DRAFT EIA REPORT

For

Bulk Drug Park

Located at

Village: Kuthar Beet, Pollian Beet, Tibbian, Jodian, Janani and Malluwal in Haroli Tehsil, District Una, Himachal Pradesh.

By

M/s Himachal Pradesh Bulk Drug Park Infrastructure Limited (HPBDPIL)

Project Schedule 7(c) - 'Industrial estates/ parks/ complexes/ areas, export processing Zones (EPZs), Special Economic Zones (SEZs), Biotech Parks, Leather Complexes'

Category: A

Project Area: 568.75 Hectares (1405.41 Acres)

Submitted by

M/s Eco Paryavaran Laboratories and Consultants Private Limited

E-207, Industrial Area, Phase-VIIIB (Sector-74), S.A.S Nagar (Mohali) Punjab

environment@ecoparyavaran.org, www.ecoparyavaran.org

(QCI NABET Accreditation No.: NABET/EIA/22-23/RA 0324 dated 17.04.2024)

(In house Lab, NABL Accreditation No. – TC-11818 dated 26.06.2023)

(*EIA Consultant to HPBDPIL*)

UID No. **July 2024**

सत्यमेव जयते

File No: 10/68/2023-IA.III
Government of India
Ministry of Environment, Forest and Climate Change
IA Division
****

Dated **01/08/2024**

To,

Tilak Raj Sharma
HIMACHAL PRADESH BULK DRUG PARK INFRASTRUCTURE LIMITED
Himachal Pradesh Bulk Drug Park Infrastructure Limited Directorate of Industries Majitha House, Near HP Secretariat Chhota Shimla, Shimla, SHIMLA, HIMACHAL PRADESH, 171002
trsharma4@gmail.com

Subject: **The proposed project is for development of "Bulk Drug Park" over an area of 568.75 Ha at Villages Kuthar Beet, Pollian Beet, Tibbian, Jodian, Janani and Malluwal, Teh. Haroli, Distt. Una, Himachal Pradesh by M/s Himachal Pradesh Bulk Drug Park Infrastructure Ltd-Terms of References reg.**

Sir/Madam,

This is in reference to your application for Grant of Terms of Reference under the provision of the EIA Notification 2006-regarding in respect of project Proposed "Bulk Drug Park" at Villages Kuthar Beet, Pollian Beet, Tibbian, Jodian, Janani and Malluwal, Teh. Haroli, Distt. Una, Himachal Pradesh by M/s Himachal Pradesh Bulk Drug Park Infrastructure Ltd. under Department of Industries, Government of Himachal Pradesh submitted to Ministry vide proposal number IA/HP/INFRA1/450106/2023 dated 25/10/2023.

2. The particulars of the proposal are as below :

(i) TOR Identification No.	TO23A3103HP5957087N
(ii) File No.	10/68/2023-IA.III
(iii) Clearance Type	TOR
(iv) Category	A
(v) Project/Activity Included Schedule No.	7(c) Industrial estates/ parks/ complexes/ areas, export processing Zones (EPZs), Special Economic Zones ,7(h) Common Effluent Treatment Plants (CETPs)
(vi) Sector	INFRA-1
(vii) Name of Project	Proposed "Bulk Drug Park" at Villages Kuthar Beet, Pollian Beet, Tibbian, Jodian, Janani and Malluwal, Teh. Haroli, Distt. Una, Himachal

	Pradesh by M/s Himachal Pradesh Bulk Drug Park Infrastructure Ltd. under Department of Industries, Government of Himachal Pradesh
(viii) Name of Company/Organization	HIMACHAL PRADESH BULK DRUG PARK INFRASTRUCTURE LIMITED
(ix) Location of Project (District, State)	UNA, HIMACHAL PRADESH
(x) Issuing Authority	MoEF&CC
(xii) Applicability of General Conditions	yes
(xiii) Applicability of Specific Conditions	no

3. 3. The proposal is for proposal is for development of “Bulk Drug Park” over an area of 568.75 Ha at Villages Kuthar Beet, Pollian Beet, Tibbian, Jodian, Janani and Malluwal, Teh. Haroli, Distt. Una, Himachal Pradesh by M/s Himachal Pradesh Bulk Drug Park Infrastructure Ltd.

4. The proposed project falls under Schedule 7(c), Industrial Estates /Parks /SEZ etc and category ‘A’ of EIA Notification 2006, as attracts general condition due to Punjab and Himachal Pradesh Border located at a distance 100 m in West direction from project site boundary. The total cost of the project is Rs. 1,923 Crores.

6. List of industries within the proposed project site includes only for those projects which are covered under 7(c) category of EIA Notification, 2006: As per guidelines of the scheme ‘Promotion of Bulk Drug Parks’, manufacturing of AP is only would be allowed in this upcoming Bulk Drug Park and the State Govt. has already decided to allow chemical based APIs only in this park due to comparatively low consumption of water & power. In this Park, about 70-80 APIs manufacturing units would be set up over 125 industrial plots. Accordingly, project layout with master plan has been worked out. Details are as following.

S.No.	Land use Description	Area in Acres	Area in ha	Percentage (%)
1	Industrial Plot area	531.06	214.92	37.79
	Green Urban Plot area	197.79	80.04	14.07
2	Commercial area	93.39	37.79	6.65
3	Electrical Utilities	23.37	9.46	1.66
4	Utility area	42.22	17.09	3.00
5	TSDF Complex	33.80	13.68	2.41
6	Parking area	24.17	9.78	1.72
7	Green area	270.78	109.58	19.27
8	Treatment units (STP/ETP/MEE & WTP)	41.70	16.87	2.97
9	Logistics hub & ware house	18.90	7.65	1.34
10	Roads Area	100.79	40.79	7.17
11	Water bodies(Existing Nallah/Khad)	27.15	10.99	1.93
12	Semi Public (Temple)	0.30	0.12	0.02
Total Area		1405.416	568.76	100

7. The land use pattern in and around 10km of project comprises of open scrub/jungle 50.2%, Agricultural land 36.6%barren/waste land 5.9%, Settlement 5.2%, River bed 1%, water body 0.7% and forest etc 0.4%.

8. Terrain and topographical features: The terrain of the Project area is semi hilly area and there is no major drainage or nallah except a few seasonal channel inflows and one khad along the western direction of the project. Further, the area in & around the site under reference is in the form of hill and channels formed due to the dendric pattern of drainage.

9. Details of water bodies, impact on drainage: Swan River is located at a distance of approx. 8.5 km NE from the

proposed project site.

10. Water requirements: Total water requirement for the proposed project will be 22.1 MLD; out of which 15 MLD will be fresh water demand which will be met from groundwater* and 7.1 MLD will be recycled water which will be met from treated water. For utilization ground water permission has been accorded by the Jal Shakti Department, Govt. of HP.

11. Detailed contour map and drainage map along with the elevation of the project area and overlaying the project layout has been prepared as per contour, map the elevation of the project area varies from 390m to 590m from Mean Sea Level (MSL) approximately to avoid any apprehension of slides retaining and breast walls will designed with adequate strength to avoid any apprehensions of slides. The terrain of the Project area is semi hilly area and there is no major drainage or nallah except a few seasonal channel inflows and one khad along the western direction of the project. Further, the area in & around the site under reference is in the form of hill and channels formed due to the dendric pattern of drainage.

12. Detailed hydrological studies of the area for hydrological suitability to establish the industrial park has also been worked and no area or block has been notified from ground water development point of view. In beet area (Polian Beet and Kuthar Beet), ground water level is more than 60m below land surface. Hence, the geography of the study area makes hydrological suitability for establishment Bulk Drug Park 1405.41acres.

13. Waste Management: CETP: Provide details type and quantity of effluent, effluent conveyance system from the member units to CETP with CETP's Capacity. 5 MLD CETP with ZLD. STP: Provide details of treatment and usage of treated sewage with STP's capacity. 3 MLD.

14. Details of tree cutting: the proposed project will not involve any tree cutting.

15. Diversion of Forest land: The proposed project does not involve any forest land. As per the land use map of the project area, the project area includes open srub/jungle is 91% and Barren/waste land is 9%. Also submitted the letter no.1270/HP Forest Department dated 13/6/2024 and Endst.No.1300-1301 dated 14/6/2024 from the state forest department stating that the said land has been vested to Govt. of Himachal Pradesh under HP village Common Lands Vesting and Utilization Act, 1974 and the said land was neither recorded as forest land before vesting nor it has been recorded as forest land thereafter at any point of time. During presentation the concerned DFO also confirmed the status of project land as non-forest

16. The proposed site is not located within 10 km of Protected Areas (PA) including National Parks, Sanctuaries and Tiger Reserves etc and Eco-Sensitive Zone (ESZ) or Eco-Sensitive Area (ESA) notified.

17. R& R issues involved: The proposed project does not involve R&R issues.

18. Employment potential: The proposed project will create total 44,000 people. Benefits of the project: Industrial Innovation, Manufacturing growth, Employment generation.

19. Details of Court cases: There are no court cases against the project

20. EAC, after discussion and presentation, observed the following:

a. PP has submitted the No Objection certificate from the Forest Department/ concerned DFO to the effect that the project does not involve forestland. During presentation the concerned DFO also confirmed the status of project land as non-forest. Though he suggested that attempt shall be made to protect the vegetative growths including shrubs and small tree growths.

b. Though out of the options explored the PP has opted for relatively plain area close to the existing industrial areas yet terrain of the project area is undulating and hilly. Therefore developing industrial plots would require careful industrial

plot development avoiding the undue earth cutting, obstructing the drainages/khads/nallah and planning for water and soil conservation.

21. The EAC, taking into account the submission made by the project proponent has a detailed deliberation during its 367th meeting of Expert Appraisal Committee held on 26th June, 2024 and recommended the proposal for grant of Terms of Reference (ToR) with the specific conditions, as mentioned below, in addition to all standard conditions applicable for such projects:

22. Based on the deliberations in the meeting and information provided by the proponent in support of the project, the EAC recommended the project for 'development of "Bulk Drug Park" over an area of 568.75 Ha at Villages Kuthar Beet, Pollian Beet, Tibbian, Jodian, Janani and Malluwal, Teh. Haroli, Distt. Una, Himachal Pradesh by M/s Himachal Pradesh Bulk Drug Park Infrastructure Ltd' and for preparation of EIA/EMP report with public consultations subject to compliance of all conditions as notified in the standard ToR applicable for Industrial Estate/parks and specific conditions, as mentioned below-

23. A detailed draft EIA/EMP report shall be prepared in terms of the above additional TOR and should be submitted to the State Pollution Control Board for Public Hearing. Public Hearing to be conducted for the project in accordance with the provisions of Environmental Impact Assessment Notification, 2006 and the issues raised by the public should be addressed in the Environmental Management Plan. The Public Hearing shall be conducted based on the TOR letter issued by the Ministry and not on the basis of Minutes of the Meeting available on the website.

24. The project proponent shall submit the detailed final EIA/EMP report prepared as per TOR including issues raised during Public Hearing to the Ministry for considering the proposal for environmental clearance before expiry of validity of TOR.

25. The consultants involved in preparation of EIA/EMP report after accreditation with Quality Council of India/National Accreditation Board of Education and Training (QCFNABET) would need to include a certificate in this regard in the EIA/EMP reports prepared by them and data provided by other Organization(s)/Laboratories including their status of approvals etc. vide notification of the MoEF dated 19th July, 2013.

26. The prescribed TOR would be valid for a period of four years for submission of the EIA/EMP Reports.

27. This issue with the approval of Competent Authority.

Copy To

1. The Member Secretary,H.P.State Pollution Control Board, 35JF+MJM Him Parivesh, Phase 3, New Shimla, Shimla, Himachal Pradesh 171009.
2. Inspector General of Forests (C), Ministry of Environment, Forest and Climate Change, Integrated Regional Office, Shimla 1st & 2nd Floor, C.G.O. Complex, Longwood, Shimla – 171001.
3. PARIVEH Portal.
4. Guard file.

Annexure 1

Specific Terms of Reference for (Industrial Estates/ Parks/ Complexes/ Areas, Export Processing Zones (Epzs), Special Economic Zones)

1. Specific Conditions

S. No	Terms of Reference
1.1	The planning of Industrial Estate should be based on the criteria mentioned in this Ministry's

S. No	Terms of Reference
	Technical EIA Guidance Manual for Industrial Estate (2009) prepared by IL&FS as well as CPCB's Zoning Atlas Guidelines for siting industries.
1.2	Categorization of industries as per CPCB/SPCB norms and as per EIA notification, 2006 has to be mentioned
1.3	Detailed layout of proposed Industrial area to be submitted along with the EIA/EMP report.
1.4	In the project area all slopes above 45 degrees shall be protected. No earth cutting shall be permitted in these slopes for plot development. Even in slopes less than 45-degree attempt shall be made to avoid undue earth cutting. Slope stabilization methods viz Breast wall/retaining wall constructions/use of geo-fabrics shall be used. A soil and water Conservation plan incorporating above suggestions shall be submitted as part of EIA report.
1.5	Muck shall not be disposed of in drains/nallah/Khad/depressions and the same shall not be obstructed by the muck. A proper muck disposal plan shall be prepared and submitted as part of EIA Report.
1.6	A detailed rain water harvesting plan including the provisions for check dams across all major and minor drains/streams and water re-charge wells along the banks of these drains/nallah/khad, shall be prepared and submitted as part of EIA Report.
1.7	The project area has undulating terrain and it is important to have detailed hydrological study and its impact need to be carried out on the catchment and drainage system in core and buffer zones.
1.8	The recommendations made by the Geologist Zone-I and II, Geological Wing, Department of Industries, Himachal Pradesh, Himachal Pradesh for the establishment of the proposed drug industrial estate shall comply later in spirit and shall submit along with the EIA/EMP report.
1.9	A detailed hydro geological study on the catchment area of the drainage system within core zone and at least 5km perimeter of the project area. The recommendations made in the Hydro geological study of the area shall comply later in spirit and shall submit along with the EIA/EMP report.
1.10	As proposed by PP Provision for reservoir for water storage shall be made, and the details of the same shall be submit along with the EIA/EMP report.
1.11	Water balancing chart and its resources for obtaining the ground water shall be submitted.
1.12	Provision for Reuse/recycle of treated wastewater, wherever feasible. Explore possibilities for recycling and reusing of treated water in the unit to reduce the fresh water demand and waste disposal. A detailed water harvesting plan needs to be submitted. Provision for Zero liquid discharge whenever techno-economically feasible. Provision for Continuous monitoring of effluent quality/quantity.
1.13	Detailed air quality study for each point source to be conducted along with the Micro metallurgical data.
1.14	The industrial layout/zones shall be planned such a way that, No tree can be felled/transplant unless exigencies demand. Where absolutely necessary, tree felling shall be with prior permission from the concern Authority. Where the trees need to be cut/transplanted with prior permission from the

S. No	Terms of Reference
	concerned local Authority, compensatory plantation in the ratio of 1:10 (i.e. planting of 10 trees for every 1 tree that is cut/ non-survival of any transplanted tree) shall be done and maintained. Plantations to be ensured species (cut) to species (planted). All the plantation will be done by state forest department as deposit work and not by private contractors.
1.15	At least 50-meter-wide green belt shall be developed all along the major streams/ nallah/khads and in minor streams 15-meter-wide green belt shall be developed. All slopes above 45 degrees and any slope around industrial plot, not planned for development within project, shall be properly afforested in consultation with forest department. Project boundary shall have at least 15-meter-wide green belt. A detailed green belt development plan shall be submitted as part of EIA Report
1.16	Plan for afforestation should be such that it is free from pesticides with flowering plants of native species for attracting bees and insects, which in turn is beneficial to the agriculture. Farmers around the project site shall be involved in developing such an afforestation Plan.
1.17	Details of Onsite and Offsite emergency plans as per provisions of the MSIHC Rules needs to be submitted.
1.18	Activity-wise, a time bound action plan along with budgetary provision for occupational health & surveillance, environment management plan, and green belt development plan.
1.19	Assessment of carrying capacity of transportation load on roads inside the notified industrial premises shall be carried out and submitted.
1.20	In addition to above, the EIA/EMP report shall also address issues such as i) Effective fugitive emission control measures for process, transportation, packing etc. ii) use of cleaner fuels and iii) best available technology for the plant.
1.21	As per the Ministry's Office Memorandum F.No.22-65/2017-IA.III dated 30th September, 2020, the activities proposed by the project proponent, based on the commitment made in the public hearing shall be incorporated in the Environmental Management Plan along with the cost estimates and submit to the Ministry. All other activities including pollution control, environmental protection and conservation, R&R, wildlife and forest conservation/protection measures including the NPV, Compensatory Aforestation etc, envisaged by the project proponent based on the social impact assessment and R&R action plan carried out during the preparation of EIA report, shall be detailed out along with the cost estimates and become part of EMP. Focus should also be kept for local floral and fauna biodiversity.

Standard Terms of Reference for (Industrial estates/ parks/ complexes/ areas, export processing Zones (EPZs), Special Economic Zones)

1. Project Details

S. No	Terms of Reference
1.1	Reasons for selecting the site with details of alternate sites examined/rejected/selected on merit with comparative statement and reason/basis for selection. The examination should justify site suitability in terms of environmental damage, resources sustainability associated with selected site as compared to rejected sites.

S. No	Terms of Reference
1.2	The analysis should include parameters considered along with weightage criteria for shortlisting selected site.
1.3	Zoning of the area in terms of 'type of industries' coming-up in the industrial area based on the resource requirement along with likely pollutants with quantity from the various industries.
1.4	Submit Roles and responsibility of the developer etc for compliance of environmental regulations under the provisions of EP Act.
1.5	Examine the details of National Highways/State Highways/ expressways falling along the corridor and the impact of the development on them.
1.6	Submit the details of the infrastructure to be developed.
1.7	Justification of the parameters, frequency and locations shall be discussed in the EIA.

2. Environment Status/baseline Data Methodology

S. No	Terms of Reference
2.1	Examine baseline environmental quality along with projected incremental load due to the project taking into account of the existing developments nearby. (ii) Environmental data to be considered in relation to the project development would be (a) land, (b) groundwater, (c) surface water, (d) air, (e) bio-diversity, (f) noise and vibrations, (g) socio economic and health.
2.2	Site justification of the identified industry sectors from environmental angle and the details of the studies conducted if any.
2.3	Identify, predict and assess the environmental and sociological impacts on account of the project.

3. Remote Sensing/ Gis

S. No	Terms of Reference
3.1	Analysis should be made based on latest satellite imagery for land use with raw images.
3.2	Check on flood plain of any river.

4. Land Use, Land Acquisition, R&r

S. No	Terms of Reference
4.1	Submit the details of the land use break-up for the proposed project. Details of land use around 10 km radius of the project site.
4.2	Submit details of environmentally sensitive places, land acquisition status, rehabilitation of communities/villages and present status of such activities.

S. No	Terms of Reference
4.3	Examine the impact of proposed project on the nearest settlements.
4.4	Submit details regarding R&R involved in the project
4.5	The project boundary area and study area for which the base line data is generated should be indicated through a suitable map.

5. Esz, Crz Details

S. No	Terms of Reference
5.1	Details regarding project boundary passing through any eco- sensitive area and within 10 km from eco- sensitive area.

6. Forest And Wildlife Related Details

S. No	Terms of Reference
6.1	An overall green area of at-least 33% of the Industrial Area should be developed with native species. The green area shall be 40% in case of critically polluted area. Green buffer in the form of green belt to a width of 15 meters should be provided all along the periphery of the industrial area.
6.2	Submit the details of the trees to be felled for the project.
6.3	Submit the present land use and permission required for any conversion such as forest, agriculture etc.

7. Court/ Litigation Related

S. No	Terms of Reference
7.1	Submit Legal frame work for the implementation of Environmental Clearance conditions - to be clearly spelt out in the EIA report.
7.2	Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the Project should be given.

8. Water Environment/quality/hydrology

S. No	Terms of Reference
8.1	Ground water classification as per the Central Ground Water Authority
8.2	Submit the source of water, requirement vis-à-vis waste water to be generated along with treatment facilities, use of treated waste water along with water balance chart taking into account all forms of water use and management.

9. Rain Water Harvesting

S. No	Terms of Reference
9.1	Rain water harvesting proposals should be made with due safeguards for ground water quality
9.2	Maximize recycling of water and utilization of rain water. Examine details.
9.3	Examine soil characteristics and depth of ground water table for rainwater harvesting.

10. Waste Management, Drainage And Stps Details

S. No	Terms of Reference
10.1	Submit a copy of the contour plan with slopes, drainage pattern of the site and surrounding area, and any obstruction of the same by the project.
10.2	Examine details of solid waste generation treatment and its disposal.

11. Soil Environment

S. No	Terms of Reference
11.1	Examine soil characteristics and depth of ground water table for rainwater harvesting.

12. Energy And Resources

S. No	Terms of Reference
12.1	Examine and submit details of use of solar energy and alternative source of energy to reduce the fossil energy consumption.

13. Air Environment

S. No	Terms of Reference
13.1	In case DG sets are likely to be used during construction and operational phase of the project. emissions from DG sets must be taken into consideration while estimating the impacts on air environment. Examine and submit details.

14. Road/transport Safety And Traffic Aspects

S. No	Terms of Reference
14.1	Examine road/rail connectivity to the project site and impact on the traffic due to the proposed project.
14.2	Present and future traffic and transport facilities for the region should be analysed with measures for

S. No	Terms of Reference
	preventing traffic congestion and providing faster trouble free system to reach different destinations in the city.
14.3	A detailed traffic and transportation study should be made for existing and projected passenger and cargo traffic.
14.4	Examine the details of transport of materials for construction which should include source and availability.

15. Noise Environment

S. No	Terms of Reference
15.1	Examine noise levels - present and future with noise abatement measures.

16. Environmental Management Plans And Mitigative Measures

S. No	Terms of Reference
16.1	Examine separately the details for construction and operation phases both for Environmental Management Plan and Environmental Monitoring Plan with cost and parameters.
16.2	Submit details of a comprehensive Disaster Management Plan including emergency evacuation during natural and man-made disaster.
16.3	Any further clarification on carrying out the above studies including anticipated impacts due to the project and mitigative measure, project proponent can refer to the model ToR available on Ministry.

Additional Terms of Reference

N/A

Annexure 2

Details of Products & By-products

Name of the product /By-product	Product / By-product	Quantity	Unit	Mode of Transport / Transmission	Remarks (eg. CAS number)
APIs and API intermediates	APIs and API intermediates	787500	Tons per Annum (TPA)	Road	Approx. 80 API units are likely proposed in the Bulk Drug Park

COMPLIANCE OF TERMS OF REFERENCE

(Vide Letter No. 10/68/2023-IA.III dated 01/08/2024)

Proposed Bulk Drug Park located at Villages Kuthar Beet, Pollian Beet, Tibbian, Jodian, Janani and Malluwal, Teh. Haroli, Distt. Una, HP by M/s Himachal Pradesh Bulk Drug Park Infrastructure Limited (HPBDPIL).

A. STANDARD TERMS OF REFERENCE

S. No.	Terms of Reference	Compliance Reply
1.	**Specific Conditions**	
1.1	The planning of Industrial Estate should be based on the criteria mentioned in this Ministry's Technical EIA Guidance Manual for Industrial Estate (2009) prepared by IL&FS as well as CPCB's Zoning Atlas Guidelines for siting industries.	The planning of Bulk Drug Park in Una, Himachal Pradesh under the category "Industrial Estate" is based on the criteria mentioned in this Ministry's Technical EIA Guidance Manual for Industrial Estate (2009) prepared by IL&FS as well as CPCB's Zoning Atlas Guidelines for siting industries.
1.2	Categorization of industries as per CPCB/SPCB norms and as per EIA notification, 2006 has to be mentioned	The project (Bulk Drug Park) falls in Category 'A' under Schedule 7(c) {Industrial estates/ parks/ complexes/ areas, export processing Zones (EPZs), Special Economic Zones (SEZs), Biotech Parks, Leather Complexes'} as per EIA Notification, 2006 and its amendments thereof. The proposed common infrastructural facilities as the CETP is covered

		under category 7(h), an integrated TSDF (comprising a secured landfill with a solid-liquid feed incinerator) under category 7(d) and the member industries (API units) covered under category 5(f) as the link projects..
1.3	Detailed layout of proposed Industrial area to be submitted along with the EIA/EMP report.	Detailed layout of proposed Industrial area depicting industrial plots, commercial area, green area, parking space and common infrastructure and utilities is enclosed as **Annexure 1.**
1.4	In the project area all slopes above 45 degrees shall be protected. No earth cutting shall be permitted in these slopes for plot development. Even in slopes less than 45-degree attempt shall be made to avoid undue earth cutting. Slope stabilization methods viz Breast wall/retaining wall constructions/use of geo-fabrics shall be used. **A soil and water Conservation plan incorporating above suggestions shall be submitted as part of EIA report.**	No earth cutting will be done at slope areas of more than 45° and these slope areas will be protected. Undue earth cutting will be avoided at slope areas of lesser than 45°. Slope stabilization methods viz Breast wall/retaining wall constructions/use of geo-fabrics will be used. Undue earth cutting will be avoided even in slopes less than 45-degree and incase of requirements of leveling the land, the slope stabilization methods as construction of breast wall/retaining walls /use of geo-fabrics will be adopted. Soil and Water Conservation plan has been incorporated in Chapter 7. Although, the detailed Soil and Water Conservation plan will be submitted with Final EIA report.
1.5	Muck shall not be disposed of in drains/nallah/ Khad/depressions and the same shall not be obstructed by the muck. **A proper muck disposal plan shall be**	Muck generated due to cutting/ site preparation will be utilized in leveling of low lying areas and widening/ levelling of roads and surplus muck if any will be disposed off at designated place for further use to avoid any obstruction

	prepared and submitted as part of EIA Report.	of drains/nallah/Khad/depressions. Detailed Muck disposal plan will be submitted with Final EIA report incorporating the cut and fill plan.
1.6	A detailed rain water harvesting plan including the provisions for check dams across all major and minor drains/streams and water re-charge wells along the banks of these drains/nallah/khad, shall be prepared and submitted as part of EIA Report.	The rain water harvesting including the provisions for check dams across all major and minor drains/streams and water re-charge wells along the banks of these drains/nallah/khad has not been considered as the area is hilly terrain and flood prone. Though the rain water collection is proposed from roof tops of buildings and other pucca areas through dedicated drainage and will be collected in storage pond/ tank. After treatment of rain water, it will be re-used industrial processes. Rain water harvesting has been incorporated in the EIA report in Chapter 7. Although, detailed Rain water harvesting plan will be submitted with Final EIA report.
1.7	The project area has undulating terrain and it is important to have detailed hydrological study and its impact need to be carried out on the catchment and drainage system in core and buffer zones.	Detailed hydrological study of the core and buffer zone to assess the impacts on catchment and drainage system is under investigation by HPBDPIL and same will be incorporated in final EIA report.
1.8	The recommendations made by the Geologist Zone-I and II, Geological Wing, Department of Industries, Himachal	The recommendations made by the Geologist Zone-I and II, Geological Wing, Department of Industries, Himachal Pradesh to establish Bulk

	Pradesh, Himachal Pradesh for the establishment of the proposed drug industrial estate shall comply later in spirit and shall submit along with the EIA/EMP report.	Drug Park will be considered and incorporated in final EIA/EMP report.
1.9	**A detailed hydro geological study on the catchment area of the drainage system within core zone and at least 5 km perimeter of the project area. The recommendations made in the Hydrogeological study of the area shall comply later in spirit and shall submit along with the EIA/EMP report.**	Detailed hydro geological study on the catchment area of the drainage system within the core and buffer zone to assess the impacts on drainage system is under investigation by HPBDPIL and the same will be incorporated in EIA report**.**
1.10	As proposed by PP Provision for reservoir for water storage shall be made, and the details of the same shall be submit along with the EIA/EMP report	The provision for reservoir for water storage is proposed as 100 ML (million liters) capacity.
1.11	Water balancing chart and its resources for obtaining the ground water shall be submitted.	**Source of water:** Groundwater through bore wells (15 Nos.) **Water Requirement:** Total water requirement for the proposed project will be 22.1 MLD; out of which 15 MLD will be fresh water demand met from groundwater and 7.1 MLD will be recycled water met from treated water. Breakup of the total water demand is given below: **Description** | **Demand (MLD)** | **Source**

		Freshwater Demand (Potable + Process water demand)	15 (2.2+12.8)	Groundwater
		Flushing water demand	1.15	Treated water
		AC Cooling demand	2.00	Treated water
		Horticulture water demand	3.95	Treated water
		Total Water Demand	**22.1 MLD**	Ground & treated water

As an alternative source of water requirement, a comprehensive scheme for the surface water supply through dedicated pipeline of approximate 15 Km length from the river Satluj to the project has already been approved by BBMB authorities. 50 MLD fresh water from the river Satluj will be stored in the tank of capacity 100 MLD. This scheme has been envisaged keeping in view the future expansions and upcoming allied industries as well as the proposed housing schemes in the vicinity.

1.12	Provision for Reuse/recycle of treated wastewater, wherever feasible. Explore possibilities for recycling and reusing of treated water in the unit to reduce the fresh water demand and waste disposal. A detailed water harvesting plan needs to be submitted. Provision for Zero liquid discharge whenever techno-economically feasible. Provision for Continuous monitoring of effluent quality/quantity.	The provision for wastewater treatment is provided by establishing CETP of 5 MLD and the reuse/recycle of treated water (from low COD – low TDS effluent) in horticulture, flushing and industrial cooling purpose. A zero liquid discharge (for high COD – high TDS effluents) is proposed as Multiple Effluent Evaporator/Spray Drier as described in **Chapter 2 of EIA report.**
1.13	Detailed air quality study for each point source to be conducted along with the Micro metallurgical data.	The detailed air quality dispersion modeling study has been carried out by considering each point source as well as mobile sources associated to the project operation along with the Micro metallurgical data to assess the project impacts on the environment **Chapter 4 of EIA report.**
1.14	The industrial layout/zones shall be planned such a way that, No tree can be felled/transplant unless exigencies demand. Where absolutely necessary, tree felling shall be with prior permission from the concern Authority. Where the trees need to be cut/transplanted with prior permission from the concerned local Authority, compensatory plantation in the ratio of 1:10 (i.e. planting of 10 trees for every 1 tree that is cut/ non-survival of any transplanted tree) shall be done and maintained. Plantations to be ensured species (cut) to species	Agreed. In case of exigencies demand, tree felling will be done with prior permission from concerned authority. A compensatory plantation in ratio of 1:10 will be adopted and maintained in project area along the green belt development areas marks in master plan. The tree remuneration survey has been done and the total tree will be fell down approx. 3440 Nos. (40% of total trees 8599 Nos. enumerated in common utility areas) and the compensatory afforestation of trees will be 34,400Nos. in the ratio of 1:10 (trees to be cut and the trees to be planted).

	(planted). All the plantation will be done by state forest department as deposit work and not by private contractors.	
1.15	At least 50-meter-wide green belt shall be developed all along the major streams/ nallah/khads and in minor streams 15-meter-wide green belt shall be developed. All slopes above 45 degrees and any slope around industrial plot, not planned for development within project, shall be properly afforested in consultation with forest department. Project boundary shall have at least 15-meter-wide green belt. A detailed green belt development plan shall be submitted as part of EIA Report	Agreed. Green belt development plan has been provided in **Chapter 7 of EIA report.**
1.16	Plan for afforestation should be such that it is free from pesticides with flowering plants of native species for attracting bees and insects, which in turn is beneficial to the agriculture. Farmers around the project site shall be involved in developing such an afforestation Plan.	Agreed
1.17	Details of Onsite and Offsite emergency plans as per provisions of the MSIHC Rules needs to be submitted.	Details of Onsite and Offsite emergency plans including Disaster Management Plan (DMP) is elaborated in **Chapter 7 of EIA report.**
1.18	Activity-wise, a time bound action plan along with budgetary provision for occupational health & surveillance,	Action plan for occupational health & surveillance, environment management plan and green belt development plan will be 3-4 years

	environment management plan, and green belt development plan.	after public hearing feedback and grant of environmental clearance for the project.
1.19	Assessment of carrying capacity of transportation load on roads inside the notified industrial premises shall be carried out and submitted.	Assessment of carrying capacity of transportation load on roads inside industrial area has been conducted and elaborated in **Chapter 4 of EIA Report.**
1.20	In addition to above, the EIA/EMP report shall also address issues such as i) Effective fugitive emission control measures for process, transportation, packing etc. ii) use of cleaner fuels and iii) best available technology for the plant.	Agreed.
1.21	As per the Ministry's Office Memorandum F.No.22-65/2017-IA.III dated 30th September, 2020, the activities proposed by the project proponent, based on the commitment made in the public hearing shall be incorporated in the Environmental Management Plan along with the cost estimates and submit to the Ministry. All other activities including pollution control, environmental protection and conservation, R&R, wildlife and forest conservation/protection measures including the NPV, Compensatory Afforestation etc, envisaged by the project proponent based on the social impact assessment and R&R action plan carried out during the preparation of EIA report,	Agreed and incorporated in EIA report.

	shall be detailed out along with the cost estimates and become part of EMP. Focus should also be kept for local flora and fauna biodiversity.	
	Standard TOR (Industrial estates/ parks/ complexes/ areas, export processing Zones (EPZs), Special Economic Zones)	
1.	**Project Details**	
1.1	Reasons for selecting the site with details of alternate sites examined/rejected/selected on merit with comparative statement and reason/basis for selection. The examination should justify site suitability in terms of environmental damage, resources sustainability associated with selected site as compared to rejected sites.	Reasons for selecting the project site among the alternate sites options were considered as topography of the area, availability of the land, environmental settings of the area, accessibility and road links of the area and availability of resources and market. Detailed site selection plan has been elaborated in **Chapter 5 of EIA Report.**
1.2	The analysis should include parameters considered along with weightage criteria for shortlisting selected site.	Detailed site selection plan has been elaborated in **Chapter 5 of EIA Report.**
1.3	Zoning of the area in terms of 'type of industries' coming-up in the industrial area based on the resource requirement along with likely pollutants with quantity from the various industries.	The proposed Bulk Drug Park is notified Industrial Area declared by Dept. of Industries, Govt. of Himachal Pradesh and upcoming industries will be API Units (70-80 Nos.)
1.4	Submit Roles and responsibility of the developer etc. for compliance of environmental regulations under the	Roles and responsibility of the developer etc. for compliance of environmental regulations under the provisions of EP Act has been

	provisions of EP Act.	elaborated in **Chapter 7 of EIA Report.**
1.5	Examine the details of National Highways/State Highways/ expressways falling along the corridor and the impact of the development on them	A detailed traffic and transportation study for existing and projected traffic on connecting roads/highways is under investigation and the same will be incorporated in final EIA Report.
1.6	Submit the details of the infrastructure to be developed	The details of the infrastructure to be developed have been elaborated in **Chapter 2 of EIA Report.**
1.7	Justification of the parameters, frequency and locations shall be discussed in the EIA.	Discussed in **Chapter 3 and EMP of EIA report.**
2.	**Environment Status/baseline Data Methodology**	
2.1	Examine baseline environmental quality along with projected incremental load due to the project taking into account of the existing developments nearby. (ii) Environmental data to be considered in relation to the project development would be (a) land, (b) groundwater, (c) surface water, (d) air, (e) bio-diversity, (f) noise and vibrations, (g) socio economic and health.	Agreed. Baseline environmental quality has been examined in details as elaborated in **Chapter 3 4 of EIA report.** Incremental load due to the proposed project has been examined and elaborated in **Chapter 4 of EIA report.**
2.2	Site justification of the identified industry sectors from environmental angle and the details of the studies conducted if any	Detailed site selection plan has been elaborated in **Chapter 5 of EIA Report.**
2.3	Identify, predict and assess the environmental and	The assessment of environmental and sociological impacts of the project

	sociological impacts on account of the project.	has been conducted and elaborated in **Chapter 4 of EIA Report.**
3.	**Remote Sensing/ GIS**	
3.1	Analysis should be made based on latest satellite imagery for land use with raw images.	Agreed and latest satellite imagery of Landsat 8 and 9 for land use with raw images has been used for the year of 2023-24.
3.2	Check on flood plain of any river.	No flood plain has been identified in the project area and its vicinity.
4.	**Land Use, Land Acquisition, R&r**	
4.1	Submit the details of the land use break-up for the proposed project. Details of land use around 10 km radius of the project site.	Details of land use break-up for the proposed project land use around 10 km radius of the project site has been elaborated in **Chapter 3 of EIA Report.**
4.2	**Submit details of environmentally sensitive places, land acquisition status, rehabilitation of communities/villages and present status of such activities**	Environmentally sensitive places are depicted in **Chapter 2.** Status of land acquisition elaborated in **Chapter 1 of EIA Report.** No rehabilitation of communities/villages is involved in the project.
4.3	Examine the impact of proposed project on the nearest settlements.	Impacts of proposed project on the nearest settlements. have been examined and elaborated in **Chapter 4 of EIA report.**
4.4	Submit details regarding R&R involved in the project	No R&R activity is involved in the project
4.5	The project boundary area and study area for which the base line data is generated should be indicated through a suitable map.	The project boundary area and study area for which the base line data is generated are delineated in **Chapter 3 of EIA report.**
5.	**Esz, Crz Details**	

<table>
<tr><td>5.1</td><td>Details regarding project boundary passing through any eco-sensitive area and within 10 km from eco- sensitive area</td><td>
<table>
<tr><th>S.No.</th><th>Description</th><th>Name</th><th>Aerial distance & Direction</th></tr>
<tr><td rowspan="2">1.</td><td rowspan="2">Nearest Forests</td><td>Polian Shamlat RF</td><td>Adjoining to project site</td></tr>
<tr><td>Kangar PF</td><td>Approx. 7 km NW</td></tr>
<tr><td>2.</td><td>Nearest Surface Water body</td><td>Swan River</td><td>Approx. 8.5 km NE</td></tr>
</table>
</td></tr>
<tr><td>6.</td><td>Forest And Wildlife Related Details</td><td></td></tr>
<tr><td>6.1</td><td>An overall green area of at-least 33% of the Industrial Area should be developed with native species. The green area shall be 40% in case of critically polluted area. Green buffer in the form of green belt to a width of 15 meters should be provided all along the periphery of the industrial area.</td><td>Green area of 185.72 Acre (13.21%) will be developed by Himachal Pradesh State Bulk Drug Park Infrastructure Limited (HPSBDPIL). In order to meet the statutory requirement of green area demand of 33%, the remaining green belt will be managed by individual member industries in their premises (Chapter 7 of EIA report).</td></tr>
<tr><td>6.2</td><td>Submit the details of the trees to be felled for the project.</td><td>The tree remuneration survey has been done and the total tree will be fell down approx. 3440 Nos. (40% of total trees 8599 Nos. enumerated in common utility areas) and the compensatory afforestation of trees will be 34,400Nos. in the ratio of 1:10 (trees to be cut and the trees to be planted).</td></tr>
<tr><td>6.3</td><td>Submit the present land use and permission required for any</td><td>As per the NOC obtained from the forest department there is no forest</td></tr>
</table>

	conversion such as forest, agriculture etc.	land is involved within the project premises. The land acquired (1405 acres) is under the ownership of Dept. of Industries, Govt. of Himachal Pradesh and per LULC plan, majority of land under project area is open scrub, hence no conversion of land is applicable.
7.	**Court/ Litigation Related**	
7.1	Submit Legal frame work for the implementation of Environmental Clearance conditions - to be clearly spelt out in the EIA report.	Mr. Tilak Raj Sharma, Additional Director of Industries, Govt. of Himachal Pradesh along with Environmental Management Cell comprising of HPBDPIL and member industries will be responsible for the implementation of Environmental Clearance conditions. The detailed legal frame work for the management and operation of the project is elaborated in **Chapter 10 of EIA report.**
7.2	Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the Project should be given.	No litigation is pending against the project. A copy of undertaking for the same is enclosed in **EIA report.**
8.	**Water Environment/quality/hydrology**	
8.1	Ground water classification as per the Central Ground Water Authority	Ground water classification and hydrological aspect of the study area in district Una is discussed in **Chapter 3 of EIA Report.**
8.2	Submit the source of water, requirement vis-à-vis waste water to be generated along with treatment facilities, use of treated waste water along with water balance chart taking	**Source of water:** Groundwater through bore wells (15 Nos.) **Water Requirement:** Total water requirement for the proposed

<table>
<tr>
<td></td>
<td>into account all forms of water use and management.</td>
<td>project will be 22.1 MLD; out of which 15 MLD will be fresh water demand met from groundwater and 7.1 MLD will be recycled water met from treated water. Breakup of the total water demand is given below:
<table>
<tr><th>Description</th><th>Demand (MLD)</th><th>Source</th></tr>
<tr><td>Freshwater Demand (Potable + Process water demand)</td><td>15 (2.2+12.8)</td><td>Groundwater</td></tr>
<tr><td>Flushing water demand</td><td>1.15</td><td>Treated water</td></tr>
<tr><td>AC Cooling demand</td><td>2.00</td><td>Treated water</td></tr>
<tr><td>Horticulture water demand</td><td>3.95</td><td>Treated water</td></tr>
<tr><td>Total Water Demand</td><td>22.1 MLD</td><td>Ground & treated water</td></tr>
</table>
As an alternative source of water requirement, a comprehensive scheme</td>
</tr>
</table>

		for the surface water supply through dedicated pipeline of approximate 15 Km length from the river Satluj to the project has already been approved by BBMB authorities. 50 MLD fresh water from the river Satluj will be stored in the tank of capacity 100 MLD. This scheme has been envisaged keeping in view the future expansions and upcoming allied industries as well as the proposed housing schemes in the vicinity.
9.	**Rain Water Harvesting**	
9.1	Rain water harvesting proposals should be made with due safeguards for ground water quality	Agreed
9.2	Maximize recycling of water and utilization of rain water. Examine details.	Maximize recycling and utilization of rain water is explored in **Chapter 7 of EIA report**
9.3	Examine soil characteristics and depth of ground water table for rainwater harvesting	Soil characteristics and depth of ground water table for rainwater harvesting are explored in **Chapter 3 of EIA report**
10.	**Waste Management, Drainage and STPs Details**	
10.1	Submit a copy of the contour plan with slopes, drainage pattern of the site and surrounding area, and any obstruction of the same by the project.	Agreed. The contour plan with slopes, drainage pattern of the site and surrounding area is enclosed as **Annexure-8**
10.2	Examine details of solid waste generation treatment and its disposal.	Solid waste of about 8.8 TPD (0.2 kg/capita/day) will be generated. Solid waste will be duly segregated into biodegradable and non-biodegradable components. Separate area will be earmarked for segregation of solid

		waste. Biodegradable waste will be composted within project premises and recyclable component will be disposed off through authorized recycler vendors. The Solid Waste will be handled/disposed off as per the provision of Solid Waste Management Rules 2016 and its amendments.
11.	**Soil Environment**	
11.1	Examine soil characteristics and depth of ground water table for rainwater harvesting.	As per CGWB (2020), the Una district has two types of soils viz., alluvial soil and non-calcic brown soil. Most of the area in the district is covered with alluvial soil and only about 25% of the area i.e. hilly area in the district is covered with non-calcic brown soil and the details are elaborated in **Point No. 3.4.5 of Chapter 3 of EIA report**.
12.	**Energy And Resources**	
12.1	Examine and submit details of use of solar energy and alternative source of energy to reduce the fossil energy consumption.	A total of 14.2 MW solar power generation is proposed on the roof tops of commercial buildings/areas, electrical utility areas and treatment units. The details on solar power system is provided in **Chapter 7.**
13.	**Air Environment**	
13.1	In case DG sets are likely to be used during construction and operational phase of the project. emissions from DG sets must be taken into consideration while estimating the impacts on air environment. Examine and submit details	DG sets have been well considered while estimating the impacts on air environment as elaborated in **Chapter 4 of EIA report**.

14.	**Road/transport Safety And Traffic Aspects**	
14.1	Examine road/rail connectivity to the project site and impact on the traffic due to the proposed project.	The proposed site is accessible through Una-Jaijon road to NH-503 (15 km, E) and NH-103A (9.5 km, W). Nearest Railway Stations are Jaijon Doaba (2 km in W) and Una (approx. 13.2 km in NE). Nearest Airports are Adampur in Jalandhar (38 km in NW) and Shaheed Bhagat Singh Airport in Chandigarh (approx. 95 km in South). A detailed traffic study for existing and projected traffic to assess the impacts is under investigation and will be included in Final EIA report.
14.2	Present and future traffic and transport facilities for the region should be analysed with measures for preventing traffic congestion and providing faster trouble free system to reach different destinations in the city.	As per the recommendations of traffic study to assess the existing and proposed traffic load, the widening of Una-Jaijon district road is proposed from 2-lane to 4-lane to avoid road congestion for smooth and continuous movement of traffic.
14.3	A detailed traffic and transportation study should be made for existing and projected passenger and cargo traffic	A detailed traffic and transportation study for existing and projected passenger and cargo traffic is under investigation and will be included in Final EIA report.
14.4	Examine the details of transport of materials for construction which should include source and availability	Constructions materials such as Cement, Aggregates, Bricks, Wood, metals, Clay, Steels and Glass etc. will be sourced from local market within 50 km radius for the ease of supplies and benefits to local peoples. Local market is easily available for construction materials as Una (approx. 15km), Haroli (approx.10kms), Tahliwal (approx. 8kms),

		Nangal (approx.10kms) in Himachal Pradesh and Garhshankar (approx. 15kms) and Hoshiarpur (approx. 30 kms) in Punjab.
15.	**Noise Environment**	
15.1	Examine noise levels - present and future with noise abatement measures	Noise levels - present and future with noise abatement measures are elaborated in **Chapter 4 of EIA report**
16.	**Environmental Management Plans And Mitigative Measures**	
16.1	Examine separately the details for construction and operation phases both for Environmental Management Plan and Environmental Monitoring Plan with cost and parameters.	The details for construction and operation phases both for Environmental Management Plan and Environmental Monitoring Plan with cost and parameters are elaborated in **Chapter 10 of EIA report**
16.2	Submit details of a comprehensive Disaster Management Plan including emergency evacuation during natural and man-made disaster.	Comprehensive Disaster Management Plan including emergency evacuation during natural and man-made disaster is described in **Chapter 7 of EIA report**
16.3	Any further clarification on carrying out the above studies including anticipated impacts due to the project and mitigative measure, project proponent can refer to the model ToR available on Ministry.	Agreed
	Additional Terms of Reference	

TABLE OF CONTENT

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Drugs play a vital role in healthcare delivery in the country. A continuous supply of drugs is necessary to ensure affordable healthcare delivery to the citizens. Any disruption in the supply of drugs can significantly adversely affects the country's drug security. Indian pharmaceutical industry is the third largest in the world by volume and 14th largest in terms of value. India contributes 3.5% of total drugs and medicines exported globally. However, despite these achievements, India is significantly dependent on the import of some of the basic raw materials, viz., bulk drugs that are used to produce the finished dosage formulations. India imports bulk drugs largely for economic considerations. Future growth of the pharmaceutical sector is contingent upon our ability to ensure an uninterrupted supply of quality bulk drugs and our capacity to upscale their manufacturing during emergencies. Self-reliance in the manufacturing of bulk drugs is, therefore, highly desirable

The Department of Pharmaceuticals (DoP), Ministry of Chemical and Fertilizer, Government of India (GoI) has notified Guideline of the Scheme "Promotion of Bulk Drug Parks" in March 2020. Under the scheme, a one- time grant-in-aid subject to a maximum limit of Rs. 1000 Cr or 90% of the project cost in case of Hilly States will be given for the development of common infrastructure facilities. The objective of the scheme is to significantly bring down the manufacturing cost of bulk drugs and thereby increase the competitiveness of the domestic bulk drug industry by providing easy access to standards testing & infrastructure facilities. A total of 3 Bulk Drug Parks were to be selected across the country under the scheme. It is indeed a step in the right direction towards reducing imports on Bulk Drug products from foreign countries thereby encouraging import substitution and giving impetus to export promotion.

1.2 VISION AND OBJECTIVES

The vision and objectives of a Bulk Drug Park typically revolve around promoting the domestic manufacturing of active pharmaceutical ingredients (APIs) and intermediates in order to strengthen the pharmaceutical industry and reduce dependency on imports. These parks are a part of the larger strategy to boost the Indian pharmaceutical industry and make it globally competitive. Here are the main vision and objectives of a Bulk Drug Park:

1. Self-Reliance in Drug Manufacturing: To reduce India's dependency on imports for critical APIs and intermediates and establish self-reliance in the production of essential drugs.
2. Promoting Indigenous Manufacturing: Encourage the development and growth of domestic pharmaceutical manufacturers, ensuring that they can produce high-quality, cost-effective bulk drugs and intermediates.
3. Global Competitiveness: Enhance the global competitiveness of Indian bulk drug manufacturers by providing state-of-the-art infrastructure, technology, and a supportive ecosystem.
4. Cost Reduction: Drive down the cost of API production through economies of scale, efficient processes, and shared infrastructure within the park, making medicines more affordable for the public.
5. Quality Assurance: Ensure that bulk drug manufacturers in the park adhere to high-quality standards, thereby boosting the reputation of Indian pharmaceutical products in the international market.
6. Research and Development: Facilitate research and development activities within the park to encourage innovation and the development of new drugs, processes, and technologies.
7. Environmental Sustainability: Implement eco-friendly practices and sustainable manufacturing processes to minimize the environmental impact of drug production.
8. Job Creation: Generate employment opportunities in the region, including skilled and unskilled labour, leading to socio-economic development.
9. Infrastructure Development: Build world-class infrastructure, including common utilities, testing facilities, and logistical support, to ease the establishment and operation of bulk drug manufacturing units.
10. Attract Investments: Attract both domestic and foreign investments in the pharmaceutical sector, boosting economic growth and technological advancement.
11. Regulatory Compliance: Ensure that manufacturing units in the park adhere to regulatory and quality standards, thereby reducing the likelihood of substandard or counterfeit drugs in the market.
12. Reducing Trade Imbalances: Mitigate the trade imbalances in the pharmaceutical sector by increasing domestic production, which can reduce the need for importing APIs and intermediates.

Overall, the vision and objectives of a Bulk Drug Park are geared towards bolstering the pharmaceutical industry in a country, making it self-sufficient, globally competitive, and able to produce essential drugs and APIs of high quality and at a competitive cost.

1.3 PURPOSE OF THE REPORT

The Environmental Impact Assessment (EIA) report serves several important purposes, and its main objective is to assess and evaluate the potential environmental, social, and economic impacts of a proposed project, plan, or development. The specific purposes of an EIA report are as follows:

- Identification and Assessment of Impacts
- Informed Decision-Making
- Mitigation and Risk Reduction
- Public Participation
- Legal and Regulatory Compliance
- Baseline Data Collection
- Sustainable Development
- Cumulative Effects Analysis
- Risk Assessment
- Feedback and Improvement

In summary, the EIA report is a comprehensive document that plays a critical role in ensuring that development projects are conducted in an environmentally, socially, and economically responsible manner. It helps decision-makers, project proponents, and the public understand the potential consequences of proposed projects and make informed decisions to minimize negative impacts and enhance sustainable development.

1.4 IDENTIFICATION OF THE PROJECT & PROJECT PROPONENT

1.4.1 IDENTIFICATIONS OF THE PROJECT

It is a proposed Bulk Drug Park to be established at Villages Kuthar Beet, Pollian Beet, Tibbian, Jodian, Janani and Mulluwal, Tehsil Haroli, District Una, Himachal Pradesh. Plot area of the project is 1,405.41 acres (or 568.75 Ha) has been allotted for establishment of the project; out of which, Govt. land of 1,365.77 acres allotted to Dept. of Industries, Govt. of HP and 39.64

acres of land purchased and transferred to Dept. of Industries, Govt. of HP for setup of the proposed industrial park. Dept. of Industries, Govt. of HP is nodal agency to coordinate and supervise the project development activities.

1.4.2 PROJECT PROPONENT

As per the clause 7 of the Bulk Drug Park scheme, the State Government has decided to set up dedicated State Implementing Agency (SIA) named the "Himachal Pradesh Bulk Drug Park Infrastructure Ltd. (HPBDPIL)" which is formed under section 8 of the Company Act, 2013 and a govt. own agency under the aegis of Department of Industries, Govt. of Himachal Pradesh. SIA will form a management committee for monitoring, operation and maintenance of the park after the completion of the park.

1.4.3 NATURE OF THE PROJECT

The proposed project comprises of 110 industrial plots in 558.28 Acre of land will be allotted to API manufacturing units involved in the production based on chemical synthesis. Apart from this, 95.02 Acres for commercial and remaining will be developed under roads, green, common facilities etc.

The proposed project falls in Category 'A' under Schedule 7(c) - 'Industrial estates/ parks/ complexes/ areas, export processing Zones (EPZs), Special Economic Zones (SEZs), Biotech Parks, Leather Complexes' as per EIA Notification, 2006 and its amendment thereof as the proposed Industrial estate has area greater than 500 hectares. Also, the project is located within 5 km of inter-State boundaries of Punjab and Himachal Pradesh, as Punjab and Himachal Pradesh Border is located at a distance of approx. 100 m from project site.

1.4.4 SIZE OF THE PROJECT

The plot area of the project is 1,405.41 acres (or 568.75 Ha); out of which, Govt. land of 1,365.77 acres was allotted to Dept. of Industries, Govt. of HP and 39.64 acres of land purchased and transferred to Dept. of Industries, Govt. of HP for setup of the proposed industrial park. Copy of the layout/master plan of proposed project is enclosed as Annexure 1.

1.4.5 LOCATION OF THE PROJECT

Bulk Drug Park site is proposed at Villages Kuthar Beet, Pollian Beet, Tibbian, Jodian, Janani and Mulluwal, Tehsil Haroli, District Una, Himachal Pradesh.

The proposed site is well connected as described in the table below:

Table 1.1 Connectivity of the proposed project

Nearest Highways	The site is accessible through Una-Jaijon Road. The proposed site has easy connectivity to the National Highways; NH-503A at a distance of approx. 10 km in 'N' direction, NH-503 at a distance of 15.5 km in 'W' direction and NH-103 A at a distance of approx. 9.5 km in 'W' direction.
Nearest Railway Station	Jaijon Doaba Railway Station: Approx. 2 km, in 'W' direction.
Nearest Airport	Adhampur Airport, Jalandhar: Approx. 38 km, in WN direction

1.4.6 IMPORTANCE TO THE COUNTRY

Drugs play a vital role in healthcare delivery in the country. A continuous supply of drugs is necessary to ensure affordable healthcare delivery to the citizens. Indian pharmaceutical industry is the 3rd largest in the world by volume and 14th largest in terms of value. However, despite these achievements, India is significantly dependent on the import of some of the basic raw materials, viz., bulk drugs that are used to produce the finished dosage formulations. India imports bulk drugs largely for economic considerations.

According to the vision & approach of Central Govt., the major focus is on the term of making India "Aatamnirbhar Bharat" and in this line, the Central Govt. has chalked out major industrial projects, which in turn will minimize or eliminate the need of the import from the neighbouring countries. As such, this project is also an ambitious project of the Central/State Govt.

Indian Government is promoting industrial development through various Institutions, schemes and policy re-structuring. The Department of Pharmaceuticals (DoP), Ministry of Chemical and Fertilizer, Government of India (GoI) has notified Guideline of the Scheme "Promotion of Bulk Drug Parks" in March, 2020. Under the scheme, a one-time grant-in-aid subject to a maximum limit of Rs. 1,000 Crores or 90% of the project cost in case of Hilly States will be given for the development of common infrastructure facilities with the objective to significantly bring down the manufacturing cost of bulk drugs and thereby increase the competitiveness of the domestic bulk drug industry by providing easy access to standards

testing & infrastructure facilities. A total of 3 Bulk Drug Parks were to be selected across the country under the scheme, Haroli bulk drug park is one of them. Himachal Pradesh is acknowledged as one of the preferred investment destinations in the country, offering immense investment opportunities across sectors. The State Government is consistently focused on accelerating the momentum of Industrial growth as industrial progress will enhance employment opportunities for the youth and further improve the socio-economic status of the people of the State.

The project is intended to facilitate development of:

1. A well-planned and resource-efficient industrial base
2. World-class sustainable connectivity infrastructure

Following are the benefit of establishment of the project to the region and industries:

1. Better upstream and downstream linkage
2. Faster turnaround time for product to reach the target market
3. Industrial Innovation
4. Manufacturing growth
5. Employment generation
6. Resource security to states coming within its influence region
7. Apart from the above-mentioned direct benefits, this project will also bring out numerous in-direct benefits, especially in transport and auxiliary sectors.

The availability of world-class infrastructure along BDP shall enable increased investments in manufacturing and industrial activity in Himachal Pradesh and neighbouring states and sub-regions.

1.5 SCOPE OF THE STUDY

This study contains information on the various Environmental factors viz-a-viz contribution of pollution by the unit after establishment. These factors include air, water, noise, health, socio economic, land use and agricultural pattern etc. It discusses the predicted impact of the plant activities on these factors. Broadly under the scope it is envisaged:

- To assess the present status of air, water, land, noise, biological & socio economic components of environment.

- To identify, quantify & evaluate positive or negative impacts of various operations on different environmental components.
- To evaluate proposed pollution control measures and to suggest additional control strategies, if any, to mitigate the adverse effects.
- To identify risk factors & suggest their mitigation including occupational health of the workers.
- To prepare Environmental Management Plan for utilization and adoption of safety measures.
- To delineate future Environmental quality monitoring programme.
- To identify the needs of the study area and suggest supportive measures under Corporate Social Responsibility

1.6 METHODOLOGY

Various steps involved in Environmental Impact Assessment study of the project are divided into the following phases:

- Identification of significant environmental parameters and study of the existing status of air, water, noise, soil and socio economic components of the environment.
- Study of the various activities of the proposed project during operational phase and to identify the area leading to impact/change in environmental quality.
- Identification/prediction of impacts for the identified activities and to study levels of impacts on various environmental components.
- Evaluation of final levels of various parameters after superimposing the predicted impacts over the baseline quality.
- Formulation of Environmental Management Plan for implementation in the project after establishment.

The baseline monitoring has been done from period April to June, 2023 at ten locations within 10km study area of the project including project site by NABL and MoEF&CC approved laboratory. Data is collected to determine the existing conditions of various environmental attributes.

1.7 COMPONENTS OF EIA

Depending on nature, location and scale of the project, EIA report contains the following components:

- Air Environment
- Noise Environment
- Water Environment
- Biological Environment
- Land Environment
- Socio-Economic and Health Environment
- Risk Assessment
- Environment Management Plan

1.7.1 EIA CYCLE AND PROCEDURE

EIA process as per EIA Notification, 2006 and its amendments is made up of the following phases:

- Screening
- Scoping
- Public Hearing
- Appraisal
- Monitoring the clearance conditions (post project six monthly compliances)

1.8 STRUCTURE OF THE REPORT

The entire EIA report is prepared based on the generic structure of EIA document given at APPENDIX III of the Notification No. S.O. 1533 dated 14th September, 2006 and its amendments. The report has been divided into twelve chapters as described below:

1.9 LAWS APPLICABLE TO THE PROJECT

The Acts, Notifications, Rules and Amendments applicable for establishment of Bulk Drug Park and its operation includes the following:

Table 1.2 List of Act, Notifications, Rules and Amendments applicable to project

S. No.	Acts, Notifications, Rules and Amendments	Applicability

1.	The Water (Prevention & Control of Pollution) Act, 1974/ Rules, 1975	Consent to Establish & Consent to Operate from PPCB
2.	The Air (Prevention & Control of Pollution) Act, 1981/ Rules, 1982	Consent to Establish & Consent to Operate from PPCB
3.	The Environment (Protection) Act, 1986/ Rules, 1986	Umbrella of all Environment Acts & Rules
4.	The Environmental Impact Assessment (EIA) Notification, 2006 & its amendments.	Environmental Clearance from SEIAA, Punjab
5.	Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 and amendments thereof.	Agreement with authorized recycler. Hazardous Waste Authorization from PPCB
6.	Plastic Waste Management Rules, 2016 and amendments thereof	Management of Plastic waste
7.	Bio-Medical Waste Management Rules, 2016	Management of Bio-medical waste
8.	Solid Waste Management Rules, 2016	Management of Solid waste within the project premises
9.	E-Waste (Management) Rules, 2016 and amendment Rules, 2018	Management of E-waste through authorized recycler
10.	Construction & Demolition Waste Management Rules, 2016	Management of Construction waste to authorized site
11.	Noise Pollution (Regulation and Control) Rules, 2000 and its amendments	Monitoring of ambient noise/source noise as well as proposing suitable mitigation measures to abate noise
12.	The Factory Act, 1948 (as amended till 1987)	Approval, licensing and registration of factories
13.	The Public Liability Insurance Act, 1991 & Rules, 1991	Covers health and safety of workers.
14.	Punjab Groundwater Extraction and Conservation Directions, 2023	Permission for abstraction of ground water

15.	The Forest Conservation Act, 1980	Forest Clearance for approach road or forest land involved, if applicable
16.	The Wildlife Protection Act, 1972	Wildlife Clearance, if applicable
17.	Himachal Pradesh Factory Rules, 1950	Approval, licensing and registration of factories

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CHAPTER 2

PROJECT DESCRIPTION

2.1 PROJECT DESCRIPTION

This chapter highlights the proposed features of the Bulk Drug Park, its layout and design, details of common infrastructure facilities, utilities and services, and sources of water, waste generation, their quantity, treatment and disposal of waste etc.

2.2 TYPE OF PROJECT AND CAPACITY

The total area of the proposed Bulk Drug Park is 1405.416 Acres (56,87,517 sq. m.) and the estimated cost of the project is 1923 Crore includes 1,638.46 Crores for Common Infrastructure Facilities (CIF) and 284.54 Crores for Development Cost. The whole project is being developed on the lines of area development projects i.e. the project is to be established in totality as an umbrella project which will have individual units to be developed by individual entities. All services, utilities, axillary, logistics, pollution abatement measures, waste management and power etc. will be provide on centralizes basis. This project will be developed on "end to end "basis and there will be no vendors or interlinked entities.

2.3 NEED FOR THE PROJECT

The pharma sector at present is dependent on the import sector up to the large extent, chiefly from China. It's a known fact that China is a hostile country, therefore the dependency on the said country if reduced or eliminated, better it will be, in the National interest. Further, the Indian Govt. has initiated a noble concept of **"Aatmanirbhar Bharat"** and this project will negate the need of import from the neighbouring countries to certain effects, will add to the self-sufficiency of the country. Hence, the project is the need of the hour and deserves all the encouragement and facilitation for implementation, to promote technologies and industry for Environment Management.

As such this project may be considered in true earnest and forward looking spirits.

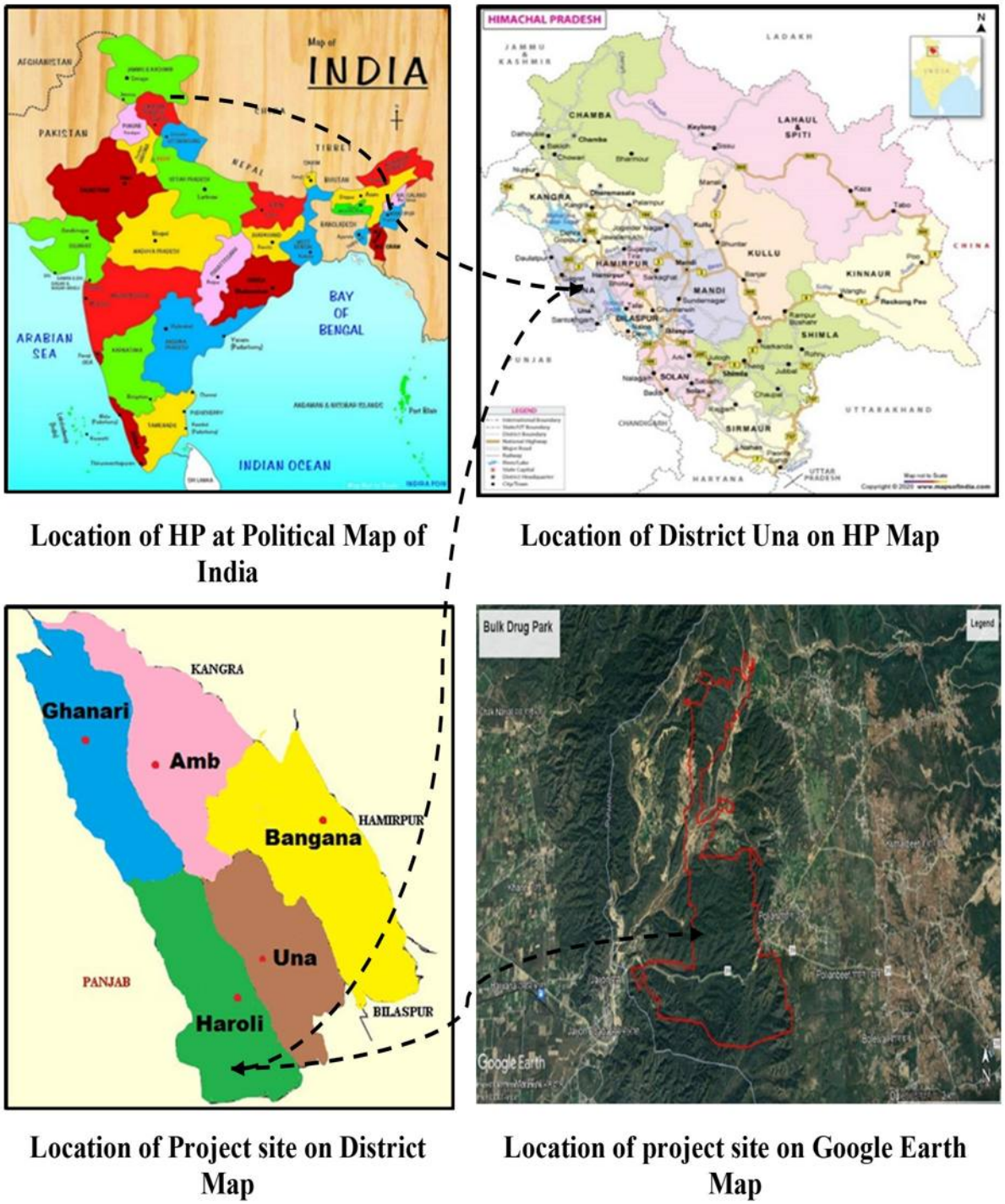
2.4 LOCATION OF PROJECT

Bulk Drug Park site is proposed in Villages Kuthar Beet, Pollian Beet, Tibbian, Jodian, Janani and Mulluwal, Tehsil Haroli, District Una, Himachal Pradesh. The proposed site is accessible through Una-Jaijon. Location of the project site is given below in **Fig. 2.1.** Project location

and its study area falls in the Survey of India, Toposheet No**. H43K2 & H43K6**. **Fig. 2.2** and boundary co-ordinates of the project site are given in **Table 2.1** below:

Table 2.1. Boundary Co-ordinates of the Project

Corners	Latitude	Longitude	Corners	Latitude	Longitude
1	N31° 20' 45.24"	E76° 11' 14.64"	**22**	N31° 23' 27.96"	E76° 10' 38.64"
2	N31° 20' 38.76"	E76° 10' 40.8"	**23**	N31° 23' 19.32"	E76° 10' 48.00"
3	N31° 20' 39.84"	E76° 10' 19.56"	**24**	N31° 23' 6.36"	E76° 10' 42.24"
4	N31° 20' 48.12"	E76° 10' 6.24"	**25**	N31° 22' 58.44"	E76° 10' 35.04"
5	N31° 20' 50.64"	E76° 9' 33.48"	**26**	N31° 22' 50.52"	E76° 10' 23.16"
6	N31° 20' 56.4"	E76° 9' 30.96"	**27**	N31° 22' 42.96"	E76° 10' 21.36"
7	N31° 21' 5.76"	E76° 9' 23.76"	**28**	N31° 22' 31.8"	E76° 10' 3.00"
8	N31° 21' 1.08"	E76° 9' 18.36"	**29**	N31° 22' 13.08"	E76° 10' 1.20"
9	N31° 21' 9.72"	E76° 9' 12.24"	**30**	N31° 22' 21.36"	E76° 10' 18.48"
10	N31° 21' 12.24"	E76° 9' 26.28"	**31**	N31° 22' 15.6"	E76° 10' 31.8"
11	N31° 21' 9.36"	E76° 10' 0.84"	**32**	N31° 22' 5.88"	E76° 10' 14.88"
12	N31° 21' 35.28"	E76° 9' 55.8"	**33**	N31° 21' 55.08"	E76° 10' 3.36"
13	N31° 21' 50.04"	E76° 9' 56.52"	**34**	N31° 21' 56.52"	E76° 10' 32.52"
14	N31° 22' 15.24"	E76° 9' 50.4"	**35**	N31° 21' 52.2"	E76° 10' 53.04"
15	N31° 22' 35.4"	E76° 9' 53.64"	**36**	N31° 21' 57.96"	E76° 10' 44.04"
16	N31° 23' 4.92"	E76° 9' 48.96"	**37**	N31° 21' 46.08"	E76° 10' 48.36"
17	N31° 23' 2.4"	E76° 10' 4.44"	**38**	N31° 21' 34.92"	E76° 10' 49.8"
18	N31° 23' 18.24"	E76° 10' 4.08"	**39**	N31° 21' 27"	E76° 10' 46.2"
19	N31° 23' 14.28"	E76° 10' 18.48"	**40**	N31° 21' 14.04"	E76° 10' 49.44"
20	N31° 23' 10.32"	E76° 10' 25.68"	**41**	N31° 21' 12.96"	E76° 11' 5.28"
21	N31° 23' 20.04"	E76° 10' 30.72"	**42**	N31° 20' 54.96"	E76° 11' 13.2"



Location of HP at Political Map of India

Location of District Una on HP Map

Location of Project site on District Map

Location of project site on Google Earth Map

Figure 2.1. Location map of the project

Table2.2. Location details of the project

S. No.	Pariculars	Details within 10 km
1.	**Location**	
	Place	Village - Kuthar Beet, Pollian Beet, Tibbian, Jodian, Janani and Malluwal.
	Tehsil	Haroli
	District	Una
	State	Himachal Pradesh
2.	**Elevation**	Approx. elevation range of the entire project lies 390 - 590 m above measn sea level (msl)
3.	**Nearest Highway**	MDR-39: passing through project site NH-103: approx. 9.5 km NH-503A: approx. 10 km NH-503: approx. 15.5 km
4.	**Nearest Railway Station**	Jaijon Doaba Railway Station: approx. 2 km
5.	**Nearest Airport**	Adhampur Airport: approx. 38 km
6.	**Nearest town:**	Haroli: approx 6.5 km in 'NE' direction
7.	**District Headquarters DC Office Una:**	approx. 11.25 km in 'NE' direction
8.	**Features within 10 km**	
	Defence installations	Nill
	Archeological Important Places	Nill
	Wild life Sancturies	Nill
	Reserved/Protecteed Forest	a. Polian Shamlat Reserve forest b. Kangar Protective Forest
	Industries	
	Canal	Nill
	Hill Ranges	Shivalik Range

	State Boundary	Punjab-Himachal State boundary present within 0.1 km of the proposed project

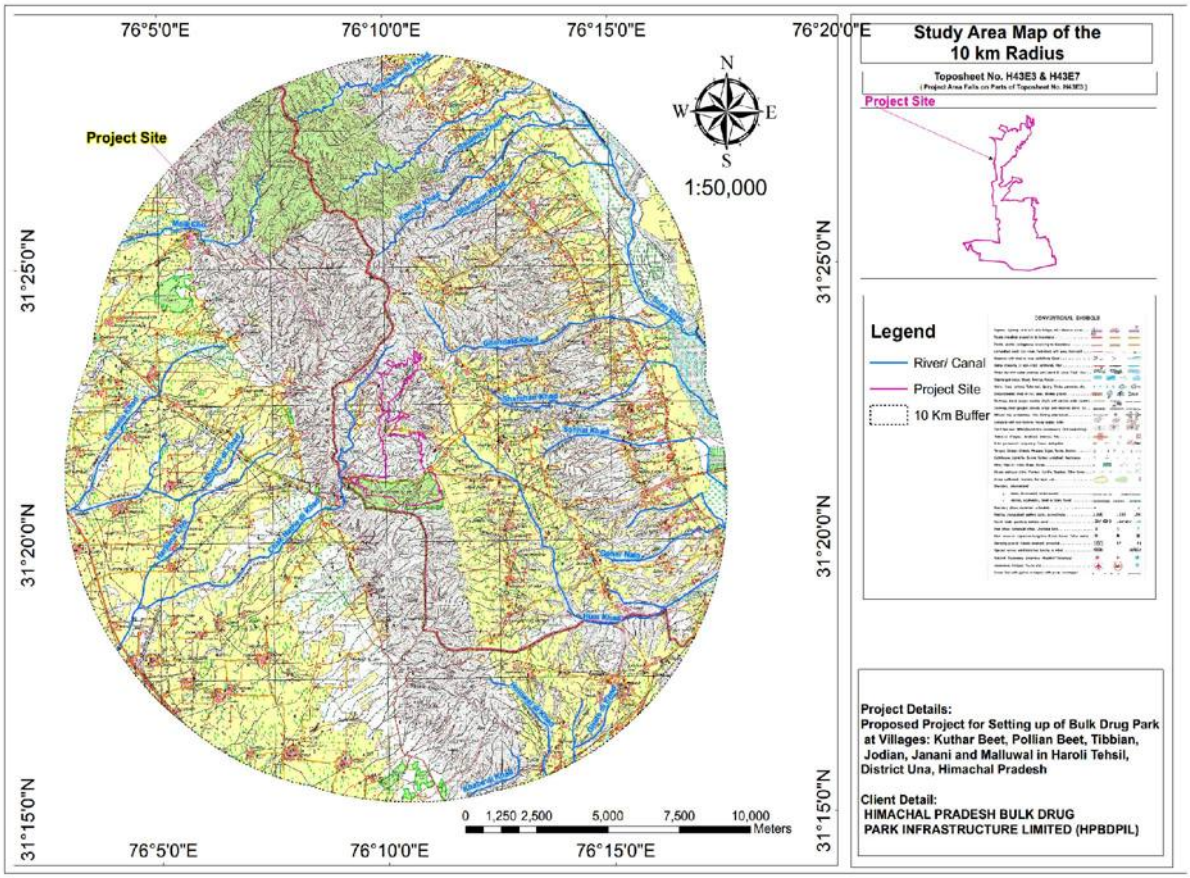


Figure 2.2. Delineation of project site on Toposheet along with 10 km buffer

Table 2.2. Environmental sensitive places within study area

	Environmental Sensitivity		
S. No.	**Areas**	**Name/ Identity**	**Aerial distance (within 10 km) Proposed project boundary**
1	Areas protected under international conventions, national or local legislation for their ecological, landscape, cultural or other related value	No such areas present within 10 km of the unit	--

2	Areas which are important or sensitive for ecological reasons - Wetlands, watercourses or other water bodies, coastal zone, biospheres, mountains, forests	**Water Bodies** Soan/Swan River Panjoianwala Khad (Seasonal) Raamsar Pond **Forests** Polian Shamlat RF Kangar PF	 Approx. 8 km in NE direction 0 km (within project site) Approx. 2.5 km E Adjoining to the project boundary
3	Areas used by protected, important or sensitive species of flora or fauna for breeding, nesting, foraging, resting, over wintering, migration	Polian Shamlat RF Kangar PF	Approx. 2.5 km E Adjoining to the project boundary
4	Inland, coastal, marine or underground waters	Yes	Underground water exists.
5	State, National boundaries	Punjab-HP border	100 m
6	Routes or facilities used by the public for access to recreation or other tourist, pilgrim areas	Una Jaijon Road (MDR 39)	Passing through the project site
7	Defense installations	No defense installation present within 10 km of the unit	--
8	Densely populated or built-up area	Haroli Una	Approx. 6 km NE Approx. 12 km NE
9	Areas occupied by sensitive man-made land uses (hospitals, schools, places of worship, community facilities)	**<u>Schools:</u>** Govt. Primary School, Malluwal Govt. Primary School, Dulehr Govt. Primary School, Haleran Ajanta Public High School Laluwal Dharampur Primary School Kukran School **<u>Colleges:</u>** Degree College Khad	 Approx. 0.88 km E Approx. 2.1 km, SE Approx. 2.5 km, E Approx. 2.5 km, E Approx. 6.0 km, NE Approx. 6.3 km, SW Approx. 14.55 km, N

		Temples/Gurudwara: Lakh Data Peer Mandir Peer Baba Temple Vankhandi Mata Mandir Gurudwara Singh Sahab Shaheeda da Gurudwara Sahib, Mahilpur Gurudwara Shri Gupalah Sahib Ji Patshahi Dasvin **Hospitals:** Community Health Centre, Dulehr Civil Hospital, Haroli Community Health Centre Bhadsali Nanda Multi Specialty Hospital, Una	 Approx. 0.1 km, N Approx. 6.6.km, NE Approx. 8.15 km, N Approx. 3.9 km, SE Approx. 10 km, W Approx. 10.5 km, EW Approx. 2.4 km NE Approx. 6.2 km NE Approx. 9.85 km, N Approx. 13.2 km, NE
10	Areas containing important, high quality or scarce resources (ground water resources, surface resources, forestry, agriculture, fisheries, tourism, minerals)	No such areas present within 10 km of the unit.	--
11	Areas already subjected to pollution or environmental damage (those where existing legal environmental standards are exceeded)	No such areas present within 10 km of the unit.	--
12	Areas susceptible to natural hazard which could cause the project to present environmental problems (*earthquakes, subsidence, landslides, erosion, flooding or extreme or adverse climatic conditions).*	No	The project falls under the zone IV as per the Seismic Zone Map of India. There are no possibilities of earthquakes, subsidence, landslides, erosion, flooding or extreme or adverse climatic conditions at project location & its study area as per records available.

(Source: Toposheet of the 10 km study area)

Project and its study area falls in the Survey of India, Toposheet No. **H43E3 (53A/3), H43E7 (53A/7)** and is attached along as **Drawing 1**.

2.5 PROJECT SIZE AND MAGNITUDE OF OPERATION

HPSBDPIL, Dept. of Industries, Govt. of HP is a nodal agency coordinating and supervising project development activities. HPBDPIL will be involved in the development of the proposed industrial estate, which will house API manufacturing industries based on the chemical synthesis only (Approx. 70-80 industrial units in the 110 industrial plots). The upcoming industries in the park will be in the pharma sector and mostly in large scale categories. The project as a whole also comes under the large scale category. Area Statement is given as table below:

Table 2.4. Area bifurcation of the proposed Bulk Drug Park

Sr. No.	Description	Area in Acres	Area in Ha	Percentage (%)
1.	Industrial Plot Area	558.28	225.93	39.72
2.	Commercial Plot Area	95.02	38.45	6.76
3.	Electric Substation	23.37	9.46	1.66
4.	Utility Area	41.65	16.86	2.96
5.	TSDF Area	29.46	11.92	2.10
6.	Parking Area	18.46	7.47	1.31
7.	Green Area and Green Area Under Industrial Plots	465.18	188.25	33.09
8.	Waste Treatment Facilities Area (STP /ETP /MEE & WTP)	41.08	16.62	2.92
9.	Common Logistic Area	18.90	7.65	1.34
10.	Roads	86.45	34.98	6.15
11.	Water Bodies	27.28	11.04	1.94
12.	Other	0.30	0.12	0.02%
	Total Area	**1405.41**	**568.75**	**100%**

(Source: Layout plan of the project)

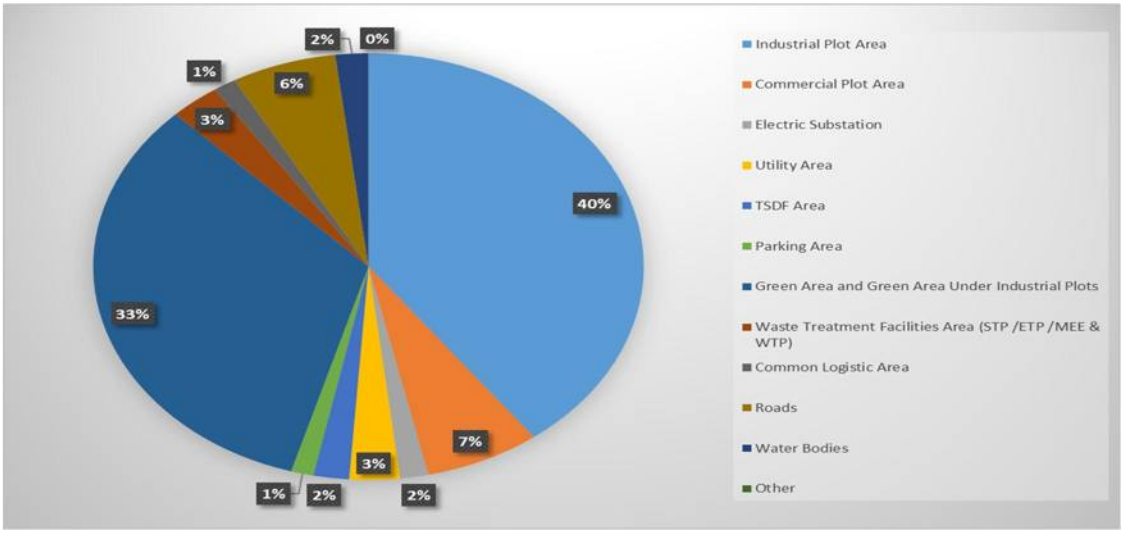


Figure 2.3. Area statement of project

2.6 PROPOSED SCHEDULE FOR APPROVAL AND IMPLEMENTATION

The project schedule is given below:

Environmental Baseline Monitoring	April, 2023 to June,2023 (12 weeks)
Submission of Form-I/PFR for issuance of TOR's	25th October, 2023
ADS raised	29th November, 2023
ToR Granted	1st August, 2024

Construction work for the project would start subsequent to receipt of Environmental Clearance (EC) from MoEF&CC and Consent to Establish (CTE) from State Pollution Control Board (HPSPCB). Tentatively, work is expected to start and likely to be commissioned within 12 months after receipt of all the clearance from different statutory authorities.

2.7 TECHNOLOGY AND PROCESS DESCRIPTION

The Master Plan Layout is prepared in such a way that it resembles an appropriate sense of dignity and decorum, accommodate both short- and long-term space needs, and contribute to the effective administration of justice by providing physical facilities that are appropriate for current practices, as well as being able to accommodate changes in procedures, operations, and policies. The Master Plan for Bulk Drug Park has evolved from a comprehensive understanding of the existing situation, market trends, infrastructure availability, best practices & success factors, existing Building guidelines and Development Control Regulations, scale of development with project development phasing strategy.

Keeping the same approach and planning principals in mind, the layout design and concept of the Bulk Drug Park was visualised with basic primary guiding factors. Conceptual plan for the park was designed on the basis of the program brief, with a view to implement the desired design principles and to test the workability and feasibility of achieving the project objectives.

Development of layout plan at conceptual level helped envisage physical manifestations of the vision and program brief proposed for the Project Area. In order to arrive at the most suitable layout plan, various options were prepared and compared to see the most relevant option of development in terms of road network and other uses. Different widths of roads were proposed throughout the process of the mapping.

The project will implement the proven technologies in the R&D for the cost effective & environment friendly practices.

2.8 AREA STATEMENT, PROJECT LAYOUTS AND COMPONENTS

Bulk Drug Park is a new project proposed at village Kuthar Beet, Pollian Beet, Tibbian, Jodian, Janani and Malluwal, Tehsil- Haroli, District Una, Himachal Pradesh by M/s Himachal Pradesh Bulk Drug Park Infrastructure limited (HPBDPIL).

The design brief specifies the provision of all plots with supporting physical and common infrastructure. Various infrastructure components planned in the park are presented in the table below:

Sr. No.	Infrastructure	Components
1	Common Infrastructure Facilities	• Central Effluent Treatment Plant (CETP) with Zero Liquid Discharge (ZLD) • Solid Waste Management (SWM) (50000 Tons per Annum) • Storm Water Drains Networks • Common Solvent Storage System • Common Warehouse • Power • Raw Portable and Demineralized Water • Steam Generation and Distribution

Sr. No.	Infrastructure	Components
		• Internal Road and Compound Wall • Advanced Laboratory Testing Centre • Emergency Response Centre • Safety/ Hazardous Operations Audit Centre • Centre of Excellence
2	Other Infrastructure	• Administrative Block • Rain shelter/bus stop • Canteen Block • Fire Station • Guest House • Duct for Cable/Wire • Pedestrian Path • Green Cover • Helipad • Site Development Works

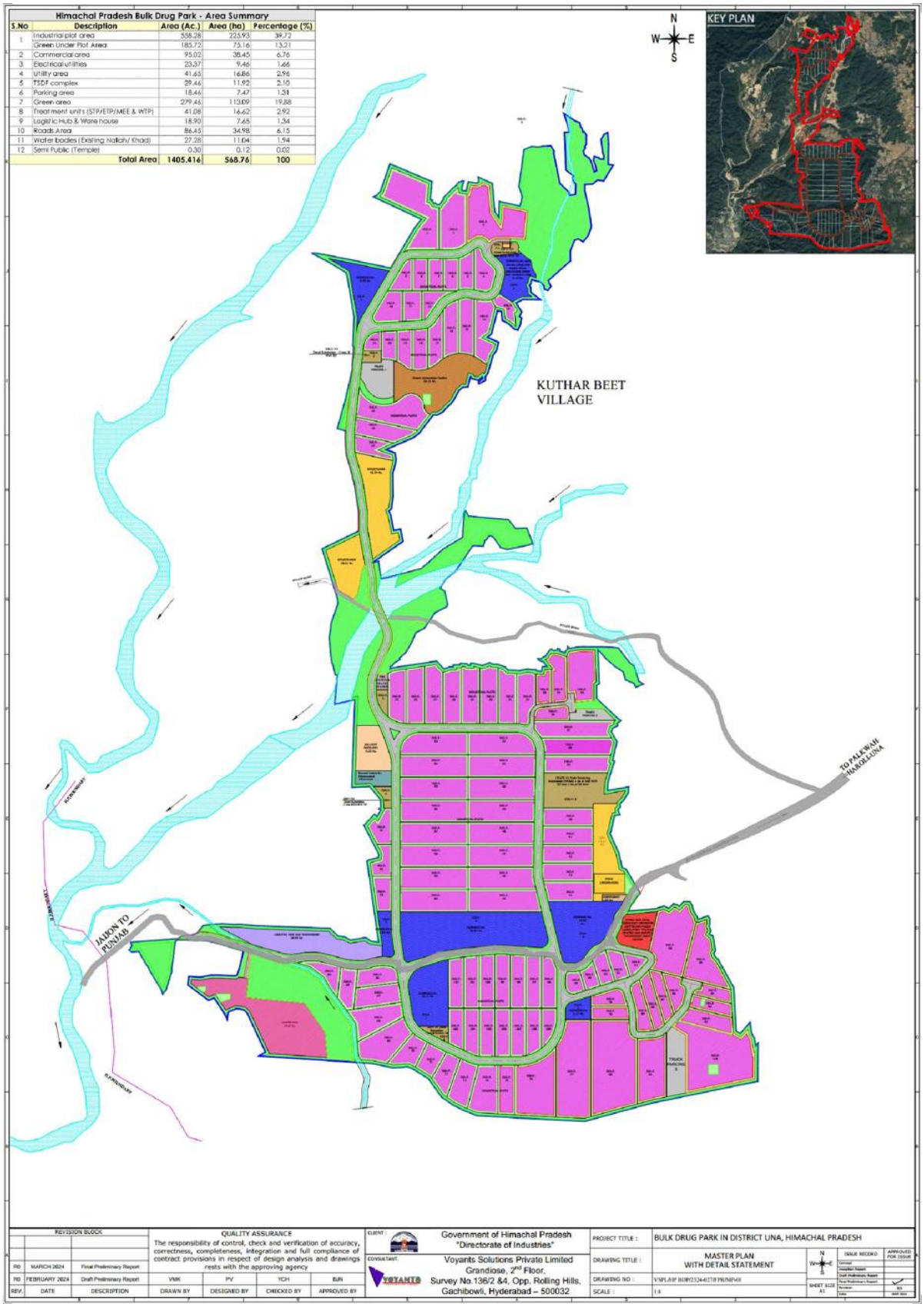


Figure 2.4. Detailed project layout with delineation of project components

2.8.1. Industries to be established in BDP

The proposed project comprises of 110 industrial plots in 558.28 Acre of land will be allotted to API manufacturing units (Approx. 70-80 industrial units) involved in the production based on chemical synthesis. The upcoming industries in the park will be in the pharma sector and mostly in large scale categories (Bulk Drug manufacturing units). The project as a whole also comes under the large scale category.

2.8.2. Employment assessment

A manpower of 2500 to 3000 persons will be employed during the construction phase. The proposed employment is projected for the entire bulk drug park, with a worker density of 120 employees/Ha. Out of the total area of 558.28 ha, nearly 225.93 Ha. will be occupied under the industrial and commercial activities. As such, an employment opportunity for approx. 40,000 no. of employees will be generated.

2.8.3. Population calculation

Apart from this direct employment, there will be numerous number of persons with indirect employment will be connected with this project. The exact number of such persons cannot be assessed at this stage; as such kind of employment/job work activities come from the informal/unorganized sectors. However, for the calculation of waste generation and other related entities/activities, a floating population of 10% of direct employees has been considered, thus arriving at the total population of 44,000 persons.

2.8.4. Project cost

The estimated cost of the project is Rs 1923.00 Cr out which Rs 1638.46 Cr is for Common Infrastructure Facility and Rs 284.54 Cr is for other infrastructure including site Development cost.

The Government of India under the Bulk Drug Park scheme is providing Rs 1000 Cr. for development of Common Infrastructure Facility (CIF). Under the scheme the Government of India will fund maximum of 90% of the total CIF facility proposed.

As the project is funded by the Central and State Govt. on equal and complimentary terms, therefore the project is firmly placed on the economic front. The pharma sector is an ever growing sector with huge gap in demand and supply, therefore the economic viability of the project is never in danger and cannot be doubted in any stage.

2.8.5. Water requirement

Source of water: Groundwater through bore wells (15 Nos.)

Water Requirement: Total water requirement for the proposed project will be 22.1 MLD; out of which 15 MLD will be fresh water demand met from groundwater and 7.1 MLD will be recycled water met from treated water. Breakup of the total water demand is given below:

Table 2.5. Water demand for the proposed Bulk Drug Park

Description	Demand (MLD)	Source
Freshwater Demand (Potable + Process water demand)	15 (2.2+12.8)	Groundwater
Flushing water demand	1.15	Treated water
AC Cooling demand	2.00	Treated water
Horticulture water demand	3.95	Treated water
Total Water Demand	**22.1 MLD**	Ground & treated water

*As an alternative source of water requirement, a comprehensive scheme for the surface water supply has been prepared and the same has been approved by the concerned authority (BBMB). Under this proposal, a dedicated pipeline of approximate 15 Km length will be laid which will supply surface water from the river Satluj to the project. 50 MLD fresh water from the river Satluj will be supplied and the PP has also proposed to provide a dedicated storage tank of capacity 100 MLD to receive surface water and to store the same for the exclusive use in the project. This scheme has been envisaged keeping in view the future expansions and upcoming allied industries as well as the proposed housing schemes in the vicinity.

Once, this scheme gets materialized the ground water abstraction will be ceased and will only act as standby measures. The PP has already paid the seed money to the BBMB for the initiation of this scheme.

Confirmation letter for the abstraction of ground water has also been obtained from Jal Shakti Department, Himachal Pradesh and a copy for the same is attached as **Annexure 4**. The water balance diagram is shown in the **Fig 5.** below.

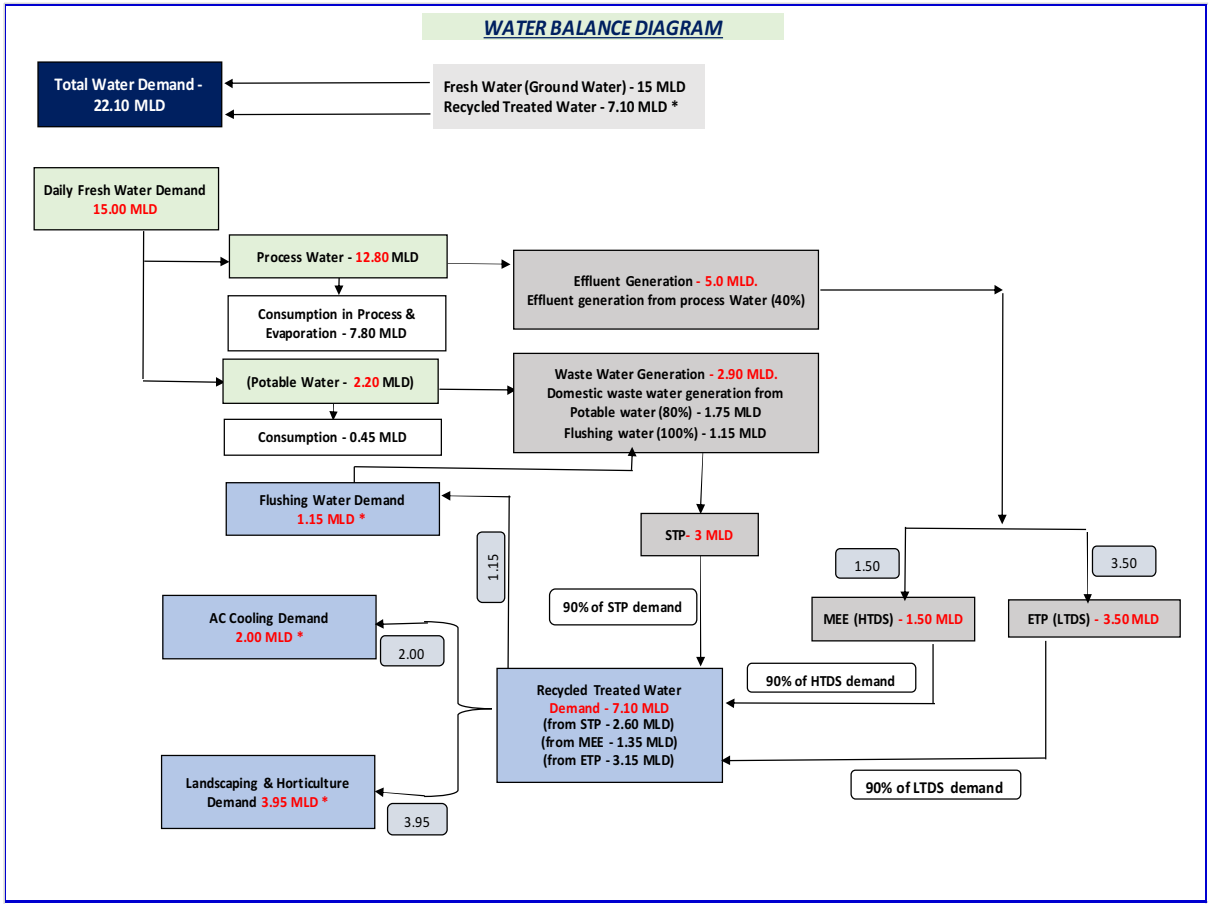


Fig. 2.5 : Water Balance Diagram

2.8.7. Sewage treatment technology (STP)

Common Sewage treatment plant (STP) of capacity 3.0 MLD will be provided within the project. The sewage water will be generated from toilets, bathrooms, canteens and floor washings etc. The sewage water requires treatment in order to meet the standard norms set by the HPSPCB.

This considers various aspects covering the parameters of sewage water (both quality and quantity), scheme & process of treatment, process units involved in the treatment, their specification with commercial terms & conditions.

2.8.8. Common Effluent Treatment Plant (CETP)

1 No. of Common Effluent Treatment Plant of capacity 5 MLD will be provided within the project to treat the industrial effluent to be generated from industrial processes. Treated water available after treatment in CETP is around 90% of total capacity i.e. 4.5 MLD which shall fulfil cooling, landscaping and horticulture water requirement.

2.8.9. Power

Electrical system and supply are one of the most important infra services and plays an important role in attracting prime developers. This section deals with the requirements of electrical power transmission and distribution within the Bulk Drug Park at Una.

Proposed power system

Total power demand for the proposed project will be 120 MW which will be provided by Himachal Pradesh State Electricity Board Limited (HPSEBL).

The total maximum demand load of 120 MVA is to be fed from the Main Receiving substation (MRSS) of 132/33kV voltage level with 5 Nos. 33/11kV Substation, proposed to be constructed inside the project area.

2.8.10. Manpower

Manpower of 2,500 to 3,000 persons will be employed during the construction phase.

Manpower of 44,000 persons will be employed during the operation phase, considering direct and indirect employment.

2.9 DESCRIPTION OF THE ASPECTS OF THE PROJECT LIKELY TO CAUSE ENVIRONMENTAL IMPACT

2.9.1. Domestic wastewater generation and its recycling from STP

The wastewater generation from domestic processes will be approx. 2.9 MLD which will be treated in STP of capacity 3 MLD. The treatment of wastewater with 90% of efficiency of STP, will generated 2.6 MLD of treated water which will be reused for flushing and gardening water requirement.

2.9.2. Process effluent and its recycling from CETP

The effluent generation from industrial processes will be approx. 5 MLD which will be treated in CETP/ETP/MEE of capacity 5 MLD. The treatment of wastewater with 90% of efficiency of CETP/EPT/MEE, will generated 4.5 MLD of treated water which will be reused for flushing and gardening water requirement.

2.9.3. Solid waste

During construction phase

Solid waste generation will be in the tune of @ 0.2 kg per person per day for 3000 persons during construction phase is about 0.6 TPD.

During operation phase

Solid waste of about 8.8 TPD (@ 0.2 kg/capita/day) will be generated. Solid waste will be duly segregated into biodegradable and non-biodegradable components. Separate area will be earmarked for segregation of solid waste. Biodegradable waste will be composted within project premises and recyclable component will be disposed off through authorized recycler vendors. The Solid Waste will be handled/disposed off as per the provision of Solid Waste Management Rules 2016 and its amendments.

2.9.4. Hazardous Waste

The proposed Bulk Drug Park will house API manufacturing units which involves chemical synthesis only. Generation of hazardous waste from API units depends upon type and quantity of production, nature and quantity of raw material used and process and technology to be used for API manufacturing. Generally, it is assumed that about 80 API units during full occupancy of Bulk Drug project with production capacity of 2000-2250 TPD of APIs will generate hazardous wastes in the tune of about 1/3rd of the production, thus a nearly 700-800 TPD of Hazardous Waste of different categories will be generated. Out of the total Hazardous Waste of 700-800 TPD quantum, likely to be generated in the project, nearly 10-12 TPD will be of storage able category (CETP sludge & MEE residue) and 650-800 TPD will be of incinerate-able/co-processing category. These all type of Hazardous Waste will be disposed of with the authorized entities. An integrated TSDF (comprising a secured landfill, a solid-liquid feed incinerator is proposed inside the project for which 33.6 acres of land has been proposed.

For the development of TSDF for the storage-able waste and incinerator for the incinerate-able waste, the separate detailed proposal will be prepared by PP to meet with the requisite as per the EIA Notification, 2006.

2.9.5. Bio-Medical Waste

The source of Bio-Medical Waste generation will be from the health care facilities/activities to be established in the project only. Biomedical waste, approx. 4-5 kg/day is likely to be generated from dispensary & Research Institute for Pharmaceutical Advancement proposed within project which includes minor first aid or medical use of disposable dressing material.

This waste will be disposed through authorized Common Bio-medical Waste Collection and Disposal Agency as per Bio-medical Waste Management Rules, 2016 and its amendments.

2.9.6. E-Waste and Plastic Waste

The quantum of Plastic Waste and E-Waste will be bare minimum in view of the fact that the plastic will be used as packing material only. The raw materials intake will be in the paper based cardboard with lesser involvement of plastic. Similarly, the E-Waste generation will also be on the lesser side during 1st five years as the life of electronic items is much better due to advancement of technology. The exact quantum of both these waste cannot be estimated upfront however, going by the average figures nearly 80 kg/day of Plastic Waste and 4 TPM (i.e., 130 kg/day) of E-Waste is expected to be generated. Both these wastes i.e., E-Waste and Plastic Waste will be handled/ disposed off to the authorized recyclers, strictly as per the provision of the prevailing/relevant Rules.

2.9.7. Effluent:

Construction phase

During construction phase, there will be generation of domestic effluent from workers or labourers. The management & disposal of domestic effluent will be taken care by Construction agency/contractor. It will be ensured by the PP that the executive agency will install skid mounted STP of suitable capacity for the treatment of expected domestic effluent and after treatment the same will be utilized in the construction activity as well as on the existing green belt within the premises. With nearly 3,000 persons involved during construction phase and going by the empirical formulae/prescribed norms, it is expected that 108 KLD of domestic effluent will be generated and for the treatment of the same, the proposed STP will be having a capacity of 120 KLD (2-3 modules of adequate capacity).

Operation phase

The project will house approx. 80 API manufacturing units, which will be of chemical synthesis based and such units consume lesser quantity of water in comparison to the fermentation based API units. On the basis of information collected from existing similar units in the State of Punjab and Himachal Pradesh as well, the average water consumption will be 160 KLD per unit including steam requirements. This figure has been taken purely on the assumption basis, however, the actual consumption may vary upto 10-15% both ways. By this virtue it is expected

that total consumption of fresh water in the process will be 12.8 MLD. Majority of the intake water with either be consumed in the process or will be lost in evaporation. As such there will be generation of wastewater approx. 62.5 KLD by the individual unit. With this analogy, Total Industrial wastewater generation will be 5 MLD which will consist of 1.5 MLD of HTDS and 3.5 MLD of LTDS streams. For the treatment of LTDS process effluents, a Common Effluent Treatment Plant (CETP) of adequate capacity of 5 MLD has been proposed. The CETP treated water will be reused in the allied activities such as cooling, flushing, & irrigation of green belts within the premises. Similarly, 1.5 MLD effluents of HTDS stream will be fed to MEE for its treatment and the recovered supernatant will be consumed in recycling/reuse chain. In the recycling/reuse of treated wastewater, three lines have been proposed e.g. cooling, flushing & irrigation of green belts. The project has sufficient area under green belt to accommodate such disposal of treated wastewater. Nearly 465.18 acres of land has been earmarked under greenbelt within the premises out of which few patches of adequate size will be developed as per K-Tech.

Apart from above a domestic effluent to the quantum of approx. 2.6 MLD will also be generated from the utilities and the human interventions. STP of capacity 3 MLD has been proposed to treat the domestic effluent. The treated wastewater in this domestic line will be utilized in the auxiliary services/activities mainly cooling and irrigation of green belts. Water balance has already been given in Fig. 5 above.

2.10 DESCRIPTION OF MITIGATION MEASURES INCORPORATED INTO THE PROJECT TO MEET ENVIRONMENTAL STANDARDS, ENVIRONMENTAL OPERATING CONDITIONS OR OTHER EIA REQUIREMENTS

Table 2.6: Environmental aspects, impacts and proposed mitigation measures

S. No.	Aspects	Impacts	Proposed Mitigation Measures
1.	Wastewater generation	Water Pollution	Domestic wastewater will be treated in proposed STP of capacity 3.0 MLD and treated water will be reutilized within premises. Industrial effluent will be treated in proposed CETP of capacity 5 MLD.
2.	• Emission of	Air Pollution	• Water sprinkling will be practiced to

	Gases • Dust Emission		control the dust emission. • Vehicles having valid Pollution Under Control Certificate will be permitted. • Individual industry will be responsible for management of emissions generated from their industries. • Trucks carrying construction material are covered with tarpaulin to prevent spreading of dust during transportation.
3.	Noise generation during operation of plant	Noise Pollution	• All noise generating machines will be provided at different places within the cover sheds. • Plantation of more trees within the project premises to control noise pollution and along the boundary wall.
4.	Use of water	Impact on Hydrogeology	Water will be recycled to the best possible extent. No effluent will be discharged directly on to the land.

2.11 ASSESSMENT OF NEW & UNTESTED TECHNOLOGY FOR THE RISK OF TECHNOLOGICAL FAILURE

For the development of the project, the reliable technology of the State of the Art has been proposed which will be approved by the Himachal Pradesh Council for Science, Technology & Environment (HIMCOSTE). Thus, no untested or new technology is proposed for expansion of the unit.

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CHAPTER 3
DESCRIPTION OF THE ENVIRONMENT

3.1 INTRODUCTION

This chapter illustrates the description of existing environmental status of the study area with reference to the major environmental attributes. The existing environmental setting is considered to establish the baseline conditions which are described with respect to physical environment, air environment, water environment, noise environment, traffic pattern and density, land environment, biological environment and socio-economic environment.

Baseline Environmental status in and around the project depicts the existing quality of Air, Noise, Water, Soil, Ecology & Biodiversity and Socio-economic environment. Based on the baseline data, environmental impact assessment is carried out and Environmental Management Plan is prepared. This baseline environmental study reveals information on existing environmental scenario:

- Delineation of project location and study area.
- Delineation of the environmental components and methodology.
- Delineation of study period.
- Delineation of the location of the plant and description of its surroundings based on secondary data.

3.2 STUDY AREA & PERIOD

Baseline Environmental data collection was done for Ambient Air, Noise, Water, Soil, Ecology & Biodiversity and Socio-economic environment from a study area of 10kms comprising core zone (1405 Acres) and buffer zone of the project. Studies of various environmental parameters have been done within the study area of 10kms (core zone and buffer zone) for one season/ three months (April to June 2023). Baseline data for ambient air quality were collected on twice a week frequency and other parameters once a time basis during the study period from each identified locations within the study area of 10 kms (core zone and buffer zone).

Impact identification always commences with collection of baseline data such as Ambient Air Quality, Micro-Meteorology, Ground and Surface Water Quality, Noise levels, Soil Quality, Land use pattern, Biological Environment and Socio-economic aspects and Hydrology within the study

area.

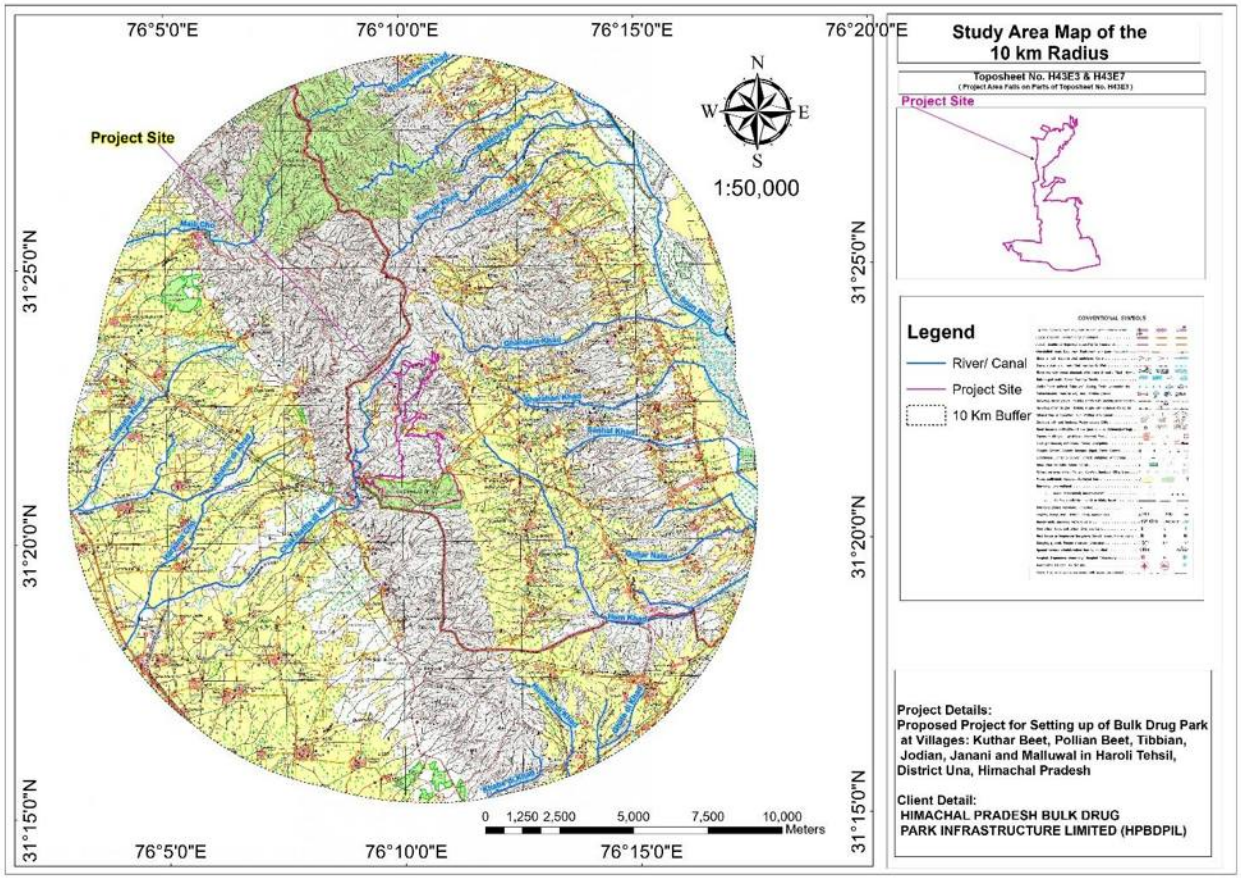


Figure 3.1. Toposheet showing project site along with 10 km radius of study area (Marked on Toposheet No. H43E3 and H43E7; Not on scale)

3.3 COMPONENTS & METHODOLOGY

The baseline data collected from both primary and secondary sources. The baseline information on micro-meteorology, ambient air quality, water quality, noise levels, soil quality and floristic descriptions are largely drawn from the data generated by M/s Eco Paryavaran Laboratories & Consultants Pvt. Ltd., NABL Accredited Lab (Certificate No. TC-11818 enclosed as **Annexure 12**) in accordance with the guidelines issued by MoEF&CC, CPCB and HPSPCB.

Climatological data of the study area of 10 kms were collected for last 10 years (2011-20) from NASA with geo referencing of project coordinates (POWER | Data Access Viewer (nasa.gov). Further, micrometeorological data at project location recorded using automatic weather station (Virtual Hydormat, AWS 10500) before two weeks and during study period. Apart from these,

secondary data collected from Census Handbook, Soil Survey and Land Use Organization, District Industries Centre, Forest Department, Central Ground Water Board (CGWB) etc.

The studies involved conducting field studies and analyzing various parameters that might be affected due to the industry and conducting socio-economic survey among the people.

During reconnaissance survey, the sampling locations identified based on:

- Existing topography and meteorological conditions
- Locations of water intake and waste disposal points
- Location of sensitive receptors (human habilitation and other sensitive areas) present in vicinity of the project
- Representative areas for baseline conditions
- Accessibility for sampling

The scoping and the extent of data were formulated based on interdisciplinary team discussions and professional judgment keeping in view of ToR issued by MoEF&CC.

The baseline studies started with reconnaissance survey and project visits in the study area for fixing the monitoring locations for collection of the primary data.

Various Government and other organizations were approached for getting information for the secondary data. The various parameters surveyed and studied for baseline study are discussed in the following components:

- Physical environment
- Air environment
- Noise environment
- Land environment
- Water environment
- Biological environment
- Socio-economic environment

Data is collected to determine the existing conditions of various environmental attributes. Environmental attributes and frequency of baseline monitoring are outlined in **Table 3.1**.

Table 3.1. Environmental Attributes and Frequency for Baseline Monitoring

S. No.	Attributes	Parameters	Locations/ Frequency/ Source
1.	Ambient Air Quality	PM_{10}, $PM_{2.5}$, NO_2, SO_2, CO, Ozone, NH_3, Benzene, BaP (PAH), VOCs and HCl	Monitoring was carried out at 10 locations at a frequency of twice a week 24 hourly sample for three months /One season from primary sources. Secondary data were also collected from EIA studies/ CPCB/ HPPCB sources and referred for a comparative evaluation of existing air quality in the region.
2.	Meteorology	Wind Speed & Direction, Temperature, Relative Humidity & Rainfall	Meteorological data for last 10 years (2011-20) were collected from secondary authorized sources as NASA (POWER | Data Access Viewer (nasa.gov) and Other EIA studies of the region. Primary source of data as Automatic weather station of Eco lab installed at project site before two weeks and during period of environmental sampling (March to June 2023).
3.	Water quality	Physical, Chemical & Bacteriological parameters	Water samples were collected from 5 Nos. of ground water sources and 4 Nos. of surface water sources at a frequency of once in a season
4.	Ecology	Existing terrestrial and aquatic flora and fauna within 10 km radius	Data collected through field visit at Core and Buffer Zone from Primary & Secondary data at a frequency of once in a season
5.	Noise levels	Noise levels in dB(A)	Noise quality was monitored at four sites (1 location at project area/ core zone and 3 locations in buffer zone within 1 km around the project area/ core zone) at a frequency of once in season for day time and night time from primary sources.

6.	Soil characteristics	Parameters related to potential of land	Soil quality was monitored at five sites (1 location at project area/ core zone and 4 locations in buffer zone) at a frequency of once in season from primary sources and compared with the data of secondary sources as EIA studies conducted in the region.
7.	Land use	Trend of land use change for different categories	Based on data from remote sensing studies (Satellite Imagery) and ground trothing. Data collected from Primary & Secondary sources.
8.	Socio-economic aspects	Socio-Economic characteristic, labor force characteristics	Based on site survey and data from latest published district census handbooks. Data collected at Core and Buffer Zone from primary & secondary sources.
9.	Geology	Geological history	Based on data collected from primary & secondary sources.
10.	Hydrology	Drainage pattern, nature of streams, aquifer characteristics recharge areas	Based on data collected from primary & secondary sources.
11.	Risk assessment and disaster management plan	Identify areas where disaster can occur by fire & explosions and release of toxic substances	Based on assessment.
12.	Existing pollution Aspects	Identification & quantification of pollution sources with respect to air emissions, water effluent and solid waste	Based on assessment

(Source: Technical EIA Guidance Manual for Industrial Estates by MoEF&CC)

3.4 ESTABLISHMENT OF BASELINE FOR VALUED ENVIRONMENTAL COMPONENTS, AS IDENTIFIED IN THE SCOPE

The scope of the study is as per the TOR (Terms of Reference) issued by MoEF&CC vide File No. 10/68/2023-IA.III dated 01st Aug, 2024.

3.4.1 PHYSICAL ENVIRONMENT

3.4.1.1 Topography

Una district is a part of Siwalik range and the Siwalik Hills are located within the political boundaries of Pakistan, India, Nepal, and Bhutan, and range between 6 to 90 km in width. They gradually become steeper and narrower in relief and width respectively, from northern Pakistan to Bhutan (over 2000 km in length). The district is bounded by plains of Punjab in the West and Sola Singhi Dhar (Siwalik Range). The ranges trend in general NW-SE direction and between there is a longitudinal valley of the Soan River. The altitude varies from 300 m to over 1200 m above MSL on Sola Singhi Dhar. The width of the Jaswan Dun Valley ranges from 7 Km to 14 Km and the town of Una, which is nearly in the middle of the Dun valley (Jaswan Valley) is on the elevation of 427 m above MSL. In general, most of the district lies between 600- 900 m elevation and slope is less than 10º.

Ongoing erosion and tectonic activity has greatly affected the topography of the Siwaliks. Associated badlands features include the lack of vegetation, steep slopes, high drainage density, and rapid erosion rates. The monsoon rains temporarily supply seasonal streams (locally known as choes, khads, or nalas) located both within the Siwalik hills and the adjacent duns.

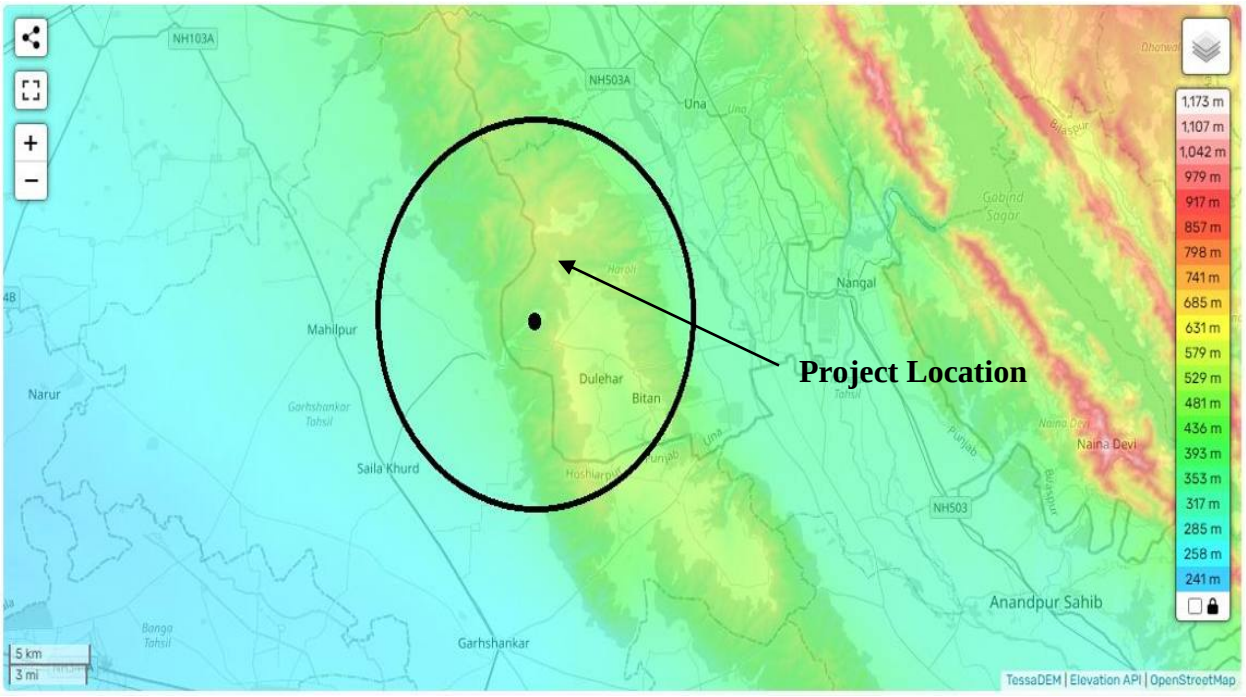


Fig. 3.2: Topographic Elevation Map showing project location and 10 km of Study Area

***(Source**: https://en-in.topographic-map.com/places/61/India/)*

3.4.1.2 Geology

Two general headings can be used to characterize the region's geology. (i) The top, middle, and lower Siwalik formations are located in hilly regions. (ii) The valley's Quaternary sediment composition.

The region is primarily made up of the Tertiary Siwalik formation, which has a narrow longitudinal tectonic valley called Una valley (Fig. 3). From Daulatpur to Santokhgarh, the Una valley stretches. In the vicinity of Dun-Syncline's northern boundary lies a thrust plane known as the Soan Thrust. The remainder of the district is hilly, with the exception of Una Valley. The geological order is listed below.

The younger valley fill deposits are unconsolidated elastic sediments with granular deposits primarily found in clays and clay-boulder beds. They are Pleistocene to Recent in age. Sand, gravel, pebbles, cobbles, and boulders make up the piedmont deposits found in the sub-mountain tracts of the Siwalik Hills. Typically, coarse-grained deposits border the hills and grade into fine-grained aggregates as they approach the Una valley's centre. Clays of different thicknesses are interbedded with the granular strata. Finer elastic sediments, primarily composed of sand, silt, and clay, are primarily found in the low lying areas of the Una Valley, specifically the central portions of the valley and the streams that cross the northern portion of the valley.

Table 3.2. Generalized stratigraphic sequence of the area

Group	Geological Age	Stratigraphic Units	Description
Quaternary	Recent	Alluvium	Sand, gravel, pebble and cobble
	Lower Pleistocene to Recent	Undifferentiated	Sand, gravel, pebble, cobble and soft sandstone
Tertiary	Lower Pliocene to Lower Pleistocene	Upper Siwalik Tertiary	Brownish clay, Conglomerate and shale
	Middle Miocene to Lower Pliocene	Middle Siwalik	Gray sandstone, shale and brownish clay
	Lower Miocene to Middle Miocene	Lower Siwalik	Red and purple sandstone and shale

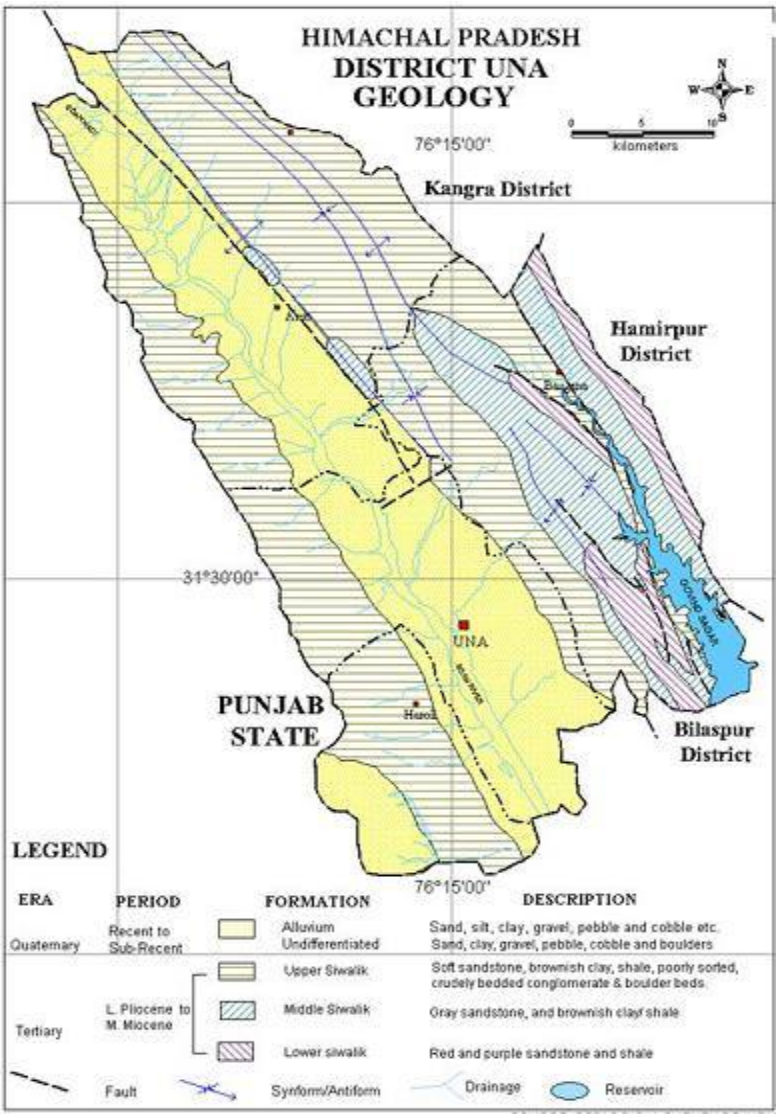


Figure 3.2. Geological and Mineral Map of Punjab marked project location *(Source: Geological Survey of India (GSI)*

The older valley fill deposits, or terraces, are found on the northern slopes of the valley and along the left bank of the Soan River. They are primarily made up of boulders, gravel, and pebbles that are thin clay lenses interspersed throughout. In the Una valley, the terrace formations predate the alluvium of the river. The piedmont deposits, which are made up of sand, pebbles, cobbles, and boulders, are found along the Siwalik Hills' sub. mountain tract.

The indurated sands, sandstones, silts, and brown clays that make up the upper Siwalik rocks are located to the northeast and southeast of the Una valley. Conglomerate beds are also found in some

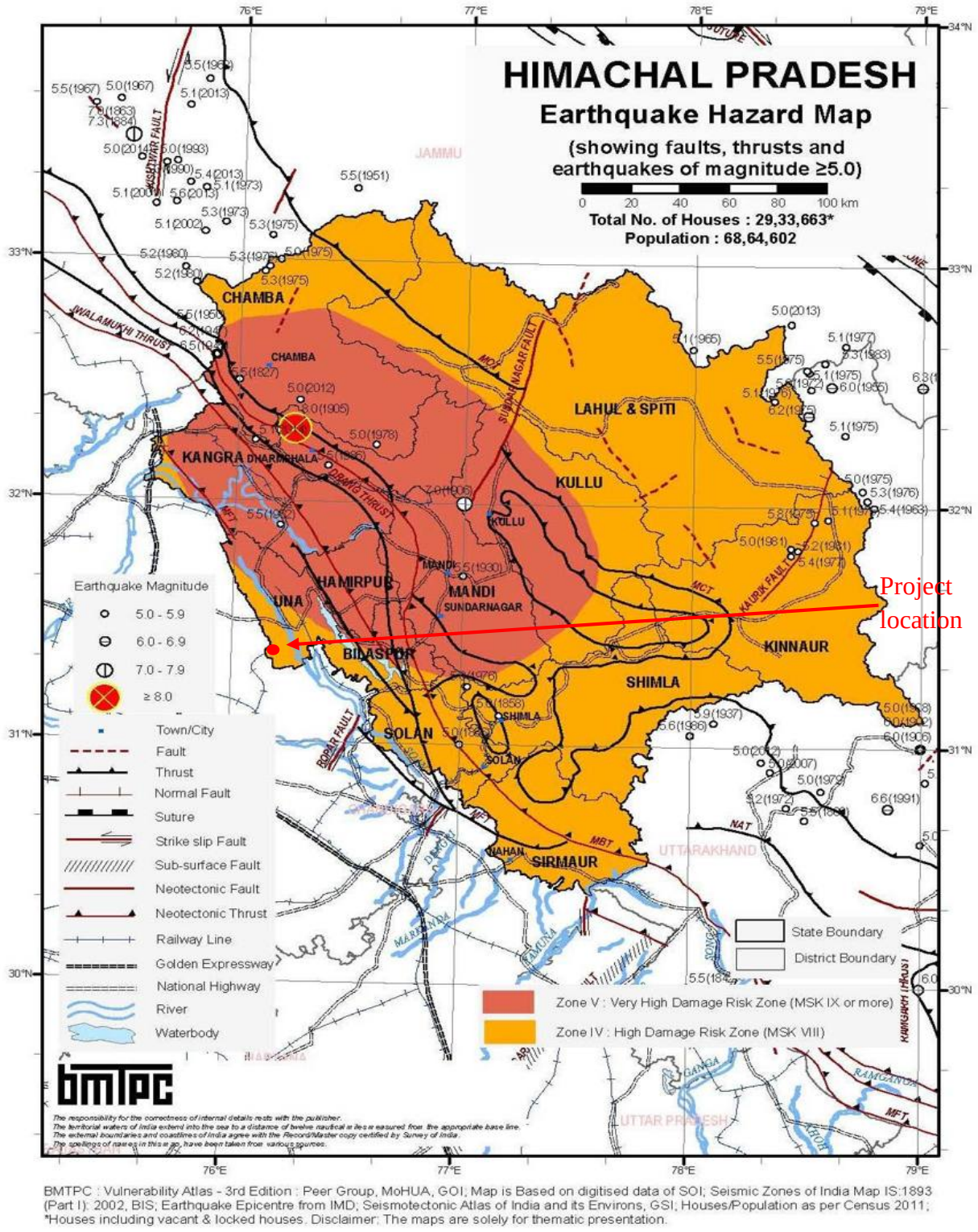
locations. In the northwest region of the region, pebble beds make up the majority of the coarser sediments. The boulder bed, which makes up the uppermost portion in the southern sections, is composed of pebbles, cobbles, and boulders with thin clay beds separating them. The higher Siwalik formations, located north of the valley, are primarily composed of huge sandstone and conglomerate, interspersed with beds of indurate sand and clay. Typically, sandstones are pebbly, soft, and friable.

The middle Siwalik is composed primarily of hard, grey or brown sandstones, with sporadic gravel beds and small amounts of dull shales and orange clays. Two isolated outcrops of middle Siwalik rocks, consisting of massive, medium- to coarse-grained, fairly hard micaceous sands with thin clay intercalations, can be found between Kathaulas-ki-Khad and Panjoa-ki-khad.

Purple shale and hard sandstones with clay nodules make up the lower Siwalik. In most cases, the sandstone creates noticeable strike ridges. Unconsolidated river deposits with boulders, pebbles, cobbles, and gravels combined with clays make up the valley fill. The different khads that are forming on the left bank and joining the Soan, as well as the piedmont and fan deposits, are probably going to show up as possible groundwater horizons.

3.4.1.3 Seismicity

The state of Himachal Pradesh, which is a portion of the Northwest Himalayas, is extremely sensitive in terms of seismic activity. The state has seen several micro and macro earthquakes throughout the past century. Several devastating earthquakes have hit the state and the areas of Punjab, Uttar Pradesh, and J&K that are next to it. A few of the notable earthquakes that shook the state were the Dharamshala earthquake of 1986 (M5.7), the Kinnaur earthquake of 1975 (M=6.7) that claimed 60 lives, and the Kangra earthquake of 1905 (M=8.0) that claimed 18,815 lives. In addition to these significant tremors, the state has seen over 250 earthquakes of magnitude 4.0 and 62 earthquakes of magnitude greater than 5.0. According to the state's earthquake hazard map, the districts of Chamba, Kangra, Mandi, Kullu, Hamirpur, and Bilaspur are particularly vulnerable because they are located in Zone V, or Very High Damage Risk Zone (MSK IX or More), while the remaining areas are located in the High Damage Risk Zone (MSK VIII). (HPSDMA, 2018)



BMTPC : Vulnerability Atlas - 3rd Edition : Peer Group, MoHUA, GOI; Map is Based on digitised data of SOI; Seismic Zones of India Map IS:1893 (Part I): 2002, BIS; Earthquake Epicentre from IMD; Seismotectonic Atlas of India and its Environs, GSI; Houses/Population as per Census 2011; *Houses including vacant & locked houses. Disclaimer: The maps are solely for thematic presentation.

Fig. 3.4: Seismic Map of Himchal Pradesh marked project location (BMTPC, 2019)

3.4.1.4 Meteorological & Climatic Conditions

The climate of different parts of the district depends to some extent on the elevation. The terrain is hilly with elevation below 300 m in valleys and western region and the elevation gently increases by a few hundred meter over the northeastern region of the district. The climate of the district is somewhat like that of the adjoining plains of the Punjab, except for a milder hot season and higher rainfall. The cold season is quite bracing. The year may be divided into four seasons. The period from November to March is the winter season. The next three months, April to June, form the summer season. The following period lasting upto about the middle of September is the southwest monsoon season. The latter half of September and October form the post monsoon or transition period.

Assessment of micro and macro meteorology is important from the point of view of understanding nature of environment. Climate has an important role in build-up of pollution levels. Climatic condition may be classified as moderately or seasonally dry, tropical or temperate savanna climate with four seasons in a year. Winter is critical for air pollution build-up because of frequent calm conditions with temperature inversions resulting in poor atmospheric mixing, natural ventilation and high emission loads. Meteorological data were collected during the study period.

3.4.1.2 Methodology for meteorological data collection:

Meteorological data for last 10 years (2011-20) were collected from secondary authorized sources as NASA ((Source: POWER | Data Access Viewer (nasa.gov)) using geo-referencing of project site coordinates. Further, primary micrometeorological data at project location recorded using automatic weather station during for a period one year (2023) to verify the secondary data record and prevailing meteorological conditions. Hourly data air temperature, barometric pressure, humidity, wind speed, wind direction, rainfall and solar radiation were recorded in data logger of AWS. The met station was kept in an open area at an appropriate height of 10m from the ground. Cloud cover is observed visually.

3.4.1.4.2 Climate

The district has a tropical to moderate climate due to its varied terrain, which includes high hills and plains. The wintertime minimum temperature is 4°C, while the summertime maximum is 46°C.

November marks the beginning of winter, which lasts until the middle of March. After then, the temperature keeps rising until the commencement of the monsoon, which begins the final week of June and lasts until the middle of September.

Both the non-monsoon (winter) and monsoon (June to September) seasons bring rainfall to the region. About 1040 mm of rain falls there on average each year. IMD keeps an eye on three rain gauge stations located in the Una district: Una, Amb, and Bangana.

3.4.1.4 Temperature:

The temperature conditions in the different parts of the district are influenced to a great extent by their elevation and geographical locations. In past 10 years (2011-20), temperature ranged 0°C to 46.2 °C. The period from March to about the end of June is one of continuous increase in temperature and June is the hottest month of the year when the monthly mean of daily maximum temperature is about 38.4^{o}C and the monthly mean of daily minimum temperature is about 23.2^{o}C. The maximum temperature on individual days may go up to about 46^{o}C. In the valleys the daily maximum temperature may be a couple of degrees higher and at places of higher elevation the temperatures are lower and the weather is pleasant. With the onset of the southwest monsoon early in July, there is an appreciable drop in day temperatures.

Table 3.3. Atmospheric Temperature record of the study area for past 10 years (2011-20)

Duration (Year)	Min. Temp. (°C)	Max. Temp. (°C)	Avg. Temp. (°C)
2011	-0.18	44.1	23.7
2012	0.79	45.2	24.1
2013	-0.24	46.2	23.8
2014	1.06	45.5	23.9
2015	1.03	43.1	23.7
2016	1.46	44.2	24.8
2017	0.74	45.9	24.2
2018	-0.21	43.3	23.7
2019	-1.45	45.6	23.0
2020	-0.30	42.6	22.7

After the withdrawal of the monsoon by about the middle of September, both day and night temperatures decrease, the drop in night temperatures being more rapid. January is the coldest month of the year with the mean daily maximum temperature of about 20^{o}C and the mean daily minimum temperature of about 0^{o}C. Temperature is lowest at places of higher elevation by a degree or two, depending on elevation. The cold season is quite bracing. During this season, cold waves in the rear of western disturbances which move across Punjab and Kashmir, affect the district. Consequently, the minimum temperature occasionally drops down to about a degree or so below the freezing point of water and frost occurs.

3.4.1.5 Rainfall:

Records of rainfall in the district are meager and limited to two rain gauge stations in Una district. Details of rainfall in the district observed by Una rain gauge stations and the data obtained by NASA source are presented in **Tables 3.4 and 3.5**. The average annual rainfall in the district is about 1200 mm. About 70 percent of the annual rainfall in the district is received during the short monsoon season July to September. July is the month with the heaviest rainfall. Rainfall amounting to about 14 percent of the normal is received during the cold season in association with passing western disturbances. The rainfall in the district generally increases from southwest towards northeast.

Table 3.4. Rainfall record of the study area for past 10 years (2011-20)

Duration (Year)	Avg. Rainfall (mm)	Max. Rainfall. (mm)	Total Rainfall (mm)
2011	0.12	10.5	1040.1
2012	0.08	9.6	680.8
2013	0.14	11.2	1229.9
2014	0.11	11.8	968.1
2015	0.13	8.4	1144.0
2016	0.12	8.9	1014.7
2017	0.13	12.1	1108.1
2018	0.15	9.0	1355.8
2019	0.14	9.3	1245.1

2020	0.14	8.5	1253.8

The variation in the rainfall from year to year is large. During the fifty year from 1951 to 2000, the highest rainfall amounting to 196 percent of the normal occurred in 1988 while the lowest annual rainfall which was only 40 percent of the normal occurred in 1981. The annual rainfall in the district was less than 80 percent of the normal in 11 years in this 50 years' period.

Table 3.5. Normal and Extremes of Rainfall in Una district (Source: IMD 2010)

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	HIGHEST	LOWEST	HEAVIEST RAINFALL in 24 HOURS *	
																ANNUAL RAINFALL AS % OF NORMAL & YEARS **		Amount (mm)	Date
Una	48	a	47.2	49.2	41.5	17.8	27.2	65.4	332.2	307.1	151.3	35.3	16.7	26.3	1117.2	212 (1988)	43 (1981)	323.4	24 Sep 1988
		b	3.1	3.0	3.3	1.4	2.1	4.1	11.1	11.2	5.5	1.3	0.9	1.5	48.5				
Una (Obsy)	10	a	29.4	48.6	35.8	22.5	44.9	137.8	369.5	342.3	191.7	29.4	25.8	22.9	1300.6	117 (1998)	86 (1999)	173.8	14 Aug 2001
		b	3.3	3.0	3.8	2.0	1.5	8.3	11.0	12.3	8.8	2.0	1.5	0.6	58.1				
Una (District)		a	38.3	48.9	38.7	20.1	36.1	101.6	350.9	324.7	171.5	32.3	21.3	24.6	1209.0	196 (1988)	40 (1981)		
		b	3.2	3.0	3.6	1.7	1.8	6.2	11.1	11.8	7.2	1.7	1.2	1.1	53.6				

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data upto 2005.
** Years of occurrence given in brackets.

3.4.1.7 Relative Humidity:

Humidity is generally high throughout the year about 80 to 90 percent in the mornings and above 60 percent in the afternoons except during April to June, the driest months, when the humidity is mostly below 50 percent in the afternoons.

Table 3.6. Relative Humidity record of the study area for past 10 years (2011-20)

Duration (Year)	Min. RH (%)	Max. RH (%)	Avg. RH (%)
2011	8.9	99.4	49.2
2012	6.9	97.4	42.8
2013	5.6	97.1	51.2
2014	5.6	97.0	47.8
2015	8.1	98.2	51.4
2016	6.3	97.6	45.9
2017	9.2	97.8	48.8

2018	6.0	97.8	50.6
2019	7.1	99.8	55.9
2020	12.6	98.9	56.7

Table 3.7. Temperature and Relative Humidity in Una District (Source: IMD 2010)

MONTH	Mean Daily Maximum Temperature	Mean Daily Minimum Temperature	Highest Maximum ever recorded		Lowest Minimum ever recorded		Relative Humidity (%)	
	°C	°C	°C	Date	°C	Date	0830 IST	1730 IST
January	20.3	5.1	28.4	1991 Jan 30	-5.8	2003 Jan 15	91	67
February	22.6	6.8	30.8	2003 Feb 28	-0.9	2002 Feb 04	89	64
March	26.3	10.7	35.2	2002 Mar 22	3.4	1997 Mar 02 2002 Mar 03	85	68
April	34.0	15.3	41.8	2002 Apr 23	6.7	2000 Apr 06	64	40
May	36.2	19.2	45.2	1988 May 30	8.6	2003 May 05	67	47
June	38.4	23.2	45.0	1995 Jun 17	15.2	2000 Jun 05 2002 Jun 15	67	50
July	33.8	24.5	42.2	1987 Jul 03	15.6	1994 Jul 01	86	75
August	32.6	24.1	38.4	1987 Aug 03	17.5	1999 Aug 27 2000 Aug 03 2002 Aug 22	91	79
September	33.0	21.9	35.8	1987 Sep 28 1988 Sep 06	13.2	2002 Sep 28	90	74
October	30.6	15.5	35.0	1987 Oct 02 2002 Oct 07	8.1	1993 Oct 23	85	67
November	27.0	9.6	33.4	2002 Nov 03	1.8	1996 Nov 30	84	61
December	21.1	6.4	28.2	2001 Dec 07 2002 Dec 01	-2.0	2001 Dec 31	92	68
Annual	29.7	15.2					82	63

3.4.1.8 Cloudiness:

October and November are the months when the skies over the district are least clouded i.e. when the skies are mostly clear. During winter (December to March) the skies are moderately clouded but in April and May the clouding decreases slightly and it again increases from June onwards. July and August are the most clouded months when on an average on 10 to 12 days per month, the skies are overcast over the district.

3.4.1.9 Wind Pattern:

Due hilly terrain of the district, the wind is highly local and variable. However, the wind is generally from the sector southwest to west in the afternoons and from north to east in the mornings. In

general, the wind is calm throughout the year (on 50% or more occasions), in the mornings except in the southwest monsoon season. During the cold season, western disturbances affect the weather over the district. Thunderstorms occur mainly during the period March to October. The thunderstorms in the cold season are occasionally associated with hail. Fog occurs occasionally during the cold season, particularly in the valleys.

Table 3.8. Wind speed record of the study area for past 10 years (2011-20)

Duration (Year)	Min. Wind speed (m/s)	Max. Wind speed (m/s)	Avg. Wind speed (m/s)
2011	0.02	8.4	2.4
2012	0.02	10.5	2.6
2013	0.03	9.9	2.5
2014	0.02	10.6	2.5
2015	0.03	8.6	2.5
2016	0.03	11.1	2.5
2017	0.01	13.6	2.6
2018	0.02	12.0	2.5
2019	0.02	10.1	2.4
2020	0.02	9.1	2.4

Wind rose

Meteorological pre-processed data used to determine its corresponding Wind Rose. Wind rose shows most pre-dominant wind direction and emissions plume will be dispersed mainly in that direction. Meteorological data collected from secondary source for last 10 years (2011-20) and recorded on continuous & hourly basis during March to June 2023 at project location. Percentage frequencies of occurrence of various wind speed classes in different directions computed from recorded as Wind Rose as given in **Fig. 3.8** below.

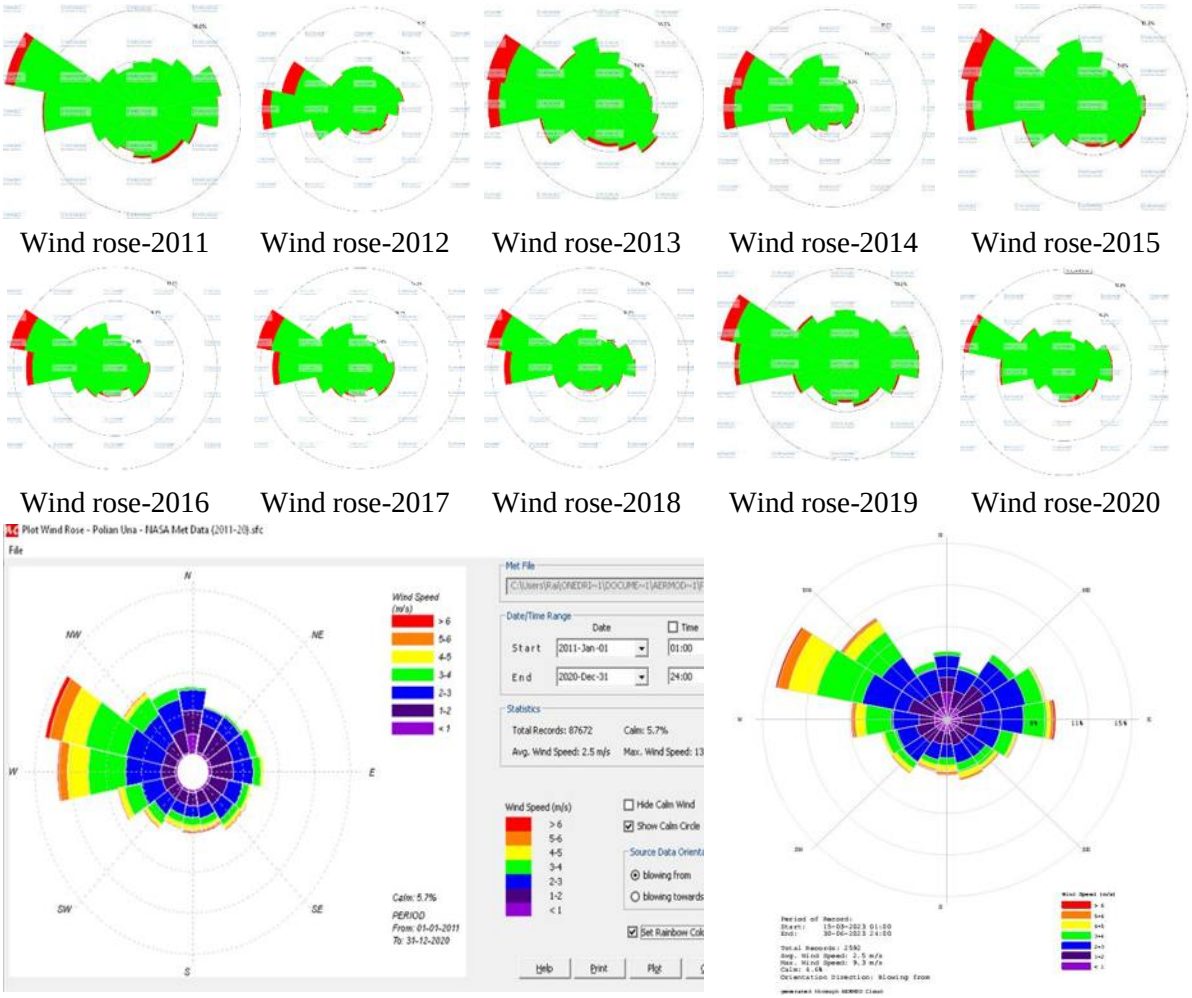


Figure 3.3. Wind rose diagram of project area for last 10 years and during study period

Wind rose diagram shows the predominant winds are mainly blowing from West North-west (WNW). Calm conditions are observed as 4.6% of the total time.

3.4.2 AIR ENVIRONMENT

Air environment defines the existing air quality, sources of air emissions, levels of criteria air pollutants, health hazards of air pollution and safe guards'/ control measures. The prime objective of baseline air quality monitoring is to assess the existing air quality of the area. This will also be useful in assessing the conformity to standards of the ambient air quality. Baseline status of ambient air quality has been assessed through scientifically designed ambient air quality network.

The design of monitoring network in the air quality surveillance program has been based on the following considerations:

- Meteorological conditions of the study area
- Topography of the study area
- Presence of human settlements & sensitive receptors in the study area
- Likely impacts on environment in the study area.

3.4.2.1 Season & period of monitoring:

Ambient air quality monitoring was carried out at 10 locations at a frequency of twice a week 24 hourly basis for three months of summer season (April to June 2023) from primary sources. Secondary data were also collected from CPCB/ HPSCB/ EIA studies and referred for a comparative evaluation of existing air quality in the region.

3.4.2.2 Methodology:

Ambient air quality monitoring (AAQM) station were installed in upwind, downwind and crosswind directions as per prevailing meteorological conditions (predominant wind direction from WNW) in the study area. Meteorological data for last 10 years (2011-20) were collected from secondary authorized sources as NASA ((Source: POWER | Data Access Viewer (nasa.gov)) and other recent EIA studies of the region. Primary source of data as automatic weather station of Eco laboratories installed at project site before two weeks and during period of environmental sampling (March to June 2023) to verify the secondary data and prevailing meteorological conditions. Air quality sampling was carried out as per the defined periodicity and for parameters indicated in ToR at 10 locations (3 locations in core zone/project area of 1405 acres and 7 locations in buffer zone of 10kms). Sampling was done at 3m height from ground level at each location as per CPCB guidelines and standard method of IS 5182. Air quality sampling was carried out using RDS for PM_{10} (including metals and BaP), Fine Particulate Sampler for $PM_{2.5}$, Thermoelectrically cooled assembly for gaseous pollutants and low volume sampler for benzene. Sampling was done twice a week on 24 hourly bases at 3m height from ground level at each location as per CPCB guidelines and standard method of IS 5182. All efforts are made to collect photographs of monitoring locations while monitoring is in operation.

3.4.2.3 Sampling frequency:

Ambient air quality monitoring was carried out at 10 locations at a frequency of twice a week. Air samples were drawn at a sampling height of 3-10m from ground level on 24 hourly bases for three months during summer season (April to June 2023) at each selected locations.

3.4.2.4 Parameters monitored & methods used:

Parameters for ambient air quality monitoring were selected as per Technical EIA Guidance Manual for Industrial Estates (MoEF&CC) as PM_{10}, $PM_{2.5}$, NO_2, SO_2, CO, Ozone, NH_3, BaP (PAH), H_2S, VOCs, HCl, HBr, Cl_2, Br_2, BTX, Acetonitrile and Dichloromethane as relevant to the nature of proposed project.

However, the parameters as BaP (PAH), H_2S, VOCs, HCl, HBr, Cl_2, Br_2, BTX, Acetonitrile and Dichloromethane which were found to be below detection limits (BDL) in present study and as per secondary data records, these parameters were excluded and not reported in EIA study. The test parameters selected and finalized are elaborated in **Table 3.9** excluding the parameters which are non-relevant to proposed project and/or which are not detected in the study area as per secondary data of HPSPCB and previous EIA studies held in Una region.

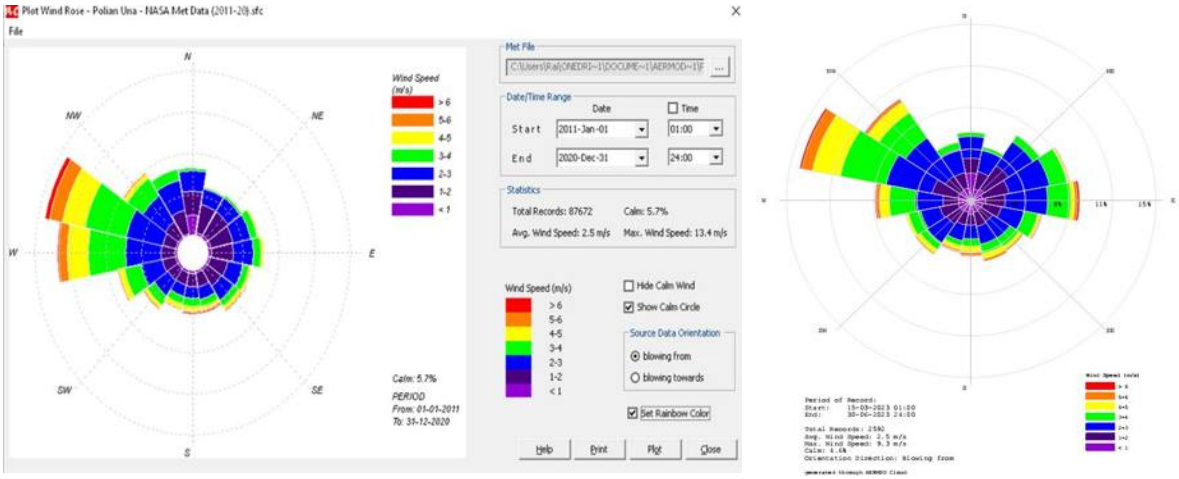
Table 3.9. Test Methods for determining various Air Quality parameters

S. No	Test Parameter	Test Method
1.	Particulate Matter (PM_{10})	IS:5182 (Part 23)
2.	Particulate Matter ($PM_{2.5}$)	IS:5182 (Part 24)
3.	Sulphur Dioxide (SO_2)	IS:5182 (Part 2)
4.	Nitrogen Dioxide (NO_2)	IS:5182 (Part 6)
5.	Ammonia (NH_3)	IS:5182 (Part 25)
6.	Ozone (O_3)	IS:5182 (Part 9)
7.	Carbon Monoxide (CO)	IS 5182 (Part 10) NDIR Method
8.	Benzene (C_6H_6)	IS:5182 (Part 11)
9.	Benzo-a-pyrene (BaP), Particulate Phase only	IS:5182 (Part 12)
10.	Bromine (Br_2)	USEPA and APHA
11.	Chlorine (Cl_2)	IS 5182 (Part – 19)

12.	Hydrogen Sulphide (H_2S)	IS-5182 (Part 7)
13.	Hydrogen Chloride (HCl)	Lab SOP/ USEPA Method
14.	Hydrogen Bromide (HBr)	Lab SOP/ USEPA Method

3.4.2.5 Ambient air quality monitoring:

Ambient air quality monitoring (AAQM) station were installed in upwind, downwind and crosswind directions as per prevailing meteorological conditions (predominant wind direction from WNW) in the study area at 3 locations in core zone/project area and 7 locations in buffer zone of 10kms.



Wind rose 2011-20 (10 Years)

Wind rose Mar-Jun 2023 (Study period)

Figure 3.4. Wind rose diagram of project area for last 10 years and during study period

Sampling stations along with their distance from project are given in **Table 3.10** and shown in **Fig. 3.5**. Ambient air quality analysis data for various parameters are given in **Table 3.11.** Test reports of project location & 10 km study area are enclosed as **Annexure 13(a) & 13(b)** respectively.

Table 3.10. Description of ambient air quality monitoring locations/ stations

Location Code	Name of Location	Co-ordinates of Location	Aerial Distance from Project Site
AQ-1	Gram Panchayat Bhawan, Village Chak Narial	31°22'51.69"N, 76° 06'51.34"E	3.3km, West
AQ-2	Shiv Mandir, Village Khanni	31°21'57.23"N, 76° 07'56.06"E	3.0km, West

AQ-3	Jaswal Cottage, Village Mohalla Nathan	31°19'22.92"N, 76° 7'49.63"E	4.0km, SW
AQ-4	Govt. Primary School, Village Dulehar	31°20'31.68"N, 76°12'35.21"E	2.2km, SE
AQ-5	Gurdwara Baba Bande Singh, Village Makorgarh	31°21'45.97"N, 76°12'33.30"E	2.7km, East
AQ-6	Jal Shakti Vibhag, Village Kuthar Beet	31°23'11.89"N, 76°11'08.83"E	1.4km, East
AQ-7	Gram Panchayat Bhawan, Village Baliwal	31°24'35.83"N, 76°11'19.47"E	1.9km, NNE
AQ-8	Post Office, Tahliwal	31°20'59.97"N, 76°16'35.75"E	8.5km, ESE
AQ-9	Project Site, Barora Niwas, Village Panjoiyan	31°22'02.96"N, 76°10'09.40"E	Project site (Central Part)
AQ-10	Project Site, Guest House Forest Dept. Village Polian Beet	31°21'25.57"N, 76°10'53.56"E	Project site (Southern Part)

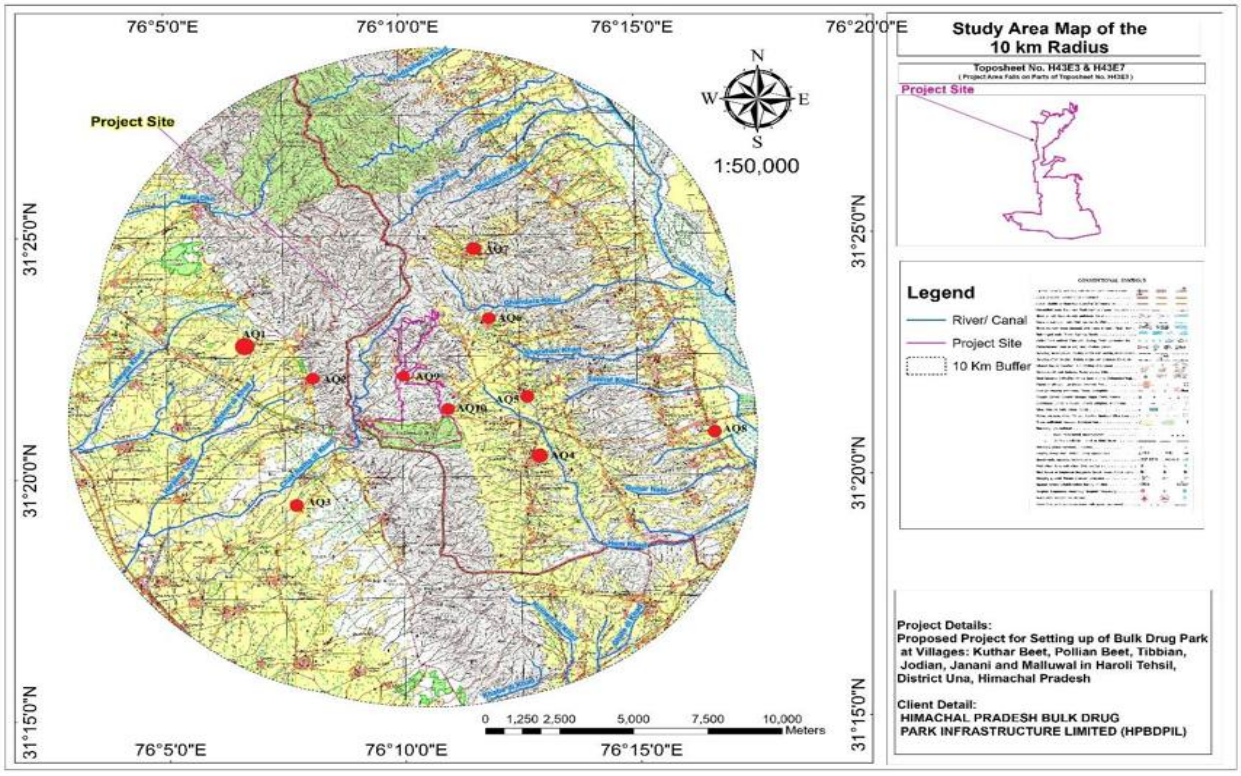


Figure 3.5. Location of ambient air monitoring stations in study area of 10 km (Marked on Toposheet No. H43E3 and H43E7; Not on scale)

Air quality sampling was carried out using RDS for PM_{10} (including metals and BaP), Fine Particulate Sampler for $PM_{2.5}$, Thermoelectrically cooled assembly for gaseous pollutants and low volume sampler for benzene. Air samples were collected twice a week on 24 hourly bases at a sampling height of 3-10m from ground level at each location as per CPCB guidelines and standard method of IS 5182. The test parameters selected and finalized are PM_{10}, $PM_{2.5}$, NO_2, SO_2, CO, Ozone, and NH_3 excluding the parameters which are non-relevant to proposed project and/or which are not detected in the study area as per secondary data of HPSPCB and previous EIA studies held in Una region. Air quality sampling was carried out using RDS for PM_{10} (including metals and BaP), Fine Particulate Sampler for $PM_{2.5}$, Thermoelectrically cooled assembly for gaseous pollutants and low volume sampler for benzene. Air samples were collected twice a week on 24 hourly bases at a sampling height of 3-10m from ground level at each location as per CPCB guidelines and standard method of IS 5182. The test parameters selected and finalized are PM_{10}, $PM_{2.5}$, NO_2, SO_2, CO, Ozone, and NH_3 excluding the parameters which are non-relevant to proposed project and/or which are not detected in the study area as per secondary data of HPSPCB and previous EIA studies held in Una region. The photographs of sample collection is represented in **Figure 3.6.**

Figure 3.6. Photographic view of ambient air quality monitoring in the study area

3.4.2.6 Interpretation of ambient air quality

The test parameters selected and finalized are PM_{10}, $PM_{2.5}$, NO_2, SO_2, CO, Ozone, and NH_3 excluding the parameters which are non-relevant to proposed project and/or which were not detected in the study area as per secondary data of HPSPCB and previous EIA studies held in Una region.

Table 3.11. Statistical summary of ambient air quality results for criteria parameters

Location	Parameter	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	NH_3 ($\mu g/m^3$)	O_3 ($\mu g/m^3$)	CO (mg/m^3)
AQ-1	Min	34.3	18.3	4.3	5.5	4.7	2.4	0.19
	Max	70.0	37.8	10.2	15.6	7.0	6.8	0.39
	Avg	51.1	28.1	6.9	10.0	5.7	4.8	0.26
	98^{th} %	69.5	37.0	9.9	15.0	7.6	6.7	0.37
AQ-2	Min	33.5	19.0	4.5	3.8	3.7	1.6	0.22
	Max	72.6	41.0	10.7	16.5	6.3	7.0	0.43
	Avg	53.4	29.2	7.4	10.0	5.5	4.3	0.28
	98^{th} %	72.2	40.4	10.3	16.3	8.1	6.9	0.39
AQ-3	Min	35.8	19.1	5.0	5.7	4.9	2.5	0.20
	Max	70.0	39.4	10.5	16.8	7.3	7.1	0.41
	Avg	52.2	28.5	7.8	10.7	5.9	5.0	0.28
	98^{th} %	69.4	38.8	10.4	16.2	7.9	7.0	0.39

AQ-4	Min	37.1	18.1	5.7	4.9	4.1	2.5	0.27
	Max	83.4	43.8	13.4	21.0	7.0	10.9	0.54
	Avg	59.9	28.9	9.3	12.7	6.1	6.7	0.35
	98^{th} %	82.3	43.5	12.9	20.7	9.0	10.7	0.48
AQ-5	Min	35.6	17.4	4.8	4.4	3.9	2.4	0.25
	Max	80.4	45.0	11.3	19.2	6.7	10.4	0.49
	Avg	57.6	30.0	7.9	11.6	5.9	6.5	0.32
	98^{th} %	79.9	44.1	10.9	18.9	8.6	10.3	0.44
AQ-6	Min	40.4	21.2	5.7	7.9	5.6	3.4	0.27
	Max	80.0	42.0	12.1	20.4	8.3	9.6	0.55
	Avg	59.4	28.8	9.1	14.2	6.7	6.8	0.37
	98^{th} %	79.0	41.1	12.0	20.4	8.9	9.4	0.52
AQ-7	Min	39.2	20.5	5.6	7.6	5.4	3.3	0.21
	Max	76.0	41.0	11.7	19.7	8.0	9.3	0.44
	Avg	57.6	28.0	8.8	14.0	6.5	6.6	0.30
	98^{th} %	75.7	40.5	11.7	19.7	8.6	9.2	0.42
AQ-8	Min	38.7	18.9	6.3	5.3	4.3	2.8	0.33
	Max	84.4	45.7	14.8	22.8	7.3	12.1	0.65
	Avg	61.9	29.3	10.3	13.8	6.4	7.5	0.42
	98^{th} %	84.1	44.6	14.2	22.5	9.4	12.0	0.58
AQ-9	Min	37.3	19.5	4.9	6.7	5.1	2.6	0.21
	Max	74.0	41.0	10.3	18.4	7.6	7.4	0.43
	Avg	55.3	27.4	7.7	12.2	6.2	5.2	0.29
	98^{th} %	72.9	40.6	10.3	17.9	8.2	7.3	0.40
AQ-10	Min	34.9	19.0	4.7	4.0	3.9	1.7	0.23
	Max	75.6	40.0	11.1	17.2	6.6	7.3	0.45
	Avg	55.5	30.4	7.7	10.4	5.8	4.5	0.29
	98^{th} %	75.2	39.5	10.7	16.9	8.5	7.2	0.40

NAAQ Limits	100	60	80	80	400	180	4

Table 3.12. Comparison of primary and secondary AAQM data of Una region.

Parameter	**Primary Data**	**Secondary Data**			**NAAQ Limits (CPCB 2009)**
	Baseline data of Present Study (Rural Area & Industrial) (April – June 2023)	HPSPCB (RO/DIC Una) data (Urban Area) (April – June 2023)	EIA Mine Project, Haroli, Una (Oct. – Dec. 2022)	EIA IOCL, Mehatpur, Una (Jan. – Apr. 2017)	
PM_{10} ($\mu g/m^3$)	33.5 – 84.4 (Avg. 56.6)	20.8 – 180.1 (Avg. 65)	35.41 – 54.98 (Avg. 44.0)	72 – 96	100
$PM_{2.5}$ ($\mu g/m^3$)	17.4 – 45.7 (Avg. 29.9)	16.9 – 62.5 (Avg. 26.4)	9.57 – 32.97 (Avg. 18.52)	18 – 71	60
SO_2 ($\mu g/m^3$)	4.3 – 14.8 (Avg. 8.3)	1.4 – 4.0 (Avg. 2.4)	3.84 – 9.83 (Avg. 6.47)	2 – 8	80
NO_2 ($\mu g/m^3$)	3.8 – 22.8 (Avg. 12.1)	2.3 – 21.5 (Avg. 8.2)	5.81 – 14.94 (Avg. 9.24)	3 – 78	80
NH_3 ($\mu g/m^3$)	3.7 – 8.3 (Avg. 6.0)	1.2 – 8.9 (Avg. 4.6)	BDL <20	Not detected	400
O_3 ($\mu g/m^3$)	1.6 – 12.1 (Avg. 5.7)	0.8 – 3.7 (Avg. 2.1)	BDL <10	Not detected	180
CO (mg/m^3)	0.19 – 0.65 (Avg. 0.34)	0.40 – 0.92 (Avg. 0.75)	0.19 – 0.92 (Avg. 0.69)	Not detected	4

Particulate Matter (PM_{10} and $PM_{2.5}$)

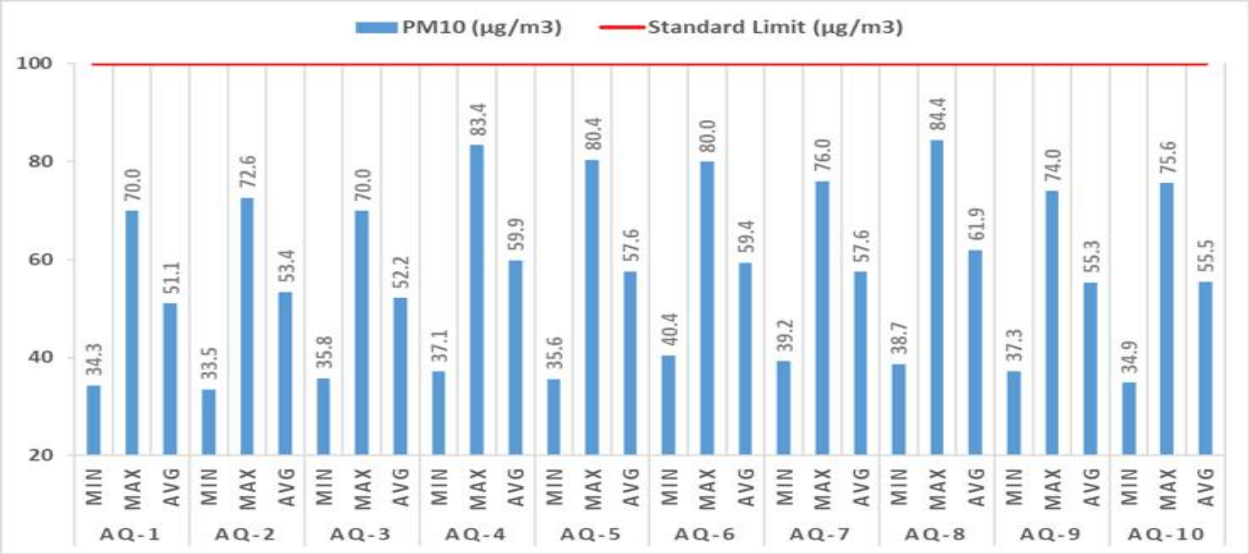


Figure 3.7. Statistical analysis of PM10

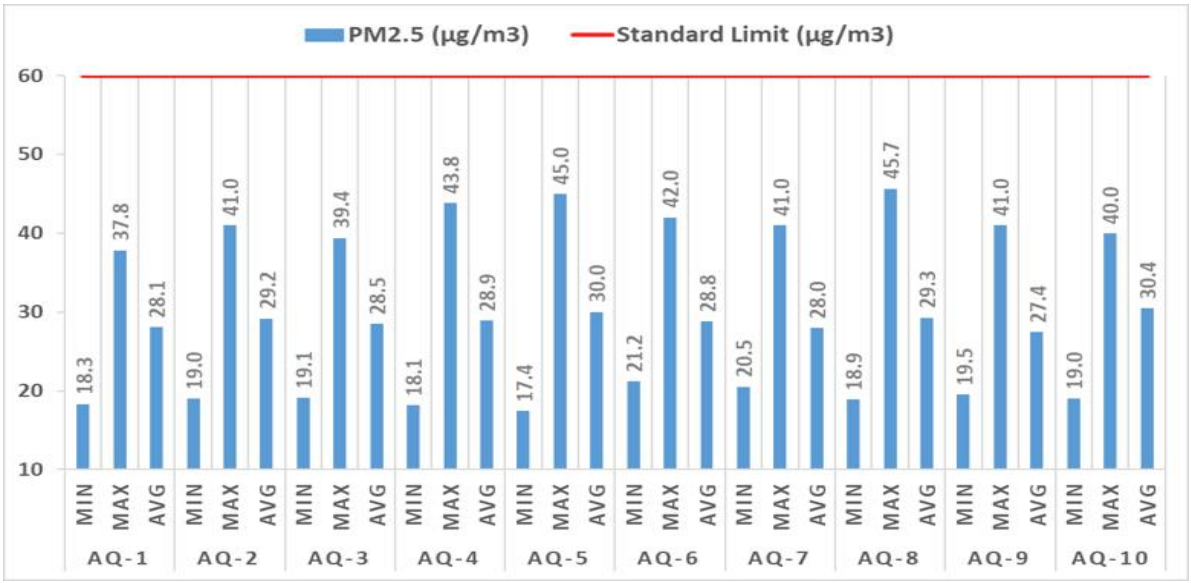


Figure 3.8. Statistical analysis of PM2.5

As it is evident from **Table 3.12 & Fig. 3.7 to 3.8,** Particulate aerosols observed in the study area during April to June 2023 ranged 33.5 - 84.4 µg/m^3 (avg. 56.6 µg/m^3) as PM_{10} and 17.4 – 45.7 µg/m^3 (avg. 29.9 µg/m^3) as $PM_{2.5}$ are within the prescribed limits of 100 µg/m^3 for PM_{10} and 60 µg/m^3 for $PM_{2.5}$ (NAAQS CPCB, 2009). The obtained results are comparable and in agreement with the secondary data collected by HPSPCB (RO/ DIC, Una) and other EIA studies of Una region. The baseline data of existing mass levels of PM_{10} and $PM_{2.5}$ are associated to industrial units operating

in Tahliwal industrial area (about 6 kms from the project) and Bathri industrial area (about 10.5kms from the project) in ESE direction and Amb-Gagret-Jeetpur industrial cluster (about 20-25kms from the project) in ENE direction. Other source can be vehicles plying on the roads, ongoing domestic and agricultural activities in the study area. As evident from the baseline data, the locations AQ-4 to AQ-8 (specially AQ-8) located in Eastern side of project experience higher air pollution load in comparison to the locations AQ-1 to AQ-3 located in Western area due to close proximity of Tahliwal and Bathri industrial areas. Furthermore, additional air emission loads due to the proposed project will be quantified based on air quality dispersion modeling which has been explored in **Chapter 4**.

Gaseous Pollutants

Sulphur Dioxide (SO_2) and Oxides of Nitrogen (NO_2)

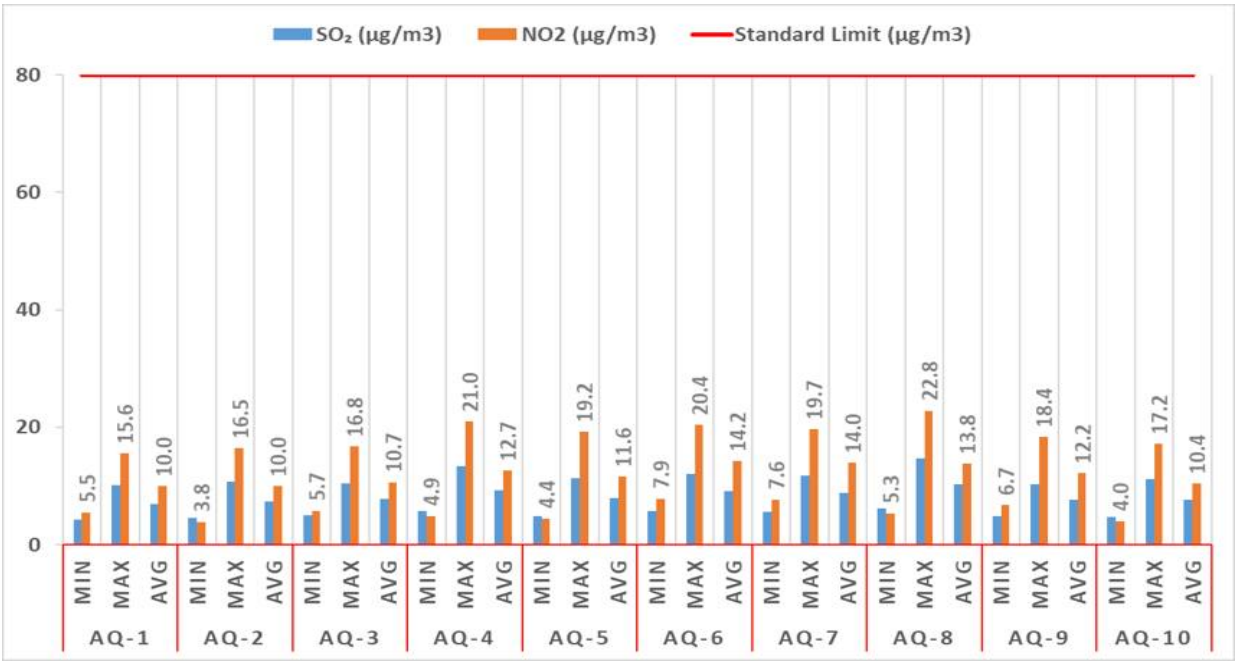


Figure 3.9. Statistical analysis of NO_2 and SO_2

As it is evident from **Table 3.12 & Fig. 3.9,** gaseous pollutants observed in the study area during April to June 2023 ranged 4.3 – 14.8 µg/m^3 (avg. 8.3 µg/m^3) as SO_2 and 3.8 – 22.8 µg/m^3 (avg. 12.1 µg/m^3) as NO_2 are well within the prescribed limits of 80 µg/m^3 (NAAQS CPCB, 2009) indicates no significant source of emission in the study area and air quality is safe and comfortable

for human health. The obtained results are comparable and in agreement with the secondary data collected by HPSPCB (RO/ DIC, Una) and other EIA studies of Una region. The observed baseline/ existing mass levels of SO_2 and NO_2 may be associated to industrial units operating in Tahliwal industrial (about 6kms from the project) and Bathri industrial area (about 10.5kms from the project) in ESE direction and Amb-Gagret-Jeetpur industrial cluster (about 20-25kms from the project) in ENE direction. Other source can be vehicles plying on the roads, ongoing domestic and agricultural activities in the study area. As evident from the baseline data, the locations AQ-4 to AQ-8 (specially AQ-8) located in Eastern side of project experience higher air pollution load in comparison to the locations AQ-1 to AQ-3 located in Western area due to close proximity of Tahliwal and Bathri industrial areas. Furthermore, additional air emission loads due to the proposed project will be quantified based on air quality dispersion modeling which has been explored in **Chapter 4**.

Carbon Monoxide (CO), Ozone (O_3) and Ammonia (NH_3)

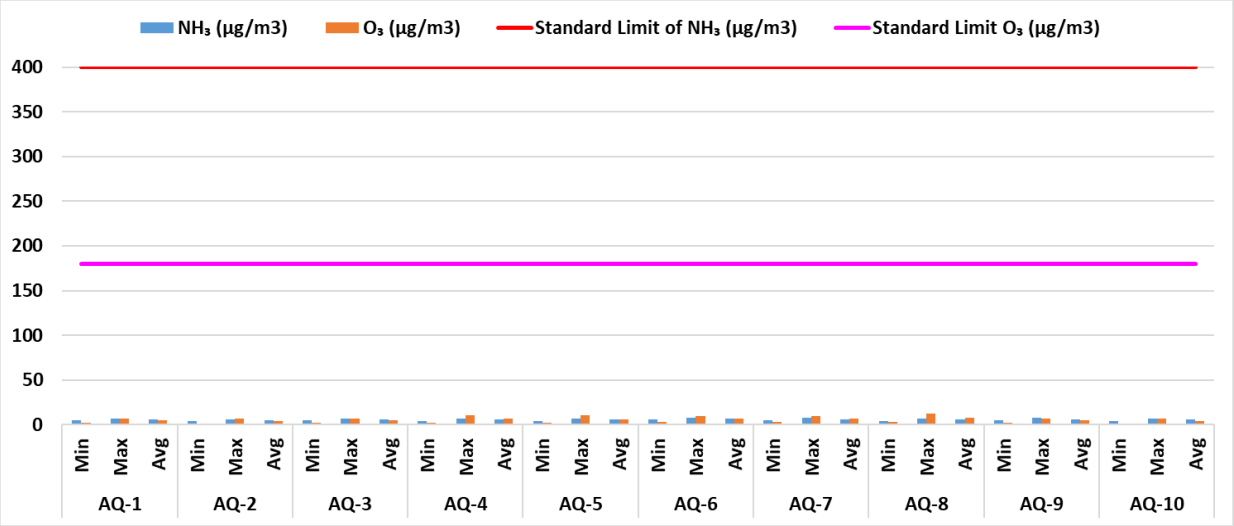


Figure 3.10. Statistical analysis of NH_3 and O_3

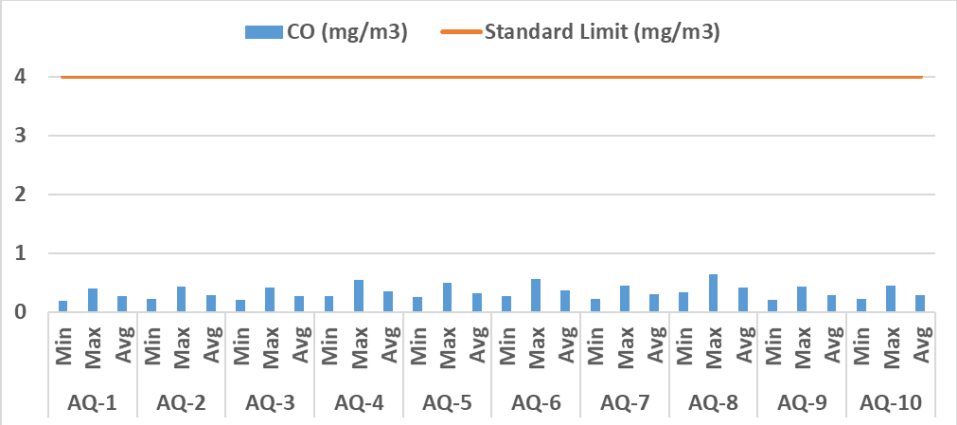


Figure 3.11. Statistical analysis of CO

As it is evident from **Table 3.12 & Fig. 3.11,** the gaseous pollutants as Carbon Monoxide (CO), Ozone (O_3) and Ammonia (NH_3) observed in the study area are found to be well within the prescribed limits (NAAQS CPCB, 2009) indicates no significant source of emission in the study area and air quality is safe and comfortable for human health. The obtained results are comparable and in agreement with the secondary data collected by HPSPCB (RO/ DIC, Una) and other EIA studies of Una region. The observed baseline/ existing mass levels of these gases may be associated to industrial units operating in Tahliwal industrial (about 6kms from the project) and Bathri industrial area (about 10.5kms from the project) in ESE direction and Amb-Gagret-Jeetpur industrial cluster (about 20-25kms from the project) in ENE direction. Other source can be vehicles plying on the roads, ongoing domestic and agricultural activities in the study area. As evident from the baseline data, the locations AQ-4 to AQ-8 (specially AQ-8) located in Eastern side of project experience higher air pollution load in comparison to the locations AQ-1 to AQ-3 located in Western area due to close proximity of Tahliwal and Bathri industrial areas. Furthermore, additional air emission loads due to the proposed project will be quantified based on air quality dispersion modeling which has been explored in **Chapter 4**.

3.4.2.7 Conclusion:

The overall ambient air quality in the study area is within the prescribed limits (NAAQS CPCB, 2009) and is safe and comfortable for human health. However, the observed baseline/ existing mass levels of air quality may be associated to industrial units operating in Tahliwal industrial (about 6kms from the project) and Bathri industrial area (about 10.5kms from the project) in ESE

direction and Amb-Gagret-Jeetpur industrial cluster (about 20-25kms from the project) in ENE direction. Other source can be vehicles plying on the roads, ongoing domestic and agricultural activities in the study area. As evident from the baseline data, the locations AQ-4 to AQ-8 (specially AQ-8) located in Eastern side of project experience higher air pollution load in comparison to the locations AQ-1 to AQ-3 located in Western area due to close proximity of Tahliwal and Bathri industrial areas. Furthermore, additional air emission loads due to the proposed project will be quantified based on air quality dispersion modeling which has been explored in **Chapter 4**.

3.4.3 NOISE ENVIRONMENT

Noise in general is sound, which is composed of many frequency components of various loudness distributed over the audible frequency range. The most common and universally accepted scale is the A weighted scale which is measured as dB (A). This is more suitable for audible range of 20 to 20,000 Hz and has been designed to weigh various components of noise according to the response of a human ear. The environmental assessment of noise from the industrial activity, construction activity and vehicular traffic can be undertaken by taking into consideration various factors like potential damage to hearing, physiological responses, and annoyance and general community responses.

The main objective of monitoring of ambient noise levels was to establish the baseline noise levels in different zones. i. e. Residential, Industrial, Commercial and Silence zones, in the surrounding areas and to assess the total noise level in the environment of the study area.

3.4.3.1 Methodology:

Identification of Sampling Locations

A preliminary reconnaissance survey was undertaken to identify the major noise sources and sensitive receptors in the study area. The sampling sites were identified considering location of proposed project, industrial units, commercial activities and residential areas with various traffic spots and sensitive areas like hospital, court, temple and schools. The noise monitoring was conducted at four locations selected in the study area of 10 kms (one in core zone and 3 in buffer

zone within 1 km radius) as described in **Table 3.13.** The location map of the sampling locations for noise monitoring is represented in **Figure 3.12.**

Table 3.13. List of sampling locations for noise monitoring

Location Code	Name of Location	Co-ordinates of Location	Distance Project Site
NQ-1	Village –Jaijon Doaba (near Gurudwara)	31°20'58.79"N, 76°08'51.73"E	6 km, WSW
NQ-2	Village - Panjoiyan (Near Lakh Data Peer Mandir)	31°22'10.38"N, 76° 09'49.74"E	100m, West
NQ-3	Village – Puboal (At Govt Ayuryedic Heath Center)	31°23'12.18"N, 76°11'33.65"E	1.2 km, NNE
NQ-4	Project Site, Guest House Forest Dept. Village Polian Beet	31°21'22.07"N, 76°10'52.07"E	0 Km, Project Site

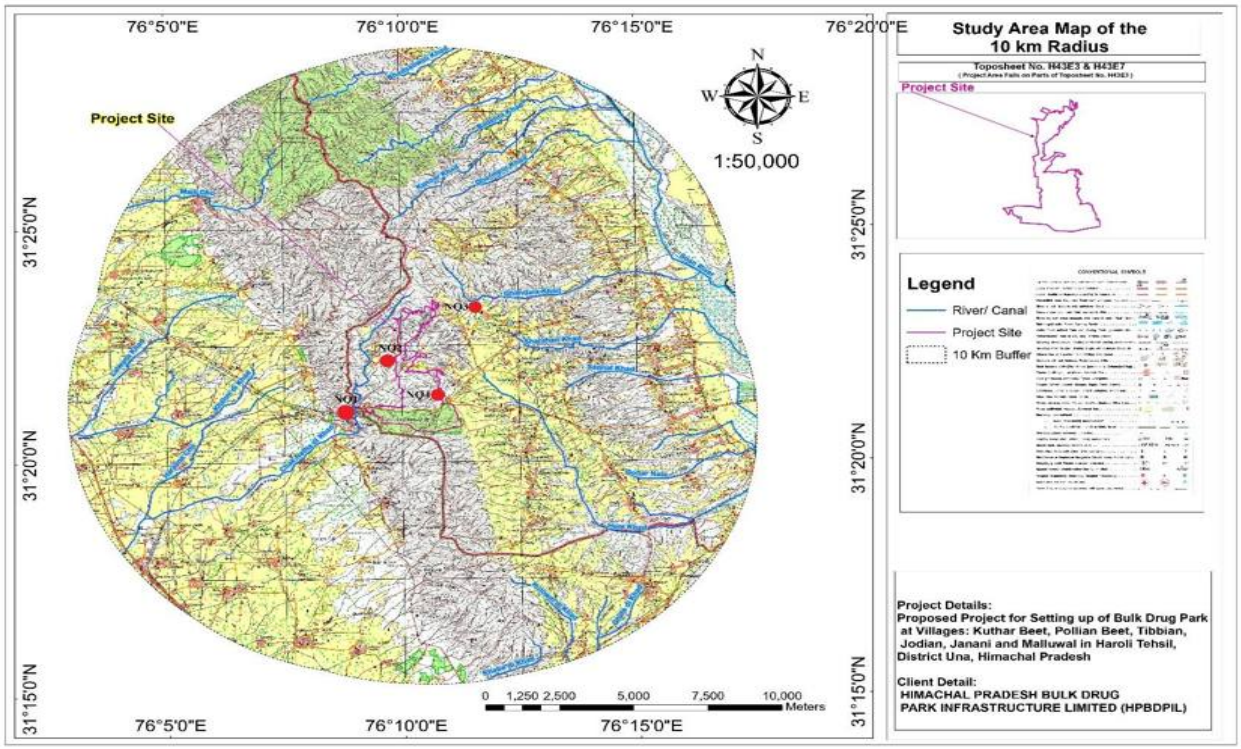


Figure 3.12. Location map of sampling locations for noise monitoring (Marked on Toposheet No. H43E3 and H43E7; Not on scale)

Methods for Noise Monitoring

Integrated Sound Level Meters (SLMs) with data logger were used for data collection. Calibration check of SLMs were performed before and after sampling. Noise sampling was done by installing SLMs at a sampling height of 1.2 to 1.5 m in open area or ≥ 250 m away from source of noise or obstructions or reflecting surfaces. Noise monitoring was carried out during day time (06:00 am – 10:00 pm) and night time (10:00 pm to 06:00 am) continuously for 24-hours with one-hour login interval as per national/ international standard methods as CPCB Noise Rules (2000), IS: 9989-1981 & IS: 4758-1968.Monitoring of noise sources/activities is observed and recorded for abnormal data and evaluation of additional sources.

Parameters for Noise Monitoring

Noise monitoring was carried out continuously for 24-hours with one-hour login interval. During each hour parameters like L10, L50, L90 and Leq were directly computed by the instrument based on the sound pressure levels. Monitoring was carried out at 'A' weighting and in fast response mode.

The key parameters of noise quality were measured as Leq, L_{day}, L_{night}, L_{10}, L_{50} and L_{90}.

Leq: Integrated SLM used has the facility for measurement of Leq directly. However, Leq can also be calculated using the following equation:

Leq (hrly) = $L_{50} + (L_{10} - L_{90})^2 / 60$

Where,

L_{10} (Ten Percentile Exceeding Level) is the level of sound exceeding 10% of the total time of measurement.

L_{50} (Fifty Percentile Exceeding Level) is the level of sound exceeding 50% of the total time of measurement.

L_{90} (Ninety Percentile Exceeding Level) is the level of sound exceeding 90% of the total time of measurement.

L_{day}: This represents L_{eq} of daytime. L_{day} is calculated as Logarithmic average using the hourly Leq's for day time hours from 6.00 a.m to 10.00 p.m

L_{night}: This represents L_{eq} of night time. L_{night} is calculated as Logarithmic average using the hourly Leq's for nighttime hours from 10.00 p.m to 6.00a.m.

3.4.3.2 Ambient standards in respect of noise:

Ministry of Environment, Forest & Climate Change has notified the ambient standards in respect of noise. **Table 3.14** gives these standards in respect of noise.

Table 3.14. Ambient Standards in respect of Noise

Area Code	Category of Area	Leq. Limits in dB(A)	
		Day Time	Night Time
A	Industrial Area	75	70
B	Commercial Area	65	55
C	Residential Area	55	45
D	Silence Zone	50	40

Note:

1. Day time is reckoned in between 6:00 a.m and 10:00 p.m.
2. Night time is reckoned is between 10:00 p.m and 6.00 a.m.
3. Silence Zone is defined as areas upto 100 m around such premises as hospitals, educational, institutions and Courts. Silence Zones are to be declared by the competent authority.

Photographic view of Noise Quality Monitoring

Figure 3.13. Photographic view of noise quality monitoring in the study area

3.4.3.3.1 Interpretation of noise results:

The reported noise levels for day-time (L_{day}) and night-time (L_{night}) computed from hourly Leq values collected from each location within the study area are presented in **Table 3.15**. The test reports are enclosed as **Annexure 13(a)**.

Table 3.15. Test Results for Noise Quality Monitoring in the Study Area

Location Code	Name of Location	Co-ordinates of Location	Distance from Project Site	Noise Leq dB(A)	
				Day Time	Night Time
NQ-1	Village –Jaijon Doaba (near Gurudwara)	31°20'58.79"N, 76°08'51.73"E	6 km, WSW	51.2	40.2
NQ-2	Village - Panjoiyan (Near Lakh Data Peer Mandir)	31°22'10.38"N, 76° 09'49.74"E	100m, West	46.3	35.4
NQ-3	Village – Puboal (At Govt Ayuryedic Heath Center)	31°23'12.18"N, 76°11'33.65"E	1.2 km, NNE	50.3	39.6
NQ-4	Project Site, Guest House Forest Dept. Village Polian Beet	31°21'22.07"N, 76°10'52.07"E	0 Km, Project Site	48.2	37.8
Standard Limits of Noise (CPCB, Noise Rules 2000)				55	45

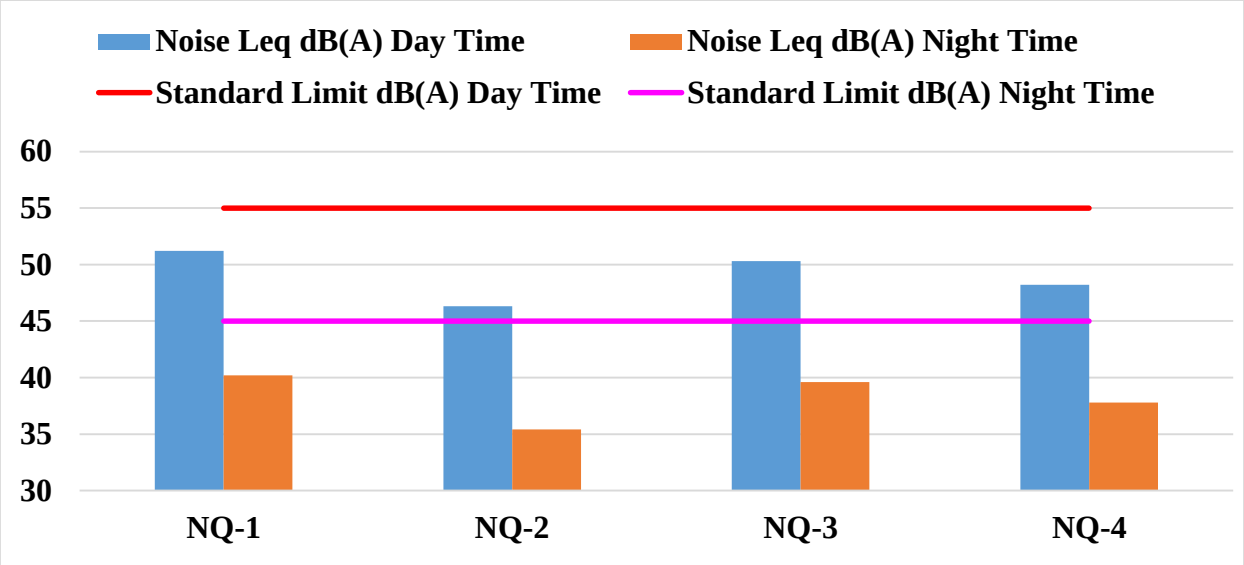


Figure 3.14. Statistical analysis of Noise Monitoring Results

As evident from **Table 3.15 & Fig. 3.14**, ambient noise levels measured in the study area varied from 46.3 – 51.2 dB(A) during day time and 35.4 – 40.2 dB(A) during night time. The observed noise levels are found to be within the prescribed limits for residential area (Noise Rules, 2000). The obtained results are comparable and in agreement with the secondary data of EIA studies conducted in Una region. The observed baseline/ existing noise quality may be associated to industrial units operating in Tahliwal industrial (about 6 km from the project) and Bathri industrial area (about 10 km from the project) in ESE direction. Other source can be vehicles plying on the roads, ongoing domestic and agricultural activities in the study area. Furthermore, additional emission loads due to the proposed project is to be quantified and associated environmental impacts are to be identified based on noise propagation modeling which has been explored in **Chapter 4**.

Table 3.16. Comparison of primary and secondary noise quality data of Una region.

Parameter	Primary Data	Secondary Data		Standard Limit (Noise Rules, 2000)
	Present Study (Rural Area & Industrial) (April – June 2023)	EIA Mine Project, Haroli, Una (Oct.-Dec. 2022)	EIA IOCL, Mehatpur, Una (Jan.-Apr. 2017)	

Day Time dB(A)	46.3 - 51.2	45.6 – 58.2	53 - 61	55
Night Time dB(A)	35.4 - 40.2	32.1 – 46.2	44 - 52	45

3.4.3.3.2 Conclusion

The overall noise quality in the study area is within the prescribed limits (CPCB, Noise Rules 2000) and is safe and comfortable for human health. The observed baseline/ existing noise quality may be associated to industrial units operating in Tahliwal industrial (about 6 km from the project) and Bathri industrial area (about 10 km from the project) in ESE direction. Other source can be vehicles plying on the roads, ongoing domestic and agricultural activities in the study area. Furthermore, additional noise emission loads due to the proposed project will be quantified and identified based on noise propagation modeling.

3.4.4 LAND ENVIRONMENT

3.4.4.1 Land use & land cover:

3.4.4.1.1 Methodology for land use land cover mapping:

The land use and land cover (LULC) map have been prepared by adopting the interpretation techniques of the image in conjunction with collateral data. Image classification was done by using visual interpretation techniques and digital classification using Arc GIS 9.3.1 image processing software. Sentinel-2 Satellite Data images were acquired and used to evaluate LULC changes. The image processing software is used for preprocessing, rectification and classifying the satellite data for preparation of land use land cover map for assessing and monitoring the temporal changes in land use land cover and land developmental activities.

3.4.4.1.2 Ground data:

Ground data is essential to verify and increase the accuracy of the interpreted classes and also to minimize the field work.

3.4.4.1.3 Data analysis:

For analysis and interpretation of satellite data, the study can be divided into three parts:

I. Preliminary work

II. Field work

III. Post field work

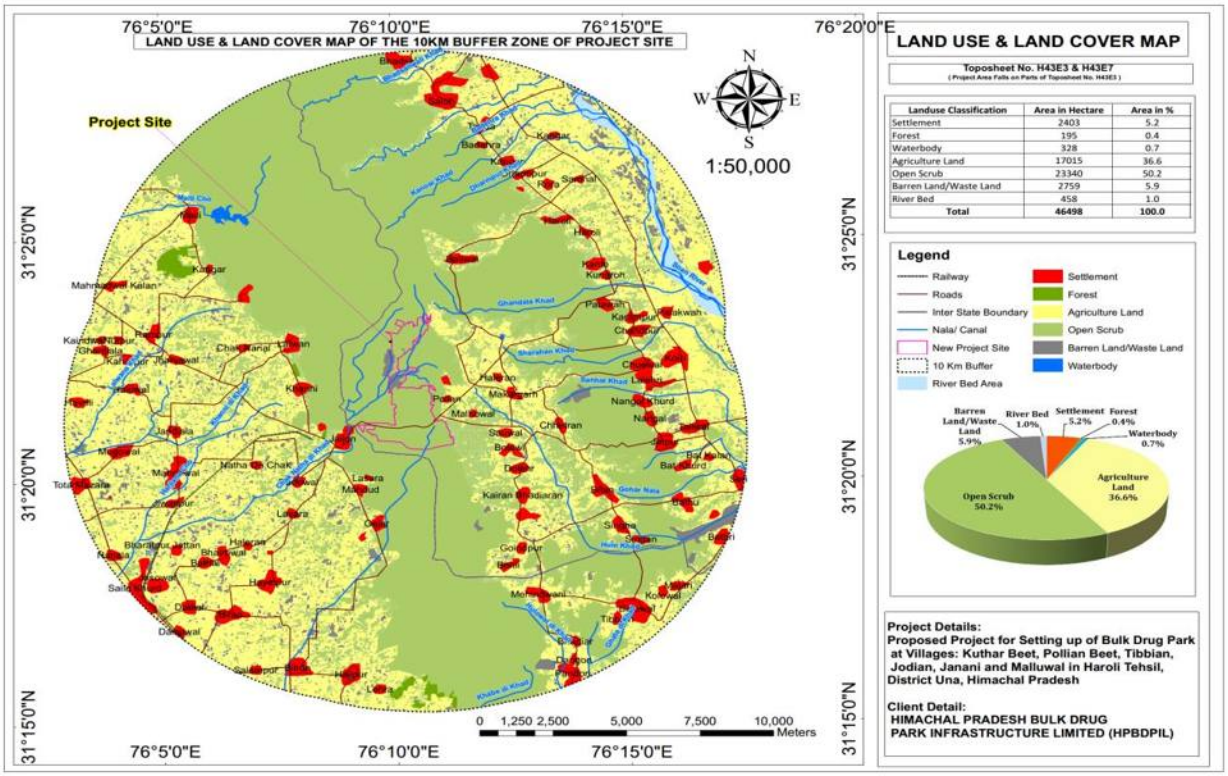
3.4.4.1.4 Outcome:

Land use and land cover have a direct relationship with environmental characteristics and processes, including the productivity of the land, species diversity, climate, biogeochemistry and the hydrologic cycle. GIS and Remote Sensing are gradually becoming an integrated technology that is being widely used in various applications. These two technologies are complementary, as they are simply variants of the digital spatial data. They have become inextricably linked in many application fields. The spatial display techniques for GIS and Remote Sensing information has greatly advanced within the past two decades. Technological advances in image processing and visualization techniques have developed display and interpretation mechanisms for the analysis of all forms and sources of geographical information.

3.4.4.1.5 Study area land use & land cover classification system:

As per the mandatory requirements, the mapping of land use and land cover of the area falling within 10 km radius of study area is to be undertaken with the help of Topographical data, Satellite data and Field studies.

The land use and land cover (LULC) map has been prepared by adopting the interpretation techniques of the image in conjunction with collateral data such as Survey of India topographical maps, census records, Sentinel-2 Satellite Data Imagery and ground truth. Land use map is shown in **Fig. 3.15.**



Landuse Classification	Area in Hectare	Area in %
Settlement	2403	5.2
Forest	195	0.4
Waterbody	328	0.7
Agriculture Land	17015	36.6
Open Scrub	23340	50.2
Barren Land/Waste Land	2759	5.9
River Bed	458	1.0
Total	46498	100.0

Figure 3.15. Land use map of the project area within 10 km of the project location

Table 3.17. Land use distribution within 10 km of project

S. No.	Land Use/Land Cover	Area in sq. Km.	%
1.	Agriculture land	170.15	36.6%
2.	Barren/Waste land	27.59	5.9%
3.	Forest land	1.95	0.4%
4.	Water body	7.86	1.7%
5.	Open Scrub land	233.40	50.2%
6.	Settlement	24.03	5.2%
	Total	**464.98**	**100**

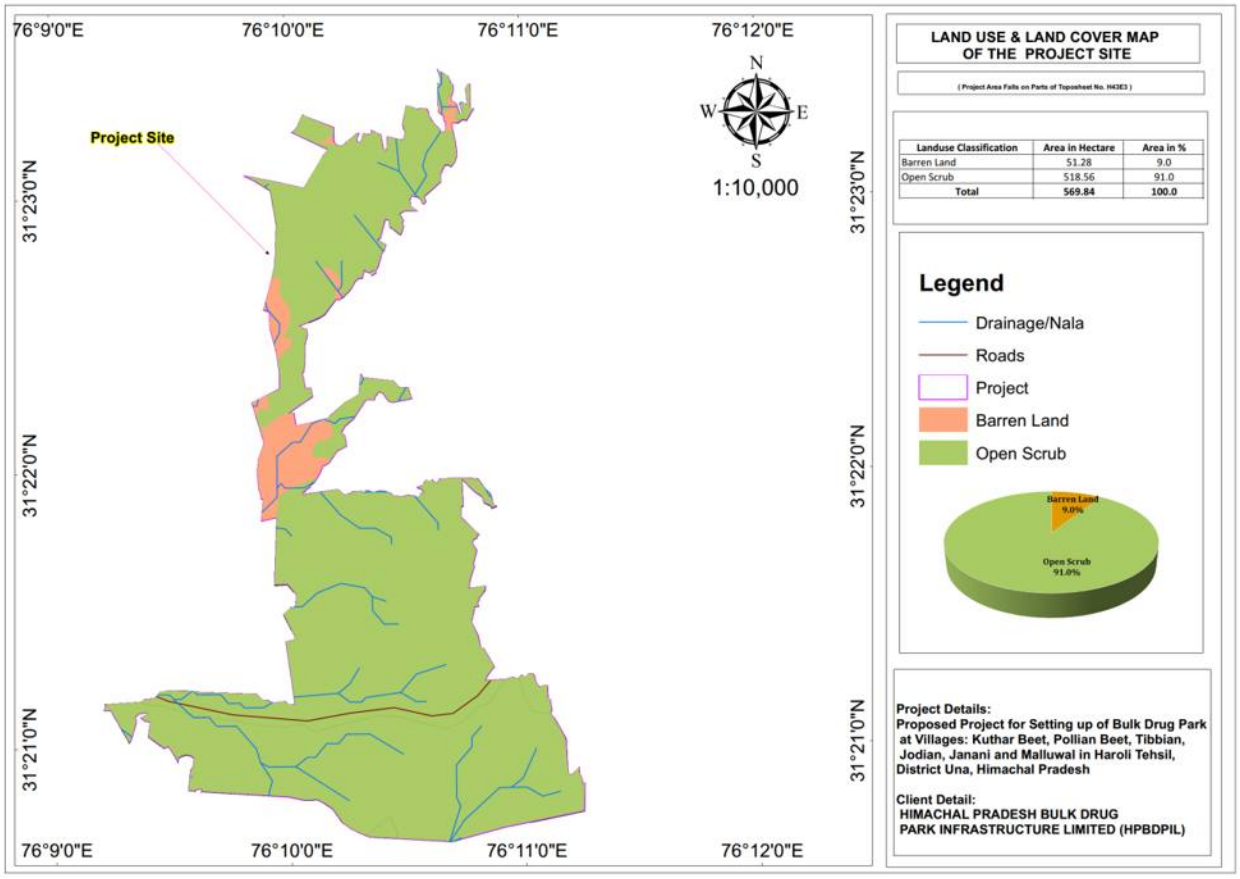


Figure 3.16. LULC map of the project site

3.4.4.1.5 Interpretation of LULC results:

The study area comprises of crop land of about 170.15 sq.km. (36.60%). Barren/Waste land of about 27.59 sq.km. (5.9%). Forest land of approximately 1.95 sq.km. (0.4%). Water of 3.28 sq.km. (0.7%). River bed of 4.58 sq.km. (1.0%). Open Scrub land of about 233.40 sq.km. (50.2%) and settlement in the study area cover an area of 24.03 sq.km (5.2%). The land cover pattern and the respective coverage are given in **Table 3.17** above.

Similarly, the LULC of project site was also prepared which comprise of open scrub land of about 5.19 sq. km. (91%) and barren land of about 0.51 sq. km. (9%). The LULC of the project site is represented in **Figure 3.16.**

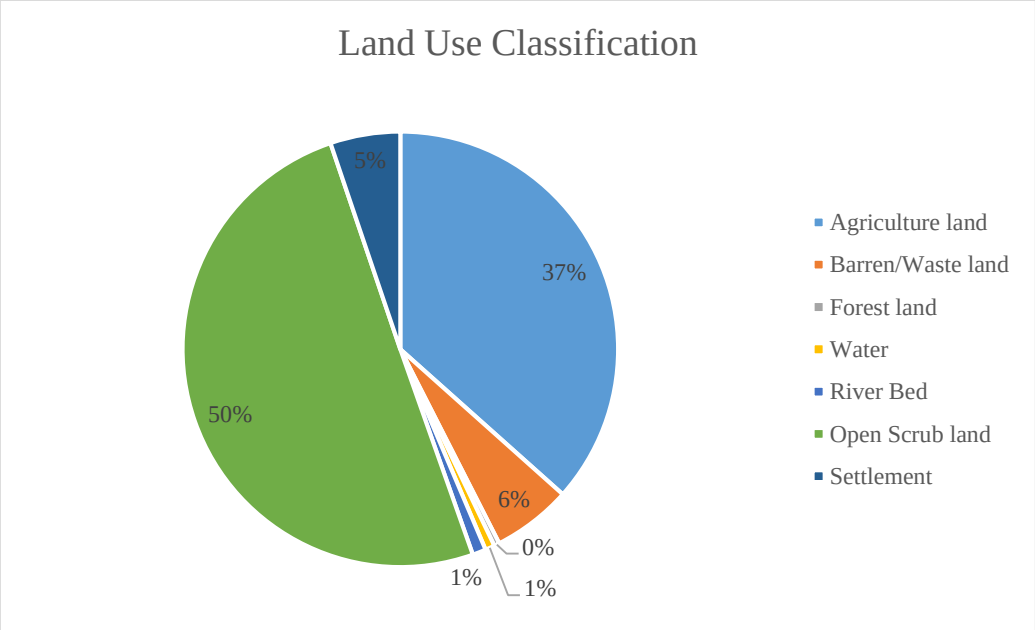


Figure 3.17. Pie-chart showing Land use of the study area

3.4.4.1.6 Conclusion of the land use

Land use Classification suggests that approx. 50 % of the land area is under Open Scrub area while approx. 37% is under agriculture land and approx. 6 % is Barren/Waste land. Thus, considering the land use pattern adequate, measures can be taken under EMP to facilitate afforestation in nearby area with the help of forest management techniques.

3.4.5 SOIL ENVIRONMENT

3.4.5.1. Geomorphology & Soil

Una district nestles between Siwalik ranges and forms part of the lesser Himalayas. It has a diverse landscape made of hills, valleys with piedmont zone, terraces. The elevations of the land surface in the district, vary from 340 m in south-eastern part to 1041 m above mean sea level (amsl) in eastern part of the district. There are three hill ranges i.e. Chamukha Dhar with maximum elevation of 1041m amsl, which borders with district Hamirpur, Dhionsar Dharwith maximum elevation of 950m amsl and Ramgarh Dhar with maximum elevation of 997m amsl. In the southwest along the border with Punjab, Siwalik hill ranges forms hilly upland or plateau area with elevation up to 666 m amsl. The vast area between the northwesterly & southeasterly hill ranges, on both sides of river

Soan is known as Una valley. The undulating to plain fertile Una valley has an area of about 455 sq km and it extends from Daulatpur in the north - west to Santokhgarh in the south - east.

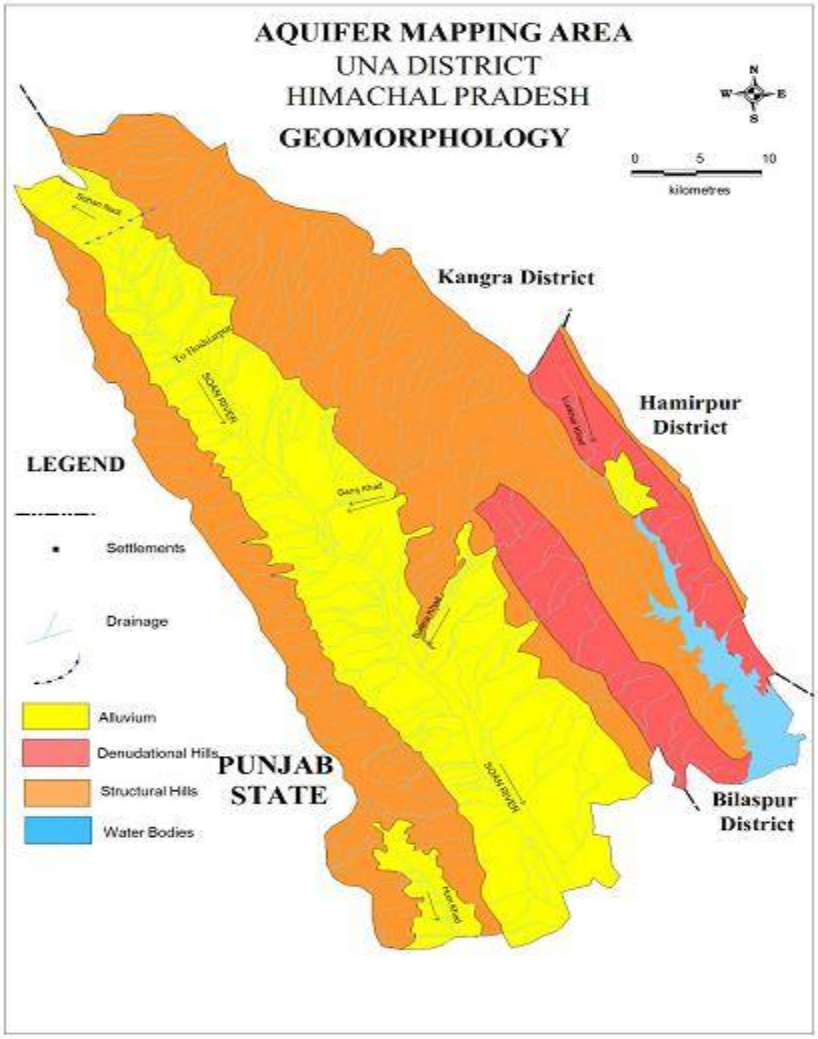


Figure 3.18. Geomorphological map of Una district, Himachal Pradesh (*Source:* CGWB, 2020)

Soan or Swan River, a tributary of river Satluj, drains the major part (80%) of the Una district. Soan is an intermittent river and maintains base flow in the lower reaches. Soan river has about 80% catchment area in Una district and divides the district into two parts. Soan river flows in a southeastern direction and has a wide channel and exhibits braided nature. It originates near Daulatpur in the northeastern part and leaves the district near Santokhgarh and subsequently joins river Satluj. Number of local streams (about 73 khads) joins the river within the district. During monsoon Soan river gets flooded due to shallow bank heights and large area on both sides get

affected. Govt. of HP has initiated riverbank protection cum flood control measures and the work is in progress. In Bangana area, another stream (Khad), flowing parallel to Soan river, is Lunkhar khad, which debouches in Govind Sagar lake. Also, in the extreme north-western part of the district small area forms the catchments of a tributary of Beas river basin.

Two types of soils are observed in the district viz., alluvial soil and non-calcic brown soil. Most of the area in the district is covered with alluvial soil and only about 25% of the area i.e. hilly area in the district is covered with non-calcic brown soil. Soils are rich in nutrients and thus are fertile.

Soil Classification Code	Soil Description
88	Shallow, well drained, hyperthermic, sandy soils on very gentle slopes with sandy surface and moderate erosion; associated with: Shallow, well drained, coarse-loamy soils with loamy surface and moderate erosion.
72	Medium deep to deep, well drained, thermic, loamy-skeletal soils on steep slopes with loamy surface and severe erosion; associated with: Medium deep, well drained, calcareous, fine-loamy soils with loamy surface and moderate erosion.
80	Medium deep, well drained, thermic, loamy skeletal soils on moderately steep slopes with loamy surface and severe erosion; associated with: Medium deep, well drained, fine-loamy soils with loamy surface and severe erosion.
90	Deep, well drained, hyperthermic, coarse loamy soils on very gentle slopes with loamy surface and severe erosion; associated with: Medium deep, well drained, coarse-loamy soils with loamy surface and moderate erosion.
78	Medium deep, well drained, thermic, coarse-loamy soils on gentle slopes with loamy surface and severe erosion; associated with, Medium deep, moderately well drained, fine-loamy soils with loamy surface and severe erosion,
81	Medium deep, well drained, hyperthermic, coarse-loamy soils on gentle slopes with loamy surface and slight erosion; associated with; Deep, well drained, coarse-loamy, calcareous soils with loamy surface and moderate erosion.
75	Medium deep, well drained, thermic, loamy skeletal soils on very gentle slopes with loamy surface, moderate erosion and moderate stoniness; associated with: Deep, well drained, fine-loamy soils with loamy surface and slight erosion.

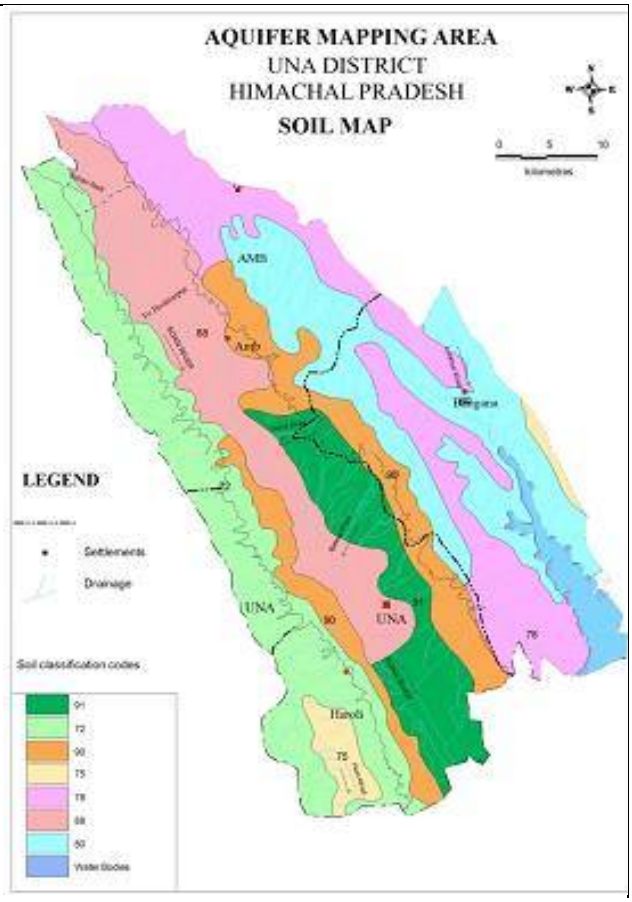


Figure 3.19. Soil characteristic of Una district, Himachal Pradesh (*Source:* CGWB, 2020)

3.4.5.1 Soil quality:

The information on soil has been collected from various secondary sources and also through primary soil sampling analysis of which is described in this section. For studying the soil profile

of the region, soil samples were collected from 5 locations in the study area as well as from project site to assess the existing soil conditions within the study area representing various land uses. The sampling locations have been finalized with the following objectives:

- To determine the base line characteristics
- To determine the soil characteristics of project location.
- To determine the impact of industrialization/urbanization on soil characteristics
- To determine the impacts on soils from agricultural productivity point of view.

3.4.5.2 Methodology for soil sampling:

The sampling locations are selected based on input source. The soil sample is collected from various depths of 30 cm, 60 cm & 90 cm from nearby agriculture land, waste disposal areas or likely impacted areas as described in Lab SOP. Monitoring and sample handling (including sample preservation and transportation) is carried out as per national/ international standard methods as Soil/Sludge quality monitoring (IS: 2720, APHA & ICAR/IARI guidelines). The interpretation of data is being done with respect to standards and norms prescribed by recognized bodies as well as statistical analysis of observed values/data where required.

3.4.2.3 Sampling frequency:

Soil quality monitored once at 5 locations (including project location) within 10 km of study area during the monitoring period. Sampling locations for monitoring of soil selected in the study area are given in **Table 3.18.** Locations of soil monitoring stations are shown in **Fig. 3.20**.

Table 3.18. Details of Soil Sample Monitoring Stations

S. No.	Sample Code	Name of Village/ Location	Distance & Direction (km)
1.	S1	Project Site	0
2.	S2	Near Lakh Data Peer Mandir, Panjoiyan	2.1 km; NW
3.	S3	Near Brora Niwas ,Vill Panjoiyan	1.6 km; NW
4.	S4	Village- Jaijon	1.5 km; NE
5.	S5	Village- Kutharbeet	2.0 km; SW

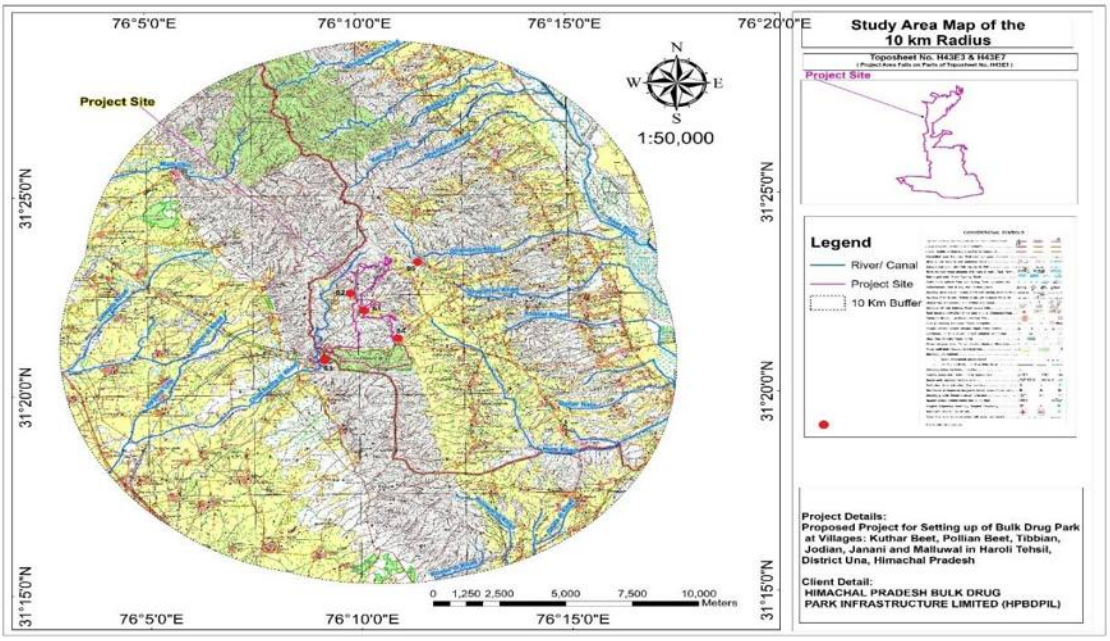


Figure 3.20. Location of Soil Monitoring Stations (Marked on Toposheet No. H43E3 and H43E7)

Figure 3.21. Sampling photographs of soil monitoring

3.4.5.4 Parameters Monitored & Methods Used

Test methods for determining Soil Quality are given below in **Table 3.19**.

Table 3.19. Test Methods for determining Soil Quality

Sr. No.	Test Parameter	Test Method
1.	pH	IS: 2720 (P-26) 1987 RA2016
2.	Electric Conductivity (EC)	IS: 14767: 2000 RA2016
3.	Texture	IS: 2720 (P-4) 1985 RA 2015
4.	Extractable Sodium as Na	Lab SOP: EL/SOP/SS/10
5.	Extractable Potassium as K	Lab SOP: EL/SOP/SS/10
6.	Available Nitrogen as N	Lab SOP:EL/SOP/SS/16
7.	Available Phosphorus as P	Lab SOP:EL/SOP/SS/14
8.	Porosity	Lab SOP:EL/SOP/SS/36
9.	Permeability	Lab SOP:EL/SOP/SS/37
10.	Sodium Absorption Ratio (SAR)	Lab SOP:EL/SOP/SS/31
11.	Cation Exchange capacity (CEC)	Lab SOP:EL/SOP/SS/30
12.	Extractable Magnesium as Mg	Lab SOP:EL/SOP/SS/09
13.	Extractable Calcium as Ca	Lab SOP:EL/SOP/SS/08
14.	Particle Size	IS: 2720 (P-4)
15.	Chloride (Cl^-)	Lab SOP:EL/SOP/SS/46

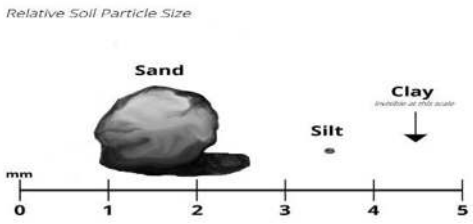
3.4.5.3 Physical characteristics:

Soil is generally considered as the upper layer of the earth that is dug or ploughed, especially the loose material in which plants grow. It is generally unconsolidated material composed of soil particles produced by disintegration of rocks. The void spaces between the particles may contain air, water or both. Physical characteristics of soil influence its use and behavior towards plants growth. The plant support root penetration, drainage, aeration, retention of moisture & plant nutrients is linked with the physical condition of soils. Normally following physical parameters are important for determining quality of soil:

(i) Soil Texture:

Soil texture determined by percentage of sand, silt and clay is the important soil characteristic

influencing soil quality. Sand particles are relatively large, silt particles are medium-sized and clay particles are very tiny in size. Clay and silt soil holds more water and plant nutrients than the sand. Soil is classified as four major textural classes: 1) sand; 2) silt; 3) clay and 4) loam based on the proportion of particle sizes.



(ii) Porosity:

Volume of soil mass that is not occupied by soil particles and usually occupied by air & water are known as pore space. The plant roots grow & exist in the pore spaces. Porosity, therefore, refers to that percentage of soil volume which is occupied by pore spaces.

(iii) Bulk Density:

Bulk density weight of a unit of volume of soil inclusive of pore spaces.

(iv) Water holding capacity:

Water holding capacity is the amount of water retained by soil to make available for crops which is determined by soil texture and available pore spaces in soil. Clay and silty soil tend to have higher water holding capacity whereas sandy soils have lower water holding capacity.

(v) Soil fertility:

Soil fertility is the ability of a soil to provide the nutrients needed by crop plants to grow.

3.4.5.4 Chemical characteristics:

The chemical characteristics for each monitoring locations were analysed and presented in **Table 3.20** along with the min., max and mean values. Test reports depicting soil results are enclosed as **Annexure 13.**

Table 3.20. Results of soil samples

Sr. No.	Parameter	Units	S1	S2	S3	S4	S5	Min	Max	Avg.
1.	pH	-	8.16	8.09	8.05	7.79	7.41	7.41	8.16	7.9
2.	EC	mmhos/cm	0.119	0.133	0.097	0.09	0.148	0.09	0.15	0.12
3.	CEC	meq/100g	8.52	11.2	5.8	10.87	12.17	5.8	12.17	9.71
4.	Na	mg/kg	35.5	89	18.5	16	92.5	16	92.5	50.3
5.	K	mg/kg	740	745	423	408	417	408	745	546.6
6.	SAR	meq/L	0.2	0.29	0.11	0.09	0.53	0.09	0.53	0.24
7.	**Particle Size** Clay Sand Gravel	%	 2.5 95.7 1.80	 2.10 67.5 30.40	 5.80 90.7 3.50	 7.90 72.50 19.60	 5.00 53.90 40.10	 2.1 53.9 1.80	 7.9 97.5 40.1	 4.66 76.1 19.1
8.	Permeability	cm/hr	1.48	0.79	1.4	1.33	1.37	0.79	1.48	1.274
9.	Porosity	%	32.9	54.32	32.16	31.72	30.15	30.15	54.32	36.25
10.	Texture	-	Loam Sand	Sandy Clay Loam	Loam Sand	Sandy Loam	Sandy Loam	--	--	--
11.	Ca	mg/kg	112	344	112	112	112	112	344	158.4
12.	Mg	mg/kg	10	21.6	4.8	10	2	2	21.6	9.68
13.	N	mg/kg	912	945	450	889	705	450	945	780.2
14.	P	mg/kg	172	188	165	168	159	159	188	170.4
15.	Cl	mg/kg	40	40	40	60	60	40	60	48

3.4.5.6 Interpretation of soil characteristics:

- **Soil pH:** Soil pH is an important soil property, which affects the availability of several plant nutrients. It is a measure of acidity and alkalinity and reflects the status of base saturation. pH of soil samples is for all sampling locations is reported neutral to slightly alkaline in nature (7.4 to 8.2). Because the pH of the soil influences the activity of beneficial bacteria, it can also effect plant growth. In highly acidic soils, the majority of legume bacteria that fix nitrogen are not very active.
- **Soil Conductivity (EC):** The ability of soil water to convey electrical current is measured by soil electrical conductivity, or EC. Water-filled pores are the main electrolytic medium via which electrical conductivity is produced. When salts are dissolved in soil water, the anions (SO_4^{2-}, Cl^-, NO_3^-, and HCO_3^-) and cations (Ca^{2+}, Mg^{2+}, K^+, Na^+, and NH_4^+) carry electrical charges and transmit the electrical current. EC has mostly been utilized in agriculture as a gauge for soil salinity. The estimated results of the EC indicate that the soil is non-saline in nature as the observed values ranges between 0.09 to 0.15 mmhos/cm.

Table 3.21. Categorisation of soil salinity based on EC (Source: USDA-NRCS handbook)

Sr. No.	EC range (mmhos/cm)	Level of soil salinity
1.	0 - 2	Non- saline
2.	2 - <4	Very Slight saline
3.	4 - <8	Slightly Saline
4.	8 - <16	Moderate Saline
5.	>16	Strongly saline

- **Soil Texture:** The soil textures refer to proportion of particle size of soil that refers to the sand, clay and silt fraction present in the soil samples. The observed soil texture is Loam sand for site S1 and S3, Sandy Clay Loam for site S2 and Sandy Loam at site S4 and S5.
- **Permeability:** Soil permeability is the property of the soil to transmit water and air. Usually, the finer the soil texture, the slower the permeability. Since, the permeability of soil samples is 1.48cm/hr. at the project site (S1) thus as per the classification of soil permeability, it is categories as moderate.

- **SAR:** SAR content of the monitoring locations were observed 0.2 meq/L, 0.29 meq/L, 0.11 meq/L, 0.09 meq/L and 0.53 meq/L for site S1, S2, S3, S4 and S5 respectively, indicating that the general distribution SAR was matching with distribution pattern of EC.
- **Chloride:** Chloride is a chemically and hydrologically inert material. Cl^- is involved in the synthesis of organically bound chlorine as part of a complex biogeochemical cycle. The accompanying anion Cl^- has traditionally been referred to as unwanted but unavoidable; generally speaking, cation K+ is generally viewed as one of the major plant nutrients. But now days, it's thought that Cl^- is a necessary vitamin for healthy growth. The primary ions involved in neutralizing charges are K^+ and Cl^-, which are also the most significant inorganic osmotic active chemicals found in plant tissues and cells. The opening and closure of stomata is connected to the relationship between K and Cl. In present investigation the Cl- concentration raged from 40-60 mg/Kg.

3.4.5.7 Conclusion:

In the current study, indicators viz., pH, EC, porosity, permeability, macro and micro-mineral compositions (such as Na, K, N, P, Ca and Mg) etc. were analyzed and assessed. The soil parameters could offer the information of soil fertility status well, so these indicators were used to evaluate the soil composition in the study area. The pH of the monitoring location indicates neutral to alkaline in nature so soil. SAR was reported below 13 meq/L and mineral composition refers to its suitability for agriculture and cultivations purposes.

3.4.6 HYDROGEOLOGY:

According to hydrogeology, the Una district is made up of two aquifer systems: The Consolidated and the Unconsolidated. Upper, middle, and lower Siwalik rocks are found in the hilly regions. The main types of rocks found in highland regions like Bhangana and Bharwain are sandstones, shale, clay, conglomerate, and exposed boulder layers **(Figure 3.22)**. By digging shallow wells along the drainage lines in low topography, ground water in these formations is poorly developed. The majority of these constructions dried up during the hottest summer months. The depth to water level of the dug wells in the overburden area ranges from 2 to approximately 8 meters. Springs can be found in low-lying topographic regions near streams, lineaments, and the intersection of several

formations.

Only valley regions contain the unconsolidated formations. These include the terrace deposits on the highlands and the valley floor. These formations are made up of boulders, cobbles, and pebbles combined with different amounts of sand and clay and boulder beds made of clay. The proportion of coarse-grained sediments rises as one moves uphill, while the deposits get finer as one moves towards the Soan River, or the central Una valley. Granular zones in terrace deposits are more promising and may generate future horizons that hold water.

Aquifer parameters

In the Una Valley, the Central Ground Water Board has dug 45 exploratory tube wells, ranging in depth from 90 to 163 meters. From artesian 1.45 m agl (Rampur) to 43.20 m bgl at Chalet, the static water level fluctuates. The tube well yield varies from 338 lpm in Badehra to 3430 lpm in Athens. For a dip of 2 to 40 meters, the exploratory wells' discharge varied from 68 lpm to 3430 lpm while tapping aquifers between 27 and 168 m bgl. For drawdowns of 24 m, 39 m, and 11 m, respectively, the artesian wells at Bhadsali, Kaloh, and Rampur that were accessing restricted aquifers produced yields of 1230 lpm, 3290 lpm, and 886 lpm. In the Valley region, transmissivity varies from 150 to 2600 m^2/day.

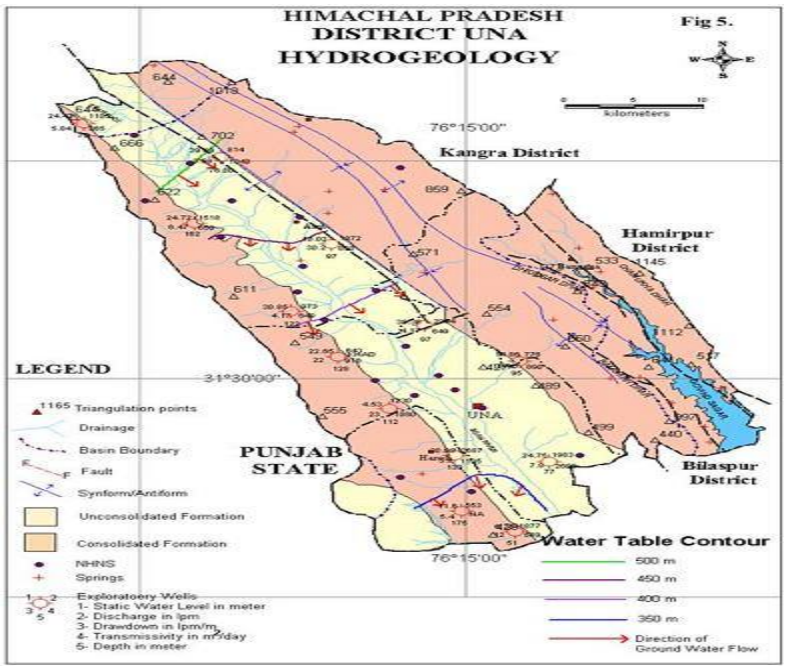


Figure 3.22. Hydrogeological map of the Una district (CGWB, 2020)

The Department of Irrigation and Public Health (I&PH) of Himachal Pradesh has also dug approximately 300 tube wells, with depths ranging from 51.0 to 220.0. These tube wells have water levels that range from artesian condition to 45.00 m. With a discharge ranging from 553 to 3500 lpm for a 7–10 m draw down, the well yields are high. Thirty of the 300 tube wells are used for irrigation, and the remaining 270 tube wells are used for water delivery. The I&PH department has dug a few shallow bore-wells (equipped with hand pumps) in the hilly regions of Una district to supply the hamlets with safe drinking water. at a depth of 45 to 80 meters, with yields or discharges of less than 0.5 litres per year.

Precipitation is the principal source of Ground water recharge to aquifer systems in the district. The return flow from the irrigation systems like tube well irrigation, surface water lift irrigation, kuhl irrigation are the main sources of ground water recharge. Inflow seepage from khads, rivers, and water reservoirs (pong dam) also contribute to the ground water reserves. In the district, all the major irrigation and drinking water supplies depend on the tube wells, and dug wells, in addition to various water supply schemes based on rivers/ nallas.

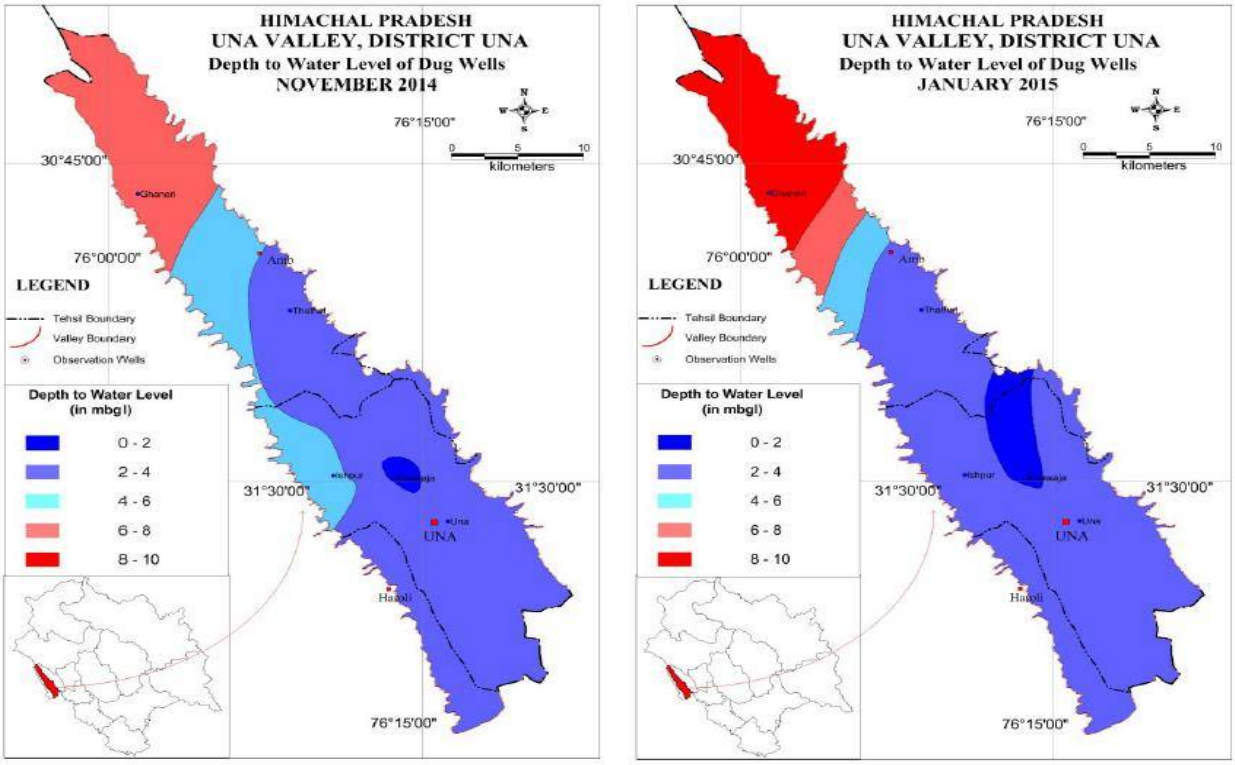


Figure 3.23. Depth of water level of Distt. Una

3.4.6.2 Ground water resources:

In the arenaceous rocks of the Siwalik group of rocks, such as sandstone, siltstone, gravel boulder beds, etc., ground water is found in unconfined to semiconfined environments. Inter granular pore spaces and fracture porosity regulate the occurrence and flow of ground water. Hilly/undulating regions with bowries and gravity/contact type springs serving as the primary groundwater structures aside from hand pumps are covered with Siwalik sediments. The springs' discharges range from seepages to 0.50 lps. Bowries are a form of dug well used to tap seepages from sediments that are built on hill slopes or in nalas. The primary groundwater constructions in the low-lying regions covered by Siwalik rock are hand pumps and dug wells, which vary in depth from 3.00 to 25.00 m bgl.

The majority of the Una Valley's ground water is found in porous, unconsolidated, alluvial formations (valley fills), which are made of gravel, sand, silt, cobbles, and other materials. Both phreatic and restricted situations can produce ground water. The lower portion of the Soan River exhibits artesian characteristics as well. In the area, hand pumps, dug-cum-borewells, medium-to-deep tube wells, and other methods are being used extensively to develop ground water. The area's dug-well and dug-cum-borewell depths range from 4.00 to 70.00 meters below the surface.

3.4.6.3 Status of ground water development:

Precipitation is the principal source of Ground water recharge to aquifer systems in the district. The return flow from the irrigation systems like tube well irrigation, surface water lift irrigation, kuhl irrigation are the main sources of ground water recharge. Inflow seepage from khads, rivers, and water reservoirs (pong dam) also contribute to the ground water reserves. Generally, these springs are tapped at the source, so that the water can be supplied under gravity. These springs are generally contact or depression types. Drainage map within 5 km of study area is shown below in **Fig. 3.12.**

3.4.6.4 Brief of drainage map:

The flow of water is according to natural slope the surface i.e. towards river Beas and the same is highlighted by drainage map of the project area within 10 km of the project location.

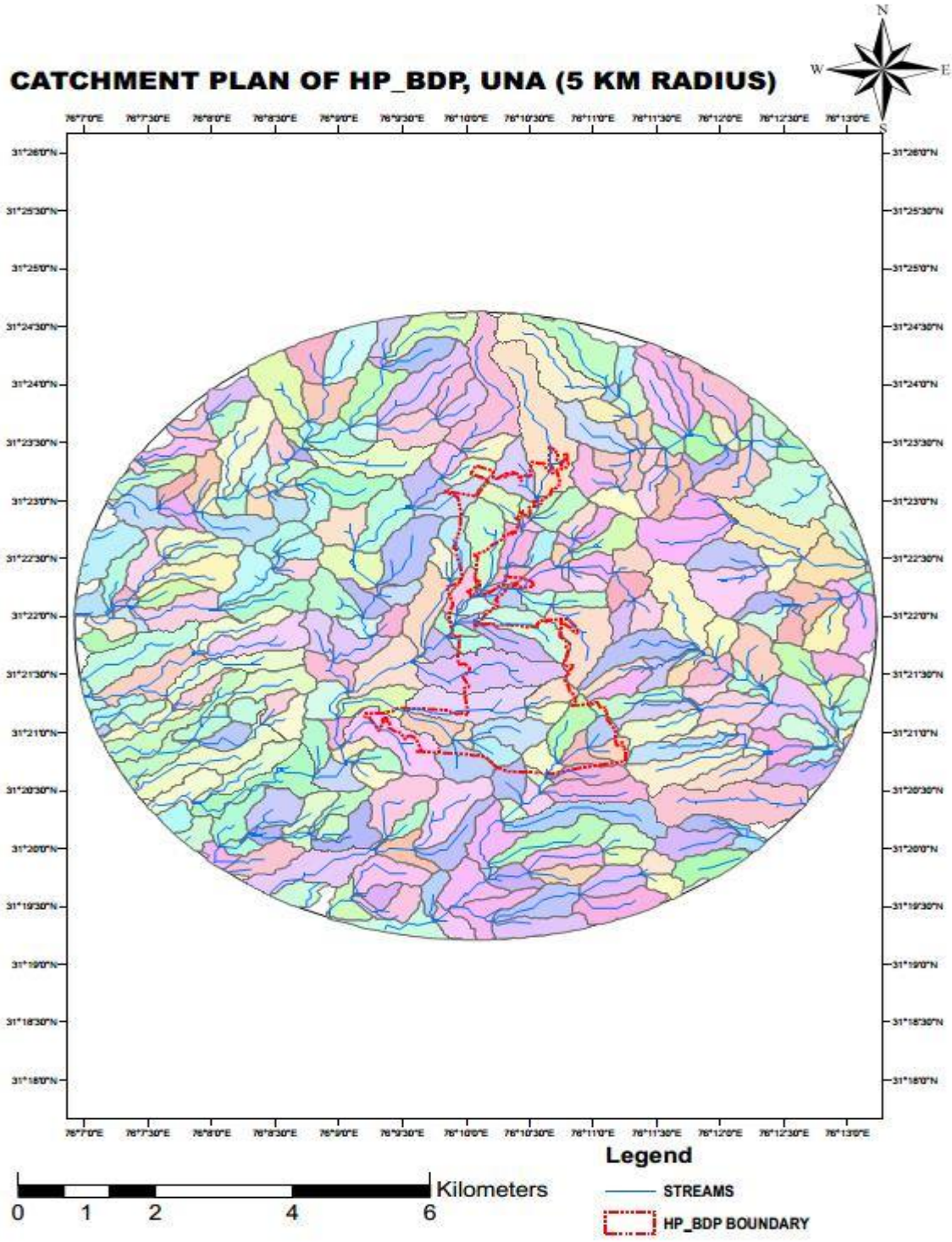


Fig. 3.12: Drainage map of the project area within 5 km of the project location

3.4.6.5 Conclusion

The water level of Una valley falls under safe category, However, rainwater harvesting outside the project premises will still be done to increase ground water level. The proposed development of Bulk drug park is expected to result in increased runoff and minor changes in drainage patterns. However, with the implementation of proposed storm water management and flood mitigation measures, the impacts on local water resources will be managed effectively.

3.4.7. WATER REQUIREMENT

3.4.7.1. Ground Water quality:

Water quality of groundwater has been studied in order to access proposed water-uses in drinking, cooling and horticulture purposes.

3.4.6.6 Methodology

Five sampling locations (including project location) has been selected as per the monitoring plan. Grab sampling method has been used to collect ground water samples. Sampling is carried out as per the defined periodicity and for the parameters indicated in the Technical Guidance Manual for Industrial Estate approved by MoEF&CC. PTFE and glass bottles have been used to collect samples depending on the parameter to be tested. Source of sampling has been sterilized properly by Iso-propyl Alcohol via cotton followed by heating by spirit lamp for 2-3 minutes. Sample is collected after pumping the borewell for a period of at least 5-6 minutes. Further, collected samples are labelled and stored in Ice box maintained at approx. 6°C. pH, temperature, etc. are analyzed on site and recorded. Samples thus collected were analyzed for various parameters. All Ground water samples are analyzed as per IS 17614: Part 1: 2021.

3.4.7.1.4 Ground water Monitoring

Ground water is available in the study area at different depths. Samples have been drawn from different locations and quality evaluated. To monitor the existing quality of groundwater, 5 samples were collected. Locations of Ground Water Monitoring stations are given in **Table 3.23** and is shown in **Fig. 3.24**. Test reports of project location & baseline data from 8 locations within study area are enclosed as **Annexure 13** respectively.

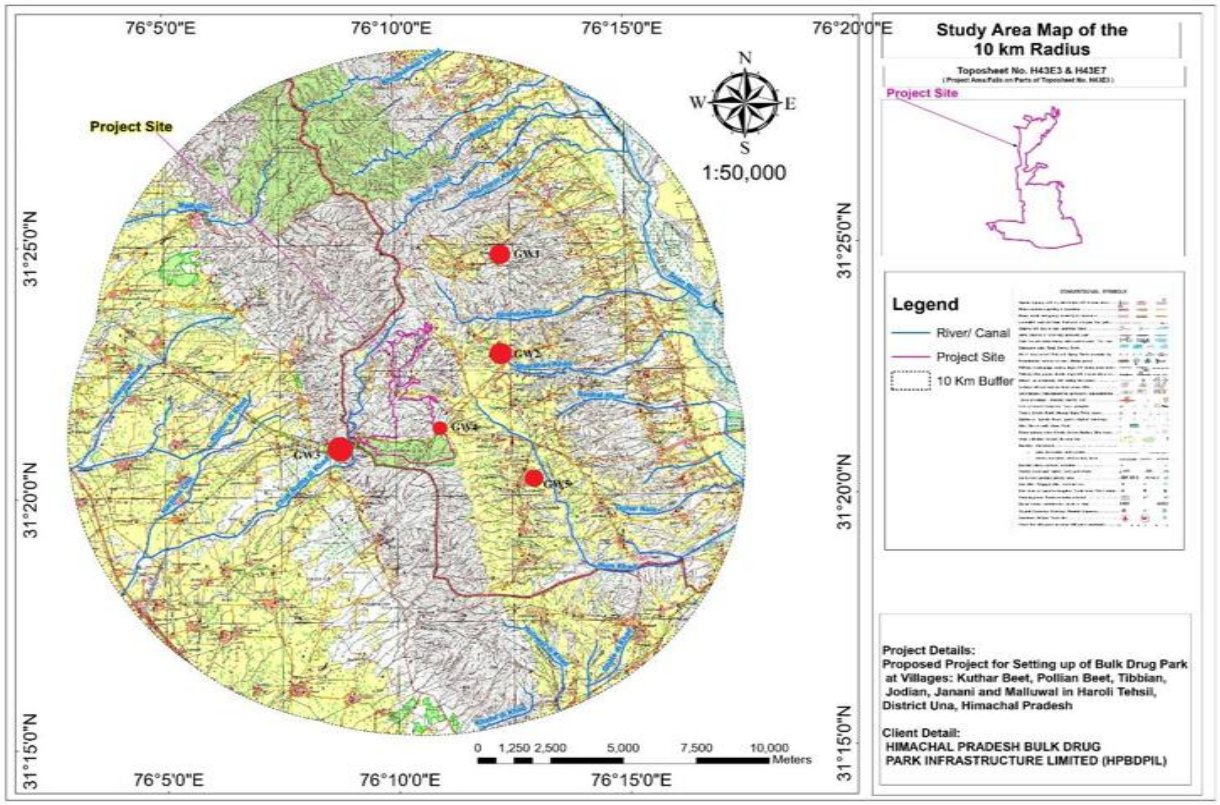


Figure 3.24. Locations of ground water monitoring stations (Marked on Toposheet No. H43E3 and H43E7; Not on scale)

Table 3.22. Details of ground water monitoring stations

S. No.	Sample Code	Name of Village/ Location	Co-ordinates of Location	Distance & Direction (km)
1.	GW1	Village – Baliwal (From Tubewell)	31°24'58.39"N, 76°12'21.56"E	3.8 km; NE
2.	GW2	Village- Pubowal (From Tubewell)	31°22'55.27"N, 76°12'15.23"E	2.5 km; E
3.	GW3	Village - Jaijon Doaba (From Borewell)	31°21'00.45"N, 76° 08'51.69"E	0.6 km; SW
4.	GW4	Project Site, Guest House Forest Dept. Village Polian Beet (From Tubewell)	31°23'3.11"N, 76°13'26.53"E	0 km; Project site
5.	GW5	Villlage – Dulehr (From Tubewell)	31°21'21.42"N, 76°10'51.60"E	2.4 km; SE

3.4.7.1.2 Sampling Frequency

Ground water quality was monitored at 5 different locations within 10 km of study area during the monitoring period (once in summer season: April, 2023).

3.4.7.1.3 Parameters Monitored & Methods Used

Test methods for determining ground water monitoring are given below in **Table 3.22**.

Table 3.23. List of tested groundwater quality variables along with method codes

Sr. No.	Test Parameter	Test Method
Physical Parameters		
1.	Colour	IS: 3025 (P-4), Cl 2.0
2.	Odour	IS: 3025 (P-5)
3.	pH	IS: 3025 (P-11)
4.	Turbidity (TU)	IS:3025 (P-10)
5.	Total Dissolved Solids (TDS)	IS:3025 (P-16)
Chemical Parameters		
6.	Electric conductivity (EC)	IS: 3025 (P-14)
7.	Salinity	EL/SOP/W/005
8.	Dissolved oxygen (DO)	IS:3025 (P-38)
9.	Biochemical oxygen demand (BOD)	IS:3025 (P-44)
10.	Mg Hardness	IS:3025 (P-46)
11.	Total Hardness (TH) as $CaCO_3$	IS: 3025 (P-21)
12.	Total Alkalinity (TA) as $CaCO_3$	IS: 3025 (P-23)
13.	Total Nitrogen (Total N)	IS: 3025 (P-34)
14.	Total Phosphorous (Total P)	IS: 3025 (P-31)
15.	Phenol	IS:3025 (P-43)
Cations		
1.	Sodium (Na^+)	IS:3025 (P-45)
2.	Potassium (K^+)	IS:3025 (P-45)
3.	Magnesium (Mg^{++})	IS: 3025 (P-46)
4.	Calcium (Ca^{++})	IS: 3025 (P-40)
Anions		
1.	Chloride (Cl^-)	IS: 3025 (P-32)

2.	Fluoride (F^-)	IS: 3025 (P-60)
3.	Nitrate (NO_3^-)	IS: 3025 (P-34)- Cl 3, 3, Chromotropic Acid Method
4.	Sulphate (SO_4^{--})	IS: 3025 (P-24), Cl 4.0
Heavy Metals		
1.	Lead (Pb)	APHA-23rd Ed-3111B A-Ac Flame AAS Method
2.	Mercury (Hg)	APHA-23rd Ed-3111B A-Ac Flame AAS Method
Biological Indicators		
1.	Total Coliform (TC)	IS:15185
2.	Fecal Coliform (FC)	IS:15185

Figure 3.25. Sampling photographs of groundwater monitoring

Table 3.24. Results of ground water samples

Sr. No.	Parameter	Units	GW1	GW2	GW3	GW4	GW5	Min	Max	Avg.	Acceptable limit	Permissible limit
Physical Parameters												
1.	Colour	CU	BDL	BDL	BDL	BDL	BDL	--	--	--	**5**	**15**
2.	Odour	--	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	--	--	--	**Agreeable**	**Agreeable**
3.	pH	--	7.51	7.2	7.32	7.44	7.25	7.2	7.51	7.34	**6.5-8.5**	**No relaxation**
4.	TU	NTU	BDL	BDL	BDL	BDL	BDL	--	--	--	**1**	**5**
5.	TDS	mg/L	461	459	429	431	408	408	461	437.6	**500**	**2000**
Chemical Parameters												
6.	EC	mmho/cm	693	690	645	648	614	614	693	658	--	--
7.	Salinity	mg/L	19	18	19	17	17	17	19	18	--	--
8.	DO	mg/L	5.4	5.6	5.5	5.3	5.8	5.3	5.8	5.52	--	--
9.	BOD	mg/L	BDL	BDL	BDL	BDL	BDL	--	--	--	--	--
10.	Mg Hardness	mg/L	128	120	136	128	128	120	136	128	--	--

11.	TH	mg/L	324	360	344	328	320	320	360	335.2	**200**	**600**
12.	TA	mg/L	364	360	328	340	316	316	364	341.6	**200**	**600**
13.	Total N	mg/L	BDL	BDL	BDL	BDL	BDL	--	--	--	--	--
14.	Total P	mg/L	BDL	BDL	BDL	BDL	BDL	--	--	--	--	--
15.	Phenol	Mg/L	BDL	BDL	BDL	BDL	BDL	--	--	--	**0.001**	**0.002**
Cations												
1.	Na^+	mg/L	22	28	29	25	22	22	29	25.2	--	--
2.	K^+	mg/L	2.4	2.7	2.1	2.6	1.9	1.9	2.7	2.34	--	--
3.	Mg^{++}	mg/L	31	29	33	31	31	29	33	31	**30**	**100**
4.	Ca^{++}	mg/L	79	96	83	80	77	77	96	83	**75**	**200**
Anions												
1.	Cl^-	mg/L	12	10	11	9.8	9.5	9.5	12	10.46	**250**	**1000**
2.	F^-	mg/L	0.40	0.55	0.35	0.50	0.4	0.35	0.55	0.44	**1**	**1.5**
3.	NO_3^-	mg/L	3.7	4.4	3.4	4.8	3.6	3.4	4.8	3.98	**45**	**No relaxation**
4.	SO_4^{--}	mg/L	32	38	41	38	33	32	41	36.4	**200**	**400**

Heavy Metals												
1.	Pb	mg/L	BDL	BDL	BDL	BDL	BDL	--	--	--	**0.01**	**No relaxation**
2.	Hg	mg/L	BDL	BDL	BDL	BDL	BDL	--	--	--	**0.001**	**No relaxation**
Biological Indicators												
1.	TC	Shall not be detectable in any 100 ml sample	Absent	Present	Absent	Absent	Absent	--	--	--	**Absent**	--
2.	FC	Shall not be detectable in any 100 ml sample	Absent	Absent	Absent	Absent	Absent	--	--	--	**Absent**	--

3.4.6.6 Interpretation of ground water quality:

The groundwater quality of 5 different monitoring locations within the 10 km radius of study area was evaluated in terms of various physico-chemical and biological parameters. The observed data set was initially statistical analyzed and represented in terms of minimum, maximum and mean values (**Table 3.24**). Later on the data set was compared with the standard guideline of acceptable and prescribed limit for drinking water quality under IS: 10500, 2012 and its amendments proposed by Bureau of Indian Standards (BIS).

The analysis of physical parameters such as colour, odour, pH, TU and TDS represents that the groundwater samples were colourless, odourless, within suitable pH (6.5-8.5), no turbid and presence of suitable amount of dissolved solids (below 500 mg/L). The comparison of groundwater variables with standards limits indicated that the all groundwater quality parameters were within the prescribed limit of drinking water quality. Only the Total Hardness, Cations (Ca++ and Mg++) and Total Alkalinity were reported exceeds the acceptable limit of 200 mg/L, 30 mg/L, 75 mg/L and 200 mg/L respectively at almost monitoring locations. This indicates the prior treatment of hardness before any use of groundwater such as domestic and commercial purposes. The graphical presentations of comparison

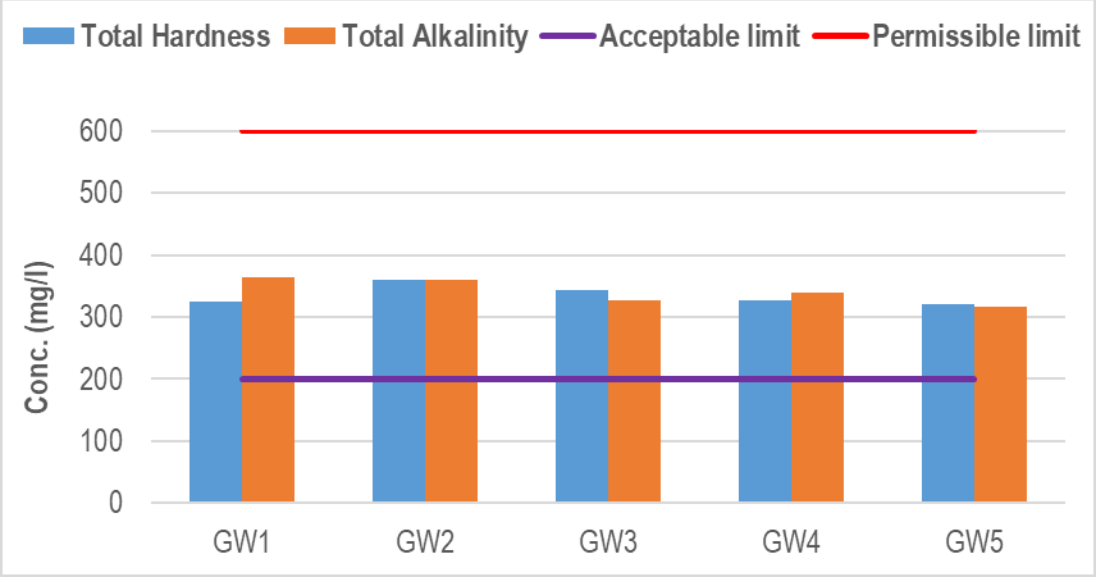


Figure 3.26. Status of Total Hardness & Total Alkalinity in Ground Water

The concentration of BOD, Total N, Total P, Phenol and Heavy Metals (PB and Hg) were recorded below detection limit (BDL) which represents negligence of these quality variables in

groundwater samples.

The biotic factors such as TC and FC were found absent in all groundwater samples at all monitoring locations.

3.4.6.7 Conclusion:

In evaluation of groundwater quality at 5 different locations of study area within 10 km radius of project site, the water quality variables were reported below the prescribed limit of drinking water quality. Only the TH and TA were reported exceeded the acceptable limit (200 mg/L) of guideline for drinking water. Similarly, the cation such Ca^{2+} and Mg^{2+} were reported above the acceptable limit. The concentration of TU, BOD, Total N, Total P, Phenol and Heavy Metals (PB and Hg) were recorded below detection limit (BDL). The biological parameters (TC and FC) were found absent in groundwater samples. The ground water test results indicate that groundwater quality at selected monitoring locations is hard water in nature and requires prior treatment before the use for domestic, industrial and commercial purposes.

3.4.7. Surface water quality:

3.4.7.1 Methodology of Surface water

Four sampling locations have been selected in the study area for surface water sampling as per the monitoring plan. Grab sampling as per APHA methods has been used to collect the surface water samples. Sampling is carried out as per the defined periodicity and for parameters indicated in the Technical Guidance Manual for Industrial Estate approved by MoEF&CC. PTFE and glass bottles have been used to collect samples. Sample has been collected from center of the source and middle of water body with the help of depth sampler. pH, temperature, etc. are analyzed on site and recorded. To fix DO, Manganese sulphate, Alkali iodide azide & conc. H_2SO_4 has been added to DO water sample bottles. All collected water samples are then stored in ice box maintained at approx. 6°C. Samples thus collected were analyzed for various parameters. All Surface water samples are analyzed as per APHA.

3.4.7.2.4 Surface water Quality Monitoring

Surface water quality was monitored at 2 locations of each 4 surface water bodies within 10 km radius. List of surface water sampling locations is given in **Table 3.26** and depicted in **Fig. 3.26.**

The descriptive statistics of hydro-chemical parameters in terms of minimum, maximum and mean is given in **Table 3.27**. Test reports depicting water analysis results are enclosed as **Annexure 9.**

Table 3.25. Details of surface water monitoring stations

S. No.	Sample Code	Name of Village/Location	Distance from project (km)
1.	SW1	Pond, Village Khutar Beet	0.7 km; E
2.	SW2	Pond, Village Pubowal	2.5 km; E
3.	SW3	Pond, Village Palakwah	6.5 km; NE
4.	SW4	Sawan River, Near Village Palakwah	8.6 km; NE

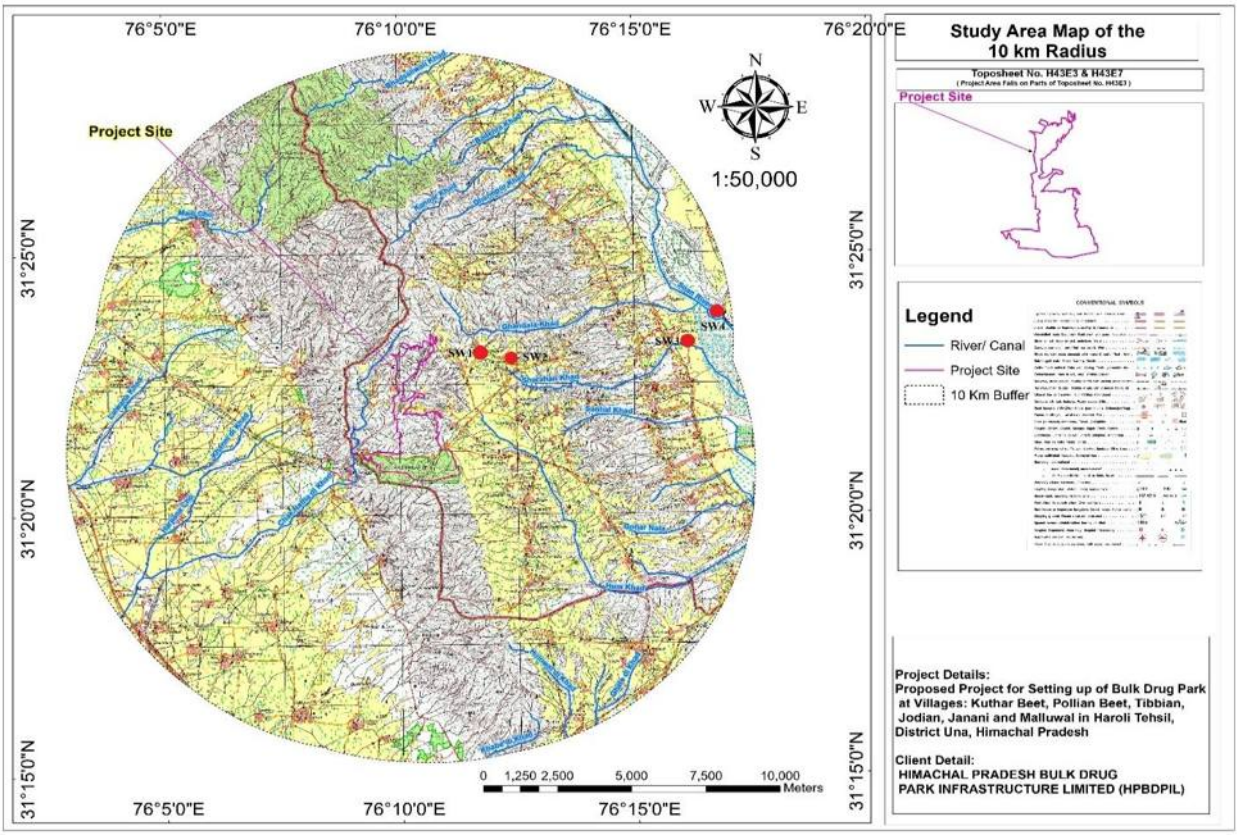


Figure 3.27. Sampling locations of surface water monitoring (Marked on Toposheet No. H43E3 and H43E7; Not on scale)

3.4.7.2.2 Sampling Frequency

The sample collection and surface water quality has been studied once in a season of summer during the monitoring period (during the year 2023).

3.4.7.2.3 Parameters & Methods of Monitoring

Surface water quality is monitored for the parameters mentioned below as per Test methods given in **Table 3.25**.

Table 3.26. Test Methods for determining Surface water Quality

Sr. No.	Test Parameter	Test Method
1.	Colour	IS: 3025 (P-4), Cl 2.0
2.	Odour	IS: 3025 (P-5)

3.	pH	IS: 3025 (P-11)
4.	EC	IS: 3025 (P-14)
5.	Salinity	EL/SOP/W/005
6.	Turbidity	IS:3025 (P-10)
7.	DO	IS:3025 (P-38)
8.	BOD	IS:3025 (P-44)
9.	COD	IS:3025 (P-16)
10.	Total Dissolved Solids	IS:3025 (P-58)
11.	Mg Hardness	IS:3025 (P-46)
12.	Total Hardness	IS: 3025 (P-21)
13.	Total alkalinity	IS: 3025 (P-23)
14.	Total Nitrogen	IS: 3025 (P-34)
15.	Total Phosphorous	IS: 3025 (P-31)
16.	Free Ammonia	IS: 3025 (P-34) Cl 2.5
17.	Phenol	IS:3025 (P-43)
18.	Boron	APHA-23rd Ed-4500B Curcumin Method
19.	SAR	IS: 11624
Cations		
1.	Sodium (Na^+)	IS: 3025 (P-45)
2.	Potassium (K^+)	IS: 3025 (P-45)
3.	Magnesium (Mg^{++})	IS: 3025 (P-46)
4.	Calcium (Ca^{++})	IS: 3025 (P-40)
Anions		
1.	Chloride (Cl^-)	IS: 3025 (P-32)
2.	Fluoride (F^-)	IS: 3025 (P-60)
3.	Nitrate (NO_3^-)	IS: 3025 (P-34)- Cl 3, 3, Chromotropic Acid Method
4.	Sulphate (SO_4^{--})	IS: 3025 (P-24), Cl 4.0
Heavy Metals		
1.	Lead (Pb)	APHA-23rd Ed-3111B A-Ac Flame AAS Method
2.	Mercury (Hg)	APHA-23rd Ed-3111B A-Ac Flame AAS Method
Biological Indicators		
1.	Total Coliform	IS:15185

Figure 3.28. Photographs of the surface water sample collection at different locations

Table 3.27. Results of surface water samples

Sr. No.	Test Parameter	Units	SW1	SW2	SW2	SW4	Min	Max	Avg.
1.	Colour	CU	BDL	BDL	BDL	BDL	--	--	--
2.	Odour	--	Agreeable	Agreeable	Agreeable	Agreeable	--	--	--
3.	pH	--	7.21	7.36	7.19	7.28	7.19	7.36	7.26
4.	EC	mmho/cm	386	326	352	278	278	386	335.5
5.	Salinity	mg/l	32	20	27	15	15	32	23.5
6.	TU	NTU	9.8	5.3	7.1	2.1	2.1	9.8	6.07
7.	DO	mg/l	3.8	4.3	4.0	5.6	3.8	5.6	4.42

8.	BOD	mg/l	12	7.2	8.2	<2	7.2	12	9.13
9.	COD	mg/l	58	36	52	8	8	58	38.5
10.	TDS	mg/l	251	212	229	181	181	251	218.25
11.	Mg Hardness	mg/l	11	20	15	28	11	28	18.5
12.	TH	mg/l	136	125	130	118	118	136	127.25
13.	TA	mg/l	140	125	132	120	120	140	129.25
14.	Total Carbon	mg/l	NP*	NP*	NP*	NP*	--	--	--
15.	Total Nitrogen	mg/l	BDL	BDL	BDL	BDL	--	--	--
16.	Total Phosphorous	mg/l	NA	NA	NA	NA	--	--	--
17.	Free Ammonia	mg/l	BDL	BDL	BDL	BDL	--	--	--
18.	Phenol	mg/l	NA	NA	NA	NA	--	--	--
19.	Boron	mg/l	BDL	BDL	BDL	BDL	--	--	--
20.	SAR	meq/l	1.30	0.97	1.10	0.73	0.73	1.3	1.025
Cations									
1.	Sodium (Na^+)	mg/l	35	25	29	18	18	35	26.75
2.	Potassium (K^+)	mg/l	2.7	2.1	2.4	1.7	1.7	2.7	2.22
3.	Magnesium (Mg^{++})	mg/l	2.7	4.9	3.7	6.1	2.7	6.1	4.35
4.	Calcium (Ca^{++})	mg/l	50	42	46	36	36	50	43.5

Anions									
1.	Chloride (Cl^-)	mg/l	18	11	15	8.5	8.5	18	13.12
2.	Fluoride (F^-)	mg/l	0.55	0.3	0.45	0.25	0.25	0.55	0.39
3.	Nitrate (NO_3^-)	mg/l	5.4	4.3	4.9	3.6	3.6	5.4	4.55
4.	Sulphate (SO_4^{--})	mg/l	40	32	36	25	25	40	33.25
Heavy Metals									
1.	Lead (Pb)	mg/l	NA	NA	NA	NA	--	--	--
2.	Mercury (Hg)	mg/l	NA	NA	NA	NA	--	--	--
Biotic Factor									
1.	Total Coliform	Shall not be detectable in any 100 ml sample	4 x10^5	3.2x 10^3	2.2 x 10^4	1.8 x 10^3	--	--	--

3.4.6.9 Surface water quality:

As per CPCB, water can be classified into different classes according to its criteria (in terms of chemical characteristics) and designated best use can be identified as shown in **Table 3.28.**

Table 3.28. Designated Best Use Water Quality Criteria

Classes of Water	Designated Best use	Criteria
Class-A	Drinking water source without conventional treatment but after disinfection	• pH between 6.5 and 8.5 • Dissolved Oxygen 6 mg/l or more • BOD_5 at 20° C 2 mg/l or less • Total Coliform (MPN/100) shall be 50 or less

Class-B	Outdoor bathing (organized)	• pH between 6.5 and 8.5 • Dissolved Oxygen 5mg/l or more • BOD5 at 20° C 3 mg/l or less • Total Coliform (MPN/100) shall be 50 or less
Class-C	Drinking water source with conventional treatment followed by disinfection	• pH between 6 to 9 • Dissolved Oxygen 4 mg/l or more • BOD5 at 20° C 3 mg/l or less • Total Coliform (MPN/100) shall be 5000 or less
Class-D	Propagation of wildlife and fisheries	• pH between 6.5 to 8.5 • Dissolved Oxygen 4 mg/l or more • Free ammonia (as N) 1.2 mg/l or less
Class-E	Irrigation, industrial cooling, controlled waste disposal	• pH between 6.0 to 8.5 • Electrical Conductivity at 25°C micro mhos/cm Max. 2250. • Sodium absorption Ratio Max. 26 • Boron Max. 2 mg/l

Source: CPCB.nic.in/wqstandards

3.4.7.2.6 Surface Water Quality Interpretation

The pH level of all monitoring locations was observed within the criteria proposed by CPCB which indicated the surface water suitability for all designated best uses. The EC were reported within the range 278-386 at all monitoring locations with an average value of 335.5 which is below the CPCB criteria for Irrigation, industrial cooling and controlled waste disposal uses. DO of all surface water samples were evaluated varied from 3.8 mg/l (at site SW1) to 5.6 mg/l (at SW4) which indicated that the surface water of site SW1 is not suitable Class A, B, C and D uses. The BOD concentration at all monitoring locations were ranged from 7.2 to 12 mg/l with the mean value of 9.13 mg/l, which showed the requirement of prior treatment before any designated use.

The value of the SAR is reported below 26 meq/l which indicated the surface water suitability for Class E uses. The Boron concentration was estimated below detection limit which also showed surface water quality for Class E use. The Total Coliform count were estimated very high (4,00,000) at SW1 site, in comparison to the criteria proposed by CPCB. Therefore, the surface water of all monitoring locations requires biological treatment before any designated use. Only for Class C the surface water of site SW2 to SW4 is suitable as the observed values were below 5000.

3.4.6.10 Conclusion:

The findings of surface water quality estimation of all monitoring locations indicated that the prior treatment is required before designated use of surface water for Class A, Class B and Class C in terms of DO, BOD and TC.

3.4.7 BIOLOGICAL ENVIRONMENT

A natural ecosystem is a structural and functional unit of nature. It has different biological and physical components, which are interrelated to each other and survive by interdependence. An ecosystem has self-sustaining ability and controls the number of organisms at any level by cybernetic rules. The basic purpose of exploring the biological environment under Environmental Impact Assessment (EIA) is to assist the decision making process and to ensure that the project options under consideration are environmental-friendly. An ecological survey of the study area was conducted, particularly with reference to listing of species and assessment of the existing baseline ecological conditions in the study area. The main objectives of the ecological survey were aimed at assessing the existing flora and fauna components in the study area, to understand the possible impacts on the biological environment by the project activities during construction and operational phase and to formulate if necessary, the appropriate mitigation/preventive measures for such impacts. Data has been collected through secondary sources and by site visits. The present study was carried out in two separate headings for floral and faunal community.

3.4.7.1 Sampling:

For field assessment, i.e. primary data collection, a standard statistical sampling method was followed. The sampling design followed random sampling method. The sampling area was decided

based on prior land-use map of the project influence zone (within the 10 km radius around the project area), outlining forest areas and other types of habitats, topographic features and build-up area.

The project is located in large chunk of land in relatively plain area and that too in the immediate vicinity of already developed industrial area namely Tahliwal and close proximity to the neighboring state of Punjab. As per toposheet no (H43E3 and H43E7), there is the Polian Shamlat Reserve Forest is adjoining the project site in West direction and the Kangar Protective Forest is approx. 7 km far away from project site in NW direction. Distance from another Eco sensitive zone, Swan River is also approx. 8.5 km from project site in NE direction.

Table 3.15: Aspect to be covered in the study area

Aspect of Environment	Impacts
A. Terrestrial Ecology	Impacts on terrestrial flora and fauna
	Impacts on Rare-Endangered-Threatened (RET) wildlife
	Impacts on socially / economically / genetically/ biologically important species
B. Aquatic Ecology	Impacts on aquatic fauna/flora
	Impacts on spawning and breeding grounds for aquatic species

The information presented in this section has been collected through field studies, consultation with various government departments and collection of available literature with various institutions and organizations.

3.4.7.2 Site selection criteria:

Land Use and Land Cover (LU/LC) Map of Core and Buffer Zone is used for the biological component assessment. Selection of sampling locations was made with reference to topography, land use, vegetation pattern, etc. The observations were taken on natural vegetation, dense forests, roadside plantation and non-forest area (agricultural field, in plain areas, village wasteland, etc.) for quantitative representation of different species. The study area for the survey has been divided into three major segments namely Primary Zone (0 - 3 km), Secondary Zone (3 - 7 km) and Tertiary/ Outer Zone (7 - 10 km) which shows the biodiversity pattern in different zones of the study area has been observed.

List of sampling locations for study on biological aspects is detailed in **Table No. 3.16** and shown in **Fig. No. 3.16.**

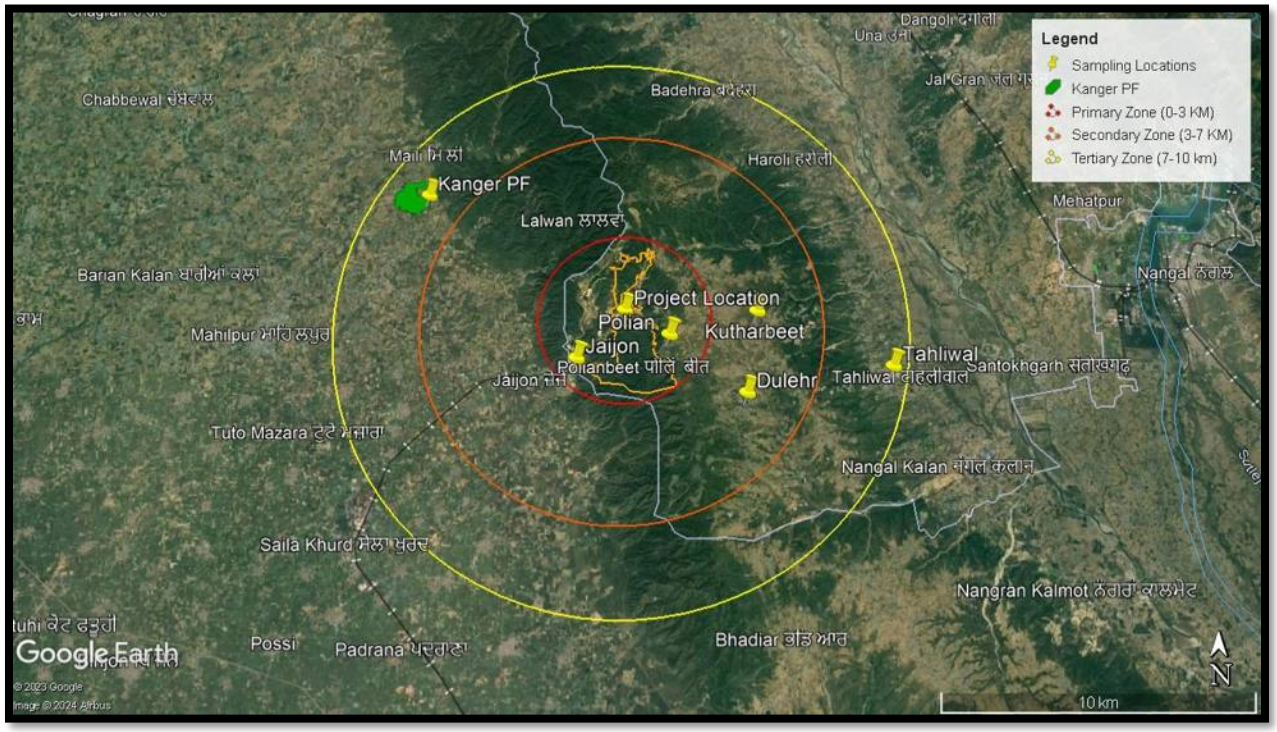


Fig. 3.16: Sampling Locations for Biological Study in Core and Buffer Zone

Table 3.16: Sampling Locations for biological study in core and buffer zone

S. No.	Sampling Location	Distance from project location	Direction from project location	Zone
1	Project location	-	-	-
2	Polian	Approx. 1.5 km	SE direction	Primary
3	Jaijon	Approx. 2.60 km	SW direction	Primary
4	Kutharbeet	Approx. 4.57 km	E direction	Secondary
5	Dulehr	Approx. 4.93 km	SE direction	Secondary
6	Kanger PF	Approx. 7.00 km	NW direction	Tertiary
7	Tahliwal	Approx. 8.59 km	SE direction	Tertiary

Source: Field Study

Summary of data collected from these sources as a part of the EIA study is outlined in **Table 3.17.**

Table 3.17: Summary of Data Collected from various sources

Aspect	Mode of data collection	Parameters Monitored	Frequency	Source(s)
Terrestrial Ecology	Primary field survey and secondary literature survey	Floral and Faunal Diversity and their Importance	One Season (Summer)	Field studies, Forest & Wildlife Department and literature review
Aquatic Ecology	Primary field survey and secondary literature survey	Diversity of Species and their Importance	One Season (Summer)	Field studies, Forest/ Wildlife Department and literature review

With the change in environmental conditions, the vegetation cover as well as animals reflects several changes in its structure, density and composition.

3.4.7.3 Ecological pattern:

Project site (core zone) as well the buffer zone area was surveyed to assess the ecological status. The present study was carried out separately for floral and faunal community respectively.

3.4.7.4 Flora

3.4.7.4.1 Methodology for floral study:

- Secondary literature survey – Published literature, including those from relevant organizations like the Botanical Survey of India (BSI), the Wildlife Institute of India (WII-Dehradun), the respective Forest Department of the State concerned etc., research papers, articles, books and reliable websites, available within and adjacent to the study area were compiled and inventoried as “Secondary Floral Diversity Database”.
- Primary database – Data generated from the field survey within and adjacent to the study area were meticulously compiled and inventoried as “Primary Floral Diversity Database”.
- Field instruments/materials for floral study – Measuring tape/s, herbarium sheets, newspaper, herbarium press, polythene bags (incl. zip-locked pouches), clinometers, and magnifying glass, camera, and GPS unit.
- Primary field survey – Field identification of the species and later identification through photographs were followed. In addition, randomly distributed quadrats were laid for ecological assessment.

Herbs: Herbaceous plants were studied using the quadrat method as followed, during vegetation survey. The size of each quadrat for herb survey was 1 m x 1 m. Field identification of the species and later identification through photographs were followed.

Shrubs: Shrubs were studied using the quadrat method as followed during vegetation survey. The size of each quadrat for shrub survey was 5 m x 5 m for shrubs of 3 m height. Field identification of the species and later identification through photographs were followed. Unidentified shrubs were collected following proper procedure and prepared into herbarium sheets for later identification.

Trees: Trees were studied using the quadrat method as followed during vegetation survey. The size of each quadrat for tree survey was 10m x 10m.

To study herbaceous and woody vegetation systematically, standard methods of analyzing vegetation were used for determination of vegetation composition and richness. Quadrat numbers depend upon the requirement in specific cases. Comparative analysis of the outcome of the Quadrat Sampling was done to understand the characteristics of species observed in the study area. The detailed species characteristics like frequency, abundance & density were computed as follows:

(i) **Frequency**: The frequency of individual species is the number of times the species occurs in the sampling quadrant. It is actually represented as a percentage calculated as follows:

$$Frequency\ (\%) = \frac{No.of\ quadrats\ in\ which\ the\ species\ occurred}{Total\ no.of\ quadrats\ studied} * 100$$

It reflects the probability of encountering the species within the sampled area

(ii) **Density:** Density is the measure of dense in the distribution of an individual species within a given area. Density of a species is defined as the average number of the species per quadrant and calculated as follows:

$$Density = \frac{Total\ no.of\ individuals\ of\ a\ species\ in\ all\ quadrats}{Total\ no.of\ quadrats\ studied}$$

(i) **Abundance:** Abundance is to determine how common or rare a species is relative to other species in a defined area. It reflects how evenly one species is distributed within the sampling area. Abundance of a species is defined as the number of individuals per quadrant and calculated as follows:

$$Abundance = \frac{Total\ no.\ of\ individuals\ of\ a\ species\ in\ all\ quadrats}{Total\ no.\ of\ quadrats\ in\ which\ species\ occurred}$$

The relative frequency (RF), relative density (RD) and relative abundance (RA) has been calculated to calculate the Importance Value Index (IVI) i.e., the species having highest IVI is of most ecological importance and the one having the lowest IVI is of least ecological importance.

The floral pattern in the study area has been studied in detail. Mainly the regional flora and fauna is found in the study area. The local species are proposed to plant during afforestation. So, biodiversity of the area due to the project shall be maintained.

3.4.7.4.2 Phyto-sociological analysis:

The forests within Study area have three distinct strata, viz., (i) Upper canopy layer with dominance of emergent trees, (ii) Sub-canopy layer with dominance of small trees and pole size trees, and (iii) Under canopy layer with dominance of shrubs, herbs and juvenile trees. The details of species available are given below:

Table 3.18: Phyto-sociological analysis of Upper canopy layer with dominance of emergent Trees

Scientific Name of Species	Common Name	Density	Frequency (%)	Abundance	RD	RF	RA	IVI
Acacia catechu	Khair	0.8	60	1.33	29.32	76.36	38.39	144.08
Juglans regia	Akhrot	2.8	80	3.50	102.62	101.82	100.79	305.22
Pinus roxburghii	Chir Pine	3.7	80	4.63	135.60	101.82	133.18	370.60
Azadirachta indica	Neem	3.2	90	3.56	117.28	114.55	102.39	334.21
Mangifera indica	Mango	2.8	60	4.67	102.62	76.36	134.38	313.36
Ficus religiosa	Pipal	3	90	3.33	109.95	114.55	95.99	320.48
Eucalyptus	Safeda	2.8	90	3.11	102.62	114.55	89.59	306.75
Total		**2.73**	**78.57**	**3.47**	**100**	**100**	**100**	**300**

The upper canopy layer covers taller trees with well-developed foliage at the site. Above given table shows the different trees varieties with their density, frequency and abundance. The Importance Value Index (IVI) of tree species varied from 144.08 of Khair *(Acacia catech)* species to 370.60 of Chir Pine *(Pinus roxburghii)* species. Chir Pine *(Pinus roxburghii)* so the high density followed by Neem *(Azadirachta indica).*

Table 3.19: Phyto-sociological analysis of Sub-canopy layer with dominance of small trees and pole size trees

Scientific Name of Species	Common Name	Density	Frequency (%)	Abundance	RD	RF	RA	IVI
Aegle marelos	Bil	2.00	80.00	2.50	87.59	100.00	87.59	275.18
Diospyross fomentosa	Kinu	2.00	80.00	2.50	87.59	100.00	87.59	275.18
Morus alba	Toot	2.40	100.00	2.40	105.11	125.00	84.09	314.20
Cassia fistula	Amaltas	1.80	70.00	2.57	78.83	87.50	90.09	256.43
Callistemon viminalis	Bottle brush	2.00	60.00	3.33	87.59	75.00	116.79	279.38
Terminalia chebula	Harrer	3.50	90.00	3.89	153.28	112.50	136.25	402.04
Total		**2.28**	**80**	**2.85**	**100**	**100**	**100**	**300**

The IVI of tree species varied from 256.43 of Amaltas (*Cassia fistula)* to 402.04 of Harrer *(Terminalia chebula*). Harrer *(Terminalia chebula*) has shown the high-density value with 3.70 followed by Toot *(Morus alba).*

Table 3.20: Phyto-sociological analysis under canopy layer with dominance of shrubs, herbs and juvenile trees

Scientific Name	Common Name	Density	Frequency (%)	Abundance	RD	RF	RA	IVI
Dendrocalamus strictus	Bamboo	3.1	80	3.88	145.31	109.09	133.20	387.61

Cymbopogon martinii	Lemon grass	0.5	40	1.25	23.44	54.55	42.97	120.95
Parthenium hysterophorus	Congress grass	2.8	100	2.80	131.25	136.36	96.25	363.86
Total		**2.13**	**73.33**	**2.91**	**100.00**	**100.00**	**100.00**	**300.00**

The number of shrubs, shrubby climbers and tree saplings together was total of 64 individuals of different species were found. The IVI varied from 120.95 of Lemon Grass (*Cymbopogon martinii)* to 387.61 of Bamboo (*Dendrocalamus strictus)*. Maximum density value is shown in Bamboo (*Dendrocalamus strictus)* followed by Congress *(Parthenium hysterophorus).*

3.4.7.4.3 Floral diversity of the study area:

A total of 52.43% is covered in forest landwithin the buffer zone of the study area. Based on Actual Sighting, based on inputs from locals and Perused from Secondary Data.

Table 3.21: Inventory of Floral Diversity in Buffer Zone

S. No.	Botanical Name	Common Name	Family
TREES			
1.	*Acacia catechu*	Khair	*Mimosaceae*
2.	*Acacia nilotica*	Babul	*Mimosaceae*
3.	*Aegle marmelos*	Bel	*Rutaceae*
4.	*Albizia lebbeck*	Siris tree	*Mimosaceae*
5.	*Albizia odoratissima*	Black Siris	*Mimosaceae*
6.	*Anogeissus latifolia*	Dhaura	*Combretaceae*
7.	*Anthocephalus cadamba*	Kadam	*Rubiaceae*
8.	*Artocarpus heterophyllus*	Jack fruit	*Moraceae*
9.	*Artocarpus lacucha*	Dheu/Monkey Jack	*Moraceae*
10.	*Azadirachta indica*	Neem	*Meliaceae*
11.	*Bauhinia variegata*	Kachnar	*Caesalpiniaceae*
12.	*Bombax ceiba*	Semal/ Kapok	*Bombacaceae*
13.	*Butea monosperma*	Palash	*Fabaceae*
14.	*Casearia tomentosa*	Chilla	*Salicaceae*
15.	*Cassia fistula*	Amaltas	*Caesalpiniaceae*
16.	*Casuarina equisetifolia*	Vilayati saru	*Casuarinaceae*
17.	*Celtis australis*	Honeyberry	*Cannabaceae*

18.	*Colebrookea oppositifolia*	Binda	*Lamiaceae*
19.	*Cordia dichotoma*	Indian Cherry	*Boraginaceae*
20.	*Cornus macrophylla*	Large Leaf Dogwood	*Cornaceae*
21.	*Cupressus torulosa*	Himalayan Cypress	*Cupressaceae*
22.	*Dalbergia sissoo*	Shisham	*Fabaceae*
23.	*Delonix regia*	Gulmohar	*Fabaceae*
24.	*Ehretia laevis*	Chamror	*Boraginaceae*
25.	*Elaeocarpus sphaericus*	Rudraksh	*Elaeocarpaceae*
26.	*Emblica officinalis*	Amla	*Phyllanthaceae*
27.	*Erythrina suberosa*	Dhaul Dhak	*Fabaceae*
28.	*Eucalyptus hybrid*	Safeda	*Myrtaceae*
29.	*Feronia limonia*	Barnasi	*Rutaceae*
30.	*Ficus auriculata*	Timla	*Moraceae*
31.	*Ficus benghalensis*	Bad	*Moraceae*
32.	*Ficus benjamina*	Weeping Fig	*Moraceae*
33.	*Ficus palmata*	Jungle Anjir	*Moraceae*
34.	*Ficus racemosa*	Goolar	*Moraceae*
35.	*Ficus religiosa*	Pipal	*Moraceae*
36.	*Flacourtia indica*	Bilangada/ Kangu	*Salicaceae*
37.	*Gmelina arborea*	Gamhar	*Verbenaceae*
38.	*Grevillea robusta*	Silver Oak	*Proteaceae*
39.	*Grewia oppositifolia*	Bihul	*Tiliaceae*
40.	*Jacaranda mimosifolia*	Blue Gulmohar	*Bignoniaceae*
41.	*Kydia calycina*	Bharanga/Bhoti/Pula	*Malvaceae*
42.	*Lagerstroemia parviflora*	Lendia/ Sidi	*Lythraceae*
43.	*Lannea coromandelica*	Mohin	*Anacardiaceae*
44.	*Limonia acidissima*	Wood Apple	*Rutaceae*
45.	*Mallotus philippensis*	Kamala/Rohan/Kambel	*Euphorbiaceae*
46.	*Mangifera indica*	Mango/Aam	*Anacardiaceae*
47.	*Melia azedarach*	Bakain/ Darek tree	*Meliaceae*
48.	*Moringa oleifera*	Senjana	*Moringaceae*
49.	*Mitragyna parvifolia*	Kaim/ Kadamb	*Rubiaceae*
50.	*Olea cuspidata*	Wild olive/ Brown olive	*Oleaceae*
51.	*Oroxylum indicum*	Bhut vriksha	*Bignoniaceae*
52.	*Ougeinia oojeinensis*	Sandan	*Fabaceae*
53.	*Phoenix sylvestris*	Khajur	*Arecaceae*
54.	*Pinus roxburghii*	Chir Pine/ Chid	*Pinaceae*
55.	*Pinus wallichiana*	Himalayan Blue Pine	*Pinaceae*
56.	*Pistacia integerrima*	Kakkar	*Anacardiaceae*

57.	*Polyalthia longifolia*	Ashok	*Annonaceae*
58.	*Populus ciliata*	Himalayan Poplar	*Salicaceae*
59.	*Prosopis cineraria*	Khejri	*Fabaceae*
60.	*Rhus punjabensis*	Tittri	*Anacardiaceae*
61.	*Sapindus mukorossi*	Reetha	*Sapindaceae*
62.	*Sapium sebiferum*	Chicken Tree	*Euphorbiaceae*
63.	*Santalum album*	Sandalwood	*Santalaceae*
64.	*Saraca asoca*	Sita Ashok	*Caesalpiniaceae*
65.	*Schleichera oleosa*	Kusum	*Sapindaceae*
66.	*Syzygium cumini*	Jamun	*Myrtaceae*
67.	*Tamarindus indica*	Imli	*Caesalpiniaceae*
68.	*Tectona grandis*	Teak/ Sagwan	*Verbenaceae*
69.	*Terminalia arjuna*	Arjun	*Combretaceae*
70.	*Terminalia bellirica*	Baheda	*Combretaceae*
71.	*Terminalia chebula*	Harad	*Combretaceae*
72.	*Terminalia tomentosa*	Asan	*Combretaceae*
73.	*Toona ciliata*	Toon	*Meliaceae*
74.	*Toona serrata*	Toon	*Meliaceae*
75.	*Vitis parviflora*	Panibel	*Vitaceae*
SHRUBS & HERBS			
76.	*Adhatoda vasica*	Adusa	*Acanthaceae*
77.	*Aloe vera*	Gwar patha	*Asphodelaceae*
78.	*Alstonia scholaris*	Saptaparni	*Apocynaceae*
79.	*Artemisia vulgaris*	Naagdona	*Asteraceae*
80.	*Berberis asiatica*	Daruhaldi	*Berberidaceae*
81.	*Berberis lycium*	Darhaldi	*Berberidaceae*
82.	*Bougainvillea glabra*	Booganbel	*Nyctaginaceae*
83.	*Caesalpinia decapetala*	Mysore Thorn/ Ralan	*Caesalpiniaceae*
84.	*Calotropis procera*	Aak	*Asclepiadaceae*
85.	*Cannabis sativa*	Marijuana/ Hemp	*Cannabaceae*
86.	*Carica papaya*	Papaya	*Caricaceae*
87.	*Carissa opaca*	Karonda	*Apocynaceae*
GRASSES			
88.	*Bambusa arundinacea*	Indian Thorny Bamboo	*Poaceae*
89.	*Bambusa vulgaris*	Golden Bamboo	*Poaceae*
90.	*Chrysopogon fulvus*	Guria grass	*Poaceae*
91.	*Cymbopogon martinii*	Lemon grass	*Poaceae*
92.	*Cynodon dactylon*	Doob grass	*Poaceae*
93.	*Desmostachya bipinnata*	Dabh grass	*Poaceae*

94.	*Dendrocalamus giganteus*	Giant Bamboo	*Poaceae*
95.	*Eulaliopsis binata*	Sabaigrasss/ Bhabar	*Poaceae*
96.	*Heteropogon contortus*	Blackspear grass	*Poaceae*
97.	*Parthenium hysterophorus*	Congress grass	*Asteraceae*
98.	*Saccharum spontaneum*	Wild Sugarcane/Kans Grass	*Poaceae*

References: *Himachal Pradesh State Biodiversity Board. (n.d.). https://hpbiodiversity.gov.in/. Retrieved August 2, 2024, from https://hpbiodiversity.gov.in/Pdf/Status%20of%20Biodiversity%20in%20Himachal%20Pradesh.pdf*

- *https://hpbiodiversity.gov.in/*
- *https://hpforest.nic.in/*

3.4.7.5 Fauna

1. Secondary literature survey: Published literature, including those from relevant organizations like Zoological Survey of India (ZSI), Forest Department of the State, research papers, articles, books & reliable websites, available within & adjacent to study area were meticulously compiled & inventoried as "Secondary Faunal Diversity Database".
2. Primary field survey –

   Birds: For avian diversity assessment, point count method was used. The radius of each of the point was 50 m. Birds were identified on-site using field-books, or later through photographs and field-sketches.

   Mammals: For mammalian diversity assessment, direct observations were done on the field. Field identification of species was done on-site through photographs/ sketches and with the help of field-books/other reliable sources.

   Amphibians and reptilians: Direct observation & indirect evidence/sign survey were done for assessing amphibian and reptilian diversity in the field site. Identification of species was done on-site through photographs/sketches and with the help of field-books or other reliable sources.
3. Primary database: Data generated from the field survey within and adjacent to the study area was meticulously compiled and inventoried as "Primary Faunal Diversity Database".
4. Field instruments/materials for faunal study: Rangefinder, compass, binoculars, camera, slide-calipers, measuring tape, GPS unit, polythene bags (incl. zip-lock pouches) and field-books.

3.4.7.1 Faunal diversity of the study area:

As per the discussion with local people, observations & studies the faunal diversity found in buffer zone are given below in **Table 3.22:**

Table 3.22: Inventory of Fauna diversity in Buffer zone

S. No.	Scientific Name	English Name	Schedule	IUCN Status
VERTEBRATES				
MAMMALS				
1.	*Boselaphus tragocamelus*	Nilgai	Schedule II	LC
2.	*Canis aureus*	Jackal	Schedule I	LC
3.	*Felis chaus*	Jungle Cat	Schedule I	LC
4.	*Funambulus pennanti*	Northern Palm Squirrel	--	LC
5.	*Herpestes edwardsii*	Common Mongoose	--	LC
6.	*Hystrix indica*	Indian Porcupine	Schedule I	LC
7.	*Lepus nigricollis*	Indian Hare	Schedule II	LC
8.	*Muntiacus muntjac*	Barking deer	Schedule I	LC
9.	*Semnopithecus entellus*	Common Langur	Schedule II	LC
10.	*Pteropus giganteus*	Flying Fox	Schedule II	EN
11.	*Rattus rattus*	Common Rat	--	LC
12.	*Suncus murinus*	Grey Musk Shrew	--	LC
13.	*Sus scrofa*	Wild Boar	Schedule II	LC
14.	*Vulpes bengalensis*	Common fox	Schedule I	LC
15.	*Panthera pardus*	Leopard	Schedule I	VU
AMPHIBIANS				
16.	*Bufo melanostictus*	Common Indian toad	--	LC
17.	*Euphlyctis cyanophlyctis*	Indian Skipper Frog	Schedule II	LC
18.	*Fejervarya limnocharis*	Indian Cricket Frog	--	LC
19.	*Hoplobatrachus tigerinus*	Indian Bull Frog	Schedule II	LC
REPTILES				
20.	*Gloydius himalayanus*	Himalayan Pit Viper	Schedule II	LC
21.	*Bungarus caeruleus*	Common Indian krait	Schedule II	LC
22.	*Calotes versicolor*	Garden Lizard	--	LC

23.	*Chameleon spp.*	Chameleon	Schedule I	LC
24.	Hemidactylus leschenaultii	Common house Gecko	--	LC
25.	*Mabuya carinata*	Brahminy Skink	--	LC
26.	*Melanochelys trijuga*	Indian black turtle	Schedule II	LC
27.	*Naja naja*	Indian Cobra	Schedule I	LC
28.	*Ptyas mucosa*	Indian Rat Snake	Schedule I	LC
29.	*Varanus bengalensis*	Monitor Lizard	Schedule I	NT
AVES				
30.	*Accipiter badius*	Shikra	Schedule I	LC
31.	*Acridotheres ginginianus*	Bank Myna	Schedule II	LC
32.	*Acridotheres fuscus*	Jungle myna	Schedule II	LC
33.	*Acridotheres tristis*	Common Myna	Schedule II	LC
34.	*Amaurornis phoenicurus*	White breasted waterhen	Schedule II	LC
35.	*Anthus rufulus*	Paddy field pipit	Schedule II	LC
36.	*Aquila rapax*	Tawny Eagle	Schedule II	LC
37.	*Ardea intermedia*	Intermediate Egret	Schedule II	LC
38.	*Ardeola grayii*	Indian Pond Heron	Schedule II	LC
39.	*Athene brama*	Spotted Owlet	Schedule II	LC
40.	*Pavo cristatus*	Indian peafowl	Schedule I	LC
41.	*Perdicula asiatica*	Jungle Bush Quail	Schedule II	LC
42.	*Perdix perdix*	Grey Partridge	Schedule I	LC
43.	*Phalacrocorax carbo*	Great Cormorant	Schedule II	LC
PISCES				
44.	*Anguilliformes Spp.*	Eel	--	LC
45.	*Cirrhinus mrigala*	White Carp	--	LC
46.	*Coryphaena spp.*	Common dolphinfish	--	LC
47.	*Hypophthalmichthys molitrix*	Silver Carp	--	LC
48.	*Labeo rohita*	Rohu	--	LC
49.	*Sperata seenghala*	Giant river-catfish	--	LC
50.	*Tor putitora*	Mahasheer	--	EN
51.	*Cirrhinus reba*	Reba carp	--	LC
52.	*Gudusia chapra*	Chappera or Palla	--	DD
53.	*Boga Labeo*	Labeo boga	--	LC

Source: *IUCN Red List of Threatened Species*
LC: Least Concerned
VU: Vulnerable

NT: Near Threatened
EN: Endangered
DD: Data deficient
Source: *Wildlife (Protection) Amendment Act, 2022*

Table 3.23(a): Inventory of Birds observed in buffer zone

			No. of individuals observed	
S. No	**Common Name**	**Scientific Name**	**Winter**	**Summer**
1.	Greater white fronted goose	*Anser albifrons*	120	0
2.	Greyleg goose	*Anser anser*	451	0
3.	Bar headed goose	*Anser indicus*	27395	30
4.	Ruddy shelduck	*Tadorna ferruginea*	124	6
5.	Common shelduck	*Tadorna tadorna*	38	0
6.	Gadwall	*Anas strepera*	332	6
7.	Eurasian wigeon	*Anas penelope*	215	0
8.	Mallard	*Anas platyrhynchos*	37	0
9.	Indian spot billed duck	*Anas poecilorhyncha*	6	4
10.	Northern shoveller	*Anas clypeata*	390	2
11.	Northern pintail	*Anas acuta*	1625	4
12.	Garganey	*Anas querquedula*	82	8
13.	Common teal	*Anas crecca*	1381	12
14.	Red crested pochard	*Netta rufina*	172	0
15.	Common pochard	*Aythya ferina*	4083	0
16.	Ferruginous duck	*Aythya nyroca*	66	0
17.	Tufted duck	*Aythya fuligula*	108	0
18.	Grey Francolin	*Francolinus pondicerianus*	0	3
19.	Red jungle fowl	*Gallus gallus*	0	2
20.	Indian Peafowl	*Pavo cristatus*	0	2
21.	Little grebe	*Tachybaptus ruficollis*	78	10
22.	Great crested grebe	*Podiceps cristatus*	60	12
23.	Woolly necked stork	*Ciconia nigra*	2	0
24.	Little cormorant	*Phalacrocorax niger*	865	7
25.	Great cormorant	*Phalacocorax carbo*	349	0
26.	Grey heron	*Ardea cinerea*	13	0
27.	Purple heron	*Ardea purpurea*	1	0
28.	Great egret	*Ardea alba*	6	0
29.	Intermediate egret	*Mesophoyx intermedia*	3	2
30.	Little egret	*Egreta garzetta*	19	23
31.	Indian pond heron	*Ardeola grayii*	7	0
32.	Osprey	*Pandion haliaetus*	3	3

33.	White rumped vulture	*Gyps bengalensis*	15	6
34.	Himalayan griffon	*Gyps himalayensis*	4	1
35.	Greater spotted eagle	*Clanga clanga*	2	0
36.	Booted eagle	*Hieraaetus pennatus*	1	0
37.	Eurasian marsh harrier	*Circus aeruginosus*	2	0
38.	Shikra	*Accipiter badius*	4	3
39.	Pariah kite	*Milvus migrans*	15	8
40.	White breasted water hen	*Amaurornis phoenicurus*	10	3
41.	Purple swamphen	*Porphyrio porphyrio*	5	1
42.	Common moorhen	*Gallinule chloropus*	1	4
43.	Common coots	*Fulica atra*	3350	56
44.	Great thick knee	*Esacus recurvirostris*	3	0
45.	Black winged stilt	*Himantopus himantopus*	26	15
46.	Pied avocet	*Recurvirostra avosetta*	16	0
47.	Northern lapwing	*Vanellus vanellus*	4	0
48.	River lapwing	*Vanellus duvaucelii*	31	0
49.	Red wattled lapwing	*Vanellus indicus*	0	31
50.	Yellow wattled lapwing	*Vanellus malabaricus*	0	4
51.	White tailed lapwing	*Vanellus leucurus*	1	0
52.	Kentish plover	*Charadrius alexandrinus*	14	0
53.	Little ringed plover	*Charadrius dubius*	137	12
54.	Common sandpiper	*Actitis hypoleucos*	14	2
55.	Green sandpiper	*Tringa ochrophus*	4	0
56.	Common greenshank	*Tringa nebularia*	9	0
57.	Marsh sandpiper	*Tringa stagnatilis*	10	0
58.	Wood sandpiper	*Tringa glareola*	4	0
59.	Common redshank	*Tringa tetanus*	4	0
60.	Curlew sandpiper	*Calidris ferruginea*	1	0
61.	Little stint	*Calidris minuta*	46	55
62.	Temminck’s stint	*Calidris tamminkii*	72	0
63.	Oriental pranticole	*Glareola lacteal*	0	2
64.	Slender billed gull	*Chroicocephalus genei*	2	0
65.	Black headed gull	*Chroicocephalus ridibundus*	50	6
66.	Brown headed gull	*Chroicocephalus brunnicephalus*	43	2
67.	Pallas’s gull	*Ichthyaetus ichthyaetus*	54	0
68.	Caspian gull	*Larus cachinnanus*	25	0
69.	Yellow legged gull	*Larus michahellis*	1	0
70.	Little tern	*Sternula albifrons*	10	0

71.	Whiskered tern	*Chlidonias hybrid*	13	0
72.	River tern	*Sterna aurantia*	108	7
73.	Black bellied tern	*Sterna acuticauda*	1	3
74.	Rock pigeon	*Columba livia*	43	16
75.	Oriental turtle dove	*Streptopelia orientalis*	0	5
76.	Eurasian collared dove	*Streptopelia decaocta*	0	5
77.	Spotted dove	*Streptopelia tranquebarica*	0	5
78.	Laughing dove	*Streptopelia senegalensis*	0	1
79.	Common Hawk –cuckoo	*Hierococcyx varius*	0	1
80.	Asian koel	*Eudynamys scolopaceus*	1	14
81.	Greater coucal	*Centropus sinensis*	1	1
82.	White throated kingfisher	*Halcyon smyrnensis*	1	2
83.	Pied kingfisher	*Ceryle rudis*	8	2
84.	Green bee-eater	*Merops orientalis*	0	2
85.	Indian roller	*Coracias benghalensis*	0	1
86.	Eurasian hoopoe	*Upupa epops*	2	3
87.	Indian grey Hornbill	*Ocyeros birostris*	0	14
88.	Great barbet	*Megaliama virens*	0	1
89.	Brown headed barbet	*Megalaima zeylanica*	4	4
90.	Copper smith Barbet	*Megaliama haemacephala*	0	2
91.	Fulvous-breasted woodpecker	*Dendrocopus macei*	0	1
92.	Peregrine falcon	*Falco peregrinus*	3	2
93.	Rose ringed parakeet	*Psittacula krameri*	27	26
94.	Plum headed parakeet	*Psittacula cyanocephala*	11	7
95.	Slaty headed parakeet	*Psittacula himalayana*	4	11
96.	Long tailed shrike	*Pericrocotus erythropygius*	2	3
97.	Rosy minivet	*Lanius tephronotus*	0	1
98.	Black Drongo	*Dicrurus macrocercus*	0	8
99.	Ashy Drongo	*Dicrurus leucophaeus*	0	2
100.	SprangledDrongo	*Dicrurus aeneus*	0	1
101.	Asian Paradise flycatcher	*Terpsiphone paradisi*	0	1
102.	Red billed blue magpie	*Urocissa erthrorhyncha*	0	1
103.	Rufous tree pie	*Dendrocitta vagabunda*	7	12
104.	House crow	*Corvus splendens*	76	3
105.	Large billed crow	*Corvus macrorhynchos*	0	12
106.	Indian bushlark	*Mirafra erythroptera*	10	12
107.	Singing bushlark	*Mirfra cantillans*	6	20
108.	Bimaculated lark	*Melanocorypha bimaculata*	5	4

109.	Humes short toed lark	*Calandrella acutirostris*	9	3
110.	Sand lark	*Calandrella raytal*	56	16
111.	Crested lark	*Galerida cristata*	17	12
112.	Eurasian skylark	*Aluda arvensis*	12	0
113.	Oriental skylark	*Alauda gulgula*	10	4
114.	Barn swallow	*Hirunda rustica*	145	25
115.	Wire tailed swallow	*Hirundo smithii*	0	6
116.	Streak throated swallow	*Petrochelidon fluvicola*	10	4
117.	Great tit	*Parus major*	4	16
118.	Red vented bulbul	*Pycnonotus cafer*	2	13
119.	Himalayan bulbul	*Pycnotus leucogenys*	22	36
120.	Pale rumped warbler	*Phylloscopus griseolus*	6	0
121.	Sulphur bellied warbler	*Phylloscopus chloronotus*	0	1
122.	Greenish warbler	*Seicercus poliogenys*	0	3
123.	Whistlers warbler	*Seicercus whistleri*	0	1
124.	Grey cheeked warbler	*Phylloscopus trochiloides*	1	0
125.	Common tailor bird	*Orthotomus sutorius*	0	6
126.	Jungle prinia	*Prinia sylvatica*	3	1
127.	Ashy prinia	*Prinia socialis*	0	1
128.	Grey breasted prinia	*Prinia hodgsonii*	2	2
129.	Yellow eyed babbler	*Chrysomma sinense*	17	0
130.	Oriental white eye	*Zosterops palpebrosus*	12	12
131.	Common babbler	*Turdoides caudate*	26	7
132.	Striated babbler	*Turdoides earlei*	8	4
133.	Jungle babbler	*Turdoides striata*	41	8
134.	Large grey babbler	*Turdois malcolmi*	0	5
135.	Streaked laughing thrush	*Trochalopteron lineatum*	1	0
136.	Indian robin	*Copsychus fulicatus*	2	18
137.	Oriental magpie robin	*Copsychus saularis*	1	6
138.	Blue whistling thrush	*Myophonus caeruleus*	1	12
139.	Plumbeous redstart	*Phoenicurus frontalis*	1	0
140.	White capped redstart	*Phoenicurus leucocephalus*	2	1
141.	Black redstart	*Phoenicurus ochruros*	0	6
142.	Grey bushchat	*Saxicola ferrus*	6	4
143.	Pied bushchat	*Saxicola caprata*	0	20
144.	Indian chat	*Ceromela fusca*	0	3
145.	Pied wheater	*Oenanthepies chanka*	0	1
146.	Jungle myna	*Acridotheres fuscus*	0	0
147.	Bank myna	*Acridotheres ginginianus*	10	0

148.	Common myna	*Acridotheris tristis*	117	13
149.	Brahminy starling	*Temenuchus pagodarum*	7	14
150.	Pale billed flowerpecker	*Dicaeumerythro rhynchos*	0	1
151.	Purple sunbird	*Cinnyris asiaticus*	0	35
152.	Western yellow wagtail	*Motacilla flava*	4	5
153.	Citrine wagtail	*Motacilla citreola*	39	20
154.	Grey wagtail	*Motacilla cinerea*	42	0
155.	White wagtail	*Motacilla alba*	135	57
156.	White browed wagtail	*Motacilla madaraspatensis*	23	18
157.	Paddyfield pipit	*Anthus rufulus*	13	40
158.	Tawny pipit	*Anthus campestris*	4	0
159.	Upland pipit	*Anthus sylvanus*	1	0
160.	Tree pipit	*Anthus trivalis*	0	3
161.	Water pipit	*Anthus spinoletta*	26	14
162.	Olive backed pipit	*Anthus hodgsoni*	0	2
163.	Crested bunting	*Melophus lathami*	0	1
164.	Rock bunting	*Emberiza cia*	0	4
165.	Fire fronted siren	*Serinus pusillus*	1	0
166.	House sparrow	*Passer rutilans*	4	40
167.	Russet sparrow	*Petronia xanthochollis*	0	6
168.	Chestnut shouldered petronia	*Passer domesticus*	0	1

Source: Book of Indian Birds

3.4.7.2 Conclusion:

The faunal and floral diversity observed during the field survey does not claim considerable attention as most of the species observed are common throughout the region. The impact of the project activities thus is understood to be negligible on the biological environment. As a measure to minimize the prevailing and forthcoming environmental impacts due to industrial pollution and activities, it is advisable to increase green areas through plantations in the available land so that the local faunal and floral biodiversity may increase.

3.4.8 SOCIO-ECONOMIC ENVIRONMENT

3.4.8.1 Scope of socio-economic survey:

Scope of the study is as follows:

- Collection of baseline data of the study area.
- Collation of data, analysis and generation of tables.
- Comprehension of socio-economic status of the people living in the study area.
- Identification and inventory of probable socio economic impacts of the project activities on social and economic aspects in the study area.
- Assessment of the probable impacts of the project on the people living in the study area.
- Facilitation of sustainability of positive impact by recommending community development initiatives in the study area.
- Suggestion of mitigation measures in case of adverse impact.

3.4.8.2 Methodology:

The socio-economic aspects of people have been analyzed and presented for the project within the Tehsil Haroli of Una District. The study carried out is descriptive and exploratory in nature.
The methodology adopted for the project has been collected from various secondary sources.

- Review of secondary data (2011 census and latest available district statistical hand books) with respect to population and occupational structure.
- Discussion with local population in some areas on socio- economic & cultural aspects of people in the study area.
- Extensive site visits and observation of the socio-economic environment.

Sociological aspects of this study include human settlements, demographic, socio economic aspects & others. The economic aspects include agriculture, industry and occupational structures of workers. Demographic & socio-economic details are described in following sections.

Site selection criteria: 2011 census data have been supplemented and corroborated by a socio-economic sample survey conducted within the study area including the project location through structured questionnaires portraying demographic and socio-economic aspects of the study area population. 49 villages falling in the 10 km radius of project location arranged on the basis of population in increasing order. Every 10^{th} village out of the total villages in the buffer zone surveyed where socio-economic survey & focus group discussions were done as given in **Table 3.25**. Primary data was collected by Mr. Himanshu and his team through a structured schedule

covering all the facilities available in the sample villagers for fulfilling the responsibility towards different sections of society through questionnaires & the same is presented in **Table 3.25.**

Table no: List of Surveyed Villages for Sample Survey in core and buffer zone

S. No.	Village Name	District Name (State Name)	Total Population	Project/ Sample Village
1.	Mehdud	Hoshiyarpur (Punjab)	743	Sample Village
2.	Kungrat (527)	Una (HP)	808	Sample Village
3.	Jaijon	Hoshiyarpur (Punjab)	1064	Sample Village
4.	Samnal (466)	Una (HP)	1098	Sample Village
5.	Lalwan	Hoshiyarpur (Punjab)	1193	Sample Village
6.	Goindpur Tarf Bula (529)	Una (HP)	1273	Sample Village
7.	Polianbeet (525)	Una (HP)	1295	Sample Village
8.	Kutharbeet (524)	Una (HP)	1420	Sample Village
9.	Saihnsowal (464)	Una (HP)	1425	Sample Village
10.	Nangal Khurd (471)	Una (HP)	1498	Sample Village
11.	Rora Baliwal (465)	Una (HP)	1502	Sample Village
12.	Haroli (467)	Una (HP)	1537	Sample Village
13.	Dulehar (526)	Una (HP)	1780	Sample Village
14.	Palakwah (469)	Una (HP)	1854	Sample Village
15.	Kangar (462)	Una (HP)	2282	Sample Village
16.	Dharampur (463)	Una (HP)	2311	Sample Village
17.	Lalehri (470)	Una (HP)	4242	Project Village
18.	Badehra (199)	Una (HP)	5000	Sample Village

3.4.8.3 Demographic & socio-economic details of study area within 10 km radius:

The study area is falling under the 10 Km buffer zone of Una Tehsil Haroli and as well as of Hoshiarpur District Tehsil Garhshanker. So, the details of demographic Features of the study area are highlighted below:

Table 3.24: Demographic feature of the study area

Area	Total Population	Male	Female	No. of literate	Total Worker
Tehsil Haroli	71,416	36,308	35,108	52,644	27,160
Tehsil Garhshankar	3,30,711	1,68,229	1,62,482	2,43,065	1,06,181

- Tehsil Haroli, District Una, Himachal Pradesh State has total population of 71,416 of which male and female were 36,308 and 35,108 respectively.
- Tehsil Garhshankar, District Hoshiarpur, Punjab State has total population of 3,30,711 of which male and female were 1,68,229 and 1,62,482 respectively.
- The average literacy Rate of the Haroli Tehsil is 73.71%. which is lower than the average literacy rate of Himachal Pradesh i.e. 82.80% whereas the literacy rate of Garhshankar Tehsil is 73.50. which is lower than the average literacy rate of Himachal Pradesh i.e. 75.84%

3.4.8.4 Demographic details of the study area:

Demographic details of the study area in detail & villages within 10 km of study are shown in **Fig. 3.17**.

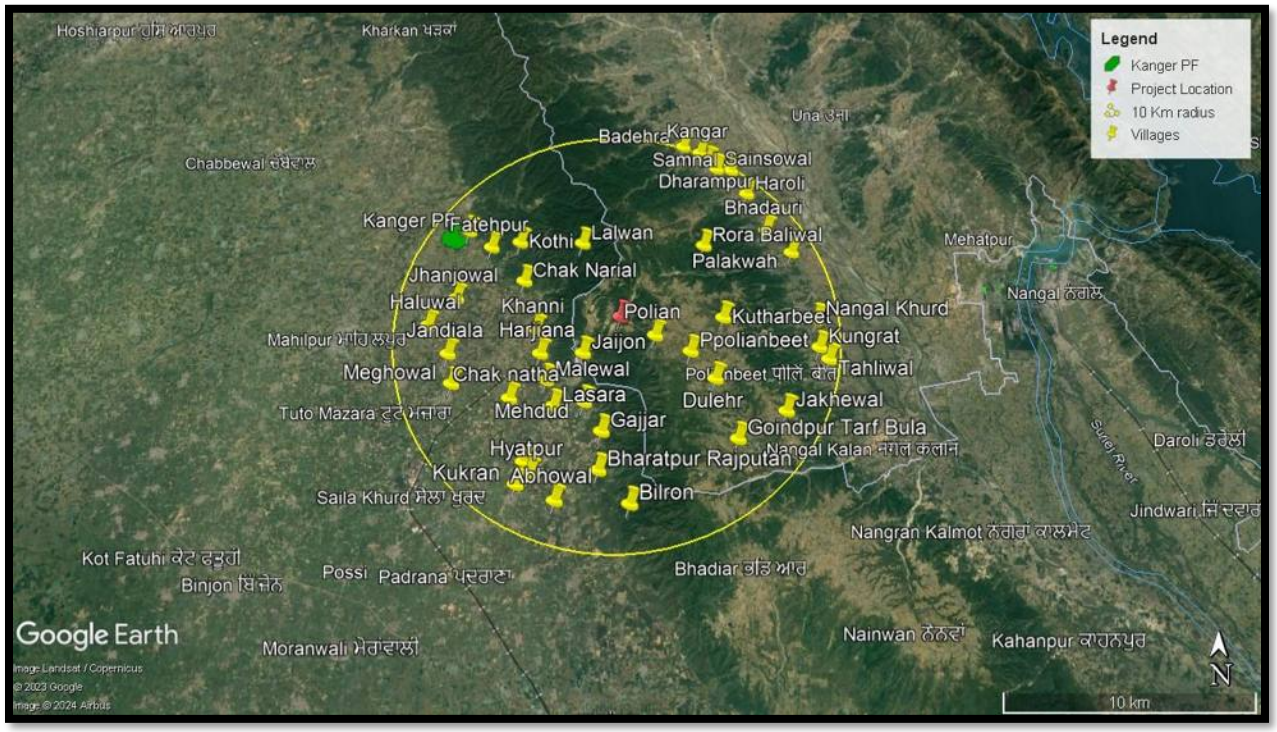


Fig. 3.17: Google Earth Image showing Villages falls within 10 km study area

Demographic details within study area of 10 km is attached as **Annexure 10.**

3.4.8.5 Interpretation of socio-economic data:

The sociological aspects of the project area have been studied that include human settlements, demographic, socio economic aspects among others. The economic aspects include agriculture, school and occupational structures of workers. The demographic & socio-economic details are described in the following sections:

3.4.8.5.1 Population distribution:

The population distribution varies from place to place. There are around 49 villages within 10 km radius of the project area. Among 49 villages 26 villages found in Himachal region & rest 23 villages falling in Punjab region. Based on Census Data 2011, the number of household population consists of 43,289 (in no.) and total population of the villages within 10 km radius comprises of 1,88,790 (in no.) Out of which, male and female were 91,797 and 96,993 respectively as given below in **Table 3.26(b):**

Table 3.26(b): Total Population of the study area

Population	Total Male Population	Total Female Population	Total Population
Total	2,04,537	1,97,590	4,02,127
Percentage (%)	51%	49%	100%

Source: Census of India, 2011

The graphical representation of the population is shown in **Fig. 3.18** which represents the overall percentage of the total population of the study area.

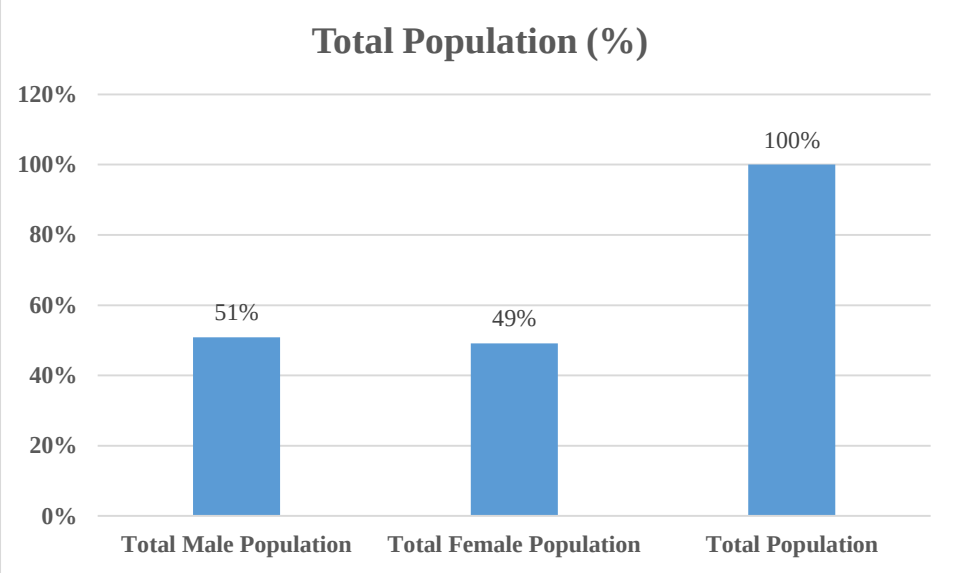


Fig. 3.18: Population distribution of study area

3.4.8.5.2 Sex ratio (Females per 1000 Males):

Sex ratio is used to describe the number of females per 1000 of males. Sex ratio is a valuable source for finding the population of women in India and what is the ratio of women to that of men in India. In the Population Census of 2011, it was revealed that the population ratio in India 2011 is 940 females per 1000 of males. The Sex Ratio 2011 shows an upward trend from the census 2001 data. Interesting and alarming trend is noticed in gender ratio. As per the Census 2011, state Himachal Pradesh has a gender ratio of (972) which is comparatively lower than the sex ratio of study area i.e. (1072) while the district Una has an average sex ratio i.e. (976) which is low from the study area but higher than the average state sex ratio.

3.4.9.9 Recommendation and Suggestion

- Vocational training centers should be established in the villages. So that rural people can get training in various activities and generate self-employment or skill themselves for various job opportunities in the nearby areas.
- Project proponent should conduct professional skills development program for Business opportunities to local people.
- Assistance in Pradhanmatri Kaushal Vikas Yojana (PMKYY) like Animal Health Worker, Green House Operator, Dairy farmer / Entrepreneur, Tractor operator, Organic Grower, Quality Seed Grower, Backhoe operator, Crane operator, Engine mechanic, Excavator operator, loader operator etc.
- Upgradation of existing school infrastructure.
- Camp to provide knowledge of Government schemes and loans or subsidies for agriculture and allied sectors. Need to subsidize construction of ground water tank for storing rainwater for utilizes it for daily chore.
- Health care center, mobile health ambulance and routine health camp facility shall be provided to make the people get easy medical facilities.
- Vocational training session shall be organized to provide self–employment to the women and unemployed youth for involve in income generation sources for short term and long-term employment.

3.4.8.9 SOCIO-ECONOMIC BENEFITS OF THE PROJECT ACTIVITIES ON THE LOCAL COMMUNITY

M/s HPBDPIL will employ the people from the local region, to ensure maximum benefit to the local qualified un-employed youth around the project location, thus the local population will benefit at large with the operation of the project.

The employment of the local population will ensure to benefit them by improving their living standard and consequently economic development of the region.

Thus, there are many youths in the district of Una who can be trained through capacity building for contributing towards the GDP improvement of the district as well as state of Himachal Pradesh.

Further, the literacy rate of District Una i.e. 86.52%. is higher than the average literacy rate of Himachal Pradesh i.e. 82.80%.

The availability of educated and qualified youth in the local region of the project site is promising. ITI students from local ITI Institutes can also be employed under the skilled people's employment. It is an effort to access or estimate, in advance, the social consequences that are likely to follow from specific policy actions and specific government action as resultant of proposed unit. Summarized socio economic benefits are as under:

- With the coming up of the project, the employment opportunities (direct as well as indirect) will increase, and local people will be employed on priority basis as per their skills. Training will also be provided to the local people.
- People will get direct opportunity in the unit. Not only direct employment but also indirect employment will be created from industry related various activities.
- Indirect employment will also be created from transportation, from the mushrooming of services, shops, and retails etc.
- After getting employment, the socio- economic status of people will be increased. They will be able to get basic amenities directly and indirectly from the project.
- Local people will be employed; hence, it will not cause any stress on the community infrastructure, or any social stress, due to changing patterns of social interaction.
- Increased income security will contribute to the empowerment of the most vulnerable sections of society.
- It is a long-term project; therefore, it will bring avenues for long term jobs.
- Group insurance, free medical facilities, ESI and EPF will be provided to the employees.
- Indirectly, the project will help the government by paying different taxes (sales tax, excise duty, etc.) from time to time, which is a part of revenue and thus, will help in development of the region.

3.4.8.10 Conclusion

As per the primary survey, basic facilities like drinking water, education, electricity, road connectivity etc. are adequate in surveyed villages. However, the project management will aid with the development of additional public amenities in the nearby area and will also employ the people from the local region, to ensure maximum benefit to the local qualified un-employed youth around the project

location, thus the local population will benefit at large with the operation of the project. The overall effect will improve the buying power of people and thus a higher standard of living viz. better education, improved health and sanitation facilities, housing and acquisition of consumer durables. Housing, transport, medical, educational, and other civic amenities will improve in the future. This is envisaged as a major positive benefit.

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CHAPTER 4

ANTICIPATED ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

4.1 INTRODUCTION

Environmental impact in the study area is any alteration of environmental conditions or creation of new set of environmental conditions, adverse or beneficial, caused or induced by the impacts of project. Prediction involving identification and assessment of potential impacts of the project on surrounding environment is a significant component of EIA studies. This chapter presents identification and appraisal of various impacts from the proposed project of Bulk Drug Park. The construction and operational phase of the proposed project comprises various activities, each of which may have an impact on environmental attributes in the region as air quality, water quality, soil, land use, ecology and public health.

The proposed project will create impact on the environment in two distinct phases:

- During the construction phase which may be regarded as temporary or short term; and
- During the operation phase which would have long term effects.

The resultant (post-project) quality of environmental parameters is reviewed with respect to the permissible limits. Based on the impacts thus, predicted preventive mitigation measures were formulated and incorporated in the environmental management plan to minimize adverse impacts on environmental quality. The environmental impacts in this study have been discussed separately for both construction and operation phase. Spatially, the impacts have been assessed over the study area of 10 km radius of the project location based on the standard methodology presented below.

Table 4.1 Severity Criteria for Magnitude of Impacts

S. No	Category	Description of category	Impact	
			Adverse	Beneficial
1.	No impact	-	0	0
2.	No appreciable impact	Short term reversible	-1	1
3.	Significant impact	Long term reversible	-2	2
4.	Major impact	Irreversible but of lesser extent	-3	3
5.	High impact	Irreversible but of medium	-4	4

		extent		
6.	Permanent impact	Severe irreversible impact	-5	5

Probability			Impact				
			Very low 1	Low 2	Medium 3	High 4	Very High 5
	Very High	5	5	10	15	20	25
	High	4	4	8	12	16	20
	Medium	3	3	6	9	12	15
	Low	2	2	4	6	8	10
	Very Low	1	1	2	3	4	5

Figure 4.1 Impact quantification chart

Table 4.2: Cumulative Score range for Beneficial and Adverse impacts

Sr. No.	Cumulative Score	Impact Type & Potential
1.	+Ve / -Ve	Beneficial impact / adverse impact
2.	2. 0-150	No appreciable Beneficial impact / adverse impact
3.	151-300	Appreciable but reversible adverse impact-mitigation measures are needed
4.	301-450	Significant adverse impacts: most of the impacts are reversible. Mitigation measures are crucial.
5.	451-600	Major adverse impacts; most of the impacts are reversible. Alternative site selection to be considered.
6.	>600	Permanent irreversible impact; alternatives to the project need to be explored

4.2 IMPACTS AND MITIGATION MEASURES DURING CONSTRUCTION PHASE

The prediction of impacts during the construction phase is an important aspect of the present study so that implementation of the EMP during construction can be ensured effectively to minimize the environmental impacts of the project. This phase involves the activities like site preparation, site levelling, construction works, infrastructure provision and other activities, greenbelt development etc. The environment impacts will be marginal and for short term only.

The officials of Bulk Drug Park will be directly involved in execution of the mitigation measures of environmental pollution generated from the project activity during construction phase.

Table 4.3: Impact Identification Matrix (During Construction Phase)

Activities	Environmental Attributes										
	Air	Water	Soil	Noise	LU/LC	Hydrology	Geology	SHW	Risks &Hazard	Ecology & Biodivers	Socio Economi
Land Acquisition	-	-	-	-	-	-	-	-	-	-	✓
Site clearing & levelling	✓	-	✓	✓	✓	-	-	✓	✓	✓	-
Transportation (vehicular movement) and operation of machineries	✓	-	✓	✓	-	-	-	-	✓	✓	✓
Storage and Handling of construction material	✓	-	✓	✓	✓	-	-	-	✓	-	-
Civil construction activities & disposal of construction debris	✓	✓	✓	✓	-	✓	-	✓	✓	✓	✓
Sewage Disposal	-	✓	✓	-	-	-	-	-	✓	-	-
Laying of pipelines and drains to develop common facilities	✓	✓	✓	✓	-	-	-	✓	✓	✓	✓
Greenbelt Development	✓	✓	✓	✓	✓	-	-	-	-	✓	✓
Employment Generation	-	✓	-	-	-	-	-	✓	-	-	✓

Table 4.4: Environmental Impact Assessment Matrix without Mitigation Measures (Construction Phase)

Activities	Environmental Attributes

	Air	Water	Soil	Noise	LU/LC	Geo hydrology	Geology	SHW	Risks &Hazards	Ecology & Biodiversity	Socio Economics	Total
Land Acquisition	-	-	-	-	-	-	-	-	-	-	-20	**-20**
Site clearing & levelling	-16	-	-16	-16	-20	-	-	-12	-15	-16	-	**-111**
Transportation (vehicular movement) and operation of	-16	-	-9	-12	-	-	-	-	-8	-9	12	**-42**
Storage and Handling of construction	-12	-	-9	-8	-8	-	-	-	-6	-4	-	**-47**
Civil construction activities & disposal of construction debris	-16	-12	-12	-16	-	-	-	-18	-10	-8	12	**-80**
Sewage Disposal	-	-9	-9	-	-	-	-	-	-	-	-	**-18**
Laying of pipeline for effluents and Drains/Nallah for storm water	-9	-12	-9	-12	-	-	-	-8	-8	-4	-6	**-68**
Greenbelt Development	9	-8	12	10	8	-	-	-	-	8	8	**47**
Employment Generation	-	-6	-	-	-	-	-	-10	-	-	20	**4**
Cumulative Score	**-60**	**-47**	**-52**	**-54**	**-20**	**0**	**0**	**-48**	**-47**	**-33**	**26**	**-335**

The total cumulative score for various environmental attributes without mitigation measures is -335 that means “Significant adverse impacts” with most of the them are reversible. Mitigation

measures are crucial and need to be proper attention to minimize the environmental impacts during construction phase.

4.2.1 Air Environment

Table 4.5: Impact on Air Environment and Mitigation Measures

Project Activity	Impacts	Mitigation Measures
Site preparation (clearing & levelling)	• Fugitive emission will be generated from site cleaning and levelling activities like removing shrubs/ de-weeding, digging, grading, cutting and filling of earth and rocky material which will affect the air quality in surrounding area of construction site. • Emission from the operation of heavy tools and machinery as Cranes, JCB, Dumpers, Mechanical Hammers, Tractors, etc. used for site clearing and levelling purpose, which may deteriorate ambient air quality. • Cutting of tress during the levelling and development of proposed project.	• Regular water sprinkling will be done for controlling fugitive emission. • Excavated soil and construction debris will be sprinkled with water and kept moist & shall be reused within the boundary for area levelling purpose. • The impact will be for short duration and confined locally to the construction site. • All the machineries used for site clearing & levelling will be examined by competent person before use and regular maintenance will be ensured. • Dust Mask will be provided to the construction workers in dust prone area. • During the primary survey it was observed major area of proposed project is semi hilly with barren land and bushy trees, hence slope stabilization will be ensured. More over

		additional greenbelt will be developed by BDP authorities.
Transportation (vehicular movement) and operation of machineries	• Fugitive Dust Emissions due to vehicular movement may deteriorate the quality of Air. • Exhaust emissions from vehicles like bulldozers, trucks etc. and equipment deployed during the construction phase is also likely to result in marginal increase in the levels of SO2, NOx and PM which may lead to health issues.	• Only valid PUC certified vehicle will be used for the transportation of materials and equipment. • Regular water sprinkling will be done to control fugitive emissions. • Regular maintenance, servicing of the vehicles and periodic emission check for equipment and machinery will be carried out in conformity with the Central Motor Vehicles Rules, 1989. • Trucks used for transportation of construction materials shall be covered with tarpaulin sheet to avoid dust dispersion at site and along the route. • The approach roads will be made paved or tarred.
Storage and Handling of construction material	• Spillage and fugitive emissions of construction materials may lead to inhalation of dust/gases/fumes which may cause adverse impacts to the workers. • Stomatal index may be minimized due to dust deposit	• Construction materials will be covered with tarpaulin sheets throughout the construction phase to avoid dust generation. • Barricading of the major dust generation area.

	on leaf which reduces crop yield and deteriorate crop quality	• Safety goggles and dust mask will be provided to the workers.
Civil Construction Activities & Disposal of Construction debris	• Increase of dust and airborne particulates due to fugitive emission may deteriorate the quality of the air and affect worker's health. • Construction debris and improper disposed of domestic garbage/wastes will create nuisance due to odour generation.	• Temporary thin sheets of sufficient height (3m) will be erected around the construction sites/ areas as a barrier for dust control. • Regular water sprinkling will be done to control emission. • Separate bin with cover lid will be provided for storage of garbage/ wastes and the same will be disposed of adequately. • Personnel Protective Equipment (PPEs) will be provided to the construction workers. Hence, there will be no significant impacts on their health due to the dust particle.
Laying of pipeline for effluent disposal	• Air quality may be affected by construction related emissions generated by construction equipment, movement of trucks and worker vehicles. • Dust will also be generated due to excavation and trenching, back filling activities for pipeline laying.	• Regular water sprinkling will be done to reduce dust generation during clearing of site. • Construction material and waste will be stored in properly covered areas/ wet conditions or use tarpaulin sheet. • Personal protective equipment will be provided to the workers.
Greenbelt Development	• Positive impact due to	• BDP authorities will develop

	Greenbelt development as it will act as natural barrier for dust emission. • The impact will be confined within the project boundary and is expected to be negligible outside the park boundaries.	19% greenbelt in Bulk Drug Park (1405 acres) and individual industries will develop remaining 14% green belt in their own premises as per CPCB/ State Board guidelines. • Regular maintenance will be carried out for proper growth and maturity of the plants.

4.2.2 Water Environment

Table 4.6: Impact on Water Environment and Mitigation Measures

Project Activity	Impacts	Mitigation Measures
Civil Construction Activities & Disposal of Construction debris	• Decrease in ground water level due to water consumption in construction activities like concrete batching, grouting, dust suppression etc. • The site development may produce large quantities of run-off with high suspended solids during the rainy season in the absence of appropriate mitigation measures it will pollute nearby receiving river body. • During the construction phase, the storm-water may be contaminated with particulate matter, oil and grease, fuel from the construction machinery/ maintenance areas of the construction equipments/ vehicles which may increase the turbidity of the same.	• Water will be sourced through Private Tankers from nearby areas from natural/ surface water bodies. No ground water will be abstracted during the construction phase and hence, Impact on ground water due to proposed project is ruled out. • Natural slope will be maintained during the site preparation to avoid any effect on the natural drainage pattern of the site. • Temporary gully network will be formed during the construction work to channelize the storm-water in natural kash (natural drain) present in that area. • Contamination of storm-water by oil and grease from the construction

		machinery/ maintenance areas of the construction equipment/ vehicles will be strictly avoided by implementing the mitigation measures like closed/ covered storage shed etc.
Sewage Disposal	• Untreated sewage if disposed openly may create nuisance in the surrounding areas. • Wastewater generated during construction activities if discharged on ground, may reach the ground water table by leaching and affect the ground water quality.	• RCC construction septic tank followed by soak pit system will be provided for treatment of sewage. • Sedimentation pits will be provided at appropriate location to trap the silt laden runoff water and prevent excessive silt from going outside.
Laying of pipeline for effluent disposal	• Impact on waterbody due to laying of pipeline and increase turbidity of water body and ultimately impact on aquatic flora & fauna. • Untreated or inadequately treated hydro test water from pipeline Hydro testing operations will also possibly be leading to surface water contamination during the pipeline laying stage.	• Pipeline will be laid by HDD method, 2.5 m below the river bed/ Nallah/ Khud, hence there will be no significant impact on waterbody. • Hydro testing is a one-time activity during construction phase. Mostly Clear water will be generated from hydro testing which can be reused. After been reused multiple times, shall be use for construction purpose. • Regular surface water quality inspection will be conducted according to the Environmental Management Plan (EMP).

Greenbelt development & Employment generation	• Water resource depletion due to water consumption for Greenbelt development	• Water requirement during construction phase will be fulfilled by deploying water tankers facility. • Wastage of water will be strictly avoided. • Awareness for water conservation will be provided to the workers.
Site clearing & levelling	• During construction, soil becomes unconsolidated due to removal of stabilizing material, such as vegetation and disturbance of stabilized existing grade resulting in loss of top soil.	• Excavated earth shall be stored in stockpiles and covered with plastic/tarpaulin sheets and reused for landscape development along the corridor. • To minimize disruption of soil and for conservation of top soil, the contractor shall keep the top soil cover separately and stockpile it. • After the construction activity is over, top soil will be utilized for landscaping activity.
Transportation (vehicular movement) and operation of machineries	• Soil may get contaminated from the spillage of chemicals such as fuels, oils, and other construction chemicals. This normally happens when these materials are transported in open or loosely capped containers. • Impacts of construction activities on soils include the surface sealing caused by buildings and asphalt and soil compaction by construction	• To prevent soil compaction in the adjoining productive lands beyond the boundary, the movement of construction vehicles, machinery and equipment shall be restricted to the designated haulage route. • Proper spillage management plan will be prepared and followed for oily residues such as transformer oil and lubricants in the case of

4.2.3 Soil Environment

Table 4.7: Impact on Soil Environment and Mitigation Measures

Project Activity	Impacts	Mitigation Measures
Site clearing & levelling	• During construction, soil becomes unconsolidated due to removal of stabilizing material, such as vegetation and disturbance of stabilized existing grade resulting in loss of top soil.	• Excavated earth shall be stored in stockpiles and covered with plastic/tarpaulin sheets and reused for landscape development along the corridor. • To minimize disruption of soil and for conservation of top soil, the contractor shall keep the top soil cover separately and stockpile it. • After the construction activity is over, top soil will be utilized for landscaping activity.
Transportation (vehicular movement) and operation of machineries	• Soil may get contaminated from the spillage of chemicals such as fuels, oils, and other construction chemicals. This normally happens when these materials are transported in open or loosely capped containers. • Impacts of construction activities on soils include the surface sealing caused by buildings and asphalt and soil compaction by construction machinery, which may reduce air, water and nutrient exchange, reduce the permeability of soils and may impair natural soil processes.	• To prevent soil compaction in the adjoining productive lands beyond the boundary, the movement of construction vehicles, machinery and equipment shall be restricted to the designated haulage route. Proper spillage management plan will be prepared and followed for oily residues such as transformer oil and lubricants in the case of accidental or unexpected release. Transformer oil will be supplied in drums from an imported source. • Oily residues, fuels and any contaminated soil residues will be captured at source. Refueling and maintenance will take place in dedicated areas. Contaminated residues and waste oily residues will be disposed as per guideline

Storage and handling of construction material	• Soil contamination due to mixing of construction material may degrade soil fertility. • Accidental spills of chemicals, oils or fuels from storage area or the leakage of lubricants or fuel by machinery etc. can affect nutritive composition of the soils.	• The construction material & diesel / oil to be used for various construction activities will be stored in designated storage yards to reduce the spills into unwarranted areas. • Good practices of storage and material handling will be carried out. • Spillage control will be carried out by disposing the affected soil at dedicated place.
Civil Construction Activities & Disposal of Construction debris	• Construction activities, such as grading and filling, drastically reduce soil quality on construction sites. • Contamination of the soils of surrounding area due to construction materials such as cement, sand, oils, etc.	• Excavated earth will be stored in stockpiles and covered with plastic / tarpaulin sheets or stored in closed room and reused for landscape development along the corridor. • The construction wastes shall be utilized for PCC works, road construction and other filling requirement etc.
Sewage Disposal	• Unmanaged sewage can contribute to contamination of soil.	• The wastewater generation during the construction period will be from the sanitary units provided for the constructional workers. • This wastewater will be treated in septic tanks/ soak pits.
Laying of pipeline for effluent disposal	• Soil inversion and resulting loss in soil fertility or structure due to digging for pipeline laying and during site clearing and leveling. • Before site development activity, the top soil of the site	• Top soils shall be strictly restored to near original condition without affecting the fertility of excavated area. • Excavated topsoil shall be used for backfilling after laying of pipeline. • Maximum portion of the ROU will be paved to minimize the soil erosion/dust carryover due to wind.

	if not properly stripped and stored for future use, the entire volume of top soil will be permanently lost or fertility/soil characteristics will be changed.	
Greenbelt Development	Positive impact as improvement in soil texture due to binding of top soil materials and root structure. Positive impact as greenbelt may increase soil fertility.	• BDP authorities will develop 20% greenbelt in Bulk Drug Park (1405 acres) and individual industries will develop remaining 13% green belt in their own premises as per CPCB/ State Board guidelines. • Regular maintenance will be carried out for proper growth and maturity of the plants.

4.2.4 Noise Environment

Table 4.8: Impact on Noise Environment and Mitigation Measures

Project Activity	Impacts	Mitigation Measures
• Site clearing & leveling • Transportation (vehicular movement) and operation of machineries • Storage and Handling of construction material • Civil Construction Activities & Disposal of Construction debris	• High noise from Site clearing & leveling activity and operation of machinery like Crawler Excavators, Wheel Loaders, and Crawler Loaders etc. and Noise generation from vehicles movement, D.G sets and construction equipment like dozers, scrapers, concrete mixers, cranes, pumps, compressors, pneumatic tools, saws, vibrators etc. may lead to hearing problem and other health related issues etc.	• Site clearing & leveling activity will be temporary during the daytime only. Hence, will not have any significant impact. • Machinery used for construction will adhere to International standards. These standards itself take care of noise pollution control / vibration control. • Lubrication will be carried-out periodically for rotation machinery. • Use of well - maintained

	• Due to increase in transportation activities during the construction phase, traffic congestion will be there which will create negative impact on air and noise environment. • Biological environment i.e. Birds, reptiles are sensitive to high noise level. Continuous exposure of high noise level may cause negative impact.	construction equipment as well as vehicles used for transportation. • Noise barriers will be provided near high noise generating areas. • Provision of quiet areas where workers can find relief during breaks • Vibration control damped tools will be used and the number of hours that a worker uses them must be limited. • No engines to be running while waiting within the site for a certain length of time. • According to traffic survey study, it was found that the existing road capacity is sufficient to cater traffic load. • D.G. set shall be provided with acoustic enclosures and shall beused only in case of power failure / emergency. • Provision of PPEs like earmuffs / earplug to avoid adverse effects of noise on occupational health and hearing capacity of workers as well as planning of working hours and shift of workers.
Laying of pipeline for effluent disposal	• Laying of the pipeline will include noise	• Construction activities carried out near

	generating activities like soil stripping, trenching, pipe stringing, welding and laying and backfilling. However, such noise generating activities will occur intermittently, primarily during the daytime. • Occupational health issues associated with high noise level like high blood pressure, heart disease etc. may be observed which can decrease working efficiency.	residential locations will be scheduled to the daytime (i.e. from 10.00 a.m. to 6.00 p.m.) only so as to have minimum disturbance to the residents. • Machinery will be maintained and lubricated as per manufacturers' guidelines to reduce noise generation. • All the major noise generating equipment will be equipped with acoustic enclosures. • Provision of ear muffs and ear plugs to prevent continuous noise exposure risk to laborers working on site. • Noise level will be monitored at regular intervals during construction phase, which will help in taking appropriate action to maintain it within the prescribed limits.
Greenbelt Development	• Plants absorb sound and rough bark and thick, fleshy leaves are particularly effective at absorbing sound with their dynamic surface area for absorbing sound.	• BDP will developed 277 Ha of area as greenbelt along the boundary wall which will increase aesthetic view as well as act as a barrier for noise.

4.2.5 Land Use/Land Cover

Table 4.9: Impact on Land Use/Land Cover and Mitigation Measures

Site clearing & levelling	• Due to clearing of agriculture • land & shrubs from acquired land, green cover area will be reduced and there will be change in land use from agriculture land to industrial area. • Due to construction and development of Bulk Drug Park, open area will be converted in to industrial area.	• The Project area comprises of agricultural land. There are no trees in the project area. No tree cutting is therefore envisaged. • Proposed project will provide various social and financial benefits to nearby community.
Laying of pipeline for effluent disposal	The impact on the land use along the pipeline corridor will be minimum and temporary as the excavated earth will be refilled back and efforts will be made to restore it to the original condition.	
Greenbelt Development	• Construction of plant and green belt development will lead to permanent change in land use pattern at the site as a direct impact.	• It is mandatory for Individual industries to develop around 33% greenbelt within their premises. • Plantation along the boundary wall shall be initiated at the start of construction itself. • Greenbelt area developed will result in beneficial impacts on land cover of the project area.

4.2.6 Hydrogeology

There will be no significant impact on Hydrogeology due to project activity during construction phase.

4.2.7 Geology

There will be no significant impact on Geology due to project activity during construction phase.

4.2.8 Solid and Hazardous Wastes

Table 4.10: Impact of Hazardous/Solid Waste and Mitigation Measures

Project Activity	Impacts	Mitigation Measures
Site clearing & levelling	• Due to Site clearing & levelling, vegetation and solid waste will be generated and will adversely affect the environment if not handle properly.	• The solid waste generated during this period being predominantly inert in nature, construction waste does not create chemical or biochemical pollution. • Most of the solid waste material will be used for filing/ leveling of low-laying areas. • Remaining Construction waste will be disposed as per guidelines.
Civil Construction Activities & Disposal of Construction Debris	• The excavated earth material if stacked loosely may result into runoff resulting in loss of top soil. • Construction waste like asphalt, ordinary concrete, reinforced concrete, bricks, wood, glass, iron, electric pipes, concrete pipes, plastic pipes etc. will be generated which may cause adverse health impact, if not disposed properly.	• Excavated earth shall be stored in stockpiles and covered with plastic / tarpaulin sheets or stored in closed room and reused for landscape development along the corridor. • Construction waste will be segregated and disposed off adequately. • The construction wastes will be utilized for leveling work etc. • Separate bins will be provided for storing Garbage / wastes and will be disposed off adequately.
Laying of pipeline for effluent disposal	• Solid wastes generated from the construction activities are	Construction Waste Management Plan (CWMP) will be prepared and implemented; which include the following measures in the plan:

	brushes cleared from the site, excess excavated earth (spoils), discarded construction materials, cement bags, and other similar items. • Domestic solid wastes may also be generated from the workers. Improper waste management will cause odour and vermin problems, pollution and flow obstruction of nearby watercourses and may negatively impact the landscape.	• Reuse of as much waste material as possible; • All waste/waste sand and vegetation will be covered by secure tarpaulins, whenever transported offsite to prevent material being blown from trucks. • Prior to being disposed, the mud will be tested for its hazardous nature and treated and/ or disposed in consultation with local authorities. • Avoid stockpiling any excess spoils at the site for long time. • Care shall also be taken that stagnant pools are not formed at the site during the construction phase. • Prohibit dumping of construction and/or domestic waste anywhere; • Provide proper collection bins and create awareness to use the dust bins. • Proper sanitation and drinking water facilities shall be provided for construction workers. • Sewage generated will be disposed properly through soak pit to avoid any adverse impacts on land. • Domestic solid wastes shall be properly segregated as biodegradable and non- • biodegradable for collection and disposal to designated solid waste disposal site.

4.2.9 Risk and Hazards

Table 4.11: Impact of Risk and Hazards and Mitigation Measures

Project Activity	Impacts	Mitigation Measures
Site clearing & levelling	• Vehicle collision due to failure may lead to loss of life and property. • Failure of machineries during construction activities may cause injuries and accidents. • Fire and explosion in storage area may cause loss of life and property. • Fall from height, falling object, cut/crush injury, due to construction activities may cause serious injuries.	• Pipes and live cables must be deenergized or labeled clearly and instructed workers accordingly. • Personnel Protective Equipment (PPEs) will be provided to the construction workers. • All the activities will be carried out under the supervision and control of the competent person. • The vehicles will be maintained in good repairs and checked thoroughly at least once a week. • The vehicles will be maintained in good repairs and checked thoroughly at least once a week by the competent person appointed by the management. • Construction machineries and equipments will be well maintained and properly guarded. • Firefighting arrangement will be made available at construction site. • Personal Protected equipment such as helmet, goggles, fall arrest earplug, etc., will be provided.
Transportation (vehicular movement) and operation of machineries		
Storage and Handling of construction material		
Civil Construction Activities & Disposal of Construction Debris		

Laying of pipeline for effluent disposal	Chances of slips, falls and other physical accidents due to presence of construction material, waste soil, trench excavation along the road, dust, narrowed road due to construction works, vehicle collisions with pedestrians, and other vehicles	• Temporary traffic control (e.g. flagmen) and signs will be necessary to improve safety and provide directions will be provided. • Warning signs, blinkers will be attached to the barricading to caution the workers and employees about the hazards associated with the works, and presence of trenches / deep excavation. • Restriction on public access to all areas where construction works are on-going through the use of barricading and security personnel. • Standard and safe practices for trenching and pipe laying will be adopted. • Safe construction practices will be followed to prevent any unwanted mishaps. • Workers will be provided with adequate PPEs to safeguard them against potential risks.

4.2.10 Ecology and Biodiversity

Table 4.12: Impact on Ecology and Biodiversity and Mitigation Measures

Project Activity	Impact	Mitigation Measures
Site clearing & leveling	• Site preparation and development works will cause loss of potential agricultural land and loss of vegetation. • Transportation of construction material by the trucks/dumper will affect the movement of	• Major trees will not be felled and protected, however in case unavoidable situation, compensatory tree plantation in the ratio of 1:10 will be followed. • Transportation of products and raw material shall be carried out during daytime only. • Only PUC vehicle shall be used for the transportation of materials and equipment. • During the site visit, it was observed that there is no forest land, or ecologically sensitive area near the project site. Hence,
Transportation (vehicular movement) and operation of machineries		
Civil Construction Activities & Disposal of Construction Debris		

	animals and birds. • Fugitive emission from vehicle movement will form a layer on the leaves thus reducing the gaseous exchange process. This ultimately affects the growth of plants. • Operation of machineries and civil construction activity will lead to noise pollution near surround areas.	impact on the same is not envisaged. • Area falling under Costal regulation zone shall be kept open and no construction activities will be carried out. • Noise control measures like enclosure, silencer will be installed to reduce noise generating from operation of construction machineries. • The proposed activities do not envisage destruction of habitat and feeding or breeding area of faunal species. Further, development of plantation will provide habitat, food and breeding areas for small animals and insects. Thus, a positive impact is envisaged. • No rare or endangered species of fauna are reported to exist in the area. • Thus, no impacts on rare / endangered species are envisaged due to normal operations.
Laying of pipeline for effluent disposal	• Accidental spills or leakage of lubricants may affect terrestrial plants and animals in the vicinity of the spill.	• It will be ensured that there is no loss of plants or animals outside the designated footprint of construction areas, and no excessive dust/emissions/noise from those areas that would harm wildlife in adjacent areas. • Ensure that all construction work or other activities near the site perimeter are conducted with particular care and include measures to reduce production of noise and dust to the minimum possible. • Prevent access to areas located beyond the construction zone. • The working area which has to be disturbed will be kept minimum at all times. • Regular maintenance of vehicles and machineries to control noise and air pollutant emission. • Noise barrier will be provided in sensitive locations.

		• Appropriate shading of lights to prevent scattering. • The movement of construction vehicles will be as per policy for road safety prescribed by the company.
Greenbelt Development	• Greenbelt development may cause positive impacts on the flora by enhancement of green spaces • Generation of habitats for avifauna i.e. positive impact	• Local species will be planted during the development of greenbelt to maintain the ecological balance of the Area • Regular watering and maintenance of the greenbelt for sustained plant growth.

4.2.11 Socio-Economic

Table 4.13: Impact on Socio-Economic and Mitigation Measures

Project Activity	Impacts	Mitigation Measures
Land Acquisition	• Due to Land Acquisition, land owners had lost their land due to proposed project of Bulk Drug Park	• Land compensation as per rules and regulations of Govt. of Gujarat has been provided to affect all land owners.
Transportation (vehicular movement) and operation of machineries	• The construction phase will generate employment opportunity in skilled as well as unskilled categories. • Although the workforce requirement will be temporary in nature, it will be met from the local populace hence, there will be positive impact.	• It will be ensured that contractor provides all necessary amenities like sanitary, drinking water facility, first aid etc. to the workers. • Local businessmen will get opportunity to supply construction materials. • Demands generated from the employees working at site for
Civil Construction Activities & Disposal of Construction Debris		
Laying of pipeline for effluent disposal		
Greenbelt Development		

Employment Generation	• Transportation, movement/ operation of machineries and civil construction activities will generate noise and air pollution, which will impair the health of the nearby community. It may also increase the traffic due to transportation. • Construction workers will require essential basic infrastructure facilities viz. safe drinking water, adequate sanitation, etc. will have temporary impact on the existing facilities. • Greenbelt will enhance the aesthetic value and beautify the landscapes.	basic facilities will increase the local business activity of the area. • During the construction phase 3500 nos. of employment will be generated. • Proper mitigation measure like use of only PUC vehicle for the transportation of materials and equipment, use of well-maintained vehicles etc. will be adopted to reduce various pollution generated by Transportation, movement/ operation of machineries and civil construction activities • Any development, either temporary or permanent will support the family of many villagers. Thus, positive impacts are envisaged on socioeconomic environment.

Table 4.14: Environmental Impact Assessment Matrix with Mitigation Measures (Construction Phase)

Project Activities	**Environmental Attributes**											
	Air	Water	Soil	Noise	LU/LC	Geo hydrology	Geology	SHW	Risks &Hazards	Ecology & Biodiversity	Socio Economics	Total
Land Acquisition	-	-	-	-	-	-	-	-	-	-	-12	-12
Site clearing & levelling	-8	-	-12	-12	-8	-	-	-8	-6	-8	-	-62

Transportation (vehicular movement) and operation of machineries	-12	-	-6	-8	-	-	-	-	-4	-4	+12	-22
Storage and Handling of construction material	-4	-	-6	-6	-	-	-	-	-4	-	-	-20
Civil Construction Activities & Disposal of Construction debris	-12	-8	-8	-12	-	-	-	-12	-8	-4	+12	-52
Sewage Disposal	-	-4	-4	-	-	-	-	-	-	-	-	-8
Laying of pipeline for effluent disposal	-8	-6	-4	-8	-	-	-	-4	-4	-2	-4	-40
Greenbelt Development	+9	-4	+8	+10	+8	-	-	-	-	+8	+6	45
Employment Generation	-	-6	-	-	-	-	-	-6	-	-	+20	**8**
Cumulative score	**-35**	**-28**	**-32**	**-36**	**0**	**0**	**0**	**-30**	**-26**	**-10**	**+34**	**-163**

The total cumulative score for various environmental attributes will reduce to -163 after providing proper mitigation measures during construction phase, which is appreciable to overcome reversible impacts of the project.

The overall and all possible adverse impacts due to various activities during the construction phase on different environmental factors have been identified and predicted. The study shows that the impact is confined within the site boundary, low in magnitude and lasts only for a short duration and will not exist beyond the construction period. On the other hand, due to construction phase of the project components are increased direct & indirect employment opportunities, transport and development of ancillary and associated small-scale units,

restaurants, shops and small vendors. These developments will have a positive impact on the socio-economic structure in the surrounding area of the Bulk Drug Park.

4.3 IMPACTS AND MITIGATION MEASURES DURING OPERATION PHASE

Operation phase activities can have significant major impacts on land use, demography and socio-economics, on-site soils and on-site noise, water use, air and water quality and ecology in the study area. During the operation phase, the project activities and their associated impacts have been identified as depicted in below table.

Table 4.15: Impact Identification Matrix (Operation Phase)

Project Activities	Environmental Attributes										
	Air	Water	Soil	Noise	LU/LC	Geo hydrology	Geology	SHW	Risks &Hazards	Ecology & Biodiversity	Socio Economics
Transportation of Raw Material, Products & Fuels	✓	-	✓	✓	-	-	-	-	✓	✓	✓
Handling and Storage of Raw Material, Products & Fuels	✓	-	✓	-	-	-	-	-	✓	-	-
Product Manufacturing	✓	✓	-	✓	-	-	-	✓	✓	-	✓
Utility Operation	✓	-	-	✓	-	-	-	-	✓	✓	✓
CETP/ ETP/ STP Operation & wastewater discharge	✓	✓	✓	-	-	✓	-	-	-	✓	-
Solid/ Hazardous waste generation & disposal	✓	✓	✓	-	-	✓	-	✓	-	✓	-
Discharge of effluent through pipeline	-	✓	✓	-	-	-	-	-	-	-	-
Greenbelt Development	✓	✓	✓	✓	✓	-	-	-	-	✓	✓
Employment Generation	-	✓	-	-	-	-	-	✓	-	-	✓

Table 4.16: Environmental Impact Matrix without Mitigation Measures (Operation Phase)

Project Activities	Environmental Attributes											
	Air	Water	Soil	Noise	LU/LC	Geo hydrology	Geology	SHW	Risks &Hazards	Ecology & Biodiversity	Socio Economics	Total
Transportation of Raw Material, Products & Fuels	-16	-	-12	-16	-	-	-	-	-12	-6	12	-50
Handling and Storage of Raw Material, Products & Fuels	-16	-	-8	-	-	-	-	-6	-16	-	-	-46
Product Manufacturing	-20	-16	-	-12	-	-	-	-16	-16	-	12	-68
Utility Operation	-20	-	-	-16	-	-	-	-12	-12	-9	9	-60
CETP/ETP/STP Operation & wastewater discharge	-9	-20	-16	-	-	-12	-	-12	-	-9	-	-78
Solid/ Hazardous waste generation & disposal	-9	-16	-16	-	-	-	-	-20	-	-6	-	-67
Discharge of effluent through pipeline	-	-16	-10	-	-	-	-	-	-	-	-	-26
Greenbelt Development	12	-8	8	12	10	8	-	-	-	10	6	58
Employment Generation	-	-8	-	-	-	-	-	-8	-	-	20	4
Cumulative Score	-78	-84	-54	-32	10	-4	0	-74	-56	-20	59	-333

The total cumulative score of various project activities phase without mitigation measures during operation would be – 333 as a significant adverse impacts: most of the impacts would be reversible and to reduce them, mitigation measures taken will be crucial.

To overcome and/ or control the associated project impacts during the operational phase, the implementation of environmental management plan will be prime responsibility of BDP authorities and individual member industries.

4.3.1 Air Environment

Air pollution during operation phase will be generated due to utility operation of Bulk Drug Park & various operations of individual member industries and vehicular emissions due to transportation of fuel, raw materials and products.

Prediction and Quantification Air Emissions

Prediction and quantification air emissions due to project operation are evaluated with scientific and mathematical tools using emission factors and Gaussian plume modeling. Air quality dispersion modelling was performed using AERMOD Cloud software assuming worst-case scenario (considering all possible emission sources running with full load and emission capacity simultaneously) during project operation.

Air Quality Modelling and Prediction of Impacts

Details of Emission Sources

Emissions sources as flue gas stacks and process gas vents were considered as a point source. The movement of traffic (Transport vehicles plus passenger vehicles) were considered as road/ line source in the study area of 10 kms. The Cumulative Air Quality Modeling for the proposed Bulk Drug Park spreads in 1405 acres was carried out by considering as an area source to predict the impact on ambient air quality during the operational phase. The prediction has been done by using AERMOD View Gaussian Plume Dispersion model. The overall air emission sources considered for air quality modeling and prediction of environmental impacts during project operation has been depicted in **Table 4.17.**

Table 4.17: Air emission sources considered for assessment and prediction of environmental impacts during project operation

Sr. No.	Type of Source	Capacity/ Qty.
Stationary Sources		
1.	Industrial Boilers	6x50 TPH
2.	Incinerators	4x25 TPH

3.	DG Sets	2x1000 KVA
4.	Process Reactors	80 Nos.
Mobile Sources (Vehicles)		
5.	Trucks (Heavy vehicle, Diesel)	80
6.	Buses (Heavy vehicle, Diesel/CNG)	480
7.	Passenger SUVs & Cars (Diesel/Petrol/CNG)	820
8.	Two wheelers (Motor cycles and scooters-Petrol)	1600
9.	Three wheelers (Auto-rickshaws-Diesel/Petrol/CNG)	100

A number of sources from the proposed project which can cause potential impacts on Air environment during operation phase are discussed as below:

- Flue gas emission of PM10, PM2.5, SO2, & NOx and CO from the stack attached to Boilers (6x50 TPH), Incinerators-4Nos. and D.G Sets (2x1000 KVA) of BDP and Process Reactors – 80 Nos. of member API industries (70-80 units).
- Vehicular exhaust emissions of PM10, PM2.5, SO2, & NOx and CO from Trucks–80 Nos., Buses–480 Nos., Cars–820 Nos., Bikes–1600 Nos. and Autos–100 Nos. associated to the project operation.
- Process emission of NH3, Cl2, Br2, HCl, HBr, BTX (Benzene, Toluene, Xylene), Acetonitrile and Dichloromethane from the vent attached to Reactors-80Nos. of member API industries (70-80 units).

The parameters were considered for dispersion modeling for an area source as blow

- Quantity of fuel;
- Emission rate of pollutants and;
- Length of the X and Y Side and Orientation Angel from North

The parameters were considered for dispersion modeling for Stack and Vent as

- Height from ground level;
- Internal diameter at top;
- Exit flue gas velocity;
- Exit flue gas temperature and;
- Efficiencies of air pollution control devices (APCDs) installed.

The details of overall emission sources associated to proposed Bulk Drug Park are as given below in **Table 4.18** and **Table 4.19**.

Table 4.18: Details of Major Source Emissions during Project Operation

S. No.	Input Parameter				
1.	Source of Emission	Boiler	Incinerator	DG Set	Process Duct (Reactor)
2.	Qty. & Capacity of Source	6x50 TPH (Working 3x50TPH, Standby 3x50TPH)	100 TPH (40+30+20+10) (Working 50TPH, Standby 50TPH)	2x1000 kva (Working 1000kva, Standby 1000kva)	80
3.	Fuel Type	Rice Husk	HSD/CNG/LPG	HSD	Electricity
4.	Fuel Consumption	37,500 kg/hr	150 ltr/h HSD	200 ltr/h	-
5.	APCD installed	ESP	Wet Scrubber	NA	Wet Scrubber
6.	Stack height from Ground (m)	90	90	60	10
7.	Inner Dia of Stack/Duct (m)	1	0.5	0.5	0.3
8.	Temperature of Flue Gas (°C)	120	150	400	Ambient
9.	Velocity of Flue Gas (m/s)	10	15	15	3

Table 4.19: Details of Vehicular Emissions during Project Operation

Emission Factors for Indian Vehicles								
Type of Vehicle	**Emission Factor, EF (gm/km/vehicle)**			**No. of Vehicles in day**	**Road Length travelled (km)**	**Vehicular Emission Load (gm/day) = No. of vehicles in a day*Road Length (km)*EF (gm/km/vehicle)**		
	CO	**NOx**	**PM**			**CO**	**NOx**	**PM**
HCV Trucks Diesel	6.00	9.30	1.24	80	20	9600	14880	1984
HCV Bus Diesel	3.92	6.53	0.30	240	20	18816	31344	1440

HCV Bus CNG	3.72	6.21	0.04	240	20	17856	29808	211
LCV Diesel	3.66	2.12	0.48	10	20	732	424	95
MUV Diesel	0.25	0.67	0.1	10	20	50	134	19
Passenger Cars LPG	2.72	0.20	0.002	200	20	10880	800	8.0
Passenger Cars CNG	0.60	0.01	0.002	200	20	2400	40	8.0
Passenger Cars Diesel	0.06	0.28	0.02	200	20	240	1120	60
Passenger Cars Petrol	0.84	0.090	0.002	200	20	3360	360	8.0
Three Wheeler CNG Retro 2S	0.69	0.19	0.12	20	10	138	38	24
Three Wheeler CNG OEM 4S	1.00	0.50	0.02	20	10	200	100	3.0
Three Wheeler Diesel	0.41	0.51	0.09	20	10	82	102	18
Three Wheelers (4Stroke)	2.29	0.53	0.010	20	10	458	106	2.0
Three Wheelers (2Stroke)	1.15	0.16	0.04	20	10	230	32	8.6
Motorcycle (4 s) (>100cc)	0.72	0.15	0.010	1000	10	7200	1500	100
Scooter (4 Stroke) (>100cc)	0.40	0.25	0.02	600	10	2400	1500	90
Total Vehicular Emission Load (gm/day)						74642	82288	4079
Vehicles running hours per day						2	2	2
Total Vehicular Emission Rate (gm/sec/day)						10.4	11.4	0.57

Prediction of GLCs

The estimation and evaluation of atmospheric emissions from proposed activity involves a number of scientific inputs i.e. meteorology and surface data and source strength and quantity of emissions from each activity/ process/ source associated to project operation. Prediction of GLC was done in case that plant is operational at full load with all proposed emission sources, transport vehicles as heavy trucks for material transportation and passenger vehicles for employees and workers plying on road on daily basis.

Air emissions were estimated based on following hypothesis/ assumptions as

- Operation of common facilities of Boilers for steam generation, Incinerators and DG sets for power backup for 10 hours in a day.
- DG sets will only be operated for power backup in case of power failure only.
- The vehicular emission factors were used as calculated by CPCB & ARAI, Pune report.
- Daily movement of vehicles (heavy trucks and passenger vehicles) in the study area about 20kms/ per day.

The average vehicular emission factors were calculated with following assumptions as

- The vehicle models were taken after the manufacturing year of 2005 (ARAI, Pune).
- The average emission factors were calculated using each type of vehicle category based on type and model, capacity and fuel used as petrol/diesel/CNG/LPG to explore the worst case scenario.

The source specific assumptions considered are as follows:

- The flue gas emission rate of stacks for PM and SO2 were calculated based on the Ash and Sulphur content specification of fuel used
- The flue gas emission rate of stacks for NOx were calculated based on respective flue gas emission standards.
- The process emission rates for NH3, Cl2, Br2, HCl, HBr, BTX, Acetonitrile and Dichloromethane were calculated based on emission standards.
- The terrain of the study area was considered as hilly.

- The mathematical equations used for the dispersion modeling assumes that the earth surface acts as a perfect reflector of plume and physio-chemical processes such as dry and wet deposition and chemical transformation of pollutants are negligible.

Prediction of GLC was done based on two approaches as

- GLC during plant operation in worst case conditions (without pollution control measures or failure of APCD/ process) and
- GLC during plant operation with controlled conditions (with effective pollution control measures/APCDs).

The details of overall emission sources associated to proposed Bulk Drug Park are considered during plant operation as given in **Table 4.20** and **Table 4.21.**

Table 4.20: Details of Source Emissions during Project Operation (Stack Emissions)

S. No.	Description				
1.	Source of Emission		Boiler	Incinerator	DG Set
2.	Qty. & Capacity of Source		6x50 TPH (Working 3x50TPH, Standby 3x50TPH)	100 TPH (40+30+20+10) (Working 50TPH, Standby 50TPH)	2x1000 kva (Working 1000kva, Standby 1000kva)
3.	Fuel Type		Rice Husk	HSD/CNG/LPG	HSD
4.	Fuel Consumption		37,500 kg/hr	150 ltr/h HSD	200 ltr/h
5.	Stack height from Ground (m)		90	90	60
6.	Inner Dia of Stack/Duct (m)		1	0.5	0.5
7.	Temperature of Flue Gas (°C)		120	150	400
8.	Velocity of Flue Gas (m/s)		10	15	15
9.	Volumetric Flow Rate of Flue Gas (Nm^3/hr)		21091	19596	4619
10.	APCD installed	Without APCD	-	-	-
		With APCD	ESP	Wet scrubber	-
11.	Emission Rate of PM_{10} (g/s)	Without APCD	58	2.72	0.096
		With APCD	0.29	0.27	0.096
12.	Emission Rate of $PM_{2.5}$ (g/s)	Without APCD	41	1.9	0.064
		With APCD	0.20	0.19	0.064
13.	Emission Rate of NO_x (g/s)	Without APCD	0.58	2.71	0.26
		With APCD	0.58	0.82	0.26
14.	Emission Rate	Without APCD	0.59	5.5	0.19

	of CO (g/s)	With APCD	0.59	0.54	0.19
15.	Emission Rate of SO_2 (g/s)	Without APCD	0.12	5.4	0.064
		With APCD	0.12	0.52	0.063

Table 4.21: Details of Source Emissions during Project Operation (Process/ Vent Emissions)

Pollutant	Limits (mg/Nm^3)	Dia of Duct (m)	Area of Duct (m^2)	Velocity of Flue gas (m/s)	APCD used	Emission Rate per duct (g/s)	Total Emission Rate (g/s)
NH_3	30	0.3	0.071	3	Wet Scrubber	0.0064	0.51
Cl_2	15	0.3	0.071	3	Wet Scrubber	0.0032	0.25
Br_2	15	0.3	0.071	3	Wet Scrubber	0.0032	0.25
HCl	35	0.3	0.071	3	Alkali Scrubber	0.0074	0.59
HBr	35	0.3	0.071	3	Alkali Scrubber	0.0074	0.59
Benzene	5	0.3	0.071	3	Wet Scrubber	0.0011	0.08
Toluene	100	0.3	0.071	3	Wet Scrubber	0.021	1.7
Xylene	100	0.3	0.071	3	Wet Scrubber	0.021	1.7
Dichloro-methane	200	0.3	0.071	3	Wet Scrubber	0.042	3.4
Acetonitrile	1000	0.3	0.071	3	Wet Scrubber	0.21	17
Acetone	2000	0.3	0.071	3	Wet Scrubber	0.42	34
HCl - Worst case	-	0.3	0.071	3	-	0.0743	5.94
Benzene - Worst case	-	0.3	0.071	3	-	0.01	0.85

GLCs during worst-case/ without APCDs

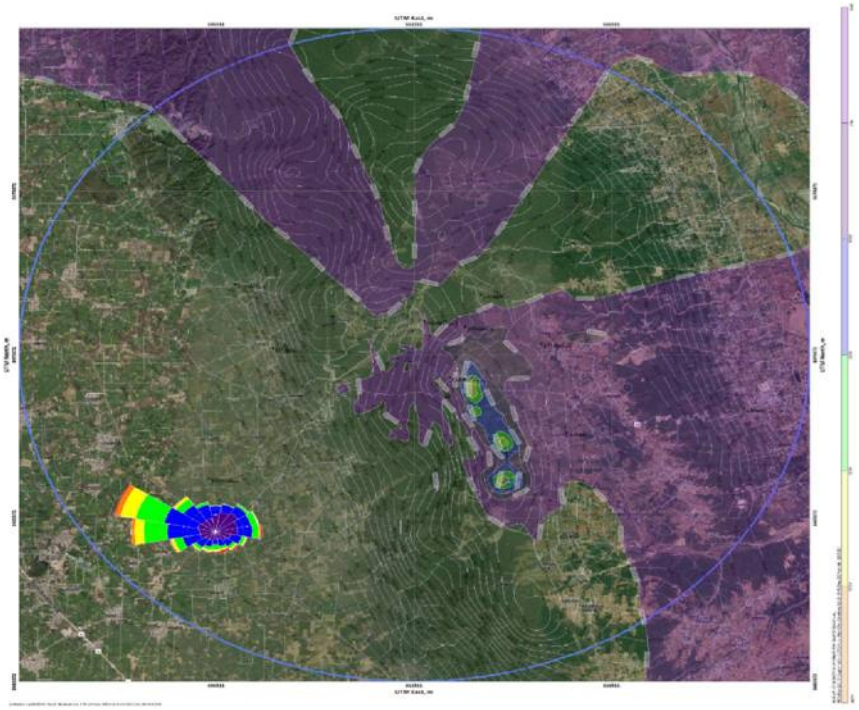

Fig. 4.2: GLCs/ Isopleths of PM_{10} during project operation in worst-case/ without APCDs

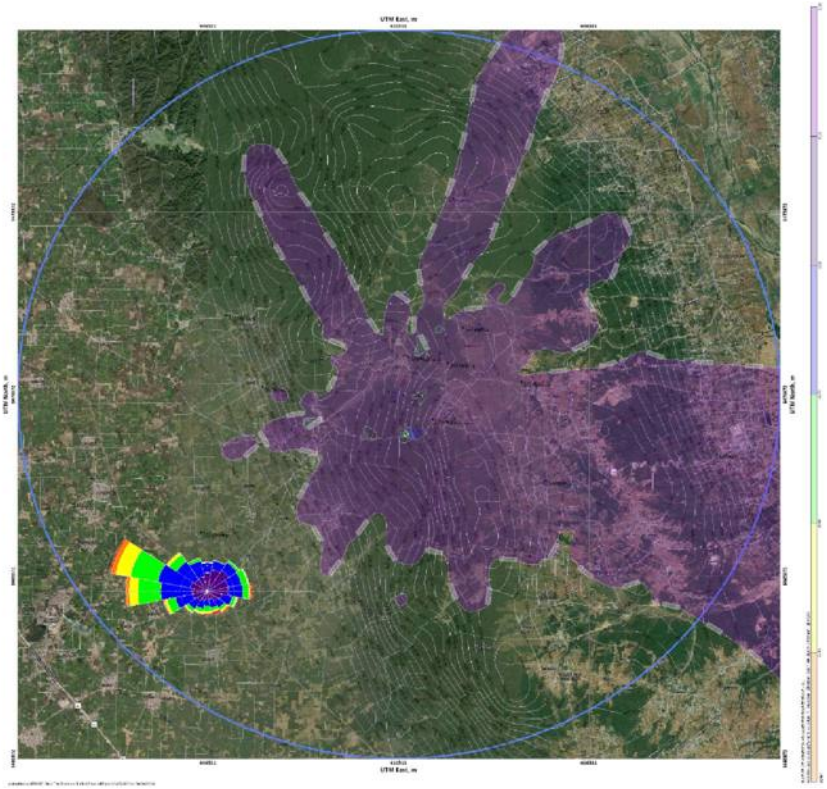

Fig. 4.3: GLCs/ Isopleths of NOx during project operation in worst-case/ without APCDs

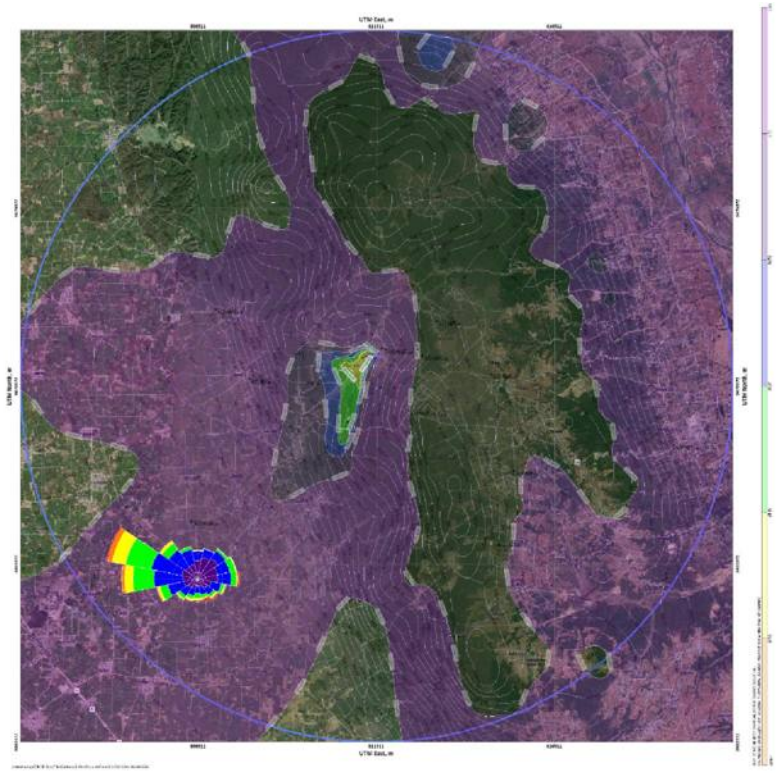

Fig. 4.4: GLCs/ Isopleths of HCl during project operation in worst-case/ without APCDs

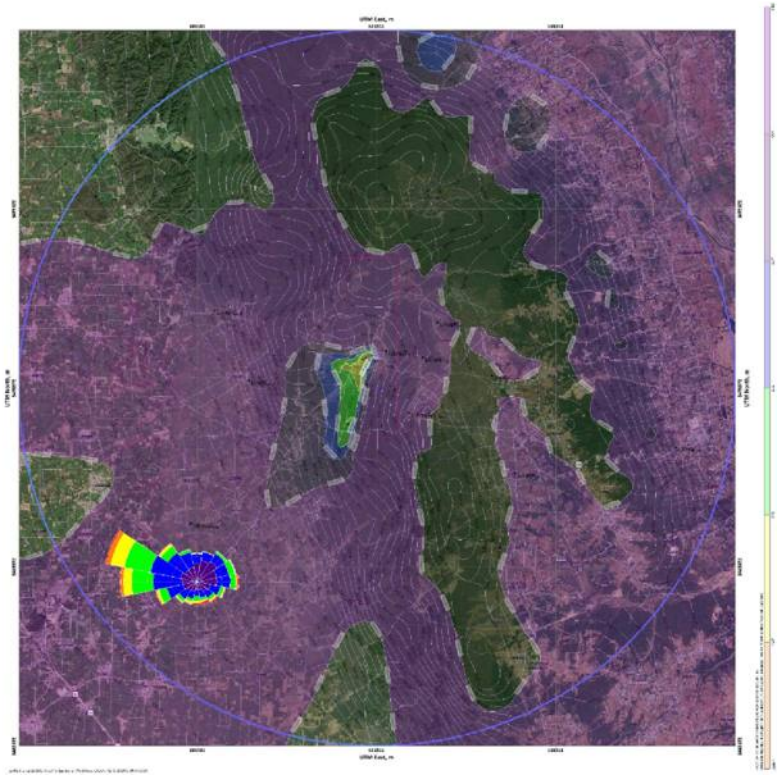

Fig. 4.5: GLCs/ Isopleths of Benzene during project operation in worst-case/ without APCDs

GLCs during controlled conditions/ with APCDs

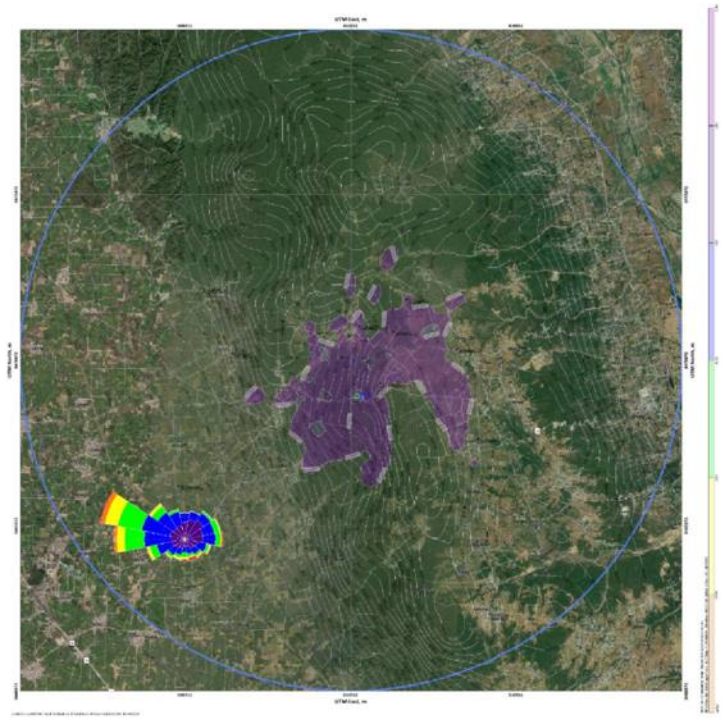

Fig. 4.6: GLCs/Incremental Emissions of PM_{10} during controlled conditions/ with APCDs

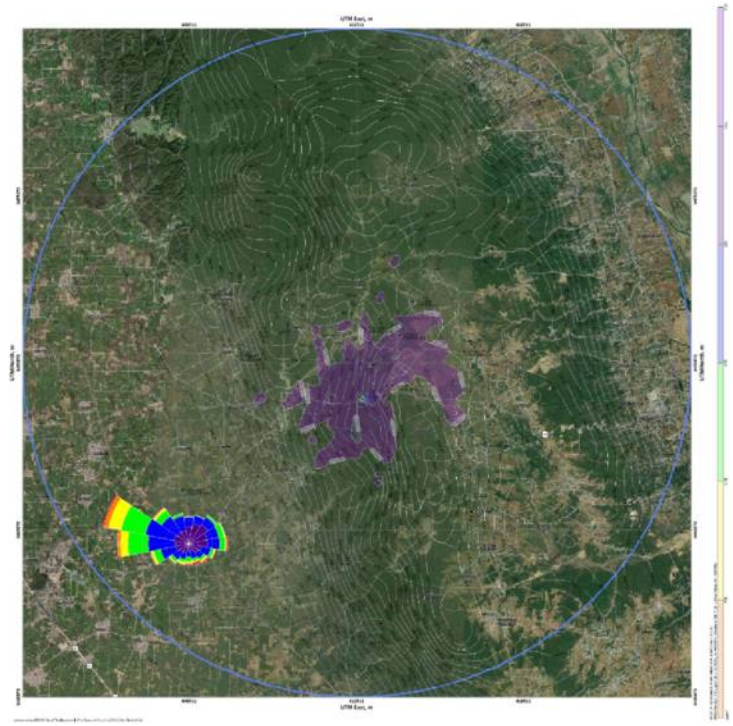

Fig. 4.7: GLCs/Incremental Emissions of $PM_{2.5}$ during controlled conditions/ with APCDs

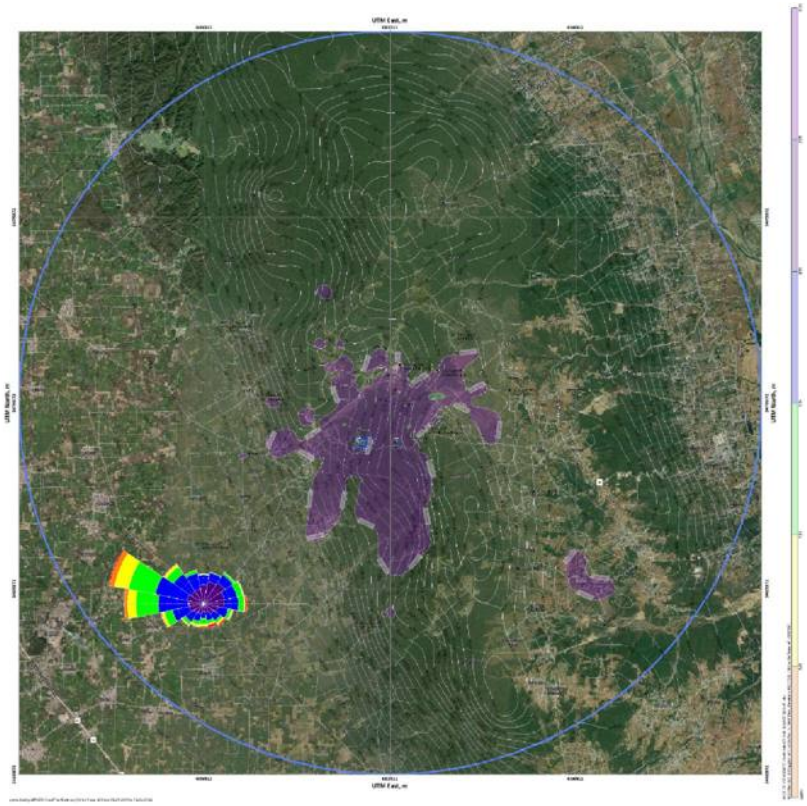

Fig. 4.8: GLCs/Incremental Emissions of NOx during controlled conditions/ with APCDs

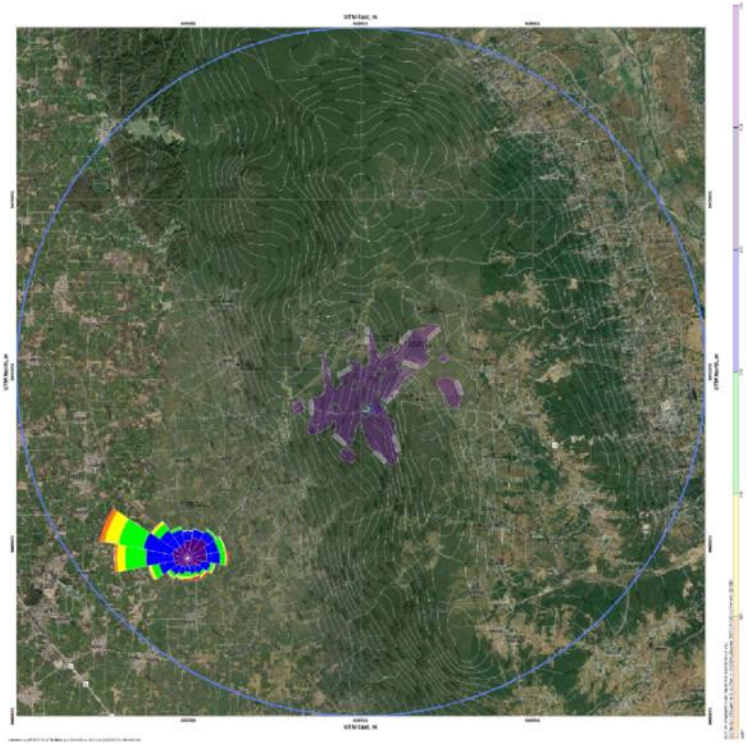

Fig. 4.9: GLCs/Incremental Emissions of SO2 during controlled conditions/ with APCDs

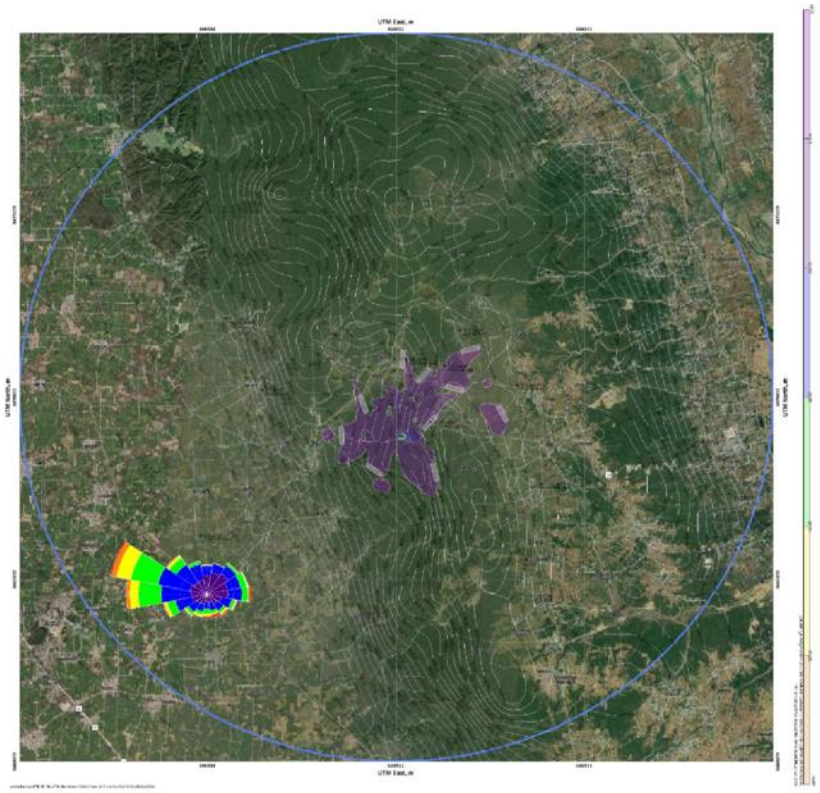

Fig. 4.10: GLCs/Incremental Emissions of CO during controlled conditions/ with APCDs

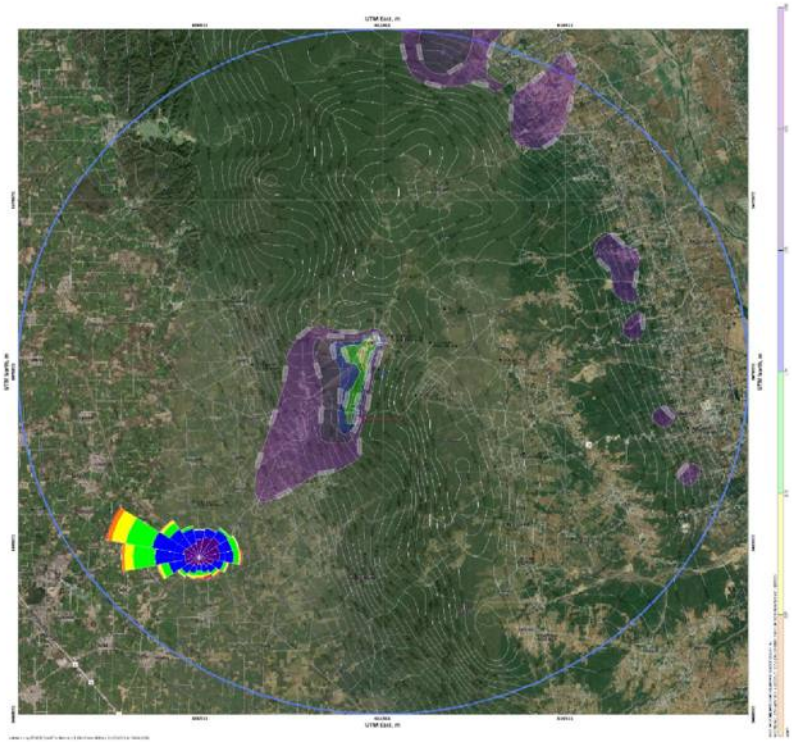

Fig. 4.11: GLCs/Incremental Emissions of NH_3 during controlled conditions/ with APCDs

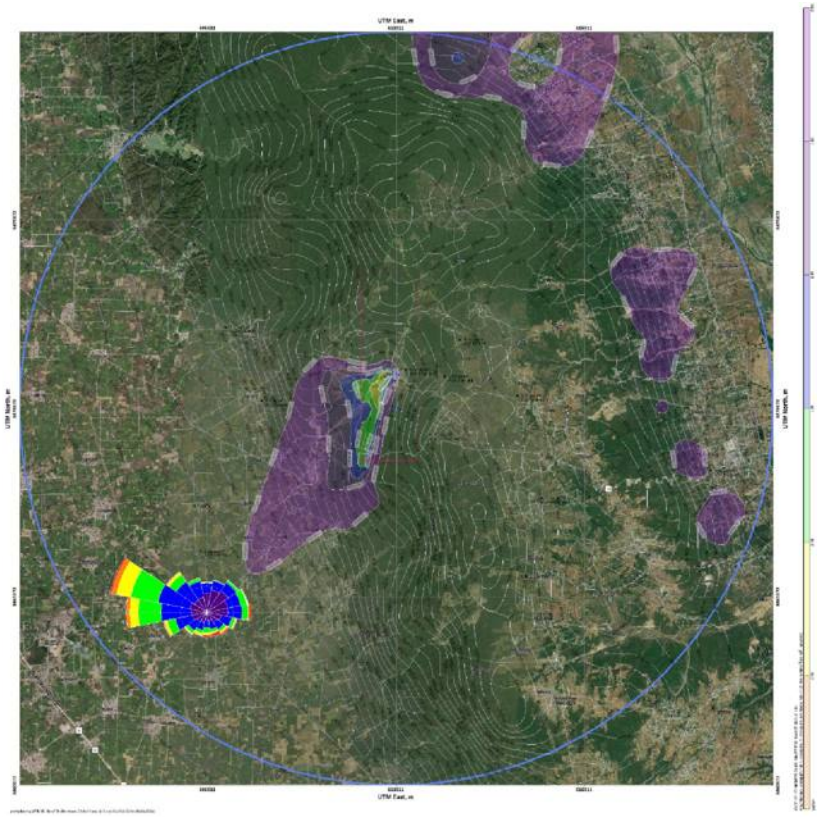

Fig. 4.12; GLCs/Incremental Emissions of HCl during controlled conditions/ with APCDs

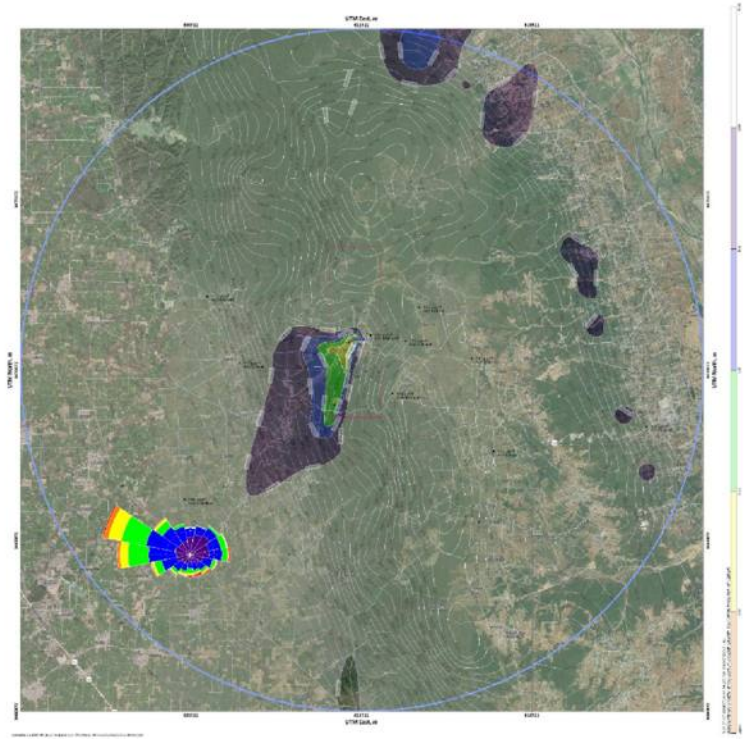

Fig. 4.13: GLCs/Incremental Emissions of Benzene during controlled conditions/ with APCDs

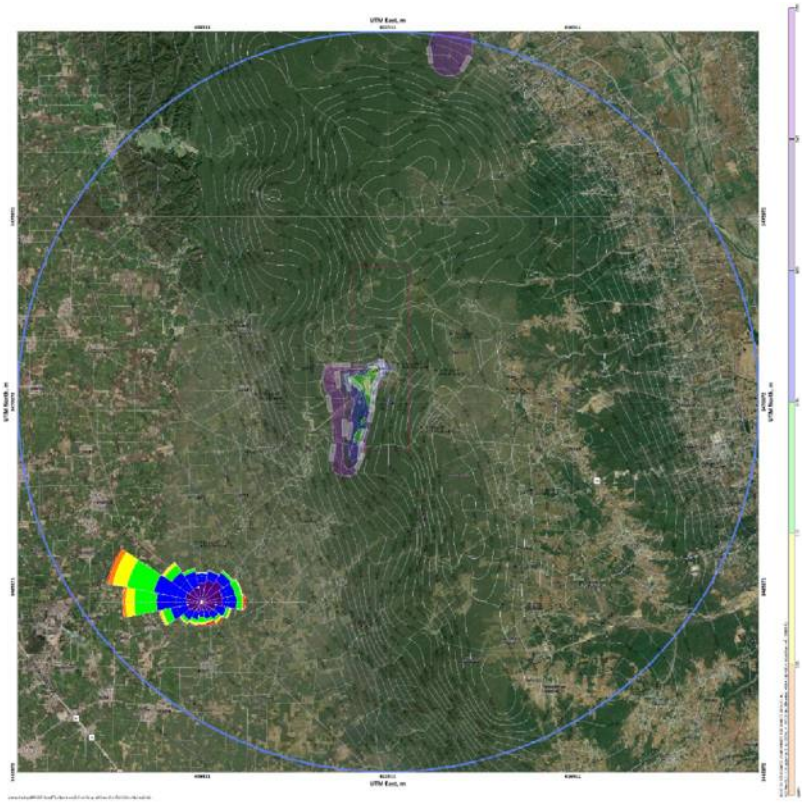

Fig. 4.14: GLCs/Incremental Emissions of Chlorine during controlled conditions/ with APCDs

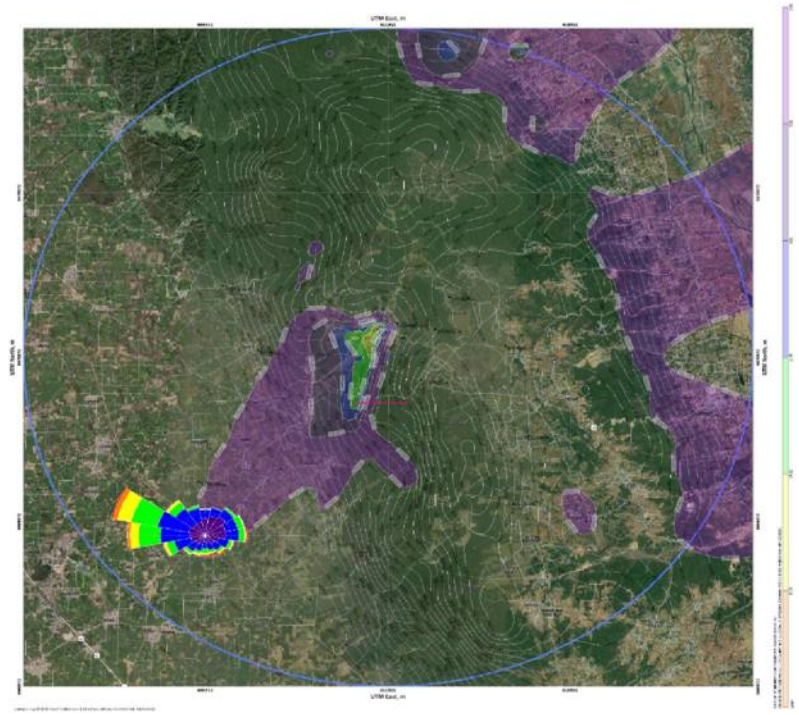

Fig. 4.15: GLCs/Incremental Emissions of Dichloromethane during controlled conditions/ with APCDs

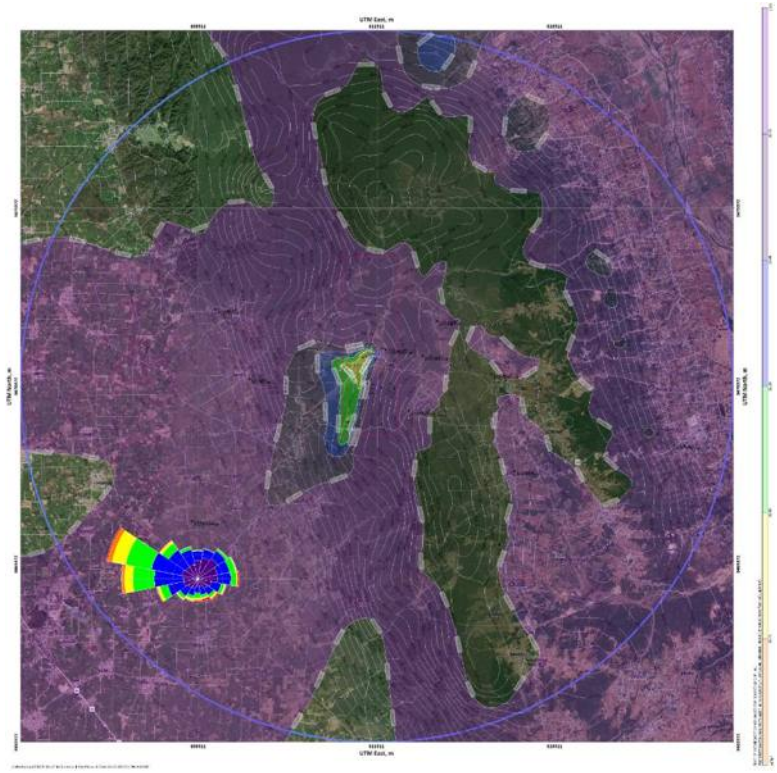

Fig. 4.16: GLCs/Incremental Emissions of Acetonitrile during controlled conditions/ with APCDs

Prediction of impacts on Air Environment

Table 4.22: A comparative overview of Max. GLCs during project operation in worst-case (without APCDs) and controlled conditions (with APCDs) in core zone area

Parameter	Baseline Data (Max. 98th %)	Max. GLC (Worst-case/ without APCDs)	Max. GLC (Controlled Cond./ with APCDs)	NAAQ Limits (CPCB, 2009)
PM_{10} ($\mu g/m^3$)	84.1	37.5	10.0	100
NO_x ($\mu g/m^3$)	22.5	21.1	9.8	80
HCl ($\mu g/m^3$)	-	29.9	10.1	-
Benzene ($\mu g/m^3$)	-	4.3	0.4	5

Table 4.23: Prediction of GLC and Assessment of Impacts on Air Environment (µg/m3) within the study area

Pollutant	Conc.	Village Chak Narial	Village Khanni	Villae Mohalla Nathan	Village Dulehar	Village Makorgarh	Village Kuthar Beet	Village Baliwal	Village Tahliwal	Project Site (Panioivan)	Project Site (Polian Beet)	NAAQ Limits (CPCB, 2009)
PM_{10}	Baseline	69.5	72.2	69.4	82.3	79.9	79	75.7	84.1	72.9	75.2	100
	Incremental	0.02	0.05	0.01	0.06	0.1	0.12	0.13	0.03	0.27	0.23	
	Cumulative	69.5	72.3	69.4	82.4	80	79.1	75.8	84.1	73.2	75.4	
$PM_{2.5}$	Baseline	37	40.4	38.8	43.5	44.1	41.1	40.5	44.6	40.6	39.5	60
	Incremental	0.01	0.04	0.01	0.05	0.08	0.1	0.1	0.02	0.21	0.18	
	Cumulative	37.0	40.4	38.8	43.6	44.2	41.2	40.6	44.6	40.8	39.7	
SO_2	Baseline	9.9	10.3	10.4	12.9	10.9	12	11.7	14.2	10.3	10.7	80
	Incremental	0	0	0	0	0.01	0.01	0.01	0.01	0.01	0.01	
	Cumulative	9.9	10.3	10.4	12.9	10.9	12.0	11.7	14.2	10.3	10.7	
NO_x	Baseline	15	16.3	16.2	20.7	18.9	20.4	19.7	22.5	17.9	16.9	80
	Incremental	0.01	0.09	0.01	0.06	0.06	0.07	0.08	0.04	0.15	0.13	
	Cumulative	15.0	16.4	16.2	20.8	19.0	20.5	19.8	22.5	18.0	17.0	
NH_3	Baseline	7.6	8.1	7.9	9.0	8.6	8.9	8.6	9.4	8.2	8.5	400
	Incremental	0.15	0.18	0.27	0.07	0.06	0.08	0.07	0.43	0.23	0.09	
	Cumulative	7.75	8.28	8.17	9.07	8.66	8.98	8.67	9.83	8.43	8.59	
CO	Baselin	37	39	39	48	44	52	42	58	400	400	4000

	e	0	0	0	0	0	0	0	0			
	Incremental	0.92	2.5	0.4	3.05	5.32	6.53	6.87	1.66	14	12.05	
	Cumulative	370.9	392.5	390.4	483.0	445.3	526.5	486.9	581.7	414	412.05	
Cl_2	Baseline	-	-	-	-	-	-	-	-	-	-	-
	Incremental	0.07	0.09	0.13	0.03	0.03	0.04	0.03	0.21	0.11	0.04	
	Cumulative	0.07	0.09	0.13	0.03	0.03	0.04	0.03	0.21	0.11	0.04	
HCl	Baseline	-	-	-	-	-	-	-	-	-	-	-
	Incremental	0.17	0.2	0.31	0.08	0.07	0.09	0.08	0.49	0.26	0.1	
	Cumulative	0.17	0.2	0.31	0.08	0.07	0.09	0.08	0.49	0.26	0.1	
Benzene	Baseline	-	-	-	-	-	-	-	-	-	-	5
	Incremental	0.02	0.03	0.04	0.01	0.01	0.01	0.01	0.07	0.04	0.01	
	Cumulative	0.02	0.03	0.04	0.01	0.01	0.01	0.01	0.07	0.04	0.01	
Dichloro-methane	Baseline	-	-	-	-	-	-	-	-	-	-	-
	Incremental	1	1.18	1.78	0.48	0.38	0.53	0.44	2.85	1.5	0.59	
	Cumulative	1	1.18	1.78	0.48	0.38	0.53	0.44	2.85	1.5	0.59	
Acetonitrile	Baseline	-	-	-	-	-	-	-	-	-	-	-
	Incremental	5.02	5.9	8.9	2.38	1.91	2.64	2.19	14.25	7.52	2.95	
	Cumulative	5.02	5.9	8.9	2.38	1.91	2.64	2.19	14.25	7.52	2.95	

Observations & Findings of Air Modelling

The prediction of GLCs/ incremental load was assessed in both cases of project operation as worst-case (without APCDs/ control measures) and controlled conditions (with APCDs/ control measures). In worst-case scenario (without APCD and/or failure of plant process).

Prediction of GLCs/ incremental load during worst-case scenario

The maximum cumulative load of PM10 will be 131.6 µg/m3 (Baseline Max. 84.1 + incremental Max. 37.5 µg/m3), NOx will be 43.6 µg/m3 (Baseline Max. 22.5 + Max. incremental 21.1 µg/m3), HCl will be 29.9 µg/m3 and Benzene will be 4.3 µg/m3

Prediction of GLCs/ incremental load during controlled conditions

In controlled conditions (with APCD /effective control measures), the maximum cumulative load of PM10 will be 94.1 µg/m3 (Baseline Max. 84.1 + incremental Max. 10 µg/m3), NOx will be 32.3 µg/m3 (Baseline Max. 22.5 + incremental max. 9.8 µg/m3), HCl will be 10.1 µg/m3 and Benzene will be 0.4 µg/m3.

The total predictive GLCs due to project operation in controlled conditions are overserved as

- PM10 in the range of 69.4-84.1 µg/m3 at receptors in the study area and 94.1 µg/m3 at core zone area is within the NAAQ Standard limit of 100 µg/m3 (CPCB, 2009).
- PM2.5 in the range of 37-44.6 µg/m3 at receptors in the study area and 52.5 µg/m3 at core zone area is within the NAAQ Standard limit of 60 µg/m3 (CPCB, 2009).
- NOx (as NO2) in the range of 15-22.5 µg/m3 at receptors in the study area and 32.3 µg/m3 at core zone area is within the NAAQ Standard limit of 80 µg/m3 (CPCB, 2009).
- SO2 in the range of 9.9-14.2 µg/m3 at receptors in the study area and 14.7 µg/m3 at core zone area is within the NAAQ Standard limit of 80 µg/m3 (CPCB, 2009).
- NH3 in the range of 7.75-9.83 µg/m3 at receptors in the study area and 12 µg/m3 at core zone area is within the NAAQ Standard limit of 400 µg/m3 (CPCB, 2009).
- CO in the range of 370.9-581.7 µg/m3 at receptors in the study area and 1107 µg/m3 at core zone area is within the NAAQ Standard limit of 4000 µg/m3 (CPCB, 2009).
- Cl2 in the range of 0.03-0.21 µg/m3 at receptors in the study area and 1.26 µg/m3 at core zone area is within the safe limits.

- HCl in the range of 0.07-0.49 µg/m3 at receptors in the study area and 2.98 µg/m3 at core zone area is within the safe limits.
- Benzene in the range of 0.01-0.07 µg/m3 at receptors in the study area and 0.4 µg/m3 at core zone area is within the safe limits.
- Dichloromethane in the range of 0.38-2.85 µg/m3 at receptors in the study area and 17.1 µg/m3 at core zone area is within the safe limits.
- Acetonitrile in the range of 1.91-14.25 µg/m3 at receptors in the study area and 58.7 µg/m3 at core zone area is within the safe limits.

Conclusion of Air Quality Modelling

The prediction of air quality due to proposed project was studied using AERMOD cloud (version 18.8) and local meteorological data in order to ensure compliance with the standard limits of ambient air quality (CPCB, 2009). The prediction of GLCs/ incremental load was assessed in both cases of project operation as worst-case (without APCDs/ control measures) and controlled conditions (with APCDs/ control measures). In worst-case scenario (without APCD and/or failure of plant process), the maximum cumulative load of PM_{10} will be 131.6 $\mu g/m^3$, NOx will be 43.6 $\mu g/m^3$, HCl will be 29.9 $\mu g/m^3$ and Benzene will be 4.3 µg/m3 can deteriorate the air quality with sever health and environmental impacts. Hence this condition will be avoided in any circumstances and the project will be operated with proper and effective pollution control measures, regular checkups and maintenance of APCDs and plant process at all stages of the operation.

In controlled conditions (with APCD /effective control measures), the maximum cumulative load of PM10 will be 94.1 µg/m3, NOx will be 32.3 µg/m3, HCl will be 10.1 µg/m3 and Benzene will be 0.4 µg/m3. The overall maximum loads at receptors within the study area will be PM10 as 69.4-84.1 µg/m3, PM2.5 as 37-44.6 µg/m3, NO2 as 15-22.5 µg/m3, SO2 as 9.9-14.2 µg/m3, NH3 as 7.75-9.83 µg/m3, CO as 370.9-581.7 µg/m3, Cl2 as 0.03-0.21 µg/m3, HCl as 0.07-0.49 µg/m3, Benzene as 0.01-0.07 µg/m3, Dichloromethane as 0.38-2.85 µg/m3 and Acetonitrile as 1.91-14.25 µg/m3 indicates the minor change in air quality with no significant health and environmental impacts.

Implementation of Environmental Management Plan, daily checkups and routine maintenance of APCDs and process equipment/ machinery, water sprinkling, tree planting and good

housekeeping can minimize the air pollution and can protect the environment at a great extent. The major point sources of air pollution will be provided with appropriate air pollution control systems and effective stack heights to limit the air pollutant emissions within the general permissible norms <50 mg/Nm3. Use of PUC certified vehicles and engines with routine maintenance, paved roads and loading/ unloading areas will also be ensured to curb the air emissions. Fugitive emissions of fumes, mists and toxic gases in work environment will be removed by adequate and effective ventilation systems.

Table 4.24: Impact on Air Environment and Mitigation Measures

Project Activity	Impact	Mitigation Measures
Transportation of Raw Material, Products and fuels	▪ Gases emission likes PM, SO2 and NOx from diesel operated vehicles and machineries. ▪ During movement of vehicles, fine dust settled on the roads get airborne and remains suspended for a long time. Repetitive movement of vehicles throughout the day leads to substantial fugitive emissions. It can have pronounced effect on people's health and wellbeing.	▪ Valid PUC certified vehicles will be used for transportation of material and equipment. ▪ Trucks used for transportation of raw material and products will be closed/ covered with tarpaulin sheet to avoid fugitive material dispersion at site. ▪ BDP authority will develop internal tar road in park and also within the plot premises pucca road will be developed by Individual member industries. ▪ Fugitive emissions will be minimized by water sprinkling on roads and regular vehicular maintenance. ▪ Vehicular speed inside the park will be restrained to 20 kmph to reduce the possibility of dust emissions
Handling and Storage of Raw Material, Products and fuels	▪ Fugitive emission may occur due to improper storage and handling of raw materials and products which may impact workers' health.	▪ Industrial members will store raw materials in closed containers and the same will be handled through closed system to avoid direct contact and handling losses. ▪ Manual handling of raw materials will be avoided. ▪ Adequate PPE's will be provided to workers.

Product Manufacturing & utility operation	▪ Flue gases like PM, SO2 and NOx etc. will be generated from boilers of common steam supply facility of the bulk drug park and from individual units on operation of various utilities like boilers, Thermic fluid heater and Hot air generator, D.G sets etc., which may increase pollutant level in air environment and impact worker's health. ▪ From common solvent recovery plant of Bulk Drug Park and chemical handling plants of individual industries, VOCs are likely to be generated which may cause eye and respiratory tract irritation and other serious health impacts. ▪ From individual industries process gas emission like PM, SO2, NOX, HCl, HBr, Cl2, Br2 and NH3, etc. will also be generated, which may have chronic health impacts on workers. ▪ Operation of various units in the park will create cumulative impact and will increase ground level concentration. ▪ Adverse air quality will directly and indirectly	▪ For controlling flue gas and process gas emissions, appropriate APCM along with adequate stack height as per CPCB, MoEFCC guidelines will be provided by BDP Authorities & industrial member units. ▪ Along with boilers, Thermic fluid heater and Hot air generator etc. adequate APCs like MDS, Bag filer and ESP etc. will be provided. ▪ To control the VOC emission from storage and handling of solvent, closed loop system, Mechanical seal and breather valve, Sufficient ▪ HTA, chilled water & brine circulation etc. will be provided by BDP Authorities & individual member industries. ▪ To control the process gas emission appropriate APCM like water scrubber, alkali/acid scrubber, cyclone separator, bag filter, adequate vent height etc. be provided by member industries. ▪ It will be mandatory for all the industries in the proposed park to obtain Consent to Establish and Consent to Operate from GPCB under section 21 of Air (Prevention and Control of Pollution) Act, 1981 ▪ Strict compliance with the standards and condition of CPCB will be mandated, wherever applicable and necessary. ▪ Air modelling has been carried out considering all the flue gas and process gas emission from BDP & individual industries, and after addition of cumulative incremental in baseline concentration; resultant concentration is within the

	affect to people and flora-fauna of nearby vicinity.	permissible limits. ▪ Post project ambient air quality monitoring will be carried out regularly at selected locations by BDP as well as individual Industries.

Greenbelt Development	▪ Positive impact due to greenbelt development as it will act natural barrier for controlling dust emissions.	▪ BDP will develop 19% area of greenbelt in the park in 15 m wide belt along the periphery of the park and individual units will maintain 14 % green area of the total plot area. ▪ Trees species to be planted in park shall be in line with the guidelines recommended by CPCB for developing greenbelt.

4.3.2 Water Environment

Table 4.25: Impact on Water Environment and Mitigation Measures

Project Activity	Impact	Mitigation Measures
Product Manufacturing & utility operation	▪ API manufacturing involves extensive usage of water in process and utilities. The water demand for manufacturing and non-manufacturing area, services, and greenbelt development is will lead to shortage of water in surrounding area.	▪ At initial stage of project, the water demand of 15 MLD will be met from ground water and waste water will be treated CETP with ZLD technology and treated water will be used in project demand only. In later stage of project, during full occupancy by industrial units, the water will be tapped from Satluj river having adequate capacity to cater the demand of the park. BDP Una has already obtained water permission letter from the BBMB and state Govt. authority.
CETP/ETP/STP operation & wastewater discharge	▪ Industrial effluent generated from process, utility, washing, scrubbers etc., which if disposed off without proper treatment may pollute nearby ground and surface water. ▪ Contamination of	▪ A CETP 15 MLD capacity with ZLD technology is provided by BDP Una. ▪ The member industries of the park will treat their effluent within own premises with ETP and final discharge will be sent to CETP ▪ The treated effluent from CETP will be utilized in process, plantation and land escaping in the project area. ▪ The concentrated effluents with HTDS will be treated in MEE and residues will

	soil and nearby surface water due to improper disposal of untreated sewage from member industries and commercial and residential units within Industrial park. ▪ Contamination of water due to disposal of untreated waste water during cleaning & maintenance activities.	be disposed off in landfill site of BDP. ▪ Industrial Members will provide STP Plant for treatment of domestic sewage and treated water will be reused in gardening purposes. ▪ The sewage generated from commercial and residential units within Industrial park will be treated in two STP of 3 MLD capacity installed by BDP Una and reused in gardening purposes. ▪ It will be mandatory for member industries to obtain CTE & CTO under Water (Prevention and Control of Pollution) Act, 1974. ▪ Online TOC and flow meters will be installed to check the quality and volumetric flow on daily basis.
Discharge of effluent through pipeline	▪ Leakage of effluent from pipeline may pollute the nearby ground and surface water	▪ All the trouble shooting mechanisms including routine check-ups and maintenance of pipeline supply system will be in place for any unforeseen circumstances. ▪ Online TOC and flow meters will be installed to check the quality and volumetric flow on daily basis.
Greenbelt Development & Employment Generation	▪ Load on water resource causing exploitation and depletion of water ▪ Contamination of water and soil quality	▪ Waste water treated with ZLD technology and will be recycled and reused in process, plantation and landscaping. • Water recycled from Sewage treatment plant of BDP and member industrial units will be used for greenbelt development. Therefore, load on fresh water requirement will be reduced. ▪ Wastage of water will be strictly avoided. ▪ Awareness to save water will be provided to employees.

4.3.3 Soil Environment

Table 4.26: Impact on Soil Environment and Mitigation Measures

Project Activity	Impacts	Mitigation Measures
Transportation (Raw Material, products, fuel Supply) Raw materials and products Handling and Storage CETP/ETP/STP operation & wastewater discharge Solid/ Hazardous Waste Generation Discharge of effluent through pipeline	▪ Soil contamination may occur due to spillage/leakage of hazardous raw materials, fuel, and oil etc. from vehicle or utilities. ▪ Degradation of soil quality due to leakage or spillage of effluent from CETP/ETP/STP pipeline or operation units and leachate generated from waste. ▪ Inadequate disposal of Solid/ Hazardous waste may also cause adverse impact on soil quality. ▪ Soil quality may be degraded on leakage of pipeline carrying effluent.	▪ Transportation vehicles shall be maintained and re-fuelled as per safe operating procedure. ▪ Spillage control plan will be prepared and workers will be trained for proper implementation. ▪ Pacca floor will be provided at raw material storage area and production area to avoid soil contamination. ▪ Regular checking and maintenance of CETP/ETP/STP operation units and pipelines will be carried out to avoid any leakage or spillage. ▪ During operation phase, hazardous waste management will be the responsibility of individual industries. Prior to the commencement of production, each unit shall take authorization for storage, handling and transport of hazardous waste, as per the Hazardous Waste (Management, Handling and Trans-boundary Movement) Rules, 2008 and amendments thereof, from HPSPCB. ▪ An integrated TSDF (comprising a secured landfill, a solid-liquid feed incinerator) is proposed inside the Bulk Drug Park to cater solid/hazardous waste generated from industrial units inside the park. ▪ All activities having potential for soil contamination will be planned properly and the hazardous materials will be collected in impermeable containers or areas.
Green Development Belt	▪ Reduction in soil erosion and improvement in soil texture due to binding of top soil materials by root structure of extensive plantation.	▪ BDP will develop 19% area of greenbelt in the park in 15 m wide belt along the periphery of the park and individual units will maintain 14% green area of the total plot area. ▪ Regular maintenance of greenbelt will be carried out.

4.3.4 Noise Environment

Table 4.27: Impact on Noise Environment and Mitigation Measures

Project Activity	Impacts	Mitigation Measures
Transportation of Raw Material, products and Fuel Supply Product Manufacturing & utility Operation	▪ Transportation of materials/ products contributes to increase in noise levels in inside and outside of project area on local and regional scale. ▪ Noise emissions associated to the proposed project will be due to vehicular movement, operation of utilities, D.G set and manufacturing plants from member industries and common utilities to be developed by BDP. ▪ High noise levels may lead to health issues such as, hearing impairment, hypertension, decreases in working efficiency, Lack of concentration,	▪ Transportation activity outside the project promises will restricted to day time only. ▪ Regular maintenance & lubrication of utilities, equipment's and vehicles will be carried out. ▪ Vehicular speed will be strictly regulated. ▪ Vibrating pads & acoustic enclosure will be provided to high noise generating equipment like pumps, motors, blowers, process machineries and D.G sets to control noise level within norms. ▪ All the equipment / machineries operated in the proposed park will be designed/operated in such a way that the noise level in work place shall not exceed 85 dB (A) and 75 dB(A) outside the project promises as per the requirement of Noise Pollution (Regulation and Control) Rules, 2000. ▪ Hearing conservation program by audiometric testing will be implemented to detect early hearing loss in the workers. ▪ Provision of PPEs like earmuffs / earplug to avoid adverse effects of noise on occupational health and hearing capacity of workers as well as planning of working hours and shift of workers will be planned. ▪ D. G. Set shall be provided with acoustic enclosures and shall be used only in case of power failure/emergency. ▪ Routine oiling/ lubrication and preventive maintenance of machinery, tools and engines shall be carried out to reduce noise generation at source to permissible limit. ▪ Adequate noise control measures such as mufflers, silencers at the air inlet/outlet, anti-vibration pad for equipment with high

	behavioural and sleep disorders in workers and nearby society and animals and wildlife etc.	vibration, earmuffs and earplugs to the operators, etc. shall be provided ▪ Pump operators are generally exposed to higher noise level for short duration. ▪ Transportation activity will be restricted to day time, regular maintenance and fitness programs will be ensured for vehicles.
Greenbelt Development	▪ Positive impacts on noise environment as greenbelt act as noise barrier and reduce noise level in surrounding area.	▪ BDP will develop 19% area of greenbelt in the park in 15 m wide belt along the periphery of the park and individual units will maintain 14% green area of the total plot area. ▪ Regular maintenance of greenbelt will be carried out.

Noise Propagation and Prediction Modelling

Sources of Noise Emission

The all sources of noise emissions associated to the project operation were considered as common infrastructures provided by BDP authority as Boilers for steam generation, incinerators for hazardous waste management, DG sets for power backup and Trucks for transportation of raw materials, products and fuels. Other sources were also considered as process equipment/ reactors operated by member industries, transporting vehicles (Trucks for material handling, Buses, Cars, bikes and autos for employs/staff) during project operation.

The details of all noise emissions during project operation are elaborated in **Table 4.28**.

Table 4.28: Details Noise Emission Sources during Project Operation

Type of Noise Source	Daily	Hourly	Noise dB(A)	Cumulative dB(A)
Stationary Sources				
Boilers (6x50 TPH)	3	3	90	94.8
Incinerators (4 x 25 TPH)	2	2	90	93.0
DG Sets (2x1000 KVA)	1	1	80	80.0
Mobile Sources (Vehicles)				
Trucks	80	3	90	94.8
Buses	480	20	85	98.0
Cars	820	34	75	90.3

Bikes	1600	67	65	83.3
Autos	100	4	70	76.0

Following assumptions were used to detail out the noise emissions during project operation as

- Boilers (6 x 50 TPH) are proposed for common steam generation facility for upcoming member industries. Three boilers will be in operation at a time and three will be on standby mode.
- Incinerators (4 x 25 TPH) are proposed for common facility of hazardous waste disposal for upcoming member industries. Two incinerators will be in operation at a time and two incinerators will be on standby mode.
- DG sets (2 x 1000 KVA) are proposed for power back up to operative common facilities for upcoming member industries. One DG set will be in operation at a time and One DG set will be on standby mode.
- Trucks (80 Nos.) are considered for transportation of goods to operate common facilities and 70-80 member industries on daily basis.
- Transporting vehicles as Buses – 480 Nos., Cars – 820 Nos., Bikes – 1600 Nos. and Autos – 100 Nos. were considered for manpower (employees/ staff and labour) to operate common facilities and 70-80 member industries on daily basis.
- The running of stationary sources was considered as 50% at a time and vehicles were considered as hourly basis (total vehicle number divided by 24 hrs) in a day.
- The source category wise cumulative noise levels were considered in noise modeling as putting too many sources in individual manner is not feasible and/or limitation of the software.

Environmental Baseline Data

To determine the baseline conditions, the sound levels in dB(A) were measured and recorded on hourly basis for a duration of 24 hours during 16-hour interval in day time (06:00-22:00) and 8-hour interval in night time (22:00-06:00). The data recapitulation of the measurement at every point, and the calculation of Leq can be observed in **Table 4.29**.

Table 4.29: Baseline noise quality data of the study area

Code of Location	Name of Location	Noise Leq dB(A)		Standard Limit dB(A)	
		Day Time	Night Time	Day Time	Night Time
NQ-1	Village –Jaijon Doaba (near Gurudwara)	51.2	40.2	55	45
NQ-2	Village - Panjoiyan (Near Lakh Data Peer Mandir)	46.3	35.4	55	45
NQ-3	Village – Puboal (At Govt Ayuryedic Heath Center)	50.3	39.6	55	45
NQ-4	Project Site, Guest House Forest Dept. Village Polian Beet	48.2	37.8	55	45

Weather/ Climatic Data

To determine the propagation/ dispersion of noise levels, weather and climatic data plays an important role. The average of one-year data (POWER | Data Access Viewer (nasa.gov)) were used as input data as required in Dhawni Pro software. The weather and climatic data of the project area were collected from NASA website and averaged for one-year data as presented in **Table 3**.

Table 4.30: Weather/climatic data of the study area

Parameter	Avg. value	Parameter	Avg. value
Atmospheric temperature	25 °C	Wind Direction	270°
Relative Humidity	60 %	Atmospheric pressure	955 hPa
Wind Speed	2.5 m/s	Frequency	500 Hz

Modelling Scenario

The scenario used for the noise level modeling was the worst-case scenario, i.e. when all noise sources as equipment/machines, boilers, incinerators, DG sets and transportation vehicles associated to the project were considered. The variation in noise value actually depends on the variation of activities and the variation and number of equipment used. This modeling

generated a Leq contour that was obtained by combining the value of sound pressure levels during the project operating hours. Ambient noise levels during the day were used and assumed that the distance of the sound source reference is calculated from the midpoint of the sound source in case the dimensions of the sound sources were unknown. The modeling generated a Leq contour that was obtained by combining the value level of noise pressure during project operating hours and the baseline/ background ambient noise level when the project/ plant is not in operation.

Table 4.31: Sources of Noise Emissions considered in noise modeling during Project Operation

Title: Sound Propagation Model Run
Subtitle: UNA BDP
Unit: dB(A)

Source ID Name	X-Coordinate m	Y-Coordinate m	Height m	SPL dB(A)
Boiler-6	611712	3473377	3	94.8
Inciner-4	610049	3468902	3	93
DG-2	611341	3469770	2	80
REACT-80	611066	3470131	2	89
Buses-480	611793	3469311	2	98
Truck-80	611147	3472590	2	94.8
Cars-820	611874	3470246	1	90.3
Auto-4	611018	3471607	1	76
Bikes-1600	610663	3469508	1	83.3

TOTAL POINT SOURCE: 9

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Output Data of Noise Modelling

Prediction of Noise Impacts on Environment

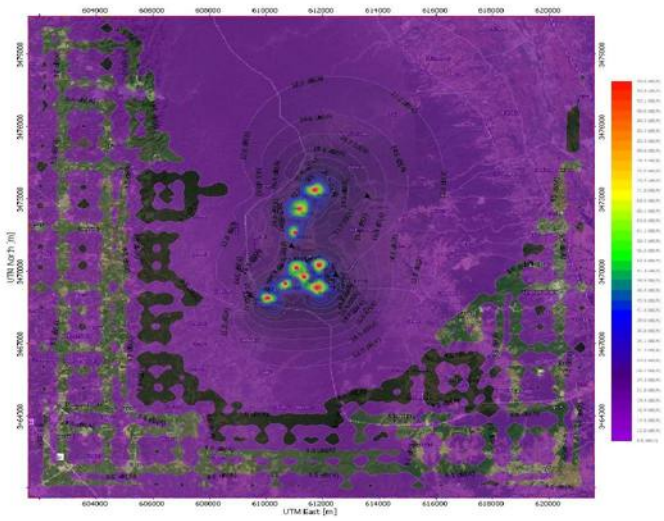

Fig. 4.17: GLCs and Isopleths showing the Impacts of Noise within the Study Area due to Project Operation

Table 4.32: Prediction of Noise Impacts on nearby Receptors during Project Operation

SUMMARY REPORT FOR DISCRETE RECEPTOR POINTS

Title: Sound Propagation Model Run
Subtitle: UNA BDP
Unit: dB(A)

Receptor ID Name	X-Coordinate m	Y-Coordinate m	Predicted Level dB(A)	Baseline dB(A)	Resultant^ dB(A)
Jaijon	609452	3468984	20.3	51.2	51.2
Panjoiyan	610905	3471033	25.9	46.3	46.3
Puboal	613568	3473115	24.5	50.3	50.3
Polian	612471	3469836	32.4	48.2	48.3

Remarks:
1. Summaries of highest values by receptor
2. ^Predicted plus background level

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As depicted in noise modeling summery, the resulting/ cumulative noise levels (Baseline + Predicted) found to be in the range of 46.3-51.2 dB(A) were within the prescribed limits of 55 dB(A) for residential areas. Therefore, there is no significant impacts of noise on surrounding receptors within the study area due to the project operation.

Control Measures for Noise Emissions

Though the predicted noise levels due to plant operation are well within prescribed limits however, the increased noise levels can be reduced by adopting following control measures as

- To provide acoustic enclosures to high noisy machinery and equipment to be ensured by member industries.
- Tree plantation along with plant boundary by BDP authorities and industry/unit boundary by member industries as wind barrier and wind shield.
- Use of PUC certified vehicles and machinery to be ensured by BDP authorities and member industries.
- Routine check-ups and maintenance of machinery and equipment to be ensured by BDP authorities and member industries.

- Use of PPEs in highly noisy areas to be ensured by BDP authorities and member industries.
- Rotation of and/ or limited duty hours in high noisy areas to be ensured by BDP authorities and member industries

4.3.5 Land Use/Land Cover

Land is specially allotted for industrial development so the land use and land cover changes are inevitable; hence there will be no significant impact on Land Use/ Land Cover.

4.3.6 Geology

No significant major impact is envisaged on the geology of the area during operational phase.

4.3.7 Hydrogeology

Project Activity	Impacts	Mitigation Measures
CETP/ETP/STP operation & wastewater discharge Operation of Industrial Units and Utilities Production and	▪ Contamination of groundwater may occur due to infiltration of untreated sewage/effluent through leaked underground pipelines or spillage from operational units. ▪ It can affect the quality water resources (ground and surface) available in nearby villages and also the growth of crops.	▪ Proper scientific design and take care of storage areas for raw material and products, explosive and hazardous materials and fuels. ▪ Care shall be undertaken to avoid spillage / leakage of effluent /sewage. ▪ Proper spill control plan will be implemented. ▪ Regular monitoring of ground water near underground pipelines, water treatment plants (CETP/ ETP/ STP/ MEE areas), Storage areas and waste disposal sites will be carried out to check the water quality and water contamination levels.
Greenbelt Development	Tree roots improve drainage because each root acts as an underground water channel to help water penetrate the soil.	Selection of trees shall be as per guidelines prescribed by CPCB / MoEF&CC.

4.3.8 Solid and Hazardous Waste

Table 4.36: Impact and Mitigation Measures on Hazardous/Solid Waste

Project Activity	Impacts	Mitigation Measures
▪ Product Manufacturing ▪ CETP/ETP/STP operation & wastewater discharge ▪ Solid/ Hazardous Waste generation	Hazardous waste generation from the proposed Bulk Drug Park has been estimated as follows: ▪ Landfill-able waste: 10-12 TPD & Inciner-able waste 650-800 TPD ▪ 8.8 TPD of Municipal Solid Waste is likely to be generated from various zones of the Park. ▪ 4-5 kg/day of Biomedical waste is likely to be generated from Industrial units & central OHC. ▪ Improper handling and disposal of above solid/hazardous waste may contaminate the soil and ground water quality and may cause serious effect on the health of the workers and surrounding area.	▪ All the solid/hazardous waste generated shall be stored in Hazardous Waste Storage Facility having impervious layer and leachate collection system by Industrial Members. ▪ Solid/ Hazardous waste will be collected, stored, transported and disposed as per the Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2016. ▪ An integrated TSDF (comprising a secured landfill, a solid-liquid feed incinerator) is proposed inside the ▪ Bulk Drug Park to cater solid/hazardous waste generated from industrial units inside the park ▪ Adequate PPEs will be provided to the workers. Hence, there will be no significant impacts on their health. ▪ Routine check-ups of hazardous waste storage areas, disposal sites and handling and transportation facilities. ▪ Routine monitoring of water and soil quality near hazardous waste storage areas and disposal sites.

4.3.9 Risk and Hazards

Table 4.37: Impact and Mitigation Measures on Risk and Hazard

Project Activity	Impacts	Mitigation Measures

▪ Transportation of Raw Materials, products, fuel Supply ▪ Handling and Storage of Raw Material and Product ▪ Product Manufacturing and Utility Operation	▪ Chances of fatal incident, severe injury and loss of property due to vehicle collision or failure or tilting of moving vehicle due to overloading. ▪ Spillage/leakage of chemicals during storage/handling may cause severe accident due to corrosion of tank and fittings. ▪ Occupational health hazard to workers working with hazardous chemicals. ▪ Due to flue gas emission and fugitive emission, there shall be adverse effect on workers' health. ▪ Risk of fire/explosion within flammable raw material/product storage area. ▪ Chances of fatal incident, severe injury and loss of property due to explosion of boiler. ▪ Due to continuous exposure to noise, work efficiency of workers will decrease and also impact on workers' health.	▪ Trained driver having valid license will be employed for transportation of raw material & products. ▪ Speed limit within plant will be prescribed as per safety norms. ▪ Well-maintained vehicles will be deployed. ▪ Vehicle safety pre-checks will be carried out before use. ▪ In the proposed park, wide road will be provided for smooth ▪ movement of the goods carrying vehicles. ▪ All the member units will store, handle and transported hazardous chemicals as per manufacture, storage and import of hazardous chemical rules, 1989. ▪ Adequate ventilation shall be provided in production area and raw material storage area. ▪ Use of acid lined MOC for acid storage tank to resist corrosion. ▪ Standard operating procedure will be prepared and be strictly followed by workers. ▪ Material loading and unloading shall be carried out properly. ▪ MSDS of all raw materials will be readily available to all. The training for awareness of MSDS will be provided. ▪ Preventive maintenance will be scheduled periodically for all utilities. ▪ Adequate PPE's will be provided to workers for handling hazardous chemicals. ▪ Fire extinguishers, fire hydrant systems, water sprinkler will be provided by BDP authorities and individual member industries. ▪ Periodic medical check-up of employees will be carried out. ▪ Safety training will be provided to

		workers.

4.3.10 Ecology and Biodiversity

Table 4.38: Impact and Mitigation Measures on Ecology and Biodiversity

Project Activity	Impacts	Mitigation Measures
Transportation of Raw Material, products, fuels	▪ Settling of fugitive dust on leaves reduces the gaseous exchange process. This affects the growth of plants, hence indirectly affects the fauna of the study area.	▪ PUC verified vehicles will be used for transportation and speed limit of vehicles will be maintained.
Production and Utility Operation	▪ Flue gas and process gas emission from GIDC and member industries will have impact on terrestrial ecology of surrounding area.	▪ BDP, Una and Industrial Members will provide appropriate APCM with adequate stack height for proper dispersion of pollutant. ▪ Strict compliance with the standards and condition of CPCB will be mandated, wherever applicable and necessary. ▪ There is no reserved forest or wildlife sanctuary in core zone and buffer zone i.e. 10 km radius of the study area. • Hence, there will be no significant impact on the ecology of the core or buffer zone due to this upcoming Bulk Drug Park.
CETP/ETP/STP operation & wastewater discharge	▪ Untreated disposal of sewage and effluent will have direct impact on nearby surface water bodies and	▪ BDP Una and Industrial Members will be provided STP Plant for treatment of domestic sewage and treated effluent will be reused in gardening purpose. • Industrial Members will be provided ETP Plant for treatment of Industrial Effluent and treated water will be discharged to in house CETP

	soil and indirect impact on plants and domestic animals.	of 15 MLD capacity for further treatment. Treated effluent from CETP will be recycled and reused in process, plantation and landscaping.
Solid/Hazardous Waste generation	▪ Improper storage of solid/ hazardous waste will contaminate soil and will have impact on plants growth.	▪ Solid/ Hazardous wastes from utilities, storage areas and industrial process will be collected, stored, transported and disposed as per the Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2016 by Industrial Members to TSDF sites.
Discharge of effluent through pipeline	▪ Impact on environment due to additional effluent discharge without proper treatment.	▪ All the faunal species reported from the core zone are very common and well adapted to the urban environment so no faunal species will be disturbed or affected significantly. ▪ As per the survey close to the proposed site and in the vicinity, no endangered species or wildlife is reported near project site. ▪ Effluent will be discharged only after adequate treatment and achieve all the prescribed parameters by the Board. ▪ Online TOC meter will be installed to check the quality of effluent. ▪ Vehicular speed will be strictly regulated.
Greenbelt Development	▪ Fugitive emission from transportation activity may deteriorate air quality of surrounding area.	▪ Valid PUC Certified Vehicle will be used for transportations. ▪ Transportation activity will be carried out during day time only. ▪ Regular maintenance & lubrication of utilities, equipment's and vehicles will be carried out

4.3.11 Socio-Economic

Table 4.39: Impact and Mitigation Measures on Socio-Economic

Project Activity	Impacts	Mitigation Measures
Transportation of Raw Material,	▪ Fugitive emission from transportation activity may deteriorate air	▪ Valid PUC Certified Vehicle will be used for transportations. ▪ Transportation activity will be carried

products, fuels	quality of surrounding area.	out during day time only. ▪ Regular maintenance & lubrication of utilities, equipment's and vehicles will be carried out. ▪ Vehicular speed will be strictly regulated.
Production and Utility Operation	▪ Hazardous flue gas emission and process gas emission will have negative effect on health of surrounding villages population. ▪ Generation of noise from operation of the park will have negative effect on hearing, mental status of surrounding village population.	▪ BDP, Una and Industrial Members will provide appropriate APCM with adequate stack height for properly dispersion of pollutant. ▪ Padding and enclosing will be provided to high noise generating machineries and Equipments. ▪ Greenbelt will be developed in plant premises of member industries as well as periphery of industrial park, which will act as natural barrier to air and noise pollution.
Greenbelt Development	Greenbelt will enhance the aesthetic value and beautify the landscapes.	▪ BDP will develop 19% area of greenbelt in the park in 15 m wide belt along the periphery of the park and individual units will maintain 14% green area of the total plot area. ▪ Regular maintenance of greenbelt will be carried out.

Table 4.40: Environmental Impact Matrix with Mitigation Measures (Operation Phase)

Project Activities	Environmental Attributes											
	Air	Water	Soil	Noise	LU/LC	Geo hydrology	Geology	SHW	Risks & Hazards	Ecology & Biodiversity	Socio Economics	Total
Transportation of Raw Material, Products & Fuels	-8	-	-8	-12	-	-	-	-	-8	-4	-6	-46
Handling and Storage of Raw	-8	-	-6	-	-	-	-	-	-12	-	-	-26

Material, Products & Fuels												
Product Manufacturing	-12	-8	-	-8	-	-	-	-8	-12	-	-4	-52
Utility Operation	-12	-	-	-12	-	-	-	-	-8	-4	-6	-42
CETP/ETP/STP Operation & wastewater discharge	-	-12	-8	-	-	-12	-	-6	-	-6	-	-44
Solid/ Hazardous waste generation & disposal	-	-	-8	-	-	-	-	-12	-	-4	-	-24
Discharge of effluent through pipeline	-	-4	-4	-	-	-	-	-	-	-4	-	-12
Greenbelt Development	+12	-4	+8	+12	-	+8	-	-	-	+10	+6	+52
Employment Generation	-	-6	-	-	-	-	-	-	-	-	+16	+10
Cumulative Score	**-28**	**-34**	**-26**	**-20**	**0**	**-4**	**0**	**-26**	**-40**	**-12**	**+6**	**-184**

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CHAPTER 5

ANALYSIS OF ALTERNATIVES (TECHNOLOGY AND SITE)

5.1 INTRODUCTION

Under the Gazette notification of The Department of Pharmaceuticals (DoP), Ministry of Chemical and Fertilizer, Government of India (GoI), dated 21 July 2021, 13 states proposed for the scheme "*Proposal for the Bulk Drug Parks"*. A total of 3 states were selected across the country under the scheme, among those 3 Himachal Pradesh is one of them.

M/s Himachal Pradesh Bulk Drug Park Infrastructure Limited (HPBDPIL) under Department of Industries, Government of Himachal Pradesh proposed to setup a Bulk Drug Park at Villages Kuthar Beet, Pollian Beet, Tibbian, Jodian, Janani and Malluwal, Teh. Haroli, Distt. Una, Himachal Pradesh.

5.2 SELECTION OF LOCATION

Three alternative sites were analyzed for establishment of the Bulk Drug Park. Analysis was carried out based on environmental sensitivity, availability of land, source of water supply, connectivity to proposed site, common infrastructure and PNG supply in the area, manpower and social aspects.

Prior to arriving at a conclusion regarding setting up of project at proposed site, a number of alternatives were examined and reviewed. The criteria and a comparison with potentially possible alternative sites are briefly described as follows:

Table 5.1. Criteria of selection of project site in comparison to alternative sites

S. No.	Parameters	Option 1	Option 2	Option 3
1.	**Sites considered**	Distt. Una	Distt. Kangra	Distt. Mandi
2.	**Availability of land**	Approx. 1,400 acres	Approx. 1,000 acres	Approx. 950 acres
3.	**Villages falls**	6 Villages namely Kuthar Beet, Pollian Beet, Tibbian, Jodian, Janani and Malluwal	7 Villages namely Kerta, Barehr, Chakban Sarotari, Dhasehr, Kamlota, Baroh and Talai	4 Villages namely Pakhrair, Bharad, Thunag and Bagsiad

S. No.	Parameters	Option 1	Option 2	Option 3
				(Less land available for set up of the unit)
4.	**Terrain**	Semi Hilly	Hilly	Hilly
5.	**Acquisition of land**	Majority of land available is Govt. land. Only small chunk of Private land involved approx. 40 acres	Chunk of Private land involved nearly 55 acres	Chunk of Private land involved nearly 70 acres
6.	**R&R Involved**	No	Yes	Yes
7.	**Cost of private land acquired**	Approx. 4 Crores	Approx. 8.5 Crores	Approx. 11.5 Crores
8.	**Source of water supply**	Surface water supply from Satluj River having tap off point located approx. 15 to 20 km away	Surface water supply from Beas River having tap off point located approx. 20 to 25 km away	Surface water supply from Satluj River having tap off point located approx. 40 to 45 km away
9.	**Cost involved for supply of surface water at proposed site**	Approx. 171 Crores	Approx. 203 Crores	Approx. 450 Crores
10.	**Connectivity to proposed site**	More connectivity with National Highways • NH-503A approx. 10 km • NH-503 approx. 15.5 km • NH-103 A approx. 9.5 km	Less connectivity with National Highways • NH-303 approx. 7 km • NH-154 approx. 10 km	Less connectivity with National Highways • NH-13 approx. 13.5 km • NH-154 approx. 21 km • NH-305 approx. 18.5 km

S. No.	Parameters	Option 1	Option 2	Option 3
		• Punjab State Border approx. 100 m		
11.	**Transportation of materials**	Easy and less cost involved in transportation of materials due to well connectivity with many National Highways and relatively semi hilly terrain	Cost involved for transportation of material will be high; as site is hilly terrain	Cost involved will be high; as site is hilly terrain
12.	**Other features**	• Site located near to already established industrial areas such as Mehatpur, Gagret, Tahliwal & Amb • PNG supply available in proximity to site	• Small Industrial areas are established such as Nagri, Dhaliara etc. for MSME units and away from proposed site • NO PNG supply available	• Small Industrial areas are established such as Mandi, Ratti and Bhambla for MSME units and away from proposed site • No PNG Supply available
13.	**Availability of manpower**	Both skilled and non-skilled manpower is available in plenty	Non-skilled manpower is available	Non-skilled manpower is available
14.	**Environment Sensitivity**	• No tree counting involved • No Forest land falls	• Tree cutting also involved • Forest land falls within site	• Tree cutting also involved

S. No.	Parameters	Option 1	Option 2	Option 3
		within proposed site	• 3 rivulets pass through proposed site • Pong Dam Wildlife Sanctuary falls in 10 km study area	• Forest land falls within site
15.	**Overall Cost involved**	Approx. 1,923 Crore	Approx. 2,500 Crore	Approx. 3,500 Crore
16.	**Selected**	Yes	No	No

5.2.1 Geographical locations of Alternate sites chosen

Option-1: Una District

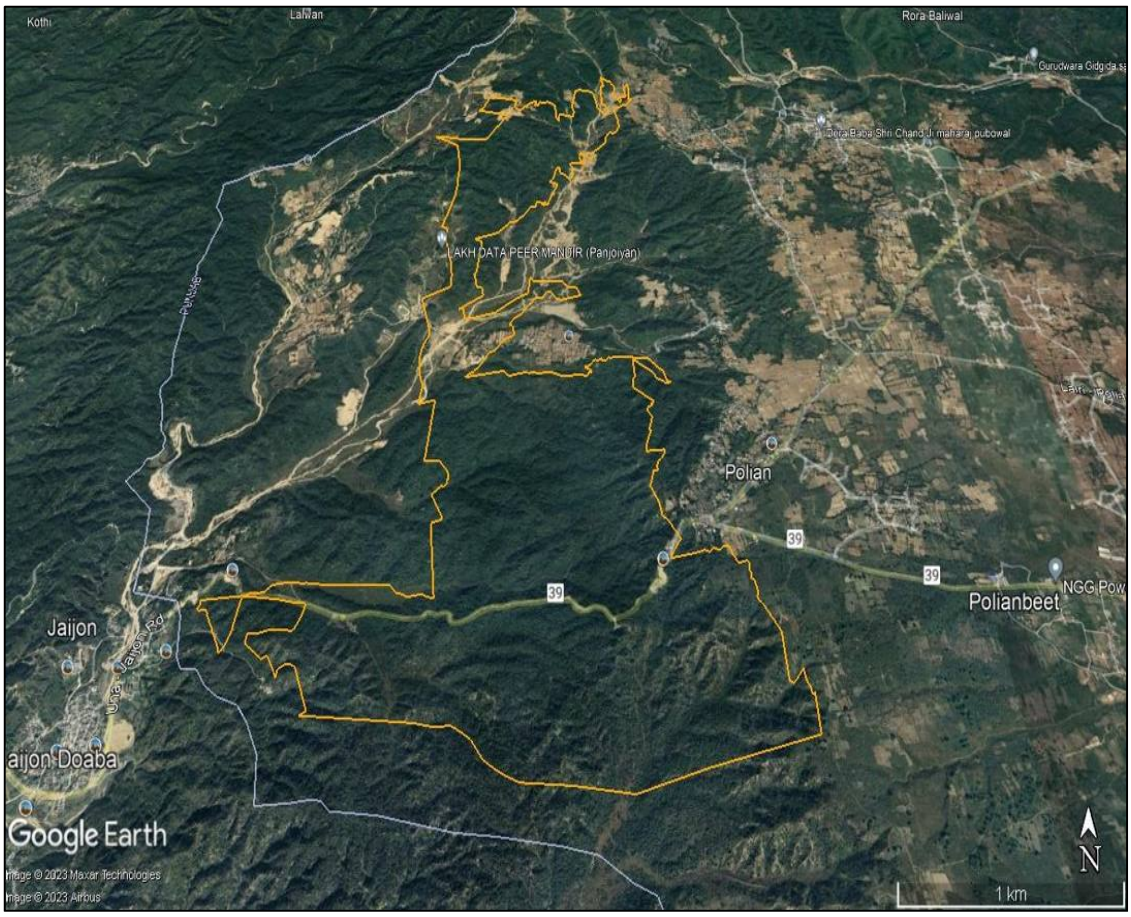

Figure 5.1. Google Earth Image of proposed site considered at Distt. Una for setup of Bulk Drug Park

Option-2: Kangra District

Figure 5.2. Google Earth Image of alternate site considered at Distt. Kangra

Option-3: Mandi District

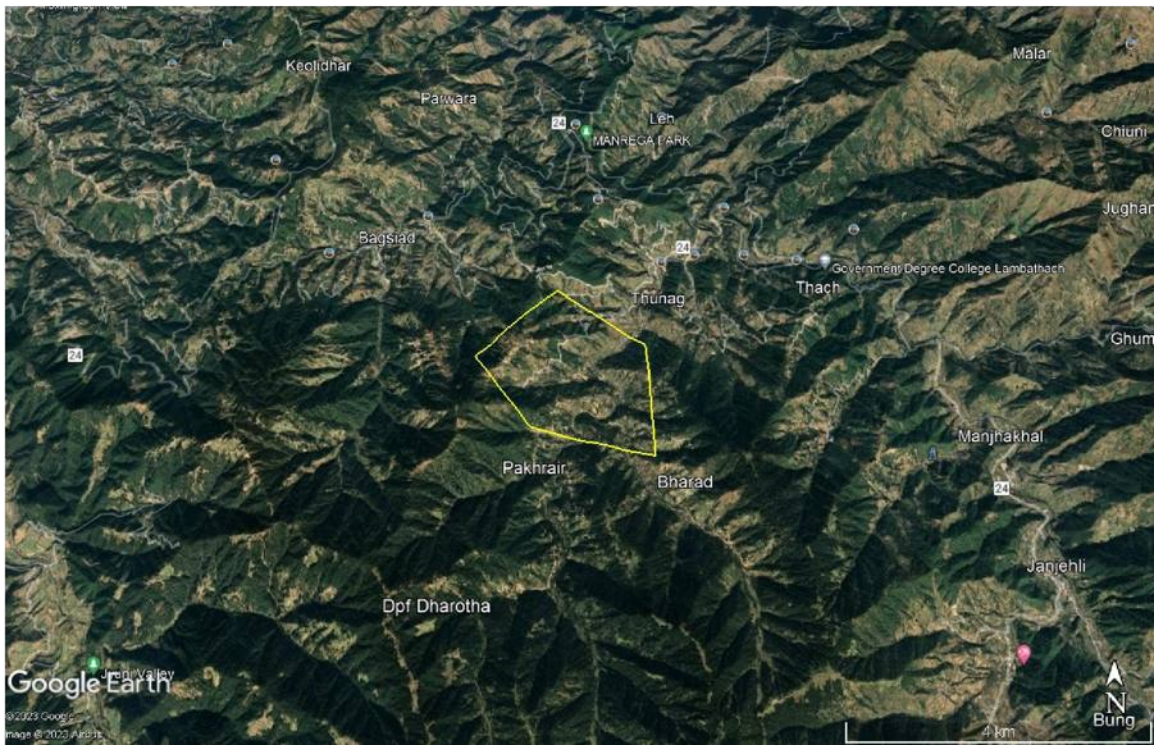

Figure 5.3. Google Earth Image of alternate site considered at Distt. Mandi

Based on the ease in approach, connectivity, availability of sufficient land, environment and social aspects, and other environmental conditions Tehsil Haroli, District Una was considered for proposed project.

Himachal Pradesh being a hilly state, the availability of relatively plain land and with easy approach is a remote possibility. As such, the other possibilities worked out in the district Mandi and Kangra proved to be non-suitable, hence, the PP zero-in on this site. The selected site fulfils all the criteria viz-a-viz large area of chunk, contours, easy approach and its location. Further, the proposed site is suitable for establishment of the project due to following reasons:

a. Una district is well developed in the industrial sector due to its close proximity to Punjab. Mehatpur, Gagret, Tahliwal & Amb are main industrial centres of Una.
b. Availability of large chunk of land in relatively plain area and that too in the immediate vicinity of already developed industrial area namely Tahliwal and close proximity to the neighboring state of Punjab.
c. The project area is a calm rural area with its natural beauty but no Eco-sensitive component comes within the 10 km of the area.
d. The proposed project area is well connected to the nearby town and cities through road, rail and airways.
e. Punjab border is close (100 m) to the proposed site which makes this project economically beneficial to Himachal Pradesh State and Punjab State.
f. The manpower is easily accessible for the purpose of construction as well as operational phase.
g. The geography (rainfall, air temperature, humidity etc.) of the area is suitable for the establishment of Bulk Drug Park.

5.3 ENVIRONMENT SENSITIVITY OF LOCATION

1. There are no Wildlife Sanctuary/National Park/Habitat of Migratory birds within 10 km radius from the project.
2. There is no Tiger Reserve/Elephant Reserve/Turtle Nesting Ground within 10 km radius from the project.

3. There is no Archaeological Monument/Defence installation within 10 km radius from the project.
4. There is no Forest land involved in the project.

Thus, the project location has no environment sensitivity zone.

5.4 SELECTION OF TECHNOLOGY

The whole project is being developed on the lines of area development projects i.e. the project is to be established in totality as an umbrella project which will have individual units to be developed by individual entities. All services, utilities, axillary, logistics, pollution abatement measures, waste management and power etc. will be provide on centralizes basis. This project will be developed on "end to end "basis and there will be no vendors or interlinked entities. However, within this project, a CETP of 5 MLD capacity has been proposed to cater the treatment requirements for the process effluents in the pharma sector. As the CETP is itself covered under category 7(h), therefore the proposed CETP may be designated as interlinked project. An integrated TSDF (comprising a secured landfill with a solid-liquid feed incinerator) under category 7(d) is proposed inside the project in 33.6 acres of land. Similarly, this industrial park is being developed for setting up the API units which are covered under category 5(f), under the ambit of EIA Notification 2006.

Further, solar energy is proposed as an alternate energy. Solar streetlights to be used and industries asked to look at feasibility of installing solar heaters to feed preheated water for process operations. Feasibility of installing solar panels with battery backup along internal roads & buffer area shall be explored to conserve energy. Industries, residential & commercial establishment shall formulate a proposal to harness solar power within their premises particularly at roof tops. Solar power as backup will be explored to reduce DG set usage.

Hence, in view of above factors, no other alternative was recommended and examined in terms of Site and Technology.

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CHAPTER 6
ENVIROMENTAL MONITORING PROGRAM

Environmental Monitoring is an essential tool for sustainable development and ensuring most effective implementation and monitoring of Environmental Management Plan and mitigation measures. The monitoring and evaluation of the management measures envisaged are critical activities in implementation of the project. Monitoring involves periodic checking to ascertain whether the activities are going according to the plans. It provides the necessary feedback for project management to keep the program on schedule. The purpose of the environmental monitoring plan is to ensure that the envisaged purpose of the project is achieved and results in desired benefits. To ensure the effective implementation of the proposed mitigation measures, the broad objectives of monitoring plan are:

- To evaluate the performance of mitigation measures proposed in the EMP.
- To evaluate the adequacy of Environmental Impact Assessment.
- To suggest improvements in management plan, if required.
- To enhance environmental quality.
- To implement and manage the mitigative measures defined in EMP.
- To undertake compliance monitoring of the project operation and evaluation of mitigative measures.

The detailed monitoring of emissions and effluent sources for different environmental parameters is being carried out as per the present norms from Himachal Pradesh State Pollution Control Board (HPSPCB), Central Pollution Control Board (CPCB) and MoEF&CC. Monitoring methodologies follows standard methods prescribed by Central Pollution Control Board (CPCB), Bureau of Indian Standards (BIS), USEPA, etc.

6.1 MONITORING PARAMTERS

- Ambient Air Quality
- Stack Monitoring
- Ground water Quality
- Surface Water Quality
- Domestic Effluent Quantity
- Noise Level

- Soil monitoring

6.1.1 Ambient Air Quality

Presently, ambient air quality has been monitored regularly in accordance with HPSPCB/CPCB guidelines. The ambient air has been monitored twice in a week (according to Central Pollution Control Board) at eight locations including project & around the project area in one season. The parameters monitored are as per National Ambient air quality Standards, 2009 as given in **Table 6.1**

Table 6.1. List of parameters as per the National Ambient Air Quality Standards, 2009

Description	
Ambient Air Quality Stations	10
Parameters	PM_{10}, $PM_{2.5}$, NO_2, SO_2, CO, Ozone, NH_3, BaP (PAH), H_2S, VOCs, HCl, HBr, Cl_2, Br_2, BTX, Acetonitrile and Dichloromethane

In addition, during operational phase monitoring of all these parameters will be done at project location on six monthly bases through NABL/MoEF&CC/HPSPCB approved lab.

6.1.2 Stack Monitoring

Periodical monitoring of stack emissions for PM, SO_2, NOx & CO and process/vent emissions for NH_3, H_2S, VOCs, HCl, HBr, Cl_2, Br_2, BTX, Acetonitrile and Dichloromethane to be done to assess performance of pollution control facilities installed at the unit as per IS-11255. Emissions from all stacks (Mainly from D.G. sets) shall be monitored once a quarter using manually operated stack emissions monitoring equipment. However, frequency of monitoring may be increased, if required in accordance with directions of HPSPCB/CPCB or other statutory authorities.

6.1.3 Ground water Quality

Ground water sample has been collected and analyzed to set the baseline of drinking water quality. Ground water shall be sampled to check for possible contamination and to ascertain the trend of variation in the water quality, if any. In case any adverse trend will be noticed, immediate remedial measures shall be taken. In addition, during operational phase monitoring

of all ground water parameters will be done at project location on six monthly bases through NABL/MoEF&CC/HPSPCB

6.1.4 Surface Water Quality

Five Surface water has been sampled from different sources within study area and analyzed for important physico-chemical & biological parameters to establish quality of water prevailing in study area. SW samples were collected from nearby distributaries, Nala, Canal to check for possible contamination, if any. In addition, during operational phase monitoring of all surface water parameters will be done on six monthly bases through NABL/MoEF&CC/HPSPCB approved lab.

6.1.5 Domestic Effluent Quantity

Total sewage generated from domestic processes will be 2.6 MLD. STP will be provided with capacity of 3 MLD. Two samples, one from STP inlet & one from STP outlet will be collected quarterly and tested as per IS: 3025.

6.1.6 Industrial Effluent

Total industrial effluent generated from industrial processes will be 5 MLD for which CETP will be provided with capacity of 5 MLD. Total of two samples one from inlet & one from outlet of CETP will be collected quarterly and analysed as per IS:2488 (Part 1-5) methods for sampling & testing of industrial effluents. Parameters to be monitored are pH, TSS, TDS, BOD, COD, Oil & grease, NH3-N, bioassay, BTX, phosphate, sulphite, phenolic compounds, cyanide and Hg etc. or as per consent. Continuous online monitoring at outlet of treatment plant for parameters, if prescribed by regulatory authorities for will be installed with direct connectivity to HPSPCB

6.1.6 Noise Level

Monitoring of Ambient noise levels shall be carried out at 2 locations in core zone area and 4 locations in buffer zone within 1 Km from the project boundary during day time (6 AM to 10 PM) and night time (10 PM to 6 AM) as per Environment Protection Act GSR 1063(E) Schedule III through NABL/MoEF&CC/HPSPCB approved lab.

6.1.7 Soil monitoring

Soil has been monitored from 5 locations (1 at project location and 4 other locations within 10km study area) and to set the baseline of soil quality. In addition, during operational phase

monitoring of all soil parameters will be done at project location on six monthly bases through NABL/MoEF&CC/HPSPCB approved lab.

6.2 ENVIRONMENTAL MONITORING BY MEMBER INDUSTRIES

The environmental monitoring shall be carried out by each member industry as applicable within their industry premises:

- Ambient Air Quality Monitoring
- Stack and Process/Vent Emission monitoring
- Work Zone/ Indoor Air monitoring
- Fugitive Emissions Monitoring
- Noise Monitoring for ambient, work zone and source noise
- Lux/Illumination Monitoring in work zone/ process areas
- Inlet & Outlet of Treatment Plant, if any
- Cooling tower blow down, if any
- Drinking Water Quality Monitoring

Continuous online stack monitoring for parameters, if prescribed by regulatory authorities for any industry will be installed by them with direct connectivity to HPSPCB. The member industries shall not only limit the environmental monitoring as stated above, environmental monitoring program in terms of parameters, location and frequency shall be formulated as per the stipulations laid by HPSPCB/MoEF&CC in their respective Environmental Clearance/Consent to Establish (CTE)/Consent to Operate (CTO). Further, individual industries will also assure the following compliance:

6.2.1 INDUSTRIAL SAFETY TRAINING

Various trainings to employees on safety, health and environmental aspects and technology and ergonomic issues will be provided time to time or as per requirements. Emergency exercises including fire drills will be documented adequately.

6.2.2 HOUSE KEEPING

There shall be different stockyard for the raw materials, so that the working shed floor area will be kept clean. Proper maintenance and cleaning of the APCD's will be done as per requirement. Solid waste generated will be kept in specific area earmarked. Regular dust cleaning to be done on working platforms, equipment's and machinery and connecting pathways and plant premises is recommended for proper housekeeping, effectiveness in working and preventing health hazard and breakthrough of diseases.

6.2.3 ACCIDENTS & DISEASES MONITORING

These systems enable workers to report immediately to their immediate supervisor in any situation, they believe presents a serious danger to life or health. The systems and the employer further enable and encourage workers to report to management.

- Occupational injuries;
- Suspected cases of occupational disease; and
- Dangerous occurrences and incidents.

All reported occupational accidents, occupational diseases, dangerous occurrences and incidents together with near misses shall be duly investigated with the assistance of a person knowledgeable/competent in occupational safety. The investigation shall:

- Establish what happened;
- Determine the cause of what happened;
- Identify measures necessary to prevent a recurrence.

6.2.4 PERIODIC PREVENTIVE MAINTENANCE

A detailed maintenance schedule will be prepared for all pollution control systems. Maintenance will be done strictly as per schedule and guidelines furnished by plant manufacturer. All pollution control, monitoring and safety equipment will be periodically checked and calibrated.

6.3 OCCUPATIONAL HEALTH & SAFETY MONITORING

Occupational health and safety monitoring programs verify the effectiveness of prevention and control strategies. The selected indicators are representative of the most significant occupational, health and safety hazards and the implementation of prevention and control strategies. The performance and achievements of the OHSMS responsible for all management of all environment, Health & Safety aspects shall be re-assessed on annual basis. The occupational health and safety monitoring program includes:

- Industries carries out inspection and testing of all safety features and hazard control measures for industry operation. This includes regular inspection and testing of all safety features and hazard control measures focusing on engineering and personal protective features, work procedures, place of work, installations, equipment and tools used. The inspection verify that issued personal protective equipment (PPE) continues to provide adequate protection and shall be worn as required.
- All instruments installed and recording of working environment parameters shall be regularly tested and calibrated and the respective records are maintained.
- Surveillance of the working environment shall be carried out.
- Surveillance of worker health: Workers will be provided appropriate and relevant health surveillance prior to exposure and at regular intervals. Industries will provide appropriate and relevant occupational health & safety measures to workers at the time of appointment and at regular intervals thereafter.

Further, general conditions to be defined in the sample allotment letter are given below:

Allotment Cum Intimation – Letter (General)

1. The Land allottee/Developer shall abide with the conditions imposed in the EC letter in spirit.
2. Every Individual Industry/ land allottee will appoint an EHS officer and constitute EMP Cell within their Organization
3. Every Industry will formulate and submit Environmental Policy within 1 month of Land Allotment, to the SPV.

4. Disposal of hazardous Industrial waste will be the responsibility of Individual industry.
5. Every Individual industry will obtain activity specific CTE/CTO from PSPCB
6. Industry will not discharge any waste/Effluent in open environment.
7. Allottee shall obtain all necessary permissions and clearances etc. from requisite department/agency as necessary according to law, rules and regulations in force. This will also apply in case of relevant amenities/facilities that the allottee may need for their project.
8. The allottee at his own expense shall take permission for all the utilities from SPV for e.g. Sewerage connection, water connection, electricity etc. and shall comply with all terms and conditions pertaining to supply of water and drainage/sewerage facilities.
9. The allottee shall abide by Punjab Building Rules 2021 and other provisions of the Punjab Industrial Development Act and rules made thereunder and any amendment thereto.

The allottee shall keep copies of all the environmental regulations/reports, clearances and all other relevant documents in his premises in the BDP, Una all the time for inspection by HHPSPCB at any time.

6.4 BUDGET AND PROCUREMENT SCHEDULE

On regular basis, Environment Management Cell will inspect the necessity and availability of the materials, technologies, services and maintenance works. The cell will make appropriate budget for the purpose. Regular record review for any change in financial requirement of environment management will be done and appropriate budgetary provisions will be made. Along with other budgets, environmental management budget will be prepared and revised regularly as per requirement. The budget will include provisions for:

- Environmental Monitoring Program
- Emergency Purchase of necessary materials, equipment, tools, services, etc.
- Landscape development

- Social and Environmental Welfare and Awareness programs/training including CER
- Annual Environmental Audit.

Table 6.2. Cost of Environmental Monitoring Program

S. No.	Particulars	Parameters	Frequency	Methods of sampling	Cost/ Annum (in lakhs)
1.	**Ambient Air Monitoring**	PM_{10}, $PM_{2.5}$, NO_2, SO_2, CO, Ozone, NH_3, BaP (PAH), H_2S, VOCs, HCl, HBr, Cl_2, Br_2, BTX, Acetonitrile and Dichloromethane	Every Six Months; Project location	IS-5182 Pt-14	10x4 =40
2.	**Stack Emission Monitoring**	Stack emissions - PM, SO_2, NOx & CO Process/vent emissions - NH_3, H_2S, VOCs, HCl, HBr, Cl_2, Br_2, BTX, Acetonitrile and Dichloromethane	Every Six Months; DG sets	IS-11255 Pt-1	5x4 =20
3.	**Treated Effluent Monitoring**	pH, TSS, TDS, BOD, COD, Oil & grease, NH3-N, bioassay, BTX, phosphate, sulphite, phenolic compounds, cyanide and Hg etc.	Quarterly; Outlet of CETP/ETPs	IS-3025 Pt-1 & IS:2488 (Part 1-5)	3 x4 =12
4.	**Domestic Wastewater Monitoring**	pH, TSS, TDS, BOD, COD, Oil & grease, NH3-N, phosphate	Quarterly; Outlet of STP	IS-3025 Pt-1 & IS:2488 (Part 1-5)	**3** x4 **=12**
4.	**Noise Level Monitoring**	24 Hrs. Noise Level	Every Six Month; Project location	IS-9989-1981	1 x4= 4
5.	**Water Quality Monitoring**	Drinking Water Specifications as per IS 10500	Every Six Months; Project location	IS-3025 Pt-1	3 x4 =12
Total					**100 Lakhs**

6.5 SUMMARY

The environment monitoring plan enables environmental management system with early sign of need for additional action and modification of ongoing actions for environment management, improvement and conservation. The environmental monitoring points will be decided considering the environmental impacts likely to occur due to the operation of project as the main scope of monitoring program is to track, timely and regularly, the change in environmental conditions and to take timely action for protection of environment. Monitoring of environmental samples will be done as per the guidelines provided by MoEF&CC/CPCB/HPSPCB. Separate records for water, wastewater, solid waste, air emission and soil will be prepared and preserved regularly. Along with other budgets, environmental management budget will be prepared and revised regularly as per requirement.

CHAPTER 7
ADDITIONAL STUDIES

The outline of the pre-project environmental status and the impact assessment of proposed project along with proper mitigation measures have been duly addressed in the previous Chapters. This Chapter briefly encompasses the additional aspects that were also dealt upon while conducting EIA study for the establishment of project.

7.1 PUBLIC CONSULTATION

Public hearing is a very significant part of the process of public participation envisaged under guidelines issued by MoEF&CC, Government of India. It facilitates involvement of all the stake holders of the project which is essential for ensuring smooth running of the proposed project and benefitting all sections of the society in the process of economic development of the region. Public hearing for establishment of the project was conducted by Himachal Pradesh State Pollution Control Board (HPSPCB) at ……. Copy of the advertisement is attached along as Annexure-. Proceedings of public hearing have been obtained vide letter dated …….. Copy of the public hearing proceedings are attached along as Annexure-. Photographs of the public hearing are attached along as Annexure-.

Therefore, summary of the complaints/queries raised during public hearings and action plan are given below in **Table 7.1**

Table 7.1. Summary of Public Hearing Proceedings at ……

Sr. No.	**Name and Address of the person**	**Detail of query / statement / information / clarification sought by the person at present**	**Reply of the query/ statement/ information/ Clarification given by the project proponent**	**Action Plan**
1.				
2.				

3.				
4.				
5.				
6.				

7.2 RISK ASSESSMENT

The safety and protection of people, equipment and environment is a serious concern in the manufacturing industries. Proposed Bulk Drug Park will have housing, different API manufacturing industries and required infrastructure associated with the units. Risk assessment for proposed project is associated with construction and operation phases. Individual industries to be established in proposed IA shall carry out risk analysis by considering hazards associated with handling of chemicals, based on nature of process and inventory. However, at the extent and specifics of industrial activities, a general safety and emergency preparedness plan has been prepared. This study, accordingly, gives an outline of the associated environmental and other risk prone hazards, their assessment and remedial measures. It also describes an approach to emergency planning to be adopted by the Plant management.

Risk assessment (RA) provides a numerical measure of the risk that a particular facility poses to the public. It begins with the identification of probable potential hazardous events at an industry and categorization as per the predetermined criteria. The consequences of major credible events are calculated for different combinations of weather conditions to simulate worst possible scenario. These consequence predictions are combined to provide numerical measures of the risk for the entire facility.

7.2.1 OBJECTIVES OF RISK ASSESSMENT

As per the requirements stated in the Terms of Reference of the EIA study, the risk assessment study has been undertaken to address the following aspects:

- To identify hazards such as fire & explosion hazards arising from handling of equipments as well as storage of chemicals.
- To predict various credible scenarios and develop maximum credible accident scenarios with consequence.

- To eliminate or reduce to as low as reasonably practical in terms of risk to human health, risk of injury, risk of damage to plant, equipment and environment, business interruption or loss etc.

7.2.2 METHODOLOGY OF RISK ASSESSMENT AND MANAGEMENT

From methodological point of view, risk assessment procedure includes risk analysis and risk evaluation as presented in **Fig. 7.1.** In particularly in risk analysis step, hazards are identified and estimated by systematic use of available information; whereas, in risk evaluation step, evaluation of the level of risk is carried and decided whether acceptable risk has been achieved or not.

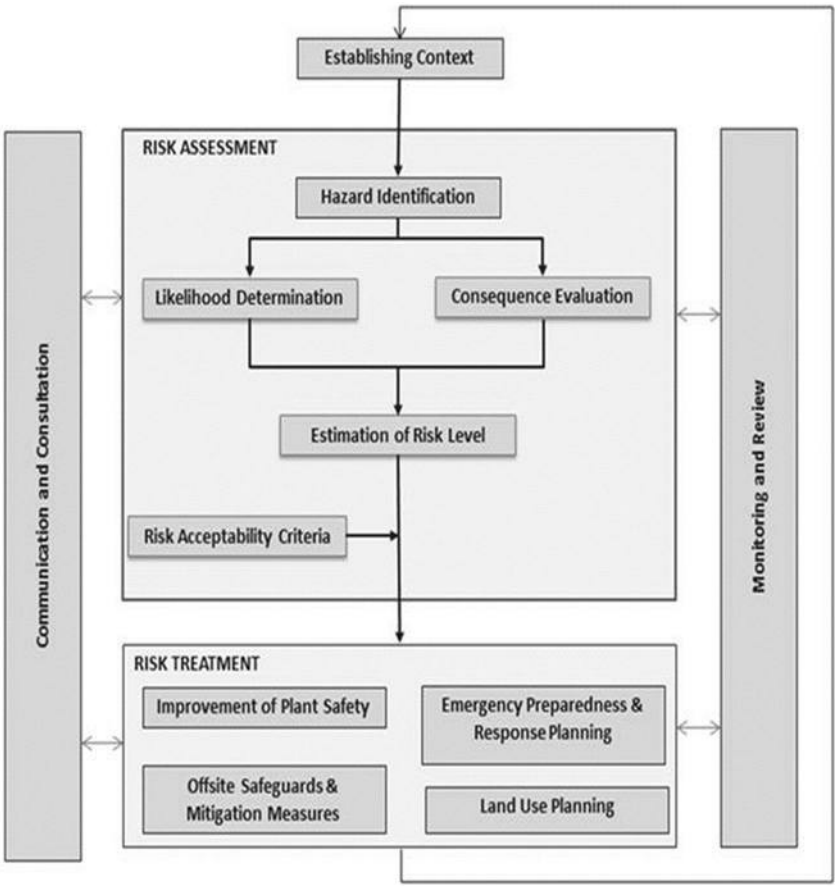


Figure 7.1. Representation of Risk assessment and management framework

The evaluation of resulted risk requires risk acceptance criteria - which issued as a basis for decisions about acceptable risk. In other words, risk assessment is the process of risk analysis and evaluation of the significance of the results. From this perspective, the risk assessment

process can be viewed as concentrating on five basic questions in relation with risk analysis and risk evaluation, as summarized in Table 7..

Table 7.2. Elements of risk assessment

Risk Assessment	Risk Analysis	**What can go wrong?** Potential accidents and the ways they could come about are identified
		How often? Probability of their occurrence is estimated
		What are the consequences? Potential consequences of the accidents are estimated
		What are the risks? Risks are identified in terms of their level by using the above analyses, and their significance assessed; and compared with established criteria
	Risk Evaluation	**So What?** Risk management actions are carried out Demonstration of resulting risk and evaluation with established tolerability criteria (identification of mitigation measures, acceptance of result, modification or abandoning)

Several approaches exist for assessing risk originating from hazardous industries and storages and they vary from purely quantitative to semi- quantitative and qualitative. Among others, methods for Quantitative Risk Assessment (QRA) based practices have evolved as an established practice amongst the scientific risk community to quantify a value of risk, based on the hazard potential of industries and the potential for damage to population present in the neighbourhood.

Hazard (scenario) identification

This step involves attaining an understanding of the hazards, including the location, type of storage involved and the hazardous property of the chemicals. It also refers to the characterization of the risk associated with hazardous storage.

Frequency estimation

Once the possible hazard scenarios and the type of negative outcome are identified, the scenario frequency is determined based on the failure frequency of the initiating event and the probability of intermediate events. The frequency of a scenario specifies the number of probable occurrences of that scenario in a period and is generally taken from failure frequency databases and literature prepared after analysing historical data of previous incidents. The probability of an intermediate event varies from 0 to 1 indicating the possibility of occurrence of that event.

Estimation of Risk

Finally, the risk estimate is derived by multiplying the consequence of the event and the probability of occurrence. The risk is represented in the form of metrics like individual and societal risk.

Individual (or location-based) Risk (IR) is the probability at which an individual may be expected to sustain a given level of harm from the realization of specified hazards (Engineers, 1992). In simple terms, it measures as the probability that an (unprotected) person dies in one year as a consequence of an accident with hazardous substances and is expressed as a frequency (per year). Principally, the IR estimation takes into account an annual frequency of occurrence of a reference damage (e.g. fatalities) in any area for a person present 24 hours/day and 365days/year without protection and possibility of being sheltered or evacuated. Graphically IR can be represented as a set of risk contours around a hazardous installation.

Societal Risk (SR), another risk measure of the QRA approach, is the relationship between frequency and the number of people suffering from a specified level of harm in a given population from the realization of specified hazards. Therefore, if no people are present around the hazardous activity, SR is zero whereas IR may be quite high.

In order to generate individual-risk contours, it was required to estimate the effect of all individual scenarios at each location. Accordingly, risk resulting from each reference scenario was estimated combining frequency of the initiating event (i.e. incident), conditional probability of the scenario (i.e. sequence) and the corresponding probability of fatality (i.e. Probit). In particular, the following expression was used to estimate IR at a given location for a particular accident scenario.

$$IR_{x,y,i} = [f_i PF_i] = [(f_{incident\ i} P_{sequence\ i}) PF_i]$$

Where,

- $IR_{(x, y, i)}$ is the individual risk at the geographical location (x, y) for a particular reference scenario *i*
- f_i is the frequency of occurrence of the accident scenario *i* (y^{-1});
- PF_i is the probability of fatality that the accident scenario i will result at location (x, y)

The resulting overall IR at that particular location (x, y) was then calculated as the sum of the individual IR's corresponding to each reference scenario.

$$IR_{(x,y,i)} = \sum IR_{(x,y,i)}$$

$IR_{(x,y)}$ is the overall IR at the geographical location (x, y) for all reference scenarios

It is important to mention that all events considered had radial effects, except for the scenarios involving toxic release which were considered as a directional footprint with its spread distributed in a sector of 22.5 degrees, using a wind direction probability of 0.125 taking any of 8 principal wind directions.

A number of measures are there to estimate or express the societal risk among them, the PLL measure is chosen as it allows spatial display of the risk to society by combining the damage potential with population density estimates. In particular, the following expression is used to estimate SR in terms of Potential Loss of Life (PLL).

$$PLL_{(x,y)} = [IR_{(x,y)} NP_{(x,y)}]$$

Where:

- PLL(x, y) is the Potential Loss of Life at a geographical location (x, y);
- IR(x, y) is the individual risk at location (x, y); and
- NP(x, y) is the number of people at a geographical location (x, y).

7.1.1.1 Risk analysis

The risk assessment process is intended to identify existing and probable hazards in all operations and work environment, to quantify the hazards and to access the risk levels of those hazards in order to prioritize those that need an immediate attention.

The methodology of risk assessment includes the following steps:

Hazard Identification: A classical definition of hazard states, "hazard is in fact the characteristic of system/ plant/ process that presents potential for an accident." Hence, all the components of a system such as process, storage of chemicals, handling, etc., need to be thoroughly examined to assess their potential for initiating or propagating an unplanned event/ sequence of events, which can be termed as an accident.

Identification of hazards is of primary significance in the analysis, quantification and cost effective control of accidents. Potential Hazards identified in the proposed Industrial

Manufacturing Cluster have been broadly classified as below:

Hazards during Construction Phase

- Mechanical Hazards
- Transportation Hazards
- Physical Hazards
- Storage and Handling of Hazardous Materials

Hazards during Operation Phase

- Material Hazards
- Mechanical Hazards
- Handling, Storage and Transportation Hazards
- Plant Hazards

Hazards due to Natural Calamities

- Earthquake
- Flood

Hazards during Construction Phase

Mechanical Hazards: Mechanical hazards during the construction phase arise due to the moving parts in the machinery, especially the belts and bolts of the construction equipment, which are heavy and pose a threat to the work personnel. Other hazards include falling (during

working at heights), falling objects like hand held tools, etc., failure of slips and traps created for scaffolding, and due to faulting of electrical equipment. **Transportation Hazards:** The planning of access/ egress to the construction site also plays a significant role in minimizing the associated hazards such as vehicles collision. **Physical Hazards:** The noise and vibrations generated during the construction phase may affect the worker's health, hinder effective communication and may jeopardize sensitive organs. In addition to noise and vibration, hot works also pose a considerable hazard to the workers. Storage and handling of hazardous materials: During the construction period, storage of hazardous materials like fuel for the engines, lubricants, paints and other flammable materials are likely to pose a fire and explosion risk. Due care shall be taken in locating these materials away from the work place, free of any influence of temperature or sparks or fire. Proper wiring of the electrical appliances like lights, exhausts, etc., would be made to ensure that there are no live wires causing short circuits to ignite these materials.

Hazards during Operation

The proposed Bulk Drug Park, Una (Himachal Pradesh) by HPBDPIL will have the following sectors of the industries represented in **Table 7.3.**

Table 7.3. List of proposed industries in Bulk Drug Park, Una, Himachal Pradesh

Industries	**Category of Industries**	**Potential Sub-Sector**
Bulk Drug Pharmaceuticals	Red	API and API Intermediates (Chemical Synthesis based only)

Material Hazards: In any installation, main hazard arises due to loss of containment during handling of flammable and toxic chemicals. The Chemicals are classified according to the properties and hazard class given by National Fire Protection Association (NFPA) is responsible for 380 codes and standards that are designed to minimize the risk and effects of fire by establishing criteria for building, processing, design, service and installation. NFPA classification **(Table 7.4)** for Health, Flammability & Reactivity of a chemical is on a scale from 04 least to worst. As per the NFPA Rating on the scale from 0-4 the chemicals having 3 & 4 are considered are highly hazardous and considered for analysis.

Table 7.4. NFPA Classification

Rating	Health	Effect
0	No Hazard	Will not burn
1	Can cause significant irritation	must be preheated before ignition occur
2	Can cause temporary incapacitation or residual injury	must be heated or high ambient temperature to burn
3	Can cause serious or permanent injury	can be ignited under almost all ambient
4	Can be lethal	will vaporize and readily burn at normal temp

NFPA provides standard for the chemicals to reduce the risk of fire and other hazards. The chemicals handled by the facility, that pose health and fire hazards as identified by their NFPA ratings, are mentioned in **Table 7.5**.

Table 7.5. NFPA Rating

Sr. no.	Solvents	Flash Point (°C)	Boiling Point (°C)	NFPA Rating		
				Health	Fire	Relativity
1	Hydrochloric Acid	NA	50.5	3	0	0
2	Methanol	16.1	64.5	1	3	0
3	Acetonitrile	5.55	81.6	2	3	1
4	Dimethyl formamide	67.2	153	1	2	0
5	N-Butanol	36.1	117.7	1	3	0

The chemicals handled at the site has been reviewed to identify the hazards associated with the same. The formulation and manufacturing of API and API intermediates in bulk drug pharma involves storage of hazardous chemicals which can lead to accidents in the proposed project are described in **Table 7.6**.

Table 7.6. Important Hazardous Events

Types of possible Events	Causes
BLEVE (Boiling Liquid Evaporating Vapor Explosion)	Due to the catastrophic failure of refrigerated or pressurized gases or liquid stored above their boiling points, followed by early ignition of the same, typically leading to a fire ball
Deflagration	Reactions occurring at less than sonic velocity and initiation of the reaction at lower energy levels
Detonation	A propagating chemical reaction of a substance in which the reaction front advances in the unreacted substance at or greater than sonic velocity in the unreacted material
Explosion	A release of large amount of energy that form a blast wave
Fire	--
	The burning of a flammable gas cloud on being immediately ignited at the edge before forming a flammable/explosive mixture.
Flash Fire	A flammable gas release gets ignited at the farthest edge resulting in flash-back fire
Jet Fire	A jet fire occurs when flammable gas releases from the pipeline (or hole) and the released gas ignites immediately. Damage distance depends on the operating pressure and the diameter of the hole or opening flow rate.
Pool Fire	Pool fire is a turbulent diffusion fire burning above a horizontal pool of vaporizing hydrocarbon fuel, where the fuel has zero or low initial momentum
Spill Release	'Loss of containment'. Release of fluid or gas to the surroundings from unit's own equipment / tanks causing (potential) pollution and / or risk of explosion and / or fire

Structural Damage	Breakage or fatigue failures (mostly failures caused by weather but not necessarily) of structural support and direct structural failures
Vapor Cloud Explosion	Explosion resulting from vapor clouds formed from flashing liquids or non-flashing liquids and gases

Mechanical and Physical Hazards: Injuries may be caused to working personnel due to the operations like cutting, lifting, and rotating machinery. Lifting and carrying heavy or awkwardly shaped objects, such as bags, can result in manual handling injuries.

Handling, Storage and Transportation Hazards: Proposed project will involve handling of various materials in the form of Solid, Liquid and Gases which are required for the operations. The individual industry may have material transport from the nearest road/rail route. The hazards related to material transport may be due to accidents of vehicles, failure in mechanical transmission components etc., The Handling hazards include:

- Insufficient knowledge on hazardous nature of chemical in use leading to inappropriate handling of the chemical.
- Failure to use appropriate control measures and Personal Protective Equipment (PPE).
- Use of expired/ worn Personal Protective Equipment (PPE's).
- Failure of liquid/solid or gas delivery tools.
- Using of container with narrow opening for a process that evolves heat and/or gases.
- Mixing of oxidizing agents with flammable / combustible substances, etc.

Storage and Handling of Chemicals: A storage and Handling of Hazardous chemical is inevitable, they carry inherent characteristic risk to the employees due to the properties of chemicals such as toxicity and flammability. Chemicals are to be handled in standard containers like MS, HDPE, GI Drums, PVC Carboys, etc. All the chemicals, if any are to be arranged and stored in accordance with their compatibility, dry, well ventilated, with flameproof electrical equipment's and lighting. All the chemicals are to be provided with identification labels. Eye wash/Drench shower is to be provided at a strategic location for emergency purpose. Chemical Safety Data Sheets and handling procedure, First Aid measures are to be prepared and displayed for information and safety of the working personnel.

Plant/Industry Hazards: The various types of hazards in the plant/industries are as follows

- **Fire Hazard:** Flammable chemicals are used in the manufacturing process of the chemicals. So it is susceptible to catch fire either at the places of storage, transportation and processing if source of ignition is available. These chemical fires may cause to catastrophic effects. The sudden development of pressure ruptures the container and causes shock waves which cause the structure damage and outburst of reaction vessel. Fire is considered very dangerous if occurs in uncontrolled manner. It should be clearly understood that when a liquid is used having flash point below the normal ambient temperature, it could, in suitable circumstances, liberate a sufficient quantity of vapour to give rise to flammable mixtures with air
- **Explosion Hazard:** Release of energy in a rapid and uncontrolled manner gives rise to explosion. Extra care shall be taken by providing rupture disc, pressure release valve and temperature controller
- **Corrosion Hazard:** Most corrosive substances will produce chemical burns, while certain chemical produce deep ulceration. Other has detailing effect on skin and may cause dermatitis. This has adverse effects on weakening the strength of material in contact.
- **Electric Hazard:** Electrical power is the main driving force of the industry. There is a potential hazard in electrical equipment like electric cables, motors, heaters, lights, electrical major equipment/ machinery, operations, welding, motors, and heavy lift devices, cabling, human intervention (short circuit possibility), maintenance work (due to machinery breakdown etc.), plant lighting related electrical hazards etc. there will be a fire hazard due to sparks and short circuits in the electrical systems. Static electricity may develop during the transfer of solvent from one vessel to another vessel and may leads to sparks, if there is no proper earthling system, the electrical sparks will act as ignition source for flammable chemicals.
- **Other Hazards:**
- Other toxic hazards due to acids/other toxic spillages (mainly limited to spillage area). The spillage if comes in contact with metal parts will produce hydrogen which is highly flammable gas. Any person moving in area and getting splash will get the injury. In

addition, the spillage will cause pollution problem. The spillage is to be collected and neutralized for toxic contents before disposal.

- Hazards due to individual soft spots like walking casually and not noticing a pit and falling or colliding/stumbling or slipping (not noticing a wet place, etc.).

Table 7.7. Details of Indicative Major Plant/Industrial Hazards

Plant/Industrial Hazards	Details
Leaks/ruptures	Fracture: Breaking open of a containment system by the propagation of a crack
	Puncture: a perforation or hole in a containment system as a result of impact
	Relief device stuck open
	Seal/gasket/flange failure
	Corrosion/erosion
	Flow surge or hydraulic hammer
Incorrect actions or inactions by people	Operator opens a valve, etc.
Exceeding process limits	Over/under pressuring
	Over heating
	Over cooling
	Over filling
Control system failure	Sensor
	Logic Solver
	Final element
	Communication interface
	Field wiring
	Power source

Reactivity	Runaway reactions
	Air ingress
	Inadvertent mixing of chemicals
Structure failure	Equipment support
	Foundations/floor
	Cyclic loading
	Pressure fluctuations
Utility failure	Electricity
	Instrument air
	Plant nitrogen
	Cooling water
Human external events	Vehicle impacts
	Dropped objects from lifting devices
Knock-on effects	Incident in adjacent processes
	Incident with process
Multiple Faliure	Combinations of equipment failures
	Combinations of human failure
	Combinations of external events
	Combination of any of these

Fire and Explosion Indices (F & EI)

Dow's Fire and Explosion Index is a step-by-step objective evaluation of the realistic fire, explosion and reactivity potential of process equipment and its contents. The quantitative measure shall be employed based on historical loss data, the energy potential of the material under study and the extent to which loss prevention practices are currently applied. This is

helpful in identifying high-risk process areas needing more detailed hazard analysis to ensure that the facilities do not pose unacceptable risks.

The steps involved in this technique are shown in **Fig. 7.2.** Once the pertinent process unit is selected, the Material Factor (MF) for the material in the unit shall be estimated. This depends on the flammability, reactivity and operating temperature. Factor for general process hazards (F_1) takes into account the nature of the reaction, ventilation of the unit, accessibility of the unit, drainage facilities etc. Factor for special process hazards (F_2) takes into account toxicity of the material, operating pressure, operation near flammable range, quantity of material, joints and packing, use of hot oil exchange system etc.

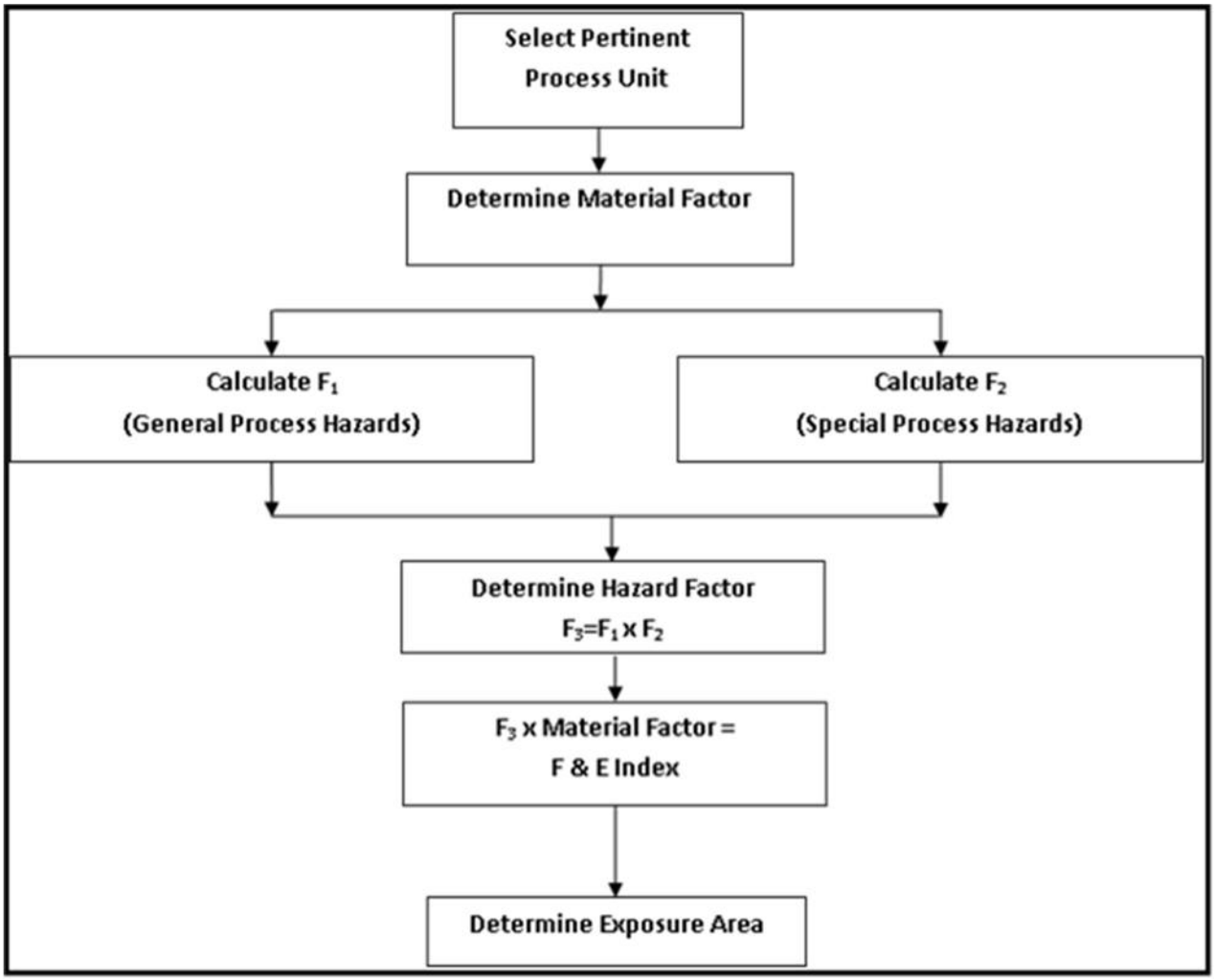


Figure 7.2. Steps involved in Fire and Explosion Index Calculation

F & EI is determined based on the procedure shown above and the relative hazard rating is done as per the following criteria. Degree of Hazard with respect to F & E Index is given in

Table 7.8.

Table 7.8. Degree of Hazard with respect to F & E Index

S. No.	F & E Index Range	Degree of Hazard
1.	1 – 60	Light
2.	61 – 96	Moderate
3.	97 – 127	Intermediate
4.	128 - 158	Heavy
5.	159 and more	Severe

Toxicity Index (TI):

The TI value is computed from Maximum Allowable Concentration (MAC), General Process Hazard (GPH) and Special Process Hazard (SPH) by use of DOW's hazard classification guide. The scale for TI is given in **Table 7.9**.

Table 7.9. Degree of Hazard with respect to Toxicity Index

TI Range	Degree of Hazard
0 - 6	Light
6 - 10	Moderate
Above 10	High

Hazards due to Natural Calamities

In case of natural disasters such as earthquake, flood etc., occurring at the proposed Bulk Drug Park may result in fire and explosions/toxic gas release due to failure of equipment. The damage consequences will be similar whether the damage is because of manmade disaster or natural calamity for the worst cases.

Hazard and Damage Assessment: Toxic, flammable and explosive substances released from sources of storage as a result of failures or catastrophes, can cause losses in the surrounding area in the form of:

- Toxic gas dispersion, resulting in toxic levels in ambient air,

- Fires, fireballs, and flashback fires, resulting in a heat wave (radiation), or
- Explosions (Vapors Cloud Explosions) resulting in blast waves (overpressure).

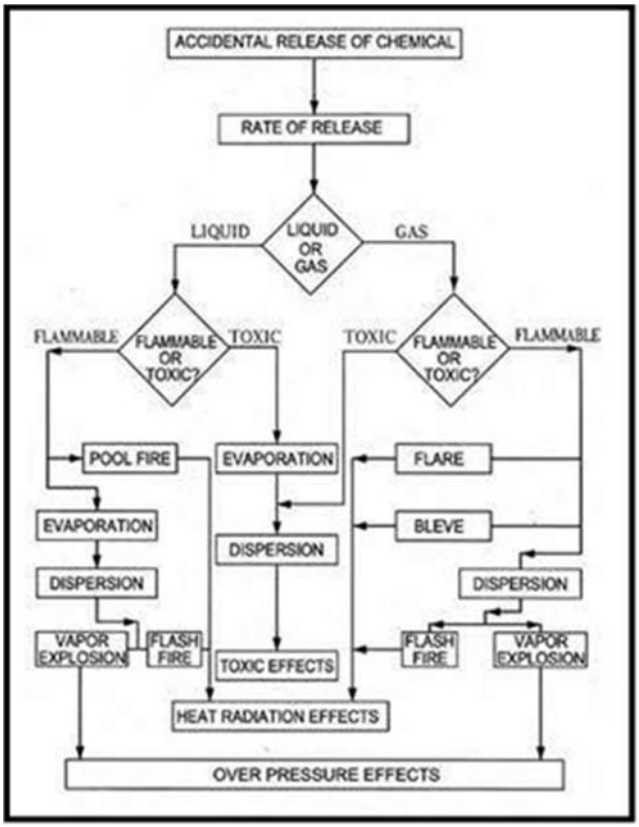


Figure 7.3. Sequence of probable events

Effect of Fire/Heat wave Radiation: The effect of thermal radiation on people is mainly a function of intensity of radiation and exposure time. The effect is expressed in term of the probability of death and different degree of burn. The consequence effects studied to assess the impact of the events on the receptors are provided in **Table 7.10**

Table 7.10. Impact of Radiation Intensity

Radiation (kW/m^2)	**Damage to Equipment**	**Damage to People**
4.0	--	Causes pain if duration is longer than 20 sec. But blistering is unlikely.
9.5	--	Pain threshold reached after 8 sec. second-degree burns after 20 sec.
12.5	Minimum energy to ignite	1% lethality in one minute. First

	wood with a flame; melts plastic tubing.	degree burns in 10 sec.
37.5	Severe damage to plant	100% lethality in 1 min. 50% lethality in 20 sec. 1% lethality in 10 sec.

Effects of Overpressure: The effects of the shock wave vary depending on the characteristics of the material, the quantity involved and the degree of confinement of the vapor cloud. The peak pressures in an explosion therefore vary between a slight over- pressure and a few hundred kilopascals (kPa). Whereas dwelling are demolished and windows and doors broken at overpressures as low as 0.03- 0.1 bar. A peak overpressure of 0.1bar will cause serious damage to 10% of the housing/structures. Falling fragments will kill one of each eight persons in the destroyed buildings. Direct injury to people occurs at greater pressures. The pressure of the shock wave decreases rapidly with the increase in distance from the source of the explosion. The overpressure damage is shown in **Table 7.11**

Table 7.11. Effect of Overpressure

Peak Overpressure	**Level of Damage**	**Description**
0.01 (bar)	Minor Damage	Crack in glass
0.02 (bar)	Minor Damage	Limited structural damage
0.03 (bar)	Significant Damage	Shattering of glass
0.1 (bar)	Moderate Damage	Repairable damage to plant equipment & structure
0.2 (bar)	Heavy Damage	Corrugated asbestos shattered; corrugated steel or aluminum panels, fastenings fail, followed by buckling, wood panels (standard housing) fastenings fail, panels blown in, structural damage to Buildings
0.3 (bar)	Heavy Damage	Major damage to plant equipment structure

1.0 (bar)	Fatality	--

Effects of toxic release

A material may be considered as toxic or poisonous, when a small quantity can cause injurious effect on an average normal adult human being. The effect of exposure to toxic substance depends upon the duration of exposure and the concentration of the toxic substance. Short-term exposures to high concentration give Acute Effects while long term exposures to low concentrations result in Chronic Effects.

Only acute effects are considered under hazard analysis, since they are likely credible scenarios. These effects are:

- Irritation (respiratory system, skin, eyes)
- Narcosis (nervous system)
- Asphyxiation (oxygen deficiency)
- System damage (blood organs)

There are several ways of expressing the severity of the toxic nature of the chemicals. These are:

- TLV - Threshold Limit Value:
- IDLH -Immediately dangerous to life and health
- LDLO - Lethal dose low
- LD50 -Median lethal dose

The Immediately Dangerous to Life and Health (IDLH) value which is a limit for personal exposure to a substance defined by the United States National Institute for Occupational Safety and Health (NIOSH), normally expressed in parts per million (ppm) can be considered as the reference concentration.

Typical Failure Frequencies

The hazardous material release scenarios can be broadly divided into two categories (i) catastrophic failures which are of low frequency and (ii) ruptures and leaks which are of

relatively high frequency. Vapour or liquid releases from failure of gasket, seal and rupture in pipe lines and storage tanks fall in second category whereas catastrophic failure of storage tanks and full bore rupture of pipelines, etc. fall into first category. Typical failure frequencies are given in **Table 7.12 .**

Table 7.12. General failure frequencies

Item	**Mode of failure**	**Failure Frequencies**
Atmospheric vessel	Serious leak catastrophic	$1x10^{-4}$/ yr $5x10^{-6}$/ yr
Pressure vessel	Serious leak	1.0×10^{-5}/yr
	Catastrophic	$3x10^{-6}$/yr
Process pipe lines		
=50 mm dia	Full bore rupture	8.8×10^{-7}/m.yr
	Significant leak	8.8×10^{-6}/m.yr
> 50 mm = 150 mm dia	Full bore rupture	2.6×10^{-7}/m.yr
	Significant leak	$6x10^{-5}$ /m.yr
> 150 mm dia	Full bore rupture	8.8×10^{-8} /m.yr
	Significant leak	$6x10^{-6}$ /m.yr
Hoses	Rupture	3.5×10^{-2}/yr
Check valve	Failure on demand	$1x10^{-4}$/demand
Motor operated valve	Failure on demand	$1x10^{-3}$/demand
Flange	Leak	3×10^{-4}/yr
Gasket failure	Failure	5×10^{-5}/yr
Pump seal	Leak	5×10^{-3}/yr
Process Safety Valve	Lifts heavily	4×10^{-3}/yr

	Blocked	1 x10^{-3}/yr
	Lifts lightly	2 x10^{-2}/yr

Source: 1. Loss Prevention in the Process Industries -Frank P.lees.Vol.2 & 3, 2nd edition.

2. TNO communication

Risk Mitigation Measures

- Consider feasibility of substitution of hazardous chemicals such as solvent based paints with less hazardous alternatives. Label chemicals with appropriate, internationally recognised, hazard symbols.
- Chemicals with different hazard symbols should not be stored together - clear guidance on the compatibility of different chemicals can be obtained from the Materials Safety Data Sheets (MSDS) which should be readily available from the manufacturer and on site.
- Store chemicals in a dedicated, enclosed and secure facility with a roof and a paved/concrete floor. Chemical tanks should be completely contained within secondary containment such as bonding.
- Install devices to prevent spills and overfills, e.g. alarms to warn of overfilling and automatic shut-off devices or secondary spill containment.
- Maintain and inspect storage units regularly.
- Consider installation and use of groundwater monitoring points on site to check for contamination. Implement a Solvent/Hazardous Materials Management Plan to monitor and control the use of solvents and hazardous materials on site.
- Necessary arrangement of firefighting facility as per various national and international codes for the facilities to avoid any major incident.
- To identify the hazards, present in the system, a hazard identification study such as a Hazard and Operability study (HAZOP) should be undertaken by the individual industries. All hazards identified should be examined and appropriate mitigating measures developed and implemented.

- For all the hazardous material tanks where there is a single in/outlet line, a Remotely Operated Vehicle (ROV) (or an equivalent design to allow isolation of the tank from the line in an emergency) should be provided.
- First aid equipment and manpower resources are at place to deal with emergencies, in consultation with emergency services to rescue any personnel, trapped or immobilized by an accident scenario.
- Implement and maintain appropriate safety management systems to control the managerial and organizational factors that can impact on the overall risk associated with the hazardous materials.
- Carryout regular checks/maintenance and testing of instruments, valves and flange joints as per strict schedule. Pipelines, flanges and valves require special attention to minimize the failure rate.
- Prevention of potential ignition sources such as:

➢ Proper grounding to avoid static electricity build up and lightening hazards (including formal procedures for the use and maintenance of grounding connections) – Use of intrinsically safe electrical installations and non-sparking tools.

➢ Implementing permit systems and formal procedures for conducting any hot work during maintenance activities, including proper tank cleaning and venting.

- Facilities should also be equipped with Fire Detection and suppression equipment such as Fire tenders, all types of fire extinguishers like DCP, CO2, water CO2 foam types in adequate numbers, Fire Hydrant and monitor system as per TAC guidelines to take care of any fire hazard.
- Fire Detection/alarm system to be provided for Control Rooms, cable Galleries, Transformers area and Administrative building and these may be of ionization, optical and heat sensing type.
- All fire systems should be located in a safe area of the proposed facility
- Firefighting equipment shall be provided as per applicable standards and guidelines.
- Consider linking foam and fire water system. Considerations should be given to directly

inject AFFF (Aqueous Film Forming Foam) compound into the respective fire mains (at 6 percent strength), which can act as a vehicle to transport foam solution to user points on either site for mobile response foam branches / cannons.

- Facilities should be properly equipped with fire suppression equipment that meets internationally recognized technical specifications for the type and amount of flammable material stored at the facility.
- Preparation of a fire response plan supported by the necessary resources and training, including training in the use of fire suppression equipment and evacuation. Procedures may include coordination activities with local authorities or neighboring facilities.
- Provision of fire safety training and response as part of workforce health and safety induction/training, including training the use of fire suppression equipment and evacuation, with advanced fire safety training provided to a designated firefighting team.
- It is recommended that all electrical fittings in the system should confirm to flame/explosion proof regulations.
- It is recommended to carryout regular maintenance and testing of instruments, valves and flange joints as per strict schedule. Pipelines, hoses, PSV's require special attention to minimise the failure rate.
- Pipeline should be protected against external / internal corrosion
- Do's and Don'ts shall be displayed prominently in the site near the pipelines and at all workplaces. Regular maintenance shall be carried out under the supervision of an authorized person.
- Important telephone numbers of emergency shall be displayed prominently in bold letters in the plant site and administration building.
- Caution boards shall be displayed for all working person. – No smoking signs
- No flames or pilot lights or electrical gadgets. – Emergency contact numbers.
- All electrical equipment shall be provided with proper earthling. Earthed electrode should be calibrated, periodically tested and maintained.

- Emergency lighting shall be available at all critical locations including the operator's room to carry out safe shut down of the plant, ready identification of firefighting facilities such as fire water pumps and fire alarm stations.
- All electrical equipment shall be free from carbon dust, oil deposits, and grease.
- Use of approved insulated tools, rubber mats, shockproof gloves and boots, tester, fuse tongs, discharge rod, safety belt, hand lamp, wooden or insulated ladder and not wearing metal ring and chain is insured.
- Flame and shock detectors for fire safety shall be provided.
- Danger from excess current due to overload or short circuit is prevented by providing fuses, circuit breakers, thermal protection.

Risk Management

a) Occupational Hazards – Steam Generation and Boilers

The Boilers Act, 1923 should be complied for establishment and operation of Boilers.

- Boilers work at a high heat adjacent to pressurized vessels, which puts their operators at risk of burns and explosions.
- Burning of fuel used in boilers may lead to fires, carbon monoxide poisoning, etc.
- Boiler operators meet various substances used in boilers (fuel, water additives, etc.) which may lead to eye and skin disorders.
- Boiler operators work in a noisy, hot and humid environment that may cause tiredness and general ill-feeling.

b) Hazards related to Steam Generation and Boilers

Table 13 Details of Hazards related to Steam Generations and Boilers

Type of Hazard	Description of Hazard
Accident hazards	Falls from ladders, stairs and elevated platforms
	Slips and falls on the level, particularly on floors made slippery by water, fuel, oils, etc.
	Mechanical accidents when operating pulveriser and stoker in coal-fired boilers

Type of Hazard	Description of Hazard
	Burns from hot surfaces, hot water and escaping steam
	Electrocution or electric shocks
	Poisoning by carbon monoxide or by other combustion products in the air, particularly in the case of faulty ventilation or inadequate air supply to burners (acute carbon monoxide poisoning may cause headache, dizziness, nausea, unconsciousness, coma and death
	Asphyxia due to breathing of oxygen-depleted air
	Splashes of hydrazine and its derivatives on the skin may cause penetrating burns and severe dermatitis
	Splashes into the eyes of chemicals used in the regeneration of ion exchange columns, in derusting and descaling; particularly, splashes of hydrazine and its derivatives may cause permanent corneal lesions
	Fires and explosions (particularly from fuel leaks) and from rags soaked with fuel; fires of soot; explosions of gas-air mixtures within the boiler
	Bursting of boilers (because of overheating and overpressure, failure of structural components due to metal fatigue, etc.) with possible fires, and injury by the explosion wave, by flying fragments, flames, steam, excessive noise, etc.
Physical hazards	Excessive continuous noise levels - as high as 94 dBA
	Heat stress caused by prolonged work at high temperatures and relative humidity's
Chemical Hazard	Irritation of eyes, respiratory tract and skin as a result of exposure to hydrazine and its derivatives, used as additives to boiler water; severe exposure may cause temporary blindness
	Pneumoconioses from exposure to vanadium-containing dust, and to asbestos from the insulation, particularly during maintenance and repair work, and from exposure to respirable fly ash

Type of Hazard	Description of Hazard
	Dermatoses from exposure to fuels and to corrosion inhibitors (various organic or metalorganic compounds) and other water additives
	Asbestos may cause cancer; smoking strongly increases the risk
Biological hazards	Development of fungi and growth of bacteria in the boiler room, due to the elevated temperature and humidity
	Presence of rodents and insects may result in bites and infectious diseases
Ergonomic, psychosocial, and organizational factors	General tiredness as a result of physical work in a noisy, warm and humid environment;
	Cumulative trauma disorders as a result of continuous repetitive movements or over strenuous efforts
	Back pains and other musculoskeletal problems (including lesions of intervertebral discs) resulting from overexertion and wrong postures, during lifting and moving of sacks and heavy loads
	Psychological stress due to dissatisfaction at work, as a result of boredom, monotony, low salary, problematic personal relations with peers and/or superiors, etc.

c) Preventive Measures

1. Wear safety shoes with non-skid soles
2. Periodically check and adjust burners operation to prevent carbon monoxide generation
3. Install effective exhaust ventilation to prevent air contamination; add local exhaust ventilation if necessary
4. Wear long-sleeve shirts and protect hands with chemical-resistant gloves; if impractical, use a barrier cream
5. Wear appropriate eye protection; consult a safety supervisor or a supplier
6. Arrange a periodic inspection of boilers to detect the failure of components, metal cracking, etc.
7. Wear hearing protection appropriate for the noise levels and type of noise - consult the supplier or an expert

8. Replace hydrazine with less-hazardous substitutes
9. Wear respiratory protection during maintenance or other work in which dust may be released into the atmosphere
10. Wear respiratory protection during maintenance or other work in which dust may be released into the atmosphere

d) Precautions to be carried out at Start in Steam Boilers

- Hydraulic should be carried out at a defined pressure before the start of a boiler.
- Check if the pump inlets are open at the start of a boiler.
- Install an automatic ash removal system such as rotary valves in a boiler so as to prevent the accumulation of ash in a furnace or other equipment. The accumulation may result in the blockage or excessive heating of boiler parts resulting in its failure.
- Pump priming must be done at the start of the boiler.
- All loose and wrong connections must be checked, and make sure to rectify the connections before starting your boiler.
- A trained and technical boiler operator must be hired to operate your boiler.

e) Precautions to be carried out Regularly

- Never operate the boiler above the design pressure and check for the safe operation of Safety valves as well as fusible plugs.
- Regular cleaning of the perforated line is necessary
- Stainer must be installed before the pump & check for its proper functioning to remove dirt particles from boiler feed water as this prevents the blockage of a feed line.
- Water must be treated before feeding it to the boiler to prevent the accumulation of dirt in a Boiler shell.
- Regular inspection and maintenance of the boiler, including its accessories and valves, to check for possible failures and cracks are necessary.
- Make sure that the boiler vents are not restricted by any kind of obstruction such as cloth etc.
- Always check for the leakages of steam, water, air and flue gases from any suspicious place.
- Follow the boiler manual for safe and efficient working of your boiler.

- The panel should be cleaned regularly and should be kept in a cool and isolated place away from your boiler.
- Check if all the hot parts of the boiler are insulated, do not touch the parts with bare hands where the insulation is not provided.
- Maintenance of both FD Fan and ID Fan is important and regularly check for greasing in all the movable parts for ease of operation.
- Regular cleaning of movable mechanical parts is necessary.
- Do not increase the frequency of a drive above 50 Hz for the safe operation of motors.
- Pressure switch, Mobrey and Pressure Gauge should be checked for their proper

f) Precautions to be carried out Occasionally:

- Occasionally clean the boiler tubes to prevent any ash deposition or to scale inside or outside the tubes. Failure to do so will affect the boiler efficiency and will eventually overheat the tubes leading to tube leakage problems.
- The ratio of primary and secondary air must be maintained in accordance with fuel feeding.
- Periodically check burner operation back pressure and line pressure to prevent any thermal hazards.

Emergency Preparedness and Response Planning

The practice of industrial risk management deals with short-term strategies and plans that can help the administration and communities at risk to prepare for and respond effectively to major accidents originating from hazardous facilities. Effective management of emergencies requires careful planning, preparedness and response in order to be able to reduce damage, rescue victims, and ensure quick return to normalcy. In the perspective of industrial risk, this would mean accidents like a toxic release, fire or explosion originating from a hazardous industry or a transportation accident involving a hazardous chemical. Emergency management deals with short-term preparedness and response strategies as well as long-term mitigation plans that can help the administration and communities deal with an emergency.

Key phases of emergency management are:

Mitigation: pre-disaster efforts directed at reducing the effect of a probable industrial event on human life and personal property;

Preparedness: actions taken prior to a disaster event that enables disaster management units to appropriately respond to the hazard;

Response: actions taken immediately prior to, during, and after, the accidental event that assists in reducing human and property losses as well as actions taken to aid in the post-disaster recovery effort;

Recovery: actions and measures that facilitate the return of social and economic activities to an acceptable standard.

The task of managing industrial emergencies is complex. Experience has shown that they often develop very rapidly, with factors that may change rapidly over time (e.g. weather conditions, traffic volumes, etc.). They are often difficult to predict and require multiple actors to work in coordination to arrive quickly at decisions to protect the community and the environment. In addition, judgments during an emergency are often tentative, imprecise and approximate due to incomplete information, and the inherent complexity and uncertainty of a rapidly evolving decision environment, where a mistake can lead to immensely adverse consequences on life and property. Such dynamic and time-sensitive requirements require emergency managers to efficient use up-to-date information from several heterogeneous and multi- disciplinary sources in order to be able to make correct decisions. The decision-making requirements are most critical when an accident situation evolves, accompanied by uncertainty and rapidly changing information. A delay in reaching a decision may lead to higher loss of lives and/or damage to property.

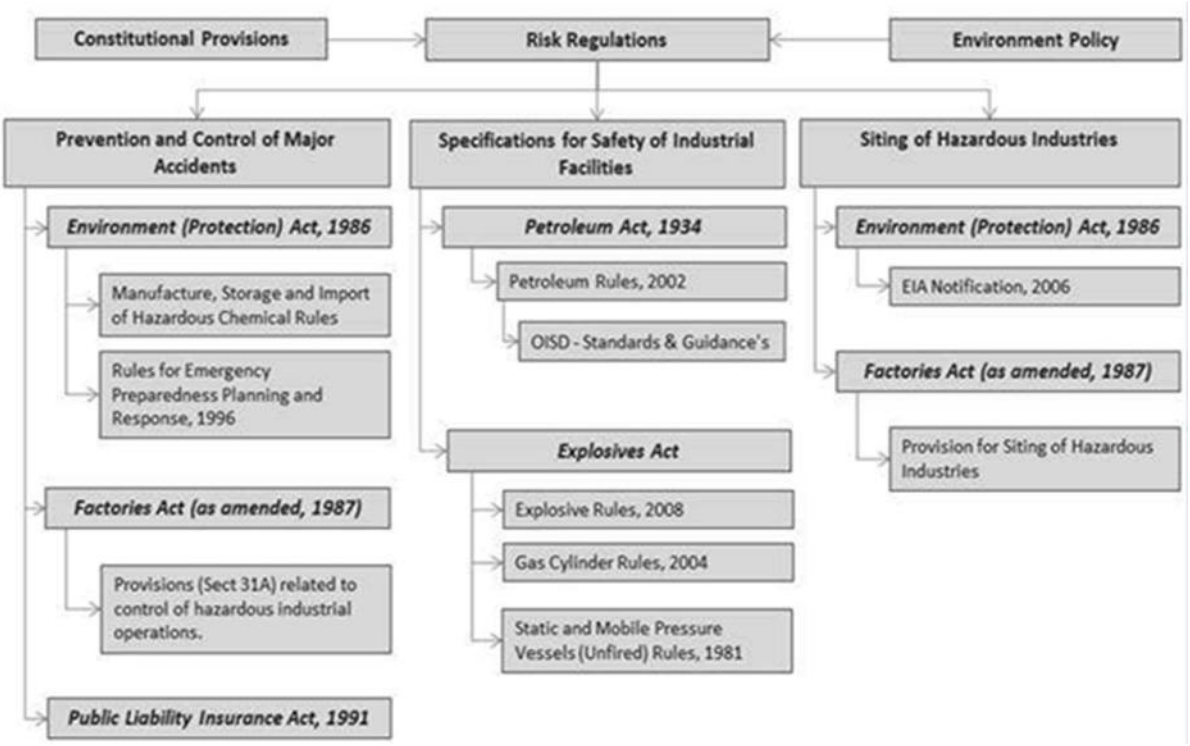


Figure 7.4. Regulatory Framework for industrial risk management

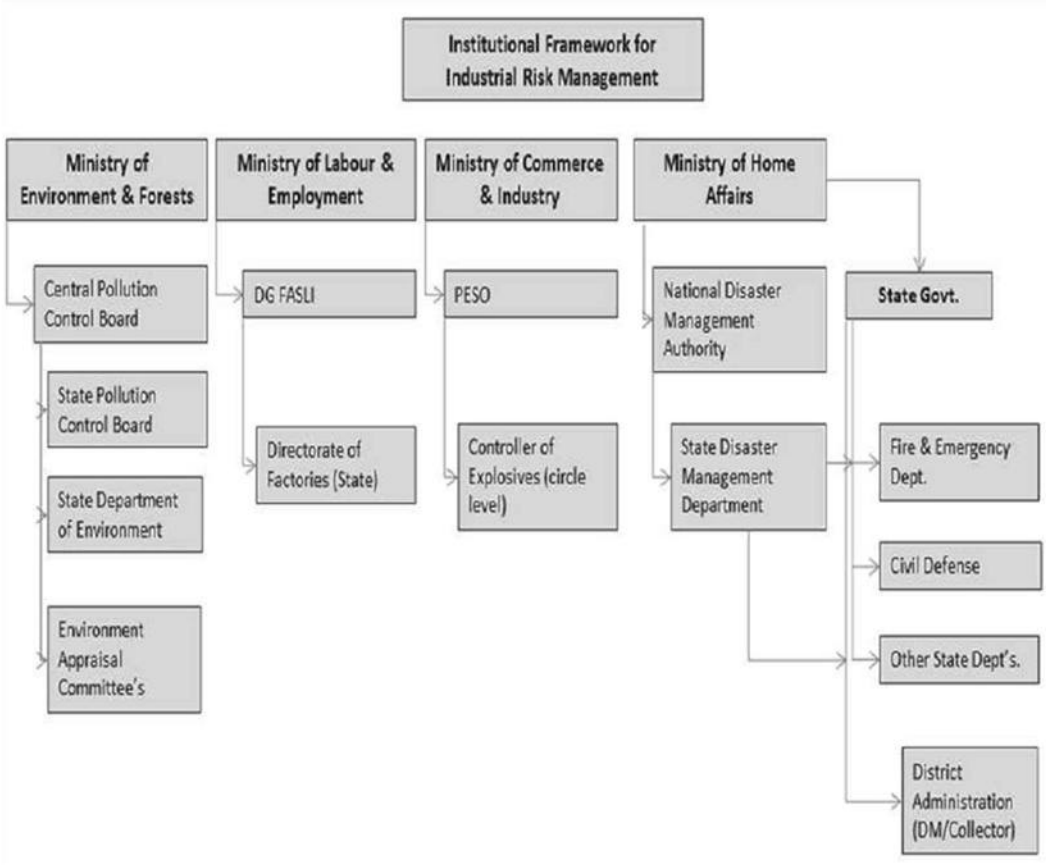


Figure 7.5. Institutional framework for industrial risk management

7.3 Disaster Management Plan

7.3.1 Introduction

The Disaster Management Plan (DMP) is a guide, giving detailed organizational responsibilities, actions, reporting requirements and support resources available to ensure effective and timely management of emergencies likely to arise from planned operations. The DMP has been prepared for the HP Bulk Drug Park on the basis of the Risk Assessment and related findings covered in the foregoing topics in this report.

7.3.2 Need for the Plan

M/s. Himachal Pradesh Bulk Drug Park Infrastructure Limited (HPBDPIL) has proposed Setting up of New Bulk drug park - HP in total area of 568.74 Hectares. The project will be developed at Villages: Kuthar Beet, Pollian Beet, Tibbian, Jodian, Janani and Mulluwal of Tahsil Haroli, District: Una, Himachal Pradesh. The Bulk Drug Park area is densely populated with large numbers of industries to be developed with manufacturing API Bulk Drug and operation of various utilities like Solvent Management Plan, Steam Supply Facility, CETP Complex, TSDF Complex etc. This clearly defines the need for a Disaster Management Plan (DMP) for HP Bulk Drug Park.

The onsite plans will be prepared by the individual Major Accident Hazard (MAH) installation as per Rule 13(1) of MSIHC Rules which will provide vital information for the offsite plan to be prepared under Rule 14(1).

A disaster can set back significantly the development of an affected region and even beyond, depending on its scale, reversing decades or more of accumulated gains. Development without recognising disaster probabilities and incorporating adequate risk reduction could, in effect, worsen existing risks and carries with it the likelihood of introducing new risks, aggravating the negative impact of potential disasters.

7.3.3 Vision

The vision behind the DMP of HP Bulk Drug Park is to work towards building a disaster safe environment for the industries and demography in the region. The DMP recognizes that disasters undermine the capacity of the district for sustainable development and that an effective Disaster Risk Reduction (DRR) approach requires administrative and financial

commitment towards sustainable human development and effective management of the environment. DMP is developed in the understanding that disaster resilience requires coordinated, committed, and inclusive action of Govt. departments, institutions and civilians to develop effective strategies for preventing hazard events from turning into disasters and to respond effectively to all emergency situations. It emphasizes building civilian and institutional capacities for DRR by promoting and advocating a policy of sustainable development and by creating awareness and enhancing the preparedness measures. It also ensures a safer community that implements a pragmatic response mechanism to manage an event of a disaster and consistently advances in all aspects of DRR.

7.3.4 Objective

By considering above, the key objectives of DMP is to plan, prepare and develop an implementable mechanism for HP Bulk Drug Park to avert and minimize the impact of disaster on human life, environment and property. Same can be described under following:

- To assess various hazard, exposure, vulnerability, capacity and risk associated with the Bulk Drug Park.
- To lay down various measures and guidelines for prevention and mitigation.
- To lay down preparedness measures for all stakeholders.
- To build the capacity of all stakeholders in the state to cope with the localized hazards.
- To provide clarity on roles and responsibilities for all stakeholders concerned with various phases of disaster risk management.
- To ensure co-ordination and promote productive partnership with all other agencies related to disaster risk management.
- To mainstream disaster risk management concerns into the developmental planning process.

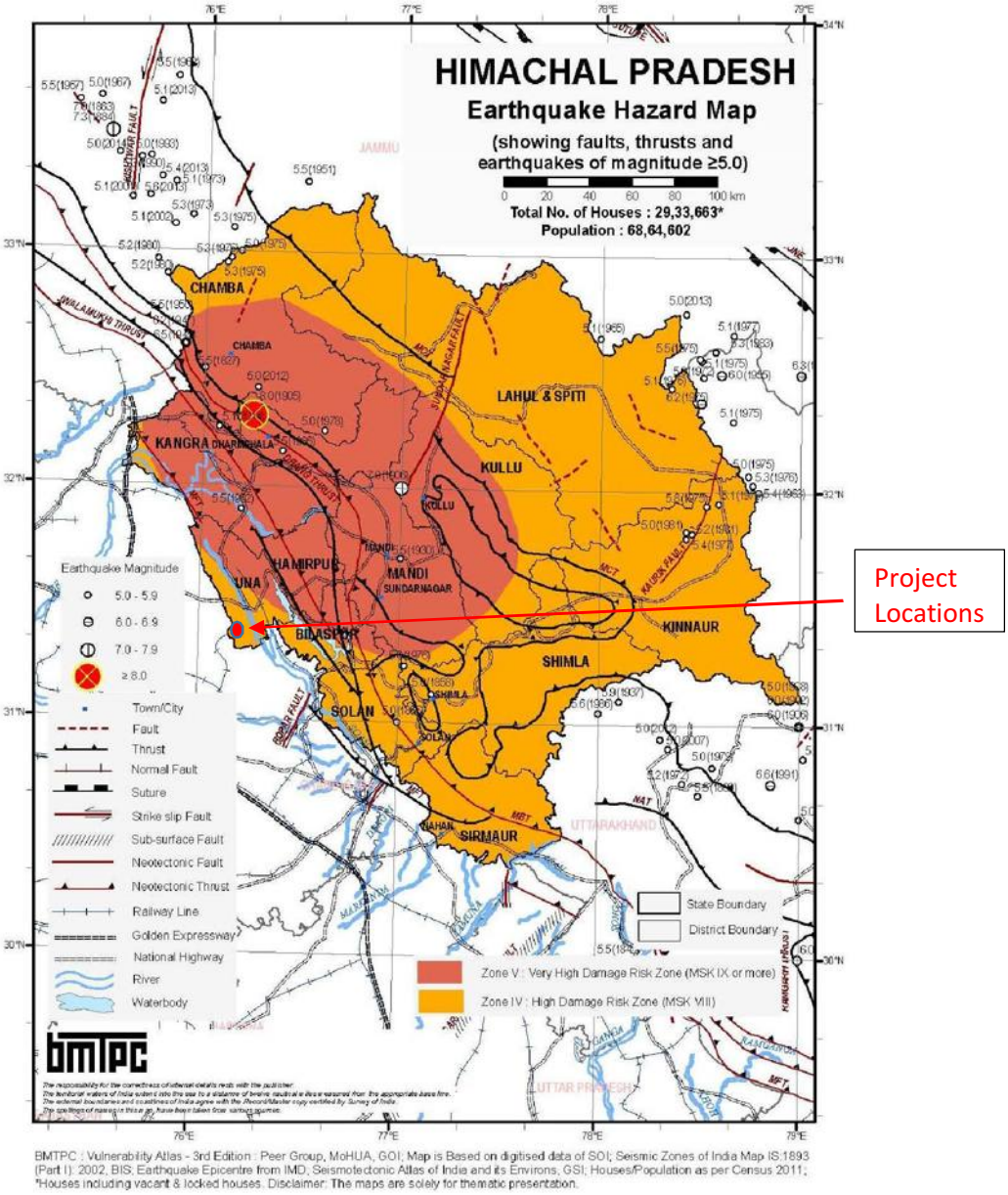
7.3.5 Brief description of the project- Identifying of Disaster Risk

M/s. Himachal Pradesh Bulk Drug Park Infrastructure Limited (HPBDPIL)has proposed Setting up of New Bulk drug park - HP in total area of 568.74 Hectares. The project will be developed at Villages: Kuthar Beet, Pollian Beet, Tibbian, Jodian, Janani and Mulluwal of Tahsil Haroli, District: Una, Himachal Pradesh.

7.3.6 Brief of Disaster Risks in Bulk Drug Park Area

7.3.6.1 Earthquake

The Bulk Drug Park area in Haroli, Una District, Himachal Pradesh falls under the Seismic Zone IV, as per the Seismic zoning map of India from IS 1893 (Part-1): 2002. Hence, the area is under no susceptible risk due to earthquakes.



BMTPC : Vulnerability Atlas - 3rd Edition : Peer Group, MoHUA, GOI; Map is Based on digitised data of SOI; Seismic Zones of India Map IS:1893 (Part I): 2002, BIS; Earthquake Epicentre from IMD; Seismotectonic Atlas of India and its Environs, GSI; Houses/Population as per Census 2011; *Houses including vacant & locked houses. Disclaimer: The maps are solely for thematic presentation.

Figure 7.6: Seismic Zones of India

7.3.6.2 Riverine Flood

The flooding in Bulk Drug Park region may occur as a result of heavy monsoons. Flash flood is the most frequent and damaging floods that occur with little or no warning causing immense loss to life and assets and infrastructures of the state. Damages are caused due to flash floods mainly in the Sutlej, Yamuna, Beas and Parvati rivers. In August 1994, the Manimahesh cloudburst and a flash flood washed away almost the entire length of Chamba-Bharmour road (62 km), over 50 people feared dead, and 2000 injured. Similarly, the flash flood in Satluj river in 2000 had claimed 140 lives in Kullu, Mandi, Kinnaur and Rampur. Floods though have not directly damaged the assets of Industrial sectors have caused direct and indirect losses to the industrial production and the manufacturing by impacting the power, road infrastructure and intra and inter-state distribution networks of the state. Floods are among the most frequent natural hazards that trigger accidents in chemical infrastructures or oil and gas pipelines that result in the release of hazardous materials, fires, and explosions. Although, the area does have storm water drains, yet the flood water may enter the industrial units. Hence, water logging becomes prominent issue which possess moderate to high risk.

7.3.6.3 Landslide

Landslides are one of the key hazards in the mountain regions particularly in the state of HP which cause damage to infrastructure i.e. roads, railways, bridges, dams, bio-engineering structures, and houses but also lead to loss of life, livelihood and environment. According to the analysis carried by TARU in 2015, 6824 villages of the state falls under high landslide risk zone whereas 11061 villages are in the medium risk zone. 824 villages are in the low-risk zone of landslides.

7.3.6.4. Fire

Fire is caused by the factory electrical short circuits, flammable materials, and operational mishandling including burning hazardous materials causing health hazards. Persons working in the factory, as well as inhabitants of in nearby places, face threat to their lives, safety and wellbeing of workers due to such fires. Industrial Fire and explosion may cause huge loss to valuable properties in the factory including stock, plants, office infrastructures, power infrastructures, storage and transport godowns, cold storages and raw material stocks thereby affecting the production and livelihood provided by the industrial units. Consideration based

on risk calculated for the different Fire scenarios and the risk levels, HPBDP possess the Fire Risk of Medium to High.

7.3.6.5 Chemical

Chemical hazard exposure (Pool Fire, Vapour Cloud Explosion and Toxic Release) due to various installations in HP Bulk Drug Park area, depending on the wind direction at the time of release it will impact the surrounding area and population. HPBDP envisages employment opportunities for more than 68,000 persons for various industries proposed in Bulk Drug Park and other contractor persons.

7.3.7 Disaster Risk Management at HP Bulk Drug Park Area

The State Government has adopted the Disaster Management Act 2005 as enacted by the Govt. of India for providing an effective mechanism for Disaster Management in the State of Himachal Pradesh. HPBDPIL includes; to identify locations suitable for industrial development, create industrial estates with infrastructure such as roads, drainage, electricity, water supply, street lights, and ready-to-occupy factory sheds.

7.3.8 Institutional Mechanism for Disaster Management at HPBDP

The proposed institutional mechanism for disaster management at HP Bulk Drug Park Area is depicted in below figure.

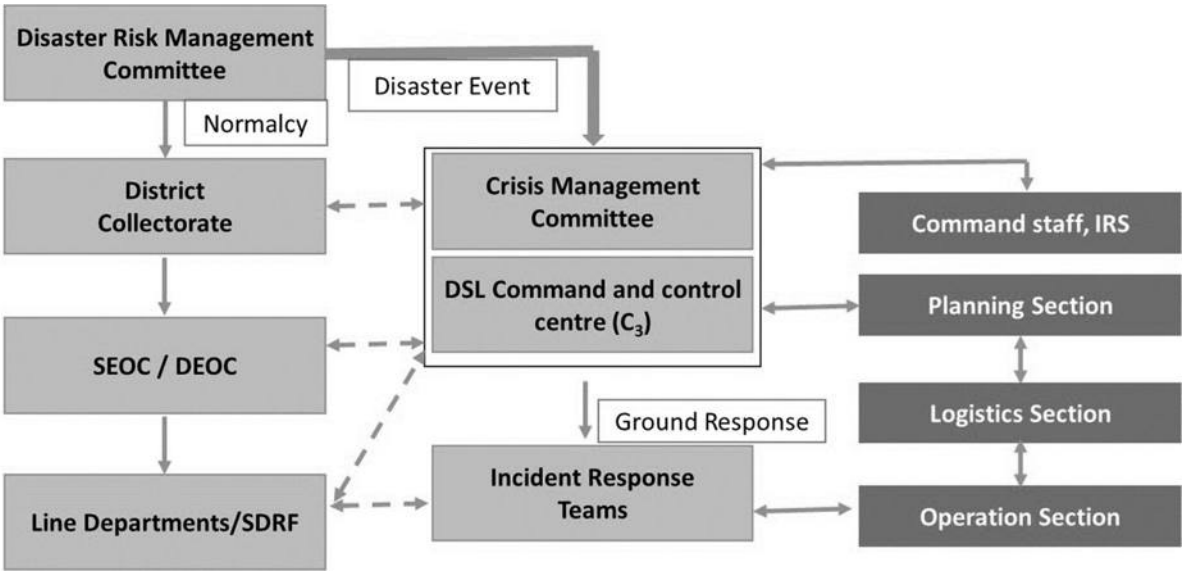


Figure 7.7: Institutional setup for Disaster Risk Management at HPBDP

7.3.9 Disaster Risk Management Committee (DRMC), HPBDP

Disaster Risk Management Committee, HPBDP is a nodal body for planning and implementing various activities during pre-disaster phase targeted for developing disaster risk resilience. To fulfil its crucial functions, DRMC shall:

a) Ensure implementation of Disaster Risk Management Plan (DRMP) of HPBDP Area
b) Ensure that on the basis of DRMP, each stakeholder lay down its Standard Operating Procedure (SOP) for integration of various DRM activities in their routine functioning and Emergency Response Plan (ERP) for prompt and effective response and relief
c) Ensure formulation of Crisis Management Committee (CMC) and Enterprise/ Financial Risk Management Committee of HPBDP
d) Develop mechanism for annual testing of DRMP, SOPs and ERPs through regular table top exercises and mock drills involving different industries and other stakeholders of HPBDP
e) Annually upgrade the Disaster Risk Management Plan of HPBDP through a participative exercise involving key stakeholders
f) Identify areas of water logging and inundation, black spots of road accidents and other specific hazard prone locations within and around HPBDP Area which may impact life, property and functioning of HPBDP.
g) Identify alternate places/ safe buildings for establishment of facilities under IRS such as temporary shelter, incident command post, staging area, medical post, relief camp, etc.

Table 7.14: Disaster Risk Management Committee, HPBDP

S. No	Designation	Designated Role
1	Chief Executive Officer	Chairperson
2	Chief Financial Officer	Vice-Chairperson
3	Manager (Infrastructure)	Member Secretary
4	Senior Manager (Land Issue & Co-ordination)	Member
5	Assistant Manager (S&M)	Member

6	Architect	Member
7	Site Engineer (Water Supply & Environment)	Member
8	Site Engineer (Civil)	Member
9	Security Officer	Member
10	Executive (Admin & Safety)	Member
11	IT Executive	Member
12	In-charge, Medical Services	Member
13	Representative, District Collectorate, Una	Member
14	Representative, Local NGO	Member
15	Representative from DMC, Haroli	Member
16	Representative from Local Crisis Group (LCG), Haroli	Member

7.3.10 Crisis Management Committee (CMC), HPBDP

It is proposed that the DRMC, HPBDP may formulate a crisis management committee (CMC), HPBDP to support decision making and monitor various activities in the event of a disaster at HP Bulk Drug Park Area level.

The key roles and responsibilities of the CMC are as follows:

a) Oversee the command, control and coordination of the disaster response and immediate relief
b) Ensures continuous information flow from the HPBDP to the stakeholders regarding the situation for effective response
c) Assist in the immediate restoration of affected services

7.3.11 Integration of Crisis Management Committee (CMC), HPBDP with Incident Response System (IRS)

The crisis management committee plays vital functions during disaster response and immediate relief. In event of any disaster, depending on the magnitude and extent of disaster, CMC activates Incident Response System of HPBDP. IRS is based on principles of unity of command and chain of command to ensure orderly and clear cut reporting pattern and eliminates duplicity in orders and efforts; thereby strengthening accountability for coordinated response. Chairperson of DRMC, HPBDP assumes the role of Responsible Officer (RO) under IRS and other members of CMC get integrated with command staff of IRS. The integration of CMC and IRS is presented in figure below.

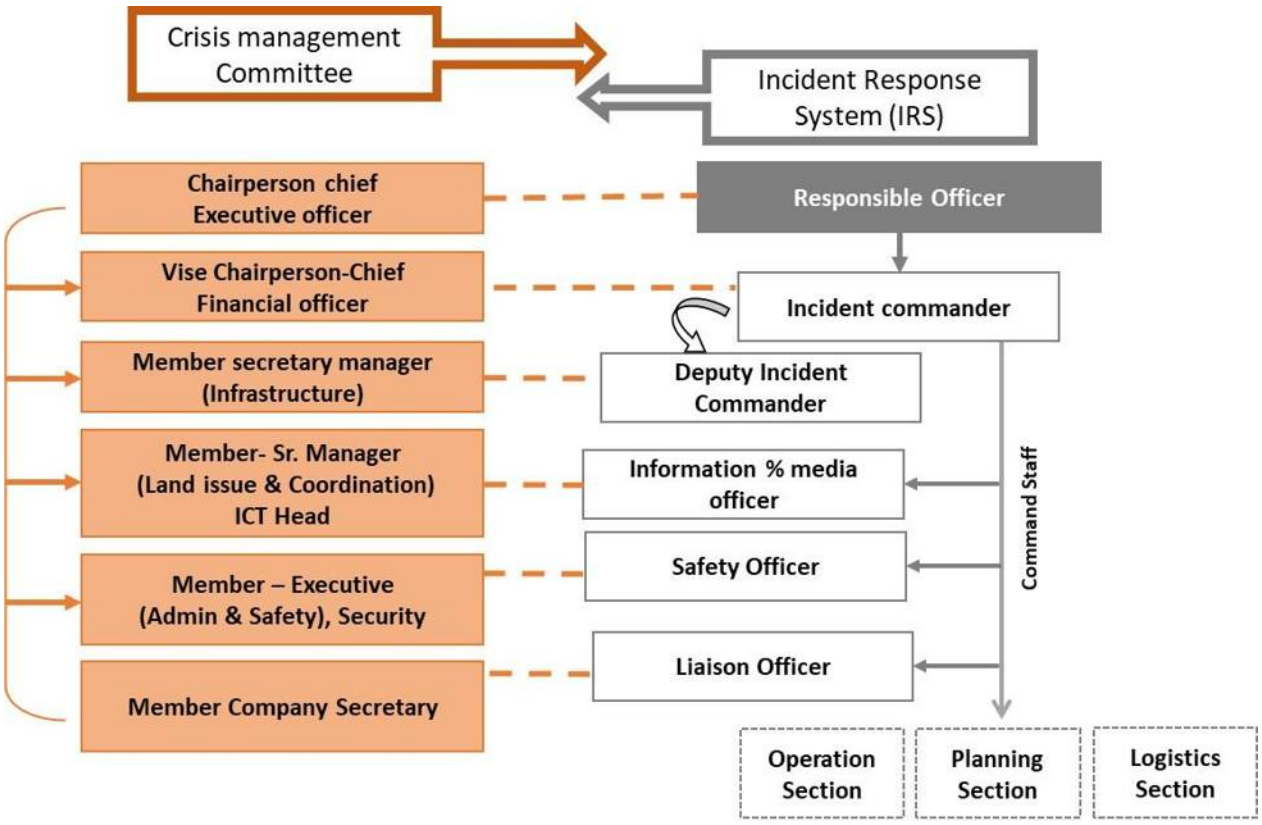


Figure 7.8: Integration of Crisis Management Committee and Incident Response System

7.3.12 Communication Linkages with Stakeholders

The communication among internal stakeholders at the HP Bulk Drug Park Area will mainly takes place through mobile phones, intercom, and emails or using hotline at Command and Control Centre (C3) and fire services. In case of disaster situation, various external departments and agencies will also play a critical role in early warning, response and relief activities.

Therefore, the C3 will act as a central hub for to and fro communication with both internal and external stakeholders. To ensure this, DRMC, HPBDP along with ICT department of HPBDP shall strengthen the resources and infrastructure at C3. Further, the DRMC, HPBDP shall also liaise with external stakeholders and establish suitable communication linkages for prompt receipt and dissemination of information as depicted in figure below. The figure identifies some of the key authorised agencies and departments for early warnings and alerts and some key emergency and response agencies with respect to HP Bulk Drug Park Area and shows the flow of communication amongst them.

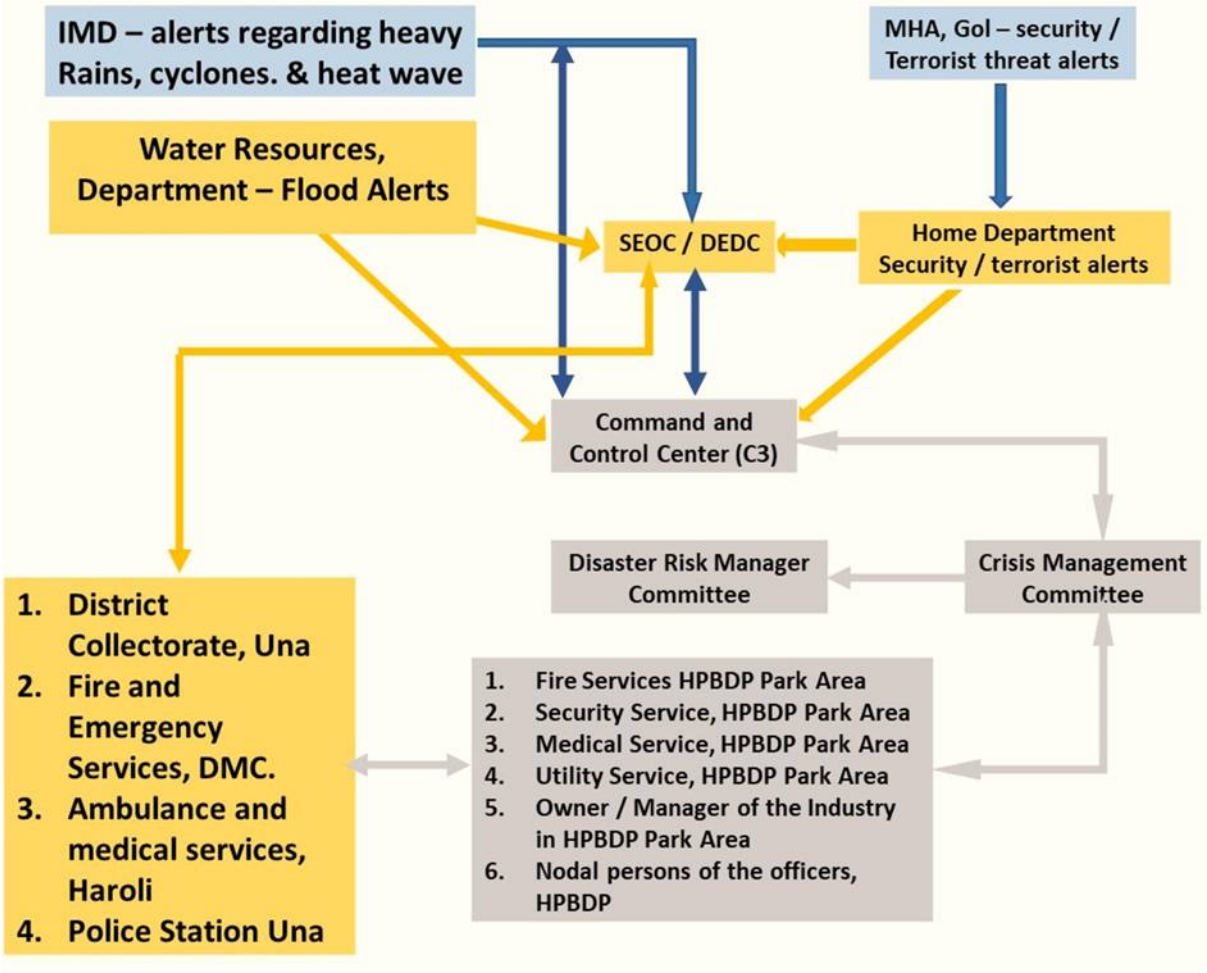


Figure 7.9: Communication Linkages with Stakeholders

7.3.13 Prevention & Mitigation Measures for Disaster Risks in HP Bulk Drug Park Area

The structural and non-structural mitigation measures to be undertaken by various stakeholders for reducing loss of life and injuries and other possible damages to assets and infrastructure at HP Bulk Drug Park Area in relation to different hazards are as follows:

7.3.13.1 Earthquake

Activities	**Responsible Department/ Agency**
▪ Ensure strict compliance with earthquake resistant building codes, standards, IRC specifications and latest techno-legal regime including NBC, BIS Codes, BMTPC guidelines, town planning byelaws, land use zoning, development control regulations and other regulations and model codes for civil works and infrastructure.	• Owner/Manager of the industry • Manager (Infrastructure), HPBDP • Senior Manager (Land Issue & Co-ordination), Architect, HPBDP.
▪ Ensure implementation of strengthening and seismic retrofitting of critical infrastructure as per recommendation of safety audits Ensure appropriate land use zonation is undertaken guided by microzonation studies conducted. ▪ Ensure that all stakeholders like developers, architects, engineers responsible for regulation and enforcement adopt earthquake-safe construction practices and provide for seismic safety in all designs and construction activities through Design Team ▪ Ensure structural safety audit of critical infrastructure and other buildings by qualified accredited professionals ▪ Liaison with leading agencies like IMD, INCOIS, ISR which provide real time seismic warnings and updates ▪ Build requisite number of trained persons to handle seismic safety and compliance of bylaws	• Site Engineer (Civil), HPBDP • DRMC, HPBDP

7.3.13.2 Riverine Floods

Activities	Responsible Department/ Agency
• Ensure regular inspection and preventive maintenance of storm water drainage / sewage system • Ensure cleaning and de-clogging of drainage before monsoon and rainy season • Build requisite number of trained persons in compliance of bylaws • Ensure strict compliance with relevant building codes, standards, IRC specifications and latest techno-legal regime including NBC, BIS Codes, BMTPC guidelines, town planning byelaws, land use zoning, development control regulations and other regulations and model codes for civil works and infrastructure • Design drains as per future projections of run off in HPBDP Area due to change in rainfall pattern • Undertake studies on flood line mapping, vulnerability analysis and flood risk assessment of the areas prone to floods and urban flooding based on hydrological profile with help of professionals and experts of the field • Regulate land use in the flood plains/ catchment areas to restrict damage due to floods • Implement afforestation programmes in chronic low lying areas Maintain a proper GIS-based inventory of existing storm water drainage system/ sewage system starting from the smallest connection to the sewer trunk mains for all the areas which are serviced with a proper sewerage system.	• Owner / Manager of the industry • Manager (Infrastructure), HPBDP • Senior Manager (Land Issue & Co-ordination), HPBDP • Architect, HPBDP • Site Engineer (Civil), HPBDP • DRMC, HPBDP • DMC, Haroli • DEOC, Una

7.3.13.3 Storm

Activities	Responsible Department/ Agency
• Ensure incorporation of wind resistant features in planning and construction of housing & commercial schemes and other critical infrastructure in HPBDP Bulk Drug Area • Ensure regular plan shapes and avoid re-entrant corners as an asymmetrical building with zig-zag plan and having empty pockets is more prone to winds compared to a symmetrical building with a compact plan-form • Ensure that communications and power transmission towers are designed on the basis of 100-year return period wind velocity • Undertake studies on vulnerability analysis and storm risk assessment • Estimate possible inundation levels and demarcate areas likely to be inundated • Liaison with IMD for real time warnings and updates • Ensure regular inspections/ survey conditions of roads, culverts and bridges pre and post monsoon period - Manual for highway inspection and Guidelines for inspection and maintenance of bridges Build requisite number of trained persons in safety and compliance of bylaws	• Owner / Manager of the industry • Manager (Infrastructure), HPBDP • Senior Manager (Land Issue & Co-ordination), HPBDP • Architect, HPBDP • Site Engineer (Civil), HPBDP • DRMC, HPBDP • DMC, Haroli • DEOC, Una

7.3.13.4 Fire

Activities	**Responsible Department/ Agency**
• Ensure that all buildings / industries in HP Bulk Drug Area meet requirements for structural fire resistance and compartmentation laid down in national building code and Himachal Pradesh Fire Prevention and Life Safety Measures Regulation. • Ensure that building elements such as columns, beams, floors shall be of minimum fire resistance rating (ability to withstand the effects of a fire for the minimum specified time period) depending on occupancy, height and floor area • Ensure that doors of HVAC room open outside • Ensure that materials used in building construction are non-combustible and do not contribute to the spread of fire.	• Owner / Manager of the industry • DRMC, HPBDP • DDMA, Una
• Ensure that all buildings are designed with proper access to emergency vehicles and minimum outback as per building codes and standards • Install requisite fire protection system and equipment on each floor of the building as mandated by NBC fire safety codes and Himachal Pradesh Fire Prevention and Life Safety Measures Regulation • Install proper fire alarm system and voice communication system for generating alert to occupants and assisting them in providing directions • Install smoke exhausts for long interior corridors, occupied large floor areas, atrium and parking areas to provide additional level of protection to occupants for evacuation	

• Install proper signage showing exit routes, fire-related instructions, assembly points, etc. • Ensure regular fire audits (Rapid Visual Screening) to check adequacy and functioning of firefighting systems and equipment in each building • Conduct regular mock drills in participation with concerned stakeholders	

7.3.13.5 Chemical Hazards

Activities	**Responsible Department/ Agency**
• Implement land-use restrictions to provide minimum safe distances from hazardous sources to residential complexes, school, hotel and other public places • Ensure suitable material for construction of chemical storage rooms/ plants to prevent corrosion and other adverse impacts in case of chemical spillage or release • Identify infrastructure and population in vicinity to these facilities which is likely to be affected in case of release of hazardous material Ensure overall chemical safety of the facilities / buildings / industries including process safety, transportation, storage, handling, personal protective equipment, staff training, etc. as laid down in MSDS and operational and handling manual of concerned chemical • Identify routes for transportation of hazardous materials and ensure necessary safety & security measures • Put in place SOP on process safety and prompt evacuation & response in case of release of hazardous materials	• Owner/ Manager of the industry • DRMC, HPBDP • DDMA, Una

• Ensure proper anchoring of storage tanks and containers to avoid spillage and other damage to them • Ensure proper bracing of overhead pipes carrying hazardous chemicals and gases • Develop inspection formats and guidelines specific to plants and utilities involving chemicals and gases • Build requisite number of trained persons in chemical safety and compliance of bylaws	

7.3.13.6 Road Accidents

Activities	**Responsible Department/ Agency**
• Ensure demarcated pedestrian facilities for differently-abled persons • Ensure roads are constructed as per technical standards laid down by • Indian Road Congress (IRC) • Ensure employees and occupants abide by safety standards including seat-belts, safety helmets, etc. • Ensure proper SOP are followed during transportation of hazardous materials • Ensure roads, pavements, dividers are fully functional during monsoon season and promptly attend to any repair works = Display proper signage showing allowed direction of traffic, parking places, etc. • Install proper road barriers wherever needed to ensure	• Owner /Manager of the industry • DRMC, HPBDP • R&B Panchayat, Una

smooth flow of traffic or at places with restricted entry	

7.3.13.7 Terrorism/ Public Unrest

Activities	**Responsible Department/ Agency**
• Identify the key facilities and infrastructure at risk of terrorist attack and public unrest • Ensure enhanced protection of critical facilities and infrastructure at risk including the ones carrying or storing hazardous material, data centre, etc. • Prevent illegal trafficking of hazardous material in the Area • Ensure integrity assessment of pipelines carrying hazardous materials, tunnel and other utilities using supervisory control and data acquisition (SCADA) system and periodic inspections • Ensure a proper grievance redressal mechanism to prevent any labour dispute or demonstrations • Train disaster management teams for crowd and rumour management	• Owner / Manager of the industry • DRMC, HPBDP

7.3.14 Training

DRMC shall ensure organising the following training programmes for different stakeholders with the help of training institutes and field experts such as HPDMA, Red Cross Society, Fire & Emergency Services, Una, 108 Emergency Services, etc. Considering the nature of development at HPBDP Area, DRMC shall ensure assessing the new training needs of the HPBDP and shall include more training programmes accordingly.

To begin with, the trainings could be targeted for members of internal response teams and different disaster management teams proposed under DRMP. After successful conduct of these

trainings, as the next step, occupants and residents of HPBDP at large shall be trained in batches for further strengthening the capacity of first responders.

Proposed Training	**Key Components of Training**	**Target Participants**
Understanding Risk Disaster Management Plan of HPBDP Area	• Concepts of Disaster Risk Management contextualised for HPBDP Area • Understanding HRVC of HPBDP Area • Hazard wise do-s and don't-s • Understanding disaster risk governance and mechanism at HPBDP Area • Knowing and understanding roles & responsibilities of all stakeholders during pre-disaster phase of prevention, mitigation, preparedness & capacity development and financial mechanism • Understanding Incident Response System and Emergency Support Functions for HPBDP Area Principles and mechanism of relief, rehabilitation, reconstruction and recovery Implementation & maintenance of DRMP	• DRMC • CMC • Developers / Property Managers / • Owners of the Industries • Medical Services, HPBDP • Representative from DMC, • Haroli.
Disaster of Communication and Functioning Control Room	• Recording and dissemination of early warning/ alert • Clear and concise dissemination to avoid panic, chaos and stampede. • Functioning of various surveillance and communication equipment at HPBDP Area Alternate communication mechanism • Effective communication with internal and external response agencies • Coordination with District and State Emergency Operation Centre	• Staff of Command and Control Centre • Staff of Control Room of various Industries • Security services, HPBDP

Fire Safety and Management	• Identification of fire hazards at HPBDP Area and possible mitigation measures • Types of fires and how to fight them • Types of fire safety and firefighting systems including fire extinguishers at HPBDP Area Operation and maintenance of these systems • Identification of fire exits and fire escape routes • Procedure of fire evacuation	• CMC, HPBDP • Representatives from Developers / Property Managers / Owners of the Industries • Representatives from DMC, Haroli.
Evacuation & Search and Rescue	• Mechanism for evacuation; knowing emergency exits and routes and assembly point Understanding signage and displayed instructions Maintenance of emergency routes and exits Procedure for head count and generating alarm for missing people Types and technical procedure for emergency lifts. Mechanism for handover to medical services	• CMC, HPBDP • Representatives from Developers / Property Managers / Owners of the Industries • Representatives from DMC, Haroli.
First Aid	• Principles of first aid • Performing triage • Detailed first steps for various kind of possible injuries in aftermath of disasters at HPBDP • Procedure for emergency lifts • Types of bandages and knots • Procedure for handover to medical/ referral services • Psycho-social first aid	• CMC, HPBDP • Representatives from Developers / Property Managers / Owners of the Industries • Representatives from DMC, Haroli • Staff of Security Services, HPBDP • Staff of Medical Services, HPBDP
Security and Surveillance	• Understanding possible security hazards Involving public at large in reporting suspicious activities Responding to different kinds of security issue Functioning of various surveillance and communication equipment at HPBDP.	• CMC, HPBDP • Representatives from DMC, Haroli. • Staff of Security Services, HPBDP

		• Staff of Medical Services, HPBDP
Chemical Safety and Management	• Understanding hazardous material stored at • HPBDP Area • Knowing the detailed mechanism of their process safety • Identification of released/ leaked material and use of antidotes • Communication to external response teams in case of chemical disasters • A separate non-technical session for general residents around the storage units on do-s and don't-s in case of release/ leakage of hazardous materials	• Staff of concerned utilities • Representatives from Developers / Property Managers / Owners of the • Industries • Staff of Fire Services, HPBDP • Staff of Security Services, HPBDP • Staff of Medical Services, HPBDP • Population at risk •
Post Damage and Need Assessment	• Understanding principles and procedure for conducting damage and need assessment Understanding minimum standards of relief existing at state, national and global level • Understanding needs of vulnerable groups Mechanism for reporting and successive updation in standard formats.	• CMC • MIRA and PDNA Team
Multi-hazard Resilient Construction and Design	• Understanding hazard profile of HPBDP Area • Knowing the techno-legal regime at state, national and global level including national building codes, BIS standards, BMTPC • guidelines for various hazards • Understanding non-structural hazards in a building and possible mitigation measures	• Concerned teams of Planning and Engineering Department, HPBDP • Representatives from Developers / Property Managers / Owners of the Industries

	• A separate easy-to-comprehend session may also be undertaken for masons deployed for construction work at HPBDP Area	

7.3.15 Roles and Responsibilities of various department of HPBDP

7.3.15.1 General Preparedness Measures for All Stakeholders

The following are some of the common preparedness measures to be undertaken by all stakeholders of the HPBDP including each industry, utilities, developers, residents, office bearers, shop/ outlet owners, school, medical centre, etc.:

- Each head/ owner to actively support Disaster Risk Management Committee (DRMC) and Crisis Management Committee (CMC) by formulation of disaster management teams in their respective industries
- Each head/ owner to ensure safety of all labourers/employees deployed by the industry/ office/ building for construction/ renovation/ maintenance or any other support and services. Maintain a record of them for head count during evacuation, search and rescue and other response and relief operations
- Each head/ owner to ensure development of SOP/ Emergency Response Plan/Onsite Emergency Plan for respective industry/ office/ building on the lines of DRMP, HPBDP
- Each stakeholder to ensure support and active participation to DRMC and CMC in implementation of all components of DRMP, HPBDP Area
- Each stakeholder to ensure compliance to all recommendations provided by DRMC and CMC

7.3.15.2 HPBDP Administration

Chief Executive Officer (CEO), heading both the development authority and administration, will ensure that the following preparedness measures are promptly and diligently implemented by respective officers, departments, subsidiaries and other stakeholders of HPBDP.

a) Legal Department

Company Secretary, HPBDP shall ensure that the following subsidiaries of HPBDP undertake their respective preparedness measures.

- Ensure all the concerned departments and stakeholders are informed of respective legal mandates of disaster risk management
- Ensure all legal compliances in relation to disaster management are incorporated in planning and development
- Establish mechanism to facilitate legal aid and advice to affected persons and entities in aftermath of disasters, if required

b) Landscape Department

Senior Manager (Land Issue & Co-ordination), HPBDP shall ensure that the following subsidiaries of HPBDP undertake their respective preparedness measures.

- Ensure suitable, deep rooted tree plantation to avoid uprooting due to strong winds
- Assess the conditions of trees/ branches before monsoon and rainy season and take appropriate measures to prevent them from uprooting/ falling
- Ensure regular maintenance and trimming of gardens, wild bushes, etc., especially during monsoon season, to prevent growth/ shelter to insects and reptiles

c) Human Resources

Assistant Manager (S & A), HPBDP shall ensure that the following subsidiaries of HPBDP undertake their respective preparedness measures.

- Develop a central digital database of all employees and staff, and HPBDP occupants of HPBDP Area with segregated data (on age, gender, differently-abled persons, night population, day population, etc. to assist in understanding vulnerable population at any given time) which can be easily updated on change of any information
- Develop a similar database for recording trained human resources available with different stakeholders at HPBDP Area and segregate the data showing their respective age, gender, skills, contact details, location and availability timing in HPBDP; ensure mechanism to promptly update any change in information
- Ensure data base of experts and practitioners who can be recruited/ hired immediately after disaster for providing technical guidance and support for post-disaster operations.

d) Engineering Department

d.1 Water and Sewage

Site Engineer, Water Supply & Environment, HPBDP shall ensure that the following subsidiaries of HPBDP undertake their respective preparedness measures.

- Ensure proper monitoring of the water and sewage carrying pipeline and other infrastructure through routine physical inspection for prompt detection of damage/ disruption in services
- Keep at disposal the MSDS and supplier's handling and storage instructions of chemicals and ensure all operators of chemicals are duly aware of safety precautions and respective do-s and don't-s.
- Keep at disposal suitable personal protective equipment including working gloves, protection shoe, chemical protective clothing while working in chemical rooms and/or handling stored chemicals
- Maintain, at disposal, minimum stock of critical spare parts, drainage inventory aids in operation & maintenance, monitoring system and other critical installations which are not readily available for prompt repair and restoration of water supply, treatment, pumping & storage and drainage & sewage system
- Identify nearby vendors for prompt supply of the same, if required
- Establish procedure for prompt communication of disruption of water supply, treatment and sewage services with suggestive time required for repair/ restoration to concerned industry/ owner, so that they can plan their functioning accordingly
- Identify nearby service providers for technical support and services during major damage / disruption of water and sewage system and consider signing MoU or having mutual aid agreement with them
- Consider signing MoU or having mutual aid agreement with nearby service providers like vehicle mounted RO systems with integrated power source, water tanker providers, packaged drinking water, vehicle mounted heavy duty dewatering pumps, portable toilets
- Ensure sufficient stock of chlorine tablets for purification of drinking water, in case of disruption in water treatment plant

e) Planning, Architecture & Environment

Architect, HPBDP in coordination with Owner / Manager of the industries shall ensure that the following subsidiaries of HPBDP undertake their respective preparedness measures.

- Ensure display of signage/ markers of 'do not dig, gas pipeline' along the route of buried gas pipeline to avoid damage/ accidents/ leakage during possible excavations
- Develop GIS databases and maps for HPBDP Area indicating all critical structures and utilities, safe assembly points, suggested location for various facilities under IRS, resources available within and in nearby areas for better DRM planning
- Develop detailed floor layout maps having details of evacuation routes, location of fire extinguishers & fire alarm, first aid box and emergency exits, staircases, lifts, ramps, assembly points, refuge area, etc. of each floor in all buildings occupied by HPBDP; display them on respective floors and ensure that a copy of the same is placed with internal response team and can also be made readily available digitally or otherwise for quick familiarisation of external response teams
- Ensure that each owner / manager of the industry prepares similar evacuation maps for their respective buildings; ensure their display on respective area and that a copy of the same is placed with internal response team and can also be made readily available digitally or otherwise for quick familiarisation of external response teams
- Ensure that all designs of proposed development comply with laid down techno-legal regime including town planning byelaws, land use zoning, development control regulations and other regulations and model codes for civil works and infrastructure, national building codes, BIS standards, BMTPC guidelines, environmental compliances, etc.

f) ICT Department

IT Executive, HPBDP and Executive, Admin & Safety, HPBDP in coordination with Owner / Manager of the industries shall ensure that the following subsidiaries of HPBDP undertake their respective preparedness measures.

- Ensure display of signage/ markers of 'do not dig, ICT cables' along the route of buried cables to avoid damage during possible excavations

- Establish mechanism to set up temporary communication facilities in case of damage to ICT infrastructure
- Ensure having binding agreements with telecom service providers to restore damaged facilities
- Ensure inter-operability among different telecom service providers
- Establish mechanism at C3 for prompt communication linkages with internal and external response agencies during disasters
- Establish mechanism for receiving early warning and alert from identified departments and agencies and prompt dissemination of the same to CMC, internal response teams and public at large through public address system/ mass messaging system, etc.
- Ensure linking of all control rooms at HPBDP with the centralised surveillance system at C3.

g) HPBDP Administration

Manager, Infrastructure, HPBDP in coordination with Owner / Manager of the industries shall ensure that the following subsidiaries of HPBDP undertake their respective preparedness measures.

- Identify and liaison with nearby service providers of packaged food, mobile kitchen and dry ration, baby foods, packaged drinking water, etc. for prompt procurement
- Identify liaison with nearby organisations/ trusts and NGOs for setting up community kitchens for prompt procurement
- Identify nearby vendors supplying blankets, tarpaulins, pre-fabricated structures, tents, inflatable lights, torches, ropes, etc. for prompt procurement during response and relief operation
- Consider entering into a pre-contract with the above identified vendors and service providers for prompt deployment during disaster
- Identify safe and open location for setting up temporary shelters and relief camps in case of failure of any safe building to host the same.

h) Fire Services

Executive, Admin & Safety, HPBDP in coordination with Owner / Manager of the industries shall ensure that the following subsidiaries of HPBDP undertake their respective preparedness measures.

- Ensure regular maintenance of firefighting and fire safety installations, fire hotline at HPBDP
- Identify and establish mutual aid agreements with nearby fire services providers of government, private and corporate sectors, industrial setups, etc.
- Establish centralised fire alarm generation system to get real time alert of fire incidents in any part of HPBDP Area
- Ensure the staff of fire services is duly aware of all possible hazards leading to fire incidents and is duly trained and equipped to fight the same
- Keep, at disposal, MSDS of various hazardous materials stored at industries in vicinity of HPBDP and train the response staff accordingly to address possible release/ leakage of the same; ensure the response staff is duly equipped with personal protective equipment before entering the exposed area
- Keep, at disposal, digital copy of floor layout of various buildings / industrial buildings and utilities of existing in HPBDP Area and familiarise the firefighting staff with the same for prompt and informed access to buildings during firefighting or search and rescue operations

i) Security Services

Security Officer, HPBDP in coordination with Owner / Manager of the industries shall ensure that the following subsidiaries of HPBDP undertake their respective preparedness measures.

- Ensure regular maintenance of security and communication equipment
- Prepare to surge the capacity of security services for emergency deployment with the help of service provider
- Ensure the staff of security services is duly aware of all possible security hazards including terrorist attack, public unrest, mob violence and is duly trained and equipped to control the same

- Establish mechanism for surveillance of HPBDP Area during high alert in Una, Himachal Pradesh or India
- Establish mechanism for robust public address system
- Establish SOP for crowd management and rumour management during large/ VVIP congregation at Haroli, Una.
- Keep, at disposal, MSDS of various hazardous material stored at industries in vicinity of HPBDP and train the response staff accordingly for carrying out search and rescue operation in case of release/ leakage of the same; ensure the response staff is duly equipped with personal protective equipment before entering the exposed area
- Keep, at disposal, digital copy of floor layout of various buildings / industrial buildings and utilities of existing in HPBDP Area and familiarise the security staff with the same for prompt and informed access to buildings during search and rescue operations

j) Medical Services

In-charge, Medical, HPBDP in coordination DRMC shall ensure that the following subsidiaries of HPBDP undertake their respective preparedness measures.

- Ensure availability of medical stocks capable of treating 25/50/100 casualties for prompt mobilisation in case of an emergency
- Identify nearby vendors of drugs, equipment and consumables including vaccines, antidotes, etc. for prompt procurement of medical supplies during response and relief operations
- Identify nearby referral services, trauma centres, blood banks, poison centres, diagnostic laboratories/ centres, specialised facilities to cater to chemical disaster victims, etc.
- Establish mechanism for prompt establishment of medical post and for surging capacities to respond to any mass casualty emergency at HPBDP Area by making advance tie ups and arrangement with Civil Hospital, Una and other private hospitals for making available doctors and para-medic staff at short notice for relief camps or for referral services
- Keep, at disposal, MSDS of various hazardous material stored at industries in vicinity of HPBDP and train the medical staff accordingly for treatment of victims exposed to

hazardous materials; ensure the medical staff is duly equipped with personal protective equipment before handling and treating such victims

- Ensure that staff of medical service is duly trained in psycho-social first aid
- Medical Services with the help of DRMC, HPBDP Industries and subject matter experts, develop and regularly update the Antidote plan.

k) Owner / Manager of the Industries

- Develop detailed emergency maps having details of evacuation routes, location of fire extinguishers & fire alarm, first aid box and emergency exits, staircases, lifts, ramps, assembly points, refuge area, etc. of each building of the industry; display them on respective area and ensure that a copy of the same is placed with internal response team and can also be made readily available digitally or otherwise for quick familiarisation of external response teams
- Develop and implement SOP and On-site Emergency Plans for respective industry as mandated by MSIHC
- Ensure that all staff including operation & maintenance team, housekeeping, etc. are duly aware of all hazards and corresponding do-s and don't-s, SOP, On-site Emergency Plans and trained for the same
- Develop and implement Disaster Risk Management Plans for respective industry as mandated by DM Act
- Ensure safety and other compliances in all buildings including under-construction sites
- Ensure regular audits and maintenance of fire-fighting systems and other safety installations in the building
- Ensure that labourers at construction/ renovation/ maintenance sites are adequately equipped with personal protective equipment and are aware of possible hazards and necessary actions to be taken in case of any emergency
- Establish mechanism for prompt dissemination of early warnings and alerts to labourers in construction/ renovation/ maintenance sites and ensure their safe evacuation
- Establish mechanism for recording labourers at construction/ renovation/ maintenance sites present on the day for ensuring headcount in case of evacuation
- Establish mechanism to receive prompt disaster warnings and alerts from C3

7.3.15.3 Occupants

a) Industries/Offices/ Businesses

- Develop business continuity mechanism for respective businesses undertaken
- Identify hazards at office level including those in pantry area, electric/ generator room, etc. and take suitable non-structural mitigation measures to ensure safety of employees and staff and to assist in safe and smooth evacuation process
- Ensure regular audit & maintenance of fire safety, first aid and other safety supplies at office level
- Ensure readily available digital database of employees and staff (segregated based on gender, age and differently abled, pregnant & lactating women, etc.) present on the day for ensuring headcount in case of evacuation
- Develop an office level disaster risk management plan/ SOP on lines of HPBDP Area DRMP and ensure its implementation & upgradation
- Actively support DRMC and CMC in planning and implementing all disaster risk management activities

b) Residents of Kuthar Beet, Pollian Beet, Tibbian, Jodian, Janani and Mulluwal

- Identify hazards at household level including electric instalments, kitchen area, LPG cylinders, chemicals stored for cleaning purpose, insect repellents and other flammable and hazardous materials, non-structural hazards, etc.
- Develop Village level disaster management plan/ SOP and emergency and safety kits
- Ensure each family member is duly aware of possible hazards and corresponding do-s and don't-s
- Ensure infants, children, old aged persons, differently-abled (divyaang) members, pregnant and lactating mothers are taken special care of during all phases of disaster risk management, especially, evacuation, response and relief
- Make a list of special needs of above mentioned vulnerable groups and convey them to MIRA team during need assessment in aftermath of disasters
- Actively support DRMC and CMC in planning and implementing all disaster risk management activities

7.3.15.4 Signage

Signage shall be placed/displayed at appropriate locations inside the buildings as well as outside the buildings. The material, colour, size etc. of the signage should adhere to the ISO/BIS standards.

- The Exit Sign shall be well illuminated.
- A sign shall be posted and maintained on every floor at or near the lift indicating that in case of fire, occupants shall use the stairs unless instructed otherwise. The sign shall also contain a plan for each floor showing the location of the stairways. Floor marking shall be done at each floor on the wall in front of the lift-landing door.
- Floor indicators and signage's for fire alarms and fire extinguishers have to be given in lobbies, staircases, refuge areas and any other escape routes.
- Smoking shall be prohibited throughout the basement(s) and in all areas where there is a profusion of combustible materials. Easily readable "NO SMOKING" signs must be conspicuously posted at locations where they can catch the eye.]

7.3.15.5 Emergency Evacuation Routes

The emergency evacuation routes need to be as direct as possible reaching to the assembly points which may take minimum possible duration of time to reach. The exit paths of a building must be clearly marked and always clutter free. Even though the floor level disaster management teams along with security personnel are guiding occupants to assembly points,

the directions shall be clearly signposted. Emergency exits shall be illuminated at all times with emergency lighting and routes shall be guided with radium signage. Evacuation maps to be prepared marking the emergency evacuation routes from emergency exits reaching out to respective assembly point. The maps shall be clearly displayed in the buildings guiding to the staff and visitors. An exercise undertaken to prepare the evacuation maps of the major operational buildings along with demarcating routes of the emergency vehicles.

7.3.15.6 Mock Exercise

Mock exercise at Bulk Drug Park Area will help in testing of the efficacy of the DRMP including evaluating preparedness, response and improving coordination within the administration, with various departments, utility service, developers, property managers, offices/businesses, communities, government departments and all other relevant stakeholders. Mock drill shall be conducted at different locations of Bulk Drug Park Areas on different scenarios. The district level mock drill shall be conducted once in a year involving multiple industries and utilities with multiple scenarios. DRMC shall prepare a mock drill calendar for ready reference.

7.3.15.7 Post Disaster Needs Assessment (PDNA)

The data collected through Multi-Cluster/ Sector Initial Rapid Assessment caters mainly for providing response and immediate relief base on extent and nature of damage. This however is not adequate for undertaking comprehensive assessment of the disaster impacts in terms of loss of livelihood, economic loss of businesses, impact on living conditions, disruption of services and social activities and thereby overall impact on the socio-economic development of the Bulk Drug Park Area and its occupants and residents. For this purpose, it is pertinent to undertake PDNA which caters to not only sectoral damages but also losses and thereby ensures that the post-disaster needs for recovery and reconstruction are duly accounted and financed. Thus, PDNA helps set up credible baselines for subsequent monitoring and evaluation of reconstruction and recovery program.

A bottom-up approach of first undertaking sectoral assessment and then careful aggregation of sectoral results to analyse overall disaster impact at Bulk Drug Park Area level is recommended. Key sectors at Bulk Drug Park Area are power, gas, water resources, water supply, sewerage and waste management, transportation, ICT, business services, Common

Steam Supply Facility, Common Effluent Treatment Plant, Sewage Treatment Plant(s), TSDF (Secured landfill, Incineration, MEE/SD facility), Municipal waste management facility, Common solvent recycling facility, etc. and other services at amenities centre. To ensure comparability of assessment results, from one disaster to another, standard methodology and format shall be used for carrying out PDNA for all concerned sectors of economic and social activity of Bulk Drug Park Area. Government of India has developed PDNA tools based on existing damage assessment system in India. The tools include PDNA India Handbook, PDNA India Manual and PDNA India SOP. DRMC, Bulk Drug Park Area shall be guided by these PDNA tools in undertaking the PDNA exercise.

Conclusion

The Disaster Management Plan (DMP) is prepared in conjunction with and taking into consideration all technical reviews and suggestions as per acceptable norms. These details shall be considered as guidelines for preparation of individual DMP by other member industries based on respective (industry specific) detailed risk analysis.

7.4 REHABILITATION AND RESETTLEMENT (R&R)

No R&R is applicable to the proposed project.

7.5 TRAFFIC STUDY

Traffic study is under investigation and will be incorporated in Final EIA report.

7.5.1 METHODOLOGY ADOPTED

Traffic analysis is basically the process of intercepting and examining the number of vehicles on the road and deducing the pattern of traffic movement. Manual counting was done so as to count the vehicles in the form of cycle, scooter, car, bus, truck, jeep etc. The safe and time efficient movement of the people and goods is dependent on Traffic flow, which is directly, connected to the traffic characteristics. For better understanding of the present status of traffic flow at the junction, traffic survey is conducted. Thereafter, value of Passenger Car Units (PCU's) is calculated for different vehicular types and accordingly value of Level of Services (LOS) is calculated for existing scenario. In order to calculate the traffic load after establishment of project, additional traffic is assumed based on projects that are being expanded. Subsequently, modified PCUs are calculated and LOS is being checked whether it is sufficient to cater the load after establishment.

7.5.2 TRAFFIC STUDY OF EXISTING & AFTER PROPOSED ESTABLISHMENT OF BDP

Traffic study measurements were performed to assess the impact on local transport infrastructure due to the establishment of project namely "Bulk Drug Park" located at Kuthar Beet, Pollian Beet, Tibbian, Jodian, Janani and Mulluwal, Tehsil Haroli, District Una, Himachal Pradesh. The project is connected to Una – Jaijon Road (Major District Road 39) through internal roads. The proposed site has easy connectivity to the National Highways; NH-503A at a distance of approx. 10 km in 'N' direction, NH-503 at a distance of 15.5 km in 'W' direction and NH-103 A at a distance of approx. 9.5 km in 'W' direction.

7.6 Land and Slope Stabilization Plan

As per ToR point no. 1.4, In reference to hilly terrain and critical topography of project area, a land and slope stabilization plan was executed to minimize the natural disasters as landslides, earthquakes and floods in the project area.

Slope areas especially sharp slopes more than 45° angles were identified using Civil 3D software within project area of 1405.41 acres. A total of five sharp slope area with more than 45° angles were observed as depicted in **Figure 1** and described in **Table 1**.

Table 7.15. Identification of slope areas in project site

Sr. No.	Location of Slope	Area of Slope (Acres)
1.	Landfill site	0.89
2.	Industrial Plot No. 110	0.68
3.	Water Reservoir/ Pond	0.62
4.	Common Steam Generation area	0.57
5.	Industrial Plot No. 93	0.20
Total Area (Acres)		**2.96**

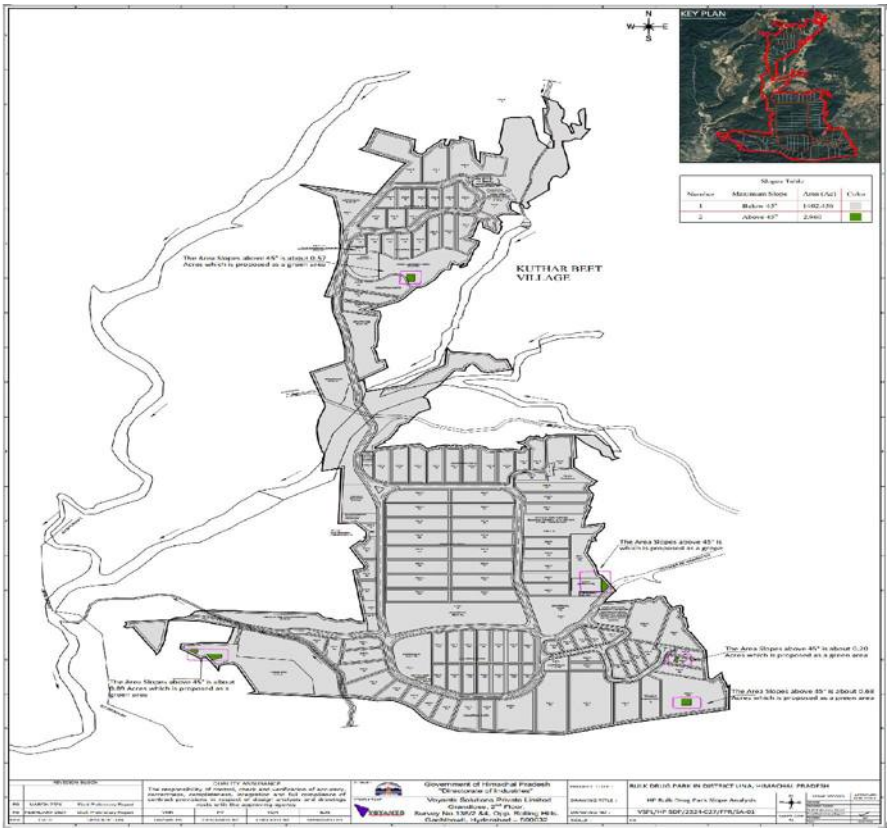


Figure 7.9. Identification of slope areas in Bulk Drug Park, Una

The total of five identified slopes of more than 45° angles comprising an area of 2.96 aces will be kept untouched at any stage of project life and will be protected by developing afforestation / green belt management.

Even in slopes less than 45-degree will be protected to avoid undue earth cuttings as feasible and using slope stabilization methods viz Breast wall/retaining wall constructions/use of geo-fabrics at under site preparation and construction sites.

In reference to hilly terrain / topography of project area, the dominant soil type is covered by loam, clay, sandy-loam at 0-30 cm depth from ground level with moderate infiltration rates. To avoid floods, water logging and landslides, dedicated drainage system is proposed for surface run off water to discharge in natural nallah/ khads. Rain water from roof tops of buildings, common utility areas and other pucca/paved areas will be tapped and collected in water storage pond of 100 MLD to recycle/reuse of water in industrial processes.

Furthermore, for the conservation of water and soil in the project area, the natural drainage such as Nallah/ khuds will be kept undisturbed by keeping 15 m wide open areas along all the

existing Nallah/ khuds. These open areas will be developed under green belt for the stabilization of land and conservation of water resources.

7.7 Muck Disposal Plan

Muck disposal plan along with cutting and filling is under investigation and will be included in final EIA report.

7.8 Rain Water Harvesting Plan

As per ToR Point No. 1.6, the rain water harvesting through the provisions for check dams across all major and minor drains/streams and water re-charge wells along the banks of these drains/nallah/khad has not been considered as the area is hilly terrain and flood prone. Though the rain water collection is proposed from roof tops of buildings and other pucca areas through dedicated drainage system and will be collected in storage pond/ tank of 100 MLD. The area of the proposed water storage tank is 5.33 ha and the proposed cost estimates for the tank is approx. 62 Cr as per project DRP. After treatment of rain water collected, it will be re-used n industrial processes. To avoid floods, water logging and landslides in the area, a dedicated drainage system is proposed for surface run off water to discharge in natural nallah/ khads.

Furthermore, for the conservation of water and soil in the project area, the natural drainage such as Nallah/ khuds will be kept undisturbed by keeping 15 m wide open areas along all the existing Nallah/ khuds. These open areas will be developed under green belt for the stabilization of land and conservation of water resources.

Pre-development runoff is estimated at 22711.52 cubic meter per second (m3/s). Post-development runoff is estimated at 34067.28 m3/s, with mitigation measures reducing peak flows by 33%.

Table 7.16. Estimation of rainfall runoff

S.No.	Internal Catchment Areas	Pre-development runoff (m3/s)	Post-development runoff (m3/s)
1	60.762	2430.48	3645.72
2	205.400	8216.01	12324.02
3	301.626	12065.03	18097.55
	Total:	**22711.52**	**34067.28**

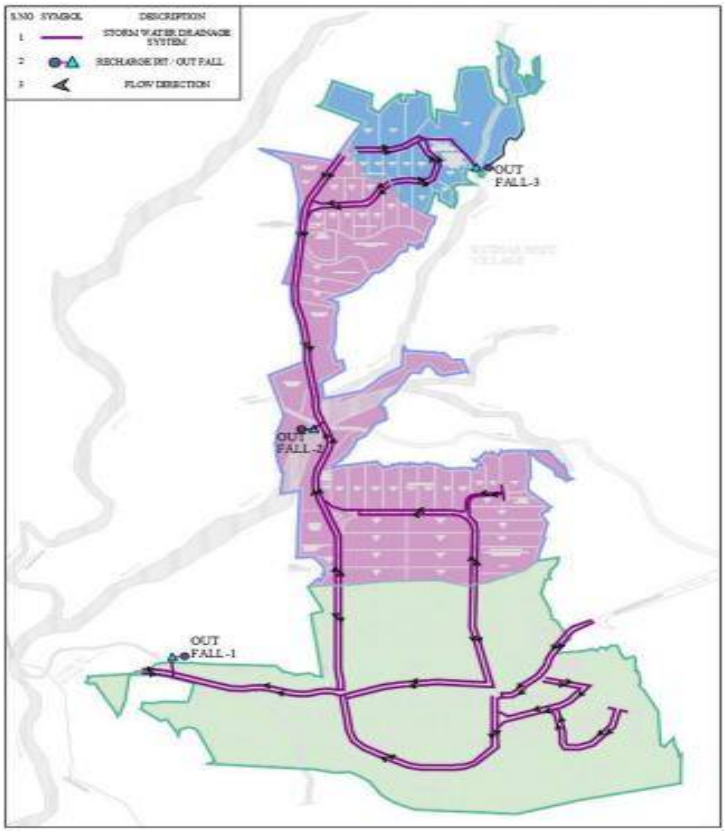


Figure 7.10. Major internal catchment areas in project area

7.9 Green Area Development Plan

Green area will be developed as per following scheme

Green belt to be developed by Himachal Pradesh Bulk Drug Park Infrastructure Ltd. (HPBDPIL) in area of 279.46 Acre (@13.21%) in following manner

- 50-meter-wide green belt all along the major streams/ nallah/khads
- 15-meter-wide green belt along the minor streams.
- 15-meter-wide green belt along the project boundary.

Green belt to be developed by member industries in area of 185.72 Acres (@20%) in their industrial premises along the plot boundary.

Green Belt in the project area will be developed with thick plantation of broad leaved trees preferably in three rows to mitigate the various types of pollution.

- Large open spaces for maintaining the green cover

- Small Quality green spaces for recreation
- Linear plantations to provide relief during movement
- Small aesthetic greens for forming vistas etc.

7.10 Tree cutting and compensatory afforestation plan

In case of exigencies demand, tree felling will be done with prior permission from concerned authority. A compensatory plantation in ratio of 1:10 will be adopted and maintained in project area along the green belt development areas marks in master plan.

The tree remuneration survey has been done and the total tree will be fell down approx. 3440 Nos. (40% of total trees 8599 Nos. enumerated in common utility areas) and the compensatory afforestation of trees will be 34,400 Nos. in the ratio of 1:10 (trees to be cut and the trees to be planted). A compensatory afforestation with native species of trees will be done by HPBDPIL in the project area in following manner

- 50-meter-wide green belt all along the major streams/ nallah/khads
- 15-meter-wide green belt along the minor streams.
- 15-meter-wide green belt along the project boundary.

Afforestation plan will be pesticides free and flowering plants of native species for attracting bees and insects, which will be beneficial to the agriculture. Farmers around the project site will be involved in developing such an afforestation Plan for social benefits.

7.11 Alternate Source of Energy

7.11.1 Solar Energy

A total of 14.2 MW solar power generation is proposed on the roof tops of commercial buildings/areas, electrical utility areas and treatment units. The complete details of solar power system are provided in **Table 7.17.**

Table 7.17. Details of proposed solar power system

Details of Solar Energy						
S.No	Description	Total Area (In Sq m.)	BUA (In Sq m.)	Actual Roof top shadow free area for Calculation (In sq. m)	Solar Power Generation(KW) (12 Sq.m for 1KW)	Solar Generation (MW)
1	Building 1	61399.65	36839.79	18419.89	1534.99	1.53
2	Building 2	13213.66	7928.20	3964.10	330.34	0.33
3	Building 3	80109.50	48065.70	24032.85	2002.74	2.00
4	Building 4	34752.04	20851.23	10425.61	868.80	0.87
5	Building 5	33027.82	19816.69	9908.35	825.70	0.83
6	Building 6	147465.16	88479.09	44239.55	3686.63	3.69
7	Building 7	14546.31	8727.79	4363.89	363.66	0.36
(A)	**Commercial area**	**384514.15**	**230708.49**	**115354.24**	**9612.85**	**9.61**
1	ESS.P.1	7884.34	3153.73	1261.49	105.12	0.11
2	ESS.P.2	5832.23	2332.89	933.16	77.76	0.08
3	ESS.P.3	6113.88	2445.55	978.22	81.52	0.08
4	ESS.P.4	6307.53	2523.01	1009.20	84.10	0.08
5	ESS.P.5	60933.75	24373.50	9749.40	812.45	0.81
6	ESS.P.6	7522.89	3009.16	1203.66	100.31	0.10
(B)	**Electrical Utilities**	**94594.62**	**37837.85**	**15135.14**	**1261.26**	**1.26**
1	WTP	60039.11	18011.73	18011.73	1500.98	1.50
2	STP/ETP/MEE	108695.26	21739.05	21739.05	1811.59	1.81
(C)	**Treatment units**	**168734.38**	**39750.79**	**39750.79**	**3312.57**	**3.31**
(A+B+C)	**Total Solar Power**	**647843.14**	**308297.12**	**170240.17**	**14186.68**	**14.19**
					Say (MW)	**14.20**

7.11.2 Natural Gas (PNG)

Supply of PNG is proposed for Bulk Drug Park in stage – 2. GAIL is committed for the supply of PNG to BDP as the GAIL has already presence in Tahliwal industrial area approx. 8-10 km from BDP area. Use of PNG will be ensured to operate common infrastructure as boilers for steam generation, MEE for waste water treatment and Incinerators for hazardous wastes management by HPBDPIL and other industrial process/ operations by member industries.

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CHAPTER 8
PROJECT BENEFIT

According to the vision & approach of Central Govt., the major focus is on the term of making India **"Aatamnirbhar Bharat"** and in this line, the Central Govt. has chalked out major industrial projects, which in turn will minimize or eliminate the need of the import from the neighboring countries. As such, this project is also an ambitious project of the Central/State Govt. The proposed project will enhance the local infrastructure of the region.

The State of Himachal Pradesh is primarily a hill state. However, the geographical location of the chosen/selected site is relatively plain chunk of land. The most peculiar aspect of the site is that, it abuts the State boundary of Punjab, which in turn is an added merit/benefit. For the localized development of the area, such projects are must. There is an abundance of natural resources in the State and easily availability of manpower consisting of local youth. In the hindsight, the local folklore consists of marginal to very small scale farmers having very small land pieces in their ownership. In such scenario employment opportunities for the local youth is minimized. In view of the present trend in local youth regarding attaining good education and skill, such project will be a big boon for the local youth including the girl child, who otherwise normally refrain from venturing out to far of places for job opportunities

Apart from above, the project is also having national value. The pharma sector at present is dependent on the import sector upto the large extent, chiefly from China. It's a known fact that China is a hostile country, therefore the dependency on the said country if reduced or eliminated, better it will be, in the National interest. Further, the Indian Govt. has initiated a noble concept of "Aatmanirbhar Bharat" and this project will negate the need of import from the neighboring countries to certain effects, will add to the self-sufficiency of the country. Hence, the project is the need of the hour and deserves all the encouragement and facilitation for implementation, to promote technologies and industry for Environment Management.

The project is intended to facilitate development of:

1. A well-planned and resource-efficient industrial base
2. World-class sustainable connectivity infrastructure

As such this project may be considered in true earnest and forward looking spirits. M/s Himachal Pradesh Bulk Drug Park Infrastructure Limited (HPBDPIL) intended to provide the improvements in following infrastructure:

8.1 Improvements in Physical Infrastructure

The proposed site for Bulk Drug Park comprises of revenue villages Kuthar Beet, Pollian Beet, Tibbian, Jodian, Janani and Malluwal in Haroli Tehsil, District Una, Himachal Pradesh. The site has access by rail, road and air links and has a distinct locational advantage of being equidistant from centers, i.e., from Ludhiana, Jalandhar, and one of India's largest Pharma Clusters, Baddi.

The Bulk Drug Park will have industrial and commercial plots, fire station & other facilities, help in meeting the growing industrial need for nation. Care has been taken to provide the staff and visitors with necessary facilities as power, water supply, parking spaces, and broad roads that are safe and secure.

- The BDP proposed to establish a mixed use area on site for essential services staff initially and may develop discreet sites in future away from the park which may facilitate local development due to increased demand on domestic services and agri produce.
- The need for additional housing in the project vicinity will provide opportunity for surrounding villagers to build and lease out their houses.
- The basic infrastructure for the community needs will be strengthened by extending health care, educational facilities, drainage, drinking water quality to the village, building/strengthening existing roads in the area, etc as part of corporate environmental responsibility (CSE).
- The occupational health facility proposed on site with all amenities may be used by surrounding population in case of emergency.

Increasing other business opportunities for local people: There will be scope of hiring materials from local market and business for the transportation agencies for transportation of raw materials and finished goods.

8.2 Improvements in Social Infrastructure

The proposed project aims at overall development of the area. The social infrastructure of the area will be enhanced by state of the art facilities of advance research institute, health care facility, residential areas, common amenities, drainages, sewerage, electricity and many more. The potential for development will increase manifolds.

Training Facility: The locals will be given much more priorities in training for different types of employment options as per the training suggested. The locals are literate but many are not qualified for the skilled jobs and illiterate people will be provided with training. The training increases the possibility for acquiring the job opportunity. The project proponent has to be given more priorities to the locals and has to be given employment with the jurisdiction.

Women Empowerment: The proposed project will enhance the status of women as they will be engaged in different types of employment opportunities. They will be given training for the job opportunities. Women earning capacity will help them in participating the decision making process in the family as well as community level.

A temple is also proposed for the spiritual faith of locals and industrial people.

Research institute for pharmaceutical advancement

8.3 Employment Potential (skilled/semi-skilled/unskilled):

The proposed project is likely to bring one of the most significant alterations of generation of employment. The BDP, Una will bring multitude level of employment opportunities in the region.

Manpower of 2,500 to 3,000 persons will be employed during the construction phase. The proposed employment is projected for the entire bulk drug park, with a worker density of 120 employees/Ha. Out of the total area of 568.76 ha, nearly 336 Ha. will be occupied under the industrial and commercial activities. As such, an employment opportunity for approx. 40,000 no. of employees will be generated. Apart from this direct employment, there will be numerous number of persons with indirect employment will be connected with this project. The exact number of such persons cannot be assessed at this stage; as such kind of employment/job work activities come from the informal/unorganized sectors. However, for the calculation of waste

generation and other related entities/activities, a floating population of 10% of direct employees have been considered, thus arriving at the total population Fig. of 44,000 persons.

8.4 Other Tangible Benefits

8.4.1 Benefits to the Environment

The following are the benefits to the Environment:

- Plantation/Green belt is being done around project site.
- Green belt will enhance the green coverage in the area & aesthetics.
- Rain water harvesting will enhance the ground water table.
- As seen above there is marginal impacts on air, noise, water & soil environments.
- The marginal impact due to the proposed assignment will be fully mitigated by the Environmental Management Plan (EMP).
- Corporate Environmental Responsibility (CER) will provide the well-being of the society and the protection of the environment will help in conserving the ecosystem. It will also provide employment opportunities to larger population.

Thus, the proposed project will benefit both the local as well as Indian economy.

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CHAPTER 9

ENVIRONMENTAL COST BENEFIT ANALYSIS

9.1 INTRODUCTION

As per EIA Notification dated 14th September, 2006 and its amendments, chapter on "Environmental Cost Benefit Analysis" is applicable only if the same is recommended at the Scoping Stage.

CHAPTER 10

ENVIRONMENTAL MANAGEMENT PLAN

10.1 GENERAL

Industrial development inevitably brings both benefits and drawbacks to the environment. While the positive aspects are often highlighted, it is crucial not to overlook the negative impacts. To address these challenges, an Environmental Management Plan (EMP) must be created. This plan is tailored to the current environmental conditions and the results of environmental impact assessments. It plays a key role in the formulation, implementation, and monitoring of environmental standards throughout and beyond the project's lifecycle. The EMP outlines strategies for effectively managing and mitigating air and water pollution. It also covers the creation of green spaces around the plant, ensuring worker safety, controlling noise, and implementing fire protection systems. Through these measures, the plan aims to maintain a balance between industrial progress and environmental stewardship.

10.2 PURPOSE OF ENVIRONMENTAL MANAGEMENT PLAN

Environment management plan is prepared with a view to facilitate effective environment management of the project, in general and implementation of the mitigation measures in particular. EMP provides a delivery mechanism to address potential adverse impacts and to introduce standards of good practice to be adopted.

For each stage of the program, the EMP lists all the requirements to ensure effective mitigation of every potential biophysical and socio-economic impact identified in the EIA. For each operation, which could otherwise give rise to impact, following information is presented:

- To treat and dispose-off all the pollutants viz. liquid, gaseous and solid waste so as to meet the statutory requirements (Pollution Control Acts) with appropriate technology.
- To support and implement work to achieve environmental standards and to improve the methods of environmental management.
- To promote green-belt development.
- To encourage good working conditions for employees.
- To reduce fire and accident hazards.

- Budgeting and allocation of funds for environment management system.
- To adopt cleaner production technology and waste minimization program.

The primary goals of the Environmental Management Plan (EMP) are to:

- Identify major environmental concerns expected during both the construction and operational phases of the project.
- Offer guidelines for effective mitigation strategies.
- Develop systems and procedures to implement these mitigation measures.
- Ensure the consistent application of the mitigation measures.
- Monitor the effectiveness of these measures over time.
- Respond swiftly and appropriately to any unexpected environmental impacts that arise.

10.3 ENVIRONMENT MANAGEMENT POLICY & ENVIRONMENT COMMITTEE

HPBDPIL is very much oblivious of its responsibility in protecting the Environment. Thus, various mitigation measures as given in the report shall be taken-up and effort will be made to nullify the effect of project on Environment, if any. Regular project monitoring and corrective measures have been proposed. Company will design well-defined policy to keep the environment clean. The management decided that all effective steps shall be taken to prevent deterioration of the environment. Environment Management Committee will be constituted for the purpose consisting of following persons as given in **Fig. 10.1**.

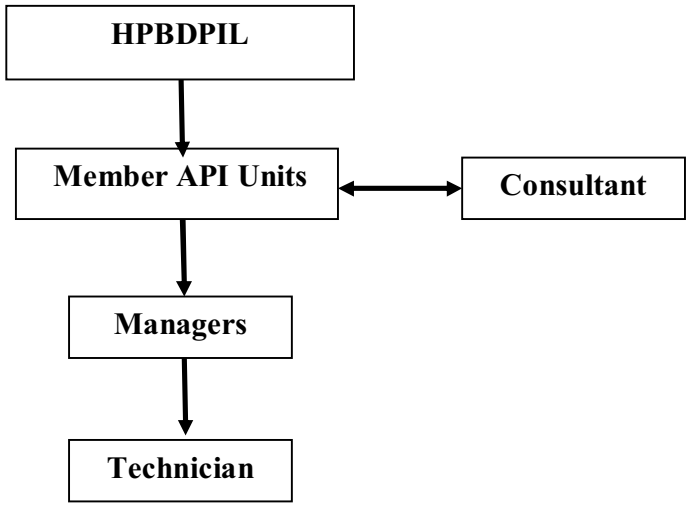

Fig. 10.1: Environment Management Committee of HPBDPIL and Member Units

The purpose of the Environment Committee is to:

- Authorities and corrective measures will be undertaken.
- Conduct reviews of our operations to monitor environmental performance.
- Comply with all relevant environmental laws and regulations to minimize risks to health, safety and environment.
- Work with local government, regulatory authorities and communities to ensure safe handling, use and disposal of all materials, resources and products.
- Violations if any, will be brought to notice of the Top Management. It will also be intimated to concerned regulatory.

The main aims under the said Policy are to:

- Effectively manage, monitor, improve and communicate the environmental performance.
- Take all reasonable steps to prevent pollution.
- Set realistic and measurable objectives and targets for continual improvement of the environmental performance.
- Ensure that all employees & contractors will be trained to understand their environmental responsibilities and create an environment that adheres to the Company's Policies, procedures and applicable regulations.
- Minimize waste and increase recycling within the framework of waste management procedures.
- Comply fully with all relevant legal requirements, codes of practice and regulations.
- Identify and manage environmental risks and hazards.
- Hold leadership accountable for good environment performance of our operations and projects. Inherent in that accountability will be the commitment of management to provide resources and successfully create an appropriate environment.
- Reduce, recycle and reuse resources.
- Project proponent shall regularly review this policy and ensure that corrective and preventive actions are taken in order to ensure continual improvement.
- To treat all the pollutants viz. liquid and gaseous, which contribute to the degradation of

the environment, with appropriate technologies.

- To comply with all regulations stipulated by the Central/State Pollution Control Boards related to air emissions and liquid effluent discharge as per Air & Water pollution control Acts.
- To handle hazardous wastes as per the Hazardous & Other Wastes (Management and Trans boundary Movement) Rules, 2016 of the Environment (Protection) Act, 1986.
- To encourage support and conduct developmental work for the purpose of achieving environmental standards and to improve the methods of environmental management.
- To make continuous efforts to improve environment.
- The system of reporting of Non-conformances/violation of any Environmental Law/ Policy will be as per the management system.

10.4 BUDGETARY PROVISION FOR EMP IMPLEMENTATION

Table 10.1: Cost of EMP

S. No.	Environmental Protection Measures	Capital Cost (Crores)	Recurring Cost (Lakhs/year)
1.	Air Pollution Control System (Installation of APCD on Steam Generation Boilers of 6 x 50 TPH with ESPs and appropriate stack height for DG sets 2 x 1000 KVA)	312.30	10
2.	Water Pollution Control System (Installation of CETP 5 MLD, STP 3 MLD, MEE along with continuous effluent monitoring system)	244.43	25
3.	Noise Pollution Control System (Acoustic enclosures for DG sets & Noisy Machinery/ Equipment & Tools, Noise Barriers along roadsides and project boundary at the places nearby settlement areas)	10	1
4.	Landscaping (Development of green area and stabilization of hilly slopes/ land)	10	120
5.	Solid and Hazardous Waste Management System (Installation of TSDF site, Incinerators 4 x 25 TPH with continuous emission monitoring	55	20

	system)		
6.	Environment Monitoring & Management	1	100
7.	Rain water harvesting	2	10

Further, the issues raised during public hearing will be considered under Corporate Environment Responsibility (CER) and covered in the final EIA report.

Environmental Policy

HPBDPIL has established a comprehensive Corporate Environmental Policy (CEP) that outlines standard operating procedures (SOPs) for reporting on the performance of its environmental management system and driving improvements. This policy includes directives for addressing environmental issues and a reporting mechanism for non-compliance or violations of environmental regulations.

The Corporate Environmental Policy includes the following key components:

1. **Raising Awareness:** Educate personnel about the environmental impact of their actions and promote effective environmental management practices in their daily activities.
2. **Advanced Technology:** Employ state-of-the-art technology to prevent and control environmental impacts.
3. **Pollution Prevention:** Commit to preventing pollution and protecting the environment by minimizing the environmental effects of our activities and products through careful design, manufacturing, distribution, use, and disposal practices.
4. **Continuous Improvement:** Prioritize continual improvement and pollution prevention by implementing practices and procedures that reduce waste and conserve energy. Regularly review facilities and programs, set measurable targets, and enhance environmental performance.
5. **Resource Optimization:** Convert waste into valuable resources and make optimal use of natural resources to lower carbon footprints.
6. **Compliance Management:** Identify and evaluate instances of non-conformance or non-compliance, determine corrective and preventive actions, and review these actions to

ensure their effectiveness. Make the policy accessible to interested parties and review it periodically.

Environment Management Cell

A qualified and experienced environmental professional—whether an environmental engineer, environmental scientist, or another relevant expert—will be appointed to oversee all issues related to Environment, Health, and Safety within the plant. This individual will work in consultation with the HPBDPIL in-charge and report directly to the CEO concerning the Environmental Management System (EMS) of the unit. Their responsibilities will include:

- **Implementation:** Effectively execute the environmental monitoring program according to the established schedule.
- **Data Management:** Collect data from regular monitoring activities and maintain a comprehensive database.
- **Analysis and Action:** Analyze the data to identify critical areas requiring immediate attention and implement corrective actions to ensure pollution levels remain within prescribed limits.
- **Action Plan Development:** Develop and execute an action plan based on recommendations from the Environmental Management Plan.
- **Budget Preparation:** Prepare and allocate the budget for the environmental management program.
- **Problem Resolution:** Address any issues within the EMS by either replacing equipment or enhancing its performance as needed.
- **Compliance Assurance:** Ensure adherence to statutory standards and norms, as well as compliance with conditions of statutory clearances and approvals, such as Environmental Clearances (EC) and Consent to Establish and Operate (CC&A).

Figure 10.1 Organization Chart of Environmental Management Cell

Role and Responsibility of EMC

The primary duties and responsibilities of the Environmental Management Coordinator (EMC) include:

- **EMP Implementation:** Oversee the implementation of the Environmental Management Plan (EMP).
- **Regulatory Compliance:** Ensure adherence to all relevant regulations and rules set by SPCB/ CPCB/ MoEF&CC.
- **Pollution Control:** Guarantee the regular operation and maintenance of air pollution control devices.
- **Impact Minimization:** Reduce environmental impacts by strictly following the EMP.
- **Environmental Monitoring:** Initiate and oversee environmental monitoring according

to the approved schedule.

- **Data Review:** Review and interpret monitoring results; implement corrective actions if results exceed specified limits.
- **Conservation Planning:** Plan and schedule activities for environmental conservation and protection to meet environmental standards and enhance management practices.
- **Workplace Improvement:** Enhance the working environment by implementing measures for Occupational Health and Safety and improving workplace conditions.
- **Budget Management:** Allocate funds and manage the budget for the environmental management system, ensuring timely updates.
- **Mitigation Implementation:** Implement planned mitigation measures, including research and development of innovative technologies for resource conservation, recovery, recycling, and waste utilization.
- **Employee Engagement:** Encourage and motivate employees and contractors to achieve high performance in environmental conservation, protection, and improvement.
- **Documentation:** Maintain documentation of best environmental practices and relevant environmental laws for reference.
- **Record Keeping:** Keep accurate records related to environmental management.
- **Coordination:** Coordinate with regulatory agencies, external consultants, and monitoring laboratories.
- **Public Complaints:** Maintain a log of public complaints and the actions taken in response.

Roles and Responsibilities of HPBDPIL

- **Industrial Plot Development:** Develop industrial plots of appropriate sizes to accommodate various industrial activities and provide power through a centrally organized supply grid.
- **Common Infrastructure Provision:** To provide roads network of sufficient width, laboratory and research centre, Safety and Hazards Management Cell, steam generation, wastes management, wares house, electricity, drainage system, water resources, solvent storage and recovery facility.

- **Water and Effluent Management:** Establish water storage and supply networks, a common effluent collection sump, a guard pond, and an effluent disposal pipeline connecting member units to the in-house Common Effluent Treatment Plant (CETP).
- **Waste Management:** Set up an Integrated Treatment, Storage, and Disposal Facility (TSDF), including a secured landfill, incinerator, Multi-Effect Evaporator (MEE) facility, and municipal waste treatment facility for the management and disposal of hazardous and municipal waste from industrial units.
- **Common Utilities:** Provide essential shared utilities, such as solvent recovery and steam supply facilities, to reduce capital and maintenance costs and space requirements for individual units.
- **Security:** Implement a security gate and essential security measures within and around the Bulk Drug Park.
- **Amenities:** Develop a canteen area, administrative building, customs house, and commercial complex with shops, a bank, and offices.
- **Emergency Services:** Establish a fire station and an occupational health center to handle emergency situations.
- **Environmental Monitoring:** Create laboratory facilities for monitoring environmental parameters of effluents and emissions from member industries.
- **Specialized Cells:** Develop an Environmental Cell, Emergency Management Cell, and Common Health Surveillance System.
- **Residential Facilities:** Provide housing and dormitory facilities for industrial workers within the Bulk Drug Park.
- **Regulatory Compliance:** Ensure compliance with environmental clearances and Consent to Establish (CCA) conditions, as well as adherence to statutory requirements and the Environmental Management Plan (EMP) during both the operational and non-operational phases.
- **Penalty and Enforcement:** Implement penalty provisions and punishment mechanisms for member units that fail to comply with regulations.
- **Stakeholder Engagement:** Facilitate effective environmental management through

regular meetings, updates, and awareness programs to bridge the interface between individual units and HPBDPIL.

Roles and Responsibilities of Individual Member Industries

- **Project Documentation:** Provide a Detailed Project Report (DPR) outlining raw materials, manufacturing processes, utilities, costs, and other infrastructure details before commencing production.
- **Pollution Control:** Install and operate pollution control measures that meet MoEF&CC standards and GPCB guidelines for water/wastewater, air emissions, solid/hazardous waste, and noise.
- **Water Usage:** Inform HPBDPIL of the required water quantity and obtain necessary permissions.
- **Wastewater Treatment:** Treat wastewater in an on-site Effluent Treatment Plant (ETP), reuse treated water for utilities, domestic purposes, and greenbelt development, and send the remaining effluent to the Common Effluent Treatment Plant (CETP) for further treatment and disposal. Obtain HPBDPIL permission for effluent disposal quantities.
- **Effluent Storage:** Maintain a minimum two-day holding capacity for treated effluent on-site.
- **Waste Management:** Provide facilities for the storage and handling of solid and hazardous waste generated at the plant.
- **Energy Conservation:** Implement energy conservation measures and adhere to the Energy Conservation Building Code (ECBC) 2005.
- **Risk and Safety:** Conduct risk analysis and develop a Disaster Management Plan (DMP) in accordance with Chemical Accident Rules.
- **Local Employment:** Guarantee employment for at least 85% of local workers based on their skills, in compliance with government regulations.
- **Greenbelt Development:** Develop a greenbelt covering at least 20-33% of the acquired plot area and 14% green belt will be provided and maintained by HPBDPIL in the project area.

- **Rainwater Harvesting:** To collect and tap the rain water from roof tops and pucca/paved areas and discharge in dedicated rain water collection system provided by HPBDPIL.
- **Corporate Responsibility:** Establish and maintain a framework for Corporate Environmental and Social Responsibilities, focusing on resource management and pollution control.
- **Environmental Upgradation:** Allocate a dedicated annual budget for environmental upgradation and monitoring.
- **Legal Compliance:** Ensure that all activities commence only after obtaining the required clearances and permits as per legal requirements.
- **Coordination with HPBDPIL:** Collaborate with HPBDPIL authorities to ensure effective environmental management.

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CHAPTER 11
SUMMARY AND CONCLUSION

11.1 OVERALL JUSTIFICATION FOR IMPLEMENTATION OF THE PROJECT

The Government of India approved the "Promotion of Bulk Drug Parks" scheme on March 20, 2020, with the goal of drastically reducing the cost of manufacturing bulk drugs and boosting the competitiveness of the domestic bulk drug industry by facilitating easy access to standard testing and infrastructure facilities.

The Department of Pharmaceuticals, Govt. of India has granted "in-principle" approval to the three states' proposals—Himachal Pradesh, Gujarat, and Andhra Pradesh—under the "Promotion of Bulk Drug Parks" Scheme, a crucial program to assist the nation's bulk drug manufacturing.

The state Govt. of Himachal Pradesh in association with Department of Industries (DOI) proposed the establishment of Bulk Druk Park in 1405.41 acres of land at Villages Kuthar Beet, Pollian Beet, Tibbian, Jodian, Janani and Mulluwal, Tehsil Haroli, District Una, Himachal Pradesh.

11.2 PROJECT DESCRIPTION

S. No.	Parameters	Description
1.	**Identification of the project**	The proposed project "**Bulk Drug Park"** falls in Category 'A' under Schedule 7(c) - 'Industrial estates/ parks/ complexes/ areas, export processing Zones (EPZs), Special Economic Zones (SEZs), Biotech Parks, Leather Complexes' as per EIA Notification, 2006 and its amendments thereof.
2.	**Project Proponent**	**M/s Himachal Pradesh Bulk Drug Park Infrastructure Limited (HPBDPIL)** E-mail: trsharma4@gmail.com
3.	**Brief description of nature of the project**	The proposed "Bulk Drug Park" located at Village Kuthar Beet, Pollian Beet, Tibbian, Jodian, Janani and Mulluwal, Tehsil Haroli, District Una, Himachal Pradesh with project area of **1,405.41 Acres (568.75 ha)** to cater **API manufacturing industries** with Common lnfrastructure Facilities, to be developed and operated by **M/s Himachal Pradesh Bulk Drug Park Infrastructure Limited (HPBDPIL),** a 100% Govt. owned agency under the aegis of Department of Industries, Govt. of Himachal Pradesh.

		The project is exclusively for API manufacturing industries to fill the gap of demand and supply under national mission of **"Aatmanirbhar Bharat"** to reduce the foreign imports and make India self-sufficient in pharma sector.
4.	**Salient Features of the Project Proposed**	
4.1	**Overall plant capacity**	The project will provide 137 industrial plots in 776.89 Acre of land dedicated for approx. 80 API industries with common infrastructure facilities as Electricity, Water, CETP, TSDF and Steam to optimize the resources for a sustainable development in the pharma sector.
4.2	**Area Details**	The total area of the project is 1405.41 Acres (or 56,87,492 sq. m.)
4.3	**Location**	Proposed project is located at Village Kuthar Beet, Pollian Beet, Tibbian, Jodian, Janani and Mulluwal, Tehsil Haroli, District Una, Himachal Pradesh. Project boundary coordinates of all corners are as follows: Corners Latitude Longitude 1 N31° 20' 45.24" E76° 11' 14.64" 2 N31° 20' 38.76" E76° 10' 40.8" 3 N31° 20' 39.84" E76° 10' 19.56" 4 N31° 20' 48.12" E76° 10' 6.24" 5 N31° 20' 50.64" E76° 9' 33.48" 6 N31° 20' 56.4" E76° 9' 30.96" 7 N31° 21' 5.76" E76° 9' 23.76" 8 N31° 21' 1.08" E76° 9' 18.36" 9 N31° 21' 9.72" E76° 9' 12.24" 10 N31° 21' 12.24" E76° 9' 26.28" 11 N31° 21' 9.36" E76° 10' 0.84" 12 N31° 21' 35.28" E76° 9' 55.8" 13 N31° 21' 50.04" E76° 9' 56.52" 14 N31° 22' 15.24" E76° 9' 50.4" 15 N31° 22' 35.4" E76° 9' 53.64" 16 N31° 23' 4.92" E76° 9' 48.96" 17 N31° 23' 2.4" E76° 10' 4.44" 18 N31° 23' 18.24" E76° 10' 4.08" 19 N31° 23' 14.28" E76° 10' 18.48" 20 N31° 23' 10.32" E76° 10' 25.68" 21 N31° 23' 20.04" E76° 10' 30.72" 22 N31° 23' 27.96" E76° 10' 38.64" 23 N31° 23' 19.32" E76° 10' 48.00" 24 N31° 23' 6.36" E76° 10' 42.24" 25 N31° 22' 58.44" E76° 10' 35.04" 26 N31° 22' 50.52" E76° 10' 23.16" 27 N31° 22' 42.96" E76° 10' 21.36" 28 N31° 22' 31.8" E76° 10' 3.00" 29 N31° 22' 13.08" E76° 10' 1.20"

		30 N31° 22' 21.36" E76° 10' 18.48" 31 N31° 22' 15.6" E76° 10' 31.8" 32 N31° 22' 5.88" E76° 10' 14.88" 33 N31° 21' 55.08" E76° 10' 3.36" 34 N31° 21' 56.52" E76° 10' 32.52" 35 N31° 21' 52.2" E76° 10' 53.04" 36 N31° 21' 57.96" E76° 10' 44.04" 37 N31° 21' 46.08" E76° 10' 48.36" 38 N31° 21' 34.92" E76° 10' 49.8" 39 N31° 21' 27" E76° 10' 46.2" 40 N31° 21' 14.04" E76° 10' 49.44" 41 N31° 21' 12.96" E76° 11' 5.28" 42 N31° 20' 54.96" E76° 11' 13.2" Google Earth Image showing project location & its surroundings within 500 m are submitted. Project and its study area falls in the Survey of India, Toposheet No. **H43E3** and **H43E7.**
4.4	**Water requirement**	**Source:** Borewells (approx. 15 No.) permitted by **Jal Shakti Department, Himachal Pradeseh** **Water Requirement:** Total water requirement for the proposed project will be 22.1 MLD; out of which 15 MLD will be fresh water demand met from groundwater and 7.1 MLD will be recycled water met from treated water. Breakup of the total water demand is given below:

Description	**Demand (MLD)**	**Source**
Freshwater Demand (Potable + Process water demand)	15 (2.2+12.8)	Groundwater
Flushing water demand	1.15	Treated water
AC Cooling demand	2.00	Treated water
Horticulture water demand	3.95	Treated water
Total Water Demand	**22.1 MLD**	Ground & treated water

4.5	**Wastewater**	During construction phase, there will be generation of domestic effluent from workers or laborers. The management & disposal of domestic effluent will be taken care by Construction agency/contractor. For operation phase, Common Effluent Treatment facility of capacity 5 MLD followed by MEE have been proposed within project for treatment of HTDS and LTDS industrial effluent

		generating from various API manufacturing units, for which 36.8 acres of land has been earmarked. Also, STP of capacity 3 MLD has been proposed to treat the domestic effluent. The project shall adhere to Zero Liquid Discharge (ZLD).
4.6	**Man Power**	Around 3,000 nos. of workers will be employed during construction phase. Further, the expected employment generation during operation phase has been calculated with worker density of 120 employees per hectare. Around 336 ha area is allotted for industrial and commercial Plots. Thus, approx. 40,000 no. of workers will be employed. The expected direct employment potential of the project is about 44,000 persons including criteria of floating population as 10%.
4.7	**Power requirement**	Total power demand for the proposed project will be about 120 MW **Source:** Himachal Pradesh State Electricity Board Limited (HPSEBL).
4.8	**Alternative site**	Himachal Pradesh being a hilly state, the availability of relatively plain land and with easy approach is a remote possibility. As such, the other possibilities worked out in the district Mandi and Kangra proved to be non-suitable, hence, the PP zero-in on this site. The selected site fulfil all the criteria viz a viz large area of chunk, contours, easy approach and its location. Further, the site has multi-nodal connectivity through Rail, Road, Dry Port, Airport. Internet connectivity, vicinity of Punjab-Himachal Pradesh boarder, environment suitability and accessibility of local manpower are available. The LPG gas pipelining will also be available in future. Considering all these options project site was selected.
4.9	**Land form, Land use and** **Land ownership**	Present land is vacant land largely covered by thick bushes and wild growth. As the land is already under the ownership of state Govt., so there is no cultivation or any other activity noted on the entire land. The present land-use of the area is required to be changed to the "industrial use", for which the PP has got approval for Building Plans/maps from the Dept. of Town & Country Planning, which in-turns and in general parlance is equivalent/substitute of the CLU. Moreover, the land has been allotted to Department of Industries, HP (PP) for establishment of the proposed Bulk Drug Park. Approval letter obtained from Department of Pharmaceuticals, Ministry of Chemicals and Fertilizers, Govt. of India for establishment of the said project.

		Plot area of the project is 1,405.41 acres (or 568.75 Ha); out of which, Govt. land of 1,365.77 acres has been allotted to Dept. of Industries, Govt. of HP and 39.64 acres of land has been purchased and transferred to Dept. of Industries, Govt. of HP for setup of the proposed industrial park.

11.3 Description of the environment

11.3.1 In terms of meteorological factors

Meteorological data for last 10 years (2011-20) were collected from secondary authorized sources as NASA ((Source: POWER | Data Access Viewer (nasa.gov)) using geo-referencing of project site coordinates. Further, primary micrometeorological data at project location recorded using automatic weather station during for a period one year (2023) to verify the secondary data record and prevailing meteorological conditions. Hourly data air temperature, barometric pressure, humidity, wind speed, wind direction, rainfall and solar radiation were recorded in data logger of AWS. The met station was kept in an open area at an appropriate height of 10m from the ground. Cloud cover is observed visually. Ambient Air Quality

The ambient air monitoring carried out from April to June,2021 at project location and within 10km radius of the project by NABL and MoEF&CC approved laboratory.

11.3.2 Ambient Air Quality

Ambient air quality monitoring (AAQM) station were installed in upwind, downwind and crosswind directions as per prevailing meteorological conditions (predominant wind direction from WNW) in the study area at 3 locations in core zone/project area and 7 locations in buffer zone of 10kms.

Particulate aerosols observed in the study area during April to June 2023 ranged 33.5 - 84.4 $\mu g/m^3$ (avg. 56.6 $\mu g/m^3$) as PM_{10} and 17.4 – 45.7 $\mu g/m^3$ (avg. 29.9 $\mu g/m^3$) as $PM_{2.5}$ are within the prescribed limits of 100 $\mu g/m^3$ for PM_{10} and 60 $\mu g/m^3$ for $PM_{2.5}$ (NAAQS CPCB, 2009). The obtained results are comparable and in agreement with the secondary data collected by HPSPCB (RO/ DIC, Una) and other EIA studies of Una region. The baseline data of existing mass levels of PM_{10} and $PM_{2.5}$ are associated to industrial units operating in Tahliwal industrial area (about 6 kms from the project) and Bathri industrial area (about 10.5kms from the project) in ESE direction and Amb-Gagret-Jeetpur industrial cluster (about 20-25kms from the project) in ENE direction. Other source can be vehicles plying on the roads, ongoing domestic and

agricultural activities in the study area. As evident from the baseline data, the locations AQ-4 to AQ-8 (specially AQ-8) located in Eastern side of project experience higher air pollution load in comparison to the locations AQ-1 to AQ-3 located in Western area due to close proximity of Tahliwal and Bathri industrial areas.

Gaseous pollutants observed in the study area during April to June 2023 ranged 4.3 – 14.8 $\mu g/m^3$ (avg. 8.3 $\mu g/m^3$) as SO_2 and 3.8 – 22.8 $\mu g/m^3$ (avg. 12.1 $\mu g/m^3$) as NO_2 are well within the prescribed limits of 80 $\mu g/m^3$ (NAAQS CPCB, 2009) indicates no significant source of emission in the study area and air quality is safe and comfortable for human health. The obtained results are comparable and in agreement with the secondary data collected by HPSPCB (RO/ DIC, Una) and other EIA studies of Una region. the gaseous pollutants as Carbon Monoxide (CO), Ozone (O_3) and Ammonia (NH_3) observed in the study area are found to be well within the prescribed limits (NAAQS CPCB, 2009) indicates no significant source of emission in the study area and air quality is safe and comfortable for human health.

11.3.3 Ambient Noise Quality

The main objective of monitoring of ambient noise levels was to establish the baseline noise levels in different zones. i. e. Residential, Industrial, Commercial and Silence zones, in the surrounding areas and to assess the total noise level in the environment of the study area. The noise monitoring was conducted at four locations selected in the study area of 10 kms (one in core zone and 3 in buffer zone within 1 km radius). Integrated Sound Level Meters (SLMs) with data logger were used for data collection. Calibration check of SLMs were performed before and after sampling. Noise sampling was done by installing SLMs at a sampling height of 1.2 to 1.5 m in open area or ≥ 250 m away from source of noise or obstructions or reflecting surfaces. Noise monitoring was carried out during day time (06:00 am – 10:00 pm) and night time (10:00 pm to 06:00 am) continuously for 24-hours with one-hour login interval as per national/ international standard methods as CPCB Noise Rules (2000), IS: 9989-1981 & IS: 4758-1968.

Ambient noise levels measured in the study area varied from 46.3 – 51.2 dB(A) during day time and 35.4 – 40.2 dB(A) during night time. The observed noise levels are found to be within the prescribed limits for residential area (Noise Rules, 2000). The obtained results are comparable and in agreement with the secondary data of EIA studies conducted in Una region. The observed baseline/ existing noise quality may be associated to industrial units operating in

Tahliwal industrial (about 6 km from the project) and Bathri industrial area (about 10 km from the project) in ESE direction. Other source can be vehicles plying on the roads, ongoing domestic and agricultural activities in the study area.

11.3.4 Water Quality

Water quality of groundwater has been studied in order to access proposed water-uses in drinking, cooling and horticulture purposes. The groundwater quality of five different monitoring locations within the 10 km radius of study area was evaluated in terms of various physico-chemical and biological parameters. The observed data set was initially statistical analyzed and compared with the standard guideline of acceptable and prescribed limit for drinking water quality under IS: 10500, 2012 and its amendments proposed by Bureau of Indian Standards (BIS).

The analysis of physical parameters such as colour, odour, pH, TU and TDS represents that the groundwater samples were colourless, odourless, within suitable pH (6.5-8.5), no turbid and presence of suitable amount of dissolved solids (below 500 mg/L). The comparison of groundwater variables with standards limits indicated that the all groundwater quality parameters were within the prescribed limit of drinking water quality. Only the Total Hardness, Cations (Ca++ and Mg++) and Total Alkalinity were reported exceeds the acceptable limit of 200 mg/L, 30 mg/L, 75 mg/L and 200 mg/L respectively at almost monitoring locations. This indicates the prior treatment of hardness before any use of groundwater such as domestic and commercial purposes. Similarly, the cation such Ca2+ and Mg2+ were reported above the acceptable limit. The concentration of TU, BOD, Total N, Total P, Phenol and Heavy Metals (PB and Hg) were recorded below detection limit (BDL). The biological parameters (TC and FC) were found absent in groundwater samples. The ground water test results indicate that groundwater quality at selected monitoring locations is hard water in nature and requires prior treatment before the use for domestic, industrial and commercial purposes.

11.3.5 Soil Quality

Two types of soils are observed in the district viz., alluvial soil and non-calcic brown soil. Most of the area in the district is covered with alluvial soil and only about 25% of the area i.e. hilly area in the district is covered with non-calcic brown soil. Soils are rich in nutrients and thus are fertile.

Soil quality monitored once at 5 locations (including project location) within 10 km of study area during the monitoring period. The soil sample were collected from various depths of 30 cm, 60 cm & 90 cm from nearby agriculture land, waste disposal areas or likely impacted areas and sample handling (including sample preservation and transportation) was carried out as per national/ international standard methods as Soil/Sludge quality monitoring (IS: 2720, APHA & ICAR/IARI guidelines).

In the current study, indicators viz., pH, EC, porosity, permeability, macro and micro-mineral compositions (such as Na, K, N, P, Ca and Mg) etc. were analyzed and assessed. The soil parameters could offer the information of soil fertility status well, so these indicators were used to evaluate the soil composition in the study area. The pH of the monitoring location indicates neutral to alkaline in nature so soil. SAR was reported below 13 meq/L and mineral composition refers to its suitability for agriculture and cultivations purposes.

11.3.6 Land Use Land Cover (LILC)

The study area comprises of crop land of about 170.15 sq.km. (36.60%). Barren/Waste land of about 27.59 sq.km. (5.9%). Forest land of approximately 1.95 sq.km. (0.4%). Water of 3.28 sq.km. (0.7%). River bed of 4.58 sq.km. (1.0%). Open Scrub land of about 233.40 sq.km. (50.2%) and settlement in the study area cover an area of 24.03 sq.km (5.2%).

Similarly, the LULC of project site was also prepared which comprise of open scrub land of about 5.19 sq. km. (91%) and barren land of about 0.51 sq. km. (9%).

11.3.7 Socio-Economic Status

The study area is falling under the 10 Km buffer zone of Una Tehsil Haroli and as well as of Hoshiarpur District Tehsil Garhshanker. So, the details of demographic Features of the study area are highlighted below:

Table 11.1: Demographic feature of the study area

Area	Total Population	Male	Female	No. of literate	Total Worker
Tehsil Haroli	71,416	36,308	35,108	52,644	27,160
Tehsil Garhshankar	3,30,711	1,68,229	1,62,482	2,43,065	1,06,181

- Tehsil Haroli, District Una, Himachal Pradesh State has total population of 71,416 of which male and female were 36,308 and 35,108 respectively.
- Tehsil Garhshankar, District Hoshiarpur, Punjab State has total population of 3,30,711 of which male and female were 1,68,229 and 1,62,482 respectively.
- The average literacy Rate of the Haroli Tehsil is 73.71%. which is lower than the average literacy rate of Himachal Pradesh i.e. 82.80% whereas the literacy rate of Garhshankar Tehsil is 73.50. which is lower than the average literacy rate of Himachal Pradesh i.e. 75.84%

11.3.8 Ecological and Biodiversity

As per toposheet no (H43E3 and H43E7), there is the Polian Shamlat Reserve Forest is adjoining the project site in West direction and the Kangar Protective Forest is approx. 7 km far away from project site in NW direction. Distance from another Eco sensitive zone, Swan River is also approx. 8.5 km from project site in NE direction.

11.4 Anticipated Environmental Impacts & Mitigation Measures

11.4.1 AIR QUALITY

In worst-case scenario (without APCD and/or failure of plant process), the maximum cumulative load of PM_{10} will be 131.6 µg/m3, NOx will be 43.6 µg/m3, HCl will be 29.9 µg/m3 and Benzene will be 4.3 µg/m3 can deteriorate the air quality with sever health and environmental impacts. Hence this condition will be avoided in any circumstances and the project will be operated with proper and effective pollution control measures, regular checkups and maintenance of APCDs and plant process at all stages of the operation.

In controlled conditions (with APCD /effective control measures), the maximum cumulative load of PM_{10} will be 94.1 µg/m3, NOx will be 32.3 µg/m3, HCl will be 10.1 µg/m3 and Benzene will be 0.4 µg/m3. The overall maximum loads at receptors within the study area will be PM_{10} as 69.4-84.1 µg/m3, $PM_{2.5}$ as 37-44.6 µg/m3, NO_2 as 15-22.5 µg/m3, SO_2 as 9.9-14.2 µg/m3, NH_3 as 7.75-9.83 µg/m3, CO as 370.9-581.7 µg/m3, Cl_2 as 0.03-0.21 µg/m3, HCl as 0.07-0.49 µg/m3, Benzene as 0.01-0.07 µg/m3, Dichloromethane as 0.38-2.85 µg/m3 and Acetonitrile as 1.91-14.25 µg/m3 indicates the minor change in air quality with no significant health and environmental impacts.

11.4.2 NOISE QUALITY

As per noise propagation modeling carried out, the resulting/ cumulative noise levels (Baseline + Predicted) found to be in the range of 46.3-51.2 dB(A) were within the prescribed limits of 55 dB(A) for residential areas. Therefore, there is no significant impacts of noise on surrounding receptors within the study area due to the project operation.

11.4.3 WATER QUALITY

Industrial effluents will be treated with CETP of 5 MLD with ZLD technology and domestic discharges will be treated in STP of 3 MLD. No wastewater (effluent/ sewage) will be discharged outside the plant premises and will be recycled and reused in industrial processes only.

Storm water drains will be kept separate from wastewater drains. Hence, surface water quality will not be affected due to project operation.

11.4.4 SOLID WASTE

Solid waste of about 8.8 TPD (@ 0.2 kg/capita/day) will be generated. Solid waste will be duly segregated into biodegradable and non-biodegradable components. Separate area will be earmarked for segregation of solid waste. Biodegradable waste will be composted within project premises and recyclable component will be disposed off through authorized recycler vendors. The Solid Waste will be handled/disposed off as per the provision of Solid Waste Management Rules 2016 and its amendments.

11.4.5 HAZARDOUS WASTE

The proposed Bulk Drug Park will house API manufacturing units which involves chemical synthesis only. Generation of hazardous waste from API units depends upon type and quantity of production, nature and quantity of raw material used and process and technology to be used for API manufacturing. Generally, it is assumed that about 80 API units during full occupancy of Bulk Drug project with production capacity of 2000-2250 TPD of APIs will generate hazardous wastes in the tune of about 1/3rd of the production, thus a nearly 700-800 TPD of Hazardous Waste of different categories will be generated. Out of the total Hazardous Waste of 700-800 TPD quantum, likely to be generated in the project, nearly 10-12 TPD will be of storage able category (CETP sludge & MEE residue) and 650-800 TPD will be of incinerate-able/co-processing category. These all type of Hazardous Waste will be disposed of with the

authorized entities. An integrated TSDF (comprising a secured landfill, a solid-liquid feed incinerator is proposed inside the project for which 33.6 acres of land has been proposed.

For the development of TSDF for the storage-able waste and incinerator for the incinerate-able waste, the separate detailed proposal will be prepared by PP to meet with the requisite as per the EIA Notification, 2006.

11.4.6 Bio-Medical Waste

The source of Bio-Medical Waste generation will be from the health care facilities/activities to be established in the project only. Biomedical waste, approx. 4-5 kg/day is likely to be generated from dispensary & Research Institute for Pharmaceutical Advancement proposed within project which includes minor first aid or medical use of disposable dressing material. This waste will be disposed through authorized Common Bio-medical Waste Collection and Disposal Agency as per Bio-medical Waste Management Rules, 2016 and its amendments.

11.5 GREENERY DEVELOPMENT

Green area will be developed as per following scheme

Green belt to be developed by Himachal Pradesh Bulk Drug Park Infrastructure Ltd. (HPBDPIL) in area of 279.46 Acre (@13.21%) in following manner

- 50-meter-wide green belt all along the major streams/ nallah/khads
- 15-meter-wide green belt along the minor streams.
- 15-meter-wide green belt along the project boundary.

Green belt to be developed by member industries in area of 185.72 Acres (@20%) in their industrial premises along the plot boundary.

Green Belt in the project area will be developed with thick plantation of broad leaved trees preferably in three rows to mitigate the various types of pollution.

- Large open spaces for maintaining the green cover
- Small Quality green spaces for recreation
- Linear plantations to provide relief during movement

- Small aesthetic greens for forming vistas etc.

The green belt would;

- Mitigate gaseous emissions;
- Have sufficient capability to arrest accidental release;
- Effective in wastewater reuse;
- Maintain the ecological balance;
- Control noise pollution to a considerable extent;
- Prevent soil erosion;
- Improve the Aesthetics;

All the species suggested are pollution tolerant, besides having an aesthetic appeal.

11.6 ENVIRONMENTAL MONITORING PLAN

The environment monitoring plan enables environmental management system with early sign of need for additional action and modification of ongoing actions for environment management, improvement and conservation. The environmental monitoring points will be decided considering the environmental impacts likely to occur due to the operation of proposed expansion as the main scope of monitoring program is to track, timely and regularly, the change in environmental conditions and to take timely action for protection of environment Monitoring of environmental samples will be done as per the guidelines provided by MoEF&CC/CPCB. Separate records for water, wastewater, solid wastes, air emission, soil and manure/ compost will be prepared and preserved regularly. Along with other budgets, Budget for environmental monitoring will be prepared and revised regularly as per requirement. The estimated yearly budget for Environmental Monitoring has been kept as Rs. 5 lakhs which include monitoring of efficiency of pollution control equipment.

11.7 RISK MITIGATION MEASURES

Even with all precautions, disasters may take place. As such, an Emergency Plan will be formulated to take care of any disaster in the plant and surrounding areas. In order to prevent occurrence of any disaster, the plant will be provided with various safety and disaster control facilities. In addition to these, numerous material handling systems, heavy road transport, high-tension electric lines, overhead cranes and various other handling and transport systems always have chances of accidents.

11.8 PUBLIC CONSULTATION

11.9 PROJECT BENEFITS

The pharma sector at present is dependent on the import sector up to the large extent, chiefly from China. It's a known fact that China is a hostile country, therefore the dependency on the said country if reduced or eliminated, better it will be, in the National interest. Further, the Indian Govt. has initiated a noble concept of **"Aatmanirbhar Bharat"** and this project will negate the need of import from the neighbouring countries to certain effects, will add to the self-sufficiency of the country. Hence, the project is the need of the hour and deserves all the encouragement and facilitation for implementation, to promote technologies and industry for Environment Management.

11.10 ENVIRONMENTAL MANAGEMENT PLAN

Environment Management Department will implement the EMP of the project. All recommendations given in the EIA report including that of occupational health, risk mitigation and safety will be complied. EMC will ensure that all air pollution control devices and water re-circulating systems function effectively. Schemes for resource conservation (raw materials, water etc.) and rainwater harvesting will be taken up by EMC. Greenbelt and greenery development inside and outside the plant premises will be intensified by the EMC. Guidelines issued by the Central Pollution Control Board (CPCB) on greenbelt development will be followed. Environmental awareness programs for the employees will be conducted. and cleanliness inside the plant will ensured by individual member industries.

Table 11.2: Cost of the Environmental Management Plan

S. No.	Environmental Protection Measures	Capital Cost (Crores)	Recurring Cost (Lakhs/year)
1.	Air Pollution Control System (Installation of APCD on Steam Generation Boilers of 6 x 50 TPH with ESPs and appropriate stack height for DG sets 2 x 1000 KVA)	312.30	10
2.	Water Pollution Control System (Installation of CETP 5 MLD, STP 3 MLD, MEE along with continuous effluent monitoring system)	244.43	25
3.	Noise Pollution Control System (Acoustic enclosures for DG sets & Noisy Machinery/ Equipment & Tools, Noise Barriers along	10	1

	roadsides and project boundary at the places nearby settlement areas)		
4.	Landscaping (Development of green area and stabilization of hilly slopes/ land)	10	120
5.	Solid and Hazardous Waste Management System (Installation of TSDF site, Incinerators 4 x 25 TPH with continuous emission monitoring system)	55	20
6.	Environment Monitoring & Management	5	5
7.	Rain water harvesting	2	10

Further, the issues raised during public hearing will be considered under Corporate Environment Responsibility (CER) and covered in the final EIA report.

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CHAPTER 12
DISCLOSURE OF CONSULTANT ENGAGED

12.1 About Consultant

Eco Group is a reputed business house working in the field of environment in North India since 1999 with Vision & Mission of "Preventing pollution with purpose- Bringing profit and goodwill in equal measure". The group aims that the customers achieve effective compliance with legislation including a better public image and earn from waste. The group comprises of Eco Paryavaran Laboratories & Consultants Pvt. Ltd. (formerly known as Eco Laboratories & Consultants Pvt. Ltd.) - engaged in consultancy & analytical services; Eco Paryavaran Engineers & Consultants Pvt. Ltd. - engaged in providing engineering solutions and Environment Matters – undertaking capacity building programs in the field of environment.

MAJOR MILESTONES

- **1999:** Eco Engineers established
- **2001:** Er. Sandeep Garg (CEO) appointed as National Director, Institute of Environmental Sciences & Technology (IEST), USA
- **2003:** First one to be registered as Environmental Consultant with Himachal Pollution Control Board (HPCB)
- **2004:** Establishment of Environmental Testing Lab
- **2007:** Approval from Punjab Pollution Control Board (PPCB)
- **2009:** Approval from Ministry of Environment, Forests and Climate Change (MoEF&CC)

Eco Paryavaran Laboratories & Consultants Pvt. Ltd. (formerly known as Eco Laboratories & Consultants Pvt. Ltd.) - LABORATORY SERVICES DIVISION is known for excellence in monitoring and analysis of environmental, building material and microbiological parameters. Some of the key analytical services provided are Ambient Air Sampling and Analysis; Stack Monitoring – Process stack, DG Stack etc.; Noise and Lux Monitoring; Indoor & work zone monitoring; Water and Wastewater analysis; Soil & Sludge Testing; Testing of Cement – all grades; Testing of Concrete – Cubes, beams, cores, Paver blocks; Testing of Aggregates – Coarse and fine; Testing of Bricks – Burnt Clay, Fly ash; Soil Testing – Both physical and Chemical; Steel Testing – Tensile, Yield, Elongation, Bend and Rebend testing; Swab testing and Indoor air quality etc. ENVIRONMENT SERVICES DIVISION undertakes various activities as - Environmental Impact Assessment/Environmental Clearances; Environmental Audits; Pollution Control Systems Engineering & Design Services; Performance Evaluation of Pollution Control Systems; Benchmarking and Environment due diligence, CGWA/PWRDA/HGWA NOC, Action Plan on Plastic Waste Management, EHS Audits, Consent to Establish, Consent to Operate (CTO), HW Authorization, BMW authorization, Feasibility Reports for various pollution control Boards including Punjab, Haryana, Himachal, Chandigarh, J&K, UP, Uttarakhand, Delhi etc.

Eco Group operates from an independent 10,000 square feet built-up area on three levels each in Mohali, Punjab (India). A dedicated team of thirty engineers, scientists along with the support staff qualified in areas as environment, civil, electrical, mechanical, chemical engineering, biotechnology, chemistry and microbiology oversees the various activities.

Office Pic

Special Facility of Eco Group for Environmental Testing & Management

Onsite Environmental Testing Mobile Testing Laboratory		Noise Dose Monitoring in Work Zone Environment Noise Dosimeter – SVANTEK SV104IS,	

		Intrinsically Safe	
Flue Gas Emissions from Stack/ Source/ Duct Flue Gas Analyzer – MRU, Optima 7		Calibration of Online CEMS (Emission/ Effluent) Calibration for Particulate Matter (Emissions) & pH, BOD, COD, TSS (Effluents)	
Aerosol Dust in Ambient/ Indoor/ Work zone Environment (TSI Side Pak™ AM520i Real Time Aerosol Sampler for PM10, PM5.0, PM2.5, PM1.0 and PM0.8 - DPM), Intrinsically Safe		Milk Powder Emission Loss Monitoring in Dairy Industry Quantification of Milk Powder Emission Loss form Milk Dryers/ Fugitive Emissions/ General Leakage	
			

Validation of Indoor Environment in Hospitals/ Operation Theaters As per ISO 14664 standard, services are delivered as Air Change/ Ventilation Rate, Air Velocity at filtration unit, Pressure Differential, Validation of HEPA Filters by DOP /POA testing, Temp. and Humidity		Industrial Hygiene & Occupational Health and Safety Study in Workzone Environment Industrial Hygiene, Ventilation Rate, Heat Stress, Health and Safety Study as per OSHA/ NIOSH/ Indian Factories Act, 1948	
Noise & Vibration Monitoring Sound level meters and octave brands		Biohazard Testing Air Quality Testing for Bacteria. Yeast & Mould Count	

Eco Paryavaran Engineers and Consultants Private Limited is a 9001: 2015 organization, that provides engineering and turnkey solutions for pollution control and recycling including- Sewage Treatment Plants/Effluent Treatment Plants (both skid mounted and civil); Ultra Filtration-RO Combination Systems for Effluent recycling; Wastewater Treatment Equipments & Components- Aeration Systems; Disinfection systems-Ozone/UV based; Sludge Handling

Systems-Filter Press/Bags; Air Pollution Control Systems; Noise Attenuation; Solid Waste Management Systems.

Environment Matters undertakes various Education & Awareness Campaigns in Schools and Universities, plantation drives, Training of People from Economically Weaker Sections, Capacity-building of qualified professionals from universities, Generating Reliable Data Pitching for Sustainable Development. Glimpses of activities are shown below:

Sensitized more than 1, 00,000 people through Social Media. Facebook: env.matters; Twitter: EcoGroupMohali; LinkedIn: Environment Matters; Instagram: environmentmatters34; YouTube: Eco Group

ASSOCIATIONS WITH ACADEMIA

- **PUNJAB ENGINEERING COLLEGE (PEC), CHANDIGARH**
  - ✓ *Name of Project: MoU for Testing and R & D in our laboratories*
  - ✓ *Date of Project: 11th July 2017*
- ***THAPAR UNIVERSITY, PATIALA***

- ✓ *Name of Project: R & D Support for Bio N; Industrial Training Programme for M.Tech. Students*
- ✓ *Date of Project: March 2012*

• ***IIT, MANDI, HIMACHAL PRADESH***

- ✓ *Name of Project: MoU for R & D projects under IMPRINT Scheme of MHRD, GoI.*
- ✓ *Date of Project: 8th July 2016*

12.2 KEY RECOGNITIONS/ACCREDITATIONS OF CONSULTANT

- QCI NABET accreditation vides Certificate No. NABET/EIA/22-23/RA 0324 dated 17.04.2024.
- Lab Approved by NABL in the field of Testing vide Certificate No. TC-11818 dated 26.06.2023.
- Recognition Letter from CPCB vide File No. LB/99/7/2021-INST LAB-HO-CPCB-HO/Pvt./2945 dated 08.08.2023.
- ISO 9000:2015, ISO 14001:2015, ISO 45001:2018, ISO 50001:2015 and ISO/IEC 17020:2012 certified.

भारतीय गुणवत्ता परिषद
QUALITY COUNCIL OF INDIA
QCI Creating an Ecosystem for Quality

NABET

National Accreditation Board for Education and Training

Certificate of Accreditation

Eco Paryavaran Laboratories & Consultants Pvt. Ltd, Mohali

E 207, Phase VIII B, Sector 74, Industrial Area, S.A.S. Nagar (Mohali), Punjab- 160071

*The organization is accredited as **Category-A** under the QCI-NABET **Scheme for Accreditation of EIA Consultant Organization, Version 3**: for preparing EIA/EMP reports in the following Sectors*

S.No	Sector Description	Sector (as per)		Cat.
		NABET	MoEFCC	
1.	Mining of minerals- open cast mining only	1	1 (a) (i)	A
2.	Metallurgical industries	8	3 (a)	A
3.	Cement plants	9	3 (b)	A
4.	Synthetic organic chemicals industry (dyes & dye intermediates; bulk drugs and intermediates excluding drug formulations; synthetic rubbers; basic organic chemicals, other synthetic organic chemicals, and chemical intermediates)	21	5 (f)	A
5.	Distilleries	22	5 (g)	A
6.	Sugar Industry	25	5 (j)	B
7.	Industrial estates/ parks/ complexes/areas, export processing Zones (EPZs), Special Economic Zones (SEZs), Biotech Parks, Leather Complexes	31	7 (c)	A
8.	Common Effluent Treatment Plants (CETPs)	36	7 (h)	B
9.	Building and construction projects	38	8 (a)	B
10.	Townships and Area Development projects	39	8 (b)	B

Note: Names of approved EIA Coordinators and Functional Area Experts are mentioned in RAAC minutes dated March 21, 2024, posted on QCI-NABET website.

The Accreditation shall remain in force subject to continued compliance to the terms and conditions mentioned in QCI-NABET's letter of accreditation bearing no QCI/NABET/ENV/ACO/24/3196 dated April 17, 2024. The accreditation needs to be renewed before the expiry date by Eco Paryavaran Laboratories and Consultants Pvt Ltd, Mohali following due process of assessment.

Issue Date
April 17, 2024

Valid up to
December 17, 2026

Mr. Ajay Kumar Jha
Sr. Director, NABET

Certificate No.
NABET/EIA/23-26/RA 0324

Prof (Dr) Varinder S Kanwar
(CEO NABET)

For the updated List of Accredited EIA Consultant Organizations with approved Sectors please refer to QCI-NABET website.

National Accreditation Board for Testing and Calibration Laboratories

NABL

CERTIFICATE OF ACCREDITATION

ECO PARYAVARAN LABORATORIES & CONSULTANTS PRIVATE LIMITED

has been assessed and accredited in accordance with the standard

ISO/IEC 17025:2017

"General Requirements for the Competence of Testing & Calibration Laboratories"

for its facilities at

ECO GROUP, ECO BHAWAN, E-207, INDUSTRIAL AREA, PHASE VIIIB (SECTOR 74), SAS NAGAR, MOHALI, PUNJAB, INDIA

in the field of

TESTING

Certificate Number: TC-11818

Issue Date: 26/06/2023 **Valid Until:** 25/06/2025

This certificate remains valid for the Scope of Accreditation as specified in the annexure subject to continued satisfactory compliance to the above standard & the relevant requirements of NABL.
(To see the scope of accreditation of this laboratory, you may also visit NABL website www.nabl-india.org)

Name of Legal Identity : Eco Paryavaran Laboratories & Consultants Private Limited

Signed for and on behalf of NABL

N. Venkateswaran
Chief Executive Officer

केन्द्रीय प्रदूषण नियंत्रण बोर्ड
CENTRAL POLLUTION CONTROL BOARD
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय भारत सरकार
MINISTRY OF ENVIRONMENT FOREST & CLIMATE CHANGE GOVT OF INDIA

CPCB | LiFE Lifestyle For Environment | G20

F.No. LB/99/7/2021-INST LAB-HO-CPCB-HO/Pvt./ 2945 **Dated: 8th August 2023**

Recognition Letter

To,

Head of Laboratory,
M/s Eco Paryavaran Laboratories & Consultants Private Limited,
E-207, Phase VIII-B, Industrial Area / Sector 74, Mohali- 160071.
Punjab.

Subject: Recognition of M/s Eco Paryavaran Laboratories & Consultants Private Limited, E-207, Phase VIII-B, Industrial Area / Sector 74, Mohali- 160071, Punjab as Environmental laboratory under the Environmental (Protection) Act- 1986.

Sir,

I am directed to refer the online application, dated 24/05/2022 for the recognition of your laboratory under Environmental (Protection) Act, 1986. Based on the recommendations of the concerned Division, approval of Competent Authority for recognition of Environmental laboratories and your acceptance of the revised terms and conditions at Annexure-III & IV of the guidelines for recognition of environmental laboratories, CPCB approves the recognition of **M/s Eco Paryavaran Laboratories & Consultants Private Limited, E-207, Phase VIII-B, Industrial Area / Sector 74, Mohali- 160071, Punjab** and shall be notified in the Gazette of India. Considering the current requirement of mandatory accreditation/ certifications of the laboratory, **this recognition shall be valid up to 31/05/2025.**

2. As sought in the aforementioned application, **M/s Eco Paryavaran Laboratories & Consultants Private Limited, E-207, Phase VIII-B, Industrial Area / Sector 74, Mohali- 160071, Punjab,** may undertake the following tests:

i. **Physical Tests-**Conductivity, Colour, pH, Fixed & Volatile Solids, Total Solids, Total Dissolved Solids, Total Suspended Solids, Turbidity, Temperature, Velocity & Discharge Measurement of Industrial Effluent Stream, Flocculation Test (Jar test), Odour, Salinity, Settleable Solids and Sludge Volume Index.
ii. **Inorganic (General and Non-metallic):** Acidity, Alkalinity, Ammonical Nitrogen, Chloride, Chlorine Residual, Dissolved Oxygen, Fluoride, Total Hardness, Total Kjeldahl Nitrogen (TKN), Nitrite Nitrogen, Nitrate Nitrogen, Phosphate, Sulphate, Carbon Dioxide, Silica, Cyanide and Sulphide.
iii. **Inorganic (Trace Metals):** Boron, Cadmium, Calcium, Total Chromium, Chromium Hexavalent, Copper, Iron, Lead, Magnesium, Mercury, Nickel, Potassium, Sodium, Sodium Absorption Ratio, Zinc, Arsenic, Aluminium, Barium, Manganese, Selenium, Silver and Antimony.
iv. **Organics (General) and Trace Organics:** Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Oil and Grease, Phenolic Compounds, Pesticides (each) (Organo-Chlorine and Organo Nitrogen-Phosphorus), Surfactants, Poly-Chlorinated Biphenyl (PCB's) each, Poly-Nuclear Aromatic Hydrocarbon (PAH) and Organic Carbon (in Solid).
v. **Microbiological Test:** Total Coliform, Faecal Coliform, *E. coli, Faecal Streptococci* and Total Plate Count and *Enterococcus*.
vi. **Toxicological Tests:** Bioassay Method for Evaluation of Toxicity using Fish, Measurement of Toxicity using Daphnia or Other Organism and Measurement of Toxicity Factor Using Zebra Fish (Dimensionless Toxicity Test).
vii. **Biological Test:** Benthic Organism Identification and Count, Macrophytic Identification, Planktonic identification count.
viii. **Characterization of Hazardous waste:** Preparation of Leachate (TCLP extract/ Water extract), Ignibility (Flash Point), Toxicity and Measurement of heavy metals/ pesticides in the waste and leachate.

Contd.

'परिवेश भवन' पर्वी अर्जुन नगर, दिल्ली-110032
Parivesh Bhawan, East Arjun Nagar, Delhi-110032
दूरभाष/Tel : 43102030, 22305792, वेबसाईट/Website : www.cpcb.nic.in

ISO 9001:2015

Certificate of Registration

This is to Certify that
Quality Management System of

ECO PARYAVARAN LABORATORIES & CONSULTANTS PRIVATE LIMITED

E-207, INDUSTRIAL AREA, PHASE VIII B (SECTOR–74), MOHALI–160071, PUNJAB, INDIA.

has been assessed and found to conform to the requirements of

ISO 9001:2015

for the following scope :

TESTING SERVICES IN BIOLOGICAL, CHEMICAL AND MECHANICAL CATEGORIES & EIA CONSULTANTS FOR PREPARING EIA/EMP REPORTS.

Certificate No	: 22IQJK83		
Initial Registration Date	: 21/04/2022	Issuance Date	: 21/04/2022
Date of Expiry	: 20/04/2025		
1st Surve. Due	: 21/03/2023	2nd Surve. Due	: 21/03/2024

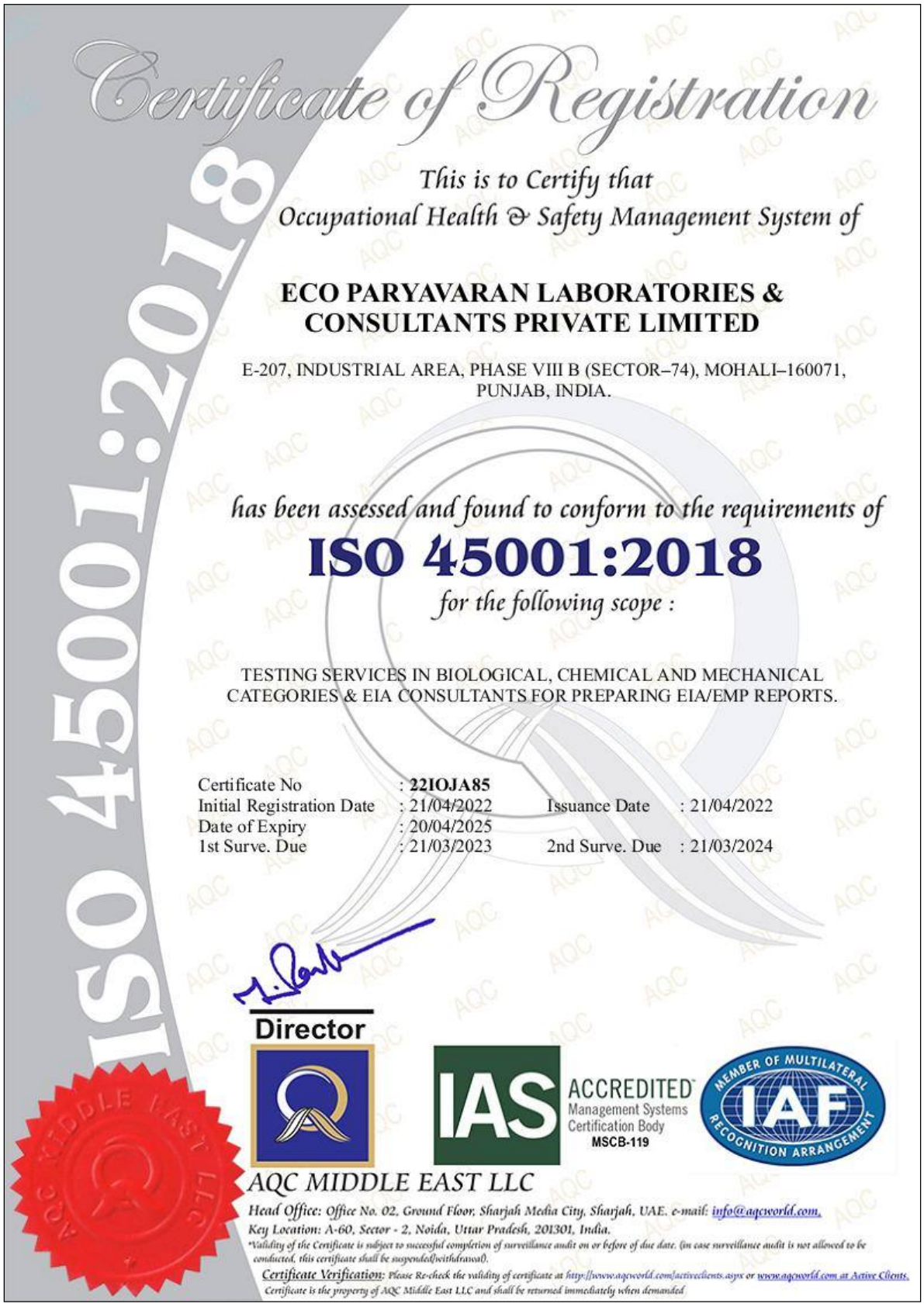
Director

IAS ACCREDITED Management Systems Certification Body MSCB-119

MEMBER OF MULTILATERAL RECOGNITION ARRANGEMENT IAF

AQC MIDDLE EAST LLC

Head Office: Office No. 02, Ground Floor, Sharjah Media City, Sharjah, UAE. e-mail : info@aqcworld.com,
Key Location: A-60, Sector - 2, Noida, Uttar Pradesh, 201301, India.
Validity of the Certificate is subject to successful completion of surveillance audit on or before of due date. (in case surveillance audit is not allowed to be conducted, this certificate shall be suspended/withdrawal).
Certificate Verification: Please Re-check the validity of certificate at http://www.aqcworld.com/activeclients.aspx or www.aqcworld.com at Active Clients.
Certificate is the property of AQC Middle East LLC and shall be returned immediately when demanded



Certificate of Registration

ISO 45001:2018

This is to Certify that
Occupational Health & Safety Management System of

ECO PARYAVARAN LABORATORIES & CONSULTANTS PRIVATE LIMITED

E-207, INDUSTRIAL AREA, PHASE VIII B (SECTOR–74), MOHALI–160071, PUNJAB, INDIA.

has been assessed and found to conform to the requirements of

ISO 45001:2018

for the following scope :

TESTING SERVICES IN BIOLOGICAL, CHEMICAL AND MECHANICAL CATEGORIES & EIA CONSULTANTS FOR PREPARING EIA/EMP REPORTS.

Certificate No	: **22IOJA85**		
Initial Registration Date	: 21/04/2022	Issuance Date	: 21/04/2022
Date of Expiry	: 20/04/2025		
1st Surve. Due	: 21/03/2023	2nd Surve. Due	: 21/03/2024

Director

IAS ACCREDITED Management Systems Certification Body MSCB-119

MEMBER OF MULTILATERAL RECOGNITION ARRANGEMENT IAF

AQC MIDDLE EAST LLC

Head Office: Office No. 02, Ground Floor, Sharjah Media City, Sharjah, UAE. e-mail: info@aqcworld.com,
Key Location: A-60, Sector - 2, Noida, Uttar Pradesh, 201301, India.
*Validity of the Certificate is subject to successful completion of surveillance audit on or before of due date. (in case surveillance audit is not allowed to be conducted, this certificate shall be suspended/withdrawal).
Certificate Verification: Please Re-check the validity of certificate at http://www.aqcworld.com/activeclients.aspx or www.aqcworld.com at Active Clients.
Certificate is the property of AQC Middle East LLC and shall be returned immediately when demanded.

ISO 14001:2015

Certificate of Registration

This is to Certify that
Environmental Management System of

ECO PARYAVARAN LABORATORIES & CONSULTANTS PRIVATE LIMITED

E-207, INDUSTRIAL AREA, PHASE VIII B (SECTOR–74), MOHALI–160071, PUNJAB, INDIA.

has been assessed and found to conform to the requirements of

ISO 14001:2015

for the following scope :

TESTING SERVICES IN BIOLOGICAL, CHEMICAL AND MECHANICAL CATEGORIES & EIA CONSULTANTS FOR PREPARING EIA/EMP REPORTS.

Certificate No	: **22IEJS76**		
Initial Registration Date	: 21/04/2022	Issuance Date	: 21/04/2022
Date of Expiry	: 20/04/2025		
1st Surve. Due	: 21/03/2023	2nd Surve. Due	: 21/03/2024

Director

IAS ACCREDITED Management Systems Certification Body MSCB-119

MEMBER OF MULTILATERAL RECOGNITION ARRANGEMENT IAF

AQC MIDDLE EAST LLC

Head Office: Office No. 02, Ground Floor, Sharjah Media City, Sharjah, UAE. e-mail: info@aqcworld.com,
Key Location: A-60, Sector - 2, Noida, Uttar Pradesh, 201301, India.
**Validity of the Certificate is subject to successful completion of surveillance audit on or before of due date. (in case surveillance audit is not allowed to be conducted, this certificate shall be suspended/withdrawal).*
Certificate Verification: Please Re-check the validity of certificate at http://www.aqcworld.com/activeclients.aspx or www.aqcworld.com at Active Clients.
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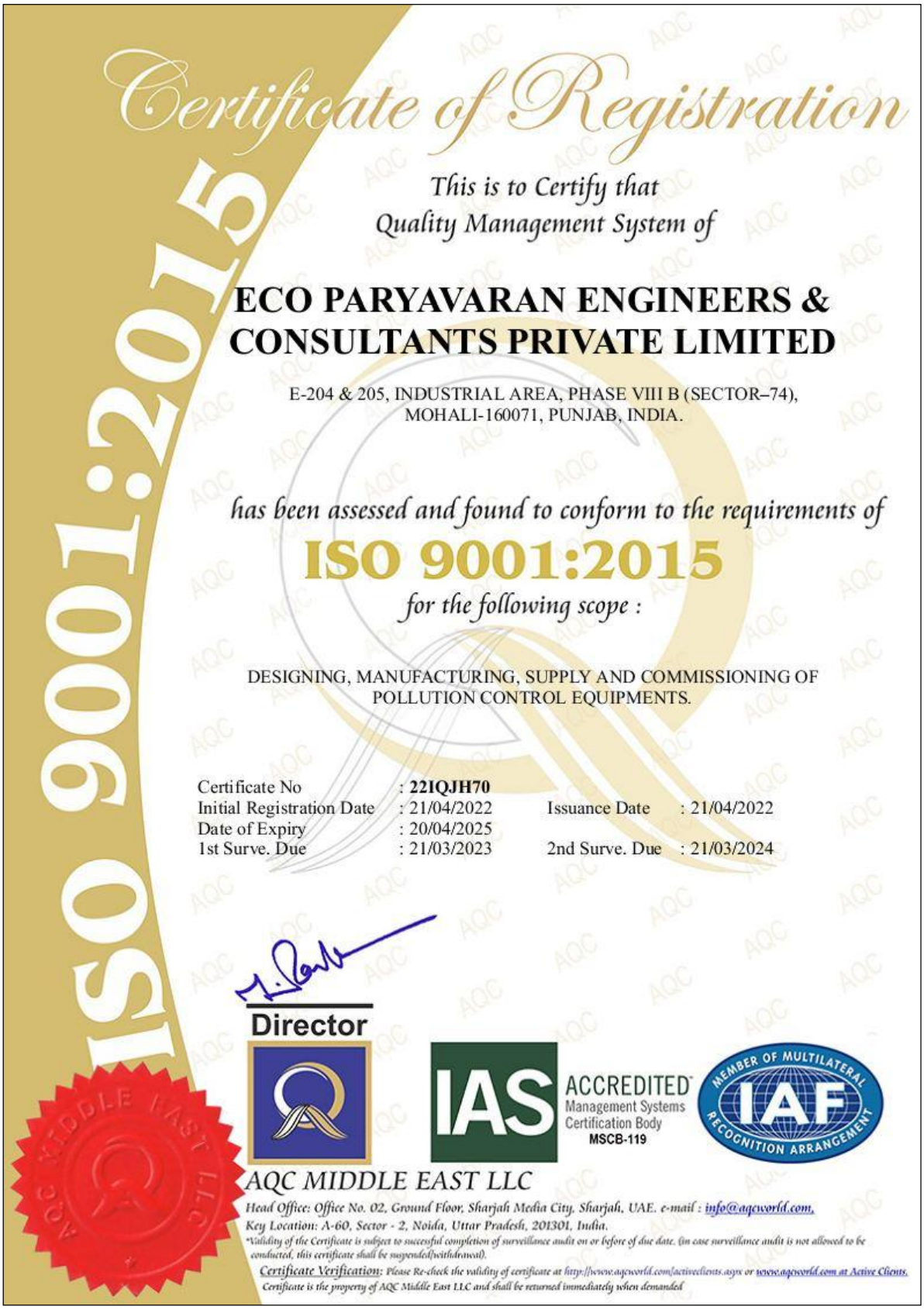

ISO 9001:2015

Certificate of Registration

This is to Certify that
Quality Management System of

ECO PARYAVARAN ENGINEERS & CONSULTANTS PRIVATE LIMITED

E-204 & 205, INDUSTRIAL AREA, PHASE VIII B (SECTOR–74),
MOHALI-160071, PUNJAB, INDIA.

has been assessed and found to conform to the requirements of

ISO 9001:2015

for the following scope :

DESIGNING, MANUFACTURING, SUPPLY AND COMMISSIONING OF POLLUTION CONTROL EQUIPMENTS.

Certificate No	: **22IQJH70**		
Initial Registration Date	: 21/04/2022	Issuance Date	: 21/04/2022
Date of Expiry	: 20/04/2025		
1st Surve. Due	: 21/03/2023	2nd Surve. Due	: 21/03/2024

Director

IAS ACCREDITED Management Systems Certification Body MSCB-119

MEMBER OF MULTILATERAL RECOGNITION ARRANGEMENT IAF

AQC MIDDLE EAST LLC

Head Office: Office No. 02, Ground Floor, Sharjah Media City, Sharjah, UAE. e-mail : info@aqcworld.com,
Key Location: A-60, Sector - 2, Noida, Uttar Pradesh, 201301, India.
**Validity of the Certificate is subject to successful completion of surveillance audit on or before of due date. (in case surveillance audit is not allowed to be conducted, this certificate shall be suspended/withdrawal).*
Certificate Verification: Please Re-check the validity of certificate at http://www.aqcworld.com/activeclients.aspx or www.aqcworld.com at Active Clients.
Certificate is the property of AQC Middle East LLC and shall be returned immediately when demanded

CERTIFICATE
OF REGISTRATION

This is to Certify that

ECO PARYAVARAN LABORATORIES AND CONSULTANTS PRIVATE LIMITED

E-207, PHASE VIII B, MOHALI, SAS NAGAR, PUNJAB - 160055, INDIA

has been independently assessed by UICL and found to be complied with the requirements of

ISO 50001:2018
(Energy Management System)

For the Following Scope of Activities

Providing Energy Audits and Consultancy Services to Industries, Educational Institutes and Commercial Establishments for the Management of Energy Performance and Environmental Carbon Footprints

Certificate No:- 206383/2024/U

Issue date : 05-06-2024 **1st Surveillance date : 04-05-2025**
Expiry date : 05-06-2027 **2nd Surveillance date : 03-04-2026**

Auth. Signatory

UNIQ INTERNATIONAL CERTIFICATIONS LIMITED
71-75, Shelton Street, Covent Garden, London, WC2H 9JQ
Web:- www.ukuicl.com, Mail:- info@ukuicl.com

Validity of this certificate is subject to successful completion of Surveillance Audits.
This certificate is property of UICL Limited.
You can check the validity of certificate at www.ukuicl.com/clients.

CERTIFICATE
OF REGISTRATION

This is to Certify that

ECO PARYAVARAN LABORATORIES AND CONSULTANTS PRIVATE LIMITED

E-207, PHASE VIII B, MOHALI, SAS NAGAR, PUNJAB - 160055, INDIA

has been independently assessed by UICL and found to be complied with the requirements of

ISO/IEC 17020:2012

(Conformity assessment — Requirements for the operation of various types of bodies performing inspection)

For the Following Scope of Activities

Providing Audits & Certification Services to Industries, Educational Institutes and Commercial Establishments for Environment Management, Green Management, Energy Management, Environmental Carbon Footprints, Industrial Hygiene, Occupational Health and Safety".

Certificate No:- 506376/2024/U

Issue date : 05-06-2024 **1st Surveillance date : 04-05-2025**

Expiry date : 05-06-2027 **2nd Surveillance date : 03-04-2026**

Auth. Signatory

UNIQ INTERNATIONAL CERTIFICATIONS LIMITED
71-75, Shelton Street, Covent Garden, London, WC2H 9JQ
Web:- www.ukuicl.com, Mail:- info@ukuicl.com

Validity of this certificate is subject to successful completion of Surveillance Audits.
This certificate is property of UICL Limited.
You can check the validity of certificate at www.ukuicl.com/clients.

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EXECUTIVE SUMMARY

1.0 PROJECT DESCRIPTION

It is a proposed Bulk Drug Park to be established at Villages Kuthar Beet, Pollian Beet, Tibbian, Jodian, Janani and Mulluwal, Tehsil Haroli, District Una, Himachal Pradesh. Plot area of the project is 1,405.41 acres (or 568.75 Ha) has been allotted for establishment of the project; out of which, Govt. land of 1,365.77 acres allotted to Dept. of Industries, Govt. of HP and 39.64 acres of land purchased and transferred to Dept. of Industries, Govt. of HP for setup of the proposed industrial park. **Himachal Pradesh Bulk Drug Park Infrastructure Ltd. (HPBDPIL)** is nodal agency to coordinate and supervise the project development activities.

As per the clause 7 of the Bulk Drug Park scheme, the State Government has decided to set up dedicated State Implementing Agency (SIA) named the **"Himachal Pradesh Bulk Drug Park Infrastructure Ltd. (HPBDPIL)"** which is **formed under section 8 of the Company Act, 2013** and a **govt. own agency under the aegis of Department of Industries, Govt. of Himachal Pradesh.** SIA will form a management committee for monitoring, operation and maintenance of the park after the completion of the park.

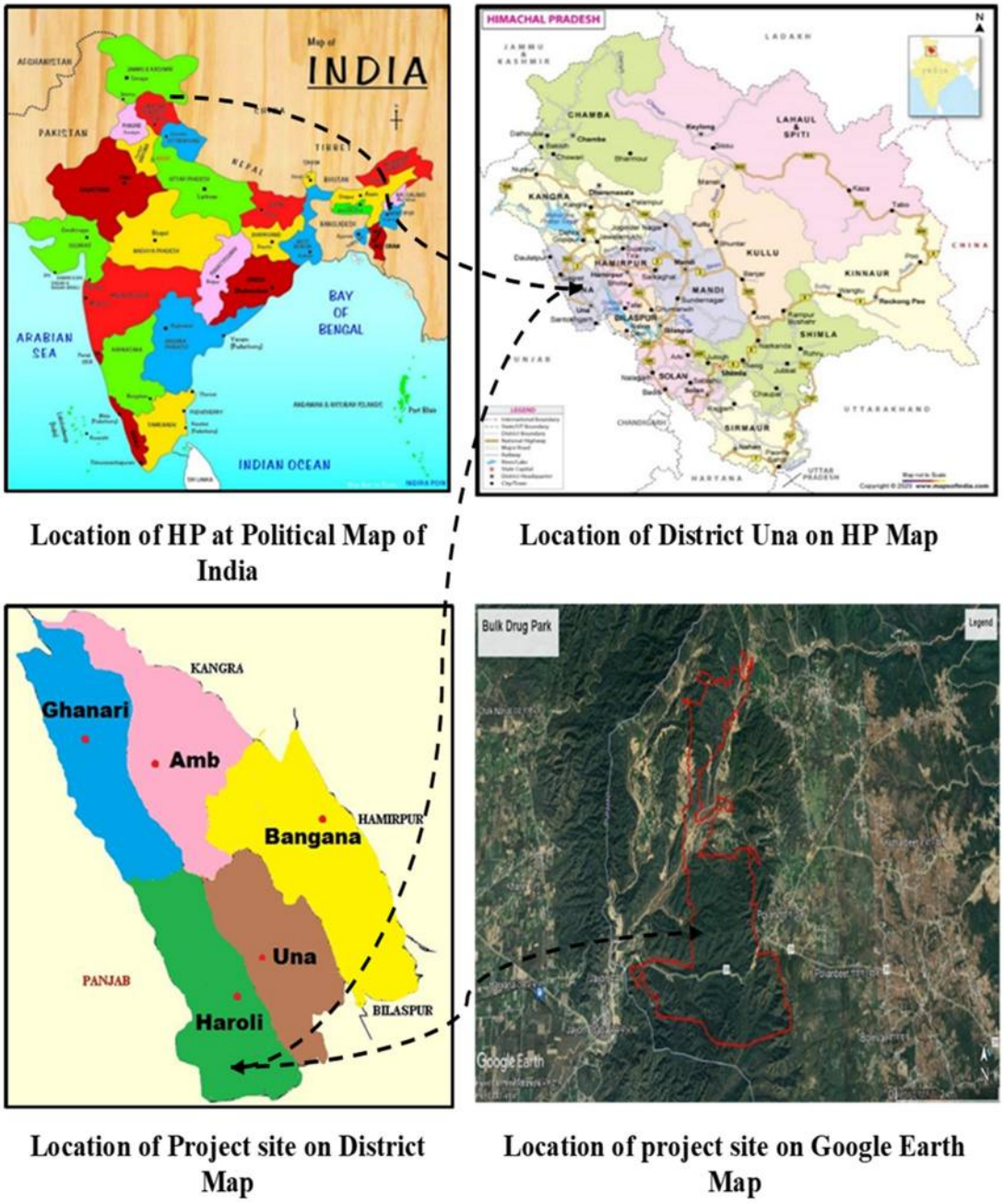
2.0 LOCATION & CONNECTIVITY

Bulk Drug Park site is proposed in Villages Kuthar Beet, Pollian Beet, Tibbian, Jodian, Janani and Mulluwal, Tehsil Haroli, District Una, Himachal Pradesh. The proposed site is accessible through Una-Jaijon. Location of the project site is given below in Fig. 1. Project location and its study area falls in the Survey of India, Toposheet No. H43K2 & H43K6. Fig. 2 and boundary co-ordinates of the project site are given in Table 1 below:

Table 1. Boundary Co-ordinates of the Project

Corners	Latitude	Longitude	Corners	Latitude	Longitude
1	N31° 20' 45.24"	E76° 11' 14.64"	**22**	N31° 23' 27.96"	E76° 10' 38.64"
2	N31° 20' 38.76"	E76° 10' 40.8"	**23**	N31° 23' 19.32"	E76° 10' 48.00"
3	N31° 20' 39.84"	E76° 10' 19.56"	**24**	N31° 23' 6.36"	E76° 10' 42.24"
4	N31° 20' 48.12"	E76° 10' 6.24"	**25**	N31° 22' 58.44"	E76° 10' 35.04"
5	N31° 20' 50.64"	E76° 9' 33.48"	**26**	N31° 22' 50.52"	E76° 10' 23.16"
6	N31° 20' 56.4"	E76° 9' 30.96"	**27**	N31° 22' 42.96"	E76° 10' 21.36"

7	N31° 21' 5.76"	E76° 9' 23.76"	**28**	N31° 22' 31.8"	E76° 10' 3.00"
8	N31° 21' 1.08"	E76° 9' 18.36"	**29**	N31° 22' 13.08"	E76° 10' 1.20"
9	N31° 21' 9.72"	E76° 9' 12.24"	**30**	N31° 22' 21.36"	E76° 10' 18.48"
10	N31° 21' 12.24"	E76° 9' 26.28"	**31**	N31° 22' 15.6"	E76° 10' 31.8"
11	N31° 21' 9.36"	E76° 10' 0.84"	**32**	N31° 22' 5.88"	E76° 10' 14.88"
12	N31° 21' 35.28"	E76° 9' 55.8"	**33**	N31° 21' 55.08"	E76° 10' 3.36"
13	N31° 21' 50.04"	E76° 9' 56.52"	**34**	N31° 21' 56.52"	E76° 10' 32.52"
14	N31° 22' 15.24"	E76° 9' 50.4"	**35**	N31° 21' 52.2"	E76° 10' 53.04"
15	N31° 22' 35.4"	E76° 9' 53.64"	**36**	N31° 21' 57.96"	E76° 10' 44.04"
16	N31° 23' 4.92"	E76° 9' 48.96"	**37**	N31° 21' 46.08"	E76° 10' 48.36"
17	N31° 23' 2.4"	E76° 10' 4.44"	**38**	N31° 21' 34.92"	E76° 10' 49.8"
18	N31° 23' 18.24"	E76° 10' 4.08"	**39**	N31° 21' 27"	E76° 10' 46.2"
19	N31° 23' 14.28"	E76° 10' 18.48"	**40**	N31° 21' 14.04"	E76° 10' 49.44"
20	N31° 23' 10.32"	E76° 10' 25.68"	**41**	N31° 21' 12.96"	E76° 11' 5.28"
21	N31° 23' 20.04"	E76° 10' 30.72"	**42**	N31° 20' 54.96"	E76° 11' 13.2"



Location of HP at Political Map of India | **Location of District Una on HP Map**

Location of Project site on District Map | **Location of project site on Google Earth Map**

Figure 1. Location map of the project

3.0 BRIEF FEATURES OF PROJECT

HPSBDPIL, Dept. of Industries, Govt. of HP is a nodal agency coordinating and supervising project development activities. HPBDPIL will be involved in the development of the proposed industrial estate, which will house API manufacturing industries based on the chemical synthesis only (Approx. 70-80 industrial units in the 110 industrial plots). The upcoming industries in the park will be in the pharma sector and mostly in large scale categories. The

project as a whole also comes under the large scale category. Area Statement is given as table below:

Table 2. Magnitude and components of Bulk Drug Park

Sr. No.	Description	Area in Acres	Area in Ha	Percentage (%)
1.	Industrial Plot Area	558.28	225.93	39.72
2.	Commercial Plot Area	95.02	38.45	6.76
3.	Electric Substation	23.37	9.46	1.66
4.	Utility Area	41.65	16.86	2.96
5.	TSDF Area	29.46	11.92	2.10
6.	Parking Area	18.46	7.47	1.31
7.	Green Area and Green Area Under Industrial Plots	465.18	188.25	33.09
8.	Waste Treatment Facilities Area (STP /ETP /MEE & WTP)	41.08	16.62	2.92
9.	Common Logistic Area	18.90	7.65	1.34
10.	Roads	86.45	34.98	6.15
11.	Water Bodies	27.28	11.04	1.94
12.	Other	0.30	0.12	0.02%
	Total Area	1405.41	568.75	100%

4.0 METEOROLOGY

Meteorological data for last 10 years (2011-20) were collected from secondary authorized sources as NASA ((Source: POWER | Data Access Viewer (nasa.gov)) using geo-referencing of project site coordinates. Further, primary micrometeorological data at project location

recorded using automatic weather station during for a period one year (2023) to verify the secondary data record and prevailing meteorological conditions. Hourly data air temperature, barometric pressure, humidity, wind speed, wind direction, rainfall and solar radiation were recorded in data logger of AWS. The met station was kept in an open area at an appropriate height of 10m from the ground. Cloud cover is observed visually.

5.0 AMBIENT AIR QUALITY

Ambient air quality monitoring (AAQM) station were installed in upwind, downwind and crosswind directions as per prevailing meteorological conditions (predominant wind direction from WNW) in the study area at 3 locations in core zone/project area and 7 locations in buffer zone of 10kms.

Particulate aerosols observed in the study area during April to June 2023 ranged 33.5 - 84.4 $\mu g/m^3$ (avg. 56.6 $\mu g/m^3$) as PM_{10} and 17.4 – 45.7 $\mu g/m^3$ (avg. 29.9 $\mu g/m^3$) as $PM_{2.5}$ are within the prescribed limits of 100 $\mu g/m^3$ for PM_{10} and 60 $\mu g/m^3$ for $PM_{2.5}$ (NAAQS CPCB, 2009). The obtained results are comparable and in agreement with the secondary data collected by HPSPCB (RO/ DIC, Una) and other EIA studies of Una region. The baseline data of existing mass levels of PM_{10} and $PM_{2.5}$ are associated to industrial units operating in Tahliwal industrial area (about 6 kms from the project) and Bathri industrial area (about 10.5kms from the project) in ESE direction and Amb-Gagret-Jeetpur industrial cluster (about 20-25kms from the project) in ENE direction. Other source can be vehicles plying on the roads, ongoing domestic and agricultural activities in the study area. As evident from the baseline data, the locations AQ-4 to AQ-8 (specially AQ-8) located in Eastern side of project experience higher air pollution load in comparison to the locations AQ-1 to AQ-3 located in Western area due to close proximity of Tahliwal and Bathri industrial areas.

Gaseous pollutants observed in the study area during April to June 2023 ranged 4.3 – 14.8 $\mu g/m^3$ (avg. 8.3 $\mu g/m^3$) as SO_2 and 3.8 – 22.8 $\mu g/m^3$ (avg. 12.1 $\mu g/m^3$) as NO_2 are well within the prescribed limits of 80 $\mu g/m^3$ (NAAQS CPCB, 2009) indicates no significant source of emission in the study area and air quality is safe and comfortable for human health. The obtained results are comparable and in agreement with the secondary data collected by HPSPCB (RO/ DIC, Una) and other EIA studies of Una region. the gaseous pollutants as Carbon Monoxide (CO), Ozone (O_3) and Ammonia (NH_3) observed in the study area are found to be well within the prescribed limits (NAAQS CPCB, 2009) indicates no significant source of emission in the study area and air quality is safe and comfortable for human health.

6.0 AMBIENT NOISE QUALITY

The main objective of monitoring of ambient noise levels was to establish the baseline noise levels in different zones. i. e. Residential, Industrial, Commercial and Silence zones, in the surrounding areas and to assess the total noise level in the environment of the study area. The noise monitoring was conducted at four locations selected in the study area of 10 kms (one in core zone and 3 in buffer zone within 1 km radius). Integrated Sound Level Meters (SLMs) with data logger were used for data collection. Calibration check of SLMs were performed before and after sampling. Noise sampling was done by installing SLMs at a sampling height of 1.2 to 1.5 m in open area or ≥ 250 m away from source of noise or obstructions or reflecting surfaces. Noise monitoring was carried out during day time (06:00 am – 10:00 pm) and night time (10:00 pm to 06:00 am) continuously for 24-hours with one-hour login interval as per national/ international standard methods as CPCB Noise Rules (2000), IS: 9989-1981 & IS: 4758-1968.

Ambient noise levels measured in the study area varied from 46.3 – 51.2 dB(A) during day time and 35.4 – 40.2 dB(A) during night time. The observed noise levels are found to be within the prescribed limits for residential area (Noise Rules, 2000). The obtained results are comparable and in agreement with the secondary data of EIA studies conducted in Una region. The observed baseline/ existing noise quality may be associated to industrial units operating in Tahliwal industrial (about 6 km from the project) and Bathri industrial area (about 10 km from the project) in ESE direction. Other source can be vehicles plying on the roads, ongoing domestic and agricultural activities in the study area.

7.0 WATER QUALITY

Water quality of groundwater has been studied in order to access proposed water-uses in drinking, cooling and horticulture purposes. The groundwater quality of five different monitoring locations within the 10 km radius of study area was evaluated in terms of various physico-chemical and biological parameters. The observed data set was initially statistical analyzed and compared with the standard guideline of acceptable and prescribed limit for drinking water quality under IS: 10500, 2012 and its amendments proposed by Bureau of Indian Standards (BIS).

The analysis of physical parameters such as colour, odour, pH, TU and TDS represents that the groundwater samples were colourless, odourless, within suitable pH (6.5-8.5), no turbid

and presence of suitable amount of dissolved solids (below 500 mg/L). The comparison of groundwater variables with standards limits indicated that the all groundwater quality parameters were within the prescribed limit of drinking water quality. Only the Total Hardness, Cations (Ca++ and Mg++) and Total Alkalinity were reported exceeds the acceptable limit of 200 mg/L, 30 mg/L, 75 mg/L and 200 mg/L respectively at almost monitoring locations. This indicates the prior treatment of hardness before any use of groundwater such as domestic and commercial purposes. Similarly, the cation such Ca^{2+} and Mg^{2+} were reported above the acceptable limit. The concentration of TU, BOD, Total N, Total P, Phenol and Heavy Metals (PB and Hg) were recorded below detection limit (BDL). The biological parameters (TC and FC) were found absent in groundwater samples. The ground water test results indicate that groundwater quality at selected monitoring locations is hard water in nature and requires prior treatment before the use for domestic, industrial and commercial purposes.

8.0 SOIL QUALITY

Two types of soils are observed in the district viz., alluvial soil and non-calcic brown soil. Most of the area in the district is covered with alluvial soil and only about 25% of the area i.e. hilly area in the district is covered with non-calcic brown soil. Soils are rich in nutrients and thus are fertile.

Soil quality monitored once at 5 locations (including project location) within 10 km of study area during the monitoring period. The soil sample were collected from various depths of 30 cm, 60 cm & 90 cm from nearby agriculture land, waste disposal areas or likely impacted areas and sample handling (including sample preservation and transportation) was carried out as per national/ international standard methods as Soil/Sludge quality monitoring (IS: 2720, APHA & ICAR/IARI guidelines).

In the current study, indicators viz., pH, EC, porosity, permeability, macro and micro-mineral compositions (such as Na, K, N, P, Ca and Mg) etc. were analyzed and assessed. The soil parameters could offer the information of soil fertility status well, so these indicators were used to evaluate the soil composition in the study area. The pH of the monitoring location indicates neutral to alkaline in nature so soil. SAR was reported below 13 meq/L and mineral composition refers to its suitability for agriculture and cultivations purposes.

9.0 ECOLOGY

As per toposheet no (H43E3 and H43E7), there is the Polian Shamlat Reserve Forest is adjoining the project site in West direction and the Kangar Protective Forest is approx. 7 km far away from project site in NW direction. Distance from another Eco sensitive zone, Swan River is also approx. 8.5 km from project site in NE direction.

10.0 ANTICIPATED ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

10.1 AIR QUALITY

In worst-case scenario (without APCD and/or failure of plant process), the maximum cumulative load of PM_{10} will be 131.6 µg/m3, NOx will be 43.6 µg/m3, HCl will be 29.9 µg/m3 and Benzene will be 4.3 µg/m3 can deteriorate the air quality with sever health and environmental impacts. Hence this condition will be avoided in any circumstances and the project will be operated with proper and effective pollution control measures, regular checkups and maintenance of APCDs and plant process at all stages of the operation.

In controlled conditions (with APCD /effective control measures), the maximum cumulative load of PM_{10} will be 94.1 µg/m3, NOx will be 32.3 µg/m3, HCl will be 10.1 µg/m3 and Benzene will be 0.4 µg/m3. The overall maximum loads at receptors within the study area will be PM_{10} as 69.4-84.1 µg/m3, $PM_{2.5}$ as 37-44.6 µg/m3, NO_2 as 15-22.5 µg/m3, SO_2 as 9.9-14.2 µg/m3, NH_3 as 7.75-9.83 µg/m3, CO as 370.9-581.7 µg/m3, Cl_2 as 0.03-0.21 µg/m3, HCl as 0.07-0.49 µg/m3, Benzene as 0.01-0.07 µg/m3, Dichloromethane as 0.38-2.85 µg/m3 and Acetonitrile as 1.91-14.25 µg/m3 indicates the minor change in air quality with no significant health and environmental impacts.

10.2 NOISE QUALITY

As per noise propagation modeling carried out, the resulting/ cumulative noise levels (Baseline + Predicted) found to be in the range of 46.3-51.2 dB(A) were within the prescribed limits of 55 dB(A) for residential areas. Therefore, there is no significant impacts of noise on surrounding receptors within the study area due to the project operation.

10.3 WATER QUALITY

Industrial effluents will be treated with CETP of 5 MLD with ZLD technology and domestic discharges will be treated in STP of 3 MLD. No wastewater (effluent/ sewage) will be

discharged outside the plant premises and will be recycled and reused in industrial processes only.

Storm water drains will be kept separate from wastewater drains. Hence, surface water quality will not be affected due to project operation.

10.4 SOLID WASTE

Solid waste of about 8.8 TPD (@ 0.2 kg/capita/day) will be generated. Solid waste will be duly segregated into biodegradable and non-biodegradable components. Separate area will be earmarked for segregation of solid waste. Biodegradable waste will be composted within project premises and recyclable component will be disposed off through authorized recycler vendors. The Solid Waste will be handled/disposed off as per the provision of Solid Waste Management Rules 2016 and its amendments.

HAZARDOUS WASTE

The proposed Bulk Drug Park will house API manufacturing units which involves chemical synthesis only. Generation of hazardous waste from API units depends upon type and quantity of production, nature and quantity of raw material used and process and technology to be used for API manufacturing. Generally, it is assumed that about 80 API units during full occupancy of Bulk Drug project with production capacity of 2000-2250 TPD of APIs will generate hazardous wastes in the tune of about 1/3rd of the production, thus a nearly 700-800 TPD of Hazardous Waste of different categories will be generated. Out of the total Hazardous Waste of 700-800 TPD quantum, likely to be generated in the project, nearly 10-12 TPD will be of storage able category (CETP sludge & MEE residue) and 650-800 TPD will be of incinerate-able/co-processing category. These all type of Hazardous Waste will be disposed of with the authorized entities. An integrated TSDF (comprising a secured landfill, a solid-liquid feed incinerator is proposed inside the project for which 33.6 acres of land has been proposed.

For the development of TSDF for the storage-able waste and incinerator for the incinerate-able waste, the separate detailed proposal will be prepared by PP to meet with the requisite as per the EIA Notification, 2006.

Bio-Medical Waste

The source of Bio-Medical Waste generation will be from the health care facilities/activities to be established in the project only. Biomedical waste, approx. 4-5 kg/day is likely to be

generated from dispensary & Research Institute for Pharmaceutical Advancement proposed within project which includes minor first aid or medical use of disposable dressing material. This waste will be disposed through authorized Common Bio-medical Waste Collection and Disposal Agency as per Bio-medical Waste Management Rules, 2016 and its amendments.

11.0 GREENERY DEVELOPMENT

Green area will be developed as per following scheme

Green belt to be developed by Himachal Pradesh Bulk Drug Park Infrastructure Ltd. (HPBDPIL) in area of 279.46 Acre (@13.21%) in following manner

- 50-meter-wide green belt all along the major streams/ nallah/khads
- 15-meter-wide green belt along the minor streams.
- 15-meter-wide green belt along the project boundary.

Green belt to be developed by member industries in area of 185.72 Acres (@20%) in their industrial premises along the plot boundary.

Green Belt in the project area will be developed with thick plantation of broad leaved trees preferably in three rows to mitigate the various types of pollution.

- Large open spaces for maintaining the green cover
- Small Quality green spaces for recreation
- Linear plantations to provide relief during movement
- Small aesthetic greens for forming vistas etc.

The green belt would;

- Mitigate gaseous emissions;
- Have sufficient capability to arrest accidental release;
- Effective in wastewater reuse;
- Maintain the ecological balance;
- Control noise pollution to a considerable extent;
- Prevent soil erosion;
- Improve the Aesthetics;

All the species suggested are pollution tolerant, besides having an aesthetic appeal.

12.0 ENVIRONMENTAL MONITORING PLAN

The environment monitoring plan enables environmental management system with early sign of need for additional action and modification of ongoing actions for environment management, improvement and conservation. The environmental monitoring points will be decided considering the environmental impacts likely to occur due to the operation of proposed expansion as the main scope of monitoring program is to track, timely and regularly, the change in environmental conditions and to take timely action for protection of environment Monitoring of environmental samples will be done as per the guidelines provided by MoEF&CC/CPCB. Separate records for water, wastewater, solid wastes, air emission, soil and manure/ compost will be prepared and preserved regularly. Along with other budgets, Budget for environmental monitoring will be prepared and revised regularly as per requirement. The estimated yearly budget for Environmental Monitoring has been kept as Rs. 5 lakhs which include monitoring of efficiency of pollution control equipment.

13.0 RISK MITIGATION MEASURES

Even with all precautions, disasters may take place. As such, an Emergency Plan will be formulated to take care of any disaster in the plant and surrounding areas. In order to prevent occurrence of any disaster, the plant will be provided with various safety and disaster control facilities. In addition to these, numerous material handling systems, heavy road transport, high-tension electric lines, overhead cranes and various other handling and transport systems always have chances of accidents.

14.0 PUBLIC CONSULTATION

15.0 PROJECT BENEFITS

The pharma sector at present is dependent on the import sector up to the large extent, chiefly from China. It's a known fact that China is a hostile country, therefore the dependency on the said country if reduced or eliminated, better it will be, in the National interest. Further, the Indian Govt. has initiated a noble concept of **"Aatmanirbhar Bharat"** and this project will negate the need of import from the neighbouring countries to certain effects, will add to the self-sufficiency of the country. Hence, the project is the need of the hour and deserves all the

encouragement and facilitation for implementation, to promote technologies and industry for Environment Management.

16.0 ENVIRONMENTAL MANAGEMENT PLAN

Environment Management Department will implement the EMP of the project. All recommendations given in the EIA report including that of occupational health, risk mitigation and safety will be complied. EMC will ensure that all air pollution control devices and water re-circulating systems function effectively. Schemes for resource conservation (raw materials, water etc.) and rainwater harvesting will be taken up by EMC. Greenbelt and greenery development inside and outside the plant premises will be intensified by the EMC. Guidelines issued by the Central Pollution Control Board (CPCB) on greenbelt development will be followed. Environmental awareness programs for the employees will be conducted. and cleanliness inside the plant will ensured by individual member industries.

Table 3: Cost of the Environmental Management Plan

S. No.	Environmental Protection Measures	Capital Cost (Crores)	Recurring Cost (Lakhs/year)
1.	Air Pollution Control System (Installation of APCD on Steam Generation Boilers of 6 x 50 TPH with ESPs and appropriate stack height for DG sets 2 x 1000 KVA)	312.30	10
2.	Water Pollution Control System (Installation of CETP 5 MLD, STP 3 MLD, MEE along with continuous effluent monitoring system)	244.43	25
3.	Noise Pollution Control System (Acoustic enclosures for DG sets & Noisy Machinery/ Equipment & Tools, Noise Barriers along roadsides and project boundary at the places nearby settlement areas)	10	1
4.	Landscaping (Development of green area and stabilization of hilly slopes/ land)	10	120
5.	Solid and Hazardous Waste Management System (Installation of TSDF site, Incinerators 4 x 25 TPH with continuous emission monitoring system)	55	20
6.	Environment Monitoring & Management	5	5
7.	Rain water harvesting	2	10

Further, the issues raised during public hearing will be considered under Corporate Environment Responsibility (CER) and covered in the final EIA report.

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परियोजना का कार्यकारी सारांश

1.0 परियोजना विवरण

यह हिमाचल प्रदेश के ऊना जिले की हरोली तहसील के कुठार बीट, पोलियन बीट, तिब्बियां, जोडियां, जनानी और मुल्लुवाल गांवों में स्थापित किया जाने वाला एक प्रस्तावित बल्क ड्रग पार्क है। परियोजना की स्थापना के लिए 1,405.41 एकड़ (या 568.75 हेक्टेयर) भूखंड आवंटित किया गया है; जिसमें से 1,365.77 एकड़ सरकारी भूमि हिमाचल प्रदेश सरकार के उद्योग विभाग को आवंटित की गई है और 39.64 एकड़ भूमि खरीद कर उद्योग विभाग, हिमाचल प्रदेश सरकार को प्रस्तावित औद्योगिक पार्क की स्थापना के लिए हस्तांतरित की गई है। हिमाचल प्रदेश बल्क ड्रग पार्क इंफ्रास्ट्रक्चर लिमिटेड (एचपीबीडीपीआईएल) परियोजना विकास गतिविधियों के समन्वय और पर्यवेक्षण के लिए नोडल एजेंसी है। बल्क ड्रग पार्क योजना के खंड 7 के अनुसार, राज्य सरकार ने "हिमाचल प्रदेश बल्क ड्रग पार्क इंफ्रास्ट्रक्चर लिमिटेड (एचपीबीडीपीआईएल)" नामक समर्पित राज्य कार्यान्वयन एजेंसी (एसआईए) स्थापित करने का निर्णय लिया है, जिसका गठन कंपनी अधिनियम, 2013 की धारा 8 के तहत किया गया है और यह हिमाचल प्रदेश सरकार के उद्योग विभाग के तत्वावधान में एक सरकारी एजेंसी है। पार्क के पूरा होने के बाद एसआईए पार्क की निगरानी, संचालन और रखरखाव के लिए एक प्रबंधन समिति बनाएगी।

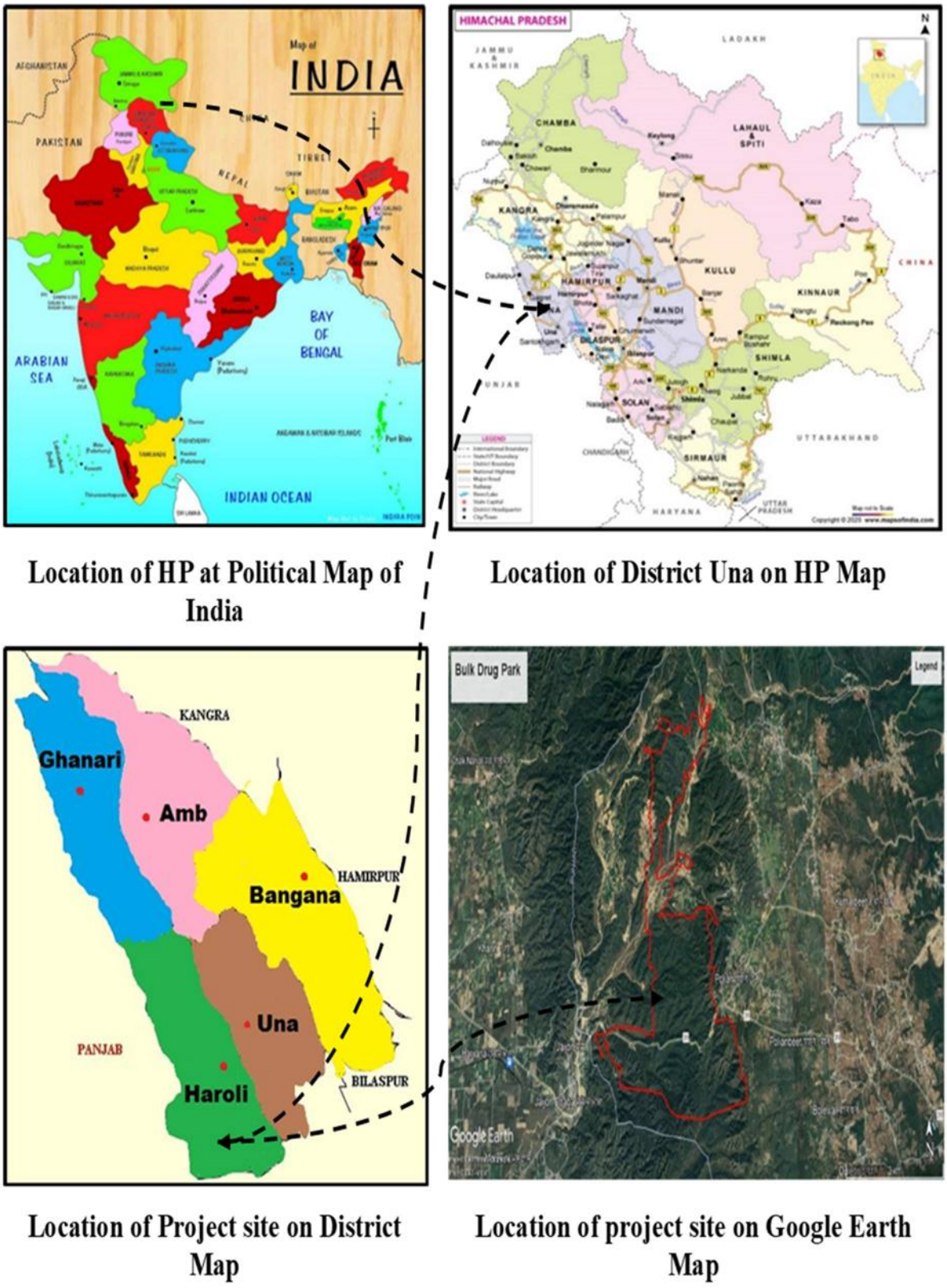
2.0 परियोजना स्थान और कनेक्टिविटी

हिमाचल प्रदेश के ऊना जिले की हरोली तहसील के कुठार बीट, पोलियन बीट, तिब्बियां, जोडियां, जनानी और मुल्लुवाल गांवों में बल्क ड्रग पार्क स्थल प्रस्तावित है। प्रस्तावित स्थल ऊना-जैजों के रास्ते से पहुँचा जा सकता है। परियोजना स्थल का स्थान नीचे चित्र 1 में दिया गया है। परियोजना का स्थान और इसका अध्ययन क्षेत्र भारतीय सर्वेक्षण विभाग, टोपोशीट संख्या H43K2 और H43K6 में आता है। परियोजना स्थल के चित्र 2 और सीमा निर्देशांक नीचे तालिका 1 में दिए गए हैं:

तालिका 1. परियोजना के सीमा निर्देशांक

कोने	अक्षांश	देशांतर	कोने	अक्षांश	देशांतर
1	N31° 20' 45.24"	E76° 11' 14.64"	**22**	N31° 23' 27.96"	E76° 10' 38.64"

2	N31° 20' 38.76"	E76° 10' 40.8"	**23**	N31° 23' 19.32"	E76° 10' 48.00"
3	N31° 20' 39.84"	E76° 10' 19.56"	**24**	N31° 23' 6.36"	E76° 10' 42.24"
4	N31° 20' 48.12"	E76° 10' 6.24"	**25**	N31° 22' 58.44"	E76° 10' 35.04"
5	N31° 20' 50.64"	E76° 9' 33.48"	**26**	N31° 22' 50.52"	E76° 10' 23.16"
6	N31° 20' 56.4"	E76° 9' 30.96"	**27**	N31° 22' 42.96"	E76° 10' 21.36"
7	N31° 21' 5.76"	E76° 9' 23.76"	**28**	N31° 22' 31.8"	E76° 10' 3.00"
8	N31° 21' 1.08"	E76° 9' 18.36"	**29**	N31° 22' 13.08"	E76° 10' 1.20"
9	N31° 21' 9.72"	E76° 9' 12.24"	**30**	N31° 22' 21.36"	E76° 10' 18.48"
10	N31° 21' 12.24"	E76° 9' 26.28"	**31**	N31° 22' 15.6"	E76° 10' 31.8"
11	N31° 21' 9.36"	E76° 10' 0.84"	**32**	N31° 22' 5.88"	E76° 10' 14.88"
12	N31° 21' 35.28"	E76° 9' 55.8"	**33**	N31° 21' 55.08"	E76° 10' 3.36"
13	N31° 21' 50.04"	E76° 9' 56.52"	**34**	N31° 21' 56.52"	E76° 10' 32.52"
14	N31° 22' 15.24"	E76° 9' 50.4"	**35**	N31° 21' 52.2"	E76° 10' 53.04"
15	N31° 22' 35.4"	E76° 9' 53.64"	**36**	N31° 21' 57.96"	E76° 10' 44.04"
16	N31° 23' 4.92"	E76° 9' 48.96"	**37**	N31° 21' 46.08"	E76° 10' 48.36"
17	N31° 23' 2.4"	E76° 10' 4.44"	**38**	N31° 21' 34.92"	E76° 10' 49.8"
18	N31° 23' 18.24"	E76° 10' 4.08"	**39**	N31° 21' 27"	E76° 10' 46.2"
19	N31° 23' 14.28"	E76° 10' 18.48"	**40**	N31° 21' 14.04"	E76° 10' 49.44"
20	N31° 23' 10.32"	E76° 10' 25.68"	**41**	N31° 21' 12.96"	E76° 11' 5.28"
21	N31° 23' 20.04"	E76° 10' 30.72"	**42**	N31° 20' 54.96"	E76° 11' 13.2"



चित्र 1. परियोजना का स्थान मानचित्र

3.0 परियोजना की संक्षिप्त विशेषताएं

एचपीएसबीडीपीआईएल, उद्योग विभाग, हिमाचल प्रदेश सरकार परियोजना विकास गतिविधियों का समन्वय और पर्यवेक्षण करने वाली एक नोडल एजेंसी है। एचपीबीडीपीआईएल प्रस्तावित औद्योगिक एस्टेट के विकास में शामिल होगा, जिसमें केवल रासायनिक संश्लेषण पर आधारित एपीआई विनिर्माण उद्योग होंगे (110 औद्योगिक भूखंडों में लगभग 70-80 औद्योगिक इकाइयाँ)। पार्क में आने वाले उद्योग फार्मा क्षेत्र में होंगे और ज़्यादातर बड़े पैमाने की श्रेणियों में होंगे। पूरी परियोजना भी बड़े पैमाने की श्रेणी में आती है। क्षेत्र विवरण नीचे दी गई तालिका में दिया गया है:

तालिका 2. बल्क ड्रग पार्क परियोजना का परिमाण और घटक

क्रम संख्या	विवरण	क्षेत्रफल एकड़ में	क्षेत्रफल हेक्टेयर में	प्रतिशत (%)
1.	औद्योगिक भूखंड क्षेत्र	558.28	225.93	39.72
2.	वाणिज्यिक भूखंड क्षेत्र	95.02	38.45	6.76
3.	विद्युत सबस्टेशन	23.37	9.46	1.66
4.	उपयोगिता क्षेत्र	41.65	16.86	2.96
5.	TSDF क्षेत्र	29.46	11.92	2.10
6.	पार्किंग क्षेत्र	18.46	7.47	1.31
7.	हरित क्षेत्र और औद्योगिक भूखंडों के अंतर्गत हरित क्षेत्र	465.18	188.25	33.09
8.	अपशिष्ट उपचार सुविधा क्षेत्र (STP /ETP /MEE और WTP)	41.08	16.62	2.92
9.	सामान्य रसद क्षेत्र	18.90	7.65	1.34

10.	सड़कें	86.45	34.98	6.15
11.	जल निकाय	27.28	11.04	1.94
12.	अन्य	0.30	0.12	0.02%
	कुल क्षेत्रफल	1405.41	568.75	100%

4.0 मौसम विज्ञान (मौसम और जलवायु)

पिछले 10 वर्षों (2011-20) के मौसम संबंधी आंकड़े नासा जैसे माध्यमिक अधिकृत स्रोतों से परियोजना स्थल निर्देशांकों के भू-संदर्भ का उपयोग करके एकत्र किए गए थे। इसके अलावा, द्वितीयक डेटा रिकॉर्ड और प्रचलित मौसम संबंधी स्थितियों को सत्यापित करने के लिए एक वर्ष (2023) की अवधि के लिए स्वचालित मौसम स्टेशन का उपयोग करके परियोजना स्थान पर प्राथमिक सूक्ष्म मौसम संबंधी डेटा रिकॉर्ड किया गया। एडब्ल्यूएस के डेटा लॉगर में प्रति घंटे हवा का तापमान, बैरोमीटर का दबाव, आर्द्रता, हवा की गति, हवा की दिशा, वर्षा और सौर विकिरण डेटा दर्ज किए गए। मौसम स्टेशन को जमीन से 10 मीटर की उचित ऊंचाई पर एक खुले क्षेत्र में रखा गया था।

5.0 परिवेशी वायु गुणवत्ता

अध्ययन क्षेत्र में प्रचलित मौसम संबंधी स्थितियों (मुख्य हवा की दिशा पश्चिमोत्तर से) के अनुसार कोर जोन/परियोजना क्षेत्र में 3 स्थानों पर और 10 किलोमीटर के बफर जोन में 7 स्थानों पर हवा की विपरीत दिशा, हवा की विपरीत दिशा और हवा की विपरीत दिशा में परिवेशी वायु गुणवत्ता निगरानी (एएक्यूएम) स्टेशन स्थापित किए गए थे। अप्रैल से जून 2023 के दौरान अध्ययन क्षेत्र में देखे गए कणिकीय एरोसोल पीएम 10 के रूप में 33.5 - 84.4 µg/m3 (औसत 56.6 µg/m3) और पीएम 2.5 के रूप में 17.4 - 45.7 µg/m3 (औसत 29.9 µg/m3) थे, जो पीएम 10 के लिए 100 µg/m3 और पीएम 2.5 के लिए 60 µg/m3 की निर्धारित सीमाओं के भीतर हैं (एनएएक्यूएस सीपीसीबी, 2009)। प्राप्त परिणाम तुलनीय हैं और एचपीएसपीसीबी (आरओ/डीआईसी, ऊना) और ऊना क्षेत्र के अन्य ईआईए अध्ययनों द्वारा एकत्र

द्वितीयक आंकड़ों के साथ सहमत हैं। पीएम 10 और पीएम 2.5 के मौजूदा द्रव्यमान स्तरों का आधारभूत डेटा ईएसई दिशा में टाहलीवाल औद्योगिक क्षेत्र (परियोजना से लगभग 6 किमी) और बाथरी औद्योगिक क्षेत्र (परियोजना से लगभग 10.5 किमी) और ईएनई दिशा में अंब-गगरेट-जीतपुर औद्योगिक क्लस्टर (परियोजना से लगभग 20-25 किमी) में संचालित औद्योगिक इकाइयों से जुड़ा हुआ है। अन्य स्रोत सड़कों पर चलने वाले वाहन, अध्ययन क्षेत्र में चल रही घरेलू और कृषि गतिविधियां हो सकती हैं। आधारभूत आंकड़ों से स्पष्ट है कि परियोजना के पूर्वी हिस्से में स्थित स्थान AQ-4 से AQ-8 (विशेष रूप से AQ-8) टाहलीवाल और बाथरी औद्योगिक क्षेत्रों की निकटता के कारण पश्चिमी क्षेत्र में स्थित स्थानों AQ-1 से AQ-3 की तुलना में अधिक वायु प्रदूषण का अनुभव करते हैं। अप्रैल से जून 2023 के दौरान अध्ययन क्षेत्र में देखे गए गैसीय प्रदूषक SO2 के रूप में 4.3 - 14.8 µg/m3 (औसत 8.3 µg/m3) और NO2 के रूप में 3.8 - 22.8 µg/m3 (औसत 12.1 µg/m3) थे, जो 80 µg/m3 (NAAQS CPCB, 2009) की निर्धारित सीमा के भीतर हैं, जो दर्शाता है कि अध्ययन क्षेत्र में उत्सर्जन का कोई महत्वपूर्ण स्रोत नहीं है और वायु की गुणवत्ता मानव स्वास्थ्य के लिए सुरक्षित और आरामदायक है। प्राप्त परिणाम तुलनीय हैं और HPSPCB (RO/DIC, ऊना) और ऊना क्षेत्र के अन्य EIA अध्ययनों द्वारा एकत्र किए गए द्वितीयक डेटा के साथ सहमत हैं। अध्ययन क्षेत्र में पाए गए कार्बन मोनोऑक्साइड (CO), ओजोन (O3) और अमोनिया (NH3) जैसे गैसीय प्रदूषक निर्धारित सीमाओं के भीतर पाए गए (NAAQS CPCB, 2009) जो इंगित करता है कि अध्ययन क्षेत्र में उत्सर्जन का कोई महत्वपूर्ण स्रोत नहीं है और वायु की गुणवत्ता मानव स्वास्थ्य के लिए सुरक्षित और आरामदायक है।

6.0 परिवेशीय शोर गुणवत्ता

परिवेशी शोर स्तरों की निगरानी का मुख्य उद्देश्य विभिन्न क्षेत्रों में आधारभूत शोर स्तरों को स्थापित करना था। अर्थात आवासीय, औद्योगिक, वाणिज्यिक और शांत क्षेत्र, आसपास के क्षेत्रों में और अध्ययन क्षेत्र के पर्यावरण में कुल शोर स्तर का आकलन करना। शोर की निगरानी अध्ययन क्षेत्र में 10 किलोमीटर के दायरे में चुने गए चार स्थानों (कोर ज़ोन में एक और 1 किलोमीटर के दायरे में बफर ज़ोन में 3) पर की गई। डेटा संग्रह के लिए डेटा लॉगर के साथ एकीकृत ध्वनि स्तर मीटर (एसएलएम) का उपयोग किया गया। नमूना लेने से पहले और बाद में एसएलएम की अंशांकन जाँच की गई। शोर का नमूना खुले क्षेत्र में 1.2 से 1.5 मीटर की नमूना ऊंचाई पर या शोर या अवरोधों या परावर्तक सतहों के स्रोत से ≥ 250 मीटर दूर एसएलएम स्थापित करके किया गया था। सीपीसीबी शोर नियम (2000), आईएस: 9989-1981 और

आईएस: 4758-1968 जैसे राष्ट्रीय/अंतरराष्ट्रीय मानक तरीकों के अनुसार एक घंटे के लॉगिन अंतराल के साथ लगातार 24 घंटे के लिए दिन के समय (06:00 बजे - 10:00 बजे) और रात के समय (10:00 बजे से 06:00 बजे तक) शोर की निगरानी की गई। अध्ययन क्षेत्र में मापा गया परिवेशी शोर का स्तर दिन के समय 46.3 - 51.2 डीबी (ए) और रात के समय 35.4 - 40.2 डीबी (ए) के बीच भिन्न था। देखे गए शोर के स्तर आवासीय क्षेत्र (शोर नियम, 2000) के लिए निर्धारित सीमाओं के भीतर पाए गए। प्राप्त परिणाम तुलनीय हैं और ऊना क्षेत्र में किए गए ईआईए अध्ययनों के द्वितीयक आंकड़ों के साथ सहमत हैं। देखी गई आधारभूत/मौजूदा ध्वनि गुणवत्ता, ताहलीवाल औद्योगिक क्षेत्र (परियोजना से लगभग 6 किमी दूर) और बाथरी औद्योगिक क्षेत्र (परियोजना से लगभग 10 किमी दूर) में संचालित औद्योगिक इकाइयों से संबंधित हो सकती है। अन्य स्रोत सड़कों पर चलने वाले वाहन, अध्ययन क्षेत्र में चल रही घरेलू और कृषि गतिविधियाँ हो सकती हैं।

7.0 जल गुणवत्ता

पीने, ठंडा करने और बागवानी के उद्देश्यों में प्रस्तावित जल उपयोगों तक पहुँचने के लिए भूजल की जल गुणवत्ता का अध्ययन किया गया है। अध्ययन क्षेत्र के 10 किमी के दायरे में पाँच अलग-अलग निगरानी स्थानों की भूजल गुणवत्ता का विभिन्न भौतिक-रासायनिक और जैविक मापदंडों के संदर्भ में मूल्यांकन किया गया था। अवलोकित डेटा सेट का प्रारंभ में सांख्यिकीय विश्लेषण किया गया और आईएस: 10500, 2012 के तहत पीने के पानी की गुणवत्ता के लिए स्वीकार्य और निर्धारित सीमा के मानक दिशानिर्देश और भारतीय मानक ब्यूरो (बीआईएस) द्वारा प्रस्तावित इसके संशोधनों के साथ तुलना की गई। रंग, गंध, पीएच, टीयू और टीडीएस जैसे भौतिक मापदंडों के विश्लेषण से पता चलता है कि भूजल के नमूने रंगहीन, गंधहीन, उपयुक्त पीएच (6.5-8.5) के भीतर थे, कोई टर्बिड नहीं थे और उपयुक्त मात्रा में घुले हुए ठोस (500 मिलीग्राम / एल से नीचे) मौजूद थे। केवल कुल कठोरता, धनायन (Ca++ और Mg++) और कुल क्षारीयता लगभग निगरानी स्थानों पर क्रमशः 200 mg/L, 30 mg/L, 75 mg/L और 200 mg/L की स्वीकार्य सीमा से अधिक बताई गई। यह घरेलू और व्यावसायिक उद्देश्यों जैसे भूजल के किसी भी उपयोग से पहले कठोरता के पूर्व उपचार का संकेत देता है। इसी तरह, धनायन जैसे Ca2+ और Mg2+ स्वीकार्य सीमा से ऊपर बताए गए। TU, BOD, कुल N, कुल P, फिनोल और भारी धातुओं (PB और Hg) की सांद्रता पता लगाने की सीमा (BDL) से नीचे दर्ज की गई। भूजल के नमूनों में जैविक पैरामीटर (TC और

FC) अनुपस्थित पाए गए। भूजल परीक्षण के परिणाम यह संकेत देते हैं कि चयनित निगरानी स्थानों पर भूजल की गुणवत्ता कठोर प्रकृति की है और घरेलू, औद्योगिक और वाणिज्यिक उद्देश्यों के लिए उपयोग से पहले पूर्व उपचार की आवश्यकता है।

8.0 मिट्टी की गुणवत्ता

जिले में दो प्रकार की मिट्टी पाई जाती है, जलोढ़ मिट्टी और गैर-कैल्सीक भूरी मिट्टी। जिले का अधिकांश क्षेत्र जलोढ़ मिट्टी से ढका है और जिले का केवल लगभग 25% क्षेत्र यानी पहाड़ी क्षेत्र गैर-कैल्सीक भूरी मिट्टी से ढका है। मिट्टी पोषक तत्वों से भरपूर होती है और इस प्रकार उपजाऊ होती है। निगरानी अवधि के दौरान अध्ययन क्षेत्र के 10 किमी के भीतर 5 स्थानों (परियोजना स्थान सहित) पर एक बार मिट्टी की गुणवत्ता की निगरानी की गई। मिट्टी के नमूने 30 सेमी, 60 सेमी और 90 सेमी की विभिन्न गहराई से पास की कृषि भूमि, अपशिष्ट निपटान क्षेत्रों या संभावित प्रभावित क्षेत्रों से एकत्र किए गए थे और नमूना हैंडलिंग (नमूना संरक्षण और परिवहन सहित) राष्ट्रीय / अंतर्राष्ट्रीय मानक तरीकों जैसे मिट्टी / कीचड़ गुणवत्ता निगरानी (आईएस: 2720, एपीएचए और आईसीएआर / आईएआरआई दिशानिर्देश) के अनुसार किया गया था। वर्तमान अध्ययन में, पीएच, ईसी, छिद्रण, पारगम्यता, मैक्रो और माइक्रो-खनिज संरचना (जैसे Na, K, N, P, Ca और Mg) आदि जैसे संकेतकों का विश्लेषण और मूल्यांकन किया गया। मिट्टी के पैरामीटर मिट्टी की उर्वरता की स्थिति की जानकारी अच्छी तरह से दे सकते हैं, इसलिए इन संकेतकों का उपयोग अध्ययन क्षेत्र में मिट्टी की संरचना का मूल्यांकन करने के लिए किया गया था। निगरानी स्थान का पीएच प्रकृति में तटस्थ से क्षारीय मिट्टी को इंगित करता है। एसएआर 13 meq/L से नीचे बताया गया था और खनिज संरचना कृषि और खेती के उद्देश्यों के लिए इसकी उपयुक्तता को संदर्भित करती है।

9.0 पारिस्थितिकीय

टोपोशीट संख्या (H43E3 और H43E7) के अनुसार, पोलियन शामलात रिजर्व फॉरेस्ट पश्चिम दिशा में परियोजना स्थल से सटा हुआ है और कंगार प्रोटेक्टिव फॉरेस्ट उत्तर-पश्चिम दिशा में परियोजना स्थल से लगभग 7 किमी दूर है। एक अन्य इको सेंसिटिव जोन, स्वान नदी की दूरी भी परियोजना स्थल से उत्तर-पूर्व दिशा में लगभग 8.5 किमी है।

10.0 प्रत्याशित पर्यावरणीय प्रभाव और शमन उपाय

10.1 परिवेशी वायु गुणवत्ता

सबसे खराब स्थिति में (एपीसीडी और/या संयंत्र प्रक्रिया की विफलता के बिना), पीएम10 का अधिकतम संचयी भार 131.6 µg/m3 होगा, NOx 43.6 µg/m3 होगा, HCl 29.9 µg/m3 होगा और बेंजीन 4.3 µg/m3 होगा जो गंभीर स्वास्थ्य और पर्यावरणीय प्रभावों के साथ वायु की गुणवत्ता को खराब कर सकता है। इसलिए किसी भी परिस्थिति में इस स्थिति से बचा जाएगा और परियोजना को उचित और प्रभावी प्रदूषण नियंत्रण उपायों, नियमित जांच और संचालन के सभी चरणों में एपीसीडी और संयंत्र प्रक्रिया के रखरखाव के साथ संचालित किया जाएगा। नियंत्रित स्थितियों में (एपीसीडी/प्रभावी नियंत्रण उपायों के साथ), पीएम10 का अधिकतम संचयी भार 94.1 µg/m3 होगा, NOx 32.3 µg/m3 होगा अध्ययन क्षेत्र के भीतर रिसेप्टर्स पर कुल अधिकतम भार PM10 69.4-84.1 µg/m3, PM2.5 37-44.6 µg/m3, NO2 15-22.5 µg/m3, SO2 9.9-14.2 µg/m3, NH3 7.75-9.83 µg/m3, CO 370.9-581.7 µg/m3, Cl2 0.03-0.21 µg/m3, HCl 0.07-0.49 µg/m3, बेंजीन 0.01-0.07 µg/m3, डाइक्लोरोमेथेन 0.38-2.85 µg/m3 और एसिटोनाइट्राइल 1.91-14.25 होगा। µg/m3 वायु गुणवत्ता में मामूली परिवर्तन को दर्शाता है जिसका स्वास्थ्य और पर्यावरण पर कोई महत्वपूर्ण प्रभाव नहीं पड़ता।

10.2 परिवेशीय शोर गुणवत्ता

शोर प्रसार मॉडलिंग के अनुसार, परिणामी/संचयी शोर स्तर (बेसलाइन + पूर्वानुमानित) 46.3-51.2 डीबी (ए) की सीमा में पाया गया जो आवासीय क्षेत्रों के लिए 55 डीबी (ए) की निर्धारित सीमा के भीतर था। इसलिए, परियोजना संचालन के कारण अध्ययन क्षेत्र के भीतर आसपास के रिसेप्टर्स पर शोर का कोई महत्वपूर्ण प्रभाव नहीं है।

10.3 जल गुणवत्ता

औद्योगिक अपशिष्टों को ZLD तकनीक के साथ 5 MLD के CETP में उपचारित किया जाएगा और घरेलू निर्वहन को 3 MLD के STP में उपचारित किया जाएगा। प्लांट परिसर के बाहर कोई अपशिष्ट जल (अपशिष्ट/सीवेज) नहीं छोड़ा जाएगा और इसे केवल औद्योगिक प्रक्रियाओं में ही पुनर्चक्रित और पुनः उपयोग किया जाएगा।

स्टॉर्म वाटर नालियों को अपशिष्ट जल नालियों से अलग रखा जाएगा। इसलिए, परियोजना संचालन के कारण सतही जल की गुणवत्ता प्रभावित नहीं होगी।

10.4 ठोस अपशिष्ट

लगभग 8.8 टीपीडी (0.2 किलोग्राम/व्यक्ति/दिन) ठोस अपशिष्ट उत्पन्न होगा। ठोस अपशिष्ट को बायोडिग्रेडेबल और गैर-बायोडिग्रेडेबल घटकों में विधिवत रूप से अलग किया जाएगा। ठोस अपशिष्ट के पृथक्करण के लिए अलग क्षेत्र निर्धारित किया जाएगा। बायोडिग्रेडेबल अपशिष्ट को परियोजना परिसर के भीतर खाद बनाया जाएगा और पुनर्चक्रणीय घटक को अधिकृत पुनर्चक्रण विक्रेताओं के माध्यम से निपटाया जाएगा। ठोस अपशिष्ट को ठोस अपशिष्ट प्रबंधन नियम 2016 और इसके संशोधनों के प्रावधान के अनुसार संभाला/निपटाया जाएगा।

10.5 खतरनाक अपशिष्ट

प्रस्तावित बल्क ड्रग पार्क में एपीआई निर्माण इकाइयां होंगी, जिनमें केवल रासायनिक संश्लेषण शामिल है। एपीआई इकाइयों से उत्पन्न खतरनाक अपशिष्ट उत्पादन के प्रकार और मात्रा, प्रयुक्त कच्चे माल की प्रकृति और मात्रा और एपीआई निर्माण के लिए इस्तेमाल की जाने वाली प्रक्रिया और प्रौद्योगिकी पर निर्भर करता है। आमतौर पर यह माना जाता है कि 2000-2250 टीपीडी एपीआई की उत्पादन क्षमता वाली बल्क ड्रग परियोजना के पूर्ण अधिभोग के दौरान लगभग 80 एपीआई इकाइयां उत्पादन के लगभग 1/3 के बराबर खतरनाक अपशिष्ट उत्पन्न करेंगी, इस प्रकार विभिन्न श्रेणियों के लगभग 700-800 टीपीडी खतरनाक अपशिष्ट उत्पन्न होंगे। परियोजना में उत्पन्न होने वाले संभावित 700-800 टीपीडी मात्रा के कुल खतरनाक अपशिष्ट में से लगभग 10-12 टीपीडी भंडारण योग्य श्रेणी (सीईटीपी कीचड़ और एमईई अवशेष) परियोजना के अंदर एक एकीकृत टीएसडीएफ (जिसमें एक सुरक्षित लैंडफिल, एक ठोस-तरल फीड भस्मक शामिल है) प्रस्तावित है, जिसके लिए 33.6 एकड़ भूमि प्रस्तावित की गई है। भंडारण योग्य अपशिष्ट के लिए टीएसडीएफ और भस्म करने योग्य अपशिष्ट के लिए भस्मक के विकास के लिए, ईआईए अधिसूचना, 2006 के अनुसार अपेक्षित को पूरा करने के लिए पीपी द्वारा अलग से विस्तृत प्रस्ताव तैयार किया जाएगा।

10.6 जैव-चिकित्सा अपशिष्ट

बायो-मेडिकल अपशिष्ट उत्पादन का स्रोत केवल परियोजना में स्थापित की जाने वाली स्वास्थ्य देखभाल सुविधाओं/गतिविधियों से होगा। परियोजना के भीतर प्रस्तावित औषधालय और फार्मास्युटिकल एडवांसमेंट के लिए अनुसंधान संस्थान से लगभग 4-5 किलोग्राम/दिन बायोमेडिकल अपशिष्ट उत्पन्न होने की संभावना है, जिसमें डिस्पोजेबल ड्रेसिंग सामग्री का मामूली प्राथमिक उपचार या चिकित्सा उपयोग शामिल है। इस अपशिष्ट का निपटान बायो-मेडिकल अपशिष्ट प्रबंधन नियम, 2016 और इसके संशोधनों के अनुसार अधिकृत कॉमन बायो-मेडिकल अपशिष्ट संग्रह और निपटान एजेंसी के माध्यम से किया जाएगा।

11.0 हरियाली बेल्ट विकास

हरित क्षेत्र का विकास निम्न योजना के अनुसार किया जाएगा। हिमाचल प्रदेश बल्क ड्रग पार्क इंफ्रास्ट्रक्चर लिमिटेड (एचपीबीडीपीआईएल) द्वारा 279.46 एकड़ क्षेत्र में निम्नलिखित तरीके से हरित पट्टी विकसित की जाएगी। • सभी प्रमुख धाराओं/नालों/खाड़ों के साथ 50 मीटर चौड़ी हरित पट्टी। • छोटी धाराओं के साथ 15 मीटर चौड़ी हरित पट्टी। • परियोजना की सीमा के साथ 15 मीटर चौड़ी हरित पट्टी। सदस्य उद्योगों द्वारा भूखंड की सीमा के साथ अपने औद्योगिक परिसर में 185.72 एकड़ क्षेत्र में (@20%) हरित पट्टी विकसित की जाएगी। परियोजना क्षेत्र में हरित पट्टी को विभिन्न प्रकार के प्रदूषण को कम करने के लिए अधिमानतः तीन पंक्तियों में चौड़ी पत्ती वाले पेड़ों के घने वृक्षारोपण के साथ विकसित किया जाएगा। • हरियाली बनाए रखने के लिए बड़े खुले स्थान

- मनोरंजन के लिए छोटे गुणवत्ता वाले हरे स्थान
- आवागमन के दौरान राहत प्रदान करने के लिए रैखिक वृक्षारोपण
- दृश्यावलोकन आदि के लिए छोटे सौंदर्यपूर्ण हरे क्षेत्र

हरित पट्टी

- गैसीय उत्सर्जन को कम करेगी;
- आकस्मिक उत्सर्जन को रोकने की पर्याप्त क्षमता होगी;
- अपशिष्ट जल के पुनः उपयोग में प्रभावी;

- पारिस्थितिक संतुलन बनाए रखेगी;
- ध्वनि प्रदूषण को काफी हद तक नियंत्रित करेगी;
- मिट्टी के कटाव को रोकेगी;
- सौंदर्य में सुधार करेगी;

सुझाई गई सभी प्रजातियाँ प्रदूषण सहने योग्य हैं, साथ ही इनमें सौंदर्य अपील भी है।

12.0 पर्यावरण निगरानी योजना

पर्यावरण निगरानी योजना पर्यावरण प्रबंधन प्रणाली को पर्यावरण प्रबंधन, सुधार और संरक्षण के लिए चल रही कार्रवाइयों में अतिरिक्त कार्रवाई और संशोधन की आवश्यकता के प्रारंभिक संकेत के साथ सक्षम बनाती है। पर्यावरण निगरानी बिंदुओं का निर्णय प्रस्तावित विस्तार के संचालन के कारण होने वाले पर्यावरणीय प्रभावों को ध्यान में रखते हुए किया जाएगा क्योंकि निगरानी कार्यक्रम का मुख्य दायरा पर्यावरणीय स्थितियों में बदलाव को समय पर और नियमित रूप से ट्रैक करना और पर्यावरण की सुरक्षा के लिए समय पर कार्रवाई करना है।

पर्यावरण नमूनों की निगरानी MoEF&CC/CPCB द्वारा प्रदान किए गए दिशानिर्देशों के अनुसार की जाएगी। पानी, अपशिष्ट जल, ठोस अपशिष्ट, वायु उत्सर्जन, मिट्टी और खाद/कम्पोस्ट के लिए अलग-अलग रिकॉर्ड तैयार किए जाएंगे और नियमित रूप से संरक्षित किए जाएंगे। अन्य बजटों के साथ-साथ पर्यावरण निगरानी के लिए बजट तैयार किया जाएगा और आवश्यकतानुसार नियमित रूप से संशोधित किया जाएगा।

13.0 जोखिम न्यूनीकरण उपाय

तमाम सावधानियों के बावजूद भी आपदाएँ हो सकती हैं। इसलिए, प्लांट और आस-पास के इलाकों में किसी भी आपदा से निपटने के लिए आपातकालीन योजना बनाई जाएगी। किसी भी आपदा की घटना को रोकने के लिए, प्लांट को विभिन्न सुरक्षा और आपदा नियंत्रण सुविधाएँ प्रदान की जाएँगी। इनके अलावा, कई मटेरियल हैंडलिंग सिस्टम, भारी सड़क परिवहन, हाई-टेंशन इलेक्ट्रिक लाइन, ओवरहेड क्रेन और कई अन्य हैंडलिंग और परिवहन प्रणालियों में हमेशा दुर्घटनाओं की संभावना बनी रहती है।

14.0 सार्वजनिक परामर्श

"सार्वजनिक सुनवाई पूरी होने के बाद विस्तृत जानकारी दी जाएगी"

15.0 परियोजना लाभ

वर्तमान में फार्मा क्षेत्र मुख्य रूप से चीन से आयात क्षेत्र पर काफी हद तक निर्भर है। यह एक ज्ञात तथ्य है कि चीन एक शत्रुतापूर्ण देश है, इसलिए यदि उक्त देश पर निर्भरता कम या समाप्त हो जाती है, तो यह राष्ट्रीय हित में बेहतर होगा। इसके अलावा, भारत सरकार ने "आत्मनिर्भर भारत" की एक महान अवधारणा शुरू की है और यह परियोजना कुछ हद तक पड़ोसी देशों से आयात की आवश्यकता को समाप्त कर देगी, देश की आत्मनिर्भरता में वृद्धि करेगी। इसलिए, यह परियोजना समय की मांग है और पर्यावरण प्रबंधन के लिए प्रौद्योगिकियों और उद्योग को बढ़ावा देने के लिए कार्यान्वयन के लिए सभी प्रोत्साहन और सुविधा की हकदार है।

16.0 पर्यावरण निगरानी योजना

पर्यावरण प्रबंधन विभाग परियोजना के ई.एम.पी. को लागू करेगा। व्यावसायिक स्वास्थ्य, जोखिम न्यूनीकरण और सुरक्षा सहित ई.आई.ए. रिपोर्ट में दी गई सभी सिफारिशों का अनुपालन किया जाएगा। ई.एम.सी. यह सुनिश्चित करेगा कि सभी वायु प्रदूषण नियंत्रण उपकरण और जल पुनःपरिसंचरण प्रणालियाँ प्रभावी रूप से कार्य करें। संसाधन संरक्षण (कच्चा माल, जल आदि) और वर्षा जल संचयन की योजनाएँ ई.एम.सी. द्वारा शुरू की जाएँगी। ई.एम.सी. द्वारा संयंत्र परिसर के अंदर और बाहर हरित पट्टी और हरियाली विकास को तीव्र किया जाएगा। हरित पट्टी विकास पर केंद्रीय प्रदूषण नियंत्रण बोर्ड (सी.पी.सी.बी.) द्वारा जारी दिशा-निर्देशों का पालन किया जाएगा। कर्मचारियों के लिए पर्यावरण जागरूकता कार्यक्रम आयोजित किए जाएँगे। तथा संयंत्र के अंदर स्वच्छता को प्रत्येक सदस्य उद्योग द्वारा सुनिश्चित किया जाएगा।

तालिका 3: पर्यावरण प्रबंधन योजना की लागत

क्र. सं.	पर्यावरण संरक्षण उपाय	पूंजीगत लागत (करोड़ में)	आवर्ती लागत (लाख/वर्ष)
1.	वायु प्रदूषण नियंत्रण प्रणाली (ईएसपी के साथ 6 x 50 टीपीएच के स्टीम जनरेशन बॉयलर पर एपीसीडी की स्थापना और डीजी सेट 2 x 1000 केवीए के लिए उचित स्टैक ऊंचाई)	312.30	10
2.	Water Pollution Control System (Installation of जल प्रदूषण नियंत्रण प्रणाली (सीईटीपी 5 एमएलडी, एसटीपी 3 एमएलडी, एमईई की स्थापना के साथ-साथ निरंतर अपशिष्ट निगरानी प्रणाली)	244.43	25
3.	ध्वनि प्रदूषण नियंत्रण प्रणाली (डीजी सेट और शोर मशीनरी / उपकरण और औजारों के लिए ध्वनिक बाड़े, सड़कों के किनारे और परियोजना सीमा के पास शोर अवरोधक)	10	1
4.	भूनिर्माण (हरित क्षेत्र का विकास और पहाड़ी ढलानों / भूमि का स्थिरीकरण)	10	120
5.	ठोस और खतरनाक अपशिष्ट प्रबंधन प्रणाली (टीएसडीएफ साइट की स्थापना, निरंतर उत्सर्जन निगरानी प्रणाली के साथ 4 x 25 टीपीएच भस्मक)	55	20
6.	पर्यावरण निगरानी और प्रबंधन	5	5
7.	वर्षा जल संचयन	2	10

इसके अलावा, सार्वजनिक सुनवाई के दौरान उठाए गए मुद्दों पर कॉर्पोरेट पर्यावरण उत्तरदायित्व (सीईआर) के तहत विचार किया जाएगा और अंतिम ईआईए रिपोर्ट में शामिल किया जाएगा।

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