Appendix G

Coastal LiDAR Survey

Introduction

Light Detection and Ranging (LiDAR) data and air photos were collected in January 2010 by Tetra Tech along the coastline from Islay Creek in the north to Avila Bay in the south, and extending from the coast to 1.6 to 2 km inland along the western side of the Irish Hills.

The data were collected during one of the lowest low tides of the year (-1.5 feet relative to MLLW @ 3:02 PM on 28 January 2010) to acquire the best imagery of the tidal zone and the coastal cliffs. Six flight lines were flown, with three flown offshore to afford the best possible view of the seaward-facing cliffs. Figure G-1 shows composite images of the LiDAR and ortho-airphoto coverage along the western side of the Irish Hills.

LiDAR

LiDAR data were collected at 8 points per square meter and interpolated into ArcGIS grid files that were gridded at both 1 and ¼ meter resolution. Digital Elevation Models (DEMs) for the onshore maps above the cliff tops have 1-meter grid spacing, and the tidal area in front of the cliffs have 25-cm grid spacing.

Multiple static GPS ground surveys, accompanied by an RTK survey of ground points with a roving GPS, on selected control points were conducted simultaneous with the LiDAR collection flight. A total of 129 points were collected to assess the absolute accuracy of the LiDAR data. The Root Mean Square Error (RMSE) for the absolute vertical accuracy was calculated at 4 to 5 cm. Elevation data are presented in NAVD88 (North American Vertical Datum 1988), which is measure relative to mean sea level.

Aerial Photography

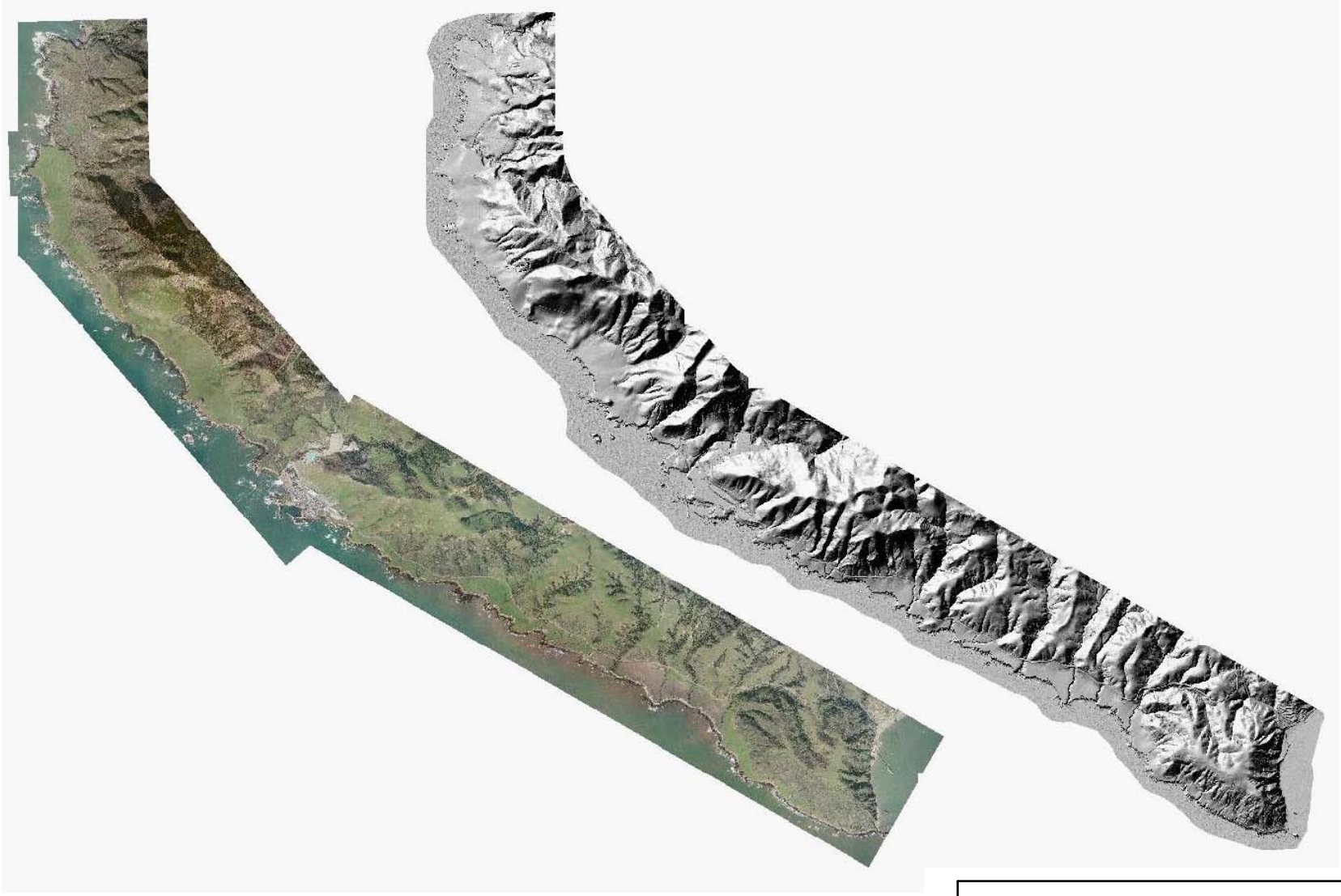
Aerial photography was also collected during the survey (tide at -0.8 to -1.0 ft., MSL) with a 0.2 meter pixel resolution at a negative scale of 1:12000. These data were used to generate color orthophotos of the coast to accurately map the geology that is well exposed in the sea cliffs and in the low-tide wave-cut platform. The photography was flown with airborne GPS collection to minimize the number of ground points necessary to control the photography for mapping. Stereo-air photos supplemented the LiDAR and provided a current orthophoto and contour map Photography was collected with the LiDAR data

The LiDAR data were used to create hill shade images, contours, and slope maps. Figures G-2 to G-9 show composite ortho-airphotos and LiDAR images for selected areas of the coastline. Both the LiDAR and ortho-photo maps greatly helped in accurately mapping the geology along the coast as well as better locating the elevations of paleoshorelines mapped during the LTSP (Hanson, et. al., 1992; 1994). The tidal zone and cliffs provided extensive rock exposures to help correlate the mapped units onshore to those interpreted from the MBES image offshore. During the geologic mapping of the coast we found that the stereo-air photos showed more detail to map the geology. We transferred the detailed geologic data to the LiDAR orthophoto map for incorporation into the onshore-offshore geologic map (Appendix B).

References

Hanson, K.L., Lettis, W.R., Wesling, J.R., Kelson, K.I., and Mezger, L., 1992, Quaternary marine terraces, south-central coastal California: Implications for crustal deformation and coastal evolution: in Fletcher, C.H., III and Wehmiller, J.F. (eds.), Quaternary coasts of the United States: Marine and lacustrine systems: SEPM (Society for Sedimentary Geology) Special Publication, 48, pp. 323-332.

Hanson, K.L., Wesling, J.R., Lettis, W.R., Kelson, K.I., and Mezger, L., 1994, Correlation, ages, and uplift rates of Quaternary marine terraces, south-central California: in Alterman, I.B., McMullen, R.B., Cluff, L.S., and Slemmons, D.B. (eds.), Seismotectonics of the Central California Coast Range, Geological Society of America Special Paper 292, pp. 45-72.



Ortho-airphoto and LiDAR images showing the coverage of the west coast of the Irish Hills obtained in 2010

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Figure **G-1**

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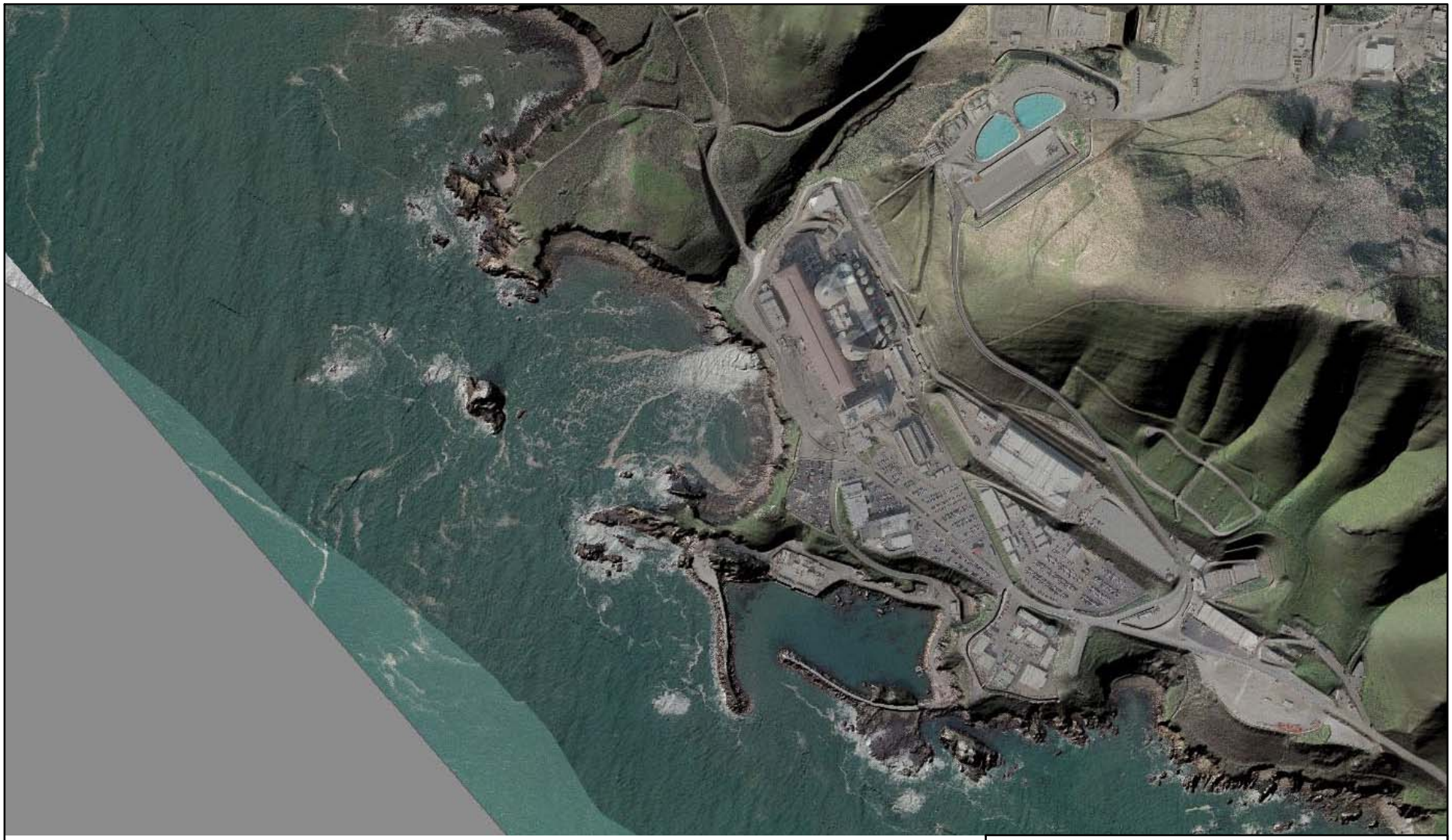

Vertical composite ortho-airphoto and LiDAR image of the DCPP

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Figure **G-2**

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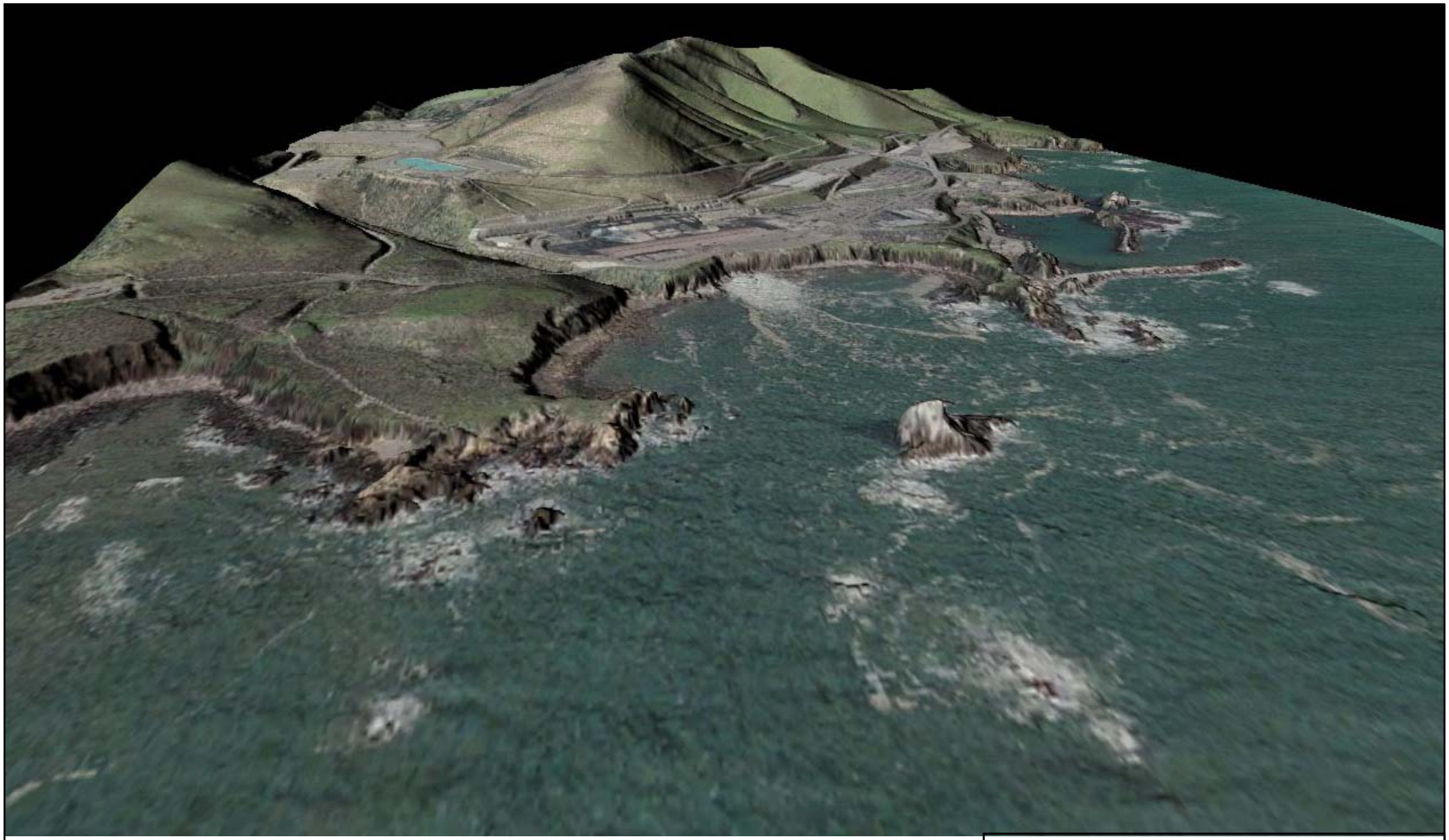

Composite ortho-airphoto-LiDAR 'view' to southeast of DCPP from

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Figure **G-3**

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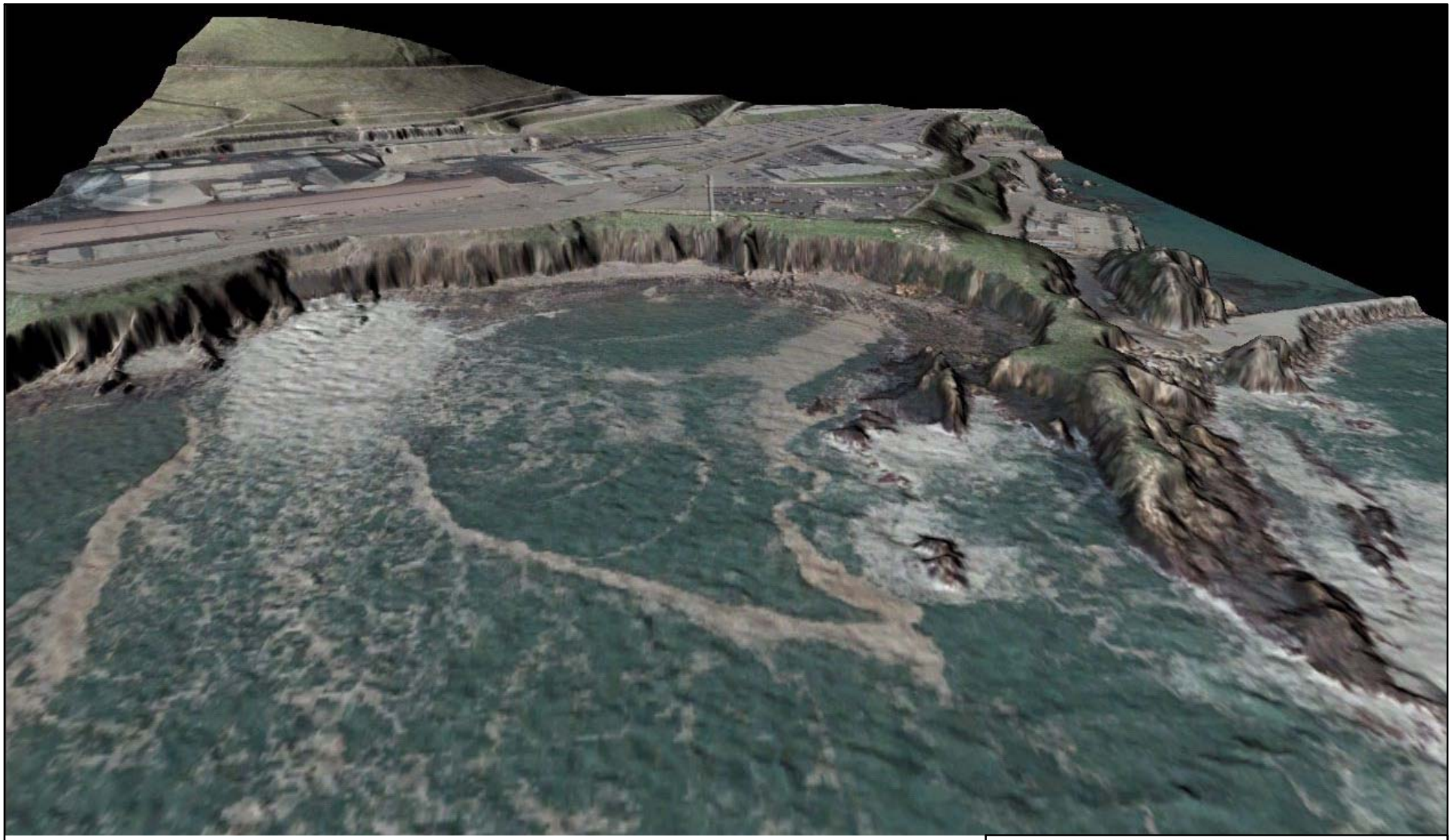

Composite ortho-airphoto-LiDAR 'view' to east of DCPP Discharge Cove

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Figure **G-4**

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Vertical composite ortho-airphoto and LiDAR image of the Olson Hill area

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Figure **G-5**

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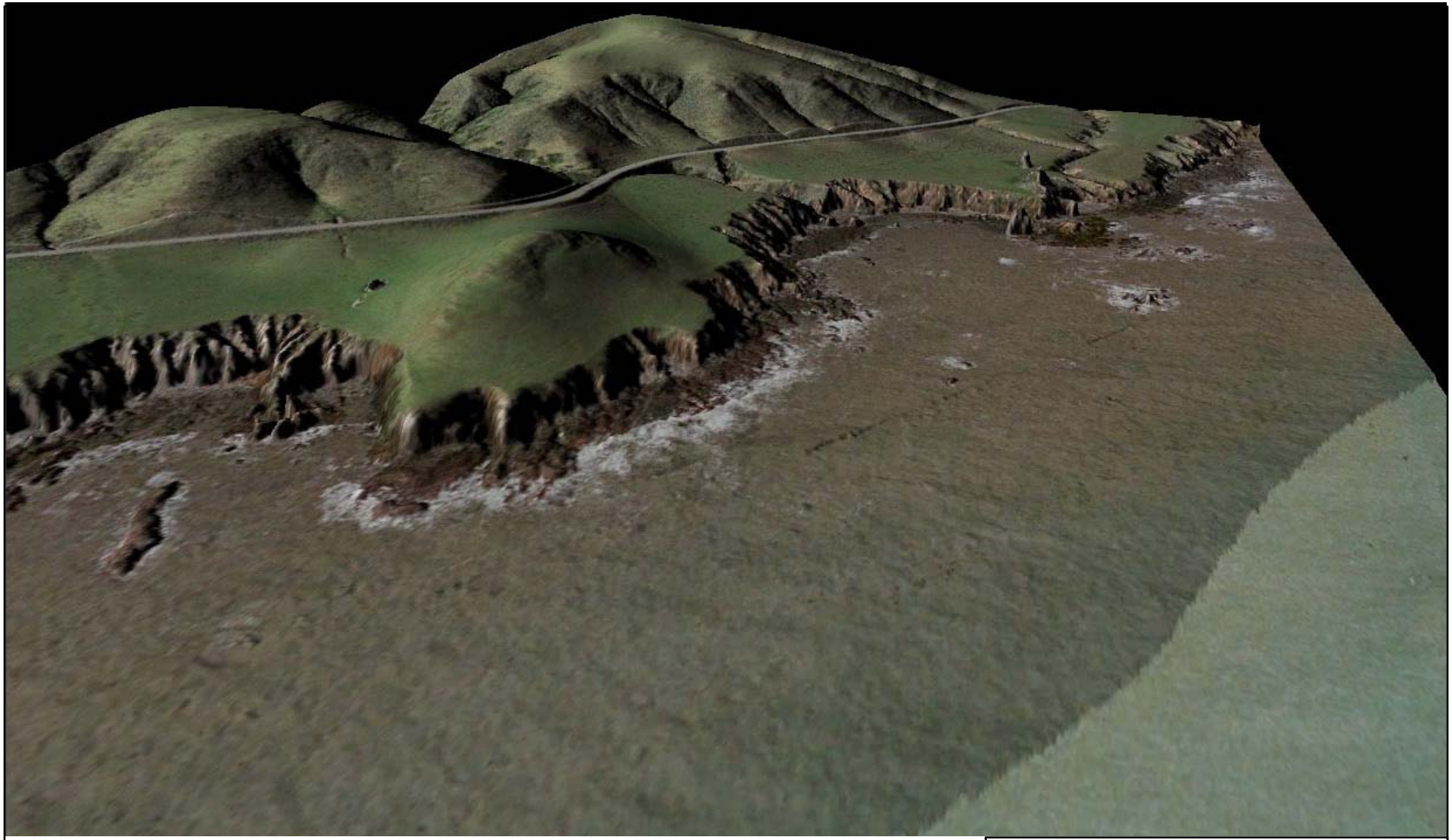

Composite ortho-airphoto-LiDAR 'view' to southeast of Olson Hill area

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Figure **G-6**

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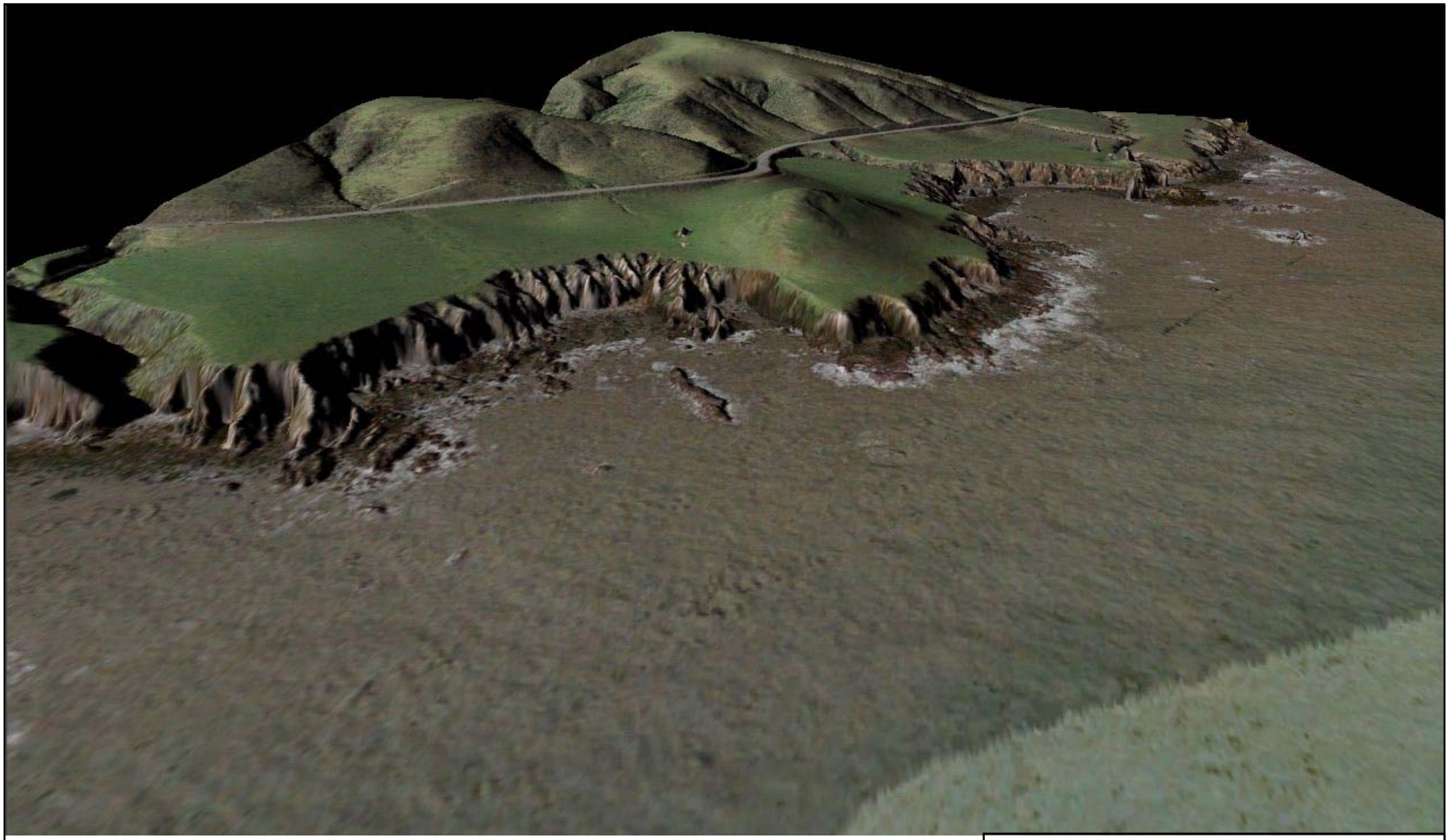

Composite ortho-airphoto-LiDAR 'view' to east of Olson Hill area

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Figure **G-7**

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Vertical composite ortho-airphoto and LiDAR image of the Rattlesnake Creek area

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Figure **G-8**

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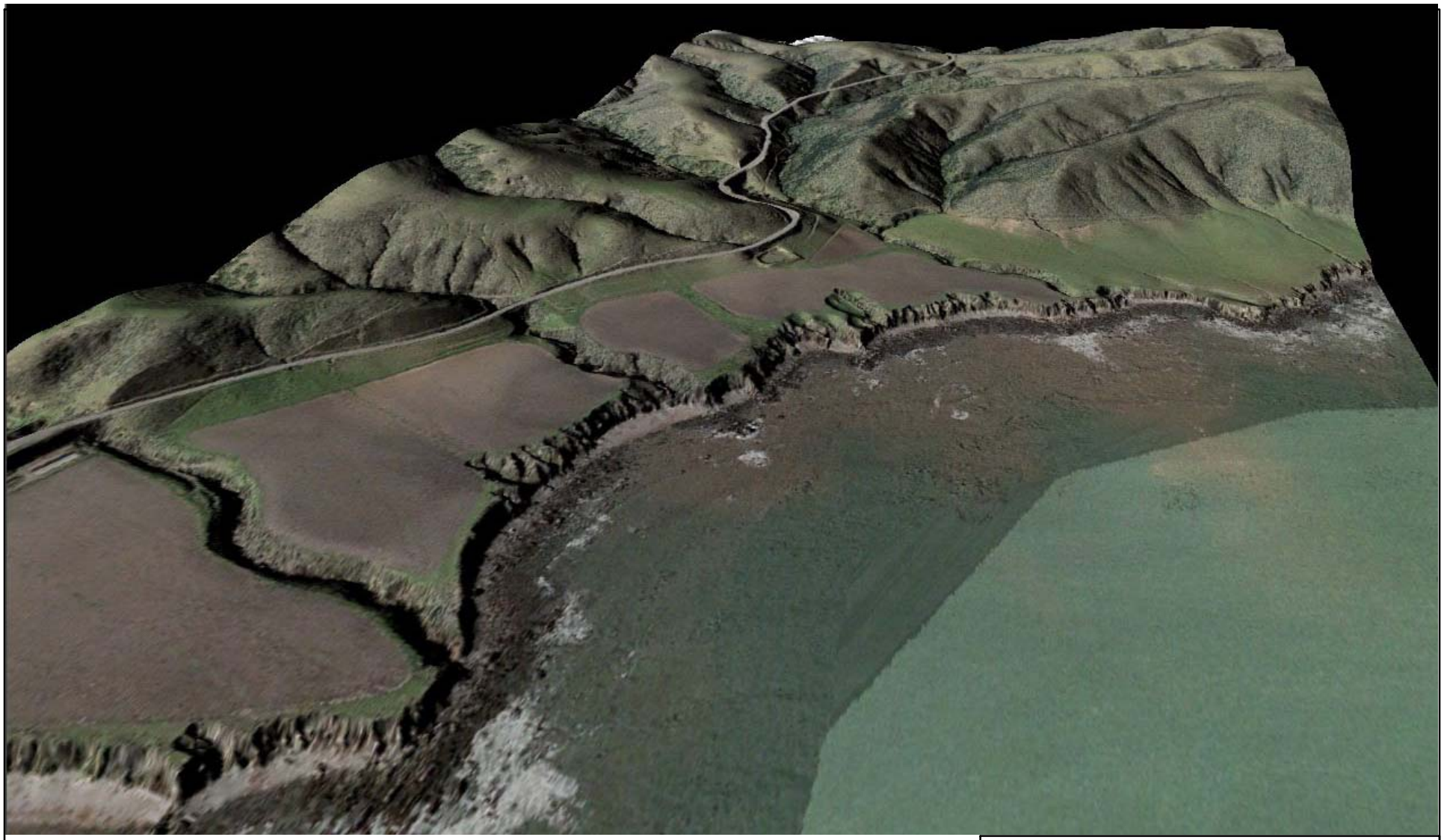

Composite ortho-airphoto-LiDAR 'view' to southeast of Rattlesnake Creek area

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Figure **G-9**

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