For Office Use Only

Government of India
Ministry of Water Resources,
River Development & Ganga Rejuvenation
Central Ground Water Board

PLAN ON

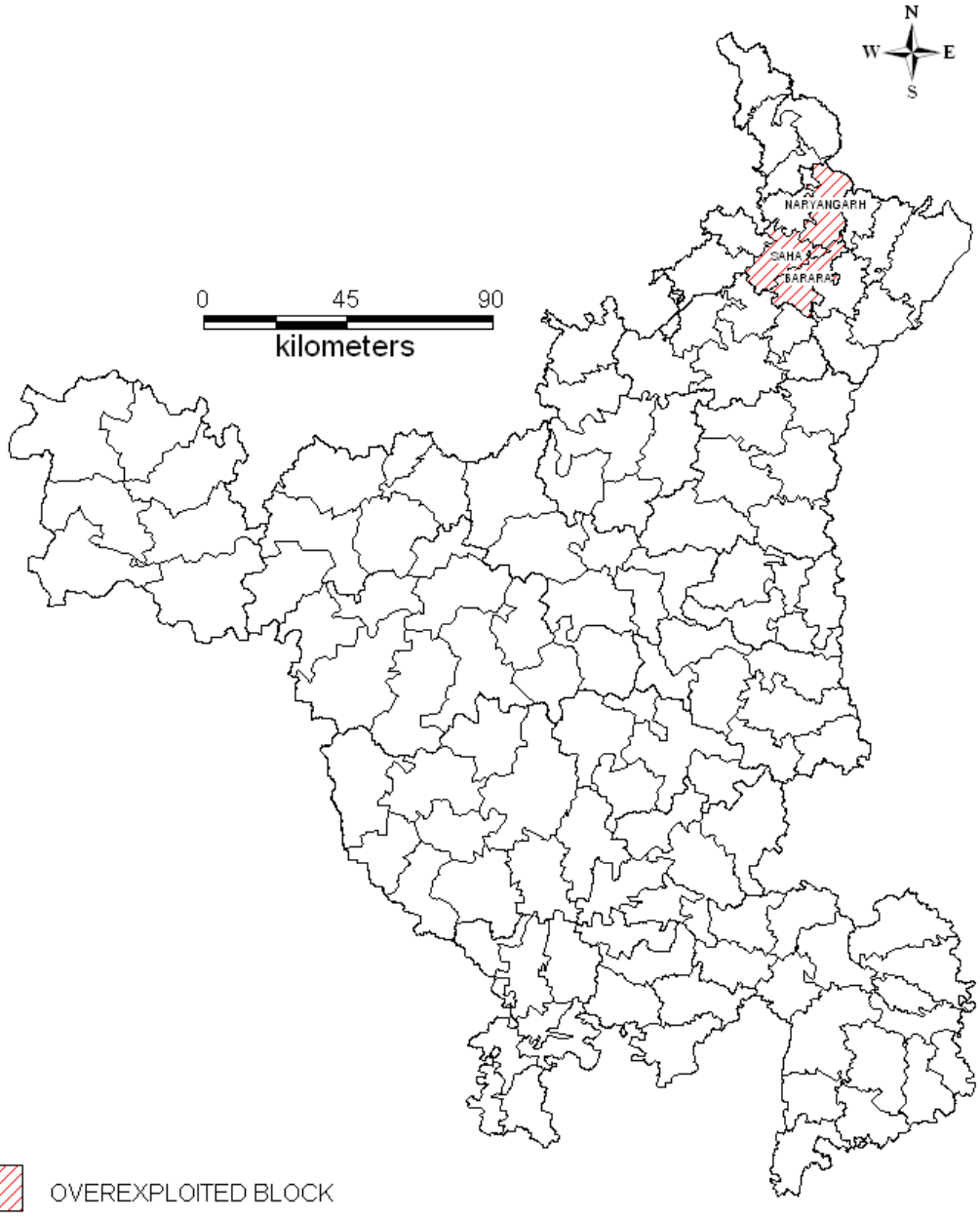
ARTIFICIAL RECHARGE TO GROUND WATER AND WATER CONSERVATION

IN OVEREXPLOITED BLOCKS OF

AMBALA DISTRICT, HARYANA

Central Ground Water Board
North Western Region
Chandigarh

PLAN OF ARTFICIAL RECHARGE TO GROUND WATER IN OVER EXPLOITED BLOCKS, DISTRICT AMBALA HARYANA



PLAN OF ARTFICIAL RECHARGE TO GROUND WATER IN OVER EXPLOITED BLOCKS, DISTRICT AMBALA, HARYANA

INTRODUCTION

Total geographical area of the district is 1574 sq.km. Administratively, the district is controlled by Ambala division. It is divided into three tehsils namely Ambala ,Barara and Naraingarh, and sub-divided into six development blocks namely Ambala I, Ambala II ,Barara, Shahzadpur, Naraingarh, and Saha. The total population of the district as per 2011 census is 1128350.

HYDROMETEOROLOGY

The climate of Ambala district can be classified as subtropical monsoon, mild & dry winter, hot summer and sub-humid, that is mainly dry with very hot summer and cold winter except during monsoon season when moist air of oceanic origin penetrate into the district. The hot weather season starts from mid March to last week of the June followed by the south west monsoon which lasts upto September. The transition period from September to November forms the post monsoon season. The winter season starts late in November and remains upto first week of March. The normal annual rainfall of the district is 1076 mm, and is unevenly distributed over the area. The average rainy days are 44. The south west monsoon, sets in from last week of June and withdraws in the end of September, contributing about 81% of normal annual rainfall. July and August are the wettest months. Rest 19% rainfall is received during non-monsoon period in the wake of western disturbances and thunderstorms.

GEOMORPHOLOGY

The district area is occupied by Indo-Gangetic alluvim. There are no surface features worth to mention except that the area is traversed and drained by seasonal streams namely Tangri, Beghna and Markanda. Physiographically the area is flat terrain. However a little part in the extreme northeastern area of the district is occupied by Siwalik hills, and falls in the zone of “Dissected Rolling Plain”. The area slopes towards southwest with an average gradient of 1.5m/km. The general elevation in the district varies between 245 m to 300 m above MSL.

The soils are non-calcareous and sandy loam on the surface, and loam to clayey loam at depth, and placed under the classification of soil as Udipsamments/Udorthents.

HYDROGEOLOGY

The district is occupied by Indo-Gangetic alluvial plain of Quaternary age. The Central Ground Water Board has drilled 20 exploratory borehole, 3 slim holes, and 13 piezometers to delineate and determine potential aquifer zones, evaluation of aquifer characteristics etc. Seismic surveys conducted in the area reveal that alluvial thickness in the district is large and the basement rock is estimated to be encountered at 3000 m depth below MSL. and thickness of alluvium thins down towards southwest. In south west and western parts of the district the sediments are more fine grained in nature, and constituted of fine to medium grained sands, clays, silts and kankars with occasional gravel. The clays are usually brown to yellowish in colour and sticky to silty in nature. The sands are usually fine grained, hence it becomes difficult to develop wells so as to give sand free water with conventional well designs. Towards east and south eastern part of the district the clays are cream or light grey coloured and are soft and silty. The sands are also mostly medium to coarse grained in nature in comparison to the fine texture of sands in south western and western part of the district.

The ground water exploration revealed the presence of 3 aquifer groups down to a depth of 450 m. comprising fine to medium grained sand, clay, silt, and kankar with occasional gravel. The formation in general is fine grained in nature. The first granular zone forms the water table aquifer and occurs upto 167 m depth and is underlain by 10 to 15 m thick clay bed. The second aquifer occurs at a depth ranging between 65 to 294 m with varying thickness of 26 to 152 m. This aquifer constitutes comparatively less coarse material than the first group and is characterised by presence of *Kankar*. The third one is characterised by fine sandy beds alternating with thick clay beds at a depth ranging from 197 to 385 m exist between 180 and 205 m depth. The fourth aquifer occurs below 212 m onwards. Shallow tubewells are generally constructed upto a depth of 40 m. The discharge of shallow tubewells ranges 100 to 600 litres per minutes for a moderate drawdown. Deep tubewells constructed to a depth of 150 m yield upto 2000 to 3000 litres per minutes for 6 m to 10 m drawdown. However deeper tubewells tapping aquifer zones between150 m to 400 m depth, discharge ranges from 248 to 3293 LPM for a drawdown ranging from 2.84 to 12.93 m. Transmissivity values ranges from 154 to 4900 m^2/day, Storativity $1.39x10^{-4}$ to $1.01x10^{-1}$. In general hydraulic conductivity values of aquifer zones

decreases with depth, with in 150 m depth it is around 10 m/day and for deeper horizons between 150 m to 400 m was around 6 m/day.

Water level behavior

The depth to water level ranges from less than 3 m bgl to 14.29 m bgl and water level of deeper aquifer is reported up to 50 m bgl during pre monsoon period in Saha block. The water level is deep in a small area occupied by bouldary formation in the extreme north east corner of the district. The water logging condition exists in the area south west of Ambala city.

The long-term water levels trend during pre monsoon period indicates in general average decline of 0.36 m per year with a range of 0.012 m to 1.76 m . The long-term water level trend is showing a rise in little area falling in northern part of Ambala block and not of much significance being 0.10 m per year.

GROUND WATER QUALITY:

The ground water is alkaline in nature of the district. The pH values ranges from 7.07 to 10.10 indicating that the ground water is neutral to alkaline (weak base type in nature). Specific conductivity is a measure of total dissolved solids present in water and it ranges from 741 to 3500 micro/mhos at 25^0C and it is directly related to **low** values of chlorides. The fluoride (F) values ranges from0.19 mg/l to 2.45 mg/l but in general it is with in the permissible limit except at Patwi (2.45 mg/l) and Saha (2.11mg/l) in the district. Thus the ground water of the district is well within the permissible limits set by the BIS :10500: 1991 and is categorized as fresh and is suitable for domestic /drinking /irrigation purposes.

The ground water is slightly to moderately alkaline in nature. The pH values range from 7.14 at Kuralito 8.28 at Pinjola with a mean pH value of 7.75. It is moderately to highly mineralized. The EC of ground water ranges from 620 μS/cm at Ambala Cantt to 3770 μS/cm at 25°C at Pinjola. In most of the water samples, EC is below 2000μS/cm and an average EC is 1955μS/cm in the area. The hardness value of ground water ranges from 120mg/l at Panjokhera to 510 mg/l at Kakru. However, exceptionally high concentration of 901mg/l is recorded at Kurali. Among cations, the concentration of calcium ranges between 20mg/l at Pinjola and 178 mg/l at Kurali. Magnesium concentration ranges between 9.7mg/l at Panjokhera and 111 mg/l at Kurali. In majority of ground water samples, calcium

and magnesium concentrations are less than 100 mg/l and their average concentrations are 84 mg/l and 45mg/l respectively. The sodium content varies widely from 83mg/l at Khan Ahmadpur to 325mg/l at Pinjola whereas potassium content ranges from 0.05 mg/l at Khan Ahmadpur to 85mg/l at Kurali. However, exceptionally high concentrations of 420 and 800mg/l are encountered at Kakru and Pinjola respectively. The average value of sodium is found to be 198.

Among anions, bicarbonate is the dominant anion. Carbonate is found to be absent whereas bicarbonate concentration is found to be ranging between 320mg/l at Panjokhera and 1051mg/l at Pinjola. Its average value is 632mg/l. The chloride concentration in most of ground water samples is within the desirable range of 250mg/l (BIS 1991) and it varies between 13mg/l at Ambala Cantt. and 375mg/l at Kurali with mean value of 175mg/l. The sulphate content in ground water ranges from 28mg/l at Khan Ahmadpur to 250 mg/l at Kurali with exception of ground water of Pinjola where its concentration is 620 mg/l. The nitrate (NO_3) concentration is within the permissible limit (45mg/l) and it ranges from trace at few places to 214mg/l at Kakru with an average of 71mg/l. The fluoride (F) content in ground water of the district is less than 1.0 mg/l and it ranges between 2.53 mg/l at Naraingarh and 02.60 mg/l at Naggal. The distribution of chemical constituents in ground water I tabulated below:

Constituents	***Concentration***
pH	7.28-8.34
EC Micromhos /cm at 25 ^{0}C	435-1708
CO_3	**Nil-12(mg/l)**
HCO_3	268-834(mg/l)
Cl	6.7-152 (mg/l)
SO_4	20-209 (mg/l)
NO_3	Nil-75(mg/l)
F	0.30-1.33 (mg/l)
Ca	12-103 (mg/l)
Mg	2.4-34 (mg/l)
Na	35-391 (mg/l)
K	1-2.9 (mg/l)

Total Hardness as $CaCO_3$ 40-267 (mg/l)

Plot of USSL diagram used for the classification of irrigation water indicated that ground water in district Ambala fall under classes C_2S_1, C_3S_2 and C_4S_1 may leading to low to vary high salinity hazards, while these may not cause sodium hazards because of low SAR. About 29% water samples having C_4S_2, and C_4S_3 classes, may lead to salinity as well as sodium hazards when used for irrigation under normal practices. However, such type of water can be used for irrigation along with an appropriate quantity of gypsum or can be used for irrigating salt tolerant crops grown on soils with adequate permeability. Classification based on RSC indicates that ground water in 14% of the samples is safe, in 28% marginal and in the remaining 56% samples ground water is unsafe for irrigation use.

Type of water

The shallow ground water in the district is of $CaHCO_3$ type. In Shehzadpur and Patwi areas the water is of $NaHCO_3$ type, while at Pinjola it was $KHCO_3$ type. At Kakru mixed facies type of water occurs.

GROUND WATER RESOURCES:

The blockwise ground water resource potential in the district has been assessed as per GEC-97. The stage of ground water development ranges between 65% (block-Ambala I) to 116% (block- Barara). The total replenishable ground water resource in the district is 53252 ham. The net ground water draft is 46033 ham, thus leaving 5975 ham for future development. The stage of ground water development in the district is 86%.

GROUND WATER RESOURCE AND DEVELOPMENT POTENTIAL OF AMBALA DISTRICT, HARYANA AS ON 31ST MARCH 2011

Assessment Unit/Block	Net Ground Water Availability (ham)	Existing Gross Ground Water Draft for irrigation (ham)	Existing gross Ground Water Draft for domestic and industrial water supply (ham)	Existing Gross Ground Water Draft for all uses (ham)	Allocation For domestic and industrial require-ment supply upto next 25 years (ham)	Net Ground Water Availability for futur irrigation develop-ment (ham)	Stage of ground Water Develop-ment (%)	CATEGORY of Block
AMBALA I	13996	7803	1305	9108	1774	4419	65	Safe
AMBALA II	7275	4438	1170	5608	1516	1321	77	Safe
BARARA	6692	6449	1320	7769	**1320**	-1077	116	Over-exploited
NARAIN GARH	9622	8395	1620	10015	**1620**	-393	104	Over-exploited
SHEHZADPUR	8640	4505	1215	5720	1644	2491	66	Critical
SAHA	7027	6733	1080	7813	1080	-786	111	Over-exploited
Total	**53252**	**38323**	**7710**	**46033**	**8954**	**5975**	**86**	

GROUND WATER IRRIGATION SCENARIO

As per the data available from minor irrigation census 2006-07 the detailed number of shallow, deep, tubewells, lined, unlined water distribution system, land holdings of wells are given below for reference

Distribution of Tubewells According to Owner's Holding Size

Sr.no	District	Marginal (0-1 ha)	Small (1-2 ha)	Semi-Medium (2-4 ha)	Medium (4-10ha)	Public	Group of Farmers	Total
1	**Ambala**	**124**	**980**	**3931**	**2144**	**1626**	**10236**	**19041**

Distribution of Shallow Tubewells According to Depth of tube well

No. by the depth of shallow Tube well								
Sr.no	District	(0-20 mts)	(20-40 mts)	(40-60 mts)	(60-70 mts)	(70 -90 mts)	90-110 mts	Total
1	**Ambala**	**0**	**0**	**12975**	**1499**	**0**	**14474**	**19041**

Number of Ground Water Schemes and Potential Utilized by water distribution device

Ground Water Schemes according to water Distribution System				
	Open Water Channel			
Sr.no	District	**Lined/pucca**	**Unlined/kutcha**	**Total**
1	**Ambala**	**14014**	**5027**	**19041**

PLAN OF THIS REPORT

In this plan 2 types of the recharge structures are proposed such as Roof Top Rain water harvesting in rural & urban areas and Recharge pits in agriculture lands of 5mt x 5mt x 3mt size. The pit will be surrounded by angle irons and barbed fencing. The size and depth depend on the availability of the land. The extra water available on the field will be stored in the pit and that will also be recharged to the ground water. **A summery outline of the artificial recharge plan for the entire district of each block is given at the beginning in tabular forms. This is followed by the salient features of each block along with the detailed structure-wise recharge plan and cost estimates.**

Details of the block wise type of suitable recharge structures and volume of water assured for annual recharge for each block, schematic design of recharge structures are annexed at annexure I & II.

This plan is focusing on the technical aspects of the ground water recharge through various means so that various implementing agencies may get the appropriate technical guidelines. The existing/ongoing schemes of the central or state govt. like MANERGA, IWSP, PMKVY, NABARD funded schemes, Urban Development schemes, departmentally funded projects etc. may be benefitted from the recharge plan by incorporating the input in the operational guidelines/ design and for locating the specific sites.

Agriculture university, engineering Collages, Academic and Research Institution, NGO may also take up the pilot or demonstrative projects in the blocks suitable to them to plan at local level as per local conditions.

A. POTENTIAL FOR REDUCTION IN OVERDRAFT AFTER RAINWATER HARVESTING AND ARTIFICIAL RECHARGE

Sr.no.	Type of Structure	No. of structures	Unit cost in Lakhs	Total cost of structure in Crore	Annual Recharge (MCM)
ROOF TOP RAIN WATER HARVESTING IN RURAL AND URBEN AREAS					
1	**Artificial Recharge Plan For Urban Areas.**	1055	**0.25**	**2.64**	**0.078**
2	**Roof Top Rain Water Harvesting in Rural Areas**	6006	**0.25**	**15.02**	**0.602**
	Total	**7061**	**0.25**	**17.66**	**0.680**
ARTIFICIAL RECHARGE IN FARMS					
1	**Artificial Recharge Plan Through Recharge Pits.**	619	0.35	**2.17**	1.116
			Total	**19.83**	**1.796**

By the implementation of the proposed recharge structures there will be a reduction of 1.43% in stage of ground water development as tabulated below

Sr.no.	Total Draft (present) **(mcm)**	Recharge through different proposed structures **(mcm)**	Draft Reduced due to Recharge **(mcm)**	Stage of development (present) (Average value of three OE Blocks)	Stage of development after recharge	Reduction in stage of development after recharge
1	**255.97**	**1.796**	**254.174**	**110.33%**	**108.9%**	**1.43%**

ARTIFICIAL RCEHARGE PLAN THROUGH RECHARGE PITS IN OVER EXPLOITED BLOCKS OF AMBALA DISTRICT

Block Name	Total area of the village (in hectares)	10%of village area taken for farm recharge(sq m)	Total number of recharge pits	Annual recharge (MCM)= (Area*Runoff 15%*Rainfall)	Cost of Pit @Rs. 35000/- (crores)
Saha	1153	1153000	115	0.101	0.4025
Barara	0	0	0	0	0
Naraingarh	5035	5035000	504	1.015	1.764
			619	1.116	2.1665

Number of Recharge pits are based on following factors:

Availability of Irrigation wells in the farmer land

Area of sandy strata at shallow depth identified

Type of structure will be recharge pit/ Recharge well(where top three meters is clay)

ARTIFICIAL RECHARGE PLAN FOR RURAL AREAS OF AMBALA

ROOF TOP RAINWATER HARVESTING IN RURAL AREAS OF AMBALA								
Name of District	Sr.no	Name of CD Block	Total area of the village (in hectares rounded up to one decimal place)	Number of households (2011 census)	No of Houses taken for Artificial Recharge (10% of total households)	Total No of AR Structures (one structure for each house)	Total recharge in MCM	Cost @ Rs.25000/- per structure (crores)
Ambala	1	Saha	22525	17867	1787	1787	0.125	4.47
	2	Barara	23985	22272	2227	2227	0.156	5.57
	3	Naraingarh	24384	19924	1992	1992	0.321	4.98
		Total	70894	60063	6006	6006	0.602	15.02

ARTIFICIAL RECHARGE PLAN FOR URBAN AREAS OF AMBALA DISTRICT, HARYANA

District	Block	Town Name	Total Households	Total Population of Town	Housholds taken for Atificial Recharge (10%)	Total Roof Top Area (sqm)	Vol of water available for recharge (MCM)	Cost @Rs.25000/- (crores)
AMBALA	NARAINGARH	Naraingarh (MC)	4677	22832	468	46770	0.050	**1.17**
	SAHA	Saha (93) (CT)	1591	8100	159	15910	0.007	**0.3975**
	BARARA	Barara (203) (CT)	4279	21545	428	42790	0.020	**1.07**
	TOTAL				**1055**		**0.078**	**2.6375**

B. POTENTIAL FOR REDUCTION IN OVERDRAFT BY ENHANCING THE GROUND WATER USE EFFICIENCY OF IRRIGATION TUBE WELLS

The micro level transformation in the ground water management have vast impact potential to counter extensive ground water depletion faced by the state of Haryana, particularly in overexploited blocks. There are around 5026 operated by farmers for irrigation through unlined/Katcha (26.4%) open channel system in Ambala district where water from the tubewell is discharge to the agricultural field. In this process huge quantity of ground water is wasted in soil moisture and evaporation losses.

Dynamic ground water resources (2011) indicate that Gross ground water draft for irrigation in Overexploited Blocks of Ambala district is estimated at 255.97 MCM. It is expected that around 6.1% of over draft can be brought down by switching over to underground/surface pipeline based distribution from the prevailing unlined open channels. Thereby gross draft will be reduced to the tune of 14.24 MCM assuming there is no crop diversification by the farmers.

The benefit will lead to saving of precious ground water resources in overexploited blocks of Ambala Districts. The measure if implemented will bring down the ground water overdraft in OE blocks from 109.67% to 103.56 %. The category of the blocks will also improve drastically resulting in boosting of agriculture and industrial development otherwise not sustainable in majority of the blocks in the state.

The tubewells also consume enormous electricity which is subsidized and government incurs significant revenue on this account. The measures therefore will result in saving of energy and money. Pollution impact will be reduced whenever diesel engines are used by the farmers. The environmental and ecological condition in the irrigated land will improve. Unwanted weed growth will also be controlled inside the farm land. This will also be useful in the waterlogged/ shallow water table areas as the seepage losses in these areas also aggravate the water logging. **Government should make/launch a mission mode program for installing the underground pipe lines instead of having *katcha* channel in the entire Haryana**. Heavy ground water overdraft can be reduced by these efforts. This will ensure **more crop per drop**.

POTENTIAL FOR REDUCTION IN OVERDRAFT BY ENHANCING THE GROUND WATER USE EFFICIENCY IN IRRIGATION TUBEWELLS

Net Annual Ground Water Availability (mcm)	Total Draft (present) (mcm)	Gross Irrigation Draft (present) (mcm)	Gross Ground Water Draft for Domestic and industrial supply (mcm)	Pecentage of unlined channel	Wastage through unlined channel, (mcm) (Col 3 X Col5 X 0.25#)	Potential of Reduced irrigation overdraft (Col3-col6) (mcm)	Gross draft after saving of water (mcm) (Col 7+Col4)	Present Stage of development (%)	Stage of development afterwards((Col 8/Col1)X100) (%)	Reduction in stage of development after constructing pucca canal (Col9-Col10) (%)
1	2	3	4	5	6	7	8	9	10	11
233.41	255.97	215.77	40.2	26.4	14.24	201.53	241.73	109.67	103.56	6.10

#losses from open kuchha channel are around 25%.

COST ESTIMATE OF UNDERGROUND PIPE LINE

District	Block	Irrigated area by ground water scheme (ha)	Percentage of Unlined Channel (%)	Area under unlined Channels	Total cost @Rs.0.50 lakh per hector(in cr) Area *0.50/100 = Crores	Total Cost in Rs.Cr. District wise
Ambala	**Barara**	19298	26.4	5095	25	**74**
	Naraingarh	19674	26.4	5194	26	
	Saha	17216	26.4	4545	23	

BLOCK WISE PLAN OF DISTRICT AMBALA HARYANA

(3 OE BLOCKS)

Ground Water Scenario of Block

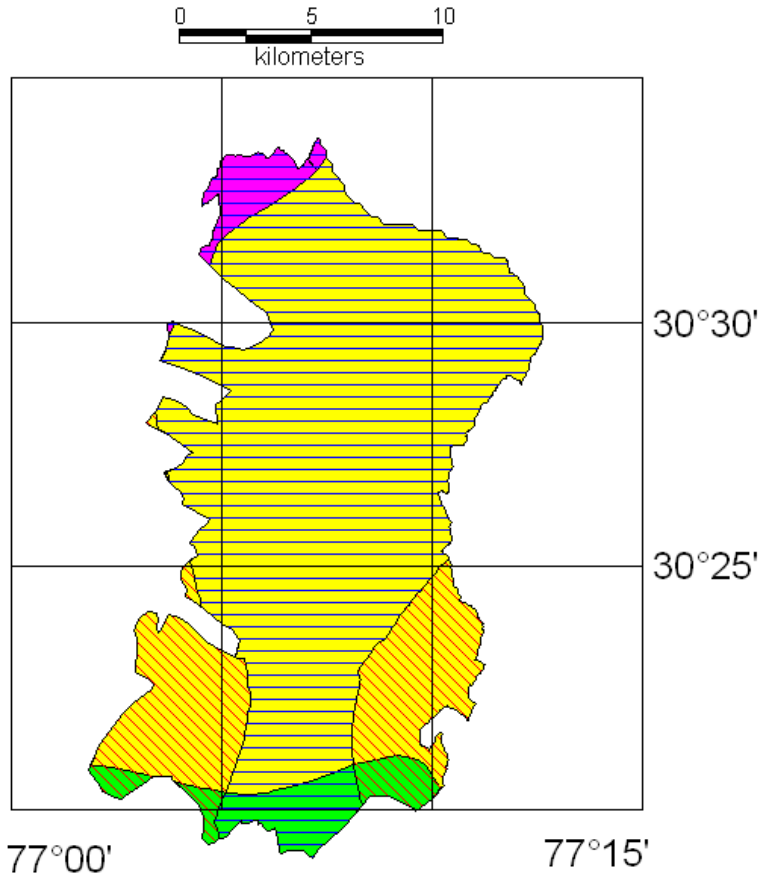
Block Name:- Barara **District:- Ambala**		**State:- Haryana**
1.	GENERAL INFORMATION	
	Geographical area (sq km)	*239.85*
	Number of Villages inhabited Un-inhabited	*73* *0*
	Average Annual Rainfall (mm)	*585*
	Area suitable for Artificial Recharge	*NIL for recharge pit, but whole area of the Block taken for Rural and Urban Rainwater harvesting due to decliningwater level trend.*
2.	GEOMORPHOLOGY	
	Major Physiographic	Alluvium Plain
	Major drainages Basin Sub-Basin	 *Ghaggar*
3.	LAND USE	
	• Current fallows (Sq.Km	4.13
	• Net Area Sown (Sq.Km)	194.96
	• Area Sown More than Once (Sq.Km)	---
	• Total Irrigated Area (Sq.Km)	192.98
	• Total UnIrrigated Area (Sq.Km)	1.98
4.	PREDOMINAT GEOLOGICAL FORMATIONS	*Younger alluvium*
5.	HYDROGEOLOGY	
	Major Water bearing Formation (Aquifer)	Fine to coarse Sand
	Avg. Depth to water level	
	• Pre- monsoon: (May 2015)	*2.94-5.62 (mbgl)*
	• Post –monsoon: (Nov2014)	*2.79-4.51(mbgl)*

6.	GROUND WATER EXPLORATION BY CGWB (As on 31.03.2015)			
	• No of wells drilled	*6*		
	• Depth Range (m)	*28.8-560.70*		
	• Discharge (Ipm)	*248-3293/2.84-12.93*		
	Aquifer Parameters			
	• Transmissivity (m2/day)	*154.4900*		
	• Storativity	*1.39*× 10^{-4}- *1..01*× 10^{-1}		
	• Soil infiltration rate mm/ hour	--		
		Min	*Max*	*Avg.*
		--	--	--
7.	GROUND WATER QUALITY	Min	Max	
	• EC in µS/cm at 25^0c			
	• NO3 (mg/l)			
	• F (mg/l)			
	• Fe (mg/l)			
	• As (mg/l)			
8.	DYANMIC GROUND WATER RESOURCES in MCM	**2011**		
	• Net Ground Water Availability (MCM)	66.92		
	• Existing Gross Ground Water Draft for Irrigation (MCM)	64.49		
	• Existing Gross Ground Water Draft for Domestic and Industrial Water Supply (MCM)	13.20		
	• Existing Gross Ground Water Draft for all Uses (MCM)	77.69		
	• Allocation for Domestic and Industrial Requirement Supply up to next 25 years (MCM)	13.20		
	• Net Ground Water Availability for Future	-10.77		

	Irrigation Development (MCM)		
	• Stage of Ground Water Development / Over Draft (%)	116	
	• Category of Block	OE	
	Any specific reasons for high stress on ground water leading to Overexploitation and decline in ground water level	*Extensive Irrigation*	*Extensive Irrigation*
9.	Percentage of sand thickness up to 50 m depth (Average)	*Thickness(m)* *19*	Percentage % 38
10	Volume of unsaturated zone available for recharge (MCM)	126	
11.	Volume of water required for recharge (MCM)	167	
12.	Volume of surplus water available for recharge(MCM)	1.93	

RECHARGE/ CONSERVATION STRUCTURES		Total Number of Recharge Structures	Total Cost (Rs. in crores)	Total Recharge in mcm
13	Farm Recharge@Rs. 35000/-	0	0	0
14	RWH Rural @ Rs. 25000/-	2227	5.57	0.126
15	RWH Urban@ Rs. 25000/-	428	0.02	1.07
16	Underground pipe line (area in hectares) @ Rs. 50000/-	5095	25.47	4.26
	TOTAL		31.06	5.456

BLOCK-NARAINGARH DISTRICT-AMBALA STATE -HARYANA
DEPTH TO WATER LEVEL NARAINGARH, DECADAL MEAN POST MONSOON
Vs
DECADAL MEAN TREND POST MONSOON
(2005-2014)



LEGEND

Decadal Mean Water Level (m.bgl)

- 0.00 to 5.00
- 5.00 to 10.00
- 10.00 to 20.00

Decadal Mean Trend (m)

- -0.10 to 0.00
- 0.00 to 0.1114

1992	No. of Recharge Structures in Rural Villages
468	No. of Recharge Structures in Urban Towns
504	No. of Recharge Pits in Agriculture land
13	Thickness of Sand

Ground Water Scenario of Block

Block Name:- Naraingarh **District:- Ambala** **State:- Haryana**		
1.	GENERAL INFORMATION	
	Geographical area (sq km)	*243.84*
	Number of Villages inhabited Un-inhabited	*92* *0*
	Average Annual Rainfall (mm)	*1344*
	Area Suitable for Artificial Recharge	*50.35 sq.km area taken for Recharge pit and whole block area taken for Urban,Rural rainwater harvesting.*
2.	GEOMORPHOLOGY	
	Major Physiographic	Alluvium Plain
	Major drainages Basin Sub-Basin	 *Ghaggar*
3.	LAND USE	
	• Current fallows (Sq.Km	--
	• Net Area Sown (Sq.Km)	208.28
	• Area Sown More than Once (Sq.Km)	---
	• Total Irrigated Area (Sq.Km)	196.74
	• Total UnIrrigated Area (Sq.Km)	11.54
4.	PREDOMINAT GEOLOGICAL FORMATIONS	*Younger alluvium*
	HYDROGEOLOGY	

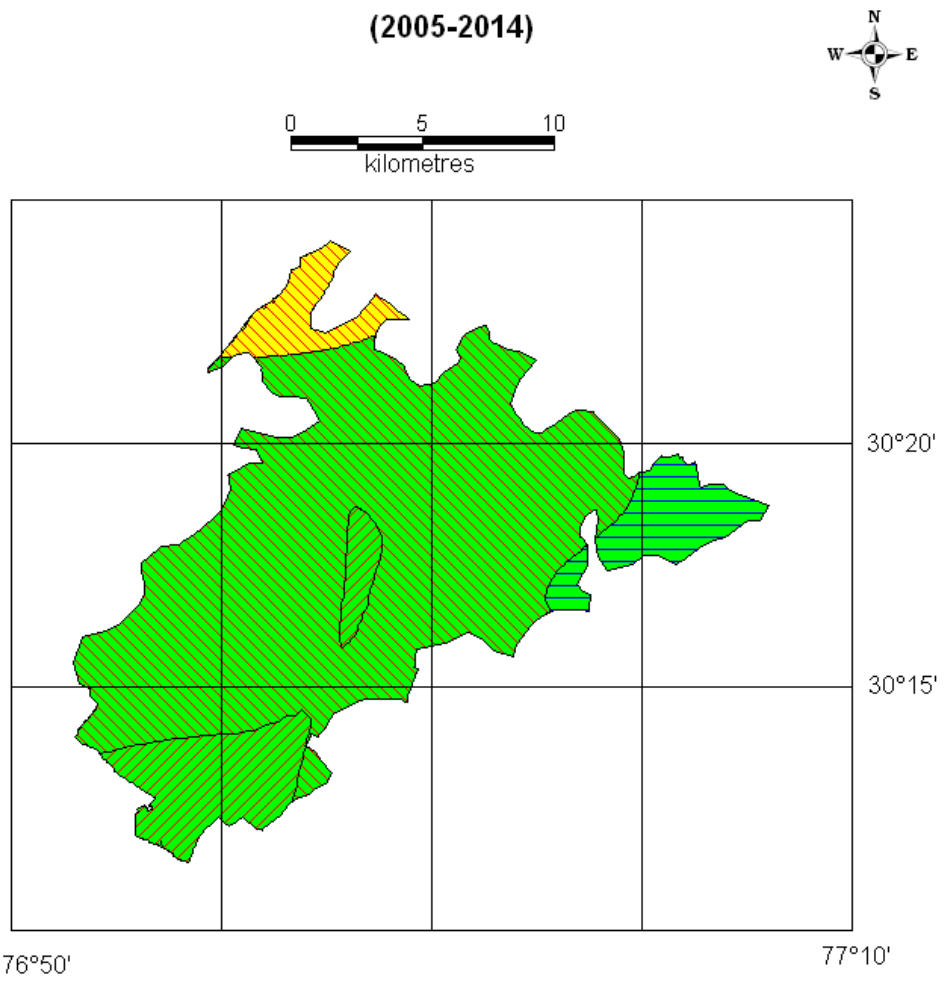
5.	Major Water bearing Formation (Aquifer)	Fine to coarse Sand		
	Avg. Depth to water level			
	• Pre- monsoon: (May 2015)	*11.31-11.31 (mbgl)*		
	• Post –monsoon: (Nov2014)	----------*(mbgl)*		
6.	GROUND WATER EXPLORATION BY CGWB (As on 31.03.2015)			
	• No of wells drilled	*5*		
	• Depth Range (m)	*28.8-560.70*		
	• Discharge (Ipm)	*248-3293/2.84-12.93*		
	Aquifer Parameters			
	• Transmissivity (m2/day)	*154.4900*		
	• Storativity	*1.39*× 10^{-4}- *1..01*× 10^{-1}		
	• Soil infiltration rate mm/ hour	--		
		Min	*Max*	*Avg.*
		--	--	--
7.	GROUND WATER QUALITY	Min	Max	
	• EC in µS/cm at 25^0c	*NA*		
	• NO3 (mg/l)			
	• F (mg/l)			
	• Fe (mg/l)			
	• As (mg/l)			
8.	DYANMIC GROUND WATER RESOURCES in MCM	**2011**		
	• Net Ground Water Availability (MCM)	96.22		
	• Existing Gross Ground Water Draft for Irrigation (MCM)	83.95		

	• Existing Gross Ground Water Draft for Domestic and Industrial Water Supply (MCM)	16.20	
	• Existing Gross Ground Water Draft for all Uses (MCM)	100.15	
	• Allocation for Domestic and Industrial Requirement Supply up to next 25 years (MCM)	16.20	
	• Net Ground Water Availability for Future Irrigation Development (MCM)	-3.93	
	• Stage of Ground Water Development / Over Draft (%)	104	
	• Category of Block	OE	
	Any specific reasons for high stress on ground water leading to Overexploitation and decline in ground water level	*Extensive Irrigation*	*Extensive Irrigation*
9.	Percentage of sand thickness up to 50 m depth (Average)	*Thickness(m) 13*	Percentage % 26
10	Volume of unsaturated zone available for recharge (MCM)	133	
11.	Volume of water required for recharge (MCM)	177	

12.	Volume of surplus water available for recharge(MCM)	2.04

RECHARGE/ CONSERVATION STRUCTURES		Total Number of Recharge Structures	Total Cost (Rs. in crores)	Total Recharge in mcm
13	Farm Recharge@Rs. 35000/-	504	1.764	1.015
14	RWH Rural @ Rs. 25000/-	1992	4.98	0.321
15	RWH Urban@ Rs. 25000/-	468	1.17	0.05
16	Underground pipe line (area in hectares) @ Rs. 50000/-	5194	25.97	5.54
	TOTAL		33.88	6.926

BLOCK-SAHA DISTRICT-AMBALA STATE -HARYANA
DEPTH TO WATER LEVEL SAHA, DECADAL MEAN POST MONSOON
Vs
DECADAL MEAN TREND POST MONSOON
(2005-2014)



LEGEND

Decadal Mean Water Level (m.bgl)

- 0.00 to 5.00
- 5.00 to 10.00

Decadal Mean Trend (m)

- -0.20 to -0.10
- -0.10 to 0.00
- 0.00 to 0.1114

- 1787 No. of Recharge Structures in Rural Villages
- 159 No. of Recharge Structures in Urban Towns
- 115 No. of Recharge Pits in Agriculture land
- 12 Thickness of Sand

Ground Water Scenario of Block

Block Name:- Saha **District:- Ambala**		**State:- Haryana**
1.	GENERAL INFORMATION	
	Geographical area (sq km)	*225.25*
	Number of Villages inhabited Un-inhabited	*64* *0*
	Average Annual Rainfall (mm)	*585*
	Area Suitable for Artificial Recharge	*11.53 sq.km area taken for Recharge pit and whole block area taken for Urban,Rural rainwater harvesting.*
2.	GEOMORPHOLOGY	
	Major Physiographic	Alluvium Plain
	Major drainages Basin Sub-Basin	 *Indus* *Ghaggar*
3.	LAND USE	
	• Current fallows (Sq.Km	5.10
	• Net Area Sown (Sq.Km)	177.44
	• Area Sown More than Once (Sq.Km)	---
	• Total Irrigated Area (Sq.Km)	174.96
	• Total UnIrrigated Area (Sq.Km)	248
4.	PREDOMINAT GEOLOGICAL FORMATIONS	*Younger alluvium*
	HYDROGEOLOGY	

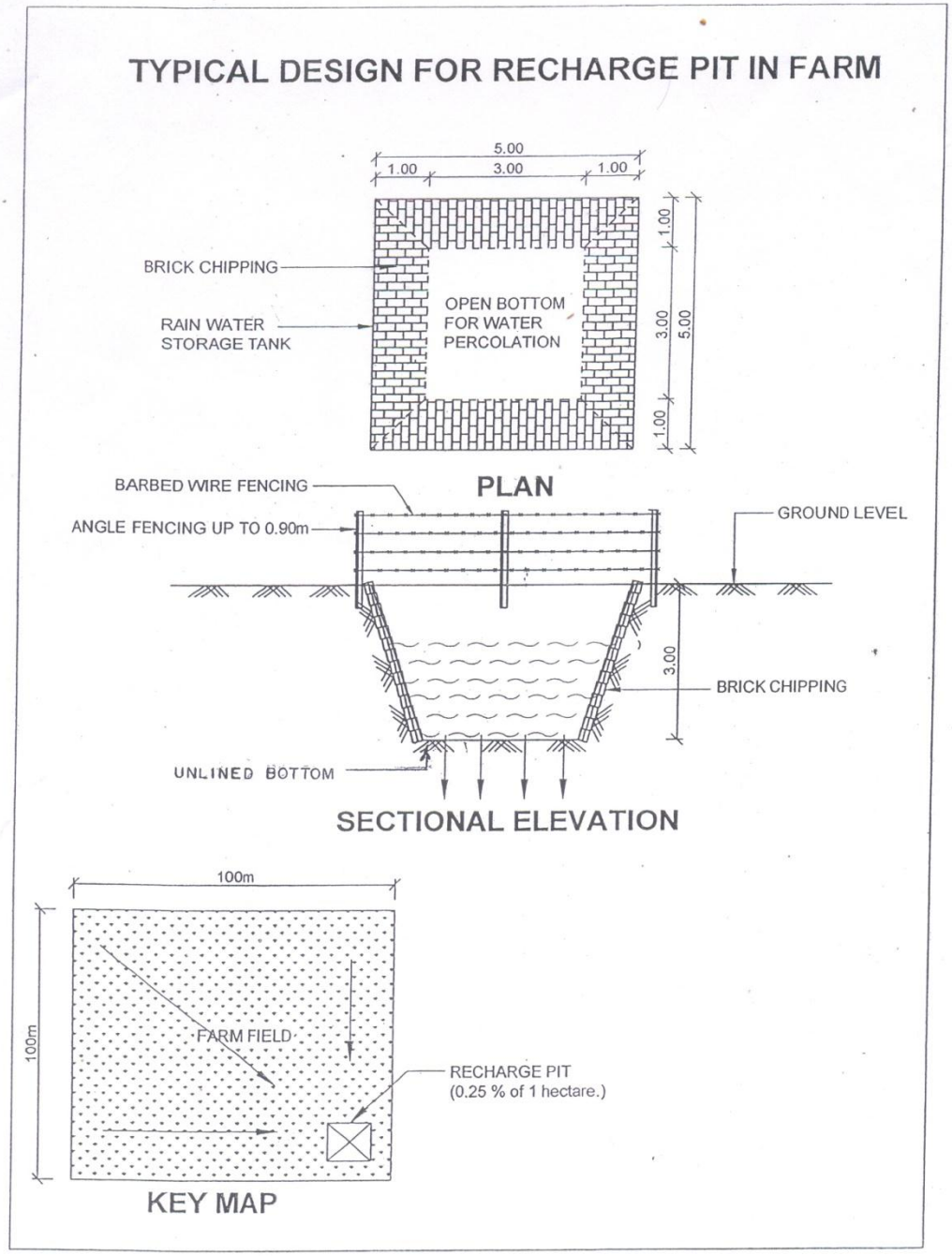
5.	Major Water bearing Formation (Aquifer)	Fine to coarse Sand		
	Avg. Depth to water level (decadal)	*0-10.00 mbgl*		
	• Pre- monsoon: (May 2015) of NHS	*2.94 -5.62 (mbgl)*		
	• Post –monsoon: (Nov2014) of NHS	*2.79-4.51 (mbgl)*		
6.	GROUND WATER EXPLORATION BY CGWB (As on 31.03.2015)			
	• No of wells drilled	*2 (Pz)*		
	• Depth Range (m)	*39-204.55*		
	• Discharge (Ipm)	-		
	Aquifer Parameters			
	• Transmissivity (m2/day)	-		
	• Storativity	-		
	• Soil infiltration rate mm/ hour	--		
		Min	*Max*	*Avg.*
		--	--	--
7.	GROUND WATER QUALITY	Min	Max	
	• EC in µS/cm at 25^0c	*445*	*475*	
	• NO3 (mg/l)	*0.5*	*5*	
	• F (mg/l)	*0.25*	*0.45*	
	• Fe (mg/l)	*.01*		
	• As (mg/l)	-		
8.	DYANMIC GROUND WATER RESOURCES in MCM	**2011**		
	• Net Ground Water Availability (MCM)	70.27		
	• Existing Gross Ground Water Draft	67.33		

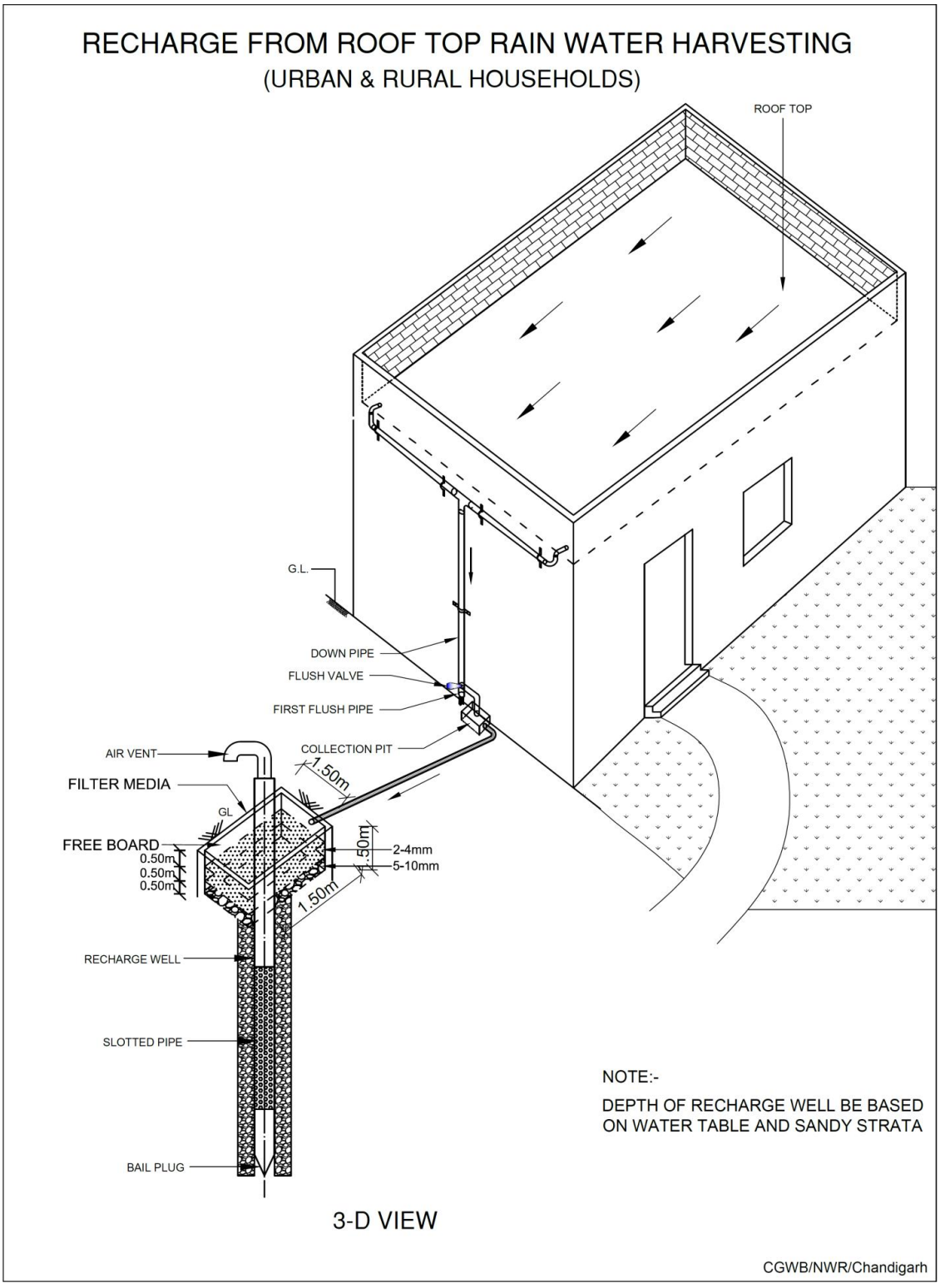
	for Irrigation (MCM)	
	• Existing Gross Ground Water Draft for Domestic and Industrial Water Supply (MCM)	10.80
	• Existing Gross Ground Water Draft for all Uses (MCM)	78.13
	• Allocation for Domestic and Industrial Requirement Supply up to next 25 years (MCM)	10.80
	• Net Ground Water Availability for Future Irrigation Development (MCM)	-7.86
	• Stage of Ground Water Development / Over Draft (%)	111
	• Category of Block	over exploited
	Any specific reasons for high stress on ground water leading to Overexploitation and decline in ground water level	Extensive Irrigation
9.	Percentage of sand thickness up to 50 m depth (Average)	24
10	Volume of unsaturated zone available for	118

	recharge (MCM)	
11.	Volume of water required for recharge (MCM)	156
12.	Volume of surplus water available for recharge(MCM)	1.80

RECHARGE/ CONSERVATION STRUCTURES		Total Number of Recharge Structures	Total Cost (Rs. in crores)	Total Recharge in mcm
13	Farm Recharge@Rs. 35000/-	115	0.4	0.101
14	RWH Rural @ Rs. 25000/-	1787	4.47	0.125
15	RWH Urban@ Rs. 25000/-	159	0.398	0.078
16	Underground pipe line (area in hectares) @ Rs. 50000/-	4545	22.73	4.44
	TOTAL		28.00	4.744

Annexure-I


TYPICAL DESIGN FOR RECHARGE PIT IN FARM
5.00
1.00
3.00
1.00
BRICK CHIPPING
RAIN WATER
STORAGE TANK
OPEN BOTTOM
FOR WATER
PERCOLATION
1.00
3.00
5.00
1.00
PLAN
BARBED WIRE FENCING
ANGLE FENCING UP TO 0.90m
GROUND LEVEL
3.00
BRICK CHIPPING
UNLINED BOTTOM
SECTIONAL ELEVATION
100m
100m
FARM FIELD
RECHARGE PIT
(0.25 % of 1 hectare.)
KEY MAP


RECHARGE FROM ROOF TOP RAIN WATER HARVESTING
(URBAN & RURAL HOUSEHOLDS)
ROOF TOP
G.L.
DOWN PIPE
FLUSH VALVE
FIRST FLUSH PIPE
COLLECTION PIT
AIR VENT
FILTER MEDIA
GL
FREE BOARD
0.50m
0.50m
0.50m
1.50m
1.50m
2-4mm
5-10mm
1.50m
RECHARGE WELL
SLOTTED PIPE
BAIL PLUG
NOTE:-
DEPTH OF RECHARGE WELL BE BASED ON WATER TABLE AND SANDY STRATA
3-D VIEW
CGWB/NWR/Chandigarh