

SALIENT FEATURES

1. General

1.1 Name of the Project : Feasibility Report for Revival of Saraswati Nadi
Part II: Construction of Adi Badri Dam on Somb
Nadi and its piped link to Sarasvati Nadi and
Sarasvati Reservoir.

1.2 River Basin :

- a) Name : Somb Nadi of Yamuna River Basin
b) Located in States : Himachal Pradesh and Haryana

1.3 Name of the following

a) District

- 1) Reservoir : Yamunanagar (Haryana) and Sirmohar (H.P.)
2) Headwork/Dam : Yamunanagar (Haryana)
3) Command Area : Yamunanagar, Kurukshetra, Kaithal, Jind and
Fatehabad

b) Tehsils :

- 1) Reservoir : Bilaspur (Haryana) and Nahan (H.P.)
2) Headwork /Dam : Bilaspur
3) Command Area : Bilaspur, Shahbad, Thanesar, Pehowa,
Narwana and Fatehabad

- c) Villages near the headworks/Dam : Kathgarh and Rampur Gainda

1.4 Location of the following:

1.4.1 Head works/ Adi Badri Dam :

- a) Longitude : 77°20'28" E
b) Latitude : 30°27'30" N

- 1.4.2 Project area reference to :**
- a) Degree sheets : H43L7 (on 1:50,000 scale)
: X¹⁰-20 (on 1:15840 scale) for west side and
east side on sheet Y¹⁰-16, (but this sheet is not
available even with Survey of India)
 - b) Index Plan : Attached

1.5 Access and distance to the Project from the following:

- a) Airport : 105.0 Km (Approx.)
- b) Rail head : 35.0 Km
- c) Road head : 1.0 Km

1.6 Estimated life of the project (Year) : 45 years, but can be used thereafter also by reduced availability of water and with desilting of Adi Badri Reservoir.

1.7 Type of Project : Revival of Sarasvati Nadi, Tourism, Ground water recharging in Himachal Pradesh & Haryana and Flood Control

1.7.1 Tourism : It will revive Saraswati Nadi by providing perennial flow. It will attract tourists along the course of Saraswati Nadi.

1.7.2 Ground Water Recharge : Adi Badri Dam Reservoir and Sarasvati Reservoir would help in recharging the ground water Himachal Pradesh & Haryana. Recharge will also take place along the course of the Sarasvati Nadi. Harvested water would recharge the ground water to a varied extent as per strata along the course of Sarasvati Nadi.

- 1.7.3 Flood Control** : At 50% dependability, whole of the flow resulting from 29.50 sq.km catchment area will be diverted from the Somb Nadi which will solve the flood problem from Somb Nadi to that extent. However, for wet years, spillway would have to be opened causing some controlled flooding, much less than that at present
- 1.7.4 Project performance : Conjunctive use of Adi Badri Dam and Sarasvati Reservoir make availability of water almost same upto 45 years and even upto 100 years after some desilting of the Adi Badri Reservoir. Thus performance of the project upto 45 years will be good. However, after some desilting, its performance can be made satisfactory even upto 100 years.
- a) Performance for Tourism : It will be OK for most of the time
- b) Ground water recharge : It is dependent on availability of water.
- c) Flood control : It will be largely checked for floods of return periods lower than 25 years. For other floods such as 50 year and 100 years return periods, it will proportionately control the floods.

2. Hydrology:

2.1 Catchment:

2.1.1 Catchment area at Adi Badri Dam site

- a) Gross : 29.50 Sq km
- b) Intercepted :
- i) By existing projects : Nil
- ii) By on- going projects : Nil
- iii) By contemplated projects : Nil
- c) Unintercepted : 29.50 Sq Km

2.1.2 Catchment area

- a) Rain- fed : 29.50 Sq Km
- b) Snowfed : Nil

2.2 Precipitation (Period 21 years)

Monsoon Rainfall

- a) Average : 1440 mm
- b) Maximum : 2220 mm (in 2010)
- c) Minimum : 1019 mm (in 2009)
- d) 50% dependable : 1396 mm
- e) 67% dependable : 1183 mm
- f) 75% dependable : 1109 mm
- g) 90% dependable : 1023 mm

2.3 Monsoon water yield and availability for use

2.3.1 Monsoon yield (Gross from 1st June to 30th September calculated at the proposed site)

Period of record : 21 years

- a) Maximum (during 2010) : 3382 ha-m
- b) Minimum(during 2006) : 541 ha-m
- c) Average : 1809 ha-m
- d) 50% dependable : 1697 ha-m
- e) 67% dependable : 1291 ha-m
- f) 75% dependable : 952 ha-m
- g) 90% dependable : 740 ha-m

2.3.2 Availability of water from Adi Badri Dam

- (i) Availability of water at 50% dependability for 365 days in an year by using the Sarasvati Reservoir also for storing water. : 17.45 Cs from 1st to 45th year of operation of the Adi Badri Dam and the Sarasvati Reservoir.
- (ii) Availability of water at 67% dependability for 365 days in an year by using the Sarasvati Reservoir also for storing water. : 13.15 Cusecs from 1st to 45th year of operation of the Adi Badri Dam and the Sarasvati Reservoir.
- (iii) Availability of water at 75% dependability for 365 days in an year by using the Sarasvati Reservoir also for storage whenever required. : 9.50 Cs from 1st to 45th year of operation of Adi Badri Dam and the Sarasvati Reservoir.
- (v) Availability of water at 90% dependability for 365 days in an year by using the Sarasvati Reservoir also for storage whenever required. : 7.30 Cs from 1st to 45th year of operation of Adi Badri Dam and the Sarasvati Reservoir.

2.3.4 Climatic Data of Command

Name of station		: Ambala	
		Maximum	Minimum
a)	Air temperature (°C)	: 43.7° (June)	2.1° (January)
b)	Humidity (Percent) (Mean)	: 89%	48.67% (May)
		(December)	
c)	Wind (Km/ h) (Monthly mean)	: 5.8 Km/ h	0.7 Km/ h (April)
		(May)	

2.3.5 Floods

(i) Floods near the headwork site :

Historical period of record : 56 years

for Dadupur

Location : Dadupur head works (about 34.0 km on downstream side for 509 sq km. catchment area whereas catchment area for this project is only 29.50 Sq km.)

a) Maximum discharge : 2407.02 Cumecs at Dadupur (579.47 Cumecs for 29.50 Sq KM catchment area at Adi Badri

$$\text{Dam site) } (2407.02 \times \sqrt{\frac{29.50}{509}}) = 579.47$$

b) Year of Occurrence : 1973

c) 100 year return period flood :
 • As derived from recorded flood peaks at Dadupur and converted for Adi Badri Dam site = 716.22 cumecs.
 • As derived by CWC's Synthetic Unit Hydrograph Method = 706.30 cumecs

(ii) Flood (as worked out by synthetic hydrograph method of CWC for 12 hour storm duration):

	Frequency	Magnitude (Cumecs)	Volume (ha- m)
a)	25 years (12 hr SD)	582.97	717.42
b)	50 years (12 hr SD)	652.24	807.75
c)	100 years (12 hr SD)	728.00	906.48
d)	SPF (12 hr SD)	886.02	1112.45
e)	PMF (12 hr SD)	1204.21	1527.25
f)	25 years (6 hr SD)	566.83	615.93
g)	50 years (6 hr SD)	635.25	692.69
h)	100 years (6 hr SD)	706.30	772.29

i)	SPF (6 hr SD)	776.83	840.14
j)	PMF (6 hr SD)	1043.15	1149.89
(iii)	Design Flood (m ³ /sec) PMF	1204.21 cumecs	1527.25 ha-m
(iv)	River flow (minimum observed):	0.10 cumecs (3.5 cusecs)	

3. Adi Badri Dam Reservoir

3.1 Water level (El. in m)

Maximum water level:

i)	For PMF	: 383.888 m (say 383.90 m)
ii)	For SPF	: 382.558 m
iii)	For 100 year Return Period	: 381.898 m
iv)	For 50 year Return Period Flood	: 381.649 m
v)	For 25 year Return Period Flood	: 381.574 m
vi)	FRL	: 381.0 m

3.2 Free board (m):

i)	For PMF	: 1.50 m
ii)	For SPF	: 2.842 m
iii)	For 100 year Flood	: 3.502 m
iv)	For 50 Year Flood	: 3.751 m
v)	For 25 year Flood	: 3.826 m

3.3 MDDL, Sill Level, Live Storage capacity and Dead Storage Capacity:

(Gross storage capacity up to FRL of 381.0 m = 321.31 ha-m)

Block of years of operation	MDDL (m)	Sill Level (m)	Average Live Storage Capacity (ha-m)	Average Dead Storage capacity (ha-m)
1-5	361.80	360.80	290.30	31.01
6-10	361.80	360.80	265.41	55.90
11-15	366.50	365.50	230.97	90.34

16-20	366.50	365.50	196.61	124.70
21-25	372.70	371.70	161.97	159.34
26-30	372.70	371.70	129.29	192.02
31-35	376.60	375.60	95.92	225.39
36-40	376.60	375.60	66.03	255.28
41-45	379.00	378.00	43.08	277.63

3.4 Assumed annual losses (seepage and evaporation from the reservoir (ha- m):

- a) Quantum : 54.85 ha- m (17.07% of live storage)
b) Depth (m) : 2.73 m (evaporation and seepage both)

3.5 Adi Badri Dam Reservoir:

- 3.5.1 Submergence upto FRL of : 33.21 ha (82.06 Acres)
381.0 m
- 3.5.2 Submergence upto 381.574 : 35.19 ha (86.95 Acres)
m level for 25 years return (77 Acres in H.P. and 11 Acres in Haryana)
period flood routing. (for
acquiring landed property)
- 3.5.3 Level upto which built up : 381.649 m
property to be acquired
(Level attained during 50
year return period flood)
- 3.5.4 No. of villages whose abadi : Nil
would fully or partially
submerged
- 3.5.5 Total land required to be : 35.61 ha (88 Acres)
acquired for the Reservoir, (77 Acres in H.P. and 19 Acres in Haryana)
Adi Badri Dam and its
Appurtenant works

- 3.5.6 Land Required for laying : 11.5 Acre underground (Equivalent to 11.5/5 =
pipeline 2.30 Acre over ground)
- 3.5.7 Transmission lines : 1.5 km 11 kv H.T. line and some LT lines of tube
wells would need relocation. Detail will be given
at DPR stage.
- 3.5.8 Roads Submerged Details will be given at DPR stage.
- 3.5.9 Tubewells submerged These will come with the land to be acquired.
Details will be worked out at DPR stage

4.0 Adi Badri Dam and its Appurtenant works :

4.1 Dam Embankment

- 4.1.1 Maximum height above : 33.40 m
deepest bed
- 4.1.2 Top width of Dam : 6.0 m
- 4.1.3 Length of Dam : 160 m at top
- 4.1.4 Top level 385.40 m
- 4.1.5 U/S and D/S slope : 3:1 and 2.75:1 respectively
- 4.1.6 Berms : Two No. berms at El. 374.0 m and 363.0 m
on u/s & d/s (all the berms are 5.0 m wide)
- 4.1.7 Central Impervious core : 3.0 m width at top and bottom width of key
trench as 12.50 m at 10 m below NSL
- 4.1.8 U/S transition Filter : 2 layers of 1.5 m thickness each
- 4.1.9 Downstream inclined filter 2 layers of 1.5 m thickness each
- 4.1.10 Horizontal Filter : Two m thick filter material
- 4.1.11 Rock toe & toe drain Provided
- 4.1.12 U/S slope protection : Hand placed rip rap of 0.5 m thick over 0.15 m
thick filter
- 4.1.13 D/S slope protection : 0.30 m thick hand placed rip rap without filter
- 4.1.14 Major Quantities for Dam ----
Embankment
- (i) Excavation 0.53 Lac cum
- (ii) Fill Material ---

(a)	Impervious material	0.77 Lac cum
(b)	Previous shell material	2.71 Lac cum
(c)	All filter materials	0.50 Lac cum
(d)	Stone quantity (including rip rap, rock toe and toe drain)	0.12 Lac cum
4.2	Spillway	
4.2.1	Type of Spillway	Chute spillway
4.2.2	Spillway capacity	: 1066.063 cum up El. 383.90 m
4.2.3	Length of approach channel (average)	37.0 m
4.2.4	No. of bays	3
4.2.5	Width of each bay	11.0 m
4.2.6	Width of piers	2.0 m each
4.2.7	Crest level	376.50 m
4.2.8	Top level of gate and gate sizes	381.15 m (3 No. 11 m x 4.65 m each)
4.2.9	2 or 3 piece stop logs with Monorail crane for lifting of stop logs	Provided
4.2.10	Bridge over the spillway	Two way bridge with carriage way of 8.50 m
4.2.11	Length of chute	58.41 m (inclined)
4.2.12	Longitudinal slope of chute	1/5 from RD 9 to 29 and 1/2 from RD 29 to 63
4.2.13	Width of chute	Varies from 37 m to 45 m as per details in the F.R.
4.2.14	Cistern level	342.50 m
4.2.15	Cistern length	41.0 m
4.3	Inlet Structure and Outlet Works :	
4.3.1	No. of outlet pipes	2 No. 1000 mm i/d steel cylinder (Concrete lined and coated of Class-2)
4.3.2	Discharge capacity of each pipe	3.115 cumecs (110.0 cumecs)

4.3.3	Trash rack	6 No. 1.65 m x 2.0 m side (vertical) panels, 2 No. 1.65 m x 1.65 m top (horizontal) panels.
4.3.4	Sluice valves	4 No. 1000 mm id/a to be installed in sluice valve chamber
4.3.5	Sluice valve chamber (Internal Dimensions)	3.0 m (along flow) x 2.6 m
4.3.6	Sill level of inlet structure	360.80 m (Initial)
4.3.7	MDDL (Initial)	361.80 m
4.3.8	Sump-Well size, FSL and bottom level	4.0 m x 3.8 m , FSL varies for 352.50 m to 358.50 m and bottom level is 348.50 m
4.3.9	Invert level of Low level entry to the conduit pipes	352.50 m

4.4 Mechanical Equipment, Electrical Features and Auxiliaries of Dam

4.4.1	Trash rack for low level entry of outlet pipes	Provided
4.4.2	Trash rack for morning glory over inlet sill	Provided, type-I as per IS:11388-1985
4.4.3	Butterfly Valves	
(i)	For conveyance pipelines	1 No. 1000 mm i/dia & 3 No. 1200 mm dia
(ii)	For sump well to release water to the river	1 No. of 1000 i/d
4.4.4	Pressure release valves://Air valves	
(i)	For outlet conduits (pressure release valves)	2 No. of 5.0 Kg/cm ² Pressure rating
(ii)	For conveyance pipes (Air valves)	16 No.

4.4.5 Electrical Features

- (i) Step down transformer : 1 No. of 100 KVA capacity
- (ii) D.G. set for emergency : 1 No. of 50 KVA capacity
- (iii) Lighting arrangement : Outside flood lighting at all key locating in the project area

4.5 Water Conveyance Pipelines

- 4.5.1 No. and type : Two No. RCC pressure pipes of P-2 class with internal dia as 1200 mm
- 4.5.2 Length : 8.820 Km from sump well of the Dam to the stilling basis of Sarasvati Reservoir
- 4.5.3 Discharge Capacity : 55 cs for each pipe (Total 110 cs or 3.115 cumecs)
- 4.5.4 Branch pipeline : One branch pipe line of 450.0 m length & of the 1000 mm dia. will off take from one of the conveyance pipe line to feed Sarasvati Nadi directly near village Rulaheri.
- 4.5.5 Invert level at the start : 349.0 m
- 4.5.6 Invert level at tail : 312.50 m (bed level of the Sarasvati Reservoir)

5.0 Environmental and Ecological Aspects

5.1 Basic information

- 5.1.1 General: : This dam is proposed on a tributary of Somb Nadi at a points 42 Km from River Yamuna
- 5.1.2 Existing land use in the catchment : Forest and Agriculture
- 5.1.3 Period of Construction : 2 years
- 5.1.4 Village affected : Nil, but ground verification will be done at DPR stage.
- 5.1.5 Submergence : 77 acre in HP and 11 Acre in Haryana
- 5.1.6 Sedimentation Rate : 24.0 ha-m/100 Sq. Km/year (initial) (with 91.25% trap efficiency)

5.1.7	Flood Situation		There is flood problem from the Somb Nadi
5.1.8	Ground water	:	Sweet, but going deep and reachaging is needed.
5.2	Environmental Status		
5.2.1	Quality of River Water	:	Good
5.2.2	Aquatic Life	:	NIL, Being Non perennial
5.2.3	Wild life and birds	:	Project will not affect them adversely.
5.2.4	Tourism		Good potential
5.3	Environmental Impact		
5.3.1	Tourism	:	It will improve tourism
5.3.2	Flood Mitigation	:	Yes
5.3.3	Climatic Changes	:	Minimal
5.3.4	Population Pressure	:	Not much
5.3.5	Impact on Seismicity	:	Insignificant
5.4	Statutory Clearances:		
5.4.1	Forest Clearance	:	Required
5.4.2	Interstate Clearance	:	Required
5.4.3	Interstate Issues	:	Involved as Reservoir area also fall in the HP
5.4.4	Environmental Clearance	:	Required
6.0	Tentative Cost of the project		
6.1	Total Cost of this part of the project		108.70 Crores
6.2	Cost of land including overheads	:	28.95 crores
6.4	Cost of works related overheads including establishment charges	:	$108.70 - 28.95 = \mathbf{79.75 \text{ crores}}$