



Airport Transit Connection Concept Evaluation Study

Appendices

Prepared by WSP, HDR, TAHA, and GPM

July 14, 2023

INTENTIONALLY LEFT BLANK

Table of Contents

Appendix K	Concept 5A: Aerial Airport Transit Connector from San Diego International Airport to Port Transit Center/Consolidated Rental Car Center and Santa Fe Depot Extended to Civic/Core	K-1
K.1.	Description of Concept	K-1
K.2.	Passenger Convenience and Ridership	K-4
K.2.1.	Regional Connectivity	K-4
K.2.2.	User Experience	K-10
K.2.3.	Travel Time	K-12
K.2.4.	Ridership	K-13
K.3.	Congestion of Airport Access	K-15
K.3.1.	Traffic Effects	K-15
K.4.	Vehicle Miles Traveled and Greenhouse Gases	K-16
K.4.1.	Vehicle Miles Traveled	K-16
K.4.2.	Greenhouse Gases	K-17
K.5.	Feasibility / Complexity	K-17
K.5.1.	Right-of-Way	K-17
K.5.2.	Construction Effects/Constructability	K-18
K.5.3.	Major Utilities	K-19
K.5.4.	Geotechnical and Seismic Conditions	K-19
K.5.5.	Regulatory Considerations	K-24
K.6.	Cost	K-27
K.6.1.	Capital Cost	K-27
K.6.2.	Cost per Rider	K-28
K.6.3.	Cost per Mile	K-28
K.6.4.	Operations and Maintenance	K-29
K.7.	Community Effects and Economic Benefits	K-30
K.7.1.	Adjacent Community Effects	K-31
K.7.2.	Adjacent Development Considerations	K-36
Appendix L	Concept 5B: Bored Tunnel Airport Transit Connector from San Diego International Airport to Port Transit Center/Consolidated Rental Car Center and Santa Fe Depot Extended to Civic/Core	L-1
L.1.	Description of Concept	L-1
L.2.	Passenger Convenience and Ridership	L-4
L.2.1.	Regional Connectivity	L-4
L.2.2.	User Experience	L-10
L.2.3.	Travel Time	L-12
L.2.4.	Ridership	L-13

L.3.	Congestion of Airport Access	L-15
L.3.1.	Traffic Effects	L-15
L.4.	Vehicle Miles Traveled and Greenhouse Gases	L-16
L.4.1.	Vehicle Miles Traveled	L-16
L.4.2.	Greenhouse Gases	L-17
L.5.	Feasibility / Complexity	L-18
L.5.1.	Right-of-Way.....	L-18
L.5.2.	Construction Effects/Constructability.....	L-18
L.5.3.	Major Utilities	L-19
L.5.4.	Geotechnical and Seismic Conditions	L-20
L.5.5.	Regulatory Considerations	L-25
L.6.	Cost.....	L-29
L.6.1.	Capital Cost.....	L-29
L.6.2.	Cost per Rider	L-30
L.6.3.	Cost per Mile.....	L-30
L.6.4.	Operations and Maintenance	L-30
L.7.	Community Effects and Economic Benefits	L-32
L.7.1.	Adjacent Community Effects	L-33
L.7.2.	Adjacent Development Considerations.....	L-38
Appendix M	Concept 5C: Hybrid Airport Transit Connector from San Diego International Airport to Port Transit Center/Consolidated Rental Car Center and Santa Fe Depot Extended to Civic/Core	M-1
M.1.	Description of Concept	M-1
M.2.	Passenger Convenience and Ridership.....	M-4
M.2.1.	Regional Connectivity.....	M-4
M.2.2.	User Experience	M-10
M.2.3.	Travel Time	M-12
M.2.4.	Ridership.....	M-13
M.3.	Congestion of Airport Access	M-15
M.3.1.	Traffic Effects	M-15
M.4.	Vehicle Miles Traveled and Greenhouse Gases	M-16
M.4.1.	Vehicle Miles Traveled	M-16
M.4.2.	Greenhouse Gases	M-17
M.5.	Feasibility / Complexity	M-17
M.5.1.	Right-of-Way.....	M-17
M.5.2.	Construction Effects/Constructability.....	M-18
M.5.3.	Major Utilities	M-19
M.5.4.	Geotechnical and Seismic Conditions	M-19
M.5.5.	Regulatory Considerations	M-24
M.6.	Cost.....	M-28

M.6.1. Capital Cost.....	M-28
M.6.2. Cost per Rider	M-29
M.6.3. Cost per Mile.....	M-29
M.6.4. Operations and Maintenance	M-29
M.7. Community Effects and Economic Benefits	M-31
M.7.1. Adjacent Community Effects	M-32
M.7.2. Adjacent Development Considerations.....	M-37
Appendix N Concept 6: Trolley Concept from San Diego International Airport to 12th & Imperial Transit Center	N-1
N.1. Description of Concept	N-1
N.2. Passenger Convenience and Ridership.....	N-4
N.2.1. Regional Connectivity.....	N-4
N.2.2. User Experience	N-11
N.2.3. Travel Time	N-14
N.2.4. Ridership.....	N-16
N.3. Congestion of Airport Access	N-18
N.3.1. Traffic Effects	N-18
N.4. Vehicle Miles Traveled and Greenhouse Gases	N-19
N.4.1. Vehicle Miles Traveled	N-19
N.4.2. Greenhouse Gases	N-19
N.5. Feasibility / Complexity	N-20
N.5.1. Right-of-Way.....	N-20
N.5.2. Construction Effects/Constructability	N-20
N.5.3. Major Utilities	N-21
N.5.4. Geotechnical and Seismic Conditions	N-22
N.5.5. Regulatory Considerations	N-27
N.6. Cost.....	N-30
N.6.1. Capital Cost.....	N-30
N.6.2. Cost per Rider	N-31
N.6.3. Cost per Mile.....	N-31
N.6.4. Operations and Maintenance	N-31
N.7. Community Effects and Economic Benefits	N-33
N.7.1. Adjacent Community Effects	N-33
N.7.2. Adjacent Development Considerations.....	N-39
Appendix O Concept 7: Bus Concept from San Diego International Airport to Old Town Transit Center and City College	O-1
O.1. Description of Concept	O-1
O.2. Passenger Convenience and Ridership.....	O-5
O.2.1. Regional Connectivity.....	O-5

0.2.2. User Experience	O-12
0.2.3. Travel Time	O-13
0.2.4. Ridership.....	O-14
0.3. Congestion of Airport Access	O-15
0.3.1. Traffic Effects	O-15
0.4. Vehicle Miles Traveled and Greenhouse Gases	O-16
0.4.1. Vehicle Miles Traveled	O-16
0.4.2. Greenhouse Gases	O-16
0.5. Feasibility / Complexity	O-17
0.5.1. Right-of-Way.....	O-17
0.5.2. Construction Effects/Constructability	O-17
0.5.3. Major Utilities	O-18
0.5.4. Geotechnical and Seismic Conditions	O-18
0.5.5. Regulatory Considerations	O-18
0.6. Cost.....	O-19
0.6.1. Capital Cost.....	O-19
0.6.2. Cost per Rider	O-20
0.6.3. Cost per Mile.....	O-20
0.6.4. Operations and Maintenance	O-21
0.7. Community Effects and Economic Benefits	O-22
0.7.1. Adjacent Community Effects	O-23
0.7.2. Adjacent Development Considerations.....	O-28
Appendix P Capital Cost Basis of Estimate.....	P-1
P.1. General	P-1
P.2. Methodology.....	P-2
P.3. Quantity Basis	P-2
P.4. Cost Basis	P-3
P.5. Assumptions, Clarifications, and Exclusions	P-3
Appendix Q Concepts Considered and Eliminated	Q-1
Q.1.1. ATC from SDIA to Navy Old Town Campus.....	Q-1
Q.1.2. ATC from SDIA to ITC Site	Q-2
Appendix R Evaluation Criteria	R-1
R.1. Passenger Convenience and Ridership.....	R-4
R.2. Congestion of Airport Access	R-5
R.3. VMT and GHG	R-6
R.4. Feasibility / Complexity	R-7
R.5. Cost.....	R-8
R.6. Community Effects and Economic Benefits	R-8

Appendix S Airport Transit Connector from San Diego International Airport to Santa Fe Depot
Extended to Civic/Core (South Route Only) S-1

- S.1. Description of Concept S-1
- S.2. Passenger Convenience and Ridership S-4
 - S.2.1. Regional Connectivity S-4
 - S.2.2. User Experience S-9
 - S.2.3. Travel Time S-11
 - S.2.4. Ridership S-13
- S.3. Feasibility / Complexity S-13
 - S.3.1. Right-of-Way S-13
 - S.3.2. Construction Effects/Constructability S-13
 - S.3.3. Major Utilities S-14
 - S.3.4. Geotechnical and Seismic Conditions S-14
 - S.3.5. Regulatory Considerations S-17
- S.4. Cost S-20
 - S.4.1. Capital Cost S-20
 - S.4.2. Cost per Rider S-21
 - S.4.3. Cost per Mile S-21
 - S.4.4. Operations and Maintenance S-22
- S.5. Community Effects and Economic Benefits S-23
 - S.5.1. Adjacent Community Effects S-23
 - S.5.2. Adjacent Development Considerations S-27
- S.6. Description of Concept S-27
- S.7. Passenger Convenience and Ridership S-29
- S.8. Feasibility / Complexity S-29
 - S.8.1. Right-of-Way S-29
 - S.8.2. Construction Effects/Constructability S-29
 - S.8.3. Major Utilities S-30
 - S.8.4. Geotechnical and Seismic Conditions S-31
 - S.8.5. Regulatory Considerations S-33
- S.9. Cost S-34
 - S.9.1. Capital Cost S-34
 - S.9.2. Cost per Rider S-34
 - S.9.3. Cost per Mile S-35
 - S.9.4. Operations and Maintenance S-35
- S.10. Community Effects and Economic Benefits S-36

Figures

Figure K-1. Concept 5A Aerial Airport Transit Connector from San Diego International Airport to Port Transit Center/Consolidated Rental Car Center and Santa Fe Depot Extended to Civic/Core.....	K-3
Figure K-2. Concept 5A Ons and Offs by Station	K-15
Figure K-3. Geologic Map of San Diego with Concept 5A Geology	K-20
Figure K-4. Downtown San Diego Alquist-Priolo Earthquake Fault Zones with Concept 5A Alignment	K-22
Figure L-1. Concept 5B Bored Tunnel Airport Transit Connector from San Diego International Airport to Santa Fe Depot Extended to Civic/Core	L-3
Figure L-2. Concept 5B Ons and Offs by Station	L-15
Figure L-3. Geologic Map of San Diego with Concept 5B Geology	L-21
Figure L-4. Downtown San Diego Alquist-Priolo Earthquake Fault Zones with Concept 5B Alignment	L-22
Figure M-1. Concept 5C Hybrid Airport Transit Connector from San Diego International Airport to Santa Fe Depot Extended to Civic/Core	M-3
Figure M-2. Concept 5C Ons and Offs by Station	M-15
Figure M-3. Geologic Map of San Diego with Concept 5C Geology.....	M-20
Figure M-4. Downtown San Diego Alquist-Priolo Earthquake Fault Zones with Concept 5C Alignment	M-22
Figure N-1. Concept 6 Trolley Concept from SDIA to 12th & Imperial Transit Center.....	N-2
Figure N-2. Concept 6 Ons and Offs by Station	N-17
Figure N-3. Geologic Map of San Diego with Concept 6 Geology.....	N-23
Figure N-4. Downtown San Diego Alquist-Priolo Earthquake Fault Zones with Concept 6 Alignment	N-24
Figure O-1. Bus Concept – San Diego International Airport to City College.....	O-3
Figure O-2. Bus Concept – San Diego International Airport to Old Town Transit Center	O-4
Figure Q-1. APM from SDIA to CMH at NAVWAR via Tunnel	Q-1
Figure Q-2. APM from SDIA to CMH at NAVWAR via At-Grade and Elevated.....	Q-2
Figure Q-3. ATC from SDIA to CMH at ITC	Q-3
Figure R-1. Roadway Segments.....	R-6
Figure S-1. South Route Airport Transit Connector from San Diego International Airport to Santa Fe Depot Extended to Civic/Core—Aerial Option	S-3
Figure S-2. South Route Airport Transit Connector from San Diego International Airport to Santa Fe Depot Extended to Civic/Core—Hybrid Option.....	S-28

Tables

Table K-1. Concept 5A Characteristics..... K-2

Table K-2. Regional Connectivity for Concept 5A..... K-5

Table K-3. Destinations within Concept 5A Station Areas K-8

Table K-4. Concept 5A Transit Travel Time K-13

Table K-5. Concept 5A and Regional 2050 Ridership K-14

Table K-6. Concept 5A Average Daily Traffic..... K-16

Table K-7. Concept 5A Vehicle Miles Traveled..... K-17

Table K-8. Concept 5A Operational GHG Emissions K-17

Table K-9. Concept 1A and 5A Right-of-Way Requirements..... K-18

Table K-10. Concept 5A Utility Impacts K-19

Table K-11. Concept 5A Geologic and Geotechnical Conditions..... K-23

Table K-12. Concept 5A Geologic and Geotechnical Conditions Favorability Evaluation K-23

Table K-13. Concept 5A Capital Cost K-28

Table K-14. Concept 5A Cost Per Rider..... K-28

Table K-15. Concept 5A Cost Per Mile K-28

Table K-16. Operations and Maintenance Costs..... K-29

Table K-17. Surrounding Communities for Concept 5A..... K-31

Table K-18. Population and Housing for Concept 5A K-32

Table K-19. Jobs and Employment Sectors for Concept 5A..... K-33

Table K-20. Home Destinations for Workers Employed in Concept 5A K-35

Table L-1. Concept 5B Characteristics..... L-2

Table L-2. Regional Connectivity for Concept 5B..... L-5

Table L-3. Destinations within Concept 5B Station Areas L-8

Table L-4. Concept 5B Transit Travel Time L-13

Table L-5. Concept 5B and Regional 2050 Ridership L-14

Table L-6. Concept 5B Average Daily Traffic..... L-16

Table L-7. Concept 5B Vehicle Miles Traveled..... L-17

Table L-8. Concept 5B Operational GHG Emissions L-17

Table L-9. Concept 1A and 5B Right-of-Way Requirements..... L-18

Table L-10. Concept 5B Utility Impacts L-19

Table L-11. Concept 5B Geologic and Geotechnical Conditions..... L-24

Table L-12. Concept 5B Geologic and Geotechnical Conditions Favorability Evaluation..... L-24

Table L-13. Concept 5B Capital Cost L-29

Table L-14.	Concept 5B Cost Per Rider.....	L-30
Table L-15.	Concept 5B Cost Per Mile.....	L-30
Table L-16.	Operations and Maintenance Costs.....	L-31
Table L-17.	Surrounding Communities for Concept 5B.....	L-33
Table L-18.	Population and Housing for Concept 5B.....	L-34
Table L-19.	Jobs and Employment Sectors for Concept 5B.....	L-35
Table L-20.	Home Destinations for Workers Employed in Concept 5B.....	L-37
Table M-1.	Concept 5C Characteristics.....	M-2
Table M-2.	Regional Connectivity for Concept 5C.....	M-5
Table M-3.	Destinations within Concept 5C Station Areas.....	M-8
Table M-4.	Concept 5C Transit Travel Time.....	M-13
Table M-5.	Concept 5C and Regional 2050 Ridership.....	M-14
Table M-6.	Concept 5C Average Daily Traffic.....	M-16
Table M-7.	Concept 5C Vehicle Miles Traveled.....	M-17
Table M-8.	Concept 5C Operational GHG Emissions.....	M-17
Table M-9.	Concept 1A and 5C Right-of-Way Requirements.....	M-18
Table M-10.	Concept 5C Utility Impacts.....	M-19
Table M-11.	Concept 5C Geologic and Geotechnical Conditions.....	M-23
Table M-12.	Concept 5C Geologic and Geotechnical Conditions Favorability Evaluation.....	M-24
Table M-13.	Concept 5C Capital Cost.....	M-29
Table M-14.	Concept 5C Cost Per Rider.....	M-29
Table M-15.	Concept 5C Cost Per Mile.....	M-29
Table M-16.	Operations and Maintenance Costs.....	M-30
Table M-17.	Surrounding Communities for Concept 5C.....	M-32
Table M-18.	Population and Housing for Concept 5C.....	M-33
Table M-19.	Jobs and Employment Sectors for Concept 5C.....	M-34
Table M-20.	Home Destinations for Workers Employed in Concept 5C.....	M-36
Table N-1.	Concept 6 Characteristics.....	N-1
Table N-2.	Regional Connectivity for Concept 6.....	N-5
Table N-3.	Destinations within Concept 6 Proposed Station Areas.....	N-9
Table N-4.	Concept 6 Transit Travel Time.....	N-15
Table N-5.	Concept 6 and Regional 2050 Ridership.....	N-16
Table N-6.	Concept 6 Average Daily Traffic.....	N-18
Table N-7.	Concept 6 Vehicle Miles Traveled.....	N-19
Table N-8.	Concept 6 Operational GHG Emissions.....	N-19

Table N-9.	Concept 6 Right-of-Way Requirements	N-20
Table N-10.	Concept 6 Utility Impacts	N-22
Table N-11.	Concept 6 Geologic and Geotechnical Conditions.....	N-26
Table N-12.	Concept 6 Geologic and Geotechnical Conditions Favorability Evaluation.....	N-26
Table N-13.	Concept 6 Capital Cost	N-31
Table N-14.	Concept 6 Cost Per Rider	N-31
Table N-15.	Concept 6 Cost Per Mile	N-31
Table N-16.	Operations and Maintenance Costs.....	N-32
Table N-17.	Surrounding Communities for Concept 6.....	N-34
Table N-18.	Population and Housing for Concept 6	N-35
Table N-19.	Jobs and Employment Sectors for Concept 6	N-36
Table N-20.	Home Destinations for Workers Employed in Concept 6.....	N-38
Table O-1.	Concept 7 Characteristics	O-2
Table O-2.	Regional Connectivity for Concept 7.....	O-6
Table O-3.	Destinations within Concept 7 Station Cluster Areas	O-9
Table O-4.	Concept 7 Transit Travel Time	O-14
Table O-5.	Concept 7 and Regional 2050 Ridership.....	O-15
Table O-6.	Concept 7 Average Daily Traffic.....	O-16
Table O-7.	Concept 7 Vehicle Miles Traveled.....	O-16
Table O-8.	Concept 7 Operational GHG Emissions	O-17
Table O-9.	Concept 7 Right-of-Way Requirements	O-17
Table O-10.	Concept 7 Capital Cost	O-20
Table O-11.	Concept 7 Cost Per Rider	O-20
Table O-12.	Concept 7 Cost Per Mile	O-20
Table O-13.	Operations and Maintenance Costs.....	O-21
Table O-14.	Surrounding Communities for Concept 7.....	O-24
Table O-15.	Population and Housing for Concept 7	O-25
Table O-16.	Jobs and Employment Sectors for Concept 7.....	O-26
Table O-17.	Home Destinations for Workers Employed in Concept 7.....	O-28
Table R-1.	Evaluation Criteria.....	R-1
Table S-1.	South Route Aerial Option Characteristics.....	S-2
Table S-2.	Regional Connectivity for South Route Aerial Option.....	S-5
Table S-3.	Destinations within South Route Aerial Option Station Areas.....	S-7
Table S-4.	South Route Transit Travel Time.....	S-12
Table S-5.	South Route 2050 Ridership	S-13

Table S-6. South Route Aerial Option Right-of-Way Requirements S-13

Table S-7. South Route Aerial Option Utility Impacts S-14

Table S-8. South Route Aerial Option Geologic and Geotechnical Conditions..... S-16

Table S-9. South Route Aerial Option Geologic and Geotechnical Conditions Favorability Evaluation..... S-16

Table S-10. South Route Aerial Option Capital Cost S-21

Table S-11. South Route Aerial Option Cost Per Rider..... S-21

Table S-12. South Route Aerial Option Cost Per Mile S-21

Table S-13. Operations and Maintenance Costs..... S-22

Table S-14. Surrounding Communities for South Route Option..... S-24

Table S-15. Population and Housing for South Route Option S-25

Table S-16. Jobs and Employment Sectors for South Route Option S-25

Table S-17. South Route Hybrid Option Characteristics..... S-27

Table S-18. South Route Hybrid Option Right-of-Way Requirements S-29

Table S-19. South Route Hybrid Option Utility Impacts..... S-30

Table S-20. South Route Hybrid Option Geologic and Geotechnical Conditions..... S-32

Table S-21. South Route Hybrid Option Geologic and Geotechnical Conditions Favorability Evaluation..... S-33

Table S-22. South Route Hybrid Option Capital Cost S-34

Table S-23. South Route Hybrid Option Cost Per Rider S-34

Table S-24. South Route Hybrid Option Cost Per Mile..... S-35

Table S-25. Operations and Maintenance Costs..... S-35

APPENDIX K CONCEPT 5A: AERIAL AIRPORT TRANSIT CONNECTOR FROM SAN DIEGO INTERNATIONAL AIRPORT TO PORT TRANSIT CENTER/CONSOLIDATED RENTAL CAR CENTER AND SANTA FE DEPOT EXTENDED TO CIVIC/CORE

K.1. Description of Concept

For the Airport Transit Connector (ATC) concepts, transit connections to the north and south of San Diego International Airport (SDIA) were evaluated with variations of stops, termini, configurations, and features. All ATC concepts assume an operations, maintenance, and storage facility (OMSF) would be located on the Port Headquarters (referred to as the Port Transit Center (PTC)). The ATC concepts evaluated in this study, include the provision of both a northern and southern alignment for the ATC, though the stops, termini, configurations, and ultimate location of the OMSF, are subject to further analysis and modification, and will be confirmed during the environmental clearance process. For this analysis, Concepts 3, 4, and 5 are combined with Concept 1A, the common north route. Concept 5A would feature a south spur of a 1.8-mile high-frequency aerial ATC in a dedicated right-of-way from Concept 1A with a connection to SDIA to a terminus at a Civic/Core ATC Station on Broadway. Concept 5A would also add a new Santa Fe Depot ATC Station, creating a connection to the existing Santa Fe Depot and an optional County Administration Building ATC Station. When interlining with Concept 1A, passengers would also have access to the SDIA ATC Station and optional Harbor Island ATC Station. Table K-1 provides information on concept characteristics.

Figure K-1 shows the combined Concept 1A and Concept 5A alignment. From the SDIA Station located at the transit-ready area at the airport, the Concept 1A fixed guideway would be on an aerial structure along Harbor Drive before transitioning to a cut-and-cover tunnel adjacent to Laurel Street. The alignment would remain in a tunnel under Pacific Highway. The alignment would then turn north and be at-grade and parallel with the existing Metropolitan Transit System (MTS) right-of-way to the PTC ATC Station. North of the station, the guideway would transition to an aerial structure and cross Pacific Highway and Admiral Boland Way to terminate at the Consolidated Rental Car Center ATC Facility (CONRAC) Station.

Concept 5A would interline with Concept 1A at Coast Guard Place and would follow Harbor Drive before turning southeast at Hawthorn Street to connect to the optional County Administration Building ATC Station and continuing south along Pacific Highway. South of B Street, the aerial alignment would curve to turn east along Broadway, connecting to the Santa Fe Depot ATC Station located on Broadway at Kettner Boulevard. From the Santa Fe Depot ATC Station, the Concept 5A alignment would continue east along Broadway to the Civic/Core ATC Station. The Civic/Core ATC terminus station would be located on Broadway, west of 3rd Avenue. A dedicated bicycle/pedestrian connection would provide a connection to the existing San Diego Trolley (Trolley) Blue and Trolley Orange Line Civic Center Station on C Street.

Table K-1. Concept 5A Characteristics

CHARACTERISTIC	
Length of alignment at-grade (miles)	0
Length of alignment on aerial structure (miles)	1.8
Length of alignment in tunnel (miles)	0
Total alignment length (miles)	1.8
Number of stations ¹	2 ²
Minimum/shortest headways	4 minutes ³

Source: WSP, HDR 2022

Notes:

¹Stations include only those provided for the south route concept, although south route passengers would also have access to the Concept 1A SDIA ATC Station and optional Harbor Island ATC Station.

²County Administration Building is a potential third station.

³When combined with Concept 1A, headways would be two minutes where the concepts overlap.

Figure K-1. Concept 5A Aerial Airport Transit Connector from San Diego International Airport to Port Transit Center/Consolidated Rental Car Center and Santa Fe Depot Extended to Civic/Core



Source: WSP, HDR 2022

K.2. Passenger Convenience and Ridership

K.2.1. Regional Connectivity

Regional connectivity is evaluated by identifying the number of modes of transportation and the number of major destinations and community facilities that can be reached within a 0.5-mile buffer of a station (defined as the “station area”). For the purpose of this analysis, “destinations” include major tourist destinations (e.g., attractions, museums, commercial shopping areas, recreational/historic areas) and community facilities (e.g., schools, parks, libraries, police/fire stations, hospitals). The information presented in this section reflects regional connectivity for the concept inclusive of Concept 1A.

Modes of Transportation

Concept 5A would have connections to the greater transit network, including the MTS bus and Trolley light rail (Blue Line, Green Line, Orange Line), North County Transit District COASTER commuter trains, and the Amtrak Pacific Surfliner. The following describes the available connections to existing bus transit routes, Trolley connections, bike routes, and major roadways. Table K-2 summarizes the potential regional connections to existing bus transit routes, rail and Trolley connections, bike routes, major roads, and arterial/collector streets for Concept 5A.

Bus Transit Routes: Concept 5A would provide connections to 19 MTS bus routes: San Diego Airport Flyer shuttle (AIR), 2, 3 5, 7, 11, 12, 20, 83, 110, 120, 215, 225, 235, 280, 290, 901, 923, and 992.

Rail and Trolley Lines: Concept 5A would have connections to five rail and Trolley lines: Trolley Blue, Green, and Orange Lines, Amtrak, and COASTER.

Bike Routes: Concept 5A would have connections to the City of San Diego Bicycle Network (including bike lanes, separated bikeways, and bike routes), Interstate (I-) 5 Bridge (i.e., the pedestrian bridge over I-5), North Harbor Drive Bike Path, Embarcadero Path, California Path, Columbia Path, Martin Luther King, Jr. Promenade, Bayshore Bikeway, and Harbor Drive Pedestrian Bridge.

Major Roads, Arterials, and Collector Streets: Major roads are usually four to six lanes wide with limited access, grade separations, and extra lanes where needed. Major roads are designed for through traffic but usually have signals at major intersections. Major arterials are usually four to six lanes wide and although designed primarily for through traffic, arterials also provide access to abutting property. Collector Streets are typically two to four lanes wide and function as feeders of traffic to the major street system and provide continuity with local streets.

Concept 5A would be accessible by 10 major roadways and 18 arterial/collector streets.

Table K-2. Regional Connectivity for Concept 5A

CATEGORY	NO. OF CONNECTIONS	ROUTE NAMES	STATION AREA ¹
Bus Routes	19	AIR (San Diego Airport Flyer Shuttle)	SDIA ATC, Harbor Island ATC (Optional)
		83 (Downtown San Diego - Old Town)	Port Transit Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC, Civic/Core ATC
		11 (SDSU - Downtown San Diego)	SDIA ATC, Harbor Island ATC (Optional), Port Transit Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC, Civic/Core ATC
		280 (Escondido Transit Center - Downtown)	
		290 (Rancho Bernardo Station – Downtown)	
		225 (Downtown - Otay Mesa TC)	
		235 (Downtown - Escondido Transit Center)	
		923 (Downtown to Point Loma)	
		992 (Airport/Downtown)	
		215 (Mid-City Rapid)	
		2 (Downtown San Diego - 30th & Adams)	
		3 (UCSD Hospital - Euclid Transit Center)	
		7 (Downtown San Diego - University/College)	
		901 (Iris Transit Center - Downtown San Diego)	
		110 (Mira Mesa - Downtown via Hwy 163)	
		120 (Downtown San Diego - Kearny Mesa Transit Center)	
		5 (Downtown San Diego - Euclid Transit Center)	Civic/Core ATC
		12 (City College - Skyline Hills)	
		20 (Downtown - Rancho Bernardo Transit Station)	

CATEGORY	NO. OF CONNECTIONS	ROUTE NAMES	STATION AREA ¹
Rail and Trolley Lines	5	Trolley Blue Line	Port Transit Center ATC, Rental Car Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC, Civic/Core ATC
		Trolley Green Line	
		COASTER	Santa Fe Depot ATC
		Amtrak Pacific Surfliner	
		Trolley Orange Line	Santa Fe Depot ATC, Civic/Core ATC
Bike Routes	7	I-5 Bridge (pedestrian bridge over I-5)	Port Transit Center ATC
		North Harbor Dr Bike Path	SDIA ATC, Harbor Island ATC (Optional), County Administration Building ATC (Optional)
		Embarcadero Path	Port Transit Center ATC, County Administration Building (Optional), Santa Fe Depot ATC
		City of San Diego Bicycle Network	SDIA ATC, Harbor Island ATC (Optional), Port Transit Center ATC, Rental Car Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC, Civic/Core ATC
		California Path	Santa Fe Depot ATC, Civic/Core ATC
		Columbia Path	
		Martin Luther King, Jr. Promenade	
Major Street	10	W Laurel St	Port Transit Center ATC, County Administration Building (Optional)
		North Harbor Dr	SDIA ATC, Harbor Island (Optional), Port Transit Center ATC, County Administration Building (Optional), Santa Fe Depot ATC
		Pacific Hwy	SDIA ATC, Harbor Island ATC (Optional), Port Transit Center ATC, Rental Car Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC
		Front St	County Administration Building ATC (Optional), Santa Fe Depot ATC, Civic/Core ATC

CATEGORY	NO. OF CONNECTIONS	ROUTE NAMES	STATION AREA ¹
		Broadway	Santa Fe Depot ATC, Civic/Core ATC
		Harbor Dr	
		Market St	
		6th Ave	Civic/Core ATC
		Park Blvd	Rental Car Center ATC
		Washington St	
Arterial/ Collector Street	18	India St	Port Transit Center ATC, Rental Car Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC, Civic/Core ATC
		Kettner Blvd	
		Sassafras St	Port Transit Center ATC, Rental Car Center ATC
		Hancock St	Rental Car Center ATC
		San Diego Ave	
		1st Ave	County Administration Building ATC (Optional), Santa Fe Depot ATC, Civic/Core ATC
		State St	
		A St	
		Ash St	
		4th Ave	
		B St	Santa Fe Depot ATC, Civic/Core ATC
		C St	
		F St	
		G St	
		5th Ave	Civic/Core ATC
		8th Ave	
10th Ave			
11th Ave			

Source: WSP, HDR, and TAHA 2022

Notes:

¹Station area is defined as a 0.5-mile buffer from the station centroid.

ATC = Airport Transit Connector; SDIA = San Diego International Airport

Connections to Destinations

There would be 59 destinations within Concept 5A station areas (Table K-3). Several of the destinations can be reached from more than one proposed station and would not require a transfer.

Table K-3. Destinations within Concept 5A Station Areas

DESTINATIONS	STATION AREA ¹	
Harbor Island	SDIA ATC, Harbor Island ATC (Optional)	
San Diego Harbor Police		
San Diego International Airport		
Spanish Landing Park (East)		
Spanish Landing Park (West)		
Maple Canyon Open Space	Port Transit Center ATC	
Montessori School of San Diego	Port Transit Center ATC, Rental Car Center ATC	
Rental Car Center		
Marine Corps Recruit Depot San Diego	Rental Car Center ATC	
San Diego Lindbergh Field Fire Station		
SDFD Fire Station 3	Port Transit Center ATC County Administration Building ATC (Optional)	
Col. Salomon Child Development Center	County Administration Building ATC (Optional)	
Washington Elementary School		
Firehouse Museum	County Administration Building ATC (Optional), Santa Fe Depot ATC	
Little Italy		
Maritime Museum of San Diego		
NHA - Stem Institute for Early Learning		
SDFD Fire Station 2		
Star of India Museum		
The Embarcadero		
Waterfront Park/Harborview		
Broadway Landing		Santa Fe Depot ATC
Lane Field Park		
Navy Pier		
Ruocco Park		

DESTINATIONS	STATION AREA ¹
Seaport Village Shopping Center	
Tuna Harbor Park	
Cruise Ship Terminal	
The Headquarters at Seaport	
USS Midway Museum	
Aspen Leaf Nursery & Preschool	Santa Fe Depot ATC, Civic/Core ATC
Balboa Theatre	
Civic Center	
Downtown San Diego/Core-Colombia	
Federal Courthouse	
Hall Of Justice	
Horton Plaza Park	
King Promenade Park	
King-Chavez Community High School	
Metro Arson Strike Team	
Metropolitan Corrections Center	
Museum of Contemporary Art San Diego	
San Diego Central Courthouse	
San Diego Central Jail	
SDFD Fire Station 1	
SDFD Fire Station 1/201	
The New Children's Museum	
NHA - Broadway Early Learning Academy	
Pantoja Park	

DESTINATIONS	STATION AREA ¹
California Western School of Law	Civic/Core ATC
Davis House Park	
DTFHC At Connections	
Gary And Mary West Senior Dental Center, Inc.	
Gaslamp Museum at Davis-Horton House Museum & Park	
Gaslamp Quarter	
New Vistas	
The School Paul Mitchell -San Diego	
San Diego Chinese Historical Museum	

Source: WSP, HDR, GPM, and TAHA 2022

Notes:

¹Station area is defined as a 0.5-mile buffer from the station centroid.

ATC = Airport Transit Connector; SDFD = San Diego Fire Department; SDIA = San Diego International Airport

K.2.2. User Experience

The evaluation of user experience relates to the station area environment and a passenger’s experience on the vehicle considering elements such as ease of transfers, navigation, and passenger comfort. For the purpose of this analysis, the ease of transfers considered the distance and navigation to the nearest connecting services. The number of modes of transportation that can be reached within 0.5-mile buffer of each station is discussed in Section K.2.1.

Drop-off/Pick-up, Navigation, and Transfer Convenience

The following sections summarize transfer convenience for each proposed station along Concept 5A, including between modes of transit and by vehicle, as applicable. Transfer convenience was evaluated in terms of distance between modes of transit and vehicular drop-off/pick-up locations and the proposed ATC Station. As design is advanced throughout subsequent phases of project development, it is assumed that wayfinding, in terms of signage and paths of travel, would be provided to direct passengers to transfer locations. Therefore, wayfinding is not evaluated on a station-by-station basis.

SDIA ATC Station: Vehicular pick-up and drop-off or transfers from the ATC to bus are not expected at this station. It is anticipated that passengers boarding or alighting the ATC at this station would be traveling to or from SDIA. The nearest entrance at Terminal 1 and Terminal 2 would require passengers to walk a minimum of 0.2 mile. This station would be served by trains traveling on both the north route Concept 1A alignment, which includes a terminus at the Rental Car Center ATC Station, and the south route alignment to the Santa Fe Depot ATC Station and Civic/Core ATC Station. The two route options may cause confusion at the SDIA ATC Station as passengers would need to select the correct train, and clear signage depicting the routes would be needed.

Harbor Island ATC Station (Optional): While connections at this location would be limited, this station would allow for access to the MTS Route 923 N Harbor Dr and Harbor Island Dr bus stop, walking 300 feet west along Harbor Drive to reach the westbound stop and 500 feet along Harbor Drive and Harbor Island Drive to reach the eastbound stop. This station would also create a direct pedestrian linkage across Harbor Drive to future development on Harbor Island. Vehicular drop-off and pick-up are not anticipated at this station.

County Administration Building ATC Station (Optional): This station would be located north of the County Administration Building and would allow for transfers to MTS bus Routes 923 and 992 on Harbor Drive and Routes 280 and 290 on Grape Street, each within a 300-foot walk.

Santa Fe Depot ATC Station: The Santa Fe Depot ATC Station includes ample transfer opportunities including eight bus routes, two light rail lines (i.e., Trolley Blue and Green Lines), Amtrak intercity rail, and COASTER commuter rail service. This station would be located along Broadway at Kettner Boulevard, southeast of the existing Santa Fe Depot, and passengers would have access to the connecting services with a 200-foot walk. Passengers exiting the ATC Station would be in view of the existing Santa Fe Depot waiting room and ticket office building, a city landmark, which would support navigation. However, given the considerable amount of connecting services scattered among various on-street stops, navigating between transit services may be confusing, and clear signage at the ATC Station would be needed. No dedicated, transit parking facilities exist at Santa Fe Depot, although there is an existing private parking lot adjacent to Santa Fe Depot which charges a fee for parking. Vehicular drop-off and pick-up space are provided along Kettner Boulevard.

Civic/Core ATC Station: The Civic/Core ATC terminus station would be located on Broadway, west of 3rd Avenue and approximately 500 feet south of the existing Trolley Blue and Trolley Orange Line Civic Center Station on C Street. A dedicated bicycle/pedestrian connection between both stations would be provided along 3rd Avenue, which would allow for clear navigation for passengers traveling between each station area and to the Civic Center. The station would also provide direct access to bus stops on Broadway, between 2nd Avenue and 3rd Avenue serving nine MTS bus routes. At Broadway and 1st Avenue, passengers would have access to four additional bus routes within a 200-foot walk.

Station Amenities

Each station, as preliminarily designed, would provide ample space for shelters, seating, lighting, trash receptacles, and other amenities. The existing Santa Fe Depot also offers restrooms, vending machines, and an ATM. The Civic/Core ATC station is located within a constrained area, but space would be available for amenities such as shelters, seating, and lighting.

Fare Payment Method

The ATC fare concept has not yet been fully established, but for the purposes of this evaluation it is assumed that the ATC would be fare free. A fare free concept allows for a smoother boarding process and would minimize travel delay compared to systems where a passenger pays as they board.

Boarding Method

It is assumed that the ATC vehicles would provide level boarding (i.e., the floor of the vehicle is at the same level as the boarding platform), allowing passengers to step or roll directly onto the vehicle without a step up or down. This type of boarding is easier for passengers with luggage, as well as passengers with strollers, in wheelchairs, or with other mobility impairments compared to vehicles that do not have level boarding.

Luggage Accommodations

The ATC vehicles are assumed to be designed with airport travel in mind, with space for luggage, available but minimal seating conducive to short trips, and ample hand-holds.

Reliability

Concept 5A would operate in a dedicated right-of-way with no shared operations for the entirety of the ATC alignment. The absence of conflicting services and separation from traffic would reduce opportunities for delays along the alignment and would support reliable operations.

Ride Comfort

Concept 5A is proposed to operate in a dedicated, fully separated aerial right-of-way before interlining with Concept 1A. The separated guideway minimizes potential conflicts with other vehicles, as well as the potential for additional stopping or starting at intersections.

K.2.3. Travel Time

Transit Travel Time

The evaluation of transit travel time considered the total time spent traveling on transit to and from destinations within the county. Transit travel time included time from the first mode of transit used to the destination, inclusive of transfers, and was obtained from the San Diego Association of Governments (SANDAG) ABM2+ model. Transit travel times to SDIA were calculated for the AM peak hour and transit travel times from SDIA were calculated for the PM peak hour. Transit travel times to and from each destination were compared to against a No Project baseline. Table K-4 outlines the transit travel times for each destination evaluated.

Compared to the No Project baseline, Concept 5A would reduce the transit travel time to each of the 14 destinations evaluated. The reduction in transit travel time for Concept 5A would range from 3-24 minutes.

Table K-4. Concept 5A Transit Travel Time

LOCATION/ DESTINATION	NO PROJECT BASELINE		CONCEPT 5A ATC TO PTC/CONRAC AND CIVIC/CORE (AERIAL)	
	TO SDIA	FROM SDIA	TO SDIA	FROM SDIA
Legoland	64	64	61	61
Carlsbad/Carlsbad Village Station	63	63	53	53
Grossmont Center Mall	61	61	41	41
Mission Bay/Mission Bay Park	32	32	18	18
Mission Valley/Fashion Valley Station	36	36	19	19
Chula Vista City Hall	45	45	41	41
Bayfront Redevelopment/E Street Station	45	45	39	39
Bayfront Redevelopment (Gaylord Pacific Resort and Convention Center & Harbor Park)	47	47	40	40
San Ysidro Transit Center	60	60	36	36
San Diego State University/SDSU Transit Center	52	52	32	32
University of California, San Diego/UCSD Central Campus Station	41	41	29	29
Convention Center	24	24	20	20
Liberty Station (Commercial & Bus Transit)	23	23	16	16
Ocean Beach (Downtown Area)	41	41	18	18

Source: SANDAG, WSP, and HDR 2022

Notes: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center; SDIA = San Diego International Airport; San Diego State University; UCSD = University of California San Diego

Headways

The evaluation of travel time also considered headways, or the time between transit vehicles. The headways presented in this evaluation are consistent with those used in the ridership forecasts. Actual headways would be determined during later stages of project development.

Concept 5A would operate with 4-minute headways. When combined with Concept 1A, Concept 5A would operate with 2-minute headways where the two concepts interline to connect to SDIA.

K.2.4. Ridership

Projected ridership in 2050 was modeled for Concept 5A by line, station, and systemwide based on forecasts from the San Diego Association of Governments (SANDAG) model. Systemwide ridership was compared against a No Project baseline. As Concept 5A includes implementation of Concept 1A, the ridership forecast included both the north route and south route ATC

segment. Concept 5A also assumes continued service of MTS Route 992 (Downtown/Airport). Table K-5 outlines the projected 2050 daily ridership for Concept 5A and systemwide.

Table K-5. Concept 5A and Regional 2050 Ridership

CONCEPT DESCRIPTION	ROUTE	DAILY RIDERSHIP	TOTAL REGIONAL BOARDINGS
Concept 5A ATC to PTC/CONRAC and Civic/Core (aerial)	ATC north route segment	39,000	1,434,000
	ATC south route segment	10,000	
	ATC Total	50,000	
	MTS Route 992	2,000	

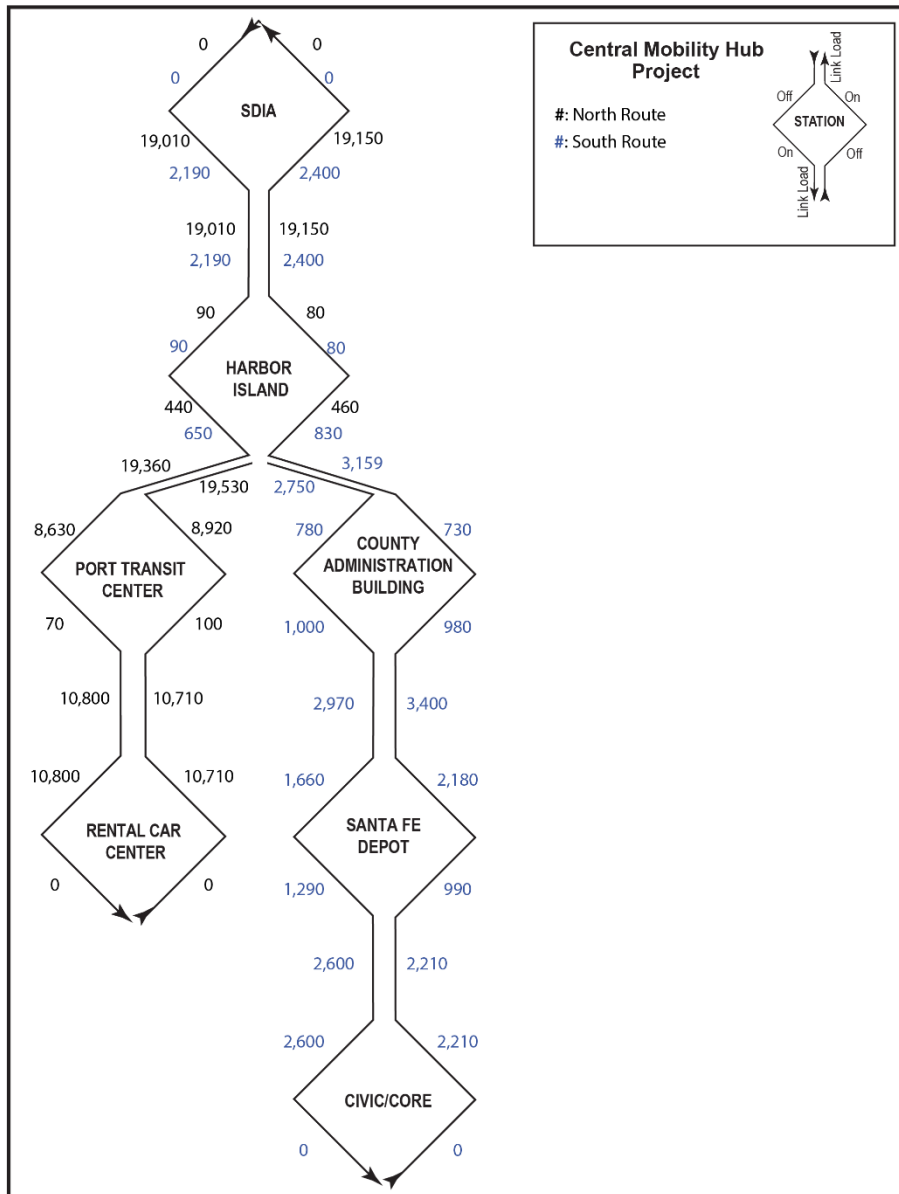
Source: SANDAG 2022

Notes: Numbers rounded to the nearest 1,000. Numbers may not equal due to rounding.

ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; MTS = Metropolitan Transit System; PTC = Port Transit Center

Figure K-2 identifies the 2050 ridership by station for Concept 5A, presenting the boardings (ons), alightings (off), and passengers on trains between stations.

Figure K-2. Concept 5A Ons and Offs by Station



Source: SANDAG 2023

Note: Numbers are rounded to the nearest 10; numbers may not equal due to rounding.

K.3. Congestion of Airport Access

K.3.1. Traffic Effects

The evaluation of traffic effects considered the change in traffic volumes on select roadways, including those entering and leaving SDIA, associated with each concept. The change in traffic volumes was evaluated using average daily traffic (ADT) volumes from the SANDAG model,

which represent the average number of vehicles passing a specific point on a connection or roadway on an average day.

The 2050 ADT volumes on these roadways were compared for each segment against a No Project baseline to calculate the percent change in ADT. Table K-6 outlines the roadways considered in this evaluation and the percent change in ADT. Compared to the No Project baseline, Concept 5A would reduce ADT for all roadway segments except for the segment on Hawthorn Street from Pacific Highway to Harbor Drive, which would result in an increase in ADT, and the segment along Harbor Drive from Market Street to Front Street which would not result in a change in ADT. The segments with the largest reduction in ADT would be the Airport Terminal 1 and 2 Roadways and the SDIA inbound access road with a 26 percent reduction, and Laurel Street from Pacific Highway to Harbor Drive with a 23 percent reduction in ADT. The reduction in ADT reflects travelers switching modes and/or points of access to reach SDIA and destinations served by Concept 5A.

Table K-6. Concept 5A Average Daily Traffic

ROADWAY SEGMENT	PERCENT CHANGE IN AVERAGE DAILY TRAFFIC COMPARED TO NO PROJECT BASELINE
Airport Terminal 1 and 2 Roadways	-26%
Harbor Drive from Laurel Street to Harbor Island Drive	-10%
SDIA Inbound Access Road from Laurel Street to SDIA	-26%
Harbor Drive from Grape Street to Ash Street	-8%
Harbor Drive from Market Street to Front Street	0%
Harbor Drive from Laning Road to McCain Road	-4%
Pacific Highway from Sassafras Road to Palm Street	-13%
Laurel Street from Pacific Highway to Harbor Dr	-23%
Hawthorn Street from Pacific Highway to Harbor Drive	8%
Grape Street from Pacific Highway to Harbor Drive	-7%

Source: SANDAG 2022

Note: SDIA = San Diego International Airport

K.4. Vehicle Miles Traveled and Greenhouse Gases

K.4.1. Vehicle Miles Traveled

Providing alternative transportation modes in the region would change the number of vehicles on the road. The change in 2050 vehicle miles traveled (VMT) associated with implementation of Concept 5A was calculated against a No Project baseline. Table K-7 summarizes the 2050 regional VMT and change in VMT compared to the No Project baseline.

Table K-7. Concept 5A Vehicle Miles Traveled

CONCEPT DESCRIPTION	2050 REGIONAL VMT ¹	REGIONAL VMT REDUCTION FROM NO PROJECT ¹
No Project Baseline	88,620,000	—
Concept 5A ATC to PTC/CONRAC and Civic/Core (aerial)	88,491,000	-129,000

Source: SANDAG 2022

Notes:

¹Numbers are rounded to the nearest 1,000.

ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center; VMT = vehicle miles traveled

K.4.2. Greenhouse Gases

A change in 2050 VMT would result in a corresponding change in 2050 greenhouse gas (GHG) emissions. To evaluate the change in emissions, A select link analysis was performed within the SANDAG ABM2+ model. The VMT on the select links was compared to the No Project baseline to calculate the change in VMT. EMFAC per mile emission rates in pollutant-per-mile-traveled units were calculated for each concept and the No Project baseline.

Table K-8 compares the GHG emissions reductions between the No Project baseline and Concept 5A. With a VMT reduction, Concept 5A would result in a 0.91 percent reduction in GHG emissions.

Table K-8. Concept 5A Operational GHG Emissions

CONCEPT DESCRIPTION	GHG EMISSIONS (MMT _{CO2E}) (TONS PER DAY) ¹	PERCENT CHANGE IN GHG COMPARED TO NO PROJECT BASELINE
No Project Alternative (2050)	24,590	—
Concept 5A ATC to PTC/CONRAC and Civic/Core (aerial)	24,370	-0.91%

Source: SANDAG 2022

Notes:

¹Numbers are rounded to the nearest 10.

ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; GHG = greenhouse gas; MMT_{CO2e} = million metric tons of CO_{2e}; PTC = Port Transit Center

K.5. Feasibility / Complexity

K.5.1. Right-of-Way

The evaluation of right-of-way requirements considered the number of parcels that may have acquisitions (partial or full) to support the concept and the number of buildings that may require demolition. A buffer was used to identify properties, defined as 20 feet for aerial and at-grade, 20 feet for tunnel/cut-and-cover, 10 feet from edge of straddle bents, and 20 feet at stations. Concept 5A would consist of an elevated alignment with elevated guideway columns and

guideway straddle bents. The evaluation considered the two stations and one optional station provided in Concept 5A. The right-of-way requirements for the SDIA and optional Harbor Island Station are included under Concept 1A. As Concept 5A would interline with Concept 1A, the evaluation considered the potential requirements of Concept 5A in addition to Concept 1A. The evaluation identified a total of 37 parcels within the buffer. Additionally, nine buildings could require demolition (Table K-9).

Table K-9. Concept 1A and 5A Right-of-Way Requirements

CONCEPT DESCRIPTION	RIGHT-OF-WAY REQUIREMENTS	
	NUMBER OF PARCELS AFFECTED	NUMBER OF BUILDINGS POTENTIALLY REQUIRING DEMOLITION
Concept 1A ATC to PTC/CONRAC	24	9
Concept 5A ATC to PTC/CONRAC and Civic/Core (aerial)	13	0
Total	37	9

Source: WSP, HDR, GPM 2022

Notes: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center

K.5.2. Construction Effects/Constructability

This section discusses constructability considerations associated with the major infrastructure elements featured in each concept under evaluation with the purpose of identifying probable construction methods, staging, sequences, traffic impacts, and any temporary facilities that would be implemented during the construction phase.

Concept 5A would include a south route addition of an aerial connection to Concept 1A, extending to Santa Fe Depot before turning east on Broadway to the Civic Center area. Concept 5A has similar constructability aspects as Concepts 1A and 3A with substantially greater aerial construction to connect to the Civic/Core ATC Station. This concept would add 1.8 miles of aerial alignment to Concept 1A (Table K-1 and Figure K-1). The primary considerations of constructability of the vertical alignment options are identical to Concept 1A, with the approximate tripling of length of aerial structure, which could affect the selection of structure type and the number of crews working to meet schedule. If schedule is critical, contractors would likely start crews on multiple headings for foundation and column work. The additional aerial construction within Harbor Drive, Pacific Highway, and Broadway would require more lane closures in congested roadway segments. Construction of the aerial station at the County Administration Building would require temporary closure of all or part of the surface parking lot located north of Grape Street. Constructing the aerial guideway along Pacific Highway toward Broadway would require a work zone on Pacific Highway of about 35 percent of the roadway width while avoiding any encroachment on intersections with Ash Street or Broadway to minimize impacts on traffic circulation. The aerial Santa Fe Depot ATC Station and Civic/Core ATC Station would require substantial periods of lane or roadway closures in those areas.

K.5.3. Major Utilities

Potential conflicts with existing utilities were identified for Concept 5A. Major utilities in this evaluation are defined as water facilities equal to or greater than 16 inches, sewer facilities equal to or greater than 18 inches, and storm drain facilities equal to or greater than 36 inches. Concept 5A consists of an elevated alignment with elevated guideway columns and guideway bents. A buffer was established from the centerline of the nearest rail to capture utilities within a 10-foot diameter from column locations for aerial, 20 feet for at-grade and 20 feet at stations. The evaluation considered the two stations and one optional station provided in Concept 5A. As Concept 5A would interline with Concept 1A, the evaluation considered the utility impacts of Concept 5A in addition to Concept 1A. Concept 5A could result in 15 utilities impacts. Table K-10 outlines the number and type of major utilities identified.

Table K-10. Concept 5A Utility Impacts

CONCEPT DESCRIPTION	NUMBER OF MAJOR UTILITY IMPACTS		
	SEWER	WATER	STORM DRAIN
Concept 1A ATC to PTC/CONRAC	3	4	4
Concept 5A ATC to PTC/CONRAC and Civic/Core (aerial)	2	1	1
Total	5	5	5

Source: WSP, HDR, GPM 2022

Notes: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center

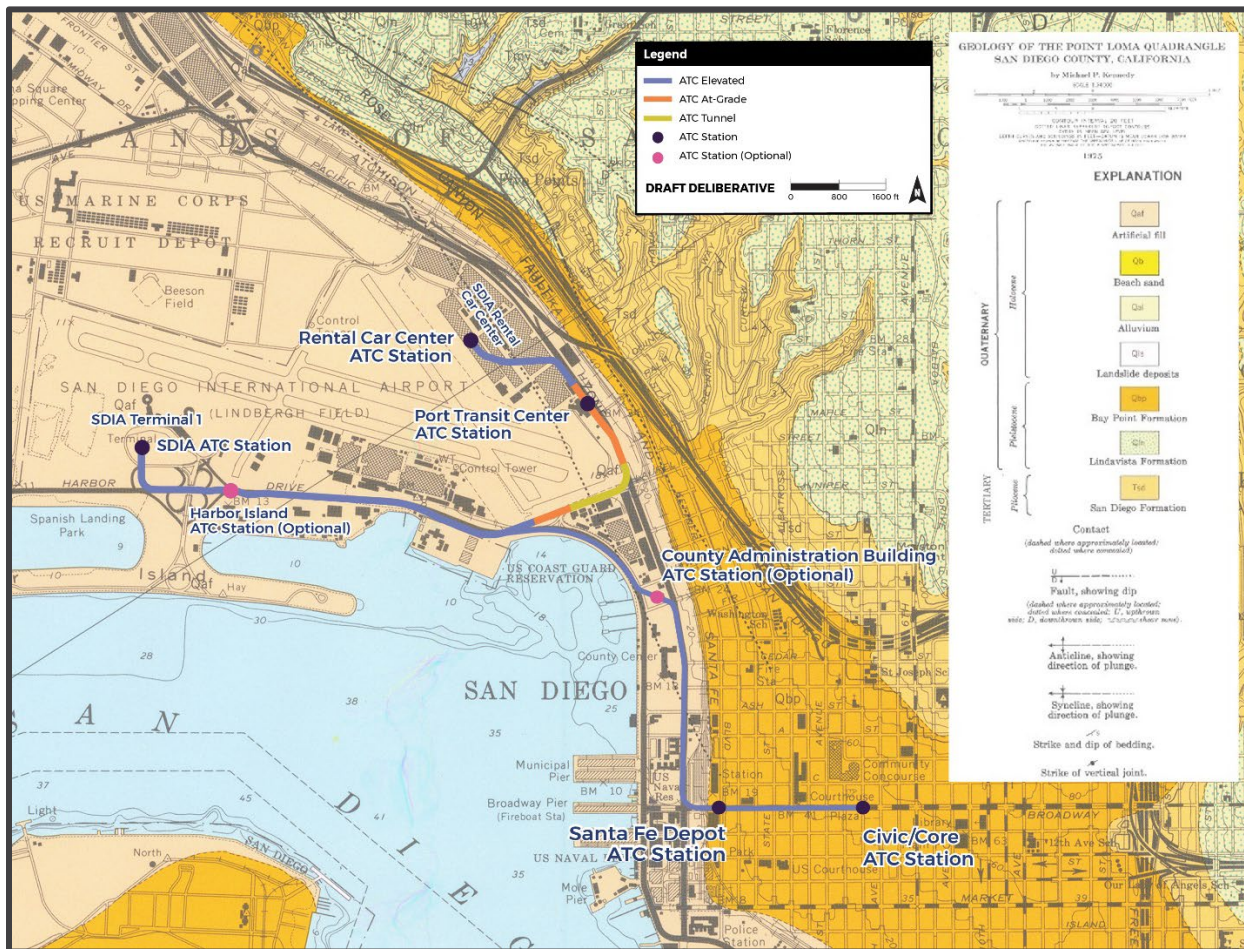
K.5.4. Geotechnical and Seismic Conditions

Geotechnical conditions along the alignment of Concept 5A are highly variable. Figure K-3 presents a geologic map of San Diego with Concept 5A overlaid onto it, and an overview of the subsurface conditions along the alignment. In particular, the subsurface materials along N Harbor Drive likely consist of a sequence of highly variable undocumented fill soil (placed above water), overlying relatively thick hydraulic fill soils (placed under water). These fill soils are sequentially underlain by various naturally deposited geologic formations that were deposited in various geologic epochs. From the youngest, and therefore right below the undocumented fills and in descending order, are Holocene-age estuarine deposits (also referred to as bay deposits), Quaternary-age granular and cohesive old paralic deposits (also known as Bay Point Formation), Pliocene-age marine sandstone and conglomerate (also known as the San Diego Formation), and undifferentiated fossilized marine and non-marine Eocene-age rock.

The area at the eastern end of the runway, located adjacent to West Laurel Street and the cut-and-cover tunnel, may consist of an easterly decreasing thickness of fill material. This area also likely contains both buried alluvial and colluvial materials that were deposited by surficial erosion from Maple Canyon located just east of I-5. This material may have a significant gravel, cobble, and boulder-sized materials. The elevated section of the alignment near the SDIA rental car center likely contains a thinner layer of estuarine deposits compared to other areas of the alignment.

The southern portion of the alignment along Pacific Highway, from the Solar Turbines parking lot to the Santa Fe Depot Station, generally follows the original, historic shoreline of San Diego Bay. The subsurface sequence of deposits in this area is anticipated to consist of variable thicknesses undocumented fill, hydraulic fill, estuarine deposits, Bay Point Formation and San Diego Formation. While the general sequence of geologic formations is similar to the areas described above, the thickness of less competent and more problematic soils (i.e. undocumented fill and estuarine deposits) is anticipated to be smaller as the alignment is closer to the original San Diego Bay shoreline in this area. The remaining portion of the alignment from the Santa Fe Depot ATC Station to the Civic/Core ATC Station is characterized by variably thick undocumented fill soils underlain by the Bay Point and San Diego Formations.

Figure K-3. Geologic Map of San Diego with Concept 5A Geology



Source: WSP 2023

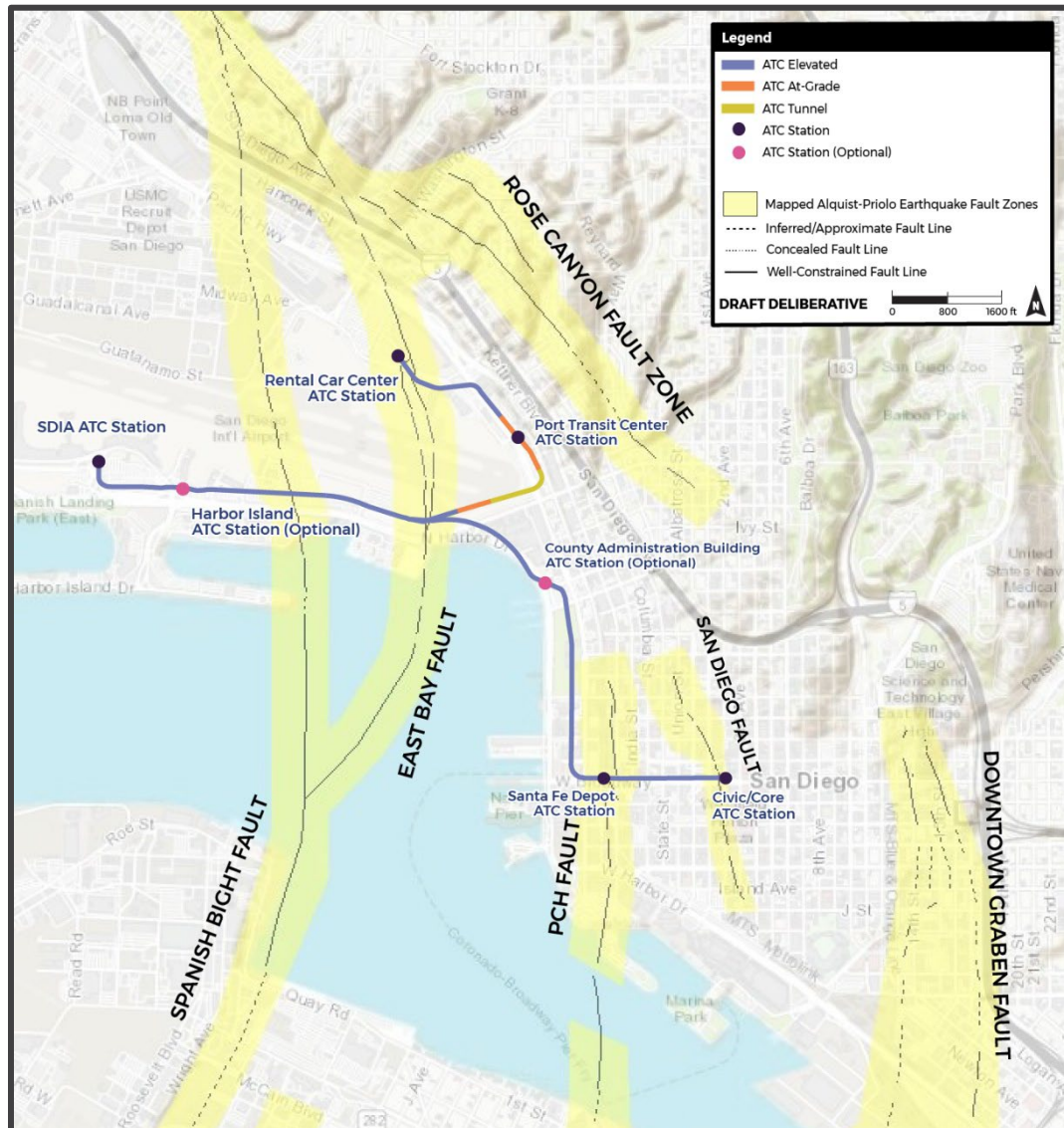
From a seismic/faulting perspective, the area is considered seismically active and includes several known active faults (Figure K-4). An active trace of the Spanish Bight Fault crosses the alignment immediately to the west of the intersection of Liberator Way and North Harbor Drive (Figure K-4). Likewise, an active trace of the East Bay Fault crosses the alignment north of the US Coast Guard Station on North Harbor Drive and it continues north toward the SDIA rental car center. These fault traces generally are perpendicular with the elevated alignment running east-west.

The seismically active, relatively wide, Rose Canyon Fault Zone (RCFZ) is located east of the cut-and-cover alignment on Laurel Street and is anticipated to run parallel to the northern part of the alignment. This portion of the RCFZ is inferred to possibly connect to the northerly converging Pacific Coast Highway and San Diego Faults. The southern portion of the alignment through Pacific Highway runs within a mapped Alquist-Priolo Earthquake Fault Zone. The last section of the alignment from the Santa Fe Depot ATC Station to the Civic/Core ATC Station crosses an additional Alquist-Priolo Earthquake Fault Zone triggered by the presence of the San Diego fault. As such, the possibility of active faulting in this area is considered very high. The presence of active faults can have a significant impact to the project, particularly for structures that are classified for human occupancy. These may include, but are not limited to, passenger stations and the OMSF. Fault rupture hazard studies will be required to ensure that habitable structures are placed at a sufficient distance from active fault traces.

Groundwater elevations near areas of the alignment located closer to San Diego Bay may be tidally influenced but are relatively close to the ground surface. The presence of relatively shallow groundwater, when coupled with seismic ground motion and certain subsurface conditions, increases susceptibility to liquefaction, lateral spreading and seismic settlements. Soil liquefaction occurs when saturated, cohesionless soils lose their stiffness and strength due to the build-up of excess pore water pressure during cyclic loading, such as that induced by earthquakes. The primary factors affecting the liquefaction potential of a soil deposit are intensity and duration of earthquake shaking, soil type and relative density, overburden pressures, fines content, and depth to groundwater. Soils most susceptible to liquefaction are saturated loose sands and low plasticity to non-plastic silts. The potential consequences of liquefaction to structures include loss of bearing capacity, post-liquefaction settlement, slope instability, and surface sand boils. When combined with a sloping ground or “free faces,” such as bridge abutments, the loss of soil shear strength and stiffness that is associated with liquefaction can result in lateral spreading displacements (a form of seismic slope instability also known as “flow failure”) that can impose lateral loads upon the foundations and result in several feet of permanent soil lateral displacements.

Post-liquefaction seismic settlements occur when the excess pore water pressure induced by the seismic shaking dissipates and the soil readjusts in a new equilibrium condition. This typically occurs within a few seconds to minutes after the earthquake event. Post-liquefaction settlements can pose a significant hazard to structures founded on shallow foundations. The hydraulic fill soils and estuarine deposits in this area likely have a moderate to high potential for earthquake induced liquefaction, lateral spreading, and seismic settlement.

Figure K-4. Downtown San Diego Alquist-Priolo Earthquake Fault Zones with Concept 5A Alignment



Source: WSP 2023

Farther from San Diego Bay, lateral spreading is less likely as the ground elevation rises and the soil conditions generally improve. The Bay Point Formation is generally considered medium dense to dense sandy soil and firm to very stiff clayey soil that is not prone to liquefaction during seismic events. The San Diego Formation may contain very dense and hard sandstone and conglomerate materials and is not considered to be prone to liquefaction.

Table K-11 provides a qualitative summary of the geologic and geotechnical conditions for the various components of this concept. Table K-12 includes an assessment of the favorability that each geotechnical/geologic condition is anticipated to have on the various project locations and alignment types.

Table K-11. Concept 5A Geologic and Geotechnical Conditions

LOCATION	UPPER SOIL LAYER COMPETENCY	DEPTH TO COMPETENT SOFT ROCK	ACTIVE FAULTING POTENTIAL	LIQUEFACTION POTENTIAL	LATERAL SPREADING POTENTIAL
Elevated ATC along N Harbor Dr	Very poor	Very Deep	Very High (3 to 4 perpendicular crossings)	Very High	High
Cut-and-cover tunnel	Poor	Deep	Moderate (possible PCH and SD Fault crossings)	High	Moderate
SDIA rental car center and vicinity	Fair	Moderate	High (3 to 4 oblique fault crossings)	Moderate	Low
Pacific Highway Alignment to Santa Fe Depot	Fair	Deep	Very High (3 to 4 oblique fault crossings)	Moderate	Low
Santa Fe Depot to Civic Center	Fair	Deep	Very High (PCH and SD Faults cross)	Moderate	Low

Source: WSP 2022

Notes: ATC = Airport Transit Connector; PCH = Pacific Coast Highway; SD = San Diego; SDIA = San Diego International Airport

Table K-12. Concept 5A Geologic and Geotechnical Conditions Favorability Evaluation

LOCATION	UPPER SOIL LAYER COMPETENCY	DEPTH TO COMPETENT SOFT ROCK	ACTIVE FAULTING POTENTIAL	LIQUEFACTION POTENTIAL	LATERAL SPREADING POTENTIAL
Elevated ATC along N Harbor Dr	Low	N/A	Low	Very Low	Low
Cut-and-cover tunnel	Medium	N/A	Medium	Low	Medium
SDIA rental car center and vicinity	High	N/A	Low	Medium	High
Pacific Highway Alignment to Santa Fe Depot	Medium	N/A	Low	High	High
Santa Fe Depot to Civic Center	High	N/A	Low	N/A	N/A
Overall Concept 5A	Medium				

Source: WSP 2022

Notes:

High: High favorability (geotechnical condition is highly favorable for this location and alignment type)

Medium: Medium favorability (geotechnical condition is favorable for this location and alignment type)

Low: Low favorability (geotechnical condition is not favorable for this location and alignment type)

Very Low: Very Low favorability (geotechnical condition is particularly not favorable for this location and alignment type)

ATC = Airport Transit Connector; N/A: Not Applicable (geotechnical condition is irrelevant for this location and alignment type); SDIA = San Diego International Airport

K.5.5. Regulatory Considerations

The Regulatory Considerations criterion identifies the federal and state agency approvals, permits, and coordination potentially required for implementation of each concept. The following details the types of agency approval and permits that may be applicable to each concept, based on information available to date. Additional approvals and coordination may be identified during subsequent phases of the project development process. All concepts would require environmental clearance pursuant to the California Environmental Quality Act (CEQA), for which SANDAG would be the CEQA lead agency. Additionally, the project would likely have a federal nexus, which would also require environmental clearance pursuant to the National Environmental Policy Act. At this time, a federal lead agency has not been identified.

Federal Aviation Administration

The Federal Aviation Administration (FAA) is the largest United States transportation agency and regulates all aspects of civil aviation within the country. Concept 5A proposes a fixed aerial structure along N. Harbor Drive and would construct facilities within 5,000 feet of FAA facilities. The following regulations would apply to both permanent features and construction activities associated with Concept 5A where the concept is in proximity or on airport property.

Title 14, Chapter 1 of the Code of Federal Regulations (CFR). Title 14, Chapter 1 of the CFR includes policies and regulations that govern the development and construction within airport property or within zones of airport influence, such as noise zones. This CFR also includes regulations governing runway protection zones and obstructions to air navigation in Part 77, "Safe, Efficient Use, and Preservation of the Navigable Airspace." Part 77.9, "Construction or Alteration Requiring Notice," provides height restriction standards for the construction of any facilities within 20,000 feet, 10,000 feet, and 5,000 feet from the nearest point of the nearest runway of the SDIA. A Notice of Proposed Construction or Alteration (FAA Form 7460-1) would need to be filed at least 45 days (1 year recommended) prior to construction to confirm a "No Hazard" determination from FAA related to permanent impacts within Part 77 surfaces. That form would also need to be filed at least 45 days prior to construction (minimum 90 days recommended) for temporary impacts and would identify the location of all construction equipment and top elevations near the runway.

California Coastal Commission

The California Coastal Commission (CCC) is a state agency within the California Natural Resources Agency with quasi-judicial control of land and public access along the state's 1,100 miles of coastline. Concept 5A proposes an aerial alignment along N. Harbor Drive, Pacific Highway, and Broadway which would be located within the California Coastal Zone as identified by the CCC. The following regulations would apply to both permanent features and construction activities within the California Coastal Zone.

Title 15, CFR Parts 923 and 930, "Coastal Zone Management Act (CZMA)." Title 15, Part 923 of the CFR contains the requirements for the California coastal management program, pursuant to the CZMA of 1972. California's program identifies coastal resources that require management or protection by the state, including resources that are located within Coastal Zones and would be subject to impacts from development. The CZMA defines Coastal Zones as

“coastal waters...and the adjacent shorelands...strongly influenced by each other and in proximity to the shorelines of coastal states.” Title 15, Part 930 of the CFR requires a federal consistency review of federal agency, federally permitted, and federally funded (to state and local government) activities that affect the Coastal Zone.

Title 14, Natural Resources, Division 5.5. Regulations under Title 14, Division 5.5, pursuant to the California Coastal Act of 1976, defines the roles and responsibilities of the CCC to carry out the full purposes and provision of the Act. Chapter 5, “Coastal Development Permits Issued by Coastal Commissions,” governs the process for the CCC to assess and approve coastal development permits for projects located within Coastal Zones.

United States Fish and Wildlife Service

The United States Fish and Wildlife Service (USFWS) is the federal agency responsible for enacting and enforcing federal conservation legislation. Due to the presence of the federally endangered California least tern near the southeast property line of the airport, consultation with USFWS would be required.

Federal Endangered Species Act (FESA). The FESA regulates the take of endangered and threatened species and their adverse modification of federally designated critical habitat. Take as defined under the FESA means “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.” Procedures for addressing take of federally listed species follow two principal pathways, both of which require consultation with the USFWS, which administers the FESA for terrestrial and aquatic species limited to inland waters, or National Oceanic and Atmospheric Administration, which administers the FESA for marine species. The first pathway, a Section 10(a) incidental take permit, applies to situations where a nonfederal governmental entity must resolve potential adverse impacts on species protected under the FESA. The second pathway, a Section 7 consultation, applies to projects directly undertaken by a federal agency or private projects requiring a federal permit or approval. Section 7 consultation between the federal project lead and USFWS is anticipated.

Migratory Bird Treaty Act (MBTA). Title 50, Part 10 of the CFR contains the provisions of the MBTA, which establishes the protection of migratory birds under the authority of the USFWS. Under this Act, taking, killing, or possessing migratory birds including feathers, or other parts, nests, eggs, or products, is unlawful except as allowed by implementing regulations (50 CFR 21). At this time there is no process in place for USFWS to authorize the incidental take of migratory birds that may result from construction activities or from striking project facilities during operations. Regulated species are listed at CFR Title 50 Part 10.13.

California Department of Fish and Wildlife (CDFW)

The CDFW is the state agency which manages and protects the state’s flora, fauna, and habitats. The CDFW is responsible for enforcing state conservation legislation including the California Endangered Species Act (CESA). Due to the presence of the California least tern, which is listed as a State of California endangered species, near the southeast property line of the airport, coordination with CDFW may be required.

California Endangered Species Act. Sections 2050 through 2098 of the California Fish and Game Code outline the protection provided to California's rare, endangered, and threatened species. Section 2080 of the Fish and Game Code prohibits the taking of plants and animals listed under the CESA. According to the Fish and Game Code, take is defined as to hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill. Applicants who obtain a federal incidental take permit for a species also listed under CESA and expect take as described above, may request a determination from CDFW that the federal document is consistent with CESA. If the CDFW Director determines that the federal incidental take permit is consistent with CESA, a Consistency Determination will be issued. If CDFW does not issue a Consistency Determination a Section 2081 incidental take permit would be required.

San Diego County Regional Airport Authority

The San Diego County Regional Airport Authority (Airport Authority) is the agency responsible for managing the operations of SDIA and for addressing the San Diego region's long-term air transportation needs. The Airport Authority also serves as the region's Airport Land Use Commission. Coordination with the Airport Authority would be required for the portions of the concept on or adjacent to airport property. Coordination with the Airport Authority would be required for the portions of the concept on or adjacent to airport property.

SDIA Biodiversity Plan. The Airport Authority publishes the Biodiversity Plan, which directs the Authority's management of plants and wildlife on airport property. In particular, the Biodiversity Plan establishes the framework for the habitat management of the endangered California least tern, which has been known to nest on bare areas in the airport infields. Management strategies are driven in part by the Airport's 1993 Biological Opinion and 2018 Informal Consultation.

Federal Railroad Administration

The Federal Railroad Administration (FRA) is a federal agency within the US Department of Transportation responsible for the transportation of goods and people on railways. Concept 5A proposes a Santa Fe Depot ATC Station located on Broadway at Kettner Boulevard. From the Santa Fe Depot ATC Station, the Concept 5A alignment would continue east along Broadway to the Civic/Core ATC Station. New facilities connecting to Amtrak facilities would require cooperation and approval from Amtrak and would be required to comply with all regulations and safety statues of the CFR related to passenger rail construction and operation.

Title 49, Subtitle B, Chapter VII of the CFR. The National Railroad Passenger Corporation (Amtrak) is a for-profit corporation authorized by the Rail Passenger Service Act which provides rail passenger services. Amtrak is not an agency or establishment of the US Government but is a service subject to the rules and regulations of the FRA. Railroads on standard gage track which are part of the general railroad system of transportation, including Class I, Class II, National Railroad Passenger Corporation (Amtrak), and other railroads providing commuter service in a metropolitan or suburban area are required to cooperate with the FRA on operating rules, timetables, and other metrics. FRA operational regulations do not apply to railroads or rapid transit operations in an urban area operating outside of the general railroad system of transportation.

California Public Utilities Commission

The California Public Utilities Commission (CPUC) has safety and security regulatory authority over all rail transit and other public transit fixed guideway systems under Public Utilities Code Section 99152 and other statutes. CPUC defines Rail Fixed Guideway Systems as any light, heavy, or rapid rail system, monorail, inclined plane, funicular, trolley, cable car, automatic people mover, or automated guideway transit system used for public transit. Coordination with CPUC and compliance with applicable General Orders will be required.

Conclusion

Concept 5A may require permitting and coordination with the FAA, CCC, USFWS, CDFW, Airport Authority, FRA, Amtrak, and the local jurisdictions and may be required to comply with applicable regulations including, but not limited to, the following:

- FAA: 14 CFR Chapter 14
- CCC: 15 CFR Parts 923 and 930 - Coastal Zone Management Act
- CCC: Title 14, Natural Resources Division 5.5, California Coastal Commission
- USFWS: Federal Endangered Species Act
- USFWS: Migratory Bird Treaty Act
- CDFW: California Endangered Species Act
- SDIA Biodiversity Plan
- FRA: 49 CFR Subtitle B, Chapters II and VII
- CPUC: General Orders

K.6. Cost

K.6.1. Capital Cost

The capital costs estimate for Concept 5A included the estimated costs for the following program components:

- Construction
- Vehicles
- Professional services
- Unallocated contingency (20%)

Concept 5A would feature an aerial alignment, but when combined with Concept 1A would also include at-grade and tunnel segments. Prototypical Unit Price Elements were developed to represent anticipated aerial guideway configurations, stations, maintenance facilities, and enabling work. High-level estimates for vehicle acquisitions and allowances for professional

services were also included. Refer to Appendix P for additional detail on the methodology used for the cost estimate.

At this stage of the project development process, costs were estimated in rough-orders-of-magnitude for purposes of comparing each concept to each other. The cost estimates are in 2022 dollars. Right-of-way costs were not included in these estimates. Table K-13 outlines the capital cost estimate for Concept 5A including a range from low to high.

Table K-13. Concept 5A Capital Cost

CONCEPT DESCRIPTION	COST IN MILLIONS (2022)		
	LOW	MID-POINT	HIGH
Concept 5A ATC to PTC/CONRAC and Civic/Core (aerial)	\$2,398.6	\$2,821.9	\$3,668.4

Source: WSP, HDR 2022

Note: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center

K.6.2. Cost per Rider

The cost per rider was calculated using the 2050 ridership forecasts and capital costs developed for this study to provide a more direct comparison of concepts given the differences in the number of stations and locations served. Table K-14 summarizes the cost per rider estimates for Concept 5A, including a range from low to high.

Table K-14. Concept 5A Cost Per Rider

CONCEPT	COST (2022)		
	LOW	MID-POINT	HIGH
Concept 5A ATC to PTC/CONRAC and Civic/Core (aerial)	\$4.65	\$5.34	\$6.95

Source: WSP, HDR 2022

Note: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center

K.6.3. Cost per Mile

Cost per mile was calculated based on capital cost and the length of each concept in 2022 dollars. Table K-15 presents the cost per mile for Concept 5A including a range from low to high.

Table K-15. Concept 5A Cost Per Mile

CONCEPT DESCRIPTION	COST IN MILLIONS (2022)		
	LOW	MID-POINT	HIGH
Concept 5A ATC to PTC/CONRAC and Civic/Core (aerial)	\$567	\$668	\$868

Source: WSP, HDR 2022

Note: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center

K.6.4. Operations and Maintenance

Estimation of annual Operations and Maintenance (O&M) costs associated with Concept 5A is outside of the scope of this study. However, a high-level comparative assessment of probable O&M cost in qualitative terms was undertaken. Table K-16 presents a qualitative assessment of the main O&M cost elements for the three technologies under consideration – ATC, Trolley (light rail transit [LRT]), and bus. Among the various ATC concepts, O&M costs would generally increase as the alignment length, number of stations, and/or ridership increases. As shown in Table K-16, the ATC concepts would have high O&M cost for two of the seven elements: guideway infrastructure and energy consumption.

Table K-16. Operations and Maintenance Costs

COST DRIVER	ATC	TROLLEY (LRT)	ENHANCED BUS	ASSESSMENT
Guideway Infrastructure	\$\$\$	\$\$	\$	LRT concept would take advantage of using existing infrastructure along the Green Line and therefore would incur less maintenance cost. Bus infrastructure is shared with infrastructure owned by others and would have low infrastructure maintenance costs.
Operations and Support Staff	\$\$	\$\$\$	\$\$\$	Additional cost for personnel (salaries/insurance/medical etc.), including drivers/operators and associated support personnel. OMSF design and capacity requirements (restrooms/conference rooms/offices/utility costs) are also affected by the number of personnel required for operations. ATC vehicles are assumed to be automated (i.e., driverless).
Vehicle Maintenance	\$\$	\$\$\$	\$	ATC vehicles operate at much shorter headways requiring higher vehicle count compared to LRT vehicles expected to operate on 15-minute headways. Buses would also have a higher vehicle count than LRT vehicles to provide comparable capacity; however, both ATC and LRT are more complex vehicles and more costly to maintain. Also, maintenance costs are lower for rubber-wheeled vehicles (ATC and bus). Special maintenance equipment is required for steel wheel truing and rail grinding. LRT vehicles also employ a pantograph system to collect power from an overhead catenary system requiring additional maintenance.
Energy Consumption	\$\$\$	\$	\$\$\$	The performance and frequency of ATC vehicles typically translates to higher energy consumption/demand. Energy cost for ATC vehicles might therefore be higher than that of LRT vehicles. Energy consumption for buses using internal combustion engines may be lower per vehicle, but the number of vehicles required would be much higher.

COST DRIVER	ATC	TROLLEY (LRT)	ENHANCED BUS	ASSESSMENT
Systems	\$	\$\$	\$	Train control systems for LRT would include Automatic Train Protection but not Automatic Train Operation because trains are manually driven. Because a typical ATC uses vehicle location/communication dynamics (as well as Automatic Train Operation) for movement, authority wayside equipment such as signals/signs and associated cables are minimal. Enhanced bus service typically implements Transit Signal Priority over existing traffic control equipment requiring a nominal amount of maintenance.

Source: WSP and HDR 2022

Notes: ATC = Airport Transit Connector; LRT = light rail transit; OMSF = Operations, Maintenance and Storage Facility

K.7. Community Effects and Economic Benefits

The community effects evaluation criteria identify the anticipated community effects and adjacent development considerations for each concept. The community effects analysis contains four primary components: (1) identifying the communities within each station area (0.5-mile buffer around each station), (2) identifying the population and housing within each station area, (3) identifying the jobs and employment industries within each station area, and (4) identifying the percentage of workers, including SDIA workers, who travel from the north, south, and east areas of San Diego County to reach the Project Area (defined as the combined station areas for the concept).

Communities were identified using ArcGIS and data from the SANDAG GIS Open Data Portal. Population and housing within each station area was determined using U.S. Census Bureau 2017-2021 American Community Survey 5-Year estimates. The US Census Bureau’s OnTheMap web feature was used to determine (1) the number of jobs by industry within each station area and (2) the municipal origins for workers commuting to the Project Area. Job industries are categorized based on the North American Industry Classification System (NAICS), which is the federal classification standard for businesses in the United States. The OnTheMap web feature displays the top 12 municipal home destinations for the Project Area and condenses the remaining destination under the “All Other Locations” category. The following 12 cities were assessed as home destinations for workers in the Project Area by the OnTheMap web feature: San Diego, Chula Vista, El Cajon, National City, Los Angeles, La Mesa, Santee, La Presa, Lemon Grove, Carlsbad, Spring Valley, and Escondido. The adjacent development considerations analysis identifies the number of vacant parcels within each station area. Vacant properties within the station areas were identified using the Parcel and Current Land Use datasets from the SanGIS/SANDAG GIS Data Warehouse.

K.7.1. Adjacent Community Effects

Surrounding Communities

Concept 5A would provide connections to 10 City of San Diego communities: SD International Airport, Middletown, Park West/Bankers Hill, Harborview, Marina, Little Italy, Core-Colombia, Horton Plaza, Gaslamp, and Cortez. The SDIA ATC Station and Harbor Island ATC station areas are within the SD International Airport community. The PTC ATC station area is within the Park West/Bankers Hill and Harborview communities. The Rental Car ATC station area is located within the Middletown community. The County Administration Building ATC Station is within the Park West/Bankers Hill, Harborview, and Marina communities, while the Santa Fe Depot ATC station area is within the Little Italy, Marina, Core-Colombia, and Horton Plaza communities. The Civic/Core ATC station area is within the Little Italy, Cortez, Marina, Core-Columbia, Horton Plaza, and Gaslamp communities (Table K-17).

Table K-17. Surrounding Communities for Concept 5A

STATION AREA ¹	COMMUNITIES
SDIA ATC Station	SDIA
Harbor Island ATC Station	SDIA
PTC ATC Station	Park West/Bankers Hill
	Harborview
Rental Car Center ATC Station	Middletown
County Administration Building ATC Station ²	Park West/Bankers Hill
	Harborview
	Little Italy
Santa Fe Depot ATC Station ³	Little Italy
	Marina
	Core-Colombia
	Horton Plaza
Civic/Core ATC Station	Little Italy
	Cortez
	Marina
	Core-Columbia
	Horton Plaza
	Gaslamp

Source: SANDAG 2022

Notes:

¹ Station Areas are defined as a 0.5-mile buffer from each station centroid.

² Under Concept 5A, the County Administration Building ATC Station would be located between Grape Street and Hawthorn Street.

³ Under Concept 5A, Santa Fe Depot ATC Station would be located on Broadway.

ATC = Airport Transit Connector; PTC = Port Transit Center; SDIA = San Diego International Airport

Population and Housing

Table K-18 summarizes the population and number of households within 0.5 mile of each station. Concept 5A station areas contain approximately 16,100 households with a population of 29,000. The station area with the largest population and number of households is the Civic/Core ATC Station.

Table K-18. Population and Housing for Concept 5A

STATION AREA ¹	POPULATION	HOUSEHOLDS
SDIA ATC Station	300	0
Harbor Island ATC Station	200	0
PTC ATC Station	4,300	2,300
Rental Car Center ATC Station	2,000	800
County Administration Building ATC Station ²	6,900	4,300
Santa Fe Depot ATC Station ³	10,900	5,300
Civic/Core ATC Station	16,800	9,300
Total Project Area ⁴	29,000	16,100

Source: US Census Bureau 2023; SANDAG 2023

Notes:

¹Station Area is defined as a 0.5-mile buffer from each station centroid.

²Under Concept 5A, the County Administration Building Station would be located between Grape Street and Hawthorn Street.

³Under Concept 5A, the Santa Fe Depot Station would be located on Broadway.

⁴Project Area reflects the combined station areas for the concept. Station Area estimates do not sum to Project Area totals due to station area overlap.

ATC = Airport Transit Connector; PTC = Port Transit Center; SDIA = San Diego International Airport

Jobs and Employment

The Concept 5A station areas contain approximately 72,400 jobs. Transportation and Warehousing represents the largest share of jobs in the SDIA ATC Station, Harbor Island ATC Station, and Rental Car Center ATC station areas. Accommodation and Food Services represents the largest share of jobs in the PTC ATC station area and the County Administration Building ATC station area. Within the Santa Fe Depot Station and Civic/Core station areas, Public Administration represents the largest share of jobs. Table K-19 summarizes the percentage of jobs by the top NAICS industry employers within each station area and Project Area for Concept 5A.

Table K-19. Jobs and Employment Sectors for Concept 5A

NAICS SECTOR	PERCENTAGE (%) OF JOBS BY STATION AREAS ¹²							
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	PTC ATC STATION	RENTAL CAR CENTER ATC STATION	COUNTY ADMINISTRATION BUILDING ATC STATION ³	SANTA FE DEPOT ATC STATION ⁴	CIVIC/COR E ATC STATION	COMBINED CONCEPT 5A STATION AREA
Accommodation and Food Services	28.7	21.3	25.9	13.0	38.2	16.2	19.6	23.0
Administration & Support, Waste Management and Remediation	3.4	4.6	7.2	13.7	3.7	3.3	3.7	4.5
Agriculture, Forestry, Fishing and Hunting	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Arts, Entertainment, and Recreation	7.3	5.4	0.4	0.9	1.4	2.1	1.8	2.0
Construction	0.2	0.3	5.1	2.7	2.9	1.9	1.8	1.9
Educational Services	0.0	0.0	1.6	0.0	1.1	0.8	1.1	1.0
Finance and Insurance	2.7	0.0	1.8	0.1	2.2	4.9	6.6	5.3
Health Care and Social Assistance	0.0	0.0	5.4	4.6	2.3	1.3	2.3	2.3
Information	0.1	0.2	0.4	1.3	0.7	3.3	3.3	2.6
Management of Companies and Enterprises	0.0	0.0	0.9	0.5	0.6	1.6	1.4	1.2
Manufacturing	0.0	0.0	4.5	0.7	18.0	0.1	0.3	2.6
Mining, Quarrying, and Oil and Gas Extraction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Services (excluding Public Administration)	0.7	2.1	8.2	4.3	5.6	1.5	7.1	6.2
Professional, Scientific, and Technical Services	0.2	0.3	13.0	3.2	14.3	20.9	22.4	17.7

NAICS SECTOR	PERCENTAGE (%) OF JOBS BY STATION AREAS ¹²							
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	PTC ATC STATION	RENTAL CAR CENTER ATC STATION	COUNTY ADMINISTRATION BUILDING ATC STATION ³	SANTA FE DEPOT ATC STATION ⁴	CIVIC/COR E ATC STATION	COMBINED CONCEPT 5A STATION AREA
Public Administration	0.5	0.3	17.3	9.8	0.8	35.4	22.6	17.3
Real Estate and Rental and Leasing	3.4	9.0	4.7	8.4	3.9	2.2	2.0	2.7
Retail Trade	2.2	1.6	2.9	2.7	2.4	2.3	2.3	2.5
Transportation and Warehousing	50.1	54.7	0.0	33.8	0.1	0.6	0.3	6.1
Utilities	0.0	0.0	0.0	0.0	0.7	1.3	0.7	0.6%
Wholesale Trade	0.3	0.2	0.6	0.2	1.3	0.5	0.7	0.7%

Source: US Census Bureau 2022; SANDAG 2022

Notes:

¹Station Areas are defined as a 0.5-mile buffer from each station centroid.

²The OntheMap tool displays employment data at the census place and census block levels. On the Map does not differentiate between employment headquarters that are physically located within the same census block.

³Under Concept 5A, the County Administration Building ATC Station would be located between Grape Street and Hawthorn Street.

⁴ Under Concept 5A, Santa Fe Depot ATC Station would be located on Broadway.

ATC = Airport Transit Connector; NAICS = North American Industry Classification System; PTC = Port Transit Center; SDIA = San Diego International Airport

Commuting Origins

The Concept 5A station areas employ workers who commute from several different cities. For Concept 5A, approximately 49 percent of workers commute from the communities within the City of San Diego; approximately 29 percent of workers commute from All Other Locations; and approximately 8 percent of workers commute from Chula Vista. For the SDIA ATC Station, Harbor Island ATC Station, PTC ATC Station, Rental Car Center ATC Station, County Administration Building ATC Station, Santa Fe Depot ATC Station, and Civic/Core ATC Station, the largest share of workers would commute to the Project Area from the City of San Diego, with the second-largest share commuting from All Other Locations, and the third-largest share commuting from Chula Vista. Table K-20 summarizes the home destination cities for workers employed in the station areas and Project Area of Concept 5A.

Table K-20. Home Destinations for Workers Employed in Concept 5A

CITY	SHARE OF TOTAL JOBS (%) BY STATION AREA ¹²							
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	PTC ATC STATION	RENTAL CAR CENTER ATC STATION	COUNTY ADMINISTRATION BUILDING ATC STATION ³	SANTA FE DEPOT ATC STATION ⁴	CIVIC/COR E ATC STATION	COMBINED CONCEPT 5A STATION AREA
San Diego	43.7	42.6	53.4	47.1	53.9	49.4	49.4	49.4
Chula Vista	7.7	8.2	8.2	9.0	7.7	8.6	8.3	8.2
El Cajon	2.0	2.4	1.8	2.5	1.9	2.4	2.3	2.2
Los Angeles	2.5	3.1	2.2	2.4	2.4	1.8	2.1	2.2
National City	3.9	3.6	1.8	2.5	1.9	1.8	1.8	2.0
La Mesa	1.5	1.8	2.1	2.5	2.0	2.2	2.1	2.1
Santee	1.2	1.3	1.6	1.2	1.6	1.6	1.4	1.4
La Presa	1.3	1.4	0.0	1.2	0.0	1.2	1.1	1.1
Lemon Grove	1.2	1.2	1.5	1.2	1.0	1.1	1.0	1.0
Carlsbad	0.0	0.0	0.0	0.0	0.9	1.1	0.0	1.0
Spring Valley	1.2	1.2	0.0	0.0	0.0	0.0	0.0	0.0
Escondido	0.0	0.0	1.2	1.2	0.0	0.0	0.0	0.0
Imperial Beach	0.0	0.0	1.2	0.0	1.0	0.0	0.0	0.0
All Other Locations ⁵	33.9	33.3	24.9	29.2	25.7	28.8	29.5	29.4

Source: US Census Bureau 2022

Notes:

¹Station Area is defined as a 0.5-mile buffer from each station centroid.

²The OntheMap tool commute destination information does not differentiate between worker transport mode (if any), regular or occasional commutes, or whether an employee works remotely. Workplace destinations are defined by the physical mailing address of each employment headquarters.

³Under Concept 5A, the County Administration Building ATC Station would be located between Grape Street and Hawthorn Street.

⁴Under Concept 5A, Santa Fe Depot ATC Station would be located on Broadway.

⁵Includes all other US Census defined Places from where workers commute.

ATC = Airport Transit Connector; PTC = Port Transit Center; SDIA = San Diego International Airport

K.7.2. Adjacent Development Considerations

Economic opportunities for Concept 5A are determined by the number of existing vacant properties within each station area. Vacant parcels identified must have a minimum of 20,000 square feet and could not be in areas zoned as residential. No parcels were identified.

APPENDIX L CONCEPT 5B: BORED TUNNEL AIRPORT TRANSIT CONNECTOR FROM SAN DIEGO INTERNATIONAL AIRPORT TO PORT TRANSIT CENTER/CONSOLIDATED RENTAL CAR CENTER AND SANTA FE DEPOT EXTENDED TO CIVIC/CORE

L.1. Description of Concept

For the Airport Transit Connector (ATC) concepts, transit connections to the north and south of San Diego International Airport (SDIA) were evaluated with variations of stops, termini, configurations, and features. All ATC concepts assume an operations, maintenance, and storage facility (OMSF) would be located on the Port Headquarters (referred to as the Port Transit Center (PTC)). The ATC concepts evaluated in this study, include the provision of both a northern and southern alignment for the ATC, though the stops, termini, configurations, and ultimate location of the OMSF, are subject to further analysis and modification, and will be confirmed during the environmental clearance process. For this analysis, Concepts 3, 4, and 5 are combined with Concept 1A, the common north route. Concept 5B would feature a south spur of 1.5-mile high-frequency underground ATC in a dedicated right-of-way from Concept 1A with a connection to SDIA to a terminus at a Civic/Core ATC Station on Broadway. Concept 5B would also add a new Santa Fe Depot ATC Station, creating a connection to the existing Santa Fe Depot and an optional County Administration Building ATC Station. When interlining with a north route concept, passengers would also have access to the SDIA ATC Station and optional Harbor Island ATC Station. Table L-1 provides information on concept characteristics.

Figure L-1 shows the combined Concept 1A and Concept 5B alignment. From the SDIA Station located at the transit-ready area at the airport, the Concept 1A fixed guideway would be on aerial structure along Harbor Drive before transitioning to a cut-and-cover tunnel adjacent to Laurel Street. The alignment would remain in a tunnel under Pacific Highway. The alignment would then turn north and be at-grade and parallel with the existing Metropolitan Transit System (MTS) right-of-way to the PTC ATC Station. North of the station, the guideway would transition to an aerial structure and cross Pacific Highway and Admiral Boland Way to terminate at the Consolidated Rental Car Center ATC Facility (CONRAC) Station.

Concept 5B would interline with Concept 1A at the cut-and-cover segment of Concept 1A adjacent to Laurel Street. The tunnel boring machine (TBM) launch site would be located at the OMSF on the Port Headquarters site located along Concept 1A, and a temporary starter tunnel would be provided. The alignment would transition to a bored tunnel to continue south beneath Pacific Highway, and the optional County Administration Building ATC Station would be located along Pacific Highway, between Grape Street and Hawthorn Street. South of Grape Street, the Concept 5B alignment would continue south below Pacific Highway in a bored tunnel before turning east to continue beneath Broadway and connect to the Santa Fe Depot ATC Station and Civic/Core ATC Station. The Civic/Core ATC terminus station would be located on Broadway, west of 3rd Avenue. A dedicated bicycle/pedestrian connection would provide a connection to

the existing San Diego Trolley (Trolley) Blue and Trolley Orange Line Civic Center Station on C Street.

Table L-1. Concept 5B Characteristics

CHARACTERISTIC	
Length of alignment at-grade (miles)	0
Length of alignment on aerial structure (miles)	0
Length of alignment in tunnel (miles)	1.5
Total alignment length (miles)	1.5
Number of stations ¹	2 ²
Minimum/shortest headways	4 minutes ³

Source: WSP, HDR 2022

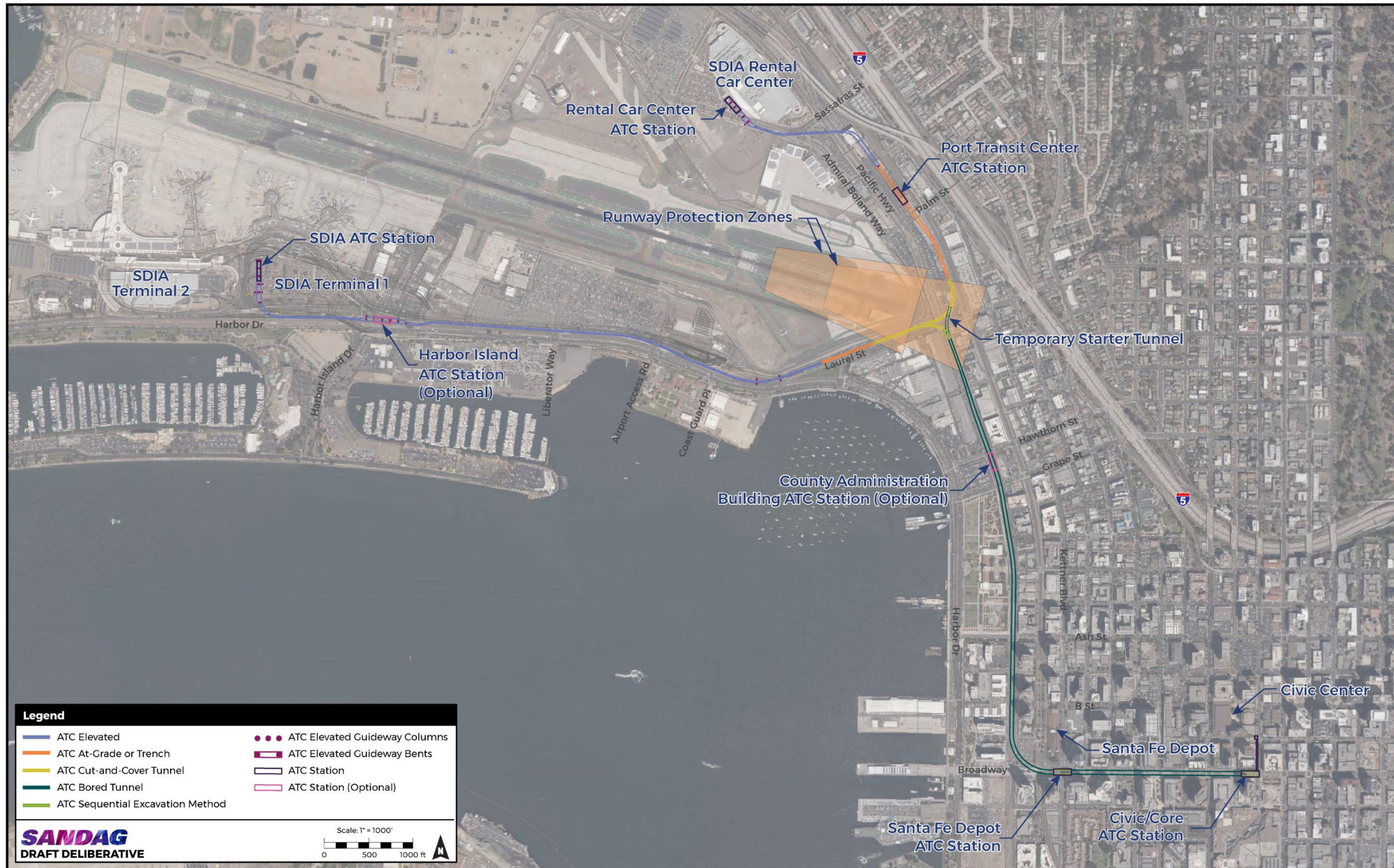
Notes:

¹Stations include only those provided for the south route concept, although south route passengers would also have access to the Concept 1A SDIA ATC Station and optional Harbor Island ATC Station.

²County Administration Building is a potential third station.

³When combined with Concept 1A, headways would be two minutes where the concepts overlap.

Figure L-1. Concept 5B Bored Tunnel Airport Transit Connector from San Diego International Airport to Santa Fe Depot Extended to Civic/Core



Source: WSP, HDR 2022

L.2. Passenger Convenience and Ridership

L.2.1. Regional Connectivity

Regional connectivity is evaluated by identifying the number of modes of transportation and the number of major destinations and community facilities that can be reached within a 0.5-mile buffer of a station (defined as the “station area”). For the purpose of this analysis, “destinations” include major tourist destinations (e.g., attractions, museums, commercial shopping areas, recreational/historic areas) and community facilities (e.g., schools, parks, libraries, police/fire stations, hospitals). The information presented in this section reflects regional connectivity for the concept inclusive of Concept 1A.

Modes of Transportation

Concept 5B would have connections to the greater transit network, including the MTS bus and Trolley light rail (Blue Line, Green Line, and Orange Line), North County Transit District COASTER commuter trains, and the Amtrak Pacific Surfliner. The following describes the available connections to existing bus transit routes, Trolley connections, bike routes, and major roadways, with information included in Table L-2.

Bus Transit Routes: Concept 5B would provide connections to 19 MTS bus routes: San Diego Airport Flyer shuttle (AIR), 2, 3, 5, 7, 11, 12, 20, 83, 110, 120, 215, 225, 235, 280, 290, 901, 923, and 992.

Rail and Trolley Lines: Concept 5B would have connections to five rail and Trolley lines: Trolley Blue, Green, and Orange Lines, Amtrak, and COASTER.

Bike Routes: Concept 5B would have connections to the City of San Diego Bicycle Network (including bike lanes, separated bikeways, and bike routes), Interstate (I-) 5 Bridge (i.e., the pedestrian bridge over I-5), North Harbor Drive Bike Path, Embarcadero Path, California Path, Columbia Path, Martin Luther King, Jr. Promenade, Bayshore Bikeway, and Harbor Drive Pedestrian Bridge.

Major Roads, Arterials, and Collector Streets: Major roads are usually four to six lanes wide with limited access, grade separations, and extra lanes where needed. Major roads are designed for through traffic but usually have signals at major intersections. Major arterials are usually four to six lanes wide and although designed primarily for through traffic, arterials also provide access to abutting property. Collector Streets are typically two to four lanes wide and function as feeders of traffic to the major street system and provide continuity with local streets.

Concept 5B would be accessible by 10 major roadways and 21 arterial/collector streets.

Table L-2. Regional Connectivity for Concept 5B

CATEGORY	COUNT	ROUTE NAMES	STATION AREA ¹
Bus Routes	19	AIR (San Diego Airport Flyer Shuttle)	SDIA ATC, Harbor Island ATC (Optional)
		83 (Downtown San Diego - Old Town)	Port Transit Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC, Civic/Core ATC
		923 (Downtown to Point Loma)	SDIA ATC, Harbor Island ATC (Optional), Port Transit Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC, Civic/Core ATC
		992 (Airport/Downtown)	
		11 (SDSU - Downtown San Diego)	
		225 (Downtown - Otay Mesa TC)	
		235 (Downtown - Escondido Transit Center)	
		280 (Escondido Transit Center - Downtown)	
		290 (Rancho Bernardo Station - Downtown)	
		215 (Mid-City Rapid)	Santa Fe Depot ATC, Civic/Core ATC
		2 (Downtown San Diego - 30th & Adams)	
		3 (UCSD Hospital - Euclid Transit Center)	
		7 (Downtown San Diego - University/College)	
		110 (Mira Mesa - Downtown via Hwy 163)	
		120 (Downtown San Diego - Kearny Mesa Transit Center)	
		901 (Iris Transit Center - Downtown San Diego)	
		5 (Downtown San Diego - Euclid Transit Center)	
		12 (City College - Skyline Hills)	
		20 (Downtown - Rancho Bernardo Transit Station)	

CATEGORY	COUNT	ROUTE NAMES	STATION AREA ¹
Rail and Trolley Lines	5	Trolley Blue Line	Port Transit Center ATC, Rental Car Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC, Civic/Core ATC
		Trolley Green Line	
		COASTER	Santa Fe Depot ATC
		Amtrak Pacific Surfliner	
		Trolley Orange Line	Santa Fe Depot ATC, Civic/Core ATC
Bike Routes	7	I-5 Bridge (pedestrian bridge over I-5)	Port Transit Center ATC
		North Harbor Dr Bike Path	SDIA ATC, Harbor Island ATC (Optional), County Administration Building ATC (Optional)
		Embarcadero Path	Port Transit Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC
		City of San Diego Bicycle Network	SDIA ATC, Harbor Island ATC (Optional), Port Transit Center ATC, Rental Car Center ATC County Administration Building ATC (Optional), Santa Fe Depot ATC, Civic/Core ATC
		Martin Luther King, Jr. Promenade	Santa Fe Depot ATC, Civic/Core ATC
		California Path	
		Columbia Path	
Major Street	10	W Laurel St	Port Transit Center ATC, County Administration Building ATC (Optional)
		North Harbor Dr	SDIA ATC, Harbor Island (Optional), Port Transit Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC
		Pacific Hwy	SDIA ATC, Harbor Island ATC (Optional), Port Transit Center ATC, Rental Car Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC
		Front St	County Administration Building ATC (Optional), Santa Fe Depot ATC, Civic/Core ATC
		Market St	Santa Fe Depot ATC, Civic/Core ATC
		Broadway	

CATEGORY	COUNT	ROUTE NAMES	STATION AREA ¹
		Harbor Dr	
		6th Ave	Civic/Core ATC
		Park Blvd	
		Washington St	Rental Car Center ATC
Arterial/Collector Street	21	Hawthorn St	County Administration Building ATC (Optional)
		Reynard Way	Port Transit Center ATC, County Administration Building ATC (Optional)
		Grape St	County Administration Building ATC (Optional), Santa Fe Depot ATC
		1st Ave	County Administration Building ATC (Optional), Santa Fe Depot ATC, Civic/Core ATC
		A St	
		Ash St	
		State St	
		Kettner Blvd	Port Transit Center ATC, Rental Car Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC, Civic/Core ATC
		India St	
		Sassafras St	Port Transit Center ATC, Rental Car Center ATC
		Hancock St	Rental Car Center ATC
		San Diego Ave	
		4th Ave	
		4th Ave	Santa Fe Depot ATC, Civic/Core ATC
		B St	
		C St	
		F St	
		G St	
		5th Ave	Civic/Core ATC
		8th Ave	
		10th Ave	
		11th Ave	

Source: WSP, HDR, GPM, and TAHA 2022

Notes:

¹Station area is defined as a 0.5-mile buffer from the station centroid.

ATC = Airport Transit Connector; SDIA = San Diego International Airport

Connections to Destinations

There would be 63 destinations within Concept 5B station areas (Table L-3). Several of the destinations can be reached from more than one proposed station and would not require a transfer.

Table L-3. Destinations within Concept 5B Station Areas

DESTINATIONS	STATION AREA ¹
Harbor Island	SDIA ATC, Harbor Island ATC (Optional)
San Diego Harbor Police	
San Diego International Airport	
Spanish Landing Park (East)	
Spanish Landing Park (West)	
Maple Canyon Open Space	Port Transit Center ATC
Montessori School of San Diego	Port Transit Center ATC, Rental Car Center ATC
Rental Car Center	
Marine Corps Recruit Depot San Diego	Rental Car Center ATC
San Diego Lindbergh Field Fire Station	
SDFD Fire Station 3	Port Transit Center ATC, County Administration Building ATC (Optional)
Col. Salomon Child Development Center	County Administration Building ATC (Optional)
Complete Caregiver, Inc	
Harborview Senior Assisted Living	
San Diego Rescue Mission Children's Center	
Planned Parenthood of SDRC - First Avenue Center	
Washington Elementary School	
Windward Home Health	
Firehouse Museum	
Little Italy	
Maritime Museum of San Diego	
NHA - Stem Institute for Early Learning	
SD Fire Station 2	
Star of India Museum	

DESTINATIONS	STATION AREA ¹
The Embarcadero	Santa Fe Depot ATC
Waterfront Park/Harborview	
Broadway Landing	
Lane Field Park	
Navy Pier	
Ruocco Park	
Seaport Village Shopping Center	
Tuna Harbor Park	
Cruise Ship Terminal	
The Headquarters at Seaport	
USS Midway Museum	Santa Fe Depot ATC, Civic/Core ATC
Aspen Leaf Nursery & Preschool	
Balboa Theatre	
Civic Center	
Downtown San Diego/Core-Colombia	
Federal Courthouse	
Hall Of Justice	
Horton Plaza Park	
King Promenade Park	
King-Chavez Community High School	
Metro Arson Strike Team	
Metropolitan Corrections Center	
Museum of Contemporary Art San Diego	
San Diego Central Courthouse	
San Diego Central Jail	
SDFD Fire Station 1	
SDFD Fire Station 1/201	
The New Children's Museum	

DESTINATIONS	STATION AREA ¹
NHA - Broadway Early Learning Academy	Civic/Core ATC
Pantoja Park	
California Western School Of Law	
Davis House Park	
DTFHC At Connections	
Gary And Mary West Senior Dental Center, Inc.	
Gaslamp Museum at Davis-Horton House Museum & Park	
Gaslamp Quarter	
New Vistas	
Paul Mitchell The School-San Diego	
San Diego Chinese Historical Museum	

Source: WSP, HDR, GPM, and TAHA 2022

Notes:

¹Station area is defined as a 0.5-mile buffer from the station centroid.

ATC = Airport Transit Connector; SDFD = San Diego Fire Department; SDIA = San Diego International Airport

L.2.2. User Experience

The evaluation of user experience relates to the station area environment and a passenger’s experience on the vehicle considering elements such as ease of transfers, navigation, and passenger comfort. For the purpose of this analysis, the ease of transfers considered the distance and navigation to the nearest connecting services. The number of modes of transportation that can be reached within 0.5-mile buffer of each station is discussed in Section L.2.1.

Drop-off/Pick-up, Navigation, and Transfer Convenience

The following sections summarize transfer convenience for each proposed station along Concept 5B, including between modes of transit and by vehicle, as applicable. Transfer convenience was evaluated in terms of distance between modes of transit and vehicular drop-off/pick-up locations and the proposed ATC Station. As design is advanced throughout subsequent phases of project development, it is assumed that wayfinding, in terms of signage and paths of travel, would be provided to direct passengers to transfer locations. Therefore, wayfinding is not evaluated on a station-by-station basis.

SDIA ATC Station: Vehicular pick-up and drop-off or transfers from the ATC to bus are not expected at this station. It is anticipated that passengers boarding or alighting the ATC at this station would be traveling to or from SDIA. The nearest entrance at Terminal 1 and Terminal 2 would require passengers to walk a minimum of 0.2 mile. This station would be served by trains traveling on both the north route Concept 1A alignment, which includes a terminus at the Rental Car Center ATC Station, and the south route alignment to Santa Fe Depot and Civic/Core.

Given the two routes, passengers travelling to SDIA would need to select the correct train, and clear signage depicting the routes would be needed.

Harbor Island ATC Station (Optional): While connections at this location would be limited, this station would allow for access to the MTS Route 923 N Harbor Dr and Harbor Island Dr bus stop, walking 300 feet west along Harbor Drive to reach the westbound stop and 500 feet along Harbor Drive and Harbor Island Drive to reach the eastbound stop. This station would also create a direct pedestrian linkage across Harbor Drive to future development on Harbor Island. Vehicular drop-off and pick-up are not anticipated at this station.

County Administration Building ATC Station (Optional): This station would be located along Pacific Highway, south of Hawthorn Street. This station would allow transfers to MTS bus Routes 923 and 992 on Harbor Drive within a 400-foot walk and Routes 280 and 290 on Grape Street within a 500-foot walk.

Santa Fe Depot ATC Station: The Santa Fe Depot ATC Station includes ample transfer opportunities including eight bus routes, two light rail lines (i.e., Trolley Blue and Green Lines), Amtrak intercity rail, and COASTER commuter rail service. This station would be located along Broadway at Kettner Boulevard, southeast of the existing Santa Fe Depot, and passengers would have access to the connecting services with a 200-foot walk. Passengers exiting the ATC Station would be in view of the existing Santa Fe Depot waiting room and ticket office building, a city landmark, which would support navigation. However, given the considerable amount of connecting services scattered among various on-street stops, navigating between transit services may be confusing, and clear signage at the ATC Station would be needed. No dedicated, transit parking facilities exist at Santa Fe Depot, although there is an existing private parking lot adjacent to Santa Fe Depot which charges a fee for parking. Vehicular drop-off and pick-up space are provided along Kettner Boulevard.

Civic/Core ATC Station: The Civic/Core ATC terminus station would be located on Broadway, west of 3rd Avenue and approximately 500 feet south of the existing Trolley Blue and Trolley Orange Line Civic Center Station on C Street. A dedicated bicycle/pedestrian connection between both stations would be provided along 3rd Avenue, which would allow for clear navigation for passengers traveling between each station area and to the Civic Center. The station would also provide direct access to bus stops on Broadway, between 2nd Avenue and 3rd Avenue serving nine MTS bus routes. At Broadway and 1st Avenue, passengers would have access to four additional bus routes within a 200-foot walk.

Station Amenities

Each station, as preliminarily designed, would provide ample space for shelters, seating, lighting, trash receptacles, and other modern conveniences and design features. The existing Santa Fe Depot also offers restrooms, vending machines, and an ATM. The Civic/Core station is located within a constrained area, but space will be available for amenities such as shelters, seating, and lighting.

Fare Payment Method

The ATC fare concept has not yet been fully established, but for the purposes of this evaluation it is assumed that the ATC would be fare free. A fare free concept allows for a smoother boarding process and would minimize travel delay compared to systems where a passenger pays as they board.

Boarding Method

It is assumed that the ATC vehicles would provide level boarding (i.e., the floor of the vehicle is at the same level as the boarding platform), allowing passengers to step or roll directly onto the vehicle without a step up or down. This type of boarding is easier for passengers with luggage, as well as passengers with strollers, in wheelchairs, or with other mobility impairments compared to vehicles that do not have level boarding.

Luggage Accommodations

The ATC vehicles are assumed to be designed with airport travel in mind, with space for luggage, available but minimal seating conducive to short trips, and ample hand-holds.

Reliability

Concept 5B would operate in a dedicated, fully separated underground right-of-way with no shared operations for the entirety of the ATC alignment. The absence of conflicting services and separation from traffic would reduce opportunities for delays along the alignment and would support reliable operations.

Ride Comfort

Concept 5B is proposed to operate in a dedicated, fully separated underground right-of-way before interlining with Concept 1A. The separated guideway minimizes potential conflicts with other vehicles, as well as the potential for additional stopping or starting at intersections.

L.2.3. Travel Time

Transit Travel Time

The evaluation of transit travel time considered the total time spent traveling on transit to and from destinations within the county. Transit travel time included time from the first mode of transit used to the destination, inclusive of transfers, and was obtained from the San Diego Association of Governments (SANDAG) ABM2+ model. Transit travel times to SDIA were calculated for the AM peak hour and transit travel times from SDIA were calculated for the PM peak hour. Transit travel times to and from each destination were compared to against a No Project baseline. Table L-4 outlines the transit travel times for each destination evaluated.

Compared to the No Project baseline, Concept 5B would reduce the transit travel time to each of the 14 destinations evaluated. The reduction in transit travel time for Concept 5B would range from 3-24 minutes.

Table L-4. Concept 5B Transit Travel Time

LOCATION/ DESTINATION	NO PROJECT BASELINE		CONCEPT 5B ATC TO PTC/CONRAC AND CIVIC/CORE (BORED TUNNEL)	
	TO SDIA	FROM SDIA	TO SDIA	FROM SDIA
Legoland	64	64	61	61
Carlsbad/Carlsbad Village Station	63	63	53	53
Grossmont Center Mall	61	61	41	41
Mission Bay/Mission Bay Park	32	32	18	18
Mission Valley/Fashion Valley Station	36	36	19	19
Chula Vista City Hall	45	45	41	41
Bayfront Redevelopment/E Street Station	45	45	39	39
Bayfront Redevelopment (Gaylord Pacific Resort and Convention Center & Harbor Park)	47	47	40	40
San Ysidro Transit Center	60	60	36	36
San Diego State University/SDSU Transit Center	52	52	32	32
University of California, San Diego/UCSD Central Campus Station	41	41	29	29
Convention Center	24	24	20	20
Liberty Station (Commercial & Bus Transit)	23	23	16	16
Ocean Beach (Downtown Area)	41	41	18	18

Source: SANDAG, WSP, and HDR 2022

Notes: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center; SDIA = San Diego International Airport; San Diego State University; UCSD = University of California San Diego

Headways

The evaluation of travel time also considered headways, or the time between transit vehicles. The headways presented in this evaluation are consistent with those used in the ridership forecasts. Actual headways would be determined during later stages of project development.

Concept 5B would operate with 4-minute headways. When combined with Concept 1A, Concept 5B would operate with 2-minute headways where the two concepts interline to connect to SDIA.

L.2.4. Ridership

Projected ridership in 2050 was modeled for Concept 5B by line, station, and systemwide based on forecasts from the San Diego Association of Governments (SANDAG) model. Systemwide ridership was compared against a No Project baseline. As Concept 5B includes implementation of Concept 1A, the ridership forecast included both the north route and south route ATC

segment. Concept 5B also assumes continued service of MTS Route 992 (Downtown/Airport). Table L-5 outlines the projected 2050 daily ridership for Concept 5B and systemwide.

Table L-5. Concept 5B and Regional 2050 Ridership

CONCEPT DESCRIPTION	ROUTE	DAILY RIDERSHIP	TOTAL REGIONAL BOARDINGS
Concept 5B ATC to PTC/CONRAC and Civic/Core (bored tunnel)	ATC north route segment	39,000	1,434,000
	ATC south route segment	10,000	
	ATC Total	50,000	
	MTS Route 992	2,000	

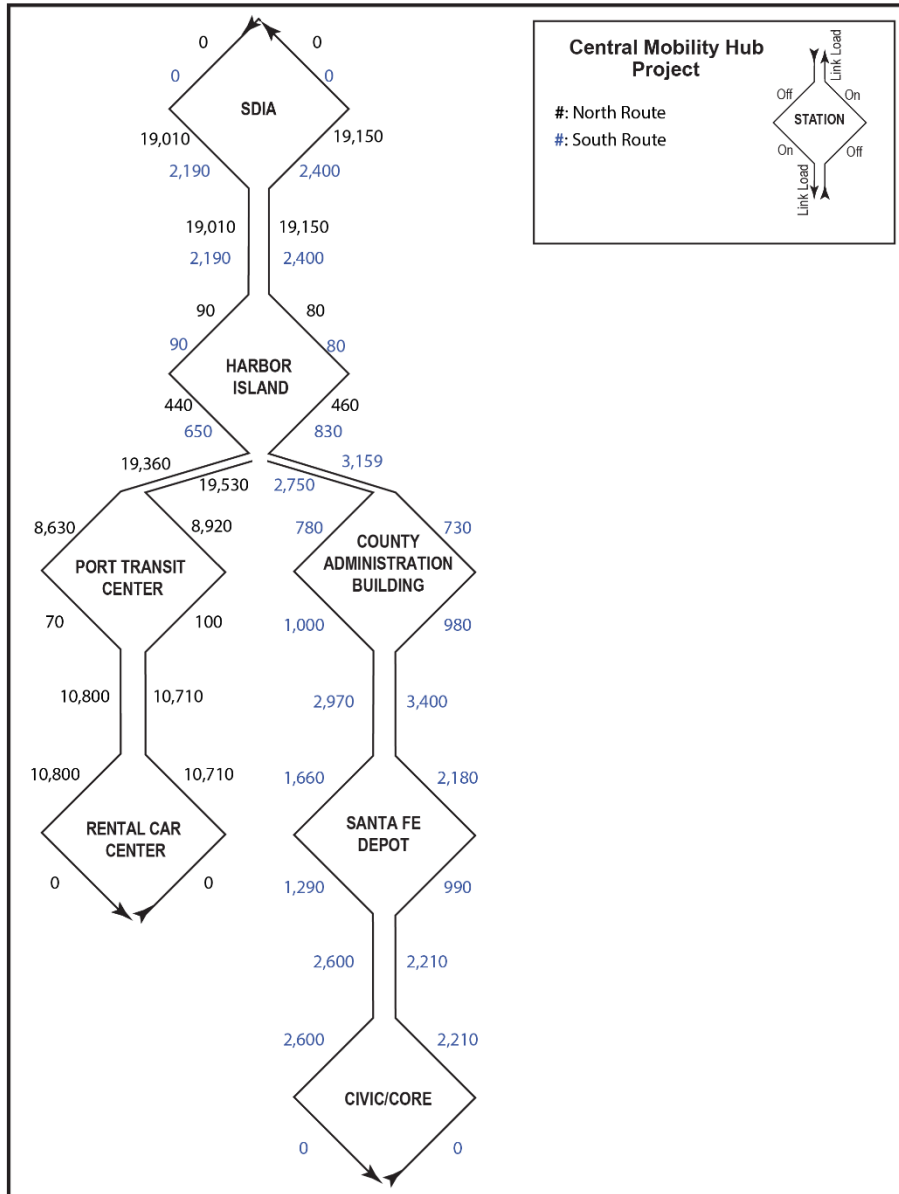
Source: SANDAG 2022

Notes: Numbers rounded to the nearest 1,000. Numbers may not equal due to rounding.

ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; MTS = Metropolitan Transit System; PTC = Port Transit Center

Figure L-2 identifies the 2050 ridership by station for Concept 5B, presenting the boardings (ons), alightings (off), and passengers on trains between stations.

Figure L-2. Concept 5B Ons and Offs by Station



Source: SANDAG 2023

Note: Numbers are rounded to the nearest 10; numbers may not equal due to rounding

L.3. Congestion of Airport Access

L.3.1. Traffic Effects

The evaluation of traffic effects considered the change in traffic volumes on select roadways, including those entering and leaving SDIA, associated with each concept. The change in traffic volumes was evaluated using average daily traffic (ADT) volumes from the SANDAG model,

which represent the average number of vehicles passing a specific point on a connection or roadway on an average day.

The 2050 ADT volumes on these roadways were compared for each segment against a No Project baseline to calculate the percent change in ADT. Table L-6 outlines the roadways considered in this evaluation and the percent change in ADT. Compared to the No Project baseline, Concept 5B would reduce ADT for all roadway segments except for the segment on Hawthorn Street from Pacific Highway to Harbor Drive, which would result in an increase in ADT, and the segment along Harbor Drive from Market Street to Front Street which would not result in a change in ADT. The segments with the largest reduction in ADT would be the Airport Terminal 1 and 2 Roadways and the SDIA inbound access road with a 26 percent reduction, and Laurel Street from Pacific Highway to Harbor Drive with a 23 percent reduction in ADT. The reduction in ADT reflects travelers switching modes and/or points of access to reach SDIA and destinations served by Concept 5B.

Table L-6. Concept 5B Average Daily Traffic

ROADWAY SEGMENT	PERCENT CHANGE IN AVERAGE DAILY TRAFFIC COMPARED TO NO PROJECT BASELINE
Airport Terminal 1 and 2 Roadways	-26%
Harbor Drive from Laurel Street to Harbor Island Drive	-10%
SDIA Inbound Access Road from Laurel Street to SDIA	-26%
Harbor Drive from Grape Street to Ash Street	-8%
Harbor Drive from Market Street to Front Street	0%
Harbor Drive from Laning Road to McCain Road	-4%
Pacific Highway from Sassafras Road to Palm Street	-13%
Laurel Street from Pacific Highway to Harbor Dr	-23%
Hawthorn Street from Pacific Highway to Harbor Drive	8%
Grape Street from Pacific Highway to Harbor Drive	-7%

Source: SANDAG 2022

Note: SDIA = San Diego International Airport

L.4. Vehicle Miles Traveled and Greenhouse Gases

L.4.1. Vehicle Miles Traveled

Providing alternative transportation modes in the region would change the number of vehicles on the road. The change in 2050 vehicle miles traveled (VMT) associated with implementation of Concept 5B was calculated against a No Project baseline. Table L-7 summarizes the 2050 regional VMT and change in VMT compared to the No Project baseline.

Table L-7. Concept 5B Vehicle Miles Traveled

CONCEPT DESCRIPTION	2050 REGIONAL VMT ¹	REGIONAL VMT REDUCTION FROM NO PROJECT ¹
No Project Baseline	88,620,000	—
Concept 5B ATC to PTC/CONRAC and Civic/Core (bored tunnel)	88,491,000	-129,000

Source: SANDAG 2022

Notes:

¹Numbers are rounded to the nearest 1,000.

ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center; VMT = vehicle miles traveled

L.4.2. Greenhouse Gases

A change in 2050 VMT would result in a corresponding change in 2050 greenhouse gas (GHG) emissions. To evaluate the change in emissions, A select link analysis was performed within the SANDAG ABM2+ model. The VMT on the select links was compared to the No Project baseline to calculate the change in VMT. EMFAC per mile emission rates in pollutant-per-mile-traveled units were calculated for each concept and the No Project baseline.

Table L-8 compares the GHG emissions reductions between the No Project baseline and Concept 5B. With a VMT reduction, Concept 5B would result in a 0.91 percent reduction in GHG emissions.

Table L-8. Concept 5B Operational GHG Emissions

CONCEPT DESCRIPTION	GHG EMISSIONS (MMT _{CO2E}) (TONS PER DAY) ¹	PERCENT CHANGE IN GHG COMPARED TO NO PROJECT BASELINE
No Project Alternative (2050)	24,590	—
Concept 5B ATC to PTC/CONRAC and Civic/Core (bored tunnel)	24,370	-0.91%

Source: SANDAG 2022

Notes:

¹Numbers are rounded to the nearest 10.

ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; GHG = greenhouse gas; MMT_{CO2e} = million metric tons of CO_{2e}; PTC = Port Transit Center

L.5. Feasibility / Complexity

L.5.1. Right-of-Way

The evaluation of right-of-way requirements considered the number of parcels that may have acquisitions (partial or full) to support the concept and the number of buildings that may require demolition. A buffer was used to identify properties, defined as 20 feet for aerial and at-grade, 20 feet for tunnel/cut-and-cover, 10 feet from edge of straddle bents, and 20 feet at stations. Concept 5B would consist of a bored tunnel alignment with two stations and one optional station. The right-of-way requirements for the SDIA and optional Harbor Island Station are included under Concept 1A. As Concept 5B would interline with Concept 1A, the evaluation considered the potential requirements of Concept 5B in addition to Concept 1A. The evaluation identified a total of 37 parcels within the buffer. Additionally, nine buildings could require demolition (Table L-9).

Table L-9. Concept 1A and 5B Right-of-Way Requirements

CONCEPT DESCRIPTION	RIGHT-OF-WAY REQUIREMENTS	
	NUMBER OF PARCELS AFFECTED	NUMBER OF BUILDINGS POTENTIALLY REQUIRING DEMOLITION
Concept 1A ATC to CONRAC	24	9
Concept 5B ATC to Civic/Core (bored tunnel)	13	0
Total	37	9

Source: WSP, HDR, GPM 2022

Notes: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center

L.5.2. Construction Effects/Constructability

This section discusses constructability considerations associated with the major infrastructure elements featured in each concept under evaluation with the purpose of identifying probable construction methods, staging, sequences, traffic impacts, and any temporary facilities that would be implemented during the construction phase.

Concept 5B is similar to 5A in connections but would provide connection to the Santa Fe Depot ATC Station and the Civic/Core ATC Station through a bored tunnel rather than via an aerial alignment. Concept 5B has similar constructability aspects to Concepts 1A and 3B. This concept would add 1.5 miles of alignment in twin-bored tunnels to Concept 1A (Table L-1 and Figure L-1). The primary considerations of constructability of the aerial alignment options are identical to Concept 1A and 3B, with an increased length of bored tunnels compared to Concept 3B. The section of cut-and-cover tunnel discussed for Concept 1A would still be required, and the bored tunnel would only provide the connection from the wye at Laurel Street to Santa Fe Depot and the Civic Center. The considerations for the bored tunnel construction are the same as for Concept 3B but would extend a greater distance.

The underground station constructability considerations would be similar as described for Concept 3B. The TBM receiving box would be located at the Civic/Core ATC Station site on Broadway between Second and Third Avenues. In addition, construction access to the Civic/Core station box could be located on Second Avenue south of Broadway using a shaft constructed next to the box or a stub out from the box. Second Avenue would be closed for traffic during station construction, but Broadway would remain open, although some nighttime closures might be necessary.

L.5.3. Major Utilities

Potential conflicts with existing utilities were identified for Concept 5B. Major utilities in this evaluation are defined as water facilities equal to or greater than 16 inches, sewer facilities equal to or greater than 18 inches, and storm drain facilities equal to or greater than 36 inches. Concept 5B consists of a bored tunnel alignment with two stations and one optional station. A buffer was established from the centerline of the nearest rail and within depth thresholds beneath the surface ground level to capture utilities within 20 feet for tunnel/cut-and-cover and 20 feet at stations. Utilities within the buffer for bored tunnels were not included in this analysis as it is expected that the tunnel will be substantially deeper than any utilities, with the exception of specific locations such as the TBM launch and retrieval sites and at stations. As Concept 5B would interline with Concept 1A, the evaluation considered the utility impacts of Concept 5B in addition to Concept 1A. Concept 5B could result in 19 utilities impacts. Table L-10 outlines the number and type of major utilities identified.

Table L-10. Concept 5B Utility Impacts

CONCEPT DESCRIPTION	NUMBER OF MAJOR UTILITY IMPACTS		
	SEWER	WATER	STORM DRAIN
Concept 1A ATC to PTC/CONRAC	3	4	4
Concept 5B ATC to PTC/CONRAC Civic/Core (bored tunnel)	3	4	1
Total	6	8	5

Source: WSP, HDR, GPM 2022

Notes: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center

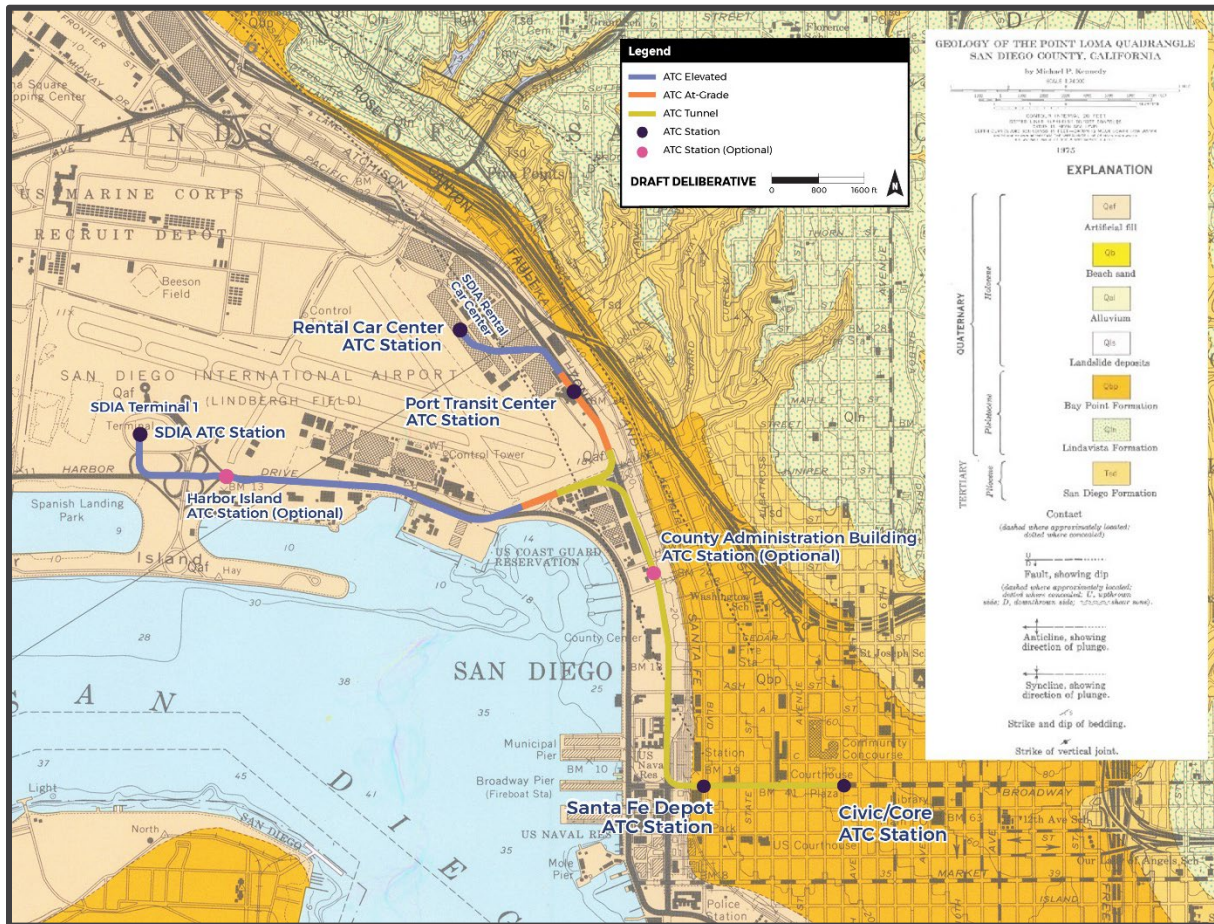
L.5.4. Geotechnical and Seismic Conditions

Geotechnical conditions along the alignment of Concept 5B are highly variable. Figure L-3 presents a geologic map of San Diego with Concept 5B overlaid onto it, and an overview of the subsurface conditions along the alignment. In particular, the subsurface materials along N Harbor Drive likely consist of a sequence of highly variable undocumented fill soil (placed above water), overlying relatively thick hydraulic fill soils (placed under water). These fill soils are sequentially underlain by various naturally deposited geologic formations that were deposited in various geologic epochs. From the youngest, and therefore right below the undocumented fills and in descending order, are Holocene-age estuarine deposits (also referred to as bay deposits), Quaternary-age granular and cohesive old paralic deposits (also known as Bay Point Formation), Pliocene-age marine sandstone and conglomerate (also known as the San Diego Formation), and undifferentiated fossilized marine and non-marine Eocene-age rock.

The area at the eastern end of the runway, located adjacent to West Laurel Street and the cut-and-cover tunnel, may consist of an easterly decreasing thickness of fill material. This area also likely contains both buried alluvial and colluvial materials that were deposited by surficial erosion from Maple Canyon located just east of I-5. This material may have a significant gravel, cobble, and boulder-sized materials. The elevated section of the alignment near the SDIA rental car center likely contains a thinner layer of estuarine deposits compared to other areas of the alignment.

The southern portion of the alignment along Pacific Highway, from the Solar Turbines parking lot to the Santa Fe Depot Station, generally follows the original, historic shoreline of San Diego Bay. The subsurface material sequence in this area is anticipated to consist of variably thick undocumented fill soil, some hydraulic fill, estuarine deposits, Bay Point Formation and San Diego Formation. While the general sequence of geologic formations is similar to the areas described above, the thickness of less competent and more problematic soils (i.e. undocumented fill and estuarine deposits) is anticipated to be smaller as the alignment is closer to the original San Diego Bay shoreline in this area. The remaining portion of the alignment from the Santa Fe Depot ATC Station to the Civic/Core ATC Station is characterized by variably thick undocumented fill soils underlain by the Bay Point and San Diego Formations.

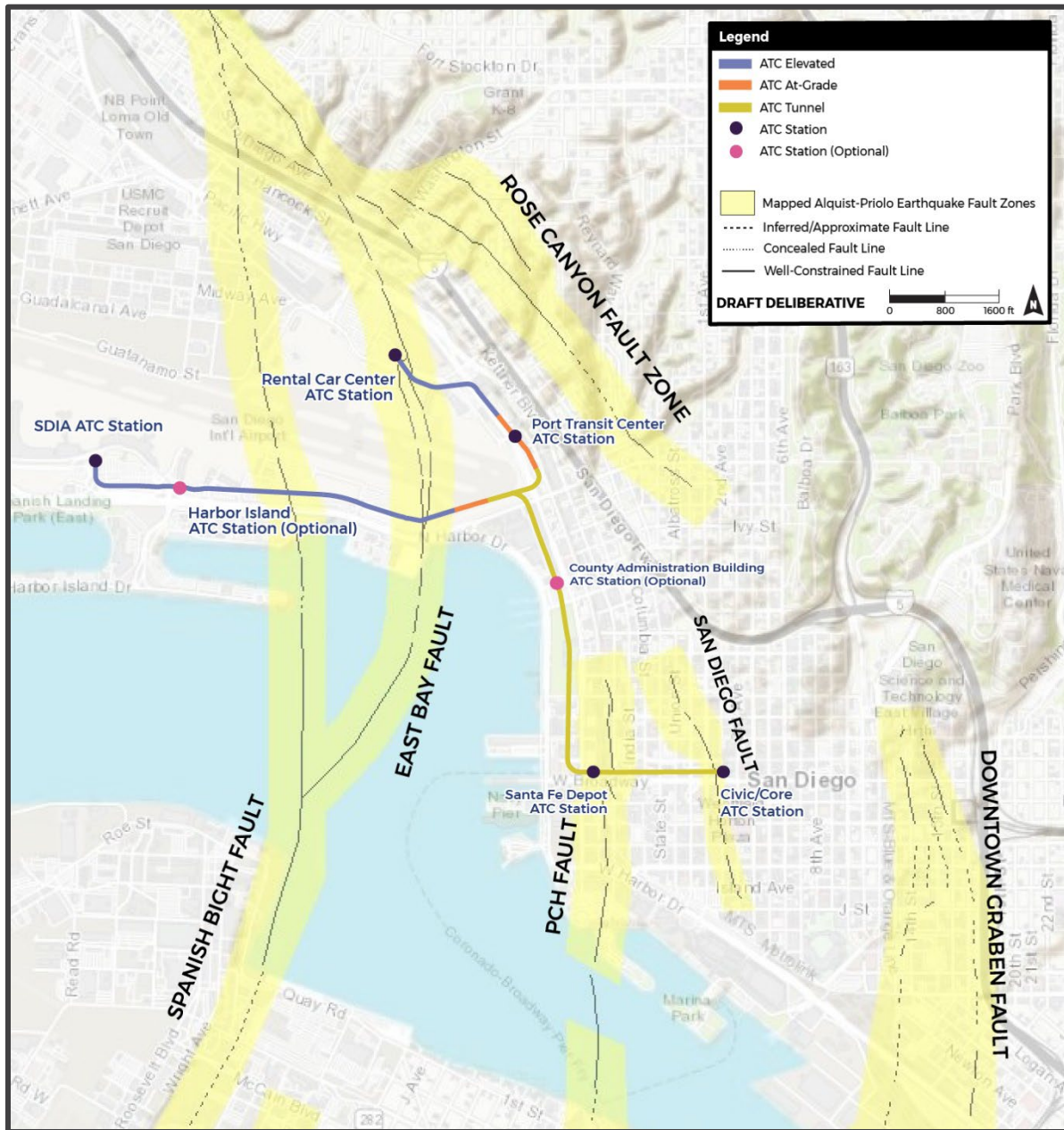
Figure L-3. Geologic Map of San Diego with Concept 5B Geology



Source: WSP 2023

From a seismic/faulting perspective, the area is considered seismically active and includes several known active faults (Figure L-4). An active trace of the Spanish Bight Fault crosses the alignment immediately to the west of the intersection of Liberator Way and North Harbor Drive (Figure L-4). Likewise, an active trace of the East Bay Fault crosses the alignment north of the US Coast Guard Station on North Harbor Drive and it continues north toward the SDIA rental car center. These fault traces generally are perpendicular with the elevated alignment running east-west. The seismically active, relatively wide, Rose Canyon Fault Zone (RCFZ) is located east of the cut-and-cover alignment on Laurel Street and is anticipated to run parallel to the northern part of the alignment. This portion of the RCFZ is inferred to possibly connect to the northerly converging Pacific Coast Highway and San Diego Faults. The location of these faults in between the designated Alquist-Priolo zones is unknown; however, there is a possibility that they could intersect the cut-and-cover alignment.

Figure L-4. Downtown San Diego Alquist-Priolo Earthquake Fault Zones with Concept 5B Alignment



Source: WSP 2023

The southern portion of the alignment beneath the Pacific Highway runs within a mapped Alquist-Priolo Earthquake Fault Zone. The last section of the alignment from the Santa Fe Depot ATC Station to the Civic/Core ATC Station crosses an additional Alquist-Priolo Earthquake Fault Zone associated with the San Diego fault. As such, the possibility of active faulting in this area is considered very high. The presence of active faults can have a significant impact to the project, particularly for structures that are classified for human occupancy. These may include, but are not limited to, passenger stations and the OMSF. Fault rupture hazard studies will be required to ensure that habitable structures are placed at a sufficient distance from active fault traces and that tunnel lining design can accommodate loads due to displacement along active fault traces.

Groundwater elevations near areas of the alignment located closer to San Diego Bay may be tidally influenced but are relatively close to the ground surface. The presence of a relatively shallow groundwater, when coupled with seismic ground motion and certain subsurface conditions, increases susceptibility to liquefaction, lateral spreading and seismic settlements. Soil liquefaction occurs when saturated, cohesionless soils lose their stiffness and strength due to the build-up of excess pore water pressure during cyclic loading, such as that induced by earthquakes. The primary factors affecting the liquefaction potential of a soil deposit are intensity and duration of earthquake shaking, soil type and relative density, overburden pressures, fines content, and depth to groundwater. Soils most susceptible to liquefaction are saturated loose sands and low plasticity to non-plastic silts. The potential consequences of liquefaction to structures include loss of bearing capacity, post-liquefaction settlement, slope instability, and surface sand boils. When combined with a sloping ground or “free faces,” such as bridge abutments, the loss of soil shear strength and stiffness that is associated with liquefaction can result in lateral spreading displacements (a form of seismic slope instability also known as “flow failure”) that can impose lateral loads upon the foundations and result in several feet of permanent soil lateral displacements.

Post-liquefaction seismic settlements occur when the excess pore water pressure induced by the seismic shaking dissipates and the soil readjusts in a new equilibrium condition. This typically occurs within a few seconds to minutes after the earthquake event. Post-liquefaction settlements can pose a significant hazard to structures founded on shallow foundations. The hydraulic fill soils and estuarine deposits in this area likely have a moderate to high potential for earthquake induced liquefaction, lateral spreading, and seismic settlement.

Farther from San Diego Bay, lateral spreading is less likely as the ground elevation rises and the soil conditions generally improve. The Bay Point Formation is generally considered medium dense to dense sandy soil and firm to very stiff clayey soil that is not prone to liquefaction during seismic events. The San Diego Formation may contain very dense and hard sandstone and conglomerate materials and is not considered to be prone to liquefaction.

Table L-11 provides a qualitative summary of the geologic and geotechnical conditions for the various components of this concept. Table L-12 includes an assessment of the favorability that each geotechnical/geologic condition is anticipated to have on the various project locations and alignment types.

Table L-11. Concept 5B Geologic and Geotechnical Conditions

LOCATION	UPPER SOIL LAYER COMPETENCY	DEPTH TO COMPETENT SOFT ROCK	ACTIVE FAULTING POTENTIAL	LIQUEFACTION POTENTIAL	LATERAL SPREADING POTENTIAL
Elevated ATC along N Harbor Dr	Very poor	Very Deep	Very high (3 to 4 perpendicular crossings)	Very High	High
Cut-and-cover tunnel	Poor	Deep	Moderate (possible PCH and SD Fault crossings)	High	Moderate
SDIA rental car center and vicinity	Fair	Moderate	High (3 to 4 oblique fault crossings)	Moderate	Low
Pacific Highway Alignment to Santa Fe Depot	Fair	Deep	Very High (3 to 4 oblique fault crossings)	Moderate	Low
Santa Fe Depot to Civic Center	Fair	Moderate	Very High (PCH and SD Faults cross)	Negligible	Negligible

Source: WSP 2022

Notes: ATC = Airport Transit Connector; PCH = Pacific Coast Highway; SD = San Diego; SDIA = San Diego International Airport

Table L-12. Concept 5B Geologic and Geotechnical Conditions Favorability Evaluation

LOCATION	UPPER SOIL LAYER COMPETENCY	DEPTH TO COMPETENT SOFT ROCK	ACTIVE FAULTING POTENTIAL	LIQUEFACTION POTENTIAL	LATERAL SPREADING POTENTIAL
Elevated ATC along N Harbor Dr	Low	N/A	Low	Very Low	Low
Cut-and-cover tunnel	Medium	N/A	Medium	Low	Medium
SDIA rental car center and vicinity	High	N/A	Low	Medium	High
Pacific Highway Alignment to Santa Fe Depot	High	Low	Very Low	N/A	N/A
Santa Fe Depot to Civic Center	High	High	Very Low	N/A	N/A
Overall Concept 5B	Medium-Low				

Source: WSP 2022

Notes:

High: High favorability (geotechnical condition is highly favorable for this location and alignment type)

Medium: Medium favorability (geotechnical condition is favorable for this location and alignment type)

Low: Low favorability (geotechnical condition is not favorable for this location and alignment type)

Very Low: Very Low favorability (geotechnical condition is particularly not favorable for this location and alignment type)

ATC = Airport Transit Connector; N/A: Not Applicable (geotechnical condition is irrelevant for this location and alignment type); SDIA = San Diego International Airport

L.5.5. Regulatory Considerations

The Regulatory Considerations criterion identifies the federal and state agency approvals, permits, and coordination potentially required for implementation of each concept. The following details the types of agency approval and permits that may be applicable to each concept, based on information available to date. Additional approvals and coordination may be identified during subsequent phases of the project development process. All concepts would require environmental clearance pursuant to the California Environmental Quality Act (CEQA), for which SANDAG would be the CEQA lead agency. Additionally, the project would likely have a federal nexus, which would also require environmental clearance pursuant to the National Environmental Policy Act. At this time, a federal lead agency has not been identified.

Federal Aviation Administration

The Federal Aviation Administration (FAA) is the largest United States transportation agency and regulates all aspects of civil aviation within the country. Concept 5B would have construction activities within the runway protection zones (RPZ) and within 5,000 feet of FAA facilities. The following regulations would apply to both permanent features and construction activities associated with Concept 5B where the concept is in proximity or on airport property.

Title 14, Chapter 1 of the Code of Federal Regulations (CFR). Title 14, Chapter 1 of the CFR includes policies and regulations that govern the development and construction within airport property or within zones of airport influence, such as noise zones. This CFR also includes regulations governing RPZ and obstructions to air navigation in Part 77, “Safe, Efficient Use, and Preservation of the Navigable Airspace.” Part 77.9, “Construction or Alteration Requiring Notice,” provides height restriction standards for the construction of any facilities within 20,000 feet, 10,000 feet, and 5,000 feet from the nearest point of the nearest runway of the SDIA. A Notice of Proposed Construction or Alteration (FAA Form 7460-1) would need to be filed at least 45 days (1 year recommended) prior to construction to confirm a “No Hazard” determination from FAA related to permanent impacts within Part 77 surfaces. That form would also need to be filed at least 45 days prior to construction (minimum 90 days recommended) for temporary impacts and would identify the location of all construction equipment and top elevations near the runway.

FAA Memorandum: Interim Guidance on Land Uses within a Runway Protection Zone.

The FAA Circular 150/5300-13B contains the FAA’s standards and recommendation for the engineering design and geometric layout of civil airport facilities, including runway design standards within RPZs. The circular acknowledges that some uses are permitted within RPZs under specific conditions. The FAA’s memorandum “Interim Guidance on Land Uses within a Runway Protection Zone” provides clarification on permissible and prohibited uses within the RPZ. Transportation development projects, including rail facilities (light or heavy, passenger or freight), that enter the limits of the RPZ would require coordination with the National Airport Planning and Environmental Division, APP-400. Concept 5B would be designed to avoid land use issues within the RPZ, minimize land use impacts in the RPZ, and mitigate risk to people and property on the ground (i.e., through tunneling, depressing, and/or protecting facilities through the RPZ).

California Coastal Commission

The California Coastal Commission (CCC) is a state agency within the California Natural Resources Agency with quasi-judicial control of land and public access along the state's 1,100 miles of coastline. Concept 5B proposes an alignment beneath Pacific Highway and Broadway which would be located within the California Coastal Zone as identified by the CCC. The following regulations would apply to both permanent features and construction activities within the California Coastal Zone.

Title 15, CFR Parts 923 and 930, “Coastal Zone Management Act (CZMA).” Title 15, Part 923 of the CFR contains the requirements for the California coastal management program, pursuant to the CZMA of 1972. California’s program identifies coastal resources that require management or protection by the state, including resources that are located within Coastal Zones and would be subject to impacts from development. The CZMA defines Coastal Zones as “coastal waters...and the adjacent shorelands...strongly influenced by each other and in proximity to the shorelines of coastal states.” Title 15, Part 930 of the CFR requires a federal consistency review of federal agency, federally permitted, and federally funded (to state and local government) activities that affect the Coastal Zone.

Title 14, Natural Resources, Division 5.5. Regulations under Title 14, Division 5.5, pursuant to the California Coastal Act of 1976, defines the roles and responsibilities of the CCC to carry out the full purposes and provision of the Act. Chapter 5, “Coastal Development Permits Issued by Coastal Commissions,” governs the process for the CCC to assess and approve coastal development permits for projects located within Coastal Zones.

United States Fish and Wildlife Service

The United States Fish and Wildlife Service (USFWS) is the federal agency responsible for enacting and enforcing federal conservation legislation. Due to the presence of the federally endangered California least tern near the southeast property line of the airport, consultation with USFWS would be required.

Federal Endangered Species Act (FESA). The FESA regulates the take of endangered and threatened species and their adverse modification of federally designated critical habitat. Take as defined under the FESA means “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.” Procedures for addressing take of federally listed species follow two principal pathways, both of which require consultation with the USFWS, which administers the FESA for terrestrial and aquatic species limited to inland waters, or National Oceanic and Atmospheric Administration, which administers the FESA for marine species. The first pathway, a Section 10(a) incidental take permit, applies to situations where a nonfederal governmental entity must resolve potential adverse impacts on species protected under the FESA. The second pathway, a Section 7 consultation, applies to projects directly undertaken by a federal agency or private projects requiring a federal permit or approval. Section 7 consultation between the federal project lead and USFWS is anticipated.

Migratory Bird Treaty Act (MBTA). Title 50, Part 10 of the CFR contains the provisions of the MBTA, which establishes the protection of migratory birds under the authority of the USFWS. Under this Act, taking, killing, or possessing migratory birds including feathers, or other parts,

nests, eggs, or products, is unlawful except as allowed by implementing regulations (50 CFR 21). At this time there is no process in place for USFWS to authorize the incidental take of migratory birds that may result from construction activities or from striking project facilities during operations. Regulated species are listed at CFR Title 50 Part 10.13.

California Department of Fish and Wildlife (CDFW)

The CDFW is the state agency which manages and protects the state's flora, fauna, and habitats. The CDFW is responsible for enforcing state conservation legislation including the California Endangered Species Act (CESA). Due to the presence of the California least tern, which is listed as a State of California endangered species, near the southeast property line of the airport, coordination with CDFW may be required.

California Endangered Species Act. Sections 2050 through 2098 of the California Fish and Game Code outline the protection provided to California's rare, endangered, and threatened species. Section 2080 of the Fish and Game Code prohibits the taking of plants and animals listed under the CESA. According to the Fish and Game Code, take is defined as to hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill. Applicants who obtain a federal incidental take permit for a species also listed under CESA and expect take as described above, may request a determination from CDFW that the federal document is consistent with CESA. If the CDFW Director determines that the federal incidental take permit is consistent with CESA, a Consistency Determination will be issued. If CDFW does not issue a Consistency Determination a Section 2081 incidental take permit would be required.

San Diego County Regional Airport Authority

The San Diego County Regional Airport Authority (Airport Authority) is the agency responsible for managing the operations of SDIA and for addressing the San Diego region's long-term air transportation needs. The Airport Authority also serves as the region's Airport Land Use Commission. Coordination with the Airport Authority would be required for the portions of the concept on or adjacent to airport property. Coordination with the Airport Authority would be required for the portions of the concept on or adjacent to airport property.

SDIA Biodiversity Plan. The Airport Authority publishes the Biodiversity Plan, which directs the Authority's management of plants and wildlife on airport property. In particular, the Biodiversity Plan establishes the framework for the habitat management of the endangered California least tern, which has been known to nest on bare areas in the airport infields. Management strategies are driven in part by the Airport's 1993 Biological Opinion and 2018 Informal Consultation.

Federal Railroad Administration

The Federal Railroad Administration (FRA) is a federal agency within the US Department of Transportation responsible for the transportation of goods and people on railways. Concept 5B would provide a new Santa Fe Depot ATC Station and an optional County Administration Building ATC Station. The Santa Fe Depot ATC Station would provide connections to the Trolley Blue and Trolley Green Lines, Amtrak Pacific Surfliner, COASTER, and bus. New facilities connecting to Amtrak facilities would require cooperation and approval from Amtrak

and would be required to comply with all regulations and safety statues of the CFR related to passenger rail construction and operation.

Title 49, Subtitle B, Chapter VII of the CFR. The National Railroad Passenger Corporation (Amtrak) is a for-profit corporation authorized by the Rail Passenger Service Act that provides rail passenger services. Amtrak is not an agency or establishment of the US Government but is a service subject to the rules and regulations of the FRA. Railroads on standard gage track that are part of the general railroad system of transportation, including Class I, Class II, Amtrak, and other railroads providing commuter service in a metropolitan or suburban area are required to cooperate with the FRA on operating rules, timetables, and other metrics. FRA operational regulations do not apply to railroads or rapid transit operations in an urban area operating outside of the general railroad system of transportation.

California Public Utilities Commission

The California Public Utilities Commission (CPUC) has safety and security regulatory authority over all rail transit and other public transit fixed guideway systems under Public Utilities Code Section 99152 and other statutes. CPUC defines Rail Fixed Guideway Systems as any light, heavy, or rapid rail system, monorail, inclined plane, funicular, trolley, cable car, automatic people mover, or automated guideway transit system used for public transit. Coordination with CPUC and compliance with applicable General Orders will be required.

Occupational Safety and Health Standards

The Occupational Safety and Health Administration (OSHA) is the regulatory agency of the US Department of Labor which ensures compliance with health and safety regulations for workers by enforcing standards and providing training, outreach, education, and assistance. Concept 5B would include boring construction activities and would be subject to OSHA regulations.

Title 29, Subtitle B, Chapter XVII, Part 1926 of the CFR. Title 29, Part 1926 of the CFR includes the safety and health regulations during construction. Section 1926.800 details workplace safety regulations for underground construction. Underground bored tunnel construction would be subject to OSHA rules and regulations contained in Title 29 of the CFR regarding safety, air quality monitoring, hazardous materials, ventilation, fire prevention, and other activities.

Conclusion

Concept 5B may require permitting and coordination with the FAA, CCC, USFWS, CDFW, SDIA, FRA, Amtrak, OSHA, and the local jurisdictions and may be required to comply with applicable regulations including, but not limited to, the following:

- FAA: 14 CFR Chapter 14
- FAA: Interim Guidance on Land Uses within a Runway Protection Zone
- CCC: 15 CFR Parts 923 and 930 - Coastal Zone Management Act
- CCC: Title 14, Natural Resources Division 5.5, California Coastal Commission

- USFWS: Federal Endangered Species Act
- USFWS: Migratory Bird Treaty Act
- CDFW: California Endangered Species Act
- SDIA Biodiversity Plan
- FRA: 49 CFR Subtitle B, Chapters II and VII
- CPUC: General Orders
- OSHA: 29 CFR, Subtitle B, Chapter XVII, Part 1926

L.6. Cost

L.6.1. Capital Cost

The capital costs estimate for Concept 5B included the estimated costs for the following program components:

- Construction
- Vehicles
- Professional services
- Unallocated contingency (20%)

Concept 5B would feature a bored tunnel alignment, but when combined with Concept 1A would also include at-grade and aerial segments. Prototypical Unit Price Elements were developed to represent anticipated tunnel guideway configurations, stations, maintenance facilities, and enabling work. High-level estimates for vehicle acquisitions and allowances for professional services were also included. Refer to Appendix P for additional detail on the methodology used for the cost estimate.

At this stage of the project development process, costs were estimated in rough-orders-of-magnitude for purposes of comparing each concept to each other. The cost estimates are in 2022 dollars. Right-of-way costs were not included in these estimates. Table L-13 outlines the capital cost estimate for Concept 5B, including a range from low to high.

Table L-13. Concept 5B Capital Cost

CONCEPT DESCRIPTION	COST IN MILLIONS (2022)		
	LOW	MID-POINT	HIGH
Concept 5B ATC to PTC/CONRAC and Civic/Core (bored tunnel)	\$4,120.0	\$4,847.1	\$6,301.2

Source: WSP, HDR 2022

Note: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center

L.6.2. Cost per Rider

The cost per rider was calculated using the 2050 ridership forecasts and capital costs developed for this study to provide a more direct comparison of concepts given the differences in the number of stations and locations served. Table L-14 summarizes the cost per rider estimates for Concept 5B, including a range from low to high.

Table L-14. Concept 5B Cost Per Rider

CONCEPT	COST (2022)		
	LOW	MID-POINT	HIGH
Concept 5B ATC to PTC/CONRAC and Civic/Core (bored tunnel)	\$6.87	\$7.90	\$10.27

Source: WSP, HDR 2022

Note: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center

L.6.3. Cost per Mile

Cost per mile was calculated based on capital cost and the length of each concept. The cost estimates are in 2022 dollars. Table L-15 presents the cost per mile for Concept 5B including a range from low to high.

Table L-15. Concept 5B Cost Per Mile

CONCEPT DESCRIPTION	COST IN MILLIONS (2022)		
	LOW	MID-POINT	HIGH
Concept 5B ATC to PTC/CONRAC and Civic/Core (bored tunnel)	\$993	\$1,169	\$1,519

Source: WSP, HDR 2022

Note: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center;

L.6.4. Operations and Maintenance

Estimation of annual Operations and Maintenance (O&M) costs associated with Concept 5B is outside of the scope of this study. However, a high-level comparative assessment of probable O&M cost in qualitative terms was undertaken. Table L-16 presents a qualitative assessment of the main O&M cost elements for the three technologies under consideration – ATC, Trolley (light rail transit [LRT]), and bus. Among the various ATC concepts, O&M costs would generally increase as the alignment length, number of stations, and/or ridership increases. Additionally, underground alignments typically have higher O&M costs than aerial alignments due to the added cost of ventilation and fire suppression equipment. As shown in Table L-16, the ATC concepts would have high O&M cost for two of the seven elements: guideway infrastructure and energy consumption.

Table L-16. Operations and Maintenance Costs

COST DRIVER	ATC	TROLLEY (LRT)	ENHANCED BUS	ASSESSMENT
Guideway Infrastructure	\$\$\$	\$\$	\$	Extended underground ATC alignment would require added maintenance of ventilation and fire life safety systems. LRT concept would take advantage of using existing infrastructure along the Green Line and therefore would incur less maintenance cost. Bus infrastructure is shared with infrastructure owned by others and would have low infrastructure maintenance costs.
Operations and Support Staff	\$\$	\$\$\$	\$\$\$	Additional cost for personnel (salaries/insurance/medical etc.), including drivers/operators and associated support personnel. OMSF design and capacity requirements (restrooms/conference rooms/offices/utility costs) are also affected by the number of personnel required for operations. ATC vehicles are assumed to be automated (i.e., driverless).
Vehicle Maintenance	\$\$	\$\$\$	\$	ATC vehicles operate at much shorter headways requiring higher vehicle count compared to LRT vehicles expected to operate on 15-minute headways. Buses would also have a higher vehicle count than LRT vehicles to provide comparable capacity; however, both ATC and LRT are more complex vehicles and more costly to maintain. Also, maintenance costs are lower for rubber-wheeled vehicles (ATC and bus). Special maintenance equipment is required for steel wheel truing and rail grinding. LRT vehicles also employ a pantograph system to collect power from an overhead catenary system requiring additional maintenance.
Energy Consumption	\$\$\$	\$	\$\$\$	The performance and frequency of ATC vehicles typically translates to higher energy consumption/demand. Energy cost for ATC vehicles might therefore be higher than that of LRT vehicles. Energy consumption for buses using internal combustion engines may be lower per vehicle, but the number of vehicles required would be much higher.

COST DRIVER	ATC	TROLLEY (LRT)	ENHANCED BUS	ASSESSMENT
Systems	\$	\$\$	\$	Train control systems for LRT would include Automatic Train Protection but not Automatic Train Operation because trains are manually driven. Because a typical ATC uses vehicle location/communication dynamics (as well as Automatic Train Operation) for movement, authority wayside equipment such as signals/signs and associated cables are minimal. Enhanced bus service typically implements Transit Signal Priority over existing traffic control equipment requiring a nominal amount of maintenance.

Source: WSP and HDR 2022

Notes: ATC = Airport Transit Connector; LRT = light rail transit; OMSF = Operations, Maintenance and Storage Facility

L.7. Community Effects and Economic Benefits

The community effects evaluation criteria identify the anticipated community effects and adjacent development considerations for each concept. The community effects analysis contains four primary components: (1) identifying the communities within each station area (0.5-mile buffer around each station), (2) identifying the population and housing within each station area, (3) identifying the jobs and employment industries within each station area, and (4) identifying the percentage of workers, including SDIA workers, who travel from the north, south, and east areas of San Diego County to reach the Project Area (defined as the combined station areas for the concept).

Communities were identified using ArcGIS and data from the SANDAG GIS Open Data Portal. Population and housing within each station area was determined using U.S. Census Bureau 2017-2021 American Community Survey 5-Year estimates. The US Census Bureau’s OnTheMap web feature was used to determine (1) the number of jobs by industry within each station area and (2) the municipal origins for workers commuting to the Project Area. Job industries are categorized based on the North American Industry Classification System (NAICS), which is the federal classification standard for businesses in the United States. The OnTheMap web feature displays the top 12 municipal home destinations for the Project Area and condenses the remaining destination under the “All Other Locations” category. The following 12 cities were assessed as home destinations for workers in the Project Area by the OnTheMap web feature: San Diego, Chula Vista, El Cajon, National City, Los Angeles, La Mesa, Santee, La Presa, Lemon Grove, Carlsbad, Spring Valley, and Escondido. The adjacent development considerations analysis identifies the number of vacant parcels within each station area. Vacant properties within the station areas were identified using the Parcel and Current Land Use datasets from the SanGIS/SANDAG GIS Data Warehouse and were field verified in September 2022.

L.7.1. Adjacent Community Effects

Concept 5B would have a similar alignment and stations as those described for Concept 5A. Concept 5B would therefore have similar connections to the surrounding communities, jobs numbers and classifications, and home destination cities as discussed for Concept 5B and described below.

Surrounding Communities

Concept 5B would provide connections to 10 City of San Diego communities: SD International Airport, Middletown, Park West/Bankers Hill, Harborview, Marina, Little Italy, Core-Colombia, Horton Plaza, Gaslamp, and Cortez. The SDIA ATC Station and Harbor Island ATC station areas are within the SD International Airport community. The PTC ATC station area is within the Park West/Bankers Hill and Harborview communities. The Rental Car ATC station area is located within the Middletown community. The County Administration Building ATC Station is within the Park West/Bankers Hill, Harborview, and Marina communities, while the Santa Fe Depot ATC station area is within the Little Italy, Marina, Core-Colombia, and Horton Plaza communities. The Civic/Core ATC station area is within the Little Italy, Cortez, Marina, Core-Columbia, Horton Plaza, and Gaslamp communities. Table L-17 summarizes the communities located within each of the station areas for Concept 5B.

Table L-17. Surrounding Communities for Concept 5B

STATION AREA ¹	COMMUNITIES
SDIA ATC Station	SDIA
Harbor Island ATC Station	SDIA
PTC ATC Station	Park West/Bankers Hill
	Harborview
Rental Car Center ATC Station	Middletown
County Administration Building ATC Station ²	Park West/Bankers Hill
	Harborview
	Little Italy
Santa Fe Depot ATC Station ³	Little Italy
	Marina
	Core-Colombia
	Horton Plaza

STATION AREA ¹	COMMUNITIES
Civic/Core ATC Station	Little Italy
	Cortez
	Marina
	Core-Columbia
	Horton Plaza
	Gaslamp

Source: SANDAG 2022

Notes:

¹ Station Area is defined as a 0.5-mile buffer from each station centroid.

² Under Concept 5B, the County Administration Building ATC Station would be located along Pacific Highway, south of Hawthorn Street.

³ Under Concept 5B, Santa Fe Depot ATC Station would be located on Broadway.

ATC = Airport Transit Connector; PTC = Port Transit Center; SDIA = San Diego International Airport

Population and Housing

Table L-18 summarizes the population and number of households within 0.5 mile of each station. Concept 5B station areas contain approximately 16,400 households with a population of 29,500. The station area with the largest population and number of households is the Civic/Core ATC Station.

Table L-18. Population and Housing for Concept 5B

STATION AREA ¹	POPULATION	HOUSEHOLDS
SDIA ATC Station	300	0
Harbor Island ATC Station	200	0
PTC ATC Station	4,300	2,300
Rental Car Center ATC Station	2,000	800
County Administration Building ATC Station ²	7,700	4,800
Santa Fe Depot ATC Station ³	10,900	5,300
Civic/Core ATC Station	16,800	9,300
Total Project Area ⁴	29,500	16,400

Source: US Census Bureau 2023; SANDAG 2023

Notes:

¹ Station Area is defined as a 0.5-mile buffer from each station centroid.

² Under Concept 5B, the County Administration Building ATC Station would be located along Pacific Highway, south of Hawthorn Street.

³ Under Concept 5B, Santa Fe Depot ATC Station would be located on Broadway.

⁴ Project Area reflects the combined station areas for the concept. Station Area estimates do not sum to Project Area totals due to station area overlap.

ATC = Airport Transit Connector; PTC = Port Transit Center; SDIA = San Diego International Airport

Jobs and Employment

Concept 5B contains approximately 72,400 jobs with Accommodation and Food Services employing the largest share of workers and Mining, Quarrying, and Oil and Gas Extraction and Agriculture, Forestry, Fishing and Hunting representing the smallest share. Transportation and Warehousing represents the largest share of jobs in the SDIA ATC Station, Harbor Island ATC Station, and Rental Car Center ATC station areas. Accommodation and Food Services represents the largest share of jobs in the PTC ATC station area and the County Administration Building ATC station area. Within the Santa Fe Depot ATC Station and Civic/Core ATC station area, Public Administration represents the largest share of jobs. Table L-19 summarizes the percentage of jobs by the top NAICS industry employers within each station area and Project Area for Concept 5B.

Table L-19. Jobs and Employment Sectors for Concept 5B

NAICS SECTOR	PERCENTAGE (%) OF JOBS BY STATION AREAS ¹²							
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	PTC ATC STATION	RENTAL CAR CENTER ATC STATION	COUNTY ADMINISTRATION BUILDING ATC STATION ³	SANTA FE DEPOT ATC STATION ⁴	CIVIC/COR E ATC STATION	COMBINED CONCEPT 5B STATION AREA
Accommodation and Food Services	28.7	21.3	25.9	13.0	34.2	16.2	19.6	23.0
Administration & Support, Waste Management and Remediation	3.4	4.6	7.2	13.7	6.1	3.3	3.7	4.5
Agriculture, Forestry, Fishing and Hunting	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Arts, Entertainment, and Recreation	7.3	5.4	0.4	0.9	1.2	2.1	1.8	2.0
Construction	0.2	0.3	5.1	2.7	2.7	1.9	1.8	1.9
Educational Services	0.0	0.0	1.6	0.0	1.6	0.8	1.1	1.0
Finance and Insurance	2.7	0.0	1.8	0.1	2.0	4.9	6.6	5.3
Health Care and Social Assistance	0.0	0.0	5.4	4.6	6.5	1.3	2.3	2.3
Information	0.1	0.2	0.4	1.3	0.6	3.3	3.3	2.6
Management of Companies and Enterprises	0.0	0.0	0.9	0.5	0.8	1.6	1.4	1.2

NAICS SECTOR	PERCENTAGE (%) OF JOBS BY STATION AREAS ¹²							
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	PTC ATC STATION	RENTAL CAR CENTER ATC STATION	COUNTY ADMINISTRATION BUILDING ATC STATION ³	SANTA FE DEPOT ATC STATION ⁴	CIVIC/COR E ATC STATION	COMBINED CONCEPT 5B STATION AREA
Manufacturing	0.0	0.0	4.5	0.7	15.6	0.1	0.3	2.6
Mining, Quarrying, and Oil and Gas Extraction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Services (excluding Public Administration)	0.7	2.1	8.2	4.3	5.2	1.5	7.1	6.2
Professional, Scientific, and Technical Services	0.2	0.3	13.0	3.2	15.2	20.9	22.4	17.7
Public Administration	0.5	0.3	17.3	9.8	0.7	35.4	22.6	17.3
Real Estate and Rental and Leasing	3.4	9.0	4.7	8.4	3.6	2.2	2.0	2.7
Retail Trade	2.2	1.6	2.9	2.7	2.4	2.3	2.3	2.5
Transportation and Warehousing	50.1	54.7	0.0	33.8	0.1	0.6	0.3	6.1
Utilities	0.0	0.0	0.0	0.0	0.6	1.3	0.7	0.6
Wholesale Trade	0.3	0.2	0.6	0.2	1.1	0.5	0.7	0.7

Source: US Census Bureau 2022; SANDAG 2022

Notes:

¹Station Area is defined as a 0.5-mile buffer from each station centroid.

²The OnTheMap tool displays employment data at the census place and census block levels. On the Map does not differentiate between employment headquarters that are physically located within the same census block.

³Under Concept 5B, the County Administration Building ATC Station would be located along Pacific Highway, south of Hawthorn Street.

⁴Under Concept 5B, Santa Fe Depot ATC Station would be located on Broadway.

ATC = Airport Transit Connector; NAICS = North American Industry Classification System; PTC = Port Transit Center; SDIA = San Diego International Airport

Commuting Origins

The Concept 5B station areas employ workers who commute from several different cities. Approximately 49 percent of workers commute from the communities within the City of San Diego; approximately 29 percent of workers commute from All Other Locations; and approximately 8 percent of workers commute from Chula Vista. For the SDIA ATC Station, Harbor Island ATC Station, PTC ATC Station, Rental Car Center ATC Station, County Administration Building ATC Station, Santa Fe Depot ATC Station, and Civic/Core ATC Station,

the largest share of workers would commute to the Project Area from the City of San Diego, with the second-largest share commuting from All Other Locations, and the third-largest share commuting from Chula Vista. Table L-20 summarizes the home destination cities for workers employed in the station areas of Concept 5B.

Table L-20. Home Destinations for Workers Employed in Concept 5B

CITY	SHARE OF TOTAL JOBS (%) BY STATION AREA ¹²							
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	PTC ATC STATION	RENTAL CAR CENTER ATC STATION	COUNTY ADMINISTRATION BUILDING ATC STATION ³	SANTA FE DEPOT ATC STATION ⁴	CIVIC/CORE ATC STATION	COMBINED CONCEPT 5B STATION AREA
San Diego	43.7	42.6	53.4	47.1	53.9	49.4	49.4	49.4
Chula Vista	7.7	8.2	8.2	9.0	7.7	8.6	8.3	8.2
El Cajon	2.0	2.4	1.8	2.5	1.9	2.4	2.3	2.2
Los Angeles	2.5	3.1	2.2	2.4	2.4	1.8	2.1	2.2
National City	3.9	3.6	1.8	2.5	1.9	1.8	1.8	2.0
La Mesa	1.5	1.8	2.1	2.5	2.0	2.2	2.1	2.1
Santee	1.2	1.3	1.6	1.2	1.6	1.6	1.4	1.4
La Presa	1.3	1.4	0.0	1.2	0.0	1.2	1.1	1.1
Lemon Grove	1.2	1.2	1.5	1.2	1.0	1.1	1.0	1.0
Carlsbad	0.0	0.0	0.0	0.0	0.9	1.1	0.0	1.0
Spring Valley	1.2	1.2	0.0	0.0	0.0	0.0	0.0	0.0
Escondido	0.0	0.0	1.2	1.2	0.0	0.0	0.0	0.0
Imperial Beach	0.0	0.0	1.2	0.0	1.0	0.0	0.0	0.0
All Other Locations ⁵	33.9	33.3	24.9	29.2	25.7	28.8	29.5	29.4

Source: US Census Bureau 2022

Notes:

¹Station Areas are defined as a 0.5-mile buffer from each station centroid.

²The OnTheMap tool commute destination information does not differentiate between worker transport mode (if any), regular or occasional commutes, or whether an employee works remotely. Workplace destinations are defined by the physical mailing address of each employment headquarters.³ Under Concept 5B, the County Administration Building ATC Station would be located along Pacific Highway, south of Hawthorn Street.

⁴ Under Concept 5B, Santa Fe Depot ATC Station would be located on Broadway.

⁵ Includes all other US Census defined Places from where workers commute.

ATC = Airport Transit Connector; PTC = Port Transit Center; SDIA = San Diego International Airport

L.7.2. Adjacent Development Considerations

Economic opportunities for Concept 5B are determined by the number of existing vacant properties within each station area. Vacant parcels identified must have a minimum of 20,000 square feet and could not be in areas zoned as residential. No parcels were identified.

APPENDIX M CONCEPT 5C: HYBRID AIRPORT TRANSIT CONNECTOR FROM SAN DIEGO INTERNATIONAL AIRPORT TO PORT TRANSIT CENTER/CONSOLIDATED RENTAL CAR CENTER AND SANTA FE DEPOT EXTENDED TO CIVIC/CORE

M.1. Description of Concept

For the Airport Transit Connector (ATC) concepts, transit connections to the north and south of San Diego International Airport (SDIA) were evaluated with variations of stops, termini, configurations, and features. All ATC concepts assume an operations, maintenance, and storage facility (OMSF) would be located on the Port Headquarters (referred to as the Port Transit Center (PTC)). The ATC concepts evaluated in this study, include the provision of both a northern and southern alignment for the ATC, though the stops, termini, configurations, and ultimate location of the OMSF, are subject to further analysis and modification, and will be confirmed during the environmental clearance process. For this analysis, Concepts 3, 4, and 5 are combined with Concept 1A, the common north route. Concept 5C would provide a high-frequency ATC alignment from a Concept 1A with a connection to SDIA to a Civic/Core ATC Station, including a Santa Fe Depot ATC Station and an optional County Administration Building ATC Station. Concept 5C would feature at-grade, aerial, and underground alignment sections. Table M-1 provides information on concept characteristics.

Figure M-1 shows the combined Concept 1A and Concept 5C alignment. From the SDIA Station located at the transit-ready area at the airport, the Concept 1A fixed guideway would be on aerial structure along Harbor Drive before transitioning to a cut-and-cover tunnel adjacent to Laurel Street. The alignment would remain in a tunnel under Pacific Highway. The alignment would then turn north and be at-grade and parallel with the existing Metropolitan Transit System (MTS) right-of-way to the PTC ATC Station. North of the station, the guideway would transition to an aerial structure and cross Pacific Highway and Admiral Boland Way to terminate at the Consolidated Rental Car Center ATC Facility (CONRAC) Station.

The Concept 5C alignment would interline with Concept 1A at Coast Guard Place. The alignment would continue along Harbor Drive in an aerial alignment, followed by an at-grade alignment. Concept 5C would transition to a cut-and-cover tunnel north of Hawthorn Street as it curves southeast. South of Grape Street, Concept 5C would continue in a bored tunnel before turning east to continue beneath Broadway and connect to the Santa Fe Depot ATC Station and Civic/Core ATC Station. The Civic/Core ATC terminus station would be located on Broadway, west of 3rd Avenue. A dedicated bicycle/pedestrian connection would provide a connection to the existing San Diego Trolley (Trolley) Blue and Trolley Orange Line Civic Center Station on C Street.

Table M-1. Concept 5C Characteristics

CHARACTERISTIC	
Length of alignment at-grade (miles)	0.1
Length of alignment on aerial structure (miles)	0.4
Length of alignment in tunnel (miles)	1.3
Total alignment length (miles)	1.8
Number of stations ¹	2 ²
Minimum/shortest headways	4 minutes ³

Source: WSP, HDR 2022

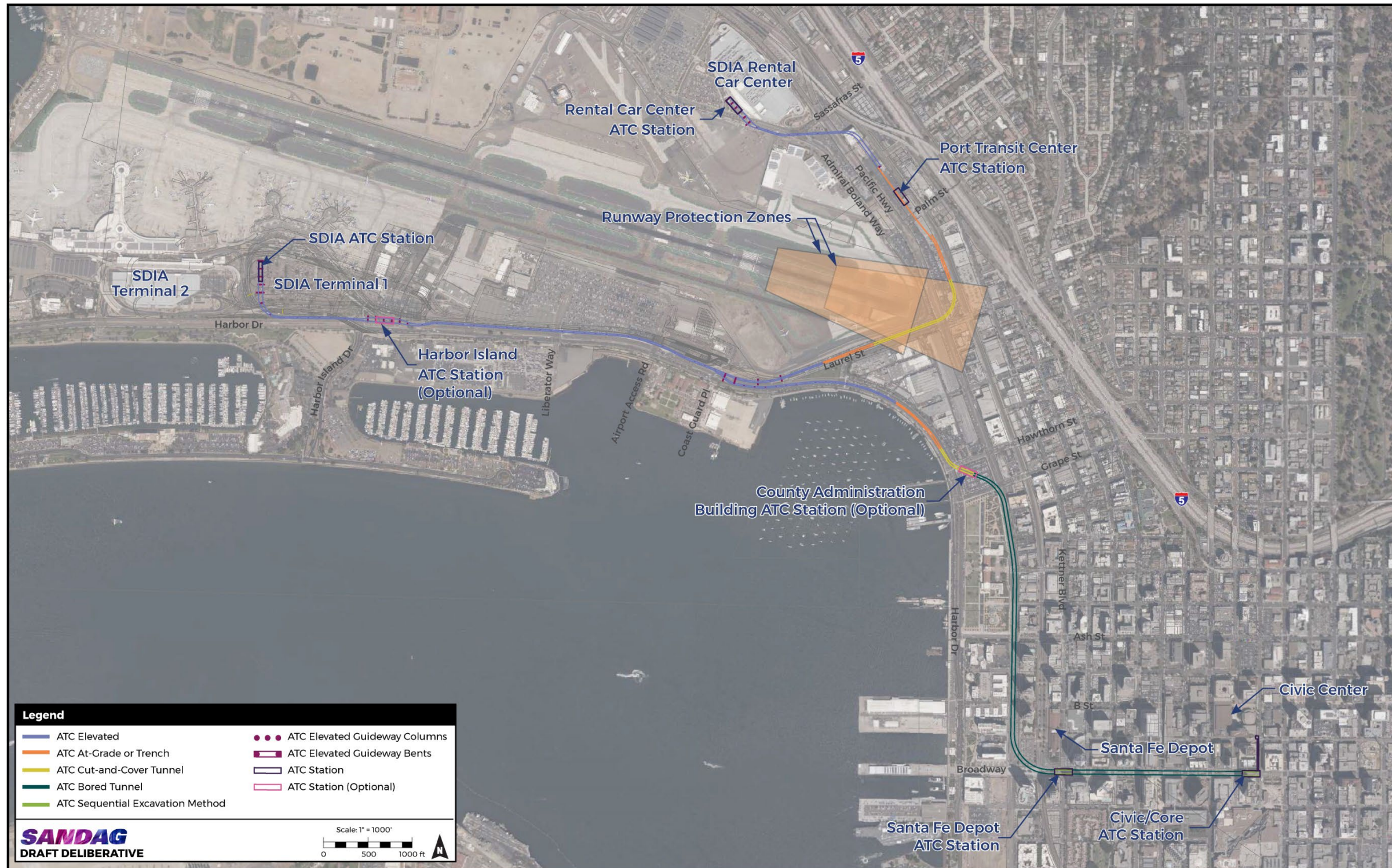
Notes:

¹Stations include only those provided for the south route concept, although south route passengers would also have access to the Concept 1A SDIA ATC Station and optional Harbor Island ATC Station.

²County Administration Building is a potential third station.

³When combined with Concept 1A, headways would be two minutes where the concepts overlap.

Figure M-1. Concept 5C Hybrid Airport Transit Connector from San Diego International Airport to Santa Fe Depot Extended to Civic/Core



Source: WSP, HDR 2022

M.2. Passenger Convenience and Ridership

M.2.1. Regional Connectivity

Regional connectivity is evaluated by identifying the number of modes of transportation and the number of major destinations and community facilities that can be reached within a 0.5-mile buffer of a station (defined as the “station area”). For the purpose of this analysis, “destinations” include major tourist destinations (e.g., attractions, museums, commercial shopping areas, recreational/historic areas) and community facilities (e.g., schools, parks, libraries, police/fire stations, hospitals). The information presented in this section reflects regional connectivity for the concept inclusive of Concept 1A.

Modes of Transportation

Concept 5C would have connections to the greater transit network, including the MTS bus and Trolley light rail (Blue Line, Green Line, and Orange Line), North County Transit District COASTER commuter trains, and the Amtrak Intercity Pacific Surfliner. Table M-2 summarizes the potential regional connections to existing bus transit routes, rail and Trolley connections, bike routes, freeways, major roads, and arterial/collector streets for Concept 5C.

Bus Transit Routes: Concept 5C would provide connections to 19 MTS bus routes: San Diego Airport Flyer shuttle (AIR), 2, 3 5, 7, 11, 12, 20, 83, 110, 120, 215, 225, 235, 280, 290, 901, 923, and 992.

Rail and Trolley Lines: Concept 5C would have connections to five rail and Trolley lines: Trolley Blue, Green, and Orange Lines, Amtrak, and COASTER.

Bike Routes: Concept 5C would have connections to the City of San Diego Bicycle Network (including bike lanes, separated bikeways, and bike routes), Interstate (I-) 5 Bridge (i.e., the pedestrian bridge over I-5), North Harbor Drive Bike Path, Embarcadero Path, California Path, Columbia Path, Martin Luther King, Jr. Promenade, Bayshore Bikeway, and Harbor Drive Pedestrian Bridge.

Major Roads, Arterials, and Collector Streets: Major roads are usually four to six lanes wide with limited access, grade separations, and extra lanes where needed. Major roads are designed for through traffic but usually have signals at major intersections. Major arterials are usually four to six lanes wide and although designed primarily for through traffic, arterials also provide access to abutting property. Collector Streets are typically two to four lanes wide and function as feeders of traffic to the major street system and provide continuity with local streets.

Concept 5C would be accessible by 10 major roadways and 18 arterial/collector streets.

Table M-2. Regional Connectivity for Concept 5C

CATEGORY	NO. OF CONNECTIONS	ROUTE NAMES	STATION AREA ¹
Bus Routes	19	AIR (San Diego Airport Flyer Shuttle)	SDIA ATC, Harbor Island ATC (Optional)
		83 (Downtown San Diego - Old Town)	Port Transit Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC, Civic/Core ATC
		11 (SDSU - Downtown San Diego)	SDIA ATC, Harbor Island ATC (Optional), Port Transit Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC, Civic/Core ATC
		280 (Escondido Transit Center - Downtown)	
		290 (Rancho Bernardo Station – Downtown)	
		225 (Downtown - Otay Mesa TC)	
		235 (Downtown - Escondido Transit Center)	
		923 (Downtown to Point Loma)	
		992 (Airport/Downtown)	
		215 (Mid-City Rapid)	
		2 (Downtown San Diego - 30th & Adams)	
		3 (UCSD Hospital - Euclid Transit Center)	
		7 (Downtown San Diego - University/College)	
		901 (Iris Transit Center - Downtown San Diego)	
		110 (Mira Mesa - Downtown via Hwy 163)	
		120 (Downtown San Diego - Kearny Mesa Transit Center)	
		5 (Downtown San Diego - Euclid Transit Center)	Civic/Core ATC
		12 (City College - Skyline Hills)	
		20 (Downtown - Rancho Bernardo Transit Station)	

CATEGORY	NO. OF CONNECTIONS	ROUTE NAMES	STATION AREA ¹
Rail and Trolley Lines	5	Trolley Blue Line	Port Transit Center ATC, Rental Car Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC, Civic/Core ATC
		Trolley Green Line	
		COASTER	Santa Fe Depot ATC
		Amtrak Pacific Surfliner	
		Trolley Orange Line	Santa Fe Depot ATC, Civic/Core ATC
Bike Routes	7	I-5 Bridge (pedestrian bridge over I-5)	Port Transit Center ATC
		North Harbor Dr Bike Path	SDIA ATC, Harbor Island ATC (Optional), County Administration Building ATC (Optional)
		Embarcadero Path	Port Transit Center ATC, County Administration Building (Optional), Santa Fe Depot ATC
		City of San Diego Bicycle Network	SDIA ATC, Harbor Island ATC (Optional), Port Transit Center ATC, Rental Car Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC, Civic/Core ATC
		California Path	Santa Fe Depot ATC, Civic/Core ATC
		Columbia Path	
		Martin Luther King, Jr. Promenade	
Major Street	10	W Laurel St	Port Transit Center ATC, County Administration Building (Optional)
		North Harbor Dr	SDIA ATC, Harbor Island (Optional), Port Transit Center ATC, County Administration Building (Optional), Santa Fe Depot ATC
		Pacific Hwy	SDIA ATC, Harbor Island ATC (Optional), Port Transit Center ATC, Rental Car Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC
		Front St	County Administration Building ATC (Optional), Santa Fe Depot ATC, Civic/Core ATC

CATEGORY	NO. OF CONNECTIONS	ROUTE NAMES	STATION AREA ¹
		Broadway	Santa Fe Depot ATC, Civic/Core ATC
		Harbor Dr	
		Market St	
		6th Ave	Civic/Core ATC
		Park Blvd	Rental Car Center ATC
		Washington St	
Arterial/ Collector Street	18	India St	Port Transit Center ATC, Rental Car Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC, Civic/Core ATC
		Kettner Blvd	
		Sassafras St	Port Transit Center ATC, Rental Car Center ATC
		Hancock St	Rental Car Center ATC
		San Diego Ave	
		1st Ave	County Administration Building ATC (Optional), Santa Fe Depot ATC, Civic/Core ATC
		State St	
		A St	
		Ash St	
		4th Ave	Santa Fe Depot ATC, Civic/Core ATC
		B St	
		C St	
		F St	
		G St	
		5th Ave	Civic/Core ATC
		8th Ave	
10th Ave			
11th Ave			

Source: WSP, HDR, GPM, and TAHA 2022

Notes:

¹Station area is defined as a 0.5-mile buffer from the station centroid.

ATC = Airport Transit Connector; SDIA = San Diego International Airport

Connections to Destinations

There would be 59 destinations within the Concept 5C proposed station (Table M-3). Several of the destinations can be reached from more than one proposed station and would not require a transfer.

Table M-3. Destinations within Concept 5C Station Areas

DESTINATIONS	STATION AREA ¹
Harbor Island	SDIA ATC, Harbor Island ATC (Optional)
San Diego Harbor Police	
San Diego International Airport	
Spanish Landing Park (East)	
Spanish Landing Park (West)	
Maple Canyon Open Space	Port Transit Center ATC
Montessori School of San Diego	Port Transit Center ATC, Rental Car Center ATC
Rental Car Center	
Marine Corps Recruit Depot San Diego	Rental Car Center ATC
San Diego Lindbergh Field Fire Station	Port Transit Center ATC County Administration Building ATC (Optional)
SDFD Fire Station 3	
Col. Salomon Child Development Center	
Washington Elementary School	
Firehouse Museum	
Little Italy	
Maritime Museum of San Diego	
NHA - Stem Institute for Early Learning	
SDFD Fire Station 2	
Star of India Museum	
The Embarcadero	Santa Fe Depot ATC
Waterfront Park/Harborview	
Broadway Landing	
Lane Field Park	
Navy Pier	
Ruocco Park	
Seaport Village Shopping Center	
Tuna Harbor Park	

DESTINATIONS	STATION AREA ¹
Cruise Ship Terminal	
The Headquarters at Seaport	
USS Midway Museum	
Aspen Leaf Nursery & Preschool	Santa Fe Depot ATC, Civic/Core ATC
Balboa Theatre	
Civic Center	
Downtown San Diego/Core-Colombia	
Federal Courthouse	
Hall Of Justice	
Horton Plaza Park	
King Promenade Park	
King-Chavez Community High School	
Metro Arson Strike Team	
Metropolitan Corrections Center	
Museum of Contemporary Art San Diego	
San Diego Central Courthouse	
San Diego Central Jail	
SDFD Fire Station 1	
SDFD Fire Station 1/201	
The New Children's Museum	
NHA - Broadway Early Learning Academy	
Pantoja Park	

DESTINATIONS	STATION AREA ¹
California Western School of Law	Civic/Core ATC
Davis House Park	
DTFHC At Connections	
Gary And Mary West Senior Dental Center, Inc.	
Gaslamp Museum at Davis-Horton House Museum & Park	
Gaslamp Quarter	
New Vistas	
The School Paul Mitchell -San Diego	
San Diego Chinese Historical Museum	

Source: WSP, HDR, GPM, and TAHA 2022

Notes:

¹Station area is defined as a 0.5-mile buffer from the station centroid.

ATC = Airport Transit Connector; SDFD = San Diego Fire Department; SDIA = San Diego International Airport

M.2.2. User Experience

The evaluation of user experience relates to the station area environment and a passenger's experience on the vehicle considering elements such as ease of transfers, navigation, and passenger comfort. For the purpose of this analysis, the ease of transfers considered the distance and navigation to the nearest connecting services. The number of modes of transportation that can be reached within 0.5-mile buffer of each station is discussed in Section M.2.1.

Drop-off/Pick-up, Navigation, and Transfer Convenience

The following sections summarize transfer convenience for each proposed station along Concept 5C, including between modes of transit and by vehicle, as applicable. Transfer convenience was evaluated in terms of distance between modes of transit and vehicular drop-off/pick-up locations and the proposed ATC Station. As design is advanced throughout subsequent phases of project development, it is assumed that wayfinding, in terms of signage and paths of travel, would be provided to direct passengers to transfer locations. Therefore, wayfinding is not evaluated on a station-by-station basis.

SDIA ATC Station: Vehicular pick-up and drop-off or transfers from the ATC to bus are not expected at this station. It is anticipated that passengers boarding or alighting the ATC at this station would be traveling to or from SDIA. The nearest entrance at Terminal 1 and Terminal 2 would require passengers to walk a minimum of 0.2 mile. This station would be served by trains traveling on both the north route Concept 1A alignment, which includes a terminus at the Rental Car Center ATC Station, and the south route alignment to the Santa Fe Depot ATC Station and Civic/Core ATC Station. Given the two routes, passengers travelling to SDIA would need to select the correct train, and clear signage depicting the routes would be needed.

Harbor Island ATC Station (Optional): While connections at this location would be limited, this station would allow for access to the MTS Route 923 N Harbor Dr and Harbor Island Dr bus

stop, walking 300 feet west along Harbor Drive to reach the westbound stop and 500 feet along Harbor Drive and Harbor Island Drive to reach the eastbound stop. This station would also create a direct pedestrian linkage across Harbor Drive to future development on Harbor Island. Vehicular drop-off and pick-up are not anticipated at this station.

County Administration Building ATC Station (Optional): This station would be located north of the County Administration Building and would allow for transfers to MTS bus Routes 923 and 992 on Harbor Drive and Routes 280 and 290 on Grape Street, each within a 300-foot walk.

Santa Fe Depot ATC Station: The Santa Fe Depot ATC Station includes ample transfer opportunities including eight bus routes, two light rail lines (i.e., Trolley Blue and Green Lines), Amtrak intercity rail, and COASTER commuter rail service. This station would be located along Broadway at Kettner Boulevard, southeast of the existing Santa Fe Depot, and passengers would have access to the connecting services with a 200-foot walk. Passengers exiting the ATC Station would be in view of the existing Santa Fe Depot waiting room and ticket office building, a city landmark, which would support navigation. However, given the considerable amount of connecting services scattered among various on-street stops, navigating between transit services may be confusing, and clear signage at the ATC Station would be needed. No dedicated, transit parking facilities exist at Santa Fe Depot, although there is an existing private parking lot adjacent to Santa Fe Depot which charges a fee for parking. Vehicular drop-off and pick-up space are provided along Kettner Boulevard.

Civic/Core ATC Station: The Civic/Core ATC terminus station would be located on Broadway, west of 3rd Avenue and approximately 500 feet south of the existing Trolley Blue and Trolley Orange Line Civic Center Station on C Street. A dedicated bicycle/pedestrian connection between both stations would be provided along 3rd Avenue, which would allow for clear navigation for passengers traveling between each station area and to the Civic Center. The station would also provide direct access to bus stops on Broadway, between 2nd Avenue and 3rd Avenue serving nine MTS bus routes. At Broadway and 1st Avenue, passengers would have access to four additional bus routes within a 200-foot walk.

Station Amenities

Each station, as preliminarily designed, would provide ample space for shelters, seating, lighting, trash receptacles, and other amenities. The existing Santa Fe Depot also offers restrooms, vending machines, and an ATM. The Civic/Core station is located within a constrained area, but space will be available for amenities such as shelters, seating, and lighting.

Fare Payment Method

The ATC fare concept has not yet been fully established, but for the purposes of this evaluation it is assumed that the ATC would be fare free. A fare free concept allows for a smoother boarding process and would minimize travel delay compared to systems where a passenger pays as they board.

Boarding Method

It is assumed that the ATC vehicles would provide level boarding (i.e., the floor of the vehicle is at the same level as the boarding platform), allowing passengers to step or roll directly onto the

vehicle without a step up or down. This type of boarding is easier for passengers with luggage, as well as passengers with strollers, in wheelchairs, or with other mobility impairments compared to vehicles that do not have level boarding.

Luggage Accommodations

The ATC vehicles are assumed to be designed with airport travel in mind, with space for luggage, available but minimal seating conducive to short trips, and ample hand-holds.

Reliability

Concept 5C would operate in a dedicated, fully separated aerial right-of-way with no shared operations for the entirety of the ATC alignment. The absence of conflicting services and separation from traffic would reduce opportunities for delays along the alignment and would support reliable operations.

Ride Comfort

Concept 5C is proposed to operate in a dedicated, fully separated aerial right-of-way with elevated, at-grade, and below ground segments. The separated guideway minimizes potential conflicts with other vehicles, as well as the potential for additional stopping or starting at intersections. While the alignment would transition between grades, Concept 5C would employ best design practices to maintain an acceptable level of ride quality.

M.2.3. Travel Time

Transit Travel Time

The evaluation of transit travel time considered the total time spent traveling on transit to and from destinations within the county. Transit travel time included time from the first mode of transit used to the destination, inclusive of transfers, and was obtained from the San Diego Association of Governments (SANDAG) ABM2+ model. Transit travel times to SDIA were calculated for the AM peak hour and transit travel times from SDIA were calculated for the PM peak hour. Transit travel times to and from each destination were compared to against a No Project baseline. Table M-4 outlines the transit travel times for each destination evaluated.

Compared to the No Project baseline, Concept 5C would reduce the transit travel time to each of the 14 destinations evaluated. The reduction in transit travel time for Concept 5C would range from 3-24 minutes.

Table M-4. Concept 5C Transit Travel Time

LOCATION/ DESTINATION	NO PROJECT BASELINE		CONCEPT 5C ATC TO PTC/CONRAC AND CIVIC/CORE (HYBRID)	
	TO SDIA	FROM SDIA	TO SDIA	FROM SDIA
Legoland	64	64	61	61
Carlsbad/Carlsbad Village Station	63	63	53	53
Grossmont Center Mall	61	61	41	41
Mission Bay/Mission Bay Park	32	32	18	18
Mission Valley/Fashion Valley Station	36	36	19	19
Chula Vista City Hall	45	45	41	41
Bayfront Redevelopment/E Street Station	45	45	39	39
Bayfront Redevelopment (Gaylord Pacific Resort and Convention Center & Harbor Park)	47	47	40	40
San Ysidro Transit Center	60	60	36	36
San Diego State University/SDSU Transit Center	52	52	32	32
University of California, San Diego/UCSD Central Campus Station	41	41	29	29
Convention Center	24	24	20	20
Liberty Station (Commercial & Bus Transit)	23	23	16	16
Ocean Beach (Downtown Area)	41	41	18	18

Source: SANDAG, WSP, and HDR 2022

Notes: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center; SDIA = San Diego International Airport; San Diego State University; UCSD = University of California San Diego

Headways

The evaluation of travel time also considered headways, or the time between transit vehicles. The headways presented in this evaluation are consistent with those used in the ridership forecasts. Actual headways would be determined during later stages of project development.

Concept 5C would operate with 4-minute headways. When combined with Concept 1A, Concept 5C would operate with 2-minute headways where the two concepts interline to connect to SDIA.

M.2.4. Ridership

Projected ridership in 2050 was modeled for Concept 5C by line, station, and systemwide based on forecasts from the San Diego Association of Governments (SANDAG) model. Systemwide ridership was compared against a No Project baseline. As Concept 5C includes implementation of Concept 1A, the ridership forecast included both the north route and south route ATC

segment. Concept 5C also assumes continued service of MTS Route 992 (Downtown/Airport). Table M-5 outlines the projected 2050 daily ridership for Concept 5C and systemwide.

Table M-5. Concept 5C and Regional 2050 Ridership

CONCEPT DESCRIPTION	ROUTE	DAILY RIDERSHIP	TOTAL REGIONAL BOARDINGS
Concept 5C ATC to PTC/CONRAC and Civic/Core (hybrid)	ATC north route segment	39,000	1,434,000
	ATC south route segment	10,000	
	ATC Total	50,000	
	MTS Route 992	2,000	

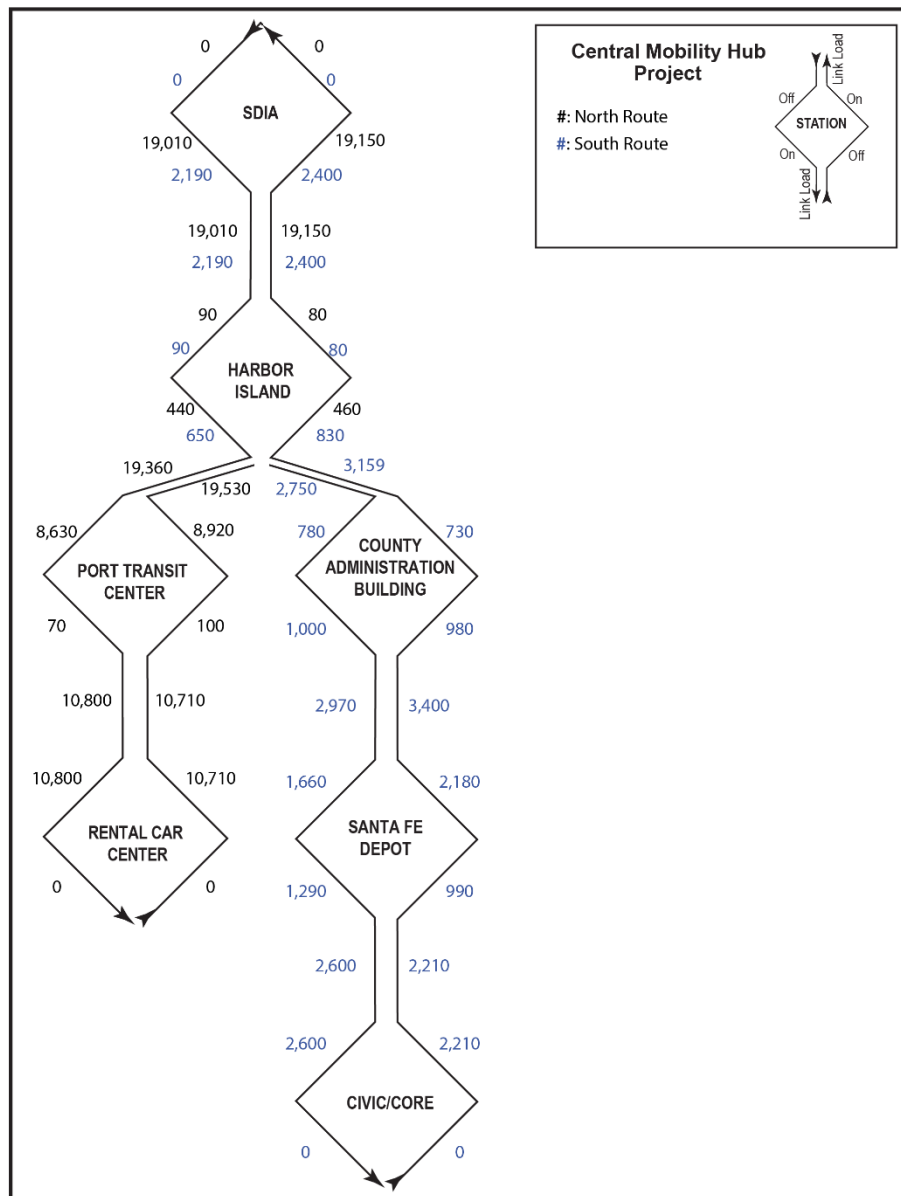
Source: SANDAG 2022

Notes: Numbers rounded to the nearest 1,000. Numbers may not equal due to rounding.

ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; MTS = Metropolitan Transit System; PTC = Port Transit Center

Figure M-2 identifies the 2050 ridership by station for Concept 5C, presenting the boardings (ons), alightings (off), and passengers on trains between stations.

Figure M-2. Concept 5C Ons and Offs by Station



Source: SANDAG 2023

Note: Numbers are rounded to the nearest 10; numbers may not equal due to rounding

M.3. Congestion of Airport Access

M.3.1. Traffic Effects

The evaluation of traffic effects considered the change in traffic volumes on select roadways, including those entering and leaving SDIA, associated with each concept. The change in traffic volumes was evaluated using average daily traffic (ADT) volumes from the SANDAG model,

which represent the average number of vehicles passing a specific point on a connection or roadway on an average day.

The 2050 ADT volumes on these roadways were compared for each segment against a No Project baseline to calculate the percent change in ADT. Table M-6 outlines the roadways considered in this evaluation and the percent change in ADT. Compared to the No Project baseline, Concept 5C would reduce ADT for all roadway segments except for the segment on Hawthorn Street from Pacific Highway to Harbor Drive, which would result in an increase in ADT, and the segment along Harbor Drive from Market Street to Front Street which would not result in a change in ADT. The segments with the largest reduction in ADT would be the Airport Terminal 1 and 2 Roadways and the SDIA inbound access road with a 26 percent reduction, and Laurel Street from Pacific Highway to Harbor Drive with a 23 percent reduction in ADT. The reduction in ADT reflects travelers switching modes and/or points of access to reach SDIA and destinations served by Concept 5C.

Table M-6. Concept 5C Average Daily Traffic

ROADWAY SEGMENT	PERCENT CHANGE IN AVERAGE DAILY TRAFFIC COMPARED TO NO PROJECT BASELINE
Airport Terminal 1 and 2 Roadways	-26%
Harbor Drive from Laurel Street to Harbor Island Drive	-10%
SDIA Inbound Access Road from Laurel Street to SDIA	-26%
Harbor Drive from Grape Street to Ash Street	-8%
Harbor Drive from Market Street to Front Street	0%
Harbor Drive from Laning Road to McCain Road	-4%
Pacific Highway from Sassafras Road to Palm Street	-13%
Laurel Street from Pacific Highway to Harbor Dr	-23%
Hawthorn Street from Pacific Highway to Harbor Drive	8%
Grape Street from Pacific Highway to Harbor Drive	-7%

Source: SANDAG 2022

Note: SDIA = San Diego International Airport

M.4. Vehicle Miles Traveled and Greenhouse Gases

M.4.1. Vehicle Miles Traveled

Providing alternative transportation modes in the region would change the number of vehicles on the road. The change in 2050 vehicle miles traveled (VMT) associated with implementation of Concept 5C was calculated against a No Project baseline. Table M-7 summarizes the 2050 regional VMT and change in VMT compared to the No Project baseline.

Table M-7. Concept 5C Vehicle Miles Traveled

CONCEPT DESCRIPTION	2050 REGIONAL VMT ¹	REGIONAL VMT REDUCTION FROM NO PROJECT ¹
No Project Baseline	88,620,000	—
Concept 5C ATC to PTC/CONRAC and Civic/Core (hybrid)	88,491,000	-129,000

Source: SANDAG 2022

Notes:

¹Numbers are rounded to the nearest 1,000.

ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center; VMT = vehicle miles traveled

M.4.2. Greenhouse Gases

A change in 2050 VMT would result in a corresponding change in 2050 greenhouse gas (GHG) emissions. To evaluate the change in emissions, A select link analysis was performed within the SANDAG ABM2+ model. The VMT on the select links was compared to the No Project baseline to calculate the change in VMT. EMFAC per mile emission rates in pollutant-per-mile-traveled units were calculated for each concept and the No Project baseline.

Table M-8 compares the GHG emissions reductions between the No Project baseline and Concept 5C. With a VMT reduction, Concept 5C would result in a 0.91 percent reduction in GHG emissions.

Table M-8. Concept 5C Operational GHG Emissions

CONCEPT DESCRIPTION	GHG EMISSIONS (MMTCO ₂ E) (TONS PER DAY) ¹	PERCENT CHANGE IN GHG COMPARED TO NO PROJECT BASELINE
No Project Alternative (2050)	24,590	—
Concept 5C ATC to PTC/CONRAC and Civic/Core (hybrid)	24,370	-0.91%

Source: SANDAG 2022

Notes:

¹Numbers are rounded to the nearest 10.

ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; GHG = greenhouse gas; MMTCO₂e = million metric tons of CO₂e; PTC = Port Transit Center

M.5. Feasibility / Complexity

M.5.1. Right-of-Way

The evaluation of right-of-way requirements considered the number of parcels that may have acquisitions (partial or full) to support the concept and the number of buildings that may require demolition. A buffer was used to identify properties, defined as 20 feet for aerial and at-grade, 20 feet for tunnel/cut-and-cover, 10 feet from edge of straddle bents, and 20 feet at stations. Concept 5C would consist of cut-and-cover tunnel, elevated, and at-grade or trench segments,

including elevated guideway columns and guideway straddle bents. The evaluation considered the two stations and one optional station provided in Concept 5C. The right-of-way requirements for the SDIA and optional Harbor Island Station are included under Concept 1A. As Concept 5C would interline with Concept 1A, the evaluation considered the potential requirements of Concept 5C in addition to Concept 1A. The evaluation identified a total of 30 parcels within the buffer. Additionally, nine buildings could require demolition (Table M-9).

Table M-9. Concept 1A and 5C Right-of-Way Requirements

CONCEPT DESCRIPTION	RIGHT-OF-WAY REQUIREMENTS	
	NUMBER OF PARCELS AFFECTED	NUMBER OF BUILDINGS POTENTIALLY REQUIRING DEMOLITION
Concept 1A ATC to PTC/CONRAC	24	9
Concept 5C ATC to PTC/ CONRAC and Civic/Core (hybrid)	6	0
Total	30	9

Source: WSP, HDR, GPM 2022

Notes: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center

M.5.2. Construction Effects/Constructability

This section discusses constructability considerations associated with the major infrastructure elements featured in each concept under evaluation with the purpose of identifying probable construction methods, staging, sequences, traffic impacts, and any temporary facilities that would be implemented during the construction phase.

Concept 5C is a variation of Concepts 5A and 5B that would be partially elevated and partially in a bored tunnel. Concept 5C has similar constructability aspects as Concepts 1A and 3C. Concept 5C would add 0.1 mile of at-grade, 0.4 mile of aerial, and 1.3 miles of twin-bored tunnel alignment to Concept 1A (Table M-1 and Figure M-1) to connect to Santa Fe Depot and the Civic/Core ATC Station. The primary considerations of each form of aerial alignment are identical to Concept 1A and 3B. The launch box for the bored section would be in the parking lot north of Grape Street between Pacific Highway and Harbor Drive and would later become part of a cut-and-cover transition section between the elevated and underground sections. This would also be the location of the optional County Administration Building Station.

The underground stations at the County Administration Building and Santa Fe Depot would be excavated from the surface either before or after completion of the tunnels and outfitted after tunnel completion. Station box construction would be similar to that of the Santa Fe Depot Station on Broadway described for Concept 3B. The receiving box would be located at the Civic/Core ATC Station.

This concept avoids impactful cut-and-cover tunnel construction on Laurel Street and Pacific Highway intersection associated with Concept 3B and simplifies construction of the optional County Administration Building Station by locating it off the street rights-of-way.

M.5.3. Major Utilities

Potential conflicts with existing utilities were identified for Concept 5C. Major utilities in this evaluation are defined as water facilities equal to or greater than 16 inches, sewer facilities equal to or greater than 18 inches, and storm drain facilities equal to or greater than 36 inches. Concept 5C consists of cut-and-cover tunnel, elevated, and at-grade or trench segments, including elevated guideway columns and guideway bents. A buffer was established from the centerline of the nearest rail and within depth thresholds beneath the surface ground level to capture utilities within a 10-foot diameter from column locations for aerial, 20 feet for at-grade, 20 feet for tunnel/cut-and-cover, 10 feet from the edge of straddle bents, and 20 feet at stations. The evaluation considered the two stations and one optional station provided in Concept 5C. Utilities within the buffer for bored tunnels were not included in this analysis as it is expected that the tunnel will be substantially deeper than any utilities, with the exception of specific locations such as the launch and retrieval site for the tunnel boring machine and at stations. As Concept 5C would interline with Concept 1A, the evaluation considered the utility impacts of Concept 5C in addition to Concept 1A. Concept 5C could result in 17 utilities impacts. Table M-10 outlines the number and type of major utilities identified.

Table M-10. Concept 5C Utility Impacts

CONCEPT DESCRIPTION	NUMBER OF MAJOR UTILITY IMPACTS		
	SEWER	WATER	STORM DRAIN
Concept 1A ATC to PTC/CONRAC	3	4	4
Concept 5C ATC to PTC/CONRAC and Civic/Core (hybrid)	2	3	1
Total	5	7	5

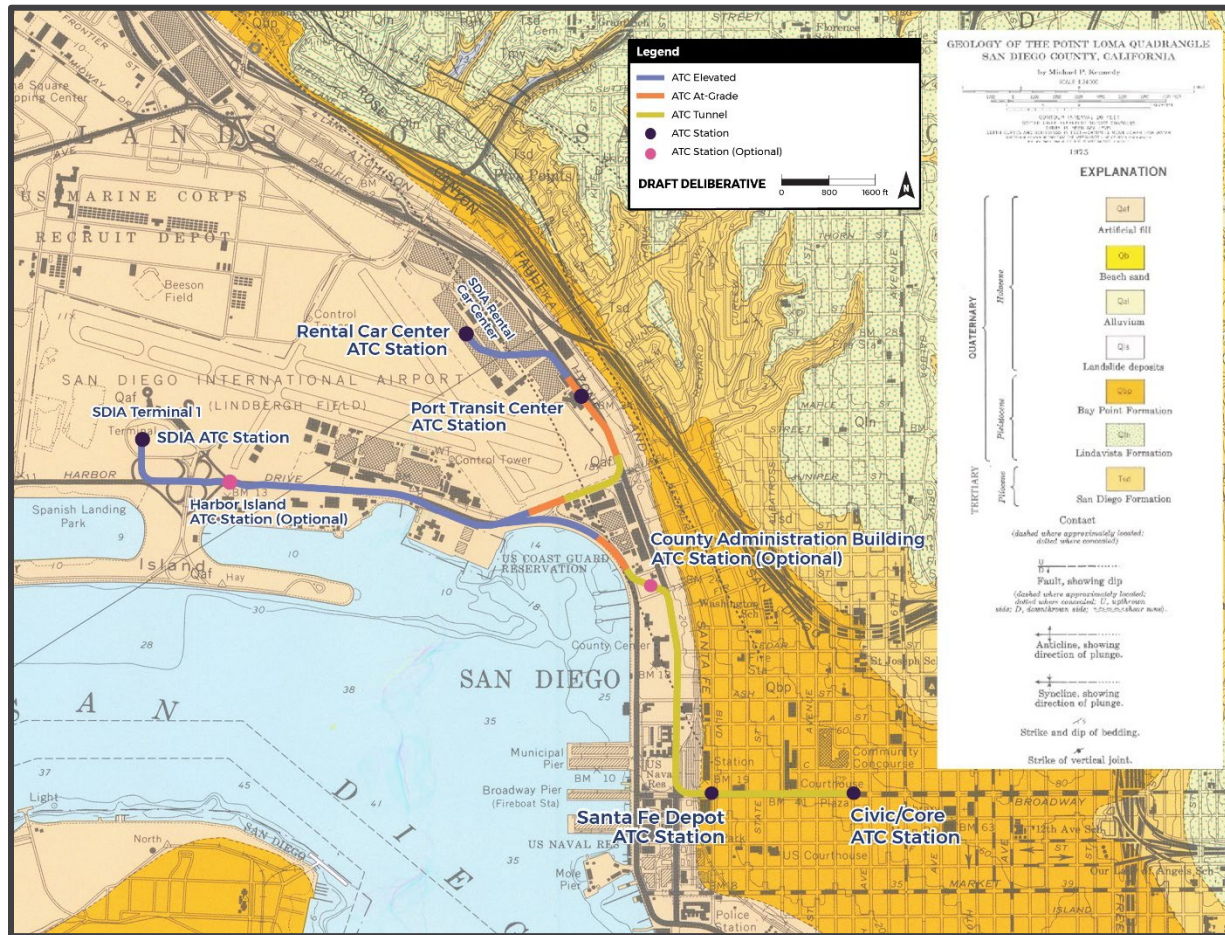
Source: WSP, HDR, GPM 2022

Notes: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center

M.5.4. Geotechnical and Seismic Conditions

Geotechnical conditions along the alignment of Concept 5C are highly variable. Figure M-3 presents a geologic map of San Diego with Concept 5C overlaid onto it, and an overview of the subsurface conditions along the alignment. In particular, the subsurface materials along N Harbor Drive likely consist of a sequence of highly variable undocumented fill soil (placed above water), overlying relatively thick hydraulic fill soils (placed under water). These fill soils are sequentially underlain by various naturally deposited geologic formations that were deposited in various geologic epochs. From the youngest, and therefore right below the undocumented fills and in descending order, are Holocene-age estuarine deposits (also referred to as bay deposits), Quaternary-age granular and cohesive old paralic deposits (also known as Bay Point Formation), Pliocene-age marine sandstone and conglomerate (also known as the San Diego Formation), and undifferentiated fossilized marine and non-marine Eocene-age rock.

Figure M-3. Geologic Map of San Diego with Concept 5C Geology



Source: WSP 2023

The area at the eastern end of the runway, located adjacent to West Laurel Street and the cut-and-cover tunnel, may consist of an easterly decreasing thickness of fill material. This area also likely contains both buried alluvial and colluvial materials that were deposited by surficial erosion from Maple Canyon located just east of I-5. This material may have a significant gravel, cobble, and boulder-sized materials. The elevated section of the alignment near the SDIA rental car center likely contains a thinner layer of estuarine deposits compared to other areas of the alignment.

The southern portion of the alignment along Pacific Highway, from the Solar Turbines parking lot to the Santa Fe Depot ATC Station, generally follows the original, historic shoreline of San Diego Bay. The subsurface sequence of deposits in this area is anticipated to consist of variable thicknesses undocumented fill, hydraulic fill, estuarine deposits, Bay Point Formation and San Diego Formation. While the general sequence of geologic formations is similar to the areas described above, the thickness of less competent and more problematic soils (i.e. undocumented fills and estuarine deposits) is anticipated to be smaller as the alignment is closer to the original San Diego Bay shoreline in this area. The remaining portion of the

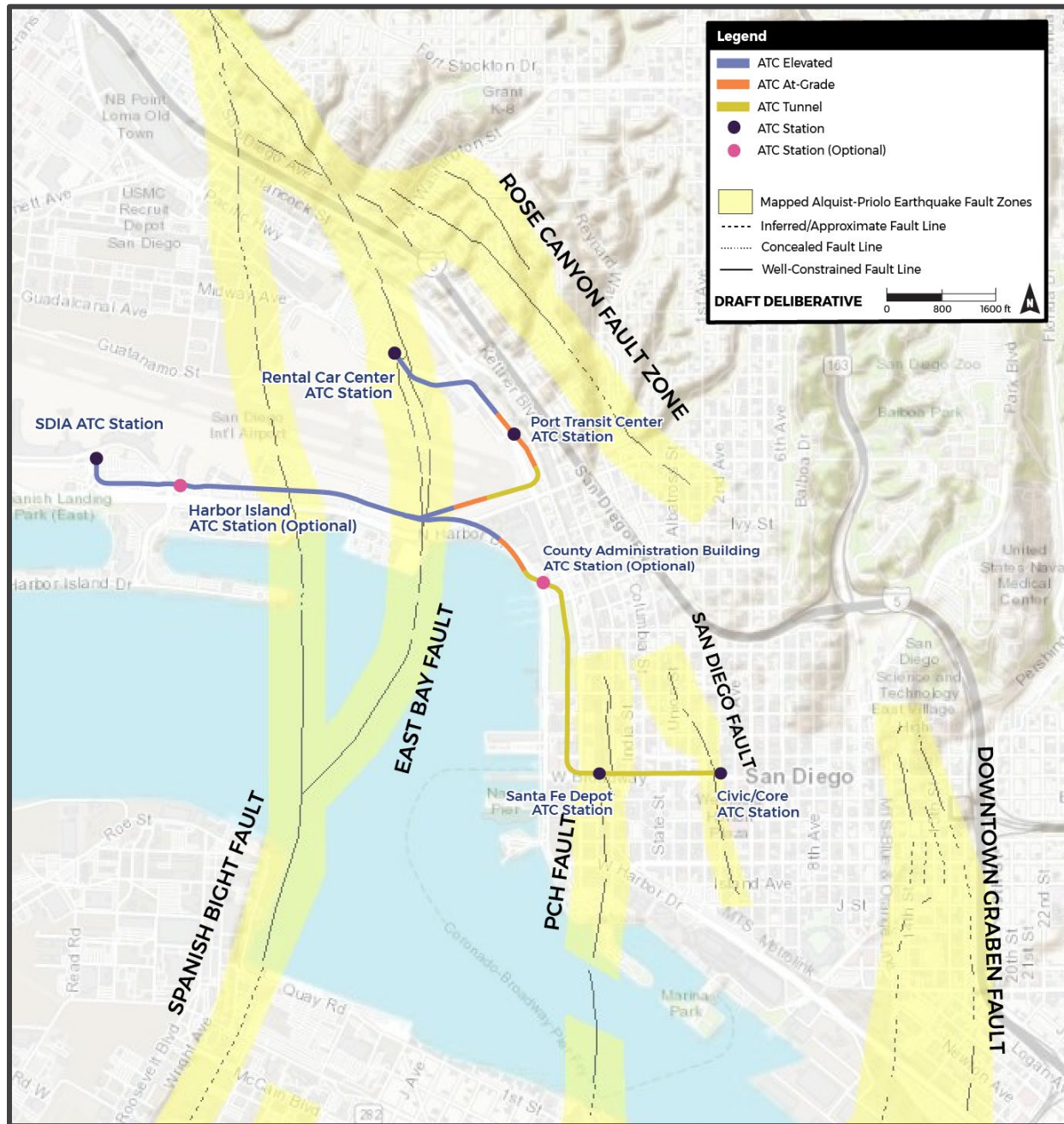
alignment from Santa Fe Depot ATC Station to the Civic/Core ATC Station is characterized by variably thick undocumented fill soils underlain by the Bay Point and San Diego Formations.

From a seismic/faulting perspective, the area is considered seismically active and includes several known active faults (Figure M-4). An active trace of the Spanish Bight Fault crosses the alignment immediately to the west of the intersection of Liberator Way and North Harbor Drive (Figure M-4). Likewise, an active trace of the East Bay Fault crosses the alignment north of the US Coast Guard Station on North Harbor Drive and it continues north toward the SDIA rental car center. These fault traces generally are perpendicular with the elevated alignment running east-west. The seismically active, relatively wide, Rose Canyon Fault Zone (RCFZ) is located east of the cut-and-cover alignment on Laurel Street and is anticipated to run parallel to the northern part of the alignment. This portion of the RCFZ is inferred to possibly connect to the northerly converging Pacific Coast Highway and San Diego Faults. The location of these faults in between the designated Alquist-Priolo zones is unknown; however, there is a possibility that they could intersect the cut-and-cover tunnel alignment.

The southern portion of the alignment through Pacific Highway runs within a mapped Alquist-Priolo Earthquake Fault Zone. The last section of the alignment from Santa Fe Depot to the Civic/Core ATC Station crosses an additional Alquist-Priolo Earthquake Fault Zone triggered by the presence of the San Diego fault. As such, the possibility of active faulting in this area is considered very high. The presence of active faults can have a significant impact to the project, particularly for structures that are classified for human occupancy. These may include, but are not limited to, passenger stations and the OMSF. Fault rupture hazard studies will be required to ensure that habitable structures are placed at a sufficient distance from active fault traces.

Groundwater elevations near areas of the alignment located closer to San Diego Bay are tidally influenced but are relatively close to the ground surface. The presence of a relatively shallow groundwater, when coupled with seismic ground motion and certain subsurface conditions, increases susceptibility to liquefaction, lateral spreading and seismic settlements. Soil liquefaction occurs when saturated, cohesionless soils lose their stiffness and strength due to the build-up of excess pore water pressure during cyclic loading, such as that induced by earthquakes. The primary factors affecting the liquefaction potential of a soil deposit are intensity and duration of earthquake shaking, soil type and relative density, overburden pressures, fines content, and depth to groundwater. Soils most susceptible to liquefaction are saturated loose sands and low plasticity to non-plastic silts. The potential consequences of liquefaction to structures include loss of bearing capacity, post-liquefaction settlement, slope instability, and surface sand boils. When combined with a sloping ground or “free faces,” such as bridge abutments, the loss of soil shear strength and stiffness that is associated with liquefaction can result in lateral spreading displacements (a form of seismic slope instability also known as “flow failure”) that can impose lateral loads upon the foundations and result in several feet of permanent soil lateral displacements.

Figure M-4. Downtown San Diego Alquist-Priolo Earthquake Fault Zones with Concept 5C Alignment



Source: WSP 2023

Post-liquefaction seismic settlements occur when the excess pore water pressure induced by the seismic shaking dissipates and the soil readjusts in a new equilibrium condition. This typically occurs within a few seconds to minutes after the earthquake event. Post-liquefaction settlements can pose a significant hazard to structures founded on shallow foundations. The hydraulic fill soils and estuarine deposits in this area likely have a moderate to high potential for earthquake induced liquefaction, lateral spreading, and seismic settlement.

Farther from San Diego Bay, lateral spreading is less likely as the ground elevation rises and the soil conditions generally improve. The Bay Point Formation is generally considered medium dense to dense sandy soil and firm to very stiff clayey soil that is not prone to liquefaction during seismic events. The San Diego Formation may contain very dense and hard sandstone and conglomerate materials and is not considered to be prone to liquefaction.

Table M-11 provides a qualitative summary of the geologic and geotechnical conditions for the various components of this concept. Table M-12 includes an assessment of the favorability that each geotechnical/geologic condition is anticipated to have on the various project locations and alignment types.

Table M-11. Concept 5C Geologic and Geotechnical Conditions

LOCATION	UPPER SOIL LAYER COMPETENCY	DEPTH TO COMPETENT SOFT ROCK	ACTIVE FAULTING POTENTIAL	LIQUEFACTION POTENTIAL	LATERAL SPREADING POTENTIAL
Elevated ATC along N Harbor Dr	Very poor	Very Deep	Very high (3 to 4 perpendicular crossings)	Very High	High
Cut-and-cover tunnel	Poor	Deep	Moderate (possible PCH and SD Fault crossings)	High	Moderate
SDIA rental car center and vicinity	Fair	Moderate	High (3 to 4 oblique fault crossings)	Moderate	Low
Pacific Highway Alignment to Santa Fe Depot	Fair	Deep	Very High (3 to 4 oblique fault crossings)	Moderate	Low
Santa Fe Depot to Civic Center	Fair	Moderate	Very High (PCH and SD Faults cross)	Negligible	Negligible

Source: WSP 2022

Notes: ATC = Airport Transit Connector; PCH = Pacific Coast Highway; SD = San Diego; SDIA = San Diego International Airport

Table M-12. Concept 5C Geologic and Geotechnical Conditions Favorability Evaluation

LOCATION	UPPER SOIL LAYER COMPETENCY	DEPTH TO COMPETENT SOFT ROCK	ACTIVE FAULTING POTENTIAL	LIQUEFACTION POTENTIAL	LATERAL SPREADING POTENTIAL
Elevated ATC along N Harbor Dr	Low	N/A	Low	Very Low	Low
Cut-and-cover tunnel	Medium	N/A	Medium	Low	Medium
SDIA rental car center and vicinity	High	N/A	Low	Medium	High
Pacific Highway Alignment to Santa Fe Depot	High	Low	Very Low	N/A	N/A
Santa Fe Depot to Civic Center	Medium	Medium	Very Low	N/A	N/A
Overall Concept 5C	Medium-Low				

Source: WSP 2022

Notes:

High: High favorability (geotechnical condition is highly favorable for this location and alignment type)

Medium: Medium favorability (geotechnical condition is favorable for this location and alignment type)

Low: Low favorability (geotechnical condition is not favorable for this location and alignment type)

Very Low: Very Low favorability (geotechnical condition is particularly not favorable for this location and alignment type)

ATC = Airport Transit Connector; N/A: Not Applicable (geotechnical condition is irrelevant for this location and alignment type); SDIA = San Diego International Airport

M.5.5. Regulatory Considerations

The Regulatory Considerations criterion identifies the federal and state agency approvals, permits, and coordination potentially required for implementation of each concept. The following details the types of agency approval and permits that may be applicable to each concept, based on information available to date. Additional approvals and coordination may be identified during subsequent phases of the project development process. All concepts would require environmental clearance pursuant to the California Environmental Quality Act (CEQA), for which SANDAG would be the CEQA lead agency. Additionally, the project would likely have a federal nexus, which would also require environmental clearance pursuant to the National Environmental Policy Act. At this time, a federal lead agency has not been identified.

Federal Aviation Administration

The Federal Aviation Administration (FAA) is the largest United States transportation agency and regulates all aspects of civil aviation within the country. Concept 5C would have construction activities within 5,000 feet of FAA facilities. The following regulations would apply to both permanent features and construction activities associated with Concept 5C where the concept is in proximity or on airport property.

Title 14, Chapter 1 of the Code of Federal Regulations (CFR). Title 14, Chapter 1 of the CFR includes policies and regulations that govern the development and construction within airport property or within zones of airport influence, such as noise zones. This CFR also includes

regulations governing runway protection zones and obstructions to air navigation in Part 77, “Safe, Efficient Use, and Preservation of the Navigable Airspace.” Part 77.9, “Construction or Alteration Requiring Notice,” provides height restriction standards for the construction of any facilities within 20,000 feet, 10,000 feet, and 5,000 feet from the nearest point of the nearest runway of the SDIA. A Notice of Proposed Construction or Alteration (FAA Form 7460-1) would need to be filed at least 45 days (1 year recommended) prior to construction to confirm a “No Hazard” determination from FAA related to permanent impacts within Part 77 surfaces. That form would also need to be filed at least 45 days prior to construction (minimum 90 days recommended) for temporary impacts and would identify the location of all construction equipment and top elevations near the runway.

California Coastal Commission

The California Coastal Commission (CCC) is a state agency within the California Natural Resources Agency with quasi-judicial control of land and public access along the state's 1,100 miles of coastline. The Concept 5C alignment along and beneath Harbor Drive, Pacific Highway, and Broadway would be located within the California Coastal Zone as identified by the CCC. The following regulations would apply to both permanent features and construction activities within the California Coastal Zone.

Title 15, CFR Parts 923 and 930, “Coastal Zone Management Act (CZMA).” Title 15, Part 923 of the CFR contains the requirements for the California coastal management program, pursuant to the CZMA of 1972. California’s program identifies coastal resources that require management or protection by the state, including resources that are located within Coastal Zones and would be subject to impacts from development. The CZMA defines Coastal Zones as “coastal waters...and the adjacent shorelands...strongly influenced by each other and in proximity to the shorelines of coastal states.” Title 15, Part 930 of the CFR requires a federal consistency review of federal agency, federally permitted, and federally funded (to state and local government) activities that affect the Coastal Zone.

Title 14, Natural Resources, Division 5.5. Regulations under Title 14, Division 5.5, pursuant to the California Coastal Act of 1976, defines the roles and responsibilities of the CCC to carry out the full purposes and provision of the Act. Chapter 5, “Coastal Development Permits Issued by Coastal Commissions,” governs the process for the CCC to assess and approve coastal development permits for projects located within Coastal Zones.

United States Fish and Wildlife Service

The United States Fish and Wildlife Service (USFWS) is the federal agency responsible for enacting and enforcing federal conservation legislation. Due to the presence of the federally endangered California least tern near the southeast property line of the airport, consultation with USFWS would be required.

Federal Endangered Species Act (FESA). The FESA regulates the take of endangered and threatened species and their adverse modification of federally designated critical habitat. Take as defined under the FESA means “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.” Procedures for addressing take of federally listed species follow two principal pathways, both of which require consultation

with the USFWS, which administers the FESA for terrestrial and aquatic species limited to inland waters, or National Oceanic and Atmospheric Administration, which administers the FESA for marine species. The first pathway, a Section 10(a) incidental take permit, applies to situations where a nonfederal governmental entity must resolve potential adverse impacts on species protected under the FESA. The second pathway, a Section 7 consultation, applies to projects directly undertaken by a federal agency or private projects requiring a federal permit or approval. Section 7 consultation between the federal project lead and USFWS is anticipated.

Migratory Bird Treaty Act (MBTA). Title 50, Part 10 of the CFR contains the provisions of the MBTA, which establishes the protection of migratory birds under the authority of the USFWS. Under this Act, taking, killing, or possessing migratory birds including feathers, or other parts, nests, eggs, or products, is unlawful except as allowed by implementing regulations (50 CFR 21). At this time there is no process in place for USFWS to authorize the incidental take of migratory birds that may result from construction activities or from striking project facilities during operations. Regulated species are listed at CFR Title 50 Part 10.13.

California Department of Fish and Wildlife (CDFW)

The CDFW is the state agency which manages and protects the state's flora, fauna, and habitats. The CDFW is responsible for enforcing state conservation legislation including the California Endangered Species Act (CESA). Due to the presence of the California least tern, which is listed as a State of California endangered species, near the southeast property line of the airport, coordination with CDFW may be required.

California Endangered Species Act. Sections 2050 through 2098 of the California Fish and Game Code outline the protection provided to California's rare, endangered, and threatened species. Section 2080 of the Fish and Game Code prohibits the taking of plants and animals listed under the CESA. According to the Fish and Game Code, take is defined as to hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill. Applicants who obtain a federal incidental take permit for a species also listed under CESA and expect take as described above, may request a determination from CDFW that the federal document is consistent with CESA. If the CDFW Director determines that the federal incidental take permit is consistent with CESA, a Consistency Determination will be issued. If CDFW does not issue a Consistency Determination a Section 2081 incidental take permit would be required.

San Diego County Regional Airport Authority

The San Diego County Regional Airport Authority (Airport Authority) is the agency responsible for managing the operations of SDIA and for addressing the San Diego region's long-term air transportation needs. The Airport Authority also serves as the region's Airport Land Use Commission. Coordination with the Airport Authority would be required for the portions of the concept on or adjacent to airport property. Coordination with the Airport Authority would be required for the portions of the concept on or adjacent to airport property.

SDIA Biodiversity Plan. The Airport Authority publishes the Biodiversity Plan, which directs the Authority's management of plants and wildlife on airport property. In particular, the Biodiversity Plan establishes the framework for the habitat management of the endangered California least

tern, which has been known to nest on bare areas in the airport infields. Management strategies are driven in part by the Airport's 1993 Biological Opinion and 2018 Informal Consultation.

Federal Railroad Administration

The Federal Railroad Administration (FRA) is a federal agency within the US Department of Transportation responsible for the transportation of goods and people on railways. Concept 5C would provide a new Santa Fe Depot ATC Station and an optional County Administration Building ATC Station. The Santa Fe Depot ATC Station would provide connections to the Trolley Blue and Trolley Green Lines, Amtrak Pacific Surfliner, COASTER, and bus. New facilities connecting to Amtrak facilities would require cooperation and approval from Amtrak and would be required to comply with all regulations and safety statutes of the CFR related to passenger rail construction and operation.

Title 49, Subtitle B, Chapter VII of the CFR. The National Railroad Passenger Corporation (Amtrak) is a for-profit corporation authorized by the Rail Passenger Service Act which provides rail passenger services. Amtrak is not an agency or establishment of the US Government but is a service subject to the rules and regulations of the FRA. Railroads on standard gage track which are part of the general railroad system of transportation, including Class I, Class II, National Railroad Passenger Corporation (Amtrak), and other railroads providing commuter service in a metropolitan or suburban area are required to cooperate with the FRA on operating rules, timetables, and other metrics. FRA operational regulations do not apply to railroads or rapid transit operations in an urban area operating outside of the general railroad system of transportation.

California Public Utilities Commission

The California Public Utilities Commission (CPUC) has safety and security regulatory authority over all rail transit and other public transit fixed guideway systems under Public Utilities Code Section 99152 and other statutes. CPUC defines Rail Fixed Guideway Systems as any light, heavy, or rapid rail system, monorail, inclined plane, funicular, trolley, cable car, automatic people mover, or automated guideway transit system used for public transit. Coordination with CPUC and compliance with applicable General Orders will be required.

Occupational Safety and Health Standards

The Occupational Safety and Health Administration (OSHA) is the regulatory agency of the US Department of Labor which ensures compliance with health and safety regulations for workers by enforcing standards and providing training, outreach, education, and assistance. Concept 5C would include boring construction activities and would be subject to OSHA regulations.

Title 29, Subtitle B, Chapter XVII, Part 1926 of the CFR. Title 29, Part 1926 of the CFR includes the safety and health regulations during construction. Section 1926.800 details workplace safety regulations for underground construction. Underground bored tunnel construction would be subject to OSHA rules and regulations contained in Title 29 of the CFR regarding safety, air quality monitoring, hazardous materials, ventilation, fire prevention, and other activities.

Conclusion

Concept 5C may require permitting and coordination with the FAA, CCC, USFWS, CDFW, Airport Authority, FRA, Amtrak, OSHA, and the local jurisdictions and may be required to comply with applicable regulations including, but not limited to, the following:

- FAA: 14 CFR Chapter 14
- CCC: 15 CFR Parts 923 and 930 - Coastal Zone Management Act
- CCC: Title 14, Natural Resources Division 5.5, California Coastal Commission
- USFWS: Federal Endangered Species Act
- USFWS: Migratory Bird Treaty Act
- CDFW: California Endangered Species Act
- SDIA Biodiversity Plan
- FRA: 49 CFR Subtitle B, Chapters II and VII
- CPUC: General Orders
- OSHA: 29 CFR, Subtitle B, Chapter XVII, Part 1926

M.6. Cost

M.6.1. Capital Cost

The capital costs estimate for Concept 5C included the estimated costs for the following program components:

- Construction
- Vehicles
- Professional services
- Unallocated contingency (20%)

Prototypical Unit Price Elements were developed to represent anticipated guideway configurations (i.e., aerial, at-grade, and/or tunnel), stations, maintenance facilities, and enabling work. High-level estimates for vehicle acquisitions and allowances for professional services were also included. Refer to Appendix P for additional detail on the methodology used for the cost estimate.

At this stage of the project development process, costs were estimated in rough-orders-of-magnitude for purposes of comparing each concept to each other. The cost estimates are in 2022 dollars. Right-of-way costs were not included in these estimates. Table M-13 outlines the capital cost estimate for Concept 5C including a range from low to high.

Table M-13. Concept 5C Capital Cost

CONCEPT DESCRIPTION	COST IN MILLIONS (2022)		
	LOW	MID-POINT	HIGH
Concept 5C ATC to PTC/CONRAC and Civic/Core (hybrid)	\$3,713.4	\$4,368.7	\$5,679.3

Source: WSP, HDR 2022

Note: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center

M.6.2. Cost per Rider

The cost per rider was calculated using the 2050 ridership forecasts and capital costs developed for this study to provide a more direct comparison of concepts given the differences in the number of stations and locations served. Table M-14 summarizes the cost per rider estimates for Concept 5C, including a range from low to high.

Table M-14. Concept 5C Cost Per Rider

CONCEPT	COST (2022)		
	LOW	MID-POINT	HIGH
Concept 5C ATC to PTC/CONRAC and Civic/Core (hybrid)	\$6.37	\$7.33	\$9.53

Source: WSP, HDR 2022

Note: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center

M.6.3. Cost per Mile

Cost per mile was calculated based on capital cost and the length of each concept in 2022 dollars. Table M-15 presents the cost per mile for Concept 5C including a range from low to high.

Table M-15. Concept 5C Cost Per Mile

CONCEPT DESCRIPTION	COST IN MILLIONS (2022)		
	LOW	MID-POINT	HIGH
Concept 5C ATC to PTC/CONRAC and Civic/Core (hybrid)	\$897	\$1,055	\$1,372

Source: WSP, HDR 2022

Note: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center

M.6.4. Operations and Maintenance

Estimation of annual Operations and Maintenance (O&M) costs associated with Concept 5C is outside of the scope of this study. However, a high-level comparative assessment of probable O&M cost in qualitative terms was undertaken. Table M-16 presents a qualitative assessment of the main O&M cost elements for the three technologies under consideration – ATC, Trolley (light rail transit [LRT]), and bus. Among the various ATC concepts, O&M costs would generally increase as the alignment length, number of stations, and/or ridership increases. Additionally, underground alignments typically have higher O&M costs than aerial alignments due to the added cost of

ventilation and fire suppression equipment. As shown in Table M-16, the ATC concepts would have high O&M cost for two of the seven elements: guideway infrastructure and energy consumption.

Table M-16. Operations and Maintenance Costs

COST DRIVER	ATC	TROLLEY (LRT)	ENHANCED BUS	ASSESSMENT
Guideway Infrastructure	\$\$\$	\$\$	\$	Extended underground ATC alignment would require added maintenance of ventilation and fire life safety systems. LRT concept would take advantage of using existing infrastructure along the Green Line and therefore would incur less maintenance cost. Bus infrastructure is shared with infrastructure owned by others and would have low infrastructure maintenance costs.
Operations and Support Staff	\$\$	\$\$\$	\$\$\$	Additional cost for personnel (salaries/insurance/medical etc.), including drivers/operators and associated support personnel. OMSF design and capacity requirements (restrooms/conference rooms/offices/utility costs) are also affected by the number of personnel required for operations. ATC vehicles are assumed to be automated (i.e., driverless).
Vehicle Maintenance	\$\$	\$\$\$	\$	ATC vehicles operate at much shorter headways requiring higher vehicle count compared to LRT vehicles expected to operate on 15-minute headways. Buses would also have a higher vehicle count than LRT vehicles to provide comparable capacity; however, both ATC and LRT are more complex vehicles and more costly to maintain. Also, maintenance costs are lower for rubber-wheeled vehicles (ATC and bus). Special maintenance equipment is required for steel wheel truing and rail grinding. LRT vehicles also employ a pantograph system to collect power from an overhead catenary system requiring additional maintenance.
Energy Consumption	\$\$\$	\$	\$\$\$	The performance and frequency of ATC vehicles typically translates to higher energy consumption/demand. Energy cost for ATC vehicles might therefore be higher than that of LRT vehicles. Energy consumption for buses using internal combustion engines may be lower per vehicle, but the number of vehicles required would be much higher.

COST DRIVER	ATC	TROLLEY (LRT)	ENHANCED BUS	ASSESSMENT
Systems	\$	\$\$	\$	Train control systems for LRT would include Automatic Train Protection but not Automatic Train Operation because trains are manually driven. Because a typical ATC uses vehicle location/communication dynamics (as well as Automatic Train Operation) for movement, authority wayside equipment such as signals/signs and associated cables are minimal. Enhanced bus service typically implements Transit Signal Priority over existing traffic control equipment requiring a nominal amount of maintenance.

Source: WSP and HDR 2022

Notes: ATC = Airport Transit Connector; LRT = light rail transit; OMSF = Operations, Maintenance and Storage Facility

M.7. Community Effects and Economic Benefits

The community effects evaluation criteria identify the anticipated community effects and adjacent development considerations for each concept. The community effects analysis contains four primary components: (1) identifying the communities within each station area (0.5-mile buffer around each station), (2) identifying the population and housing within each station area, (3) identifying the jobs and employment industries within each station area, and (4) identifying the percentage of workers, including SDIA workers, who travel from the north, south, and east areas of San Diego County to reach the Project Area (defined as the combined station areas for the concept).

Communities were identified using ArcGIS and data from the SANDAG GIS Open Data Portal. Population and housing within each station area was determined using U.S. Census Bureau 2017-2021 American Community Survey 5-Year estimates. The US Census Bureau’s OnTheMap web feature was used to determine (1) the number of jobs by industry within each station area and (2) the municipal origins for workers commuting to the Project Area. Job industries are categorized based on the North American Industry Classification System (NAICS), which is the federal classification standard for businesses in the United States. The OnTheMap web feature displays the top 12 municipal home destinations for the Project Area and condenses the remaining destination under the “All Other Locations” category. The following 12 cities were assessed as home destinations for workers in the Project Area by the OnTheMap web feature: San Diego, Chula Vista, El Cajon, National City, Los Angeles, La Mesa, Santee, La Presa, Lemon Grove, Carlsbad, Spring Valley, and Escondido. The adjacent development considerations analysis identifies the number of vacant parcels within each station area. Vacant properties within the station areas were identified using the Parcel and Current Land Use datasets from the SanGIS/SANDAG GIS Data Warehouse and were field verified in September 2022.

M.7.1. Adjacent Community Effects

Concept 5C would have a similar alignment and stations as those described for Concepts 5A and 5B. Concept 5C would therefore have similar connections to the surrounding communities, jobs numbers and classifications, and home destination cities as discussed for Concept 5C and described below.

Surrounding Communities

Concept 5C would provide connections to 10 City of San Diego communities: SD International, Middletown, Park West/Bankers Hill, Harborview, Marina, Little Italy, Core-Colombia, Horton Plaza, Gaslamp, and Cortez. The SDIA ATC Station and Harbor Island ATC station areas are within the SD International Airport community. The PTC ATC station area is within the Park West/Bankers Hill and Harborview communities. The Rental Car ATC station area is located within the Middletown community. The County Administration Building ATC Station is within the Park West/Bankers Hill, Harborview, and Marina communities, while the Santa Fe Depot ATC station area is within the Little Italy, Marina, Core-Colombia, and Horton Plaza communities. The Civic/Core ATC station area is within the Little Italy, Cortez, Marina, Core-Columbia, Horton Plaza, and Gaslamp communities. Table M-17 summarizes the communities located within each of the station areas for Concept 5C.

Table M-17. Surrounding Communities for Concept 5C

STATION AREA ¹	COMMUNITIES
SDIA ATC Station	SDIA
Harbor Island ATC Station	SDIA
PTC ATC Station	Park West/Bankers Hill
	Harborview
Rental Car Center ATC Station	Middletown
County Administration Building ATC Station ²	Park West/Bankers Hill
	Harborview
	Little Italy
Santa Fe Depot ATC Station ³	Little Italy
	Marina
	Core-Colombia
	Horton Plaza

STATION AREA ¹	COMMUNITIES
Civic/Core ATC Station	Little Italy
	Cortez
	Marina
	Core-Columbia
	Horton Plaza
	Gaslamp

Source: SANDAG 2022

Notes:

¹Station Areas are defined as a 0.5-mile buffer from each station centroid.

²Under Concept 5C, the County Administration Building ATC Station would be located between Grape Street and Hawthorn Street.

³Under Concept 5C, Santa Fe Depot ATC Station would be located on Broadway.

ATC = Airport Transit Connector; PTC = Port Transit Center; SDIA = San Diego International Airport

Population and Housing

Table M-18 summarizes the population and number of households within 0.5 mile of each station. Concept 5C station areas contain approximately 16,100 households with a population of 29,000. The station area with the largest population and number of households is the Civic/Core ATC Station.

Table M-18. Population and Housing for Concept 5C

STATION AREA ¹	POPULATION	HOUSEHOLDS
SDIA ATC Station	300	0
Harbor Island ATC Station	200	0
PTC ATC Station	4,300	2,300
Rental Car Center ATC Station	2,000	800
County Administration Building ATC Station ²	6,900	4,300
Santa Fe Depot ATC Station ³	10,900	5,300
Civic/Core ATC Station	16,800	9,300
Total Project Area ⁴	29,000	16,100

Source: US Census Bureau 2023; SANDAG 2023

Notes:

¹Station Area is defined as a 0.5-mile buffer from each station centroid.

²Under Concept 5C, the County Administration Building Station would be located between Grape Street and Hawthorn Street.

³Under Concept 5C, the Santa Fe Depot Station would be located on Broadway.

⁴Project Area reflects the combined station areas for the concept. Station Area estimates do not sum to Project Area totals due to station area overlap.

ATC = Airport Transit Connector; PTC = Port Transit Center; SDIA = San Diego International Airport

Jobs and Employment

The Concept 5C station areas contain approximately 72,400 jobs with Accommodation and Food Services employing the largest share of workers, and Mining, Quarrying, and Oil and Gas Extraction and Agriculture, Forestry, Fishing and Hunting representing the smallest share. Transportation and Warehousing represents the largest share of jobs in the SDIA ATC Station, Harbor Island ATC Station, and Rental Car Center ATC station areas. Accommodation and Food Services represents the largest share of jobs in the PTC ATC station area and the County Administration Building ATC station area. Within the Santa Fe Depot ATC Station and Civic/Core ATC station area, Public Administration represents the largest share of jobs. Table M-19 summarizes the percentage of jobs by the top NAICS industry employers within each station area and Project Area for Concept 5C.

Table M-19. Jobs and Employment Sectors for Concept 5C

NAICS SECTOR	PERCENTAGE (%) OF JOBS BY STATION AREAS ¹²²							
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	PTC ATC STATION	RENTAL CAR CENTER ATC STATION	COUNTY ADMINISTRATION BUILDING ATC STATION ³	SANTA FE DEPOT ATC STATION ⁴	CIVIC/COR E ATC STATION	COMBINED CONCEPT 5C STATION AREA
Accommodation and Food Services	28.7	21.3	25.9	13.0	38.2%	16.2	19.6	23.0
Administration & Support, Waste Management and Remediation	3.4	4.6	7.2	13.7	3.7%	3.3	3.7	4.5
Agriculture, Forestry, Fishing and Hunting	0.0	0.0	0.1	0.0	0.0%	0.0	0.0	0.0
Arts, Entertainment, and Recreation	7.3	5.4	0.4	0.9	1.4	2.1	1.8	2.0
Construction	0.2	0.3	5.1	2.7	2.9	1.9	1.8	1.9
Educational Services	0.0	0.0	1.6	0.0	1.1	0.8	1.1	1.0
Finance and Insurance	2.7	0.0	1.8	0.1	2.2	4.9	6.6	5.3
Health Care and Social Assistance	0.0	0.0	5.4	4.6	2.3	1.3	2.3	2.3
Information	0.1	0.2	0.4	1.3	0.7	3.3	3.3	2.6
Management of Companies and Enterprises	0.0	0.0	0.9	0.5	0.6	1.6	1.4	1.2

NAICS SECTOR	PERCENTAGE (%) OF JOBS BY STATION AREAS ¹²²							
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	PTC ATC STATION	RENTAL CAR CENTER ATC STATION	COUNTY ADMINISTRATION BUILDING ATC STATION ³	SANTA FE DEPOT ATC STATION ⁴	CIVIC/COR E ATC STATION	COMBINED CONCEPT 5C STATION AREA
Manufacturing	0.0	0.0	4.5	0.7	18.0	0.1	0.3	2.6
Mining, Quarrying, and Oil and Gas Extraction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Services (excluding Public Administration)	0.7	2.1	8.2	4.3	5.6	1.5	7.1	6.2
Professional, Scientific, and Technical Services	0.2	0.3	13.0	3.2	14.3	20.9	22.4	17.7
Public Administration	0.5	0.3	17.3	9.8	0.8	35.4	22.6	17.3
Real Estate and Rental and Leasing	3.4	9.0	4.7	8.4	3.9	2.2	2.0	2.7
Retail Trade	2.2	1.6	2.9	2.7	2.4	2.3	2.3	2.5
Transportation and Warehousing	50.1	54.7	0.0	33.8	0.1	0.6	0.3	6.1
Utilities	0.0	0.0	0.0	0.0	0.7	1.3	0.7	0.6
Wholesale Trade	0.3	0.2	0.6	0.2	1.3	0.5	0.7	0.7

Source: US Census Bureau 2022; SANDAG 2022

Notes:

¹ Station Area is defined as a 0.5-mile buffer from each station centroid.

² The OnTheMap tool displays employment data at the census place and census block levels. On the Map does not differentiate between employment headquarters that are physically located within the same census block.

³ Under Concept 5C, the County Administration Building ATC Station would be located between Grape Street and Hawthorn Street.

⁴ Under Concept 5C, Santa Fe Depot ATC Station would be located on Broadway.

ATC = Airport Transit Connector; NAICS = North American Industry Classification System; PTC = Port Transit Center; SDIA = San Diego International Airport

Commuting Origins

Within the Concept 5C station areas, approximately 49 percent of workers commute from the communities within the City of San Diego; approximately 29 percent of workers commute from All Other Locations; and approximately 8 percent of workers commute from Chula Vista. For the SDIA ATC Station, Harbor Island ATC Station, PTC ATC Station, Rental Car Center ATC Station, County Administration Building ATC Station, Santa Fe Depot ATC Station, and Civic/Core ATC Station, the largest share of workers would commute to the Project Area from

the City of San Diego, with the second-largest share commuting from All Other Locations, and the third-largest share commuting from Chula Vista. Table M-20 summarizes the home destination cities for workers employed in the station areas and Project Area of Concept 5C.

Table M-20. Home Destinations for Workers Employed in Concept 5C

CITY	SHARE OF TOTAL JOBS (%) BY STATION AREA ¹²							
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	PTC ATC STATION	RENTAL CAR CENTER ATC STATION	COUNTY ADMINISTRATION BUILDING ATC STATION ³	SANTA FE DEPOT ATC STATION ⁴	CIVIC/COR E ATC STATION	COMBINED CONCEPT 5C STATION AREA
San Diego	43.7	42.6	53.4	47.1	53.9	49.4	49.4	49.4
Chula Vista	7.7	8.2	8.2	9.0	7.7	8.6	8.3	8.2
El Cajon	2.0	2.4	1.8	2.5	1.9	2.4	2.3	2.2
Los Angeles	2.5	3.1	2.2	2.4	2.4	1.8	2.1	2.2
National City	3.9	3.6	1.8	2.5	1.9	1.8	1.8	2.0
La Mesa	1.5	1.8	2.1	2.5	2.0	2.2	2.1	2.1
Santee	1.2	1.3	1.6	1.2	1.6	1.6	1.4	1.4
La Presa	1.3	1.4	0.0	1.2	0.0	1.2	1.1	1.1
Lemon Grove	1.2	1.2	1.5	1.2	1.0	1.1	1.0	1.0
Carlsbad	0.0	0.0	0.0	0.0	0.9	1.1	0.0	1.0
Spring Valley	1.2	1.2	0.0	0.0	0.0	0.0	0.0	0.0
Escondido	0.0	0.0	1.2	1.2	0.0	0.0	0.0	0.0
Imperial Beach	0.0	0.0	1.2	0.0	1.0	0.0	0.0	0.0
All Other Locations ⁵	33.9	33.3	24.9	29.2	25.7	28.8	29.5	29.4

Source: US Census Bureau 2022

Notes:

¹ Station Areas are defined as a 0.5-mile buffer from each station centroid.

² The OnTheMap tool commute destination information does not differentiate between worker transport mode (if any), regular or occasional commutes, or whether an employee works remotely. Workplace destinations are defined by the physical mailing address of each employment headquarters.

³ Under Concept 5C, the County Administration Building ATC Station would be located between Grape Street and Hawthorn Street.

⁴ Under Concept 5C, Santa Fe Depot ATC Station would be located on Broadway.

⁵ Includes all other US Census defined Places from where workers commute.

ATC = Airport Transit Connector; PTC = Port Transit Center; SDIA = San Diego International Airport

M.7.2. Adjacent Development Considerations

Economic opportunities for Concept 5C are determined by the number of existing vacant properties within each station area. Vacant parcels identified must be a minimum of 20,000 square feet and could not be in areas zoned as residential. No parcels were identified.

INTENTIONALLY LEFT BLANK

APPENDIX N CONCEPT 6: TROLLEY CONCEPT FROM SAN DIEGO INTERNATIONAL AIRPORT TO 12TH & IMPERIAL TRANSIT CENTER

N.1. Description of Concept

Concept 6 would feature an extension of the San Diego Trolley (Trolley), providing a connection from San Diego International Airport (SDIA) to the existing 12th & Imperial Transit Center. Table N-1 provides information on concept characteristics. The Trolley concept evaluated in this study was developed in coordination with the Metropolitan Transit System (MTS) and is substantially similar to the Trolley alternative included in the April 2021 Notice of Preparation.

Figure N-1 illustrates the concept alignment. From SDIA, Concept 6 would provide a new aerial alignment traveling east along Harbor Drive for 1.4 miles. At Laurel Street, the Concept 6 alignment would shift to at-grade using retaining walls for 0.2 mile before transitioning to a tunnel to continue beneath Harbor Drive. At Hawthorn Street, the underground alignment would turn east to connect with the existing Trolley Green and Blue Line tracks between Pacific Highway and Kettner Boulevard. Concept 6 would continue traveling south using the existing Trolley Green and Blue Line tracks to Santa Fe Depot before continuing south along the Trolley Green Line tracks. This concept would provide access to the existing Trolley stations at County Center/Little Italy, Santa Fe Depot, Seaport Village, Convention Center, and Gaslamp Quarter, before terminating at the 12th & Imperial Transit Center. A new Trolley station would be constructed at the transit-ready area at SDIA, and an optional station is under consideration near Harbor Island.

Table N-1. Concept 6 Characteristics

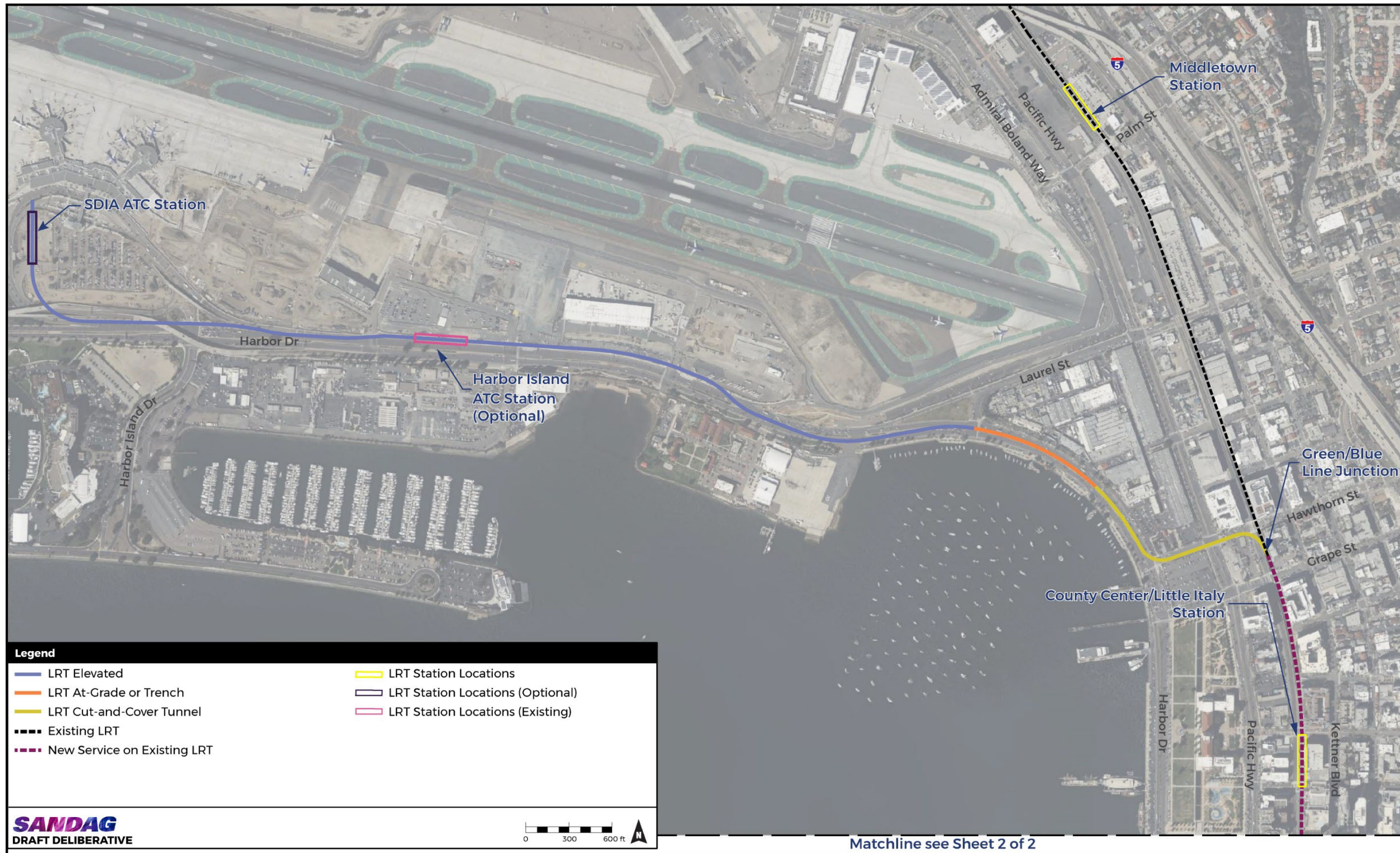
CHARACTERISTIC	
Length of alignment at-grade (miles)	0.2
Length of alignment on aerial structure (miles)	1.4
Length of alignment in tunnel (miles)	0.3
Length of alignment on existing tracks (miles)	2
Number of stations	8 (6 existing)
Minimum/shortest headways ¹	15 minutes

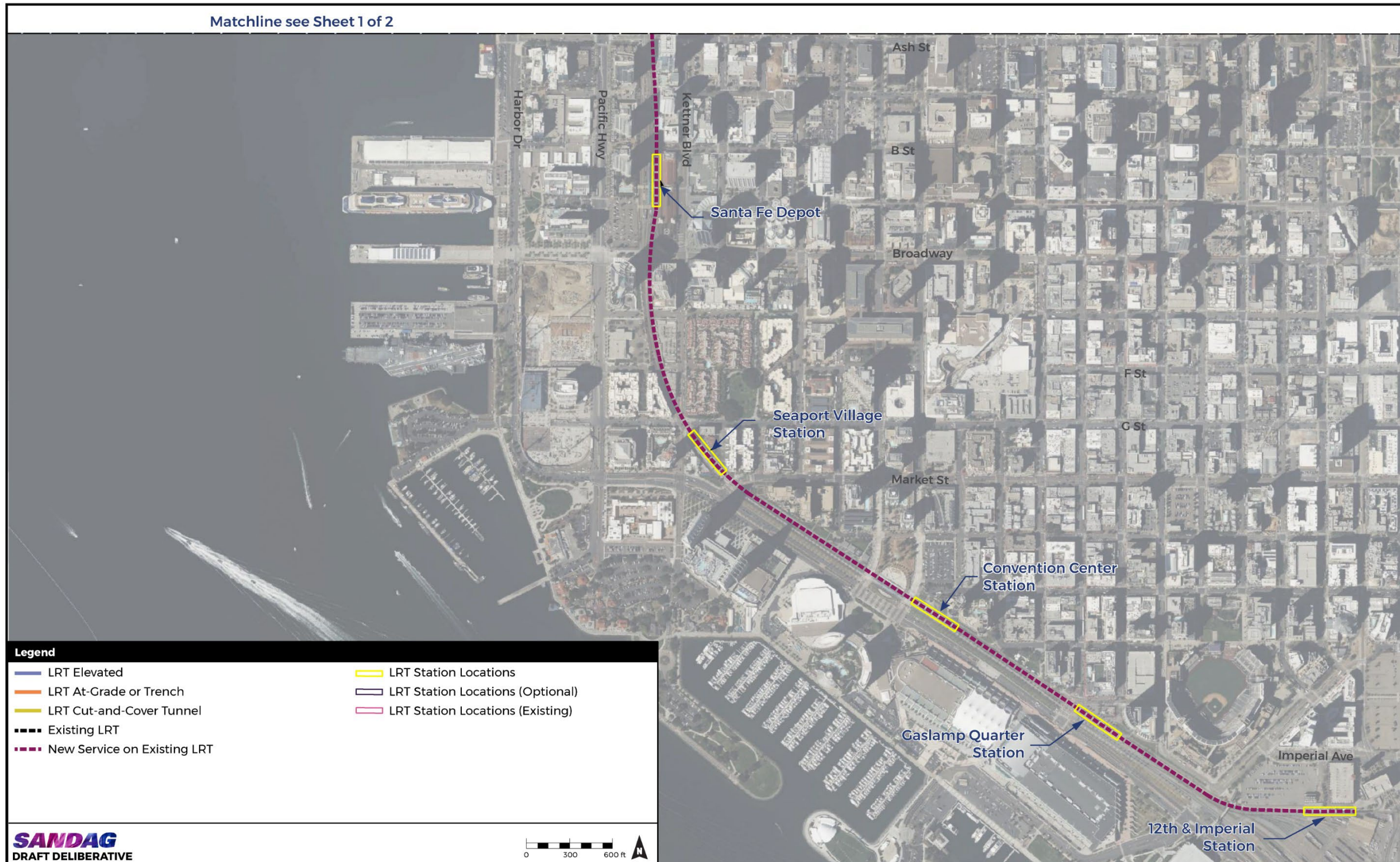
Source: WSP, HDR 2022

Notes:

¹ Shorter headways may be feasible but could require modifications to existing Trolley infrastructure for the portions of the alignment where the SDIA Trolley route would interline with the Trolley Green and Blue Lines. Such modifications could be considered in future studies.

Figure N-1. Concept 6 Trolley Concept from SDIA to 12th & Imperial Transit Center





Source: WSP, HDR 2022

N.2. Passenger Convenience and Ridership

N.2.1. Regional Connectivity

Regional connectivity is evaluated by identifying the number of modes of transportation and the number of major destinations and community facilities that can be reached within a 0.5-mile buffer of a station (defined as the “station area”). For the purpose of this analysis, “destinations” include major tourist destinations (e.g., attractions, museums, commercial shopping areas, recreational/historic areas) and community facilities (e.g., schools, parks, libraries, police/fire stations, hospitals).

Modes of Transportation

Concept 6 would have connections to the greater transit network, including the MTS bus and Trolley light rail (Blue Line, Green Line, and Orange Line), North County Transit District COASTER commuter trains, and the Amtrak Pacific Surfliner. Concept 6 would have connections to five existing Trolley stations at County Center/Little Italy, Santa Fe Depot, Seaport Village, Convention Center, and Gaslamp Quarter. Concept 6 would connect to the Trolley Blue Line, Green Line, and Orange Line, the COASTER commuter train, and the Amtrak Pacific Surfliner. A new Trolley station would be constructed at the transit-ready area at SDIA, and an optional station is under consideration near Harbor Island. Table N-2 summarizes the potential regional connections to existing bus transit routes, rail and Trolley connections, bike routes, major roads, and arterial/collector streets for Concept 6.

Bus Transit Routes: Concept 6 would provide connections to 20 MTS bus routes: AIR, 2, 3, 4, 5, 7, 11, 12, 83, 110, 120, 215, 225, 235, 280, 290, 901, 923, 929, and 992.

Rail and Trolley Lines: Concept 6 would serve 6 existing Trolley stations: County Center/Little Italy, Santa Fe Depot, Seaport Village, Convention Center, and Gaslamp Quarter, and 12th & Imperial Transit Center, with these stations also served by the Trolley Blue and/or Green Lines. At Santa Fe Depot, passengers could transfer to the Trolley Orange Line, COASTER, and Amtrak.

Bike Routes: Concept 6 would have connections to seven bicycle routes, including to the City of San Diego Bicycle Network (including bike lanes, separated bikeways, and bike routes), North Harbor Drive Bike Path, Embarcadero Path, California Path, and Columbia Path.

Major Roads, Arterials, and Collector Streets: Major roads are usually four to six lanes wide with limited access, grade separations, and extra lanes where needed. Major roads are designed for through traffic but usually have signals at major intersections. Major arterials are usually four to six lanes wide and although designed primarily for through traffic, arterials also provide access to abutting property. Collector Streets are typically two to four lanes wide and function as feeders of traffic to the major street system and provide continuity with local streets.

Concept 6 would be accessible by 12 major roadways and 16 arterial/collector streets.

Table N-2. Regional Connectivity for Concept 6

CATEGORY	NO. OF CONNECTIONS	ROUTE NAMES	STATION AREA (ATC STATIONS AND EXISTING STATIONS) ¹
Bus Routes	20	4 (12th & Imperial Trolley - Lomita Village)	Gaslamp Quarter (Existing), 12th & Imperial (Existing)
		12 (City College - Skyline Hills)	Convention Center (Existing), Gaslamp Quarter (Existing), 12th & Imperial (Existing)
		5 (Downtown San Diego - Euclid Transit Center)	
		215 (Mid-City Rapid)	County Center/Little Italy (Existing), Santa Fe Depot (Existing), Seaport Village (Existing), Convention Center (Existing)
		225 (Downtown - Otay Mesa TC)	
		235 (Downtown - Escondido Transit Center)	
		280 (Escondido Transit Center - Downtown)	
		290 (Rancho Bernardo Station - Downtown)	
		11 (SDSU - Downtown San Diego)	County Center/Little Italy (Existing), Santa Fe Depot (Existing), Seaport Village (Existing), Convention Center (Existing), Gaslamp Quarter (Existing)
		83 (Downtown San Diego - Old Town)	County Center/Little Italy (Existing), Santa Fe Depot (Existing), Seaport Village (Existing)
		923 (Downtown to Point Loma)	San Diego International Airport, Harbor Island, County Center/Little Italy (Existing), Santa Fe Depot (Existing), Seaport Village (Existing), Convention Center (Existing)
		992 (Airport/Downtown)	
		AIR (Old Town to Airport Shuttle)	San Diego International Airport, Harbor Island
		120 (Downtown San Diego - Kearny Mesa Transit Center)	Seaport Village (Existing), Convention Center (Existing)
3 (UCSD Hospital - Euclid Transit Center)	Seaport Village (Existing), Convention Center (Existing), Gaslamp Quarter (Existing), 12th & Imperial (Existing)		

CATEGORY	NO. OF CONNECTIONS	ROUTE NAMES	STATION AREA (ATC STATIONS AND EXISTING STATIONS) ¹
		110 (Mira Mesa - Downtown via Hwy 163)	County Center/Little Italy (Existing), Santa Fe Depot (Existing), Seaport Village (Existing), Convention Center (Existing)
		2 (Downtown San Diego - 30th & Adams)	County Center/Little Italy (Existing), Santa Fe Depot (Existing), Seaport Village (Existing), Convention Center (Existing)
		7 (Downtown San Diego - University/College)	County Center/Little Italy (Existing), Santa Fe Depot (Existing), Seaport Village (Existing), Convention Center (Existing)
		901 (Iris Transit Center - Downtown San Diego)	County Center/Little Italy (Existing), Santa Fe Depot (Existing), Seaport Village (Existing), Convention Center (Existing), Gaslamp Quarter (Existing), 12th & Imperial (Existing)
		929 (Iris Transit Center - 12th & Imperial)	County Center/Little Italy (Existing), Santa Fe Depot (Existing), Seaport Village (Existing), Convention Center (Existing), Gaslamp Quarter (Existing), 12th & Imperial (Existing)
Rail and Trolley Lines	5	Trolley Blue Line	County Center/Little Italy (Existing), Santa Fe Depot (Existing), Seaport Village (Existing), Gaslamp Quarter (Existing), 12th & Imperial (Existing)
		Trolley Green Line	County Center/Little Italy (Existing), Santa Fe Depot (Existing), Seaport Village (Existing), Gaslamp Quarter (Existing), 12th & Imperial (Existing)
		COASTER	County Center/Little Italy (Existing), Santa Fe Depot (Existing), Seaport Village (Existing)
		Amtrak Pacific Surfliner	County Center/Little Italy (Existing), Santa Fe Depot (Existing), Seaport Village (Existing)
		Trolley Orange Line	County Center/Little Italy (Existing), Santa Fe Depot (Existing), Seaport Village (Existing), Gaslamp Quarter (Existing), 12th & Imperial (Existing)
Bike Routes	7	North Harbor Dr Bike Path	San Diego International Airport, Harbor Island
		Embarcadero Path	County Center/Little Italy (Existing), Santa Fe Depot (Existing), Seaport Village (Existing), Convention Center (Existing), Gaslamp Quarter (Existing), 12th & Imperial (Existing)

CATEGORY	NO. OF CONNECTIONS	ROUTE NAMES	STATION AREA (ATC STATIONS AND EXISTING STATIONS) ¹
		City of San Diego Bicycle Network	San Diego International Airport, Harbor Island, County Center/Little Italy (Existing), Santa Fe Depot (Existing), Seaport Village (Existing), Convention Center (Existing), Gaslamp Quarter (Existing), 12th & Imperial (Existing)
		California Path	County Center/Little Italy (Existing), Santa Fe Depot (Existing), Seaport Village (Existing), Convention Center (Existing)
		Columbia Path	County Center/Little Italy (Existing), Santa Fe Depot (Existing), Seaport Village (Existing), Convention Center (Existing)
		Bayshore Bikeway	Convention Center (Existing), Gaslamp Quarter (Existing), 12th & Imperial (Existing)
		Martin Luther King, Jr. Promenade	Santa Fe Depot (Existing), Seaport Village (Existing), Convention Center (Existing), Gaslamp Quarter (Existing), 12th & Imperial (Existing)
Major Roads	12	6th Ave	Convention Center (Existing), Gaslamp Quarter (Existing)
		Park Blvd	Convention Center (Existing), Gaslamp Quarter (Existing), 12th & Imperial (Existing)
		Imperial Ave	Convention Center (Existing), Gaslamp Quarter (Existing), 12th & Imperial (Existing)
		12th Ave	Gaslamp Quarter (Existing), 12th & Imperial (Existing)
		13th ST	
		National Ave	
		Front St	County Center/Little Italy (Existing), Santa Fe Depot (Existing), Seaport Village (Existing), Convention Center (Existing), Gaslamp Quarter (Existing)

CATEGORY	NO. OF CONNECTIONS	ROUTE NAMES	STATION AREA (ATC STATIONS AND EXISTING STATIONS) ¹
		Pacific Hwy	County Center/Little Italy (Existing), Santa Fe Depot (Existing), Seaport Village (Existing), Convention Center (Existing)
		North Harbor Dr	San Diego International Airport, Harbor Island, County Center/Little Italy (Existing), Santa Fe Depot (Existing), Seaport Village (Existing)
		Broadway	County Center/Little Italy (Existing), Santa Fe Depot (Existing), Seaport Village (Existing), Convention Center (Existing)
		Harbor Dr	Santa Fe Depot (Existing), Seaport Village (Existing), Convention Center (Existing), Gaslamp Quarter (Existing), 12th & Imperial (Existing)
		Market St	Santa Fe Depot (Existing), Seaport Village (Existing), Convention Center (Existing), Gaslamp Quarter (Existing), 12th & Imperial (Existing)
Arterial/Collector Roads	16	1st Ave	County Center/Little Italy (Existing), Santa Fe Depot (Existing), Seaport Village (Existing), Convention Center (Existing), Gaslamp Quarter (Existing)
		4th Ave	Seaport Village (Existing), Convention Center (Existing), Gaslamp Quarter (Existing)
		5th Ave	Seaport Village (Existing), Convention Center (Existing), Gaslamp Quarter (Existing), 12th & Imperial (Existing)
		8th Ave	Convention Center (Existing), Gaslamp Quarter (Existing), 12th & Imperial (Existing)
		11th Ave	Gaslamp Quarter (Existing), 12th & Imperial (Existing)
		A St	County Center/Little Italy (Existing), Santa Fe Depot (Existing), Seaport Village (Existing)
		Ash St	County Center/Little Italy (Existing), Santa Fe Depot (Existing)

CATEGORY	NO. OF CONNECTIONS	ROUTE NAMES	STATION AREA (ATC STATIONS AND EXISTING STATIONS) ¹
		B St	County Center/Little Italy (Existing), Santa Fe Depot (Existing), Seaport Village (Existing)
		C St	
		F St	Santa Fe Depot (Existing), Seaport Village (Existing), Convention Center (Existing), Gaslamp Quarter (Existing)
		G St	
		Grape St	County Center/Little Italy (Existing)
		Hawthorn St	
		India St	County Center/Little Italy (Existing), Santa Fe Depot (Existing), Seaport Village (Existing)
		Kettner Blvd	
		State St	

Source: WSP, HDR, GPM, and TAHA 2022

Notes:

¹Station area is defined as a 0.5-mile buffer from the station centroid.

ATC = Airport Transit Connector; SDIA = San Diego International Airport

Connections to Destinations

There would be 65 destinations within Concept 6 station areas (Table N-3). The SDIA Station and Harbor Island (Optional) Station would be within walking distance to five destinations.

Table N-3. Destinations within Concept 6 Proposed Station Areas

DESTINATIONS	STATION AREA (ATC STATIONS AND EXISTING STATIONS) ¹
Monarch School	12th & Imperial (Existing)
Perkins K-8 School	
California Western School of Law	County Center/Little Italy (Existing)
New Vistas	Gaslamp Quarter (Existing)
Gaslamp Quarter	Convention Center (Existing), Gaslamp Quarter (Existing)
Davis House Park	Seaport Village (Existing), Convention Center (Existing), Gaslamp Quarter (Existing)
Gaslamp Museum at Davis-Horton House Museum & Park	
San Diego Chinese Historical Museum	
Embarcadero Marina Park South	Convention Center (Existing), Gaslamp Quarter (Existing)
Convention Center	Convention Center (Existing), Gaslamp Quarter (Existing), 12th & Imperial (Existing)
Fashion Institute of Design & Merchandising-San Diego	

DESTINATIONS	STATION AREA (ATC STATIONS AND EXISTING STATIONS) ¹
Fifth Avenue Landing Lawn Area	
Marina Linear Park	
Petco Park	
San Diego Bayfront Park	
SD Fire Station 4	
E3 Civic High	Gaslamp Quarter (Existing), 12th & Imperial (Existing)
San Diego Central Library	
Via Talentum Academy	
Embarcadero Marina Park North	Seaport Village (Existing), Convention Center (Existing)
Col. Salomon Child Development Center	County Center/Little Italy (Existing)
Washington Elementary	
Firehouse Museum	County Center/Little Italy (Existing), Santa Fe Depot (Existing)
Little Italy	
Maritime Museum of San Diego	
NHA - Stem Institute for Early Learning	
SD Fire Station 2	
Star of India Museum	
Waterfront Park/Harborview	
Complete Caregiver, Inc	
Planned Parenthood of SDRC - First Avenue Center	County Center/Little Italy (Existing)
San Diego Rescue Mission Children's Center	
Harbor Island	
San Diego Harbor Police	San Diego International Airport, Harbor Island
San Diego International Airport	
Spanish Landing Park (East)	
Spanish Landing Park (West)	
Horton Plaza Park	
Balboa Theatre	Civic/Core, Santa Fe Depot (Existing), Seaport Village (Existing), Convention Center (Existing)
King Promenade Park	
The New Children's Museum	Seaport Village (Existing), Convention Center (Existing), Gaslamp Quarter (Existing)
Seaport Village Shopping Center	Seaport Village (Existing), Convention Center (Existing)
Civic Center	

DESTINATIONS	STATION AREA (ATC STATIONS AND EXISTING STATIONS) ¹
Downtown San Diego/Core-Colombia	County Center/Little Italy (Existing), Santa Fe Depot (Existing)
King-Chavez Community High	
Hall of Justice	County Center/Little Italy (Existing), Santa Fe Depot (Existing), Seaport Village (Existing)
Metro Arson Strike Team	
Museum of Contemporary Art San Diego	
San Diego Central Courthouse	
San Diego Central Jail	
SD Fire Station 1/201	
Metropolitan Corrections Center	
NHA - Broadway Early Learning Academy	
Aspen Leaf Nursery & Preschool -Barry Ted Moskowitz CCC	Santa Fe Depot (Existing), Seaport Village (Existing), Convention Center (Existing)
Federal Courthouse	
Pantoja Park	
The Embarcadero	County Center/Little Italy (Existing), Santa Fe Depot (Existing), Seaport Village (Existing)
Cruise Ship Terminal	County Center/Little Italy (Existing), Santa Fe Depot (Existing)
Broadway Landing	County Center/Little Italy (Existing), Santa Fe Depot (Existing), Seaport Village (Existing)
Lane Field Park	
Navy Pier	Santa Fe Depot (Existing), Seaport Village (Existing)
Ruocco Park	
Tuna Harbor Park	
USS Midway Museum	
The Headquarters at Seaport	Santa Fe Depot (Existing), Seaport Village (Existing), Convention Center (Existing)

Source: WSP, HDR, and TAHA 2022

Notes:

¹Station area is defined as a 0.5-mile buffer from the station centroid.

ATC = Airport Transit Connector; SDFD = San Diego Fire Department; SDIA = San Diego International Airport

N.2.2. User Experience

The evaluation of user experience relates to the station area environment and a passenger's experience on the vehicle considering elements such as ease of transfers, navigation, and passenger comfort. For the purpose of this analysis, the ease of transfers considered the distance and navigation to the nearest connecting services. The number of modes of transportation that can be reached within 0.5-mile buffer of each station is discussed in Section N.2.1.

Drop-off/Pick-up, Navigation, and Transfer Convenience

The following sections summarize transfer convenience for each station along Concept 6, including between modes of transit and by vehicle, as applicable. Concept 6 would include one new light rail transit (LRT) station, one new optional LRT station, and six existing LRT stations along the Trolley Green Line, two of which are also currently served by the Trolley Blue Line. Transfer convenience at these stations was evaluated in terms of distance between modes of transit and vehicular drop-off/pick-up locations and the LRT stations along the alignment that would serve SDIA. As design is advanced throughout subsequent phases of project development, it is assumed that wayfinding, in terms of signage and paths of travel, would be provided to direct passengers to transfer locations. Therefore, wayfinding is not evaluated on a station-by-station basis.

SDIA Station: Vehicular pick-up and drop-off or transfers from the LRT to bus are not expected at this station. It is anticipated that passengers boarding or alighting the LRT at this station would be traveling to or from SDIA. The nearest entrance at Terminal 1 and Terminal 2 would require passengers to walk a minimum of 0.2 mile.

Harbor Island Station (Optional): While connections at this location would be limited, this station would allow for access to the MTS Route 923 N Harbor Dr and Harbor Island Dr bus stop, walking 300 feet west along Harbor Drive to reach the westbound stop and 500 feet along Harbor Drive and Harbor Island Drive to reach the eastbound stop. This station would also create a direct pedestrian linkage across Harbor Drive to future development. Vehicular drop-off and pick-up are not anticipated at this station.

Existing Trolley Stations: Concept 6 would interline with the Trolley Green and Blue Lines from Hawthorn Street to Santa Fe Depot and interline with the Trolley Green Line to the 12th & Imperial Transit Center. The total distance of interlining would be approximately two miles, with connections to six existing stations. Considerable signage and navigation assistance is already in place at existing stations, which supports the ease of access at each station. However, passengers boarding at an existing Trolley Blue or Green Line Station to travel to SDIA would need to select the correct train, as the Trolley Blue and Green Line currently continue north at the County Center/Little Italy Station. This may confuse passengers at the station areas, and additional signage would be needed to communicate the multiple routes that serve each station.

- **County Center/Little Italy Station (Trolley Blue and Green Line):** Connections and space for vehicular drop-off and pick-up would be limited. The nearest opportunities to transfer to connecting service would be to the MTS bus Route 83 at Kettner Boulevard with a 500-foot walk and the MTS Routes 280 and 290 on Pacific Highway with a 600-foot walk.
- **Santa Fe Depot Station (Trolley Blue and Green Line):** This station would provide connections to Amtrak Pacific Surfliner, COASTER, and bus. Passengers would have access to the adjacent COASTER and Amtrak as well as access to MTS bus Routes 85, 215, 225, and 235 within a 200-foot walk. Access to MTS Routes 280, 290, 923, and 992 are within a 600-foot walk. Given the considerable amount of connecting services scattered among various on-street stops, navigating between transit services may be confusing. No dedicated transit parking facilities exist at Santa Fe Depot, although there is an existing

private parking lot adjacent to Santa Fe Depot which charges a fee for parking. Vehicular drop-off and pick-up space are also provided along Kettner Boulevard.

- **Seaport Village Station (Trolley Green Line):** Connections and space for vehicular drop-off and pick-up at this location are limited; however, existing wayfinding is available to support the ease of navigation between the station area and surrounding destinations.
- **Convention Center Station (Trolley Green Line):** Connections and space for vehicular drop-off and pick-up at this location is limited; however, existing wayfinding is available to support the ease of navigation between the station area and surrounding destinations, including the Convention Center. The adjacent pedestrian plaza has ample space for station amenities and helps to demarcate the station area and connect to the Gaslamp Quarter, supporting ease of navigation.
- **Gaslamp Quarter Station (Trolley Green Line):** This station is located on Harbor Drive at 5th Avenue, providing a clear and direct connection to the entrance of the Convention Center. While space for vehicular drop-off and pick-up at this location is limited, the adjacent pedestrian plaza has ample space for station amenities and helps to demarcate the station area and connect to the Gaslamp Quarter, supporting ease of navigation.
- **12th & Imperial Station (Trolley Green Line):** At this station, passengers have access to the Trolley Blue Line and Orange Line, as well as bus service on MTS bus Routes 12, 901, and 929 at the existing Trolley Plaza, within a 0.1 mile walk. Existing wayfinding is available directing travelers between transit services. Dedicated space for vehicular drop-off and pick-up purposes is limited.

Station Amenities

The stations along this alignment would utilize existing facilities aside from the SDIA Station and the optional Harbor Island Station. Current LRT stations typically provide amenities including shelters, seating, lighting, trash receptacles, transit service information, and ticket vending machines. It is assumed new stations at SDIA and Harbor Island would have station amenities consistent with other MTS Trolley stations.

Fare Payment Method

Trolley passengers would pay their fare at off-vehicle ticket vending machines or by tapping the PRONTO card on a validator at the platform prior to boarding a Trolley vehicle. No fare collection occurs on board so delay is minimized compared to systems where a passenger pays as they board.

Boarding Method

Passengers typically access Trolley service by stepping up from the platform onto the train, although ramps are available to bridge the gap for wheelchair passengers.

Luggage Accommodations

Trolley vehicles are not specifically designed for passengers carrying luggage but do provide space particularly in the sections of the vehicle with seats placed along the walls facing the

middle. Traveling with luggage may be challenging as Trolley vehicles are not specifically designed for passengers with luggage.

Reliability

From SDIA, this concept would operate in a dedicated right-of-way with no shared operations until it interlines with the Trolley Blue and Green Line near Hawthorn Street. When interlining with the Trolley Blue and Green Line, Concept 6 would operate along existing Trolley tracks and share operations with Green and Blue Line trains to Santa Fe Depot and with Trolley Green Line trains to 12th & Imperial. While rail operation provides a level of insulation from roadway congestion, reducing opportunities for delays along the alignment, disruptions could occur at the existing at-grade crossings, which would affect Trolley service. Additionally, disruptions along the broader Trolley network could impact airport connector operations. Delays and service interruptions could require the use of a bus bridge to reinstate a connection to the airport while Trolley network issues are resolved.

Ride Comfort

The Trolley vehicles provide a smooth ride with steel wheels against rail. This concept includes all the existing stops along the current Trolley Green Line alignment between 12th/Imperial and Santa Fe Depot and along the Trolley Green and Blue Line between Santa Fe Depot and County Center/Little Italy, so there would be stopping and starting. Non-airport passengers traveling shorter distances may utilize this service rather than waiting for a Blue or Green Line train, so there may be more crowding and boarding/alighting activity than a dedicated airport service.

N.2.3. Travel Time

Transit Travel Time

The evaluation of transit travel time considered the total time spent traveling on transit to and from destinations within the county. Transit travel time included time from the first mode of transit used to the destination, inclusive of transfers, and was obtained from the San Diego Association of Governments (SANDAG) ABM2+ model. Transit travel times to SDIA were calculated for the AM peak hour and transit travel times from SDIA were calculated for the PM peak hour. Transit travel times to and from each destination were compared to against a No Project baseline. Table N-4 outlines the transit travel times for each destination evaluated.

Compared to the No Project baseline, Concept 6 would reduce the transit travel time to 11 of the 14 destinations evaluated. The reduction in transit travel time for Concept 6 would range from 0-23 minutes.

Table N-4. Concept 6 Transit Travel Time

LOCATION/ DESTINATION	NO PROJECT BASELINE		CONCEPT 6 TROLLEY FROM SDIA TO 12TH & IMPERIAL TRANSIT CENTER	
	TO SDIA	FROM SDIA	TO SDIA	FROM SDIA
Legoland	64	64	63	63
Carlsbad/Carlsbad Village Station	63	63	61	61
Grossmont Center Mall	61	61	49	49
Mission Bay/Mission Bay Park	32	32	35	35
Mission Valley/Fashion Valley Station	36	36	13	13
Chula Vista City Hall	45	45	43	43
Bayfront Redevelopment/E Street Station	45	45	45	45
Bayfront Redevelopment (Gaylord Pacific Resort and Convention Center & Harbor Park)	47	47	36	36
San Ysidro Transit Center	60	60	38	38
San Diego State University/SDSU Transit Center	52	52	32	32
University of California, San Diego/UCSD Central Campus Station	41	41	38	38
Convention Center	24	24	19	19
Liberty Station (Commercial & Bus Transit)	23	23	24	24
Ocean Beach (Downtown Area)	41	41	24	24

Source: SANDAG, WSP, and HDR 2022

Notes: SDIA = San Diego International Airport; San Diego State University; UCSD = University of California San Diego

Headways

The evaluation of travel time also considered headways, or the time between transit vehicles. The headways presented in this evaluation are consistent with those used in the ridership forecasts. Actual headways would be determined during later stages of project development.

Concept 6 would operate with 15-minute headways. Shorter headways may be feasible but could require modifications to existing Trolley infrastructure for the portions of the alignment where the SDIA Trolley route would interline with the Trolley Green and Blue Lines. Such modifications could be considered in future studies.

N.2.4. Ridership

Projected ridership in 2050 was modeled for Concept 6 by line, station, and systemwide based on forecasts from the San Diego Association of Governments (SANDAG) model. Systemwide ridership was compared against a No Project baseline. Concept 6 also assumes continued service of MTS Route 992 (Downtown/Airport). Table N-5 outlines the projected 2050 daily ridership for Concept 6 and systemwide.

Table N-5. Concept 6 and Regional 2050 Ridership

CONCEPT DESCRIPTION	ROUTE	DAILY RIDERSHIP	TOTAL REGIONAL BOARDINGS
Concept 6 Trolley from SDIA to 12th & Imperial Transit Center	Concept 6 Trolley	14,000	1,415,000
	MTS Route 992	2,000	

Source: SANDAG 2022

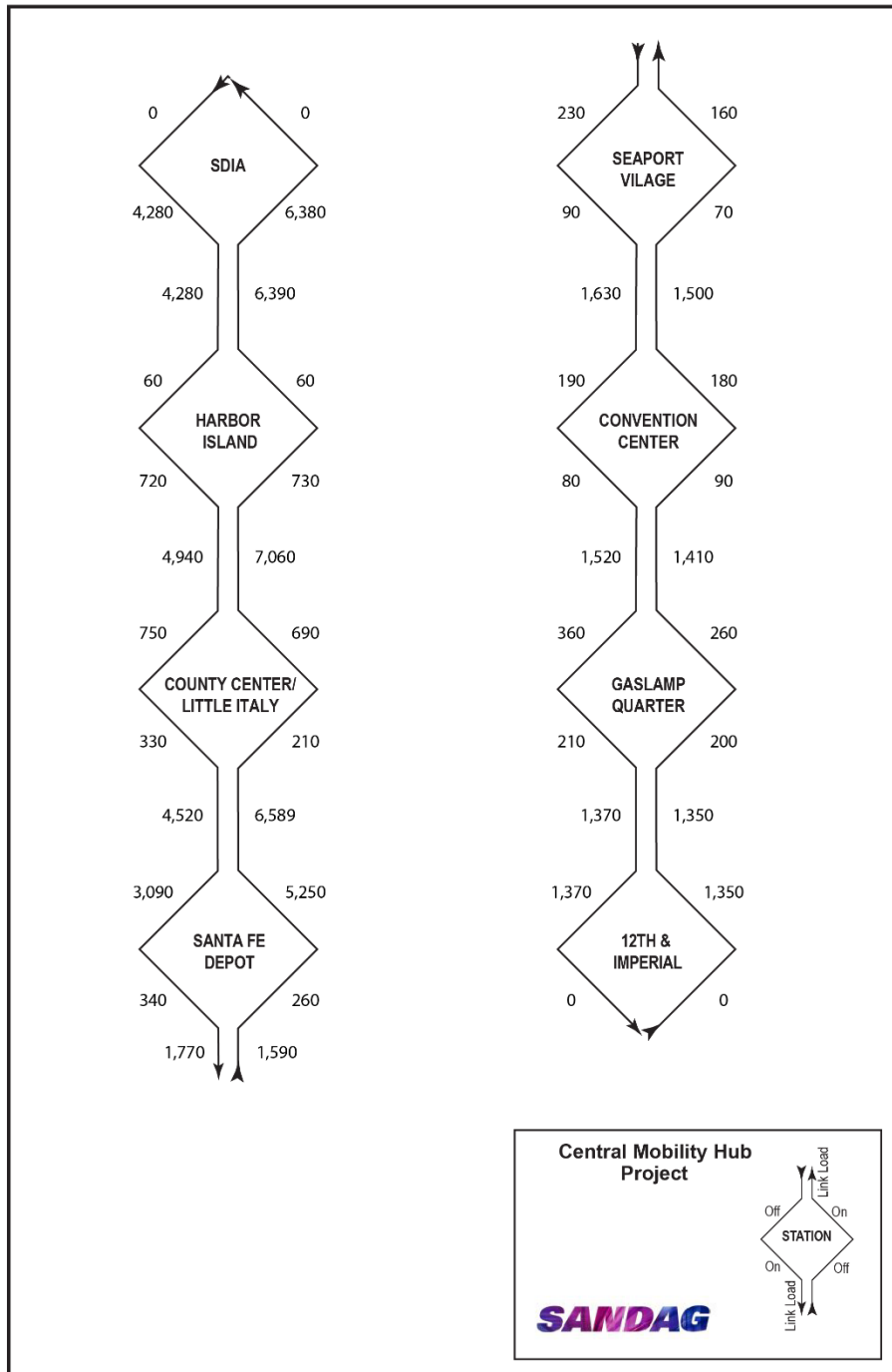
Notes:

Numbers rounded to the nearest 1,000.

MTS = Metropolitan Transit System; SDIA = San Diego International Airport

Figure N-2 identifies the 2050 ridership by station for Concept 6, presenting the boardings (ons), alightings (off), and passengers on trains between stations.

Figure N-2. Concept 6 Ons and Offs by Station



Source: SANDAG 2022

Note: Numbers are rounded to the nearest 10; numbers may not equal due to rounding

N.3. Congestion of Airport Access

N.3.1. Traffic Effects

The evaluation of traffic effects considered the change in traffic volumes on select roadways, including those entering and leaving SDIA, associated with each concept. The change in traffic volumes was evaluated using average daily traffic (ADT) volumes from the SANDAG model, which represent the average number of vehicles passing a specific point on a connection or roadway on an average day.

The 2050 ADT volumes on these roadways were compared for each segment against a No Project baseline to calculate the percent change in ADT. Table N-6 outlines the roadways considered in this evaluation and the percent change in ADT. Compared to the No Project baseline, Concept 6 would reduce ADT for all roadway segments except for the segment on Hawthorn Street from Pacific Highway to Harbor Drive, which would result in an increase in ADT. The segments with the largest reduction in ADT would be the Airport Terminal 1 and 2 Roadways and the SDIA inbound access road, with a 10 percent reduction in ADT, and Laurel Street from Pacific Highway to Harbor Drive, with an 11 percent reduction in ADT. The reduction in ADT reflects travelers switching modes and/or points of access to reach SDIA and destinations served by Concept 6.

Table N-6. Concept 6 Average Daily Traffic

ROADWAY SEGMENT	PERCENT CHANGE IN AVERAGE DAILY TRAFFIC COMPARED TO NO PROJECT BASELINE
Airport Terminal 1 and 2 Roadways	-10%
Harbor Drive from Laurel Street to Harbor Island Drive	-4%
SDIA Inbound Access Road from Laurel Street to SDIA	-10%
Harbor Drive from Grape Street to Ash Street	-4%
Harbor Drive from Market Street to Front Street	-1%
Harbor Drive from Laning Road to McCain Road	-2%
Pacific Highway from Sassafras Road to Palm Street	-4%
Laurel Street from Pacific Highway to Harbor Dr	-11%
Hawthorn Street from Pacific Highway to Harbor Drive	15%
Grape Street from Pacific Highway to Harbor Drive	-4%

Source: SANDAG 2022

Note: SDIA = San Diego International Airport

N.4. Vehicle Miles Traveled and Greenhouse Gases

N.4.1. Vehicle Miles Traveled

Providing alternative transportation modes in the region would change the number of vehicles on the road. The change in 2050 vehicle miles traveled (VMT) associated with implementation of Concept 6 was calculated against a No Project baseline. Table N-7 summarizes the 2050 regional VMT and change in VMT compared to the No Project baseline.

Table N-7. Concept 6 Vehicle Miles Traveled

CONCEPT DESCRIPTION	2050 REGIONAL VMT ¹	REGIONAL VMT REDUCTION FROM NO PROJECT ¹
No Project Baseline	88,620,000	—
Concept 6 Trolley from SDIA to 12th & Imperial Transit Center	88,569,000	-51,000

Source: SANDAG 2022

Notes:

¹Numbers are rounded to the nearest 1,000.

SDIA = San Diego International Airport; VMT = vehicle miles traveled

N.4.2. Greenhouse Gases

A change in 2050 VMT would result in a corresponding change in 2050 greenhouse gas (GHG) emissions. To evaluate the change in emissions, A select link analysis was performed within the SANDAG ABM2+ model. The VMT on the select links was compared to the No Project baseline to calculate the change in VMT. EMFAC per mile emission rates in pollutant-per-mile-traveled units were calculated for each concept and the No Project baseline.

Table N-8 compares the GHG emissions reductions between the No Project baseline and Concept 6. With a VMT reduction, Concept 6 would result in a 0.83 percent reduction in GHG emissions.

Table N-8. Concept 6 Operational GHG Emissions

CONCEPT DESCRIPTION	GHG EMISSIONS (MMTCO ₂ E) (TONS PER DAY) ¹	PERCENT CHANGE IN GHG COMPARED TO NO PROJECT BASELINE
No Project Alternative (2050)	24,590	—
Concept 6 Trolley from SDIA to 12th & Imperial Transit Center	24,390	-0.83%

Source: SANDAG 2022

Notes:

¹Numbers are rounded to the nearest 10.

GHG = greenhouse gas; MMTCO₂e = million metric tons of CO₂e; SDIA = San Diego International Airport

N.5. Feasibility / Complexity

N.5.1. Right-of-Way

The evaluation of right-of-way requirements considered the number of parcels that may have acquisitions (partial or full) to support the concept and the number of buildings that may require demolition. A buffer was used to identify properties, defined as 20 feet for aerial and at-grade, 20 feet for tunnel/cut-and-cover, 10 feet from edge of straddle bents, and 20 feet at stations. Concept 6 would consist of cut-and-cover tunnel, elevated, and at-grade or trench segments, including elevated guideway columns and guideway straddle bents. Concept 6 could affect 11 parcels and require demolition of four buildings (Table N-9).

Table N-9. Concept 6 Right-of-Way Requirements

CONCEPT DESCRIPTION	RIGHT-OF-WAY REQUIREMENTS	
	NUMBER OF PARCELS AFFECTED	NUMBER OF BUILDINGS POTENTIALLY REQUIRING DEMOLITION
Concept 6 Trolley from SDIA to 12th & Imperial Transit Center	11	4

Source: WSP, HDR, GPM 2022

Note: SDIA = San Diego International Airport

N.5.2. Construction Effects/Constructability

This section discusses constructability considerations associated with the major infrastructure elements featured in each concept under evaluation with the purpose of identifying probable construction methods, staging, sequences, traffic impacts, and any temporary facilities that would be implemented during the construction phase.

Concept 6 would feature an extension of the Trolley, providing a connection from SDIA to the existing 12th & Imperial Transit Center. New guideway construction would start near Hawthorn Street, where the new guideway would connect into the existing Trolley Green and Blue Line tracks allowing Trolley operation to continue south using the existing tracks through Santa Fe Depot to the 12th & Imperial Transit Center over Green Line tracks. Concept 6 includes 0.2 mile of new at-grade tracks and rail junction with existing LRT tracks, 1.4 miles of new LRT aerial guideway, and 0.3 mile of new LRT cut-and-cover tunnel, as well as operation on approximately 2 miles of existing tracks (Table N-1 and Figure N-1).

The constructability aspects associated with the aerial LRT guideway are similar to those for an ATC system with the addition of an overhead catenary system, which increases the height of the vehicle's operating envelope, and a more restrictive maximum profile grade criteria than that of the ATC system, which requires cut-and-cover tunnel segments to be deeper and at-grade transitions to an aerial guideway longer.

However, connection of the new LRT guideway with the existing Trolley Green and Blue Lines would involve construction of a complex grade separation under the existing Los Angeles–San Diego–San Luis Obispo Rail Corridor (LOSSAN) tracks in the highly constrained site conditions of a busy rail corridor that would require use of absolute work windows and would likely result in interruption of passenger and freight service operating on the corridor. Constructing the grade separations of the new LRT tracks and existing LOSSAN tracks would require a temporary shoofly track to be built along California Street to maintain rail traffic while the grade separations are being constructed. The shoofly track would displace existing on-street parking used by businesses along California Street. In addition, temporary single-track operation over the shoofly track would likely constrain the throughput capacity in this segment of the LOSSAN corridor, adversely impacting frequency of passenger rail service during the construction period. Additionally, redevelopment is proposed on the property fronting Hawthorn Street and California Street where the Trolley concept would diverge from the mainline tracks. With implementation of Concept 6, a corner of this property would be clipped in a cut and cover tunnel. Constructing this concept after the redevelopment has been implemented would be more complex due to likely restricted construction access and lack of staging areas. Excavation support features such as secant piles or slurry walls necessary for construction of the tunnel would require additional space on the property and are likely to remain in place, causing greater level of impacts to the property if redeveloped.

The existing Trolley trench structure would have to be modified to create sufficient opening for the new LRT tracks. Realignment of the existing Trolley Green and Blue Line tracks inside the trench structure may also be required to create horizontal tangents necessary for the wye junction special trackwork. Modifications to the existing LRT trench structure and realignment of direct fixation tracks would result in prolonged suspension of Trolley service on both the Green and Blue Lines in this segment of the LRT system.

Another unique constructability complexity is associated with the new Trolley alignment having to cross under a 108-inch-diameter sewer-interceptor pipeline owned and operated by the City of San Diego. This important sanitary sewer pipeline would have to be supported in place with a shoring system while excavating under it for the cut-and-cover tunnel.

N.5.3. Major Utilities

Potential conflicts with existing utilities were identified for Concept 6. Major utilities in this evaluation are defined as water facilities equal to or greater than 16 inches, sewer facilities equal to or greater than 18 inches, and storm drain facilities equal to or greater than 36 inches. Concept 6 consists of cut-and-cover tunnel, elevated, and at-grade or trench segments, including elevated guideway columns and guideway bents. A buffer was established from the centerline of the nearest rail and within depth thresholds beneath the surface ground level to capture utilities within a 10-foot diameter from column locations for aerial, 20 feet for at-grade, 20 feet for tunnel/cut-and-cover, 10 feet from the edge of straddle bents, and 20 feet at stations. Concept 6 could result in 10 utilities impacts. Table N-10 outlines the number and type of major utilities identified.

Table N-10. Concept 6 Utility Impacts

CONCEPT DESCRIPTION	NUMBER OF MAJOR UTILITY IMPACTS		
	SEWER	WATER	STORM DRAIN
Concept 6 Trolley from SDIA to 12th & Imperial Transit Center	1	7	2

Source: WSP, HDR, GPM 2022

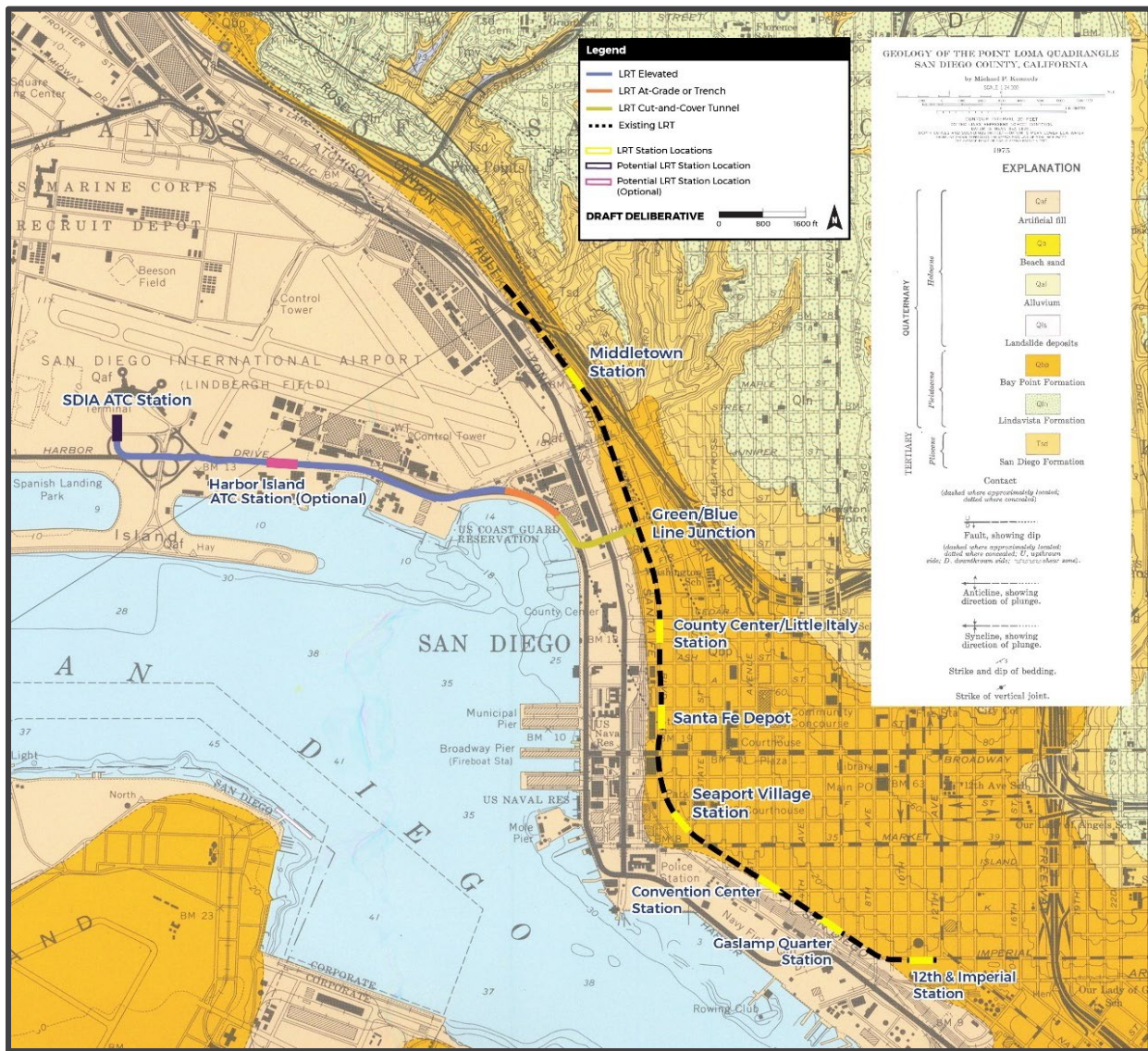
Note: SDIA = San Diego International Airport

N.5.4. Geotechnical and Seismic Conditions

Geotechnical conditions along the alignment of Concept 6 are highly variable. Figure N-3 presents a geologic map of San Diego with Concept 6 overlaid onto it, and an overview of the subsurface conditions along the alignment. In particular, the subsurface materials along N Harbor Drive likely consist of a sequence of highly variable undocumented fill soil (placed above water), overlying relatively thick hydraulic fill soils (placed under water). These fill soils are sequentially underlain by various naturally deposited geologic formations that were deposited in various geologic epochs. From the youngest, and therefore right below the undocumented fills and in descending order, are Holocene-age estuarine deposits (also referred to as bay deposits), Quaternary-age granular and cohesive old paralic deposits (also known as Bay Point Formation), Pliocene-age marine sandstone and conglomerate (also known as the San Diego Formation), and undifferentiated fossilized marine and non-marine Eocene-age rock. As the alignment moves farther away from the bay, the overall thickness of the less competent materials (estuarine deposits, bay deposits and undocumented fills) tends to decrease, leading to more favorable geotechnical conditions.

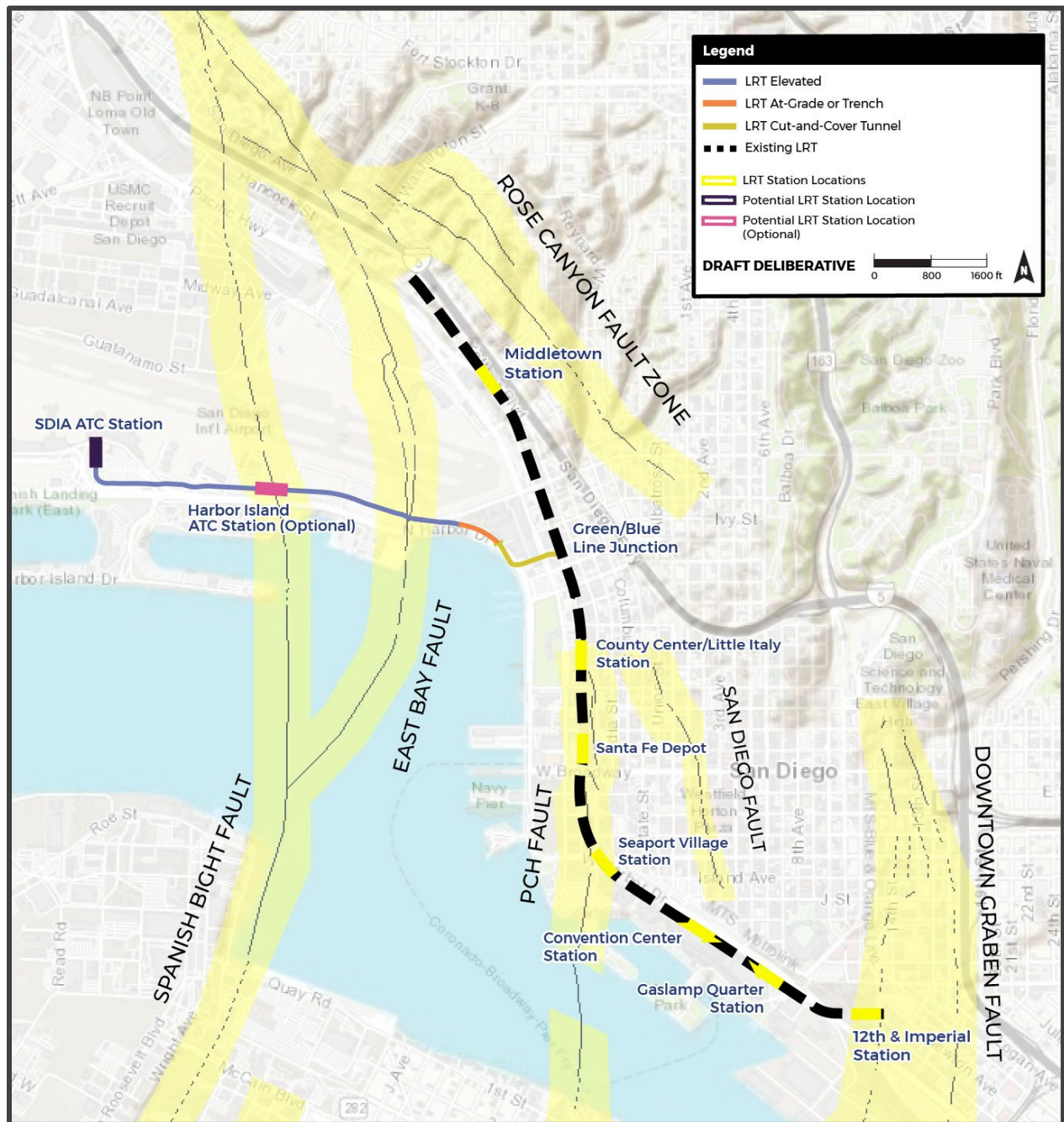
From a seismic/faulting perspective, the area is considered seismically active and includes several known active faults (Figure N-4). An active trace of the Spanish Bight Fault crosses the alignment immediately to the west of the intersection of Liberator Way and North Harbor Drive (Figure 9-28). Likewise, an active trace of the East Bay Fault crosses the alignment north of the US Coast Guard Station on North Harbor Drive and it continues north toward the SDIA rental car center. These fault traces generally are perpendicular with the elevated alignment running east-west. The presence of active faults can have a significant impact to the project, particularly for structures that are classified for human occupancy. These may include, but are not limited to, passenger stations and the Operations, Maintenance, and Storage Facility. Fault rupture hazard studies will be required to ensure that habitable structures are placed at a sufficient distance from active fault traces.

Figure N-3. Geologic Map of San Diego with Concept 6 Geology



Source: WSP 2022

Figure N-4. Downtown San Diego Alquist-Priolo Earthquake Fault Zones with Concept 6 Alignment



Source: WSP 2022

Groundwater elevations near areas of the alignment located closer to San Diego Bay may be tidally influenced but are relatively close to the ground surface. The presence of a relatively shallow groundwater, when coupled with seismic ground motion and certain subsurface conditions, increases susceptibility to liquefaction, lateral spreading and seismic settlements. Soil liquefaction occurs when saturated, cohesionless soils lose their stiffness and strength due to the build-up of excess pore water pressure during cyclic loading, such as that induced by earthquakes. The primary factors affecting the liquefaction potential of a soil deposit are intensity and duration of earthquake shaking, soil type and relative density, overburden pressures, fines content, and depth to groundwater. Soils most susceptible to liquefaction are saturated loose sands and low plasticity to non-plastic silts. The potential consequences of liquefaction to structures include loss of bearing capacity, post-liquefaction settlement, slope instability, and surface sand boils. When combined with a sloping ground or “free faces,” such as bridge abutments, the loss of soil shear strength and stiffness that is associated with liquefaction can result in lateral spreading displacements (a form of seismic slope instability also known as “flow failure”) that can impose lateral loads upon the foundations and result in several feet of permanent soil lateral displacements.

Post-liquefaction seismic settlements occur when the excess pore water pressure induced by the seismic shaking dissipates and the soil readjusts in a new equilibrium condition. This typically occurs within a few seconds to minutes after the earthquake event. Post-liquefaction settlements can pose a significant hazard to structures founded on shallow foundations. The hydraulic fill soils and estuarine deposits in this area likely have a moderate to high potential for earthquake induced liquefaction, lateral spreading, and seismic settlement.

Farther from San Diego Bay, lateral spreading is less likely as the ground elevation rises and the soil conditions generally improve. The Bay Point Formation is generally considered medium dense to dense sandy soil and firm to very stiff clayey soil that is not prone to liquefaction during seismic events. The San Diego Formation may contain very dense and hard sandstone and conglomerate materials and is not considered to be prone to liquefaction.

Table N-11 provides a qualitative summary of the geologic and geotechnical conditions for the various components of this concept. Table N-12 includes an assessment of the favorability that each geotechnical/geologic condition is anticipated to have on the various project locations and alignment types.

Table N-11. Concept 6 Geologic and Geotechnical Conditions

LOCATION	UPPER SOIL LAYER COMPETENCY	DEPTH TO COMPETENT SOFT ROCK	ACTIVE FAULTING POTENTIAL	LIQUEFACTION POTENTIAL	LATERAL SPREADING POTENTIAL
Elevated ATC along N Harbor Dr	Very poor	Very Deep	Very high (3 to 4 perpendicular crossings)	Very High	High
At-grade portion along N Harbor Drive	Fair	Deep	Very High (1 to 2 oblique fault crossings)	High	Moderate
Underground Portion along N Harbor Dr	Very Poor	Deep	Very High (1 to 2 oblique fault crossings)	High	High
Underground Portion along W Hawthorn	Poor	Deep	Very High (PCH and SD Faults cross)	High	High

Source: WSP 2022

Notes: ATC = Airport Transit Connector; PCH = Pacific Coast Highway; SD = San Diego

Table N-12. Concept 6 Geologic and Geotechnical Conditions Favorability Evaluation

LOCATION	UPPER SOIL LAYER COMPETENCY	DEPTH TO COMPETENT SOFT ROCK	ACTIVE FAULTING POTENTIAL	LIQUEFACTION POTENTIAL	LATERAL SPREADING POTENTIAL
Elevated ATC along N Harbor Dr	Low	N/A	Low	Very Low	Low
At-grade portion along N Harbor Drive	Medium	N/A	Low	Low	Medium
Underground Portion along N Harbor Dr	High	Medium	Very Low	Low	Medium
Underground Portion along W Hawthorn	High	Medium	Very Low	Low	Medium
Overall Concept 6	Low				

Source: WSP 2022

Notes:

High: High favorability (geotechnical condition is highly favorable for this location and alignment type)

Medium: Medium favorability (geotechnical condition is favorable for this location and alignment type)

Low: Low favorability (geotechnical condition is not favorable for this location and alignment type)

Very Low: Very Low favorability (geotechnical condition is particularly not favorable for this location and alignment type)

ATC = Airport Transit Connector; N/A: Not Applicable (geotechnical condition is irrelevant for this location and alignment type)

N.5.5. Regulatory Considerations

The Regulatory Considerations criterion identifies the federal and state agency approvals, permits, and coordination potentially required for implementation of each concept. The following details the types of agency approval and permits that may be applicable to each concept, based on information available to date. Additional approvals and coordination may be identified during subsequent phases of the project development process. All concepts would require environmental clearance pursuant to the California Environmental Quality Act (CEQA), for which SANDAG would be the CEQA lead agency. Additionally, the project would likely have a federal nexus, which would also require environmental clearance pursuant to the National Environmental Policy Act. At this time, a federal lead agency has not been identified.

Federal Aviation Administration

The Federal Aviation Administration (FAA) is the largest United States transportation agency and regulates all aspects of civil aviation within the country. Concept 6 would have construction activities within 5,000 feet of FAA facilities. The following regulations would apply to both permanent features and construction activities associated with Concept 6 where the concept is in proximity or on airport property.

Title 14, Chapter 1 of the Code of Federal Regulations (CFR). Title 14, Chapter 1 of the CFR includes policies and regulations that govern the development and construction within airport property or within zones of airport influence, such as noise zones. This CFR also includes regulations governing runway protection zone and obstructions to air navigation in Part 77, “Safe, Efficient Use, and Preservation of the Navigable Airspace.” Part 77.9, “Construction or Alteration Requiring Notice,” provides height restriction standards for the construction of any facilities within 20,000 feet, 10,000 feet, and 5,000 feet from the nearest point of the nearest runway of the SDIA. A Notice of Proposed Construction or Alteration (FAA Form 7460-1) would need to be filed at least 45 days (1 year recommended) prior to construction to confirm a “No Hazard” determination from FAA related to permanent impacts within Part 77 surfaces. That form would also need to be filed at least 45 days prior to construction (minimum 90 days recommended) for temporary impacts and would identify the location of all construction equipment and top elevations near the runway.

California Coastal Commission

The California Coastal Commission (CCC) is a state agency within the California Natural Resources Agency with quasi-judicial control of land and public access along the state's 1,100 miles of coastline. The Concept 6 alignment along Harbor Drive would be located within the California Coastal Zone as identified by the CCC. The following regulations would apply to both permanent features and construction activities within the California Coastal Zone.

Title 15, CFR Parts 923 and 930, “Coastal Zone Management Act (CZMA).” Title 15, Part 923 of the CFR contains the requirements for the California coastal management program, pursuant to the CZMA of 1972. California's program identifies coastal resources that require management or protection by the state, including resources that are located within Coastal Zones and would be subject to impacts from development. The CZMA defines Coastal Zones as “coastal waters...and the adjacent shorelands...strongly influenced by each other and in

proximity to the shorelines of coastal states.” Title 15, Part 930 of the CFR requires a federal consistency review of federal agency, federally permitted, and federally funded (to state and local government) activities that affect the Coastal Zone.

Title 14, Natural Resources, Division 5.5. Regulations under Title 14, Division 5.5, pursuant to the California Coastal Act of 1976, defines the roles and responsibilities of the CCC to carry out the full purposes and provision of the Act. Chapter 5, “Coastal Development Permits Issued by Coastal Commissions,” governs the process for the CCC to assess and approve coastal development permits for projects located within Coastal Zones.

United States Fish and Wildlife Service

The United States Fish and Wildlife Service (USFWS) is the federal agency responsible for enacting and enforcing federal conservation legislation. Due to the presence of the federally endangered California least tern near the southeast property line of the airport, consultation with USFWS would be required.

Federal Endangered Species Act (FESA). The FESA regulates the take of endangered and threatened species and their adverse modification of federally designated critical habitat. Take as defined under the FESA means “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.” Procedures for addressing take of federally listed species follow two principal pathways, both of which require consultation with the USFWS, which administers the FESA for terrestrial and aquatic species limited to inland waters, or National Oceanic and Atmospheric Administration, which administers the FESA for marine species. The first pathway, a Section 10(a) incidental take permit, applies to situations where a nonfederal governmental entity must resolve potential adverse impacts on species protected under the FESA. The second pathway, a Section 7 consultation, applies to projects directly undertaken by a federal agency or private projects requiring a federal permit or approval. Section 7 consultation between the federal project lead and USFWS is anticipated.

Migratory Bird Treaty Act (MBTA). Title 50, Part 10 of the CFR contains the provisions of the MBTA, which establishes the protection of migratory birds under the authority of the USFWS. Under this Act, taking, killing, or possessing migratory birds including feathers, or other parts, nests, eggs, or products, is unlawful except as allowed by implementing regulations (50 CFR 21). At this time there is no process in place for USFWS to authorize the incidental take of migratory birds that may result from construction activities or from striking project facilities during operations. Regulated species are listed at CFR Title 50 Part 10.13.

California Department of Fish and Wildlife (CDFW)

The CDFW is the state agency which manages and protects the state’s flora, fauna, and habitats. The CDFW is responsible for enforcing state conservation legislation including the California Endangered Species Act (CESA). Due to the presence of the California least tern, which is listed as a State of California endangered species, near the southeast property line of the airport, coordination with CDFW may be required.

California Endangered Species Act. Sections 2050 through 2098 of the California Fish and Game Code outline the protection provided to California’s rare, endangered, and threatened species. Section 2080 of the Fish and Game Code prohibits the taking of plants and animals

listed under the CESA. According to the Fish and Game Code, take is defined as to hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill. Applicants who obtain a federal incidental take permit for a species also listed under CESA and expect take as described above, may request a determination from CDFW that the federal document is consistent with CESA. If the CDFW Director determines that the federal incidental take permit is consistent with CESA, a Consistency Determination will be issued. If CDFW does not issue a Consistency Determination a Section 2081 incidental take permit would be required.

San Diego County Regional Airport Authority

The San Diego County Regional Airport Authority (Airport Authority) is the agency responsible for managing the operations of SDIA and for addressing the San Diego region's long-term air transportation needs. The Airport Authority also serves as the region's Airport Land Use Commission. Coordination with the Airport Authority would be required for the portions of the concept on or adjacent to airport property. Coordination with the Airport Authority would be required for the portions of the concept on or adjacent to airport property.

SDIA Biodiversity Plan. The Airport Authority publishes the Biodiversity Plan, which directs the Authority's management of plants and wildlife on airport property. In particular, the Biodiversity Plan establishes the framework for the habitat management of the endangered California least tern, which has been known to nest on bare areas in the airport infields. Management strategies are driven in part by the Airport's 1993 Biological Opinion and 2018 Informal Consultation.

Federal Railroad Administration

The Federal Railroad Administration (FRA) is a federal agency within the US Department of Transportation responsible for the transportation of goods and people on railways. Concept 6 would provide for a new grade separation of LRT and railroad tracks requiring construction within active railroad right-of-way. This construction would require cooperation and approval from Amtrak and would be required to comply with all regulations and safety statutes of the CFR related to passenger rail construction and operation.

Title 49, Subtitle B, Chapter VII of the CFR. The National Railroad Passenger Corporation (Amtrak) is a for-profit corporation authorized by the Rail Passenger Service Act which provides rail passenger services. Amtrak is not an agency or establishment of the US Government but is a service subject to the rules and regulations of the FRA. Railroads on standard gage track which are part of the general railroad system of transportation, including Class I, Class II, National Railroad Passenger Corporation (Amtrak), and other railroads providing commuter service in a metropolitan or suburban area are required to cooperate with the FRA on operating rules, timetables, and other metrics. FRA operational regulations do not apply to railroads or rapid transit operations in an urban area operating outside of the general railroad system of transportation.

California Public Utilities Commission

The California Public Utilities Commission (CPUC) has safety and security regulatory authority over all rail transit and other public transit fixed guideway systems under Public Utilities Code Section 99152 and other statutes. CPUC defines Rail Fixed Guideway Systems as any light, heavy, or rapid rail system, monorail, inclined plane, funicular, trolley, cable car, automatic

people mover, or automated guideway transit system used for public transit. Coordination with CPUC and compliance with applicable General Orders will be required.

Conclusion

Concept 6 may require permitting and coordination with the FAA, CCC, USFWS, CDFW, Airport Authority, FRA, Amtrak, and the local jurisdictions and may be required to comply with applicable regulations including, but not limited to, the following:

- FAA: 14 CFR Chapter 14
- CCC: 15 CFR Parts 923 and 930 - Coastal Zone Management Act
- CCC: Title 14, Natural Resources Division 5.5, California Coastal Commission
- USFWS: Federal Endangered Species Act
- USFWS: Migratory Bird Treaty Act
- CDFW: California Endangered Species Act
- SDIA Biodiversity Plan
- FRA: 49 CFR Subtitle B, Chapters II and VI
- CPUC: General Orders

N.6. Cost

N.6.1. Capital Cost

The capital costs estimate for Concept 6 included the estimated costs for the following program components:

- Construction
- Vehicles
- Professional services
- Unallocated contingency (20%)

Concept 6 would feature an aerial alignment before connecting to the existing Trolley Green and Blue Line tracks. Prototypical Unit Price Elements were developed to represent anticipated aerial guideway configurations, stations, maintenance facilities, and enabling work. High-level estimates for vehicle acquisitions and allowances for professional services were also included. Refer to Appendix P for additional detail on the methodology used for the cost estimate.

At this stage of the project development process, costs were estimated in rough-orders-of-magnitude for purposes of comparing each concept to each other. The cost estimates are in 2022 dollars. Right-of-way costs were not included in these estimates. Table N-13 outlines the capital cost estimate for Concept 6 including a range from low to high.

Table N-13. Concept 6 Capital Cost

CONCEPT DESCRIPTION	COST IN MILLIONS (2022)		
	LOW	MID-POINT	HIGH
Concept 6 Trolley from SDIA to 12th & Imperial Transit Center	\$1,145.0	\$1,347.1	\$1,751.2

Source: WSP, HDR 2022

Note: SDIA = San Diego International Airport

N.6.2. Cost per Rider

The cost per rider was calculated using the 2050 ridership forecasts and capital costs developed for this study to provide a more direct comparison of concepts given the differences in the number of stations and locations served. Table N-14 summarizes the cost per rider estimates for Concept 6, including a range from low to high.

Table N-14. Concept 6 Cost Per Rider

CONCEPT	COST (2022)		
	LOW	MID-POINT	HIGH
Concept 6 Trolley from SDIA to 12th & Imperial Transit Center	\$6.93	\$7.97	\$10.37

Source: WSP, HDR 2022

Note: SDIA = San Diego International Airport

N.6.3. Cost per Mile

Cost per mile was calculated based on capital cost and the length of each concept in 2022 dollars. Table N-15 presents the cost per mile for Concept 6 including a range from low to high.

Table N-15. Concept 6 Cost Per Mile

CONCEPT DESCRIPTION	COST IN MILLIONS (2022)		
	LOW	MID-POINT	HIGH
Concept 6 Trolley from SDIA to 12th & Imperial Transit Center	\$294	\$345	\$449

Source: WSP, HDR 2022

Note: SDIA = San Diego International Airport

N.6.4. Operations and Maintenance

Estimation of annual Operations and Maintenance (O&M) costs associated with Concept 6 is outside of the scope of this study. However, a high-level comparative assessment of probable O&M cost in qualitative terms was undertaken. Table N-16 presents a qualitative assessment of the main O&M cost elements for the three technologies under consideration – ATC, Trolley (LRT), and bus. As shown in Table N-16, the Trolley concept would have high O&M cost for five of the seven elements: guideway infrastructure, support staff, maintenance facility, vehicle maintenance, and train controls.

Table N-16. Operations and Maintenance Costs

COST DRIVER	ATC	TROLLEY (LRT)	ENHANCED BUS	ASSESSMENT
Guideway Infrastructure	\$\$\$	\$\$	\$	Extended underground ATC alignment would require added maintenance of ventilation and fire life safety systems. LRT concept would take advantage of using existing infrastructure along the Green Line and therefore would incur less maintenance cost. Bus infrastructure is shared with infrastructure owned by others and would have low infrastructure maintenance costs.
Operations and Support Staff	\$\$	\$\$\$	\$\$\$	Additional cost for personnel (salaries/insurance/medical etc.), including drivers/operators and associated support personnel. OMSF design and capacity requirements (restrooms/conference rooms/offices/utility costs) are also affected by the number of personnel required for operations. ATC vehicles are assumed to be automated (i.e., driverless).
Vehicle Maintenance	\$\$	\$\$\$	\$	ATC vehicles operate at much shorter headways requiring higher vehicle count compared to LRT vehicles expected to operate on 15-minute headways. Buses would also have a higher vehicle count than LRT vehicles to provide comparable capacity; however, both ATC and LRT are more complex vehicles and more costly to maintain. Also, maintenance costs are lower for rubber-wheeled vehicles (ATC and bus). Special maintenance equipment is required for steel wheel truing and rail grinding. LRT vehicles also employ a pantograph system to collect power from an overhead catenary system requiring additional maintenance.
Energy Consumption	\$\$\$	\$	\$\$\$	The performance and frequency of ATC vehicles typically translates to higher energy consumption/demand. Energy cost for ATC vehicles might therefore be higher than that of LRT vehicles. Energy consumption for buses using internal combustion engines may be lower per vehicle, but the number of vehicles required would be much higher.

COST DRIVER	ATC	TROLLEY (LRT)	ENHANCED BUS	ASSESSMENT
Systems	\$	\$\$	\$	Train control systems for LRT would include Automatic Train Protection but not Automatic Train Operation because trains are manually driven. Because a typical ATC uses vehicle location/communication dynamics (as well as Automatic Train Operation) for movement, authority wayside equipment such as signals/signs and associated cables are minimal. Enhanced bus service typically implements Transit Signal Priority over existing traffic control equipment requiring a nominal amount of maintenance.

Source: WSP and HDR 2022

Notes: ATC = Airport Transit Connector; LRT = light rail transit; OMSF = Operations, Maintenance and Storage Facility

N.7. Community Effects and Economic Benefits

The community effects evaluation criteria identify the anticipated community effects and adjacent development considerations for each concept. The community effects analysis contains three primary components: (1) Identifying the communities within each station area (0.5 mile buffer around each station), (2) identifying the jobs and employment industries within each station area, and (3) identifying the percentage of workers, including SDIA workers, who travel from the north, south, and east areas of San Diego County to reach the Project Area, defined as the combined proposed station areas for the concept.

Communities were identified using ArcGIS and data from the SANDAG GIS Open Data Portal. The US Census Bureau’s OnTheMap web feature was used to determine (1) the number of jobs by industry within each station area and (2) the municipal origins for workers commuting to the Project Area. Job industries are categorized based on the North American Industry Classification System (NAICS), which is the federal classification standard for businesses in the United States. The OnTheMap web feature displays the top 12 municipal home destinations for the Project Area and condenses the remaining destination under the “All Other Locations” category. The following 12 cities were assessed as home destinations for workers in the Project Area by the OnTheMap web feature: San Diego, Chula Vista, El Cajon, National City, Los Angeles, La Mesa, Santee, La Presa, Lemon Grove, Carlsbad, Spring Valley, and Escondido. The adjacent development considerations analysis identifies the number of vacant parcels within each station area. Vacant properties within the station areas were identified using the Parcel and Current Land Use datasets from the SanGIS/SANDAG GIS Data Warehouse and were field verified in September 2022.

N.7.1. Adjacent Community Effects

Surrounding Communities

Concept 6 would provide connections to the City of San Diego communities of SD International Airport, Little Italy, Core-Columbia, Marina, Horton Plaza, East Village, and Gaslamp. The SD International Airport community would be accessible from the SDIA ATC Station and Harbor

Island ATC Station. The County Center/Little Italy (Existing) Station Area would be within the communities of Little Italy and Core-Columbia. The Santa Fe Depot (Existing) Station Area would be within the communities of Little Italy, Marina, Core-Columbia, and Horton Plaza. The Seaport Village (Existing) Station Area would be within the communities of Marina, Core-Columbia, and Horton Plaza. The Convention Center (Existing) Station Area would be located within the communities of East Village, Gaslamp, Marina, and Horton Plaza. The Gaslamp Quarter (Existing) Station Area would be located within the communities. Table N-17 summarizes the communities located within each of the station areas for Concept 6.

Table N-17. Surrounding Communities for Concept 6

STATION AREA ¹	COMMUNITIES
SDIA ATC Station	SDIA
Harbor Island ATC Station	SDIA
County Center/Little Italy (Existing)	Little Italy
	Core-Columbia
Santa Fe Depot (Existing)	Little Italy
	Marina
	Core-Colombia
	Horton Plaza
Seaport Village (Existing)	Marina
	Core-Columbia
	Horton Plaza
Convention Center (Existing)	East Village
	Gaslamp
	Marina
	Horton Plaza
Gaslamp Quarter (Existing)	Horton Plaza
	East Village
	Gaslamp
12th & Imperial (Existing)	East Village

Source: SANDAG 2022

Notes:

¹Station Area is defined as a 0.5-mile buffer from each station centroid.

ATC = Airport Transit Connector; SDIA = San Diego International Airport

Population and Housing

Table N-18 summarizes the population and number of households within 0.5 mile of each station. Concept 6 station areas contain approximately 15,600 households with a population of 28,500. The station area with the largest population is Seaport Village, and the station area with the largest number of households is the 12th & Imperial Station.

Table N-18. Population and Housing for Concept 6

STATION AREA ¹	POPULATION	HOUSEHOLDS
SDIA ATC Station	300	0
Harbor Island ATC Station	200	0
County Center/Little Italy (Existing)	10,200	5,800
Seaport Village (Existing)	10,700	5,300
Convention Center (Existing)	8,700	4,200
Gaslamp Quarter (Existing)	9,800	5,400
12th & Imperial (Existing)	10,600	6,600
Total Project Area ²	28,500	15,600

Source: US Census Bureau 2023; SANDAG 2023

Notes:

¹Station Area is defined as a 0.5-mile buffer from each station centroid.

²Project Area reflects the combined station areas for the concept. Station Area estimates do not sum to Project Area totals due to station area overlap.

ATC = Airport Transit Connector; SDIA = San Diego International Airport

Jobs and Employment

Concept 6 would provide new transit connections for workers traveling to and from employment centers in the Project Area. The Concept 6 station areas contain approximately 70,000 jobs with Accommodation and Food Services employing the largest share of workers. Within the SDIA ATC Station and Harbor Island ATC Station, Transportation and Warehousing represents the largest share of jobs. Within the County Center/Little Italy (Existing) Station, Public Administration represents the largest share of jobs. Within the Santa Fe Depot (Existing) Station Area, Public Administration represents the largest share of jobs. Within the Seaport Village (Existing) station area, Convention Center (Existing) station area, Gaslamp Quarter (Existing) station area, and 12th & Imperial (Existing) station area. Accommodation and Food Services represents the largest share of jobs. Table N-19 summarizes the percentage of jobs by the top NAICS industry employers within each station area for Concept 6 and for the Project Area.

Commuting Origins

Within the Concept 6 station areas, the majority of workers commute from the City of San Diego, with the second-largest share commuting from All Other Locations, and the third-largest share commuting from Chula Vista. Within the SDIA ATC Station, Harbor Island ATC Station, and the County Center/Little Italy Station, the largest share of workers would commute from San Diego, followed by All Other Locations, followed by Chula Vista. Table N-20 summarizes the home destination cities for workers employed in the station areas and Project Area of Concept 6.

Table N-19. Jobs and Employment Sectors for Concept 6

NAICS SECTOR	PERCENTAGE (%) OF JOBS BY STATION AREAS ¹²								
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	COUNTY CENTER /LITTLE ITALY	SANTA FE DEPOT (EXISTING)	SEAPORT VILLAGE (EXISTING)	CONVENTION CENTER (EXISTING)	GASLAMP QUARTER	12TH & IMPERIAL (EXISTING)	PROJECT AREA3
Accommodation and Food Services	28.7	21.3	14.8	16.2	34.5	52.1	55.2	40.7	29.9
Administration & Support, Waste Management and Remediation	3.4	4.6	4.0	3.3	8.3	8.2	9.0	6.9	5.4
Agriculture, Forestry, Fishing and Hunting	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Arts, Entertainment, and Recreation	7.3	5.4	1.8	2.1	1.4	5.6	6.7	9.4	3.5
Construction	0.2	0.3	2.3	1.9	1.1	1.3	1.8	1.5	1.8
Educational Services	0.0	0.0	1.5	0.8	0.5	0.7	0.3	1.5	1.2
Finance and Insurance	2.7	0.0	4.7	4.9	6.1	2.1	1.5	1.7	3.1
Health Care and Social Assistance	0.0	0.0	1.8	1.3	2.1	1.6	2.1	1.9	1.8
Information	0.1	0.2	2.8	3.3	2.1	1.9	1.2	1.1	2.0
Management of Companies and Enterprises	0.0	0.0	1.6	1.6	0.6	0.5	0.2	0.1	0.9
Manufacturing	0.0	0.0	5.3	0.1	0.1	1.7	2.3	5.4	3.4
Mining, Quarrying, and Oil and Gas Extraction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Services (excluding Public Administration)	0.7	2.1	1.8	1.5	1.6	1.7	1.6	1.8	1.8

NAICS SECTOR	PERCENTAGE (%) OF JOBS BY STATION AREAS ¹²								
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	COUNTY CENTER /LITTLE ITALY	SANTA FE DEPOT (EXISTING)	SEAPORT VILLAGE (EXISTING)	CONVENTION CENTER (EXISTING)	GASLAMP QUARTER	12TH & IMPERIAL (EXISTING)	PROJECT AREA ³
Professional, Scientific, and Technical Services	0.2	0.3	15.0	20.9	25.1	13.5	7.2	8.1	12.8
Public Administration	0.5	0.3	37.5	35.4	8.6	1.7	0.0	2.3	17.0
Real Estate and Rental and Leasing	3.4	9.0	1.9	2.2	3.7	3.2	3.7	1.4	3.1
Retail Trade	2.2	1.6	1.0	2.3	2.9	3.3	3.1	3.1	2.4
Transportation and Warehousing	50.1	54.7	0.2	0.6	0.8	0.0	3.7	11.7	8.4
Utilities	0.0	0.0	1.3	1.3	0.1	0.1	0.0	0.0	0.6
Wholesale Trade	0.3	0.2	0.7	0.5	0.5	0.5	0.6	1.7	0.8

Source: US Census Bureau 2022; SANDAG 2022

Notes:

¹Station Area is defined as a 0.5-mile buffer from each station centroid.

²The OnTheMap tool displays employment data at the census place and census block levels. On the Map does not differentiate between employment headquarters that are physically located within the same census block.

³Project Area reflects the combined station area for the concept.

ATC = Airport Transit Connector; NAICS = North American Industry Classification System; SDIA = San Diego International Airport

Table N-20. Home Destinations for Workers Employed in Concept 6

CITY	SHARE OF TOTAL JOBS (%) BY STATION AREA ¹²								
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	COUNTY CENTER/ LITTLE ITALY	SANTA FE DEPOT (EXISTING)	SEAPORT VILLAGE (EXISTING)	CONVENTION CENTER (EXISTING)	GASLAMP QUARTER	12TH & IMPERIAL (EXISTING)	PROJECT AREA ³
San Diego	43.7	42.6	50.5	49.4	49.2	49.8	49.7	50.4	49.2
Chula Vista	7.7	8.2	9.0	8.6	8.2	8.6	9.2	9.9	8.9
El Cajon	2.0	2.4	2.5	2.4	2.0	1.9	2.0	2.1	2.2
Los Angeles	2.5	3.1	1.5	1.8	2.6	2.8	2.7	2.3	2.2
National City	3.9	3.6	1.8	1.8	2.1	2.5	2.7	2.8	2.3
La Mesa	1.5	1.8	2.3	2.2	2.0	1.8	1.9	2.0	2.1
Santee	1.2	1.3	1.8	1.6	1.3	1.1	1.1	1.3	1.5
La Presa	1.3	1.4	1.2	1.2	0.0	1.1	1.2	1.3	1.2
Lemon Grove	1.2	1.2	1.2	1.1	0.0	0.9	1.0	1.3	1.1
Carlsbad	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spring Valley	1.2	1.2	0.0	0.0	0.0	0.0	0.0	0.0	1.0
Escondido	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0	0.0
Imperial Beach	0.0	0.0	0.0	0.0	1.1	1.1	1.2	1.3	0.0
All Other Locations ⁴	33.9	33.3	27.1	28.8	29.5	28.4	27.3	25.4	28.4

Source: US Census Bureau 2022; SANDAG 2022

Notes:

¹ Station Areas are defined as a 0.5-mile buffer from each station centroid.

² The OnTheMap tool commute destination information does not differentiate between worker transport mode (if any), regular or occasional commutes, or whether an employee works remotely. Workplace destinations are defined by the physical mailing address of each employment headquarters.

³ Project Area reflects the combined station areas for the concept

⁴ Includes all other US Census defined Places from where workers commute.

ATC = Airport Transit Connector; SDIA = San Diego International Airport

N.7.2. Adjacent Development Considerations

Economic opportunities for Concept 6 are determined by the number of existing vacant properties within each station area. Vacant parcels identified must be a minimum of 20,000 square feet and could not be in areas zoned as residential. No parcels were identified.

INTENTIONALLY LEFT BLANK

APPENDIX O CONCEPT 7: BUS CONCEPT FROM SAN DIEGO INTERNATIONAL AIRPORT TO OLD TOWN TRANSIT CENTER AND CITY COLLEGE

O.1. Description of Concept

Concept 7 would provide an enhanced bus route from San Diego International Airport (SDIA) to the San Diego Trolley (Trolley) Blue Line and Trolley Orange Line City College Station and a route from SDIA to Old Town Transit Center (OTTC). Table O-1 provides information on concept characteristics.

The Concept 7 route to City College would provide enhanced service of the Metropolitan Transit System (MTS) Route 992 which provides service from SDIA to downtown San Diego and City College. Currently, MTS Route 992 operates with 15-minute headways and serves 16 bus stops in one direction. Concept 7 would serve the existing bus stops with an enhanced headway of 7.5 minutes. Figure O-1 illustrates the concept alignment. The MTS Route 992 travels around the airport in mixed traffic along Airport Terminal Road with stops at Terminal 1 and Terminal 2. From the SDIA entrance, Concept 7 assumes the bus would operate in a dedicated transit-only lane as the route continues east, then south along Harbor Drive. The Concept 7 route would turn east onto Broadway and travel in a dedicated transit lane until the Broadway and Park Boulevard bus stop located between 11th Avenue and Park Boulevard. This stop would provide access to the Trolley Blue Line and Trolley Orange Line City College Station located at the northwest corner of the Broadway and Park Avenue intersection.

The Concept 7 route from OTTC would utilize a route similar to the current San Diego Flyer and would provide a direct route from SDIA to OTTC with 10-minute headways. Figure O-2 illustrates the concept alignment. Table O-1 provides information on concept characteristics. The Concept 7 route would travel around the airport in mixed traffic along Airport Terminal Road with stops at Terminal 1 and Terminal 2. From the SDIA entrance, the route would travel in a dedicated transit-only lane before turning north to continue along Laurel Street in mixed traffic. This Concept 7 route would turn northwest on Pacific Highway to travel in a dedicated transit-only lane to connect to the existing OTTC, providing connections to the Trolley Blue and Trolley Green Lines, Amtrak Pacific Surfliner, COASTER, and buses.

Table O-1. Concept 7 Characteristics

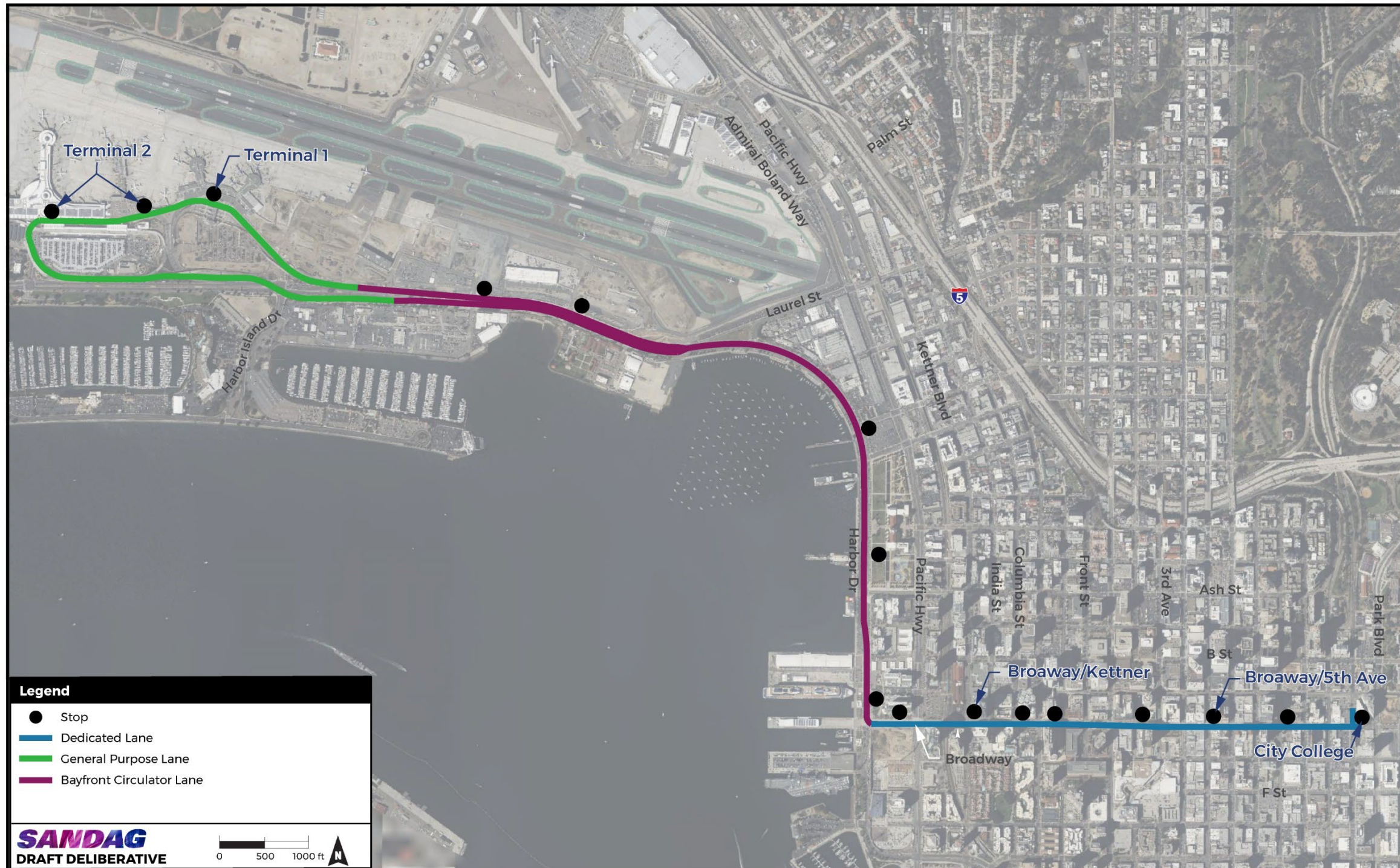
CHARACTERISTIC	ROUTE TO CITY COLLEGE	ROUTE TO OLD TOWN TRANSIT CENTER
Length in transit-only lanes (miles)	3	3.2
Length in mixed traffic (miles) ¹	0	0.4
Number of stops	16	3
Headways	7.5 minutes	10 minutes

Source: WSP, HDR 2022

Notes:

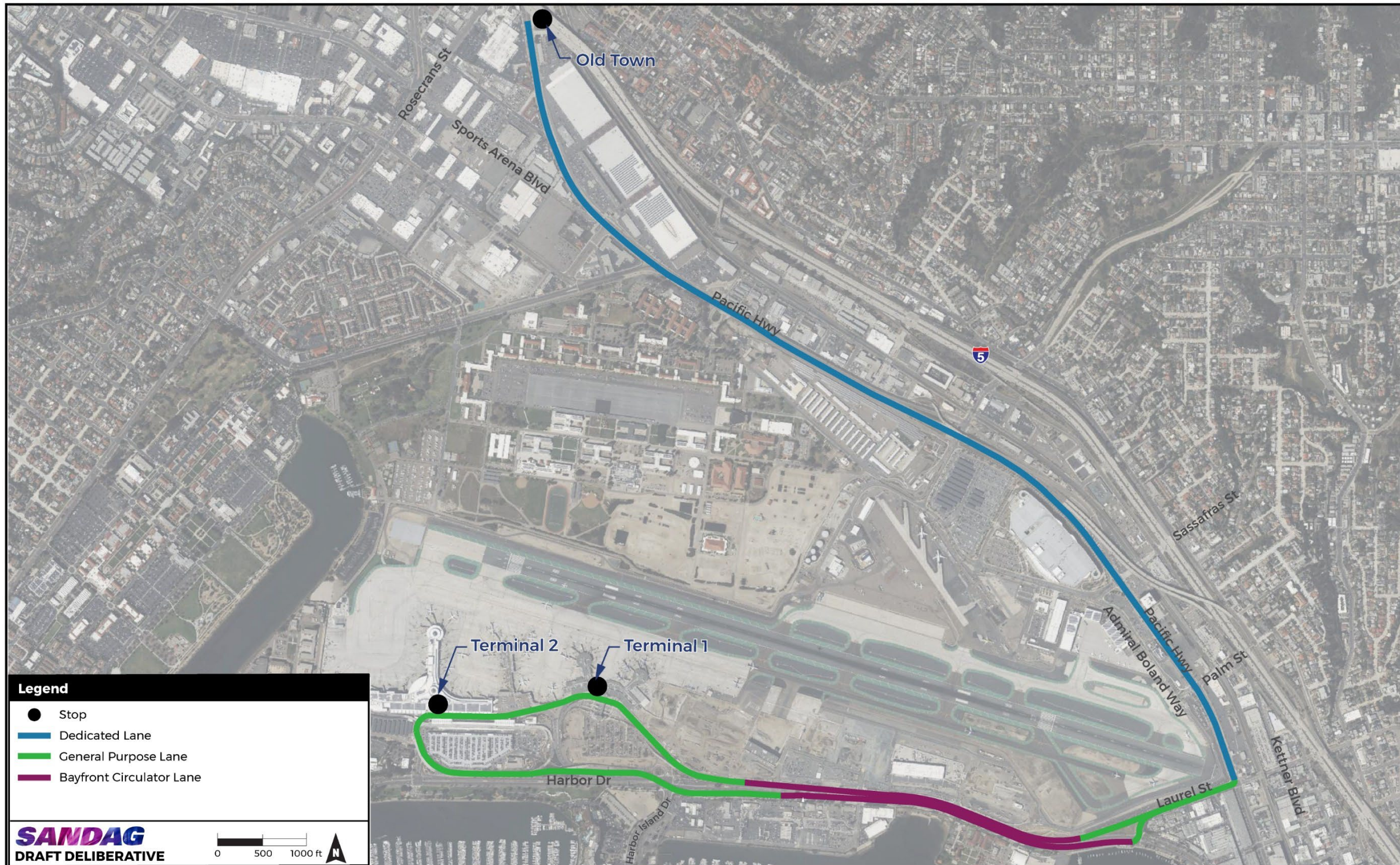
¹ The length of the alignment includes that along local streets. The route from City College and Old Town Transit Center would also operate in mixed traffic on SDIA property

Figure O-1. Bus Concept – San Diego International Airport to City College



Source: WSP, HDR 2022

Figure O-2. Bus Concept – San Diego International Airport to Old Town Transit Center



Source: WSP, HDR 2022

O.2. Passenger Convenience and Ridership

O.2.1. Regional Connectivity

Regional connectivity is evaluated by identifying the number of modes of transportation and the number of major destinations and community facilities that can be reached within a 0.5-mile buffer of a station (defined as the “station area”). For the purpose of this analysis, “destinations” include major tourist destinations (e.g., attractions, museums, commercial shopping areas, recreational/historic areas) and community facilities (e.g., schools, parks, libraries, police/fire stations, hospitals).

Modes of Transportation

Concept 7 would have connections to the greater transit network, including the MTS bus and Trolley light rail (Blue Line, Green Line, and Orange Line), North County Transit District COASTER commuter trains, and the Amtrak Pacific Surfliner. For the purpose of this analysis, The bus stops along the Concept 7 route to City College were grouped into six 0.5-mile clusters based on geographic areas: Broadway, W Broadway, the N Harbor Dr (Embarcadero), N Harbor Dr (Harbor), SDIA, and Old Town. Concept 7 route to City College includes the Broadway, the N Harbor Dr (Embarcadero), N Harbor Dr (Harbor), W Broadway, and SDIA Clusters; while the Concept 7 route to OTTC includes the SDIA and Old Town Clusters.

Table O-2 summarizes the potential regional connections to existing bus transit routes, rail and Trolley connections, bike routes, major roads, and arterial/collector streets for Concept.

Bus Transit Routes: In total, Concept 7 would provide connections to 28 MTS bus routes. Specifically, Concept 7 route to City College would provide connections to 18 MTS bus routes: 2, 3, 5, 7, 11, 12, 20, 83, 110, 120, 215, 225, 235, 280, 290, 901, 923, and 929. Concept 7 route to OTTC would provide connections to 12 MTS bus routes: 8, 9, 10, 28, 30, 35, 44, 83, 84, 88, 105, and 923.

Rail and Trolley Lines: Concept 7 would have connections to five rail and Trolley lines: Trolley Blue, Green, and Orange Lines, Amtrak, and COASTER.

Bike Routes: Concept 7 would have connections to eight bike networks. Specifically, Concept 7 route to City College would have connections to six bike networks, including the City of San Diego Bicycle Network (including bike lanes, separated bikeways, and bike routes), North Harbor Drive Bike Path, California Path, Columbia Path, Martin Luther King, Jr. Promenade, and the Embarcadero Path. Concept 7 route to OTTC would have connections to four bike networks, including the City of San Diego Bicycle Network (including bike lanes, separated bikeways, and bike routes), North Harbor Drive Bike Path, Mission Valley Bike Path, and Ocean Beach Bike Path.

Major Roads, Arterials, and Collector Streets: Major roads are usually four to six lanes wide with limited access, grade separations, and extra lanes where needed. Major roads are designed for through traffic but usually have signals at major intersections. Major arterials are usually four to six lanes wide and although designed primarily for through traffic, arterials also provide access to abutting property. Collector Streets are typically two to four lanes wide and function as feeders of traffic to the major street system and provide continuity with local streets.

Concept 7 would be accessible by 15 major roadways and 34 arterial/collector streets. Specifically, Concept 7 route to City College would be accessible by 9 major roadways and 17 arterial/collector streets. Concept 7 route to OTTC would be accessible by eight major roadways and two arterial/collector streets.

Table O-2. Regional Connectivity for Concept 7

CATEGORY	NO. OF CONNECTIONS	ROUTE NAMES	BUS STATION CLUSTER AREAS
Bus Routes	28	901 (Iris Transit Center - Downtown San Diego)	SDIA, N Harbor Dr (Harbor), N Harbor Dr (Embarcadero), W Broadway, Broadway
		923 (Downtown to Point Loma)	
		929 (Iris Transit Center - 12th & Imperial)	SDIA, Old Town, N Harbor Dr (Harbor), N Harbor Dr (Embarcadero)
		02 (Downtown San Diego - 30th & Adams)	Broadway
		03 (UCSD Hospital - Euclid Transit Center)	
		05 (Downtown San Diego - Euclid Transit Center)	
		7 (Downtown San Diego - University/College)	Broadway, W Broadway, N Harbor Dr (Embarcadero)
		8 (Old Town - Balboa Av TC)	
		9 (Old Town - Jewell & Garnet)	
		10 (Old Town - University/College)	
		11 (SDSU - Downtown San Diego)	
		110 (Mira Mesa - Downtown via Hwy 163)	
		12 (City College - Skyline Hills)	
		120 (Downtown San Diego - Kearny Mesa Transit Center)	
		20 (Downtown - Rancho Bernardo Transit Station)	
		215 (Mid-City Rapid)	
		225 (Downtown - Otay Mesa TC)	Broadway, W Broadway, N Harbor Dr (Embarcadero), Old Town
		235 (Downtown - Escondido Transit Center)	

CATEGORY	NO. OF CONNECTIONS	ROUTE NAMES	BUS STATION CLUSTER AREAS
		28 (Old Town T.C. - Shelter Island)	Old Town Transit Center
		280 (Escondido Transit Center - Downtown)	
		290 (Rancho Bernardo Station - Downtown)	
		30 (Old Town - UTC via Pacific Beach)	
		35 (Ocean Beach - Old Town)	
		44 (Old Town - Kearny Mesa)	
		83 (Downtown San Diego - Old Town)	
		84 (Point Loma Shuttle)	
		88 (Old Town - Fashion Valley)	
		105 (Old Town - University City)	
Rail and Trolley Lines	5	COASTER	Broadway, W Broadway, N Harbor Dr (Embarcadero), Old Town
		Amtrak Pacific Surfliner	
		Trolley Blue Line	
		Trolley Green Line	
		Trolley Orange Line	Broadway, W Broadway, N Harbor Dr (Embarcadero)
Bike Routes	8	City of San Diego Bicycle Network	SDIA, N Harbor Dr (Harbor), N Harbor Dr (Embarcadero), Broadway, W Broadway, Old Town
		North Harbor Dr Bike Path	SDIA, N Harbor Dr (Harbor), N Harbor Dr (Embarcadero)
		Embarcadero Path	
		California Path	Broadway, W Broadway, N Harbor Dr (Embarcadero)
		Columbia Path	
		Martin Luther King, Jr. Promenade	
		Mission Valley Bike Path	Old Town Transit Center
		Ocean Beach Bike Path	

CATEGORY	NO. OF CONNECTIONS	ROUTE NAMES	BUS STATION CLUSTER AREAS
Major Street	15	6th Ave	Broadway, W Broadway
		Broadway	Broadway, W Broadway, N Harbor Dr (Embarcadero)
		Front St	Old Town
		Harbor Dr	Broadway, W Broadway, N Harbor Dr (Embarcadero)
		Market St	Broadway, W Broadway, N Harbor Dr (Embarcadero)
		Midway Dr	Broadway, W Broadway, N Harbor Dr (Embarcadero)
		Morena Blvd	Old Town
		North Harbor Dr	Old Town
		Pacific Hwy	SDIA Cluster, N Harbor Dr (Harbor) Cluster, N Harbor Dr (Embarcadero) Cluster, W Broadway
		Park Blvd	Broadway, W Broadway, N Harbor Dr (Embarcadero), Old Town
		Rosecrans St	Broadway
		Sports Arena Blvd	Old Town
		Taylor St	Old Town
		W Laurel St	Old Town
Camino Del Rio West	Old Town		
Arterial/ Collector Street	19	1st Ave	Broadway, W Broadway
		4th Ave	
		5th Ave	
		8th Ave	
		10th Ave	Broadway
		11th Ave	
		Grape St	N Harbor Dr (Embarcadero)
		Hawthorn St	
		A St	Broadway, W Broadway, N Harbor Dr (Embarcadero)
		Ash St	

CATEGORY	NO. OF CONNECTIONS	ROUTE NAMES	BUS STATION CLUSTER AREAS	
		B St		
		C St		
		F St		
		G St		
		Kettner Blvd		
		State St		
		India St		
		Juan St		Old Town Transit Center
		Congress St		

Source: WSP, HDR, and TAHA 2022

Note: SDIA = San Diego International Airport

Connections to Destinations

There would be 74 destinations within Concept 7 station clusters. Specifically, Concept 7 route to City College would have approximately 61 destinations within walking distance of a station cluster. Concept 7 route to OTTC would have approximately 13 destinations are within walking distance of a station cluster. Table O-3 summarizes the destinations within walking distance from a Concept 7 route to City College proposed station.

Table O-3. Destinations within Concept 7 Station Cluster Areas

DESTINATIONS	BUS STATION CLUSTER AREA
San Diego International Airport	SDIA
Spanish Landing Park (East)	
Spanish Landing Park (West)	
San Diego Harbor Police	SDIA, N Harbor Dr (Harbor)
E3 Civic High	Broadway
Fashion Institute of Design & Merchandising-San Diego	
New Vistas	
San Diego Central Library	
SDFD Fire Station 4	
Via Talentum Academy	
San Diego City College	
Balboa Stadium	
San Diego Police Headquarters	

DESTINATIONS	BUS STATION CLUSTER AREA
Seaport Village Shopping Center	W Broadway
Balboa Theatre	Broadway, W Broadway
California Western School Of Law	
Civic Center	
Davis House Park	
Downtown San Diego/Core-Colombia	
DTFHC At Connections	
Gary And Mary West Senior Dental Center, Inc.	
Gaslamp Museum at Davis-Horton House Museum & Park	
King Promenade Park	
King-Chavez Community High	
Metro Arson Strike Team	
Paul Mitchell The School-San Diego	
San Diego Chinese Historical Museum	
SDFD Fire Station 1	
Cruise Ship Terminal	
The Headquarters at Seaport	
The New Children's Museum	
Gaslamp Quarter	
Horton Plaza Park	
Col. Salomon Child Development Center	
Maple Canyon Open Space	
SDGF Fire Station 3	
Washington Elementary	
Broadway Landing	N Harbor Dr (Embarcadero), W Broadway
Lane Field Park	
Maritime Museum of San Diego	
Navy Pier	
NHA - Stem Institute For Early Learning	
Ruocco Park	
SDFD Fire Station 2	
Star of India Museum	
The Embarcadero	

DESTINATIONS	BUS STATION CLUSTER AREA	
Tuna Harbor Park		
USS Midway Museum		
Waterfront Park/Harborview		
Aspen Leaf Nursery & Preschool -Barry Ted Moskowitz CCC	Broadway, W Broadway, N Harbor Dr (Embarcadero),	
Federal Courthouse		
Firehouse Museum		
Hall Of Justice		
Little Italy		
Metropolitan Corrections Center		
Museum of Contemporary Art San Diego		
NHA - Broadway Early Learning Academy		
Pantoja Park		
San Diego Central Courthouse		
San Diego Central Jail		
SDFD Fire Station 1/201		
Early Learners Children's Academy		Old Town Transit Center
El Campo Santo		
Heritage County Park		
IHigh Virtual Academy		
Midway District		
Mission Valley Preserve		
Old Town San Diego State Park		
Presidio Park		
San Diego County Psychiatric Hospital		
San Diego University Integrative Studies		
TRACE		
Urban Corps of San Diego County Charter		
Whaley House Complex		

Source: WSP, HDR, and TAHA 2022

Notes: SDFD = San Diego Fire Department; SDIA = San Diego International Airport

O.2.2. User Experience

The evaluation of user experience relates to the station area environment and a passenger's experience on the vehicle considering elements such as ease of transfers, navigation, and passenger comfort. For the purpose of this analysis, the ease of transfers considered the distance and navigation to the nearest connecting services. The number of modes of transportation that can be reached within 0.5-mile buffer of each station is discussed in Section O.2.1.

Drop-off/Pick-up, Navigation, and Transfer Convenience

The following sections summarize transfer convenience for each bus stop along Concept 7, including between modes of transit and by vehicle, as applicable. Transfer convenience at these stations was evaluated in terms of distance between modes of transit and vehicular drop-off/pick-up locations and the bus stops.

The Concept 7 route from SDIA to City College would serve 16 existing bus stops along the current MTS Route 992. Transfer opportunities to other transit services are provided at Santa Fe Depot and along Broadway, which is the main bus corridor through downtown San Diego. Vehicular drop-off/pick-up locations are limited and challenging in the downtown area, although Santa Fe Depot provides space for that purpose along Kettner Boulevard.

The Concept 7 route from SDIA to OTTC would provide a direct connection to SDIA at Terminal 1 and Terminal 2. OTTC provides a dedicated vehicular drop-off/pick-up area, dedicated transit parking, and ample transfer opportunities to ten bus routes, two Trolley lines (i.e., Blue and Green Lines), Amtrak intercity rail service, and COASTER commuter rail service. The considerable amount of connecting transit services present opportunities for confusion and clear signage would be needed. Wayfinding for on-street bus services in mixed traffic is typically more challenging than for services with dedicated right-of-way as stops are small in size and signage is limited. Bus stops along the transit-only lanes provide opportunities for enhanced wayfinding signage.

Station Amenities

The stops along the bus alignment would utilize existing MTS bus stops. Along Broadway, bus stops include a range of amenities including shelters, seating, trash receptacles, and/or signage.

Fare Payment Method

For the purposes of this evaluation, it is assumed that the Airport Transit Connector (ATC) would be fare free. A fare free concept allows for a smoother boarding process and would minimize travel delay compared to systems where a passenger pays as they board.

Boarding Method

Passengers typically access the bus by stepping up to board through the front door only. Buses can "kneel" to get closer to the curb, lessening the distance passengers need to climb.

Wheelchair passengers would board via a lift process, which is more time-consuming than rolling directly onto the vehicle.

Luggage Accommodations

Standard buses are not specifically designed for passengers carrying luggage; however, Concept 7 is assumed to be designed with airport travel in mind, with space for luggage.

Reliability

Parts of the bus routes would operate on transit-only lanes along Broadway, Pacific Highway, and Harbor Drive, which would minimize potential conflicts with other vehicles, thereby improving reliability compared to buses that are entirely within mixed traffic. Bus services operating along city streets are often affected by congestion, roadway construction, accidents, and other issues. Unlike rail services, however, bus services have the ability to deviate onto other roadways to avoid major issues. Concept 7 would be expected to deal with the usual variations in service reliability due to roadway conditions but could avoid major service disruptions to route flexibility.

Ride Comfort

Buses travel on rubber tires along city streets which are in various states of repair. Bus travel is typically bumpier than rail or other modes which use dedicated trackways. Concept 7 would serve 16 bus stops in the route to City College which would require frequent stops and starts; however, the OTTC route would only stop at OTTC and the airport terminals.

O.2.3. Travel Time

Transit Travel Time

The evaluation of transit travel time considered the total time spent traveling on transit to and from destinations within the county. Transit travel time included time from the first mode of transit used to the destination, inclusive of transfers, and was obtained from the San Diego Association of Governments (SANDAG) ABM2+ model. Transit travel times to SDIA were calculated for the AM peak hour and transit travel times from SDIA were calculated for the PM peak hour. Transit travel times to and from each destination were compared to against a No Project baseline. Table O-4 outlines the transit travel times for each destination evaluated.

Compared to the No Project baseline, Concept 7 would reduce the transit travel time to 10 of the 14 destinations evaluated. The reduction in transit travel time for Concept 7 would range from 1-24 minutes.

Table O-4. Concept 7 Transit Travel Time

LOCATION/ DESTINATION	NO PROJECT BASELINE		CONCEPT 7 BUS CONCEPT FROM SDIA TO OLD TOWN TRANSIT CENTER AND CITY COLLEGE	
	TO SDIA	FROM SDIA	TO SDIA	FROM SDIA
Legoland	64	64	57	57
Carlsbad/Carlsbad Village Station	63	63	62	62
Grossmont Center Mall	61	61	43	43
Mission Bay/Mission Bay Park	32	32	21	21
Mission Valley/Fashion Valley Station	36	36	23	23
Chula Vista City Hall	45	45	51	51
Bayfront Redevelopment/E Street Station	45	45	55	55
Bayfront Redevelopment (Gaylord Pacific Resort and Convention Center & Harbor Park)	47	47	57	57
San Ysidro Transit Center	60	60	57	57
San Diego State University/SDSU Transit Center	52	52	28	28
University of California, San Diego/UCSD Central Campus Station	41	41	30	30
Convention Center	24	24	28	28
Liberty Station (Commercial & Bus Transit)	23	23	18	18
Ocean Beach (Downtown Area)	41	41	25	25

Source: SANDAG, WSP, and HDR 2022

Notes: SDIA = San Diego International Airport; San Diego State University; UCSD = University of California San Diego

Headways

The evaluation of travel time also considered headways, or the time between transit vehicles. The headways presented in this evaluation are consistent with those used in the ridership forecasts. Actual headways would be determined during later stages of project development.

The Concept 7 route to City College would operate with 7.5-minute headways and the Concept 7 route to OTTC would operate with 10-minute headways.

O.2.4. Ridership

Projected ridership in 2050 was modeled for Concept 7 by route, station, and systemwide based on forecasts from the San Diego Association of Governments (SANDAG) model. Concept 7

ridership considered enhanced bus service of the MTS Route 992 from SDIA to City College Station with a second route from SDIA to OTTC.

Systemwide ridership was compared against a No Project baseline. Table O-5 outlines the projected 2050 daily ridership for Concept 7 and systemwide.

Table O-5. Concept 7 and Regional 2050 Ridership

CONCEPT DESCRIPTION	ROUTE	DAILY RIDERSHIP	TOTAL REGIONAL BOARDINGS
Concept 7 Bus Concept from SDIA to Old Town Transit Center and City College	Route 992	4,000	1,392,000
	Route 987	6,000	
	Total	9,000	

Source: SANDAG 2022

Notes:

Numbers rounded to the nearest 1,000. Numbers may not equal due to rounding.

SDIA = San Diego International Airport

O.3. Congestion of Airport Access

O.3.1. Traffic Effects

The evaluation of traffic effects considered the change in traffic volumes on select roadways, including those entering and leaving SDIA, associated with each concept. The change in traffic volumes was evaluated using average daily traffic (ADT) volumes from the SANDAG model, which represent the average number of vehicles passing a specific point on a connection or roadway on an average day.

The 2050 ADT volumes on these roadways were compared for each segment against a No Project baseline to calculate the percent change in ADT. Table O-6 outlines the roadways considered in this evaluation and the percent change in ADT. Compared to the No Project baseline, Concept 7 would reduce ADT for all roadway segments except for the segment on Hawthorn Street from Pacific Highway to Harbor Drive, on Harbor Drive from Laning Road to McCain Road, and Grape Street from Pacific Highway to Harbor Drive which would result in an increase in ADT. The segments with the largest reduction in ADT would be the Airport Terminal 1 and 2 Roadways with a seven percent reduction, the SDIA inbound access road and Pacific Highway from Sassafras Road to Palm Street with an eight percent reduction, and Laurel Street from Pacific Highway to Harbor Drive with a 10 percent reduction in ADT. The reduction in ADT reflects travelers switching modes and/or points of access to reach SDIA and destinations served by Concept 7.

Table O-6. Concept 7 Average Daily Traffic

ROADWAY SEGMENT	PERCENT CHANGE IN AVERAGE DAILY TRAFFIC COMPARED TO NO PROJECT BASELINE
Airport Terminal 1 and 2 Roadways	-7%
Harbor Drive from Laurel Street to Harbor Island Drive	-2%
SDIA Inbound Access Road from Laurel Street to SDIA	-8%
Harbor Drive from Grape Street to Ash Street	-3%
Harbor Drive from Market Street to Front Street	-1%
Harbor Drive from Laning Road to McCain Road	2%
Pacific Highway from Sassafras Road to Palm Street	-8%
Laurel Street from Pacific Highway to Harbor Dr	-10%
Hawthorn Street from Pacific Highway to Harbor Drive	16%
Grape Street from Pacific Highway to Harbor Drive	1%

Source: SANDAG 2022

Note: SDIA = San Diego International Airport

O.4. Vehicle Miles Traveled and Greenhouse Gases

O.4.1. Vehicle Miles Traveled

Providing alternative transportation modes in the region would change the number of vehicles on the road. The change in 2050 vehicle miles traveled (VMT) associated with implementation of Concept 7 was calculated against a No Project baseline. Table O-7 summarizes the 2050 regional VMT and change in VMT compared to the No Project baseline.

Table O-7. Concept 7 Vehicle Miles Traveled

CONCEPT DESCRIPTION	2050 REGIONAL VMT ¹	REGIONAL VMT REDUCTION FROM NO PROJECT ¹
No Project Baseline	88,620,000	—
Concept 7 Bus Concept from SDIA to Old Town Transit Center and City College	88,598,000	-22,000

Source: SANDAG 2022

Notes:

¹Numbers are rounded to the nearest 1,000.

SDIA = San Diego International Airport; VMT = vehicle miles traveled

O.4.2. Greenhouse Gases

A change in 2050 VMT would result in a corresponding change in 2050 greenhouse gas (GHG) emissions. To evaluate the change in emissions, A select link analysis was performed within the SANDAG ABM2+ model. The VMT on the select links was compared to the No Project baseline

to calculate the change in VMT. EMFAC per mile emission rates in pollutant-per-mile-traveled units were calculated for each concept and the No Project baseline.

Table O-8 compares the GHG emissions reductions between the No Project baseline and Concept 7. With a VMT reduction, Concept 7 would result in a 0.65 percent reduction in GHG emissions.

Table O-8. Concept 7 Operational GHG Emissions

CONCEPT DESCRIPTION	GHG EMISSIONS (MMT _{CO₂E}) (TONS PER DAY)	PERCENT CHANGE IN GHG COMPARED TO NO PROJECT BASELINE
No Project Alternative (2050)	24,590	—
Concept 7 Bus Concept from SDIA to Old Town Transit Center and City College	24,430	-0.65%

Source: SANDAG 2022

Notes:

¹Numbers are rounded to the nearest 10.

GHG = greenhouse gas; MMT_{CO₂E} = million metric tons of CO₂e; SDIA = San Diego International Airport

O.5. Feasibility / Complexity

O.5.1. Right-of-Way

The evaluation of right-of-way requirements considered the number of parcels that may need to be acquired to support the concept and the number of buildings that may require demolition. As Concept 7 utilizes existing right-of-way and does not consist of new tracks, tunneling, or new stations; therefore, no right-of way requirements or potential building demolition were identified.

Table O-9. Concept 7 Right-of-Way Requirements

CONCEPT DESCRIPTION	RIGHT-OF-WAY REQUIREMENTS	
	NUMBER OF PARCELS AFFECTED	NUMBER OF BUILDINGS POTENTIALLY REQUIRING DEMOLITION
Concept 7 Bus Concept from SDIA to Old Town Transit Center and City College	0	0

Source: WSP, HDR, GPM 2022

Note: SDIA = San Diego International Airport

O.5.2. Construction Effects/Constructability

This section discusses constructability considerations associated with the major infrastructure elements featured in each concept under evaluation with the purpose of identifying probable construction methods, staging, sequences, traffic impacts, and any temporary facilities that would be implemented during the construction phase.

Concept 7 would serve SDIA with enhanced bus access, with one route operating from OTTC and a second route from City College via Santa Fe Depot (Table O-1, Figure O-1, and Figure O-2). The service would largely operate in existing roadways with transit-only lane conversions on Broadway, Harbor Drive, and Pacific Highway. This concept would require traffic signaling upgrades, intersection and lane reconfigurations, pavement repair or replacement in some areas, and limited ramp or lane construction to connect transit-only lanes. It would also include sidewalk and bus stop reconstruction, and drainage improvements where required. Relative to the other concepts with substantial new dedicated guideway construction, Concept 7 would encompass simple and limited-scale construction.

O.5.3. Major Utilities

Potential for conflicts with existing utilities was analyzed for Concept 7. Major utilities in this evaluation are defined as water facilities equal to or greater than 16 inches, sewer facilities equal to or greater than 18 inches, and storm drain facilities equal to or greater than 36 inches. As Concept 7 utilizes existing right-of-way and does not consist of new tracks, tunneling, or new stations, no impacts to existing utilities were identified.

O.5.4. Geotechnical and Seismic Conditions

Geotechnical and seismic considerations are not anticipated to play a substantial role in this concept as the concept does not include new structures or other types of improvements that are sensitive to geotechnical and seismic conditions.

O.5.5. Regulatory Considerations

The Regulatory Considerations criterion identifies the federal and state agency approvals, permits, and coordination potentially required for implementation of each concept. The following details the types of agency approval and permits that may be applicable to each concept, based on information available to date. Additional approvals and coordination may be identified during subsequent phases of the project development process. All concepts would require environmental clearance pursuant to the California Environmental Quality Act (CEQA), for which SANDAG would be the CEQA lead agency. Additionally, the project would likely have a federal nexus, which would also require environmental clearance pursuant to the National Environmental Policy Act. At this time, a federal lead agency has not been identified.

California Coastal Commission

The California Coastal Commission (CCC) is a state agency within the California Natural Resources Agency with quasi-judicial control of land and public access along the state's 1,100 miles of coastline. Concept 7 proposes an enhanced bus service in transit-only lanes along N. Harbor Drive which would be located within the California Coastal Zone as identified by the CCC. The following regulations would apply to both permanent features and construction activities within the California Coastal Zone.

Title 15, Code of Federal Regulations (CFR) Parts 923 and 930, “Coastal Zone Management Act (CZMA).” Title 15, Part 923 of the CFR contains the requirements for the California coastal management program, pursuant to the CZMA of 1972. California’s program identifies coastal resources that require management or protection by the state, including resources that are located within Coastal Zones and would be subject to impacts from development. The CZMA defines Coastal Zones as “coastal waters...and the adjacent shorelands...strongly influenced by each other and in proximity to the shorelines of coastal states.” Title 15, Part 930 of the CFR requires a federal consistency review of federal agency, federally permitted, and federally funded (to state and local government) activities that affect the Coastal Zone.

Title 14, Natural Resources, Division 5.5. Regulations under Title 14, Division 5.5, pursuant to the California Coastal Act of 1976, defines the roles and responsibilities of the CCC to carry out the full purposes and provision of the Act. Chapter 5, “Coastal Development Permits Issued by Coastal Commissions,” governs the process for the CCC to assess and approve coastal development permits for projects located within Coastal Zones.

Conclusion

Concept 7 may require permitting and coordination with the FAA, CCC, and may be required to comply with applicable regulations including, but not limited to, the following:

- CCC: 15 CFR Parts 923 and 930 - Coastal Zone Management Act
- CCC: Title 14, Natural Resources Division 5.5, California Coastal Commission

O.6. Cost

O.6.1. Capital Cost

The capital costs estimate for Concept 7 included the estimated costs for the following program components:

- Construction
- Vehicles
- Professional services
- Unallocated contingency (20%)

Prototypical Unit Price Elements were developed to represent station and roadway improvements necessary to implement Concept 7. High-level estimates for vehicle acquisitions and allowances for professional services were also included. Refer to Appendix P for additional detail on the methodology used for the cost estimate.

At this stage of the project development process, costs were estimated in rough-orders-of-magnitude for purposes of comparing each concept to each other. The cost estimates are in 2022 dollars. Right-of-way costs were not included in these estimates; however, no right-of-way

requirements were identified for Concept 7. Table O-10 outlines the capital cost estimate for Concept 7 including a range from low to high.

Table O-10. Concept 7 Capital Cost

CONCEPT DESCRIPTION	COST IN MILLIONS (2022)		
	LOW	MID-POINT	HIGH
Concept 7 Bus Concept from SDIA to Old Town Transit Center and City College	\$45.8	\$53.9	\$70.0

Source: WSP, HDR 2022

Note: SDIA = San Diego International Airport

O.6.2. Cost per Rider

The cost per rider was calculated using the 2050 ridership forecasts and capital costs developed for this study to provide a more direct comparison of concepts given the differences in the number of stations and locations served. Table O-11 summarizes the cost per rider estimates for Concept 7 including a range from low to high.

Table O-11. Concept 7 Cost Per Rider

CONCEPT	COST (2022)		
	LOW	MID-POINT	HIGH
Concept 7 Bus Concept from SDIA to Old Town Transit Center and City College	\$0.91	\$1.05	\$1.37

Source: WSP, HDR 2022

Note: SDIA = San Diego International Airport

O.6.3. Cost per Mile

Cost per mile was calculated based on capital cost and the length of each concept. The cost estimates are in 2022 dollars. Table O-12 presents the cost per mile for Concept 7 including a range from low to high.

Table O-12. Concept 7 Cost Per Mile

CONCEPT DESCRIPTION	COST IN MILLIONS (2022)		
	LOW	MID-POINT	HIGH
Concept 7 Bus Concept from SDIA to Old Town Transit Center and City College	\$6.9	\$8.2	\$10.6

Source: WSP, HDR 2022

Note: SDIA = San Diego International Airport

O.6.4. Operations and Maintenance

Estimation of annual Operations and Maintenance (O&M) costs associated with Concept 7 is outside of the scope of this study. However, a high-level comparative assessment of probable O&M cost in qualitative terms was undertaken. Table O-13 presents a qualitative assessment of the main O&M cost elements for the three technologies under consideration – ATC, Trolley (light rail transit [LRT]), and bus. Among the various ATC concepts, O&M costs would generally increase as the alignment length, number of stations, and/or ridership increases. As shown in Table O-13, the enhanced bus would have high O&M cost for three of the seven elements: support staff, motive power, and energy consumption.

Table O-13. Operations and Maintenance Costs

COST DRIVER	ATC	TROLLEY (LRT)	ENHANCED BUS	ASSESSMENT
Guideway Infrastructure	\$\$\$	\$\$	\$	Extended underground ATC alignment would require added maintenance of ventilation and fire life safety systems. LRT concept would take advantage of using existing infrastructure along the Green Line and therefore would incur less maintenance cost. Bus infrastructure is shared with infrastructure owned by others and would have low infrastructure maintenance costs.
Operations and Support Staff	\$\$	\$\$\$	\$\$\$	Additional cost for personnel (salaries/insurance/medical etc.), including drivers/operators and associated support personnel. OMSF design and capacity requirements (restrooms/conference rooms/offices/utility costs) are also affected by the number of personnel required for operations. ATC vehicles are assumed to be automated (i.e., driverless).
Vehicle Maintenance	\$\$	\$\$\$	\$	ATC vehicles operate at much shorter headways requiring higher vehicle count compared to LRT vehicles expected to operate on 15-minute headways. Buses would also have a higher vehicle count than LRT vehicles to provide comparable capacity; however, both ATC and LRT are more complex vehicles and more costly to maintain. Also, maintenance costs are lower for rubber-wheeled vehicles (ATC and bus). Special maintenance equipment is required for steel wheel truing and rail grinding. LRT vehicles also employ a pantograph system to collect power from an overhead catenary system requiring additional maintenance.

COST DRIVER	ATC	TROLLEY (LRT)	ENHANCED BUS	ASSESSMENT
Energy Consumption	\$\$\$	\$	\$\$\$	The performance and frequency of ATC vehicles typically translates to higher energy consumption/demand. Energy cost for ATC vehicles might therefore be higher than that of LRT vehicles. Energy consumption for buses using internal combustion engines may be lower per vehicle, but the number of vehicles required would be much higher.
Systems	\$	\$\$	\$	Train control systems for LRT would include Automatic Train Protection but not Automatic Train Operation because trains are manually driven. Because a typical ATC uses vehicle location/communication dynamics (as well as Automatic Train Operation) for movement, authority wayside equipment such as signals/signs and associated cables are minimal. Enhanced bus service typically implements Transit Signal Priority over existing traffic control equipment requiring a nominal amount of maintenance.

Source: WSP and HDR 2022

Notes: ATC = Airport Transit Connector; LRT = light rail transit; OMSF = Operations, Maintenance and Storage Facility

O.7. Community Effects and Economic Benefits

The community effects evaluation criteria identify the anticipated community effects and adjacent development considerations for each concept. The community effects analysis contains four primary components: (1) identifying the communities within each station area (0.5-mile buffer around each station), (2) identifying the population and housing within each station area, (3) identifying the jobs and employment industries within each station area, and (4) identifying the percentage of workers, including SDIA workers, who travel from the north, south, and east areas of San Diego County to reach the Project Area.

For Concepts 7 route to City College and Concept 7 route to OTTC, the Project Area is defined by those areas within 0.5 mile from a given grouping of stations grouped based on geographic proximity (bus station clusters). There are six bus station clusters: Broadway, W Broadway, N Harbor Dr (Embarcadero), N Harbor Dr (Harbor), Old Town, and SDIA. The Broadway Cluster is roughly bounded by Interstate (I-) 5 to the north, K Street to the south, 20th Street to the east, and Pacific Hwy to the west. The W Broadway Cluster is roughly defined by Date Street to the north, Embarcadero Street to the south, 9th Street to the east, and San Diego Bay to the west. The N Harbor Dr (Embarcadero) Cluster is roughly defined by Olive Street to the north, Embarcadero Street to the south, 1st Avenue to the east, and San Diego Bay to the west. The N Harbor Dr (Harbor) Cluster is roughly defined by Admiral Boland Way to the north, San Diego Bay to the south, Pacific Highway to the east, and SDIA to the west. The Old Town Cluster is roughly defined by I-8 to the north, Pacific Highway to the south, Heritage Park to the east, and East Drive to the west. The SDIA Cluster is roughly defined by Midway Avenue to the north, San

Diego Bay to the south, the San Diego Unified Port District to the east, and the Naval Training Center Park to the west.

Communities were identified using ArcGIS and data from the SANDAG GIS Open Data Portal. Population and housing within each station area was determined using U.S. Census Bureau 2017-2021 American Community Survey 5-Year estimates. The US Census Bureau's OnTheMap web feature was used to determine (1) the number of jobs by industry within each station area and (2) the municipal origins for workers commuting to the Project Area. Job industries are categorized based on the North American Industry Classification System (NAICS), which is the federal classification standard for businesses in the United States. The OnTheMap web feature displays the top 12 municipal home destinations for the Project Area and condenses the remaining destination under the "All Other Locations" category. The following 12 cities were assessed as home destinations for workers in the Project Area by the OnTheMap web feature: San Diego, Chula Vista, El Cajon, National City, Los Angeles, La Mesa, Santee, La Presa, Lemon Grove, Carlsbad, Spring Valley, and Escondido. The adjacent development considerations analysis identifies the number of vacant parcels within each station area. Vacant properties within the station areas were identified using the Parcel and Current Land Use datasets from the SanGIS/SANDAG GIS Data Warehouse and were field verified in September 2022.

For analysis purposes, the proposed bus stations for Concept 7 were grouped within clusters (bus station clusters), and the surrounding communities, jobs, and employment, commuting origins, and adjacent development considerations

O.7.1. Adjacent Community Effects

Surrounding Communities

Concept 7 route to City College would provide connections to nine City of San Diego communities: Park West/Bankers Hill, Harborview, Marina, Little Italy, Core-Columbia, Horton Plaza, Gaslamp, Cortez, and SD International Airport. Concept 7 route to OTTC would provide connections to the City of San Diego communities of Old Town, Midway District, and SD International Airport. The Broadway Cluster is within the Little Italy, Cortez, Marina, Core-Columbia, Horton Plaza, and Gaslamp communities. The W Broadway Cluster is within the Little Italy, Marina, Core-Columbia, Horton Plaza, and Gaslamp communities. The N Harbor Dr (Embarcadero) Cluster is within the Park West/Bankers Hill, Harborview, Marina, Little Italy communities. The N Harbor Dr (Harbor) Cluster is within the Harborview community. The SDIA Cluster is within the SD International Airport community. Table O-14 summarizes the communities located within each of the station areas for Concept 7.

Table O-14. Surrounding Communities for Concept 7

BUS STATION CLUSTER ¹	COMMUNITIES
Broadway Cluster	Little Italy
	Cortez
	Marina
	Core-Columbia
	Horton Plaza
	Gaslamp
W Broadway Cluster	Little Italy
	Marina
	Core-Columbia
	Horton Plaza
	Gaslamp
N Harbor Dr (Embarcadero) Cluster	Park West/Bankers Hill
	Little Italy
	Harborview
	Marina
N Harbor Dr (Harbor) Cluster	Harborview
SDIA Cluster	SDIA
Old Town Cluster	Old Town

Source: SANDAG 2022

Notes:

¹A bus station cluster area is an area within 0.5 mile from a given grouping of stations grouped based on geographic proximity.

SDIA = San Diego International Airport

Population and Housing

Table O-15 summarizes the population and number of households within 0.5 mile of each bus station cluster. Concept 7 station areas contain approximately 20,400 households with a population of 36,600. The cluster with the largest population and number of households is the Broadway Cluster.

Table O-15. Population and Housing for Concept 7

BUS STATION CLUSTER ¹	POPULATION	HOUSEHOLDS
Broadway Cluster	24,900	14,400
W Broadway Cluster	15,800	8,00
N Harbor Dr (Embarcadero) Cluster	12,100	6,900
N Harbor Dr (Harbor) Cluster	500	300
SDIA Cluster	1,700	200
Old Town Cluster	2,000	900
Total Project Area ²	36,600	20,400

Source: US Census Bureau 2023; SANDAG 2023

Notes:

¹A bus station cluster area is an area within 0.5 mile from a given grouping of stations grouped based on geographic proximity.

²Project Area reflects the combined bus station clusters for the concept. Bus station cluster estimates do not sum to Project Area totals due to station area overlap.

SDIA = San Diego International Airport

Jobs and Employment

The Concept 7 route to City College study area contains approximately 88,300 jobs with Accommodation and Food Services employing the largest share of workers and Mining, Quarrying, and Oil and Gas Extraction and Agriculture, Forestry, Fishing and Hunting representing the smallest share. Within the Broadway Cluster, W Broadway Cluster, and N Harbor Dr (Embarcadero) Cluster, Accommodation and Food Services represents the largest share of jobs. Within N Harbor Dr (Harbor) Cluster and SDIA Cluster, Transportation and Warehousing represents the largest share of jobs and within the OTTC Cluster, Retail Trade is the largest share of jobs. Table O-16 summarizes the percentage of jobs by the top NAICS industry employers within each bus concept cluster for Concept 7.

Table O-16. Jobs and Employment Sectors for Concept 7

NAICS SECTOR	PERCENTAGE (%) OF JOBS BY BUS STATION CLUSTER ¹²						
	BROADWAY CLUSTER	W BROADWAY CLUSTER	N HARBOR DR (EMBARCADERO) CLUSTER	N HARBOR DR (HARBOR) CLUSTER	SDIA CLUSTER	OLD TOWN CLUSTER	COMBINED CONCEPT 7
Accommodation and Food Services	21.3	24.0	27.3	11.4	28.7	24.6	26.0
Administration & Support, Waste Management and Remediation	4.1	5.2	5.3	8.6	3.3	7.0	5.2
Agriculture, Forestry, Fishing and Hunting	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Arts, Entertainment, and Recreation	3.6	1.7	1.0	8.5	9.3	1.9	3.3
Construction	1.6	1.5	1.4	0.4	0.2	4.1	1.7
Educational Services	3.3	1.1	0.5	0.0	0.0	2.6	2.6
Finance and Insurance	6.2	6.1	6.1	0.0	2.6	0.3	4.6
Health Care and Social Assistance	2.2	1.7	1.7	0.0	0.0	3.8	2.0
Information	3.1	3.0	1.1	0.2	0.1	0.2	2.3
Management of Companies and Enterprises	1.2	1.3	0.8	0.0	0.0	1.4	1.1
Manufacturing	0.4	0.2	7.7	0.0	0.0	5.6	2.6
Mining, Quarrying, and Oil and Gas Extraction	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Services (excluding Public Administration)	6.4	6.5	3.3	3.2	0.7	2.8	5.3
Professional, Scientific, and Technical Services	20.8	20.1	26.0	0.2	0.3	13.1	16.2

NAICS SECTOR	PERCENTAGE (%) OF JOBS BY BUS STATION CLUSTER ¹²						
	BROADWAY CLUSTER	W BROADWAY CLUSTER	N HARBOR DR (EMBARCADERO) CLUSTER	N HARBOR DR (HARBOR) CLUSTER	SDIA CLUSTER	OLD TOWN CLUSTER	COMBINED CONCEPT 7
Public Administration	19.7	21.0	10.5	0.0	0.4	12.0	14.6
Real Estate and Rental and Leasing	1.9	2.5	2.9	15.5	3.3	0.7	2.8
Retail Trade	2.4	2.2	2.1	0.6	2.2	13.7	3.3
Transportation and Warehousing	0.3	0.5	0.8	51.4	48.6	5.1	5.4
Utilities	0.7	0.8	0.4	0.0	0.0	0.0	0.5
Wholesale Trade	0.7	0.7	0.8	0.0	0.3	1.1	0.7

Source: US Census Bureau 2022; SANDAG 2022

Notes:

¹A Bus station cluster area is an area within 0.5 mile from a given grouping of stations grouped based on geographic proximity.

²The OnTheMap tool displays employment data at the census place and census block levels. On the Map does not differentiate between employment headquarters that are physically located within the same census block.

NAICS = North American Industry Classification System; SDIA = San Diego International Airport

Commuting Origins

Within the Concept 7 bus station clusters, approximately 49 percent of workers commute from the communities within the City of San Diego; approximately 29 percent of workers commute from All Other Locations; and approximately 8 percent of workers commute from Chula Vista. Within the Broadway Cluster, W Broadway Cluster, N Harbor Dr (Embarcadero) Cluster, N Harbor Dr (Harbor) Cluster, SDIA, and Old Town Cluster, the majority of workers commute from the City of San Diego, with the second-largest share commuting from All Other Locations, and the third-largest share commuting from Chula Vista. Table O-17 summarizes the home destination cities for workers employed in the station areas of Concept 7.

Table O-17. Home Destinations for Workers Employed in Concept 7

CITY	SHARE OF TOTAL JOBS (%) BY BUS STATION CLUSTER ¹²						
	BROADWAY CLUSTER	W BROADWAY CLUSTER	N HARBOR DR (EMBARCADERO) CLUSTER	N HARBOR DR (HARBOR) CLUSTER	SDIA CLUSTER	OLD TOWN CLUSTER	COMBINED CONCEPT 7
San Diego	50.0	49.1	51.	43.8	43.9	47.4	49.4
Chula Vista	8.3	8.4	7.9	8.7	7.6	8.0	8.3
El Cajon	2.3	2.2	2.0	2.8	1.9	3.0	2.2
La Mesa	2.1	2.0	2.0	2.0	1.6	2.8	2.1
Los Angeles	2.1	2.2	2.4	3.1	2.5	1.6	2.2
National City	1.8	1.9	1.8	3.5	3.8	2.5	2.1
Santee	1.4	1.4	1.5	1.6	1.4	1.5	1.4
La Presa	1.1	1.1	0.0	1.4	1.3	1.2	1.1
Lemon Grove	1.1	1.0	0.0	1.2	1.1	0.0	1.0
Carlsbad	1.0	1.1	1.1	0.0	0.0	0.0	1.0
Oceanside	0.0	0.0	1.0	0.0	0.0	0.0	0.0
Imperial Beach	0.0	0.0	0.9	0.0	0.0	1.2	0.0
Spring Valley	0.0	0.0	0.0	1.3	1.2	0.0	0.0
Escondido	0.0	0.0	0.0	0.0	0.0	1.1	0.0
All Other Locations ³	28.8	29.5	27.6	30.5	33.7	29.5	29.0

Source: US Census Bureau 2022

Notes:

¹A bus station cluster area is an area within 0.5 mile from a given grouping of stations grouped based on geographic proximity.

²The OnTheMap tool commute destination information does not differentiate between worker transport mode (if any), regular or occasional commutes, or whether an employee works remotely. Workplace destinations are defined by the physical mailing address of each employment headquarters.³ Includes all other US Census defined Places from where workers commute.

SDIA = San Diego International Airport

O.7.2. Adjacent Development Considerations

Economic opportunities for Concept 7 are determined by the number of existing vacant properties within each station area. Vacant parcels identified must be a minimum of 20,000 square feet and could not be in areas zoned as residential. One parcel, totaling approximately 50,000 square feet, was identified that could support redevelopment.

APPENDIX P CAPITAL COST BASIS OF ESTIMATE

P.1. General

The Central Mobility Hub project would begin adjacent to San Diego International Airport and extend to the Consolidated Rental Car Center (CONRAC), with additional concepts for extending the guideway to the Old Town Transit Center, Santa Fe Depot, Downtown Civic Center, and Downtown Convention Center. A breakdown of the 15 different conceptual layouts is listed below:

- Concept 1A – Airport Transit Connector from San Diego International Airport to Port Transit Center and the Consolidated Rental Car Center
- Concept 1B – Airport Transit Connector from San Diego International Airport to Port Transit Center and the Rental Car Center with a Direct Access Ramp
- Concept 1C – ATC from San Diego International Airport to Port Transit Center and the Consolidated Rental Car Center with a Los Angeles–San Diego–San Luis Obispo Rail Corridor (LOSSAN) Platform
- Concept 2 – Airport Transit Connector from San Diego International Airport to Old Town Transit Center
- Concept 3A – Aerial Airport Transit Connector from San Diego International Airport to Santa Fe Depot
- Concept 3B – Bored Tunnel Airport Transit Connector from San Diego International Airport to Santa Fe Depot
- Concept 3C – Hybrid Airport Transit Connector from San Diego International Airport to Santa Fe Depot
- Concept 4A – Aerial Airport Transit Connector from San Diego International Airport to Santa Fe Depot Extended to Convention Center
- Concept 4B – Bored Tunnel Airport Transit Connector from San Diego International Airport to Santa Fe Depot Extended to Convention Center
- Concept 4C – Hybrid Airport Transit Connector from San Diego International Airport to Santa Fe Depot Extended to Convention Center
- Concept 5A – Aerial Airport Transit Connector from San Diego International Airport to Santa Fe Depot Extended to Civic/Core
- Concept 5B – Bored Tunnel Airport Transit Connector from San Diego International Airport to Santa Fe Depot Extended to Civic/Core
- Concept 5C – Hybrid Airport Transit Connector from San Diego International Airport to Santa Fe Depot Extended to Civic/Core

- Concept 6 – Trolley Concept Light Rail Transit from San Diego International Airport to 12th & Imperial Avenue Station
- Concept 7– Enhanced Busway from San Diego International Airport to Old Town Transit Center and to City College

Major work elements include construction of at-grade, retained fill, retained cut, bored tunnel, cut-and-cover tunnel, and aerial viaduct sections of the automated people mover/light rail transit (APM/LRT) guideway, various roadway improvements along Harbor Drive and other areas affected by construction, construction of the Port Transit Center and APM Maintenance Storage Facility, construction of the Interstate (I-) 5 Direct Access Ramps, Port of San Diego Building demolition, purchasing of APM/LRT vehicles, highway realignments and striping to support enhanced busways, and all applicable utility modifications and relocations.

P.2. Methodology

This estimate is a Class 4 estimate based on AACE Estimate Classification. The range of costs presented extends 15 percent lower from the Point Estimate to create the low range, as well as 30 percent higher from the Point to create the high range.

The estimate was prepared by developing Unit Pricing Elements (UPEs) for each applicable construction scope item. Each UPE scope of work has been developed based on a unit section of length or quantity. All UPEs can be found listed in the Composite Cost Library.

UPEs become grouped into Program Elements, which are comprised of specific construction scope sections of layouts found to be repeated between different concepts. Within the built Program Elements, parametric quantities for each layout are applied against the unit costs. Additionally, an allocated contingency percentage of 30 to 40 percent is applied and is intended to cover design evolution and uncertainties related to the specific project elements.

Each concept estimate is built using elements, which are built from individual UPEs as described above. After the Capital Construction costs are calculated, a percentage of additional costs based on the construction costs is added to account for any Professional Services (30 percent) such as Engineering, Legal Services, Consultants, etc. Additionally, an Unallocated Contingency (20 percent) is applied to cover future unforeseen conditions during the procurement and construction phases of the project. The total of these costs results in the Total Program Cost presented for each concept. Each concept is presented in a range as described above, which is determined from the *AACE Cost Estimate Classification Matrix for Building and General Construction Industries*.

P.3. Quantity Basis

Aerial Viaduct: The following design assumptions were used when quantifying the aerial viaduct:

- Pier spacing of 130 feet from column to column
- Aerial piers built on top of 120-inch drilled shafts extending 100VLF into ground
- A superstructure of precast segmental box girders

Underground Structures: Utilized typical tunnel and cut-and-cover sections provided to quantify underground structures. Additional assumptions:

- Secant pile system required for cut-and-cover systems for ground water control
- Temporary Street Decking assumed in traffic areas that are unable to remain closed for extended periods of time

Stations: Prototypical stations based on similar design intent at Los Angeles International Airport and Seattle-Tacoma International Airport:

- Includes Architectural Features Premium factor of 10 percent on architectural scope costs (such as canopy, stairs, platform edge, MEPs, etc.)
- Allowances included for Mechanical, Electrical, Lighting, and Station Furnishings

Quantities were generated from the conceptual layout documents as well as collaboration with the engineering team. Software applications such as Bluebeam, Google Earth, and On-Screen Takeoff were used to scale drawings and complete takeoff.

P.4. Cost Basis

Unit prices were originally sourced from applicable aviation transit projects, such as those at Los Angeles International and Seattle-Tacoma International Airport. This pricing data source was a mixture from both conceptual estimates and constructed projects. Upon receipt of this pricing information, it was escalated to 2022 dollars using the Construction Cost Indexes published by Engineering News-Record (ENR), Los Angeles city cost index.

P.5. Assumptions, Clarifications, and Exclusions

The following assumptions, clarifications, and exclusions are included in each estimate:

- A productivity loss factor of 20 percent is included for items constructed within the Restricted Airspace.
- All rebar assumed at 200#/cy on cast-in-place concrete items. Precast concrete items are inclusive of reinforcement.
- Mobilization and Demobilization Allowance of 10 percent of construction costs included on each Unit Pricing Element.
- General Conditions Allowance of 20 percent of construction costs included on each Unit Pricing Element.
- Overhead and Profit Allowance of 8 percent of construction costs included on each Unit Pricing Element.
- Land acquisition costs are excluded from this estimate.
- APM concepts include demolition of the existing concrete structure identified as the Port of San Diego Building.

- APM, LRT, and Enhanced Bus concepts include the purchase of transit vehicles.
- All track power, control, and communications costs are included.
- Vertical circulation at both aerial and underground pedestrian stations is included.
- Ground improvements (jet grouting) is included at all cut-and-cover guideways and underground stations.
- Ground improvements (jet grouting) is included for 20 percent of the bored tunnel length to account for poor soil conditions at the beginning and ends of the bored tunnel guideways.
- Allowance included for utility modifications and relocations at applicable sites. Utility modifications tiered between three levels dependent on the assumed location conditions.
- Allowance included for environmental mitigation and hazardous materials removal. These items are tiered between three levels dependent on the assumed location conditions.
- Global supply chain shortages and COVID productivity loss factors are excluded from this estimate.
- Existing sanitary sewer structural support costs included where applicable (Concepts 3C, 4C, 5C, and LRT).
- All costs are priced with no acceleration.

APPENDIX Q CONCEPTS CONSIDERED AND ELIMINATED

Several airport connection concepts were evaluated in previous studies and have been eliminated from further consideration. The following sections describe these concepts and the reasoning for their elimination.

Q.1.1. ATC from SDIA to Navy Old Town Campus

In the 2019 *Airport Connectivity Analysis*, two airport transit connector (ATC) concepts featured a Central Mobility Hub (CMH) at the Navy’s Naval Information Warfare Systems Command (NAVWAR) Old Town Campus. One concept included a tunnel under the airport (Figure Q-1), while the other included an at-grade and elevated route along Pacific Highway, Laurel Street, and Harbor Drive (Figure Q-2). The second concept was included in the Notice of Preparation (NOP) issued in April 2021 as the “Proposed Project.” The NOP stated that the tunnel alignment was not being advanced as a result of further coordination with stakeholders, including the Federal Aviation Administration. In April 2022, the Navy and the San Diego Association of Governments (SANDAG) mutually agreed to cease exploration of the Navy’s Old Town Campus as a site for the CMH. Without a willing landowner, the Navy Old Town Campus is removed from consideration.

Figure Q-1. APM from SDIA to CMH at NAVWAR via Tunnel



Source: SANDAG 2019

Figure Q-2. APM from SDIA to CMH at NAVWAR via At-Grade and Elevated



Source: SANDAG 2019

Q.1.2. ATC from SDIA to ITC Site

The 2019 *Airport Connectivity Analysis* report featured an ATC via an at-grade and elevated route from San Diego International Airport (SDIA) along Harbor Drive, Laurel Street, and Pacific Highway to a CMH at a location referred to as the Intermodal Transportation Center (ITC) site (Figure Q-3). The ITC was to be located across Pacific Highway from the Consolidated Rental Car Facility (CONRAC), west of I-5 and south of Washington Street and would have been made up mostly of private property. This location was selected as it had sufficient publicly owned land and would require little to no private acquisitions. Additionally, this site is located adjacent to the existing LOSSAN and LRT corridors, I-5, and CONRAC. The NOP included this concept as “Alternative 1.” In response to the April 2021 NOP, the Port of San Diego submitted a letter to SANDAG to consider the Port Tidelands for the location of the CMH. The Port of San Diego Headquarters site was subsequently studied by SANDAG and determined to be a more advantageous location than ITC for the following reasons:

- The Port of San Diego Headquarters site has a willing landowner and comprises most of the property required for an ATC station and operations, maintenance and storage facility (OMSF).
- The Port of San Diego Headquarters site has space to accommodate an OMSF.
- The Port Headquarters site is closer in proximity to the airport, which would reduce project cost by requiring a shorter alignment.
- The Port Headquarters site has better access to I-5 under existing conditions and can more easily accommodate a direct access ramp (DAR).

- The ITC site is partially located within an Alquist-Priolo (AP) Earthquake Fault Zone and therefore has a relatively high potential to contain active fault traces. Active fault traces at the site, if confirmed through site-specific studies, would pose significant limitations to the development of the ITC site due to AP Act requirements related to habitable structures. Though the risk of active faulting at the Port Transit Center (PTC) site may be considered medium to high due to known active faults and corresponding AP zones located to the east and west, the PTC site is not located within an AP zone. Therefore, the ITC has been replaced by the Port Headquarters site.

Figure Q-3. ATC from SDIA to CMH at ITC



Source: SANDAG 2019

INTENTIONALLY LEFT BLANK

APPENDIX R EVALUATION CRITERIA

The criteria used for the evaluation of concepts are grouped into six key categories, which are the same categories presented in the *Airport Connectivity Analysis* (San Diego Association of Governments [SANDAG] 2019):

- Passenger Convenience and Ridership
- Congestion of Airport Access
- Vehicle Miles Traveled (VMT) and Greenhouse Gases (GHG)
- Feasibility and Complexity
- Cost
- Community Effects and Economic Benefits

Each category consists of one or more criteria that were developed to assess each concept studied in this report. Table R-1 presents and describes the evaluation criteria. All criteria were viewed as being equal in importance. Detailed information for each evaluation criterion is included in this appendix.

Table R-1. Evaluation Criteria

EVALUATION CRITERIA	CRITERIA ELEMENTS	DESCRIPTION
PASSENGER CONVENIENCE AND RIDERSHIP		
Regional Connectivity	Modes of Transportation that Connect at Each Station	The number of existing transportation modes and routes available for connections within a 0.5-mile buffer of proposed stations for each concept that represents a typical walk distance. The modes of transit include those operated by MTS, SDIA, NCTD, and Amtrak. Connections to bicycle facilities, multimodal paths, and arterials.
	Connections to Destinations	The number of destinations that can be reached by each concept per station within a 0.5-mile buffer of the station without requiring a transfer to another mode to complete the trip. "Destinations" include tourist destinations (e.g., attractions, museums, commercial shopping areas, recreational/historic areas) and community facilities (e.g., schools, parks, libraries, police/fire stations, hospitals).

EVALUATION CRITERIA	CRITERIA ELEMENTS	DESCRIPTION
User Experience	Drop-Off/Pick-Up and Navigation and Transfer Convenience	Distance of access between the proposed station and transfers and drop-off/pick-up areas. Simplicity of access and ease of navigation.
	Station Amenities	Shelters, seating, lighting, trash receptacles, and other features.
	Fare Payment Method	Ease of fare payment (e.g., off-vehicle ticketing which takes less time and allows all-door boarding vs. on-vehicle fare payment).
	Boarding Method	Ease of boarding (e.g., level boarding that allows passengers to roll on and off with luggage vs. navigating stairs).
	Luggage Accommodations	On-board space and circulation experience for travelers with luggage.
	Reliability	Ability to maintain scheduled headways with minimal interruptions or delays.
	Ride Comfort	Smoothness, minimal stopping and starting.
Travel Time	Transit Travel Time	The total time spent traveling from the first transit boarding to the destination, inclusive of transfers. Travel time was obtained from the SANDAG ABM2+ model.
	Headways	The amount of time between transit vehicle arrivals.
Ridership	Ridership	Projected ridership in 2050 for each concept (total line and by station) and systemwide based on forecasts from the SANDAG ABM2+ model.
CONGESTION OF AIRPORT ACCESS		
Traffic Effect	Percent Change in Roadway Volumes on Select Roads during Operation	The 2050 ADT on select roadway segments for each concept were compared to the No Project baseline to determine the percent change in ADT (increase or decrease). ADT represents the average number of vehicles passing a specific point on a connection or roadway on an average day. ADT was extracted from the SANDAG ABM2+ model.
VMT AND GHG		
VMT	Regional VMT	The change in 2050 regional VMT associated with providing a new transit option. The VMT for each concept was compared against a No Project baseline to calculate the change in VMT associated with implementation of that concept. VMT was extracted from the SANDAG ABM2+ model.

EVALUATION CRITERIA	CRITERIA ELEMENTS	DESCRIPTION
GHG	GHG Compared to No Project	A select link analysis was performed within the SANDAG ABM2+ model. The VMT on the select links was compared to the No Project baseline to calculate the change in VMT. EMFAC per mile emission rates in pollutant per mile traveled units were calculated for each concept and the No Project baseline.
FEASIBILITY / COMPLEXITY		
Right-of-Way	Affected Parcels	The number of parcels located within a buffer from the centerline of the nearest rail line (20 feet for aerial and at-grade, 20 feet for tunnel/cut-and-cover, 20 feet at stations, and 10 feet from edge of straddle bents) that may need to be acquired to support the concept.
	Demolition of Buildings	The number of buildings potentially requiring demolition within a buffer, as described above.
Construction Effects/ Constructability	Construction Effects and Constructability	Analysis of the constructability considerations associated with each concept, including construction access and staging needs, traffic handling or detour scenarios, and potential effects on existing LOSSAN and LRT tracks and service, as applicable, that would be required to construct each concept.
Major Utilities	Type and Number of Utilities	Identification of major utilities located within a buffer, defined as: a 10-foot diameter from column and straddle bent locations for aerial alignments, 20 feet from track centerline for at-grade and cut-and-cover alignments, 20 feet at stations, and within the limits of the launch and retrieval sites for tunnel boring machines. "Major Utilities" is categorized as water facilities equal to or greater than 16 inches, sewer facilities equal to or greater than 18 inches, and storm drain facilities equal to or greater than 36 inches.
Geotechnical, Seismic Conditions	Geotechnical and Seismic Conditions	Major risk/challenges related to the geotechnical and seismic conditions (active faults, ground conditions) associated with implementation of each concept.
Regulatory Considerations	Regulatory Considerations	The number of agency approvals, permitting requirements, and potential coordination efforts required for each concept.
COST		
Capital Cost	Capital Costs in 2022 Dollars	Prototypical Unit Price Elements were developed to represent anticipated guideway configurations (i.e., aerial, at-grade, and/or tunnel), stations, maintenance facilities, and enabling work. Additionally, station and roadway improvements necessary to implement the Enhanced Bus Service option are provided. High-level estimates for vehicle acquisitions and allowances for professional services are also

EVALUATION CRITERIA	CRITERIA ELEMENTS	DESCRIPTION
		included. Real estate acquisition costs are excluded from the capital cost estimates.
Cost/Rider	Cost per Rider	Cost per rider based on capital cost (as described above) and 2050 projected ridership on the concept. For purposes of the analysis, an annualization factor was applied to the daily ridership to calculate annual ridership. The capital cost was also annualized.
Cost/Mile	Cost per Mile	Cost per mile based on capital cost (as described above) and length of the concept.
Operations and Maintenance	O&M Costs	A high level comparative assessment that considers the main O&M cost elements.
COMMUNITY EFFECTS AND ECONOMIC BENEFITS		
Community Effects	Surrounding Communities and Neighborhoods Served	The number of communities and/or neighborhoods (per boundaries defined in City of San Diego community plans) that each concept would serve within a 0.5 mile buffer from each station.
	Population and Housing	The population and number of households within a 0.5-mile buffer from each station.
	Jobs and Employment	The number of jobs within a 0.5-mile buffer of the station for each concept.
	Commuting Origins	The percentage of workers, including SDIA workers, who travel from the north, south, and east to reach the areas within a 0.5-mile buffer of stations along the concept.
Adjacent Development Considerations	Redevelopment Opportunities Based on Vacant Properties	The potential for redevelopment based on the number of vacant properties measuring at least 20,000 square feet within a 0.5-mile buffer from each station per concept.

Source: WSP, HDR, GPM, and TAHA 2022

Notes: ADT = average daily traffic; EMFAC = Emission Factors; GHG = greenhouse gases; LOSSAN = Los Angeles–San Diego–San Luis Obispo Rail Corridor; LRT = light rail transit; MTS = Metropolitan Transit System; NCTD = North County Transit District; O&M = operations and maintenance; SANDAG = San Diego Association of Governments; SDIA = San Diego International Airport; VMT = vehicle miles traveled

R.1. Passenger Convenience and Ridership

To evaluate passenger convenience and ridership for each concept, several key factors were evaluated, as described in the following sections.

Regional Connectivity: Regional connectivity was evaluated by identifying the number of existing modes of transportation that are available within a 0.5-mile buffer of each station along the concept, including transit, bicycle facilities, multimodal paths, and streets. This criterion also considered the number of major destinations and community facilities that can be reached within a 0.5-mile buffer of a station, which represents a typical walk distance. For the purpose of

this analysis, “destinations” include major tourist destinations (e.g., attractions, museums, commercial shopping areas, recreational/historic areas) and community facilities (e.g., schools, parks, libraries, police/fire stations, hospitals). Transportation data was derived from the SanGIS/SANDAG Geographic Information System (GIS) Data Warehouse. Destinations data combines the Community Resources and Public Facilities data from the SanGIS/SANDAG GIS Data Warehouse, Google Maps, and San Diego Tourism Authority. Information from GIS was verified for accuracy by reviewing existing conditions. For the purpose of the bus station analysis, Concept 7 route stops were grouped into six 0.5-mile clusters based on geographic areas: Broadway, W Broadway, N Harbor Dr (Embarcadero), N Harbor Dr (Harbor), SDIA, and Old Town. Concept 7 route to City College includes the Broadway, N Harbor Dr (Embarcadero), N Harbor Dr (Harbor), W Broadway, and San Diego International Airport (SDIA) Clusters; and the Concept 7 route to the Old Town Transit Center includes the SDIA and Old Town Clusters.

User Experience: User experience is a broad topic that based on research includes many elements, as identified in Table R-1, including ease of transfers, navigation, reliability, and passenger comfort. For the purposes of this analysis, this criterion relates to the station area environment and a passenger’s experience on the vehicle. Information regarding transfers and pick-ups/drop-offs was based on a review of existing transit services and roadways, or elements that would be incorporated as part of the project. Evaluation of other elements related to user experience for the Airport Transit Connector concepts was based on current design and review of similar systems. Evaluation for the bus and San Diego Trolley was based on the current Metropolitan Transit System. Considerations such as travel time and frequency (in terms of headways), which are relevant to the user experience but not directly related to the station and vehicle environment, are included in the travel time evaluation criterion.

Travel Time: This evaluation criterion considers transit travel time from the first mode of transit used to the destination, inclusive of transfers. This information was obtained from the SANDAG ABM2+ model. Transit travel times to SDIA were calculated for the AM peak hour and transit travel times from SDIA were calculated for the PM peak hour. Headways, or the time between transit vehicles, was also evaluated. The headways presented under this criterion are consistent with those used in the ridership forecasts. Actual headways would be determined during later stages of project development.

Ridership: This evaluation criterion presents information regarding ridership in 2050, including systemwide, on the concept, and by station. Ridership forecasts were obtained from the SANDAG ABM2+ model for Concepts 1 through 7, including Concepts 1A, 1B, and 1C. The variations of Concepts 3 through 5 (aerial, underground, or hybrid) do not substantially change the length of the alignment or travel speed and would not affect the number of stations provided. As such, model runs for the variations were not conducted.

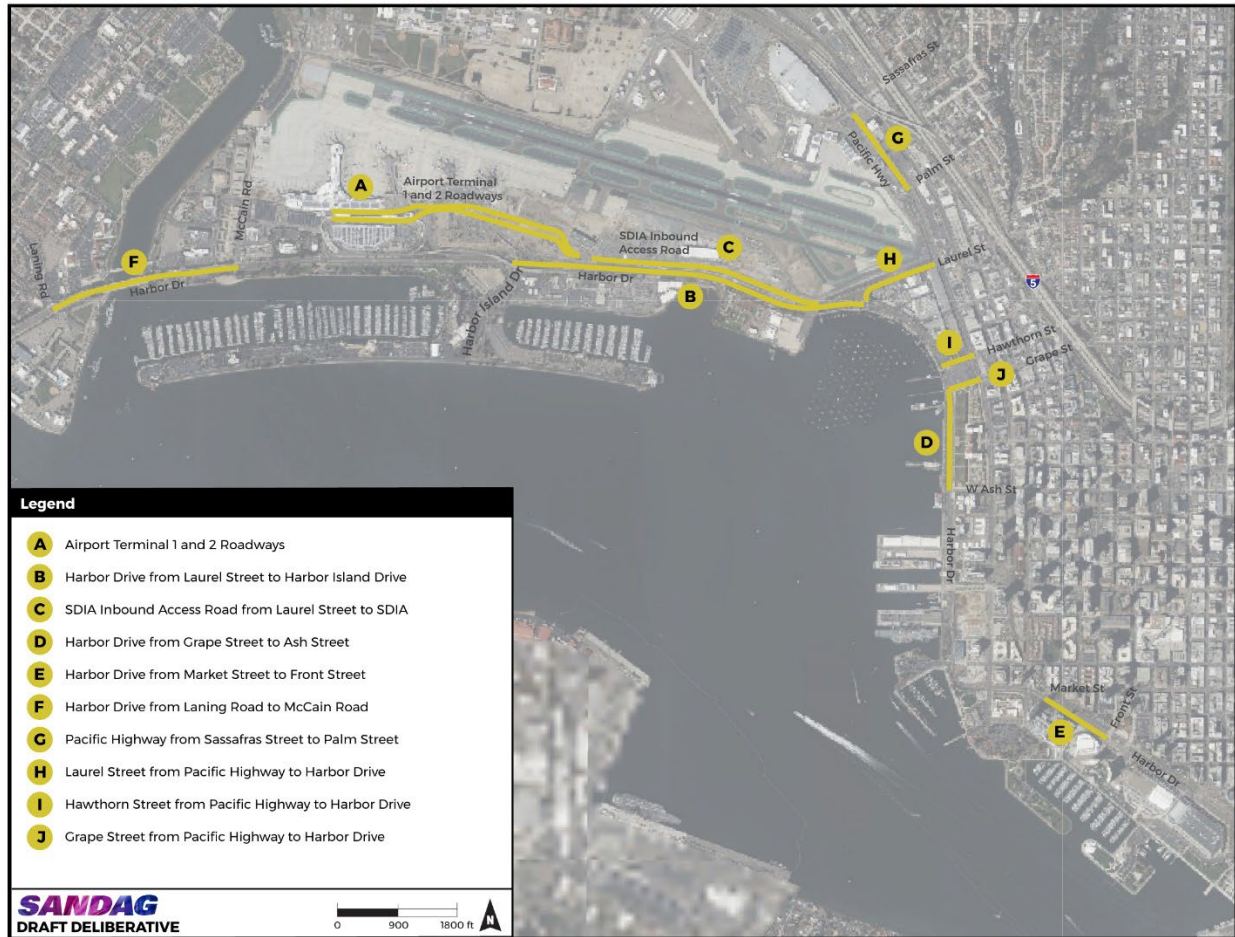
R.2. Congestion of Airport Access

This category includes one criterion: traffic effects.

Traffic Effects: This evaluation criterion considers the change in average daily traffic (ADT) volumes on select roadways, including those entering and leaving SDIA, based on information from the SANDAG ABM2+ model. The 2050 ADT volumes on select roadways were compared for each segment against a 2050 No Project baseline to calculate the percent change in ADT. By introducing a new transportation option, travelers may switch modes and/or points of access

to reach destinations served by each concept. Figure R-1 shows the roadways segments that were considered in this evaluation.

Figure R-1. Roadway Segments



Source: WSP, HDR 2022

R.3. VMT and GHG

This criterion evaluated the change in 2050 VMT associated with providing a new transit option in the San Diego region and the corresponding change in 2050 GHG emissions.

VMT: Providing alternative transportation modes in the region would change the number of vehicles on the road. The VMT for each concept was compared against a No Project baseline to calculate the change in VMT associated with implementation of that concept based on information from the SANDAG ABM2+ model.

GHG: A select link analysis was performed within the SANDAG ABM2+ model. The VMT on the select links was compared to the No Project baseline to calculate the change in VMT. Emission rates in pollutant-per-mile-traveled units were calculated for each concept and the No Project baseline. To estimate the GHG reduction associated with the change in VMT, a standard 2050

carbon dioxide (CO₂)/VMT rate (approximately 0.55 pound of CO₂ per VMT) was used from EMFAC 2017 for the San Diego Region. It is important to note that this is a CO₂ reduction estimate performed without running EMFAC 2017 and does not account for any additional VMT that does not access the airport terminals. Further study on the exact effects to regional GHG totals is still required.

R.4. Feasibility / Complexity

The evaluation of the feasibility of each concept focused on factors related to construction and implementation of the project that could affect project cost or schedule. Specifically, the criteria included: right-of-way (ROW), major utilities, construction effects/constructability, geotechnical and seismic conditions, and regulatory considerations.

Right-of-Way: This evaluation criterion considers the number of parcels that may require acquisition to support each concept and the number of buildings that may require demolition. ROW is evaluated by identifying properties or buildings that are within the buffer from the nearest track centerline, defined as 20 feet for aerial and at-grade, 20 feet for tunnel/cut-and-cover, 20 feet at stations, and 10 feet from edge of straddle bents.

Construction Effects/Constructability: This criterion evaluates constructability considerations associated with each concept, including general construction methods, staging and laydown areas, construction sequencing, excavation hazards, traffic handling and detours, and potential effects to the Los Angeles–San Diego–San Luis Obispo Rail Corridor and light rail transit tracks and service, as applicable.

Major Utilities: This evaluation criterion identifies major utilities, defined as water facilities equal to or greater than 16 inches, sewer facilities equal to or greater than 18 inches, and storm drain facilities equal to or greater than 36 inches, located within a buffer. The buffer was defined as: a 10-foot diameter from column and straddle bent locations for aerial alignments, 20 feet from the track centerline for at-grade and cut-and-cover alignments, 20 feet at stations, and within depth thresholds beneath the surface ground level. Utilities within the buffer for bored tunnels were not included in this analysis as it is expected that the tunnel would be substantially deeper than any utilities, with the exception of specific locations, such as the launch and retrieval sites for the tunnel boring machine and at stations. During later stages of the design process, efforts would be made to avoid utility conflicts to the extent practicable.

Geotechnical, Seismic Conditions: This criterion evaluates geotechnical and seismic conditions associated with each concept that may pose risks and challenges to the implementation of that concept. Conditions evaluated include Alquist-Priolo fault zones and other major fault lines, liquefaction zones and landslide risks, unstable and/or expansive soils, and other geotechnical and seismic hazards. Some elements would impact the entire airport connection system, regardless of grade level or location, while other impacts would be specific to the concept alignment and grade level.

Regulatory Considerations: This evaluation criterion identifies the federal and state agency approvals, permits, and coordination potentially required for implementation of each concept. An initial list of applicable regulations and permitting agencies was identified based on the location and features of each concept.

R.5. Cost

This category included criteria for capital cost, cost per rider, cost per mile, and operating and maintenance (O&M) costs.

Capital Costs: Capital cost estimates include construction costs, vehicles, and professional services, as well as contingency. Prototypical Unit Price Elements were developed to represent anticipated guideway configurations (i.e., aerial, at-grade, and/or tunnel), stations, traction power and maintenance facilities, and enabling work. Additionally, station and roadway improvements necessary to implement the Enhanced Bus Service option are provided. High-level estimates for vehicle acquisitions and allowances for professional services are also included. The cost estimates are in 2022 dollars. Real estate costs are not included. Further information on the capital cost methodology is included in Appendix P.

Cost per Rider: Cost per rider was calculated using capital costs developed under the prior criteria and 2050 ridership on the concept, as obtained from the SANDAG ABM2+ model. For the purposes of the analysis, an annualization factor was applied to the daily ridership to calculate annual ridership. The capital cost was also annualized. This criterion was included in order to provide a more direct comparison of concepts given the differences in the number of stations and locations served, which affect total ridership on a concept.

Cost per Mile: Cost per mile was calculated based on capital cost developed for this study and the length of each concept. This criterion was included in order to provide a more direct comparison of concepts given the differences in the lengths of alignment.

Operating and Maintenance Costs: The O&M cost evaluation is a high-level, comparative assessment that considers the main O&M cost elements. These elements include guideway infrastructure, support staff, maintenance facility (the capital cost of the facility is included with capital cost estimates as applicable), vehicle maintenance, motive power, energy consumption, and train control.

R.6. Community Effects and Economic Benefits

Economic benefits to the region were measured in terms of the communities served, jobs and employment industries within station areas, and potential for redevelopment opportunities.

Community Effects: The community effects analysis contains four primary components: (1) identifying the communities and/or neighborhoods within each station area (0.5-mile buffer around each station), (2) identifying the population and housing within each station area, (3) identifying the jobs and employment industries within each station area, and (4) identifying the percentage of workers, including SDIA workers, who travel from the north, south, and east to reach the project area (the combined area of the 0.5-mile buffer from each proposed station)—and whose jobs and employers would benefit from having high-quality transit access to SDIA via a one-seat ride. Communities were identified using ArcGIS and data from the SANDAG GIS Open Data Portal. Population and housing within each station area was determined using U.S. Census Bureau 2017-2021 American Community Survey 5-Year estimates. The U.S. Census Bureau's OnTheMap web feature was used to determine (1) the number of jobs by industry within each station area and (2) the municipal origins for workers commuting to the project area. Job industries are categorized based on the North American Industry Classification System, which is the federal classification standard for businesses in the United States.

Adjacent Development Considerations: This evaluation criterion considered the potential for redevelopment opportunities on vacant properties measuring at least 20,000 square feet within a 0.5-mile buffer of a station. Vacant parcels in areas zoned residential were not included in the analysis. Vacant properties within the station areas were identified using the Parcel and Current Land Use datasets from the SanGIS/SANDAG GIS Data Warehouse and were field verified in September 2022.

INTENTIONALLY LEFT BLANK

APPENDIX S AIRPORT TRANSIT CONNECTOR FROM SAN DIEGO INTERNATIONAL AIRPORT TO SANTA FE DEPOT EXTENDED TO CIVIC/CORE (SOUTH ROUTE ONLY)

The San Diego Association of Governments (SANDAG) team also conducted a high level evaluation of the effects and benefits of a variation on Concepts 5A and 5C where the Airport Transit Connector (ATC) would only have a south route from San Diego International Airport (SDIA) to the Civic/Core ATC Station. For purposes of the evaluation, two south route options were considered—an aerial option and a hybrid aerial/underground option. These south route options have not been developed as their own concepts but rather the evaluation extrapolates of information from Concepts 5A and 5C. Travel time, traffic effects, vehicle miles traveled, greenhouse gases, and commuting origins were not evaluated as part of this option. Should a south-route-only concept be selected to be carried into the environmental phase, additional analysis would be required.

South Route Aerial Option

S.1. Description of Concept

The South Route aerial option is a variation on Concept 5A without the portion of the north route to the Port Transit Center (PTC) and the Consolidated Rental Car Facility (CONRAC). The south route would feature a 2.9-mile high-frequency aerial Airport Transit Connector (ATC) in a dedicated right-of-way from SDIA to a terminus at a Civic/Core ATC Station on Broadway. It would also add a new Santa Fe Depot ATC Station, creating a connection to the existing Santa Fe Depot and an optional Harbor Island ATC Station and optional County Administration Building ATC Station. This option would require a connection to an operations, maintenance, and storage facility (OMSF), the location of which has yet to be determined. Table S-1 provides information on concept characteristics.

Figure S-1 shows the South Route Aerial alignment. From the SDIA Station located at the transit-ready area at the airport, the fixed guideway would follow Harbor Drive on an aerial structure before turning southeast at Hawthorn Street to connect to the optional County Administration Building ATC Station and continuing south along Pacific Highway. South of B Street, the aerial alignment would curve to turn east along Broadway, connecting to the Santa Fe Depot ATC Station located on Broadway at Kettner Boulevard. From the Santa Fe Depot ATC Station, the alignment would continue east along Broadway to the Civic/Core ATC Station. The Civic/Core ATC terminus station would be located on Broadway, west of 3rd Avenue. A dedicated bicycle/pedestrian connection would provide a connection to the existing San Diego Trolley (Trolley) Blue and Trolley Orange Line Civic Center Station on C Street.

Table S-1. South Route Aerial Option Characteristics

CHARACTERISTIC	
Length of alignment at-grade (miles)	0
Length of alignment on aerial structure (miles)	2.9 ¹
Length of alignment in tunnel (miles)	0
Total alignment length (miles)	2.9 ¹
Number of stations	3 ²
Minimum/shortest headways	2 minutes

Source: WSP, HDR 2022

Notes:

¹Length is an approximation; this option has not been fully developed

²County Administration Building and Harbor Island are a potential fourth and fifth station.

Figure S-1. South Route Airport Transit Connector from San Diego International Airport to Santa Fe Depot Extended to Civic/Core—Aerial Option



Source: WSP, HDR 2023

S.2. Passenger Convenience and Ridership

S.2.1. Regional Connectivity

Regional connectivity is evaluated by identifying the number of modes of transportation and the number of major destinations and community facilities that can be reached within a 0.5-mile buffer of a station (defined as the “station area”). For the purpose of this analysis, “destinations” include major tourist destinations (e.g., attractions, museums, commercial shopping areas, recreational/historic areas), and community facilities (e.g., schools, parks, libraries, police/fire stations, hospitals).

Modes of Transportation

The South Route aerial option would have connections to the greater transit network, including the Metropolitan Transit System (MTS) bus and Trolley light rail (Blue Line, Green Line, Orange Line), North County Transit District COASTER commuter trains, and the Amtrak Pacific Surfliner. The following describes the available connections to existing bus transit routes, Trolley connections, bike routes, and major roadways. Table S-2 summarizes the potential regional connections to existing bus transit routes, rail and Trolley connections, bike routes, major roads, and arterial/collector streets.

Bus Transit Routes: Connections to 19 MTS bus routes: San Diego Airport Flyer shuttle (AIR), 2, 3 5, 7, 11, 12, 20, 83, 110, 120, 215, 225, 235, 280, 290, 901, 923, and 992.

Rail and Trolley Lines: Connections to five rail and Trolley lines: Trolley Blue, Green, and Orange Lines, Amtrak, and COASTER.

Bike Routes: Connections to the City of San Diego Bicycle Network (including bike lanes, separated bikeways, and bike routes), North Harbor Drive Bike Path, Embarcadero Path, California Path, Columbia Path, Martin Luther King, Jr. Promenade, Bayshore Bikeway, and Harbor Drive Pedestrian Bridge.

Major Roads, Arterials, and Collector Streets: Major roads are usually four to six lanes wide with limited access, grade separations, and extra lanes where needed. Major roads are designed for through traffic but usually have signals at major intersections. Major arterials are usually four to six lanes wide and although designed primarily for through traffic, arterials also provide access to abutting property. Collector Streets are typically two to four lanes wide and function as feeders of traffic to the major street system and provide continuity with local streets. The South Route option would be accessible by 9 major roadways and 15 arterial/collector streets.

Table S-2. Regional Connectivity for South Route Aerial Option

CATEGORY	NO. OF CONNECTIONS	ROUTE NAMES	STATION AREA ¹	
Bus Routes	19	AIR (San Diego Airport Flyer Shuttle)	SDIA ATC, Harbor Island ATC (Optional)	
		83 (Downtown San Diego - Old Town)	County Administration Building ATC (Optional), Santa Fe Depot ATC, Civic/Core ATC	
		11 (SDSU - Downtown San Diego)	SDIA ATC, Harbor Island ATC (Optional), County Administration Building ATC (Optional), Santa Fe Depot ATC, Civic/Core ATC	
		280 (Escondido Transit Center - Downtown)		
		290 (Rancho Bernardo Station – Downtown)		
		225 (Downtown - Otay Mesa Transit Center)		
		235 (Downtown - Escondido Transit Center)		
		923 (Downtown to Point Loma)		
		992 (Airport/Downtown)		
		215 (Mid-City Rapid)		Santa Fe Depot ATC, Civic/Core ATC
		2 (Downtown San Diego - 30th & Adams)		
		3 (UCSD Hospital - Euclid Transit Center)		
		7 (Downtown San Diego - University/College)		
		901 (Iris Transit Center - Downtown San Diego)		
		110 (Mira Mesa - Downtown via Hwy 163)		
		120 (Downtown San Diego - Kearny Mesa Transit Center)		
		5 (Downtown San Diego - Euclid Transit Center)	Civic/Core ATC	
		12 (City College - Skyline Hills)		
		20 (Downtown - Rancho Bernardo Transit Station)		

CATEGORY	NO. OF CONNECTIONS	ROUTE NAMES	STATION AREA ¹
Rail and Trolley Lines	5	Trolley Blue Line	County Administration Building ATC (Optional), Santa Fe Depot ATC, Civic/Core ATC
		Trolley Green Line	
		COASTER	Santa Fe Depot ATC
		Amtrak Pacific Surfliner	
		Trolley Orange Line	Santa Fe Depot ATC, Civic/Core ATC
		North Harbor Dr Bike Path	SDIA ATC, Harbor Island ATC (Optional), County Administration Building ATC (Optional)
		Embarcadero Path	County Administration Building (Optional), Santa Fe Depot ATC
		City of San Diego Bicycle Network	SDIA ATC, Harbor Island ATC (Optional), County Administration Building ATC (Optional), Santa Fe Depot ATC, Civic/Core ATC
		California Path	Santa Fe Depot ATC, Civic/Core ATC
		Columbia Path	
		Martin Luther King, Jr. Promenade	
Major Street	9	W Laurel St	County Administration Building (Optional)
		North Harbor Dr	SDIA ATC, Harbor Island (Optional), County Administration Building (Optional), Santa Fe Depot ATC
		Pacific Hwy	SDIA ATC, Harbor Island ATC (Optional), County Administration Building ATC (Optional), Santa Fe Depot ATC
		Front St	County Administration Building ATC (Optional), Santa Fe Depot ATC, Civic/Core ATC
		Broadway	Santa Fe Depot ATC, Civic/Core ATC
		Harbor Dr	
		Market St	
		6th Ave	Civic/Core ATC
		Park Blvd	

CATEGORY	NO. OF CONNECTIONS	ROUTE NAMES	STATION AREA ¹
Arterial/ Collector Street	15	India St	County Administration Building ATC (Optional), Santa Fe Depot ATC, Civic/Core ATC
		Kettner Blvd	
		1st Ave	County Administration Building ATC (Optional), Santa Fe Depot ATC, Civic/Core ATC
		State St	
		A St	
		Ash St	Santa Fe Depot ATC, Civic/Core ATC
		4th Ave	
		B St	
		C St	
		F St	
		G St	Civic/Core ATC
		5th Ave	
		8th Ave	
		10th Ave	
		11th Ave	

Source: WSP, HDR, and TAHA 2023

Notes:

¹Station area is defined as a 0.5-mile buffer from the station centroid.

ATC = Airport Transit Connector; SDIA = San Diego International Airport; SDSU = San Diego State University

Connections to Destinations

There would be 53 destinations within the station areas (Table S-3). Several of the destinations can be reached from more than one proposed station and would not require a transfer.

Table S-3. Destinations within South Route Aerial Option Station Areas

DESTINATIONS	STATION AREA ¹
Harbor Island	SDIA ATC, Harbor Island ATC (Optional)
San Diego Harbor Police	
San Diego International Airport	
Spanish Landing Park (East)	
Spanish Landing Park (West)	
SDFD Fire Station 3	County Administration Building ATC (Optional)

DESTINATIONS	STATION AREA ¹	
Col. Salomon Child Development Center	County Administration Building ATC (Optional)	
Washington Elementary School		
Firehouse Museum	County Administration Building ATC (Optional), Santa Fe Depot ATC	
Little Italy		
Maritime Museum of San Diego		
NHA - Stem Institute for Early Learning		
SDFD Fire Station 2		
Star of India Museum		
The Embarcadero		
Waterfront Park/Harborview		
Broadway Landing		Santa Fe Depot ATC
Lane Field Park		
Navy Pier		
Ruocco Park		
Seaport Village Shopping Center		
Tuna Harbor Park		
Cruise Ship Terminal		
The Headquarters at Seaport		
USS Midway Museum		
Aspen Leaf Nursery & Preschool	Santa Fe Depot ATC, Civic/Core ATC	
Balboa Theatre		
Civic Center		
Downtown San Diego/Core-Colombia		
Federal Courthouse		
Hall Of Justice		
Horton Plaza Park		
King Promenade Park		
King-Chavez Community High School		
Metro Arson Strike Team		

DESTINATIONS	STATION AREA ¹
Metropolitan Corrections Center	
Museum of Contemporary Art San Diego	
San Diego Central Courthouse	
San Diego Central Jail	
SDFD Fire Station 1	
SDFD Fire Station 1/201	
The New Children's Museum	
NHA - Broadway Early Learning Academy	
Pantoja Park	
California Western School of Law	Civic/Core ATC
Davis House Park	Civic/Core ATC
DTFHC At Connections	Civic/Core ATC
Gary And Mary West Senior Dental Center, Inc.	Civic/Core ATC
Gaslamp Museum at Davis-Horton House Museum & Park	Civic/Core ATC
Gaslamp Quarter	Civic/Core ATC
New Vistas	Civic/Core ATC
The School Paul Mitchell -San Diego	Civic/Core ATC
San Diego Chinese Historical Museum	Civic/Core ATC

Source: WSP, HDR, GPM, and TAHA 2023

Notes:

¹Station area is defined as a 0.5-mile buffer from the station centroid.

ATC = Airport Transit Connector; SDFD = San Diego Fire Department; SDIA = San Diego International Airport

5.2.2. User Experience

The evaluation of user experience relates to the station area environment and a passenger's experience on the vehicle considering elements such as ease of transfers, navigation, and passenger comfort. For the purpose of this analysis, the ease of transfers considered the distance and navigation to the nearest connecting services. The number of modes of transportation that can be reached within 0.5-mile buffer of each station is discussed in Section K.2.1.

Drop-off/Pick-up, Navigation, and Transfer Convenience

The following sections summarize transfer convenience for each proposed station associated with this option, including between modes of transit and by vehicle, as applicable. Transfer convenience was evaluated in terms of distance between modes of transit and vehicular drop-off/pick-up locations and the proposed ATC Station. As design is advanced throughout subsequent phases of project development, it is assumed that wayfinding, in terms of signage and paths of travel, would be provided to direct passengers to transfer locations. Therefore, wayfinding is not evaluated on a station-by-station basis.

SDIA ATC Station: Vehicular pick-up and drop-off or transfers from the ATC to bus are not expected at this station. It is anticipated that passengers boarding or alighting the ATC at this station would be traveling to or from SDIA. The nearest entrance at Terminal 1 and Terminal 2 would require passengers to walk a minimum of 0.2 mile.

Harbor Island ATC Station (Optional): While connections at this location would be limited, this station would allow for access to the MTS Route 923 N Harbor Drive and Harbor Island Drive bus stop, walking 300 feet west along Harbor Drive to reach the westbound stop and 500 feet along Harbor Drive and Harbor Island Drive to reach the eastbound stop. This station would also create a direct pedestrian linkage across Harbor Drive to future development on Harbor Island. Vehicular drop-off and pick-up are not anticipated at this station.

County Administration Building ATC Station (Optional): This station would be located north of the County Administration Building and would allow for transfers to MTS bus Routes 923 and 992 on Harbor Drive and Routes 280 and 290 on Grape Street, each within a 300-foot walk.

Santa Fe Depot ATC Station: The Santa Fe Depot ATC Station includes ample transfer opportunities, including eight bus routes, two light rail lines (i.e., Trolley Blue and Green Lines), Amtrak intercity rail, and COASTER commuter rail service. This station would be located along Broadway at Kettner Boulevard, southeast of the existing Santa Fe Depot, and passengers would have access to the connecting services with a 200-foot walk. Passengers exiting the ATC Station would be in view of the existing Santa Fe Depot waiting room and ticket office building, a city landmark, which would support navigation. However, given the considerable amount of connecting services scattered among various on-street stops, navigating between transit services may be confusing and clear signage at the ATC Station would be needed. No dedicated transit parking facilities exist at Santa Fe Depot, although there is an existing private parking lot adjacent to Santa Fe Depot that charges a fee for parking. Vehicular drop-off and pick-up space are provided along Kettner Boulevard.

Civic/Core ATC Station: The Civic/Core ATC terminus station would be located on Broadway, west of 3rd Avenue and approximately 500 feet south of the existing Trolley Blue and Trolley Orange Line Civic Center Station on C Street. A dedicated bicycle/pedestrian connection between both stations would be provided along 3rd Avenue, which would allow for clear navigation for passengers traveling between each station area and to the Civic Center. The station would also provide direct access to bus stops on Broadway, between 2nd Avenue and 3rd Avenue serving nine MTS bus routes. At Broadway and 1st Avenue, passengers would have access to four additional bus routes within a 200-foot walk.

Station Amenities

The South Route aerial option would provide three new transit stations along the ATC alignment, with the option to include up to two additional stations. Each station, as preliminarily designed, would provide ample space for shelters, seating, lighting, trash receptacles, and other amenities. In addition, the SDIA ATC Station is adjacent to SDIA, which provides restrooms, air conditioning, and other amenities. The existing Santa Fe Depot also offers restrooms, vending machines, and an ATM. The Civic/Core station is located within a constrained area, but space would be available for amenities such as shelters, seating, and lighting.

Fare Payment Method

The ATC fare concept has not yet been fully established, but for the purposes of this evaluation it is assumed that the ATC would be fare free. A fare free concept allows for a smoother boarding process and would minimize travel delay compared to systems where a passenger pays as they board.

Boarding Method

It is assumed that the ATC vehicles would provide level boarding (i.e., the floor of the vehicle is at the same level as the boarding platform), allowing passengers to step or roll directly onto the vehicle without a step up or down. This type of boarding is easier for passengers with luggage, as well as passengers with strollers, in wheelchairs, or with other mobility impairments compared to vehicles that do not have level boarding.

Luggage Accommodations

The ATC vehicles are assumed to be designed with airport travel in mind, with space for luggage, available but minimal seating conducive to short trips, and ample hand-holds.

Reliability

This option would operate in a dedicated, fully separated right-of-way with no shared operations for the entirety of the ATC alignment. The absence of conflicting services and separation from traffic would reduce opportunities for delays along the alignment and would support reliable operations.

Ride Comfort

This option is proposed to operate in a dedicated, fully separated right-of-way. The separated guideway minimizes potential conflicts with other vehicles, as well as the potential for additional stopping or starting at intersections.

S.2.3. Travel Time

Transit Travel Time

The evaluation of transit travel time considered the total time spent traveling on transit to and from destinations within the county. Transit travel time included time from the first mode of transit used to the destination, inclusive of transfers, and was obtained from the San Diego

Association of Governments (SANDAG) ABM2+ model. Transit travel times to SDIA were calculated for the AM peak hour and transit travel times from SDIA were calculated for the PM peak hour. Transit travel times to and from each destination were compared to against a No Project baseline. Table S-4 outlines the transit travel times for each destination evaluated.

Compared to the No Project baseline, the south route would reduce the transit travel time to each of the 14 destinations evaluated. The reduction in transit travel time for the south route would range from 1-26 minutes.

Table S-4. South Route Transit Travel Time

LOCATION/ DESTINATION	NO PROJECT BASELINE		SOUTH ROUTE ATC TO CIVIC/CORE (AERIAL)	
	TO SDIA	FROM SDIA	TO SDIA	FROM SDIA
Legoland	64	64	57	57
Carlsbad/Carlsbad Village Station	63	63	57	57
Grossmont Center Mall	61	61	37	37
Mission Bay/Mission Bay Park	32	32	31	31
Mission Valley/Fashion Valley Station	36	36	30	30
Chula Vista City Hall	45	45	40	40
Bayfront Redevelopment/E Street Station	45	45	38	38
Bayfront Redevelopment (Gaylord Pacific Resort and Convention Center & Harbor Park)	47	47	39	39
San Ysidro Transit Center	60	60	34	34
San Diego State University/SDSU Transit Center	52	52	32	32
University of California, San Diego/UCSD Central Campus Station	41	41	38	38
Convention Center	24	24	18	18
Liberty Station (Commercial & Bus Transit)	23	23	22	22
Ocean Beach (Downtown Area)	41	41	27	27

Source: SANDAG, WSP, and HDR 2022

Notes: ATC = Airport Transit Connector; SDIA = San Diego International Airport; San Diego State University; UCSD = University of California San Diego

Headways

The evaluation of travel time also considered headways, or the time between transit vehicles. The headways presented in this evaluation are consistent with those used in the ridership forecasts. Actual headways would be determined during later stages of project development. The south route aerial option would operate with 2-minute headways.

S.2.4. Ridership

Projected ridership in 2050 is shown in Table S-5 for the south route option based on forecasts from the SANDAG model.

Table S-5. South Route 2050 Ridership

CONCEPT DESCRIPTION	DAILY RIDERSHIP
South Route ATC to Civic/Core (aerial)	19,000

Source: SANDAG 2023

Notes: Numbers rounded to the nearest 1,000.

ATC = Airport Transit Connector

S.3. Feasibility / Complexity

S.3.1. Right-of-Way

The evaluation of right-of-way requirements considered the number of parcels that may have acquisitions (partial or full) to support the concept and the number of buildings that may require demolition. A buffer was used to identify properties, defined as 20 feet for aerial, 10 feet from edge of straddle bents, and 20 feet at stations. The South Route aerial option would consist of an elevated alignment with elevated guideway columns and guideway straddle bents. The evaluation considered the three stations and two optional stations. The evaluation identified a total of 22 parcels within the buffer. Additionally, no buildings would require demolition (Table S-6).

Table S-6. South Route Aerial Option Right-of-Way Requirements

CONCEPT DESCRIPTION	RIGHT-OF-WAY REQUIREMENTS	
	NUMBER OF PARCELS AFFECTED	NUMBER OF BUILDINGS POTENTIALLY REQUIRING DEMOLITION
South Route ATC to Civic/Core (aerial)	22	0

Source: WSP, HDR, GPM 2023

Notes: ATC = Airport Transit Connector

S.3.2. Construction Effects/Constructability

This section discusses constructability considerations associated with the major infrastructure elements featured in the South Route aerial option with the purpose of identifying probable construction methods, staging, sequences, traffic impacts, and any temporary facilities that would be implemented during the construction phase.

The South Route aerial option would be a completely aerial alignment from SDIA to the Civic Center area. This option has similar constructability aspects as Concepts 1A and 5A without the section of Concept 1A that continues along the end of the airport runway to the PTC and CONRAC. The length of the aerial structure could affect the selection of structure type and the number of crews working to meet schedule. If schedule is critical, contractors would likely start

crews on multiple headings for foundation and column work. The additional aerial construction within Harbor Drive, Pacific Highway, and Broadway would require lane closures in congested roadway segments. Construction of the optional aerial station at the County Administration Building would require temporary closure of all or part of the surface parking lot located north of Grape Street. Constructing the aerial guideway along Pacific Highway toward Broadway would require a work zone on Pacific Highway of about 35 percent of the roadway width while avoiding any encroachment on intersections with Ash Street or Broadway to minimize impacts on traffic circulation. Aerial stations at the Santa Fe Depot and Civic/Core ATC Station would require substantial periods of lane or roadway closures in those areas.

S.3.3. Major Utilities

Potential conflicts with existing utilities were identified. Major utilities in this evaluation are defined as water facilities equal to or greater than 16 inches, sewer facilities equal to or greater than 18 inches, and storm drain facilities equal to or greater than 36 inches. The South Route aerial option consists of an elevated alignment with elevated guideway columns and guideway bents. A buffer was established from the centerline of the nearest rail to capture utilities within a 10-foot diameter from column locations for aerial and 20 feet at stations. The evaluation considered the three stations and two optional stations. This option could result in eight utilities impacts. Table S-7 outlines the number and type of major utilities identified.

Table S-7. South Route Aerial Option Utility Impacts

CONCEPT DESCRIPTION	NUMBER OF MAJOR UTILITY IMPACTS		
	SEWER	WATER	STORM DRAIN
South Route ATC from SDIA to Civic/Core (aerial)	3	3	2

Source: WSP, HDR, GPM 2022

Notes: ATC = Airport Transit Connector; SDIA = San Diego International Airport

S.3.4. Geotechnical and Seismic Conditions

Geotechnical conditions along the alignment of the South Route aerial option are highly variable. Figure K-3 presents a geologic map of San Diego with Concept 5A overlaid onto it, and an overview of the subsurface conditions along the alignment. In particular, the subsurface materials along N Harbor Drive likely consist of a sequence of highly variable undocumented fill soil (placed above water), overlying relatively thick hydraulic fill soils (placed under water). These fill soils are sequentially underlain by various naturally deposited geologic formations that were deposited in various geologic epochs. From the youngest, and therefore right below the undocumented fills and in descending order, are Holocene-age estuarine deposits (also referred to as bay deposits), Quaternary-age granular and cohesive old paralic deposits (also known as Bay Point Formation), Pliocene-age marine sandstone and conglomerate (also known as the San Diego Formation), and undifferentiated fossilized marine and non-marine Eocene-age rock.

The southern portion of the alignment along Pacific Highway, from the Solar Turbines parking lot to the Santa Fe Depot Station, generally follows the original, historic shoreline of San Diego Bay. The subsurface sequence of deposits in this area is anticipated to consist of variable

thicknesses undocumented fill, hydraulic fill, estuarine deposits, Bay Point Formation, and San Diego Formation. While the general sequence of geologic formations is similar to the areas described above, the thickness of less competent and more problematic soils (i.e. undocumented fill and estuarine deposits) is anticipated to be smaller as the alignment is closer to the original San Diego Bay shoreline in this area. The remaining portion of the alignment from Santa Fe Station to the Civic/Core ATC Station is characterized by variably thick undocumented fill soils underlain by the Bay Point and San Diego Formations.

From a seismic/faulting perspective, the area is considered seismically active and includes several known active faults (Figure K-4). An active trace of the Spanish Bight Fault crosses the alignment immediately to the west of the intersection of Liberator Way and North Harbor Drive. Likewise, an active trace of the East Bay Fault crosses the alignment north of the U.S. Coast Guard Station on North Harbor Drive and it continues north toward the SDIA rental car center. These fault traces generally are perpendicular with the elevated alignment running east-west.

The southern portion of the alignment through Pacific Highway runs within a mapped Alquist-Priolo Earthquake Fault Zone. The last section of the alignment from Santa Fe Depot to the Civic/Core ATC Station crosses an additional Alquist-Priolo Earthquake Fault Zone triggered by the presence of the San Diego fault. As such, the possibility of active faulting in this area is considered very high. The presence of active faults can have a significant impact to the project, particularly for structures that are classified for human occupancy. These may include, but are not limited to, passenger stations and the OMSF. Fault rupture hazard studies will be required to ensure that habitable structures are placed at a sufficient distance from active fault traces.

Groundwater elevations near areas of the alignment located closer to San Diego Bay may be tidally influenced but are relatively close to the ground surface. The presence of a relatively shallow groundwater, when coupled with seismic ground motion and certain subsurface conditions, increases susceptibility to liquefaction, lateral spreading, and seismic settlements. Soil liquefaction occurs when saturated, cohesionless soils lose their stiffness and strength due to the build-up of excess pore water pressure during cyclic loading, such as that induced by earthquakes. The primary factors affecting the liquefaction potential of a soil deposit are intensity and duration of earthquake shaking, soil type and relative density, overburden pressures, fines content, and depth to groundwater. Soils most susceptible to liquefaction are saturated loose sands and low plasticity to non-plastic silts. The potential consequences of liquefaction to structures include loss of bearing capacity, post-liquefaction settlement, slope instability, and surface sand boils. When combined with a sloping ground or “free faces,” such as bridge abutments, the loss of soil shear strength and stiffness that is associated with liquefaction can result in lateral spreading displacements (a form of seismic slope instability also known as “flow failure”) that can impose lateral loads upon the foundations and result in several feet of permanent soil lateral displacements.

Post-liquefaction seismic settlements occur when the excess pore water pressure induced by the seismic shaking dissipates and the soil readjusts in a new equilibrium condition. This typically occurs within a few seconds to minutes after the earthquake event. Post-liquefaction settlements can pose a significant hazard to structures founded on shallow foundations. The hydraulic fill soils and estuarine deposits in this area likely have a moderate to high potential for earthquake-induced liquefaction, lateral spreading, and seismic settlement.

Farther from San Diego Bay, lateral spreading is less likely as the ground elevation rises and the soil conditions generally improve. The Bay Point Formation is generally considered medium dense to dense sandy soil and firm to very stiff clayey soil that is not prone to liquefaction during seismic events. The San Diego Formation may contain very dense and hard sandstone and conglomerate materials and is not considered to be prone to liquefaction.

Table S-8 provides a qualitative summary of the geologic and geotechnical conditions for the various components of this concept. Table S-9 includes an assessment of the favorability that each geotechnical/geologic condition is anticipated to have on the various project locations and alignment types.

Table S-8. South Route Aerial Option Geologic and Geotechnical Conditions

LOCATION	UPPER SOIL LAYER COMPETENCY	DEPTH TO COMPETENT SOFT ROCK	ACTIVE FAULTING POTENTIAL	LIQUEFACTION POTENTIAL	LATERAL SPREADING POTENTIAL
Elevated ATC along N Harbor Dr	Very poor	Very Deep	Very High (3 to 4 perpendicular crossings)	Very High	High
Pacific Highway Alignment to Santa Fe Depot	Fair	Deep	Very High (3 to 4 oblique fault crossings)	Moderate	Low
Santa Fe Depot to Civic Center	Fair	Deep	Very High (PCH and SD Faults cross)	Moderate	Low

Source: WSP 2023

Notes: ATC = Airport Transit Connector; PCH = Pacific Coast Highway; SD = San Diego

Table S-9. South Route Aerial Option Geologic and Geotechnical Conditions Favorability Evaluation

LOCATION	UPPER SOIL LAYER COMPETENCY	DEPTH TO COMPETENT SOFT ROCK	ACTIVE FAULTING POTENTIAL	LIQUEFACTION POTENTIAL	LATERAL SPREADING POTENTIAL
Elevated ATC along N Harbor Dr	Low	N/A	Low	Very Low	Low
Pacific Highway Alignment to Santa Fe Depot	Medium	N/A	Low	High	High
Santa Fe Depot to Civic Center	High	N/A	Low	N/A	N/A
Overall	Medium				

Source: WSP 2023

Notes:

High: High favorability (geotechnical condition is highly favorable for this location and alignment type)

Medium: Medium favorability (geotechnical condition is favorable for this location and alignment type)

Low: Low favorability (geotechnical condition is not favorable for this location and alignment type)

Very Low: Very Low favorability (geotechnical condition is particularly not favorable for this location and alignment type)

ATC = Airport Transit Connector; N/A: Not Applicable (geotechnical condition is irrelevant for this location and alignment type)

S.3.5. Regulatory Considerations

The Regulatory Considerations criterion identifies the federal and state agency approvals, permits, and coordination potentially required for implementation of each concept. The following details the types of agency approval and permits that may be applicable to each concept based on information available to date. Additional approvals and coordination may be identified during subsequent phases of the project development process. All concepts would require environmental clearance pursuant to the California Environmental Quality Act (CEQA), for which SANDAG would be the CEQA lead agency. Additionally, the project would likely have a federal nexus, which would also require environmental clearance pursuant to the National Environmental Policy Act. At this time, a federal lead agency has not been identified.

Federal Aviation Administration

The Federal Aviation Administration (FAA) is the largest United States transportation agency and regulates all aspects of civil aviation within the country. The South Route aerial option proposes a fixed aerial structure along N Harbor Drive and would construct facilities within 5,000 feet of FAA facilities. The South Route aerial option is in proximity or on airport property but not within the runway protection zone.

Title 14, Chapter 1 of the Code of Federal Regulations (CFR). Title 14, Chapter 1 of the CFR includes policies and regulations that govern the development and construction within airport property or within zones of airport influence, such as noise zones. This CFR also includes regulations governing runway protection zones and obstructions to air navigation in Part 77, “Safe, Efficient Use, and Preservation of the Navigable Airspace.” Part 77.9, “Construction or Alteration Requiring Notice,” provides height restriction standards for the construction of any facilities within 20,000 feet, 10,000 feet, and 5,000 feet from the nearest point of the nearest runway of the SDIA. A Notice of Proposed Construction or Alteration (FAA Form 7460-1) would need to be filed at least 45 days (1 year recommended) prior to construction to confirm a “No Hazard” determination from FAA related to permanent impacts within Part 77 surfaces. That form would also need to be filed at least 45 days prior to construction (minimum 90 days recommended) for temporary impacts and would identify the location of all construction equipment and top elevations near the runway.

California Coastal Commission

The California Coastal Commission (CCC) is a state agency within the California Natural Resources Agency with quasi-judicial control of land and public access along the state's 1,100 miles of coastline. The South Route option proposes an aerial alignment along N Harbor Drive, Pacific Highway, and Broadway, which would be located within the California Coastal Zone as identified by the CCC. The following regulations would apply to both permanent features and construction activities within the California Coastal Zone.

Title 15, CFR Parts 923 and 930, “Coastal Zone Management Act (CZMA).” Title 15, Part 923 of the CFR contains the requirements for the California coastal management program, pursuant to the CZMA of 1972. California’s program identifies coastal resources that require management or protection by the state, including resources that are located within Coastal Zones and would be subject to impacts from development. The CZMA defines Coastal Zones as

“coastal waters...and the adjacent shorelands...strongly influenced by each other and in proximity to the shorelines of coastal states.” Title 15, Part 930 of the CFR requires a federal consistency review of federal agency, federally permitted, and federally funded (to state and local government) activities that affect the Coastal Zone.

Title 14, Natural Resources, Division 5.5. Regulations under Title 14, Division 5.5, pursuant to the California Coastal Act of 1976, defines the roles and responsibilities of the CCC to carry out the full purposes and provision of the Act. Chapter 5, “Coastal Development Permits Issued by Coastal Commissions,” governs the process for the CCC to assess and approve coastal development permits for projects located within Coastal Zones.

United States Fish and Wildlife Service

The United States Fish and Wildlife Service (USFWS) is the federal agency responsible for enacting and enforcing federal conservation legislation. Due to the presence of the federally endangered California least tern near the southeast property line of the airport, consultation with USFWS would be required.

Federal Endangered Species Act (FESA). The FESA regulates the take of endangered and threatened species and the adverse modification of federally designated critical habitat. Take as defined under the FESA means “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.” Procedures for addressing take of federally listed species follow two principal pathways, both of which require consultation with the USFWS, which administers the FESA for terrestrial and aquatic species limited to inland waters, or the National Oceanic and Atmospheric Administration, which administers the FESA for marine species. The first pathway, a Section 10(a) incidental take permit, applies to situations where a nonfederal governmental entity must resolve potential adverse impacts on species protected under the FESA. The second pathway, a Section 7 consultation, applies to projects directly undertaken by a federal agency or private projects requiring a federal permit or approval. Section 7 consultation between the federal project lead and USFWS is anticipated.

Migratory Bird Treaty Act (MBTA). Title 50, Part 10 of the CFR contains the provisions of the MBTA, which establishes the protection of migratory birds under the authority of the USFWS. Under this Act, taking, killing, or possessing migratory birds including feathers, or other parts, nests, eggs, or products, is unlawful except as allowed by implementing regulations (50 CFR 21). At this time there is no process in place for USFWS to authorize the incidental take of migratory birds that may result from construction activities or from striking project facilities during operations. Regulated species are listed at CFR Title 50 Part 10.13.

California Department of Fish and Wildlife (CDFW)

The CDFW is the state agency that manages and protects the state’s flora, fauna, and habitats. The CDFW is responsible for enforcing state conservation legislation, including the California Endangered Species Act (CESA). Due to the presence of the California least tern, which is listed as a State of California endangered species, near the southeast property line of the airport, coordination with CDFW may be required.

California Endangered Species Act. Sections 2050 through 2098 of the California Fish and Game Code outline the protection provided to California’s rare, endangered, and threatened species. Section 2080 of the Fish and Game Code prohibits the taking of plants and animals listed under the CESA. According to the Fish and Game Code, take is defined as to hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill. Applicants who obtain a federal incidental take permit for a species also listed under CESA and expect take as described above may request a determination from CDFW that the federal document is consistent with CESA. If the CDFW Director determines that the federal incidental take permit is consistent with CESA, a Consistency Determination will be issued. If CDFW does not issue a Consistency Determination, a Section 2081 incidental take permit would be required.

San Diego County Regional Airport Authority

The San Diego County Regional Airport Authority (Airport Authority) is the agency responsible for managing operations of SDIA and for addressing the San Diego region’s long-term air transportation needs. The Airport Authority also serves as the region’s Airport Land Use Commission. Coordination with the Airport Authority would be required for the portions of the concept on or adjacent to airport property.

SDIA Biodiversity Plan. The Airport Authority publishes the Biodiversity Plan, which directs the Authority’s management of plants and wildlife on airport property. In particular, the Biodiversity Plan establishes the framework for the habitat management of the endangered California least tern, which has been known to nest on bare areas in the airport infields. Management strategies are driven in part by the Airport’s 1993 Biological Opinion and 2018 Informal Consultation.

Federal Railroad Administration

The Federal Railroad Administration (FRA) is a federal agency within the U.S Department of Transportation responsible for the transportation of goods and people on railways. The South Route option proposes a Santa Fe Depot ATC Station located on Broadway at Kettner Boulevard. From the Santa Fe Depot ATC Station, the alignment would continue east along Broadway to the Civic/Core ATC Station. New facilities connecting to Amtrak facilities would require cooperation and approval from Amtrak and would be required to comply with all regulations and safety statues of the CFR related to passenger rail construction and operation.

Title 49, Subtitle B, Chapter VII of the CFR. The National Railroad Passenger Corporation (Amtrak) is a for-profit corporation authorized by the Rail Passenger Service Act which provides rail passenger services. Amtrak is not an agency or establishment of the U.S. Government but is a service subject to the rules and regulations of the FRA. Railroads on standard gage track that are part of the general railroad system of transportation, including Class I, Class II, National Railroad Passenger Corporation (Amtrak), and other railroads providing commuter service in a metropolitan or suburban area, are required to cooperate with the FRA on operating rules, timetables, and other metrics. FRA operational regulations do not apply to railroads or rapid transit operations in an urban area operating outside of the general railroad system of transportation.

California Public Utilities Commission

The California Public Utilities Commission (CPUC) has safety and security regulatory authority over all rail transit and other public transit fixed guideway systems under Public Utilities Code Section 99152 and other statutes. CPUC defines Rail Fixed Guideway Systems as any light, heavy, or rapid rail system, monorail, inclined plane, funicular, trolley, cable car, automatic people mover, or automated guideway transit system used for public transit. Coordination with CPUC and compliance with applicable General Orders will be required.

Conclusion

The South Route option may require permitting and coordination with the FAA, CCC, USFWS, CDFW, Airport Authority, FRA, Amtrak, and local jurisdictions and may be required to comply with applicable regulations including, but not limited to, the following:

- FAA: 14 CFR Chapter 14
- CCC: 15 CFR Parts 923 and 930 – Coastal Zone Management Act
- CCC: Title 14, Natural Resources Division 5.5, California Coastal Commission
- USFWS: Federal Endangered Species Act
- USFWS: Migratory Bird Treaty Act
- CDFW: California Endangered Species Act
- SDIA Biodiversity Plan
- FRA: 49 CFR Subtitle B, Chapters II and VII
- CPUC: General Orders

S.4. Cost

S.4.1. Capital Cost

The capital costs estimate for the South Route aerial option included the estimated costs for the following program components:

- Construction
- Vehicles
- Professional services
- Unallocated contingency (20%)

The aerial option would feature an aerial alignment, but when combined with Concept 1A would also include at-grade and tunnel segments. Prototypical Unit Price Elements were developed to represent anticipated aerial guideway configurations, stations, maintenance facilities, and enabling work. High-level estimates for vehicle acquisitions and allowances for professional

services were also included. Refer to Appendix P for additional detail on the methodology used for the cost estimate.

At this stage of the project development process, costs were estimated in rough-orders-of-magnitude for purposes of comparing each concept to each other. The cost estimates are in 2022 dollars. Right-of-way costs were not included in these estimates. Table S-10 outlines the capital cost estimate, including a range from low to high.

Table S-10. South Route Aerial Option Capital Cost

CONCEPT DESCRIPTION	COST IN MILLIONS (2022)		
	LOW	MID-POINT	HIGH
South Route ATC to Civic/Core (aerial)	\$1,338.3	\$1,574.5	\$2,046.9

Source: WSP, HDR 2023

Note: ATC = Airport Transit Connector

S.4.2. Cost per Rider

The cost per rider was calculated using the 2050 ridership forecasts and capital costs developed for this study to provide a more direct comparison of concepts given the differences in the number of stations and locations served. Table S-11 summarizes the cost per rider estimates, including a range from low to high.

Table S-11. South Route Aerial Option Cost Per Rider

CONCEPT	COST (2022)		
	LOW	MID-POINT	HIGH
South Route ATC to Civic/Core (aerial)	\$7.12	\$8.19	\$10.65

Source: WSP, HDR 2023

Note: ATC = Airport Transit Connector

S.4.3. Cost per Mile

Cost per mile was calculated based on capital cost and the length of each concept in 2022 dollars. Table S-12 presents the cost per mile, including a range from low to high.

Table S-12. South Route Aerial Option Cost Per Mile

CONCEPT DESCRIPTION	COST IN MILLIONS (2022)		
	LOW	MID-POINT	HIGH
South Route ATC to Civic/Core (aerial)	\$457	\$538	\$699

Source: WSP, HDR 2023

Note: ATC = Airport Transit Connector

S.4.4. Operations and Maintenance

Estimation of annual Operations and Maintenance (O&M) costs associated with this option is outside of the scope of this study. However, a high-level comparative assessment of probable O&M cost in qualitative terms was undertaken. Table S-13 presents a qualitative assessment of the main O&M cost elements for the three technologies under consideration—ATC, Trolley (light rail transit [LRT]), and bus. Among the various ATC concepts, O&M costs would generally increase as the alignment length, number of stations, and/or ridership increases. As shown in Table S-12, the ATC concepts would have high O&M cost for two of the seven elements: guideway infrastructure and energy consumption.

Table S-13. Operations and Maintenance Costs

COST DRIVER	ATC	TROLLEY (LRT)	ENHANCED BUS	ASSESSMENT
Guideway Infrastructure	\$\$\$	\$\$	\$	LRT concept would take advantage of using existing infrastructure along the Green Line and therefore would incur less maintenance cost. Bus infrastructure is shared with infrastructure owned by others and would have low infrastructure maintenance costs.
Operations and Support Staff	\$\$	\$\$\$	\$\$\$	Additional cost for personnel (salaries/insurance/medical etc.), including drivers/operators and associated support personnel. OMSF design and capacity requirements (restrooms/conference rooms/offices/utility costs) are also affected by the number of personnel required for operations. ATC vehicles are assumed to be automated (i.e., driverless).
Vehicle Maintenance	\$\$	\$\$\$	\$	ATC vehicles operate at much shorter headways requiring higher vehicle count compared to LRT vehicles expected to operate on 15-minute headways. Buses would also have a higher vehicle count than LRT vehicles to provide comparable capacity; however, both ATC and LRT are more complex vehicles and more costly to maintain. Also, maintenance costs are lower for rubber-wheeled vehicles (ATC and bus). Special maintenance equipment is required for steel wheel truing and rail grinding. LRT vehicles also employ a pantograph system to collect power from an overhead catenary system requiring additional maintenance.
Energy Consumption	\$\$\$	\$	\$\$\$	The performance and frequency of ATC vehicles typically translates to higher energy consumption/demand. Energy cost for ATC vehicles might therefore be higher than that of LRT vehicles. Energy consumption for buses using internal combustion engines may be lower per vehicle, but the number of vehicles required would be much higher.

COST DRIVER	ATC	TROLLEY (LRT)	ENHANCED BUS	ASSESSMENT
Systems	\$	\$\$	\$	Train control systems for LRT would include Automatic Train Protection but not Automatic Train Operation because trains are manually driven. Because a typical ATC uses vehicle location/communication dynamics (as well as Automatic Train Operation) for movement, authority wayside equipment such as signals/signs and associated cables are minimal. Enhanced bus service typically implements Transit Signal Priority over existing traffic control equipment requiring a nominal amount of maintenance.

Source: WSP and HDR 2022

Notes: ATC = Airport Transit Connector; LRT = light rail transit; OMSF = Operations, Maintenance and Storage Facility

S.5. Community Effects and Economic Benefits

The community effects evaluation criteria identify the anticipated community effects and adjacent development considerations for each concept. The community effects analysis contains three primary components: (1) Identifying the communities within each station area (0.5-mile buffer around each station) (2) identifying the population and housing within each station area, and (3) identifying the jobs and employment industries within each station area.

Communities were identified using ArcGIS and data from the SANDAG GIS Open Data Portal. Population and housing within each station area was determined using U.S. Census Bureau 2017-2021 American Community Survey 5-Year estimates. Job industries are categorized based on the North American Industry Classification System (NAICS), which is the federal classification standard for businesses in the United States. The adjacent development considerations analysis identifies the number of vacant parcels within each station area. Vacant properties within the station areas were identified using the Parcel and Current Land Use datasets from the SanGIS/SANDAG GIS Data Warehouse.

S.5.1. Adjacent Community Effects

Surrounding Communities

The South Route option would provide connections to nine City of San Diego communities: SDIA, Park West/Bankers Hill, Harborview, Marina, Little Italy, Core-Colombia, Horton Plaza, Gaslamp, and Cortez. This option would not provide direct connections to the Middletown community. The SDIA ATC Station and Harbor Island ATC station areas are within the SDIA community. The County Administration Building ATC Station is within the Park West/Bankers Hill, Harborview, and Marina communities, while the Santa Fe Depot ATC station area is within the Little Italy, Marina, Core-Colombia, and Horton Plaza communities. The Civic/Core ATC station area is within the Little Italy, Cortez, Marina, Core-Columbia, Horton Plaza, and Gaslamp communities (Table S-14).

Table S-14. Surrounding Communities for South Route Option

STATION AREA ¹	COMMUNITIES
SDIA ATC Station	SDIA
Harbor Island ATC Station	SDIA
County Administration Building ATC Station ²	Park West/Bankers Hill
	Harborview
	Little Italy
Santa Fe Depot ATC Station ³	Little Italy
	Marina
	Core-Colombia
	Horton Plaza
Civic/Core ATC Station	Little Italy
	Cortez
	Marina
	Core-Columbia
	Horton Plaza
	Gaslamp

Source: SANDAG 2022

Notes:

¹ Station Areas are defined as a 0.5-mile buffer from each station centroid.

² The County Administration Building ATC Station would be located between Grape Street and Hawthorn Street.

³ Santa Fe Depot ATC Station would be located on Broadway.

ATC = Airport Transit Connector; SDIA = San Diego International Airport

Population and Housing

Table S-15 summarizes the population and number of households within 0.5 mile of each station. The South Route station areas contain approximately 14,500 households with a population of 25,300. The station area with the largest population and number of households is the Civic/Core ATC Station.

Table S-15. Population and Housing for South Route Option

STATION AREA ¹	POPULATION	HOUSEHOLDS
SDIA ATC Station	300	0
Harbor Island ATC Station	200	0
County Administration Building ATC Station ²	6,900	4,300
Santa Fe Depot ATC Station ³	10,900	5,300
Civic/Core ATC Station	16,800	9,300
Total Project Area ⁴	25,300	14,500

Source: U.S. Census Bureau 2023; SANDAG 2023

Notes:

¹Station Area is defined as a 0.5-mile buffer from each station centroid.

²The County Administration Building Station would be located between Grape Street and Hawthorn Street.

³The Santa Fe Depot Station would be located on Broadway.

⁴Project Area reflects the combined station areas for the concept. Station Area estimates do not sum to Project Area totals due to station area overlap.

ATC = Airport Transit Connector; SDIA = San Diego International Airport

Jobs and Employment

The South Route option station areas contain approximately 62,300 jobs. Transportation and Warehousing represents the largest share of jobs in the SDIA ATC Station and Harbor Island ATC station areas. Accommodation and Food Services represents the largest share of jobs in the County Administration Building ATC station area. Within the Santa Fe Depot Station and Civic/Core station areas, Public Administration represents the largest share of jobs. Table S-16 summarizes the percentage of jobs by the top NAICS industry employers within each station area and combined station area.

Table S-16. Jobs and Employment Sectors for South Route Option

NAICS SECTOR	PERCENTAGE (%) OF JOBS BY STATION AREAS ¹					
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	COUNTY ADMINISTRATION BUILDING ATC STATION ³	SANTA FE DEPOT ATC STATION ⁴	CIVIC/CORE ATC STATION	COMBINED STATION AREA
Accommodation and Food Services	28.7	21.3	38.2	16.2	19.6	23.5
Administration & Support, Waste Management and Remediation	3.4	4.6	3.7	3.3	3.7	3.8
Agriculture, Forestry, Fishing and Hunting	0.0	0.0	0.0	0.0	0.0	0.0
Arts, Entertainment, and Recreation	7.3	5.4	1.4	2.1	1.8	1.7

NAICS SECTOR	PERCENTAGE (%) OF JOBS BY STATION AREAS ¹					
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	COUNTY ADMINISTRATION BUILDING ATC STATION ³	SANTA FE DEPOT ATC STATION ⁴	CIVIC/CORE ATC STATION	COMBINED STATION AREA
Construction	0.2	0.3	2.9	1.9	1.8	1.8
Educational Services	0.0	0.0	1.1	0.8	1.1	1.1
Finance and Insurance	2.7	0.0	2.2	4.9	6.6	5.9
Health Care and Social Assistance	0.0	0.0	2.3	1.3	2.3	2.2
Information	0.1	0.2	0.7	3.3	3.3	2.9
Management of Companies and Enterprises	0.0	0.0	0.6	1.6	1.4	1.3
Manufacturing	0.0	0.0	18.0	0.1	0.3	2.9
Mining, Quarrying, and Oil and Gas Extraction	0.0	0.0	0.0	0.0	0.0	0.0
Other Services (excluding Public Administration)	0.7	2.1	5.6	1.5	7.1	6.8
Professional, Scientific, and Technical Services	0.2	0.3	14.3	20.9	22.4	20.2
Public Administration	0.5	0.3	0.8	35.4	22.6	19.2
Real Estate and Rental and Leasing	3.4	9.0	3.9	2.2	2.0	2.1
Retail Trade	2.2	1.6	2.4	2.3	2.3	2.6
Transportation and Warehousing	50.1	54.7	0.1	0.6	0.3	0.5
Utilities	0.0	0.0	0.7	1.3	0.7	0.7
Wholesale Trade	0.3	0.2	1.3	0.5	0.7	0.8

Source: US Census Bureau 2022; SANDAG 2022

Notes:

¹Station Areas are defined as a 0.5-mile buffer from each station centroid.

²The OnTheMap tool displays employment data at the census place and census block levels. On the Map does not differentiate between employment headquarters that are physically located within the same census block.

³The County Administration Building ATC Station would be located between Grape Street and Hawthorn Street.

⁴The Santa Fe Depot ATC Station would be located on Broadway.

ATC = Airport Transit Connector; NAICS = North American Industry Classification System; SDIA = San Diego International Airport

S.5.2. Adjacent Development Considerations

Economic opportunities for the South Route option are determined by the number of existing vacant properties within each station area. Vacant parcels identified must be a minimum of 20,000 square feet and could not be in areas zoned as residential. No parcels were identified.

South Route Hybrid Option

S.6. Description of Concept

The South Route hybrid option is a variation on Concept 5C without the portion of the north route to PTC and CONRAC. The south route would feature a 2.9-mile high-frequency ATC in a dedicated right-of-way from SDIA to a terminus at a Civic/Core ATC Station on Broadway. It would also add a new Santa Fe Depot ATC Station, creating a connection to the existing Santa Fe Depot and an optional Harbor Island ATC Station and optional County Administration Building ATC Station. This option would feature at-grade, aerial, and underground alignment sections and would require a connection to an OMSF, of which the location is yet to be determined. Table S-17 provides information on concept characteristics.

Figure S-2 shows the South Route hybrid option alignment. From the SDIA Station located at the transit-ready area at the airport, the fixed guideway would follow Harbor Drive on aerial structure followed by an at-grade alignment. The alignment would transition to a cut-and cover-tunnel north of Hawthorn Street as it curves southeast at the location of the optional County Administration Building ATC Station. South of Grape Street, the alignment would continue in a bored tunnel before turning east to continue beneath Broadway and connect to the Santa Fe Depot ATC Station and Civic/Core ATC Station. The Civic/Core ATC terminus station would be located on Broadway, west of 3rd Avenue. A dedicated bicycle/pedestrian connection would provide a connection to the existing Trolley Blue and Trolley Orange Line Civic Center Station on C Street.

Table S-17. South Route Hybrid Option Characteristics

CHARACTERISTIC	
Length of alignment at-grade (miles)	0.1
Length of alignment on aerial structure (miles)	1.5 ¹
Length of alignment in tunnel (miles)	1.3
Total alignment length (miles)	2.9 ¹
Number of stations	3 ²
Minimum/shortest headways	2 minutes

Source: WSP, HDR 2022

Notes:

¹Length is an approximation; this option has not been fully developed.

²County Administration Building and Harbor Island are a potential fourth and fifth station.

Figure S-2. South Route Airport Transit Connector from San Diego International Airport to Santa Fe Depot Extended to Civic/Core—Hybrid Option



Source: WSP, HDR 2022

S.7. Passenger Convenience and Ridership

Passenger convenience and ridership would be the same as the South Route Aerial Option. This option would include fully grade separated right-of-way with elevated, at-grade and below grade ground segments. The separated guideway minimizes potential conflicts with other vehicles, as well as the potential for additional stopping or starting at intersections. While the alignment would transition between grades, the South Route hybrid option would employ best practices to maintain an acceptable level of ride quality. Refer to Section S.2 for additional information regarding passenger convenience and ridership.

S.8. Feasibility / Complexity

S.8.1. Right-of-Way

The evaluation of right-of-way requirements considered the number of parcels that may have acquisitions (partial or full) to support the concept and the number of buildings that may require demolition. A buffer was used to identify properties, defined as 20 feet for aerial and at-grade, 20 feet for tunnel/cut-and-cover, 10 feet from edge of straddle bents, and 20 feet at stations. The South Route hybrid option would consist of cut-and-cover tunnel, elevated, and at-grade or trench segments, including elevated guideway columns and guideway straddle bents. The evaluation considered the three stations and two optional stations. The evaluation identified 15 parcels within the buffer. Additionally, no buildings would require demolition (Table S-18).

Table S-18. South Route Hybrid Option Right-of-Way Requirements

CONCEPT DESCRIPTION	RIGHT-OF-WAY REQUIREMENTS	
	NUMBER OF PARCELS AFFECTED	NUMBER OF BUILDINGS POTENTIALLY REQUIRING DEMOLITION
South Route ATC to Civic/Core (hybrid)	15	0

Source: WSP, HDR, GPM 2023

Notes: ATC = Airport Transit Connector

S.8.2. Construction Effects/Constructability

This section discusses constructability considerations associated with the major infrastructure elements featured in each concept under evaluation with the purpose of identifying probable construction methods, staging, sequences, traffic impacts, and any temporary facilities that would be implemented during the construction phase.

The South Route hybrid option is a variation of the aerial option that would be partially elevated and partially in a bored tunnel. This option has similar constructability aspects as Concepts 1A and 5A without the section of Concept 1A that continues along the end of the airport runway to the PTC and CONRAC. The primary considerations of the aerial portion of the alignment would be similar to that presented for the South Route Aerial Option. The launch box for the bored

section would be in the parking lot north of Grape Street between Pacific Highway and Harbor Drive and would later become part of a cut-and-cover transition section between the elevated and underground sections. This would also be the location of the optional County Administration Building Station.

The underground stations at the County Administration Building and Santa Fe Depot would be excavated from the surface either before or after completion of the tunnels and outfitted after tunnel completion. Station box construction would be similar to that of the Santa Fe Depot Station on Broadway described for Concept 3B. The receiving box would be located at the Civic/Core ATC Station.

This concept avoids impactful cut-and-cover tunnel construction on the Laurel Street and Pacific Highway intersection associated with Concept 3B and simplifies construction of the optional County Administration Building Station by locating it off the street rights-of-way.

S.8.3. Major Utilities

Potential conflicts with existing utilities were identified. Major utilities in this evaluation are defined as water facilities equal to or greater than 16 inches, sewer facilities equal to or greater than 18 inches, and storm drain facilities equal to or greater than 36 inches. The South Route hybrid option consists of cut-and-cover tunnel, elevated, and at-grade or trench segments, including elevated guideway columns and guideway bents. A buffer was established from the centerline of the nearest rail and within depth thresholds beneath the surface ground level to capture utilities within a 10-foot diameter from column locations for aerial, 20 feet for at-grade, 20 feet for tunnel/cut-and-cover, 10 feet from the edge of straddle bents, and 20 feet at stations. The evaluation considered the three stations and two optional stations. Utilities within the buffer for bored tunnels were not included in this analysis as it is expected that the tunnel will be substantially deeper than any utilities, with the exception of specific locations such as the launch and retrieval site for the tunnel boring machine and at stations. This option could result in 10 utilities impacts. Table S-19 outlines the number and type of major utilities identified.

Table S-19. South Route Hybrid Option Utility Impacts

CONCEPT DESCRIPTION	NUMBER OF MAJOR UTILITY IMPACTS		
	SEWER	WATER	STORM DRAIN
South Route ATC to Civic/Core (hybrid)	3	5	2

Source: WSP, HDR, GPM 2023

Notes: ATC = Airport Transit Connector

S.8.4. Geotechnical and Seismic Conditions

Geotechnical conditions along the alignment of the South Route hybrid option are highly variable. Figure L-3 presents a geologic map of San Diego with Concept 5C overlaid onto it, and an overview of the subsurface conditions along the alignment. In particular, the subsurface materials along N Harbor Drive likely consist of a sequence of highly variable undocumented fill soil (placed above water), overlying relatively thick hydraulic fill soils (placed under water). These fill soils are sequentially underlain by various naturally deposited geologic formations that were deposited in various geologic epochs. From the youngest, and therefore right below the undocumented fills and in descending order, are Holocene-age estuarine deposits (also referred to as bay deposits), Quaternary-age granular and cohesive old paralic deposits (also known as Bay Point Formation), Pliocene-age marine sandstone and conglomerate (also known as the San Diego Formation), and undifferentiated fossilized marine and non-marine Eocene-age rock.

The southern portion of the alignment along Pacific Highway, from the Solar Turbines parking lot to the Santa Fe Depot Station, generally follows the original, historic shoreline of San Diego Bay. The subsurface sequence of deposits in this area is anticipated to consist of variable thicknesses undocumented fill, hydraulic fill, estuarine deposits, Bay Point Formation, and San Diego Formation. While the general sequence of geologic formations is similar to the areas described above, the thickness of less competent and more problematic soils (i.e. undocumented fills and estuarine deposits) is anticipated to be smaller as the alignment is closer to the original San Diego Bay shoreline in this area. The remaining portion of the alignment from Santa Fe Depot ATC Station to the Civic/Core ATC Station is characterized by variably thick undocumented fill soils underlain by the Bay Point and San Diego Formations.

From a seismic/faulting perspective, the area is considered seismically active and includes several known active faults (Figure L-4). An active trace of the Spanish Bight Fault crosses the alignment immediately to the west of the intersection of Liberator Way and N Harbor Drive (Figure L-4). Likewise, an active trace of the East Bay Fault crosses the alignment north of the US Coast Guard Station on N Harbor Drive and it continues north toward the SDIA rental car center. These fault traces generally are perpendicular with the elevated alignment running east-west.

The southern portion of the alignment through Pacific Highway runs within a mapped Alquist-Priolo Earthquake Fault Zone. The last section of the alignment from Santa Fe Depot to the Civic/Core ATC Station crosses an additional Alquist-Priolo Earthquake Fault Zone triggered by the presence of the San Diego fault. As such, the possibility of active faulting in this area is considered very high. The presence of active faults can have a significant impact to the project, particularly for structures that are classified for human occupancy. These may include, but are not limited to, passenger stations and the OMSF. Fault rupture hazard studies will be required to ensure that habitable structures are placed at a sufficient distance from active fault traces.

Groundwater elevations near areas of the alignment located closer to San Diego Bay are tidally influenced but are relatively close to the ground surface. The presence of a relatively shallow groundwater, when coupled with seismic ground motion and certain subsurface conditions, increases susceptibility to liquefaction, lateral spreading, and seismic settlements. Soil liquefaction occurs when saturated, cohesionless soils lose their stiffness and strength due to

the build-up of excess pore water pressure during cyclic loading, such as that induced by earthquakes. The primary factors affecting the liquefaction potential of a soil deposit are intensity and duration of earthquake shaking, soil type and relative density, overburden pressures, fines content, and depth to groundwater. Soils most susceptible to liquefaction are saturated loose sands and low plasticity to non-plastic silts. The potential consequences of liquefaction to structures include loss of bearing capacity, post-liquefaction settlement, slope instability, and surface sand boils. When combined with a sloping ground or “free faces,” such as bridge abutments, the loss of soil shear strength and stiffness that is associated with liquefaction can result in lateral spreading displacements (a form of seismic slope instability also known as “flow failure”) that can impose lateral loads upon the foundations and result in several feet of permanent soil lateral displacements.

Post-liquefaction seismic settlements occur when the excess pore water pressure induced by the seismic shaking dissipates and the soil readjusts in a new equilibrium condition. This typically occurs within a few seconds to minutes after the earthquake event. Post-liquefaction settlements can pose a significant hazard to structures founded on shallow foundations. The hydraulic fill soils and estuarine deposits in this area likely have a moderate to high potential for earthquake induced liquefaction, lateral spreading, and seismic settlement.

Farther from San Diego Bay, lateral spreading is less likely as the ground elevation rises and the soil conditions generally improve. The Bay Point Formation is generally considered medium dense to dense sandy soil and firm to very stiff clayey soil that is not prone to liquefaction during seismic events. The San Diego Formation may contain very dense and hard sandstone and conglomerate materials and is not considered to be prone to liquefaction.

Table S-20 provides a qualitative summary of the geologic and geotechnical conditions for the various components of this concept. Table S-21 includes an assessment of the favorability that each geotechnical/geologic condition is anticipated to have on the various project locations and alignment types.

Table S-20. South Route Hybrid Option Geologic and Geotechnical Conditions

LOCATION	UPPER SOIL LAYER COMPETENCY	DEPTH TO COMPETENT SOFT ROCK	ACTIVE FAULTING POTENTIAL	LIQUEFACTION POTENTIAL	LATERAL SPREADING POTENTIAL
Elevated ATC along N Harbor Dr	Very poor	Very Deep	Very high (3 to 4 perpendicular crossings)	Very High	High
Pacific Highway Alignment to Santa Fe Depot	Fair	Deep	Very High (3 to 4 oblique fault crossings)	Moderate	Low
Santa Fe Depot to Civic Center	Fair	Moderate	Very High (PCH and SD Faults cross)	Negligible	Negligible

Source: WSP 2023

Notes: ATC = Airport Transit Connector; PCH = Pacific Coast Highway; SD = San Diego

Table S-21. South Route Hybrid Option Geologic and Geotechnical Conditions Favorability Evaluation

LOCATION	UPPER SOIL LAYER COMPETENCY	DEPTH TO COMPETENT SOFT ROCK	ACTIVE FAULTING POTENTIAL	LIQUEFACTION POTENTIAL	LATERAL SPREADING POTENTIAL
Elevated ATC along N Harbor Dr	Low	N/A	Low	Very Low	Low
Pacific Highway Alignment to Santa Fe Depot	High	Low	Very Low	N/A	N/A
Santa Fe Depot to Civic Center	Medium	Medium	Very Low	N/A	N/A
Overall	Low				

Source: WSP 2023

Notes:

High: High favorability (geotechnical condition is highly favorable for this location and alignment type)

Medium: Medium favorability (geotechnical condition is favorable for this location and alignment type)

Low: Low favorability (geotechnical condition is not favorable for this location and alignment type)

Very Low: Very Low favorability (geotechnical condition is particularly not favorable for this location and alignment type)

ATC = Airport Transit Connector; N/A: Not Applicable (geotechnical condition is irrelevant for this location and alignment type)

S.8.5. Regulatory Considerations

The Regulatory Considerations for the South Route hybrid option would be the same as for the South Route aerial option with the addition of the following regulatory requirements necessary for tunneling as described below. Refer to Section S.3.5 for all other potential requirements associated with this option.

Occupational Safety and Health Standards

The Occupational Safety and Health Administration (OSHA) is the regulatory agency of the U.S. Department of Labor which ensures compliance with health and safety regulations for workers by enforcing standards and providing training, outreach, education, and assistance. The South Route hybrid option would include boring construction activities and would be subject to OSHA regulations.

Title 29, Subtitle B, Chapter XVII, Part 1926 of the CFR. Title 29, Part 1926 of the CFR includes the safety and health regulations during construction. Section 1926.800 details workplace safety regulations for underground construction. Underground bored tunnel construction would be subject to OSHA rules and regulations contained in Title 29 of the CFR regarding safety, air quality monitoring, hazardous materials, ventilation, fire prevention, and other activities.

S.9. Cost

S.9.1. Capital Cost

The capital costs estimate for the South Route hybrid option included the estimated costs for the following program components:

- Construction
- Vehicles
- Professional services
- Unallocated contingency (20%)

Prototypical Unit Price Elements were developed to represent anticipated guideway configurations (i.e., aerial, at-grade, and/or tunnel), stations, maintenance facilities, and enabling work. High-level estimates for vehicle acquisitions and allowances for professional services were also included. Refer to Appendix P for additional detail on the methodology used for the cost estimate.

At this stage of the project development process, costs were estimated in rough-orders-of-magnitude for purposes of comparing each concept to each other. The cost estimates are in 2022 dollars. Right-of-way costs were not included in these estimates. Table S-22 outlines the capital cost estimate, including a range from low to high.

Table S-22. South Route Hybrid Option Capital Cost

CONCEPT DESCRIPTION	COST IN MILLIONS (2022)		
	LOW	MID-POINT	HIGH
South Route ATC to Civic/Core (hybrid)	\$2,653.1	\$3,121.3	\$4,057.7

Source: WSP, HDR 2023

Note: ATC = Airport Transit Connector

S.9.2. Cost per Rider

The cost per rider was calculated using the 2050 ridership forecasts and capital costs developed for this study to provide a more direct comparison of concepts given the differences in the number of stations and locations served. Table S-23 summarizes the cost per rider estimates, including a range from low to high.

Table S-23. South Route Hybrid Option Cost Per Rider

CONCEPT	COST (2022)		
	LOW	MID-POINT	HIGH
South Route ATC to Civic/Core (hybrid)	\$11.62	\$13.36	\$17.37

Source: WSP, HDR 2023

Note: ATC = Airport Transit Connector

S.9.3. Cost per Mile

Cost per mile was calculated based on capital cost and the length of each concept in 2022 dollars. Table S-24 presents the cost per mile, including a range from low to high.

Table S-24. South Route Hybrid Option Cost Per Mile

CONCEPT DESCRIPTION	COST IN MILLIONS (2022)		
	LOW	MID-POINT	HIGH
South Route ATC to Civic/Core (hybrid)	\$934	\$1,099	\$1,429

Source: WSP, HDR 2023

Note: ATC = Airport Transit Connector

S.9.4. Operations and Maintenance

Estimation of annual Operations and Maintenance (O&M) costs associated with this option is outside of the scope of this study. However, a high-level comparative assessment of probable O&M cost in qualitative terms was undertaken. Table S-25 presents a qualitative assessment of the main O&M cost elements for the three technologies under consideration – ATC, Trolley (LRT), and bus. Among the various ATC concepts, O&M costs would generally increase as the alignment length, number of stations, and/or ridership increases. Additionally, underground alignments typically have higher O&M costs than aerial alignments due to the added cost of ventilation and fire suppression equipment. As shown in Table S-25, the ATC concepts would have high O&M cost for two of the seven elements: guideway infrastructure and energy consumption.

Table S-25. Operations and Maintenance Costs

COST DRIVER	ATC	TROLLEY (LRT)	ENHANCED BUS	ASSESSMENT
Guideway Infrastructure	\$\$\$	\$\$	\$	Extended underground ATC alignment would require added maintenance of ventilation and fire life safety systems. LRT concept would take advantage of using existing infrastructure along the Green Line and therefore would incur less maintenance cost. Bus infrastructure is shared with infrastructure owned by others and would have low infrastructure maintenance costs.
Operations and Support Staff	\$\$	\$\$\$	\$\$\$	Additional cost for personnel (salaries/insurance/medical etc.), including drivers/operators and associated support personnel. OMSF design and capacity requirements (restrooms/conference rooms/offices/utility costs) are also affected by the number of personnel required for operations. ATC vehicles are assumed to be automated (i.e., driverless).

COST DRIVER	ATC	TROLLEY (LRT)	ENHANCED BUS	ASSESSMENT
Vehicle Maintenance	\$\$	\$\$\$	\$	ATC vehicles operate at much shorter headways requiring higher vehicle count compared to LRT vehicles expected to operate on 15-minute headways. Buses would also have a higher vehicle count than LRT vehicles to provide comparable capacity; however, both ATC and LRT are more complex vehicles and more costly to maintain. Also, maintenance costs are lower for rubber-wheeled vehicles (ATC and bus). Special maintenance equipment is required for steel wheel truing and rail grinding. LRT vehicles also employ a pantograph system to collect power from an overhead catenary system requiring additional maintenance.
Energy Consumption	\$\$\$	\$	\$\$\$	The performance and frequency of ATC vehicles typically translates to higher energy consumption/demand. Energy cost for ATC vehicles might therefore be higher than that of LRT vehicles. Energy consumption for buses using internal combustion engines may be lower per vehicle, but the number of vehicles required would be much higher.
Systems	\$	\$\$	\$	Train control systems for LRT would include Automatic Train Protection but not Automatic Train Operation because trains are manually driven. Because a typical ATC uses vehicle location/communication dynamics (as well as Automatic Train Operation) for movement, authority wayside equipment such as signals/signs and associated cables are minimal. Enhanced bus service typically implements Transit Signal Priority over existing traffic control equipment requiring a nominal amount of maintenance.

Source: WSP and HDR 2022

Notes: ATC = Airport Transit Connector; LRT = light rail transit; OMSF = Operations, Maintenance and Storage Facility

S.10. Community Effects and Economic Benefits

The South Route hybrid option would have the same community effects and economic benefits as the aerial option. Refer to Section S.5.1 for details.