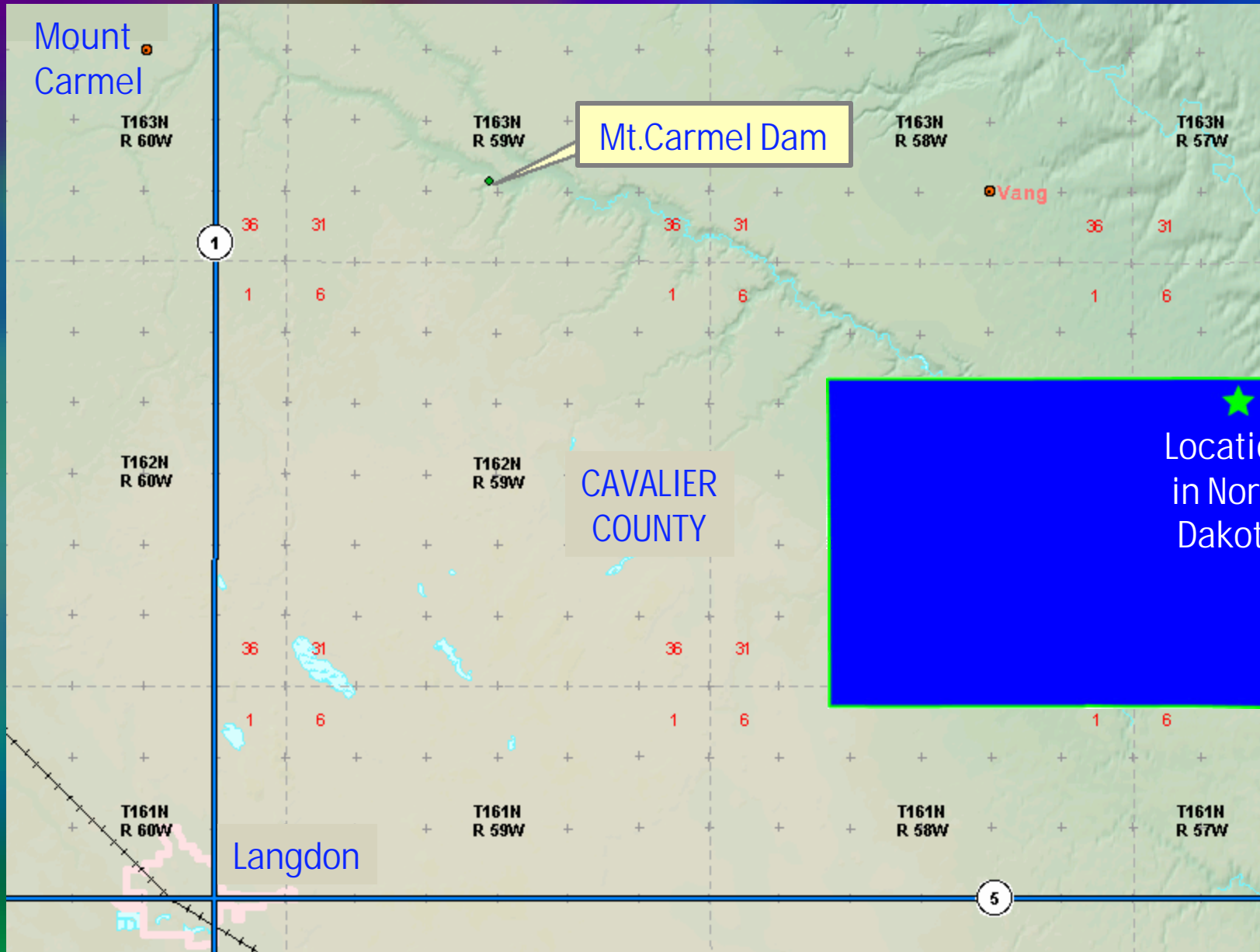


Mt. Carmel Dam Incident



Brad Benson
ND State Water Commission

Location of Mt. Carmel Dam



Location
in North
Dakota

Background of Mt. Carmel Dam

Construction History

- Started June 1970
- Completed June 1971

Background of Mt. Carmel Dam

Watershed

- Located on Little South Pembina River
- Watershed Area: 72 sq. mi., with a contributing area of 66 sq. mi.

Background of Mt. Carmel Dam

Embankment

- Earthen Embankment
- Length: 670 ft.
- Centerline: Dam trends north-south, with right abutment to south
- Height: 45 ft. - crest elev. 1538 msl; streambed elev. 1493 msl

Background of Mt. Carmel Dam

Principal Spillway

- Reinforced concrete drop inlet with 66-in. diameter concrete pipe
- Weir elevation: 1528 msl
- Length of RCP: 187 ft.

Background of Mt. Carmel Dam

Emergency Spillway

- Grass-lined channel in right abutment
- 50-ft. bottom width; 4:1 side slopes; length of 350 ft.
- Control elevation: 1534 msl

Background of Mt. Carmel Dam

Reservoir

- 337 acres at control elev. 1528 msl;
volume of 4200 ac-ft
- 537 acres at top-of-dam elev. 1538 msl;
volume of 8400 ac-ft
- Control elevation: 1534 msl
- Primary uses - recreation & water supply:
 - Cavalier Co. WRD - 4220 ac-ft storage;
990 ac-ft annual use
 - City of Langdon - 330 ac-ft annual use
 - Langdon RWA - 123 ac-ft annual use

Modifications to Mt. Carmel Dam

- Partnership between SWC and Cavalier Co. WRD
- Bring into compliance with safety requirements
- Provide additional water supply
- Raise embankment 4 feet
- Remove existing spillway; construct 30-ft wide concrete chute spillway system
- Widen emergency spillway from 50 to 100 ft.
- Work by Swingen Construction
- Started May 1995; Completed June 1996

Mount Carmel Dam
September 1997





Rainfall Event
August 18, 1995

Before
←

After
→





Partial Failure - March 2003



Emergency Actions Taken

- Construction of sheet-pile cutoff wall
- Removal of concrete headwall from 66-in. diameter concrete pipe



Investigation of Failure

- PHASE 1: Site visit to gather data
Installation of instrumentation
- PHASE 2: Design for repair/reconstruction of spillway provided by GEI