Santa Ana-Garden Grove Fixed Guideway Corridor

Appendix G

Paleontological Technical Memorandum

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Paleontological Technical Memorandum

in support of the

SANTA ANA AND GARDEN GROVE FIXED GUIDEWAY CORRIDOR STUDY

Santa Ana Regional Transportation Center (SARTC) to Harbor Boulevard

Prepared for
City of Santa Ana
in cooperation with
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Orange County Transportation Authority

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Chapter 1 Regulatory Setting

1.1 Federal

The Antiquities Act of 1906 has been used as the basis for federal protection of paleontological resources on federal lands. The Antiquities Act of 1906 authorizes the government to regulate any disturbance of objects of antiquity on federal lands through the responsible managing agency and to prosecute unauthorized damage or removal.

The National Environmental Policy Act of 1969 (NEPA) requires that important aspects of our national heritage be considered in assessing the environmental consequences of any proposed Project. While NEPA does not provide specific guidance regarding paleontological resources, the requirement that the federal agencies take all practicable measures to "…preserve important historic, cultural, and natural aspects of our national heritage…" is interpreted to apply to paleontological materials. Paleontological resources are treated in a manner similar to that used for cultural resources, but are not subject to the regulations set forth in Section 106 of the National Historic Preservation Act. The Federal Transportation Administration (FTA) is the lead agency under NEPA. Identify and remain consistent with FTA policies that are applicable to paleontological resources with regard to this proposed Project. (See Appendix A for a detailed project description.)

The Paleontological Resources Preservation Act (PRPA) of 2009 codifies the existing practice of requiring that vertebrate fossils and other rare and scientifically significant fossils be collected only by qualified researchers who obtain a permit. Permittees must agree to deposit the fossils in public institutions, which will ensure their future availability to researchers and the public.

1.2 State

The California Environmental Quality Act (CEQA) applies to projects within California. Guidelines for the implementation of CEQA define procedures, types of activities, persons, and public agencies required to comply with CEQA. Appendix G in Section 15023 provides an Environmental Checklist of questions that a lead agency should normally address if relevant to a proposed Project's environmental impacts. One of the questions to be answered in the Environmental Checklist (Section 15023, Appendix G, Section V, part c) is the following: "Would the project directly or indirectly destroy a unique paleontological resource or site?" Although CEQA does not define "a unique paleontological resource or site," Section 21083.2 defines "unique archaeological resources" as "…any archaeological artifact, object, or site about which it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria:

1. Contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information.
2. Has a special and particular quality such as being the oldest of its type or the best available example of its type.
3. Is directly associated with a scientifically recognized important prehistoric or historic event."

This definition is equally applicable to recognizing "…a unique paleontological resource or site." CEQA Section 15064.5 (a)(3)(D), which indicates "…generally, a resource shall be considered historically significant if it has yielded, or may be likely to yield, information important in prehistory or history…" provides additional guidance.

The legislation does not specifically address paleontological resources, but the Guidelines for the Implementation of CEQA, as amended in 2004, include a standard checklist that requires proponents and regulators to determine whether the proposed Project will directly or indirectly destroy a unique paleontological resource or site. A paleontological investigation is mandated if the answer to the question of the presence of paleontological resources is "yes" or "possibly". Section XVII, part a, of the CEQA Environmental Checklist asks a second question equally applicable to paleontological resources: "Does the project have the potential to…eliminate important examples of the major periods of California history or pre-history?" To be in compliance with CEQA, environmental impact assessments, statements, and reports must answer both these questions in the Environmental Checklist. If the answer to either question is yes or possibly, a mitigation and monitoring plan must be designed and implemented to protect significant paleontological resources.

The CEQA lead agency having jurisdiction over a project is responsible to ensure that paleontological resources are protected in compliance with CEQA and other applicable statutes. California Public Resources Code Section 21081.6, entitled Mitigation Monitoring Compliance and Reporting, requires that the CEQA lead agency demonstrate project compliance with mitigation measures developed during the environmental impact review process.

Other State requirements for paleontological resource management are in California Public Resources Code Chapter 1.7, Section 5097.5 (Stats. 1965, c. 1136, p. 2792), entitled Archaeological, Paleontological, and Historical Sites. This statute defines as a misdemeanor any unauthorized disturbance or removal of a fossil site or remains on public land, and specifies that State agencies may undertake surveys, excavations, or other operations as necessary on State lands to preserve or record paleontological resources. This statute would apply to any construction or other related project impacts that would occur on State-owned or State-managed lands.

1.3 Regional

The Southern California Association of Governments (SCAG) Regional Transportation Plan (RTP), updated in 2008, and the Regional Comprehensive Plan and Guide (RCPG), currently being updated, are tools used for identifying the transportation priorities of the Southern California region. The cultural resources mitigation program of the Transportation Section of the RTP includes a measure for monitoring construction activity in areas with moderate-to-high potential to support paleontological resources, and overseeing salvage operations of paleontological resources.

The County of Orange Municipal Code (1980) includes Sec. 2-5-27 for the protection of natural, cultural, structural, and archaeological resources. This code indicates that no person shall possess, destroy, injure, deface, remove, dig, or disturb from its natural state any fossilized or non-fossilized paleontological specimens, cultural or archaeological resources, or the parts thereof in any park, beach or recreational facility. No further municipal codes were available regarding the regulation.

1.4 Local

The Orange County Code of Ordinances, Sec. 2-5-227 protects paleontological resources by disallowing any person to possess, destroy, injure, deface, remove, dig, or disturb from its natural state any fossilized or non-fossilized paleontological specimens in any designated park. Sec. 2-5-240 of the Code of Ordinances requires a permit for the collection of paleontological specimens in any designated park without the permission of a consenting owner or operator or in performance of official duties.

The City of Santa Ana General Plan (reformatted 2010) Conservation Elements notes the City's goal to minimize damage to paleontological resources. The City of Santa Ana Municipal Code and City of Garden Grove Municipal Plan and General Plan (1995) do not specifically address paleontological resources.

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Chapter 2 Geographic Location

Overall, the proposed Project area is characterized by dense urban development within the Cities of Santa Ana and Garden Grove. The Project is located within the USGS 7.5-Minute Anaheim, Orange, Tustin, and Newport Beach Quadrangles. The western terminus of the Project is at UTM 11S 414807 mE/ 3736009 mN, Section 3 of Township 5 South, Range 10 West (S.B.B.M). The eastern terminus is at UTM 11S 420629 mE/ 3734896 mN, Section 7 of Township 5 South, Range 9 West (S.B.B.M).

With the exception of the OCTA ROW, which is primarily disturbed grass and dirt, the ground surface in the Project is overlain with asphalt, hardscape, landscaping, and existing buildings that date from the late nineteenth century to the present. The roadways have been built-up and few areas of native soil and vegetation exist.

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Chapter 3 Geologic Setting

The Project Study Area is located within the southeastern margin of the Los Angeles Basin of the northern Peninsular Ranges geomorphic province of California (Figure 3-1). The Peninsular Ranges geomorphic province of Southern California extends east from the Colorado Desert geomorphic province of Imperial and Coachella Valleys, north from the Transverse Ranges, and west tens of miles offshore into northwest-trending ridges and basins of the Continental Borderland. Physiographically, the northern section of the Peninsular Ranges Province is divided into three major fault-bounded blocks. From east to west these three blocks include the San Jacinto Mountains, Perris, and the Santa Ana Mountains block. The Santa Ana Mountains block extends eastward from the coast to the Elsinore fault zone.

The Project Study Area is within Orange Country coastal plain in the northern region of the Santa Ana Mountains block. The northern region of the Santa Ana block is underlain principally by the broad, northwest-plunging synclinal Los Angeles Basin. The Los Angeles Basin is a northwest-trending structural trough, which includes up to 4,200 feet of relatively unconsolidated Pleistocene-aged marine and non-marine sediments and up to 170 feet of unconsolidated non-marine sediments (CGS, 1997). The Los Angeles Basin is bounded by active reverse and left-lateral faults of the Transverse Ranges to the north, and by active right-lateral faults of the Peninsular Ranges to the northeast and southwest (Grant et al., 1999). The Los Angeles Basin culminates abruptly with the Newport-Inglewood Uplift (USGS, 2004).

The Project Study Area is west of the Santa Ana Mountains and north of San Joaquin Hills within southern margin of the Orange County coastal plain. The San Joaquin Hills area a topographic expression of folded and faulted Neogene-aged marine strata, overlain by Quaternary-aged marine terrace deposits and alluvial sediments of the Orange County coastal plain (USGS, 2004). The hills of anticlinal folds within broadly warped mesas along the coast represent uplifted areas along the Newport-Inglewood structural zone. These mesas are comprised of Quaternary–aged alluvial and fluvial deposits which are deeply incised courses by the ancestral Santa Ana River system of latest Pleistocene through the Holocene (CGS, 1997). The Project site lies near the lower reaches of the present location of the Santa Ana River.

The Project Study Area is mostly underlain by late Quaternary-aged unconsolidated deposits of young alluvial fans (Qyf) from the Santa Ana River alluvial system. The young alluvial fan deposits consist predominantly of gravel, sand, and silt. The Santa Ana River crossing area is underlain mostly by late Holocene-age wash deposits (Qw) consisting of unconsolidated bouldery to sandy alluvium. It is anticipated that some of the underlying material within the Study Area will have some and clay-bearing soil horizons, and localized artificial fill comprised of native alluvial soils.

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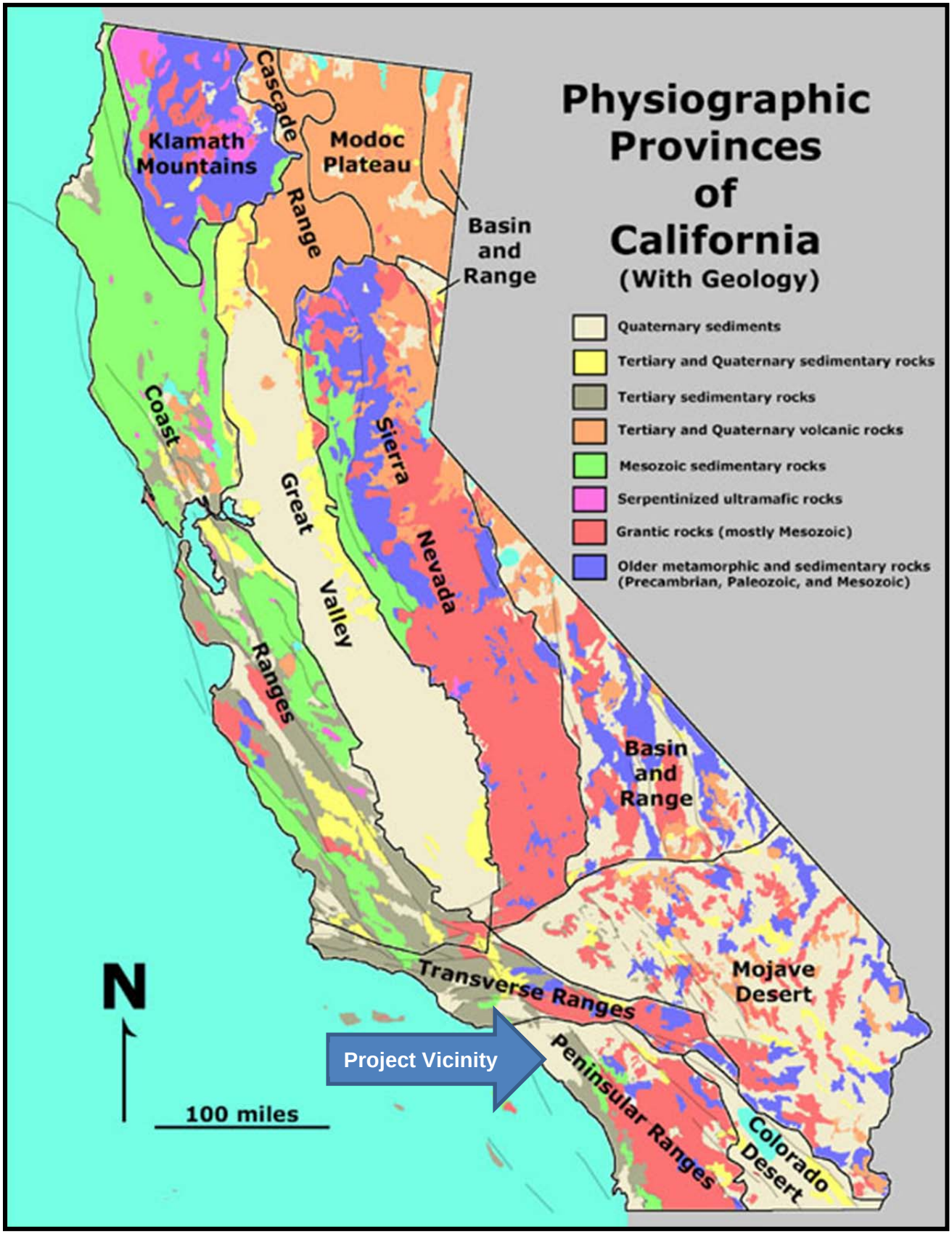
Physiographic Provinces of California



Source: Stoffer, et. al 2005

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Chapter 4 Resource Inventory Methods

This study utilized multiple sources of information to assess the known and potential paleontological sources that could be affected or impacted by the proposed Project. These include:

- A Paleontological Records Search through the Natural History Museum of Los Angeles County which includes the records of the Page Museum of La Brea Discoveries;
- Published Geologic maps;
- Published documents describing the area geology and paleontological resources;
- Previously prepared unpublished environmental documentation for related projects; and
- Unpublished documents prepared for various other planned and constructed projects in the vicinity of the possible alignments of the proposed Project.

A paleontological review was conducted for the proposed Project area, with the Natural History Museum of Los Angeles County on June 13, 2011. According to the Natural History Museum of Los Angeles County, the proposed Project area has no vertebrate fossil localities, but there are localities nearby from the same sedimentary units that occur as subsurface deposits in the proposed Project area. The proposed Project area is comprised of younger terrestrial Quaternary Alluvium derived from the Santa Ana River floodplain that extends through the western portion of the proposed Project area, with older terrestrial Quaternary sediments occurring at various depths. The younger Quaternary deposits typically do not contain significant vertebrate fossils, at least in the uppermost layers, but vertebrate fossil locality, LACM 1652, due north of the eastern portion of the proposed Project area (on the western side of the Santa Ana River along Rio Vista Avenue south of Lincoln Avenue) produced a fossil specimen of sheep, *Ovis.* The closest fossil locality is older Quaternary sediments, LACM 4943, situated almost due east of locality LACM 1653, along Fletcher Avenue east of Glassell Street, and east of the Santa Ana River. This locality produced a specimen of fossil horse, *Equus*, at a depth of 8-10 feet below the surface, from the adjacent Rio Hondo to the west, and the San Gabriel River and Walnut Creek to the east. Surface grading or shallow excavations in the uppermost few feet of the younger Quaternary alluvial sediments in the proposed Project area are unlikely to uncover significant fossil vertebrate remains. Deeper excavations in the proposed Project area, however, may well encounter significant vertebrate fossils in older Quaternary sediments.

Correspondence with the Natural History Museum of Los Angeles County is provided in Appendix B.

Given the densely built environment throughout most of the corridor and alternative alignments, only limited information can be gained through a field survey. Aerial photos of the alternative alignments and adjacent areas were scrutinized for areas where surficial geology might be observed. As part of the field efforts, between June and July 2011, investigators performed a pedestrian survey along both sides of the SAFG alignment, with a focus on finding areas—either through current construction activities or through existing geologic exposures—where indications of native (natural) geologic units could be observed. Results of geotechnical

investigations for the alternative alignments, which supplied the most reliable information in areas where no surface exposures were present, were also used to assist in the analysis.

Chapter 5 Resource Assessment Criteria

The Society of Vertebrate Paleontology (SVP) is an international scientific organization of professional vertebrate paleontologists. The Society has established standard guidelines (SVP, 1995, 1996) that outline acceptable professional practices in the conduct of paleontological resource assessments and surveys, monitoring and mitigation, data and fossil salvage, sampling procedures, specimen preparation, identification, analysis, and curation. Most practicing professional paleontologists in the nation adhere closely to the SVP's assessment, mitigation, and monitoring requirements as specifically addressed in its standard guidelines. The SVP's standard guidelines were approved by a consensus of professional paleontologists and are the standard against which all paleontological monitoring and mitigation programs are judged. Many federal and California state regulatory agencies have either formally or informally adopted the SVP's "standard guidelines" for the mitigation of construction-related adverse impacts on paleontological resources as a measure of professional practice.

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Chapter 6 Impact Analysis

Excavation and ground disturbance areas are expected to be fairly limited for both Build Alternatives for this Project. The Build Alternatives, including the Initial Operable Segments and all other design options, are described in further detail in Appendix A of this report.

In most areas, ground disturbance would not be more than 5' beneath the existing surface. Near Raitt Street, ground disturbance may slightly exceed 5’ to accommodate drainage improvements. Additionally, for the bridge over the Santa Ana River, excavation will be limited to 8’ (not inclusive of potential pile driving methods that do not result in excavated soils).

The destruction or dispersion of a fossil deposit as a result of uncontrolled excavations in sediment with moderate or high paleontological sensitivity would be a significant impact or adverse effect to non-renewable paleontological resources that possess both scientific as well as educational values. Because those values are scientific and educational, they can be largely recovered by the controlled collection and investigation of fossils after discovery, and by their curation into a qualified museum. With these measures, the resources would be available for subsequent scientific study and educational use, and the values of the resource largely realized. Therefore, mitigation measures Pale-MM#1 through Pale-MM#3 will reduce potential significant impacts to paleontological resources to a level that is less than significant and avoid adverse effects.

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Chapter 7 Standard Conditions, Avoidance, Minimization, and/or Mitigation Measures

While disturbance in the younger Quaternary Alluvium in the vicinity of the Project is unlikely to encounter significant vertebrate fossils, any substantial excavations, particularly in the older Quaternary Alluvium in the proposed Project area should be monitored for paleontological resources, including microvertebrate fossils. Therefore, the following measures should be applied to reduce potential impacts to paleontological resources to a less than significant level, and to avoid adverse effects to paleontological resources.

SC-PA-A: Engage Paleontological Resources Specialist to Direct Monitoring during Construction

At least 120 days prior to construction, a paleontological resource specialist (PRS) will be designated for the Project. It will be the responsibility of the PRS to determine where and when paleontological resources monitoring should be conducted. Paleontological resources monitors (PRMs) will be selected by the PRS based on their qualifications, and the scope and nature of their monitoring will be determined and directed based on this Paleontological Resource Monitoring and Mitigation Plan (PRMMP). The PRS will be responsible for developing and implementing the Worker Environmental Awareness Program Training. All management and supervisory personnel and construction workers involved with ground-disturbing activities will be required to take this training prior to beginning work on the Project and will be provided with the necessary resources response in case paleontological resources are found during construction. Under CEQA Guidelines Section 15064.5, any object, building, structure, site, area, place, record, or manuscript which a lead agency determines to be historically significant or significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California may be considered to be an historical resource, provided the lead agency's determination is supported by substantial evidence in light of the whole record. According to this definition, paleontological resources are considered historical resources for the purposes of CEQA. As such, the PRS will document any discoveries as needed, evaluate the potential resource, and assess the significance of the find under the criteria set forth in CEQA Guidelines Section 15064.5.

SC-PA-B: Prepare and Implement a Paleontological Resource Monitoring and Plan (PRMMP)

Paleontological monitoring and mitigation measures are restricted to those construction-related activities that will result in the disturbance of paleontologically-sensitive sediments. The PRMMP will include a description of when and where construction monitoring will be required; emergency discovery procedures; sampling and data recovery procedures; procedures for the preparation, identification, analysis, and curation of fossil specimens and data recovered; preconstruction coordination procedures; and procedures for reporting the results of the monitoring program.

In general, the monitoring program will reflect site-specific construction of the selected option. The PRMMP will be consistent with Society of Vertebrate Paleontology (SVP, n.d.) guidelines for the mitigation of construction-related impacts and effects to paleontological resources. The PRMMP will also stipulate the requirements of the designated repository for any fossils collected.

If fossil or fossil-bearing deposits are discovered during construction, excavations within 50 feet of the find will be temporarily halted or diverted until the discovery is examined by a qualified paleontologist [in accordance with SVP standards (SVP 1995)]. The paleontologist will notify the appropriate agencies to determine procedures that will be followed before construction will be allowed to resume at the location of the find. If the Project proponent determines that avoidance is not feasible, the paleontologist will prepare an excavation plan for mitigating the impact and effects of the Project on the qualities that make the resource important. The plan will be submitted to the Project proponent for review and approval prior to implementation.

SC-PA-C: Halt to Construction when Paleontological Resources are Found

Regardless of the individual making a paleontological discovery, the first thing that will occur is that construction activity in the immediate vicinity of the discovery will cease. This requirement will be spelled out in the Worker Environmental Awareness Program. Construction activity may continue elsewhere provided that it continues to be monitored as appropriate. If the discovery is made by someone other than a paleontological monitor or the PRS, a paleontological monitor or the PRS will immediately be notified.

Chapter 8 Cumulative Impacts

Paleontological resources refer to “any fossilized remains, traces, or imprints of organisms, preserved in or on the earth's crust, that are of paleontological interest and that provide information about the history of life on earth, except that the term does not include materials associated with an archaeological resource and any cultural item (per 16 USC 470aaa).”

Cumulative impacts to paleontological resources are directly related to the presence and significance of these resources within the area of direct effect. The paleontological resources assessment prepared for the proposed Project did not identify any previously or newly recorded paleontological resources within the boundaries of the proposed Project area. Given the lack of direct impacts to significant paleontological resources associated with the proposed Project, and the proposed mitigation measures, no significant cumulative impacts are anticipated as a result of concurrent construction activities in the area.

While numerous planned projects could encounter paleontological resources (See table below), these projects are subject to CEQA-level environmental review and include provisions to preserve significant paleontological resources. Consequently, impacts to significant or potentially significant paleontological resources can typically be mitigated through the avoidance of important paleontological resources, and the development and implementation of a data recovery plan. During future project development, these measures could lessen cumulative impacts to paleontological resources, and, therefore, cumulatively considerable impacts to paleontological resources are not expected to occur.

Table 8-1: Santa Ana and Garden Grove Fixed Guideway - Cumulative Projects List

Compiled 7-21-11

No.	Project	Description/ Land Use	No. of u or square feet (sf)	Location	Primary APN
Approved					
1	Alliance Church of Orange	Church addition (gym/classroom), *approved 2009*	21,000 sf	2130 N. Grand Ave.	396-191-44
2	Christ Our Savior Cathedral	Sanctuary (2,800-seat), *approved 2005*		2001 W. McArthur Blvd.	140-061-94
3	Discovery Science Center Ph. II	IMAX theatre (275-seat), *approved 2002*		2032 N. Main St.	399-102-09
4	Lyon Homes	Residential (Condo), *approved 2011*	300 u	100-130 E. McArthur Blvd.	411-081-26
5	Promenade Point	Residential (Condo), *approved 2005*	194 u	200 E. First American Wy.	411-074-03
6	CVS/Sav-On Drug Store	Pharmacy, drive through, *approved 2008*	15,836 sf	115 N. Harbor Blvd.	198-182-22
7	Skyline Phase II	Residential (Condo), *approved 2005*	150 u	10 E. Hutton Ctr.	411-081-28
8	Vista Del Rio	Residential, approved 2009	41 u	1600 W. Memory Ln.	101-055-27
9	Xerox Tower II	Office, approved 2001	210,000 sf	200 N. Cabrillo Park Dr.	400-071-03
10	YMCA	Recreational Facility, *approved 2007*	32,000 sf	2100 W. Alton Ave.	140-061-91
11	1306 W. Santa Ana Blvd.	Medical/Office Building, *approved 2011*	6,000 sf	1306 W. Santa Ana Blvd.	007-183-08
12	Grand Avenue Widening NOTE: Specifically included in SAFG No Build Description	Roadway Widening		First St. to Fourth St.	Multiple APNS
13	Broadway Reconstruction	Street Reconstruction		Civic Center Dr. to Santa Clara St.	Multiple APNS
14	Bristol Street Widening NOTE: Specifically included in SAFG No Build Description	Street Widening		Warner Ave. to Memory Ln.	Multiple APNS
15	First and Cabrillo Towers	Residential (Condo), *approved 2007*	374 u	1901 E. First St.	400-081-08
16	Related Co. Apartments	Residential (Apartments)	74 u	611 E. Minter St.	398-301-07
A	First Street Widening Source: RTIP / RTP. Specifically included in SAFG No Build Description	Roadway widening from 4 to 6 Lanes		Susan St. to Fairview St.	Multiple APNS
B	Transit Zoning Code NOTE: Specifically included in SAFG No Build Description	Land Use/Zoning Overlay, *approved 2010*		eastern third of SAFG Project area	Multiple APNS
Application Under Review					
17	C & C Affordable Housing Project	Residential (Apartments)	36 u	605 E. Washington Ave.	398-151-12
18	Dayton Commercial Center	Commercial	7,275 sf	W. Edinger Ave.	408-273-11
19	Dr. Bui Medical Building	Medical Office	6,500 sf	202 N. Euclid Ave.	099-223-26
20	Francis Xavier	Residential (Affordable/Special Needs)	12 u	801 E. Santa Ana Blvd.	398-303-04
21	Related Co. Apartments	Residential (Apartments)	13 u	714 E. Santa Ana Blvd.	398-312-18
22	Related Co. Apartments	Residential (Apartments)	12 u	801 E. Brown St.	398-312-09
23	Related Co. Apartments	Residential (Apartments)	12 u	806 E. Santa Ana Blvd.	398-313-02

No.	Project	Description/ Land Use	No. of u or square feet (sf)	Location	Primary APN
24	Related Co. Site A	Residential (Rowhouse)	6 u	501-515 E. Fifth St.	398-332-06
25	Related Co. Site B	Residential (Rowhouse)	9 u	606-620 E. Fifth St.	398-228-02
26	Related Co. Site C1 & C2	Residential (Rowhouse and duplex)	6 u	601-607 E. Fifth St.	398-333-01
27	Related Co. Site D	Residential (Rowhouse)	4 u	615-621 E. Fifth St.	398-333-05
28	Related Co. Site E	Residential (Duplex)	2 u	712 E. Fifth St.	398-337-03
29	Santa Ana Blvd. Spec. Plan Area	Mixed-used	600 u	Santa Ana Blvd.	398-311-14
30	The MET at South Coast	Residential (Condo) (five- and six-story over parking)	TBD	200 E. First American Wy.	411-074-03
31	TAVA Homes	Residential (Single Family)	24 u	1584 E. Santa Clara Ave.	396-052-14
32	Town and Country Independent Living	Residential (Condo)	144 u	555 E. Memory Ln.	041-213-04
33	Vista Del Rio	Residential (Apartments/Special needs)	41 u	1600 W. Memory Ln.	101-055-27
34	1100 S. Grand Ave.	McDonald's with drive through	3,838 sf	1100 S. Grand Ave.	011-263-02
35	3312 W. First St.	Office (two-story)	29,000 sf	3312 W. First St.	144-341-07
36	630 S. Hathway St.	Industrial (two-story)	4,100 sf	630 S. Hathaway	011-311-04
C	Santa Ana Blvd. Grade Separation NOTE: PSR / conceptual engineering is in process. City of Santa Ana is lead. Not included in SAFG No Build	Reconstruct Santa Ana Blvd. at Metrolink railroad tracks		north of SARTC	Multiple APNS
D	SARTC Expansion / Redevelopment NOTE: Master Planning Stage - Santa Ana is lead, funded by OCTA Go Local. Not included in SAFG No Build	Intermodal Transportation Center / Land Use Development		SARTC and surrounding parcels including east of existing Metrolink tracks	Multiple APNS
E	PE Major Arterial NOTE: RSTIS completed. OCTA to issue RFQ for PSR phase in 2011. OCTA is lead. Project is listed as part of the MPAH. Not included in SAFG No Build	New four-lane roadway in PE ROW / ramps to SR-22		PE ROW, from SR-22 to Raitt St.	Multiple APNS
F	Class II bike lane on Civic Center Dr. NOTE: City of Santa Ana is lead and planning concept for this bike lane has been identified. Not in SAFG No Build, but design for SAFG Streetcar Alternative 2 accounts	Early planning stages (per Citywide bicycle program)		TBD - on Civic Center Dr.	Multiple APNS
G	Class I bicycle facility on PE ROW NOTE: No work has been completed. Not in SAFG No Build list.	OCTA and County of Orange Bicycle Master Plan only.		Harbor Blvd. to Raitt	Multiple APNS

No.	Project	Description/ Land Use	No. of u or square feet (sf)	Location	Primary APN
Under Construction					
37	Alton Court	Residential (Single Family)	38 u	3321 S. Fairview St.	414-171-01
38	Wintersburg Presbyterian Church	Classrooms, Gym, Outreach Center	24,348 sf	2000 N. Fairview St.	101-652-13
39	Audi Dealership	Commercial, addition to showroom	7,700 sf	1425 S. Auto Mall Dr.	402-101-37
40	Courtyard by Marriot Hotel	Hotel (155 rooms)	100,000 sf	8 McArthur Pl.	411-081-28
41	Downtown Artist Lofts III	Artist Live/Work Lofts	16 u	SWC Main/Third St.	398-601-02
42	Dr. Do Medical Office	Office (two-story)	6,000 sf	4718 W. First St.	108-101-45
43	Goodwill Industries	Office/Industrial	12,000 sf	410 N. Fairview St.	405-222-04
44	Latino Health Access	Community Center	3,074 sf	602 E. Fourth St.	398-481-05
45	Santa Ana Express Car Wash	Drive-through car wash		202 E. First St.	398-51-401
46	Olen Properties (Parkcenter)	Office (one and two-story)	29,170 sf	601 N. Park Center Dr.	400-042-04
47	One Broadway Plaza	Office (37-story)	518,000 sf	1109 N. Broadway	398-561-07

Source: City of Santa Ana Planning Department Aug. 2011

Notes:
Unit (u), Not Applicable (N/A)
Projects A - G are reasonably foreseeable, but note that Projects C – F are not yet funded and committed.
Projects A and B have been approved. Projects C - F are in various stages of early project development.
Project Number: 12-14 retrieved from City of Santa Ana Capital Improvement Program FY 09-10 CIP Projects by Category (http://www.ci.santaana.ca.us/finance/budget/1011/10-11_proposed_annual_budget.pdf)

Chapter 9 References

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Appendix A: Detailed Project Description

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Project Description

The alternatives addressed in this EA/DEIR consist of a No Build Alternative, which is used as a basis for comparing the costs and benefits of the three alternatives, TSM, Streetcar 1 and Streetcar 2, each of which responds to purpose and need, study goals, and community input. Additional details are provided below.

Project Location

The Study Area is located in the Cities of Santa Ana and Garden Grove, in Orange County, California. The transit corridor is regionally located in central Orange County, California and directly accesses both the Los Angeles-San Diego (LOSSAN) rail corridor and the Pacific Electric Right-of-Way (PE ROW) rail corridor. The Study Area is generally bounded by Harbor Boulevard to the west, 17th Street/Westminster Avenue to the north, Grand Avenue to the east, and 1st Street to the south. The approximate foul-mile transit corridor extends from the Harbor Boulevard/Westminster Avenue intersection in the City of Garden Grove at its western terminus to the Santa Ana Regional Transportation Center (SARTC) in the City of Santa Ana at its eastern terminus. **Figures A-1** and **A-2** provide the Regional Location and Study Area maps, respectively

No Build Alternative

The No Build Alternative includes existing conditions, as well as conditions that would be reasonably expected to occur in the foreseeable future without implementation of any of the build alternatives. The No Build Alternative provides the basis for comparing future conditions resulting from other alternatives. Conditions in the foreseeable future (through planning horizon year 2035) include projects that (1) have environmental analysis approved by an implementing agency and (2) have a funding source identified for implementation.

Other projects in the foreseeable future include:

- Implementation of the Transit Zoning Code (SD 84A and SD 84B), both project-level and program-level components, that are anticipated for build-out by 2028
- Implementation of the Station District Development Projects, which consist of a variety of residential develop projects, community open space and some limited neighborhood-serving commercial development
- Transit improvements including modest adjustments to existing local bus routes; and expanded Metrolink service
- Three, new bus rapid transit routes: (1) Harbor Boulevard Bus Rapid Transit Corridor [Costa Mesa to Fullerton, 10-minute headways, peak period]; (2) Westminster/17th Street Bus Rapid Transit Corridor [Santa Ana to Long Beach, 10-minute headways, peak period]; and (3) Bristol Street Bus Rapid Transit Corridor [Irvine Transportation Center to Brea Mall, 10-minute headways, peak period]
- Roadway improvements including the Bristol Street Widening project, which will widen Bristol Street from four to six lanes between Warner Avenue and Memory Lane, and the

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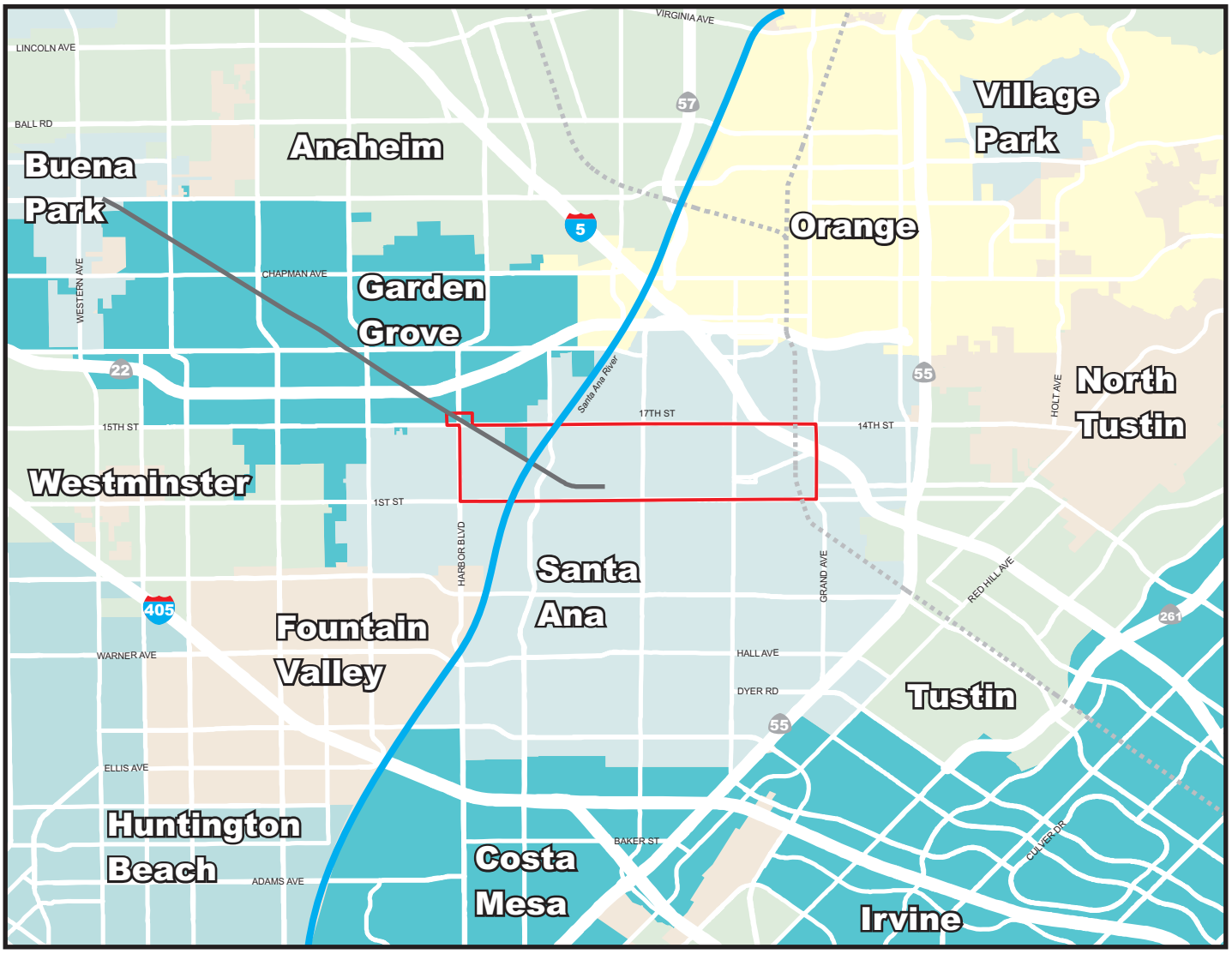
Location Map



LEGEND:

- Study Area
- PE ROW
- Metrolink/Amtrak Rail Line

0 1.1 2.2 MILES

NORTH

Source: Cordoba Corporation, *Draft Alternatives Analysis Report for the Santa Ana-Garden Grove Fixed Guideway Corridor Study,* July 11, 2012; updated by Terry A. Hayes Associates Inc., August 2012.

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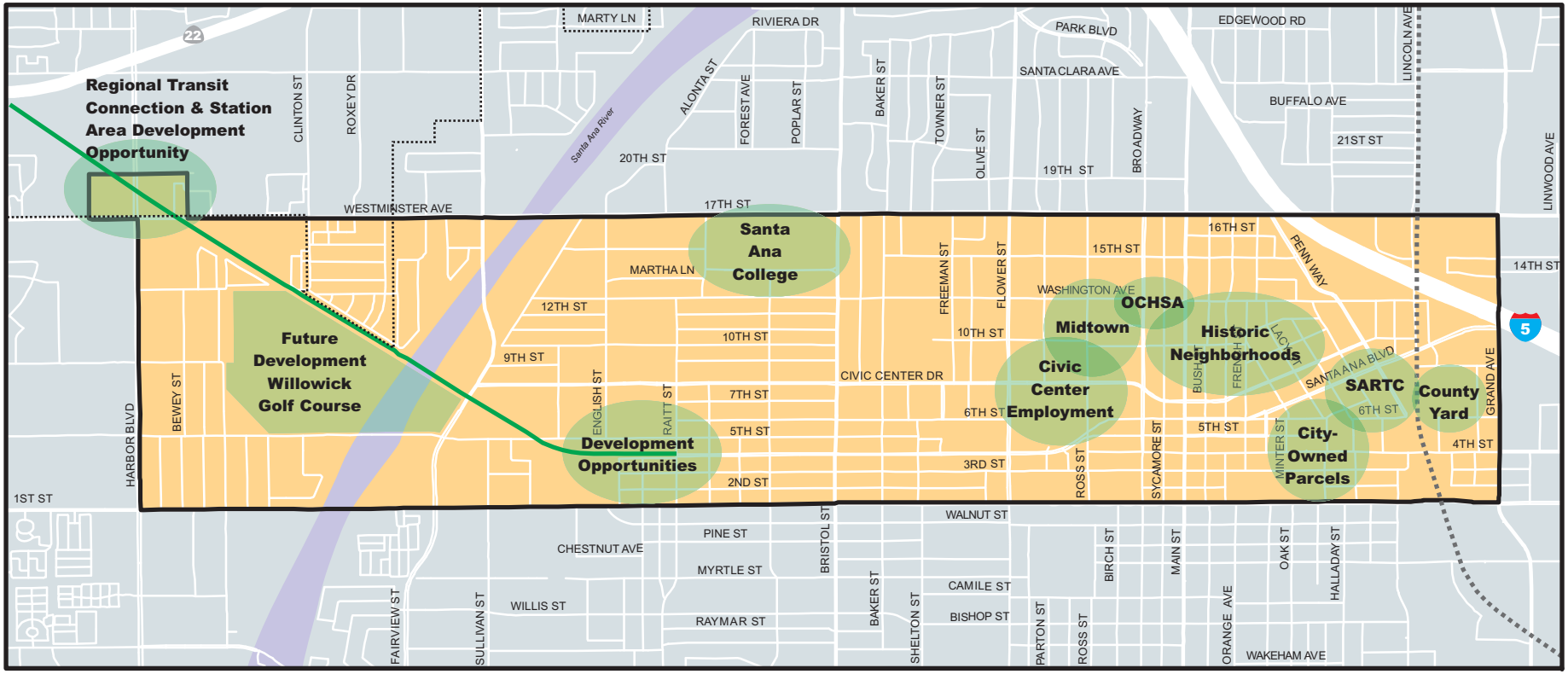
Study Area



LEGEND:

- Study Area
- Activity Center
- PE ROW
- Metrolink/Amtrak Rail Line
- Boundary of City of Garden Grove

NORTH

0 1500 3000 FEET

Source: Cordoba Corporation, *Draft Alternatives Analysis Report for the Santa Ana-Garden Grove Fixed Guideway Corridor Study,* July 11, 2012; updated by Terry A. Hayes Associates Inc., August 2012.

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- Grand Avenue Widening project, which will widen Grand Avenue from four to six lanes between 1st Street and 17th Street

TSM Alternative

The TSM Alternative enhances the mobility of existing transportation facilities and transit network without construction of major new transportation facilities or significantly, costly physical capacity improvements. Consistent with FTA guidelines, the TSM Alternative emphasizes low cost (i.e., small physical) improvements and operational efficiencies such as focused traffic engineering actions, expanded bus service, and improved access to transit services. Included within the TSM Alternative are modifications and enhancements to selected bus routes in the Study Area including:

- Skip-stop overlay service on 1st Street (Route 64) which includes access to SARTC
- A new route between SARTC and Harbor Boulevard/Westminster Avenue via Civic Center Drive, Bristol Street and 17th Street/Westminster Avenue, providing 10-minute peak and 20-minute off-peak service
- Expanded service span for StationLink service (Route 462) between SARTC and the Civic Center, providing 15-minute service during both peak and off-peak hours.

Figure A-3 is a map of the proposed routes for the TSM bus network enhancements.

In addition, the following system operational improvements are included in the TSM Alternative:

- Traffic signal timing improvements at select congested locations along Santa Ana Boulevard and Civic Center Drive to provide for enhanced east-west bus flow, potential including but not limited to:
    - Main Street at Civic Center Drive
    - Broadway at Civic Center Drive
    - Flower Street at Civic Center Drive
    - Fairview Street at Civic Center Drive
    - Santa Ana Boulevard at Santiago Street
    - Santa Ana Boulevard at Lacy Street (install traffic signal)
- Real-time bus schedule information at high-volume transit stops (e.g., Flower Street and 6th Street, Santa Ana Boulevard and Main Street)
- Improvements to transit stop amenities (benches, shelters, kiosks, sidewalk connections, etc.) along the Santa Ana Boulevard and Main Street corridors
- Improvements to bicycle and pedestrian circulation to promote safe, convenient and attractive connectivity between the transit system and surrounding neighborhoods and activity centers , including accommodating bicycles on all buses, providing real time bus arrival information via internet and mobile devices, installing bicycle storage facilities at SARTC and the Harbor/Westminster stop, and providing study area maps/walking guides on all buses

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Transportation Systems Management (TSM) Alternative

Source: Cordoba Corporation, *Draft Alternatives Analysis Report for the Santa Ana-Garden Grove Fixed Guideway Corridor Study,* July 11, 2012; updated by Terry A. Hayes Associates Inc., August 2012.

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Streetcar Alternative 1

Streetcar Alternative 1 would utilize the PE ROW through the western half of its alignment and generally operate along Santa Ana Boulevard and 4th Street on the way to SARTC. The 4.1-mile alignment for Streetcar Alternative 1 would include 12 stations. It is anticipated that the streetcar system would operate seven days a week with 10-minute headways during peak periods and 15-minute headways during off-peak periods. The streetcars would be electrically powered using an overhead contact system and a series of TPSS located intermittently along the alignment. Although the specific vehicle has not been selected at this preliminary stage, streetcars generally have a capacity of 30 to 40 seated passengers and 80 to 90 standing passengers for a total of 120 to 130 passengers. **Table A-1** provides a summary description of the key physical and operational attributes of Streetcar Alternative 1 (PE ROW with Santa Ana Boulevard and 4th Street Couplet). **Figure A-4** provides a conceptual illustration of the alignment for Streetcar Alternative 1 relative to the existing street network within the Study Area.

Sasscer Park Alignment

In Streetcar Alternative 1, the Downtown Santa Ana segment features couplet operations with the westbound streetcar alignment on Santa Ana Boulevard and the eastbound streetcar alignment on 4th Street. For the eastbound transition from Santa Ana Boulevard to 4th Street, a direct route from Santa Ana Boulevard along a public easement on the southern edge of Sasscer Park to 4th Street has been identified in **Figure A-5**.

Streetcar Alternative 2

Streetcar Alternative 2 would utilize the PE ROW through the western half of its alignment and substantially operate along Santa Ana Boulevard, Civic Center Drive, and 5th Street along the eastern half of the alignment to SARTC. The operational characteristic of this alternative are identical to Streetcar Alternative 1. The differences between the two streetcar alternatives are the alignment and the fact that Streetcar 2 would have one additional station for a total of 13. **Table A-2** provides a summary description of the key physical and operational attributes of Streetcar Alternative 2 (PE ROW with Santa Ana Boulevard and 5th Street/Civic Center Drive Couplet). This table also includes station locations for comparison to station locations for Streetcar Alternative 1 shown in Table A-1, above. **Figure A-6** provides a conceptual illustration of the alignment for Streetcar Alternative 2 relative to the existing street network within the Study Area.

Civic Center Bike Lane

The Streetcar Alternative 2 alignment travels westbound through the Civic Center along Civic Center Drive between Spurgeon and Flower Streets. As part of the City of Santa Ana's Complete Streets Program, and not as part of the SA-GG Fixed Guideway, the City plans to construct bicycle lanes are along Civic Center Drive. Streetcar Alternative 2 would acquire additional ROW (**Figure A-7**) in order not to preclude the westbound bike lane.

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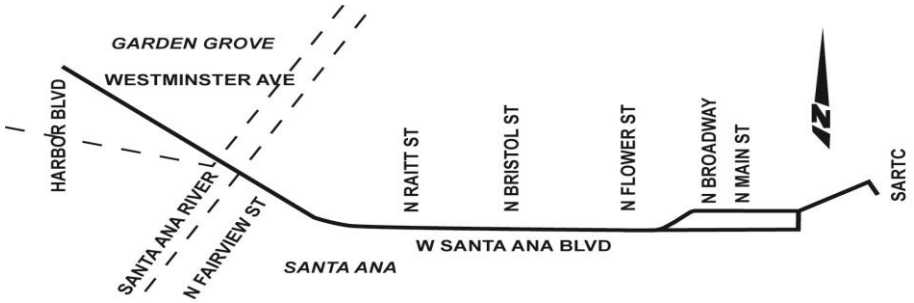
TABLE A-1: KEY PHYSICAL AND OPERATIONAL ATTRIBUTES OF STREETCAR ALTERNATIVE 1		
Key Attributes	**Descriptions**	
Transmit Mode	Streetcar	
Termini	Western Terminus: Harbor Blvd. Eastern Terminus: SARTC	
Alignment Description	<u>Routing by Segment:</u> • PE ROW, from Harbor Blvd. to Raitt St.: streetcars operate at-grade, bi-directionally, in exclusive ROW. • Santa Ana Blvd., from Raitt St. to Ross St.: streetcars operate in the street, at-grade, bi-directionally, along with mixed-flow traffic. • 4th St./Santa Ana Blvd. Couplet, from Ross St. to Mortimer St.: streetcars operate in the street, at-grade, one-way, along with mixed-flow traffic. • Santa Ana Blvd., from Mortimer St. to SARTC: streetcars operate in the street, at-grade, bi-directionally, along with mixed-flow traffic.  	
Length of Alignment	4.1 miles (Harbor Blvd. to SARTC)	
Stations (12 Stations)	<u>Station Locations:</u> 1. Harbor Blvd. and Westminster Ave. 2. Willowick 3. Fairview St. and PE ROW 4. Raitt St. and Santa Ana Blvd. 5. Bristol St. and Santa Ana Blvd. 6. Flower St. and Santa Ana Blvd.	
	Couplet Section (Eastbound) 7E. Sasscer Park 8E. Broadway and 4th St. 9E. Main St. and 4th St. 10E. French St. and 4th St.	*Couplet Section (Westbound)* 7W. Ross St. and Santa Ana Blvd. 8W. Broadway and Santa Ana Blvd. 9W. Main St. and Santa Ana Blvd. 10W. French St. and Santa Ana Blvd.
	11. Lacy St. and Santa Ana Blvd. 12. SARTC	

TABLE A-1: KEY PHYSICAL AND OPERATIONAL ATTRIBUTES OF STREETCAR ALTERNATIVE 1	
Key Attributes	**Descriptions**
Design Options Carried Forward	Santa Ana River Crossing: • Adjacent Single Track Bridge Option
	4th Street Parking Scenarios: • Scenario A: South side parallel • Scenario B: South side removal • Scenario C: South side and north side removal
Headways	Peak: 10 minutes (6:00 a.m. to 6:00 p.m.) Off-Peak: 15 minutes (after 6:00 p.m.)
Hours of Operation (in revenue service)	Monday – Thursday: 6:00 a.m. to 11:00 p.m. (17 hours) Friday and Saturday: 6:00 a.m. to 1:00 a.m. (19 hours) Sunday: 7:00 a.m. to 10:00 p.m. (15 hours)
Transit Vehicle	Streetcar – Vehicle type selection has yet to be determined. The two classifications under consideration include: • Classic Modern Streetcar (e.g., Portland, Oregon) • CPUC Compliant Streetcar (e.g., San Diego, California)
Power Source	Electric, Overhead Contact System, Traction Power Substations (TPSS) TPSS Locations: a. Northwest of Harbor Boulevard and Westminster Avenue b. Along PE ROW, west of Susan Street c. Along PE ROW, east of Santa Ana River d. North on Santa Ana Boulevard. East of Bristol Street e. North of 5th Street, east of Main Street
Operations and Maintenance Facility Sites	Two Candidate Sites: • Site A: South of SARTC, bordered by 4th St., 6th St., Poinsettia St., and Metrolink tracks. • Site B: West of Raitt St., between the PE ROW and 5th Street
Major Bicycle and Pedestrian Features	• Sidewalk and pedestrian improvements in the vicinity of proposed station platforms. • 4th St.: In conjunction with on-street parking modifications, widen sidewalks on 4th St. between Ross St. and French St.: – Scenario A: On south side by 8 ft. for a total width of 20 ft. – Scenario B: On south side by 16 ft. for a total width of 28 ft. – Scenario C: On both sides by 16 ft. for a total width of 28 ft.

Source: Cordoba Corporation, Conceptual Design Plan Set, August 2011.

Streetcar Alternative 1 Alignment

LEGEND:

- Study Area
- Proposed Stop
- Streetcar Alternative 1

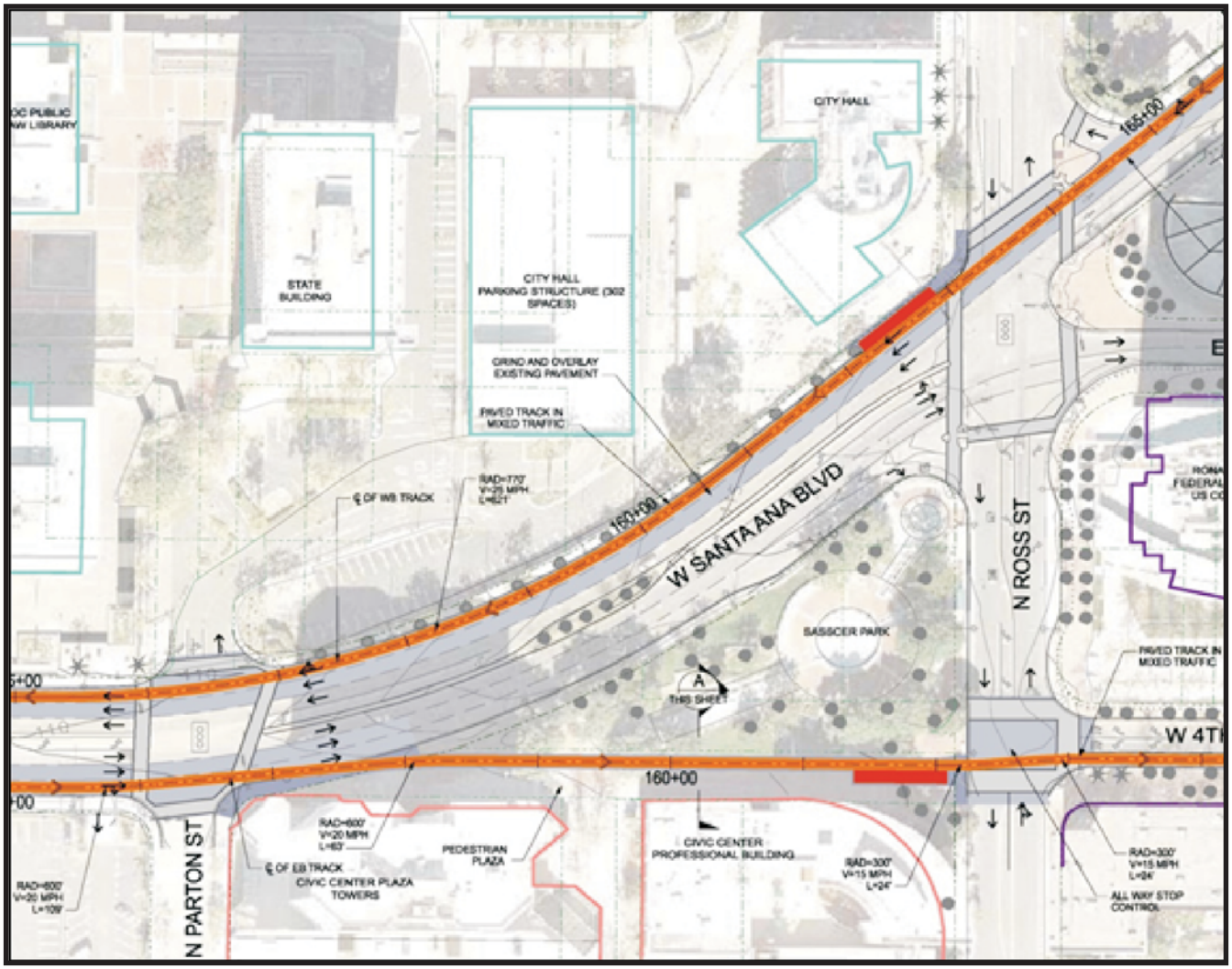
0 1500 3000 FEET

NORTH

Source: Cordoba Corporation, *Draft Alternatives Analysis Report for the Santa Ana-Garden Grove Fixed Guideway Corridor Study*, July 11, 2012; updated by Terry A. Hayes Associates Inc., August 2012.

Note: Termini for Initial Operable Segment 1 (IOS-1) are located at Raitt Street and SARTC.

Sasscer Park Design



Source: Cordoba Corporation, *Draft Alternatives Analysis Report for the Santa Ana-Garden Grove Fixed Guideway Corridor Study,* July 11, 2012.

TABLE A-2: KEY PHYSICAL AND OPERATIONAL ATTRIBUTES OF STREETCAR ALTERNATIVE 2

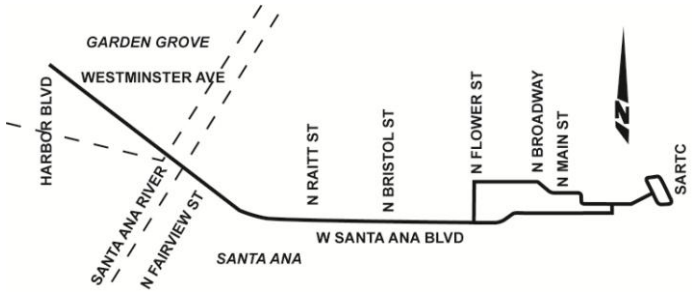
Key Attributes	Descriptions
Transit Mode	Streetcar
Termini	Western Terminus: Harbor Blvd. Eastern Terminus: SARTC
Alignment Description	Routing by Segment: • PE ROW, from Harbor Blvd. to Raitt St.: streetcars operate at-grade, bi-directionally, in exclusive ROW. • Santa Ana Blvd., from Raitt St. to Flower St.: streetcars operate in the street, at grade, bi-directionally, along with mixed-flow traffic. • Santa Ana Blvd./5th St. and Civic Center Dr. Couplet, from Flower St. to Minter St.: streetcars operate in the street, at-grade, one-way, along with mixed-flow traffic. • 6th St./Brown St., from Minter St. to Poinsettia St.: streetcars operate in the street, at-grade, bi-directionally, along with mixed-flow traffic. • Poinsettia St./Santa Ana Blvd./Santiago St./6th St. (SARTC Loop): streetcars operate in a one-way loop, in the street, at-grade, along with mixed-flow traffic. 
Length of Alignment	4.5 miles (Harbor Boulevard to SARTC)
Stations(13 Stations)	Station Locations: 1. Harbor Blvd. and Westminster Ave. 2. Willowick 3. Fairview St. and PE ROW 4. Raitt St. and Santa Ana Blvd. 5. Bristol St. and Santa Ana Blvd.
	Couplet Section(Eastbound) 6E. Flower St. and Santa Ana Blvd. 7E. ---------- 8E. Ross St. and Santa Ana Blvd. 9E. Broadway and 5th St. 10E. Main St. and 5th St. 11E. French St. and 5th St.
	Couplet Section(Westbound) 6W. Flower St. and 6th St. 7W. Flower St. and Civic Center Dr. 8W. Van Ness Ave. and Civic Center Dr. 9W. Broadway and Civic Center Dr. 10W. Main St. and Civic Center Dr. 11W. French St. and Santa Ana Blvd.
	12. Brown St. and Lacy St.

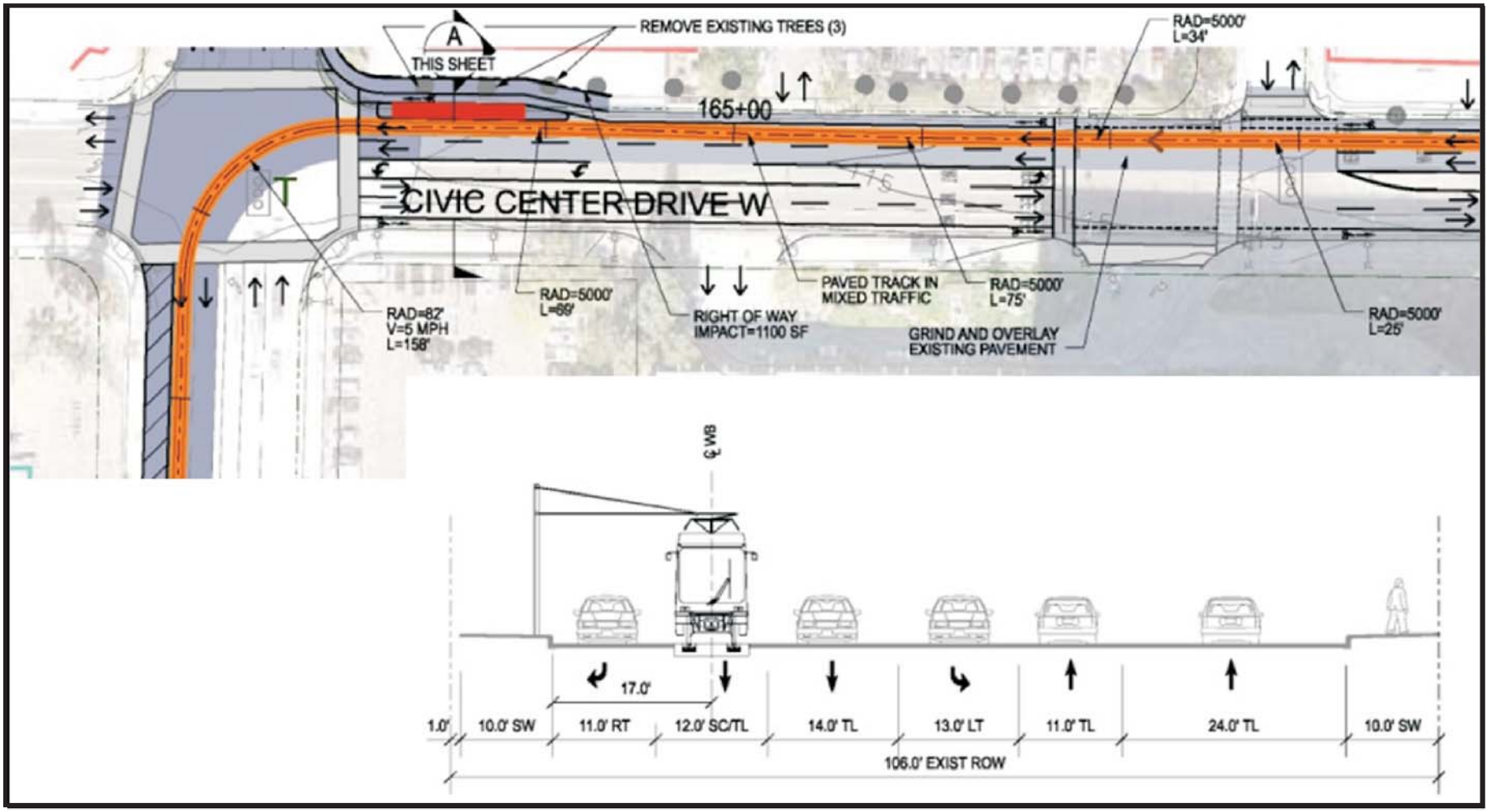
TABLE A-2: KEY PHYSICAL AND OPERATIONAL ATTRIBUTES OF STREETCAR ALTERNATIVE 2	
Key Attributes	**Descriptions**
	13. SARTC
Design Options Carried Forward	Santa Ana River Crossing: Adjacent Single Track Bridge
Headways	Peak: 10 minutes (6:00 a.m. to 6:00 p.m.) Off-Peak: 15 minutes (after 6:00 p.m.)
Hours of Operation (in revenue service)	Monday – Thursday: 6:00 a.m. to 11:00 p.m. (17 hours) Friday and Saturday: 6:00 a.m. to 1:00 a.m. (19 hours) Sunday: 7:00 a.m. to 10:00 p.m. (15 hours)
Transit Vehicle	Streetcar – Vehicle type selection has yet to be determined. The two classifications under consideration include: • Classic Modern Streetcar (e.g., Portland, Oregon) • CPUC Compliant Streetcar (e.g., an Diego, California)
Power Source	Electric, Overhead Contact System, Traction Power Substations(TPSS) TPSS Locations: a. Northwest of Harbor Boulevard and Westminster Avenue b. Along PE ROW, west of Susan Street c. Along PE ROW, east of Santa Ana River d. North on Santa Ana Boulevard, east of Bristol Street e. North of 5th Street, east of Main Street
Operations and Maintenance Facility Sites	Two Candidate Sites: • Site A: South of SARTC, bordered by 4th St., 6th St., Poinsettia St., and the Metrolink tracks. • Site B: West of Raitt St., between the PE ROW and 5th St.
Major Bicycle and Pedestrian Features	• Sidewalk and pedestrian improvements in the vicinity of proposed station platforms. • Civic Center Drive: Provide sufficient street width on Civic Center Drive between Flower Street and Spurgeon Street to support the City's planned development of a striped bike lane on each side of the street.

Source: Cordoba Corporation, Conceptual Design Plan Set, August 2011.

Streetcar Alternative 2 Alignment

Source: Cordoba Corporation, *Draft Alternatives Analysis Report for the Santa Ana-Garden Grove Fixed Guideway Corridor Study,* July 11, 2012*;* updated by Terry A. Hayes Associates Inc., August 2012.
Note: Termini for Initial Operable Segment 2 (IOS-2) are located at Raitt Street and SARTC.

Civic Center Drive Bike Lane



Source: Cordoba Corporation, *Draft Alternatives Analysis Report for the Santa Ana-Garden Grove Fixed Guideway Corridor Study,* July 11, 2012.

Streetcar Alternatives Initial Operable Segments

In response to funding and phasing issues raised by fiscal constraints identified during OCTA's long-range transportation planning process, IOSs which are shorter segments of Streetcar Alternatives 1 and 2 were developed for the SA-GG Fixed Guideway Project. The intent of the IOSs was to identify starter segments that could be constructed and operated until funding is assembled to complete the projects. Both IOS-1 and IOS-2 would terminate at Raitt Station (Raitt Street and Santa Ana Boulevard) rather than Harbor Station (Harbor Boulevard and Westminster Avenue). Both would include the same project features and design options as their respective full alignment build alternatives between Raitt Street and SARTC. These tracks would extend another hundred feet west within the PE ROW to reach the O & M Facility Site B should this site ultimately be selected for either IOS-1 or IOS-2.

The configuration of Raitt as an interim terminus station is the same for IOS-1 and IOS-2. Just over 50 spaces would be provided for station parking at Raitt within the PE ROW on an interim basis to be replaced by parking at Harbor Station upon completion of the full Project. Vehicular access to Raitt Station parking would be via Daisy Avenue.

IOS-1 (Santa Ana Boulevard and 4th Street Couplet). IOS-1 follows the same alignment as Streetcar Alternative 1, but terminates at Raitt Station rather than extending to Harbor Station (**Figures A-8** through **A-10**). The IOS-1 streetcar alignment is about 2.2 miles in length. IOS-1 includes the same project features, design options, and parking scenarios as Streetcar Alternative 1 between Raitt Street and SARTC (**Table A-3**).

IOS-2 (Santa Ana Boulevard/5th Street and Civic Center Drive Couplet). IOS-2 follows the same alignment as Streetcar Alternative 2, but terminates at Raitt Station rather than extending to Harbor Station (**Figures A-8** through **A-10**). The IOS-2 streetcar alignment is about 2.6 miles in length. IOS-2 includes the same project features and design options as Streetcar Alternative 2 between Raitt Street and SARTC (**Table A-3**).

Key Attributes

Western Terminus Elevated Crossing

The western terminus for both of the streetcar alternatives is located at the northeast corner of Harbor Boulevard and Westminster Avenue; the transition from the PE ROW to the western terminus site will include an elevated crossing. This crossing is illustrated in **Figure A-11**.

Streetcar Stations

The stations for each streetcar alternative alignment are located curbside adjacent to the platforms within the public ROW. They will consist of a shelter constructed substantially of transparent materials. In addition to seating, the stations will provide traveler information such as estimates of next train arrival time. The two terminus stations will include parking (approximately 52 spaces at the western terminus station; shared-use of SARTC parking for the eastern terminus station). The terminus stations and one inline station in the Downtown

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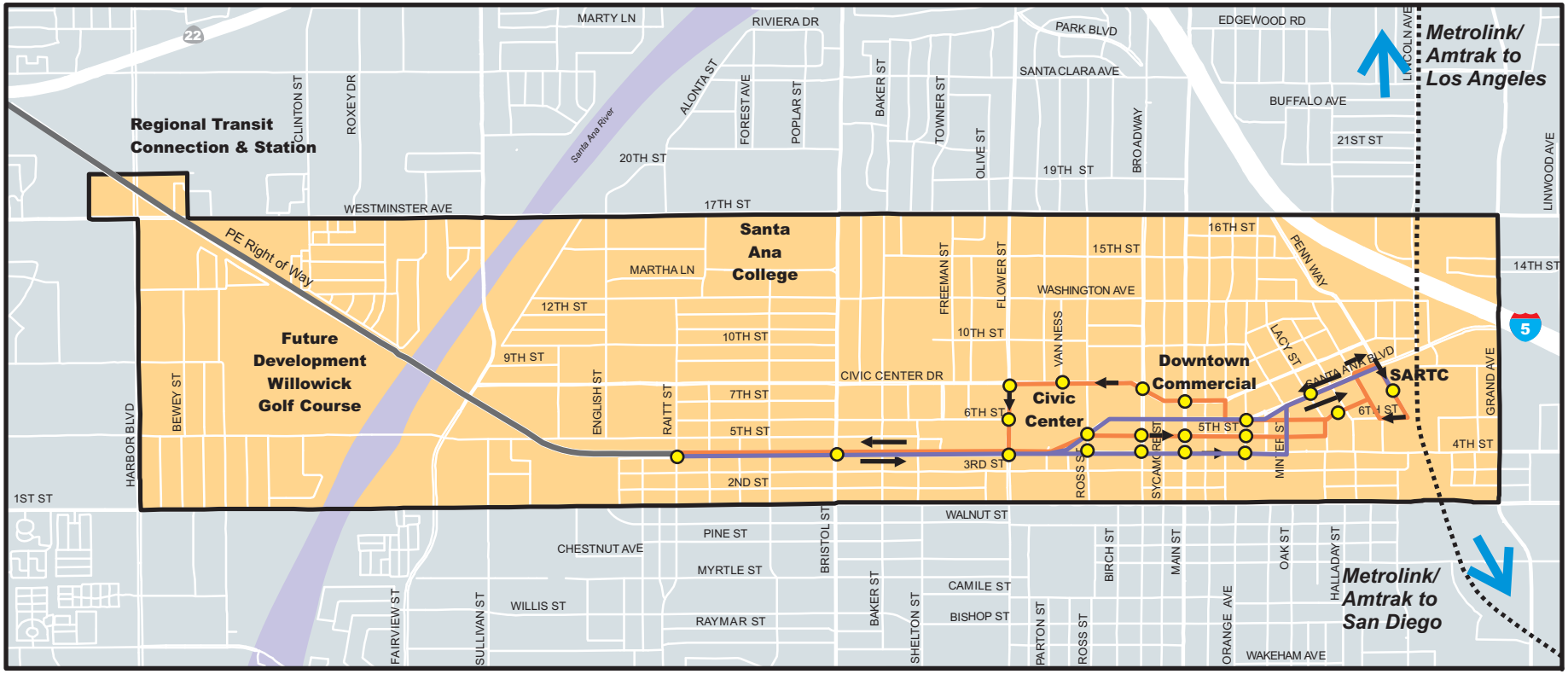
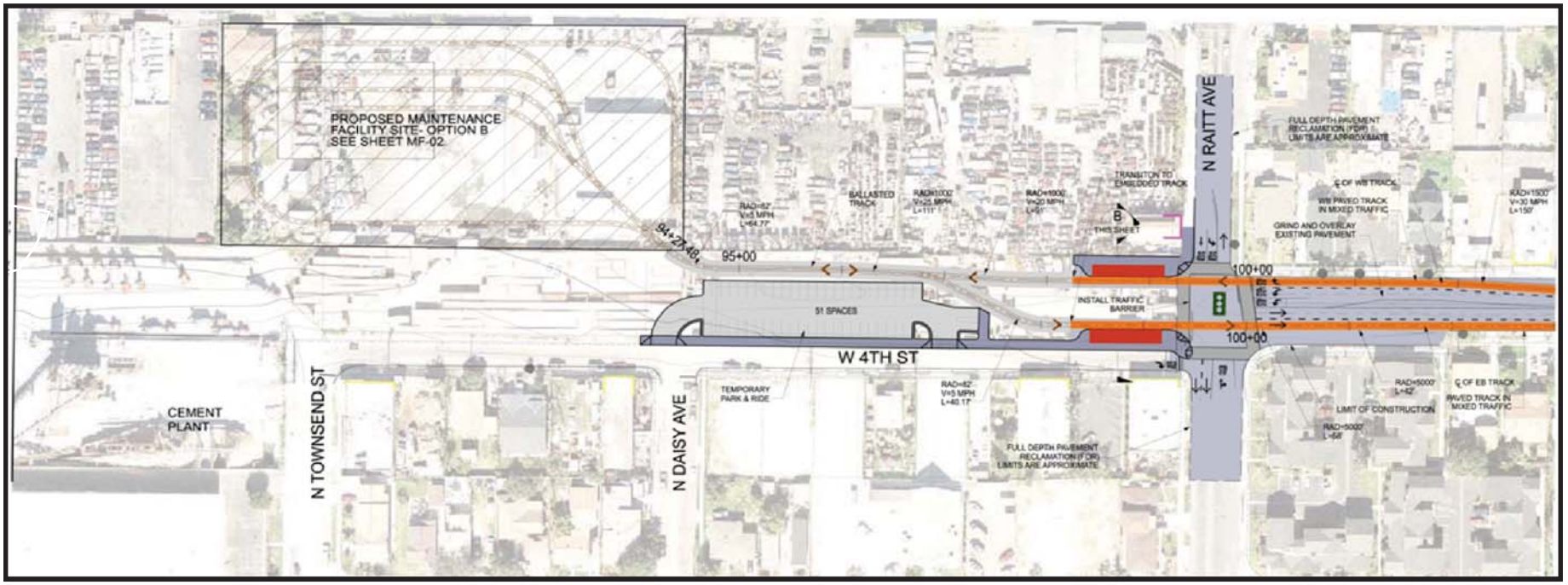
IOS-1 and IOS-2 Alignments



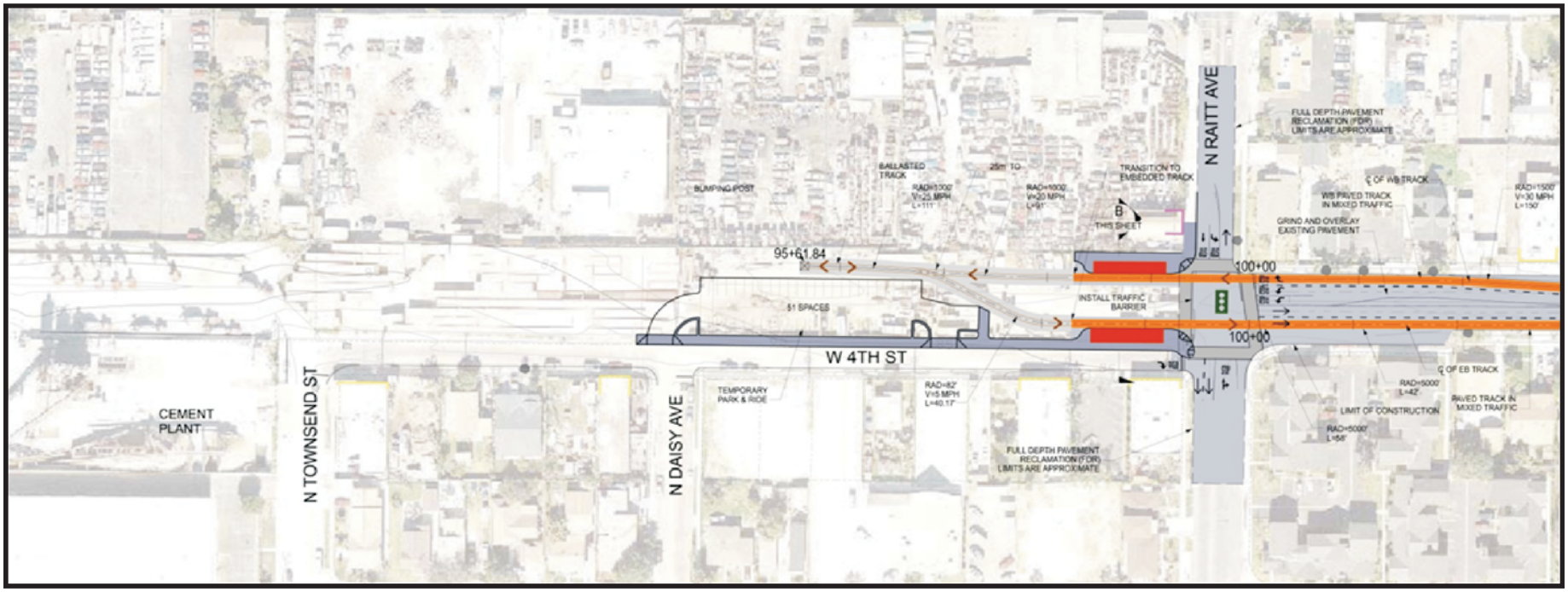
Source: Cordoba Corporation, *Draft Alternatives Analysis Report for the Santa Ana-Garden Grove Fixed Guideway Corridor Study,* July 11, 2012*;* updated by Terry A. Hayes Associates Inc., August 2012.

IOS-1 and IOS-2 Raitt Street Terminus Configuration with O & M Facility



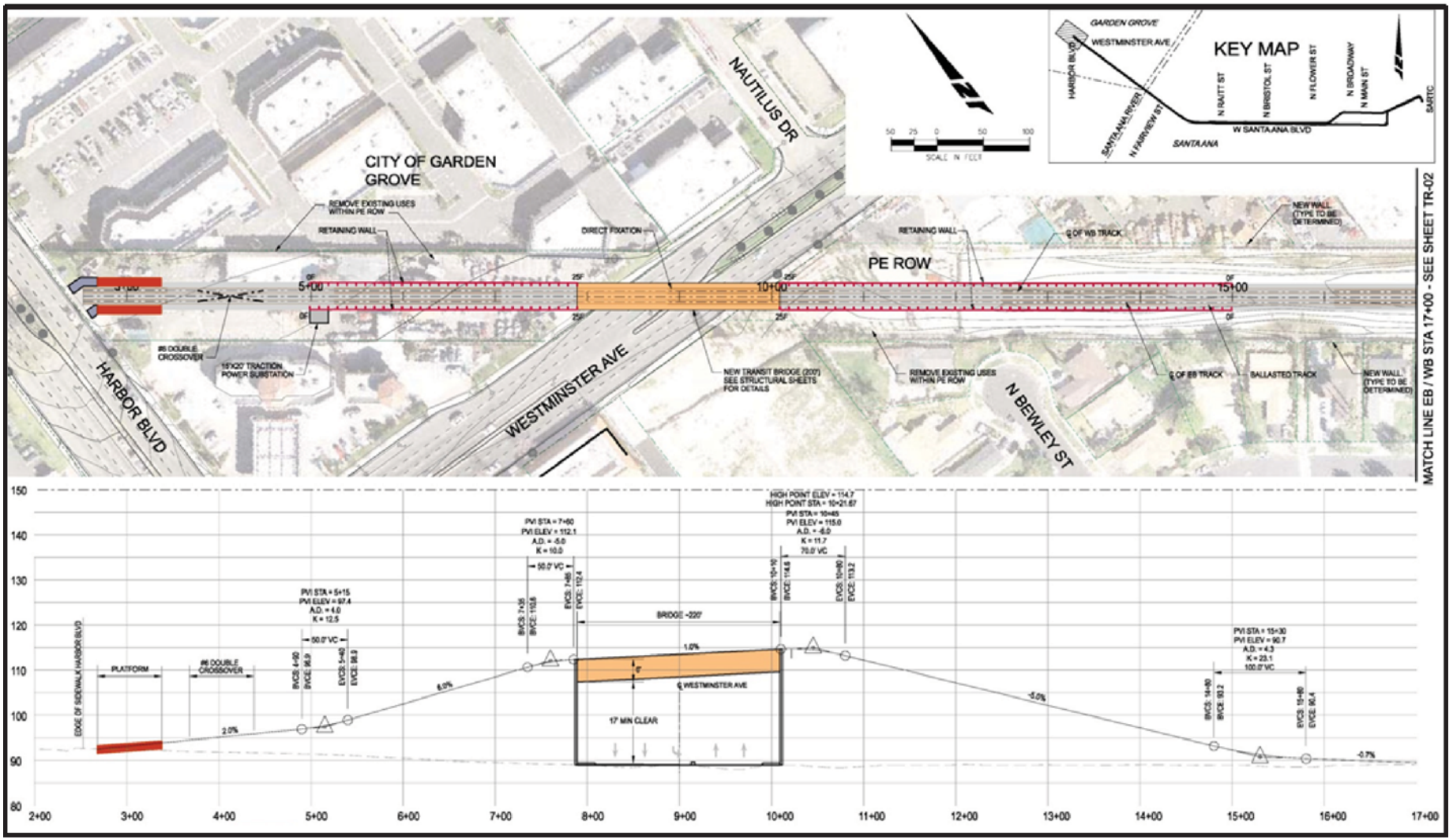
Source: Cordoba Corporation, *Draft Alternatives Analysis Report for the Santa Ana-Garden Grove Fixed Guideway Corridor Study,* July 11, 2012.

IOS-1 and IOS-2 - Raitt Street Terminus Configuration without O & M Facility



Source: Cordoba Corporation, *Draft Alternatives Analysis Report for the Santa Ana-Garden Grove Fixed Guideway Corridor Study,* July 11, 2012.

Western Terminus Design



Source: Cordoba Corporation, *Draft Alternatives Analysis Report for the Santa Ana-Garden Grove Fixed Guideway Corridor Study,* July 11, 2012.

TABLE A-3: KEY PHYSICAL AND OPERATIONAL ATTRIBUTES OF STREETCAR IOS-1 AND IOS-2

Key Attributes	IOS-1	IOS-2
Termini	Western Terminus: Raitt St. Eastern Terminus: SARTC	
Alignment Description	Routing by Segment: • Santa Ana Blvd., from Raitt St. to Ross St.: streetcars operate in the street, at grade, bi-directionally, along with mixed-flow traffic. • 4th St./Santa Ana Blvd. Couplet, from Ross St. to Mortimer St.: streetcars operate in the street, at grade, one-way, along with mixed-flow traffic. • Santa Ana Blvd., from Mortimer St. to SARTC: streetcars operate in the street, at grade, bi-directionally, along with mixed-flow traffic.	Routing by Segment: • Santa Ana Blvd., from Raitt St. to Flower St.: streetcars operate in the street, at grade, bi-directionally, along with mixed-flow traffic. • Santa Ana Blvd./5th St. and Civic Center Dr. Couplet, from Flower St. to Minter St.: streetcars operate in the street, at-grade, one-way, along with mixed-flow traffic. • 6th St./Brown Street, from Minter St. to Poinsettia St.: streetcars operate in the street, at-grade, bi-directionally, along with mixed-flow traffic. • Poinsettia St./Santa Ana Blvd./Santiago St./6th St. (SARTC Loop): streetcars operate in a one-way loop, in the street, at-grade, along with mixed-flow traffic.
Length of Alignment	2.2 miles (Raitt St. to SARTC)	2.6 miles (Raitt St. to SARTC)
Stations	Station Locations: 4. Raitt St. and Santa Ana Blvd. 5. Bristol St. and Santa Ana Blvd. 6. Flower St. and Santa Ana Blvd.	Station Locations: 4. Raitt St. and Santa Ana Blvd. 5. Bristol St. and Santa Ana Blvd.
	Couplet Section (Eastbound) 7E. Sasscer Park 8E. Broadway and 4th St. 9E. Main St. and 4th St. 10E. French St. and 4th St.	*Couplet Section (Westbound)* 7W. Ross St. and Santa Ana Blvd. 8W. Broadway and Santa Ana Blvd. 9W. Main St. and Santa Ana Blvd. 10W. French St. and Santa Ana Blvd.
		Couplet Section (Eastbound) 6E. Flower St. and Santa Ana Blvd. 7E. ---------- 8E. Ross St. and Santa Ana Blvd. 9E. Broadway and 5th St. 10E. Main St. and 5th St. 11E. French St. and 5th St.
		Couplet Section (Westbound) 6W. Flower St. and 6th St. 7W. Flower St. and Civic Center Dr. 8W. Van Ness Ave.* and Civic Center Dr. 9W. Broadway and Civic Center Dr. 10W. Main St. and Civic Center Dr. 11W. French St. and Santa Ana Blvd.
	11. Lacy St. and Santa Ana Blvd. 12. SARTC	12. Lacy St. and Santa Ana Blvd. 13. SARTC
Headways	Peak: 10 minutes (6:00 a.m. to 6:00 p.m.) Off-Peak: 15 minutes (after 6:00 p.m.)	
Hours of Operation (in revenue service)	Monday – Thursday: 6:00 a.m. to 11:00 p.m. (17 hours) Friday and Saturday: 6:00 a.m. to 1:00 a.m. (19 hours) Sunday: 7:00 a.m. to 10:00 p.m. (16 hours)	
Power Source	Electric, Overhead Contact System, Traction Power Substations (TPSS) TPSS Locations: d. North on Santa Ana Boulevard. East of Bristol Street e. North of 5th Street, east of Main	
Operations and Maintenance Facility Sites	Two Candidate Sites: • Site A: South of SARTC, bordered by 4th St., 6th St., Poinsettia St. and Metrolink tracks. • Site B: West of Raitt St., between the PE ROW and 5th St.	

Source: Cordoba Corporation, Conceptual Design Plan Set, August 2011.

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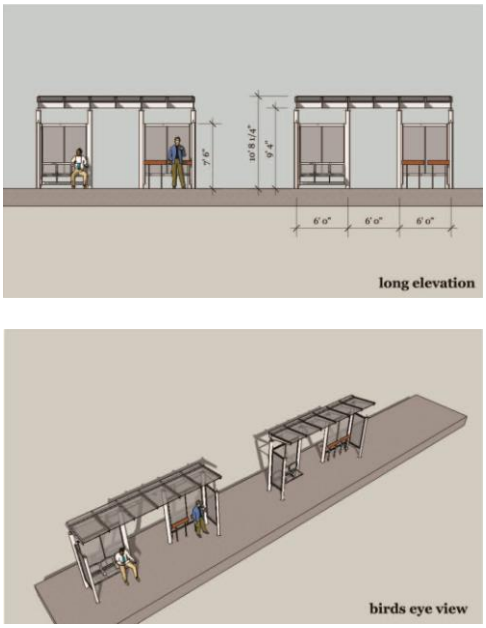
area will also include ticketing machines for the convenience of passengers who may want an alternative to the on-vehicle ticketing during busy peak periods.

Streetcar Alternative 1 includes 12 stations along its 4.1-mile long alignment. Streetcar Alternative 2 includes 13 stations along its 4.5-mile long alignment. An additional station is included in Streetcar Alternative 2 compared to Streetcar Alternative 1. It is located at Flower Street and 6th Street for the westbound streetcar couplet. This is because of the distance between the directional Flower Street stations in Streetcar Alternative 2, with the eastbound stop at Santa Ana Boulevard and the corresponding westbound stop at Civic Center Drive. Additionally, Flower Street, at 6th Street, is a gateway to the Civic Center Plaza with City, County, State and federal offices, as well as the Orange County Sheriff's Department and jail, and the Santa Ana Police Department.



Views of typical streetcar station structure and platform.

Source: Cordoba Corporation

Streetcar Vehicles

Views of typical streetcar vehicles.

Source: Cordoba Corporation

Two types of streetcar vehicles have been identified for use: classic European style streetcar, and the CPUC-compliant vehicle. The former would be similar to the vehicles currently in service in Portland, Oregon and Tucson, Arizona, manufactured by Oregon Ironworks. Neither the Portland vehicle nor the Tucson vehicle meet all CPUC structural requirements, and would therefore require either a waiver from the CPUC or a revision of the CPUC regulations that specifically acknowledge streetcars operating in mixed flow traffic at lower speed. The CPUC-compliant vehicle is derived from a light rail vehicle design. Light rail vehicles are typically CPUC-compliant and do not require CPUC waivers. The Siemens built "S70 short" is a CPUC-compliant vehicle. Both the Oregon Ironworks vehicle and the Siemens vehicle comply with Section 165: "Buy America" provisions of the Surface Transportation Assistance Act of 1982.

Santa Ana River Crossing

Both streetcar alternatives would utilize the PE ROW and cross over the Santa Ana River. This alignment was once used for the Pacific Electric Railway red car system and the Old Pacific Electric Santa Ana River Bridge still remains.

However, it has long been closed for use and not utilized by vehicles or pedestrians since 1950. The historic bridge is inadequate to accommodate the proposed project due to its age, size, (it was constructed as a single-track bridge), disrepair, undetermined structural integrity (both superstructure and foundation) and non-compliance with current building and safety requirements. Four design options were developed for Streetcar Alternatives 1 and 2 at the Santa Ana River Crossing.

These design options were evaluated against identified criteria (cost, feasibility, and potential impacts) to determine which were to be carried forward for evaluation in the EA/DEIR. As detailed in the Section 4(f) Resources Technical Report, Appendix D, and Bridge Design Options Technical Memorandum, Appendix N, four design options were developed for Streetcar Alternatives 1 and 2 at the Santa Ana River Crossing. One was determined feasible for carrying forward for analysis in the EA/DEIR, as illustrated in **Figure A-12**.

The existing bridge would remain in its current location and condition. A new single-track bridge would be constructed immediately south of the existing bridge for the fixed guideway. Through the use of gates and signaling, the single-track bridge would accommodate bi-directional fixed guideway traffic.

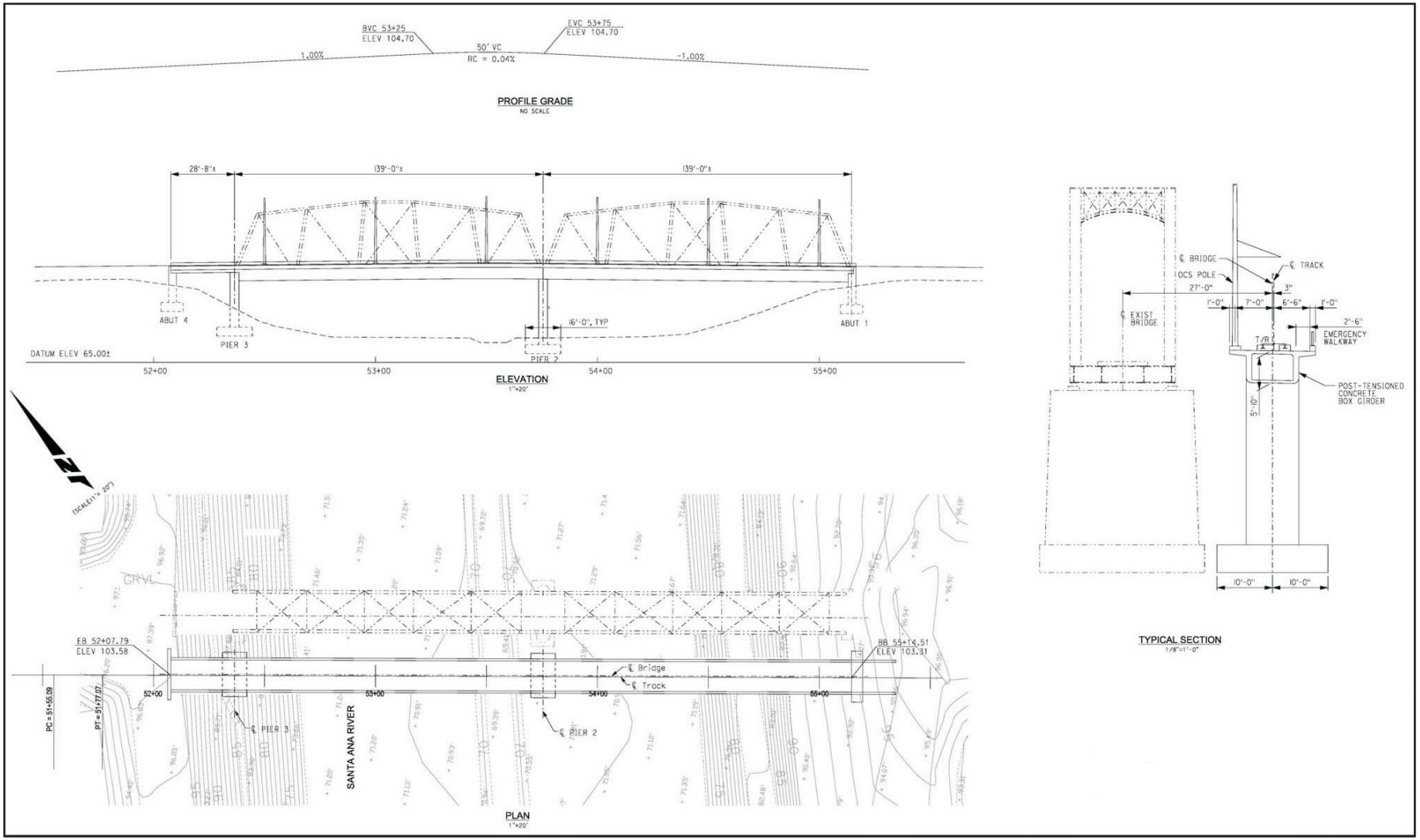
Design Options

During detailed evaluation, design options were developed to avoid identified constraints or to take advantage of specific opportunities presented along the alignments. In most cases the design options are the same for Streetcar Alternatives 1 and 2. However, where the design option is unique to a specific alternative, it is identified in the discussion. The full results of the analysis of the design options are provided in the Detailed Evaluation of Alternatives Technical Report, March 2012. Based on this technical report, the design options that have been carried into the environmental assessment are described below:

Operations and Maintenance (O & M) Facility Site Options

Both Streetcar Alternatives 1 and 2 would require the construction of an O & M Facility for streetcar operations. An O & M Facility is a stand-alone building which would meet the maintenance, repair, operational and storage needs of the proposed streetcar system. The O & M Facility accommodates daily and routine vehicle inspections, interior/exterior cleaning of the streetcars, preventative (scheduled) maintenance, unscheduled maintenance, and component change-outs. The proposed facility would also provide a venue for parking vehicles that are not in use and for rebuilding components.

The site for the O & M Facility would need to accommodate a building that houses both maintenance and administrative functions; provides for off-street employee parking; and provides for various functions such as outside storage of system components, vehicle washing, and local requirements for landscaping and screening. Currently, two candidates O & M Facility sites have been identified for either Streetcar Alternative 1 or 2. See **Figure A-13** for the approximate locations of these sites.



Source: Cordoba Corporation, *Draft Alternatives Analysis Report for the Santa Ana-Garden Grove Fixed Guideway Corridor Study,* July 11, 2012.

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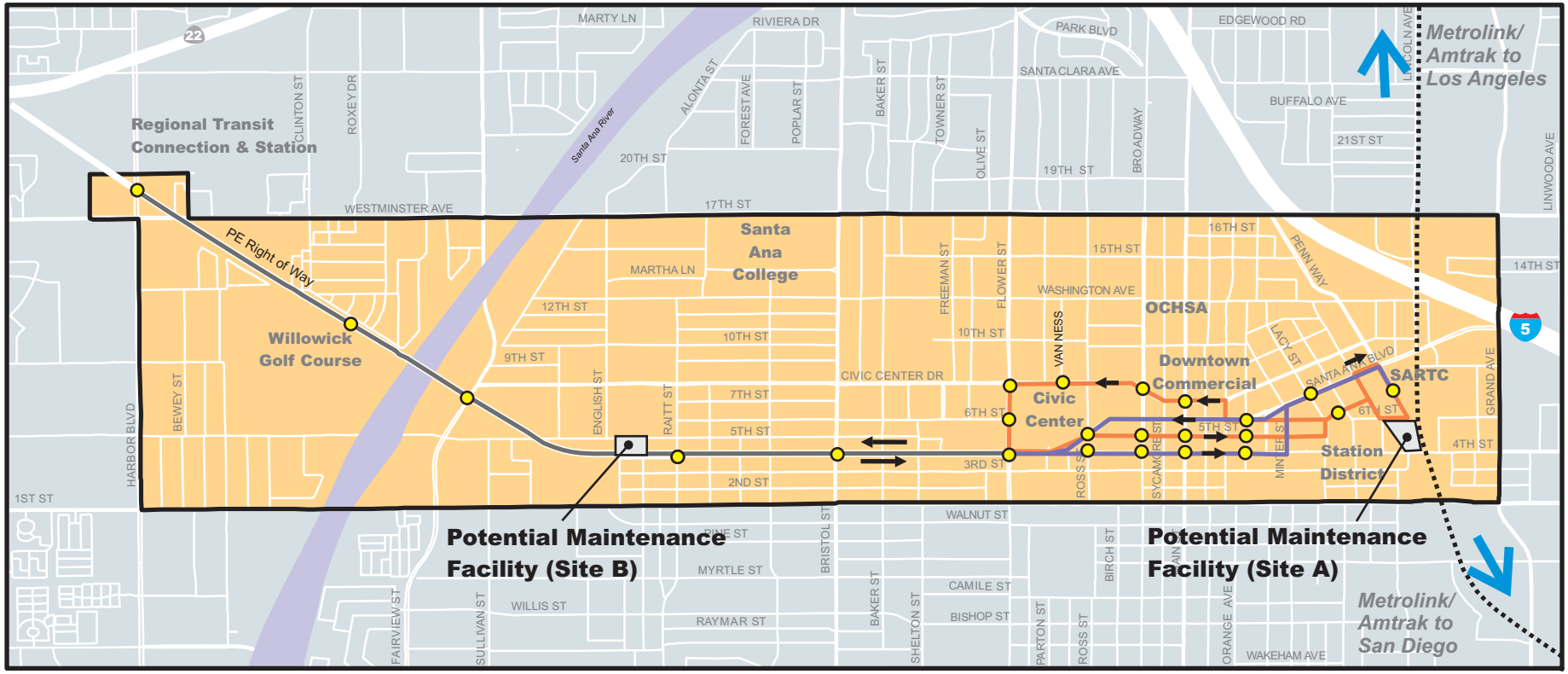
Candidate Sites of Operations and Maintenance Facilities



Source: Cordoba Corporation, Draft Conceptual Design Technical Report, March 2011, updated by Terry A. Hayes Associates Inc. August 2012.

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O & M Facility Site A (near SARTC). O & M Facility Site A is an irregularly shaped parcel slightly larger than 2.2 acres, and bordered by 6th Street to the north, 4th Street to the south, the Metrolink tracks to the east, and various industrial and commercial businesses to the west. Currently used as a waste transfer and recycling center, this site contains one primary structure with the remainder of the site used for receiving and sorting recycling materials, and parking. **Figure A-14** shows the proposed location of Site A and **Figure A-15** shows a conceptual layout of Site A. This site connects to either Streetcar Alternative 1 or 2 via a nonrevenue extension of track on Santiago Street for the equivalent of approximately two city blocks.

O & M Facility Site B (near Raitt Street). O & M Facility Site B is a rectangular site slightly larger than 2.4 acres. It is located west of Raitt Street and is bordered by 5th Street to the north and the PE ROW to the south. Located in an area zoned for industrial and commercial uses, this site is comprised of three parcels, two of which contain existing businesses and a combination of industrial buildings. The third parcel contains several residences. **Figure A-16** shows the proposed location of Site B and **Figure A-17** shows a conceptual layout of Site B. This site connects to the streetcar alignment for Streetcar Alternative 1 or 2 from the PE ROW. Motor vehicle access to the site would be to and from 5th Street.

Fourth Street Parking Scenarios

The Streetcar Alternative 1 alignment would utilize 4th Street between Ross Street and Mortimer Street in the westbound direction. From east of Ross Street to French Street, 4th Street has one travel lane in each direction with head-in diagonal parking along each side of the roadway. The diagonal parking, with vehicles exiting parking spaces by backing into the travel lane, is incompatible with reliable streetcar operations. Three design scenarios were identified to address the diagonal parking on 4th Street as described below and shown on **Figure A-18**.

Scenario A: Convert the diagonal parking along the south side of 4th Street, between Ross Street and French Street, to parallel parking and widen the sidewalk along the south side from 12 feet to 20 feet, and replace streetlights and landscaping. A total of 26 on-street parking spaces would be removed under this scenario.

Scenario B: Remove the diagonal parking along the south side of 4th Street, between Ross Street and French Street, and widen the sidewalk along the south side from 12 feet to 28 feet, and replace streetlights and landscaping. A total of 77 on-street parking spaces would be removed under this scenario.

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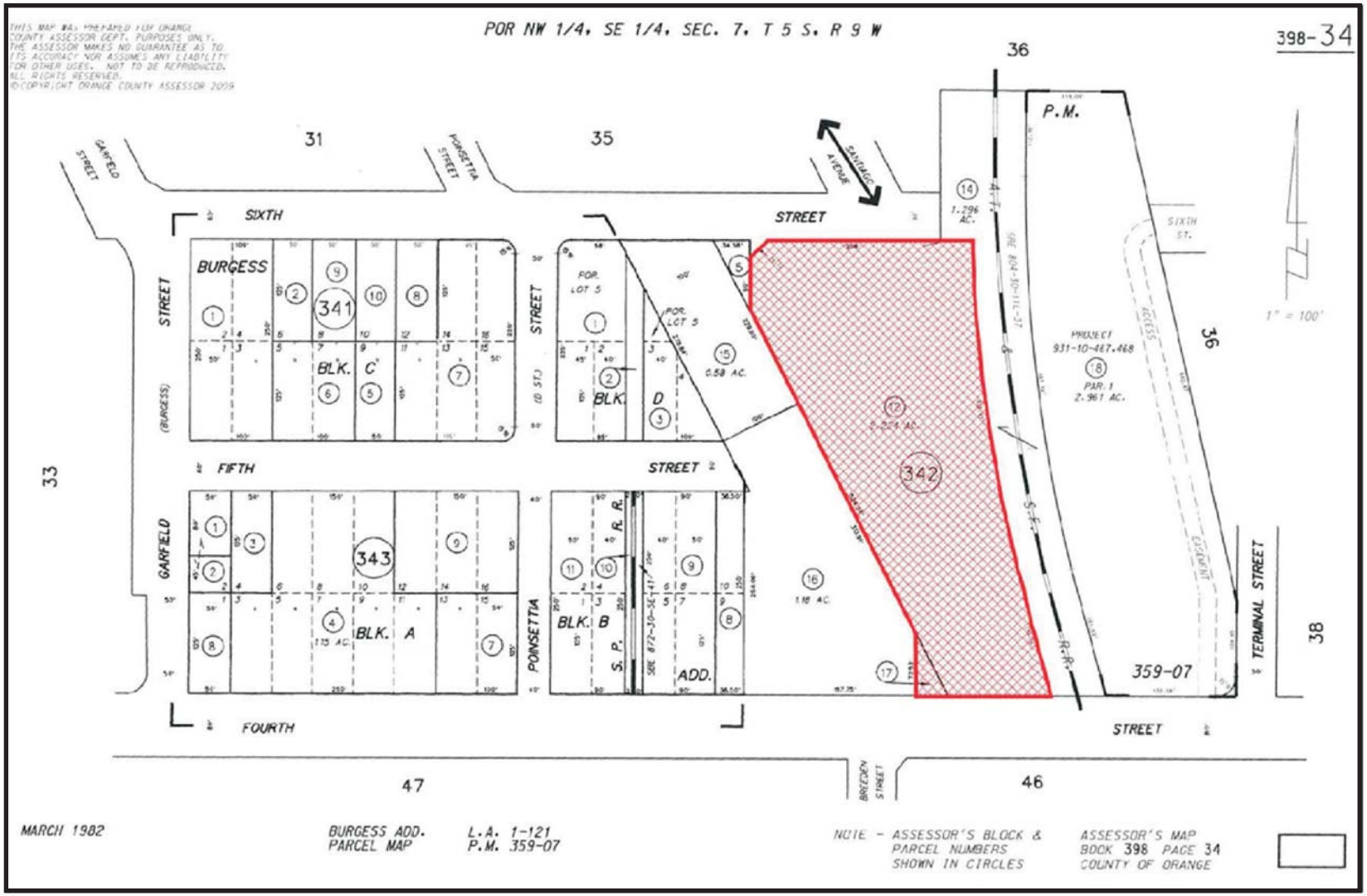
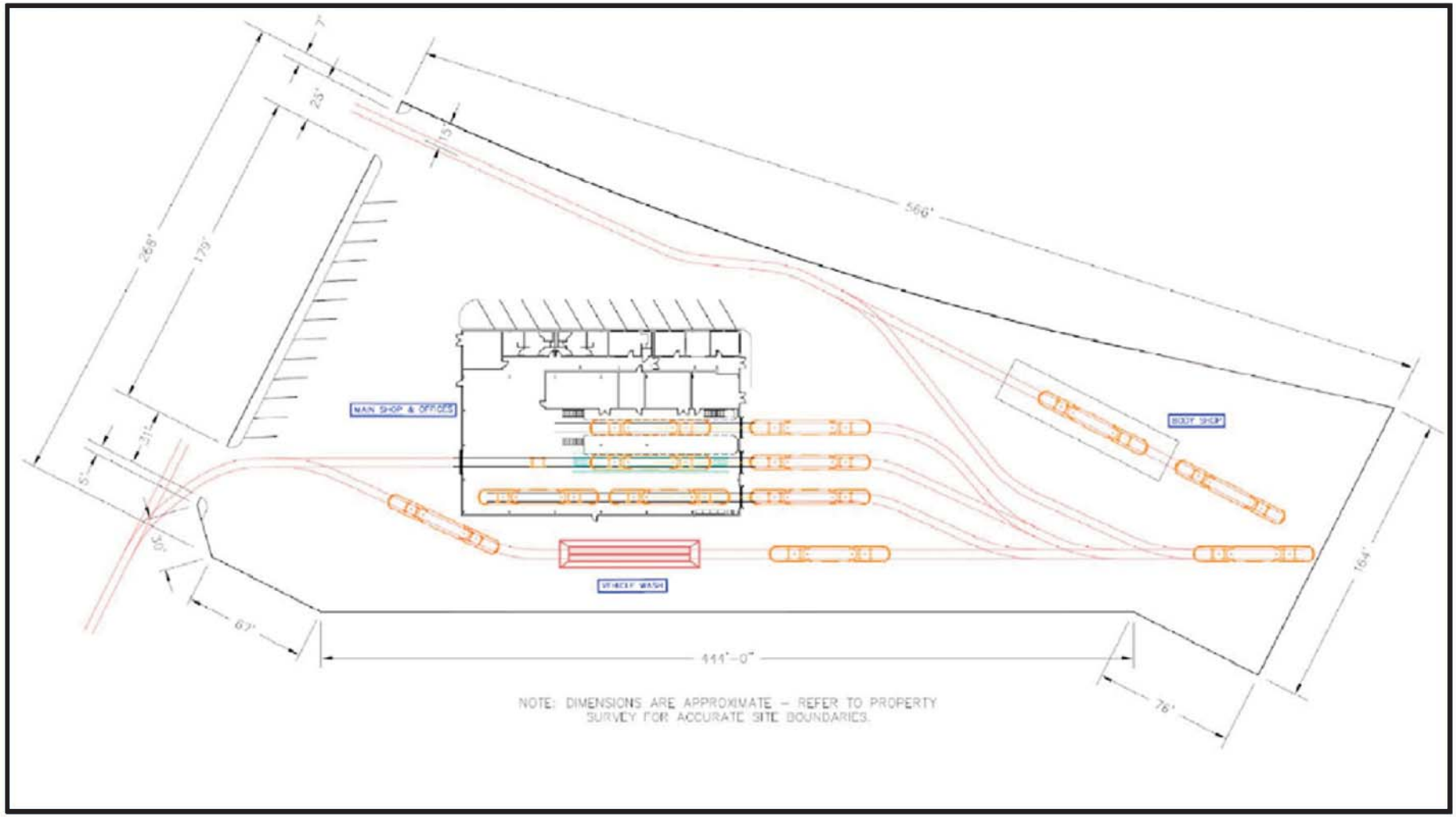
Operations and Maintenance Facility Site A - Location and Configuration



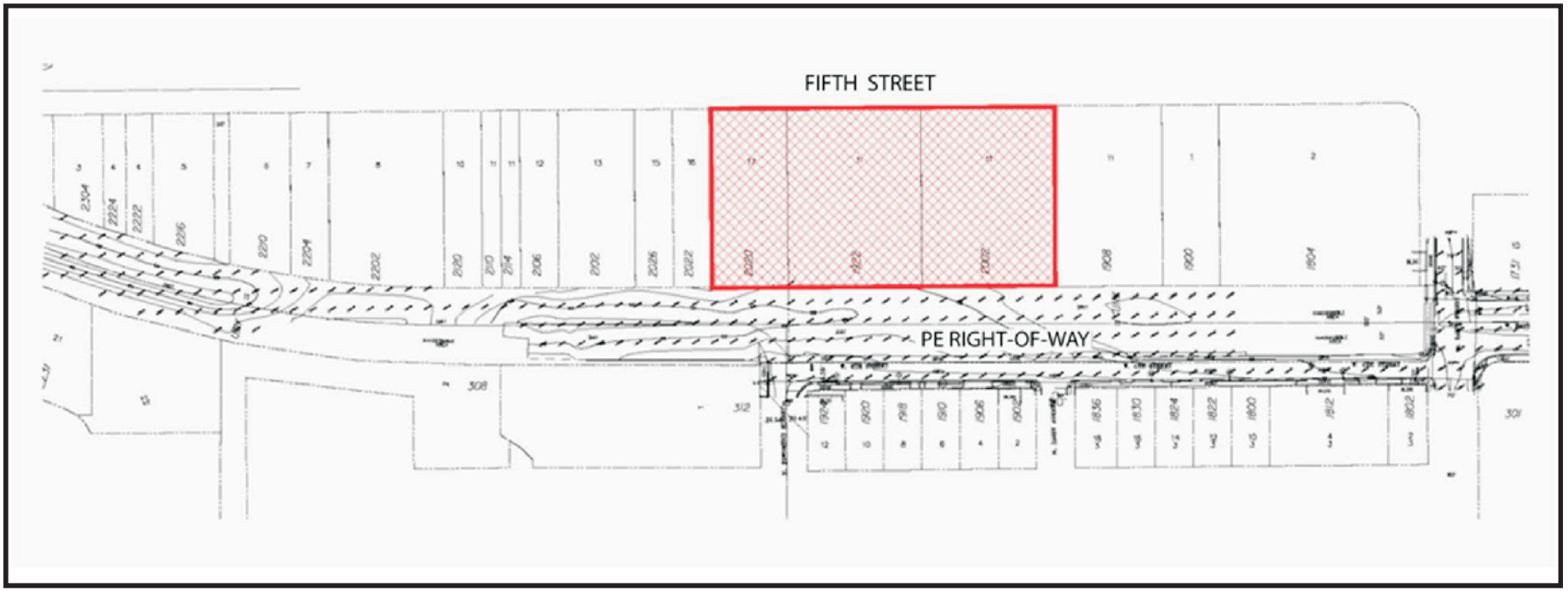
Source: Cordoba Corporation, *Draft Alternatives Analysis Report for the Santa Ana-Garden Grove Fixed Guideway Corridor Study,* July 11, 2012.

Operations and Maintenance Facility Site A - Conceptual Layout



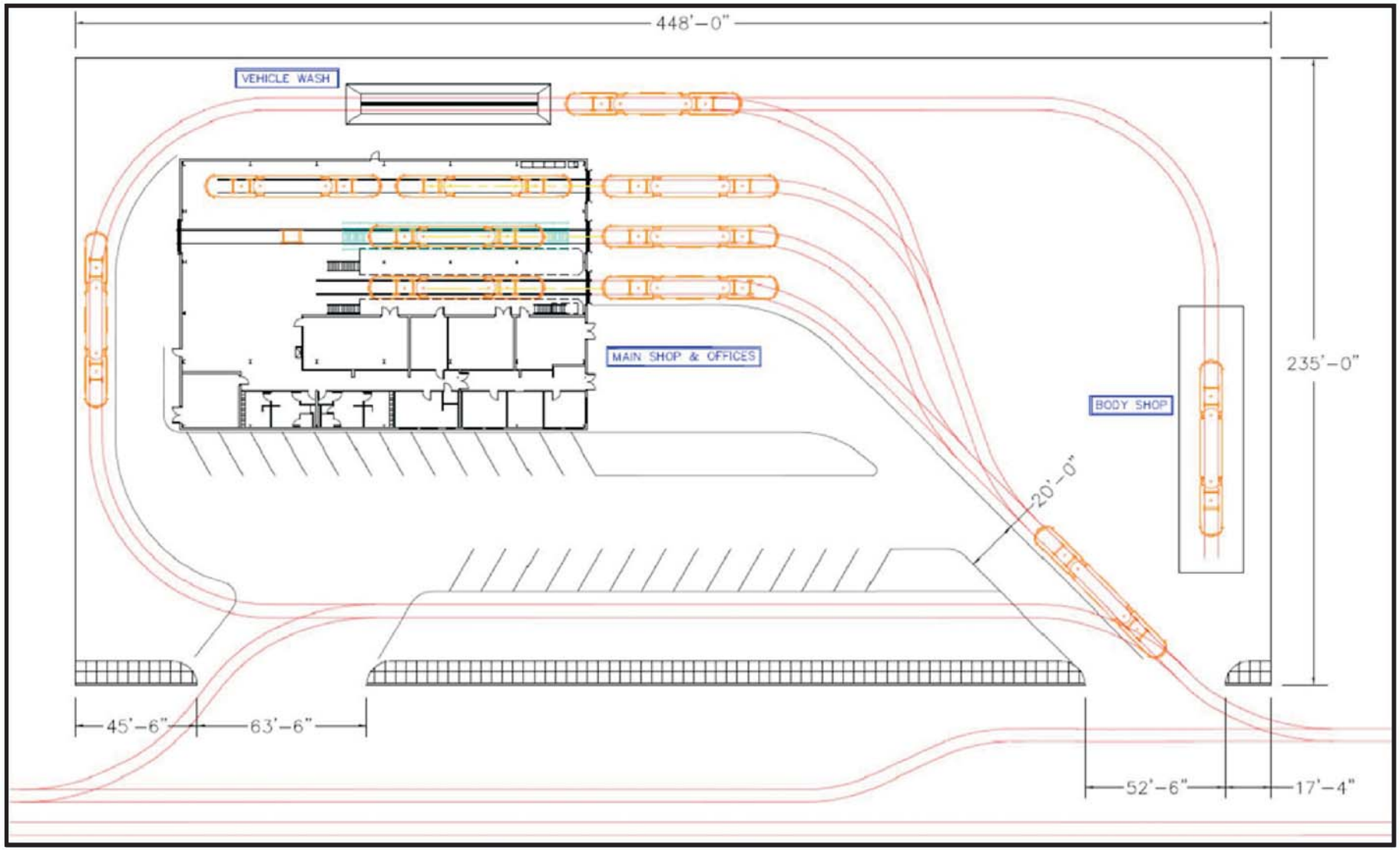
Source: Cordoba Corporation, *Draft Alternatives Analysis Report for the Santa Ana-Garden Grove Fixed Guideway Corridor Study,* July 11, 2012.

Operations and Maintenance Facility Site B - Location and Configuration



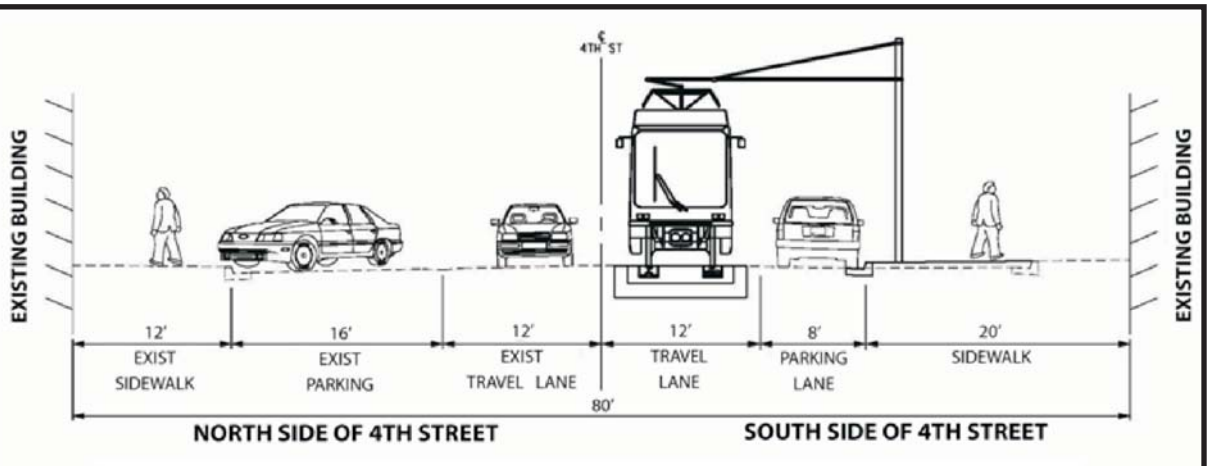
Source: Cordoba Corporation, *Draft Alternatives Analysis Report for the Santa Ana-Garden Grove Fixed Guideway Corridor Study,* July 11, 2012.

Operations and Maintenance Facility Site B - Concept Layout

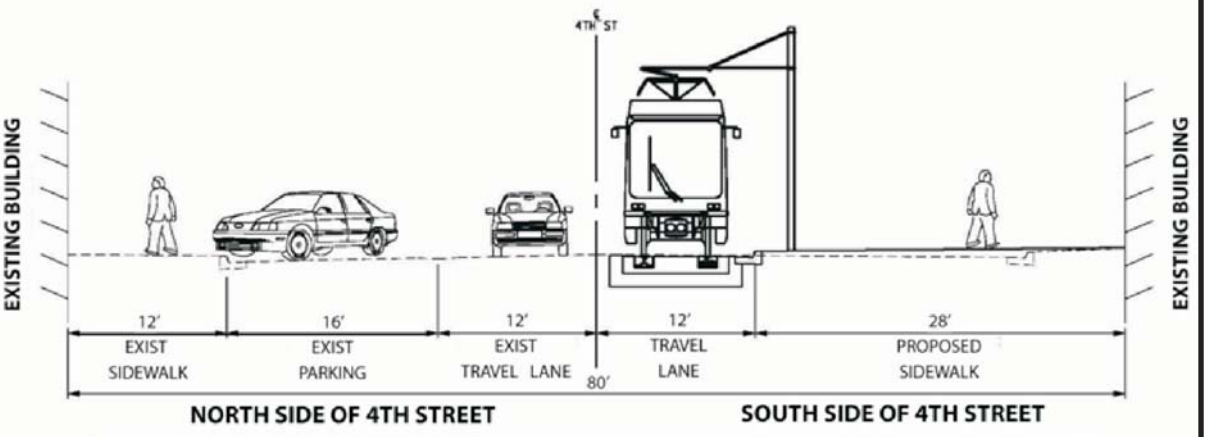


Source: Cordoba Corporation, *Draft Alternatives Analysis Report for the Santa Ana-Garden Grove Fixed Guideway Corridor Study,* July 11, 2012.

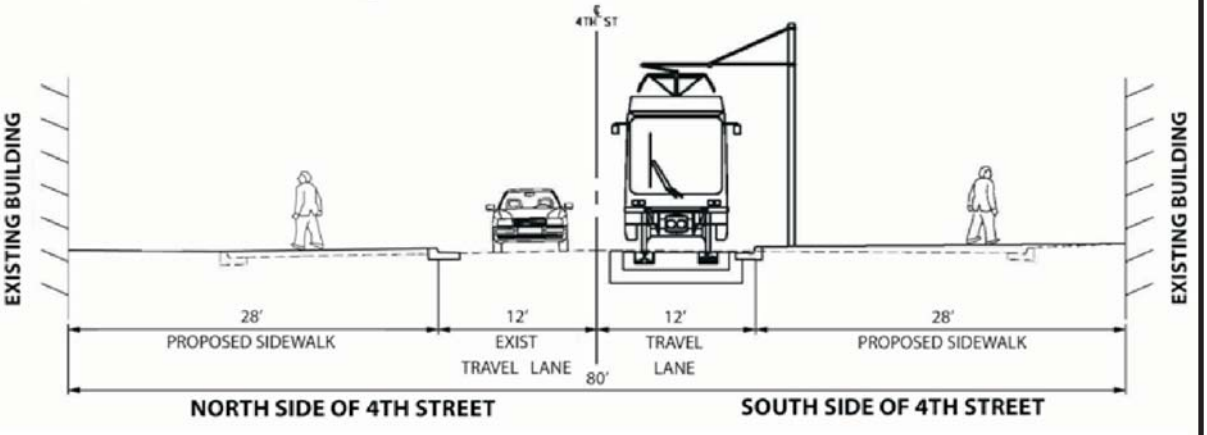
4th Street Parking Scenarios



4th Street Parking Scenario A: Convert Parking along South Side to Parallel and Widen Sidewalks to 20 Feet



4th Street Parking Scenario B: Remove Parking along South Side to and Widen Sidewalks to 28 Feet



4th Street Parking Scenario C: Remove Parking along South Side and North Side and Widen Sidewalks to 28 Feet

Source: Cordoba Corporation, *Draft Alternatives Analysis Report for the Santa Ana-Garden Grove Fixed Guideway Corridor Study,* July 11, 2012.

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Scenario C: Remove the diagonal parking along both sides of 4th Street, between Ross Street and French Street, widen the sidewalks along both sides from 12 feet to 28 feet. In this scenario, only the parking removal and sidewalk widening along the south side would be included in the cost of the project. The City of Santa Ana would pursue alternative funding to construct the improvements to the north side.

Construction

Construction of either Streetcar Alternative 1 or 2 would take place on a segment-by-segment basis along the streetcar alignment, with the exception of the bridge structures and the O & M Facility. The duration of concentrated construction activities would be no more than six months at one location along the alignment. The construction approach would be the same for Streetcar Alternatives 1 and 2. Construction activities would include, but would not be limited to, site preparation, bridge structure construction, roadway and sidewalk reconstruction, laying streetcar track and embedded trackwork, and construction of an O & M Facility.

Construction hours would generally occur between 7:00 a.m. and 6:00 p.m., Monday through Friday. There are some exceptions, such as nighttime construction, where temporary street lane closures and utility work would be required. Project construction would follow the applicable local, State, and federal laws for building and safety. In addition, standard conditions would be included in project construction contracts to ensure consistency with applicable laws for traffic, noise, vibration, and dust control.

The following description summarizes the construction approach and methods that have been defined for the project at this preliminary stage of conceptual design:

- In general, all construction of tracks would be within the existing PE ROW, existing streets, or proposed future streets;
- Construction of the O & M Facility would be within one of the designated sites along the alignment, as defined in the project description as O & M Facility Sites A and B;
- The construction period is anticipated to be approximately 30 months, with major activities to be completed within the first 24-month period;
- It is anticipated that the construction activities would be staged and sequenced based on location and types of construction. The likely staging of the proposed project would include four to five segments to allow for construction crews to work in sequence, moving one team to a new location, while the next team takes over the next set of activities; and
- Two potential areas are identified as construction staging and track laydown areas:
  - The east end of the PE ROW at Raitt Street would be used as a temporary construction and welding plant and material storage sites. This location would serve as the midpoint of distribution to both east and west directions of the alignment. The welding plant would be a combined operation of flash butt welding and laydown storage to produce designated length of rail ribbons to be dragged or truck-hauled into position for embedment or attachment to ties; and

- The second area is identified as land owned by the City of Santa Ana, located at the corner of 6th and Santiago Streets. Some special trackwork and pre-curved rails could be stored at this location;

- Construction of the proposed project would require the relocation of one catch basin under Alternative 2 at Flower Street and Civic Center Drive in addition to the installations of approximately 50 new catch basins to improve drainage along the alignment.

Construction Scenario

The project would use conventional construction techniques and equipment typical to the Southern California region and follow all applicable federal, State, and local laws for building and safety. Working hours would be varied to meet special circumstances and restrictions. Customary local practices consistent with all applicable laws would be used to control traffic, noise, vibration, erosion, and dust during construction. Design and construction would include mitigation commitments. Generally, construction would be divided into a series of often overlapping activities to minimize the construction duration and associated impacts. **Table A-4** depicts a typical construction activities sequencing for an LRT project of similar scope and complexity.

TABLE A-4: TYPICAL CONSTRUCTION SEQUENCE AND AVERAGE CONSTRUCTION TIME

Activity/a/	Tasks	Average Time Required (months)
Preconstruction	Locate utilities; establish right-of-way and project control points and centerlines; establish and relocate survey monuments	2 – 4
Site Preparation	Establish environmental controls and install soil and erosion-control measures; relocate utilities and clear and grub right-of-way (demolition); establish detours and haul routes; erect safety devices and mobilize special construction equipment; prepare construction equipment yards, and stockpile materials	3 – 6
Heavy Construction	Construct aerial structure, retaining walls, trackbed drainage, at-grade guideway, soil stabilization, pile caps/foundations, abutments, bents, and dispose of excess material	12 – 16
Medium Construction	Lay track, construct stations, install off-site drainage, and construct elevated station enclosures	6 – 12
Light Construction	Finish work, install systems elements (electrical, signals, and communication), street lighting where applicable, traffic signals, signing and striping, landscaping, close/remove detours, and clean up and test system	3 – 9
Pre-Revenue Service	Test vehicles, power, communication, signaling, train operators and maintenance personnel	1 – 3

/a/ Some of these activities would be conducted in parallel.
Source: Terry A. Hayes Associates Inc., 2012.

- Some profile grade leveling, clearing, and grubbing of the PE ROW would take place during the early stages to establish grade for the ballast track sections. The duration of this activity would be two to three months;

Construction equipment would include graders, bulldozers, cranes, drill rigs, excavators, concrete-batching equipment, pumping equipment, concrete trucks, flat bed trucks, dump trucks, and rail-mounted equipment. While the final construction approach, including methods, staging, and sequencing coordination, will be determined in detail with the construction contractor, who has yet to be selected, the following describes the likely sequencing of the major construction activities. It should be noted that most of these activities overlap.

- Early work activities would include relocation of some of the private and public underground utilities identified as being in conflict with the track alignment;
- Work on the new bridge structure at Westminster Avenue and for the new Santa Ana River bridge structure would also begin early in the construction period;
- Demolition and clearing of the selected O & M Facility site would begin in the early phase of construction in order to be available for receipt and testing of the vehicles. Construction of the maintenance facility yard would also likely commence at this time;
- Prior to initiating work on the ballast track, overhead contact wire pole foundations and station foundations would be constructed to grade level. In addition, structure approach slabs, underground utilities, or subsurface structures would be constructed prior to the laying of the ballasted sections;
- Track construction would begin next for the in-street and the non-structure ballasted sections of the streetcar trackway. The steps would involve setting up the reinforcement for the concrete slab, placing the rail, boots, and ties and finally pouring track slab concrete. The following construction activities would also occur during the same 24-month timeframe as track construction:
  - Preparation for substation sites and installation of conduits, grounding mats, and substation foundations.
  - Track construction activity, including installation of special trackwork, field welds, installation of insulated joints and other special trackwork material.
  - Sidewalk improvements, platforms, pavement grading and resurfacing to the limits of the project between Raitt Street and SARTC.
  - Foundation work for new traffic signal, lighting, and overhead contact wire poles.
  - Roadway grinding and overlay operations beginning at Raitt Street and advancing eastward along the alignment; and
- The final steps of the construction work would include pavement striping, reestablishing ROW temporarily impacted by construction, landscaping, system testing, lining and surfacing of the ballasted track, and other miscellaneous finishing.

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Appendix B: Paleontological Record Search

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Natural History Museum
of Los Angeles County
900 Exposition Boulevard
Los Angeles, CA 90007

tel 213.763.DINO
www.nhm.org

NATURAL HISTORY MUSEUM
LOS ANGELES COUNTY

Vertebrate Paleontology Section
Telephone: (213) 763-3324
FAX: (213) 746-7431
e-mail: smcleod@nhm.org

13 June 2011

URS Corporation
4225 Executive Square, Suite 1600
La Jolla, CA 92037

Attn: Jeremy Hollins, Architectural History Team Lead

re: Paleontological resources for the proposed Santa Ana and Garden Grove Fixed Guideway Corridor Project, URS project # 29866419.00000, in the City of Santa Ana, Orange County, project area

Dear Jeremy:

I have conducted a thorough check of our paleontology collection records for the locality and specimen data for the proposed Santa Ana and Garden Grove Fixed Guideway Corridor Project, URS project # 29866419.00000, in the City of Santa Ana, Orange County, project area as outlined on the portions of the Anaheim, Newport Beach, Tustin and Orange USGS topographic quadrangle maps that you sent to me via e-mail on 15 May 2011. We do not have any vertebrate fossil localities that lie within the project boundaries, but we do have localities nearby from the same sedimentary units that occur as subsurface deposits in the proposed project area.

Surficial sediments in all of the proposed project area and in the surrounding vicinity consist of younger terrestrial Quaternary Alluvium, derived either as fan deposits from the hills to the northeast or as fluvial deposits from the floodplain of the Santa Ana River floodplain that flows through the western portion of the proposed project area, with older terrestrial Quaternary sediments occurring at various depths. The younger Quaternary deposits typically do not contain significant vertebrate fossils, at least in the uppermost layers, but we have a vertebrate fossil locality, LACM 1652, due north of the eastern portion of the proposed project area on the western side of the Santa Ana River along Rio Vista Avenue south of Lincoln Avenue, that produced a fossil specimen of sheep, *Ovis*. Our closest fossil locality in older Quaternary sediments is LACM 4943, situated almost due east of locality LACM 1652 along Fletcher Avenue east of Glassell Street east of the Santa Ana River, that produced a specimen of fossil horse, *Equus*, at a depth of 8-10 feet below the surface.

Surface grading or shallow excavations in the uppermost few feet of the younger Quaternary alluvial sediments in the proposed project area are unlikely to uncover significant fossil vertebrate remains. Deeper excavations at the proposed project site area, however, may well encounter significant vertebrate fossils in older Quaternary sediments. Any substantial excavations below the uppermost layers, therefore, should be closely monitored to quickly and professionally collect any specimens without impeding development. Any fossils recovered during mitigation should be deposited in an accredited and permanent scientific institution for the benefit of current and future generations.

This records search covers only the vertebrate paleontology records of the Natural History Museum of Los Angeles County. It is not intended to be a thorough paleontological survey of the proposed project area covering other institutional records, a literature survey, or any potential on-site survey.

Sincerely,

Samuel A. McLeod, Ph.D.
Vertebrate Paleontology

enclosure: draft invoice

FOUNDATION INVOICE
NATURAL HISTORY MUSEUM OF LOS ANGELES COUNTY

900 Exposition Boulevard, Los Angeles, California 90007

13 June 2011

INVOICE TO:

URS Corporation
4225 Executive Square, Suite 1600
La Jolla, CA 92037

Attn: Jeremy Hollins, Architectural History Team Lead

Vertebrate Paleontology Records Check for paleontological resources for the proposed Santa Ana and Garden Grove Fixed Guideway Corridor Project, URS project # 29866419.00000, in the City of Santa Ana, Orange County, project area

AMOUNT DUE: $ 395.00

Paleontology Account #164-000 - invoice # VP110613B

PLEASE RETURN THIS STUB WITH YOUR REMITTANCE

This is a draft invoice for your information

The official invoice will be sent separately by the Natural History Museum of Los Angeles County Finance Department

"Samuel A. McLeod" <smcleod@nhm.org>
06/13/2011 09:59 AM

To Jeremy_Hollins@URSCorp.com
cc
bcc
Subject Re: Paleontological Records Search Request - Santa Ana and Garden Grove, Orange County, CA results

History: This message has been forwarded.

Hi Jeremy:

Attached are the pdf scans of the draft invoice and the records search results for the Santa Ana and Garden Grove Fixed Guideway Corridor Project. Hard copy will be sent by mail today.

Cheers,
SAM

Samuel A. McLeod, Ph.D.
Vertebrate Paleontology
LACM Natural History
900 Exposition Blvd.
Los Angeles, CA 90007

(213) 763-3325 [voice]
(213) 746-7431 [fax]

At 01:48 PM 05/15/2011, you wrote:

>Dr. Sam McLeod, Director of Vertebrate Paleontology
>Natural History Museum of Los Angeles County
>900 Exposition Boulevard
>Los Angeles, CA 90007
>
>Subject: Santa Ana and Garden Grove Fixed Guideway Corridor,
>Orange County, California
>
>Dear Dr. McLeod:
>
>The Orange County Transit Authority is proposing the construction of
>the Santa Ana and Garden Grove Fixed Guideway Corridor. The project
>will entail track alignment and roadway improvements for
>approximately five miles between the cities of Santa Ana and Garden
>Grove. There is currently extensive development throughout the
>proposed project area. The project area is covered in hardscape and
>pavement, and there does not appear to be native soils or vegetation
>present within the project area.
>
>The project area is shown on the following USGS 7.5 Minute
>Quadrangle Maps: Anaheim, 1981; Orange, 1981; Tustin, 1981; Newport
>Beach, 1981. The blue dotted line indicates a one-mile radius from
>the edge of the project area.
>
>URS Corporation (URS), on behalf of the Orange County Transit
>Authority, requests a record search from the Natural History Museum
>of Los Angeles County for paleontological resources within the
>project area (identified as Alternative 1 and 2 on the attached
>figure) and within a one-mile radius of the project area.

>
>Thank you for your assistance in completing this task. If you should
>have any questions about this project, please do not hesitate to
>contact me at 858-812-8268 or jeremy_hollins@urscorp.com.
>
>Sincerely,
>
>Jeremy Hollins
>Architectural History Team Lead
>URS Corporation
>4225 Executive Square, Suite 1600
>La Jolla, CA 92037
>Main Number: 858-812-9292
>Direct Number: 858-812-8268
>Cellular Number: 619-278-8056
>jeremy_hollins@urscorp.com
>
>

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