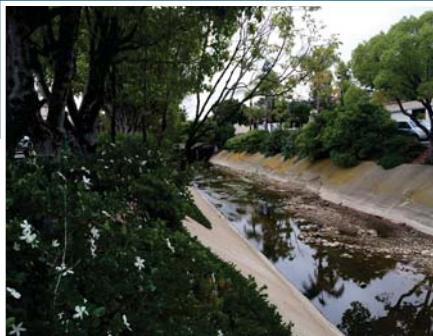




# Grantville Trolley Station/ Alvarado Creek Enhancement Study



## EXISTING CONDITIONS REPORT

JANUARY 2017

PREPARED BY

**DYETT & BHATIA**  
Urban and Regional Planners

WITH

**RECON**

**RICK**  
ENGINEERING COMPANY

The City of  
**SAN DIEGO**



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# Executive Summary

The Navajo Community Plan seeks to transform the area near the Grantville Trolley Station and Alvarado Creek into a vibrant mixed-use residential neighborhood with new pedestrian and bicycle trails and access. A 102-acre area— which encompasses the Grantville Trolley Station and is bound by Fairmont Avenue/Mission Gorge Road to the west, Waring Road to the east, Alvarado Creek Road to the south, and Twain Avenue to the north— is being studied for the Grantville Trolley Station/Alvarado Creek Enhancement Study. The Study focuses on solutions to the flooding that affects the area during storm events, increasing access to the Grantville Trolley Station from the north, improving water quality, and transforming Alvarado Creek into an amenity.

A majority of the area near the creek corridor is under private ownership and dominated by commercial and industrial uses. Existing development is frequently oriented away from and provides surface parking directly adjacent to Alvarado Creek. Fencing and concrete barriers, as well as surface parking lots and outdoor storage, surround Alvarado Creek. These factors, in addition to the creek's issues with respect to flooding, water quality, and the like, will need to be addressed for the creek to serve as a public amenity. Realization of the Community Plan's land use vision and implementation of improvements to the creek corridor to ameliorate flooding issues will require support and buy-in from the adjacent private property owners.

Grantville is well connected with regional automobile (Interstate 8) and transit (trolley and buses) accessibility. However, the area lacks a comprehensive internal street network to promote transit-oriented development. Access to the Grantville Trolley Station from the north is extremely poor by foot, with the creek itself presenting a major barrier. By enhancing the creek corridor with bridges and walking/cycling trails, the pedestrian and bicycle experience between future development and a transit stop will be greatly enhanced.

The Study Area includes several areas with natural vegetation, biological resources, and jurisdictional waters. Changes to Alvarado Creek and grading, landscaping, or development that impact sensitive vegetative communities, plant species, wildlife, or wetlands will need consideration during project design. The creek has the potential to be an amenity, open up views, provide open spaces for recreation, and include revegetation and other designs that can improve water quality, storm water flow rates, and natural habitat.

Alvarado Creek conveys flows from the Alvarado Creek watershed to the San Diego River through naturalized and concrete channels and culverts for seasonal and storm events. The creek channel varies in geometry through the Study Area; the majority of the channel reaches do not have adequate hydraulic capacity to convey either the 100-year storm event or many of the small events that occur. Alternatives to improve the flooding conditions will be assessed during the next stages of this planning process.

Grantville Trolley Station/Alvarado Creek Enhancement Study

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# I Introduction

## I.1 Purpose of Study

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### **BACKGROUND AND PURPOSE**

In 2015, the City of San Diego adopted a Focused Plan Amendment for the Navajo Community Plan, which envisions the transformation of the primarily industrial area around the Grantville Trolley Station (Grantville Station) into a vibrant mixed-use community. The Community Plan seeks to promote housing and a mix of uses in a transit-oriented setting, as well as new bicycle and pedestrian trails along open spaces. A revitalized Alvarado Creek also fulfills the San Diego River Park Master Plan.

Also in 2015, the City of San Diego received a Smart Growth Incentive Program (SGIP) grant from the San Diego Association of Governments (SANDAG). The purpose of this grant is to develop concepts and assess the feasibility of alternatives to transform Alvarado Creek into an amenity that catalyzes redevelopment and improves access and connections to the Grantville Station for new residents, local businesses, and the community as a whole.

The Grantville Trolley Station/Alvarado Creek Enhancement Study (Study) is a key element in achieving the Community Plan's vision. The specific Study objectives include:

- Improve flooding, storm water, and water quality issues;
- Increase access to the Grantville Station and Alvarado Creek;
- Enhance Alvarado Creek as an amenity that includes bicycle and pedestrian trails; and
- Foster transit-oriented development adjacent to the Grantville Station.

### **EXISTING CONDITIONS REPORT**

This Existing Conditions Report provides baseline spatial information on existing conditions, opportunities, and challenges in the Grantville Trolley Station/Alvarado Creek Enhancement Study Area (Study Area). The focus of this Report is on mapping resources, trends, and critical concerns that will frame choices for the revitalization of Alvarado Creek and the area surrounding the Grantville Station. Thus, this Report maps information about land uses, transportation facilities, biological resources, hydrology, Alvarado Creek channel conditions, and utilities.<sup>1</sup>

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<sup>1</sup> The report entitled, *Grantville Trolley Station/Alvarado Creek Enhancement Project*, dated October 5, 2016, was prepared by RECON Environmental, Inc. to support the information contained within this Existing Conditions

This Existing Conditions Report is the first major step in the planning process for the Study. The Report will be used as a basis for:

- Facilitating community input on planning issues and priorities;
- Evaluating potential alternatives; and
- Preparing creek improvement and trail designs.

In total, the planning process is expected to result in an Alvarado Creek Revitalization Plan, a set of preliminary construction drawings for creek improvements, and associated cost estimates. Public outreach will occur throughout the planning process, giving the community an opportunity to learn about proposals and provide input at all stages.

## 1.2 Setting and Study Area

---

### REGIONAL LOCATION

The Study Area is located in the easterly portion of the City of San Diego. The Study Area is located within the Grantville community in the Navajo planning area. The Study Area is in close proximity to Mission Valley, Allied Gardens, and San Diego State University. The Study Area is developed with primarily industrial and commercial uses. Alvarado Creek runs through the Study Area before its confluence with the San Diego River, to the west (Figure 1-1). Alvarado Creek is a low-lying area of Grantville that gradually increases in elevation in the western and northern portions of the Study Area. The Grantville Station and Interstate 8 (I-8) are situated in the southern portion of the Study Area.

### PLANNING BOUNDARIES

As shown in Figure 1-2, the Study Area is encompassed by Twain Avenue to the north, Mission Gorge Road/Fairmount Avenue to the west, Alvarado Canyon Road to the south, and Waring Road to the east.

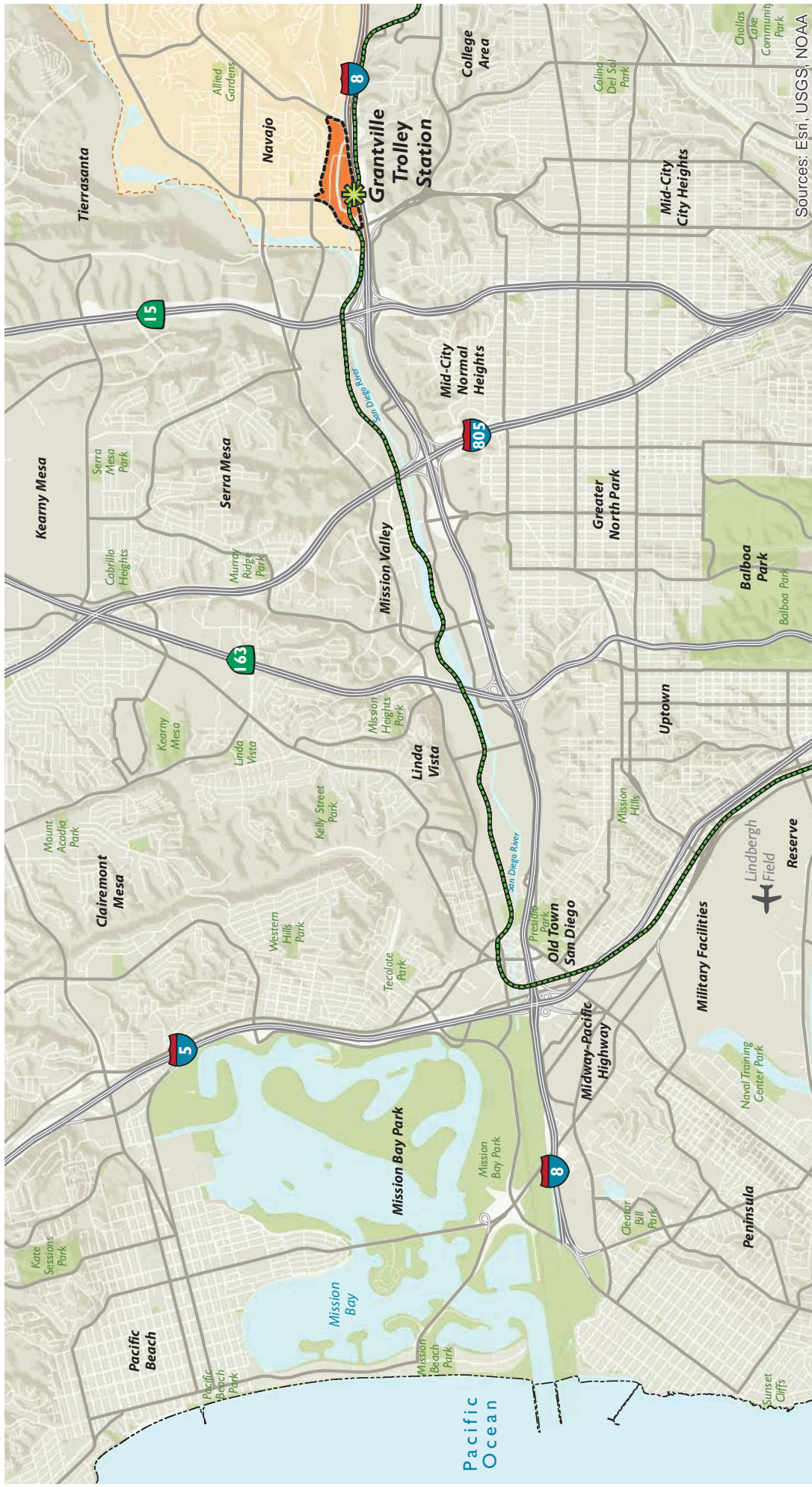
Alvarado Creek in the Study Area is a series of open channels and box culverts. For the purposes of this Study, the creek is divided into several reaches, identified as Reaches 1 through 6. The location of the reaches is presented on a high resolution aerial photograph taken for the Study in 2016 (Figure 1-3). The existing topography of the Study Area is illustrated in Figure 1-4.

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




Report. The RECON report may be accessed via the Study website. Field visits and aerial photography of the Study Area along with secondary source information were reviewed in the preparation of this report.

Figure 1-1:

# Regional Location



Sources: Esri, USGS, NOAA

-  Grantville Trolley Station
-  Green Line
-  Freeways
-  Major Roads
-  Bay/Water
-  Study Area
-  Navajo Community Plan Area
-  San Diego City Limits
-  Parks

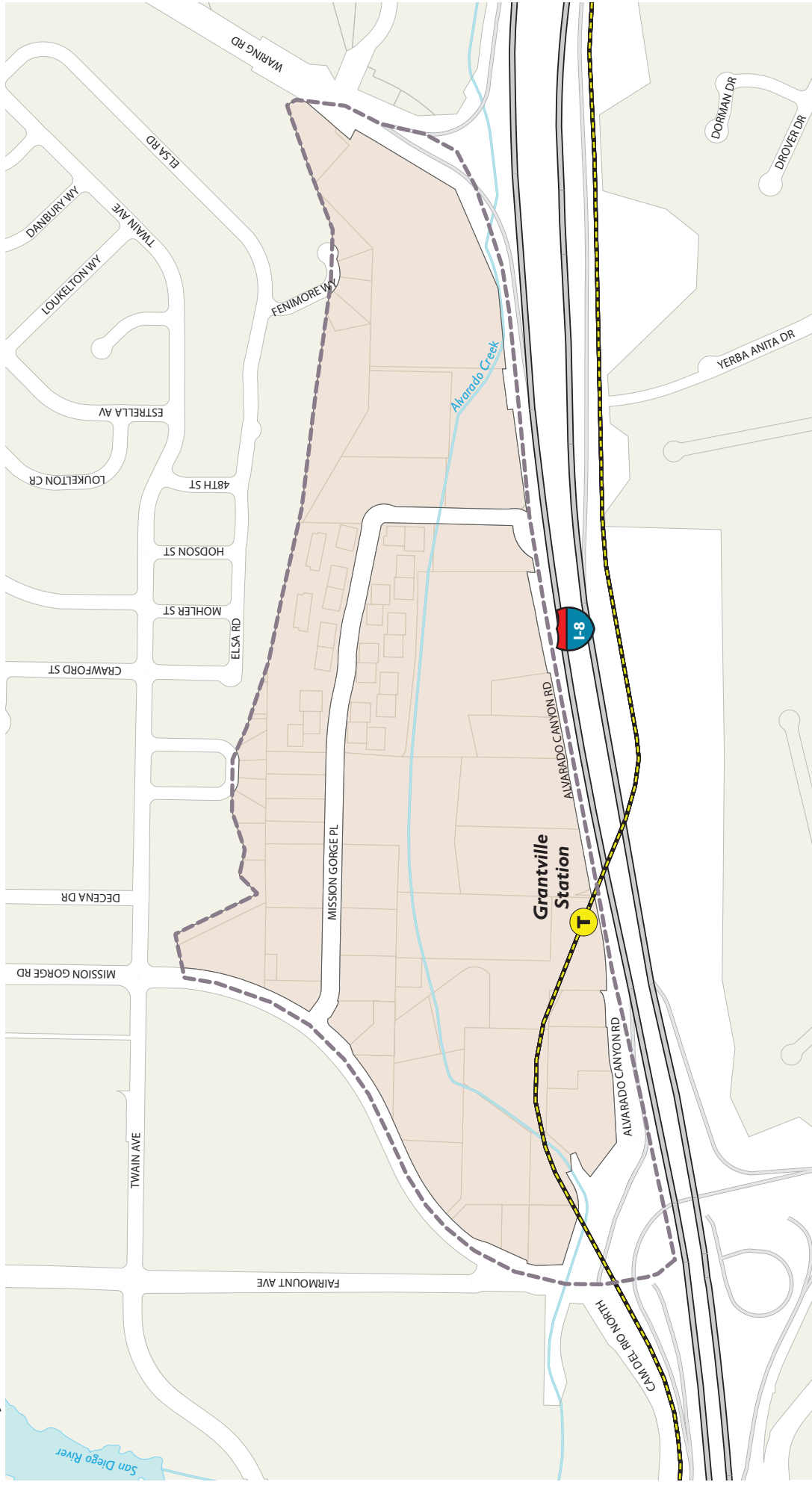
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Data Source: City of San Diego, 2016; SANGIS/SANDAG Regional GIS Data Warehouse, 2016. ([www.sangis.org](http://www.sangis.org)) Dyett & Bhatia, 2016

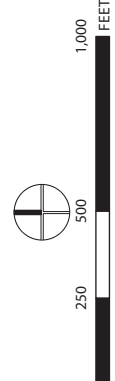


Figure 1-2:  
**Study Area**



- Trolley Stop
- Green Line
- Freeway
- Ramps
- Major Roads
- River/Streams/Creeks
- Study Area Parcels
- Study Area

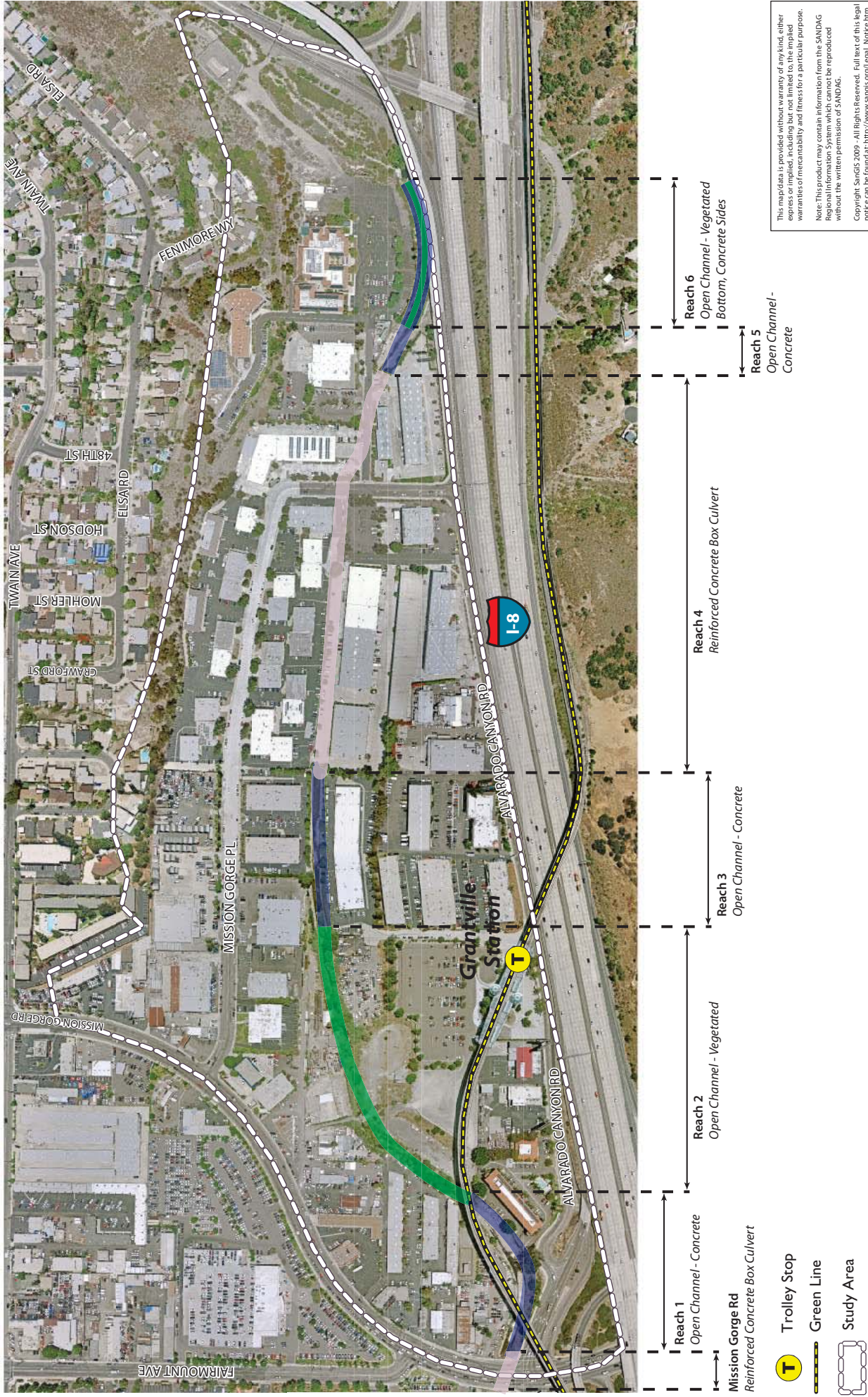
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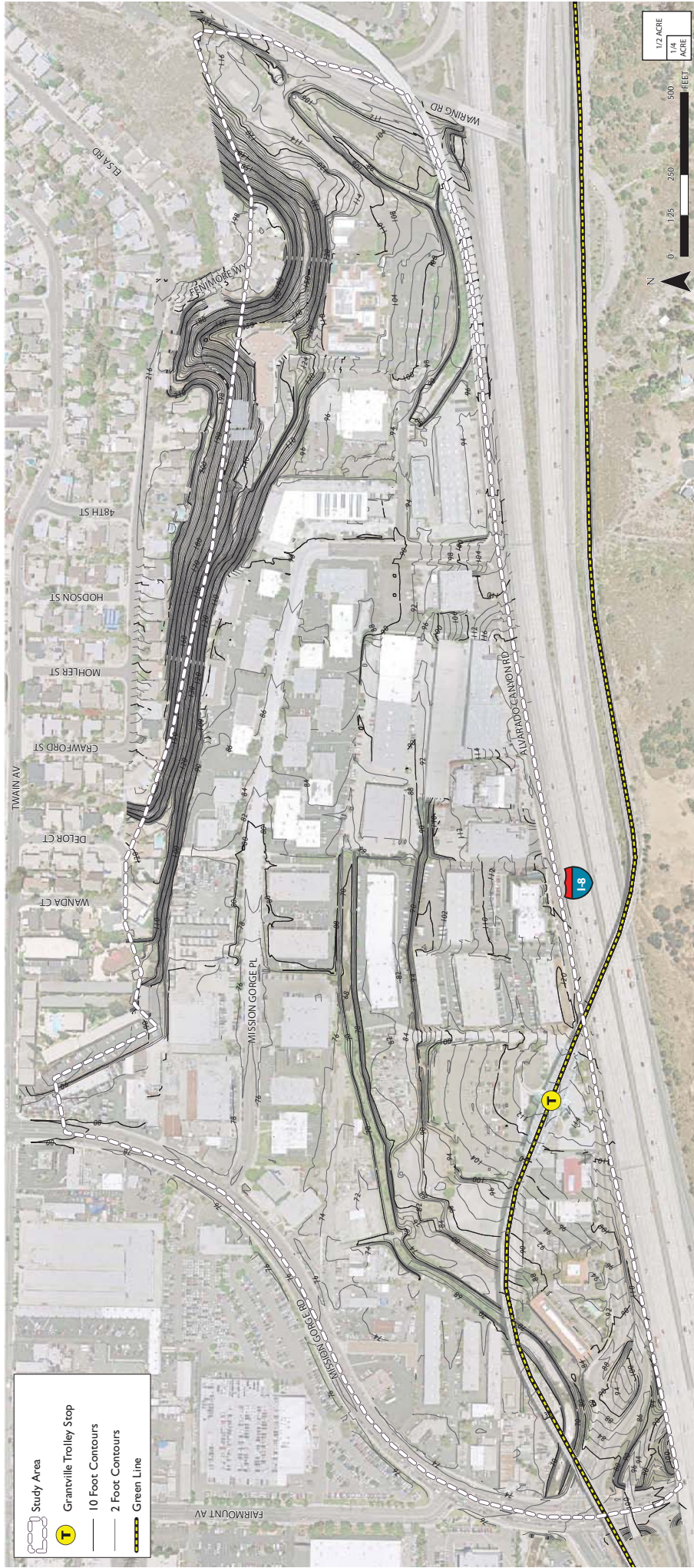
Figure I-3:  
**Existing Aerial with Reaches**



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Figure 1-4:  
**Existing Topography**



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## 2 Land Use and Ownership

### 2.1 Existing Plans

---

#### **NAVAJO COMMUNITY PLAN**

The Navajo Community Plan was adopted by the San Diego City Council in 1982, and guides future land uses for Grantville and the Study Area. The Navajo Community Plan has been amended on several occasions. Most recently, and as applicable to the Study Area, it was amended in 2015 via the Grantville Focused Plan Amendment, which seeks to promote transit-oriented development (TOD); transition the largely industrial and service commercial area to a vibrant, walkable, mixed-use neighborhood; provide housing greatly needed by the San Diego region; and promote a multi-modal transportation network.

A key component of the Grantville Focused Plan Amendment was the re-designation of land uses and intensities within the Study Area (see Section 2.2). This, coupled with the accompanying rezoning ordinance, is intended to implement the vision of Grantville as a high intensity, walkable, mixed-use commercial and residential neighborhood that capitalizes on the area's proximity to the Grantville Station.

The Grantville Focused Plan Amendment also includes a Community Plan Implementation Overlay Zone (CPIOZ) with supplemental development regulations (SDR). These design regulations are intended to encourage new TOD that is designed in such a way that supports walkability, strengthens connectivity, and minimizes over-reliance on automobiles. The Navajo Community Plan also addresses the importance of public recreational opportunities and connections to regional recreational and open space areas along Alvarado Creek with pocket parks near Grantville Station.

The design regulations also address conditions along Alvarado Creek. They provide specific requirements to facilitate pedestrian and bicycle connectivity and require that new development faces the creek. Proposals must comply with these requirements to be processed ministerially. Applicable portions of the SDR and the urban design framework (UD), intended to foster creative approaches to design and facilitate the transition to transit-supportive land uses in the Study Area, are set forth below.

- UD-1. Enhance pedestrian and bicycle connectivity by including sidewalks and bike facilities.
- UD-7. Design projects that incorporate connections to the Grantville Trolley Station and bus routes.

## Grantville Trolley Station/Alvarado Creek Enhancement Study

- UD-10. Provide the opportunity for a pedestrian/bicycle bridge over Alvarado Creek, which will allow any development projects adjacent to Alvarado the creek a critical linkage to the Grantville Trolley Station.<sup>2</sup>
- SDR 36. Development along Alvarado Creek shall provide a 10-foot wide multi-use pedestrian and bicycle trail directly adjacent to the Alvarado Creek.
- SDR 37. Developments shall orient buildings, common areas, and dwelling units toward the Alvarado Creek trail as identified in SDR 36.
- SDR 38. Provide direct access to the Alvarado Creek trail as identified in SDR 36 from common areas and ground floor units.
- SDR 39. Surface parking is prohibited within 50 feet of the Alvarado Creek floodway.<sup>3</sup>



*Existing development is frequently oriented away from and provides surface parking directly adjacent to Alvarado Creek.*

### **MASTER STORM WATER SYSTEM MAINTENANCE PROGRAM**

The City of San Diego Transportation & Storm Water Department (T&SW) maintains a series of natural and constructed drainage channels that make up a city-wide storm water system. The facilities in the system include underground storm drain pipes, culverts, detention basins, and flood control channels. Depending on the location and structure, the storm water facilities may serve multiple purposes, such as conveying storm water and urban runoff, protecting property from flooding during high-flow storm events, protecting water quality by filtering pollutants from urban runoff, and sustaining wildlife.

In performing facility maintenance, the City works to balance the needs for conveyance capacity with protection of water quality and biological resources. T&SW oversees public drainage facilities and performs maintenance for open flood control facilities (channels) according to an annual priority list and the 2013 Master Storm Water System Maintenance Program (Master Program). The Master Program covers maintenance work through 2018 and identifies access routes and maintenance protocols. The primary method used for maintenance of channels is sediment and vegetation removal using heavy equipment and hand tools for vegetation or trash/debris removal. The City of San Diego also performs emergency maintenance activities, which are not included in an annual maintenance plan.

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<sup>2</sup> The urban design framework for the Grantville Community Plan Implementation Zone is located in the Navajo Community Plan on page 33.

<sup>3</sup> The quoted supplemental development regulations are located in the Navajo Community Plan on pages 33 and 44.

Alvarado Creek within the Study Area is part of the Master Program. Of the 4,400 feet of channel within the Study Area, the City maintains approximately 1,825 feet. Alvarado Creek was a priority project, with maintenance completed in 2015. Completed maintenance for segments within the Study Area are recorded in the Individual Maintenance Activity Report Form and annual Maintenance and Monitoring Reports.

The City is developing a Waterways Maintenance Plan that will guide maintenance of the storm drain system following the expiration of the Master Program. The Waterways Maintenance Plan will cover watershed water quality improvements, stream protection and restoration, infrastructure improvements, and flood risk maintenance.

### **SAN DIEGO RIVER PARK MASTER PLAN**

The San Diego River Master Plan, adopted by the San Diego City Council in 2013, is a policy document that communicates a common vision, principles, and recommendations to guide land use decisions within the River Corridor and River Influence Areas along the San Diego River. The location and role of the San Diego River is important as it provides a floodway along with a water quality buffer, habitat, and recreational space. Like the Study Area, portions of the San Diego River have historically experienced periodic flooding.

The Master Plan recognizes that as Grantville is redeveloped, new active uses can be oriented to the river with plazas, public access and architecture to enhance the river corridor. The San Diego River Park Master Plan also speaks to the treatment of Alvarado Creek, which flows into the river just west of the Study Area. The Master Plan indicates the potential for the creek to be an amenity by replacing culverts with bridges and reducing the channelization of Alvarado Creek to re-establish connections from the canyon system to the river valley. It also states that “the greening” of Alvarado Creek is an important component of connecting the river valley with the canyon, which, in turn, has the potential to expand and connect habitat to the canyon, San Diego State University, and upland neighborhoods.

The San Diego River Park Master Plan<sup>4</sup> provides the following applicable recommendations with respect to the Study Area:

- Recommendation C: Improve water flow under the bridge at Mission Gorge/Fairmount Avenue for Alvarado Creek to connect to the San Diego River. Provide a pedestrian connection under or over the bridge for access to the river pathway from Alvarado Creek.
- Recommendation E: Improve open space and trail connections with Alvarado Canyon and Navajo Canyon.

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<sup>4</sup> See San Diego River Park Master Plan, pages 73-74.

## 2.2 Land Use

### EXISTING LAND USE

Existing land uses were identified from City of San Diego and County of San Diego data and aerial photography. The analysis uses parcel-level information from Geographic Information Systems (GIS) databases retrieved in 2016 from the City of San Diego and SANGIS/SANDAG.

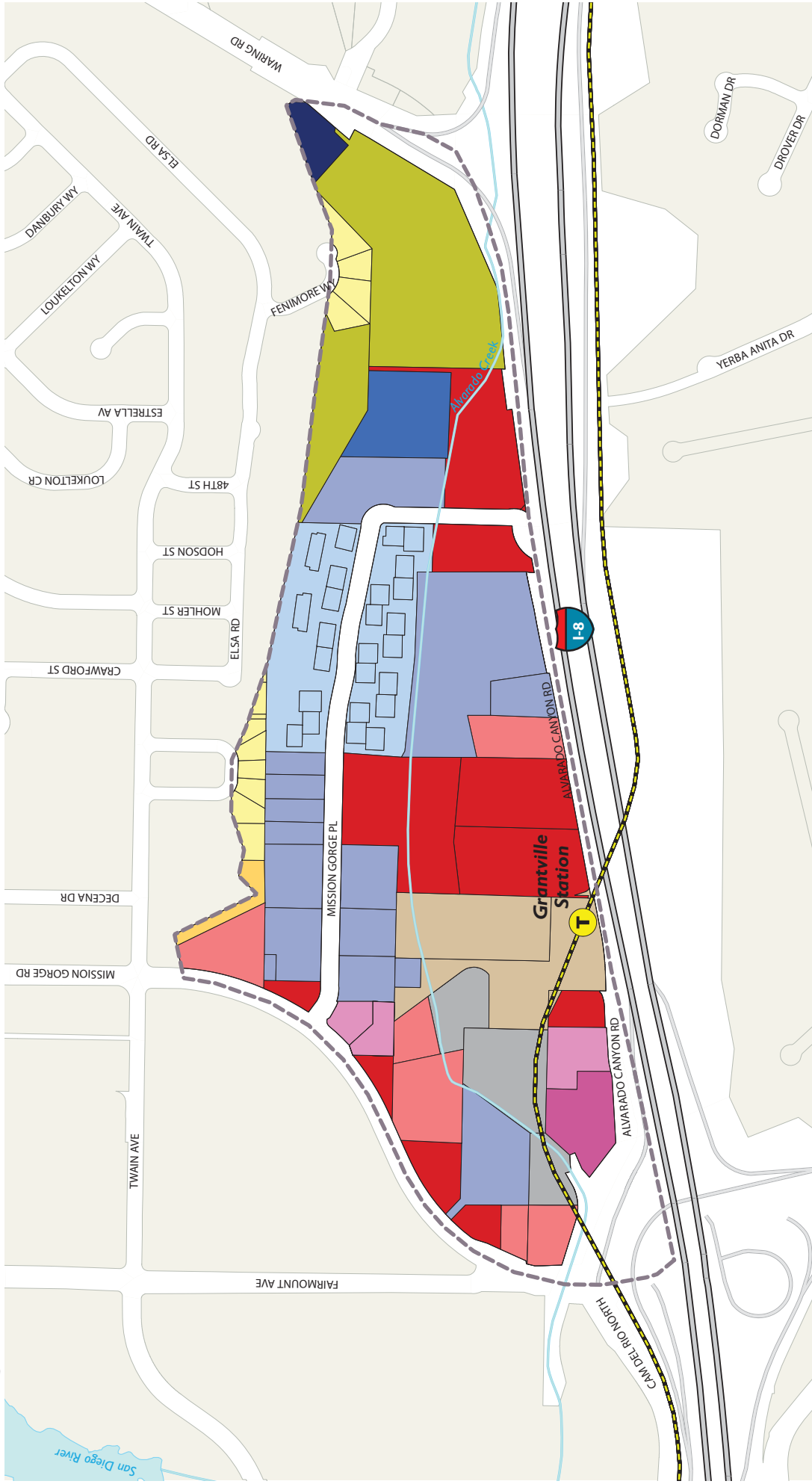
There are approximately 102 acres in the Study Area, or 87 acres excluding rights-of-way. Table 2-1 shows the breakdown of existing land uses, and Figure 2-1 shows the overall pattern of existing land uses in the Study Area. Figure 2-2 shows photos of existing land uses and transit facilities on a map of the Study Area.

**Table 2-1: Existing Land Use**

<i>Existing Land Use Categories</i>	<i>Acres</i>	<i>Percentage</i>
<b>Residential</b>	<b>3.4</b>	<b>3%</b>
Single-Family	2.8	3%
Multi-Family	0.6	1%
<b>Commercial</b>	<b>28.2</b>	<b>28%</b>
General/Retail Commercial	17.6	17%
Auto Commercial	6.8	7%
Hotel/Motel/Lodging Commercial	1.8	2%
Office	2.1	2%
<b>Industrial</b>	<b>28.9</b>	<b>28%</b>
General Industrial	19.4	19%
Light Industrial/Business Park	9.5	9%
<b>Public and Community Facilities</b>	<b>21.2</b>	<b>21%</b>
Religious/Institutional	11.5	11%
Rail Station/Transit Center	7.1	7%
Public	2.6	3%
<b>Vacant</b>	<b>4.5</b>	<b>4%</b>
<b>Utilities and Right-of-Way</b>	<b>16.0</b>	<b>16%</b>
Railroad ROW	0.1	0%
Street ROW	15.1	15%
Utilities	0.8	1%
<b>Total</b>	<b>102.3</b>	<b>100%</b>

Figure 2-1:

# Existing Land Use

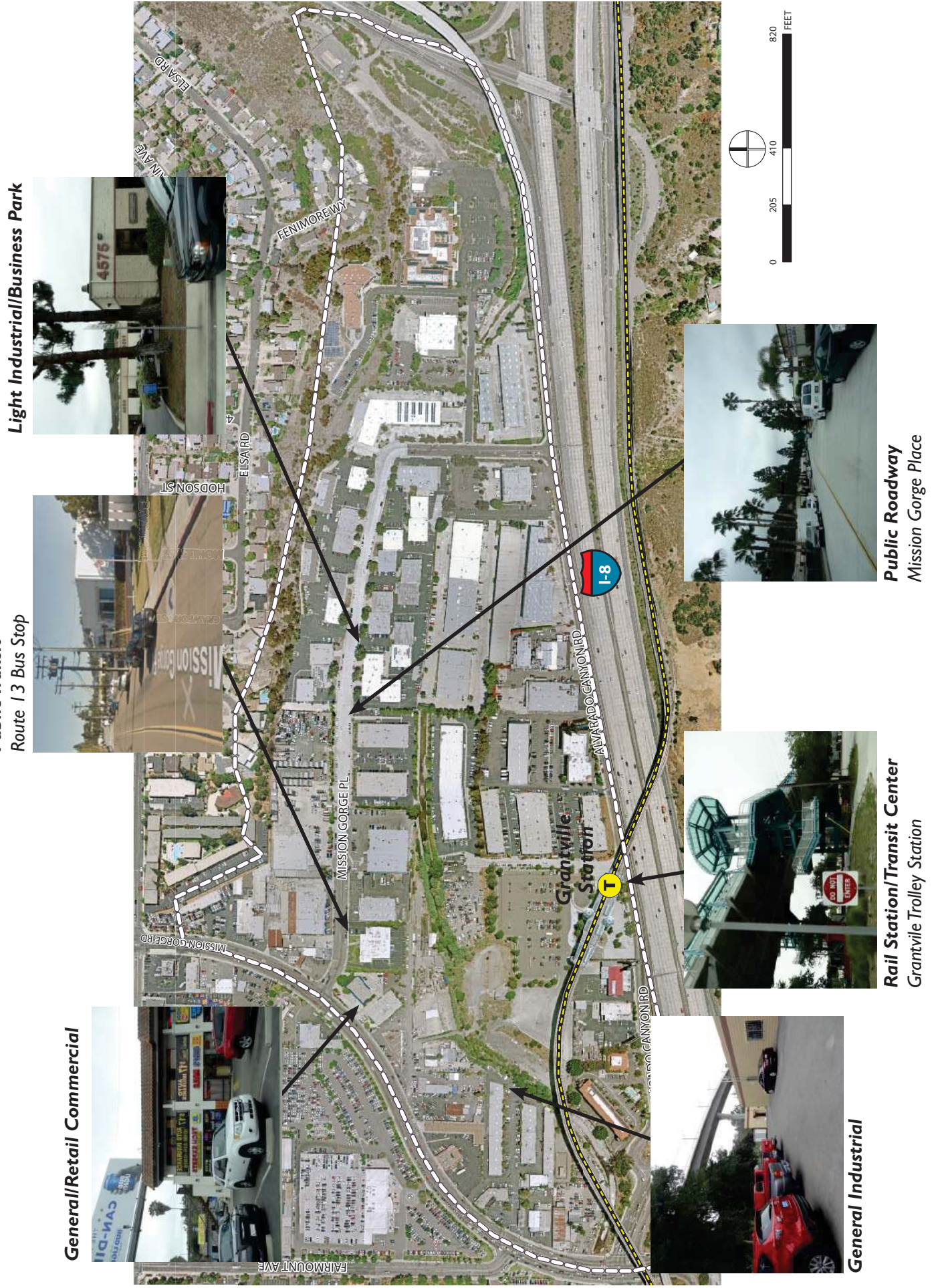


	Single Family Residential		Hotel/Motel/Lodging Commercial		Rail Station/Transit Center		Vacant		Ramps
	Multi Family Residential		Office		Religious/Institutional		Trolley Stop		River/Streams/Creeks
	Auto Commercial		Light Industrial/Business Park		Public		Green Line		Study Area
	General/Retail Commercial		General Industrial		Utilities		Freeway		

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Figure 2-2:

### Land Use and Transit Network Photo Map



As shown in Table 2-1 and Figure 2-1, the two most prevalent land uses in the Study Area are commercial and industrial, each accounting for approximately 28 acres or just over 28 percent of the Study Area. Together, these two land uses comprise a majority of the Study Area's acreage and significantly contribute to the character of the area.

Commercial uses generally located along Mission Gorge and Alvarado Canyon include shops, exercise studios, and drinking and dining establishments. This area also includes auto commercial uses, including automobile service stations and dealers, office, and hotel/motel/lodging uses.



*Commercial uses located in the Study Area.*

## Grantville Trolley Station/Alvarado Creek Enhancement Study

Industrial uses are focused along Mission Gorge Place. Within this general category, approximately 19 acres are occupied by general industrial land uses, and 9 acres are occupied by light industrial/business park uses.

Public and community uses also account for a significant portion—21 acres—of the Study Area. The Grantville Station occupies 7 acres of this use. In addition, a large portion (11 acres) is constituted by religious and institutional facilities, including those of the Junior Achievement of San Diego County and the Mission Valley Church of the Nazarene.



*Industrial uses located in the Study Area.*



## **PLANNED LAND USE (NAVAJO COMMUNITY PLAN)**

The Navajo Community Plan, as amended in 2015 by the Grantville Focused Plan Amendment, provides the proposed land uses for the Study Area. Table 2-2 provides a breakdown and brief description of planned land uses, and Figure 2-3 shows the overall pattern of planned land uses in a diagram. These indicate an intention for the Study Area to transform from largely an industrial and commercial district to a mixed-use and residential neighborhood that accommodates medium- and high-density housing. It is notable that the residential acreage in the area is designated to increase from 3 acres existing to a total 16 acres planned, and 62 acres of new mixed-use development.

## **2.3 Property Ownership**

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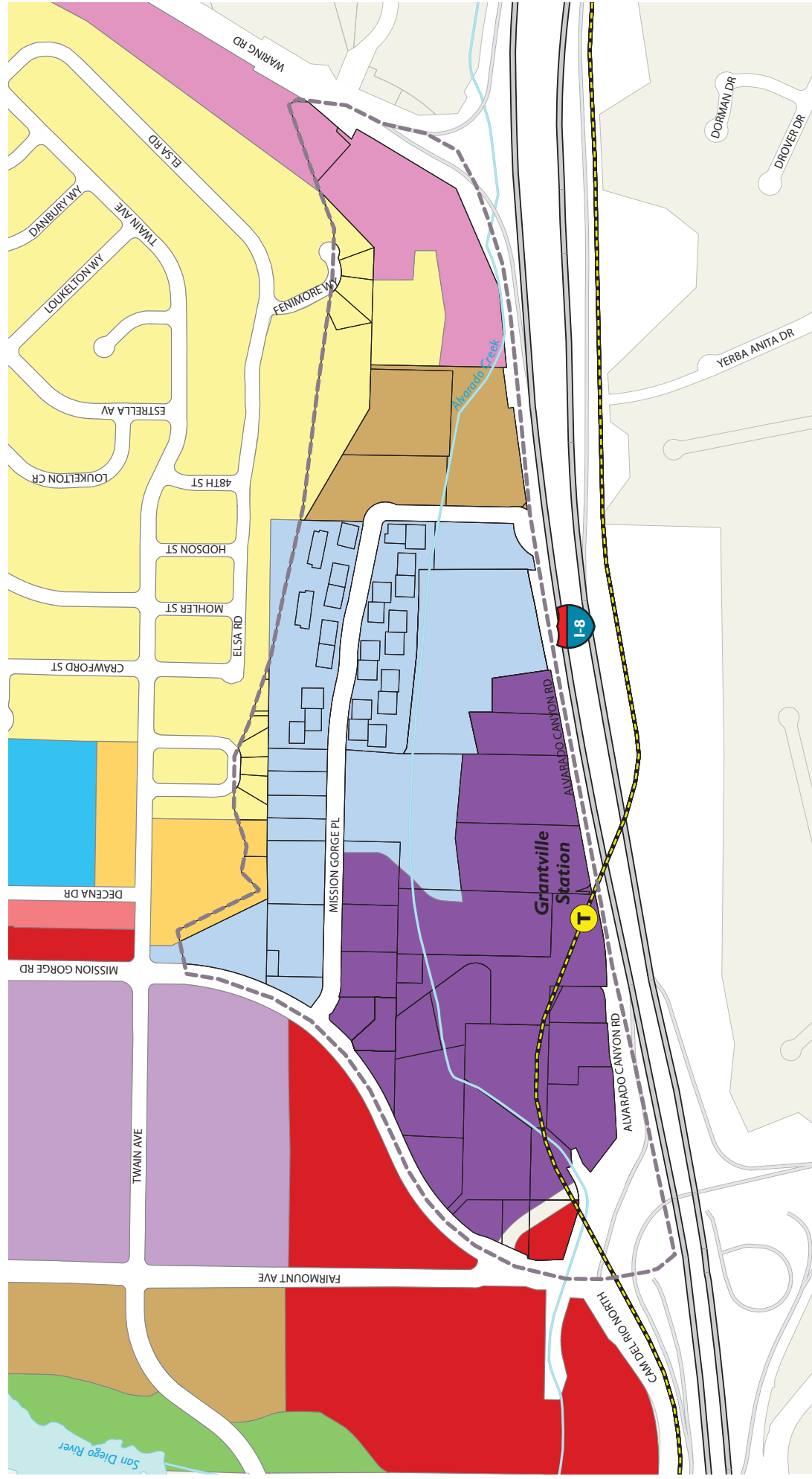
Figure 2-4 shows property ownership. Several of the parcels along Alvarado Creek are owned by private parties. Indeed, of the approximately 48 acres of parcels that are located adjacent to the creek in the Study Area, 35 acres are privately owned.

**Table 2-2: Planned Land Use**

<i>Land Use Designation</i>	<i>Acres</i>	<i>Percentage</i>	<i>Description</i>
<b>Residential</b>	<b>16.4</b>	<b>19%</b>	
Residential - Medium High (30-43 du/ac)	8.2	9%	Provides for multifamily housing within a medium-high-density range.
Single Family Residential	7.3	8%	Provides for single-family residential housing (existing homes in the northeast part of the Study Area; area not included in Focused Plan Amendment).
Multi-Family Residential	0.9	1%	Provides for multifamily housing (area not included in Focused Plan Amendment, but is in the Study Area at the very northern edge).
<b>Commercial, Employment, Retail, and Services</b>	<b>8.2</b>	<b>9%</b>	
Office	7.5	9%	Provides for a range of office uses (area not included in Focused Plan Amendment).
Community Commercial	0.7	1%	Provides for shopping areas with retail, service, civic, and office uses for the community at large within three to six miles.
<b>Mixed Use</b>	<b>62.1</b>	<b>72%</b>	
Urban Village (44-109 du/ac)	33.8	39%	Serves the region with many types of uses, including housing, in a high-intensity, mixed-use setting. Integration of commercial and residential use is emphasized; larger, civic uses and facilities are a significant component. Uses include housing, business/professional office, commercial service, and retail.
Business Park - Residential (44-73 du/ac)	28.3	33%	Allows office, research and development, and light manufacturing uses.
<b>Total</b>	<b>86.7</b>	<b>100%</b>	

Figure 2-3:

# Planned Land Use



	Single Family Residential		Open Space		River/Streams/Creeks
	Multi Family Residential		Trolley Stop		Study Area
	Residential - Medium High (30-43 du/ac)		Green Line		Freeway
	Office		Ramps		School
	Commercial		Community Commercial		Community Village (44-109 du/ac)
			Community Village (44-109 du/ac)		Urban Village (44-109 du/ac)
			Business Park - Residential (44-73 du/ac)		School

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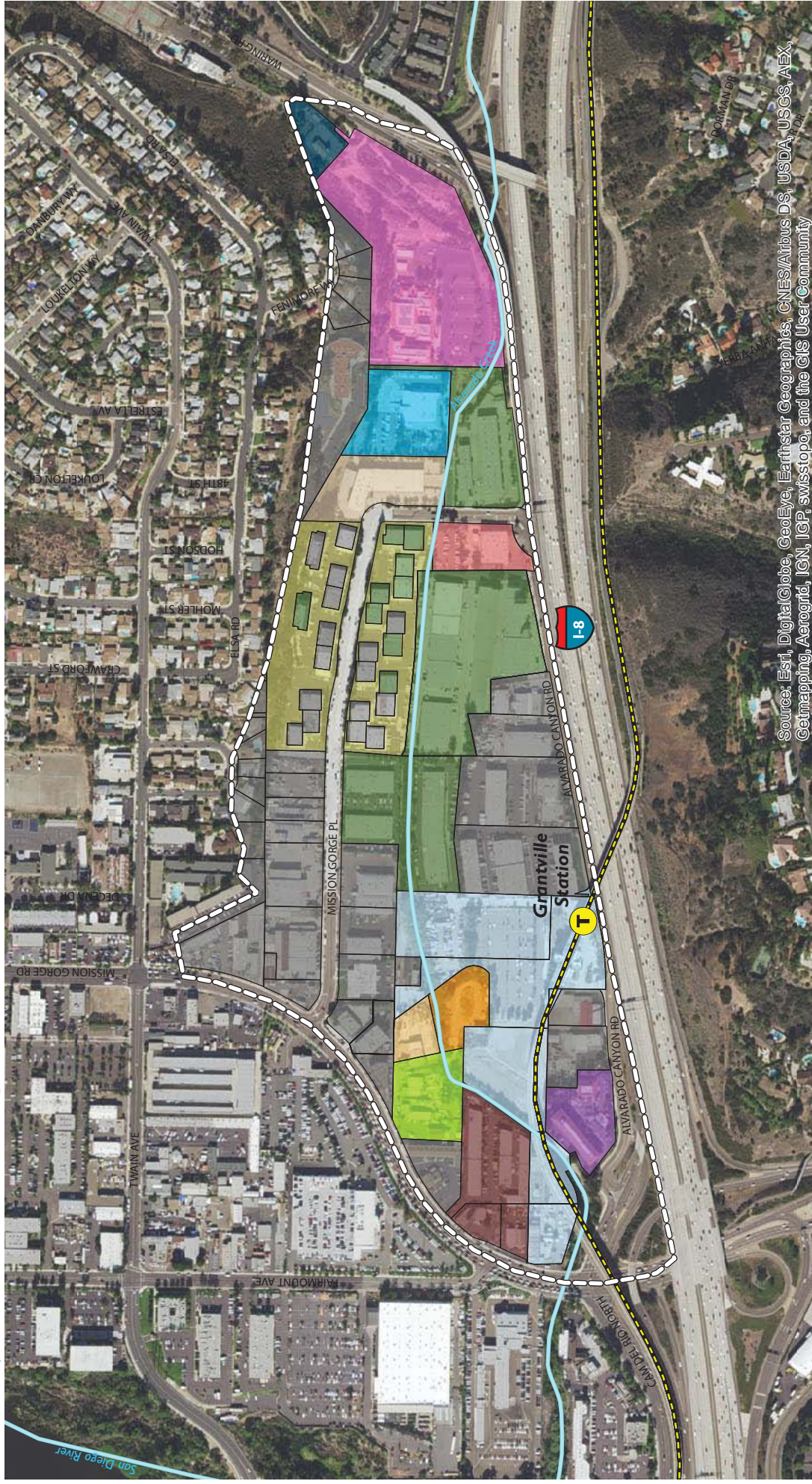
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 Dyett & Bhatia, 2016

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Figure 2-4:

# Property Ownership Along the Channel



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

<b>Public</b>	San Diego Metropolitan Transit Development Board	Owner 4	Owner 8	Trolley Stop
US Postal Service	Owner 1	Owner 5	Owner 9	Green Line
City of San Diego	Owner 2	Owner 6	Owner 10	Study Area
	Owner 3	Owner 7	Parcels Not Along the Channel	River/Streams/Creeks

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0 250 500 1,000 FEET



## 3 Transportation Network

### 3.1 Roadways

---

Both the California Department of Transportation (Caltrans) and the City of San Diego provide the existing, functional roadway classifications within and adjacent to the Study Area. Three basic functional categories of streets shown in Figure 3-1 include interstate, major streets, and collector. In addition, private streets are located within the Study Area. Notably, most of these streets border the Study Area, and no local streets are present within its boundaries.

Egress and ingress into the Study Area through the roadway system may be achieved via I-8, which may be accessed by Alvarado Canyon Road. The Study Area may also be accessed via Alvarado Canyon Road and Mission Gorge Road/Fairmount Avenue. Mission Gorge Place is the only public road that provides access to properties and destinations within the Study Area.



*Mission Gorge Place is the only public street that provides access to properties within the Study Area.*

## 3.2 Pedestrian Facilities

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Figure 3-2 depicts the pedestrian facilities in the Study Area and walksheds from the Grantville Station platform. As the figure indicates, pedestrian connectivity is an area for improvement. A typical pedestrian route to or from a transit station is within a quarter mile in any direction or a five-minute walk to a destination. However, in the Study Area, a pedestrian is only able to access a small portion of that area due to the significant obstacle to north-south connectivity presented by Alvarado Creek and the fact that only one public street provides access to the Study Area. Moreover, as Figure 3-2 indicates, pedestrians are not able to access the station within ten minutes when approaching from north of the station.

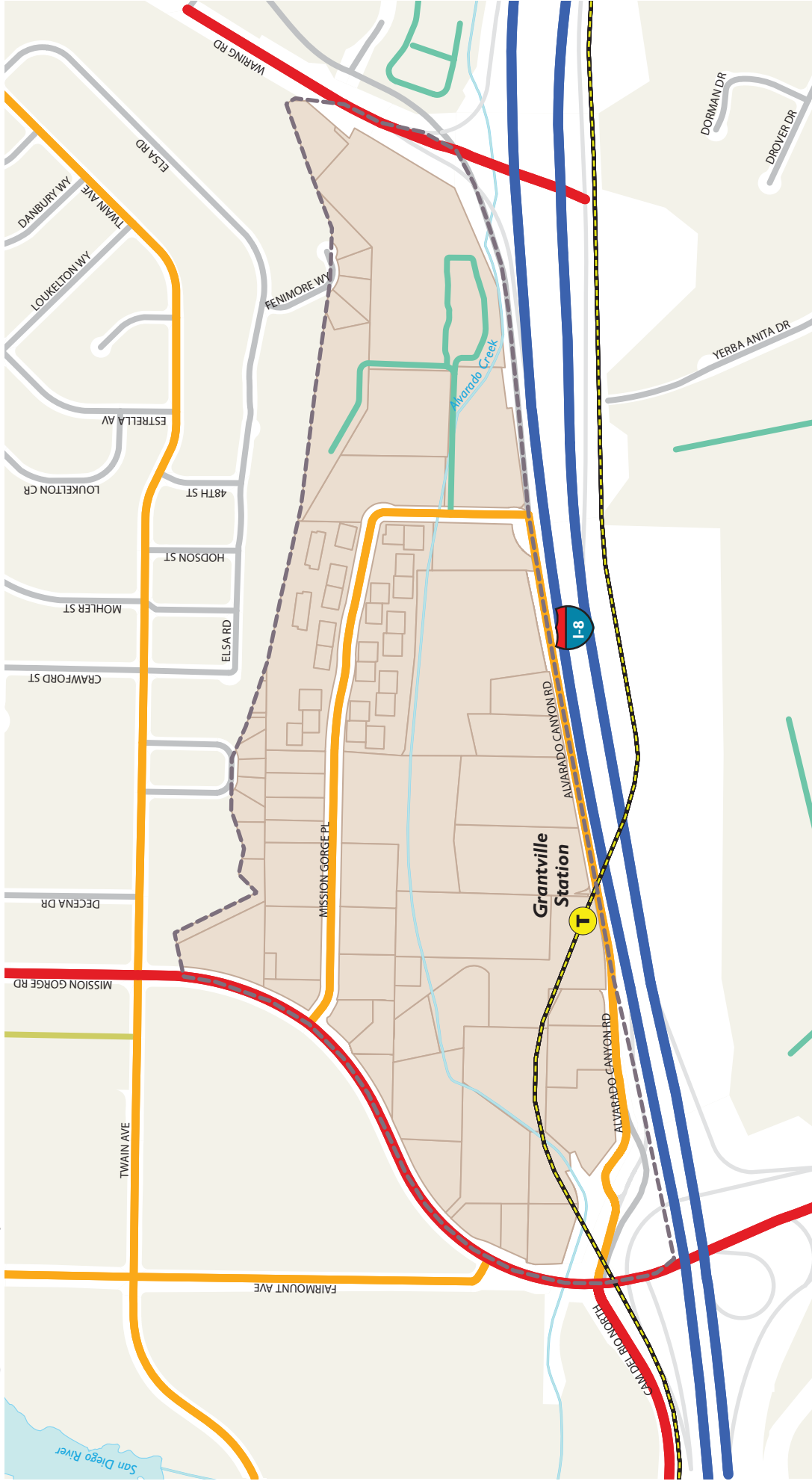
Alvarado Creek not only presents a barrier to pedestrians accessing the Grantville Station, it is itself inaccessible to those who visit the Study Area. Within the Study Area, the creek is frequently surrounded by fencing or concrete barriers, as well as by surface parking lots and outdoor storage.

With Mission Gorge Place serving as the only roadway within the Study Area, designated routes for pedestrians are limited. Conditions of the facilities are low quality and in some areas lacking. Figure 3-2 displays roadway segments with missing sidewalks within the Study Area. Missing sidewalks are present on a segment of Alvarado Canyon Road, east of Mission Gorge Place. In addition, the lack of protected and shaded areas combined with curb cuts for private roads and driveways affects the quality of the pedestrian connectivity in the Study Area.

The addition of trails along Alvarado Creek and within the Study Area, in accordance with the Focused Plan Amendment's supplemental development regulations, has the potential to enhance connectivity in the Study Area, provide connections to the San Diego River corridor and Navajo Canyon, and enrich the river valley's recreational opportunities.

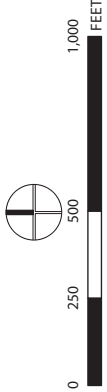
Figure 3-1:

# Existing Roadway Classifications



- T** Trolley Stop
- Green Line
- Road Class**
  - Interstate/Other Freeways
  - Arterial Streets/Major Streets
- Collector Streets
- Local Streets
- Private Street
- Alley
- Ramps
- River/Streams/Creeks
- Study Area Parcels
- Study Area

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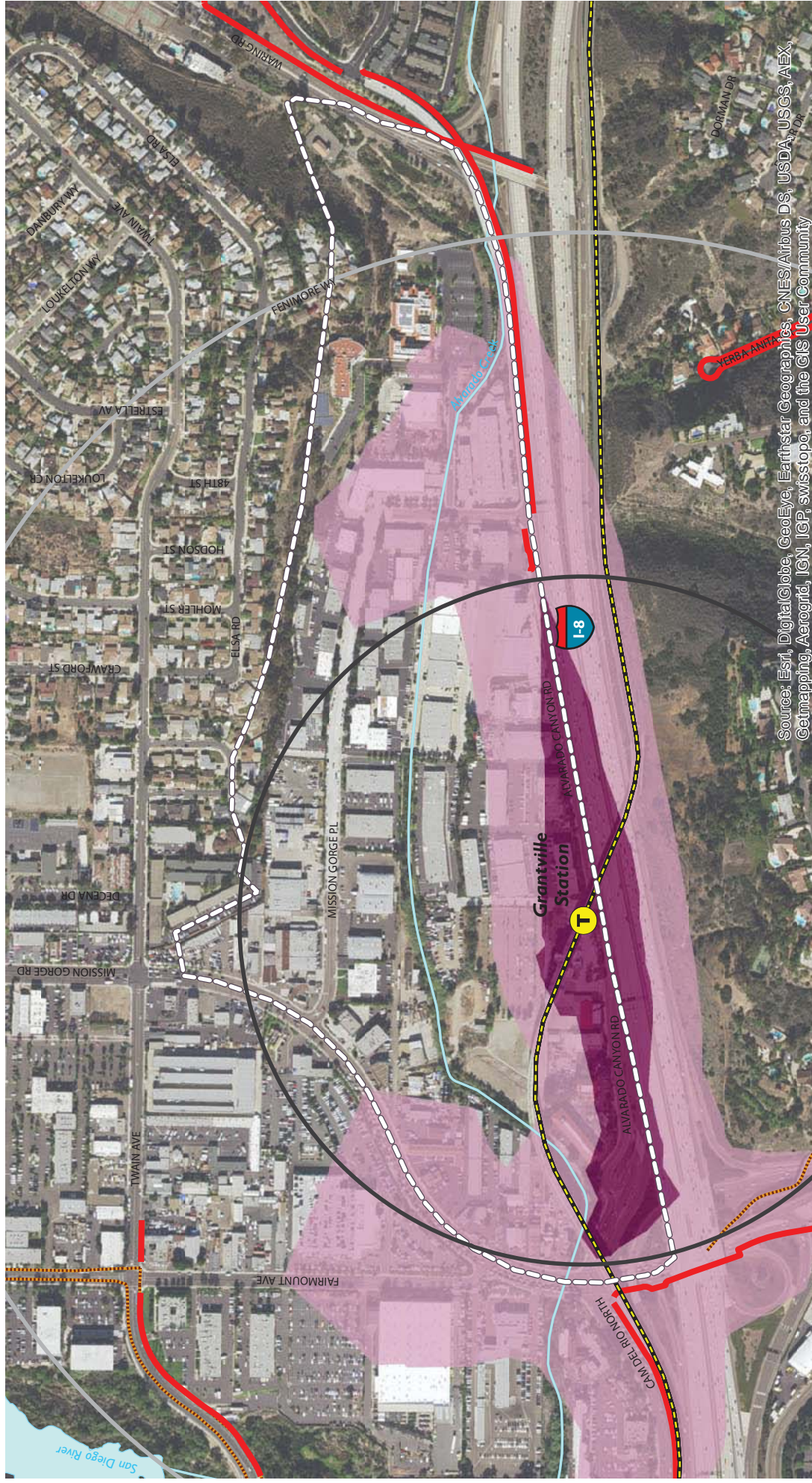


Data Source: City of San Diego, 2016; Caltrans GIS Data, 2016; SANGIS/SANDAG Regional GIS Data Warehouse, 2016. (www.sangis.org), Dyett & Bhatia, 2016



Figure 3-2:

# Pedestrian Facilities and Walksheds



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

<b>T</b> Trolley Stop	<b>Grantville Trolley Walkshed</b>	<b>Grantville Station Service Area</b>	<b>River/Streams/Creeks</b>
Green Line	5 Minute Service Area (Quarter Mile)	Quarter Mile Station Buffer	Study Area
Existing Multi-Use Trails	10 Minute Service Area (Half Mile)	Half Mile Station Buffer	
Missing Sidewalk			

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### 3.3 Bicycle Facilities

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Figure 3-3 displays the location of existing bicycle facilities and bicycle facilities planned in accordance with the City's 2013 Bicycle Master Plan. Caltrans and the City of San Diego classify bicycle facilities based on a standard typology:

- Class I Bikeway (Bike Path) provides a paved right-of-way for exclusive use by bicyclists, pedestrians, and those using non-motorized modes of travel. They are physically separated from vehicular traffic and can be constructed in roadway right-of-way or exclusive right-of-way.
- Class II Bikeway (Bike Lane) provides a restricted right-of-way and is designated for the use of bicycles with a striped lane and signage on a street or highway. Bicycle lanes are one-way facilities on either side of the roadway and are generally five feet wide.
- Class III (Bike Route) provides for a right-of-way designated by signs and/or pavement markings for shared use with motor vehicle traffic within the same travel lane.

As Figure 3-3 indicates, the Study Area is not currently served by any bicycle facilities. The City's Bicycle Master Plan proposes the installation of a Class II Bikeway (Bike Lane) along Alvarado Canyon Road, between Mission Gorge Road/Fairmount Avenue and Mission Gorge Place. Bicycle facilities are also proposed along Mission Gorge Road. The proposed bike facilities would provide a connection from the Study Area to the San Diego River Trail.

Moreover, the Navajo Community Plan provides supplemental development regulations (SDR) that require new projects to provide new bike paths, access-ways, and wayfinding signage within the Study Area, in order for the projects to be processed ministerially.

- SDR 5. All new development shall provide a minimum of one pedestrian and bicycle access-way through the project site. Pedestrian and bicycle access-ways shall be coordinated and connected to public streets. Fencing, walls, and gates that limit access are prohibited.
- SDR 6. For all new projects, provide way-finding signage. The signage shall identify the pedestrian and bicycle routes to and from the Grantville Trolley Station and San Diego River.
- SDR 36. Development along Alvarado Creek shall provide a 10-foot wide multi-use pedestrian and bicycle trail directly adjacent to the Alvarado Creek.<sup>5</sup>

### 3.4 Public Transit

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Public transit in the Study Area is provided by the Metropolitan Transit System (MTS) with both bus and Light Rail Trolley services. Figure 3-4 displays existing transit service and facilities within

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<sup>5</sup> The quoted supplemental development regulations are located in the Navajo Community Plan on pages 37-38, and 44.

the Study Area, including bus transit stops and routes, as well as the Light Rail Trolley line and Grantville Station. A summary of the transit facilities in the Study Area is provided in Table 3-1.

**Table 3-1: Transit Facility Summary**

<i>Route</i>	<i>Regions Served</i>	<i>Direction</i>	<i>Hours of Operation</i>	<i>Number of Weekday Peak Hour Buses<sup>1</sup></i>	<i>Stop Location</i>
13	National City/City Heights/Grantville	North	Weekdays: 5:44am-11:13pm Saturday: 6:12am-10:43pm Sunday: 6:42am-8:14pm	15	Grantville Station, Mission Gorge Road and Fairmont Avenue, Mission Gorge Road and Mission Gorge Place
		South	Weekdays: 4:45am-11:46pm Saturday: 5:45am-11:16pm Sunday: 7:17am-8:16pm	16	Grantville Station, Mission Gorge Road and Fairmont Avenue, Mission Gorge Road and Mission Gorge Place
14	Grantville/La Mesa	East	Weekdays: 5:45am-6:50pm	4	Grantville Station
		West	Weekdays: 7:23am-6:25pm	4	Grantville Station
18	Grantville/Camino del Rio		Weekdays: 6:38am-5:38pm	8	Grantville Station
Green Line Trolley	Downtown/Santee	East (Santee)	Weekdays: 5:30am-12:30am Weekends 5:45am-12:30am	16	Grantville Station
		West (Downtown)	Weekdays: 4:30am-12:15am Weekends 4:45am-12:15am	16	Grantville Station

Note:

1. Peak hours are from 7a.m. to 9a.m. and from 4p.m. to 6p.m.

**TROLLEY ROUTE AND STOPS**

The Study Area is served by the San Diego Trolley Green Line, with the Grantville Station located off of Alvarado Canyon Road. A surface parking lot is provided adjacent to the station for Trolley riders. The Green Line travels east from the Grantville Station to San Diego State University, El Cajon, and Santee, and travels west to Qualcomm Stadium, Mission Valley, and the Santa Fe Depot, before terminating Downtown.

The Grantville Station is an underutilized asset. Metropolitan Transit System data from the 2013 fiscal year indicates that, on average, 7 passengers boarded and 11 passengers alighted at the Grantville Station from each train traveling in the eastbound direction; 11 boarded and 7 alighted in the westbound direction. In total, the Grantville Station saw, in the 2013 fiscal year, a daily average of 517 boardings and 759 alightings in the eastbound direction, and 762 boardings and 536 alightings in the westbound direction.

By comparison, at the highly-utilized San Diego State University Station, the stop directly eastbound of Grantville, an average of 18 passengers boarded and 27 passengers alighted from each train in the eastbound direction, and 27 passengers board and 19 passengers alighted each train in the westbound direction. In total, the San Diego State Station saw a daily average of 1,291 boardings and 1,948 alightings in the eastbound direction, and 1,925 boardings and 1,364 alightings in the westbound direction. In Mission Valley, the community directly to the west of Grantville, Trolley stations ranged in their utilization. Depending on the station, between three and 20 passengers, on average, boarded each train, and between three and 22 passengers departed each train.<sup>6</sup> Station daily averages ranged from 251 to 1,512 boardings a day, and 268 to 1,646 alightings a day.



*The Study Area is served by the Grantville Station (left) and bus routes (right).*

## **BUS ROUTES AND STOPS**

There are currently three bus routes with a total of four bus transit stops serving the Study Area. Route 13 stops at the Grantville Trolley Station, at two stops along Mission Gorge Road, and at one stop on Mission Gorge Place; the route travels north to Kaiser Hospital and south to City Heights and National City on weekday and weekends, both during the day and in the evening. Route 14 stops at the Grantville Trolley Station and travels on weekdays through Grantville to La Mesa. Route 18 stops at the Grantville Trolley Station and travels, on weekdays, in a loop along Camino del Rio between Fairmount Avenue and Qualcomm Way.

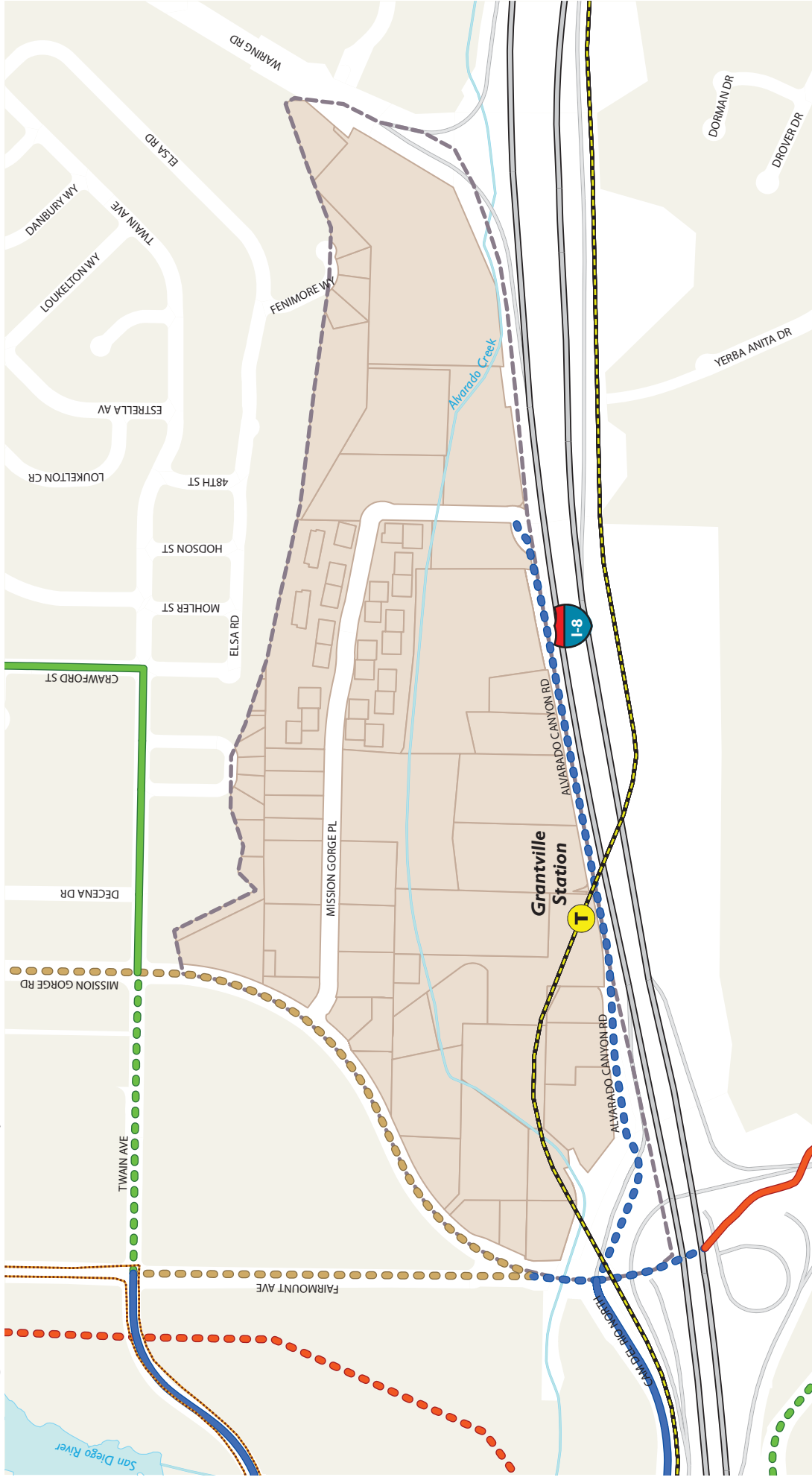
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<sup>6</sup> The ridership for the following stations is included in these figures: Fashion Valley Transit Center, Hazard Center Station, Mission Valley Center Station, Rio Vista Station, and Fenton Parkway Station.

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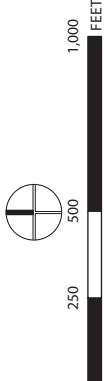
Figure 3-3:

# Existing and Planned Bicycle Facilities



- | Existing Network       | Proposed Network       | Existing River Trails | River/Streams/Creeks |
|------------------------|------------------------|-----------------------|----------------------|
| Class I - Bike Path    | Class I - Bike Path    | Existing River Trails | River/Streams/Creeks |
| Class II - Bike Lane   | Class II - Bike Lane   | Trolley Stop          | Study Area Parcels   |
| Class III - Bike Route | Class III - Bike Route | Green Line            | Study Area           |
| Class II or III        | Class II or III        | Freeway               |                      |
|                        | Ramps                  |                       |                      |

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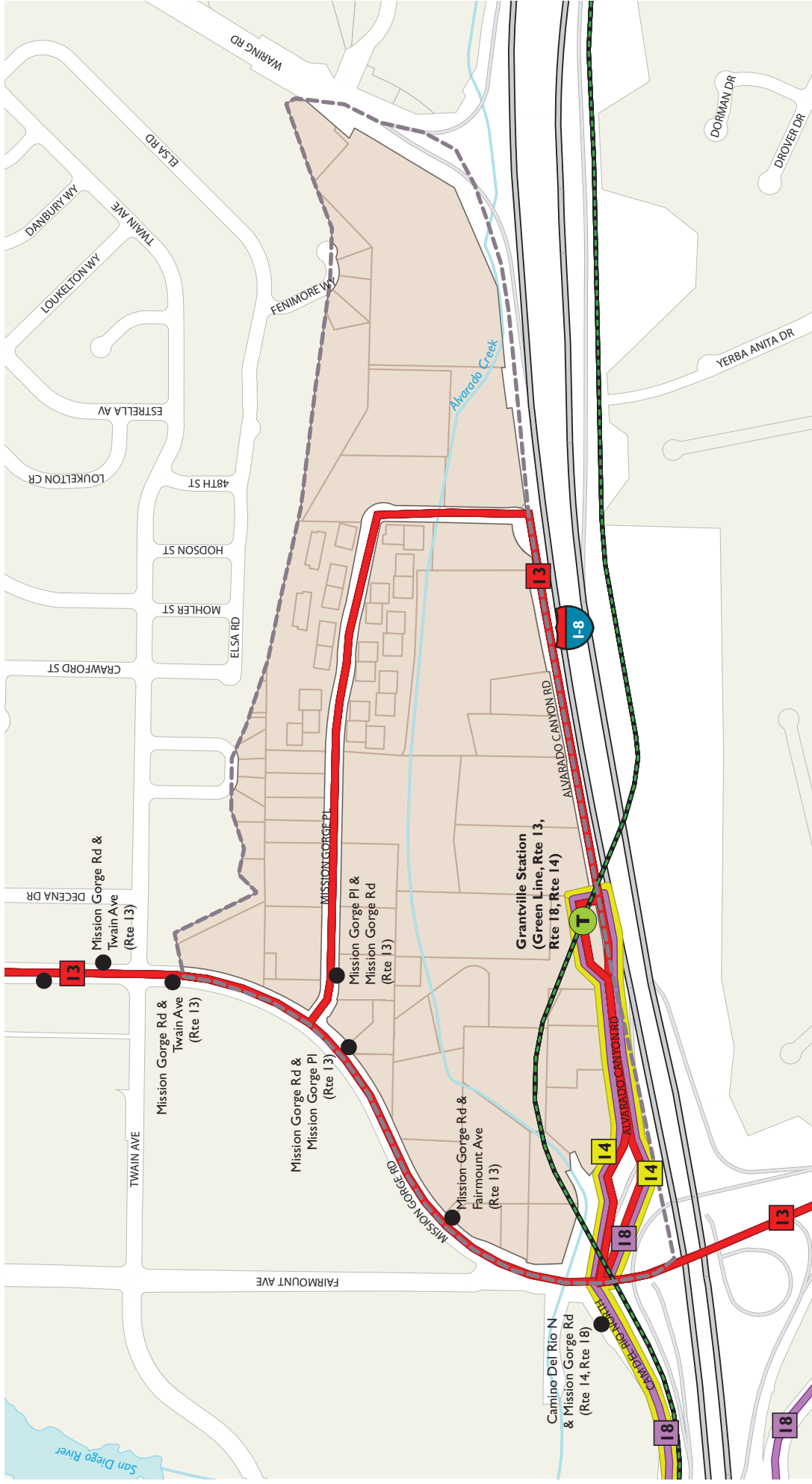


Data Source: San Diego Bicycle Master Plan, 2010; City of San Diego, 2016; SANGIS/SANDAG Regional GIS Data Warehouse, 2016. ([www.sangis.org](http://www.sangis.org)); Dyett & Bhatia, 2016



Figure 3-4:

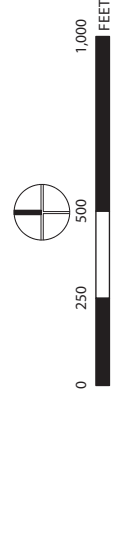
# Transit Routes & Stops



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- Bus Routes**
- Route 13 (24th Street Transit Center - Kaiser Hospital)
- Route 14 (Grantville Trolley - Lake Murray Bl)
- Route 18 (Grantville - Camino del Rio)
- Bus Stops
- Trolley Routes**
- Trolley Station
- River/Streams/Creeks
- Study Area Parcels
- Study Area
- Green Line
- Freeway
- Ramps



Data Source: Metropolitan Transit System (MTS), 2016; City of San Diego, 2016; SANDAG/SANDAG Regional GIS Data Warehouse, 2016. ([www.sangis.org](http://www.sangis.org)); Dyett & Bhatia, 2016

## 4 Biological Conditions and Resources

Alvarado Creek is a tributary to the San Diego River and a defining element within the Study Area as it contains natural vegetation and areas that support wildlife and plants. Alvarado Creek connects an unnamed drainage and storm drain facilities from the east to a culvert and the San Diego River to the west. Alvarado Creek is separated from Navajo Canyon by Waring Road and from Alvarado Canyon by I-8.

### 4.1 Vegetation Communities

---

The Study Area includes several areas with natural vegetation, biological resources, and jurisdictional waters. Of the 102-acre Study Area, there are approximately eight acres of sensitive vegetation communities. More than half of this acreage is located along the eastern and northern slopes of the Study Area, with the remaining areas located along Alvarado Creek (Reaches 1, 2, 3, 5, and 6).

As shown in Figure 4-1 and Table 4-1, seven of the land cover types and vegetation communities in the Study Area are considered sensitive. Of these seven sensitive vegetation communities, six occur within the Alvarado Creek corridor. Most of the sensitive vegetation communities are dominated by native plant species; however, non-native riparian, arundo-dominated riparian and disturbed wetland are characterized primarily by non-native or invasive species. Figure 4-2 shows photos of vegetation communities on a map of the Study Area. When there are potential impacts to these communities, mitigation may occur through dedication of a conservation easement, purchase of mitigation credits at an approved mitigation bank, or contribution to the City's Habitat Acquisition Fund. This mitigation is required at a ratio of 1:1 up to 3:1 depending on the type and sensitivity of the community. In addition to habitat preservation, wetlands communities are also subject to no-net-loss policies.

Grantville Trolley Station/Alvarado Creek Enhancement Study

**Table 4-1: Vegetation Communities**

Vegetation Type	Acres	Agencies that Consider Vegetative Community Sensitive	Location in Study Area
Southern Willow Scrub (63320)	0.81	CDFW, USACE, RWQCB, San Diego	Along Alvarado Creek (Reaches 2, 6) & small tributary drainage in eastern portion
Freshwater Marsh (52400)	0.03	Typically by CDFW, USACE, RWQCB, San Diego	Along Alvarado Creek (Reaches 2, 5)
Non-native Riparian (65000)	0.16	Typically by CDFW, may be regulated as a wetland by USACE, RWQCB, San Diego	Along Alvarado Creek (Reach 2)
Arundo-dominated Riparian (65100)	1.00	Typically by CDFW, may be regulated as a wetland by USACE, RWQCB, San Diego	Along Alvarado Creek (Reach 2) & tributary drainage in eastern portion
Disturbed Wetland (11200)	1.15	May be considered sensitive if determined to be USACE, CDFW, RWQCB, or San Diego wetland	Along Alvarado Creek (Reaches 1, 2, 3, 5, 6)
Diegan Coastal Sage Scrub (32510)	4.09	Federal and state resource agencies, considered Tier II <sup>2</sup> by City of San Diego Biology Guidelines	Undeveloped area near Waring Road & slopes to the north
Non-native Grassland (42200)	0.59	Considered Tier IIIB <sup>3</sup> by the City of San Diego Biology Guidelines	Slope west of Junior Achievement Finance Park
<i>Subtotal (Sensitive)</i>	<i>7.83</i>		
Eucalyptus Woodland (79100)	2.49	N/A	Northern portion
Non-native Woodland (79000)	0.22	N/A	Eastern-most portion
Disturbed Land (11300)	4.38	N/A	Along Alvarado Creek (Reaches 1, 2), northern portion, and eastern portion
Urban/Developed Land (12000)	87.34	N/A	Throughout
<i>Subtotal (Not considered sensitive)</i>	<i>94.43</i>		
<b>Total</b>	<b>102.3<sup>1</sup></b>		

Notes:

1. Total acres rounded for consistency.  
 CDFW = California Department of Fish and Wildlife  
 USACE = U.S. Army Corps of Engineers  
 RWQCB = Regional Water Quality Control Board

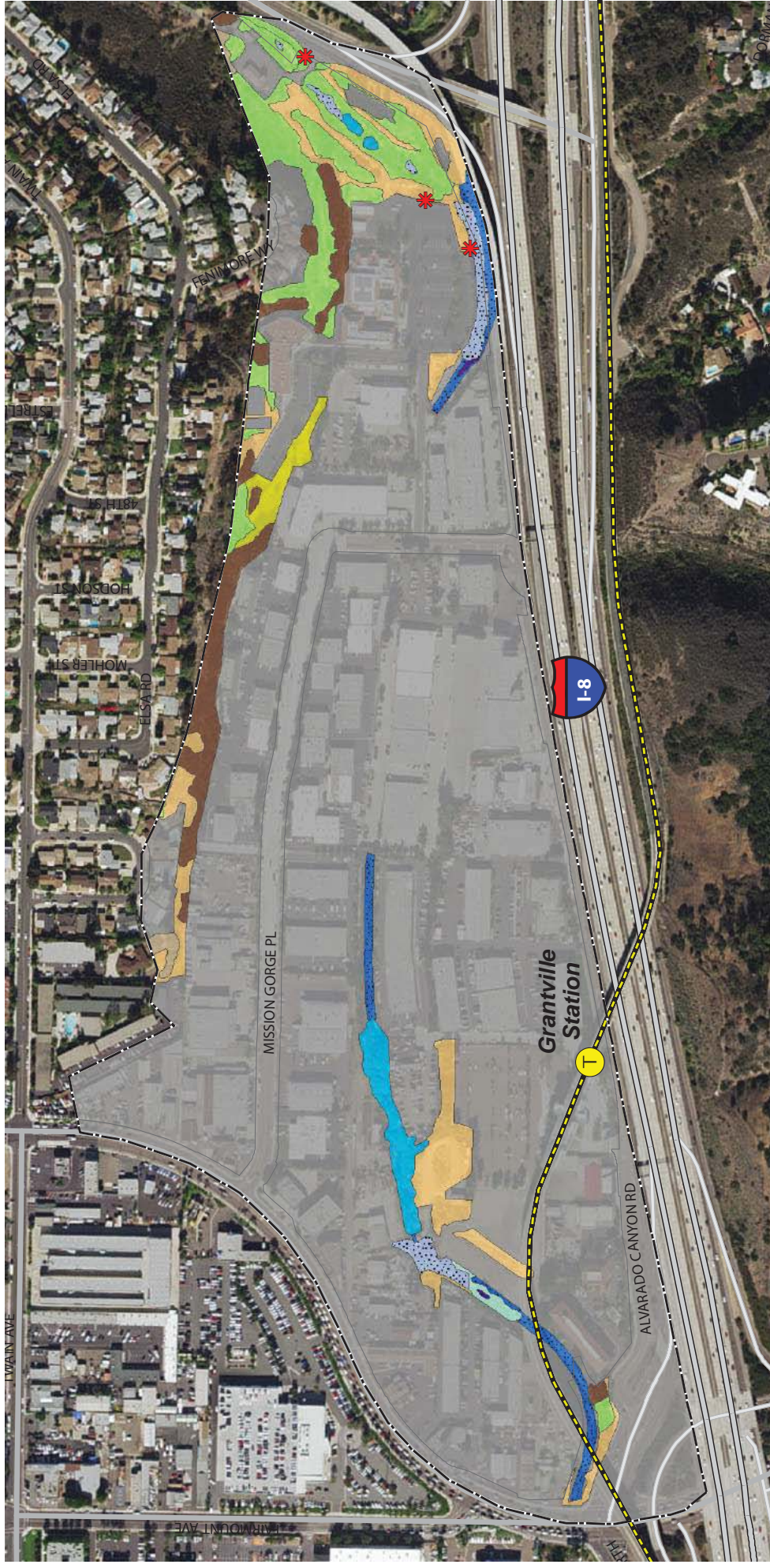
San Diego = City of San Diego  
 2. Tier II is “Uncommon Upland”  
 3. Tier IIIB is “Common Upland”

Source: RECON, 2016.



Figure 4-1:

# Vegetation Communities and Special Status Species



**T** Trolley Stop  
**—** Green Line  
**—** Freeway  
**—** Ramps  
**—** Major Roads

**Vegetation Communities**  
**Sensitive Wetland/Riparian**  
 Southern Willow Scrub  
 Freshwater Marsh  
 Non-native Riparian  
 Arundo-Dominated Riparian  
 Disturbed Wetland

**Sensitive Upland**  
 Diegan Coastal Sage Scrub  
 Non-native Grassland  
**Non-sensitive Upland**  
 Eucalyptus Woodland  
 Non-native Woodland  
 Disturbed Land  
 Urban/Developed Land

**Sensitive Species**  
 Singlewhorl Burrowbush (*Ambrosia monogyra*)

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 Dyett & Bhatia, 2016

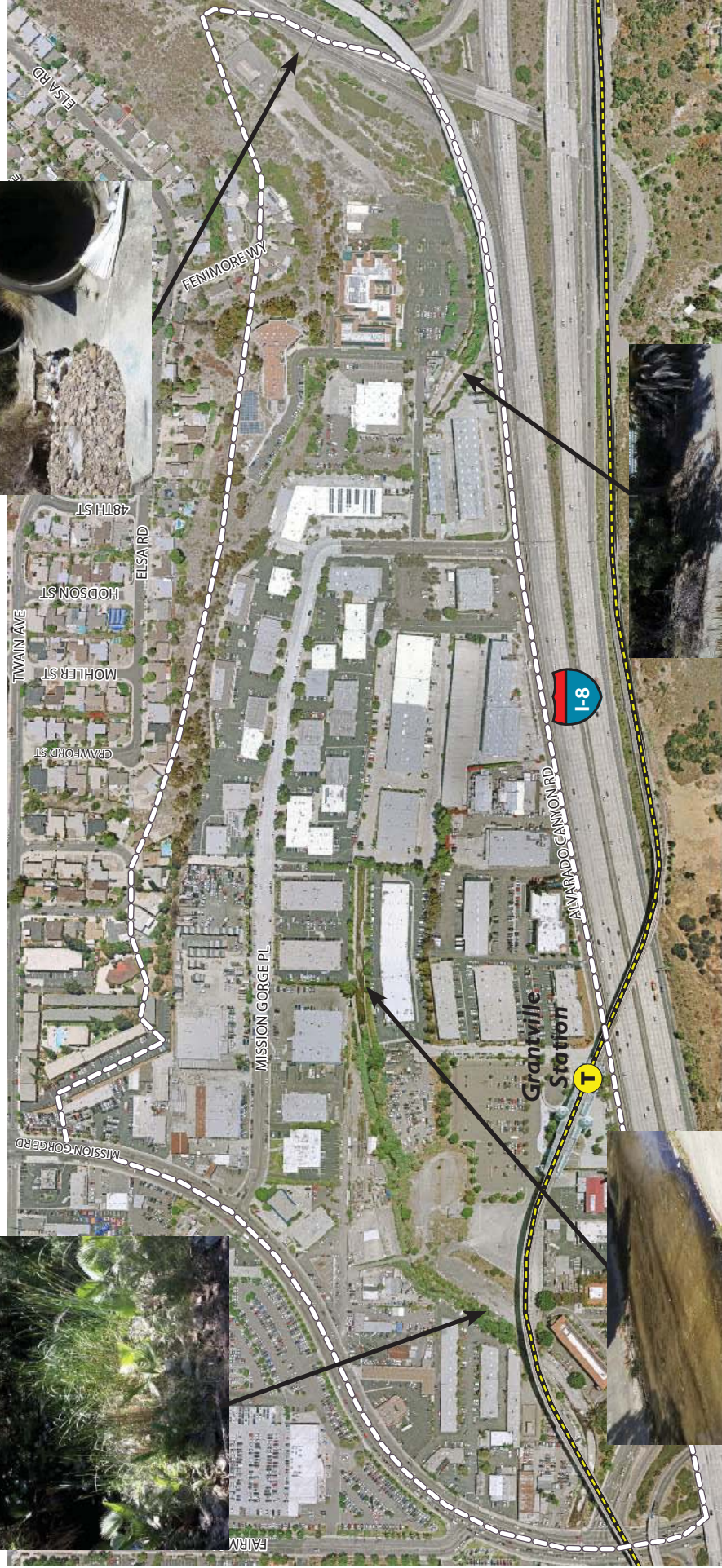


**Figure 4-2: Biological Conditions and Constraints Photo Map**

*Facing southeast toward patch of freshwater marsh within larger area of non-native riparian vegetation within Alvarado Creek.*



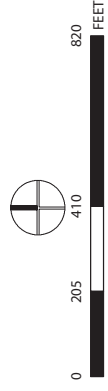
*Facing northeast within unnamed tributary drainage supporting disturbed diegan coastal sage scrub near eastern edge of Project Area.*



*Facing southwest at concrete-lined portion of Alvarado Creek mapped as disturbed wetland.*



*Facing Southwest across patch of freshwater marsh growing above concrete-lined portion of Alvarado Creek south of Nazarene Church.*



## 4.2 Plant Species

A total of 98 plant species were identified within the Study Area, including 40 native and 58 non-native plant species. Species are considered sensitive if they are protected by state or federal agencies as threatened or endangered or are proposed for listing; designated by the City of San Diego as a narrow endemic species<sup>7</sup>; covered species under the City of San Diego Multiple Species Conservation Program (MSCP);<sup>8</sup> or considered endangered as a California Rare Plant Rank 1B or Rank 2 by the California Native Plant Society *Inventory of Rare and Endangered Vascular Plants of California*<sup>9</sup>.

One of the plant species identified within the Study Area, singlewhorl burrobush (*Ambrosia monogyra*), is identified as a California Native Plant Society California Rare Plant Rank 2B.2 species and therefore considered sensitive (see Figure 4-1).

Three additional sensitive plant species have the potential to occur in the Study Area: San Diego marsh-elder (*Iva hayesiana*), southwestern spiny rush (*Juncus acutus* ssp. *leopoldii*), and California adolphia (*Adolphia californica*). San Diego marsh elder and southwestern spiny rush would most likely be found in riparian vegetation (southern willow scrub, freshwater marsh, or non-native riparian) along earthen-lined portions of Alvarado Creek or the unnamed drainage near Waring Road. California adolphia would most likely occur within the coastal sage scrub in the undeveloped area near Waring Road, or on the nearby slopes. As Rank IB or 2B.2 rare and endangered plant species, which occur or have a moderate potential to occur, these species require additional protections. However, none of these four species observed or with moderate potential to occur is state or federally listed or a MSCP covered species. State, federal, and local agencies protect sensitive species through habitat preservation and enhancement.



One of the plant species identified in the Study Area, singlewhorl burrobush, is considered sensitive.

<sup>7</sup> City of San Diego. 2012. Land Development Code Biology Guidelines. Amended April 23.

<sup>8</sup> The purpose of the Multiple Species Conservation Program is to conserve a network of 900 square miles of habitat and open space to protect biodiversity in the San Diego region, pursuant to the federal and California Endangered Species Acts and the California Natural Community Conservation Planning Act. The City of San Diego is one of several jurisdictions participating in the Multiple Species Conservation Program.

<sup>9</sup> California Native Plant Society. 2016. *Inventory of Rare and Endangered Plants of California* (online edition, v8-02). Sacramento, CA. Website <http://www.rareplants.cnps.org> accessed in August 2016.

### 4.3 Wildlife Species

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Although the Study Area is developed, wildlife use this area, especially the drainage west of Waring Road and in the vegetated portions of Alvarado Creek which flow to the San Diego River. The animal species identified during the biological survey are not considered sensitive. However, there are seven sensitive species that have a moderate potential to occur: Belding's orange-throated whiptail (*Aspidoscelis hyperythra beldingi*), red-diamond rattlesnake (*Crotalus ruber*), least Bell's vireo (*Vireo bellii pusillus*), coastal California gnatcatcher (*Poliophtila californica californica*), southern California rufous-crowned sparrow (*Aimophila ruficeps canescens*), western mastiff bat (*Eumops perotis californicus*), and San Diego black-tailed jackrabbit (*Lepus californicus bennettii*). Of these, least Bell's vireo is federally and state-listed as endangered; its potential to occur is within the Study Area's southern willow scrub habitats, which is found along Alvarado Creek (Reaches 2 and 6). Coastal California gnatcatcher is federally listed as threatened and a California Department of Fish and Wildlife species of concern; its potential to occur is within the Diegan coastal sage scrub community within the undeveloped area near Waring Road, as well as the slopes to the north.

Similar to sensitive vegetation communities which provide habitat for these species, it is typical for state, federal, and local agencies to require habitat to be preserved or enhanced as part of project design or mitigation for potential impacts. For least Bell's vireo and coastal California gnatcatcher, additional surveys would be required to determine their presence and location. Additional precautions such as avoiding construction or clearing during the six-month breeding season and monitoring and controlling noise or predator species (e.g., the brown-headed cowbird) may also be required per the City of San Diego Multiple Species Conservation Program Conditions for Coverage.



Least Bell's vireo (l) is federally and state-listed as endangered. Coastal California gnatcatcher (r) is federally listed as threatened and a California Department of Fish and Wildlife species of concern. Both have a moderate potential to occur in the Study Area.

## 4.4 Jurisdictional Wetlands and Waters

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The creek corridor contains wetland areas and vegetation that may be under the jurisdiction of state, federal, and local agencies. A formal jurisdictional delineation would be needed at a later date. For the purposes of this report and planning for the Study Area, Figure 4-3 and Table 4-2 shows the estimated amount of the Study Area that is in the jurisdictions of the United States Army Corps of Engineers (USACE), Regional Water Quality Control Board (RWQCB), California Department of Fish and Wildlife (CDFG), and City of San Diego. Although the acreages are shown for the entire Study Area, these wetland resources are concentrated in the Alvarado Creek corridor.

The USACE regulates the discharge of dredged or fill material into waters of the United States; the RWQCB is the regional agency responsible for protecting water quality in California; the CDFW regulates activities that would change the natural flow or the channel of any river, stream, or lake that supports fish or wildlife; and the City of San Diego regulates wetlands as identified as such in the San Diego Municipal Code.

Given the sensitive areas within Alvarado Creek, any change to the creek corridor or function, or any encroachment into biologically sensitive areas would be under the authority of state and federal permitting agencies. Low quality wetland areas and even channelized portions of the creek would be under the jurisdiction of these agencies due to their connectivity and function as a tributary to the San Diego River. Development projects, including land use projects and restoration projects, are reviewed for jurisdiction by USACE, RWQCB, and/or CDFW and may require permits. These include a Clean Water Act, Section 404/401 permit issued by the USACE and the RWQCB, respectively, and a Section 1602 Streambed Alteration Agreement issued by the CDFW.

## 4.5 Opportunities for Enhancement

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Alvarado Creek is a naturally-occurring stream channel that currently exists within an urban setting, flowing west from La Mesa, through College Area, Del Cerro, Grantville, and Mission Valley, where it drains into the San Diego River. While the creek historically existed as a meandering stream, development of the surrounding communities has substantially altered it, resulting in substantial channelization and urbanization of much of its historic floodway. At present, the stream is mostly concrete, diverted into underground culverts, or dominated by exotic vegetation. As a result, Alvarado Creek currently functions primarily for water conveyance and provides little wetland value for wildlife habitat, infiltration, or water quality.

One of the goals of this Study is to identify opportunities to enhance Alvarado Creek so that it is an amenity for the community. These opportunities include providing an earthen-bottom channel with native or landscaped vegetation that would create an attractive, natural-looking stream setting. Enhancements could improve habitat values, water quality, and infiltration, as well as provide for storm flow conveyance if the creek channel is widened.

## Grantville Trolley Station/Alvarado Creek Enhancement Study

The primary location within the Study Area that provides enhancement opportunities is the stretch of Alvarado Creek north of Grantville Station (Reach 2). The creek channel is wider in this location than in many other portions of the Study Area, and it presently supports riparian vegetation. Much of the land to the south of the creek in this area consists of vacant or undeveloped lots, which could provide an opportunity to widen the creek channel and install native or naturalized vegetation. Widening the channel in this area would allow the creek channel to follow a smoother, more natural course through the western portion of the Study Area.

Vegetation that could be installed in this area includes trees such as western sycamore (*Platanus racemosa*), Fremont cottonwood (*Populus fremontii*), willows (*Salix* spp.), and blue elderberry (*Sambucus nigra*). Additionally, patches of marsh species such as cattail (*Typha* sp.), southern bulrush (*Schoenoplectus californicus*), and sedge (*Carex* sp. Or *Cyperus* sp.) could provide visual diversity and improve water quality.

**Table 4-2: Potential Jurisdictional Waters**

<i>Jurisdiction</i>	<i>Jurisdictional Waters<sup>1</sup></i>	<i>Acres</i>
USACE	Wetlands <sup>2</sup>	1.92
	Non-wetland Waters	1.25
	<b>USACE Total Jurisdiction</b>	<b>3.17</b>
RWQCB	Wetland Waters of the State <sup>2</sup>	1.92
	Non-wetland Waters of the State	1.25
	<b>RWQCB Total Jurisdiction</b>	<b>3.17</b>
CDFW	Riparian <sup>2</sup>	2.00
	Streambed	1.25
	<b>CDFW Total Jurisdiction</b>	<b>3.25</b>
City of San Diego	Wetlands <sup>2</sup>	2.00
	Streambed	1.25
	<b>City of San Diego Total Jurisdiction</b>	<b>3.25</b>

Notes:

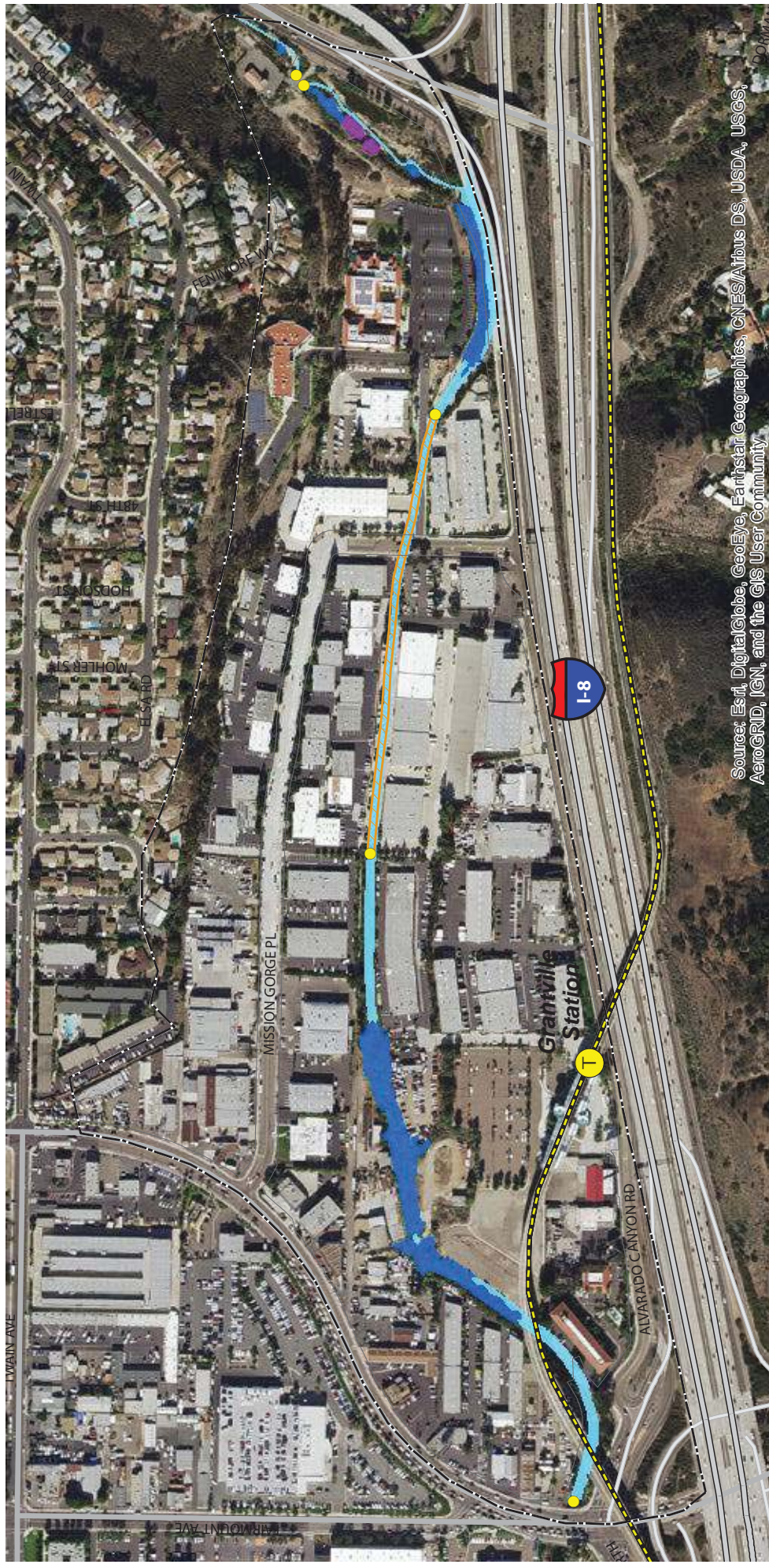
USACE = U.S. Army Corps of Engineers; CDFW = California Department of Fish and Wildlife; RWQCB = Regional Water Quality Control Board; City = City of San Diego

1. These resources are considered potentially jurisdictional because a formal delineation was not conducted.

2. Freshwater marsh, southern willow scrub, non-native riparian, and the large patch of arundo-dominated riparian are likely USACE wetlands, CDFW Riparian, RWQCB wetlands, and City wetlands. Two small patches of arundo-dominated riparian in the east of the Study Area are only CDFW riparian. The disturbed wetland and the tributary drainage are likely USACE non-wetland Waters of the U.S., CDFW streambeds, and RWQCB non-wetland waters of the state.

Source: RECON, 2016.

**Figure 4-3:  
Jurisdictional Resources**



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

- Trolley Stop
- Green Line
- Freeway
- Ramps
- Major Roads
- Study Area
- USACE Non-wetland Waters of the U.S./
- RWQCB Non-wetland Waters of the State/ CDFW Streambed
- USACE/RWQCB/CDFW Wetlands
- CDFW Wetlands Only
- Underground Portion of Alvarado Creek (assumed approximately 20 feet wide)
- Culvert

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# 5 Hydrology

## 5.1 Watershed

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The Alvarado Creek watershed extends from the Grantville Area approximately seven miles east to the Grossmont Area, beyond the Study Area, covering 14 square miles in total, as shown in Figure 5-1.<sup>10</sup> The watershed generally consists of developed urban land uses, as shown in Table 5-1. The majority of the uses within the watershed are residential, including multi-family and single-family housing. Residential uses combined with road rights-of-way account for approximately 70 percent of the uses in the watershed; parks and open space account for an additional 15 percent of the uses. The watershed also includes a variety of other land uses (e.g., commercial, industrial, civic and institutional). Lake Murray is located near the center of the watershed.

## 5.2 Flow Rates During Storm Events

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Alvarado Creek conveys flows from the Alvarado Creek watershed to the San Diego River through naturalized and concrete channels and culverts for both dry weather, seasonal flows and storm event flows. Table 5-1 below provides the estimated flow rates of Alvarado Creek through the Study Area during the 2-, 5-, 10-, 25-, 50-, and 100-year storm event. A 2-year storm event is defined as a storm event having a 50 percent chance of occurring in any given year, and a 100-year storm event is defined as having a one percent chance of occurring in any given year. The estimated flow rate for the 2-year storm event is 1,180 cubic feet per second (cfs), and the flow rate for the 100-year storm event is 5,100 cfs.

---

<sup>10</sup> The U.S. Geological Survey's StreamStats program was used to delineate the watershed. The drainage area is consistent with the drainage area listed in the Federal Emergency Management Agency (FEMA) 2016 Flood Insurance Study (FIS) for Alvarado Creek at the confluence with the San Diego River.

**Table 5-1: Flow Rates during Storm Events**

<i>Storm Event</i>	<i>Flow Rate (cfs)</i>	<i>Source<sup>1</sup></i>
2-Year	1,180	Extrapolated
5-Year	2,050	Extrapolated
10-Year	2,700	2016 San Diego FIS
25-Year	3,800	Extrapolated
50-Year	4,500	2016 San Diego FIS
100-Year	5,100	2016 San Diego FIS

Note:

1. The 10-, 50-, and 100-year flow rate information for Alvarado Creek was obtained from the FEMA 2016 Flood Insurance Study for San Diego County. These flow rates were then extrapolated to estimate flow rates for the 2-, 5-, and 25-year storm events.

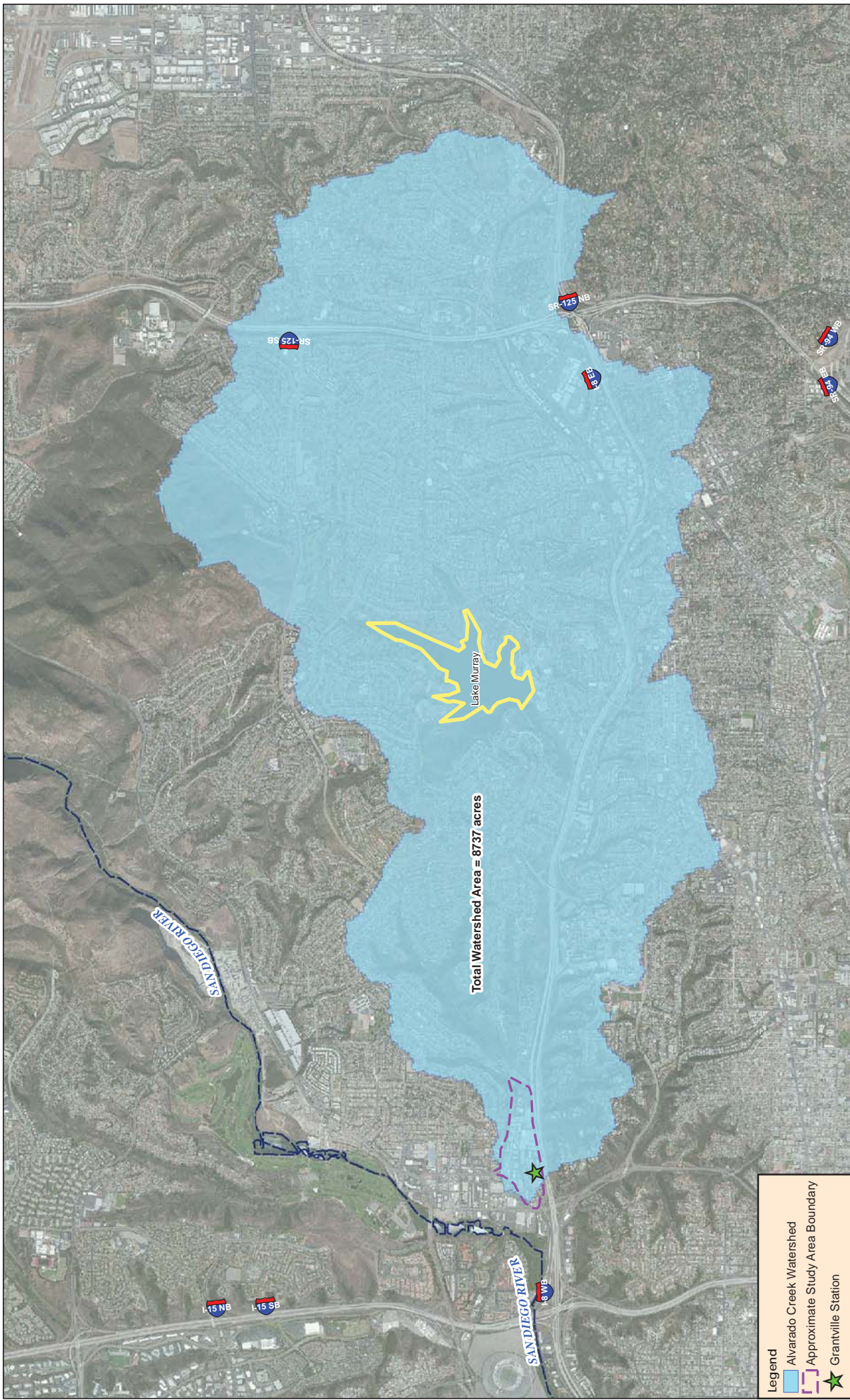
## 5.3 Channel Conditions

### CHANNEL TYPES AND CONDITIONS

The existing conditions of the channel were determined utilizing aerial photography, topographical survey, as-built plan data, previous studies, and general knowledge of flood control infrastructure.<sup>11</sup>

Within the Study Area, the Alvarado Creek channel extends approximately 4,400 feet upstream from directly east of Mission Gorge Road to the southbound Waring Road onramp to Westbound I-8. Each reach of Alvarado Creek channel has a fairly contiguous geometry and composition. The different channel reaches, channel types, and the creek’s cross-section are shown on Figure 5-2; figures in Appendix A show the profile of the existing channel as well as typical cross sections. Descriptions of the channel reaches are provided below. Figure 5-3 shows photos of each reach on a map of the Study Area.

<sup>11</sup> The survey horizontal datum is California State Plane Coordinate System 83, Zone 6, and the vertical datum for the survey is the National Geodetic Vertical Datum of 1929 (NGVD 29). Available as-built plans for the channel reaches and associated storm drainage connection were obtained from the City of San Diego Development Services Department.



**Legend**

- Alvarado Creek Watershed
- Approximate Study Area Boundary
- ★ Grantville Station

Scale in Feet

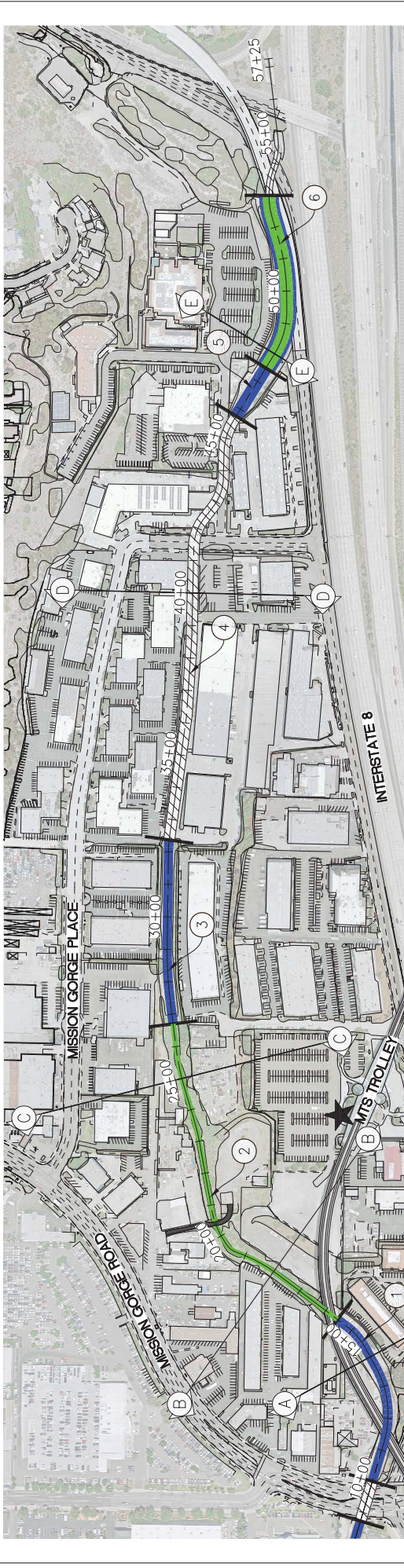
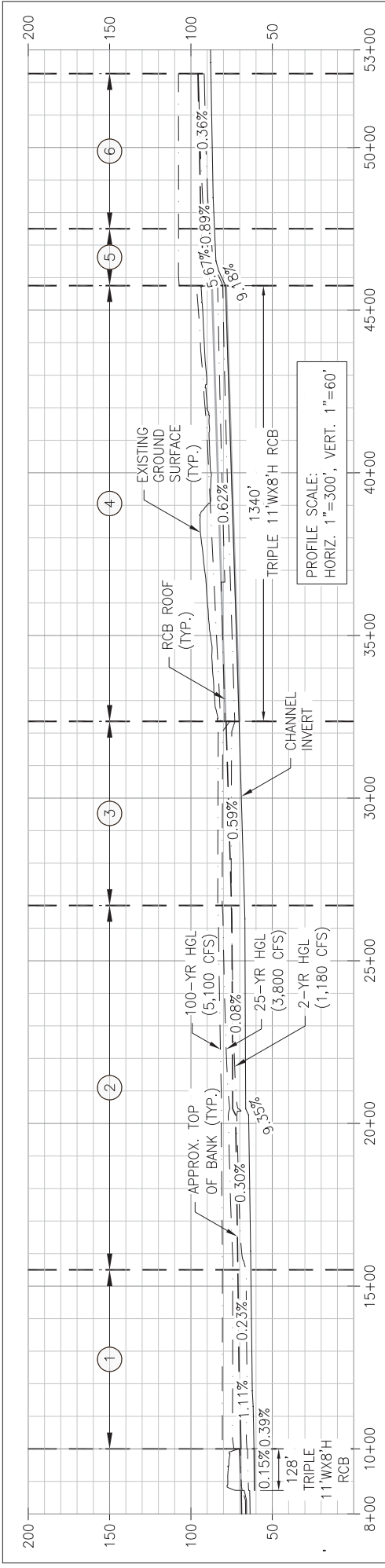
0 2,000 5,000

North

Elevations listed on this exhibit are in reference to the NAVD 88 datum  
 Date of Exhibit: 1/5/2017  
 DigitalGlobe Aerial Image: 04.2013



**Figure 5-1: Alvarado Creek Watershed J-17571-A**



**LEGEND**

- OPEN CHANNEL - CONCRETE
- OPEN CHANNEL - VEGETATED BOTTOM, CONCRETE SIDES
- OPEN CHANNEL - VEGETATED BOTTOM, CONCRETE SIDES
- REINFORCED CONCRETE BOX CULVERT
- CHANNEL REACH DESIGNATION BY THIS STUDY
- 20'-00' CHANNEL STATION DESIGNATION (FEET) BY THIS STUDY
- GRANTVILLE TROLLEY STATION
- EXISTING ACCESS ROAD

**SCALE**

0 300' 600'

**PROJECT INFORMATION**

5020 PROJECT NO. 17571A-10/2016  
 619.291.0707  
 619.291.0707  
 FAX 619.291.1165

**REVISIONS**

Rev	Description	By	Date
1	Issue for Construction	TRICK	10/2016

**PROJECT NO. 17571A-10/2016**  
 \\SRV\_JVE1\Project2\17571A-Grantville\_Trolley\_Station\WaterResources\Hydraulics\17571A-ECR-Exhibit-ChHyd.dwg Friday, Dec. 30 2016 12:03pm acotts

**Figure 5-2: Channel Types**

Figure 5-3: Reach Photo Map

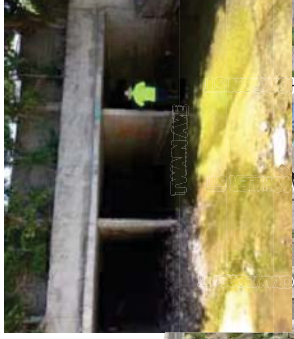


Mission Gorge Road

Reach 3



Reach 4



Reach 5



Interstate 8/Waring Road



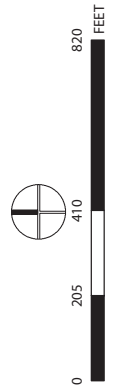
Reach 2



Reach 6



Reach 1



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## **Mission Gorge Road**

A triple reinforced concrete box (RCB) culvert is located beneath Mission Gorge Road. The triple RCB culvert is approximately 128 feet long, and each box is 11 feet wide and eight feet tall. At the east end of the culvert is a short transition structure, known as a warped wingwalls structure used for connecting rectangular channels with trapezoidal channels.

### **Reach 1**

Directly upstream of the Mission Gorge Road culvert transition structure is a trapezoidal concrete channel with a bottom width of approximately 29.5 feet and sides with an approximate 1.5 to 1 slope (horizontal to vertical).<sup>12</sup> The concrete channel extends upstream about 550 feet and transitions into an earthen (vegetated) channel.

### **Reach 2**

Reach 2 consists of a vegetated channel that varies in bottom width between 13 and 17 feet and sides with an approximate 2 to 1 slope. This reach extends for approximately 1,100 feet. Near the middle of this reach, a small paved access road crosses the channel. Along the west side of the road there is a rapid drop in elevation of about six inches over a length of approximately 20 feet. This geometry causes the road to act as grade control structure. The vegetation downstream of the access road is mature and appears to consist of palm trees intermixed with riparian woody vegetation. The vegetation upstream of the access road appears to primarily consist of tules vegetation with some riparian vegetation. At the upstream limits of this vegetated reach, the channel becomes wider as it transitions to a concrete channel.

### **Reach 3**

Reach 3 is a concrete channel with a bottom width of approximately 29.5 feet and length of approximately 550 feet. At the upstream limits of this reach, there is a warped wing walls structure that transitions the channel into a triple RCB culvert.

### **Reach 4**

Reach 4 consists of a triple RCB culvert (each box with an 11-foot width and 8-foot height) that extends upstream approximately 1,340 feet. Based on a review of as-built drawings, the triple RCB culvert was constructed as part of two separate projects. An as-built plan dated 1980<sup>13</sup> shows that the downstream or westernmost 900 feet of culvert was constructed first. This portion of the culvert is nearly straight with a couple of points at angles. The upstream or easternmost 440 feet of culvert was constructed next, with a completion date of 1988.<sup>14</sup> This upstream section of the culvert meanders in order to be in alignment with access roads located west and east of Mission Gorge Place. Upstream of the triple RCB culvert, the channel transitions through a warped wingwalls structure to a concrete trapezoidal channel (Reach 5).

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<sup>12</sup> In this report, slopes are horizontal to vertical, unless otherwise indicated.

<sup>13</sup> City of San Diego plan sheet 18412-2-D

<sup>14</sup> City of San Diego plan sheet 19862-3-D

**Reach 5**

Reach 5 is a relatively short reach. The concrete channel is approximately 175 feet in length with a bottom width of 45 feet and sides with an approximate slope of 1.5 to 1. At the western end of the triple RCB culvert, the concrete channel is fairly steep, increasing in elevation by approximately 6 feet over a distance of 75 feet. East of the stretch, the channel slope flattens and continues for approximately 100 feet.

**Reach 6**

In Reach 6, the channel is approximately 44 feet wide with a vegetated bottom and concrete sides that are sloped at approximately 2 to 1. The vegetation in this reach is mature and appears to consist of palm trees intermixed with riparian woody vegetation. This channel reach extends approximately 550 feet, at which point the channel enters a culvert located beneath the Waring Road onramp to westbound I-8.

**Summary of Reaches**

Table 5-2 provides a summary of the channel reaches, listed from downstream to upstream. Within the Study Area, the City maintains portions of Reaches 1, 2, 3, 4, and 5. Private property owners are present within Reaches 1, 2, and 3 (see Table 5-2). The culvert under Mission Gorge Road is maintained as a Caltrans facility.

**Table 5-2: Summary of Channel Types**

<i>Reach</i>	<i>Channel Type</i>	<i>Bottom Width (feet)</i>	<i>Approximate Length (feet)</i>	<i>Facility Maintenance<sup>1</sup></i>
Mission Gorge Road	Triple RCB	3 X 11 = 33	128	Caltrans
1	Concrete Trapezoidal	29.5	550	T&SW No. 59
2	Vegetated	13 to 16	1,100	--
3	Concrete Trapezoidal	29.5	550	T&SW No. 60
4	Triple RCB	3 X 11 = 33	1,340	--
5	Concrete Trapezoidal	45	175	T&SW No. 61
6	Concrete & Vegetated Trapezoidal	44	550	T&SW No. 61

Note:

1. Information prepared by Rick Engineering and summarized in the 2013 Master Program (available at: <https://www.sandiego.gov/stormwater/services/mswsmp>), and the Master Program Final Program Environmental Impact Report, Table 3-1 (available at: <https://www.sandiego.gov/stormwater/services/mswsmp>). T&SW storm water facilities nos. 59, 60 and 61 are within the Alvarado Creek channel within the San Diego Hydrologic Unit. Portions of nos. 59 and 61 maintained by T&SW extend outside of the Study Area.



## **CHANNEL EXISTING HYDRAULIC CAPACITY**

The material, geometry, and alignment of the channel affect the amount of water (flowrate) that can be conveyed through Alvarado Creek Channel. Hydraulic calculations were performed in order to assess the existing channel capacity.<sup>15</sup> The results of the hydraulic modeling indicate that the majority of the channel reaches do not have adequate hydraulic capacity to convey either the 100-year event or many of the small events that occur. Sheet 1 in Appendix A shows the profile of the channel through the Study Area along with the hydraulic grade lines (HGLs) for the 2-, 25-, and 100-year storm event flows.

While some reaches have adequate conditions, including width and depth, to convey the flows from smaller storm events, other reaches do not have sufficient capacity and can affect the capacity upstream or downstream. The elevation and topography of the adjacent properties also affects conditions in the Study Area. The existing hydraulic capacity conditions of Mission Gorge Road culvert and Reaches 1 through 6 are discussed individually below.

### **Mission Gorge Road**

Events in excess of the 10-year storm event will exceed the capacity of the Mission Gorge Road triple RCB culvert and cause a backwater condition, or, in other words, upstream flooding caused by downstream conditions.

#### **Reach 1**

As estimated by the model calculations performed for this Study, the Mission Gorge Road triple RCB culvert's inadequate capacity will result in flooding in Reach 1 during a 50-year and 100-year storm event. A 50-year storm event flow will result in the water surface elevating slightly above the northbound Mission Gorge Road sidewalk and pavement surface, but not the southbound pavement surface. This elevated water surface will result in extensive flooding of the area north of Alvarado Creek and east of Mission Gorge Road.

Compared to the 50-year flow, Reach 1 does not have the capacity to fully convey the 100-year flow through the Mission Gorge Road triple RCB culvert. Thus, the 100-year flow will result in the complete inundation of Mission Gorge Road adjacent to Alvarado Canyon Road, as well as extensive flooding of the area north of Alvarado Creek and east of Mission Gorge Road.

#### **Reach 2**

Reach 2, consisting of a 1,100-foot vegetated channel, has by far the least hydraulic capacity of the entire channel system within the Study Area. The main factors contributing to the low hydraulic capacity of Reach 2 include the narrow bottom width, low bank height, and flat topography along the north side of the channel. The 2-year storm event flow will result in some flooding through this area. The degree of flooding from smaller storms, such as the 2-year event, is related to the

---

<sup>15</sup> The Water Surface Pressure Gradient for Windows (WSPGW) modeling software was utilized to compute and plot the uniform and non-uniform steady flow water surface profiles and pressure gradients in the open channels and closed conduits. Models were prepared and evaluated for 2-, 5-, 10-, 25-, 50-, and 100-year storm events.

resistance to flow imposed by the vegetation—heavy vegetation will result in slightly more flooding. Various land owners along the reach are responsible for maintaining their portion of the channel to prevent increased flooding of other adjacent properties. With regularly maintained vegetation, the reach will have minor flooding along the north side of the channel for small events. Larger events, including the 5-year storm event and greater, will result in flooding along the north side of the channel regardless of the maintenance condition of this reach. Flows in excess of about the 25-year event will result in flooding along relatively low elevation areas of the south side of the channel.

### **Reach 3**

Reach 3 has a similar channel bottom width and composition as Reach 1. However, Reach 3 has a slightly steeper longitudinal slope and higher top of bank elevations in comparison to Reach 1. Thus, although these two reaches appear very similar, Reach 3 has slightly better hydraulic capacity than Reach 1. Under the current conditions of Reach 2, Reach 3 will flood south and north of the channel during 50- and 100-year flows.

### **Reach 4**

The approximately 1,340 feet long triple RCB culvert, located in Reach 4 and near the middle of the Study Area, has adequate capacity to convey up to the 25-year storm event flow. However, the 50- and 100-year flows will result in water overtopping the upstream culvert inlet. During these larger storm events, flows not conveyed within the culvert will travel west down the access road, onto Mission Gorge Place, and continue down Mission Gorge Place before entering the downstream open channel east of Mission Gorge Road. There is a sump (i.e., a low point along the roadway) with inlets that connect to the channel along Mission Gorge Place, located approximately 600 feet east of Mission Gorge Road; water will remain within this sump area until the water in the channel subsides. Hence, the 50- and 100-year storm event flows that over top the culvert inlet will cause flooding of the immediate access road and a significant portion of Mission Gorge Place.

### **Reach 5**

In the existing configuration, the 50- and 100-year storm event flows will cause flooding along this reach.

### **Reach 6**

Under the current conditions, the elevated 50- and 100-year flow depths at the inlet of the Reach 4 triple RCB culvert will result in significant flooding along both sides of Reach 6.

## 5.4 Flood Hazard Areas

### FEMA SPECIAL FLOOD HAZARD AREA

FEMA floodplain mapping indicates that a significant portion of the Study Area is within a Special Flood Hazard Area (SFHA), the 100-year floodplain, as shown on Figures 5-4a and 5-4b. This is consistent with the hydraulic capacity analysis that indicates that the majority of the channel reaches lack the hydraulic capacity to convey the 100-year storm event flow, as well as the flow from much smaller storm events. The area north of Alvarado Creek along Reaches 1 through 4, a limited area south of Alvarado Creek at Reach 2, and an area west of Reaches 5 and 6 is shown within the 100-year floodplain (see Figures 5-4a and 5-4b).

Changes being proposed for the Alvarado Creek channel must be analyzed to determine any impacts to the hydraulics of the channel. If the proposed improvements are changing the effective Base Flood Elevations or the SFHA, a Conditional Letter of Map Revision (CLOMR) from FEMA is required, followed by Letter of Map Revision (LOMR) from FEMA once construction of the improvements is complete. In order to process a request for a CLOMR/LOMR through FEMA, the request must first be approved by the affected Community (City of San Diego) and signed by the Community Official responsible for floodplain management.

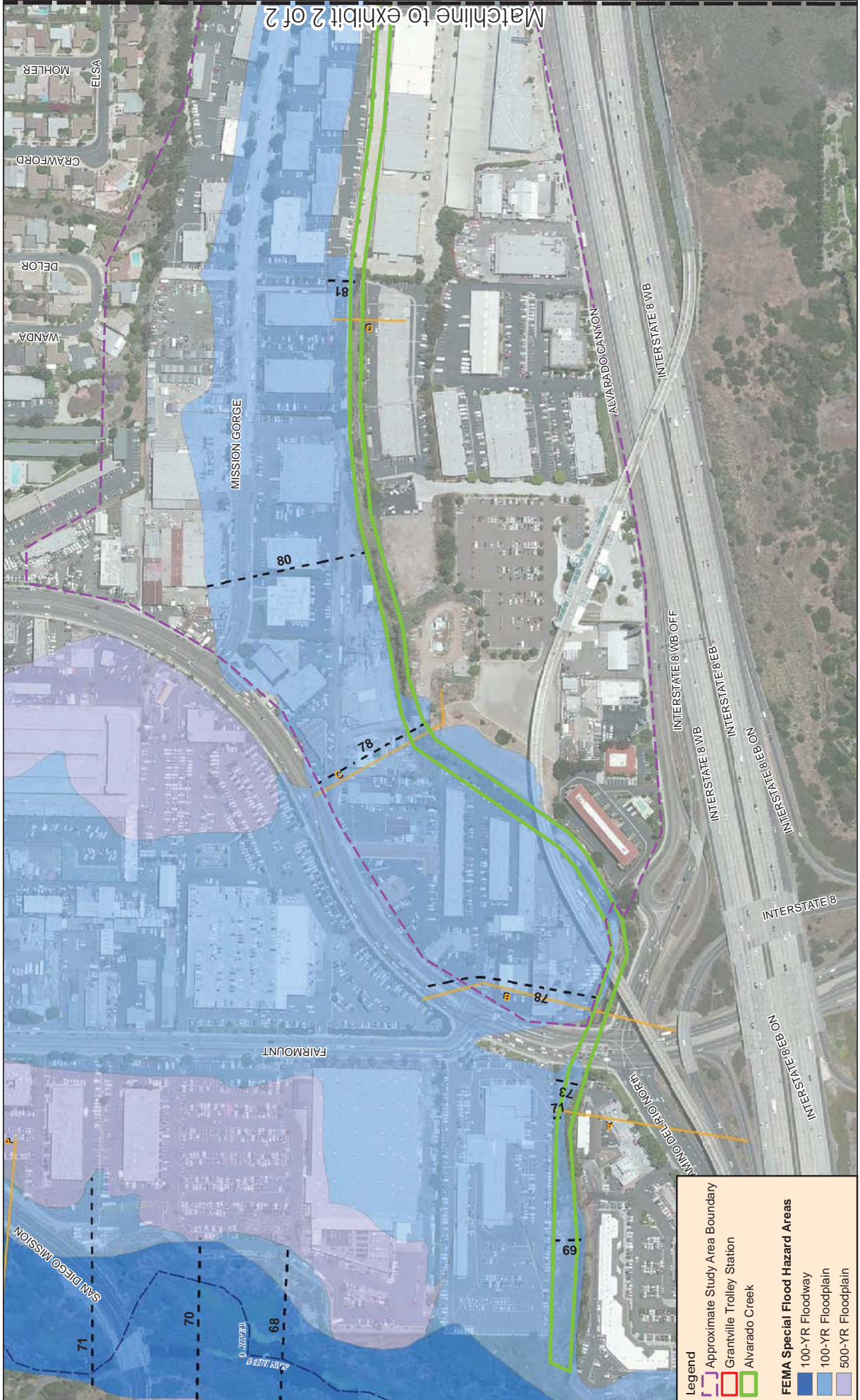
### VEGETATION

Areas of dense vegetation can restrict flows during storm events and contribute to flooding. As recently as 2015, the City of San Diego performed maintenance on segments of Alvarado Creek from the San Diego River to the entrance of the culvert for Reach 4. Maintenance activities within the Study Area focused on invasive removal from the vegetated creek bottom and adjacent areas along Reaches 1 and 3.



*Alvarado Creek has received attention due to flooding of properties surrounding the creek corridor during small storm events.*

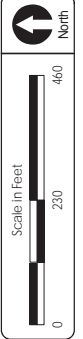
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Matchline to exhibit 2 of 2

**Figure 5-4a: FEMA Floodplain Mapping (Exhibit 1 of 2)**

Elevations listed on this exhibit are in reference to the NAVD 88 datum  
 Date of Exhibit: 1/5/2017  
 DigitalGlobe Aerial Image: 04.2013



**Legend**

- Approximate Study Area Boundary
- Grantville Trolley Station
- Alvarado Creek

**FEMA Special Flood Hazard Areas**

- 100-YR Floodway
- 100-YR Floodplain
- 500-YR Floodplain



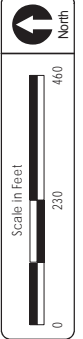


**Legend**

- Approximate Study Area Boundary
- Grantville Trolley Station
- Alvarado Creek

**FEMA Special Flood Hazard Areas**

- 100-YR Floodway
- 100-YR Floodplain
- 500-YR Floodplain



Elevations listed on this exhibit are in reference to the NAVD 88 datum  
 Date of Exhibit: 1/5/2017  
 DigitalGlobe Aerial Image: 04.2013

**Figure 5-4b: FEMA Floodplain Mapping (Exhibit 2 of 2)**



Matchline to exhibit 1 of 2

## 6 Utilities and Structures

There are a number of existing utilities situated within and through the Study Area. The existing underground utilities (storm drain, sewer, and water) flow generally in an east to west direction, with several exiting the Study Area to the northwest in Mission Gorge Road.

### 6.1 Utilities

---

The location and size of the storm drain, sewer, and water pipelines both within and adjacent to the Study Area are shown on Figure 6-1. The location of these existing utilities is based on as-built drawings and field observations, and is for informational purposes only. All utility crossings in the Alvarado Creek channel will need to be vertically located and verified before any improvements are made. In addition, any channel improvements such as widening or realignment will necessitate a closer review and verification of any existing utilities.

#### **STORM DRAIN**

The bulk of the storm water runoff in the Study Area is conveyed via the existing open channel/box culvert Alvarado Creek system running east to west. In addition, there are a number of feeder pipes that pick up local runoff and transport it to Alvarado Creek channel. These reinforced concrete pipes (RCP) are generally situated in a north-south configuration and range from 18" to 36" in diameter.

#### **SEWER**

Similar to the storm drain system, there is a trunk sewer system that runs from east to west through the Study Area. The trunk system consists of 30"-33" vitrified clay (VC) pipe. The trunk sewer crosses the creek from the north side to the south side just before the creek enters the box culvert system at Reach 5. From there, the 30" VC pipe runs roughly parallel to the channel on the south side before re-crossing the open channel at Reach 2.

Feeder lines serving the surrounding commercial businesses are typically 8"-10" VC and tie into the trunk system in various locations. There is also an existing 8" VC sewer line within Mission Gorge Place within the Study Area, and additional sewer lines in Mission Gorge Road outside the Study Area.

## **WATER**

Pressurized water distribution lines are present throughout the Study Area. Larger 36" - 48" steel cylinder rod-wrapped (SCRW) pipes run the length of Mission Gorge Place and Alvarado Canyon Road, while smaller 8"-12" asbestos cement (AC) lines loop through the commercial and business areas. The trunk water lines within Alvarado Canyon Road cross the Alvarado Creek channel at Reach 5; otherwise, few, if any, water lines cross the open channel.

## **OVERHEAD UTILITIES**

Overhead utilities (power and telephone) exist along Mission Gorge Place, running east approximately 650 linear feet from the intersection with Mission Gorge Road. The utilities turn south into the adjacent property and terminate at that location just short of the existing open channel. Overhead utilities are also located along one of the private entryways off of Mission Gorge Road. That line extends east approximately 600 linear feet and terminates short of the existing open channel.

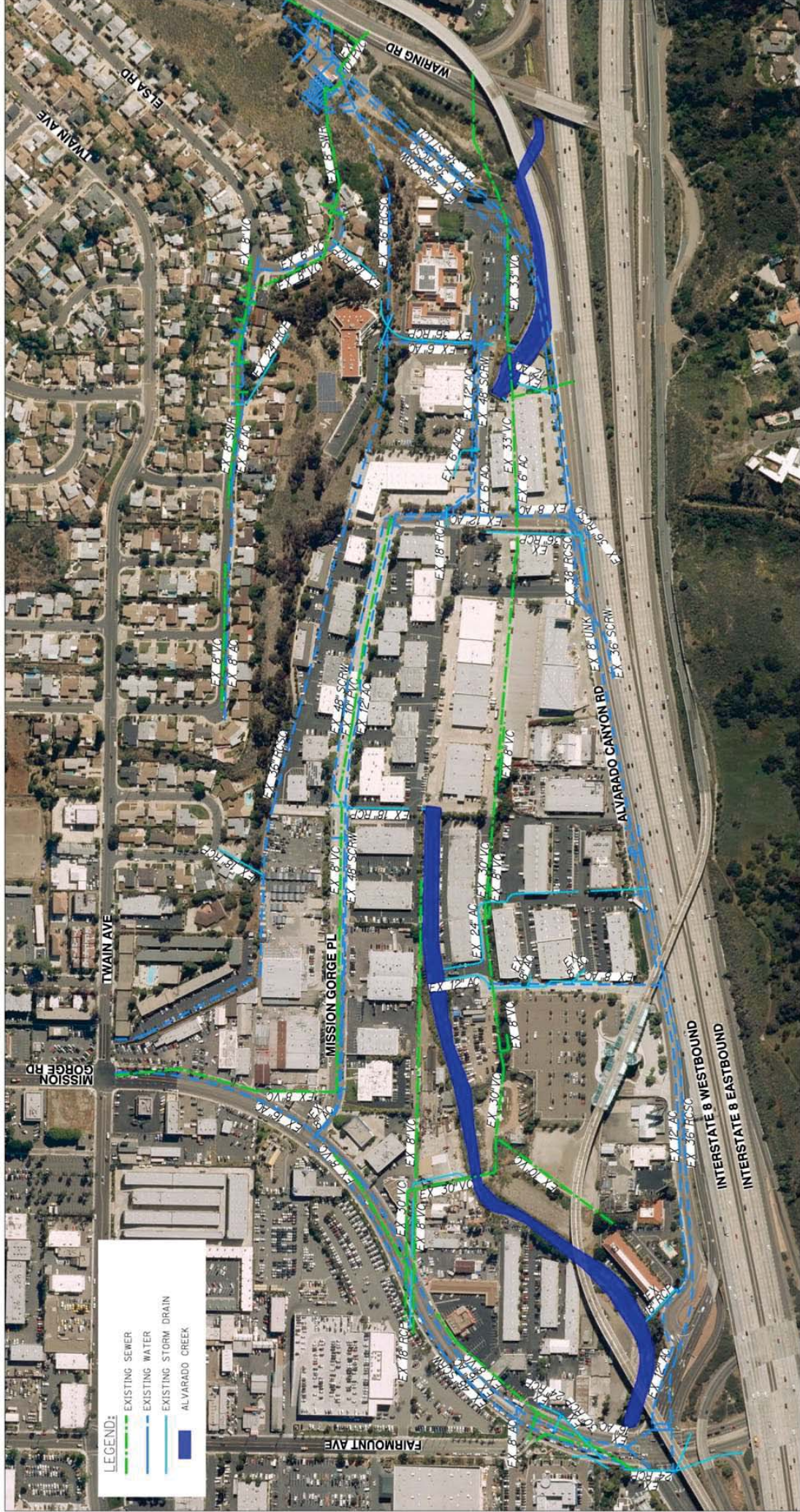
## **6.2 Structures**

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In addition to Alvarado Creek, there are several other structures within the Study Area. An approximate 900 linear foot stretch of triple box culvert is located in Reach 4. This underground culvert is in an area with several existing buildings and parking lot retaining walls. There is also a low-water crossing approximately 500 feet northwest of the Grantville Station. The crossing will be considered in conjunction with any proposed changes to Alvarado Creek. At the west end of the Study Area near Reaches 1 and 2, the existing open channel is straddled by several support columns associated with the above-grade Grantville Station. Again, any channel improvements will need to consider these structures and their associated footings.



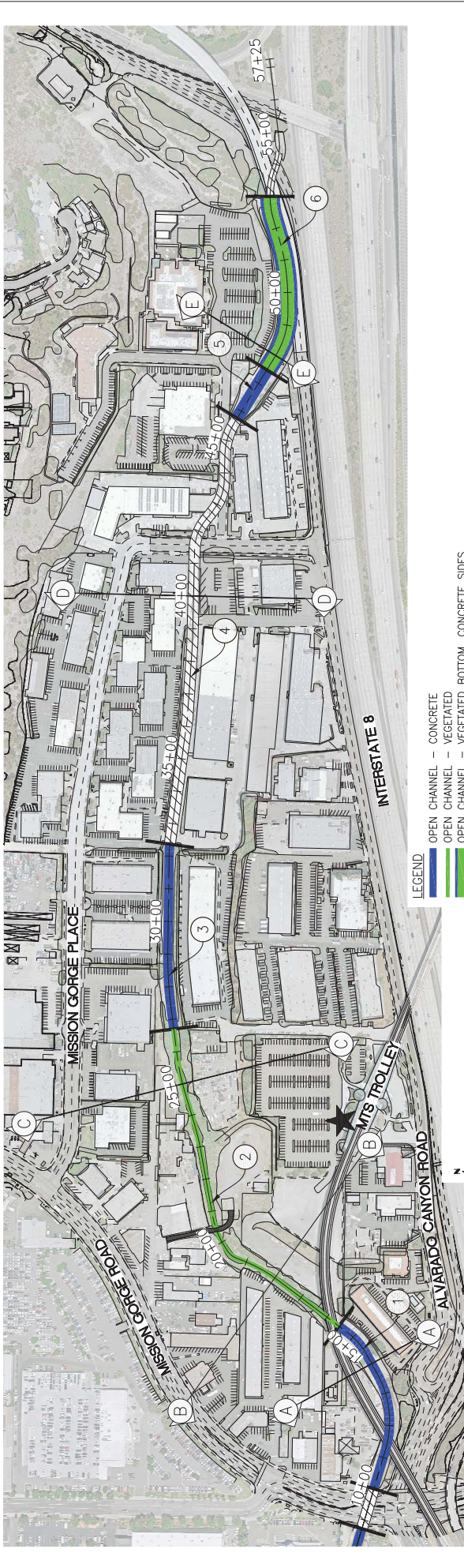
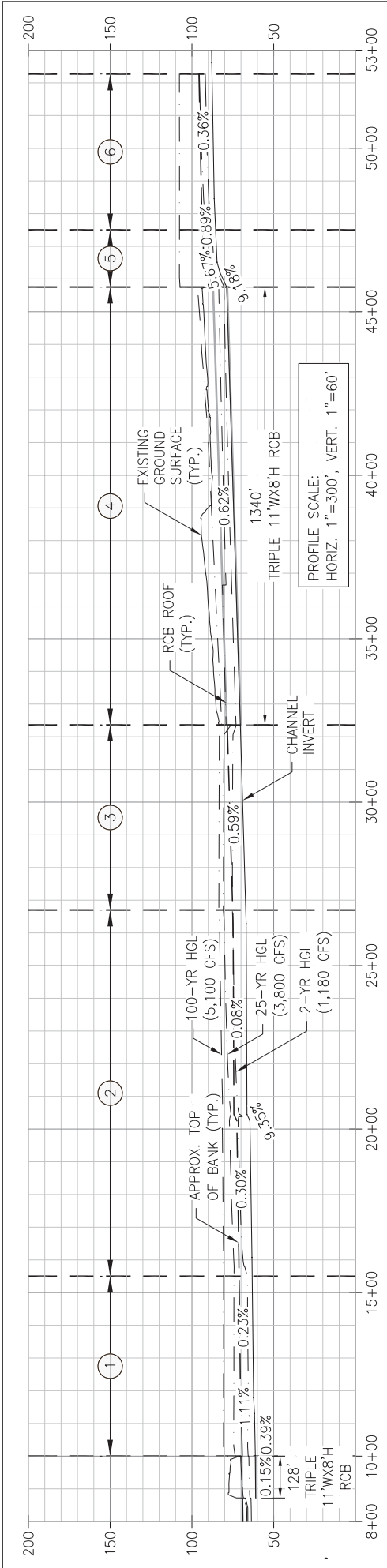
Figure 6-1: Existing Utilities



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## **Appendix A: Existing Channel Reaches and Section Views**

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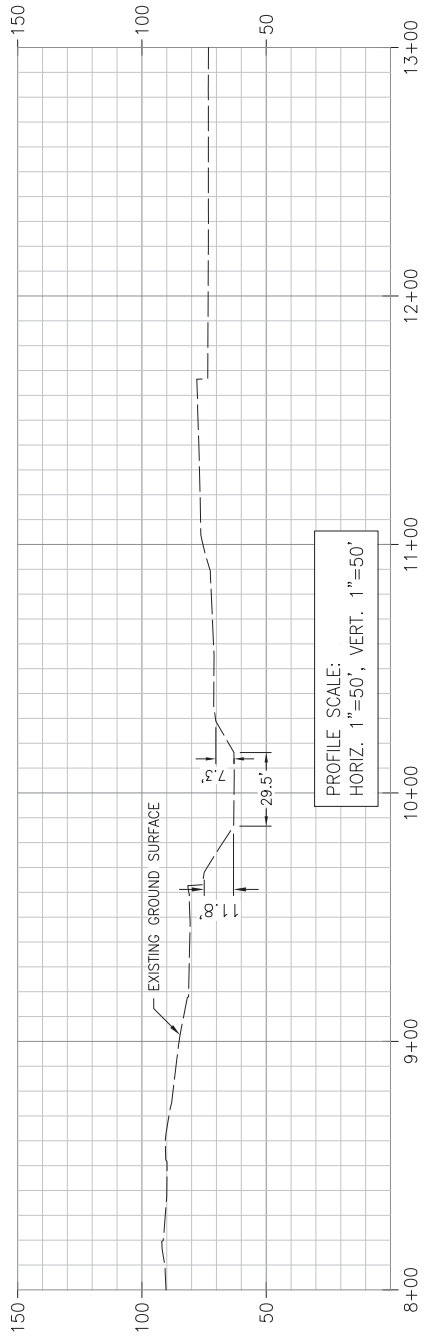
- LEGEND**
- OPEN CHANNEL - CONCRETE
  - OPEN CHANNEL - VEGETATED
  - OPEN CHANNEL - VEGETATED BOTTOM, CONCRETE SIDES
  - REINFORCED CONCRETE BOX CULVERT
  - CHANNEL REACH DESIGNATION BY THIS STUDY
  - CHANNEL STATION DESIGNATION (FEET) BY THIS STUDY
  - GRANTVILLE TROLLEY STATION
  - EXISTING ACCESS ROAD



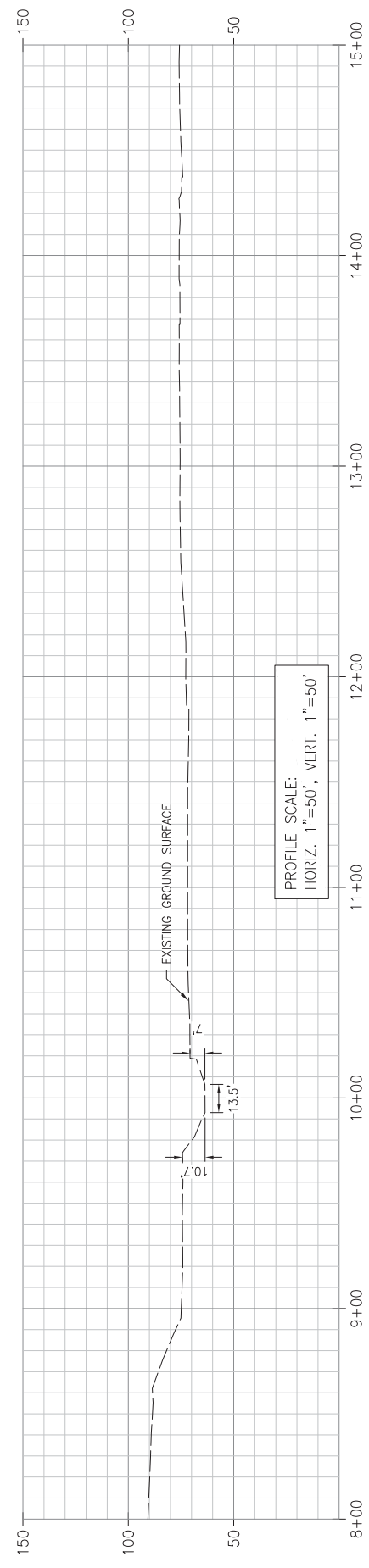
GRANTVILLE TROLLEY STATION/  
ALVARADO CREEK ENHANCEMENT PROJECT  
EXISTING CONDITION CHANNEL REACHES  
SHEET 1 OF 4

**TRICK**  
ENGINEERING COMPANY  
5025 FRUITS ROAD  
DENVER, CO 80231  
303.429.0707  
FAX: 303.429.1165

Revised: Sacramento  
Change: 10/2016  
Project: rick-engineering.com  
Project: 17571A



SECTION A

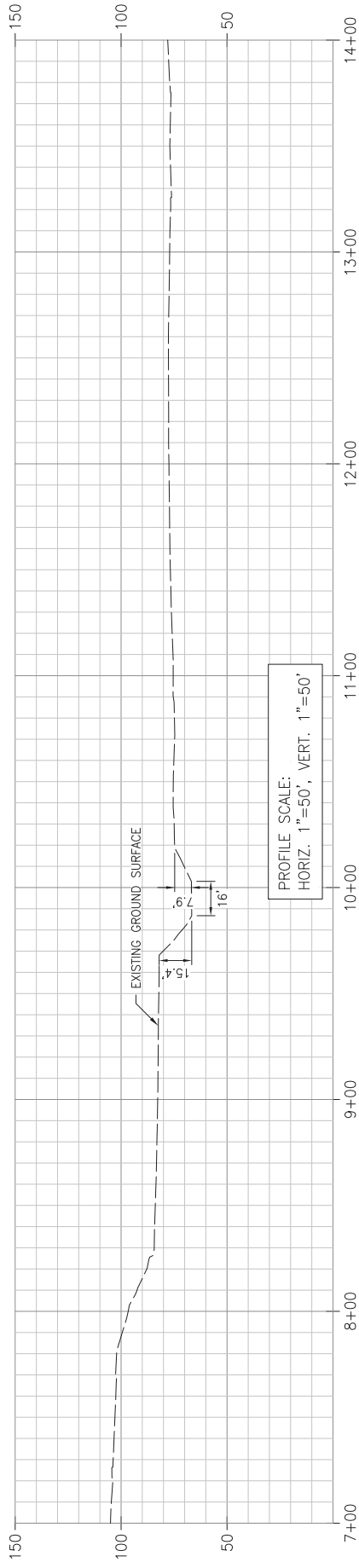


SECTION B

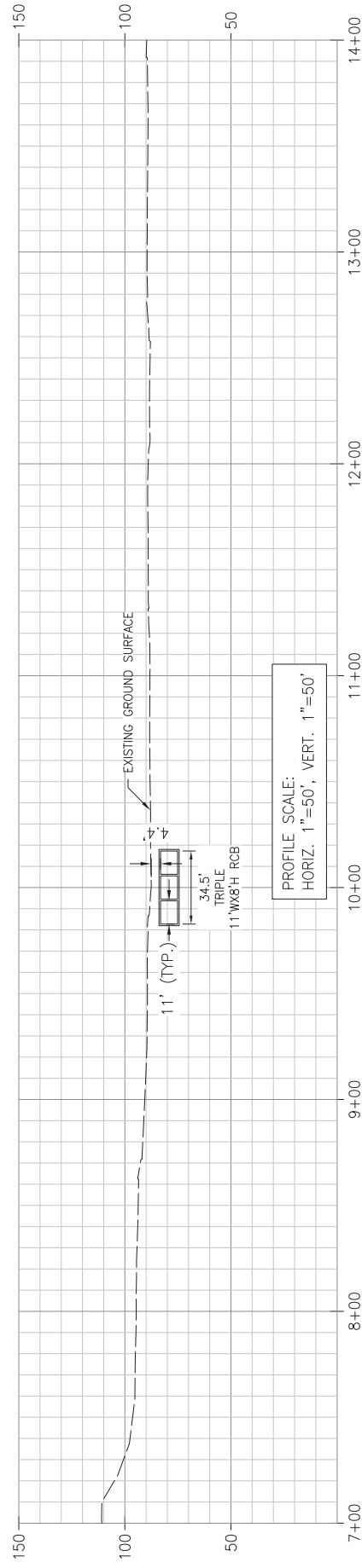
GRANTVILLE TROLLEY STATION/  
 ALVARADO CREEK ENHANCEMENT PROJECT  
 EXISTING CONDITION CHANNEL REACHES  
 SHEET 2 OF 4

**TRICK**  
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 FAX: (916) 487-1165  
[trickengineering.com](http://trickengineering.com)  
 Project: Trolley Station

PROJECT NO. 17571AW, 10/2016  
 H:\17571A-Grantville\_Trolley\_Station\WaterResources\Hydraulics\17571A-ECR-Exhibit-ChHyd.dwg Thursday, Oct. 06 2016 9:54am acotts



SECTION C

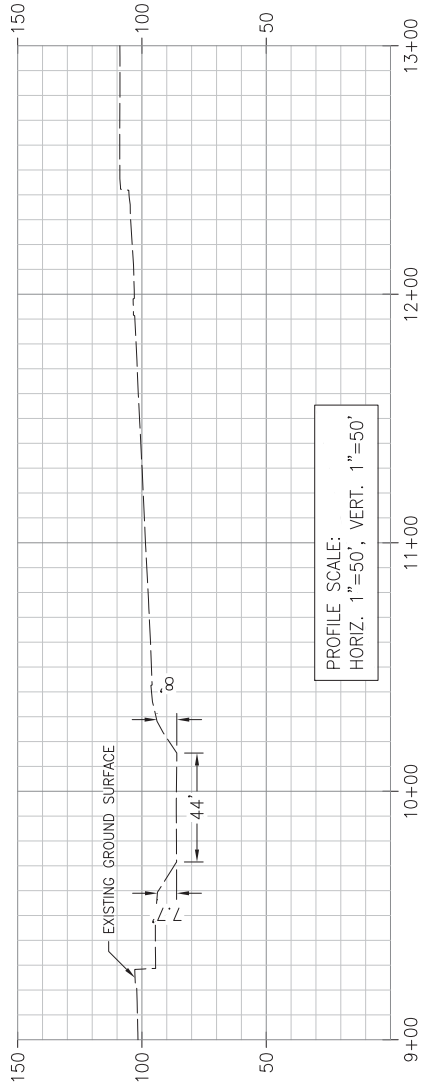


SECTION D

GRANTVILLE TROLLEY STATION/  
 ALVARADO CREEK ENHANCEMENT PROJECT  
 EXISTING CONDITION CHANNEL REACHES  
 SHEET 3 OF 4

**TRICK**  
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 Project: 17571AW

PROJECT NO. 17571AW, 10/2016  
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SECTION E

GRANTVILLE TROLLEY STATION/  
 ALVARADO CREEK ENHANCEMENT PROJECT  
 EXISTING CONDITION CHANNEL REACHES  
 SHEET 4 OF 4

2025 PROJECT NO. 17571A-ECR-Exhibit-ChHyd.dwg  
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 PROJECT NO. 17571A-ECR-Exhibit-ChHyd.dwg



San Diego: Rick Engineering Company  
 Riverside: Rick Engineering Company  
 Sacramento: Rick Engineering Company  
 Tucson: Rick Engineering Company





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