BALBOA RESERVOIR

INFRASTRUCTURE PLAN

JUNE 12, 2020

Prepared by

BKF 100+ YEARS
ENGINEERS . SURVEYORS . PLANNERS

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BKF No. 20160367

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FIGURES

APPENDICES

The appendices are for reference only and are not approved as part of the Infrastructure Plan approval.

1. INTRODUCTION

1.1 Purpose

This Infrastructure Plan is an exhibit to the Development Agreement (DA) between Balboa Community Partners, LLC (Developer) and City and County of San Francisco (City). The Infrastructure Plan describes the infrastructure to be constructed for the Balboa Reservoir Project (Project), associated with Project sustainability, demolition, grading, street and transportation improvements, open space and park improvements, low pressure water system, combined sewer system, auxiliary water supply system (AWSS), stormwater management system and dry utility system. Initially capitalized terms unless separately defined in this Infrastructure Plan have the meanings and content set forth in the DA. Initially capitalized terms unless separately defined in this Infrastructure Plan have the meanings and content set forth in the DA.

1.2 Design Standards and Guidelines

The Balboa Reservoir Design Standards and Guidelines (DSG) is a separate document that establishes the design framework and detailed standards that guide the design of open spaces and buildings. The DSG is approved by the Planning Commission and is a companion document to the Infrastructure Plan. Chapter 5 of the DSG has been included as Appendix A to the Infrastructure Plan as it is relevant to the design of the streets, pedestrian network, loading zones and other features within the public right of way.

1.3 Land Use Program

The Project Site is located north of Ocean Avenue, West of Frida Kahlo Way, Southwest of Riordan High School and east of Plymouth Avenue as shown in Figure 1.0. The project boundary includes approximately 17.6 acres (Block 3180, Lot 190) as shown on Figure 1.1A. The proposed Project includes the redevelopment of the Project Site into a mixed-use development including residential, community room, limited retail, and parking. The proposed Project will also include public access areas and open spaces as well as public and private streets which extend beyond the project boundary. The limits of proposed improvements are shown in Figure 1.1B.

Overall the proposed Project will construct up to approximately 1,640,400 gross square feet (gsf) including approximately 1,100 residential units, approximately 7,500 gsf of retail use, approximately 339,900 gsf of parking, and approximately 10,000 gsf of daycare facilities.

Table 1.1: Proposed Development Program Scenarios

Proposed Building Use	Preferred Development Program
Residential	1,100 total units *450 market-rate units* *550 affordable units* *100 townhomes*
Retail	7,500 sf
Day Care	10,000 sf
Parking	339,900 sf
Public Open Space	4 acres

The land use program may be adjusted in the future provided that it remains within the limits analyzed under the Project EIR. The Project utility demands and infrastructure requirements have been evaluated based on the Development Program that results in the highest utility demand. Accordingly, future adjustments are not anticipated to significantly change the overall Project utility demands or general infrastructure requirements outlined in this Plan.

1.4 Property Acquisition, Dedication, and Easements

The mapping, dedication and acceptance of streets and other infrastructure improvements is anticipated to occur through the subdivision mapping process. Except as otherwise noted, infrastructure described in this Infrastructure Plan shall be constructed within the public right-of-way or dedicated easements to provide for access and maintenance of infrastructure facilities. Existing and Proposed Property lines and easements are shown on Figure 1.2A and Figure 1.2B respectively.

Public service easements will be allowed within the Project as necessary to provide infrastructure and services to the Project and are subject to review and approval by the affected City agency. Proposed public water, combined sewer, auxiliary water supply system (AWSS), and power easements benefitting the San Francisco Public Utilities Commission (SFPUC) on the property will be reviewed on a case-by-case basis. Full access for vehicles and equipment for the maintenance and repair of utility mains will be provided. Public utilities within easements will be installed in accordance with applicable City regulations for public acquisition and acceptance within public utility easement areas, including provisions for maintenance access. Where improvement standards proposed herein differ from the City and County of San Francisco Subdivision Regulations (Subdivision Regulations), such standards and infrastructure shall be subject to design modification or exception requests and reviewed by the affected City Agencies during the Project Phase application or construction document approval process. The City strongly prefers public utilities be installed within public rights-of-way. With the exception of those easement areas shown herein, public utilities in easements will only be allowed at the City's sole discretion during detailed design.

1.5 Project Datum

Elevations referred to herein, are based on the CCSF 2013 NAVD88 Vertical Datum.

1.6 Conformance with EIR/EIS & Entitlements

This Infrastructure Plan has been developed to be consistent with Project mitigation measures required by the Draft Environmental Impact Report (EIR) and other entitlement documents. Regardless of the status of their inclusion in this Infrastructure Plan, the mitigation measures of the EIR shall apply to the Project.

1.7 Applicability of Uniform Codes and Infrastructure Standards

The Infrastructure Plan is intended to comply with the current City of San Francisco Subdivision Regulations. The Infrastructure Plan may be modified in the future to the extent that future modifications are in accordance with the current City of San Francisco Subdivision Regulations and the DA. Approval of future modifications will require approval from the relevant City agencies.

1.8 Master Utility Plans

Each publicly-owned or accepted infrastructure system described herein will be more fully described and evaluated in Master Utility Plans (MUPs), which will be submitted to the City Agencies after approval of the Infrastructure Plan. The MUPs provide detailed layouts and modeling of each infrastructure system. The Infrastructure Plan is to be approved by the City Agencies as part of the DA approval processes. Approval of this Infrastructure Plan does not imply approval of the MUPs, which will be approved after DA execution and prior to the submittal of the Basis of Design.

1.9 Project Phasing

It is anticipated that the Project will be developed in two phases (Development Phase(s)) subject to the approval process outlined in the DA. See Figure 1.3. Each Development Phase would include a Development Parcel or Parcels and associated infrastructure and open space areas. Phased Improvements are the street, access, utility and open space improvements necessary to accommodate development of a particular Development Parcel or Parcels.

The parties acknowledge that certain improvements of the Infrastructure Plan, such as site preparation, grading, soil compaction and stabilization, may be required or desired at an earlier stage of development and in advance of such Phase Improvements. As described in the DA, the parties will cooperate in good faith in determining the scope and timing of such advance improvements, so as not to delay the construction of Development Parcels and associated Phase Improvements, or affect the criteria for the proportional scope of Phase Improvements.

1.10 Phases of Infrastructure Construction

The construction of infrastructure, as described in the Infrastructure Plan, Tentative Map and other Project approvals, can be phased to serve the incremental build-out of the Project in accordance with the Project approvals. Each phase of construction will result in a functioning infrastructure system. Phase Improvements will be described in subsequent Improvement Plans and associated Public Improvement Agreements or permits approved prior to filing a Final Map for the associated Development Parcels.

For each Development Parcel proposed for development, the associated adjacent and as needed infrastructure to provide access and utilities to serve that development, such as streets, and improvements therein and thereon, will be constructed. As described in the DA, adjacent infrastructure refers to infrastructure that is necessary and near to and may share a common border or end point with the proposed Development Parcel or Parcels.

The limits of the existing infrastructure to be demolished as well as conceptual layouts of the permanent and/or temporary infrastructure systems for each Development Parcel will be provided as part of the construction document submittals for that Development Parcel or Phase. Repairs and/or replacement of the existing facilities necessary to serve the Development Parcel will be designed and constructed by the Developer.

Where requested by Developer, and if the City Agency(s) with jurisdiction over the affected infrastructure determines it is appropriate in connection with the phased development of the Project, portions of the Phase Improvements may be constructed or installed as interim improvements to be owned and maintained by the Developer. Interim improvements would be removed or abandoned, as determined by the City Agency, when substitute permanent Phase Improvements are provided to serve a subsequent Development Parcel. Infrastructure within the right of way will not be constructed in phases.

Demolition of existing Project area infrastructure and construction of each proposed Development Parcel and associated Phase Improvements will impact site accessibility. During construction of each Development Parcel and associated Phase Improvements, interim access shall be provided and maintained for emergency vehicles, subject to San Francisco Fire Department (SFFD) approval, as well as pedestrian access on at least one side of the street around the construction perimeter that is American with Disabilities Act (ADA) compliant. Interim access to the existing parking will also be maintained and coordinated between the Developer and City, as required.

At all phases of development prior to full build out, the Developer shall demonstrate to the City Agency that functioning utility systems are in place at all times and comply with applicable City laws, codes and regulations.

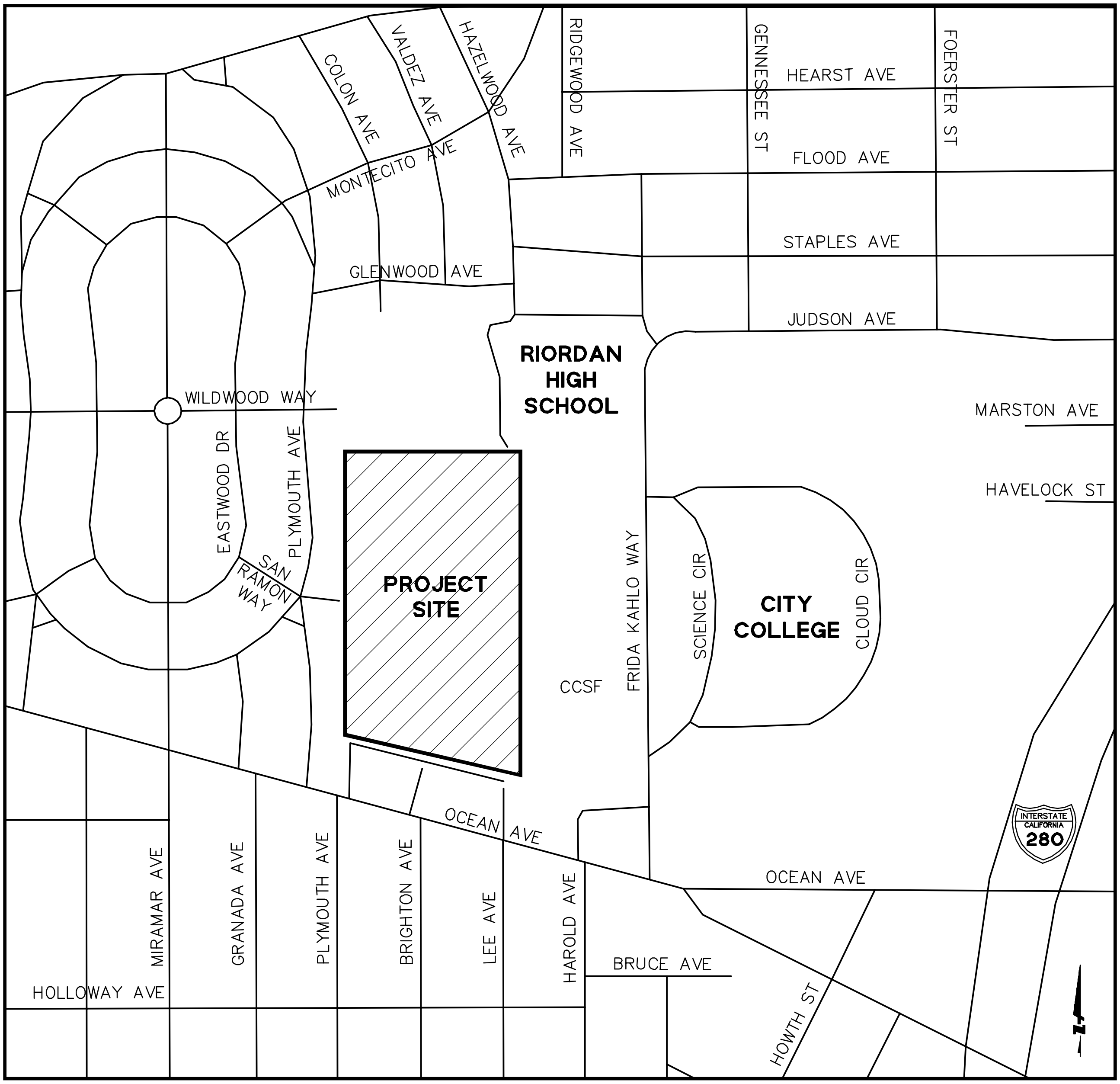
1.11 Operation and Maintenance

After formal acceptance of public infrastructure installed by the Developer, the City will be responsible for maintenance of the infrastructure installed by the Developer, except as otherwise agreed to in writing by the Developer and the City. A maintenance agreement, as required by the Public Improvement Agreement (PIA), will be prepared in conjunction with the first phase of the Improvement Plans and may be subject to a Major Encroachment Permit (MEP).

1.12 Companion Documents

The following attachment and appendices contain reference documents that are referenced by the Infrastructure Plan:

- Appendix A Balboa Reservoir Design Standards and Guidelines, Chapter 5
- Appendix B Preliminary Geotechnical Report
- Appendix C SU-30 and WB-40 Design Vehicle Movements
- Appendix D Fire Engine and Fire Truck Turning Movements
- Appendix E Passenger Vehicle Turning Movements
- Appendix F Balboa Reservoir – Fire Flow Evaluation
- Appendix G "Balboa Reservoir Hydrologic and Hydraulic Modeling" memo by BKF
- Appendix H Balboa Reservoir Design Standards and Guidelines, Sustainable Neighborhoods Framework



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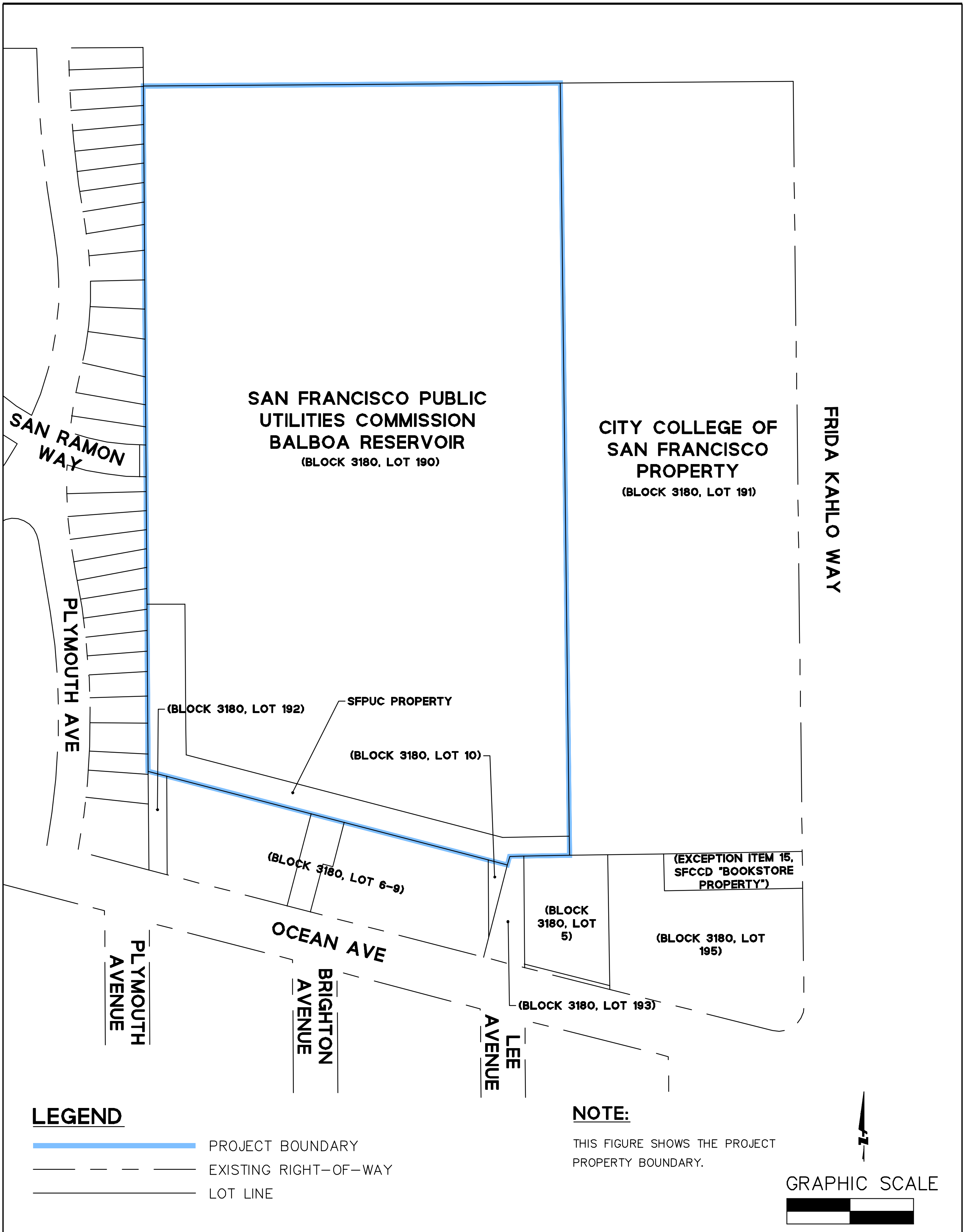
PLOT DATE: 06-10-20 PLOTTED BY: pasc

Source: BKF ENGINEERS, 06/2020

FIGURE 1.0 – SITE LOCATION



LEGEND

PROJECT BOUNDARY
EXISTING RIGHT-OF-WAY
LOT LINE

NOTE:

THIS FIGURE SHOWS THE PROJECT PROPERTY BOUNDARY.

Source: BKF ENGINEERS, 06/2020

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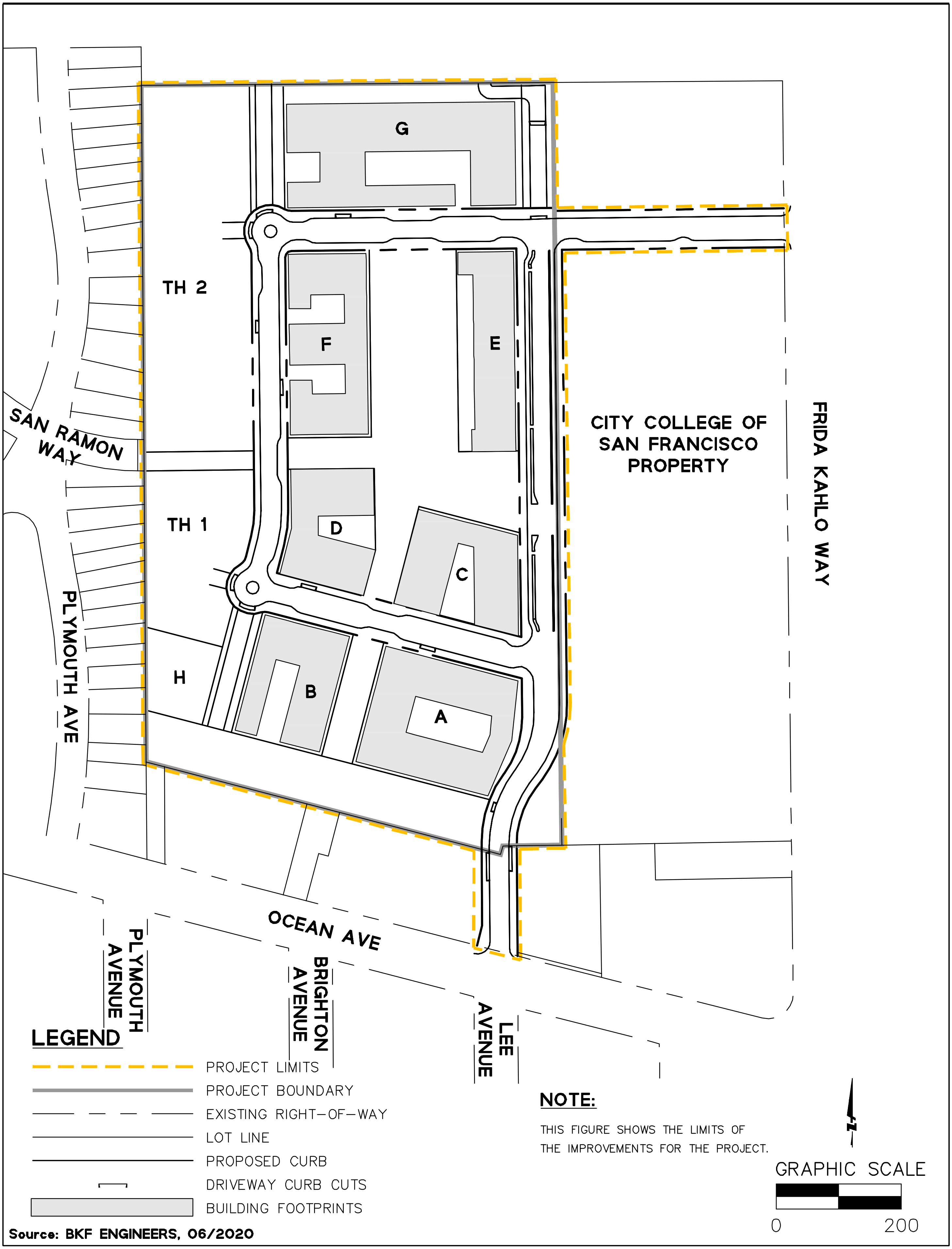
PLOT DATE: 06-10-20 PLOTTED BY: pasc

FIGURE 1.1A – PROJECT BOUNDARY



NOTE:

THIS FIGURE SHOWS THE LIMITS OF THE IMPROVEMENTS FOR THE PROJECT.

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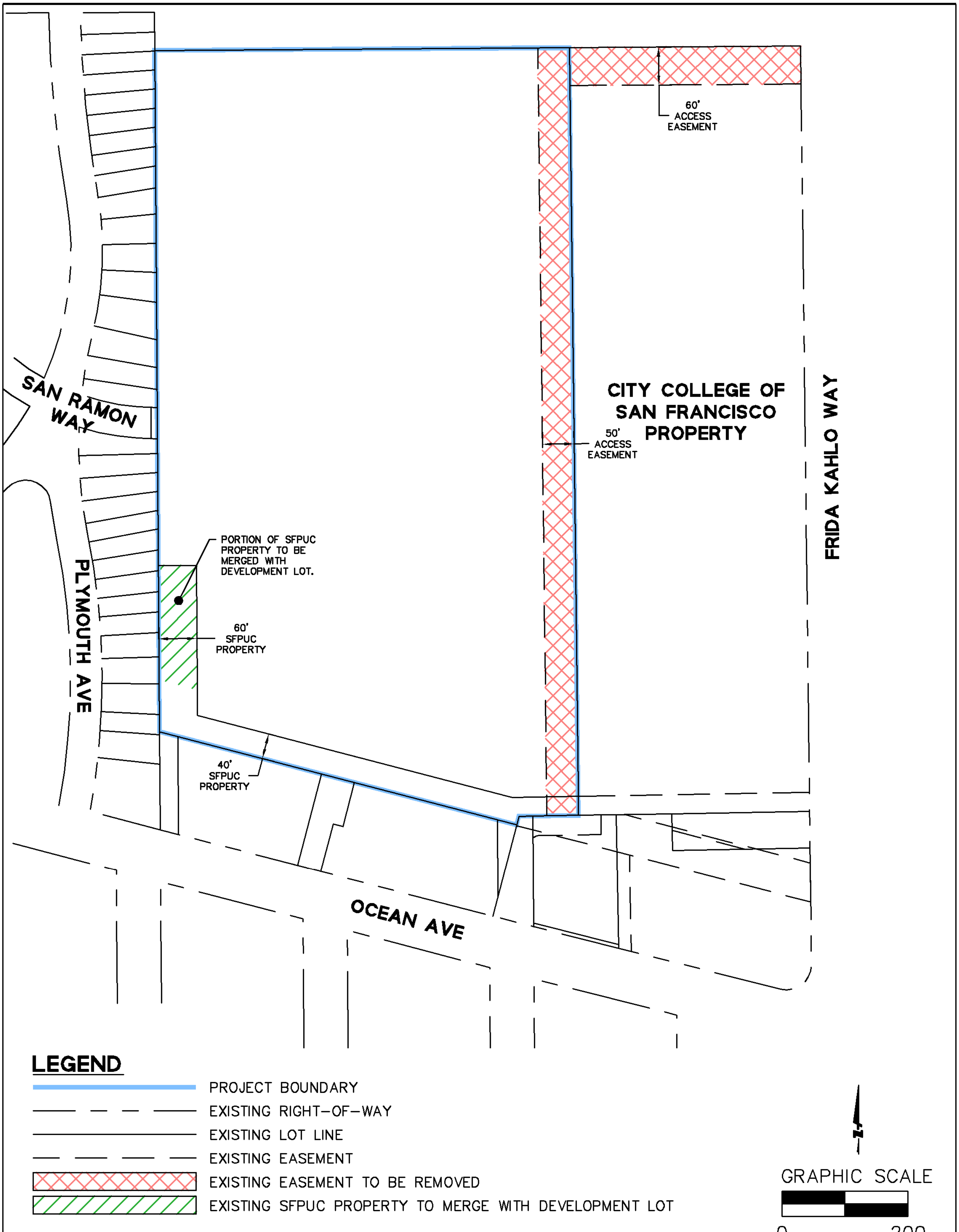
BALBOA RESERVOIR INFRASTRUCTURE PLAN

FIGURE 1.1B – PROJECT LIMITS



Source: BKF ENGINEERS, 06/2020

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BALBOA RESERVOIR INFRASTRUCTURE PLAN FIGURE 1.2A - EXISTING PROPERTY LINES & EASEMENTS

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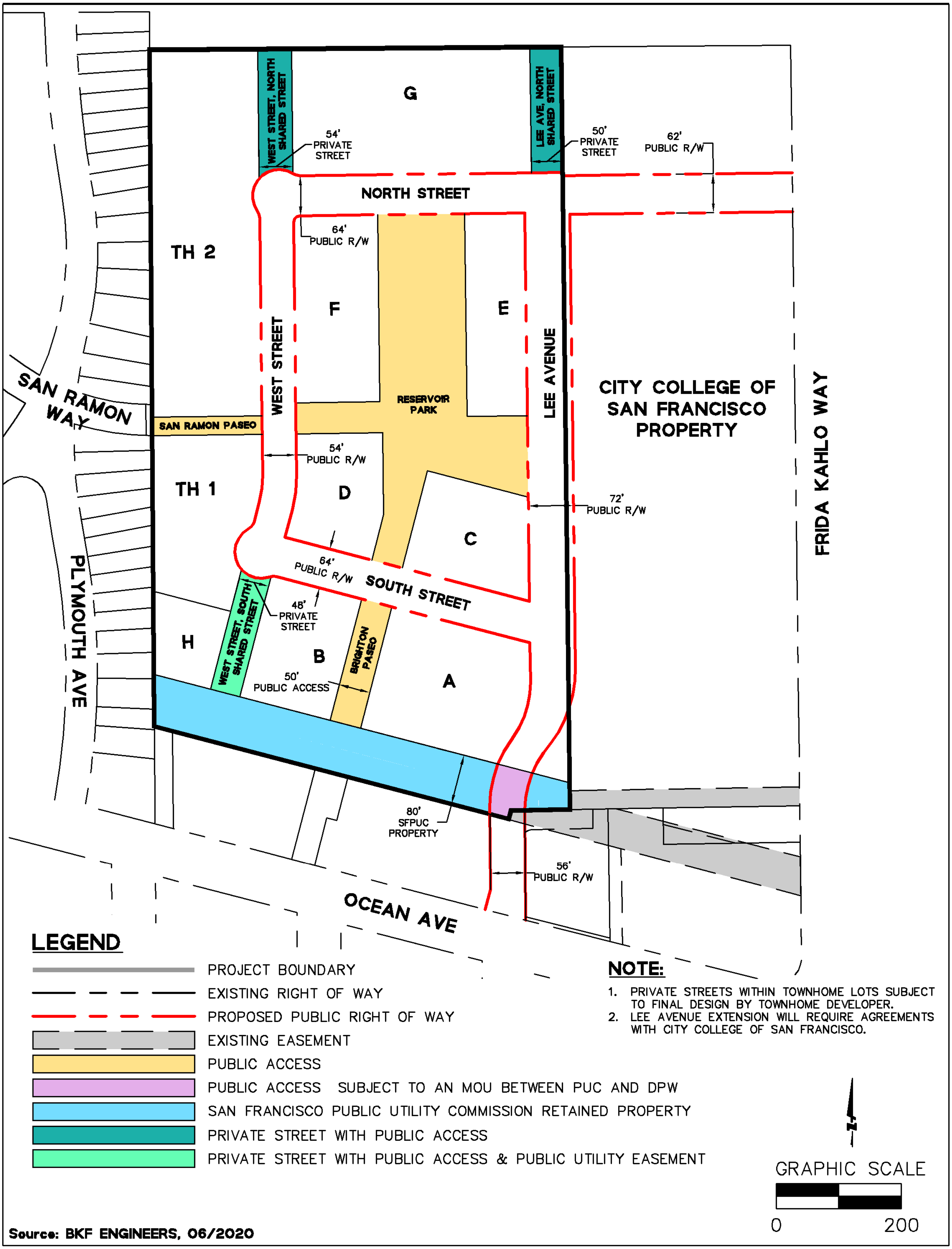
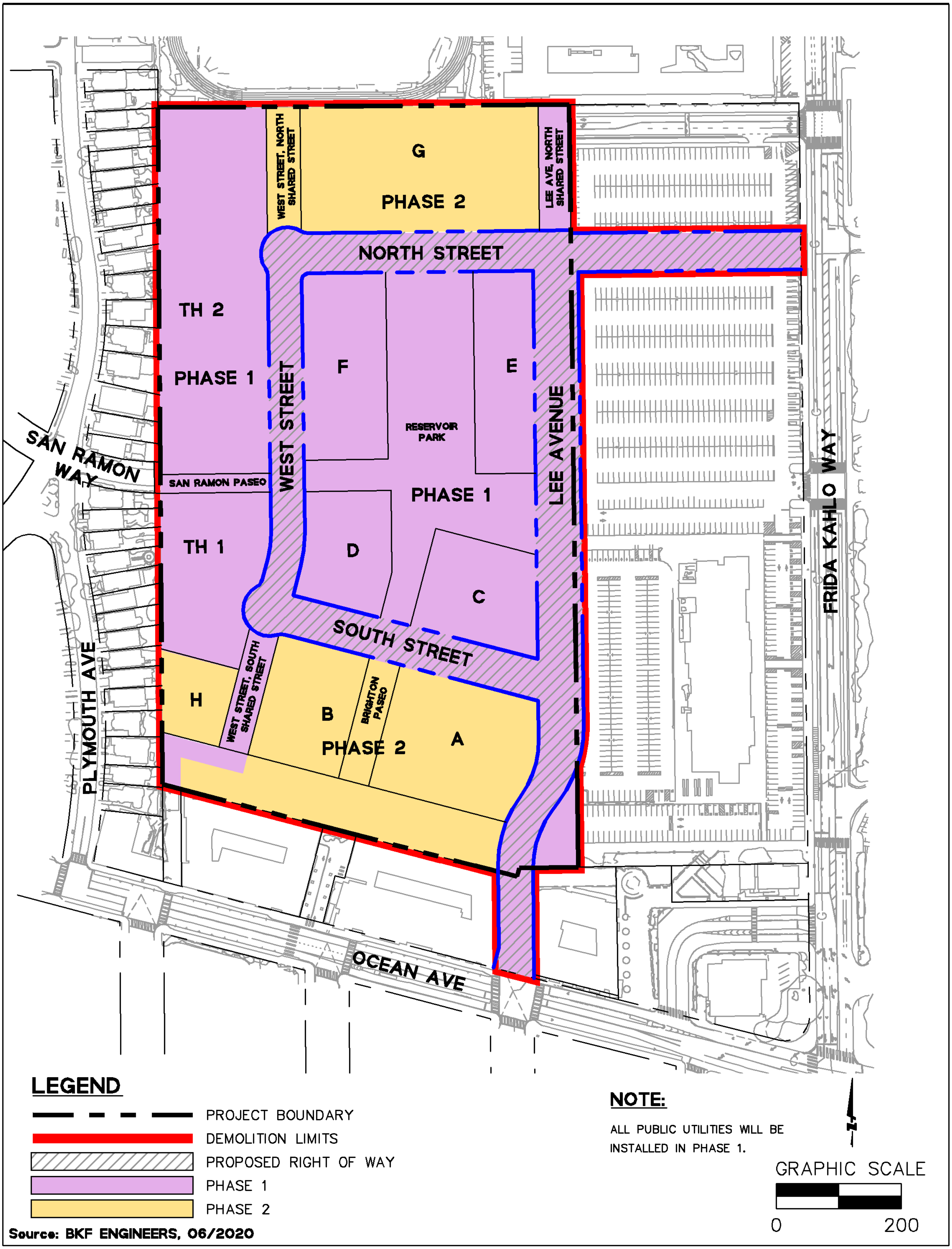


NOTE:

1. PRIVATE STREETS WITHIN TOWNHOME LOTS SUBJECT TO FINAL DESIGN BY TOWNHOME DEVELOPER.
2. LEE AVENUE EXTENSION WILL REQUIRE AGREEMENTS WITH CITY COLLEGE OF SAN FRANCISCO.

Source: BKF ENGINEERS, 06/2020

BALBOA RESERVOIR INFRASTRUCTURE PLAN FIGURE 1.2B – PROPOSED PROPERTY LINES & EASEMENTS



NOTE:

ALL PUBLIC UTILITIES WILL BE INSTALLED IN PHASE 1.

Source: BKF ENGINEERS, 06/2020

DRAWING NAME: K:\2016\160367_Balboa_Reservoir\DOCS\05-Planning_Entitlements\H-Infrastructure_Plan\Exhibits\BR-PR-Project-Phasing.dwg
PLOT DATE: 06-10-20 PLOTTED BY: pasc

BALBOA RESERVOIR INFRASTRUCTURE PLAN **FIGURE 1.3 – PROJECT PHASING**

2. SUSTAINABILITY

2.1 Sustainable Infrastructure

The Balboa Reservoir Project includes sustainable design development through modern infrastructure and attention to community health and prosperity. Improvements will comply with the City and County of San Francisco and State sustainability requirements including Title 24 (Divisions 6 and 11) and The San Francisco Green Building Code. A summary of the key sustainable infrastructure design strategies are as follows:

Section 4 – Site Demolition

- Recycle materials on-site where feasible.

Section 6 – Site Grading

- Erosion and sedimentation control measures during construction will be implemented consistent with an approved Erosion and Sediment Control Plan for the site during grading and construction to protect and control runoff.

Section 6 – Street, Mobility, and Circulation Designs

- New infrastructure and facilities to improve circulation and safely support all transportation modes such as walking and cycling to regional transit hubs.
- Establish an accessible neighborhood that prioritizes walking and biking.
- New public bicycle and pedestrian paths to provide connection to open spaces to support safety of bicycles and pedestrians.
- Selection of street trees that support Site ecosystems.

Section 7 – Open Space and Parks

- New parks and recreation facilities that will complement the existing surrounding neighborhood and citywide open space network.
- Selection of plants and trees that support Site ecosystems and habitats.

Section 9 – Low Pressure Water System

- New reliable potable water system.
- Use of water conservation fixtures.

Section 10 – Non-Potable Water System

- Non-potable water system for toilet flushing and irrigation uses.

Section 11 – Auxiliary Water Supply System (AWSS)

- New AWSS to improve reliability of fire suppression systems and improve site resiliency during a seismic event.

Section 13 – Stormwater Management System

- Stormwater management controls included in the buildings, streets, and open spaces to reduce runoff volume and rate affecting the City Combined Sewer System.

Section 14 – Dry Utility Systems

- New power, gas and communication systems to serve the Development.
- Refer to the DSG for discussion on photovoltaics and solar preheat systems on building rooftops in accordance with the Better Roofs Ordinance and energy efficient equipment and fixtures to reduce energy demands.

Please refer to Appendix H: Balboa Reservoir DSG Sustainable Neighborhood Framework and Chapter 4 of the DSG for a thorough discussion of the project’s sustainability and resilience goals, standards and guidelines.

3. SITE DEMOLITION

3.1 Scope of Demolition

The Developer will be responsible for the demolition and deconstruction of all non-retained existing buildings and infrastructure features. Demolition and deconstruction will include removal and disposal of hardscape, landscape and utilities. The demolition limit of work consists of the existing surface parking lot, earthen berm on the west side of the site, and road on the east side. Project demolition and grading activities will comply with City Ordinance 175-91 for use of non-potable water for soil compaction and dust control. Where feasible, concrete and asphalt pavements will be recycled and used on-site or made available for use elsewhere. Soil removal associated with demolition activities will comply with the Project environmental permit requirements.

As part of the vegetation grubbing and clearing operation, trees and other plant materials will be removed, relocated or protected in placed, as required. Trees and plant materials removed as part of the demolition process will be recycled by composting or similar methods for on-site uses associated with the planting of new vegetation and erosion control to the extent feasible.

The Developer shall be responsible for providing for the infrastructure permanent improvements proposed to replace the existing infrastructure in accordance with approved building and construction permits issued by the City Agency. The extent of these improvements and associated demolition will be finalized during the construction document approval process.

3.2 Phases of Demolition

Demolition will occur in one phase for the entire site. Demolition will staged to allow the existing utility services, vehicular and pedestrian access areas, and landscaped spaces to remain in place as long as possible and reduce disruption of existing uses on the site and adjacent facilities. Project demolition activities will comply with City Ordinance 175-91 for use of non-potable water for soil compaction and dust control. The project will also meet City Ordinance 27-06 by recycling a minimum of 65% of its construction and demolition debris. As feasible, a 75% recycling rate will be achieved to meet LEED thresholds and align with municipal building requirements

4. GEOTECHNICAL CONDITIONS

4.1 Existing Site Geotechnical Conditions

The site is currently owned by the San Francisco Public Utilities Commission and was originally planned for use as a municipal water reservoir. Although the site was never used as a reservoir, the central portion of the site was excavated down approximately 15 feet and an embankment approximately 30 feet tall was constructed along the western and southern boundary. The southern embankment was removed in 2008, and a new embankment was constructed along the eastern site boundary between 2008 and 2009. The central, depressed portion of the site is currently occupied by an asphalt parking lot.

A preliminary geotechnical investigation was performed at the site by Rockridge Geotechnical, Inc. (Rockridge) on January 3, 2017. The investigation consisted of advancing four borings to depths of between 6 and 26 feet below ground surface (bgs) and advancing six cone penetrations tests (CPTs) until practical refusal in very dense sand, which occurred at depths between 5 and 46 feet bgs.

The site is mapped in a zone of early-Pleistocene alluvium (Qoa) (Graymer, 2006). Based on the results of the preliminary geotechnical investigation, the non-embankment portion of the site is underlain by a deposit of medium dense to very dense silty sand with occasional clay interbeds, known locally as the Colma formation. The Colma formation extends to a depth of at least 46 feet bgs at location CPT-6, the maximum depth explored. The embankment consists of sand fill which was likely excavated onsite and re-worked. Documentation of the embankment construction was not available; however, the results of the preliminary investigation indicates that the fill appears to have been well-compacted and is generally dense to very dense in consistency.

Free groundwater was not observed in the borings drilled for the preliminary investigation. A geotechnical investigation was previously performed in 2010 for a development on Phelan Loop immediately southeast of the site. In that investigation, groundwater was encountered in one boring at a depth of about 22 feet bgs, while a second boring drilled to 40 feet did not encounter groundwater.

4.2 Existing Site Geotechnical Constraints

Based on the results the preliminary geotechnical investigation, Rockridge concludes there are no major geotechnical or geological issues that would preclude development of the site as proposed. The primary geotechnical issues affecting the proposed development include site grading and support of the proposed structures.

4.3 Site Grading

Conceptual development plans include removing the western berm and raising grades across the remainder of the site. In some areas, grades may be raised 20 feet or more. Even where fill is properly placed and compacted, some minor settlement of the new fill is expected. During final design, the anticipated settlement will be determined so the site improvements can be designed to accommodate minor differential settlement. If necessary, building entrance slabs can be designed to accommodate settlement of the fill and building utility connections can be designed with a flexible connection. These and other approaches to manage site settlement will be reviewed during final design. The SFPUC's maximum threshold for differential settlement is ½-inch post-construction. The SFPUC may require settlement monitoring during the warranty period of installed improvements.

4.4 Foundations

Foundations should be designed to provide adequate foundation support and limit total and differential settlements of the proposed buildings to acceptable levels.

4.5 Stormwater Infiltration

Conceptual development plans include incorporating infiltration facilities to manage stormwater runoff from impervious surfaces.

4.6 Geotechnical Approaches

4.6.1 Site Grading Approach

Fill should be placed and compacted in accordance with the recommendations of the final geotechnical report. In general, fill should consist of on-site soil or imported soil (select fill) that is free of organic matter, contains no rocks or lumps larger than three inches in greatest dimension, has a liquid limit of less than 40 and a plasticity index lower than 12, and is approved by the Geotechnical Engineer. It is anticipated that the embankment material will meet these criteria.

Where proposed buildings or infrastructure will span different fill thicknesses, the Geotechnical Engineer should evaluate the need of overexcavating and recompacting in-place soil to reduce potential for differential performance.

4.6.2 Foundation Approach

Rockridge preliminarily concluded the proposed buildings could be supported on shallow foundations bearing on firm native soil or properly placed and compacted engineered fill.

4.6.3 Stormwater Infiltration Approach

Where explored in the preliminary geotechnical investigation, the soil at the site primarily consists of silty sand. The silty sand is anticipated to have moderate to high infiltration rates, depending on the exact gradation and mineralogy of soil exposed at designated infiltration areas. Infiltration facilities, including determination of infiltration rates, will be designed and constructed in accordance with SFPUC standards.

4.7 Schedule for Additional Geotechnical Studies

Prior to starting final design of the new infrastructure, the Geotechnical Engineer should perform additional borings/CPTs and prepare a final geotechnical report based on the supplemental field investigation. The geotechnical report should provide information about the soil and groundwater conditions at the site and include design-level recommendations regarding:

- site seismicity and seismic hazards, including the potential for liquefaction and liquefaction-induced ground failure
- the most appropriate foundation type for the proposed buildings
- design criteria for the recommended foundation type, including vertical and lateral capacities
- estimates of foundation settlement
- lateral earth pressures (static and seismic) for design of below-grade walls
- design groundwater level
- subgrade preparation for floor slabs, pavements, and exterior concrete flatwork
- flexible and rigid pavement design
- site grading and excavation, including criteria for fill quality and compaction
- temporary slopes
- temporary shoring and underpinning of adjacent structures, if required
- 2016 San Francisco Building Code (SFBC) site class and design spectral response acceleration parameters
- soil corrosivity
- construction considerations

In addition, infiltration rates should be determined in accordance with SFPUC guidelines[1] after the locations of infiltration facilities have been finalized. Approved infiltration testing methods for a development of this size include "Large Pilot Infiltration Test (PIT)" and "Soil Grain Size Analysis", as appropriate.

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[1] *Determination of Design Infiltration Rates for the Sizing of Infiltration-based Green Infrastructure Facilities,* April 2017

5. SITE GRADING

5.1 Project Datum

Site elevations, referred to herein are on the CCSF 2013 NAVD88, unless identified otherwise.

5.2 Existing Site Conditions

The existing grade within the Project Site slopes gradually north, south, and west, away from the roadway to the north east with ground elevations ranging from approximately 315 feet elevation at the roadway to approximately 292 feet elevation to the south of the existing berm. The northern border is bounded by the track and field of Riordan High School with elevations between 315 and 325. The eastern border is bounded by the City College of San Francisco (City College) parking lot and drive aisle with grades varying between elevation 307 and 315. Along the southern border, there is a grade different of approximately 10 feet at the termination of Lee Avenue with elevation change from 308 on the Project Site to 298 at the termination of Lee Avenue. Mixed-use buildings border the south boundary. The elevation differential is reduced at the southwest corner of the site at elevation 289 where it conforms to the adjacent parcel. Along the western border, the site is bounded by and conforms to the existing grades along the backyards of residences fronting Plymouth Ave with ground elevations ranging from 286 feet to 320 feet in elevation. The existing site elevations are shown in Figure 5.1.

5.3 Site Geotechnical Constraints and Approaches

The Preliminary Geotechnical Report was prepared for the Project by Rockridge Geotechnical. Although the site was intended to be used as a reservoir, it never fulfilled that purpose as it was converted into a parking lot. The central of the portion of the site was excavated down approximately 15 feet and an embankment approximately 30 feet tall was constructed along the west and east boundaries. The southern embankment was removed in 2008 and a new embankment was constructed on the east boundary between 2008 and 2009.

The Project Site sits on sufficiently dense soil which is able to resist liquefaction, and associated manifestations such as settlement, loss of bearing capacity, sand boils, and lateral spreading. Furthermore, as the soil above the groundwater table consists primarily of dense to very dense silty sand, the Project Site is not susceptible to cyclic densification (also referred to as differential compaction).

5.4 Project Grading Overview

The Developer will be responsible for the design and construction of the proposed grading for the Project. Below is a description of the grading design for the different areas of the site. The proposed Project conceptual grading plan is shown in Figure 5.2.

The Project is comprised of a street network with North Street, West Street, and South Street located as described in their name and Lee Avenue occupying the eastern leg of the loop. The street network connects to Ocean Avenue to the south via Lee Avenue and Frida Kahlo Way at the northeast via North Street. Development areas are divided into Blocks with Block A and B south of South Street, Blocks C, D, E, and F occupying the center, Block G to the north, and Block H and townhomes to the west.

Proposed grading for the Project raises the development area to approximate elevations of 299.6 feet to 315.5 feet at the center of the site. The street grades will slope generally to the southwest through a private street into the existing SFPUC easement. The streets and sidewalks will be designed to provide ADA compliant accessible pathways throughout the site and adjacent parcels. The proposed looped street with interconnected open space and accessible pathways will be constructed to link San Ramon Way and City College in the west-east direction and Ocean Avenue and North Street in the north-south direction. Throughout the site longitudinal street grades less than 5 percent will be provided. Proposed watershed boundaries are shown in Figure 5.3.

5.5 Proposed Grading Designs

5.5.1 Building Areas

Proposed finished floors will be set at highest adjacent grades. Project development and grading designs will be developed to comply with the City requirements for ADA accessible paths of travel.

5.5.2 Proposed Roadways

Proposed slopes along public streets and private streets will be set at a maximum longitudinal slope of 5 percent to provide ADA accessible pathways of travel without requiring handrails as shown in Figure 5.2. The proposed public street system is designed in linear grading pattern from north to south and generally east to west as illustrated in Figure 5.2. At conforms, the site conforms or slopes down to the existing adjacent streets. Handrails will be provided for stairs and accessible areas exceeding 5 percent, where required.

At street intersections, grades will be designed at a maximum slope of 2% to provide an accessible path of travel in crosswalks. In addition, vertical curves within the streets will be designed to both begin and end outside the limits of the crosswalk areas.

5.5.3 Overland Release

The drainage design will be examined in the project's Grading, Sewer, and Stormwater Master Plan to ensure project designs contain the 100-year HGL below top of curb, consistent with the requirements of the San Francisco Subdivision Regulations. If necessary to avoid any potential adverse effects from overland release, stormwater will be detained onsite, including a variance request to contain flows from the 100-year storm within the pipe network for the Project Site. The proposed drainage system will route the 100-year runoff through the pipe network to the two points of connection to the existing combined sewer in Ocean Avenue. See Figure 5.4.

5.6 Proposed Site Earthwork

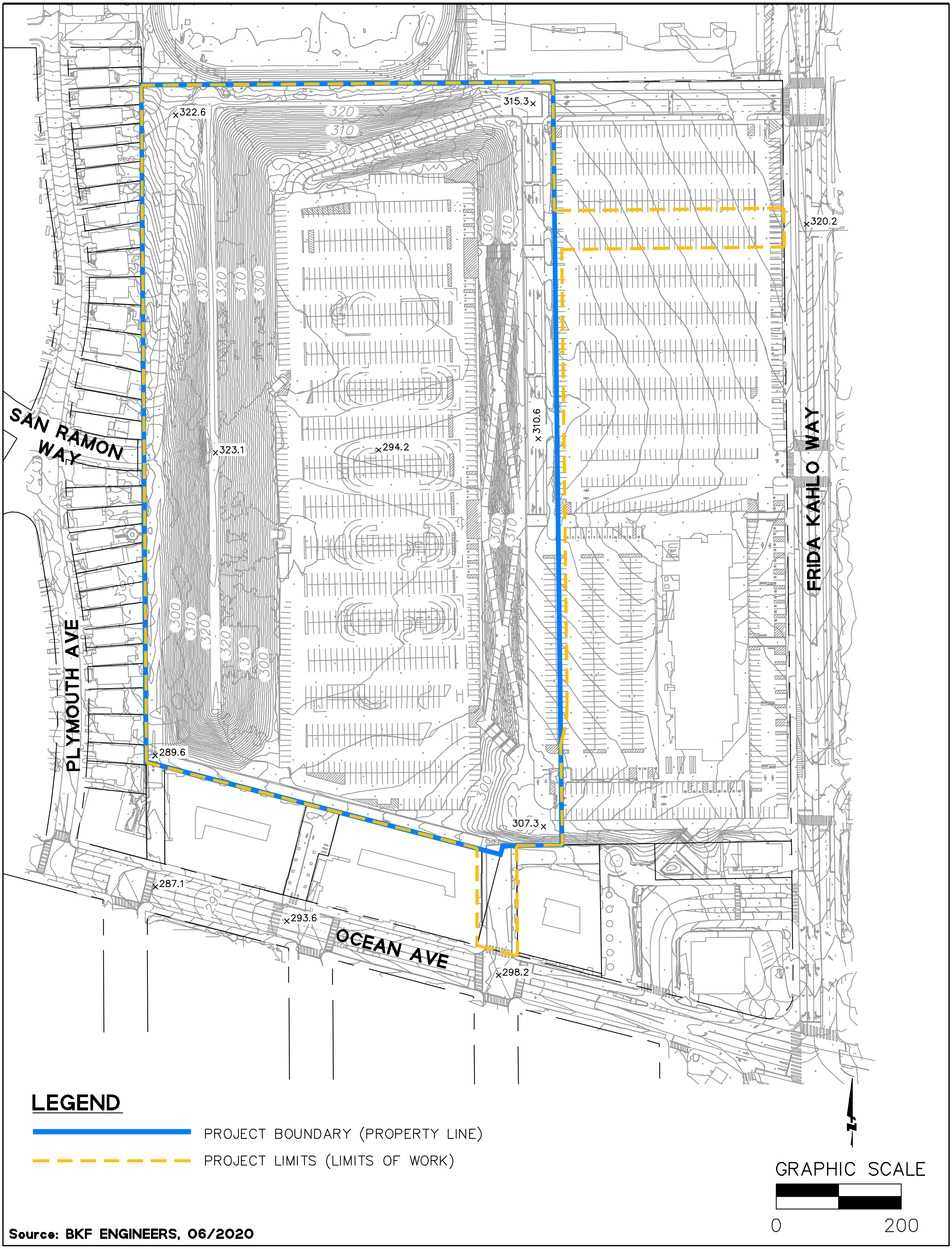
The conceptual grading plan for the Project will require approximately 171,000 CY of gross earthwork. To support grading activities, an Erosion and Sediment Control Plan (ESCP) will be submitted in parallel with future grading permits. Grading in conjunction with site remediation efforts will be performed by the Developer.

5.7 Cut/Fill Quantities

Approximate total quantity of soil to be exported is 56,000 CY. The remaining excavated material will be reused on site to eliminate the need to import additional fill.

5.8 Phases of Grading Activities and Approvals

The Developer will grade the site based on the principle of adjacency and as-needed to facilitate a specific proposed Development Phase and consistent with the requirements of the DA. The amount and location of the grading proposed will be the minimum necessary to support the Development Phase. The new Development Phase will conform to the existing grades as close to the edge of the Development Phase area as possible while maintaining the integrity of the remainder of the Project. Repairs and/or replacement of the existing facilities necessary to support the proposed Development Phase will be designed and constructed by the Developer. Interim grading will be constructed and maintained by the Developer as necessary to maintain existing facilities impacted by proposed Development Phases. Project grading activities will comply with City Ordinance 175-91 for use of non-potable water for soil compaction and dust control.



Source: BKF ENGINEERS, 06/2020

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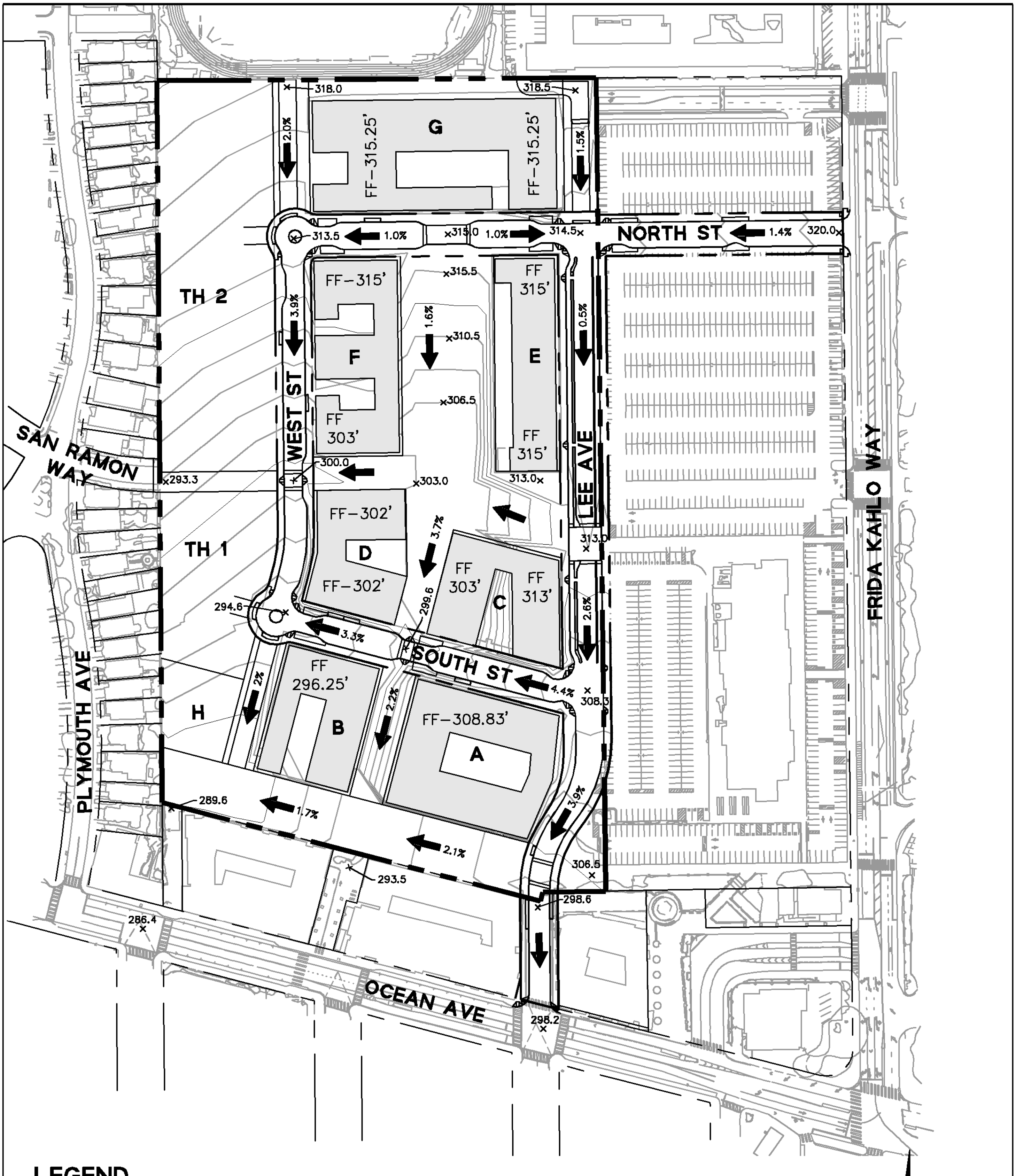
PLOT DATE: 06-10-20 PLOTTED BY: pasc

FIGURE 5.1 – EXISTING SITE TOPOGRAPHY



LEGEND

➡	SITE SLOPE DIRECTION
FF	FINISHED FLOOR ELEVATION AT GROUND LEVEL

Source: BKF ENGINEERS, 06/2020

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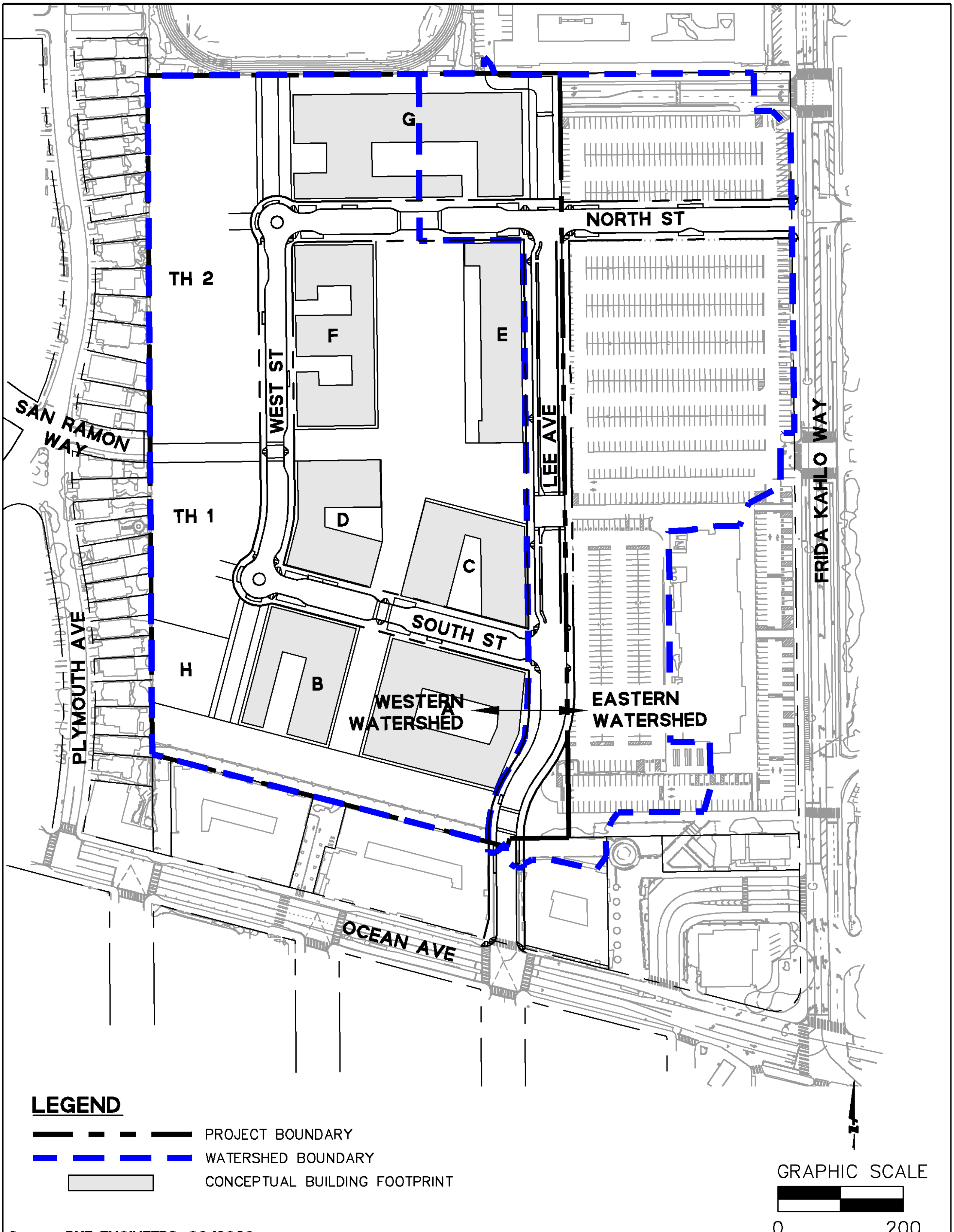
BALBOA RESERVOIR INFRASTRUCTURE PLAN **FIGURE 5.2 – PROPOSED GRADING**



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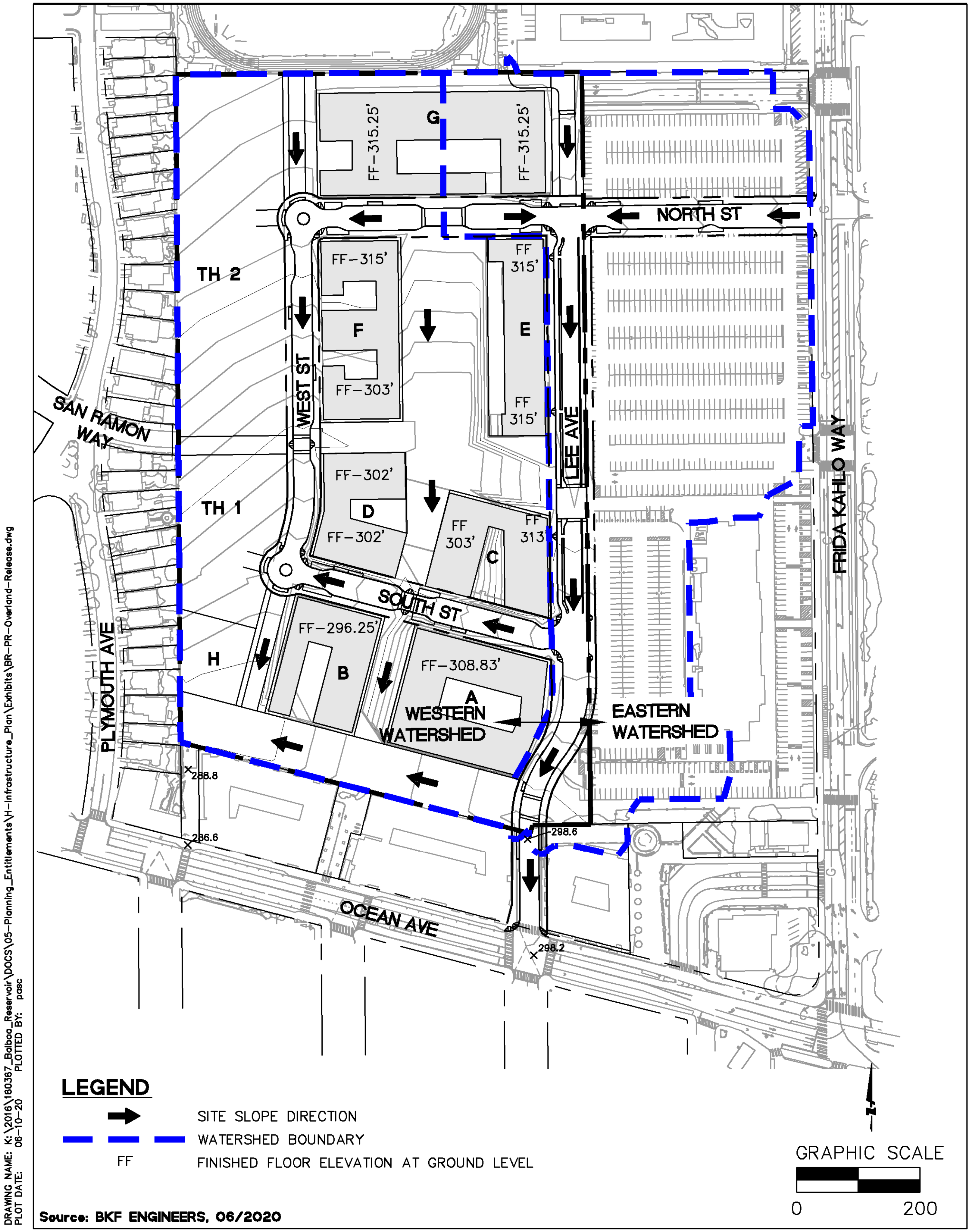
BALBOA RESERVOIR INFRASTRUCTURE PLAN

FIGURE 5.3 – PROPOSED WATERSHED



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BALBOA RESERVOIR INFRASTRUCTURE PLAN **FIGURE 5.4 – PROPOSED OVERLAND RELEASE**

6. STREET, MOBILITY AND CIRCULATION DESIGNS

Balboa Reservoir's street network will be comprised of short, walkable blocks that connect to the existing neighborhoods, City College, and adjacent streets. The Project will prioritize pedestrian and bicycle safety and access to the buildings, streets, and open spaces through careful consideration of transit and transportation connections, accessibility, traffic calming measures, and on-street parking. The bicycle network will provide safe and convenient access within the Project and connections to nearby Ocean Avenue and Frida Kahlo Way. These facilities will be integral to the character of Balboa Reservoir's streets.

The report makes reference to specific sections of Chapter 5 of the DSG which is included as Attachment A to this report. The reviewer shall review both Chapter 6 of the Infrastructure Plan and Chapter 5 of the DSG concurrently.

6.1 Plan Overview

As a pedestrian-priority development, the street network will provide safe and easy access to open spaces, building entrances, and retail, with unique street types designed to the scale of the pedestrian experience. A combination of traffic calming strategies will discourage unnecessary vehicle traffic and ensure that internal traffic will be low-speed and low-volume. The public realm will be fully integrated with the design and scale of the ground floor of the buildings.

6.2 Public Street Modes of Travel and Access

6.2.1 Pedestrian Circulation and Accessibility

Creating a safe, accessible, and comfortable pedestrian experience will be a priority on all streets, with safe pedestrian street crossings and connections to open spaces and surrounding streets. All of the proposed internal streets will have raised crosswalks which raise pedestrians slightly above the adjoining vehicle traveled way and simultaneously providing a vehicle traffic calming measure. Passenger loading and building servicing strategies will be designed to minimize conflicts between pedestrians and vehicles, and to maximize the special street-life elements that create a rich pedestrian experience.

The pedestrian network is further defined in Section 5.3 of the DSG.

6.2.2 Bicycle Circulation

The Project is dedicated to improving bicycle transportation throughout the area by providing infrastructure for improved cyclist safety. Bicycle lanes of various class designations will be incorporated into the public streets throughout the site. Lee Avenue will accommodate the majority of bicycle traffic traveling north and south through the site via Class II and Class IV bike lanes providing a safe environment that separates bicycles from vehicular traffic and prioritizes bicycle travel. Due to limited right-of-way and curb-to-curb widths, dedicated bike lanes cannot be accommodated in North, South, and West Streets. These streets will incorporate Class III bike routes. Figure 6.2 shows the conceptual strategy for bicycle facilities at a network scale. Refer to Section 6.4 for specific street designs, bicycle facilities, and safety strategies.

The bicycle network and bikeway design guidelines are further defined in the DSG.

6.2.3 Vehicular Circulation and Intersections

All streets shall have two-way, low-volume, posted low-speed limit traffic circulation. Streets should be designed for a 25 mph design speed and posted for 20 mph. Controlled intersections are shown on Figures 6.5A – 6.5D. Alternate options for implementing mountable traffic circles at the north and south ends of West Street are shown on Figure 6.5B2 and 6.5C2.

Refer to Section 5.14 of the DSG for additional information on traffic circle implementation.

All intersections shall adhere to City standards for signage and street markings. Where crosswalks at uncontrolled intersections are proposed at Open Space connections, an appropriate combination of traffic control strategies, including crosswalk markings, shall be employed to maximize visibility and safe pedestrian crossing. Refer to Section 6.8 for more detailed information on intersection design and controls.

The vehicle design guidelines are further defined in Section 5.3 of the DSG.

6.2.4 Fire Department Access

Based on the planning efforts undertaken during the initial meetings with the San Francisco Fire Department, intersection radii, land widths, street widths from curb to curb, and right-of-way layouts have been designed to accommodate fire truck turning movements at the Project intersections shown in Appendix D. Per the SFFD requirements, intersections are designed to accommodate the truck turning movements of the City of San Francisco 57-foot Articulated Fire Truck (Fire Truck). Other emergency vehicles turning movements analyzed include the SFFD Engine. The SFFD 57-foot Articulated Fire Truck shown in Figures D.6-D.9 was the most restricted vehicle and thus was the basis for street layout designs. At intersection approaches and within intersections, the Fire Truck may encroach into the opposing vehicular travel lane to complete turning movements, but a minimum of 7-feet of refuge area is provided for any cars within these lanes. Appendix D shows enlargements of the fire truck turning movements for the San Francisco 57-foot Articulated Fire Truck at the site intersections.

Where aerial ladder access is required, a 26-foot wide unobstructed clear width within 15-feet to 30-feet from the building façade will be provided.

Dead ends shall have an unobstructed clear width without parking of not less than 26-feet for aerial ladder access and shall be capable of supporting the imposed load of fire apparatus weighing at least 75,000 pounds.

Buildings H shall be provided with an unobstructed fire access road clear width of not less than 26-feet and will be provided under separate submittal.

The townhome building sites will be provided with a minimum 20-foot wide fire access road without parking for all streets where the townhome buildings are less than 40-feet in height. This will be provided under separate submittal.

Low pressure water system fire hydrant, stand pipe inlet, and auxiliary water supply system fire hydrant layout is shown on Figure 6.8.

6.2.5 Parking, Loading, and Service

Parking, loading, and service will be distributed to minimize impact on the public realm pedestrian experience. Passenger loading across the site will be accommodated in dedicated areas. Servicing needs for Development Parcels will be accommodated on all streets in time-limited or dedicated zones that will be either on-street or off-street. Commercial loading, trash pickup, mail drop-off and residential move-in and move-outs will require careful coordination in an active pedestrian environment. Loading and service areas are shown on Figure 6.9.

Refer to Section 5.12-5.16 of the DSG for more detailed information on parking, loading, and service.

6.2.6 Large Vehicle Access

All Project streets within the public right-of-way shall accommodate commercial vehicle circulation. Access through the public right-of-way shall be designed for the SU-30 truck and accommodate the WB-40 trucks. Refer to Appendix C for truck turning studies.

6.3 Public Street System

The Developer will be responsible for the design and construction of the public streets as shown on Figure 6.1. Improvements will generally include the following:

- Pavement structural sections
- Concrete curbs and gutters
- Concrete sidewalk and curb ramps
- Traffic control signage and striping
- Traffic signal
- Street chicane for traffic calming
- Street lighting and pedestrian-scale lighting
- Street landscaping and trees
- Stormwater management facilities (may include such methods as landscape strips, permeable pavements, and bioretention areas)
- Street furnishings (includes, but are not limited to, benches, trash cans and bike support facilities)
- Accessible on-street passenger loading zones with adjacent street level passenger loading aisles and curb ramps.
- Accessible curb ramps
- Accessible Pedestrian Signal (APS) at traffic signal
- Raised crosswalks
- Sidewalk bulb-outs
- Class II, III, and IV bikeways
- Enhanced Paving
- Utility Clearance Requirements
- Flashing Beacon

Approval of and responsibility for maintenance and liability for non-standard facilities, if any, shall be as described in the DA.

Refer to Chapter 5 of the DSG for additional information on Streetscape and landscape improvements.

6.3.1 Public Street Layout and Parcelization

A system of street and parcel numbers has been created to facilitate planning and design coordination and is shown on Figure 6.1. The new grid network of public streets includes two streets oriented north to south: the Lee Avenue and West Street. Lee Avenue will conform to the existing dead-end street just north of Ocean Avenue. Property frontage improvements will result in partial renovation of the existing City College parking lots to the east. North Street and South Street will be oriented east to west. North Street will tie into Frida Kahlo Way at a new intersection. The existing intersection just north of North Street will be closed.

6.3.2 Roadway Dimensions

Street widths—curb to curb—are designed to accommodate emergency access, utility clearances, bicycle facilities, passenger loading and building servicing, and vehicular access throughout the site. Typical vehicular travel lanes within streets will range from 10-feet to 13-feet in width. Travel lanes are measured from the face of curb or outside edge of bicycle facilities. All streets will provide for two-way traffic and fire access, with street widths varying from a minimum of 26-feet to 40-feet. Additional roadway dimension information at intersections is shown in Figure 6.5A-D and detailed cross section information is shown on the utility cross section exhibits in Figures 8.2A-G.

6.4 Public Street Network and Hierarchy

The Balboa Reservoir street network will include several street types with distinctive character, traffic speed, and street-life elements – site furniture, street trees, special paving, and understory planting that combine with active ground floor uses to enrich the pedestrian experience.

Refer to Chapter 5.3 of the DSG for detailed information about the public street network and hierarchy.

6.4.1 Street Zones and Designs

The streets will contribute to a varied public realm while satisfying above- and under-ground infrastructure needs at the Project. Proposed streets shall conform to the Subdivision Regulations. The public right-of-way must be open to the sky with the exception of permitted landscape and street-wall encroachments per the DSG, and publicly accessible at all times unless subject to maintenance, operations, security and safety rights, or closure by Master Developer for events. Street closure by Master Developer or others shall be subject to all applicable City permitting and authorizations. Ownership and maintenance and liability for streetscape elements and encroachments shall be addressed as set forth in the DA including, but not limited to non-standard design features, such as lighting, stormwater gardens, and other stormwater treatments.

6.5 Components of Public Streets

6.5.1 Curb Heights

The curb heights shall be 6-inches unless at a raised crosswalk where they are reduced to 4-inches.

6.5.2 Paving

Final pavement design for the roadway sections will be designed for the anticipated traffic load and equivalent single axial loads (ESAL) for a design life coordinated with the City Agency per the terms of the DA. See Figure 6.7 for pavement surfaces.

The Pedestrian Throughway defined on each street shall be an accessible path of travel that is unobstructed by non-ADA-compliant paving or material treatments. Paving and built-in site elements shall be comprised of high-quality materials and finishes that are durable to withstand high-intensity use. All material textures in designated clear path of travel and accessible use areas shall be ADA-compliant.

Refer to Section 5.9 of the DSG for street paving materials.

6.5.3 Street Planting

Planting will function ecologically to help achieve the Project's goals for sustainability and contribute to a healthy environment. Composition and distribution of a diverse, adapted urban forest, stormwater gardens, and planted areas will create a resilient ecological framework to shape varied sensory experiences across the site and urban habitat.

Refer to Section 5.5 and 5.8 of the DSG for more detailed information about the public street trees and planting palette respectively.

6.5.4 Sustainable Water Strategies

The Project's landscape and building systems will work together and be designed to conserve, re-use, and filter water. Site hydrology will be intertwined with daily life in a unique and systematic way, with stormwater management gardens that are a part of the public experience in every streetscape and open space. Irrigation is an essential element of plant health and should be considered as part of the site hydrology strategy.

6.5.5 Lighting

Lighting will be an important component of nighttime identity, experience, and safety. Lighting of special, unique character should reinforce key pedestrian routes along the streetscapes. SFPUC acceptable lighting fixtures will work together to create a warm, inviting, and safe nighttime environment. Energy efficient LED street lighting will also be designed to limit light pollution within the streets.

6.5.5.1 Lighting Design Intent

Lighting design shall follow SFPUC – Streetlight Guidelines and IES-RP8, Illuminating Engineering Society standards appropriate to the subject street type. The street type classifications will be determined as part the MUPs. Metal finishes and colors shall be coordinated with other site furnishings and building color palette. Streetlight plans will be subject to review and approval by SFPUC – Streetlights.

6.5.5.2 Location

All street lights shall be located within the furnishing zone per SFPUC – Streetlight Guidelines and the SF Better Streets Plan. Streetlights shall not be installed in pavers, planters, or be surround by dirt. Streetlight infrastructure shall be in the sidewalk.

6.5.5.3 Fixtures

Light fixtures within the ROW shall comply with SFPUC – Streetlight Guidelines and shall be selected from the SFPUC catalogue of acceptable fixtures. Streetlight fixtures will be subject to review and approval by SFPUC – Streetlights.

6.5.5.4 Scale of Light Fixtures

Lighting shall satisfy functional needs of auto circulation but also be scaled to the pedestrian and bicycle experience. Lighting shall be coordinated with the design of the open space lighting, and glare shall not be created at eye level. Pole heights shall follow SFPUC – Streetlight Guidelines.

Refer to Section 5.11 of the DSG for additional information on public street lighting.

6.5.6 Accessible Loading

Loading zones for vehicular and paratransit loading and unloading will be distributed across the site to enable access to all Development Parcels and open spaces, with priority given to significant pedestrian connections. See Figure 6.9. Proposed configurations for loading stalls are described for integration with DPW-Standard Curb, 6-inches typical.

Refer to Sections 5.12-5.15, of the DSG for detailed information about the accessible loading zones.

6.5.7 Utility, Driveway, and Streetscape Coordination

The project will ensure that locations of above-grade utility structures, where provided, are coordinated with streetscape elements. These locations shall be coordinated with tree spacing to ensure City Standards are applied to the greatest extent possible. Driveway locations shall be coordinated with placement of streetscape elements.

Refer to Sections 5.4 and 5.7 of the DSG for additional information on streetscape coordination.

Full-street cross-sections with utilities are shown in Figures 8.2A-8.2F in Section 8

6.6 Traffic Calming

As part of the pedestrian and bicycle focused development plan, traffic calming elements are proposed to improve non-vehicular traffic safety and access. Proposed traffic calming elements for the Project street rights-of-way are identified in Figure 6.3 and include raised crosswalks, chicanes, bulb-outs, narrowed lane widths to accommodate bicycle infrastructure.

Refer to Section 5.6 of the DSG for additional information traffic calming strategies.

6.6.1 Raised Mid-Block Crosswalks

Raised mid-block pedestrian crosswalks are proposed along all streets except the portion of North Street east of Lee Avenue. At raised crosswalk locations, the street pavement areas will be raised as much as 3.5-inches to reduce the adjacent curb heights to 4-inches and will change paving material for a more effective visual cue to motorists. Final grades are dependent on overland release studies.

Where raised crossings are proposed, striped continental crosswalks shall be provided unless the project elects to use decorative crosswalk treatments that comply with the 2014 SFMTA Crosswalk Guidelines and required review. Any potential decorative crosswalks or ground mural require approval from SFMTA and must be in accordance with FHWA regulations. Proposed decorative treatments shall meet ADA standards for slip-resistance. Each mid-block crossing will also have a Rectangular Rapid Flashing Beacon (RRFB). The design for these crosswalks will be coordinated with and are subject to the approval of the SFPUC, SFDPW, the SFMTA, and the San Francisco Fire Department (SFFD). Refer to Section 5: Site Grading for additional information about Project grading and overland release requirements. Raised crossing configurations are shown on Figure 6.4A-E.

The Developer or HOA will be responsible for maintenance and restoration of the street pavement sections, including pavement markings, within the raised crosswalk. Designs will incorporate measures to minimize maintenance and reduce the potential for dirt, silt and other debris to settle within the crosswalks.

6.6.2 Street Chicane

A chicane is integrated at the northern end of West Street to calm traffic and reduce vehicle speeds approaching and departing from the intersection at North Street and West Street. The chicane offset is 8-feet and maintains a 12.5-foot travel lane consistent with the land widths of West Street. Layout of the chicane is shown on Figure 6.5B.

6.6.3 Intersection Bulb-Outs

Bulb-outs have been incorporated at all intersections. These locations are expected to have a high concentration of pedestrian traffic. Bulb-outs will narrow driving lanes, create a shorter pedestrian crossing, make pedestrians more visible to motorists and require vehicles to reduce speeds. The final design for the bulb-outs will be coordinated with the SFMTA, SFDPW, SFPUC, and the SFFD. Bulb-out improvements will be constructed if the designs can meet the City Agency's requirements for overland drainage release, utility clearances, and accessibility for persons with disabilities. Overland release at these locations will be studied in the Sewer, Stormwater and Grading Master Utility Plan. Typical intersection bulb-out details are shown on Figures 6.5A-D.

6.7 Off-Site Traffic Signalization

The Developer will be responsible for design and construction funding, either as partial contribution or in full, of traffic signal modifications or new traffic signals, as well as striping. Where possible, the electrical service for traffic signals will be located within the joint trench (see Section 17). Traffic signals shall be designed by and constructed to the specifications of the SFMTA and SFDPW. Relocation of the traffic signal will require approval by the SFMTA Board of Directors. If determined feasible, planned off-site intersection improvements include, but may not be limited to the following:

6.7.1 Frida Kahlo Way and North Street Intersection

A new signalized intersection will be constructed at the proposed intersection of North Street and Frida Kahlo Way. The existing signalized intersection at the northern access road to the existing surface parking lot will be removed. See Figure 6.6 for the proposed intersection geometry.

6.8 On-Site Traffic Controls

Traffic calming and stop-controlled intersections, rather than signalization, are the primary strategy for on-site traffic control. Stop signs will be added at all intersections, with final locations to be determined by traffic sight distance requirements and coordination with the City. If implemented, stop signs on city streets will require legislation from SFMTA Board and traffic calming may also require SFMTA Board and/or public hearing.

6.9 Public Transportation System

No public transportation is envisioned within the Project Site. The site is not being designed to accommodate large passenger buses, which includes both large public buses and private transportation buses. However the site is located within a 1/4 mile of bus and streetcar service and less than 1 mile from the Balboa BART Station.

6.10 SFMTA Infrastructure

Where required, the following list of infrastructure items includes items to be owned, operated and maintained by the SFMTA within public right-of-ways:

- Signals and Signal Interconnects, including Muni Bus Prioritization signals
- TSP signal preempt detectors
- Conduit containing TSP signal cables
- Shelters (Via Vendor)
- Paint – poles and asphalt delineating coach stops
- Asphalt painting for transit lanes
- Departure prediction ("NextBus") monitors and related communications equipment
- Bicycle racks
- Crosswalk striping, except for areas with a raised crosswalk or with painted concrete special striping or other special decorative treatment
- Bike lane and traffic striping
- APS/Pedestrian crossing signals

- Street, traffic and parking signs
- Parking meters
- Colored curbs
- Rectangular Rapid Flash Beacon (RRFB)

6.11 Acceptance and Maintenance of Street Improvements

Upon acceptance of the new and/or improved public streets by the Board of Supervisors, responsibility for the operation and maintenance of the roadway and streetscape elements will be designated to the appropriate City Agency as defined in the City of San Francisco Municipal Code and related ordinances, and the Project DA. Conflicts between proposed public utility infrastructure and the surface improvements proposed as part of the Project, including but not limited to dedicated transportation routes, trees, bulb-outs, and medians, shall be minimized in the design of the infrastructure and surface improvements. The City Agency responsible for said utility infrastructure will review all proposals for surface improvements above proposed public utility infrastructure on a case-by-case basis to ensure that future access for maintenance is preserved. Stormwater management infrastructure installed as part of the streetscape to meet the Stormwater Management Requirements and Design Guidelines (SMR) will be maintained by the Master Developer and/or City Agency subject to the terms of the Project DA. The SFPUC will maintain stormwater controls located in the public ROW that receive stormwater runoff from the public ROW only. Parcel developer or Master HOA will be required to maintain any stormwater control that manages private parcel runoff, or a blend of private parcel and public ROW runoff.

As outlined in the DA, the Master Developer will be responsible for maintenance and restoration of the non-standard materials and design features, including decorative paving and hardscape elements, as well as specific streetscape elements and encroachments. Restoration will include replacement of the pavement markings within areas with non-standard materials.

6.12 Phasing of New Roadway Construction

All new public roadways will be constructed in Phase 1.

6.13 Lee Avenue Right-of-Way

On the east side of the proposed 72-foot wide Lee Avenue right-of-way, approximately 11-feet of land needs to be dedicated from City College. At this time, the developer and City are negotiating this land dedication with City College. Should the land dedication not occur, the Lee Avenue street cross section would need to be revised to fit within a narrower 61-foot wide right-of-way. The alternate street cross section for Lee Avenue is shown on Figure 6.10.

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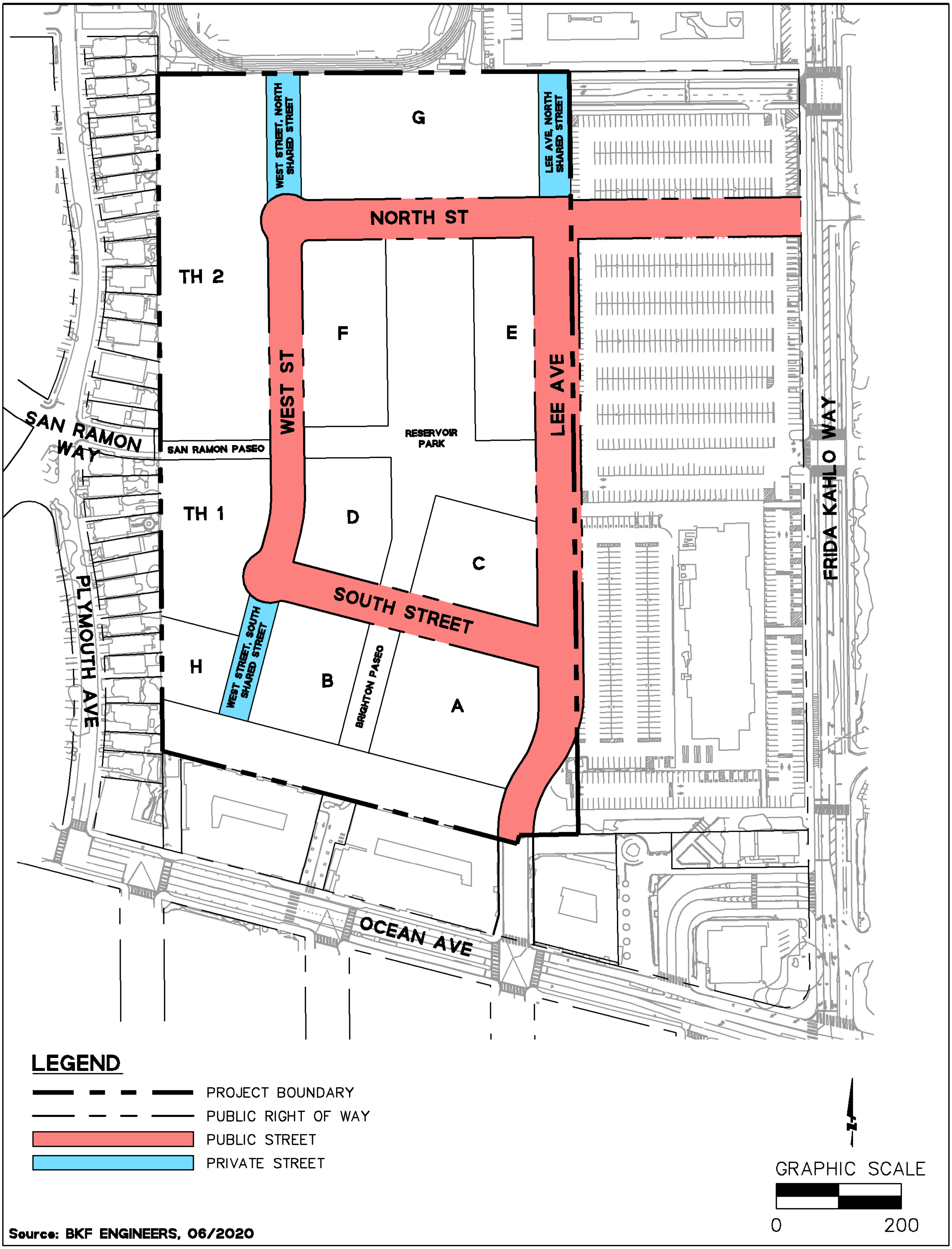

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BALBOA RESERVOIR INFRASTRUCTURE PLAN

FIGURE 6.1 – PROPOSED STREET SYSTEM

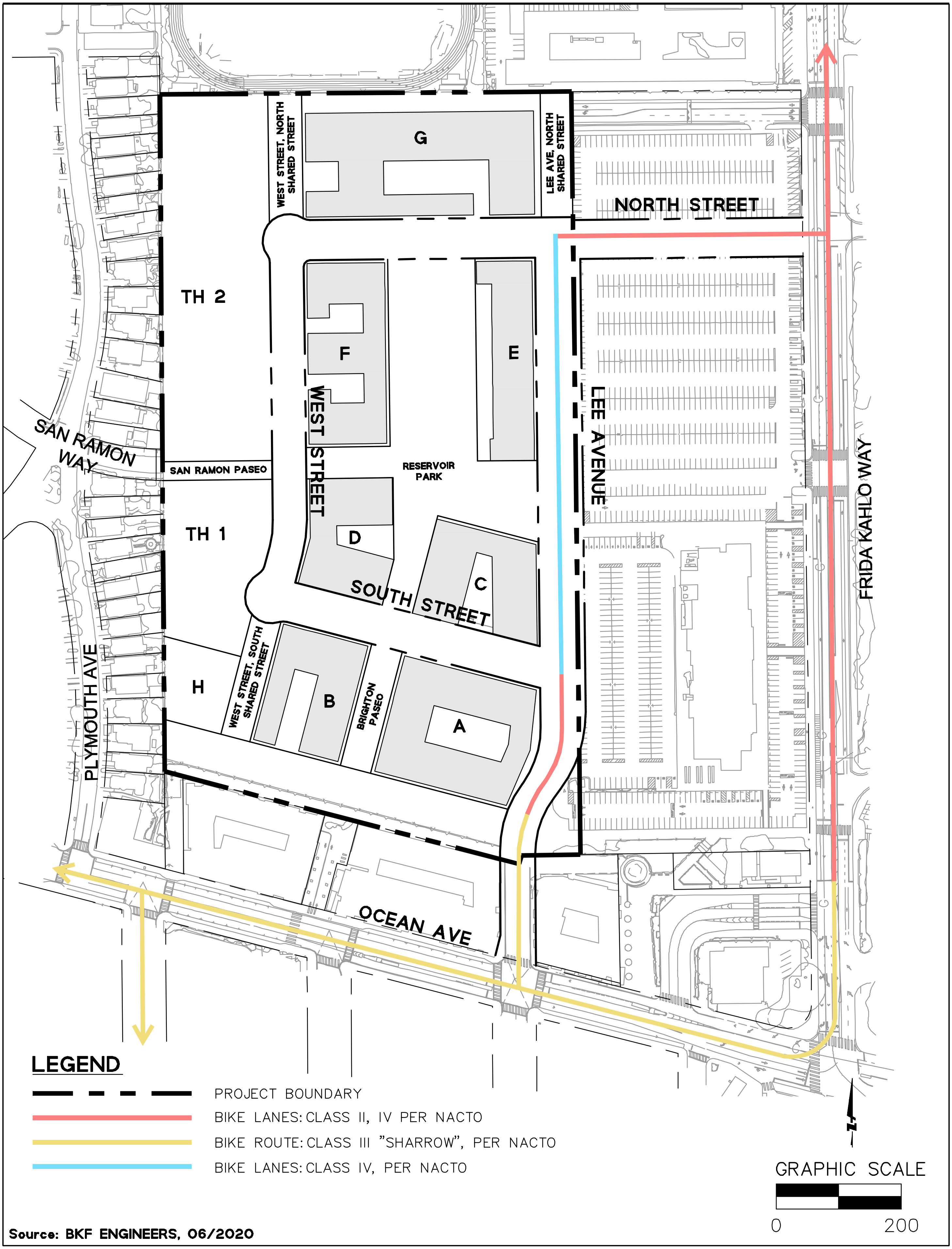

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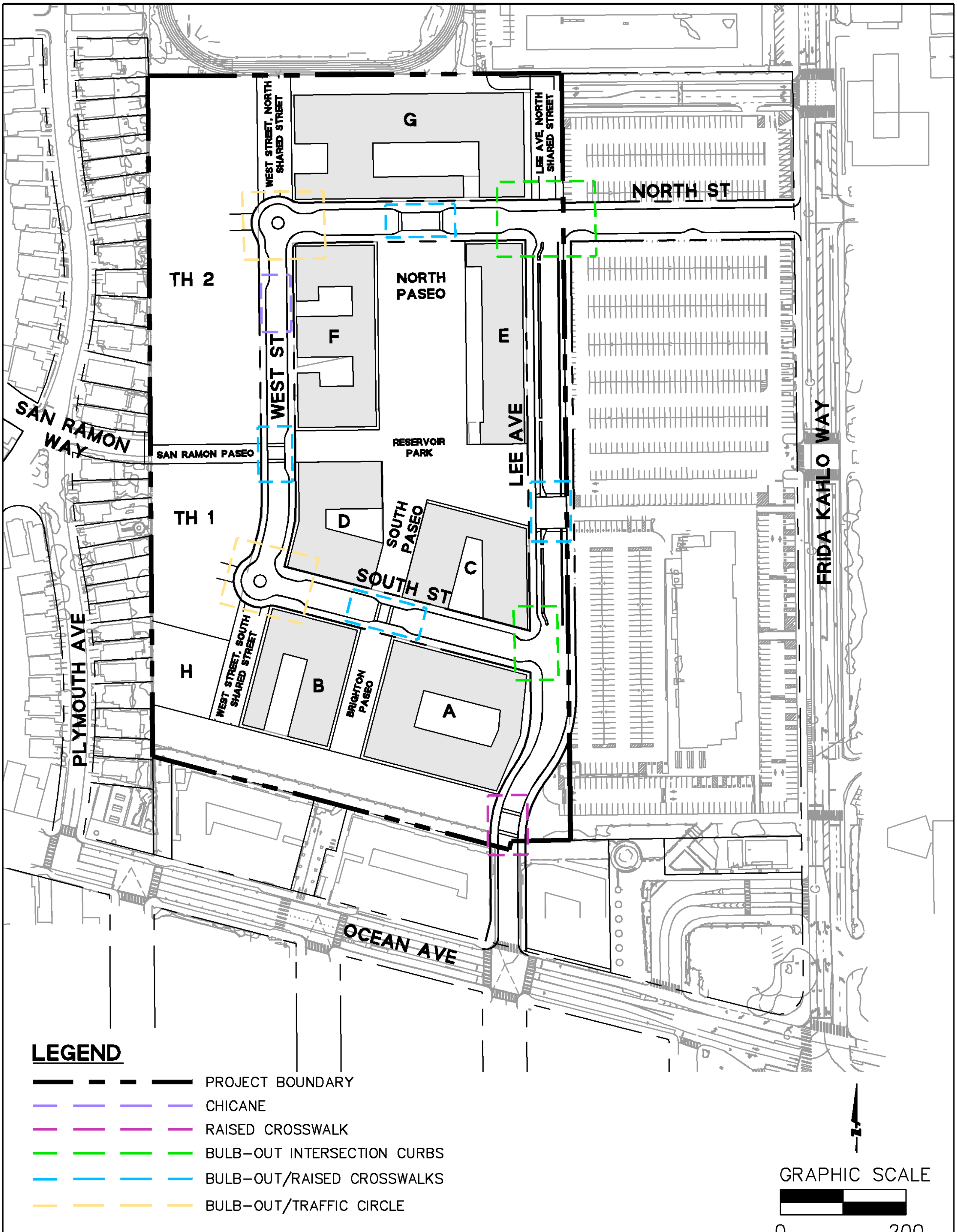
FIGURE 6.2 – PROPOSED BICYCLE FACILITIES



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BALBOA RESERVOIR INFRASTRUCTURE PLAN **FIGURE 6.3 – TRAFFIC CALMING MEASURES**

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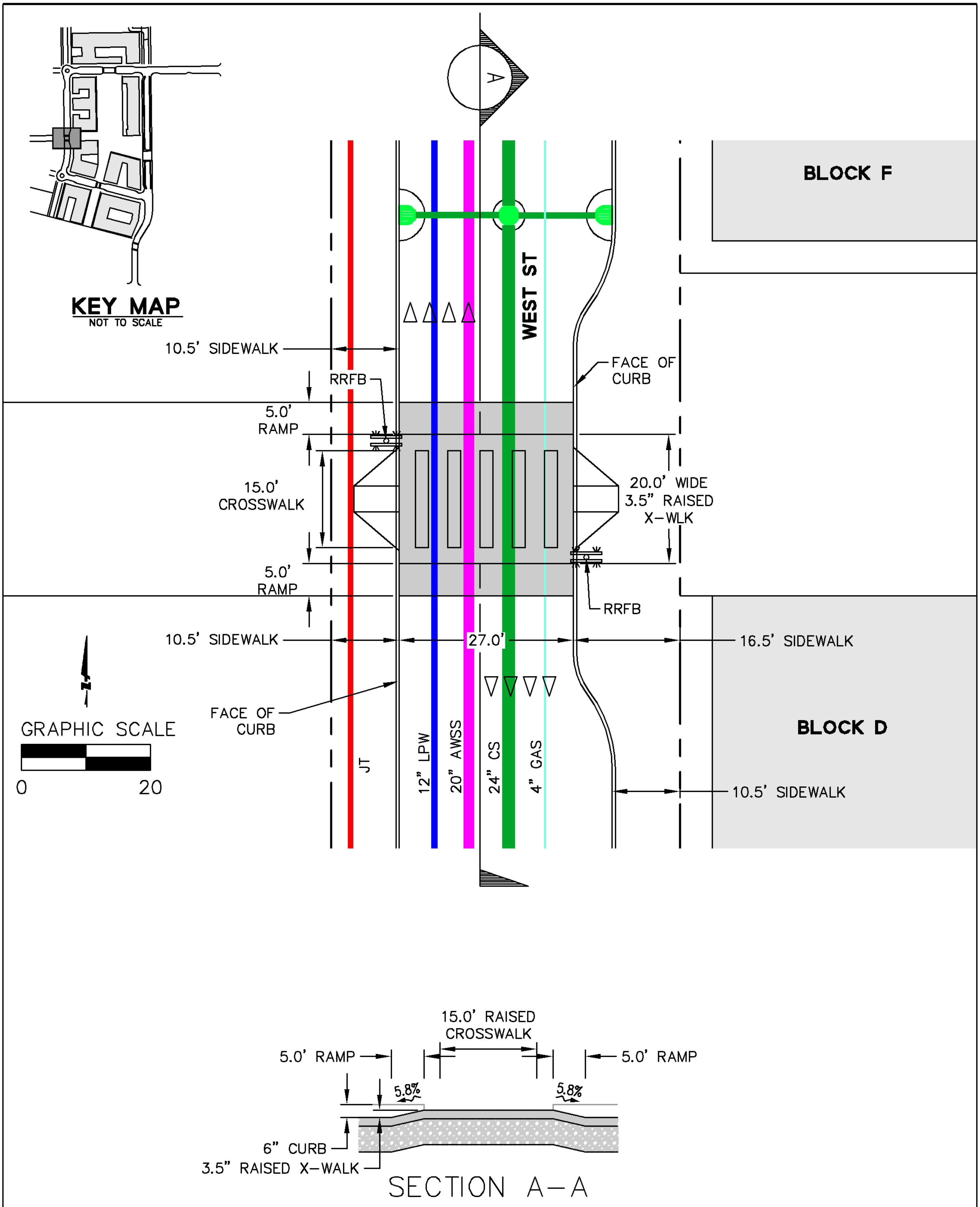

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FIGURE 6.4A – RAISED STREET CROSSING (WEST STREET)

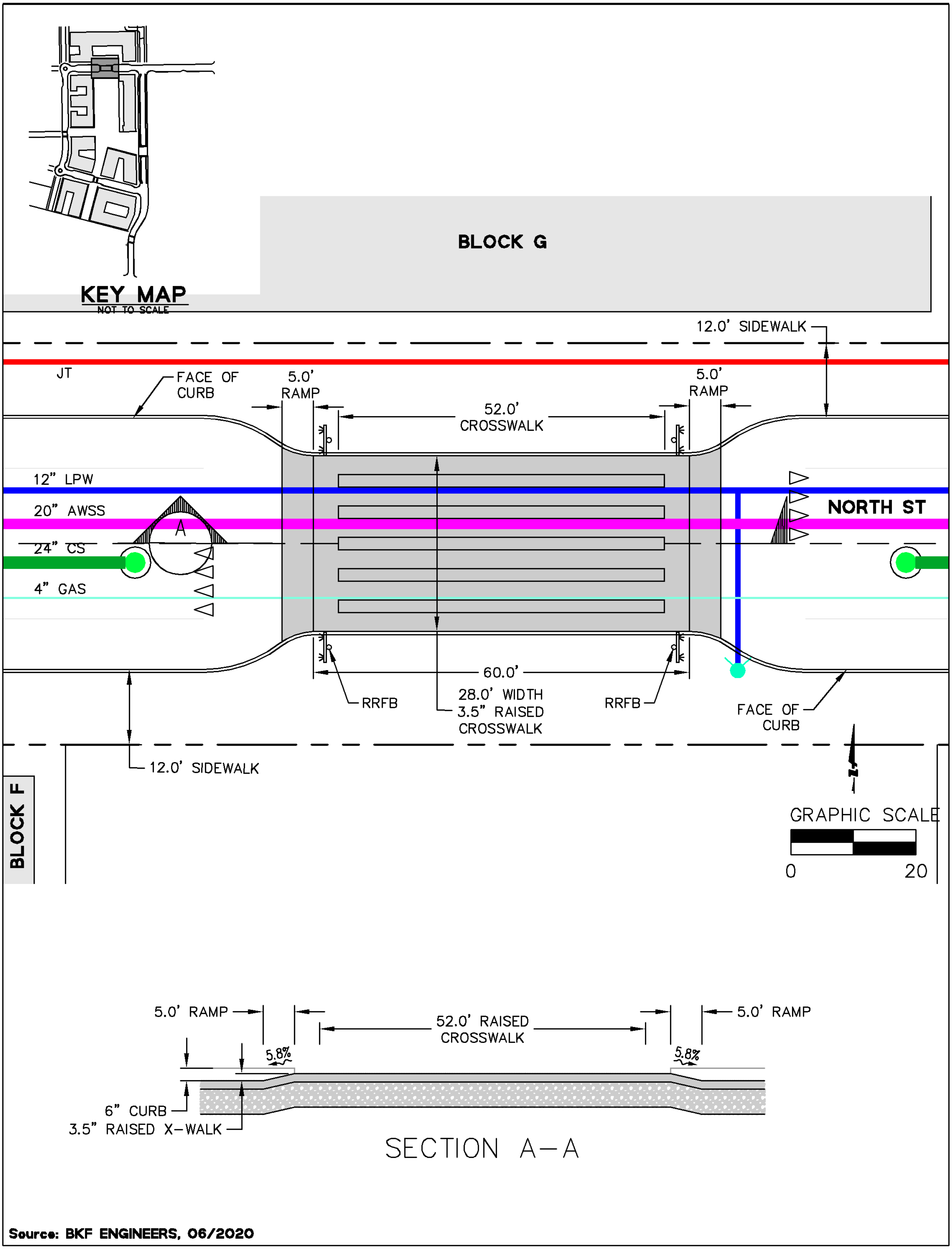

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FIGURE 6.4B – RAISED STREET CROSSING (NORTH STREET)

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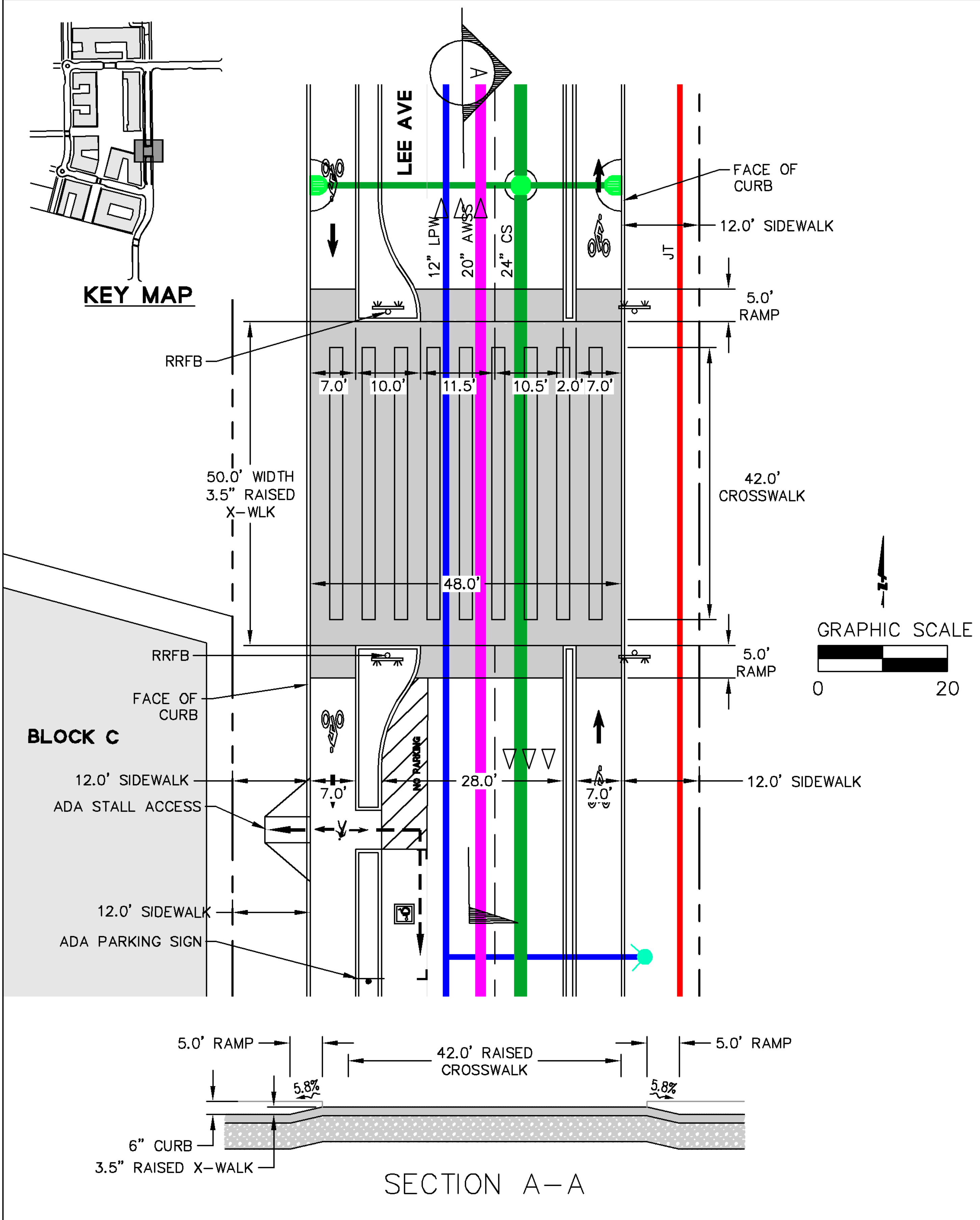

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BALBOA RESERVOIR INFRASTRUCTURE PLAN **FIGURE 6.4C – RAISED STREET CROSSING (LEE AVE)**

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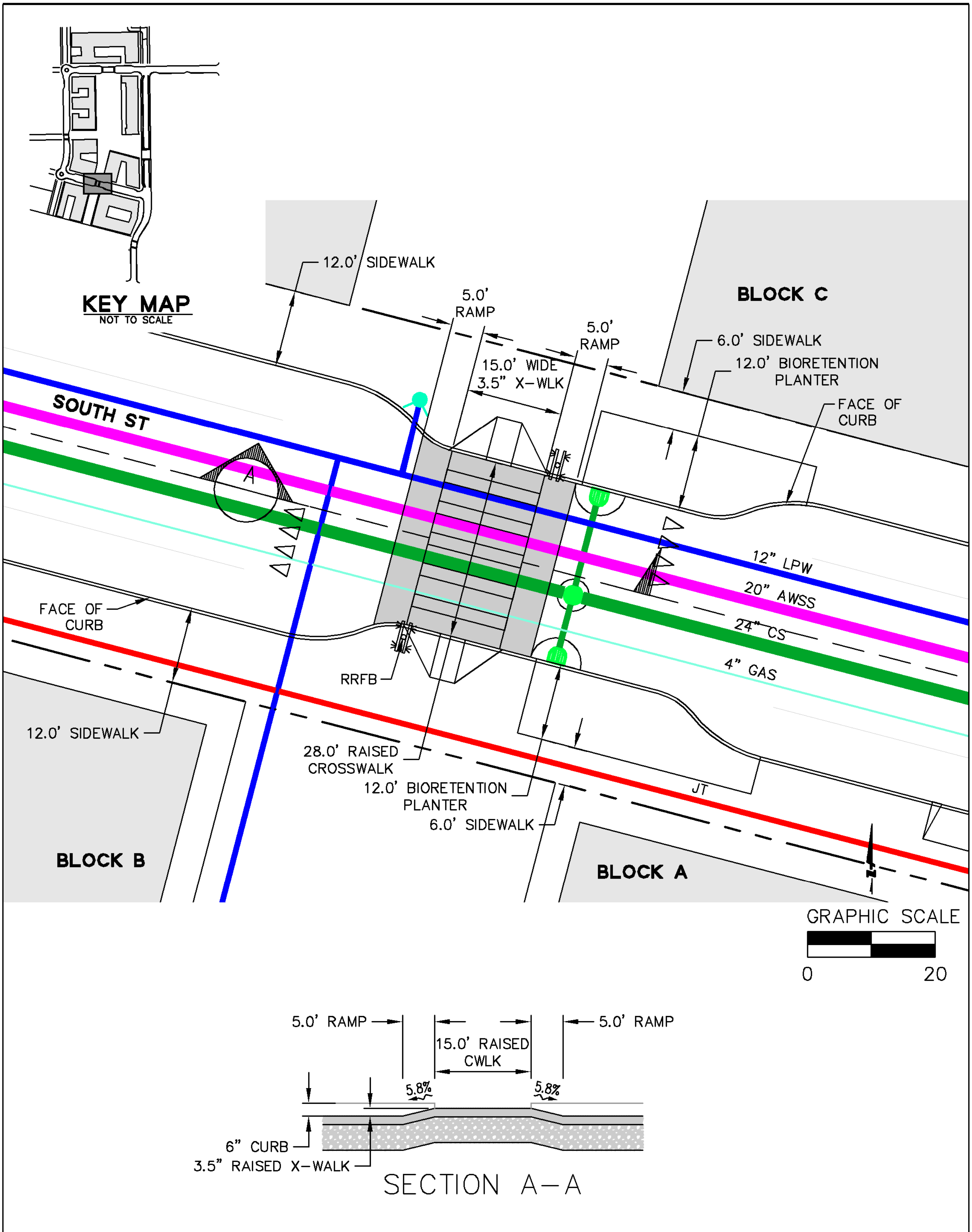

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BALBOA RESERVOIR INFRASTRUCTURE PLAN FIGURE 6.4D – RAISED STREET CROSSING (SOUTH STREET)

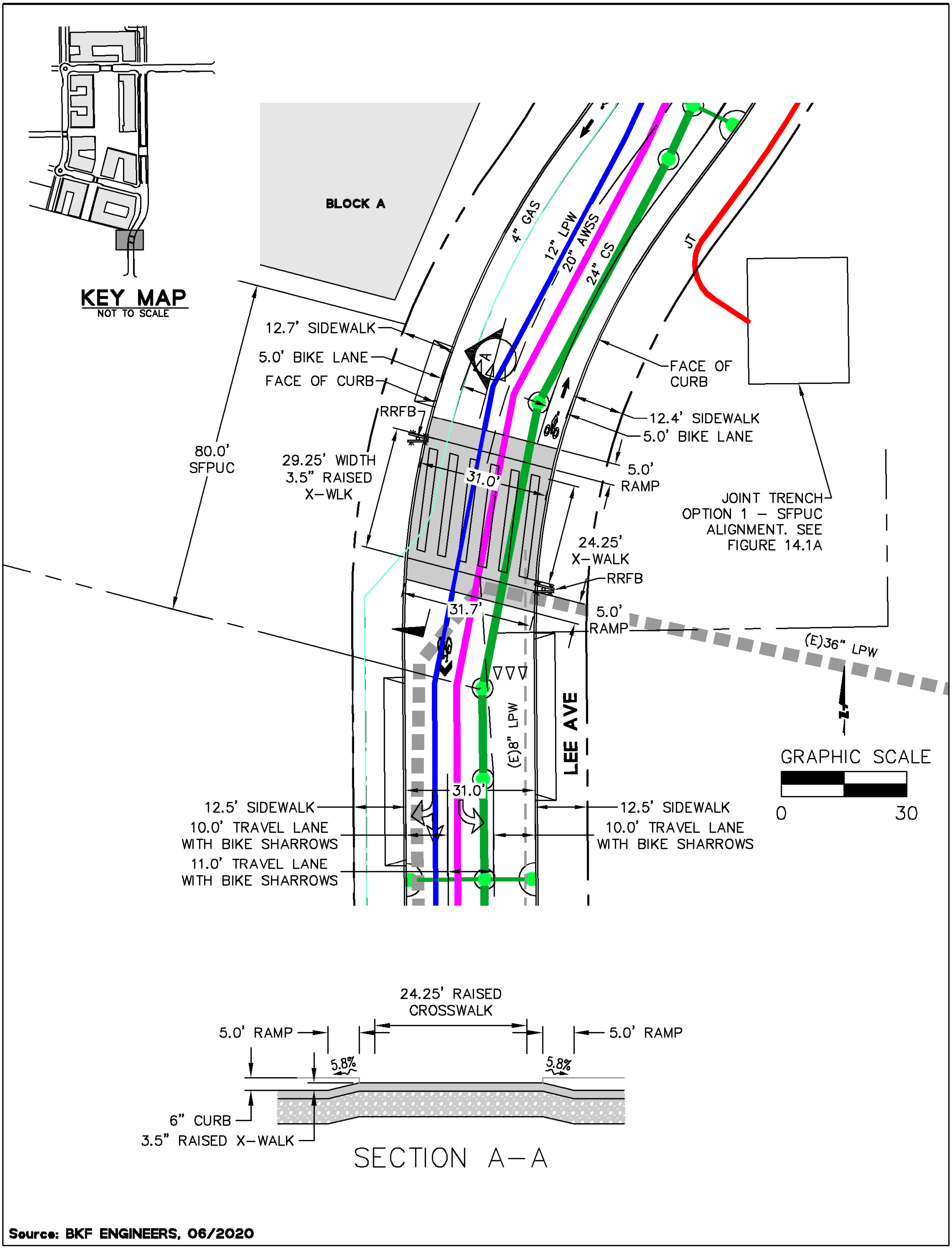

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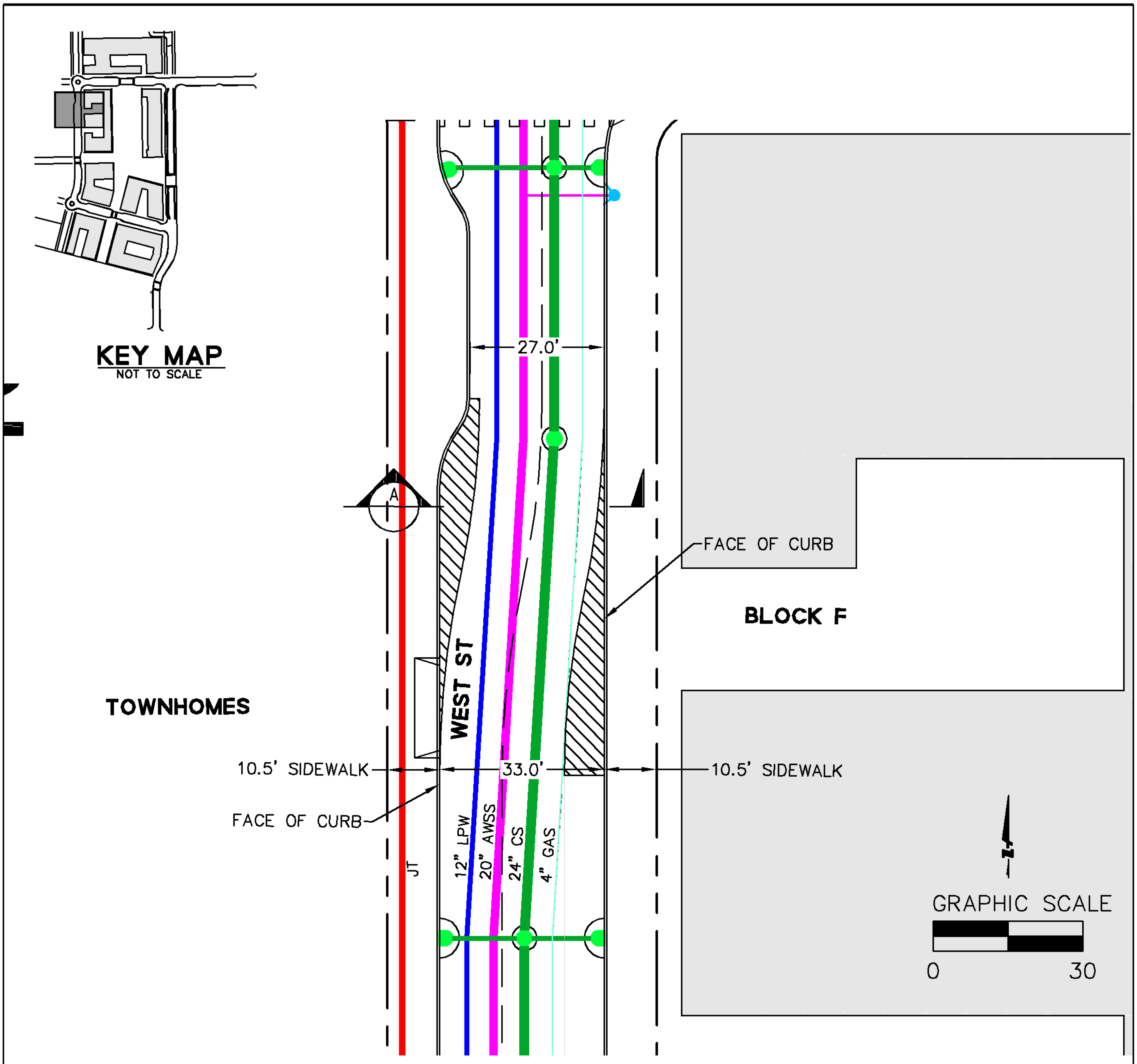
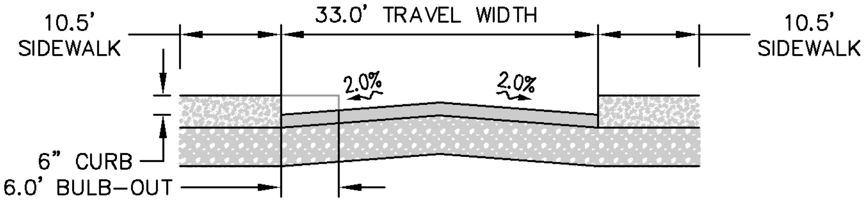
FIGURE 6.4E – RAISED STREET CROSSING (LEE AVE)





SECTION A–A

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FIGURE 6.4F – CHICANE (WEST STREET)

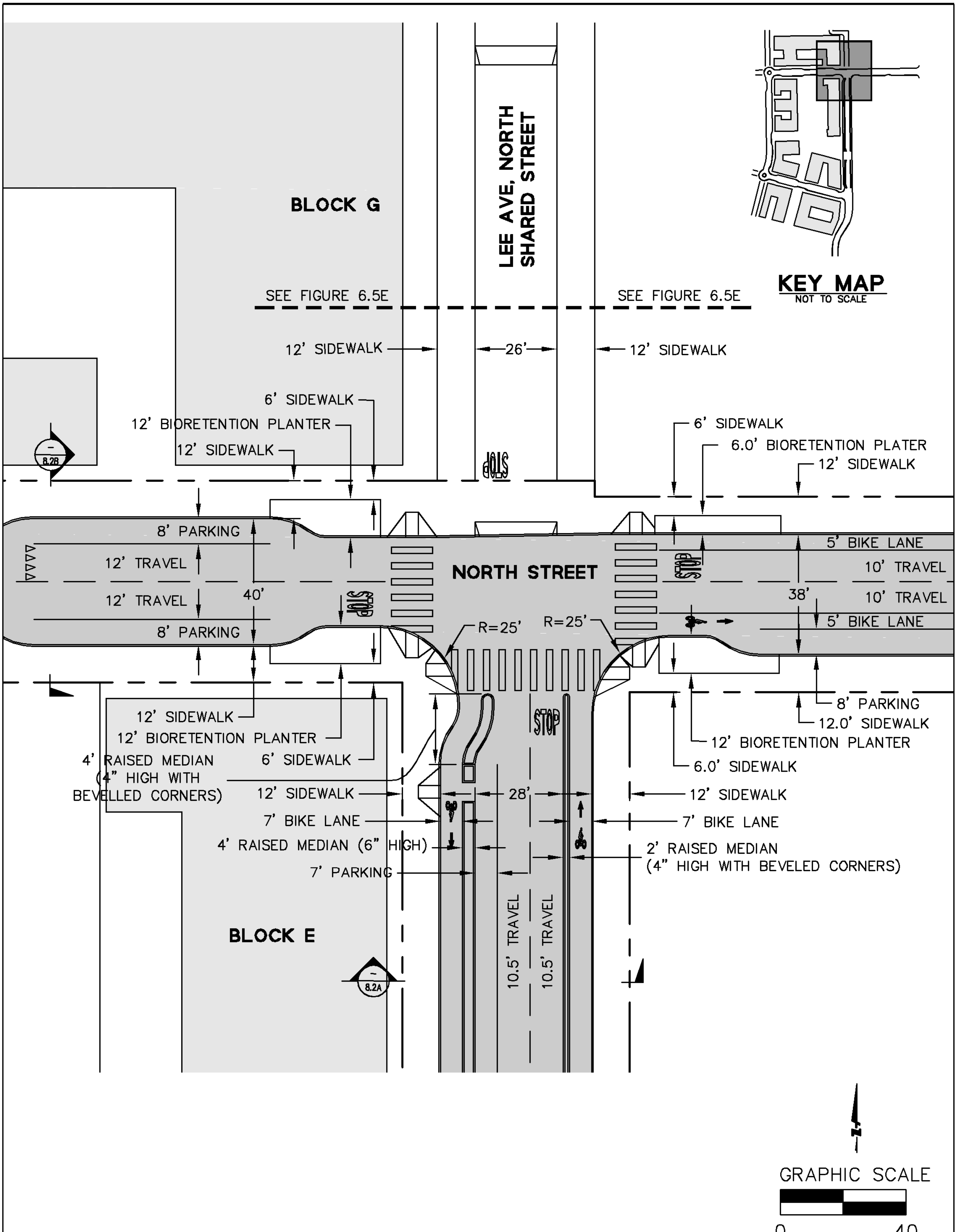

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FIGURE 6.5A - INTERSECTION GEOMETRY (NORTH ST & LEE AVE)

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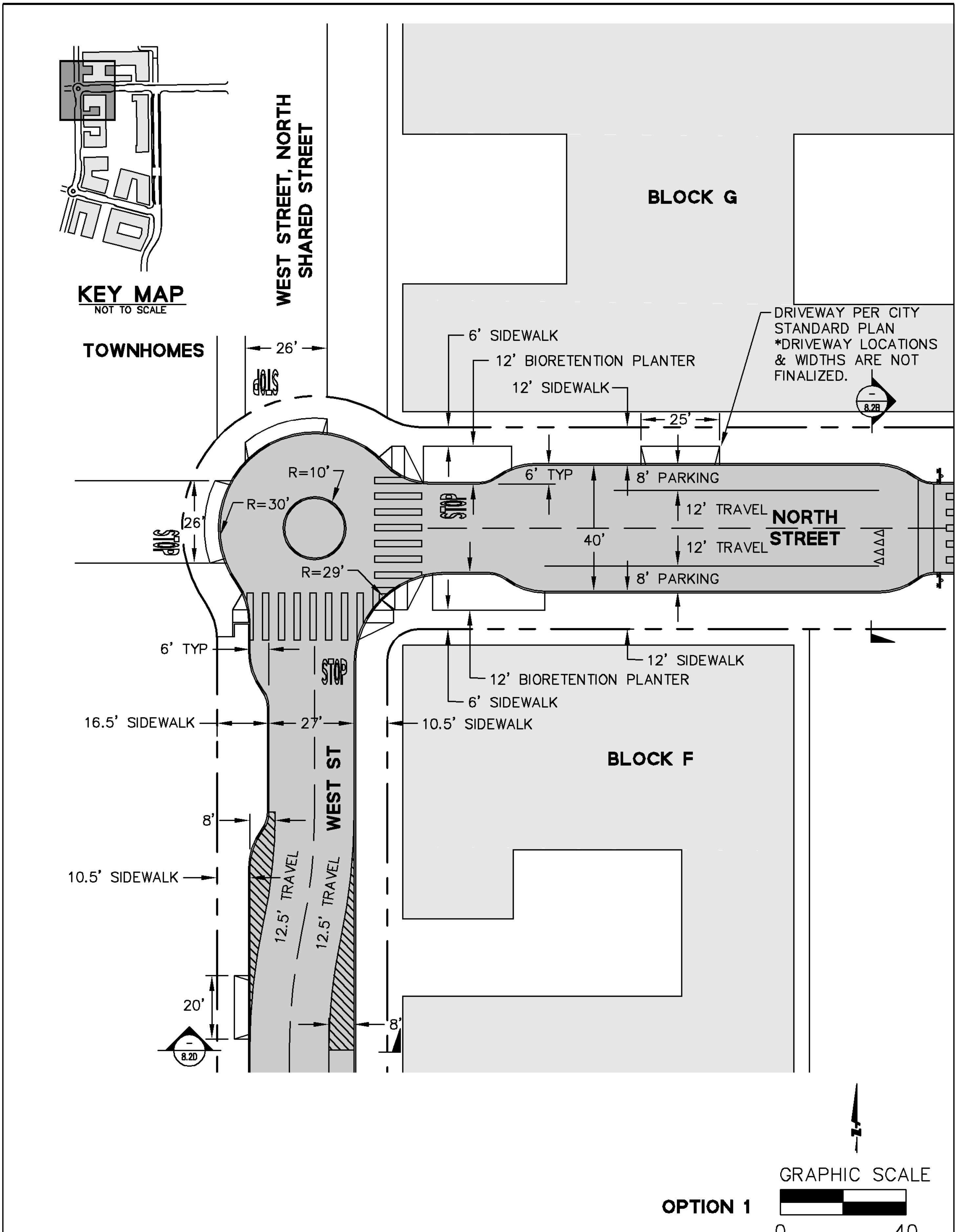
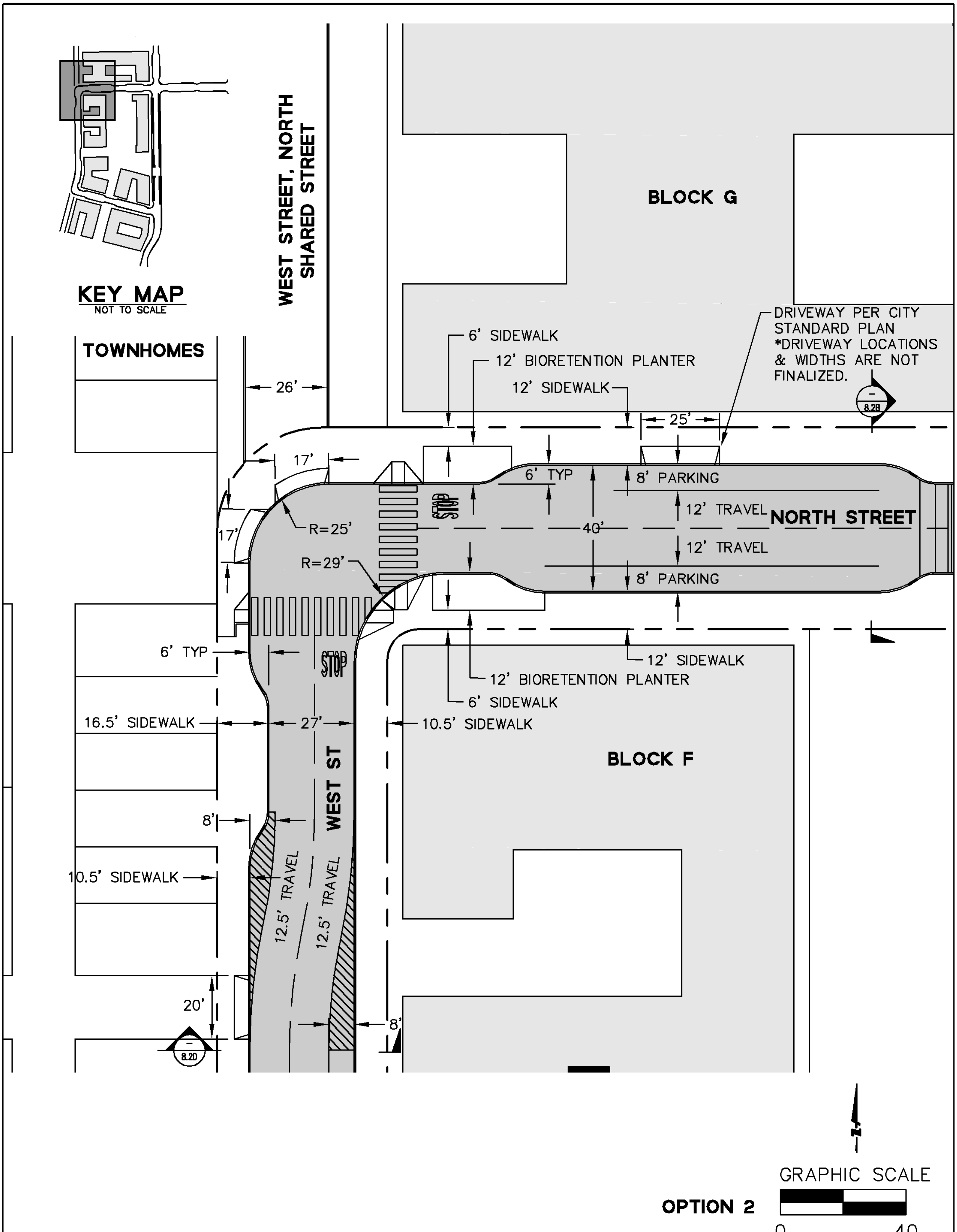


Source: BKF ENGINEERS, 06/2020

FIGURE 6.5B1 - INTERSECTION GEOMETRY (NORTH ST & WEST ST)



Source: BKF ENGINEERS, 06/2020

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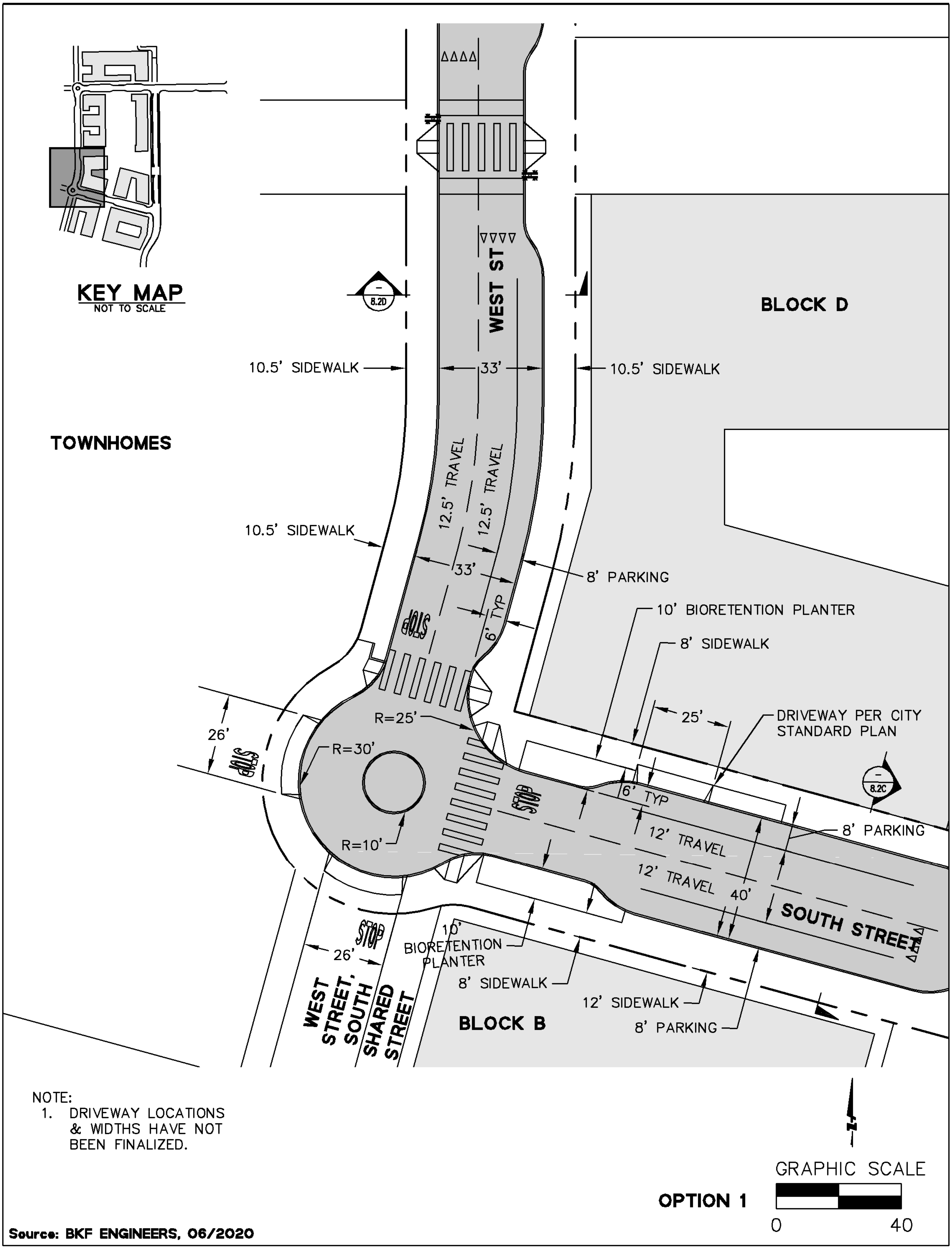
PLOT DATE: 06-10-20 PLOTTED BY: pasc

FIGURE 6.5B2 - INTERSECTION GEOMETRY (NORTH ST & WEST ST)

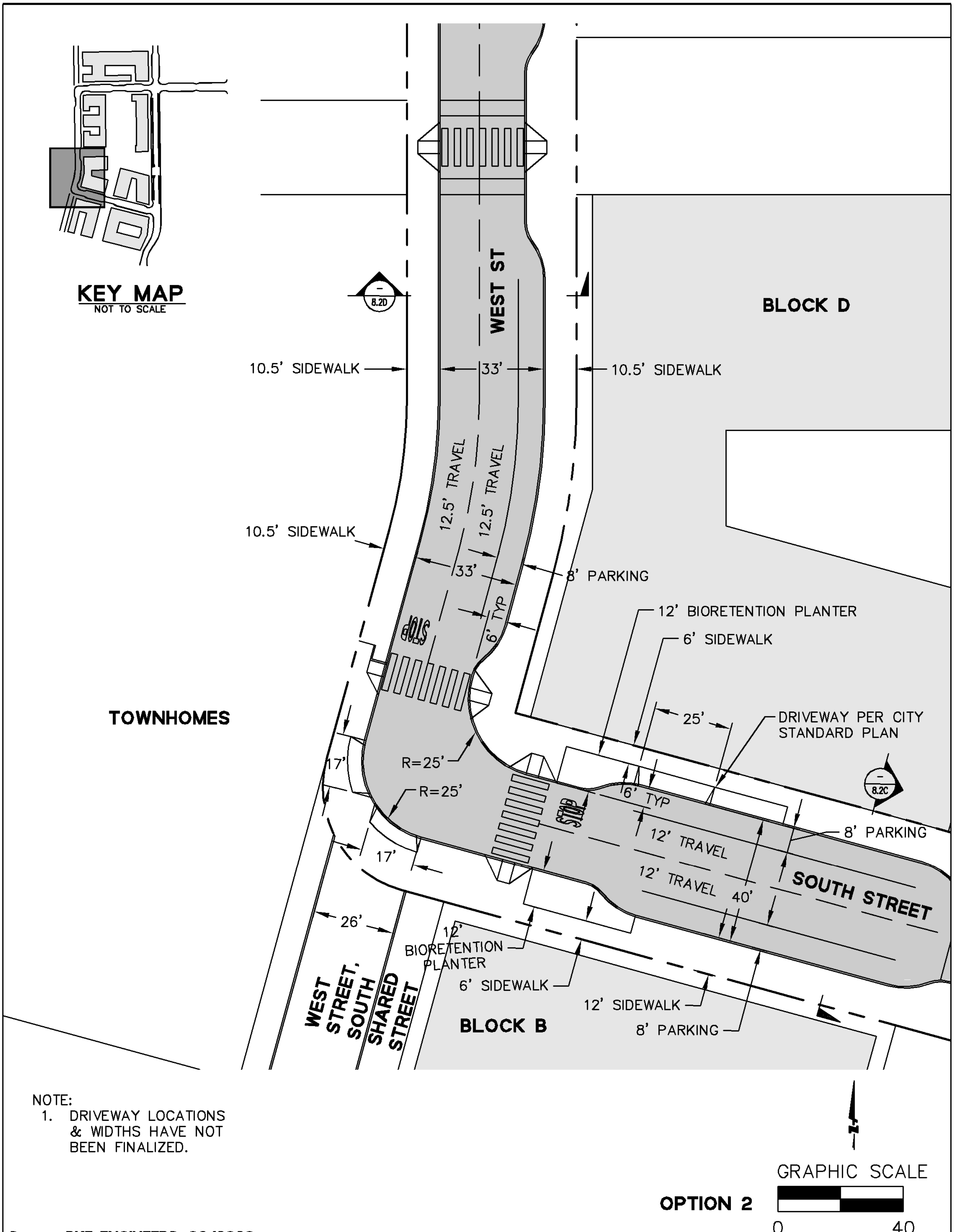


NOTE:
1. DRIVEWAY LOCATIONS & WIDTHS HAVE NOT BEEN FINALIZED.

Source: BKF ENGINEERS, 06/2020

DRAWING NAME: K:\2016\160367_Balboa_Reservoir\DOCS\05-Planning_Entitlements\H-Infrastructure_Plan\Exhibits\BR-PR-Intersection-Geometry.dwg
PLOT DATE: 06-10-20 PLOTTED BY: pasc

FIGURE 6.5C1 - INTERSECTION GEOMETRY (SOUTH ST & WEST ST)



NOTE:
1. DRIVEWAY LOCATIONS & WIDTHS HAVE NOT BEEN FINALIZED.

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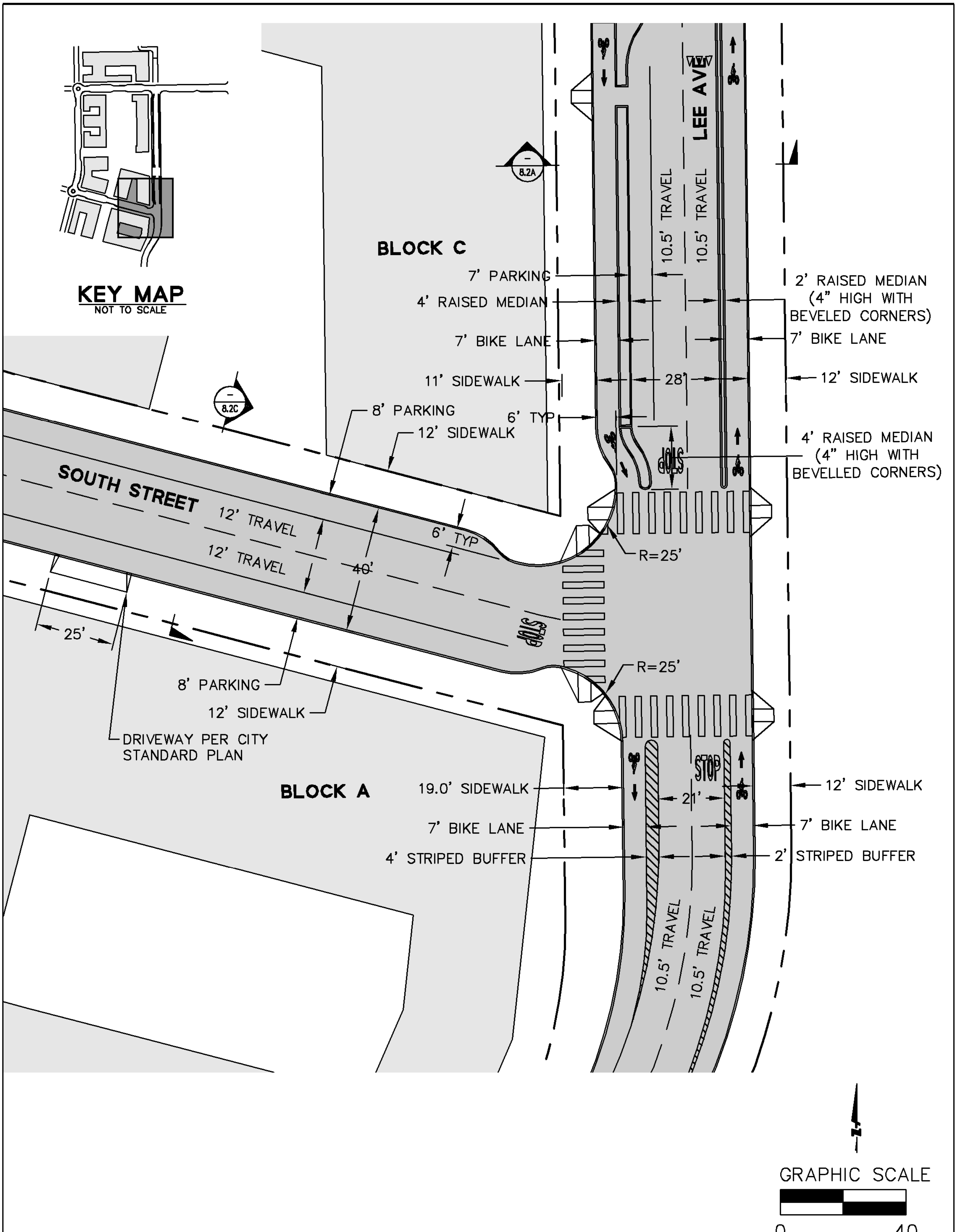
PLOT DATE: 06-10-20 PLOTTED BY: pasc

Source: BKF ENGINEERS, 06/2020

BALBOA RESERVOIR INFRASTRUCTURE PLAN **FIGURE 6.5C2 - INTERSECTION GEOMETRY (SOUTH ST & WEST ST)**



Source: BKF ENGINEERS, 06/2020

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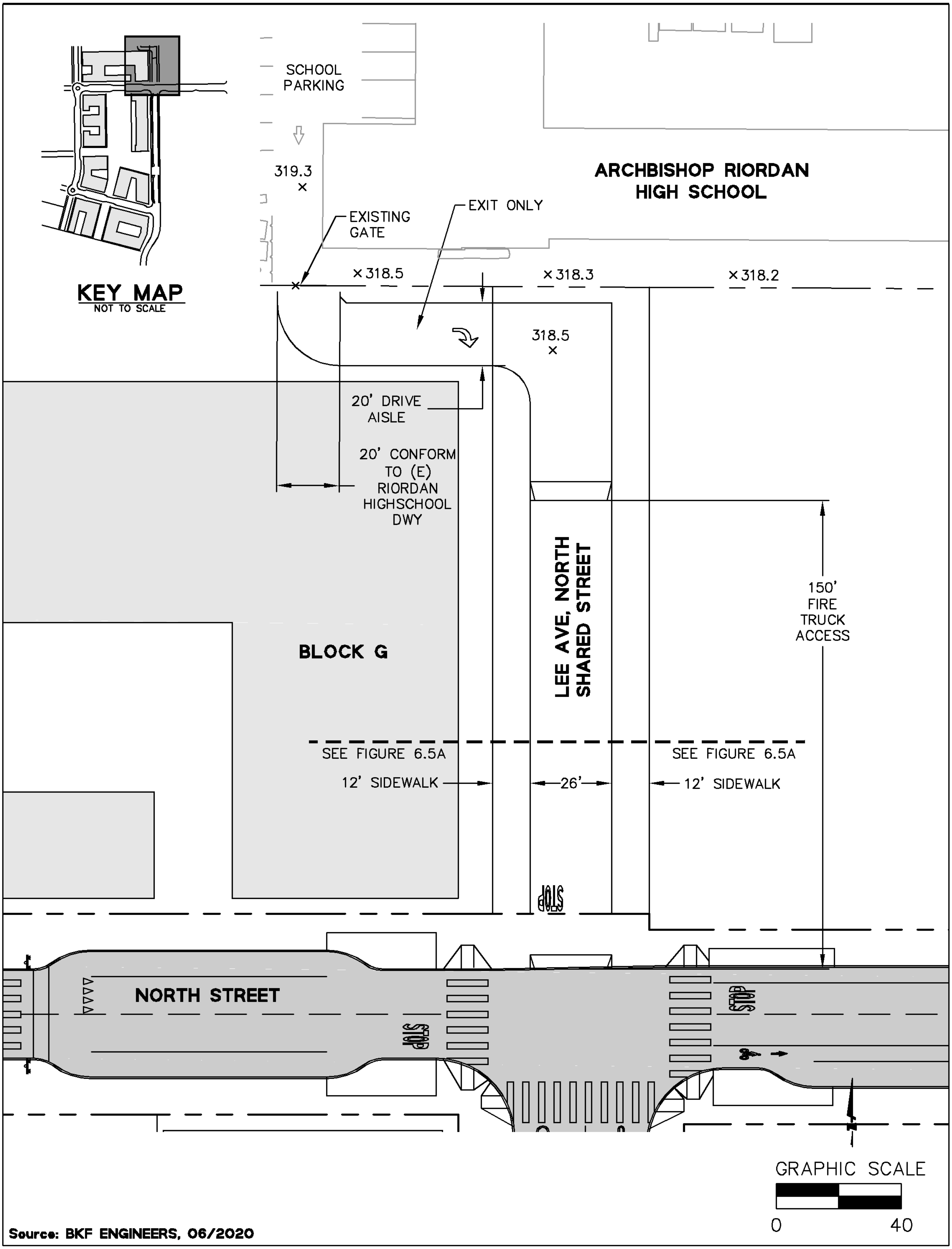
PLOT DATE: 06-10-20 PLOTTED BY: pasc

FIGURE 6.5D – INTERSECTION GEOMETRY (SOUTH ST & LEE AVE)



Source: BKF ENGINEERS, 06/2020

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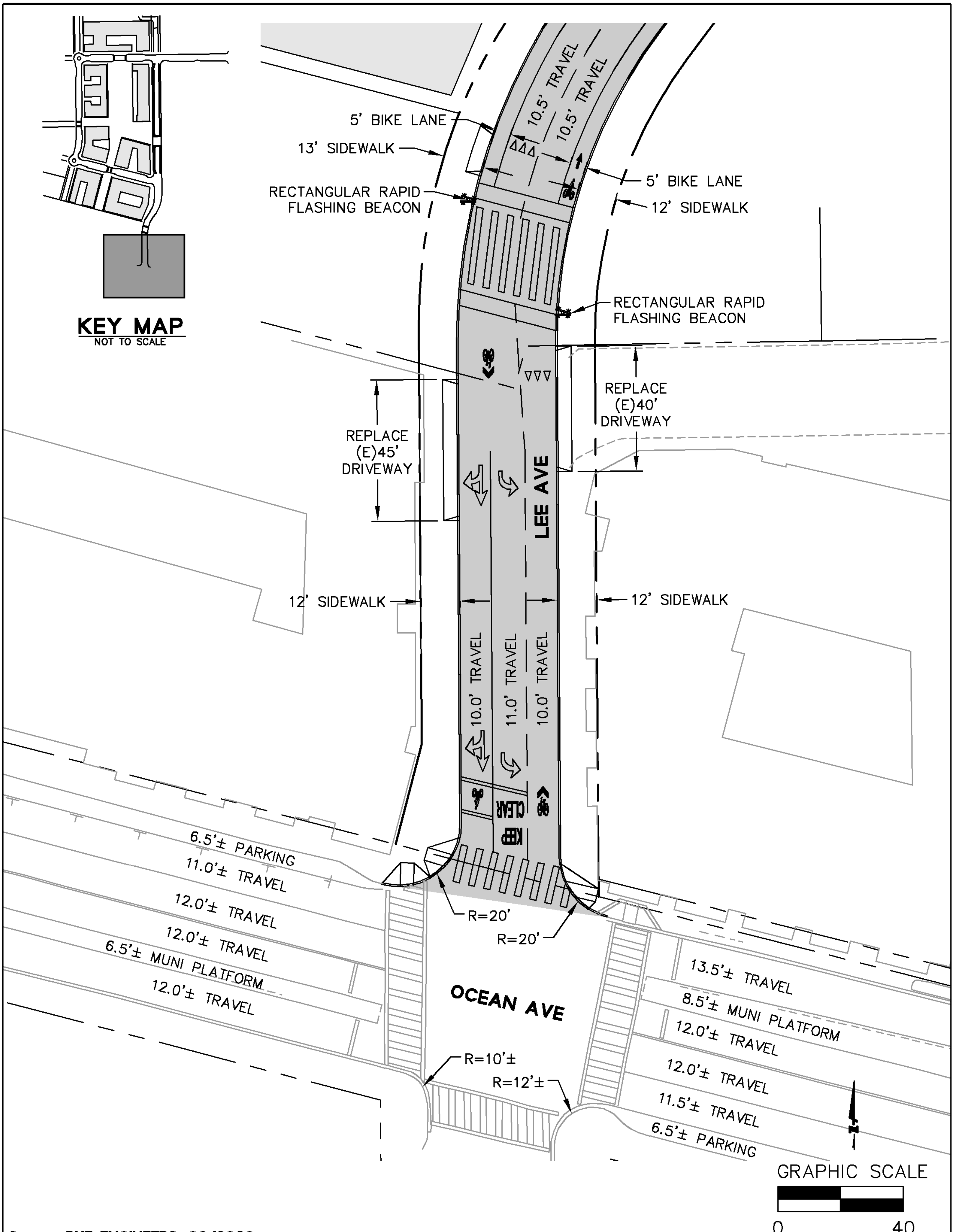
PLOT DATE: 06-10-20 PLOTTED BY: pasc

FIGURE 6.5E – INTERSECTION GEOMETRY (LEE AVE & RIORDAN HS)



Source: BKF ENGINEERS, 06/2020

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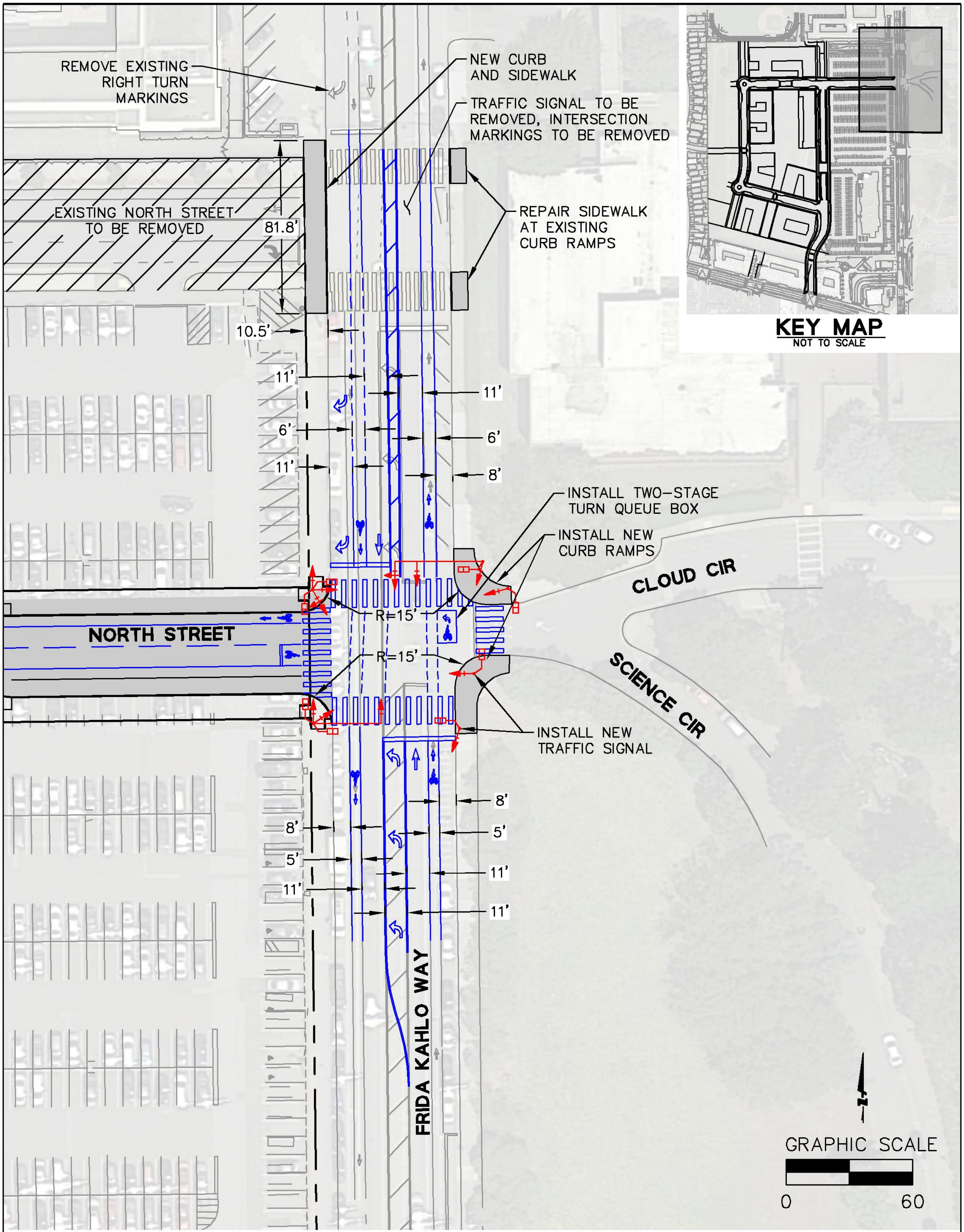
PLOT DATE: 06-10-20 PLOTTED BY: pasc

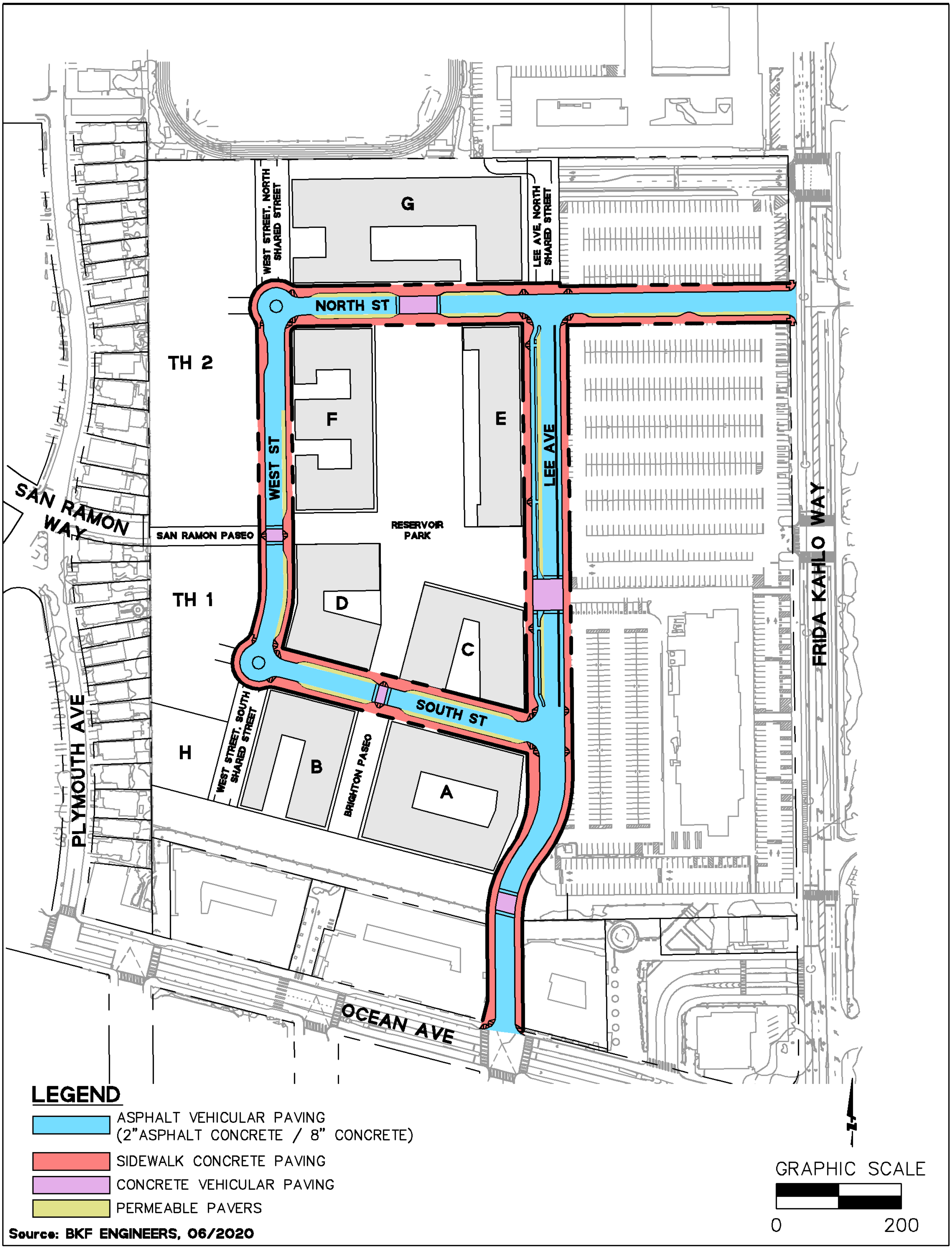
FIGURE 6.5F - INTERSECTION GEOMETRY (LEE AVE & OCEAN AVE)

DRAWING NAME: K:\2016\160367_Balboa_Reservoir\DOCS\05-Planning_Entitlements\H-Infrastructure_Plan\Exhibits\BR-PR-FKW-Intersection.dwg
PLOT DATE: 06-10-20 PLOTTED BY: pasc



Source: BKF ENGINEERS, 06/2020

FIGURE 6.6 – FRIDA KAHLO WAY INTERSECTION



Source: BKF ENGINEERS, 06/2020

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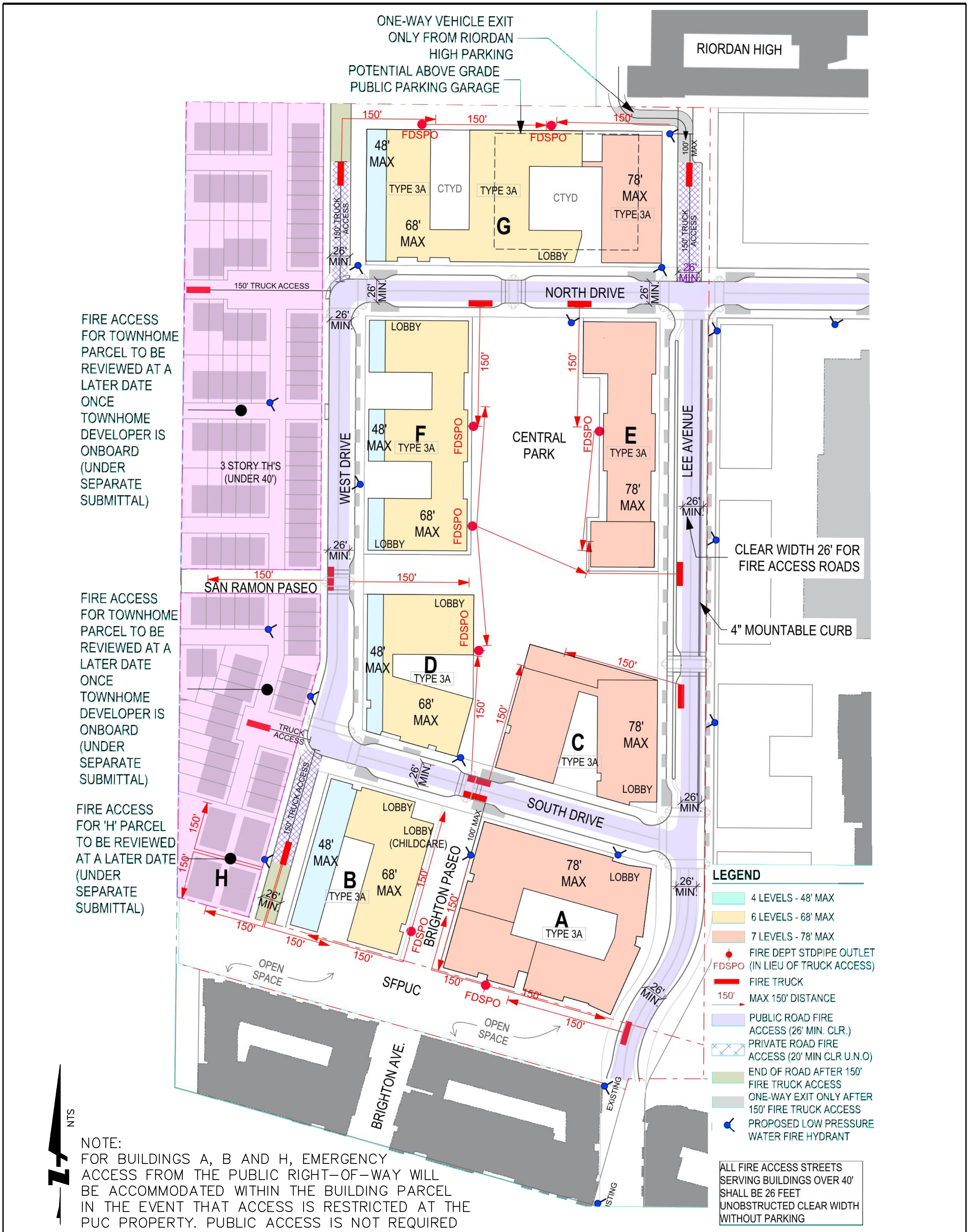
PLOT DATE: 06-10-20
PLOTTED BY: pasc

FIGURE 6.7 – PAVEMENT SURFACES



NOTE:
FOR BUILDINGS A, B AND H, EMERGENCY ACCESS FROM THE PUBLIC RIGHT-OF-WAY WILL BE ACCOMMODATED WITHIN THE BUILDING PARCEL IN THE EVENT THAT ACCESS IS RESTRICTED AT THE PUC PROPERTY. PUBLIC ACCESS IS NOT REQUIRED AT THE PUC PROPERTY.

Source: VMWP ARCHITECTS, 06/2020

DRAWING NAME: K:\2016\160367_Balboa_Reservoir\DOCS\05-Planning_Entitlements\H-Infrastructure_Plan\Exhibits\BR-PR-Fire-Access-Plan.dwg
PLOT DATE: 06-10-20 PLOTTED BY: pasc

FIGURE 6.8 – FIRE ACCESS PLAN

DRAWING NAME: K:\2016\160367_Balboa_Reservoir\DOCS\05-Planning_Entitlements\H-Infrastructure_Plan\Exhibits\BR-PR-Loading-Service.dwg
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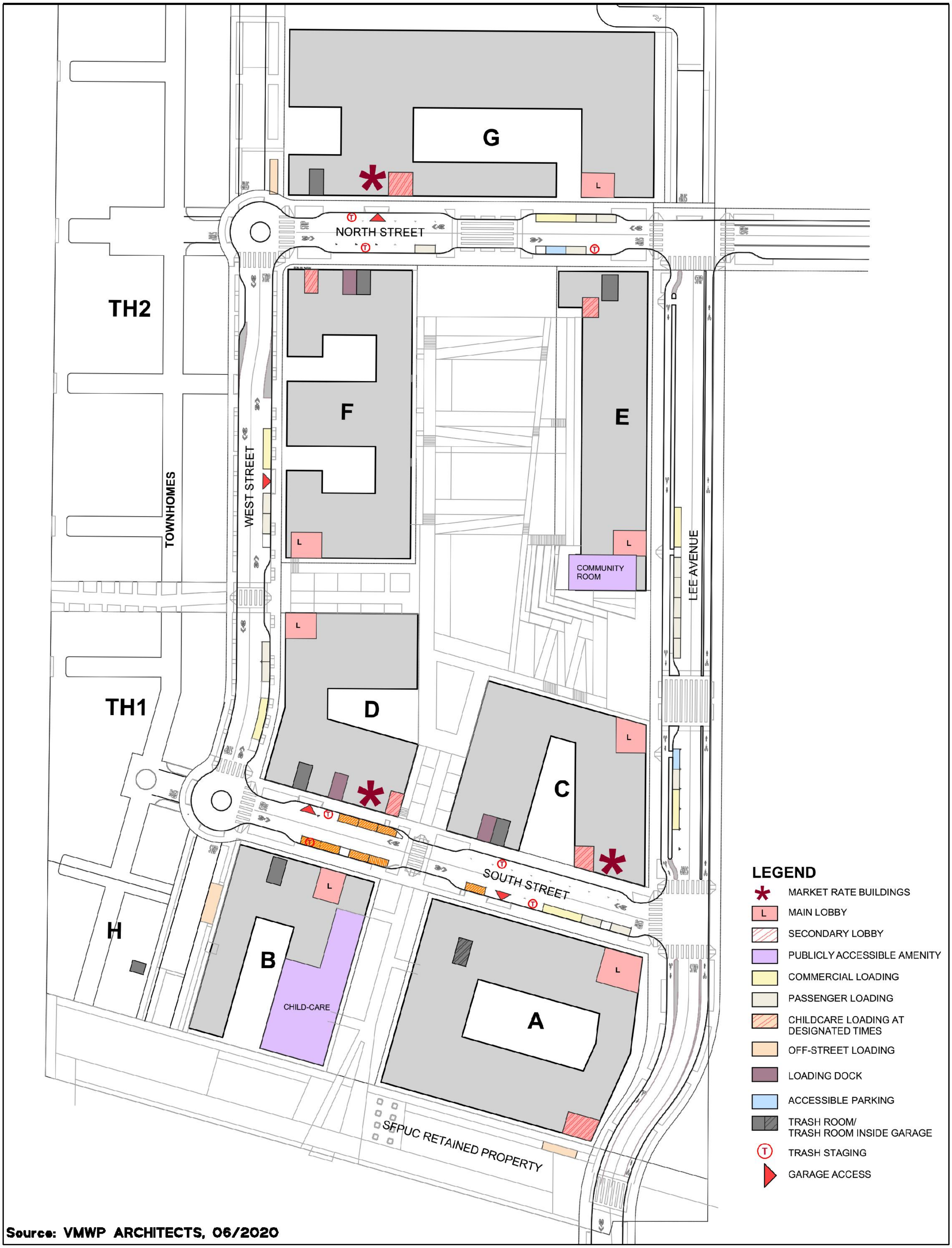
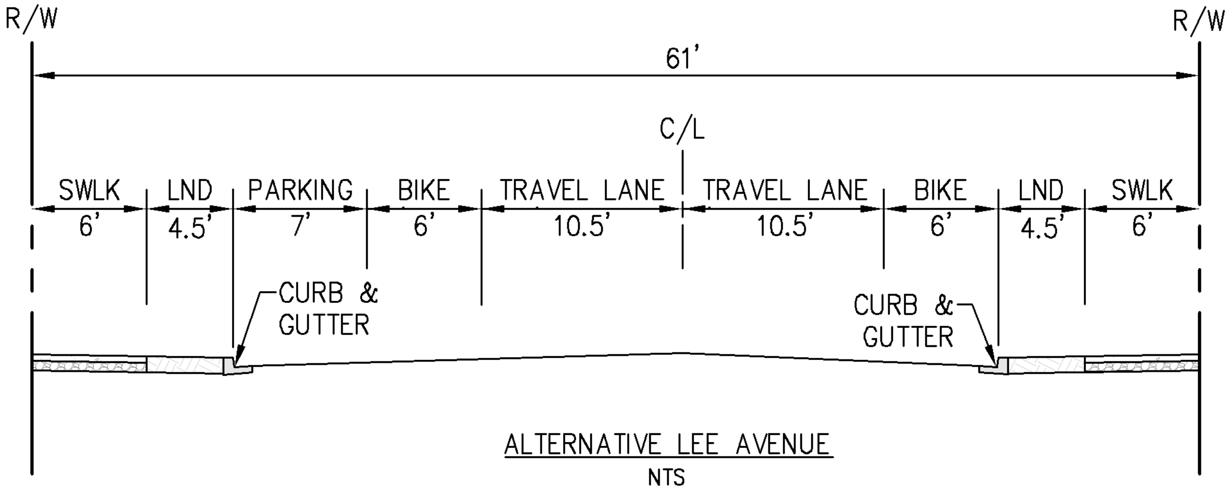


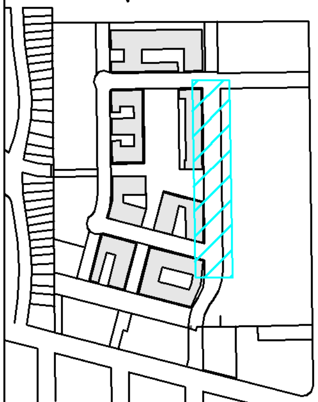
Source: VMWP ARCHITECTS, 06/2020

BALBOA RESERVOIR INFRASTRUCTURE PLAN FIGURE 6.9 – PROPOSED SERVICE & LOADING PLAN

ALTERNATIVE LEE AVENUE
NTS



ALTERNATIVE LEE AVENUE
NTS



LOCATION MAP

Source: BKF ENGINEERS, 06/2020

DRAWING NAME: K:\2016\160367_Balboa_Reservoir\DOCS\05-Planning_Entitlements\H-Infrastructure_Plan\Exhibits\BR-PR-Util-Cross-Sections.dwg
PLOT DATE: 06-10-20 PLOTTED BY: pasc

FIGURE 6.10 - ALTERNATIVE LEE AVE CROSS SECTION

7. OPEN SPACE AND PARKS

The proposed Project will provide approximately 4.0 acres of publicly accessible open space. The following is a summary of the major components of the open space network. See Figure 7.1 for an overview of the Open Space System and the corresponding DSG Open Space section for a detailed description. These improvements are intended to extend the connection from San Ramon Way to City College, and create a connection from the SFPUC easement south of the project to the centralized public open space. The Developer's infrastructure obligations include the design, construction, and maintenance of the open space and park improvements. Key components of the open space program area are described below.

Refer to Chapter 6 of the Balboa Reservoir DSG for detailed information about the open space design.

7.1 Proposed Open Space and Parks to be built by Developer

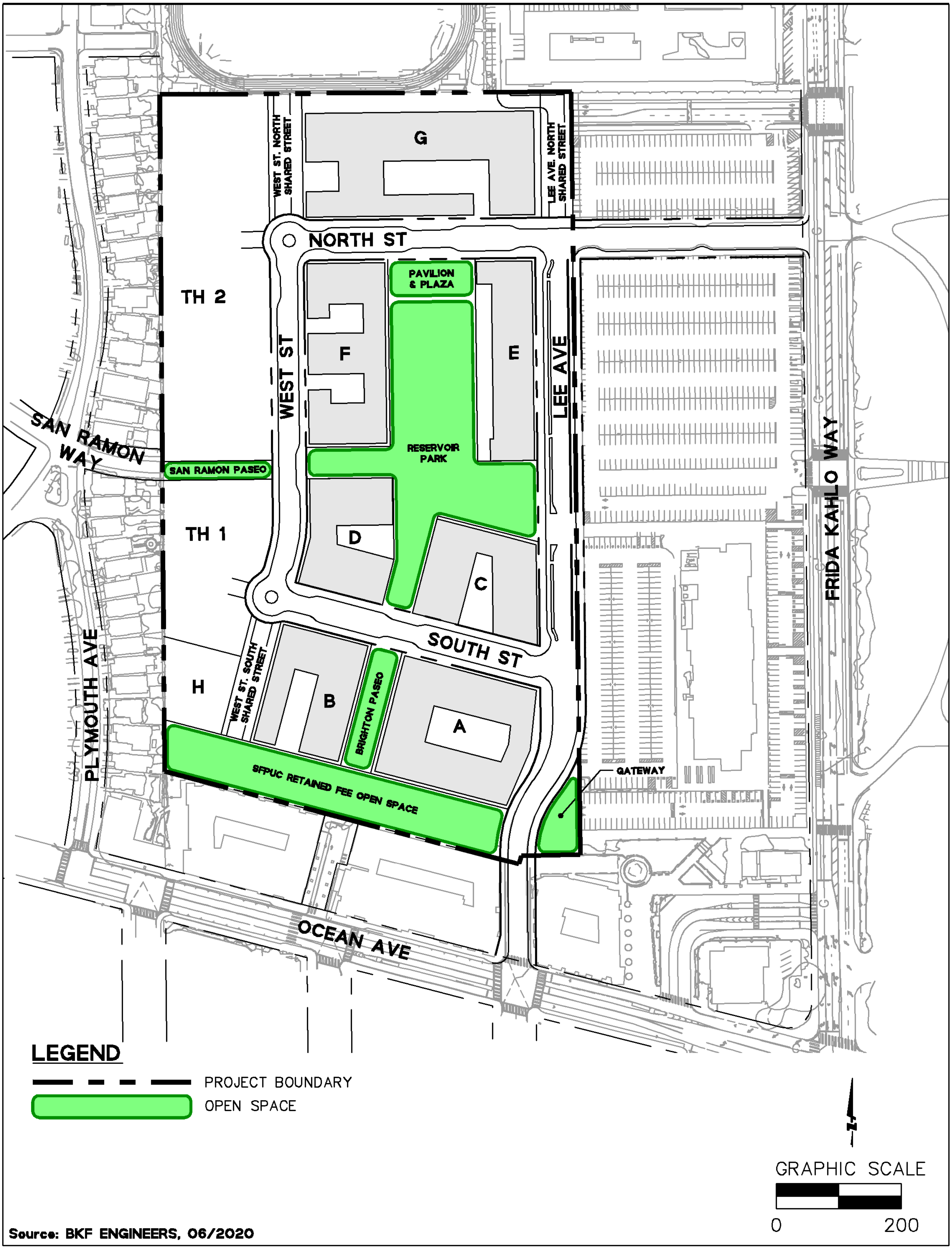
Open space to be built by the Developer shall be substantially completed consistent with the following schedule:

Reservoir Park	2.0 acres	Phase 1
PUC Open Space	1.2 acres	Phase 2
Paseos	0.8 acres	Phase 1 and 2

7.2 Phasing, Ownership, Operation, and Maintenance

New open space and parks system will be constructed in phases to match the Phases of the Project and as depicted on the Phasing Plan, Figure 1.3. The Phase will connect to the existing open space and parks as close to the edge of the Phase area as possible where a logical transition line can be established within the open space improvement features.

Reservoir Park and the Paseos will be owned and maintained by the Master Homeowner's Association. The SFPUC is and will remain the property owner of the Retained Fee and will issue a revocable license to the Developer and later, to any assignee homeowner's association, to allow for construction, management, and operations of the public open area. The Infrastructure Plan does not approve any use in the SFPUC retained fee. All uses (including infrastructure installed on the retained fee) will be permitted through the open space license issued by PUC Real Estate.



Source: BKF ENGINEERS, 06/2020

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PLOT DATE: 06-10-20 PLOTTED BY: pasc

BALBOA RESERVOIR INFRASTRUCTURE PLAN

FIGURE 7.1 – OPEN SPACES

8. UTILITY LAYOUT AND SEPARATION

8.1 Utility Systems

The Project proposes to install public utility systems, including the combined sewer system, low pressure water (LPW) system, auxiliary water supply system (AWSS), and dry utility systems. Ownership, maintenance, and acceptance responsibilities of utility infrastructure will be documented in the DA.

8.2 Utility Layout and Separation Criteria

Utility main layout and separations will be designed in accordance with the Subdivision Regulations and SFPUC Utility Standards. Utility main separation requirements are presented in Figure 8.1 Utility Separation Criteria.

8.3 Conceptual Utility Layout

The Project utility layout is designed to connect the proposed Project utility infrastructure to the existing adjacent public utility infrastructure facilities. The proposed LPW system, shown on Figure 9.1, will be a looped system and have two connections to the existing SFPUC LPW system on Frida Kahlo Way and Ocean Avenue. The proposed AWSS, shown on Figures 11.1A and B, will have a single connection point to the existing AWSS at the intersection of Ocean Avenue and Lee Avenue. The Project studied the feasibility of installing a second AWSS connection through the SFPUC property at the southwest corner of the project (Block 318 Lot 192) to create a looped system but was deemed infeasible by SFPUC. The proposed combined sewer system, shown on Figure 12.1, will have two connections to the existing SFPUC combined sewer system in Ocean Avenue via Lee Avenue and the SFPUC property.

8.4 Utility Layout and Clearance Design Modifications and Exceptions

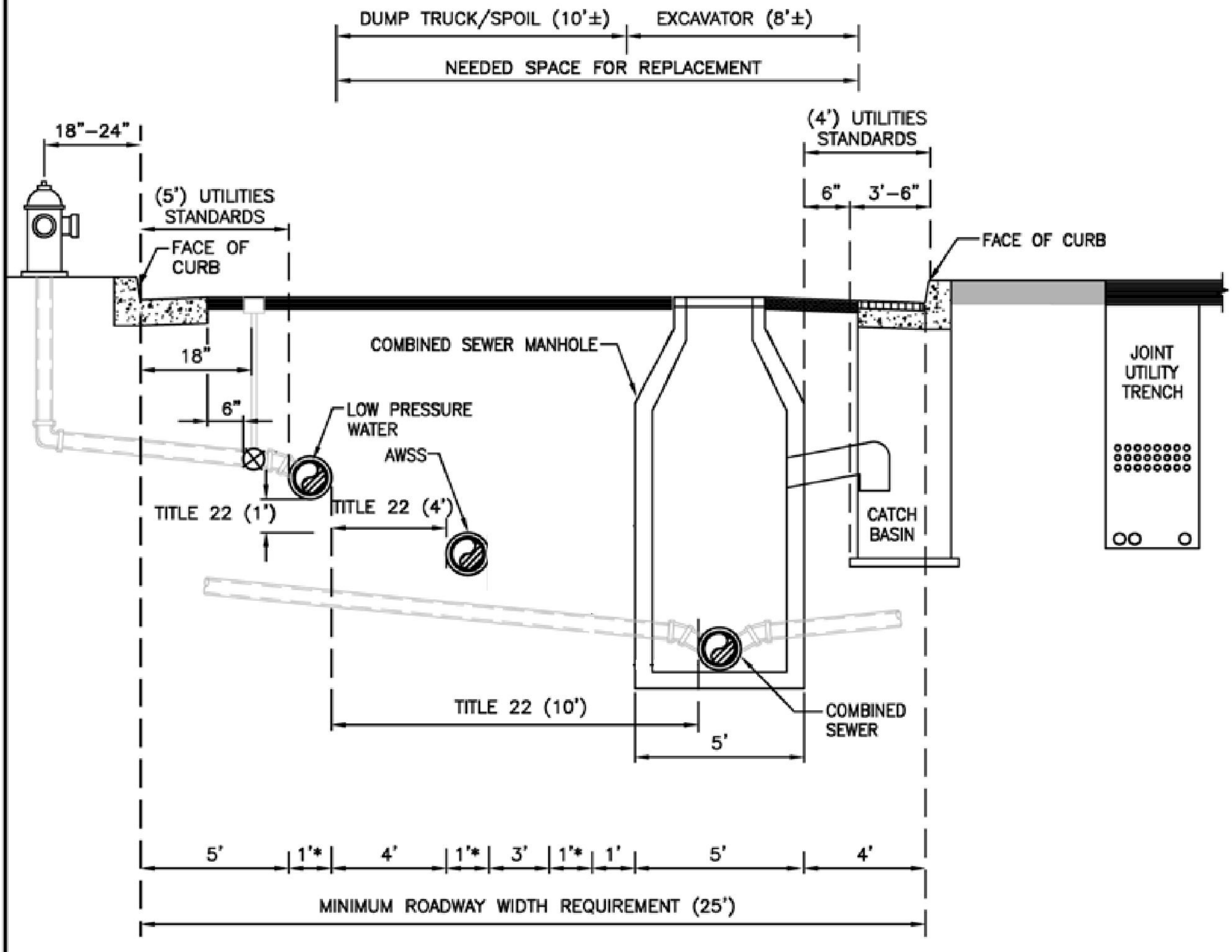
Due to constraints within the Project Site, design modifications and exceptions to standard sizing, spacing, and locations of utilities may be requested. A design modification and exception request to utility standards and requirements is subject to the review and approval by the department with authority over each utility. The combined sewer system, LPW system, and AWSS design modifications and exceptions receive authorization per the process outlined in the Subdivision Regulations. Potential locations for the design modifications and exceptions will be identified in the future. Approval of this Infrastructure Plan does not constitute authorization of utility-related design modifications and exceptions.

* ASSUME 1' OUTSIDE DIAMETER FOR ALL PIPES

** MINIMUM HORIZONTAL CLEARANCE BETWEEN SEWER MAIN AND OTHER UTILITIES SHALL BE 3.5' FOR FUTURE REPAIR AND REPLACEMENT (IE. EXCVACATION/SHORING)

NOTES:

1. ALL DIMENSIONS REPRESENT MINIMUM SEPARATION REQUIREMENTS.
2. SFPUC NEEDS TO REVIEW AND APPROVE A VARIANCE FOR UTILITY CLEARANCES FOR PROPOSALS OF ROADWAY WIDTHS LESS THAN INDICATED IN DRAWING.
3. MINIMUM ROADWAY WIDTH REQUIREMENT WILL INCREASE FOR LARGER MAINS.
4. A 15' MINIMUM SURFACE AREA IS REQUIRED FOR BASIC VEHICLE AND EQUIPMENT ACCESS, SERVICING, AND MAINTENANCE OF WASTEWATER ASSETS.
5. TITLE 22 CA CODE OF REGULATIONS REQUIRES MINIMUM 10' HORIZONTAL AND 1' VERTICAL SEPARATION BETWEEN PARALLEL POTABLE WATER AND SEWER LINES; MINIMUM 4' HORIZONTAL AND 1' VERTICAL SEPARATION BETWEEN PARALLEL POTABLE WATER AND STORM DRAIN, RECYCLED WATER AND OTHER NON-POTABLE WATER LINES.
6. MINIMUM HORIZONTAL CLEARANCE OF LOW PRESSURE WATER, AWSS, AND RECYCLED WATER WITH OTHER DRY UTILITIES SHALL BE 3'.
7. MINIMUM OUTSIDE DIAMETER MANHOLE IS 5' FOR MAIN SEWER SIZES UP TO 24"ø. MANHOLE DIMENSION INCREASES FOR MAIN SEWERS LARGER THAN 24"ø. (EX. 9.75' WIDE FOR 72"ø MAIN)



NOT TO SCALE

APPROVED XXXXX APPROVED XXXXX APPROVED XXXXX	SAN FRANCISCO PUBLIC UTILITIES COMMISSION MINIMUM UTILITIES SEPARATION REQUIREMENTS FOR WASTEWATER AND WATER - COMBINED SEWER SYSTEM	DWG NO. 1
	DATE OCTOBER 2014	REVISION 1.0	REVISED

San Francisco Water Power Sewer

S:\Projects\0092-007 SFPUC WW CS-955B\B. Task Orders\TO 10 - Sewer Laterals Program Phase 11B. Project Work\Task5- Permitting\CAD\MINIMUM STREET WIDTH.dwg

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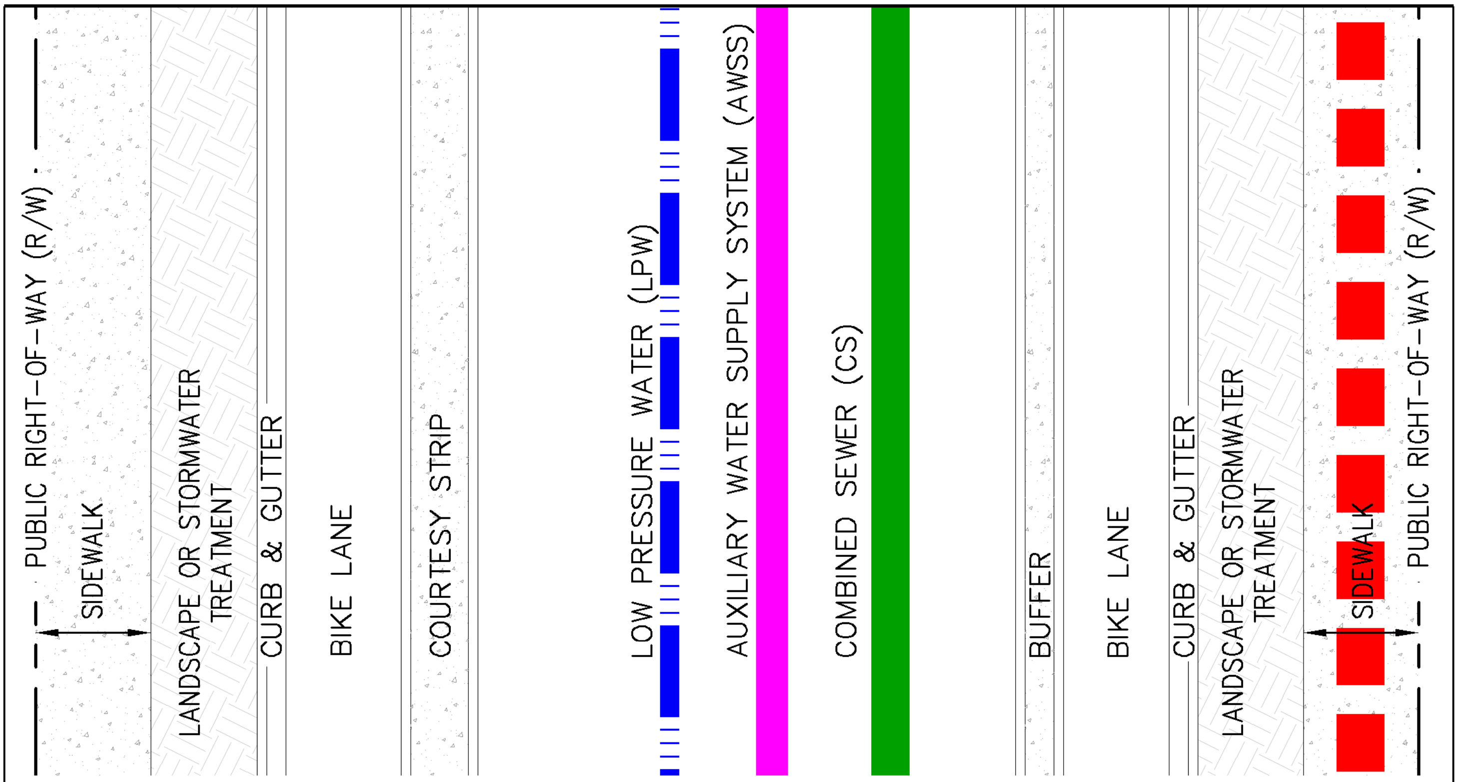
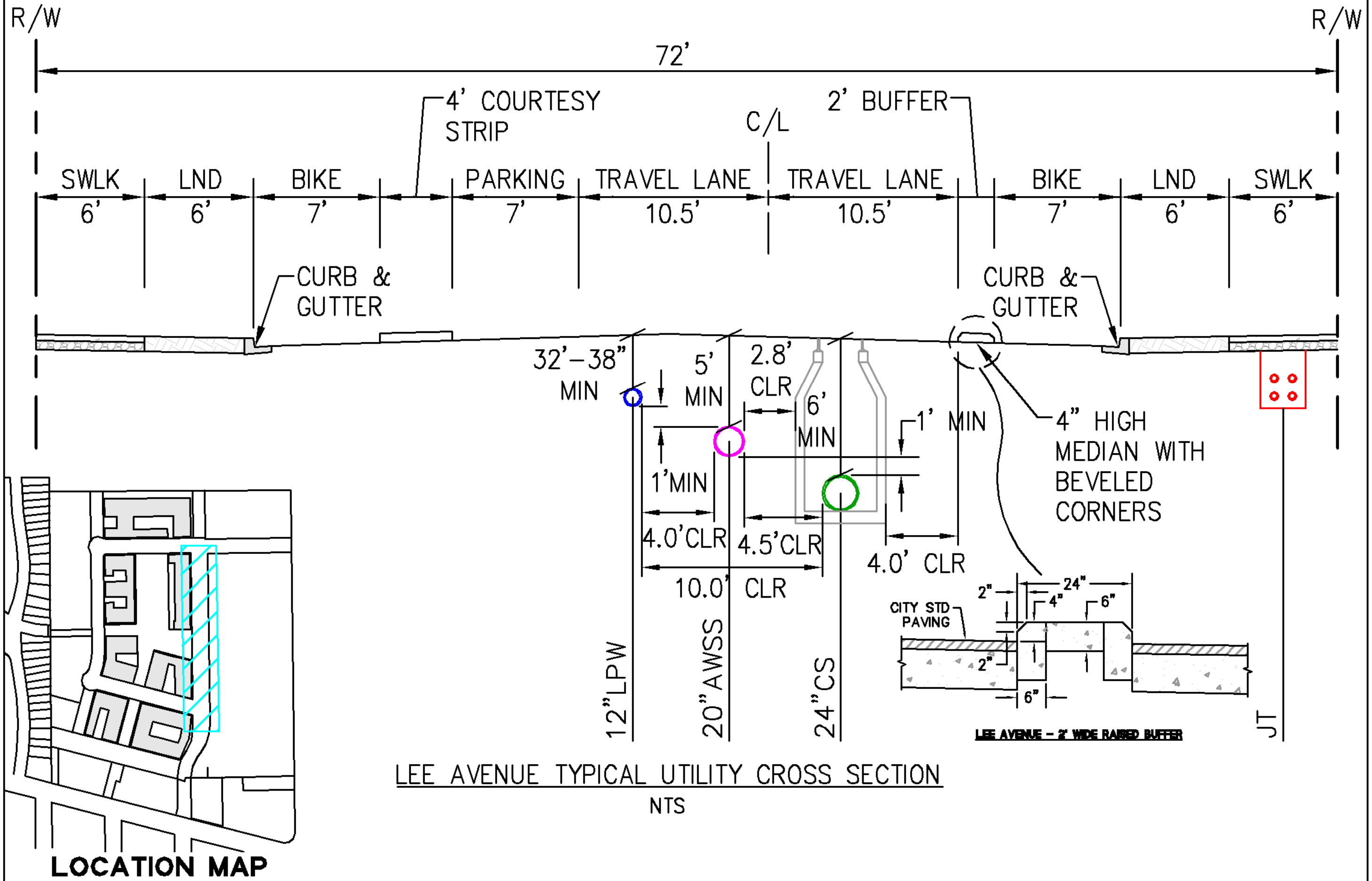
PLOT DATE: 06–10–20 PLOTTED BY: pasc

Source: BKF ENGINEERS, 06/2020



LEE AVENUE TYPICAL UTILITY PLAN

NTS



LOCATION MAP

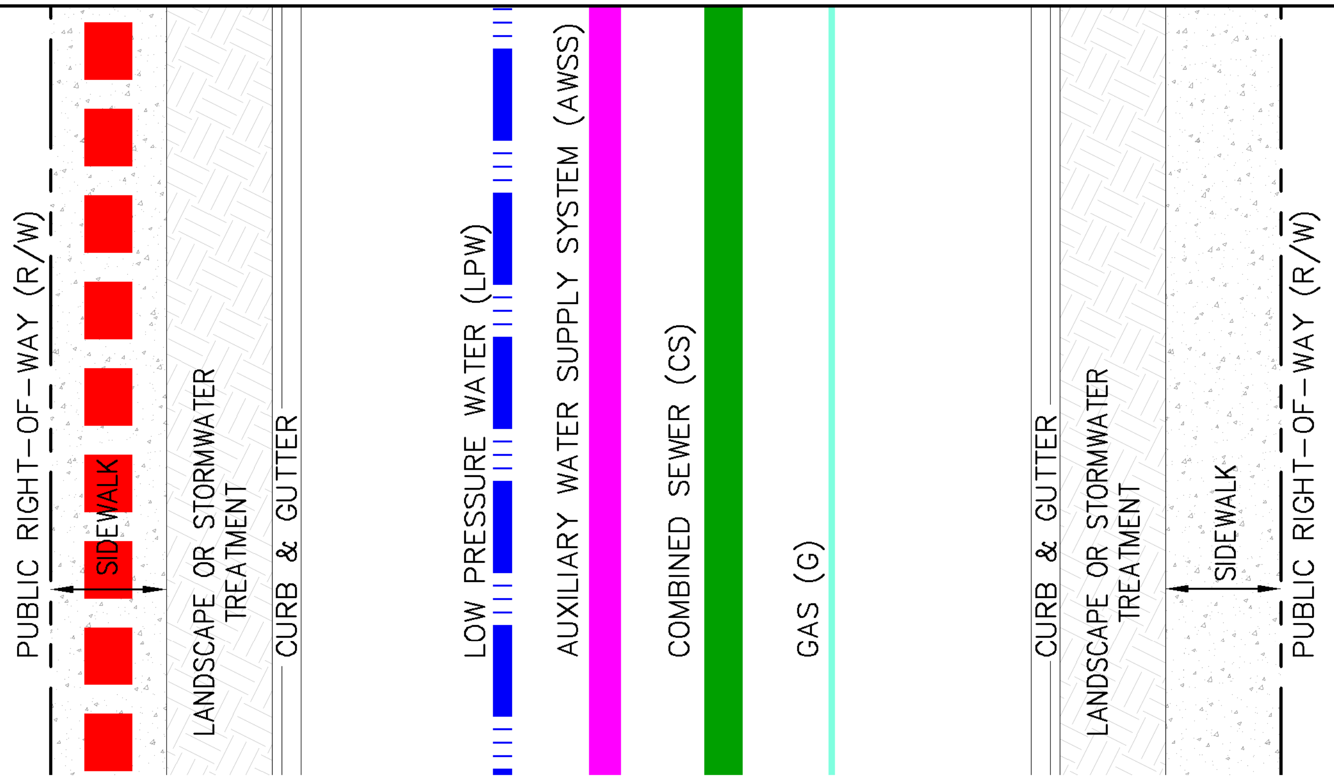
LEE AVENUE TYPICAL UTILITY CROSS SECTION

NTS

Source: BKF ENGINEERS, 06/2020

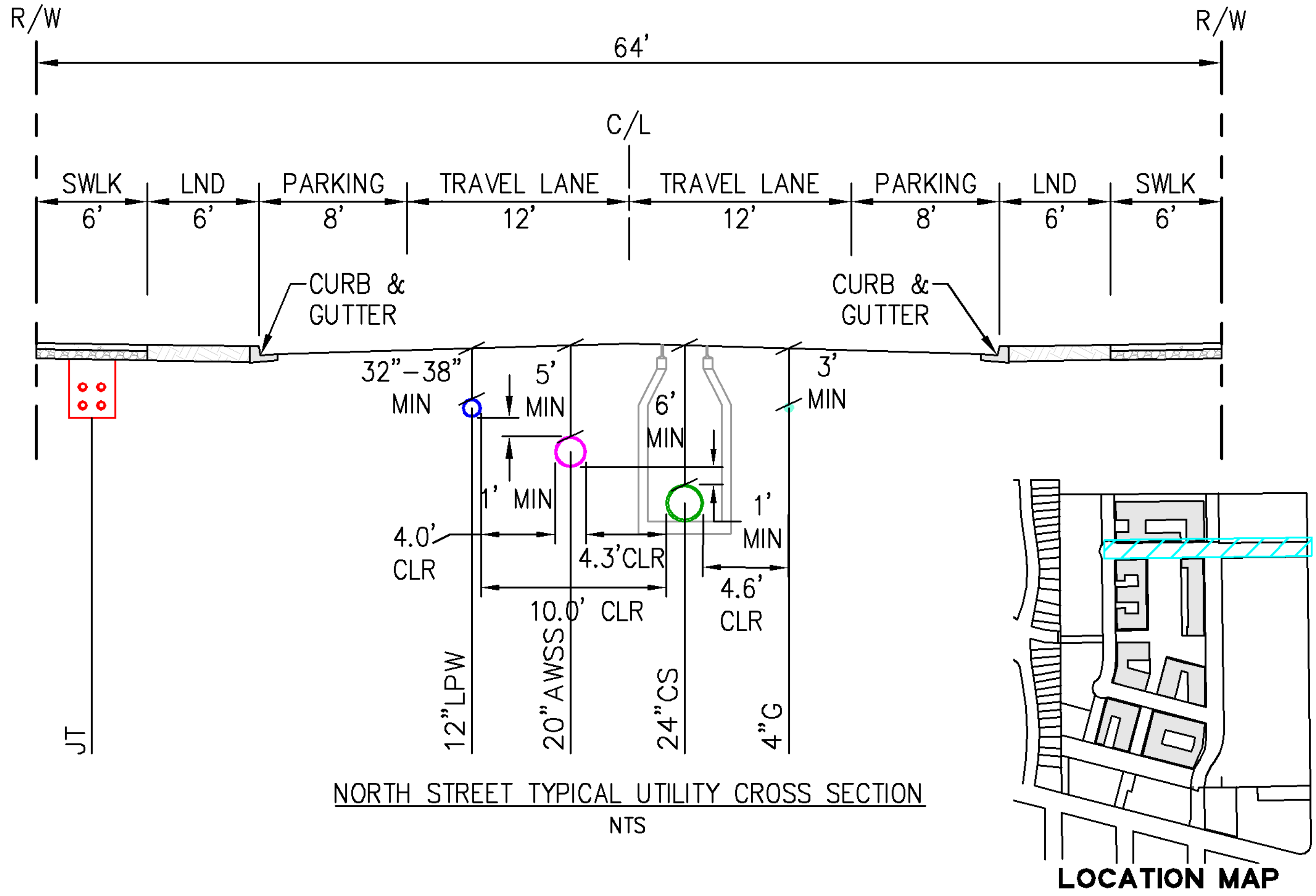
DRAWING NAME: K:\2016\160367_Balboa_Reservoir\DOCS\05-Planning_Entitlements\H-Infrastructure_Plan\Exhibits\BR-PR-Util-Cross-Sections.dwg
PLOT DATE: 06-10-20 PLOTTED BY: pasc

FIGURE 8.2A – TYPICAL UTILITY CROSS SECTION (LEE AVE)



NORTH STREET TYPICAL UTILITY PLAN

NTS



NORTH STREET TYPICAL UTILITY CROSS SECTION

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PLOT DATE: 06-10-20 PLOTTED BY: pasc

Source: BKF ENGINEERS, 06/2020

FIGURE 8.2B - TYPICAL UTILITY CROSS SECTION (NORTH STREET)

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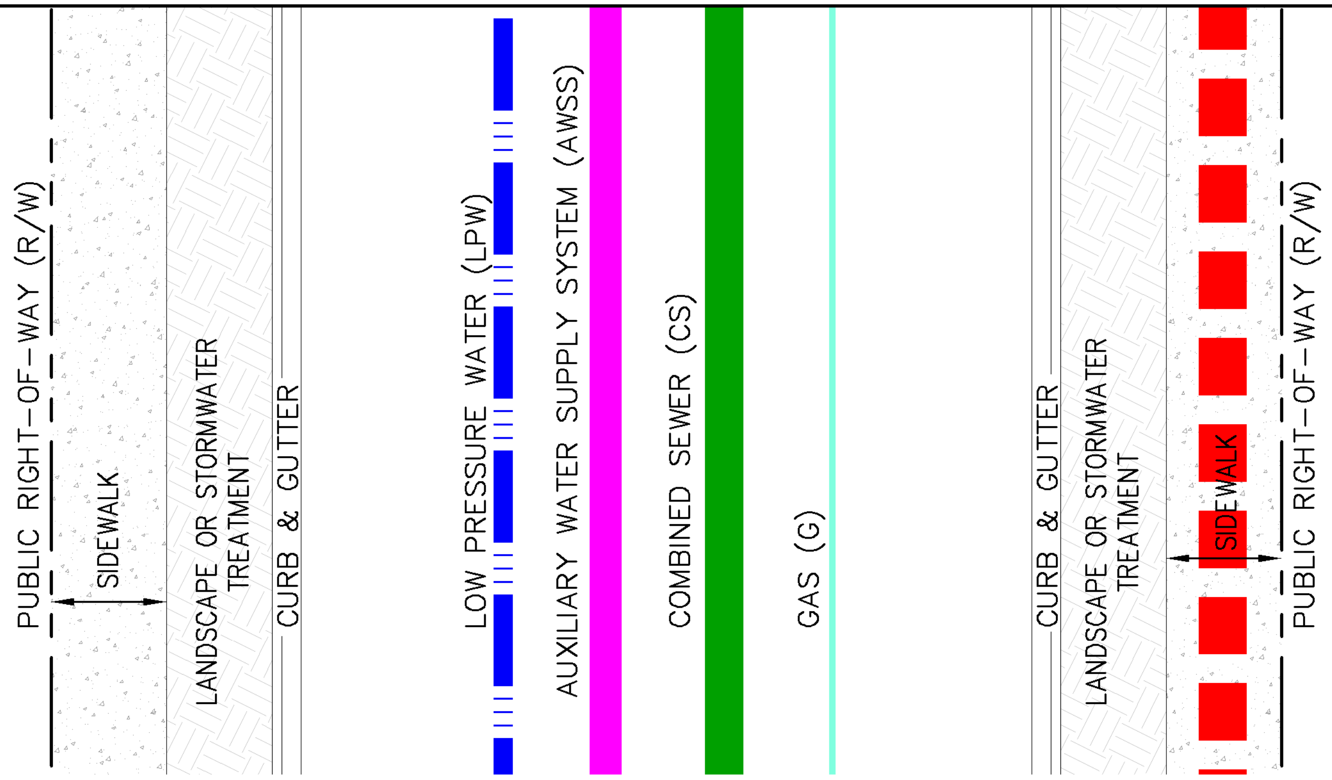
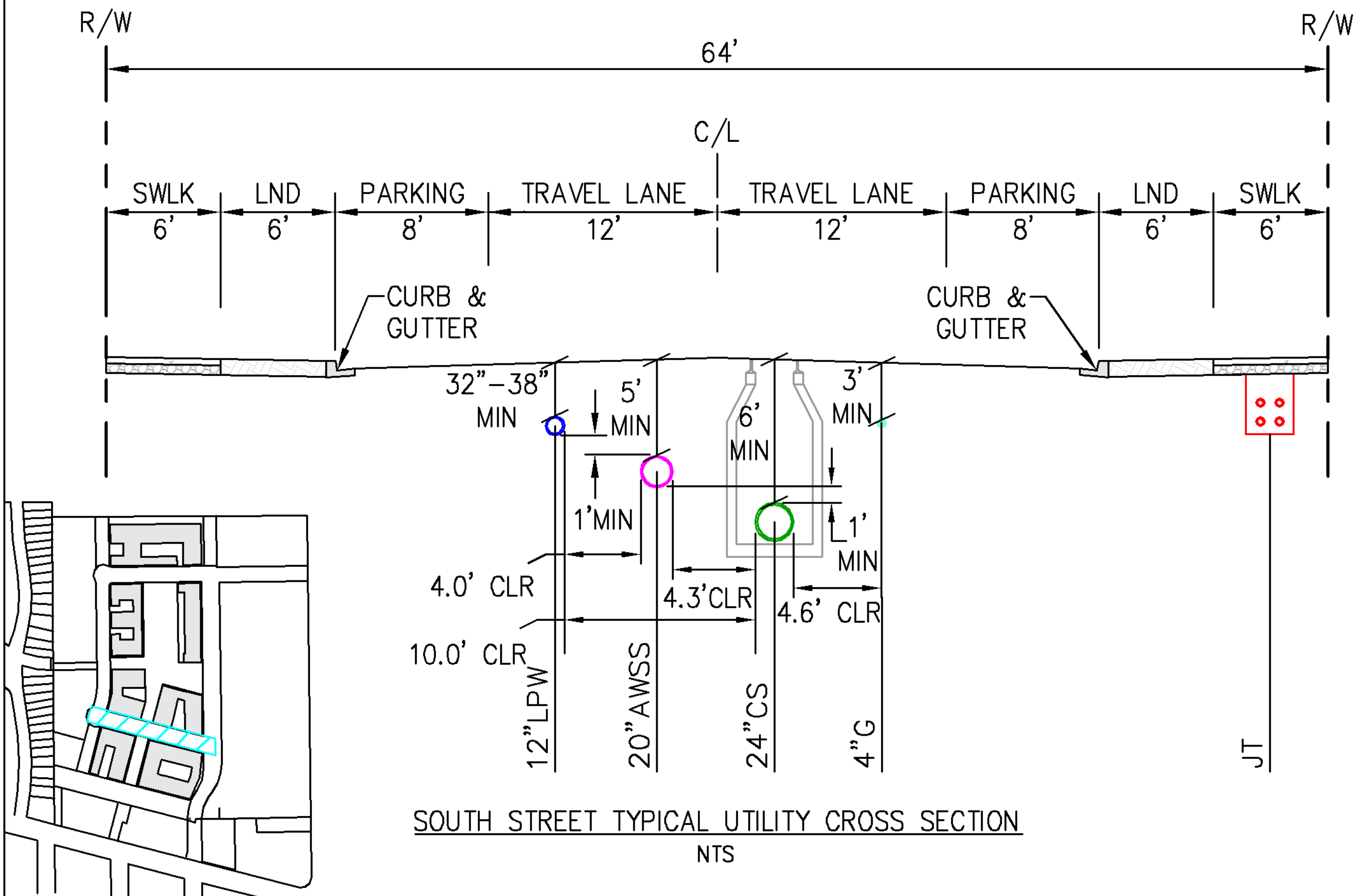


SOUTH STREET TYPICAL UTILITY PLAN
NTS

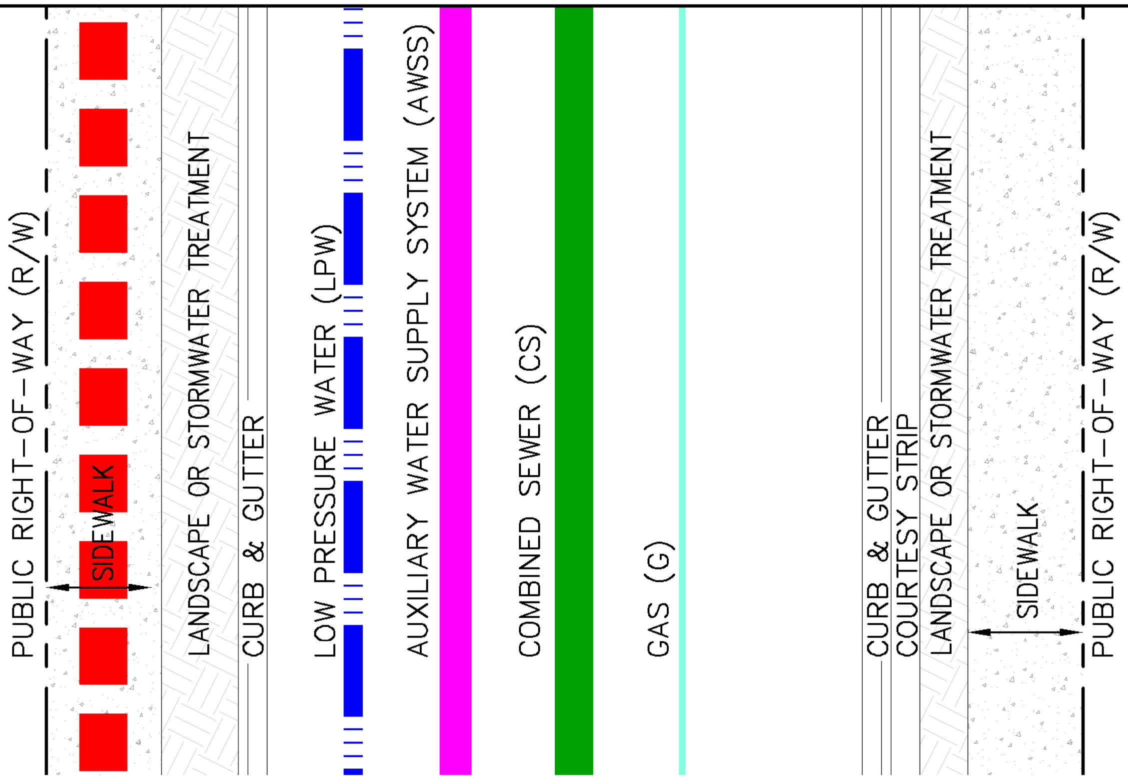


SOUTH STREET TYPICAL UTILITY CROSS SECTION
NTS

LOCATION MAP

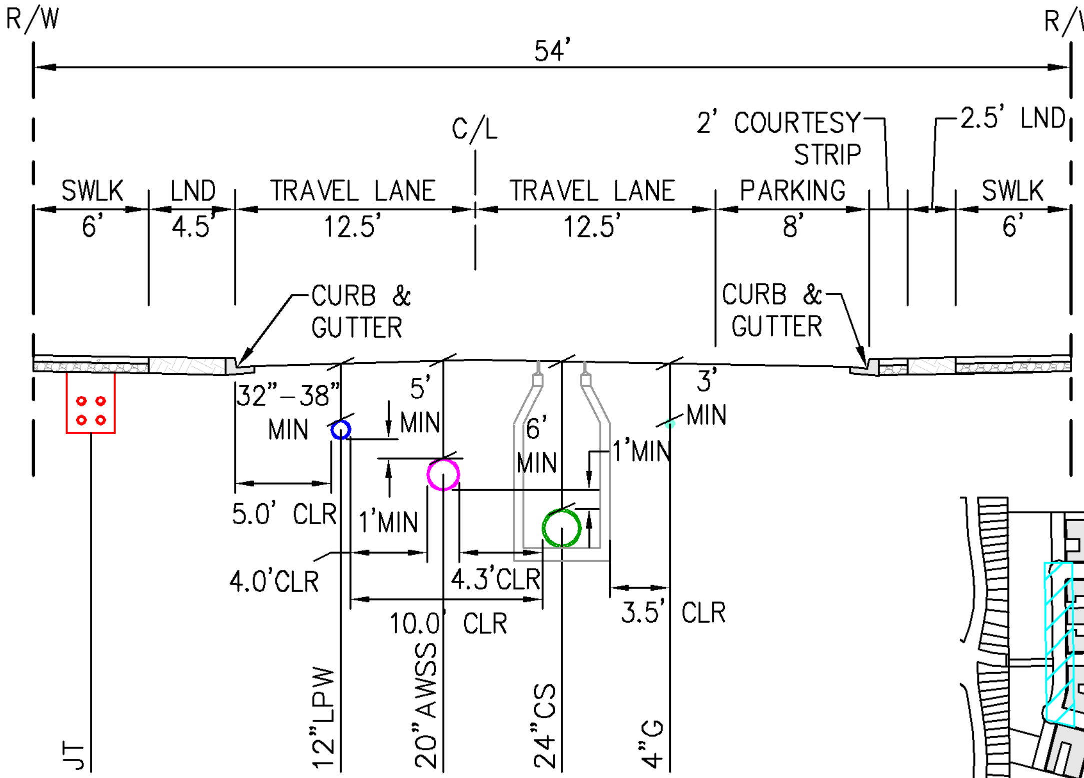
Source: BKF ENGINEERS, 06/2020

BALBOA RESERVOIR INFRASTRUCTURE PLAN **FIGURE 8.2C – TYPICAL UTILITY CROSS SECTION (SOUTH STREET)**



WEST STREET TYPICAL UTILITY PLAN

NTS



WEST STREET TYPICAL UTILITY CROSS SECTION

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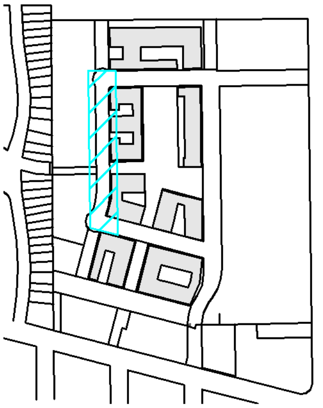

LOCATION MAP

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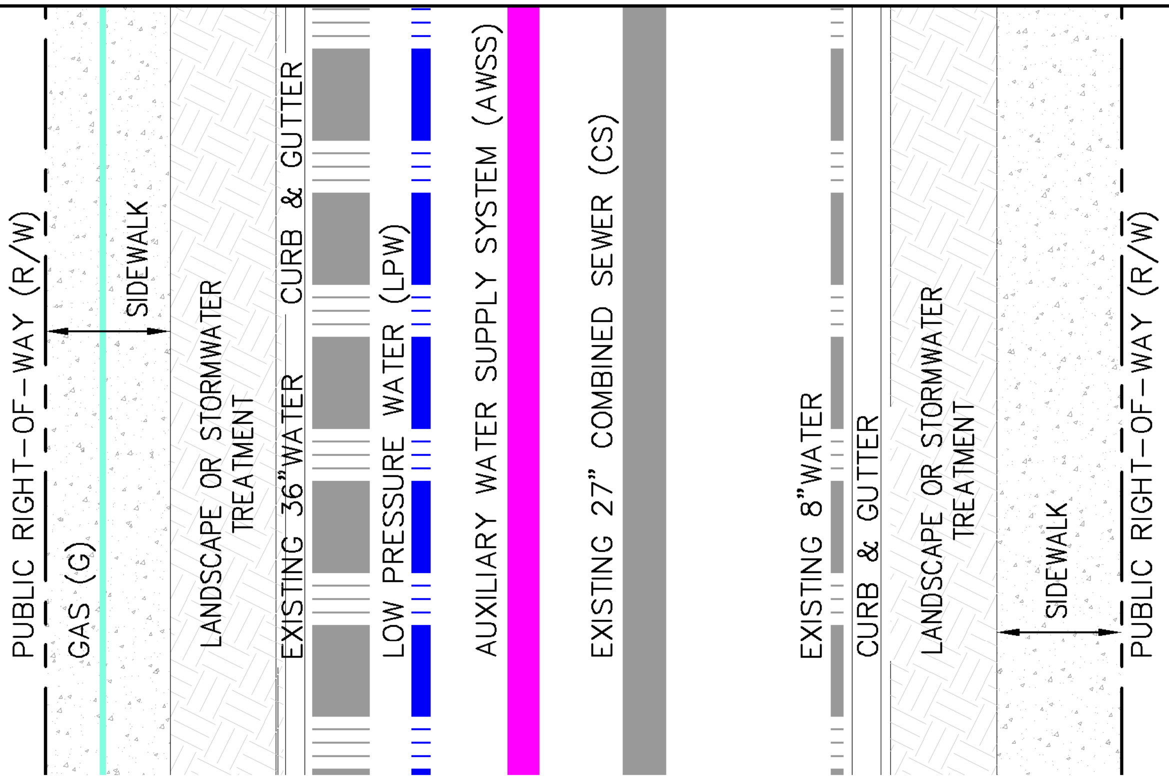
PLOT DATE: 06-10-20 PLOTTED BY: pasc

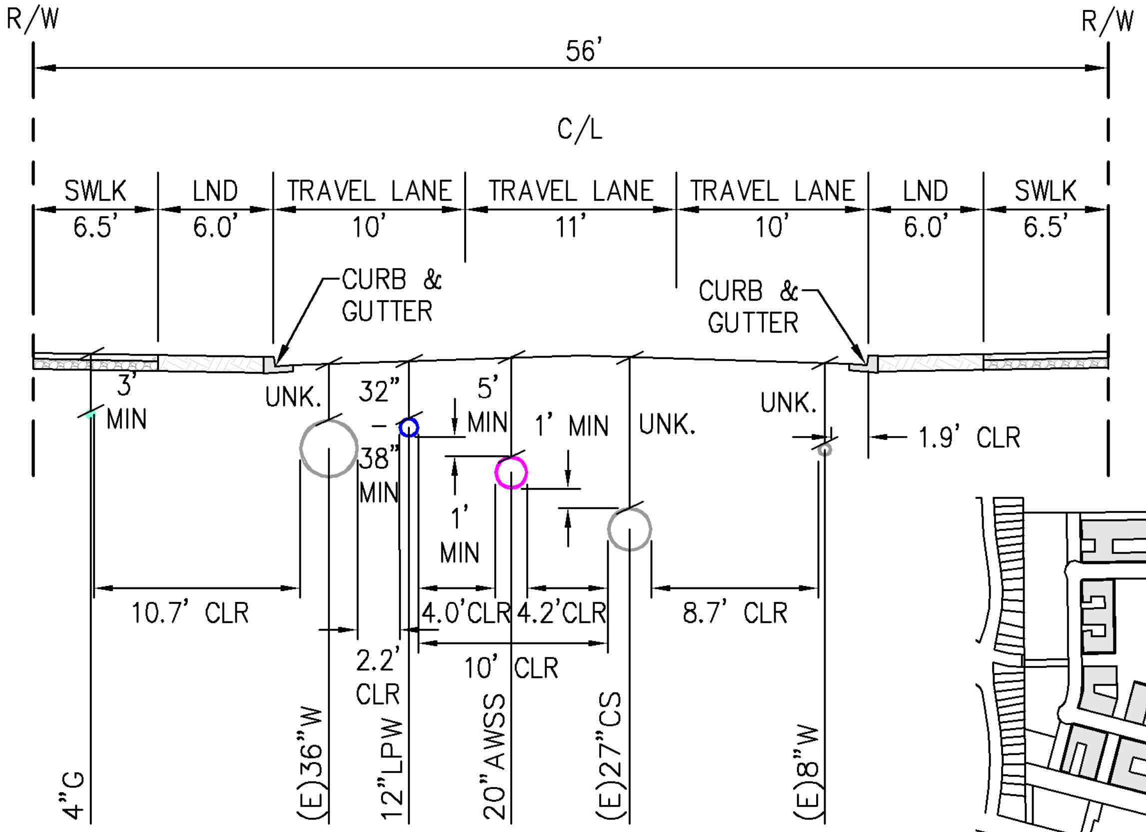
Source: BKF ENGINEERS, 06/2020

FIGURE 8.2D – TYPICAL UTILITY CROSS SECTION (WEST STREET)



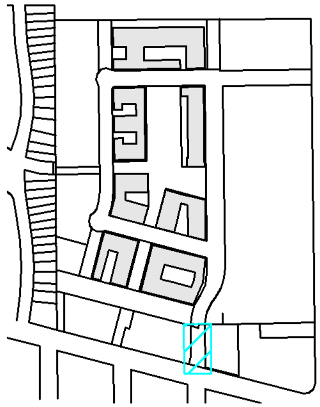
EXISTING LEE AVENUE TYPICAL UTILITY PLAN

NTS



EXISTING LEE AVENUE TYPICAL UTILITY CROSS SECTION

NTS



LOCATION MAP

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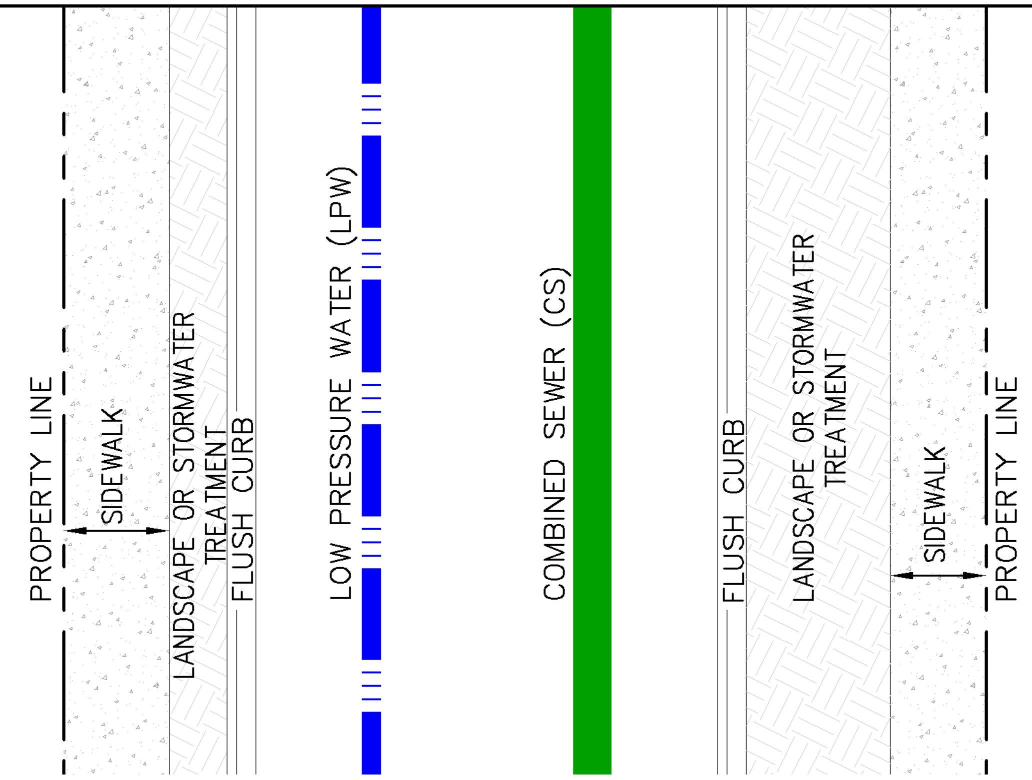
PLOT DATE: 06-10-20 PLOTTED BY: pasc

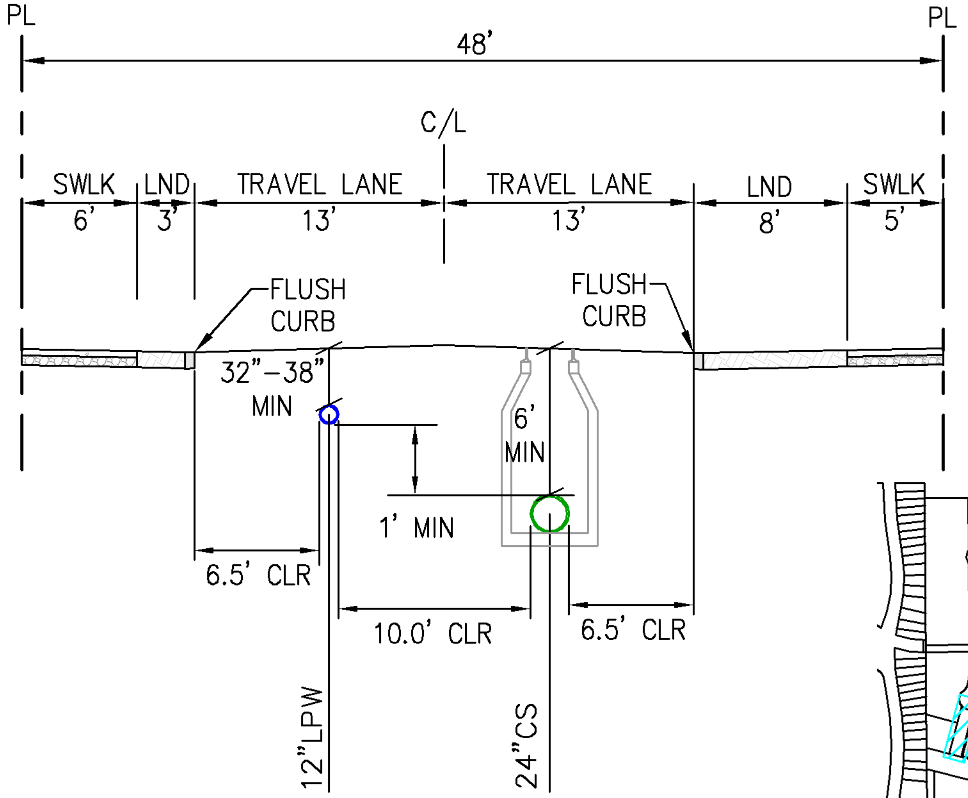
Source: BKF ENGINEERS, 06/2020

BALBOA RESERVOIR INFRASTRUCTURE PLAN **FIGURE 8.2E - TYPICAL UTILITY CROSS SECTION (EXISTING LEE AVE)**



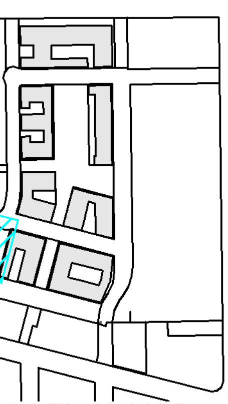
WEST STREET (PRIVATE) TYPICAL UTILITY PLAN

NTS



WEST STREET (PRIVATE) TYPICAL UTILITY CROSS SECTION

NTS



LOCATION MAP

DRAWING NAME: K:\2016\160367_Balboa_Reservoir\DOCS\05-Planning_Entitlements\H-Infrastructure_Plan\Exhibits\BR-PR-Util-Cross-Sections.dwg
PLOT DATE: 06-10-20 PLOTTED BY: pasc

Source: BKF ENGINEERS, 06/2020

BALBOA RESERVOIR INFRASTRUCTURE PLAN **FIGURE 8.2F - TYPICAL UTILITY CROSS SECTION (WEST STREET - PRIVATE)**

9. LOW PRESSURE WATER SYSTEM

9.1 Existing Low Pressure Water System

Potable water service will be provided by a water supply, storage, transmission, and distribution system that is metered with back flow preventers operated by the SFPUC. The proposed Project will connect to the SFPUC's Low Pressure Water (LPW) system for domestic supply and fire protection. The existing LPW system within the project vicinity includes 8 and 12-inch diameter distribution pipelines and low pressure fire hydrants within Frida Kahlo Way and Ocean Avenue. Existing potable water and fire protection infrastructure near the Project Site are located along Frida Kahlo Way and on Lee Avenue.

Fire hydrant flow information was obtained for the 12-inch main in Ocean Avenue and the 8-inch main in Frida Kahlo Way. Both of these mains are located within the Sutro Pressure Zone.

	12-inch Main in Ocean Ave	**8-inch Man in Frida Kahlo Way**
Static Pressure (psi)	80	69
Residual Pressure (psi)	62	51
Observed Flow (gpm)	1,197	947
Available Flow at 20 psi (gpm)	2,290	1,630

9.2 Proposed Low Pressure Water System

9.2.1 Project Water Supply

In accordance with the California Water Code, SFPUC is preparing a Water Supply Assessment for the proposed Project. The Water Supply Assessment was approved by the SFPUC Commission on May 28, 2019.

9.2.2 Project Water Demands

The proposed Project water demands are summarized in Table 9.1 below. The Project's water demands have been calculated using the SFPUC's Non-Potable Water Program District Scale water calculator. The proposed Project will include building-based recycled water treatment plants in certain buildings that will divert, treat and reuse graywater (and potentially rainwater) for non-potable uses within the project, such as toilet flushing and irrigation. The annual non-potable water demand will be calculated as part of the master utility plan once the final system is determined.

9.2.2.1 Fire Flows

The required fire flows will be according to Appendix B of the California Fire Code and approved by SFFD. Fire flows are based on the building area and the type of construction. The proposed buildings will be Type I-A, II-A and V-A construction. See Appendix F for Fire Flow Evaluation which presents the CFC required fire flow for each building.

Table 9.1. Water Demands

Annual Potable Water Demand	39,543,600 gpy

Project Potable Water Demands	
Design Scenario	**Demand**
Domestic Average Day Demand (ADD)	108,300 gpd
Maximum Day Demand (MDD) = 1.2 x ADD	130,000 gpd
Peak-Hour Demand (PHD) = 2.65 x ADD	287,000 gpd
Required Fire-Flow[2] (FF) = 1,500 gpm x 4 hours	360,000 gpd
Maximum Potable Water Demand (Maximum Day Demand + Required Fire Flow)	490,000 gpd

9.2.3 Project Water Distribution System

The proposed Project will include the design and construction of the proposed LPW system by the Developer. The proposed LPW system will be owned and maintained by the SFPUC upon completion and acceptance of the improvements. The proposed LPW system is depicted on Figure 9.1. The proposed LPW system pipeline sizes will be verified by the PUC’s review of the hydraulic modeling in the Low Pressure Water Master Plan (LPWMP) that will be prepared after Project approvals.

The project will connect to the existing 12-inch LPW line in Ocean Avenue and the existing 8-inch line in Frida Kahlo Way. The Project will install new 12-inch LPW lines in the new proposed streets while meeting the necessary separation requirements to other utilities and proposed improvements as outlined in Section 10. The vertical and horizontal separation distances to other utilities will be consistent with the requirements outlined in Title 22 of the California Code of

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[2] *The required fire flow will be determined by SFFD based on final building areas and construction type.*

Regulations, the SFDPW Subdivision Regulations and the State of California Department of Health Services Guidance Memorandum 2003-02. The typical utility cross sections for each street are depicted on Figures 8.2A-G.

SFPUC will perform the required disinfections of new mains and connections to existing mains at the Developer’s cost.

9.2.4 Low Pressure Water Design Criteria

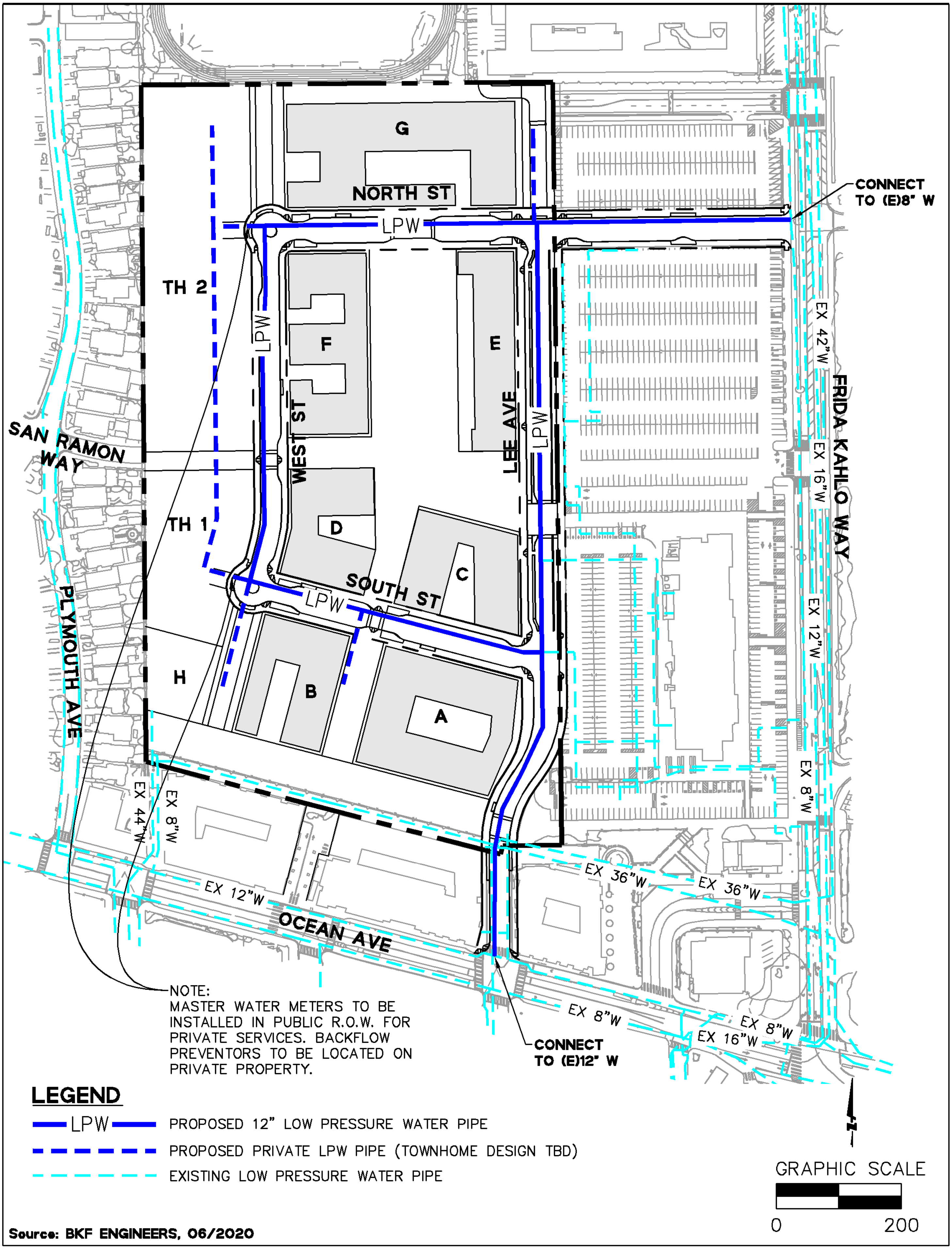
The proposed LPW system will be designed to maintain a minimum system pressure of 20 psi and a maximum velocity of 14 fps during MDD plus Fire Flow design scenario. The LPW system will also maintain 40 psi minimum residual pressure and 8 fps maximum velocity during PHD. The proposed LPW system will be modeled in the LPWMP to confirm the proposed system meets the pressure and flow requirements in each design scenario.

9.2.5 Proposed Fire Hydrant Locations

The LPW system will be the secondary fire water supply for the Project Site. The proposed LPW fire hydrants will have a maximum radial separation of 300-feet between hydrants, or as specified in Appendix C of the California Fire Code. Additionally, the LPW hydrants will be placed within 100-feet of building fire department connections. The proposed LPW fire hydrant locations are depicted on Figure 9.2A. The required fire flow will provide adequate fire protection for new and reuse construction per Appendix B of the California Fire Code. The project will coordinate with the SFFD for the final locations of new LPW fire hydrants within the Project.

9.2.6 Proposed Fire Department Standpipe Outlets

As shown on Figure 9.2B, fire department standpipe outlets will be provided on the exterior of the buildings. The outlets will be connected to the building sprinkler system and will provide a location where the fire department can connect a hose and provide hose coverage to the sides of the buildings.

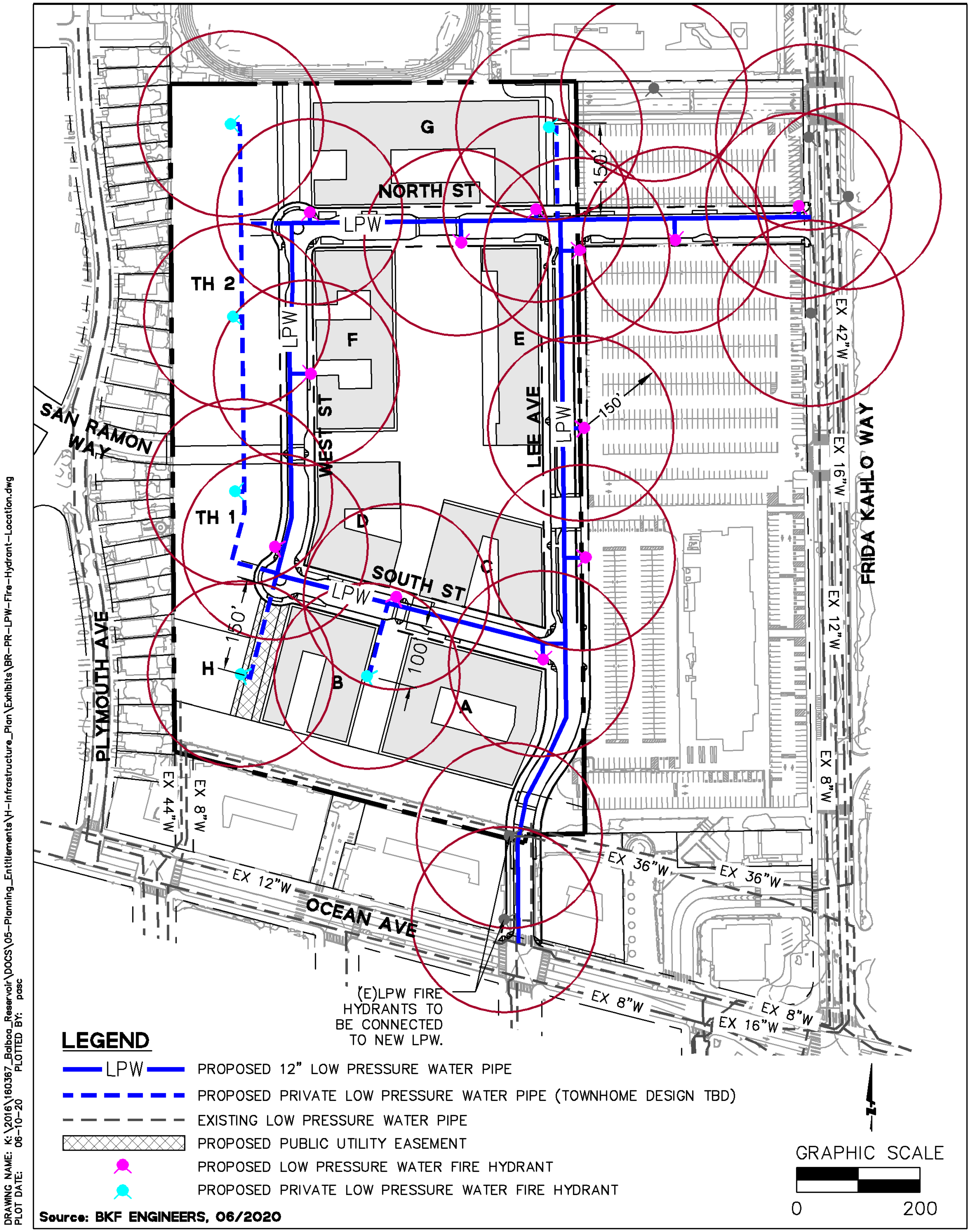


NOTE:
MASTER WATER METERS TO BE INSTALLED IN PUBLIC R.O.W. FOR PRIVATE SERVICES. BACKFLOW PREVENTORS TO BE LOCATED ON PRIVATE PROPERTY.

Source: BKF ENGINEERS, 06/2020

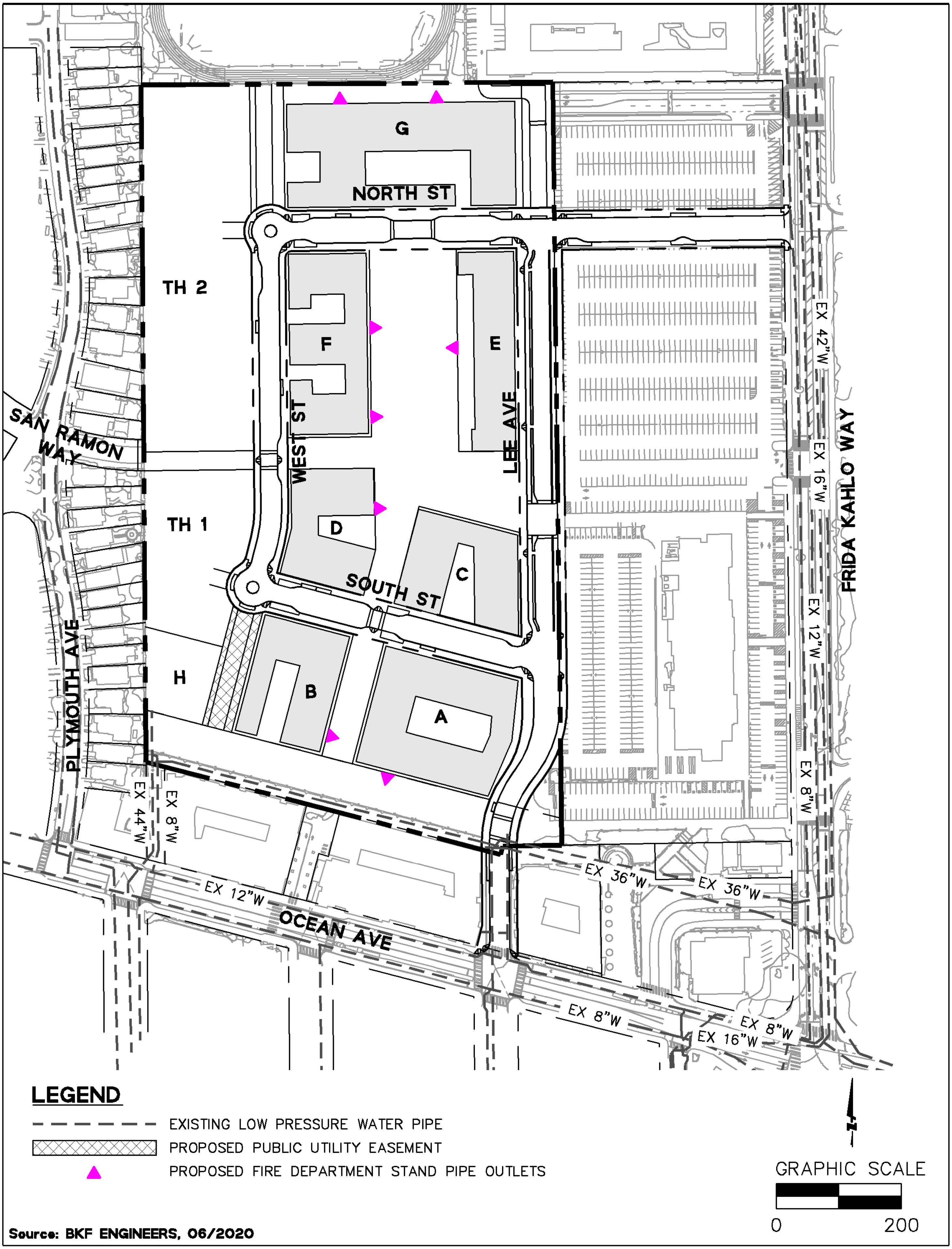
DRAWING NAME: K:\2016\160367_Balboa_Reservoir\DOCS\05-Planning_Entitlements\H-Infrastructure_Plan\Exhibits\BR-PR-Low-Pressure-Water-System.dwg
PLOT DATE: 06-10-20 PLOTTED BY: pasc

BALBOA RESERVOIR INFRASTRUCTURE PLAN FIGURE 9.1 – PROPOSED LOW PRESSURE WATER SYSTEM



Source: BKF ENGINEERS, 06/2020

BALBOA RESERVOIR INFRASTRUCTURE PLAN FIGURE 9.2A – PROPOSED FIRE HYDRANT LOCATIONS



Source: BKF ENGINEERS, 06/2020

DRAWING NAME: K:\2016\160367_Balboa_Reservoir\DOCS\05-Planning_Entitlements\H-Infrastructure_Plan\Exhibits\BR-PR-LPW-Fire-Hydrant-Location.dwg
PLOT DATE: 06-10-20 PLOTTED BY: pasc

BALBOA RESERVOIR INFRASTRUCTURE PLAN FIGURE 9.2B - PROPOSED STANDPIPE OUTLET LOCATIONS

10. NON-POTABLE WATER SYSTEM

In September 2012, the City and County of San Francisco adopted the Non-Potable Water Ordinance (NPO) allowing the collection, treatment, and use of alternative water sources for non-potable applications. In October 2013, the ordinance was amended to allow district-scale water systems consisting of two or more building sharing a non-potable water system. The ordinance was further amended in July 2015 to mandate the installation of onsite non-potable water systems in new developments 250,000 sf or more (the "Non-Potable Water Ordinance", Ordinance 109-15 – Mandatory Use of Alternate Water Supplies in New Construction).

The Project will comply with the NPO per the terms of the DA.

10.1 Existing Non-Potable Water System

The City's non-potable water system does not currently extend to or serve the Project Site. The City does not have existing non-potable water facilities within the vicinity of the Project Site.

10.2 Proposed Non-Potable Water System

The Project will either implement parcel-based graywater reuse systems or a district wide non-potable water system to comply with the City's Non-Potable Water Program. The decision between parcel-based or district-wide system will be made prior to construction of Phase 1 and documented in the Water System Masterplan. For the potential district wide system, the Project would only consider distributing non-potable water between adjacent market-rate buildings and landscape areas. The Project is not considering installing non-potable water infrastructure within the public right-of-ways.

Graywater from the residential showers, bathroom sinks and bathtubs will be collected and stored in a tank for treatment and reuse. The non-potable water will be reused for toilet flushing and landscape irrigation. The Project is not considering collecting and treating blackwater.

10.3 Non-Potable Water System Phasing

The new NPW system will be installed as-needed to facilitate a specific proposed Development Phase. The amount and location of the proposed NPW system installed will be the minimum necessary to support the Development Phase. Each phase will be operational prior to occupancy of proposed buildings to be constructed as a part of that phase. The Operator of the NPW distribution system will be responsible for the new, phased NPW facilities once construction of the improvements is complete.

For each Development Phase, the Developer will provide the City a Non-Potable Water Utility Report describing and depicting the existing NPW infrastructure and the proposed phased improvements and demonstrate that the Development Phase will provide the required pressure and flow.

11. AUXILIARY WATER SUPPLY SYSTEM (AWSS)

11.1 Existing AWSS Infrastructure

The SFPUC, in cooperation with the SFFD, owns and operates the Auxiliary Water Supply System (AWSS). The AWSS is a high pressure, non-potable water distribution system dedicated to fire suppression specifically designed for reliable operation after a major seismic event. The existing AWSS system within the vicinity of the project includes a 20-inch diameter main in Ocean Avenue.

11.2 AWSS Regulations and Requirements

The proposed Project will meet the fire protection requirements established by the SFFD to meet their City-wide objectives for fire protection following a seismic event. This includes the extension and installation of AWSS facilities to and within the Project. The proposed AWSS facilities will be located in the proposed streets that are within the public right-of-way, as approved by the SFPUC.

The AWSS facilities will be placed with vertical and horizontal separation distances to other utilities as shown in Section 8.

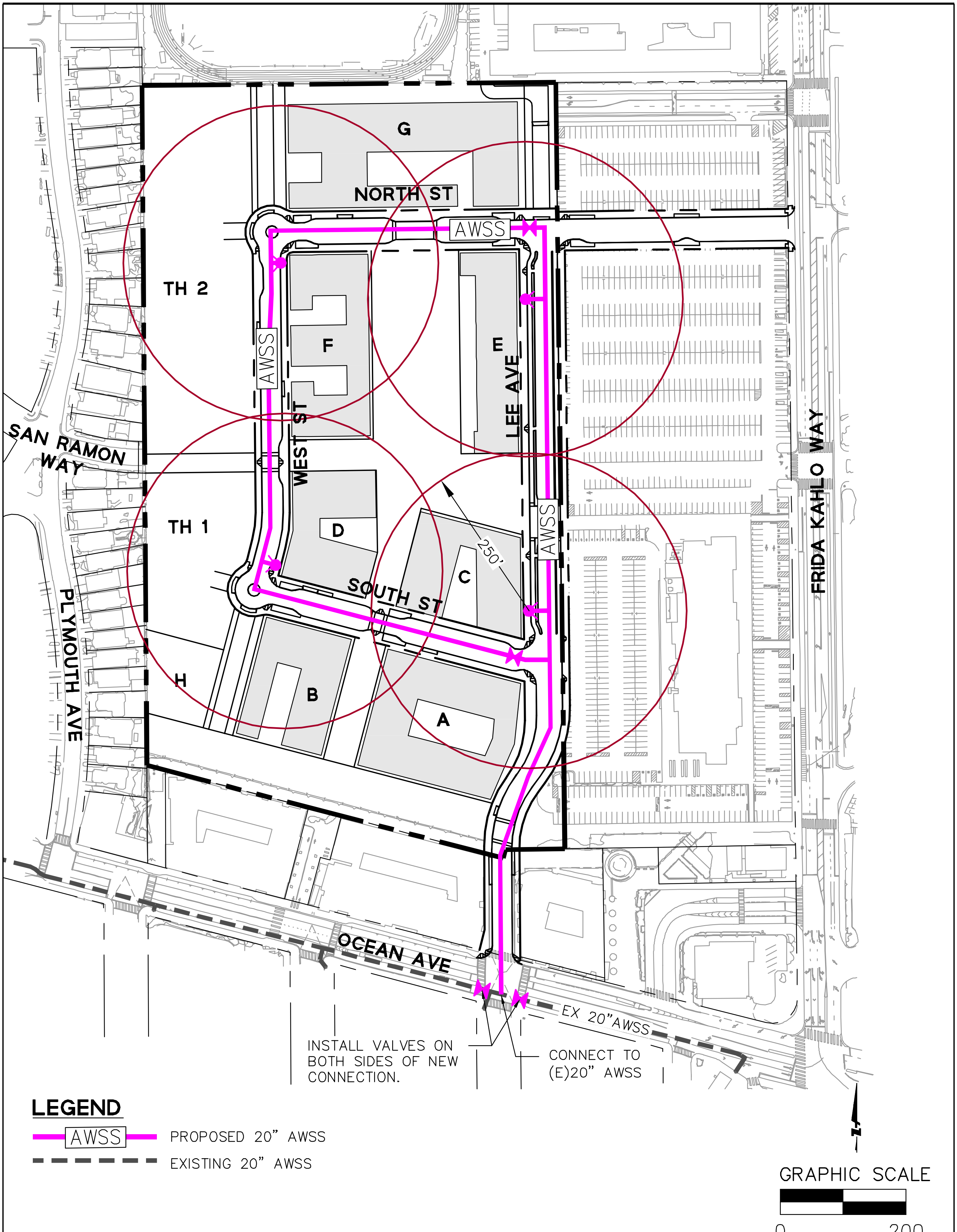
11.3 Proposed AWSS Infrastructure

The proposed Project will install new AWSS facilities within the Project, extending and connecting to the existing AWSS main in Ocean Avenue.

The project shall provide a single point of connection to the existing AWSS main in Ocean Avenue. Two valves will be installed on the existing AWSS line in Ocean Ave on both sides of the new connection. The alignment will run north on Lee Avenue, west on North Street, south on West Street, and east on South Street and connect back to the main in Lee Avenue creating a loop within the Project Site. This option has been deemed the most feasible option to supply AWSS to the Project Site.

The proposed Project will design and install the new AWSS facilities in a single phase consistent with the Project Phasing Plan. The proposed 20-inch pipeline will be earthquake resistant ductile iron pipe material. The Project will also install AWSS fire hydrants, at a maximum spacing of 500 feet, at locations determined by the SFPUC and SFFD. The proposed AWSS facilities for both options, including proposed hydrant locations, are depicted on Figure 11.1.

The SFPUC will be responsible for maintenance of existing AWSS facilities. The SFPUC will be responsible for the new AWSS facilities once construction of a new AWSS facility is complete and accepted by the SFPUC. Impacts to improvements installed with previously constructed portions of the Development due to the designs of subsequent blocks will be the responsibility of the Developer and will be addressed prior to approval of construction documents for each subsequent block. The SFPUC and SFFD will provide flow and pressure capacities of the existing AWSS that the proposed AWSS will connect to.



Source: BKF ENGINEERS, 06/2020

DRAWING NAME: K:\2016\160367_Balboa_Reservoir\DOCS\05-Planning_Entitlements\H-Infrastructure_Plan\Exhibits\BR-PR-AWSS-System.dwg
PLOT DATE: 06-10-20 PLOTTED BY: pasc

FIGURE 11.1 – PROPOSED AWSS SYSTEM

12. COMBINED SEWER SYSTEM

12.1 Existing Combined Sewer

12.1.1 Existing Conditions

The existing conditions within the Project Site consists of a parking lot that is used under contract by City College which is enclosed by three sides of the old Balboa Reservoir embankments. The Project Site is roughly 75% impervious. The site is adjacent to the City College Multi-Use Building built in 2010 and has private sanitary sewer and stormwater pipelines that collect and discharge the wastewater into a 27-inch combined sewer gravity pipeline located at the dead end segment of Lee Avenue.

12.1.2 Existing Drainage Area

The Project is comprised of one stormwater watershed defined by the existing topography in Figure 5.1 of the Project Site. The stormwater runoff on the raised side of the East reservoir embankment is collected in the private storm drain inlets located behind the City College Multi-Use Building, and the lower parking lot drains to the South West corner of the site.

12.1.3 Existing Sewer Demands

The existing sewer demands on the Project Site are at a minimum as there is only the existing City College building present in the nearby lot.

12.1.4 Existing Combined Sewer System

There is an existing 30-inch diameter combined sewer main in Frida Kahlo Way that flows south into a 3-foot by 4.5-foot concrete sewer at the intersection with Ocean Avenue. It then runs west along Ocean Avenue to the intersection of Lee Avenue, where it transitions to a 2-foot by 3-foot concrete sewer and continues west down Ocean Avenue. There is also a private 8-inch sewer line on the west side of the City College Multi-Use Building which connects to the 27-inch combined sewer in Lee Avenue and which discharges into the 2-foot by 3-foot concrete sewer in Ocean Avenue.

12.2 Proposed Combined Sewer System

12.2.1 Proposed Sewer Demands

The proposed Project estimated sewer flow assumes a return of 95% on the indoor potable water demand and 100% on the indoor non-potable water for the Average Day Demands. The potable and non-potable water demand calculations associated with the proposed Project are estimated using the SFPUC's Non-Potable Water Program District Scale Water Calculator.

Project Sewage Generation	
Design Scenario	**Demand**
Average Dry Weather Flow (ADWF)	102,900 gpd
Peak Dry Weather Flow (PDWF) = 3 x ADWF	308,700 gpd

12.2.2 Proposed Stormwater Flows

Runoff from the Project Site is divided in to two main watersheds as shown on Figure 12.2. Runoff from both of these watersheds will be conveyed by the new combined sewer system to the existing system in Ocean Avenue. Due to existing capacity limitations in the Ocean Avenue combined sewer system, the proposed Project will not increase peak stormwater discharge from the project site during the 5-year, 3-hour and 100-year, 3-hour storm events, including stormwater flow amounts equal to the estimated project peak sanitary flow, as a requirement of the SFPUC for project implementation. Onsite detention and retention will be provided to limit the peak discharge to existing conditions. Preliminary modeling and stormwater calculations have been prepared and are included in Appendix G and example stormwater detention alternatives are outlined in Figure 12.3. The conceptual stormwater detention alternatives will be further examined and the SFPUC-approved alternative will be identified prior to submittal for review in the Grading, Sewer, and Stormwater Master Plan.

The approximate existing 5-year and 100-year peak flows for each watershed are listed below:

	Area (acre)	5-year Flow (cfs)	100-year Flow (cfs)
Western Watershed	14.3	8.5	9.4
Eastern Watershed	11.3	17.2	28.8

12.2.3 Proposed Combined Sewer Capacity and Design Criteria

Design criteria, pipe sizes and flow velocities will conform to the requirements of the San Francisco Subdivision Regulations and the San Francisco Public Works Standard Specifications and Plans, subject to SFPUC review and approval.

12.2.4 Proposed Combined Sewer System

The wastewater and stormwater from the Project will be collected and conveyed by a proposed combined sewer system. The proposed combined sewer system is depicted on Figure 12.1. The combined sewer system will be designed and constructed by the Developer. The combined sewer design will be reviewed and approved by the SFPUC. The proposed combined system will consist of a diameter pipe size to be finalized in the Grading, Sewer, and Stormwater Master Plan and to convey sanitary sewer and stormwater by gravity to existing 24-inch and 27-inch pipes connecting to the combined sewer facilities in Ocean Avenue.

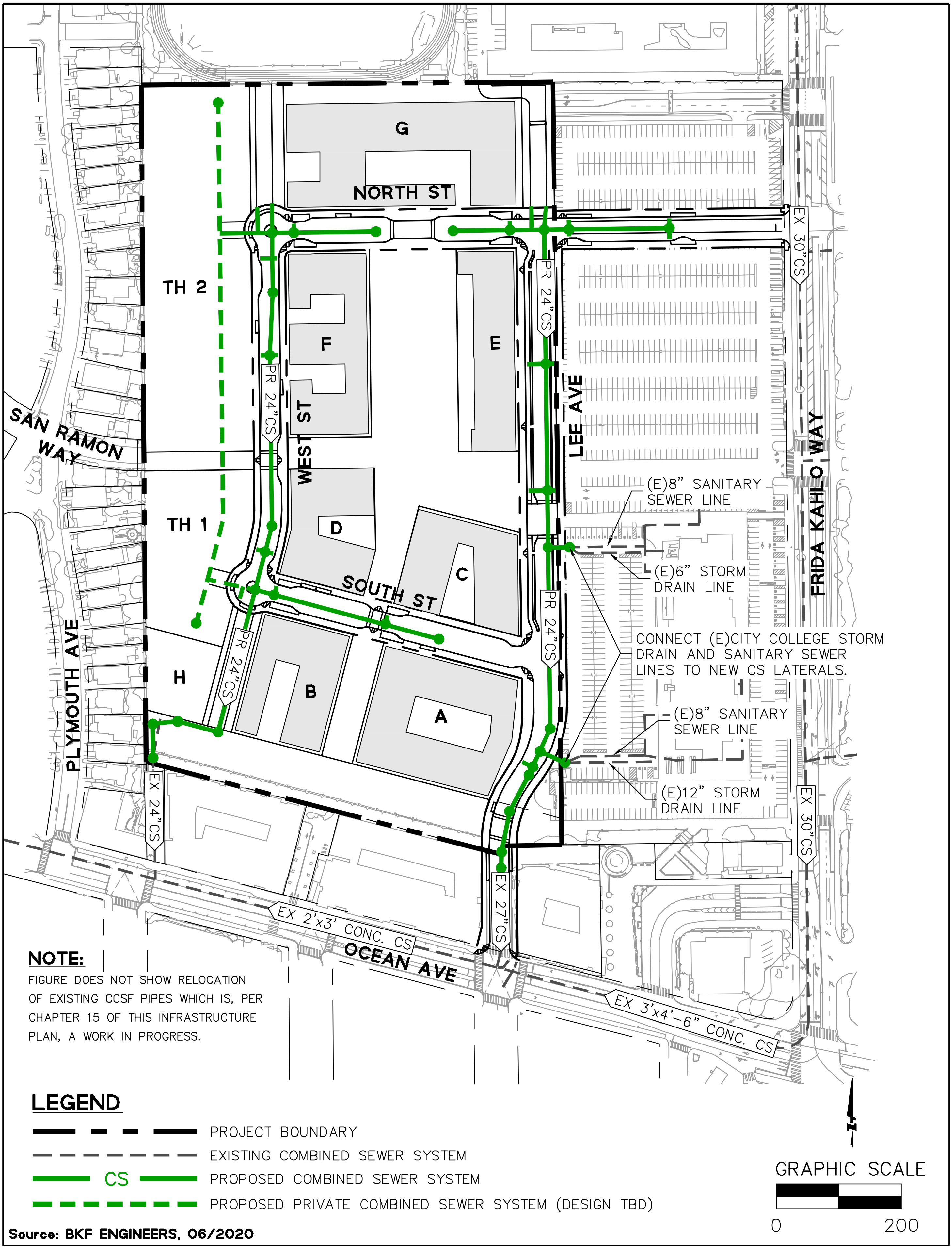
Prior to issuance of the draft basis of design, the Developer will conduct inspections of these existing connection pipes and SFPUC will determine if the pipes require repair or replacement by the Developer. As appropriate, the project's Grading, Sewer, and Stormwater Master Plan may also contemplate flows from other entitled projects connecting in the future Lee Avenue.

12.2.5 Pipe Material

HDPE will be the pipe material proposed by the Developer pending approval by the San Francisco Public Utilities Commission, Collection System Division.

12.2.6 Combined Sewer Construction and Phasing

The new combined sewer system will be installed with Phase 1 of the improvements which includes the street improvements and infrastructure to serve the entire project.



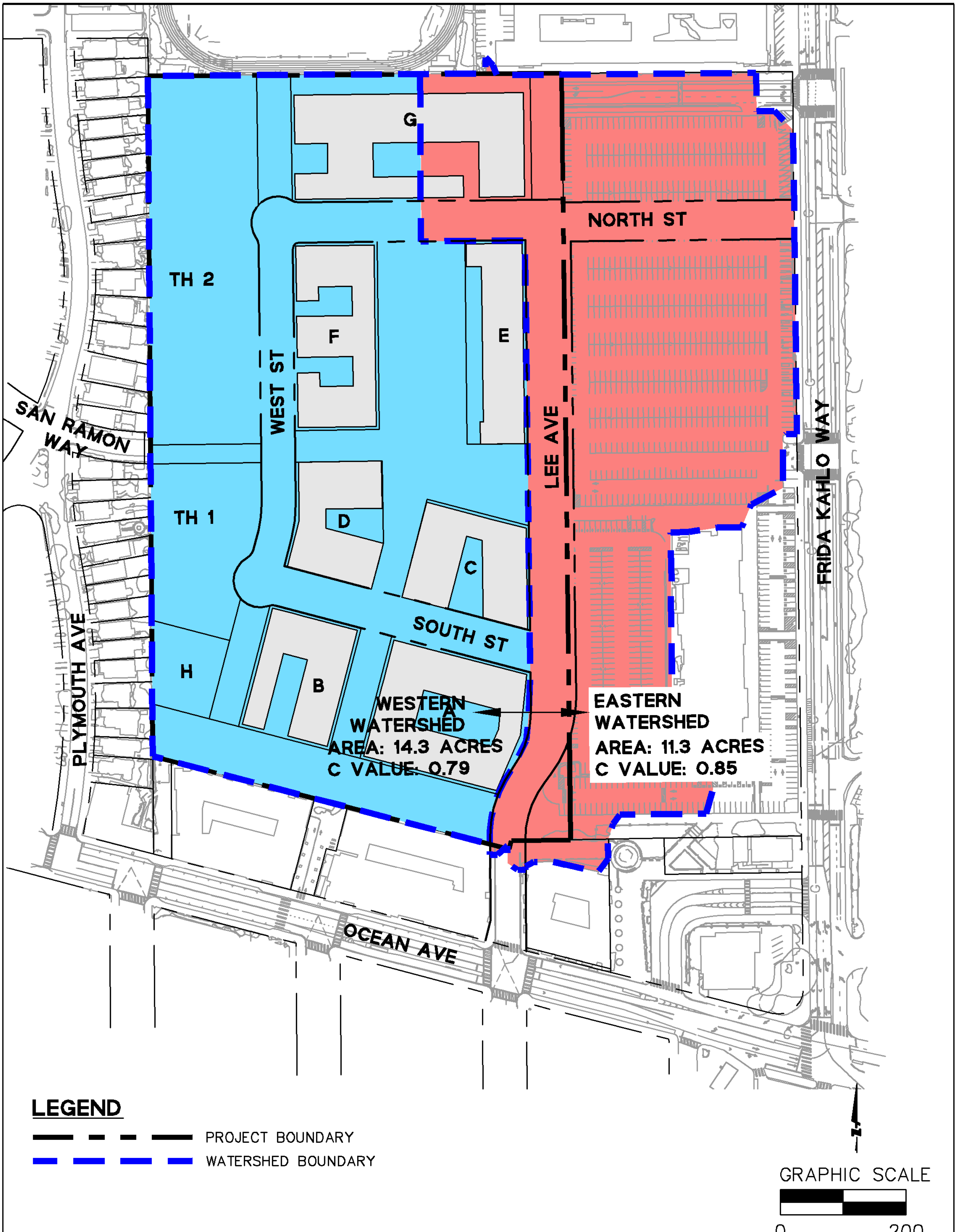
NOTE:

FIGURE DOES NOT SHOW RELOCATION OF EXISTING CCSF PIPES WHICH IS, PER CHAPTER 15 OF THIS INFRASTRUCTURE PLAN, A WORK IN PROGRESS.

Source: BKF ENGINEERS, 06/2020

DRAWING NAME: K:\2016\160367_Balboa_Reservoir\DOCS\05-Planning_Entitlements\H-Infrastructure_Plan\Exhibits\BR-PR-Combined-Sewer-System.dwg
PLOT DATE: 06-10-20 PLOTTED BY: pasc

BALBOA RESERVOIR INFRASTRUCTURE PLAN **FIGURE 12.1 – PROPOSED COMBINED SEWER SYSTEM**



Source: BKF ENGINEERS, 06/2020

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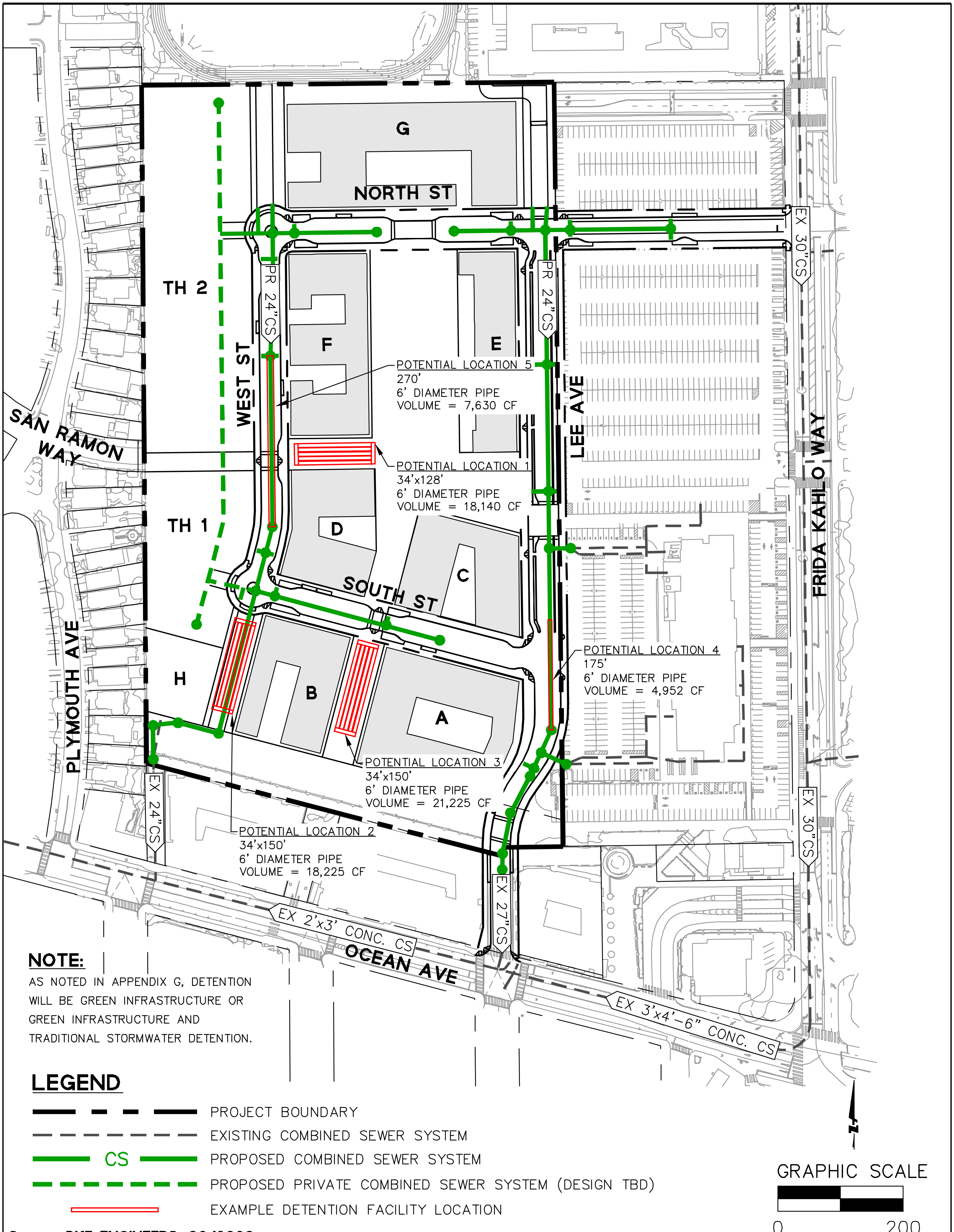
FIGURE 12.2 – PROPOSED WATERSHED



NOTE:

AS NOTED IN APPENDIX G, DETENTION WILL BE GREEN INFRASTRUCTURE OR GREEN INFRASTRUCTURE AND TRADITIONAL STORMWATER DETENTION.

LEGEND

PROJECT BOUNDARY
EXISTING COMBINED SEWER SYSTEM
CS PROPOSED COMBINED SEWER SYSTEM
PROPOSED PRIVATE COMBINED SEWER SYSTEM (DESIGN TBD)
EXAMPLE DETENTION FACILITY LOCATION

Source: BKF ENGINEERS, 06/2020

DRAWING NAME: K:\2016\160367_Balboa_Reservoir\DOCS\05-Planning_Entitlements\H-Infrastructure_Plan\Exhibits\BR-PR-Detention-System.dwg
PLOT DATE: 06-10-20 PLOTTED BY: pasc

FIGURE 12.3 - EXAMPLE STORMWATER DETENTION ALTERNATIVES

13. STORMWATER MANAGEMENT SYSTEM

13.1 Existing Stormwater Management System

The existing site is approximately 76.2% impervious, mostly covered in asphalt pavement. The existing site drains to the City's combined sewer system that drains to the Oceanside Water Pollution Control Plant which discharges to the Pacific Ocean.

13.2 Proposed Stormwater Management System

13.2.1 San Francisco Stormwater Management Requirements and Design Guidelines

The Project is located in a combined sewer area and is subject to the Combined Sewer Area Performance Requirements of the San Francisco Stormwater Management Requirements (SMR). A Grading, Sewer, and Stormwater Master Plan will be provided prior to the submittal of the Basis of Design and the Improvement Plans. Since the site was previously more than 50% impervious, the Project must reduce from the existing condition the runoff rate and volume of stormwater going into the combined system for the 2-year, 24-hour design storm. The Developer's Infrastructure obligations include the design and construction of the proposed stormwater management system. Typically, the SMR require projects to reduce runoff rate and volume of stormwater by 25% each.

Due to existing capacity limitations in the Ocean Avenue combined sewer system, the Project may not increase the peak discharge to the Ocean Avenue sewer system in the 5-year, 3-hour and 100-year, 3-hour storm events. Additional onsite detention and retention (above what is required to the SMR) will be provided to limit the peak discharge to existing conditions.

13.2.2 Proposed Site Conditions and Baseline Assumptions

The Project includes public streets, parks and plaza open space areas, and Private Development Parcels. The Project will be designed to integrate Low Impact Development (LID) elements with stormwater best management practices (BMPs) to create a sustainable environment at the site and achieve compliance with the SMR. Stormwater BMPs considered for the Project include flow-through planters, bioretention areas, rain gardens and infiltration galleries to manage and reduce stormwater runoff prior to discharging to the public combined sewer system.

Public streets will consist of at-grade streets with a combination of landscape strips, tree wells, and flow-through planters. Reservoir Park will include landscape strips, tree wells, and centralized bioretention areas. Brighton Paseo, San Ramon Paseo, West Street, North and South Paseo will likely include either bioretention areas or infiltration galleries, or a combination of both. Development parcels covered entirely with podium structures will include a combination of flow-through planters, landscape planters, tree wells, and pedestrian pathways.

13.2.3 Private Parcel Stormwater Management Design Concepts

The SMR requires the Project to implement BMPs to reduce the flow and volume of runoff from the Project Site. To be included with the Grading, Sewer, and Stormwater Master Plan, a process flow diagram illustrating the limits of the drainage management areas (DMAs), location of runoff discharge to existing combined sewer system, and existing combined sewer system will be developed to illustrate compliance with the SMR.

The conceptual stormwater management plan for the Project includes DMAs with either localized or centralized management facilities. Localized stormwater management occurs in DMAs that are able to direct surface runoff to BMPs that are sized to manage stormwater runoff from impervious areas per the given design storm event. Private development parcels located within DMAs with localized stormwater management will allocate a space to implement BMP measures and manage stormwater for the design storm event prior to discharging into the adjacent public combined sewer system. Alternatively, Development Parcels also have the option to collect and reuse stormwater on-site for non-potable uses to meet the SMO requirements.

Centralized stormwater management facilities will be implemented to collect runoff from larger site areas and from different properties to manage stormwater with a larger scale BMP. Adjacent private parcels to Reservoir Park plan to direct stormwater runoff to the centralized bioretention facility within Reservoir Park. These parcels could include C, D, E and F. Runoff from the new public streets could be directed to a centralized BMP located on private property. The centralized facility is planned to be sized to meet parcel C, D, E, & F SMO compliance as well as partial SMO compliance for the proposed public ROW. This option will be explored and included in the Grading, Sewer, and Stormwater Master Plan.

13.2.4 Public ROW Stormwater Management Design Concepts

The primary BMP within the public ROW will be flow through planters that will manage runoff from the streets and sidewalks. However, it is anticipated that the public streets will be unable to meet the 25% reduction for rate and volume on their own due to lack of space for flow through planters. Therefore, the centralized stormwater management facilities located in Reservoir Park will be oversized to ensure stormwater management requirements of the public streets are met providing additional reductions for rates and volume beyond the 25% required by the SMRs.

13.2.5 Stormwater Management Phasing

Each phase of the Project as a whole, including the public right-of-way, private streets, development parcels, and open spaces, will meet the 25% rate and volume reductions. Phase 1 currently includes all of the public ROW, parcels C, D E and F and the townhome site. Phase 2 currently includes parcels A, B, G, and H. Refer to Figure 1.3 for phasing of parks and open space.

13.2.6 Conceptual Stormwater Management Sizing

The conceptual stormwater management approach for the Project is presented in Figures 13.1 and 13.2. Figure 13.1 shows the large scale DMAs that are used for the conceptual BMP sizing calculations.

Figure 13.2 presents the conceptual location and size of the BMPs for each DMA. The BMP sizes were determined for planning purposes using the SFPUC's latest CSS BMP sizing calculator.

Table 13.1. Estimating BMP Sizing

DMA	DMA area (acre)	Permeable Pavement (sf)	Bioretention or Infiltration Gallery (sf)	Lined Private Bioretention (sf)	Unlined Public Bioretention (sf)	Unlined Private Bioretention (sf)
1	2.22	3,500	0	5,100	0	0
2	4.84	12,600	7,400	5,800	0	7,200
3	2.55	6,000	2,000	4,300	0	7,700
4	1.15	0	0	0	3,100	0
5	3.39	12,400	0	0	0	7,400
6	1.02	16,100	0	0	0	0
7	0.32	0	0	570	0	0
8	0.51	0	0	0	1,200	0
9	0.16	0	0	0	0	280

13.3 Stormwater Control Plan

Based on the designs to be reviewed and approved by the SFPUC as part of the Grading, Sewer, and Stormwater Master Plan and Basis of Design, the stormwater management strategies for the Project will be documented in a series of Stormwater Control Plans (SCP) in compliance with SFPUC stormwater management regulations and the requirements of the SMR. The selected modeling methodology will be per the SFPUC accepted hydrologic calculation methods. A Preliminary SCP will be submitted for the public right-of-way and public open space improvement with proposed ROW and centralized BMP stormwater controls to the SFPUC at, or before, the 60% Improvement Plan milestone. The Final SCP approval by SFPUC shall occur prior to issuance of the Street Improvement Permit. When full stormwater compliance is not met within a public ROW SIP, the Preliminary SCP of the corresponding centralized bioretention facility project (i.e. Reservoir Park) will be approved prior to issuance of the subject ROW SIP project permit.

Private parcels will submit the SCP for SFPUC review and approval per the standard SCP Project Review process. The Townhome parcel and SFPUC open space parcel will independently comply with the SMO and submit separate SCPs. When full stormwater compliance is not fully met within a public ROW SIP, the Preliminary SCP of the corresponding centralized bioretention facility project (i.e. Reservoir Park) will be approved prior to issuance of the subject ROW SIP project permit. Where private parcels discharge stormwater to the centralized bioretention facility to comply with their stormwater management requirements, the centralized facility must be fully operation prior to the issuance of the Certificate of Final Completion of any subject connecting private parcels.

13.4 Phases for Stormwater Management System Construction

The Developer will design and install the new stormwater management system as-needed to ensure SMO compliance during each proposed Development Phase. The amount and location of the proposed stormwater management systems shall be installed to ensure full compliance by the end of each completed Development Phase(s). The new Development Phase will connect to the existing utility systems as close to the boundary of the Development Phase area as possible. Development phasing with regard to stormwater management system is conceptual and remains under design. The phasing and simplification of the stormwater management systems will be further coordinated with the SFPUC prior to approval of the Grading, Sewer, and Stormwater Master Plan and Basis of Design.

At all phases of the development, the Developer must provide functioning and adequate stormwater management in compliance with the SFPUC’s post-construction stormwater management requirements and the SMR. In addition, the Developer must complete the construction of the approved stormwater management improvements required for each development phase prior to receiving a Certification of Completion for the development phase.

Centralized stormwater management facilities necessary to achieve SMR compliance within a development phase will be constructed and operational prior to or in conjunction with that phase.

Stormwater management systems, which may include bioretention areas, street flow-through planters, infiltration galleries, and retention areas located on public or private property within the Project, will be constructed and maintained by the City Agency, Developer, or its Assignees, where applicable, per the terms of the DA. SFPUC will only maintain stormwater control facilities that receive public ROW runoff, only. The Developer or Master HOA will maintain any stormwater control facility managing private parcel runoff, or a blend of private parcel and public ROW runoff.

13.4.1 Phase 1 Stormwater Management Construction

Phase 1 will include all the public ROWs, the townhome site, Lots C, D, E and F and Reservoir Park. All parcel and public ROW BMPs within the phase boundary will be constructed in this phase. The centralized stormwater management area in Reservoir Park will be constructed in this phase. This will likely be over-sized to manage future runoff from Phase 2.

13.4.2 Phase 2 Stormwater Management Construction

Phase 2 will include Lots A, B, H and G. Parcel BMPs needed to meet the SMR requirements for these lots will be constructed in this phase.

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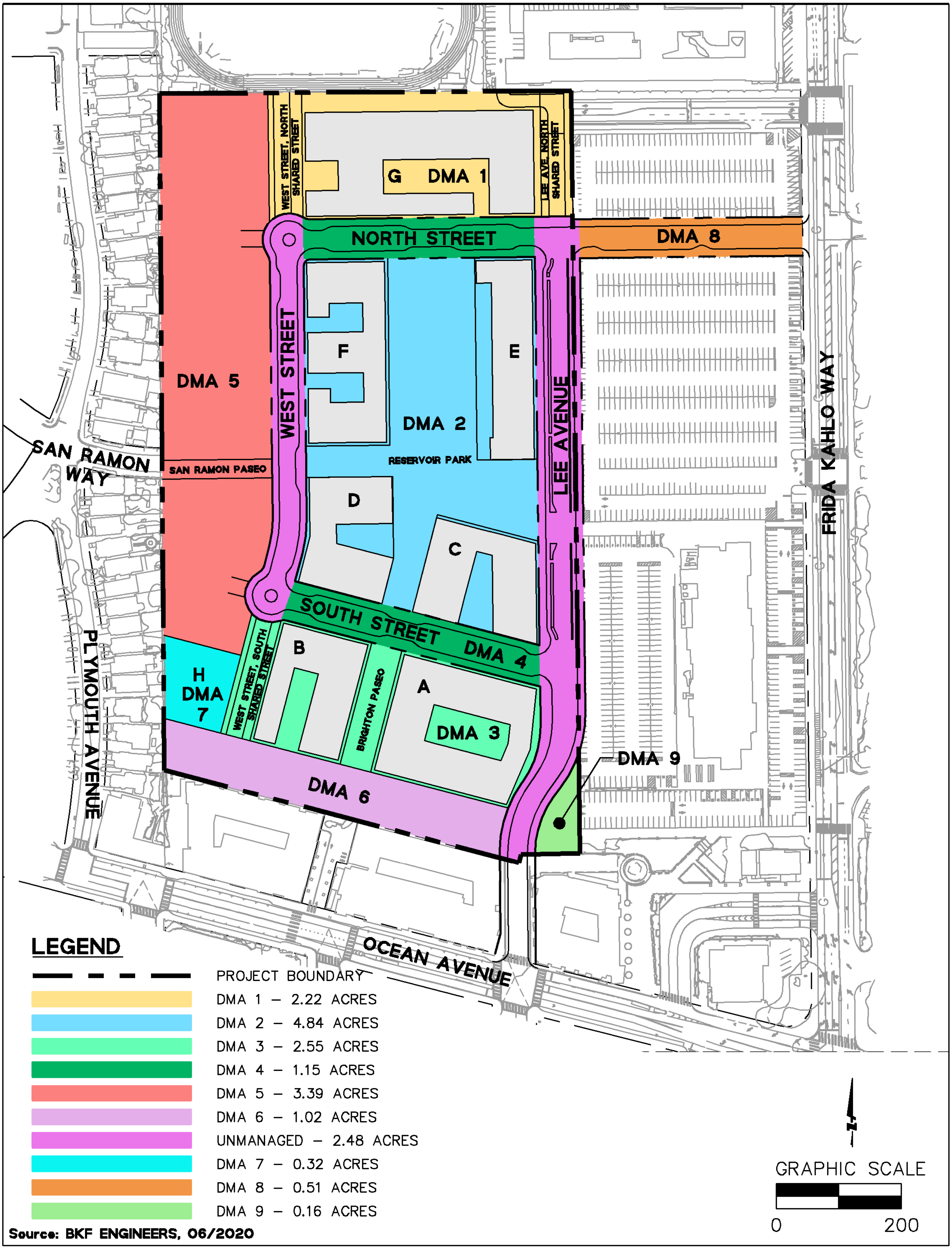
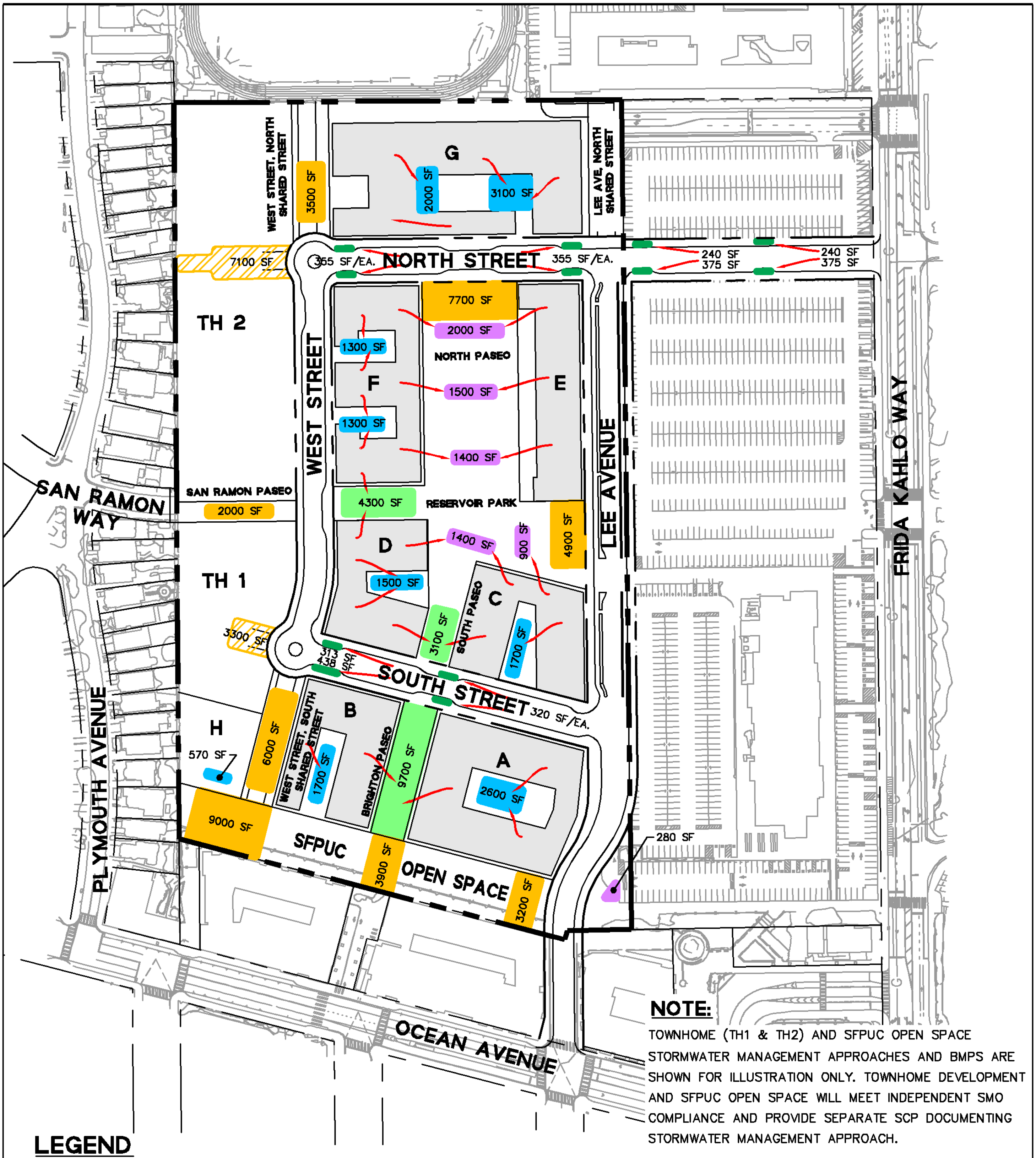


Source: BKF ENGINEERS, 06/2020

FIGURE 13.1 – STORMWATER DRAINAGE MANAGEMENT AREAS



NOTE:
TOWNHOME (TH1 & TH2) AND SFPUC OPEN SPACE STORMWATER MANAGEMENT APPROACHES AND BMPS ARE SHOWN FOR ILLUSTRATION ONLY. TOWNHOME DEVELOPMENT AND SFPUC OPEN SPACE WILL MEET INDEPENDENT SMO COMPLIANCE AND PROVIDE SEPARATE SCP DOCUMENTING STORMWATER MANAGEMENT APPROACH.

LEGEND

- ▬ ▬ ▬ PROJECT BOUNDARY
- 🟧 PERMEABLE PAVEMENT (▨ AREA DESIGN TBD)
- 🟩 BIORETENTION OR INFILTRATION GALLERY
- 🟦 PRIVATE BIORTENTION/FLOW THROUGH PLANTERS (LINED)
- 🟩 PUBLIC BIORETENTION/FLOW THROUGH PLANTERS (UNLINED)
- 🟪 PRIVATE BIORETENTION/FLOW THROUGH PLANTERS (UNLINED)

GRAPHIC SCALE
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Source: BKF ENGINEERS, 06/2020

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PLOT DATE: 06-10-20 PLOTTED BY: pasc

BALBOA RESERVOIR INFRASTRUCTURE PLAN

FIGURE 13.2 – STORMWATER CONTROL PLAN

14. DRY UTILITY SYSTEMS

14.1 Existing Dry Utility Systems

14.1.1 Electric

Balboa Reservoir project area is surrounded by Ocean Ave. on the south, Plymouth Ave. on the west and across a parking lot to remain, Frida Kahlo Way on the east. According to record maps provided by PG&E, Ocean Ave. includes 4kV and 12kV underground electrical distribution. On Plymouth Ave., overhead electrical lines with 4kV run along the backyards of existing properties. Finally, underground electrical distribution has been established on Frida Kahlo Way as well.

14.1.2 Natural Gas

Per record maps provided by PG&E, there are existing high pressure distribution gas mains running along Ocean Ave on the south and north sides. Additionally, the record maps show a deactivated gas line cutting through Ingleside branch of San Francisco Public Library near the intersection of Plymouth Ave. and Ocean Ave. On the west side, a high pressure distribution main line begins (capped with an electronic marker, EM) approximately 50′ north off the corner of Plymouth Ave. and Ocean Ave. and runs along Plymouth Ave. Along Frida Kahlo Way, there is a high pressure distribution main line in the westerly side of the street.

14.1.3 Communications

Based on visual inspection at the Project Site, AT&T and Comcast operate existing communication facilities along Ocean Ave., Plymouth Ave. and Frida Kahlo Way. Ocean Ave. and Frida Kahlo Way consist of underground low voltage distribution systems while Plymouth Ave. consists of joint poles carrying the AT&T, Comcast, and San Francisco Department of Technology (DT) overhead lines along the backyards of the properties

14.2 Project Power Providers and Requirements

Per Chapter 99 of the San Francisco Administrative Code, the Developer will provide the SFPUC with all Project information the SFPUC requires to determine the feasibility of providing electric service to the Project Site (the “Feasibility Study”). The SFPUC will complete the Feasibility Study within thirty (30) days after the date that Developer provides to the SFPUC all Project information needed to complete the Feasibility Study. Developer agrees that if the SFPUC determines it is feasible to provide electricity for the Project Site, then the SFPUC will be the exclusive power provider to the Project Site. The SFPUC electrical power will be provided under the SFPUC’s Rules and Regulations Governing Electric Service and at rates that are comparable to rates in San Francisco for comparable service from other providers. SFPUC requires adequate space for the Wholesale Distribution Tariff (WDT) intervening facilities be provided as an easement or fee title land rights at the time of the Final Map for each applicable phase.

14.3 Proposed Joint Trench

The proposed joint trench for dry utilities (that lie in public streets and in the sidewalk area if at all possible) consists of trench excavation and installation of conduit ducts for gas, electric, voice / data, and fire and police alarm. Additionally, utility vaults, splice boxes, street lights and bases, wire and backfill are included. The utility owner/franchisee (voice / data companies) will be responsible for installing their own facilities such as transformers and wire. Options for a proposed joint trench system are shown on Figures 14.1A-C depending on provider and proposed point of connection.

All necessary and properly authorized public utility improvements for which franchises are authorized by the City shall be designed and installed in the public right-of way in accordance with governing codes, rules and regulations, and permits approved by San Francisco Public Works (SFPW). Joint trenches or utility corridors will be utilized wherever feasible. The location and design of joint trenches and utility corridors in the right-of way must be approved by SFPW during the street improvement review process. All subsurface vaults serving one building shall be placed behind the property line. If a subsurface vault serves the distribution system, it may be placed in the right of way. Other facilities (e.g., traffic signal controllers) shall be located above ground as necessary for operational reasons. The precise location of the joint trench in the right of way will be determined prior to recording the applicable final map and identified in the street improvement plans. Nothing in this Infrastructure Plan shall be deemed to preclude Owner from seeking reimbursement for or causing others to obtain consent for the utilization of such joint trench facilities where such reimbursement or consent requirement is otherwise permitted by law.

14.4 Street Lights

Secondary power for street lighting may be installed in the joint trench or separate trench with proper separation as a street light utility. Service points are limited to one point per side of the street per block.

14.5 Public Utility Easements

Public Utility Easements are not necessarily allowed by the City for public facilities. The SFPUC must approve each PUE on a case-by-case basis, otherwise it is assumed that all facilities will be in the public right-of-ways.

Public utilities in easements will be installed in accordance with the standards in this Infrastructure Plan and applicable City Regulations for public acquisition and acceptance within public utility easement areas, including provisions for maintenance, but such areas shall not be required to be dedicated as public right of ways or improved to public right of way standards but may including paving, street furnishings, lighting, landscaping and irrigation.

14.6 Phases for Dry Utility Systems Construction

Joint trench design and installation will occur in phases based on the principle of adjacency and as-needed to facilitate a specific proposed Development Phase and consistent with the requirements of the DA. The amount of existing system replaced, and new infrastructure installed along Lee Avenue, North Road, West Road, and South Road will be the minimum necessary to support the Development Phases. The new infrastructure will connect to the existing systems as close to the proposed development as possible while maintaining the integrity of the existing system. Repairs and/or replacement of the existing facilities necessary to serve the Development Phase will be designed and constructed by the Developer. Such phased dry utility installation will allow the existing utility services to remain in place as long as possible and reduce disruption of existing uses on the site and adjacent facilities. Temporary or interim electric or dry utility infrastructure may be constructed and maintained as necessary to support service to existing buildings.

The service providers will be responsible for maintenance of existing facilities until replaced by the Developer. In the interim, the service provider is responsible for any power facilities installed under any agreement with the Developer and City Agency. The service provider will also be responsible for any new power facilities once the improvements for the Development phase or the new power facility is complete and accepted by the City Agency.

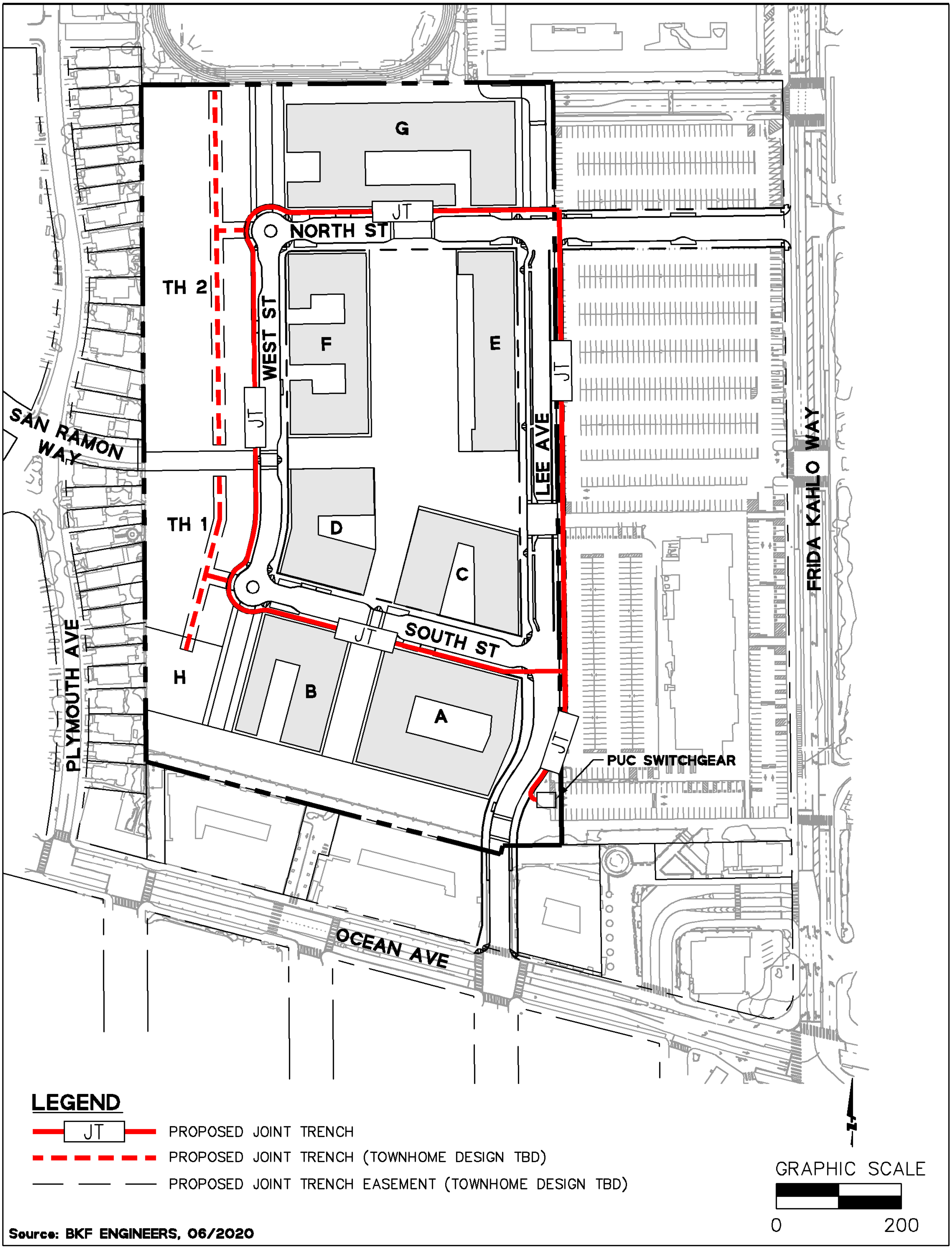

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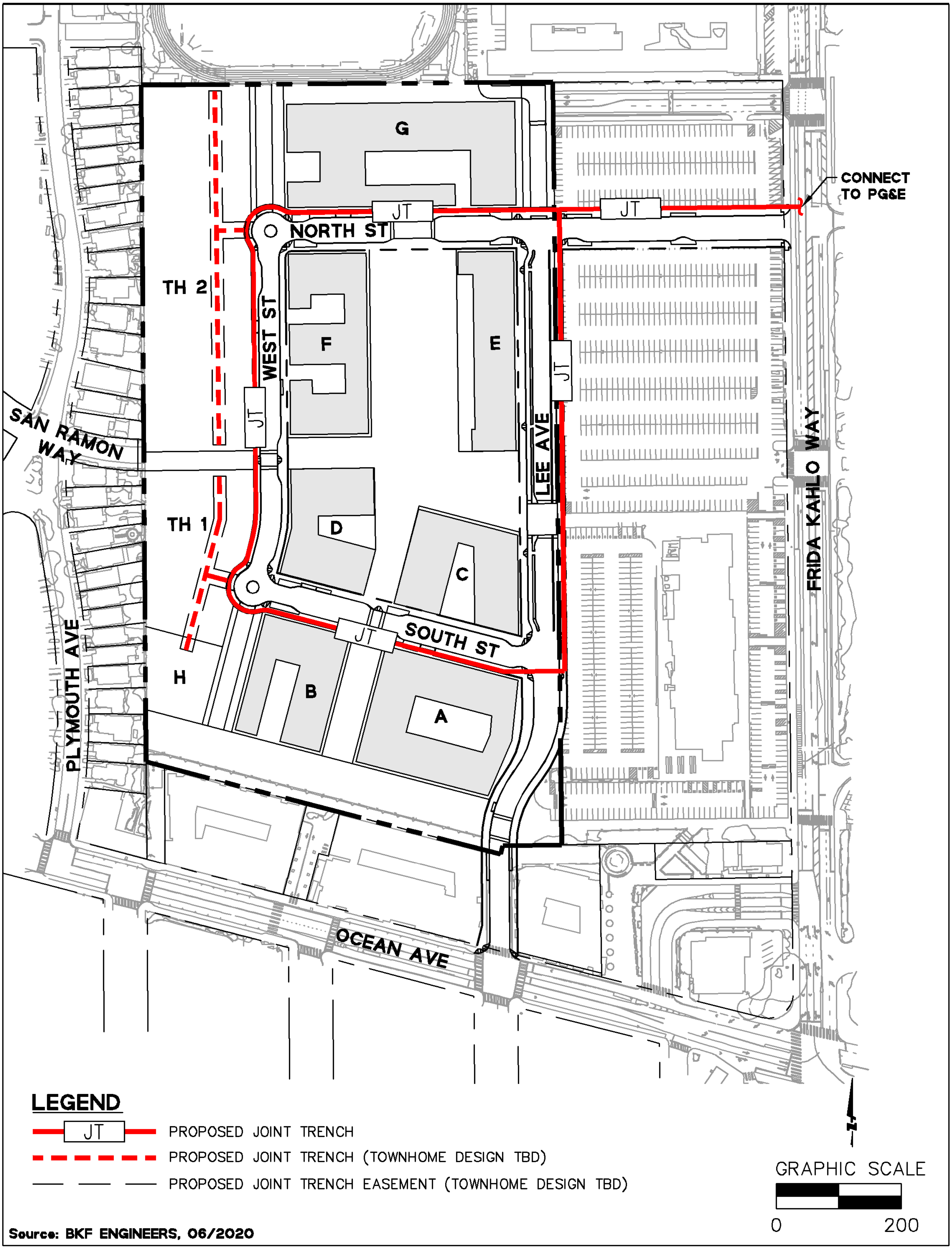
FIGURE 14.1A - PROPOSED JOINT TRENCH SYSTEM (OPTION 1 - SFPUC)



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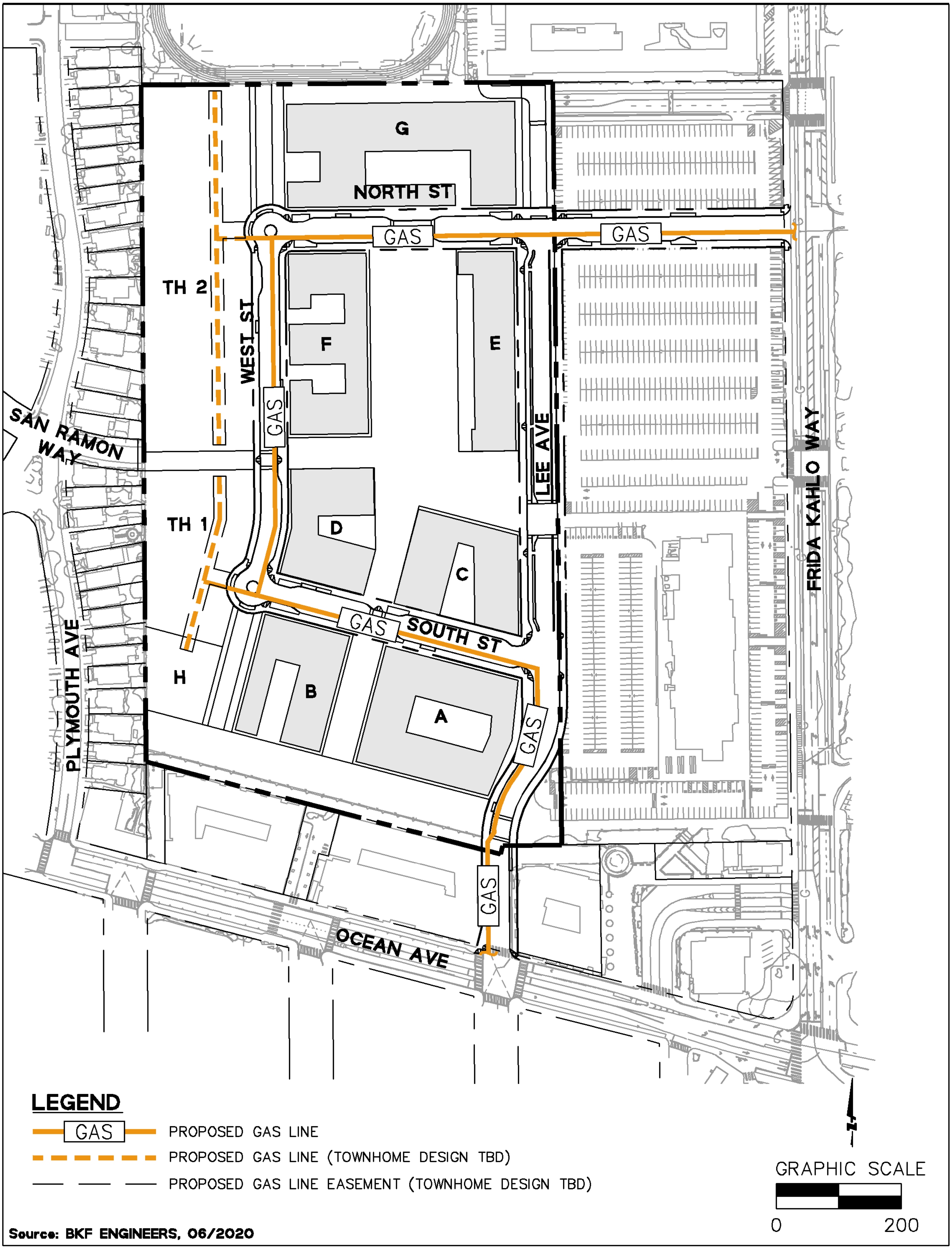
BALBOA RESERVOIR INFRASTRUCTURE PLAN **FIGURE 14.1B – PROPOSED JOINT TRENCH SYSTEM (OPTION 2 – PG&E)**



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BALBOA RESERVOIR INFRASTRUCTURE PLAN **FIGURE 14.2 – PROPOSED GAS SYSTEM**

15. EXISTING CITY COLLEGE OF SAN FRANCISCO UTILITIES

15.1 Existing Private Utilities

Within the proposed right-of-way of Lee Avenue, there are currently private utilities owned by the City College of San Francisco (City College). These utilities primarily serve City College's multi-use building, located east of the Project Site. See Figure 15.1A.

15.1.1 Fire Water

There is an existing 8-inch private fire water line that runs in the proposed Lee Avenue right-of-way. This line has two points of connection to the City water system in Frida Kahlo Way. It serves several on site, private fire hydrants.

15.1.2 Sanitary Sewer

There is an existing 8-inch private sanitary sewer line that runs in the proposed Lee Avenue right-of-way. This line flows south and connects to the existing 27-inch City combined sewer line at the dead end of Lee Avenue.

15.1.3 Storm Drain

There are existing 18-inch and 60-inch private storm drain lines that run in the proposed Lee Avenue right-of-way. These lines collect storm water runoff and flow south towards Ocean Avenue. The 18-inch line collects runoff from the northern portion of the City College site and conveys it to the 60-inch line. The 60-inch line is a detention pipe that holds storm water and slowly releases it to the City's 27-inch combined sewer line in Lee Avenue. On the downstream end of the 60-inch line, there is a weir structure which controls the rate of discharge from the line.

15.1.4 Geothermal Wells

There is a field of geothermal wells owned by City College that extend under a portion of the future Lee Avenue right-of-way and into the Project Site. These wells are part of the heating and cooling system for the multi-use building which has a central plant that uses hydronic heating for climate control. Water is pumped through the wells and then returned to the building where it either heats or cools the building.

15.2 Relocation of Private Utilities

The private utilities will need to be relocated or abandoned to construct Lee Avenue. Proposed City College utility reconnections to the new utilities in Lee Avenue are shown in Figure 15.1B.

- The City College storm drain and sanitary sewer laterals will be connected to the new public CS line in Lee Avenue.
- The City College fire service laterals will be connected to the new 12-inch LPW in Lee Avenue. Backflow preventors will be installed on the fire service laterals.
- The 60-inch detention pipe in Lee Avenue will need to be either relocated out of the right-of-way or removed. At this time, the final direction is not known. This issue will be studied as part of the Grading, Sewer, and Stormwater Master Plan.

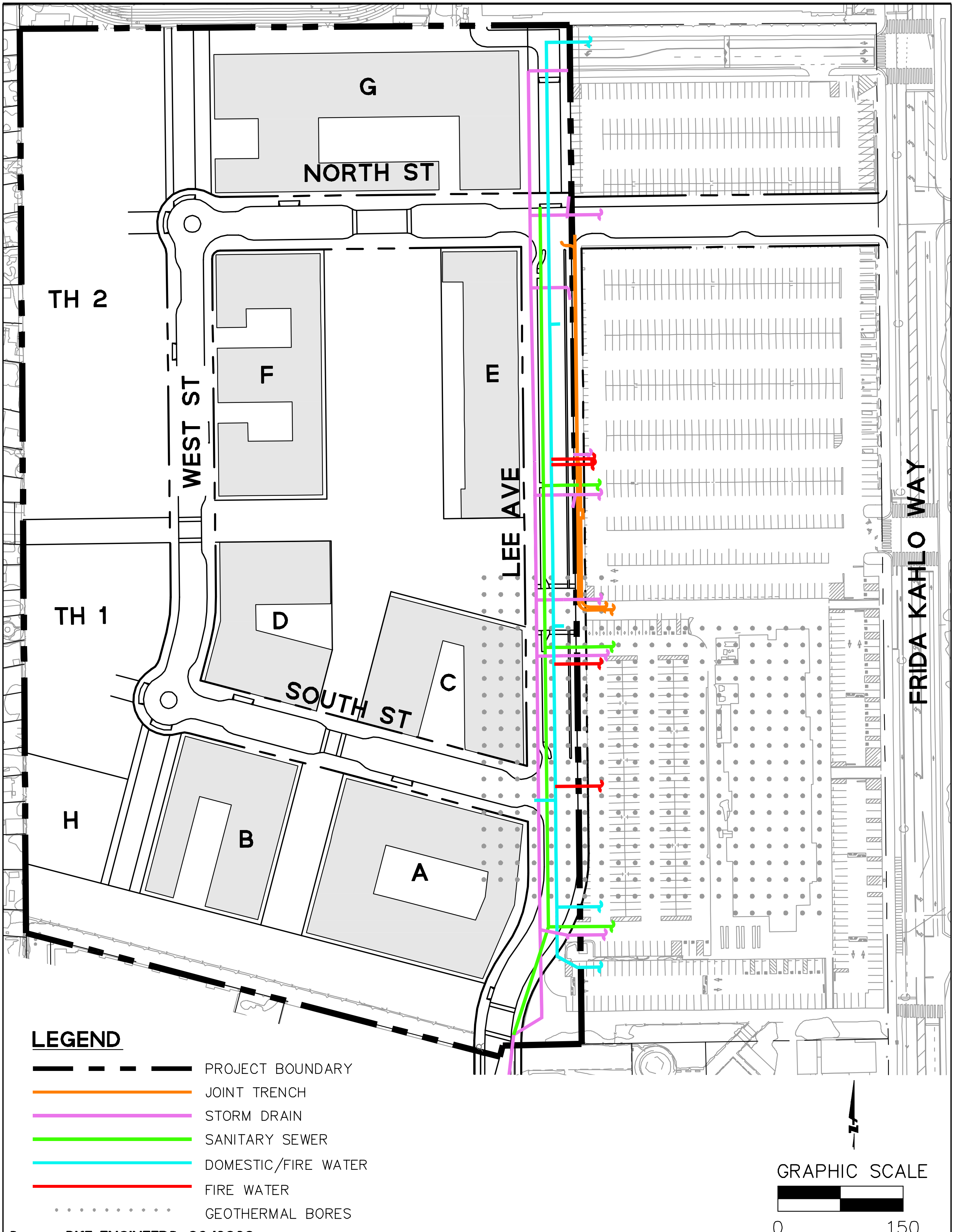

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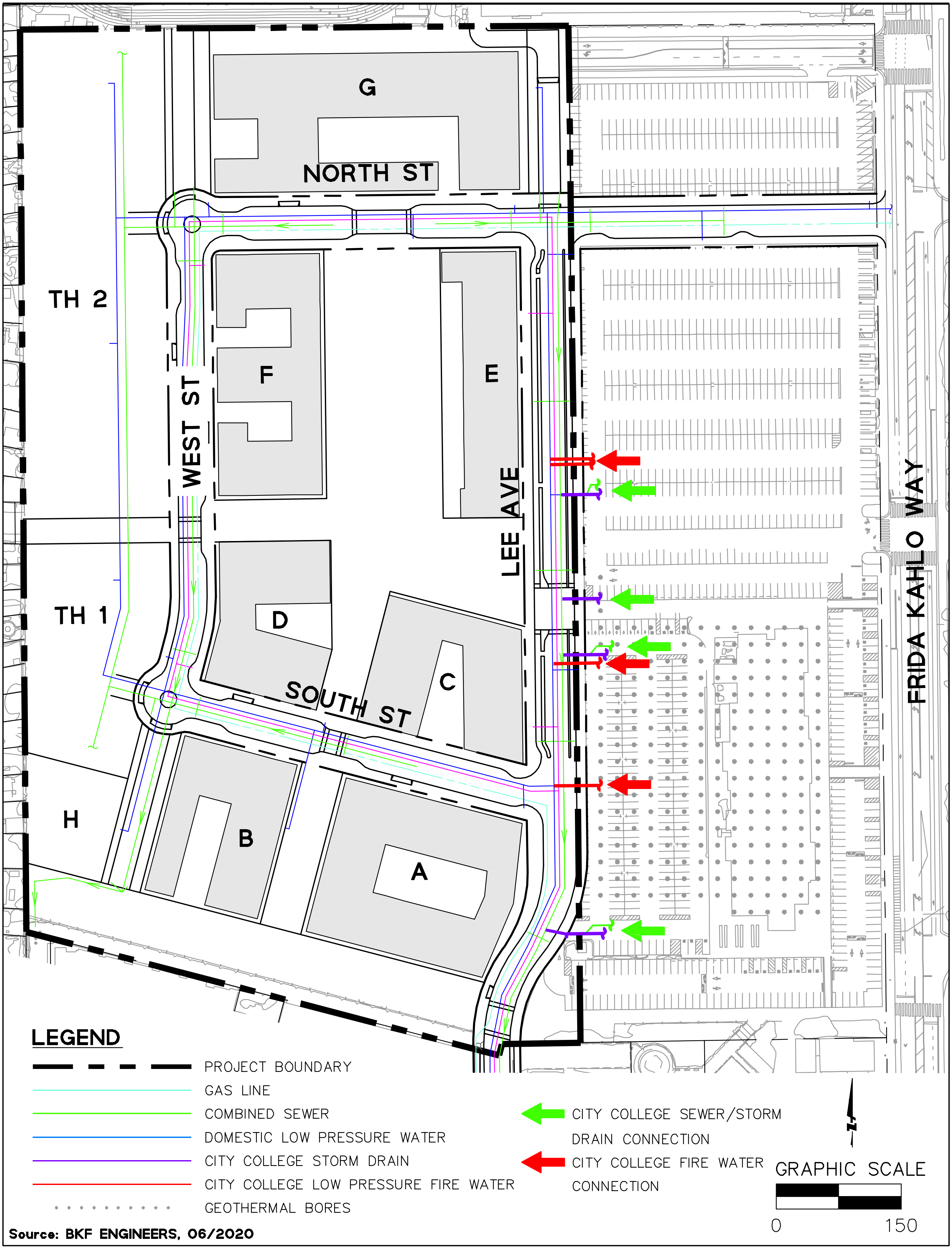
FIGURE 15.1A – EXISTING CITY COLLEGE UTILITIES



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BALBOA RESERVOIR INFRASTRUCTURE PLAN

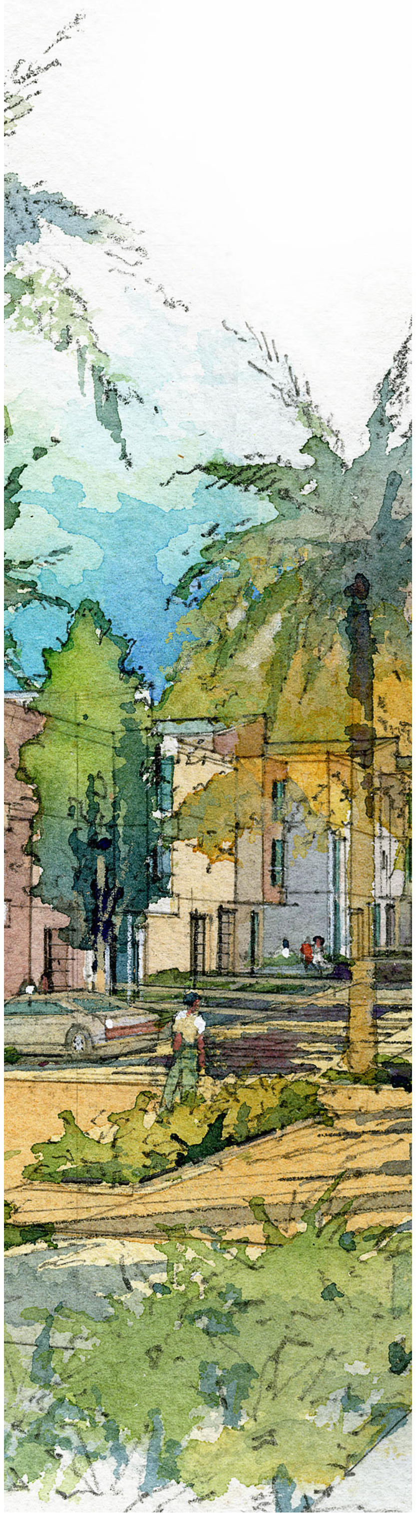
FIGURE 15.1B – PROPOSED CITY COLLEGE UTILITY CONNECTIONS

APPENDICES

APPENDIX A – BALBOA RESERVOIR DESIGN STANDARDS AND GUIDELINES
CHAPTER 5

CIRCULATION

5



Overview

5.1 STREET DESIGN OVERVIEW

Circulation Overview

If the heart of the new Balboa Reservoir neighborhood is the park and open space network, then the streets are the circulatory system that brings vitality to and from the surrounding neighborhoods. The Balboa Reservoir neighborhood is located in close proximity to local and regional transit lines, and therefore the Balboa Reservoir DSG prioritizes walking and biking over driving through the use of traffic calming measures, in coordination with the SFMTA and City College of San Francisco.

Design Context and Concept

The Balboa Reservoir neighborhood's streets conform to the geometry of adjacent streets such as Frida Kahlo Way, Lee Avenue, and Ocean Avenue. Except for Lee Avenue, all streets will have lower and slower moving traffic volumes than is typical. The neighborhood will also have a more pedestrian character, and will be an ideal destination for families, dog owners, residents, and neighbors walking to transit.

Design Principles and Objectives

All streets should be designed according to the requirements of SF Public Works and the design principles of the San Francisco Better Streets Plan (BSP). The Balboa Reservoir neighborhood streets shall achieve the following objectives:

- Streets should accommodate a comprehensive set of mobility, infrastructure, and streetscape elements, with facilities for diverse users including pedestrians, bicyclists, disabled persons, and drivers (cars, service, and emergency vehicles).
- Streets provide an array of horizontal elements: utilities, stormwater management infrastructure, furnishings, planting, and traffic calming.
- Streets should be designed to create a cohesive visual and physical connection between the public realm and private spaces.
- The streetscape palette should include regularly planted street trees, for creating a canopy for shade and shelter from wind as well as contributing to a pleasant walking and cycling environment.

- Streets should be accessible to all modes of transportation via Lee Avenue, North Street, South Street, and West Street. Figure 5.1–1 (Site Illustrative Plan) shows the designation for each street within the site boundary.

Specific street designs and characteristics are described further in Section 6.18 (Dog Relief Area) through Section 5.17 (Townhouse Entry Courts and Private Drives).

The street names "North Street," "South Street,"and "West Street" are placeholders to be renamed at a later date.

Note: building footprints are for illustrative purposes only

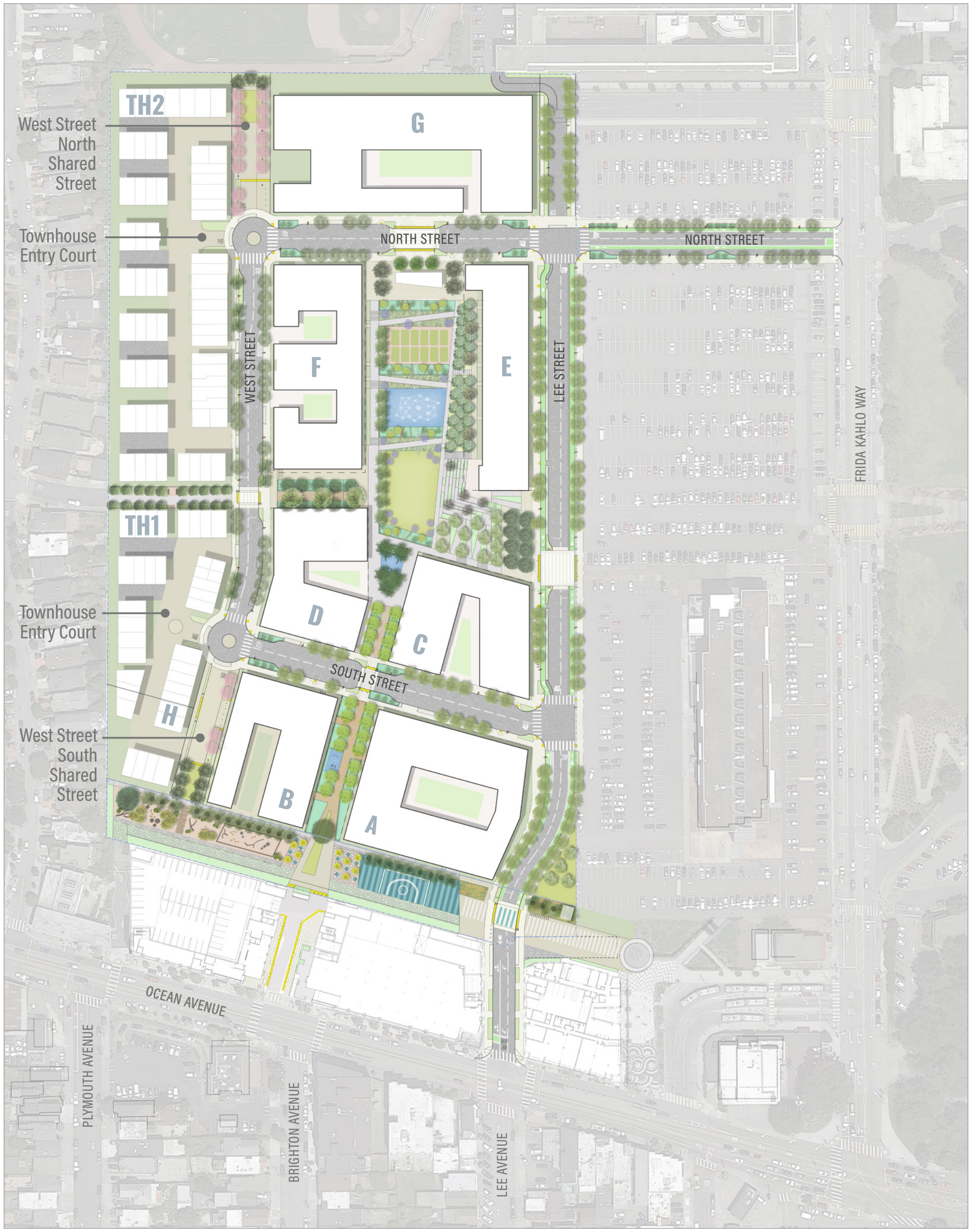


Figure 5.1–1: *Site Illustrative Plan*

5.2 STREET TYPOLOGY

Street Typology

The street typology is designed to promote safer streets and ensure traffic flows freely throughout the circulation network. It is determined by the following characteristics:

- **Circulation Context:** the number of connection points to adjacent streets.
- **Traffic Volume:** frequency and total amount of traffic flowing through the street.
- **Size:** street width and total number of lanes.

Street Types

The street types represented in the Balboa Reservoir neighborhood are listed below:

- **Mixed-Use Street:** Lee Avenue is designed as a mixed-use street for its adjacency to City College campus. Mixed-use streets serve a variety of needs, Lee Avenue is the place where campus life interfaces with the new residential neighborhood, including a great diversity of users.
- **Neighborhood Residential Lane:** narrower and lower volume publicly owned streets that tend to only accommodate traffic internal to the Balboa Reservoir neighborhood. These include North Street, South Street, and West Street.
- **Shared Streets:** shared streets are small-scale, single-surface streets that prioritize pedestrian use, but permit vehicles and bicycles to share the open space. Shared streets should be designed to emphasize their pedestrian scale and calm traffic. They offer opportunities to complement the open space network by creating pockets of usable open space.
- **Townhouse Entry Court/Private Drives:** primarily serving townhouse residents.

More detail can be found in Street Design by Individual Case.

LEGEND

🟨 *Mixed-Use Street*
🟧 *Neighborhood Residential Lane*
🟦 *Shared Street*
⬜ *Public Open Space*
🟩 *Townhouse Entry Court & Private Drive*
🟨 *Paseo (documented under Chapter 6 Open Space)*

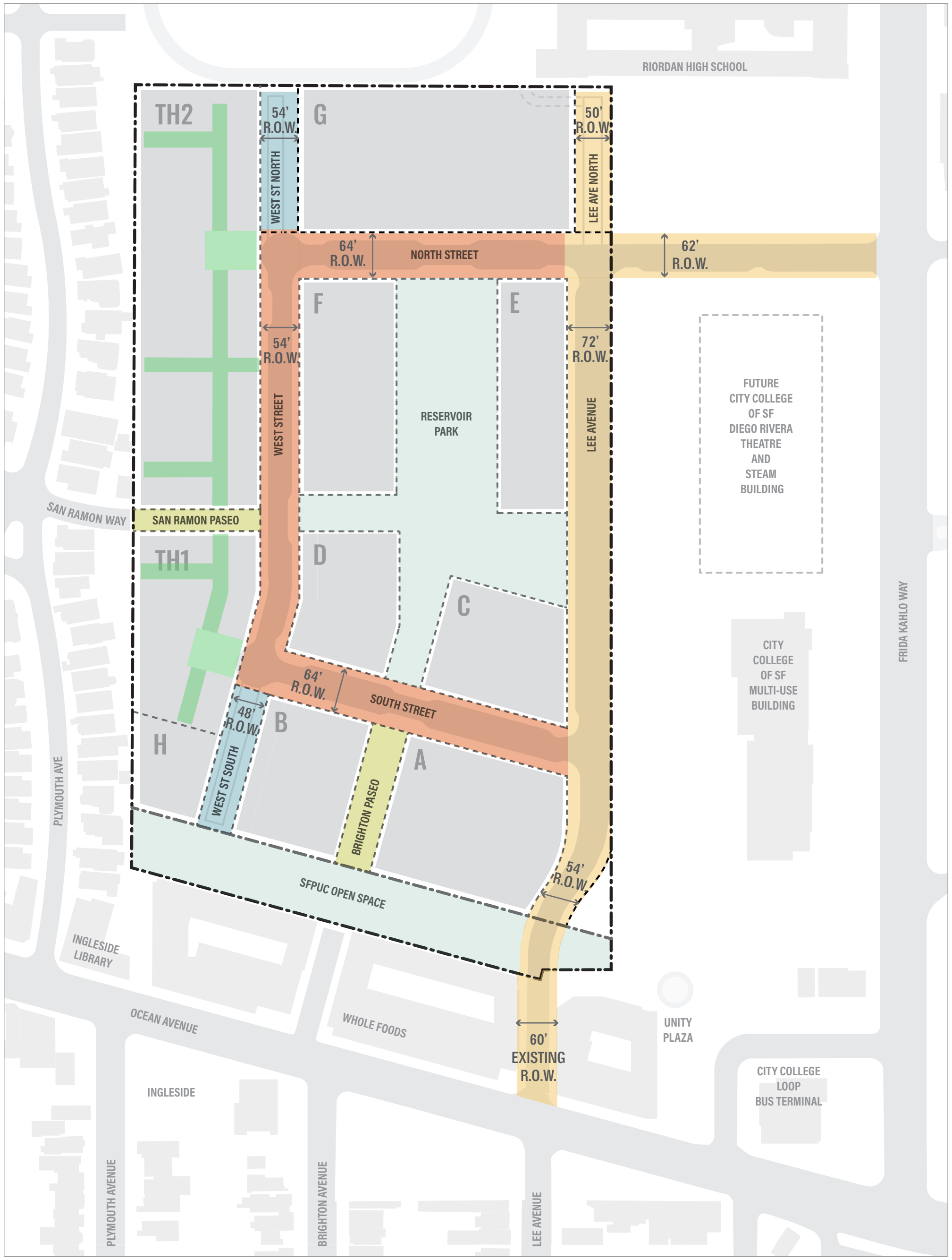


Figure 5.2–1: *Street Typology and Street Width*

5.3 CIRCULATION NETWORKS

Four circulation-related networks are illustrated on the following pages:

- Transit Network
- Pedestrian Network
- Bicycle Network
- Vehicular Network

Transit Network

The Balboa Reservoir neighborhood is ideally situated with multiple transit services nearby, including the MUNI K Line on Ocean Avenue, bus connections at the City College Terminal and Frida Kahlo Way, and the Balboa Park BART Station. In order to further develop an area-wide transportation strategy, the Balboa Reservoir team will continue developing its partnership with SFMTA and City College. The Balboa Reservoir neighborhood will implement cost-effective residential strategies that also meet the City's TDM ordinance.

LEGEND

K — *Muni Metro Rail*

8 49 — *Bus Route 8 & 49 (Every 10 min or less)*

29 43 — *Bus Route 29 & 43 (Every 10-20 mins)*

8BX — *Bus Route 8BX (Peak Services, Limited Hour)*

Ⓚ *Muni/Bus Stop*

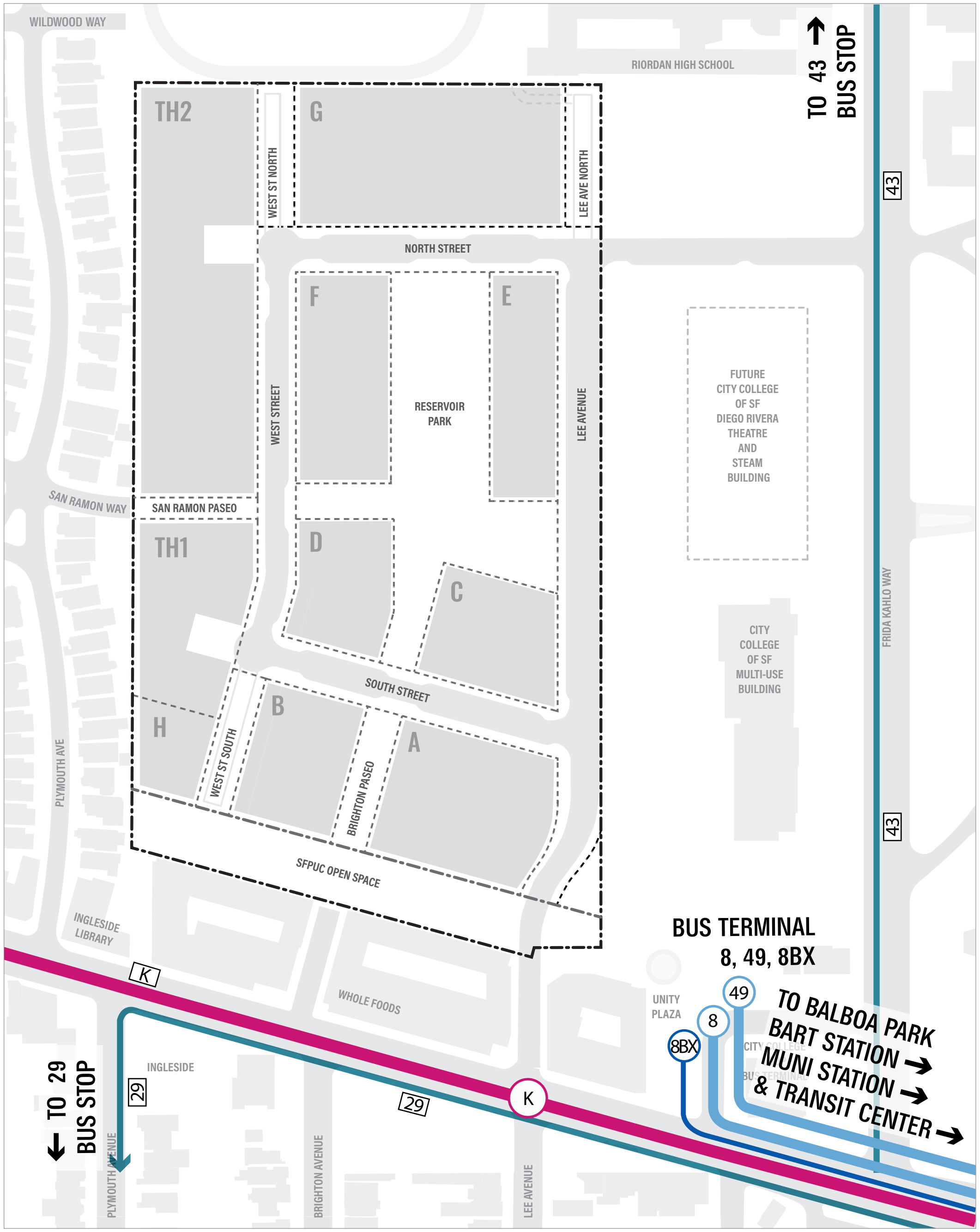


Figure 5.3–1: *Transit Network Diagram*

0 125 250 ft

Pedestrian Network

The Balboa Reservoir neighborhood prioritizes walking and biking. The surrounding street network creates direct access points, for residents and neighbors, to the central open space and connects to a family-friendly pedestrian and bike network. Raised crossings are located at key open space intersections, prioritizing pedestrians. Additionally, there are multiple pedestrian connections to public transportation and neighborhood services on Ocean Avenue.

LEGEND

🟨 *Raised Pedestrian Crossings*
🟩 *Standard Pedestrian Crossings*
🟦 *Primary Pedestrian Flow*
▦ *Secondary Pedestrian Flow*
● *MUNI Bus Stop*
●→ *MUNI Bus Terminal*
Ⓚ *MUNI Metro Stop*

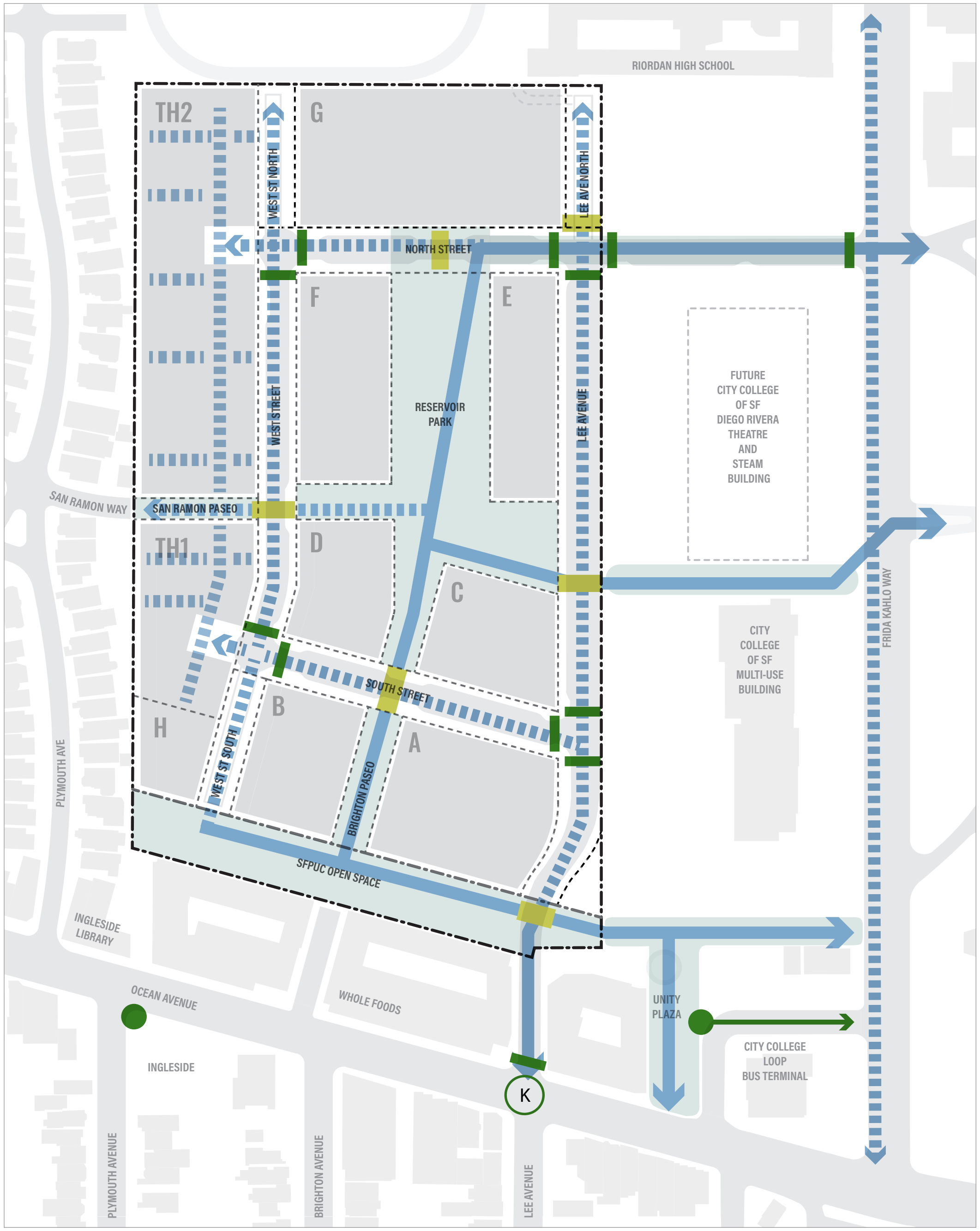


Figure 5.3–2: *Pedestrian Network Diagram*

Bicycle Network

The Balboa Reservoir bicycle network provides dedicated bike lanes on Lee Avenue linking to the Holloway Avenue Bike Route to Park Merced, as well as to the bike lanes on Frida Kahlo Way to Sunnyside and Ocean Avenue. Internal bike circulation is provided on North, South, and West Streets.

Each building will house a Class I bike storage room and Class II bike parking near building entries. A bike share station will be proposed at the intersection of the SFPUC Retained Fee Open Space and Lee Avenue.

Also, refer to Chapter 3 (Land Use) and Section 7.23 (On-Site Bicycle Parking) for bike parking requirements for buildings.

LEGEND

- ● *Potential Bike Share Station*
- ● *Class II Bike Parking for Building*
- ▬ *Bike Lanes: Class II**
- ▬ *Internal Bike Circulation*
- ▬ *Bike Lanes: Class IV**
- ◉ *Class II Bike Parking for Open Space Users*
- ▬ *Bike Route: Class III "Sharrow"**
- ▬ *Existing Bike Route*
- ⊟ *Bike Box Improvement*

**NACTO Bike Facilities Definition*

Class II: a portion of road reserved for the preferential or exclusive use of biking, indicated by road markings

Class III: travel lanes shared by bicyclists and vehicles

Class IV: bike lanes separated from traffic by physical barriers

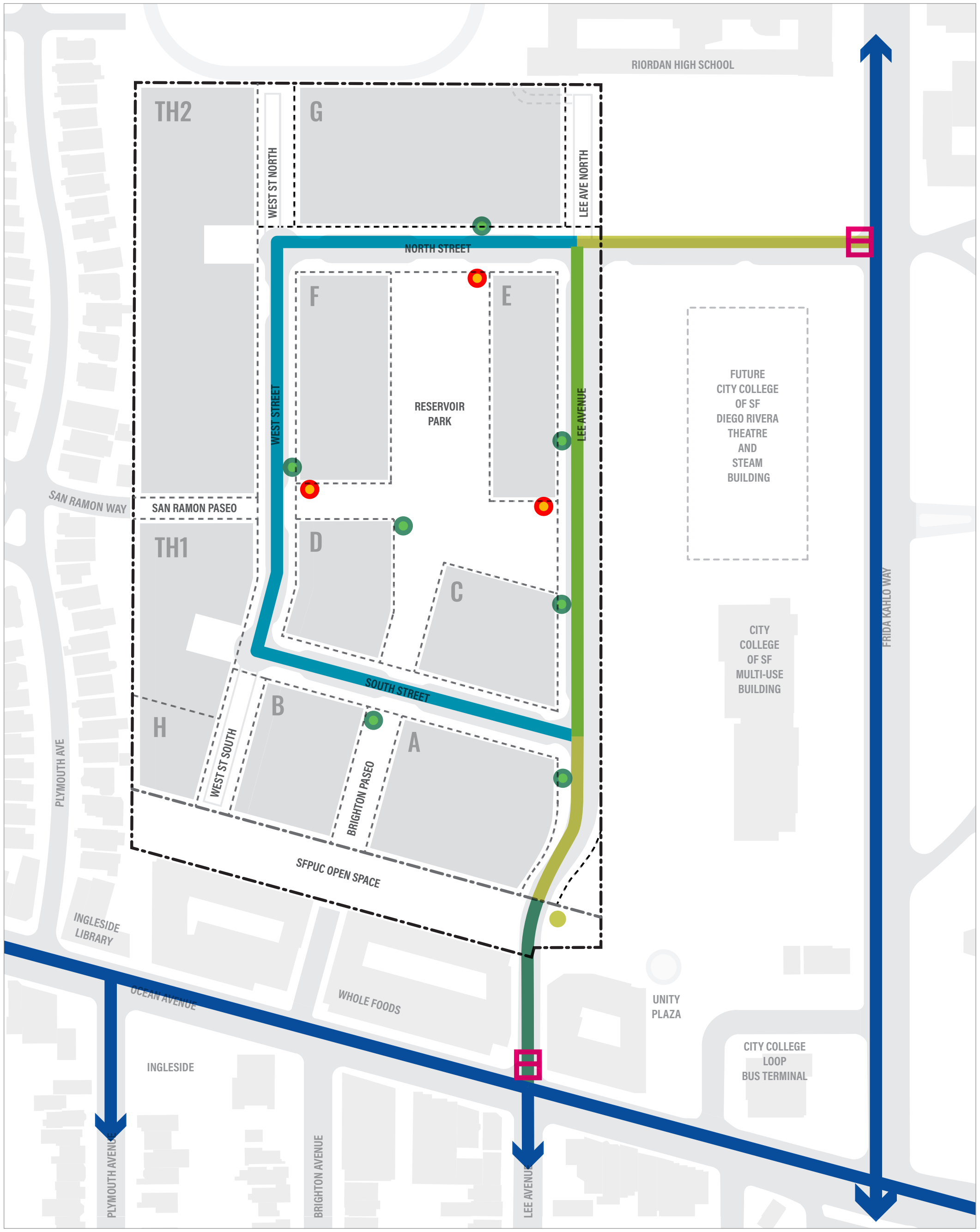


Figure 5.3–3: *Bicycle Network Diagram*

0 125 250 ft

Vehicle Network

Vehicular connections to the site shall be located at two access points: Lee Avenue at Ocean Avenue and Frida Kahlo Way at North Street.

The loop formed by North, West and South Streets at the interior of the site provides vehicle access to each building entry, loading zone, and garage. Streets are designed to slow down vehicles and support safe pedestrian and bicycle movement. Shared streets will provide access to townhouse units.

An above-grade public parking garage may potentially be located at either the northern or southern block of the site. Refer to Section 7.20 (Private Parking Garages) and Section 7.21 (Public Parking Garages) for additional information.

For a detailed study of streets and intersections, see Section 5.13 (Lee Avenue) through Section 5.17 (Townhouse Entry Courts and Private Drives).

LEGEND

▬ *Streets and auto access*

▮▮▮▮ *Shared street*

● ● ● *Entry courts and private drives at townhouses*

- - ➡ *One-way exit drive from Riordan High School*

◌ *Signalized intersection*

⃠ *Signalized intersection with no left turn into Lee Ave.*

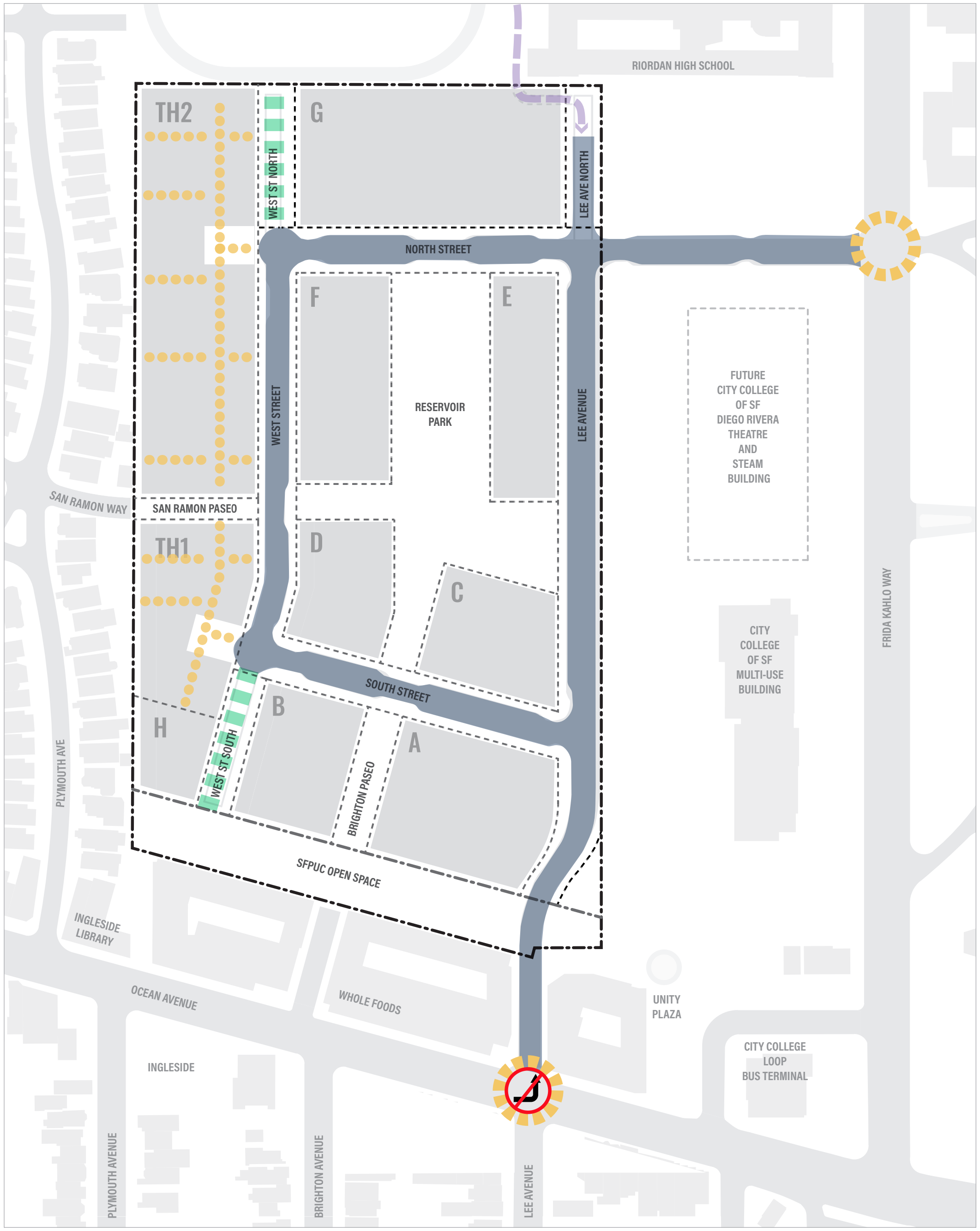


Figure 5.3–4: *Vehicle Network Diagram*

Street Design Standards and Guidelines

5.4 OVERVIEW

Streetscape is defined as the zone between the faces of buildings, including the publicly accessible right-of-way and the building setbacks. There are six streetscape zones referenced throughout the following Street Standards and Guidelines. Except for the drive lane zone, the categories are derived from the San Francisco Better Streets Plan.

Setback Zone

The setback zone is the area between the property line and the face of the building where transitions between public use at the sidewalk and private use inside the building occur. The adjacent users may occupy this zone for outdoor display, seating, and planting with appropriate permits.

Architectural elements that protrude into the street such as awnings, canopies, and marquees may also occupy this zone.

Pedestrian Throughway Zone

The pedestrian throughway zone is intended for accessible pedestrian travel only and should be clear of obstacles, including driveway aprons or other changes to cross slope. The walking surface should be stable, firm and slip-resistant.

Furnishing Zone

The furnishing zone provides a buffer between pedestrian and vehicular traffic. It also contains street trees, lighting, planting and site furnishings such as benches, trash receptacles, and bike racks.

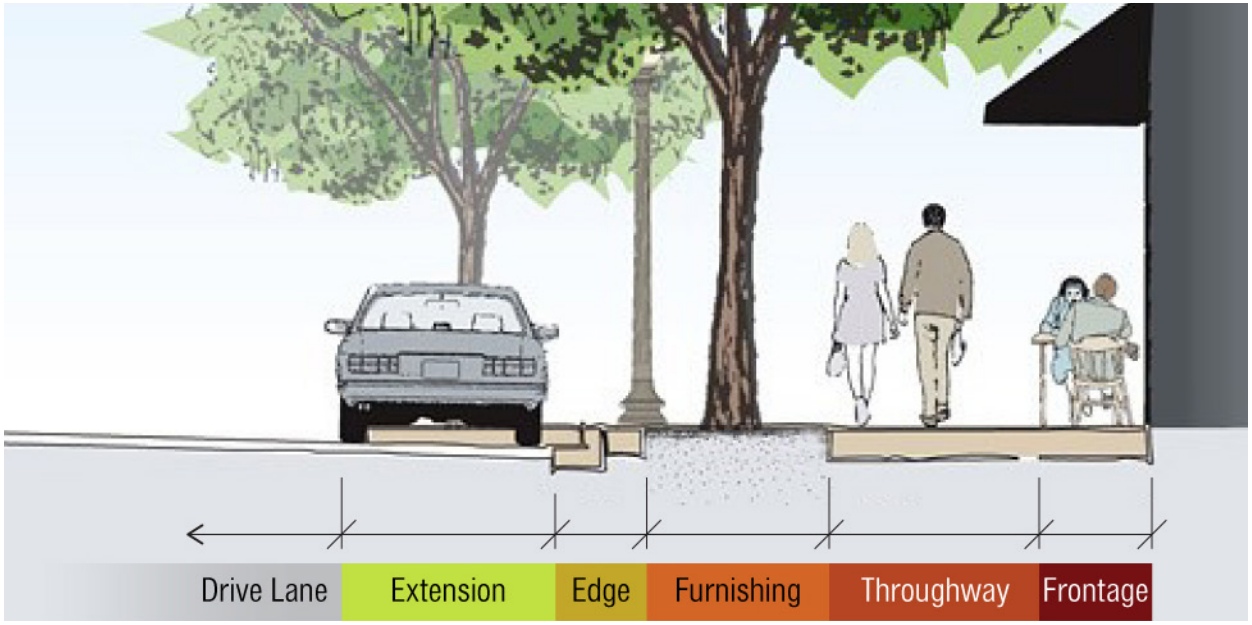


Figure 5.4–1: *Source: SF Better Streets Plan*

Edge Zone

The edge zone is the area intended to provide access to parallel parking from the sidewalk. The surface of the edge zone should be stable, firm and slip-resistant.

Extension Zone

The extension zone refers to specific conditions where the sidewalk extends into the parking lanes. Applications include curb extension, flexible use of parking lanes and bicycle parking, tree planting, and stormwater features in the parking lane.

Drive Lane Zone

The drive lane zone is allocated to vehicular travel. In this pedestrian and bicycle-prioritized neighborhood, the width of the vehicular drive lane should be minimized but should still provide fire access.

STANDARDS

S.5.4.1 Pedestrian Throughway Zone

- All streets shall provide at minimum a 6-foot-wide pedestrian throughway.
- At sidewalks where there is a continuous planting zone, a minimum of 3-foot by 5-foot passing zone at a maximum of 200-feet on center shall be provided.
- SF Public Works standard concrete paving shall be used at throughway zones.

S.5.4.2 Furnishing Zone

- Furnishing zones shall be surfaced with cast-in-place concrete or accessible permeable paving to allow rainfall to supplement street tree irrigation. For furnishing zones located adjacent to parking, a minimum of a 4-foot-wide accessible pathway should be provided centered to the parking space.
- See Section 5.9 (Street Planting Palette) for street planting requirements at furnishing zones.
- See Section 5.12 (Street Lighting) for street lighting requirements at furnishing zones.
- See Section 5.11 (Street Furniture) for site furnishing requirements at furnishing zones.

S.5.4.3 Extension Zone

- See Section 5.6 (Traffic Calming Strategies) for bulb-out and chicane design requirements.
- Accessible loadings zones and associated curb ramps shall be designed according to the Balboa Reservoir Infrastructure Plan (Figure 6.9 Proposed Service & Loading Plan). Post-entitlement, the ADA coordinator and SFMTA curb management staff shall provide final approval of loading zones.

S.5.4.4 Drive Lane

- All streets shall comply with SF Fire Department fire access requirements. For more information see the Balboa Reservoir Infrastructure Plan (Section 6.2.4 Fire Department Access).

S.5.4.5 Curb Cut

- See Section 7.20 (Private Parking Garages), Section 7.21 (Public Parking Garages), and Section 7.22 (Facilities for Residential Moving) for garage/loading access curb cuts.

Typical Streetscape Accessibility Requirements and Layout

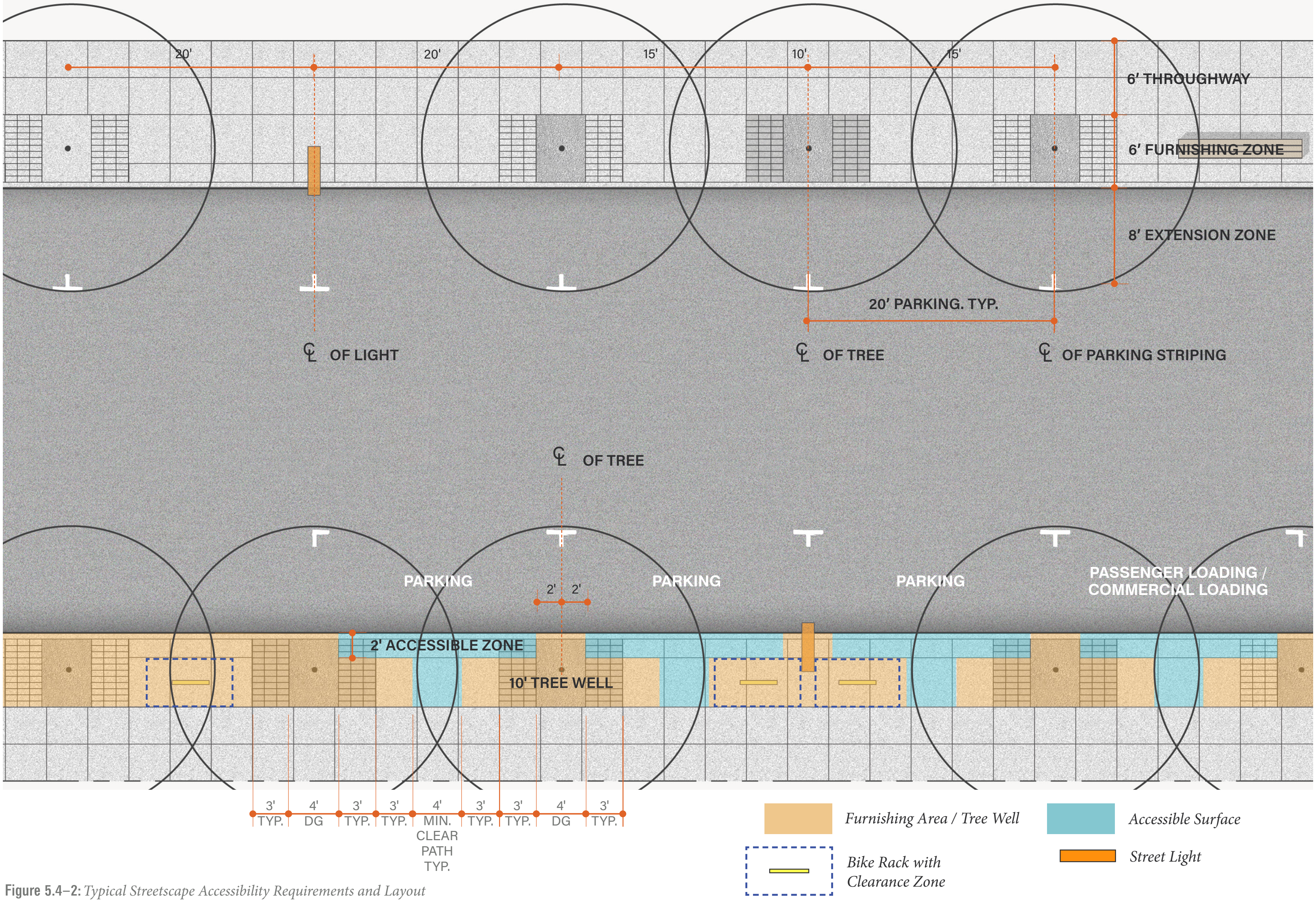


Figure 5.4–2: *Typical Streetscape Accessibility Requirements and Layout*

5.5 STREET TREES

City Policies

As the Better Streets Plan describes, street trees offer benefits such as traffic calming, shade, stormwater runoff reduction, support for ecological habitats, air quality improvements, and the potential to enhance property values and retail activity by creating a comfortable pedestrian environment. They are also a reminder of natural cycles and changing seasons.

City codes require new development projects to plant a 24-inch box tree for every 20 feet along the property's street frontage. The following City Codes apply to the Balboa Reservoir site:

- SF Planning Code – Section 138.1: Streetscape and Pedestrian Improvements
- SF Public Works Code – Article 16: Urban Forestry Ordinance
- SF Administrative Code – Chapter 98: The Better Streets Policy
- SF Environment Code – Chapter 12: Urban Forestry Council

For a complete a street tree species list, see Section 5.9 (Street Planting Palette).

STANDARDS

S.5.5.1 Street Trees

Street trees shall be in a minimum 24-inch box at installation and spaced at max 20 feet on center along the property street frontage. See Figure 5.5–2 for additional tree planting requirements.

S.5.5.2 Tree Spacing and Utility Coordination

Although regular tree spacing is not always possible due to curb cuts, sub-grade utilities, or other sidewalk elements, regular spacing shall be maintained to the extent possible. Utility planning and street tree layouts shall be carefully coordinated to minimize tree gaps. See Figure 5.5–2 for typical street layout. See also the Balboa Reservoir Master Infrastructure Plan (Section 8: Utility Layout and Separation) for more details.

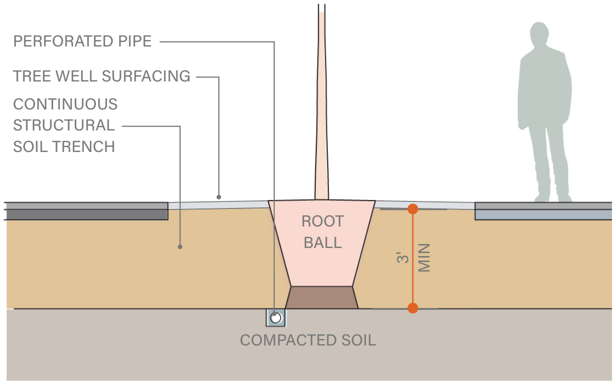


Figure 5.5–1: *Typical Section of Sand-Based Structural Soil*

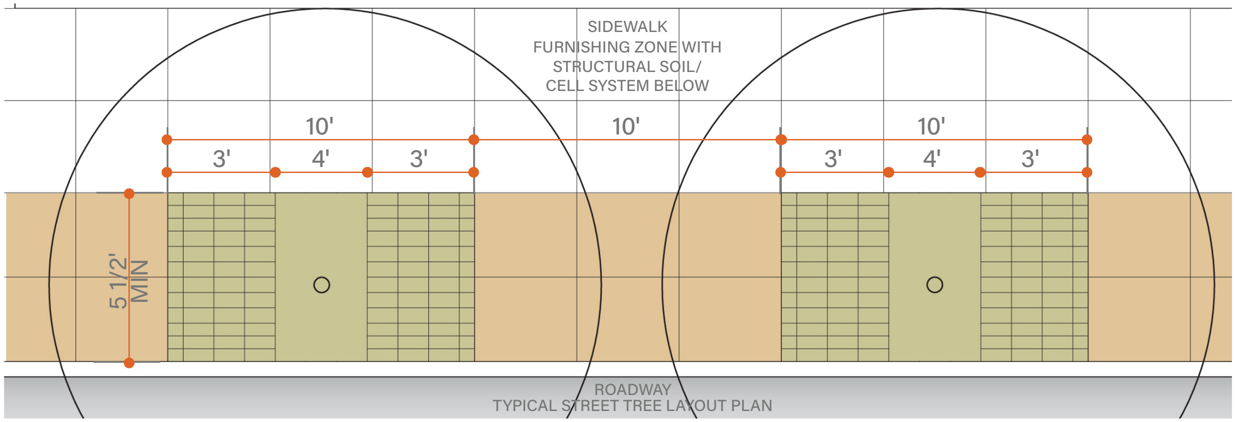


Figure 5.5–2: *Tree Well Diagram*

S.5.5.3 Soil Preparation for Street Trees

In order to maintain healthy growing conditions, each tree shall have at least 500 cubic feet of growing medium 3 feet deep. This can be achieved in several ways including structural cells placed under the sidewalk or continuous trenches of sand-based structural soils in the furnishing zone. See Figure 5.5–1.

S.5.5.4 Tree Wells and Sand-Based Structural Soil

Where trees are spaced 20 feet on-center, successive tree wells should be connected with a structural soil trench in the furnishing zone. Sand-based structural soil involves a blend of soil and sand, which is not "trademarked" and is uniformly graded. This blend provides structural strength and high levels of compaction, while allowing for aeration, fertility, and percolation.

S.5.5.5 Streetscape Planting

Landscape material shall be planted up to the crosswalk edge on sidewalks, provided it does not exceed 3 feet in height as measured from the street.

S.5.5.6 Street Trees, Intersection Design, and Visibility

Sight line clearance requirements for the placement of trees and plantings shall comply with the 'Street Tree Planting' guidelines by SF Public Works.

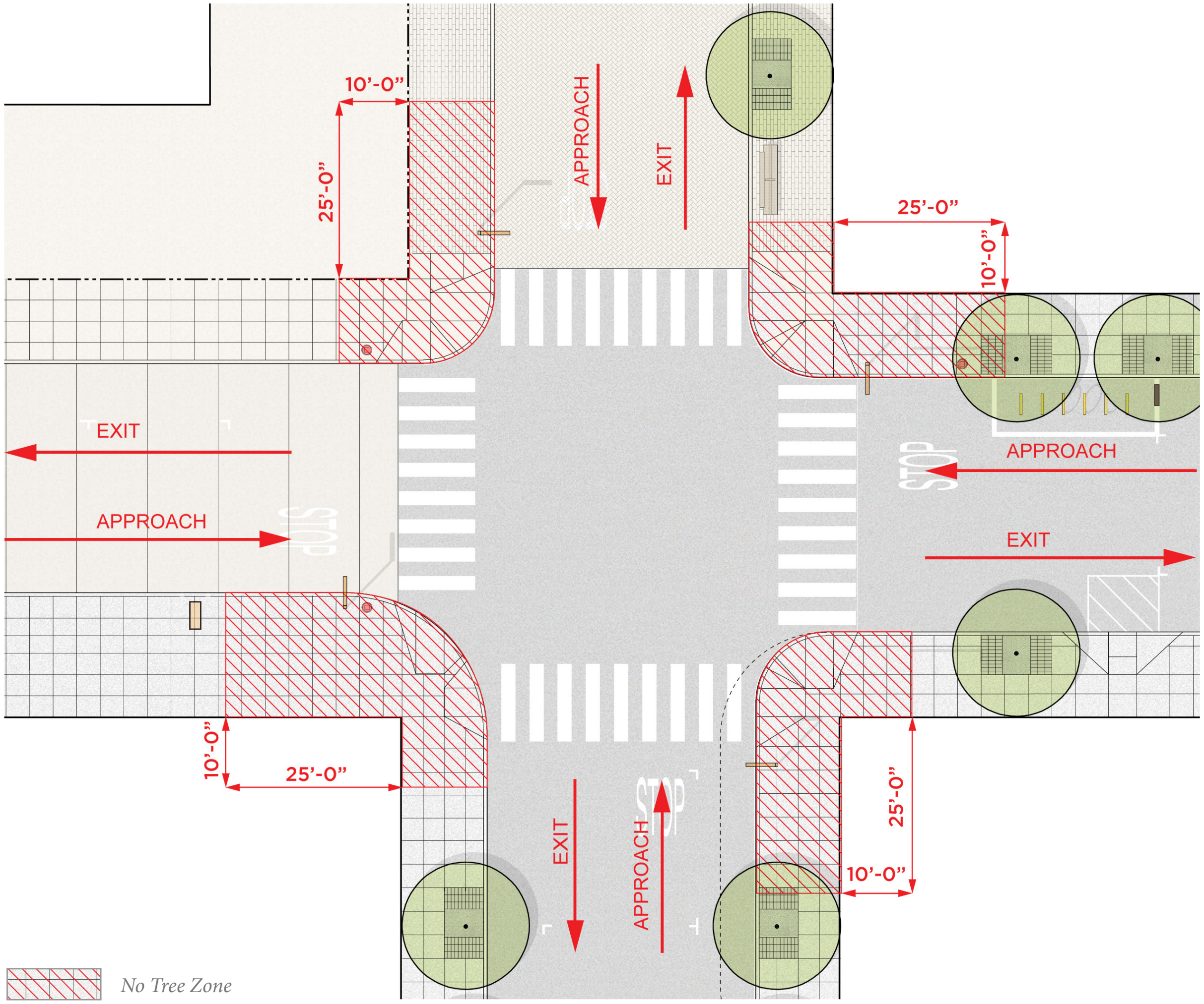


Figure 5.5–3: *Typical Intersection Sight Line Clearance*

On the approach to any intersection, trees shall be planted no closer than 25 feet from the corner of the property line. On the far side of any intersection, trees shall be planted no closer than 10 feet from the corner of the property line.

S.5.5.7 Tree Vertical Clearance

Trees shall have a vertical clearance of 84 inches over the sidewalk measured from the lowest branch, and 14 feet of vertical clearance for any portion of the tree that hangs over the roadway.

5.6 TRAFFIC CALMING STRATEGIES

To promote a pedestrian-friendly environment, the following strategies have been incorporated into the DSG. For more information see Balboa Reservoir Infrastructure Plan (Section 6.6: Traffic Calming).

STANDARDS

S.5.6.1 Chicane

Chicanes shall be installed along West Street. A chicane is a form of bulb-out added to the roadway to shift the alignment and slow down vehicles. It provides additional sidewalk space, and thus opportunities for additional landscaping at the street, while visually reducing the width of drive lane. A chicane is one of the potential traffic calming measures that can be used for the treatment of West Street. SFMTA shall have final authority on the location and design of the chicane.

S.5.6.2 Raised Crossings

Raised pedestrian crosswalks prioritize pedestrians in the vehicular traffic zone by slowing down vehicles. A raised crosswalk shall be provided at the locations shown in Figure 5.3–2 (Pedestrian Network Diagram) .

Chicane

Mountable traffic circle

S.5.6.3 Bulb-Outs

Bulb-outs (also known as curb extensions) shall be provided at intersections and mid-block crossings to shorten pedestrian crossings, and to provide opportunities for stormwater management and streetscape planting. The width of each bulb-out shall be maximized based on vehicle turning radius and adjacent bike lane requirements. SFMTA shall have final authority on the location and design of bulb-outs.

GUIDELINES

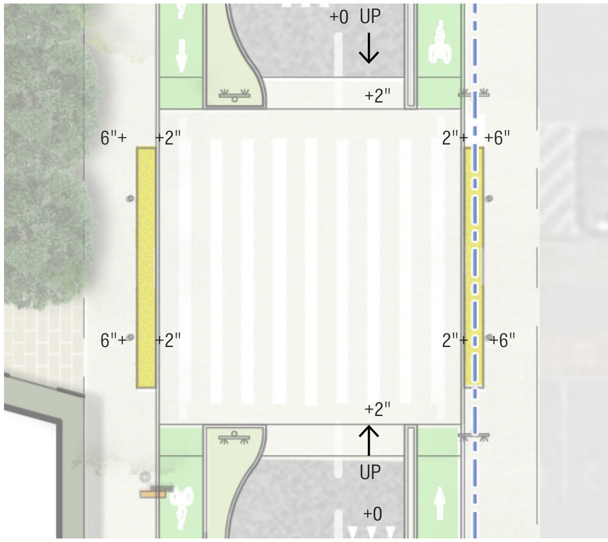
G.5.6.1 Mountable Traffic Circle

A mountable traffic circle should be provided at the intersection of West Street and North Street and the intersection of West Street and South Street. Mountable traffic circles provide an opportunity to create neighborhood identity while facilitating the childcare drop-off at South Street.

Each mountable traffic circle shall accommodate the turning radius of a typical passenger vehicle while allowing large vehicles such as firetrucks to drive over the raised traffic circle. Highly textured traffic-rated paving material shall be used in the traffic circle. The final layout and design shall be subject to SF Public Works and SFMTA approval.

Raised street crosswalk

Bulb-out



Raised crosswalk at Lee Avenue and Reservoir Park

5.7 STREET UTILITIES AND PARKING METERS

The layout of street utilities and parking meters will be carefully coordinated with street tree placement to minimize potential conflict between trees and street furniture.

STANDARDS

S.5.7.1 Above-Grade Utilities Location

All above-grade utilities within the right-of-way shall be located within the furnishing zone and shall not interfere with the clear throughway zone. All laterals and appurtenances must be outside of any driveway curb cuts.

S.5.7.2 Parking Meters and Other Street Elements

All parking meters and other street elements, including pay and display machines and multi-space meters, shall be placed in the furnishing zone. Street elements shall be organized and consolidated where possible.

S.5.7.3 Parking Meters

SFMTA standard parking meters shall be provided per SFMTA standards. Legislation will be required from SFMTA to install parking meters and establish time limits.

GUIDELINES

G.5.7.1 Location and Access

All utilities should be placed below grade wherever feasible or be clustered around driveway curb cuts. When possible, utilities should be grouped and should allow clear access to the throughway zone adjacent to street furnishing elements.

Street Palette

5.8 OVERVIEW

Streets serve as the primary realm for daily pedestrian life and vehicular circulation throughout the Balboa Reservoir neighborhood. The following sections outline the materials and planting palettes that help define the Balboa Reservoir neighborhood's public realm identity.

Most of the streets will be publicly owned except for the dead end sections of West Street and Lee Avenue and the driveways and entry courts within the townhouse blocks. These private streets are primarily used as loading, garage access, and driveway access for buildings. Privately owned streets allow for more flexibility on material selection and streetscape amenities to create a pedestrian-prioritized streetscape. Privately owned streets will be maintained by the HOA and will remain accessible to the public. Publicly owned streets are subject to City standards and material requirements.

The following diagram identifies the streets where City standard materials and lighting palettes will be used. The street planting palette is applicable for all streets within the Balboa Reservoir neighborhood.

LEGEND

🟩 *Publicly Owned Street with City-Standard Materials and Lighting Fixtures*

🟦 *Privately Owned and Publicly Accessible Street with Non-City-Standard Materials and Lighting Fixtures*

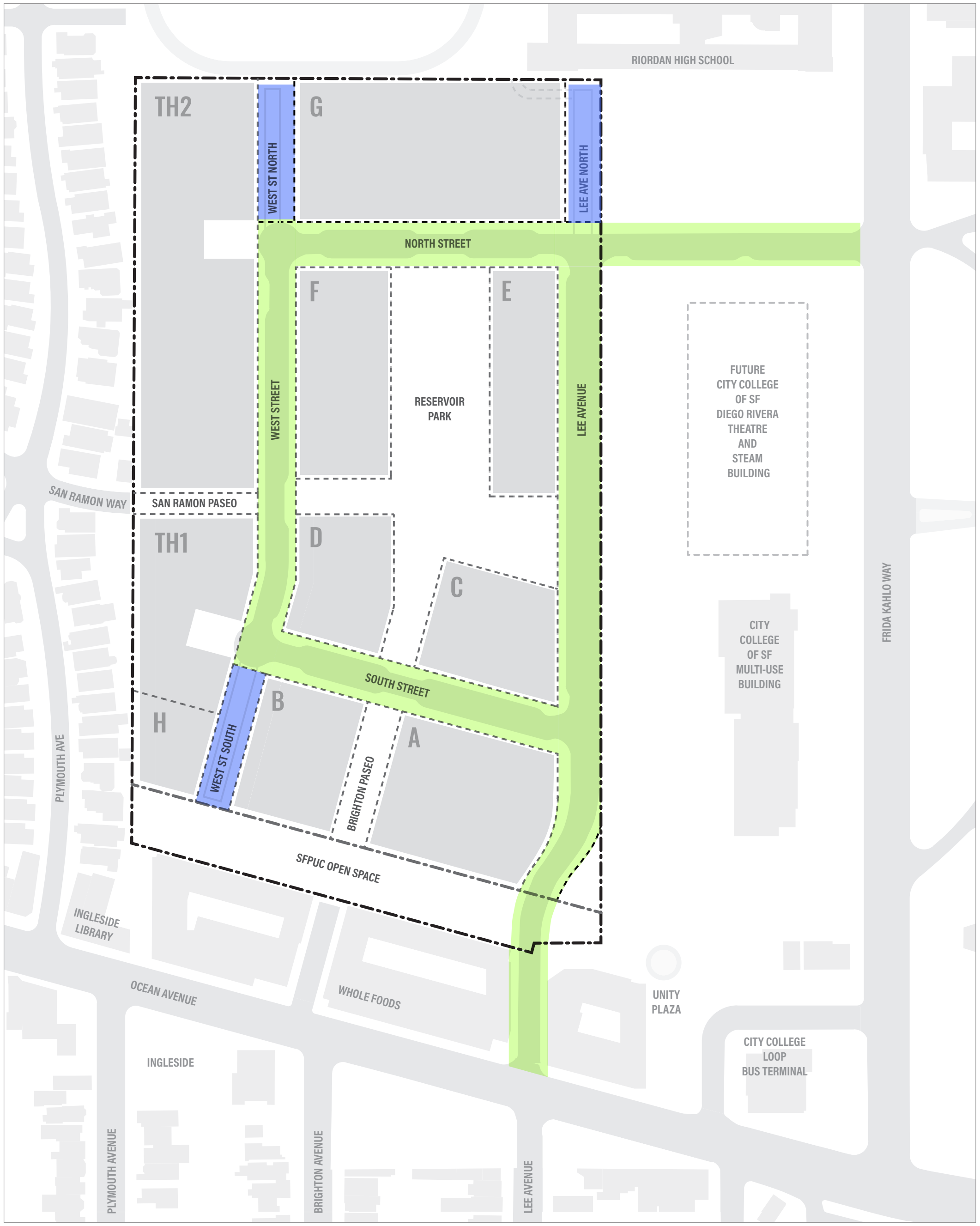


Figure 5.7–1: *Street Ownership & Material Application Diagram*

0 125 250 ft

5.9 STREET PLANTING PALETTE

Sustainable plant choices are those that are climate-adapted and that favor relatively large tree canopies that can capture carbon, hold rainwater, provide shade, mitigate wind, enhance local biodiversity, and encourage pedestrian activity. Plants shall be selected according to standards approved by the City of San Francisco (sfplantfinder.org) for adaptability to urban soil conditions.

There are three types of plantings in the right-of-way:

- Street trees
- Low shrubs and groundcovers
- Low shrubs and groundcovers for stormwater treatment.

The following symbols, adapted from sfplantfinder.org, are used throughout the planting palette to denote place of origin:

SF San Francisco native species

CA California native species

EX Exotic species, not native to the region or state

Street Trees

Street trees are chosen for their ability to withstand San Francisco's strong wind and fog, compaction, limited soil volumes, and the harsh alkaline soil conditions found in urban settings. All trees, except the Southern California native Catalina ironwood, are from Australia where growing conditions most closely resemble urban conditions in San Francisco. See Section 4.8 (Biodiversity) for more information on Balboa Reservoir neighborhood's biodiversity goal

LEGEND

● *Street Tree Type 1 – Evergreen Large Size Tree with Rounded Shape*

● *Street Tree Type 2 – Evergreen Medium Size Tree with Oval Shape*

● *Street Tree Type 3 – Evergreen Large Tree with Oval Shape*

● *Street Tree Type 4 – Evergreen Small Flowering Tree*

● *Street Tree Type 5– Evergreen Large Focal Point Tree*

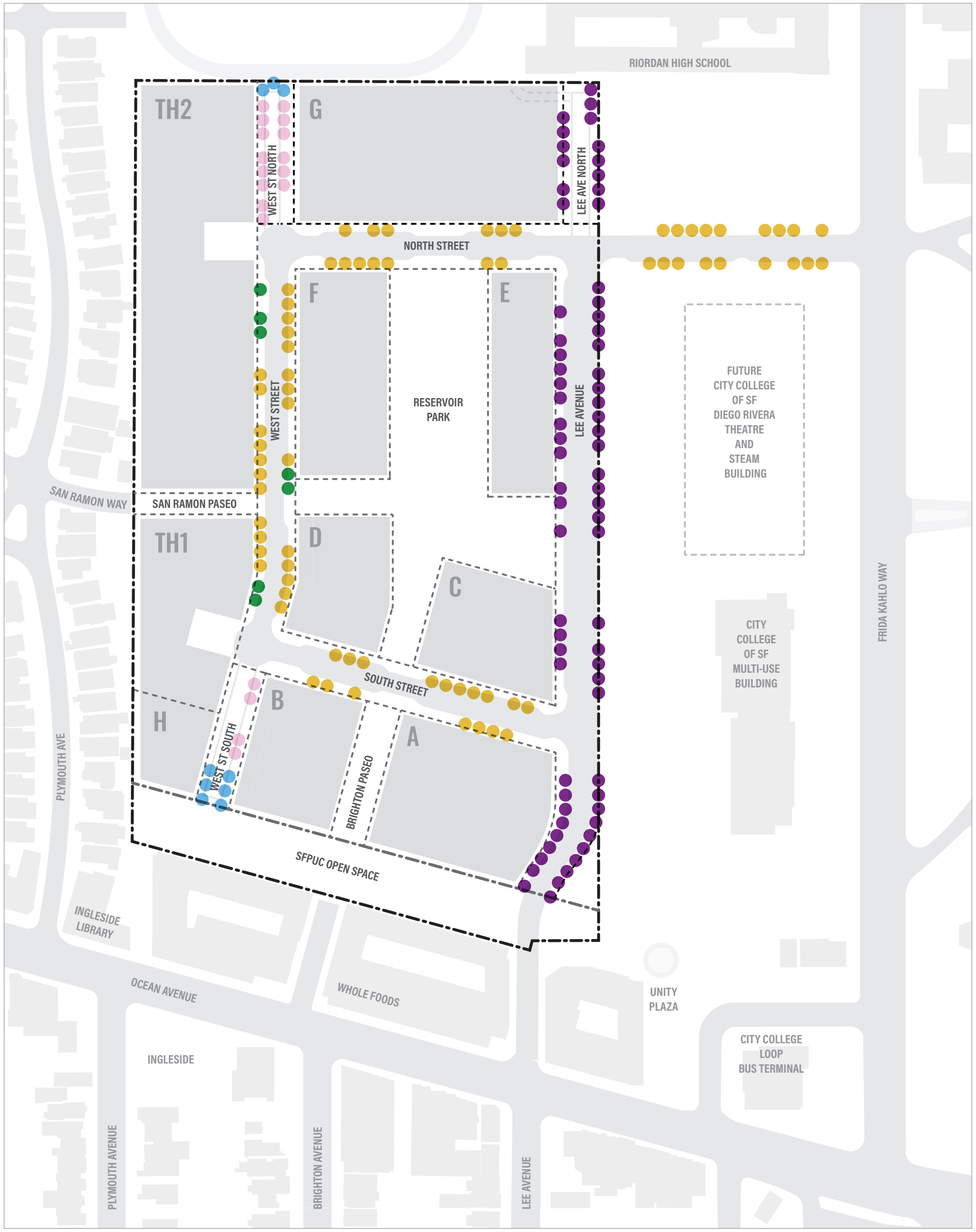
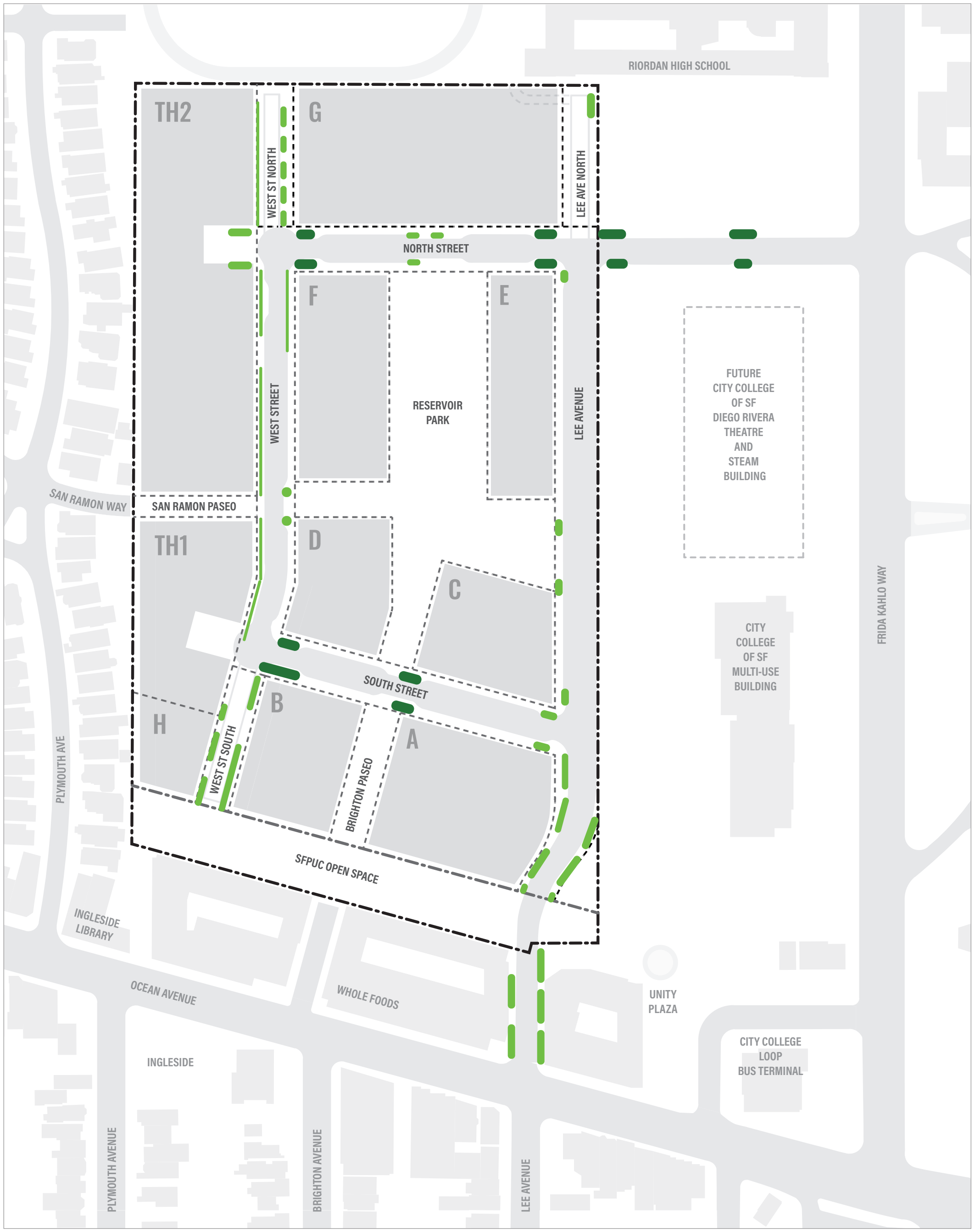


Figure 5.9–1: *Street Trees Type Diagram*

Low Shrubs and Groundcovers

Plantings in the right-of-way and the associated irrigation systems are encouraged when regular maintenance and replacement can be guaranteed by the adjacent property owner. Low plantings need to be sturdy and low-maintenance and should be resistant to trampling and other environmental conditions. Woody shrubs and large-leaved succulents are discouraged. Plants that have proven to do well are a very few selected monocots that withstand a wide range of soil, drainage, and compaction conditions, and are crush resistant and drought-tolerant, such as Dietes and Lomandra. Additional species are Muhlenbergia lindheimeri and Muhlenbergia emerslyii. Those plantings can be supplemented with climate-adapted desert and subtropical species, such as Yucca, Beschorneria, Agave, and Aloe arborescens. These right-of-way shrubs and groundcovers will have some overlap with those used in the open space to establish continuity.



LEGEND

🟩 *Low Shrubs and Groundcovers*

🟩 *Low Shrubs and Groundcovers for Stormwater Treatment*

Figure 5.9–2: *Low Shrubs and Groundcover Planting Diagram*

Low Shrubs and Groundcover Planting for Stormwater Treatment

Stormwater plantings within the right-of-way are selected to withstand all the above conditions in addition to seasonal flooding. Some limited use of natives is possible.
A preliminary list of stormwater plantings are:

- Elymus glaucus (Blue Wild Rye)
- Cornus sericea (Redtwig Dogwood)
- Fragaria chiloensis (Beach Strawberry)
- Lomandra longifolia (Spiny Head Mat Rush)
- Carex tumulicola (Berkeley Sedge)
- Chondrapetalum elephantinum (Giant Cape Rush)
- Muhlenbergia emersleyi (Emersly's Muhley Grass)

STANDARDS

S.5.9.1 Native Plant Ratio

100% of non-turf green areas must be climate appropriate plants, within which 75% must be native species.

Figure 5.9–3: *Drought Tolerant and Low Maintenance Low Planting at Street*

STREET TREES, preferred species

Climate Appropriateness
CA

Bloom Time
Summer

Water Needs
None

Associated Wildlife
Birds

Habitat Value
Fruit

Size Determined by SF Urban Forestry Council
Large Street Tree

Catalina Ironwood *Type 1* ●
Lyonothamnus

Climate Appropriateness
EX

Bloom Time
Spring, Summer

Water Needs
Moderate

Associated Wildlife
Birds, Bees

Habitat Value
Fruit

Size Determined by SF Urban Forestry Council
Large Street Tree

Native Frangipani *Type 2* ●
Hymenosporum flavum

Climate Appropriateness
EX

Bloom Time
June to September

Water Needs
Moderate

Associated Wildlife
Bees, Butterflies, Birds

Habitat Value
Fruit, Seeds

Size Determined by SF Urban Forestry Council
Large Street Tree

Primrose Tree *Type 1* ●
Lagunaria patersonii

Climate Appropriateness
EX

Bloom Time
Spring

Water Needs
None

Associated Wildlife
Birds, Butterflies

Habitat Value
Fruit

Size Determined by SF Urban Forestry Council
Large Street Tree

Brisbane Box *Type 2* ●
Lophostemon confertus

STREET TREES, preferred species

Paperbark Tea Tree
Melaleuca quinquenervia

Type 3 ●

Climate Appropriateness
EX

Bloom Time
Summer, Fall

Water Needs
None

Associated Wildlife
Birds, Bees

Habitat Value
Fruit, Shelter

Size Determined by SF Urban Forestry Council
Medium Street Tree

Toyon
Heteromeles arbutifolia

Type 4 ●

Climate Appropriateness
CA

Bloom Time
Summer

Water Needs
Low

Associated Wildlife
Birds, Bees

Habitat Value
Pollinators, Fruit

Size Determined by SF Urban Forestry Council
Small Street Tree

Water Gum
Tristaniopsis laurina

Type 3 ●

Climate Appropriateness
EX

Bloom Time
Spring, Summer

Water Needs
Moderate

Associated Wildlife
Butterflies

Habitat Value
Fruit, Shelter

Size Determined by SF Urban Forestry Council
Medium Street Tree

Mountain Lilac
Ceanothus 'Ray Hartman'

Type 4 ●

Climate Appropriateness
CA

Bloom Time
Winter

Water Needs
Low

Associated Wildlife
Birds, Bees

Habitat Value
Fruit, Pollinators

Size Determined by SF Urban Forestry Council
Small Street Tree

STREET TREES, preferred species

Monterey Cypress
Hesperocyparis macrocarpa

Type 5 ●

Climate Appropriateness
CA

Bloom Time
Fall

Water Needs
Low

Associated Wildlife
Birds

Habitat Value
Fruit

Note
Used at Private Shared Street

Silk Oak
Grevillea robusta

Type 5 ●

Climate Appropriateness
EX

Bloom Time
Spring

Water Needs
None

Associated Wildlife
Birds, Bees

Habitat Value
Pollinators

LOW SHRUBS AND GROUNDCOVERS, preferred species

Climate Appropriateness

CA

Bloom Time
Summer, Spring, Fall

Water Needs
Low

Associated Wildlife
Bees, Butterflies

Habitat Value
Pollinators, Buds/Greens

California Buckwheat
Eriogonum fasciculatum

Climate Appropriateness

EX

Bloom Time
July-Nov

Water Needs
Low

Associated Wildlife
Birds

Habitat Value
Buds/Greens, Cover

Gooding's Muhly
Muhlenbergia emersleyi

Climate Appropriateness

SF CA

Bloom Time
Spring, Summer

Water Needs
Low

Associated Wildlife
Bees, Birds, Butterflies

Habitat Value
Pollinators, Cover

California Poppy
Eschscholzia californica

Climate Appropriateness

SF CA

Bloom Time
Spring, Summer, Fall

Water Needs
Low

Associated Wildlife
Birds, Butterflies

Habitat Value
Buds/Greens, Cover, Pollinators

California Sagebrush
Artemisia californica

Climate Appropriateness

SF CA

Bloom Time
Summer, Fall

Water Needs
Low

Associated Wildlife
Butterflies, Bees, Hummingbirds

Habitat Value
Buds/Greens, Pollinators

Sage and Variety
Salvia "Bee Bliss" and Variety

Climate Appropriateness

EX

Bloom Time
Spring, Fall

Water Needs
Low

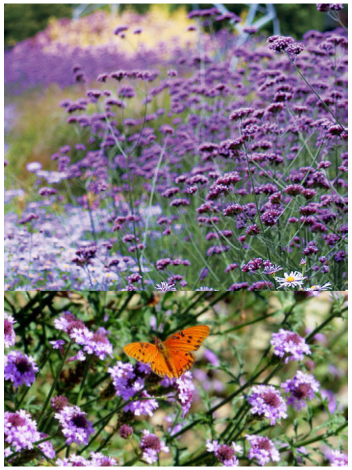
Associated Wildlife
Butterflies, Bees, Hummingbirds

Habitat Value
Buds/Greens, Pollinators

Striped Fortnight Lily
Dietes grandiflora 'variegata'

Figure 5.9–4: *Regular Planting Palette for Bulb-Outs and Sidewalks*

LOW SHRUBS AND GROUNDCOVER, preferred species



Cedros Island Verbena
Verbena lilacina "De La Mina"

Climate Appropriateness
CA

Bloom Time
Spring/Summer

Water Needs
Moderate

Associated Wildlife
Butterflies

Habitat Value
Buds/Greens

Idaho Fescue
Festuca idahoensis

Climate Appropriateness
CA

Bloom Time
Summer

Water Needs
Low

Associated Wildlife
Butterflies, Insects

Habitat Value
Buds/Greens

Yellow/Red Yucca
Hesperaloe parviflora

Climate Appropriateness
EX

Bloom Time
Summer

Water Needs
Low

Associated Wildlife
Butterflies, Insects

Habitat Value
Pollinators

Torch Aloe and Aloe Variety
Aloe arborescens

Climate Appropriateness
EX

Bloom Time
February to September

Water Needs
Low

Associated Wildlife
Bees, Birds

Habitat Value
Pollinators, Buds/Greens

Smooth Agave and Agave Variety
Agave desmettiana

Climate Appropriateness
EX

Bloom Time
Rarely Flowers

Water Needs
Moderate

Associated Wildlife
Bees, Birds

Habitat Value
Pollinators, Buds/Greens

LOW SHRUBS AND GROUNDCOVERS FOR STORMWATER TREATMENT, preferred species

Blue Wild-Rye
Elymus glaucus

Climate Appropriateness
CA

Bloom Time
Summer

Water Needs
Low

Associated Wildlife
Butterflies, Bees, Insects

Habitat Value
Buds/Greens, Cover

American Dogwood
Cornus sericea

Climate Appropriateness
EX

Bloom Time
Spring to Fall

Water Needs
Low

Associated Wildlife
Butterflies, Birds

Habitat Value
Fruit, Cover

Berkeley Sedge
Carex tumulicola

Climate Appropriateness
CA

Bloom Time
Winter, Spring

Water Needs
Low

Associated Wildlife
Birds

Habitat Value
Buds/Greens, Cover

Fragaria chiloensis
Coast Strawberry

Climate Appropriateness
SF CA

Bloom Time
Spring, Winter

Water Needs
Low

Associated Wildlife
Bees, Birds, Butterflies

Habitat Value
Cover, Fruit

Large Cape Rush
Chondropetalum elephantinum

Climate Appropriateness
EX

Bloom Time
Summer/Fall

Water Needs
Low

Associated Wildlife
None

Habitat Value
Cover

Douglas Iris
Iris douglasiana

Climate Appropriateness
SF CA

Bloom Time
Winter, Spring

Water Needs
Low

Associated Wildlife
Bees, Birds, Butterflies

Habitat Value
Buds/Greens, Nesting

5.10 STREET PAVING MATERIALS

Paving materials are selected to withstand extensive wear and to signify the circulation hierarchy. The street network in the Balboa Reservoir neighborhood consists of publicly owned and privately owned streets which will be maintained by SF Public Works and private developers respectively and will have different standards and guidelines.

Publicly Owned/Maintained Streets

STANDARDS

S.5.10.1 Public Works Specification

The design of the public right-of-way sidewalk and roadway shall be compliant with SF Public Works standard specifications and shall deploy the latest approved list of paving materials.

S.5.10.2 Roadway

Standard roadway asphalt shall be used on roadways. Vehicular concrete paving shall be used at key raised crosswalks to prioritize pedestrians and enhance open space network connections.

S.5.10.3 Sidewalk

Concrete paving shall be used and designed to meet load-bearing requirements. The materials shall be able to provide level surfaces onto which furnishings, stages and elements can be secured. At the intersections of mid-block crossings, unit paving shall be used at 18 inches in length (in the direction of travel). Where a sidewalk abuts a plaza, sidewalk paving materials shall be coordinated with the plaza paving to create a continuous public space.

S.5.10.4 Warning Paving

City standard detectable warning paving shall be used at raised crosswalks and curb ramps.

GUIDELINES

G.5.10.1 Raised Crosswalk

Custom crossing design using materials in compliance with SF Public Works approved material palette should be encouraged in all key street intersections and park entrances to signify pedestrian priority, add neighborhood character, and enhance place-making.

G.5.10.2 Unit Paving at Parallel Parking

Unit paving should be used at parallel parking. Where possible, permeable unit paving should be considered for stormwater management subject to City approval.

Crosswalks

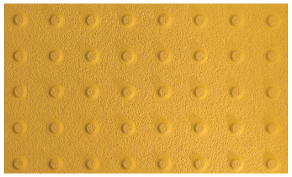
Thermoplastic crossing

Thermoplastic crossing with custom pattern inlay

Traffic Lane

City standard asphalt

Warning Pavers



Warning pavers, cast intact

Parallel Parking

4"x 8" dark grey paver

Pedestrian Throughway/ Protected Bike Lane Median

Cast-in-place concrete; medium gray w/ silica carbide and water jet finish

Tree Well Surfacing

Cobble stone with split sides and flamed top or split top and sides

Tree Well Mulch

¾" minimum crushed black basalt

Figure 5.10–1: *City-Approved Materials for Publicly Owned Streets*

Privately Owned/Maintained Streets

In privately owned and maintained streets, paving materials are not limited to the SF Public Works standard paving palette. Privately owned streets provide an opportunity to feature unique materials and details to introduce variation within the design of the public realm.

STANDARDS

S.5.10.5 Sidewalk and Roadway

The materials used for sidewalk and roadway in shared streets shall be durable enough to withstand extensive use, wear-and-tear, and load-bearing requirements for all types of vehicles. Materials, colors and finishes used for both pedestrian and vehicular zones create a unified pedestrian priority auto space.

S.5.10.6 Warning Paving

Detectable warning paving shall be used at shared streets to signify pedestrian priority. Cast iron or white precast detectable warning pavers are recommended for durability and aesthetic quality and variation.

S.5.10.7 Vehicular Unit Paving

When unit pavers are used for roadway applications, smaller unit pavers and a bituminous setting bed shall be used to withstand heavy loads and extend longevity of the paving system.

GUIDELINES

G.5.10.3 Permeable Paving

Permeable paving should be used to reduce impervious surface for stormwater management, should meet SFPUC stormwater management requirements, and to conform to DPW's Better Streets Plan.

G.5.10.4 Paving Patterns

Special paving pattern designs and material variations are recommended to define spatial identity.

Concrete Unit Paving

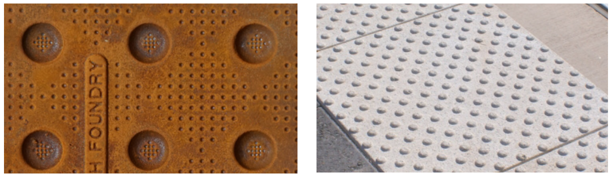
6x12 concrete unit paver, ground and blasted finish

Permeable Paving

Pedestrian permeable paving

Vehicular permeable paving

Warning Paving



Warning pavers, cast iron

Warning pavers, precast concrete (alt 1)

Tree Well Surfacing

4x4 cobble stone with flamed finish

Tree Well Mulch

Gravel mulch

Figure 5.10–2: *Street Material Examples for Privately Owned Street*

5.11 STREET FURNITURE

Seating, Receptacles, Bike Racks, and Other Amenities

Street furniture is intended to be an amenity that supports a wide variety of activities. The primary materials for furnishings are steel and wood, for durability and comfort. Pictured to the right is suggested street furniture that shows the recommended character of naturally-weathered materials and finishes which should be coordinated across the site to ensure a consistent palette. The standards and guidelines outlined in this chapter are for both private and public streets.

STANDARDS

S.5.11.1 Location

Site furnishings shall be located within the furnishing zones parallel to the curb per the Better Streets Plan. Site furnishings shall be located in areas where they are likely to be used, such as low traffic shared streets or at the Reservoir Park entrance. Their locations are also determined by ADA access and loading zones. Use of non-DPW standard furniture on public right-of-ways requires a special permit

S.5.11.2 Bike Racks

- Selected bike racks shall have a rectangular section, be securely mounted, and employ durable materials that do not require maintenance. They shall also meet all additional requirements as noted in the SFMTA Bicycle Rack Specifications.
- The Balboa Reservoir neighborhood shall provide Class II bike parking for each building and open space at the right-of-way or in the publicly accessible open space.
- The placement of bike racks shall comply with SFMTA Bicycle Parking Standards, Guidelines, and Recommendations. The total Class II bike parking requirement shall be defined according to the final TDM plan. See additional bike parking requirements see Section 7.23 (On-Site Bicycle Parking) and Section 7.39 (On-Site Bicycle Parking) at townhouses.

S.5.11.3 Bollards

Fixed bollards shall be provided at mid-block crossings.

GUIDELINES

G.5.11.1 Litter and Recycling Receptacles

Litter and recycling receptacles should be provided when regular maintenance and cleaning is available. They should be attractive site furnishings which contribute to the character of the street and provide options for landfill, recycling, and compost. Waste receptacles shall be located in areas of high pedestrian traffic, such as near pedestrian crossings. SF Public Works shall have final authority on trash receptacle selection and locations.

Bollards

Bollard, metal finish or similar

Bike Racks

Square stainless or galvanized steel tube section

Litter + Recycling Receptacles

Trash and recycling receptacles, for metal finish

Benches

Manufactured bench with back, metal and wood finish

Manufactured backless bench, metal and wood finish

Manufactured bench with reclaimed wood or similar

Figure 5.11–1: *Street Furnishing Examples*

5.12 STREET LIGHTING

Street lighting at the Balboa Reservoir neighborhood is an important component of the streetscape design. It helps to establish a sense of continuity and cohesiveness in the neighborhood and a hierarchy of primary and secondary streets. The quality and intensity of the light provides neighborhood character, as well as a sense of safety and security. Lighting design intent shall follow IES-RP8, Illuminating Engineering Society standards appropriate to the subject street type.

STANDARDS

S.5.12.1 Location

All street lights shall be located within the furnishing zone and should not obstruct pedestrian throughways or the loading and unloading of people and goods.

S.5.12.2 Public Street Pole Lights

Street lighting design for public right-of-ways shall be in compliance with SFPUC guidelines and the light fixtures shall be selected from the SFPUC Street Light Catalogue. See MIP (Section 6.5.5: Lighting) for more information.

S.5.12.3 Privately Owned Shared Street Pole Lights

Street pole lights at privately owned shared public ways shall be pedestrian in scale to emphasize pedestrian priority. Colors and finishes shall be coordinated with other site furnishings and building color palettes. The same pedestrian poles shall be used at both the shared public way and the public open space. Street light fixtures in privately owned streets are not required to be selected from the SFPUC Street Light Catalogue.

GUIDELINES

G.5.12.1 Suspended Lights

Suspended lights are recommended for the privately owned shared streets.

Privately Owned Shared Street Pole Lights

Manufactured pedestrian light, metal finish

Louis Poulsen Abertslund Maxi Post or similar

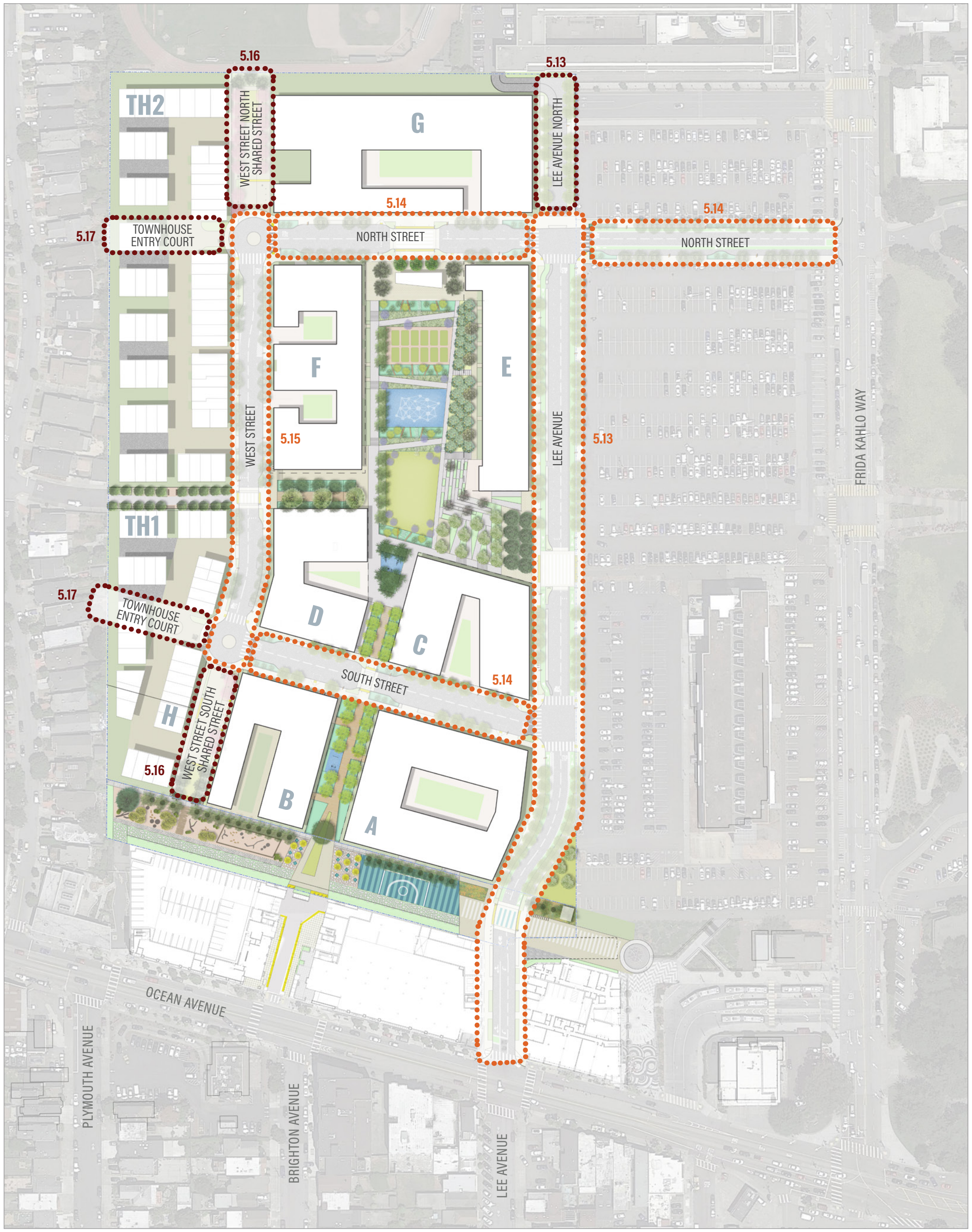
Public Street Pole Light

Manufactured pole light from SFPUC catalogue of acceptable fixtures, metal finish

Figure 5.12–1: *Street Lighting Palette*

Street Design by Individual Case

Given the number of unique conditions at Balboa Reservoir, maintaining a simple and coherent street design is essential to providing a unifying framework for development over time. In order to support implementation of the Streetscape Design Guidelines, the following sections will provide detailed standards and guidelines for individual streets. The streets are listed per Section 5.2 (Street Typology).



LEGEND

◌	*Publicly Owned Streets*
◌	*Privately Owned Streets with Public Access*
5.XX	*Section Number in Chapter 5*
5.XX	*Section Number in Chapter 5*

Note: building footprints are for illustrative purposes only

Figure 5.12–2: *Street Ownership & Key Plan*

5.13 LEE AVENUE

Lee Avenue is a primary mixed-use street connecting the project site to the adjacent neighborhood. Lee Avenue will serve nonresidential and residential uses including potential future housing on City College property. The extension of Lee Avenue is a tree-lined bicycle boulevard that provides a gateway to Reservoir Park and a complementary edge to the City College Master Plan. It will be the primary bicycle connection south to the Class III bike route to Holloway Avenue and to Frida Kahlo Way. The treatment of Lee Avenue is divided into three main zones, with five total segments. See Figure 5.13–1 (Lee Avenue, Key Map).

Lee Avenue North of North Street (L.1)

The section of Lee Avenue north of North Street provides a one-way exit route for Riordan High School, a possible garage exit for Block G, and a potential parking garage exit from the City College property. This segment will be a conventional two-way street with a minimum 12-foot sidewalk on both sides. The right-of-way for this segment is 50-feet wide. This segment of Lee Avenue will be privately owned with public access. See Figure 5.13–2 (Lee Avenue, Site Plan Enlargement L.1).

Lee Avenue at Central Block (L.2 & L.3)

The section of Lee Avenue between North Street and South Street will have an asymmetric profile within a 72-foot-wide-right-of-way. It will have one travel lane in each direction and a protected Class IV bike lane and a minimum of 12-foot-wide sidewalks on both sides. Parallel parking and loading areas are provided only on the west side of the street. See Figure 5.13–4 (Lee Avenue, Site Plan L.2) and Figure 5.13–5 (Lee Avenue, Site Plan L.3).

Note: building footprints are for illustrative purposes only

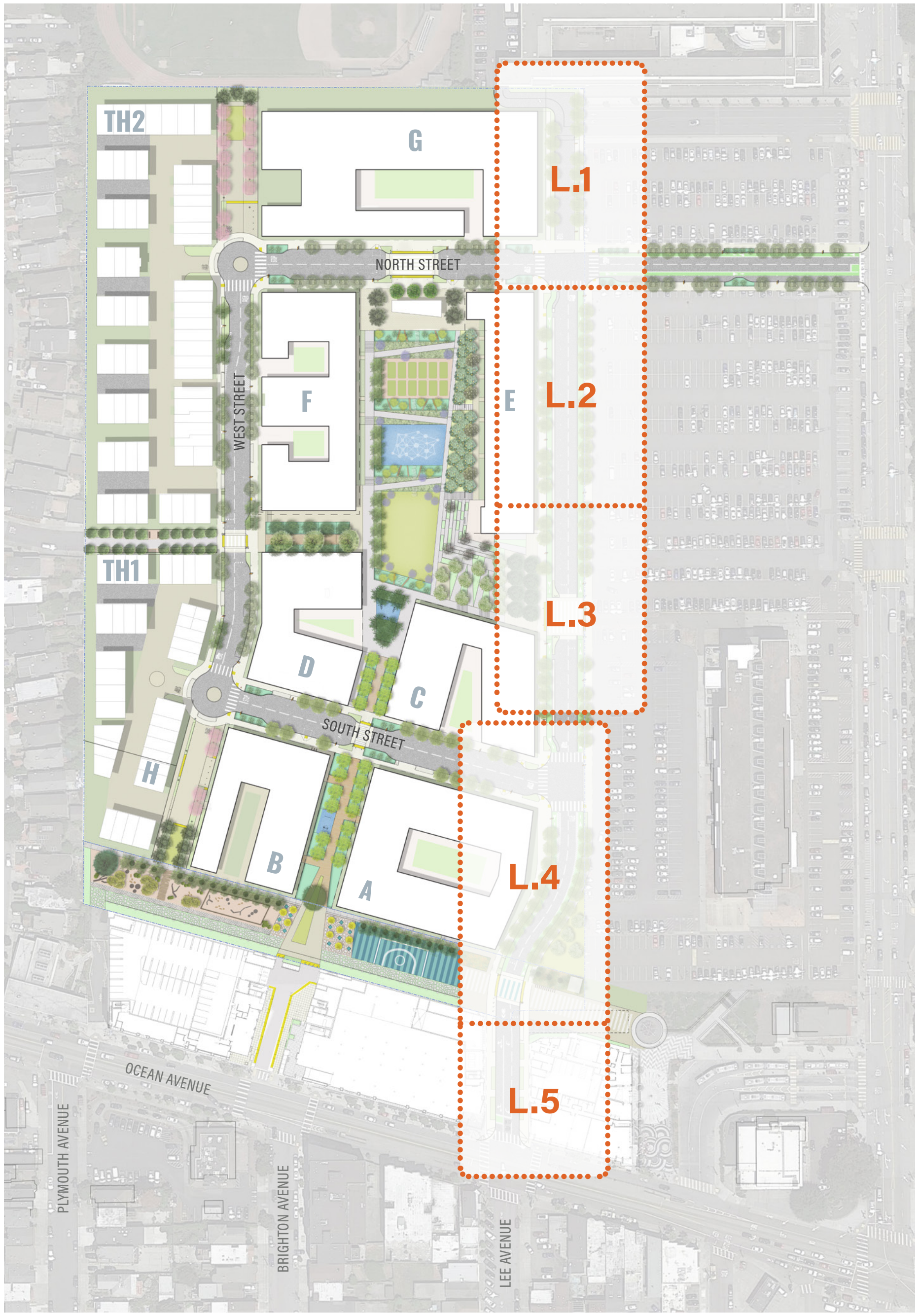


Figure 5.13–1: *Lee Avenue, Key Map*

Lee Avenue South of South Street (L.4 & L.5)

Lee Avenue south of South Street will taper from a 72-foot-wide right-of-way to a 56-foot-wide right-of-way to match the existing width between 1110 and 1150 Ocean Avenue. At this segment, there will be no parking on either side of the street and one travel lane and bike lane in each direction. Class II bike lanes run from South Street to the SFPUC Retained Fee Open Space and transition into Class III bike lanes through Ocean to Holloway Avenue Class III bike route. There will be bulb-outs at intersections and midblock crossings at the Reservoir Park and SFPUC Retained Fee Open Space to emphasize pedestrian priority and traffic calming. A vehicular left turn lane on the southern most end of Lee Avenue will assist with traffic control at the intersection of Lee Avenue and Ocean Avenue. See Figure 5.13–7 (Lee Avenue, Site Plan L.4) and Figure 5.13–9 (Lee Avenue, Site Plan L.5).

STANDARDS

S.5.13.1 Street Zone Dimensions

Right-of-way cross-section dimensions shall be as shown in Figure 5.13–2 through Figure 5.13–10.

S.5.13.2 Element and Material Specification

Landscape elements shall be provided per Figure 5.13–2 through Figure 5.13–9. Dimensions vary.

S.5.13.3 Raised Crosswalk

The crosswalk at the intersection of Lee Avenue and the Reservoir Park entry and the intersection of Lee Avenue and the SFPUC Retained Fee Open Space shall be raised and a minimum of 50 feet long. High quality paving materials such as unit paving are encouraged. See Balboa Reservoir Infrastructure Plan (Section 6.6: Traffic Calming) and Section 5.6 (Traffic Calming Strategies) for more details.

S.5.13.4 Loading

Loading per Balboa Reservoir Infrastructure Plan, (Figure 6.9: Proposed Service and Loading Plan)..

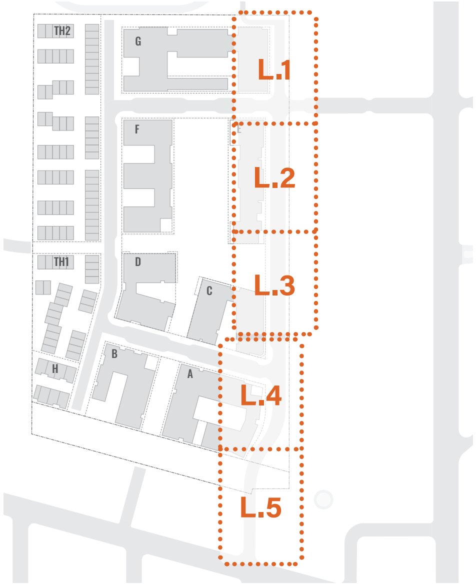
S.5.13.5 SFPUC Asset Protection Standards

Street trees are not allowed where the roadway and sidewalk cross the SFPUC Retained Fee parcel. Refer to SFPUC Asset Protection Standards for tree restrictions over transmission distribution assets at this parcel.

GUIDELINES

G.5.13.1 Stormwater Management

Some of the Lee Avenue stormwater requirements will be offset in the open space stormwater management areas. See Chapter 6 (Open Space Network) for more information. This enables flexibility in the design of Lee Avenue including managing challenging grading, potential inclusion of protected bike ways, and other pedestrian amenities. The open space stormwater management area will be sized over the 25% requirement to offset the Lee Avenue stormwater requirement.



Key Map

LEGEND

① *Tree Well*
② *Concrete Sidewalk*
③ *Street Light*
④ *Litter + Recycling Receptacle*
⑤ *Bioretention Planting*
⑥ *Regular Planting*
⑦ *Warning Paver*
⑧ *Curb Cut for Accessible Loading/Parking*
⑨ *Raised Crosswalk*
⑩ *Traffic Island*
⑪ *Curb Cut for Garage*
⑫ *Bike Rack*
⑬ *Bench*
⑭ *Bollard*
⑮ *Concrete Unit Pavers*
⑯ *Roadway - Asphalt*
⑰ *Curb Cut for Driveway*
⑱ *Bike Share*

BL	*bike lane*
P	*parking*
SW	*sidewalk*
TL	*travel lane*
M	*median*
BO	*bulb-out*

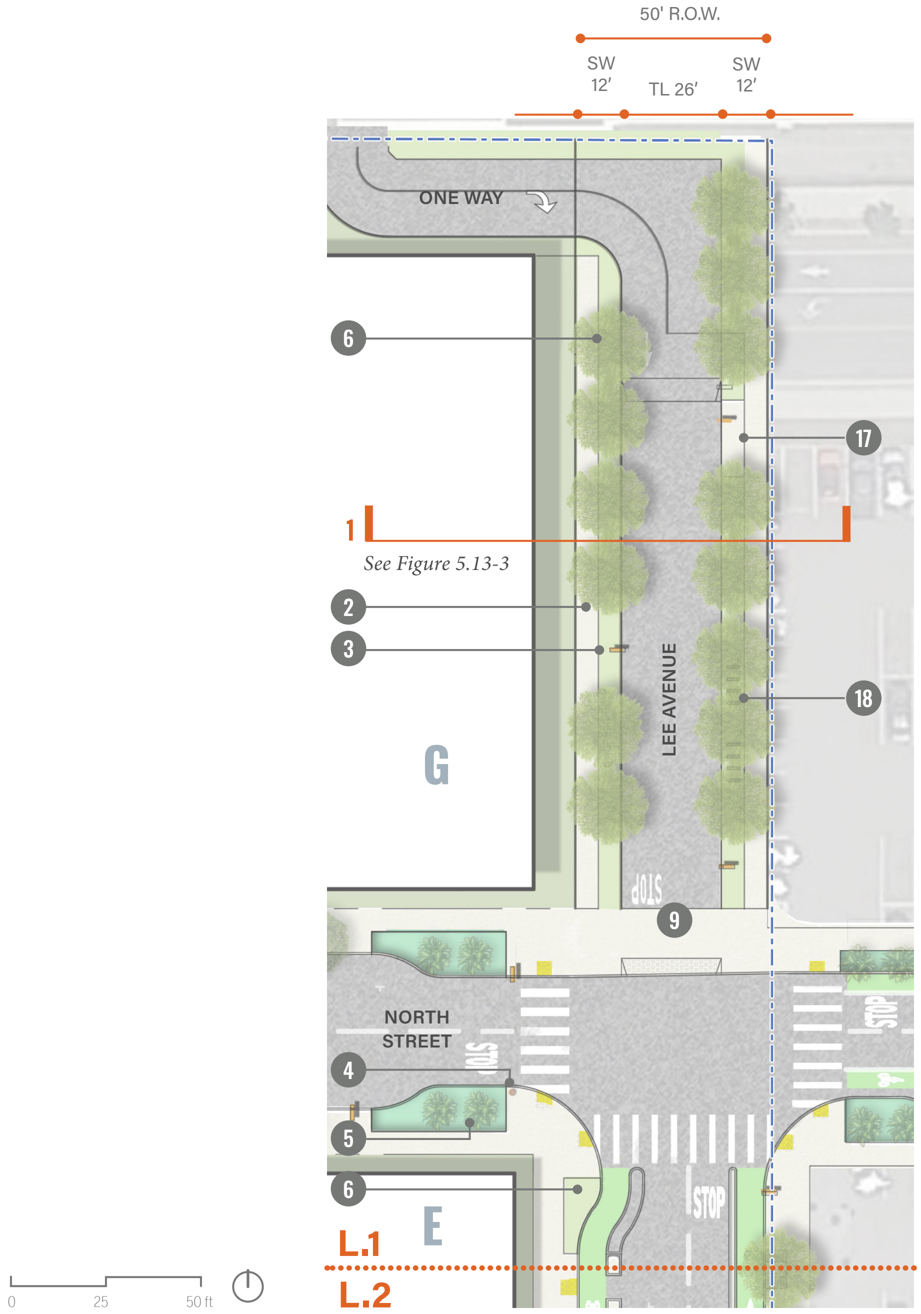


Figure 5.13–2: *Lee Avenue, Site Plan Enlargement L.1*

Key Map

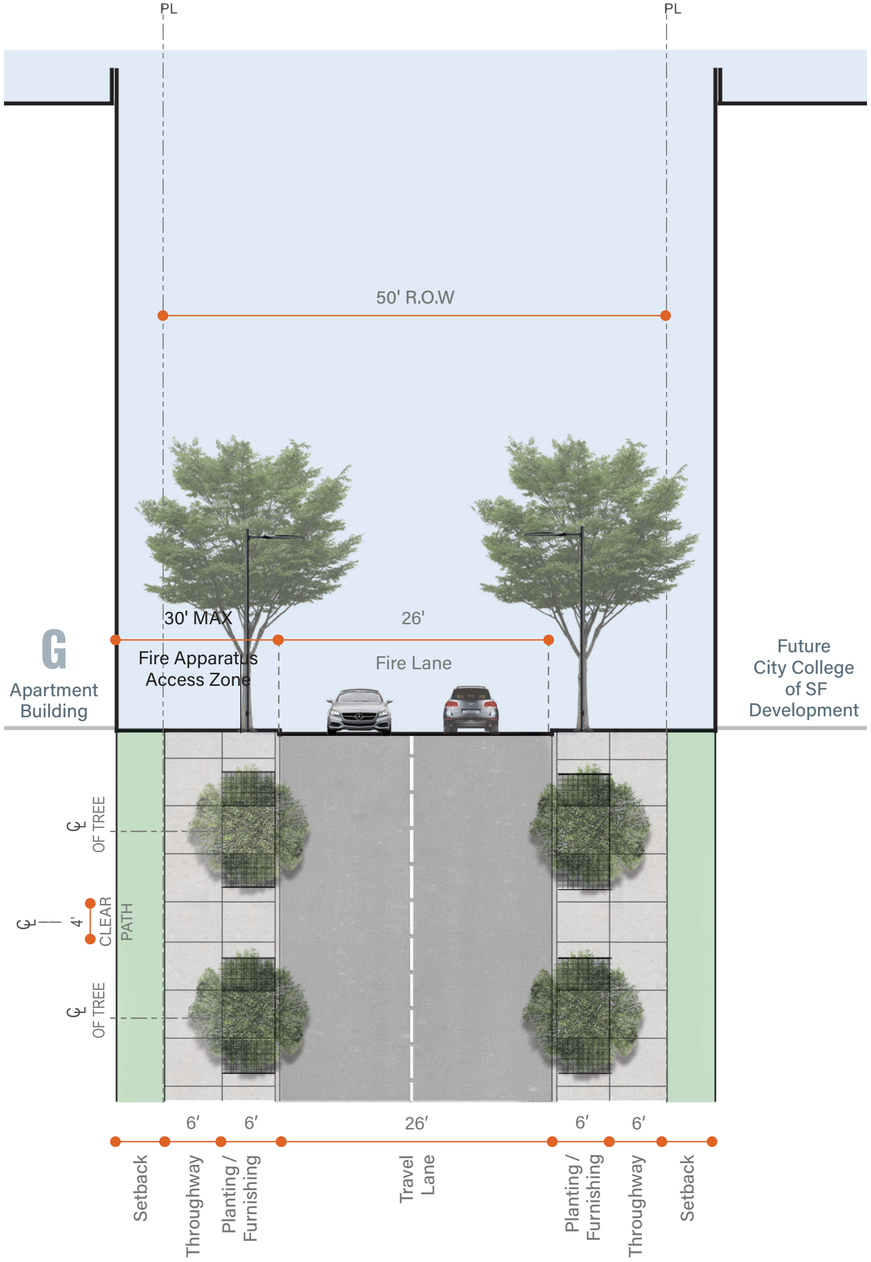
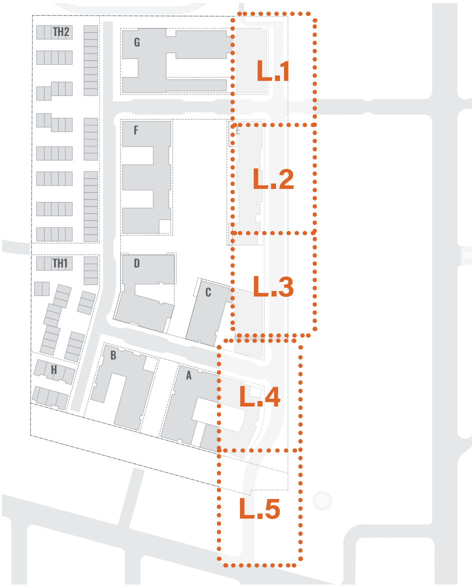


Figure 5.13–3: *Lee Avenue, Section 1* **See Figure 5.13–2: Lee Avenue, Site Plan Enlargement L.1.*



Key Map

LEGEND

① *Tree Well*
② *Concrete Sidewalk*
③ *Street Light*
④ *Litter + Recycling Receptacle*
⑤ *Bioretention Planting*
⑥ *Regular Planting*
⑦ *Warning Paver*
⑧ *Curb Cut for Accessible Loading/Parking*
⑨ *Raised Crosswalk with Special Treatment*
⑩ *Traffic Island*
⑪ *Curb Cut for Garage*
⑫ *Bike Rack*
⑬ *Bench*
⑭ *Bollard*
⑮ *Concrete Unit Pavers*
⑯ *Roadway - Asphalt*
⑰ *Curb Cut for Driveway*
⑱ *Bike Share*

BL	*bike lane*
P	*parking*
SW	*sidewalk*
TL	*travel lane*
M	*median*
BO	*bulb-out*

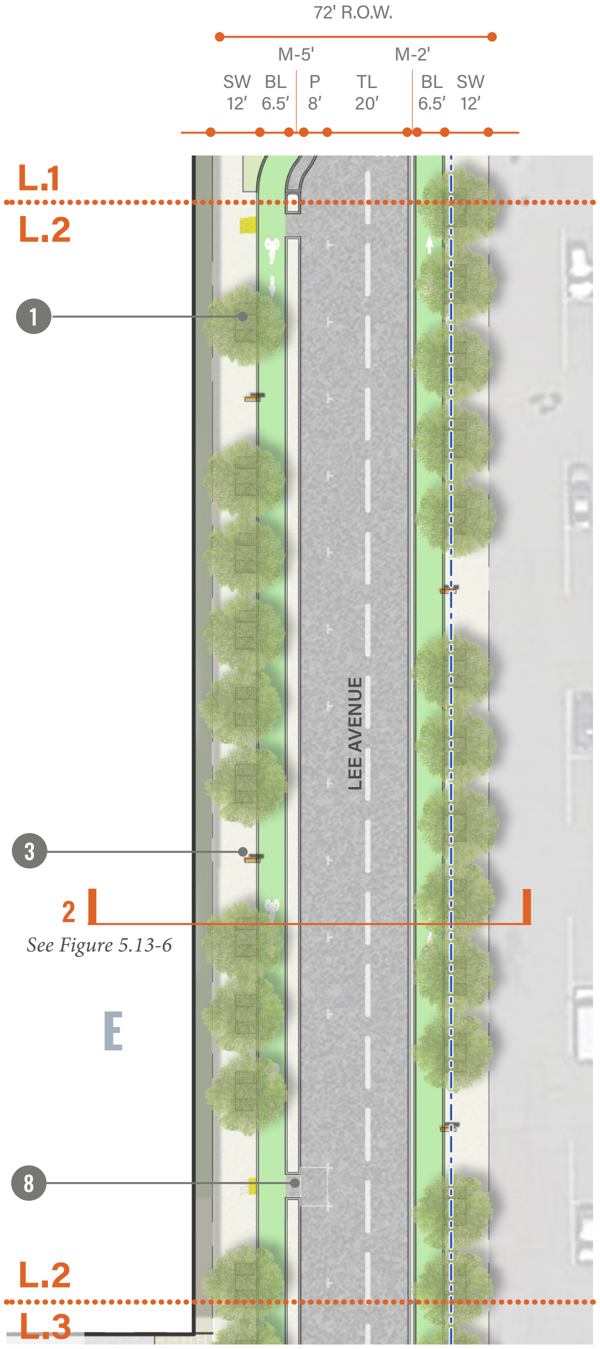


Figure 5.13–4: *Lee Avenue, Site Plan L.2*

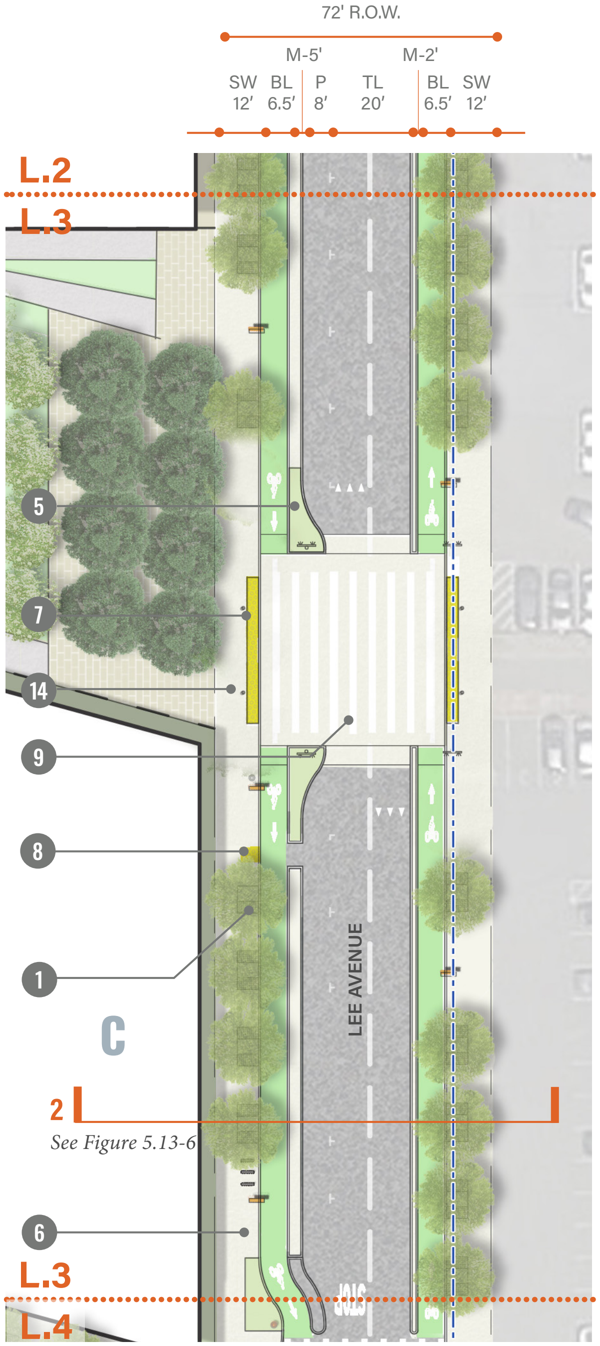


Figure 5.13–5: *Lee Avenue, Site Plan L.3*

Key Map

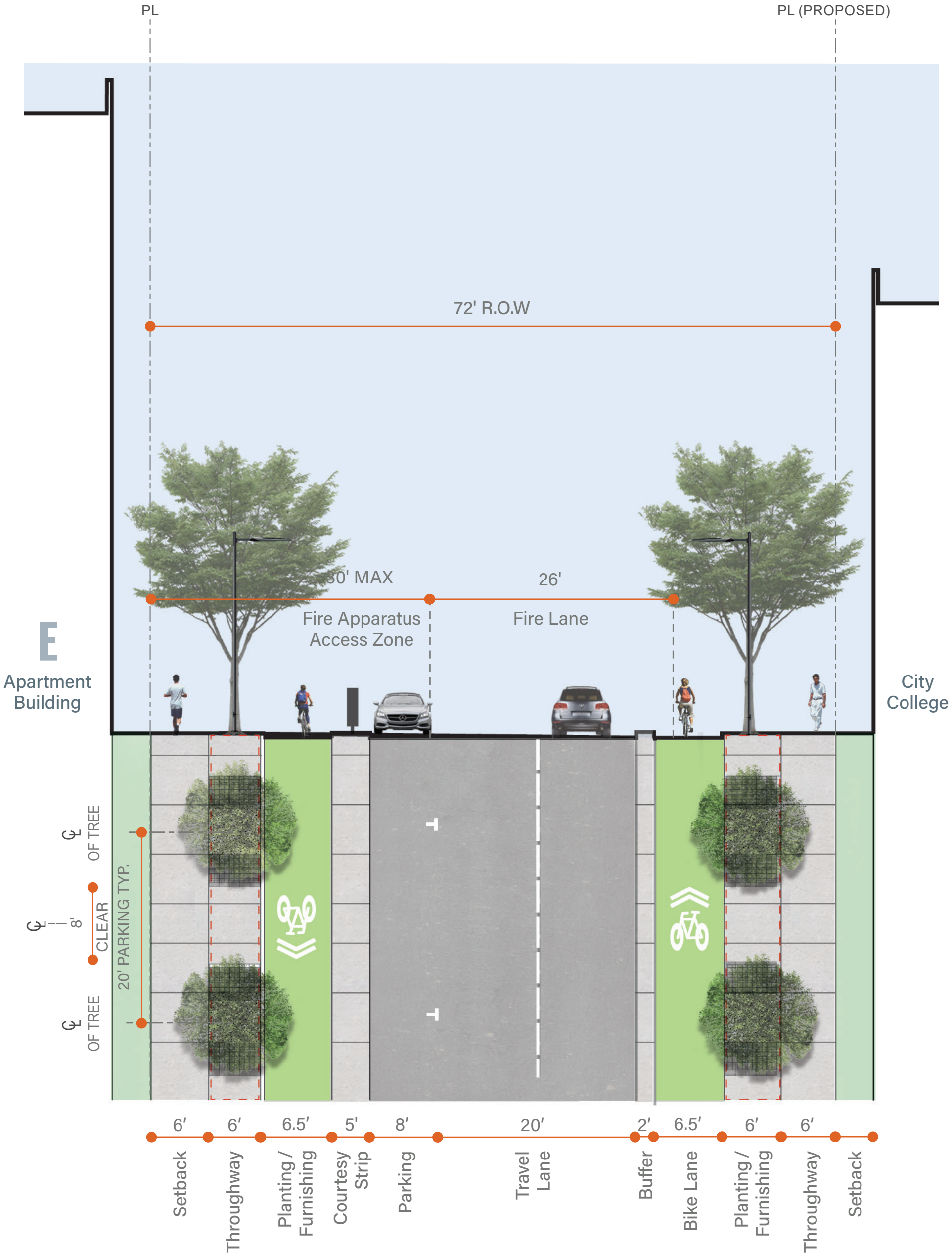
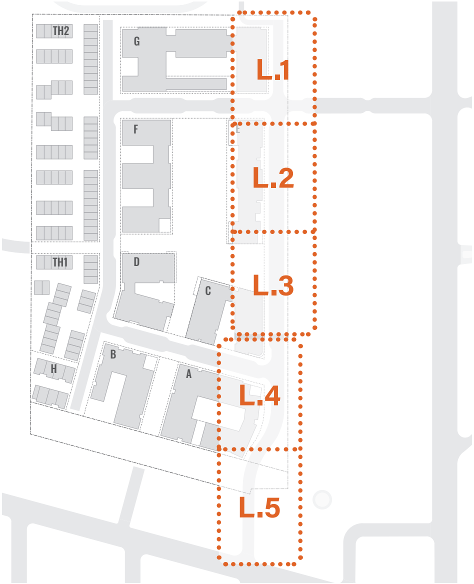


Figure 5.13–6: *Lee Avenue, Section 2* **see "Figure 5.13– 4 & 5: Lee Avenue, Plan Enlargements L.2 & L.3*



Key Map

LEGEND

- ① *Tree Well*
- ② *Concrete Sidewalk*
- ③ *Street Light*
- ④ *Litter + Recycling Receptacle*
- ⑤ *Bioretention Planting*
- ⑥ *Regular Planting*
- ⑦ *Warning Paver*
- ⑧ *Curb Cut for Accessible Loading/Parking*
- ⑨ *Raised Crosswalk*
- ⑩ *Traffic Island*
- ⑪ *Curb Cut for Garage*
- ⑫ *Bike Rack*
- ⑬ *Bench*
- ⑭ *Bollard*
- ⑮ *Concrete Unit Pavers*
- ⑯ *Roadway - Asphalt*
- ⑰ *Curb Cut for Driveway*
- ⑱ *Bike Share*

BL	*bike lane*
P	*parking*
SW	*sidewalk*
TL	*travel lane*
M	*median*
BO	*bulb-out*

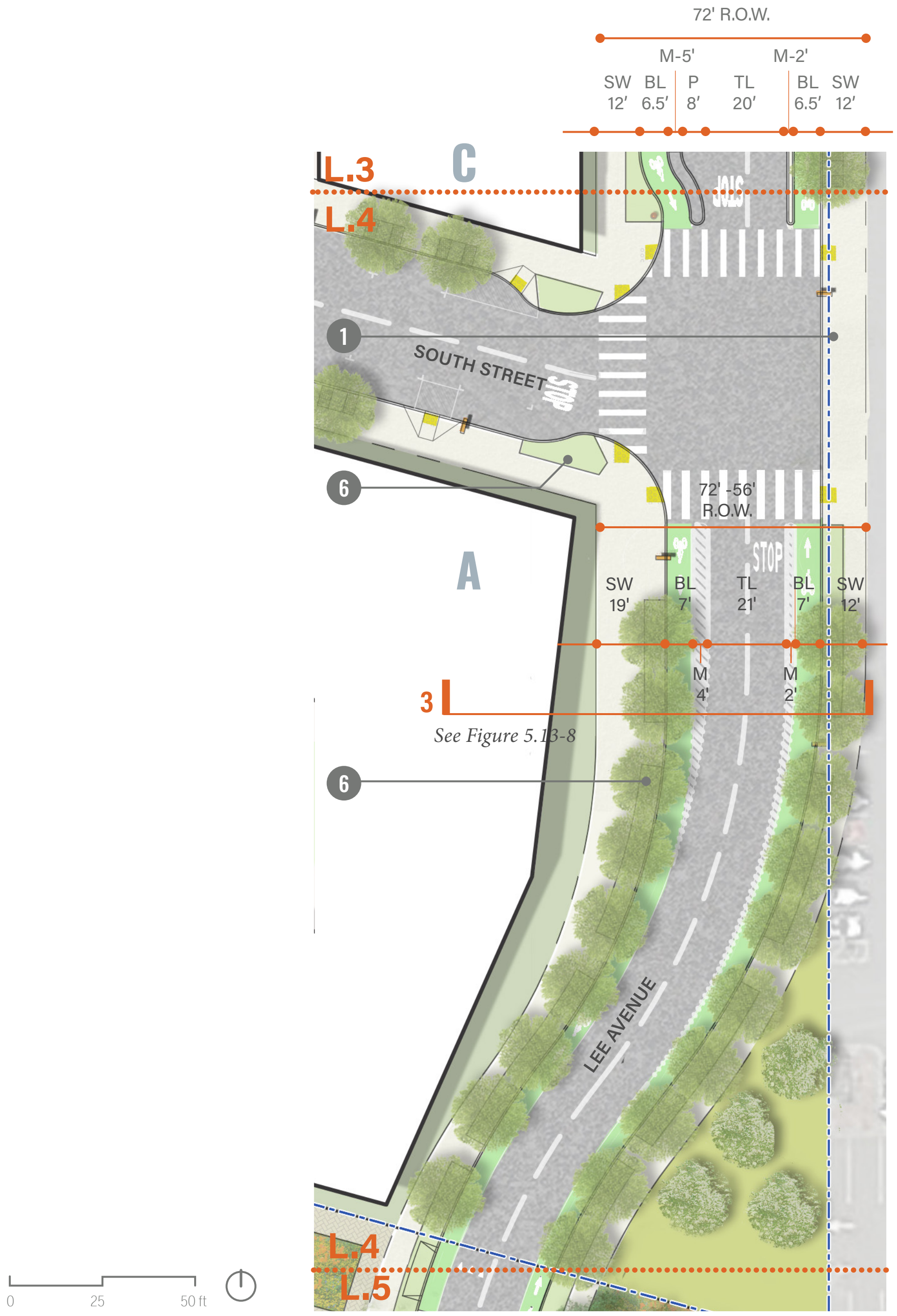


Figure 5.13–7: *Lee Avenue, Site Plan L.4*

Key Map

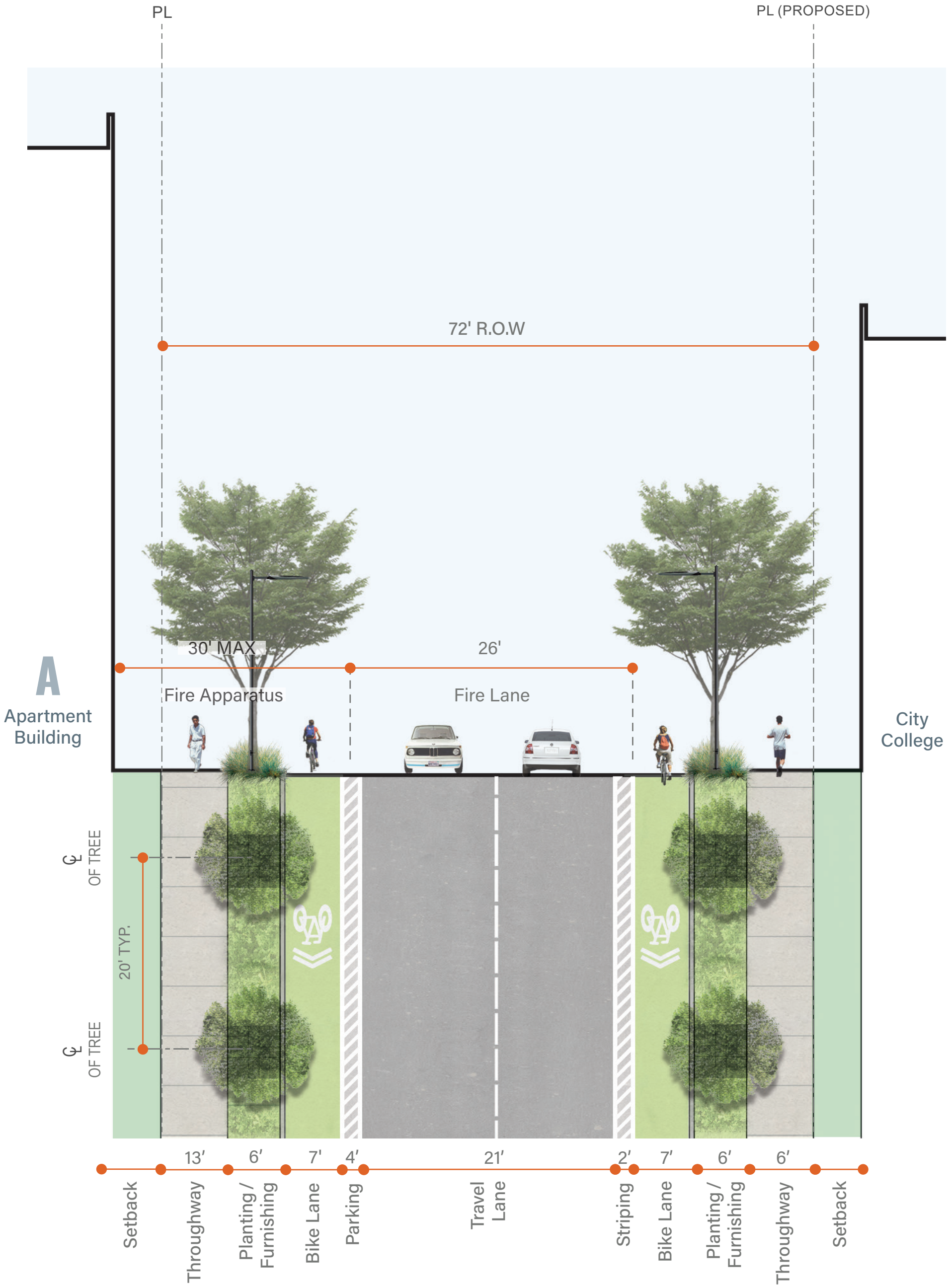
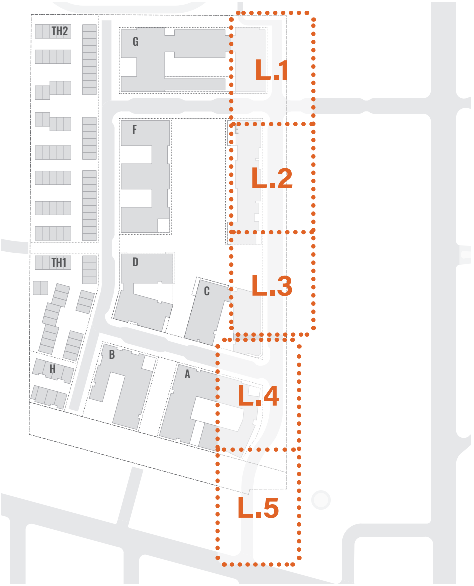


Figure 5.13–8: *Lee Avenue, Section 3*

**see "Figure 5.13–2: Lee Avenue, Site Plan Enlargement L.1".4*



Key Map

LEGEND

- ① *Tree Well*
- ② *Concrete Sidewalk*
- ③ *Street Light*
- ④ *Litter + Recycling Receptacle*
- ⑤ *Bioretention Planting*
- ⑥ *Regular Planting*
- ⑦ *Warning Paver*
- ⑧ *Curb Cut for Accessible Loading/Parking*
- ⑨ *Raised Crosswalk with Special Treatment*
- ⑩ *Traffic Island*
- ⑪ *Curb Cut for Garage*
- ⑫ *Bike Rack*
- ⑬ *Bench*
- ⑭ *Bollard*
- ⑮ *Concrete Unit Pavers*
- ⑯ *Roadway - Asphalt*
- ⑰ *Curb Cut for Driveway*
- ⑱ *Bike Share*

BL	*bike lane*
P	*parking*
SW	*sidewalk*
TL	*travel lane*
M	*median*
BO	*bulb-out*

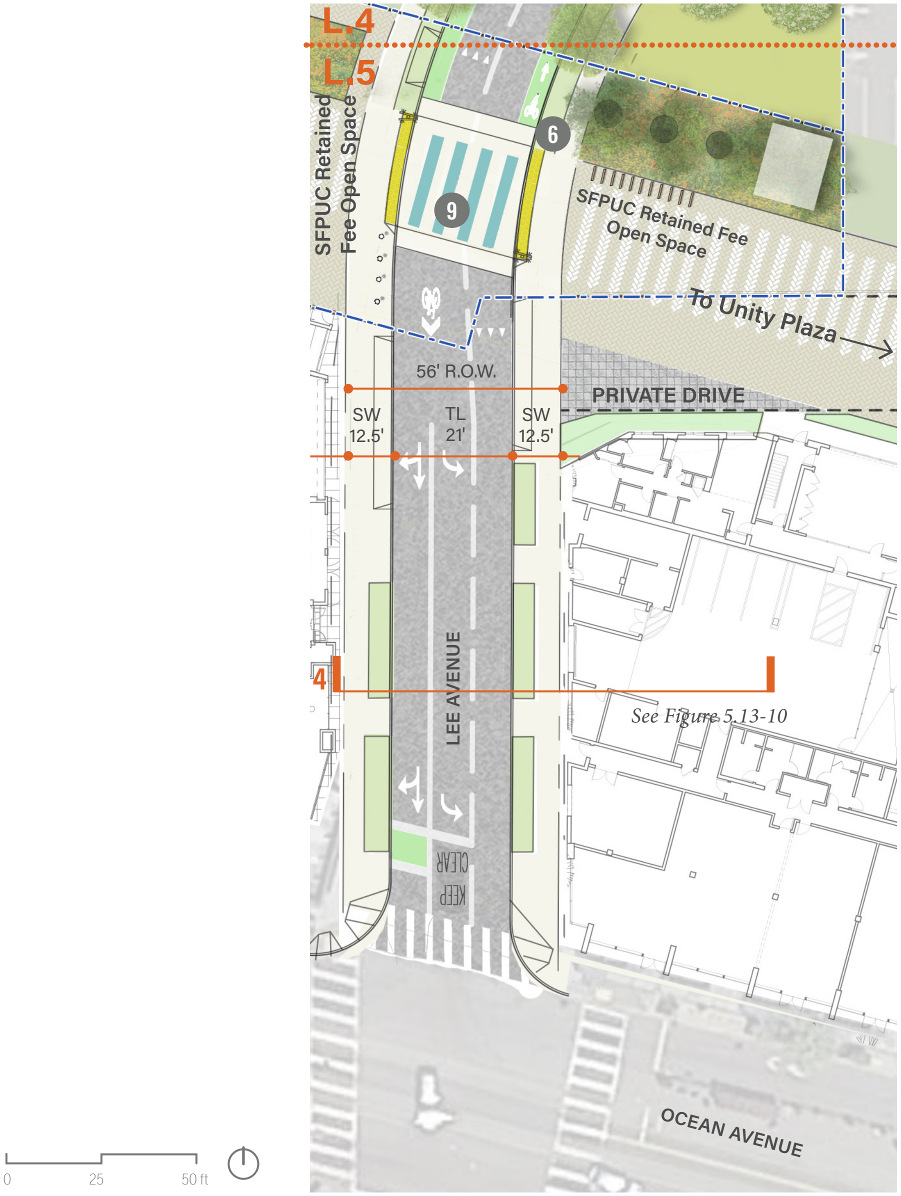
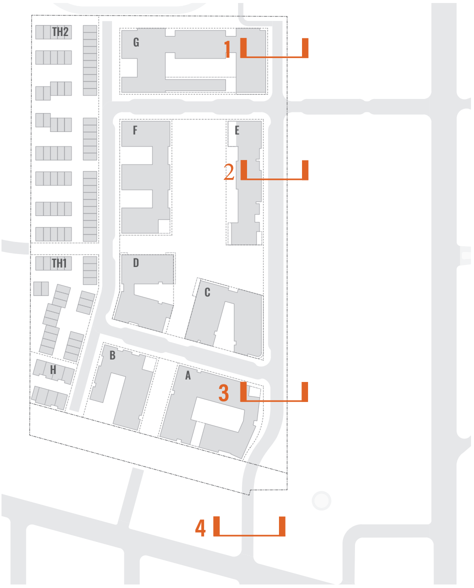


Figure 5.13–9: *Lee Avenue, Site Plan L.5*



Key Map

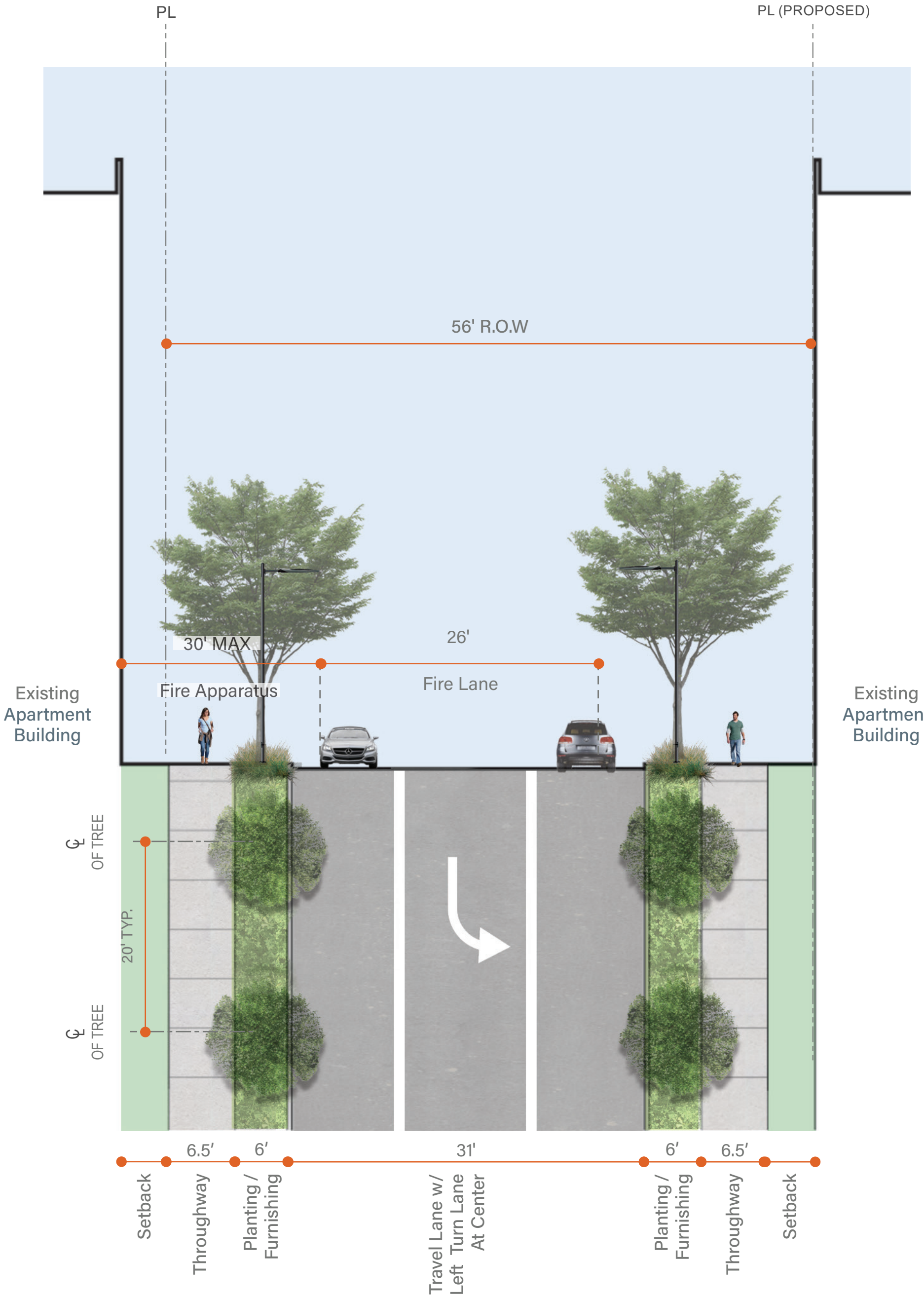


Figure 5.13–10: *Lee Avenue, Section 4* **see "Figure 5.13–2: Lee Avenue, Site Plan Enlargement L.1"5*

5.14 NORTH STREET AND SOUTH STREET

North Street (N.1 and N.2)

North Street will be an east-west neighborhood residential street with a 64-foot-wide right-of-way providing vehicular, bike, pedestrian and service access to buildings and to Reservoir Park. Parallel parking and 12-foot-wide sidewalks are provided on both sides of the street. North Street will also extend eastward connecting Lee Avenue to the existing Frida Kahlo Way and provide access to the future Performing Arts Education Center at City College. The portion of North Street between Lee Avenue and Frida Kahlo Way will be narrowed to a 62-foot-wide right-of-way to accommodate designated bike lanes on both sides of the street and parallel parking on the south side. There will be bulb-outs at intersections and a raised midblock crossing at Reservoir Park to strengthen pedestrian connections to the central public space. Street stormwater will be treated with rain gardens in bulb-outs or pervious paving in vehicular areas.

South Street (S.1)

South Street will be an east-west neighborhood residential lane with a 64-foot-wide right-of-way. It will provide vehicular, pedestrian and bike access to individual buildings, childcare, Brighton Paseo, and Reservoir Park. Loading zones and 12-foot-wide sidewalks are provided on both sides of the street. South Street will have slower traffic and will accommodate bicycles on the street. There will be bulb-outs at intersections and, as in the case of North Street, a midblock raised crossing to create safe connections to Reservoir Park and Brighton Paseo. Stormwater will be treated through bioswales located in the bulb-out areas and through pervious paving in vehicular areas.

Note: building footprints are for illustrative purposes only

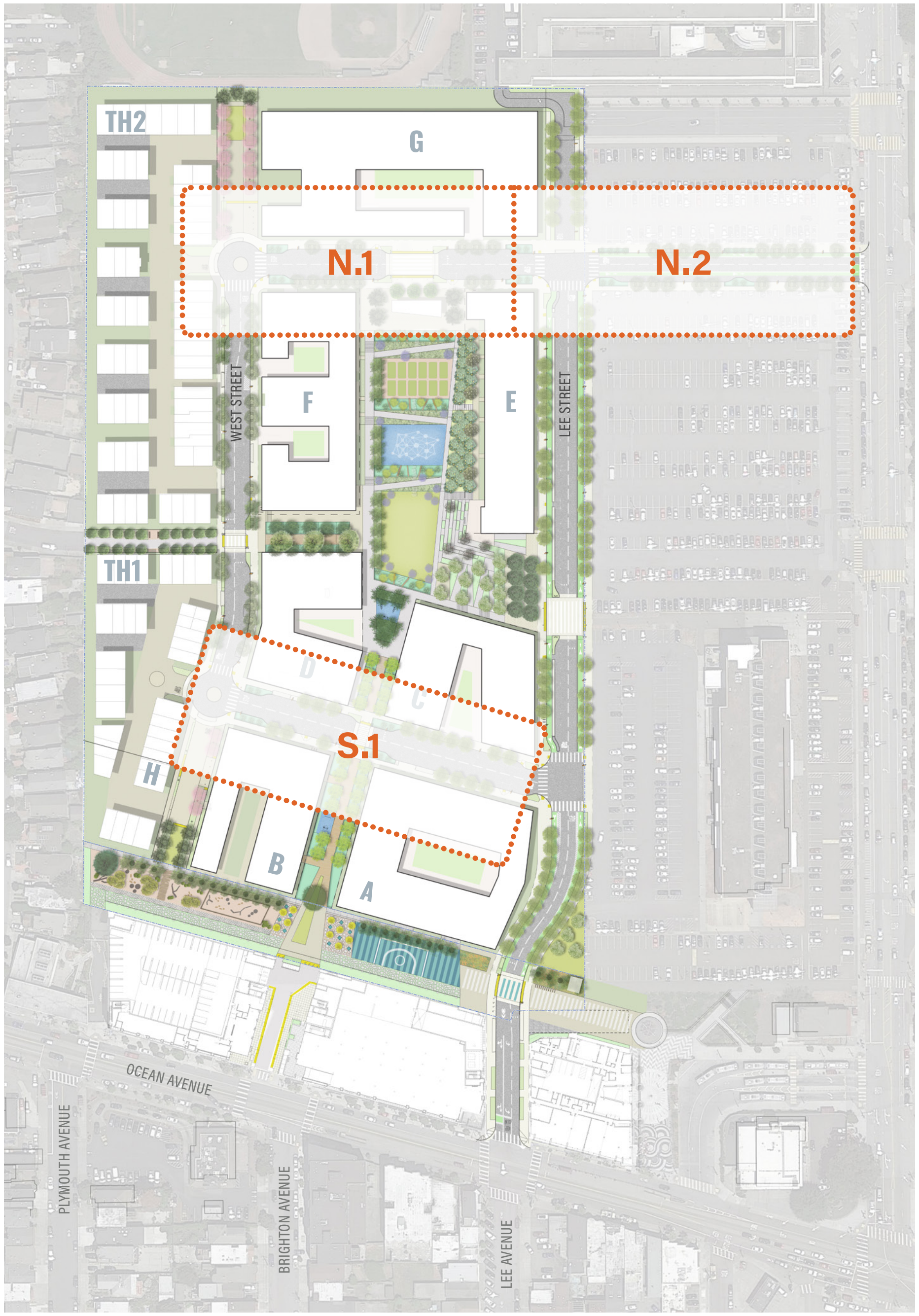


Figure 5.14–1: *North & South Street Key Map*

STANDARDS

S.5.14.1 Street Zone Dimensions

Right-of-way cross-section dimensions shall be as shown in Figure 5.14–2 to Figure 5.14–6.

S.5.14.2 Element and Material Specification

Elements shall be included per Figure 5.14–2 to Figure 5.14–5. All elements shown shall be included.

S.5.14.3 Raised Crosswalk

Crosswalks at the intersection of North Street and the Reservoir Park entrance, and South Street and the Reservoir Park entrance shall be raised and at minimum 60 feet long at North Street and 15 feet long at South Street. High quality paving materials such as unit paving are recommended. See Balboa Reservoir Infrastructure Plan (Section 6.6: Traffic Calming) and Section 5.6 (Traffic Calming Strategies) for more details.

GUIDELINES

G.5.14.1 Stormwater Management

To the extent possible, stormwater generated within the North Street and South Street right-of-ways shall be treated within the right-of-way in centralized linear bioretention treatment areas adjacent to the sidewalk. The bioretention planters adjacent to the sidewalk shall have a 6-inch curb for fall protection. An alternate treatment option is to route North Street and South Street stormwater to Reservoir Park. A Brighton Paseo stormwater area is also under consideration.

G.5.14.2 Mountable Traffic Circle

High quality paving such as unit paving is encouraged around the mountable traffic circles at the intersection of North Street and West Street and the intersection of South Street and West Street. See Balboa Reservoir Infrastructure Plan (Section 6.6: Traffic Calming) and Section 5.6 (Traffic Calming Strategies) for more details.

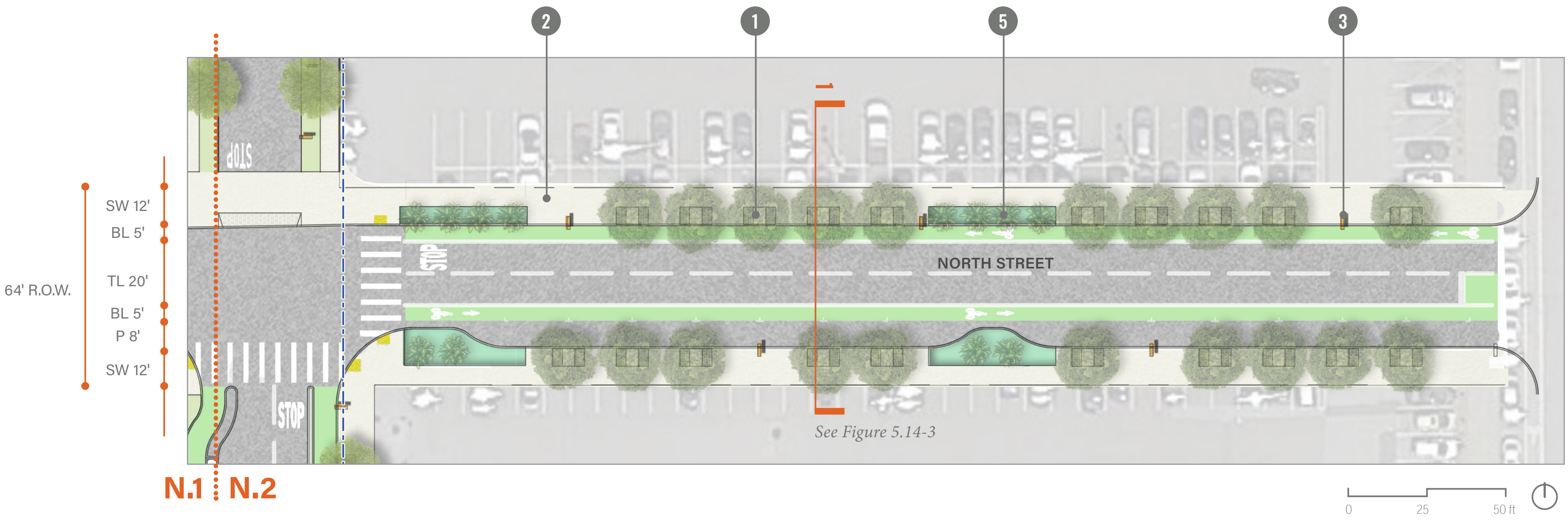
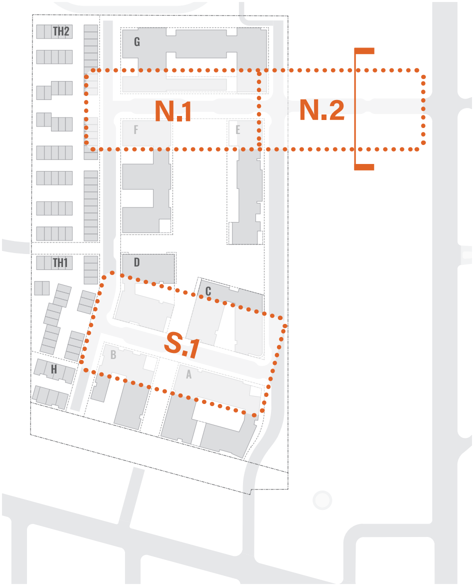


Figure 5.14–2: *North Street Site Plan N.2*

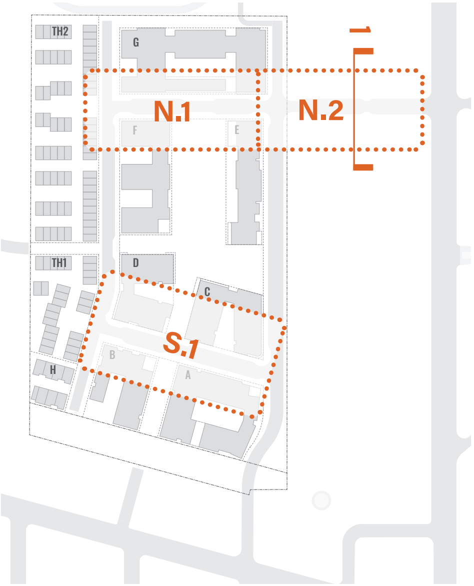


Key Map

LEGEND

① *Tree Well*
② *Concrete Sidewalk*
③ *Street Light*
④ *Litter + Recycling Receptacle*
⑤ *Bioretention Planting*
⑥ *Regular Planting*
⑦ *Warning Paver*
⑧ *Curb Cut for Accessible Loading/Parking*
⑨ *Raised Crosswalk*
⑩ *Traffic Island*
⑪ *Curb Cut for Garage*
⑫ *Bike Rack*
⑬ *Bench*
⑭ *Bollard*
⑮ *Concrete Unit Pavers*
⑯ *Roadway - Asphalt*
⑰ *Curb Cut for Driveway*
⑱ *Bike Share*

BL	*bike lane*
P	*parking*
SW	*sidewalk*
TL	*travel lane*
M	*median*
BO	*bulb-out*



Key Map

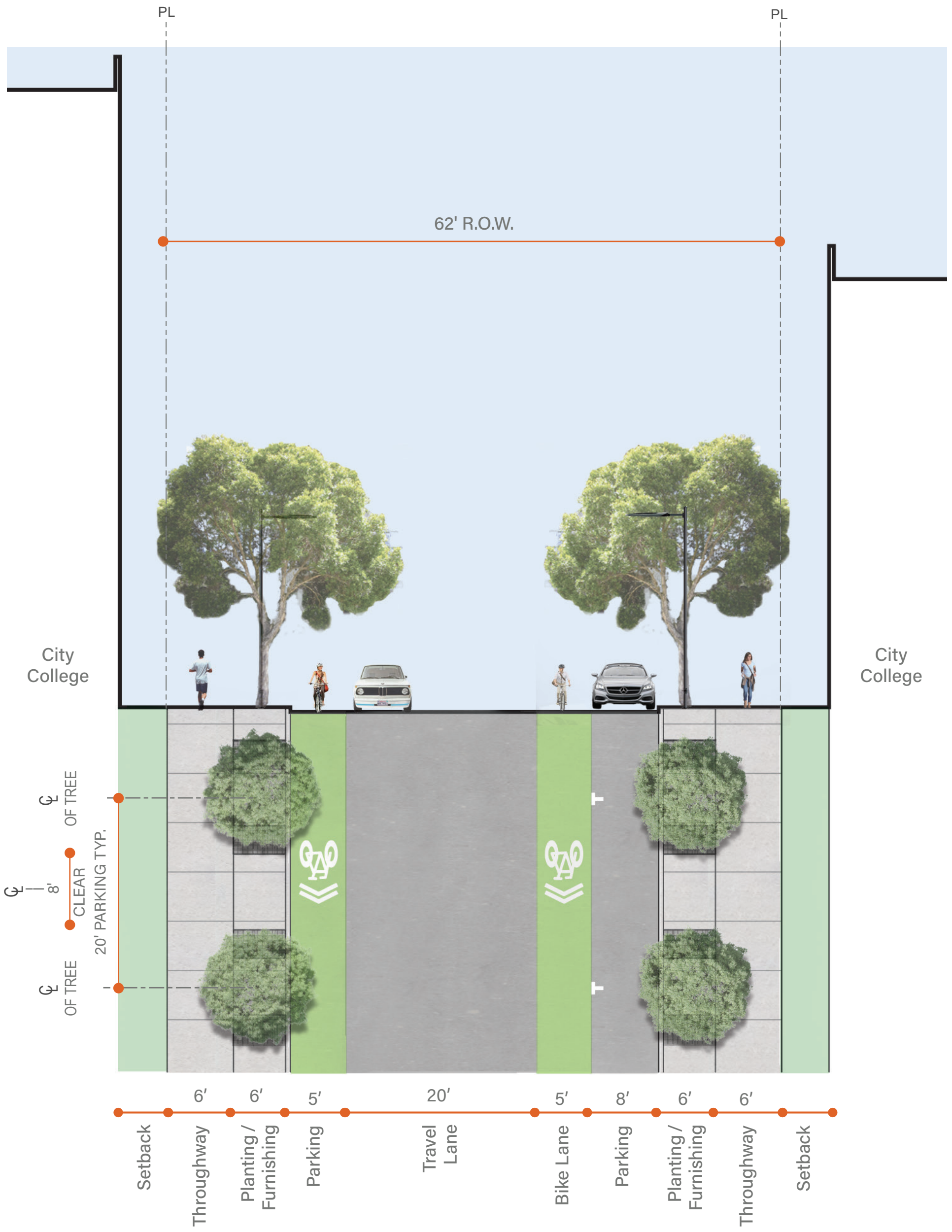


Figure 5.14–3: *North Street N.2 Section*

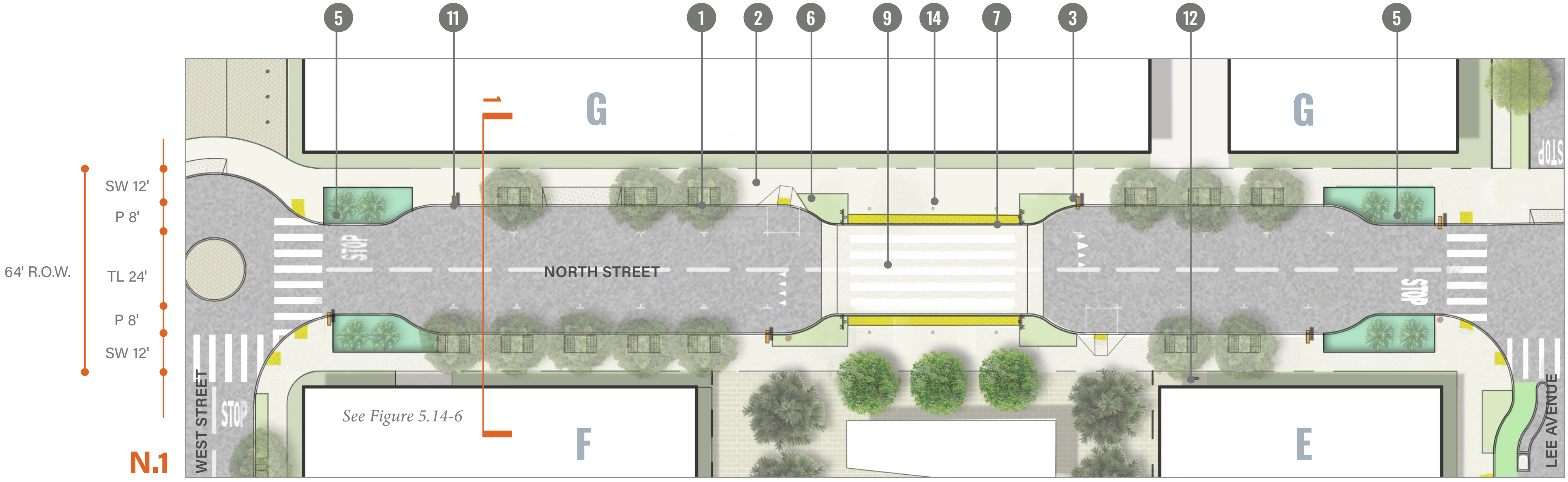
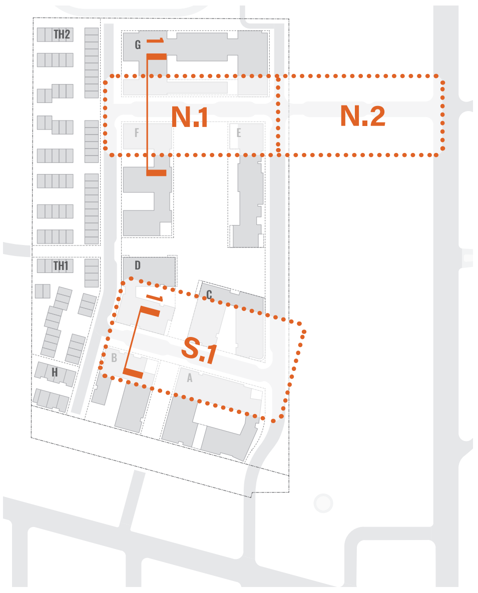


Figure 5.14–4: *North Street Site Plan N.1*



Key Map

LEGEND

1 *Tree Well*
2 *Concrete Sidewalk*
3 *Street Light*
4 *Litter + Recycling Receptacle*
5 *Bioretention Planting*
6 *Regular Planting*
7 *Warning Paver*
8 *Curb Cut for Accessible Loading/Parking*
9 *Raised Crosswalk with Special Treatment*
10 *Traffic Island*
11 *Curb Cut for Garage*
12 *Bike Rack*
13 *Bench*
14 *Bollard*
15 *Concrete Unit Pavers*
16 *Roadway - Asphalt*
17 *Curb Cut for Driveway*
18 *Bike Share*

BL	*bike lane*
P	*parking*
SW	*sidewalk*
TL	*travel lane*
M	*median*
BO	*bulb-out*

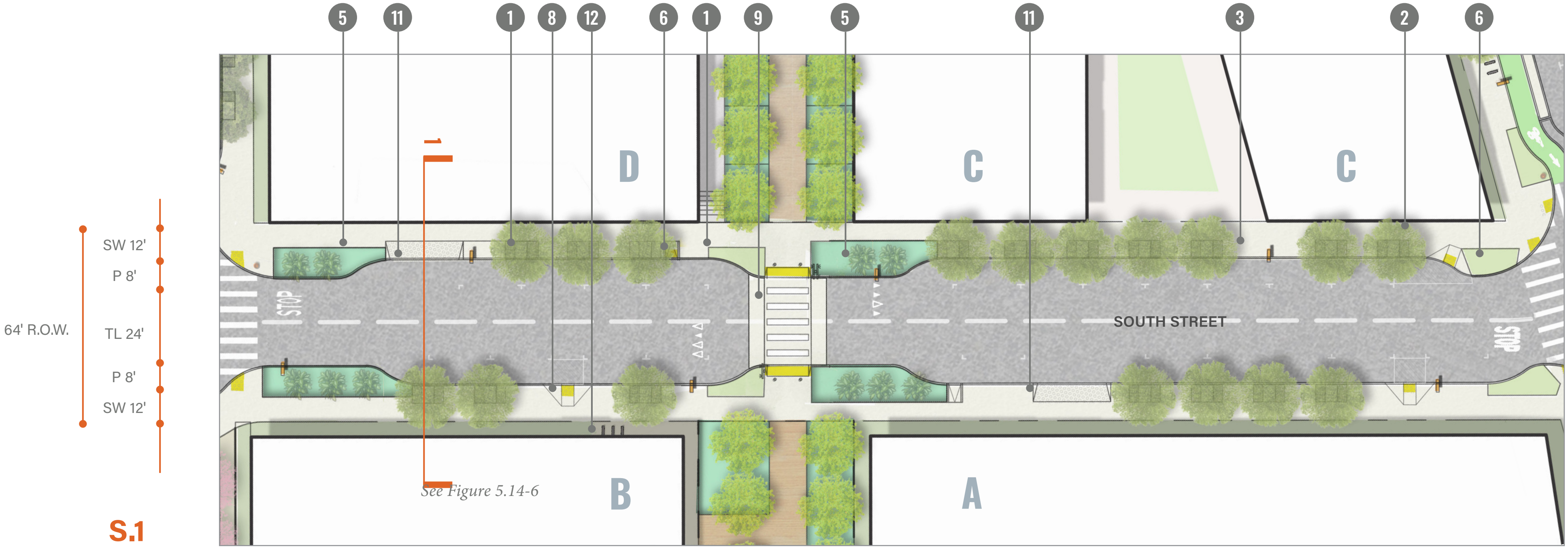
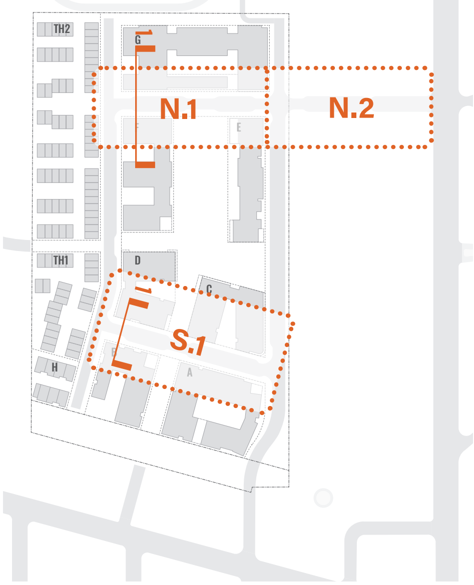


Figure 5.14–5: *South Street Site Plan S.1*



Key Map

LEGEND

1	*Tree Well*
2	*Concrete Sidewalk*
3	*Street Light*
4	*Litter + Recycling Receptacle*
5	*Bioretention Planting*
6	*Regular Planting*
7	*Warning Paver*
8	*Curb Cut for Accessible Loading/Parking*
9	*Raised Crosswalk with Special Treatment*
10	*Traffic Island*
11	*Curb Cut for Garage*
12	*Bike Rack*
13	*Bench*
14	*Bollard*
15	*Concrete Unit Pavers*
16	*Roadway - Asphalt*
17	*Curb Cut for Driveway*
18	*Bike Share*
BL	*bike lane*
P	*parking*
SW	*sidewalk*
TL	*travel lane*
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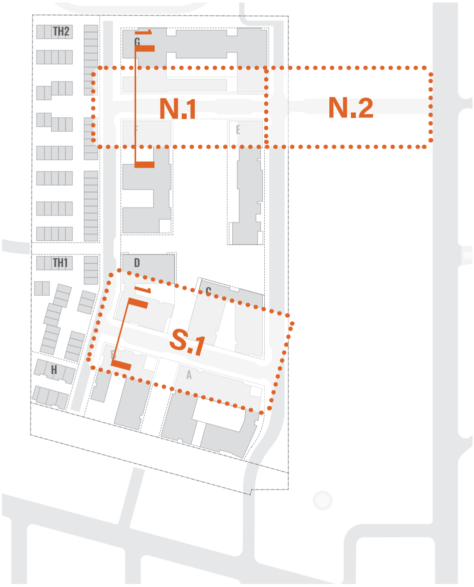
BO	*bulb-out*



Key Map

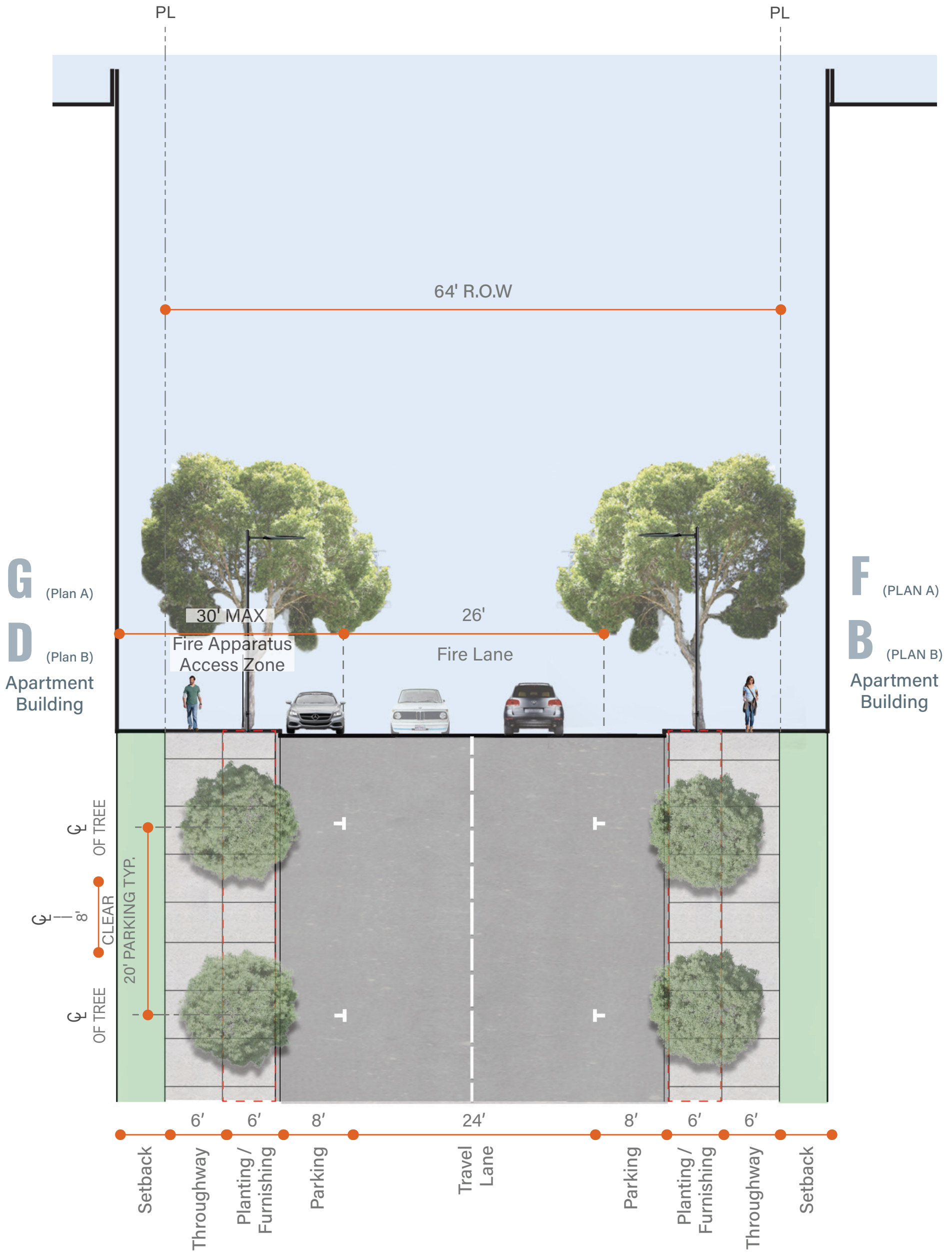


Figure 5.14–6: *North & South Street N.1 & S.2 Section*

5.15 WEST STREET

West Street will be a north-south neighborhood residential street with a 54-foot-wide right-of-way providing vehicular, pedestrian, and bike access to individual buildings, townhouses, San Ramon Paseo, and Reservoir Park. This street will have an asymmetrical profile with parallel parking on the east side. There will be one travel lane in each direction with a 10.5-foot-wide sidewalk on both sides of the street. Since there will be no parallel parking at the townhouse side of the street, a continuous 4-foot-wide tree and planting buffer with 8-foot-wide breaks every 60 feet will be provided along this frontage. The streetscape design will feature traffic calming elements such as chicanes, raised crosswalks, and mountable traffic circles.

Note: building footprints are for illustrative purposes only

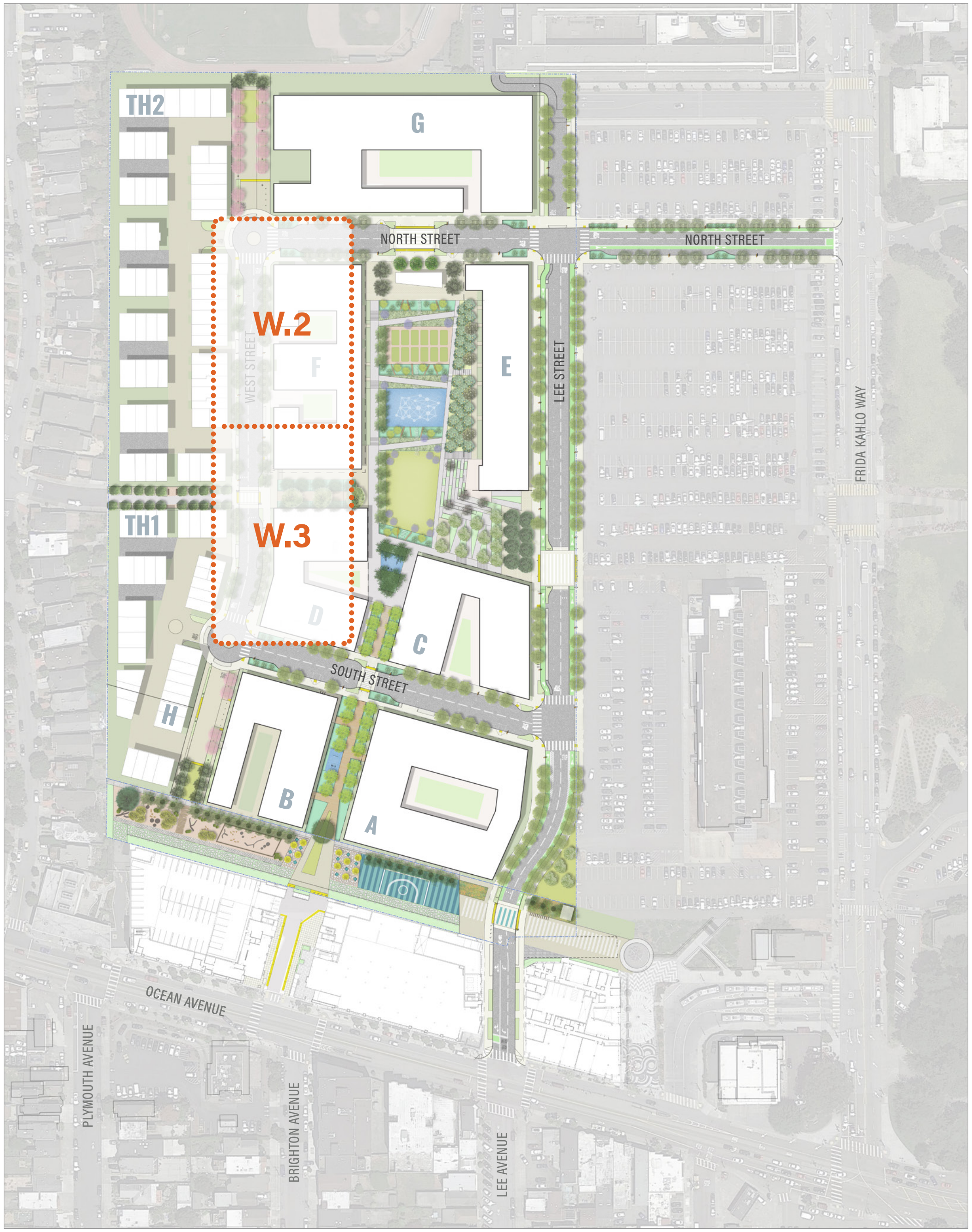


Figure 5.15–1: *West Street, Key Map*

0 125 250 ft

STANDARDS

S.5.15.1 Street Zone Dimensions

Right-of-way cross-section dimensions shall be as shown in Figure 5.15–2 through Figure 5.15–3.

S.5.15.2 Element and Material Specification

Elements per Figure 5.15–2. All elements shown shall be included. Dimensions vary to meet site-specific conditions.

S.5.15.3 Raised Crosswalk

The crosswalk at the intersection of West Street and the Reservoir Park entry shall be raised and 30 feet long at minimum. High quality paving materials such as unit paving is recommended. See MIP (Section 6.6: Traffic Calming) and Section 5.6 (Traffic Calming Strategies) for more details.

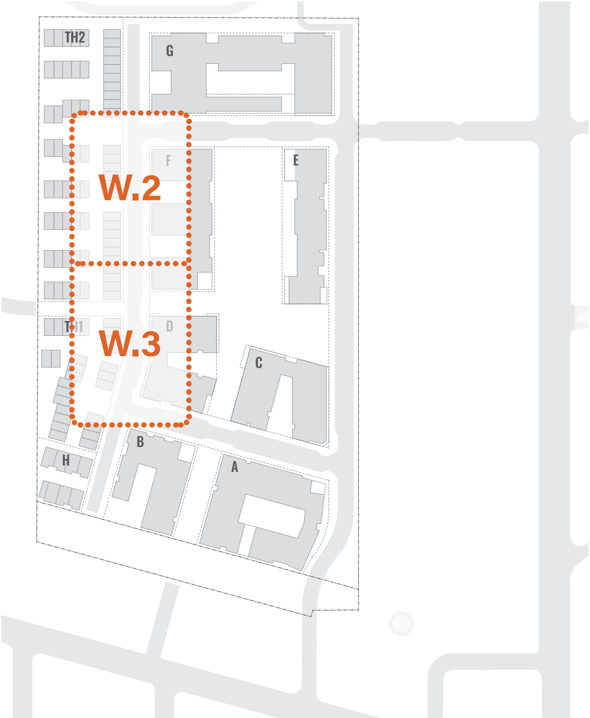
GUIDELINES

G.5.15.1 Stormwater Management

Due to grading challenges and spatial constraints, West Street will not be able to meet the 25% reduction in stormwater rate and volume. The open space stormwater management area will be oversized beyond the 25% requirement to offset the West Street stormwater requirement. See Chapter 6 (Open Space Network) for more information.

G.5.15.2 Mountable Traffic Circle

High-quality paving such as unit paving is recommended at the mountable traffic circle at the intersection of North Street and West Street and the intersection of South Street and West Street.



Key Map

LEGEND

1. Tree Well
2. Concrete Sidewalk
3. Street Light
4. Litter + Recycling Receptacle
5. Bioretention Planting
6. Regular Planting
7. Warning Paver
8. Curb Cut for Accessible Loading/Parking
9. Raised Crosswalk
10. Traffic Island
11. Curb Cut for Garage
12. Bike Rack
13. Bench
14. Bollard
15. Concrete Unit Pavers
16. Roadway – Asphalt
17. Curb Cut for Driveway
18. Mountable Traffic Circle

BL	bike lane
P	parking
SW	sidewalk
TL	travel lane
M	median
BO	bulb-out

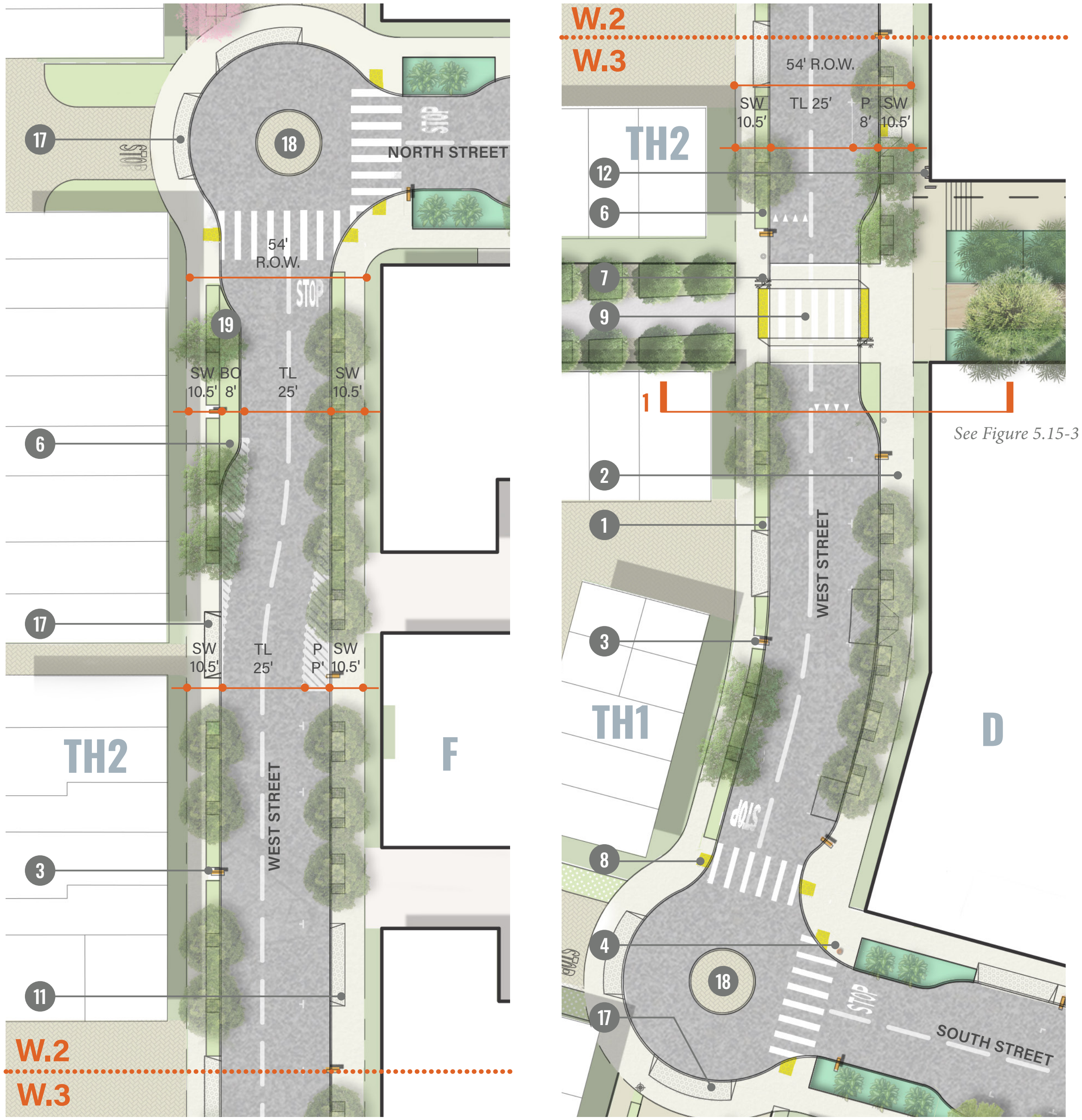


Figure 5.15–2: *West Street, Site Plan W.2 & W.3*

Key Map

**Planting zone to contain 500 cubic feet of verified growing media at a 3-foot depth per street tree*

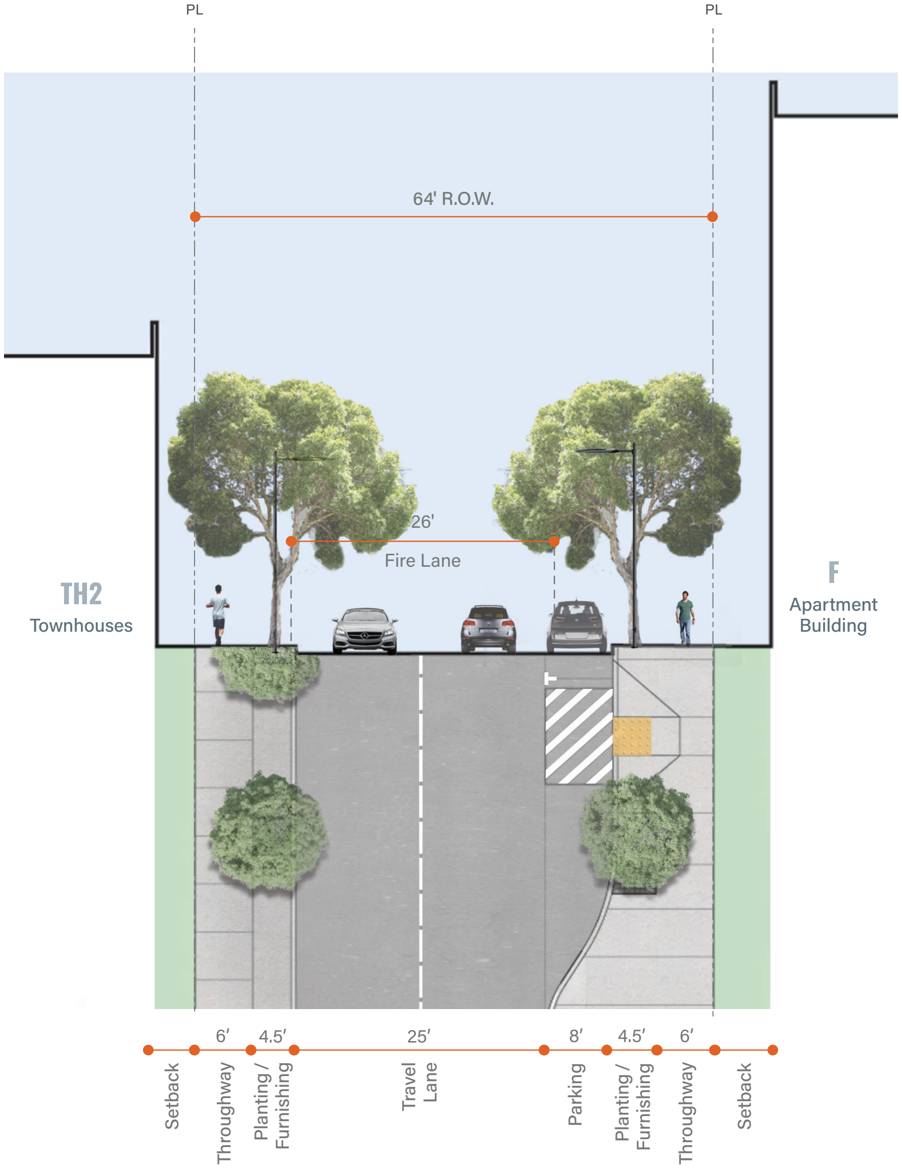


Figure 5.15–3: *West Street, Section 1* **see "Figure 5.15–2: West Street, Site Plan W.2 & W.3".*

5.16 WEST STREETS NORTH AND SOUTH, SHARED STREETS

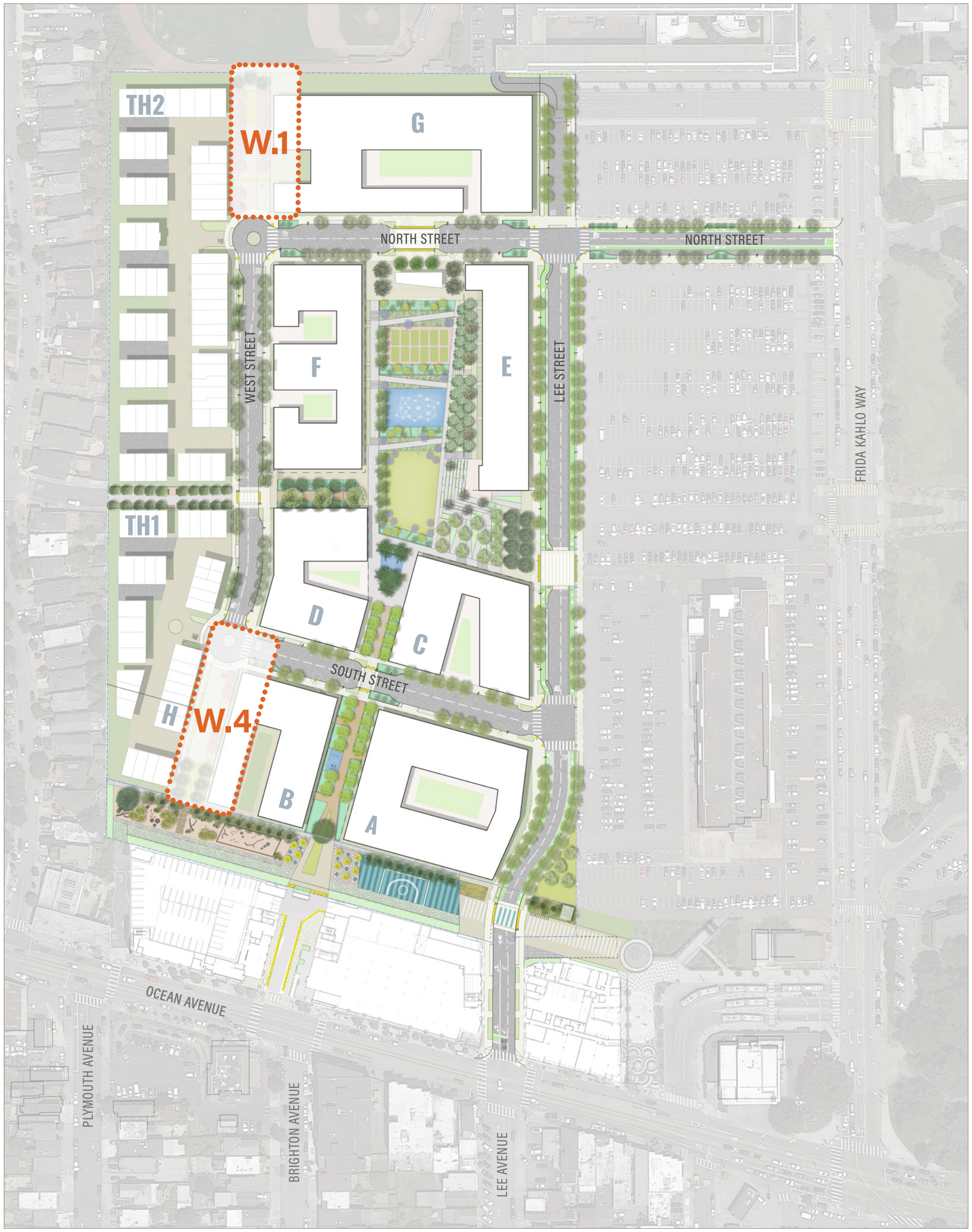
West Street North Shared Street (W.1)

The privately managed, pedestrianized raised street at the north end of West Street has a 54-foot-wide right-of-way. 28-feet outside the fire lane will serve as a usable open space with attractive paving that provides supplemental fire access and signifies pedestrian priority, and at the seating area with large trees at the end of the street to terminate the view. The streets will be flanked by townhouse entries on the west side and stoops on the east side. Off-street loading for Block G will be accommodated on the West Street North Shared Street.

West Street South Shared Street (W.4)

The West Street South shared street will also be a privately operated street. The south end of West Street will provide fire access, vehicular access, and off-street loading for Block B and the townhouse area. This curbless street will be flanked by plantings and stoops on both sides and will be curbless with permeable paving and warning pavers to emphasize its pedestrian nature of the street.

The pocket park at the West Street North is one of the possible dog relief area locations currently under consideration. See Section 6.18 (Dog Relief Area) for additional information.



Note: building footprints are for illustrative purposes only

Figure 5.16–1: *West Street, Shared Street Key Map*

0 125 250 ft

STANDARDS

S.5.16.1 Street Zone Dimensions

Right-of-way cross-section dimensions shall be as shown in Figure 5.16–2 (West Street North, Site Plan W.1).

S.5.16.2 Element and Material Specification

Elements are per Figure 5.16–2 and Figure 5.16–5. All elements shown shall be included. Dimensions vary.

S.5.16.3 Street Profile

The street shall be curbless and paved with ADA accessible, H-20 load-bearing special paving to emphasize pedestrian priority.

S.5.16.4 Fire Access

26-foot-clear fire access zones shall be provided. See Balboa Reservoir Infrastructure Plan (Section 6.2.4: Fire Department Access) for more details.

S.5.16.5 Loading

Shared public ways at the north and south end of West Street shall accommodate auto access and loading to adjacent townhouses. See Balboa Reservoir Infrastructure Plan (Figure 6.9: Proposed Service & Loading Plan) for more details.

S.5.16.6 Street Furnishing and Lighting

Since West Street has limited auto access at the north and the south ends, the termini can double-up as usable outdoor space. They should be developed to have a plaza-like character with furnishings and street lighting which serves pedestrians as well as autos.

GUIDELINES

G.5.16.1 Vehicular Access

At West Street South, vehicular access shall be limited to 2/3 of the street so a mini park can be accommodated at the end of the street to serve as a gateway to the SFPUC Open Space and to provide a visual terminus at the end of street at West Street North. Special paving shall be used for the entire roadway to distinguish the shared zone from vehicular driveway in public streets.

G.5.16.2 Planting

Planting should maximize habitat creation and stormwater management. See Section 5.9 (Street Planting Palette).

G.5.16.3 Stormwater Management

Stormwater generated within West Street South should be treated within the right-of-way. Permeable paving is recommended.

High quality paving creates a plaza-like environment to serve slow vehicles, bike and pedestrian circulation

Fire access lane serves as pedestrian pathway

WEST STREET NORTH, SHARED STREET

Key Map

LEGEND

① *Firelane*
② *Stoop Entrances*
③ *Mini Park /Dog Relief Area*
④ *Off-Street Loading Zone*

P	*parking*
SW	*sidewalk*
TL	*travel lane*
BL	*bike lane*
M	*median*
BO	*bulb-out*
FL	*fire lane*

W.1

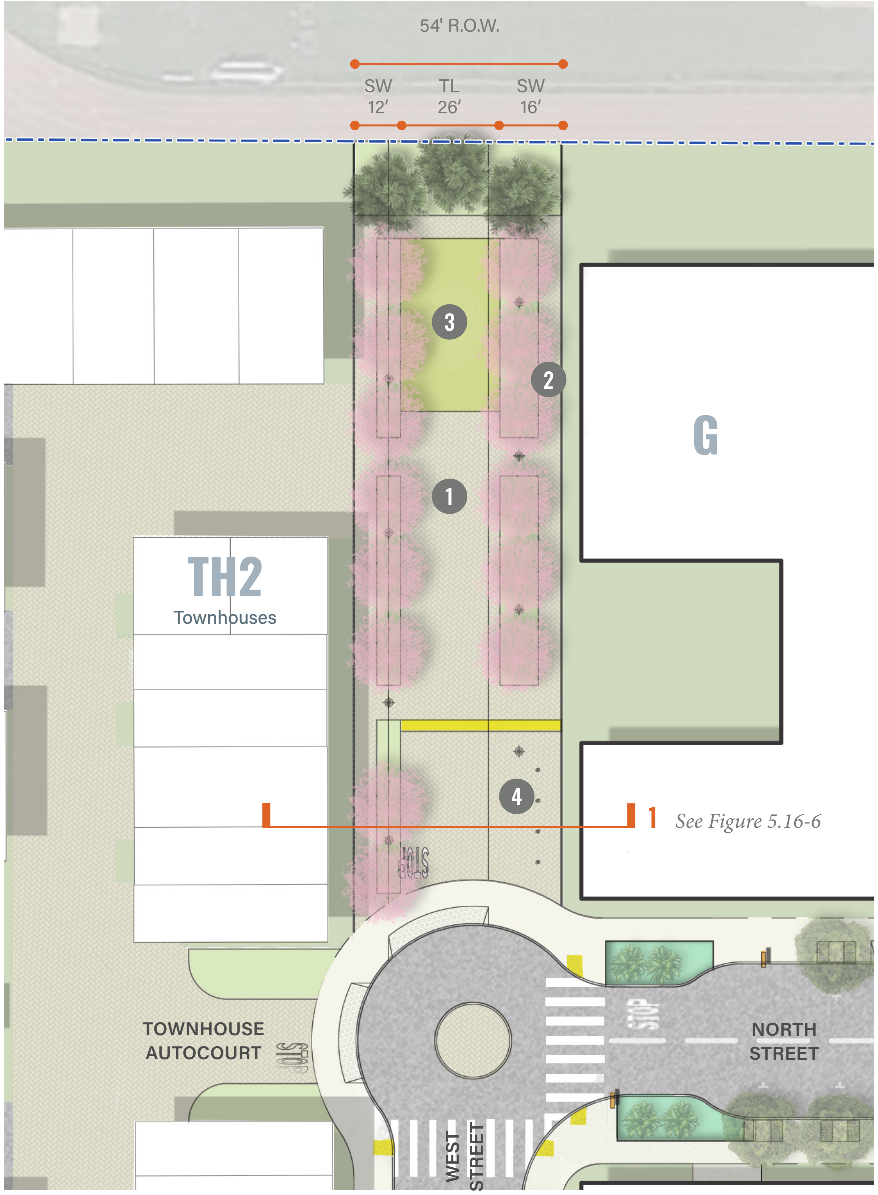


Figure 5.16–2: *West Street North, Site Plan W.1*

Key Map

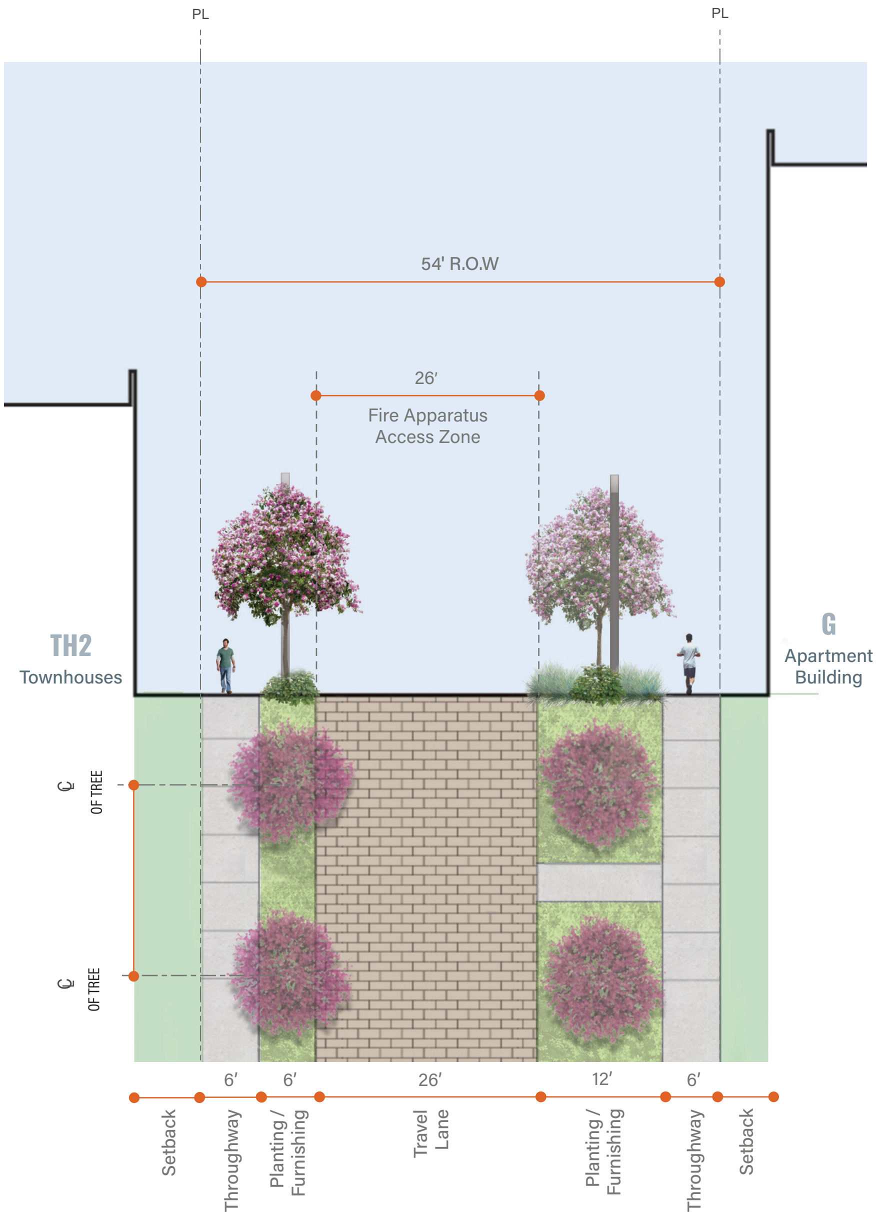
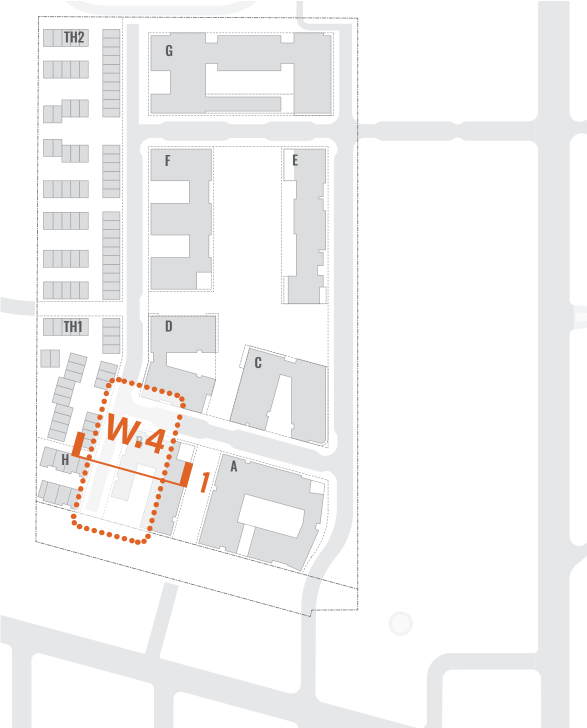


Figure 5.16–3: *West Street North, Section 1* **see "Figure 5.15.2: West Street North, Plan Enlargement", Site Plan W.1*

WEST STREET SOUTH, SHARED STREET



Key Map

LEGEND

1. *Off-Street Loading Zone*
2. *Raised Street /Fire Lane With Permeable Paving*
3. *Warning Paving*
4. *Stoop Entrances*
5. *Mini Park*

BL	*bike lane*
P	*parking*
SW	*sidewalk*
TL	*travel lane*
M	*median*
BO	*bulb-out*

W.4

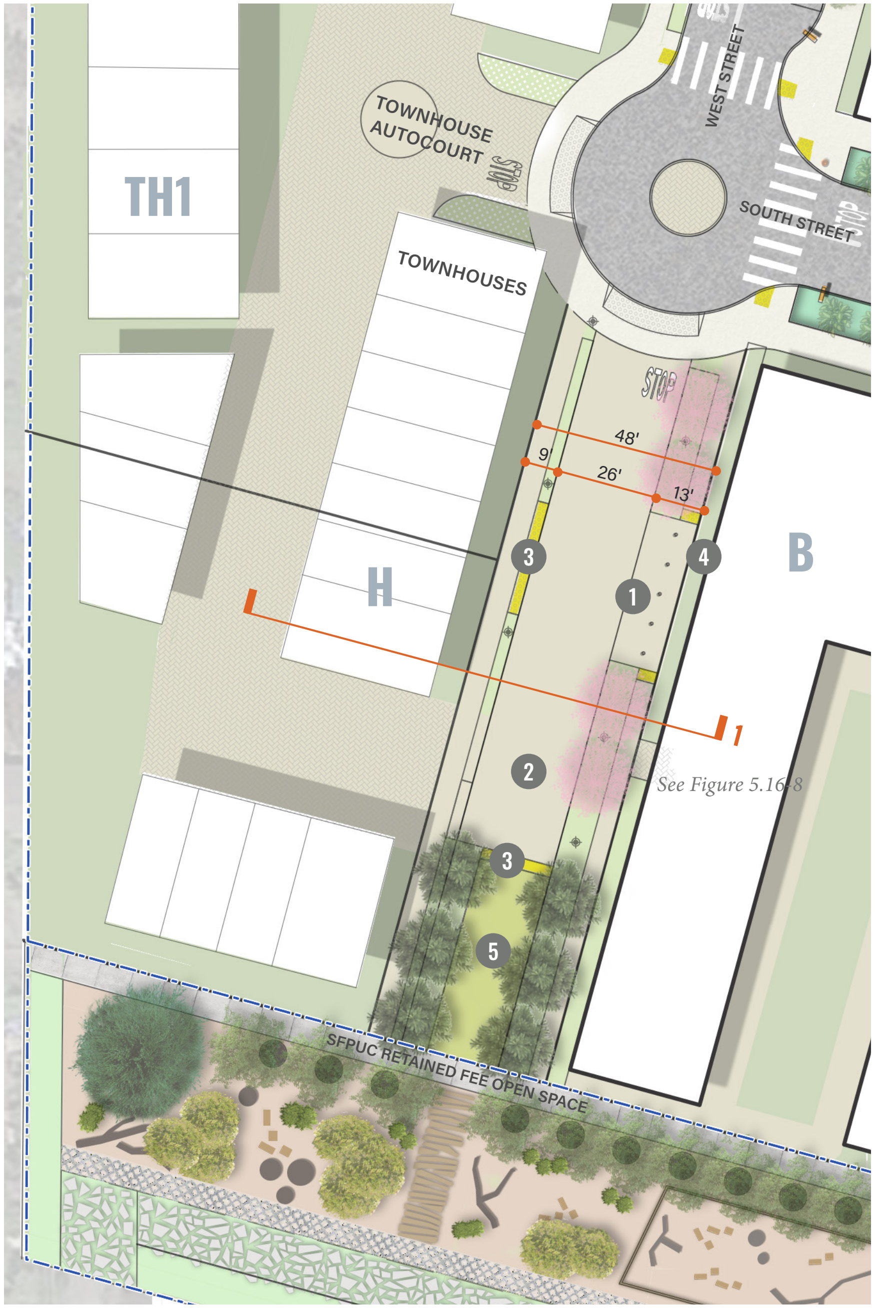


Figure 5.16–4: *West Street South, Site Plan W.4*

Key Map

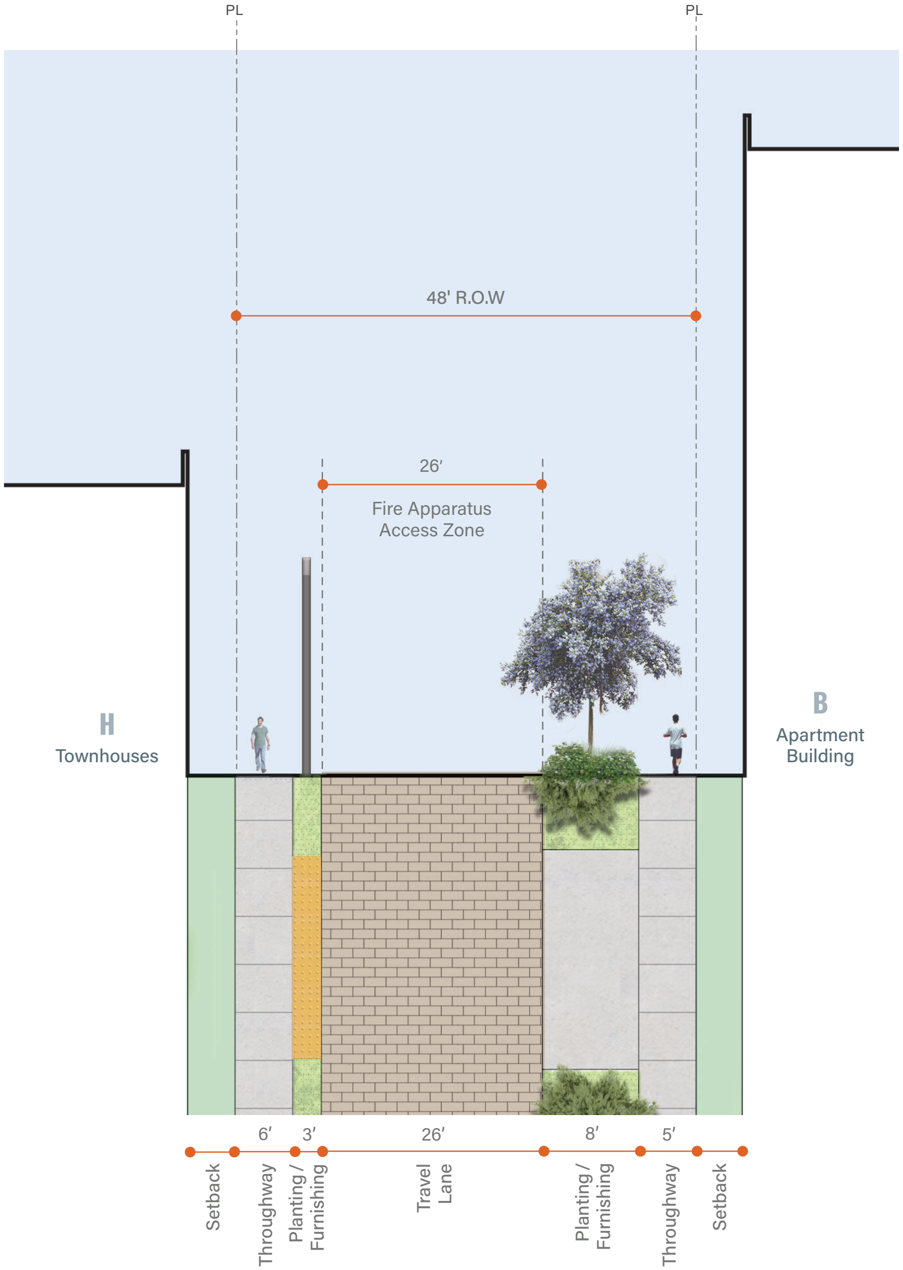
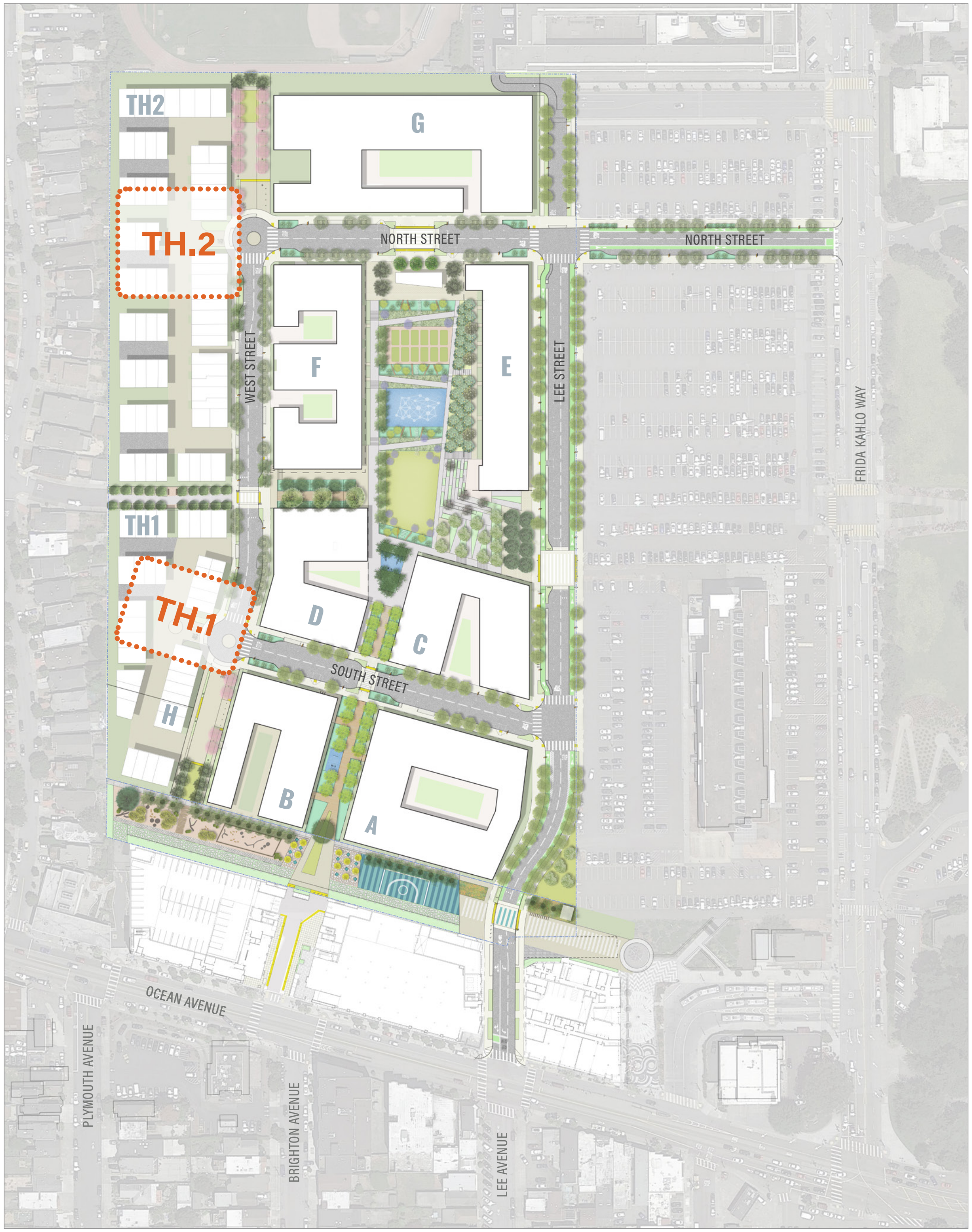


Figure 5.16–5: *West Street South, Section 1* **see "Figure 5.15.6: West Street South, Plan Enlargement", Site Plan W.4*

5.17 TOWNHOUSE ENTRY COURTS AND PRIVATE DRIVES

The intent of the townhouse entry courts is to provide a strong visual terminus to North and South Streets, and to integrate the townhouses into the rest of the project. Entry courts and private drives within the townhouse neighborhood will be designed to accommodate pedestrian and cyclists as well as low speed vehicle circulation.



Note: *configuration of private drives and buildings are for illustrative purposes only.*

Figure 5.17–1: *Townhouse Entry Courts, Key Map*

STANDARDS

S.5.17.1 Entry Courts

Entry courts shall be designed as auto/pedestrian courts and shall be located at the ends of North Street and South Street. Special paving and curbless treatment shall be used to emphasize their pedestrian character. No gates or fences are allowed at the auto court entries. Refer to Section 7.29 (Entry Courts)for additional standards at entry courts and private drives.

S.5.17.2 Private Drives

Special paving and curbless treatment shall be provided at private drives within the townhouse neighborhood to emphasize the pedestrian character. Planting shall be maximized to enhance the pedestrian character and to slow vehicle traffic.

S.5.17.3 Stormwater Management

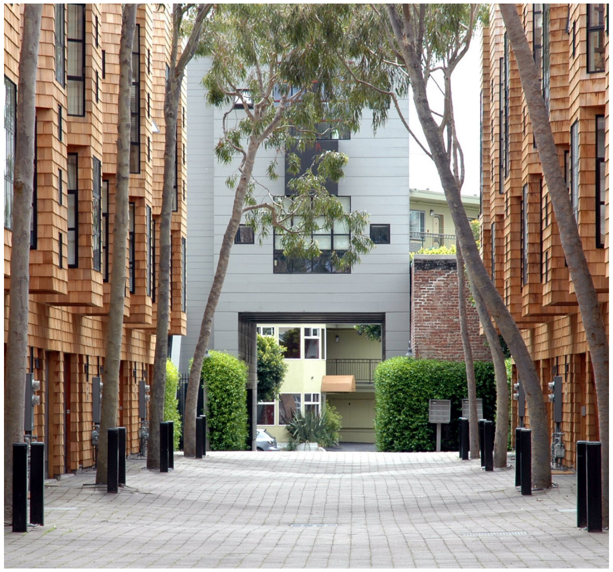
Stormwater that is generated within the right-of-way of townhouse driveways shall be treated within the townhouse development parcel. Permeable paving is recommended as a driveway and auto court treatment to increase pervious surface area.

GUIDELINES

G.5.17.1 Planting

Planting should maximize habitat creation and stormwater management. See Section 5.9 (Street Planting Palette).

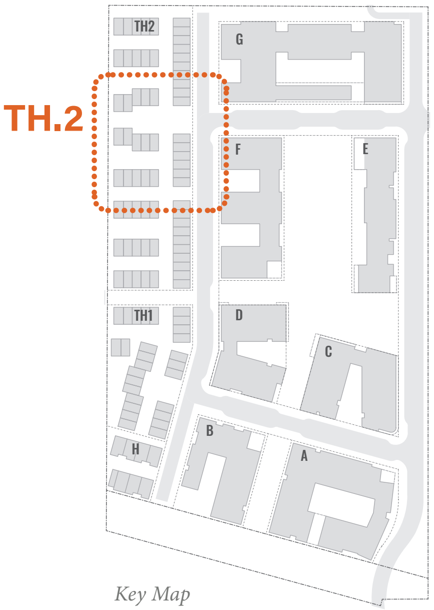
Permeable and vehicular rated paving is used to maximize pervious surface for stormwater management



Planting is maximized wherever possible to scale down the width of the driveway and for traffic calming.

High quality paving material, planting and accent lighting create a pedestrian environment.

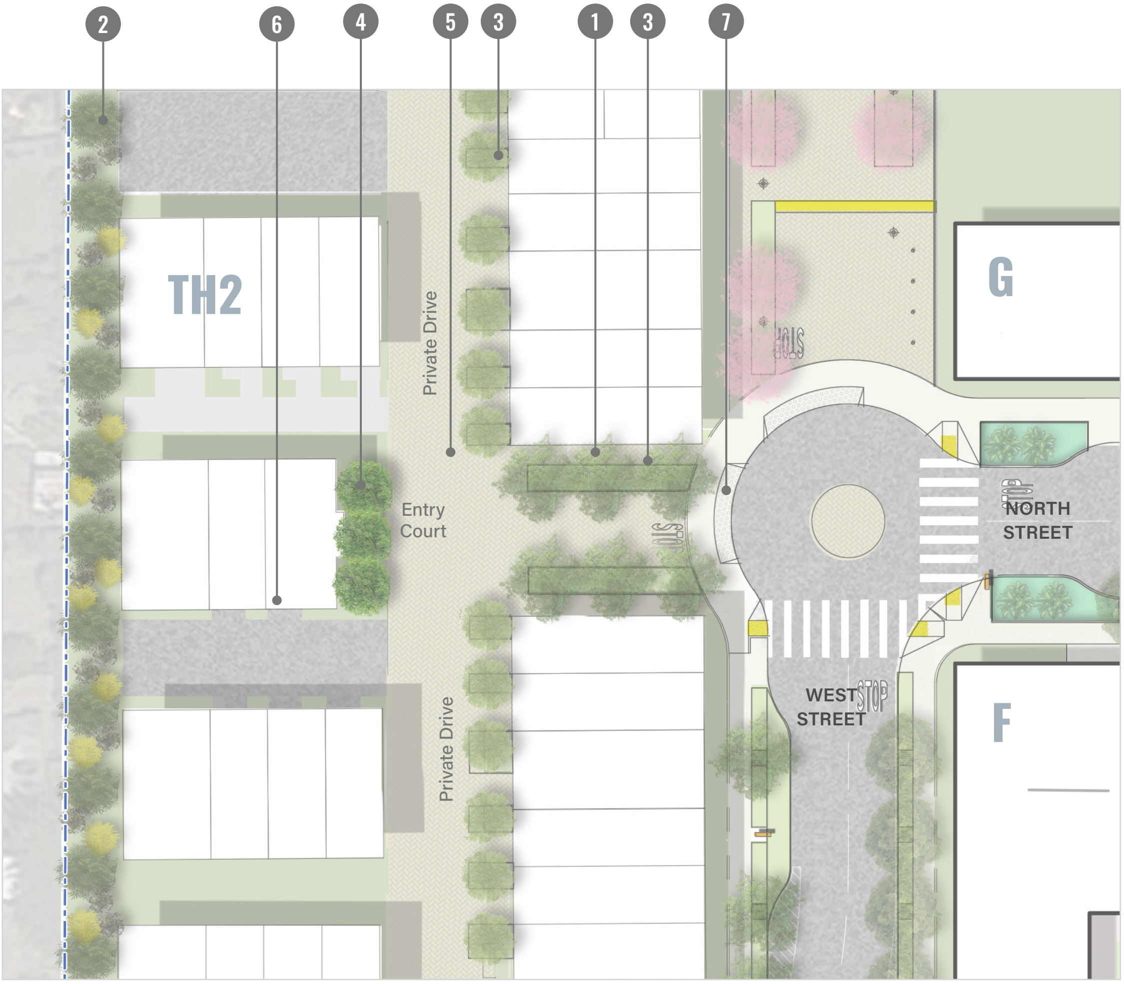
Figure 5.17–2: *Auto Court and Private Drive Precedents*



Key Map

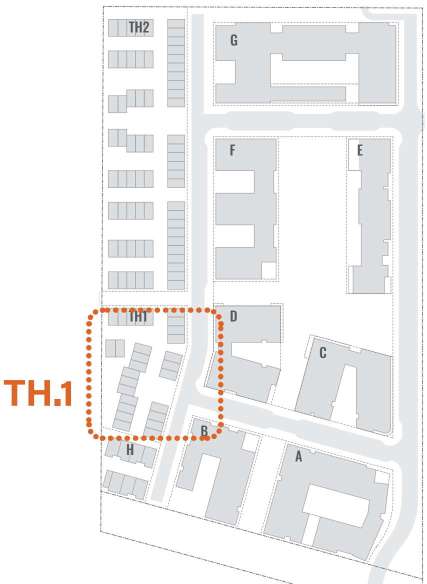
LEGEND

① *Pedestrian Walkway*
② *Buffer Planting*
③ *Tree Planting*
④ *Focal Tree Planting*
⑤ *Concrete Unit Paver*
⑥ *Townhouse Garage Entrance*
⑦ *Curb Cut for Private Drives*

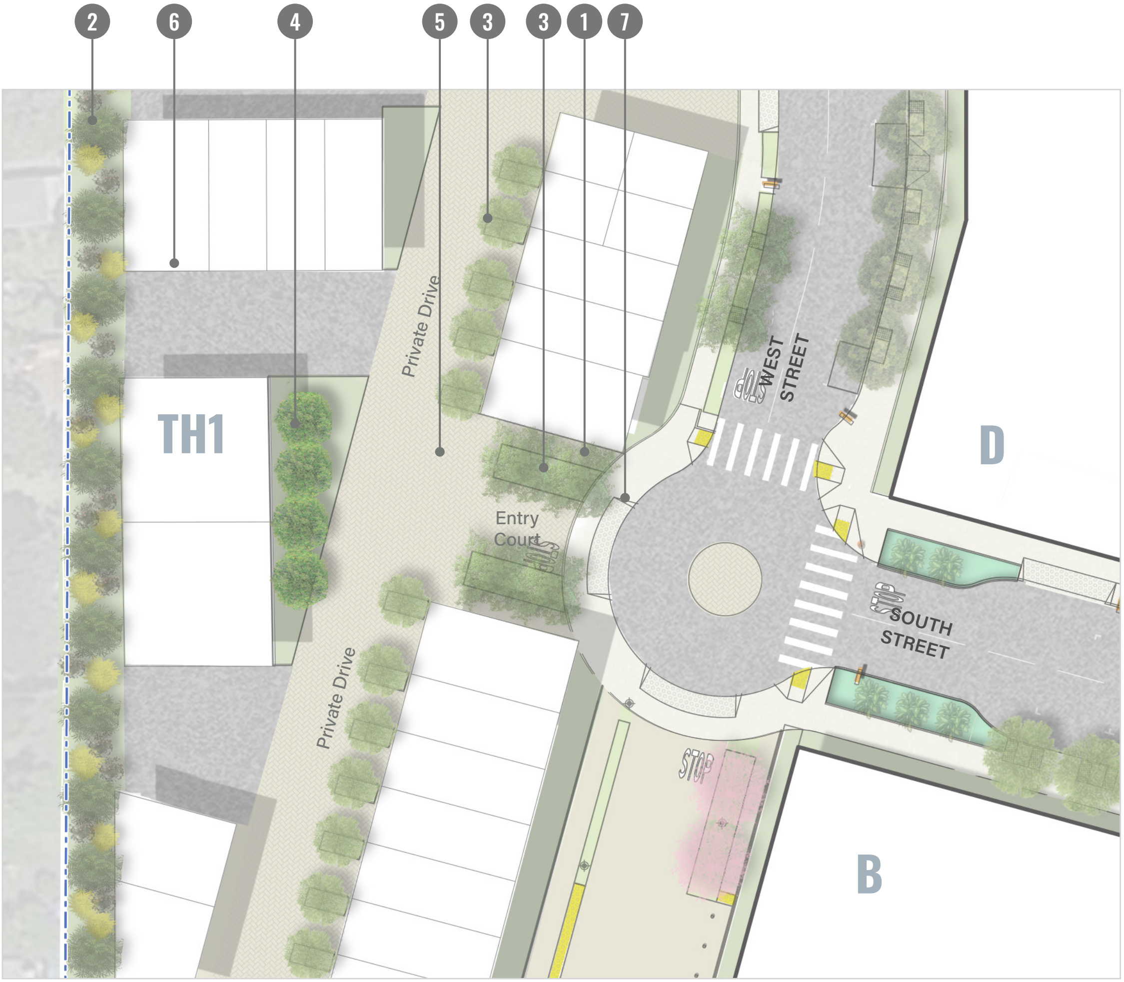


TH.2

Figure 5.17–3: *Townhouse Entry Court, Site Plan TH.2*



Key Map



TH.1

LEGEND

① *Pedestrian Walkway*
② *Buffer Planting*
③ *Tree Planting*
④ *Focal Tree Planting*
⑤ *Concrete Unit Paver*
⑥ *Townhouse Garage Entrance*
⑦ *Curb Cut for Private Drives*

Figure 5.17–4: *Townhouse Entry Court, Site Plan TH.1*

APPENDIX B – PRELIMINARY GEOTECHNICAL REPORT

DRAFT

ROCKRIDGE
GEOTECHNICAL

Prepared for **BRIDGE Housing Corporation**

PRELIMINARY GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT AT BALBOA RESERVOIR
PHELAN AND OCEAN AVENUES
SAN FRANCISCO, CALIFORNIA

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January 22, 20118
Project No. 17-1425

ROCKRIDGE
GEOTECHNICAL

January 22, 2018
Project No. 17-1425

Mr. Justin Lai
Investment Analyst
BRIDGE Housing Corporation
600 California Street, Suite 900
San Francisco, California 94108

Subject: Preliminary Geotechnical Investigation
Proposed Residential Development at Balboa Reservoir Site
Phelan and Ocean Avenues
San Francisco, California

Dear Mr. Lai:

We are pleased to present the results of our preliminary geotechnical investigation for the proposed residential development to be constructed at the Balboa Reservoir site in San Francisco. Our services were provided in accordance with our proposal dated October 26, 2017 and a Budget Increase Request dated January 2, 2018.

The project site consists of a rectangular-shaped, 17-acre lot on the western side of Phelan Avenue, north of its intersection with Ocean Avenue. The site is bordered by Riordan High School to the north, single-family residential developments to the west, multi-story mixed-used buildings to the south, and a parking lot and multi-use building for the City College of San Francisco (CCSF). The site, which was previously excavated up to 15 feet below original grades for a planned reservoir, is currently an asphalt-paved parking lot used for CCSF student parking.

Current plans are to construct a 1,100-unit residential development which will consist of clusters of residential buildings separated by landscaped areas, walkways and parks. The buildings will be constructed near the existing grades and will consist of residential units of Type 5 construction over one-story concrete (Type I) podiums.

From a geotechnical standpoint, we conclude the site can be developed as planned, provided the recommendations presented in this report are incorporated into the project plans and specifications and implemented during construction. The primary geotechnical issues affecting the proposed development include site grading and support of the proposed structures. We preliminarily conclude the proposed buildings should be supported on conventional spread footings that gain support on undisturbed native soil or engineered fill.

This report presents our preliminary conclusions and recommendations regarding foundation design, earthwork and grading, seismic design, and other geotechnical aspects of the project. The recommendations contained in our report are based on limited subsurface exploration and review of available data for the site, and are not intended for final design. Final geotechnical design values should be confirmed by a detailed geotechnical investigation. In addition, variations between expected and actual soil conditions may be found in localized areas during construction. Therefore, we should be engaged to observe shoring and foundation installation, and fill placement, during which time we may make changes in our recommendations, if deemed necessary.

We appreciate the opportunity to provide our services to you on this project. If you have any questions, please call.

Sincerely,
ROCKRIDGE GEOTECHNICAL, INC.

DRAFT	**DRAFT**
Clayton J. Proto, P.E. Project Engineer	Craig S. Shields, P.E., G.E. Principal Engineer

Enclosure

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PRELIMINARY GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT AT BALBOA RESERVOIR
PHELAN AND OCEAN AVENUES
San Francisco, California

1.0 INTRODUCTION

This report presents the results of the preliminary geotechnical investigation performed by Rockridge Geotechnical, Inc. (Rockridge) for the proposed residential development to be constructed at the Balboa Reservoir site in San Francisco, California.

The project site consists of a rectangular-shaped, 17-acre lot on the western side of Phelan Avenue, north of its intersection with Ocean Avenue, as shown on Figure 1, Site Location Map. The site is bordered by Riordan High School to the north, single-family residences to the west, multi-story mixed-used buildings to the south, and a parking lot and multi-use building for the City College of San Francisco (CCSF) to the east. The site is currently an asphalt-paved parking lot used for CCSF student parking. The central portion of the site was previously excavated up to 15 feet below original grades for a planned reservoir, and an embankment up to about 30 feet tall was constructed along the western portion of the site.

Plans are to construct a 1,100-unit residential development which will consist of clusters of residential buildings separated by landscaped areas, walkways and parks. The buildings will consist of residential units of Type 5 construction over one-story concrete (Type I) podiums.

2.0 SCOPE OF SERVICES

Our investigation was performed in accordance with our Proposal for Preliminary Geotechnical Investigation with BRIDGE Housing, dated October 27, 2017, and a subsequent Budget Increase Request dated January 2, 2018. Our scope of services consisted of reviewing available geologic maps and geotechnical reports of the site and vicinity, exploring subsurface conditions at the site by performing six cone penetration tests (CPTs), advancing four exploratory borings, and performing engineering analyses to develop preliminary conclusions and recommendations regarding:

- site seismicity and seismic hazards, including the potential for liquefaction and liquefaction-induced ground failure
- the most appropriate foundation type(s) for the proposed structures
- preliminary design criteria for the recommended foundation type(s)
- estimates of foundation settlement
- 2016 San Francisco Building Code (SFBC) site class and design spectral response acceleration parameters
- construction considerations.

3.0 FIELD INVESTIGATION

Prior to performing the subsurface field investigation, we obtained a permit from the San Francisco Department of Public Health (SFDPH) and contacted Underground Service Alert (USA) to notify them of our work, as required by law. We also retained Precision Locating LLC, a private utility locator, to minimize the likelihood that an underground utility was encountered during our investigation. Details of the field exploration are described below.

3.1 Test Borings

Four borings, designated B-1 through B-4, were drilled on January 3, 2018 by Benevent Building of Concord, California at the approximate locations shown on Figure 2. Borings B-1, B-2, B-3, and B-4 were drilled to depths of about 26, 26, 11, and 6 feet bgs, respectively, using a limited-access drill rig equipped with solid flight augers. During drilling, our field engineer logged the soil encountered and obtained representative samples for visual classification and laboratory testing. The logs of the borings are presented on Figures A-1 through A-4 in Appendix A. The soil encountered in the borings was classified in accordance with the classification chart shown on Figure A-5.

Soil samples were obtained using a Standard Penetration Test (SPT) split-barrel sampler with a 2.0-inch outside and 1.5-inch inside diameter, without liners. The sampler was driven with an above-ground, 140-pound, hammer falling 30 inches per drop using a rope and cathead. The samplers were driven up to 18 inches and the hammer blows required to drive the samplers were recorded every six inches and are presented on the boring logs. A “blow count” is defined as the number of hammer blows per six inches of penetration or 50 blows for six inches or less of penetration. The blow counts required to drive the SPT samplers were converted to approximate SPT N-values using factors of 1.2, respectively, to account for approximate hammer energy and the fact that the sampler was sized to accommodate liners, but was driven without liners. The blow counts used for this conversion were: (1) the last two blow counts if the sampler was driven more than 12 inches, (2) the last one blow count if the sampler was driven more than six inches but less than 12 inches, and (3) the only blow count if the sampler was driven six inches or less. The converted SPT N-values are presented on the boring logs.

Upon completion of drilling, the boreholes were backfilled with cement grout in accordance with SFDPH standards. The soil cuttings generated by the borings were spread in landscaping areas.

3.2 Cone Penetration Tests

Six CPTs, designated CPT-1 through CPT-6, were advanced on January 3, 2017 by Middle Earth GeoTesting of Orange, California at the approximate locations shown on the Site Plan, Figure 2. The CPTs were advanced until practical refusal was met in very dense sand, which occurred at depths ranging from approximately 5 to 46 feet below ground surface (bgs). The CPTs were performed with a truck-mounted rig hydraulically pushing a 1.7-inch-diameter cone-tipped probe into the ground. The probe measured tip resistance, pore water pressure, and frictional resistance on a sleeve behind the cone tip. Electrical sensors within the cone continuously measured these parameters for the entire depth advanced, and the readings were digitized and recorded by a computer. Accumulated data were processed by computer to provide engineering information such as soil behavior types, correlated strength characteristics, and estimated liquefaction resistance of the soil encountered. The CPT logs, showing tip resistance, friction ratio, pore water pressure, and soil behavior type, are shown on Figures A-6 through A-12 in Appendix A. Upon completion, the CPT holes backfilled with neat cement grout in accordance with SFDPH requirements.

4.0 SITE AND SUBSURFACE CONDITIONS

We understand the site is currently owned by the San Francisco Public Utilities Commission, and was originally planned for use as a municipal water reservoir. Although the site was never used as a reservoir, the central portion of the site was excavated down approximately 15 feet and an embankment approximately 30 feet tall was constructed along the western and southern boundary. The southern embankment was removed in 2008, and a new embankment was constructed along the eastern site boundary between 2008 and 2009. The central, depressed portion of the site is currently occupied by an asphalt parking lot.

As presented on the Regional Geologic Map (Figure 3), the site is mapped in a zone of early-Pleistocene alluvium (Qoa) (Graymer, 2006). Based on the results of our investigation and our understanding of the site history, we conclude the non-embankment portion of the site is underlain by a deposit of medium dense to very dense silty sand with occasional clay interbeds, known locally as the Colma formation. The Colma formation extends to a depth of at least 46 feet bgs at location CPT-6, the maximum depth explored. The embankment consists of sand fill which was likely excavated onsite and re-worked. Documentation of the embankment construction was not available; however, the results of our investigation indicates that the fill appears to have been well-compacted and is generally dense to very dense in consistency.

Free groundwater was not observed in our borings. We reviewed the results of a 2010 geotechnical investigation performed by Fugro, Inc for a development on Phelan Loop immediately southeast of the site. In this investigation, groundwater was encountered in one boring at a depth of about 22 feet bgs, while a second boring drilled to 40 feet did not encounter groundwater. To better estimate the highest potential groundwater level at the site, we also reviewed information on the State of California Water Resources Control Board GeoTracker website (http://geotracker.waterboards.ca.gov/). The closest site with groundwater information on the GeoTracker website is at 1490 Ocean Avenue, which is about 600 feet west of the subject property. Recorded depths to groundwater at the 1490 Ocean Avenue site has fluctuated from about 18 to 33 feet bgs during the time period of 2002 to 2012. Ground surface elevations at 1490 Ocean Avenue are approximately 20 feet below existing grades at the Balboa Reservoir site. The groundwater level at the site is expected to fluctuate several feet seasonally with potentially larger fluctuations annually, depending on the amount of rainfall. Based on available data, we conclude a design high groundwater level of 20 feet bgs could be used for preliminary design.

5.0 SEISMIC CONSIDERATIONS

The San Francisco Bay Area is considered to be one of the more seismically active regions in the world. We preliminarily evaluated the potential for earthquake-induced geologic hazards including ground shaking, ground surface rupture, liquefaction,[1] lateral spreading,[2] and cyclic densification[3]. The results of our evaluation regarding seismic considerations for the project site are presented in the following sections.

5.1 Regional Seismicity and Faulting

The major active faults in the area are the Hayward, San Andreas, and Calaveras faults. These and other faults of the region are shown on Figure 4. The fault systems in the Bay Area consist of several major right-lateral strike-slip faults that define the boundary zone between the Pacific and the North American tectonic plates. Numerous damaging earthquakes have occurred along these fault systems in recorded time. For these and other active faults within a 50-kilometer radius of the site, the distance from the site and estimated mean characteristic moment magnitude[4] [Working Group on California Earthquake Probabilities (WGCEP, 2008) and Cao et al. (2003)] are summarized in Table 2.

---

[1] Liquefaction is a phenomenon where loose, saturated, cohesionless soil experiences temporary reduction in strength during cyclic loading such as that produced by earthquakes.

[2] Lateral spreading is a phenomenon in which surficial soil displaces along a shear zone that has formed within an underlying liquefied layer. Upon reaching mobilization, the surficial blocks are transported downslope or in the direction of a free face by earthquake and gravitational forces.

[3] Cyclic densification is a phenomenon in which non-saturated, cohesionless soil is compacted by earthquake vibrations, causing ground-surface settlement.

[4] Moment magnitude is an energy-based scale and provides a physically meaningful measure of the size of a faulting event. Moment magnitude is directly related to average slip and fault rupture area.

TABLE 2
Regional Faults and Seismicity

Fault Segment	Approximate Distance from Site (km)	Direction from Site	Mean Characteristic Moment Magnitude
N. San Andreas - Peninsula	5	West	7.20
N. San Andreas (1906 event)	5	West	8.05
San Gregorio Connected	12	West	7.50
N. San Andreas - North Coast	12	West	7.51
Total Hayward	24	Northeast	7.00
Total Hayward-Rodgers Creek	24	Northeast	7.33
Monte Vista-Shannon	37	Southeast	6.50
Mount Diablo Thrust	40	East	6.70
Rodgers Creek	40	North	7.07
Total Calaveras	41	East	7.03
Point Reyes	41	Northwest	6.90
Green Valley Connected	45	East	6.80

Since 1800, four major earthquakes (i.e., Magnitude > 6) have been recorded on the San Andreas fault. In 1836, an earthquake with an estimated maximum intensity of VII on the Modified Mercalli (MM) Intensity Scale occurred east of Monterey Bay on the San Andreas fault (Toppozada and Borchardt 1998). The estimated moment magnitude, M_w, for this earthquake is about 6.25. In 1838, an earthquake occurred on the Peninsula segment of the San Andreas fault. Severe shaking occurred with an MM of about VIII-IX, corresponding to an M_w of about 7.5. The San Francisco Earthquake of 1906 caused the most significant damage in the history of the Bay Area in terms of loss of lives and property damage. This earthquake created a surface rupture along the San Andreas fault from Shelter Cove to San Juan Bautista approximately 470 kilometers in length. It had a maximum intensity of XI (MM), an M_w of about 7.9, and was felt 560 kilometers away in Oregon, Nevada, and Los Angeles. The Loma Prieta Earthquake of

October 17, 1989 had an M_w of 6.9 and occurred about 92 kilometers southeast of the site. On August 24, 2014 an earthquake with an estimated maximum intensity of VIII (severe) on the MM scale occurred on the West Napa fault. This earthquake was the largest earthquake event in the San Francisco Bay Area since the Loma Prieta Earthquake. The M_w of the 2014 South Napa Earthquake was 6.0.

In 1868, an earthquake with an estimated maximum intensity of X on the MM scale occurred on the southern segment (between San Leandro and Fremont) of the Hayward fault. The estimated M_w for the earthquake is 7.0. In 1861, an earthquake of unknown magnitude (probably an M_w of about 6.5) was reported on the Calaveras fault. The most recent significant earthquake on this fault was the 1984 Morgan Hill earthquake ($M_w = 6.2$).

The U.S. Geological Survey's 2014 Working Group on California Earthquake Probabilities has compiled the earthquake fault research for the San Francisco Bay area in order to estimate the probability of fault segment rupture. They have determined that the overall probability of moment magnitude 6.7 or greater earthquake occurring in the San Francisco Region during the next 30 years (starting from 2014) is 72 percent. The highest probabilities are assigned to the Hayward fault, Calaveras fault, and the northern segment of the San Andreas fault. These probabilities are 14.3, 7.4, and 6.4 percent, respectively.

5.2 Geologic Hazards

During a major earthquake on a segment of one of the nearby faults, strong to very strong ground shaking is expected to occur at the project site. Strong shaking during an earthquake can result in ground failure such as that associated with soil liquefaction, lateral spreading, and cyclic densification. We used the results of the CPTs and borings performed for this investigation to evaluate the potential of these phenomena occurring at the project site.

5.2.1 Ground Shaking

The ground shaking intensity felt at the project site will depend on: 1) the size of the earthquake (magnitude), 2) the distance from the site to the fault source, 3) the directivity (focusing of earthquake energy along the fault in the direction of the rupture), and 4) site-specific soil conditions. The site is 5 kilometers from the San Andreas fault. Therefore, the potential exists for a large earthquake to induce strong to violent ground shaking at the site during the life of the project.

5.2.2 Liquefaction and Liquefaction-Induced Settlement

When a saturated, cohesionless soil liquefies, it experiences a temporary loss of shear strength created by a transient rise in excess pore pressure generated by strong ground motion. Soil susceptible to liquefaction includes loose to medium dense sand and gravel, low-plasticity silt, and some low-plasticity clay deposits. Flow failure, lateral spreading, differential settlement, loss of bearing strength, ground fissures and sand boils are evidence of excess pore pressure generation and liquefaction. The site mapped outside of a liquefaction hazard zone, as shown on Figure 5 from the map titled *State of California, Seismic Hazard Zones, City and County of San Francisco, Official Map*, prepared by the California Geological Survey (CGS) and dated November 17, 2000.

Liquefaction susceptibility was assessed using the software CLiq v2.1 (GeoLogismiki, 2017). CLiq uses measured field CPT data and assesses liquefaction potential, including post-earthquake vertical settlement, given a user-defined earthquake magnitude and peak ground acceleration (PGA). We performed a liquefaction triggering analysis using our CPT data in accordance with the methodology by Boulanger and Idriss (2014).

Our analyses were performed using a “during earthquake” groundwater depth of 20 feet bgs. In accordance with the 2016 San Francisco Building Code (SFBC), we used a peak ground acceleration of 0.76 times gravity (g) in our liquefaction evaluation; this peak ground acceleration is consistent with the Maximum Considered Earthquake Geometric Mean (MCE_G) peak ground acceleration adjusted for site effects (PGA_M). We also used a moment magnitude of 8.05, corresponding to the mean characteristic moment magnitude of the San Andreas fault (Table 2).

The results of our liquefaction analysis indicate the soil at the site is sufficiently dense to resist liquefaction. Therefore, we preliminarily conclude that the potential for liquefaction and associated surface manifestations, such as settlement, loss of bearing capacity, sand boils, and lateral spreading, are nil.

5.2.3 Cyclic Densification

Cyclic densification (also referred to as differential compaction) of non-saturated sand (sand above groundwater table) can occur during an earthquake, resulting in settlement of the ground surface and overlying improvements. The CPTs indicate that the soil above the groundwater table at the site consists predominantly of dense to very dense silty sand, which is not susceptible to cyclic densification. Therefore, we preliminarily conclude that the potential for cyclic densification is nil.

5.2.4 Ground Surface Rupture

Historically, ground surface displacements closely follow the trace of geologically young faults. The site is not within an Earthquake Fault Zone, as defined by the Alquist-Priolo Earthquake Fault Zoning Act, and no known active or potentially active faults exist on the site. We therefore conclude the risk of fault offset at the site from a known active fault is very low. In a seismically active area, the remote possibility exists for future faulting in areas where no faults previously existed; however, we conclude the risk of surface faulting and consequent secondary ground failure from previously unknown faults is also very low.

6.0 PRELIMINARY CONCLUSIONS AND RECOMMENDATIONS

Based on the results of our engineering analyses using the data from the CPTs, we conclude there are no major geotechnical or geological issues that would preclude development of the site as proposed. The primary geotechnical issues affecting the proposed development include site grading and support of the proposed structures. These issues, as well as construction considerations and seismic design, are discussed in more detail in the following sections.

6.1 Foundations and Settlement

The results of borings and CPTs performed at the site indicate the central portion of the site is underlain by dense to very dense silty sand of the Colma formation. The western portion of the site is currently occupied by an embankment which measures approximately 30 feet high and has a footprint approximately 180 feet wide (east-west) and 1000 feet long (north-south). The embankment was likely constructed using soil excavated from the central portion of the site. We understand that current plans are to remove the western embankment and use the material to raise grades across the site. If spread uniformly, we estimate that this grading would raise site grades by approximately 4 to 5 feet; therefore, it is likely that some or all of the proposed structures will bottom in the newly placed fill. Provided that this fill is properly placed and well-compacted, we conclude conventional spread footings are appropriate for foundation support.

We preliminarily recommend that spread footings be designed using an allowable bearing pressure of 7,000 pounds per square foot (psf) for dead-plus-live loads; this pressure may be increased by one-third for total design loads, which include wind or seismic forces. Estimated total settlements will be on the order of 3/4 inch and differential settlement will be on the order of 1/2 inch over a 30-foot horizontal distance. Continuous footings should be at least 18 inches wide and isolated spread footings should be at least 36 inches wide. Footings should extend at least 18 inches below the lowest adjacent soil subgrade.

Lateral loads may be resisted by a combination of friction along the base of the footing and passive resistance against the vertical faces of the footing. To compute lateral resistance, we recommend using an equivalent fluid weight of 330 pounds per cubic foot (pcf); the upper foot of soil should be ignored unless confined by a slab or pavement. Frictional resistance should be computed using a base friction coefficient of 0.40 where the footing is in direct contact with soil. The passive pressure and frictional resistance values include a factor of safety of at least 1.5 and may be used in combination without reduction.

6.2 Construction Considerations

Site demolition should include the removal of all existing improvements, including pavements, underground utilities, and buried foundations. In general, abandoned underground utilities should be removed to the property line or service connections and properly capped or plugged with concrete. Where existing utility lines are outside of the proposed building footprint and will not interfere with the proposed construction, they may be abandoned in-place provided the lines are filled with lean concrete or cement grout to the property line. Voids resulting from demolition activities should be properly backfilled with compacted fill following the recommendations provided later in this section.

The exposed soil subgrade is expected to generally consist of dense to very dense sand. However, if loose sand or weak clay is encountered, those materials should be removed and replaced with either properly compacted fill or lean concrete.

In areas that will receive fill, the soil subgrade exposed should be scarified to a depth of at least eight inches, moisture-conditioned to above optimum moisture content, and compacted to at least 90 percent relative compaction[5]. The soil subgrade should be compacted to at least 95 percent relative compaction if the soil consists of clean sand or gravel (defined as soil with less than 10 percent fines passing the No. 200 sieve). The soil subgrade should be kept moist until it is covered by fill.

Fill should consist of on-site soil or imported soil (select fill) that is free of organic matter, contains no rocks or lumps larger than three inches in greatest dimension, has a liquid limit of

---

[5] Relative compaction refers to the in-place dry density of soil expressed as a percentage of the maximum dry density of the same material, as determined by the ASTM D1557 laboratory compaction procedure.

less than 40 and a plasticity index lower than 12, and is approved by the Geotechnical Engineer. It is anticipated that the embankment material will meet these criteria. Samples of proposed imported fill material should be submitted to the Geotechnical Engineer at least three business days prior to use at the site. The grading contractor should provide analytical test results or other suitable environmental documentation indicating the imported fill is free of hazardous materials at least three days before use at the site. If this data is not available, up to two weeks should be allowed to perform analytical testing on the proposed imported material.

Fill should be placed in horizontal lifts not exceeding eight inches in uncompacted thickness, moisture-conditioned to above optimum moisture content, and compacted to at least 90 percent relative compaction. Fill consisting of clean sand or gravel (defined as soil with less than 10 percent fines by weight) should be compacted to at least 95 percent relative compaction. Fill greater than five feet in thickness, fill placed below proposed foundations, or fill placed within the upper foot of vehicular pavement soil subgrade should also be compacted to at least 95 percent relative compaction.

6.3 Soil Corrosivity

Corrosivity analyses were performed by Project X Corrosion Engineering on a sample of the native soil from boring B-2 at a depth of 15 feet bgs. The results of the tests are presented in Appendix B of this report. Based on the results of the laboratory corrosivity analyses performed on the samples, we conclude the soil is “negligibly corrosive” to metal with respect to resistivity, sulfate ion concentration, and pH. The chloride ion concentration classifies as “mildly corrosive”. Accordingly, all buried metallic structures and reinforcing steel in concrete structures should be protected against corrosion depending upon the critical nature of the structure. If it is necessary to have metal in contact with soil, a corrosion engineer should be consulted to provide recommendations for corrosion protection.

6.4 Seismic Design

We anticipate the proposed building will be designed using the seismic provisions in the 2016 San Francisco Building Code (SFBC). We preliminarily conclude a Site Class D designation should be used for seismic design. The latitude and longitude of the site are 37.7238° and -122.4553°, respectively. In accordance with the 2016 CBC, we recommend the following:

- S_S = 1.937g, S_1 = 0.907g
- S_{MS} = 1.937g, S_{M1} = 1.361g
- S_{DS} = 1.291g, S_{D1} = 0.907g
- Seismic Design Category E for Risk Categories I, II, and III.

7.0 ADDITIONAL GEOTECHNICAL SERVICES

The preliminary conclusions and recommendations presented within are based on a preliminary field investigation and not intended for final design. Prior to final design, we should be retained to provide a final geotechnical report based on a supplemental field investigation. Additional borings and CPTs will be required to further evaluate the subsurface conditions beneath the site and develop final foundation design recommendations. After our final report has been completed and the design team has selected a foundation system, we should review the project plans and specifications prior to construction to check their conformance with the intent of our final recommendations. During construction, we should observe site preparation, foundation installation, and the placement and compaction of backfill. These observations will allow us to compare the actual with the anticipated soil conditions and to check if the contractor's work conforms with the geotechnical aspects of the plans and specifications.

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FIGURES

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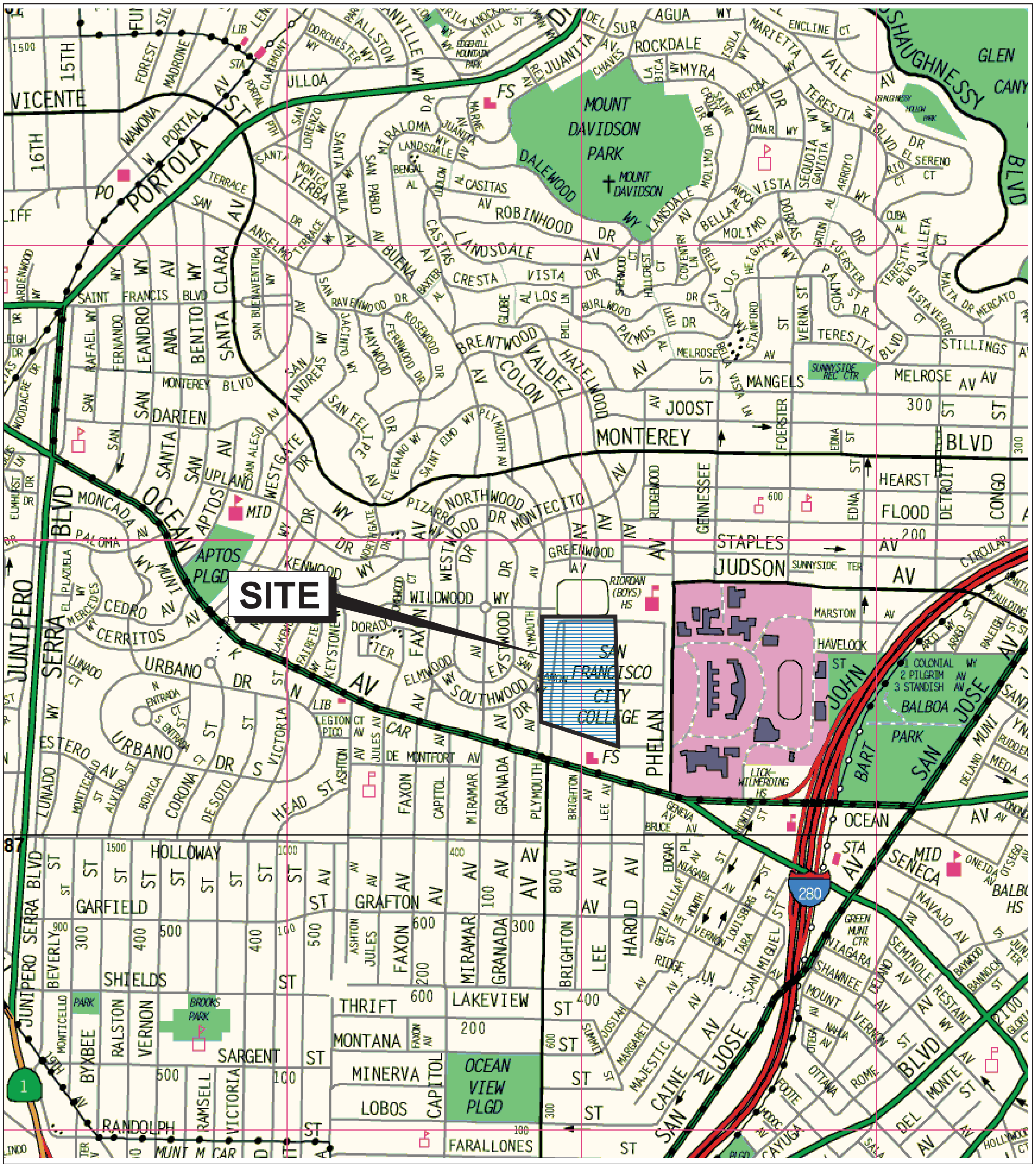


Base map: The Thomas Guide
San Francisco County
2002

0 1/4 1/2 Mile

Approximate scale

BALBOA RESERVOIR
San Francisco, California

ROCKRIDGE
GEOTECHNICAL

SITE LOCATION MAP

Date 01/05/18 | Project No. 17-1425 | Figure 1

DRAFT

EXPLANATION

B-1 ⌖	Approximate location of boring by Rockridge Geotechnical Inc., January 3, 2018
CPT-1 ⊙	Approximate location of cone penetration test by Rockridge Geotechnical Inc., January 3, 2018
― ‒ ―	Project limits

0 150 Feet

Approximate scale

Base map: Google Earth, 2017.

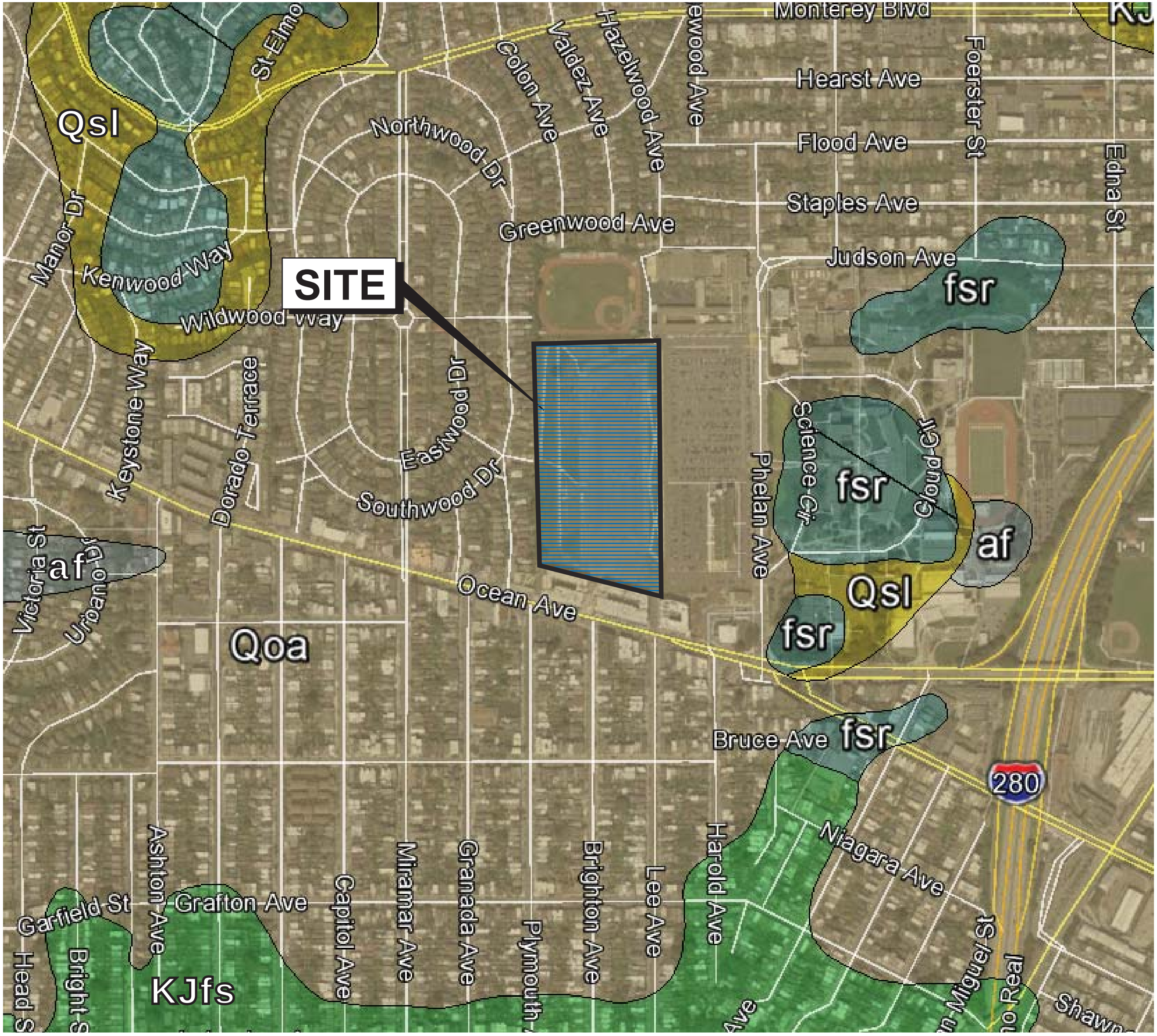
BALBOA RESERVOIR
San Francisco, California

SITE PLAN

Date 01/10/18	Project No. 17-1425	Figure 2

ROCKRIDGE
GEOTECHNICAL

DRAFT

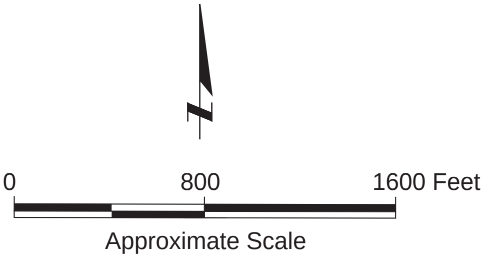


Base map: Google Earth with U.S. Geological Survey (USGS), San Francisco County, 2016.

EXPLANATION

af	Artificial Fill
Qsl	Hillslope Deposits (Quaternary)
Qoa	Alluvium (early Pleistocene)
KJfs	Franciscan Complex sedimentary rocks (Early Cretaceous and (or) Late Jurassic)
fsr	Franciscan Complex melange (Eocene, Paleocene, and (or) Late Cretaceous)

Geologic contact: dashed where approximate and dotted where concealed, queried where uncertin



BALBOA RESERVOIR
San Francisco, California

ROCKRIDGE
GEOTECHNICAL

REGIONAL GEOLOGIC MAP

Date 01/05/18 | Project No. 17-1425 | Figure 3

DRAFT

Base Map: U.S. Geological Survey (USGS), National Seismic Hazards Maps - Fault Sources, 2008.

EXPLANATION

🟥	Strike slip
⬛	Thrust (Reverse)
🟦	Normal

0 5 10 Miles

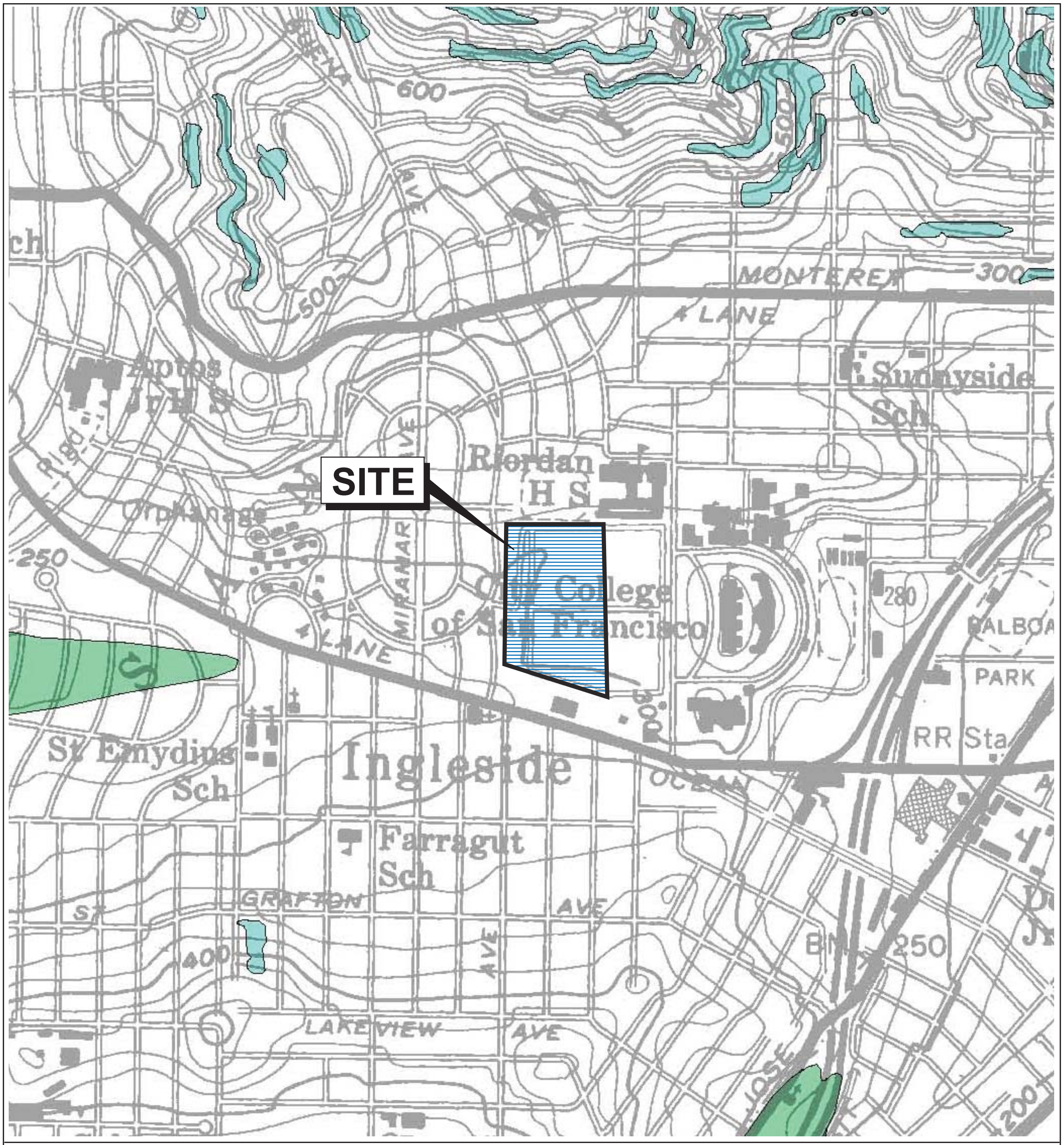
Approximate scale

BALBOA RESERVOIR
San Francisco, California

ROCKRIDGE GEOTECHNICAL

REGIONAL FAULT MAP

Date 01/05/18 | Project No. 17-1425 | Figure 4



EXPLANATION

🟩 **Liquefaction;** Areas where historic occurence of liquefaction, or local topographic, geological, geotechnical, and subsurface water conditions indicate a potential for permanent ground displacements.

🟦 **Earthquake-Induced Landslides;** Areas where previous occurence of landslide movement, or local topographic, geological, geotechnical, and subsurface water conditions indicate a potential for permanent ground displacements.

0 1,000 2,000 Feet

Approximate scale

Reference:
State of California "Seismic Hazard Zones"
City and County of San Francisco
Released on November 17, 2000

BALBOA RESERVOIR
San Francisco, California

ROCKRIDGE
GEOTECHNICAL

SEISMIC HAZARDS ZONE MAP

Date 01/05/18 | Project No. 17-1425 | Figure 5

APPENDIX A

Cone Penetration Test Results and Logs of Borings

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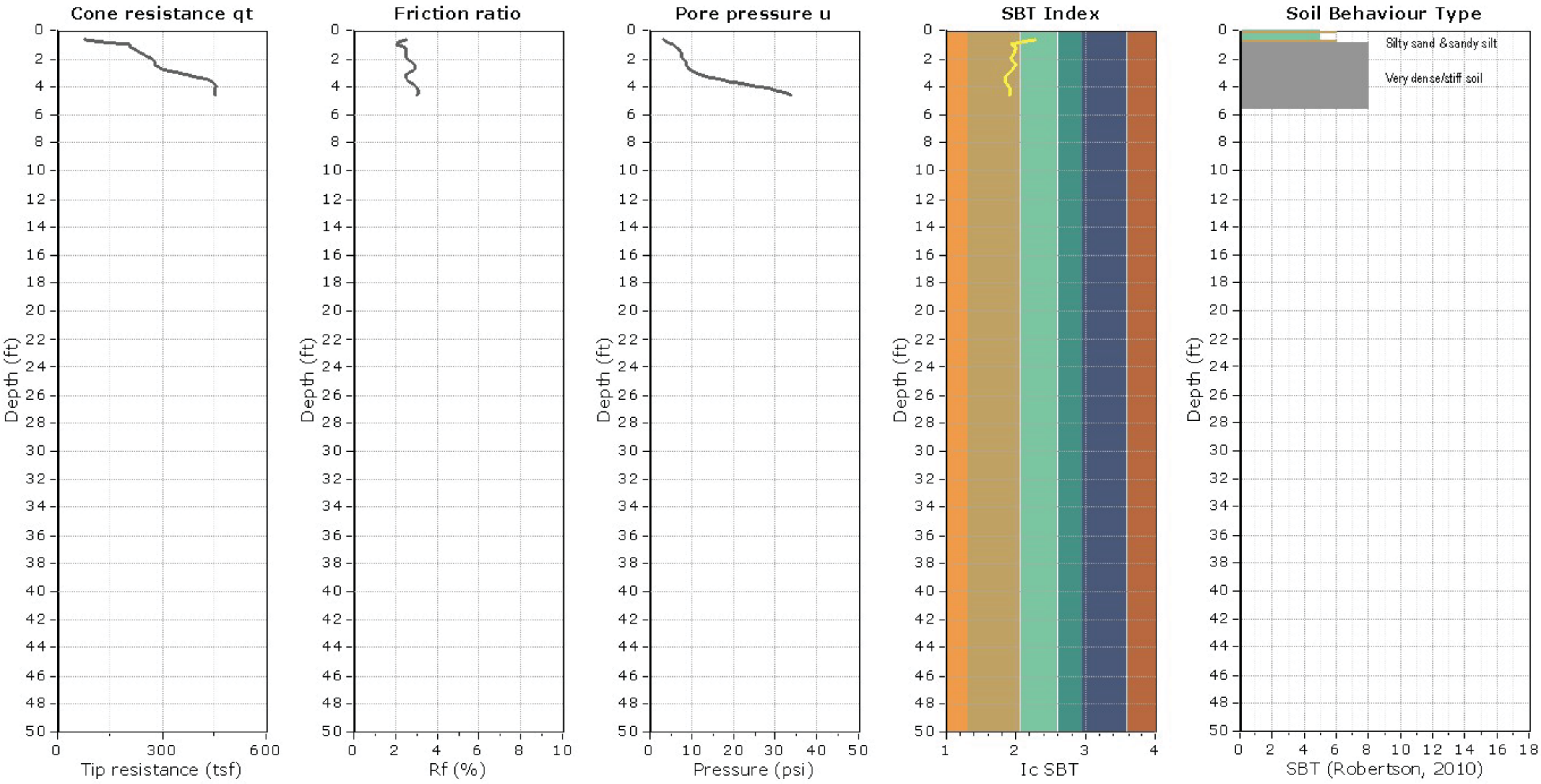

SBT legend

🟥 1. Sensitive fine grained
🟫 2. Organic material
🟦 3. Clay to silty clay
🟩 4. Clayey silt to silty clay
🟩 5. Silty sand to sandy silt
🟫 6. Clean sand to silty sand
🟧 7. Gravely sand to sand
⬛ 8. Very stiff sand to clayey sand
⬜ 9. Very stiff fine grained

Total depth: 4.59 ft, Date: 1/3/2018 (Refusal at 4.6 on second attempt)
Groundwater not measured
Cone Operator: Middle Earth Geo Testing, Inc.

BALBOA RESERVOIR
San Francisco, California

ROCKRIDGE
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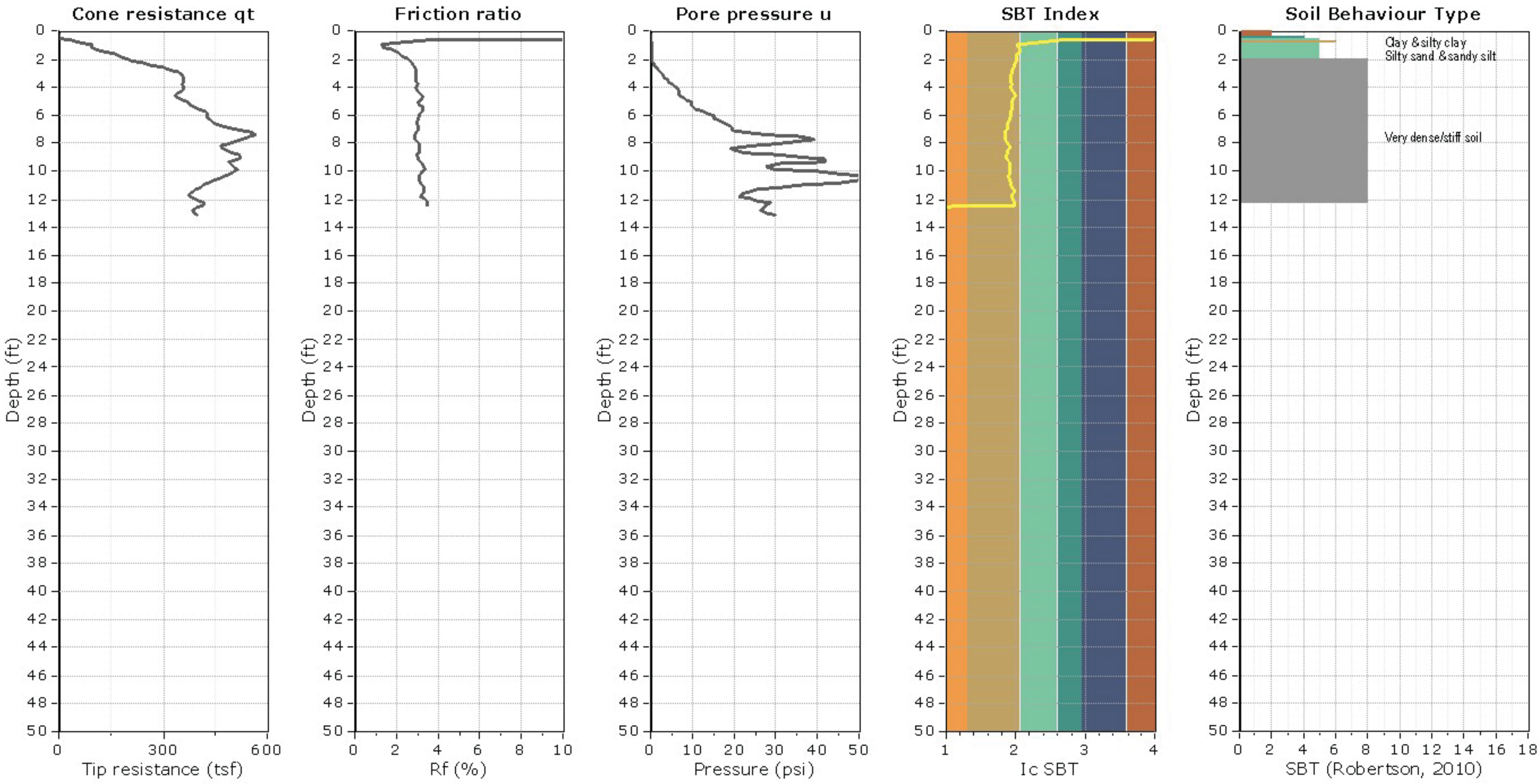
CONE PENETRATION TEST RESULTS
CPT-1

Date 01/16/18	Project No. 17-1425	Figure A-1

DRAFT



SBT legend

🟥 1. Sensitive fine grained
🟫 2. Organic material
🟦 3. Clay to silty clay
🟩 4. Clayey silt to silty clay
🟩 5. Silty sand to sandy silt
🟫 6. Clean sand to silty sand
🟧 7. Gravely sand to sand
▨ 8. Very stiff sand to clayey sand
⬜ 9. Very stiff fine grained

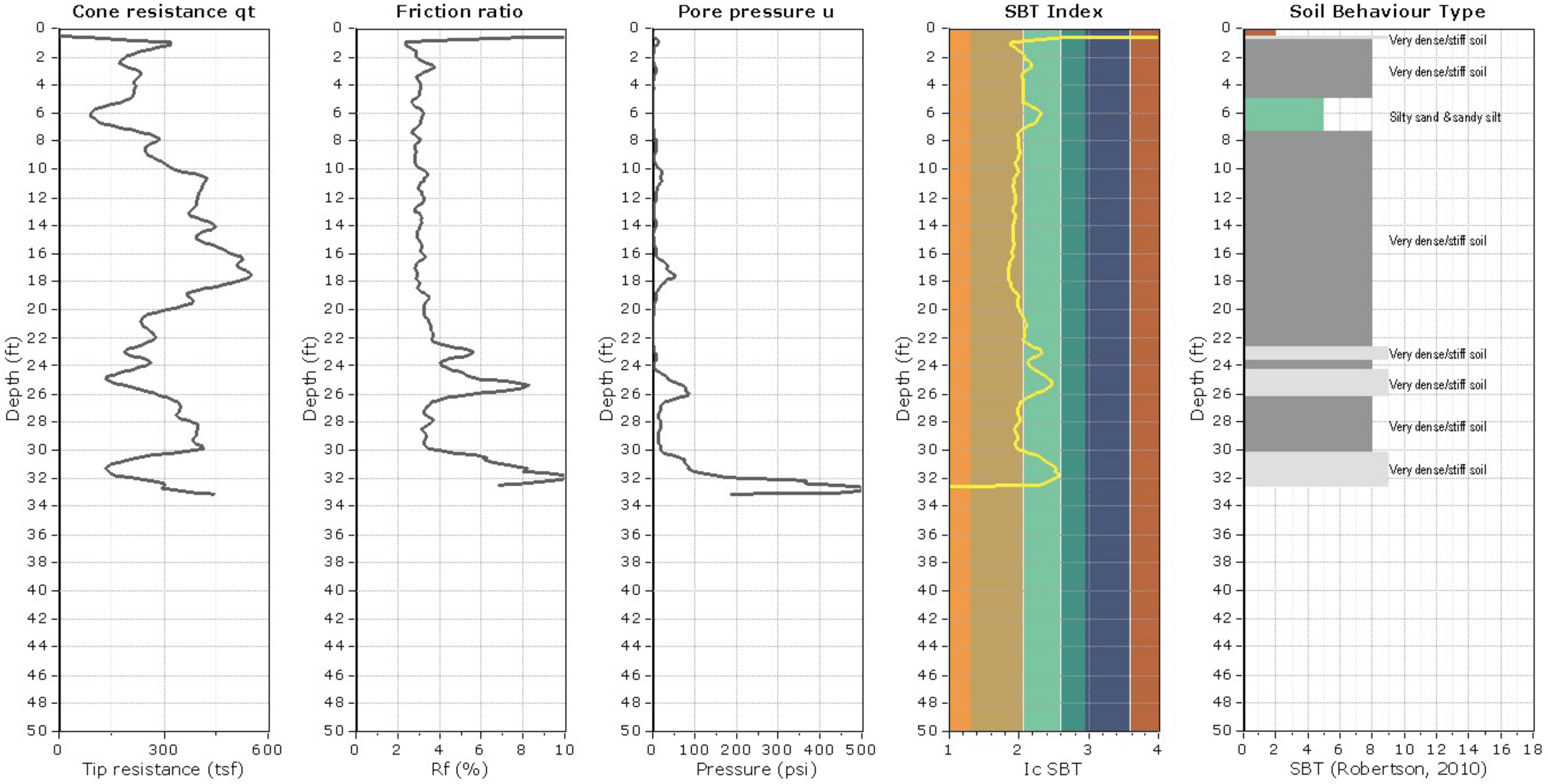
Total depth: 13.12 ft, Date: 1/3/2018
Groundwater not measured
Cone Operator: Middle Earth Geo Testing, Inc.

BALBOA RESERVOIR
San Francisco, California

ROCKRIDGE
GEOTECHNICAL

CONE PENETRATION TEST RESULTS
CPT-2

Date 01/16/18	Project No. 17-1425	Figure A-2



Total depth: 33.14 ft, Date: 1/3/2018
Groundwater not measured
Cone Operator: Middle Earth Geo Testing, Inc.

SBT legend

🟥 1. Sensitive fine grained
🟫 2. Organic material
🟦 3. Clay to silty clay
🟩 4. Clayey silt to silty clay
🟩 5. Silty sand to sandy silt
🟫 6. Clean sand to silty sand
🟧 7. Gravely sand to sand
⬛ 8. Very stiff sand to clayey sand
⬜ 9. Very stiff fine grained

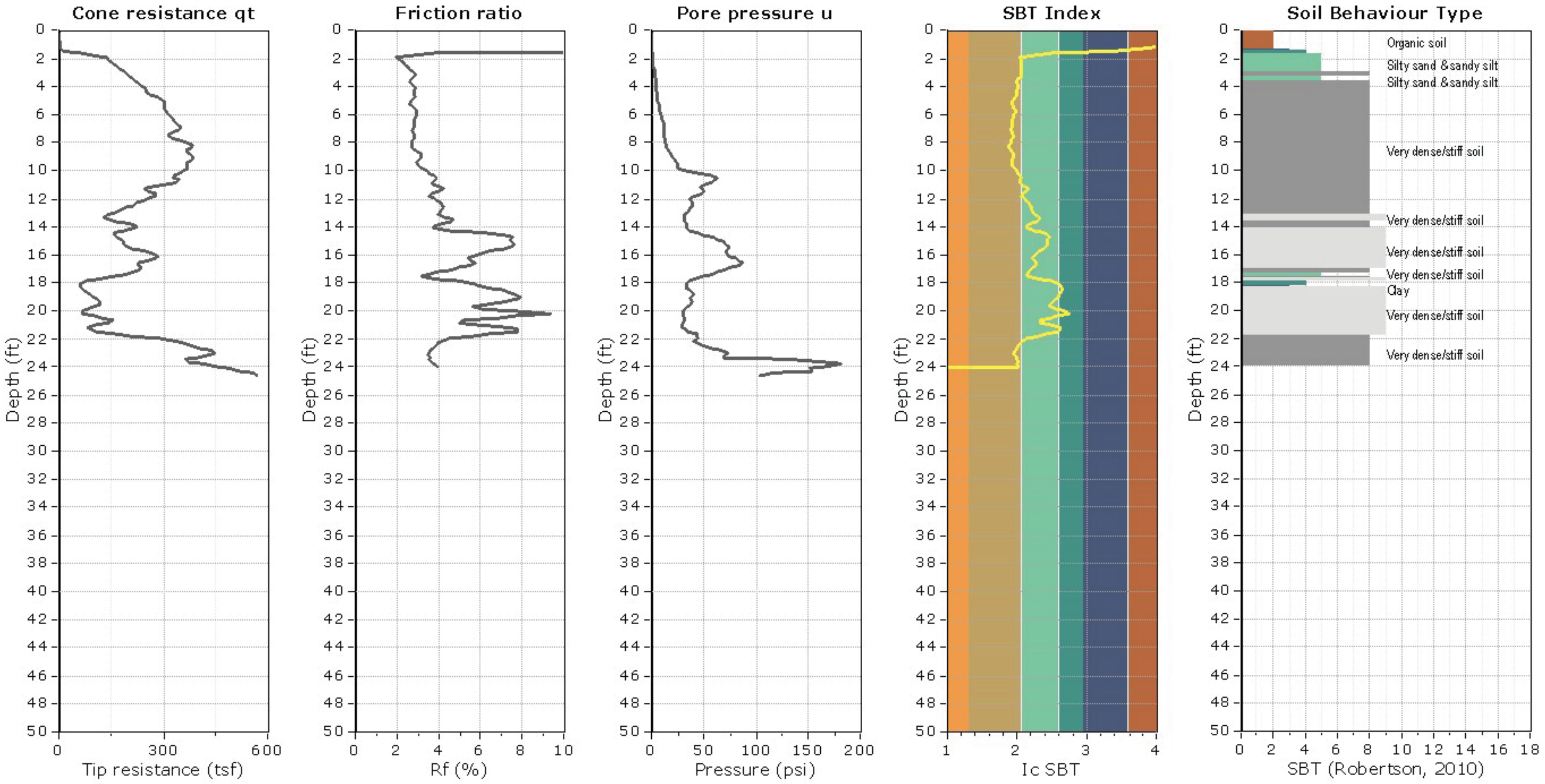
BALBOA RESERVOIR
San Francisco, California

ROCKRIDGE
GEOTECHNICAL

CONE PENETRATION TEST RESULTS
CPT-3

Date 01/16/18 | Project No. 17-1425 | Figure A-3

DRAFT



SBT legend

- 🟥 1. Sensitive fine grained
- 🟫 2. Organic material
- 🟦 3. Clay to silty clay
- 🟩 4. Clayey silt to silty clay
- 🟩 5. Silty sand to sandy silt
- 🟫 6. Clean sand to silty sand
- 🟧 7. Gravely sand to sand
- ⬛ 8. Very stiff sand to clayey sand
- ⬜ 9. Very stiff fine grained

Total depth: 24.61 ft, Date: 1/3/2018
Groundwater not measured
Cone Operator: Middle Earth Geo Testing, Inc.

BALBOA RESERVOIR
San Francisco, California

ROCKRIDGE
GEOTECHNICAL

CONE PENETRATION TEST RESULTS
CPT-4

Date 01/16/18	Project No. 17-1425	Figure A-4

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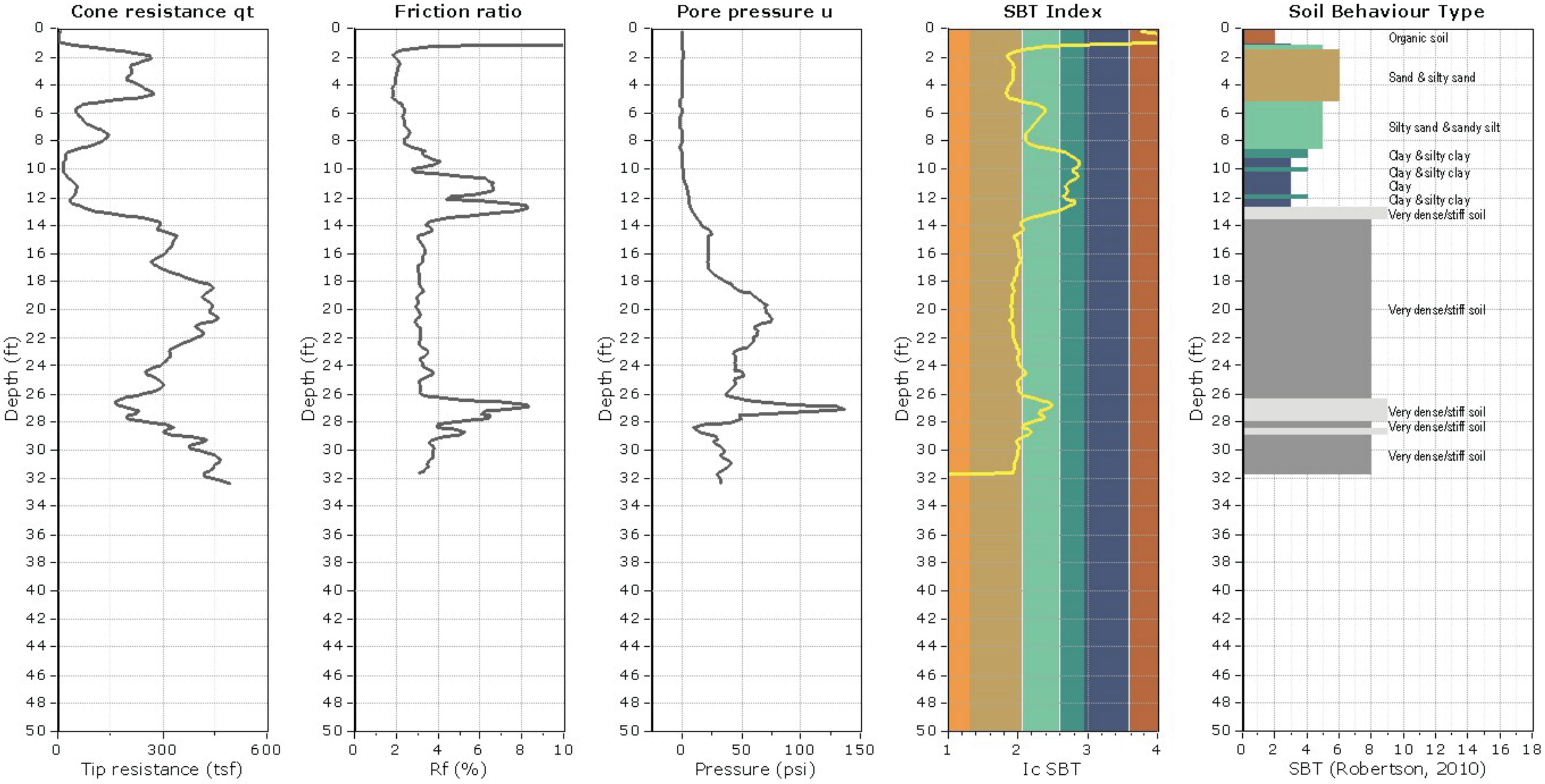


SBT legend

- 🟥 1. Sensitive fine grained
- 🟫 2. Organic material
- 🟦 3. Clay to silty clay
- 🟩 4. Clayey silt to silty clay
- 🟩 5. Silty sand to sandy silt
- 🟨 6. Clean sand to silty sand
- 🟧 7. Gravely sand to sand
- ⬛ 8. Very stiff sand to clayey sand
- ⬜ 9. Very stiff fine grained

Total depth: 32.32 ft, Date: 1/3/2018
Groundwater not measured
Cone Operator: Middle Earth Geo Testing, Inc.

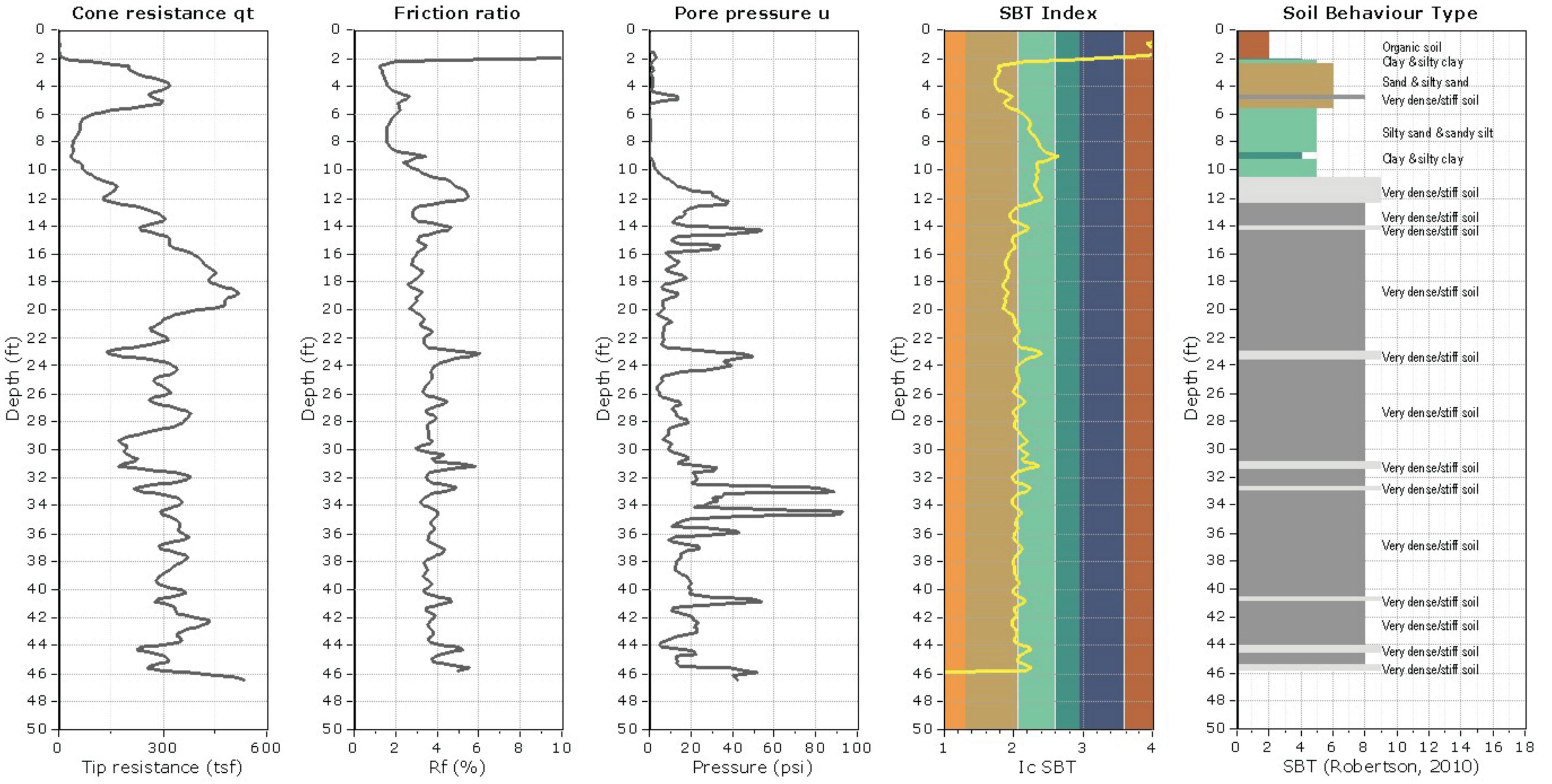
BALBOA RESERVOIR
San Francisco, California

ROCKRIDGE
GEOTECHNICAL

CONE PENETRATION TEST RESULTS
CPT-5

Date 01/16/18	Project No. 17-1425	Figure A-5

DRAFT



Total depth: 46.42 ft, Date: 1/3/2018
Groundwater not measured
Cone Operator: Middle Earth Geo Testing, Inc.

SBT legend

🟥 1. Sensitive fine grained
🟫 2. Organic material
🟦 3. Clay to silty clay
🟩 4. Clayey silt to silty clay
🟩 5. Silty sand to sandy silt
🟫 6. Clean sand to silty sand
🟧 7. Gravely sand to sand
⬛ 8. Very stiff sand to clayey sand
⬜ 9. Very stiff fine grained

BALBOA RESERVOIR
San Francisco, California

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CONE PENETRATION TEST RESULTS
CPT-6

Date 01/16/18	Project No. 17-1425	Figure A-6

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PROJECT: **BALBOA RESERVOIR**
San Francisco, California

Log of Boring B-1

PAGE 1 OF 1

Boring location: See Site Plan, Figure 2

Date started: 1/3/18 | Date finished: 1/3/18

Drilling method: Solid Stem Auger

Hammer weight/drop: 140 lbs./30 inches | Hammer type: Safety/Rope & Cathead

Sampler: Standard Penetration Test (SPT)

Logged by: D. Landkamer

DEPTH (feet)	SAMPLES				LITHOLOGY	MATERIAL DESCRIPTION	LABORATORY TEST DATA					
	Sampler Type	Sample	Blows/ 6"	SPT N-Value[1]			Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
1					SM	SILTY SAND (SM) olive-brown, dense, dry, fine-grained sand, with clay, weak cementation, trace rootlets						
2	SPT	◩	13 22 18	48								
3						orange-brown						
4	SPT	◩	16 21 23	53		6 inches gravel layer very dense, moist, no cementation						
5												
6	SPT	◩	13 16 14	36		dense						
7												
8												
9												
10						red-brown, medium dense, decreased silt content, no clay						
11	SPT	◩	6 5 7	14								
12												
13												
14												
15						orange-brown, dense						
16	SPT	◩	13 14 15	35								
17												
18												
19												
20						very dense, increased silt content						
21	SPT	◩	18 20 28	58								
22												
23												
24												
25						yellow-brown						
26	SPT	◩	24 30 38	82								
27												
28												
29												
30												

Boring terminated at a depth of 26.5 feet below ground surface.
Boring backfilled with cement grout.
Groundwater not encountered during drilling.

[1] SPT blow counts for the last two increments were converted to SPT N-Values using a factor of 1.2 to account for sampler type and hammer energy.

ROCKRIDGE GEOTECHNICAL

Project No.: 17-1425

Figure: A-7

ROCKRIDGE 17-1425.GPJ TR.GDT 1/10/18

PROJECT: **BALBOA RESERVOIR**
San Francisco, California

Log of Boring B-2

PAGE 1 OF 1

Boring location: See Site Plan, Figure 2

Logged by: D. Landkamer

Date started: 1/3/18

Date finished: 1/3/18

Drilling method: Solid Stem Auger

Hammer weight/drop: 140 lbs./30 inches

Hammer type: Safety/Rope & Cathead

Sampler: Standard Penetration Test (SPT)

DEPTH (feet)	SAMPLES				LITHOLOGY	MATERIAL DESCRIPTION	LABORATORY TEST DATA					
	Sampler Type	Sample	Blows/ 6"	SPT N-Value[1]			Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
						SILTY SAND (SM) orange-brown, very dense, moist, fine-grained sand, trace clay						
1												
2	SPT	◩	21 22 21	52								
3												
4	SPT	◩	11 22 22	53		trace gravel						
5						no gravel						
6	SPT	◩	17 23 26	54								
7												
8												
9					SM							
10												
11	SPT	◩	10 19 23	50								
12												
13												
14												
15						dense, with clay, trace gravel						
16	SPT	◩	14 16 22	46								
17												
18												
19						CLAYEY SAND (SC) brown to red-brown, dense, moist, fine- to coarse-grained sand, trace gravel						
20					SC							
21	SPT	◩	16 18 27	54		SILTY SAND (SM) orange-brown, very dense, moist, fine-grained sand, with clay, trace fine gravel						
22												
23												
24					SM							
25												
26	SPT	◩	10 13 22	42		dense, with clayey sand inclusions						
27												
28												
29												
30												

Boring terminated at a depth of 26.5 feet below ground surface.
Boring backfilled with cement grout.
Groundwater not encountered during drilling.

[1] SPT blow counts for the last two increments were converted to SPT N-Values using a factor of 1.2 to account for sampler type and hammer energy.

ROCKRIDGE GEOTECHNICAL

Project No.: 17-1425

Figure: A-8

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PROJECT: **BALBOA RESERVOIR**
San Francisco, California

Log of Boring B-3

PAGE 1 OF 1

Boring location: See Site Plan, Figure 2

Date started: 1/3/18

Date finished: 1/3/18

Drilling method: Solid Stem Auger

Hammer weight/drop: 140 lbs./30 inches

Hammer type: Safety/Rope & Cathead

Sampler: Standard Penetration Test (SPT)

Logged by: D. Landkamer

DEPTH (feet)	SAMPLES Sampler Type	 Sample	 Blows/ 6"	 SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	LABORATORY TEST DATA Type of Strength Test	 Confining Pressure Lbs/Sq Ft	 Shear Strength Lbs/Sq Ft	 Fines %	 Natural Moisture Content, %	 Dry Density Lbs/Cu Ft
						SAND with SILT (SP-SM) olive gray, dense, dry to moist, fine-grained sand						
1												
2	SPT	◩	7 13 20	40								
3												
4	SPT	◩	13 13 15	34		yellow-brown and olive-gray						
5												
6	SPT	◩	15 21 25	55	SP-SM	very dense, moist						
7												
8												
9												
10												
11	SPT	◩	21 23 26	59								
12												
13												
14												
15												
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
28												
29												
30												

Boring terminated at a depth of 11.5 feet below ground surface.
Boring backfilled with cement grout.
Groundwater not encountered during drilling.

[1] SPT blow counts for the last two increments were converted to SPT N-Values using a factor of 1.2 to account for sampler type and hammer energy.

ROCKRIDGE GEOTECHNICAL

Project No.: 17-1425

Figure: A-9

PROJECT: **BALBOA RESERVOIR**
San Francisco, California

Log of Boring B-4

PAGE 1 OF 1

Boring location: See Site Plan, Figure 2

Date started: 1/3/18

Date finished: 1/3/18

Drilling method: Solid Stem Auger

Hammer weight/drop: 140 lbs./30 inches

Hammer type: Safety/Rope & Cathead

Sampler: Standard Penetration Test (SPT)

Logged by: D. Landkamer

DEPTH (feet)	SAMPLES				LITHOLOGY	MATERIAL DESCRIPTION	LABORATORY TEST DATA					
	Sampler Type	Sample	Blows/ 6"	SPT N-Value[1]			Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
					SC	CLAYEY SAND with GRAVEL (SC) brown to red-brown, medium dense, moist, fine- to medium-grained sand						
1												
2	SPT	◩	7 14 18	38		SILTY SAND (SM) brown, dense, moist, fine- to medium-grained sand						
3												
4	SPT	◩	6 7 12	23	SM	orange-brown, medium dense, with clay						
5						mottled dark brown, dense, weak cementation						
6	SPT	◩	14 20 20	48		brown, no clay						
7												
8												
9												
10												
11												
12												
13												
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28												
29												
30												

Boring terminated at a depth of 6.5 feet below ground surface.
Boring backfilled with cement grout.
Groundwater not encountered during drilling.

[1] SPT blow counts for the last two increments were converted to SPT N-Values using a factor of 1.2 to account for sampler type and hammer energy.

ROCKRIDGE GEOTECHNICAL

Project No. 17-1425

Figure A-10

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UNIFIED SOIL CLASSIFICATION SYSTEM

Major Divisions		Symbols	Typical Names
Coarse-Grained Soils (more than half of soil > no. 200 sieve size)	Gravels (More than half of coarse fraction > no. 4 sieve size)	**GW**	Well-graded gravels or gravel-sand mixtures, little or no fines
		GP	Poorly-graded gravels or gravel-sand mixtures, little or no fines
		GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
	Sands (More than half of coarse fraction < no. 4 sieve size)	**SW**	Well-graded sands or gravelly sands, little or no fines
		SP	Poorly-graded sands or gravelly sands, little or no fines
		SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
Fine -Grained Soils (more than half of soil < no. 200 sieve size)	Silts and Clays LL = < 50	**ML**	Inorganic silts and clayey silts of low plasticity, sandy silts, gravelly silts
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, lean clays
		OL	Organic silts and organic silt-clays of low plasticity
	Silts and Clays LL = > 50	**MH**	Inorganic silts of high plasticity
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic silts and clays of high plasticity
Highly Organic Soils		**PT**	Peat and other highly organic soils

GRAIN SIZE CHART

Classification	Range of Grain Sizes	
	U.S. Standard Sieve Size	Grain Size in Millimeters
Boulders	Above 12"	Above 305
Cobbles	12" to 3"	305 to 76.2
Gravel coarse fine	3" to No. 4 3" to 3/4" 3/4" to No. 4	76.2 to 4.76 76.2 to 19.1 19.1 to 4.76
Sand coarse medium fine	No. 4 to No. 200 No. 4 to No. 10 No. 10 to No. 40 No. 40 to No. 200	4.76 to 0.075 4.76 to 2.00 2.00 to 0.420 0.420 to 0.075
Silt and Clay	Below No. 200	Below 0.075

▽	Unstabilized groundwater level
▼	Stabilized groundwater level

SAMPLE DESIGNATIONS/SYMBOLS

⬒	Sample taken with Sprague & Henwood split-barrel sampler with a 3.0-inch outside diameter and a 2.43-inch inside diameter. Darkened area indicates soil recovered
◩	Classification sample taken with Standard Penetration Test sampler
◨	Undisturbed sample taken with thin-walled tube
☒	Disturbed sample
⊡	Sampling attempted with no recovery
◫	Core sample
▣	Analytical laboratory sample
▥	Sample taken with Direct Push sampler
▥	Sonic

SAMPLER TYPE

C	Core barrel
CA	California split-barrel sampler with 2.5-inch outside diameter and a 1.93-inch inside diameter
D&M	Dames & Moore piston sampler using 2.5-inch outside diameter, thin-walled tube
O	Osterberg piston sampler using 3.0-inch outside diameter, thin-walled Shelby tube
PT	Pitcher tube sampler using 3.0-inch outside diameter, thin-walled Shelby tube
S&H	Sprague & Henwood split-barrel sampler with a 3.0-inch outside diameter and a 2.43-inch inside diameter
SPT	Standard Penetration Test (SPT) split-barrel sampler with a 2.0-inch outside diameter and a 1.5-inch inside diameter
ST	Shelby Tube (3.0-inch outside diameter, thin-walled tube) advanced with hydraulic pressure

BALBOA RESERVOIR
San Francisco, California

ROCKRIDGE
GEOTECHNICAL

CLASSIFICATION CHART

Date 01/05/18 | Project No. 17-1425 | Figure A-11

APPENDIX B

Corrosivity Test Results

Results Only Soil Testing
for
Balboa Reservoir

January 15, 2018

Prepared for:
Clayton Proto
Rockridge Geotechnical
270 Grand Ave,
Oakland, CA 94610
cjproto@rockridgegeo.com

Project X Job#: S180112A
Client Job or PO#: 17-1425

Soil Analysis Lab Results

Client: Rockridge Geotechnical
Job Name: Balboa Reservoir
Client Job Number: 17-1425
Project X Job Number: S180112A
January 15, 2018

	Method	ASTM G187		ASTM D516		ASTM D512B		SM 4500-NO3-E	SM 4500-NH3-C	SM 4500-S2-D	ASTM G200	ASTM G51
Bore# / Description	**Depth**	**Resistivity**		**Sulfates**		**Chlorides**		**Nitrate**	**Ammonia**	**Sulfide**	**Redox**	**pH**
		As Rec'd	**Minimum**									
	(ft)	**(Ohm-cm)**	**(Ohm-cm)**	**(mg/kg)**	**(wt%)**	**(mg/kg)**	**(wt%)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mV)**	
B-2 #5	15.0	12,060	10,050	120	0.0120	255	0.0255	165	97.5	5.70	211	7.99

Unk = Unknown
NT = Not Tested
mg/kg = milligrams per kilogram (parts per million) of dry soil weight
mg/L - milligrams per liter of liquid volume
Chemical Analysis performed on 1:3 Soil-To-Water extract

Please call if you have any questions.

Prepared by,

Nathan Jacob,
Lab Technician

Respectfully Submitted,

Ed

Eddie Hernandez, M.Sc., P.E.
Sr. Corrosion Consultant
NACE Corrosion Technologist #16592
Professional Engineer
California No. M37102
ehernandez@projectxcorrosion.com

EDUARDO HERNANDEZ
No. M37102

Project X
Corrosion Engineering
Corrosion Control - Soil, Water, and Metallurgy Lab

S180112A ROCKRIDGE 17-1425 1 FULL

DRAFT

Lab Request Sheet Chain of Custody
Phone: (213) 928-7213 · Fax (951) 226-1720 · www.projectxcorrosion.com
Ship Samples To: 29970 Technology Dr, Suite 105F, Murrieta, CA 92563

IMPORTANT: Please complete Project and Sample Identification Data as you would like it to appear in report & include this form with samples.

Project X Job #:
Date:

Company Name: Rockridge Geotechnical
Contact Name: Clayton Proto
Phone No. : 510-420-5738 x 120
Mailing Address: 270 Grand Avenue, Oakland California
Contact Email: cjproto@rockridgegeo.com
Accounting Contact: Kate Schenk
Invoice Email: kaschenk@rockridgegeo.com
Project Name: Balboa Reservoir
Client Project No: 17-1425
P.O. #:

	5 Day Normal	3 Day RUSH 75% mark-up	2 Day RUSH 100% mark-up
Turn Around Time:	X		

Results By: ☐ Phone ☐ Fax ☒ Email ☒ Mail ☐ Overnight Mail (charges apply)

Received by:

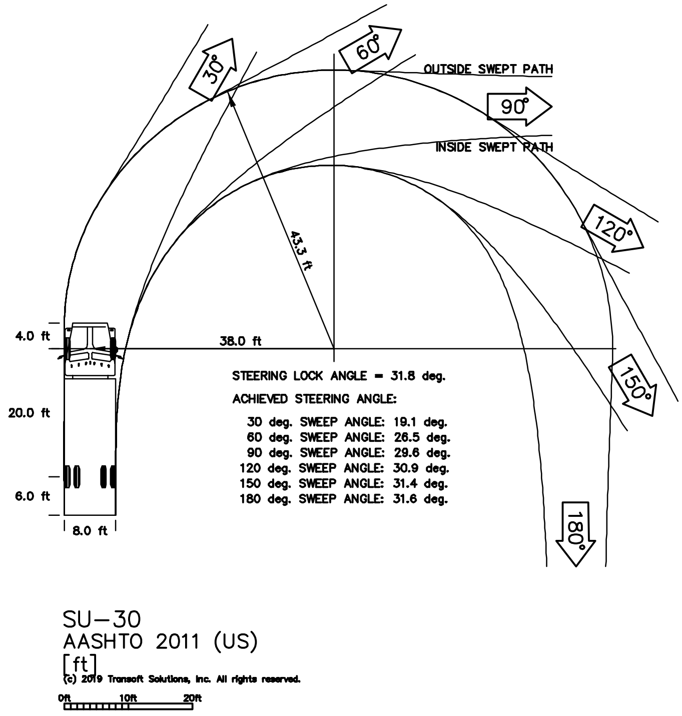
Default Method

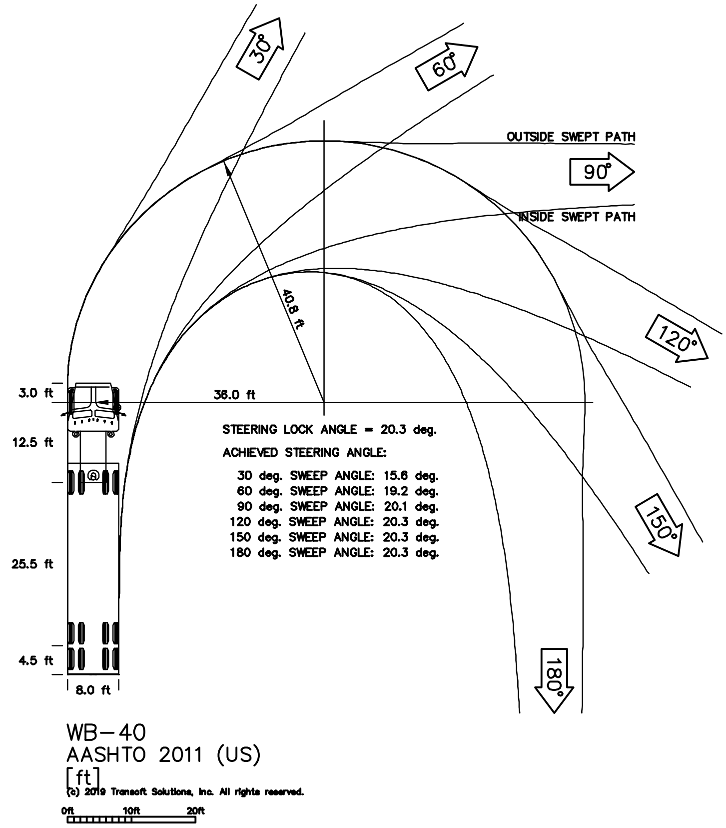
SPECIAL INSTRUCTIONS:

ANALYSIS REQUESTED (Please circle)

	SAMPLE ID - BORE #	DESCRIPTION	DEPTH (ft)	DATE COLLECTED	CORROSION SERIES Min. Resistivity, Sulfate, Chloride, Sulfide, Redox, pH, Ammonia, Nitrate.	Soil Resistivity Caltrans CTM643 ASTM G57 ASTM G187	pH Caltrans CTM643 AASHTO T 289 ASTM G 51	Sulfate Caltrans CTM417 AASHTO T 290 ASTM D516	Chloride Caltrans CTM422 AASHTO T 291 ASTM D512B	Redox Potential SM 2580B	BiCarbonate SM 2320B	Alkalinity SM 2520B	Acidity SM 2510B	Nitrate SM 4500-NO3 Hach 835	Ammonia SM 4500-NH3 Hach 830	Sulfide SM 4500-S2 SM 4500-S2	Moisture Content ASTM D2216	Soil Corrosivity Evaluation Report	Metallurgical Analysis	NOTES
1	B-2 #5	Silty Sand (SM)	15'	1/3/18	X															
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				
11																				
12																				
13																				
14																				

APPENDIX C – SU-30 AND WB-40 DESIGN VEHICLE MOVEMENTS





GRAPHIC SCALE

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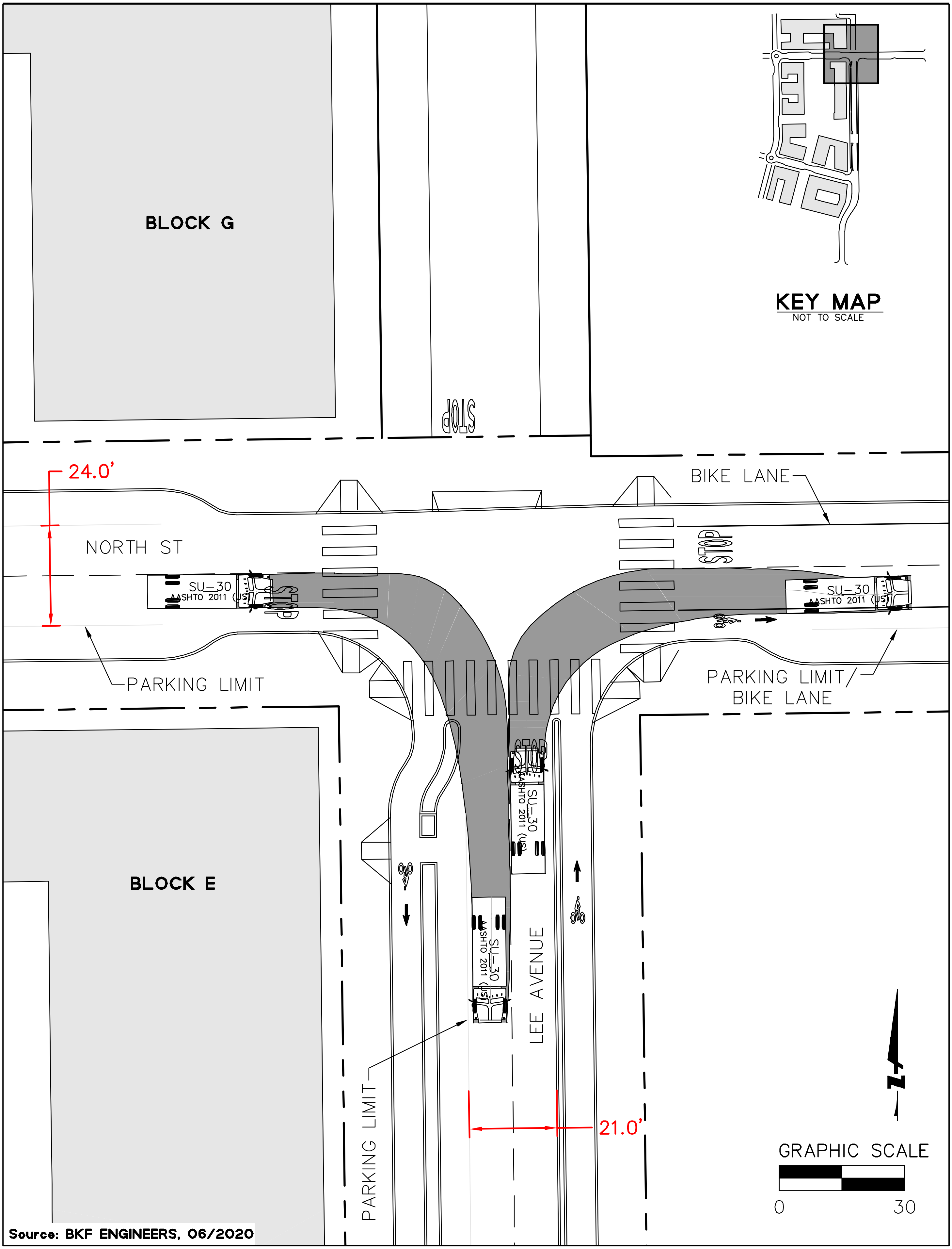
PLOT DATE: 06-10-20 PLOTTED BY: pasc

Source: BKF ENGINEERS, 06/2020

BALBOA RESERVOIR INFRASTRUCTURE PLAN **APPX. C.1 - SU-30 & WB-40 TURNING TEMPLATES**



Source: BKF ENGINEERS, 06/2020

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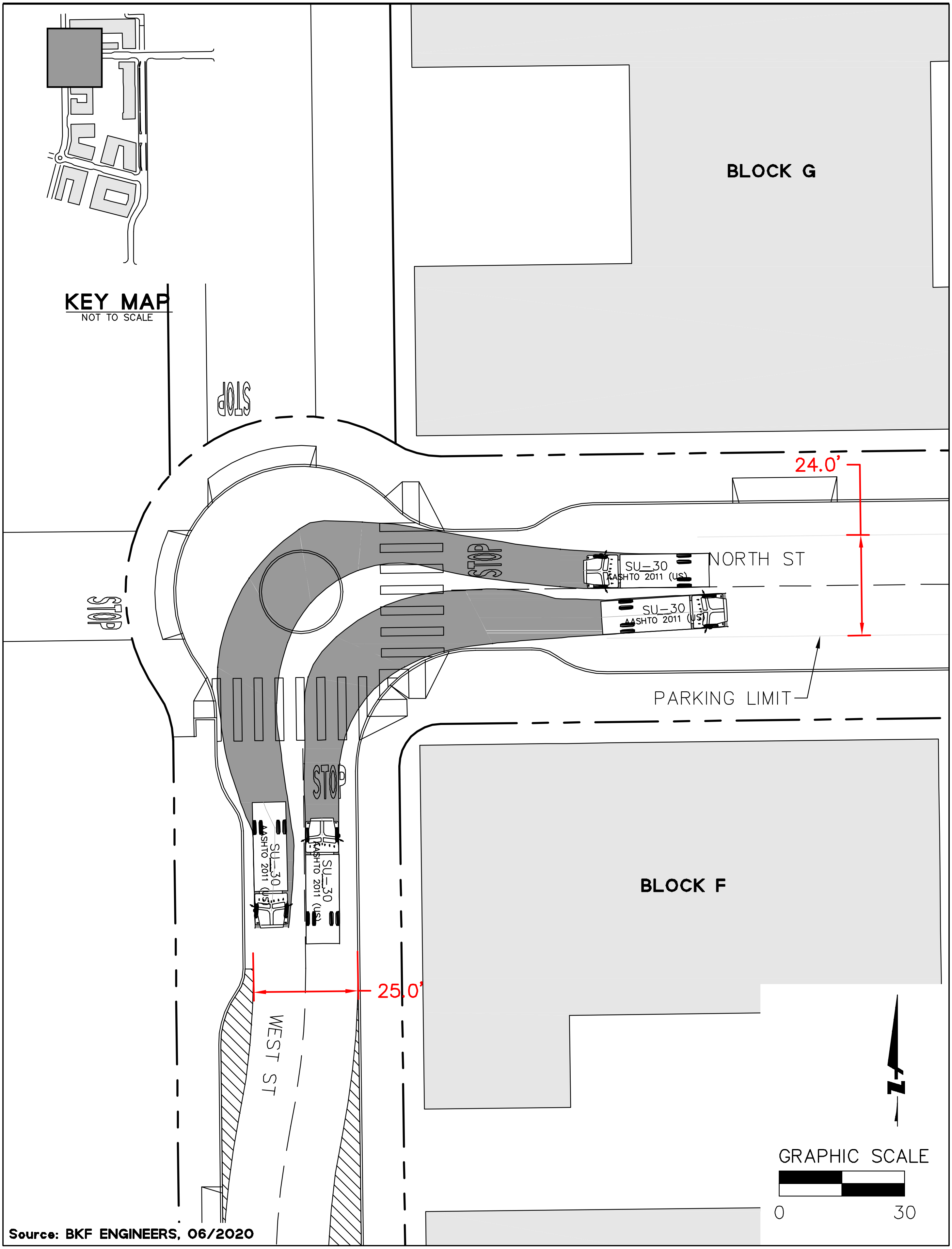
PLOT DATE: 06-10-20
PLOTTED BY: pasc

BALBOA RESERVOIR INFRASTRUCTURE PLAN

APPX. C.2 – SU-30 TURNING TEMPLATE – NE CORNER



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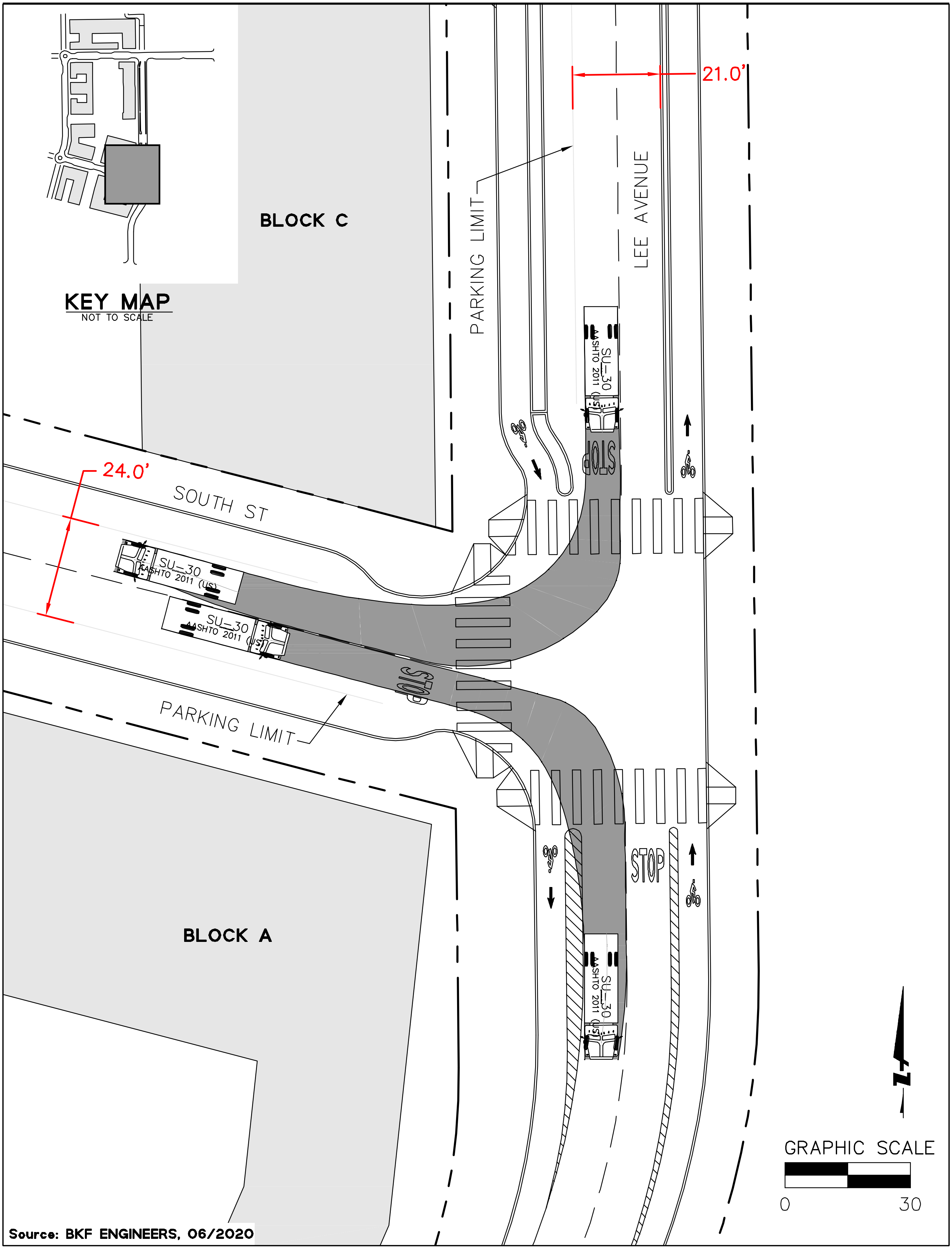
PLOT DATE: 06-10-20 PLOTTED BY: pasc

BALBOA RESERVOIR INFRASTRUCTURE PLAN **APPX. C.3 - SU-30 TURNING TEMPLATE - NW CORNER**



Source: BKF ENGINEERS, 06/2020

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PLOT DATE: 06-10-20 PLOTTED BY: pasc

BALBOA RESERVOIR INFRASTRUCTURE PLAN

APPX. C.4 – SU-30 TURNING TEMPLATE – SE CORNER

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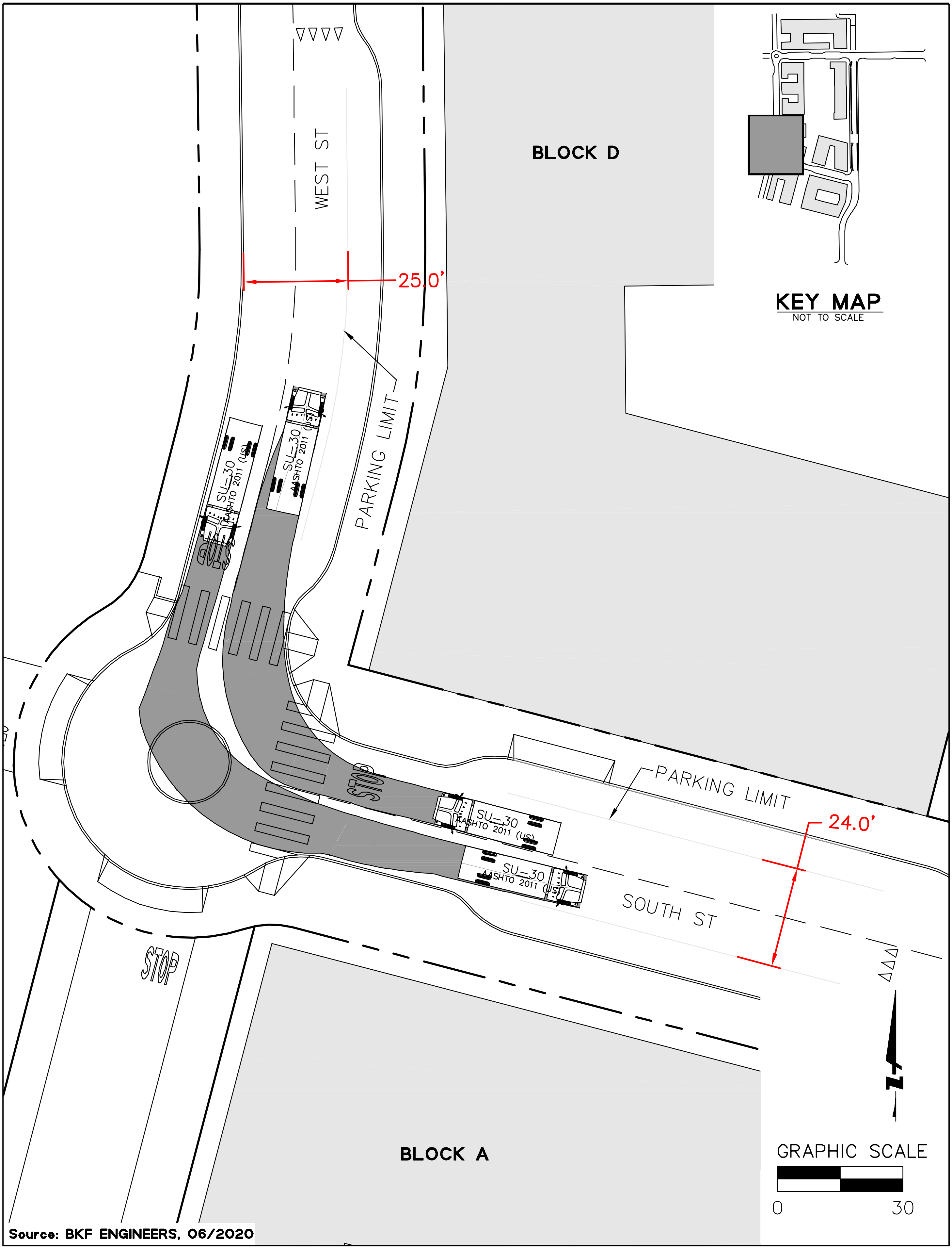
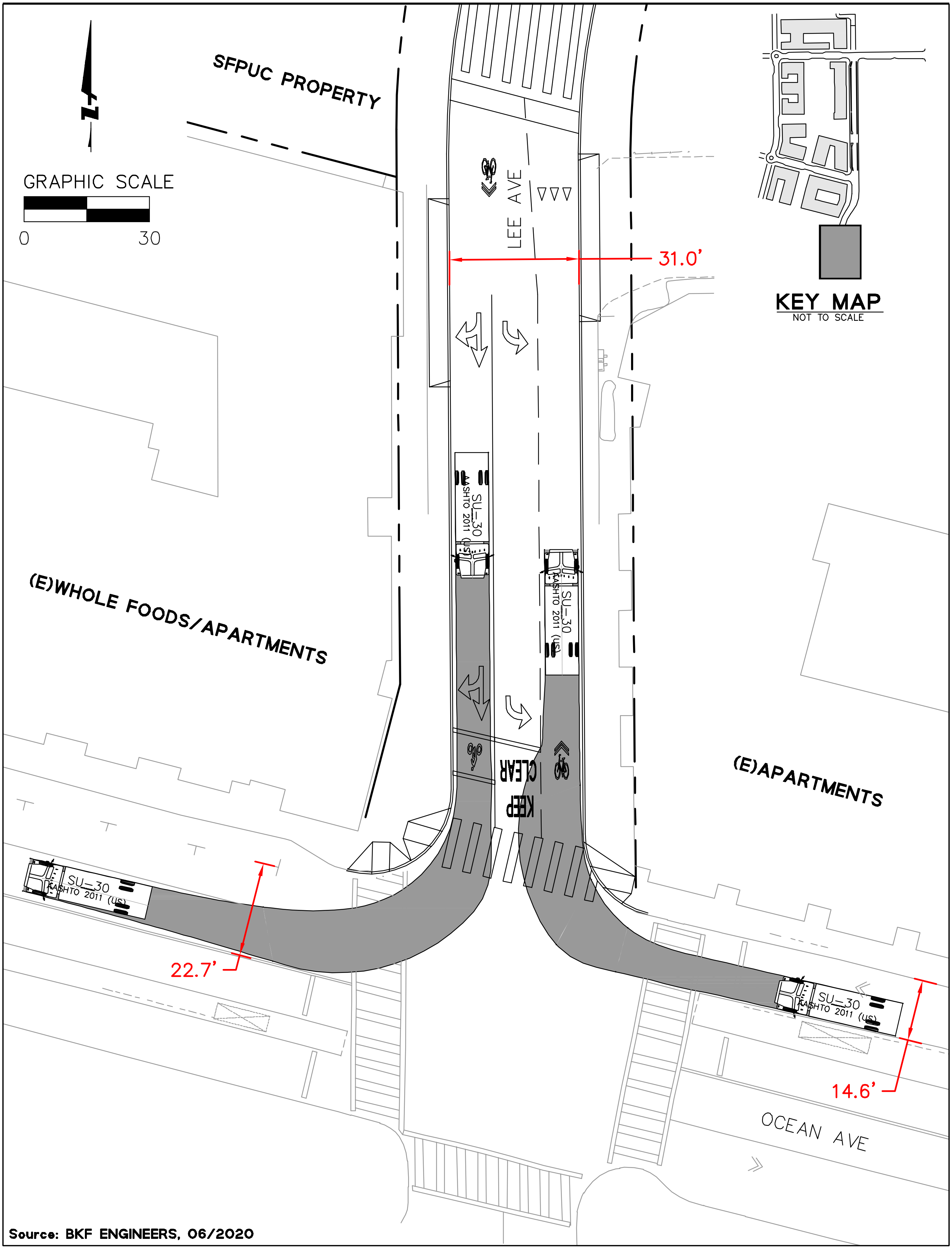
PLOT DATE: 06-10-20 PLOTTED BY: pasc



Source: BKF ENGINEERS, 06/2020

BALBOA RESERVOIR INFRASTRUCTURE PLAN

APPX. C.5 – SU-30 TURNING TEMPLATE – SW CORNER



Source: BKF ENGINEERS, 06/2020

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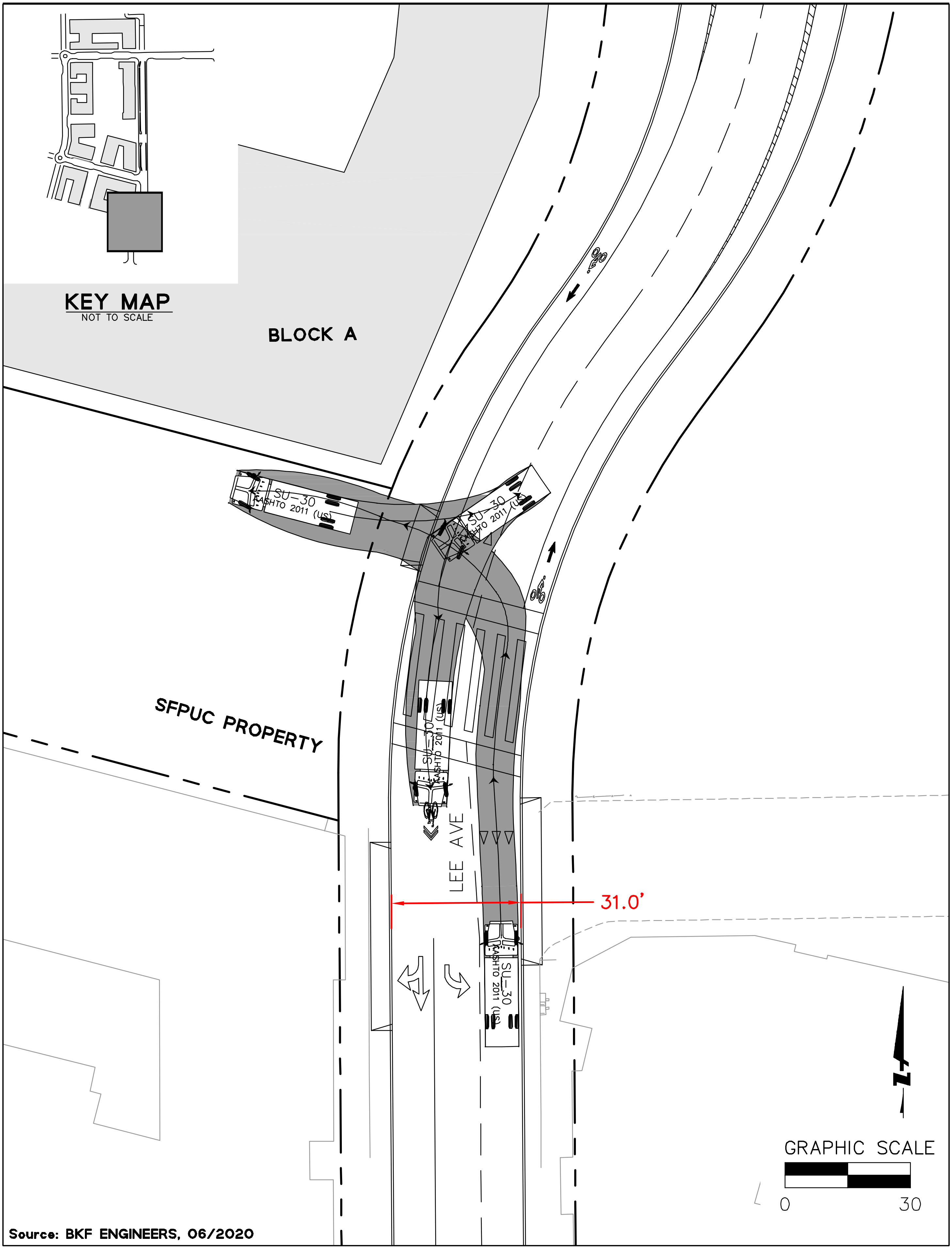
PLOT DATE: 06-10-20 PLOTTED BY: pasc

BALBOA RESERVOIR INFRASTRUCTURE PLAN

APPX. C.6 - SU-30 TURNING TEMPLATE - LEE/OCEAN



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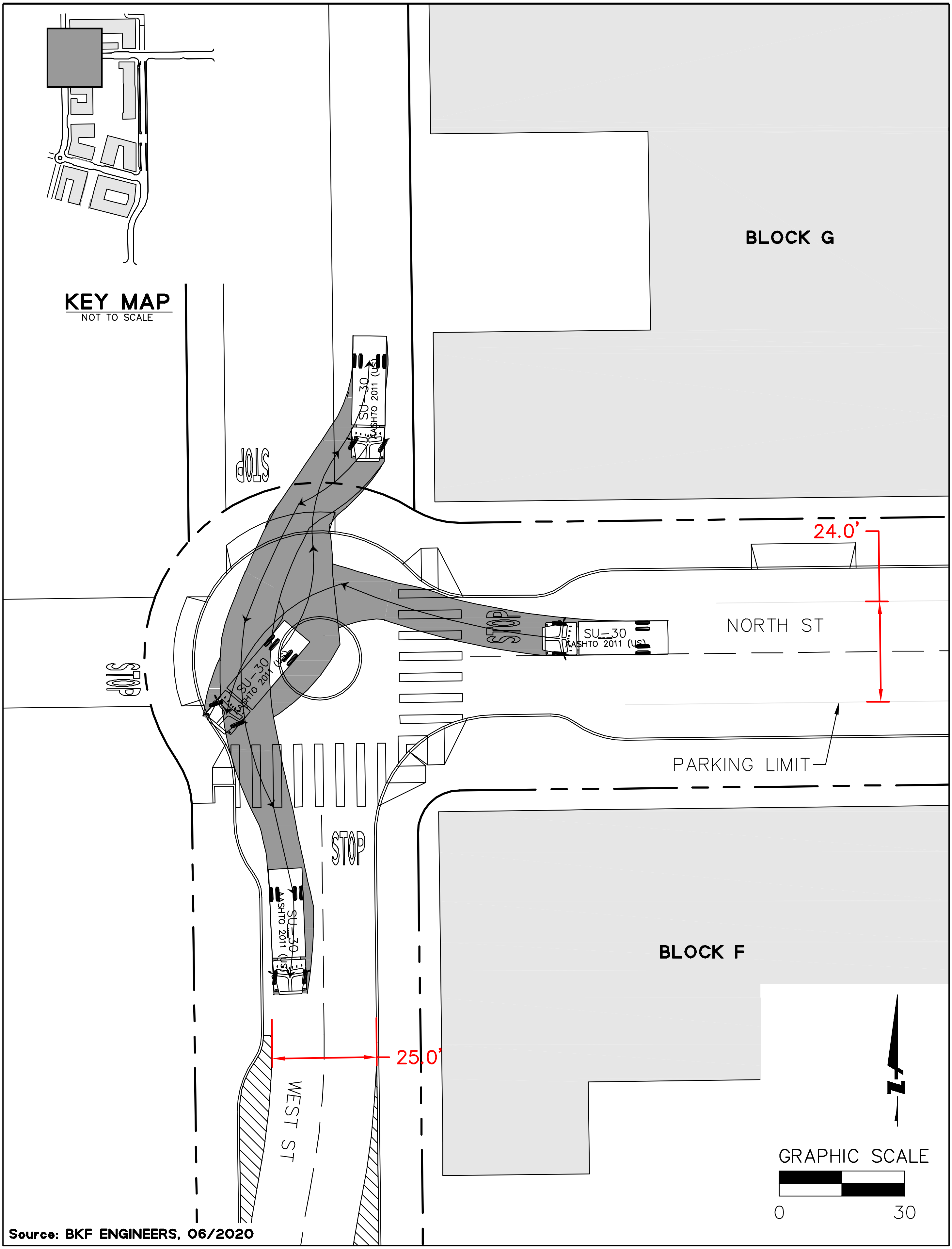
PLOT DATE: 06-10-20 PLOTTED BY: pasc

BALBOA RESERVOIR INFRASTRUCTURE PLAN

APPX. C.7 – SU-30 TURNING TEMPLATE – BLOCK A LOADING



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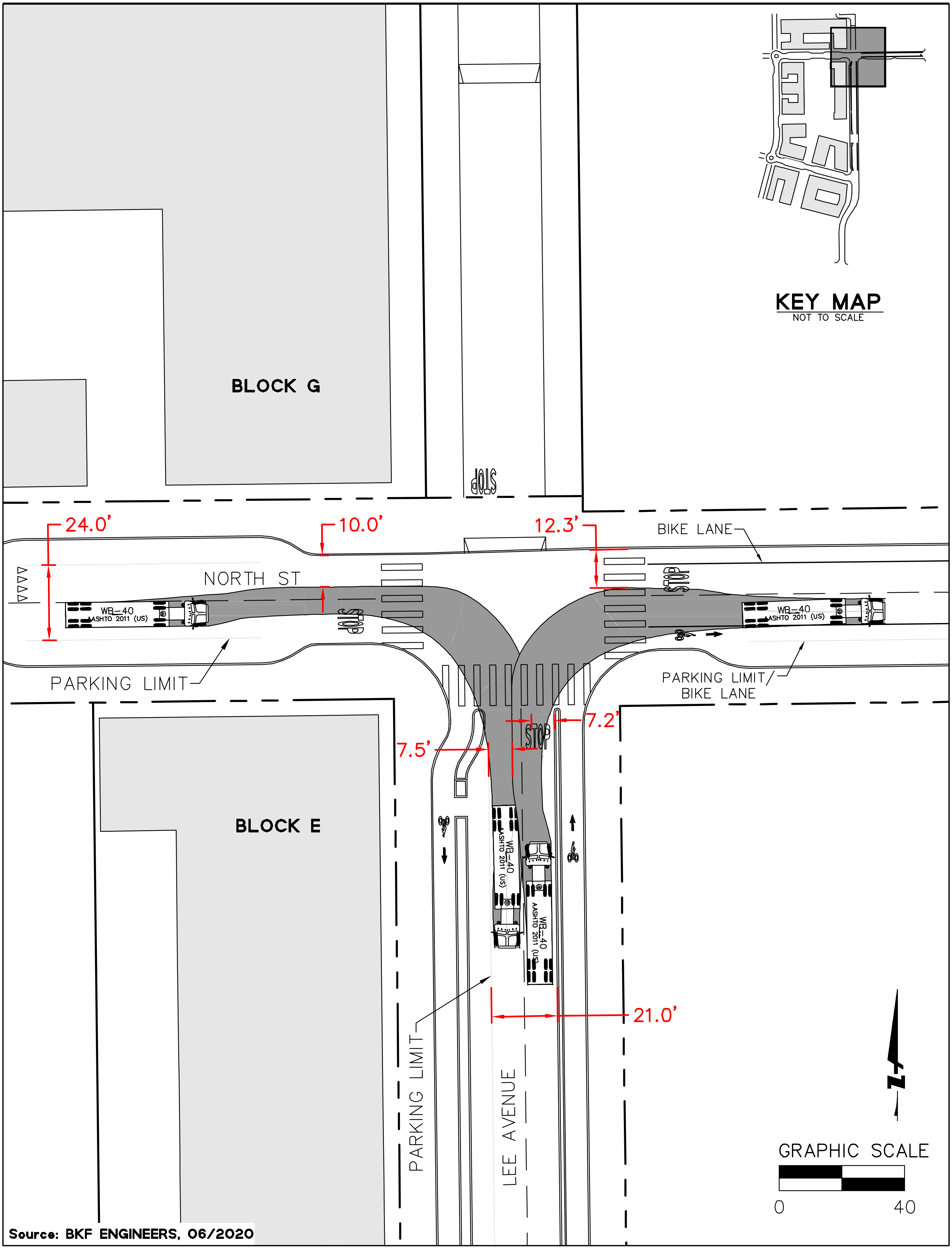
PLOT DATE: 06-10-20 PLOTTED BY: pasc

BALBOA RESERVOIR INFRASTRUCTURE PLAN **APPX. C.8 – SU-30 TURNING TEMPLATE – BLOCK G LOADING**



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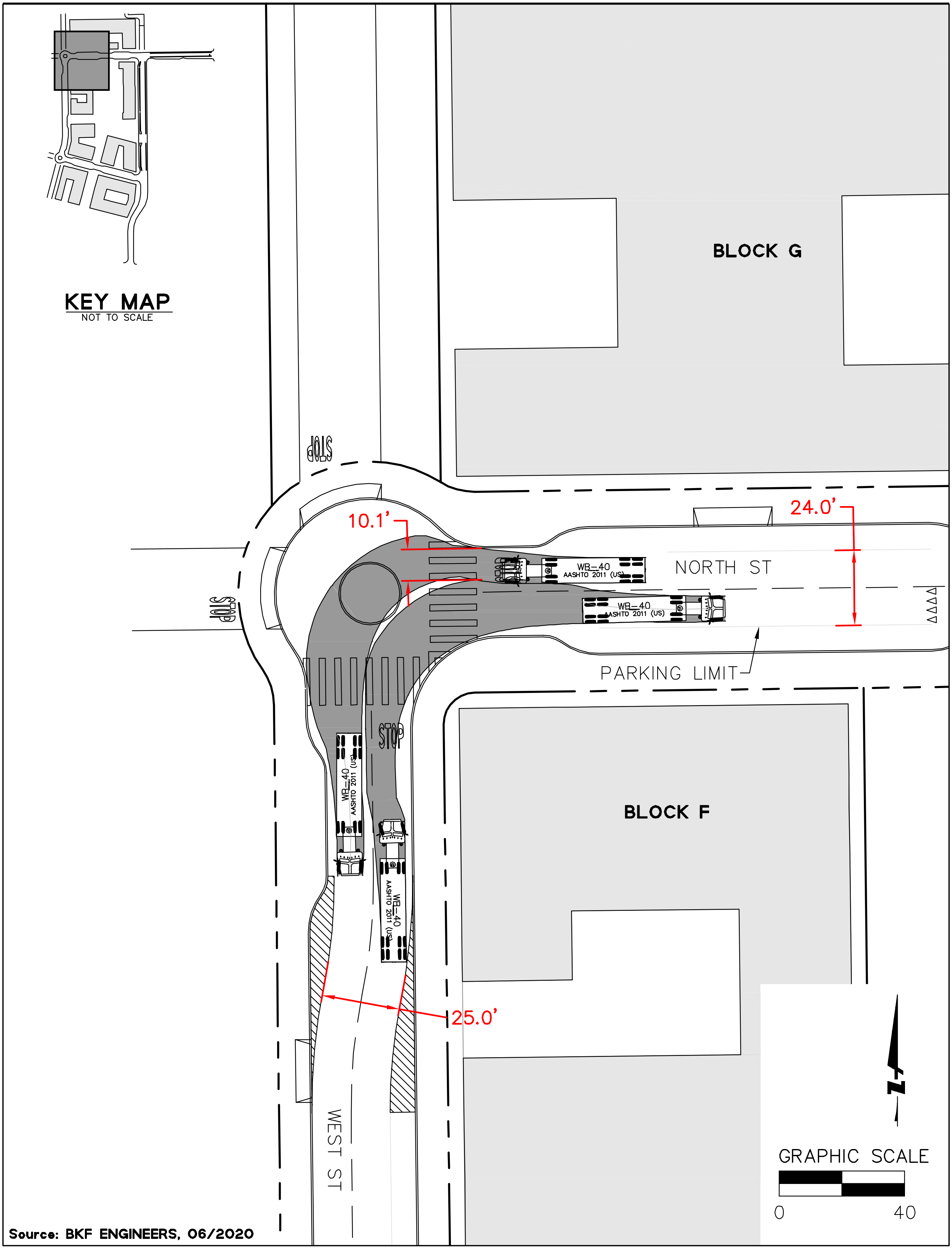
BALBOA RESERVOIR INFRASTRUCTURE PLAN

APPX. C.9 – WB-40 TURNING TEMPLATE – NE CORNER



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PLOT DATE: 06-10-20 PLOTTED BY: pasc

BALBOA RESERVOIR INFRASTRUCTURE PLAN

APPX. C.10 – WB-40 TURNING TEMPLATE – NW CORNER

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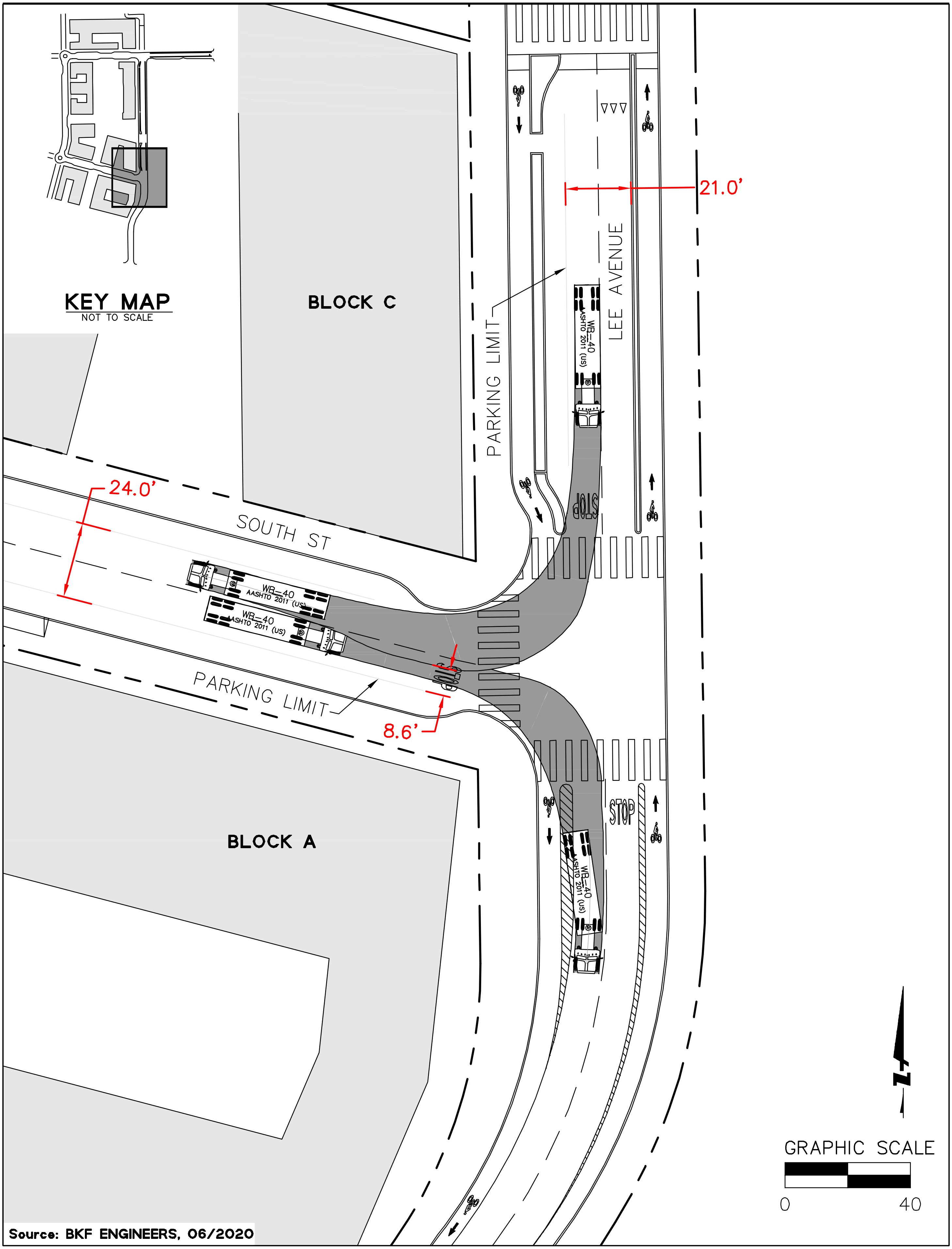
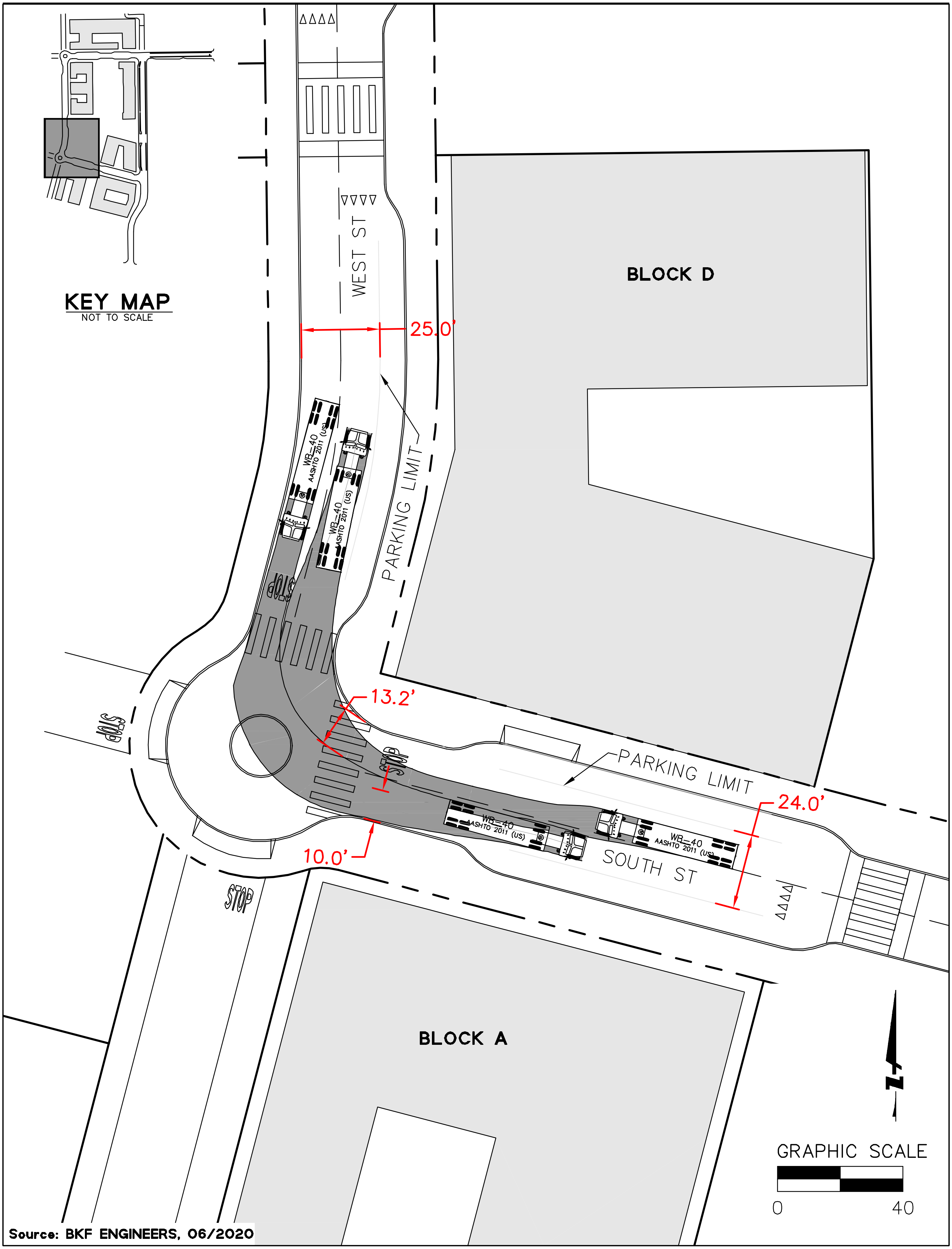


Source: BKF ENGINEERS, 06/2020

BALBOA RESERVOIR INFRASTRUCTURE PLAN

APPX. C.11 – WB-40 TURNING TEMPLATE – SE CORNER



Source: BKF ENGINEERS, 06/2020

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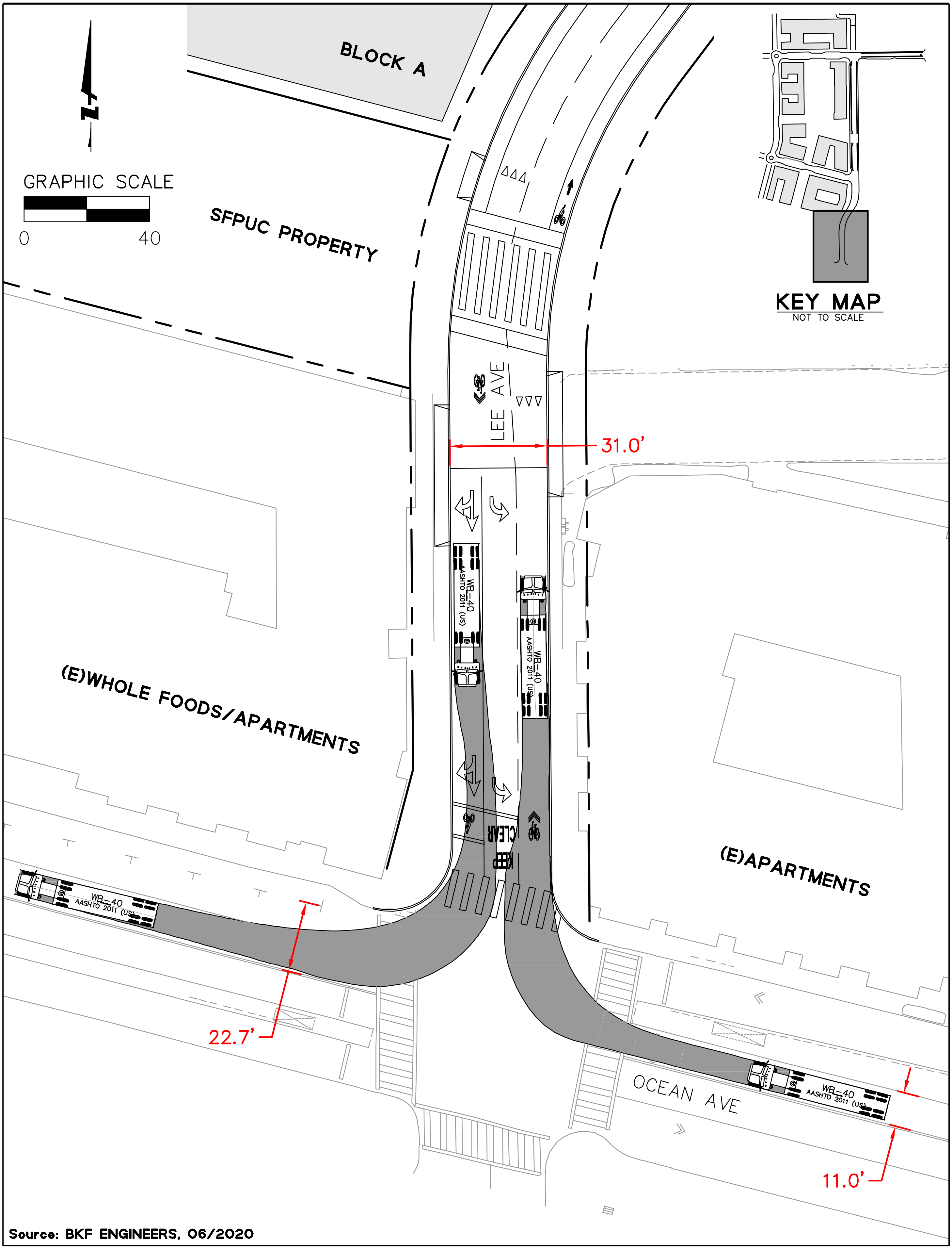
PLOT DATE: 06-10-20 PLOTTED BY: pasc

BALBOA RESERVOIR INFRASTRUCTURE PLAN

APPX. C.12 - WB-40 TURNING TEMPLATE - SW CORNER



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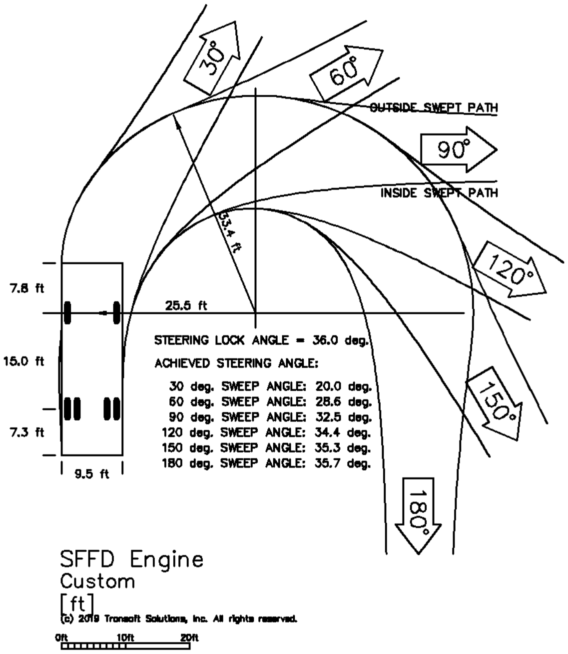
PLOT DATE: 06-10-20 PLOTTED BY: pasc

BALBOA RESERVOIR INFRASTRUCTURE PLAN

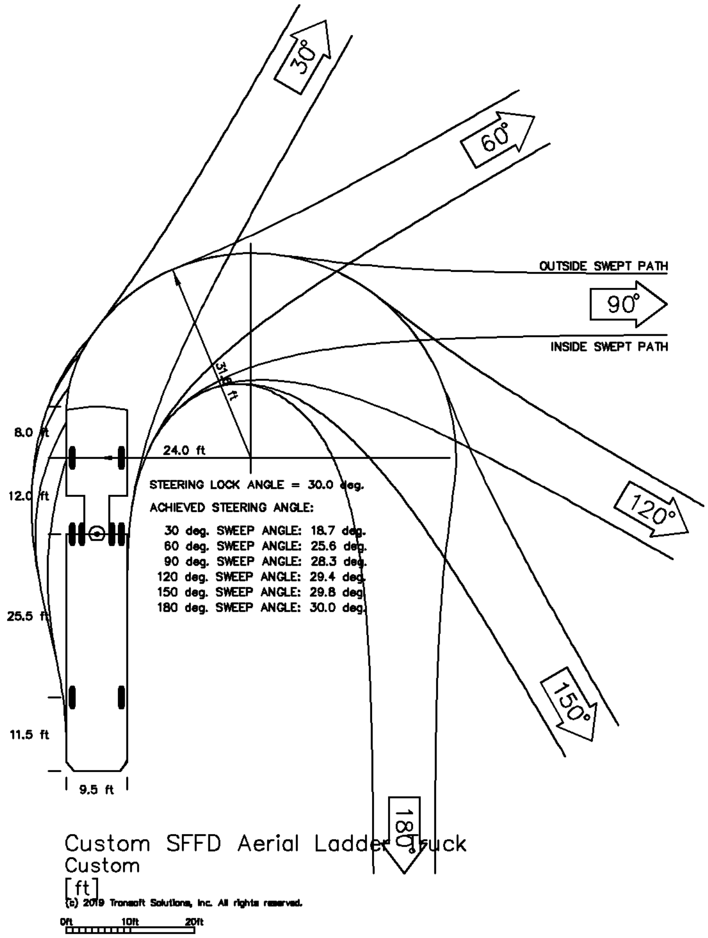
APPX. C.13 – WB-40 TURNING TEMPLATE – LEE/OCEAN

APPENDIX D – FIRE ENGINE AND FIRE TRUCK TURNING MOVEMENTS



STEERING LOCK ANGLE = 36.0 deg.
ACHIEVED STEERING ANGLE:
30 deg. SWEEP ANGLE: 20.0 deg.
60 deg. SWEEP ANGLE: 28.6 deg.
90 deg. SWEEP ANGLE: 32.5 deg.
120 deg. SWEEP ANGLE: 34.4 deg.
150 deg. SWEEP ANGLE: 35.3 deg.
180 deg. SWEEP ANGLE: 35.7 deg.

SFFD Engine
Custom
[ft]



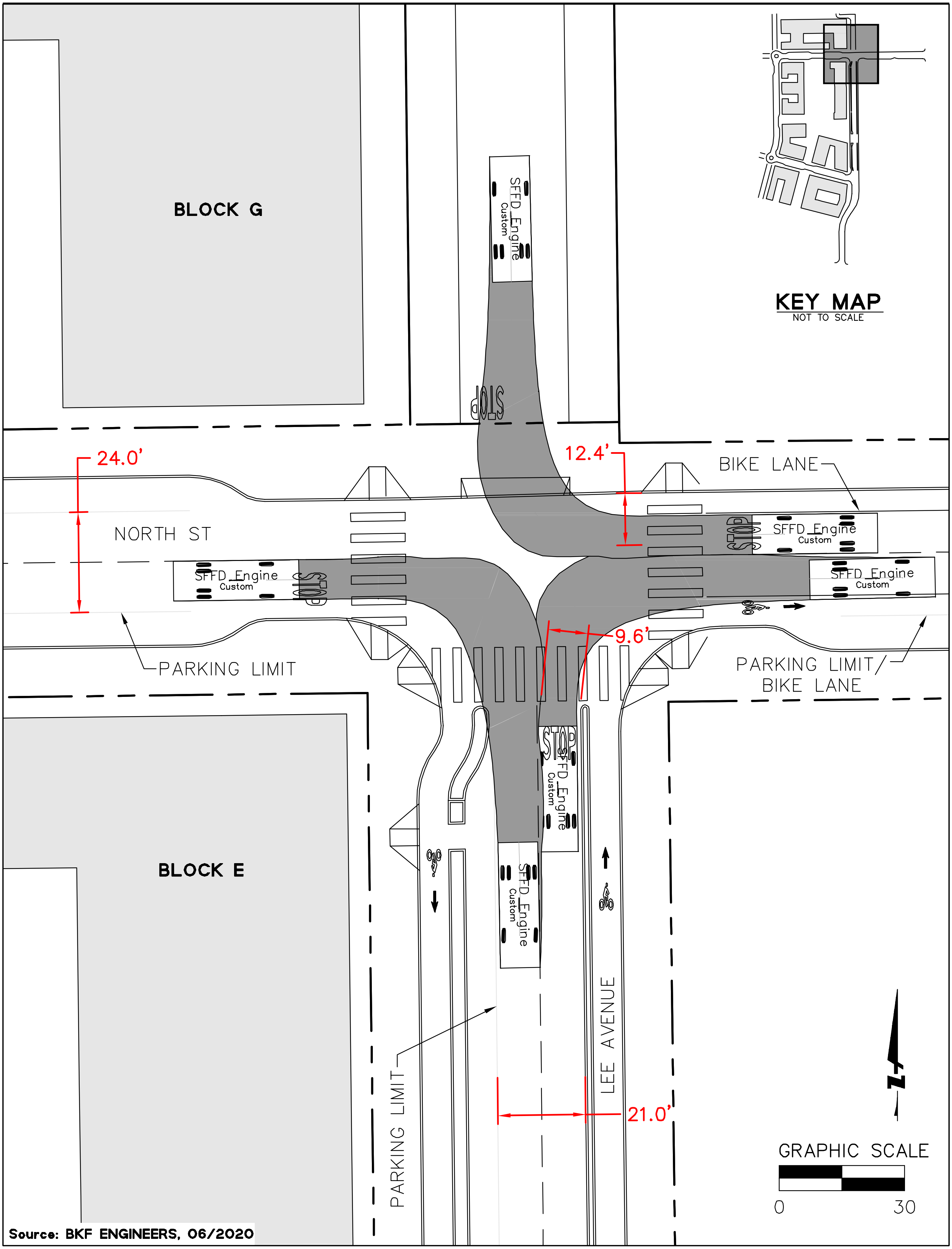
STEERING LOCK ANGLE = 30.0 deg.
ACHIEVED STEERING ANGLE:
30 deg. SWEEP ANGLE: 18.7 deg.
60 deg. SWEEP ANGLE: 25.6 deg.
90 deg. SWEEP ANGLE: 28.3 deg.
120 deg. SWEEP ANGLE: 29.4 deg.
150 deg. SWEEP ANGLE: 29.8 deg.
180 deg. SWEEP ANGLE: 30.0 deg.

Custom SFFD Aerial Ladder Truck
Custom
[ft]

GRAPHIC SCALE
0 30

DRAWING NAME: K:\2016\160367_Balboa_Reservoir\ENG\EXHIBITS\AUTOTURN\Fire_Truck\Fire_Truck_Turning.dwg
PLOT DATE: 06-10-20 PLOTTED BY: pasc

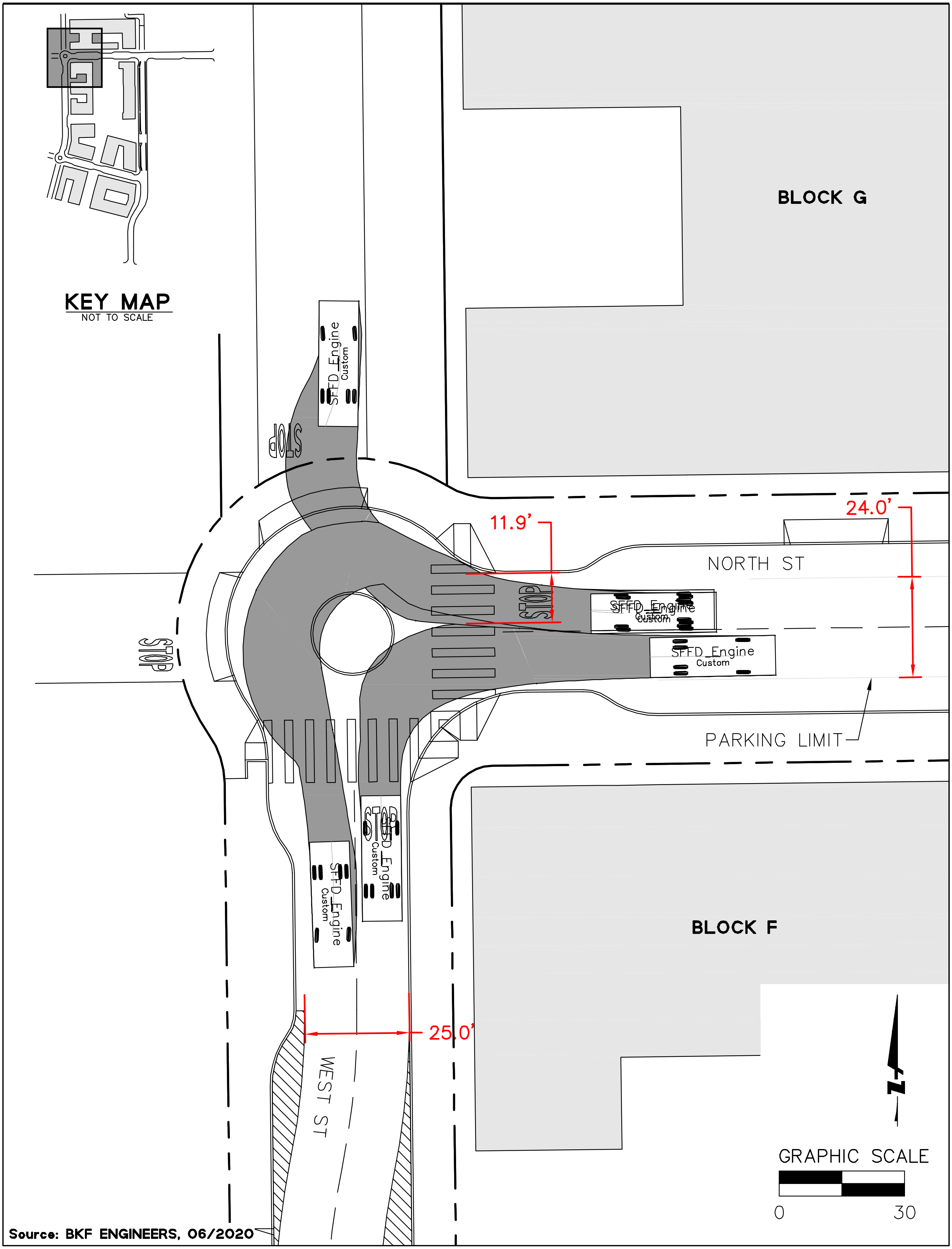
Source: BKF ENGINEERS, 06/2020



Source: BKF ENGINEERS, 06/2020

DRAWING NAME: K:\2016\160367_Balboa_Reservoir\ENG\EXHIBITS\AUTOTURN\Fire_Truck\Fire_Truck_Turning.dwg
PLOT DATE: 06-10-20 PLOTTED BY: pasc

BALBOA RESERVOIR INFRASTRUCTURE PLAN **APPX. D.2 – SFFD FIRE ENGINE TURNING TEMPLATE – NE CORNER**



Source: BKF ENGINEERS, 06/2020

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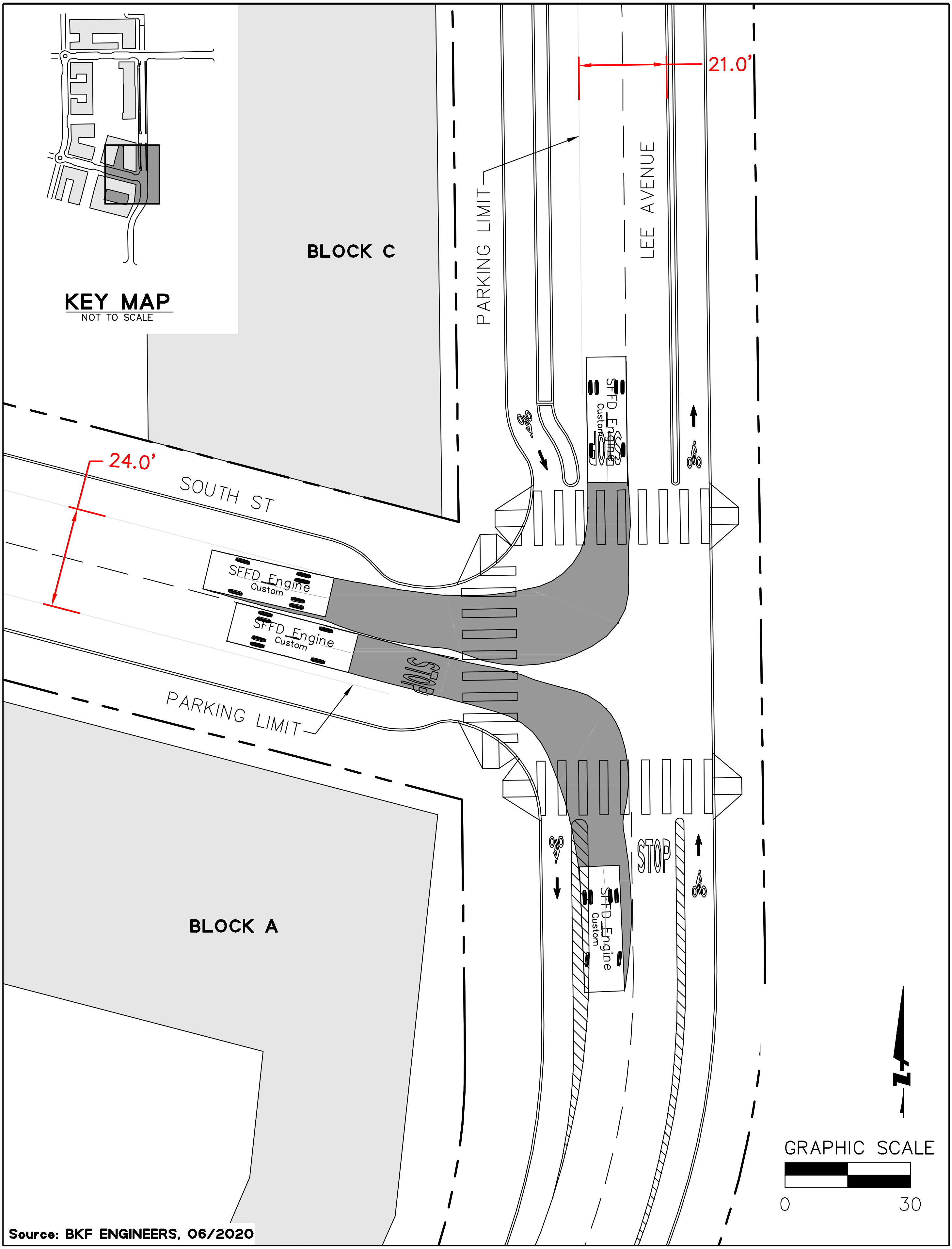
PLOT DATE: 06-10-20 PLOTTED BY: pasc

BALBOA RESERVOIR INFRASTRUCTURE PLAN

APPX. D.3 – SFFD FIRE ENGINE TURNING TEMPLATE – NW CORNER



Source: BKF ENGINEERS, 06/2020

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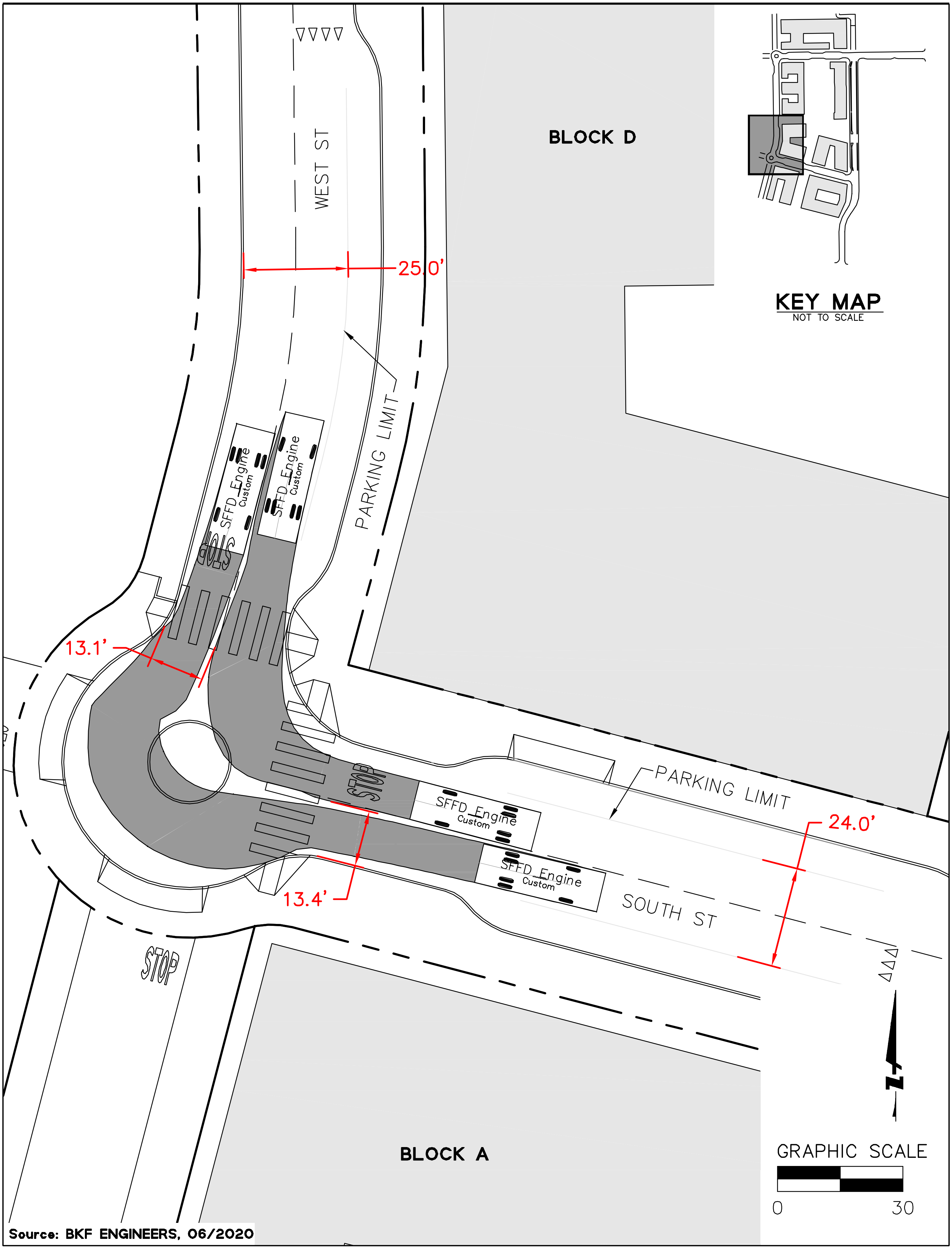
PLOT DATE: 06-10-20 PLOTTED BY: pasc

BALBOA RESERVOIR INFRASTRUCTURE PLAN

APPX. D.4 – SFFD FIRE ENGINE TURNING TEMPLATE – SE CORNER



Source: BKF ENGINEERS, 06/2020

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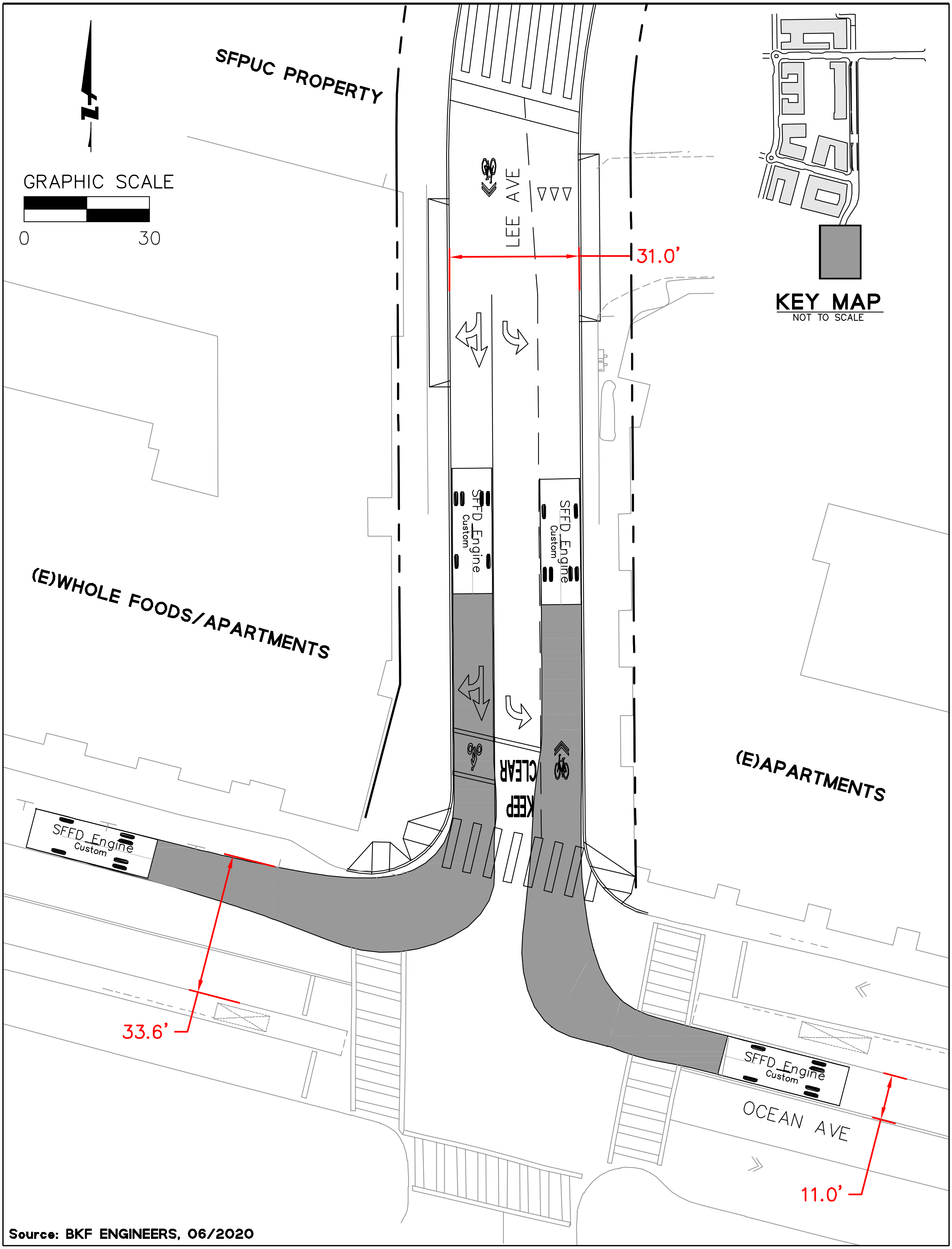
PLOT DATE: 06-10-20 PLOTTED BY: pasc

BALBOA RESERVOIR INFRASTRUCTURE PLAN **APPX. D.5 – SFFD FIRE ENGINE TURNING TEMPLATE – SW CORNER**



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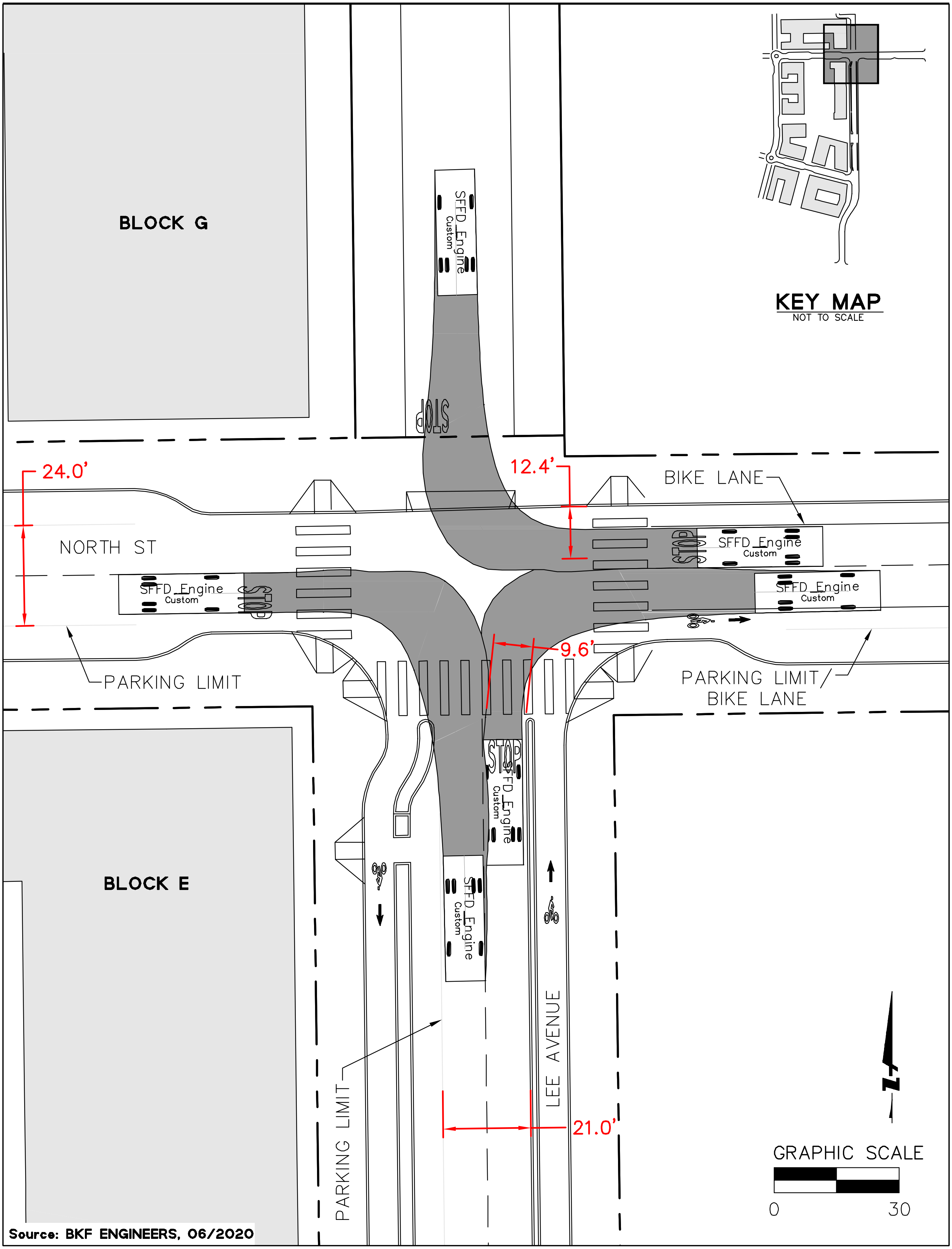
PLOT DATE: 06-10-20 PLOTTED BY: pasc

BALBOA RESERVOIR INFRASTRUCTURE PLAN

APPX. D.6 – SFFD FIRE ENGINE TURNING TEMPLATE
LEE AVE/OCEAN AVE



Source: BKF ENGINEERS, 06/2020

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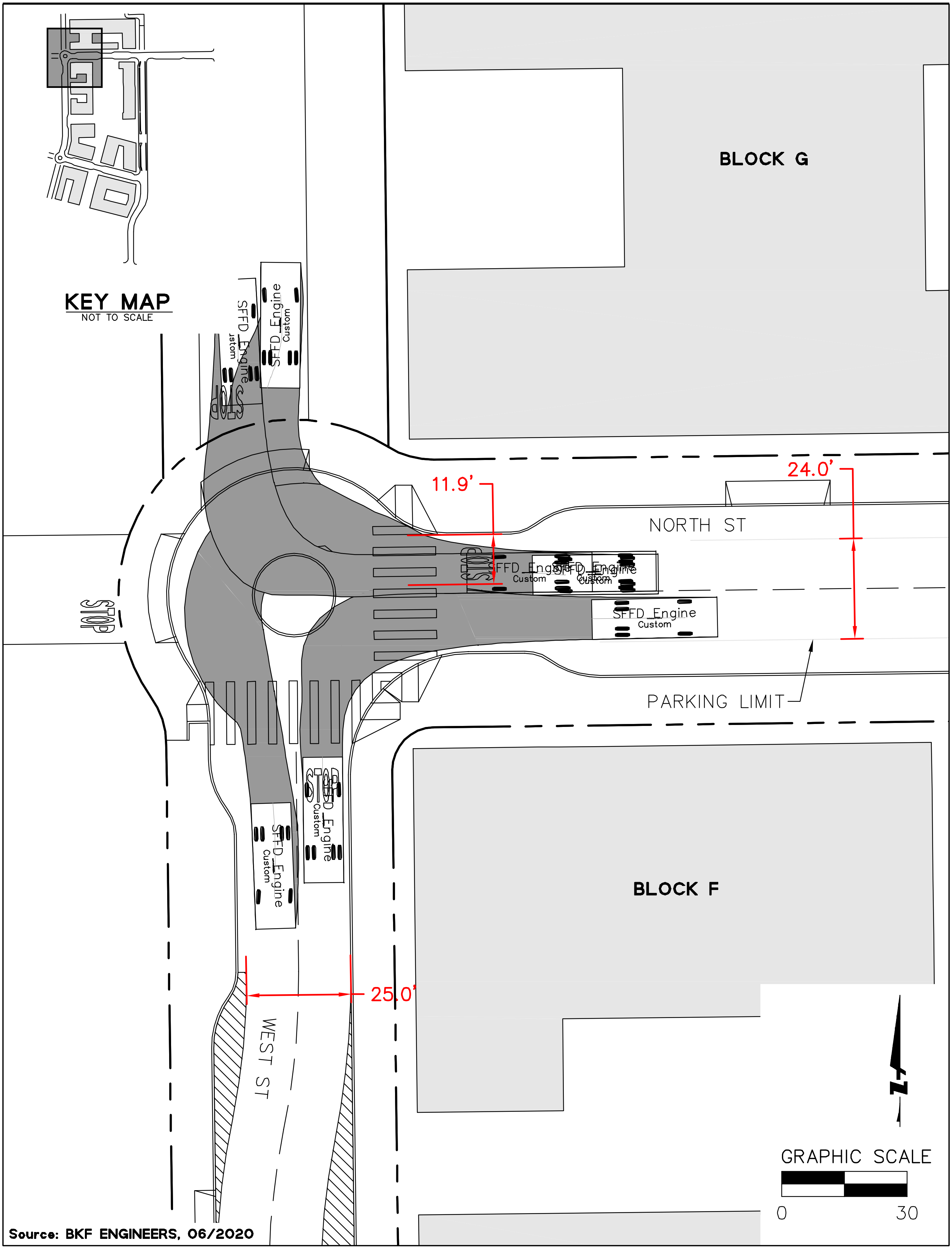
PLOT DATE: 06-10-20 PLOTTED BY: pasc

BALBOA RESERVOIR INFRASTRUCTURE PLAN APPX. D.7 – SFFD AERIAL FIRE TRUCK TURNING TEMPLATE – NE



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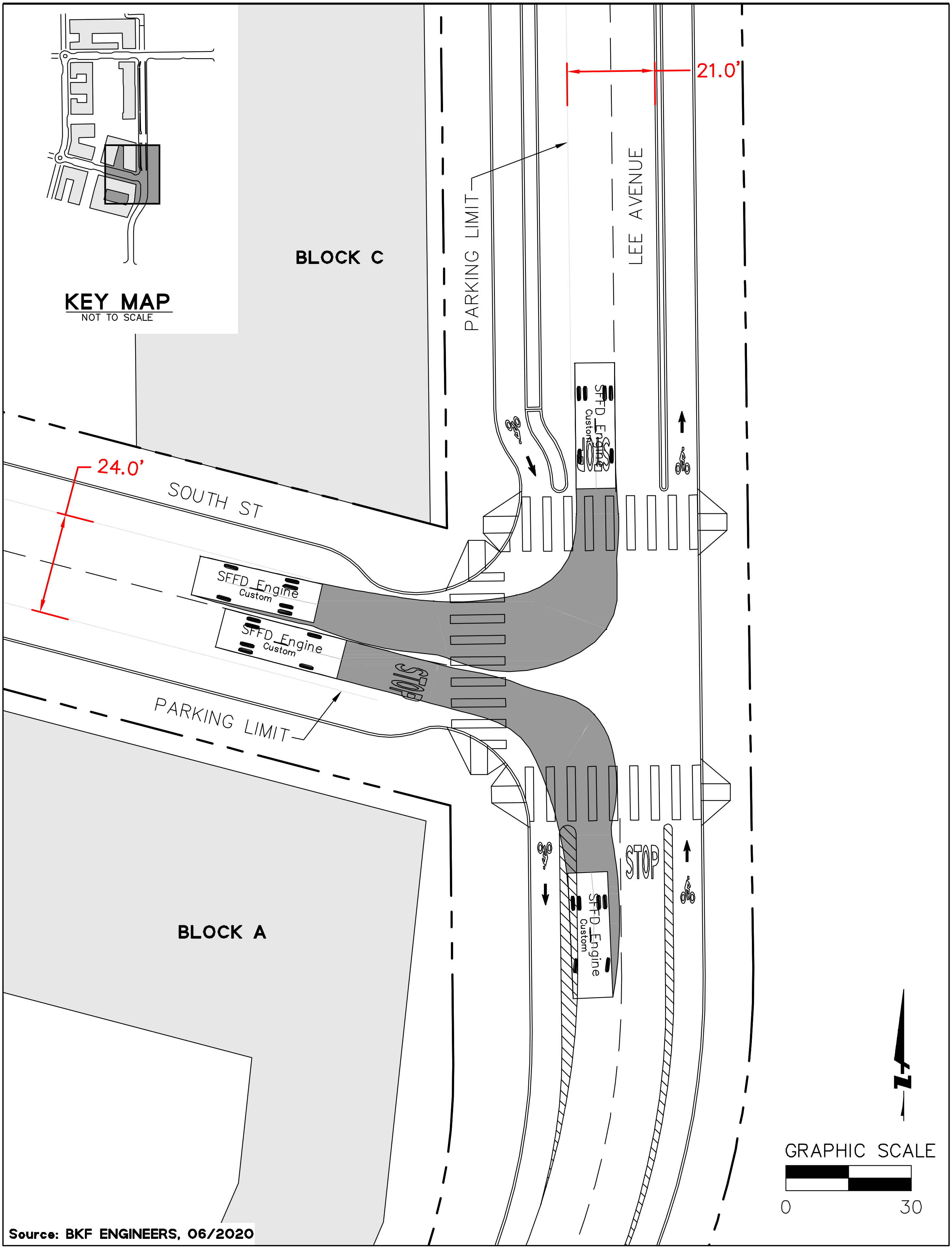
PLOT DATE: 06-10-20 PLOTTED BY: pasc

BALBOA RESERVOIR INFRASTRUCTURE PLAN **APPX. D.8 – SFFD AERIAL FIRE TRUCK TURNING TEMPLATE – NW**



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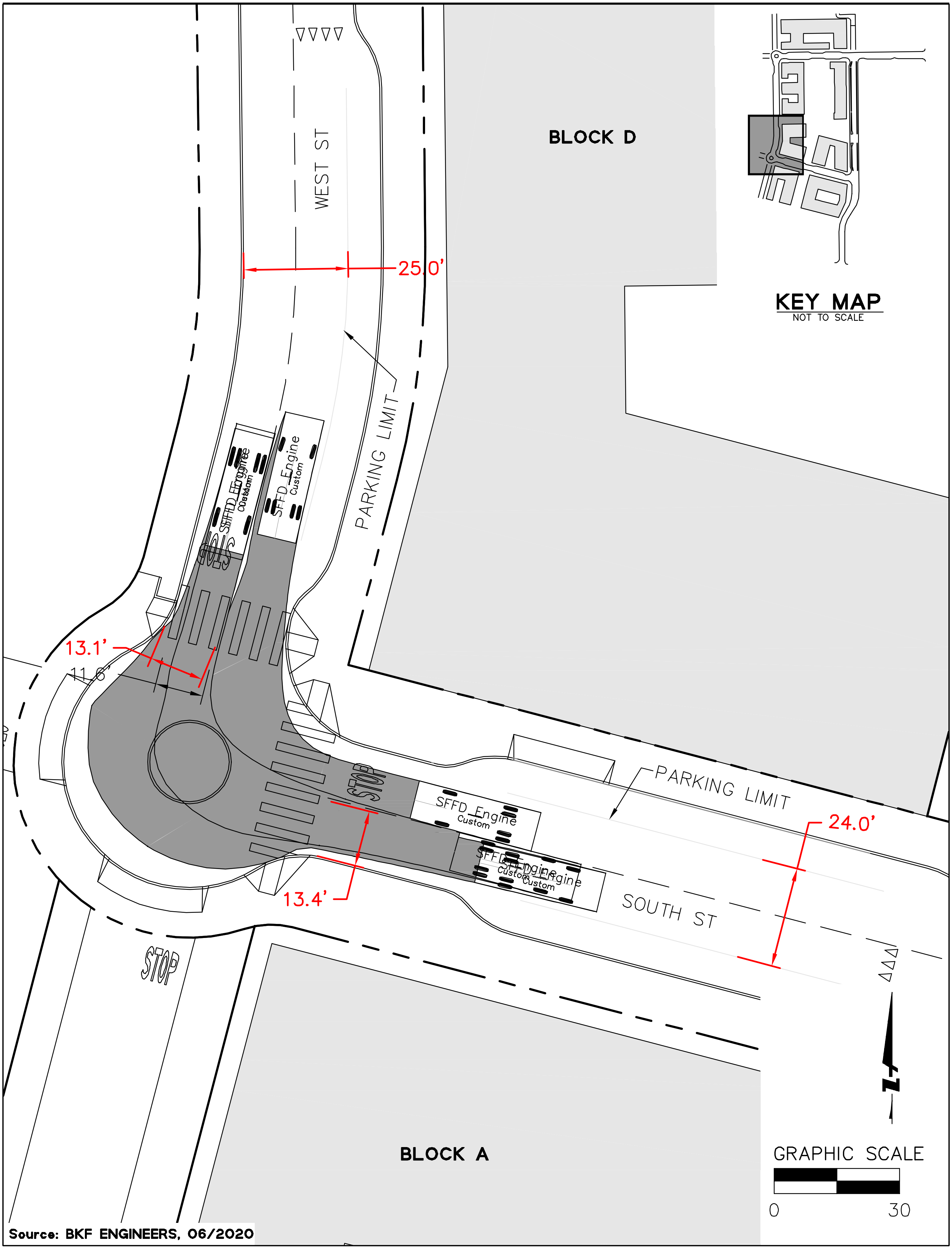
PLOT DATE: 06-10-20 PLOTTED BY: pasc

BALBOA RESERVOIR INFRASTRUCTURE PLAN APPX. D.9 – SFFD AERIAL FIRE TRUCK TURNING TEMPLATE – SE



Source: BKF ENGINEERS, 06/2020

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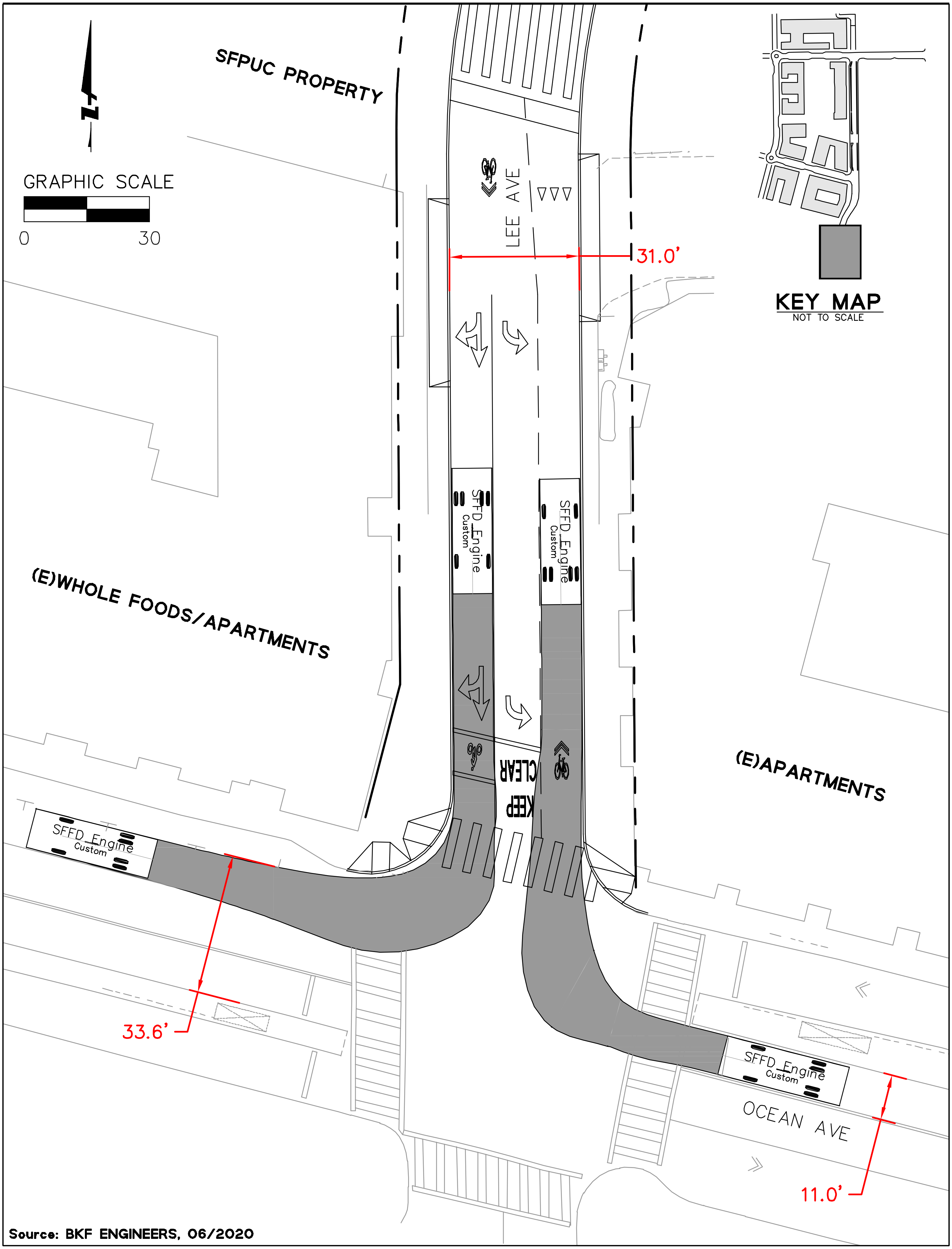
PLOT DATE: 06-10-20 PLOTTED BY: pasc

BALBOA RESERVOIR INFRASTRUCTURE PLAN

APPX. D.10 – SFFD AERIAL FIRE TRUCK TURNING TEMPLATE – SW



Source: BKF ENGINEERS, 06/2020

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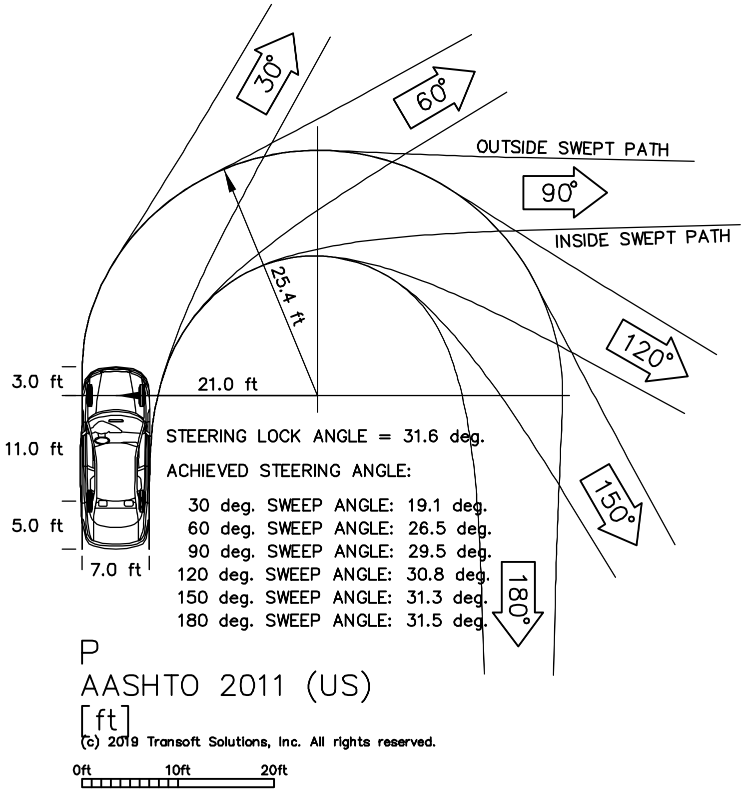
PLOT DATE: 06-10-20 PLOTTED BY: pasc

BALBOA RESERVOIR INFRASTRUCTURE PLAN

APPX. D.11 - SFFD AERIAL FIRE TRUCK TURNING TEMPLATE
LEE AVE/OCEAN AVE

APPENDIX E – PASSENGER VEHICLE TURNING MOVEMENTS



GRAPHIC SCALE

0 20

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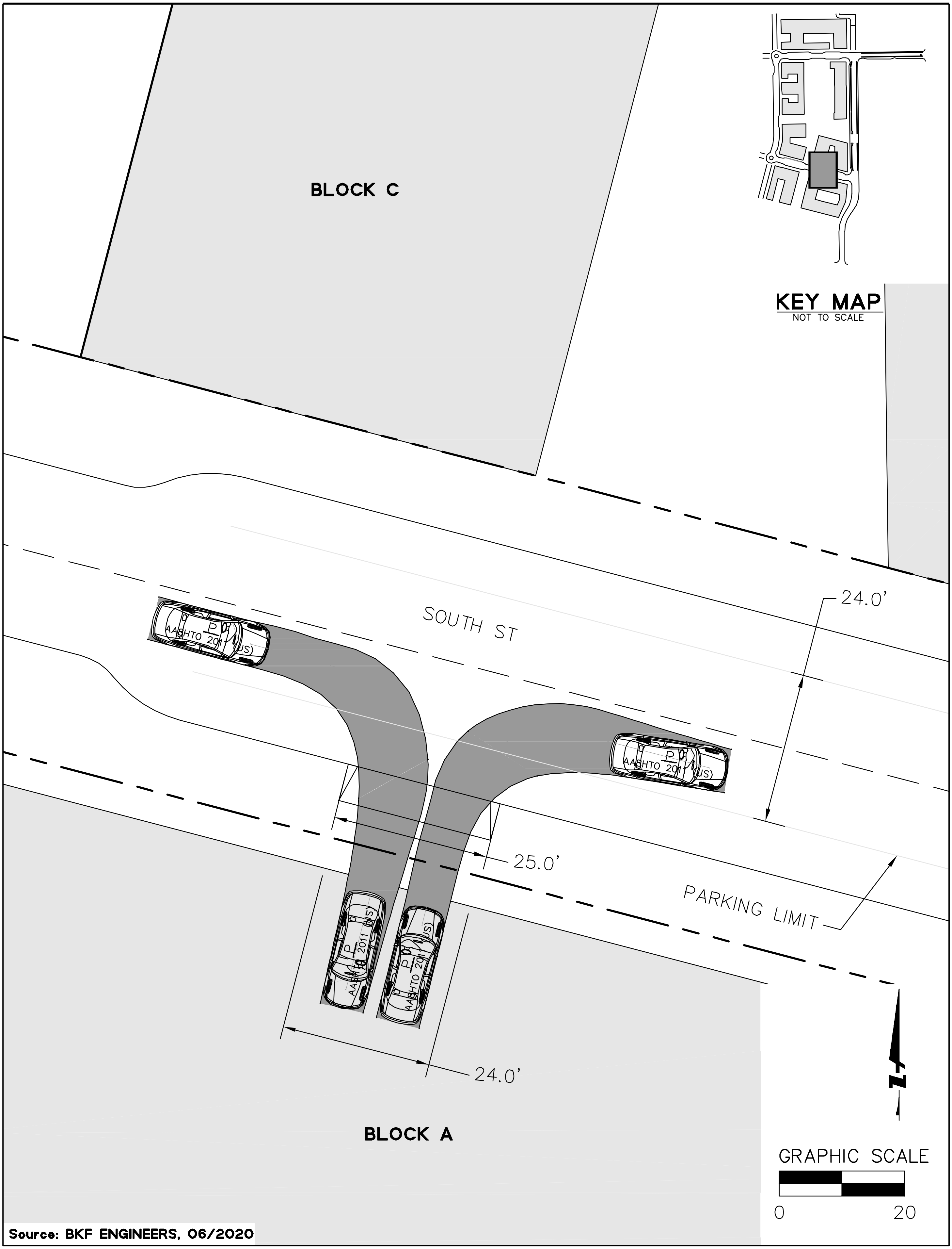
PLOT DATE: 06-10-20 PLOTTED BY: pasc

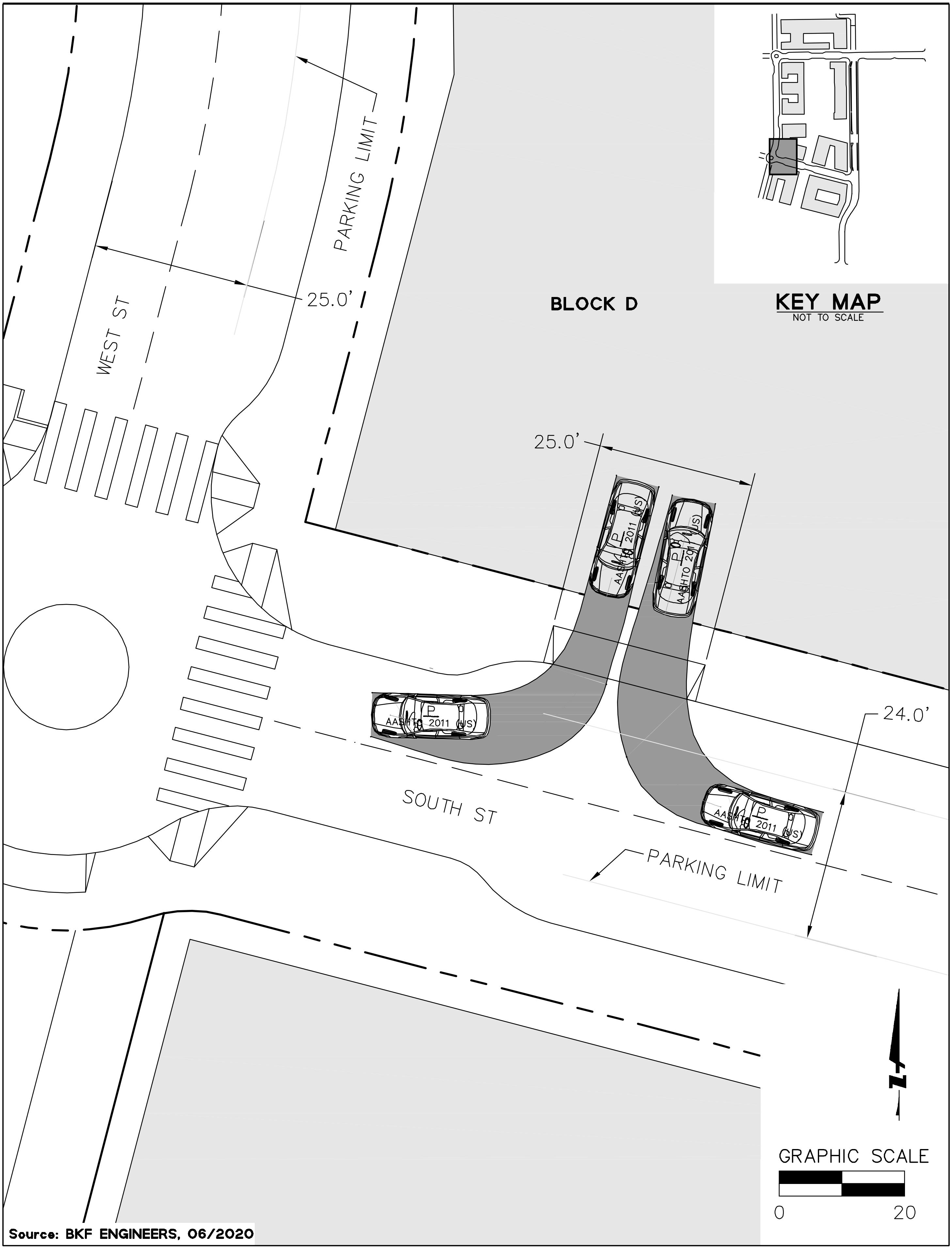
Source: BKF ENGINEERS, 06/2020



Source: BKF ENGINEERS, 06/2020

DRAWING NAME: K:\2016\160367_Balboa_Reservoir\ENG\EXHIBITS\AUTOTURN\Garage Entrances\Garage_Entrance_Turning.dwg
PLOT DATE: 06-10-20 PLOTTED BY: pasc

BALBOA RESERVOIR INFRASTRUCTURE PLAN **APPX. E.2 - PASS. VEH. TURNING TEMPLATE - GARAGE A & B**



Source: BKF ENGINEERS, 06/2020

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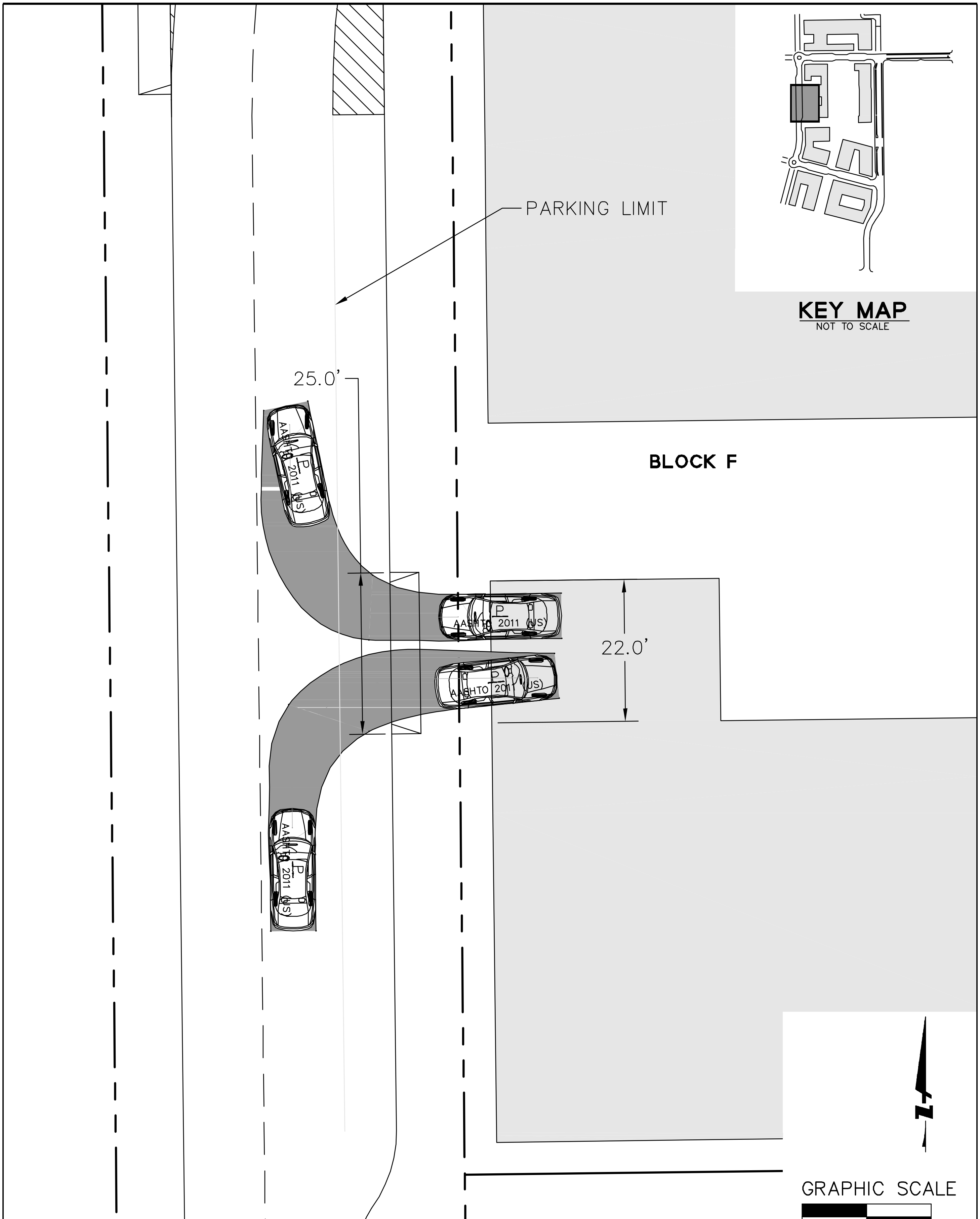
PLOT DATE: 06-10-20 PLOTTED BY: pasc

BALBOA RESERVOIR INFRASTRUCTURE PLAN

APPX. E.3 - PASS. VEH. TURNING TEMPLATE - GARAGE C & D



Source: BKF ENGINEERS, 06/2020

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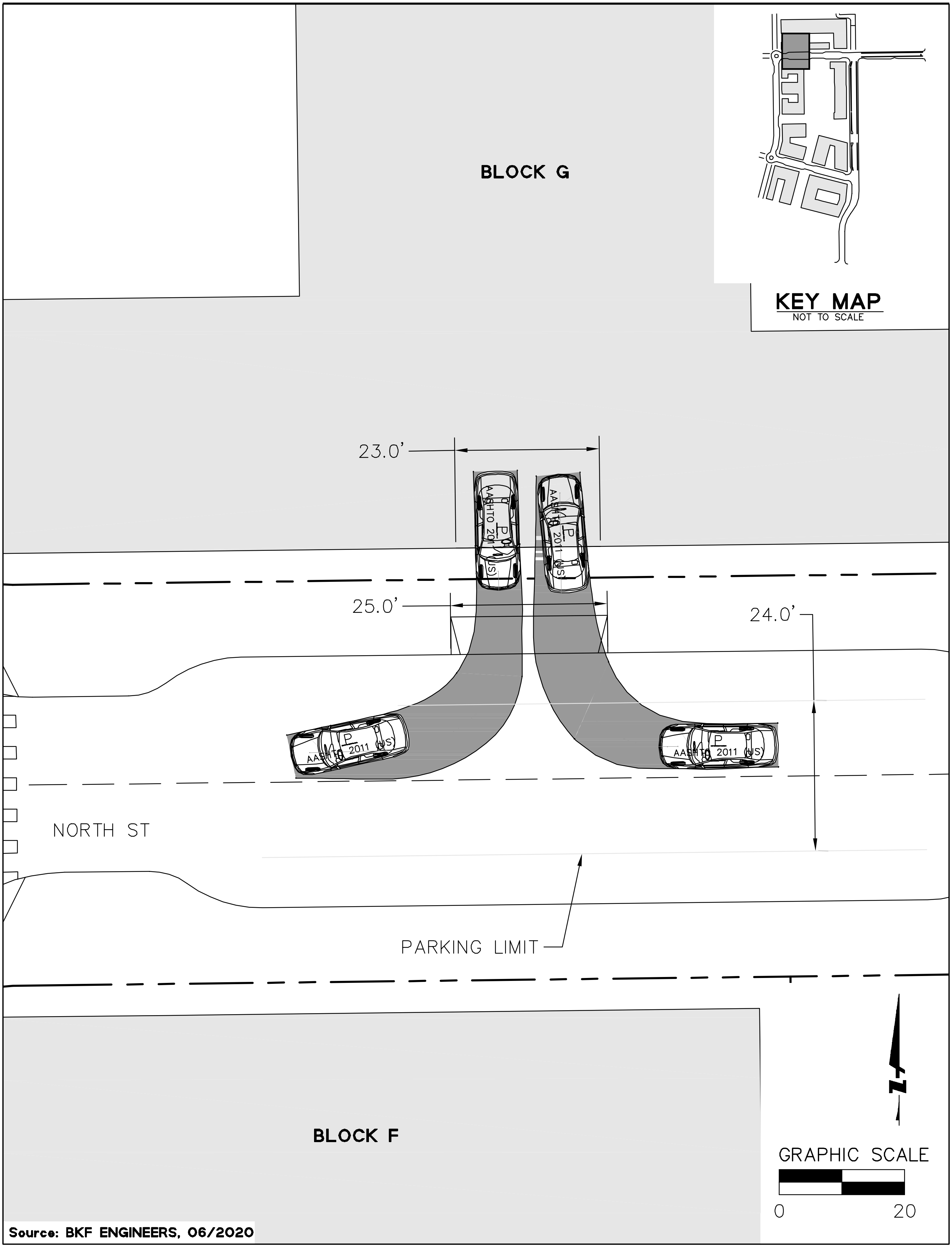
PLOT DATE: 06-10-20 PLOTTED BY: pasc

BALBOA RESERVOIR INFRASTRUCTURE PLAN

APPX. E.4 - PASS. VEH. TURNING TEMPLATE - GARAGE F

DRAWING NAME: K:\2016\160367_Balboa_Reservoir\ENG\EXHIBITS\AUTOTURN\Garage Entrances\Garage_Entrance_Turning.dwg
PLOT DATE: 06-10-20 PLOTTED BY: pasc



Source: BKF ENGINEERS, 06/2020

BALBOA RESERVOIR INFRASTRUCTURE PLAN

APPX. E.5 - PASS. VEH. TURNING TEMPLATE - GARAGE G

APPENDIX F – FIRE FLOW EVALUATION

The Fire Consultants, Inc.

December 17, 2019

Ms. Karen Murray
Van Meter Williams Pollack LLP
333 Bryant Street, Suite 300
San Francisco, CA 94104

BALBOA RESERVOIR – FIRE FLOW
FIRE FLOW EVALUATION

Dear Karen,

This letter will outline our assessment of the fire flow requirements for the planned multi-building Balboa Reservoir development project in San Francisco, California. The purpose of our assessment is to develop an estimate for fire flow required for the buildings anticipated to be on site and compare that to the anticipated fire flow available.

REQUIRED FIRE FLOW

Site Fire Flow. The project anticipates approximately 7 new buildings of R-2 occupancy and 100 Townhouses of R-3 occupancy. All buildings are anticipated to be provided with sprinkler protection. No car stackers are planned. The buildings are anticipated to be built of types I-A over III-A construction, and range in height from 4 to 7 stories. The Townhouses will be Type V-A and 1800 sf each. While the design details have not yet been developed, we have looked at the various scenarios to determine what might be the most challenging fire flow requirement presented. The project will include multi-family homes with construction type III-A over Type I-A podium and Townhouses with construction type V-A. We assume fire flow will be similar for all building since they are planned to be Type III-A over Type I-A podium and of a similar size. The townhouse fire flow will be similar for all Townhouses since they are planned to be Type V-A and the same size. However, if the townhouses are combined into 3 or more units, they will become R-2 occupancy and the fire flow would have to be adjusted.

The fire flows required for building projects in San Francisco are determined from Table B105.1 in Appendix B of the 2019 California Fire Code (CFC). A weighted average of required fire flow based on Table B105.1 is calculated for Type IA and Type IIIA areas. The required fire flow for Townhouses is calculated based from Table B105.1(1) for NFPA 13 R or 13D sprinkler protected Townhouses with areas between 0-3600 sq.

Table B105.2 of the CFC allows a reduction of 75%, but not to less than a total requirement of 1,500 gallons per minute, if NFPA 13 R sprinkler protection is provided in the building (footnote a) or 1,000 gallons per minute, if NFPA 13 sprinkler protection is provided (footnote b). However, the lowest fire flow allowed by SFFD when using the sprinkler reduction is 1,500 GPM. The weighted area and fire flow calculation for each building is presented in table below.

Bldg A	Area	% Area	Fire Flow	25%	
Type IA	72600	0.32	3000	1000	GPM
Type IIIA	155600	0.68	5750	1437.5	GPM
total	228200		**Weighted Ave**	**1298**	**GPM**

Bldg B	Area	% Area	Fire Flow	25%	
Type IA	19091	0.17	1500	1000	GPM
Type IIIA	93659	0.83	4500	1125	GPM
total	112750		**Weighted Ave**	**1104**	**GPM**

Bldg E	Area	% Area	Fire Flow	25%	
Type IA	38350	0.28	2000	1000	GPM
Type IIIA	100800	0.72	4500	1125	GPM
total	139150		**Weighted Ave**	**1091**	**GPM**

Bldg F	Area	% Area	Fire Flow	25%	
Type IA	60300	0.33	2750	1000	GPM
Type IIIA	120650	0.67	5000	1250	GPM
total	180950		**Weighted Ave**	**1167**	**GPM**

Townhouse	Area	Table B105.1(1)	Fire Flow	
Type V-A	1800		**500**	**GPM**

Based on calculations above and the fact that a minimum 1500 GPM fire flow is required by SFFD, the required fire flow for all buildings will be 1500 GPM. Higher fire flow requirements could be applicable if sprinklers are not installed, or lesser construction types are used or car stackers are added in the future.

<u>System Water Flows.</u> CFC Appendix B105.3 requires the water systems at the site to be capable of supplying the required water to the fixed fire protection systems in each of the buildings, for 2 hours. Various fire protection system arrangements would require a variety of fire flows for them to function properly. We understand that flammable liquid storage rooms/warehouses and car stackers are not anticipated for the site, and storage will be limited to heights less than 12 feet. Based upon these stipulations, our opinion is that the highest fixed fire protection system water flows required would probably be those required for the following systems:

- Sprinkler systems protecting generator fuel storage rooms and similar environments.

The required water flow rates for these two scenarios would be estimated given the assumptions below:

The requirements for sprinkler systems protecting generator rooms would be similar to Extra Hazard Group 1 criteria (0.30 gpm per ft.^{2}) over the area of the room up to an area of 2,500 ft.^{2}. The anticipated water demand for this type of system (for the maximum remote area) could be up to approximately 1,475 GPM.

Combined Flows. In previous years the Fire Department had calculated fire flows in a manner that would require the site fire flow calculated from CFC Appendix B and the fire flow based upon the sprinkler system demands to be added together. This approach is not specifically mandated by the Code language, and the current approach enforced by the San Francisco Fire Department (SFFD) is to meet the highest demand between the two fire flows and not as a combined flow.

AVAILABLE FIRE FLOW

There are two points of connection from the existing municipal water mains to the network supplying the required fire flow for the project. The water flow information is determined by flow tests conducted by City for both water mains. Based on the location of city mains, Building A and Building B will be connected to water supply at 1110 Ocean Ave and Building E and Building F will be supplied by city main at 155 Frida Kahlo Way. The townhouses could be connected to either main, which will require some on site private piping. That piping should be designed to accommodate the required 500 gpm fire flow. The available water supply at 20 psi residual pressure calculated based on the method from NFPA Fire Protection Handbook, 18th ed, page 6-104. Calculations are as follow, based on water flow information provided by the 10/22/19 based on flow tests conducted by SFFD.

Frida Kahlo:

S = static pressure of 69 psi
R1= calculation of residual pressure of 51 psi
Q1= calculated flow of 947 gpm at residual of 51 psi (R1)
R2 = residual pressure of 20 psi (maximum fire flow pressure allowed per CFC Appendix B102)
Q2 = flow at residual pressure of 20 psi (R2)

Q2 = Q1 *((S-R2)0.54/(S-R1)0.54)
Q2 = 1626 gpm

The available water supply of 1626 gpm exceeds the fire flow requirement of 1500 gpm.

Ocean:

S = static pressure of 80 psi
R1= calculation of residual pressure of 62 psi
Q1= calculated flow of 1197 gpm at residual of 51 psi (R1)
R2 = residual pressure of 20 psi (maximum fire flow pressure allowed per CFC Appendix B102)
Q2 = flow at residual pressure of 20 psi (R2)

Q2 = Q1 *((S-R2)0.54/(S-R1)0.54)
Q2 = 2293 gpm

The available water supply of 2293 gpm exceeds the fire flow requirement of 1500 gpm.

SUMMARY

This evaluation concludes that the water distribution system proposed for the project site must be sufficient to supply both the 1,475 GPM water requirements of the anticipated fixed fire protection systems for any building proposed, and the 1,500 GPM site fire flow as indicated in Appendix B of the CFC for the largest anticipated building proposed, but not a combination of both flows simultaneously as long as there will be no car stacker in buildings. This should comply with current fire flow standards in San Francisco and those currently enforced by SFFD.

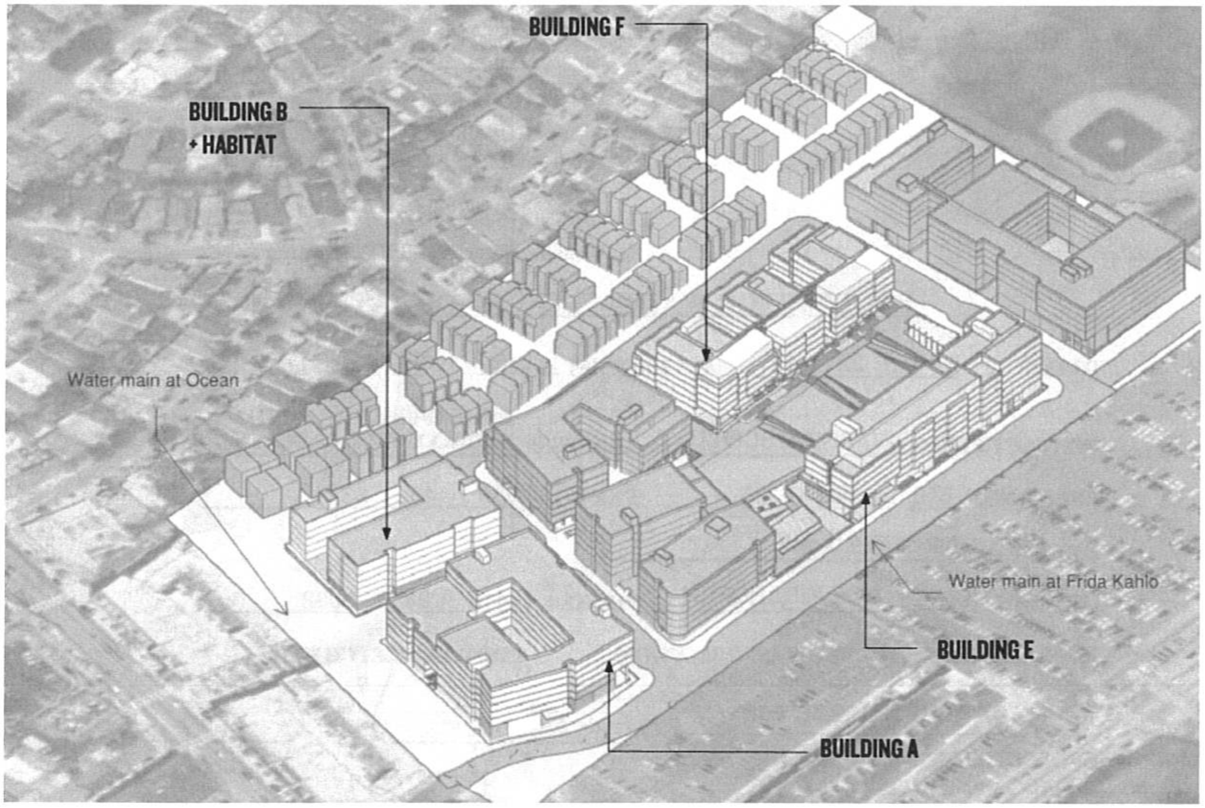
Sincerely,

Jeff Maddox

Jeffrey A. Maddox, P.E.

HS/JAM:hs
19-2283/LTHS Balboa Reservoir Site Fire Flow

REGISTERED PROFESSIONAL ENGINEER
JEFFREY A. MADDOX
No. 1231
Exp. 9/20
FIRE PROTECTION
STATE OF CALIFORNIA


BUILDING F
BUILDING B
+ HABITAT
Water main at Ocean
Water main at Frida Kahlo
BUILDING E
BUILDING A

SAN FRANCISCO FIRE DEPARTMENT
BUREAU OF FIRE PREVENTION
PLAN CHECK DIVISION/WATER FLOW
1660 MISSION STREET, 4TH FLOOR
SAN FRANCISCO, CA. 94103
FAX # 415-575-6933
Email: WaterflowSFFD@sfgov.org

REQUEST FOR WATER FLOW INFORMATION

DATE: 10 / 22 / 18 **REQUEST IS FOR:** ☒ **FIRE FLOW** ☐ **SPRINKLER DESIGN**

CONTACT PERSON: BRIAN SCOTT **ADDRESS:** 255 SHORELINE DR, SUITE 200 REDWOOD CITY, CA 94065

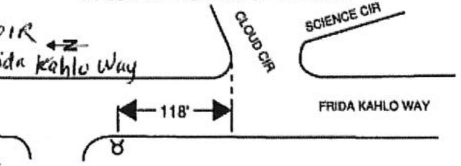
PHONE NO. (650) 482 / 6335 **FAX NO.** (650) 482 / 6399

EMAIL : bscott@bkf.com

OWNER'S NAME: JOE KIRCHOFER **PHONE #** (415) 284 / 9082

ADDRESS FOR WATER FLOW INFORMATION: **PROVIDE SKETCH HERE:**

SE CORNER OF BALBOA RESERVOIR
37.727121, -122.452507 IFO #55 Frida Kahlo Way



CROSS STREETS (*BOTH ARE REQUIRED*):
JUDSON AVE
~~FRIDA KAHLO WAY~~ / CLOUD CIRCLE

SPECIFY STREET FOR POINT OF CONNECTION: 8" LINE ON FRIDA KAHLO WAY

OCCUPANCY (CIRCLE ONE): R3 R2 LIVE/WORK COMMERCIAL OTHER_____

HAZARD CLASSIFICATION: LIGHT ORD 1 ORD 2 EXT 1 EXT 2 OTHER_____

CAR-STACKER: YES NO

NUMBER OF STORIES: N/A **HEIGHT OF BLDG.:** N/A **FT.**

- SUBMIT FORM WITH A $125.00 CHECK MADE PAYABLE TO 'S.F.F.D.'
- REQUESTS REQUIRING A FIELD FLOW TEST WILL BE NOTIFIED BY FAX OR EMAIL, AND AN ADDITIONAL FEE OF $250.00 WILL BE NECESSARY.
- WATER FLOW INFORMATION WILL BE RETURNED BY FAX, MAIL, OR EMAIL.
- INCOMPLETE FORMS **WILL NOT** BE PROCESSED.
- PLEASE ALLOW 7-14 WORKING DAYS FOR PROCESSING.

*********************************Official use only*********************************

Flow data provided by: LAU Date Forwarded 11/1/18

Flow data: **FIELD FLOW TEST** X **STATIC** 69 **PSI**

RECORDS ANALYSIS_____ **RESIDUAL** 51 **PSI**

FLOW 947 **GPM**

Gate Page 178 8 **" MAIN on** Frida Kahlo Way

SAN FRANCISCO FIRE DEPARTMENT
BUREAU OF FIRE PREVENTION
PLAN CHECK DIVISION/WATER FLOW
1660 MISSION STREET, 4TH FLOOR
SAN FRANCISCO, CA. 94103
FAX # 415-575-6933
Email: WaterflowSFFD@sfgov.org

REQUEST FOR WATER FLOW INFORMATION

DATE: 10 / 22 / 18 **REQUEST IS FOR:** ☒ **FIRE FLOW** ☐ **SPRINKLER DESIGN**

CONTACT PERSON: BRIAN SCOTT **ADDRESS:** 255 SHORELINE DR, SUITE 200 REDWOOD CITY, CA 94065

PHONE NO. (650) 482 / 6335 **FAX NO.** (650) 482 / 6399

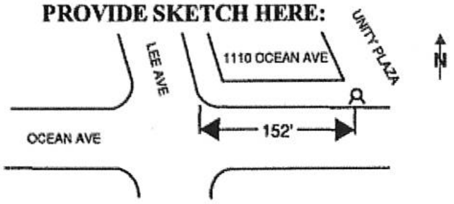
EMAIL : bscott@bkf.com

OWNER'S NAME: JOE KIRCHOFER **PHONE #** (415) 284 / 9082

ADDRESS FOR WATER FLOW INFORMATION:

1110 OCEAN AVE

PROVIDE SKETCH HERE:



CROSS STREETS (*BOTH ARE REQUIRED*):
HAROLD ~~OCEAN~~ AVE / LEE AVE

SPECIFY STREET FOR POINT OF CONNECTION: 12" LINE ON OCEAN AVE

OCCUPANCY (CIRCLE ONE): R3 R2 LIVE/WORK COMMERCIAL OTHER____

HAZARD CLASSIFICATION: LIGHT ORD 1 ORD 2 EXT 1 EXT 2 OTHER____

CAR-STACKER: YES NO

NUMBER OF STORIES: N/A **HEIGHT OF BLDG.:** N/A **FT.**

- SUBMIT FORM WITH A **$125.00** CHECK MADE PAYABLE TO 'S.F.F.D.'
- REQUESTS REQUIRING A FIELD FLOW TEST WILL BE NOTIFIED BY FAX OR EMAIL, AND AN ADDITIONAL FEE OF **$250.00** WILL BE NECESSARY.
- WATER FLOW INFORMATION WILL BE RETURNED BY FAX, MAIL, OR EMAIL.
- INCOMPLETE FORMS **WILL NOT** BE PROCESSED.
- PLEASE ALLOW 7-14 WORKING DAYS FOR PROCESSING.

**********************************Official use only*********************************

Flow data provided by: LAU Date Forwarded 11/1/18

Flow data: **FIELD FLOW TEST** ____ **STATIC** 80 **PSI**

RECORDS ANALYSIS X **RESIDUAL** 62 **PSI**

FLOW 1197 **GPM**

Gate Page 181 12 **" MAIN on** Ocean

Appendix G "Balboa Reservoir Hydrologic and Hydraulic Modeling" memo by BKF, dated June 12, 2020

BKF 100+ YEARS
ENGINEERS . SURVEYORS . PLANNERS

TECHNICAL MEMORANDUM

Date: June 12, 2020 **BKF Job No.:** C20160367-11

Deliver To: Craig Freeman, SFPUC

From: Erik Moreno, BKF Engineers
Lindsey Carmona, BKF Engineers

Subject: **Balboa Reservoir**
Hydrologic and Hydraulic Modeling

Balboa Reservoir is a 17-acre site in San Francisco bounded by City College campus to the east, multi-family housing and retail on Ocean Avenue to the south, Westwood Park neighborhood to the west, and Riordan High School to the north. Balboa Reservoir is proposed to be developed (the Project).

The Project is subject to the Stormwater Management Requirements (SMR) and shall provide stormwater best management practices (BMPs) to reduce the 2-year, 24-hour peak runoff rate and total runoff volume from the Project (i.e. runoff from on-site areas only) by 25%. Herein, this is referred to as the 2-year storm requirement.

There are capacity limitations in the Ocean Avenue combined sewer system. Therefore, the Project may not increase the peak discharge to the Ocean Avenue sewer system in the 5-year, 3-hour and 100-year, 3-hour storm events. Herein, this is referred to as the 5-year and 100-year storm requirement. In the master plan, the project peak dry weather sanitary flows will be analyzed and accounted for in the detention sizing calculations.

This memorandum has been prepared to document the hydrologic and hydraulic modeling, and to present two alternatives for the project that will meet these requirements. Alternative 1 uses only green infrastructure, and alternative 2 uses a combination of green infrastructure and traditional stormwater detention.

Assumptions

The following assumptions were made to develop the existing and proposed conditions model:

- Sewer System geometry developed using:
    - Ocean Avenue Combined Sewer System (CSS) provided by SFPUC;
    - As-built drawings;
    - Estimated pipe slopes (1% assumed).
- Green infrastructure assumed to be a single, vertical wall bioretention planter:
    - 6” ponding depth;
    - 1 in/hr infiltration rate
- Detention system assumed to be off-line vaults separated from the main with a side weir and with orifice controls to throttle discharge to the sewer main.
- Existing 6’ x 6’ storm drain structure at Node C-010, downstream of 72” pipe in East system is shown on survey and may contain orifice controls. Due to insufficient information, 6’ x 6’ structure not modeled.

- NAVD88 vertical datum.
- All impervious area is assumed to be directly connecting (no composite curve number).

Drainage Systems

In existing conditions, the Project site may be split into two drainage systems (West and East), each with a separate connection to the combined sewer under Ocean Avenue. The East system captures runoff from off-site areas (areas not impacted by the Project). The West system does not include runoff from any off-site areas. Refer to Exhibit 1.

Table 1. Existing Drainage System Areas

Drainage System	On-site Area *Acres*	Off-site Area *Acres*	Total Area *Acres*
West System	14.5	0.0	14.5
East System	2.4	7.2	9.6

In the proposed conditions, additional area is added to the West system, and a portion of the West system is diverted to the East system. Refer to Exhibit 2.

Table 2. Proposed Drainage System Areas

Drainage System	On-site Area *Acres*	Off-site Area *Acres*	Total Area *Acres*
West System	14.3	0.0	14.3
East System	4.3	7.0	11.3

Existing Runoff

Runoff from the West system in existing conditions is significantly attenuated by two undersized pipes. The pipes are both 12-inch diameter, relatively flat and are the only outlets for the existing parking lot. The limited capacity of these pipes results in significant volume stored in the parking lot, and low discharge rates to Ocean Avenue. Runoff rates from the East system are not attenuated in existing conditions.

Table 3. Existing Conditions Flow Results

Drainage System	2-year Storm (On-site Only)		5-year Storm (On-site and Offsite)		100-year Storm (On-site and Offsite)	
	cfs	*AF*	*cfs*	*AF*	*cfs*	*AF*
West System	8.4	2.3	8.5	0.9	9.4	1.7
East System	3.4	0.5	17.2	0.8	28.8	1.5

Proposed Runoff

Two alternatives were studied to meet the Project requirements the proposed conditions.

Alternative 1 – Green Infrastructure:

The required flow rate and volume reductions are achieved using only green infrastructure (GI), assumed to be unlined bioretention planters. For the 2-year on-site analysis, the amount of green infrastructure provided in the West system is based on preliminary site plans; the amount provided in the East system is the minimum required based on modeling. For the 5-year and 100-year requirement, additional green infrastructure area was added to reduce peak discharge to Ocean Avenue down to existing conditions. Modeling results are shown in the following tables.

Table 4. Alternative 1 – Required GI for 2-year Requirement (On-site Only)

Drainage System	Provided GI Area	2-year Peak Runoff Rate	2-year Rate Reduction	2-year Total Runoff Volume	2-year Volume Reduction
	Acres	*cfs*	*Percent*	*cf*	*Percent*
West System	1.1	5.9	30%	1.1	54%
East System	0.4	1.3	61%	0.3	28%

Table 5. Alternative 1 – Required GI for 5-year and 100-year Requirement (On-site and Off-site)

Drainage System	Provided GI Area	5-year Storm		100-year Storm	
		Existing Discharge Rate	Proposed Discharge Rate	Existing Discharge Rate	Proposed Discharge Rate
	Acres	*cfs*	*cfs*	*cfs*	*cfs*
West System	1.9	8.5	0.0	9.4	9.0
East System	0.5	17.2	17.0	28.8	28.4

<u>Alternative 2 – Combination Green Infrastructure and Detention:</u>

For this alternative, the 2-year requirement volume reduction is achieved using GI, and an off-line detention system is used to reduce the 2-year peak rate down to existing conditions. The benefit of this approach is less green infrastructure is required in the western system. For the 5-year and 100-year requirement, additional detention volume was added to reduce the peak discharge to Ocean Avenue down to existing conditions. Modeling results are shown in the following tables.

Table 6. Alternative 2 – Required GI and Detention for 2-year Requirement (On-site)

Drainage System	Provided GI Area	Provided Detention Volume	2-year Peak Runoff Rate	2-year Rate Reduction	2-year Total Runoff Volume	2-year Volume Reduction
	Acres	*AF*	*cfs*	*Percent*	*cf*	*Percent*
West System	0.4	0.3	6.2	26%	1.7	25%
East System	0.4	0.0	1.3	61%	0.3	28%

Table 7. Alternative 2 – Required GI and Detention for 5-year and 100-year Requirement (On-site and Off-site)

Drainage System	Provided GI Area	Provided Detention Volume	5-year Storm		100-year Storm	
			Existing Discharge Rate	Proposed Discharge Rate	Existing Discharge Rate	Proposed Discharge Rate
	Acres	*AF*	*cfs*	*cfs*	*cfs*	*cfs*
West System	0.4	0.9	8.5	4.5	9.4	9.2
East System	0.4	0.1	17.2	17.1	28.8	26.5

Storm Drain System Model

The XPSWMM 2017 dynamic hydrologic and hydraulic modeling program developed by XP Solutions was used to analyze the performance of the existing and proposed storm drain system. Santa Barbara Urban Hydrograph (SBUH) methodology is used to compute the runoff and the USEPA SWMM hydraulic computational engine to compute the one-dimensional flow through the proposed storm drain system.
The existing conditions XPSWMM model consists of two storm sewer lines that drain the east and west side of the site. The storm sewer line that drains the west side of the site connects to the existing combined sewer main in Ocean Avenue near Plymouth Avenue. The storm sewer line that drains the east side of the site connects to the same combined sewer main in Ocean Avenue near Lee Avenue.

The proposed conditions model consists of two sewer systems that serve the east and west side of the site. The model includes green infrastructure and detention facilities that are required for the project to comply with the SFPUC's Stormwater Management Requirements (per discussion above). The two proposed storm sewer lines connect to the combined sewer main in Ocean Avenue at the same location as the existing storm sewer lines.

Santa Barbara Unit Hydrograph Hydrologic Parameters

Rainfall

The green infrastructure is modeled using the SFPUC's 2-year, 24-hour hyetograph. For the 5-year and 100-year requirements, the SFPUC's 5-year, 3-hour "Level of Service" storm and the 100-year, 3-hour storm hyetograph are used.

Runoff Curve Number

The curve number (CN) of a drainage area is based on the soil type and surface cover. SBUH automatically assigns a Curve Number of 98 to all impervious areas. Per the geotechnical report dated January 22, 2018 from Rockridge Geotechnical, the top layer of soil encountered in the borings taken on site were silty sand, sand with silt, and clayey sand with gravel. These soil types behave similar to type B soils. Therefore, a Curve Number of 61 was assigned to all pervious areas. This number is based on type B soils with "Open Space" land use (lawns, parks, etc.) with "Good Condition" (grass cover > 75%).

Percent Impervious

The total impervious area for each DMA was estimated based on a combination of the proposed roadway and preliminary site layout. Roof and pavement covers (i.e. asphalt, concrete, etc.) are assumed to be 100% impervious. Note that impervious area is modeled as directly connecting impervious area (i.e. a composite curve number is not computed for our analysis).

Time of Concentration

The time of concentration was calculated using the velocity methodology developed by the Natural Resources Conservation Service (NRCS). A time of concentration of 5 minutes was used for DMAs that had a calculated time of concentration less than 5 minutes, per the Santa Barbara Urban Hydrograph Methodology.

Computational Time Step

For the hydrologic analyses, a computational time step of 60 seconds was used.

SWMM Hydraulic Parameters

Manning's n

Manning's n, or the roughness coefficient, is dependent on the storm drain pipe material. The existing storm drain is assumed to be vitrified clay pipe. Manning's n is 0.014 for vitrified clay. The same Manning's n was used in proposed conditions because the pipe type has not yet been determined.

Computational Time Step

For the hydraulic analyses, a computational time step of 10 seconds was used.

Green Infrastructure

A storage node representing bioretention areas was added to both the west and east systems. Both bioretention nodes have infiltration rates of 1.0 inch/hour[1], and 6-inches of ponding depth before flows bypass downstream.

Detention Systems

An off-line detention node is added to the model, downstream of the Green Infrastructure. Flow is diverted to the detention node using a side weir. The crest of the side weir is set to divert the peak of the hydrograph to optimize detention volume. An orifice meters flow from the detention vault back to the storm drain main. No infiltration is modeled for the detention node.

---

[1] Estimated based on recommendations provided by Rockridge Geotechnical through email.

EXISTING			
OUTFALL	NODE	RIM ELEV	INV ELEV
WEST	B-000	286.85	275.85
	B-002	289.82	283
	B-004	290.1	285.35
	B-006	302.39	286.35
	B-008	304.44	287.64
	B-010	304.35	288.77
	B-012	289.77	289.77
	B-102	289.89	289.89
EAST	C-000	298.13	287.53
	C-002	298.12	287.89
	C-004	298.15	288.36
	C-006	298.53	289.15
	C-008	306.34	289.94
	C-010	306.93	290.12
	C-012	311.29	294.99
	C-014	310.51	296.68
	C-016	314.6	301.31

LEGEND

IMPERVIOUS COVER
PROJECT BOUNDARY
DRAINAGE MANAGEMENT AREA (DMA) BOUNDARY
WATERSHED BOUNDARY
COMBINED STORM SEWER
● MODEL NODE

BKF 100+ YEARS
ENGINEERS . SURVEYORS . PLANNERS

255 SHORELINE DR.,
SUITE 200
REDWOOD CITY, CA 94065
(650) 482-6300
www.bkf.com
JOB NO.: C20160367-11

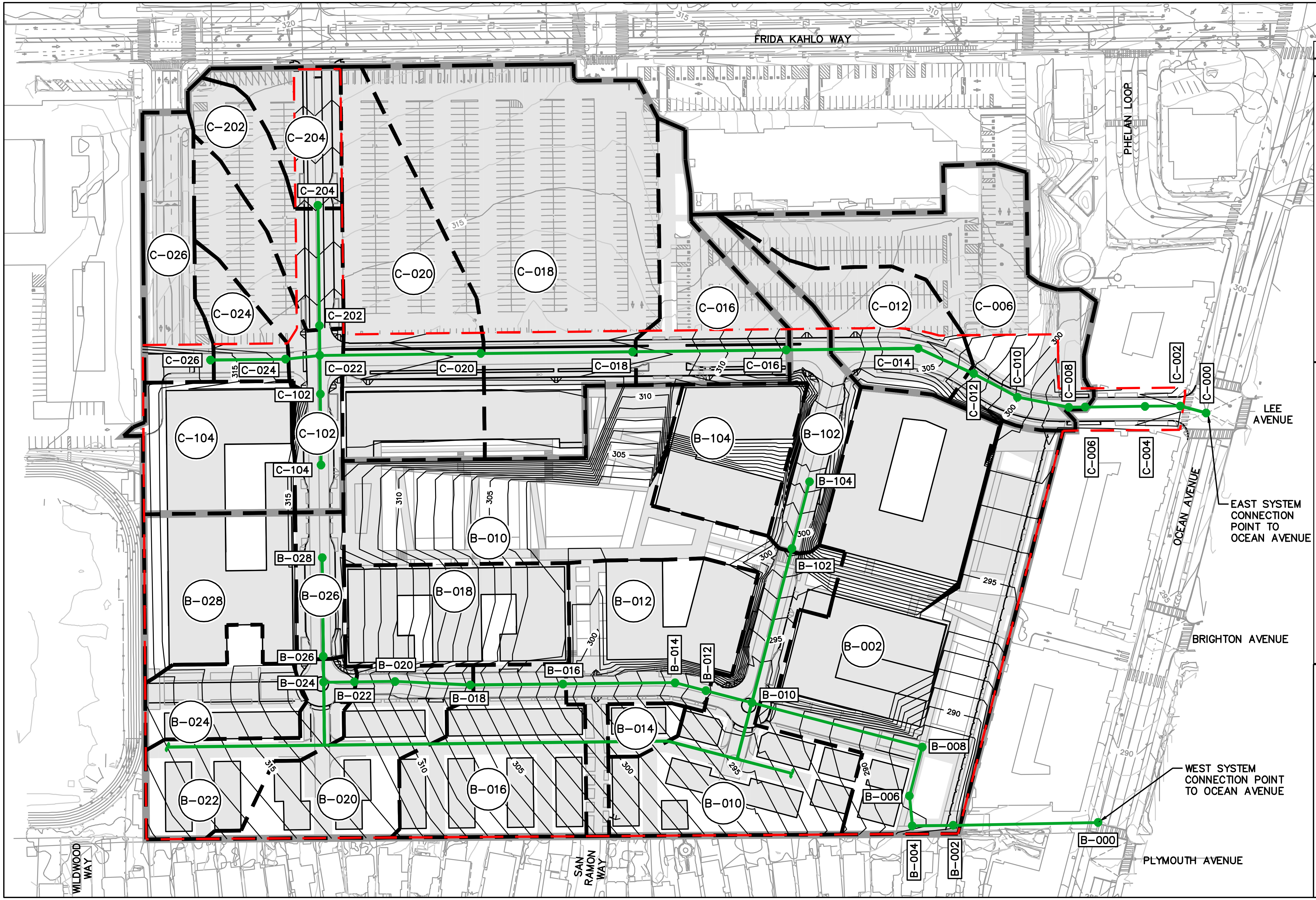
BALBOA RESERVOIR

EXISTING SYSTEM

SAN FRANCISCO, CALIFORNIA

JANUARY 9, 2020

EXHIBIT 1



PROPOSED			
OUTFALL	NODE	RIM ELEV	INV ELEV
WEST	B-000	286.85	275.85
	B-002	288.64	283
	B-004	289.18	283.54
	B-006	288.77	283.94
	B-008	288.11	284.61
	B-010	293.38	286.95
	B-012	294.24	287.58
	B-014	295.58	288.01
	B-016	300.77	289.5
	B-018	305.8	290.73
	B-020	309.79	291.73
	B-022	312	292.27
	B-024	312.21	292.68
	B-026	312.49	293.03
	B-028	313.49	294.34
	B-102	299.35	289.07
	B-104	302.51	289.99
EAST	C-000	298.13	287.53
	C-002	297	287.89
	C-004	297.21	288.36
	C-006	297.56	289.15
	C-008	297.66	289.37
	C-010	299.92	290.07
	C-012	302.99	290.73
	C-014	305.24	291.54
	C-016	307.82	293.29
	C-018	312.12	295.33
	C-020	312.81	297.35
	C-022	313.5	299.49
	C-024	313.68	299.95
	C-026	315.73	300.95
	C-102	313.47	300.01
	C-104	313.76	300.95
	C-202	313.52	299.89
	C-204	316.07	301.49

LEGEND

▨	IMPERVIOUS COVER
– –	PROJECT BOUNDARY
– –	DRAINAGE MANAGEMENT AREA (DMA) BOUNDARY
—	WATERSHED BOUNDARY
—	COMBINED STORM SEWER
●	MODEL NODE

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BALBOA RESERVOIR

PROPOSED SYSTEM

SAN FRANCISCO, CALIFORNIA

JANUARY 9, 2020

EXHIBIT 2

Appendix H Design Standards and Guidelines Sustainable Neighborhoods Framework

HEALTHY AIR

GOAL 1

Ensure Non-Toxic & Comfortable Air Indoors & Out

EQUITY

OPPORTUNITIES: Keep from exacerbating the health impacts of cumulative air pollution like respiratory and cardiovascular; decrease hospital visits for those with limited access to health insurance

CONSIDERATIONS: projects in neighborhoods with populations with greatest sensitivity to extreme heat should take additional measures to provide habitable environments; population-specific health challenges may warrant additional study

RESILIENCE

OPPORTUNITIES: better respond to heat waves and bad air quality days

CONSIDERATIONS: integrate future heating and cooling needs into energy capacity scaling equipment; extreme heat puts pressure on essential services such as energy, transport, and health

CLIMATE

OPPORTUNITIES: lower toxic pollutants; renewable electricity exports; reduced risks of ozone production due to higher temperatures

CONSIDERATIONS: analyze long-term climate impacts of strategies to respond to high temperatures

CITY TARGET	APPROACHES	CITY REQUIREMENTS	GOALS FOR THE BALBOA RESERVOIR NEIGHBORHOOD	PROJECT STANDARDS & GUIDELINES FROM DSG
ZERO-EMISSION environments	**LAND USE**			**G.4.2.1.1** Electric Building Systems **G.4.2.1.2** Domestic Water Heating **G.4.2.4.1** Construction Indoor Air Quality Management Plan **S.4.2.3.1** Sustainable Procurement Evaluation **G.4.2.3.1** Prioritize Local Materials and Manufacturers **G.4.2.3.2** Material Life Cycle **S.4.2.5.1** TDM Ordinance **S.4.2.2.1** EV Infrastructure
	ALL-ELECTRIC	All-electric preferred [GBC '20]	● 100% of building systems will be designed for electricity. Buildings will reduce all sources of local GHG.	
	CONSTRUCTION PRACTICES	/ Construction Air Filtration [GBC]	● Minimize particulate matter emissions associated with diesel fuel engines during construction by implementing a Clean Construction Plan.	
	MATERIAL SELECTION	/ GHG Emissions checklist [CEQA]	● Establish a Sustainable Procurement Program for each building targeting 100% of materials to meet at least one sustainable materials criteria. ● Evaluate carbon sequestration concrete and utilize as demonstration project. ● Prioritize Forest Stewardship Council (FSC) Certifed Wood and use FSC certifed wood for 50% of total framing materials.	
	ACTIVE MOBILITY	/ Transportation Demand Management (TDM) / Sidewalk widening, bike racks [BSP, PC]	● 80% of the trips to and from the site will be by sustainable modes and the project will achieve a vehicle trip reduction of at least 30% compared with a comparable project without TDM measures.	
	ELECTRIC VEHICLES	/ 100% EV-ready off-street parking [EC] / EV charges @ 5% of spaces [EC]	● A load management system will be installed to manage the EV charging stations. This would allow EV charging stations to be installed at 100% of the on-site parking spaces while avoiding any upgrades to the electrical infrastructure.	
100% NON-TOXIC interiors	**MATERIAL SELECTION**	/ Low-Emitting Materials [GBC/LEED]	● 100% of interior materials will meet all low-emitting materials and emissions testing requirements of the current version of LEED.	**G.4.3.1.1** Low Emitting Materials **S.4.3.2.1** Ventilation Requirements **G.4.3.2.1** Improved Ventilation and Windows
	AIR FILTERATION	/ High Quality Air Filtration [Art 38]		
COMFORTABLE micro-climate	**PASSIVE EXTERIOR COOLING**			
	INTERIOR RESPITES			

RENEWABLE ENERGY

GOAL 2

ACHIEVE AN EFFICIENT & FOSSIL FUEL-FREE ENVIRONMENT

EQUITY

OPPORTUNITIES: healthier air; lower utility costs & minimized rate volatility; improved indoor comfort; energy revenues for local economy; equal access to energy efficiency upgrades for renters; increase job opportunities for energy upgrade work.

CONSIDERATIONS: avoid passing upfront retrofit costs to residents; limited triggers/funding for existing building retrofits; explore opportunities for community-owned solar.

RESILIENCE

OPPORTUNITIES: reduced outages; emergency power supplies; reduced risk from natural gas explosions; secure against global oil price shifts and instability; better respond to heat waves and bad air quality days.

CONSIDERATIONS: plan for most vulnerable communities; tenant education about energy measures are great opportunities to foster stronger and connected communities.

CLIMATE

OPPORTUNITIES: emission free; increasing energy efficiency reduces overall demand and accommodates fuel switching; reduce toxic pollutants.

CONSIDERATIONS: when assessing carbon footprint factor-in gas leak rates at well sites, forgo gas infrastructures to receive credits.

CITY TARGET	APPROACHES	CITY REQUIREMENTS	GOALS FOR THE BALBOA RESERVOIR NEIGHBORHOOD	PROJECT STANDARDS & GUIDELINES FROM DSG
MAXIMUM ENERGY EFFICIENT environments	SOLAR ORIENTATION	/ Reduce energy use by 5% [Title 24/GBC]		**S.4.4.1.1** Glazing **G.4.4.1.1** Natural Ventilation **G.4.4.1.2** Reduced Solar Gain **S.4.4.2.1** Infiltration **G.4.4.2.1** High Efficiency HVAC Systems
	BUILDING FORM			
	ENVELOPE & FAÇADE TREATMENTS			
	MECHANICAL SYSTEMS			
	VEGETATION			
100% CARBON-FREE energy	ON-SITE RENEWABLE POWER GENERATION	/ 15% roof area installed with solar PV or solar thermal systems [GBC]	• The project will generate 25% of its building energy demand via on-site renewable energy generation systems, in conjunction in conjunction with measures to reduce EUI. • The project will offset all carbon emissions related to building operations. Any gas use on site or at the grid level will be offset by renewable energy credit (REC) or carbon offset credit purchases. • The project will evaluate providing battery storage for PV systems on a building by building basis to provide power supply for up to 72 hours in the event of a power outage or emergency.	**S.4.5.1.1** On-Site Renewable Energy **S.4.5.2.1** Solar Thermal Arrays **S.4.5.4.1** SFPUC Power
	SOLAR THERMAL HOT WATER			
	BATTERY STORAGE			
	ALL-ELECTRIC			
	GREEN POWER PURCHASE			
SMART systems & operations	AUTOMATION & CONTROL		• The project will provide thermal and clean air safety zones for heat wave and compromised air quality relief at community room or at childcare. Safety zones will include centralized emergency power and communication zones where people can charge phones or refrigerate medications during extended power outages.	**S.4.6.1.1** Individual Metering **S.4.6.2.1** Resident education **G.4.13.1** Connect Residents with Local Resources
	REPORTING & ENGAGEMENT			

ROBUST ECO-SYSTEMS

GOAL 3

SUPPORT BIODIVERSITY & CONNECT EVERYONE TO NATURE DAILY

EQUITY

OPPORTUNITIES: access to healthy and affordable food; physical and mental health improvement; social cohesion and connection to one's environment; reduced exposure to noise, air pollution, and extreme heat; robust biodiversity minimizes rodent infestations.

CONSIDERATIONS: inequitable access, use, or quality of green spaces by vulnerable populations; additional maintenance costs (public & private); potential existing contaminants for safe food production.

RESILIENCE

OPPORTUNITIES: ecosystem services improve shoreline and urban flood management, reducing housing and work place instability and access due to flooding; planted hillsides are less susceptible to erosion and landslides; wildlife biodiversity.

CONSIDERATIONS: increased landscaping that includes too much impervious surface can increase flooding; poor plant selection or irrigation equipment can exacerbate water scarcity.

CLIMATE

OPPORTUNITIES: enhance climate regulation and carbon sequestration; reduce carbon footprint associated with to large-scale food production; distribution and waste; improve water efficiency.

CONSIDERATIONS: gas-powered lawn equipment exacerbates emissions and health impacts of landscaping; poor landscaping maintenance practices can lead to additional methane from decomposing green waste.

CITY TARGET	APPROACHES	CITY REQUIREMENTS	GOALS FOR THE BALBOA RESERVOIR NEIGHBORHOOD	PROJECT STANDARDS & GUIDELINES FROM DSG
GREEN space equivalent to 1/2 site area	OPEN SPACES	/ X SF per unit, X SF if common space (does not require greening) [PC]	• 50% of site area will be vegetated, including areas of tree canopy and green roofs or landscaping at courtyards. • Provide a 25% peak rate and total volume stormwater management reduction for the overall site using green infrastructure and Low Impact Development. • Minimize stormwater management at public streets by providing equal offsetting management at private development parcels.	**G.4.7.1** Planting at On-Site Open Space **S.4.11.1** Stormwater Management **G.4.11.1** Infiltration
	LIVING ROOFS	/ 25% front yard set-back landscaped (50% pervious) [PC] / 30% roof area as living roof [PC alt]		
	GREEN WALLS			
	GREEN INFRASTRUCTURE	/ Manage 25% of stormwater onsite [SMO option]		
	RIGHT-OF-WAY	/ 1 street tree every 20' [PC]		
BIODIVERSE landscapes of 100% climate appropriate, majority local species	TREE CANOPY		• 100% healthy landscaping practices - minimizing or eliminating pesticide, herbicide or fertilizer use following the City's Integrated Pest Management Ordinance. • Use all-electric / clean fuel landscape maintenance equipment.	**S.4.8.1** Native Landscaping **G.4.8.1** Low Emissions Maintenance **G.4.8.2** Ecological Placemaking **G.4.8.3** Daily Maintenance **G.4.8.4** Quarterly Horticultural Services
	UNDERSTORY PLANTING			
	NATURAL AREAS			
	BUILDING FAÇADES			
HEALTHY food & wildlife systems	BUILDINGS	/ Bird Safe Buildings [PC]	• Collaborate with City College culinary program to create on-site programs to assist resident and neighbors in growing and preparing healthy foods.	**G.4.9.1** Access to Community Gardens **G.4.9.2** Healthy Food Education **G.4.9.3** Food Corridor **G.4.9.4** Sustainable Pest Control
	OPEN SPACES			
	OPERATIONS			

GOAL 4

MAXIMIZE CONSERVATION, FLOOD PROTECTION & WATERSHED HEALTH

EQUITY

OPPORTUNITIES: Keep from exacerbating the health impacts of populations impacted by toxins in water; reduce home-based health hazards; reduce the disproportionate racial impact of flooding.

CONSIDERATIONS: ground water pollution is more prevalent in disadvantaged communities; in case of emergency plan for large-scale temporary relocation of low-income residents; use high quality potable water filters.

RESILIENCE

OPPORTUNITIES: decrease risk of flooding of power generation, transmission, and distribution networks; reduce vulnerability to droughts; better respond to heat waves and bad air quality days.

CONSIDERATIONS: In urban centers, critical services like healthcare, food supply, transportation, energy systems, schools and retail share interdependencies with water.

CLIMATE

OPPORTUNITIES: decrease in energy and emissions associated with extraction, conveyance, treatment and consumption of water.

CONSIDERATIONS: climate change is expected to impact water quality by increasing the nutrient content, pathogens, and the sediment levels of surface water.

CITY TARGET	APPROACHES	CITY REQUIREMENTS	GOALS FOR THE BALBOA RESERVOIR NEIGHBORHOOD	PROJECT STANDARDS & GUIDELINES FROM DSG
REGENERATIVE systems that minimize consumption & maximize reuse	EFFICIENT FIXTURES	/ Reduced water consumption [GBC]		**S.4.10.1.1** Plumbing Fixtures **S.4.10.2.1** Drip Irrigation **S.4.10.2.2** Gray Water Irrigation **S.4.10.2.3** Edible Plating Irrigation **S.4.10.3.1** Non-Potable Reuse **G.4.10.3.1** Gray Water Treatment
	SMART-METERING	/ Residential multifamily water sub-metering [GBC/CA Water Code]		
	NON-POTABLE REUSE	/ Onsite systems for non-potable flushing and irrigation [Art 12C]		
	IRRIGATION	/ Low water, climate appropriate plants [GBC]		
100% FLOOD-SAFE buildings & sidewalks	DESIGN ELEVATIONS	/ Sea level rise consideration [CEQA] / 100-yr flood disclosure		**S.4.11.1** Stormwater Management **G.4.11.1** Infiltration
	GREY INFRASTRUCTURE	/ Ensure positive sewage flow, raise entryway elevation and/or special sidewalk construction and deep gutters if risk of ground-level flooding	● Provide a 25% peak rate and total volume stormwater management reduction for the overall site using green infrastructure and Low Impact Development. ● Minimize stormwater management at public streets by providing equal offsetting management at private development parcels.	
	GREEN INFRASTRUCTURE	/ Front setback 25% permeable [PC]		
HIGH QUALITY waterways & sources	EROSION PREVENTION	/ Slowed stormwater flow rates [SMO]		
	POLLUTANT MANAGEMENT	/ Reduced runoff and pollution from construction [GBC] / (MS4) filter or treat 80% on site [SMO]		

GOAL 5

PRIORITIZE RESOURCE CONSERVATION, RESPONSIBILITY & REUSE

EQUITY

OPPORTUNITIES: Keep from exacerbating the health impacts of cumulative air pollution like respiratory and cardiovascular; decrease hospital visits for those with limited access to health insurance

CONSIDERATIONS: projects in neighborhoods with populations with greatest sensitivity to extreme heat should take additional measures to provide habitable environments; population-specific health challenges may warrant additional study

RESILIENCE

OPPORTUNITIES: better respond to heat waves and bad air quality days

CONSIDERATIONS: integrate future heating and cooling needs into energy capacity scaling equipment; extreme heat puts pressure on essential services such as energy, transport, and health

CLIMATE

OPPORTUNITIES: lower toxic pollutants; renewable electricity exports; reduced risks of ozone production due to higher temperatures

CONSIDERATIONS: analyze long-term climate impacts of strategies to respond to high temperatures

CITY TARGET	APPROACHES	CITY REQUIREMENTS	GOALS FOR THE BALBOA RESERVOIR NEIGHBORHOOD	PROJECT STANDARDS & GUIDELINES FROM DSG
100% RESPONSIBLE material use	**RESOURCE EXTRACTION**		● Divert 100% of residential waste generated from landfll.	**S.4.12.1** Recycling and Composting Ordinance **S.4.12.2** Recycling of Construction Waste **G.4.12.1** Recycling **G.4.12.2** Balanced Cut and Fill
	REUSABLE PRODUCTS	/ Accessible and sufficient collection systems / Recycling and composting (Buildings)		
Significantly REDUCED per-capita waste generation	**3-STREAM WASTE COLLECTION**			
	CONSUMPTION & PURCHASING		● Divert 75% of construction and demolition waste with a minimum of 4 separate waste streams.	
	COST MONITORING			
100% materials RECOVERED from waste stream	**MATERIAL RE-USE**			
	CONSTRUCTION DEBRIS	/ Construction waste diversion (65%)		