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**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 KAPURTHALA DISTRICT, PUNJAB**

**Central Ground Water Board
North Western Region
Chandigarh**

**PLAN OF ARTIFICIAL RECHARGE TO GROUND WATER
IN OVER EXPLOITED BLOCKS
DISTRICT KAPURTHALA, PUNJAB**



0 35 70
kilometres



OVER EXPLOITED BLOCKS



NOTIFIED BLOCKS

PLAN OF ARTIFICIAL RECHARGE TO GROUND WATER IN OVER EXPLOITED BLOCKS, DISTRICT KAPURTHALA PUNJAB

INTRODUCTION

Kapurthala District is situated in the Bist Doab and comprises two non-contiguous parts, separated by some 32 kilometers. Kapurthala, Sultanpur Lodhi and Bolath Tehsils form one part and Phagwara Tehsil, the second separated portion. The former area lies between North latitude $31^{\circ} 07'$ and $31^{\circ} 39'$ and East longitude $74^{\circ} 55'$ and $75^{\circ} 36'$ Total geographical area of the district is 1633 sq.km. Kapurthala District is bounded partly in the North and wholly in the West by the Beas River, The Phagwara block is surrounded on three sides, the NW, W and SW by Jalandhar District, on the NE and E by Hoshiarpur District and by Nawanshahr in the South. Kapurthala district ranks 13th in Punjab with a population of 817668 which is 3% of the total population of Punjab state, the density of population is 501 per Sq.Km. The main drainage system of the district forms a part of Beas river system. The flow direction is towards Southwest. West or Black Bein drains the central part and flows NE to SW. In Phagwara tehsil East or White Bein Flows West wards and then takes SW turn near western border of the tehsil. It is main drainage system in the tehsil and joins the Sutlej River.

CLIMATE and RAINFALL

The climate of the district is characterized by general dryness except for a short period during south-west monsoon season. There are four seasons in a year namely the cold season from November to March, hot season from April to June, monsoon season from last week of June to the middle of September followed by post monsoon season till the beginning of November. The weather becomes humid and cloudy during July to September due to penetration of moist air of oceanic origin into the atmosphere. The normal annual rainfall of the district is 779 mm, which is distributed over 33 days in a year. The south west monsoon which contributes 75% sets in last week of June and withdrawn in middle of September, July and August receive maximum rainfall. Rest 25% of annual rainfall occurs in the non-monsoon months in the wake of western disturbances and thunder storms.

GEOMORPHOLOGY AND SOIL TYPES

The Kapurthala district is occupied by Indo-Gangetic alluvium. The major portion of this region lies in the river tract falling between the Beas and Black

Bein and is called 'BET'. To the south of the Black Bein lies the tract known as 'Dona'. The word 'Dona' means that the soil is formed of two constituents, sand and clay, with sand predominating. The Phagwara region consists of the Sirowal, Dhak and Manjki tracts lying roughly in the North-East, middle and South-East of the tehsils. Sirowal possesses the characteristics of the 'Bet. The Major Soil types found in the district are the arid brown soils and Tropical Arid brown soils. The arid brown soils are found mostly in Southern parts of the district and Tropical Arid brown soils are found in the Northern part and Phagwara block of the district. The arid brown soils are calcareous in nature and Tropical arid brown soil is deficient in nitrogen, potassium and phosphorus.

HYDROGEOLOGY

The district is occupied by Indo-Gangetic alluvial plain of Quaternary age. The Central Ground Water Board has drilled 12 Piezometers, in the district to delineate and determine potential aquifer zones, evaluation of aquifer characteristics etc. In alluvium thin granular zones exist down to the entire thickness, the top aquifer ranges from 20 to 45 m. The depth of the top aquifer in the North is upto 40 m., in the south it is upto 45m, in the Central it is 20 m. the top granular zone is interspersed by 2 to 3 thin clay lenses. A thick clay bed of thickness from 15 to 35 m. present beneath the Granular zone. Broadly it indicates 10 to 12 prominent granular horizons exist down to 350 m. and are separated by thick clay layers. The granular material is comprised of fine to coarse sand and at places mixed with gravel and pebble.

During the pre-monsoon period depth to water in the district varies from 4.04 m bgl (western part) to 23.05m bgl (Eastern part).The depth to water level less than 10m in the Northern (Nadala and Dhilwan blocks) it ranges between 10 to 20 m in Southern parts of district (Sultanpur Lodhi and Kapurthala blocks), water levels still becomes deeper (>20m) in the western parts of the district falling in Kapurthala and Phagwara blocks.

During the post-monsoon period depth to water in the district varies from 2.95 m bgl (western part) to 24.21m bgl (Eastern part).The depth to water level less than 10m in the Northern (Nadala and Dhilwan blocks) it ranges between 10 to 20 m in Southern parts of district (Sultanpur Lodhi and Kapurthala blocks), water levels still becomes deeper (>20m) falling in Phagwara block.

Water level rise upto 2m has been recorded along river Beas in Kapurthala, Nadala and Sultanpur Lodhi blocks. South central part covering Kapurthala and Sultanpur blocks has observed water level

rise more than 2m. Northern part of Nadala and southern part of Phagwara blocks have observed decline upto 2m.

The long-term (2003-2012) water level trend indicates that the pre monsoon water level decline ranges from 0.0.1316m/yr Bolath to 0.8693m/yr at Phagwara. During post-monsoon water level declined at rates of 0.3666m/yr at Dalla to 1.0824m/y at Phagwara. Annual water level trends indicate that water declined at rates of 0.0971m/yr at to 1.0906m/y at Phagwara. Maximum decline has been noticed in Phagwara block. Ground water flow

The elevation of the water table in the district varies from 221.34 to 229.34 m above mean sea level. The water table elevation map shows the general slope of the water table towards South SE from North. The average gradient of the water table is of the order of 1.5 m/km. The overall flow of ground water is from north to southeast direction.

GROUND WATER RESOURCES

The block wise ground water resource potential in the district has been assessed as per GEC-97. The stage of ground water development ranges between 192% (block-Nadala) to 364% (block-Phagwara). The total replenishable ground water resource in the district is 660.19 mcm. The net ground water draft is 1544.88 mcm thus over exploiting 892.61mcm .The stage of ground water development in the district is 234%.

GROUND WATER QUALITY

Chemical quality data obtained from the analysis of ground water samples representing shallow aquifers reveals that ground water is Alkaline in nature and fresh to moderately saline. Concentrations of various chemical parameters, except nitrate at Kapurthala (105 mg/l), all ground waters are within permissible limits for safe drinking water (BIS, 1991, Rev.2007). Among anions, bicarbonate is the dominant anion and among cations, Ca and Mg are dominant. Arsenic is more than the permissible limit (0.01 mg/l) at Dhilwan (0.072 mg/l). By and large , Ground water is suitable for drinking purposes. Salinity (EC), Sodium Adsorption Ratio (SAR) and Residual Sodium Carbonate (RSC) are the basic parameters considered for ascertaining the irrigational suitability of ground water. Based on the plot of EC and SAR on USSL diagram for rating irrigation water, it is observed that all ground water fall under C₂S₁ except ground water at Phagwara which falls under class C₃S₁. Such waters cause neither salinity nor sodium hazards when used for customary irrigation. From this it is concluded that ground water of the district is suitable for irrigation.

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 Shallow Tubewells According to Owner's Holding Size

No. of shallow tube wells by size class of individual owner							
Sr.no	district	Marginal (0-1 ha)	Small (1-2 ha)	Semi-Medium (2-4 ha)	Medium (4-10ha)	Big (>=10 ha)	Total
1	Kapurthala	3567	9994	23015	13678	1172	51426

Distribution of Deep Tubewells According to Owner's Holding Size

No. of deep tube wells by size class of individual owner							
Sr.no	district	Marginal (0-1 ha)	Small (1-2 ha)	Semi-Medium (2-4 ha)	Medium (4-10ha)	Big (>=10 ha)	Total
1	Kapurthala	134	408	1467	526	10	2545

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 mts)	Total
1	Kapurthala	684	29151	10648	11097	0	51580

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	Under ground pipe
1	Kapurthala	6348	46600	1180

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.

S.N.	Type of Structure	No. of structures	Unit cost in Lakhs	Total cost of structure in Crores	Annual Recharge (MCM)
ROOF TOP RAIN WATER HARVESTING IN RURAL AND URBEN AREAS					
1	Artificial Recharge Plan For Urban Areas.	6028	0.25	15.07	0.680
2	Roof Top Rain Water Harvesting in Rural Areas	10776	0.25	26.94	0.890
	Total	16804	0.25	42.01	1.57
ARTIFICIAL RECHARGE IN FARMS					
1	Artificial Recharge Plan Through Recharge Pits.	15917	0.35	55.70	16.346
			Total	55.70	16.346

By the implementation of the proposed recharge structures there will be a reduction of 2.71% in stage of ground water development as tabulated below

Sr. no.	Total Draft (present) (mcm)	Overdraft (mcm)	Additional Recharge through proposed structures (mcm)	Draft Reduced due to Recharge (mcm)	Stage of development (present)	Stage of development after recharge	Reduction in stage of development after recharge
1	1544.88	-892.61.63	17.916	1526.964	234%	231.29 %	2.71 %

**ARTIFICIAL RECHARGE PLAN THROUGH RECHARGE PITS IN OVER EXPLOITED BLOCKS
KAPURTHALA DISTRICT**

Block Name	Total area of the village (in hectares)	10%of village area taken for farm recharge (hectares)	Total number of recharge pits	Annual recharge (MCM)= (Area*Runoff 15%*Rainfall)	Cost of Pit @Rs.0.35 lakh (crores)
NADALA	21344.90	2134	2134	2.523	7.47
DHILWAN	27219.60	2722	2722	3.217	9.53
KAPURTHALA	39023.30	3902	3902	3.986	13.66
SULTANPUR LODHI	43905.00	4391	4391	3.655	15.37
PHAGWARA	27685.00	2768	2768	2.965	9.69
			15917	16.346	55.71

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)

ROOF TOP RAINWATER HARVESTING IN RURAL AREAS KAPURTHALA DISTRICT OF PUNJAB								
Name of District	Sr.no	Name of CD Block	Total area of the village (in hectares)	Number of households (2011 census)	No of Houses taken for Artificial Recharge	Total No of AR Structures	Total recharge in MCM	Cost @ 0.25 Lacs/structure (Crores)
KAPURTHALA	1	NADALA	21344.90	18752	1880	1880	0.178	4.7
	2	DHILWAN	27219.60	17817	1782	1782	0.150	4.455
	3	KAPURTHALA	39023.30	25311	2531	2531	0.207	6.3275
	4	SULTANPUR LODHI	43905.00	19771	1977	1977	0.132	4.9425
	5	PHAGWARA	27685.00	26063	2606	2606	0.223	6.515
		Total		159177.8	107714	10776	10776	0.890

ARTIFICIAL RECHARGE PLAN FOR URBAN AREAS OF DISTRICT FATEHGARH SAHIB PUNJAB

District	Block	Town Name	Total Households	Total Population of Town	Households taken for Artificial Recharge (10%)	Total Roof Top Area (sqm)	Vol of water available for recharge (MCM)	Cost @Rs.0.25 lakh (Crores)
KAPURTHALA	NADALA	BHULATH (NP)	2235	10548	224	44700	0.028	0.56
	NADALA	BEGOWAL (NP)	2366	10116	237	47320	0.030	0.59
	KAPURTHALA	KAPURTHALA (MCL)	20484	98916	2048	409680	0.230	5.12
	DHILWAN	DHILWAN (NP)	1701	8157	170	34020	0.019	0.43
	DHILWAN	HUSSAINPUR (CT)	4013	15575	401	80260	0.045	1.00
	LODHI	SULTANPUR (MCL)	3460	16877	346	69200	0.031	0.87
	PHAGWARA	PHAGWARA (MCL)	20719	117966	2072	414380	0.237	5.18
	PHAGWARA	PHAGWARA SHARKI (CT)	4343	20102	434	86860	0.050	1.09
	PHAGWARA	CHACHOKI (CT)	958	4307	96	19160	0.011	0.24
		TOTAL	60279	302564	6028	1205580	0.680	15.07

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 Punjab, particularly in overexploited blocks. There are around 54125 operated by farmers for irrigation through unlined/Katcha (86.03%) open channel system in Kapurthala 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 Kapurthala district is estimated at 1489.90. It is expected that around 51.50% 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 1143.84 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 Kapurthala Districts. The measure if implemented will bring down the ground water overdraft from 205% to 153 %. 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 Punjab.** 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, KAPURTHALA DISTRICT













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)	Percentage of unlined channel	Wastage through unlined channel, (mcm) (Col 3 X Col5 X 0.30 [#])	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
746.60	1528	1489.90	38.10	86.03	384.53	1105.38	1143.84	205	153	51.50

Losses from open kuchha channel are around 30%.

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 lack per hector(in cr) Area *0.50/100 = Crores	Total Cost in Rs.Cr. District wise
KAPURTHALA	NADALA	19174.2	86.03	16496	82.48	583.54
	DHILWAN	23839	86.03	20509	102.54	
	KAPURTHALA	32290	86.03	27779	138.90	
	SULTANPUR LODHI	37701.10	86.03	32434	162.17	
	PHAGWARA	22656.5	86.03	19491	97.46	

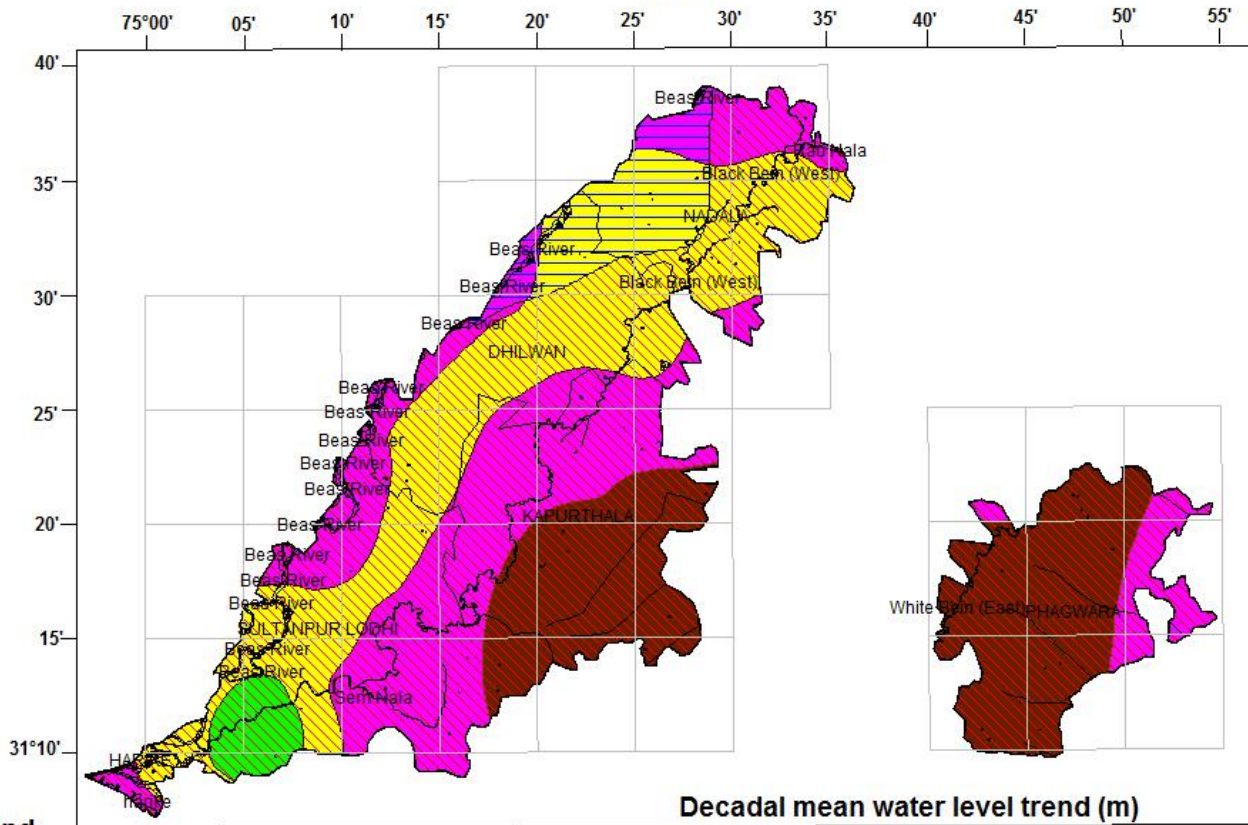
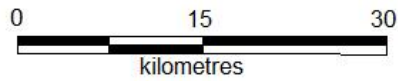
SALIENT FEATURES OF HYDROGEOLOGY OF DISTRICT KAPURTHALA

Wells Feasible	Rigs Suitable	Depth of Well (m)	Discharge (lpm)	Suitable Artificial Recharge Structures
Tube Wells	Direct and Reverse Rotary	50 - 110	2000 - 3500	Recharge Trench With Injection well
Tube Wells	Direct and Reverse Rotary	40 - 100	1000 - 2000	Recharge Trench With Injection well
Tube Wells	Direct and Reverse Rotary	40 - 75	800 - 1000	Recharge Trench With Injection Well
DEPTH TO WATER LEVEL NOVEMBER 2014				
	0.00 - 5.00 mbgl	 National Highway	 International Boundary	
	5.00 - 10.00 mbgl	 Canals	 State Boundary	
	10.00 - 20.00 mbgl	 Water Bodies	 Block Boundary	
	20.00 - 40.00 mbgl	 Major Drainage	 Block Headquarters	

OTHER INFORMATION


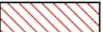
Name of State	Punjab
Name of District	KAPURTHALA
Geographical Area	1633 sq.km
Major Geological Formation	Alluviam
Major Drainage System	Sutlej and Beas
Population (as on 2011)	8,17,688
Total Number of Blocks	5
Existing Major/Medium Irrigation Projects	Bist Doab Canal
Utilizable Ground Water Resources 2011	660.19 (mcm)
Net Ground Water Draft	1544.88 (mcm)
Stage of Ground Water Development	234 %
Average Annual Rainfall	779 mm
Range of Mean Daily Temperature	6° - 42° C
Over Exploited Blocks	NADALA DHILWAN KAPURTHALA SULTANPUR LODHI PHAGWARA

**PLAN OF ARTIFICIAL RECHARGE TO GROUND WATER
DISTRICT KAPURTHALA, PUNJAB**



Legend

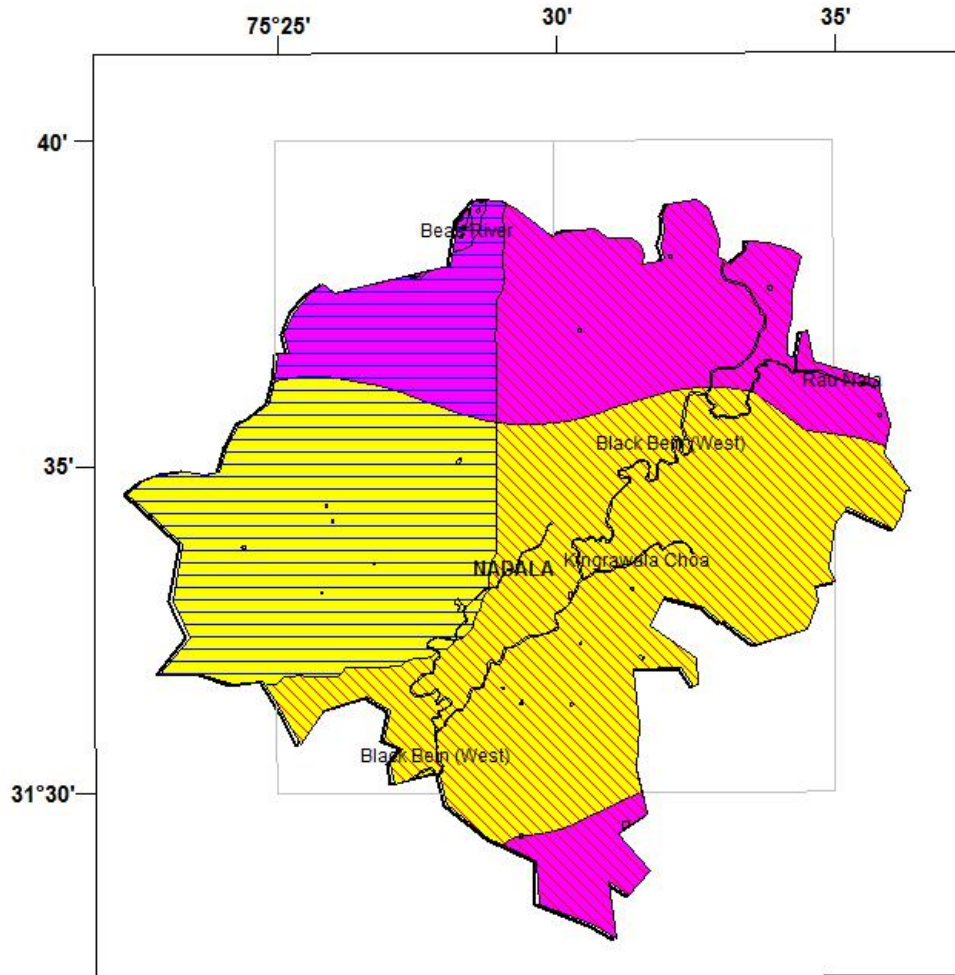
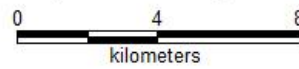
Refer Salient Features of Hydrogeology

Decadal mean water level trend (m)	
	0.00 -- 0.1114
	-0.10 -- -0.00

***BLOCK
WISE PLAN OF
DISTRICT
KAPURTHALA
PUNJAB***

(5 OE BLOCKS)

**BLOCK NADALA DISTRICT KAPURTHALA, PUNJAB
 DEPTH TO WATER LEVEL - DECADAL MEAN POST MONSOON
 VS
 DECADAL MEAN TREND POST MONSOON
 (2004-2013)**



Legend

Decadal mean water level (post monsoon)

- 5.00 - 10.00 mbgl
- 10.00 - 20.00 mbgl

Decadal mean water level trend (m)

- 0.00 - 0.1114
- 0.1 - 0.00

2765

**No. of Recharge Structures
in Rural Villages**

14317

**No. of Recharge Structures
in Urban Towns**

3406

**Recharge Pits in
Agricultural Land**



Canal Network



Water Bodies

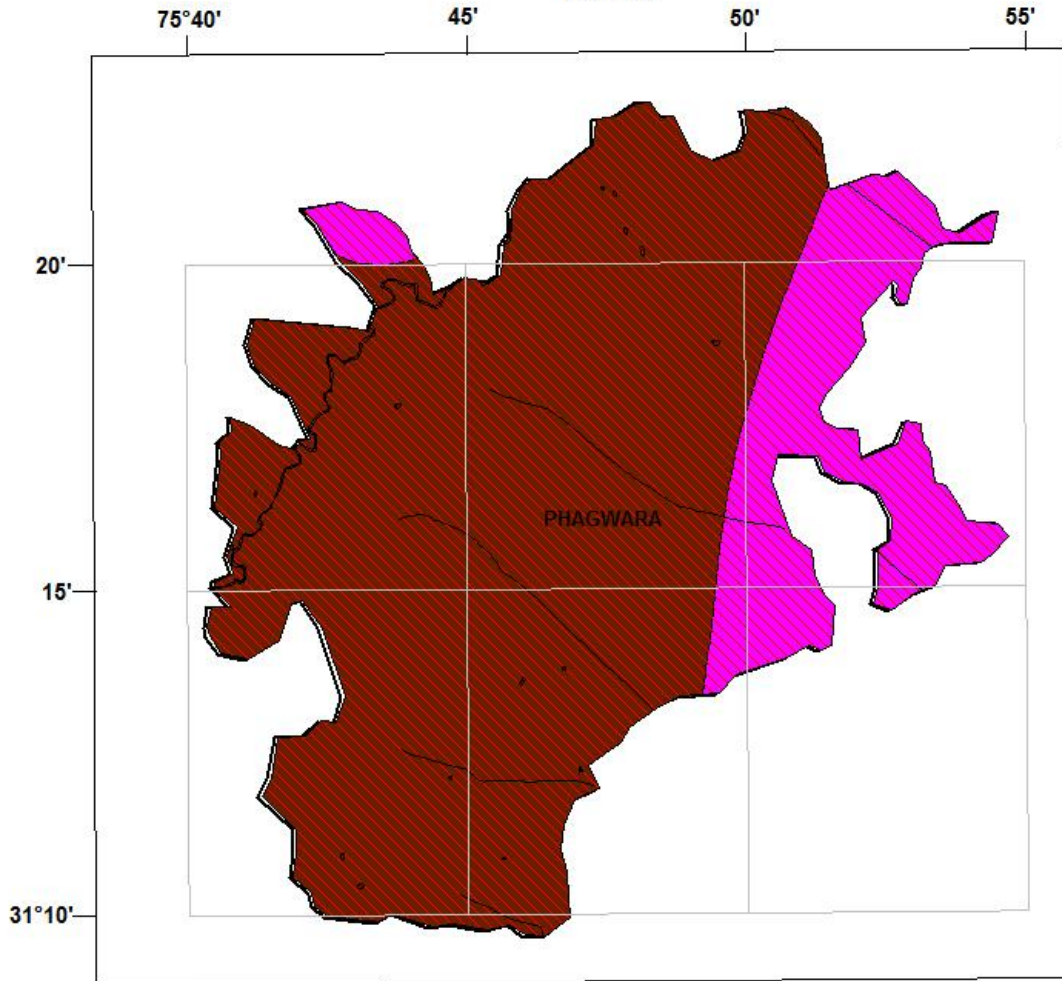
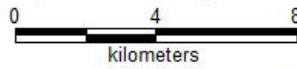
Ground Water Scenario of Block

Block Name:- Nadala		State:- PUNJAB
District:- Kapurthala		
1.	GENERAL INFORMATION	
	i) Geographical area (sq km)	224.4
	• Number of Villages inhabited • Un-inhabited	87 09
	ii) Average Annual Rainfall (mm)	707
	iii) Area feasible for Artificial Recharge	224.4
	iv) Village identified under scarcity of Water?	75
	v) Village covered under water supply	12
	vi) Water Tank exists in the village	03
2.	GEOMORPHOLOGY	
	Major Physiographic	Alluvium Plain
	Major drainages	
	Basin Sub-Basin	Beas 100%
3.	LAND USE	
	• Area According to Village Papers (Sq.Km)	206.95
	• Net Area Sown (Sq.Km)	180.24
	• Area Sown More than Once (Sq.Km)	--
	• Total Cropped Area (Sq.Km)	180.24
	• Cropping Intensity	100
	• Area under Thur and Sem (Sq.Km)	--
4.	PREDOMINANT GEOLOGICAL FORMATIONS	Recent alluvium
5.	HYDROGEOLOGY	

	Major Water bearing Formation (Aquifer)	Fine to coarse Sand	
	Avg. Depth to water level (decadal)	Depth to water level May 2015 (mbgl)	
	•Pre- monsoon: (May 2015) •5.19 – 13.77 (mbgl)	5.00-20.00 (mbgl)	
	•Post –monsoon: (Nov2014) •5.50 – 13.69 (mbgl)		
6.	GROUND WATER EXPLORATION BY CGWB (As on 31.03.2015)		
	•No of wells drilled	--	
	•Depth Range (m)	36.00-303.28	
	•Discharge (Ipm)	-----	
	Aquifer Parameters		
	•Transmissivity (m ² /day)	----	
	•Storativity	----	
	•Specified yield	0.072	
7.	GROUND WATER QUALITY	Min	Max
	•EC in $\mu\text{S}/\text{cm}$ at 25 ⁰ c	404	812
	•NO ₃ (mg/l)	3	31
	•F (mg/l)	0.07	0.15
	•As (mg/l)	0.072	0.072
8.	DYANMIC GROUND WATER RESOURCES in MCM	2011	
	•Net Ground Water Availability (Mcm)	138.82	
	•Existing Gross Ground Water Draft for Irrigation (Mcm)	282.68	
	•Existing Gross Ground Water Draft for Domestic and Industrial Water Supply (Mcm)	4.32	
	•Existing Gross Ground Water Draft for all Uses (Mcm)	286.69	
	•Allocation for Domestic and Industrial Requirement Supply up to next 25 years (Mcm)	5.28	
	•Net Ground Water Availability for Future Irrigation Development (Mcm)	-149.14	



	•Stage of Ground Water Development / Over Draft (%)	207		
	•Category of Block	OE		
	Any specific reasons for high stress on ground water leading to Overexploitation and decline in ground water level	<i>Extensive Irrigation</i>	Extensive Irrigation	
9.	Percentage of sand thickness up to 50 m depth (Average)	<i>Thickness(m)</i> --	Percentage % --	
10	Volume of unsaturated zone available for recharge (MCM)	259.49		
11.	Volume of water required for recharge (MCM)	345.06		
12.	Volume of surplus water available for recharge(MCM)	08.98		
	RECHARGE/ CONSERVATION STRUCTURES	Total Number of Recharge Structures	Total Cost (Rs. in crores)	Total Recharge in mcm
13	Farm Recharge @Rs. 35000/-	2134	7.469	2.523
14	RWH Rural @ Rs. 25000/-	1880	4.700	0.178
15	RWH Urban@ Rs. 25000/-	461	1.153	0.058
16	Underground pipe line (area in hectares)@ Rs. 50000/-	16496	82.480	55.68
	TOTAL		95.802	58.439

**BLOCK PHAGWARA DISTRICT KAPURTHALA, PUNJAB
 DEPTH TO WATER LEVEL - DECADAL MEAN POST MONSOON
 VS
 DECADAL MEAN TREND POST MONSOON
 (2004-2013)**








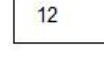


Legend

Decadal mean water level (post monsoon)

-  10.00 - 20.00 mbgl
-  20.00 - 40.00 mbgl

Decadal mean water level trend (m)

-  0.00 - 0.1114
-  - 0.1 - 0.00

-  **No. of Recharge Structures in Rural Villages**
-  **No. of Recharge Structures in Urban Towns**
-  **Recharge Pits in Agricultural Land**
-  **Thickness of Sand**
-  **Canal Network**
-  **Water Bodies**

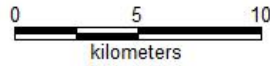
Ground Water Scenario of Block

Block Name:- Phagwara		
District:- Kapurthala		State:- PUNJAB
1.	GENERAL INFORMATION	
	vii) Geographical area (sq km)	300.4
	<ul style="list-style-type: none"> • Number of Villages inhabited • Un-inhabited 	101 10
	viii) Average Annual Rainfall (mm)	715
	ix) Area feasible for Artificial Recharge	300.4
	x) Village identified under scarcity of Water	100
	xi) Village covered under water supply	67
	xii) Water Tank exists in the village	41
	2.	GEOMORPHOLOGY
Major Physiographic		Alluvium Plain
Major drainages Basin Sub-Basin		Satluj 100%
3.	LAND USE	
	• Area According to Village Papers (Sq.Km)	275.17
	• Net Area Sown (Sq.Km)	234.60
	• Area Sown More than Once (Sq.Km)	--
	• Total Cropped Area (Sq.Km)	234.62
	• Cropping Intensity	100
4.	• Area under Thur and Sem (Sq.Km)	--
	PREDOMINANT GEOLOGICAL FORMATIONS	Recent alluvium
5.	HYDROGEOLOGY	

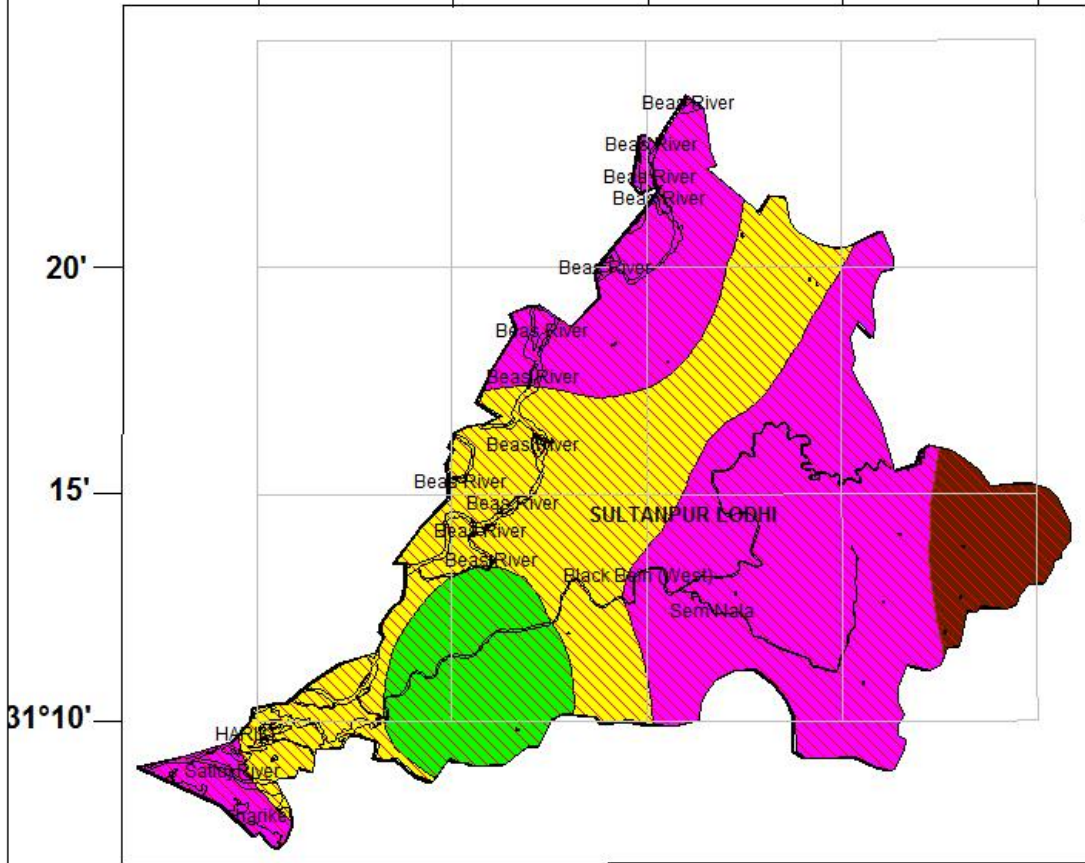
	Major Water bearing Formation (Aquifer)	Fine to coarse Sand	
	Avg. Depth to water level (decadal)	Depth to water level May 2015 (mbgl)	
	<ul style="list-style-type: none"> • Pre- monsoon: (May 2015) • 15.95-25.10 (mbgl) 	10.00- 40.00 (mbgl)	
	<ul style="list-style-type: none"> • Post –monsoon: (Nov2014) • 11.5-26.92(mbgl) 		
6.	GROUND WATER EXPLORATION BY CGWB (As on 31.03.2015)		
	<ul style="list-style-type: none"> • No of wells drilled 	8	
	<ul style="list-style-type: none"> • Depth Range (m) 	36.00-303.28	
	<ul style="list-style-type: none"> • Discharge (Ipm) 	-----	
	Aquifer Parameters		
	<ul style="list-style-type: none"> • Transmissivity (m²/day) 	----	
	<ul style="list-style-type: none"> • Storativity 	----	
	<ul style="list-style-type: none"> • Specified yield 	0.072	
7.	GROUND WATER QUALITY	Min	Max
	<ul style="list-style-type: none"> • EC in $\mu\text{S/cm}$ at 25⁰c 	500	500
	<ul style="list-style-type: none"> • NO₃ (mg/l) 	20	20
	<ul style="list-style-type: none"> • F (mg/l) 	0.23	0.23
	<ul style="list-style-type: none"> • As (mg/l) 	---	---
8.	DYANMIC GROUND WATER RESOURCES in MCM	2011	
	<ul style="list-style-type: none"> • Net Ground Water Availability (Mcm) 	93.88	
	<ul style="list-style-type: none"> • Existing Gross Ground Water Draft for Irrigation (Mcm) 	329.37	
	<ul style="list-style-type: none"> • Existing Gross Ground Water Draft for Domestic and Industrial Water Supply (Mcm) 	12.16	
	<ul style="list-style-type: none"> • Existing Gross Ground Water Draft for all Uses (Mcm) 	341.54	
	<ul style="list-style-type: none"> • Allocation for Domestic and Industrial Requirement Supply up to next 25 years (Mcm) 	14.53	
	<ul style="list-style-type: none"> • Net Ground Water Availability for Future Irrigation Development (Mcm) 	-250.03	

	• Stage of Ground Water Development / Over Draft (%)	364		
	• Category of Block	OE		
	Any specific reasons for high stress on ground water leading to Overexploitation and decline in ground water level	<i>Extensive Irrigation</i>	Extensive Irrigation	
9.	Percentage of sand thickness up to 50 m depth (Average)	<i>Thickness(m)</i> 14	Percentage % 28	
10	Volume of unsaturated zone available for recharge (MCM)	347.37		
11.	Volume of water required for recharge (MCM)	461.93		
12.	Volume of surplus water available for recharge(MCM)	12.02		
	RECHARGE/ CONSERVATION STRUCTURES	Total Number of Recharge Structures	Total Cost (Rs. in crores)	Total Recharge in mcm
13	Farm Recharge @Rs. 35000/-	1384	4.844	2.965
14	RWH Rural @ Rs. 25000/-	1303	3.258	0.223
15	RWH Urban@ Rs. 25000/-	1301	3.253	0.298
16	Underground pipe line (area in hectares) @ Rs. 50000/-	19491	97.455	84.11
	TOTAL		108.809	87.596

**BLOCK SULTANPUR LODHI DISTRICT KAPURTHALA, PUNJAB
 DEPTH TO WATER LEVEL - DECADAL MEAN POST MONSOON
 VS
 DECADAL MEAN TREND POST MONSOON
 (2004-2013)**



75°00' 05' 10' 15' 20'



Legend

Decadal mean water level (post monsoon)



1977

**No. of Recharge Structures
in Rural Villages**

346

**No. of Recharge Structures
in Urban Towns**

4391

**Recharge Pits in
Agricultural Land**

Decadal mean water level trend (m)



Canal Network



Water Bodies

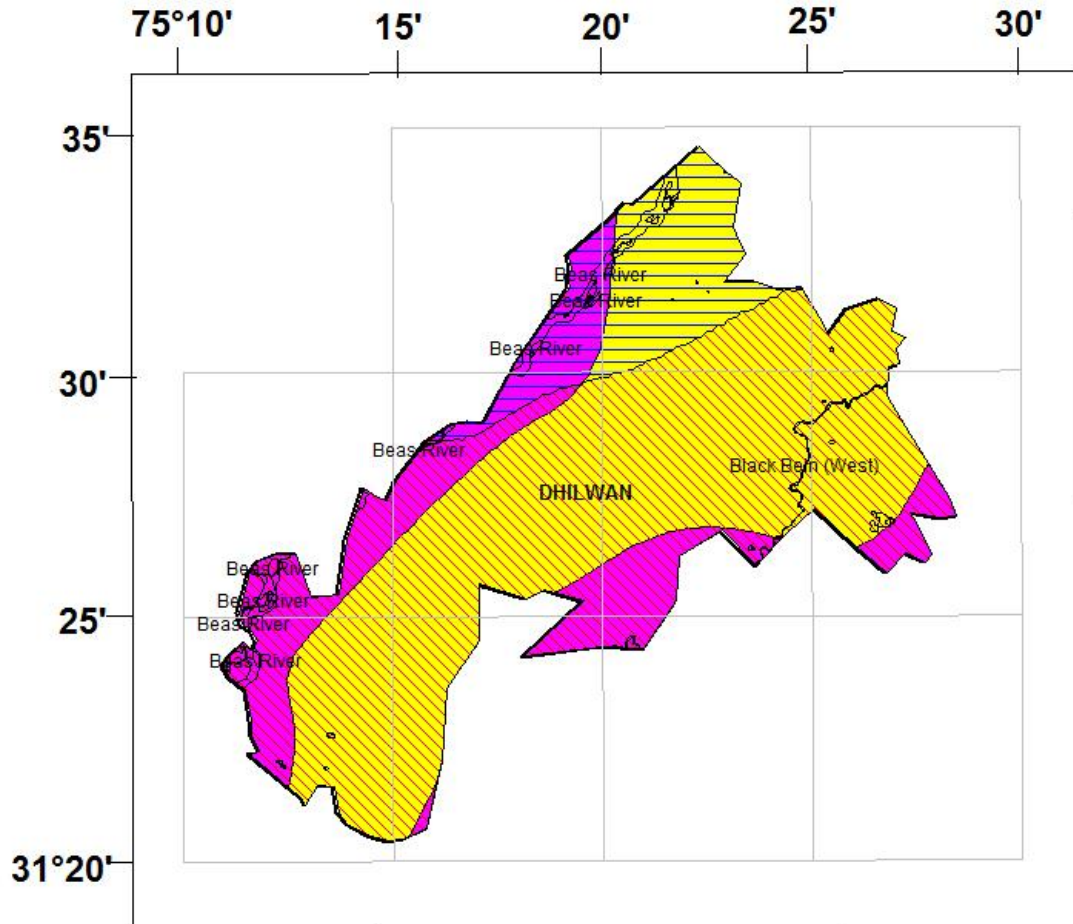
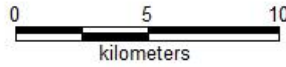
Ground Water Scenario of Block

Block Name:- Sultanpur Lodhi		
District:- Kapurthala		State:- PUNJAB
1.	GENERAL INFORMATION	
	i) Geographical area (sq km)	444.7
	• Number of Villages inhabited • Un-inhabited	137 --
	ii) Average Annual Rainfall (mm)	556
	iii) Area feasible for Artificial Recharge	400.23
	iv) Village identified under scarcity of Water	154
	v) Village covered under water supply	50
	vi) Water Tank exists in the village	24
2.	GEOMORPHOLOGY	
	Major Physiographic	Alluvium Plain
	Major drainages Basin Sub-Basin	<i>Beas 90%</i> <i>Satluj 10%</i>
3.	LAND USE	
	• Area According to Village Papers (Sq.Km)	445.87
	• Net Area Sown (Sq.Km)	268.41
	• Area Sown More than Once (Sq.Km)	0
	• Total Cropped Area (Sq.Km)	368.41
	• Cropping Intensity • Area under Thur and Sem (Sq.Km)	100 --
4.	PREDOMINANT GEOLOGICAL FORMATIONS	<i>Recent alluvium</i>
5.	HYDROGEOLOGY	

	Major Water bearing Formation (Aquifer)	Fine to coarse Sand	
	Avg. Depth to water level (decadal)	Depth to water level May 2015 (mbgl)	
	<ul style="list-style-type: none"> • Pre- monsoon: (May 2015) • 3.85-25.60 (mbgl) 	2.00- 40.00 (mbgl)	
	<ul style="list-style-type: none"> • Post –monsoon: (Nov2014) • 3.90 – 27.50 (mbgl) 		
6.	GROUND WATER EXPLORATION BY CGWB (As on 31.03.2015)		
	• No of wells drilled	3	
	• Depth Range (m)	36.00-303.28	
	• Discharge (Ipm)	-----	
	Aquifer Parameters		
	• Transmissivity (m ² /day)	----	
	• Storativity	----	
	• Specified yield	0.072	
7.	GROUND WATER QUALITY	Min	Max
	• EC in $\mu\text{S/cm}$ at 25 ⁰ c	370	711
	• NO ₃ (mg/l)	--	29
	• F (mg/l)	0.12	0.31
	• As (mg/l)	0.0041	0.0041
8.	DYANMIC GROUND WATER RESOURCES in MCM	2011	
	• Net Ground Water Availability (Mcm)	167.91	
	• Existing Gross Ground Water Draft for Irrigation (Mcm)	408.08	
	• Existing Gross Ground Water Draft for Domestic and Industrial Water Supply (Mcm)	4.43	
	• Existing Gross Ground Water Draft for all Uses (Mcm)	412.51	
	• Allocation for Domestic and Industrial Requirement Supply up to next 25 years (Mcm)	5.80	
	• Net Ground Water Availability for Future Irrigation Development (Mcm)	-245.97	

	• Stage of Ground Water Development / Over Draft (%)	246		
	• Category of Block	OE		
	Any specific reasons for high stress on ground water leading to Overexploitation and decline in ground water level	<i>Extensive Irrigation</i>	Extensive Irrigation	
9.	Percentage of sand thickness up to 50 m depth (Average)	<i>Thickness(m)</i> --	Percentage % -	-
10	Volume of unsaturated zone available for recharge (MCM)	514.24		
11.	Volume of water required for recharge (MCM)	683.82		
12.	Volume of surplus water available for recharge(MCM)	17.79		
	RECHARGE/ CONSERVATION STRUCTURES	Total Number of Recharge Structures	Total Cost (Rs. in crores)	Total Recharge in mcm
13	Farm Recharge @Rs. 35000/-	4391	15.369	3.655
14	RWH Rural @ Rs. 25000/-	1977	4.943	0.132
15	RWH Urban@ Rs. 25000/-	346	0.865	0.031
16	Underground pipe line (area in hectares) @ Rs. 50000/-	32434	162.170	104.21
	TOTAL		183.346	108.028

**BLOCK DHILWAN DISTRICT KAPURTHALA, PUNJAB
 DEPTH TO WATER LEVEL - DECADAL MEAN POST MONSOON
 VS
 DECADAL MEAN TREND POST MONSOON
 (2004-2013)**



Legend

Decadal mean water level (post monsoon)

- 5.00 - 10.00 mbgl
- 10.00 - 20.00 mbgl

Decadal mean water level trend (m)

- 0.00 - 0.1114
- 0.1 - 0.00

1782

**No. of Recharge Structures
in Rural Villages**

571

**No. of Recharge Structures
in Urban Towns**

2722

**Recharge Pits in
Agricultural Land**



Canal Network



Water Bodies

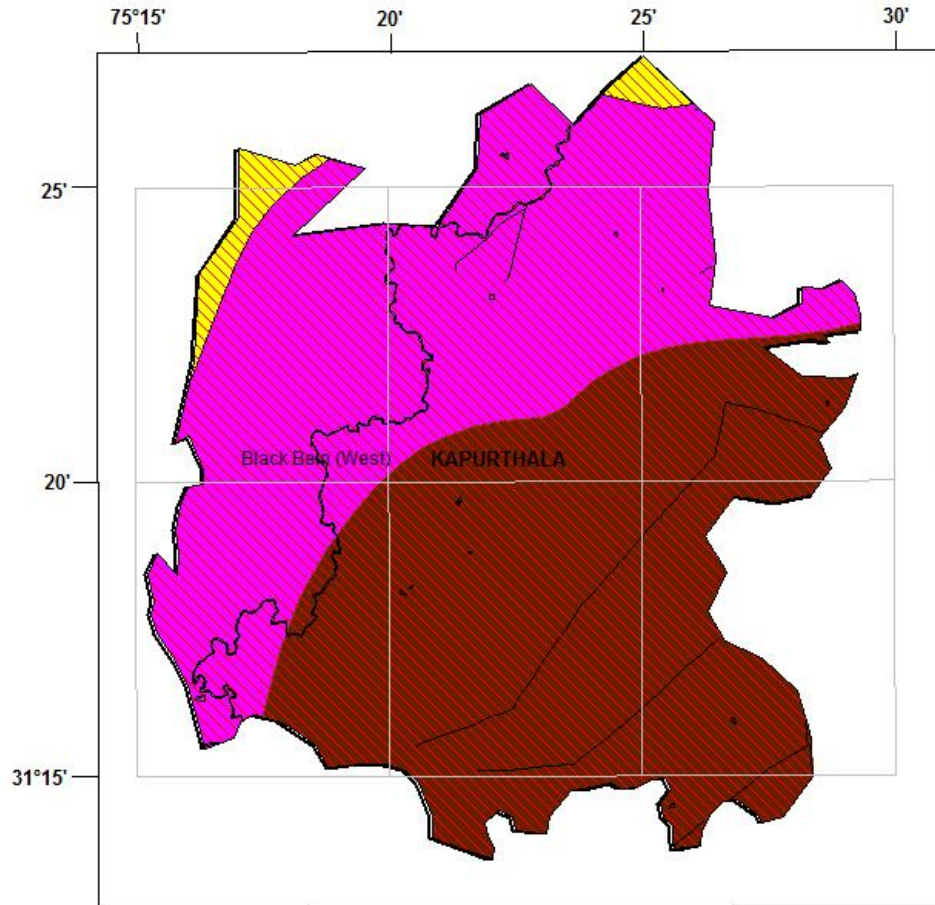
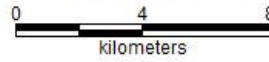
Ground Water Scenario of Block

Block Name:- Dhilwan		State:- PUNJAB
District:- Kapurthala		
1.	GENERAL INFORMATION	
	i) Geographical area (sq km)	256.5
	• Number of Villages inhabited • Un-inhabited	78 13
	ii) Average Annual Rainfall (mm)	707
	iii) Area feasible for Artificial Recharge	256.5
	iv) Village identified under scarcity of Water	86
	v) Village covered under water supply	15
	vi) Water Tank exists in the village	10
2.	GEOMORPHOLOGY	
	Major Physiographic	Alluvium Plain
	Major drainages Basin Sub-Basin	<i>Beas 100%</i>
3.	LAND USE	
	• Area According to Village Papers (Sq.Km)	268.95
	• Net Area Sown (Sq.Km)	216.20
	• Area Sown More than Once (Sq.Km)	--
	• Total Cropped Area (Sq.Km)	216.20
	• Cropping Intensity	100
• Area under Thur and Sem (Sq.Km)	--	
4.	PREDOMINAT GEOLOGICAL FORMATIONS	<i>Recent alluvium</i>
5.	HYDROGEOLOGY	

	Major Water bearing Formation (Aquifer)	Fine to coarse Sand	
	Avg. Depth to water level (decadal)	Depth to water level May 2015 (mbgl)	
	<ul style="list-style-type: none"> • Pre- monsoon: (May 2015) • 5.19 – 13.77 (mbgl) 	5.00 – 20.00 (mbgl)	
	<ul style="list-style-type: none"> • Post –monsoon: (Nov2014) • 5.50 – 13.69 (mbgl) 		
6.	GROUND WATER EXPLORATION BY CGWB (As on 31.03.2015)		
	• No of wells drilled	--	
	• Depth Range (m)	36.00-303.28	
	• Discharge (Ipm)	-----	
	Aquifer Parameters		
	• Transmissivity (m ² /day)	----	
	• Storativity	----	
	• Specified yield	0.072	
7.	GROUND WATER QUALITY	Min	Max
	• EC in $\mu\text{S}/\text{cm}$ at 25 ⁰ c	404	812
	• NO ₃ (mg/l)	3	31
	• F (mg/l)	0.07	0.15
	• As (mg/l)	0.072	0.072
8.	DYANMIC GROUND WATER RESOURCES in MCM	2011	
	• Net Ground Water Availability (Mcm)	138.82	
	• Existing Gross Ground Water Draft for Irrigation (Mcm)	282.68	
	• Existing Gross Ground Water Draft for Domestic and Industrial Water Supply (Mcm)	4.32	
	• Existing Gross Ground Water Draft for all Uses (Mcm)	286.69	
	• Allocation for Domestic and Industrial Requirement Supply up to next 25 years (Mcm)	5.28	
	• Net Ground Water Availability for Future Irrigation Development (Mcm)	-149.14	
	• Stage of Ground Water Development / Over Draft(%)	207	

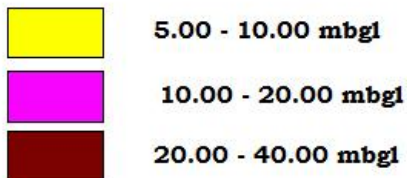
	• Category of Block	OE		
	Any specific reasons for high stress on ground water leading to Overexploitation and decline in ground water level	<i>Extensive Irrigation</i>	Extensive Irrigation	
9.	Percentage of sand thickness up to 50 m depth (Average)	<i>Thickness(m)</i> --	Percentage % -	-
10	Volume of unsaturated zone available for recharge (MCM)	296.61		
11.	Volume of water required for recharge (MCM)	394.42		
12.	Volume of surplus water available for recharge(MCM)	10.26		
	RECHARGE/ CONSERVATION STRUCTURES	Total Number of Recharge Structures	Total Cost (Rs. in crores)	Total Recharge in mcm
13	Farm Recharge @Rs. 35000/-	2722	9.527	3.217
14	RWH Rural @ Rs. 25000/-	1782	4.455	0.15
15	RWH Urban@ Rs. 25000/-	571	1.428	0.064
16	Underground pipe line (area in hectares) @ Rs. 50000/-	20509	102.545	72.18
	TOTAL		117.955	75.611

**BLOCK KAPURTHALA DISTRICT KAPURTHALA, PUNJAB
DEPTH TO WATER LEVEL - DECADAL MEAN POST MONSOON
VS
DECADAL MEAN TREND POST MONSOON
(2004-2013)**

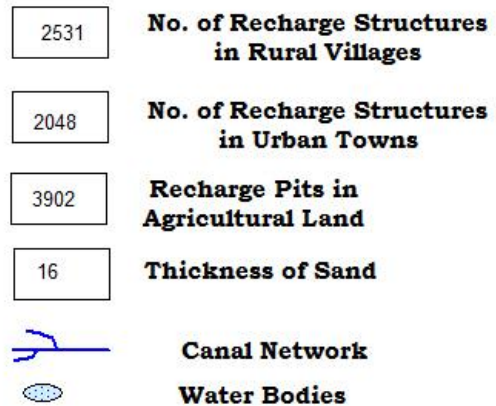


Legend

Decadal mean water level (post monsoon)



Decadal mean water level trend (m)



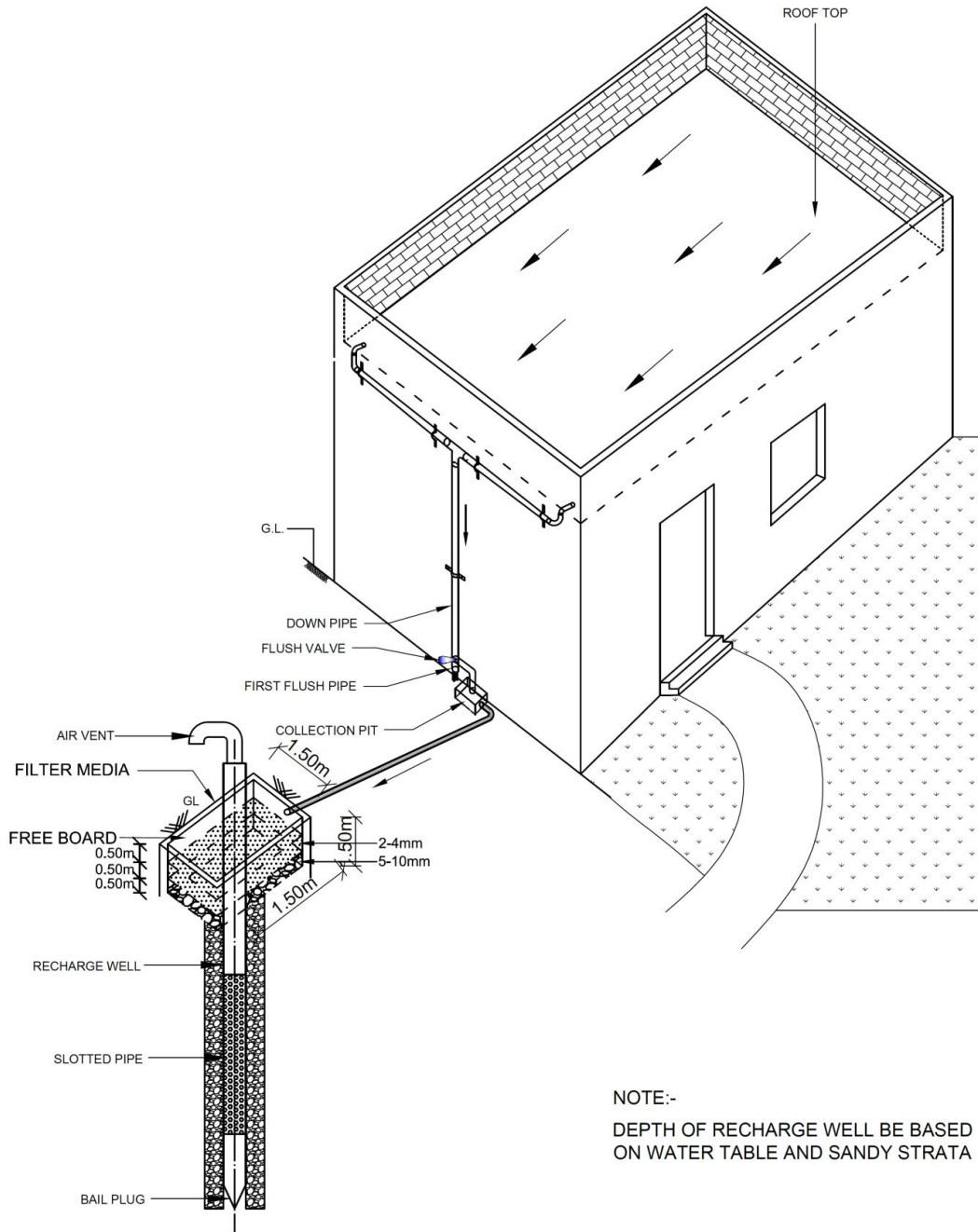
Ground Water Scenario of Block

Block Name:- Kapurthala		State:- PUNJAB
District:- Kapurthala		
1.	GENERAL INFORMATION	
	i) Geographical area (sq km)	392.1
	• Number of Villages inhabited • Un-inhabited	131 7
	ii) Average Annual Rainfall (mm)	681
	iii) Area feasible for Artificial Recharge	392.1
	iv) Village identified under scarcity of Water	146
	v) Village covered under water supply	57
	vi) Water Tank exists in the village	24
2.	GEOMORPHOLOGY	
	Major Physiographic	Alluvium Plain
	Major drainages Basin Sub-Basin	Beas 50% Satluj 50%
3.	LAND USE	
	• Area According to Village Papers (Sq.Km)	367.08
	• Net Area Sown (Sq.Km)	285.32
	• Area Sown More than Once (Sq.Km)	--
	• Total Cropped Area (Sq.Km)	285.32
	• Cropping Intensity	100
• Area under Thur and Sem (Sq.Km)	--	
4.	PREDOMINAT GEOLOGICAL FORMATIONS	Recent alluvium
5.	HYDROGEOLOGY	

	Major Water bearing Formation (Aquifer)	Fine to coarse Sand	
	Avg. Depth to water level (decadal)	Depth to water level May 2015 (mbgl)	
	<ul style="list-style-type: none"> • Pre- monsoon: (May 2015) • 8.75-26.60 (mbgl) 	5.00-40.00 (mbgl)	
	<ul style="list-style-type: none"> • Post –monsoon: (Nov2014) • 9.60-29.40(mbgl) 		
6.	GROUND WATER EXPLORATION BY CGWB (As on 31.03.2015)		
	• No of wells drilled	8	
	• Depth Range (m)	36.00-303.28	
	• Discharge (Ipm)	-----	
	Aquifer Parameters		
	• Transmissivity (m ² /day)	----	
	• Storativity	----	
	• Specified yield	0.072	
7.	GROUND WATER QUALITY	Min	Max
	• EC in $\mu\text{S}/\text{cm}$ at 25 ⁰ c	1050	1050
	• NO ₃ (mg/l)	136	136
	• F (mg/l)	0.18	0.18
	• As (mg/l)	0.0077	0.0184
8.	DYANMIC GROUND WATER RESOURCES in MCM	2011	
	• Net Ground Water Availability (Mcm)	143.56	
	• Existing Gross Ground Water Draft for Irrigation (Mcm)	267.64	
	• Existing Gross Ground Water Draft for Domestic and Industrial Water Supply (Mcm)	13.42	
	• Existing Gross Ground Water Draft for all Uses (Mcm)	281.06	
	• Allocation for Domestic and Industrial Requirement Supply up to next 25 years (Mcm)	15.52	
	• Net Ground Water Availability for Future Irrigation Development (Mcm)	-139.61	
	• Stage of Ground Water Development / Over Draft (%)	196	

	• Category of Block	OE		
	Any specific reasons for high stress on ground water leading to Overexploitation and decline in ground water level	<i>Extensive Irrigation</i>	Extensive Irrigation	
9.	Percentage of sand thickness up to 50 m depth (Average)	<i>Thickness(m)</i> 16	Percentage % 32	
10	Volume of unsaturated zone available for recharge (MCM)	453.41		
11.	Volume of water required for recharge (MCM)	602.93		
12.	Volume of surplus water available for recharge(MCM)	15.68		
	RECHARGE/ CONSERVATION STRUCTURES	Total Number of Recharge Structures	Total Cost (Rs. in crores)	Total Recharge in mcm
13	Farm Recharge @Rs. 35000/-	3902	13.657	3.986
14	RWH Rural @ Rs. 25000/-	2531	6.328	0.207
15	RWH Urban@ Rs. 25000/-	2048	5.120	0.230
16	Underground pipe line (area in hectares) @ Rs. 50000/-	27779	138.895	68.35
	TOTAL		164.000	72.77

RECHARGE FROM ROOF TOP RAIN WATER HARVESTING (URBAN & RURAL HOUSEHOLDS)



3-D VIEW

CGWB/NWR/Chandigarh

