

ALAN L. HOWARD, P.G., C.E.G.

VICE PRESIDENT

Mr. Howard is responsible for the development, planning, management, and completion of project work for tunnels, shafts, microtunnels, mining, water resource development and transportation. Mr. Howard has over 28 years of progressive experience in engineering geology and hydrogeology, including field experience on a wide variety of projects throughout the United States and overseas. His responsibilities include project management, geotechnical investigations, tunnel design and construction and senior review of all geologic aspects of the company's project work. Mr. Howard is a specialist in geotechnical investigations and instrumentation for tunneling, civil engineering, hydro-geologic and environmental remediation projects.

Mr. Howard's experience in tunneling and underground construction includes responsibility for subsurface investigations, Geotechnical Baseline Report (GBR) preparation, tunnel design evaluations, ground-water modeling, tunnel mapping, grouting, evaluation and implementation of tunnel instrumentation installation and data acquisition/analysis, and tunnel claim investigation and analysis. He has also served as a project manager for tunnel design and construction management projects. Mr. Howard has worked on geotechnical investigations and tunnel instrumentation programs for rapid transit, water supply and sewer interceptor tunnels in numerous locations involving soft ground, hard rock and mixed face conditions and also including tunneling in contaminated subsurface conditions. Technical skills obtained through these projects include geologic mapping and map interpretation, in situ testing procedures in soil and rock, ground-water monitoring and modeling, seismograph monitoring of blasts and vibrations, construction monitoring, instrumentation installation and interpretation techniques, report preparation, and project management.

Years of Experience: 28

Years with Brierley: 10

Education

BS, Geology, University of California

Professional Registration

Certified Engineering Geologist,
California (Reg. No. 1876)

Registered Geologist, California (Reg.
No. 5971)

Professional Societies

Association of Engineering Geologists
(Rocky Mt. Section Chair 95-96)

Colorado Rock Products Association
American Underground Construction
Association

Society of Mining Engineers

PROJECT EXPERIENCE

Caldecott Tunnel 4th Bore, San Francisco Bay Area, CA

Bore No. 4 is located north of the existing Caldecott Tunnel on SR 24 between SR 13 in Oakland, CA and Gateway Boulevard in Orinda, CA. The existing Caldecott Tunnels connect Oakland and Orinda through the Berkeley Hills. The project area is situated at the eastern margin of the San Francisco Bay Region (SFBR).

The mined tunnel portion of Bore No. 4 will be 990.4 m (3249.2 ft) long and have a horseshoe shape with excavated dimensions of approximately 15 m (49.2 ft) in width and 11.0 to 12.3 m (36.1 to 40.3 ft) in height. Seven cross passages will also be mined between Bore No. 4 and the existing Bore No. 3. The horseshoe-shaped cross passages will range from 32.7 to 44.1 m (107 to 145 ft) long and have excavated dimensions of about 4.2 m (13.8 ft) wide and 4.7 m (15.4 ft) high. Excavation is anticipated to take place from two portals using roadheader equipment. Engineering geologic conditions are

anticipated to range from highly weathered (near soil) shale under shallow cover to blocky and seamy sandstone under approximately 530 ft of cover.

The design and construction of Bore No. 4 and cross passages is based on the philosophy of the sequential excavation method (SEM). Depending on ground conditions along the alignment, the initial support system will include shotcrete, rock dowels, lattice girders, spiles, and grouted steel pipes in various combinations. The final lining of Bore No. 4 will be cast-in-place reinforced concrete lining, and the final lining within the cross passages will be reinforced shotcrete lining. A waterproofing membrane and drainage system will be placed between the initial and final linings in Bore No. 4 and the cross passages.

Brierley Associates evaluated the contract design documents and geologic / geotechnical conditions anticipated to be encountered during construction in order to provide construction recommendations and bid assistance to Tutor-Saliba Corporation.

Brierley Associates has subsequently been retained by Tutor-Saliba to provide engineering services during the preconstruction and submittal phase as well as field engineering and geologic / geotechnical documentation during the construction phase. Preconstruction and submittal phase services include evaluation of initial support design, finite element analysis, construction means and methods evaluations and recommendations, and submittal preparation. Construction phase services will include evaluation and documentation of ground conditions and initial support recommendations during excavation of the tunnel

LACSD Ocean Outfall, Los Angeles, CA.

Senior Tunneling Geologist for the Geotechnical Team performing feasibility evaluations and design for this new tunnel and outfall project destined to be one of the major marine outfall projects in the world. The new tunnel and ocean outfall will provide for increased future demands along with benefits of increased reliability, flexibility, and redundancy. Engineering geologic conditions along each of three alignment corridors were studied and will range from saturated alluvial soils to weak sedimentary rock, and possibly metamorphic basement rock, and will likely encounter mixed face and squeezing ground conditions. Other significant challenges include the potential for encountering high water pressure, crossing seismically active faults and the potential of encountering gassy and contaminated ground conditions.

Mr. Howard is responsible senior-level project management assistance for in-depth geological and geotechnical data collection, review and summary and implementation of new project geotechnical investigations, including development of geotechnical data and interpretive report preparation for shafts, tunnels, marine pipelines and diffusers in the Los Angeles Basin in Pleistocene sediments and Pliocene and Miocene weak bedrock formations. Mr. Howard also serves a key liaison function between the prime geotechnical engineering firm and the Design Consultant based on his extensive background in tunneling in both soil and rock.

Richmond Transport Tunnel, San Francisco, CA.

Provided an evaluation of the contractor's dewatering submittal for this two-mile-long-tunnel driven through rock and soil beneath the northern portion of the San Francisco Peninsula. Provided technical advice related to tunneling, chemical grouting, compaction grouting, and instrumentation during construction of 10,200 ft of 14-ft diameter tunnel. Project includes 9,000 ft of TBM-excavated hard rock tunnel, 1,200 ft of shield-driven soft ground tunnel, and a mixed-face transition zone. Project also includes a drill/blast section that consists of an incline and decline tunnel and an underground chamber.

New Crystal Springs Bypass Tunnel, San Francisco, CA.

The San Francisco Public Utilities Commission (SFPUC) is planning construction of the New Crystal Springs Bypass Tunnel (NCSBT), an approximate 4,500 foot long tunnel by 10 foot diameter to replace the existing Crystal Springs Bypass Pipeline (CSBP). The purpose of the NCSBT is to improve the long-term reliability of the water transmission system in the service area. Construction of the proposed project is limited to two surface access locations: the entry or South Shaft, and the exit or North Shaft. Brierley Associates, LLC is managing the design of this project for the SFPUC in joint venture with Ove Arup & Partners. Alan Howard provided QA input to the geotechnical investigations and was a technical reviewer of the Geotechnical Baseline Report.

Lower Williamson Creek Interceptor, Fugro South Inc., Austin, TX.

The Lower Williamson Creek Interceptor is planned to be installed along Williamson Creek in South Austin, Texas. A study was conducted to evaluate various alignment alternatives. Most of the alignments have significant lengths of tunnel (14,000 to 17,000 ft). Brierley Associates assisted in preparation of the study by providing tunnel engineering consulting and opinions of probable cost of tunneling for the various alignments.

Saguaro Ranch Tunnel, Marana, AZ.

The Saguaro Ranch Tunnel is an approximately 675-ft-long, 34-ft-wide, and 21-ft-high two-lane roadway tunnel built to access a proposed 1035-acre luxury development which includes approximately 180 exclusive home sites. Cover above the tunnel varies from 15 to 20 ft at the portals to a maximum of 140 ft near the midpoint. Brierley Associates conducted subsurface explorations utilizing horizontal coring techniques. A single horizontal boring was drilled through the ridge, thereby collecting core data along the entire tunnel horizon. These feasibility data were then used by Brierley to prepare an aggressive design-build proposal for the tunnel with little to no contingency for unforeseen ground conditions.

It was determined early in design that the tunnel would be excavated either by drill-and-blast or roadheader as the short length and large opening were not compatible with TBM excavation. Initial support was planned as a combination of pattern rock bolts and wire mesh in generally competent rock with additional measures consisting of shotcrete, spiling, and lattice girders in poorer . Staged excavation, involving three top and two bench headings were also used to create the opening. Shotcrete was placed to the specified thickness along the strike of adverse geologic features in order to minimize the total area requiring 8-in. of shotcrete.

Brierley jointly performed construction QA/QC with a heavy emphasis on the final lining. Cooperative relationships fostered at the beginning of the project between the owner, the contractor and Brierley created maximum flexibility and it was possible to make design adjustments based on actual ground observations. Alan Howard was responsible for all geotechnical explorations, served as project manager for design and performed construction management oversight for this project.