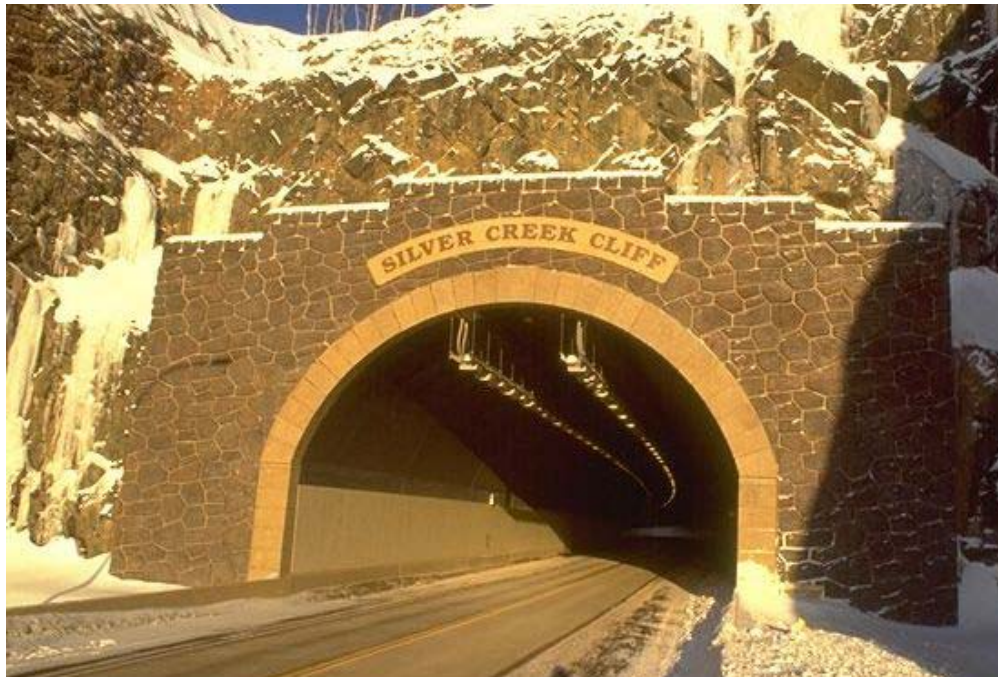


# Silver Creek Cliff Highway Tunnel

The Silver Cliff highway tunnel, located on the environmentally and aesthetically sensitive North Shore of Lake Superior, was opened for traffic in the summer of 1994. The tunnel is part of an 18-year, \$104-million program to upgrade U.S. Route 61 in northeastern Minnesota. The existing highway was threatened by steep, unstable cliffs and contained tight curves not meeting current design standards. The project was featured in the July 18, 1994 issue of ENR.

CNA Consulting Engineers was prime design consultant for the project, and also provided consulting services and on site staff during construction. The Minnesota Department of Transportation project consisted of open cut rock slopes for the approaches, portal structures, and 1344 ft of mined rock tunnel. The photograph illustrates the south portal and open cut approach.



The tunnel was constructed in a closely-jointed diabase rock mass, with numerous thick infilled seams intersecting the tunnel. The arch-shaped tunnel was excavated 53' wide by 36' high and finished 46' wide by 31' high. Tunnel excavation was by controlled blasting, with multiple top headings and benches. Rock support and lining consisted of external portal beams, rockbolts and reinforced shotcrete. A final concrete lining provided structural support for the rock mass and the membrane waterproofing system.

Related construction included 5373' of roadway, fire protection system, a service building, lighting, closed-circuit TV, weather detection system, variable message signs, emergency phones, and a microwave system to send information to the highway department. A UPS and generator system provides emergency power to the electrical system during power outages.

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**Owner — Minnesota Department of Transportation**

**Completion Date — Opened to Traffic July 1994**

**Construction Cost — Entire Project \$23.6 million**

**CNA**  
**Consulting**  
**Engineers**

2800 University Ave. SE  
Minneapolis, MN 55414  
Ph: (612) 379-8805  
Fax: (612) 379-8160  
E-mail: [bkn@cnaengineers.com](mailto:bkn@cnaengineers.com)