Appendix D
Preliminary Geotechnical Study Santa Ana River Trail April 5, 2011

FINAL REPORT

PRELIMINARY DESIGN GEOTECHNICAL STUDY

SANTA ANA RIVER TRAIL

RECOMMENDED CLASS I PAVED TRAIL FROM STATE ROUTE 71

TO WEST BANK SPUR NORTH OF RIVER ROAD

RIVERSIDE COUNTY, CALIFORNIA

Prepared by

WRC Consulting Services, Inc.

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April 5, 2011

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1.0 GENERAL

The Regional Santa Ana River Trail (SART) has been designed to provide a recreation and alternative-transportation corridor for bicyclists, equestrians and pedestrians. The subject Santa Ana River Trail Project from the Orange/Riverside County line to the Hidden Valley Wildlife Area is a joint effort among the Riverside County Regional Parks and Open Space District, the cities of Corona and Norco, and the Jurupa Community Services District (JCSD). Many alternatives were analyzed and evaluated, and the final recommended paved and soft trails are stated in the 2011 Santa Ana River Trail Master Plan Report. As part of the Master Plan, WRC Consulting Services, Inc., has prepared Preliminary Design Plans (35%-level design) for the recommended Class I paved trail along the river and Concept Plan for bike trails along the streets.

The 35%-level design plans for the Santa Ana River Class I paved trail include the following segments:

- Line B – From the 71 Freeway to the Wastewater Treatment Dike
- Line C – From the Wastewater Treatment Dike to OCWD Property
- Line D – From River Road to Archibald Avenue at Prado Basin Road

The recommended paved trail alignment is shown in Figure 1. In addition to the recommended paved trail, other paved trails which are not part of the 35% Preliminary Design include, but are not limited to,: the newly constructed River Road Bridge trail, the future recommended Class I paved trail from Stage Coach Drive to the River Road Bridge (along the toe of the east bluff within private properties), the paved trails in Eastvale to be designed and constructed by JCSD, and the Hamner Bridge trail by the City of Norco.

A geotechnical study was performed to evaluate the underlying soil conditions of the recommended paved trails along Lines B, C and D stated above. This study included a review of site conditions, aerial photographs, previous soils laboratory test data, and previous geotechnical reports for adjacent projects. This study resulted in general geotechnical engineering recommendations including pavement and soils preparation in support of the above-referenced plans. Geology and hydrogeology features were briefly reviewed based on Prado Dam data provided by the Los Angeles District, U.S. Army Corps of Engineers (USACE).

Geotechnical evaluations were performed and pavement and soils preparation requirements were identified for trail segments located adjacent to developed areas, flood-control facilities, or other facilities currently under design or construction. These areas have been studied and explored previously for other projects, and soils tests, boring logs and geotechnical studies are available for detailed review. (see attached Soils Preparation Maps on Sheets C-04 through C-07, Sheets C-11 through C-17, and Sheets C-20 through C-28). The data mentioned above are

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Class I Bike Trail Preliminary Design Reach
Class I or Class II Bike Trail by others (Future Design)
Existing Bike Trail

0 5,000 10,000 Feet

Figure 1 Recommended Trail Alignment

not available for the following three segments: (1) between Pomona-Rincon Road and the Wastewater Treatment Dike, (2) at the Knoll (north of Rincon Street), and (3) along the West Bank Spur (north of the River Road Bridge). These areas involve sensitive habitats, unstable bluffs, inhomogeneous soils conditions, water ponds, and encroachment into the Santa Ana River. New field-exploration tests were not performed due to extensive sampling costs relating to inhomogeneous field conditions, accessibility problems, and habitat-disturbance potentials. The construction costs, efforts, environmental disturbance, and potential alignment changes for final construction do not warrant the immediate work requirements. Future boring, testing, investigation and study are recommended in these areas and at any proposed structure locations (e.g., storm drains and bridges) prior to detailed design when the environmental clearance is granted, project alignment is confirmed, and funding for construction is secured.

2.0 PROPOSED DEVELOPMENT

The purpose of this project is to construct paved trails for bikeways (and other common uses for maintenance vehicles and hiking) as well as unpaved trails for equestrian use along the Santa Ana River. The preliminary design plans describe trail sections for various reaches (see Sheets T-04 and T-04A). In general, the paved trail has a 12- to 14-foot width including 8- to 10-foot-wide asphalt concrete pavement and 2-foot unpaved shoulder on each side. Where the trail is jointly used for bike, equestrian, hiking and maintenance (at the Knoll), and asphalt concrete is not suitable pavement material, a rubberized asphalt pavement is recommended. The soft trail with decomposed granite surface (DG) generally has no geotechnical concerns and is not a focus of this study.

3.0 GEOLOGY

This section provides a review of the geology features of the project area based on Appendix B: Geotechnical, Santa Ana River Design Memorandum No. 1, Phase II GDM on the Santa Ana River Mainstem Project including Santiago Creek, Vol. 2: Prado Dam, prepared by USACE Los Angeles District in 1988.

3.1 Regional Geology

The planned Santa Ana River Trail follows the ancestral flood path of the Santa Ana River. The river has cut a wide path into the underlying rocks and has deposited broad areas of alluvium at the surface, including older Pleistocene alluvium in the ancestral floodplain and recent (Holocene) alluvium in the active flood and river channel.

Prado Dam is located at the western end of the trail at the eastern tip of the Chino Hills (also known as the Eastern Puente Hills) at the head of Santa Ana Canyon. These hills are composed of Tertiary-age (Eocene to Pliocene) sedimentary rocks which overlie a basement complex consisting chiefly of granodioritic and associated plutonic rocks of the Cretaceous Age. Most of the rocks exposed in the Chino Hills belong to the Puente Formation of the Upper Miocene Age. These sediments consist of friable sandstone with hard siltstone and shale interbeds and scattered conglomerate lenses.

The basement complex does not outcrop in the immediate project area. Oil well data indicate that the top of the basement rocks is at an average depth of 4,000 feet below sea level near the Chino fault, decreasing to about 1,000 feet below sea level in the area north of the Prado Flood Control Basin.

The Chino Hills and the Puente Hills to the northwest comprise a structural unit that has been uplifted between the Whittier Fault, which forms the southwestern margin, and the Chino Fault, which forms the eastern margin of these hills. Uplift of the region occurred during the past two to three million years and deformed the Puente Formation with extensive warping and faulting. The warping generally trends northwest to southeast, paralleling the major faults. There are numerous minor faults between the Whittier and Chino Faults, which trend in two general directions: northwest to southeast, or parallel to the major faults; and northeast to southwest, perpendicular to the major faults.

3.2 Local Geology

The general site geologic conditions have been explored in the Prado Basin and Santa Ana River area as documented in Plate B-1, Appendix B, Volume 2 Prado Dam of the 1988 Santa Ana River GDM stated above.

The abutments, spillway and outlet works of Prado Dam are founded on the same Puente Formation exposed in the Chino Hills. The stream-bed portion of the dam is founded on alluvium up to 90 feet thick. The foundation bedrock is composed of the uppermost portion of the Puente Formation, known as the Sycamore Canyon member. The rock is characterized locally by white friable sandstone interbedded with conglomerates and brown, very fine-grained sandstone and siltstone. The majority of the alignment is located over older Pleistocene alluvium deposited by the ancestral Santa Ana River.

Seven areas reviewed in the 1988 study in Borrow Area No. 1 (near Prodo Dam Spillway and western end of Auxilliary Dike) and Borrow Site No. 2 (along east side of Chino Creek outlet), the auxiliary dike, and the dikes constructed for the California Institution for Women, the Alcoa Aluminum Plant, the Corona Sewage Treatment Plant, and the Corona National Housing Tract. Conditions were found to be similar, and underlain by alluvial sediments. Bedrock does not outcrop in these areas, although it was identified in prior borings. Sandstone, representative of the Sycamore Canyon member of the Puente Formation, was present at an average depth of 35 feet, eventually dropping off at depths below 75 feet beneath Borrow Area No. 1.

Holocene alluvial materials present consist of two types: (1) active stream channel and associated floodplain deposits of the Santa Ana River, Temescal Wash, and other water courses, including those incised stream courses on the Corona compound alluvial fan; and (2) lacustrine deposits in the Prado Reservoir. Older, generally Late Pleistocene-Age alluvial sediments include terrace deposits along the northeastern fan of the Santa Ana Mountains and along the Santa Ana River east of the I-15 Freeway and some of its larger tributaries, and alluvial fan deposits in the Corona area.

3.3 Geologic and Erosion Hazards

There is no known geological hazards associated with the proposed paved trail. Surface erosion hazards, however, may occur where steep slope exists (e.g. Line D andPart of Line C at the Knoll) pending on the future detailed geotechnical findings (see Section 5.0). the unpaved portion of the trail, road, and side slopes along Line B where trail ascends from the base of the spillway outlet to the top of the spillway bluff may be subject to erosion and a drainage ditch was proposed along the trail pavement to convey the flows and reduce erosion. At the base of the spillway, trail pavement is subject to damage and replacement when the spillway flow occurs and the roadway base is washed out. The probability for this event to occur is extremely low.

4.0 HYDROGEOLOGY

Prado Dam and that portion of the adjoining Prado Dam Flood Control Basin west of the Santa Ana River lie at the southwestern edge of the Chino Basin, the largest basin in the Upper Santa Ana Valley. The area near Alcoa Dike and Rincon Street lies at the northern edge of the Temescal Basin, which occupies the northwest end of the Elsinore structural trough. Underflow from adjacent basins and recharge from runoff and rainfall are the main sources of groundwater in the basins.

The project area lies within a zone of shallow groundwater. The groundwater flows in the project area move generally west and southwest along the river, converging toward Prado Dam (see Figure 2). This was taken from Appendix B: Geotechnical, Santa Ana River Design Memorandum No. 1, Phase II GDM on the Santa Ana River Mainstem Project including Santiago Creek, Vol. 2: Prado Dam, prepared by the USACE Los Angeles District in 1988. The groundwater contours were referred to in the following groundwater impact assessment. The topographic survey maps used for the 35% level design were applied in lieu of the contour maps shown in the map, which were found to be inconsistent with the detailed survey in several locations.

In general, the depths to groundwater are shallowest (between 10 to 50 feet) along the Santa Ana River channel and Prado Basin, increasing to between 50 and 100 feet on high banks and bluffs. Specifically, groundwater depths were evaluated by comparing the trail profiles shown on the preliminary plans to those indicated in Figure 2. The evaluation results are summarized for the segments which were found to have high flood inundation potentials as documented in "Santa Ana River Trail Preliminary Design Drainage Study Report for Class I Recommended Paved Trail from Route 71 to West Bank Spur North of River Road Bridge", prepared by WRC Consulting Services, Inc., dated April 2011:

- Between Pomona-Rincon Road (Auto Center Drive) and Wastewater Treatment Dike - Trail is at 513 to 530 ft msl (29 NGVD) and groundwater is between 500 and 510 ft msl (29 NGVD). Note that the Prado Basin conservation pool is at 505 ft msl (29 NGVD).
- Clearwater Drive - Trail is at 525 ft msl (29 NGVD) and groundwater is at nearly 510 ft msl (29 NGVD)
- The Knoll - Trail is at 525 to 528 ft msl (29 NGVD) and groundwater is at nearly 510 ft msl (29 NGVD).
- Prado Basin Park to Archibald Avenue/Prado Basin Park Road - Trail is at 540 ft msl (29 NGVD) approximately from Station 818+00 to 831+00, Line D and Groundwater level is at 530 ft msl (29 NGVD).

The estimated depth to groundwater ranges from less than 10 to approximately 20 feet below the trail elevation. Considering the seasonal fluctuation of the groundwater, construction in this area may encounter groundwater, and more site-specific and detailed groundwater monitoring is required, especially for pavement foundations requiring substantial overexcavation, bridge substructures, and storm drain crossings.

LEGEND

—— 10 — — CONTOUR LINE SHOWING MINIMUM DEPTH TO GROUNDWATER DURING 1973–1979 PERIOD, DASHED WHERE APPROXIMATELY LOCATED, DEPTH IN FEET BELOW LAND SURFACE.

—— 500 —— CONTOUR LINE SHOWING APPROXIMATE GROUNDWATER ELEVATION IN FEET.

— — • • ? • • FAULT, DASHED WHERE APPROXIMATELY LOCATED, DOTTED WHERE CONCEALED, QUERIED WHERE UNCERTAIN.

NOTES:

1. MINIMUM DEPTH TO GROUNDWATER CONTOURS FROM CARSON AND MATTI (1985).
2. GROUNDWATER ELEVATION CONTOURS DERIVED FROM PUBLISHED SOURCES AND CORPS OF ENGINEERS FIELD INVESTIGATIONS.
3. SEE PLATE 1 FOR LOCATION OF VARIOUS PROJECT FEATURES.

SCALE 1:48000

½ 0 1 2 MILES

CONTOUR INTERVALS 20 AND 25 FEET. DOTTED LINES REPRESENT 5-AND 10-FOOT CONTOURS.
DATUM IS NATIONAL GEODETIC VERTICAL DATUM OF 1929

DATUM IS NATIONAL GEODETIC VERTICAL DATUM OF 1929

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
REVISIONS			

U. S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SANTA ANA RIVER MAINSTEM, CALIFORNIA
PHASE II GENERAL DESIGN MEMORANDUM

PRADO DAM

GROUNDWATER CONTOURS

DESIGNED BY: DRAWN BY: CHECKED BY: SUBMITTED BY: DATE APPROVED: SPEC. NO. DACW09-____ B-____ DISTRICT FILE NO. SHEET OF

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Figure 2
Groundwater Contours

5.0 GEOTECHNICAL EVALUATION

All grading shall be accomplished under the observation and testing of the Project Geotechnical Engineer and/or their authorized representatives, in accordance with the recommendations contained herein and the current Building Code requirements.

5.1 Removals

The surface soils along the alignment will require removal and re-compaction of between one to five feet to provide a firm base for the trail. The removal depth is based on the type of soil, the anticipated use (loading), and the thickness of the proposed overlying engineered fill. The anticipated depths of removal are outlined below by trail segment. This provides a general guidance for design and estimates in this project. Deviation from this value and the excavation depth and extent at critical areas such as bridges, ditches and culverts shall be determined based on site-specific field tests and/or investigations during grading operations.

The excavated on-site materials may be inspected by the soils engineer and reused for compaction-fill if these are free of organics and debris.

5.1.1 Station 273+76 to 279+50 (Line B)

The proposed river trail alignment extends from the existing trail to the southern side through the toe of the existing spillway. The soils underlying this area consist of sand, silty sand, and clayey sand (artificial fill and alluvium; Source Reference: Santa Ana GDM Vol. 2, Prado Dam Geotech Plate.pdf report, Rotary Boring R83-17 and Trench TT83-1). Following clearing, grubbing, and removing organic debris, it is recommended that loose or soft soils be over-excavated and replaced with certified compacted fill. The depth for removal, fill and re-compaction was estimated to be 3 to 5 feet with a fill cap extending a minimum 1-to-1 projection beyond the edge of the river trail for pavement support. (This means that removals would extend out from 3 to 5 feet wider than the anticipated trail edges.)

5.1.2 Station 279+50 to 302+21 (Line B)

The soils underlying this area consist of sandstone and siltstone bedrock (Tpsc Puente formation) and older alluvium (coal) (Source Reference: Santa Ana GDM Vol. 2, Prado Dam Geotech Plate.pdf report, Seismic Trench RS83-1 & RS83-2). After the construction area is clear of all vegetation and organic materials, it is recommended that loose or soft soils be over-excavated and replaced with certified compacted fill. The depth for removal, fill and re-compaction was estimated to be 1 to 3 feet with a fill cap extending a minimum 1-to-1 projection beyond the edge of the trail for pavement support.

5.1.3 Station 302+21 to 354+00, Line B (Auxiliary Dike and Ramp)

In this area, the trail is proposed on the asphalt concrete-paved maintenance road on top of the Prado Dam Auxiliary Dike. The dike is to be constructed by the Los Angeles District of the U.S. Army Corps of Engineers, and no new pavement is required. Trail striping and fencing will be added to the dike either during or after dike-construction (depending on schedule, funding, and inter-agency agreement).

5.1.4 Station 354+00 to 358+36, Line B (Existing Access Road)

The soils underlying this area consist of sandy silt, sandy clay and silty sand (alluvium and terrace deposits; Source Reference: AuxDike_Geotechnical Logs). The trail alignment must be clear of all vegetation and organic materials. Any incompetent soils (loose or soft soils) must be removed prior to trail surface paving and replaced with certified compacted fill. The depth for removal, fill and re-compaction was estimated to be 1 to 3 feet with a fill cap extending a minimum 1- to-1 projection beyond the edge of the trail for pavement support.

5.1.5 Station 358+36 to 377+00, Line B (Pomona-Rincon Road, Auto Center Drive)

The soils underlying this area consist of sandy silt, sandy clay and silty sand (Source Reference: AuxDike_Geotechnical Logs, TH75-26 through TH75-29, TH79-5, TT79-6, TH79-9 and TH80-2). After the trail alignment is clear of all vegetation and organics, it is recommended that loose or soft soils be over-excavated and replaced with certified compacted fill. The depth for removal, fill and re-compaction was estimated to be 1 to 3 feet with a fill cap extending a minimum 1-to-1 projection beyond the edge of the trail for pavement support.

5.1.6 Station 377+00 to 394+00, Line B

The soils underlying this area consist of sandy silt, sandy clay, clayey sand, sandy gravel and silty sand (Source Reference: AuxDike_Geotechnical Logs, TH75-26 through TH75-29, TH79-5, TT79-6, TH79-9, and TH80-2). Soils in this reach are expected to contain organic debris due to drainage-concentration and its proximity to riparian woodland. Vegetation and organic materials must be cleared, and loose or soft soils must be excavated prior to fill and re-compaction for trail pavement placement. The depth for removal, fill and re-compaction was estimated to be 3 to 5 feet with a fill cap extending a minimum 1-to-1 projection beyond the edge of the trail for pavement support.

5.1.7 Station 394+00 to 429+51, Line B

The soils underlying this area consist of sandy silt, silty gravelly sand, sandy clay, and sand/clayey sand (Source Reference: Dike at Corona Sewage Treatment Plant, Foundation Soil Logs TT87-9, TT87-10, and TH-87-10). After the trail alignment is clear of all vegetation and organics, it is recommended that the loose or soft soils be over-excavated and replaced with certified compacted fill. The depth for removal, fill and re-compaction was estimated to be 3 to 5 feet with a fill cap extending a minimum 1-to-1 projection beyond the edge of the trail for pavement support.

5.1.8 Station 429+51, Line B (Station 500+00, Line C) to 523+40, Line C (Wastewater Treatment Dike)

This trail alignment has been constructed on the bench of the Wastewater Treatment Dike embankment. No geotechnical data is needed.

5.1.9 Station 523+40 to 538+34, Line C (Near Clear Water Road) and Station 538+34 to 567+80, Line C (Airport Next to Butterfield Road)

The soils underlying this area consist of sandy silt, silty gravelly sand, sandy clay, and sand/clayey sand (Source Reference: Dike at Corona Sewage Treatment Plant, Foundation Soil Logs TH87-1, TH87-2, and TH87-3). After the trail alignment is clear of all vegetation and organics, it is recommended that the loose or soft soils be over-excavated and replaced with certified compacted fill. The depth for removal, fill and re-compaction was estimated to be 1 to 3 feet with a fill cap extending a minimum 1-to-1 projection beyond the edge of the trail for pavement support.

5.1.10 Station 567+80 to 578+00, Line C (Alcoa Dike)

This segment of the trail is proposed along the toe of a planned dike to be constructed by the Los Angeles District of the U.S. Army Corps of Engineers to protect the Alcoa facility. As such, we have not provided any geotechnical recommendations for this section of the trail. Once approved, the proposed trail design will be incorporated in the dike construction.

5.1.11 Station 578+00 to 590+73, Line C (Next to Rincon Street)

The soils underlying this area consist of an existing compacted fill area that previously served as earthen berms for wastewater ponds. After the trail alignment is clear of all vegetation and organics, it is recommended that any loose or soft soils be over-excavated and replaced with certified compacted fill. The depth for removal, fill and re-compaction was estimated to be 3 to 5 feet with a fill cap extending a minimum 1-to-1 projection beyond the edge of the trail for pavement support.

5.1.12 Station 590+73 to 591+53, Line C (Temescal Wash Crossing)

This section of the trail includes a trail bridge. There is no existing geotechnical information on the immediate area. Geotechnical information from nearby projects includes Rincon Street and Temescal Wash Bridge improvement data. The bridge was built in 1995-96 with the following parameters (refer to City of Corona, Rincon Street Phase II Improvement As-built drawings, Sheets 14 through 20 of 21):

- Pile Diameter: 16 inches
- Pile Capacity: 45 tons
- Estimated Depth of Piles: 50 feet below the existing grade

- Number of Piles: six piles at each of the Abutment Nos. 1 and 4 and nine piles at each of Bent Nos. 2 and 3

The trail bridge to be located downstream of this existing bridge was designed to have similar dimensions, but the future detailed design will require additional site-specific geotechnical exploration, evaluation, and recommendation. The above information is useful for general planning only.

5.1.13 Station 591+53 to 618+71, Line C

The soils underlying this area consist of gravelly sand and silty sand (Source Reference: City of Corona, Rincon Street Phase II improvement, Sheet 21 of 21, Foundation Soil Logs B-1, B-2 and B-3). The area is overgrown with vegetation and possibly has high organic contents in the soils. These must be cleared, and loose or soft soils must be excavated prior to fill and re-compaction for trail pavement placement. The depth for removal, fill and re-compaction was estimated to be 1 to 3 feet with a fill cap extending a minimum 1-to-1 projection beyond the edge of the trail for pavement support. The area north of Rincon Road (Station 609+60, Line C) may require deeper soils removal.

5.1.14 Station 618+71 to 684+73, Line C (The Knoll)

This area of the trail is located along the base of the steep hills downslope from the existing developments. No site-specific geotechnical data are available for geotechnical evaluation. The trail area traverses thick brush, and no topographic maps are reliable for grading evaluation in the reach from Station 627+54 to 646+00, Line C. This reach does not have an access road and may be inundated frequently by river flows (based on elevations shown on the City of Corona 2007 topographic maps adjusted with the WRC survey data in the adjacent roads). Substantial grading may be needed to raise the trail pavement above the frequent flood inundation level. (520 ft msl is the 10-year flood inundation level from Prado Basin. See Drainage Study Report stated in Section 4.0.) The remaining reach has an existing unpaved access road, but there will be no ready access to public streets until the future trail within the OCWD property is completed (by other project). The existing access road is adjacent to the sensitive habitat area of the Santa Ana River.

Because this area is subject to high groundwater, frequent inundation, inaccessibility, and environmental sensitivity (which will not allow for frequent maintenance), the trail was designed with reduced width (8'-wide pavement) and rubberized asphalt concrete pavement (in lieu of asphalt concrete pavement). To reduce overall grading and disturbance, this trail will be jointly used by bikers, equestrian users, hikers, and light maintenance vehicles and is referred to in the Master Plan as the multi-purpose soft service trail.

Due to the lack of available information and potential high groundwater, it is recommended that a detailed geotechnical investigation be performed prior to final design and recommendations. Several borings may be needed in areas of anticipated grading. Early planning and permitting for field work is essential due to the access and habitat issues mentioned above.

5.1.15 Station 800+00 to 836+52, Line D (West Bank Spur North of River Road)

This area is not accessible and involves steep terrain and moderate vegetation. In general, the reach will require clearance, organic materials removal, grading, compact fill, drainage control, and slope stabilization. The reach from the River Road to north of the existing paved road at Prado Basin Park (Station 812+00, Line D) is situated on the high banks, lacking groundwater concern. The reach from Station 818+00 to 831+60 is subject to flood inundation and high groundwater. Due to the lack of available information, it is recommended that a detailed geotechnical investigation be performed along this portion of the alignment before final design recommendations are made. We recommend using a backhoe to clear a roadway for a drilling rig and to excavate exploratory trenches. Several borings may be needed in areas of anticipated grading. To avoid substantial disturbance to vegetation and the steep slopes, the trail was designed to follow the existing unpaved path. This alignment can be modified to raise the trail elevations if future recommendations provide sufficient justification.

5.2 Processing of On-Site Soils

Areas to be processed shall be thoroughly ripped to a depth of six to twelve inches, brought to optimum moisture content or above, thoroughly mixed to obtain a near-uniform moisture condition and uniform blend of materials, and then compacted to 90% of the latest ASTM D1557 laboratory maximum density. The on-site soil characteristics (unit weight and optimal moisture) will need to be determined prior to final design with field test data.

5.3 Shrinkage Factor

The on-site soil is expected to “shrink” or decrease in volume between 10 and 24 percent based on previous studies (this is not applicable to the areas without previous investigation). These shrinkage factors are based on *in-situ* densities compared to a minimum compaction of 90 percent relative to the maximum dry density determined per the latest ASTM D1557 test. The shrinkage factors are only approximate; relative compaction greater than 90% will result in higher shrinkage factors.

6.0 PRELIMINARY PAVEMENT DESIGN

The appropriate pavement section for the River Trail depends primarily upon the design traffic-loading and the strength of the subgrade soil. Design traffic-loading is represented by the Traffic Index (TI), which is calculated based on anticipated traffic loads and load repetitions for a particular design life considered to be adequate by the designer. The strength of the subgrade soil, on the other hand, is represented by R-Value test data. The TI should be verified with governing agencies prior to construction.

6.1 Asphalt Concrete Pavement

The following tentative pavement design data are in accordance with the California procedure based on the Gravel Equivalent Concept. We have used an assumed R-Value of 30 for design purposes. The design may be revised at the completion of final or precise grading based on the actual R-value data of the subgrade. There is no sufficient soils data available for evaluation of the thickness for rubberized asphalt concrete pavement along the multi-service soft trail segment at the Knoll.

Table 1: Asphalt Concrete Pavement Thickness

Traffic Index	Pavement Section Thickness (inch)	
	Asphalt Concrete (AC)	Base Course (AB)
4	2.5	4.5
5	3.0	5.5
6	3.5	7.5

6.2 Decomposed Granite Pavement

For shoulders and other unpaved trail surface, the following parameters for Decomposed Granite (DG) surface are provided in accordance with the California procedure based on the Gravel Equivalent Concept, assuming an R-Value of 30. The design may be revised based on the actual R-value data of the subgrade obtained during the final design phase.

Table 2: Decomposed Granite Thickness

Traffic Index	Thickness (inch)	
	Decomposed Granite (DG)	Base Course (AB)
4	6	10.0
5	9	12.5
6	12	15.0

The above recommendations are based upon a full section of crushed aggregate base within the trail compaction width. The thickness of the base material may be revised depending upon the thickness of the proposed decomposed granite (DG) cap.

6.3 Subgrade Support for PCC Curb and Gutter

Although not proposed at this time, if PCC curb and gutter is planned, the following recommendations can be used for planning purposes. Based on the materials encountered during our investigation, the expansion potential of the proposed subgrade materials may be greater than 5%. The expansion potential should be verified during grading operations. It is recommended that the PCC curb and gutter be placed on 4 inches of crushed aggregate base or processed miscellaneous base. Grading on the site may warrant revisions to the above recommendations. The following criteria were used for the above PCC curb and gutter recommendations:

- Expansion <5%: Place curb and gutter on subgrade
- Expansion 5% - 6.5%: Place curb and gutter on 4 inches of base
- Expansion >6.5%: Place curb and gutter on 6 inches of base

Additional grading on the site and/or additional expansion tests may warrant revisions to the above recommendations.

7.0 LIMITATIONS

This report has been prepared for the exclusive use of the County of Riverside, its project partners, and their design consultants for the specific trail segments and alignments discussed herein. This report is not transferable to unauthorized or other project uses without consultation with the authors regarding the data limitations, assumptions, interpretations and applications.

In the event that any modifications in the design or location of the proposed development, as discussed herein, are planned, the conclusions and recommendations contained in this report will require a written review by WRC Consulting Services, Inc., with respect to the planned modifications.

In performing these professional services, we have used that degree of care and skill ordinarily exercised, under similar circumstances, by reputable engineering geologists and geotechnical engineers practicing in this or similar locations.

The analyses and interpretations presented in this report have been based solely on a review of the field conditions and the limited data available to WRC Consulting Services, Inc. These data include boring log data and geotechnical testing information associated with other projects near the Santa Ana River project reach provided by the U.S. Army Corps of Engineers, the City of Corona, and the County of Riverside. It should be recognized that subsurface conditions can vary significantly in time, depth, and locations.

The preliminary design information and recommendations stated in this report were derived using the best data available and based on standard engineering practice. **These statements are professional opinions only for future design reference and are not meant for final design and construction application; therefore, no warranty is expressed or implied herein. Further field exploration, laboratory analysis, geotechnical, geology, ground-water monitoring, and professional recommendations are required for each trail segment during the final design and construction phase. Extreme care must be taken in reference to these statements and any interpretation of the information based on the sources of data reviewed and any assumptions made for the current study.**

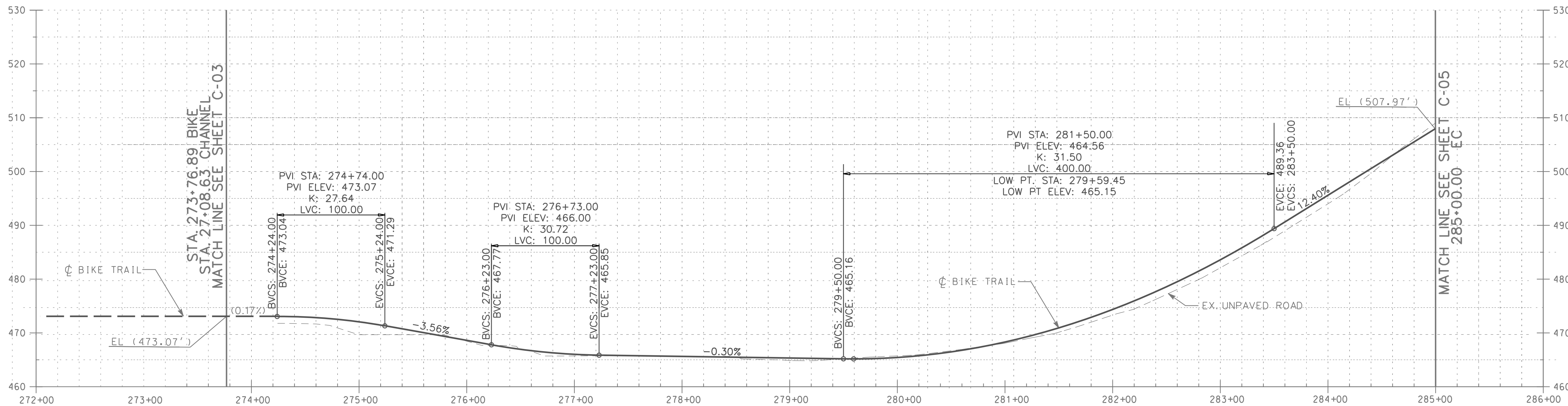
ATTACHMENT

GEOTECHNICAL MAPS

RECOMMENDED SOILS REMOVAL

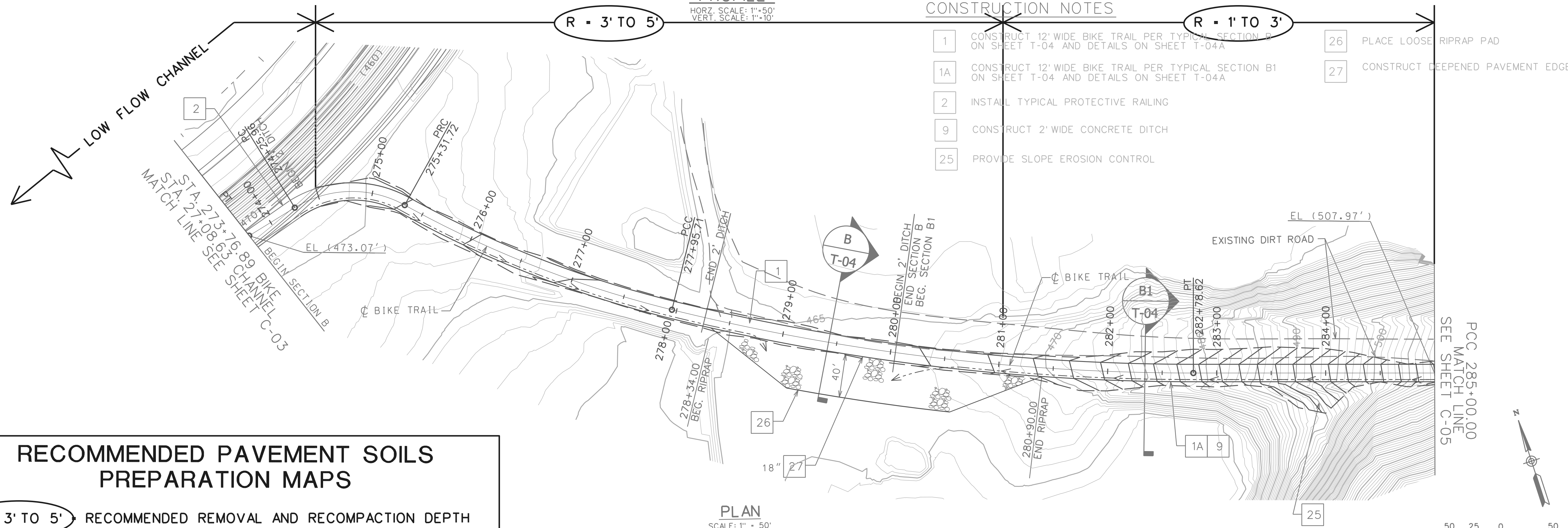
AND RECOMPACTION DEPTHS

The preliminary recommendations are provided for reference only. Verification of the soils conditions and additional boring logs are required for final design and construction.



PROFILE

HORZ. SCALE: 1"=50'
VERT. SCALE: 1"=10'



CONSTRUCTION NOTES

1	CONSTRUCT 12' WIDE BIKE TRAIL PER TYPICAL SECTION B ON SHEET T-04 AND DETAILS ON SHEET T-04A
1A	CONSTRUCT 12' WIDE BIKE TRAIL PER TYPICAL SECTION B1 ON SHEET T-04 AND DETAILS ON SHEET T-04A
2	INSTALL TYPICAL PROTECTIVE RAILING
9	CONSTRUCT 2' WIDE CONCRETE DITCH
25	PROVIDE SLOPE EROSION CONTROL
26	PLACE LOOSE RIPRAP PAD
27	CONSTRUCT DEEPENED PAVEMENT EDGE

PLAN

SCALE: 1" = 50'

RECOMMENDED PAVEMENT SOILS PREPARATION MAPS

R = 3' TO 5' = RECOMMENDED REMOVAL AND RECOMPACTION DEPTH

35% SUBMITTAL

Don't Dig...Until You Call U.S.A. Toll Free **1-800-227-2600** for the location of buried utility lines. Don't disrupt vital services. TWO WORKING DAYS BEFORE YOU DIG

REF.	REVISIONS DESCRIPTION	ENGINEER APPR.	DATE	RC.. APPR.	DATE

DESIGNED BY: JC/LW
DRAWN BY: LB / TP
DATE DRAWN: March 2011

APPROVED BY:
WRC Consulting Services Inc.
1800 E. Garry Ave Suite 213
Santa Ana, CA 92705
Tel: (949) 833-8388
Fax: (949) 833-8380
LAN WEBER, ENGINEER, RCE 35894 DATE:

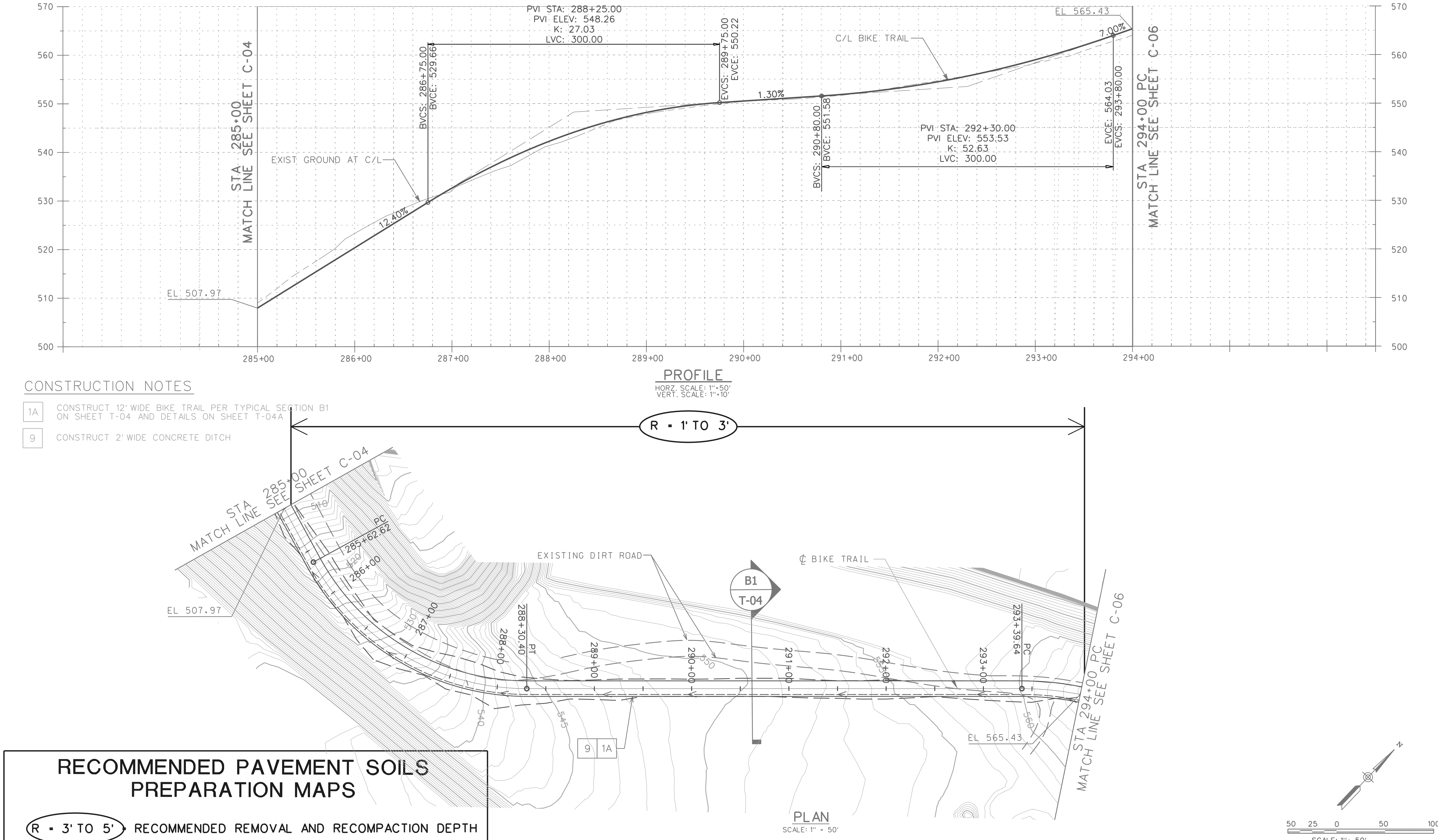
REGISTERED PROFESSIONAL ENGINEER LAN-TIN LI WEBER No. 35894 Exp. 12-31-11 CIVIL STATE OF CALIFORNIA

COUNTY OF RIVERSIDE
REGIONAL PARKS AND OPEN SPACE DISTRICT
APPROVED BY:
SCOTT BANGLE, GENERAL MANAGER DATE:
RECOMMENDED DATE:

COUNTY OF RIVERSIDE
TRANSPORTATION DEPARTMENT
APPROVED BY:
ALEN FRENCH DATE:
RECOMMENDED DATE:

SANTA ANA RIVER TRAIL
CLASS I BIKEWAY
LINE B
PLAN AND PROFILE
STA. 273+76.89 TO STA. 285+00

PROJECT NO. 0-0-0000
DRAWING NO. W-XYZ
SHEET NO. C-04 OF 49



CONSTRUCTION NOTES

1A CONSTRUCT 12' WIDE BIKE TRAIL PER TYPICAL SECTION B1 ON SHEET T-04 AND DETAILS ON SHEET T-04A

9 CONSTRUCT 2' WIDE CONCRETE DITCH

RECOMMENDED PAVEMENT SOILS PREPARATION MAPS

R = 3' TO 5' — RECOMMENDED REMOVAL AND RECOMPACTION DEPTH

35% SUBMITTAL

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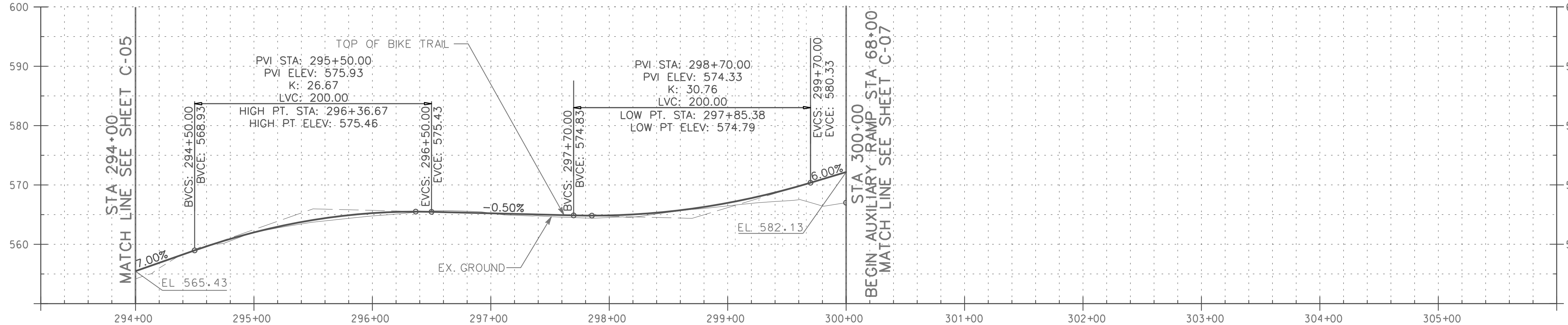
TRANSPORTATION DEPARTMENT
APPROVED BY:
ALEN FRENCH DATE:
RECOMMENDED DATE:

SANTA ANA RIVER TRAIL
CLASS I BIKEWAY
LINE B
PLAN AND PROFILE
STA. 285+00 TO STA. 294+00

PROJECT NO. 0-0-0000
DRAWING NO. W-XYZ
SHEET NO. C-05 OF 49

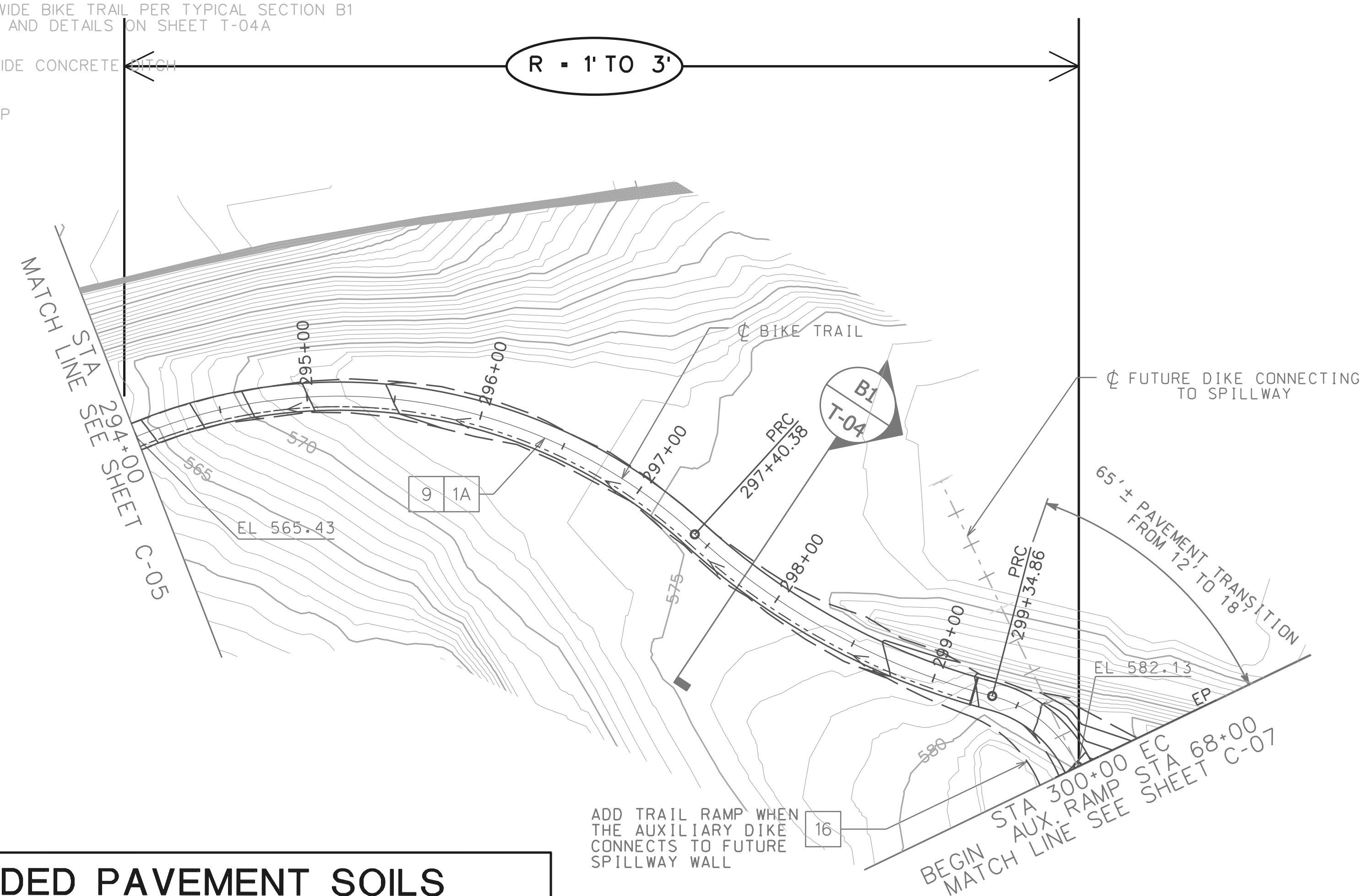


PROFILE

HORZ. SCALE: 1"=50'
VERT. SCALE: 1"=10'

CONSTRUCTION NOTES

1A	CONSTRUCT 12' WIDE BIKE TRAIL PER TYPICAL SECTION B1 ON SHEET T-04 AND DETAILS ON SHEET T-04A
9	CONSTRUCT 2' WIDE CONCRETE DITCH
16	CONSTRUCT RAMP



NOTE:
SEE AUXILLIARY DIKE PLANS PREPARED BY U.S. ARMY CORPS OF ENGINEERS FOR UPDATED PLANS

RECOMMENDED PAVEMENT SOILS PREPARATION MAPS

R = 1' TO 3' = RECOMMENDED REMOVAL AND RECOMPACTION DEPTH

PLAN

SCALE: 1" = 50'

50 25 0 50 100FT
SCALE: 1"= 50'

35% SUBMITTAL

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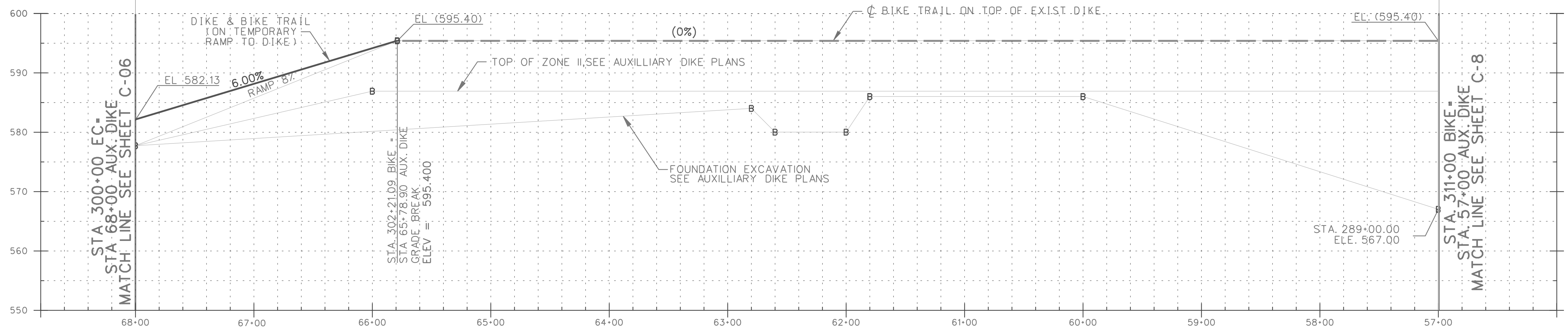
RECOMMENDED DATE:

COUNTY OF RIVERSIDE
TRANSPORTATION DEPARTMENT
APPROVED BY:
ALEN FRENCH DATE:
RECOMMENDED DATE:

SANTA ANA RIVER TRAIL
CLASS I BIKEWAY
LINE B
PLAN AND PROFILE
STA. 294+00 TO STA. 300+00

PROJECT NO. 0-0-0000
DRAWING NO. W-XYZ
SHEET NO. C-06 OF 49



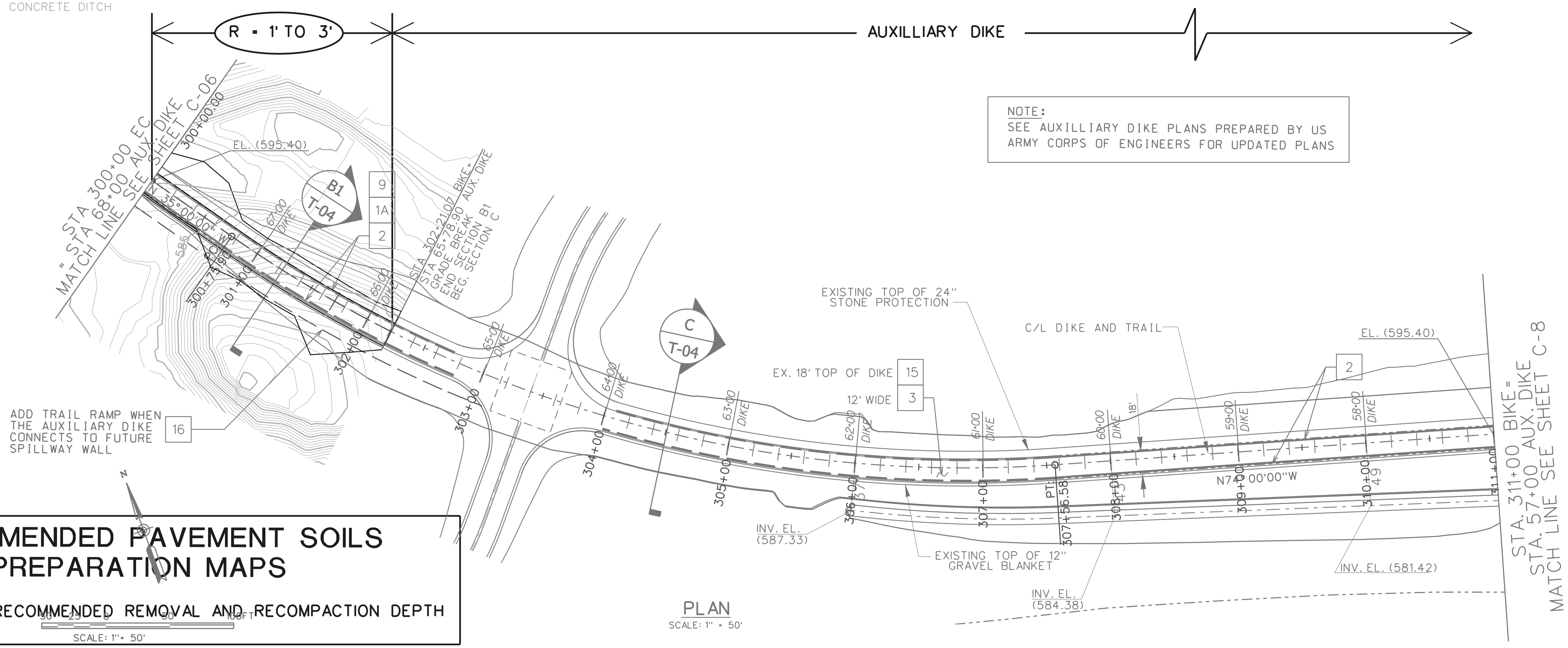
PROFILE

HORZ. SCALE: 1"=50'
VERT. SCALE: 1"=10'

CONSTRUCTION NOTES

1A	CONSTRUCT 12' WIDE BIKE TRAIL PER TYPICAL SECTION B1 ON SHEET T-04 AND DETAILS ON SHEET T-04A
2	INSTALL TYPICAL PROTECTIVE RAILING
3	PROVIDE BIKE TRAIL STRIPING ON EX. PAVEMENT PER DETAIL ON SHEET T-04A
9	CONSTRUCT 2' WIDE CONCRETE DITCH
15	PROTECT IN PLACE
16	CONSTRUCT RAMP

NOTE:
SEE AUXILLIARY DIKE PLANS PREPARED BY US ARMY CORPS OF ENGINEERS FOR UPDATED PLANS



RECOMMENDED PAVEMENT SOILS PREPARATION MAPS

R = 3' TO 5' = RECOMMENDED REMOVAL AND RECOMPACTION DEPTH

PLAN

SCALE: 1" = 50'

35% SUBMITTAL

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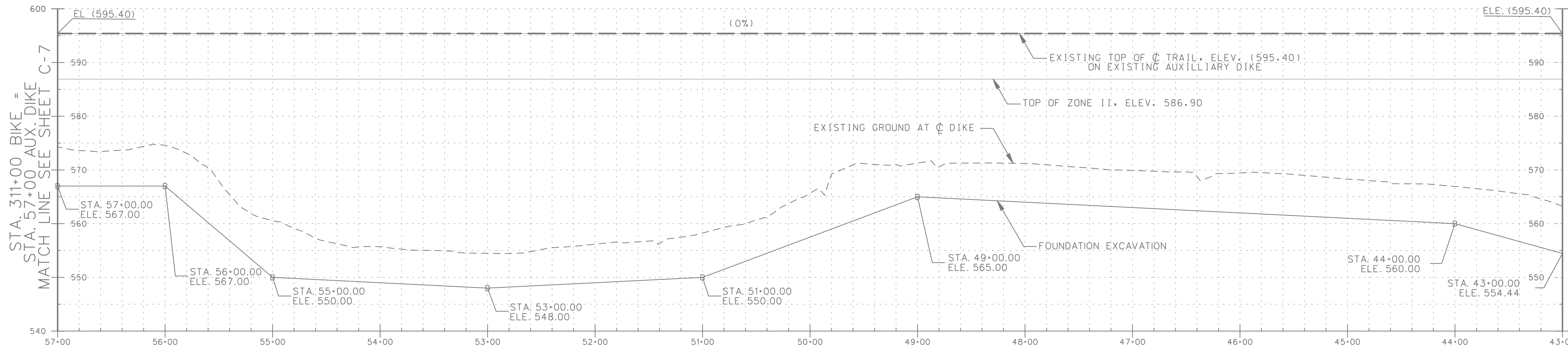
ALEN FRENCH DATE:
RECOMMENDED DATE:

SANTA ANA RIVER TRAIL
CLASS I BIKEWAY
LINE B
PLAN & PROFILE
STA 300+00.00 - STA 311+00.00

PROJECT NO. 0-0-0000
DRAWING NO. W-XYZ
SHEET NO. C-07 OF 49



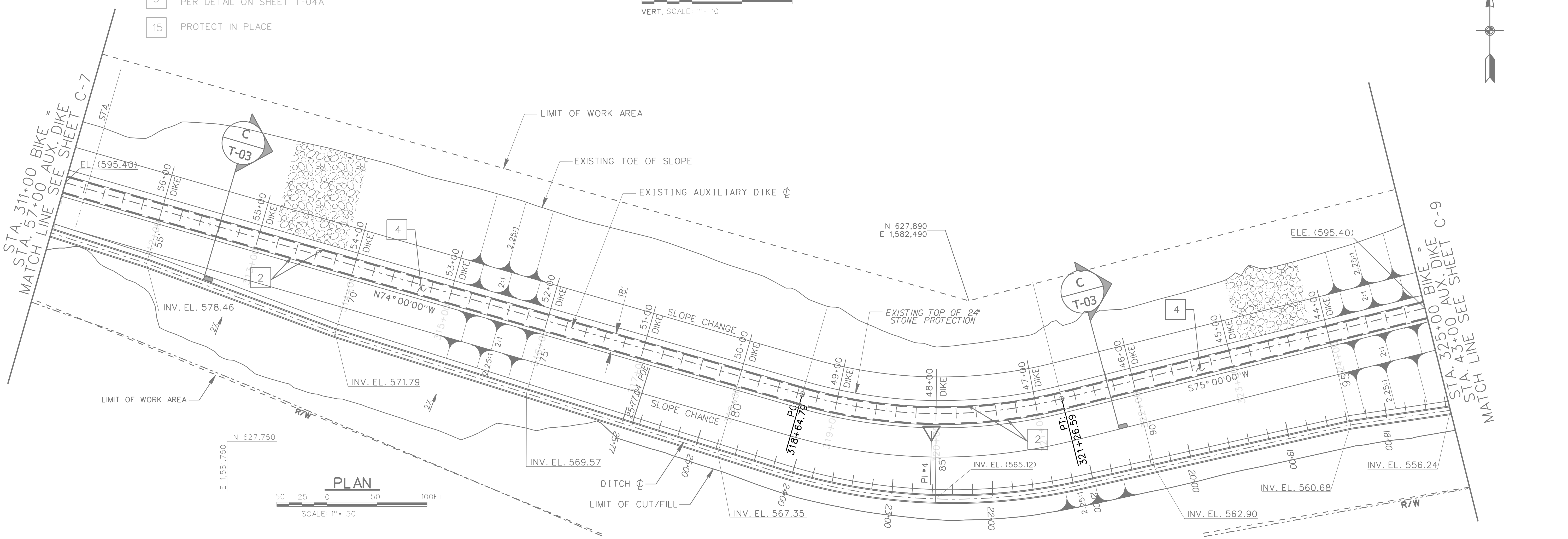
PROFILE

HORZ. SCALE: 1"= 50'

VERT. SCALE: 1"= 10'

CONSTRUCTION NOTES

2	INSTALL TYPICAL PROTECTIVE RAILING
3	PROVIDE BIKE TRAIL STRIPING ON EX. PAVEMENT PER DETAIL ON SHEET T-04A
15	PROTECT IN PLACE



PLAN

SCALE: 1"= 50'

35% SUBMITTAL

Don't Dig...Until You Call U.S.A. Toll Free **1-800-227-2600** for the location of buried utility lines. Don't disrupt vital services.
TWO WORKING DAYS BEFORE YOU DIG

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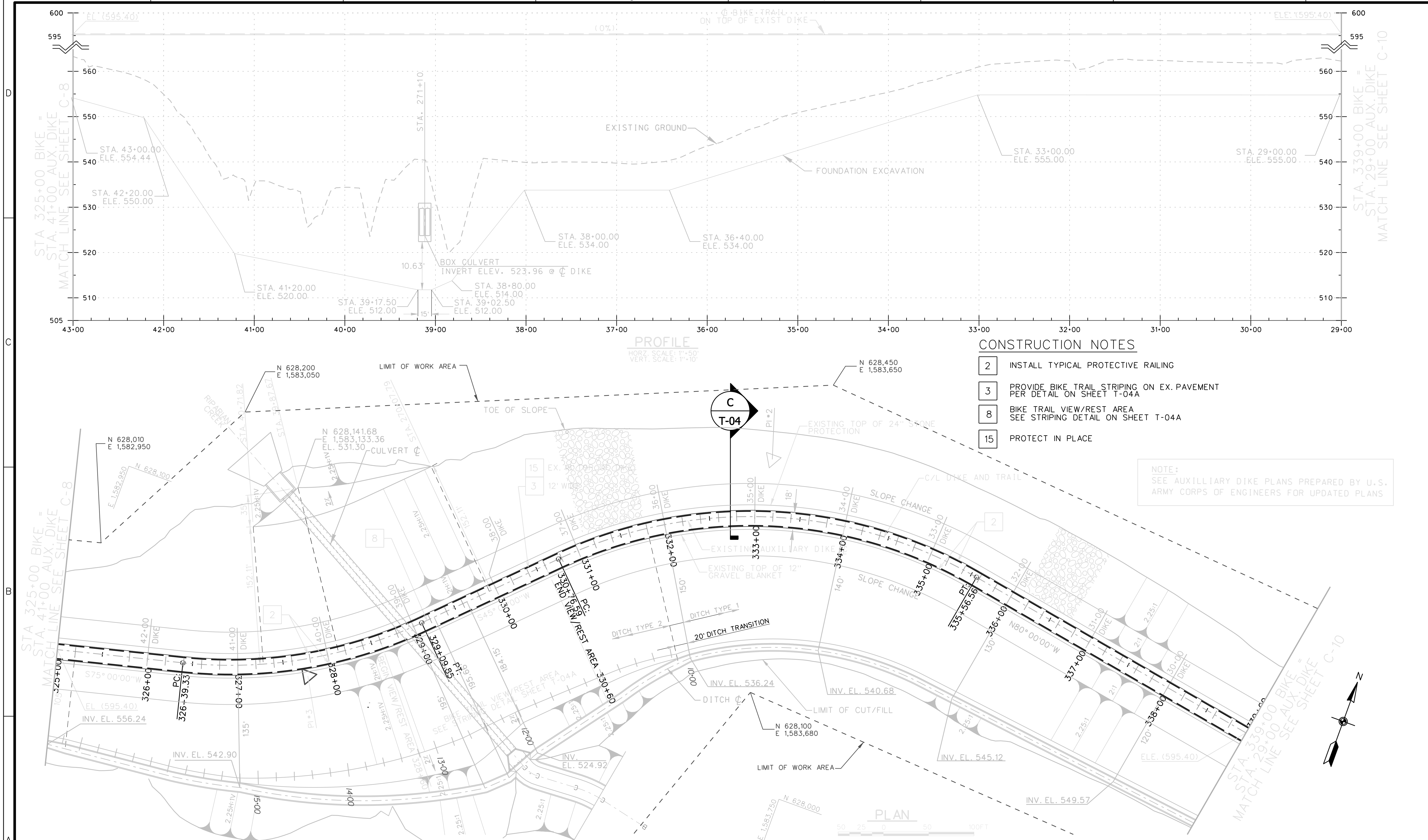
RECOMMENDED DATE:

COUNTY OF RIVERSIDE
TRANSPORTATION DEPARTMENT
APPROVED BY:
ALEN FRENCH DATE:
RECOMMENDED DATE:

SANTA ANA RIVER TRAIL
CLASS I BIKEWAY
LINE B
PLAN & PROFILE
STA 311+00 - STA 325+00

PROJECT NO. 0-0-0000
DRAWING NO. W-XYZ
SHEET NO. C-08 OF 49



CONSTRUCTION NOTES

2	INSTALL TYPICAL PROTECTIVE RAILING
3	PROVIDE BIKE TRAIL STRIPING ON EX. PAVEMENT PER DETAIL ON SHEET T-04A
8	BIKE TRAIL VIEW/REST AREA SEE STRIPING DETAIL ON SHEET T-04A
15	PROTECT IN PLACE

35% SUBMITTAL

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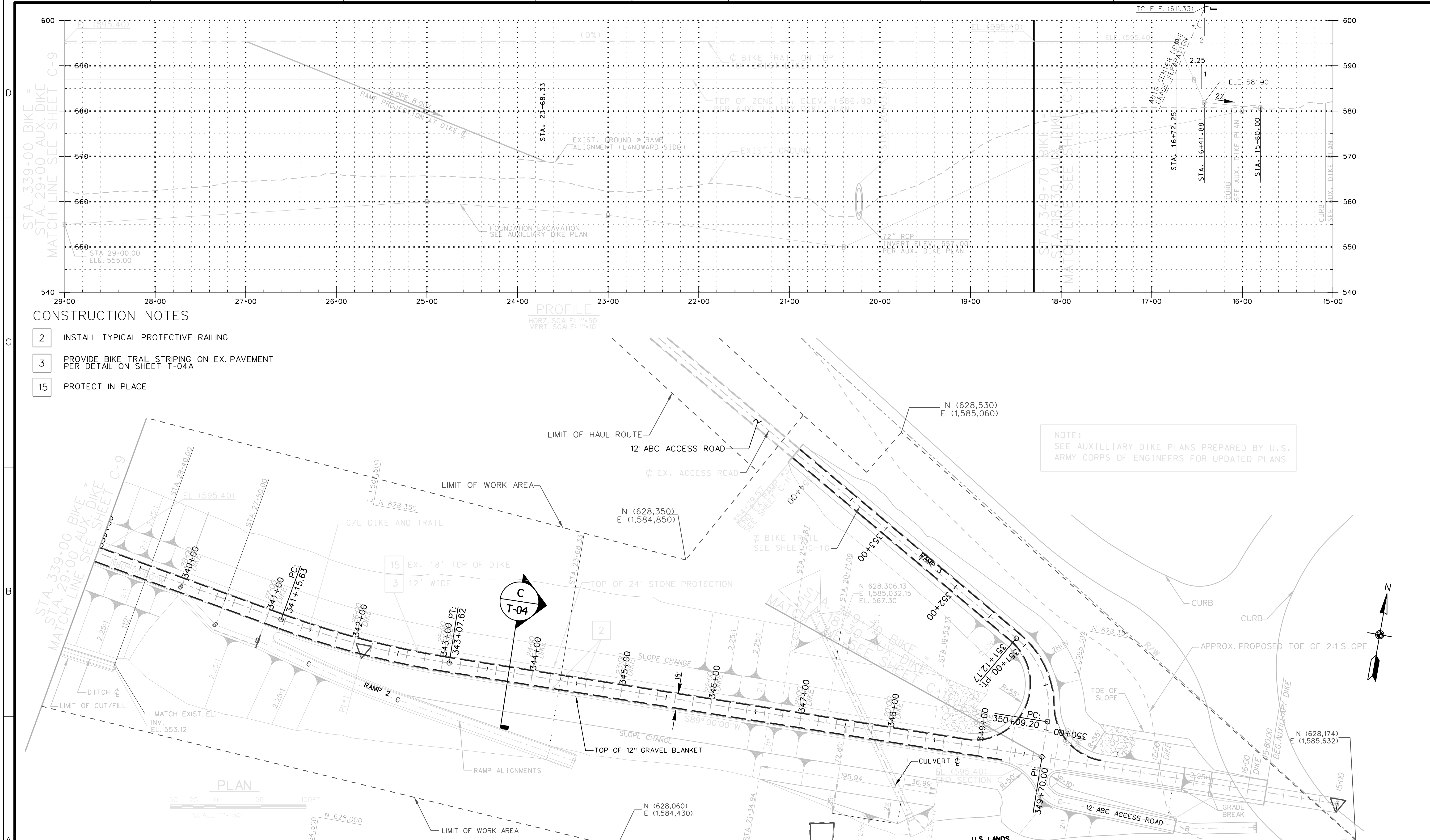
COUNTY OF RIVERSIDE
TRANSPORTATION DEPARTMENT
APPROVED BY:
ALEN FRENCH DATE:
RECOMMENDED DATE:

SANTA ANA RIVER TRAIL
CLASS I BIKEWAY
LINE B
PLAN & PROFILE
STA 325+00 - STA 339+00

PROJECT NO. 0-0-0000
DRAWING NO. W-XYZ
SHEET NO. C-09 of 49



CONSTRUCTION NOTES

2	INSTALL TYPICAL PROTECTIVE RAILING
3	PROVIDE BIKE TRAIL STRIPING ON EX. PAVEMENT PER DETAIL ON SHEET T-04A
15	PROTECT IN PLACE

35% SUBMITTAL

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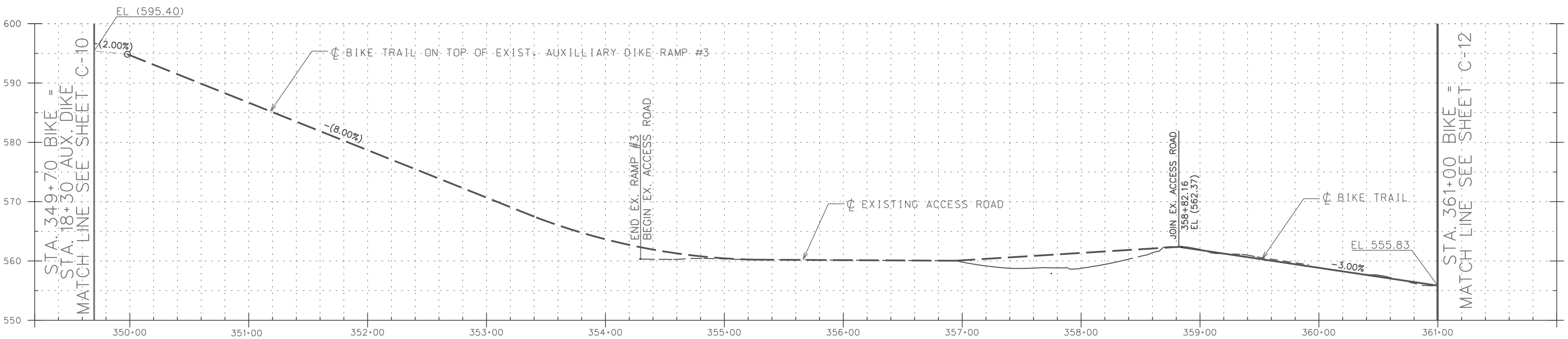
APPROVED BY:
SCOTT BANGLE DATE:
GENERAL MANAGER
RECOMMENDED DATE:

COUNTY OF RIVERSIDE
TRANSPORTATION DEPARTMENT
APPROVED BY:
ALEN FRENCH DATE:
RECOMMENDED DATE:

SANTA ANA RIVER TRAIL
CLASS I BIKEWAY
LINE B
PLAN & PROFILE
STA 339+00 - STA 349+70

PROJECT NO. 0-0-0000
DRAWING NO. W-XYZ
SHEET NO. C-10 of 49



PROFILE
HORZ. SCALE: 1"=50'
VERT. SCALE: 1"=10'

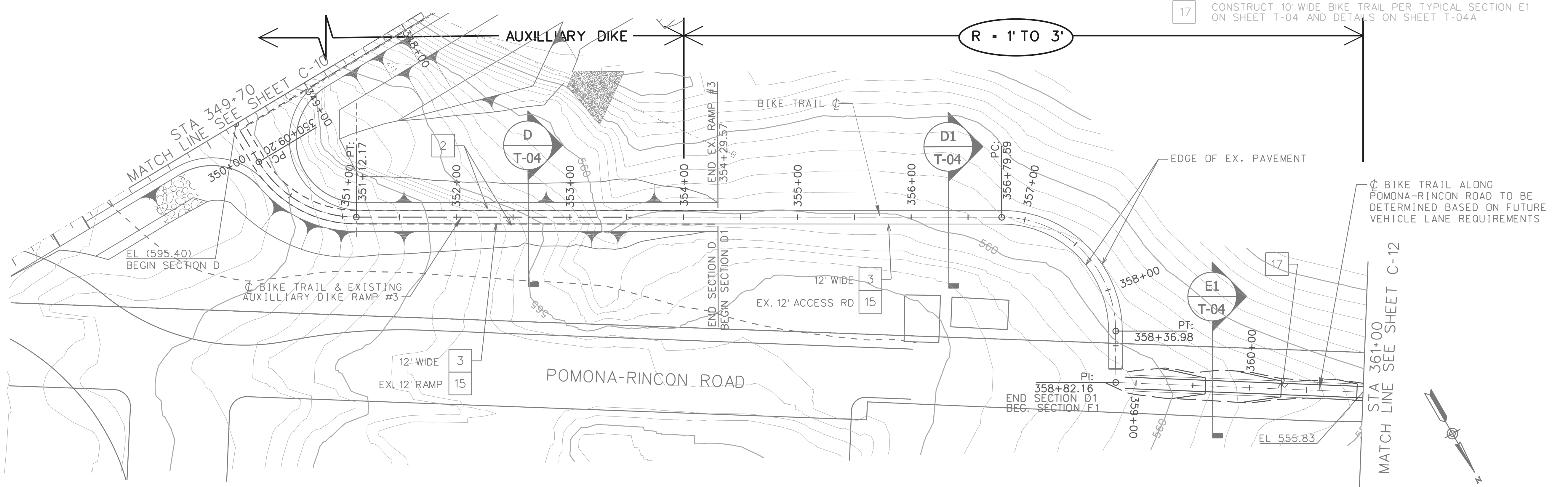
RECOMMENDED PAVEMENT SOILS PREPARATION MAPS

R = 1' TO 3' = RECOMMENDED REMOVAL AND RECOMPACT DEPTH

NOTE:
SEE AUXILLIARY DIKE PLANS PREPARED BY US ARMY CORPS OF ENGINEERS FOR UPDATED PLANS

CONSTRUCTION NOTES

2	INSTALL TYPICAL PROTECTIVE RAILING
3	PROVIDE BIKE TRAIL STRIPING ON EX. PAVEMENT PER DETAIL ON SHEET T-04A
15	PROTECT IN PLACE
17	CONSTRUCT 10' WIDE BIKE TRAIL PER TYPICAL SECTION E1 ON SHEET T-04 AND DETAILS ON SHEET T-04A



PLAN
SCALE: 1" = 50'

35% SUBMITTAL

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APPROVED BY:
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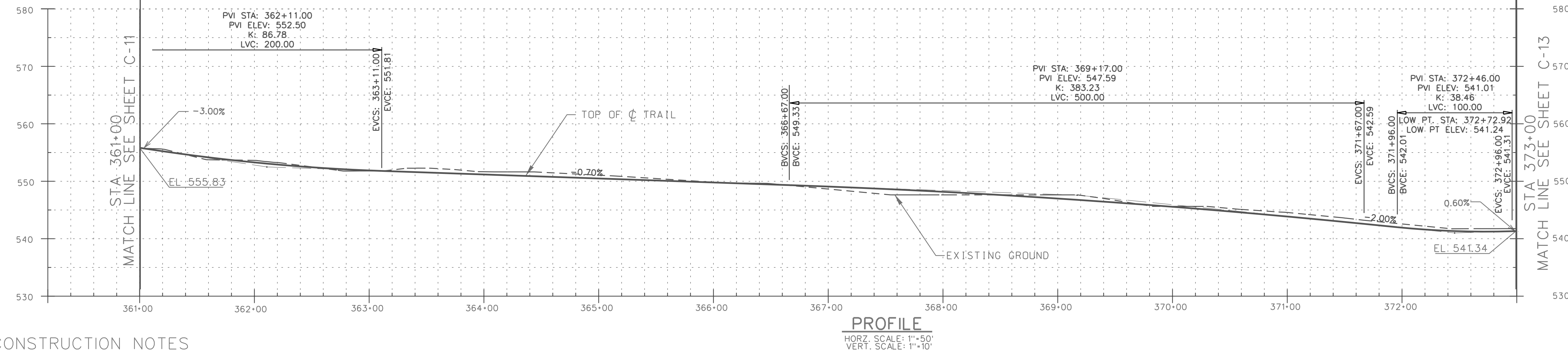
RECOMMENDED DATE:

SANTA ANA RIVER TRAIL
CLASS I BIKEWAY
LINE B
PLAN & PROFILE
STA 349+70 - STA 361+00

PROJECT NO. 0-0-0000
DRAWING NO. W-XYZ
SHEET NO. C-11 OF 49

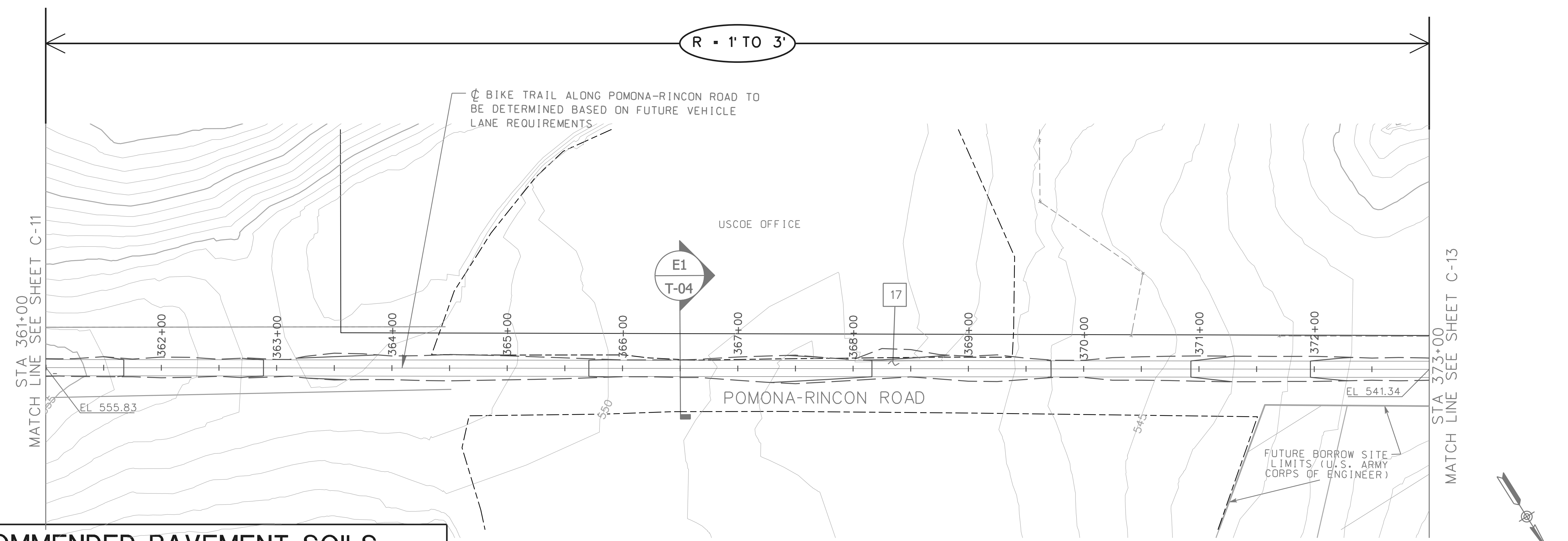


PROFILE

HORZ. SCALE: 1"=50'
VERT. SCALE: 1"=10'

CONSTRUCTION NOTES

17	CONSTRUCT 10' WIDE BIKE TRAIL PER TYPICAL SECTION E1 ON SHEET T-04 AND DETAILS ON SHEET T-04A



RECOMMENDED PAVEMENT SOILS PREPARATION MAPS

R = 1' TO 3' = RECOMMENDED REMOVAL AND RECOMPACT DEPTH

PLAN

SCALE: 1" = 50'

50 25 0 50 100FT

SCALE: 1"= 50'

35% SUBMITTAL

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for the location of buried utility lines.
Don't disrupt vital services.
TWO WORKING DAYS BEFORE YOU DIG

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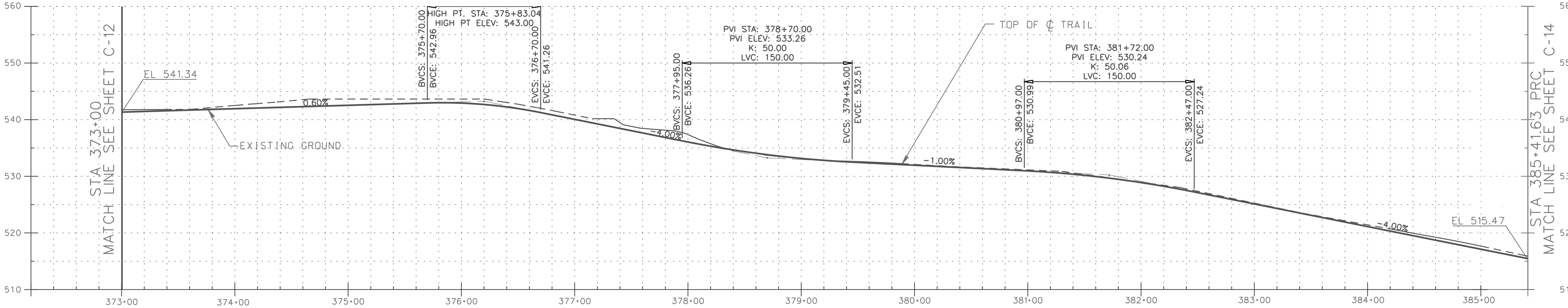
RECOMMENDED DATE:

SANTA ANA RIVER TRAIL
CLASS I BIKEWAY
LINE B
PLAN & PROFILE
STA 361+00- STA 373+00

PROJECT NO. 0-0-0000
DRAWING NO. W-XYZ
SHEET NO. C-12 OF 49



PROFILE

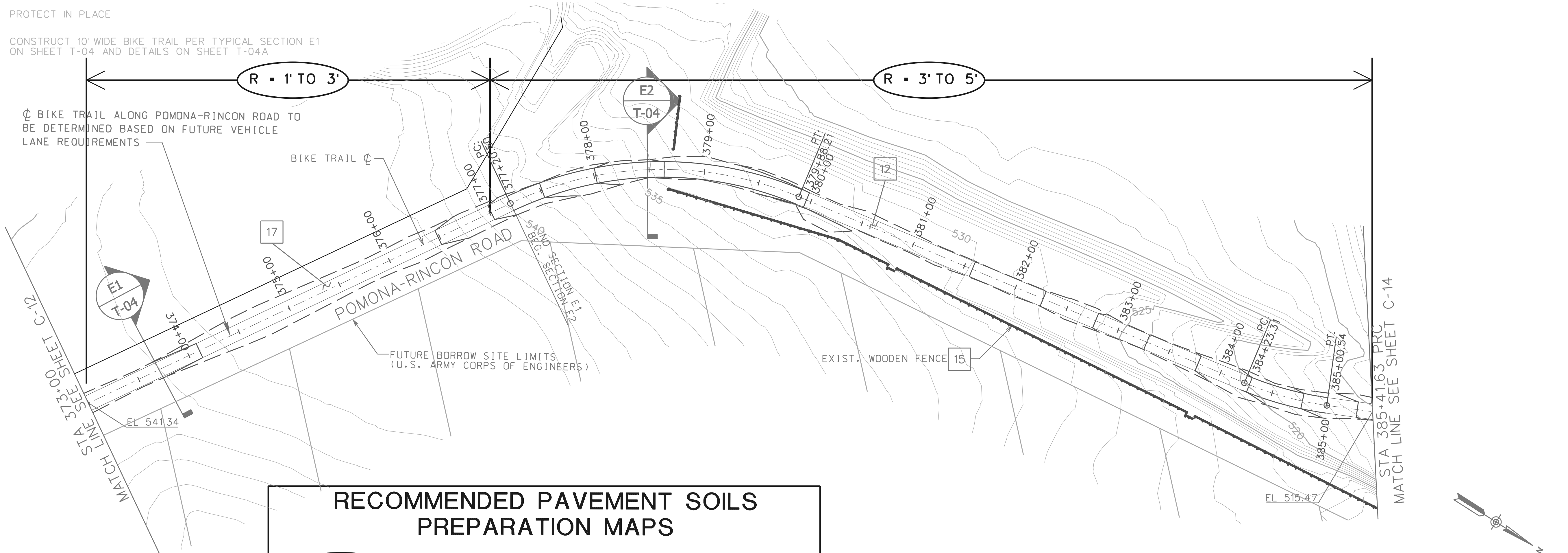
HORZ. SCALE: 1"=50'
VERT. SCALE: 1"=10'

CONSTRUCTION NOTES

12 CONSTRUCT 10' WIDE BIKE TRAIL PER TYPICAL SECTION E2 ON SHEET T-04 AND DETAILS ON SHEET T-04A

15 PROTECT IN PLACE

17 CONSTRUCT 10' WIDE BIKE TRAIL PER TYPICAL SECTION E1 ON SHEET T-04 AND DETAILS ON SHEET T-04A



RECOMMENDED PAVEMENT SOILS PREPARATION MAPS

R = 3' TO 5' = RECOMMENDED REMOVAL AND RECOMPACT DEPTH

PLAN

SCALE: 1" = 50'

SCALE: 1"= 50'

35% SUBMITTAL

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COUNTY OF RIVERSIDE
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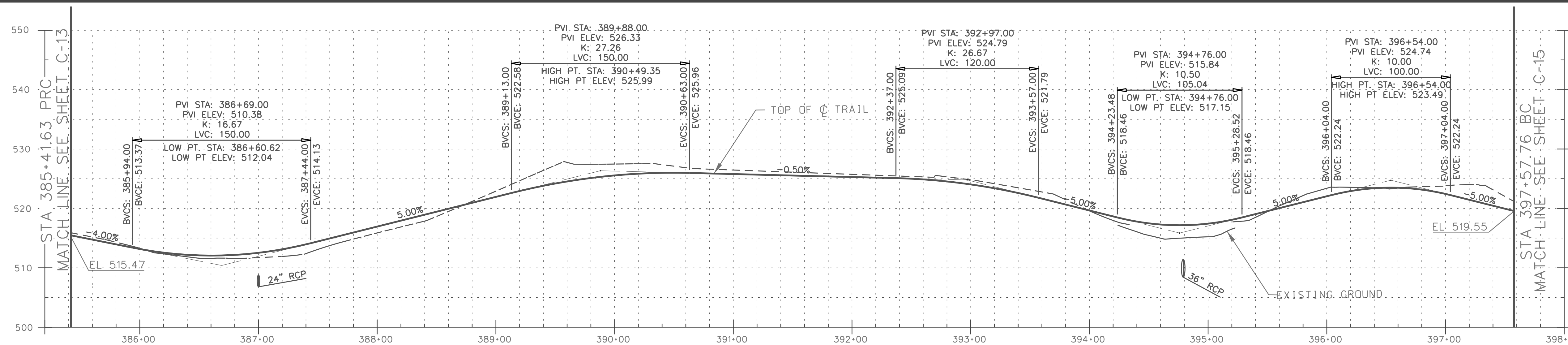
APPROVED BY:
ALEN FRENCH DATE:
RECOMMENDED DATE:

SANTA ANA RIVER TRAIL
CLASS I BIKEWAY
LINE B
PLAN & PROFILE
STA 373+00 - STA 385+41.63

PROJECT NO. 0-0-0000
DRAWING NO. W-XYZ
SHEET NO. C-13 OF 49

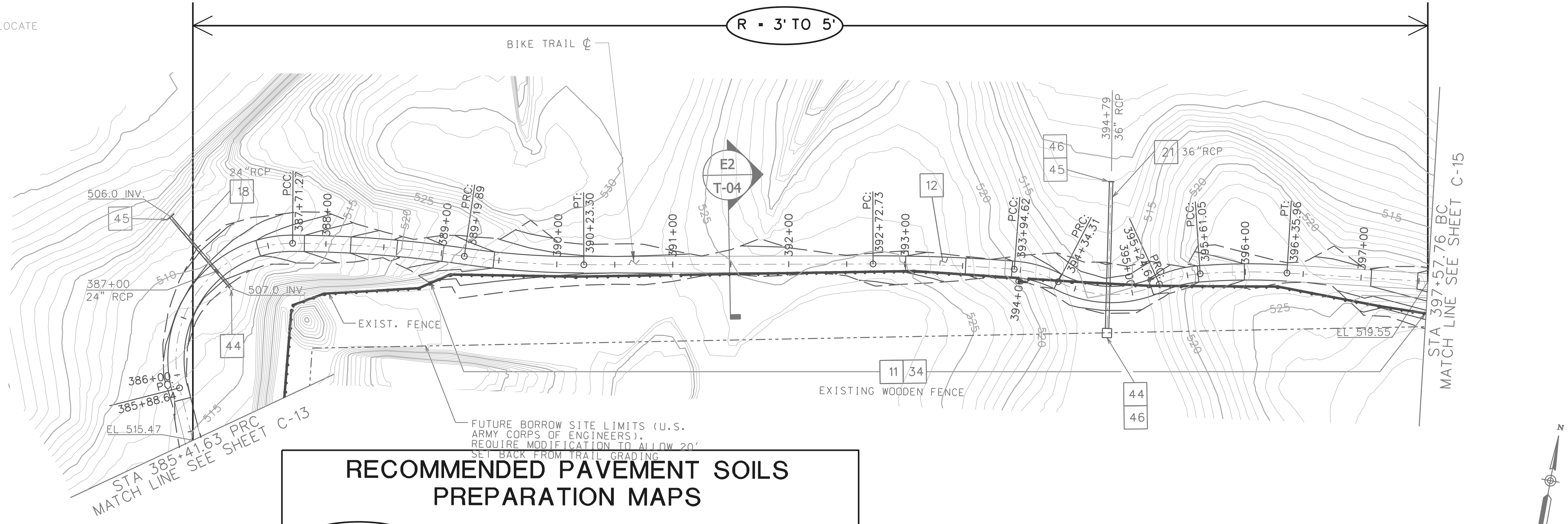


PROFILE

HORZ. SCALE: 1"=50'
VERT. SCALE: 1"=10'

CONSTRUCTION NOTES

11	REMOVE
12	CONSTRUCT 10' WIDE BIKE TRAIL PER TYPICAL SECTION E2 ON SHEET T-04 AND DETAILS ON SHEET T-04A
18	FURNISH AND INSTALL 24" DIA. RCP (1500D)
21	FURNISH AND INSTALL 36" DIA. RCP (1500D)
34	RELOCATE
44	CONSTRUCT STORM DRAIN INLET STRUCTURE AND EROSION CONTROL
45	CONSTRUCT STORM DRAIN OUTLET STRUCTURE AND EROSION CONTROL
46	CONSTRUCT STORM DRAIN (LARGER THAN 36" DIA.) INLET AND OUTLET PROTECTED BARRIERS



RECOMMENDED PAVEMENT SOILS PREPARATION MAPS

R = 3' TO 5' = RECOMMENDED REMOVAL AND RECOMPACT DEPTH

PLAN

SCALE: 1" = 50'

35% SUBMITTAL

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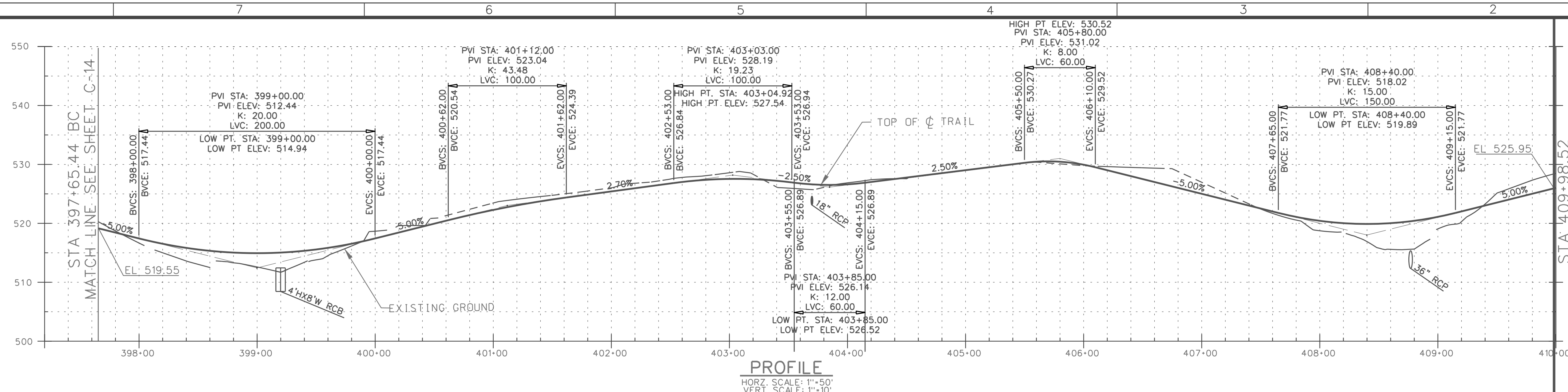
REGISTERED PROFESSIONAL ENGINEER LAN-YIN LI WEBER No. 35894 Exp. 12-31-11 CIVIL STATE OF CALIFORNIA

COUNTY OF RIVERSIDE
REGIONAL PARKS AND OPEN SPACE DISTRICT
APPROVED BY:
SCOTT BANGLE, GENERAL MANAGER DATE:
RECOMMENDED DATE:

COUNTY OF RIVERSIDE
TRANSPORTATION DEPARTMENT
APPROVED BY:
ALEN FRENCH DATE:
RECOMMENDED DATE:

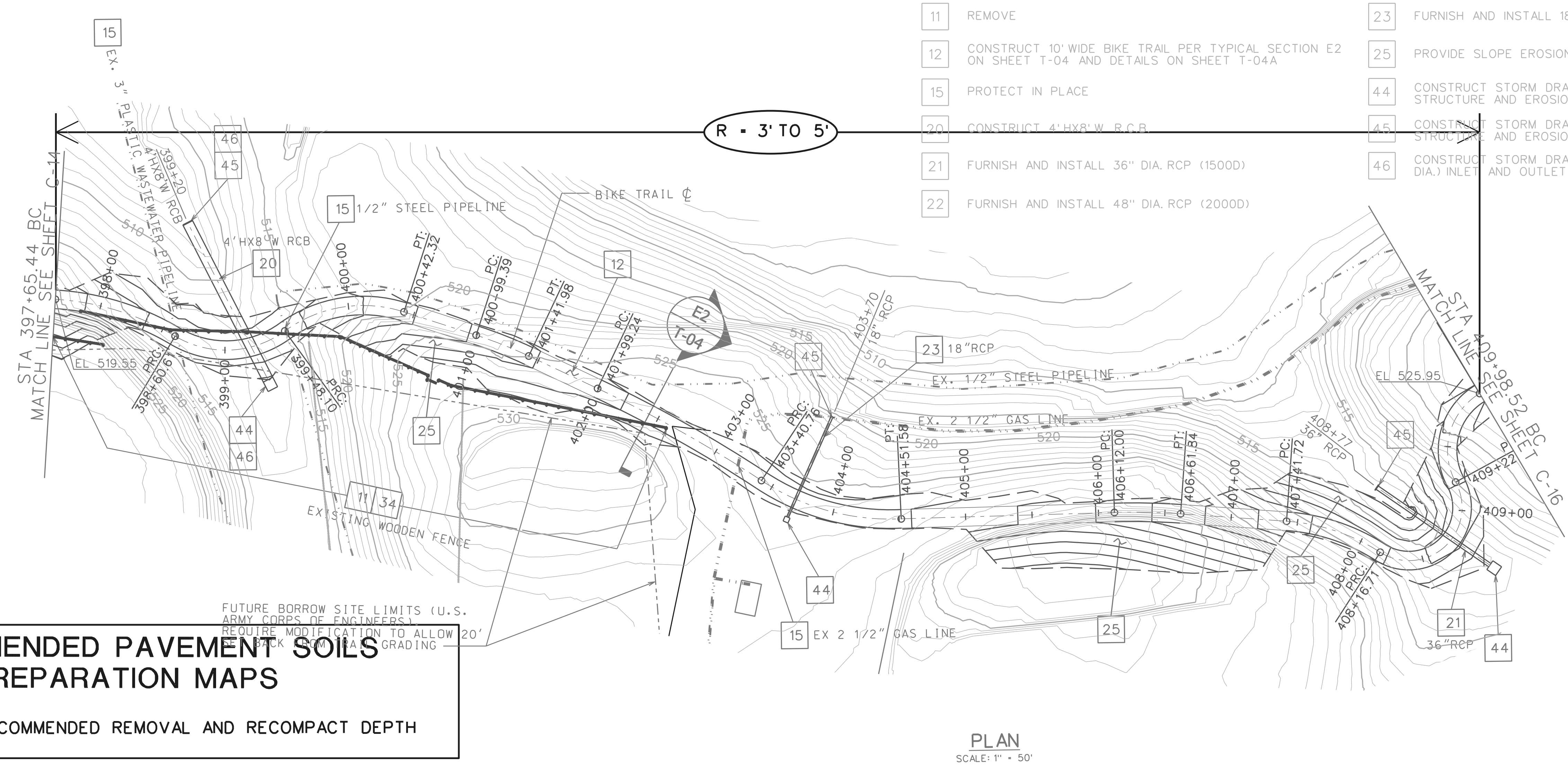
SANTA ANA RIVER TRAIL
CLASS I BIKEWAY
LINE B
PLAN & PROFILE
STA 385+41.63 - STA 397+57.76

PROJECT NO. 0-0-0000
DRAWING NO. W-XYZ
SHEET NO. C-14 OF 49



CONSTRUCTION NOTES

- 11 REMOVE
- 12 CONSTRUCT 10' WIDE BIKE TRAIL PER TYPICAL SECTION E2 ON SHEET T-04 AND DETAILS ON SHEET T-04A
- 15 PROTECT IN PLACE
- 20 CONSTRUCT 4'HX8'W R.C.B.
- 21 FURNISH AND INSTALL 36" DIA. RCP (1500D)
- 22 FURNISH AND INSTALL 48" DIA. RCP (2000D)
- 23 FURNISH AND INSTALL 18" DIA. RCP (1200D)
- 25 PROVIDE SLOPE EROSION CONTROL
- 44 CONSTRUCT STORM DRAIN INLET STRUCTURE AND EROSION CONTROL
- 45 CONSTRUCT STORM DRAIN OUTLET STRUCTURE AND EROSION CONTROL
- 46 CONSTRUCT STORM DRAIN (LARGER THAN 36" DIA.) INLET AND OUTLET PROTECTED BARRIERS



RECOMMENDED PAVEMENT SOILS PREPARATION MAPS

R = 3' TO 5' = RECOMMENDED REMOVAL AND RECOMPACT DEPTH

35% SUBMITTAL

Don't Dig...Until You Call U.S.A. Toll Free 1-800-227-2600 for the location of buried utility lines. Don't disrupt vital services. TWO WORKING DAYS BEFORE YOU DIG

REF.	REVISIONS DESCRIPTION	ENGINEER APPR.	DATE	RC.. APPR.	DATE

DESIGNED BY: JC/LW
DRAWN BY: LB / TP
DATE DRAWN: March 2011

APPROVED BY:
WRC Consulting Services Inc.
1800 E. Garry Ave Suite 213
Santa Ana, CA 92705
Tel: (949) 833-8388
Fax: (949) 833-8380
LAN WEBER, ENGINEER, RCE 35894 DATE:

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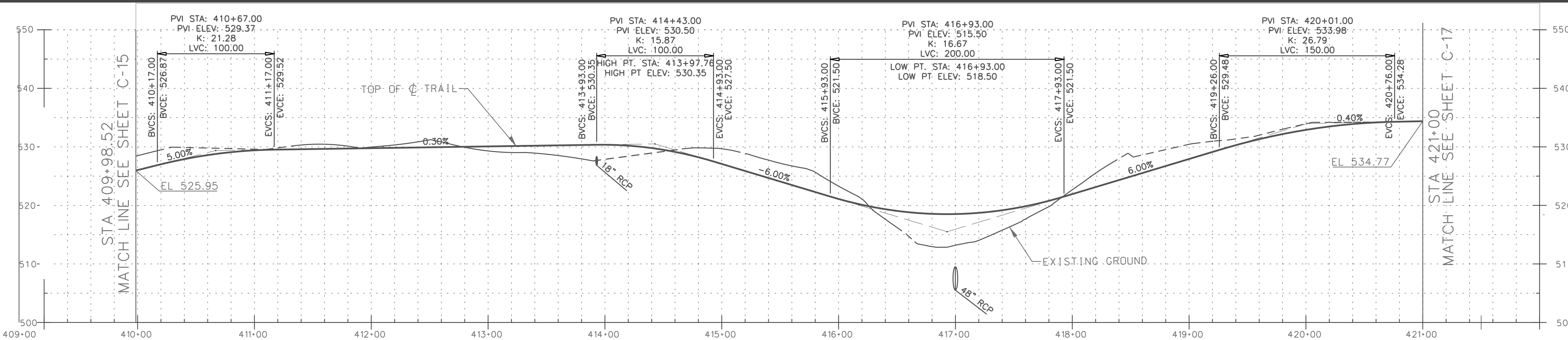
TRANSPORTATION DEPARTMENT
APPROVED BY:
ALEN FRENCH DATE:
RECOMMENDED DATE:

SANTA ANA RIVER TRAIL
CLASS I BIKEWAY
LINE B
PLAN & PROFILE
STA 397+65.44- STA 409+98.52

PROJECT NO. 0-0-0000
DRAWING NO. W-XYZ
SHEET NO. C-15 OF 49

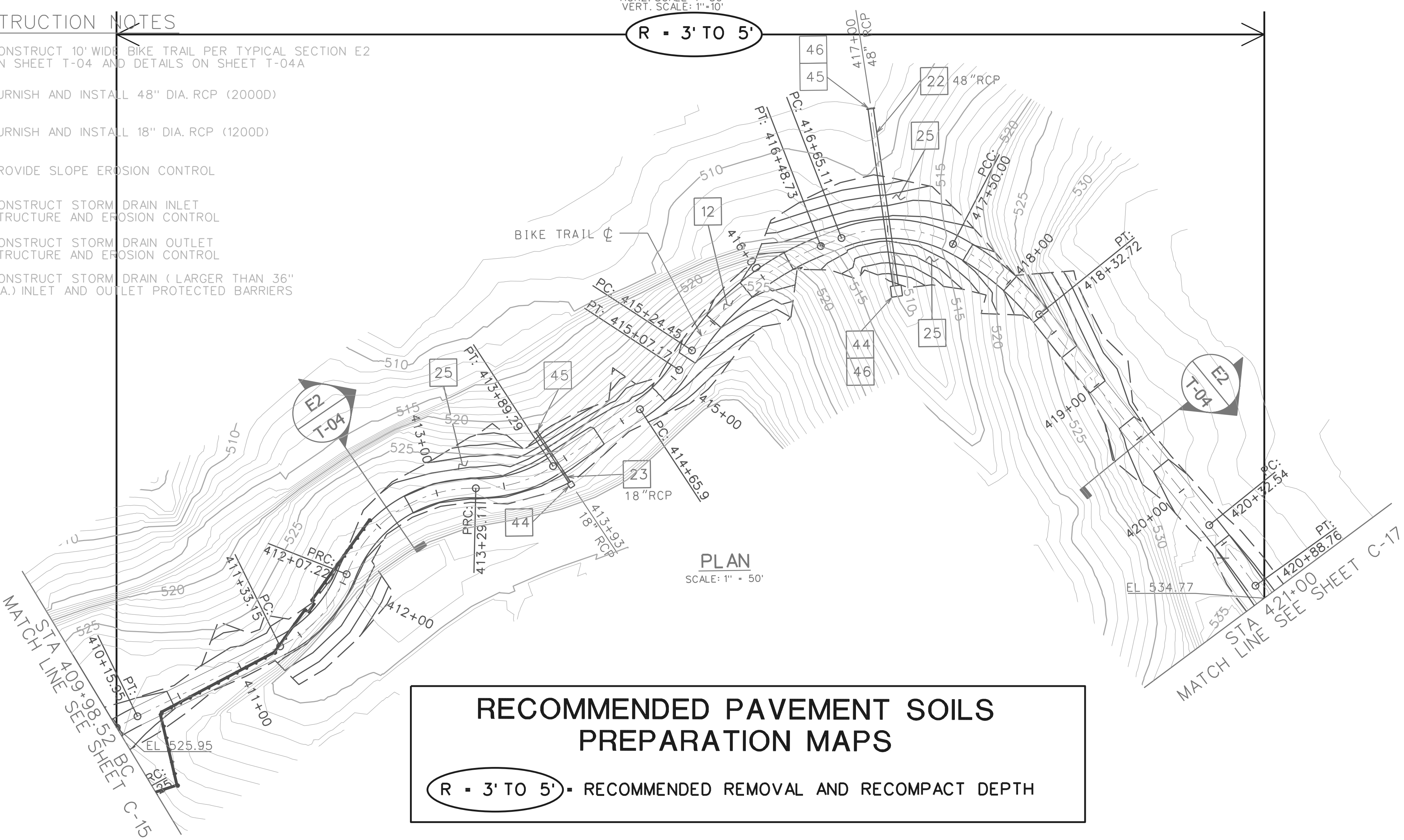


PROFILE

HORZ. SCALE: 1"=50'
VERT. SCALE: 1"=10'

CONSTRUCTION NOTES

12	CONSTRUCT 10' WIDE BIKE TRAIL PER TYPICAL SECTION E2 ON SHEET T-04 AND DETAILS ON SHEET T-04A
22	FURNISH AND INSTALL 48" DIA. RCP (2000D)
23	FURNISH AND INSTALL 18" DIA. RCP (1200D)
25	PROVIDE SLOPE EROSION CONTROL
44	CONSTRUCT STORM DRAIN INLET STRUCTURE AND EROSION CONTROL
45	CONSTRUCT STORM DRAIN OUTLET STRUCTURE AND EROSION CONTROL
46	CONSTRUCT STORM DRAIN (LARGER THAN 36" DIA.) INLET AND OUTLET PROTECTED BARRIERS



PLAN

SCALE: 1" = 50'

RECOMMENDED PAVEMENT SOILS PREPARATION MAPS

R = 3' TO 5' = RECOMMENDED REMOVAL AND RECOMPACT DEPTH

50 25 0 50 100FT
SCALE: 1"= 50'

35% SUBMITTAL

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APPROVED BY:
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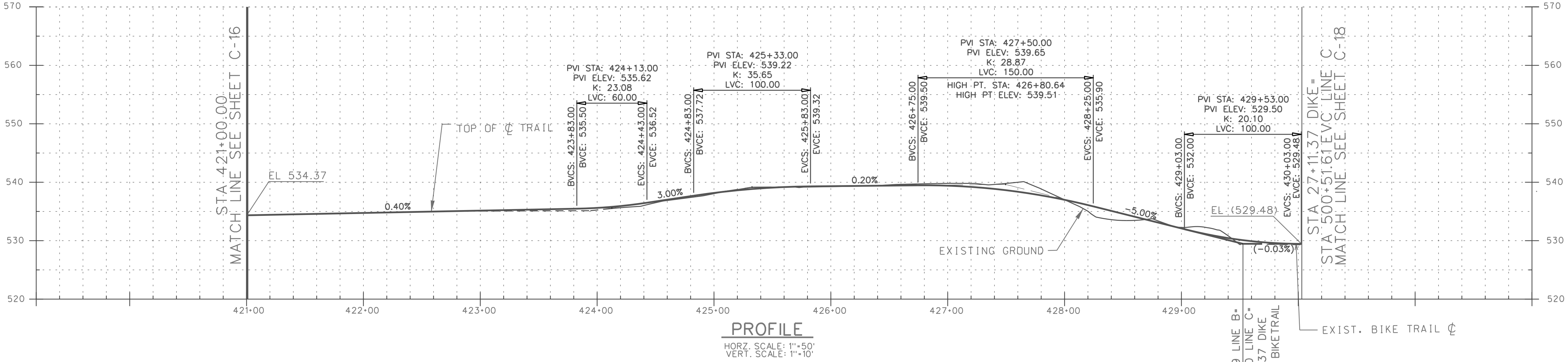
COUNTY OF RIVERSIDE
TRANSPORTATION DEPARTMENT
APPROVED BY:
ALEN FRENCH DATE:
RECOMMENDED DATE:

SANTA ANA RIVER TRAIL
CLASS I BIKEWAY
LINE B
PLAN & PROFILE
STA 409+98.52 - STA 421+00.00

PROJECT NO. 0-0-0000
DRAWING NO. W-XYZ
SHEET NO. C-16 OF 49



PROFILE

HORZ. SCALE: 1"=50'
VERT. SCALE: 1"=10'

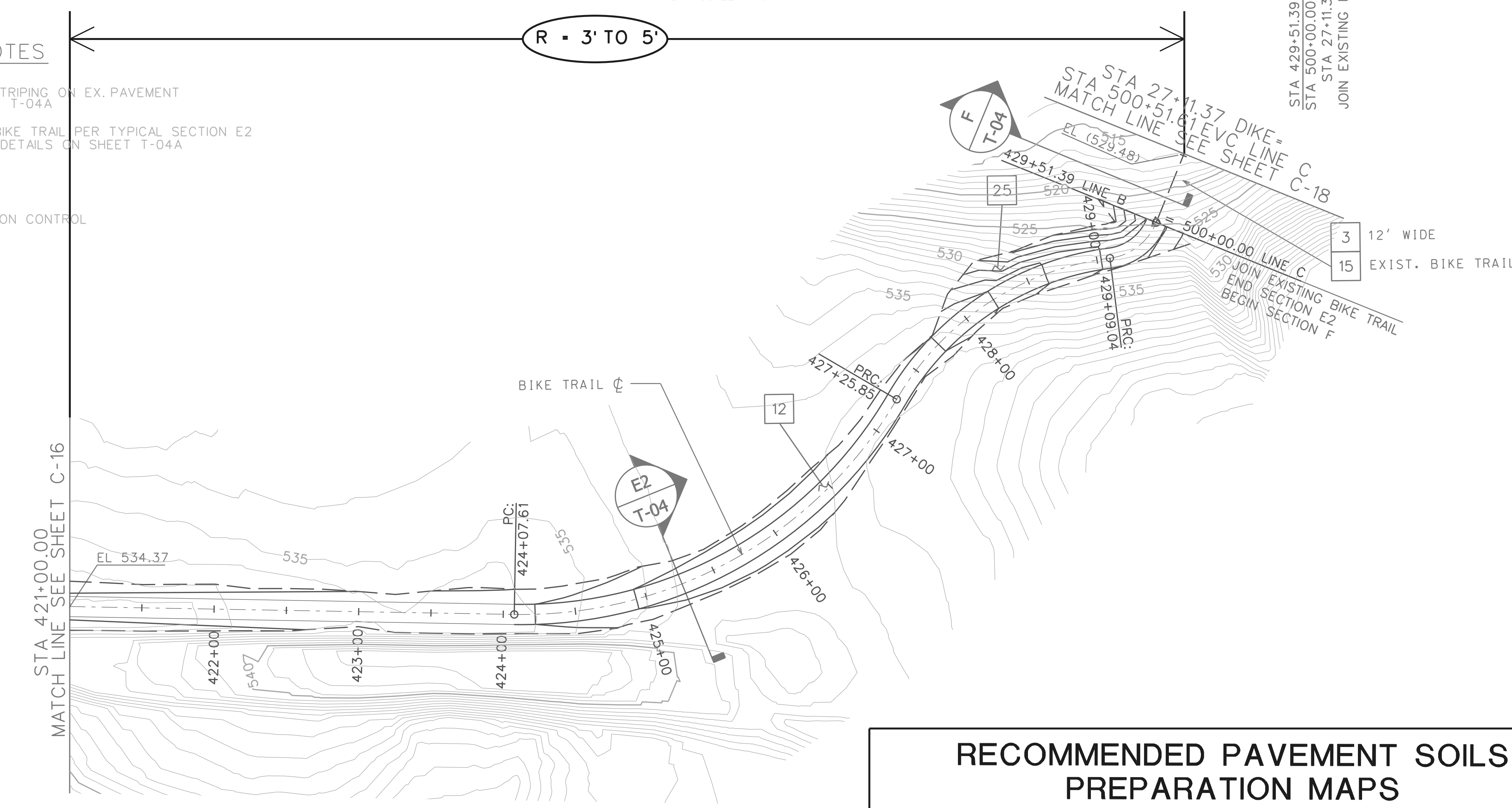
CONSTRUCTION NOTES

3 PROVIDE BIKE TRAIL STRIPING ON EX. PAVEMENT PER DETAIL ON SHEET T-04A

12 CONSTRUCT 10' WIDE BIKE TRAIL PER TYPICAL SECTION E2 ON SHEET T-04 AND DETAILS ON SHEET T-04A

15 PROTECT IN PLACE

25 PROVIDE SLOPE EROSION CONTROL



PLAN

SCALE: 1" = 50'

RECOMMENDED PAVEMENT SOILS PREPARATION MAPS

(R = 3' TO 5') = RECOMMENDED REMOVAL AND RECOMPACT DEPTH

50 25 0 50 100FT
SCALE: 1"= 50'

35% SUBMITTAL

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COUNTY OF RIVERSIDE
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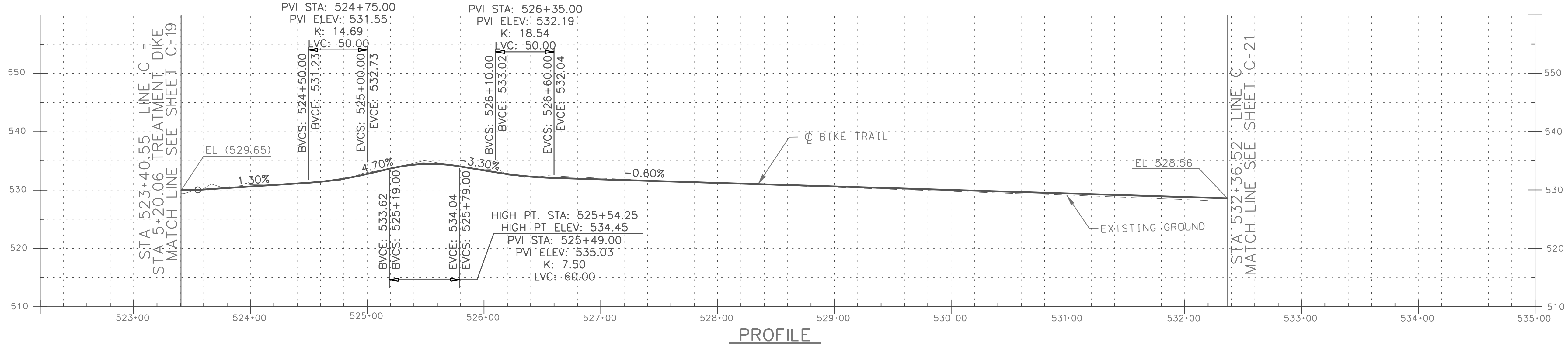
APPROVED BY:
SCOTT BANGLE DATE:
GENERAL MANAGER
RECOMMENDED DATE:

COUNTY OF RIVERSIDE
TRANSPORTATION DEPARTMENT
APPROVED BY:
ALEN FRENCH DATE:
RECOMMENDED DATE:

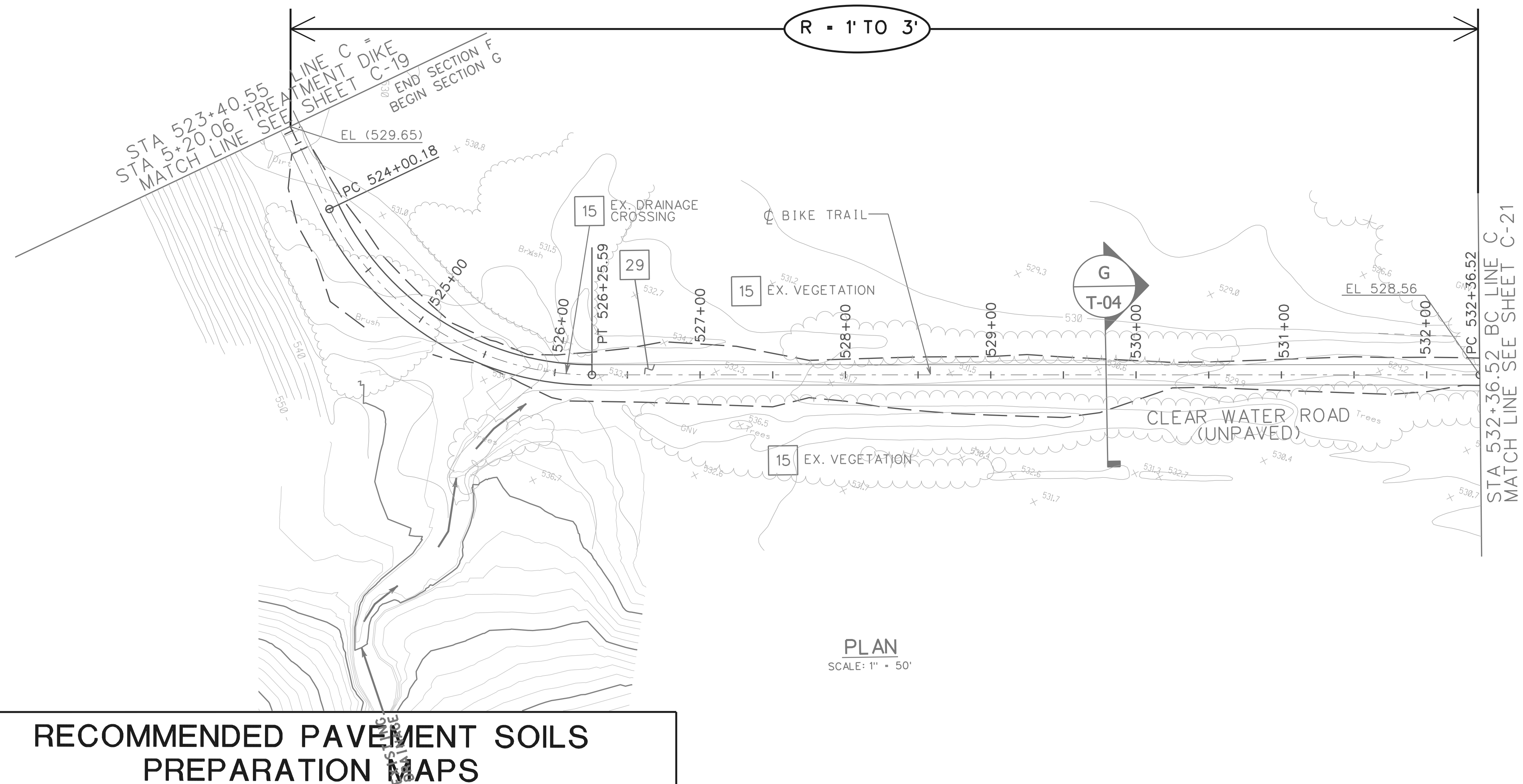
SANTA ANA RIVER TRAIL
CLASS I BIKEWAY
LINES B & C
PLAN & PROFILE
STA 421+00.00 - 429+51.39 (B)
STA 500+00.00 - 500+51.61 (C)

PROJECT NO. 0-0-0000
DRAWING NO. W-XYZ
SHEET NO. C-17 OF 49



PROFILE

HORZ. SCALE: 1"=50'
VERT. SCALE: 1"=10'



PLAN

SCALE: 1" = 50'

CONSTRUCTION NOTES

15 PROTECT IN PLACE

29 CONSTRUCT 10' WIDE BIKE TRAIL PER TYPICAL SECTION G ON SHEET T-04 AND DETAILS ON SHEET T-04A

RECOMMENDED PAVEMENT SOILS PREPARATION MAPS

R = 1' TO 3' = RECOMMENDED REMOVAL AND RECOMPACT DEPTH

SCALE: 1" = 50'

35% SUBMITTAL

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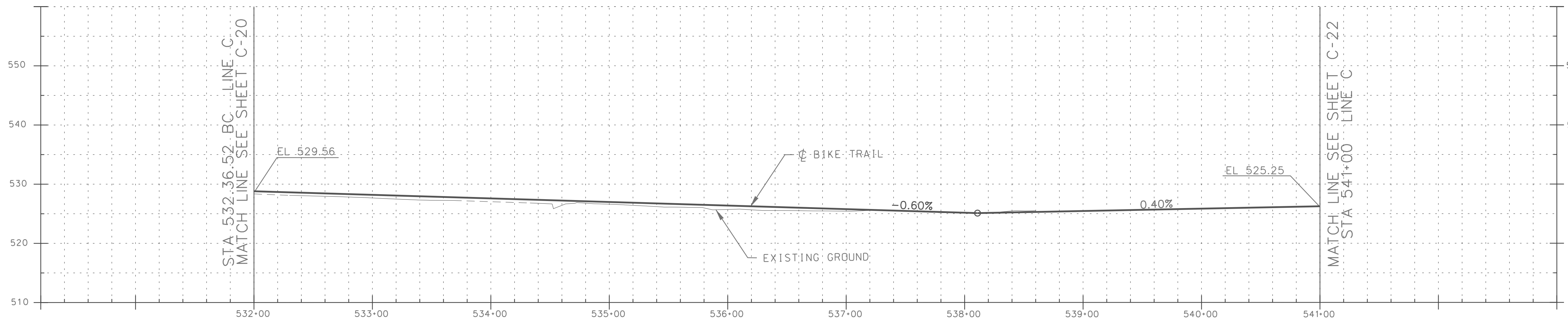
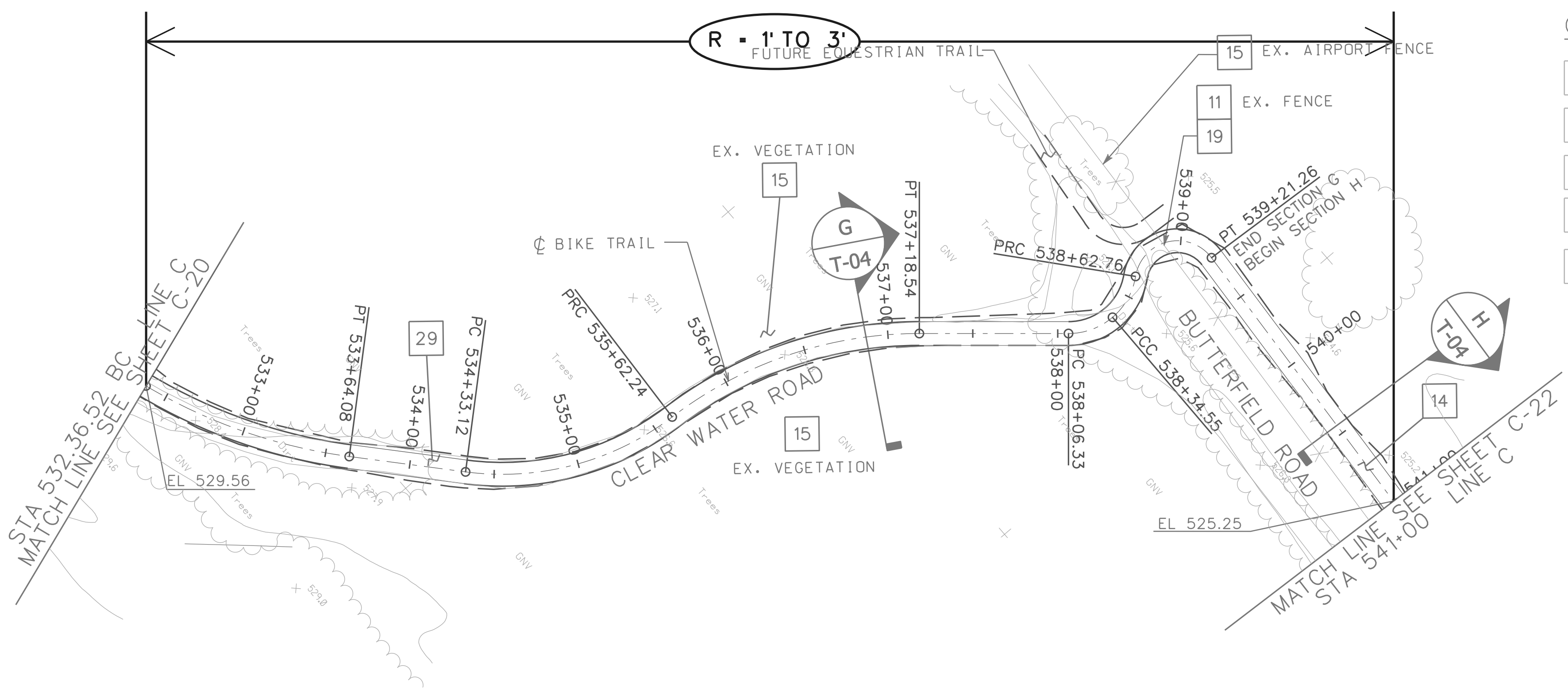
ALEN FRENCH DATE:
RECOMMENDED DATE:

SANTA ANA RIVER TRAIL
CLASS I BIKEWAY
LINE C
PLAN & PROFILE
STA 523+40.55 - STA 532+36.52

PROJECT NO. 0-0-0000
DRAWING NO. W-XYZ
SHEET NO. C-20 OF 49



PROFILE
HORZ. SCALE: 1"=50'
VERT. SCALE: 1"=10'



PLAN
SCALE: 1" = 50'

CONSTRUCTION NOTES

11	REMOVE
14	CONSTRUCT 10' WIDE BIKE TRAIL PER TYPICAL SECTION H ON SHEET T-04 AND DETAILS ON SHEET T-04A
15	PROTECT IN PLACE
19	CONSTRUCT TRAIL AND VEHICLE ACCESS CONTROL
29	CONSTRUCT 10' WIDE BIKE TRAIL PER TYPICAL SECTION G ON SHEET T-04 AND DETAILS ON SHEET T-04A

RECOMMENDED PAVEMENT SOILS PREPARATION MAPS

R = 1' TO 3' = RECOMMENDED REMOVAL AND RECOMPACT DEPTH

50 25 0 50 100FT
SCALE: 1"= 50'

35% SUBMITTAL

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COUNTY OF RIVERSIDE
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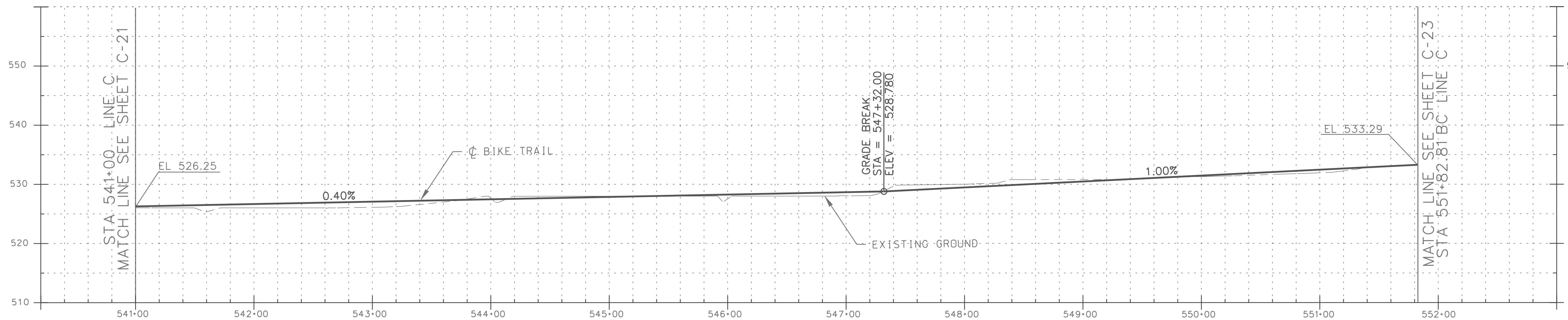
APPROVED BY:
ALEN FRENCH DATE:
RECOMMENDED DATE:

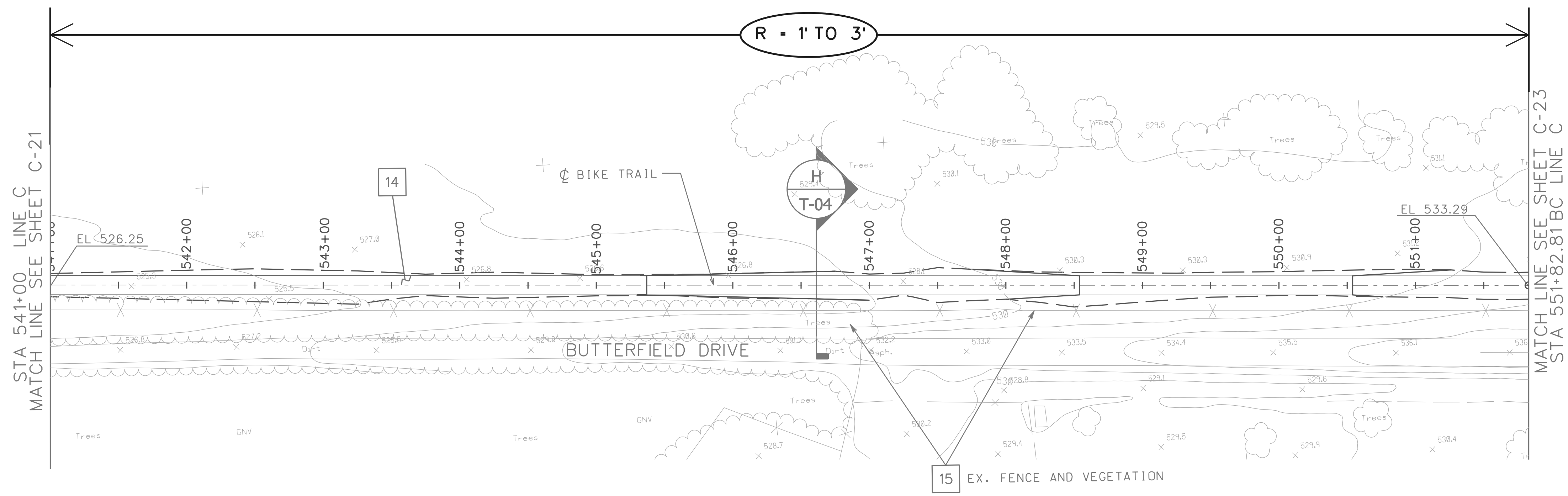
SANTA ANA RIVER TRAIL
CLASS I BIKEWAY
LINE C
PLAN & PROFILE
STA 532+36.52 - STA 541+00.00

PROJECT NO. 0-0-0000
DRAWING NO. W-XYZ
SHEET NO. C-21 OF 49



PROFILE

HORZ. SCALE: 1"=50'
VERT. SCALE: 1"=10'



PLAN

SCALE: 1" = 50'

CONSTRUCTION NOTES

14	CONSTRUCT 10' WIDE BIKE TRAIL PER TYPICAL SECTION H ON SHEET T-04 AND DETAILS ON SHEET T-04A
15	PROTECT IN PLACE

RECOMMENDED PAVEMENT SOILS PREPARATION MAPS

R = 1' TO 3' = RECOMMENDED REMOVAL AND RECOMPACT DEPTH

N

50 25 0 50 100FT
SCALE: 1" = 50'

35% SUBMITTAL

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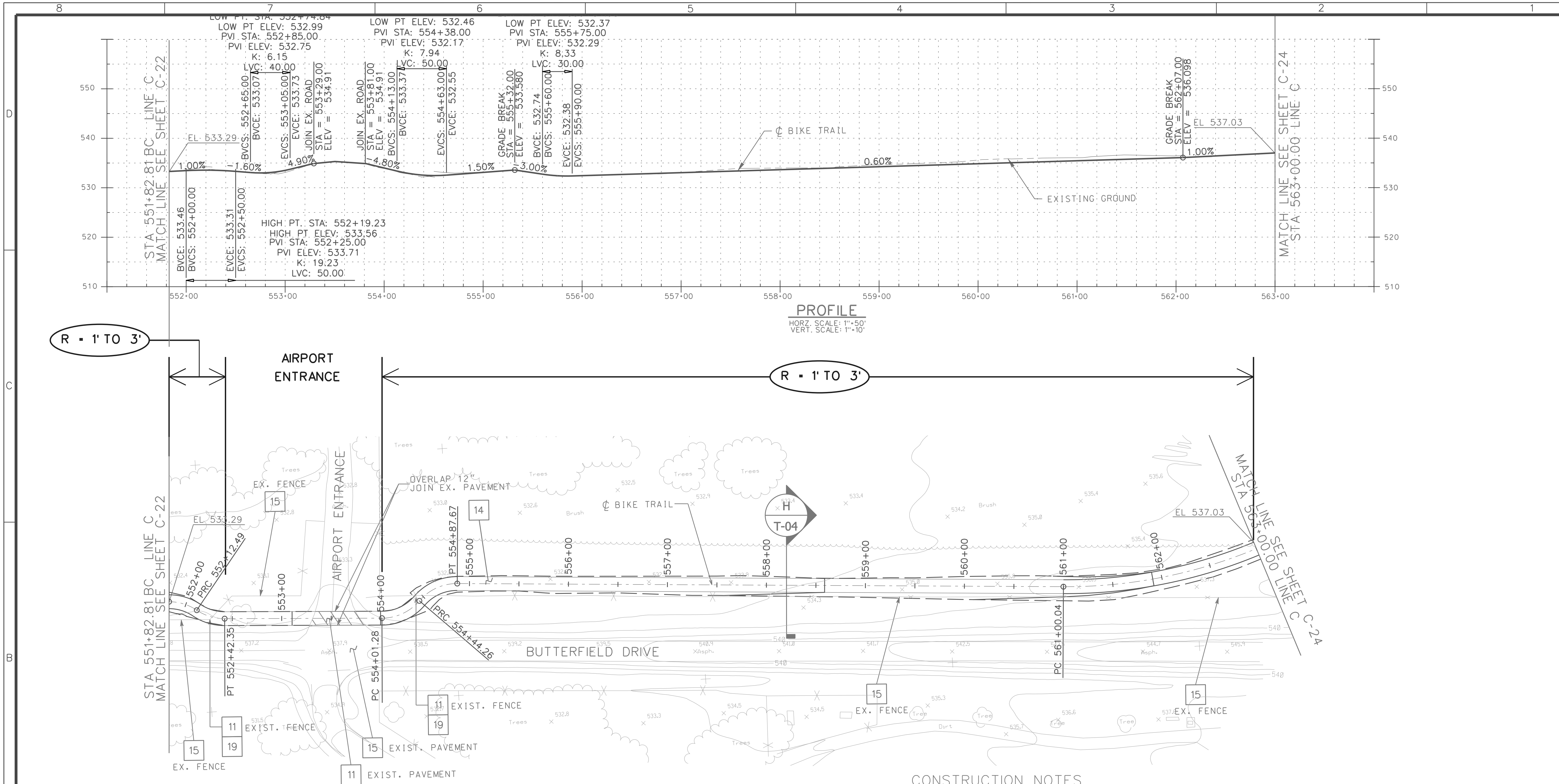
TRANSPORTATION DEPARTMENT
APPROVED BY:
ALEN FRENCH DATE:
RECOMMENDED DATE:

SANTA ANA RIVER TRAIL
CLASS I BIKEWAY
LINE C
PLAN & PROFILE
STA 541+00.00 - STA 551+82.81

PROJECT NO. 0-0-0000
DRAWING NO. W-XYZ
SHEET NO. C-22 OF 49



RECOMMENDED PAVEMENT SOILS PREPARATION MAPS

R = 1' TO 3' = RECOMMENDED REMOVAL AND RECOMPACT DEPTH

CONSTRUCTION NOTES

11	REMOVE
14	CONSTRUCT 10' WIDE BIKE TRAIL PER TYPICAL SECTION H ON SHEET T-04 AND DETAILS ON SHEET T-04A
15	PROTECT IN PLACE
19	CONSTRUCT TRAIL AND VEHICLE ACCESS CONTROL

SCALE: 1"= 50'

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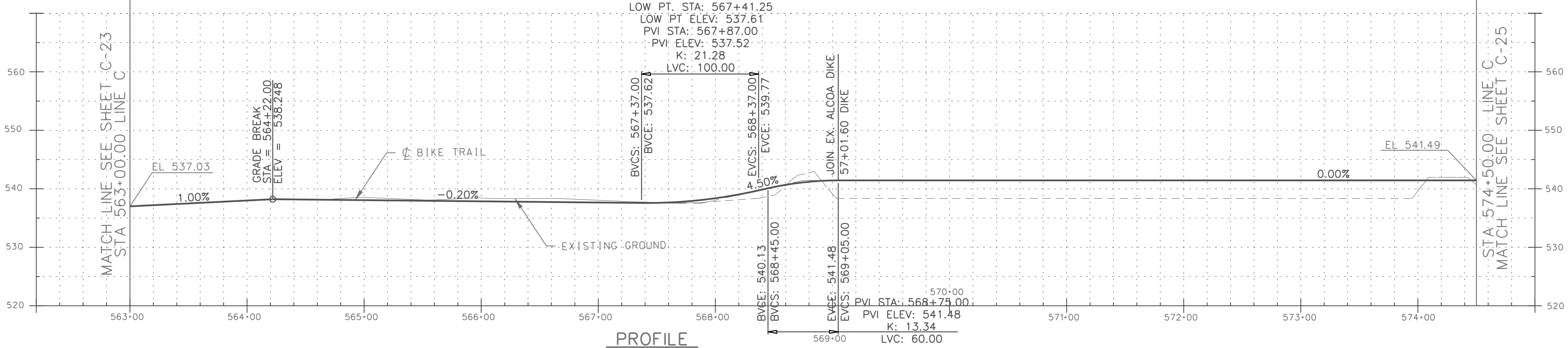
ALEN FRENCH DATE:
RECOMMENDED DATE:

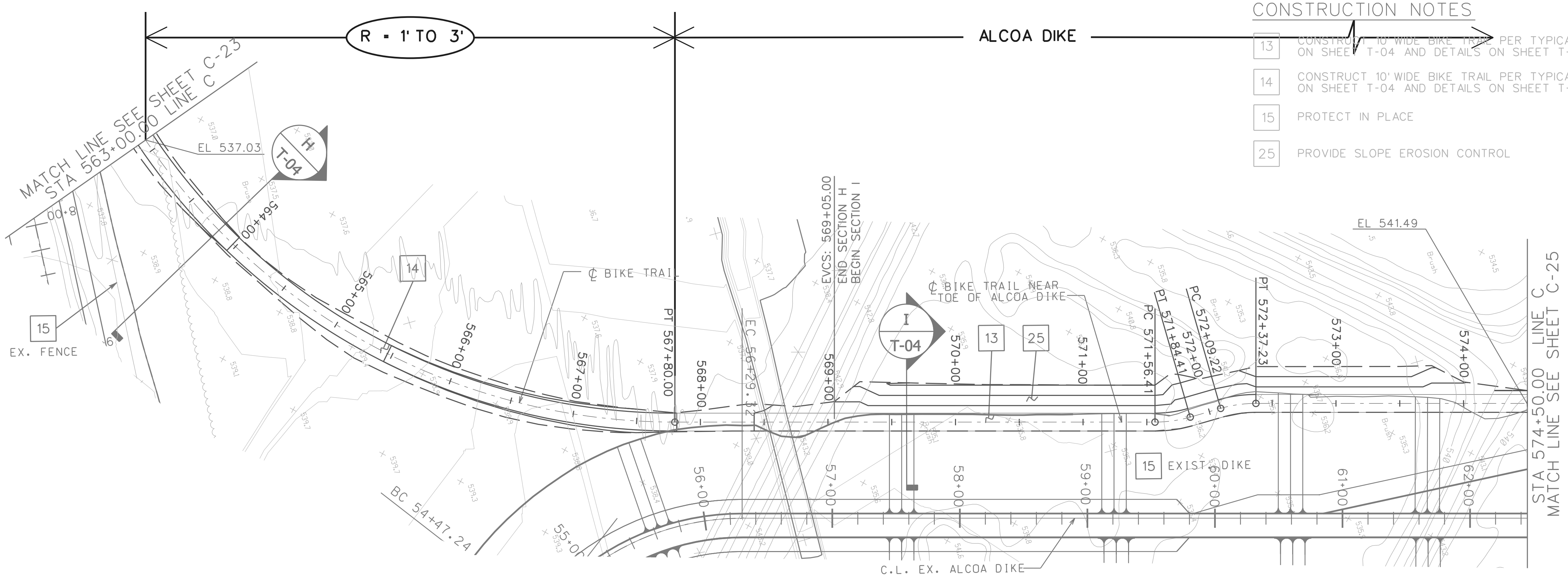
SANTA ANA RIVER TRAIL
CLASS I BIKEWAY
LINE C
PLAN & PROFILE
STA 551+82.81 - STA 563+00.00

PROJECT NO. 0-0-0000
DRAWING NO. W-XYZ
SHEET NO. C-23 OF 49



PROFILE

HORZ. SCALE: 1"=50'
VERT. SCALE: 1"=10'



CONSTRUCTION NOTES

- 13 CONSTRUCT 10' WIDE BIKE TRAIL PER TYPICAL SECTION I ON SHEET T-04 AND DETAILS ON SHEET T-04A
- 14 CONSTRUCT 10' WIDE BIKE TRAIL PER TYPICAL SECTION H ON SHEET T-04 AND DETAILS ON SHEET T-04A
- 15 PROTECT IN PLACE
- 25 PROVIDE SLOPE EROSION CONTROL

NOTE :
SEE ALCOA DIKE PLANS PREPARED BY U.S. ARMY CORPS OF ENGINEERS FOR UPDATED PLANS

PLAN

SCALE: 1" = 50'

50 25 0 50 100FT
SCALE: 1"= 50'

RECOMMENDED PAVEMENT SOILS PREPARATION MAPS

R = 1' TO 3' = RECOMMENDED REMOVAL AND RECOMPACT DEPTH

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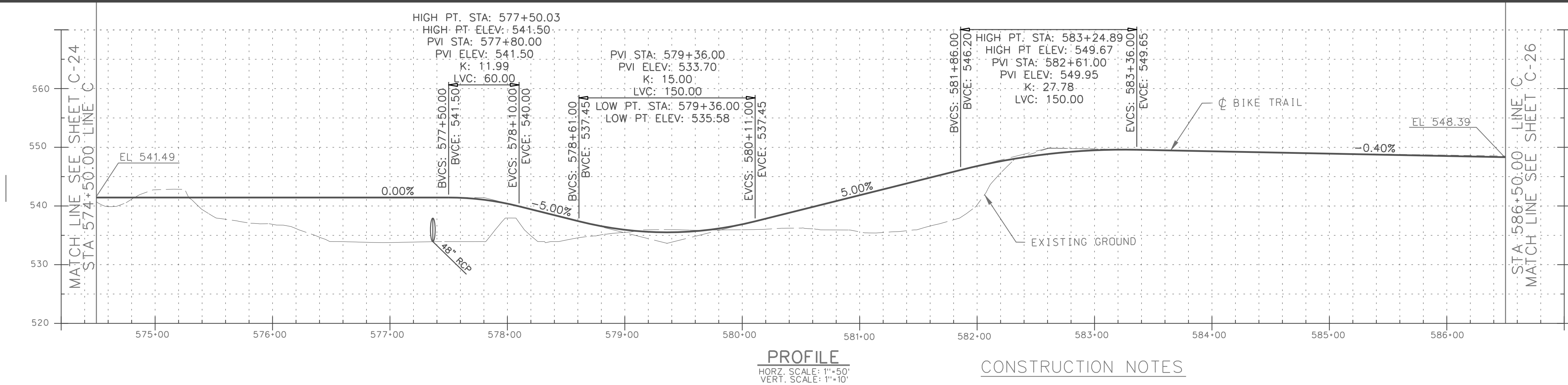
SANTA ANA RIVER TRAIL
CLASS I BIKEWAY
LINE C
PLAN & PROFILE
STA 563+00.00 - STA 574+50.00

PROJECT NO. 0-0-0000
DRAWING NO. W-XYZ
SHEET NO. C-24 OF 49



PROFILE
HORZ. SCALE: 1"=50'
VERT. SCALE: 1"=10'

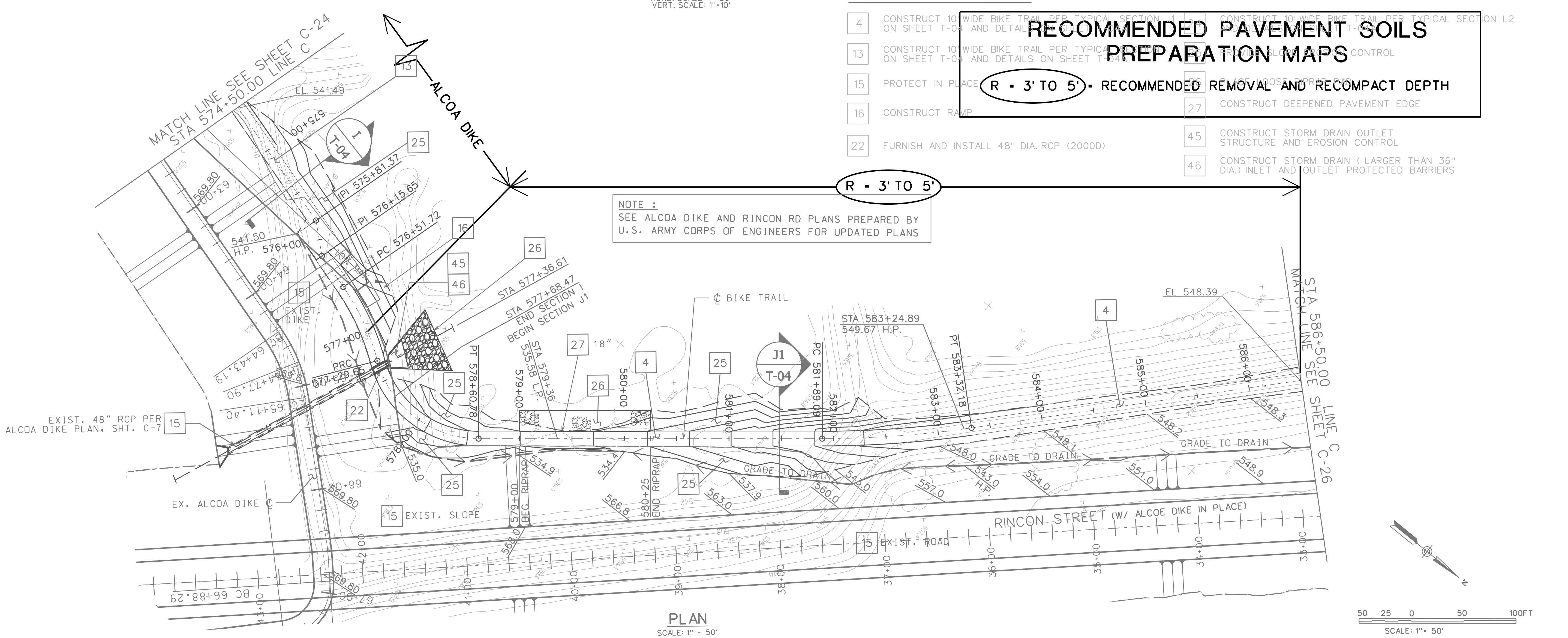
CONSTRUCTION NOTES

4 CONSTRUCT 10' WIDE BIKE TRAIL PER TYPICAL SECTION J1 ON SHEET T-04 AND DETAILS ON SHEET T-04
13 CONSTRUCT 10' WIDE BIKE TRAIL PER TYPICAL SECTION ON SHEET T-04 AND DETAILS ON SHEET T-04
15 PROTECT IN PLACE
16 CONSTRUCT RAMP
22 FURNISH AND INSTALL 48" DIA. RCP (2000D)
25 CONSTRUCT 10' WIDE BIKE TRAIL PER TYPICAL SECTION L2
26 ... SLOPE ... CONTROL
27 CONSTRUCT DEEPENED PAVEMENT EDGE
45 CONSTRUCT STORM DRAIN OUTLET STRUCTURE AND EROSION CONTROL
46 CONSTRUCT STORM DRAIN (LARGER THAN 36" DIA.) INLET AND OUTLET PROTECTED BARRIERS

RECOMMENDED PAVEMENT SOILS PREPARATION MAPS

R = 3' TO 5' = RECOMMENDED REMOVAL AND RECOMPACT DEPTH

NOTE : SEE ALCOA DIKE AND RINCON RD PLANS PREPARED BY U.S. ARMY CORPS OF ENGINEERS FOR UPDATED PLANS



PLAN
SCALE: 1" = 50'

35% SUBMITTAL

Don't Dig...Until You Call U.S.A. Toll Free 1-800-227-2600 for the location of buried utility lines. Don't disrupt vital services. TWO WORKING DAYS BEFORE YOU DIG	REVISIONS	ENGINEER	RC..	DESIGNED BY: JC/LW DRAWN BY: LB / TP DATE DRAWN: March 2011
REF.	DESCRIPTION	APPR. DATE	APPR. DATE	

APPROVED BY:
WRC Consulting Services Inc.
1800 E. Garry Ave Suite 213
Santa Ana, CA 92705
Tel: (949) 833-8388
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LAN WEBER, ENGINEER, RCE 35894 DATE:

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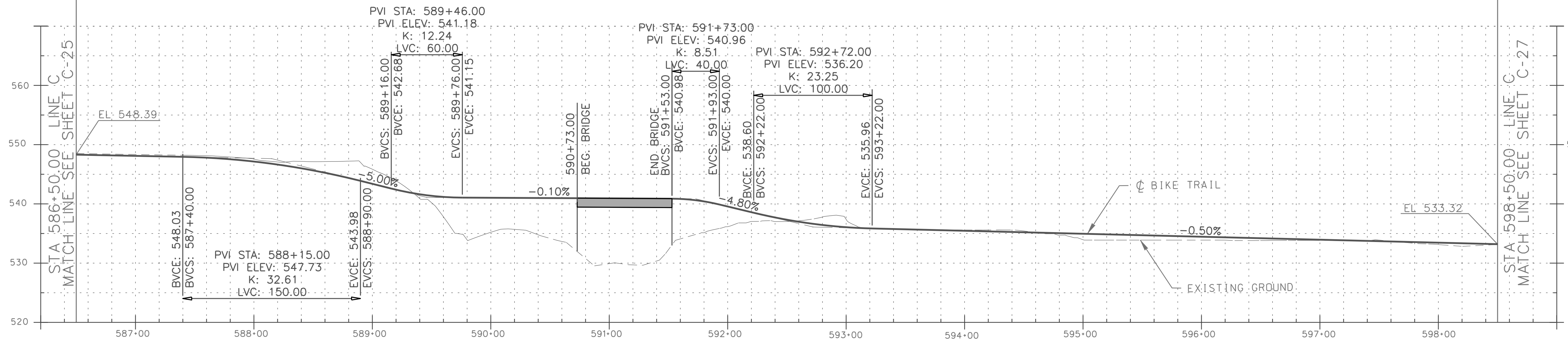
COUNTY OF RIVERSIDE
REGIONAL PARKS AND OPEN SPACE DISTRICT
APPROVED BY:
SCOTT BANGLE, GENERAL MANAGER DATE:
RECOMMENDED DATE:

COUNTY OF RIVERSIDE
TRANSPORTATION DEPARTMENT
APPROVED BY:
ALEN FRENCH DATE:
RECOMMENDED DATE:

SANTA ANA RIVER TRAIL
CLASS I BIKEWAY
LINE C
PLAN & PROFILE
STA 574+50.00 - STA 586+50.00

PROJECT NO. 0-0-0000
DRAWING NO. W-XYZ
SHEET NO. C-25 OF 49

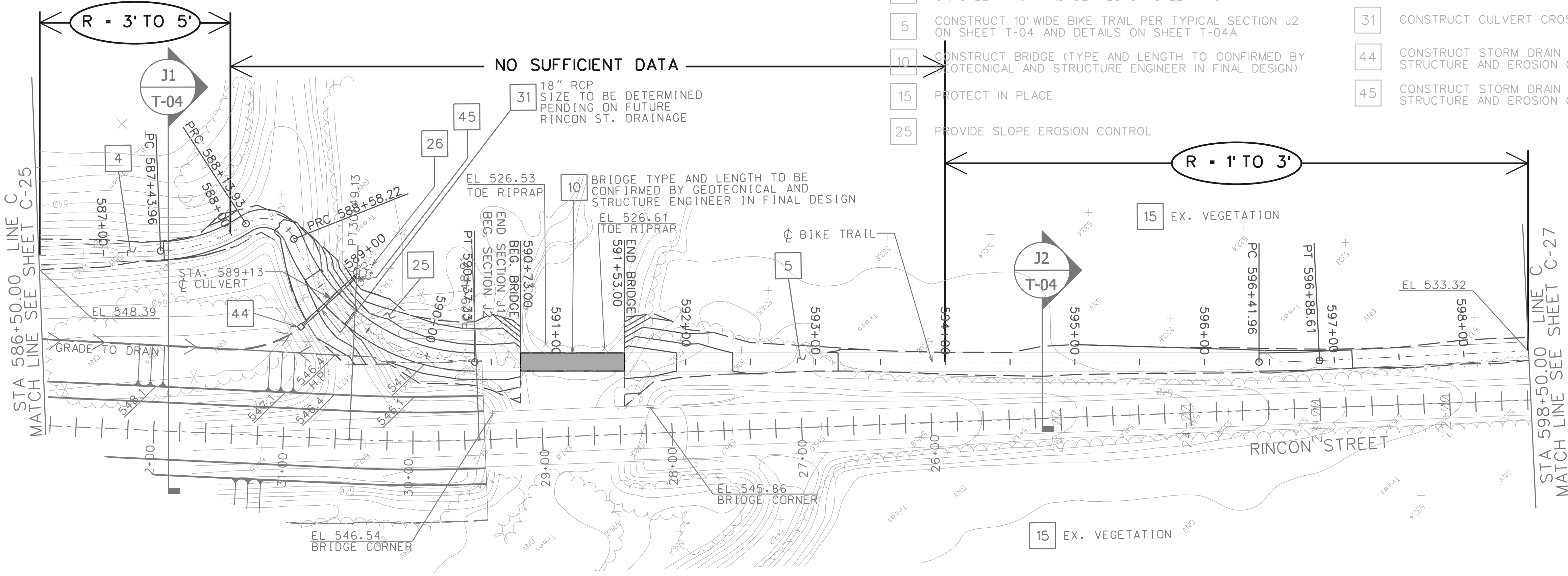


PROFILE

HORZ. SCALE: 1"=50'
VERT. SCALE: 1"=10'

CONSTRUCTION NOTES

- 4 — CONSTRUCT 10' WIDE BIKE TRAIL PER TYPICAL SECTION J1 ON SHEET T-04 AND DETAILS ON SHEET T-04A
- 5 — CONSTRUCT 10' WIDE BIKE TRAIL PER TYPICAL SECTION J2 ON SHEET T-04 AND DETAILS ON SHEET T-04A
- 10 — CONSTRUCT BRIDGE (TYPE AND LENGTH TO CONFIRMED BY GEOTECNICAL AND STRUCTURE ENGINEER IN FINAL DESIGN)
- 15 — PROTECT IN PLACE
- 25 — PROVIDE SLOPE EROSION CONTROL
- 26 — PLACE LOOSE RIPRAP PAD
- 31 — CONSTRUCT CULVERT CROSSING
- 44 — CONSTRUCT STORM DRAIN INLET STRUCTURE AND EROSION CONTROL
- 45 — CONSTRUCT STORM DRAIN OUTLET STRUCTURE AND EROSION CONTROL



NOTE:
SEE ALCOA DIKE AND RINCON ROAD PLANS PREPARED BY U.S. ARMY CORPS OF ENGINEERS FOR UPDATED PLANS

RECOMMENDED PAVEMENT SOILS PREPARATION MAPS

R = 3' TO 5' = RECOMMENDED REMOVAL AND RECOMPACT DEPTH

PLAN
SCALE: 1" = 50'

SCALE: 1"= 50'

35% SUBMITTAL

Don't Dig...Until You Call U.S.A. Toll Free **1-800-227-2600** for the location of buried utility lines. Don't disrupt vital services. TWO WORKING DAYS BEFORE YOU DIG

REF.	REVISIONS DESCRIPTION	ENGINEER APPR.	DATE	RC.. APPR.	DATE

DESIGNED BY: JC/LW
DRAWN BY: LB / TP
DATE DRAWN: March 2011

APPROVED BY:
WRC Consulting Services Inc.
1800 E. Garry Ave Suite 213
Santa Ana, CA 92705
Tel: (949) 833-8388
Fax: (949) 833-8380
LAN WEBER, ENGINEER, RCE 35894 DATE:

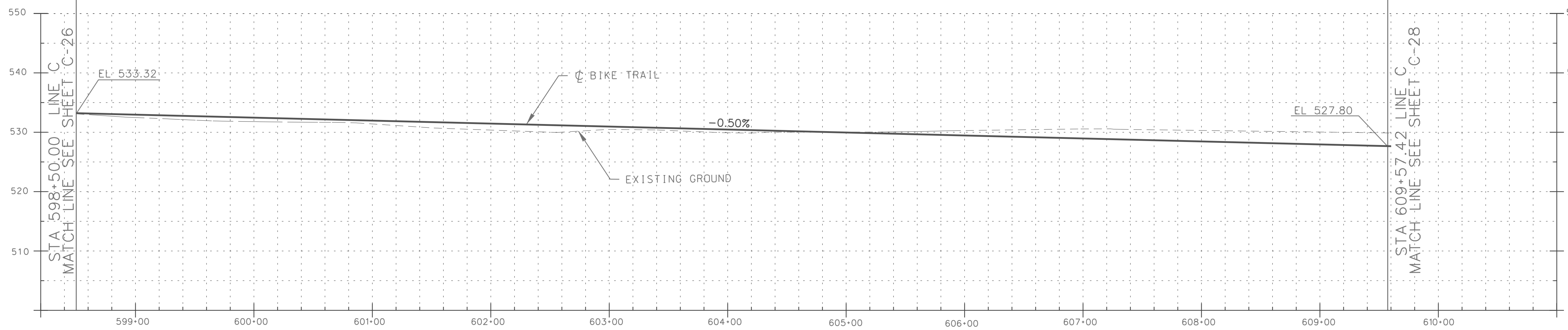
REGISTERED PROFESSIONAL ENGINEER LAN-TIN LI WEBER No. 35894 Exp. 12-31-11 CIVIL STATE OF CALIFORNIA

COUNTY OF RIVERSIDE
REGIONAL PARKS AND OPEN SPACE DISTRICT
APPROVED BY:
SCOTT BANGLE, GENERAL MANAGER DATE:
RECOMMENDED DATE:

COUNTY OF RIVERSIDE
TRANSPORTATION DEPARTMENT
APPROVED BY:
ALEN FRENCH DATE:
RECOMMENDED DATE:

SANTA ANA RIVER TRAIL
CLASS I BIKEWAY
LINE C
PLAN & PROFILE
STA 586+50.00 - STA 598+50.00

PROJECT NO. 0-0-0000
DRAWING NO. W-XYZ
SHEET NO. C-26 OF 49

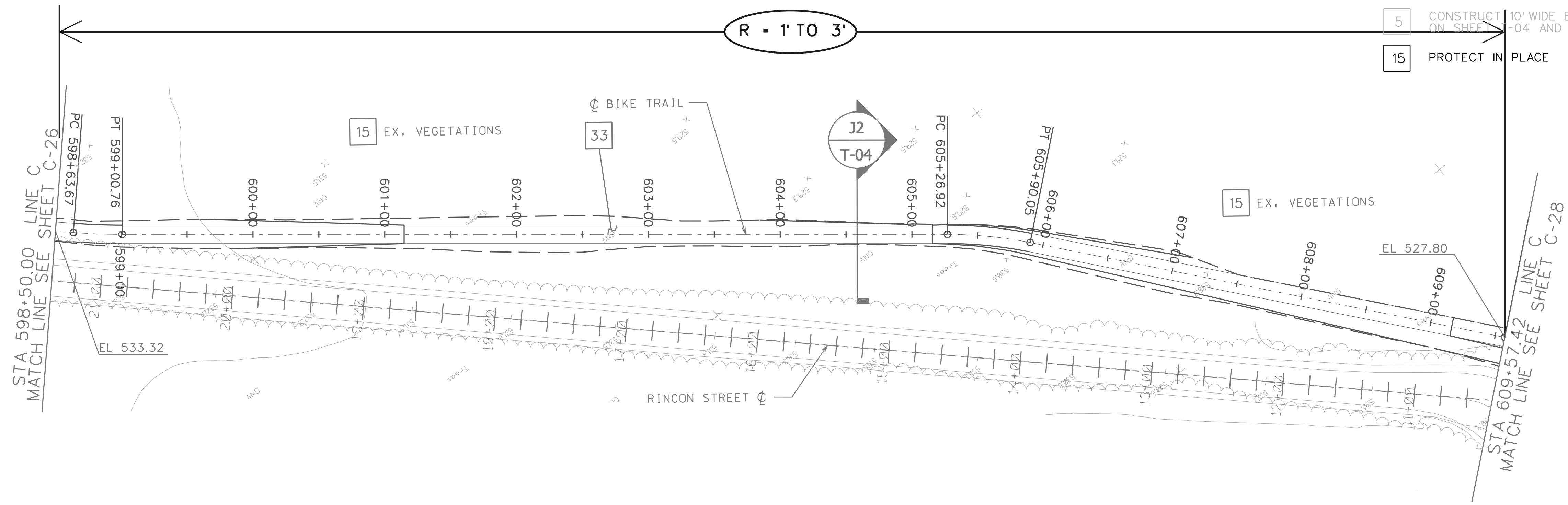


PROFILE

HORZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 10'

CONSTRUCTION NOTES

5	CONSTRUCT 10' WIDE BIKE TRAIL PER TYPICAL SECTION J2 ON SHEET T-04 AND DETAILS ON SHEET T-04A
15	PROTECT IN PLACE



RECOMMENDED PAVEMENT SOILS PREPARATION MAPS

R = 1' TO 3' = RECOMMENDED REMOVAL AND RECOMPACT DEPTH

PLAN

SCALE: 1" = 50'

50 25 0 50 100FT

SCALE: 1" = 50'

35% SUBMITTAL

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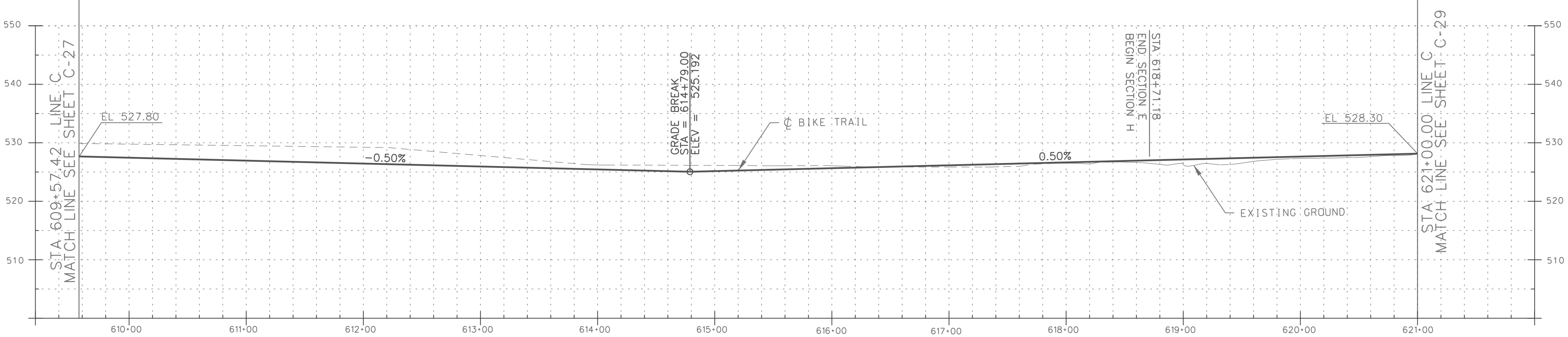
ALEN FRENCH DATE:
RECOMMENDED DATE:

SANTA ANA RIVER TRAIL
CLASS I BIKEWAY
LINE C
PLAN & PROFILE
STA 598+50.00 - STA 609+57.24

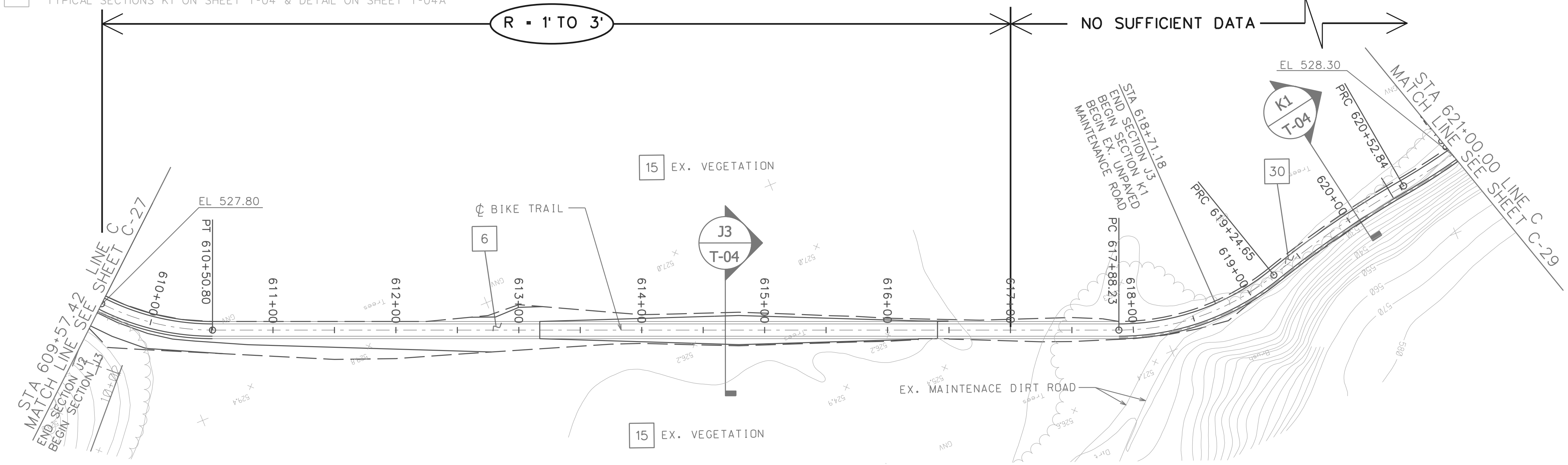
PROJECT NO. 0-0-0000
DRAWING NO. W-XYZ
SHEET NO. C-27 OF 49



PROFILE
HORZ. SCALE: 1"=50'
VERT. SCALE: 1"=10'

CONSTRUCTION NOTES

6	CONSTRUCT 10' WIDE BIKE TRAIL PER TYPICAL SECTION J3 ON SHEET T-04 AND DETAILS ON SHEET T-04A
15	PROTECT IN PLACE
30	CONSTRUCT 10' WIDE MULTI-USE RUBBERIZED ASPHALT PAVED TRAIL PER TYPICAL SECTIONS K1 ON SHEET T-04 & DETAIL ON SHEET T-04A



RECOMMENDED PAVEMENT SOILS PREPARATION MAPS

R = 3' TO 5' = RECOMMENDED REMOVAL AND RECOMPACT DEPTH

PLAN
SCALE: 1" = 50'

50 25 0 50 100FT
SCALE: 1"= 50'

35% SUBMITTAL

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SANTA ANA RIVER TRAIL
CLASS I BIKEWAY
LINE C
PLAN & PROFILE
STA 609+57.42 - STA 621+00.00

PROJECT NO. 0-0-0000
DRAWING NO. W-XYZ
SHEET NO. C-28 OF 49