
Appendix F:

Trail Design and Construction Details and Specifications

Design and Construction Details and Specifications

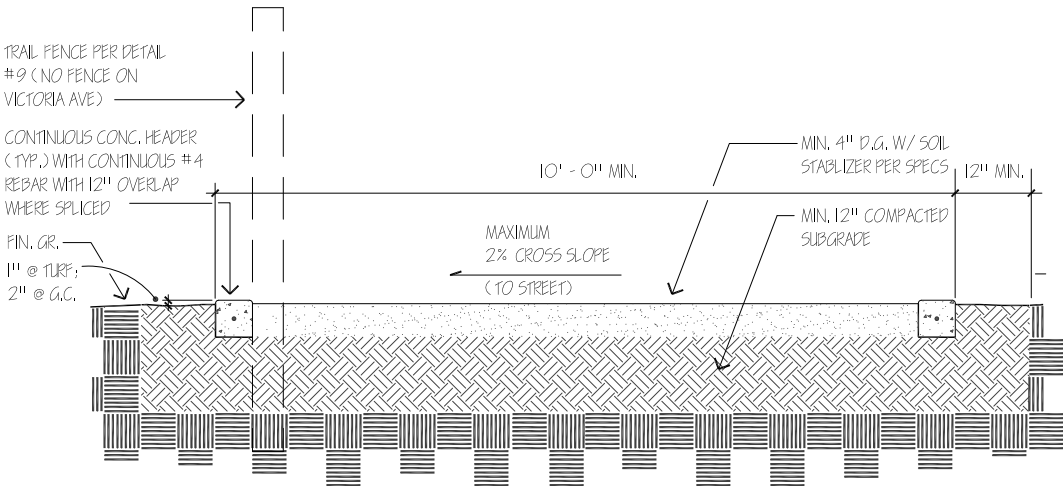
The following pages include the City of Riverside's most commonly used trail construction details and trail specifications, and the more commonly used design details from the California State Parks Trails Handbook (2019) and the USDA United States Forest Service Standard Trail Plans and Specifications. These include:

- Travelway Excavation
- General Brushing
- Clearing and Brushing Travelway
- Railings
- Typical Switchbacks
- Puncheons
- Wooden Steps
- Rock Steps
- Equestrian Steps
- Split Rail Gate
- Timber Planking
- Equestrian Puncheon

Following the previous information are details showing types of fence construction.

These include:

- Post and Rail
- Post and Cable
- City of Riverside Standard PVC



NOTES:

GRADES:

TRAIL LONGITUDINAL GRADIENT SHALL COMPLY W/ ADA STANDARDS WHERE FEASIBLE.

GRADE TRAIL TREAD FLUSH TO T.C. AT LOWER SIDE AND MAX. 1/ 2" BELOW AT UPPER SIDE.

NATIVE SOILS MAY BE USED FOR D.G. WHERE MEETING 'GREENBOOK' DEFINITION OF "D.G."

TRAIL SUBGRADE TO BE COMPACTED TO 90% RELATIVE COMPACTION FOR MINIMUM OF 12" BELOW D. G. SUBGRADE.

TRAIL LONGITUDINAL GRADIENT SHALL NOT EXCEED 10% WITHOUT PRIOR WRITTEN CITY APPROVAL.

D.G. TO BE MIXED WITH SOIL STABILIZER AS SPECIFIED PRIOR TO PLACEMENT. APPLICATION RATE TO BE FOR "HIGH TRAFFIC."

FENCE:

WHERE R.O.W. IS 66' OR LESS, AND TRAIL IS ALONG FRONT OR SIDE YARDS, PLACE FENCE AT EDGE OF TRAIL EASEMENT ADJACENT TO PRIVATE PROPERTY TO SERVE AS P / L FENCE.

WHERE R.O.W. EXCEEDS 66' (e.g. REVERSE FRONTAGE LANDSCAPE AREAS) PLACE TRAIL FENCE ON STREET SIDE OF TRAIL TREAD.

TRAIL FENCE MAY BE OMITTED WHERE TRAIL LEAVES RIGHT OF WAY ONCE 25' AWAY FROM R.O.W. LINE.

CONCRETE:

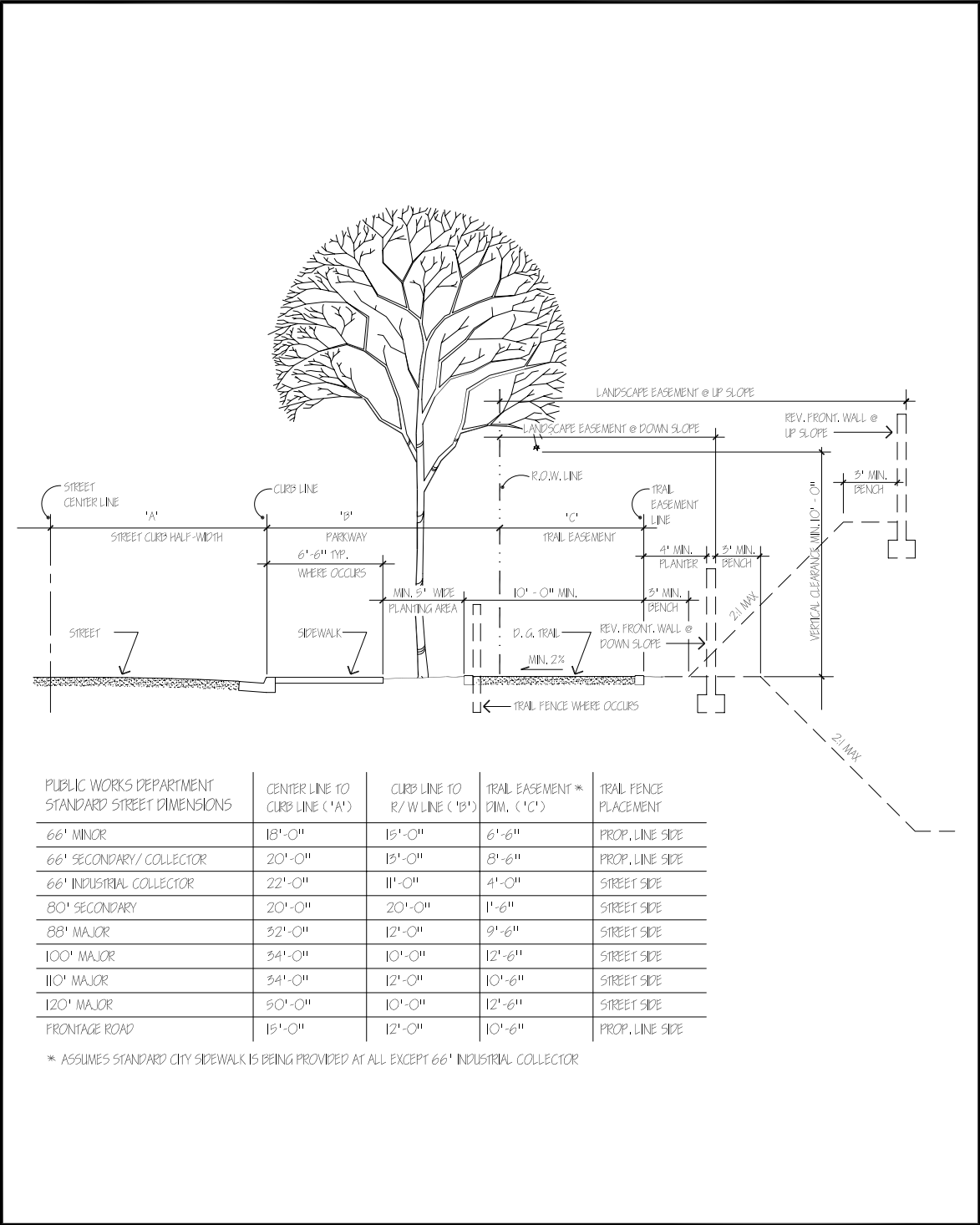
CONCRETE MOWCURE(S) MAY BE OMITTED WHERE TRAIL ABUTS "NATIVE VEGETATION" (I.E. NON-IRRIGATED) AREAS.

WHERE TRAIL CROSSES DRIVEWAYS/ SIDEWALKS PROVIDE HEAVY BROOM FINISH CONCRETE.

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Revised	Date

Park and Recreation Department CITY OF RIVERSIDE
STANDARD TRAIL SECTION

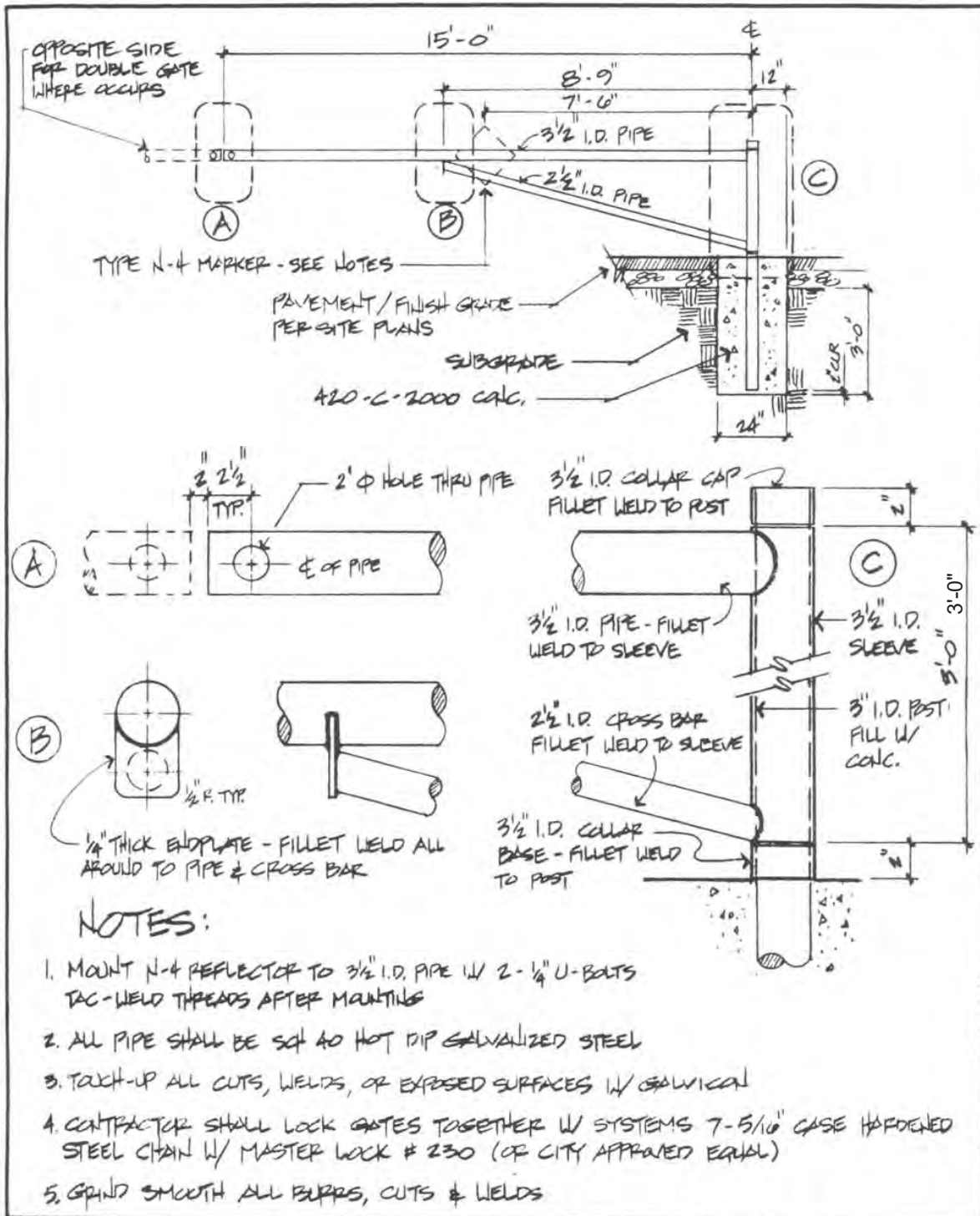
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Park and Recreation Department
CITY OF RIVERSIDE
TYP. TRAIL & PARKWAY SECTION

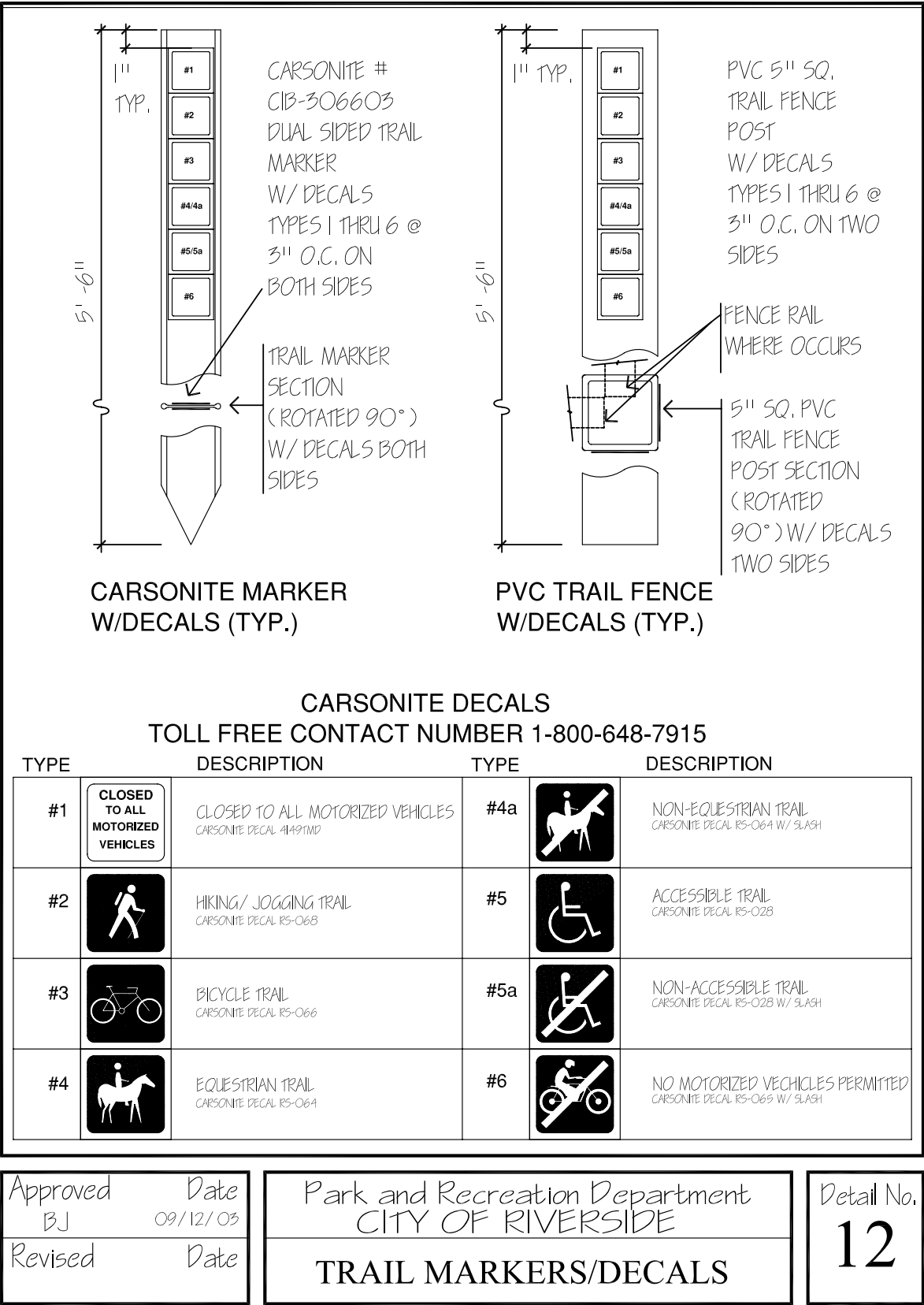
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Approved	Date
Revised	Date

Park & Recreation Department CITY OF RIVERSIDE
STEEL SWING ARM GATE

Detail No.
5110



SECTION 02211 - TRAIL GRADING AND CONSTRUCTION

PART 1 - GENERAL

- 1.01 STANDARD SPECIFICATIONS: The provisions of the "Standard Specifications for Public Works Construction" shall apply except as modified herein.
- 1.02 SCOPE: The Work of this Section shall consist of furnishing all labor, materials, equipment, appliances and services necessary for the execution and completion of all **Trail Grading and Construction Work** as shown on the Plans and as described in the Specifications including, but not necessarily limited to, the following:
- Rough grading as shown on the plans, including cut, fill, backfill and backfill compaction
 - Subgrade preparation for D.G. paving including any over-excavation and re-compaction as may be required
 - Excavation of soils for all trail fence posts and structures
 - Excavation, backfill and compaction of soils for all mowcurbs
 - Soil compaction as required;
 - Protective measures;
 - Dust and noise abatement;
 - Borrow from and/or export to a local borrow/disposal site as directed and as necessary for a balanced grading operation;
 - Fine grading of the work site;
 - Decomposed Granite Paving;
 - Soil testing as required;
 - Coordination with Work of other Sections;
 - Clean-up; and,
 - Erosion Repairs, Guarantees and Warranty Work.
- 1.03 RELATED WORK SPECIFIED ELSEWHERE:
Finish Grading in Landscaped Areas Section 02480
- 1.04 QUALITY ASSURANCE:
- A. Other Requirements: All Work of this Section shall comply with the requirements of the following:
1. The Grading Code of the City of Riverside.
 2. The Soils Engineering Investigation Reports for the site prepared by Soils Engineer (see Appendix).
- B. Tests and Inspections:
1. All Work in this Section shall be subject to the observation and testing as required by the Soils Engineer selected by City. The Soils Engineer will submit a compaction report to the Parks Department Representative certifying Contractor's compliance with the Plans, Specifications, Soils Reports and City Grading Ordinance in placing all fills and backfills. The Soils Engineer will conduct all specified tests to insure compliance. The Soils Engineer will also test, identify and make recommendations on borrow site fill materials as specified in this Section.
 2. The number and location of soils tests shall be at the discretion of the Soils Engineer to assure uniformity and compliance with the City Grading Ordinance, and shall be at least one test per two vertical feet of fill, but not less than one test per 500 cubic yards, all as approved by the Parks Department Representative.
 3. The costs of services of the Soils Engineer for specified field density and maximum density tests, compaction reports and certificates of compliance, will be borne by City except that additional tests and recompactions made necessary by inadequate compaction, inadequate materials provided by Contractor, or inaccurate excavations shall be paid for by Contractor.
- 1.05 GRADING A "BALANCED" OPERATION: It is the intent of the Plans and Specifications that the grading shall be a balanced operation with site material. No import nor export is contemplated. If during grading operations an excess or deficiency of earth becomes apparent, Contractor shall notify the Parks Department Representative immediately in writing and ask for direction in adjustment of plan grades such that the grading

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shall be completed with site material conforming as nearly as possible to the finish grades shown and insuring positive drainage all at no additional cost to City.

- 1.06 **WATER**: See Special Provisions Section **7-8.5 Temporary Light, Power, and Water** regarding temporary construction water.
- 1.07 **JOB CONDITIONS**:
- A. **Protection of Existing Items**:
 1. Contractor shall furnish, place and maintain all shoring and bracing as may be required for protection of existing structures and utility services during execution of the Work.
 2. All bench marks, monuments and other reference points shall remain undisturbed unless specifically directed otherwise by the Park Projects Inspector.
 - B. **Coordination with Others**:
 1. Contractor shall give written notice to the Parks Department Representative, utility agencies, and other legal authorities prior to starting Work.
 2. Contractor shall coordinate Contractor's operations with other trades, utility agencies, and other affected public departments to assure continuity for both access and service of all utility service distribution lines, in conformance with applicable requirements of these organizations. No services to any property shall be impeded.
 - C. **Abandoned and Unknown Utilities**:
 1. Abandoned lines, meters and boxes, obstructions or piping, shall be removed, plugged, or capped in accordance with the requirements and approval of the agencies affected, or as directed by the Park Projects Inspector. Coordinate all such Work with applicable mechanical or electrical trade having responsibility. Remove all abandoned utility lines, pipes, or conduits, to a point outside new construction lines.
 2. Where unmarked utility lines or other underground obstructions or piping are uncovered within the Work area, notify the agencies or service utility companies having jurisdiction and take necessary measures to prevent interruption of service. Should such lines or services be damaged, broken, or interrupted through Contractor's own negligence, those services shall be repaired immediately by the party designated by the utility owner, at Contractor's expense. If an unmarked utility is damaged other than through the negligence of Contractor, Contractor's responsibility is limited to providing immediate and proper notification of the damage to the utility owner so that repairs can be made. Contractor shall cooperate with the utility owner and provide access for repair work.

PART 2 - MATERIALS

- 2.01 **D.G. PAVING**: Shall be Natracil™ Stabilized Decomposed Granite/Crushed Aggregate Stone, as manufactured by Gail Materials, 10060 Dawson Canyon Road, Corona, CA 92883, (951) 667-6106, <http://www.gailmaterials.com/> or City approved equal.
- A. **D.G.**: Shall be color as approved by the Inspector to match existing, decomposed granite free of silt, clay, weed seed, and any other deleterious material, conforming with Section 400-2.3 Disintegrated Granite, per the Standard Specifications and as approved by the Parks Department Representative. Contractor shall provide a one pound sample to the Parks Department Representative a minimum of 35 days prior to ordering materials for the review and approval of the Parks Department Representative.
 - B. **Stabilizer**: Shall be Natracil™ psyllium husk binder, or City approved equal. The stabilizer shall be incorporated with the granite fines by the use of a pug mill that includes a weight belt feeder that ensures the proper ratio of binder to granite fines. Blending with the use of a bucket loader or similar is not acceptable. The binder shall be blended at the rate of 12 lbs. per ton of granite fines.
- 2.02 **DRAIN ROCK**: Drain rock for all sumps and french drains shall be pervious backfill as specified in Standard Specifications, Section **300-3.5.2 Pervious Backfill**.

2.03 FILL MATERIAL:

- C. Required Approval: All fill material must be approved by the Soils Engineer and the Parks Department Representative.
- D. On-site Material: On-site excavated materials may be used for fill as approved by the Soils Engineer and the Parks Department Representative.

2.04 GRANULAR BEDDING MATERIAL: Where called for on the Plans, granular bedding material shall be crushed stone or pea gravel conforming to the following grading:

<u>Sieve Size</u>	<u>% Passing</u>
3/4"	100
1/2"	95
#4	5

2.05 IMPORT:

- E. Landscape Fills: All import soil used for fill in landscape areas shall be Class 'A' topsoil per Standard Specifications, Section **212-1.1 Top Soil, General**.
- F. Structural Fills: All import soil used solely for structural fill shall be non-expansive, predominantly granular material free from organic contaminants, and capable of attaining the required compacted densities.
- G. Approved Samples: Samples of all import soil, as obtained by the City's Inspector at the borrow site, must be approved by the Parks Department Representative prior to start of import of soil to the Project site.

2.06 TRAIL FENCE: Trail fence shall be as specified by the Parks, Recreation and Community Services Department, per the updated Trails Master Plan (2021).

PART 3 - EXECUTION

3.01 GENERAL:

- A. Work Sequence: All demolition, clearing and grubbing of objectionable materials must be completed to the satisfaction of the Parks Department Representative before starting any earthwork grading and excavation.
- B. Survey: See Special Provisions Section **2-9.3 Survey Service** regarding responsibility for provision of all survey services as necessary for horizontal and vertical control points, layouts, lines and levels, and staking of the Work.
- C. Allowable Gradients: Trails shall be constructed in the field to comply with the following maximum and minimum gradients.
 - 1) Cross Slope: Trail cross slope shall be between 1% minimum and 2% maximum.
 - 2) Longitudinal Gradients:
 - a) Accessible Trails: Trails designated for ADA access shall not exceed a longitudinal slope of 5% (20:1) unless configured as an Accessible Ramp.
 - b) Non-Accessible Trails: Trails designated as non-accessible, must be so marked, and generally shall not exceed a longitudinal gradient of 10% (10:1). However, slopes steeper than this for short distances may be allowed under the following conditions:
 - Maximum of 15% slope for distance of 500' or less.
 - 20% slope permitted only in unique situations and limited to 100' or less.
 - Under no circumstances shall any slope exceed 20%.
 - c) Alternate Trail Designs: Where the natural terrain is so steep that provision of a trail at more

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- than 20% gradient is required, to decrease grade, terrace steps may be used.
- 3) Accessible Ramp Systems: All ramps shall not exceed a maximum slope of 8.333% (12:1). Ramps shall not exceed a maximum of 30' in length between landings. All landings shall not exceed a maximum cross slope of 2% in any direction. All landings shall be sized at a minimum of 60" x 60" or the width of the trail whichever is greater, all per ADA requirements. All ramps and landings shall be provided with accessible handrails.
 - 4) Trail Edge: Where adjacent to developed landscape areas, the trail D.G. shall be contained by a concrete mowcurb on each edge of the trail tread. Where adjacent to native landscapes, no mowcurb is required and may be omitted.
 - 5) Trail Fence and Markers: All trails along public streets shall be fenced and marked per the Trails Master Plan and Trails Standard Details.
 - 6) Crossing Concrete: Where the trail is designated to cross concrete aprons and sidewalks, such aprons and sidewalks shall be constructed of concrete with rough broom or rake finish to prevent slipping. Where such areas exist, they shall be removed and replaced with rough broom finish concrete, or shall be heavy sandblasted in place to provide an equivalent non-slip surface..

3.02 ROUGH GRADING:

- A. Conformance with Plans: Rough grading of the site shall be completed in accordance with indicated contours, elevations, and limit lines shown on the Plans and shall allow for the depths of slabs, paving, sub-base, topsoil, and controlled fills.
- B. Grading Tolerances:
 1. Sub-grades to receive slabs and pavements shall be graded to a tolerance of plus or minus one-half (1/2) inch, and shall be compacted as specified below in Sub-section **3.04 CONTROLLED FILL**, paragraph **G. Relative Compaction Requirements**, sub-paragraph **1. Slabs & Pavement Subgrades**.
 2. Tolerance for rough grading in all other areas is 1/10th of a foot.
 3. In all areas, appearance and positive drainage will be factors in the acceptability of grades.
- C. Compacted Lifts: Graded material shall not be left in loose layers, but shall be stockpiled for use in controlled fill or compacted in thin layers as grading takes place in accordance with the requirements for controlled fill.
- D. Scarification: Shall be performed on all areas indicated to ~~receive~~ paving to depths as indicated in the soils report. In the absence of a soils report, scarification shall be to a minimum depth of six (6) inches or to a depth permitting twelve (12) inches of controlled fill whichever is greater.
- E. Engineer's Approval: Contractor shall obtain the Soil Engineer's approval of all scarified surfaces prior to placement of fill.

3.03 CONTROLLED FILL:

- A. Landscape Fills: The topmost 12" of fill in all landscape areas shall be topsoil.
- B. Rocks: Rocks larger than two (2) inches in diameter shall be removed from all fills to be compacted.
- C. Lifts: Fill material shall be spread in uniform lifts of six (6) to eight (8) inches of un-compacted thickness.
- D. Moisture Content: Prior to starting compaction, the fill material shall be brought to optimum moisture content by spraying with water if too dry, and aeration if too wet.
- E. Mixing: Thoroughly mix each lift to assure uniform distribution of water content.
- F. Allow for Shrinkage & Subsidence: Bring fills to suitable elevations above required grades to provide foreffects of shrinkage and settlement.

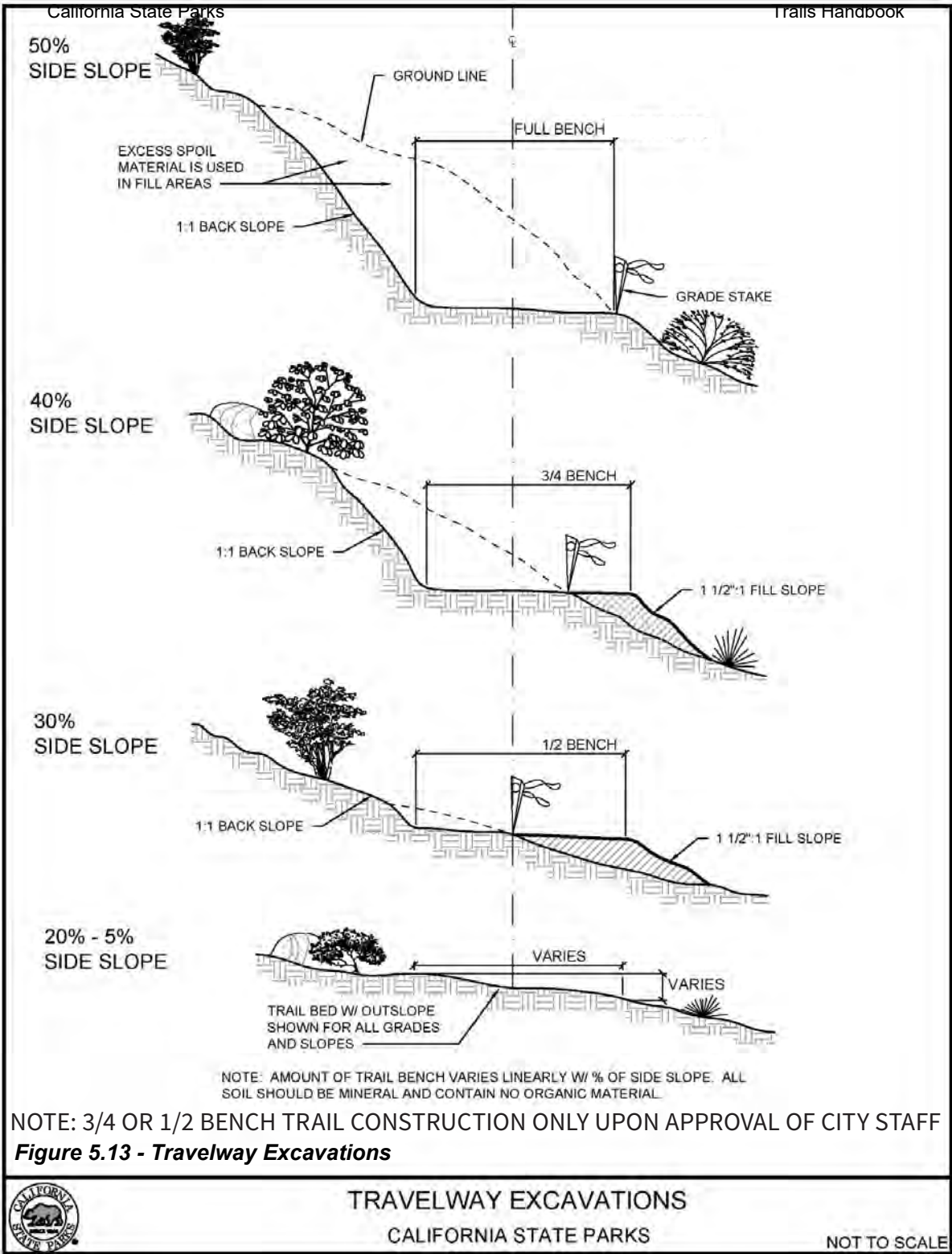
- G. Relative Compaction Requirements:
1. D.G. Pavement Subgrades: For all areas designated to receive D.G. pavement and within a perimeter five (5) feet outside these areas, each lift shall be compacted to a minimum of 90% of maximum density as determined by ASTM D1557-78.
 2. Planting Areas: Where fill is required in planting areas each lift shall be compacted to a minimum of 85% maximum density.
 3. Mechanical Equipment: Perform all compaction by suitable mechanical equipment and methods approved by the Soils Engineer.
- H. Contractor's Responsibility: During the grading operations, inspection and field tests will be carried on by the Soils Engineer. However, Contractor is responsible to ensure obtaining the required degree of compaction and the proper moisture content. Where compaction of less than the specified percentage is found, additional compaction effort shall be made with adjustment of the moisture content as necessary until the minimum specified compaction is obtained.
- I. Over-excavation Due to Unsuitable Materials: Excessively wet material, material in any soft or spongy spots, and material in standing water shall be over-excavated to such depth as directed by the Soils Engineer and replaced with suitable material, properly compacted.
- 3.04 EXCAVATION: Contractor shall perform all necessary excavation work for trail fence footings and mowcurbs and shall perform any additional excavation work necessary to provide ample room for installation of concrete forms where required. The bottom of all excavations shall be level and free from loose material, and shall be brought to the indicated or required grades in undisturbed earth. All excavations shall be kept free of standing water. Contractor shall perform all pumping, draining, and dewatering as may be necessary to keep excavations free of standing water while carrying on the Work. Should excavations for footings, through error, be excavated to a greater depth or size than indicated or required, such additional depth or size shall be filled with concrete at Contractor's expense.
- 3.05 OPEN TRENCH OPERATIONS: Shall conform with Standard Specifications Section **306-1 Open Trench Operations**, as modified by the following:
- A. General: Add the following to Standard Specifications Section **306-1.1.1 General:**
"Where trench is close to existing pole mounted lights, catch basins, or other structures that are to remain, Contractor shall brace as necessary to prevent dislocation of such structures. In the area of any such structures, the trench backfill shall be compacted to 90% to the full depth of the structure."
- B. Unsuitable Material: Add new subsection 306-1.1.7 as follows:
3.06-1.1.7 Unsuitable Material. The conditions and requirements for the determination and disposition of unsuitable material encountered during open trench operations shall be in accordance with Standard Specifications Section **300-2.2 Unsuitable Material**.
- C. Trench Backfill: Shall conform with Public Works Department Standard Drawing No.453.
- 3.06 BACKFILLING:
- A. Material: Select site material shall be used for backfill of trenches and shall be free from large stones and clods. Material shall be as approved by the Soils Engineer.
- B. Pre-Conditioning and Placement:
1. Layers of backfill shall be pre-conditioned by moistening with water, the amount to be controlled to insure optimum moisture conditions for the type of fill material used. Excess water causing saturated earth beneath footings, walks, and curbs is unacceptable.
 2. Backfill shall be deposited in layers of maximum six inch thickness.
 3. Backfill shall be compacted by suitable means to a minimum relative compaction of 90%.
 4. All trenches shall be backfilled in accordance with this Section, and may be tested at the discretion of the Engineer.

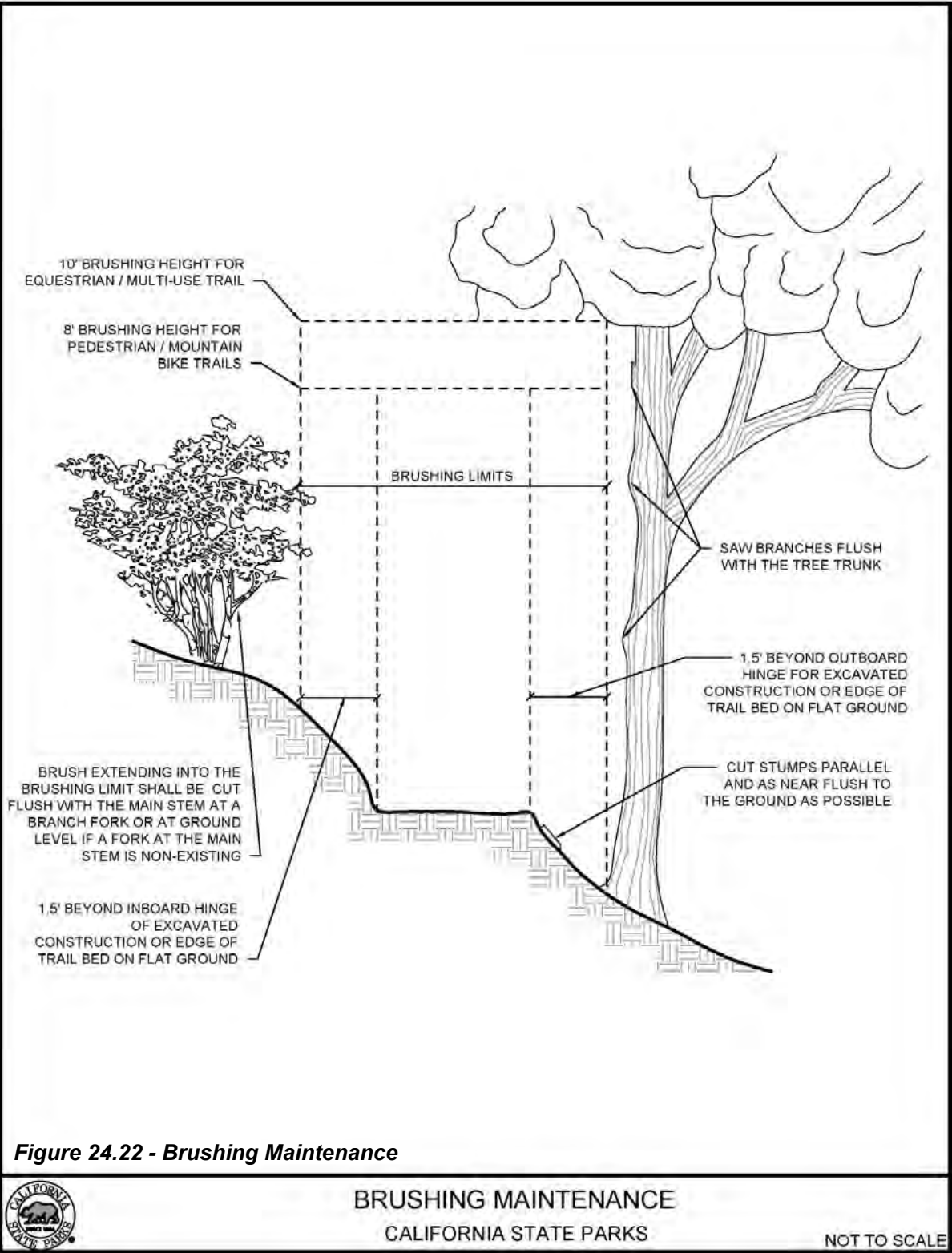
- 3.07 **FINE GRADING:** Fine grading, as specified under this Section, is a separate operation from finish grading as specified under Section **02480 Planting**. Fine Grading Work is to commence upon completion of all trenching and backfill operations, and prior to soil preparation.

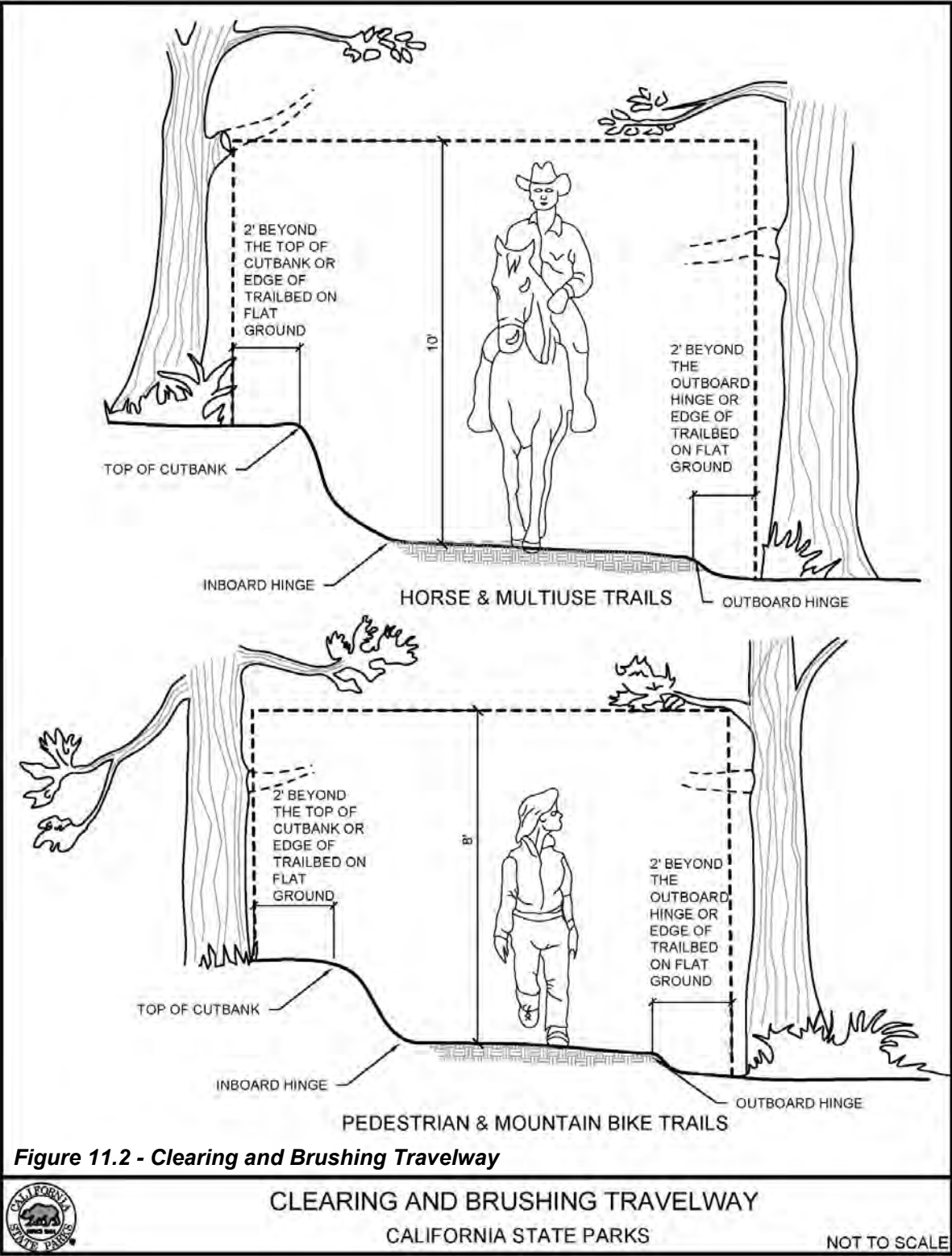
Upon completion of Fine Grading Work all areas shall slope to drain without water pockets or irregularities and shall conform to the intent of all Plans and Specifications after thorough settlement and compaction of the soil. Fine grading should allow for Soil Preparation Work as specified under Section **02480 Planting**, such that finish grades shall meet the elevations indicated on the Plans. Tolerance for fine grading is 1/4 inch, plus or minus. Any corrections to the Grading Work required to obtain proper drainage and to bring it into conformance with the intent of the Plans and Specifications and City codes shall be performed by Contractor at no additional cost to City.

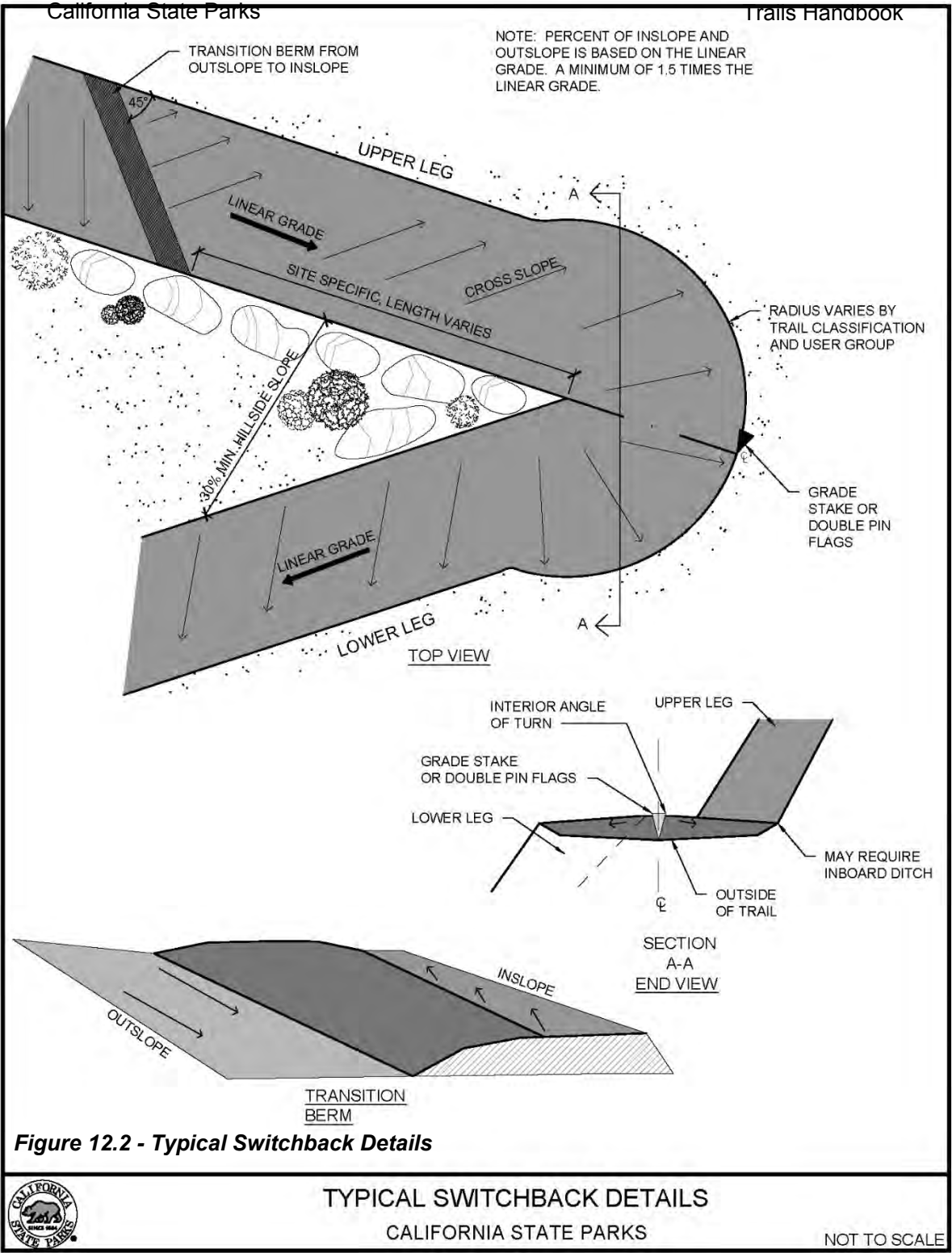
- 3.08 **DECOMPOSED GRANITE:** Pre-mixed D.G. and stabilizer shall be placed in lifts, wetted and compacted as specified by the stabilizer manufacturer to a minimum relative compaction of 90%. D.G. pavement shall be smooth, free of rills, dips, and flow lines, such that surface water will properly drain off the surface of the pavement. Contractor shall provide as a turn-over item a minimum of 10 pounds of stabilizer product per 1000 lineal feet of trail being installed.
- 3.09 **UTILITY INFRASTRUCTURE:** Any and all utility infrastructure shall be place outside of the trail. Lines may pass under the trail, however, no cabinets, valves, boxes, etc. shall be installed within the trail.
- 3.10 **DUST AND NOISE ABATEMENT:** During the entire construction period, site areas shall be kept sprinkled (either with water or an approved dust palliative) as necessary to minimize dust in the air and annoyance to surrounding properties. Adhere to the requirements of City ordinances for dust and noise control.

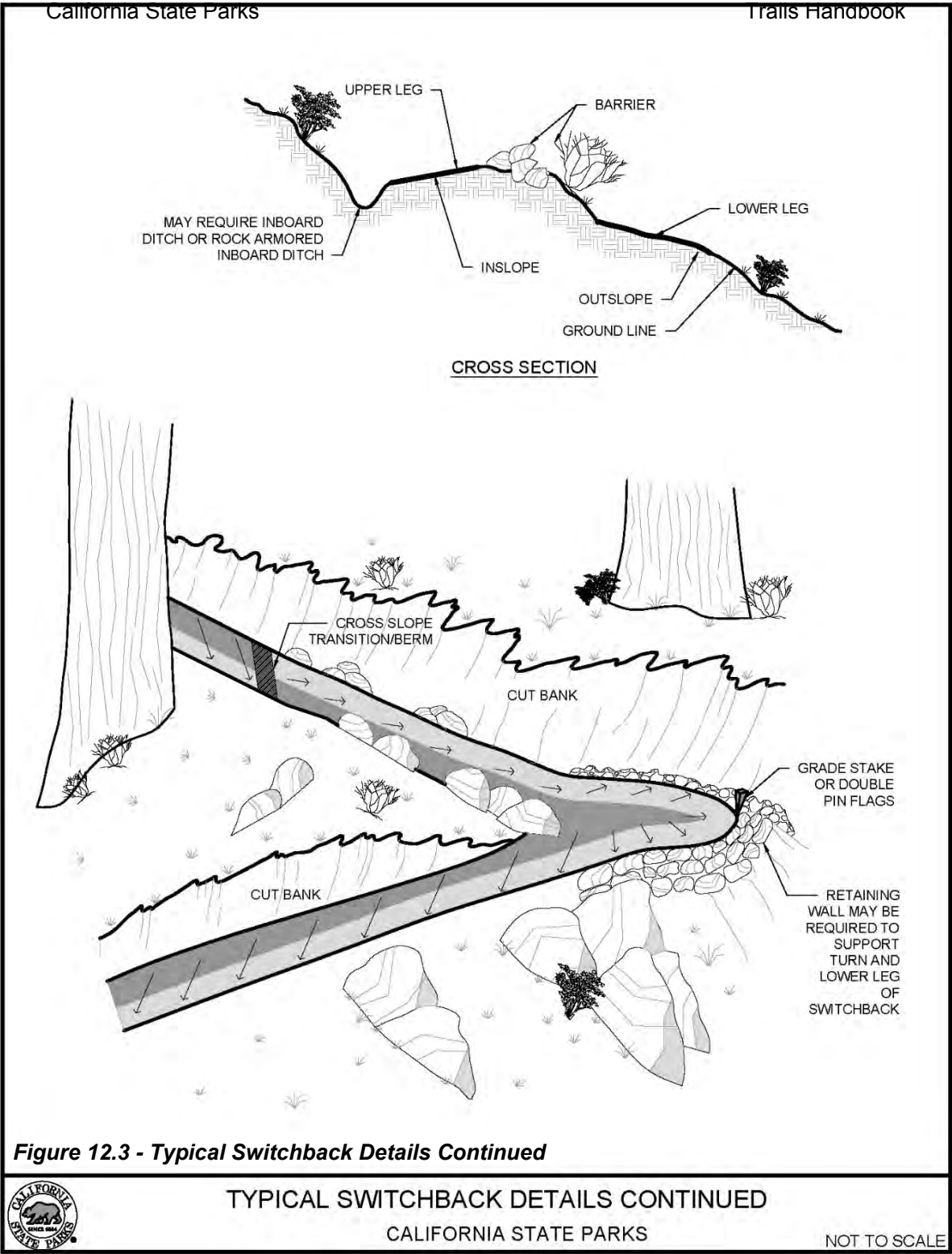
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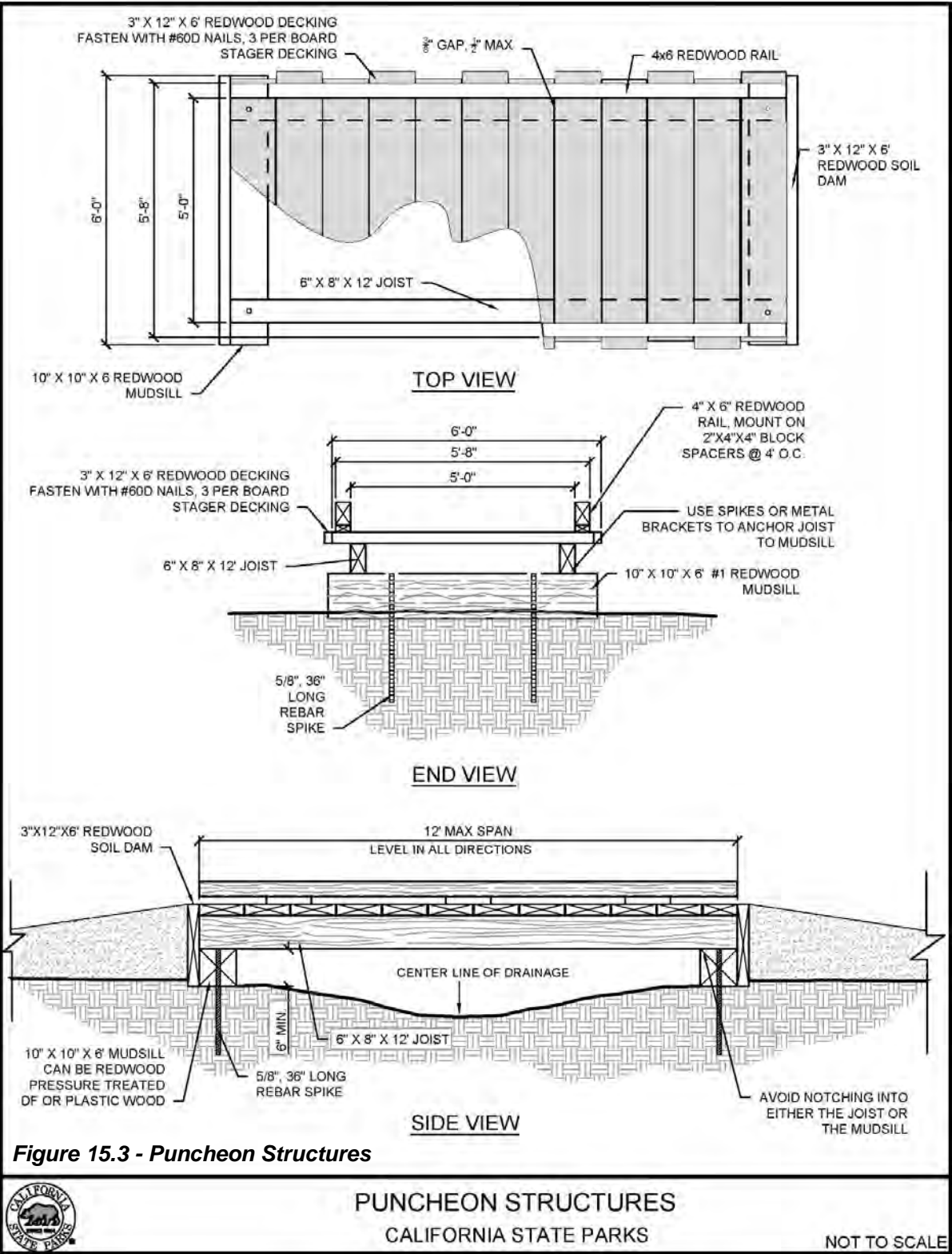


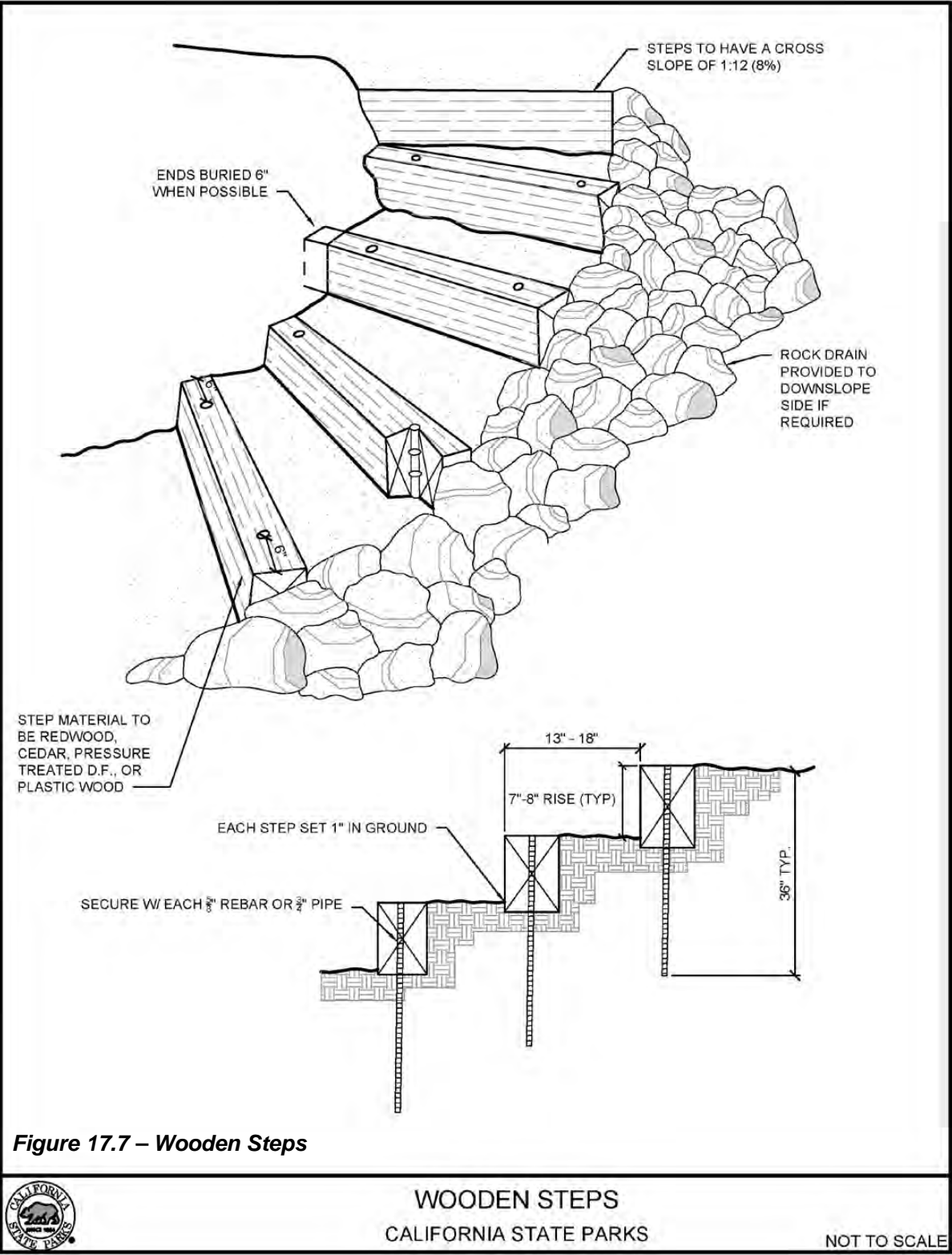


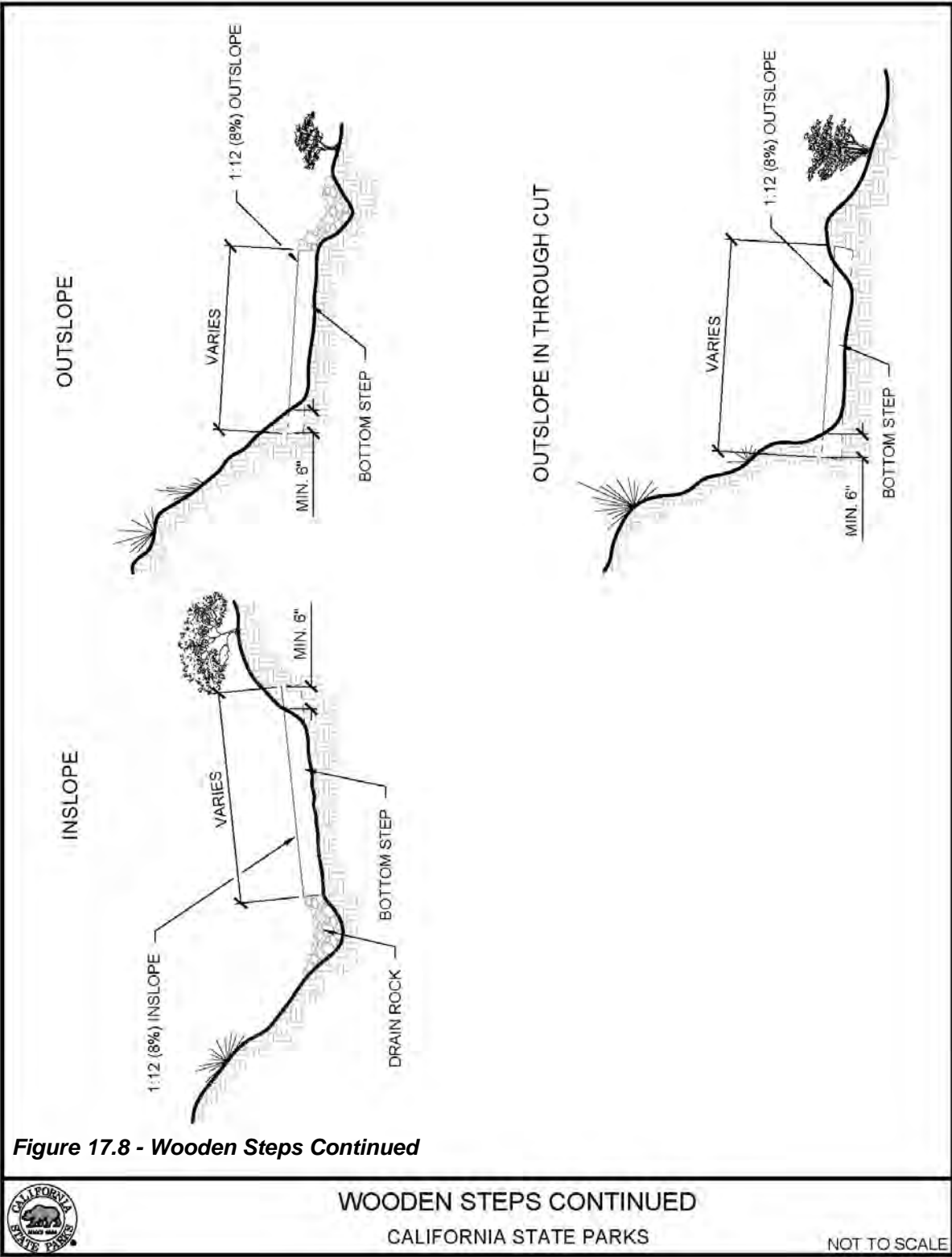


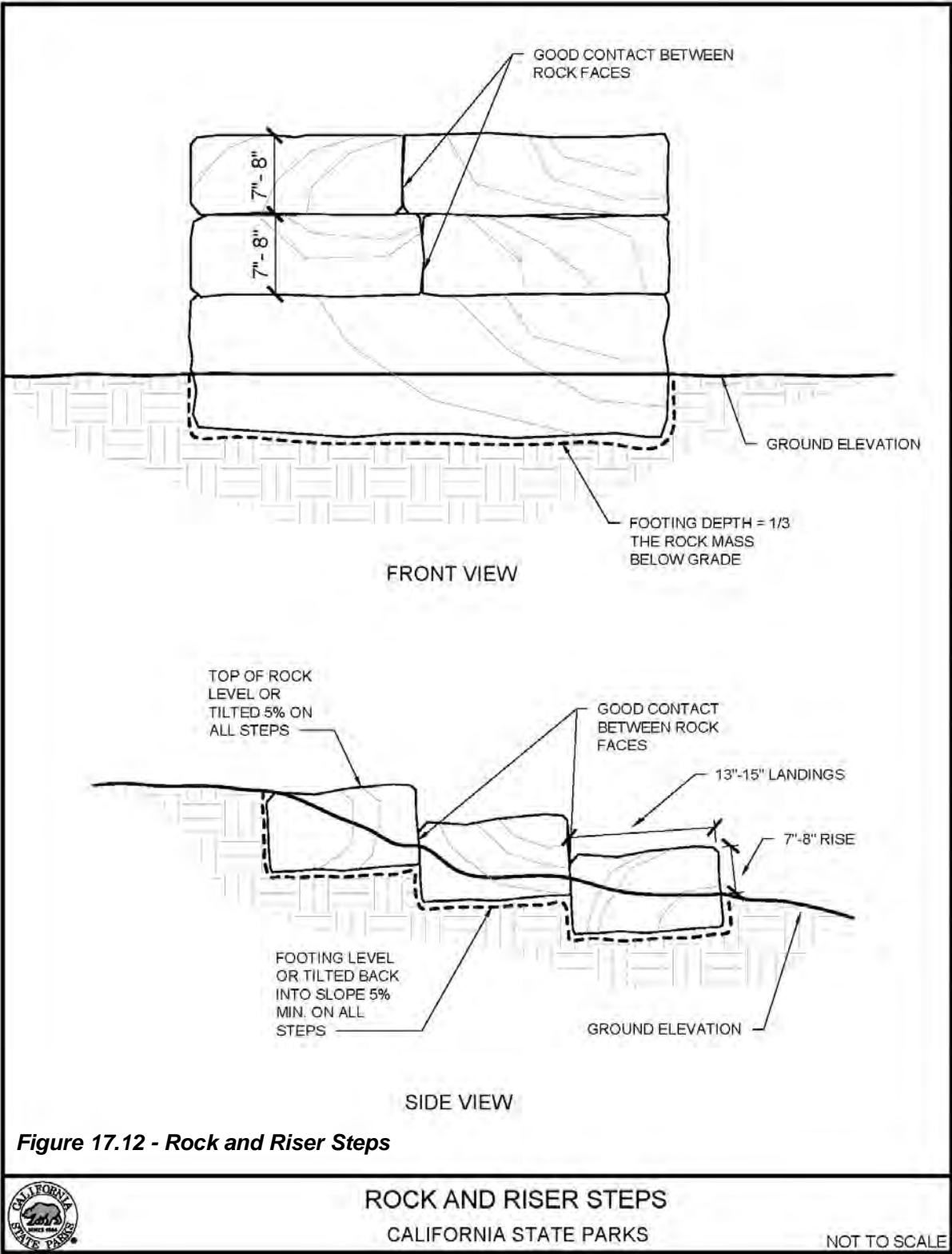


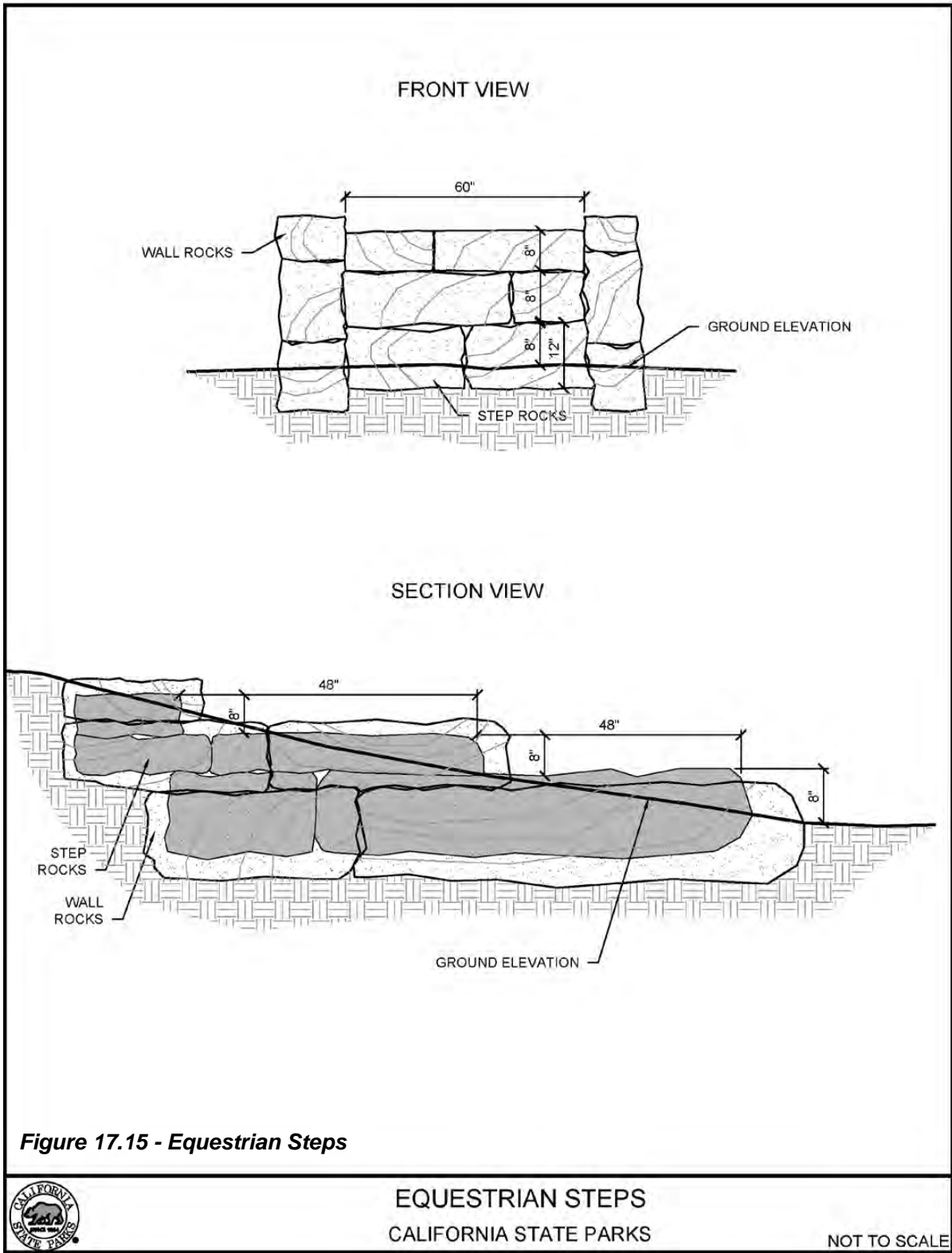


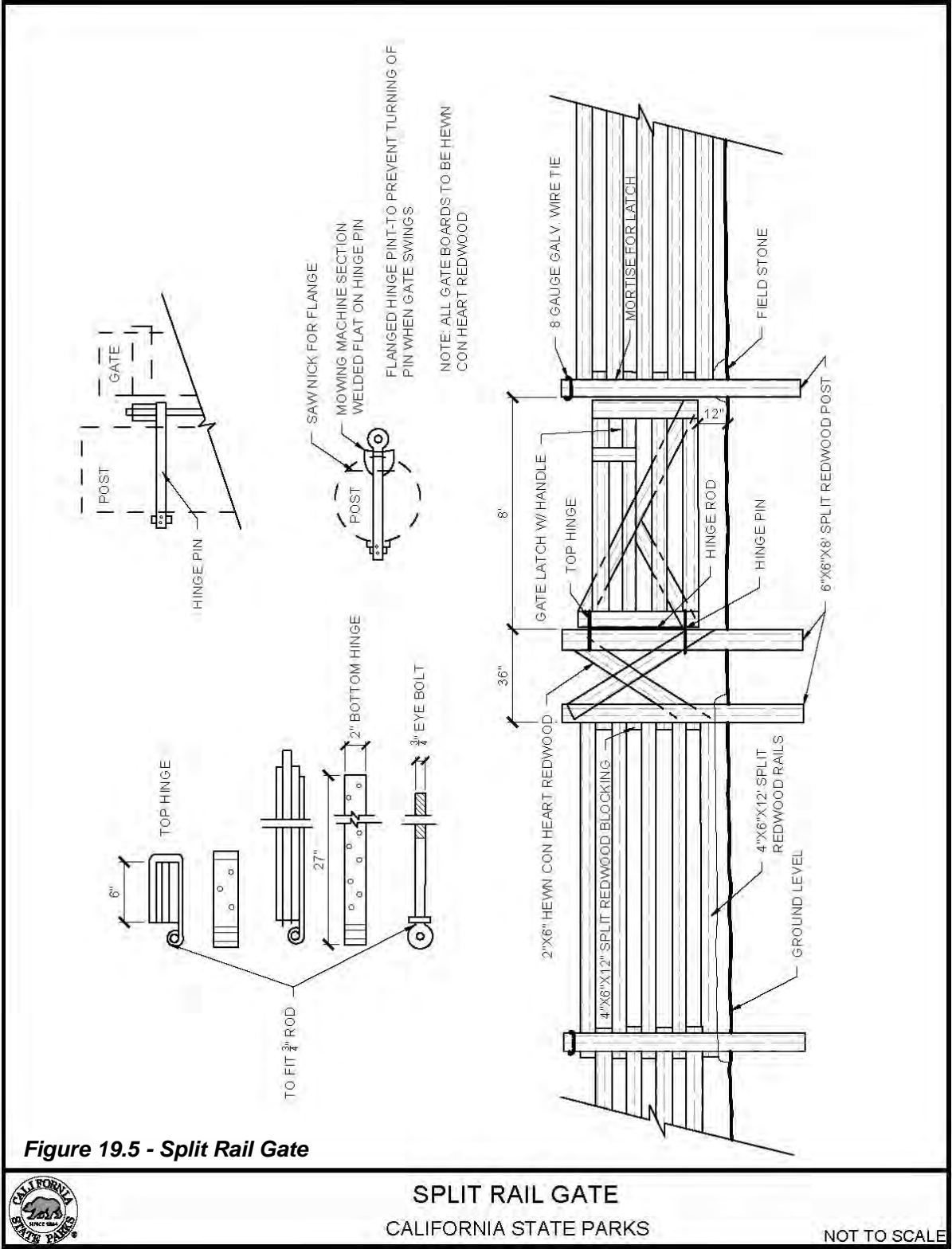


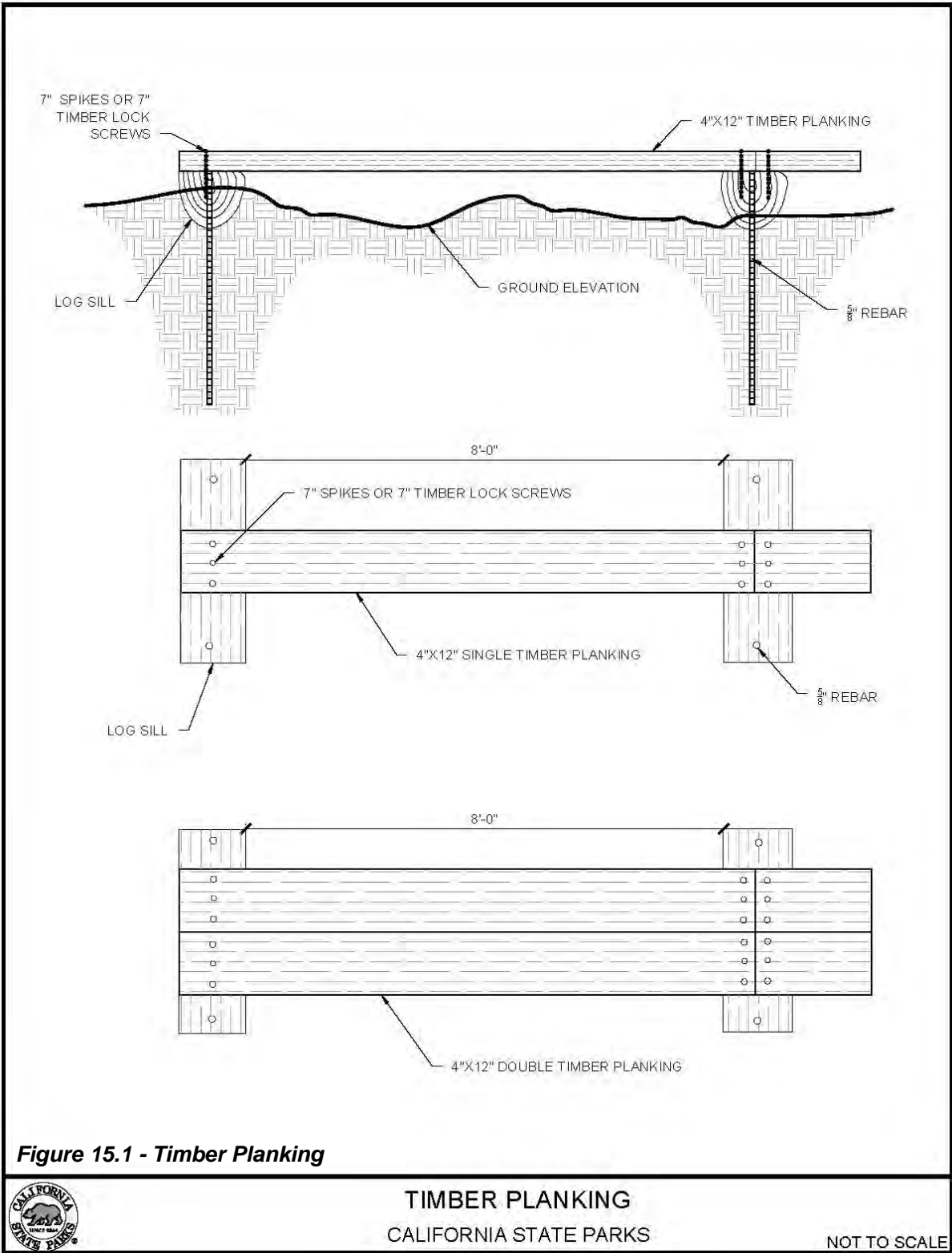


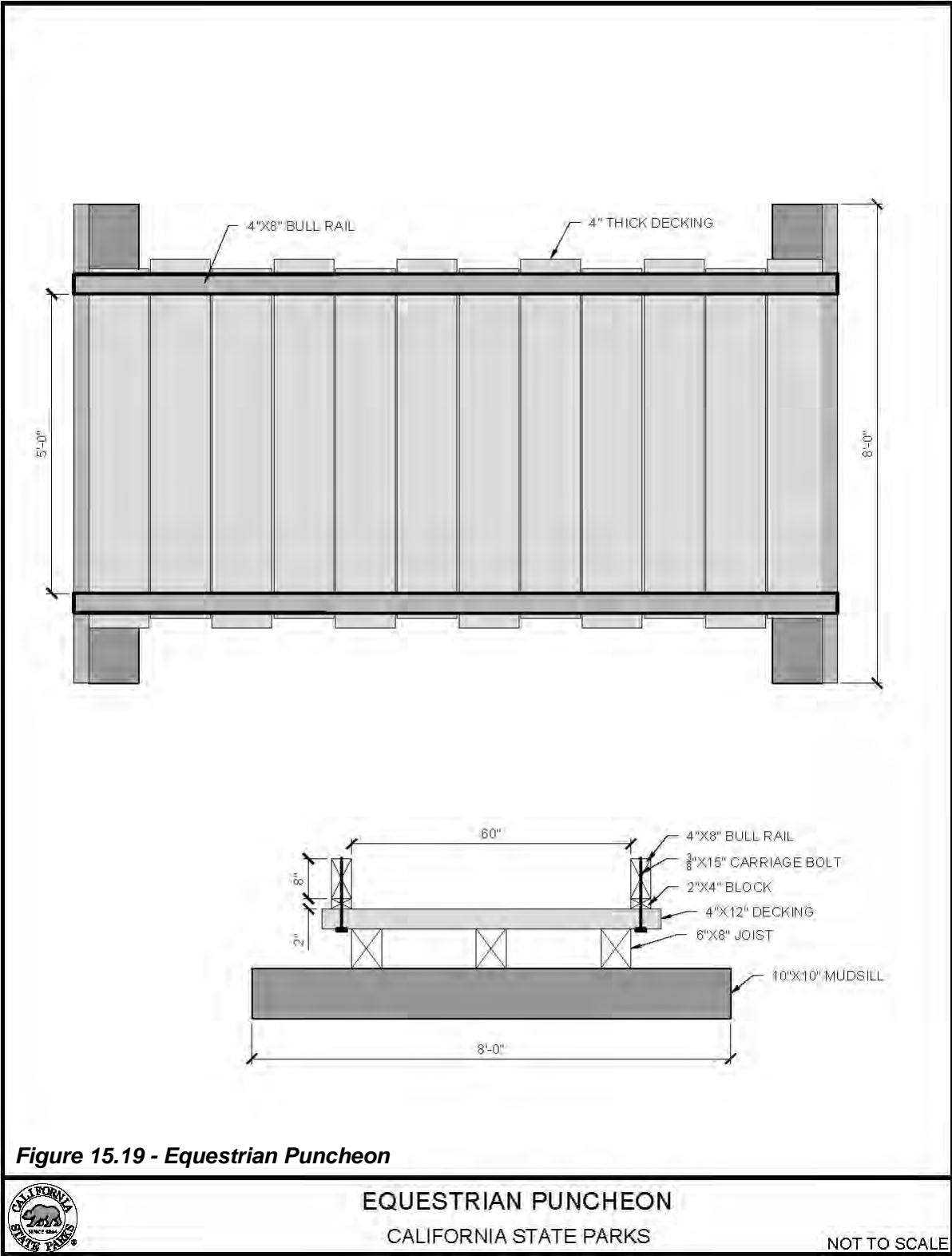


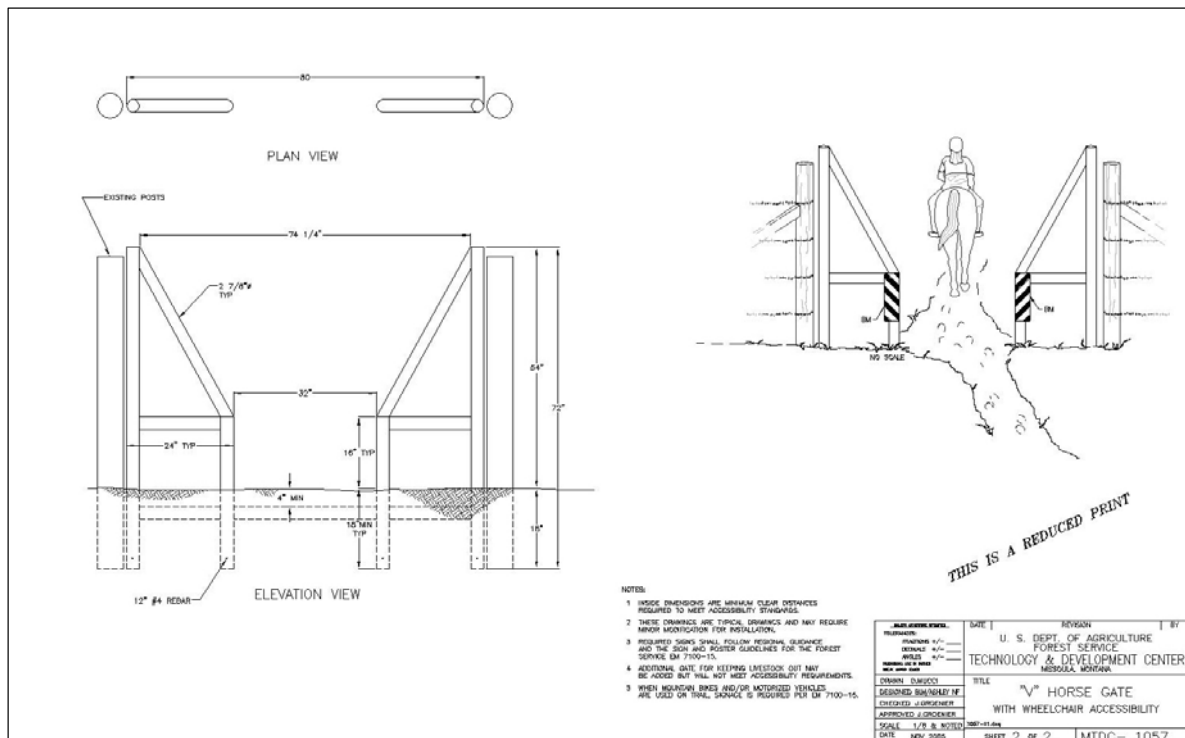


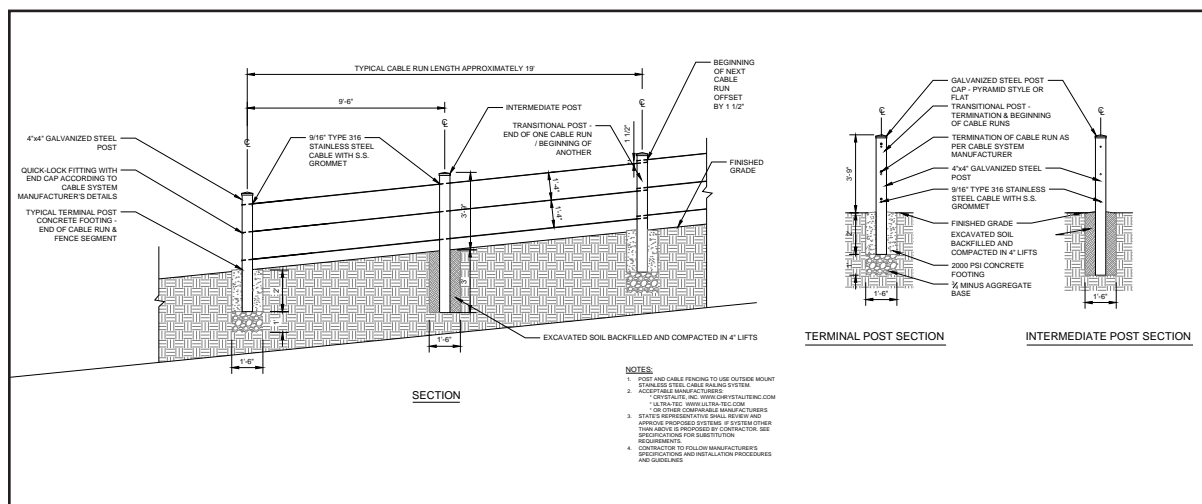
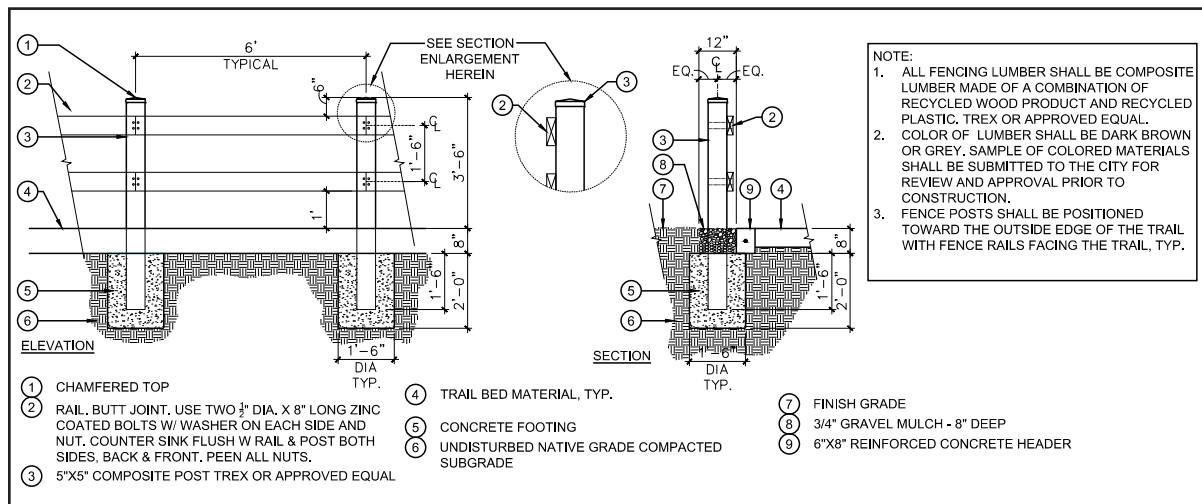


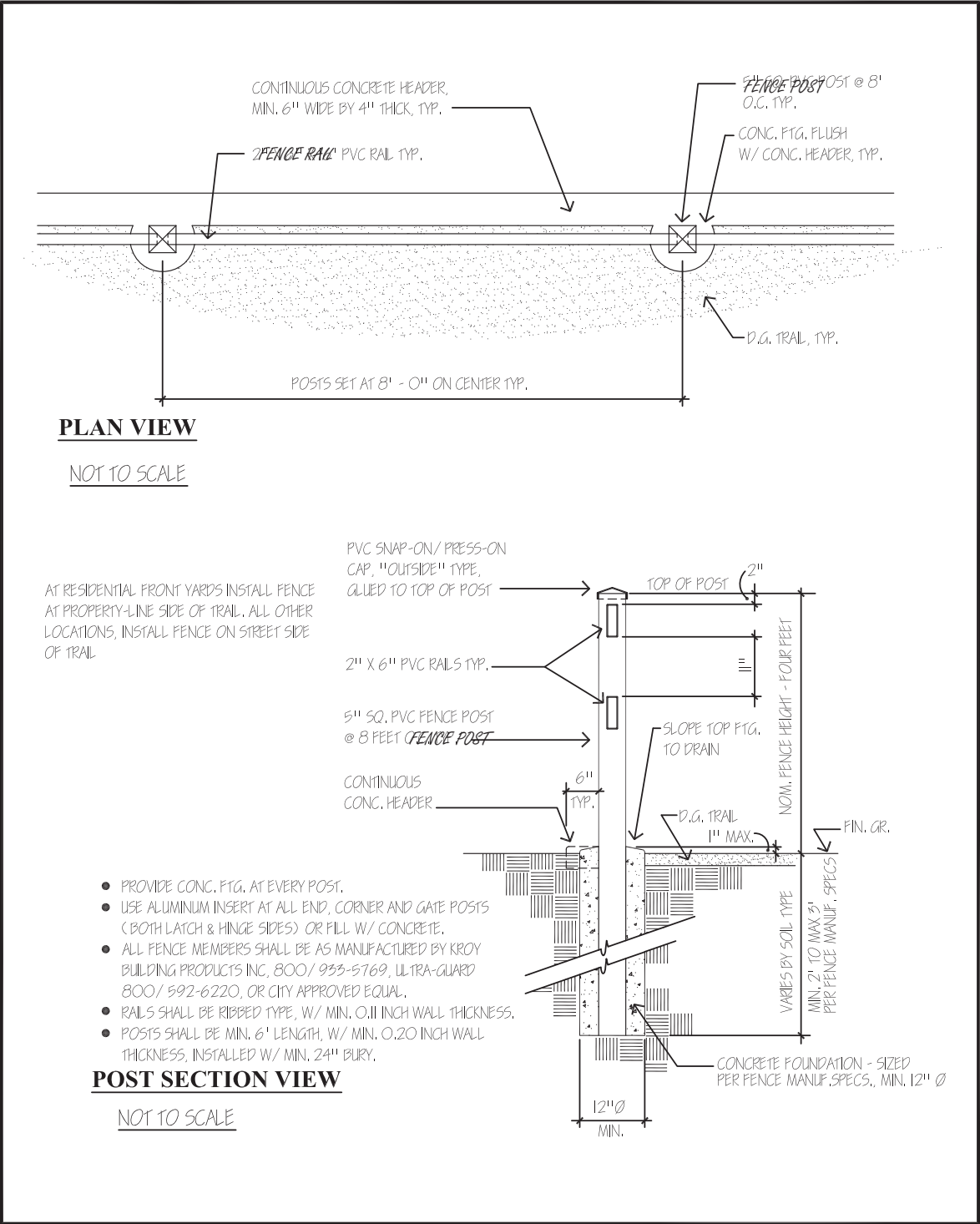












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Park and Recreation Department CITY OF RIVERSIDE
PVC TRAIL FENCE

Detail No. 9
