कार्यालय कार्यपालन यंत्री

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पत्र क्रमांक 1197 /कार्य/गंगाबावडी वन प्रकरण/2025 दिनांक 14/05/25

प्रति,

वन मण्डलाधिकारी

जिला नीमच

विषय :– जिला नीमच अंतर्गत गंगाबावडी तालाब योजना के निर्माण हेतु 43.149 हेक्टर वन भूमि जल संसाधन विभाग को उपयोग पर देने बाबत्।

संदर्भ :– आपका पत्र क्र./तकनीकी/2025/2893 नीमच दिनांक 13.05.2025

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उपरोक्त विषयान्तर्गत लेख है कि जिला नीमच अंतर्गत गंगाबावडी तालाब योजना के निर्माण हेतु 43.149 हेक्टर वन भूमि जल संसाधन विभाग को उपयोग पर देने के संबंध में उप वनमण्डलाधिकारी मनासा एवं वन परिक्षेत्राधिकारी रामपुरा द्वारा प्रेषित प्रतिवेदन अनुसार संशोधित कैचमेंट एरिया ट्रीटमेंट प्लान आपकी ओर आवश्यक कार्यवाही हेतु संलग्न प्रस्तुत है।

संलग्न :– उपरोक्तानुसार

(विमल श्रीवास्तव)
कार्यपालन यंत्री
जल संसाधन संभाग, नीमच

पृष्ठा. क्रमांक 1198 /कार्य/गंगाबावडी वन प्रकरण/2025 दिनांक 11/05/25

प्रतिलिपि :–

अनुविभागीय अधिकारी, जल संसाधन उपसंभाग रामपुरा की ओर अनुशीलन हेतु।

(विमल श्रीवास्तव)
कार्यपालन यंत्री
जल संसाधन संभाग, नीमच

GOVERNMENT OF MADHYA PRADESH

WATER RESOURCES DEPARTMENT

GANGA BAWADI TANK
Catchment Area Treatment Plan
Amount Rs. 56.83 Lakhs

DISTT. :- NEEMUCH TEH:- MANASA BLOCK:- MANASA

EXECUTIVE ENGINEER
WATER RESOURCES DIVISION
NEEMUCH (M.P.)

CATCHMENT AREA TREATMENT PLAN

1.1 Introduction

It is well-established fact that reservoirs formed by dams on rivers area subjected to sedimentation. The process of sedimentation embodies the sequential processes of erosion, Entrainment, transportation, deposition and compaction of sediment. The study of erosion and sediment yield from catchment is of up most importance as the deposition of sediment in reservoir reduces its capacity. Thus affecting th water available for the designated use. The eroded sediment from catchment when deposited on streambeds and banks causes braiding of river reach. The removal of top fertile soil from catc ment also adversely affects the agricultural production and growth of plants another crucial factor that adds to the sediment load and which contributes to soil degradation is grazing pressure.

The lack of proper vegetal cover is a factor to cause degradation and thereby results in severe run off/soil erosion, and subsequently premature siltation of the reservoir. Thus, a well designed catchment area treatment (CAT) plan is essential to ameliorate the above- mentioned adverse cause and process of soil erosion. The Catchment Area treatment involves the understanding of the erosion characteristics of the terrain and suggesting remedial measures to reduce the erosion rate. For this reason, the catchment of the directly draining rivers, streams, tributaries, etc. are treated and the cost is included in t e project cost.

The pre-requisite for a watershed management is the collection of multipronged data e.g. geology, geomorphology, topography, soil, land use/land cover, climate, hydrology, drainage pattern, etc. the multi-pronged data generated from various published sources and actual data collected from these watershed on the above mentioned parameters forms the basis of the action plan for catchment area treatment is presented here.

Catchment area treatment (CAT) plans for the free draining catchment area of the proposed project has been prepared for areas with high soil erosion intensity. The CAT plan targets toward overall improvement in the environmental conditions of the region. All the Activities are aimed at treating the degraded and potential areas with severe soil erosion. The plan provides benefits due to biological and engineering measures and its utility in Maintaining the ecosystem health. The plan with objectives addresses i sues such as prevention of gully erosion, enhanching the forest cover for increasing soil holding capacity and arresting total sediment flow in the reservoir and flowing waters.

1.2 Objectives

Integrated watershed management plan minimizes the sedimentation of reservoir. The main aim of the catchment area treatm nt plan is to rejuvenate various potential and degraded ecosystems in the catchment area for longevity of the reservoir storage capacity. For this purpose, the action plan has been prepared with the following objectives.

1 To facilitate the hydrologi al functioning of the catchment and to augment the quality of water of the river and its tributaries.

2. Conservation of soil cover and to arrest the soil erosion, floods and siltation of the river along with its tributaries and consequent reduction of siltation in the reservoir of the project.

3. Rehabilitation of degraded forest areas through afforestation and facilitating natural regeneration of plants.
4. Mitigation of landslide, landslip and rock falls.
5. Soil Conservation through biological and engineering measures to reduce sedlment load in river and tributaries, incidentally improving the quality of water.
6. Ecosystem conservation resulting from increased vegetal cover and water retaining properties of soil.

1.3 Catchment Area

Ganga Bawari Tank Project Scheme is a minor irrigation rises on Local Nalla in the manasa Range of Neemuch Division in the Neemuch distt., of Madhya Pradesh at Ganga bawari Village Block manasa elevation on 500 m. Geographical coordinat's origination are at north Latitude 24^0-33'-30" and East Longitude 75^0-10'-00". The side can be located on the Topo sheet No. 45 P/2 Minor Local Nallas flows in a generally direction for a total length of 10 km away to join the river. The forest area boundary in the catchment as per the forest proposal is about 12.62 Sq.Km & about 0.3939 Sq.Km is in the submergence.

1.4 Free Draining Catchment

CAT Plan has been formulated for free draining catchment I.e. up to the p oposed Ganga bawari Tank Project on minor nallas of ganga bawari Village. Free draining catchment area for this CAT plan is 12.81 Sq.Km. As per nomenclature contained in water atlas of india, edition 1993, the free draining catchment under the study area lies in water resources Region- (Chambal) Basin Catchment 2D4

The basin characteristics watershed are illustrated in table 1.1 the satellite imagery of the free daring catchment is presented in figure 1.1 the intercepted catchment area is 12.68 Sq.km. net Catchment area of project is 12.81 sq.km also illustrated in table 1.1

The basin characteristics of different sub-watersheds are illustrated in table 1.1 and the mosacic map of watershed location is shown in figure 1.2.

Table – 1.1 Ganga Bawari Tank Project area details

S. No.	Particulars	Value
1	Gross Catchment Area	12.81 Sq.Km
2	Designed flood (Estimated SPF)	161.84 Cumecs
3	Net 75% dependable Yield	2.44 MCM
4	Full reservoir (FRL)	108.60 M
5	Tank Bund Level (TBL)	111.80 M

Table – 1.2 Basin Characterlstics of Different sub- watershads

S. No.	Watersheds	Total catchment area (SqKm)
1	2D4	12.81
	Total	12.81

Catchment Area of Ganga Bawari Tank Scheme

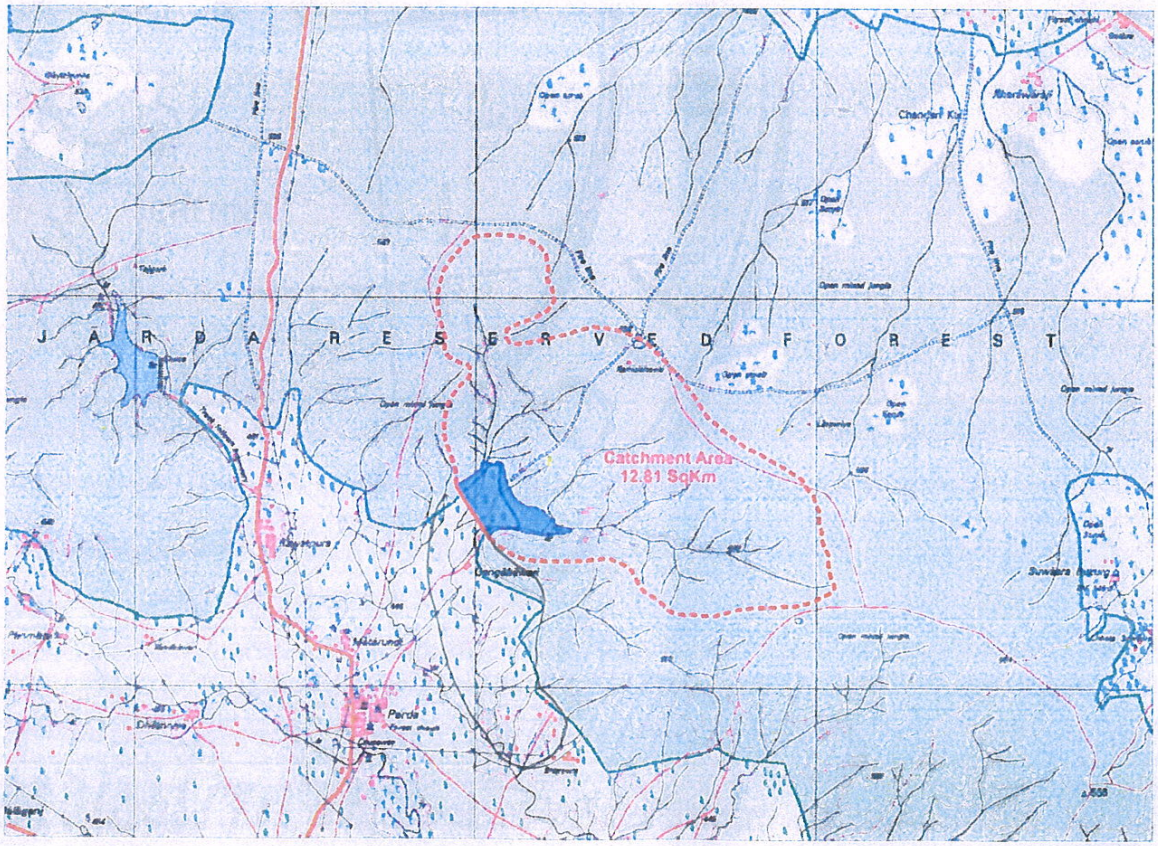

Figure 1.1 : FCC Map of Catchment Area

Catchment Area of Ganga Bawari Tank Scheme

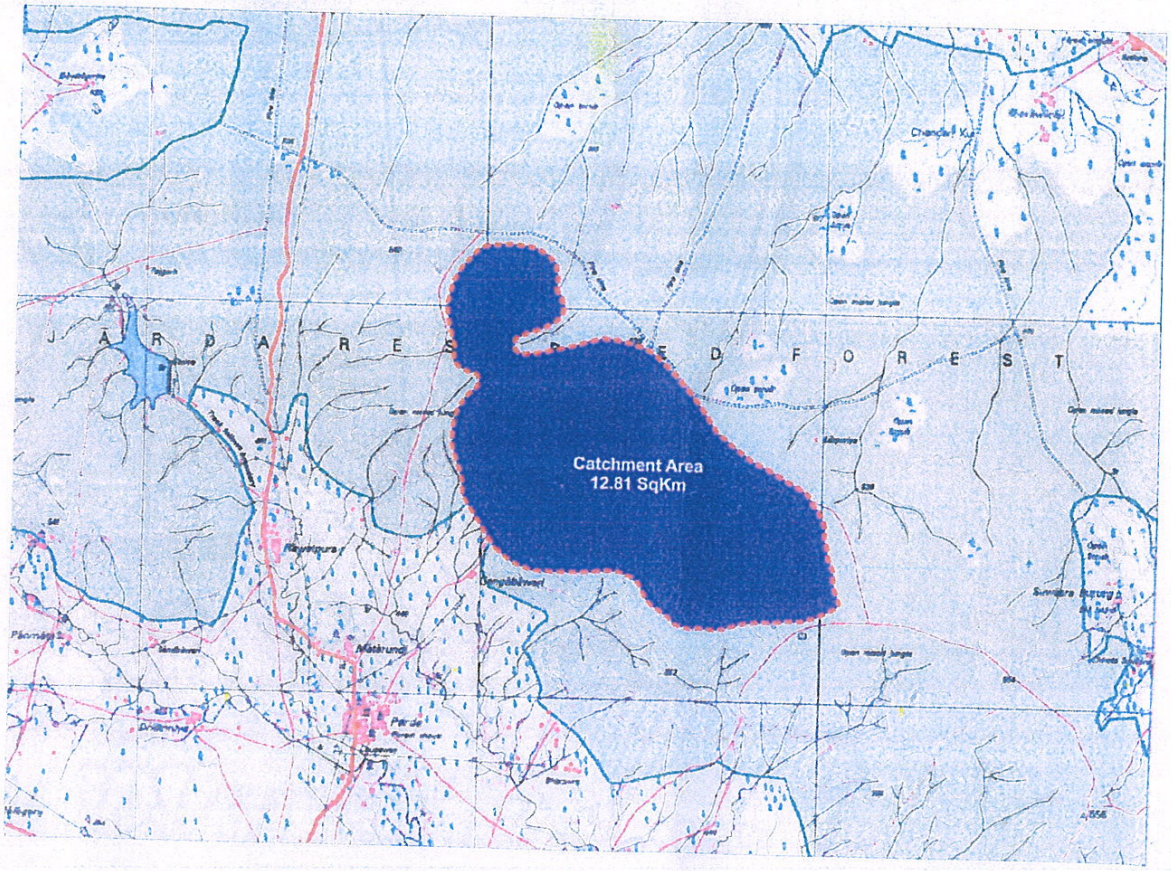

Figure 1.2 : Mosaic Map showing Location of Sub-watershed

1.5 Topography

The project catchment area is non hilly and nearby 51.13 % of catchment is covered by open/degraded/forest of deciduous dry type with scrubs/bushes/grasses.

Total catchment area of project is 12.81 Sq.km and there are 1 proposed minor scheme Ganaga Bawari tank on this project . the drainage map of the catchment is shown is figure 1.3.

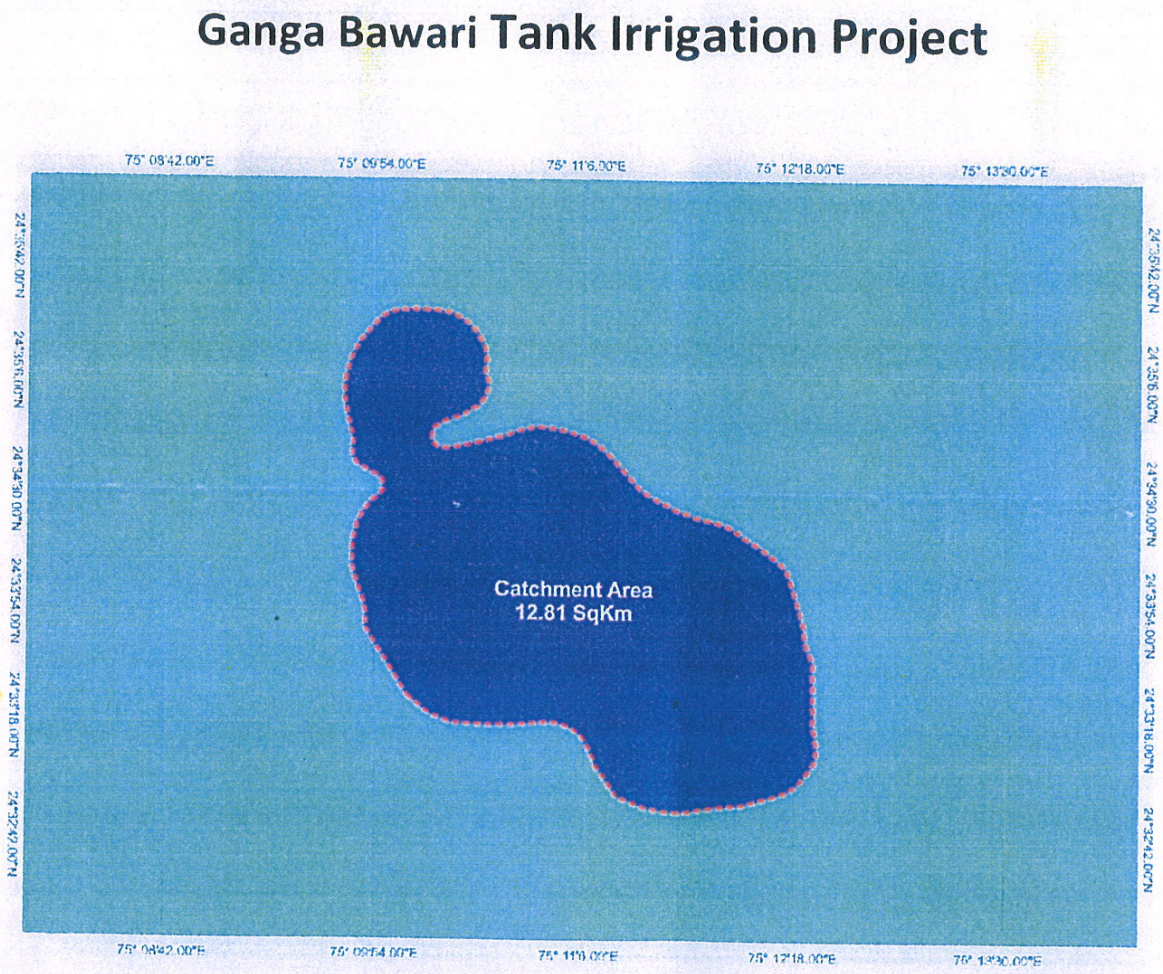

Figure 1.3 : Drainage map of the catchment

1.6 Soil

Soil erosion and Forest Area Coverage.

Mainly this area has medium black soils which cover the largest area in the state, The black soils are medium in depth. Shallow soils are also common. It is observed that soils of central malwa plateau are slightly coarse in texture than in other parts. The soils are usually dark brown in color, light reddish soils are also common. The malwa plateau is a vast undulating plain with a few hilly range. The light reddish, soils and shollow soils are found around these hill ranges.

Soil erosion in the malwa plateau region is not problem, as the catchment area is in hilly range which consist tropical thorry forest growing babool, ber and pala's. which results has no loss of soil fertility and no such increased sediment load in the rivers. During ground survey the soil is pronominally loam clay and deep brown in colour i.e. hard soil and moorum.

Therefore, it is not required to e proper maintenance of soil functions and its health. So this project not proposing additional measures for management interventions in the relevant watershed. The slope and the satellite maps are attached for the reference of slope and soil erosion.

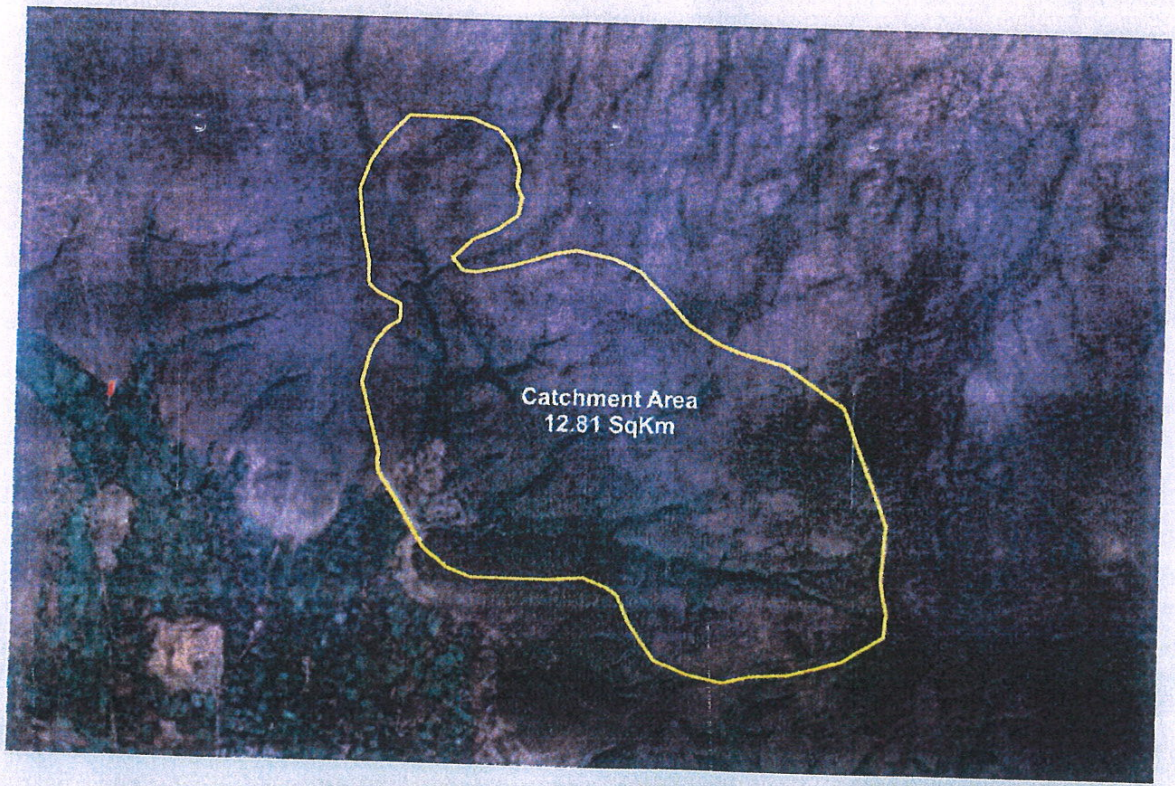

Figure – Catchment Area Forest Cover Map

1.7 Land use

Land use-land cover classification

Based on satellite data a d topo sheets, a land-use map has been prepared and verified in detail during ground surveys i.e. crosschecked with ground truths. The land use/land-cover map of the catchment area is presented in figure 1.5 and its details are presented in table 1.3.

Land use Categories and erosion

The erosion acts differently in different land-use types. It is important to understand the nature of erosion in a land-use class to further plan for treatment.

Agricultural Land

Around 0.21 Sq.km area of the catchment constituting 1.63 % of the total catchment comes under this category. Plain to well-planned and developed terraces were seen at some places. In general, at places the sheet and rill type of soil erosion predominates with few gullies in early stage of its development. Very few or no measures are taken to conserve soil and tendency exists to interrupt the natural drainage due to faulty agricult ral practices. Runoff often exceeds the safe velocity on long slope lengths. It is suggested to repair and better design the agricultural terraces, which follows the faulty agricultural practices.

Temporary and semi-permanent soil conservation structures like brushing dams, wiring woven and gabion check dams etc. shall be made for effective adaptive management.

Protected Forest Land

Under Protected forest category about 6.55 Sq.km constituting 51.13% of the total catchment, is present. Soils have relatively good water holding capacity, humus, nutrient content and moderate to slight erosion rates on steeper slopes. Therefore, rill erosion predominates which in due course leads to scrub land formation with gullies. Afforestation is suggested so as increase the crown density by 20 % in whole of the area to reduce erosion.

River/Water body

Around 0.05 Sq.km area constituting 0.39% of the catchment area is classified under water bodies. The category needs no treatment except that the unstable bank shall be provided stream bank stabilization through protection measures whenever required.

Scrub/Bushes/Grasses

Under Shrub category about 6.00 Sq.km area of catchment constituting 46.85% of the total catchment is present.

Table 1.3: Land use classification for free draining catchment at project site

S. No.	Land use/Land cover	Area %	Area (ha)
1	River/Water Bodies	0.39%	5.00Hact.
2	Agricultural Areas	1.63%	21.00 Hact.
3	Protected Forest	51.13%	655.00 Hact.
4	Scrubs/Bushes/Grasses	46.85	600.00 Hact.
	Total	**100.00%**	**1281 Hact.**

Ganga Bawari SCHEME CATCHMENT AREA 12.81 Sq.K.M.

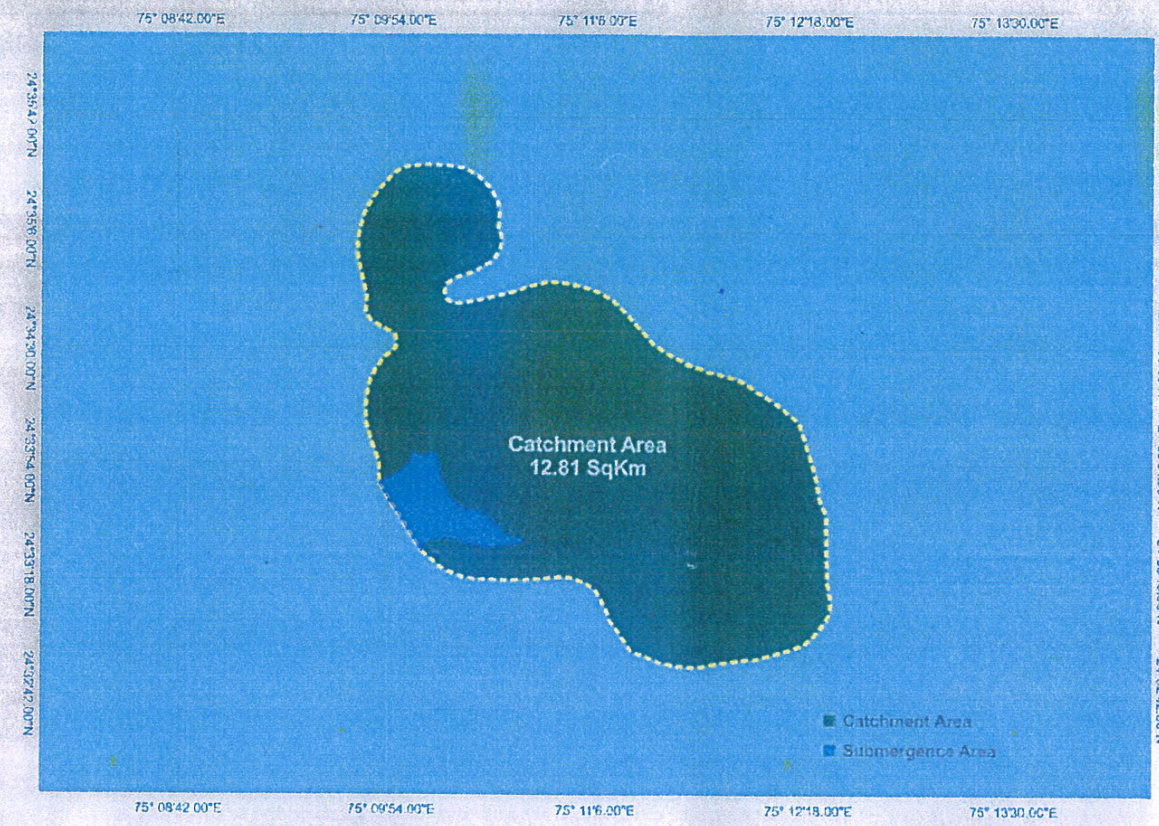

Figure 1.5 Land use Map of Catchment Area

Slope

The slope of a watershed plays a key role in controlling the soil and water retention thereby affecting the land-use capability. The percentage of the slope in a watershed determines the soil erosion susceptibility and basis for classifying different of the watershed into suitable classes for formulating effective soil erosion conservation measures. Broadly, the following slope classes and ranges (Table1.4) as per norms of all india soil & Land use survey were adopted to classify the slopes for the present study.

Table 1.4: Slope Ranges showing the intensity of catchment area

S.No.	Slope Range (Degrees)	Description
1	0-5	Very Gentle Slope
2	5-10	Gentle Slope
3	10-15	Moderate Slope
4	15-25	Moderately Steep Slope
5	25-35	Steep S ope

The Slope map of the free draining catchment is presented under Table 1.5

Table 1.5 : Area Falling under different slops categories

Slope Category (%)	Area (%)	Area (Sq.km)
0-10	56.67	7.26
10-20	28.74	3.68
20-30	14.59	1.87
Total	100	12.81

Figure 1.5 : Slope Map of Catchment

1.8 Methodology Used for the study

Superimposing topography, slope, soil and land use data/maps, a tentative estimation of erosion prone areas and landslides area in the catchment were made. The vulnerable and problematic areas were identified in different physiographic zones.

These-data sets were used for preparation of the thematic maps, calculation of sediment yield index and Erosion intensity Units.

Soil loss using silt yield index (SYI) Method

- The silt yield index model (SYI), Considering sedimentation as product of erosivity, erodibiity and aerial extent was conceptualized in the all india soil and land use survey (AISLUS) as early as 1969. And has been in operational use since then to meet the requirements of prioritization of smaller hydrologic units within river valley project catchment areas.
- Methodology for the ca culation of sediment yield index developed by all india soil b land use survey (Development of agriculture, Govt. of India) was followed in this study.

Erosion intensity and Delivery Ratio

- Determination of erosion intensity unit is primarlly based upon the integrated information on soil characters, physiographic, slope, land-use/land-cover, litho logy and structure. This is achieved through super-imposition of different thematic map overlays, Based upon the field data collected during the field survey and published data, weightage val e and delivery ration were assigned to each erosion intensity unit. The composite map for delineating different erosion intensity units was prepared through superimposition of the maps showing soil types, slope and land-use/land cover this thematic mapping of erosion intensity for entire catchment was done using the overlay and union techniques Based on ground truth verification conducted during fields work and published data, weightage and delivery ratio was assigned to each erosion intensity units. The composite erosion intensity map was then superimposed on the drainage map with sub-watershed boundaries to evolve CEIU for individual sub-watershed.

- Each element of erosion intensity unit is assigned a weightage value. The cumulative weightage values of the erosion intensity units represent approximately the relative comparative erosion intensity within the watershed . A Basic factor of K=10 was used in determining thess cumulative weightage values. The value of 10 indicated an equilibrium condition between erosion and deposition. Any value of K(10+x) is suggestive of erosion intensity in an ascending order whereas the value of K (10-X) is suggestive of deposition intensity in descending order.

- The delivery ratios were calculated for each composite erosion intensity unit. The delivery ration suggests the percentage of eroded material that finally finds entry into the reservoir or river/stream total area of different erosion intensity classes (composite-erosion intensity unit) in each watershed was then calculated.

- The delivery ratio is gen rally governed by the type of material, soil erosion, relief length ratio, cover conditions, distance from the nearest stream, etc. however, in the present study the delivery ration to the erosion intensity units were assigned upon their distance from the nearest stream (being the most crucial factor responsible for delivery of the sediments) per the following scheme. The delivery ratio criteria adopted for the study is presented in table 1.6.

Table 1.6 : Delivery ratio (DR) Criteria

Nearest Stream	Delivery Ratio (DR)
0-0.9 Km	1.00
1.0-2.0 Km	0.90
2.1-5.0 Km	0.80
5.1-15, Km	0.70
15.1-30 0 Km	0.50

(ii) **Sediment Yield index & rioritization of sub-watershed**

- The erosivity determinates are the climatic factors and soil and land attributes that have direct or reciprocal bearing on the units of the detached soil material. The relationship can be expressed as:

Soil erosivity = f(Climate, physiography, slope, soil parameters land use/land cover, soil management)

- The Slit Yield index (SYI) is defined as the yield per unit area and SYI value for hydrologic unit is obtained by taking the weightage arithmetic mean of the products of the weightage value and delivery ratio over the entire area of the hydrologic unit by using suitable empirical equation.

- Prioritization of smaller ydrological units within the vast catchments is based on the SYI of the smaller units. The boundary values of range of SYI Values for different priority categories are arrived at by studying the frequency distribution of SYI values and locating the suitable breaking point. The watershed/sub-watershed are subsequently rated into various categories corresponding to their respective SYI values.

- The application of SYI model for prioritization of sub-watershed in the catchment areas invalves the evaluation of :
  * Climatic factors comprising total precipitation, its frequency and intensity
  * Geomorphic factor comprising land forms, physiography, slope and drainage characteristics
  * Surface cover factors governing the flow hydraulics
  * Management Factors.

- The data on climatic factors can be obtained for various locations in the catchment area from the meteorological stations whereas the field investigations are required for estimating the other attributes.
- The various steps involved in the application of model are :
- Preparation of a framework of sub-watershed through systematic delineation
- Rapid reconnaissance surveys on 1:50,000 Scale leading to the generation of a map indicating erosion-intensity mapping units.
- Assignment of weight age values to various mapping units based on relative silt-yield potential.
- Computing silt yield index for individual watershed/ sub watershed.
- Grading of watershed/sub-watershed into very high, high medium. Low and very low priority categories.
- The area of each of the mapping units is computed and silt yield indices of individual sub-watershed are calculated using the following equations :

Silt Yield index

SYI = (AI X WI X DI) X 100/Aw ; where I – 1 to n

Where

AI	=	Area of Ith (EIMU)
WI	=	Weight age value of Ith mapping unit
DI	=	Delivery ratio
n	=	No. of mapping units
Aw	=	Total area of sub-watershed

The SYI values for classification of various categories of erosion intensity rates were taken for the present study as :

	Priority Category	SYI Values
1	Very High	> 1300
2	High	1200-1299
3	Medium	1100-1199
4	Low	1000-1099
5	Very Low	<1000

Accordingly, the sediment yield index has been calculated for sub-watershed. The computation of SYI for each SWS is presented in Table 1.7.

Table 1.7 : SYI and Priority Rating as per Erosion intensity

Watershed	Erosion intensity	A ea (Ha)	Weightage	Area X Weightage	Delivery Ratio	Sediment Yeild	Sdeiment Yeild index	Priorit
2D4	V. severe	55	18	990	0.9	8 1		
2D4	Severe	128	16	2048	0.9	1843.2		
2D4	Moderate	259	14	3626	0.9	3263.4	1260	Matti
2D4	Slight	310	12	3728	0.9	3355.2		
2D4	Negligible	529	10	5290	0.8	4232		
	Total	**1281**				13584.8		

1.9 Catchment Area Treatment Plan

There are mainly four categories of land used for which a proper treatment plan should be developed. First is the agricultural land, as this activity can never be eliminated, because the faulty practice results in heavy loss of fertile soil. Second, being open forestland for abvious conservation reasons. Third is scrub or degraded land, which contributes heavily to the silt load and possibilities exist to bring this area under pastures and other plantation to meet the local demand of fuel and fodder and thus decreasing the biotic pressure on the forests and leading to environment friendly approach of sustainable development. The fourth and most important category is barren land because with practically no vegetal cover. The area produces huge amount of silt load. Where in a few places soil conservation measures are required. For treatment of catchment area. The areas that require treatment have been delineated from the composite erosion intensity unit map. The sum of weightage was reclassified as per the table 1.8 below to further subdivide the area as per the erosion intensity classes. The weightages for land use, slope & soil were summed to get the Erosion intensity Classes.

Table 1.8 : Erosion intensity & Weightages

Erosion intensity Class	Sum of weightages
Very severe (E5)	12 to 14
Severe (E4)	9 to 11
Moderate (E3)	6 to 8
Slight (E2)	4 to 5
Negligible (E1)	0 to 3

After exclusion of rocks and inaccessible terrain, only those areas which fall under very severe and severe erosion intensity category would be taken up for conservation treatment measures in very high priority category micro-watershed, whereas in the rest of micro-watershed belonging to other priority categories, the area falling under very severe erosion intensity class shall be taken to treatment with biological and engineering measures under the CAT Plan.

Considering the topographic factors, soil type, climate, land-use/land-cover in the catchment area following engineering and biological measures have been proposed to be undertaken with the aim to check the soil erosion, prevent/check siltation of reservoir and to maintain its storage capacity in the long run. The Aulliya watershed area Treatment map is presented in figure 1.7 and the statistics are presented in Table 1.9.

Table – 1 9 : Area of Low sediment index watershed wise

S. No.	Watershed	Very severe	Severe	Moderate	Slight	Negligible	Water bodies	Total
1	2D4	0.55	1.28	2.59	3.10	5.29	-	12.81

1.10 Treatment of individual sub-watershed

There are mainly five categories of land uses for which a proper treatment plan should be developed first is the agricultural land as this activity can never be elimi ated and, agriculture activities, if faulty, result in heavy loss of fertile soil. Second. Is open forest land for conservation reasons third is scrub or degraded land which contributes heavily to silt load. Possibilities exist to bring this area under pastures and plantation to meet local demand of fuel and fodder and thus decreasing the biotic pressure on the forests leading to environment friendly approach of sustainable development. The fourth and most important category is barren land because with practically no vegetal cover the area produces huge amount of silt load. T e fifth is dense forest land where a few places soil conservation measures are required.

In the present case An area of 1281 ha falling under forest case would be taken up for conservation under the CAT plan within free draining catchment.

Considering the topographic factors, soil type. Climate, land –use/land-cover in the catchment area following measures have been proposed to be undertaken with aim to check soil erosion, prevent/check siltation of reservoir and to maintain its storage capacity in the long run.

1.10.1 Activities to be Undertaken Enrichment

Plantation

There are a few locations within forest in the catchment area where the crown density is poor and plantation can be done to increase the patch density of crop.

Treatment of pasture

The restoration and management of degraded pasture is a vital objective, both to provide sufficient habitat for spatial movement of the spillover species outside and within catchment area and to provide biological resources to the local populace. The pastures have their own unique significance in the geophysical, environmental and socio-economi set-up of the region. They are the prime and continual source of herbage for the wild herbivores which are prey base for carnivores, cattle, sheep and goats. These pastures are extensively grazed by the live stocks of the local people. The large scale and indiscriminate grazing of these pasture over a prolong time has left these pastures ominously degraded. The palatable grasses are no more than a few inches tall and the other related pasture species have also started showing signs of stress. Because of continuous and heavy pressure of grazing. Barren patches have developed over vast areas and soil erosion is rampant in these pastures. There is an imperative need to address this abysmal and alarming ituation immediately before these pastures are brought to such a condition, where, their rejuvenation becomes impossible. Owning to traditional rights of the grazers, it is difficult to restrict the number of animals grazing there. Thus, the only alternative left is to increase the p oductivity of these pastures to cope with the grazing pressures. The situation warrants for a realistic survey and allied research in context of entire grazing issues and formulation of an action plan for corrective measures within the gambit of the state policy on the subject matter. Till such time the following recommendations are made for the management of pastures.

- Assessment of the carrying capacity of the pastures through surveys to ascertain allowable size of live stocks.
- Periodical field checking of the size of the herds mentioned in the permits to avoid misuse by some permit holders.
- Public awareness.
- Periodical closure of areas in pastures for the proliferation of seeds of desirable grass species.
- Implementation of rotational deferred grazing system to derive the advantage of early nutritive growth and rest period during the growing season.
- Interaction with the local people and so that a sort of social could be achieved.

Nursery support

In order the meet the huge requirement of saplings required under biological/bioengineering measures and reservoir rim treatment new nursery has to be developed along with support to the existing nurseries which shall also augment the supply of saplings for the works proposed.

Table – 1.14 : Basis for selection of catchment area treatment measures

Treatment measure	Basis for selection
Social forestry, fuel wood and fodder grass development	Near settlements to control tree felling
Contour Bunding	Control of soil erosion from agricultural fields.
Pasture Development	Open Canopy, barren land, degraded surface
Afforestation	Open canopy, degraded surface, high soil erosion, gentle to moderate slope
Barbed wire fencing	In the vicinity of afforestation work to protect it from grazing etc.
Step drain	To check soil erosion in small streams, steps with concrete base are prepare in sloppy area where silt erosion in the stream and bank erosion is high due to turbidity of current.
Nursery	Centrally located points for better supervision of proposed afforestation, minimize cost of transportation of seeding and ensure better survival.

Civil Structures

- **Brush wood check dams and Retaining walls**

Brushes wood check dams are useful in arresting further erosion of depressions, channels, and gullies on the denuded landslides. In addition, retaining walls of stone masonry and RCC would be constructed to provide support at the base of threatened slopes.

- **Slope modification by stepping or Terracing**

The slope stability increases considerably by grading it. The construction of steps or terraces to reduce the slope gradient is one of the measures.

- **Bench Terracing**

The area under moderately steep slope i.e. between 10^0-15^0 slopes would be subjected to bench terracing. The local people would be convinced to follow this type of terracing for comparatively better yield and with minimum threat to erosion, moreover, in several habitations in the catchment such practices are already v sible. While making bench terraces, care must be taken not to disturb the topsoil

By spreading earth from the lower terraces to higher terraces. The verti al intervals between terraces will not be more than 1.5 m and cutting depth may be kept at 50 cm. the minimum average width of the terrace would e kept from 4 to 5 m to enable usage of prolong hinge. The shoulder bunds of 30 x 15 cm would also be provided staggered channels will drain off the excess water from the terraces.

- **Gully Control- Check Dams**

Gullies are mainly formed because physiographic, soil type, and heavy biotic interference in an area. The scouring of stream at their peak flows and sediment laden run-off cause gullies. The gullies would be required to be treated with engineering/mechanical as well as vegetative methods. Check dams would be constructed in some of the areas to promote growth of vegetation that will consequently lead to the stabilization of slopes/ area and prevention of further deepening of gullies and erosion. Diverse types of check dams would be required for different co ditions comprising of different materials depending upon the site conditions and the easy availability of material (stones) at local level and transport accessibility, Generally, brush wood check dams are recommended to control the erosion in the first order basin/streams in upper reaches and dry random stone masonry check dam shall be provided in the lower reaches where discharge is higher in such stream where discharge and velocity of flow are still higher gabion structure shall be provided Lower down the sub-watershed, i.e. in the t ird order drainage silt retention dams in the form of gabion structure shall be provided.

- **Stream bank Protection**

Stream bank erosion is caused by variety of reasons such as destruction of vegetative cover, mass movement on unstable bank slopes, undermining of top portion of lower bank by turbulent flow and sliding of slopes when saturated with water. The stream bank protection would include wire crate boulder spurs in two to three tiers depending upon the high flood level of the stream.

- **Contour Staggered Trenches**

Contour Staggered trenches are mainly, provided to trap the silt and runoff. This is also done to prepare a fertile base for plantation, in moderately steep to very, very steep slopes.

- **Landslide Control**

Rainfall pattern of the area and water seepage coupled with geological formation results in landslides. Water plays an important role in triggering of landslides and mass wasting processes along with other factors such as slope and nature of soil/land-cover/land-use, however, most of the landslides are caused by human negligence. Road construction, overgrazing of hill slopes, felling of trees for timber, fuel, and fodder and upslope extension of cultivation are some of main causes of landslides. Gabion structures shall be provided at the base of the land slide zones to control the toe erosion by water.

- **Provision for Forest Protection**

The need for rigorous watch and ward of the forest covered under the catchment area becomes more imperative in view of proposed new plantation under the CAT plan and due to increased human activity in the form of labour, who shall be engaged for forestry works. Thus, fire protection measures including construction and maintenance of fire lines, construction of check posts, watch towers have to be undertaken, Besides these construction/ repair of forest boundary pillars shall also be carried out. The forest staff shall have to be properly equipped with modern utility gadgets like walky-talky, GPS and fire-fighting equipment's.

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1.11 Cost estimation for treatment in Forest area coming under-Catchment Area

Total Catchment Area = 1281 Ha

Total affected Forest Area = 43.149

Name of Forest Division :- Neemuch, Distt. – Neemuch

(Estimate is prepared on basis of approved estimate of Ganga Bawari Tank Project CAT Plan

For 1st year Daily Wages Rate Rs.:- 466/- (Year 2025-26)

S.No.	Description of work	Unit	Qty.	Rate in Mandays per unit	Total Amount (Rs.)
1	Survey of Area with cleaning in 3 m wide strip & marking over tree lie within 3 m strip and fixing of pegs on 200-200 meter-interval with making of frame (Khancha) & writing over them.	Hact.	1281	0.45	268626
2	Construction of Check dam by Collection of loose Boulders spread over surface of forest area	Cum	5000	1	2330000
3	Excavation work of pond	Cum.	5000	0.6	1398000
4	Marking of Contour Trench and excavation in Forest Area	RM	2000	0.1115	103918
5	Work Execution supervision & other expenses	L.S.	L.S.	L.S.	133956
				Total Amount	**4234500**

For 2nd year Daily Wages Rate Rs.:- 512/- (Year 2026-27)

S.No.	Description of work	Unit	Qty.	Rate in Mandays per unit	Total Amount (Rs.)
1	Seed collection/ purchase work	Per kg	1922	200	384300
2	Seed sowing work on pond	RM	15000	0.0025	19200
3	Seed sowing work in bushes	Ha	480	4	983040
4	Seed sowing work on contour trenches in forest area	RM	2000	0.0025	2560
5	Other expenses	L.S	L.S	L.S	59400
				Total Amount	**1448500**

Total Cost of treatment ofCatchment Area (Year1+Year 2) 5683000

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COST BENEFIT ANALYSIS FOR

GANGA BAWARI TANK PROJECT NEEMUCH

Table-A Cases User which A Cost Benefit Analysis for Forest Diversion Area Required

S. No.	Parameters	Applicable/Not Applicable	Remark
1	All categories of proposal involving forest land up to 7.98 Ha. In plains and up to 30 Ha. In hills.	Applicable	
2	Proposal for defense installation purpose and oil prospecting (prospecting only)	Not Applicable	
3	Habitation, establishment of industrial units. Tourist lodges complex and other building construction.	Not Applicable	
4	All other proposal involving forest land more than 7.98 Ha. In plain and more than 30 Ha. In hills including roads, transmission lines, Minor, medium and major irrigation project, hydro projects, mining activity, railway lines, location specific installation like micro-wave station, auto repeater centers. TV towers etc.	Applicable	These are cases where a cost benefit analysis is necessary to determine when diverting the forest land to non forest use of overall public interest. The Ganga Bawari Tank Project falls under this category.

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Table-B Estimate of Cost of Forest Diversion

S. No.	Parameters	Remark
1	Ecosystem service losses due to proposed forest diversion	Ecosystem services due to diversion of forest land suggested by the forest classification report of proposed, Ganga Bawari Irrigation Project is Rs. 12.2859 lakhs/Ha. Cost of land = 43.149 Ha. X 12.28590 lakhs/Ha. = 530.12 Lakhs
2	Loss of animal husbandry productivity including cost of fodder.	As per the cost benefit guideline i.e. 10 % of N.P.V 1.228 Lakh per Ha.= 43.149 x 1.228 = 53.01 Lakh
3	Cost Human Resettlement	There is no human settlement due to proposed Ganga Bawari Tank Project Hence cost of human resettlement is Nil.
4	Loss of public facilities and administrative infrastructure (road, building, School, Dispensaries, electric lines, railways etc) on forest land if these facilities were diverted due to the project	There is no loss of public facilities and administrative infrastructure of forest land due to construction of Ganga Bawari Tank Project No cost has been added on this account.
5	Possession value of fores land diverted.	The possession Value of forest land diverted is takan 30 % of the N.P.V due to loss of forest i.e Rs. 3.686 Lakhs/Ha. Hence amount will be = 43.149 x 3.686 = 159.04 Lakhs
6	Cost of Suffering to oustees	No Applicable
7	Habitat fragmentation cost	Forest land is being acquired the submergence of Ganga Bawari Tank Project. There is No amount taken under this account.
8	Compensatory afforestation and soil and moisture conservation cost	The cost @ Rs. 4.00 Lakhs per Ha. Is taken for compensatory afforestation and soil moisture conservation. Hence amount will be = 43.149 x 4.00 = 172.596 Lakhs
9	Total cost due to forest land diversion	Total cost due to forest land diversion for Ganga Bawari Tank Project will be 530.12+53.01+159.04+172.596 = 914.766 Lakhs.

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Table-C Existing guidelines for estimating benefits of forest diversion in CBA

S. No.	Parameters	Remark
1	Increase in productivity attribute to the specific project.	The Crop production benefit due to Ganga Bawari Tank Project will be Rs. 24044 Lakhs in designed life of 100 Years and water level will increase economic growth of the nearby Villages.
2	Benefits to economy due to the specific project	Ganga Bawari Tank Project will trigger economic development and also influence with irrigation facility to a land of 430 Ha. In the surrounding area Irrigation is proposed both by Lift & Canal System.
3	No. of Population benefited due to specific project	Project is located in back ward area of the village. After completion of project 472 No. cultivators will be benefited and ground water level will be increased in surround area. This Project will also facilitate drinking water supply to adjacent villages.
4	Economic benefits due to of diret and indirect employment due to the project	The project will provide direct employment for approximate 300 people (18 month) during its construction period.
5	Economic benefits due to compensatory aforestation.	An economic benefit due to compensatory afforestation has considered as per the benefit of C.A. guidelines of Ministry for N.P.V estimation.

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GANGA BAWARI TANK PROJECT

TEHSIL –MANASA **DISTRICT- NEEMUCH**

COST BENEFIT ANALYSIS

PARAMETER FOR EVALUATION OF FOREST

Table-C Existing guidelines for estimating benefits of forest diversion in CBA

S. No.	Parameters	Remark
1	Increase in perceptivity attributed to specified project	The Ganga Bawari Tank Project is conceived to cater irrigation water to 430 Ha. Of CCA in Village. Ganga Bawari, Hundi Bherpura and Deori of Manasa Tehsil of Neemuch district. Irrigation intensity will increase. Total amount of annual benefits in terms of productivity have been work out 11504 quintal from 1440 quintal, therefore total profit in next 100 Years would be 24044 Lakh.
2	Benefits to economy	The Main objective of Ganga Bawari Tank is to provide irrigation water to 430 ha land which mainly owned by triabls and after completion assured water will be given to boost up their economy.
3	Number of the population benefited.	The Ganga Bawari Tank is conceived to cater irrigation water to 430 ha of CCA in village Ganga Bawari, Hundi, Bherpura and Deori of Manasa Tehsil of District Neemuch will be benefited by this scheme by way of irrigation so the total cultivators benefited through irrigation shall be near by 472 Nos
4	Employment Potential	During the construction stage temporary employment 300 man days and permanent employment 10 person shall be generated for 18 months.
5	Cost of acquisition facility on non forest land wherever feasible	No human commodity will affected due to construction of project.
6	Loss of (a) Agriculture (b) Animal Husbandry	No loss of agriculture envisaged In fact

	Production due to diversion.	present object has been proposed for the improvement of agriculture in this area No loss in the animal husbandry production.
7	Cost of rehabilitating the displacement person has different from.	Not applicable based on survey it was found that there no displacement due to project and as such
8	Cost of supply of free fuel would to workers residing in are near forest area during period of construction	The labour camps will be facilitated with kerosene/LPG facilities and hence no free cutting shall be there for fuel woo.
9	Total benefit due to project	Rs. 240.44 Lakh per year Rs. 24044 Lakh after 100 years.

Cost Benefit Analysis :-

1. Total Benefit due to project = Rs 240.44 Lakhs
2. B.C (Cost Benefit) Ratio 5% Interest = 2.65
   B.C (Cost Benefit) Ratio 10 % interest = 1.45

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GANGA BAWARI TANK PROJECT

TEHSIL –MANASA **DISTRICT- NEEMUCH**

COST BENEFIT RATIO

1. Project Cost = Rs 1501.24 Lakh
2. Irrigation (Rabi) = 430 Hact.

Pre Development

S No.	Name of Crop	Area under cultivation	Cost of Cultivation per hact.	Total Cost of Cultivation	Yield per hact. In quintal	Total Yield	Rate per Quintal	Total Value of produce in lakh
1	2	3	4	5	6	7	8	9
1	Wheat Hyb	40	8000	3.20	24	960	1800	17.28
2	Gram	60	5500	3.30	08	480	4000	19.20
	Total	100	-	6.50	-	1440	-	36.48

(A) Net benefit – 36.48 -6.50 = 29.98 lakh

POST DEVELOPMENT

S No.	Name of Crop	Area under cultivation	Cost of Cultivation per hact.	Total Cost of Cultivation	Yield per hact. In quintal	Total Yield	Rate per Quintal	Total Value of produce in lakh
1	2	3	4	5	6	7	8	9
1	Wheat Hyb	232	10000	23.20	35	8120	2000	162.40
2	Gram	90	7000	6.30	16	1440	4000	57.60
3	Mustard	108	7000	7.56	18	1944	4500	87.48
	Total	430	-	37.06	-	11504	-	307.48

(B) Net benefit – 307.48-37.06 = 270.42 lakh

B.C Ratio

S. No.		5% Interest	10% Interest
1	Project Cost	1501.24 lakh	1501.24 Lakh
2	Project cost interest	75.062 lakh	150.124 lakh
3	Depreciation@ 1% on (1) above	15.0012 lakh	15.012 lakh
4	Administrative expenses @ 100/hact. (Design irrigation 430 x 100)	0.430 lakh	0.430 lakh
5	(C)	90.49 lakh	165.56 lakh
6	B.C Ratio = B-A/C	2.65	1.45

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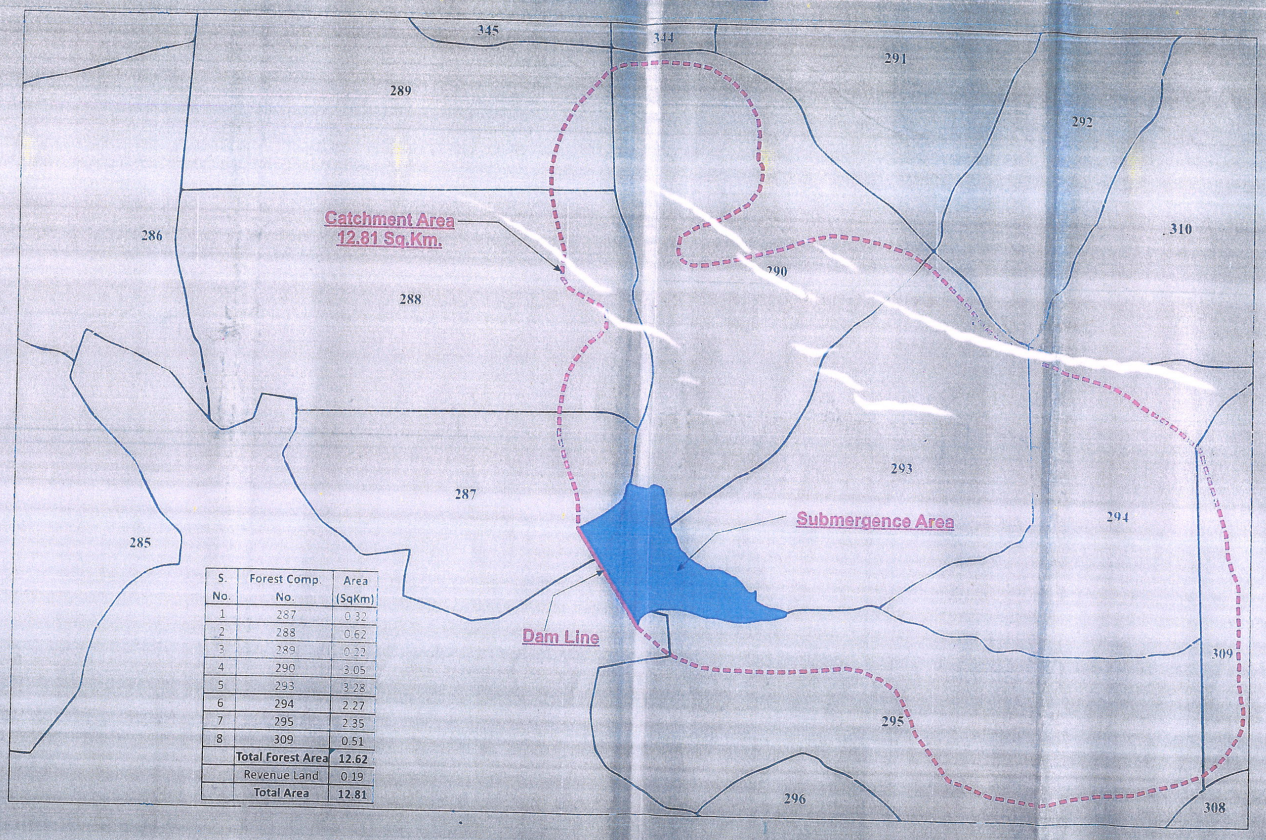
GANGABAWDI TANK PROJECT

Catchment Area Treatment Plan

Forest Land Area : 1262 Ha.

Teh. : Manasa

Dist. : Neemuch



S. No.	Forest Comp. No.	Area (SqKm)
1	287	0.32
2	288	0.62
3	289	0.32
4	290	3.05
5	293	3.28
6	294	2.27
7	295	2.35
8	309	0.51
	Total Forest Area	12.62
	Revenue Land	0.19
	Total Area	12.81

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