



Photo No. 1 **Bolivar Dam, Ohio** **January 2005**
Aerial view of Bolivar Dam during the pool of record.



Photo No. 2 **Bolivar Dam, Ohio** **January 2005**
View of Bolivar Lake, upstream side of the dam.



Photo No. 3 **Bolivar Dam, Ohio** **January 2005**
View of the downstream toe of Bolivar Dam, in which, the pool of Dover Dam inundated the area.



Photo No. 4 **Bolivar Dam, Ohio** **January 2005**
Closer view of the downstream toe of Bolivar Dam.



Photo No. 5 **Bolivar Dam, Ohio** **January 2005**
Through seepage in terrace embankment area and general view of rock toe.



Photo No. 6 **Bolivar Dam, Ohio** **January 2005**
Through seepage at terrace embankment area. Note trees and lack of maintenance of rock toe in background of picture.



Photo No. 7 **Bolivar Dam, Ohio** **January 2005**
Material shown consists of fine grained sand and was piped out of the terrace toe during the pool of record. This condition was pervasive for approximately 700 ft. of the terrace toe between approximate stations 36+00 and 43+00.



Photo No. 8 **Bolivar Dam, Ohio** **January 2005**
Additional view of material moved from toe of terrace slope



Photo No. 9 **Bolivar Dam, Ohio** **January 2005**
Heavy equipment brought in to place emergency sand and gravel blanket at approximately station 50+00.



Photo No. 10 **Bolivar Dam, Ohio** **January 2005**
Completed emergency filter blanket constructed during pool of record.



Photo No. 11 **Bolivar Dam, Ohio** **January 2005**
Sinkholes observed in downstream seepage blanket just beyond the rock toe.
Filter material was being sluiced into rock toe due to high tailwater elevation.



Photo No. 12 **Bolivar Dam, Ohio** **January 2005**
Typical view of relief wells flowing during pool of record.



Photo No. 13 **Bolivar Dam, Ohio** **January 2005**
Relief wells in downstream toe area inundated by Dover Dam's pool.



Photo No. 14 **Bolivar Dam, Ohio** **January 2005**
Inside view of a relief well in the downstream toe area.



Photo No.15 **Bolivar Dam, Ohio** **January 2005**
Piezometers with extensions, in the downstream toe area, show frozen artesian conditions. Readings could not be taken during this time due to freezing.



Photo No. 16 **Bolivar Dam, Ohio** **January 2005**
Piezometer extension showing artesian condition and freezing temperatures which precluded the ability to take readings.



Photo No. 17 **Bolivar Dam, Ohio** **January 2005**
General view of outlet channel during pool of record.



Photo No. 18 **Bolivar Dam, Ohio** **January 2005**
Downstream view of outlet channel.



Photo No. 19 **Bolivar Dam, Ohio** **January 2005**
Submerged fishing area, downstream of outlet channel.



Photo No. 20

Bolivar Dam, Ohio

January 2005

Upstream side of spillway showing pool approaching.

BOLIVAR DAM PROJECT PHOTOGRAPHS



PHOTO NO. 21 **BOLIVAR DAM, OHIO** **27-28 JUNE 2006**
General view to the northeast of Bolivar Dam with a pool elevation of 921 ft retained; photograph taken from the embankment crest.



PHOTO NO. 22 **BOLIVAR DAM, OHIO** **27-28 JUNE 2006**
General view to the northwest and downstream of Bolivar Dam from the embankment crest.



PHOTO NO. 23 **BOLIVAR DAM, OHIO** **27-28 JUNE 2006**
View of the upstream embankment taken from the upstream impervious blanket at approximately station 55+00. Note upper embankment covered with crown vetch was in the process of being mowed.



PHOTO NO. 24 **BOLIVAR DAM, OHIO** **27-28 JUNE 2006**
View to the northeast of relief wells and catch basins (bare spots) from the embankment crest at approximate station 26+00.



PHOTO NO. 25 **BOLIVAR DAM, OHIO** **27-28 JUNE 2006**
View southward of the embankment crest taken from approximately station 10+00.



PHOTO NO. 26 **BOLIVAR DAM, OHIO** **27-28 JUNE 2006**
View of upstream toe of dam wet spot (surface and groundwater related) in the area of stations 8+00 and 10+00 as noted in previous inspections.



PHOTO NO. 27 **BOLIVAR DAM, OHIO** **27-28 JUNE 2006**
Uprooted tree (one of many) in the gravel terrace section of the embankment resulting from a recent storm.



PHOTO NO. 28 **BOLIVAR DAM, OHIO** **27-28 JUNE 2006**
One of several rotted tree stumps observed in the gravel terrace section of the embankment. Note thick vegetation.



PHOTO NO. 29 **BOLIVAR DAM, OHIO** **27-28 JUNE 2006**
One of many sinkholes (1 to 2 feet deep) observed in the downstream seepage blanket near station 35+00; sinkholes occurred during the January 2005 POR.



PHOTO NO. 30 **BOLIVAR DAM, OHIO** **27-28 JUNE 2006**
Vegetative growth (3-5 ft high) preventing observation of terrace gravel embankment section of project.



PHOTO NO. 31 **BOLIVAR DAM, OHIO** **27-28 JUNE 2006**
Seepage observed downstream of the seepage blanket at approximate station 43+00.



PHOTO NO. 32 **BOLIVAR DAM, OHIO** **27-28 JUNE 2006**
General view of emergency blanket that was constructed at station 50+00 during the January 2005 pool of record.



PHOTO NO. 33 **BOLIVAR DAM, OHIO** **27-28 JUNE 2006**
Seepage downstream of the seepage blanket at approximate station 58+00 (pool was at elevation 921 ft).



PHOTO NO. 34 **BOLIVAR DAM, OHIO** **27-28 JUNE 2006**
View inside housing of relief well No. 6. No relief wells were flowing today because the pool was less than 930 ft elevation.



PHOTO NO. 35 **BOLIVAR DAM, OHIO** **27-28 JUNE 2006**
Screens placed over toe drain and relief well outlets since the last periodic inspection. Note iron staining on outlets indicating well biofouling potential.



PHOTO NO. 36 **BOLIVAR DAM, OHIO** **27-28 JUNE 2006**
View inside of toe drain showing apparent open/non-clogged perforations. Note that data regarding potential positive pressure relief contribution of toe drain has not been quantified. Toe drain is 2 foot diameter.



PHOTO NO. 37 **BOLIVAR DAM, OHIO** **27-28 JUNE 2006**
General view of outlet channel. Note some stone slope protection missing above the right training wall (has been previously noted).



PHOTO NO. 38 **BOLIVAR DAM, OHIO** **27-28 JUNE 2006**
General downstream view of outlet channel. No hydraulic restrictions were observed.



PHOTO NO. 39 **BOLIVAR DAM, OHIO** **05 MARCH 1975**
Overall view of the toe drain seepage and ponding looking from the left
downstream abutment. Pool El. 898.0



PHOTO NO. 40 **BOLIVAR DAM, OHIO** **05 MARCH 1975**
General view of the toe drain seepage and ponding looking downstream
from on top of the dam toward the left abutment. Pool El. 898.0



PHOTO NO. 41 **BOLIVAR DAM, OHIO** **05 MARCH 1975**
View of the toe drain seepage and ponding looking downstream from on top of the dam. Pool El. 898.0



PHOTO NO. 42 **BOLIVAR DAM, OHIO** **05 MARCH 1975**
View of the toe drain seepage and ponding in the old stream channel looking downstream from on top of the dam. Pool El. 898.0



PHOTO NO. 43 **BOLIVAR DAM, OHIO** **18-19 JUNE 1981**
Downstream toe of the main embankment. Note ponded seepage.
Pool El. 928.81



PHOTO NO. 44 **BOLIVAR DAM, OHIO** **18-19 JUNE 1981**
D/S toe of main embankment in the vicinity of the old stream channel.
Note area of clearing for sand & gravel blanket. Pool El. 928.81



PHOTO NO. 45 **BOLIVAR DAM, OHIO** **18-19 JUNE 1981**
Downstream face and toe of the embankment. Pool El. 928.81



PHOTO NO. 46 **BOLIVAR DAM, OHIO** **18-19 JUNE 1981**
Upstream face of the dam at the main section. Note pool.
Pool El. 928.81



PHOTO NO. 47 **BOLIVAR DAM, OHIO** **18-19 JUNE 1981**
Upstream face of the dam. Pool El. 928.81



PHOTO NO. 48 **BOLIVAR DAM, OHIO** **18-19 JUNE 1981**
Downstream face of the main embankment. Note ponded seepage from the pool. Pool El. 928.81



PHOTO NO. 49 **BOLIVAR DAM, OHIO** **18-19 JUNE 1981**
“Normal” seepage at downstream toe of the main embankment during a typical pool rise. Pool El. 928.81



PHOTO NO. 50 **BOLIVAR DAM, OHIO** **18-19 JUNE 1981**
D/S toe area. Two boils showing sand deposits. Sand & gravel blanket installed as part of a DSA Project. Pool El. 928.81



PHOTO NO. 51 **BOLIVAR DAM, OHIO** **18-19 JUNE 1981**
D/S face & toe of dam. Sand & gravel blanket essentially complete.
Note two drill rigs working on pilot holes for RWs. Pool El. 928.81



PHOTO NO. 52 **BOLIVAR DAM, OHIO** **18-19 JUNE 1981**
Closer view of the sand and gravel blanket at contact with the
embankment toe. Pool El. 928.81



PHOTO NO. 53 **BOLIVAR DAM, OHIO** **18-19 JUNE 1981**
Sand and gravel blanket in the area downstream of the terrace section of the dam. Pool El. 928.81



PHOTO NO. 54 **BOLIVAR DAM, OHIO** **18-19 JUNE 1981**
Sand and gravel blanket at the toe of the main embankment. Note rigs drilling relief well pilot holes. Pool El. 928.81



PHOTO NO. 55 **BOLIVAR DAM, OHIO** **18-19 JUNE 1981**
Manholes & perforated pipe for collection of subsurface seepage.
Location is opposite C_L dam station 27+00 to 29+50. Pool El. 928.81



PHOTO NO. 56 **BOLIVAR DAM, OHIO** **18-19 JUNE 1981**
Closer view of the perforated seepage collection pipe shown in
Photograph No. 55. Pool El. 928.81



PHOTO NO. 57 **BOLIVAR DAM, OHIO** **17 MARCH 1982**
General view of relief well installation work in area downstream of
terrace section of the dam. Pool El. 897.51



PHOTO NO. 58 **BOLIVAR DAM, OHIO** **17 MARCH 1982**
Relief well installation on sand and gravel blanket downstream of main
embankment section. Pool El. 897.51



PHOTO NO. 59 **BOLIVAR DAM, OHIO** **17 MARCH 1982**
Close view of drilling equipment used for relief well installation. Pool
El. 897.51



PHOTO NO. 60 **BOLIVAR DAM, OHIO** **17 MARCH 1982**
Closer view of relief well work at the downstream toe of the main
embankment. Pool El. 897.51



PHOTO NO. 61 **BOLIVAR DAM, OHIO** **17 MARCH 1982**
Perforated concrete pipe (24" Dia) and corrugated metal pipe connector
to handle. Pool El. 897.51



PHOTO NO. 62 **BOLIVAR DAM, OHIO** **17 MARCH 1982**
Area opposite Sta. 27+00. Old stream tributary channel (before dam
construction) was treated with perforated pipe and sand & gravel
blanket to control underseepage. Pool El. 897.51



PHOTO NO. 63 **BOLIVAR DAM, OHIO** **17 MARCH 1982**
Sand and gravel blanket after completion of relief wells.
Pool El. 897.51



PHOTO NO. 64 **BOLIVAR DAM, OHIO** **17 MARCH 1982**
Below main embankment after relief well installation. Pool El. 897.51



PHOTO NO. 65 **BOLIVAR DAM, OHIO** **17 MARCH 1982**
Same view as photograph No. 63 – four years later. Pool El. 897.51



PHOTO NO. 66 **BOLIVAR DAM, OHIO** **17 MARCH 1982**
Same view as photograph No. 64 – four years later. Pool El. 897.51



PHOTO NO. 67 **BOLIVAR DAM, OHIO** **17 MARCH 1982**
General view of D/S slope of the main embankment and D/S toe area, as seen from the left abutment. Pool El. 897.51



PHOTO NO. 68 **BOLIVAR DAM, OHIO** **17 MARCH 1982**
Upstream slope of the main embankment and crest. View is toward the left abutment. Pool El. 897.51



PHOTO NO. 69 **BOLIVAR DAM, OHIO** **30 MARCH 1988**
Construction work on the upstream berm, as seen from the upstream side
of the left abutment area. Pool El. 897.47



PHOTO NO. 70 **BOLIVAR DAM, OHIO** **27 OCTOBER 1988**
Construction work on the upstream berm as it nears completion.
Pool El. 897.47



PHOTO NO. 71 **BOLIVAR DAM, OHIO** **20 APRIL 1989**
Looking toward the left abutment contact. Riprap covered toe area in foreground. Pool El. 897.47



PHOTO NO. 72 **BOLIVAR DAM, OHIO** **20 APRIL 1989**
Upstream berm. Looking toward the left abutment. Note intake structure in the left background. Pool El. 897.47