IN THE HON'BLE NATIONAL GREEN TRIBUNAL
PRINCIPAL BENCH, NEW DELHI.
O.A. No. 421/2022

INTHEMATTER OF :-

Ranvir Singh. ..... Applicant

Versus

State of Haryana & Ors ..... Respondent

REPLY FROM HARYANA, IRRIGATION & WATER RESOURCES DEPARTMENT IN COMPLIANCE OF ORDERS DATED 22.05.2024.

As per directions issued from Hon'ble National Green Tribunal Principal Bench, New Delhi submissions from Haryana Irrigation & Water Resources Department is as under for the kind consideration of Hon'ble NGT.

The Notification dated 27.10.2023 has been issued U/s 45 of Haryana Canal & Drainage Act, 1974 (29 of 1974) the Governor of Haryana hereby prohibited the formation of any obstruction of the river Ghaggar by any way within the limits as specified.

Accordingly as per direction issued from the Hon'ble NGT Principal Bench, New Delhi, the estimate for the Demarcation of boundary pillar in the flood plain zone in river Ghaggar has been approved by Superintending Engineer, SYL Water Services Circle, Ambala vide letter No. 5620/162W dated 04.09.2024. Accordingly, Tender will be floated after Model Code of Conduct in the State of Haryana. Hon'ble NGT has also decided that Irrigation & Water Resources Department may provide the analysis of 100 years peak discharge of the river Ghaggar.

In this regard, it is submitted that Irrigation & Water Resources has the data of 54 years (**Copy attached**) which was used to evaluate flood peaks data for 100 years by Gumbel's Method which comes out to be 2933.45 Cumecs or 103594 Cusecs. It is humbly requested to consider the present reply from Haryana Irrigation & Water Resources Department in compliance of order dated 22.05.2024.

Anurag Goyal
Executive Engineer
Water Services Division
Sirsa

2.4 Flood Forecasting:

2.4.1 Frequency Analysis of the recorded flood peaks:

Flood forecasting has been evaluated by Frequency Analysis of the recoded flood peaks. Annual flood peak data for the monsoon period for the following gauge discharge sites on river Ghaggar is available for the period mentioned there in. Gumbel's method has been used to evaluate flood peaks at these sites for 25 year, 50 year and 100 year return periods.

i) Ghaggar at Nadha Sahib Bridge (discharge Site no.4-A) : 54 years ;
ii) Ghaggar at Bhankharpur (Zirak pur) Bridge (discharge site no.4-B): 28 years;
iii) Ghaggar at Railway Bridge at RD 43530 Near Village Ghel as Per CWC Survey Indo Ganga Plains sub-zone 1(e)-50 Yrs
iv) Ghaggar at Cheeka Patiala Road 47 years
v) Ghaggar a Chandpur Aqueduct 22 years

Flood peak data has been supplied by the concerned Executive Engineers. Flood peak data so received has been used for frequency analysis using Gumbel's Method and details are given in table 2.7(a &b) to 2.10(a & b)

Frequency analysis for the recorded flood peaks has been carried out with Gumbel's Method in table no. 2.7(a & b) to 2.10 (a & b). Results have been abstracted in Table no.2.11 including its comparison with the discharge at these locations achieved during running of Mathematical Model Studies (MMS) by CWPRS, Pune.

i) Flood forecasting for Ghaggar at Nadha Sahib Bridge (discharge Site no.4-A (Frequency Analysis of Peak Flow)

Table 2.7(a)

Sr. No.	Date	Year	Discharge (in Cs.)	Discharge in Cumecs (Q)	(Q-Q[illegible])^2
1		1950	34961.6	990.0	40[illegible]1.69
2		1957	13419.6	380.0	166[illegible].29
3		19[illegible]	15679.7	444.0	118[illegible]91.05
4		1960	18893.4	535.0	64[illegible]49.4[illegible]
5		1961	28216.4	799.0	[illegible]19.25
6		19[illegible]2	49016.8	1388.0	35[illegible]04.01
7	27.08.1972	1972	5155.9	146.0	41[illegible]266.73
8	04.08.1974	1974	17798.6	504.0	80701.45
9	04.09.1975	1975	9393.7	266.0	27[illegible]567.53
10	26.07.1976	1976	46650.7	1321.0	28[illegible]
11	03.09.1977	[illegible]77	33760.9	956.0	[illegible]197.1[illegible]
12	09.07.1978	[illegible]78	46650.7	1321.0	2[illegible]003.7[illegible]
13	21.07.1979	[illegible]79	6462.6	183.0	3[illegible]121.81
14	13.07.1980	1980	52689.5	1492.0	4[illegible]503.37
15	03.08.1981	1981	42201.1	1195.0	[illegible]583.89

16	08.08.1982	1982	22212.9	629.0	25[illegible]06.45
17	10.09.1983	1983	20235.3	573.0	4[illegible]59.41
18	19.06.1984	1984	5261.9	149.0	40[illegible]23.25
19	20.08.1985	1985	16562.6	469.0	101312.05
20	27.07.1986	1986	8793.4	249.0	29[illegible]07.25
21	28.08.1987	1987	10135.3	287.0	25[illegible]81.17
22	08.08.1988	1988	76880.1	2177.0	192[illegible]98.77
23	20.08.1989	1989	33054.6	936.0	[illegible]1880.33
24	13.08.1990	1990	34325.9	972.0	3[illegible]826.57
25	10.08.1991	1991	15150.0	429.0	12[illegible]938.45
26	27.09.1992	1992	77833.6	2204.0	200[illegible]329.45
27	14.08.1995	1995	61425.27	1739.4	904949.45
28	08.09.1996	1996	53289.85	1509.0	51[illegible]724.33
29	03.08.1997	1997	18175.82	514.7	[illegible]746.78
30	10.07.1998	1998	24614.6	697.0	[illegible]294.26
31	21.07.1999	1999	28913.59	818.7	[illegible]940.09
32	17.07.2000	2000	83684.7	2369.7	2501473.04
33	14.08.2001	2001	61730.7	1748.0	921479.26
34	14/08/2002	2002	17862.0	505.8	[illegible]9684.80
35	1/7/2003	2003	10818.0	306.3	23[illegible]081.75
36	3/8/2004	2004	65676.6	1859.8	11[illegible]3481.85
37	5/7/2005	2005	10438.0	295.6	2[illegible]2565.15
38	9/7/2006	2006	7779.0	220.3	3[illegible]2400.77
39	13/08/2007	2007	49088.0	1390.0	3[illegible]2327.02
40	20/09/2008	2008	36786.0	1041.7	[illegible]4304.10
41	9/9/2009	2009	46532.0	1317.6	[illegible]80431.95
42	8/9/2010	2010	33369.0	944.9	[illegible]24593.76
43	8/7/2011	2011	7660.0	216.9	[illegible]26238.78
44	19/08/2012	2012	4720.2	133.7	[illegible]28262.68
45	24/07/2013	2013	22514.0	637.5	[illegible]22666.84
46	15/08/2014	2014	55058.5	1559.1	[illegible]94444.39
47	1/8/2015	2015	3937.0	111.5	[illegible]57783.07
48	2/7/2016	2016	3045.1	86.2	[illegible]92595.67
49	19/8/2017	2017	1977.4	56.0	[illegible]35952.04
50	13/08/2018	2018	12751.0	361.1	[illegible]82339.44
51	18/08/2019	2019	14861.0	420.8	[illegible]34882.65
52	13/08/2020	2020	3604.0	102.1	[illegible]70691.92
53	2/8/2021	2021	5391.0	152.7	[illegible]03763.69
54	25/09/2022	2022	15762.0	446.3	[illegible]16793.26
Average Peak discharge(Qav)=				788.08	
Σ(Q-Qav)^2=					20235609.99

S= ((Σ(Q-Qav))/(n-1))0^0.5=	617.903
Cv=s/Qav=	0.78406
n=54	
For n=54 Signbar=	1.16662
and	
Ynbar=	0.54962

Table 2.7(b)

Return Period in Years T	y=-ln.ln(T/(T-1))=	Qf=Q*(1+Cv*((y-Ynbar)/Signbar)) (Cumecs)	Qf (Cusecs)
100	4.60014923	2933.45	103594
50	3.90193866	2563.64	90534
25	3.19853426	2191.02	77377
7.2	1.90024664	1503.44	53094

Abstract of peak discharges at various return periods Table -8

Particulars	Peak discharge at following return period (years)	Gauge discharge sites on Ghaggar			
		Nadha Sahib Bridge, RD (-) 2015 m (54 years flood peak data)	Bhankharpur (Zirakpur) Bridge, RD 10391m (28 years flood peak data)	Cheeka Patiala Rd, RD 125500m (47years flood peak data)	Chandpur aqueduct, RD 240290m (22 years flood peak data)
(1)	(2)	(3)	(4)	(5)	(6)
Discharges at Return Periods in (Cumecs)	100	2933.45	5558.80	2774.44	795.61
	50	2563.64	4781.62	2503.96	708.11
	25	2191.08	3998.66	2231.48	619.96
Return Period Corresponding to Discharge in MMS case 2		Approximately 7.2 years for 1503.79 cumecs	Approximately 1.54 years for 385.63 cumecs	Approximately 1.0 year for 124.07 cumecs	Approximately 1.25 years for 156.40 cumecs
Return Period Corresponding to discharge at sites in 2012 against which model has been validated		-	Approximately 1.4 years for 189.16 cumecs	-	Approximately 1.14 years for 123.18 cumecs

Comments: From the above table, it is observed that discharges given by the MMS at four key discharge sites on river Ghaggar are on very lower side. As per IS 12094-2000, the flood peak to be considered for design of embankments for protection agricultural land should be of 25 years return period and for protection of towns the flood should be of 100 years return period. However, at least 1.0 meter free board should be there for 100 year return period flood even for agricultural land. Thus both 25 years flood and 100 year flood are required to be taken in to consideration for designing of river embankments. Therefore, the flood discharges predicted by MMS are of very low return periods as discussed below.

Nadha Sahib Bridge, (RD (-)2015 m): Here the discharge taken for MMS for case-2, correspond to 7.2 years return period or less than 8 years return period. Such a low flood discharge cannot be used for construction of embankments or widening of the river.

Bhankharpur (Zirakpur) Rd. Bridge, RD 10391 m: Here the discharge given by MMS for case-2, correspond to 1.54 years return period or less than 2 years return period. Such a low flood discharge cannot be used for construction of embankments or widening of the river.

Cheeka-Patiala Road (RD 125500 m): Here the discharge given by MMS for case- 2, correspond to 1.0001 years return period or one year return period only. This shows that the discharge given by MMS at this location of the Ghaggar River would almost come every year. Such a low flood discharge cannot be used for construction of embankments or widening of the river.

Chandpur Aqueduct (RD 240290 m): Here, the discharge given by MMS for case-2, correspond to 1.25 years return period or less than 2 years return period. Such a low flood discharge cannot be used for construction of embankments or widening of the river.

PRS reply: The discharge data was submitted by the state governments after mutual consent. The peak discharge of the hydrographs and fixed discharge for the tributaries were same as the peak discharges given by them for the study. They wanted this peak flood to be passed through without causing any trouble to the villagers.

The flood values mentioned above in the comment are taken from the Table IV-3 which is a result of unsteady flow condition at an instant/ moment at which the flood levels in the river channel are maximum and the velocities and discharge are lowest. The various flow parameters like water surface elevation, average velocity of flow and discharge are the functions of time and are also interdependent. The target of the studies were to restrict the water surface elevation to less than or equal to 2 m above the LOB or ROB so that the engineers are able to handle the floods by provision of embankments wherever necessary. The instantaneous discharge in the river channel keep on varying with respect to time and the same cannot be used for comparing it with return period flood as has done in above comment.

It is again requested to kindly understand the properties of unsteady flows and try understand the results.

Table IV-2: Results for existing condition (Case 2) (Reaches relevant to Haryana)

River Station		Deepest Bed Level	Maximum Water Surface Elevation (MWS)	Correspo-nding Discharge Total	Velocity in Channel	Flow Area	Top Width	LOB Elev	ROB Elev	(LOB-MWS)	(ROB-MWS)	Maximu Discharg eTotal	Corresp-onding Water Surface Elevation
		(RL, m)	(RL, m)	(m^3/s)	(m/s)	(m^2)	(m)	(m)	(m)	(m)	(m)	(m^3/s)	(m)
1		2	3	4	5	6	7	8	9	10	11	12	13
34	RD -2027	343.18	347.67	1504.15	2.74	549.68	189.79	350.35	347.68	2.68	0.01	1504.15	347.67
33	RD -2015	343.18	347.77	1503.79	2.36	690.39	345.09	346.44	346.95	-1.33	-0.82	1503.79	347.77
32.6	Nada Sahib Road Bridge, Upstream												
32.1	RD -2006	342	347.54	1498.92	2.12	706.37	163.93	350.64	353.57	3.1	6.03	1503.79	347.54
32	RD -2005	342	347.54	1498.92	2.12	706.3	163.93	350.62	353.57	3.08	6.03	1503.76	347.54
31.8	Nada Sahib Road Bridge, Downstream												
31.6	RD -1990	340.61	347.65	1498.92	1.43	1069.8	228.86	346.55	349.56	-1.1	1.91	1503.76	347.65
31	RD -1980	340.61	347.66	1498.56	1.35	1131.2	249.38	346.55	349.53	-1.11	1.87	1502.74	347.66
30	RD -1500	335.95	338.73	1493.56	9.74	161	127.65	338.05	340.56	-0.68	1.83	1493.56	338.73
29	RD -1000	328.83	332.47	1491.05	4.59	327.43	229.49	332.36	334.12	-0.11	1.65	1491.05	332.47
28	RD -500	327.62	331.19	1487.61	2.85	521.68	271.77	332.75	334.22	1.56	3.03	1488.05	331.19
27	RD -20	326.17	330.87	1484.69	1.41	1081.26	401.79	330.2	332.84	-0.67	1.97	1484.69	330.87
26.4	RD -12	326.17	330.86	1484.54	1.42	1044.85	377.76	329.91	329.88	-0.95	-0.98	1484.65	330.86
26.2	Panchkula Sector 21 Road Bridge												
26	RD -3	323.55	330.92	1484.65	0.76	1949.47	333.14	330.96	332.8	0.04	1.88	1484.65	330.92
25	RD 20	328.55	330.37	1483.69	4.22	362.2	335.29	331.46	329.2	1.09	-1.17	1484.56	330.37
24	RD 500	323.06	328.24	1471.74	1.44	1112.03	500	326.92	326.81	-1.32	-1.43	1473.11	328.24
23	RD 1000	319.63	322.26	1469.63	7.73	190.21	107.5	325.34	323.19	3.08	0.92	1469.91	322.26
22	RD 1500	316.11	319.45	1466.64	2.18	686.19	401.68	318.18	320.06	-1.27	0.61	1466.73	319.45
21	RD 2000	313.36	316.24	1465.26	5.26	278.82	149.98	319.52	317.54	3.28	1.3	1465.26	316.24