INLAND WATERWAYS AUTHORITY OF INDIA

Ministry of Shipping, Government of India

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT REPORT, ENVIRONMENTAL MANAGEMENT PLAN AND RESETTLEMENT ACTION PLAN FOR "CAPACITY AUGMENTATION OF NATIONAL WATERWAY.1" BETWEEN HALDIA AND ALLAHABAD

(JAL MARG VIKAS PROJECT)

(DRAFT)

CUMULATIVE IMPACT ASSESSMENT REPORT

FOR

NATIONAL WATERWAYS-1

MAY, 2016

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EXECUTIVE SUMMARY

Inland Waterways Authority of India (IWAI) is a statutory body under Ministry of Shipping, Govt. of India. IWAI is primarily responsible for development, maintenance and regulation of Inland Water Transport (IWT) in the country specifically on National waterways. In this context, the Ganga-Bhagirathi-Hooghly river system from Allahabad to Haldia has been declared as National Waterway-I (NW-I). It is a natural waterway of about 1620 km in length and passes through the states of Uttar Pradesh, Bihar, Jharkhand and West Bengal. One of the limitations on viable Inland waterway transport on NW-1 is a weak navigation infrastructure. Therefore, IWAI has proposed the Capacity Augmentation of navigational infrastructure of NW-I between Allahabad to Haldia with technical and financial assistance from The World Bank.

In this regard, IWAI has commissioned Social & Environmental Impact Assessment (SEIA) studies to map and understand potential environmental and social impacts associated with navigation improvement of NW-I and to prepare plan for effective mitigation and management of the Impact associated with the project. This report is prepared for Cumulative Impact Assessment (CIA) study which is the part of the SEIA study.

NW-1 is being fed by various tributaries at different locations. Major tributaries to NW-1 between Haldia to Allahabad are Tons, Gomti, Ghagra, Son, Gandak, Punpun and Kosi. The following interventions have been proposed and planned under the Jal Marg Vikas Project.

- Maintenance dredging to provide LAD in waterway/channel and the terminal facility
- Improved Navigation Infrastructure & Navigation Aids
  - Construction of 10 Ro-Ro jetties & ferry passenger jetties. Locations of these jetties are yet to be identified.
  - Construction of 6 terminals: Site identification and planning for 3 terminals sites at Sahibganj, Varanasi and Haldia is completed. 2 more potential sites for development of terminals are identified at Ghazipur and Kalughat. These two sites are still under consideration for finalization and planning of design at initial stage only. One more terminal site along NW-1 is being identified.
  - Construction of one Navigation Lock at Farakka, West Bengal.
  - Provision for tow barges, inland vessels, survey vessels including rescue boats and survey equipment. Development of low draught cargos.
  - Development of navigation aids along NW-1 for facilitation of day & night time navigation.
- Development of efficient River Information System with all hardware & software.
- Provision for bank protection / slope protection and river training works for critical locations.

The project also envisages the creation and improvement of integration opportunities with other surface transport modes such as roads and railways, so as to improve the overall efficiency of the logistics chain by linking the waterways through various well equipped terminals and jetties.

The main objectives of this study are:

- Assess the potential impacts and risks of a proposed and other developments over time on a chosen Critical Environmental Resources (CER)

- Verify that the proposed development's cumulative social and environmental impacts and risks will not exceed a threshold that could compromise the sustainability or viability of selected CERs;
- Confirm that the proposed development's value and feasibility are not limited by cumulative social and environmental effects;
- Support the development of governance structures for making decisions and managing cumulative impacts at the appropriate geographic scale (e.g., airshed, river catchment, town, regional landscape);
- Ensure that the CERs of affected communities about the cumulative impacts of a proposed development are identified, documented, and addressed; and
- Manage potential reputation risks

Approach & Methodology for CIA study is given below.

Step 1: Identify CERs, and determine spatial and temporal Boundaries for CIA
Step 2: Identify other activities and developments affecting CERs
Step 3: Establish information on baseline status of CERs
Step 4: Assess cumulative impacts on CERs
Step 5: Assess significance of predicted cumulative impacts
Step 6: Management of cumulative impacts – design and implementation

Draft Cumulative Impact Assessment Report has been structured in seven chapters containing 1. Introduction and Background, 2. Project Description, 3. Delineation of CIA boundaries and CERs, 4. Stakeholders consultations, Other Development Proposals and finalization of CERs, 5. Cumulative Baseline Study, 6 Cumulative Impact Assessment and 7 Mitigation measure and management Plan.

Chapter 2 describes existing infrastructure & current traffic, components and salient features. At first, project description has been summarized. This is followed by summary of existing project components, proposed components, applicable legislation and World Bank Operational Policies. NW-1 project offers potential opportunity for diversification of cargo movement from road & rail to waterways. In order to achieve this diversification, the existing infrastructure needs to be augmented with proposed project interventions. These proposed interventions consisting of both development & operation of navigation route require availability of water (depth) & its maintenance supported by new infrastructure. Further, these activities will trigger indirect & induced development in the influence area. Therefore, NW-1 development along with these existing, direct, indirect & induced developments will have cumulative impact in the influence area.

Chapter 3 describes spatial and temporal boundaries in order to assess the impacts of direct, indirect and induced activities due to proposed project. Process of delineation of boundary largely depends upon the type of development & its potential to exhibit direct & indirect impacts on the surrounding environment. The chapter describes the CIA boundary, the rationale & basis of its delineation, CERs within the delineated boundaries, and hot spots identified.

In this study all the natural as well as manmade features have been taken into account and plotted spatially to delineate the boundary of the CIA. The natural and manmade features mapped are Forests; National parks; Wild Life Sanctuaries; Tiger Reserves; Birds Areas; Archaeological sites; Water bodies; Wetlands; Roads; Railways; Urban Agglomerations; Industrial Areas; Thermal Power Plants and Critically Polluted Areas (CEPI)

To conduct the detailed study of the project, 10 kms buffer boundary has been considered. The basis for delineating these buffer boundaries are based on the EIA/SIA (NW-

1/terminals/ maintenance dredging) basin level CER reports as the influence area EIA report, IFC guidelines and stakeholders consultations and the expert's consultation/judgment.

10 kms buffer has been considered so that the extent of area of influence of the project may not go upto 10 kms as per the expert's and stakeholder's consultations. Therefore, the farthest distance covered in the CIA boundary is 10 kms.

CERs have been classified in terms of Physical features comprising Urban Agglomerations / Centers and Land Resources, Ecological Profile comprising Bio Diversity(Wildlife Sanctuaries/ National Parks / Tiger Reserves / Bird Areas / Wetlands) and Agriculture, Physical Environmental Profile (e.g., water and nutrient cycles, microclimate), Water, Air and noise and Socio Economic (e.g., health, economics), or Infrastructure, Industry, Power Plants and Cultural aspects comprising Archaeological/ Heritage Sites.

Assessment of Status of Identified CERs including the site visits, study of the project alignment through topographic maps & Google maps, review of existing studies and literature was carried out to assess the status of identified CERs within the CIA boundary of NW-1. On the basis of the identified CERs, spatial analysis, literature review and study of the EIA & SIA Reports of the NW1 1, hotspots have been identified. Identified hotspots and CERs in NW-1 have also been mapped.

The CERs are the ultimate recipient of impacts because they tend to be at the ends of ecological pathways considering water related proposed activities both in terms of availability & quality in NW-1. These CERs may be directly or indirectly affected by a specific development or by the cumulative effects of several developments.

Chapter 4 provides details of the public consultation and participation activities undertaken during the CIA/ESIA studies for the Project "Jal Marg Vikas". From CIA perspective, an effort was made by conducting consultations particularly in reference to confirmation of hotspots mentioned in Chapter 3 as well as to identify new hotspots, if any. The approach involved a mix of conventional as well as participatory/ rapid rural appraisal (PRA/RRA), focus group discussions (FGD) and one-to-one discussions with wide range of stakeholders encompassing government, non government organisations, local communities, research and development organisations, academia, media. Two stage consultations have been carried out in line with World Bank Guidelines for conducting the public consultation. First level consultation was carried out prior and during impact assessment studies and second level consultation was carried out after completion of impact assessment studies. Finally, this chapter concludes with identification of hotspots based on preliminary assessment, baseline data and inputs from stakeholder consultations. The inputs of stakeholder consultations have been used in finalisation of hotspots.

During the formal and informal consultations for 'Jal Marg Vikas Project', it is found that there is mix view of people about the project. Some people take it as positive development as the proposed project will benefit the economy of country. Whereas affected people, i.e. fishermen and land holders who will loose land are concerned about the restriction of fishing activity, reduction in fish yield, loss of land and livelihood and receipt of adequate compensation and alternate livelihood. Locals and experts are also concerned about the water pollution and impact on the aquatic fauna which may result due to the project. All the concerns were taken in consideration during assessment of impacts and the mitigation measures are proposed for all the concerns to minimize/mitigate the impact. Mitigation measures proposed are well addressed in management plan along with their period of implementation.

Chapter 5 provides details of baseline study which has been conducted to assess the existing condition or status of the identified CERs in the study area. Baseline study has been carried out on the basis of secondary information collected from EIA/SIA study of NW-1, data from pollution control boards, IMD, Agricultural departments and other Governmental Organization. Baseline study has provided the details of condition of identified CERs along the NW-1 and of the district through which NW-1 traverse. This data has helped to identify the significance of the impact on the VECs condition and has provided the basis of carrying out the impact assessment study. Baseline study indicates NW1 has flat terrain with vast catchment being drained by main river along with tributaries. Geological influence area has alluvial soil and falls in Zone III & IV. Land use is largely agricultural land followed by water body, settlements with only 3.59 %vegetation. Turtle sanctuary Vikramshila Gangetic Dolphin sanctuary & Hilsa sanctuary are major CERs with Vikramshila Gangetic Dolphin sanctuary & Udhwa bird sanctuary are protected areas. This area has diverse terrestrial & aquatic biodiversity with spawning & breeding grounds adjoining NW1. Flow analysis indicates that NW 1 has flow constraints in certain stretches considering CAD requirements.

Overall soil type / quality along the NW-1 area is of moderately fertile and not expected to be detrimental to the growth of agricultural and forest crops. It can be concluded that soils fall within medium fertility levels in the entire stretch of NW-1and forms the basis of agriculture resources / cropping pattern. Assessment of land resources indicates land use change particularly diversion of agriculture land for urbanization industries & infrastructure development. Though it is an ongoing phenomenon, any new infrastructure development intervention is expected to accelerate it. No portion of NW-1 and intervention areas falls under any reserved forest or normal forests area. Ecologically the area has important CERs.
Udhwa bird sanctuary and 5 other important bird areas are also located within 10 km radius of NW-1 stretch. However, project interventions like maintenance dredging with alleviate the flow constraints for smooth operation of the barges, water availability analysis also indicates the river water is good for propagation of wild life and fisheries.

Observations on River Bed-Dredge Material Quality indicate that the concentration level of heavy metal was found low and within acceptable limit as per standard (Criteria for Off-Shore Dumping of Dredged Material, USA) except cadmium which is slightly above the USA standard that may be due to industrial effluent discharge in this section. Pesticide concentration in all samples was found below the USA criteria. The pesticides presence is on expected line as these are predominantly used for various agriculture applications. The source of these pesticide parathion and endosulphan might be from applications of insecticides and pesticides for agriculture in the study area which has significant agriculture land use. Air quality in terms of $PM_{10,}$ $PM_{2.5}$ NOx SO_2 has been found high in major urban centers.

The population of major cities/ town located along the Ganga River in NW-1 section was recorded as 12875343 comprising 6782150 male and 6093193 females. Scheduled Caste population consisting of 544284 males and 483706 females respectively in major city/towns along the study area and accounts for 7.9% of the total population. The 'Scheduled Tribe' population consist of 27576 males and 25244 females respectively and accounts for 0.41% of the total population (12875343). About 75.4% of the population is literate and 23.6% is illiterate in cities/town located along the NW-1 is illiterate. Male population is more literate than female. In cities and town along NW-1 area the main and marginal workers[1] are 14% and 29% respectively while the remaining 57% of total

1A person who has worked for more than 183 days in a year is called the main worker. Marginal workers are those who have worked any time in the year preceding the census but have not worked for major part, which is not more than 183 days, of the year

population constitutes non-workers. The main occupation is agriculture, labour class and trading activities. Agriculture is the main source of the livelihood generation for the people residing along the NW-1 area. Many towns in the area are primarily industrial. Ganga provides the necessary infrastructure for the factories to perform. Commercial fisheries in the Ganga River System are an important source of livelihood for the people residing along the Ganga River. Pilgrimage and the associated tourism brings along a major source of revenue for religious towns and their people. There is substantial decline in major carps fish catch in Allahabad to Farakka stretch over past few years. At Buxar hilsa was the main fishery and with the commissioning of Farakka barrage the fishery declined sharply between 1972-80. Fishery improved during 1981-86 due to improvement in landings of other species. Patna centre also showed drastic decline in major carp landings and as compared to sixties it was almost half during 1986-93. Decline at Bhagalpur was not as severe as at other centres. It is reported that almost every village along the both sides of the river are having some fishermen who earn their livelihood by fishing in the Ganga river. Generally, one member of the family is engaged in fishing in lower stretch of NW-1(Allahabad to Haldia), sometimes two, the average comes to be 1.5. However, in upper stretch (Allahabad to Farakka) the average person engaged in fishing is 1.2 that is mainly due to low fish catch in this stretch. Fishing Income: The monthly average income of the fisherman ranged from Rs.4000 to 7000 per month in Allahabad to Patna stretch. In lower zone (Farakka to Haldia) the average income of fisherman is slightly high and ranging between 7000 to Rs. 10,000 per month because of higher catch and high value fish (mainly hilsa) in the catch.

All the towns and cities along the NW-1 are well connected with national highways, state highways, district roads, railways. Cities like Varanasi, Patna, and Kolkata are also connected with airways. Eleven thermal power plants are located in close proximity of river Ganga between Haldia and Allahabad and 10 more are reportedly are proposed to be set up in close proximity of the river. There are 30 class I cities and 8 class II towns along the mainstream of river Ganga at NW-1 segment. These cities are discharging 2173.8 MLD wastewater out of which only 959.6 MLD has the treatment capacity.

The above mentioned baseline data provides basis for identification, classification & quantification of impacts.

Chapter 6 provides Cumulative Impact Assessment of NW-1 from Haldia to Allahabad carried out for 10 km area in both sides along the entire stretch. For the purpose of CIA, CERs has been identified to assess their existing conditions so that probable impact & significance of the impacts on these CERs can be evaluated.

For purpose of CIA study an influence zone is identified where cumulative impact due to NW-1 and other developments within this zone will be identified. Through preliminary desktop study, baseline study and stakeholder consultations the existing developments in influence area, baseline scenario of the influence area, pollution load in environmental area, planned and anticipated developments in influence area are identified. It is found that some zones are experiencing/will experience more of the above mentioned developments as compared to other zones. Such zones are demarcated on the basis of quantum and nature of developments the zone is experiencing or will experience in future. These zones are termed as hotspots as the impacts due to existing/planned development will be maximum/more in these zones as compared to other zones.

Type and nature of the cumulative impact has been evaluated on all CERs in each finalized hotspot Table 1.

Finalized Hotspots Selected for CIA Study

S. No.	Hotspots Stretch/Location	Criteria For Selection of Hotspots	CERs
1.	Haldia	• Declared as critically polluted area but at present moratorium is lifted by MoEF&CC • Declared notified zone by CGWB • Operation of terminal would require dredging of 1,57,60,596 cum. • Existing floating terminal and proposed new terminal at Haldia • Shifting of ammonia pipeline of TATA chemicals and existing road to Mitsubishi Plant • Haldia Port & Shipping Activities • Haldia Dock Complex & Industrial Area • Celebration of Ganga Sagar Mela at Sagar • Urban areas: Haldia Town • Expected increased industrial development in existing industrial area and enhanced traffic movement • Indragachi TPP at Sangrampur & Haldia Energy Ltd. TPP	• Ground Water Quality • River Water Quality • Traffic • GHG emissions (micro climate) • Air Quality • Religious Values • Aquatic ecology • Existing infrastructure • New infrastructure development • Fishing Activities • Quality of Life • Water Resources • Drainage • Traffic • Noise • Soil Quality
2.	Kolkata-Mahesthala	• Existing BISN jetty, GR-1 & GR-2 and Botanical Garden Jetty • Archaeological sites within 300 m: Temple of Gour Chandra and Krishnachandra at Chatra-Gaur Chandra Ghat (0 m, W) , St John Church • High PM_{10} concentration in Howrah • Urban areas: Mahesthala, Kolkata & Howrah	• Archaeological sites • Air Quality • Water resources • River Water Quality • Ground Water Quality • Traffic • Aquatic ecology • Quality of Life
3.	Katwa to Hoogly Ghat	• Floating Terminal Katwa, Floating Terminal Swarupganj, Floating Terminal Shantipur, Floating Terminal Tribeni, BISN jetty • New proposed terminal at Tribeni • Hilsha Sanctuary (fishing restriction for larvae of Hilsha) • TPP at Bandel & Balagarh • Urban Areas: Katwa, Swaroopganj, Nabadwip, Kalna, Balagarh, Kanchrapara, Hoogly • Increased traffic volume due to newly proposed terminal	• Traffic • GHG emissions (micro climate) • Air Quality • Aquatic Ecology • Terrestrial ecology • Existing infrastructure • Fishing Activities & Livelihood (Agriculture Land Acquisition) • New infrastructure development • Water resources • River Water Quality • Ground Water Quality

S. No.	Hotspots Stretch/Location	Criteria For Selection of Hotspots	CERs
			• Drainage • Noise • Terrestrial ecology • Soil Quality • Quality of Life • Land Use
4.	Farakka to Murshidabad	• Floating Terminal at Hazardwari, Existing RCC Jetty Pakur, U/s & D/s jetty, feeder canal, RCC jetty and old lock at Farakka • Proposed New lock at Farakka • Archaeological Sites: Hazardwari Palace • Hilsha Sanctuary (fishing restriction for larvae of Hilsha) • IBA: Farakka and surrounding areas • Farakka feeder canal is prone to erosion • Sagardighi TPP, Farakka STPS • Urban Areas: Farakka, Murshidabad, Azimganj, Baranagar, Balia, Raghunathganj • Bagmari siphon	• Bank/Soil erosion • GHG emissions (micro climate) • Air Quality • Water resources • River Water Quality • Ground Water Quality • Existing Infrastructure • New Infrastructure Development • Fishing Activities • Traffic • Noise • Drainage • Aquatic ecology • Terrestrial Ecology • Soil Quality • Quality of Life • Land Use • Archaeological Sites
5.	Mangalghat (Rajmahal)	• Existing floating terminal • Archaeological sites within 300 m: Jama Maszid & Singhi Dalan • Chatt Pooja celebration Oct-Nov • Udhawa Lake Bird Sanctuary at app 6 km • Mining activities	• Traffic • Air Quality • Archaeological sites • Religious Values • River Water Quality • Aquatic ecology
6.	Sahibganj	• Existing Samdhaghat terminal and proposed Sahibganj terminal • Chatt Pooja celebration Oct-Nov • Construction of approach road to connect the terminal to NH-80 • Construction of railway siding to provide linkage with existing IR track • Existing Fishing Activities • Acquisition of Land, R& R and shifting of community temple • Cutting of app. 500 trees	• Land Use • Livelihood (agriculture land acquisition) & Fishing Activities • Socio-economy • Air Quality • GHG emissions (micro climate) • Aquatic ecology • Terrestrial Ecology • Existing Infrastructure • Religious Values • New infrastructure development • Water resources • River Water Quality • Ground Water Quality

S. No.	Hotspots Stretch/Location	Criteria For Selection of Hotspots	CERs
			• Bank/Soil erosion • Traffic • Noise • Drainage • Quality of Life • Land Use
7.	Pirpanti-kahalgaon-Bhagalpur	• Chatt Pooja celebration Oct-Nov • Existing Bateshwarsthan Floating Terminal, Bhagalpur Terminal • Vikramshila Gangetic Dolphin Sanctuary • IBA: Kurseala River Course and Diyara Flood Plains • Bhagalpur TPP, Kahalgaon STPS, Pripanti TPP, Pripanti Power CESC • Presence of arsenic in ground water • Urban Area: Bhagalpur, Kahalgaon	• Air Quality • GHG emissions (micro climate) • Religious Values • Aquatic Ecology • Avifauna • Water resources • River Water Quality • Ground Water Quality • Traffic • Soil Quality • Quality of Life
8.	Munger	• Existing Floating Terminal at Munger • Chatt Pooja celebration Oct-Nov • Presence of arsenic in ground water • Urban Area: Munger	• Ground Water Quality • Religious Values • Traffic • Aquatic ecology
9.	Semaria-Begusarai-Barh	• Existing Floating Terminal at Semaria • Chatt Pooja celebration Oct-Nov • Urban Area: Semaria, Doraiganj, Begusarai, Barh • Barauni TPP, Barh TPP & Lakhisarai TPP • IBA: Mokama Taal	• Air Quality • GHG emissions (micro climate) • Aquatic ecology • Terrestrial flora • Religious value • Water resources • River Water Quality • Ground Water Quality • Avifauna • Soil Quality • Quality of Life
10.	Patna	• Low & High Level Jetty (Gaighat) • Proposed Terminal at Kalughat • Chatt Pooja celebration Oct-Nov • IBA: Danapur Cantonment Area • High PM_{10} concentration in Patna • Urban Area: Patna • Development of River Front at Patna	• Avifauna • Air Quality • River Water Quality • Religious Value • Traffic • Noise • Water resources • Drainage • Aquatic ecology • Terrestrial Ecology

S. No.	Hotspots Stretch/Location	Criteria For Selection of Hotspots	CERs
			• Bank/soil erosion • Quality of Life • Land Use
11.	Buxar	• Existing floating terminal at Buxar • Buxar TPP (under construction) • Chatt Pooja celebration Oct-Nov • Urban Area: Buxar	• Religious Values • Traffic • Air Quality • Water resources • River Water Quality • Ground Water Quality • Aquatic ecology • Soil Quality • Quality of Life
12.	Ghazipur	• Proposed Terminal • Urban Area: Ghazipur	• Land Use • Livelihood (agriculture land acquisition) • Air Quality • GHG emissions (micro climate) • Aquatic ecology • Terrestrial Ecology • Existing Infrastructure • River Bed Sediments Quality • New infrastructure development • Water resources • River Water Quality • Ground Water Quality • Bank/Soil erosion • Drainage • Traffic • Noise • Quality of Life
13.	Varanasi	• Rajghat floating terminal • Proposed Varanasi Terminal • Archaeological Sites: Kardmeshwar Mahadeva Mandir, Ramnagar, fort, archaeological excavation site, Varanasi • Festival: Ganga Mahotsav at Varanasi (Oct-Nov) & Dhrupad Mela at Tulsi Ghat of Varanasi (Feb to March) • Kashi Turtle Sanctuary • DFCCIL Connectivity at Varanasi Terminal • Slightly high cadmium concentration in river bed sediments but below toxicity	• Land use • Livelihood (agriculture land acquisition) & Fishing Activities • Aquatic ecology • Existing Infrastructure • New infrastructure development • Archaeological sites • Air Quality • GHG emissions (micro climate) • River Bed Sediments Quality • Bank/Soil erosion • Noise level • Religious Value

S. No.	Hotspots Stretch/Location	Criteria For Selection of Hotspots	CERs
		level of fishes • High PM_{10} levels in Varanasi • High noise level in Turtle sanctuary area	• Vibrations • Water resources • River Water Quality • Drainage • Traffic • Noise • Quality of Life
14.	Allahabad	• Festival: Kumbh Mela • Slightly high cadmium concentration in river bed sediments but below toxicity level of fishes	• Religious Value • River Bed Sediments Quality • River Water Quality • Aquatic ecology • Quality of Life

Attempt has been made to quantify the anticipated impact by assigning score to each impact and the development in scale of 1-5.

Cumulative impact assessment is carried out for the 14 hotspots identified in Table.1 & the criteria for selection of them as hotspot above to assess the magnitude and significance of cumulative impact. It has been identified that nature of impact varied from low to moderately high. For example, Varanasi, Patna and Howrah, air quality of the area is already impacted due to high PM_{10} concentration. Varanasi turtle sanctuary and Dolphin sanctuary are the eco-sensitive zones in NW-1 which are being impacted due to existing development and will be impacted due to development of NW-1 and other upcoming and planned development in the area. Other areas like Barh, Danapur, Bhagalpur etc are sensitive due to presence of important bird area. Varanasi will be the common station of upcoming EDFC and NW-1 and exchange of material will take place between these two points. Depending on the sensitivity of the area and nature of existing & upcoming developments in the area, certain zones are declared as hotspots. Total 14 zones are identified as hotspots. Rating is provided to impact of each identified activity on CERs and it is found that impact on these hotspots due to existing, planned and upcoming development varies from low to moderate. As per the impact assessment it is also found that the identified impacts can be mitigated by implementing the mitigation measures and management plan.

Chapter 7 provides mitigation measures and management plan. The chapter provides review of the mitigation measures proposed in EIA/SIA Study of the Jal Marg Vikas Project, Mitigation Measures & Management Plan for Jal Marg Vikas Project & strengthening measures identified to minimize cumulative impacts, Environment Management Plan, Environment Monitoring Plan, Organizational framework, Environmental Health & Safety Policy and EHS Management System, Mechanism for Feedback and Adjustments and Grievance Redress Mechanism.

Mitigation measures as proposed in EIA/SIA studies have been reviewed in detail. It has been found that mitigation measures proposed are adequate and address all major and minor issues which may have an impact on environment and society. Impacts are adequately addressed for the construction and operation of proposed civil interventions, barge operation and maintenance dredging and accordingly mitigation measures are proposed and management plans are prepared. After carrying out the CIA study and assessment of the baseline condition of the areas through which proposed NW-1 traverses

and nature of developments which this area will experience after & due to development of Jal Marg Vikas Marg, it is learned that some of the proposed measures requires strengthening.

IWAI can take up the mitigation measures and remediation measures for controlling the impact on CERs in influence area, however an extended role of IWAI is suggested in this plan so as to manage the cumulative impacts in the influence area. IWAI has an operational and effective institutional framework which will implement the environment management plan as suggested for Jal Marg Vikas Project during all the stages. It is recommended through this plan that IWAI should additionally take up the task of interaction with the ULBs, DAs, PCBs, Industrial Departments, EDFC, Road Development Authorities, NHAI and other concerned department six monthly so as to know their developmental plans, to assess effect of their plans on NW-1 and sharing the suggestive environment management and impact mitigation plan for respective development prepared in this document. This practise can regulate the cumulative impacts to some extent and may help in mitigation of the impacts.

Chapter 1. : INTRODUCTION & BACKGROUND

1.1. Introduction

From the beginning of history, human sensitivity has revealed an urge for mobility leading to a measure of Society's progress. The history of this mobility or transport is the history of civilization. For any country to develop with right momentum modern and efficient. Transport as a basic infrastructure is a must. It has been seen throughout the history of any nation that a proper, extensive and efficient Road Transport has played a major role. Where roads are considered as veins and arteries of a nation, passenger and goods transported are likened to blood in circulation, water transport is the cheapest and the oldest form of transport for heavy goods and bulk cargoes.

Inland Waterways Authority of India (IWAI) is a statutory body under Ministry of Shipping, Govt. of India. IWAI is primarily responsible for development, maintenance and regulation of Inland Water Transport (IWT) in the country specifically on National waterways. In this context, the Ganga-Bhagirathi-Hooghly river system from Allahabad to Haldia has been declared as National Waterway-I (NW-I). It is a natural waterway of about 1620 km in length and passes through the states of Uttar Pradesh, Bihar, Jharkhand and West Bengal. One of the limitations on viable Inland waterway transport on NW-1 is a weak navigation infrastructure. Therefore, IWAI has initiated the project of “Capacity Augmentation of National Waterway-1” between Haldia and Allahabad named as “Jal Marg Vikas Project”. However, considering the available LAD and cargo demand scenario, IWAI is focusing on the stretch between Haldia to Varanasi at present.

In this regard, IWAI has commissioned Social & Environmental Impact Assessment (SEIA) studies to map and understand potential environmental and social impacts associated with navigation improvement of NW-I and to prepare plan for effective mitigation and management of the Impact associated with the project. This report is prepared for Cumulative Impact Assessment (CIA) study which is the part of the SEIA study.

1.2. Objectives

The main objectives of this study are as follows:

- Assess the potential impacts and risks of a proposed and other developments over time on a chosen CERs;
- Verify that the proposed development’s cumulative social and environmental impacts and risks will not exceed a threshold that could compromise the sustainability or viability of selected CERs;
- Confirm that the proposed development’s value and feasibility are not limited by cumulative social and environmental effects;
- Support the development of governance structures for making decisions and managing cumulative impacts at the appropriate geographic scale (e.g., airshed, river catchment, town, regional landscape);
- Ensure that the CERs of affected communities about the cumulative impacts of a proposed development are identified, documented, and addressed; and
- Manage potential reputation risks

1.3. Study Area, Project Description

The NW-1 stretch starts from Haldia (Sagar) to Allahabad (1620 km) on Ganga - Bhagirathi - Hooghly river system. The Hooghly river portion of the waterway from Haldia to Nabadwip is under tidal influence. From Nabadwip to Jangipur the NW1 stretch is formed by Bhagirathi river. Bhagirathi river flow is regulated through barges at Farakka and Jangipur. From Farakka upstream the navigable route depends upon the main Ganga river flow. The Feeder Canal and the navigation lock at Farakka become the link between the Bhagirathi and main Ganga upstream of Farakka Barrage. NW-1 is passing through four states namely UP, Bihar, Jharkhand and West Bengal. Location map, alignment map of NW-1 is shown in **Figure 1.1.**

Proposed Project-Jal Marg Vikas aims at improvement of navigation in entire stretch of 1620 km. of NW-1 (Haldia to Allahabad). NW-1 is the Ganga - Bhagirathi - Hooghly river system. NW-1 is being fed by various tributaries at different locations. Major tributaries to NW-1 between Haldia to Allahabad are Tons, Gomti, Ghagra, Son, Gandak, Punpun and Kosi. The following interventions have been proposed and planned under the Jal Marg Vikas Project.

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- Improved Navigation Infrastructure & Navigation Aids
  - Construction of 10 Ro-Ro jetties & ferry passenger jetties. Locations of these jetties are yet to be identified.
  - Construction of 6 terminals: Site identification and planning for 3 terminals sites at Sahibganj, Varanasi and Haldia is completed. 2 more potential sites for development of terminals are identified at Ghazipur and Kalughat. These two sites are still under consideration for finalization and planning of design at initial stage only. One more terminal site along NW-1 is being identified.
  - Construction of one Navigation Lock at Farakka, West Bengal.
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  - Development of navigation aids along NW-1 for facilitation of day & night time navigation.
- Development of efficient River Information System with all hardware & software.
- Provision for bank protection / slope protection and river training works for critical locations.

The project also envisages the creation and improvement of integration opportunities with other surface transport modes such as roads and railways, so as to improve the overall efficiency of the logistics chain by linking the waterways through various well equipped terminals and jetties.

Cargo being transported in NW-1 includes cement, fly ash, iron ore, iron ore fines, coal, steel shed, tyres, iron fines, iron ingots, Galvanized steel plain sheets, stone chips, furnace oil, high Speed diesel, lube oil, boulders, pulses, aluminium block, sand, chips, ship block, log, pulses, Manganese ore, Petroleum, Coke, Cooking coal, Rock Phosphate, Timber, Peas, Slag oil, and Non-cooking coal. Traffic projections for the planned infrastructure site are given at **Table 1.1.** The terminals cargo handling capacity are being designed considering these traffic projections.

Table 1.1 : Traffic Forecast for Planned Navigational Infrastructural Facilities

S. No.	Infrastructural Facility	Projected Cargo-2015 (MTPA)	Projected Cargo-2030 (MTPA)	Projected Cargo-2045 (MTPA)
1	Sahibganj Terminal	2.24	4.39	9.00
2	Varanasi Terminal	0.54	1.22	1.22

S. No.	Infrastructural Facility	Projected Cargo-2015 (MTPA)	Projected Cargo-2030 (MTPA)	Projected Cargo-2045 (MTPA)
	(with current land)			
3	Haldia Terminal	4.07 MTPA (1.57 other cargo & 2.5 MTPA coal transhipment)		

Source: HOWE Engineering Projects (India) Pvt.Ltd. (Design Consultant)

There are various challenges for Jal Marg Vikas Project development which includes typical characteristics alluvial river Ganga his braiding, meandering large water fluctuations between summer and monsoon months and annual silt loads of 1600 million tonnes. The maintenance dredging requirements, planned infrastructures facilities, and other facilities are planned keeping these challenges and transportation requirements in consideration. The salient features of the Jal Marg Vikas Project with the details of planned and proposed developments are given at **Table 1.2.**

Table 1.2 : Salient Features of Jal Marg Vikas Project

<table>
<tr><th>Salient Features</th><th>Capacity/Quantity/Nos.</th></tr>
<tr><td>Facilities Planned</td><td>• 3 terminal sites (Sahibganj, Varanasi & Haldia)
• 1 new Navigation lock- Farakka
• River bank protection works at planned terminal sites and along Feeder canal</td></tr>
<tr><td>Facilities under Planning Stage</td><td>• 3 additional terminal sites
• 10 ro-ro jetties
• Barge repair and maintenance facility
• River training works
• River bank protection works at the proposed civil intervention sites</td></tr>
<tr><td>Designed capacity of Terminals</td><td><table><tr><td>Infrastructural Facility</td><td>Projected Cargo-2015 (MTPA)</td><td>Projected Cargo-2030 (MTPA)</td><td>Projected Cargo-2045 (MTPA)</td></tr><tr><td>Sahibganj Terminal</td><td>2.24</td><td>4.39</td><td>9.00</td></tr><tr><td>Varanasi Terminal (with current land)</td><td>0.54</td><td>1.22</td><td>1.22</td></tr><tr><td>Haldia Terminal</td><td colspan="3">4.07 MTPA (1.57 other cargo & 2.5 MTPA coal transhipment)</td></tr></table></td></tr>
<tr><td>Navigation Channel</td><td>Width-64 m
LAD-3 m from Haldia to Barh, 2.5 m from Barh to Buxar and 2.2 m from Buxar to Varanasi at present</td></tr>
<tr><td>Design Vessel Specifications</td><td>Vessels of maximum length 110 m, beam 11.4 m, draught 2.5 m-2.8 m and air draught of 9 m will ply in the waterway</td></tr>
<tr><td>Size of Vessels</td><td>1500-2000 dWT</td></tr>
<tr><td>River Slope</td><td>Haldia to Farakka-1 in 11000
Farakka downstream-1 in 18000
Farakka to Allahabad-1 in 17,000</td></tr>
<tr><td>Maintenance Dredging</td><td>Navigation Channel-15,765,596 cum/year*</td></tr>
<tr><td>Type of Dredgers</td><td>CSD, Agitation dredgers/plough dredgers and back hoe dredgers</td></tr>
<tr><td>Dredge disposal</td><td>Preferably off-shore, onshore only if sediments are found to be contaminated</td></tr>
</table>

* quantities are tentative and subject to change with revision in planning

Figure 1.1 : Location and Alignment of the Project

1.4. Approach & Methodology

Stepwise approach & methodology (A&M) is given below.

Step 1: Identify CERs, and determine spatial and temporal Boundaries for CIA
Step 2: Identify other activities and developments affecting CERs
Step 3: Establish information on baseline status of CERs
Step 4: Assess cumulative impacts on CERs
Step 5: Assess significance of predicted cumulative impacts
Step 6: Management of cumulative impacts – design and implementation

The above step wise approach has been converted into activities and tasks as mentioned below & schematically shown in **Figure 1.2.**

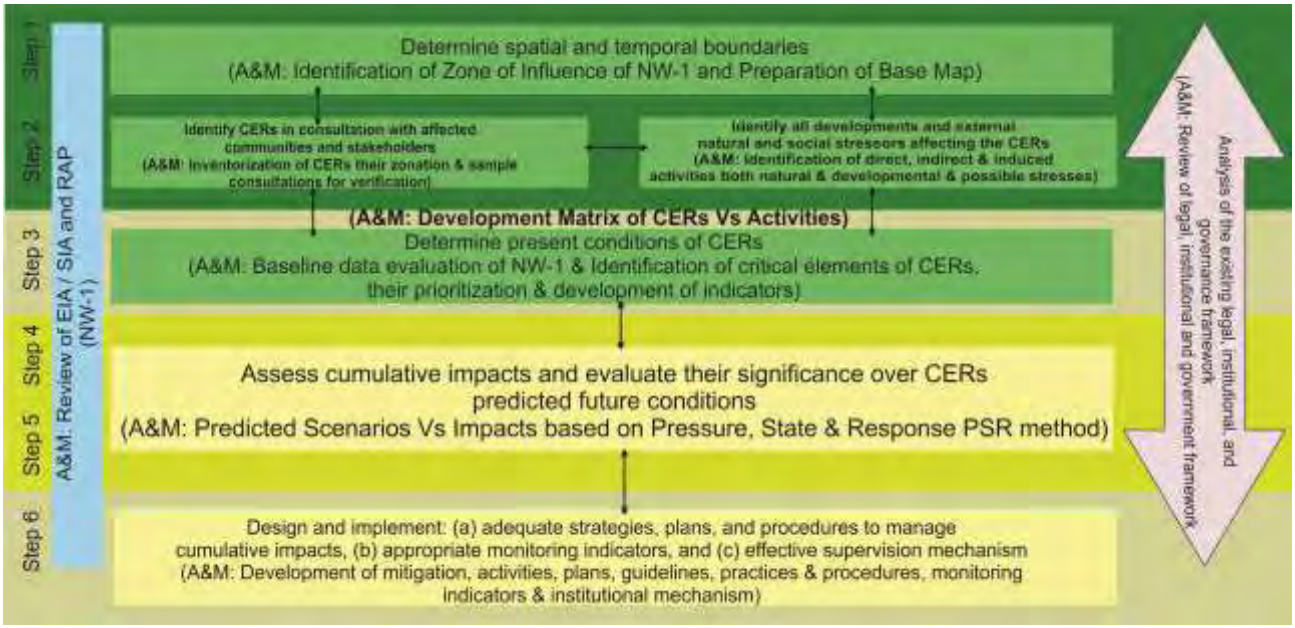

Figure 1.2 : Schematic Representation of Proposed Approach & Methodology (A&M)

Activity 1: Scoping Phase I – CERs, Spatial and Temporal Boundaries

1. Identify the CERs to include in the CIA.
2. Identify the spatial boundaries of the CIA.
3. Identify the temporal extent of the CIA.

A&M: (1) Determine spatial and temporal boundaries (Identification of Zone of Influence of NW-1 and Preparation of Base Map) Identify CERs in consultation with affected communities and stakeholders (2) Inventorization of CERs their zonation & sample consultations for verification.

Activity 2: Other Activities and Environmental Drivers

1. Identify other existing and reasonably predictable projects and human activities that do/would affect the CERs to be included in the CIA;
2. Identify natural environmental drivers that also impact the condition of CERs identified in Step 1.

A&M: Identify all developments and external natural and social stressors affecting the CERs Identification of direct, indirect & induced activities both natural & developmental & possible

stresses.

Activity 3: Establish Information on Baseline Status of CERs

1. Collect available information on the impacts of the other activities and natural drivers on the condition of the CER;
2. Collect available information on CER trends;
3. Collect any available information on regional thresholds for CERs (e.g. air pollution).

A&M: (1) Identify all developments and external natural and social stressors affecting the CERs Identification of direct, indirect & induced activities both natural & developmental & possible stresses (2) Development Matrix of CERs Vs Activities.

Activity 4: Assess Cumulative Impact on CERs

1. Establish indicators for expression of CER condition. This may already be reflected in the information collected on CER baseline status (in Step 3 above). If not, then indicators may need to be established that can be estimated from the baseline information;
2. Estimate the "future baseline" for condition of the CERs—i.e., the condition of CERs as affected by the other projects, human activities, and natural drivers; and Estimate the project impact on CERS condition. This estimation is done with the effects of planned project mitigation included; and
3. Estimate the cumulative impact on CERs—the total impact on the CERs when the impacts of the development are combined with the future baseline.

A&M: Baseline data evaluation of NW-1 & Identification of critical elements of CERs, their prioritization & development of indicators.

Activity 5: Assess Significance of Anticipated Cumulative Impacts

1. Assess the significance of the foreseen cumulative impacts on the CERs;

Activity 6: Management of Cumulative Impacts: Design and Implementation

1. Identify, when necessary, additional project mitigation (beyond that identified in the project ESIA) to reduce an estimated unacceptable cumulative impact on a CER to an acceptable level. This should represent effective application of the mitigation hierarchy in environmental and social management of the specific project contributions to the expected cumulative impacts;
2. If necessary, identify the potential, or need for, additional mitigation of other existing or reasonably predictable future projects;
3. Identify the potential for other regional strategies that could maintain CERs at acceptable conditions; and
4. Undertake best efforts to engage, enhance, and contribute to a multi-stakeholder collaborative approach for the implementation of management actions that are beyond the capacity of the project proponent.

A&M: (1) Assess cumulative impacts and evaluate their significance over CERs predicted future conditions (Predicted Scenarios Vs Impacts based on Pressure, State & Response PSR method). Design and implement: (a) adequate strategies, plans, and procedures to manage cumulative impacts, (b) appropriate monitoring indicators, and (c) effective supervision mechanism (2) Development of mitigation, activities, plans, guidelines, practices & procedures, monitoring indicators & institutional mechanism)

Activity 7: Stakeholder Engagement

1. Identify the stakeholders getting affected during the construction phase and operational phase of the project and other developmental proposals along the alignment.
2. Consultation with stakeholders including public, line departments, infrastructure, service providers and experts.
3. Incorporate input from other people knowledgeable of the study area to inform conclusions about future land use and developments in the study area.
4. Identify and finalise the Hotspots / Pressure Points based on Consultations.

1.5. Format of the Report

Draft Cumulative Impact Assessment Report has been compiled in seven chapters. The table of contents of each chapter is given below.

Chapter 1 Introduction and Background: This chapter describes Introduction; Objective of the Study as per ToR; Study Area; Approach and Methodology and format of the report.

Chapter 2 Project Description: This chapter describes project description; components of NW-1 in an integrated manner; and applicable legislations and World Bank policies.

Chapter 3 Delineation of CIA boundaries and CERs. This chapter describes delineation of CIA boundary; CERs and Social components; Assessment of status of identified CERs; Preliminary Identification of Hotspots.

Chapter 4 Stakeholders consultations, Other Development Proposals and finalization of CERs: This chapter describes Basis and Strategy of Stakeholder's Selection; Methodology and the Tools Used; Proceedings of Stakeholder Consultations; Public Consultations; Summary of Output of the Stakeholders Consultations; and Identification of Hotspots based on Consultations.

Chapter 5: Cumulative Baseline Study: This chapter describes cumulative baseline including EIA's of NW-1 in an integrated manner.

Chapter 6: Cumulative Impact Assessment: This chapter describes Finalization of Hotspots/CERs for Cumulative Impact Assessment; Impact identification due to Proposed project; Interaction of CERs and proposed development; Assessment of Cumulative Impacts; Recommendation of Basin level CERs Study.

Chapter 7: Mitigation measure and management Plan: This chapter describes review of the Mitigation Measures Proposed in standalone EIA/EMP/SIA Studies; Mitigation Measures for Proposed / Planned & Anticipated Developments within Study Area; Environment Management Plan; Environment Monitoring Plan; and Organizational Framework. Further, sections describe Segment wise maintenance and augmentation of River Flow; Segment wise strategies of the targeted quality of water; Segment wise avoidance and/or minimization of pollution load; segment wise avoidance and/or minimization of social issues.

Chapter 2. : DESCRIPTION OF THE PROJECT

2.1. Introduction

This chapter presents the details of the project, its existing infrastructure & current traffic, components and salient features. At first, project description has been summarized. This is followed by summary of existing project components, proposed components, applicable legislation and World Bank Operational Policies. Finally, inferences have been drawn considering the scope & boundaries of CIA.

2.2. Project Description of NW-1

NW-1 which is natural waterway, extends from Haldia (Sagar) to Allahabad and spans 1620 kms crossing the states of Bihar, Jharkhand, Uttar Pradesh & West Bengal. NW-1 falls in The Ganga - Bhagirathi - Hooghly river system between Haldia & Allahabad. It links the ports of Haldia and Kolkata to Bhagalpur, Patna, Ghazipur, Varanasi and Allahabad, their industrial hinterlands, and several industries located along the Ganga basin. Alignment of NW-1 is depicted in Figure 2.1 below.

Figure 2.1 : Alignment of NW-1

NW-1 is being fed by various tributaries at different locations. Major tributaries to NW-1 between Haldia to Allahabad are Tons, Gomti, Ghagra, Son, Gandak, Punpun and Kosi. Jal Marg Vikas project is aimed at augmentation of navigation in the waterway by maintaining the LAD in the

waterway throughout the year for navigation, development of the navigational infrastructure and navigation aids, river training works at critical location, equipment of the necessary barges/dredgers/boats for navigation purpose and development of efficient River information system.

2.3. Components of the Existing Infrastructure & Current Cargo Movement

Navigation infrastructure existing at NW-1 which facilitates the cargo transportation are given below. This includes, Low & High level jetties at Patna; GR jetty in Kolkata; Fixed Jetty at Farakka & Pakur and floating terminals at Haldia, BISN & Botanical Garden in Kolkata, Tribeni, Shantipur, Swaroopganj, Katwa, Hazardwari, d/s Farakka, u/s Farakka, Manglahaat (Rajmahal), Samdaghat (sahebganj), Bateshwarsthan, Bhagalpur, Munger, Semaria, Buxar, Ghazipur, Ramnagar (Varanasi) and Allahabad. Details of the location, Chainage, capacity, area, facilities of these above mentioned existing facilities in NW-1 are given below in **Table 2.1**. Map showing location of the existing developments in NW-1 is given in **Figure 2.2** below.

Table 2.1 : Details of Existing Infrastructure in NW-1

A. Floating Terminals										
Sl. No.	**Name of terminal with chainage (In km)**	**Land area (in Sq. m)**	**Size of berth, water front (In metre)**	**No. of Pontoon Barge & Gangway**	**Cargo Handling equipment**	**Storage area**	**Link approach road**	**Security (in each shift)**	**Water/ Lighting facility**	**Remarks**
1	Allahabad (Ch. 1535)	8.759 Hectare Land	35 m berth & 300 WF	01 Pontoon Barge 01 Pontoon Gangway	Nil	To be stored on Pontoon and open space of IWAI's land 5000 Sq. m	Pucca Rasta (Concreted road)500 m and metalled road 2 kmconnected with NH 76	01 no. armed 01 no. unarmed	Drinking Water facility available	Generator could be provided for lighting if required
2	Ramnagar (Varanasi) (Ch. 1315)	5.586 Hectare Land	35 m berth & 300 WF	01 Pontoon Barge 01 Pontoon Gangway	Nil	To be stored on Pontoon and open space of IWAI's land 2000 Sq. m	Land acquisition in process for approach road of about 700m connecting with NH 07	01 no. armed 01 no. unarmed	-	Being developed under Jal Marg Vikas Project
3	Ghazipur (Ch. 1177 Km) / Rajghat (Varanasi)	-	35 m berth	01 Pontoon Barge 01 Pontoon Gangway	Nil	To be stored on Pontoon. Private land could be made available if required	Kachcha Rasta(Earthen Road) 100m and Pucca road 100 m connected with NH 19	-	Drinking Water facility available	Generator could be provided for lighting if required
4	Buxar (Ch. 1124 Km)	-	35 m berth	01 Pontoon Barge 01 Pontoon Gangway	Nil	To be stored on Pontoon. Private land could be made available if required	KachchaRasta100 m and Pucca road 400 m connected with NH 84	-	Drinking Water facility available and Street Lights available as provided by Local Administration	
4	Semaria (Ch. 850 Km)	-	35 m berth	01 Pontoon Barge 01 Pontoon Gangway	Crane on Pontoon available	To be stored on Pontoon. Private land could be made	Kachcha Rasta 200m and Pucca road 300 m connected with NH	-	Drinking Water facility available	

A. Floating Terminals										
Sl. No.	**Name of terminal with chainage (In km)**	**Land area (in Sq. m)**	**Size of berth, water front (In metre)**	**No. of Pontoon Barge & Gangway**	**Cargo Handling equipment**	**Storage area**	**Link approach road**	**Security (in each shift)**	**Water/ Lighting facility**	**Remarks**
						available if required	31			
5	Munger (Ch.793Km.)	3.40 Acre Land	35 m berth	01 Pontoon Barge 01 Pontoon Gangway	Nil	To be stored on Pontoon and open space of IWAI's land 1000 Sq. m	Pucca Rasta 100 m and metalled road 5 km connected with NH 80	01 no. armed 01 no. unarmed	Drinking Water facility available and Street Lights available provided by Local Administration	Generator could be provided for lighting whenever required
6	Bhagalpur (Ch715Km.)	3.86 Acre Land	35 m berth	01 Pontoon Barge 01 Pontoon Gangway	Nil	To be stored on Pontoon and open space of IWAI's land 1000 Sq. m	Pucca Rasta 300 m and metalled road 2 km connected with NH 80	01 no. armed 02 nos unarmed	Drinking Water Sodium Vapour Lamps (Full Illumination)	DGPS Station is operational and being utilized since 2010.
7	Bateshwarsthan (Ch. 683Km.)	-	35 m berth	01 Pontoon Barge 01 Pontoon Gangway	Nil	To be stored on Pontoon.	Kachcha Rasta 200m and Pucca road 5km connected with NH 80	-	Drinking Water facility available	Generator could be provided for lighting whenever required
8	Samdaghat (Sahebganj) (Ch.617Km.)	-	35 m berth	01 Pontoon Barge 01 Pontoon Gangway	Crane on pontoon	To be stored on Pontoon. Private land could be made available if required	Kachcha Rasta300m and Pucca road 1km connected with NH 80	-	Drinking Water facility available	Generator could be provided for lighting whenever required
9	Manglahat (Rajmahal) (Ch. 588Km.)	-	35 m berth	01 Pontoon Barge 01 Pontoon Gangway	Nil	To be stored on Pontoon. Private land could be made available if required	Kachcha Rasta 100m and connected with NH 80	-	Drinking Water facility available	Generator could be provided for lighting whenever required

A. Floating Terminals										
Sl. No.	**Name of terminal with chainage (In km)**	**Land area (in Sq. m)**	**Size of berth, water front (In metre)**	**No. of Pontoon Barge & Gangway**	**Cargo Handling equipment**	**Storage area**	**Link approach road**	**Security (in each shift)**	**Water/ Lighting facility**	**Remarks**
10	U/s Farakka (Ch. 545.0)	4800	35 m berth	01 Pontoon 01 Bamboo Gangway	NIL	To be stored on Pontoon & land of FBP	100 m	01 nos. armed 03 no. unarmed	Drinking Water Sodium Vapour Lamps	Land belongs to FBP being used by IWAI.
11	D/s Farakka (Ch. 542.0)	-	35 m berth	01 Pontoon 01 Bamboo Gangway	NIL	To be stored on Pontoon.	Along the road	NIL	Street Lights provided by Local Administration	Land not available pontoon placed on water front
12	Hazardwari (Ch. 439.0)	-	35 m berth	01 Pontoon 01 Bamboo Gangway	NIL	To be stored on Pontoon.	100 m	NIL	Street Lights provided by Local Administration	Land not available pontoon placed on water front
13	Katwa (Ch. 334.50)	-	35 m berth	01 Pontoon 01 Bamboo Gangway	NIL	To be stored on Pontoon.	1.5 km	NIL	NIL	Land not available pontoon placed on water front
14	Swaroopganj (Ch. 280)	2337	35 m berth	01 Pontoon 01 Bamboo Gangway	NIL	One Godown of size 4.5 x 5 m and Open space 290 m^2	500 m	01 nos. armed 03 no. unarmed	Drinking Water Sodium Vapour Lamps	Land taken from KoPT on lease basis
15	Shantipur (Ch. 241.0)	8000	35 m berth & 100 WF	01 Pontoon 06 Modular Pontoons Gangway	NIL	To be stored on Pontoon and open space of IWAI's land 2000 Sq. m	3 km	03 nos. unarmed	NIL	Land belongs to State Govt. of W.B. being used by IWAI.
16	Tribeni (Ch. 196.0)	-	35 m berth	01 Pontoon 01 Bamboo Gangway	NIL	To be stored on Pontoon	Along the road	01 nos. armed 02 no. unarmed	NIL	Land not available pontoon placed on water front
17	BISN Jetty & G.R.	30409.64	70 m berth & 100 WF	03 Pontoons 01 Steel Gangway	NIL	Open Space area 6000 m^2	1 km	01 nos. armed 03 no.	Sodium Vapour Lamps (Full Illumination)	Land taken from KoPT on lease basis

A. Floating Terminals										
Sl. No.	**Name of terminal with chainage (In km)**	**Land area (in Sq. m)**	**Size of berth, water front (In metre)**	**No. of Pontoon Barge & Gangway**	**Cargo Handling equipment**	**Storage area**	**Link approach road**	**Security (in each shift)**	**Water/ Lighting facility**	**Remarks**
	Jetty-1 (Ch. 135.0)							unarmed		
18	Botanical Garden Jetty (Ch. 134.5)	996	35 m berth & 50 m WF	01 Pontoon 01 Steel Gangway	NIL	To be stored on Pontoon	150 m	03 nos. unarmed	Sodium Vapour Lamps (Full Illumination)	Land belongs to KoPT being used by IWAI.
19	Haldia (Ch. 35.0)	10930	70 m berth & 200 m WF	04 Pontoons 01 Gangway	NIL	One Godown of size 12 x 30 m and Open space 1630 m^2	3.5 km via HDC	01 nos. armed 03 no. unarmed	Drinking Water Sodium Vapour Lamps	Land taken from Haldia Dock Complex (HDC) on lease basis.
B. Fixed RCC Jetties										
1	G.R.Jetty-2 (Ch. 134.5)	14,557	70 m berth	-	-	One Transit shed of size 25 x 46 m and Open space 4000 m^2	500 m.	01 nos. armed 03 no. unarmed	Drinking Water Sodium Vapour Lamps (Full Illumination)	Land taken from KoPT on long term lease basis. RCC Jetty completed and being operational since Nov., 2013.
2	Farakka RCC Jetty (Ch. 542 km)	-	115 m berth	-	-	-	Along the road	-	Drinking Water Sodium Vapour Lamps	Owned by FBP this can be used by the common users.
3	Pakur RCC Jetty (Ch. 522 km)	-	60 m berth	-	-	-	1 km	-	-	Owned by FBP this can be used by the common users.
4	Patna (Gaighat) (Ch.	2.93 Acre	46.0 m berth 100 m WF	Nil	Shore Crane-2 with capacity of	45m x 14m Transit shed and open space of IWAI's	Pucca Rasta 500 m and metalled road 2 km connected with NH 30	01 no. armed 03 no.unarme	Drinking Water Sodium Vapour Lamps (Full Illumination)	Permanent High level Jetty and DGPS Station is operational and being utilised

A. Floating Terminals										
Sl. No.	**Name of terminal with chainage (In km)**	**Land area (in Sq. m)**	**Size of berth, water front (In metre)**	**No. of Pontoon Barge & Gangway**	**Cargo Handling equipment**	**Storage area**	**Link approach road**	**Security (in each shift)**	**Water/ Lighting facility**	**Remarks**
	955Km.)				01 - 20 tonnes subject to radius	land 1000 Sq. m		d		since 2012.

(Source: Howe Engineering -Detailed Feasibility Report)

Figure 2.2 : Existing Navigation Infrastructure Facilities in NW-1

2.3.2. Existing and Anticipated Cargo Movement at NW-1

The above infrastructure supported a cargo movement of 27,16,436 MT (15,11,961,380 TKM/1.512 BTKM) during 2012-2013 (IWAI). Cargo transported include cement, fly ash, iron ore, iron ore fines, coal, steel shed, tyres, iron fines, iron ingots, Galvanized steel plain sheets, stone chips, furnace oil, high Speed diesel, lube oil, boulders, pulses, aluminium block, sand, chips, ship block, log, pulses, Manganese ore, Petroleum, Coke, Cooking coal, Rock Phosphate, Timber, Peas, Slag oil, and Non-cooking coal. Cargo traffic and the commodities transported in NW-1 vary in different stretches. Cargo volume by rail & road mode along NW-1 stretch for year 2014 is given at **Table 2.2**.

Table 2.2 : Current Traffic Along NW-1 Stretch (2014)

Commodities	By Road (in tonne)	By Rail (in tonne)	Total Cargo (in tonne)
Coal	45258500	18723758	68222258
Construction Material	30171490	14429354	44760679
Consumer Goods	191811	0	191811
Container	2033280	0	2033280
Fertilizer	156900	1377741	1534641
Food and Food Stuff	1404369	484233	1888602
Gas and Petroleum	8400	217026	475976
Minerals and Chemicals	43950	575750	1953161
Project Cargo	186560	18250	228622
Vehicles	37100	100000	137100
Total Cargo (in tonnes)	79492360	35926112	121426130

Source: HPC&HOWE ENGINEERING PROJECTS (INDIA) PVT. LTD. (DESIGN CONSULTANT)

Table 2.2 indicates that the current potential along NW-1 vis a vis other modes is very high which can be shared by NW-1.

Further, an Indo-Bangladesh Protocol on Inland Water Transit & Trade also exists between India and Bangladesh apart from intra country water transport. Under Indo-Bangladesh Protocol, inland vessels of one country can transit through the specified routes of the other country. The existing protocol routes are: Kolkata – Pandu-Kolkata, Kolkata-Karimganj–Kolkata, Rajshahi-Dhulian-Rajshahi, and Pandu-Karimganj-Pandu. For Inter-country trade, four ports of call have been designated in each country, namely; India –Haldia (West Bengal), Kolkata (West Bengal), Pandu (Assam), Karimganj (Assam) and Silghat (Assam) and Bangladesh-Narayanganj, Khulna, Mongla, Sirajganj and Ashuganj.

2.4. Traffic Projections & Components of Planned Project

Projection study for 30 years has been undertaken by survey and marketing consultant HPC for growth of traffic under three scenarios, i.e. base scenario (in absence of Jal Marg Vikas Project), Medium Augmentation scenario (Jal Marg Vikas project with 3 m LAD upto Farakka, 2.5 m until Patna and 2 m upto Varanasi) and Full augmentation scenario (LAD of 3 m upto Patna and 2.5 m upto Varanasi). For HPC has considered scenario for medium augmentation. Since traffic will be generated for different stretches, the traffic projections is made for three different stretches, i.e. Haldia-Varanasi, Haldia-Patna & Patna-Varanasi. The traffic projection for these stretches as per medium augmentation scenario is given below in **Table 2.3, 2.4 & 2.5**.

Table 2.3 : Traffic Forecast for Stretch-1 (Haldia-Varanasi)*

Cargo Type	Commodity	Forecast Medium Augmentation Case (tons)				
		Forecast MAC 2015 (t)	Forecast MAC 2020 (t)	Forecast MAC 2025 (t)	Forecast MAC 2035 (t)	Forecast MAC 2045 (t)
Dry Bulk	Stone chips	99,336	1,01,52,467	1,27,98,104	1,70,90,680	1,98,68,049
Dry Bulk	Coal	32,82,875	74,05,156	84,57,510	1,04,26,875	1,16,59,733
Dry Bulk	Iron ore	0	85,444	1,12,020	1,52,328	1,61,924
Dry Bulk	Limestone	0	3,889	4,932	6,925	8,050
Dry Bulk	Sand	0	1,38,070	1,74,090	2,32,932	2,70,785
Bagged	Food & Foodstuff	0	15,61,662	18,88,883	23,85,956	25,19,450
Bagged	Cement	0	8,27,552	12,13,633	20,34,856	25,62,950
Bagged	Fertilizer	0	60,061	66,117	75,037	80,216
Bagged	Plastic granules	0	9,383	12,270	18,713	24,250
Bagged	Textile	0	1,25,941	1,80,823	3,11,868	3,99,577
Neo-bulk	Logs & woods	63,151	86,976	1,08,042	1,45,196	1,82,878
Neo-bulk	Paper	0	3,745	5,282	8,320	10,480
Neo-bulk	Petroleum	2,62,460	5,15,815	6,61,925	9,25,784	10,70,067
Neo-bulk	Project cargo	0	3,79,560	4,43,000	5,67,556	7,14,850
Neo-bulk	Statues	0	1,07,208	1,21,296	1,37,339	1,37,339
Neo-bulk	Steel products	0	8,86,183	10,89,119	14,69,146	18,50,424
Ro-Ro	Vehicles	0	47,863	65,484	1,09,045	1,45,370
Container	General cargo	0	18,72,123	27,83,131	48,68,543	63,44,978
Total		37,07,822	2,42,69,096	3,01,85,663	4,09,67,100	4,80,11,367

Source: HPC & HOWE ENGINEERING PROJECTS (INDIA) PVT. LTD. (DESIGN CONSULTANT)

Table 2.4 : Traffic Forecast for Stretch-2 (Patna-Varanasi)*

Cargo Type	Commodity	Forecast Medium Augmentation Case (tons)				
		Forecast MAC 2015 (t)	Forecast MAC 2020 (t)	Forecast MAC 2025 (t)	Forecast MAC 2035 (t)	Forecast MAC 2045 (t)
Dry bulk	Coal	0	2,51,993	2,46,256	2,68,992	2,71,067
Dry bulk	Sand stone	0	5,185	6,576	9,233	10,733
Dry bulk	Limestone	0	3,889	4,932	6,925	8,050
Bagged	Food & Foodstuff	0	3,32,723	4,35,396	5,94,442	6,28,316
Bagged	Textile	0	61,229	73,563	1,01,778	1,30,401
Bagged	Plastic granules	0	9,383	12,270	18,713	24,250
Bagged	Cement	0	8,13,646	11,93,886	20,03,696	25,23,702
Neo-Bulk	Paper	0	3,745	5,282	8,320	10,480
Neo-Bulk	Project cargo	0	2,02,152	2,24,605	2,77,894	3,50,014
Neo-bulk	Steel products	0	4,81,730	5,77,518	7,69,196	9,68,820
Neo-bulk	Statues	0	1,07,208	1,21,296	1,37,339	1,37,339
Ro-Ro	Vehicles	0	47,863	65,484	1,09,045	1,45,370

Cargo Type	Commodity	Forecast Medium Augmentation Case (tons)				
		Forecast MAC 2015 (t)	Forecast MAC 2020 (t)	Forecast MAC 2025 (t)	Forecast MAC 2035 (t)	Forecast MAC 2045 (t)
Container	General cargo	0	17,43,011	25,91,191	45,32,781	59,07,393
Total		0	38,11,763	53,12,000	85,69,361	1,08,44,869

Source: HPC & HOWE ENGINEERING PROJECTS (INDIA) PVT. LTD. (DESIGN CONSULTANT

Table 2.5 : Traffic Forecast for Stretch-3 (Haldia-Patna)*

Cargo Type	Commodity	Forecast Medium Augmentation Case (tons)				
		Forecast MAC 2015 (t)	Forecast MAC 2020 (t)	Forecast MAC 2025 (t)	Forecast MAC 2035 (t)	Forecast MAC 2045 (t)
Dry bulk	Stone chips	0	23,98,814	30,23,922	40,38,168	46,94,401
Dry bulk	Coal	32,82,875	69,39,211	79,69,586	98,53,827	1,10,56,473
Dry bulk	Iron ore	0	9,71,959	12,25,242	16,36,197	19,02,091
Dry bulk	Limestone	0	3,23,986	4,08,414	5,45,399	6,34,030
Dry bulk	Sand	0	68,652	84,513	1,12,091	1,41,182
Bagged	Food & Foodstuff	1,62,487	63,63,580	79,20,893	1,04,42,930	1,19,90,623
Bagged	Fertilizers	0	17,94,026	26,47,350	45,96,517	59,75,527
Bagged	Plastic granules	0	23,258	32,621	50,627	58,517
Bagged	Textile	0	2,22,364	3,02,610	4,71,792	5,99,523
Neo-Bulk	Logs and wood	0	6,47,972	8,16,828	10,90,798	12,68,061
Neo-bulk	Petroleum	2,62,460	14,63,318	18,43,599	24,76,593	28,74,916
Neo-Bulk	Project cargo	0	2,64,189	3,15,652	4,24,786	5,19,963
Neo-bulk	Steel products	0	9,39,231	11,52,032	15,42,578	19,02,495
Ro-Ro	Vehicles	0	25,886	30,543	41,522	53,199
Container	General cargo	0	2,17,457	2,95,933	4,65,037	5,85,405
Total		37,07,822	2,26,63,903	2,80,69,739	3,77,88,862	4,42,56,407

Source: HPC& HOWE ENGINEERING PROJECTS (INDIA) PVT. LTD. (DESIGN CONSULTANT

Though above traffic projection indicates sufficient traffic cargo potential till 2045, however design consultant has considered different traffic forecasted the traffic again for the presently designed infrastructure facility. These terminals are designed on the basis of the traffic expected to be shifted at these sites from rail/road to IWT mode. Traffic projections for the planned infrastructure site are given below in **Table 2.6.**

Table 2.6 : Traffic Forecast for Planned Navigational Infrastructural Facilities*

Sr. No.	Infrastructural Facility	Projected Cargo-2015 (MTPA)	Projected Cargo-2030 (MTPA)	Projected Cargo-2045 (MTPA)
1	Sahibganj Terminal	2.24	4.39	9.00
2	Varanasi Terminal (with current land)	0.54	1.22	1.22

3	Haldia Terminal	4.07 MTPA (1.57 other cargo & 2.5 MTPA coal transhipment)

Source: HOWE ENGINEERING PROJECTS (INDIA) PVT. LTD. (DESIGN CONSULTANT
** Quantities are tentative and subject to change with revision in planning*

2.4.2. Components of the Planned Project

Entire stretch measures 1620 kms and traverses through 4 states namely Jharkhand, Uttar Pradesh, Bihar and West Bengal. Developments planned under the Jal Marg Vikas project to support traffic forecasts includes.

- Maintenance dredging to maintain the LAD in waterway/channel and the terminal facility
- Improved Navigation Infrastructure & Navigation Aids
  - Construction of 10 Nos. of Ro-Ro jetties & ferry passenger jetties. Location for these jetties is not yet identified.
  - Construction of 6 Nos. of terminals. Site identification and planning for 3 terminals sites at Sahibganj, Varanasi and Haldia is completed. 2 more potential sites for development of terminals are identified at Ghazipur and Kalughat. These two sites are still under consideration for finalization and planning is at initial stage only. One more terminal site is to be identified along NW-1.
  - Construction of Navigation Locks
  - Provision for tow barges, inland vessels, survey vessels including rescue boats and survey equipment. Development of low draught cargos
  - Development of navigation aids along NW-1 for facilitation of day & night time navigation
- Development of efficient River Information System with all hardware & software
- Provision for bank protection / slope protection and river training works for critical locations

2.4.3. Depth & Width of Navigation Channel & Size of Vessel / Ships

It is planned to maintain depth of 3 m from Haldia to Barh, 2.5 m from Barh to Buxar and 2.2 m from Buxar to Varanasi at present * [2]. Further, it is planned to maintain the channel width of 64 m and side slopes of 1:10 from section Haldia to Varanasi[3]. As per IWAI planning, Vessels of maximum length 110 m, beam 11.4 m, draught 2.5 m-2.8 m and air draught of 9 m will play in the waterway (***Detailed Feasibility Study for Jal Marg Vikas Project and Detailed Engineering for its Ancillary Works and Processes between Haldia to Allahabad by HOWE Engineering Projects (India) Pvt. Ltd)***. However, the vessel size will vary in different stretched as per the available LAD and type and quantity of cargo to be transported. Vessels of size 1500-2000 DWT is expected to ply in the waterway. However, size of the ships to ply in waterway will depend on the estimated cargo generation capacity and available LAD at particular intervention. Study for cargo estimation is under process and size of the vessels will be finalized accordingly.

2.4.4. Challenges for Project Development

Some of the major challenges include nature of the river, its morphology & related phenomena along NW-1. River Ganga (NW-1) is alluvial river with typical characteristic of braiding, meandering and large water level fluctuation between summer and monsoon months. Wide variations in water level are observed ranging from 2.5 m at Farakka to 16.5 m at Allahabad. Current velocity varies between 0.2m/s during lean season to 4.0 m/s during flood season in the

[2] *Source of Data: (Detailed Feasibility Study for Jal Marg Vikas Project and Detailed Engineering for its Ancillary Works and Processes between Haldia to Allahabad by HAWE Engineering Projects (India) Pvt. Ltd). * quantities are tentative and subject to change with revision in planning*
[3] *Source of Data: (Detailed Feasibility Study for Jal Marg Vikas Project and Detailed Engineering for its Ancillary Works and Processes between Haldia to Allahabad by HAWE Engineering Projects (India) Pvt. Ltd).*

stretch between Allahabad to Farakka. Current velocity is 1.2 m/s in Feeder Canal & 1.7 m/s (max.) in Bhagirathi river stretch.

Ganga carries annual silt load of 1600 million tons. Fine silt leads to rapid shoal formation. It becomes difficult to maintain even 2 m depth during low water season throughout the stretch. The stretch between Haldia and Tribeni (196 km) is tidal and the Least Available Depth (LAD) of more than 3.0 m is maintained naturally therein. IWAI has to erect bandals and carry out dredging to maintain the LAD in upper stretches of Tribeni. Due to unavailability of adequate depth/width and navigational infrastructure facilities, navigation of the large cargos throughout the year is not possible. Major challenges for navigation in NW-1 are listed below.

1. Highly braiding and meandering river
2. Large water level fluctuation
3. Unavailability of LAD for navigation throughout NW-1 and unreliable water depths
4. Existence of sharp bends
5. High silt load & shoal/bar/island formation leading to splitting of main channel
6. Growing of bars reducing the available depth
7. Lateral migration of the river
8. Existence of power line pylons at various locations
9. Existence of pontoon bridges. About 7 pontoon bridges are present between Buxar and Allahabad which are in use. Pontoon bridges are significant threat to navigation
10. Existence of siphon in the Farakka feeder canal for irrigation purpose which generates eddy currents, reduces water level by 0.1-0.2 m in immediate vicinity of the structure and reduction in buoyancy of vessel due to presence of air bubbles in water column above this siphon leading to increase in vessel draught
11. Existence of critical bridges (bridges with Horizontal Clearance (HC) & Vertical Clearance (VC) less than 70 m & 9 m respectively). Details of the critical bridges are given below in **Table 2.7** below.
12. Inadequate navigation infrastructure and aids like inadequate fairway width, channel marking, navigation lights, signals, RIS etc., lack of modern vessel based navigation aids, absence of effective waterway reporting & tracking system etc.

Table 2.7 : Details of Critical Bridges on NW-1

S. No.	Location	Chainage	Horizontal Clearance (HC)-m	Vertical Clearance (VC)-m
1	Pakur Bridge	525	49.07	12.15
2	Rajendra Setu- Semaria	853	40.00	10.00
3	Malaviya-Varanasi	1308	101.50	6.56
4	Mirzapur	1398	30.50	2.52
5	Swami Vivekananda Setu	--	--	8.8
6	Bridge at Digha	--	20	--
7	Rajendra/Mokama Bridge, Hathida	--	--	10.6
8	Buxar Road Bridge	--	--	10.91
9	Ghazipur Road Bridge	--	--	11.82

Source: IWAI & HAWE ENGINEERING PROJECTS (INDIA) PVT. LTD. (DESIGN CONSULTANT)

Project Jal Marg Vikas is aimed at minimizing these challenges to ensure the navigation in the entire stretch during most of the time in year. Implementation of project will focus on maintaining the LAD for navigation in the desired stretches, improving existing navigation infrastructure, developing new infrastructure, improved navigation aids and navigation cargos.

2.5. Physical Intervention

The components of the projects, during phase 1 mentioned in 2.3 which are required to be achieved have been described in the following sections. These include:

1. Planned Infrastructure
- Terminal sites at Haldia, Sahibganj & Varanasi
- New Lock at Farakka

2. Infrastructure Facilities at Initial Planning Stage
- Terminals at Ghazipur and Tribeni

3. Facilities yet to be planned
- One similar terminal site
- 10 Nos. Ro-Ro Jetty and Passenger Ferry Jetties
- Development of low draught cargo
- River Training Works at Critical Locations like bends
- Bank/slope & scour protection works
- Equipment of tow barges, inland vessels, survey vessels including rescue boats and survey equipment
- Maintenance dredging for maintenance of waterways and proposed civil interventions/ navigation infrastructure.

Currently planned infrastructure and infrastructure facilities at initial planning stage have been considered as part 1 of phase 1. Map showing the location of already planned and the sites under initial planning stage on NW-1 under Jal Marg Vikas Project are given below in Figure 2.3. However, facilities yet to be planned have been considered as part 2 of the phase 1.

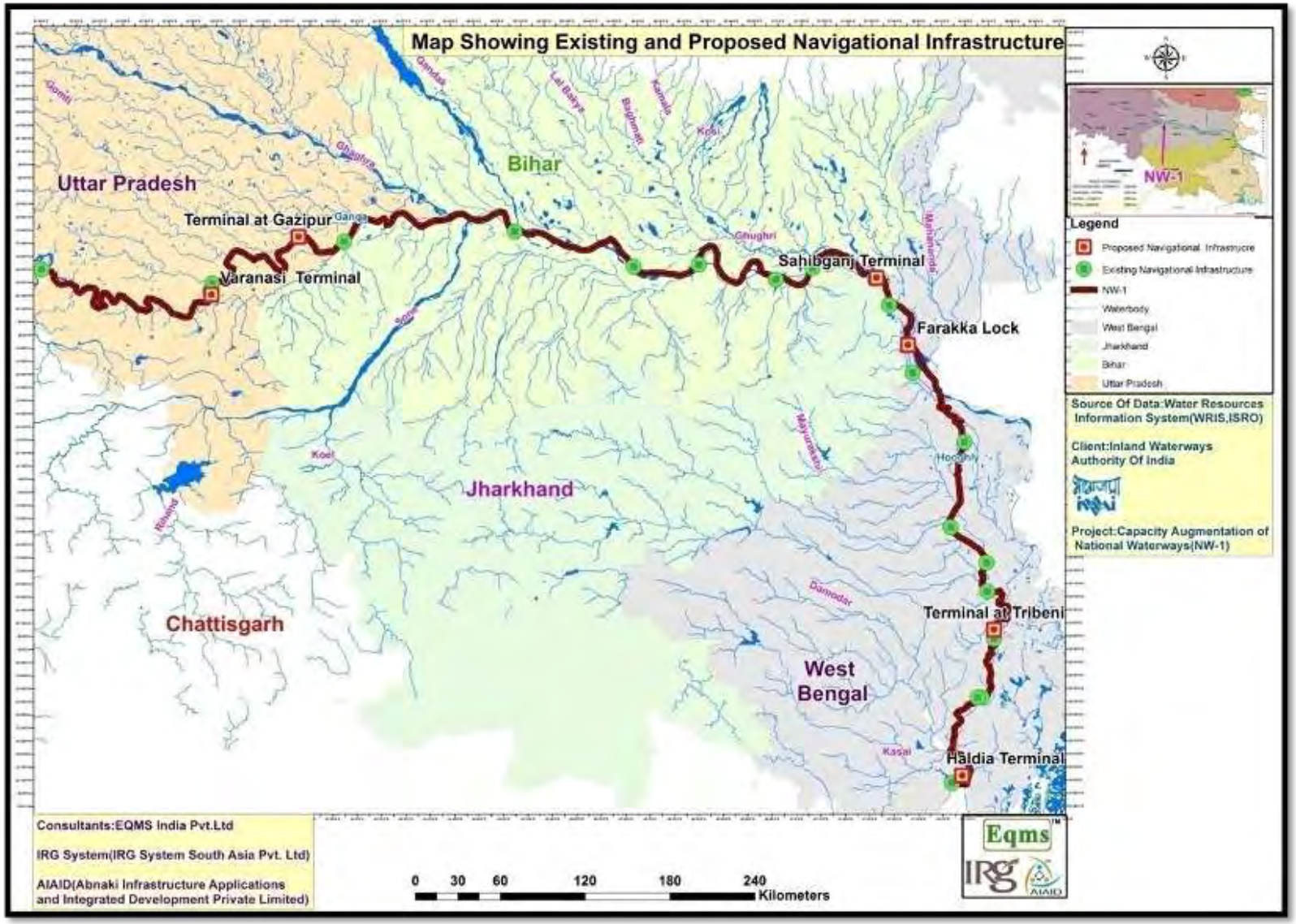

Figure 2.3 : Planned Navigation Infrastructure Facilities in NW-1 Under Jal Marg Vikas project

2.5.2. Terminal at Haldia

Haldia inland water terminal at River Hooghly (NW-1) is proposed to be located at River Hooghly at Industrial Zone of Haldia dock Complex near Durgachak (J.L.No-135, Barmurchak-138 & Jagatchak J.L.No-140), Haldia, District Purbi Medinipur, West Bengal. River Hooghly flows in South direction of the terminal site. Map showing location of Terminal at Haldia is given in **Figure 2.4**. Salient features of the project are given below in **Table 2.8.**

Figure 2.4 : Location Map of Haldia Terminal

Table 2.8 : Salient Features of the Haldia Terminal

Sr. No.	Salient Feature	Capacity/Quantity/Nos.
1.	Location	Haldia Industrial Complex area, Haldia, District Purbi Medinipur, West Bengal.
2.	Geographical Coordinates	22°03'38.34"N & 88°08'29.49"E
3.	Capacity of Cargo Handling	4.07 million MTPA 1.57 MTPA for Stone aggregates, fertilizers, Fly ash and edible oil & POL and 2.5 MTPA for coal transhipment
4.	Connectivity	Site connected to NH-41 through 7 m wide road along western boundary of site. Nearest railway station is Durgachak Railway

<table>
<tr><th>Sr. No.</th><th>Salient Feature</th><th>Capacity/Quantity/Nos.</th></tr>
<tr><td></td><td></td><td>Station at 600 m in NE direction. Railway connectivity is not proposed.</td></tr>
<tr><td>5.</td><td>Topography of terminal site</td><td>Site is almost flat in topography and elevation ranges of 4-9 m amsl. Site requires levelling and filling (3.3 lakh cum) to achieve finished level of 7 m</td></tr>
<tr><td>6.</td><td>Facilities Proposed for Haldia Terminal (Phase 1A & 1 B)</td><td>• Storage sheds (future storage area will be developed in phase 1B)
• 8 Nos. of Silos in phase 1A & 8 nos. of silos in phase 1B for flyash storage and pipeline conveyor system
• Unloading & Loading Areas
• Internal Roads
• Berths (5 Nos.) (berth for coal transhipment in phase 1 B)
• Water area & approach channel
• Administration Building
• Workers Amenity Building
• Fuel bunker
• Security office
• Weigh bridge building
• Lighting Towers
• Railway siding (future development)
• Other associated facilities like sewerage system, STP, dump pond, drainage system, RWH pond, fire-fighting facilities, communication system, water supply, ESS & power supply.</td></tr>
<tr><td>7.</td><td>Facilities to be shifted</td><td>Existing underground ammonia pipeline of Tata chemicals further towards the bank (above ground) and Existing Road to Mitsubishi Plant in South to Eastern Boundary of the site</td></tr>
<tr><td>8.</td><td>Shore Protection Works</td><td>The existing river bank protection works is adequate</td></tr>
<tr><td>9.</td><td>LAD (Least Available Draft)</td><td>3 m for barge vessels (4 nos. berths) and 8 m for large vessel (coal transhipment berth)</td></tr>
<tr><td>10.</td><td>Extension of Off-shore structure in River</td><td>
<table>
<tr><th>Offshore structure</th><th>Extension of off-shore structure (berth + approach trestle) inside the river</th><th>Length of approach trestle inside river</th><th>Length of Berth</th><th>Width of Berth</th></tr>
<tr><td>2 Nos of berths for barges</td><td>200</td><td>170</td><td>30</td><td>105</td></tr>
<tr><td>1 Nos of berths for barges</td><td>200</td><td>170</td><td>30</td><td>120</td></tr>
<tr><td>1 No of berth for barges/Berth No. 4</td><td>200</td><td>150</td><td>50</td><td>120</td></tr>
<tr><td>1 No of berth for coal transhipment</td><td>313.5</td><td>85 + 50 m (length of berth no.</td><td>28.5</td><td>150</td></tr>
</table>
</td></tr>
</table>

Sr. No.	Salient Feature	Capacity/Quantity/Nos.
		attached to Berth No. 4 | | 4) | | * length of 4 nos. approach trestle at terminal site is 145 m
11.	HFL of the River	4.46 m amsl
12.	Finished level of site	7 m
13.	Top level of berth & approach trestle	14 m
14.	Dredging During Construction Phase	7 lakh cum
15.	Material Transportation System	Trucks, Pay loaders, Barge loaders, mobile harbour cranes & granty cranes. Fly ash will be transported by trucks and loaded to the silos pneumatically by pumps and then it will be loaded to barge by pipe conveyor system. 16 Nos. silos of 1200 Tonne capacity will be provided for ash storage
16.	Maintenance Dredging during operation phase	8.5 lakh cum/year
17.	Water Requirement-construction phase	90 KLD
18.	Water Requirement-operation phase	70 KLD 20 KLD-Raw water requirement and 50 KLD potable water requirement
19.	Power Requirement	Connected load-5500 KW Demand Load-2400 KW
20.	Storm Water System	Open Storm water drains of total length 6 km Stock yard, parking area & roads –dump pond Buildings- Rain water storage sump
21.	STP Capacity-Operation Phase	30 KLD
22.	Dust Suppression Methods	Fly Ash-Dust extraction system on top of silos Aggregate & fertilizers stockyards- Swivelling plain water sprinklers for abatement of aggregate dust generation along the length of the stockpile.

Source: Site visit & HOWE Engineering Projects (India) Pvt. Ltd. (Design Consultant) India

2.5.3. Terminal at Sahibganj

Sahibganj terminal will be developed along River Ganga, Village Samdha Nala & Rampura, Tehsil & District Sahibganj, Jharkhand. Map showing location of Terminal at Sahibganj is given in **Figure 2.5**. Salient features of project are given below in **Table 2.9**.

Figure 2.5 : Location Map of Sahibganj Terminal Site

Table 2.9 : Salient Features of the Sahibganj Terminal

S. No.	Salient Feature	Capacity/Quantity/Nos.
1.	Location	River Ganga, Village Samdha Nala & Rampura, Tehsil & District Sahibganj, Jharkhand
2.	Geographical coordinates	25°15'0.73"N & 25°15'0.73"N
3.	Cargo Handling Capacity	Phase I-2.24 million MTPA Phase II-4.39 million MTPA Phase III-9.00 million MTPA
4.	Nature of Cargo to be handled	Coal, stone chips, food grains, cement, fertilizers & sugar
5.	Connectivity	Approach road to be constructed by PWD to connect to NH-80 and Railway connectivity to be developed to link the existing railway line Nearest Railway Station: Sakrigali Railway Station (1.1 km, S) & Sahibganj Railway Station (6 kms, W) Nearest Airport: Patna Airport (270 km, NW) Ferry Service: Sahibganj ghat to Manihari Ghat
6.	Topography of terminal site	Undulating with level variation of 30 m-56 m

S. No.	Salient Feature	Capacity/Quantity/Nos.
7.	On-shore Facilities Proposed for Phase I	• Stockyard for coal (6 stock piles-1.12 ha), for stone chips (8 stock piles-0.875 ha) & 1 covered shed (0.416 ha) • Unloading & Loading Areas • Internal Roads (12 m wide & 3.6 km length) • Administration Building • Workers Amenity Building • Lighting Towers • Other associated facilities like sewerage system, STP, drainage system, fire-fighting facilities, communication system, water supply & power supply (ESS) • Boundary wall of 2.4 m high • Green belt- 15-20 m (2.9 ha) To be developed by PWD/Railways: • Approach Road (1 km connecting to NH-80 crossing LC-54) • Railway Connectivity (through Sagrakali Railway Station) with provision of ROB over LC-54 for approach road to be developed
8.	Off-shore Facilities Proposed for Phase I	• Jetty (1 No.) & Berth (2 Nos.) • Water area & approach channel (45 m wide channel) • Turning Circle (2 Nos. at starting & end of channel) • Shore protection (1.5 kms along River Bank, 800 m in Phase I & 700 m in phase II)
9.	Extension of Off-shore structure (jetty & Berths) in River	75 m (50 m-approach trestle & 25 m jetty) length & 270 m width.
10.	Shore Protection Works	Retaining wall and stone pitching (30-50 kgs) along the length of bank (1.5 km total, 800 m in phase I & 700 m in phase II) and 40 m apron inside the River.
11.	LAD	1-2.5 m near shoreline 7-11 m at distance of 50 m
12.	Water level fluctuation of River near Terminal Site	10 m
13.	HFL of Site	30.91 m amsl
14.	Finished Level of Site	37 m amsl
15.	Top level of Berth & Jetty	33.5 m
16.	Earthwork Phase I	Cut: 14.25 lakh cum Fill: 2.15 lakh cum Muck for disposal: 12.1 lakh cum
17.	Dredging During Construction Phase	1.5 lakh cum

S. No.	Salient Feature	Capacity/Quantity/Nos.
18.	Material Transportation System	In Phase-1 of terminal, it is proposed to provide hopper at the coal and stone chips stockyard and the cargo shall be carried through conveyor system to the berth where it shall be discharged to the vessels through barge loader
19.	Maintenance Dredging during operation phase	30,000 cum in lean season
20.	River Water Requirement for dust suppression and horticulture	Phase 1: 162 KLD Phase II: 210 KLD Phase III: 350 KLD
21.	Municipal supply water for domestic purpose (staff & vessels)	Phase 1: 46.5 KLD Phase II: 65 KLD Phase III: 90 KLD
22.	Power Requirement	Phase 1: 588 KW Phase II: 2535 KW Phase III: 1897 KW
23.	Storm Water System	Storm water drain of length 3.05 km Stock yard, parking area & roads –dump pond Buildings- Rain water storage sump
24.	Sewage Generation & STP	Phase 1: 30 KLD Phase II: 36 KLD Phase III: 40 KLD STP: 40 KLD capacity
25.	Dust Suppression Methods	**Barge Loaders-** Plain water fine spray with medium pressure standard hydraulic system using raw water **Coal Stock Yard-** Swivelling plain water sprinklers for abatement of coal dust generation along the length of the stockpile.
26.	Vehicle Parking Area	1 ha
27.	Solid Waste Generation & management	Solid waste to be generated from terminal facility will include majorly the food waste and the garden waste. This waste can be disposed off through the local agency in the area responsible for waste handling. Dustbins shall be provided at the site for collection of the waste. Used oils from DG sets/transformers/pumps etc may also generate at the site. Used/Waste oil will be stored in HDPE containers at the site in isolated location and will be sold to authorized vendors

Source: Site visit & HOWE Engineering Projects (India) Pvt. Ltd. (Design Consultant) India

2.5.4. Terminal at Varanasi (Ramnagar)

A multimodal terminal is proposed to be developed at Ramnagar, on river Ganga in Varanasi district in Uttar Pradesh. Map showing location of Terminal at Varanasi is given in **Figure 2.6**. Salient features of the development of phase 1A of the Varanasi terminal are listed in **Table 2.10** below.

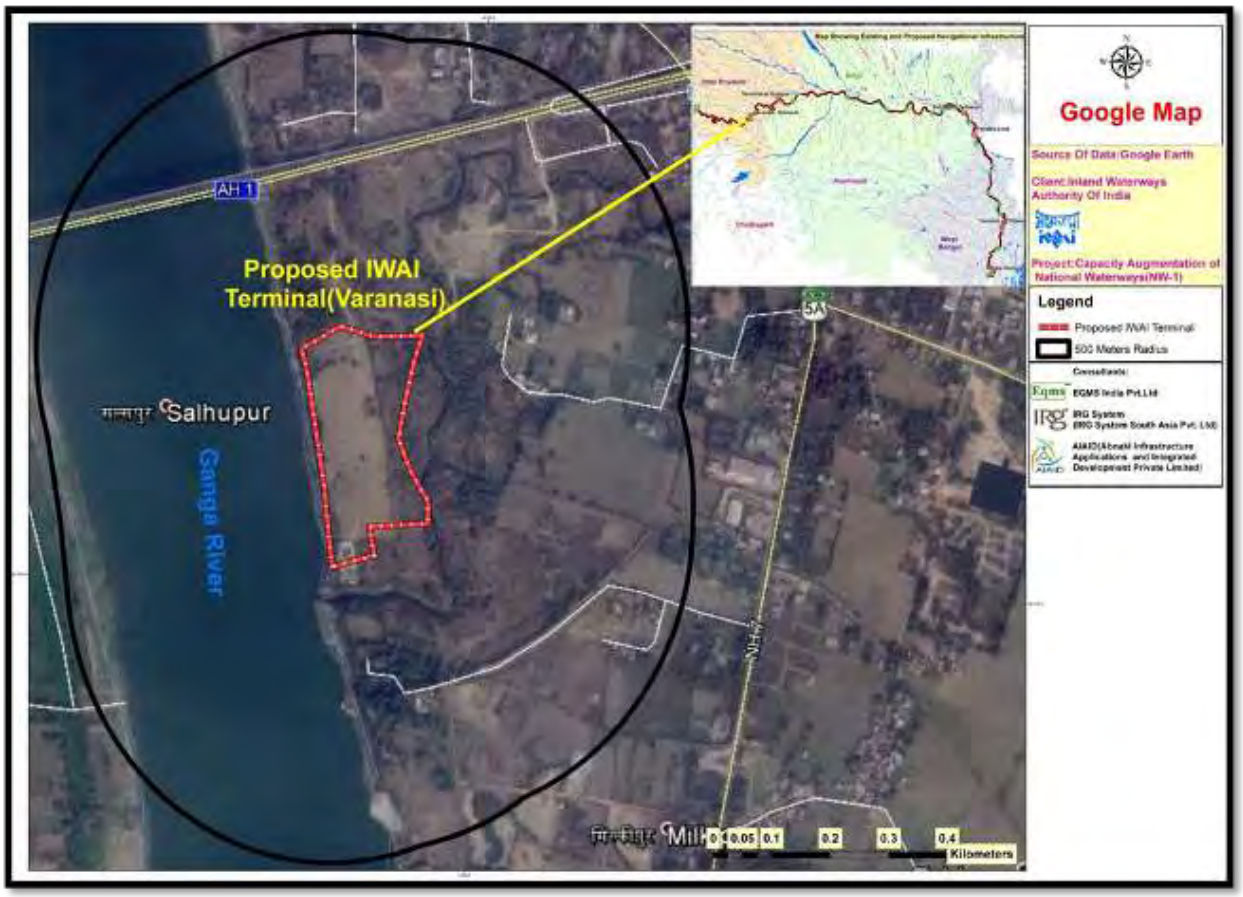

Figure 2.6 : Location of Varanasi Terminal Site

Table 2.10 : Salient Features of Varanasi Terminal

Sr. No.	Salient Feature	Capacity/Quantity/Nos.
1.	Location	River Ganga, Ramnagar, Varanasi, U.P.
2.	Project site Geographical Coordinates	25°15'7.90"N & 83° 1'55.45"E
3.	Project Area	5.685 ha
4.	Type of Land	Private Agricultural Land (12 small khejur trees and 8 babool shrubs) but no agricultural activity is being undertaken
5.	Site Surroundings	River Ganga (abuts site, West) Gurha Nallah (Abuts, East & South)
6.	Accessibility &	No pucca public road to access site. Site accessible through katcha village

<table>
<tr><th>Sr. No.</th><th>Salient Feature</th><th>Capacity/Quantity/Nos.</th></tr>
<tr><td></td><td>Connectivity</td><td>road and it connects site to NH-7. Approach road of 700 m is planned to connect the site with NH-7 for which additional area of 0.592 ha will be acquired.
Nearest Railway Station – Jeonathpur (4.0 km, SE)
Nearest Airport - Lal Bahadur Shastri Airport (30 km, NW)</td></tr>
<tr><td>7.</td><td>Facilities Proposed</td><td>• 2 Nos. berths (100 m length & 36 m width each) so as 2 vessels of 80 m each can be berthed at one time. Berth will be laong the River bed
• 2 mobile cranes for loading & unloading
• Open area at site for storage of transportation material (Edible oil tank storage area)
• Passenger jetty (floating pontoons-20 m X 10 m) & gangway (1.2 m wide)
• Stone pitching upstream & downstream river bank (35 m length downstream & 117 m length upstream)
• Area for DGPS
• 12 m wide internal roads-365 m & 22 m wide internal road-650 m
• Approach road to NH-7
• ESS (400 sq m) building & power back-up
• Soak pit & septic tanks-wastewater management system
• Workers amenity building (30 sqm)
• Water supply system
• Storm water drainage system
• Earthing & lighting protection system for all conducting materials
• Lighting system
• Green area</td></tr>
<tr><td>8.</td><td>Cargo to be handled</td><td>Coal (imported & domestic), cement, fertilizers, wheat & crude edible oil</td></tr>
<tr><td>9.</td><td>Plying vessel</td><td><table><tr><th>Multimodal jetty</th><th>DWT</th><th>LOA (m)</th><th>Beam (m)</th><th>Loaded Draft (m)</th></tr><tr><td>Maximum Ship Size</td><td>2000</td><td>80</td><td>11</td><td>3.5</td></tr><tr><td>Minimum Ship Size</td><td>200</td><td>18</td><td>5</td><td>1.0</td></tr></table></td></tr>
<tr><td>10.</td><td>LAD at jetty</td><td>+3.5 m</td></tr>
<tr><td>11.</td><td>Eco-sensitivity</td><td>Kashi Turtle Sanctuary at 2.3 km in North direction (downstream)
No national park, reserved/protected forest, reserves, zoological parks, migratory bird route, protected wetland under Ramsar convention etc are present within the 10 km radius area</td></tr>
<tr><td>12.</td><td>Water Supply System</td><td>Municipal Corporation, Varanasi</td></tr>
<tr><td>13.</td><td>Power Requirement</td><td>State grid (Purvanchal Vidyut Vitran Nigam Ltd).</td></tr>
</table>

Source: Site visit & HOWE Engineering Projects (India) Pvt. Ltd. (Design Consultant) India

2.5.5. Lock at Farakka

A new lock is proposed to be developed in Farakka on the Feeder Canal of Farakka Barrage adjacent to the existing lock at Farakka in Murshidabad district of West Bengal. New lock will be further West to the existing lock and will share its right bank with the left bank of the existing lock. Site is located in village Goraipada, Gram panchayat Bewa, Farakka in Murshidabad district of West Bengal. The Ganga River is flowing about 1.2 km East of the

proposed lock gate site. Map showing location of Lock at Farakka is given in **Figure 2.7**. The salient features of the existing lock site are given in **Table 2.11.**

Figure 2.7 : Location Map of Farakka Lock

Table 2.11 : Salient Features of New Lock

S. No.	Parameters	Value
1	Location	Feeder Canal, village Goraipada, Grampanchayat Bewa, Farakka in Murshidabad district of West Bengal.
2	Geographical Coordinates	24°48'32.38"N to 24°49'02.23"N & 87°54' 05.63"E to 87°54' 17.18"E.
3	Land Required	14.86 ha
4	Topography	RL+13 to RL+29m
5	Finished Level of Site	28.44 m
6	High Water Level U/S High Water Level D/S	RL + 26.30 m RL +24.38 m
7	Length of Lock	179 m
8	Width of Lock	25.148 m
9	Av. Depth of Lock	13.10 m
10	Capacity of Lock to handle no. of vessels of size 85 m (length) X 12 m (width)	four vessels of size 85 m (length) X 12 m, (width) so as two vessels are moored lengthwise and two sidewise like existing lock

S. No.	Parameters	Value
11	Seismic Risk Design Consideration	Site lies in Zone III and design is calculated as per IS: 1893:2002
12	Length of extension of U/S Approach Channel (m)	190
13	Length of extension of D/S Approach Channel (m)	310
14	Dredging required in upstream and downstream of approach channel to achieve water depth of 3 m	0.05 + 0.08 = 0.13
15	Counter Fort Retaining wall • Top wall level • Bottom wall level • Slope	 28.44 m 12.8-14.8 m 1V:370 H
16	Slope of Excavation along River Bank	1.5 H :1 V
17	Inlet & Outlet water Structures	4 Nos. feeder culverts (2 U/s & 2 D/s) of length 60 m each.
18	Base Slab Thickness	1.2 m
19	Main Units other than the lock	• Mitre Gates- 2 sets (two leaves per set) • Radial Valve Gates- 4 sets (2 for U/S and 2 for D/S) • Mooring Bits (Floating)- 8 sets (4 sets per bank) • Caisson Gates/Stoplogs- 2 Nos (Used for U/S or D/S) • Bulkhead Gates- 4 sets (2 sets for U/S or D/S) • Control Rooms for remote control-1 each for U/S or D/S
20	Length of FBP Inspection Road to be realigned (m)	675
21	Length of Boundary Wall to be constructed (m)	1180
22	Scour Protection • River Bank Slopes U/s & D/s of approach channel • Guide wall	 2 layers of back pitching with PCC blocks of size 1 X 1 X 0.6 m and 6 m wide launching apron consisting of two layers of concrete blocks of size 1.5 X 1.5 X 0.9 m Tied to existing lock and cut-offs to a depth of 5 m
23	Flood Protection	Filling site to 28.44 m + RL, i.e. above HFL, strengthening of existing levees and banks to prevent erosion & flooding
24	Other facilities	Water supply system, soak pit & septic tanks, storm water drainage system, green belt (1 ha & 900 trees) and office building
25	Water Requirement	Construction Phase-16.5 KLD Operation Phase-6.5 KLD for domestic, 7.3 KLD for dust suppression & 2.7 KLD for horticulture
26	Power Requirement	557 KW

S. No.	Parameters	Value
	Green Area	10000 m^2 (1000 m X 10 m). 900 trees to be planted

Source: HOWE Engineering Projects (India) Pvt. Ltd. (Design Consultant) India

2.5.6. Terminal at Tribeni (Tentative Location)

It is planned to develop terminal at Tribeni. Currently, Planning is at initial stage and site selection & finalization is under progress at present. Two locations have been considered for development of terminal. First site is located on left bank of River Hoogly upstream of Road Bridge on SH-6 at Tribeni, west Bengal. Site is well connected with road & railways. Kalyani Samanta is nearest railway station. App. 40 ha of agricultural land is identified for development of terminal at this site. Some brick kilns also exist at the site. One more site is considered for development of the terminal. Site is located on the right bank of the River downstream of the road bridge at SH-6. This site is located near the thickly populated area. Out of both the options alternative 1, i.e. site located upstream if SH-6 is considered for development of terminal. Google map showing the site considered for development of terminal at Tribeni is given in **Figure 2.8**.

Figure 2.8 : Proposed Terminal Site at Tribeni

2.5.7. Terminal at Ghazipur (Tentative Location)

It is planned to develop terminal at Ghazipur, U.P. Currently, planning is at initial stage for this terminal & site identification and alternative site analysis are under progress. Two sites have been identified at present for development of project. Out of the two sites, preferable site is located at Village Chaukiya, Ghazipur. This site is located on left bank of River Ganga (main channel) and downstream of NH-97. The site is agricultural land with no development or facilities or settlements on it. Area of the site identified is app. 22 ha. Site is well connected with road & railway. Depth of the channel is more than 2.5 m close to the shoreline. However, approach road will require to be constructed for connecting the terminal site to NH-19. Google map showing the site considered for development of terminal at Ghazipur is given in **Figure 2.9**.

Figure 2.9 : Proposed Terminal Site at Ghazipur

Table 2.12 : Implementation Time for Key Proposed Interventions

Sr. No.	Intervention Type	Construction/Implementation Time
1	Terminal	30 months
2	Lock	30 months
3	Maintenance Dredging	During Low flow time (6-8 months in year)

2.6. Applicable Legislation and World Bank Operational Policies

There are four World Bank operational policies applicable to NW-1. These are listed at **Table 2.13.** Required mitigation measures have been incorporated in project design/Environmental management plans.

Table 2.13 : Salient World Bank Safeguard Policies

Name	Key Requirement	Applicability	Remarks
OP 4.01 Environmental Assessment	Ensures sustainability and environmental feasibility of the project. Projects are classified into A, B & C category depending on the nature and extent of the impact.	Triggers	Project classified as Category A considering nature of activities and impacts
OP 4.04 Natural habitats	Ensures conservation of natural habitats and discourages disturbance of nay natural habitat due to project development by recommending adoption of alternative method/route/approach or	Triggered	Triggered for Sahibganj & Varanasi Terminal Projects. No other project is in close vicinity of such endangered or protected environment

Name	Key Requirement	Applicability	Remarks
	adopting management measures		
OP 4.36 Forests	Ensures that project activities donot disturbs/interfere with the forest, forest dwellers activities, fauna and flora of the forest. Prevents and discourages deforestation and impacts on rights of forest dependent people.	Triggers	No diversion of forest land is involved however large number of tree cutting is involved. Permission will be required for felling these trees from forest department.
OP 4.12 Involuntary Resettlement	Ensures minimal involuntary resettlement by considering feasible alternatives project design, assisting displaced people to improve their former living standard.	Triggers	Applicable for facilities which involves land acquisition like Sahibganj terminal, Varanasi terminal etc.
OP 4.10 Indigenous people	Ensures protection of the dignity, right and cultural uniqueness of indigenous people and ensures they receive social and economic benefits	Triggers	No indigenous group of people will be affected directly by project, however ST population is residing within 10 km radius area of the Sahibganj terminal.
OP 4.11 Physical Cultural Resources	Ensures preservation of property of cultural and religious importance, heritage and property of natural importance and enhancement of cultural properties	Triggers	Applicable for Sahibganj terminal project as it involves shifting of one of the community temple which exists at the site. It may be applicable for other sites for civil interventions which are under planning and identification
OP 7.5 Projects on International Waterways	Projects on international waterways may affect the relations between the World Bank and its borrowers, and between riparian states. Therefore, the Bank attaches great importance to the riparian making appropriate agreements or arrangements for the entire waterway, or parts thereof, and stands ready to assist in this regard. A borrower must notify other riparian of planned projects that could affect water quality or quantity, sufficiently far in advance to allow them to review the plans and raise any concerns or objections	Triggered	NW-1 traverse through Farakka canal to Hoogly River and does not affect or change the water treaty between India and Bangladesh in any way. However due to movement of vessels in River Ganga in Farakka area which is part of international riparian treaty between India & Bangladesh, this policy is considered triggered with a view to give advance intimation of NW-1 plans of this area to Bangladesh

World Bank's operational policy 4.01 (OP 4.01) categorize the project into Category A, B & C on the basis of nature and extent of the impacts anticipated from the project. Scope of Environmental assessment studies depends on the category in which the project falls and is defined below.

Category A - Projects with significant environmental impacts and requiring a full Environmental Assessment (EA),
Category B - Projects with moderate environmental impacts and requiring a lesser level of environmental assessment,
Category C - Projects which require no environmental analysis.

India has well defined environmental and social legislation framework. Applicability of these regulations depends on nature of project and activities. The summary of various Laws and Regulation applicable to NW-1 project is summarized at **Table 2.14**.

The Government of India (GOI) has detailed legislative framework imposing various restrictions for developments of inland & water areas. The attempt has been made to summarize the legislations which will determine the No Go/restriction areas for project foot prints.

The key legislations are
1. Wildlife Protection Act
2. Forest Conservation Act
3. Environmental Protection Act
4. Ancient Monuments and Archaeological Sites and Remains Act

Various national parks & sanctuaries are notified under above acts which impose ban of any activities without following a defined clearance process going up to Supreme Court level. Such areas have been considered as no go areas wherever applicable in the basin and project intervention areas. Other areas identified like reserve forest, Hilsa sanctuaries are also notified but with much lesser degree of restrictions.

Table 2.14 : Key Environmental Legislation at a Glance

Name	Key Requirement	Likely Applicability	Controlling Authorities
Acts/Rules			
Environment Protection Act-1986 and Rules there under including EIA Notification 14th Sep 2006 and amendment till date	To protect and improve overall environment	Considered Not Applicable (EIA Notification 2006 does not classify terminals/jetties/ floating terminals on river or dredging in the river as a project requiring environmental clearance. The applicability of this legislation should be re-assessed periodically from the concerned authority during NW-1 project development and implementation stages to ensure conformity with changes in the regulations if any).	MoEFCC/SEIAA

Name	Key Requirement	Likely Applicability	Controlling Authorities
Acts/Rules			
		Borrowing of earth for road construction as may be required, will require prior environment clearance under mining category.	
The Forest (Conservation) Act, 1980 and amendments The Forest (conversion) Rules 1981 and amendments	To protect forest by restricting conversion of forested areas into non- forested areas and deforestation	Applicable if forest land is diverted or tree cutting is involved.	Forest Department, MoEFCC
Wild Life Protection Act, 1972	To protect wildlife through notifying National Parks and Sanctuaries and buffer areas around these zones	Applicable, project passes through the sanctuary area or its eco sensitive zone.	Sate Wild Life Departments and MoEFCC
Air (Prevention and Control of Pollution) Act, 1981	To control air pollution Pollutants from the construction and operation activities	Applicable for construction activities like setting up hot mix plants, batching plants	SPCB
Water Prevention and Control of Pollution) Act, 1974	To control water pollution Pollutants from the construction and operation activities	Applicable for construction activities for setting up construction camps involving discharges of liquid waste	SPCB
Noise Pollution (Regulation and Control Act) 2000 and amendment till date	The standards for noise for day and night have been promulgated by the MoEFCC for various land uses.	Applicable for all construction and operation phase activities	SPCB/MoEFCC
Hazardous Wastes (Management Handling and Trans-boundary) Rules, 2008 .	The rules prescribe the details of management of hazardous industrial solid wastes from its generation to final disposal (cradle to grave) and fixes responsibilities on the generator, the	Applicable for managing hazardous waste that can be generated during construction & operation phase	SPCB

Name	Key Requirement	Likely Applicability	Controlling Authorities
Acts/Rules			
	transporter and the disposal agent.		
Ancient Monuments and Archaeological Sites and Remains Act, 1958	Conservation of cultural and historical remains found in India	Applicable for river stretches located within 300 m of such monument	Archaeological Dept.
Explosive Act 1984	Safe transportation, storage and use of explosive material	Applicable only if large quantity of fuel is stored.	Chief Controller of Explosives
Central Motor Vehicle Act 1988 Central Motor Vehicle Rules, 1989 and amendments till date	To check vehicular air and noise pollution.	Applicable, for construction vehicles	Motor Vehicle Department
Prevention of Collision on national Waterways Regulations, 2002	Regard to precautions required by the ordinary practice of Seamen and limitation of the vessel	Applicable for development of the terminal for all the vessel plying in National Waterway	IWAI
National Waterways, Safety of Navigation and Shipping Regulations, 2002	ensuring safety of navigation and shipping on the national waterways	Applicable for development of the terminal for all the vessel plying in National Waterway	IWAI
The National Waterway-1 Act, 1982	Provision for regulation and development of that river for purpose of shipping and navigation on the NW-1 and for the matters connected therewith or incidental thereto	Applicable for development of the terminal for all the vessel plying in National Waterway	IWAI
New Inland Vessel Act, 2015 & Rules Under IV Act	Economical and safe transportation through inland waters	Applicable for development of all the vessel plying in National Waterway	IWAI

2.6.2. International Conventions, Protocols and Agreements

International Maritime Organization Conventions: India is member state of the International Maritime Organization (IMO). Therefore, all activities relating to shipment through the port shall have to be done strictly in compliance with the standards set by the IMO, particularly the conventions, protocols and agreements. IMO Conventions/ Protocols related to environment & pollution are given in **Table 2.15** for reference purposes and inputs for design requirement.

The World Bank Operation Policies are also applicable to the project but are not summarized here as these would be followed while developing the mitigation measures in the EIA reports.

Table 2.15 : International Maritime Conventions, Protocols and Agreements

Sr. No.	Issues	International Maritime Conventions, Protocols and Agreements	Remarks
1.	Maritime safety	SOLAS Convention, 1974	The SOLAS Convention in its successive forms is generally regarded as the most important of all international treaties concerning the safety of merchant ships. The 1974 version includes the tacit acceptance procedure - which provides that an amendment shall enter into force on a specified date unless, before that date, objections to the amendment are received from an agreed number of Parties. The Convention came into force on May 25, 1980
2.	Measurement of ships	Load Lines Convention,1966	It has long been recognized that limitations on the draught to which a ship may be loaded make a significant contribution to her safety. These limits are given in the form of freeboards, which constitute, besides external weather tight and watertight integrity, the main objective of the Convention.
3.	Preventing collisions at sea	Convention on International Regulations for Preventing Collisions at Sea (COLREG), 1972	The 1972 Convention was designed to update and replace the Collision Regulations of 1960 which were adopted at the same time as the 1960 SOLAS Convention. One of the most important innovations in the 1972 COLREGs was the recognition given to traffic separation schemes - Rule 10 gives guidance in determining safe speed, the risk of collision and the conduct of vessels operating in or near traffic separation schemes.
4.	Prevention of Pollution from Ships	International Convention for the Prevention of Pollution from Ships (MARPOL), 1973, as modified by the Protocol of 1978 relating thereto and by the Protocol of 1997(MARPOL)	The MARPOL Convention is the main international convention covering prevention of pollution of the marine environment by ships from operational or accidental causes. It is a combination of two treaties adopted in 1973 and 1978 respectively and also includes the Protocol of 1997 (Annex VI). It has been updated by amendments through the years.
		Convention on Facilitation of International Maritime Traffic (FACILITATION), London, 1965	The Convention's main objectives are to prevent unnecessary delays in maritime traffic, to aid cooperation between Governments, and to secure the highest practicable degree of uniformity in formalities and other procedures. In particular, the Convention reduces the number of declarations which can be required by public authorities.
5.	Safety of maritime navigation	Convention for The Suppression of Unlawful Acts of Violence Against the Safety of Maritime Navigation (SUA	The main purpose of the convention is to ensure that appropriate action is taken against persons committing unlawful acts against ships. These include: • the seizure of ships by force; • acts of violence against persons on board ships; and

Sr. No.	Issues	International Maritime Conventions, Protocols and Agreements	Remarks
		convention), 1988	• the placing of devices on board a ship which are likely to destroy or damage it. The convention obliges Contracting Governments either to extradite or prosecute alleged offenders.
6.	Environmental Safety	Convention Relating to Intervention on the High Seas, 1969	Contracting States are empowered to act against ships of other countries which have been involved in an accident or have been damaged on the high seas if there is a grave risk of oil pollution occurring as a result.
7.	Standards of Training, Certification and Watch keeping for Seafarers	International Convention on Standards of Training, Certification and Watch keeping for Seafarers (STCW) as amended, including the 1995 and 2010 Manila Amendments	The main purpose of the convention is to ensure the safety of seagoing personnel. Convention in explained in two codes A & B. Code A is mandatory while Code B is recommendation. It intends to help parties implement the convention.
8.	Safe containers	International Convention for Safe Containers (CSC) 72/77	The 1972 Convention for Safe Containers has two goals. • to maintain a high level of safety of human life in the transport and handling of containers by providing generally acceptable test procedures and related strength requirements • to facilitate the international transport of containers by providing uniform international safety regulations, equally applicable to all modes of surface transport to avoid proliferation of divergent national safety regulations The requirements of the Convention apply to the great majority of freight containers used internationally, except those designed especially for carriage by air. As it was not intended that all containers or reusable packing boxes should be affected, the scope of the Convention is limited to containers of a prescribed minimum size having corner fittings - devices which permit handling, securing or stacking.
9.	Safety of Fishing vessel	The Torremolinos International Convention for the Safety of Fishing Vessels (SFV),1977,	The Protocol applies to fishing vessels of 24 metres in length and over including those vessels also processing their catch. The general trend in modern designed fishing vessels, if they are to be economically profitable, must include improvements in machinery and fishing gear, improvements in safety features as

Sr. No.	Issues	International Maritime Conventions, Protocols and Agreements	Remarks
		superseded by the The 1993 Torremolinos Protocol; Cape Town Agreement of 2012 on the Implementation of the Provisions of the 1993 Protocol relating to the Torremolinos International Convention for the Safety of Fishing Vessels	a whole and better working conditions for fishermen. The safety provisions include automatically controlled machinery spaces, improved life-saving appliances, immersion suits and thermal protective aids, satellite communication systems and other components of the global maritime distress and safety system.
10.	Standards of Training, Certification and Watch keeping for Fishing Vessel Personnel	International Convention on Standards of Training, Certification and Watch keeping for Fishing Vessel Personnel (STCW-F), 1995	General Provisions & certifications of Safety of Skippers, Officers, Engineer Officers and Radio Operators.
11.	Space Requirements for Special Trade Passenger Ships, 1973	Special Trade Passenger Ships Agreement (STP), 1971 and Protocol on Space Requirements for Special Trade Passenger Ships, 1973	Following the International Conference on Special Trade Passenger Ships, 1971, IMO, in cooperation with other Organizations, particularly the World Health Organization (WHO), developed technical rules covering the safety aspects of carrying passengers on board in special trade passenger ships (ships carrying large nos. of unberthed passengers such as in pilgrim area)
12.	Prevention of Marine Pollution by Dumping of Wastes and Other Matter	Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (LC), 1972 (and the 1996 London Protocol)	London Convention, one of the first international conventions for the protection of the marine environment from human activities, came into force on 30 August 1975. Since 1977, it has been administered by IMO. It contributes to the international control and prevention of marine pollution by prohibiting the dumping of certain hazardous materials. In addition, a special permit is required prior to dumping of a number of other identified materials and a general permit for other wastes or matter.
13.	Oil Pollution Preparedness, Response and Co operation	International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC), 1990	As per convention, Ships are required to carry a shipboard oil pollution emergency plan. Operators of offshore units under the jurisdiction of Parties are also required to have oil pollution emergency plans or similar arrangements which must be coordinated with national systems for responding promptly and effectively to oil pollution incidents. Ships are required to report incidents of pollution to coastal authorities and the

Sr. No.	Issues	International Maritime Conventions, Protocols and Agreements	Remarks
			convention details the actions that are then to be taken. The Convention calls for the establishment of stockpiles of oil spill combating equipment, the holding of oil spill combating exercises and the development of detailed plans for dealing with pollution incidents. Parties to the convention are required to provide assistance to others in the event of a pollution emergency and provision is made for the reimbursement of any assistance provided.
14.	Preparedness, Response and Co-operation to pollution Incidents by Hazardous and Noxious Substances	Protocol on Preparedness, Response and Co-operation to pollution Incidents by Hazardous and Noxious Substances, 2000 (OPRC-HNS Protocol)	Convention aims to establish national systems for preparedness and response and to provide a global framework for international co-operation in combating major incidents or threats of marine pollution. Parties to the OPRC-HNS Protocol are required to establish measures for dealing with pollution incidents, either nationally or in co-operation with other countries. Ships are required to carry a shipboard pollution emergency plan to deal specifically with incidents involving hazardous and noxious substances. The OPRC-HNS Protocol ensures that ships carrying hazardous and noxious substances are covered by preparedness and response regimes similar to those already in existence for oil incidents.
15.	Control of Harmful Anti-fouling Systems	International Convention on the Control of Harmful Anti-fouling Systems on Ships (AFS), 2001	Under the terms of the AFS Convention, Parties to the Convention are required to prohibit and/or restrict the use of harmful anti-fouling systems on ships flying their flag, as well as ships not entitled to fly their flag but which operate under their authority and all ships that enter a port, shipyard or offshore terminal of a Party. Anti-fouling paints are used to coat the bottoms of ships to prevent sealife such as algae and molluscs attaching themselves to the hull – thereby slowing down the ship and increasing fuel consumption. n the early days of sailing ships, lime and later arsenic were used to coat ships' hulls, until the modern chemicals industry developed effective anti-fouling paints using metallic compounds. These compounds slowly "leach" into the sea water, killing barnacles and other marine life that have attached to the ship. But studies have shown that these compounds persist in the water, killing sea-life, harming the environment and possibly entering the food chain. One of the most effective anti-fouling paints, developed in the 1960s, contains the organotin tributyltin (TBT), which has been proven to cause deformations in oysters and sex changes in whelks.
16.	Safe and Environmentally	The Hong Kong International Convention	Convention aimed at ensuring that ships, when being recycled after reaching the end of their operational lives, do not pose any unnecessary risk to human health

Sr. No.	Issues	International Maritime Conventions, Protocols and Agreements	Remarks
	Sound Recycling of Ships	for the Safe and Environmentally Sound Recycling of Ships, 2009	and safety or to the environment. It intends to address all the issues around ship recycling, including the fact that ships sold for scrapping may contain environmentally hazardous substances such as asbestos, heavy metals, hydrocarbons, ozone depleting substances and others. It will address concerns about working and environmental conditions in many of the world's ship recycling facilities. Regulations in the new Convention cover: the design, construction, operation and preparation of ships so as to facilitate safe and environmentally sound recycling, without compromising the safety and operational efficiency of ships; the operation of ship recycling facilities in a safe and environmentally sound manner; and the establishment of an appropriate enforcement mechanism for ship recycling, incorporating certification and reporting requirements. Ships to be sent for recycling will be required to carry an inventory of hazardous materials, which will be specific to each ship.
17.	Control and Management of Ships' Ballast Water and Sediments	International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004	Convention aims to prevent the spread of harmful aquatic organisms from one region to another, by establishing standards and procedures for the management and control of ships' ballast water and sediment. Under the Convention, all ships in international traffic are required to manage their ballast water and sediments to a certain standard, according to a ship-specific ballast water management plan. All ships will also have to carry a ballast water record book and an international ballast water management certificate. The ballast water management standards will be phased in over a period of time. As an intermediate solution, ships should exchange ballast water mid-ocean. However, eventually most ships will need to install an on-board ballast water treatment system
18.	Salvage Convention, 1989	International Convention on Salvage (SALVAGE), 1989	As per convention, "special compensation" to be paid to salvors who have failed to earn a reward in the normal way (i.e. by salving the ship and cargo). The compensation consists of the salvor's expenses, plus up to 30% of these expenses if, thanks to the efforts of the salvor, environmental damage has been minimized or prevented. The salvor's expenses are defined as "out-of-pocket expenses reasonably incurred by the salvor in the salvage operation and a fair rate for equipment and personnel actually and reasonably used".
19.	The United Provinces Fisheries Act, 1948	The Fisheries Act provides for the	Definition of fish is a broad one under the Act and includes a wide gamut of aquatic biodiversity including “turtles, dolphins, aquatic plants, fisheries, whale

Sr. No.	Issues	International Maritime Conventions, Protocols and Agreements	Remarks
		prohibition and licensing of fishing in selected waters.	and fish in all states in its life history". For the purposes of regulating fishing, the rules made under this Act provides for selected waters where there is prohibition for fishing. However, this excludes 'private waters' 4and 'religious waters'5. The authority constituted under this Act has been vested with power of arrest without warrant, compound certain offences as well as prohibit the sale of fish in such area as may be specified.

[4] *Private waters are exclusive property of any person or religious body or institution where such persons or institution has exclusive right of fishery.*
[5] *Religious water means water belonging to a religious body or institutions and which have never been fished before on account of any restrictions on religious grounds.*

2.7. Other Convention and Policies

International Maritime Dangerous Goods Code (IMDG-code): The IMDG code relates to methods of safe transport of dangerous cargoes and related activities. It sets out procedures for documentation, storage, segregation, packing, marking and labelling of dangerous goods.

2.8. Conclusion

NW-1 project offers potential opportunity for diversification of cargo movement from road & rail to waterways. In order to achieve this diversification, the existing infrastructure needs to be augmented with proposed project interventions. These proposed interventions consisting of both development & operation of navigation route require availability of water (depth) & its maintenance supported by new infrastructure. Further, these activities will trigger indirect & induced development in the influence area. Therefore, NW-1 development along with these existing, direct, indirect & induced developments will have cumulative impact in the influence area.

Chapter 3. : DELINEATION OF CIA BOUNDARY AND CERs

3.1. Introduction

Proposed NW1 is expected to enhance the economic development of the country by increasing the freight transportation substantially. The NW-1 will provide the accessibility to the areas through which it traverses and the nearby areas and this activity will lead to development and growth of these areas. This necessitates that study area size should be based on the extent of the area where accessibility improvements could occur and may require some judgments about the extent of the influence of the project. Therefore, Cumulative Impact Assessment (CIA) requires fixation of spatial and temporal boundaries in order to assess the impacts of direct, indirect and induced activities due to proposed project. Process of delineation of boundary largely depends upon the type of development & its potential to exhibit direct & indirect impacts on the surrounding environment. The following sections describe the CIA boundary, the rationale & basis of its delineation, CERs within the delineated boundaries, and hot spots identified.

3.2. Delineation of the CIA Boundary

Important factors which need to be considered for proposed assessment of indirect and cumulative impacts and impact interactions is the setting of the geographical or 'spatial' boundary and the temporal or 'time frame' boundary. Indirect and direct impacts as well as impact interactions may well extend beyond the geographical site boundaries of the project. Therefore, preferred methodology for detailed analysis is a combination of collaborative judgment and GIS based allocation mode as described in chapter 1. Hence, mapping the geographical and time boundaries provides areas of potential overlap and therefore where indirect and cumulative impacts as well as impact interactions may occur.

The boundary delineation exercise identifies the potential impacts considered to be significant and which require further assessment. In this study all the natural as well as manmade features have been taken into account and plotted spatially to delineate the boundary of the CIA. The natural and manmade features mapped are as follows:

- Forests;
- National parks;
- Wild Life Sanctuaries;
- Tiger Reserves;
- Birds Areas;
- Archaeological sites;
- Water bodies;
- Wetlands;
- Roads;
- Railways;
- Urban Agglomerations;
- Industrial Areas;
- Thermal Power Plants
- Critically Polluted Areas, based on Comprehensive Environmental Pollution Index (CEPI)

To conduct the detailed study of the project, 10km buffer (Influenced area) boundary has been considered. The basis for delineating these buffer boundaries are based on the EIA /

SIA (NW-1 / terminals / maintenance dredging) basin level CER reports as the influence area EIA report, IFC guidelines and stakeholders consultations and the expert's consultation/ judgment.

10 kms buffer – It is being considered that the extent of area of influence of the project may not go upto 10 kms as per the expert's and stakeholder's consultations. Therefore, the farthest distance covered in the CIA boundary is 10 kms.

3.3. Critical Environmental Resources (CERs)

CERs are environmental attributes that are considered to be important in assessing risks. While CERs may be directly or indirectly affected by a specific development, they often are also affected by the cumulative effects of several developments. CERs are the ultimate recipient of impacts because they tend to be at the ends of ecological pathways. CERs in general refer to sensitive or valued receptors of impact whose desired future condition determines the assessment end points to be used in the CIA process.

3.3.1. Approaches for Identification of CERs

To identify the CERs for CIA study, it is possible to largely obtain cumulative opinions of various stakeholders which are directly & indirectly impacted due to proposed development, and extensive review of the existing environmental and social impact assessment studies of the proposed project. Approach followed to identify CERs for purpose of CIA study is shown in Figure 3.1.

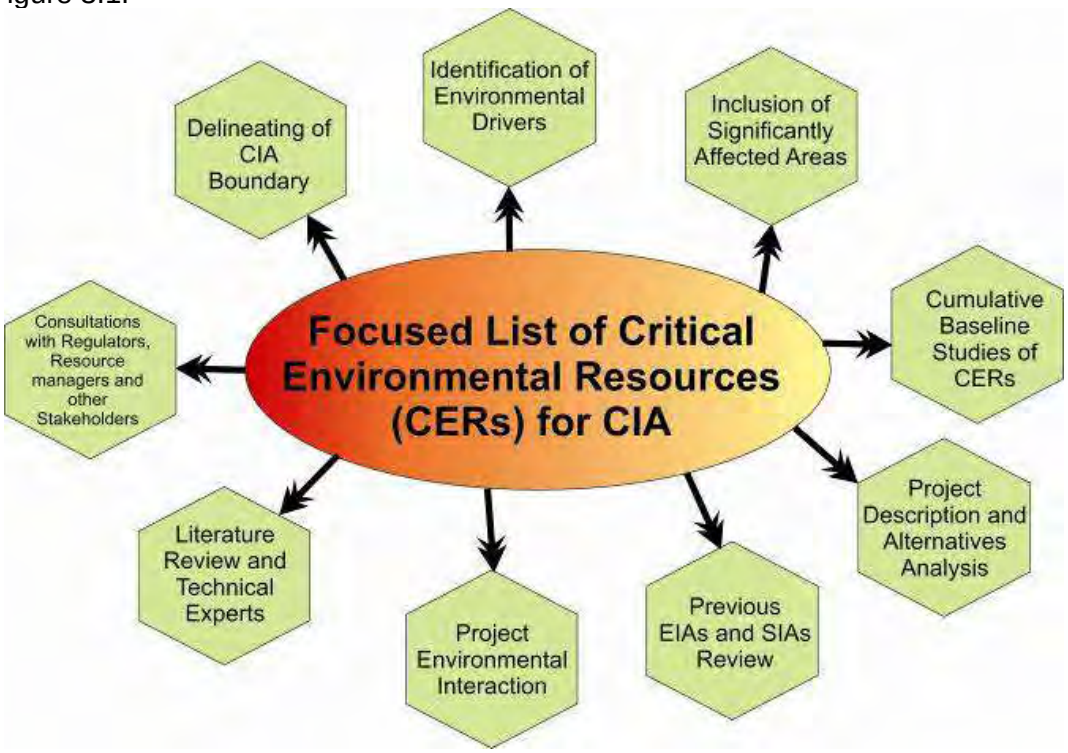

Figure 3.1 : Approach for CERs Identification

Source: Derived from IFC Guideline

3.3.2. Classification of CERs

Further, overlay mapping and GIS have been used for identifying the spatial distribution of CERs. Based on the above approach, mapping method as per IFC guidelines for Cumulative Impact Assessment and Management, CERs have been classified as given below.

• Physical features,

- Urban Agglomerations / Centers
- Land Resources

• Ecological Profile,

- Bio Diversity (Wildlife Sanctuaries/ National Parks / Tiger Reserves / Bird Areas / Wetlands)
- Agriculture

• Physical Environmental Profile (e.g., water and nutrient cycles, microclimate),

- Water
- Air
- Noise

• Socio Economic (e.g., health, economics), or

- Infrastructure
- Industry
- Power Plants

• Cultural aspects

- Archaeological / Heritage Sites

3.3.3. Identification of Indicators to Assess Conditions of CERs

To analyze the conditions and impact on identified CERs various indicators have been identified & analyzed. These indicators will help to identify the extent of impact on the identified CERs and assist in defining “Cause & Effect” relationship.

3.4. Assessment of Status of Identified CERs

An extensive study including the site visits, study of the project alignment through topographic maps & Google maps, review of existing studies and literature was carried out to assess the status of identified CERs within the CIA boundary of NW - 1. Details are given in Table 3.2 for NW-1.

Table 3.1 : Indicators of CERs

Sr. No.	Critical Environmental Resources		Indicators	References / Basis
1.	**Physical Features / Habitats**	**Urban Centers / Agglomerations**	Population	PCA U.P., Bihar, Jharkhand and West Bengal.
			Literacy	PCA U.P., Bihar, Jharkhand and West Bengal
		Land Resources	Soil Erosion	Experts / Stakeholders Secondary consultation / Literature Review / EIA (NW-1)
			Soil Quality	Experts / Stakeholders Secondary consultation / Literature Review / EIA (NW-1)
			Land Use Change	EIA / SIA (NW1 – 1)
2.	**Ecological Profile**	**Bio Diversity**	Impact on flora & fauna	EIA / SIA (NW1 - 1), IWAI
		Agriculture	Agricultural production	Experts / Stakeholders Secondary consultation / Literature Review / EIA (NW-1)
3.	**Physical Environmental Profile**	**Air**	Air Quality Index	Experts / Stakeholders Secondary consultation / Literature Review / EIA (NW-1)
		Noise	Noise Levels	Experts / Stakeholders Secondary consultation / Literature Review / EIA (NW-1)
		Surface Water / Ground Water	Water quality	Experts / Stakeholders Secondary consultation / Literature Review / EIA

Sr. No.	Critical Environmental Resources		Indicators	References / Basis
				(NW-1)
			Water Resources	Experts / Stakeholders Secondary consultation / Literature Review / EIA (NW-1)
		Micro Climate change	GHG	Experts / Stakeholders Secondary consultation / Literature Review / EIA (NW-1)
4.	**Socio Economic**	**Infrastructure**	Roads	Experts / Stakeholders Secondary consultation / Literature Review / EIA (NW-1)
			Traffic Congestion (Main Routes)	Experts / Stakeholders Secondary consultation / Literature Review / EIA (NW-1)
			Traffic Congestion (Feeder Routes)	Experts / Stakeholders Secondary consultation / Literature Review / EIA (NW-1)
			Rails	IWAI
			Quality of Life	Experts / Stakeholders Secondary consultation / Literature Review / EIA (NW-1)
		Industry	Number of Industries	UPSIDC, BSIDC, Jk DIC, WBIIDA
		Power Plants	Power production (Number)	CEAI, CERC, BEE (Websites)
5.	**Cultural Aspects**	**Archaeological Sites / Heritage Sites**	Impact on Archeological Monuments	Experts / Stakeholders Secondary consultation / Literature Review / EIA (NW-1)

Table 3.2 : Details of CERs and their Status within the CIA boundary (NW1)

Sr. No.	CERs in NW1		Upto 10 kms	Remarks
1	**Physical Features**	Urban Agglomerations / Centers	Varanasi, Kadipur, Ramnagar, Ghazipur, Saidpur, Buxar, Mokama, Barahiya, Munger, Bhagalpur , Sultanganj, Sahibganj Township, Rajmahal, Farakka Township, Baharampur, Katwa, Shantipur, Kalyani, Gayespur, Bhatpara, Halisahar, Mahestala, South Dum Dum, Bidhan Nagar, Budge Budge, Haldia, Nandigram, Mirzapur, Chunar, Dhanapur, Zamania, Gahmar, Chausa, Doriganj, Dighwara, Sitakund, Salapur, Narainpur, Barari, Palashgachhi, Jangipur, Jiaganj, Shaktipur, Dainhat, Patuli, Kalna, Guptipara, Bansberia, Chunchura, Naihati, Chandan Nagar, Ichhapur, Barrakpore, Serampore, Titagarh, Panihati, Bally, Phalta.	Landuse is varying constantly throughout the stretch.
		Land Resources (landuse)	Agricultural, habitation, Encroachment, Industrial	
2	**Ecological Profile**	Agriculture (yield)	Good to moderate	Agricultural yield may decrease, as a result of change in landuse.
		Bio Diversity (Wildlife Sanctuaries/ National Parks / Tiger Reserves / Bird Areas / Wetlands)	Kachhua Sanctuary, Vikramshila GDS, Udhwa Lake	
3	**Physical Environmental Profile (**Micro Climate)	Air Quality	Moderate / Critical	
		Noise Pollution	Critical	
		Vibrations	No impact	
		Water Quality	Moderate / Critical	
4	**Social Economic**	Infrastructure (Education, Health, Connectivity)	Improved social and physical infrastructure	The list of existing and proposed power plants along the districts through which NW1 crosses has been provided in Chapter – 3.
		Industrial Corridor (Proposed / Planned)		

Sr. No.	CERs in NW1		Upto 10 kms	Remarks
		Power Plants (Existing & Proposed)	Exist	
5	**Cultural Aspects**	Archaeological Sites		Area important due to archaeological perspective

3.5. Preliminary Identification of Hotspots

On the basis of the identified CERs, spatial analysis, literature review and study of the EIA & SIA Reports of the NW1 1, hotspots have been identified. This list will be further enhanced after addition of input from stakeholder consultation and baseline study of the CERs. From the primary desktop study, it is obvious that these areas are significantly going to be impacted and this has helped focusing on these areas while carrying out stakeholder consultation. Base map of identified hotspots and CERs in NW-1 are given in Table 3.3 and are also given in Figure 3.2 to 3.22.

Table 3.3 : Identified Major Hotspots

Sr. No.	Locations	CERs identified to be impacted majorly	Reasons for declaring Hotspot
1.	Allahabad	• Religious Value • River Bed Sediments	• Festival: Kumbh Mela
2.	Varanasi	• Land acquisition • Livelihood & Fishing Activities • Aquatic ecology • Terrestrial flora • Existing Infrastructure • Archaeological sites • Air Quality • River Bed Sediments • Noise level • Religious Value	• Rajghat floating terminal • Proposed Varanasi Terminal • Kashi Turtle Sanctuary • DFCCIL Connectivity at Varanasi Terminal
3.	Ghazipur	• Land acquisition • Livelihood • Aquatic ecology • Terrestrial flora • Existing Infrastructure • River Bed Sediments	• Proposed Terminal • Urban Area: Ghazipur
4.	Buxar	• Religious Values	• Existing floating terminal at Buxar • Urban Area: Buxar
5.	Patna	• Avifauna • Air Quality • Religious Value	• Low & High Level Jetty • Urban Area: Patna • Development of River Front
6.	Semaria	• Land acquisition • Livelihood • Aquatic ecology • Terrestrial flora • Existing Infrastructure • Religious value	• Existing Floating Terminal at Semaria • Proposed Terminal at Kalughat • Urban Area: Semaria, Doraiganj
7.	Munger	• Ground Water • Religious Values	• Existing Floating Terminal at Munger • Urban Area: Munger
8.	Bhagalpur	• Aquatic Ecology	• Existing Bhagalpur Terminal

		• Avifauna • Air Quality • Ground Water • Religious Values • Fishing Activities	• Vikramshila Gangetic Dolphin Sanctuary • Urban Area: Bhagalpur
9.	Khalgaon	• Aquatic Ecology • Avifauna • Air Quality • Religious Values	• Existing Bateshwarsthan Floating Terminal • Urban Area: Kahalgaon
10.	Sahibganj	• Land Use • Livelihood & Fishing Activities • Socio-economy • Aquatic ecology • Terrestrial flora • Existing Infrastructure • Religious Values	• Existing Samdhaghat terminal and proposed Sahibganj terminal • Construction of approach road to connect the terminal to NH-80 • Construction of railway siding to provide linkage with existing IR track • Existing Fishing Activities • Acquisition of Land, R& R and shifting of community temple • Cutting of app. 500 trees
11.	Rajmahal	• Archaeological sites • Religious Values	• Mining activities
12.	Mangalghat		• Existing floating terminal
13.	Lalbagh in Farakka to Murshidabad*	• Bank erosion • Air Quality • Existing Infrastructure • Fishing Activities	• Floating Terminal, Hazardwari, Existing RCC Jetty Pakur, U/s & D/s jetty, feeder canal, RCC jetty and old lock at Farakka • New lock Farakka • Urban Areas: Farakka, Murshidabad, Azimganj, Baranagar, Balia, Raghunathganj • Bagmari siphon
14.	Katwa to HooglyGhat	• Traffic • Air Quality • Aquatic Ecology • Existing infrastructure • Fishing Activities	• Floating Terminal Katwa, Floating Terminal Swarupganj, Floating Terminal Shantipur, Floating Terminal Tribeni • New proposed terminal at Tribeni • Urban Areas: Katwa, Swaroopganj, Nabadwip, Kalna, Balagarh, Kanchrapara, Hoogly • Increased traffic volume due to newly proposed terminal
15.	Maheshthala		• Existing BISN jetty, GR-1 & GR-2 and Botanical Garden Jetty • Urban areas: Mahesthala
16.	Haldia	• Ground water • Traffic • Air Quality • Religious Values • Aquatic ecology • Existing infrastructure • Fishing Activities	• Declared as critically polluted area but at present moratorium is lifted by MoEFCC • Declared notified zone by CGWB • Presence of Industrial Zone of Haldia Dock Complex • Operation of terminal would require dredging of 0.1-0.2 million cum • Existing floating terminal and proposed new terminal at Haldia

			• Shifting of ammonia pipeline of TATA chemicals and existing road to Mitsubishi Plant • Haldia Port & Shipping Activities • Haldia Dock Complex & Industrial Area • Urban areas: Haldia Town • Expected increased industrial development in existing industrial area and enhanced traffic movement

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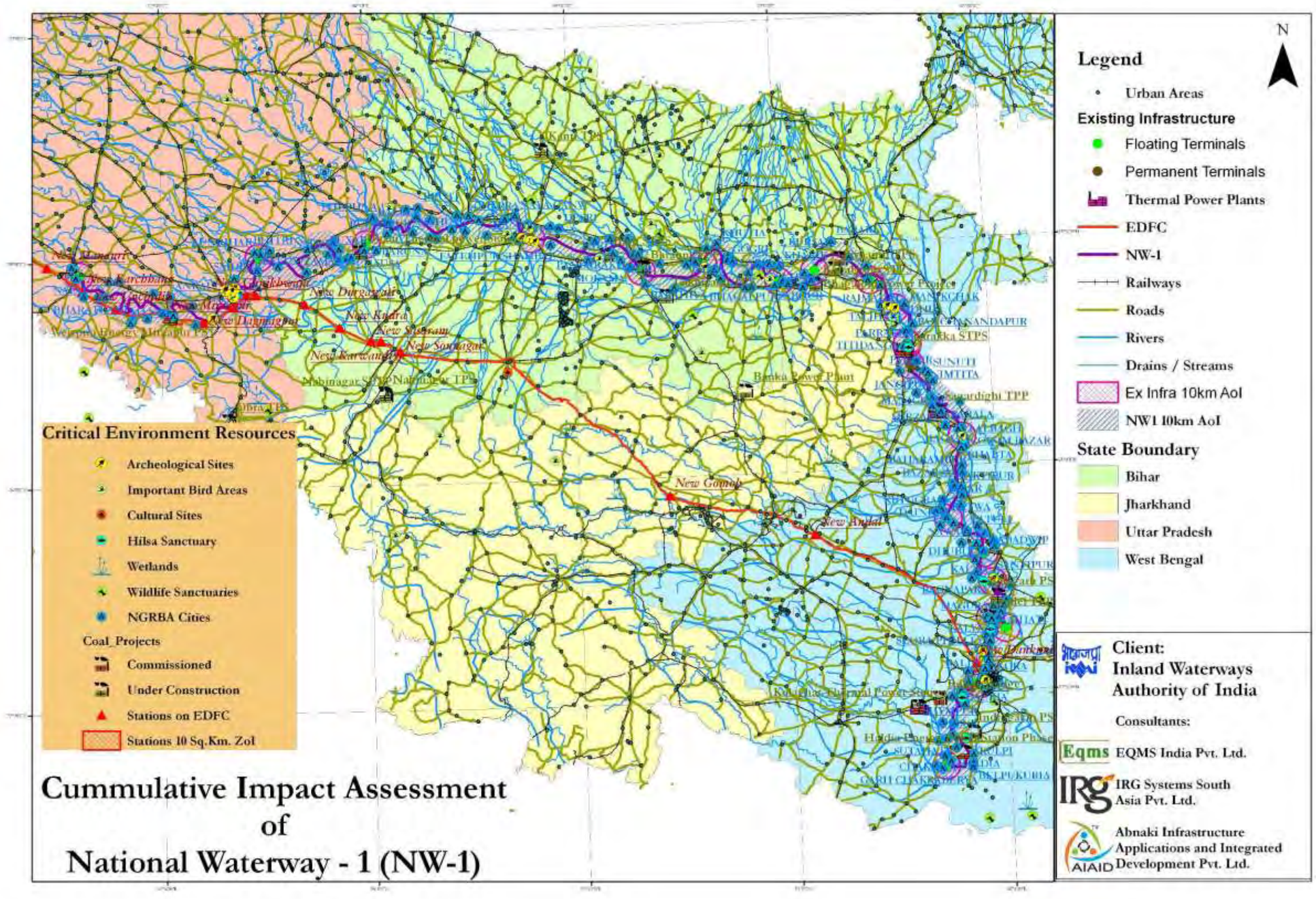

Figure 3.2 : Base Map of CERs in UP

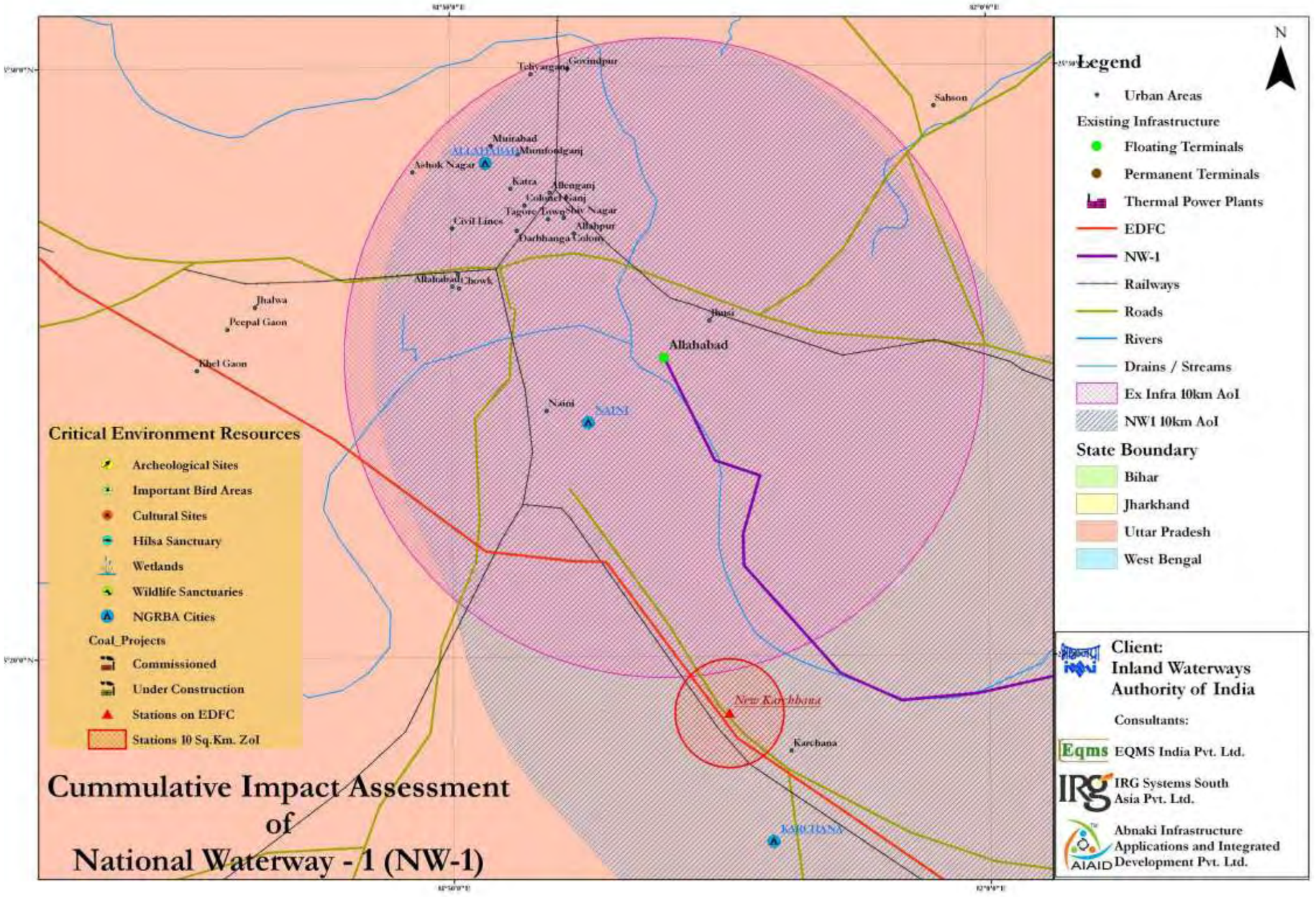

Figure 3.3 : CERs in Allahabad

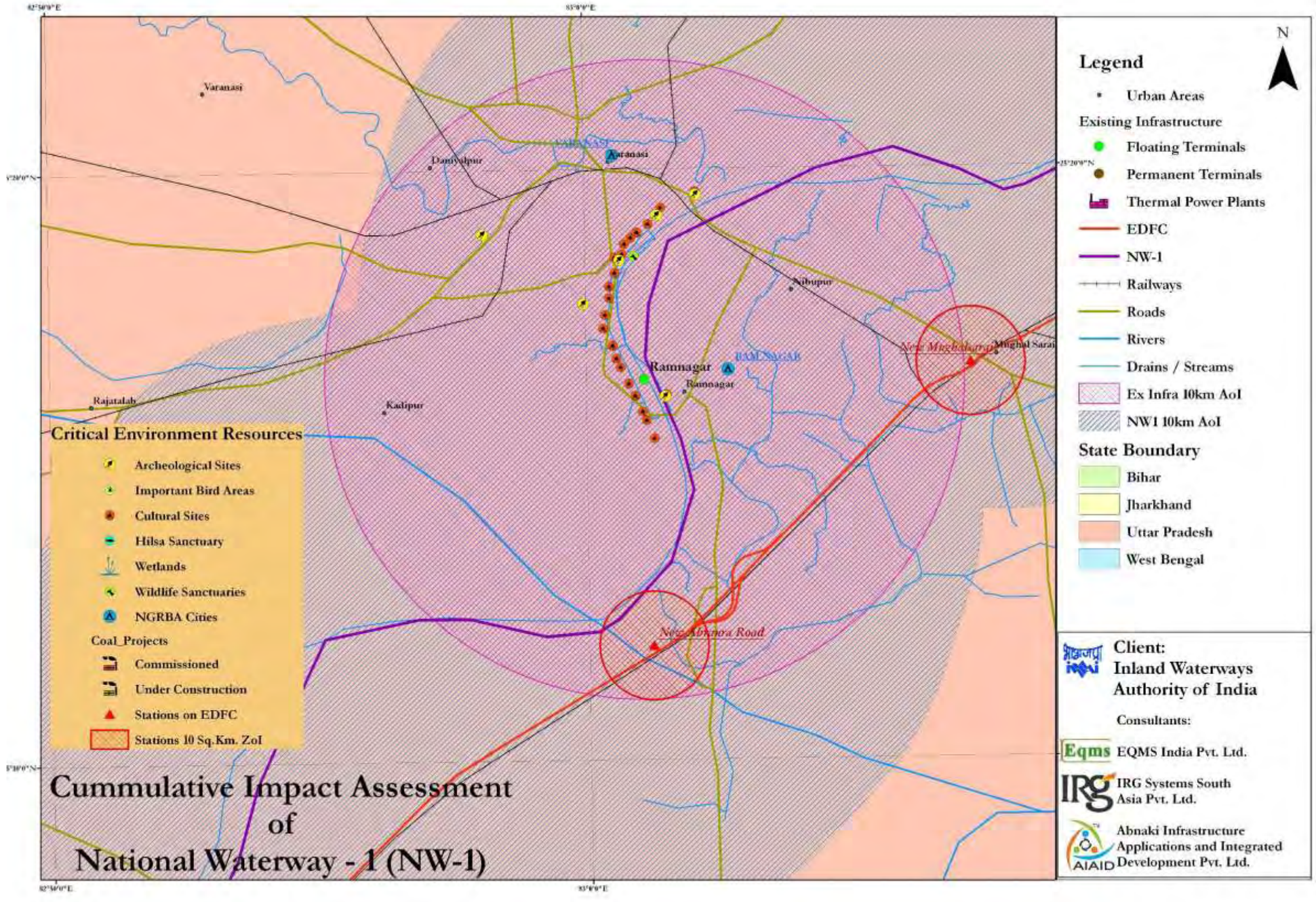

Figure 3.4 : CERs in Varanasi

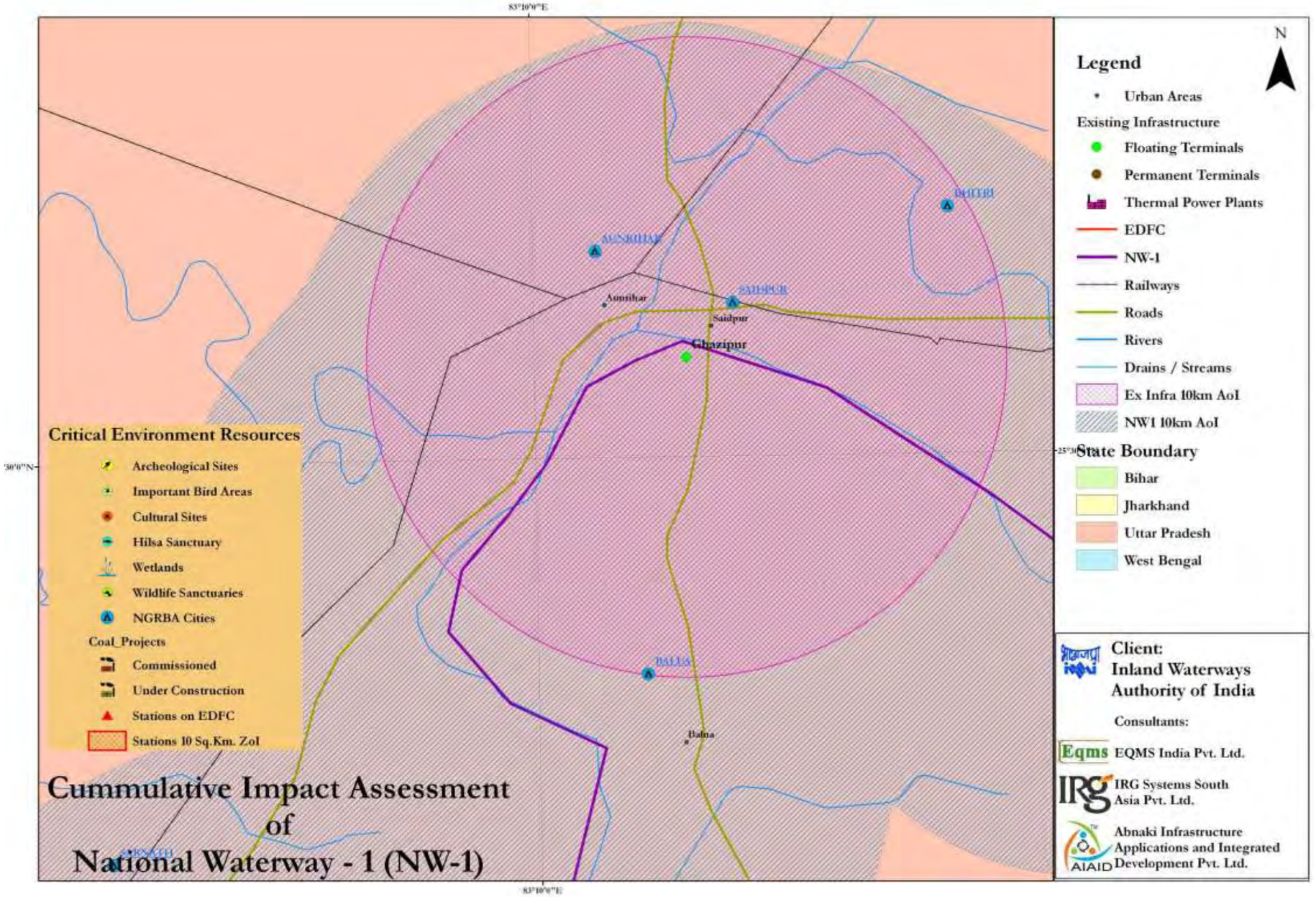

Figure 3.5 : CERs in Ghazipur

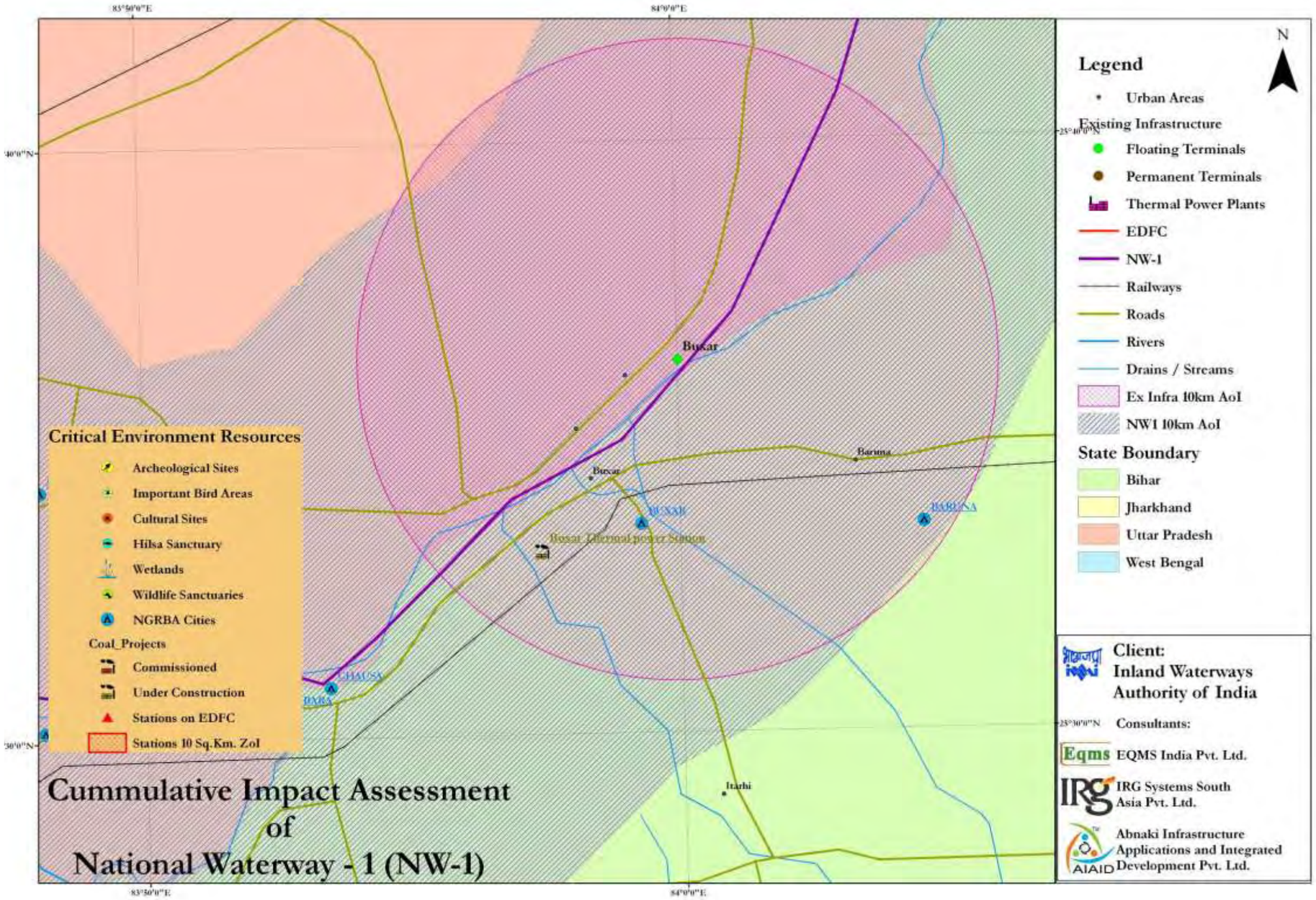

Figure 3.6 : CERs in Buxar

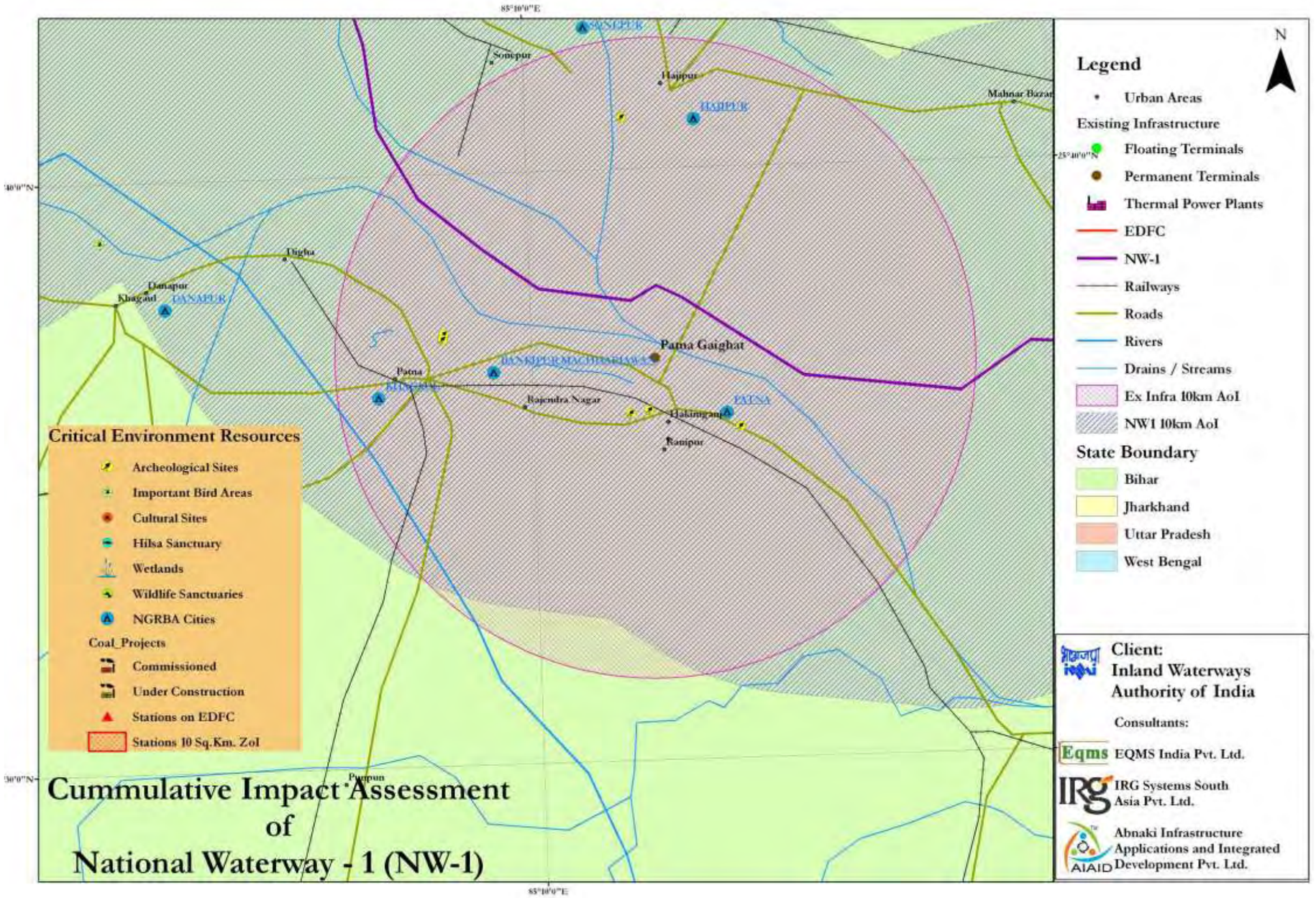

Figure 3.7 : CERs in Patna Gaighat

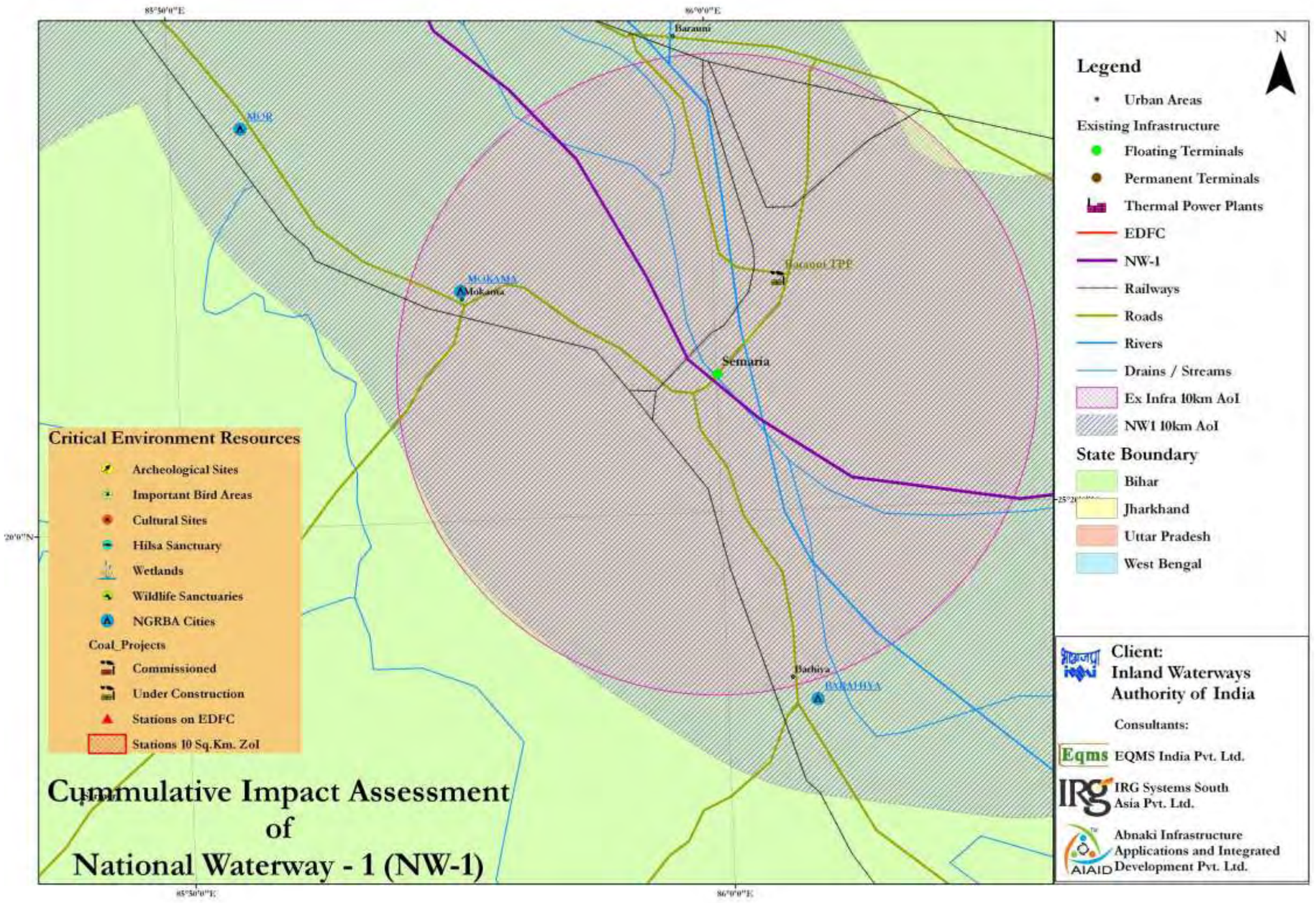

Figure 3.8 : CERs in Semaria

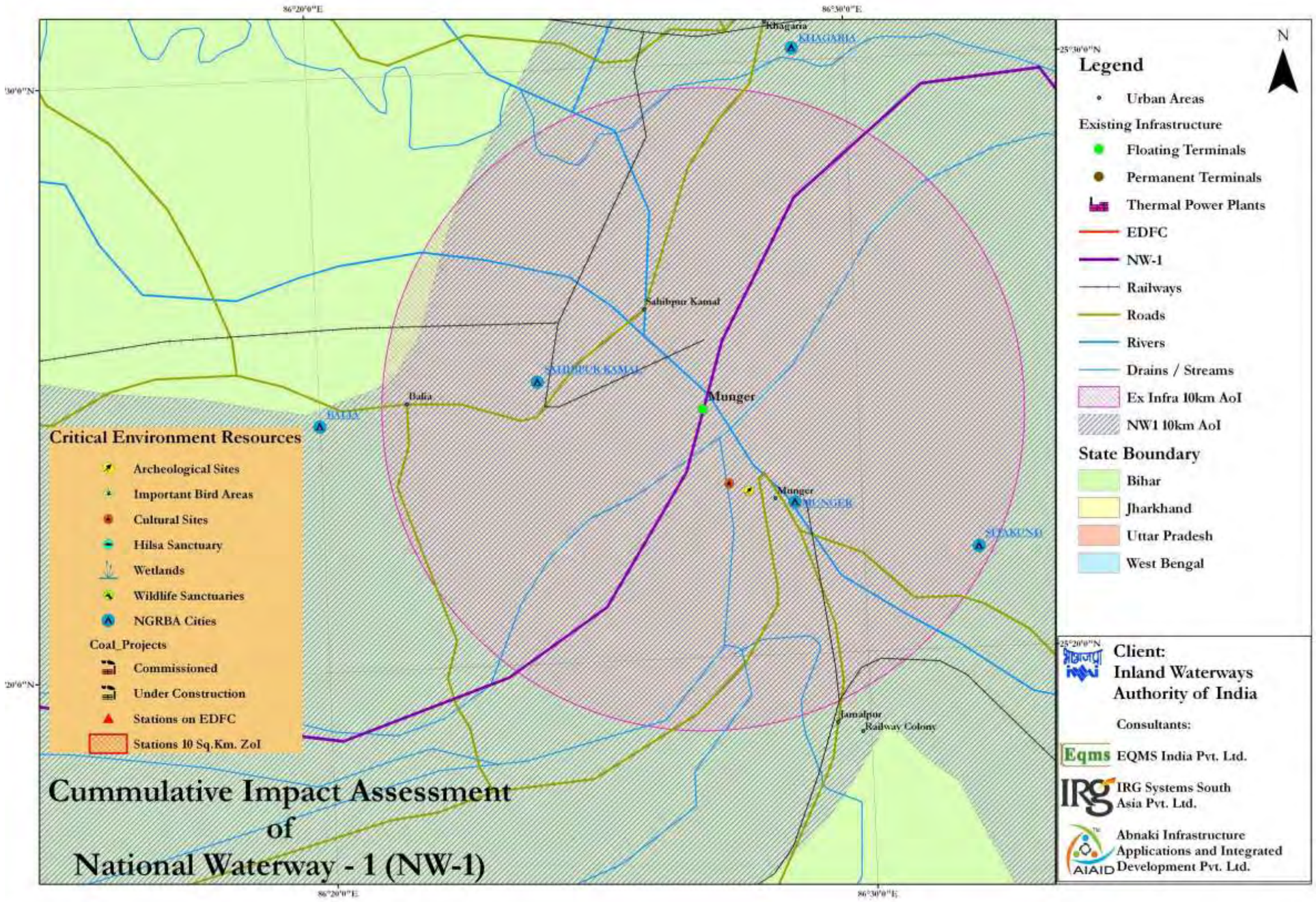

Figure 3.9 : CERs in Munger

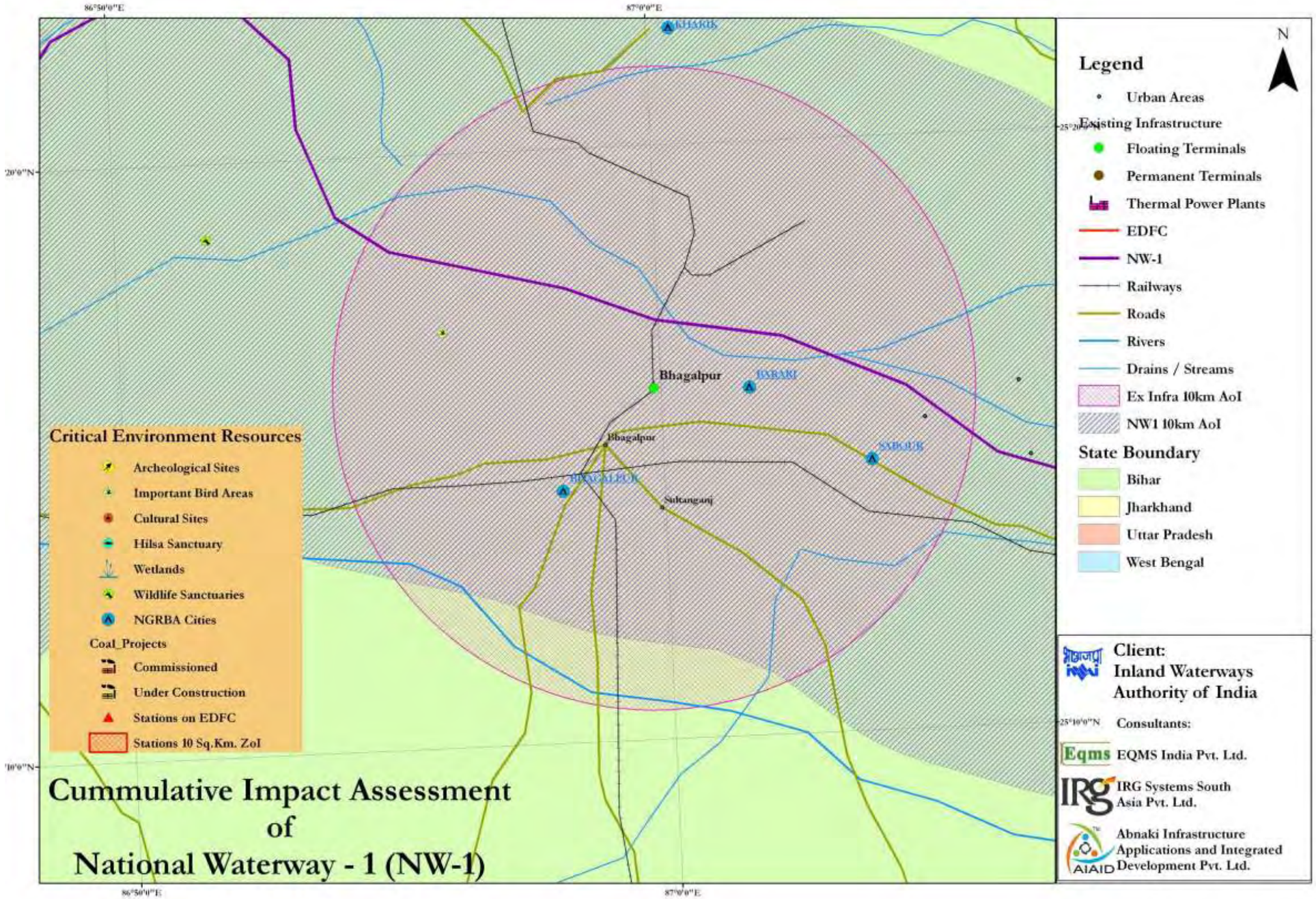

Figure 3.10 : CERs in Bhagalpur

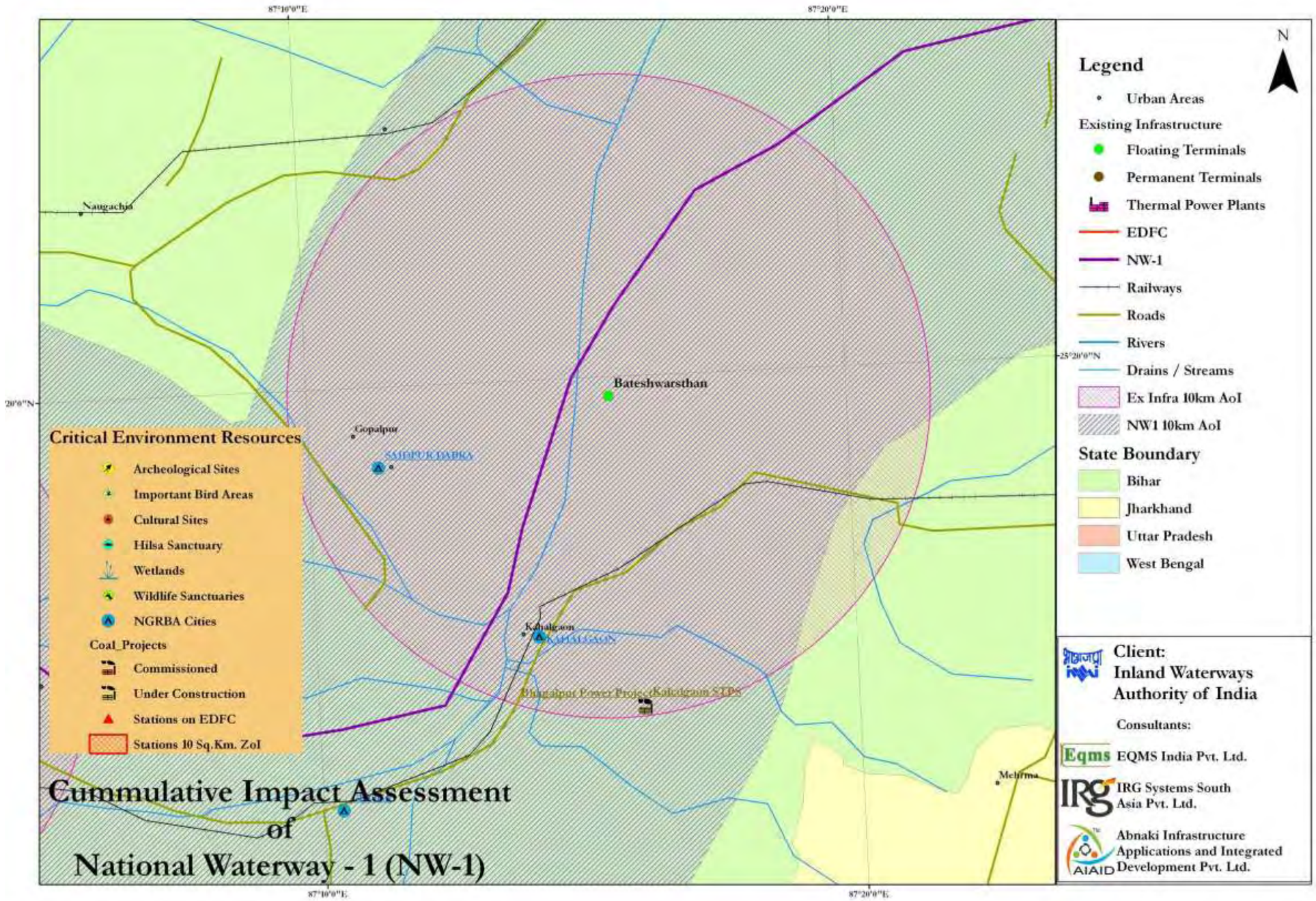

Figure 3.11 : CERs in Bateshwarsthan

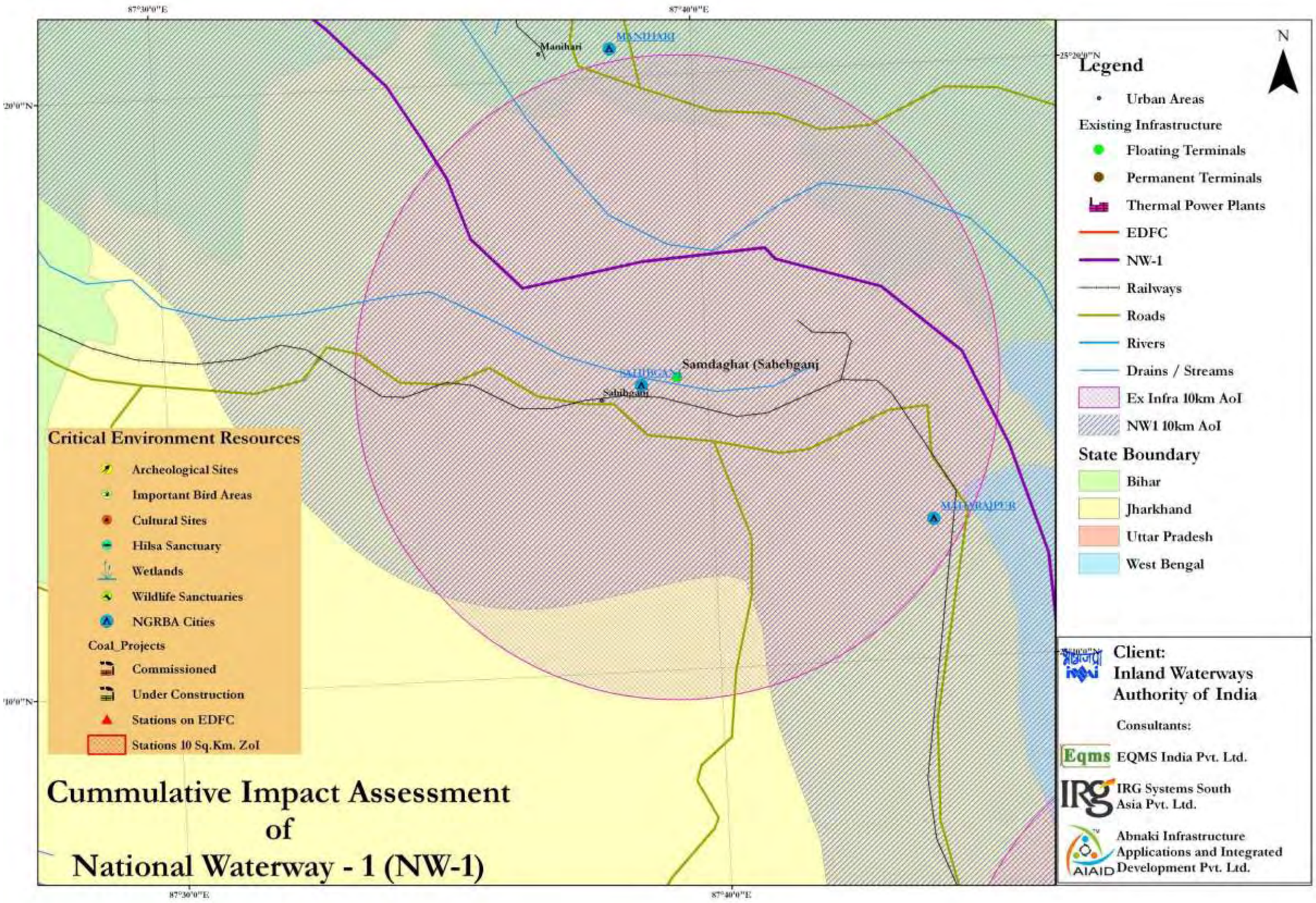

Figure 3.12 : CERs in Samdhaghat (Sahebganj)

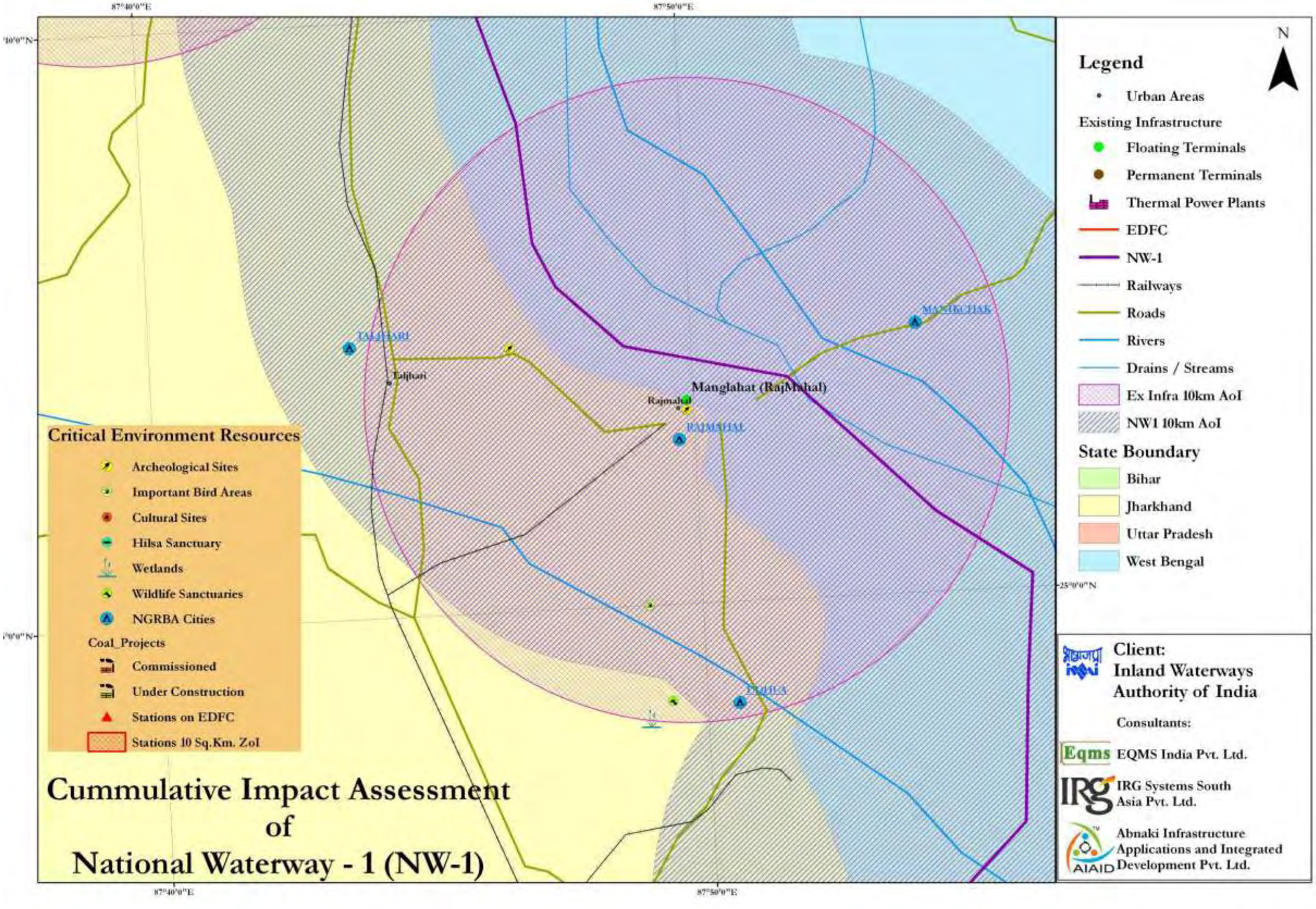

Figure 3.13 : CERs in Manglahat (Rajmahal)

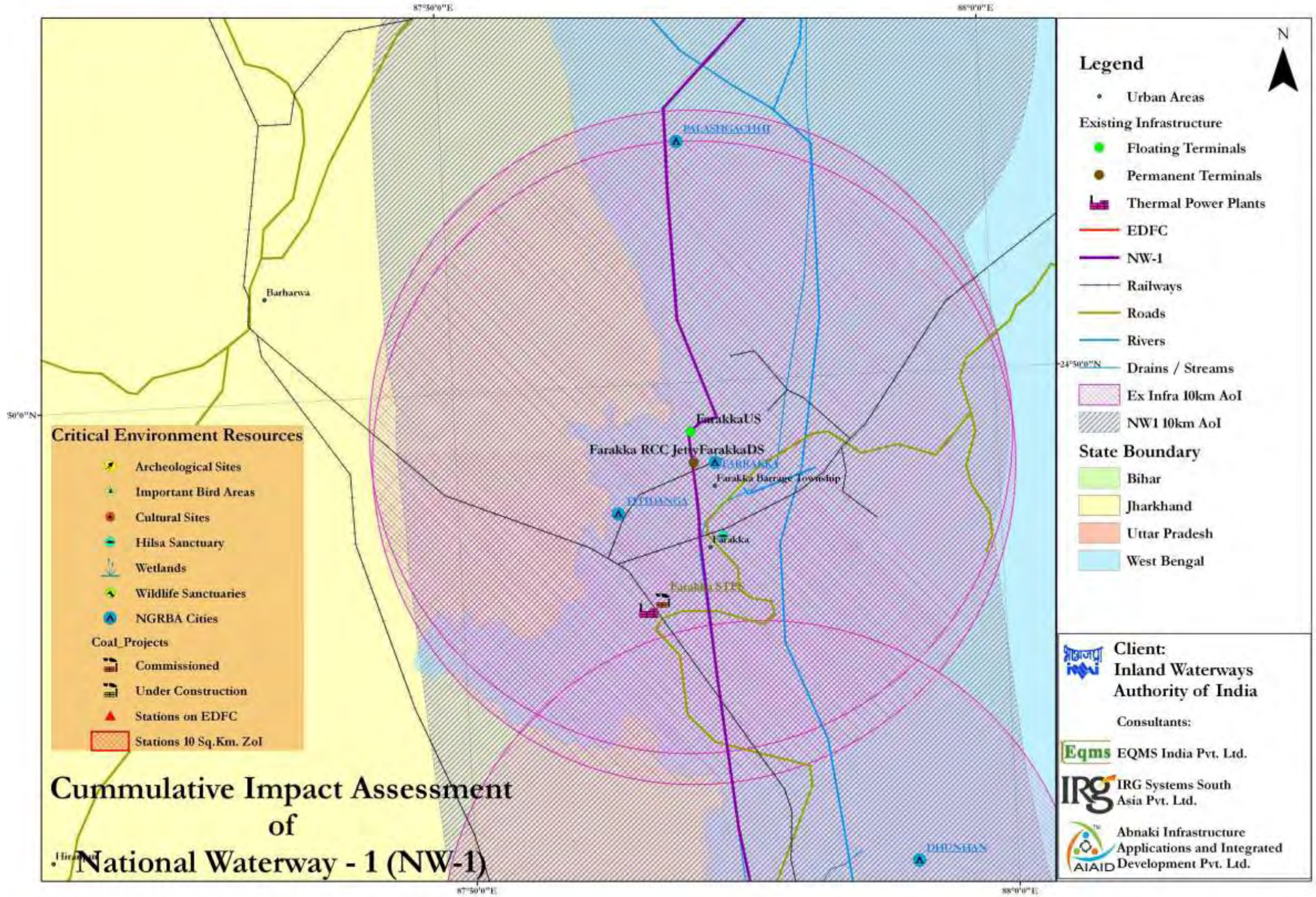

Figure 3.14 : CERs in Farakka

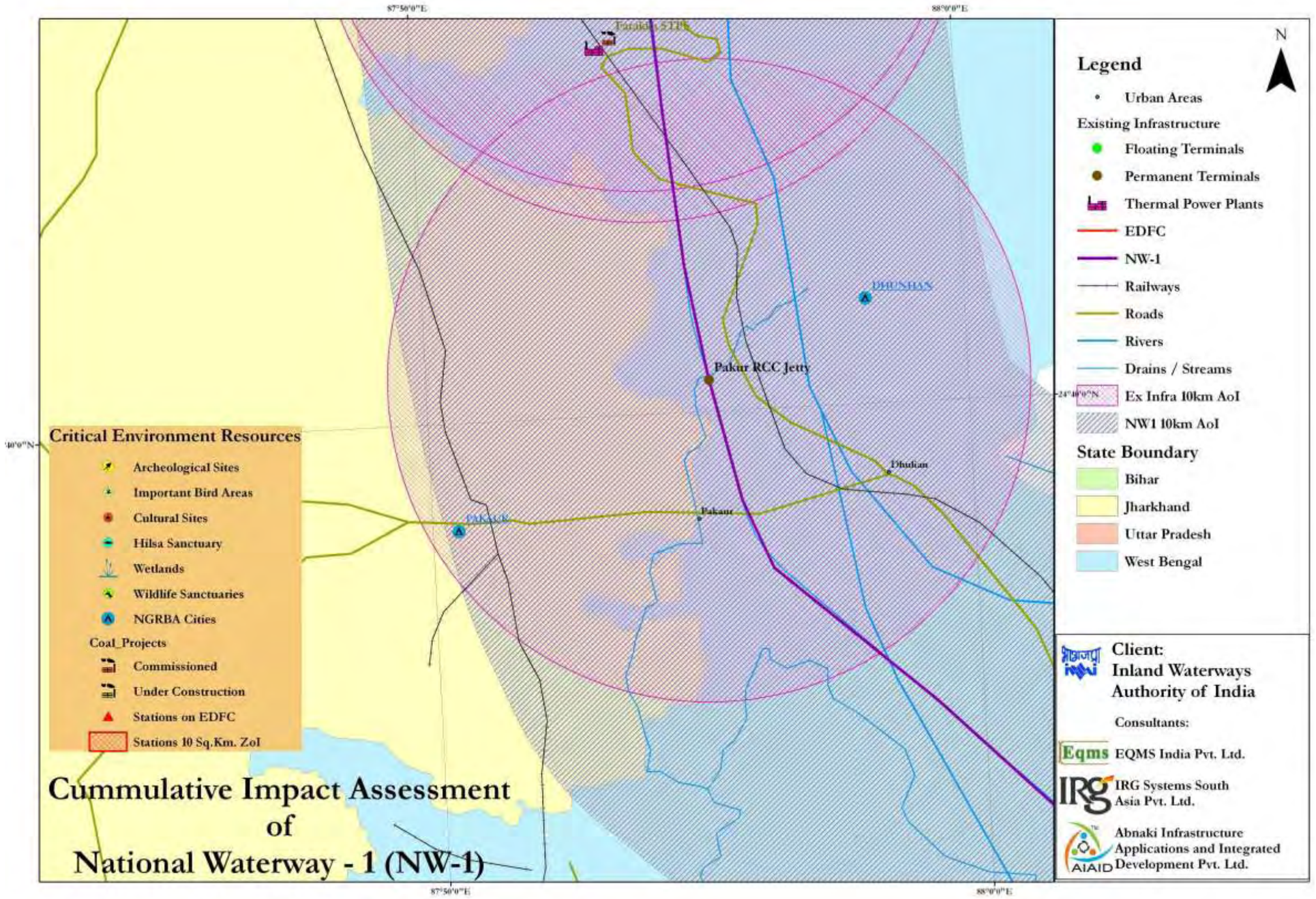

Figure 3.15 : CERs in Pakur

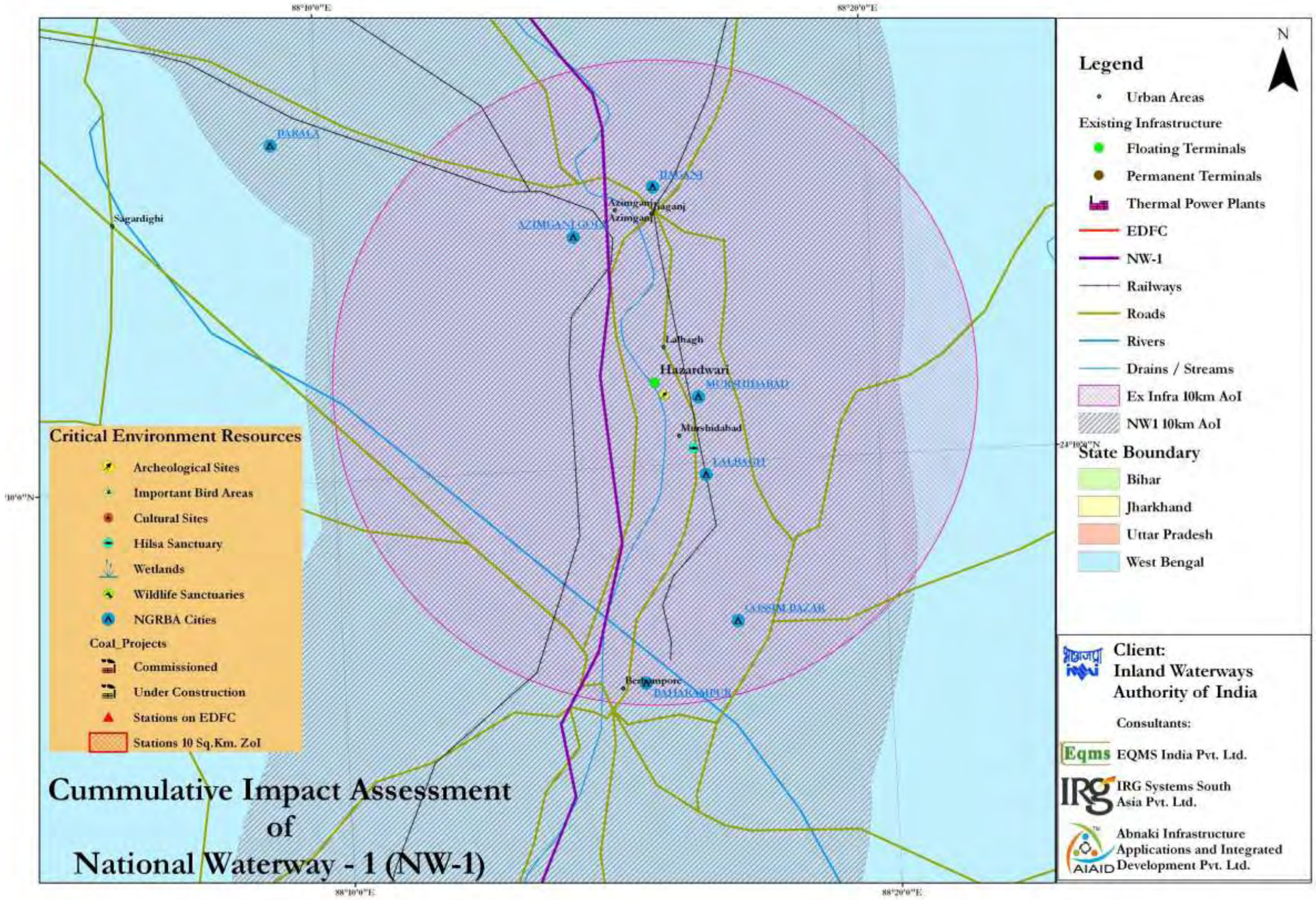

Figure 3.16 : CERs in Hazardwari

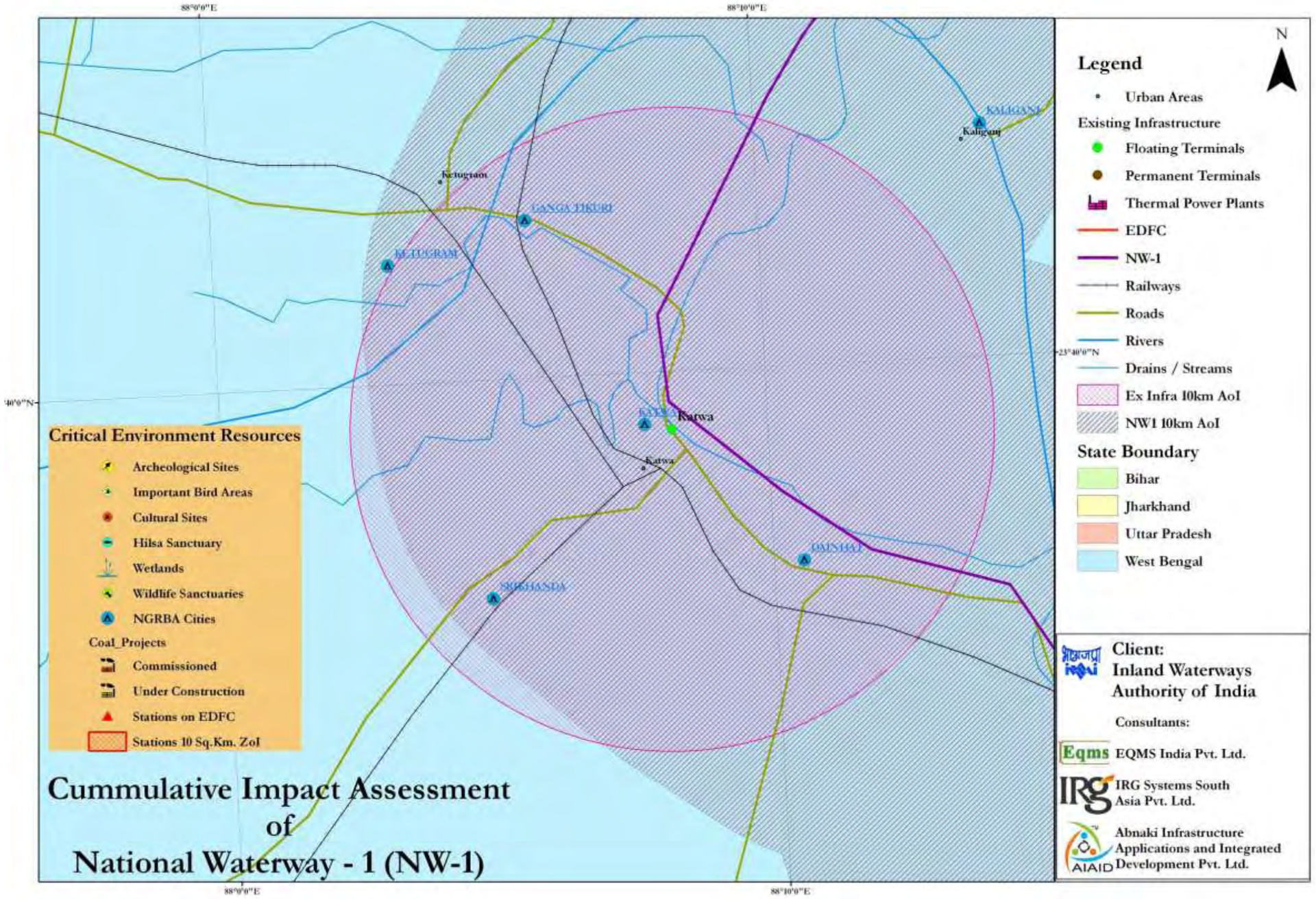

Figure 3.17 : CERs in Katwa

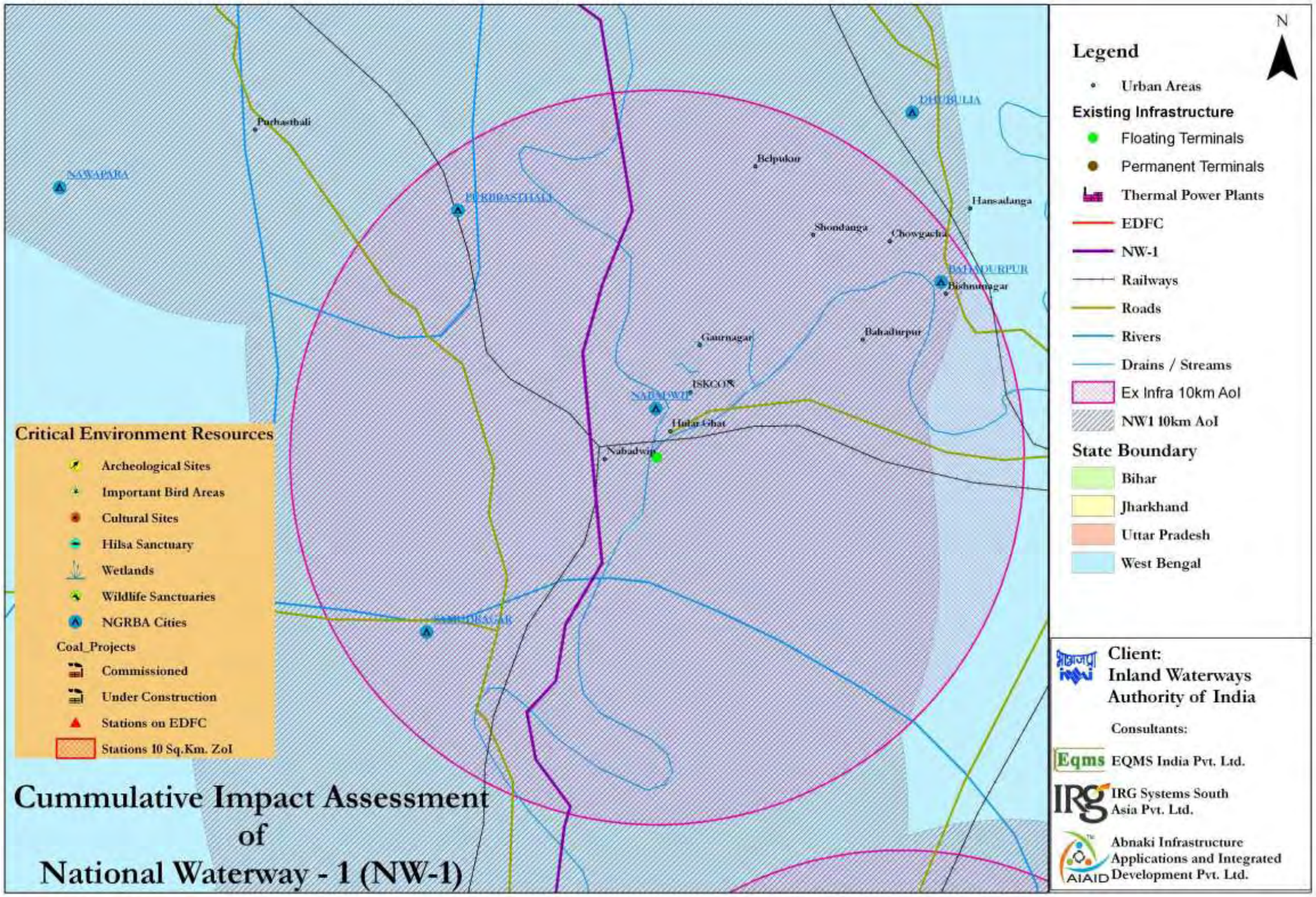

Figure 3.18 : CERs in Swaroopganj

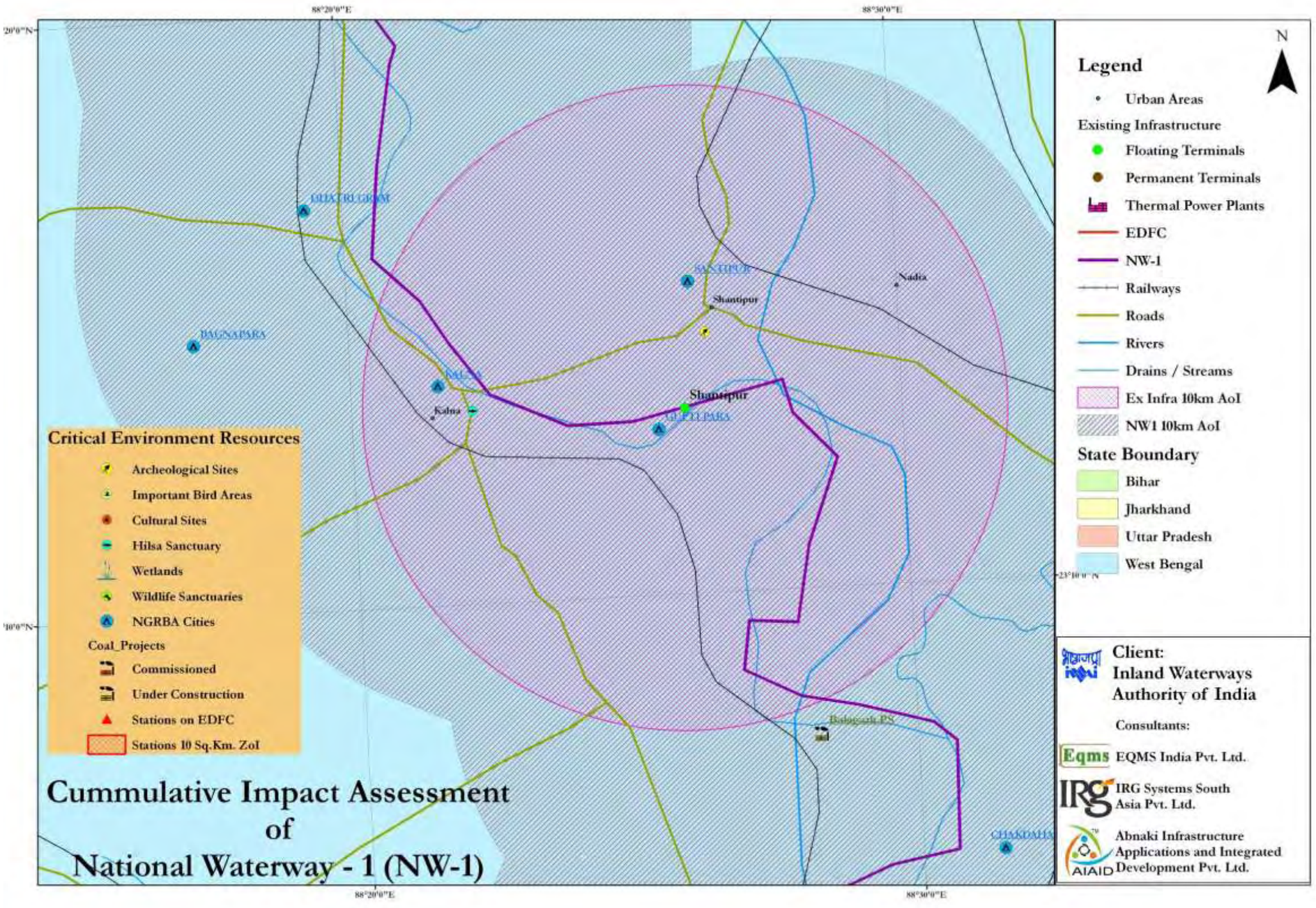

Figure 3.19 : CERs in Shantipur

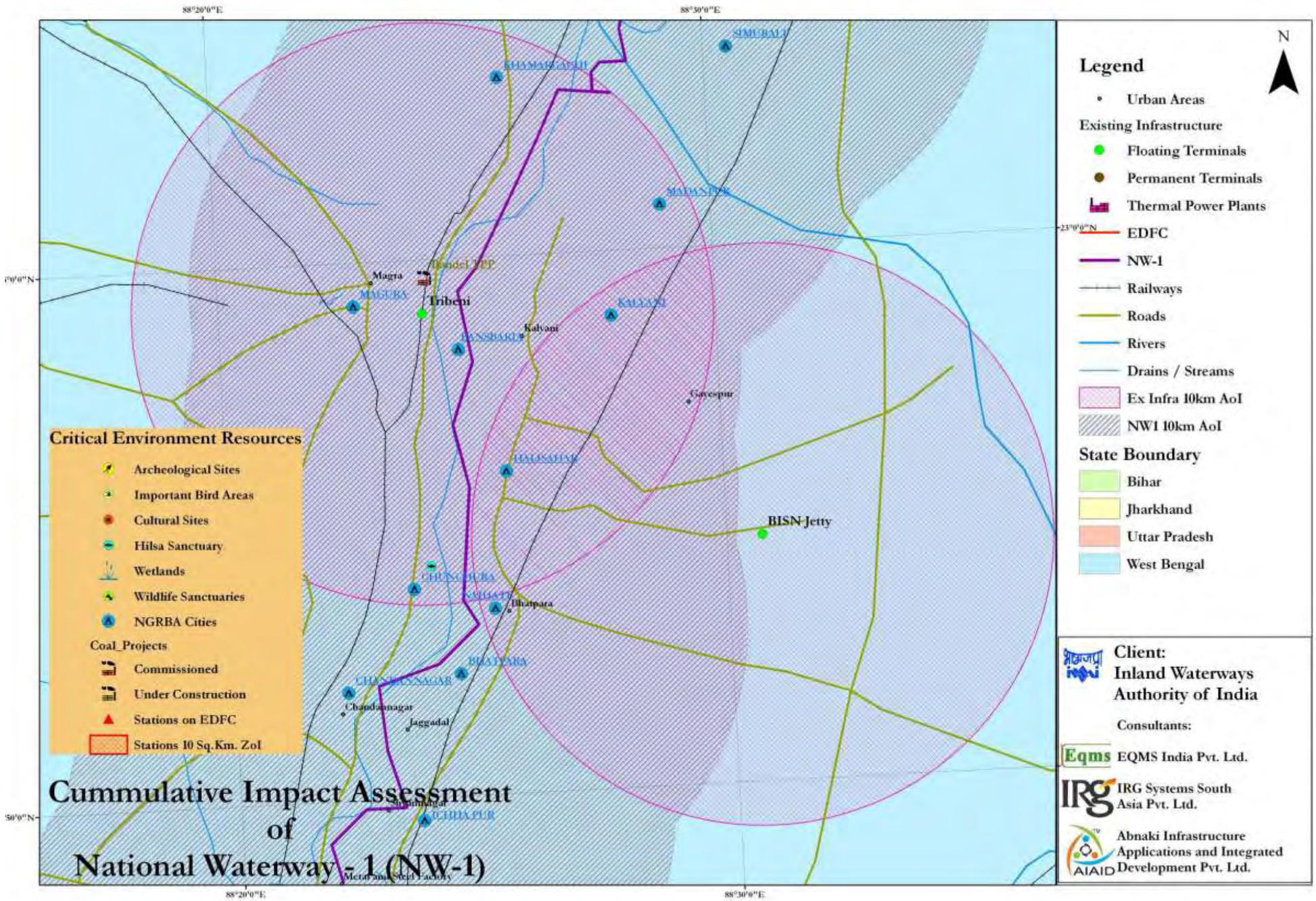

Figure 3.20 : CERs in Tribeni

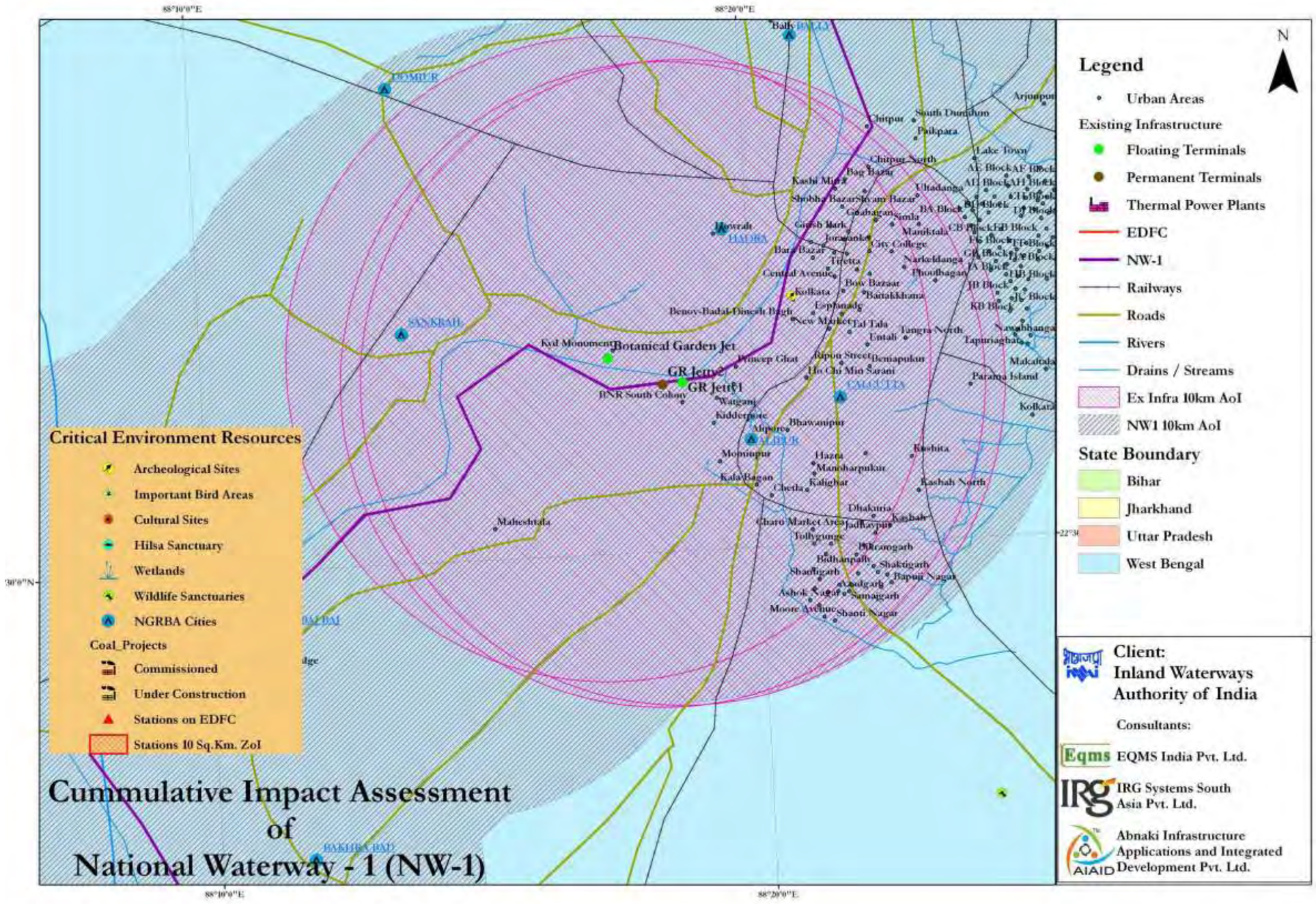

Figure 3.21 : CERs in Botanical Garden / Garden Reach Jetty

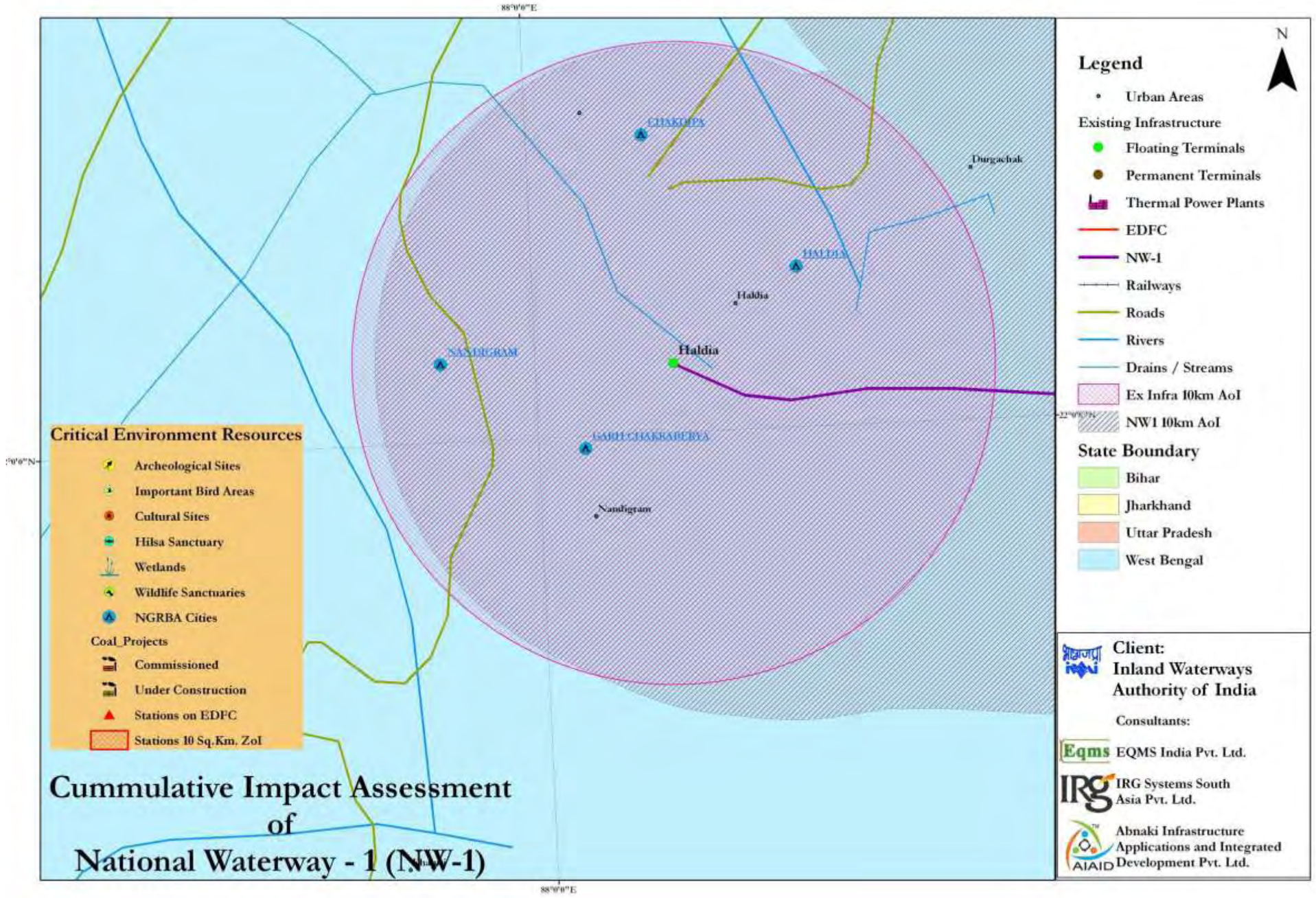

Figure 3.22 : CERs in Haldia

3.6. Conclusion

Delineation of CIA boundaries has been carried out along with identification of CERs, their current status and hotspots in the NW1 study area. These CERs are the ultimate recipient of impacts because they tend to be at the ends of ecological pathways considering water related proposed activities both in terms of availability & quality in NW-1. These CERs may be directly or indirectly affected by a specific development or by the cumulative effects of several developments. Therefore, it is essential to carry out the stakeholders consultations (a kind of collaborative judgement) considering other proposed developmental work within the CIA influence area. This will give insight into type and extent of impacts and after finalization of hotspots, further baseline assessments of the CERs can be done.

Chapter 4. : PUBLIC CONSULTATIONS AND DISCLOSURE

4.1. Introduction

Public consultation is one of the key components of the environmental assessment. The CIA/ESIA team conducted public consultations in project site area and study area. From CIA perspective, an effort was made by conducting consultations particularly in reference to confirmation of hotspots mentioned in Chapter 3 as well as to identify new hotspots, if any. The approach involved a mix of conventional as well as participatory/ rapid rural appraisal (PRA/RRA), focus group discussions (FGD) and one-to-one discussions with wide range of stakeholders encompassing government, non government organisations, local communities, research and development organisations, academia, media. Two stage consultations have been carried out in line with World Bank Guidelines for conducting the public consultation. First level consultation was carried out prior and during impact assessment studies and second level consultation was carried out after completion of impact assessment studies. Finally, this chapter concludes with identification of hotspots based on preliminary assessment, baseline data and inputs from stakeholder consultations.

This chapter provides details of the public consultation and participation activities undertaken during the CIA/ESIA studies for the Project “Jal Marg Vikas” extending from Allahabad to Haldia. During public consultation, emphasis was placed on a fully-inclusive, open and transparent public participation process in the transfer of information regarding the project and likely impacts from the project on each environment and social components. A number of stakeholders are involved in this project ranging from the local communities, local bodies, State & Central Level Government agencies and Non-Government Organizations.

4.2. Methods of Public Consultation

4.2.1. First Stage Consultations

Both the informal and formal consultations were conducted during and prior to the CIA/ESIA study to obtain the views of people about the project and to ensure their involvement. Issues pertaining to both environment and social environment were discussed in depth during the consultations.

4.2.2. Informal Consultation

Informal consultations were carried out between June, 2015 to April, 2016, prior and during the CIA/ESIA study of the different components of the Jal Marg Vikas project. Since the project comprises of various components like terminals, jetties etc., informal consultations were undertaken in reference to these proposed components at the respective locations. One to one and focused consultations were conducted on informal interview basis. No questionnaires/ brochures were supplied to the participants.

The discussions were primarily focused on receiving maximum inputs from the participants regarding their acceptability and environmental concerns arising out of the project. Consultations were initiated with the short description of the upcoming project components under Jal Marg Vikas Project. The objectives, proposed developments and the possible impacts of the project components and the connectivity links of the study area with the project were also explained. The survey team recorded their perceptions, demands and recommendations, about the project.

Informal consultations were carried out for different planned components at different time periods. The details of the same are given in **Table 4.1**.

Table 4.1 : Detail of Developmental Activity and Period of Public Consultation

Sr. No.	Details of Developmental Activity	Period
1.	Haldia Terminal	Sep, 2015
2.	Farakka Lock	June, 2015
3.	Sahibganj Terminal	July-Nov, 2015
4.	Varanasi Terminal	Oct-Nov, 2015
5.	Movement of Barges in Buxar & Patna Area	Feb, 2016
6.	Proposed development in NW-1, Bihar & Jharkhand	April, 2016

Visits were made to the villages and offices of the local bodies, Government officials, Universities and NGOs to meet the stakeholders and obtain their views. Local people included the farmers, fishermen, boatmen, land owners, cultivators and students. Interaction with females was also done during the informal focused group discussions. During the consultations, it was found that people are generally aware about the IWAI planning for development of planned components, i.e. terminals and lock. Again a brief was provided to people prior consultation. People were then asked about their views, issues and expectation from the project. Focus on both environmental and social issues was given during the consultations.

4.2.3. Formal Consultations

Formal consultations were carried out for the interventions sites where acquisition of land involved has associated R & R issues and indirect impact. Two large scale consultations have been carried out for the project, one for Farakka Lock on 9th October, 2015 at Bewa Panchayat, Farakka and second for Sahibganj Terminal on 16th October, 2015 at Ashram, Samda Nala village, Sahibganj. Invitation letter were given through e-mail and through in person meeting to Local bodies, Government officials & NGOs for attending the public consultation, minimum a day before the formal public consultation meeting. Locals were given invitation by personally visiting the village. List of the stakeholders invited for the consultation meeting at Farakka Lock and Sahibganj Terminal are attached as Annexure 4.1. Copy of one invitation letter sent to stakeholder is attached as Annexure 4.2 as sample and for the reference.

4.2.4. Second Stage Consultations

Second stage public consultation was carried out after the completion of impact assessment studies by IWAI on 22nd February, 2016 at Maurya Hotel in Patna. Second stage public consultation was carried out with the experts, NGOs, Government Officials, prominent personalities of the public, and other interested parties for discussion of identified impacts and proposed mitigation measures to get their opinions and suggestion for enhancing the acceptability of the project by the public and improvement in mitigation and management plan. Consultations with officials of Bihar Pollution Control Board and Jharkhand Pollution Control Board were held to elicit views on proposed development in NW-1 and suggestions w.r.t likely impacts and mitigation.

4.3. Objectives of Public Consultation

The public consultations were conducted with the following objectives:

- To spread awareness and generate understanding about the project among stakeholders, and to collect their opinion, suggestions for planning and designing of the project
- To assess positive as well as adverse socio economic and environmental impacts in the area through participatory methods such as walk through and focus group discussions.
- To identify the need and concern of the public
- To assess cultural patterns and behaviour of local communities towards the project
- To understand the environmental and social issues associated with the project through discussions
- To understand suggestions and opinions of the community, Government officials and NGOs on mitigation measures to counter and check the adverse and negative impact that threaten the socio economic environment in the area.
- To understand the satisfaction level of people with proposed mitigation and management measures proposed for the project

4.4. Outcome of Informal Stakeholder Consultation

People and are supportive of the project in general. Extract of the informal public consultation meetings held are attached as **Annexure 4.3**. Main concerns raised during the consultation and redressal of the concerns is given at **Table 4.2**. Photographs of informal public consultation are given in **Annexure 4.5.**

Table 4.2 : Main Outcome of Informal Consultation and Redressal of Concerns

Sr. No.	Outcomes/Concerns	Redressal
1	Development of project may lead to fish kill and in turn will affect the fishing businesses. They expect some allowances from the Government in lieu of their affected income.	Mitigation measures and management plan includes the measures for reduction of impacts of intervention construction &operation, maintenance dredging and barge movement on fish yield. Some of the measures are: Regulated/slow speed shipping Management of pollution by ships/vessels Intimation of dredging/piling plan to fishers prior carrying out any activity Enhancement of fishing in the area by boosting and funding fish nurseries and provision of better fishing aids and funding training of fishermen by CIFRI or organizing training program for fishermen through CIFRI Provision of sirens and strong search lights in vessels/barges so as fishermen would know the approach of ship/barge from minimum distance of 500 m
2	Nearby roads to the terminal facilities should be strengthened and widened, as there may be substantial increase in traffic	Being taken care and approach road will be constructed at Sahibganj terminal and Varanasi terminal.

Sr. No.	Outcomes/Concerns	Redressal
	movement in the roads connecting the terminal site after development of terminal.	
3	Turtle will get impacted due to regular movement of ships and vessels in river.	Only 1-2 vessels per hour are expected to move in the sanctuary area. Speed of vessels will be maintained to 5 kmph/2.7 knots in turtle sanctuary area. Such speed barges generate noise in order of 11-140 dB. Threshold noise level of turtles for change in behavioural response is 150 dB which is above the noise expected to be generated by moving barges and the impact on turtles behaviour responses is insignificant. Other measures are also being proposed in the EMP to minimize impact of barge movement on turtle.
4	Oil spillage from ships during accident may impact the aquatic flora, fauna and water quality	Safety measures to be taken by vessels are given in the EMP. This will minimize the chances of accidents and will facilitate the quick clean-up operations in case of spillage
5	Concerns regarding the water quality issues which may be there due to construction of terminal facility and operation of cargos, spillage in case of accidents, discharge of waste and sewage, oil leakage and other related activities	Environment management plan has incorporated the measures for barges and terminal facilities to be taken up to minimize the water pollution
6	Adequate compensation should be provided for the land which will be acquired	SIA has been carried out for Sahibganj terminal site and RAP/LA/compensation plan has been prepared as per the R & R Act, 2013 and R & R policy for the project
7	Demand for livelihood by the people who will loose their land	Engagement of NGO can be taken up to find them alternative livelihood
8	At Sahibganj, locals expressed that they were keen on being relocated near the River Ganga iteself	It was informed that a relocation site has been identified by the District Officials near the current habitation in the diyara land
9	Large no. of tree cutting involved at Sahibganj site which may impact the climate.	Compensatory plantation and additional plantation is proposed to be undertaken. At all the terminal/jetty site green belt will be developed to the extent possible. This will help in minimizing the impact and will lead to reduced impact of CO2.
10	Impact of barge movement on dolphins	Regulated speed of barge movement in dolphin sanctuary area. Provision of propeller guards to prevent entangling of dolphins. Other measures are also proposed in management plan to reduce the impact on dolphins
11	Plying vessels at present get stuck in lean season and this enhances the impact	LAD is proposed to be maintained in stretch between Haldia to Varanasi during entire lean period

Sr. No.	Outcomes/Concerns	Redressal
12	Dredging may have significant impact on breeding and spawning season	Dredging is proposed to be regulated during this season
	Erosion occurs along the bank of feeder canal and that is creating problem. Ship movement has further enhanced erosion	River training works of 39 km are proposed to be undertaken on banks of feeder canal
13	As part of social development the local immersion Ghat at Durgachak (near project site) should be expanded by the project sponsors to overcome the current congestion especially during the local festival.	Proposal is made to undertake expansion of ghat and budgetary provisions are also kept.
14	The access road of Haldia terminal needs to be carpeted as present road is not in good condition.	Shall be carried out as part of project development
15	Provision for appropriate parking facilities inside the proposed terminal for better management of container carrying vehicles.	Provision of parking area is made at each terminal site
16	Sanjana Chemicals near Haldia terminal site suggested that no water logging should take place at terminal site and nearby areas after development of terminal and firefighting measures should be provided at the site	Adequate storm water drainage is provided at the site to drain the storm water and fire-fighting facility is also proposed at the site.

4.5. Formal Public Consultation Meetings

Formal public consultation was conducted for Terminal at Sahibganj & Lock at Farakka. Formal consultation at Sahibganj was conducted on 16th October, 2015 in Ashram, Samda Nala village, Sahibganj. Formal consultation at Haldia was conducted on 9th October, 2015 at Bewa Panchayat, Farakka. Request for support and participation in public consultation meeting was sent to stakeholder, Gram Panchayat, other locals such as fishermen and Local Administrations. Some of the stakeholders were invited by giving invitations personally. Villagers were invited through Gram Sarpanch and also by giving door to door invitations.

4.5.1. Formal Consultation in Sahibganj

Meeting was started with brief introduction about the project by Mr. Ravi Kant, Director IWAI, Patna. At the community meetings information on the socio-economic studies, environment impact studies and other engineering related to the proposed terminal of IWAI were discussed. He requested stakeholders to cooperate and provide information to these teams for facilitating their studies. The stakeholders and community members were then given an opportunity to raise their concerns regarding the proposed project. About 700 people participated in the PCM. Meeting was attended by Government officials, PAF's, World Bank Officials, IWAI Official, ESIA/CIA team and General public. The summary of the key concerns/views and observations of the different stakeholders are presented in Table 4.3. Photographs of the formal public consultation meeting are given in Annexure 4.5. Attendance sheet for the PCM is attached as Annexure 4.4.

Table 4.3 : Summary of Formal Public Consultation Meeting at Sahibganj

Sr. No.	Person Name/organization, Phone, Address	Outcome (concerns and suggestions) / Views
1	**Person/ Organization:** Shri K.K. Tiwari **Designation:** Divisional Forest Officer ,Sahibganj **E mail:** sbgforest@gmail.com **Phone**: 09431306331 **Address:** Divisional Forest Office, Sahibganj, Jharkhand	Shri K.K. Tiwari told that the area behind the terminal site is protected forest. He told that forest department has plans to carry out afforestation and grasses/shrubs in 5 km area of the Ganga River and along the Railway lines in Udhwa Region for benefit of livelihoods of local communities. Also forest department has plan to develop wetland. His concerns about the project development are: 1. Dolphins will be impacted due to the movement of cargo so mitigation measures should be taken to minimize the accidents 2. Water pollution may result due to disposal of sewage from terminal and from vessels and disposal of solid and other waste in River Water. Thus mitigation measures and management plan should be prepared to prevent water pollution. 3. Surveys should be carried out to identify the breeding and spawning grounds of fishes and project activities should not be undertaken in those regions 4. Construction activities should not be carried out during spawning and breeding seasons 5. Piling and construction within water should be carried out during low flow period 6. Measures should be taken to minimize the impact of the project on aquatic organism
21	**Person/ Organization Consulted:** Shri Jayant Ranjan **Designation:** District Fisheries officer **Phone**: 09835031630 **Email**:jayant.ranjan21@gmail.com **Address:** Department of Fisheries, Sahibganj	Shri Jayant Ranjan raised the following concerns: 1. About 5000 fishermen depend on River for their livelihood 2. Major fish species in the area are Indian Major carps, singhi, shrimps, Mystus sp. catfishes, tengra etc. These are commercially important species. Project development may affect the production of fishes in the River and will affect the livelihood of people 3. Breeding and spawning grounds of the fishes should be identified and care should be taken that no development should be carried out in

Sr. No.	Person Name/organization, Phone, Address	Outcome (concerns and suggestions) / Views
		these regions 4. Dolphins are very sensitive and care should be taken that minimum disturbance should be caused to dolphins 5. Mechanism should be developed for river clean up during accidents, oil spills, spillage etc. 6. Dredged material should be disposed in safe places and dumping should not be carried out on banks as these are habitat to various important species. 7. Fish catch may reduce due to increase in water pollution due to project development 8. Project may increase the export of frozen fishes and also there is potential for growth of commercial fisheries
4.	**Person/ Organization:**Mrs Munni Gaud **Phone**: 07808789116, 7070603324	Mrs. Munni Gaud raised the following concerns: 1. Appropriate compensation should be given to the land owners 2. Alternate employment options should be provided to people who are losing their complete land 3. Developments should be carried out in the nearby areas also for development of villages 4. Fishing activity should not be restricted after development of terminals 5. Farmers practising river terrace agriculture should not be stopped
5.	**Person/ Organization:** Mrs Usha Khalkoo **Phone**: 9801018326,9801352024 **Address:** Gram Panchyat Head, Hathigarhi	Mrs. Usha Khalkoo raised the following concerns: 1. Villagers are opposing the project as they are losing their land and they do not have any alternate employment option and are completely dependent on agriculture for their livelihood 2. Compensation should be given to villagers as per prevailing market rate, then they may get interested in selling their land 3. Alternate livelihood options should be provided to affected people 4. Pollution should not increase at the site and nearby areas due to project development
6.	**Person/ Organization:**Mr	Mr. Niranjan Kumar informed the survey of

Sr. No.	Person Name/organization, Phone, Address	Outcome (concerns and suggestions) / Views
	Niranjan Kumar **Designation:** Additional Deputy Collector + Land Acquisition officer, Sahib ganj **Phone**: 09431306331 **Location/ Address: District Collectorate Office** Sahibganj, Jharkhand	land is under process and some more time is required to finalize the award list and land details.
7.	**Person/ Organisation:** Mr Vishal Chandra **Address:** Jharkhand RajyaVidutVitran Nigam Ltd Sahibganj Jharkhand	Mr Vishal Chandra raised the following points: 1. He was in favour of project and said that the project is good for betterment of the area 2. This project will increase the development opportunities in the area 3. Shifting of LT line may be required from village which will be a challenging task 4. IWAI should be responsible to compensate for shift of the utilities
8.	**Person/ Organization:**Mr Sushil Kumar Executive Engineer PWD **Address:** Public works Department Sahibganj, Jharkhand	Mr Sushil Kumar said that project is good for development of the area and raised the following points: 1. Land acquisition will be the major hurdle for project development as one of the PWD project of road is also on hold due to difficulties in land acquisition 2. No paved public road connects the site to the highway or other road. Also it is expected that traffic will increase in the area, thus to prevent dust generation and traffic congestion, it is required to construct minimum 4 lane road to connect site to NH-80. 3. ROB should also be constructed above the railway line to allow smooth flow of traffic 4. Green belt should be maintained along the approach road to suppress the dust generation 5. Assessment of increase in traffic should also be carried out on existing roads so as expansion can be planned when required
9.	**Person/ Organization :** Dr. Bhagwant Marandi **Designation:** Chief Medical Officer **Address:** CMO,Health Department, Sahinganj, Sahibganj, Jharkhand	Dr. Bhagwant said that in his point of view, project will lead to overall development of the area. Healthcare facilities will also increase in the area after development of project.

Sr. No.	Person Name/organization, Phone, Address	Outcome (concerns and suggestions) / Views
10	**Person/ Organization :** Mr Safaij Reiz, **Address:** Ganga pump Canal Nahar Pariyojna (Irrigation Department, Sahibganj, Jharkhand	He supported the project and said that project is beneficial for overall development of area and improvement of living standards of people.
11.	**Person/ Organization :** Mr Faiku Ram **Address:** District Mining Officer , Sahibganj, Jharkhand	He supported the project and said that project is beneficial for overall development of area and improvement of living standards of people. He is ready to extend his support to IWAI, if required
12	**Person/ Organization :** Mr Vinay Kumar Mishra and (5 staff members) **Address:** District Land Acquisition Officer Sahibganj, Sahibganj, Jharkhand	He said that land acquisition is under process and they are trying to identify land near the village for relocation and resettlement of displaced families and facilities
13.	**Person/ Organization :** Mr Prasant Kumar Additional Director, IWAI and (6staff members) **Address:** IWAI, Bhagalpur, Jharkhand	He gave confirmation to villagers that no additional land will be acquired for terminal construction. Land will be acquired as per law of land. He explained about the project to villagers and clarified the queries of people during meeting.
14.	**Person/ Organization:** Villagers of Samda Nala and Rampur village (Direct and Indirect Affected Persons)	Villagers were highly concerned and raised following points 1. They said that land should be acquired as per prevailing market rates 2. Alternate employment options should be provided to people who are losing their land 3. Land should be provided to affected people within or near village for relocation and resettlement 4. Fishing should not be restricted in the River due to project development 5. Employment opportunity should be provided preferably to local people
15.	**Other Participant** Mrs. Abha Singal Joshi, Consultant World Bank Mrs. Mridula Singh, World Bank Mr Pranay Kumar +2 persons from social team of IWAI Consultant Mr Krishna + 2 persons from Environment team of IWAI Consultant Media: Dainik Jagaran, Hindustan	

4.5.2. Formal Consultation in Farakka

The consultation was kicked off by Mr. Madhusudan Hanumappa (Social Expert), part of EQMS-AIAID-IRGSSA JV by welcoming all the dignitaries and participants. In his address, he emphasized on the proposed project i.e. “Capacity Augmentation of Navigational Infrastructure on NW-1 between Allahabad to Farakka”. He also explained the objective of

the ESIA/CIA for managing environmental and social issues for sustainable development. At the community meetings information on the socio-economic studies, environment impact studies and other engineering aspects related to the proposed lock gate of IWAI were discussed. He requested stakeholders to cooperate and provide information to these teams for facilitating their studies. The stakeholders and community members were then given an opportunity to raise their concerns regarding the proposed project. The summary of the key concerns/views and observations of the different stakeholders are presented in Table 4.4. Photographs of the formal public consultation meeting are given in Annexure 4.5.

Table 4.4 : Summary of formal Stakeholder Consultation

Sr. No.	Person Name/organization, Phone, Address	Outcome (concerns and suggestions) / Views
1.	Kesang Dhendup Bhutia BDO & Block Executive Officer Farakka Block Development Office, Farakka, Murshidabad	• BDO, Farakka, welcomed the project development and assured his and local administration cooperation for the project implementation. • Also mentioned that without addressing environmental and social concern/impact in a structured manner no project can be completed on time successfully. • Any kind of toxic pollution by the vessel like oil spillage and chemicals in the river water, transport emissions, needs to be considered. • The project implementing agency should be careful about river erosion during the vessels movement. River bank erosion has a permanent effect upon the socio-economic conditions and demographic dislocation. • As Farakka BDO, he appealed to the authority that they should provide jobs to the local unemployed youth based on their skill and should give business opportunities to the local people. • The access road needs to widened and upgraded to ensure smooth traffic movement because it has an important link with NH-34. A traffic management plan needs to be in place. • He suggested that the project should employ local people in the proposed location on a priority basis provided they have the required skills. • The health safety and protection of labour and other community members should be considered on project site as well as nearest locality of the villages during the operation phase. • Also suggested for adequate mitigation measures in ESIA/CIA to address to erosion issue because due to river bank erosion Farakka block is one of the worse affected area and many people have lost their homes/properties since 1975 when Farakka barrage was commissioned. • The public consultation meeting should be held at different places for awareness of the people and Grievance Redressal Committees should be active with timely conflict resolution. • The Interviewee was optimistic that implementation of

Sr. No.	Person Name/organization, Phone, Address	Outcome (concerns and suggestions) / Views
		this project would change the current socio-economic scenario of the local communities.
2.	Mr. Arnab Chakraborty Journalist (Malda & Murshidabad Division) Uttarbanga Samgbad Farakka, Murshidabad	• He suggested that the project should employ local people in the proposed location on a priority basis provided they have the required skills. • The health safety and protection of labour and other community members should be considered on project site as well as nearest locality of the villages during the operation phase. • Also suggested for adequate mitigation measures in ESIA/CIA to address to erosion issue because due to river bank erosion Farakka block is one of the worse affected area and many people have lost their homes/properties since 1975 when Farakka barrage was commissioned. • The public consultation meeting should be held at different places for awareness of the people and Grievance Redressal Committees should be active with timely conflict resolution. • The Interviewee was optimistic that implementation of this project would change the current socio-economic scenario of the local communities.
3.	Mr.Jahid Hussain Director, Mahadevnagar Rural Welfare Society, Farakka,Murshidabad	• The authority can support them through livelihood restoration programmes. • Also suggested for safety and protection from the construction site near the locality of the villages and • The consensus described as during the construction period authority should consider the vulnerable health issues like HIV/AIDS because Murshidabad is one of the vulnerable health related district in West Bengal.
4.	Mr. Rana Dutta,IFS DFO Divisional Forest Office,Nadia&Murshidabad Range Institutional Stakeholders consultation through KII (key informant interview)	• There is no forest conservation around the Farakkaarea. • The continuous turbulence and waves from plying vessel movement can cause river bank erosion. This is problem that is difficult to resolve in entire downstream • As a DFO gave the assurances that DFO range will give all help for smooth operation of the project activities.
5.	Community members of local Villages at PCM	• The villagers also informed that there is no forest area. Further, they did not anticipate any adverse impacts on their livelihood due to construction works. • They further opined that there would be positive impacts on the sources of livelihood due to increased economic opportunities which will provide good earning sources to the local families due to the project implementation. It was also informed that there is no

Sr. No.	Person Name/organization, Phone, Address	Outcome (concerns and suggestions) / Views
		Schedule Tribe (ST) population in the project area. • Representatives from Beoa Panchayat extended their support during the construction and operational phase of the proposed project. -They also suggested that public consultation meetings should be held at different places for awareness of the people and Grievance Redressal Committee should be active with timely conflict resolution.

4.6. Second Stage Consultation

Second stage consultation for the project was held at Patna on 22.02.2016 at Patna with IWAI team, environmental and design consultants and experts of various fields. Identified impacts were discussed during the consultation and discussion was held on adequacy of the mitigation and management measures proposed. Suggestions were given and concerns were raised by the experts during the consultations. Suggestions and concerns are given in the Table 4.5. Photographs of the consultation are given in Annexure 4.5.

Table 4.5 : Summary of the Second Stage Consultation

S. No.	Person Consulted	Concerns Raised
1	Mohd. Najeeb Ahsan, Sr. Social Management. Specialist, National Mission for Clean Ganga	Alignment of Jal Marg Vikas Project's Environmental Management Plans and afforestation plans with the DPR's of Namami Gange would be appropriate. Facilities of Ferry and Ro-Ro crossings should be examined in detail under the JMV Project. Provision of Water Ambulance for transportation of patients in congested cities. Disaster Management and Emergency Response System should be developed under the project. Plan for treatment of waste water and re-use should be developed. As traffic on NW-1 would increase in future; proper planning for deployment of river patrolling and security is required. Last mile connectivity should be examined properly.
2	Dr. S. Samanta, Principal Scientist, CIFRI	Documenting the impacts along the river and understanding the various relationships with the river is important. IWAI is also a stakeholder in river. As other stakeholders need water in river for different uses as irrigation, drinking etc., IWAI also require water for navigation. The role of the project on overall water management in the river must be clarified.
3	Shri Vishva Ranjan, Urban Planning & Urban Development Specialist, Patna	Environment friendly waste disposal mechanism is required for vessels. Need of a Charter for ensuring waste is not directly discharged in the river and third party monitoring to

S. No.	Person Consulted	Concerns Raised
		ensure the same. Waste management has been included in the draft revised Indian Vessels Act.
4	Shri K. Praveen Rao, Chief Conservator of Forests-Kanpur, Department of Forest, U.P	Reconstitution of Project Oversight Committees with representation of appropriate Forest Officers. Afforestation along the banks of Ganga should be done under the project.
5	Professor R.K Sinha, Head, Zoology Dept., Patna University	Vessel traffic management system should be developed under the Project. Dolphins are National aquatic animals and are blind. Noise generated due to vessel movement should be controlled to avoid adverse impact on dolphins. Propellers on the vessels should be caged for safety of the dolphins
6	Shri Rakesh Tiwary, Astt. Professor, A.N. Sinha Institute of Social Studies	Proper planning should be done to maintain sufficient depth by conserving wet lands and constructing reservoirs (rain water harvesting) and releasing them in the river during lean season in the system. Long term modelling of rivers should be ensured to meet the water depth requirement Cumulative impact on the society due to the project should be studied in details and proper mitigation measures should be adopted
7	Office of Member Secretary, Bihar Pollution Control Board Beltron Bhawan, Shastri Nagar Jawahar Lal Nehru Marg Patna (Bihar) - 800 023 Phone - 2281250; 2281776; 2283782	-Impacts on air, water and noise are anticipated due to various components by proposed development in NW-1. It is essential to formulate environment and social safeguards in CIA/ESIA particularly to address pollution and quality of life aspects. -Required clearances and NOCs should be taken from concerned regulatory authorities and ensure compliances.
8	Office of Member Secretary, Jharkhand Pollution Control Board H.E.C., Dhurwa, Ranchi-834004 (Jharkhand) **Tel.** : 2400894/851/852/902/979/138.	-Impacts on air, water and noise are anticipated due to various components by proposed development in NW-1. It is essential to formulate environment and social safeguards in CIA/ESIA particularly to address pollution and quality of life aspects. -Required clearances and NOCs should be taken from concerned regulatory authorities and ensure compliances. Due to proposed location of terminal at Sahibgunj, it is important to consider impacts on aquatic biodiversity and address them in EMP.

4.7. Finalisation of Hotpots

Hotspots have been identified based on consultative process by engaging with various stakeholders. These hotspots are given in **Table 4.6.**

Table 4.6 : Hotspots based on Stakeholder Consultations

S. No.	Hotspots Strech/Location	Criteria For Selection of Hotspots	CERs
1.	Haldia	• Celebration of Ganga Sagar Mela at Sagar • Urban areas: Haldia Town	• Religious Values
2.	Farakka to Murshidabad	• Farakka feeder canal is prone to erosion • Urban Areas: Farakka, Murshidabad, Azimganj, Baranagar, Balia, Raghunathganj	• Bank/Soil erosion
3.	Rajmahal	• Chatt Pooja celebration Oct-Nov • Mining activities	• Religious Values • Air Quality
4.	Sahibganj	• Chatt Pooja celebration Oct-Nov • Acquisition of Land, R& R and shifting of community temple • Cutting of app. 500 trees	• Land Use • Livelihood & Fishing Activities • Socio-economic • Air Quality • Terrestrial flora • Religious Values • New infrastructure development
5.	Pirpanti	• Chatt Pooja celebration Oct-Nov	• Religious Values
6.	Kahalgaon	• Chatt Pooja celebration Oct-Nov • Urban Area: Kahalgaon	• Religious Values
7.	Bhagalpur	• Chatt Pooja celebration Oct-Nov • Urban Area: Bhagalpur	• Religious Values
8.	Munger	• Chatt Pooja celebration Oct-Nov •	• Religious Values
9.	Semaria	• Chatt Pooja celebration Oct-Nov • Urban Area: Semaria, Doraiganj	• Religious Values
10.	Begusarai	• Chatt Pooja celebration Oct-Nov • Urban Area: Begusarai	• Religious Values
11.	Barh	• Chatt Pooja celebration Oct-Nov • Urban Area: Barh	• Religious Values
12.	Patna	• Chatt Pooja celebration Oct-Nov • Urban Area: Patna • Development of River Front	• Religious Values • Water Quality • Land Use • Soil Erosion
13.	Buxar	• Chatt Pooja celebration Oct-Nov	• Religious Values

S. No.	Hotspots Strech/Location	Criteria For Selection of Hotspots	CERs
		• Urban Area: Buxar	
14.	Varanasi	• Festival: Ganga Mahotsav at Varanasi (Oct-Nov) & Dhrupad Mela at Tulsi Ghat of Varanasi (Feb to March)	• Religious Values
15.	Allahabad	• Festival: Kumbh Mela	• Religious Values

4.8. Conclusion

Stakeholder's view and perception was assessed through informal and formal public consultation meetings. Two stage consultations have been carried out for the project. This ensures involvement of public, NGO, experts in the project's pre-planning stage itself and addressal of their problems and expectation from the projects. The inputs of stakeholder consultations have been used in finalisation of hotspots.

During the formal and informal consultations for 'Jal Marg Vikas Project', it is found that there is mix view of people about the project. Some people take it as positive development as the proposed project will benefit the economy of country. Whereas affected people, i.e. fishermen and land holders who will loose land are concerned about the restriction of fishing activity, reduction in fish yield, loss of land and livelihood and receipt of adequate compensation and alternate livelihood. Locals and experts are also concerned about the water pollution and impact on the aquatic fauna which may result due to the project. All the concerns were taken in consideration during assessment of impacts and the mitigation measures are proposed for all the concerns to minimize/mitigate the impact. Mitigation measures proposed are well addressed in management plan along with their period of implementation.