

# **Appendix F**

**Technical Memorandum - Geotechnical**



# PARIKH

*Practicing in the Geosciences*

*Geotechnical ■*  
*Environmental ■*  
*Materials Testing ■*  
*Construction Inspection ■*

**J.L. PATTERSON & ASSOCIATES**  
725 Town & Country Road, Suite 300  
Orange, CA 92868

August 29, 2012  
Job No. 2011.157.RET

Attn: Mr. Dan Davis

Sub: Preliminary Slope Evaluation and Remediation  
Slope Conditions Adjacent to Railroad Track  
Santa Cruz Rail Project - Mile Post 8.94 to 9.09  
Playa Boulevard  
La Selva Beach, California

Dear Mr. Davis:

As requested, we are providing this letter to provide you with a preliminary evaluation of the existing slope conditions, and remedial measures needed to improve the support conditions for the railroad track between the subject mile posts.

### Site Conditions

The subject railroad track is located on a west-facing coastal bluff of La Selva Beach, California. This section of the railroad track appears to be supported on relatively level cut and fill surface above the bluff approximately 15 to 20 feet wide, which parallels Playa Boulevard to the east, see Plate No. 1 (Project Location Map) and Plate No. 2 (Site Location Map).

The existing slope at the west side of the railroad track is on the order of 50 feet in height and has a slope ratio of approximately 1.5 horizontal to 1 vertical (1.5:1). The slope has been generally steepened, and is locally incised by erosion at several locations. This erosion has resulted in a hole in the ballast within about 5 feet of the railroad track where a former surface drainage inlet (or culvert under the tracks) has failed. The slope is predominantly vegetated with ice plant, ivy and some scrub brush.

An aging retaining wall is located along the break in slope at the west side of the railroad track. The wall consists of vertically driven railroad rails and railroad tie lagging. Where visible this wall is on the order of 4 to 5 feet in height. The wall currently leans down slope at some locations, and at another location appears to have previously failed and been buttressed from below by the same type of wall.

### Geology

The site vicinity is underlain by Pleistocene age marine terrace deposits referred to by the Geologic Map of Santa Cruz County (E.E. Brabb, 1997) as "lowest emergent coastal terrace deposits"; see Plate 3 (Geologic Map). These deposits are described as consisting of semi-consolidated, generally well-sorted sand with a few thin, relatively continuous layers of gravel.

No subsurface investigation has been performed at the site; however, based on preliminary observations of the slope, the material exposed in the slope appears consistent with the geologic map. These terrace deposits are likely overlain by up to a few feet of fill (sand and ballast) placed at the outboard edge of the slope to backfill the timber retaining wall, and support of the railroad track.

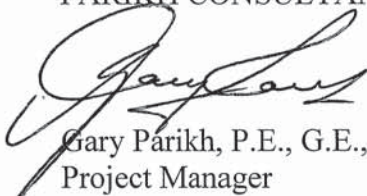
### **Preliminary Evaluation and Remediation**

The erosion of the slope at the west side of the railroad tracks has resulted in the generally over-steepened slopes, and locally in ground loss in close proximity to the track which may be beginning to undermine the track. The existing retaining wall buttressing the tracks is very old, and is distressed to various degrees. Without some form of remedial measures, the current erosion can be expected to continue, and eventually result ground loss which will functionally impact the railroad track.

Remedial measures to provide permanent buttressing (lateral support) of the materials supporting the railroad tracks would include replacement of the existing wall with a new soldier pier wall with concrete lagging. Generally soldier pier walls consist of wide-flange beams set in drilled holes advanced to depths adequate for structural design demand. The piers would derive frictional support in the native marine terrace deposits. Additionally, both axial capacity and lateral support would begin at depth below a 10-foot daylight dimension/horizontal setback between the pier and the face of the existing slope. At this site, we anticipate that the pier holes would need to be at least 2 feet in diameter. The actual pier diameter, depth, pile spacing and beam size would be highly dependent on anticipated railway surcharge loading. These foundation details would need to be determined by the project Structural Engineer following a geotechnical investigation of the site.

**Limitations.** Please be advised that we are performing a professional service and that our conclusions are professional opinions only. All work done and all recommendations made are in accordance with generally accepted geotechnical engineering principles and practices. No warranty, expressed or implied, of merchantability or fitness, is made or intended in connection with our work.

Very truly yours,  
PARIKH CONSULTANTS, INC.

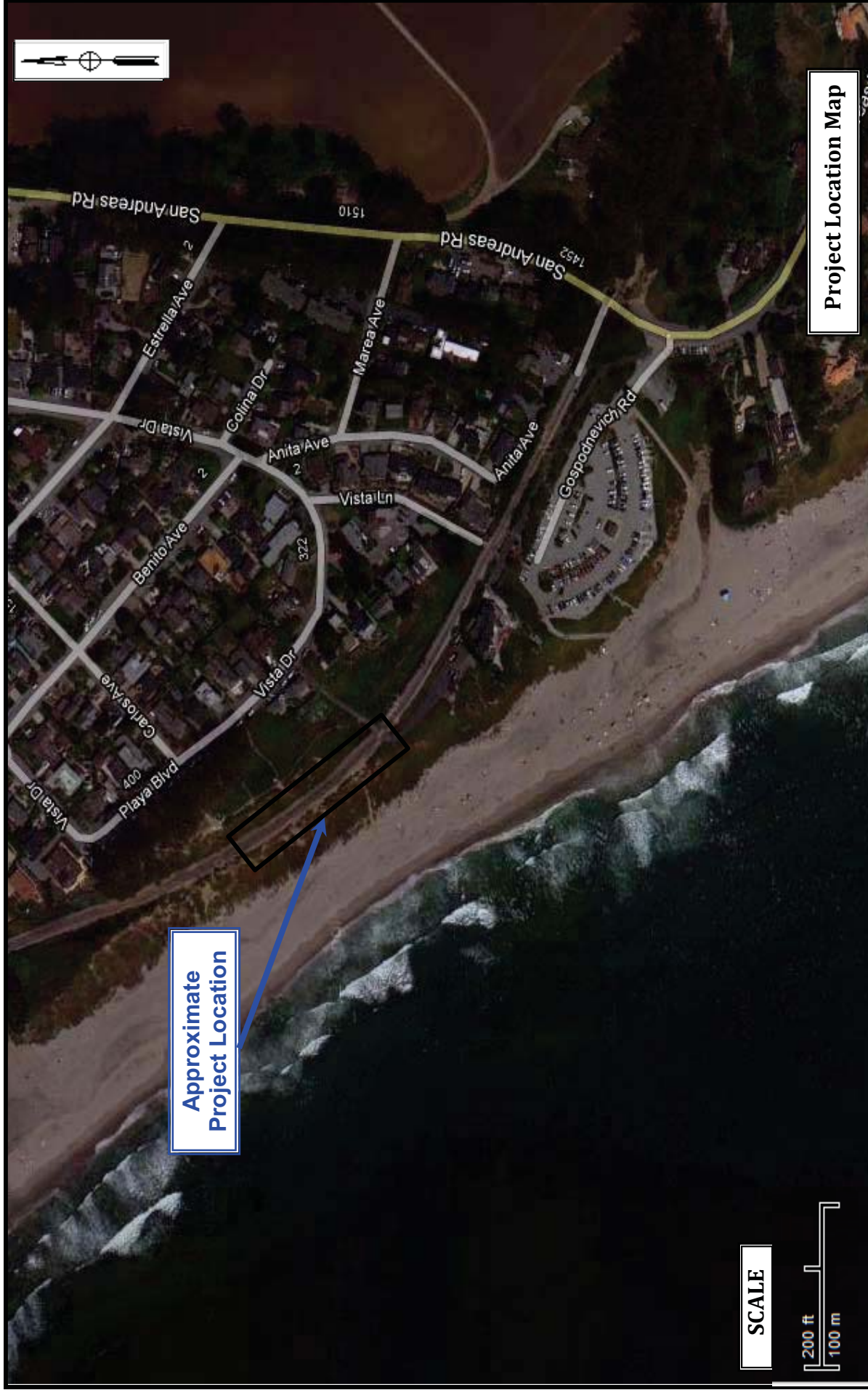
  
Gary Parikh, P.E., G.E., 666  
Project Manager



Attachments: Project Location Map (Plate No. 1)  
Site Location Map (Plate No. 2)  
Geologic Map (Plate No. 3)







SCALE

200 ft  
100 m

Project Location Map

Approximate  
Project Location

SANTA CRUZ BRANCH RAIL LINE - MILE POST 8.94 - 9.09  
SANTA CRUZ, CALIFORNIA

JOB NO.: 2011-157-RET

PLATE NO.: 1



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**SANTA CRUZ BRANCH RAIL LINE - MILE POST 8.94 - 9.09**  
**SANTA CRUZ, CALIFORNIA**

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**PLATE NO.: 2**



## SOURCE:

### GEOLOGIC MAP OF SANTA CRUZ COUNTY, CALIFORNIA

Compiled by  
Earl E. Brabb  
Digital Database Prepared by S. Graham, C. Wentworth, D. Kuifong, R. Graymer and J. Blissenbach  
1997

## LEGEND:

Value	Definition
Qtl	Colluvium (Holocene)
Qal	Alluvial deposits, undifferentiated (Holocene)
Qb	Basin deposits (Holocene)
Qbs	Beach sand (Holocene)
Qt	Terrace deposits, undifferentiated (Pleistocene)
Qes	Eolian deposits of Sunset Beach (Pleistocene)
Qcl	Lowest emergent coastal terrace deposits (Pleistocene)
Qcu	Coastal terrace deposits, undifferentiated (Pleistocene)
Qyf	Younger flood-plain deposits (Holocene)
Qof	Older flood-plain deposits (Holocene)
Qyfo	Alluvial fan deposits (Holocene)
Qds	Dune sand (Holocene)
Qcf	Abandoned channel fill deposits (Holocene)
Qem	Eolian deposits of Manresa Beach (Pleistocene)
Qvf	Fluvial facies (Pleistocene)
Qce	Eolian facies - Coastal terrace deposits (Pleistocene)
Qcl	Lowest emergent coastal terrace deposits - Coastal terrace deposits (Pleistocene)
Qar	Aromas Sand, undivided (Pleistocene)
Qae	Eolian lithofacies - Aromas sand (Pleistocene)

Approximate  
Project Location

Geology Map

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SANTA CRUZ, CALIFORNIA

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PLATE NO.: 3