DRAFT MASTER PLAN

Gage Canal Multi-Purpose Trail Phase 1

City of Riverside Parks, Recreation, & Community Services

MAY, 2021
PREPARED BY ALTA PLANNING + DESIGN
IN ASSOCIATION WITH
RINCON CONSULTANTS
DIAZ YOURMAN & ASSOCIATES
COAST SURVEYING INC

CITY OF RIVERSIDE alta

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To be completed for final master plan

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Introduction

Project Description

The Gage Canal Multi-Purpose Trail Phase 1 project is a 2-mile active-transportation and recreational green space trail. The project will create a Class I asphalt concrete (AC) shared use path and an unpaved path within an existing city-owned water utility easement. The trail corridor will be landscaped with native and climate appropriate trees, shrubs, and will feature additional amenities including entry plazas, trailside seating, bicycle racks, interpretive signage, and solar lighting. It will create a continuous off-street multi-purpose trail connection from Palmyrita Avenue to Blaine Street, and will offer local residents both recreational opportunities and a connection to the Box Springs Reserve.

Project corridor with existing bike path pictured facing north between Blaine Street and Watkins Drive.

Project Goals

At its core, this project has three main goals: to reduce vehicle miles driven, reduce energy use from tree shade, and promote carbon sequestration through tree planting. Through these goals, the 2-mile trail will enhance safety, ADA accessibility, and promote a livable community where people can circulate without cars. The project goals will also include:

- Construction of bicycle and pedestrian facilities that provide safe routes for travel between residences, workplaces, commercial centers, and schools.
- Expand and enhance community green spaces and provide sustainable landscaping.
- Provide a recreational trail to disadvantaged and low-income communities in the City of Riverside.
- Expand the city's existing transportation network and provide usable car-less connection between Palmyrita Avenue and Blaine Street.
- Provide opportunities for green infrastructure to capture runoff in a system which mimics the natural environment.
- Provide opportunities for recreation and increase public health benefit.
- Provide connection to Box Springs Reserve and natural hiking trails.
- Create a safe and secure space throughout the trail corridor.

Project History

In 2018, the City of Riverside Parks, Recreation, and Community Services Department conducted city-wide phone and internet surveys, and hosted five focus group meetings and seven community workshops (one in each city ward). In Wards 1 and 2 where the project is located, extension and improvements of trails and bike lanes, and creation of more hiking trails were listed among the top priorities from residents. The surveys in the other wards furnished the same results. The community workshops were advertised to residents

using social media, the internet/web, telephone, emails, community calendars, digital billboards, promotional videos on YouTube, and local government cable television. The project was also presented at a joint Riverside Bicycle Club and City Bicycle Advisory Committee meeting, and was supported unanimously with no objections, but with suggestions for how the improvements could be made for a well-functioning and user friendly trail.

Gage Canal History

The Gage Canal was constructed in 1885 with the purpose of transporting water from the Santa Ana River to citrus groves and citizens of Riverside. The canal was instrumental in the development of the Riverside citrus industry and at the time was the most ambitious irrigation project undertaken in California, nearly doubling the irrigated area in Riverside. As a result of increased urbanization and the declining local citrus industry, by 1959 the city announced its plan to condemn the canal. A battle between canal stakeholders and the city ensued with the result that the canal survives to this day although in a different physical form. So that Gage Canal water could be used for domestic purposes in the City of Riverside, a pipeline was constructed in 1974 from the headworks south to Linden Street, where the city started taking water for domestic use. Today the canal is known as a local historical landmark and is part of school district curriculum so students learn about this important piece of Riverside history.

Project Funding

The Urban Greening Grant Program, funded by the California Natural Resources Agency (CNRA), selects projects that reduce greenhouse gases by sequestering carbon, decreasing energy consumption, and reducing vehicle miles traveled. Projects funded under this program also aim to transform the built environment into places that are more sustainable, enjoyable, and effective in creating healthy and vibrant communities.

The total amount of Urban Greening funding available during the round 3 application period was approximately 19 million dollars. The amount of funds awarded to the City of Riverside for this project totals $3,708,509.20 and was the largest amount distributed during round 3 of the program.

The project will be required to include a consistent quantity of elements detailed in the grant application such as trees, plants, an unpaved path, bicycle path, and other amenities and furnishings. As indicated in the grant application, the project will eventually sequester 868 metric tons of CO2 equivalent (CO2e).

Project Team and Stakeholders

The Trail project is being spearheaded by the City of Riverside Parks, Recreation, and Community Services Department (PRCSD), and all approvals related to the project will be through the Riverside City Council. Riverside Public Utilities (RPU) owns the Gage Canal right-of-ways in fee; however, the Gage Canal Company operates and maintains the Gage Canal itself. The proposed project will depend on interdepartmental cooperation between PRCSD, Riverside Public Works Department, and RPU.

The team coordinated with key stakeholders who include, but are not limited to the following:

- Riverside Transit Agency (RTA)
- The Gage Canal Company
- University of California (UCR)
- Local businesses, trail advocates, and residents
- Riverside Bicycle Technical Advisory Committee
- Metrolink

Alta Planning + Design is leading the Trail design with support from Rincon Consultants, Diaz Yourman & Associates, and Coast Surveying Inc. Rincon Consultants are providing environmental services, Diaz Yourman & Associates are provide geotechnical engineering services, and Coast Surveying provided supplemental topography.

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Existing Conditions

Existing Conditions

Site Characteristics

Canal Easement Corridor

Maintaining an open canal can be difficult due to accumulation of sand, mud, and plant growth which ultimately reduces the capacity of the canal. This led the Gage Canal Company to begin experimenting with various canal coverings as early as the 1920s. In 1974, so that water could be used for domestic purposes, the Gage Canal Company installed a new pipeline, from the canal headworks to the City of Riverside.

The project site (corridor) follows the existing city-owned water utility easement for the Gage Canal. In this segment of the easement, the canal is subterranean and encased in concrete. On the surface, the corridor is improved with a dirt road that is used for canal maintenance and operations vehicles, while the remaining easement is disturbed but improved. The typical right-of-way (ROW) width of the corridor is 50 feet, except for a narrow section that runs adjacent to Sugarloaf Mountain on the north and west sides where the width decreases to approximately 10-feet.

Project corridor between Columbia Avenue and Palmyrita Avenue.

Physical Character

The linear slope from south to north along the project corridor is primarily gentle with a steeper section where the existing maintenance road intersects an asphalt-paved access road that provides maintenance access from Marlborough Avenue to a water tank in Box Springs Mountain Reserve (Box Springs).

Native plant and animal communities are present adjacent to the project corridor primarily within and around Box Springs. Coastal Sage Scrub is the dominant plant community, although fire damage in Box Springs has diminished it somewhat leading to an increase in coverage by invasive annual grasses. During site reconnaissance *Encelia farinosa* was observed along much of the trail section around Box Springs. Two stands of cholla cactus were observed along the existing corridor near the interface of Box Springs and the residential neighborhood north of Spruce Street. A number of reptile species are present at Box Springs including three rare species: coast horned lizard, orange-throated whiptail, and the red diamond rattlesnake. Sixteen species of mammals including pacific kangaroo rat, mountain lion, and mule deer, along with eighty five species of birds inhabit the reserve.

Topography

Most of the project corridor is fairly level with a gentle linear slope, however, there are more significant slopes between Spruce Street and Marlborough Avenue near the existing water tank maintenance road:

- Blaine Street to Watkins Drive: 0.04% - 2.50%
- Spruce Street to Marlborough Avenue: 0.30% - 13.0%
- Marlborough Avenue to Palmyrita Avenue: 0.05% - 2.50%

Drainage is generally via sheet flow from east to west and higher adjacent elevations generally occur to the east side of the corridor. From Marlborough Avenue north there are manufactured slopes down draining adjacent commercial/industrial properties. There are steep slopes adjacent to the project corridor as it rounds the northwest corner of Box Springs Mountain Reserve. Any proposed drainage across the project site should follow the prevailing cross slope. This cross slope drainage creates opportunities for potential

stormwater capture, treatment, and infiltration using a series of landscaped swales along the edges of the proposed asphalt path and unpaved path where space permits. Strategic tree and shrub planting can also be used to protect the path and trail from stormwater runoff from adjacent steep slopes. In the segments of the project corridor at the south end between Blaine Street and Watkins Drive and at the northern end between Columbia Avenue and Palmyrita Avenue both outside edges are at higher elevation than the center of the corridor creating a center draining condition leading to ponding during wet weather. In these instances it may be possible to mitigate this condition with the installation of landscaped swales in the center of the corridor, where the path and trail run on near the outside edges. Grading along and adjacent to the unpaved path will prevent the concentration of flows that can lead to long-term erosion. Certain areas, mostly around Box Springs and north of Marlborough Avenue have loosely consolidated soil along the western edges of the corridor where runoff has caused sloughing and downcutting of the top of slope. Strategic planting of trees and shrubs along these edges can help stabilize the top of slope and prevent continued erosion.

The cross slopes along the project corridor primarily flow downhill from east to west, although there are some sections that are level to slightly reversed, with the steepest cross slopes occurring in the section from Marlborough Avenue north to Columbia Avenue.

Adjacent topography ranges from nearly level in the southern residential section, to steep adjacent slopes along the northwest corner of Box Springs. Evidence of ponding was found during site reconnaissance in areas with center draining topography, and there are a few locations where erosion has caused sloughing of the downslope edge of the existing corridor.

Gage Canal Trail Corridor looking south as it enters the Box Springs Mountain Reserve area

Vegetation

The dominant native vegetation of the project area is coastal sage scrub (CSS), a complex of tough, woody, aromatic shrubs typically 1-6 feet tall. Common species of CSS include California buckwheat, brittle-bush, black sage, and white sage. It is estimated that nearly 90% of the existing CSS habitat in Riverside County has been lost due to urbanization, frequent fires, OHV-use, invasive species, and military activity.

Vegetation on and adjacent to the project corridor consists primarily of typical commercial landscaping in the section from Marlborough Avenue north to Palmyrita Avenue, with trees and shrubs such as *Lophostemon confertus* (Brisbane Box) and *Acacia redolens* (Desert Carpet) for example. In the project area around Box Springs, from Marlborough Avenue south to Spruce Street, a mix of native CSS and invasive annual grasses was observed during site reconnaissance. On the southern section of the project corridor from Spruce Street to the southern terminus at Blaine Street, there is virtually no existing vegetation. Adjacent residential vegetation consists of small to medium size trees and hedges such as African sumac, palo verde, and bougainvillea for example.

Another approach would be to use the proposed landscaping to strategically supplement and enhance the remaining CSS habitat in the area. This could be done by using primarily CSS species in tree and plant selections. In a sense this would leverage the project's landscaping toward habitat creation and enhancement, and could provide a strong element of identity. Another opportunity for vegetation on the project is to use fruit trees in strategic locations along the trail such as trailheads or rest areas. The use of fruit trees in the proposed landscape would create a connection to the history of the citrus industry in the region and could be combined with interpretive elements indicating this. Fruit trees could also become part of a larger system of community orchards in Riverside. The organization "Fallen Fruit" has worked to establish "Urban Fruit Trails of Riverside" which is a network of walking trails, populated with fruit trees and planted, tended, and harvested by the public. Lincoln Park was one park

On-street portion of Trail alignment, looking southeast on Watkins Drive south of Spruce Street

location that received a large number of fruit trees as part of this program.

Another opportunity with vegetation is to use the proposed project landscape to sequester carbon. Indeed this is a requirement of the project funding and can be accomplished by planting trees which sequester and store carbon in the process of wood creation. Various species can be proposed to create a carbon sequestration bank as long as the total carbon captured meets or exceeds the project estimate created as part of the grant funding requirement. Finally the proposed project landscape could be visually anchored through the use of 'signature large trees', a repeating large tree such as an oak or sycamore that could create an identity for a section of the trail.

Hydrology

The Santa Ana Watershed drains into the Santa Ana River, the largest river in Southern California. In very broad terms, the Santa Ana Region is a group of connected inland basins and open coastal basins drained by surface streams flowing generally southwestward to the Pacific Ocean. The Santa Ana watershed is an arid region; therefore, there is little natural perennial surface water in the watershed. The occurrence of groundwater in the watershed is highly controlled by the geology of the area, both the configuration of bedrock and by the extensive geological faults. Most groundwater basins are unconfined. However, the variable depth to bedrock, variations in geologic layers, and the presence of faults cause pressure zones where water flows toward the ground surface. In general, groundwater flows the same direction as surface water: from the mountains in the east/north to the Pacific Ocean in the west. There are multiple drainage ditches that can be found along

the surface path of the Gage Canal, which takes water runoff to local storm drain systems and rivers, then down to the ocean.

The Gage Irrigation Canal is basically a gravity flow system with water being distributed in pipelines to individual plots of land below the level of the canal. The canal, however, also supplies water above the line of the canal by pumping water through pipelines to a higher point, allowing water to flow by gravity individual groves for irrigation by open furrow.

Adjacencies

ADJACENT PROPERTIES

The northern section of the Gage Canal Multi-Purpose Trail Phase 1 from Marlborough Avenue to Palmyrita Avenue, passes through the Hunter Industrial Park neighborhood of Riverside. This area consists primarily of industrial and commercial campuses and is known for technology-based firms, clean industries, and research facilities. Through this section, both sides of the trail are bordered by large concrete tilt-up style buildings, associated parking lots and landscaped areas. It passes between 13 industrial complexes for about 3,000 feet. The project offers an opportunity to create an additional active-transportation commuting option for local employees, and an area for recreation before and after work.

The southern section of the Trail from Spruce Street south to Blaine Street passes through a mixed residential zone comprised of single-family homes, multi-family residential complexes, and student housing. 23 single family homes and 3 multi-family complexes border the project corridor for approximately 2,800 feet. There are two neighborhood access points

Cage Canal Trail corridor looking north as it enters Hunter Park Industrial neighborhood

Cage Canal Trail corridor looking north where it lies adjacent to the railroad ROW and single family homes north of Spruce Street

to the corridor via utility easements connecting to Massachusetts Avenue and Canyon Crest Drive respectively. The trail will offer residents an additional active-transportation commuting option, directly linking them with employment centers in Hunter Industrial Park to the north, and creating easy connections to the existing on-street bicycle network to access employment centers in the University District. The Trail will also offer residents opportunities for active recreation, as well as a place to relax. Trailheads and other nodes along the corridor can be enhanced with small landscaped plazas with the potential of seating areas, exercise equipment, and community fruit trees.

RAILROAD RIGHT OF WAY

From Spruce Street north for approximately 2,300-feet the trail corridor runs adjacent to a railroad right-of-way which is located directly to the west. A Riverside County Transportation Commission property is located at the junction of Spruce Street and Watkins Drive. In 2013 the environmental group Friends of Riverside's Hills reached a settlement with the RCTC, which allowed for the completion of the 24-mile commuter rail extension from Riverside to the city of Perris. Discussions regarding this topic are ongoing.

BOX SPRINGS MOUNTAIN RESERVE

The portion of the project corridor from Marlborough Avenue south to Spruce Street runs along the northwestern edge of the Box Springs Mountain Reserve for approximately 3,500 feet. Two main trails

within Box Springs will connect to the proposed Trail, and would allow users to access the miles of trails within the Reserve. Where the Box Springs trails intersect the Trail there is an opportunity for placemaking by creating trail rest stops at these circulation nodes. Wayfinding and interpretive signage would also be appropriate at these intersections.

Transit, Intersections, and Crossings

TRANSIT

Located on the west side of the street on Watkins Drive just 80 feet south of the Spruce Street intersection is a UC Riverside shuttle stop. A Metrolink station is located on Marlborough Avenue, 2000' west of the Gage Canal corridor.

INTERSECTIONS

- Spruce Street: Starting from the south end of the plan area, users will first encounter the intersection at Spruce Street and Watkins Drive when traveling north. Users will need to make two crossings to connect up with the next section of trail. Spruce Street in this location is a three lane road and the crossing is 50 feet long. Users will then turn east to cross over an existing pedestrian rail crossing before connecting back to the off-street trail.
- Marlborough Avenue: To facilitate a direct connection between the Trail and the Metrolink station, a mid block crossing will be created. Marlborough Avenue in this location is a two lane road with class II bike lanes on both sides of the street and a center median. The proposed crossing will span roughly 43 feet. Users will then travel east or west over an existing pedestrian rail crossing. The rail crossing on the south side of the street is 54 feet across whereas the northern crossing is 37 feet across.
- Columbia Avenue: The trail design will implement a mid-block crossing at Columbia Avenue. Columbia avenue is a five lane road with Class II bike lanes. The crossing will span 70 feet.

Gage Canal corridor looking north where it crosses Columbia Avenue.

Asphalt concrete service road connecting Marlborough Avenue to existing water tank. This is a potential pedestrian and bicycle connection from the Metrolink station.

Connections

DESTINATIONS

The heart of the UC Riverside campus is located approximately half a mile south of the Trail terminus at Blaine Street (and there is a direct Class II connection between the trail and UCR). Another half mile to the west of UCR is University Village, a large outdoor mall, which offers areas to shop and dine. In addition to UC Riverside, this section of the Trail is located close to two other schools. University Heights Middle School is roughly a quarter mile west of the trail. Continuing east across the Metrolink Rail line is Highland Elementary School on Highlander Drive. With no direct connection across the rail track, the school is about 0.4 miles to the trail intersection at Spruce Street. Other nearby destinations include: Riverside Sports Center UCR, Stonehaven Student Housing, and places of employment in the Hunter Industrial Park neighborhood adjacent to northern segment of trail from Marlborough

Avenue to Palmyrita Avenue. The Trail will offer access to Hunter Hobby Park, which is approximately ¾ mile west of the Trail on Marlborough Avenue and has playgrounds, sports fields, and picnic areas. An existing Class II bike lane connects the park to the Trail through Malborough Avenue and Columbia Avenue.

TRANSIT

Located near the halfway point of the northern 'industrial' segment, there is a connection to the Riverside-Hunter Park/UCR Metrolink Station. The trail links UCR and the Metrolink station, creating an important connection for students and faculty commuting to the campus. A transit stop is located on Blaine Street (Riverside transit line 10), with another transit stop located on Watkins Drive just south of Spruce Street adjacent to on-street section of the trail (Riverside transit line 51).

TRAILS

Besides connecting students and residents to Metrolink, the trail forms a direct link to the Box Springs Mountain Reserve trail system. The Box Springs Mountain Reserve covers 3,500 acres of land in the cities of Riverside and Moreno Valley. This will allow trail users easier access to many miles of existing and proposed multi-use trails and scenic views of Riverside and Moreno Valley.

BICYCLE FACILITIES

The Trail is also benefited by the connections to Class II bike lanes that are found on every cross street along the project corridor. These streets include:

Eastern terminus of Marlborough Avenue at its intersection with the Gage Canal corridor.

- Blaine Street: 6' wide Class II bike lanes
- Watkins Drive: 6' wide Class II bike lanes
- Marlborough Avenue: 5 wide Class II bike lanes
- Columbia Avenue: 5' wide Class II bike lanes
- Palmyrita Avenue: 7' wide Class II bike lanes

Irrigation System Points of Connection

The landscape irrigation system for the Trail corridor will make points of connection (POC) to existing potable water mains within public street ROW where the trail intersects the streets.

Carbon Sequestration

The Urban Greening grant application for this project planned for the planting of 700 trees along the two mile long corridor. These trees would sequester an estimated 868 metric tons of CO2e. The final number of trees will likely change based on the trail alignment and the species that are chosen to be planted. However, the project team will aim for the same target CO2 reduction as specified in the grant application.

Stormwater Capture

The City is under the federal Clean Water Act (CWA) which establishes requirements for the discharge of urban runoff from Municipal Separate Storm Sewer System (MS4 permit) under the National Pollutant Discharge Elimination System (NPDES) program. The Santa Ana Regional Water Quality Board (RWQCB) issued Permit No. R8-2010-033 to authorize the discharge of urban runoff from MS4 facilities in Riverside County within the Santa Ana Region MS4 Permit areas. This project will adhere to the Low Impact Development (LID): Guidance and Standards for Transportation Projects for the Santa Ana Region Riverside County Co-Permittees. The guidance establishes minimum LID Principal and Best Management Practices (BMPs) that will treat runoff and address Hydrologic Conditions of Concern.

In lieu of a Water Quality Management Plan (WQMP), the Master Plan will identify minimum required BMP's and address storm water pollution from the proposed improvements. The goal of implementing storm water quality management is to minimize storm water pollutants runoff. Waste material dumped into storm drain inlets can adversely impact surface and ground waters. The pollutants of concern that are expected

Beginning of southern section of Trail at Watkins Drive entry point. This is a potential trailhead amenity location.

to be generated from the runoff of impervious areas are typically oil, grease, metals (copper, lead, zinc, chlorinated pesticides), suspended soils, trash and debris.

Land Use

The adjacent land uses vary as one moves north to south down the project corridor, with mixed commercial/light manufacturing uses in the north from approximately Palmyrita Avenue down to Marlborough Avenue, a more naturalized setting between Marlborough Avenue and Spruce Street, and a residential setting between Spruce Street and the southern terminus of the project at Blaine Street. The local climate is semi-arid with hot, dry summers and mild, occasionally wet winters.

Summary of Surveys

Topographic Survey

Existing topographic aerial mapping was provided by the City at 1-foot contours. The design was supplemented by conventional field surveys at eight (8) locations along the project limits. The existing typical section along the Gage Canal Multi-Use Trail between Blaine Street and Watkins Drive consist of an 8-feet 6-inch asphalt concrete path over native soil and 42-feet of native soil. At Watkins Drive the multi-use trail meets the existing sidewalk and traverses two driveways up to Spruce Street. The multi-use trail crosses Metrolink rights-of-way and continues north up to Columbia Avenue. This segment consists of an existing natural dirt trail with graded native slopes on each side of the trail up to Box Springs. The existing terrain between Columbia Avenue and Palmyrita Avenue mainly consists of natural swales and undeveloped grassland.

Utilities

The design team requested maps and records from utility owners with facilities within the project limits and will field verify the utilities that may be impacted. Based on the records received we determined the horizontal and vertical location, as well as size of existing utilities from available record drawings. Based on this preliminary research the utilities listed in Table 1 are within the project limits.

Geotechnical Survey

Field exploration were performed from February 19 to February 26, 2021, and consisted of performing 12 hand auger borings that were subsequently converted to percolation test wells. The boring/percolation test locations were chosen to provide coverage of the Project site for grading and to collect data for infiltration and agronomic testing. The boring depths, which ranged from approximately 3 to 5 feet below the ground surface (bgs), were selected to extend below the depth of significant influence of the proposed pavement loads and to the likely depths of site infiltration. Details of the field exploration, including sampling and percolation test procedures, and boring logs, are presented in Appendix D.

Soil samples collected from the borings were re-examined in the laboratory to substantiate field classifications. Selected soil samples were tested for moisture content, grain-size distribution, percent passing the No. 200 sieve, Atterberg limits, compaction characteristics, pavement-supporting capacity (R-value), and corrosion potential (pH, electrical resistivity, soluble chlorides, and soluble sulfates). The soil samples tested are identified on the boring logs.

Argonomy

Agronomy testing was performed by Wallace Laboratories and A&L Laboratories on selected soil samples. Tests included standard agricultural suitability, growth studies, and nematode testing. Results of the agronomy testing and recommendations for the Project site are summarized in the reports prepared by Wallace Laboratories and A&L Laboratories that are presented in Appendix D. The soils are overall adequate, and will require standard amendments during planting.

Soil Survey

Based on the findings of our field exploration and laboratory testing, the subsurface conditions along the Project alignment generally consisted of coarse-grained (i.e., sandy) soils with varying fines (i.e., silt, clay) content. Laboratory test results did indicate that some of the soils contained similar amounts of coarse- and fine-grained soils. Trace to few gravel and cobbles were encountered in the bulk samples collected during the field exploration, as was evidence of debris (e.g., concrete, glass, brick) in many of the borings. The hand auger borings performed along the Project segment between Marlborough Avenue and Watkins Drive generally encountered refusal caused by cobbles and boulders at depths ranging from 3 to 4 feet bgs.

The moisture content of the near-surface soils generally ranged from 3% below to 3% above optimum moisture content. The likely pavement subgrade soils were visually classified as non-expansive. The pavement-supporting capacity of the proposed multi-use path subgrade soils was evaluated using laboratory R-value testing, the results of which indicated R-values ranging from 54 to 73. The saturated permeability calculated from field percolation tests performed in the sandy soils encountered in the upper 3 to 5 feet of the subsurface profile ranged from approximately 0.02 to 6.8 inches per hour (in/hr).

The saturated permeability calculated from field percolation tests performed in the sandy soils encountered in the upper 3 to 5 feet of the subsurface profile ranged from approximately 0.02 to 6.8 inches per hour (in/hr).

Groundwater measurements performed within approximately 1 mile of the Project alignment within the last 20 years (California State Water Resources Control Board, 2021) generally indicate that groundwater is more than 50 feet bgs. Therefore, a design groundwater elevation of 50 feet bgs was selected for the purposes of our analysis.

Environmental Summary

The environmental component for this project will follow the provisions of Senate Bill 288, which provides for a Statutory Exemption from the California Environmental Quality Act (CEQA) for projects like the Gage Canal Trail. The exemption recognizes that transportation projects like trails, transit centers, rights-of-way improvements intended to promote transit, cycling and pedestrian modes that have potential to lower carbon emissions from the transportation system, are exempt from CEQA when certain criteria are met. To support the Notice of Exemption (NOE), biological and cultural resource technical study memos were performed.

The biological technical study will include consideration of legally protected resources (e.g., listed species, waters/streambeds) and any implications (e.g., surveys, avoidance, minimization, mitigation, or permits) that may be required. The cultural resource technical study will offer historic background and management recommendations for the cultural resources within this two-mile stretch of the Gage Canal. The recommended mitigation measures for the Gage Canal Trail will be incorporated in the final plans and specifications.

Table 1.0: Utilities Within the Project Limits

Utility	Contact Information
AT&T Distribution	ATTN: Susan Blackburn (510) 645-2929 ATTSubstructureOCR@att.com
AT&T Transmission	ATTN: Joseph Forkert 22311 Brookhurst Street, Suite 203 Huntington Beach, CA 92646 (714) 963-7964 joef@forkertengineering.com
The Gage Canal Company	ATTN: Ben Alms 7452 Dufferin Avenue Riverside, CA 92504 (951) 780-1333 gage-db@sbcglobal.net
HP Communications Fontana	ATTN: Stacy Allee 8440 Cottonwood Avenue Fontana, CA 92335 (760) 985-2438 stacy.allee@hpcominc.com
Kinder Morgan Energy Partners	ATTN: Kurtis Johnson 1100 Town and Country Road Orange, CA 92868 (714) 560-4400 Kurtis_johnson@kindermorgan.com
Level 3 Communications/ Century Link	ATTN: Anthony Williams 1025 Eldorado Boulevard Broomfield, CO 80021 (877) 366-8344 Anthony.Williams1@lumen.com
MCI – Verizon	400 International Pkwy Richardson, TX 75081 (972) 729-6322 investigations@verizon.com
Crown Castle Fiber – LA & VEN	ATTN: Nicholas Belinsky 1500 Corporate Drive Canonsburg, PA 15317 (724) 416-2449 nicholas.belinsky@crowncastle.com
Riverside Highland Water Company	ATTN: Craig Gudgeon 12374 Michigan Street Grand Terrace, CA 92313 (909) 825-4128 cgudgeon@rhwco.com
City of Riverside – Water	City of Riverside - Water ATTN: Blake Yamamoto 3750 University Ave., 3rd Fl. Riverside, CA 92501 (951)826-5549 BYamamoto@riversideca.gov
City of Riverside – Traffic Engineering	ATTN: Nathan Mustafa 3900 Main Street Riverside, CA 92522 (951) 826-5148 NMustafa@riversideca.gov
City of Riverside – Electric	ATTN: Efren Mejia 3900 Main Street 3750 University Ave., 4th Fl. Riverside, CA 92501 (951)826-2182 EMejia@riversideca.gov
City of Riverside – Sewer	ATTN: Thuy Nguyen 3901 Orange Street Riverside, CA 92501 (951) 826-5285 TNNguyen@riversideca.gov
City of Riverside- City Surveyor	ATTN: Curt Stephens cstephens@riversideca.gov
Spectrum - Riverside	ATTN: Rey Lopez 7337 Central Avenue. Riverside, CA 92504 dl-socal-charter-engineering@charter.com
University of California Riverside	ATTN: Mike Mendoza 900 University Avenue, Telephone Bldg. Riverside, CA 92521 (951) 827-1881 michael.mendoza@ucr.edu
SCE Distribution – Desert Region	ATTN: Map Requests 14005 S. Benson Avenue Chino, CA 91710 maprequests@sce.com
SC Gas Riverside - Distribution	ATTN: Geary Ambers 1981 W Lugonia Avenue Redlands, CA 92374 (909) 335-7955 scgseregionredlandsutilityrequest@semprautilities.com
SCG – Transmission	socalgastransmissionutilityrequest@semprautilities.com

Planning Context

City of Riverside Trails Master Plan (2021)

The City of Riverside's recently developed Trails Master Plan (TMP) serves as an update to the Multi-Purpose Recreational Trails Master Plan and Trails Standards document adopted by Council in January 1996, with slight modifications and updates included in the 2003 Parks and Recreation Master Plan update. The TMP identified a series of existing and proposed trail corridors throughout the city. A prioritization process, examining opportunities and constraints and considering public input, identified a group of "top-ranked" proposed trails. The Gage Canal corridor was classified as a top-ranked trail through this process.

The portion of the Trail planned and designed in this document is part of the larger Gage Canal corridor that runs through the City of Riverside and is detailed in the recently updated Riverside Trails Master Plan. The Gage Canal Corridor creates a continuous 13+ mile long trail connection across Riverside. Currently, roughly 1.9 miles of the corridor is constructed whereas 11.7 miles are proposed. This Trail plan will upgrade an existing .5 mile section of trail and create an additional 1.5 miles of existing trail through the corridor.

The Gage Canal corridor, once completed, will form one of the longest continuous trails through Riverside. The completion of other adjoining trail corridors will assist in connecting Gage Canal to other major trail corridors like the Santa Ana River Trail, Victoria Avenue, and 7-mile trail.

The future upgraded and constructed Trail between Blaine Street and Marlborough Avenue will create a vital connection between UC Riverside and adjacent neighborhoods to the Riverside-Hunter Park/UCR Metrolink Station. Besides connecting students and residents to the Metrolink, this trail segment forms a direct link to the Box Springs trail system. This will allow trail users easier access to several miles of multi-use trails and scenic views or Riverside and Moreno Valley. The Trail is also benefited in this area by the connections to Class II bike lanes found on every cross street along the trail segment.

City of Riverside Active Transportation Plan (2021)

The City of Riverside Active Transportation Plan (AT Plan) builds on the city's previous Bicycle Master Plan and Master plan Update from 2007 and 2012. The AT Plan integrates walking, bicycling, and other transportation modes into a single plan that includes policies, infrastructure recommendations, and supporting programs, as well as identifies context specific funding sources, prioritized infrastructure projects, and implementation strategies.

As a means to create a cohesive network of connectivity between transportation and recreation facilities within the city, the AT Plan proposes links to major trail networks identified in the city's Trails Master Plan including Gage Canal.

Riverside County Comprehensive Trails Plan (2018)

The Riverside County Comprehensive Trails Plan establishes three primary goals: 1) the creation of a backbone trail network that is feasible, compatible with other plans, leverages trails within other jurisdictions, and closes gaps in a countywide trail system; 2) provide guidance for the design of trails which are accessible, usable by a variety of users, and connect to major destinations and other trails; and 3) sharing of recommendations for continued management of regional trails. The plan also identifies regional parks and connections to county backbone trails, including the Box Springs to which the Trail forms an important connection.

Riverside General Plan - Parks and Recreation Element (2012)

As part of the Parks and Recreation element of the city's general plan amended in November of 2012, a vision for the future of open space in the city was established. Coined "A Necklace of Open Space", Riverside envisions a "necklace" of parks and open space that exists on and/or defines the edges of the city with connectivity between those spaces and to Riverside's neighborhoods with landscaped parkways and trails accessible to pedestrians and cyclists.

Riverside General Plan - Circulation and Community Mobility Element (2012)

The Circulation and Community Mobility Element of the city's General Plan includes a subsection on walking and biking in Riverside that establishes a vision to "provide an extensive and regionally linked public bicycle, pedestrian and equestrian trails system." This vision is supported by 13 policy objectives that provide guidance for expansion of the city's trail network, including maximizing connections between trails and major activity centers and neighborhoods, linking to the trails of adjacent jurisdictions, and incorporating trails into future development projects.

Bicycle Master Plan (2007, 2012)

Riverside's Bicycle Master Plan, adopted in 2007 and updated in 2012, recommends several Class I Bike Paths such as the completion of the Trail and providing connections to the Santa Ana River Trail. The Bicycle Master Plan also proposes guidelines to encourage trail usage, and calls for coordination with the county to connect city trails with the county's network of regional trails.

Riverside County Box Springs Comprehensive Trails Master Plan (2015)

The Box Springs Trails Master Plan was created to establish a vision for improved trails and increased connectivity within the 3,400 acre reserve. While much of Box Springs is situated outside of the city, a portion of the land falls within Riverside's northwestern border. The plan identifies several opportunities to connect from the city trail network and local destinations to the reserve. One of the areas identified as a "staging area" for the Box Springs trail system is located at the Metrolink station on Marlborough. This plan aims to create that connection.

City, State, Federal Standards and Requirements Influencing Design

The design of the Trail utilizes applicable standards and criteria from the City of Riverside, Caltrans Highway Design Manual, American Public Works Association, and CA MUTCD. These standards form the basis for all improvements, including the horizontal path geometry, cross slope grades, typical pathway sections (including pavement sections), driveways, curb ramps, sidewalk, striping, signs and pavement markers, landscaping, irrigation, and local drainage deficiency improvements. All aspects of the trail will be accessible in accordance with State and Federal Law.

Applicable Codes and Standards

The following lists applicable codes and standards to be used for design specific elements. References to these documents will be provided in the appendices of the Special Provisions during the design phase.

- **City of Riverside Standard Plans for Public Works Construction** – for special provisions and plans for Class I bikeway, landscape, irrigation, driveway, curb ramps, curb and gutter, sidewalk, and signs.
- **Caltrans Standard Plans and Specifications** – for striping and pavement markers standards
- **Caltrans Highway Design Manual (HDM)** – for bikeway design criteria.
- **California Manual on Uniform Traffic Control Devices (CA MUTCD)** – for specifications and requirements for traffic control devices, including their use and placement.
- **Standard Plans and Specifications for Public Works Construction (SPPWC)** – for supplemental improvements not found in the city standards.
- **Americans with Disabilities Act (ADA)** - for all newly planned and constructed buildings, structures, sidewalks, curbs, curb ramps, and other related facilities.
- **City of Riverside Trails Master Plan (2021)** - for soft-surface trail design

04

Public Engagement

Public Engagement

Outreach Summary

In order to deliver a project that is reflective of community desires, the City solicited public input to better understand existing usage, concerns, and amenity preferences. This feedback was gathered through a community survey, which was advertised via direct mailers to households within 1/4 mile (or 1,320' totaling about 600 mailers) of the project corridor, signage posted at key Gage Canal access points such as the Box Springs Mountain Reserve, newspaper advertisements in the UCR Highlander and Press Enterprise, social media postings on the City's Facebook and Instagram accounts, a City-issued press release, and fliers posted around the city. Project materials and survey information were also included in messages to parents of nearby schools in the Riverside Unified School District and Alvord Unified School District. The survey was available in both English and Spanish, and was open for input between April 1 - May 30, 2021.

Technical Advisory Committee

The project team reached out to a group of stakeholders who previously provided input on the city's Trails Master Plan (2021). This group met on March 1, 2021, and again on June 14, 2021. Key topics discussed included: the three main project zones (industrial, Box Springs, residential); coordination with RCTC where rights-of-way overlapped with the project corridor; access control at gateways and avoiding the use of bollards; lighting and its interaction with trees; wayfinding; interpretive signage and themes; and planting monarch butterfly host plants. The draft master plan was shared with this group to solicit feedback prior to finalizing the document.

Q1. What is your zip code?	
92506	34% / 186 respondents; Canyon Crest, Victoria, Magnolia Center
92507	17% / 92 respondents; University, Eastside, Highgrove
92504	12% / 65 respondents; Alessandro Heights, Casa Blanca, Hawarden Hills

Q2. Do you currently use the Gage Canal for recreation or commuting?	
Yes	73% / 399 respondents
No	27% / 145 respondents

Q3. Which best describes how you use the Trail?	
Walking, Jogging, or Running	79% / 310 respondents
Riding a Bike	37% / 145 respondents
Dog Walking	33% / 131 respondents

Q4. How often do you visit the Gage Canal?	
A Few Times a Month	29% / 152 respondents
A Few Days a Week	24% / 127 respondents
A Few Times a Year	24% / 124 respondents

Q5. When you think about how you use the Canal today, or how you might use it in the future, what types of trips do you think you would use it for?	
Exercising	87% / 445 respondents
Being in Nature	79% / 407 respondents
Visiting the California State Citrus Historic Park	43% / 220 respondents

Q6. If you don't use the existing portions of the Gage Canal Trail, what would encourage you to use it more?	
More Connections to Nature	57% / 279 respondents
Increased Safety and Security	52% / 255 respondents
More connections to Destinations	45% / 219 respondents
Improved Trail Surface	43% / 212 respondents

Q7. What types of improvements would you most like to see on the Gage Canal?	
Trash Cans / Pet Waste Stations	61% / 307 respondents
Shade / Trees	59% / 296 respondents
Lighting / Safety	50% / 249 respondents

Q8. Is there anything else you'd like our project team to consider?
Maintain natural surface of trail / do not pave / preserve nature
Address homeless encampments / improve perceptions of safety
Provide amenities such as restrooms, equestrian facilities, lighting, and crossings

05

Conceptual Plans

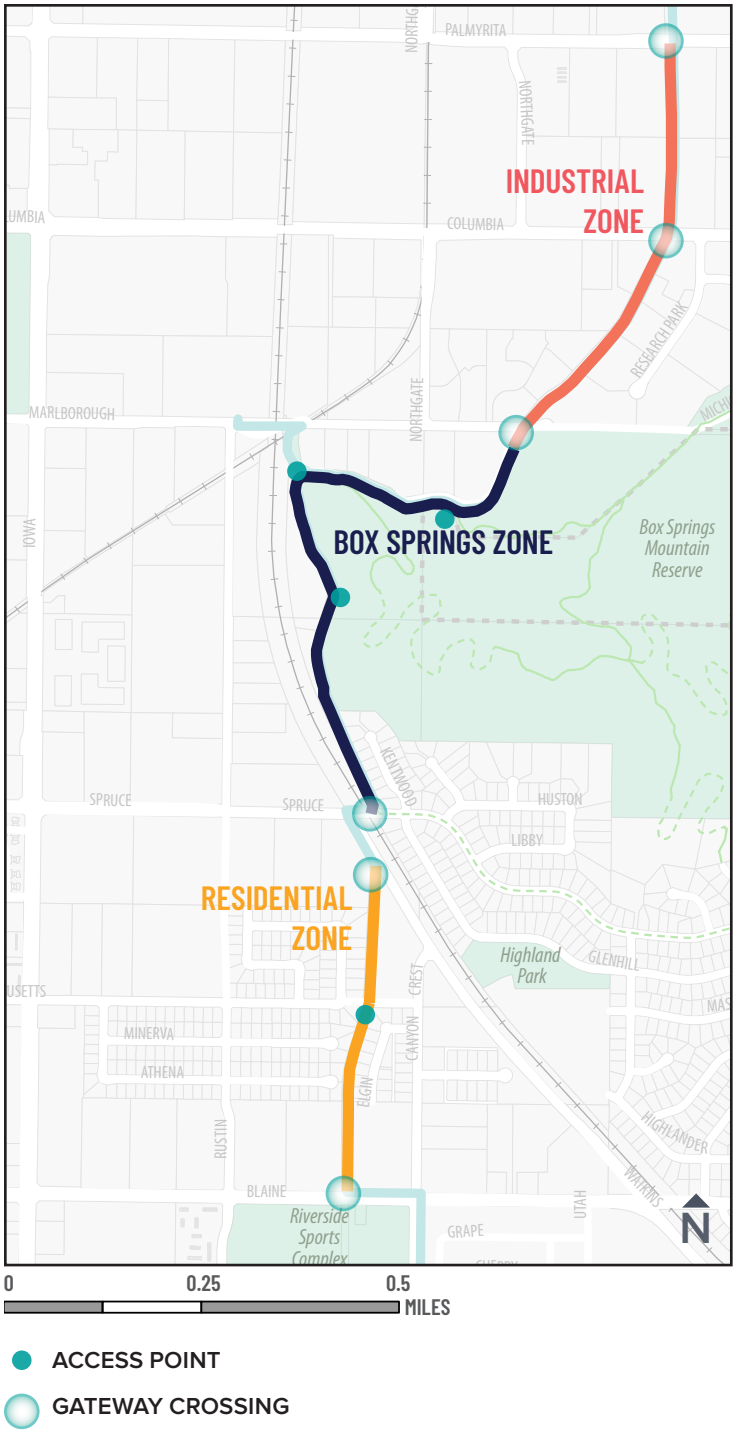
Conceptual Plans

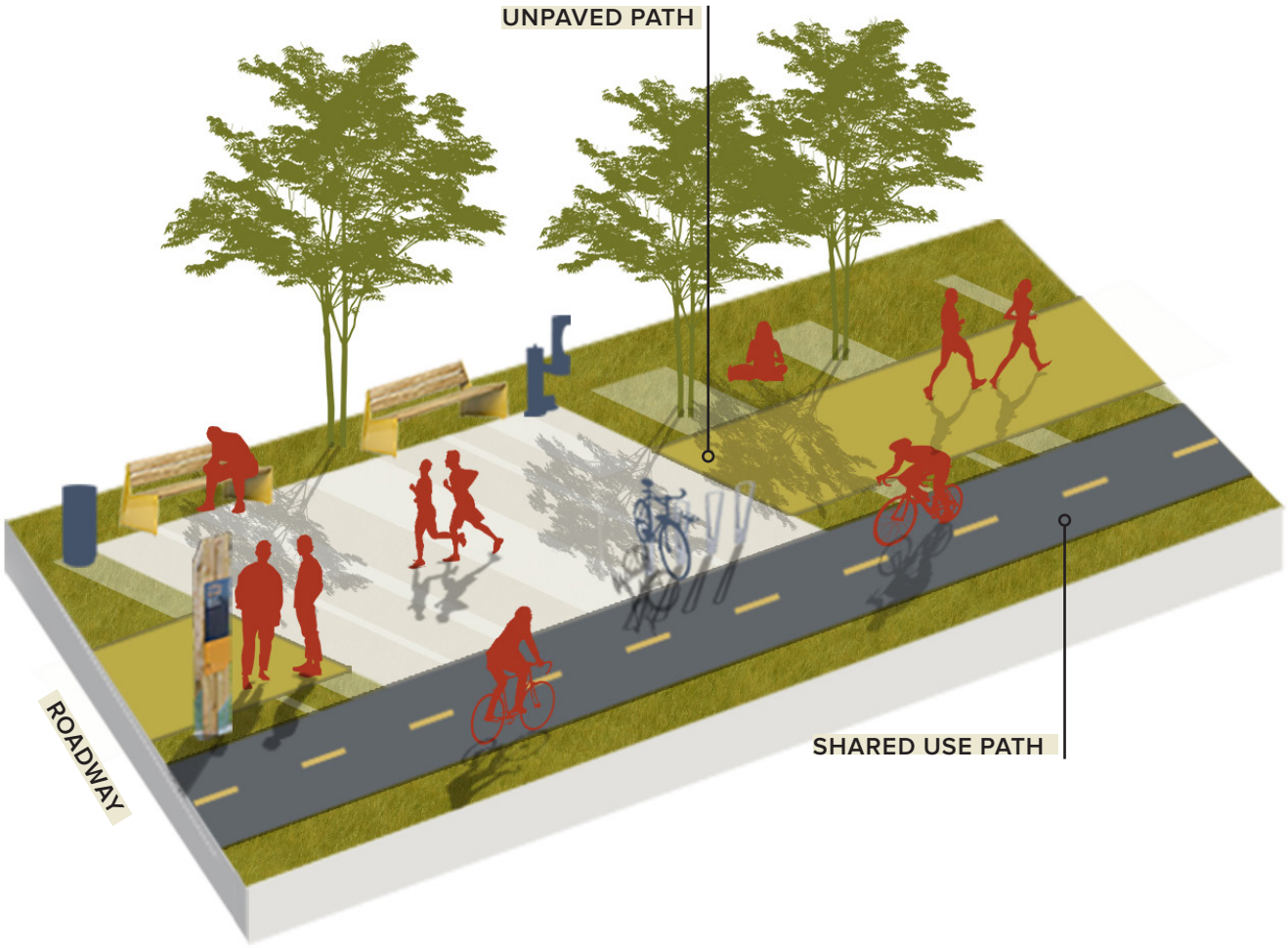
Introduction

For the purpose of design, the two-mile long trail corridor has been split into three main zones. The extents of each segment are based on the surrounding land use context. The zones are:

- Residential Zone,
  - from Blaine Street to Watkins Drive
- Box Springs Zone,
  - from Spruce Street to Marlborough Road
- Industrial Zone,
  - from Marlborough Road to Palmyrita Avenue

These zones have traits unique from one another that have influenced the design approach of each safety needs, wildlife habitat, trail function, cost benefit, maintenance commitments, connections to adjacent roadways, and levels of separation from adjacent properties will vary from one zone to another.





Gateways and Access Points

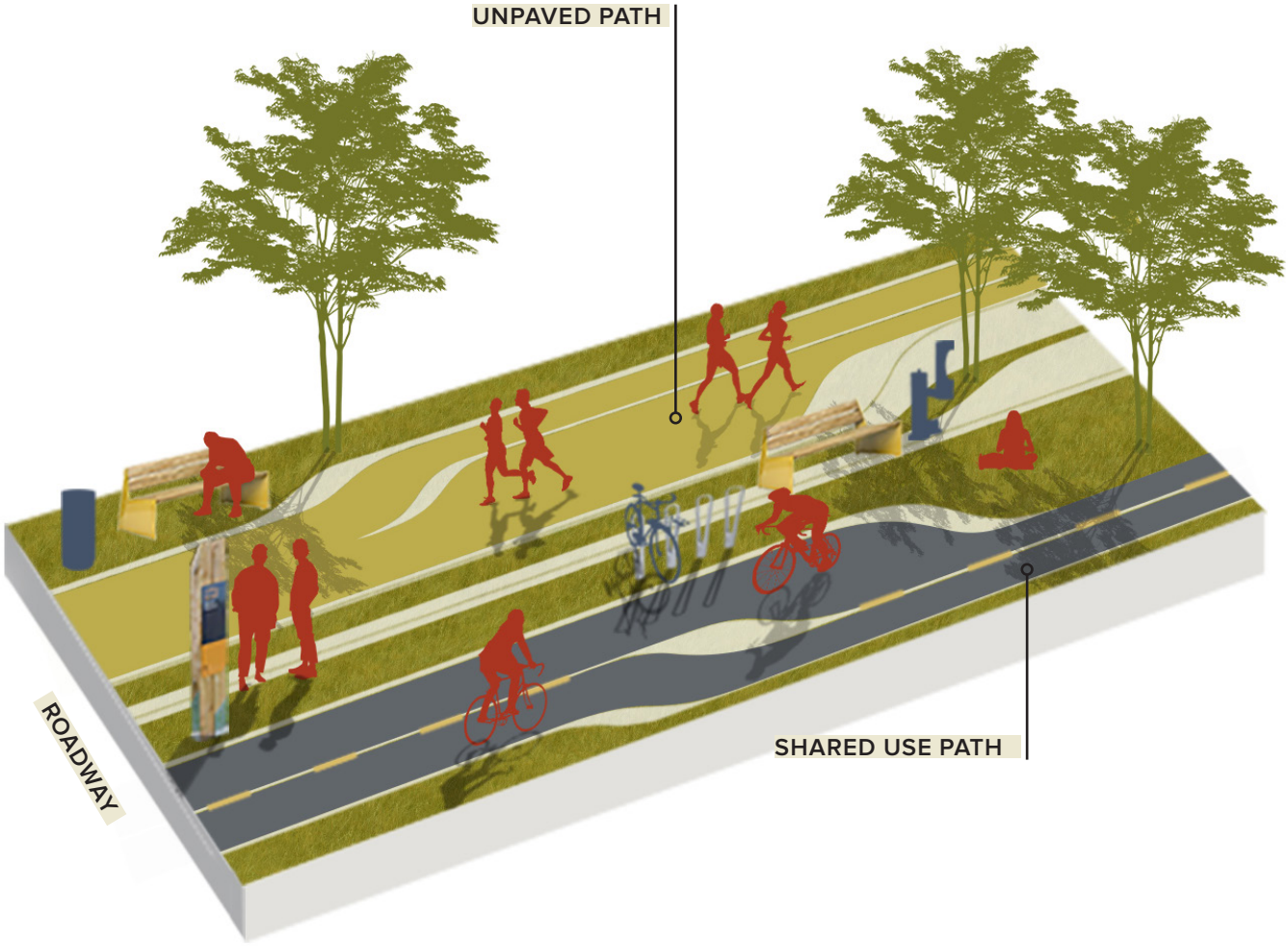
Gateways are entryways at major intersections and have the potential to reflect local culture and provide safe access to the Trail and across roadways. Gateways will include a combination of the following features: bicycle parking, seating, drinking fountains, trash receptacles, dog waste stations, bicycle repair stations, trail wayfinding and informational signage. Existing adjacent street parking may be available at some gateways. Additional information on design features appear in the Design Elements section on the following pages.

Gateway Concept Alternatives

The concepts presented here show two alternative approaches to gateway design for the Trail. A series of vehicular access strategies are presented following these two concepts, which can be applied to either concept.

Gateway Concept 1: Composed + Rectilinear

Inspired by the historical citrus groves in the city, this concept is directly connected to the use of modular grids that give composition and proportion to the space. The geometric form gives a feeling of balance, formality and unity.



Gateway Concept 2: Rhythmic + Curvilinear

Characterized by meandering lines which mimic the natural course of rivers or streams, this concept can be described as smooth lines with deeply curved undulations. The curved paths create an informal, calm, tranquil character that is associated more with nature and asymmetrical balance.

Access Control

Maintenance access and the prevention of unauthorized vehicles are significant considerations for gateway and access point design. The safety of users must be considered when proposing the use of access control elements such as gates and bollards which can become obstacles for trail users, and can lead to collision and injury. The access control alternatives presented below range from a level of lesser to greater entry control and can be varied in implementation based on the contextual conditions at a particular access point. It is anticipated that less entry control will be needed in the residential and industrial zones, while more entry control may be needed for The Box Springs Zone to prevent OHV or motorcycle entry into in the reserve. Maintenance vehicle access driveways can be configured with a rolled curb to differentiate them from a standard vehicular driveway. Descriptions of the proposed options are as follows:

Split Trail

The 'split trail' concept uses a combination of a vehicular swing gate for maintenance vehicles and a pedestrian/bicyclist entry for trail users. Unimpeded access to the Trail will be maintained for cyclists. The planted median between the split trail will discourage vehicles from entering while allowing emergency vehicles to gain entry if needed. This configuration would be most appropriate for sections of the trail that aren't attractive to OHV or motorcycles such as the southern residential section or the northern industrial section.

Chicane

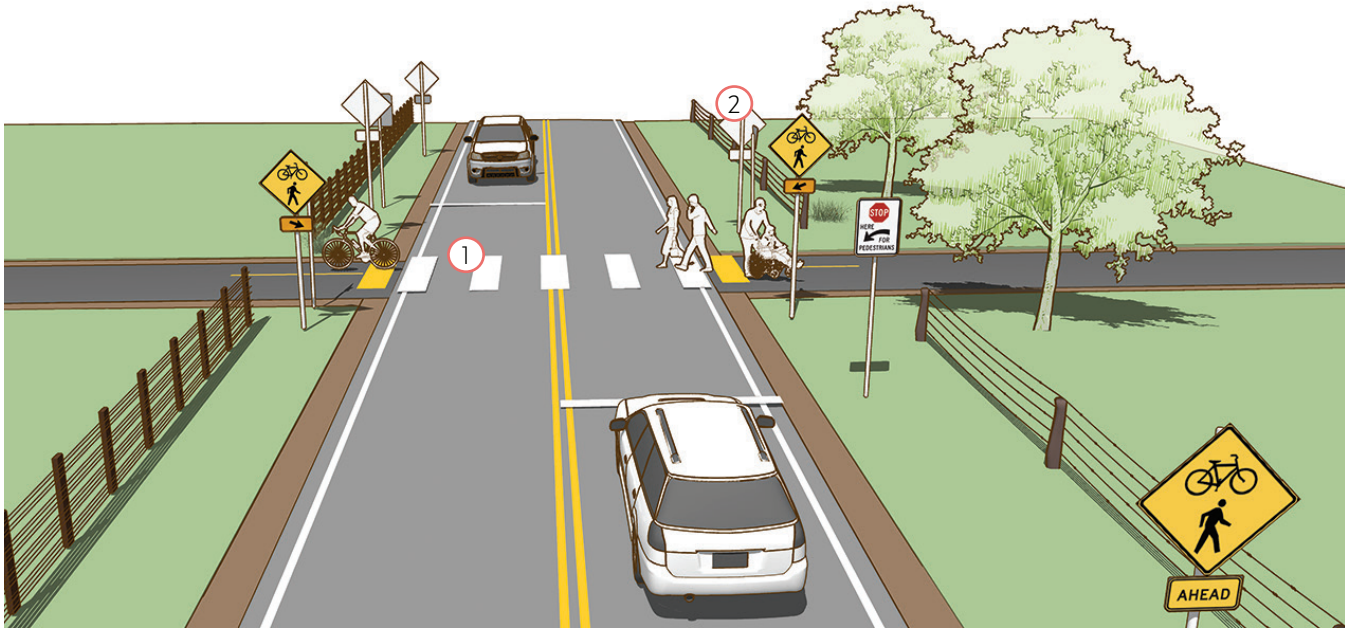
The 'Chicane' concept uses a combination of a vehicular swing gate for maintenance vehicles and separate pedestrian and bicyclist entries. Easy access to the asphalt-concrete path is maintained for bicyclists while the curvilinear entry configuration with offset tree planting slows cyclists ahead of the intersection and serves as a visual cue to dissuade motor vehicles from entering. Like the 'Split Trail' concept, this configuration is most suited to areas of the trail that are less attractive to OHV and motorcycles.

Swing Gate + Bollards

This concept provides more entry control against unauthorized vehicles by utilizing a combination of swing gate and bollards. Integrating the multi-use path striping into the entry plaza paving eliminates the 'road appearance' of the path at the entry point while the bollards are a visual cue that motor vehicles are not allowed. Maintenance vehicles access the trail via a rolled curb and swing gate. This configuration is suited to areas where additional control is desired.

Swing Gate + Barriers

This concept provides the greatest level of entry control against unauthorized vehicles by utilizing a combination of swing gate, fence, and bollard. Integrating the multi-use path striping into the entry plaza paving eliminates the 'road appearance' of the path at the entry point while the bollard is a visual cue that motor vehicles are not allowed. Maintenance vehicles access the trail via a rolled curb and swing gate. This configuration is suited to areas deemed most at risk of unauthorized vehicular use such as the Box Springs section.



SOURCE: ALTA PLANNING + DESIGN
STAR GUIDE

Roadway Crossing Treatments

Well-designed roadway crossings are essential for trail safety, convenience, and support continuous travel experiences.

Where the Trail crosses public roadways, the typical crossing treatment will be a Mid-Block Trail crossing, with a high visibility crosswalk and warning signs to alert people driving to the presence of potential trail users. Users of the Trail will cross roadways in parallel, with crossings striped separately for pedestrians and cyclists.

Mid-Block Trail Crossing

DESIGN FEATURES

1. **Crosswalk.** Appropriate high visibility crosswalk markings should be installed.
2. **Warning Signs.** A Bicycle/Pedestrian warning sign (W11-15) with Downward Arrow plaque (W16-7P) at the crossing, on both sides. Signs are used to warn users of the crossing location.

Design Elements

The Trail will include elements such as trees, plants, lighting, seating, and other user amenities. Trees and lighting will be present along the entirety of the two mile long corridor, whereas amenities such as seating and drinking fountains will be clustered at trail gateways.

Trail Elements

The trail will, for the most part, include a parallel unpaved pedestrian path with concrete headers, and an asphalt (Class I) bicycle path. Widened curb ramps will be installed where the trail crosses roadways. Striping and signage will be provided for the trail and street crossings. Access points to the trails will be created at each street intersection, and will include amenities such as benches, bike racks, water fountains, waste receptacles, fitness equipment and enhanced landscape planting. The trail will be lit with solar lighting throughout its length, with a double row of trees where space allows.

Landscape

Tree planting patterns can be used to create a sense of uniformity or visual variation. Varying tree types along stretches of the corridor will allow for a denser planting of trees where space allows. A mix of tree species are beneficial for establishing bio-diverse landscapes that are resilient to pests and drought. Tree patterns will include those that are irregular and repeating, regular and repeating, or alternating form (see graphic below). Trees planted along the trail will emphasize locally native species, intermixed with pest and disease-resistant species that are climate-appropriate. Tree palettes will also reflect the surrounding industrial, natural, and residential contexts. Trees will not be planted directly above the canal pipeline and will be placed as far away as possible to minimize the chance for potential root intrusion to the canal wall.

Gateways will feature enhanced planting areas that will include additional native shrubs and ground covers as well as modified tree palettes to include fruit trees or specimen trees that draw attention to the gateway.

The concept as presented includes 702 trees which capture a total of 702.5 tons of CO2.

IRREGULAR & REPEATING

REGULAR & REPEATING

ALTERNATING FORM

Water Quality Recommendations

Stormwater infiltration areas will be designed to not seep below foundations of adjacent structures. Because of the potential for erosion of existing slopes, we recommend that v-ditches that are planned for surface water capture be maintained regularly. Based on the assessment of subsurface conditions, the upper 5 feet of the soil profile between Columbia Avenue and Watkins Drive can support infiltration; however, we recommend that infiltration devices not be planned north of Columbia Avenue and south of Watkins Drive, as the factored infiltration rates in these areas of the Project would likely not exceed the minimum infiltration rate of 0.5 inch per hour required by the County of Riverside (2006). Where practical, infiltration devices be planned a minimum of 5 feet from the proposed shared use path.

Where space and infiltration rates allow, swales and detention areas will be designed to slow and capture runoff from the asphalt trail, and to control potentially erosive runoff from adjacent properties onto the trail. As feasible, trail access points will integrate stormwater capture through bioswales and planted detention areas.

In accordance with the Low Impact Development (LID): Guidance and Standards for Transportation Projects for the Santa Ana Region Riverside County Co-Permittees, LID-based Best Management Practices (BMPs) will be incorporated into the project. Site considerations, soil conditions, and maximum drainage area, are considered in choosing the best suitable BMP for a given location. Considering the project conditions, infiltration trenches and bioretention facilities (bioswales) are recommended and varied based on adjacent conditions. In the Residential Zone between Watkins Drive and Blaine Street, bioswales are suggested due to existing drainage structures in the area. Infiltration trenches are recommended in both the Box Springs Zone and Industrial Zone, between Columbia Avenue and Spruce Street. In designing these BMPs in the Santa Ana Watershed, they are sized based on their design capture volume, VBMP. Using the spreadsheet shown in Appendix #, the VBMP is estimated to be 6160 cubic feet.

Vegetated Infiltration Trench *MPCA*

Bioswale *Whittier Daily News*

Geotechnical Analysis

Based on geotechnical considerations, the site is suitable for the proposed improvements. The primary geotechnical consideration was the variable soil conditions encountered through the corridor, which will impact the preparation of pavement subgrade and the siting of infiltration devices. Minor cuts and fills will likely be required to construct the proposed paths and infiltration devices. The earthwork for the proposed shared use path will generally be minor and will consist of cuts and fills within 2 feet of existing grades. Overexcavation will not be required for the proposed improvements. The recommended excavation bottoms in cut areas and existing surfaces in fill areas should be prepared by:

- Scarifying the upper 6 inches
- Moisture-conditioning to above optimum moisture content
- Compacting to at least 95% relative compaction

The fill and backfill should be compacted by:

- Placing in loose layers less than 8 inches thick
- Moisture-conditioning to above optimum moisture content
- Compacting to at least 95% relative compaction

The compacted subgrade soils should be firm, hard, and unyielding. Site grading may generally be accomplished with conventional heavy-duty construction equipment. The fill should be compacted using soil compactors as recommended by the Caterpillar Performance Handbook (2021) or equivalent.

Recommended minimum dense-graded hot-mix asphalt (HMA) pavement sections deviate slightly from the City's standard plan. The preferred pavement section will look to minimize the overall excavation, while meeting Caltrans design methods. The recommended minimum pavement sections are based on the following:

- R-value of 50, which we judged to be conservative based on the results of DYA's laboratory testing summarized in Section 3.2
- Caltrans (2020) design method
- Traffic index (TI) values of 5.5 and 6

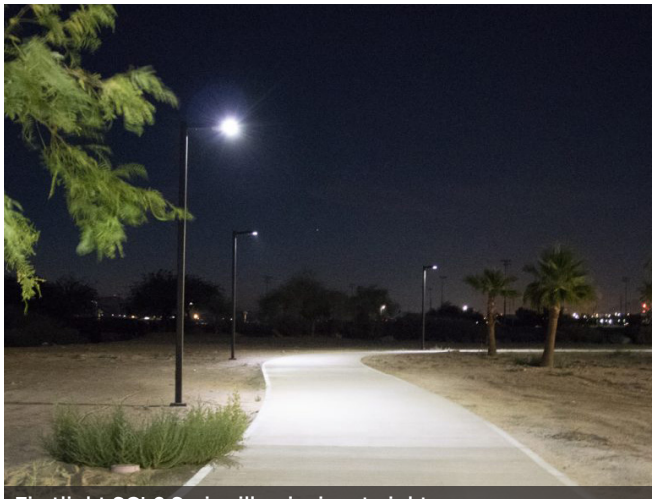
Based on the previous considerations the pavement sections are as follows:

- 3" HMA over 4" Class 2 Aggregate Base over 6" Compacted Native Soil
- 4" HMA over 4.5" Class 2 Aggregate Base over 6" Compacted Native Soil
- 5.5" HMA over 6" Compacted Native Soil
- 6" HMA over 6" Compacted Native Soil

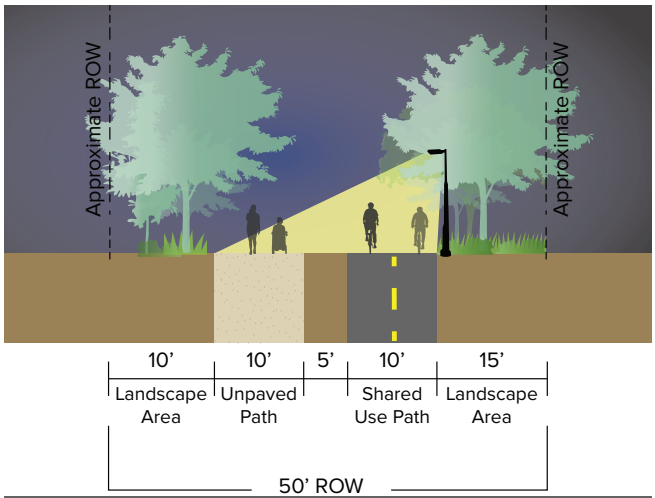
Lighting

Lighting can be an effective tool for increasing trail user comfort, improving security and reducing the likelihood of unwanted behavior. Lighting provides a choice for how to use trails during non-daylight hours. The goal of lighting trails for security is to make a place unattractive or uncomfortable to offenders while also providing a sense of security and attracting the intended use of trails. Properly lit trails should be easy to observe, eliminate potential hazards at intersections or access points, attract use and enhance other environmental design techniques.

According to the AASHTO Guide for the Development of Bicycle Facilities, pedestrian-scale lighting is preferred to tall highway style lights. Pedestrian-scale lighting is characterized by shorter light poles (standards about 15 ft high), lower levels of illumination (except at crossings), and closer spacing of standards (to avoid dark zones between luminaires). Additionally, overhead lighting is preferred to very low bollard lighting. Bollard lighting does not project sufficient light at eye level and distorts the available light due to the 'up-lighting' effect. This makes it difficult for users to recognize facial features, and diminishes their perception of safety. For these reasons, bollard lighting should only be used in combination with overhead lighting or when overhead lighting fixtures are not permitted or feasible.



Firstlight SCL2 Series illuminaire at night



Lighting relative to A/C and an unpaved path

GUIDING PRINCIPLES INCLUDE:

- Lighting will be at pedestrian scale. Placement, spacing, and other finish specifications depends on the fixture and optics
- Good lighting improves natural surveillance and visibility
- Lighting will minimize energy usage, operating costs, light trespass, light pollution and glare
- Lighting will be placed at decision points and areas of interest, such as street crossings, intersections with other trails, trail spurs, and near commercial and mixed-use developments
- Lighting will use dark-sky compliant fixtures that illuminate only the intended targeted areas and minimize spillover onto adjacent properties.
- Lighting will include timers, sensors, and remote-control technology which can enhance the sense of security and conserve energy
- Light placement works hand-in-hand with tree placement, and will be finalized as tree planting plans are completed.

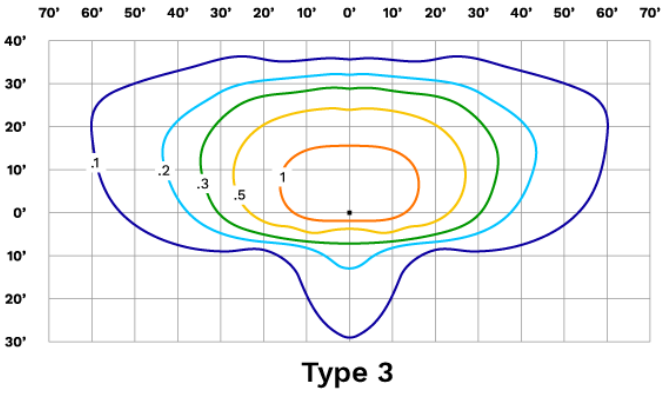
APPLICATION

Lighting has been recommended per segment context with consideration for safety needs, wildlife habitat, trail function, cost benefit, and maintenance commitments. The Trail crosses through various surrounding land-uses and landscapes, including industrial, residential, and sensitive environment areas that will allow for and/or require different lighting solutions.

Lights are directional and are anticipated to be placed on one side of the trail, casting light onto the unpaved path and shared use path. Overhead lighting has been selected for greater security and to achieve a fewer number of total fixtures. For example, the segment between Watkins and Marlborough would need six times as many bollards to achieve the same illumination

Firstlight SCL2 Series illuminaire in daylight w/ footers

Firstlight SCL2 Series illuminaire solar panel top



Lighting distribution photogrametric diagram (type 3)

as pole mounted fixtures.

Solar panels may be either mounted per light standard or centralized, to power a series of lights. This determination will be made for the final concept, once overall alignment and tree planting concepts are determined.

Lighting calculations have been based upon a Firstlight SCL2 Series Illuminaire positioned at 16' above the ground using a type 3 lighting distribution pattern.

Furnishings and Amenities

Amenities that will be included in the trail corridor design include seating, drinking fountains, trash receptacles, and bike racks.

Seating contributes to the user experience by inviting users to rest, congregate, or contemplate. Seating opportunities along the trail provide a short relief and also promote added enjoyment of the scenic environment. Seating areas are designed to create identity along the trail.

Drinking fountains are spaced at regular intervals that correspond with key gateways and landmarks. Locating fountains with multiple heights will help accommodate a range of user ages and physical abilities, as well as pets.

Trash receptacles are installed at trail entry points and as-needed for user convenience. While requiring dedicated maintenance, they will help prevent the spread of refuse throughout the trail corridor and onto surrounding areas. The appearance should match other trail amenities. Bicycle racks provide opportunities for trail users to use the trail as transportation, where users can engage in other activities without the worry of losing their bicycles.

Additional amenities that may be included in the trail design if funding allows are picnic tables, fitness stations, and bicycle repair stations. Picnic tables provide places for trail users to congregate for meals, relax, or have informal events. Bicycle repair stations are self-serve kiosks designed to offer a complete set of tools necessary for routine bicycle maintenance. Fitness stations are areas where outdoor fitness equipment for workouts are included to enhance the recreational opportunities on the trail.

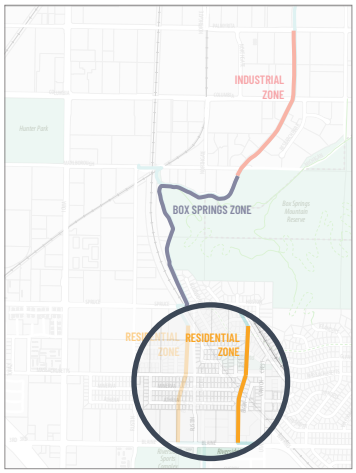
Amenity palettes are provided in the following sections to match the character of each design zone. If the city prefers to keep amenities more consistent, the same furnishing models can be used for all zones, and color can be used as a differentiator.

Map 1. **Blaine Street - Watkins Drive : Conceptual Design Location**

Residential Zone

The southernmost segment of the project corridor from Spruce Street south to the project terminus at Blaine Street travels through a residential neighborhood composed of single and multi-family dwellings, including student housing for UCR. A mix of CMU block walls and chain link fence line both sides in this section, and the corridor backs up to residential backyards and housing complex parking areas.

The graphics on the following pages with labels A or B correspond to the locations shown on the Conceptual Design Location map on this page.



Key Map

CONCEPTUAL DESIGN LOCATION

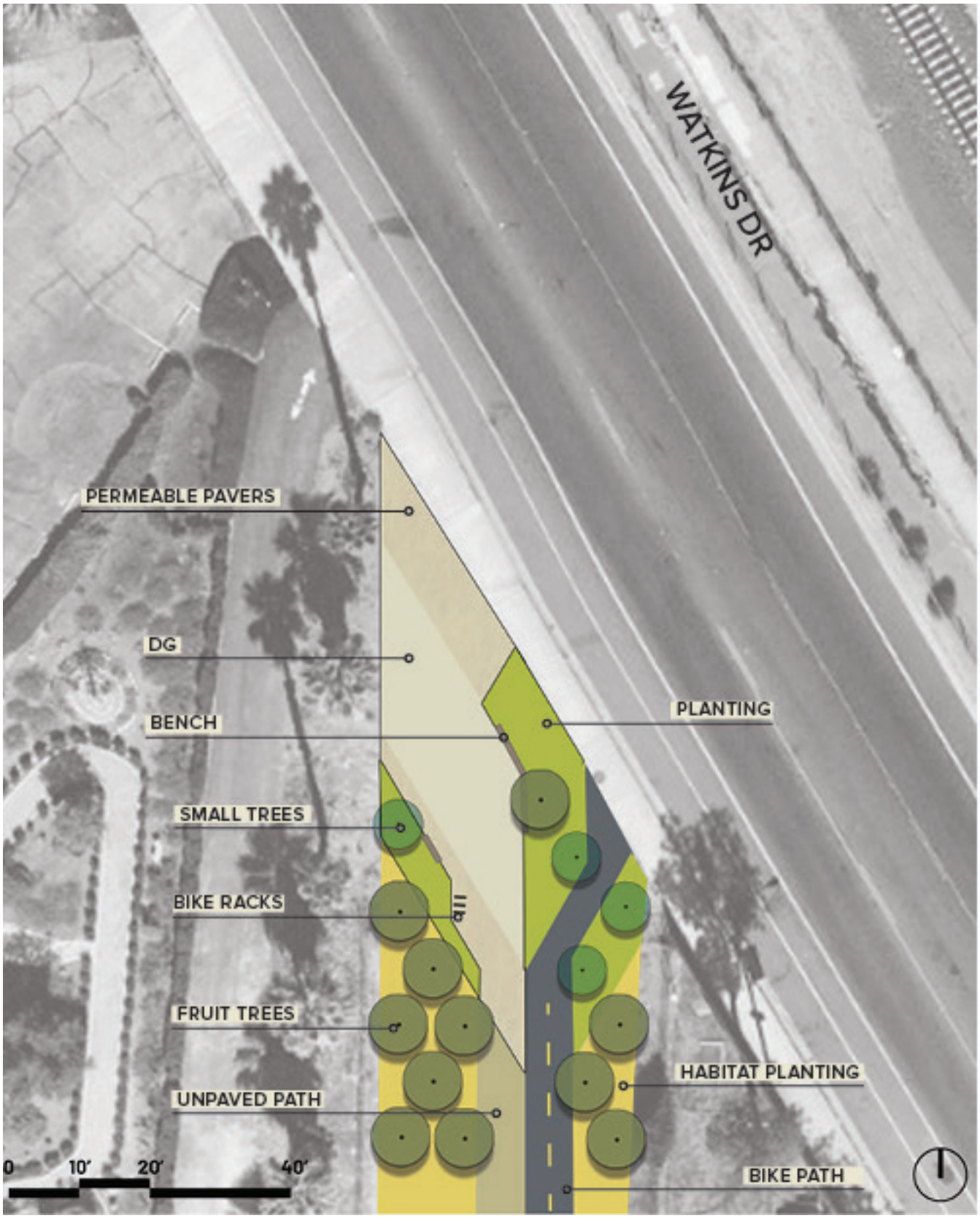
A

Trail gateway concept rendering located at Watkins Drive looking south

B

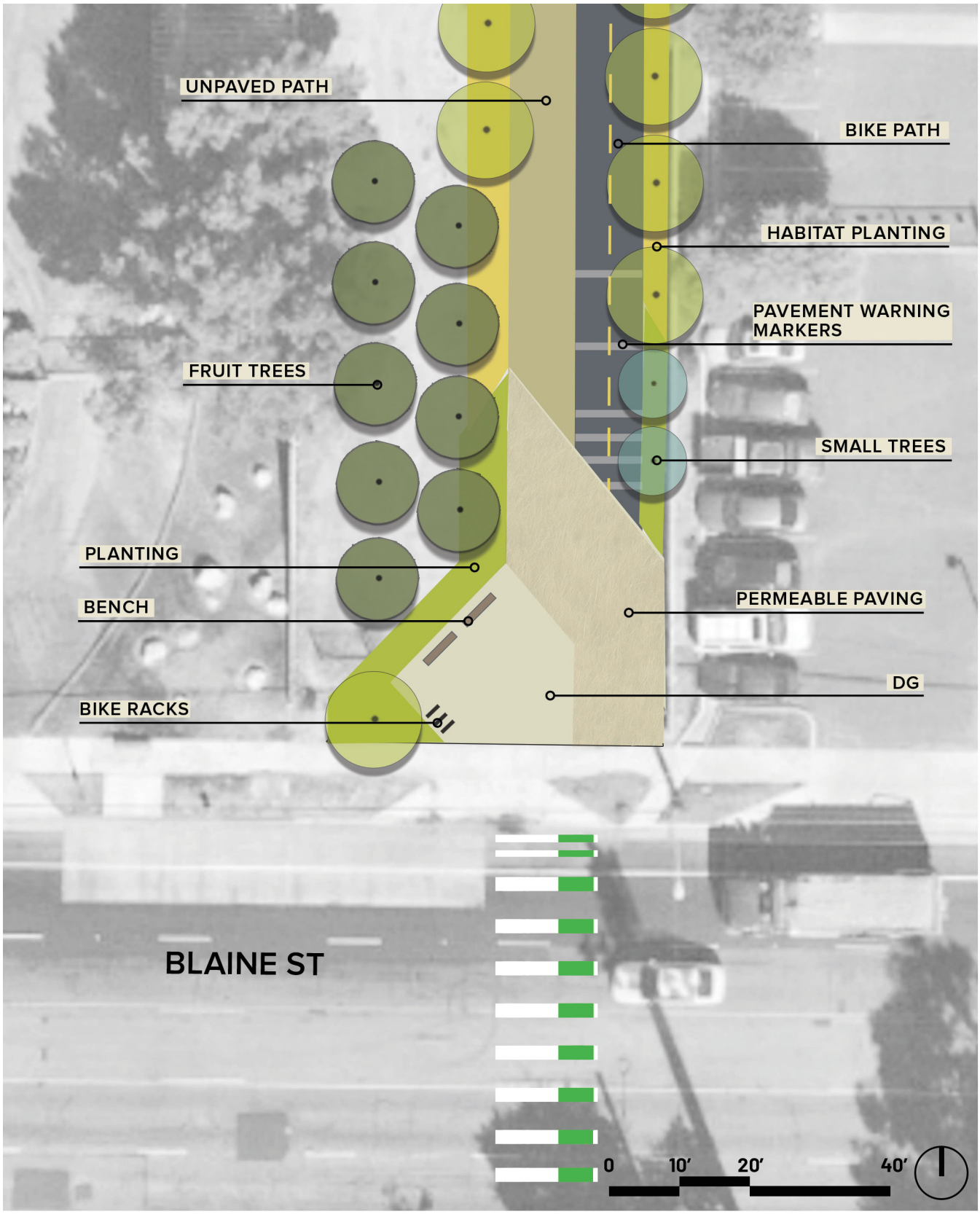
Trail concept rendering located between Blaine Street and Watkins Drive looking north

CONCEPTUAL GATEWAY DESIGN- PLAN VIEW

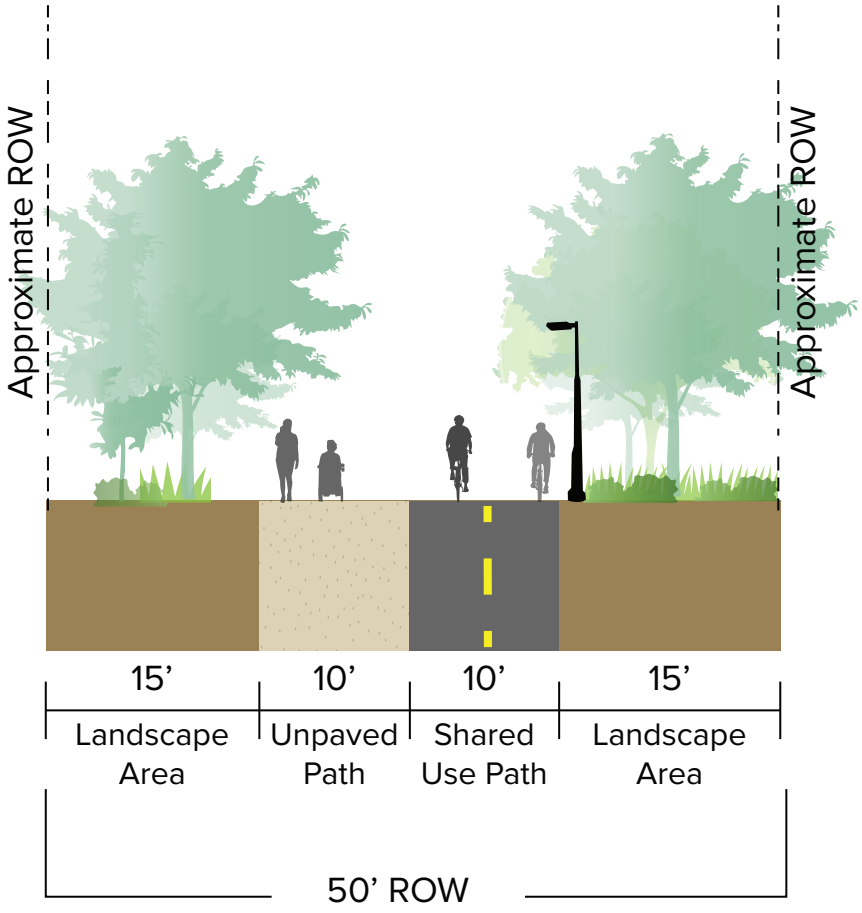


The trail gateway design depicted above is located at the trail corridor intersection on Watkins Drive. The design utilizes the rectilinear gateway typology detailed earlier in the document.

CONCEPTUAL GATEWAY DESIGN- PLAN VIEW



The trail gateway design depicted above is located at the trail corridor intersection on Blaine Street. The design utilizes the rectilinear gateway typology detailed earlier in the document.



Blaine Street to Watkins Drive Typical Section Detail

Mesquite Tree

Palo Verde Tree

Urban orchards have been created at parks and trails in Los Angeles and Riverside. These provide an attraction for visitors and an interpretive link to local history.

Landscape

The southern section of the Gage Canal Multi-Purpose Trail, between Blaine Street and Watkins Drive runs through a residential zone consisting of a mix of single family dwellings and multi-family residential complexes. The plant palette in this section should complement and reference some of the adjacent planting language found in the surrounding residential area in order to seamlessly integrate the future trail into the existing landscape. This can be accomplished by incorporating smaller, residential-scale trees such as palo verde and mesquite to support a signature large oak tree.

Another approach to planting at trailhead gateways in the residential zone is to create a community orchard. A community orchard references Riverside's rich agricultural history, while providing an attraction for the trail. Long term fruit tree maintenance agreements may be possible through community partnerships.

Lighting

This is the most densely populated section of the Trail project and therefore requires additional consideration to reduce light pollution for neighboring residents. In this section of the trail, residences are positioned on both sides of the trail, which requires that the lighting be controlled in both directions. Cut-off fixtures should be used to direct all illumination down towards the trail surface. Based on the Illuminating Engineering Society (IES) lighting standards for pedestrian and bikeways, lighting fixtures should be designed and placed to produce between 0.2-0.5 foot-candles.

To achieve the recommended illumination of 0.2-0.5 foot-candles, the 2,280' stretch of trail will require 23 total light fixtures spaced 100' apart on center.

Trash Receptacle

Water Fountain

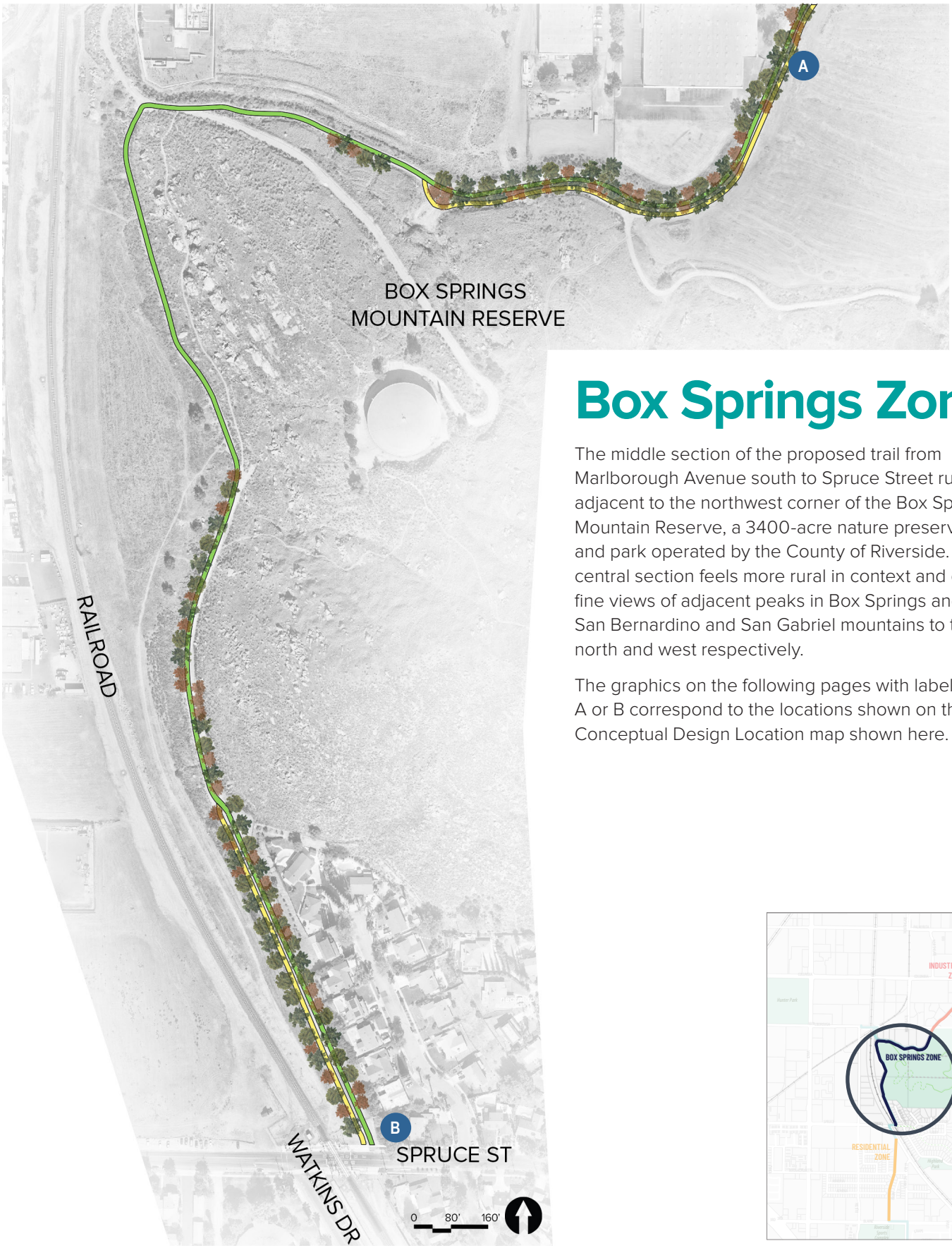
Seating

Bicycle Parking

Amenities

Throughout the trail corridor amenities may be tailored to fit the design language of each respective zone. For implementation in the residential zone, options are proposed above for the categories of seating, water fountains, trash receptacles, and bicycle parking. Additional amenities such as picnic tables, bicycle repair stations, and pet waste stations may be implemented if funding is available.

Map 2. **Spruce Street - Marlborough Avenue : Conceptual Design Location**



Box Springs Zone

The middle section of the proposed trail from Marlborough Avenue south to Spruce Street runs adjacent to the northwest corner of the Box Springs Mountain Reserve, a 3400-acre nature preserve and park operated by the County of Riverside. This central section feels more rural in context and offers fine views of adjacent peaks in Box Springs and the San Bernardino and San Gabriel mountains to the north and west respectively.

The graphics on the following pages with labels A or B correspond to the locations shown on the Conceptual Design Location map shown here.

Key Map

CONCEPTUAL DESIGN LOCATION

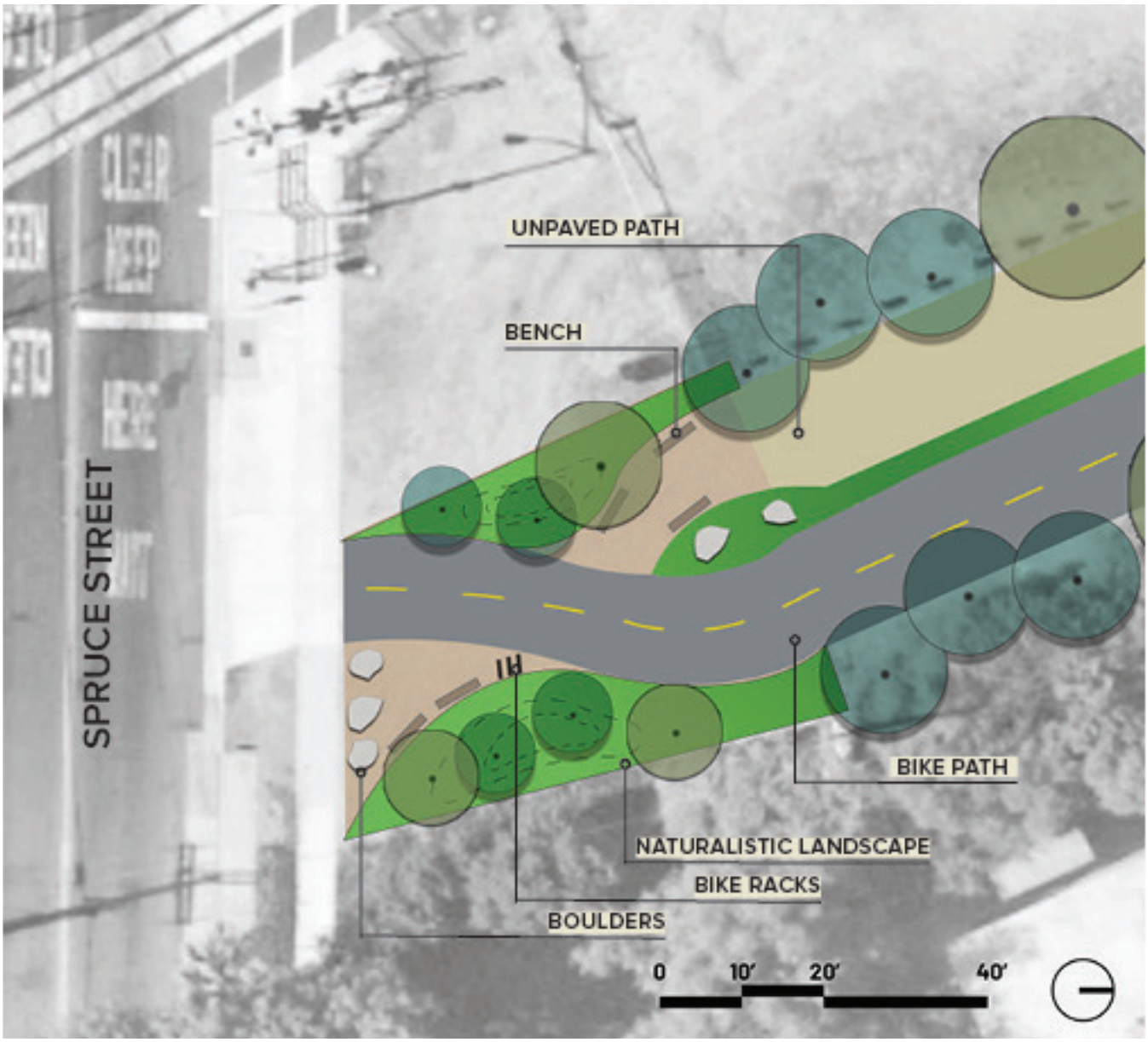
A

Trail concept rendering located at Spruce Street

B

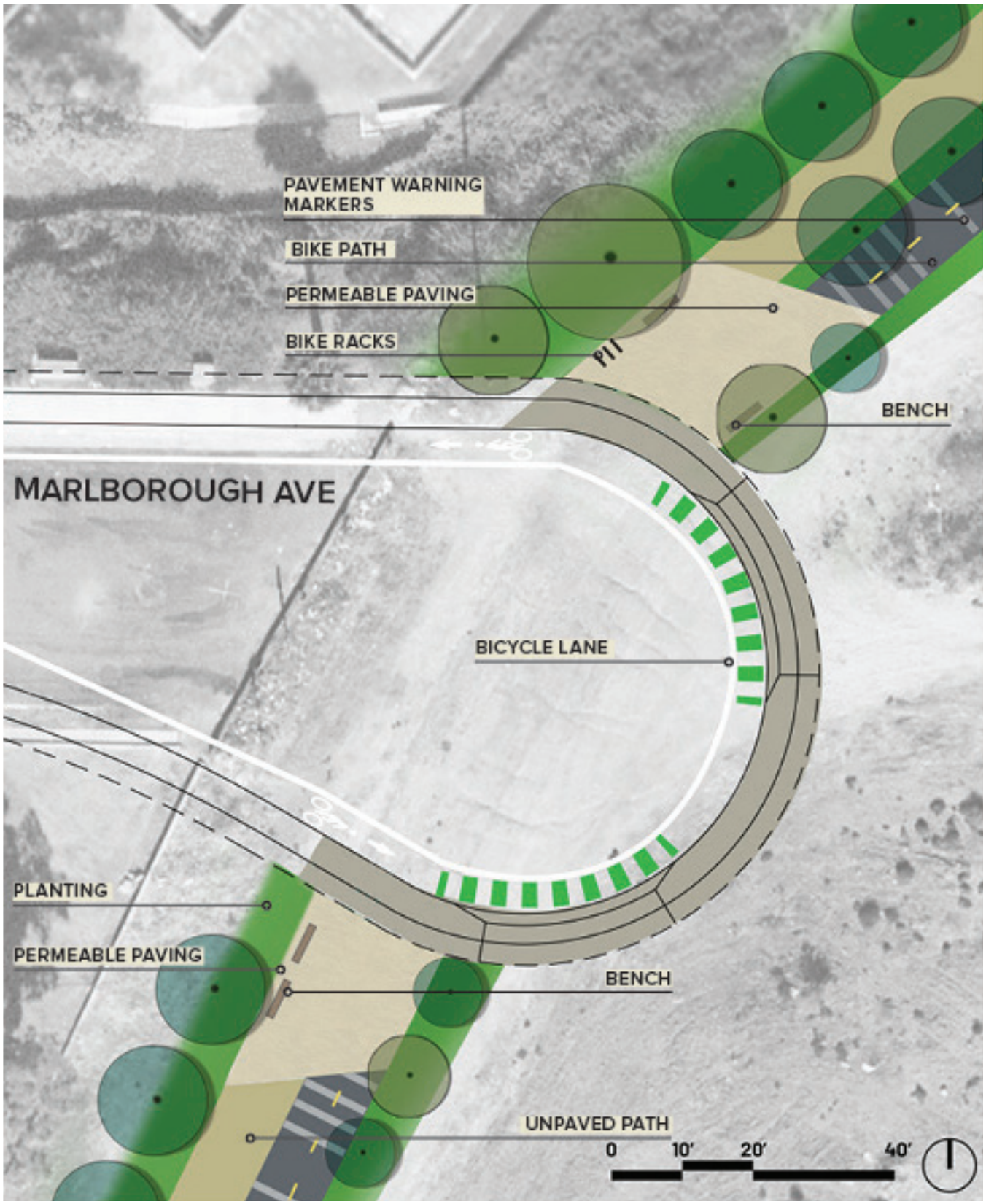
Trail gateway concept rendering at Malborough Avenue

CONCEPTUAL GATEWAY DESIGN- PLAN VIEW

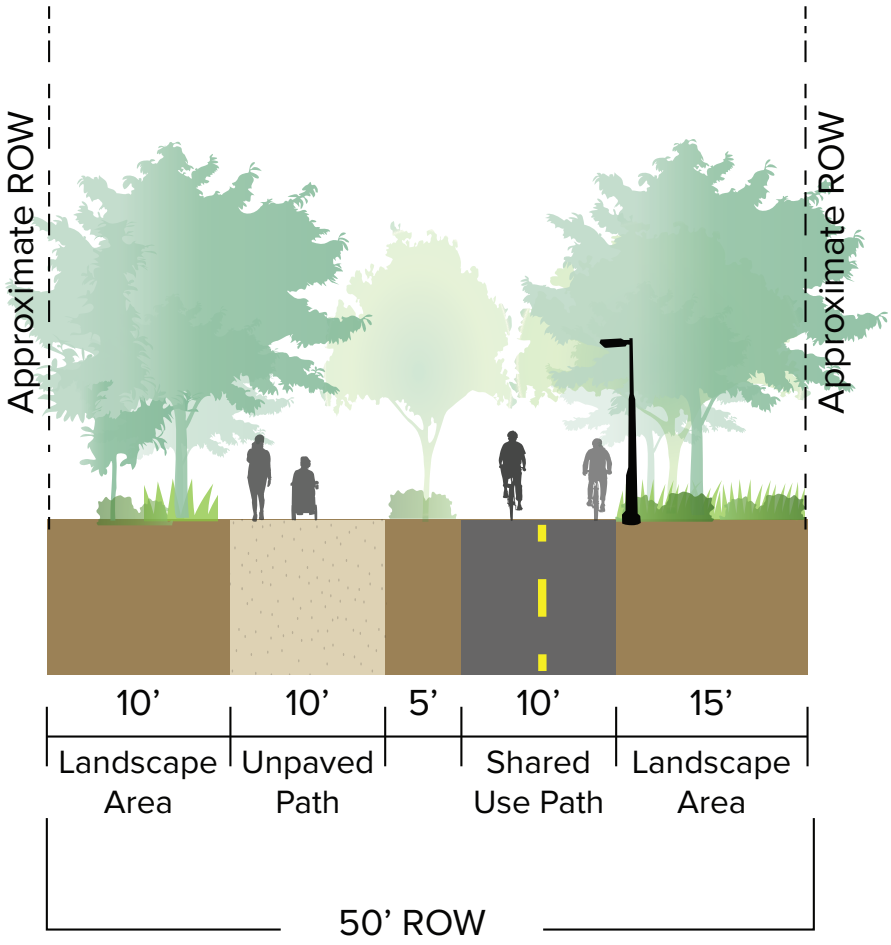


The trail gateway design depicted above is located at the trail corridor intersection on Spruce Street. The gateway is positioned adjacent to a rail right-of-way, and the design utilizes the curvilinear typology detailed earlier in the document.

CONCEPTUAL GATEWAY DESIGN- PLAN VIEW



The trail gateway design depicted above is located at the trail corridor intersection on Marlborough Avenue.



Spruce Street to Box Springs Typical Cross Section


Coral Bells


Desert Willow


Western Sycamore


California Natives Planting

Landscape

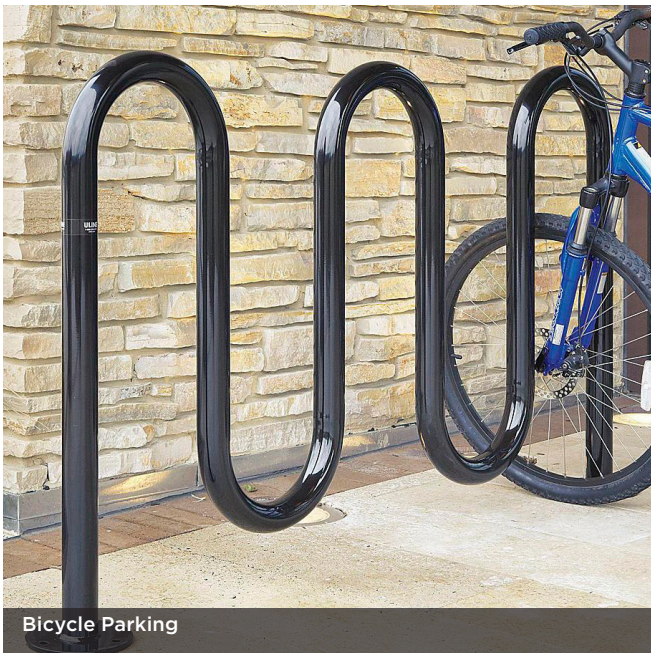
The central section of the Gage Canal Multi-Purpose Trail, between Spruce Street and Marlborough Avenue, runs adjacent to the existing Box Springs Mountain Reserve, a 3,400-acre nature preserve and park operated by the County of Riverside. As the reserve is primarily dominated by coastal sage scrub plant community, the plant palette on this portion of the trail will primarily feature trees and shrubs native to Riverside and/or Southern California. Signature large trees in this section will include oaks and sycamore, and will be supplemented by smaller, native trees such as desert willow. The planting in this section should emphasize a connection to nature and a commitment to supporting local biodiversity.

Lighting

In this segment the trail transitions to a more natural condition as it moves towards Box Springs. Here, residences are found on just the east side of the trail before moving into the unpopulated Box Springs Reserve. Like the Blaine to Spruce segment, cut-off fixtures should be used to direct light down towards the trail to eliminate light pollution to neighboring residences. Sections of trail within the Box Springs Reserve should have less lighting to limit disruption to sensitive ecosystems. Lighting fixtures should be designed and placed to produce 0.1-0.3 foot-candles along this segment and use amber colored luminaires.

To achieve the recommended illumination of 0.1-0.3 foot-candles, the 4,255’ stretch of trail will require 36 total light fixtures spaced 120’ apart on center.

Trash Receptacle



Bicycle Parking

Water Fountain

Seating option 1

Amenities

Throughout the trail corridor amenities may be tailored to fit the design language of each respective zone. For implementation in the Box Springs zone, options are proposed below for the categories of seating, water fountains, trash receptacles, fitness stations, and bicycle parking. Additional amenities such as picnic tables, bicycle repair stations, and pet waste stations may be implemented if funding is available.

Seating option 2

Map 3. **Marlborough Avenue - Palmyrita Avenue : Conceptual Design Location**

Industrial Zone

The northern section of the project corridor from Marlborough Avenue to Palmyrita Avenue runs through an industrial district known as Hunter Industrial Park. It is characterized by large concrete tilt-up buildings and associated asphalt concrete parking lots. Through this section, the proposed Gage Canal Multi-Purpose Trail, is bordered on both sides by these industrial buildings and parking lots, often in view of adjacent site operations.

The graphics on the following pages with labels A or B correspond to the locations shown on the Conceptual Design Location map shown here.

Key Map

CONCEPTUAL DESIGN LOCATION

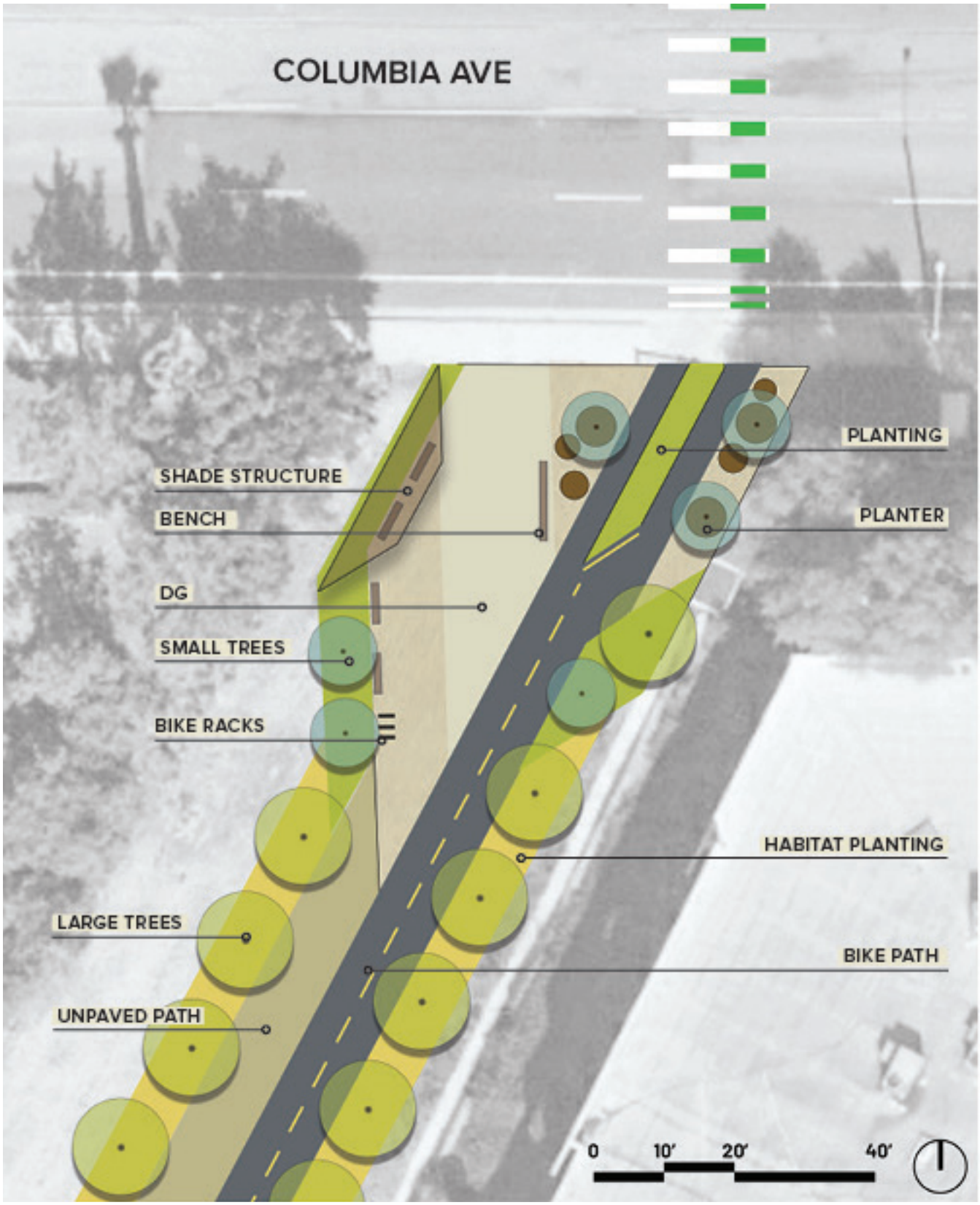
A

Trail gateway concept rendering at Columbia Avenue

B

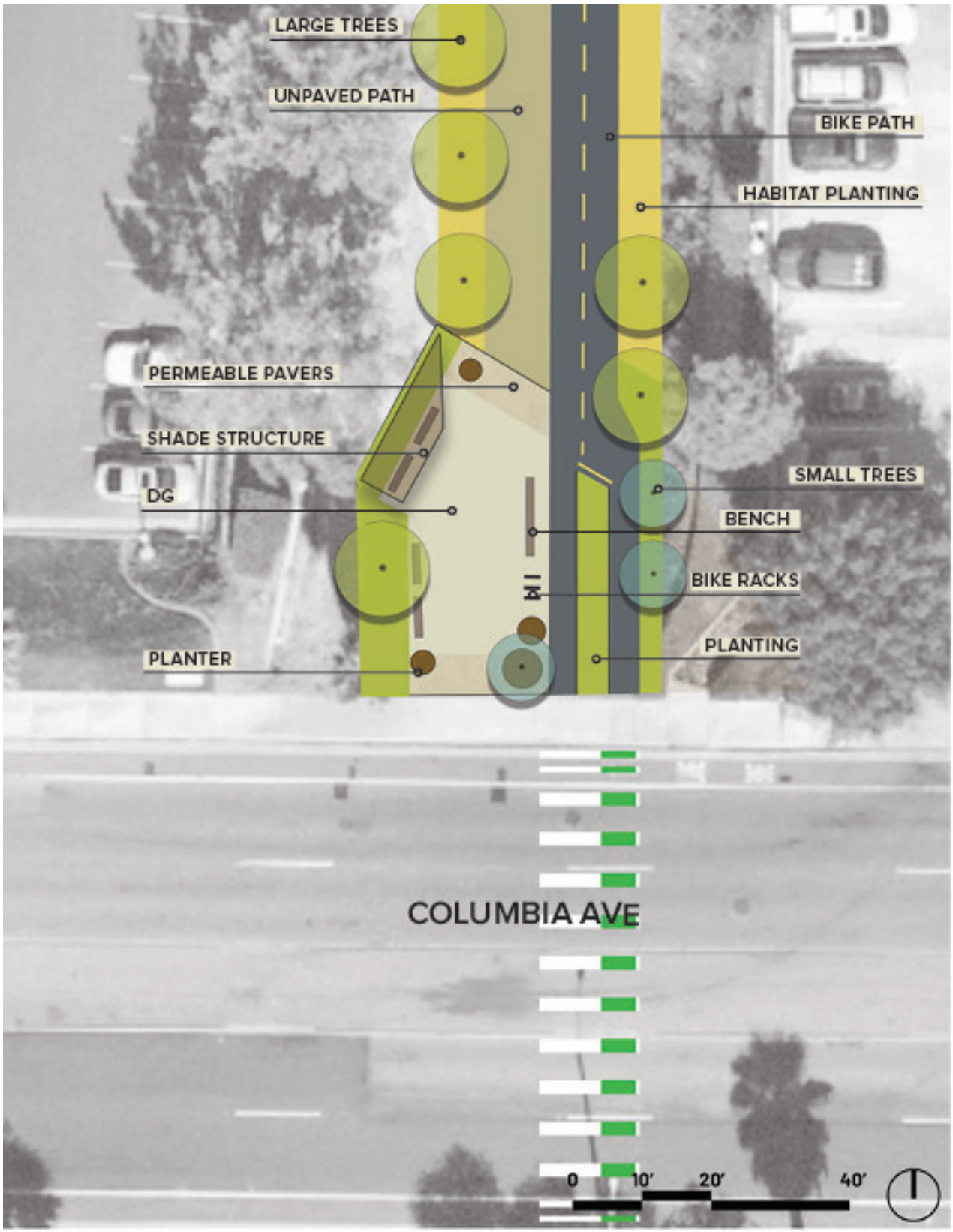
Trail concept rendering located between industrial facilities

CONCEPTUAL GATEWAY DESIGN- PLAN VIEW



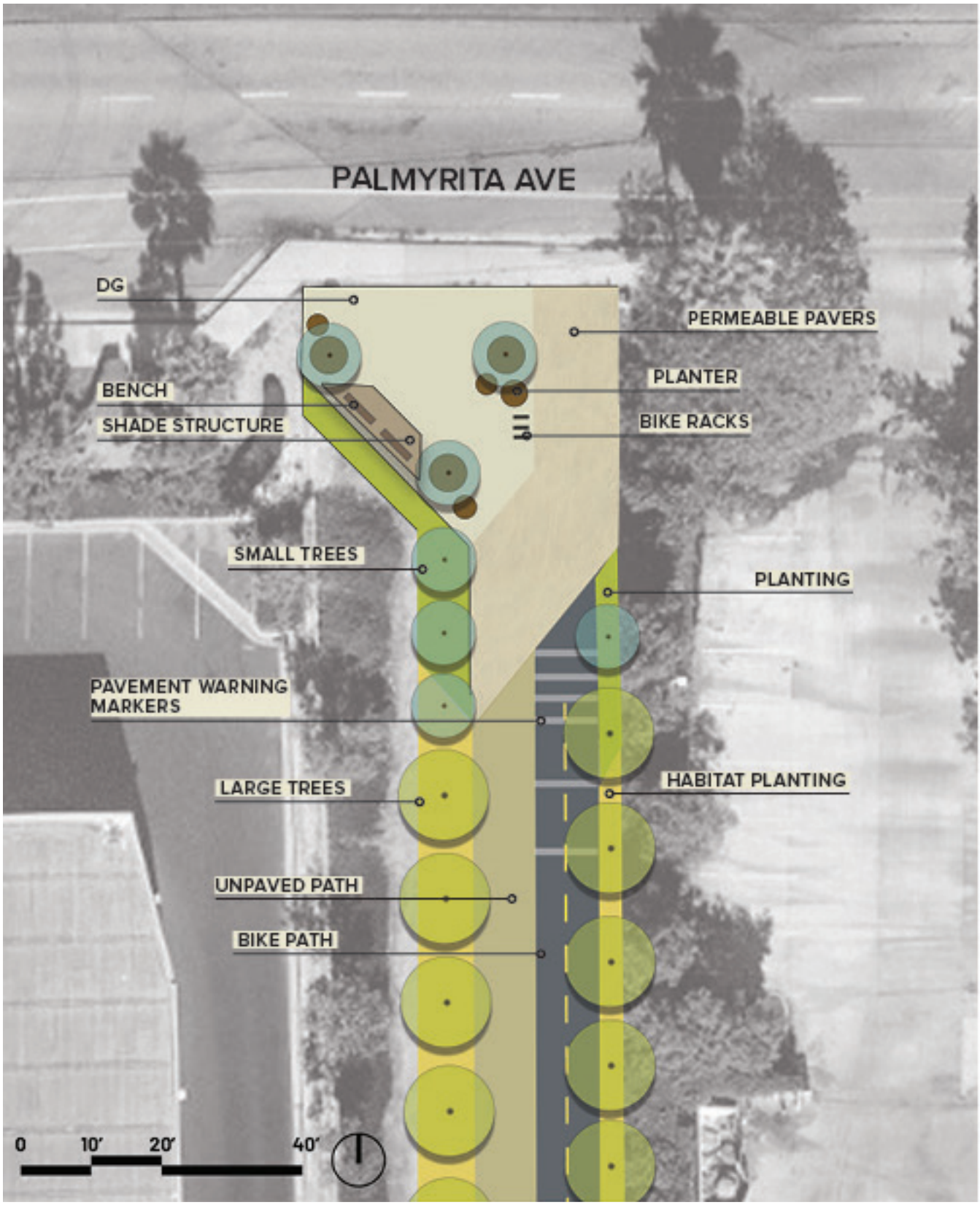
The trail gateway design depicted above is located at the trail corridor intersection on Columbia Avenue on the south side of the street. The design utilizes the rectilinear gateway typology detailed earlier in the document.

CONCEPTUAL GATEWAY DESIGN- PLAN VIEW

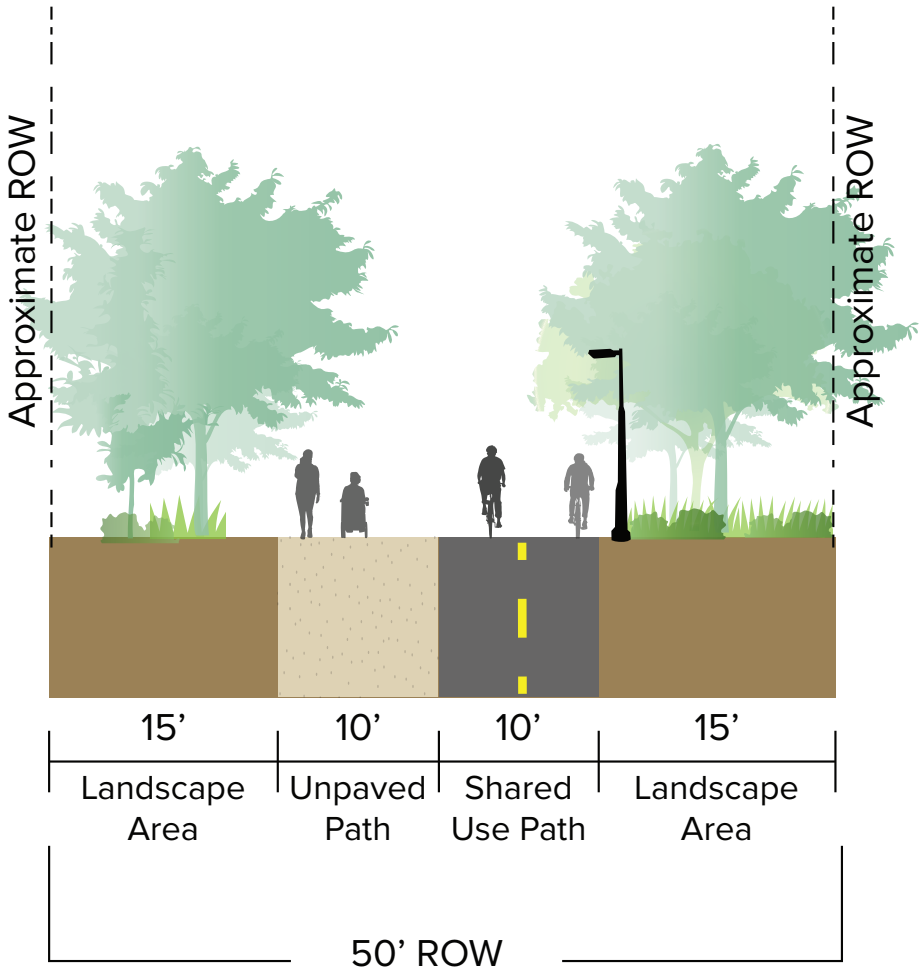


The trail gateway design depicted above is located at the trail corridor intersection on Columbia Avenue on the north side of the street. The design utilizes the rectilinear gateway typology detailed earlier in the document.

CONCEPTUAL GATEWAY DESIGN- PLAN VIEW



The trail gateway design depicted above is located at the trail corridor intersection on Palmyrita Avenue. The design utilizes the rectilinear gateway typology detailed earlier in the document.



Spruce Street to Box Springs Typical Section Detail

Brisbane Box

Industrial Zone Shrub Planting

Landscape

The northern section of the Gage Canal Multi-Purpose Trail, between Marlborough Avenue and Palmyrita Avenue, runs through an industrial area dominated by large warehousing and manufacturing operations each of which feature their own campus and street adjacent landscaping with various tree and shrub species. Signature large trees on this section of the Trail can reference and tie into the existing adjacent landscapes found along the corridor by featuring some of the same trees present in the adjacent corporate campuses. Examples of these include trees such as brisbane box or aleppo pine. By tying into the adjacent existing landscapes, the Gage Canal through this section will feel like a seamless addition to the existing fabric of industrial campus landscapes.

Lighting

The northern most segment of the Trail is surrounded by industrial land use. For this reason, spill-over from lighting fixtures is less of a concern and illumination of the trail surface can increase. Cut-off fixtures are not necessary in this location and the illumination range should be designed within .5-1 foot-candles. Additionally, trailheads should be designed with an illumination of 1 foot-candle to facilitate user access to the trail.

To achieve the recommended illumination of 0.5-1.0 foot-candles, the 2808’ stretch of trail will require 35 total light fixtures spaced 80’ apart on center.

Trash Receptacle

Water Fountain

Bicycle Parking

Seating

Amenities

Throughout the trail corridor amenities may be tailored to fit the design language of each respective zone. For implementation in the industrial zone, options are proposed for the categories of seating, water fountains, trash receptacles, and bicycle parking. Additional amenities such as picnic tables, bicycle repair stations, and pet waste stations may be implemented if funding is available.

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Final Concept Design

Final Concept Design

The Final Concept Design is to be determined pending city and stakeholder selection.

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Appendix 1

Citizen's Group Mailing List

SECTION TO BE COMPLETED
FOLLOWING CONCLUSION OF
OUTREACH ACTIVITIES

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Appendix 2

Citizen Surveys with Tabulation of Results

SECTION TO BE COMPLETED
FOLLOWING CONCLUSION OF
OUTREACH ACTIVITIES

07

Appendix 3

Technical Committee Feedback Summary

Gage Canal Multi-Purpose Recreational Trail Design

Technical Advisory Committee Meeting #1
2:00pm – 3:00pm

I. Introductions

II. Project Background

a. One of the things we were looking for in the gateways seating, amenities, water, interpretive panels re: canal history; would like to get any additional info re: gage canal from folks that have been around for a while; gage middle school mural has neat interpretive exhibit re: gage canal history; would like to make sure that when bikes and walkers are crossing, there are some dividers from traffic. What about interpretive panels? Can that include info re: GHG and other environmental information? We are open to input. We should interpret the urban greening element for the public as well. We also want to build resilience into the project from a sustainability element. Looks like the trees will outcompete the solar.

III. Project Walkthrough / Key Challenges

- Have you discussed this with RCTC? We have trail access along the entire metrolink row. We should us it. Settlement agreement. RCTC should be at the table for this section.
- Public record, should be on RCTC. Will track down and forward to consultant.
- Is that the boundary to grand terrace? Does trail continue into next city? We know we'll need environmental work and to get crossing. We are able to go all the way to Spring in future iteration.

IV. Crossings (Blaine, Columbia, Palmyrita)

a. Trails would converge at gateways before crossing so all trail users would cross at one location

V. Design Considerations

a. Three Project Zones

1. Industrial: Security, lighting, existing disturbance
2. Box Springs: Lighter Touch, trees, lighting will be more directed to keep it out of homes and Box Springs, Views
3. Residential: existing bike path, lighting will need to be directed and not spilling into adjacent residences

b. Landscape: low water use species, will decrease over time as trees become established, 15-gal size

1. Native California, Industrial Park, Options; we aren't going to monocrop the trees; landscape design will be context driven
2. Gateways can call out agricultural history by creating an urban orchard

c. Lighting: keep trail secure and increase user enjoyment; solar lighting. We will need to work with manufacturers to specify models where solar panel is above tree canopy, and luminaire is below

canopy. We will be working with best practices for trail lighting

- What about battery life expectancy?
- Is there an option for centralized solar panel location re: gateway (could be integrated into shade structure + battery)
- Did you have to compute the amount of carbon sequestration? City does have a plant list. There is opportunity to get more detailed in the planting as long as we get the same amount of carbon sequestration.
- We are working on expanding the plant list submitted for the grant.
- Does anything take into account tree maintenance in the grant? As part of construction contract, we can perhaps extend the maintenance period. Will have to verify. If structural pruning is needed when trees are young, perhaps an urban conservation corps could be involved. Job training. Beginner arborist training.

d. Amenities: Signage, seating, bike racks…what would be really valuable to add?

- Pop up espresso stations
- Overall trail map (showing local connections)

e. Misc. Comments: Crossings themselves should have separate bike crossing markings, connection at Watkins is there budget to make sidewalk wider and just leave it unmarked like Irvine has done? No bollards please. City has issue of people driving down the trails. Having a small median is better. Swing gates, 'maze' gate option. Water opportunity recommend bottle filler station (work great for peds and cyclists). Trees look great when they go in, then start lifting the trail (root barriers?, distance from trail). Nice to have small pullout eg. 8-foot half dome with natural rocks so people can stop for breaks, phone calls etc. every ¼ to ½ mile. Donkeys are beginning to come this way. Connection to industrial properties so employees can use trail adjacent to the industrial section. Barnyard style gates work better for peds than gates that come down from above. Can we tap into Gage Canal water directly?

f. Erosion issues – make sure these are addressed; narrow portion that goes around box springs, may need small drainage ditch and maybe periodic drainage structures. Like the idea of the 3 contexts; doesn't have to be the same along the full corridor.

VI. Next Steps

a. Draft Master Plan – Late March

b. TAC Meeting #2 – Early April

c. Design – Complete October 2021

d. Construction – December 2021 – August 2022

NOTES FROM TAC MEETING #2

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Appendix 4

Agronomic and Geotechnical Reports

Infiltration Trench - Design Procedure	BMP ID	Legend:	Required Entries / Calculated Cells
Company Name:	Alta Planning and Design	Date:	5/5/2021
Designed by:	Alta Planning and Design	County/City Case No.:	

Design Volume

Enter the area tributary to this feature, Max = 10 acres	A_t=	1	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	6,550	ft^3

Calculate Maximum Depth of the Reservoir Layer

Enter Infiltration rate	I =	3.0	in/hr
Enter Factor of Safety, FS (unitless)	FS =	3	
Obtain from Table 1, Appendix A: "Infiltration Testing" of this BMP Handbook			
	n =	40	%
Calculate D_1. $D_1 = \frac{I\ (in/hr) \times 72\ hrs}{12\ (in/ft) \times (n/100) \times FS}$	D_1 =	15.00	ft
Enter depth to historic high groundwater mark (measured from finished grade)		50	ft
Enter depth to top of bedrock or impermeable layer (measured from finished grade)		11	ft
D_2 is the smaller of:			
Depth to groundwater - 11 ft; & Depth to impermeable layer - 6 ft	D_2 =	5.0	ft
D_{MAX} is the smaller value of D_1 and D_2, must be less than or equal to 8 feet.	D_{MAX} =	5.0	ft

Trench Sizing

Enter proposed reservoir layer depth D_R, must be ≤ D_{MAX}	D_R =	2.50	ft
Calculate the design depth of water, d_W			
Design d_W = $(D_R) \times (n/100)$	Design d_W=	1.00	ft
Minimum Surface Area, A_S $A_S = \frac{V_{BMP}}{d_W}$	A_S =	6,550	ft^2
Proposed Design Surface Area	A_D =	6,600	ft^2
Minimum Width = D_R + 1 foot pea gravel		3.50	ft
Sediment Control Provided? (Use pulldown)		Yes	
Geotechnical report attached? (Use pulldown)		Yes	

If the trench has been designed correctly, there should be no error messages on the spreadsheet.

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries; Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: Alta Planning and Design — Date: 5/5/2021

Designed by: Alta Planning and Design — Case No:

Company Project Number/Name: Gage Canal Multi Purpose Trail

BMP Identification

BMP NAME / ID: Infiltration Trench

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.64 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
1.1	*22710*	*Concrete or Asphalt*	*1*	*0.89*	*20257.3*			
1.2	*17707*	*Decomposed Granite*	*0.4*	*0.28*	*4952.9*			
1.3	*73561*	*Natural (A Soil)*	*0.03*	*0.06*	*4600.6*			
2.1	*24520*	*Concrete or Asphalt*	*1*	*0.89*	*21871.8*			
2.2	*8911*	*Decomposed Granite*	*0.4*	*0.28*	*2492.5*			
2.3	*46288*	*Natural (A Soil)*	*0.03*	*0.06*	*2894.9*			
3.1	*33731*	*Concrete or Asphalt*	*1*	*0.89*	*30088.1*			
3.2	*26969*	*Decomposed Granite*	*0.4*	*0.28*	*7543.6*			
3.3	*50106*	*Natural (C Soil)*	*0.3*	*0.23*	*11282.2*			
4.1	*12390*	*Concrete or Asphalt*	*1*	*0.89*	*11051.9*			
4.2	*11403*	*Decomposed Granite*	*0.4*	*0.28*	*3189.6*			
4.3	*38350*	*Natural (A Soil)*	*0.03*	*0.06*	*2398.5*			
	366646		*Total*		*122623.9*	*0.64*	*6539.9*	*6615*

Notes:

A & L WESTERN AGRICULTURAL LABORATORIES, INC.
1311 Woodland Avenue, Suite 1 • Modesto, California 95351 • (209) 529-4080

Report: 21-077-076

Grower: GAGE CANAL, RIVERSIDE BIKE PATH

DIAZ-YOURMAN & ASSOCIATES
1616 EAST 17TH STREET
SANTA ANA, CA 92705

Client: 90574
Page # 1 of 1
Date: 03/23/2021

Attn: BRIAN

Nematode Analysis Report

			Number of nematodes recovered per 100cc of soil																	
											CYST									
Lab Number	Sample Number	Crop Past/Present	Root-Knot (Meloidogyne)	Lesion (Pratylenchus)	Stunt (Tylenchorhynchus)	Spiral (Helicotylenchus)	Stubby-Root (Trichodorus)	Dagger (Xiphinema)	Ring (Criconemoides)	Larva	Adult	Egg	Sting (Belonolaimus)	Lance (Hoplolaimus)	Sheath (Hemicriconemoides)	Pin (Paratylenchus)	Citrus (Tylenchulus)			Comments
57499	21-01	Ornamentals							88											E**
57500	21-04	Ornamentals		N	O	N	E		D	E	T	E	C	T	E	D				A
57501	21-05	Ornamentals		N	O	N	E		D	E	T	E	C	T	E	D				A
57502	21-09	Ornamentals		N	O	N	E		D	E	T	E	C	T	E	D				A
57503	21-11	Ornamentals														36				B
57504	21-12	Ornamentals														31				B

A. None detected. If symptoms are present, check that proper sampling and shipping techniques were followed.
B. Populations and kinds detected are not likely to cause plant/crop damage or yield loss.
C. Continue to monitor populations.
D. If this is a PREPLANT situation, treatment should definitely be considered.
E. Populations and/or kinds detected may cause plant/crop damage or yield loss.
F. Populations are high and treatment may be necessary.
G. Recording crop information in the future will help to provide more meaningful recommendations, as varying tolerance levels exist.

Do not apply a nematicide that is not labeled for your specific situation.

Comments:
Ring nematode can cause damage to some ornamental trees by its feeding with its long stylet into the vascular tissue of the root system. **Check on the varietal characteristics of the ornamental you are growing before making management decisions. Pin nematode is not known to cause damage to ornamental trees/shrubs.

Analyzed by Ever-Green Nematode Testing Labs, Inc.

AGRONOMIC SURVEY SUMMARY

WALLACE LABORATORIES, LLC

365 Coral Circle

El Segundo, CA 90245

phone (310) 615-0116 fax (310) 640-6863

March 15, 2021

Brian Diaz, brian@diazyourman.com

Clint Isa, clint@diazyourman.com

Diaz Yourman & Associates

1616 East 17th Street

Santa Ana, CA 92705

RE: Job No. 2021-001

Six samples received March 10, 2021

Preliminary Report

Dear Brian and Clint,

DYB 21-01, Bulk at 0-5’

DYB 21-03, Bulk at 0-5’

DYB 21-05, Bulk at 0-5’

DYB 21-09, Bulk at 0-5’

DYB 21-11, Bulk at 0-5’

DYB 21-12, Bulk at 0-5’

Acidity/Alkalinity – The average pH is moderately alkaline at 7.74. The pH values range from 7.31 to 8.05.

Salinity – The average salinity is moderate at 1.37 millimho/cm. Salinity ranges from 0.14 millimho/cm for DYB 21-03 to 3.37 millimho/cm for DYB 21-01.

AGRONOMIC SURVEY SUMMARY

Fertility -

Nitrogen – Nitrogen is low for DYB 21-03 and DYB 21-11. Nitrogen is moderate for DYB 21-12. Nitrogen is high for the other three samples.

Phosphorus – Phosphorus is moderate for DYB 21-09 and DYB 21-12. Phosphorus is low for the other samples.

Potassium – Potassium is modest on average.

Iron – Iron is sufficient for DYB 21-09 and is low for the other samples.

Manganese – Manganese is deficient.

Zinc – Zinc is deficient.

Copper – Copper is sufficient.

Boron – Boron is moderate on average.

Magnesium – Magnesium is moderate for DYB 21-05 and DYB 21-09. Magnesium is high for the other samples.

Sulfur – Sulfur is modest for DYB 21-01 and DYB 21-09. Sulfur is low for the other samples.

Sodicity – Sodium is modest on average. SAR (sodium adsorption ratio) is 1.1 on average.

Soil organic matter – Soil is low on 0.37% on a dry weight basis on average.

CEC – The average cation exchange capacity is 10.4 milliequivalents per 100 grams. Exchangeable potassium is low. Exchangeable magnesium is moderate. Exchangeable calcium is good. Exchangeable sodium is low. Exchangeable hydrogen is good.

Growth studies are being commenced. A final report will be issued in about 2 weeks.

Sincerely,

Garn A. Wallace, Ph. D.

GAW:n

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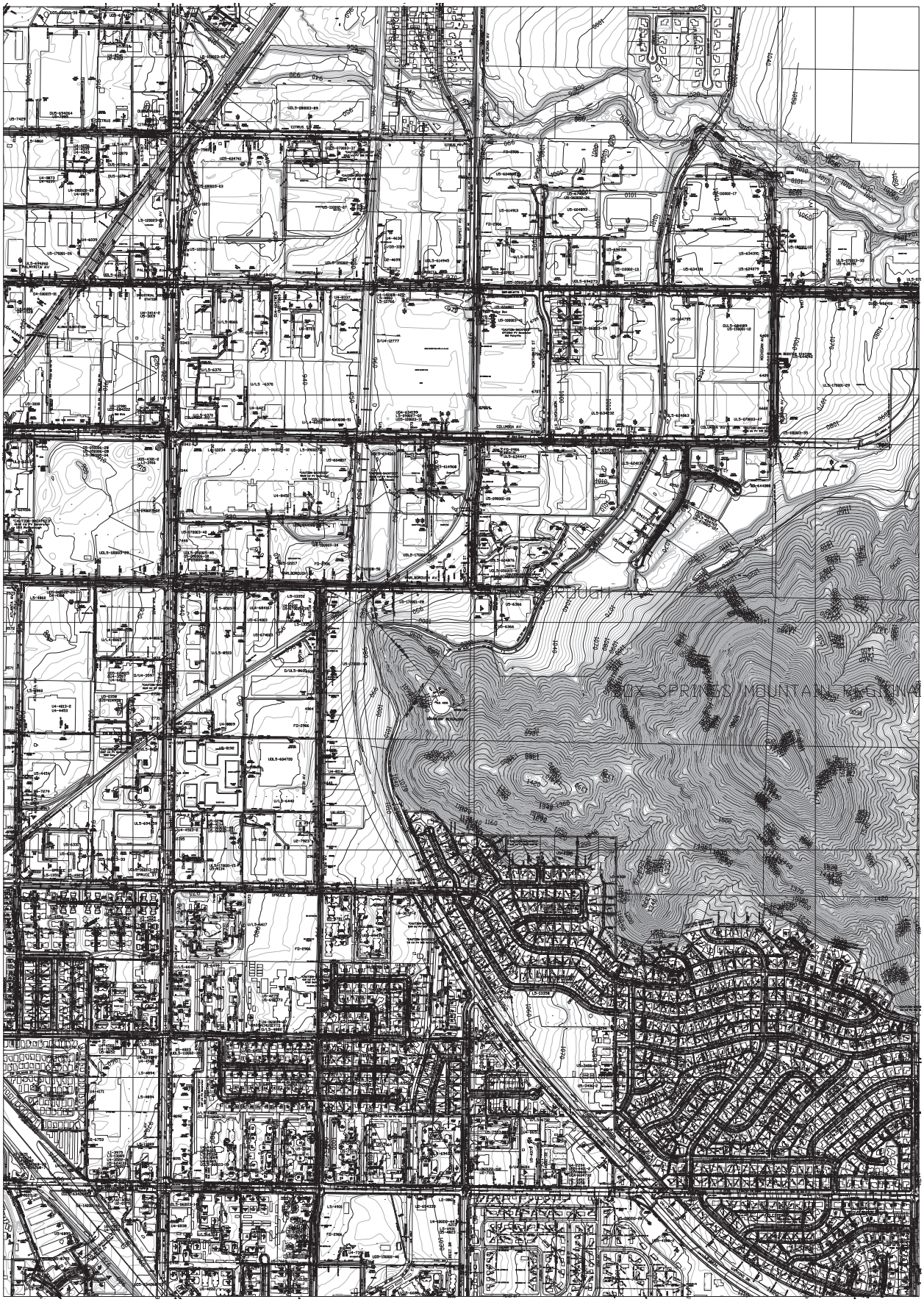
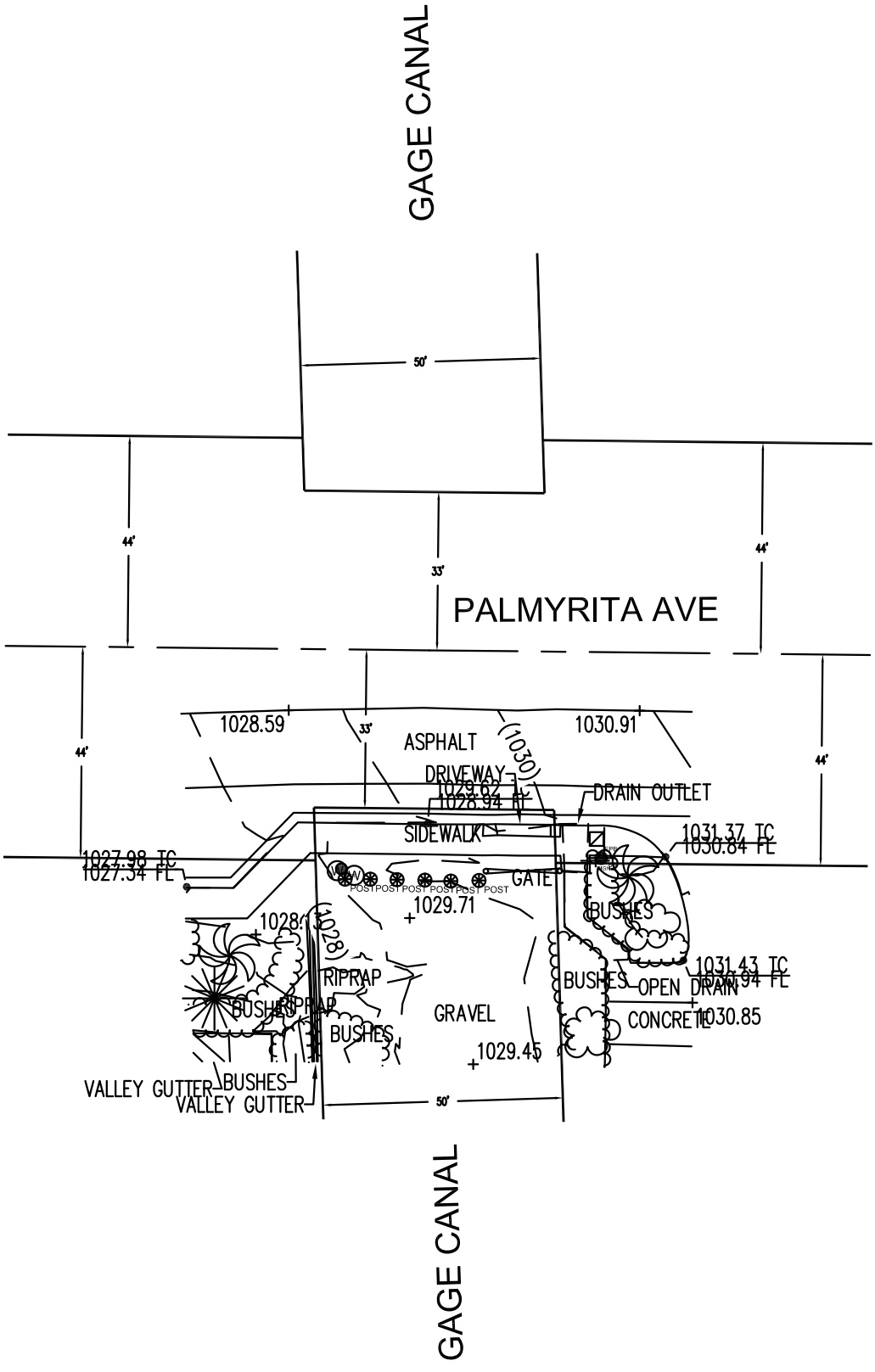
Appendix 6

Topographic Survey

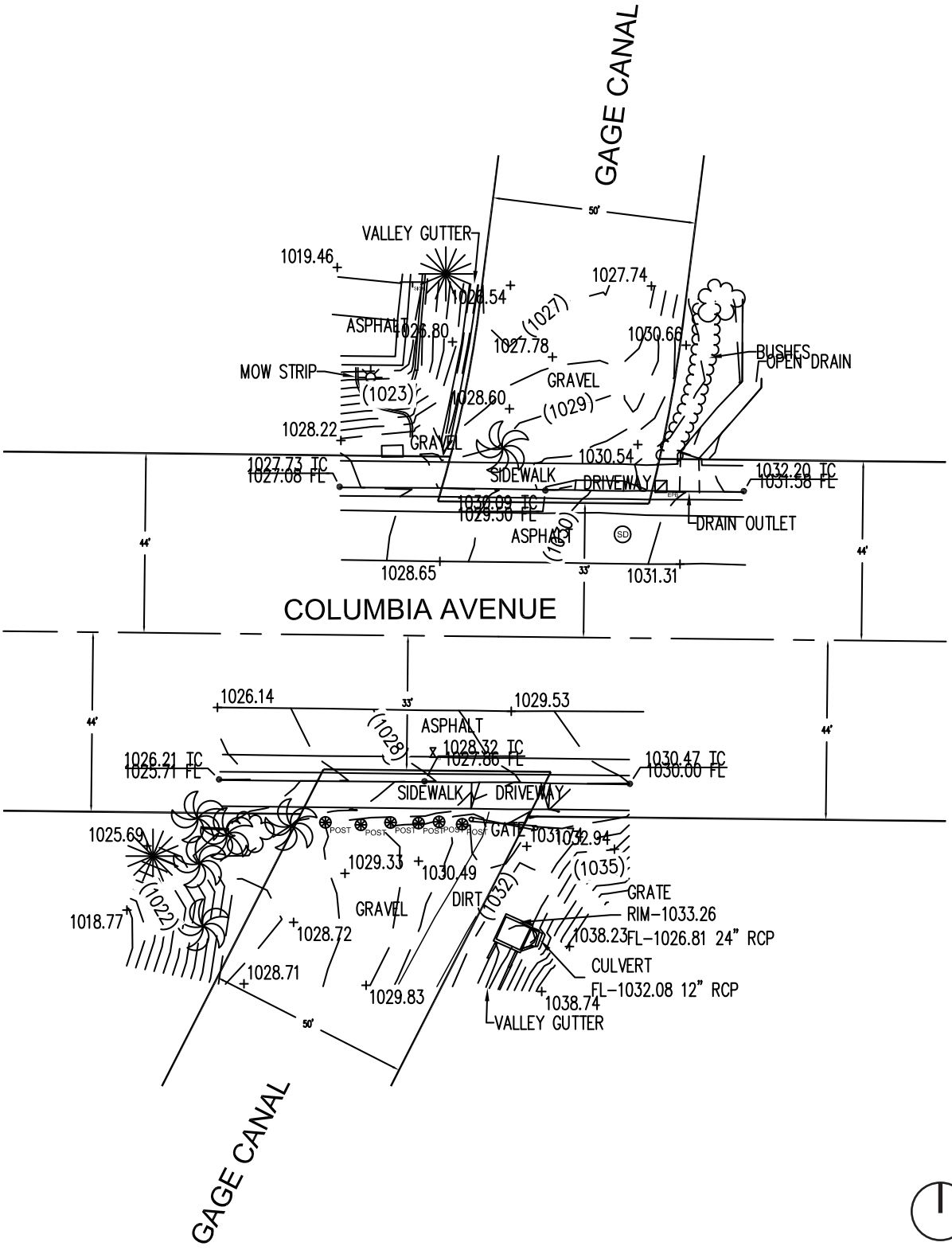
CITY-PROVIDED 1-FOOT CONTOURS



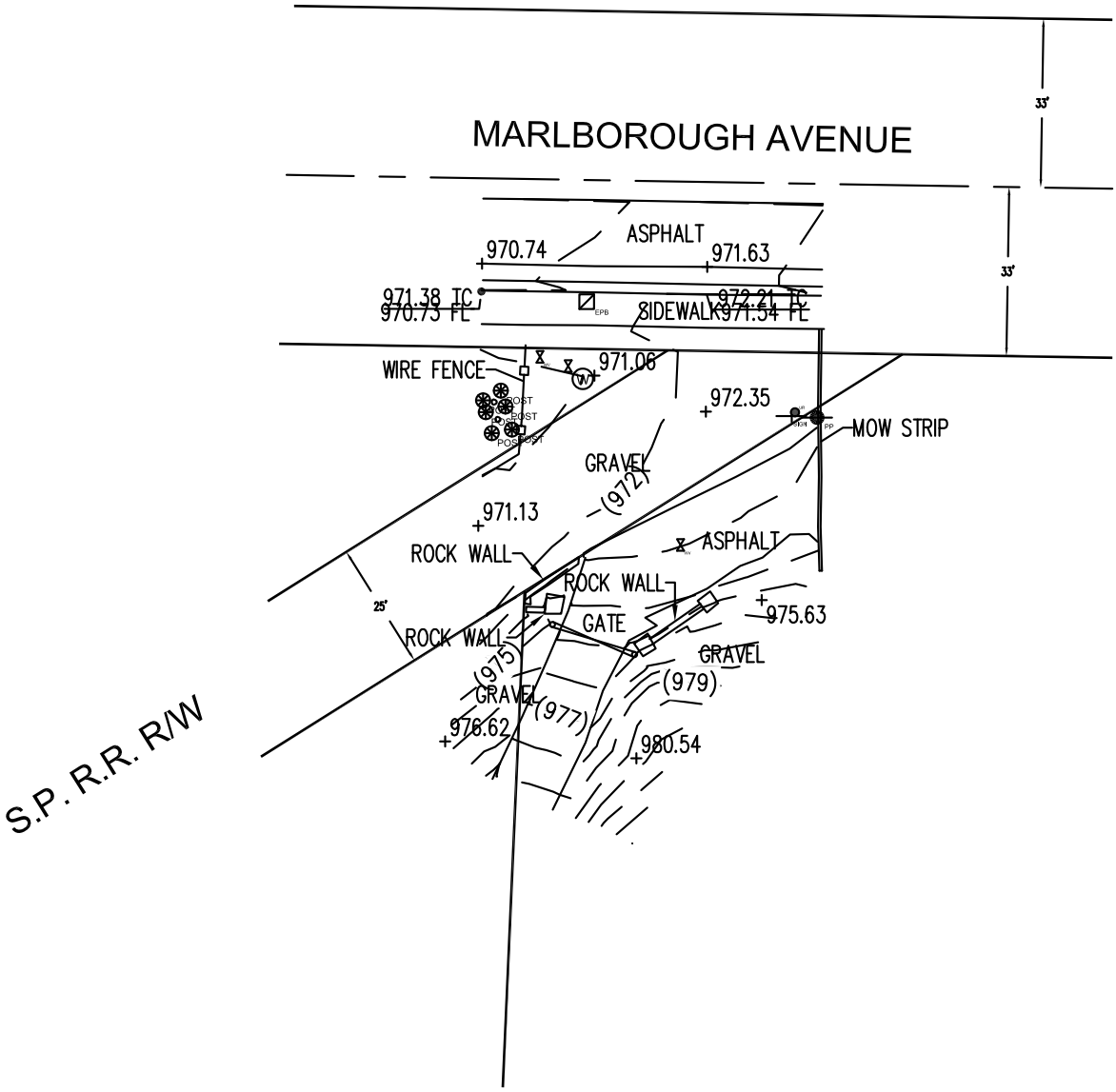
GROUND SURVEY AT INTERSECTIONS



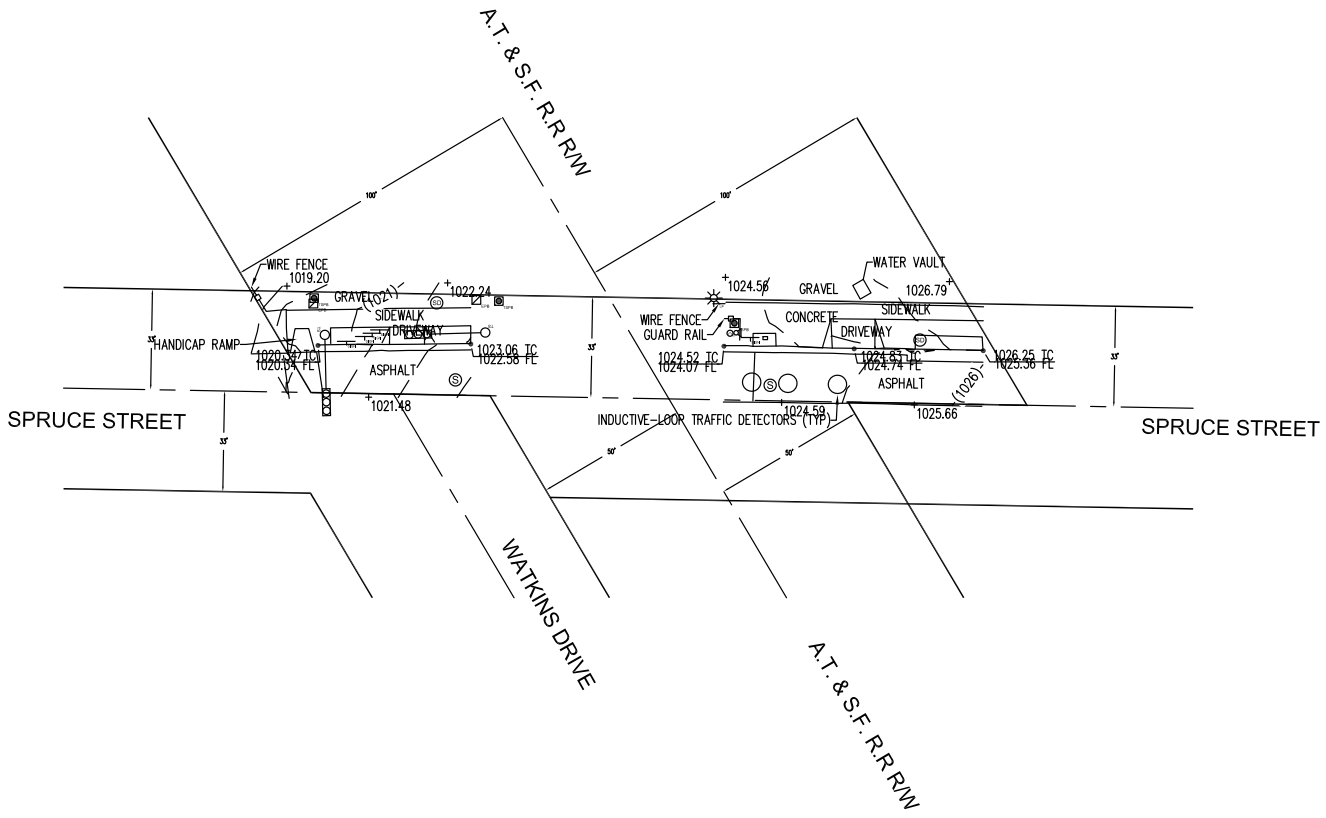
GROUND SURVEY AT INTERSECTIONS



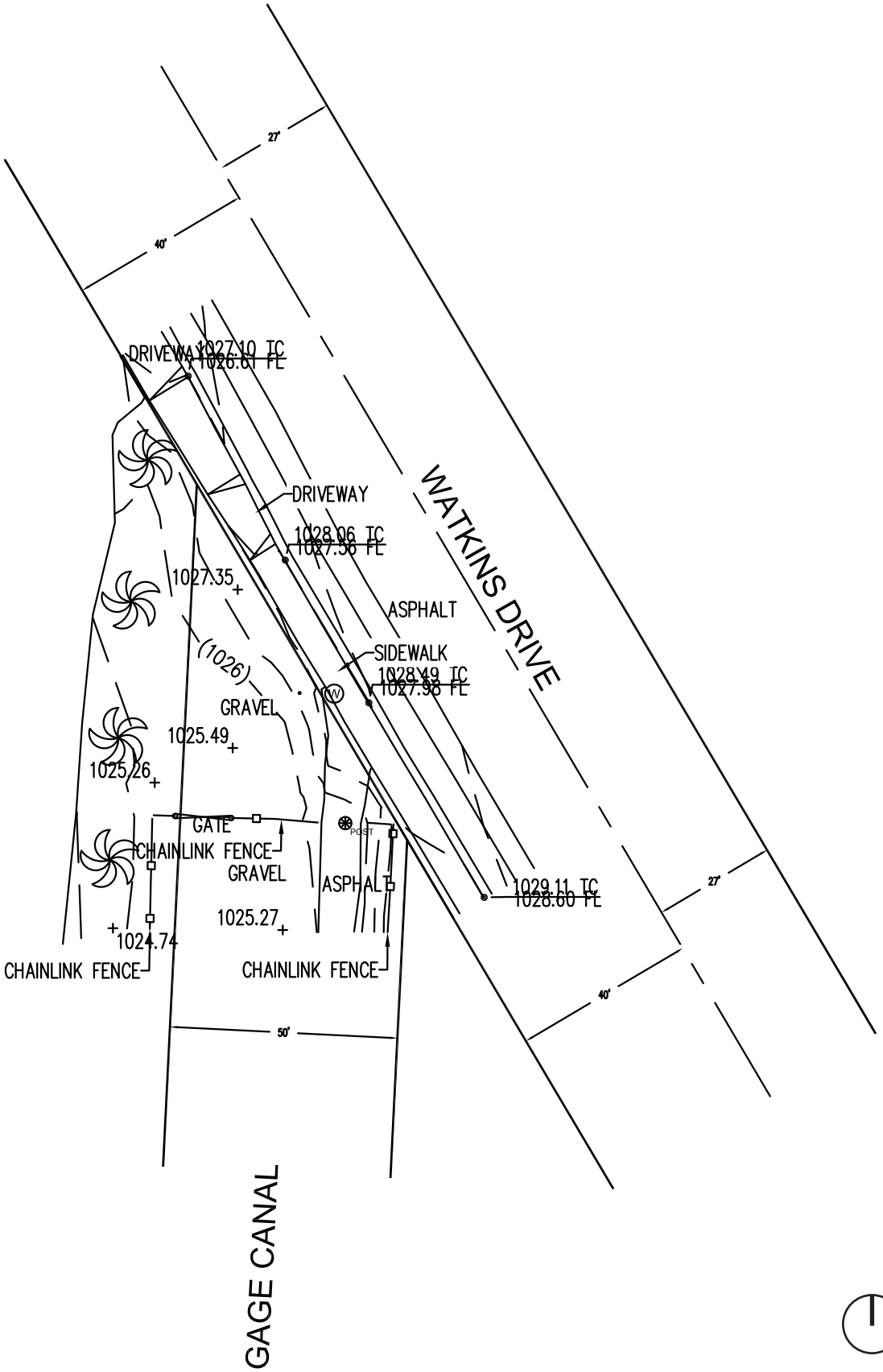
GROUND SURVEY AT INTERSECTIONS



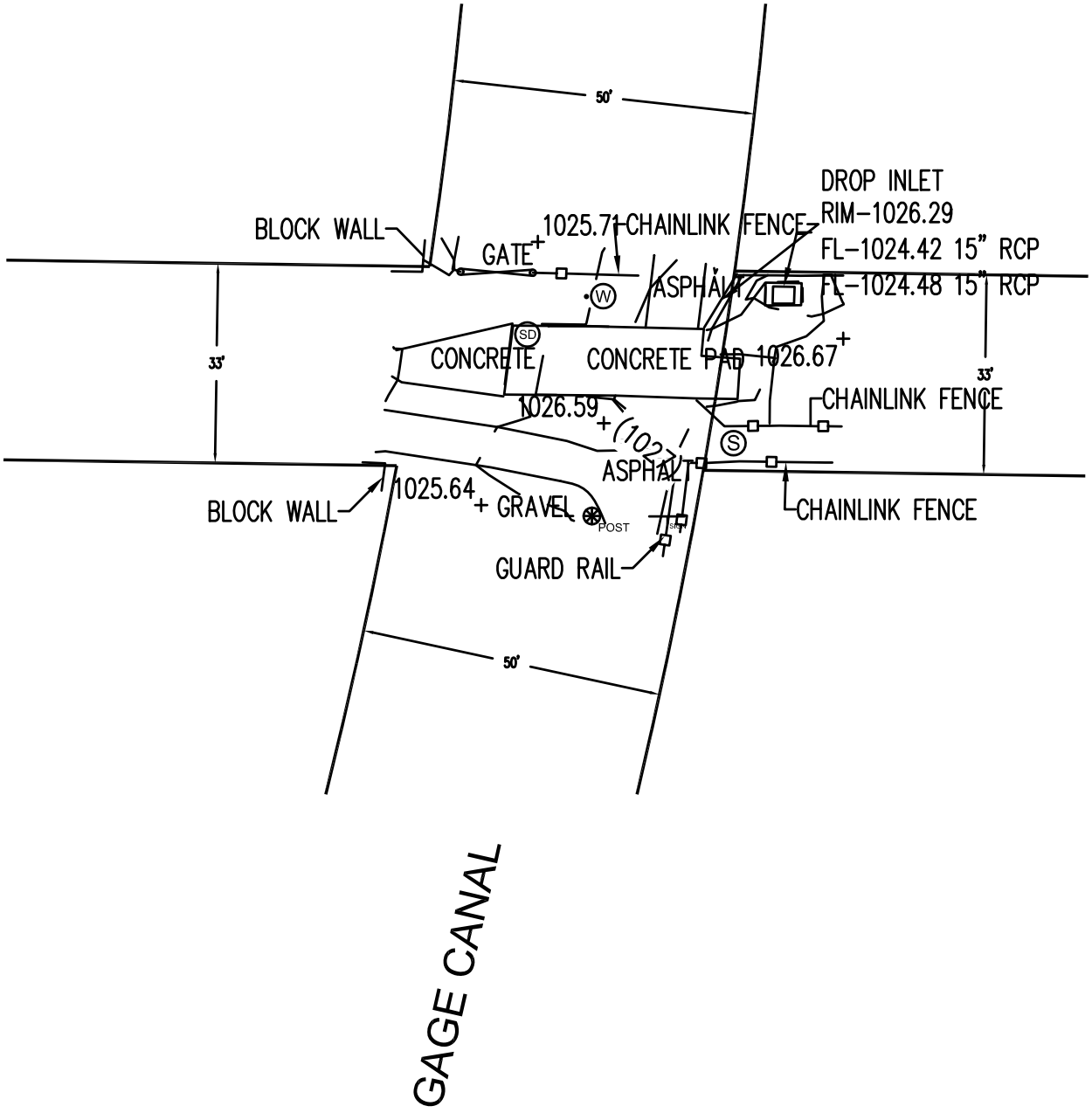
GROUND SURVEY AT INTERSECTIONS



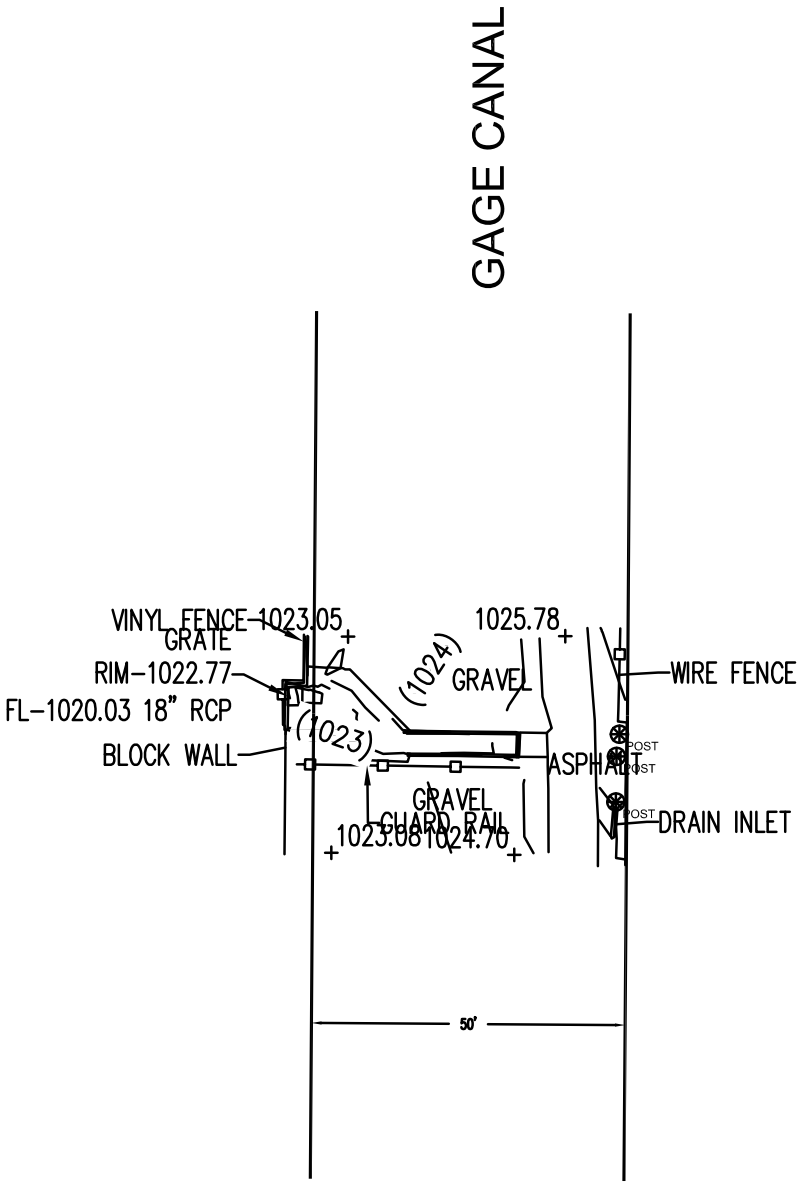
GROUND SURVEY AT INTERSECTIONS



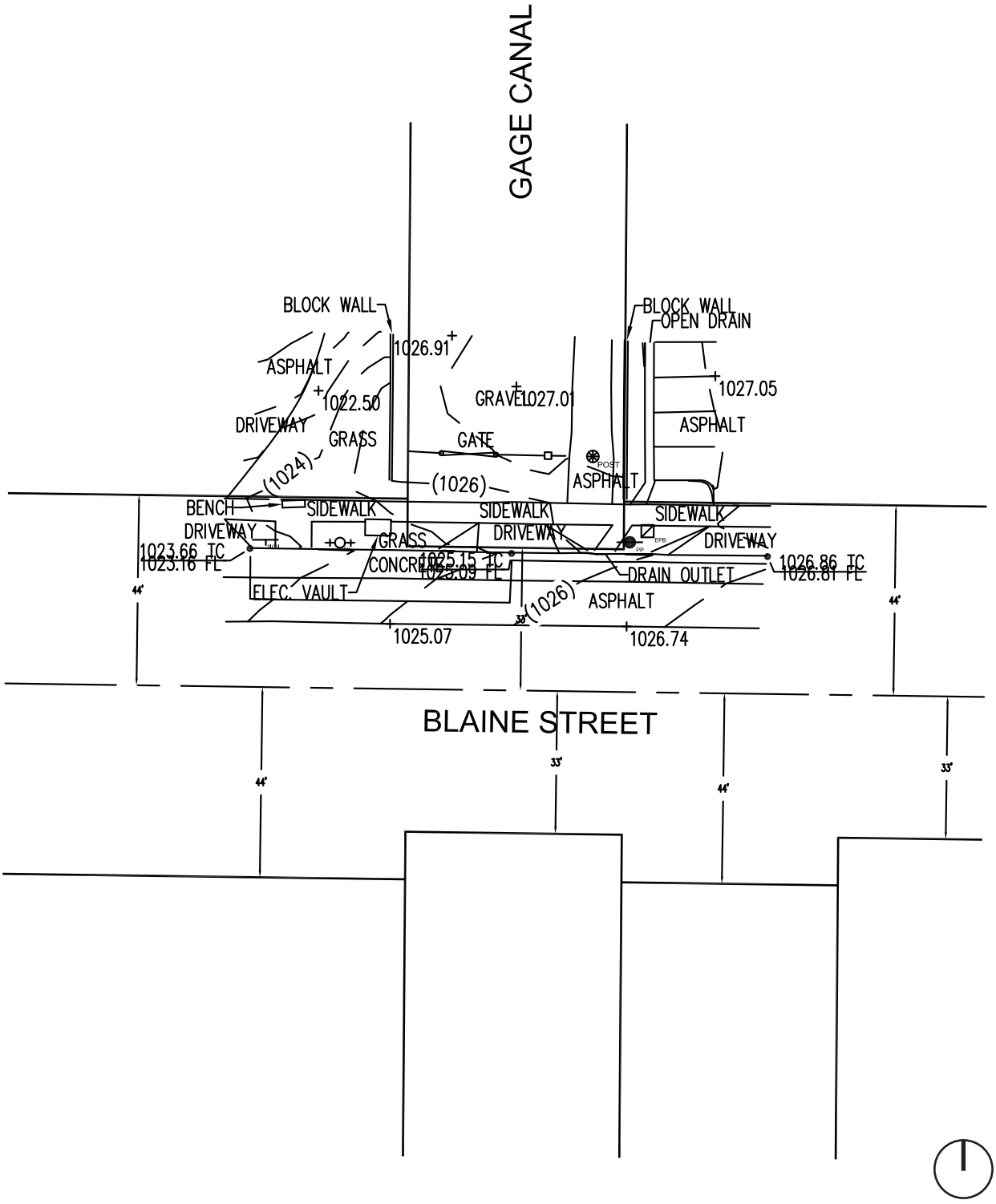
GROUND SURVEY AT INTERSECTIONS



GROUND SURVEY AT INTERSECTIONS



GROUND SURVEY AT INTERSECTIONS



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Appendix 7

35% Conceptual Plans

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