

GOVERNMENT OF THE PUNJAB IRRIGATION DEPARTMENT



CASE STUDY ON BREACHES IN IRRIGATION CHANNELS, CAUSES AND REMEDIAL MEASURES



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BREACHES IN IRRIGATION CHANNELS, CAUSES AND REMEDIAL MEASURES

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BREACHES IN IRRIGATION CHANNELS, CAUSES AND REMEDIAL MEASURES

ABSTRACT

Results of breaches may include loss of property due to flooding, wave attack, and erosion; loss of navigability in adjacent inlets sharing the same water body as breach; destruction of roads, high-ways, utilities, and other infrastructure; and creation of environmental concern over loss of habitat and unwanted increases or decreases in water level and salinity. Breaches usually enlarge rapidly, increasing the complexity and cost of closing the breach with time. Therefore, it is often desirable to close breaches in the most timely and efficient possible manners.

The case study on the topic will review the technical note / document learned through experiences with breaches occurred during the *Kharif* 2011 in Irrigation Zone Bahawalpur. Experience has taught that breach closures require the quickest possible response to minimize cost. What may start as a small breach that could easily be plugged by conventional methods can become a large inlet requiring millions of rupees to fill. Rapid response is supported through effective interagency coordination. Efficient closure of breaches is facilitated by proper timing of the fill operation. Breach closures may need to be properly filled, strengthen and then reinforced by formation of berms along the breach site in designed width to protect against erosion or reoccurrence.

BREACHES IN IRRIGATION CHANNELS, CAUSES AND REMEDIAL MEASURES

INTRODUCTION

The irrigation water is delivered to the field through barrages, main canals, branch canals, distributaries, minors, sub minors and outlets. The irrigation System of Punjab consists of about 23,184 miles length of canals, which command Culturable Commanded Area (CCA) of about 21 million acres. The 24 canal systems, which have a total capacity of 1.10 lac cusecs, draw their allocated discharges from 14 barrages of the Punjab. The barrages also control diversion of supplies to the inter-river link canals which transfer the water of the western rivers to the eastern rivers to cater for irrigation systems off taking from these rivers. The water from the rivers is diverted to Main Canals / Link Canals from Barrages and head Regulators and distributed to the farmer's fields through 58,000 outlets after flowing through the lengthy irrigation net-work.

Networks of irrigation canals are used to convey, distribute, and apply water to the land. A canal in the network may be a rigid boundary (lined) canal or a mobile boundary (unlined) canal. However, breaches in lined or unlined channels may cause huge losses to the irrigation system, public and private property. This problem has become a major challenge for the Engineers of Irrigation Department to combat alarming situation for the succeeding years. Consequently, lining is being provided to overcome the frequent breaches occurred in the mobile boundary channels due to different causes / reasons. This paper will illustrate causes / reasons for occurring breaches in the mobile boundary channels and their remedial measures to overcome any unpleasant situation.

BREACHES IN IRRIGATION CHANNELS, CAUSES AND REMEDIAL MEASURES

OBJECTIVES

Objectives of writing a paper on the topic, “Breaches in Irrigation Channels, Causes and Remedial Measures” are to develop a framework:

- To know causes / reasons of occurrence of breaches in mobile boundary channels.
- To ensure adopting remedial measures to avoid any unpleasant situation occurred in case of mishap.
- To ensure proper watching / maintenance of channels to avoid such incidents.
- To save the public as well as private property to be damaged by occurring breaches.
- To minimize human misery and sufferings.
- To save water wasted through breaches.
- To protect the Irrigation Network.
- To save huge cost used in closing of breaches.

CANAL BREACHES

Breach can be defined as an opening, a tear or a rupture to a substance. Explicitly, in terms of canal irrigation, it advances to a gap or rift especially in or as if in a soil / solid structure such as a dike or fortification.

IRRIGATION NETWORK IN SOUTHERN PUNJAB

The Bahawalpur Irrigation Zone basically comprises three Districts i.e Bahawalnagar, Bahawalpur and Rahimyarkhan, and the area in these systems mostly fall within jurisdiction of Bahawalnagar, Bahawalpur and Rahimyarkhan Canal Circles respectively.

At present Bahawalpur Irrigation Zone gets irrigation supplies from Terbela and Mangla Command. Panjnad Canal system receives water from Terbela command while the Bahawalpur and Bahawalnagar Districts receive supplies from Mangla command. Sometimes the water from Terbela command is diverted to Mangla command via CJ Link.

District Bahawalnagar, District Bahawalpur and District Rahimyarkhan receive supply from Suleimanki Headworks, Islam Headworks / SMB Link Canal and Panjnad Headworks respectively.

CANAL BREACHES**SALIENT FEATURES OF BAHAWALPUR IRRIGATION ZONE**

SR. NO.	DESCRIPTION	DETAIL
1	Channels	549 No.
2	Length of Main Canals, Branches and Link Canals	725 Miles
3	Length of Disty, Minors and Sub-Minors	3860 Miles.
4	Length of lined Channels	401 Miles
5	Tails	509 No.
6	Outlets	12499 No.
7	Total area	12.80 M. Acres
8	Total G.C.A	4.506 M. Acres
9	Total C.C.A	3.989 M. Acres
10	Total Designed discharge	29,767 cfs
	i) Perennial	13,124 cfs
	ii) Non-Perennial	16,643 cfs

CANAL BREACHES**DIVISION-WISE LIST OF BREACHES OCCURRED DURING KHARIF 2011**

Case study is proceeded on the data of canal breaches occurred in the Irrigation Zone Bahawalpur during the Kharif 2011 to come up to a conclusion. Division-wise data of breaches is tabulated below:

FORDWAH CANAL DIVISION, BAHAWALNAGAR CIRCLE

Sr. No.	Name of Channel	Date of Occurrence	Breach / Cut	RD	Side	Causes
1	Mureed Disty	04.05.2011	cut	38-39	R	Cut made by Zimandar
2	Pir Garh Disty	07.05.2011	cut	14-15	R	Cut made by Zimandar
3	Pir Garh Disty	07.05.2011	cut	17-18	L	Cut made by Zimandar
4	Fateh Garh Disty	08.05.2011	cut	2-3	L	Cut made by Zimandar
5	Mureed Disty	08.05.2011	cut	39-40	L	Cut made by Zimandar
6	Mureed Disty	09.05.2011	cut	22-23	R	Cut made by Zimandar
7	Mureed Disty	10.05.2011	cut	37-38	R	Cut made by Zimandar
8	Chabiana Minor	10.05.2011	cut	12-13	R	Cut made by Zimandar
9	Mureed Disty	10.05.2011	cut	32-33	R	Cut made by Zimandar
10	Saru Disty	11.05.2011	cut	1-2	R	Cut made by Zimandar
11	Saru Disty	11.05.2011	cut	6-7	R	Cut made by Zimandar
12	Darbari Disty	11.05.2011	cut	50-51	R	Cut made by Zimandar
13	Chabiana Minor	16.05.2011	cut	40-41	R	Cut made by Zimandar
14	Chabiana Minor	16.05.2011	cut	16975	R	Cut made by Zimandar
15	Noshehra Disty	16.05.2011	cut	24-25	R	Cut made by Zimandar

CANAL BREACHES

16	Noshehra Disty	16.05.2011	cut	23-24	L	Cut made by Zimandar
17	Saru Disty	17.05.2011	cut	2-3	R	Cut made by Zimandar
18	Saru Disty	17.05.2011	cut	2-3	R	Cut made by Zimandar
19	Saru Disty	17.05.2011	cut	6-7	R	Cut made by Zimandar
20	New Saeed wala Disty	30.04.2011	cut	5-6	R	Weak side/Ghatt site
21	Shehar Fareed Disty	04.05.2011	Breach	10-11	R	Excess Supply
22	Soda Disty	04.05.2012	Breach	12-13	R	Excess Supply
23	Masood Disty	22.05.2011	cut	8-9	R	Theft of water
24	Soda Disty	25.05.2011	cut	10-11	L	Theft of water
25	Azeem Disty	30.05.2011	Breach	66-77	R	Cut
26	Darbari Disty	08.06.2011	Cut	60-61	L	Cut mad by Zameendar
27	Mirza Disty	08.06.2011	Cut	0-1	L	Cut made by Zimandar
28	Mirza Disty	18.06.2011	Cut	30-31	R	Cut made by Zimandar
29	Saru Disty	06.06.2011	Cut	27-27	L	Cut made by Zimandar
30	Saru Disty	06.06.2011	Cut	25-26	L	Cut made by Zimandar
31	Saru Disty	06.06.2011	Cut	23-24	R	Cut made by Zimandar
32	Saru Disty	06.06.2011	Cut	7-8	R	Cut made by Zimandar
33	Dona Disty	04.06.2011	Cut	14-15	L	Cut made by Zimandar
34	Habibka Minor	01.06.2011	Cut	15-16	L	Cut made by Zimandar
35	Chabiana Minor	08.06.2011	Cut	19-20	R	Cut made by Zimandar
36	Chabiana Minor	16.06.2011	Cut	22-23	R	Cut made by Zimandar
37	1-R/ESC	08.06.2011	Cut	3-4	R	Cut made by Zimandar
38	Lower Bair Dy.	29-30/06.011	Cut	101-102	R	Cut made by Zimandar
39	Lower Bair Dy.	29-30/06.011	Cut	108570	R	Cut made by Zimandar
40	Shehar Fareed Disty	09.06.2011	Breach	22-23	R	Leakage
41	Chabiana Minor	03.07.2011	Cut	2-3	R	Cut by Zimindar
42	Lower bair Disty	23-24/07/011	Cut	108570	R	Cut by Zimindar
43	Fordwah Disty	17-08-2011	Breach	87-88	L	Heavy rain fall

CANAL BREACHES**SADIQIA CANAL DIVISION, BAHAWALNAGAR**

Sr. No.	Name of Channel	Date of Occurrence	Breach / Cut	RD	Side	Causes
1	Jalwala Disty	09.05.2011	Breach	14-15	L	Due to daff made by Irrigators
2	Jalwala Disty	18-19/06.2011	Cut	47-48	R	Cut made by irrigators
3	Murad Disty	26-27/06.2011	Cut	28-29	R	Cut made by irrigators

HAKRA CANAL DIVISION, BAHAWALNAGAR

Sr. No.	Name of Channel	Date of Occurrence	Breach / Cut	RD	Side	Causes
1	1L/3R Minor	12.04.2011	Cut	27-28	L	Cut made by Zimindars
2	3R Disty	07.07.2011	Cut	70-71	R	Cut made by Zimindars
3	Hakra Branch	30.07.2011	Cut	119-120	L	Cut made by Zimindars
4	6R Disty	02.07.2011	Cut	113-114	L	Cut made by Zimindars
5	1L/1L/6R Minor	30.05.2011	Cut	29-30	R	Cut made by Zimindars
6	2L/6R Minor	28.09.2011	Cut	16-17	R	Cut made by Zimindars
7	5R Disty	03.10.2011	Cut	8-9	R	Cut made by Zimindars
8	5R Disty	01.10.2011	Cut	8-9	R	Cut made by Zimindars
9	2L/Hakra Br.	29.09.2011	Cut	8-9	L	Cut made by Zimindars
10	7R Disty	10.07.2011	Cut	59-60	L	Cut made by Zimindars
11	7R Disty	08.08.2011	Cut	17-18	L	Cut made by Zimindars

CANAL BREACHES**AHMADPUR CANAL DIVISION, BAHAWALPUR**

Sr. No.	Name of Channel	Date of Occurrence	Breach / Cut	RD.	Side	Causes
1	Abbasia Link Canal	01.04.2011	Cut	190-191	L	Cut mad by zimindar
2	Abbasia Link Canal	01.04.2011	Cut	194-195	L	Cut mad by zimindar
3	2-L/1-L/AC	04.04.2011	Cut	52400	R	Cut mad by zimindar
4	Abbasia Link Canal	10.04.2011	Cut	189-190	L	Cut mad by zimindar
5	Basit Minor	10.04.2011	Cut	0-1	R	Cut mad by zimindar
6	2-R/AC	15.04.2011	Cut	98000	L	Cut mad by zimindar
7	1-L/AC	17.04.2011	Cut	71-72	R	Cut mad by zimindar
8	1-L/1-L/AC	17.04.2011	Cut	63000	R	Cut mad by zimindar
9	1-L/1-L/AC	17.04.2011	Cut	707500	L	Cut mad by zimindar
10	1-L/1-L/AC	17.04.2011	Cut	75500	L	Cut mad by zimindar
11	1-L/1-L/AC	17.04.2011	Cut	79750	L	Cut mad by zimindar
12	1-L/1-L/AC	17.04.2011	Cut	92000	R	Cut mad by zimindar
13	1-L/1-L/AC	17.04.2011	Cut	63400	L	Cut mad by zimindar
14	1-L/1-L/AC	17.04.2011	Cut	75500	L	Cut mad by zimindar
15	1-L/1-L/AC	17.04.2011	Cut	70500	L	Cut mad by zimindar
16	1-L/1-L/AC	17.04.2011	Cut	87-88	L	Cut mad by zimindar
17	1-L/1-L/AC	17.04.2011	Cut	81000	R	Cut mad by zimindar
18	1-L/1-L/AC	17.04.2011	Cut	79750	L	Cut mad by zimindar
19	1-L/1-L/AC	17.04.2011	Cut	89-90	L	Cut mad by zimindar
20	1-L/1-L/AC	23.04.2011	Cut	52-53	R	Cut mad by zimindar
21	1-L/1-L/AC	23.04.2011	Cut	64-65	R	Cut mad by zimindar
22	Abbasia Link Canal	23.04.2011	Cut	199-200	L	Cut mad by zimindar
23	1L/Ac	06.05.2011	Cut	71-72	L	Cut mad by zimindar
24	1L/Ac	08.05.2011	Cut	71-72	L	Cut mad by zimindar
25	1R/Ac	11-12.05.2011	Cut	23400	L	Cut mad by zimindar
26	1R/Ac	12-13.05.2011	Cut	23400	L	Cut mad by zimindar
27	3R/Ac	14-15.05.2011	Cut	2180	R	Cut mad by zimindar
28	1L/Ac	20-21.05.2011	Cut	45700	R	Cut mad by zimindar
29	1L/Ac	20-21.05.2011	Cut	46210	L	Cut mad by zimindar
30	1L/Ac	22.05.2011	Cut	110300	L	Cut mad by zimindar
31	1L/6L	06.05.2011	Cut	9-10	L	Cut mad by zimindar
32	1R/6L	08.05.2011	Cut	15-16	L	Cut mad by zimindar
33	1R/6L	08.05.2011	Cut	15-16	R	Cut mad by zimindar

CANAL BREACHES

Sr. No.	Name of Channel	Date of Occurrence	Breach / Cut	RD.	Side	Causes
34	1L/AP	10.05.2011	Cut	26-27	L	Cut mad by zimindar
35	1L/AP	12.05.2011	Cut	30-31	L	Cut mad by zimindar
36	5L/AP	13.05.2011	Cut	24600	R	Cut mad by zimindar
37	4L/AP	14.05.2011	Cut	19125	L	Cut mad by zimindar
38	1R/AP	23.05.2011	Cut	65-66	L	Cut mad by zimindar
39	1R/AP	26.05.2011	Cut	22.23	R	Cut mad by zimindar
40	3L/AP	11.05.2011	Breach	35-36	R	Cut mad by zimindar
41	Uch Disty	03.05.2011	Cut	127-128	R	Cut mad by zimindar
42	Bahawal Wah	05.05.2011	Cut	126060	L	Cut mad by zimindar
43	Bahawal Wah	11.05.2011	Cut	122230	L	Cut mad by zimindar
44	Sultan Wah	21.05.2011	Cut	57-58	L	Cut mad by zimindar
45	L/AP	04.06.2011	Cut	30-31	R	Cut mad by zimindar
46	1L/6L	03.06.2011	Cut	15-16	R	Cut mad by zimindar
47	52/AP	07.06.2011	Cut	18-19	L	Cut mad by zimindar
48	1L/AP	06.06.2011	Cut	59901	L	Cut mad by zimindar
49	1R/AP	12.06.2011	Cut	18-19	L	Cut mad by zimindar
50	6L/AP	14.06.2011	Cut	144700	R	Cut mad by zimindar
51	3L/AP	22.06.2011	Cut	60516	L	Cut mad by zimindar
52	3L/AP	22.06.2011	Cut	63125	R	Cut mad by zimindar
53	1-L/6-L	19.06.2011	Cut	6-7	L	Cut mad by zimindar
54	Bahawal Wah	01.06.2011	Cut	120-121	R	Cut mad by zimindar
55	Uch Disty	13.06.2011	Cut	108-109	R	Cut mad by zimindar
56	1L/AC	02.06.2011	Cut	90000	R	Cut mad by zimindar
57	1L/AC	07.06.2011	Cut	38000	R	Cut mad by zimindar
58	1R/AC	09.06.2011	Cut	46200	L	Cut mad by zimindar
59	ALC	10.06.2011	Cut	179300	L	Cut mad by zimindar
60	ALC	14.06.2011	Cut	117-118	L	Cut mad by zimindar
61	ALC	14.06.2011	Cut	194-195	L	Cut mad by zimindar
62	2L/1L/AC	14.06.2011	Cut	33700	R	Cut mad by zimindar
63	2L/1L/AC	14.06.2011	Cut	52400	R	Cut mad by zimindar
64	5R/AC	21.06.2011	Cut	11786	L	Cut mad by zimindar
65	ALC	21.06.2011	Cut	179-180	R	Cut mad by zimindar
66	1-L/1-L/AC	21.06.2011	Cut	66-67	L	Cut mad by zimindar
67	1-L/AC	24.06.2011	Cut	38000	R	Cut mad by zimindar

CANAL BREACHES

Sr. No.	Name of Channel	Date of Occurrence	Breach / Cut	RD.	Side	Causes
68	1-L/AC	24.06.2011	Cut	72-73	R	Cut mad by zimindar
69	2L/1L/AC	25.06.2011	Cut	47000	R	Cut mad by zimindar
70	1-L/AP	20.06.2011	Cut	6-7	R	Cut mad by zimindar
71	3L/AP	29.06.2011	Cut	15-16	L	Cut mad by zimindar
72	6L/AP	01.06.0211	Cut	143-144	L	Cut mad by zimindar
73	3L/AP	05.06.2011	Cut	12-13	R	Cut mad by zimindar
74	6L/AP	10.06.2011	Cut	149-150	L	Cut mad by zimindar
75	1R/6-L/AP	11.06.2011	Cut	16-17	R	Cut mad by zimindar
76	5-L/AP	11.06.2011	Cut	13-14	R	Cut mad by zimindar
77	2-R/6-L	13.06.2011	Cut	12-13	R	Cut mad by zimindar
78	6L/AP	14.06.2011	Cut	144-145	R	Cut mad by zimindar
79	6L/AP	14.06.2011	Cut	142-143	L	Cut mad by zimindar
80	3L/AP	21.07.2011	Cut	26-27	R	Cut mad by zimindar
81	4-L/AP	17.07.2011	Cut	47-48	R	Cut mad by zimindar
82	1-L/3-L/AP	18.07.2011	Cut	4-5	R	Cut mad by zimindar
83	3L/AP	20.07.2011	Cut	26-27	R	Cut mad by zimindar
84	Uch Disty	17.07.2011	Cut	38-39	L	Cut mad by zimindar
85	Bahawal Wah	22.07.2011	Cut	122-123	R	Cut mad by zimindar
86	Sultan Wah	25.07.2011	Cut	92-93	L	Cut mad by zimindar
87	2L/1L/AC	08.07.2011	Cut	34500	L	Cut mad by zimindar
88	2L/1L/AC	08.07.2011	Cut	47000	R	Cut mad by zimindar
89	2L/1L/AC	08.07.2011	Cut	46000	L	Cut mad by zimindar
90	1-L/AC	08.07.2011	Cut	72-73	R	Cut mad by zimindar
91	Mamoon Minor	09.07.2011	Cut	5452	L	Cut mad by zimindar
92	1-L/1-L/AC	11.07.2011	Cut	5253	R	Cut mad by zimindar
93	7-R/AC	17.07.2011	Cut	75100	L	Cut mad by zimindar
94	1-R/1-L/AC	29.07.2011	Cut	37-38	R	Cut mad by zimindar
95	6L/AP	09.08.2011	Cut	134-135	L	Cut mad by zimindar
96	1R/AP	02.08.2011	Cut	2675	L	Cut mad by zimindar
97	1L/AP	03.08.2011	Cut	26-27	L	Cut mad by zimindar

CANAL BREACHES

Sr. No.	Name of Channel	Date of Occurrence	Breach / Cut	RD.	Side	Causes
98	1-L/6-L/AP	04.08.2011	Cut	04-05	R	Cut mad by zimindar
99	1-L/4-L/ AP	08.08.2011	Cut	12-13	R	Cut mad by zimindar
100	4-L/ AP	12.08.2011	Cut	45-46	R	Cut mad by zimindar
101	4-L/ AP	14.08.2011	Cut	29-30	R	Cut mad by zimindar
102	4-L/ AP	20.08.2011	Cut	81-82	R	Cut mad by zimindar
103	1R/AP	22.08.2011	Cut	20-21	R	Cut mad by zimindar
104	5L/AP	26.08.2011	Cut	53725	R	Cut mad by zimindar
105	5L/AP	28.08.2011	Cut	53725	R	Cut mad by zimindar
106	2R/AP	25.08.2011	Cut	5-6	R	Cut mad by zimindar
107	1L/AC	02.08.2011	Cut	90000	R	Cut mad by zimindar
108	1R/AC	02.08.2011	Cut	13-14	R	Cut mad by zimindar
109	ALC	08.08.2011	Cut	103500	L	Cut mad by zimindar
110	ALC	09.08.2011	Cut	103500	L	Cut mad by zimindar
111	2L/1L/AC	15.08.2011	Cut	52400	R	Cut mad by zimindar

CANAL BREACHES**RAHIMYARKHAN CANAL DIVISION, RAHIMYARKHAN**

Sr. No.	Name of Channel	Date of Occurrence	Breach / Cut	RD.	Side	Causes
1	Rahimyarkhan Branch	31.08.2011	Breach	83-84	R	Due to fixing pipe
2	Sinawar Minor	31.08.2011	Breach	42000	L	Due to heavy rain
3	Sinawar Minor	31.08.2011	Breach	31-42	L	Due to heavy rain
4	Sinawar Minor	31.08.2011	Breach	57-85	R	Due to heavy rain
5	Sinawar Minor	31.08.2011	Breach	60-61	R	Due to heavy rain
6	Sinawar Minor	31.08.2011	Breach	63-64	L	Due to heavy rain
7	Chandrami Sub Minor	31.08.2011	Breach	6-7	R	Due to heavy rain
8	Akil Sub Minor	31.08.2011	Breach	0-1	L	Due to heavy rain
9	Talla Disty	31.08.2011	Breach	20-21	R	Due to heavy rain
10	Talla Disty	31.08.2011	Breach	29-30	R	Due to heavy rain
11	Chamman Disty.	31.08.2011	Breach	9-10	R	Due to heavy rain
12	Chamman Minor.	31.08.2011	Breach	35-36	L	Due to heavy rain
13	Kandera Disty	31.08.2011	Breach	45-46	R	Due to heavy rain
14	1L Kandera	31.08.2011	Breach	2-3	R	Due to heavy rain
15	1R Kandera	31.08.2011	Breach	9-10	R	Due to heavy rain
16	Lakhi Minor	31.08.2011	Breach	9-10	L	Due to heavy rain
17	Tarinda Disty	31.08.2011	Breach	81-82	L	Due to heavy rain

CANAL BREACHES**KHANPUR CANAL DIVISION, RAHIMYARKHAN**

Sr. No.	Name of Channel	Date of Occurrence	Breach / Cut	RD.	Side	Causes
1	Minchin Branch	26/27.05.2011	Breach	89-90	R	Due to weak site
2	Upper Nawankot Dy.	10.05.2011	Breach	63-64	R	Due to rate hole
3	Upper Nawankot Dy.	10.05.2011	Breach	126-127	R	Due to rate hole
4	Abehayat Disty	07/08.06.2011	Cut	1-2	L	Cut by Zimndar
5	1L/Abehayat Minor	14.08.2011	Breach	40-41	R	Due to rain
6	Behari Disty	18.08.2011	Breach	5-6	L	Due to weak site
7	1L/Abehayat Minor	31.08.2011	Breach	107-108	L	Due to rain
8	1R/1L/Abehayat Mr.	31.08.2011	Breach	23-24	R	Due to rain
9	Sherin Disty	19.08.2011	Breach	4-5	L	Due to sloughing of jungle / sarkanda
10	Shergarh Minor	31.08.2011	Breach	31-32	R	Due to rain
11	1L/Abehayat Minor	25.09.2011	Breach	17-18	R	Due to rain
12	Shergarh Minor	24/24.08.2011	Breach	4-5	R	Due to rain
13	Behari Disty	10.10.2011	Cut	30-31	L	Cut made by Zimindar

DALLAS CANAL DIVISION, RAHIMYARKHAN

Sr. No.	Name of Channel	Date of Occurrence	Breach / Cut	RD.	Side	Causes
1	Sabzal Minor	01.08.2011	Breach	6-7	L	Due to heavy rain

CANAL BREACHES**DIVISION-WISE ABSTRACT**

Sr. No.	Name of Division	Cause / Reason									
		Cut	Weak Site	Excessive Supply	Theft of water by Syphon etc.	Leakage	Rain	Daff	Fixing Pipe	Rate Hole	Jungle
1	Fordwah	36	1	2	2	1	1	-	-	-	-
2	Sadiqia	2	-	-	-	-	-	1	-	-	-
3	Hakra	11	-	-	-	-	-	-	-	-	-
4	Bahawal-pur	-	-	-	-	-	-	-	-	-	-
5	Ahmadpur	111	-	-	-	-	-	-	-	-	-
6	Rahimyar Khan	-	-	-	-	-	16	-	1	-	-
7	Khanpur	2	2	-	-	-	6	-	-	2	1
Total:		162	3	2	2	1	23	1	1	2	1

CAUSES OF BREACHES

In Chapter-1 the abstract of breaches reveals that 162 No. breaches occurred due to deliberate cut made by Zimindars for unauthorized irrigation followed by 23 No. breaches occurred due to the rains in the area. However, there are two main causes of occurring breaches.

1. NATURAL PHENOMENA

Rain, windstorm, falling dead and hollow trees in the channels.

2. HUMAN INTERFERENCE

While doing unauthorized irrigation breaches occurs by cutting of banks, fixing pipes, stealing of water by syphoning and trespassing of animals etc.

OCCURRENCE OF BREACHES DUE TO NATURAL DISASTERS

RAINS

Heavy rains are the major natural phenomena of occurring breaches in Canals. When the channels are running to their Authorized Full Supply Discharge the rains will definitely enhance the capacity of the water prism in the channels resulted in the channels overflow to the extent of occurring breaches. This problem arises when farmers close the outlets of irrigation channels in their respective fields due to slack demand of water due to rains.

WINDSTORM

Wind wave action in the windstorm, the weak banks of the channels are eroded and slight thrust of water cause damage the bank which can develop into a breach.

FALLING OF DEAD AND HOLLOW TREES

Dead and hollow trees grown along the berms and banks can also be a major cause of occurring breaches in the channel. These trees fall down in the channel due to wind action or their own load by the reasons extra heading up is created by this obstruction in

CAUSES OF BREACHES

the upstream of the channel. Mostly over flowing of water from the weak banks can develop in to a beach.

OCCURRENCE OF BREACHES DUE TO HUMAN INTERFERENCE

OBSTRUCTION OF FLOW BY VARIOUS MEANS

Due to high intensity of Irrigation, there is a tendency of stealing of water from canals by the farmers to meet the demands of the crops in the area. In small Distributaries and Minors, unauthorized irrigators create Daffs / obstructions by putting needles across the channels to enhance water head at their outlets so that the discharge of the outlet is increased. Some times this practice can damage the weak bank and cause uncontrollable breach particularly at upstream of the Daff.

CUTTING OF BANKS OR EVEN REMOVING OF PIPE OUTLETS

Farmers are also habitual of cutting of banks and some times they are compelled to pull out the pipe outlets from the banks in the keen demand of water for watering their crops particularly before sowing season. This practice is also done by the un-authorized irrigators when the channels are running with the short canal supply or before closing of the channel in the Rotational Programme. Cutting of banks or removal of pipes from the banks can be preceded to an uncontrollable breach.



CAUSES OF BREACHES

TAMPERING HEADS OF CHANNELS OR ESCAPES

The selfish attitude of tail irrigators encouraged them to tamper Head Regulators of channels to receive excessive supplies at the tail end but the weak banks of the channel cannot bear the capacity of surplus water. Consequently, the breaches are obvious to be occurred in the weak reaches that damage crops as well as public property in the area.

CROSSINGS THROUGH CHANNELS

In the Non-Perennial System of Irrigation the irrigators construct pipe crossings over the channel or they fix syphon under the bed of the channel to irrigate their lands by Turbines / Tubewells on the either side of the channel. A little leakage of the pipe fixed under the bed of the channel can cause a serious breach during the flow period of the channel.

ENCROACHING CANAL BANKS

Illegal encroachers on the banks of the channels tightens the cross section of the channel, upshot of the encroachment can be a major cause of a breach.

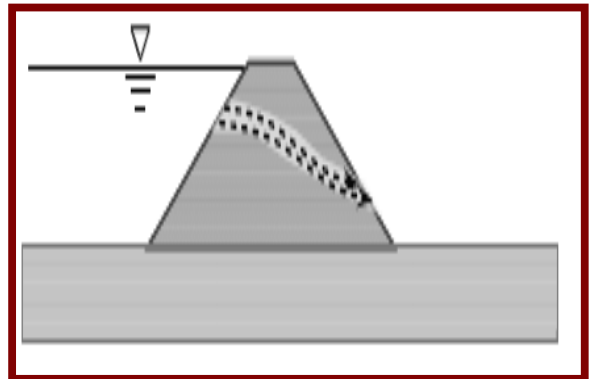
UNAUTHORIZED USE OF SERVICE ROADS

Service road along the channels is meant for inspection of the channel by the Engineers of Irrigation Department but in the present political scenario the service roads on the channels are being used in abundance by the public transport. Due to heavy axel point and uniformly distributed load, the banks of channels become weak and deteriorated. Ultimately, excess running of public vehicles can be one of the factors of causing breaches.

CAUSES OF BREACHES

BREACHING BANKS DUE TO PIPING

Historically, the term piping has been used in different contexts to indicate a variety of physical processes creating an often confusing terminology, particularly when disciplinary boundaries are crossed. For canal banks the most relevant forms of piping are internal erosion, initiated along cracks or zones of concentrated leakage



and backward erosion initiated at the exit point of seepage in a homogeneous granular material. Piping can be occurred due to the roots buried under the canal banks, tress passing of the insects, rate / porcupine holes which can be developed in to an unavoidable breach.

BREACHING OF BANKS FROM INSTABILITY

The canal banks are usually not designed after detailed soil tests of the bank material. Especially, few years after of construction of banks, they loose their shape and become moist. Even banks of lined canals get moist in course of time as no rigid lining is absolutely impervious. Hence, failure of a bank or breach can occur to it automatically by damaging banks.

POOR COMPACTION OF BANKS

Compaction as per specifications of canal banks plays a vital role for durability. Poor compaction causes sliding a subsidence / banks and leakage of water from weak zones ultimately leads to breaches. Consequently, damage to the banks of channels may result in to a huge loss due to a breach.

CAUSES OF BREACHES

DAMAGE OF BANKS DUE TO SUDDEN DRAW-DOWN

Irrigation channels sometimes have to be closed suddenly, for instance when a breach occurs, or when the demand for irrigation water suddenly drops due to heavy rains in the command area. The berms of the channels are saturated by running channel to its authorized supply upon sudden draw down the berms fall down and cause to a breach.

VEGETATION GROWTH

Vegetation, Sarkanda and wiled shrubs growth can be a major cause in developing breaches in the canal banks. Availability of water in a good soil provide opportunity to wiled vegetation to flourish spontaneously due to which detection of any piping action become difficult while inspecting the channels. Therefore the removal of vegetation growth is too obvious to protect the channels from mishaps or breaches.



CONSTRUCTION OF WATER COURSES ALONG THE CHANNELS

Practically, Zimindars have become very greedy. They almost try to construct water courses in the toe of the banks for availing the opportunity of unauthorized irrigation from channel to water course by putting syphons, pipes or cutting of banks. Consequently, weak banks pave way to a breach. According to MIP the watercourses should be constructed by the Zimindars $\frac{1}{2}$ Killa away from the toe of bank to eliminate a little chance of damage of bank or steeling of water.



CLOSING OF BREACHES, METHODS AND STEPS

CLOSING OF BREACHES IN MAIN CANALS AND MAJOR DISTRIBUTARIES

When a breach is occurred in channel, its closing becomes very essential in a diminutive time span to safeguard the public property as well as valuable crops of the area. Following steps are to be taken for closing and strengthening of a breach:

1. Arranging reduction of canal supply from Head of the channel.
2. Closing of channel as per regulation orders, sudden draw down may create problem on the other weak areas of the channels.
3. Upon receiving the reduction at breach site the exercise to collect the spoil / earth on upstream and downstream of the bank is started.
4. A ring bund is marked at the breach site for filling of earth when no water is passing through the breach.



CLOSING OF BREACHES, METHODS AND STEPS

5. Earth filling on the alignment on the ring bund be done with compaction in layers till the top level of the bank is attained.



6. Bamboos / Killa bushing is done in the design berm width along the breach site with 50 ft. up / down stream of the breach.



7. Additional *Pushta* with the bank is also provided at the breach site to cover the Hydraulic gradient.

8. Upon complete satisfaction that the breach site is properly closed and the brush wood is filled up, canal supply is restored in the channel as per regulation orders.

CLOSING OF BREACHES, METHODS AND STEPS

9. Watching of the breach, it's strengthening is carried out around the clock to avoid any complication and be continued till the formation of berm.



CLOSING OF BREACHES IN DISTRIBUTARIES / MINORS HAVING LESS THAN 100 Cs. DISCHARGE

Closing of breaches in the distributaries having less than 100 Cs. discharge or minors is less hectic than those of the main canals and major distributaries. Upon receiving reduction in the channel at breach site it can be closed by putting earth filled Jute / Gunny Bags or temporary closing of breach by placing *Tarpal* / frame of Parachute in equal



length of breach in the channel so that the breach is closed in the running of channel. When the leakage of water in the breach site is stopped, collected earth / spoil is pushed in the breach to maintain and strengthen the breached bank upto required level.

REMEDIAL MEASURES TAKEN TO AVOID BREACHES

To avoid and overcome to any unpleasant situation to be faced in case of any breach / mishap, the following necessary remedial steps are essential to be taken:

1. Proper maintenance of the channels or bringing them into their design section is essential.
2. Formation of berms is required to be done to give design free board to the channel.
3. Dowel on the main canals, branches and major distributaries should be provided.
4. Sarkanda / weeds growth should be removed from the inner and outer section of the channel.
5. Dead and fallen trees should be removed from the channel banks in the canal closure period.
6. Operation of escape channels should be ensured in the rainy weather.
7. Animal trespassing should be eliminated and only Cattle Ghats may be utilized for drinking water / bathing by the animals.
8. Running of public transport should absolutely be prohibited to ply on the service roads of the channels.
9. Unauthorized irrigation by cutting of banks should be dealt in accordance with the provision in the law.
10. Water course crossing or siphoning for crossing the turbine/ Tubewell irrigation from the one side to other side should be eradicated and it should not be permitted at any cost.
11. Water courses along the channels, particularly in the toe of the bank should be dismantled and it should be constructed $\frac{1}{2}$ *Killa* away from the toe of the bank to eliminate chances of theft of water from the channel.
12. Tampering of Head Regulators of the channels or removing the pipe outlets by the Zimindars to receive excessive water should be delt in accordance with the provisions in the Law.
13. Rate / Porcupine holes should not be left unattended.

REMEDIAL MEASURES TAKEN TO AVOID BREACHES

14. Proper watching of the channel around the clock should no way be ignored.
15. Old stumps / roots which can cause piping action should be pulled out in the canal closure and strengthening of the same site should be done according to specification of compaction.
16. The recharge well would be used to take the water diverted from the irrigation channels whenever there was no demand of water from farmers. The farmers would be urged to release water into the recharge well instead of closing the outlets.

BREACHES IN IRRIGATION CHANNELS, CAUSES AND REMEDIAL MEASURES

CONCLUSION

In view of above narrated facts, discussions on the topic, it is transpired that in Irrigation Zone Bahawalpur, 162 No. of breaches occurred due to deliberate cuts made by Zimindars for unauthorized irrigation and then 23 No. breaches have been occurred because of heavy rain in the area. Therefore, it is concluded that in the present scenario maximum breaches in irrigation channels are occurred owing to human interference. The main reason behind this offence is abrupt increase in intensity of irrigation which has become almost double. Hence, the Zimindars are compelled to irrigate their lands by making cuts before closing of channel in Rotational Programme as they don't want to miss any opportunity of watering their crops by what so ever means.

BREACHES IN IRRIGATION CHANNELS, CAUSES AND REMEDIAL MEASURES

RECOMMENDATIONS

Considering the conclusion of the case study, it is recommended that:

1. Escape Channels should be opened in heavy rains to divert enhance capacity of the channels.
2. The recharge well would be used to take the water diverted from the irrigation channels whenever there was no demand of water from farmers. The farmers would be urged to release water into the recharge well instead of closing the outlets.
3. The capacity of irrigation channels should be doubled to match with the intensity.
4. All Minor Distributaries, Minors and Sub Minors are required to be lined especially in brackish zones.
5. Enforcement of law and order should be ensured in letter and spirit to illuminate cuts and breaches in irrigation channels. 1 No. ASI and 3 No. Constables should be deployed with the SDCOs for summoning the culprits under Section 70 of Canal and Drainage Act and frequent watching of channels in the critical reaches.
6. The offenders causing damages to the channels by making deliberate cuts should be trailed under Section 70 of Canal and Drainage Act 1873, amended 2006.
7. FIRs should registered against the culprits under Sections 430 PPC and such type of offences should be declared as non-bailable.
8. *Tawan* be imposed under Section 31, 33 with Rule 32 of Canal and Drainage Act 1873, amended 2006 upon the unauthorized irrigation. All such cases be completed within stipulated period and 20 times special charges must be levied without any discrimination / relaxation at initial stage.
9. Close liaison among Irrigation, Police and Revenue Department is required at particular hierarchy to get the optimum results.