

Report on Flood at Tokwe –Mukosi Dam

14th April 2014, 08:00hrs

Background



Tokwe-Mukosi Dam

The Mukosi catchment has received significant rainfall far exceeding the average rainfall of the region. For instance, since the onset of the rainy season (1st October 2013), to date the site has recorded 1 395 mm of rainfall. These rains are producing a corresponding increase in the runoff in the region. Resultant upon this runoff, the site has received two floods. The first one started in late December 2013 and peaked on 4th January, 2014 and reached level 656m above mean sea level. The diversion works managed to evacuate the flood to level 631.8m on the 26th January 2014, before the next flood reached site on the same date. The flood statistics are tabulated on the next page.

Tokwe-Mukosi Site Statistics

Date (2014)	Storage level in the Dam (m)(above mean sea level)	Rainfall (mm)	Daily Water Rise(m)	Storage Capacity (10 ⁶ m ³)	Depth of Water (m)	Reservoir Surface Area (ha)	Dam Wall Level (m)	Inflow (m ³ /s)	Outflow (m ³ /s)
26/01	631.80				15.80	60	676.4		
27/01	637.08		5.28		21.08	110	676.4		
28/01	654.28		17.20	40	38.28	380	676.4		
29/01	657.80		3.52	45	41.80	570	676.8		
30/01	659.60		1.80	60	43.60	700	677.2		
31/01	661.90		2.30	70	45.90	850	677.2		
01/02	665.25		3.35	105	49.25	1 100	677.2		
02/02	666.93		1.68	125	50.93	1 300	677.2		
03/02	668.72		1.79	160	52.72	1 500	677.6		
04/02	671.30		2.58	190	55.30	1 590	678.4		
05/02	672.50		1.20	210	56.50	1 930	678.8	519	110
06/02	672.95		0.45	230	56.95	1 960	679.4	375	110
07/02	673.32		0.37	240	57.32	1 960	680.2	605	110
08/02	675.28		1.96	270	59.28	2 310	680.7	710	110
09/02	676.46		1.18	290	60.46	2 500	681.2	430	110
10/02	676.98		0.52	320	60.98	2 550	681.6	280	110
11/02	677.39		0.41	340	61.39	2 600	682.4	274	110
12/02	677.56		0.17	350	61.56	2 620	682.4	168	110
13/02	677.55	17.0	-0.01	350	61.55	2 620	683.2	115	110
14/02	677.50		-0.05	350	61.50	2 620	683.2	109	90
15/02	677.44		-0.06	340	61.44	2 600	683.6	77	90
16/02	677.33	13.6	-0.11	340	61.33	2 600	684.0	85	90
17/02	677.21		-0.12	330	61.21	2 600	684.0	85	90
18/02	677.12		-0.09	330	61.09	2 600	684.5	78	86
19/02	677.00		-0.12	320	61.00	2 580	684.9	75	85
20/02	676.87		-0.13	320	60.87	2 580	685.3	62	85
21/02	676.71		-0.16	300	60.71	2 570	685.8	60	83
22/02	676.53		-0.18	300	60.53	2 570	685.8	59	83
23/02	676.36	13.7	-0.17	290	60.36	2 560	686.2	55	83
24/02	676.20	13.6	-0.16	280	60.20	2 560	686.2	56	83
25/02	676.06		-0.14	280	60.06	2 560	686.6	111.3	87.3
26/02	675.96		-0.10	270	59.96	2 550	687.1	67.81	87
27/02	675.82		-0.14	270	59.82	2 550	687.4	79.72	83
28/02	675.68		-0.14	265	59.68	2 360	687.4	51.41	83
01/03	675.52	21.0	-0.16	265	59.52	2 360	687.4	65.80	83
02/03	675.40	17.4	-0.12	260	59.40	2 350	687.4	122.06	83
03/03	675.71	65.4	0.31	265	59.71	2 400	687.4	285.30	83
04/03	676.62		0.91	300	60.62	2 500	687.4	242.80	83
05/03	677.23		0.61	310	61.23	2 600	687.9	171.1	83
06/03	677.45		0.22	340	61.45	2 620	687.9	165.8	83
07/03	677.46	46.2	0.01	340	61.46	2 620	687.9	83.59	83
08/03	677.42		-0.04	340	61.42	2 620	687.9	94.7	83
09/03	677.35		-0.07	335	61.35	2 600	687.9	58.07	83
10/03	677.30		-0.05	330	61.30	2 600	687.9	61.89	83
11/03	677.20		-0.10	330	61.20	2 600	687.9	62.92	83
12/03	677.11	55.2	-0.09	320	61.11	2 550	687.9	70.35	83
13/03	677.12	11.8	0.01	320	61.12	2 550	687.9	190.60	83
14/03	677.60	1.6	0.48	360	61.60	2 620	687.9	138.77	83
15/03	677.68		0.08	360	61.68	2 620	688.4	122.45	83

Date (2014)	Storage level in the Dam (m)(above mean sea level)	Rainfall (mm)	Daily Water Rise(m)	Storage Capacity (10 ⁶ m ³)	Depth of Water (m)	Reservoir Surface Area (ha)	Dam Wall Level (m)	Inflow (m ³ /s)	Outflow (m ³ /s)
16/03	677.69		0.01	360	61.69	2 620	688.4	59.56	83
17/03	677.64		-0.05	360	61.64	2 620	688.4	63.89	83
18/03	677.52		-0.12	350	61.52	2 620	688.8	52.56	83
19/03	677.39		-0.13	340	61.39	2 600	688.8	32.10	83
20/03	677.17	5.0	-0.22	325	61.17	2 580	688.8	36.87	83
21/03	677.00	12.6	-0.17	320	61.00	2 570	689.2	26.30	83
22/03	676.89		-0.11	310	60.89	2 565	690.0	35.16	83
23/03	676.74		-0.15	300	60.74	2 560	690.45	28.59	83
24/03	676.57		-0.17	300	60.57	2 560	690.45	32.98	83
25/03	676.33		-0.24	290	60.33	2 550	690.90	30.45	83
26/03	676.12		-0.21	280	60.12	2 540	690.90	22.74	83
27/03	675.88		-0.24	270	59.88	2 530	691.30	27.08	83
28/03	675.64		-0.24	260	59.64	2 450	691.30	21.00	83
29/03	675.40		-0.24	270	59.40	2 390	691.30	23.80	83
30/03	675.12		-0.28	260	59.12	2 350	691.30	19.33	83
31/03	674.89		-0.23	260	58.89	2 290	691.30	21.55	83
01/04	674.63		-0.26	250	58.63	2 250	691.30	20.47	83
02/04	674.34		-0.39	250	58.34	2 180	691.30	17.14	79.8
03/04	674.08		-0.26	240	58.08	2 050	691.30	18.83	79.8
04/04	673.78		-0.30	240	57.78	2 010	691.30	15.83	79.8
05/04	673.50		-0.28	240	57.50	1 980	691.30	16.30	79.8
06/04	673.18	15.2	-0.32	230	57.18	1 960	691.30	14.83	79.8
07/04	672.90		-0.28	230	56.90	1 960	691.30	18.40	79.8
08/04	672.57		-0.33	210	56.57	1 930	691.30	17.20	79.8
09/04	672.25	15.6	-0.32	200	56.32	1 920	691.30	15.82	79.8
10/04	671.93	3.8	-0.32	200	55.93	1920	691.3	14.92	79.8
11/04	671.64	9.8	-0.29	195	55.64	1750	691.3	14.50	79.8
12/04	671.32	10.8	-0.32	190	55.32	1590	691.3	18.21	79.8
13/04	671.03		-0.29	190	55.03	1590	691.3	17.80	79.8
14/04	670.71		-0.32	190	54.71	1590	691.3	18.87	79.0

Another point to note is that Muzhwi dam which is upstream of Tokwe-Mukosi Dam is spilling. This therefore means all the Muzhwi dam spillage water is now coming to Mukosi Dam.

The maximum discharge through the outlet works which presently is serving as the diversion works is 80m³/s which translates to 6.912 x 10⁶m³ per day. Quarry dust is being placed upstream of the dam wall to reduce seepage through the embankment rock fill. The estimate for seepage through the embankment rock fill now estimated at +/-3m³/s. This brings discharge to +/- 7.171 x 10⁶m³/day.

The highest dam water level of 677.69m amsl was reached on the 16th March 2014 and now has dropped to 670.71m amsl giving average daily water fall of 0.23m. Since the 16th of March 2014 to today 14th April, 2014, the dam level fell cumulatively by 6.98m. This fall corresponds to a net evacuation of 170 x 10⁶m³ from the dam.



Water body stored in the dam.



Discharge through the diversion works during and after the floods.

Events on the Ground

- The water level decreased from 671.03m a.m.s.l. at 07:00hrs on the 13th of April 2014 to 670.71m a.m.s.l at 07:00hrs on the 14th of April 2014. The dam wall is at level 691.3 a.m.s.l. Thus, there is a free board of 20.59m and an additional volume of about $740 \times 10^6 \text{m}^3$ of water can be accommodated in the lake.
- Today (14/04/2014), records of inflows from upstream gauging stations are as follows:

Gauging Station	River	Flows (m ³ /s)
E143 (Austral)	Tokwe	13.3
E107	Musogwesi	1.97
Estimate flows into the dam but from catchment without gauge stations	Mukosi and other streams	3.6
TOTAL FLOWS		18.87

Thus inflow volume translates to $1.63 \times 10^6 \text{m}^3/\text{day}$ against outflow volume of $6.826 \times 10^6 \text{m}^3/\text{day}$.

- Work in critical areas to safeguard the dam structure is in progress. These works are:
 - Raising the kerb to avoid overtopping of the dam wall which is now at level 691.30m a.m.s.l and
 - Placement of quarry dust (fine material) on the upstream to reduce seepage
 - Stabilization of the downstream dam on rock slip is in progress.
 - Rock fill remedial works started at level 634.00 on the rock fill slip area. The works have now reached level 657m.



Stabilizing of downstream toe of embankment

Effects of Flooding on the upstream dam basin

- Most of the families under the High Flood Level Zone in both Masvingo and Chivi Districts have been relocated to either Chingwizi or to areas of their choice. However, some of the family members remained in the dam basin waiting for harvesting crops in their recently owned fields.

- Livestock transportation in both Districts was reported complete by the 28th of March 2014; hence the CPU transport committee has since demobilized all vehicles which were transporting livestock.