SURVEY OF INDIA PROJECT SURVEY WING GEODETIC & RESEARCH BRANCH



REPORT ON
CRUSTAL MOVEMENT STUDIES
FOR
JAMRANI DAM PROJECT IN UTTARAKHAND
SEASON 2006-07

SURVEY OF INDIA PROJECT SURVEY WING, G&RB

REPORT OF ANALYSIS OF GEODETIC OBSERVATIONS FOR CRUSTAL MOVEMENT STUDIES FOR JAMRANI DAM IN NAINITAL, UTTARAKHAND DURING 2006-07.

INTRODUCTION: Jamrani Dam is proposed to construct 145 m high rock fill Dam on Gola River in Jamrani area of Nanital District, Uttarakhand. Krol Thrust is crossing the reservoir area of the proposed Dam. To study the crustal movement behaviour due to Krol Thrust in the vicinity of and around the Dam area, No. 14 Party (G&RB) had taken up the field observations to conduct the study during season 1981-82 on the basis of the indent sent by the Superintending Engineer of Jamrani Dam project and 1st, 2nd, 3rd and 4th epoch observations were taken up during the year 1981-82, 1986-87, 1989-90 and 1996 (Summer) respectively. At present a set of 5th epoch observation has been completed by Project Survey Wing, G&RB during season 2006-07.

LOCATION: The Jamrani Dam project falls in sheet No. 53 O/11 in district Nanital, Uttarakhand.

<u>OBSERVATIONS</u>: All the Geodetic observations for planimetric and height control for scheme were taken up during 2006-07 as detailed below:

- (a) <u>Planimetric Control</u>: All the crustal movement stations were connected in main scheme of observation.
- (b) <u>Vertical Control</u>: Precision levelling was carried out in Fore and Back directions by starting the work from Type 'B' at Arna and closing on Type 'B' at Barajala established during season 1981-82. All the crustal movement stations were also connected in the above closed circuit of levelling.

DATA PROCESSING AND ADJUSTMENT:

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The Bhimtal H.S. and Raunshil New-1 H.S. were taken as fixed station in 1st, 2nd, 3rd and 4th epoch and for 5th epoch Biloti H.S. and Raunshil New-1 H.S. were taken fixed station for adjustment as Bhimtal H.S. was found destroyed.

The comparative statement of co-ordinates of all epochs are tabulated in - Table I & II.

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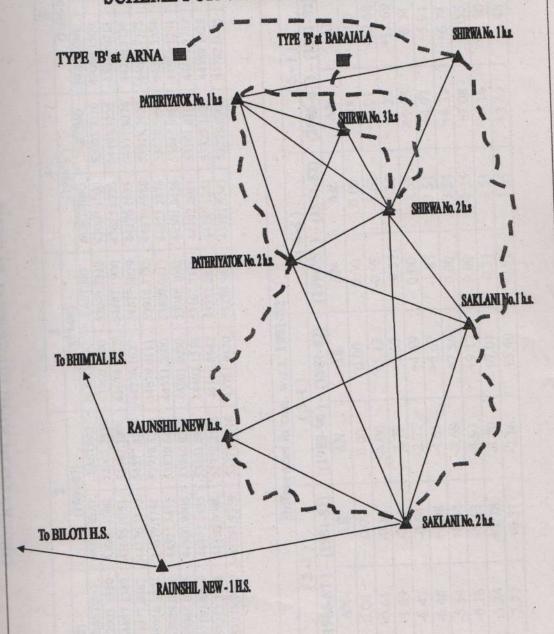
ANALYSIS OF RESULTS:

- (a) <u>Horizontal Movement</u>: By comparing and analyzing the results of all seasons w.r.t. 1981-82 it was noticed that the lateral movement is vibratory and it does not follow any particular direction. The movement is 1cm per year approximately as concluded from the study carried out in the area.
- (b) <u>Vertical Movement</u>: The vertical movement is minor and is well within the permissible limits. This shows no sinking or upheaval of the terrain during the period of study.

INTERPRETATION OF RESULTS: Precautions may be taken by the project authorities during the construction of Dam as found deemed fit from the engineering point of view.

JAMRANI DAM PROJECT TRIANGULATION SCHEME SHIRWA No. 1 kg. SHIRWA No. 3 hs. SHIRWA No. 2 hs. PATHRIYATOK No. 2 hs. SAKLANI No.1 hs. TO BHIMTAL H.S. RAUNSHIL NEW h.s. SAKLANI No. 2 hs. To BILOTI H.S. RAUNSHIL NEW-1 H.S.

SCHEME FOR VERTICAL CONTROL



COMPARATIVE STATEMENT OF CO-ORDINATES OF JAMRANI DAM PROJECT OBSERVED DURING DIFFERENT EPOCHS

Name of Station 1 (1980-87) (1980-90) (1981-82) (1980-90) (1981-82) (1980-90) (1981-82) (1980-90) (1981-82) (1980-90) (1981-82) (1980-90) (1981-82) (1980-90) (1981-82) (1980-90) (1981-82) (1980-90) (1981-82) (1980-90) (1981-82) (1980-90) (1981-82) (1980-90) (1981-82) (1980-90) (1981-82) (1980-90) (1981-82) (1980-90) (1981-82) (1980-90) (1981-82) (1980-90) (1981-82) (1980-90) (1980-90) (1981-82) (1980-90) (1980-
(1981 NORTHING 43060.1500 43635.0312 44276.1904 44679.6388 44521.3061 44501.0459 44402.2051 44189.1312 43781.9636
-82) EASTING 52003.7310 54487.1387 54577.8462 53918.3274 53828.6350 53946.0305 53161.6299 53322.2178
1986-87) NORTHING EA 43060.1500 520 43065.1535 545 44276.1535 545 44679.5741 538 44679.5741 538 44679.12415 538 44402.1435 53 44489.0788 53 44189.0788 53
1 (1981-82) (1981-82) (1986-87) (1989-90) (1991-90) (1981-82) (1981-82) (1986-87) (1989-90) (1981-82) (1981-82) (1986-87) (1989-90) (1981-82) (198
(1985) NORTHING 43060.1500 43634.9912 44276.1627 44679.6111 44679.6111 44521.2600 44501.0090 44402.1558 44189.0942 43781.9420
3 (1989-90) (1989-90) (1900 52003.7310 (1900 52003.7310 (1910 54487.1900 (1911 54577.9029 (1911 53918.3733 (1911 53828.6917 (1909 53946.1061 (1942 53322.2879 (1942 53322.2879 (1942 53278.9637
(1996'S') NORTHING EASTING 43060.1500 52003.7310 43635.0220 54487.1225 44679.6388 53918.2927 44521.2876 53828.599 44501.0459 53945.998 44402.2051 53161.616 44402.2051 53222.182 44189.1281 53322.182 43781.9543 53278.890
1 1 1 1981-82 1986-87 1989-90 19
(2006-07) (2006-
(2006-07) (2006-

43781.9636

Name of Station RAUNSHIL NEW 1 H.S. SAKLANI No. 2 h.s. SAKLANI No. 1 h.s. SHIRWA No. 3 h.s. SHIRWA No. 3 h.s. SHIRWA No. 2 h.s. PATHRIYATOK No. 1 h.s. PATHRIYATOK No. 2 h.s.	RAUNSHIL NEW h.s. 43781.9636
(2-1) (1986-87) – (1981 AN A 0.00 0. -0.61 -0 -3.69 -2 -5.47 +1 -5.54 +1 -5.24 +1 -2.77 +	43781.9636 53278.9097 43781.750
(1989-90) – (1989-	
(4-1) 1996'S') - (19) AN 0.00 -0.92 +0.31 -1.85 0.00 0.00 -0.93	
(5-1) 981-82) (2006-07) - (1981-82) AE AN AE AE AN 0.00 0.00 0.00 0.00 -1.62 +4.01 +12.68 -1.88 +8.32 +6.74 -3.51 +4.93 +5.94 -3.51 +8.32 +6.74 -3.24 +8.32 +6.74 -3.51 +6.74 +7.55 -1.35 +7.08 +7.55 -1.89 +3.69 +6.48	
1981-82) AE 0.00 +12.68 +12.69 +6.74 +5.94 +7.55 +3.50 +6.48	

RAUNSHIL NEW h.s.

-2.77

		Differen	nces in cms.	Differences in cms. consecutive years	Caro		10	-
	(2-1)		(3	(3-2)	(4	-3)	(5-	(5-4)
NI of Station	(1081-87)	(1081_87)	(1989-90) - (1986-87)	- (1986-87)	(1996'S')	- (1989-90)	(2006-07)-	-(1996'S')
Name of Station	(170-00/)	(TOTOL)	NN	AF	AN	ΔE	AN AE	ΔE
	AN	ΔE	DIN	TAL.	CALT		200	000
DATINGUII NEW I HS	000	000	0 00	0.00	0.00	0.00	0.00	0.00
KAUNSTIL NEW 111.5.	0.00	0.00	0.00		200	27.7	+1 03	+1430
SAKLANI No. 2 h.s.	-0.61	-0.81	-3.39	+5.94	+3.08	-0.73	14.22	. 100
SAKI ANI NO 1 hs	-3 69	-2.15	+0.92	+7.82	+3.08	-7.55	+8.01	+14.5/
CITINITA NO. 1 ho	647	054	+3 70	+5.13	+2.77	-8.10	+9.85	+10.25
SITHAWA INC. I H.S.	77.77	0.0.			75.01	018	±6 78	+945
SHIRWA No. 3 h.s.	-6.46	+1.08	+1.85	+4.59	+2./0	-9.10	10.70	10.00
SHIRWA No 2 hs	-5 54	+0.54	+1.85	+7.02	+3.69	-10.80	+8.32	T9.90
DATE NO. 2 III	616	+5 13	+1 23	+4 04	+4.93	-10.52	+7.08	+8.90
PAIHKIYATOK No. 1 n.s.	-0.10	LJ.LJ	1.40			10 60	LV 7T	±7 01
PATHRIYATOK No. 2 h.s.	-5.24	+3.78	+1.54	+3.23	+3.39	-10.52	+0.4/	10.7
DATMINIT NEW L	777	+621	+0 61	-0.81	+1.23	-7.29	+4.62	+8.3/

	Diffe	rences in cm	s. of year 20	Differences in cms. of year 2006-07 with previous year	previous yes	7	n	
	(5-1)		(5	5-2)	(5	5-3)	(3-4)	4)
Station	(2006-07) - (1981-87)	(1981_82)	(2006-07) - (1986-87)	- (1986-87)	(2006-07)	-(1989-90)	(2006-07) - (1996'S'	-(1996'S')
Station	(2000-0)	AE.	AN	ΔE	AN	ΔE	AN	ΔE
THE RESIDENCE OF THE PROPERTY OF THE PARTY O	CT.				200	000	000	000
RAUNSHIL NEW 1 H.S.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SAC SIMILATORS	±4 01	+17 68	+4 62	+13.49	+8.01	+7.55	+4.93	+14.50
SANLANI NO. 2 m.s.	10.00	+12.60	+12 01	+14 84	+11.09	+7.02	+8.01	+14.57
SANLAINI NO. 1 II.S.	10.34	14.07			1000	1016	70 04	+1005
SHIRWA No. 1 h.s.	+9.85	+6.74	+16.32	+7.28	+12.62	+2.13	TY.03	110.25
CHIRWA No 3 hs	+4 93	+5.94	+11.39	+4.86	+9.54	+0.27	+6./8	+9.43
CHIPWY NI- 2 L	10.33	VL 97	+13 86	+6 20	+12.01	-0.82	+8.32	+9.98
SHIKWA NO. 2 n.s	₹0.34	10.17	. 10.00		1001	1 60	1700	100 8+
PATHRIYATOK No. 1 h.s.	+7.08	+7.55	+13.24	+2.42	+12.01	-1.62	+/.00	+0.90
DATURIVATOR No 24 s	41.74	+3 50	+11 40	-0.28	+9.86	-3.51	+6.47	+7.01
FAILM I ATOM INC. 2 H.S.	10.10	. 0.00		1000	100	+1 08	+460	+8 37
RAUNSHIL NEW h.s.	+3.69	+6.48	+6.46	+0.27	₹3.03	11.00	11.04	. 0.0.

COMPARATIVE STATEMENT OF HEIGHTS OF BENCH-MARKS OF JAMRANI DAM PROJECT OBSERVED DURING DIFFERENT EPOCHS

		Н	Heights in metres	es		Differe	Difference of heights in centimeters	its in centin	neter
No. No.	1	3	3	4	5	(2-1)	(3-2)	(4-3)	(5-4)
TABLE 10 SUBNI	1	*					Contract of the Contract of th		
	1981-82	1986-87	1989-90	1996(S)	2006-07				
	2000	200 1000	010 1050	010 1739	818 4707	to 59	+1.24	-2.12	+0
1 SAKLANI No. 2 h.s.	818.4767	818.4826	818.4900	010,4/00	010,7/2	.0.00	1 2 1	300	5
CATT AND I LO	92/ /010	834 4077	834 4203	834.3994	834.4064	+0.53	+1.31	-2.03	-
2. SAKLANI NO. 1 ILS.	034.4017	W. 101.TCO	000000000000000000000000000000000000000	200 / 150	700 2700	±0.18	+0 87	-0 42	5
3 SHIRWA No. 1 h.s.	798.6396	798.6414	798.6501	198.0439	190.0000	10.10	10.01	1 50	
Cumuly No 3 ho	8110 189	683 0387	683.0335	683.0185	683.0173	-0.31	+0.48	-1.00	2
4. SHIRWA NO. 3 II.S.	002.0020	000.000	2010510	701 7431	331C 10E	5000	+0 58	-1.15	±
5. SHIRWA No. 2 h.s	701.2490	701.2488	/01.2540	/01.2451	701.2700	0.02	0000	0.70	7000
6 PATHRIVATOK No 1 hs	714.5891	714.5831	714.5805	714.5727	/14.3631	-0.00	-0.20	0.70	
o. Intillution of the	720 2380	730 3364	730 3262	730.3215	730.3197	-0.16	-0.02	-0.47	9
/ PAIHKIAION NO. 2 ILS.	130.3200	100.000		000000	055 2210	022	40.60	-1 83	+
8 RAIJNSHIL NEW h.s.	855.2348	855.2315	855.2375	855.2193	822.2219	-0.33	10.00	-1.02	
-									

SI.			Н	Heights in metres	es		Differe	ice of	neign
Vo.	Name of Station	1	2	3	4	5	(5	(5-1)	-1) $(5-2)$
	TABLE OF SERVICE	1001 00	1086_87	1989-90	1996(S)	2006-07			
		1701-02	100001	2000	010 1000	616 4707	5	24	
-	SAKLANI No. 2 h.s.	818.4767	818.4826	818.4950	818.4738	818.4/92	t	0.42	+0.0-
1.	Of the Party of th	221 1010	07/ 1077	2007 720	834 3004	834 4064	±	0.45	
2.	SAKLANI No. 1 h.s.	834.4019	834.40/2	834.4203	004.0774	007.7007		200	1
2	SHIRWA No 1 hs	798.6396	798.6414	798.6501	798.6459	/98.6388		0.00	-
	CTIIDWA No 3 ho	8150 589	683 0287	683.0335	683.0185	683.0173		1.45	
4.	SHIKWA NO. 3 ILS.	0100.000	000.000		2010101	227C 10C		004	
7	SHIRWA No. 2 h.s	701.2490	701.2488	701.2546	/01.2451	/01.2400		0.44	-
1	BATHBIVATOK No 1 hs	714 5891	714 5831	714.5805	714.5727	714.5631		-2.60	
o.	WITHAT UT ON TAO. 1 TO.	10000	אארר חרד	720 2060	730 3315	730 3197		-0.83	
7.	PATHRIYATOK No. 2 h.s.	730.3280	730.3264	730.3262	/30.3213	170.001	T	10.00	-
0	BAINSHII NEW h s	855.2348	855.2315	855.2375	855.2193	855.2219		-1.29	
0.	CANCEL CAMPAGE A SALES AND ASSESSED.	The second secon					Ì		

CHART SHOWING THE HORIZONTAL MOVEMENT IN VARIOUS EPOCHS
Scale of movement: - 1mm = 4mm

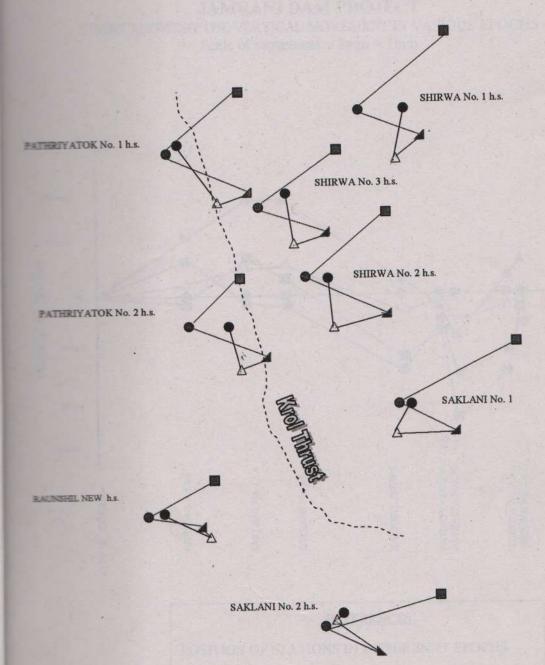
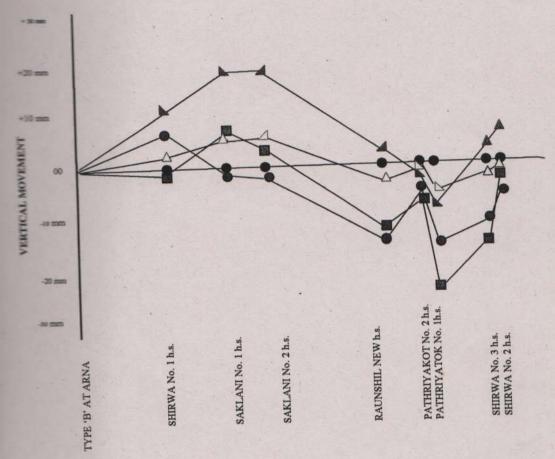


CHART SHOWING THE VERTICAL MOVEMENT IN VARIOUS EPOCHS
Scale of movement: - 2mm = 1mm



			REF	ERENC	<u>ES</u>	
POS	SITION C	F STAT	TIONS I	N DIFFE	ERENNT	EPOCI
1 0	EASON	1081-82				•
2 5	EASON	1986-87				Δ
3. S	EASON	1989-90)			A
4. S	EASON	1996 (S))			-
5. S	EASON	2006-07	7			

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OBSERVATIONS: All the Geodetic observations for planimetric and height control for scheme were taken up during 2006-07 as detailed below:

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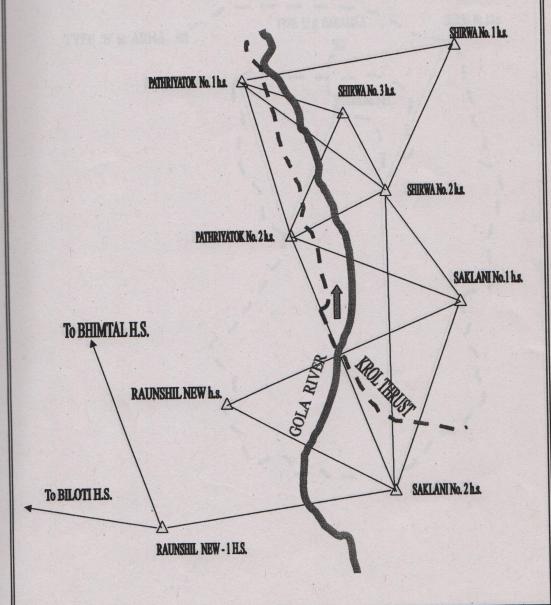
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ANALYSIS OF RESULTS:

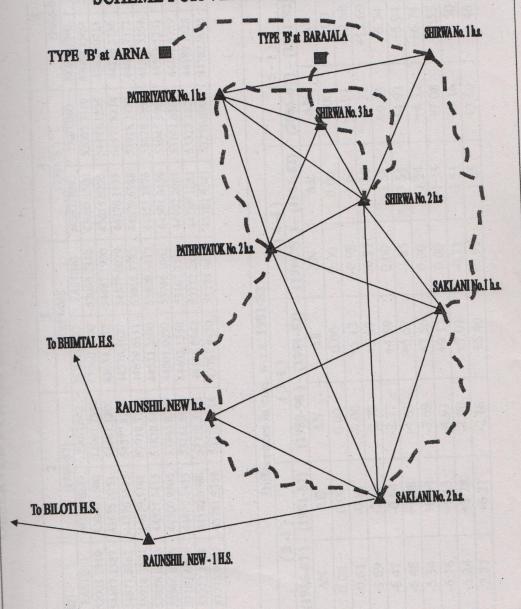
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INTERPRETATION OF RESULTS: Precautions may be taken by the project authorities during the construction of Dam as found deemed fit from the engineering point of view.

JAMRANI DAM PROJECT TRIANGULATION SCHEME



SCHEME FOR VERTICAL CONTROL



COMPARATIVE STATEMENT OF CO-ORDINATES OF JAMRANI DAM PROJECT OBSERVED DURING DIFFERENT EPOCHS

Name of Station RAUNSHIL NEW 1 H.S. SAKLANI No. 2 h.s. SAKLANI No. 1 h.s. SHIRWA No. 1 h.s. SHIRWA No. 3 h.s. SHIRWA No. 2 h.s SHIRWA No. 2 h.s PATHRIYATOK No. 1	Name of Station N N N N N N N N N N N N N N N N N N N
Name of Station RAUNSHIL NEW 1 H.S. RAKLANI No. 2 h.s. SAKLANI No. 1 h.s. SHIRWA No. 1 h.s. SHIRWA No. 3 h.s. SHIRWA No. 2 h.s. PATHRIYATOK No. 2 h.s. PATHRIYATOK No. 2 h.s.	1 (1981- NORTHING 43060.1500 43635.0312 44276.1904 44679.6388 44521.3061 44521.3061 44501.0459 44402.2051 44189.1312 43781.9636
(1986-87) AN 0.00 -0.61 -3.69 -6.47 -6.46 -5.54 -5.54	ASTING 03.7310 03.7310 487.1387 577.8462 918.3274 828.6350 828.6350 1946.0305 1161.6299 3322.2178
Differ (2-1) (1986-87) - (1981-82) (1986-87) - (1981-82) (1986-87) - (1981-82) (1986-87) - (1981-82) (1986-87) - (1981-82) (19	2 (1986-87) (1986-87) (1986-87) (1986-1500
Differences in cms. w.r.t. 1981-82 (3-1) -82) (1989-90) – (1981-82) (-82) AN AE E AN O +5.13 81 -4.00 +5.13 81 -2.77 +4.59 .54 -2.77 +4.59 .54 -3.69 +7.56 .54 -3.69 +9.17 5.13 -4.93 +9.17 5.13 -4.93 +7.01 3.78 -3.70 +5.40	EASTING DEATH OF THE PROPERTY
1.000 (1.981-82) 1.000 (1.981	(1989-90) NORTHING E.4 43060.1500 520 43634.9912 54 44276.1627 54 44679.6111 53 44521.2600 53 44501.0090 53 44402.1558 53 44189.0942 53 43781.9420 53
1996'S AN 0.00 0.00 -0.92 +0.31 -1.8: 0.00 0.00	1.7310 4 1.7310 4 1.79029 4 8.3733 4 8.6917 6.1061 1.7216 1.7216 1.7216 1.7216
(4-1) AE 0.00 -1.62 -1.88 -3.51 -3.51 -3.51 -3.51 -3.51 -3.51 -1.35 1 -3.51	4 NORTHING E 43060.1500 52 43635.0220 54 44276.1935 54 44679.6388 53 44521.2876 53 44501.0459 53 44402.2051 53 44189.1281 55 43781.9543 5
	ASTING N 003.7310 4 487.1225 4 577.8274 9 918.2923 828.5999 828.5998 1 3945.9981 3161.6164 3 3161.6164 3322.1827 33278.8908
(5-1) (2006-07) – (1981-82) AN AE 0.00 0.00 +4.01 +12.68 +4.01 +12.69 +8.32 +6.74 +9.85 +6.74 +4.93 +5.94 +4.93 +5.94 +4.93 +7.55 +7.08 +7.55 +7.08 +3.50 +6.16 +3.50 +6.48	(2006-07) NORTHING EASTING 43060.1500 52003.7310 43635.0713 54487.2655 44679.7373 53918.3948 44679.7373 53918.3948 44501.1291 53946.0979 44402.2759 53161.7054 44189.1928 53322.2523 44189.1928 53278.974
	07) EASTING \$2003.7310 54487.2655 54577.9731 53918.3948 53828.6944 53828.6944 53161.7054 53161.7054 53278.9745

PATHRIYATOK No. 2 h.s.

-5.24 -2.77

> +3.78 +6.21

> > -2.16

+5.40

RAUNSHIL NEW h.s.

		Differe	nces in cms.	Differences in cms. consecutive years	ears			
	(7)		(3	(3-2)	•	4-3)	(5-4)	4)
200	(1000 07)	(1001 07)	(1989-90) - (1986-87)	(1986-87)	(1996'S')	- (1989-90)	(2006-07) - (1996'S')	-(1996'S')
Name of Station	(1700-07) - (1701-02)	AE (1)OI	AN	A.F.	N	ΔE	N	ΔE
	N	ΔE	AN	AE	ATA			201
RAIJUSHII NEW I H.S.	000	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SAVI ANI No 3 hs	0.61	-0.81	-3 39	+5.94	+3.08	-6.75	+4.93	+14.30
CART ANIAL 1 L	260	215	+0 97	+7 82	+3.08	-7.55	+8.01	+14.57
SANLAINI INO. 1 II.S.	-5.00	2.30	000	±5 12	77 C+	-8 10	+9.85	+10.25
SHIKWA No. 1 h.s.	-0.4/	-0.04	10.10	. 0.10		0 10	07.71	TO 72
SHIRWA No. 3 h.s.	-6.46	+1.08	+1.85	+4.59	+2.76	-9.18	to./6	19.45
CHIDWA No 7 hs	-5.54	+0 54	+1.85	+7.02	+3.69	-10.80	+8.32	+9.98
SIENWA INC. Z II.S	616	+5 12	+1 23	+4 04	+4.93	-10.52	+7.08	+8.90
PAIHKIYAIUN NO. 1 II.S.	-0.10	1 J. LJ	. 1.40			10.50	LV 71	±7 01
PATHRIYATOK No. 2 h.s.	-5.24	+3.78	+1.54	+3.23	+3.39	-10.52	+0.4/	10.7⊤
BATINGUII NEW h s	-277	+621	+0.61	-0.81	+1.23	-7.29	+4.62	+8.3/
INTOINDILLE INDIVIDUO.	1	0:11						

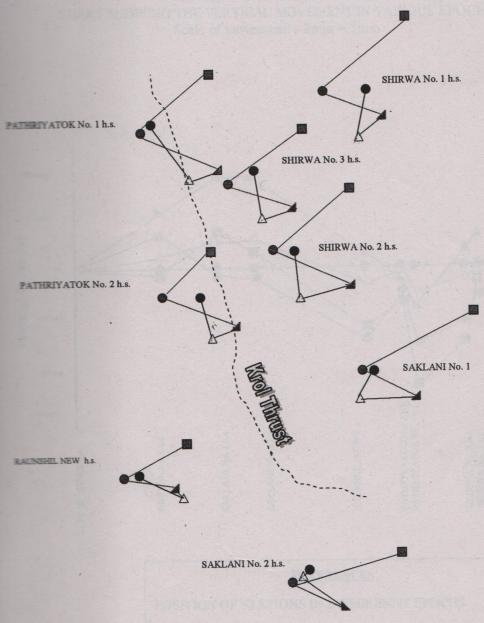
	Diffe	rences in cm	s. of year 20	Differences in cms. of year 2006-07 with previous year	previous year	ar .	(5-	
	(5-1)	<u>:</u>	(5	(5-2)	(3	(0-0)	10	1
O to the	(70,000)	2006-07) - (1981-82)	(2006-07)	(2006-07) - (1986-87)	(2006-07)-(1	-(1989-90)	(2006-07)	-(1996'S')
Station	AN	AF	N	ΔE	NO	ΔE	N	ΔE
このなるない ない とればない 大き	TITO						200	000
RAINSHIL NEW 1 H.S.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SAVI ANI No 2 hs	+4 01	+12.68	+4.62	+13.49	+8.01	+7.55	+4.93	+14.30
SAINLAINI NO. 2 m.s.		110 60	+1201	+1484	+11 09	+7.02	+8.01	+14.57
SAKLANI NO. 1 II.S.	70.34	114.00			1000	10 15	58 O+	+10 25
SHIRWA No. 1 h.s.	+9.85	+6.74	+16.32	+1.28	+12.02	12.13	17.00	10.45
SHIRWA No 3 hs	+4 93	+5.94	+11.39	+4.86	+9.54	+0.27	+0.78	ТУ.43
CITIBUIA NIO 2 ho	- CE 8+	+6 74	+13 86	+6.20	+12.01	-0.82	+8.32	+9.98
SILLAWA INO. 2 ILS	10.04				1001	163	+7.08	+8 90
PATHRIYATOK No. 1 h.s.	+7.08	+7.55	+13.24	+2.42	+12.01	-1.02	17.00	1701
DATIMINATON No 246	71.74	+3 50	+11 40	-0.28	+9.86	-3.51	+6.47	+/.01
PAIRMIAION NO. 2 II.S.	0.10	10.00			100	±1 00	+463	+8 37
RAUNSHIL NEW h.s.	+3.69	+6.48	+6.46	+0.27	+3.83	₹1.00	17.04	.0.07

COMPARATIVE STATEMENT OF HEIGHTS OF BENCH-MARKS OF JAMRANI DAM PROJECT OBSERVED DURING DIFFERENT EPOCHS

21			H	Heights in metres	Se		Dillere	uce of riergi	Difference of neights in continuous	TICLETS
No.	Name of Station	-	2	ه د	4	S	(2-1)	(3-2)	(4-3)	(5-4)
	TATILE OF STREAM	1001	1007 07	1000 00	1006/8)	2006-07				
		1981-82	1986-87	1989-90	(3)0661	10-000			2 12	10.57
	SAVI ANTINA 3 ha	218 4767	818 4876	818.4950	818.4738	818.4792	+0.59	+1.24	-2.12	+C.0+
:	SAKLAINI NO. 2 ILS.	010.4.07	OTO. TOTO	0.0	1000	1701 100	50 53	+1 31	-2 09	±0.70
3	SAKLANI No. 1 h.s.	834.4019	834.4072	834.4203	834.3994	004.4004	10.00	1	200	071
, !	CITTUIN No 1 ho	708 6306	798 6414	798.6501	798.6459	798.6388	+0.18	+0.8/	-0.42	-0./1
3.	DITTIN WAY INO. I II.S.	100.000	700000	602 0225	693 0195	683 0173	-031	+0.48	-1.50	-0.12
4	SHIRWA No. 3 h.s.	083.0318	003.0201	000.0000	000.0100	201010		0.50	1 15	+0 35
,	SHIRWA No 2 hs	701.2490	701.2488	701.2546	701.2431	/01.2400	-0.02	10.00	1.10	000
1	DATE TOWN IN 1 ha	717 5801	714 5831	714 5805	714.5727	714.5631	-0.60	-0.26	-0.78	-0.90
6.	PAIRMIAION NO. 1 ILS.	1100.71	11.0001	20000	700 0015	720 2107	71.0	500	-0.47	-0.18
7	PATHRIYATOK No. 2 h.s.	730.3280	730.3264	/30.3262	/30.3213	150.5171	0.10	10.00	100	75. UT
×	RAIJNSHII NEW h.s.	855.2348	855.2315	855.2375	855.2193	855.2219	-0.33	+0.00	-1.02	10.20
10										

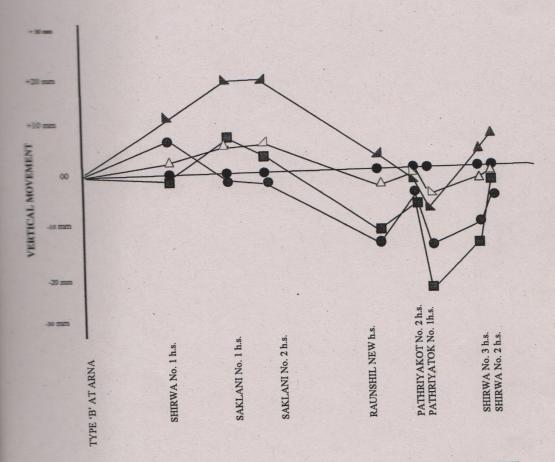
1	00	7.	6.	1.	,	4.	0.	ند	2.	,	1.	T			No.	SI.	
	RAUNSHIL NEW h.s.	PATHRIYATOK No. 2 h.s.	PATHRIYATOK No. 1 h.s.	DIMINAL ING. E M.S	SHIRWA No 7 hs	SHIRWA No. 3 h.s.	DIMINITA INC. A AND.	SHIRWA No 1 hs	SAKLANI NO. 1 II.S.	CATT ANTING 1 ha	SAKLANI No. 2 h.s.			Name of Station	N. Station		
	855.2348	730.3280	/14.5891	714 5001	701 2490	683,0318	100 0010	798.6396	034.4017	92/ /010	818.4/0/	010 4777	1981-82	-	-		
	855.2315	730.3264	14.3031	71/ 5021	701.2488	003.0201	700 000	798.6414	21.01.70	834 4077	010.4020	2007 010	1986-87		3	Н	
	855.2375	730.3262	11.000	714 5805	701.2546	000.000	\$250 28%	798.6501	00	834 4203	010.7750	0207 818	1989-90	,	2	Heights in metres	
	855.2193	/30.3213	700 0015	714 5727	701.2431	000.0100	683 0185	798.6459		834.3994	010.1100	818 4738	1996(S)		4	es	
	855.2219	/30.313/	720 2107	714.5631	/01.2466	201040	683 0173	/98.0388	200 /200	834.4064	201 1071	818.4792	2006-07	2000	Un.		
	-1.29	100	280	-2.60	-0.24	024	-1.45	-0.00	000	+0.45	10 45	+0.25			(5-1)	Dillerence	D. C.
	-0.90	0.00	-0.67	-2.00	-0.22	0 33	-1.14	-0.20	200	-0.08	0.00	-0.34	2000		(5-2)		-
	-1.JO	156	-065	-1.74	-0.00	080	-1.62	-1.10	_1 13	-1.39	1 20	-1.58			(5-3)	leights in centimeters	hts in contin
	10.20	40%	-0.18	-0.96	10.55	\$5.0+	-0.12	0.11	521	10.70	10 TO	+0.54			(5-4)	THE COLUMN	motors

CHART SHOWING THE HORIZONTAL MOVEMENT IN VARIOUS EPOCHS
Scale of movement: - 1mm = 4mm



REFERENCES POSITION OF STATIONS IN DIFFERENNT EPOCHS 1. SEASON 1981-82 ● 2. SEASON 1986-87 ● 3. SEASON 1989-90 ● 4. SEASON 1996 (S) ● 5. SEASON 2006-07 ●

CHART SHOWING THE VERTICAL MOVEMENT IN VARIOUS EPOCHS
Scale of movement: - 2mm = 1mm



REFERENCES POSITION OF STATIONS IN DIFFERENT EPOCHS	
2 SEASON 1986	-87
3. SEASON 1989	-90
4. SEASON 1996	(S)
5. SEASON 2006	-07