

Volume 1

Non-technical summary | 20TPD|CBG Plant| Shahjahanpur, UP

Akaia Greenfuel Pvt. Ltd

20 April 2026



1 Introduction

This document serves as the Non-Technical Summary (NTS) of the Environmental and Social Impact Assessment (ESIA) for the proposed 20 Tons Per Day (TPD) Compressed Biogas (CBG) plant in Shahjahanpur, Uttar Pradesh. It outlines key project features, methodologies adopted during the ESIA process, and the environmental, social, and ecological sensitivities identified. The NTS provides a concise summary of anticipated impacts during construction and operation, proposed mitigation measures, and the expected residual impacts post-implementation. It also presents an overview of the implementation and supervisory framework designed to ensure effective environmental and social management throughout the project lifecycle.

1.1 Project Background

Envint Services LLP was appointed by Akaia Greenfuel Pvt. Ltd. (hereinafter referred to as “Akaia” or “AGF” or “the Company”) as the independent Environmental and Social (E&S) consultant to undertake the Environmental and Social (E&S) Risk Screening (Red Flag), E&S Impact Assessment (ESIA) Scoping Study (“the Report”) and the ESIA for the Project, as required under the AGF and CFM Environmental and Social Management Systems (ESMS).

1.2 Justification for the ESIA

AGF intended to set up a CBG project, to assess potential environmental and social risks associated with the development of the proposed CBG plant, AGF commissioned an Environmental & Social (E&S) Scoping Study in November 2024.

The Scoping Study highlighted the need for a detailed Environmental and Social Impact Assessment (ESIA). Envint subsequently reviewed the Scoping Study and prepared a work plan for the ESIA, which also identified the requirement for a Climate Risk and Vulnerability Assessment (CRVA) study.

Terminologies used in the report

The 20 TPD CBG project has been referred to as ‘Project’ for the remainder of the document.

Objectives and Scope of work

The main objective of the ESIA is to assess social, environmental and ecological impacts of the proposed CBG plant and provide management strategies to comply with the reference framework. The specific objectives are depicted in **Figure 1-1**.

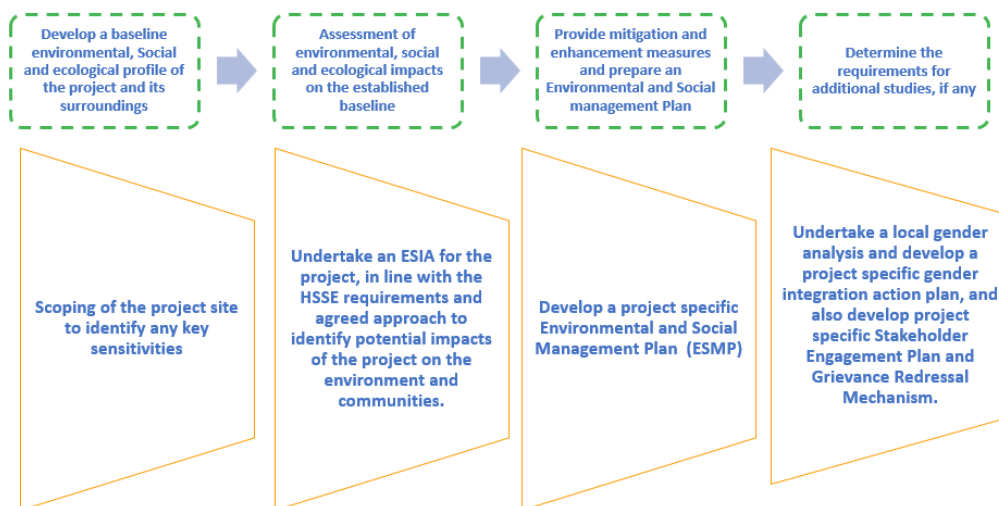


Figure 1-1: Objective of the ESIA

2 Approach & Methodology for ESIA

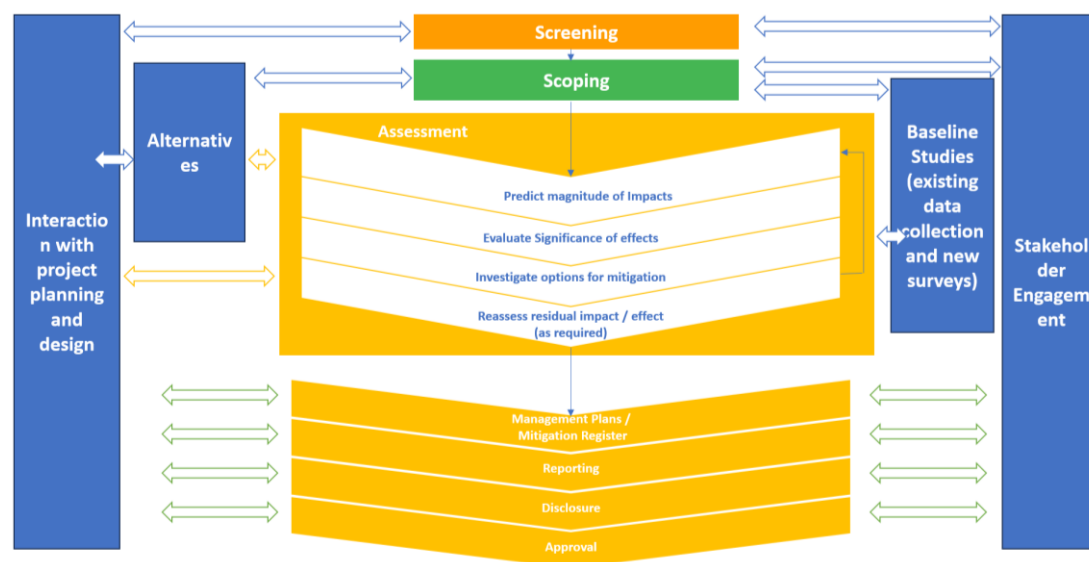


Figure 2-1: Approach and Methodology for ESIA

The approach has been divided into two work streams:

Work stream 1 E&S Screening

- Desk-based Review of key environmental, social and ecological sensitivities.
- A site Visit was undertaken in November 2024 to gather preliminary information on environmental, ecological, and socio-economic aspects, including identification of sensitive habitats and species, biodiversity considerations, and initial gender and stakeholder consultations.
- The first draft of the E&S Screening & Red flag review report was submitted in December 2024, which summarized the salient features and preliminary categorization of the Project. The report was finalized in June 2025.

Work stream 2 E&S Scoping & ESIA

- A Document Review of maps and satellite imagery was undertaken to understand the key environmental, social and ecological sensitivities.
- A site visit was undertaken in January 2025 for the activities including assessment of feedstock supply chains and storage facilities, collection of environmental baseline data, stakeholder consultations, and traffic count surveys along procurement routes.
- An analysis of alternatives process to evaluate different project design, technology, and site options to minimize environmental and social risks
- Assessment of potential impacts on the various environmental, ecological and social elements.
- An ESMP has been developed to summarize the list of mitigation measures recommended to reduce the overall impacts on environmental, social and ecological elements.

Climate Risk and Vulnerability Assessment

The Climate Risk and Vulnerability Assessment (CRVA) was undertaken to evaluate the potential impacts of climate variability and long-term climate change on the Project. The study focuses on assessing risks such as droughts, extreme rainfall, and temperature fluctuations, and proposes adaptive measures to enhance the

Project Influence Area

The Project footprint, access road, alignment of gas pipeline, procurement routes for paddy straw, press mud shared by the Company were treated as the Project area. A buffer of 5 km was taken from the Project boundary to study the presence of sensitive receptors. Biodiversity related receptors were reviewed in a 10 km buffer including transmission line. The receptors present along the gas pipeline in 500 m buffer on both sides were also reviewed.

3 Project Description

#	Particular	Description
1	Location and terrain	The Project is located in Bhamauri village, in Tilhar Tehsil of Shahjahanpur District in Uttar Pradesh. The approximate centre-point coordinates of the proposed site are 28° 1'30.48"N and 79°38'34.89"E. The Project site comprises flat agricultural land with no significant undulations. Natural drainage features are present, and the site has not yet been levelled.
2	Technology	- Anaerobic digestion and Biogas purification - Moisture & CO₂ to reach 98% Methane Content
3	Batching Plant	Tentative 2 batching plant
4	Capacity of gas generation	20 TPD
5	Raw Materials	150 TPD of paddy straw, 114 TPD of sugarcane press mud, and 21 TPD of cow dung
6	Land Size	33.35 acres
7	Current Status	Planning Stage; Land acquisition completed; construction work expected to commence in Q4-2025 Greenfield site

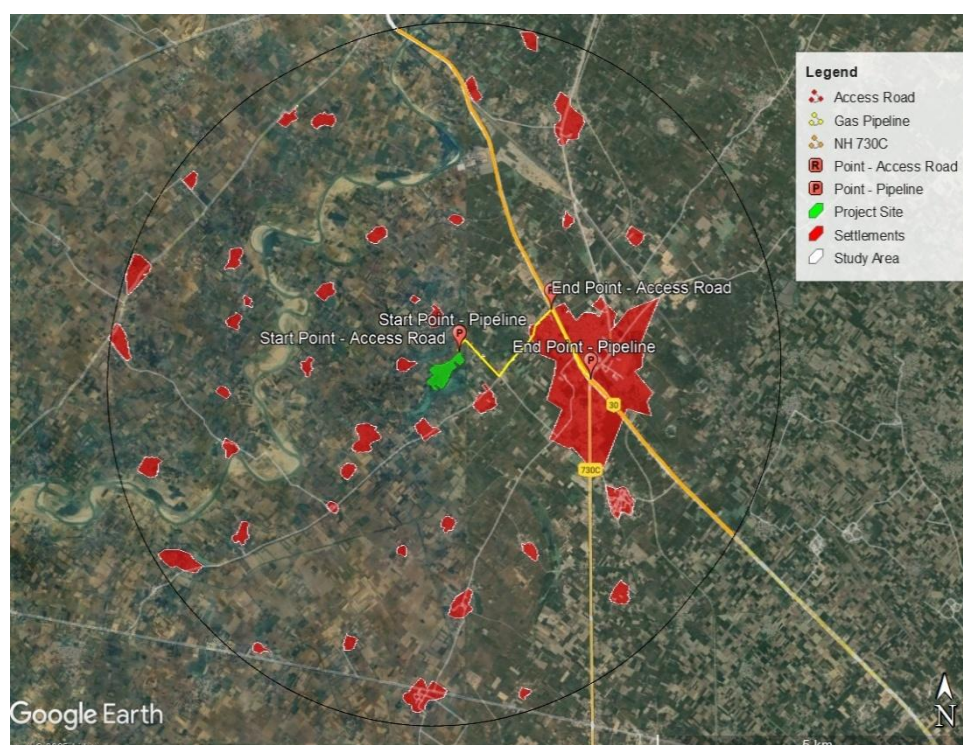


Figure 3-1: Project Location map

#	Location Information	
1	Village	Bhamauri
2	Tehsil	Tilhar
3	District	Shahjahanpur
4	State	Uttar Pradesh
5	Land Size	29.36 acres (i.e. 11.88 hectares)
6	Project Coordinates	28° 1'30.48"N; 79°38'34.89"E
7	Type of Land	The land identified for the project is private agricultural land.
8	Transmission line	During the construction phase, power supply will be sourced from an existing 11 kV distribution line located adjacent to the project site along the northern access road. For the operational phase, electricity will be drawn from the 132/33 kV power grid operated by MGVNL, located approximately 17.81 km from the site. Accordingly, a dedicated transmission line spanning 17.81 km will be developed to ensure reliable grid connectivity for the plant.
9	Batching Plant	Tentatively 2 batching plant.
10	Capacity of gas generation	20 TPD

3.1 Project Components

Refer to **Figure 3-2** for plant layout. The ancillary units associated with Project components is presented in Table 3-2Table 3-1.

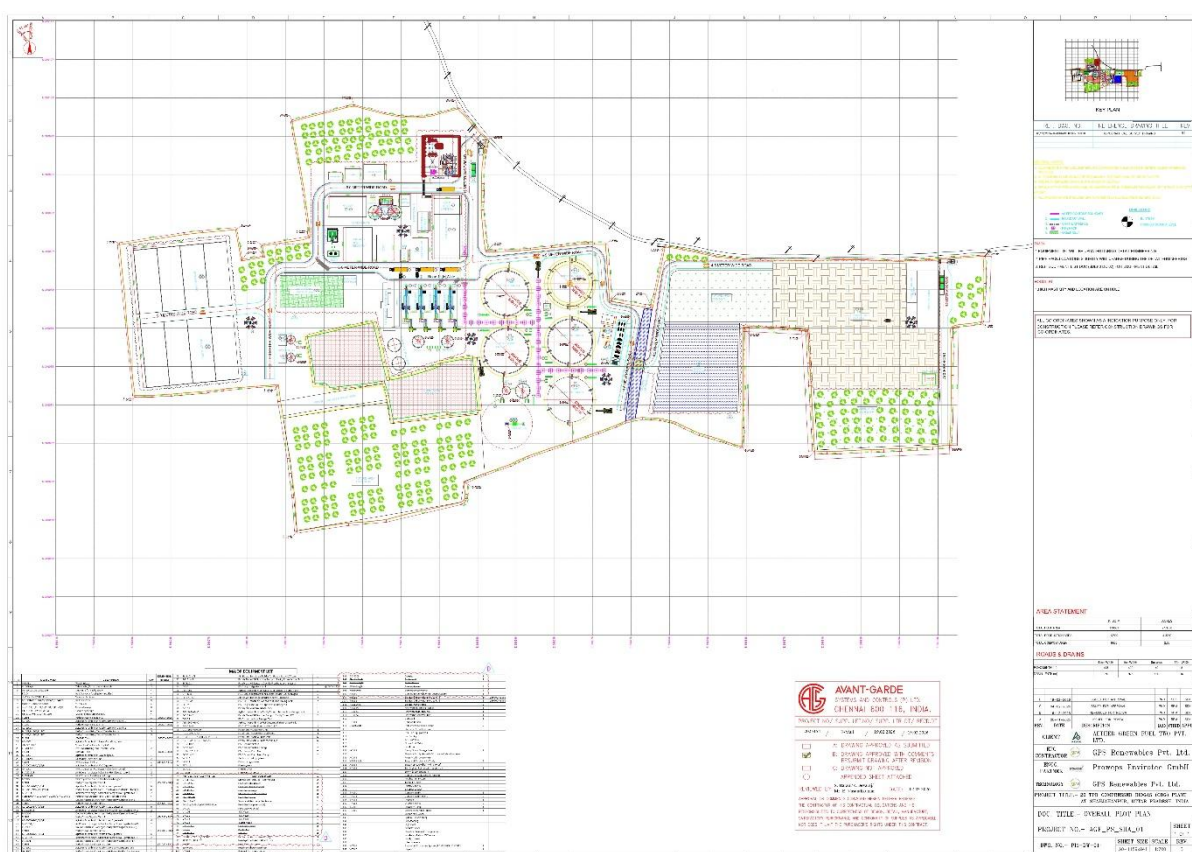


Figure 3-2: Plant Layout

For further land and area details of CBG plant associated utilities refer **Table 3-1** below.

Table 3-1: Area of CBG Plant and associated utilities

Project Components	Total land required/ procured: Area (in Acres)	Mode of Procurement	Remarks
CBG Main Plant			
Project Area (Digester, Extruder, Feeding Area, Purification unit, CO2 liquification unit, Electrical & control Room Lagoon, Raw Material Storage Area, FOM Bagging Unit and Greenbelt area)	29.39 acres	Procured land	Total Procured land- 11.897 Hectare / 29.36 acres Total Proposed to be procured - 1.615 Hectare / 3.99 acres
Total	29.39 acres		33.35 acres
Associated Utilities			
Press mud storage	1 acres	Private land – through purchase/sale	Outside of the CBG plant boundry apprx 0.5km
Paddy straw (PS) storage area	PS 1- 2 acres PS 2- 2 acres PS 3- 2 acres	PS Storage 1 - Procured by AGF, PS Storage 2 — Lease agreement done for 11 months. PS Storage 3 – Lease agreement to be done for 11 months	PS Storage 1 – within CBG plant boundary (under 29.39 acres) PS Storage 2 – Lease agreement for 11 months. Lease deed executed on 18th December 2025. PS Storage 3 – This will be completed after wheat harvesting (by mid April).
Transmission Line (17.81 km) Width -11m	Approximately 48.4 acres	Revenue land -80% Private land – 20%	ROW permission and License under progress from PWD, NHAI and Forest department. Private land RoW route being mapped by AGF team.
Gas Pipeline total of 4.2 km. Width - 4.5 inches	0.11 acre	2+ km on private land rest is on revenue land	ROW permission and license from PWD and NHAI has been obtained. Permission from Forest department under Forest Right Act, is under progress. Private land ROW is yet to be obtained.
Access Road	NA	None	Not private/revenue land required to procure for access road. However AGF2 received letter from DM Shahjahanpur

Project Components	Total land required/ procured: Area (in Acres)	Mode of Procurement	Remarks
			to facilitate 3 km road under the U.P. Bioenergy policy provision.
Labour camp	0.1377 acres	Labour camp is under contractor's scope, the area is rented property for 11 months.	There is no Labour Camp planned on AGF Plant boundary. However, Labour camp is under contractor's (GPS) scope. The area is approx 0.5 km away from main plant

Table 3-2 : CBG Plant Components

#	Process	Ancillary Units
1	Pre-treatment system	• Weighbridge • Paddy Straw Storage • Paddy Straw Shredding & Milling/ Bio Extruder Machine
2	Biodigester and auxiliary system	• Feed Mixing Tank • Hydrolysis Tank • Digester Tanks & Inflatable Balloons • Plant Water Tank • Biogas Clean and Upgradation Unit • Pumps, Motors, Valves
3	Digestate management system	• Solid Liquid Separator • Liquid Digestate Tank • Biogas to Inflatable Balloons • Solid Digested to FOM / PROM Yard
4	Feedstock storage system within project site	• Press mud storage – of 30,000 tons capacity • Paddy straw storage – of 186 tons capacity • Cow dung will not be stored and will be procured on requirement basis
5	Biogas purification and upgradation system	• H₂S scrubber • Moisture scrubber • Membrane purification system

#	Process	Ancillary Units
		• Flare Stack
6	Other supporting systems	• Electrical & Control Room • Workshop • (Hot Water Generator, Air Compressor, Generator Area) Utility Shed • Transformer Yard • Rock Phosphate Storage • Fire Water Tank • Security Room • Admin Building & Lab • Workshop
7	By Products	• Composting Windrow Plant • Bagging Unit & Storage Shed • CO₂ Plant • Compressed Biogas (CBG) Compressor

- **Forest Land:** No forest land falls within the Project Influence Area. As such, there will be no direct or indirect impacts on forests due to the Project.
- **Landlessness:** Based on consultations, the entire land parcel being acquired belonged to a single family comprising a mother and her two sons. One son managed agricultural activities, while the other is an advocate and not dependent on the land for livelihood. The family is permanently relocating to their hometown in Punjab, where they own alternative fertile land parcels. Proceeds from the land sale are expected to be invested in improving those properties or acquiring additional land. Therefore, no landlessness is anticipated as a result of the Project.
- **Encroachment:** Site visits and consultations with the landowner and land coordinator confirmed that there are no encroachments, informal occupants, or squatters on the land parcel. The land is privately owned and supported by valid legal title documents.
- **Common Property Resources:** The Project land is entirely private agricultural land. No common property resources—such as grazing lands (Gochar), community assets, or drainage channels—have been identified on or affected by the Project site.
- **Cultural Heritage:** While there are some local places of religious or cultural significance within the broader Project Influence Area, none are located within the Project site. The nearest locally significant religious site is the Biriya Baba Temple, located approximately 11.38 km east of the Project site in Mauzampur village, Tilhar tehsil.
- **Land Use Change:** The proposed CBG plant is being established on agricultural land, which will undergo permanent conversion to industrial use. As confirmed during discussions with the land coordinator, the land conversion to non-agricultural (NA) status is currently in process. The AGF land team, in coordination with the coordinator, will facilitate the conversion and formal ownership transfer to AGF. Since the landowning family is relocating permanently and does not rely solely on the land, the impact of this land use change on livelihoods is negligible.
- **Comparison of Land Price with Current Market Rates:** As per the Department of Stamps and Registration, Government of Uttar Pradesh, the official circle rate for land in Bhamauri village is ₹31,25,000 per acre. Consultations with the land coordinator and landowner confirmed that this rate reflects the prevailing market price, and compensation will be provided accordingly.
- **Grievance Redressal Process and Stakeholder Engagement:** During stakeholder consultations, the landowner confirmed that the Project site team and land coordinator had engaged with them to explain the project scope, acquisition process, and the grievance redressal mechanism. As the landowning family is permanently relocating to Punjab, they expressed willingness to proceed with the sale of land. It was also clarified that no marginalized or vulnerable landowners are involved in the acquisition. At present, the land coordinator is responsible for addressing any concerns raised by the landowner or community members. A formal grievance redressal mechanism has been disclosed to the local community as part of the detailed ESIA process.

Table 3-3 : Resource Requirement

Feedstock	Paddy straw	Sugarcane Pressed Mud	Cow Dung
Amount of be Procured	150 TPD over a period of 350 days	114 TPD over a period of 350 days	21 TPD over a period of 350 days
Source and Contract	- Biomass aggregators from the Shahjahanpur area will be engaged. These aggregators will manage their own infrastructure for collection and storage. - The transportation mechanism for delivering paddy straw to the site has not yet been finalized.	- Press mud, a by-product of the sugar industry, will be sourced from Dwarikesh Sugar Mill, located in a region with extensive sugarcane cultivation. - A feedstock supply contract is in place with Dwarikesh Sugar Mills to procure surplus press mud beyond the mill's self-consumption, with an anticipated annual capacity of 40,519 tons.	Cow dung will be sourced from individual cow sheds (Goshalas) and used primarily as microbial seed (inoculum) to initiate the anaerobic digestion process.
Current Use/Disposal Route of Feedstock	Paddy straw is an agricultural residue from rice cultivation and is commonly disposed of through in-situ burning on farms.	Press mud, a by-product of sugar manufacturing, is typically handed over to third-party vendors for conversion into biofuel or agricultural fertilizer.	Cow dung, generated at cow sheds, is traditionally used as manure in agricultural fields.

4 Applicable Reference Framework

The applicable reference framework for the ESIA is provided below:

- Applicable Legal Requirement: Applicable national laws and regulations pertaining to environment, health, safety, social and labour, and obligations under relevant international social and environmental treaties, agreements, and conventions.
- IFC Performance Standards (IFC PS) on Environmental and Social Sustainability (2012)
- IFC/World Bank EHS General Guidelines;
- Climate Fund Managers Policies
- National Policy on Biofuels
- EU Taxonomy Regulation
- CPCB Environmental Guidelines for BioCNG Plants 2022

Status of Key Permits & Licenses

Permit or license	Status as on date (Sept,2025)
Environment Clearance	Not required as per Schedule-A of the EIA notification 2006
Consent to establish/Operate	Project comes under "white category". However, an Intimation will be made to concerned regarding setting up of project.
Ground Water abstraction approval from UPGWA	Ground water NOC has been obtained from UPGWA
Hazardous Waste Authorisation	Not required for white category project in accordance with the Hazardous and Other waste amendment rules, 2019.

5 Analysis of Alternatives

Scenario		Analysis
No Project Scenario		Not proceeding with the project would avoid immediate environmental and social impacts. However, it would represent a lost opportunity to advance national and state-level renewable energy goals, reduce reliance on imported fossil fuels, and address critical waste management issues. The absence of the project would hinder effective utilization of agricultural residues, perpetuate stubble burning, and forgo potential socio-economic benefits such as employment generation and farmer income enhancement.
Alternate Project Location		India's policy landscape, including the National Bioenergy Policy (2022) and SATAT initiative, supports CBG development nationwide. However, Shahjahanpur offers a strategic advantage due to its abundant agricultural residues (paddy straw, press mud, and cow dung), proximity to gas infrastructure, and enabling policy ecosystem under the Uttar Pradesh Bio-Energy Policy (2022). These factors render Shahjahanpur a more feasible and sustainable location compared to other regions.
Alternate Project Land		The selected 29-acre site in Bhamauri village satisfies AGF's internal land acquisition criteria, emphasizing minimal displacement, feedstock accessibility, and avoidance of ecologically or socially sensitive areas. The land is privately owned agricultural land, with no encumbrances, encroachments, or common property resource diversion. The acquisition process has adhered to regulatory norms and involved stakeholder consultations. The landowner has willingly consented to the sale, with no anticipated landlessness or grievances.
Alternate Access Road Route		The site is accessible via a bituminous village road connected to NH-730C. While the existing road is serviceable, minor upgradation (e.g., road widening) may be required to support heavy-duty transport. The chosen access route minimizes additional land acquisition and aligns with the proposed 4.2 km gas pipeline, enabling efficient logistics and grid integration. This route is preferred for its proximity to existing infrastructure and reduced environmental footprint.
Alternate Raw Material		The plant is designed to process locally sourced paddy straw, press mud, and cow dung—ensuring year-round feedstock availability and aligning with circular economy principles. These inputs not only address waste management challenges but also enhance soil health through digestate application. Alternate feedstocks were considered, but the selected mix offers optimal energy yield, local availability, and logistical efficiency.
Alternate Technology		Among available anaerobic digestion technologies, thermophilic digestion was selected for its superior biogas yield (up to 35% higher), faster metabolic rate, lower operational expenditure, and better suitability for high-fiber agricultural waste. Comparative analysis with mesophilic and acid-phase digestion technologies confirmed thermophilic digestion as the most efficient and stable option for the intended feedstock mix and operating conditions.
Alternate Method of Power Generation		Various renewable and non-renewable energy sources were evaluated. Biomass-based power generation was found to be the most context-appropriate due to resource availability, zero emissions during operation, and compatibility with project objectives. Alternatives such as coal, oil, gas, and nuclear power pose significant environmental and economic constraints, while other renewable options (e.g., solar, wind) are less viable due to site-specific limitations.

Scenario	Analysis
Alternate Transmission Line Route	The proposed 17.81 km transmission line will connect to a 33-kV substation located 4.7 km from the site and onward to a 132 × 33 kV grid. The alignment avoids ecologically sensitive areas and follows existing roadways, minimizing land acquisition and environmental impact. Alternate routing options were evaluated, but the selected alignment ensures operational reliability, minimal disruption, and integration with existing grid infrastructure, in line with UPNEDA’s renewable energy integration plans.

6 Environmental Baseline

Envint team has undertaken the primary site survey from 25th to 28th January 2025 (Envint Team) and from 28th to 30th January 2025 (Eco Consultants), M/s Eco Consultants Pvt Ltd, a National Accreditation Board for Testing and Calibration Laboratories (NABL) accredited laboratory, was engaged for collection of baseline information on ambient air, noise quality, odour, surface water, ground water and soil quality. during the same period.

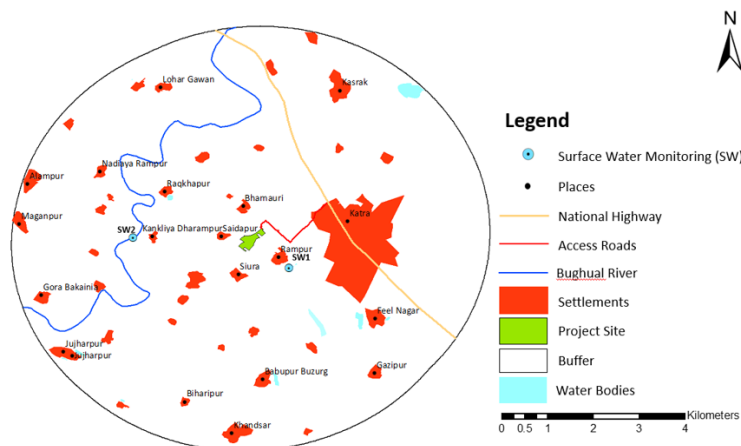


Figure 6-1: Surface Water monitoring locations

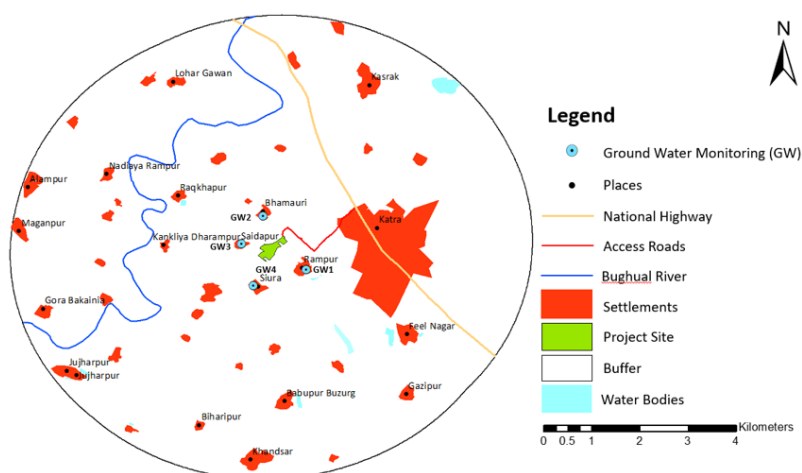


Figure 6-2: Ground Water monitoring locations

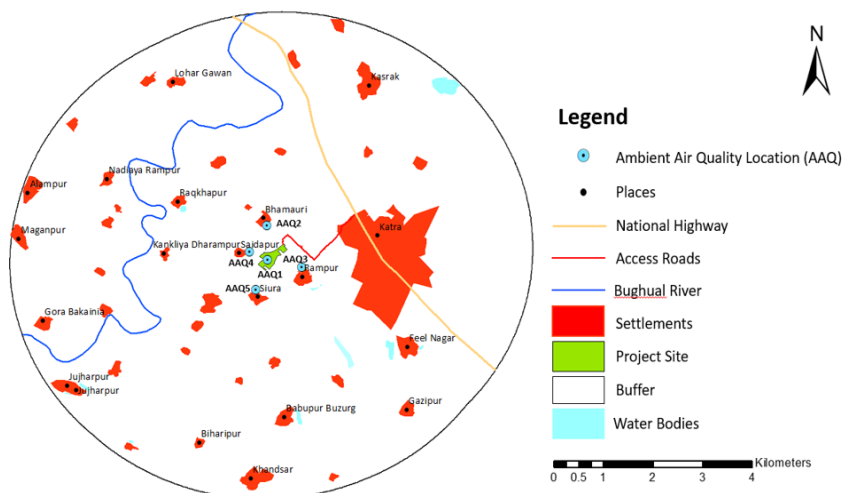


Figure 6-3: Ambient Air Quality monitoring locations

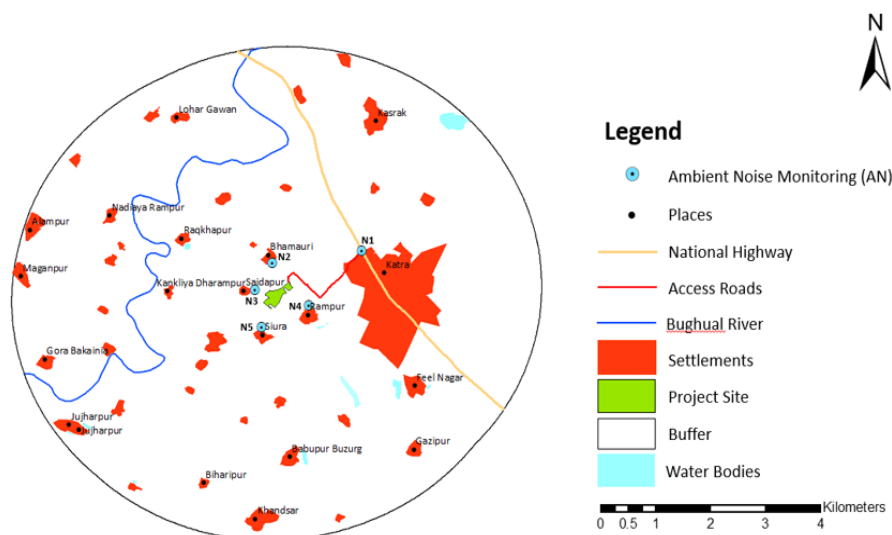


Figure 6-4: Ambient Noise monitoring locations

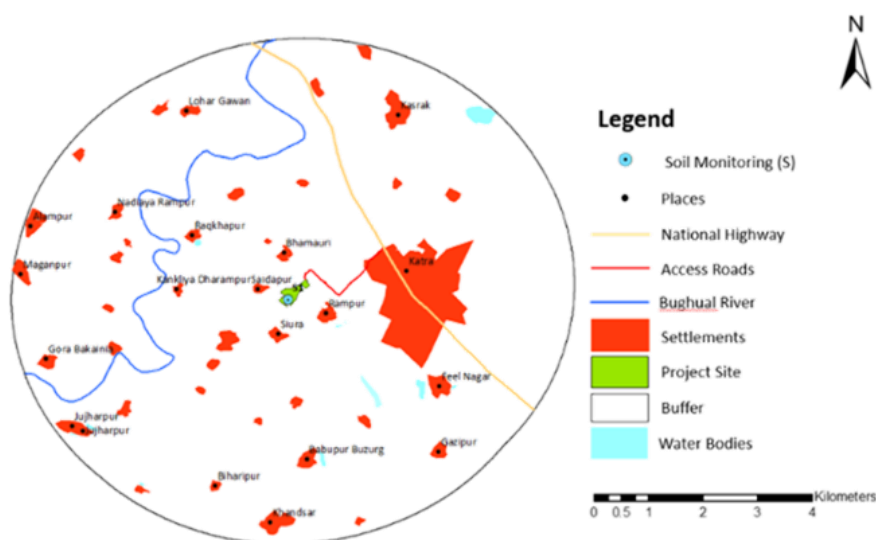


Figure 6-5: Soil monitoring location

Water Quality

- As per the District ground water report (2021) published by CGWB, Shahjahanpur district falls under ‘Safe’ Category.
- Surface water analysis against IS:2296 & IS:10500 showed all parameters within limits except fluoride and lead, which exceeded acceptable levels at both the sampling locations.
- As per the CPCB water quality criteria water quality of all surface water samples falls under class ‘B’ that is the designated best use is outdoor bathing (Organized).
- Groundwater quality compared against IS 10500:2012 standard showed all parameters within permissible limits except alkalinity exceeded acceptable levels at two locations, Bhamauri and Siura, fluoride at Rampur, and hardness at Saidapur.

Air & Oduor Monitoring

- Air quality was monitored for 24 hours at five PIA locations and compared against CPCB NAAQS and WHO guidelines (World Bank EHS, 2007)
- It was observed that average concentrations of all parameters were within limits when compared to NAAQS Standard of Central Pollution Control Board (CPCB). However, the PM₁₀ and PM_{2.5} concentration exceeded the limits specified in the World Bank EHS Guidelines 2007 for all five monitoring locations.
- Additionally, 24-hour odour monitoring for Hydrogen Sulfide and Methane at the five air monitoring locations showed negligible concentrations.
-

Noise Monitoring

- Five locations within the PIA were monitored once for ambient noise levels during the study period.
- The average ambient noise levels recorded at all locations were found to be within the limits prescribed by the CPCB standards and WHO Noise Quality Guidelines as referenced in the World Bank EHS Guidelines 2007 for both day and night noise levels on both the days.

Natural Hazards

Table 6-1: Natural Hazard Summary as per Building Materials and Technology Promotion Council (BMTPC)

Characteristics	Risk	Details
Earthquake	Moderate	The Project Influence Area lies in the Zone III i.e., Moderate Damage Risk Zone (MSK VII) according to the Building Materials and Technology Promotion Council (BMTPC) Earthquake Hazard Map.
Cyclone	Low	The Project Influence Area is not prone to cyclones according to the BMTPC Cyclone Occurrence Hazard Map and is physiologically in a land locked set up.
Flood	High	The Project Influence Area is located in the High-Risk Zone for floods according to the BMTPC Flood Hazard Map. However, no flood or waterlogging was reported at the project site in the past two years, unlike nearby villages along the Baghual River. While the site lacks perennial water sources, localized flood risks during heavy rainfall indicate alternating conditions of dry spells and flooding.
Drought	Medium	Project area is primarily classified as semi-arid based on aridity intensity. The region shows moderate variations in rainfall and temperature, with an overall increasing trend in precipitation. However, irregular rainfall patterns make it prone to droughts.

7 Climate Risk & Vulnerability Assessment

The climate risk assessment for the proposed CBG plant outlines acute and chronic risks from rising temperatures, erratic rainfall, and water stress under near-term (2025–2034) and long-term (2035–2055) scenarios, impacting operations and local communities.

Acute Risks

- **Near term scenario (2025–2034):**
The project site faces extreme heat, with summer temperatures exceeding 49 °C and 120–127 hot days annually. Winters drop to 1–7 °C, with fog disrupting transport. Storms are rare, though high winds occur occasionally. Sandy soils increase vulnerability if land use changes. The semi-arid climate, declining groundwater, and variable rainfall drive recurring droughts and occasional flooding. Clayey soils and shifting groundwater levels pose some subsidence risk.
- **Long term scenario (2035–2055):**
Heat stress worsens, with 137–150 hot days and more frequent heatwaves. Winter fog, tied to poor air quality, persists. Stronger winds may increase storm risks. Droughts become longer and more severe, evolving into chronic stress. Rainfall is less frequent but more erratic, causing both waterlogging and water shortages. Combined drought and heavy rain heighten subsidence risk.

Chronic Risks

- **Near term scenario (2025–2034):**
Average temperatures remain around 27 °C with minimal variation. About 1,200 hot days indicate ongoing heat stress. Winds weaken slightly during monsoon and winter, while rainfall stays low (0.9–1.5 mm/day) with fewer heavy rain days. Water stress remains extreme (>80%), increasing risks of soil erosion and degradation.
- **Long term scenario (2035–2055):**
Temperatures rise to 28–28.4 °C, with over 4,000 hot days, intensifying heat stress. Continued wind weakening affects monsoon inflows and fog dispersion. Rainfall and recharge decline further, while water stress stays above 80%. Persistent drought and heat drive soil degradation, threatening agriculture and feedstock supply.

Ground Water Analysis

Given the reliance of the proposed CBG plant on groundwater resources, it is critical to assess how projected variations in rainfall and temperature may impact groundwater recharge and long-term availability. Accordingly, a monthly and seasonal acute risk exposure analysis has been conducted for both the near-term (2025–2034) and long-term (2035–2055) periods.

Under moderated climate conditions, seasonal droughts and monsoon rains continue to operate within a functional recharge-discharge cycle, albeit with increased inter-annual variability. While recharge periods may become shorter and less predictable, some level of hydrogeological resilience is expected, ensuring adequate groundwater replenishment during monsoon periods and reducing long-term depletion risks.

In the absence of effective climate mitigation, intensifying heatwaves, prolonged droughts, and the potential disruption of monsoonal patterns could drastically undermine groundwater recharge. Combined with higher evapotranspiration and increased agricultural demand, this scenario projects a progressive decline in water tables, leading to chronic groundwater depletion and water insecurity by mid-century. This risk is particularly acute for water-intensive sectors and rural communities dependent on shallow aquifers.

Monthly analysis:

The analysis highlights that groundwater availability in Shahjahanpur is increasingly at risk under both drought and heavy precipitation conditions. The severity of stress is contingent on the trajectory of climate change, with variable implications:

Under moderated climate conditions, seasonal droughts and monsoon rains continue to operate within a functional recharge-discharge cycle, albeit with increased inter-annual variability. While recharge periods may become shorter and less predictable, some level of hydrogeological resilience is expected, ensuring adequate groundwater replenishment during monsoon periods and reducing long-term depletion risks.

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Seasonal analysis:

The seasonal analysis indicates that groundwater recharge and stress are increasingly shaped by shifting seasonal extremes. In the best-case scenarios, the system remains largely monsoon-driven: drought stress is mainly confined to the summer/pre-monsoon months, while rainfall continues to peak during monsoon, ensuring a stable though variable recharge cycle. However, in the worst-case scenarios, a transition occurs where both drought intensity and heavy precipitation shift away from traditional monsoon dominance. Extreme heat extends into the monsoon itself, creating a dual-season high-heat regime, while rainfall peaks progressively shift toward winter and post-monsoon months. This dual shift undermines the timing and reliability

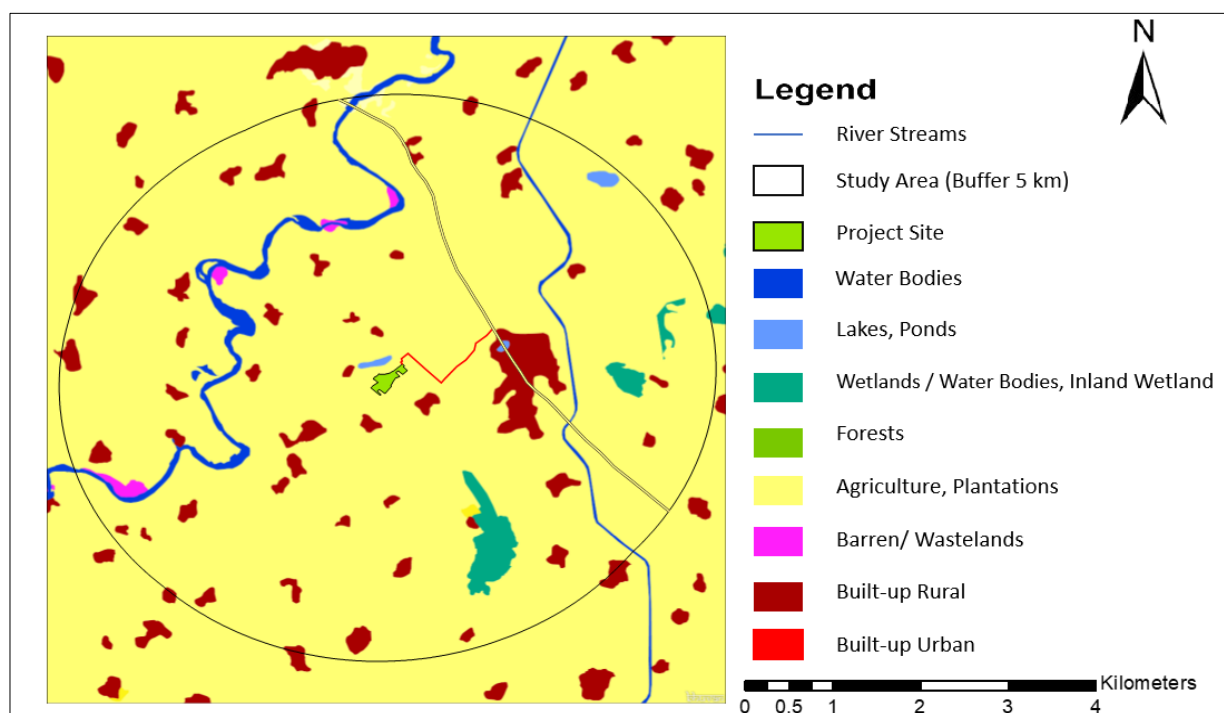


Figure 7-1: Land Use Map of Study Area

Local Topographic Features

The project site comprises relatively flat agricultural land with minimal topographic variation. At the time of assessment, the site had not undergone any land-leveling or grading activities and retained natural drainage features. The site falls under the administrative jurisdiction of Bhamauri village, located approximately 0.5 km from the project boundary.

The elevation varies from 152 m to 164 m in the whole study area. General Slope in study area is from North to West. Lowest elevation is found in West of study area where elevation ranges from 152-156 m Above Mean Sea Level.

Geomorphology

Shahjahanpur district, located in the Central Ganga Plains of the upper Ganga Basin, has flat terrain sloping south and southeast, with elevations between 148–172 masl. The north merges into the Terai, known for forests and marshes. Geomorphologically, the area consists of the upland Varanasi Older Alluvium (VOA) Plain, elevated above flood levels with palaeochannels and depressions, and the lowland Khadar surface, which includes older and active floodplains with two terrace levels.

As the project site is located in Ramganga basin, alternate sequence of fine sand and medium grey micaceous sand is found in PIA.

Hydrology

The region's hydrology is shaped by the Ramganga and Gomti rivers and their tributaries—Garra, Khannaut, Bahgul, and Jokhaland. The Ganga forms the southwestern boundary, while the Garra bisects the district. Only one seasonal river, the Baghaul, lies 2.58 km west of the project site. The area has small lakes and ponds but no major reservoirs.

No perennial drainage channels exist at the project site, though during monsoon, natural pathways activate and carry surface runoff into ephemeral drainage features within and beyond the study area.

Ground Water

Shahjahanpur district hosts three distinct aquifer groups, with groundwater occurring in fine to coarse sand and gravel formations. According to 2012 data from CGWB and Uttar Pradesh's Ground Water Department, pre-monsoon water levels range from 2.60 to 9.17 mbgl, with most readings between 3–7 mbgl. Post-monsoon levels range from 0.82 to 8.45 mbgl, typically within 2–5 mbgl, reflecting significant seasonal recharge and dynamic aquifer conditions.

As per the 2021 Dynamic Groundwater Resources Assessment by CGWB, Tilhar tehsil is classified as "Safe," indicating groundwater extraction is $\leq 70\%$ of the available resource.

Groundwater, primarily accessed through deep tubewells, is the main source of domestic and irrigation water. Government pipelines supply most drinking water, and Bhamauri village has both public and private toilets.

8 Ecological Baseline

An ecological survey was conducted to establish an ecological baseline and identify any sensitive ecological receptors within 10 km radius of the Project site, including the proposed Transmission Line route. The survey was carried during November 2024.

Attribute	Description
Wildlife Institute of India's Biogeographic Classification	Indogangetic Plains
Champion and Seth Classification	Tropical Dry Deciduous Forest
Soil type	Alluvial soil
Climatic condition	Tropical Dry Deciduous Forest

Floral Analysis

The Project Influence Area recorded 37 tree species, 13 shrub species, and 47 herbaceous species. Many herbs were medicinal, including *Ocimum sanctum* (Tulsi), *Aloe vera* (Ghrit Kumari), and *Phyllanthus niruri* (Bhui Amla). Invasive species such as *Parthenium hysterophorus* (Gajar Ghans) and *Cynodon dactylon* (Dubh Ghash) were also noted, along with the presence of *Datura metel* (Dhatura) and *Capsicum annuum* (Mirch). However, no endangered, protected or endemic floral species has been identified.

Faunal Analysis

The Project Influence Area hosts diverse fauna, including mammals, birds, reptiles, and amphibians.

Mammals: Common species included the Indian Palm Squirrel (*Funambulus palmarum*, IUCN: LC) and the Indian Hare (*Lepus nigricollis*, IUCN: LC).

Birds: Resident birds observed were the Common Myna (*Acridotheres tristis*, IUCN: LC), House Sparrow (*Passer domesticus*, IUCN: LC), Indian Peafowl (*Pavo cristatus*, IUCN: LC), and Shikra (*Accipiter badius*, IUCN: LC). Migratory birds were reported near the Baghaul river, 2.58 km west of the project site, during winter (November–February).

Notably, two Vulnerable (VU) species — the Sarus Crane (*Antigone antigone*) and the Indian Spotted Eagle (*Clanga hastata*) — were recorded within 3 km of the project site. The eagle was seen feeding on frogs in agricultural fields and later entering farmland within the site boundary. Sarus Cranes, including a pair near the site periphery and a flock of ~10 birds, were observed foraging and returning to nesting grounds, though they showed sensitivity to human presence.

Reptiles & amphibians: Reptiles observed included the Rat Snake (*Ptyas mucosa*), Indian Cobra (*Naja naja*), and several gecko species. Amphibians such as the Indian Bullfrog (*Hoplobatrachus tigerinus*) and Common Toad (*Duttaphrynus melanostictus*) were recorded, particularly near water bodies.

Conclusion

The site is not part of any national parks, wildlife sanctuaries, or eco-sensitive zones. The nearest protected area is Pilibhit Tiger Reserve, 90 km northeast of the site, with no protected areas found within 10 km of the site or transport routes based on Google Earth imagery.

Although the project site supports biodiversity, including IUCN Vulnerable (VU) species such as the Sarus Crane (*Antigone antigone*) and Indian Spotted Eagle (*Clanga hastata*), it is primarily an agricultural landscape with no protected status, unique habitats, or critical ecological features. Both species use the site only transiently for foraging, relying on wetlands and other habitats for breeding and essential lifecycle stages.

As the site lacks distinctive ecological features such as rare habitats, keystone species, or critical functions like breeding grounds, forest cover, or intact wetlands necessary for regional biodiversity. Accordingly, a critical habitat assessment was not required.

Socio economic Baseline

This baseline provides an understanding of the administrative set up of the district, the demographic profile of the villages in the PIA, the social groups present, the land use patterns in the area, the livelihood profile of the community and the social and physical infrastructure available. The social and physical infrastructure includes education and health infrastructure, the water supply for irrigation and drinking purposes, sanitation facilities and electricity.

Profile of the Study Area

State: Between 1991 and 2011, Uttar Pradesh saw household numbers rise by over 45%, with projections suggesting nearly 50 million households by 2025. The population grew by around 20% each decade, and is expected to increase by another 45% by 2025. The gender ratio (females/1000 males) improved by nearly 5% over two decades, while literacy rose significantly, with over 60% growth in the 1990s and more than 50% in the 2000s, and is projected to grow by another 56% by 2025.

District: Shahjahanpur recorded a 20–32% increase in households per decade, and a projected 45% rise by 2025. Population grew by nearly 29% in the 1990s, slowing to 18% in the 2000s, with a projected 18% rise by 2025. The gender ratio improved steadily by 3–5% per decade, while literacy saw extraordinary gains, with a 93% jump in the 1990s, followed by 48% in the 2000s.

Tehsil: In Tilhar Tehsil, households increased by 18% in the 1990s, 38% in the 2000s, and are projected to grow by 54% by 2025. Population growth was 25% in the 1990s, 23% in the 2000s, and is estimated at 29% by 2025. Gender ratio improvements were more striking here, with a 5% rise in the 1990s, 10% in the 2000s, and a projected 18% rise by 2025. Literacy rates surged with 93% growth in the 1990s, 57% in the 2000s, and are expected to grow by another 56% by 2025.

Study Area for Social Baseline: In Bhamauri village, households have steadily increased from 1991 to 2025, with growth rates rising from about 14% in the first decade to over 36% in the latest projection. Population growth was strongest between 1991 and 2001 (about 35%) but slowed in later years, with around 21% growth projected up to 2025. The gender ratio improved in the earlier decades but is expected to decline slightly by 2025. Literacy has seen the most significant improvement, more than doubling in the 1990s and continuing to rise strongly in the following years.

Definitions

The key terms used for sub-categorization of the Study Area are:

- **Project footprint** – Project Footprint comprises of the area within the proposed boundary of the CBG plant, the RoW of the TL (connecting the PSS to the GSS) & gas pipeline that falls outside the CBG plant boundary.
- **Project Village** – The CBG plant will be located entirely within the village of Bhamauri where the land for the Project is being procured which is in Tilhar Tehsil in Shahajhanpur District.
- **Project Influence Area** - Project Influence Area comprises of the villages within the 10 km radius of the Project, apart from Project Villages, that may be directly or indirectly affected.

Both the Project footprint and Project influence area are under Tilhar Tehsil in Shahajhanpur District

CBG Plant Footprint	Transmission Line	Gas Pipeline	Project Influence Area (10 km buffer)	
Bhamauri	Katra (Town)	Bhamauri	1. Katra	2. Alampur
	Tilhar (Town)	Katra (Town)	3. Raqkhapur	4. Maganpur
			5. Siura	6. Gora Bakainia
			7. Kankliya	8. Jujharpur
			9. Dharampur	10. Lohar Gawan
			11. Feel Nagar	12. Kasrak
			13. Gazipur	14. Kiratpur Bihari
			15. Babupur Buzurg	16. Nadiaya Rampur
			17. Khandsar	18. Rampur

Schedule Caste & Schedule Tribe

In Shahjahanpur district, SCs make up 17.2% of the population and STs 0.02%, slightly higher than Tilhar tehsil (16.43% SC, 0.01% ST). Bhamauri village shows a much higher SC share at 31% with no ST population. Within 5 km of the project site, ST presence is negligible, with Khansar village reporting just 0.00043%.

Landuse

The project site spans 29.76 acres, of which about 95.5% is agricultural land and 0.5% is the landowner's residence. During operations, the 11.88 hectare plant premises will be divided into rooftop and operational facilities (12%), roads and paved areas (55%), and green belt (33%). In the surrounding area, cropland dominates land use, covering 90.08% within a 5 km radius and 88.73% within a 10 km radius, followed by rural settlements, fallow land, rivers, scrubland, and small patches of other categories.

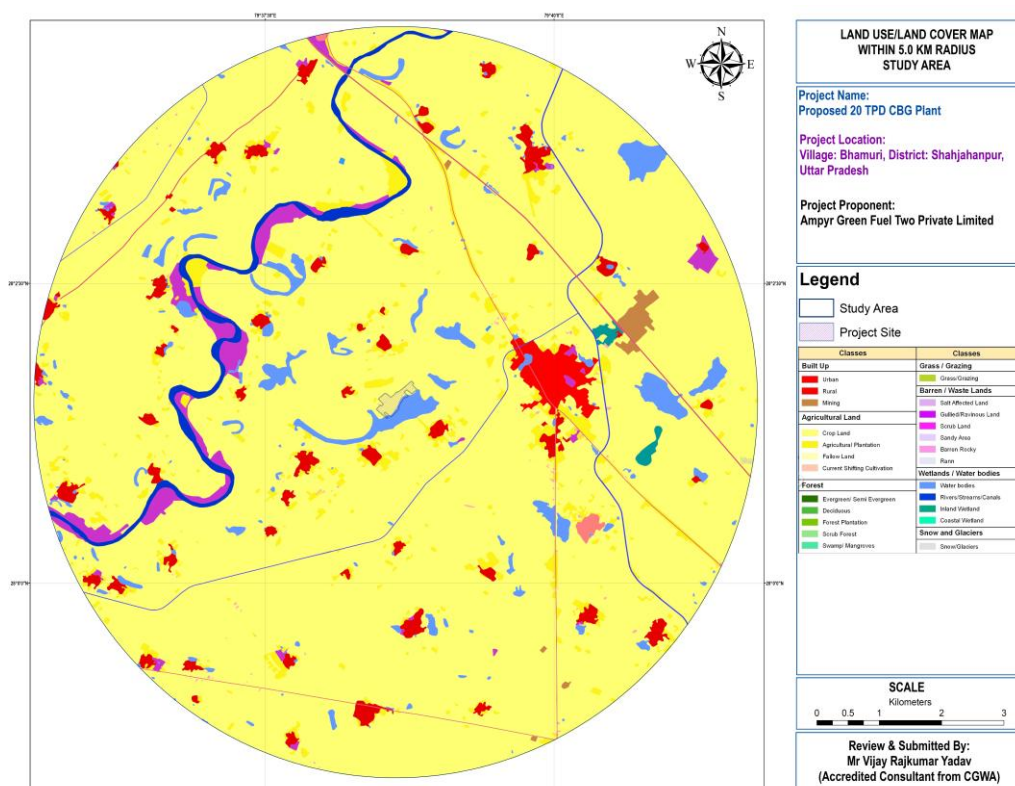


Figure 8-1: Land Use Map of PIA of 10 km

Occupational & Livelihood

Agriculture is the primary occupation in the area, with major crops including wheat, paddy, sugarcane, potatoes, peas, and pulses such as gram and pigeon pea. Horticulture crops like mango, orange, litchi, and guava are also significant. Shahjahanpur district cultivates wheat over ~2.5 lakh ha and paddy over ~2.1 lakh ha, and is designated as an Agri Export Zone for basmati rice. Kharif crops include bajra, jowar, and maize, while oilseeds like mustard are also grown. The district hosts four APMCs and one of Uttar Pradesh's largest vegetable markets, strengthening market linkages for feedstock procurement and digestate offtake. At the tehsil level, wheat, paddy, and sugarcane dominate, alongside secondary livelihoods from dairy, agricultural labor, and small-scale industries like brick making.

Social & Physical Infrastructure

Water & Sanitation: The hydrology of the region is shaped by the Ramganga and Gomti rivers, along with their tributaries—Garra, Khannaut, Bahgul, and Jokhaland. The Ganga River defines the district's southwestern boundary, while the Garra River bisects it into two nearly equal parts. Within the Project influence area, only the seasonal Baghaul River flows, located ~2.6 km west of the site. The area also contains small lakes and ponds but no major reservoirs.

Groundwater occurs in fine to coarse sand and gravel aquifers. Monitoring data (2012) indicate pre-monsoon depths of 2.6–9.2 mbgl, mostly between 3–7 mbgl, and post-monsoon depths of 0.8–8.5 mbgl, with many wells in the 2–5 mbgl range. Seasonal fluctuations highlight the reliance on monsoonal recharge. As per CGWB (2021), Tilhar tehsil is categorized as "Safe," with groundwater extraction ≤70%. Domestic water supply comes mainly from government pipelines linked to deep tubewells, while tubewells are also used for irrigation.

Healthcare and health seeking behaviour: A government hospital is located in Katra, ~1.2 km northeast of the site. Bhamauri village does not have a Primary Health Centre, but no major outbreaks of air- or water-borne diseases have been reported in recent years.

Electricity: The village has consistent electricity with no reported load-shedding. Solar energy provides an alternative source, supported by the KUSUM C-1 scheme under which the government pays 75% of electricity charges and villagers contribute 25%. Bhamauri village is served by two separate lines: one for domestic use (24-hour supply) and another for tubewells (18-hour supply).

9 Stakeholder Consultation

Primary Stakeholder	Secondary Stakeholder
- Landowner - Vulnerable Groups / Local Community - Land Aggregator - Gram panchayat - Businesses / Households near Katra town entry point	- Agricultural labourers - Local Communities in Project Footprint - EPC & Labour Contractors - Raw Material Suppliers - Labourers engaged by Contractors - Regulatory authorities

Summary of Stakeholder Consultation

- Stakeholder consultations reported expectations for employment opportunities and market linkages for feedstocks such as paddy straw and cow dung.
- Existing feedstock supply chains are operational but subject to logistical and safety considerations, including seasonal smog, fire risks in straw storage, and requirements for transport challans, indicating the need for sealed or covered transport and fire-safe storage.
- The Bhamauri Gram Panchayat issued NOC for the CBG plant
- Communities noted gaps in healthcare access, waste management, stray cattle control, road conditions, skill training, and electricity supply.
- Regulatory agencies outlined compliance with CTE/CTO conditions, inspections, and controls for emissions, leakages, and waste management.
- The partner sugar mill maintains EHS and CSR systems and can supply press-mud
- The local NGOs and Panchayats referenced potential for employment and skill development, including women's participation, along with grievance handling and inclusion of vulnerable groups.

10 Impact Assessment

10.1 Activity - Interaction Matrix

An Activity–Receptor Interaction Matrix was developed to map potential interactions between Project activities and environmental/social receptors across all phases—planning and land purchase, construction, operation and maintenance, and decommissioning. The matrix, informed by Project data, stakeholder discussions, and community inputs, identifies whether each activity–receptor interaction is **absent (No interaction)**, **negligible (interactions reasonably possible but none of the of the outcome will lead to significant impacts)**, or **significant (interactions reasonably possible with one of the outcomes leading to potential significant impact)**. It provides a structured scoping tool, with activities listed on the vertical axis and receptors on the horizontal, highlighting where Project actions may influence environmental or social conditions.

Legend	
	Represents no interactions are reasonably expected
	Represents interactions reasonably possible but none of the of the outcome will lead to significant impacts;
	Represents interactions reasonably possible with one of the outcomes leading to potential significant impact

Table 10-1: Activity Receptor Interaction matrix

		Resources/Receptors																	
		Environment						Ecology			Socio-Economic								
Project Activities	Land use and land classification	Soil Environment	Ambient Air Quality	Ground Water Resources and Quality	Surface water Resources and Quality	Topography and Drainage	Noise and Vibrations	Terrestrial Ecology	Aquatic Ecology	Occupational health and Safety	Community Health and Safety	Electromagnetic field	Traffic	Land based Livelihoods/ Economic Displacement	Labour Welfare	Social Infrastructure and Services	Indigenous People	Vulnerable Social Groups	Cultural Heritage
Pre-Construction Phase																			
Site Survey																			
Project designing and planning																			
Land procurement CBG Plant & pipeline																			
Construction Phase																			
Widening/strengthening of access roads																			
Site clearance																			

		Resources/Receptors																	
		Environment						Ecology		Socio-Economic									
Project Activities	Land use and land classification	Soil Environment	Ambient Air Quality	Ground Water Resources and Quality	Surface water Resources and Quality	Topography and Drainage	Noise and Vibrations	Terrestrial Ecology	Aquatic Ecology	Occupational health and Safety	Community Health and Safety	Electromagnetic field	Traffic	Land based Livelihoods/ Economic Displacement	Labour Welfare	Social Infrastructure and Services	Indigenous People	Vulnerable Social Groups	Cultural Heritage
Site preparation & levelling																			
Excavation, foundation and construction works for CBG Plant																			
Stockpiling of excavation spoil																			
Transport of equipment, machinery, materials and labour																			
Establishing material storage area																			

		Resources/Receptors																	
		Environment						Ecology		Socio-Economic									
Project Activities	Land use and land classification	Soil Environment	Ambient Air Quality	Ground Water Resources and Quality	Surface water Resources and Quality	Topography and Drainage	Noise and Vibrations	Terrestrial Ecology	Aquatic Ecology	Occupational health and Safety	Community Health and Safety	Electromagnetic field	Traffic	Land based Livelihoods/ Economic Displacement	Labour Welfare	Social Infrastructure and Services	Indigenous People	Vulnerable Social Groups	Cultural Heritage
Establishing contractor facilities and labour camps																			
Operation of DG set																			
Welding & drilling activities																			
Laying of pipeline																			
Installation of plant machineries																			
TL Construction																			
Operation Phase																			
Operation and maintenance of CBG plant																			

		Resources/Receptors																	
		Environment						Ecology		Socio-Economic									
Project Activities	Land use and land classification	Soil Environment	Ambient Air Quality	Ground Water Resources and Quality	Surface water Resources and Quality	Topography and Drainage	Noise and Vibrations	Terrestrial Ecology	Aquatic Ecology	Occupational health and Safety	Community Health and Safety	Electromagnetic field	Traffic	Land based Livelihoods/ Economic Displacement	Labour Welfare	Social Infrastructure and Services	Indigenous People	Vulnerable Social Groups	Cultural Heritage
Operation and maintenance of pipeline																			
Operation and maintenance of TL																			
Collection and transport of the three types of feedstock																			
Sanitation facilities operation																			
Use of equipment (conveyors, hoppers, bailing machines, compressors)																			

		Resources/Receptors																	
		Environment						Ecology		Socio-Economic									
Project Activities	Land use and land classification	Soil Environment	Ambient Air Quality	Ground Water Resources and Quality	Surface water Resources and Quality	Topography and Drainage	Noise and Vibrations	Terrestrial Ecology	Aquatic Ecology	Occupational health and Safety	Community Health and Safety	Electromagnetic field	Traffic	Land based Livelihoods/ Economic Displacement	Labour Welfare	Social Infrastructure and Services	Indigenous People	Vulnerable Social Groups	Cultural Heritage
Handling and storage of hazardous substances																			
Vehicular movement (including trucks, tractors, trailers, dumpers, EV, diesel vehicles)																			

10.2 Consolidated Summary of E&S Impacts For Pre-Construction and Construction Phase

Nature of Impact	Receptor Sensitivity	Affected E&S Component(s)	Impact Significance (Pre-Mitigation)	Residual Impact (Post-Mitigation)
Land Holdings & Associated Income (CBG Plant)	Medium	Local community	Medium	Minor
Land Holdings & Associated Income (Access road, Gas Pipeline, Transmission Line, Feedstock, Paddy Straw procurement and Storage depot)	Low	Local community	Minor	Negligible
Employment Opportunity	Medium	Project Site / PIA	Medium (Positive)	High (Positive)
Change in Land Use (CBG Plant)	Medium	Project Site / PIA	Medium	Minor
Change in Land Use (Access Road, Gas Pipeline, Transmission Line, Feedstock, Cow Dung, Paddy Straw procurement and storage depot)	Low	Project Site / PIA	Minor	Negligible
Fuel & Energy Consumption	Medium	PIA	Medium	Minor
Impact on Air Environment	Low	Local community, Construction Workers	Minor	Negligible
Impact on Noise Environment	Medium	Local community, School, Workers	Medium	Minor
Impact on Water Environment	Medium	Groundwater, Surface Water, Workers	Minor	Negligible
Impact on Soil Environment	Low	Soil, Water Quality, Community Health	Minor	Negligible
Impact on Ecology (Flora / Fauna) (CBG plant, Access Road, TL, Gas Pipeline, Paddy straw storage depot)	Low	Avian Fauna, Flora, Biodiversity	Minor	Negligible
Occupational Health & Safety (CBG Plant, Gas Pipeline, TL, Access Road)	Medium	Construction Workers	Medium	Minor
Occupational Health & Safety (Paddy straw procurement/storage depot)	Low	Construction Workers	Minor	Negligible
Community Health & Safety (CBG Plant, Gas Pipeline, TL, Access Road)	Medium	Local Community, Schools, Road Users	Medium	Minor
Community Health & Safety (Paddy straw procurement/storage depot)	Low	Local Community, Schools, Road Users	Minor	Negligible
Impact on Topography & Drainage Pattern (CBG Plant, Gas Pipeline)	Medium	Land, Water Bodies	Medium	Minor

Nature of Impact	Receptor Sensitivity	Affected E&S Component(s)	Impact Significance (Pre-Mitigation)	Residual Impact (Post-Mitigation)
Impact on Topography & Drainage Pattern (Access Road, paddy straw procurement/ storage depot)	Low	Land, Water Bodies	Minor	Negligible

10.3 Consolidated Summary of E&S Impacts for O&M Phase

Nature of Impact	Receptor Sensitivity	Affected E Component(s)	Impact Significance (Pre-Mitigation)	Residual Impact (Post-Mitigation)
Employment Opportunity	Medium	Project Site / PIA	Medium (Positive)	High (Positive)
Fuel & Energy Consumption	Low	PIA	Medium	Minor
Impact on Air Environment	Medium	Local community, Construction Workers	Medium	Minor
Impact on Noise Environment	Medium	Local community, School, Workers	Medium	Minor
Impact on Water Environment	Medium	Groundwater, Surface Water, Workers	Medium	Minor
Impact on Soil Environment	Medium	Soil, Water Quality, Community Health	Medium	Minor
Impact on Ecology (Flora / Fauna)	Low	Avian Fauna, Flora, Biodiversity	Minor	Negligible
Occupational Health & Safety	Medium	Construction Workers	Medium	Minor
Community Health & Safety	Medium	Local Community, Schools, Road Users	Medium	Minor

10.4 Cumulative Impact Summary

Nature of Impact	Receptor Sensitivity	Affected Receptors	Impact Significance (Pre-Mitigation)	Residual Impact (Post-Mitigation)
Cumulative Impact	Medium	Project Site / PIA	Minor	Negligible

11 Environment & Social Management Plan

This section highlights the potential impacts, mitigation measures, monitoring strategies, and management responsibilities across the construction, operation, and decommissioning phases of the Project.

The ESMP is designed to:

- Establish a structured framework with clearly defined roles and responsibilities to ensure the implementation of mitigation measures identified in the ESIA.
- Outline all recommended safeguards, control technologies, and mitigation strategies identified during the ESIA process.
- Provide a monitoring program to assess the effectiveness of mitigation measures and evaluate the efficiency of environmental management and risk control systems.
- Ensure compliance with applicable local, state, and national regulations.

To minimize potential impacts throughout the Project lifecycle, mitigation strategies, monitoring plans, and assigned responsibilities are detailed in the following tables. The primary responsibility for implementing the ESMP will rest with the EPC Contractor's HSSE department, under the supervision of AGF's HSSE Head.

11.1 ESMP for Pre-Construction and Construction Phase

No.	Impact Area	Project Components	Key Mitigation Measures	Monitoring & Reporting
1	Land Holding & Income (Social)	CBG Plant, Storage	- Restrict construction to designated areas - Maintain land and payment records as per circle rates - Verify absence of informal land use; compensate if required - Establish grievance mechanism.	Site checks; Monthly Report
2	Land Holding & Income (Social)	Pipeline, TL, Access Road	- Restrict construction within approved areas. - Obtain required NOCs and ensure legal compliance.	Permit review; Site inspection
3	Employment (Social)	All Components	- Promote local hiring including women/vulnerable groups. - Ensure fair recruitment and skill training. - Conduct labour awareness programs.	Hiring & training records
4	Land Use	All Components	- Limit construction to approved areas. - Avoid disturbance to surrounding land.	Site inspection
5	Fuel & Energy	All Components	- Use efficient machinery and optimize operations - Promote energy-saving practices. - Monitor fuel and energy use.	Resource logs
6	Air Quality	All Components	- Control dust (sprinkling, covers). - Maintain vehicles; avoid open burning. - Develop green buffers and monitor air quality.	Air monitoring reports
7	Noise	All Components	- Maintain equipment; restrict daytime work. - Provide PPE and install silencers. - Address community complaints.	Noise checks; GRM logs
8	Water	All Components	- Use water efficiently; prevent leaks. - Manage wastewater and hazardous materials. - Provide sanitation facilities.	Water logs; Inspection

9	Soil	All Components	• Preserve topsoil; control erosion. • Prevent contamination and ensure proper disposal. • Limit excavation to required areas.	Site inspection
10	Ecology	All Components	• Train workers on biodiversity protection. • Restore vegetation using native species. • Monitor ecological impacts.	Monitoring records
11	Worker Health & Safety	All Components	• Provide PPE and safety systems. • Conduct training and emergency drills. • Maintain incident records.	Safety audits
12	Community Health & Safety	All Components	• Implement grievance mechanism and community engagement. • Ensure sanitation, traffic safety, and awareness. • Control dust and noise impacts.	Community feedback
13	Topography & Drainage	All Components	• Minimize land disturbance. • Implement erosion and drainage control. • Follow hydrology recommendations.	Site inspection

11.2 ESMP for Operations & Maintenance Phase

No.	Impact Area	Project Components	Key Mitigation Measures	Monitoring & Reporting
1	Employment (Social)	All Components incl. Feedstock	• Promote local hiring incl. women/vulnerable groups. • Implement skill training and fair recruitment. • Conduct labour awareness and livelihood programs.	Monthly records
2	Fuel & Energy	Plant, TL, Storage, Feedstock	• Implement energy monitoring systems. • Use energy-efficient equipment (LEDs, motors). • Optimize fuel use and train workers.	Monthly logs
3	Fuel & Energy (Pipeline Safety)	Gas Pipeline	• Ensure pipeline integrity and leak detection. • Install monitoring and emergency systems.	Inspection s

No.	Impact Area	Project Components	Key Mitigation Measures	Monitoring & Reporting
			Conduct community awareness and enforce ROW restrictions.	
4	Fuel & Energy	Access Road	- Use efficient machinery and approved material sources. - Maximize reuse of materials. - Maintain equipment regularly.	Monthly logs
5	Air Quality & Odour	All Components incl. Feedstock	- Maintain machinery and vehicles (PUC compliant). - Control dust and odour (covers, sprinkling, biofilters). - Monitor ambient air quality and odour levels.	Monthly monitoring
6	Noise	All Components	- Use low-noise, well-maintained equipment. - Install acoustic enclosures and limit honking. - Monitor noise at sensitive receptors.	Monthly monitoring
7	Water	All Components	- Monitor water use and prevent leaks. - Implement rainwater harvesting and audits. - Prevent contamination via proper storage and disposal. - Ensure spill response and wastewater management.	Monthly logs
8	Soil	All Components	- Prevent contamination via proper storage and spill control. - Ensure safe disposal of contaminated soil. - Conduct inspections and staff training.	Site inspection
9	Ecology & Biodiversity	All Components	- Minimize vegetation clearance and follow regulations. - Develop green buffers and restore vegetation. - Monitor biodiversity and install bird diverters.	Monitoring reports
10	Occupational Health & Safety	All Components	- Implement fire, gas leak, and electrical safety systems. - Provide PPE and continuous gas monitoring. - Conduct training, drills, and emergency planning.	Safety audits
11	Community Health & Safety	All Components	- Implement GRM and community engagement. - Ensure traffic safety and signage. - Use compliant vehicles and optimize resources.	Monthly feedback

No.	Impact Area	Project Components	Key Mitigation Measures	Monitoring & Reporting
12	Cumulative Impact	All Components	• Monitor air, noise, and water at key receptors. • Coordinate with stakeholders and manage traffic. • Implement site-level grievance mechanism.	Monitoring reports

11.3 ESMP for Cumulative Impact

Nature of Impact	Applicable Project Component	Mitigation Measures	Responsibility for Implementation	Mode of Verification	Timeline of Monitoring	Responsibility of Monitoring	Reporting Requirements
Cumulative Impact	I. CBG Plant	a) Monitor ambient air quality, noise, and water quality at combined receptor points to track potential cumulative trends.	O&M Manager/ Contractor Manager/ Personnel	Site Inspection	Monthly	AGF	Quarterly Progress Reports
	II. Gas Pipeline						
	III. TL						
	IV. Access Road						
	V. Paddy Straw Procurement	b) Engage with local authorities and communities to manage overlapping transport and access requirements.					
	VI. Cow dung Procurement						
	VII. Press mud procurement						
		c) Engage vendors, sub-contractors and manpower from the PIA.					
		d) Implement grievance redressal mechanism at the site level					

Disclaimer

This assessment was performed according to professionally accepted principles. Professional judgments expressed herein are based on the information currently available within the limits of the existing data, scope of work, budget and time. This report is prepared to aid the Client in identifying and addressing environment and social risks, and may not be relied upon by any other person or entity without the written authorization of Envint.

Envint has assumed where reasonable to do so, that the information provided is true and accurate. If information to the contrary subsequently is discovered, our conclusions and recommendations may not be valid.

Envint makes no other representations whatsoever, including those concerning the legal significance of its findings or as to other legal matters touched upon in this report. Except as otherwise may be requested by the Client, Envint disclaims any responsibility to update the report for events taking place after the time which we conducted our assessment. The conclusions and recommendations describe only the conditions present at the time of our assessment, in areas that were observed. The scope of this report is limited to matters expressly covered.