands, the regulatory approval of the FAA for the construction of connectivity improvements within an active airport environment, and issues associate with construction activities within an active rail corridor, freeway, and urban roadway environment.
- 5. Cost. Capital, right-of-way, project development, and operating costs are evaluated in this criterion. Capital costs include the construction of all connectivity improvement infrastructure and related facilities. Right-of-way costs include the acquisition, relocation, and goodwill costs for the private lands that would need to be acquired for the infrastructure improvements. Project development costs include all planning, engineering, construction-management, and related professional services necessary to advance the project to completion. Operating costs include the cost to operate and maintain the system for a 30-year period. At this early stage of the project development process, the cost estimates are rough-order-of-magnitude costs for purposes of comparing each concept to each other. The cost estimates are in 2019 dollars and should not be used for programming purposes.
- **6. Economic Benefit.** Economic benefits to the region measured in terms of the construction benefits associated with job creation.

The final evaluation of the airport connectivity concepts is shown at the end of this report in Figure 6-1.

The reader will note that the organization of the final evaluation is slightly different than presented here in Section 5. This is due to the desire to maintain the final evaluation as closely as possible to the evaluation criterion as previously presented to the Airport Connectivity Subcommittee. The evaluation criterion is organized in Section 5 for ease of reading.

#### 5.1 Passenger Convenience and Ridership

This criterion assesses passenger convenience and ridership for each concept outlined in Section 4. In general, the attractiveness of transit is directly influenced by passenger convenience factors such as vehicle design, travel time, number of transfers, and walk distance. Airport-related transit attractiveness is additionally influenced by design features such as Central Mobility Hub to facilitate airport transit ridership, the pick-up and drop-off experience, ease of moving baggage, and walk distance to and from the terminals.

#### 5.1.a Improved Access to Transit

The SANDAG Board approved an action plan on February 22, 2019, to develop a bold new vision for the 2021 Regional Plan with the goal to transform the way people and goods move throughout the San Diego region by providing compelling alternatives to driving. This innovative transportation system will strive to get people where they need to go quickly.

A focus of the new transportation vision will be on the creation of a complete network of high-capacity, high-speed, and high-frequency transit services that incorporates new transit modes and improves existing services. Another focus area will be on the creation of mobility hubs, places of connectivity where a variety of travel options come together to deliver a seamless travel experience in the heart of the communities where people live, work, and play. Supporting land uses that increase housing near transit and enhanced infrastructure for bikes and pedestrians will encourage more people to walk, bike, and use transit.

Due to its central location in the region and the regional priority to improve connectivity to San Diego International Airport, the opportunity presents itself to investigate the possibility of a Central Mobility Hub that can serve as the centerpiece of the new transportation vision while also solving one of the region's most vexing problems, how to improve transit connectivity to the airport. The concept of a Central Mobility Hub located near the airport for improved access to transit is shown in Figure 5-1.



Figure 5-1: Regional Transit Connectivity

Concepts 1 and 2 would locate the Central Mobility Hub at the NAVWAR site, see Figures 4-3 and 4-10. NAVWAR is a large site which can accommodate a revitalized NAVWAR campus as well as a Central Mobility Hub with roadway, Amtrak, COASTER, Trolley, bus, and future high-speed transit services. Concepts 1 and 2 would relocate the Old Town Transit Center, combining it with the Central Mobility Hub at NAVWAR. Concepts 1 and 2 at NAVWAR also could include access to a major economic commercial center that could provide new job, housing, retail, and hotel amenities. Concepts 1 and 2 would provide ample space for airport passenger pick-up and drop-off, an important design feature for diverting traffic away from key airport access roadways. The NAVWAR site offers the greatest flexibility for future expansion and modification to meet the mobility needs for generations to come.

Concept 3 would locate the Central Mobility Hub at the ITC site (Figure 4-11). The site can accommodate the program requirements for a Central Mobility Hub with roadway, Trolley, bus, and future high-speed transit services. However, based on previous discussions with stakeholders, Amtrak and COASTER rail services would not stop at the ITC site as these services would continue to use the Old Town Transit Center and Santa Fe Depot stations and would not add an intermediate stop at the ITC site. This limits access to transit as would the expected limited bus service at the ITC site as the majority of the bus service is expected to remain at the Old Town Transit Center. The ITC site offers some opportunity for job, housing, retail, and hotel amenities but to a much lesser extent as compared to the NAVWAR site. Concept 3 would provide space for airport passenger pick-up and drop-off. The ITC site is constrained by the existing roadway and freeway network and offers less ability for future expansion but does provide good flexibility to accommodate future modal shifts and future transportation needs.

Concept 4 would not provide a Central Mobility Hub. Instead, a new Trolley line would be connected to the existing Trolley system between the Old Town Transit Center and the 12th & Imperial Transit Center with a spur to San Diego International Airport (see Figures 2-2, 2-12, and 2-13). Concept 4 would provide connectivity to existing Amtrak, COASTER, and bus service but would not provide a location or facilities for connecting to future high-speed transit. Concept 4 would not provide opportunities for new job, housing, retail, and hotel amenities and there would be limited opportunity for airport passenger pick-up and drop-off. With future advancements in transportation technology, Concept 4 offers little ability to accommodate future modal shifts and future transportation needs.

The "No Build" scenario offers the fewest transit access improvements. Transit service to the airport would be limited to the existing MTS Bus Route 992 from Downtown/Santa Fe Depot plus the Airport Authority's new shuttle service from Old Town Transit Center (currently in development and expected to open in 2020).

#### 5.1.b Passenger Convenience

The following convenience-related factors have a strong influence on the relative attractiveness of various airport transit connection options:

- Modes and vehicle amenities
- Transit travel time, wait time, and service frequency
- Transfers

#### Modes and Vehicle Amenities

This study identified modes and vehicle amenities associated with the modes and vehicles in Concepts 1 through 4 that would be designed to enhance the airport-related transit users' experience and convenience.

Concept 1 (Tunnel APM) has the highest potential benefits, with a tunnel-based APM allowing for the fastest trips of any concept. APM vehicles are specifically designed and optimized for airport travel with level boarding, level floors, wide doors, and ample space for passengers with luggage (see Figures 5-2, 5-3, and 5-4).

Concepts 2 and 3 (Surface APM) have slightly lower potential benefits compared to Concept 1 because of the distance of the trip. The surface APM must travel around the end of the runway, whereas the tunnel APM can go directly through the tunnel. APM vehicles are optimized for airport travel with level boarding, level floors, wide doors, and ample space for passengers with luggage.

Concept 4 (Trolley) has much lower potential benefits. While use of the Trolley would be a positive given its strong familiarity to passengers, it is slower than the other three concepts. The current Trolley vehicles are not optimized for airport travel. Boarding is not fully level as the deployment of ramps is required leaving airport passengers to navigate a ramp between the platform and the vehicle (see Figure 5-5). The interior of the vehicle is not level, as climbing stairs is required to reach seating on each end of the Trolley vehicle (see Figure 5-6). The doors are narrower than APMs and the seating configuration is not suited for passengers with luggage (see Figure 5-7). This would be exacerbated during peak periods with full vehicles (see Figure 5-8).



Figure 5-2: Automated People Mover Vehicle Interior (Empty)

Source: SFO AirTrain – mliu92 from San Mateo [CC BY-SA 2.0]

Figure 5-3: Airport Passengers Boarding an APM Vehicle



Figure 5-4: APM Vehicle Interior (with passengers)





Figure 5-6: Trolley Vehicle Stairway



Figure 5-7: Trolley Vehicle Interior (Empty)

Figure 5-5: Trolley Vehicle Ramp



Figure 5-8: Trolley Vehicle Interior (with passengers)



#### Transit Travel Time, Wait Time, and Service Frequency

Figure 5-9 provides the average transit travel time to San Diego International Airport for each concept, including platform waiting time and in-vehicle time to the airport transit-ready area.

Figure 5-9: Average Transit Travel Time to San Diego International Airport in 2050 (Platform Wait Time + In-Vehicle Time)



A SANDAG goal is to develop transit options that are comparable in time to driving. Even with freeway and roadway modifications outlined in Section 4-2, average auto drive times are expected to increase as travel demand in and around San Diego International Airport increases. Concept 1 is expected to offer a superior transit travel time than driving. Concepts 2 and 3 are anticipated to offer a competitive travel time, while Concept 4 is not expected to offer a competitive travel time.

Service frequency, which determines wait time, is a significant contributor to total travel time. The lower the service frequency, the higher the average wait time at the station platform. The 2-minute APM service frequency in Concepts 1 through 3 results in lower overall travel times than the 15-minute Trolley service frequency in Concept 4. These differences have been accounted for in the travel time analysis and are factored into the travel times listed below in Table 5-2.

While Trolley service could be increased to 7.5-minute service frequency, as shown in Figure 5-10, the ridership potential may not justify this frequency. As outlined in Section 5.4.b, there are also technology and rail corridor capacity constraints that may limit the ability to provide 7.5-minute frequencies. For the purpose of this analysis, 15-minute Trolley frequencies are assumed.

Concept 1 has the highest potential benefits, as its service would be the best match for time-sensitive airport travelers. A two-minute service frequency means riders would not have to plan their airport travel around the APM schedule, with an average wait time of one minute on the platform. Concept 1 directly serves the airport and the Central Mobility Hub, with no stops in between. This results in the shortest trip length of all the concepts. Note that Concept 1 does not include time associated with potential FAA and Transportation Security Administration (TSA) security clearance process requirements. It is unclear at this point if a security check would be required.

Concept 3 has more circuitous routing than Concept 1 – along the north side of the airport and Laurel Street/Harbor Drive – and includes two intermediate stops. The longer routing and intermediate stops would result in a total average travel time of eight minutes, two and a half times greater than Concept 1.

Concept 2, with a similar path, but longer travel distance than Concept 3, has a total travel time of nine minutes. As with Concept 3, the intermediate stops at the Rental Car Center and Harbor Island East Basin would increase the total travel time for passengers.

Concept 4 offers the least time-competitive option, with an indirect route to the airport that includes numerous stops and a travel time range between 13 minutes (from Santa Fe Depot) and 20 minutes (from 12th & Imperial station).

Due to 15-minute headways, Concept 4 requires a longer station wait time—an average of 7.5 minutes on the platform given its 15-minute service frequencies—along with additional waiting time at intermediate stops including Harbor Island East Basin and several existing Trolley stations. The reduced service frequency would require users to plan their trips around the Trolley schedule, making it a less-attractive service to time-sensitive travelers.

A further breakdown of the specific travel times for each concept is summarized in Table 5-1.

Concept/Mode	Concept 1 Tunnel APM	Concept 2 Surface APM	Concept 3 Surface APM		Concept 4 Trolley	
Origin	NAVWAR	NAVWAR	ITC	Old Town	Santa Fe Depot	12th & Imperial
Avg. Platform Wait (1/2 service frequency)	1 min	1 min	1 min	7.5 mins	7.5 mins	7.5 mins
In-Vehicle Time	2 mins	8 mins	7 mins	9.5 mins	5.5 mins	12.5 mins
Avg. Travel time to San Diego International Airport	3 mins	9 mins	8 mins	17 mins	13 mins	20 mins

 Table 5-1 Transit Travel Time to San Diego International Airport, 2050

Source: SANDAG Series 13 Regional Travel Model

#### Transfers

Concepts 1 and 2 offer one transfer for airport travelers utilizing existing bus, Trolley, COASTER, Amtrak, and future high-speed transit services. Once travelers reach the Central Mobility Hub, where all these transit services meet, travelers can reach San Diego International Airport with one transfer.

Concept 3 would require additional transfers as the Central Mobility Hub at the ITC site is not expected to be served by COASTER and Amtrak rail services. These riders would need to transfer from Old Town Transit Center or Santa Fe Depot to reach the ITC via Trolley and its follow-on APM service to the airport.

Concept 4 would require no transfers for airport passengers boarding the Trolley system between Old Town Transit Center and 12th & Imperial Transit Center (see Figure 2-2). Travelers boarding the Trolley somewhere else in the system, along with bus, COASTER, and Amtrak services, would make one transfer at the Old Town Transit Center, Santa Fe Depot, or 12th & Imperial Transit Center. Airport passengers on the future highspeed network would potentially need to make multiple transfers to reach the airport. A Central Mobility Hub is not provided with Concept 4.

#### 5.1.c Transit Ridership

Table 5-2 and Figure 5-9 show the estimated ridership to and from the airport for each concept. The total net new ridership to and from the airport is the sum of three inputs:

- **Modeled Ridership:** The raw ridership from the SANDAG Series 13 Regional Travel Model.
- **Off-Model Adjustments:** As is typical in this situation, the model has some limitations that would be updated and improved through future efforts:
  - *Rental Car Center Shuttle Ridership* Additions to account for the ridership from the San Diego International Airport Rental Car Center to the airport via shuttles. This existing service currently carries approximately 17,200 riders a day and is not modeled.
  - Additions with Design Features, Policies, and Drop-off and Pick-up Capacity Additions to potential ridership that are possible through APM and Trolley design features, policies, and pick-up and dropoff capacity (discussed below).
- Less Ridership Shifted from Existing Transit Services: Concepts 2 and 3 assume ridership would be shifted from the existing Rental Car Center shuttle services to the proposed APM. Concept 4 assumes the new Trolley line replaces MTS Route 992, with its riders from Downtown San Diego and Santa Fe Depot shifting to the Trolley. These riders contribute to total ridership and allow for consolidating transit service. However, these trips are not new transit trips and therefore would not contribute to new ridership, change mode share, alleviate traffic congestion, or reduce VMT and GHG emissions.

Concept	Modeled Ridership to/from San Diego International Airport	Rental Car Shuttle Ridership	Additions w/ Design Features, Policies & Drop- off/Pick-up Capacity	Less Ridership Shifted from Existing Transit Services	Total Potential New APM/Trolley Ridership to/from San Diego International Airport
Concept 1 NAVWAR Tunnel APM	20,400	N/A	24,700	N/A	45,100
Concept 2 NAVWAR Surface APM	16,500	17,200	27,600	-17,200	44,100
Concept 3 ITC Surface APM	17,300	17,200	27,100	-17,200	44,300
Concepts 4a/4b Trolley	12,700	N/A	5,500	-4,200	14,000
No Build	4,200	N/A	N/A	-4,200	0

Table 5-2: APM/Trolley Daily Ridership to San Diego International Airport, 2050

Figure 5-10: APM/Trolley Daily Ridership to San Diego International Airport, 2050



Source: SANDAG Series 13 Regional Travel Model, WSP

The modeled APM ridership in Concepts 1 through 3 is consistent with similar APM systems in the United States that offer both transit connections and facilities to support auto pick-up and drop-off of airport passengers. The two most comparable existing systems are in Phoenix (approximately 16,000 daily riders) and Miami (approximately 33,000). Similar APM systems offering auto pick-up and drop-off facilities are under construction in Los Angeles, Boston, and Orlando.

#### Achieving Higher Ridership Through Policy and Design Features

While the ridership levels in Concepts 1 through 3 are in line with similar systems, reducing traffic on key airport access roadways will require higher ridership. Concepts 1 through 3 make this goal achievable with a combination of policy tools and design features to direct and incentivize airport traffic to the Central Mobility Hub. The traffic shift can be phased and implemented over time. The limiting factor in Concepts 1 through 3 is not the capacity of the APM system, but rather the capacity of the Central Mobility Hub, designed to accommodate up to 40,000 daily airport travelers and accompanying vehicle traffic flows. The Central Mobility Hub has been designed to accommodate approximately 30% of the projected airport drop-off and pick-up demand. Additionally, due to its size, the Central Mobility Hub at NAVWAR has good ability to accommodate future modal shifts. Due to its more constrained location, the ITC location has less ability to accommodate future modal shifts.

These potential additional policies and design features may include:

- Sufficient curb length to accommodate airport-related traffic flows from multiple vehicle types (private autos, TNC/taxi, shuttle buses, etc.).
- Airport-like pick-up and drop-off experience featuring dual-level roadways, curbside services, and direct connection to the APM station.
- Policies diverting commercial modes, including TNCs, taxis, rideshare vans, as well as private shuttles to Central Mobility Hub.
- Policies implementing variable tolling of San Diego International Airport driveways.

It is important to note that these potential policies are conceptual in nature and are not anticipated to be allinclusive and/or implemented at one time. A phased approached that is consistent with travel demand and traffic congestion around the airport should be considered when implementing any of these additional policies and programs.

Concept 4 has limitations on potential ridership due to its inability to accommodate heavy airport-related traffic flows at Trolley stations, limiting the feasibility of the policy and design features contemplated for Concepts 1 through 3. Concept 4 can serve transit-based trips to and from San Diego International Airport, but its available curb and parking lot space cannot accommodate a sufficient number of auto drop-offs and pick-ups to achieve the project's traffic-reduction goals at the airport.

#### **5.2 Reduce Congestion Related to the San Diego International Airport Access**

This criterion measures improvements to transit mode share as well as auto access to the airport. The focus is on creating transit options that are more attractive than driving a personal vehicle to the airport. It also looks to reduce congestion on local streets related to airport access.

#### 5.2.a Transit Mode Share

Transit mode share is highly correlated with transit ridership, with the fastest and best transit connections drawing the most riders as a share of overall trips. Concepts 1 through 3 offer the highest transit mode shares for airport travelers, clustered between 15 and 17%, with Concept 1 performing the best. Concept 4 has a transit mode share of 10%, which is consistent with its lower relative ridership. As with ridership, the transit mode share in Concepts 1 through 3 may be increased another 6 to 18% through a combination of policy and design features that reduce airport traffic and increase use of the Central Mobility Hub for auto drop-off and pick-up of airport passengers. Details of transit mode share are shown in Figure 5-11.



Figure 5-11: San Diego International Airport's Estimated Mode Share in 2050

#### 5.2.b Congestion Reduction Around San Diego International Airport

Improving transit mode share to the airport will directly reduce vehicle trips and improve congestion levels on key airport access roads, allow for Harbor Drive to be repurposed for waterfront uses, and reduce traffic that currently bisects Little Italy. Improving transit mode share is a primary goal of the region. Today under existing conditions, the following priority airport access roadways have reached their daily capacities:

- Harbor Drive between San Diego International Airport and Grape Street
- Grape Street and Hawthorn Street between Harbor Drive and I-5
- Laurel Street between Harbor Drive and I-5

#### "No Build" Scenario Comparison

As shown in Figure 5-12, existing traffic on key airport access roadways exceeds capacity. As shown in Figure 5-12, forecasted growth of airport activity at San Diego International Airport and anticipated growth associated with regional development, traffic on key airport access roadways will further burden this already-exceeded capacity. According to the SANDAG regional model, preliminary modeling analysis for 2050 future conditions demonstrates that these roads will be further constrained and over capacity if mode share shift to transit, transit improvements, and roadway modifications are not implemented. As shown in Figure 5-14, based on 2050 modeling analysis of a future "No Build" scenario, without improvements, gridlock conditions are expected on key airport access roadways including Harbor Drive, Grape Street, and Hawthorn Street. This

Harbor Drive Grape Street + Laurel Street

Figure 5-12: Average Daily Traffic on San Diego Intentional Airport's

Key Access Roadways, 2018

Figure 5-13: Average Daily Traffic on San Diego International Airport's Key Access Roadways, 2050 "No Build" Scenario



has the potential to create a scenario where airport passengers are unable to reach the airport terminals, resulting in missed flights and associated economic repercussions.



Figure 5-14: Traffic on Airport Priority Roadways – Future "No Build"

#### **Projected Future Traffic Conditions**

#### Harbor Drive

All concepts reduce traffic on Harbor Drive and would support the goal of redeveloping Harbor Drive for waterfront uses. Based on preliminary 2050 transit ridership results for Concepts 1 through 4, Concepts 1 through 3 have the potential to reduce San Diego International Airport Terminals 1 and 2 traffic by 9 to 12% and Concept 4 reduces the airport's Terminal 1 and 2 traffic by 6%. Additional policy considerations associated with these concepts could further reduce traffic on Harbor Drive.

#### Grape, Hawthorn, and Laurel Streets

As stated above, all concepts commonly assume the relocation of the south-facing I-5 ramps to Laurel Street. As a result of this potential improvement, traffic modeling results show reduced traffic on Grape and Hawthorn streets by approximately 30,000 average daily traffic and, as shown in Figure 5-15, key airport access roadways would operate at an acceptable level of service and with sufficient capacity.



Figure 5-15: Traffic on Airport Priority Roadways – Future Modified (All Concepts)

Policy and Design Features to Advance and Support Congestion Relief Goals

Preliminary modeling suggests that future congestion on key access roads could be alleviated by shifting traffic to new pick-up and drop-off locations outside of the airport terminal area. This is accomplished through policies and design features and results in an increase in transit ridership. Preliminary modeling also demonstrates that the existing freeway ramp connections to Grape and Hawthorn streets would need to be removed in order to reduce traffic on Grape and Hawthorn streets. Transit vehicle, station limitations, vehicle access, and other capacity constraints would provide some limit on the ultimate capacity to accommodate a total diversion of airport traffic. To greatly improve overall system ridership, reduce congestion, and increase levels of services on key airport access roads, policies would have to be considered that include pricing such as tolling or fees on commercial shuttles, taxis, TNCs, and private mode shares.

Assuming such policies are implemented, Concepts 1 through 3 have the highest attractiveness of auto pickup and drop-off, as the Central Mobility Hub would provide curb space to accommodate up to 40,000 daily pick-ups and drop-offs, with dual-level roadways and supporting facilities that emulate the airport experience (see Figures 4-4 to 4-9). These concepts would also offer direct connections to I-5 via direct access ramps and new or enhanced interchanges, providing a high level of convenience for pick-up and drop-off operations. The Central Mobility Hub with new airport pick-up and drop-off locations could accommodate the potential future implementation of such policies. Concept 4 has limited curb capacity to accommodate pick-ups and drop-offs at Old Town Transit Center, Santa Fe Depot, and intermediate stations at Washington Street and Middletown. The acquisition of some additional property at existing trolley stations is assumed, but it would have limited ability to accommodate the pick-ups and drop-offs. Additionally, none of the stations have direct access from I-5 and the stations are dispersed. It is unclear how effective traffic diversion techniques would be without a centrally-located pick-up and drop-off location. Moreover, Concept 4 does not include the ability to provide an airport terminal experience and is less able to accommodate diverted traffic than Concepts 1 through 3.

Two comparable airport transit systems, in Phoenix and Miami, provide transit connections and facilities to support auto pick-up and drop-off of airport passengers. Daily ridership on these two systems ranges from 16,000 to 33,000 passengers.

#### 5.3 Greenhouse Gas Emissions and Vehicle Miles Traveled

Goals in this criterion include reducing energy use by encouraging energy-efficient alternative transportation modes and meeting state emissions mandates and stakeholder climate action plans. For the purposes of this analysis, the focus is on airport travelers.

VMT and GHG emissions are closely correlated, with more miles traveled resulting in higher emissions. As such, both metrics will have the same relative trends. Airport travelers using the Central Mobility Hub for auto-based pick-up and drop-off will save approximately two to three VMT per trip for most travelers compared to drop-off and pick-up at the airport's terminals. As shown in Figure 5-10, Concepts 1through have the highest potential ridership and therefore the highest potential to reduce VMT and GHG.

Concept 1 provides the shortest trip length to San Diego International Airport, followed by Concept 3, then by Concept 4, with Concept 2 having the longest trip length. The longer the trip length the greater the energy consumption. Both VMT and GHG emissions are sensitive to the availability of transit as an alternate mobility option, with the highest-quality transit service (Concept 1) providing the greatest incentive to choose transit. For Concepts 1 through 3, the benefits resulting from the availability of high-quality transit and dropoff and pick-up options are partially offset by the effects of construction of the Central Mobility Hub and transit guideway. This would also be the case for the construction of new Trolley guideway infrastructure with Concept 4.

#### 5.4 Feasibility

This section identifies the feasibility, regulatory agency permitting factors, and geotechnical and seismic issues. It also considers the cooperation of the Navy for use of Naval Base Point Loma Old Town Campus (NAVWAR) lands, the cooperation of the FAA for the construction of connectivity improvements within an active airport environment, and issues associated with construction activities within an active rail corridor, freeway, and urban roadway environment. SANDAG planners and engineers, Caltrans, Airport Authority, Port of San Diego, City of San Diego, Metropolitan Transit System, Los Angeles – San Diego – San Luis Obispo Rail Corridor (LOSSAN), and NCTD and their respective consultant and experts have provided substantial input for the feasibility of Concepts 1 through 4. However, it is important to note that only conceptual engineering analysis has been completed at this early stage of project definition. Additional engineering and environmental analysis will be required to further plan, design, scope, cost, and risk. Based on the analysis completed to date, the top feasibility risks are summarized in Figure 5-18.

#### Figure 5-16: Top Feasibility Risks



#### 5.4.a Footprint Requirements and Space Constraints

Concepts 1 through 3 involve the development of a Central Mobility Hub, which includes enough space for multiple local, regional, and interregional transit, as well as facilities for airport passenger pick-up and drop-off activity. Considerable curb and roadway spaces are needed for airport passenger pick-up and drop-off activity. Program requirements for a Central Mobility Hub are shown in Table 5-3. While further analysis is necessary to refine program elements of the Central Mobility Hub, the following table demonstrates the extent of needed facilities and footprint requirements necessary to accommodate a fully functional facility.

Trolley Platforms	2 each at 360 linear ft.
Commuter Rail Platforms	2 each at 1,000 linear ft.
Intercity Rail Platforms	2 each at 1,400 linear ft.
Airport APM Platforms	2 each at 500 linear ft.
Bus Bays	20 each and 2.5 acres total
Micro-mobility Staging	20,000 square ft.
Passenger Curb-side Pick-up/Drop-off	4,000 linear ft.
Cell Phone Lot	0.4 acres
Taxi/TNC Staging Area	0.5 acres

Table 5-3: Central Mobility Hub Program Requirements

Based on preliminary layout analysis, approximately 18 to 25 acres at ground level are needed to meet Central Mobility Hub program requirements.

Concepts 1 and 2 have ample acreage necessary to meet program requirements. The Navy has begun efforts to revitalize the site for an improved NAVWAR campus. SANDAG and the Navy have entered into an MOU to explore the possibility of a Central Mobility Hub being located at the site. The DAR from I-5 to the Central Mobility Hub and a new Hortensia Street interchange would require the acquisition of private lands and have potential impacts to surrounding land uses and traffic during construction.

Concept 3, located at the ITC site, is more challenging as it is constrained by the local roadway network and is situated on a slope, bounded by Kettner Boulevard and Pacific Highway. Kettner Boulevard is roughly 30 feet higher than Pacific Highway at its lowest point. The acquisition of private lands would be needed for the Central Mobility Hub, the DARs from I-5 to the Central Mobility Hub, and improvements to Washington Street and Pacific Highway.

Concept 4 does not create a new Central Mobility Hub, relying on the existing trolley stations for passenger loading. The concept for Trolley operation would be from the Old Town Transit Center to the 12th & Imperial station via the airport. There are 11 Trolley stations along this airport route, including Old Town Transit Center, Washington Street, Middletown, Harbor Island East Basin, airport, Little Italy, Santa Fe Depot, Seaport Village, Convention Center, Gaslamp Quarter, and 12th & Imperial Transit Center. There is insufficient curb space to accommodate airport-level volumes of passenger pick-up and drop-off at these stations. Small properties have been identified at the Washington Street, Middletown, and 12th & Imperial stations that could potentially be acquired for some additional passenger pick-up and drop-off capacity. Even with addition of pick-up and drop-off curb space, Concept 4 would provide much less active curb space than Concepts 1 through 3. As the stations are dispersed throughout the area, it would also be difficult to sign and direct traffic in such a way that would not be confusing to drivers.

The Old Town Trolley Station is a good example of the space limitations at the existing stations. Currently, the Old Town Transit Center is fully utilized with Trolley, COASTER, Amtrak, bus, and Park & Ride facilities. It has limited potential to accommodate expansion due to street capacity, circulation constraints and the I-5 overhead viaduct, which reduces the opportunity for vertical expansion. Santa Fe Depot has limited curb space for additional pick-up and drop-off as it is already heavily utilized for auto drop-off and pick-up for Amtrak, COASTER, and Trolley passengers. The remaining stations are constrained by existing land uses and have limited or no curb space potential for airport passenger pick-up and drop-off.

#### 5.4.b Transit Operations and Construction Risks

Concept 1 includes an APM route in a tunnel from a Central Mobility Hub at NAVWAR under the Marine Corps Recruit Depot (MCRD) and the San Diego International Airport runway to the airport transit-ready area, which could pose risks. Land subsidence (sinking or settling) would be the key risk, either during construction or operation. Impacts to San Diego International Airport's runway operations would have a ripple effect, impacting airport operations nationally. Impacts to MCRD could impact military operations and historic structures located at MCRD. However, initial analysis indicates a tunnel located at a depth of 80 feet is feasible and could be constructed in a manner to not pose significant risk to San Diego International Airport or MCRD operations. It should be noted that the FAA has raised concerns about potential impacts to runway operations at the airport. Concept 1 would be subject to FAA approval. Additional analysis is necessary to fully understand the potential negative and positive impacts of a direct tunnel connection.

Relocation of the Old Town Transit Center to the Central Mobility Hub located at the NAVWAR site may have impacts on ongoing transit operations, and the construction of a Central Mobility Hub at NAVWAR could have impacts on NAVWAR operations, if timing of the Navy's needs is not worked out beforehand. It is believed that sufficient land is available at the NAVWAR location to stage construction with minimal impact.

Concept 2 involves an at-grade and elevated APM route from a Central Mobility Hub at the NAVWAR site around the east side of the airport runway to the airport transit-ready area which could have risk. It is assumed the APM fixed guideway would be located within public right-of-way and along Pacific Highway, Laurel Street, and Harbor Drive. The space requirement may affect travel lane widths for auto, bike, and pedestrian travel. There would likely be temporary construction impacts to traffic for up to three years. Similar to Concept 1, relocation of the Old Town Transit Center to NAVWAR could have impacts to ongoing transit operations and the construction of a Central Mobility Hub at NAVWAR could have impacts on NAVWAR operations. Yet, it is believed that sufficient land is available at the NAVWAR location to stage construction with minimal impact.

Concept 3 involves an at-grade and/or elevated APM route from a Central Mobility Hub at ITC around the east side of the airport runway to the airport transit-ready area which has some identified risk. The APM fixed guideway would be located within the public right-of-way on and along Pacific Highway, Laurel Street, and Harbor Drive. The space requirement may affect travel lane widths for auto, bike, and pedestrian travel and potential existing utility impacts. There would likely be temporary construction impacts to traffic for up to two years. Relocation of the Washington Street and Middletown Trolley stations to the ITC location could have impacts to ongoing transit operations.

For Concepts 2 and 3, the APM fixed guideway would be located within the public right-of-way on and along Pacific Highway, Laurel Street, and Harbor Drive. The space requirement may affect travel lane widths for auto, bike, and pedestrian travel. There would likely be temporary construction impacts to traffic for up to two years.

Concept 4 would increase Trolley crossings on seven local roadway locations in the vicinity of the airport including: Noell, Washington, Sassafras, Palm, Cedar, Beech, and Ash streets. Increasing the number of Trolley crossings would result in more crossing gate down time resulting in increased delay to local traffic around the airport. Relying on the traffic impact analysis completed for the Mid-Coast Trolley Extension project, which is currently under construction, and the Trolley service frequencies that are defined in the Regional Plan, it is assumed that grade separations will be required at these seven local roadway locations. Due to the identified modifications to the local roadway network, it is also likely that grade separation of the LOSSAN heavy-rail (COASTER, Amtrak, and freight service) crossing at Laurel Street would be required, but this would be subject to future analysis and is not assumed in this study.

Grade separation at Sassafras Street may be problematic. The Trolley tracks currently traverse under the south-facing Pacific Highway to I-5 ramps. The ramps are constructed on spread footings, which eliminates the feasibility of trenching under the ramp foundations. The only feasible alternative is to fly the guideway over the ramps at approximately 60 feet above the existing track elevation. in order for the service to operate effectively Due to the limitations on grade design for the Trolley (the maximum steepness of the tracks) and needing to cross Sassafras Street 60 feet above existing track elevation, grade design alone would require grade separations from Washington to Laurel streets. The Trolley station at Washington Street would need to be elevated. It is assumed that the Trolley station at Middletown would be replaced by a station at the NAVWAR site with Concept 4.

Due to the existing Trolley guideway being in an existing trench section under Grape and Hawthorn streets, the most feasible approach to grade separations at Cedar, Beech, and Ash is to continue the trench southerly and return to surface grade of the tracks at Santa Fe Depot before reaching the existing station platforms. This would also require creating a subgrade station at Little Italy.

The potential construction of grade separations at Noell, Washington, Sassafras, Palm, Cedar, Beech, and Ash streets will have impacts on Amtrak, COASTER, and the Trolley Blue and Green Lines level of service. The construction period could last as long as three years. This could require Trolley service in the corridor to be shut down. A shuttle service between the Old Town Transit Center and Santa Fe Depot would be required during much of the construction period. The COASTER may have to operate on a single track through the same period. If the Trolley service is maintained at some level during construction, the construction duration and costs would increase significantly.

Concept 4a envisions connecting to the existing Trolley bridge structure over Laurel Street (see Figure 5-22). Heavy-rail tracks are at-grade and immediately to the west of the Trolley tracks. An elevated wye connection —a triangle of railroad track used to turn trains—would need to be constructed.



Figure 5-17: View of Laurel Street Trolley Bridge from Pacific Highway

Source: Google Maps



Figure 5-18: Airport Trolley Connection to Laurel Street Trolley Bridge – Conceptual Layout

The existing tracks used by the COASTER and Amtrak would require a shift to the west, which would necessitate the need to take California Street and other properties or rights-of-way along the length of the track relocation. A third Trolley track would diverge to the west and parallel the COASTER and Amtrak track. It would climb to the elevation required to reach 24 feet vertical clearance above the COASTER and Amtrak tracks and then curve to the west to complete the full double-track wye. This clearance requirement will cause the Trolley tracks to vertically fly over Pacific Highway, remain aerial along Laurel Street, continuing to the dedicated on-airport roadway to the entrance of Terminal 1 and 2.

The new Trolley connection to the Laurel Street bridge would be within the Runway Protective Zone, meaning it would require FAA approval.

Concept 4b involves a wye in the track at the existing Grape and Hawthorn streets trench. This concept would require undergrounding the County Center/Little Italy Station. Extension of the trench, grade separations, elevated and subterranean stations would be challenging. With a very constrained right-of-way and no availability of land to construct a shoofly (temporary track), construction of the Trolley infrastructure would require closure of the Trolley corridor between Little Italy and Middletown stations during construction. If grade separation is not required as anticipated, the existing trench would still require modification and would most likely require closing Trolley service but for a lesser time duration. Concept 4b is the only concept that would not require FAA approval.

#### 5.4.c Roadway and Freeway Operations

All concepts include modification to the roadway and freeway network to reduce traffic on Harbor Drive and in Little Italy and to convert Laurel Street to an airport priority roadway. The freeway and roadway modifications are common to Concepts 1 through 4 but may present constructability challenges.

 Converting Laurel Street to the airport priority roadway would likely warrant the widening of Laurel Street from four lanes to a minimum of six lanes between Pacific Highway and I-5. This widening could likely be accomplished without having to rebuild the existing Laurel Street Trolley bridge. However, the widening would likely require the acquisition of residential and commercial property on both sides of Laurel Street. It is likely that modifications could be made to the existing parking structures on either side of Laurel Street to avoid full acquisition.

- Converting Laurel Street to the airport priority roadway may warrant grade separations at the intersection of Pacific Highway and Laurel Street; however, constructing a grade separation at this location would be challenging due to the proximity to the Runway Protective Zone, groundwater, geotechnical, and right-of-way challenges.
- Converting Laurel Street to the airport priority roadway may impact Solar Turbines, Inc. and its ability to
  use its driveway connection to Laurel Street. Solar Turbines is a manufacturer of energy products and a
  subsidiary of Caterpillar, Inc. Operating in that location since 1927, the company relies on this driveway
  for delivery shipments using semi-tractor trailers (18-wheelers). It is possible that special design features
  could be incorporated into Laurel Street to accommodate Solar Turbines shipment needs without
  significantly minimizing the efficiency of Laurel Street to serve as the airport priority roadway.
- New freeway ramp connections between Laurel Street and I-5 would provide direct access from the freeway to Laurel Street; however, the new freeway ramp connections would likely require residential and commercial property acquisition, including the relocation of City of San Diego Fire Station 3.
- Redesigning Harbor Drive from a six-lane roadway to a four-lane roadway with dedicated transit and bike lanes would require construction-related traffic impacts. These impacts would be temporary and could be minimized with traffic control and traffic advisory techniques.

Concepts 1 and 2 involve the construction of a DAR, which would provide access at the upper level (50-foot level) to a Central Mobility Hub and may pose impacts to frontage roads due to freeway expansion.

Construction of a new Hortensia Street interchange and demolition of the existing Old Town Avenue interchange would be a significant upgrade in circulation and capacity and would require well-planned staged construction with some short night-time freeway closures and detours to allow erection and demolition of bridge falsework. This concept also serves Barnett Avenue with a better connection to I-5.

Rights-of-way for the Hortensia Street freeway interchange and the pedestrian crossing from Old Town to the Central Mobility Hub would require the acquisition of property. The DAR from I-5 to the Central Mobility Hub, the Hortensia Street freeway interchange, and the pedestrian crossing from Old Town to the Central Mobility Hub would have potential impacts to surrounding land uses and traffic during construction.

Pacific Highway would be modified to provide a multi-level connection to the Central Mobility Hub, resulting in impacts to traffic during construction.

The at-grade/elevated APM would compete for limited space around the end of the airport runway at the Laurel Street and Pacific Highway intersection and at the Harbor Drive and Laurel Street merge point.

Concept 3 envisions removing the existing grade separation at Washington Street and Pacific Highway and constructing an at-grade signalized intersection. This is consistent with the City of San Diego's community plan. Also, a new intersection on Pacific Highway would be constructed to accommodate traffic access to the lower level of the Central Mobility Hub.

Access from Kettner Boulevard to the middle level (30-foot level) of the Central Mobility Hub would require some modifications on Kettner Boulevard, potentially a right-turn-only deceleration lane and a right-turn-only acceleration lane. This would generate minimal traffic impacts during construction.

#### 5.4.d Geotechnical, Seismic Conditions, Hazardous Materials, and Soils

The project footprint falls in the active earthquake zone of the Rose Canyon Fault, see Figure 5-19 below. The active fault zone has experienced multiple past displacements, ground ruptures, and strong ground motion. The entire area has a shallow groundwater condition and near-surface soils with low to marginal strength. Some areas may have historically suffered liquefaction, lateral spreading, and seismically-induced settlement. The zone extends through the project footprint in a north-south orientation. The zone is considered wider in the east-west direction at Harbor Drive and then converges to a narrower zone to the north near the NAVWAR footprint. Potential fault rupture, seismic shaking, and induced deformations can have significant impact to design and require extensive mitigation measures. The design of fixed guideways, like an APM and the Trolley, require special attention. Comprehensive geotechnical, fault hazard, environmental, and hazardous materials studies should be performed during the preliminary design phase.

Sea af World Qya San Diego River Old Town D na PortalQop6 Qva VOD10 Im lop<sub>6</sub> Tmss Kcs MARINE RUHT RUNWAY Qvop San T2 T1 San Diego Bay Sant Fe Dep

Figure 5-19: Rose Canyon Fault Zone (area between solid red lines)

For Concept 1, locating a twin-bore tunnel at a recommended depth of approximately 80 feet below the surface, measured from the bottom of the tunnel to the surface, is considered technically feasible and constructible. At a depth of 80 feet, the tunnel would reside in the more competent Bay Point Formation (old paralic deposits) (Figure 4-2). The earth pressure balanced Tunnel Boring Machine drilling method would be the probable method of construction. Subsurface stations and vehicle storage/maintenance facility would be constructed in deep shored caverns. The tunnel alignment provides flexibility in routing to avoid crossing known and mapped earthquake faults. However, other unknown active splays of the Rose Canyon Fault may exist. In addition, compared to Concepts 2 through 4, the tunnel alignment runs in a north-south direction that sub parallels the general trend of faults in the area rather than crossing them, which is preferable. Additional studies will be required to further evaluate the profile and tunnel alignment, engineering requirements, potential risks, and potential presence of faulting that may cross the proposed tunnel alignment.

National Fire Protection Association standards for fire protection and life safety in tunnels is stringent. Accommodating tunnel egress points below the MCRD and the San Diego International Airport airfield would be problematic. Tunnel ingress and egress is not anticipated to be needed as with twin bore tunnels and cross overs, safety requirements are expected to be met. The English Chunnel is 28 miles with no surface access, the investigated airport connectivity tunnel is 1.1 miles. Future analysis to evaluate fire protection and life safety issues will be needed.

Concept 1 will require boring under the runway and most likely under a portion of Terminal 1. Terminal 1 pile foundations are anticipated to be driven to a depth of 50 feet. The top of the tunnel is conceived to be plus or minus 60 feet deep and the tunnel liner can be designed to accommodate the building's load. The station will require deep shoring and excavation of a station cavern, which will be filled over at completion of construction. The FAA has raised concerns regarding the risk of subsidence of the runway during tunneling operations, especially since the airport only has a single main runway. FAA permission will need to be obtained for Concept 1.

Concept 1 would require the vertical transfer of passengers from the tunnel, at a depth of 80 feet, to the surface. The APM would deboard large numbers of passengers directly to a vertical transportation mode. Escalators can efficiently move large numbers of passengers. However, the footprint to construct the escalator system could be quite large. An assessment will need to be done to further assess the feasibility of escalator construction within the footprint of the transit-ready area at the airport terminals. Elevators provide another viable solution, but they would need to be carefully sized to accommodate large passenger flows.

For Concepts 2 through 4, active mapped earthquake faults are known to exist in the project corridor and the APM and Trolley alignments provide little or no flexibility to avoid crossing them. Aerial structures and cutand-cover tunnel sections can be designed to accommodate crossing an active fault. Crossing an active fault will increase the cost of all structures. Late identification of a fault during construction may cause unknown cost and construction delays. Extensive geotechnical investigations and fault studies will be required.

#### 5.4.e FAA and Navy Requirements, Protected Species, and Regulatory Agency Considerations

#### Compatibility with FAA and/or other Regulatory Constraints

The east side of San Diego International Airport, in the vicinity of the Pacific Highway and Laurel Street intersection, is subject to FAA restrictions due to its location near the end of the runway. This area is subject to two key FAA overlay zones:

• **Runway Protection Zone (RPZ):** A wedge-shaped zone covering all elevations, extending approximately 750 feet from the end of the runway and widening to approximately 1,000 feet, fully encompassing the Pacific Highway and Laurel Street intersection and the existing Trolley overcrossing of Laurel Street.

• **Part 77 Approach Surface:** An imaginary, sloped surface on the lower edge of the aircraft approach path that serves as a development height limit. In the project area, the limit ranges from approximately 10 feet above ground level near the Pacific Highway/Laurel Street intersection, to approximately 20 feet above ground level near the existing Trolley tracks at Laurel Street.

Concept 1 will require cooperation and approval from the Navy to tunnel under the MCRD and require cooperation by San Diego International Airport and from the FAA to tunnel under the airport's runway. There are concerns about the risks associated with tunneling under the runway due to vital airport operations of only one working runway. A non-secure transit system below or adjacent to secure airport facilities will require approval through multiple local, state, and federal agencies including local police, TSA, and Department of Homeland Security. Requirements for infrastructure hardening to protect existing critical facilities can drive costs well above what may be anticipated or is financially feasible. Accommodating the security needs for MCRD will have similar challenges. A threat assessment and safety/security requirements and mitigation plan should be developed for all concepts.

For Concepts 1 through 3, the NAVWAR and ITC sites are within another FAA overlay zone known as the Part 77 Horizontal Surface, an imaginary, flat surface 150 feet above the airport elevation that acts as a development height limit extending approximately 10,000 feet around the runway. Any development above this height would require discretionary approval from the FAA.

All concepts contain freeway/roadway improvements in the RPZ and Part 77 Approach Surface areas, as well as the APM and Trolley alignments featured in Concepts 2, 3, and 4a. If the FAA approves the APM and Trolley alignment in Concepts 2 or 3, it may require a depressed trench section around the end of the runway as a condition of approval to minimize vertical encroachment into these restricted areas. This would add cost and complicate construction of these concepts. Due to grade limitations, a trench section would not be feasible for concept 4a. Concept 4b is not expected to pose impacts to the RPZ or approach areas.

During the discretionary review process for any development with the RPZ or Part 77 overlays, the FAA — with input from the San Diego International Airport's operations team and major airlines — would determine whether the project would pose any impacts to the airport's airspace or operations. The Airport Authority, acting as the regional Airport Land Use Commission, will also review development for consistency with the Airport Land Use Compatibility Plan. FAA approval is based on a variety of specific factors including the development's purpose, need, alternatives, site conditions, and other considerations. To increase the likelihood of FAA approval, the Airport Authority must be consulted regarding any proposed development near San Diego International Airport.

#### Wildlife/Coastal Commission

Concept 1 is expected to pose the fewest potential impacts to coastal and wildlife regulations, as it has the smallest development footprint of any concept. The NAVWAR site is located outside the California Coastal Zone and does not include any protected habitat areas. The tunnel alignment to San Diego International Airport does enter the coastal zone and would require analysis and approval by the California Coastal Commission (CCC).

Like the NAVWAR site, the ITC (Concept 3) is located outside the California Coastal Zone and does not include any protected habitat areas. CCC approval would be required for all improvements west of Pacific Highway, including the Laurel Street access road (in all concepts) as well as the APM and Trolley alignments in Concepts 2, 3, 4a, and 4b. Similarly, these same project elements may impact protected habitat areas used by the California least tern, a bird listed as endangered by both federal and state regulations. The southeast side of the airport's property, adjacent to Laurel Street and Harbor Drive, contains several of these protected areas, which are actively maintained by the Airport Authority. Any development impacting these protected areas may require mitigation and special coordination with the Airport Authority and resource agencies.

#### Compatibility with other Land Use Plans

The at-grade or elevated APM system would compete for limited space in the Harbor Drive and Laurel Street merge points where space is limited for planned roadway, bikeway, transit, and pedestrian uses. There also would be space and geometric challenges routing the people mover around the end of the runway at the Laurel Street and Pacific Highway intersection.

In Concept 2 and 3, communities along the at-grade and especially the aerial segments of the APM alignments may raise concerns of visual and view impacts.

#### **5.4.f Utility Conflicts**

This preliminary analysis does not include detailed analysis of utility conflicts. Additional analysis and more extensive utility research and mapping will be needed to help refine cost estimates and characterize risks associated with Concepts 1 through 4. Pacific Highway serves as a major utility corridor and Harbor Drive also contains some major utilities. For Concept 4b the cut-and-cover tunnel would sever all utilities in Pacific Highway and many of the utilities in Harbor Drive until the tunnel reaches grade at Harbor Drive. Concept 4b would have the greatest impact to existing utilities. For Concept 1 the APM tunnel would have the least impact on existing utilities. Concepts 2 and 3 at-grade aerial APM alignments are constrained to existing public right-of-way, which is where most major utilities are located. Foundation column placements may allow avoidance of numerous potential conflicts and relocations. Additional analysis is required to identify conflicts with large gravity/forced main sewers, jet fuel pipeline, water pipelines, communication lines, and other critical utility infrastructure.

#### 5.5 Cost

Cost and financial feasibility consider both capital and operating costs. Capital costs include construction and supporting facilities. Operating costs include the annual cost to operate and maintain the system. This information is used to assess potential fiscal impacts and the cost effectiveness of each concept.

Figure 5-20 and Tables 5-5 to 5-8 show high-level, rough-order-of-magnitude cost estimates for each concept, including 30 years of transit operations for the APM (Concepts 1 through 3) and the Trolley (Concepts 4a and 4b).

Concepts 1 and 2 have the highest estimated costs at \$3.8 to \$4.7 billion. This is because both concepts contain a Central Mobility Hub, as well as the two highest-cost APM options: a tunnel-based APM in Concept 1, and a 3.6 milesurface/aerial APM in Concept 2, which also bears higher operating costs than Concept 1. However, the higher APM operating costs of Concept 2 are partially offset by the elimination of the current Rental Car Center shuttle buses, which would be





replaced by the Concept 2 APM with its stop at the Rental Car Center.

Concept 3 has a moderate estimated cost at \$3 to \$3.6 billion. While this does contain a Central Mobility Hub, like Concepts 1 and 2, the Concept 3 surface/aerial APM is shorter than the Concept 2 APM (2.6 miles versus 3.6 miles) and carries lower operating costs. The Concept 3 APM operating costs are further offset by the elimination of the current Rental Car Center shuttle buses, which would be replaced by the APM with its stop at the Rental Car Center. Additionally, Concept 3 has lower freeway and roadway costs with no new I-5 interchange.

Concepts 4a and 4b have the lowest estimated costs at \$1.8 to \$2.5 billion. This is mainly because the costs do not contain a Central Mobility Hub, nor the freeway and roadway elements that support the Central Mobility Hub (new I-5 interchange and DARs). However, the cost to bring the Trolley across to the west side of the adjacent heavy rail corridor — either via aerial structure (Concept 4a) or tunnel (Concept 4b) — is roughly comparable to the tunneling costs of Concept 1.

	Concept 1	Concept 2	Concept 3	Concept 4a	Concept 4b
	Mobility Hub at NAVWAR with Tunnel APM	Mobility Hub at NAVWAR with APM At- Grade/Aerial	Mobility Hub at ITC with APM At-Grade/Aerial	Trolley Connection Via Aerial Wye at Laurel Street	Trolley Connection Via Tunnel at Grape and Hawthorn
Total	\$3.9 to \$4.7 billion	\$3.8 to \$4.6 billion	\$3.0 to \$3.6 billion	\$1.8 to \$2.2 billion	\$1.9 to \$2.5 billion

Table 5-4: Estimated Total Project Cost (Capital Cost + 30 Years of Transit Operations)

	Concept 1	Concept 2	Concept 3	Concept 4a	Concept 4b
Project Development	\$1,099	\$955	\$673	\$357	\$405
Right-of-Way	\$172	\$172	\$480	\$239	\$144
Construction	\$2,747	\$2,388	\$1,683	\$892	\$1,012
Vehicles	\$63	\$95	\$79	\$119	\$119
30-Year Annual Transit Operations	\$213	\$640	\$427	\$427	\$427
Total	\$4,294	\$4,250	\$3,343	\$2,033	\$2,107

Table 5-5: Cost by Work Breakdown Structure (\$ millions)

Table 5-6: Estimated Cost by Major Facility (Excludes 30 Years of Transit Operations, \$ millions)

	Concept 1	Concept 2	Concept 3	Concept 4a	Concept 4b
Central Mobility Hub	\$1,568	\$1,568	\$1,450	N/A	N/A
Tunnel/Guideway	\$659	\$344	\$223	\$608	\$682
AMP/Trolley Vehicles and Systems	\$450	\$610	\$387	\$237	\$236
Transit Stations	\$482	\$158	\$180	\$172	\$172
Roadway/Freeway	\$922	\$922	\$676	\$586	\$586
Total	\$4,081	\$3,603	\$2,916	\$1,602	\$1,676

Table 5-7 further details the estimated costs to acquire property to accommodate the required right-of-way for each concept.

All concepts contain approximately \$118 million in right-of-way costs for the common freeway and roadway improvements near Laurel Street.

In addition to the shared freeway and roadway costs, the additional right-of-way costs for Concepts 1 and 2 are relatively low at \$54 million and cover the freeway/roadway improvements that would serve the Central Mobility Hub at the NAVWAR site (new I-5 interchange and DARs). Concept 3 has the highest additional right-of-way costs at \$362 million, which is required to acquire numerous parcels at the planned ITC site for the Central Mobility Hub and I-5 direct access ramps. Concept 4a has moderate right-of-way costs at \$121 million for the required aerial infrastructure near Laurel Street. Finally, Concept 4b has the lowest additional right-of-way cost at \$26 million, requiring acquisition only at the short tunnel section near Grape and Hawthorn streets.

Table 5-7: Estimated Right-of-Way Cost (\$ millions)

	Concept 1	Concept 2	Concept 3	Concept 4a	Concept 4b
I-5 Ramps at Laurel Street	\$22	\$22	\$22	\$22	\$22
Laurel Street Widening from Pacific Highway to I-5	\$96	\$96	\$96	\$96	\$96
NAVWAR Hortensia Street Interchange and Direct Access Ramps	\$54	\$54			
ITC Site, Direct Access Ramps, and Washington Street/Pacific Highway			\$362		
LRT Aerial Wye Connection at Laurel Street				\$121	
LRT Cut-and-Cover Tunnel at Grape and Hawthorn Streets					\$26
Total	\$172	\$172	\$480	\$239	\$144

#### **5.6 Economic Benefit**

The creation of a transit connection to the airport, including a regional mobility hub with associated transitoriented development, would have substantial economic benefits for the region. While the transit benefits are expected to be substantial, economic benefits also stem from the increase in population and jobs in the region that result from the development around a potential Central Mobility Hub. Additional land development allows the regional population and economy to grow. For example, the redevelopment of the 72-acre NAVWAR site into a mixed-used transit-oriented development would:

- Provide the Navy with upgraded office facilities that will improve their operational capabilities and keep a major employer in the region.
- Provide travelers a convenient multi-modal station with direct access to the airport, increasing the viability of transit for all San Diegans.
- Provide thousands of housing units close to regional jobs.
- Develop a large, centrally located, and currently underutilized parcel of valuable real estate into an urban village, consistent with local growth and development initiatives.

All concepts assume redevelopment of the NAVWAR site, Harbor Island East Basin, and other development programs outlined in the cities and County general plans. For modeling purposes, the same level of development is assumed in the analysis of each concept. However, Concepts 1 and 2, due to the size of the NAVWAR site, offer the greatest potential for new transit-oriented development, followed by Concept 2. Concept 3 offers the least opportunity for new transit-oriented development.

This preliminary economic analysis of the airport and Central Mobility Hub proposed projects only looks at two aspects of the proposed project concepts and estimates their potential economic effects. This analysis provides a rough overview of the economic benefits of the proposed projects and is designed to provide guidance for moving forward. As proposals are developed further, more detailed analyses will be conducted.

The analysis has two parts: (1) an economic impact analysis of the construction activity; and (2) an analysis of the impact of the redevelopment of the NAVWAR facility on the San Diego region.

#### **Economic Impact of Construction**

The economic impact analysis of the construction activity uses the IMPLAN input-output model, which is an economic model that traces the effect of an economic change, such as a major construction project, through the regional economy. It illustrates how the building of as multi-billion-dollar development would translate into jobs and income for construction workers, architects and engineers, and all associated businesses, and how this increased income would ripple through the local economy to a wide variety of businesses.

The economic activity resulting from constructing any one of the concepts is in the billions. For every billion in construction expenditure, almost 12,000 jobs are created in the construction, architecture and engineering, legal, and associated professions, as well as in the wider economy (such as wholesale and retail, restaurants, real estate, etc.). An accounting of the employment, output and income created for different development scenarios follows (in millions) and shows that the NAVWAR site with the tunnel APM has the greatest economic impact, as it is the most expensive option. On a per-dollar basis, all the concepts score the same.

Concept 1	HUB/NAVWAR/Tunnel APM Transit Facilities	Associated Development	Total Potential Benefit
Project Cost	\$3.9 to \$4.7 billion	\$7.6 to \$8.7 billion	\$11.5 to \$13.4 billion
Employment Effects	43,000 to 50,000 jobs	88,000 to 101,000 jobs	131,000 to 151,000 jobs
Output	\$6.1 to- \$7.0 billion	\$12.4 to \$14.3 billion	\$18.6 to \$21.3 billion

#### Table 5-8: Economic Benefit – Construction Employment

Concept 2	HUB/NAVWAR/At- Grade APM Transit Facilities	Associated Development	Total Potential Benefit
Project Cost	\$3.8 to \$4.6 billion	\$7.6 to \$8.7 billion	\$11.4 to \$13.3 billion
Employment Effects	38,000 to 43,000 jobs	88,000 to 101,000 jobs	125,000 to 144,000 jobs
Output	\$5.3 to \$6.1 billion	\$12.4 to \$14.3 billion	\$17.8 to \$20.4 billion

Concept 3	ITC/At-Grade APM Transit Facilities	Associated Development	Total Potential Benefit
Project Cost	\$3.0 to \$3.6 billion	\$6.7 to \$7.8 billion	\$9.7 to \$11.4 billion
Employment Effects	29,000 to 33,000 jobs	78,000 to 90,000 jobs	107,000 to 123,000 jobs
Output	\$4.1 to \$4.7 billion	\$11.1 to \$12.8 billion	\$15.2 to \$17.5 billion

Concept 4a	Trolley – Laurel Street		Concept 4b	Trolley – Hawthorn/Grape
Project Cost	\$1.8 to \$2.2 billion		Project cost	\$1.9 to \$2.5 billion
Employment Effects	14,000 to 16,000 jobs		Employment Effects	16,000 to 18,000 jobs
Output	\$2.0 to \$2.3 billion		Output	\$2.3 to \$2.6 billion

#### Economic Impact of NAVWAR Relocation

NAVWAR has a significant impact on the San Diego economy. The possibility has been raised that the NAVWAR facility could be relocated outside of the region if the Navy is unable to find a willing development partner for the site. To understand this impact, this analysis looked at the effects of losing the 5,000 jobs currently at NAVWAR.

The economic impact of that possibility would be the loss not only of 5,000 Navy employees, but of roughly 7,000 additional permanent jobs in the region, and an annual \$2 billion loss to the regional economy. This would represent a decline of roughly 1% of regional economic activity.

## 6. Summary of Key Findings

It is imperative that SANDAG and stakeholder partners work to improve transit access to San Diego International Airport and develop a world-class transportation system that not only enhances the passenger and visitor experience, but also addresses anticipated severe congestion on key airport access roads. Given forecasted regional growth and anticipated increases in activity at San Diego International Airport, SANDAG strongly urges implementation of improved transit connectivity to the airport. The freeway and roadway modifications outlined should also be considered, but these measures alone may not prevent severe congestion on key airport access roadways.

A Central Mobility Hub has the potential to provide improved transit connectivity, efficient freeway access, ample room for convenient pick-up and drop-off facilities, a quick and comfortable ride directly to the airport terminals, and the potential to divert a significant amount of traffic away from key airport access roadways. Policies to divert traffic away from key airport access roadways to a Central Mobility Hub can be analyzed, considered, and implemented over time as traffic conditions warrant.

A Trolley connection to the airport also has the potential to provide improved transit connectivity. The Trolley system is familiar to regional travelers but is not well suited for airport travelers. The vehicles themselves are not designed for passengers with luggage, and there is concern that this may limit ridership. There is also limited capacity for passenger pick-up and drop-off at the trolley stations near the airport. Passenger pick-up and drop-off depends on available curb space, which is very limited at the trolley stations near the airport. It would also be challenging to divert traffic to Trolley stations using policies to encourage alternative drop-offs as the stations are dispersed throughout the area with no central location for pick-up and drop-off activity.

The freeway and roadway modifications outlined in this study have the potential to reduce traffic on Harbor Drive and reduce traffic in Little Italy. However, more traffic would be channeled onto Laurel Street. Even with the recommended widening of Laurel Street, traffic would likely need to be monitored and managed closely to prevent gridlock on this key airport access roadway.

All of the proposed concepts would meet the goals and objectives as stated herein. Yet, as summarized below and in Figure 6-1, the concepts vary in terms of performance and the ability to address program goals. Initial analysis shows the following key findings:

- APM vehicles (Concept 1 through 3) are optimized for airport travel, with level boarding, wide doors, and ample space for passengers with luggage.
- A Central Mobility Hub (Concept 1 through 3) has the highest potential for auto pick-up and drop-off, as the Central Mobility Hub would provide curb space to accommodate up to 40,000 daily pick-ups and drop-offs, with dual-level roadways and supporting facilities that emulate the airport pick-up and drop-off experience.
- A Trolley connection to the airport (Concept 4) would provide a direct connection to the existing Trolley system and provide a service that is familiar to regional travelers.
- Central Mobility Hub at NAVWAR with APM in tunnel to the airport (Concept 1) provides the fastest trip to the airport.

- Central Mobility Hub at NAVWAR with APM at-grade/elevated to the airport (Concept 2) and Central Mobility Hub at ITC with APM at-grade/elevated to the airport (Concept 3) provide connectivity to the Rental Car Center.
- Concept 1 through 3 have roughly twice the transit ridership potential of Concept 4.
- Concept 4 is roughly half the estimated cost of Concepts 1 through 3.
- Concepts 1 through 3 provide a Central Mobility Hub that provides the greatest flexibility to connect future regional transit services.
- Concepts 1 and 2 provide the greatest flexibility for program requirements due to the size of potentially available land.
- Concepts 1 and 2 provide the greatest flexibility for program requirements due to the size of potentially available land.
- Concepts 1, 2, and 4 would provide the greatest amount of transit connectivity (Concept 3 would likely not connect to COASTER commuter rail or Amtrak Surfliner intercity rail).
- All concepts would require the acquisition of privately-owned land with Concept 3 requiring the most.
- Concept 1 through 3 would likely not require the closure of existing Trolley service during construction. Concept 4 would likely require periodic and possibly even permanent closure of existing Trolley service between Old Town Transit Center and Santa Fe Depot for a period up to three years requiring temporary bus service between Old Town Transit Center and Santa Fe Depot.

## 7. Recommendations and Next Steps

SANDAG staff has completed a comprehensive analysis of the challenges toward realizing improved transit connectivity to the San Diego International Airport and maintaining roadway capacity, but recognizes that much additional work is required, including: additional modeling analysis, planning, preliminary engineering, environmental analysis including a social equity evaluation, community outreach, and stakeholder coordination. To achieve a better understanding of potential travel demand, additional modeling work is required. While helpful as a preliminary assessment, the SANDAG Regional Travel Model, which is designed to—a regional macro model large scale projects—that impact the entire region, is not necessarily sufficiently sensitive to capture distinctions at the micro scale and the nuances of airport travel. Additional planning, preliminary engineering, environmental analysis, community outreach, and stakeholder coordination is needed to better understand the costs, risks, and benefits that the various airport connectivity solutions provide. SANDAG will work with all agency partners to coordinate and provide feedback on technical analyses and policy assumptions that involve airport connectivity and planning jurisdictions.

SANDAG staff recommends the following next steps:

- Initiating community outreach to begin the discussion on the various concepts presented in this analysis
- Continuing studies leading to the selection of a locally preferred alternative by the SANDAG Board of Directors to be carried forward into the environmental review process, pursuant to both the California Environmental Quality Act and the National Environmental Policy Act

## 8. Appendices

This report is a summary of numerous individual studies, work products, and technical memos. As they become available, the appendices will be posted to the project's website: sandag.org/airport.

## Figure 6-1 - Evaluation of Airport Connectivity Concepts

Criterion	Concept 1: NAVWAR Tunnel APM	Concept 2: NAVWAR Surface APM	Concept 3: ITC Surface APM	Concept 4: Trolley	
<ol> <li>Improve Transit Access to/from San Diego International Airport</li> </ol>	<ul> <li>High ridership (20k-40k) &amp; transit mode share (17-35%)</li> <li>Ample capacity to accommodate pick-up/dropoff</li> <li>Capacity to accommodate future modal shifts</li> </ul>	<ul> <li>High ridership (17k-40k) &amp; transit mode share (15-33%)</li> <li>Ample capacity to accommodate pick-up/drop-off</li> <li>Capacity to accommodate future modal shifts</li> </ul>	<ul> <li>High ridership (17k-40k) &amp; transit mode share (16-34%)</li> <li>Ample capacity to accommodate pick-up/dropoff</li> <li>Less capacity to accommodate future modal shifts</li> </ul>	<ul> <li>Moderate ridership (13k-14k) &amp; transit mode share (10-16%)</li> <li>Minimal capacity to accommodate pick-up/drop-off</li> <li>Minimal capacity to accommodate future modal shifts</li> </ul>	
2. Minimize Travel Time to/from San Diego International Airport	<ul> <li>Shortest total travel time (3 mins)</li> <li>Shortest avg. wait time (1 min)</li> <li>Nonstop</li> <li>Many existing &amp; future connecting transit services at Old Town</li> </ul>	<ul> <li>Moderate total travel time (9 mins)</li> <li>Shortest avg. wait time (1 min)</li> <li>2 intermediate stops</li> <li>Many connecting transit services at Old Town, ITC, ConRAC</li> </ul>	<ul> <li>Moderate total travel time (8 mins)</li> <li>Shortest avg. wait time (1 min)</li> <li>2 intermediate stops</li> <li>Fewer connecting transit services at ITC, ConRAC</li> </ul>	<ul> <li>Longest total travel time (13-20 mins)</li> <li>Longest avg. wait time (7.5 mins)</li> <li>2-6 intermediate stops</li> <li>Many connecting to other transit services at Old Town, Santa Fe Depot, 12th &amp; Imperial</li> </ul>	
3. Reduce Congestion Related to San Diego International Airport Access	<ul> <li>High reduction in San Diego International Airport traffic (12%-30%) through transit</li> <li>Ability to manage traffic through policy</li> </ul>	<ul> <li>High reduction in San Diego International Airport traffic (9%-30%) through transit</li> <li>Ability to manage traffic through policy</li> </ul>	<ul> <li>High reduction in San Diego International Airport traffic (11%-30%) through transit</li> <li>Ability to manage traffic through policy</li> </ul>	<ul> <li>Moderate reduction in San Diego International Airport traffic (6%-15%) through transit</li> <li>Minimal ability to manage traffic through policy</li> </ul>	
4. Reduce VMT & GHG Emissions	Greatest reduction in VMT/GHG compared to No Build	Good reduction in VMT/GHG compared to No Build	Good reduction in VMT/GHG compared to No Build	Moderate reduction in VMT/GHG compared to No Build	
5. Feasibility & Constructability	<ul> <li>Acquisition of private property</li> <li>Tunneling challenges</li> <li>Use of Navy lands</li> </ul>	<ul> <li>Acquisition of private property</li> <li>Runway protective zone</li> <li>Use of Navy lands</li> </ul>	<ul> <li>Acquisition of private property</li> <li>Runway protective zone</li> </ul>	<ul> <li>Impacts to existing rail service</li> <li>Acquisition of private property</li> <li>Runway protective zone (4a)</li> <li>Utility corridor bisected (4b)</li> </ul>	
6. Cost	• \$3.9-\$4.7 billion	• \$3.8-\$4.6 billion	• \$3.0-\$3.6 billion	• \$1.8-\$2.5 billion	
7. Economic Benefit	<ul> <li>Largest economic benefit of construction (130-150k jobs)</li> </ul>	<ul> <li>Largest economic benefit of construction (120-140k jobs)</li> </ul>	• Largest economic benefit of construction (100-120k jobs)	Modest economic benefit of construction (14-18k jobs)	
8. User Experience & Convenience	<ul> <li>Airport-like pick-up/drop-off experience</li> <li>APM vehicles optimized for airport travelers</li> <li>Most frequent service</li> <li>Most direct route</li> </ul>	<ul> <li>Airport-like pick-up/drop-off experience</li> <li>APM vehicles optimized for airport travelers</li> <li>Most frequent service</li> <li>Less direct route, more stops</li> </ul>	<ul> <li>Airport-like pick-up/drop-off experience</li> <li>APM vehicles optimized for airport travelers</li> <li>Most frequent service</li> <li>Less direct route, more stops</li> </ul>	<ul> <li>Familiar mode</li> <li>No airport-like pick-up/drop-off experience</li> <li>Trolley vehicles not optimized for airport travelers</li> <li>Least frequent service</li> <li>Less direct route, many stops</li> </ul>	
Symbols represent the potential to fulfill each evaluation criterion, using the following scale:					

Symbols represent the potential to fulfill each evaluation criterion, using the following scale:

