Initial Environmental Examination

Project Number: 51308-008
September 2023

India: Uttarakhand Climate Resilient Power System Development Project

Main Report Part 3

Prepared by Power Transmission Corporation of Uttarakhand Limited and Uttarakhand Power Corporation Limited for the Asian Development Bank.

6.7.1. Near Collectorate Summary

406. The alignment is set in a flat urban environment, comprising a mix of industrial and open land. Some residential properties can also be found close to the start point of the alignment. Portions of the open land comprise a drain (SIDCUL drain) however, the power line poles will be placed mainly along existing road alignments and the power lines will only cross the watercourses (SIDCUL drain) at three points. No poles will be located within the watercourses themselves. The alignment is along existing road corridor for a major part and along vacant land spaces with vegetation growth. Few ornamental trees along the road, no tree felling envisaged. SIDUCUL Industrial area is 35 m on the eastern and southwest side of the alignment. There is a borewell and Over Head Tank in the Mandi Housing premises at a distance of 85 m on the southwest side close to the proposed SS. Residential properties are at a distance of 10-13 m near the proposed SS. No schools or temples within 50 m of the alignment. No ASI sites within 500 m.

6.7.2. Bharauni Summary

407. Bharauni alignment traverses flat agricultural land for its extent, the only notable feature within the RoW being a river, over which the alignment crosses twice. Trees of poplar, eucalyptus on the periphery of agricultural fields. No trees are present within the RoW. Some small villages are close to the alignment. Within 12 m to 100 m, there are few houses (Dohari village, Barauni). Borewells on the fields for irrigation. 4-5 borewells within 50 m of the alignment. Ground water quality of the borewell found near the proposed SS site was found within permissible limits for drinking water (IS: 10500-2012). Air quality good. Tests for air quality at the proposed SS site were found within permissible levels. No industries or other point sources of pollution. Traffic flow on local roads is low. No schools or temples along the route. 1 Gurudwara is at 200 m of the alignment near the proposed SS site. No ASI site within 500 m of the alignment.

6.7.3. Kaniya Summary

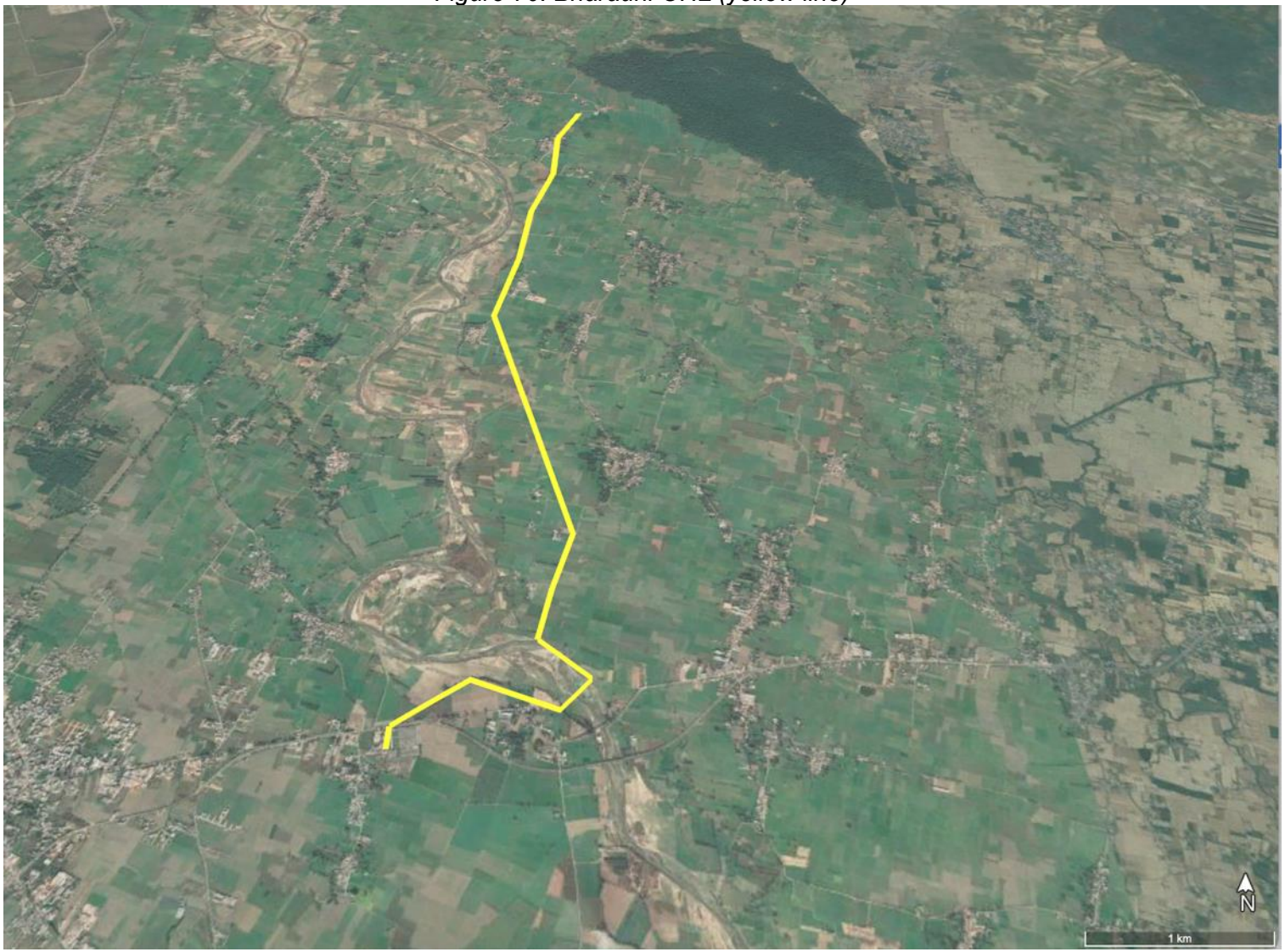
408. Kaniya alignment traverses a mix of agricultural and semi-urban landscapes. This alignment will be placed underground, except for the portion of the alignment which crosses a bridge, approximately 120m wide which will be attached to the bridge in a duct or similar. All the UG works will be completed adjacent to existing roads. Trees of Sal, Sagon, Gulmohur are present along the road sides. But tree felling not envisaged as alignment shall pass through existing road corridor. However, as noted in Table 48, the alignment is located close to the Corbett National Park (200m at its nearest point) and is located within its 10km ESZ buffer (Corbett National Park is neither notified nor draft notified ESZ so the 10km ESZ buffer is applicable per the Supreme Court). The alignment is also located within 250m of an IBA (Corbett National Park) and within 4-5km of an elephant corridor (E8 - Malani-Kota) and tiger corridor.

409. Hotels and Resorts catering to tourists visiting Corbett National Park, residences and commercial structures are located within 50 m of the alignment on both sides. Government Inter College Goujani (15 m on the North East) Garden Valley Public School (180 m on the South), Mount Sinal School (20 m), Shemrock Public School (20 m near Chilkya SS). 2-3 temples within 50 m of the alignment. No ASI site within 500 m. 4-5 borewells within 50 m of the alignment. Ground water quality of the borewell found near the proposed SS site was found within permissible limits for drinking water (IS: 10500-2012). Air quality is good. Tests for air quality at the proposed SS site were found within permissible levels. Traffic flow on the road is high during peak tourist season of Corbett National Park. (November to May). Sources of noise pollution is vehicles and noise from businesses located alongside roads.

Figure 69: Near Collectorate OHL

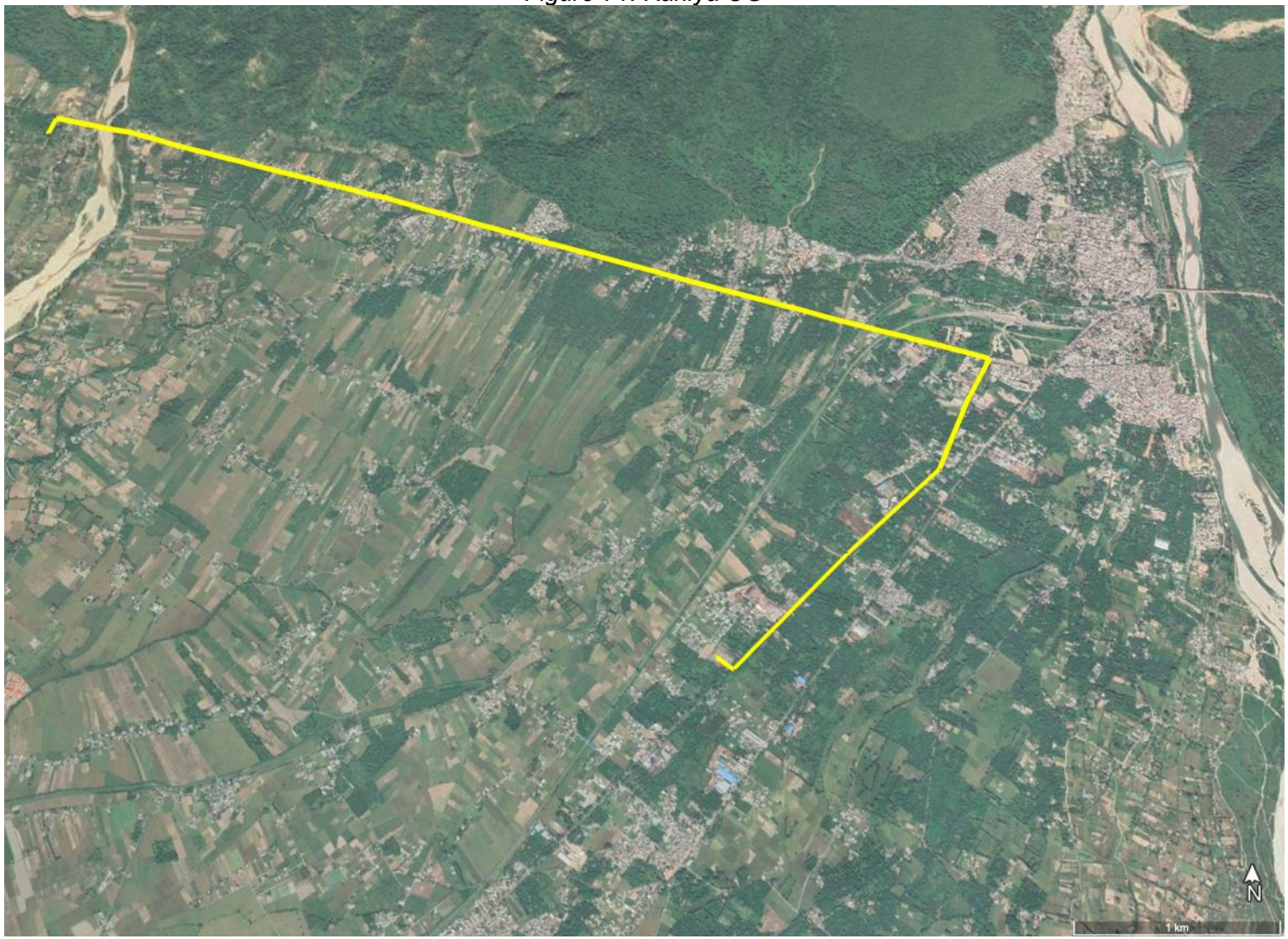
Source: Google Earth / PTCUL

Figure 70: Bharauni OHL (yellow line)



Source: Google Earth / PTCUL

Figure 71: Kaniya UG



Source: Google Earth / PTCUL

6.8. Sub-activity Environment – Component 2 – UPCL UG Cables

6.8.1. Physical Environment

410. **Topography -** The sub-activity area is part of Dehradun city. The topography of the area is mostly flat. The average altitude of the project area is about 638 m. Dehradun City is surrounded by dense hilly forests. The altitude of the City ranges from 1000 m in the north hilly region to 600 m in the south, with an average altitude of 640 m. It slopes north to south and is dissected by numerous seasonal streams, locally known as Khalas. City drainage is borne by the Bindal and Rispana Rivers. The direction of flow of streams in the eastern part is north to south (Bindal River) and in western part it is north to southwest (Rispana River).

411. **Hydrology -** Dehradun district is drained by Ganga, Yamuna and their tributaries. The two basins are separated by a ridge starting from Mussoorie and passing through Dehradun. The easterly flowing rivers join River Ganga and the westerly flowing rivers join River Yamuna. The Asan, the Suswa, the Bandal and the Rispana are noteworthy amongst these. The Asan river flows westerly while the remaining rivers i.e., the Suswa, Bandal and Rispana flow southeasterly to join the Song river which is a tributary of River Ganga. Dehradun City is surrounded by River Song in the east and River Tons in the west.

412. Due to hilly terrain Dehradun City has a natural drainage pattern with sufficient gradients to drain off storm water easily in to the two main natural drainage channels i.e., rivers Bindal and Rispana. Asan, Tons and Duchene rivers discharges in these two rivers directly or through their tributaries. The slope of both the main rivers i.e., Rispana and Bindal is from North to South.

413. Majority portion of Dehradun city are covered by gravely material brought down by the streams from both the northern and southern hills. They are deposited in the form of fans popularly known as Doon Fans.

414. **Soils** - The soils of Dehradun City are alluvial, riverine, and non-calcareous to moderate calcareous soils, which have been carved out by the fast-flowing rivers draining the Himalayas. Limited distribution of red soil is also found in some places. All the hill ranges around Dehradun (except the Sivaliks) are rich in lime stone reserves. Soil texture varies from sandy loam to clayey loam. Soil pH is slightly higher which favors the increased availability of nutrient elements. The soil color varies according to profile but generally color observed is dark brown to olive brown.

415. **Geohazards** - The city of Dehradun lies in seismic Zone IV.

416. **Climate** - The climate of Dehradun is humid subtropical. It varies greatly from tropical to severe cold depending upon the altitude of the area. Temperature variations due to difference in elevation are considerable. In the hilly regions, the summer is pleasant. But in Dehradun, the heat is often intense and summer temperatures can reach up to 44ºC for a few days as a hot wind called loo blows over North India. The district Dehradun experiences three seasons, i.e., cold winter season (Oct-Feb), hot or summer season (March-June) and wet monsoon season (July-Sept). During summer, average temperature ranges between 16ºC to 34ºC and during winters temperature variations is observed between 5ºC to 24ºC. The winter, from October to February, is cold, and temperatures touches near freezing occasionally. The months of December and January are the coldest due to winter rains, coinciding with snowfall in the nearby mountain ranges (maximum and minimum winter temperature is 23.4°C and 5.2°C respectively). Overall, the winters are dry. The spring, lasting from March to April, is very pleasant.

417. The average wind speed in Dehradun is 1.7 m/s with the maximum wind speed of around 5 m/s. Windrose of Dehradun shows that predominantly wind blow from the NE - about 19.78% of all wind directions.

418. As per Central Ground Water Board (CGWB) report on Dehradun District Groundwater Scenario, 2006, Depth to Water (DTW), in the southernmost part of the district, ranges between 5 and 10 m. The area close to the hills is represented by water table >15 m bgl. The intermediate part has DTW in the range between 10 and 15 mbgl. During the post monsoon period the 5-10 m and 10-15 m ranges of DTW increased and the >15 m group is reduced.

419. **Air Quality -** Under the National Ambient Air Quality Monitoring (NAAQM) Programme, Uttarakhand Environmental Protection and Pollution Control Board (UEPPCB) is regularly monitoring the ambient air quality at Clock Tower, Raipur Road and ISBT in Dehradun City. The status of month-wise ambient air quality of the city during the period of 2022 are presented in Table 60. Annual averages exceed national standards in all locations for PM10, and in two locations for SO2. No exceedances of national standards for NO2 or PM.2.5 are shown. Note, all locations already exceed the WHO guidelines.

Table 60: Ambient Air Quality Characteristics of Dehradun (Year 2022)

City	Dehradun											
Locations	**Clock Tower**				**Raipur Road**				**Himalayan Drug, ISBT**			
Zone	**Commercial**				**Commercial/ Residential**				**Commercial/ Industrial**			
Month	**P.M. 10**	**PM2.5**	**SO2**	**NO2**	**P.M. 10**	**PM2.5**	**SO2**	**NO2**	**P.M.10**	**PM2.5**	**SO2**	**NO2**
January	140.21	84.23	19.94	25.65	147.38	79.25	18.37	23.22	156.65	83.66	22.00	**25.28**
February	158	85.66	20.21	25.24	150	82.12	18.12	23.14	159.31	84.22	22.06	**25.28**
March	165.07	-	20.51	24.48	156.7	84.88	19.34	24.23	164.22	89.52	22.66	**25.80**
April	176.2	-	21.06	25.96	167.24	88.4	19.47	24.39	172.87	93.47	22.51	**25.74**
May	176.82	-	22	27.11	165.01	90.25	20.31	25.70	171.57	93.06	22.80	**26.34**

City	Dehradun											
Locations	**Clock Tower**				**Raipur Road**				**Himalayan Drug, ISBT**			
Zone	**Commercial**				**Commercial/ Residential**				**Commercial/ Industrial**			
June	195.16	93.67	21.68	27.87	169.69	89.49	20.41	26.05	193.08	93.49	22.30	**25.87**
July	130.75	85.72	19.27	26.03	115.81	78.80	18.12	24.57	134.64	82.34	21.2	**25.43**
August	103.64	-	15.69	23.18	96.17	RF	16.09	24.86	106.91	-	20.12	**25.66**
September	115.55	80.1	17.55	23.86	111.48	74.33	14.45	23.17	94.40	-	18.52	**23.94**
October	131.52	78.45	-	-	-	-	121.11	-	137.1	84.84	-	**-**
November	146.36	84.65	15.92	20.64	128.64	77.71	14.37	19.15	150.08	87.8	17.73	**21.15**
December	170.64	87.21	15.67	20.32	158.39	82.85	15.15	20.1	173.26	88.75	18.84	**22.26**
Annual Average	**150.83**	**84.96**	**19.05**	**24.59**	**142.41**	**82.81**	**26.28**	**23.51**	**151.17**	**88.12**	**20.97**	**24.80**
WHO Annual Standards	**45**	**15**		**10**	**45**	**15**		**10**	**45**	**15**		10
Annual Standard NAAQS	**60**		**20**	**30**	**60**		**20**	**30**	**60**		**20**	**30**

City	Dehradun											
Locations	**Clock Tower**				**Raipur Road**				**Himalayan Drug, ISBT**			
Zone	**Commercial**				**Commercial/ Residential**				**Commercial/ Industrial**			
24 hours Standard NAAQS	**100**		**80**	**80**	**100**		**80**	**80**	**100**		**80**	**80**

Source: https://ueppcb.uk.gov.in/files/air_2022_(7).pdf

420. **Noise Levels** - UEPPCB carried out monthly noise level monitoring at various locations of Dehradun city. As presented in Table 48, the noise levels at all monitoring locations during 2022 are exceeding the standards. According to the National Noise Level Standards of India, noise level in intersections which fall under silent zone, residential areas and commercial areas should not cross 50 dB, 55 dB and 65 dB, respectively, during daytime (6 am to 10 pm) and 40 dB, 45 dB and 55 dB respectively at night (10 pm to 6 am). WHO Guidelines Value for Noise Levels for silent zone, residential and commercial areas respectively should not exceed 50 dB, 55 dB and 70 dB during daytime, and 40 dB, 45 dB and 70 dB during night time. Transportation and horn used in vehicles are the major source of noise pollution in Dehradun city. The project area is expected to have higher noise levels due to the traffic and other activity.

Table 61: Status of Noise Level Data for the Year 2022

#	Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
1	Survey Chowk, Dehradun	76.72	79.09	80.3	79.32	79.21	78.8	79.46	80.45	81.45	81.85	80.8
2	Doon Hospital, Dehradun	76.91	77.39	76.52	72.56	75.33	76.73	75.78	78.52	80.43	78.2	78.7
3	Clock Tower, Dehradun	80.31	80.37	79.56	80.57	81.39	81.58	81.96	77.5	79.6	82.2	81.45
4	Gandhi Park, Dehradun	73.19	71.79	74.94	75.17	75.99	75.95	75.54	76.77	77.31	77.75	79.55
5	Race Course, Dehradun	71.48	70.84	69.97	69.94	70.79	71.06	71.19	69.87	69.52	67.2	70.3
6	CMI Hospital Chowk, Dehradun	78.08	79.52	77.45	76.14	77.01	78.16	78.54	73.96	76.7	80.95	80.35
7	Nehru Colony, Dehradun	69.73	60.78	63.17	62.23	62.61	63.18	59.61	59.55	59.55	58	58.75

Source: UEPPCB

421. Noise levels in the Project area can be well related to the data provided by UEPPCB since the monitoring locations are busy and traffic is high on these roads.

6.8.2. Biological Environment

422. **Flora** - Dehradun is distinguished from other districts in the state by the existence of a very large forest area chiefly stocked with Sal (Table 62). Additionally, forests play an important role in the economy of the district.

Table 62: Forest cover of Dehradun district

District	Geographical Area (km^2)	Very dense	Moderately dense	Open Forest	Total	Percentage Change as of 2017 assessment
Dehradun	3,088	659.77	601.56	347.36	1,608.69	3.69 %

423. Different types of forests and varying species of shrubs and grasses, depending upon the aspect, altitude and soil condition are found in the district. The four major type of forests prevalent in different localities of Dehradun are as given in Table 63.

Table 63: Type of forests in the district

#	Forest Types	Major Localities
1.	Moist Shiwalik Sal Forests	Thano and Motichur forest ranges
2.	Moist Bhabar Doon Sal Forests	Barkot and Thano forest Range
3.	West Gangetic Moist Deciduous Forests	Barkot ,Motichur and Thano forest ranges
4.	Dry Shiwalik Sal Forests	Higher slopes of Shiwaliks

424. **Fauna** - Ecologically, the district of Dehradun is interesting due to its varied physiography and climatic conditions. The district is very rich in its biological diversity and faunal diversity. Table 64 depicts some of the famous wildlife sanctuaries and national parks which are home to diverse range of flora and fauna.

Table 64: Ecological features of the district Dehradun

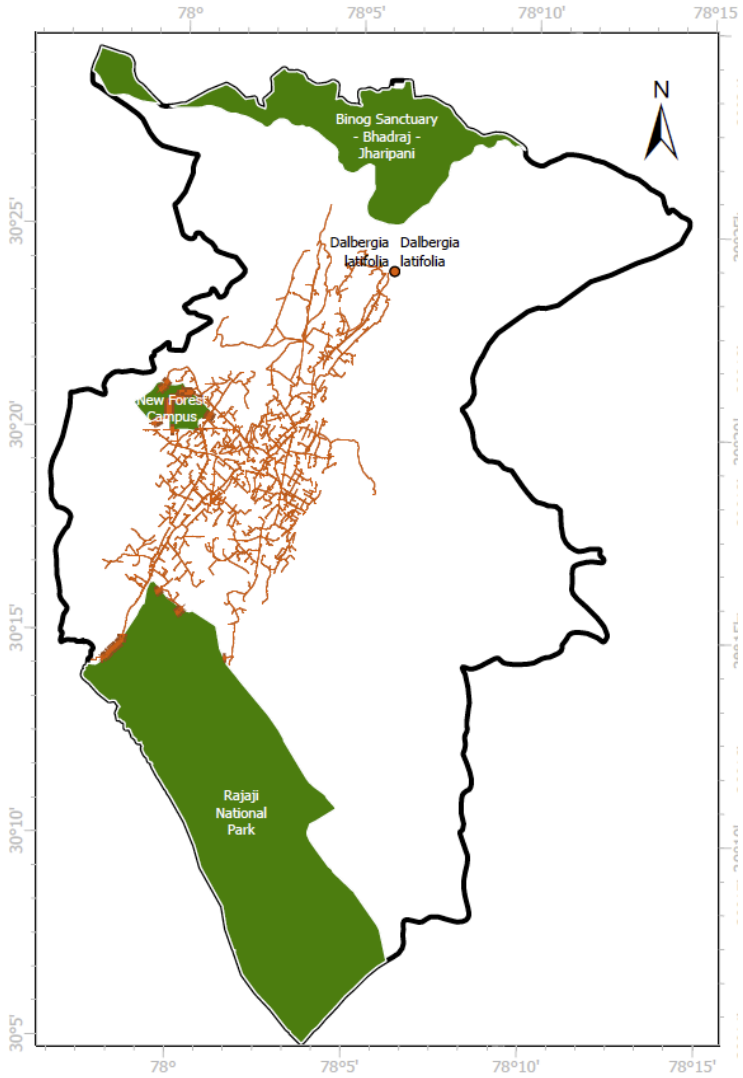
#	Name	Area (km^2)	Prevalent Faunal / Flora Species
1.	Rajaji Tiger Reserve and National Park	820.42	Himalayan Bear, Samba Deer, Common Krait, Himalayan-Pied Kingfisher, Tiger
2.	New Forest Campus	5	A number of habitats have been identified in the campus: Tons river, irrigation canal, paddy fields, Tons valley forest (Moist Deciduous), Champion block forest (Moist deciduous and plantations), Tons valley scrub jungle, experimental gardens, botanical gardens, arboretum, bungalows, lawns and fields, the large main building and housing colonies.
3.	Benog Wildlife Sanctuary	11	Himalayan Goat, Leopard, Bear, Red-Billed Blue Magpie

Source: Rawat and Puri, 2017

425. **Dehradun City,** the district headquarters, is an urban area surrounded by hilly forested areas. **There is no remaining natural habitat within the developed area of the city.** Some forest areas

(Raipur Reserve Forest, Bindal Reserve Forest) are situated outside the Municipal area towards north and north-east. Variety of species of shrubs, climbing plants and grasses are found in these forests. Sal and Chir are predominant in and around Dehradun. The closest protected area is Rajaji National Park situated 10 km west of Dehradun City. Designated as National Park in 1964, it spreads over an area of 820 square kilometres (sq. km) and is endowed with pristine beauty and rich biodiversity. The other protected areas in the Dehradun district are: (i) Benog Wildlife Sanctuary near Mussooriee, north of Dehradun, and (ii) New Forest Campus (Key Biodiversity Area only).

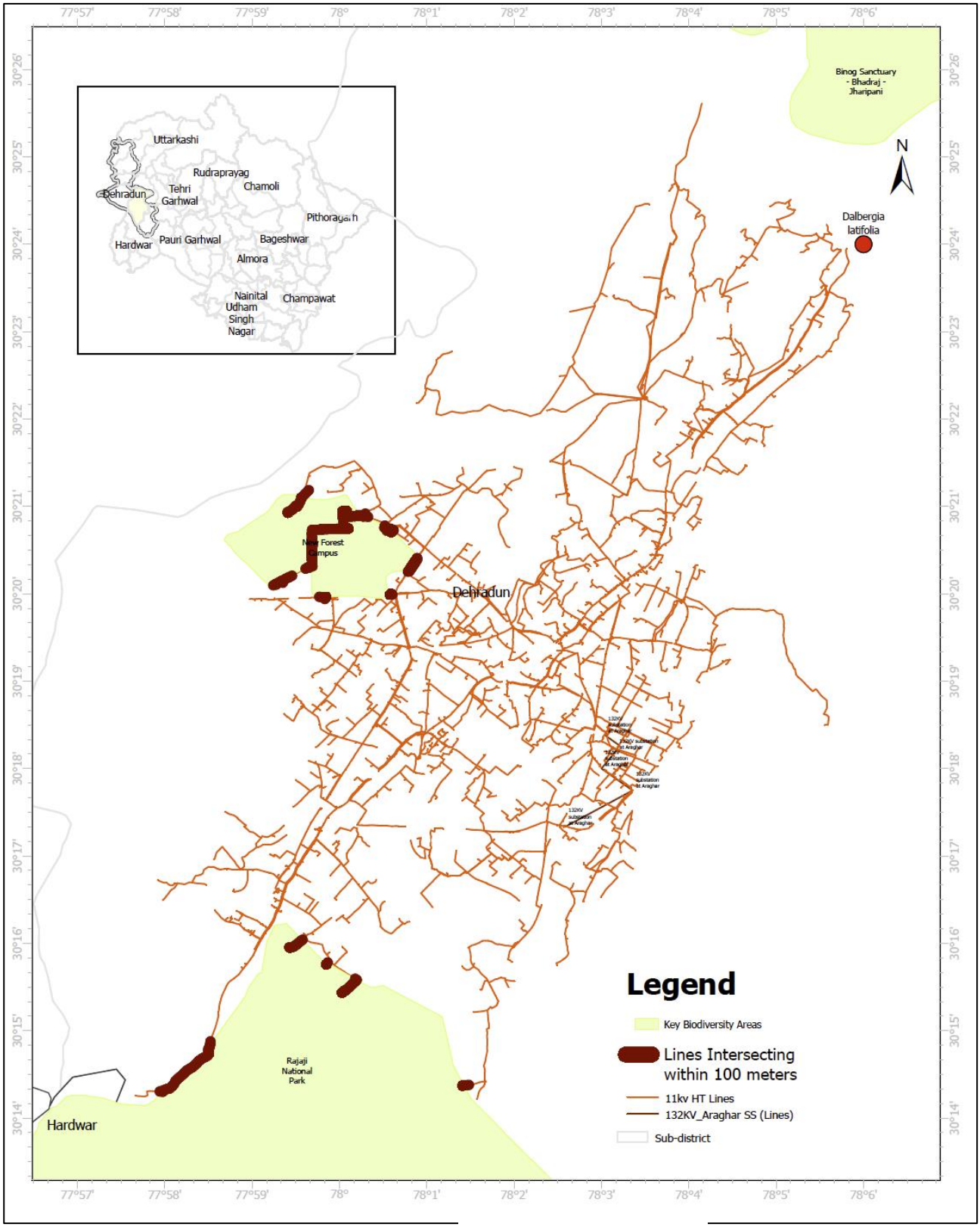
Figure 72: Nationally Protected Areas around Dehradun, overlapped with the existing MLV network



Data Source: Power Transmission Corporation of Uttarakhand Ltd. (PTCUL) and Integrated Biodiversity Assessment Tool (IBAT)

426. Three key biodiversity areas can also be found around Dehradun as shown in Figure 73. Portions of the existing MLV intercept with these sites.

Figure 73: KBAs – Dehradun and Overlap with Existing Network



Data Source: Power Transmission Corporation of Uttarakhand Ltd. (PTCUL) and Integrated Biodiversity Assessment Tool (IBAT)

427. Sub-activity components are in immediate surroundings of Dehradun city which were converted into urban/semi-urban use many years ago, and generally there is no natural habitat left at the proposed sites. The underground cables will be constructed within the right of way of existing roads in the municipal boundary of Dehradun city. Trees exist alongside the roads on the Rajpur road, and Raipur. Roadside trees include Eucalyptus, Mango (*Mangifera indica*), Gulmohur (*Delonix regia*), Peepal (*Ficus religiosa*), Banyan (*ficus benghalensis*), Amaltas (*Cassia fistula*), Silver oak (*Grevillea robusta*), Dalbergia sissoo, Abies pindrow, Tun (*Toona ciliata*), Jamun (*Syzygium cumini*), Pilkhan (*Ficus virens*) etc. **Based on discussions with UPCL tree felling is not required during UG cabling works.**

428. Grasses like dub (*Cynedon dactylon*), Baib (*Enlaliopis bineta*), kans (*Saccharum spontaneum*) and spear grass are also found in the district. There are some Litchi trees and mango tree orchards in the study area. These are in private orchards

429. The study area harbours common species found in urban habitats. The most commonly found animals are Indian fox (*Vulpesben galensis*) sambhar (*Gervus unicolor*), hyaena (*Hyaena hyaena*), hare (*Lepus ruficandatus*), porcupine (*Hystrix indica*), jungle cat (*Felis chaus*), jackal (*Canis aureus*), mongoose (*Harpestes edwardsi*), monkey (*Innus rhesus*) and squirrel (*Funambulus pennauti*).

430. Variety of birds are found in the study area. The most common birds is the sparrow, kabutar or pigeon (*Columbialivia*), fakhta or dove (*streptopelia decacte*), parkia or turtle dove (*Streptopelia chinensis*), harial (*Streptopelia senegalensis*), peacock (*Pavo cristatus*), swallow, Slaty-headed Parakeet snipe or chaha (*Capella gallinago*), lal sir (*Netta rufina*), white-eyed pochard or khanjan (*Aythya rufa*), nil sir (*Anas Platy rhynchos*), seekhpar (*Anas acuta*), and, jal murgi (*Amaurornis phoeonucums*).

431. Fish are found in the rivers, and ponds of the district, the common species being rohu (*Labeo rohua*), karonch (*Labeo calbasu*), Khursa (*Labeo gonius*), nain (*Corrine mrigala*). Catla (*Catla Catla*), bam (*Mastacenbelus armatus*), and silond (*Silondia silondia*).

432. Snakes are common in the area especially in the rural area including Cobra (*Naja naja*), Karait (*Bungrus caeruleus*) and water snake (*Natrix piscator*). The other reptiles are the chameleon (*girgit*), the goh and the Chhipkali (*liazard*).

6.8.3. Socio-Economic Conditions

433. **Industry and Agriculture** - Economy of Dehradun is mainly service sector based. Industrial development is very limited. After the formation as a separate state in 2000, the industrial development in Uttarakhand has been picked up. Dehradun District houses 37 large and medium scale industrial units (which include 7 chemical/pharmaceutical units, 8 electrical and 4 food processing units) providing employment for about 8,278 persons. Though these units are not located in the City, Dehradun benefits from the presence of these industries as a service provider.

434. The main source of economy in Dehradun is its tourist places. The city's economy is enhanced by the presence of nearby national parks, mountain peaks and historical sites. Dehradun has a per capita income close to $2400 (per 2012 figures: national average $800). It has enjoyed strong economic growth in the last 20 years. Dehradun has experienced a commercial and information technology upswing, amplified by the establishment of software technology parks of India (STPI) and SEZs (special economic zones) throughout. Regional offices of Genpact, Spice Digital, Serco, Aptara and IndiaMART are present in Dehradun. A number of manufacturing units are present in the Selaqui area.

435. Owing to its hilly topography, agricultural development in the state is also limited. Although limited, the State draws advantage from fertile lands and the availability of abundant water.

Dehradun and surroundings were well known for production the famous “Basmati” rice crop. However, of late, the development pressure has converted many of these agricultural lands. Also, nestled in a wide and thickly forested valley of the Sivalik ranges, Dehradun is also famous for its fruit orchards such as lychees and mangoes.

436. **Solid waste management -** According to the “Dehradun Nagar Nigam (DNN)” the city on an average, generates about 200 MT of MSW per day. The assessment is based on the assumption of per capita generation of 0.4kg/capita/day. Besides domestic, other major sources of MSW generation of the city are shops and commercial establishments, hotels and restaurants and fruit and vegetable markets. The DNN is responsible for solid waste management including collection, transportation and safe disposal. Waste is collected through community bins, and the DDN also introduced door-to-door waste collection in part of the city. Street sweeping is carried out regularly. Sheeshambada waste processing plant is located on the outskirts of the city of Dehradun near Sahaspur. It is based on Integrated Solid waste management approach. It is operational from 2019. This plant is based on Built, Operate and Transfer (BOT) model under which a concession agreement has been signed with Dehradun Waste Management Pvt. for a period of 15 years. The plant is well equipped with modern facilities for processing solid waste and ensuring its scientific disposal. Sheeshambada waste processing plant receives mixed waste from 7 ULBs of Dehradun district. On average, about 450 MTPD waste is received at the waste processing plant.

437. **Administration** - Dehradun city is governed by Municipal Corporation which comes under Dehradun Metropolitan Region. As per provisional reports of Census India, population of Dehradun in 2011 is 569,578; of which male and female are 298,638 and 270,940 respectively. Although Dehradun city has population of 569,578. Total number of slums in Dehradun city and its outskirts numbers 32,861 in which population of 158,542 resides. The sex ratio of the city is 907 females per 1000 males. Child sex ratio is 873 girls per 1000 boys, lower than the national average. There are 31,600 boys and 27,580 girls. Children form 10.59% of total population of Dehradun City. The number of children of age under six in Dehradun city is 60,339 as per figure from Census India report in 2011.

438. **Language and Religion** - Hindi, the official state language, is the primary language in Dehradun. English is also used, particularly by defence wing and the white-collar workforce. Other major regional languages are Garhwali, which is spoken by 23%, Kumaoni 20%, Jaunsari 1.3% and Nepali 1.1%. Literacy rate of Uttarakhand is 78.80%.

439. Hinduism is majority religion in Dehradun city with 82.53 % followers. Islam is second most popular religion in city of Dehradun with approximately 11.75 % following it. In Dehradun city, Christianity is followed by 1.06 %, Jainism by 0.63 %, Sikhism by 3.50 % and Buddhism by 3.50 %. Around 0.01 % stated 'Other Religion’; approximately 0.24 % stated 'No Particular Religion'.

440. **Education** - Literacy rate of Dehradun at 88.36 percent is the highest in the region. Male literacy is 91.76 percent and female literacy is 84.63 percent. Total 449,950 people are literate in Dehradun of which males and females are 244,462 and 205,488 respectively.

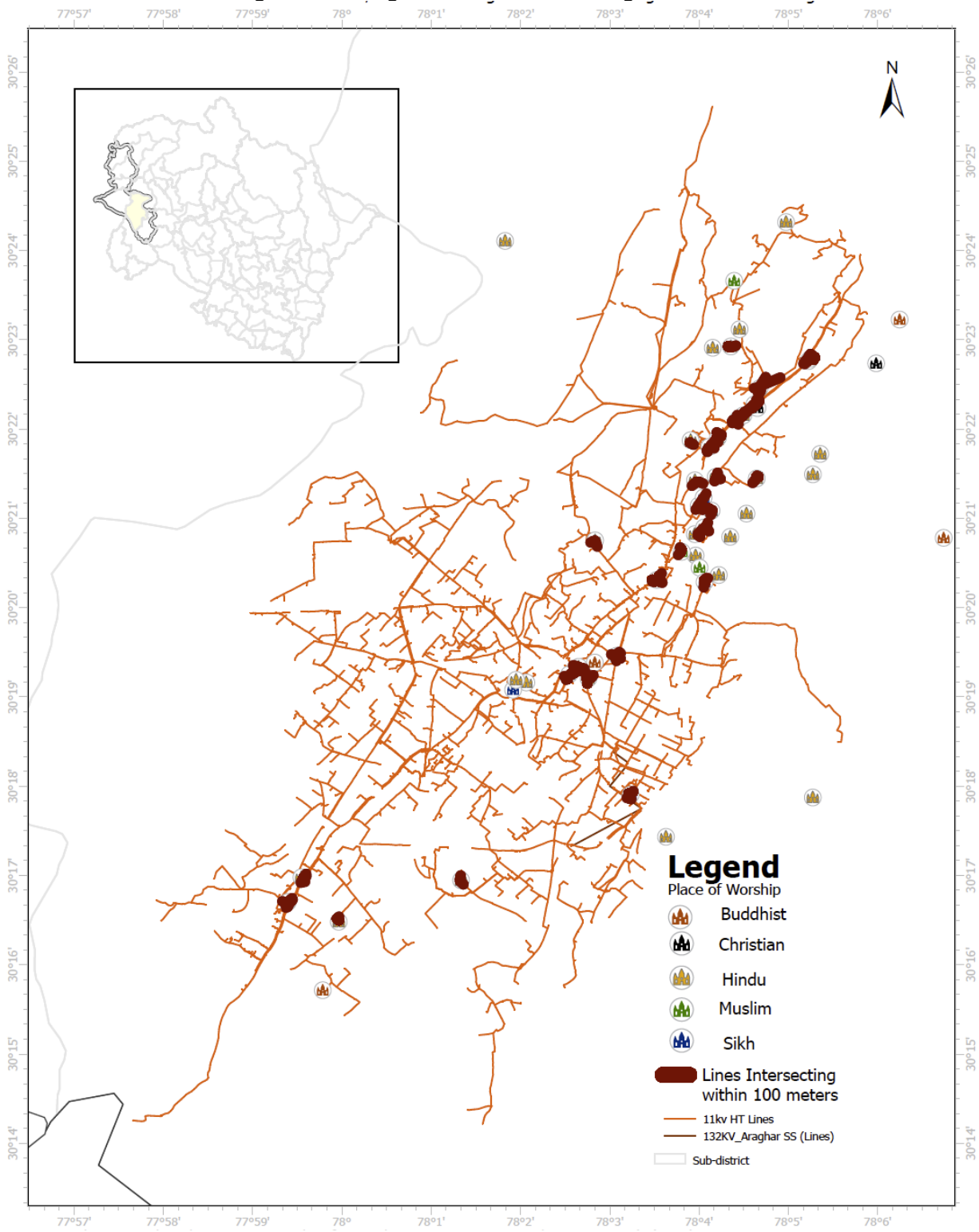
441. There are few schools lying alongside the roads. Raja Rammohan Roy Academy, Arya Inter College Subhash Nagar, Convent of Jesus and Mary, Olympus, Summer Valley, Doon International are some of the schools identified within 100 m of the alignment.

442. **Museums/ASI Protected Areas -** There are no notable or significant archaeological places or protected monuments within 200m of the proposed work alignment The closest ASI protected area is Khalanga War memorial (GPS coordinates 30.343141ºN and 78.098147ºE). However, the distance between the ASI site (Khalanga War memorial (GPS coordinates 30.343141ºN and

78.098147 ºE) and the nearest UG line is more than 768 m away. The works are proposed on the RoW of existing roads and beyond the 300 m regulated zone of ASI.

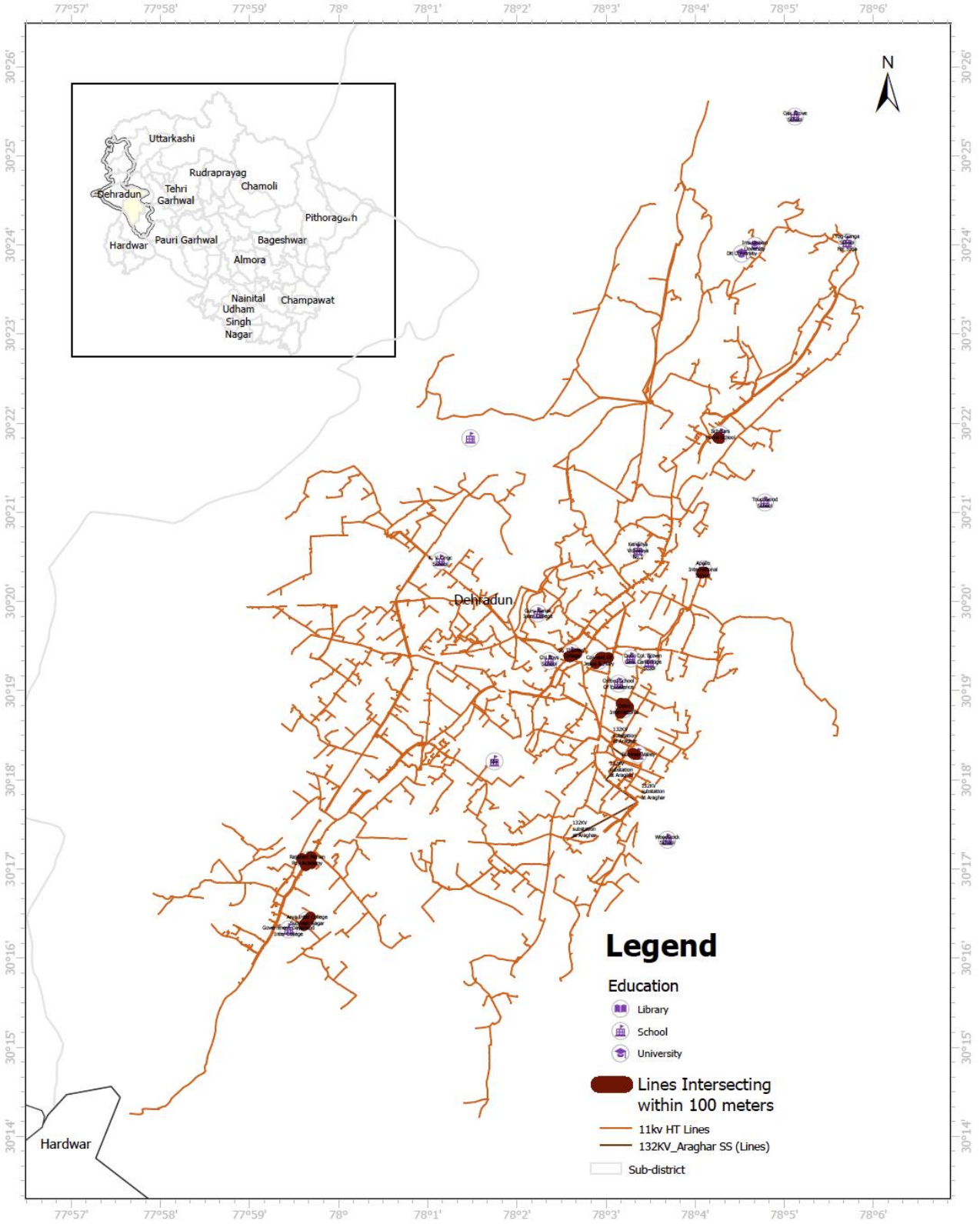
443. Few museums are also located inside the campus of Government Department buildings (Tribal Research Institute and Museum, FRI Museum, Subir Raha Oil Museum, Saheed Smarak, Old Tehri City Model, Satabdi Van Vigyan Kendra, Regional Science Centre). However, the UG lines are proposed along the existing utility corridors of roads.

Figure 74: Religious Sites and Existing UPCL Network



Data Source: Power Transmission Corporation of Uttarakhand Ltd. (PTCUL) and OSM

Figure 75: Educational Facilities and Existing UPCL Network



Data Source: Power Transmission Corporation of Uttarakhand Ltd. (PTCUL) and OSM

6.9. Project Level Baseline

444. The environmental baseline monitoring is undertaken to determine the ambient air, water, and soil quality and ambient noise levels and how they are currently affected by anthropogenic activities in the project area. Monitoring is done to determine the quality of the ambient environment before the start of any kind of project related activities, as it provides a means of comparison with impact monitoring during the project implementation. It will also be used simply to check whether any unexpected change is occurring to existing conditions.

445. Primary tests were conducted by a recognized laboratory Econ Laboratory and Consultancy. The environmental monitoring for air, water, soil and noise were conducted at sub-stations using standard methodologies prescribed by the Central Pollution Control Board.

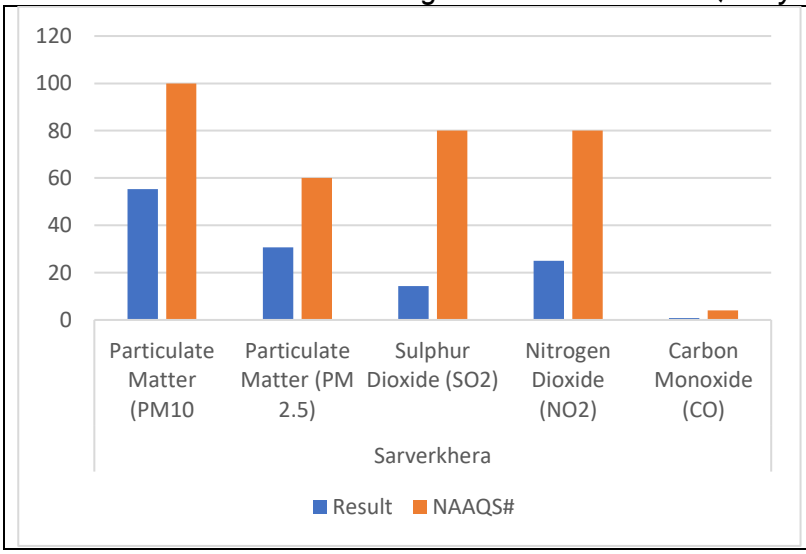
446. 13 locations for air quality, 16 locations for surface water quality, 17 locations for groundwater quality, 34 locations for ambient noise monitoring and 18 locations for soil sampling were selected, taking into consideration location of sensitive receptors and existing site conditions, to collect the baseline environmental data. Further analysis of air, water, soil, and noise at the subproject sites will be conducted by the EPC Contractors before commencing construction when the substation designs are being finalized.

447. The environmental baseline results, sampling and testing methodologies are attached in full as **Appendix F**. Regular monitoring of all relevant parameters during the construction phase by the EPC contractor will further describe the pollutants loads in the ambient environmental conditions and provide for effective implementation of the Environment Management Plan and adherence to intentional good practices by the EPC Contractors and PTCUL/UPCL.

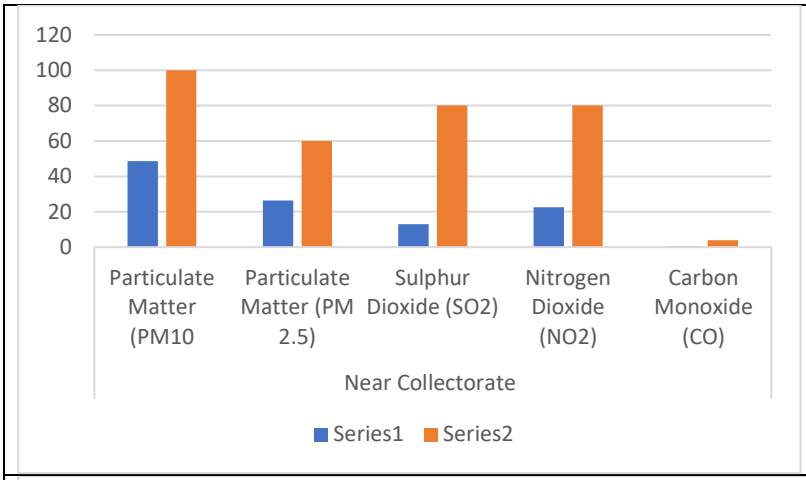
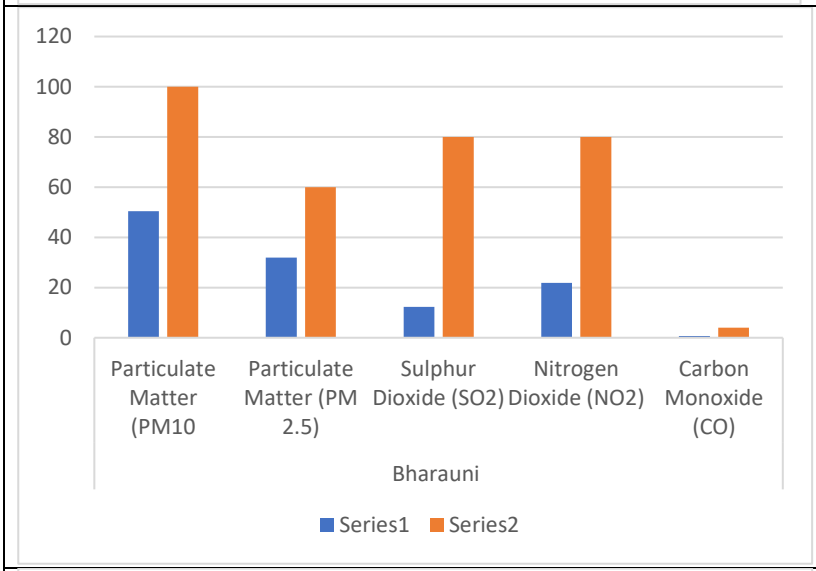
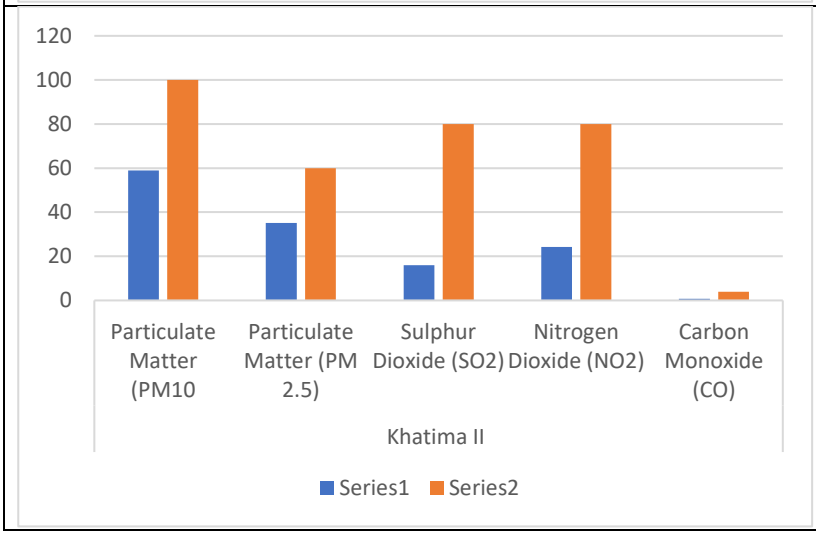
6.9.1. Ambient Air Quality

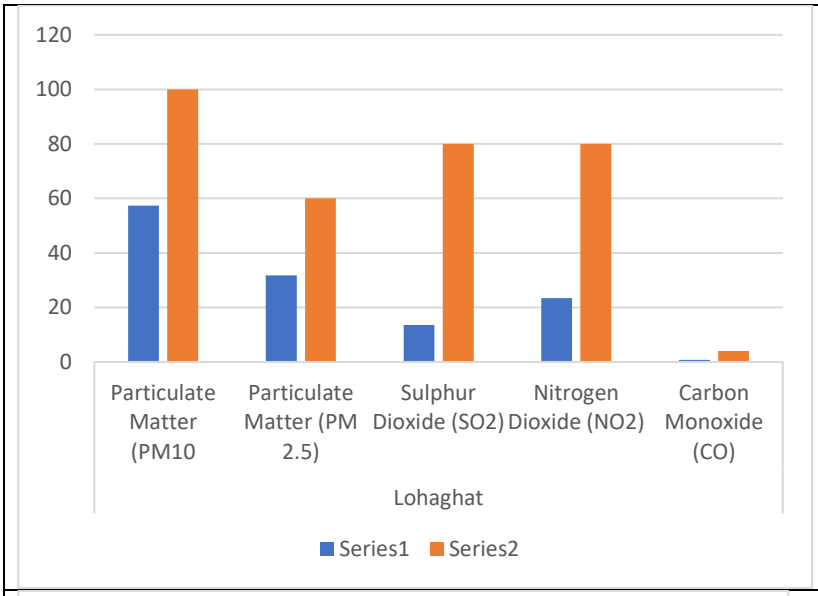
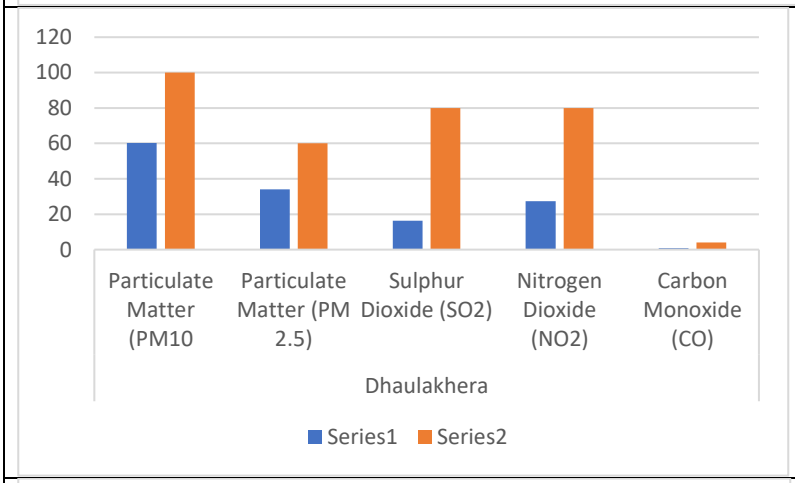
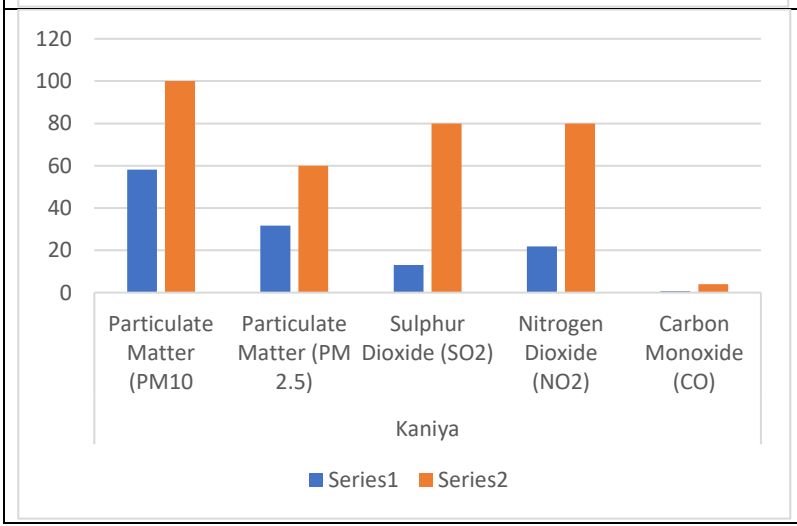
448. Baseline air quality monitoring results for 14 monitored substations are summarized in the graphs in Figure 76. The results, which are provided in full in Appendix F show that air quality meets the national standards for all measured parameters.

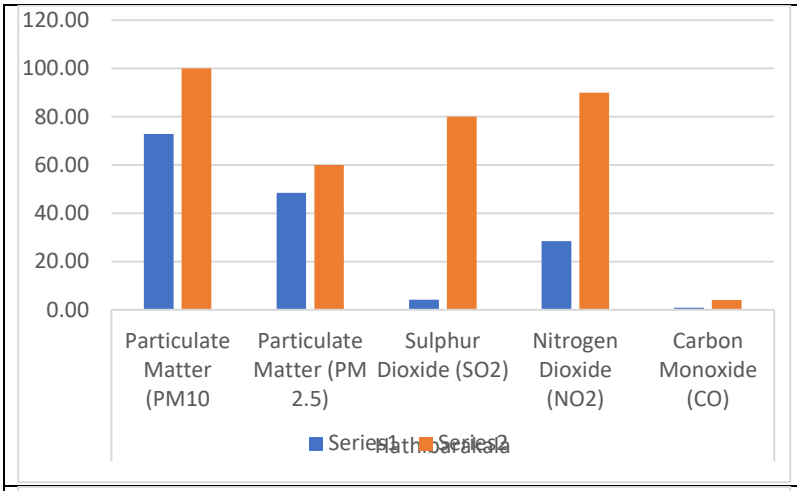
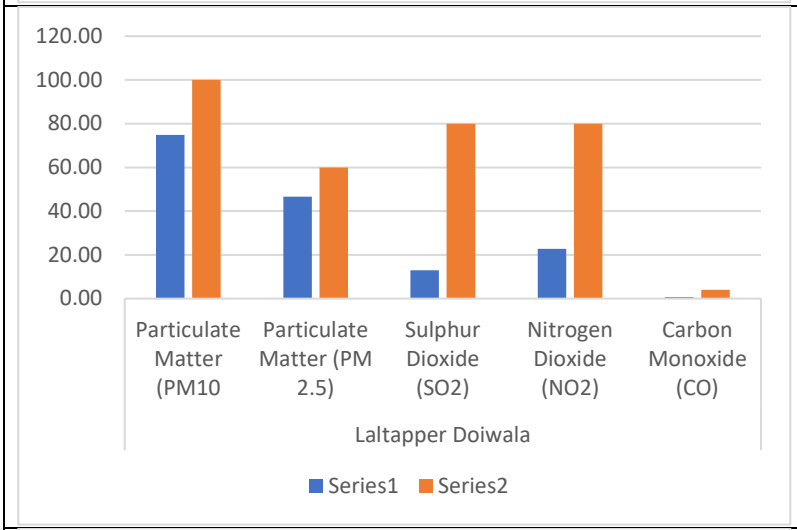
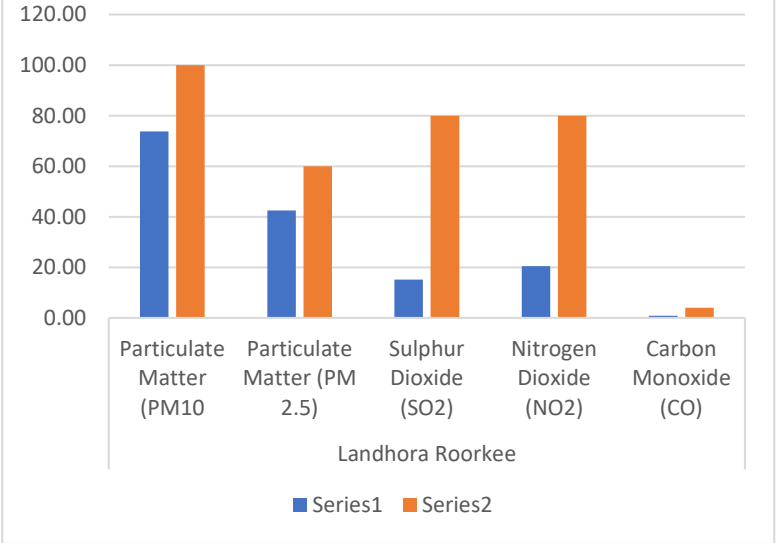
Figure 76: Baseline Air Quality Monitoring

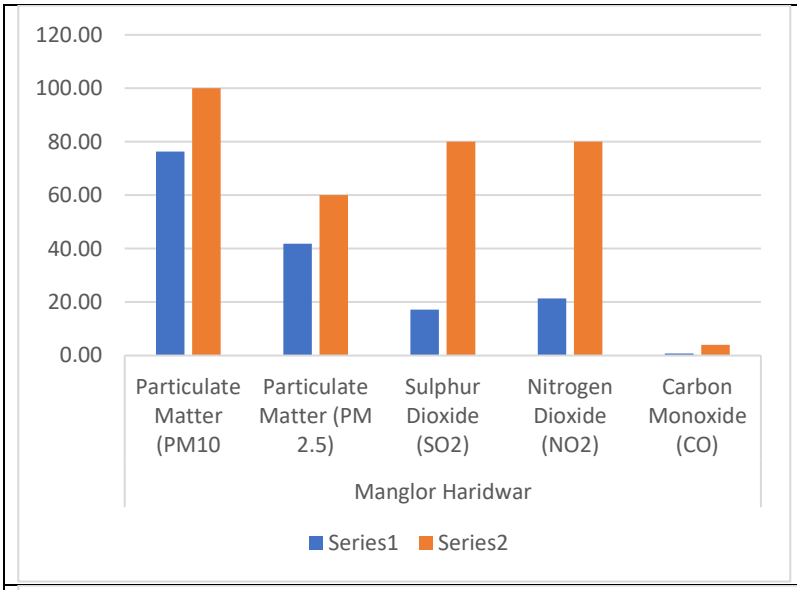
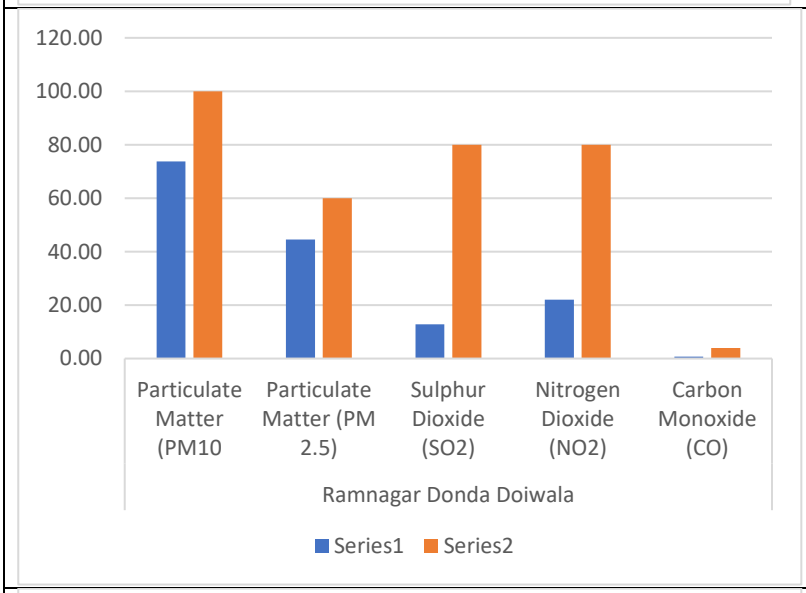
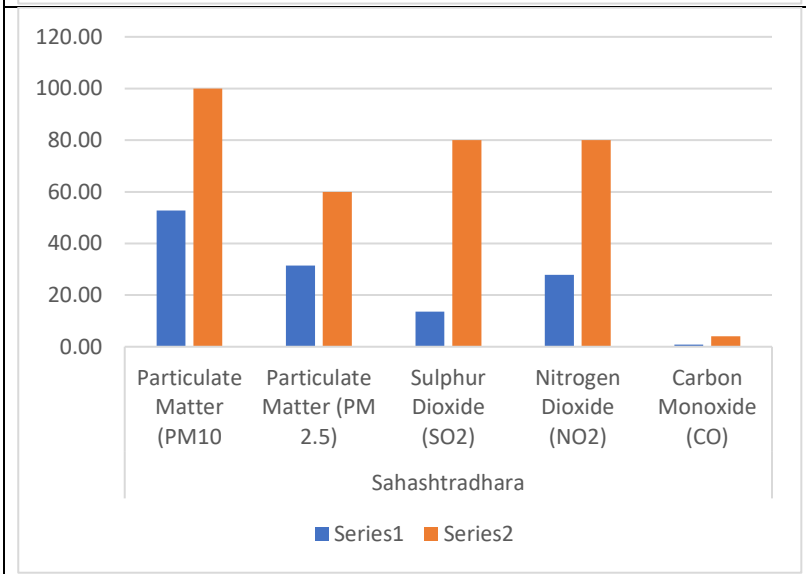


Saverkhera SS. All parameters within NAAQs

		Near Collectorate SS. All parameters within NAAQs
		Bharauni SS. All parameters within NAAQs
		Khatima II SS. All parameters within NAAQs

		Lohaghat SS. All parameters within NAAQs
		Dhaulakhera SS. All parameters within NAAQs
		Kaniya SS. All parameters within NAAQs

		Hathibarakala SS. All parameters within NAAQs
		Laltapper Doiwala SS. All parameters within NAAQs
		Landhora Roorkee SS. All parameters within NAAQs

		Manglor Haridwar SS. All parameters within NAAQs
		Ramnagar Donda Doiwala SS. All parameters within NAAQs
		Sahashtradhara SS. All parameters within NAAQs

6.9.2. Groundwater Quality Results

449. Baseline groundwater quality monitoring was undertaken at substations close to boreholes and wells. Table 65 provides the results of the short-term monitoring. None of the samples showed levels above permissible limits.

Table 65: Baseline Groundwater Quality

#	Parameters	Units	Substation									Limit of IS: 10500-2012	
			Bharuni Sitarganj	Jhankat Khatima	Khatima	Lamgarh Almora	Garampani Haldwani	Talla Ramgarh,Haldwani	Sarghat Mukteshwar	Pines, Nainital	Kaniya Ramgarh Haldwani	Desirable Limits (Max)	Permissible Limits the absence of Alternate Source (Max.)
1	pH (at 25^{0}C)	-	7.05	6.54	6.54	6.97	7.34	7.06	7.03	6.95	7.01	6.5 to 8.5	No relaxation
2	Color	Hazen	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	5	15
3	Turbidity	NTU	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	1	5
4	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
5	Taste	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
6	Total Hardness as CaCO3	mg/l	38.5	28.7	88.0	67.3	65.2	32.7	22.5	56.3	106	200	600
7	Calcium as Ca	mg/l	15.3	11.5	35.4	27.0	26.4	13.6	9.0	22.5	53.2	75	200
8	Alkalinity as CaCO3	mg/l	108.0	66.0	53.0	98.0	45.3	66.2	85.2	87.1	98.2	200	600
9	Chloride as Cl	mg/l	32.5	66.0	107.4	35.4	16.4	22.0	32.7	16.4	34.7	250	1000
10	Magnesium as Mg	mg/l	6.0	4.2	13.5	10.4	10.0	5.0	3.3	10.3	16.2	30	100
11	Total Dissolved Solids	mg/l	202	122	356	197	126	105	96.0	140	266	500	2000
12	Total Coliform	MPN/100ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	NA
13	E. Coli	MPN/100ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	NA

6.9.3. Surface Water Quality Results

450. Baseline surface water quality monitoring was undertaken at substations close to surface water features. Table 66 provides the results of the short-term monitoring.

Table 66: Baseline Surface Water Quality

#	Parameters	Units	Substation															
			Sahashtradhara	Doraha Bazpur	Kashipur	Matkota Rudrapur	Bhadaipura Rudrapur-1	Lalpur Rudrapur-1	Sitarganj Rudrapur	Jhankat Khatima	Bajol Almora Ranikhet	Garampani Haldwani	Transport Nagar Haldwani	Talla Ramgarh Haldwani	Saraighat Ranikhet Almora	Sahiya	Rudrapur Vikasngar Dehradun	Khatima-II U.S.Nagar
1	pH	-	7.21	7.38	7.38	6.75	6.42	6.19	6.64	6.83	5.95	7.25	6.99	6.59	7.43	7.76	7.32	6.71
2	Electrical Conductivity	µs/cm	1510	406	543	398	324	343	412	365	324	254	3098	208	392	845	365	298.4
3	Turbidity	NTU	75	< 5.0	< 5.0	< 5.0	< 5.0	343	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	7.4	2.1	< 5.0
4	Color	Hazen	Hazy	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	Hazy	Colorl ess	< 5.0
5	COD	mg/l	265	43	16	9.7	28.0	86.0	106.0	14.0	20.0	15.0	28.0	8.0	17.0	112	90.4	20.6
6	DO	mg/l	0.7	4.5	3.9	5.7	2.7	2.8	4.2	4.2	3.8	4.7	4.7	3.6	5.8	0.3	0.2	4.4
7	BOD (3 Days at 27 0C)	mg/l	84.7	8.0	< 5.0	< 5.0	8.8	15.2	12.1	4.1	4.2	5.0	9.4	< 5.0	6.2	32.4	27.7	8.6
8	Total Suspended Solid	mg/l	150	65	10.8	12.4	76	163	14	16.7	13.0	15.4	17.6	18.7	19	89.4	45.0	10.7
9	Total Dissolved Solids	mg/l	982	236	365	256	206	200	354	198	200	156	20.5	129	287	468	192	168
10	Oil and Grease	mg/l	14.8	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	2.4	2.4	< 5.0
11	Total Phosphate	mg/l	2.69	0.74	0.6	0.42	1.95	1.3	0.7	N.D	ND	1.9	2.7	ND	1.9	1.4	1.01	ND
12	Total Nitrogen	mg/l	4.3	ND	0.34	ND	0.8	1.0	1.0	1.5	ND	ND	1.3	0.9	1.2	2.1	1.1	ND

13	Total Coliform	MPN/100	1780	102	122	26	28	40	46	80	19.0	20	43	55	50	1042	920	67
14	Fecal Coliform	MPN/100	480	32	45	8.0	12	12	10	21	4.0	12	27	30	36	240	120	22

6.9.4. Soil Analysis Results

451. Soil samples were taken from existing substations where potential soil contamination was identified during environmental audits (including new PTCUL substations to be constructed at UPCL substation land). Analysis of soil samples taken from substations did not detect (ND) Polychlorinated Biphenyl's (PCBs), Polyaromatic Hydrocarbons (PAH), Total Petroleum Hydrocarbons (TPH) and Volatile Organic Compounds (VOC). However, contamination with lead was noted in the soil samples in more than 50% of the sites. However, these values are far lower than the US EPA's thresholds for lead in soil (classified as hazardous in a child-occupied facility) which is 0.4mg/g. The full results, including other general soil quality parameters (e.g., moisture content) can be found in Appendix F.

Table 67: Soil Analysis Results

Substation	VOC	TPH	Heavy Metals (as Pb)	PCB	PAH
Hathibarkala	ND	ND	ND	ND	ND
Araghar	ND	ND	0.039	ND	ND
Doraha	ND	ND	0.036	ND	ND
Kashipur	ND	ND	ND	ND	ND
Matkota	ND	ND	0.022	ND	ND
Badhaipura	ND	ND	0.017	ND	ND
Lalpur	ND	ND	0.011	ND	ND
Sitarganj	ND	ND	ND	ND	ND
Jhankat	ND	ND	0.013	ND	ND
Bajol	ND	ND	ND	ND	ND
Tarikhet	ND	ND	ND	ND	ND
Garampani	ND	ND	0.076	ND	ND
Pines	ND	ND	ND	ND	ND
Phoolchour	ND	ND	0.054	ND	ND
Dhaulakhera	ND	ND	ND	ND	ND
Sawra	ND	ND	0.034	ND	ND
Transport Nagar	ND	ND	0.076	ND	ND
Selaqui	ND	ND	ND	ND	ND

6.9.5. Baseline Noise Levels

452. Baseline noise monitoring was completed at 34 locations of new and proposed substations. The Figure 77 and 78 provide the results of the daytime and night time noise monitoring and compare them against WBG guideline limits for noise as well as the Indian Standards for silent zones. The results are mixed and show that in general, ambient noise levels exceed both the Indian Residential Zone/WBG guideline for residential areas and Indian Silent Zone standards, both during daytime and night time periods.

Figure 77: Average Daytime Noise (dB)

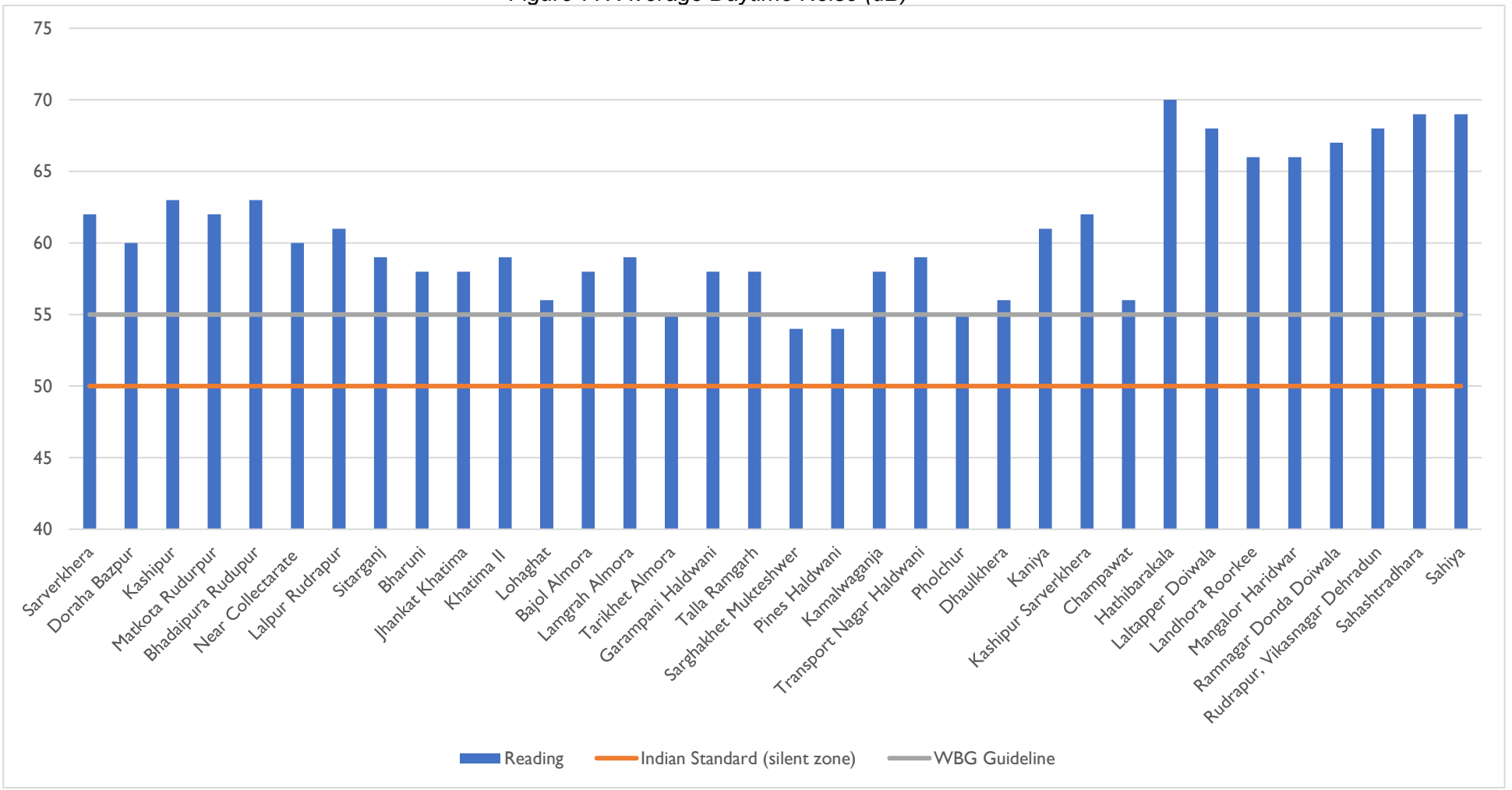
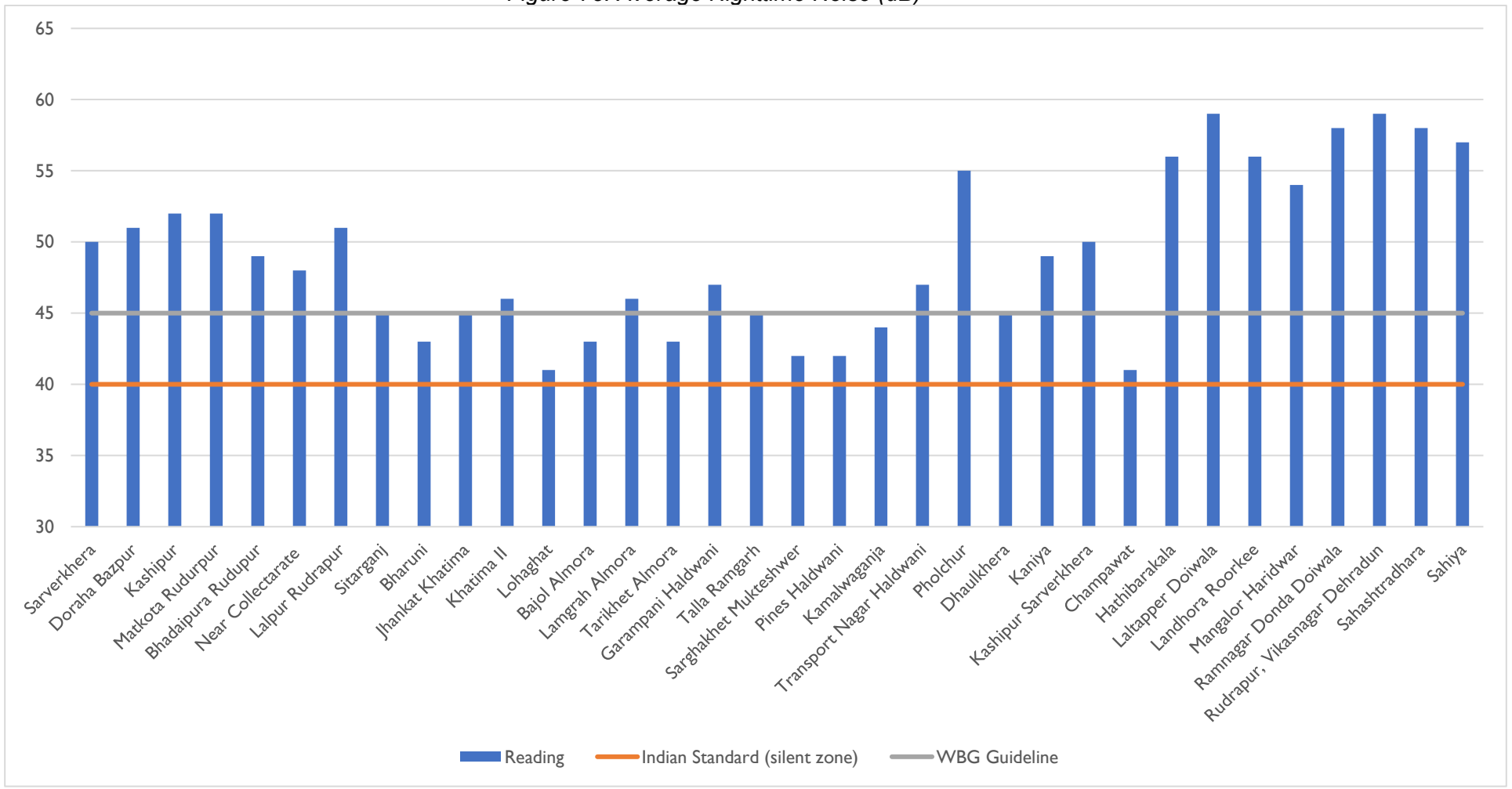


Figure 78: Average Nighttime Noise (dB)



VII. SUBSTATION ENVIRONMENTAL AUDITS

7.1. Preamble

453. This section of the report summarizes the findings of the environmental audit of 25 substations to be augmented and rehabilitated under the MLV component of the Project along with a summary of the audit of the 132 kV Chilkiya Ramnagar Substation. The full audit of the 25 substations and the 132 kV Chilkiya Ramnagar Substation are included in the IEE appendices (Appendix P and V respectively).

7.2. Environmental Audit Requirements

454. Under ADB's Safeguard Policy Statement (2009) for projects involving facilities that already exist or are under construction before ADB's involvement, ADB requires relevant external experts to conduct an environment audit, including on site assessment. For a project involving an upgrade or expansion of existing facilities, as is the case for 25 existing substations (SS) under the MLV component the requirements for environmental assessment (this IEE) and EMP apply in addition to the environmental audit.

455. The environmental audit will determine the existence of any areas where the existing substations of UPCL and PTCUL may cause or are causing environmental impacts and risks. The existing facilities must comply with ADB's Safeguard Policy Statement (2009) and applicable national laws and regulations on environment, health, and safety. Where existing facilities are found not to be in accordance with the environment safeguard principles and requirements that are applicable to the MLV component of the project, a Corrective Action Plan (CAP) is to be prepared, including implementation schedule and sufficient budget, to bring the existing facilities into compliance.

7.3. Audit Methodology for UPCL Substations

456. Desktop review (available information from UPCL, team discussions, Google Earth search of study area, internet searches/UPCL website, etc.) of the substations were conducted to identify the environmental setting before undertaking site visits and audits. The environmental audit took place from 7th June to 25th June 2022. A work plan containing the auditing details and output as well as detailed schedules and plans were communicated to/approved by UPCL before visits were conducted. Twenty-five existing substations, across Uttarakhand, were visited by the environmental expert together with UPCL officials. During the site visits to these substations, a visual inspection of the surroundings, compound including switch yard and control rooms/buildings, road access condition was conducted. Photos and videography, measuring of coordinates, air temperature, noise and EMF using smartphone-based applications were taken and the critical environment, health and safety issues cross checked using an audit checklist to identify areas of strength in each substation, and areas that need corrective actions to meet the required standard. Interviews were also held with UPCL substation engineers and staff and at most locations with local communities in the vicinity of the substations. The Audit Checklist identifies critical issues as per the following criteria deduced from the standards and guidelines relating to:

- General environmental management,
- Waste management practices,
- Hazardous material management,
- Occupational health and safety management, and

- Community health and safety management.

7.4. UPCL Substation Setting

457. The 25 existing substations are spread all across the state and within 4 districts – Dehradun, Almora, Nainital and US Nagar and all support modified habitat. The typical land use within the substations comprises control buildings, switch yards with electrical equipment, and open areas with exposed soil, grass, shrubs, and internal roads; the available open space within the substations varies from 5% (Hatibarakala, Tarikhet and Pines) to 70% (Ramnagar Danda).

458. Twelve of the substations are within or just on the outskirts of a major city and urban areas (Dehradun, Nainital and US Nagar district). Another eight substations are within rural and semi builtup areas. All the substations in rural areas are set in village areas where the surrounding habitats have been modified. Five of the susbtations are isolated (Dehradun and Almora district) and surrounded mostly by natural habitats. Three of the substations, Rudrapur, Garampani and Talla Ramgarh are within river valleys. Among the twenty five substations, 9 are located in plain lands (4 in Dehradun and 5 in US Nagar District), whereas the rest are located on steep terrains and slopes. The layout and build of the substations varies across the state based on terrain.

7.5. UPCL Consultations

459. Small informal group community consultations were conducted during substation auditing, for consultees to express any views on living near substations, environmental and social conditions, or concerns they had regarding the substation as well as planned renovation of the substations. In total 28 participants (42% female) were consulted for the existing substations of the MLV component. The consultations were conducted for people living within 50m of the substations, by invitation from UPCL. The consultations were held during the audits in June 2022. No significant environmental and social concerns were raised, although in Sahiya, severe flash flooding was reported during monsoon season, and it was requested to develop a storm water drain, improve the access road and build a high wall in between the substation and the private house.

7.6. UPCL Key Findings

460. Positives identified based on the environmental audit include:

- All substations are located on UPCL land
- Most of the substations are adequately fenced and gated
- No asbestos containing materials (ACMs) were recorded in the audited substations based on visual inspection. UPCL officials informed that they were not aware of ACMs being used either as insulating material or in other equipment in the SS. However, there is no documentary evidence to confirm if asbestos is present or not.
- Majority of the substations have available area within the existing compound for renovation/upgradation works.
- Overall, most of the SS were kept clean with good housekeeping
- None of the substations were affected by significant noise or air pollution.
- Records of breakdown and maintenance, transformer oil changes are available in the substations.

- Well maintained garden and green belt is present in Doraha SS

461. However, several environmental and social issues have been identified at the sites. The generic (common to all substations) and specific issues (applicable to individual substations) are outlined in Table 69.

Table 68: Environmental Compliance Audit Findings of UPCL Substations

Audit Item	Audit Findings and Observations	
	Generic	Specific
General	• UPCL has not developed any EHS policy or manuals/procedures for substation operation (other than its company safety manual) • SS staff are not aware of EHS management systems and procedures • Records of EHS permits are not available at any of the SSs	• Applicable to all SSs
Housekeeping / Waste Management	• No guidelines for pollution prevention or waste management, including hazardous wastes management, were available at the substations • Some SSs are not having good housekeeping • No waste storage areas were observed in any of the SS. • Solid waste handling was not observed to be undertaken as per statutory requirements of segregation, storage, transport, and disposal. • Empty and filled drums are stored in the yards with no impermeable floor or bund. • Storage was mostly in the open due to lack of dedicated storage area. • End of life batteries are stored at site and then replaced by the vendors. • Trash (municipal waste) stored / dumped inside some SS yards. • Some signs of burning trash/garbage were also observed in couple of SSs. • In some SSs, end of life equipment including redundant transformers are kept at site and in the open for long term. • In some of the SSs, defunct/to be repaired transformers and other electrical systems were observed to be significantly rusted, broken, leaking oil and posing significant health and safety hazards to staff as well as locals including risk of soil contamination. As reported by UPCL, some of the units are taken away to other substations, and some others are scrapped or auctioned.	• Open drum storage in yard/SS compound were observed in – Shashtradhara SS, Badhaipura SS, Lalpur SS, Lamgarah SS, Matkota SS, Phoolchaur SS, Pines SS, Ramnagar Danda SS, Sargakhet SS, Sitarganj SS and Transport Nagar SS. • Large scale material, poles, cable wheels, and transformers/equipment and municipal waste debris storage was observed all over the SS compounds including yards in – Badhaipura SS, Lalpur SS, Matkota SS, Sargakhet SS, Sitarganj SS and Transport Nagar SS • Open burning in SS was observed at – Doraha SS, Ramangar Danda SS, Rudrapur SS, Sargakhet SS • Electric meters are stored in heaps inside Phoolchaur SS control room
Transformers and Oil Leakage	• Capacitors were not installed in any of the SS • All transformers were oil insulated • Transformer and other oils – there are no dedicated, labelled storage areas for drums, oil storage • Drums are kept in an unorganised manner all over the SS and are a significant health and safety risk. • Drums are not labelled, and content is not provided/disclosed. • Material Safety Data Sheets were not available at any of the SS • Transformer test report not available at any of the SS • Transformer bunds, containment bund / tanks for oil spillage management of 110% capacity are not available in any of the SS. Some have concrete platforms; others have bunds but not up to capacity of 110% and they are not extending beyond the transformer area.	• Low to Medium (up to 10) quantity transformer storage inside compound was observed at: Badhaipura SS, Bajol SS, Tarikhet SS • Large scale (more than 10) storage of defunct/to be repaired transformers and soil contamination were observed at – Lalpur SS and Sitarganj SS • As per UNIDO guidelines, one 1980 make HHEL Transformer in Sawra SS, 1971 make TELK Transformer in Garampani SS and 1977 make Electra Transformer in Talla Ramgarh SS were at risk of containing PCBs and another one at Lamgarah SS and two at Pines SS can be at potential risk as the date labels/information are not available; others

Audit Item	Audit Findings and Observations	
	Generic	Specific
	• Leaks and oil spills were observed in varying degrees across all SS. • No specific management or handling procedures were observed for hazardous wastes, oil spills, spillage, runoff from leaks of equipment in any of the SS. • Spill management materials like sand, cloth was not available or mostly inadequate. • Spills were left as it is to be soaked in ground resulting in soil contamination. • No PCB labelling in transformers and capacitors, documentations like certifications PCB free are not available onsite • Records of transformer oil change dates were available at SS • Maintenance records are available for most of the SS	whilst not listed by UNIDO in their guidance may still be at risk of containing PCBs due to oil changes etc. • In Pines SS defunct transformers were observed to be stored along the main road (outside SS) with significant oil leakage and oil seepage along the road as the site is on steep terrain. The SS has inadequate available space for storage. • Oil leaks from transformers: ○ Moderate: Hatiberakala, Bajol, Doraha, Garampani, Kashipur, Phoolchaur ○ High – Badhaipura, Jhankat, Lalpur, Pines, Matkota, Siratganj
Escape of SF_6 (sulfur hexafluoride) and other greenhouse/ hazardous gases	• Among those visited, six SS had a Gas Circuit Breaker that are operational and housed in the switch yard. The SF6 labels are visible. • No leakage / breakdown was reported, although no SF6 leakage detectors are available to check the leakage. • No SF6 leakage detectors are installed in any of the SSs • Record of SF6 leakage and other information not kept/available at any of the SS	• Gas Circuit Breakers are operational in Sahastradhara SS, Hathibarakala SS, Rudrapur SS, Lamgarah SS, Sairaghat SS and Talla Ramgarh SS. • In the Pines SS, potential release from Circuit Breaker which is defunct and broken and internal systems exposed and stands in the SS since the last 10 years.
Noise, EMF, Lighting and Ventilation	• Ambient noise levels were observed to be low with most SS not exposed to traffic or other noise sources. • Spot noise levels near gates, yards, transformer area and inside office using smartphone-based app were mostly in the 34 dB(A) to 64 dB (A) range and within safe limits for OHS • Transformer hum was audible in some cases from nearly 3 meters and spot levels ranged between 43 dB(A) to 67 dB(A) using a smartphone-based app • No high level of air pollution was observed in any of the SS, although moderate to high levels were observed in the SS within built-up areas and on roads • Air and noise monitoring was not conducted by SS (baseline monitoring will be conducted at some SS for IEE purposes) • There were no sources of vibrations observed • No EMF warnings were present in any SS • No EMF shields were installed in 24 of the SS. • No EMF monitoring is conducted by SS. • Spot EMF reading using smartphone-based app were mostly low at all locations, inside office and near gates, varying between 21 uT – 52 uT.	• Higher noise levels were observed at Kamalwaganja, Badhaipura, Transport Nagar and Kashipur SS located on main roads in built up areas • Dust levels were high in Transport Nagar, Badhaipura and Kamalwaganja SS area • EMF shield was observed in Lalpur SS • Highest EMF level of 198 uT near transformer was recorded at Tarikhet SS • Inadequate ventilation and lightening were observed at – Lamgarah SS, Transport Nagar SS, Pines SS

Audit Item	Audit Findings and Observations	
	Generic	Specific
	In one case the EMF levels were recorded to exceed 190 uT near the transformer and are likely in mid to high range. However, this is compared to ICNIRP exposure limits for occupational exposure of 415-500 uT. • Ventilation was mostly adequate, and vents were not blocked as they are located high up near the ceiling. • Control panels were placed along the walls/windows, and this reduces ventilation and lighting to a degree. • Natural light was mostly adequate across all SS, except three. • Artificial lighting working condition inside control rooms varied between 35% to 90%. • Faulty bulbs / tubes were observed in all SS. • Lighting in the SS compound including the switch yard was not adequate, with some SS reporting that the yard remains completely dark as bulbs are not working / not being replaced. • Entry gates and inside paths mostly had no lighting system or were not working	
First Aid Equipment	• First Aid box was not available in 24 of the SS visited. Some SSs had first aid kits, which were expired and inadequate.	• First aid box was available in Badhaipura SS, although it was observed that it was recently procured.
Fire Safety Equipment	• Fire safety equipment was not adequate in all the SSs • Sand buckets were limited, with many of them either empty, not available, or not having adequate sand content. • All SS have CO_2 based fire extinguisher, although all were expired and not replaced. • No automatic alarm and fire suppressions system was found in any of the SS. • No firewalls in any of the SS	• The extinguisher at Sahiya SS was used up and not replaced since 2020 after a fire broke out in the control room.
Community Health and Safety	• Overall, the security of the SS areas is not adequate, and locals can easily access the SS area, control room, as well as the switch yards. • Most SS have moderately adequate fencing apart from some SSs. • Fencing although provided in all the SS has gaps where humans, wild animals, etc. can easily enter. • SS gates remain open 24 hours • Doors to control rooms are reported to be closed only late at night, except those in areas of leopard observation/conflict areas. In these cases, control room doors/gate is closed around dusk. • Caution / danger signage were not observed at any of the SS entry points or on the boundary / fence and on the electrical equipment	• SSs located within densely populated settlements- Kamalwaganja, Badhaipura, Transport Nagar and Kashipur. • Residences adjacent to SS are present in – Badhaipura, Tarikhet, Phoolchaur, Doraha, Garampani, Jhankat, Kashipur and Talla Ramgarh • Sarghakhet SS is located within tourist destination and surrounded by hotels in steep terrain. The access road is narrow and difficult for heavy vehicle movements.

Audit Item	Audit Findings and Observations	
	Generic	Specific
	• Sensitive receptors / settlement near SS were observed in some cases. (refer next column and baseline table) • Some SS are also housing divisional offices and locals come to pay energy bills/other works. They have easy access to the SS and possibly exposed to health risks without any signage or caution boards.	• Meters, defunct units/electrical equipment, cables stored in SS area, which is not gated and beside main road in Hatibarakala SS and Pines SS. • The transformers at Pines SS can be easily assessed by locals as they are located at a lower level than the control room and beside the road. • One side of the fencing missing/broken observed in Bajol SS, Kamlwagunja SS • In Garampani SS, the access road passes along one private residence and on this road are stored with defunct/broken electric poles and other small units • Hospital is adjacent to Kashipur SS • A temple and primary school are located across the access road (5m) from the Ramnagar Danda SS compound • Labour camps adjacent to Lal Tappar SS reported transformer fire two years back with no casualty. Fire was controlled by SS • Pines SS is located on the main road to Nainital hill station, a national important tourist and cultural town. Cranes are used to move transformers and traffic is stopped for long periods when work is ongoing. • In Lamgarah SS, the access road is step sloped and not paved/broken. Since this road pass along a local temple, the community has objected to any construction work on the road, as they anticipate this may damage the temple. • The access road to the Sahiya SS and that used by the only private resident adjacent to the SS is washed out and high-volume storm water flow during the monsoon season every year, which possess high H&S risks both for the residents and the SS. The flooding water meets the Amlawa River downstream located at 60m from the SS. • In Sahiya SS a wall between the housing and SS was requested. • The Tarikhet SS and entrance is located on sharp bend in steep terrain • A new hospital-medical college is under construction (almost ready) adjacent to Matkota SS compound

Audit Item	Audit Findings and Observations	
	Generic	Specific
		• A school is present adjacent to the yard and close to the transformers in the Phoolchaur SS • Technical Institute is located adjacent to Pines SS • Construction materials stored on main road outside Phoolchaur SS, including road tar, narrowing the road in front of the SS • SSs which also double as sub-division offices, where local consumers come for bill payments/related works/applications include- Transport Nagar, Matkota, Shashtradhara
Handling Emergencies	• No emergency preparedness plan available in any of the SS • Some of the SSs have been subjected to low to moderate earthquake and/or moderate to high flooding during monsoon, although no major impacts reported. • One reported landslide issues and one heavy snowing incident • Emergency exit signage was not observed in any of the SSs. • No emergency response training provided to staff • No staff are trained in first aid in any of the SSs • Posters on medical revival, prevention / fire safety was observed in some cases. • No doctors/emergency health contacts list in case of any emergency was observed in any of the SS • No trainings / workshops on fire safety, first aid or other emergency situations are conducted • Some staff reported they had fire safety training, but documentation / records / certificates were not available • Fire drills and alarm tests are not conducted • Fire safety posters were present in many of the SS • No incident logbook available	• Earthquake reported (low/moderate) at – Tarikhet, Garampani, Sairakhet, Lamgarah and Sahiya • Forest fire reported at Pines SS every year. The presence of the dry pine needles accelerates the spread of fire. Multiple brunt trees were observed inside the SS compound. • Flooding risk/SS inundation reported at – Garampani SS. This SS is in a river valley. SS staffs reported complete washing away of the SS if retaining wall in proper orientation is not provided in the river flood plain near the SS. • The Rudrapur SS is in the river valley of the flood prone Gona River. Flash floods are recorded every year along the SS compound. • Sairaghat SS is prone to landslide during monsoon. • Snow fall and cease work reported at Sarghakhet SS. • Fire broke out in the control room of the Sahiya SS in 2020, majorly damaging the walls and control panel.
Health and Safety of Staff	• No OHS inductions were received • No medical tests / health check-up records of staff are available at any of the SS • Working at height training/permits not available for SS staff or for contractors who they call in if required • No OHS training for staffs, no safety, calibration report and records available. No training materials are available • Staff are aware of PPE although not adequately supplied with them, they were mostly worn out and old.	• High altitude and steep terrain SSs with difficult access/manoeuvring, included- Bajol, Pines, Lamgarah, Sahiya, Sawra, Sairaghat and Sarghakhet, • Pines SS was observed to be most difficult to access and high chances of trip and fall from the steep terrain • Movement was difficult in Pines SS, as it being in steep terrain with the Control room, Yard (Circuit Breakers and Others) and transformers located at different steps/height.

Audit Item	Audit Findings and Observations	
	Generic	Specific
	• PPE were in short supplies across all the SSs in relation to staffing power. • Across all SSs, staff were not wearing any PPE including safety boots. • Exposure assessment equipment are not available. • Trip hazards, cracks, holes, cracked tiles are observed across all SS both inside the control room and in the compound • Gaps, cracks, faulty tiles, missing floor panels in the control buildings. • Storage of defunct panels, small parts, units, meters, cables, wires were recorded inside the control rooms, some restricting movement and posing trip and fall hazards risk. • In the switch yard and open areas, hazards were recorded in the form of trip hazards like open cable channels, broken and unstable drain/channel covers, broken and defunct equipment, drums, rods, cables, broken meter boxes and streetlights and trash. • No air conditioning and / or heating systems have been installed in any of the SS • Communication problem/no network is potential risk during accidents to report event and call for medical/other help for the high-altitude SSs. • Building structural status – most of the SS are adequately managed, and some repair work is required although they were structurally sound except one in which is severely damaged. • Cracks were observed in many of the SS walls. Moisture / damp walls, plaster and paints stripped off were observed. • No ACM survey done but asbestos containing materials not observed • Most maintenance works and civil works/maintenance are done by hired labors/contractors • No pest problems were reported in any of the SS. Pest control measures are not conducted. • Regarding COVID-19 although they reported that guidelines were followed, observation during the audit was that they did not adequately meet the requirements of masks, hand sanitizers, liquid soaps, etc.	• Major trip/fall hazards, cracks in the yard were observed at – Badhaipura SS, Lalpur SS, Phoolchaur SS, Pines SS, Transport Nagar SS, Sahiya SS, Sawra SS and Sitarganj SS • In Badhaipura SS underage causal labour was observed, hired for yard grass cutting. No induction and/or PPE were provided to labours • In Lalpur SS, contract workers were observed working atop transformers and handling cables connections without any PPE, boots, etc. • Ongoing O&M and civil works observed at Matkota SS with no PPE, safety equipment • Crack in control room wall was observed in Bajol SS and Transport Nagar SS. • The control building at Lamgarah SS is severely damaged and old and will need complete repair and re-development.
Drainage	• Drainage and wastewater – in most cases storm drains were absent from the SS area. • The wastewater from toilets (bathing, basin, urinals) other than WC is moved through internal drains and either directed into open main drains or dumped in the open ground outside the compound. • Standing water was not observed in any SS.	• Flash flooding from storm water runoff was reported at Sahiya SS with a requirement for storm drainage observed.

Audit Item	Audit Findings and Observations	
	Generic	Specific
Sanitation and Welfare Facilities	• Toilets are available on site and inside the buildings of all SS • Separate toilets for women are not available in any of the SS. No women staff were recorded in any of the SSs. • Overall, the toilets were observed to be clean and hygienic. • Lights were working and doors were adequate with locks working. • Septic tanks are available for all the SS although the septic tanks overflow drains off in open areas / fields outside the SS. No soak pits available. Septic tanks are mostly below ground and were observed to be inadequately maintained. • Potable water is available on site. Quality of drinking water, as reported by staff was mostly potable and agreeable. The source of water is mostly municipal / piped water, while some used bore well water. The storage of the water inside the SS was mostly hygienic and stored adequately. Testing reports are not available and no periodic potability testing was reported. • No dedicated accommodation / rest rooms are available in any of the SS. The staff, including night shift staff stay within the control rooms and have temporary mats/beds within the control room area. • Cooking is mostly not practiced, but in some SS a temporary cooking set up, using electric heaters was observed inside the control/office rooms, which may pose a fire hazard. • Dedicated accommodations, TV/Internet connection AC/heating area not available.	• Bore well water used by Rudrapur SS, Lamgarah SS, Sarghakhet SS, Matkota SS, Badhaipura SS, Lalpur SS, Jhankat SS, and Doraha SS and Kashipur SS • Cooking inside SS using faulty electric heater were observed at – Phoolchaur SS
Other	• Birds' common to the locality are sometimes sited in the SS areas, a few rare cases of electrocution of birds were reported from some SS • **Wildlife conflicts were not reported from any of the SS, although sightings were recorded by SS staff in some of the SSs.** • Grasses of different heights, shrubs and herbs were observed in many of the SS, they are not maintained or trimmed / managed. • No medium/large trees are present in the SS yards.	• Parthenium sp, a weed and allergic plant was observed at – Doraha SS, Sitarganj, Matkota, Matkota, Lalpur and Badhaipura SS. • Leopard (*Panthera pardus*) sightings in and around SS were reported at – Pines, Bajol, Tarikhet, Garampani and Sairaghat • Leopard sighted in the 132 kV Chilkiya Ramnagar Substation (see Section 7.8 below for details of this substation). • Elephant movement along access road of Lal Tappar SS. The fencing is missing in the front of the SS. • Electrocution of Red Flying squirrel report within Sarghakhet SS

7.7. Conclusions of UPCL Environmental Audit

462. Overall waste management, including handling, storage, and disposal, is the principal EHS concern in all substations audited. Pieces of solid wastes (removed parts of transformers, metal scraps etc.) had no specific and designated area for collection and storage, and there was no organized disposal mechanism. Usually, they are seen all over the compound and stored there until transported to another substation. Although major oil leaks/contaminations were observed only in 10 out of 25 substations almost all transformers were leaking oil and without spill bund, etc. Furthermore, safety requirements and training and awareness of staff was found to be woefully inadequate. There are no written hazardous materials or solid and hazardous waste management systems and guidelines for substation personnel; other than the corporate safety manual there were no written Environment, Health and Safety procedures or trainings to prepare staff for emergencies. Inadequate Personal Protective Equipment (PPE) and first aid was recorded at all substations. The EHS audit findings reflect the fact that neither the national nor the ADB's SPS 2009 requirements are complying in any of the substations.

7.8. Environmental Audit of 132 kV Chilkiya Ramnagar Substation

463. Kaniya UG Line will be connected to the 132 kV Chilkiya Ramnagar Substation of PTCUL, which is not being upgraded as part of the Project. An audit of this substation has been undertaken and the key findings of the audit are aligned with the general findings of other UPCL substations audited (

464. Table 68). The only site-specific point of note was the sighting of a leopard in the substation compound in 2021. The corrective actions outlined in Table 69 should also be applied to this substation by PTCUL. The full audit can be found as Appendix V.

7.9. Corrective Action Plan

465. The following corrective action plan has been prepared and shall be implemented by UPCL and PTCUL as part of the Project scope.

Table 69: Substation Corrective Actions

Non-Compliance Issue	Corrective Action	By whom	By when	Budget (source)
SHORT TERM CORRECTIVE ACTIONS				
General	• Provide all SS managers with EHS awareness training so they can understand and implement the corrective action that is required at each SS • Provide specific training to all SS managers/workers on PCBs to raise awareness of the risks and the need for compliance with national regulations; the Regulation of Use, Handling and Disposal of Polychlorinated Biphenyls and the Hazardous and Other Wastes (Management and Transboundary Movement) Rules. • Provide specific training to SS managers/workers on SF6 management, and management of end of life/defunct/damaged units like gas-based circuit breakers to ensure they are appropriately disposed of by a certified industrial waste management company who will need to remove SF6 and treat the equipment prior to disposal in accordance with International Electrotechnical Commission (IEC) standard 61634 and ensure the SF6 is not released to atmosphere.	PIU ESSOs with support of PISC	Upon loan effectiveness	UPCL/ PTCUL with training expertise provided under PISC budget
	• Submit a status report for each SS confirming the implementation status of short-term corrective action plan to ADB for clearance prior to commencement of any works at the SS in question	PIU ESSOs with support of PISC	Before access to SS given to contractor	UPCL/ PTCUL
	• Records of all EHS permits applicable to the SS to be made available at the SS site	UPCL/PTCUL SS Manager with support PIUs/Electrical Sub-Division under guidance of PIU ESSOs	Before access to SS given to contractor	UPCL/ PTCUL
Housekeeping/waste management	• Prohibit any open burning of waste at the SS site • Dedicated labelled storage areas for materials and segregated waste; ideally storage will be in a locked area, under cover to provide shelter from the elements, having fully enclosed garbage bins for the disposal of municipal solid waste, and where liquids or leachable materials are stored having an impermeable floor bunded to 110% capacity of the volume that is stored • If impermeable floor bunded to 110% is not available in the short-term, liquid and leachable materials/waste to be kept on drip trays to provide secondary containment • Tidy up the SS ensuring all materials and wastes including cables, broken electrical systems, meters, glass and plastic, oils etc. are collected up, segregated, and stored in the designated and labelled storage areas	UPCL/PTCUL SS Manager with support PIUs/Electrical Sub-Division under guidance of PIU ESSOs	Before access to SS given to contractor, or if including corrective action in contract this is to be completed by contractor before they commence works	UPCL/ PTCUL

Non-Compliance Issue	Corrective Action	By whom	By when	Budget (source)
	• Remove (and prohibit any further) end-of-life equipment or waste stored outside the SS boundary relocating it to designated and labelled storage areas within the SS • Remove all end-of-life equipment that has built up on site to UPCL stores with storage, transport, and disposal as per the GoI regulations following the waste hierarchy • Remove all other waste that has built up on site by appropriately licensed waste management company with all storage, transport, and disposal as per GoI regulations [including but not limited to the (i) Hazardous and Other (Management and Transboundary Movement) and Amendment, Rules, 2019 (ii) Construction and Demolition Waste Management Rules, 2016, (iii) E-Waste Management Rules, 2016, and (iv) Plastic Waste Management Rules, 2016] whilst following the waste hierarchy			
Transformers and oil leakage	• Filled drums (mineral oil) are all to be sealed and labelled with their contents with safety warnings • MSDS to be available at the SS site for all the materials used on site • Collect up and store empty and filled drums (mineral oil) in a locked, under cover, designated storage area, they should either be stored on an impermeable floor bunded to 110% capacity of volume stored, or if not available in the short-term kept on drip trays to provide secondary containment • Defunct transformers prior to being removed from site are to be placed in a designated storage area, they should either be stored on an impermeable floor bunded to 110% capacity of volume stored, or if not available in the short-term kept on drip trays to provide secondary containment • Inventory to be prepared of existing transformers on site, make, model, risk of PCBs and other details including transformer test report, details any maintenance works undertaken, dates oil changes, leakage incidents etc. • Clearly label all transformers as either containing PCBs, at risk of containing PCBs, or PCB-free provided documentary evidence exists[73]	UPCL/PTCUL SS Manager with support PIUs/Electrical Sub-Division under guidance of PIU ESSOs	Before access to SS given to contractor, or if including corrective action in contract this is to be completed by EPC contractor before they commence works	UPCL/ PTCUL

[73] In the absence of documentary evidence (e.g., contract specification or certification for supply of original transformer, maintenance records for oil replacement including material safety data sheet, or transformer oil test results etc.) for given transformers confirming they are PCB-free, all old transformers must be considered by the staff at risk of containing PCBs. Mineral oil-filled transformers were not designed to use PCBs, but many have been found to be contaminated with PCBs.

Non-Compliance Issue	Corrective Action	By whom	By when	Budget (source)
	• Carry out inspections and preventive maintenance to minimize oil leakages; ensure values, nuts and bolts are fully functional and tightly secured, ensure rubber seals of radiators are intact • Existing transformers in a poor state of repair and which are currently leaking oil to be maintained/repaired so they are left in good condition • Health and safety risk assessment for exposure of staff to PCBs to be undertaken before maintenance/repair work is undertaken on any existing SS transformers • Clean up all existing oil spill, excavate any contaminated soil and send for disposal (as hazardous waste) using appropriately licensed waste management company with all storage, transport, and disposal as per the Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 • Make available spill management materials (sorbent pads, loose sorbent material, sand, etc.) next to the storage area for immediately soaking up any leaks or spills that do accidentally occur			
Escape of SF6	• Inventory to be prepared of all SF6 containing equipment on site, their make and model, volume of SF6 contained, details of repair works undertaken, dates of SF6 replenishment, leakage incidents etc. • Provide SF6 leakage detection equipment at all SS supporting SF6 containing equipment. • Carry out inspections and preventive maintenance to minimize SF6 leakages.	UPCL/PTCUL SS Manager with support PIUs/Electrical Sub-Division under guidance of PIU ESSOs	Before access to SS given to contractor, or if including corrective action in contract this is to be completed by contractor before they commence works	UPCL/ PTCUL
Noise, EMF, lighting, and ventilation	• Existing vents/windows to be unblocked • Defunct bulbs/lights to be replaced • Provide adequate natural and/or artificial lighting levels to meet the WBG EHS Guidelines on Occupational H&S (*Table 2.3.3. Minimum Limits for Workplace Illumination Intensity*) within control rooms, toilets, stairways, and other areas having regular staff movements	UPCL/PTCUL SS Manager with support PIUs/Electrical Sub-Division under guidance of PIU ESSOs	Before access to SS given to contractor, or if including corrective action in contract this is to be	UPCL/ PTCUL

Non-Compliance Issue	Corrective Action	By whom	By when	Budget (source)
			completed by contractor before they commence works	
First aid equipment	• Make available fully stocked, in-date first aid kit in a prominent, signed position • Provide eye wash station and water supply to shower located near the storage areas for fuel/oil/chemicals	UPCL/PTCUL SS Manager with support PIUs/Electrical Sub-Division under guidance of PIU ESSOs	Before access to SS given to contractor, or if including corrective action in contract this is to be completed by contractor before they commence works	UPCL/ PTCUL
Fire safety equipment	• Provide sand buckets, full of sand, placed in a prominent, signed location near to fire-risk locations such as transformers and oil storage areas • Make available fire extinguishers (including for oil and electric fires) in a prominent, signed location near to fire-risk locations such as transformers and oil storage areas with service and expiration dates clearly labelled. • Expired/exhausted fire extinguishers to be refilled/replaced so all are in date.	UPCL/PTCUL SS Manager with support PIUs/Electrical Sub-Division under guidance of PIU ESSOs	Before access to SS given to contractor, or if including corrective action in contract this is to be completed by contractor before they commence works	UPCL/ PTCUL
Community H&S	• Entire SS boundary to be well secured, existing boundary fence or wall to be installed/repaired/replaced ensuring no gaps for entry of people or livestock/wild animals and that it is sufficiently high so that it cannot be climbed over • For SS that are housing divisional offices to be fenced off from the SS so that office workers and members of community paying bills do not have access to the SS. • Gates are to be installed/repaired/replaced and to be kept always closed except when there is vehicle/staff movement through the gate. Recommended to have a larger gate for the vehicles and a side gate for staff entry/exit.	UPCL/PTCUL SS Manager with support PIUs/Electrical Sub-Division under guidance of PIU ESSOs	Before access to SS given to contractor, or if including corrective action in contract this is to be completed by contractor before they	UPCL/ PTCUL

Non-Compliance Issue	Corrective Action	By whom	By when	Budget (source)
	• Doors to control rooms to be kept shut during both day and night. • Security persons are to be deployed at all SS for 24x7 period with rotation/shifts. Number of security guards is to be determined by UPCL based on the size/area of the SS and adjacent land use. • Close-circuit (CC TV) camera to be installed at those substations located in leopard encounter areas with monitoring in the control room • Dedicated shelter to be provided at the site entrance for use by any security guards, shielding them from rain, wind, and extreme (hot and cold) temperatures. • Switch yard area/transformers are also to be fenced having a locked gate with visual and written warning signages including the ISO 7010 Hazard Type: Electrical Symbol warning of the risk of electrocution. • Safety signage with large and colorful display to be placed along SS boundary and at gate with visual and written warning signages including the ISO 7010 Hazard Type: Electrical Symbol warning of the risk of electrocution. • Safety sign to be placed to make local community aware that the SS site is out of bounds for livestock.		commence works	
Handling emergencies	• Identify and install emergency exit signage on all emergency exits • Keep clear all the emergency exits, remove blockages due to storage of end-of-life equipment • Provide first aid posters including first aid for electrocution incident • Prominently post a list of doctors/emergency health/fire station contacts (names/locations/phone numbers) list in case of emergency • Provide posters on fire safety • Establish and maintain an incident logbook	UPCL/PTCUL SS Manager with support PIUs/Electrical Sub-Division under guidance of PIU ESSOs	Before access to SS given to contractor, or if including corrective action in contract this is to be completed by contractor before they commence works	UPCL/ PTCUL
H&S of staff	• Provide everyone who enters the SS with an OHS induction • Records of medical tests / health check-up of staff to be accessible by the SS Manager • All staff to be given required PPE and other requisite safety equipment. • Provide sufficient PPE spares available on site for visitors etc. • Ensure all staff and visitors always wear PPE including safety boots	UPCL/PTCUL SS Manager with support PIUs/Electrical Sub-Division under guidance of PIU ESSOs	Before access to SS given to contractor, or if including corrective action in contract this is to be	UPCL/ PTCUL

Non-Compliance Issue	Corrective Action	By whom	By when	Budget (source)
	• Introduce disciplinary system for non-compliance with PPE requirements to enforce their use • All potential trip and fall hazards to be removed including repair of broken floor inside control rooms, cable drain tiles and covers, etc. • All the electrical equipment to have visual and written warning signage including the ISO 7010 Hazard Type: Electrical Symbol warning of the risk of electrocution. • Carry out inspections and preventive maintenance to ensure electrical standards are upheld • Employ third party to conduct pest control, if required. Pest control to be based on integrated pest management approaches and aim to reduce reliance on synthetic chemical pesticides especially those hazardous to human health and the environment, such as, the use of carbolic acid as deterrent to snakes. • Food waste to be stored in fully enclosed bins to avoid attracting wild life, rodents usually followed by snakes • Strict observation of COVID-19 requirements whilst pandemic is ongoing including wearing of masks, use of hand sanitizers, etc. • Health and safety risk assessment for exposure of staff to asbestos dust to be undertaken before maintenance/repair work is undertaken; potential presence of asbestos at the SS to be surveyed by using a competent third party[74]		completed by contractor before they commence works	
Drainage	• In damp/wet areas the surfaces of the SS are to be cleaned so algae (slippiness) is not present and warning signs to be placed	UPCL/PTCUL SS Manager with support PIUs/Electrical Sub-Division under guidance of PIU ESSOs	Before access to SS given to contractor, or if including corrective action in contract this is to be completed by contractor before they commence works	UPCL/ PTCUL

[74] In the event asbestos is found, its presence should be documented, and warning signs installed to avoid it being disturbed. If at risk of being disturbed thereby exposing workers to asbestos dust an Asbestos Removal Plan is to be prepared detailing how asbestos will be safely removed from site, asbestos must not be disturbed by workers but removed by a competent specialist asbestos contractor in accordance with GoI requirements, the WB-WBG EHS general guidelines and other GIIP. Asbestos waste must be safely and soundly disposed of as a hazardous waste material in accordance with GoI regulations and WBG EHS general guidelines.

Non-Compliance Issue	Corrective Action	By whom	By when	Budget (source)
Old Equipment	• Bunded storage area for old equipment / replaced equipment will be established. Must be able to contain at least 1500 liters of oil and be large enough to store a 20 ton transformer	UPCL/PTCUL SS Manager with support PIUs/Electrical Sub-Division under guidance of PIU ESSOs	Before access to SS given to contractor, or if including corrective action in contract this is to be completed by contractor before they commence works	UPCL/ PTCUL
Sanitation and welfare facilities	• Provide potable drinking water supply meeting GoI drinking water standards (regular testing of drinking water is included in IEE EMoP scope) • For all existing toilets ensure adequate lightening, repairing of door, locks, and latches provided as well as hand washing facilities with soap and water • Cleaning of existing toilets on daily basis, use of disinfectant and floor cleaners • Ensure all sources of wastewater connected to septic tank • Ensure that septic tanks are well maintained • Install a soakaway for disposal of the septic tank wastewater, no untreated wastewater should be disposed of to surface water or ground • For the welfare of SS staff during their shifts provide a dedicated cooking area / clean eating area / rest area for staff on-site that meets GoI and ILO worker accommodation requirements	UPCL/PTCUL SS Manager with support PIUs/Electrical Sub-Division under guidance of PIU ESSOs	Before access to SS given to contractor, or if including corrective action in contract this is to be completed by contractor before they commence works	UPCL/ PTCUL
Other	• Provide a safe vehicular access for entry/exit from the substation to the road (public highway) having adequate sight lines for all drivers and warning signs of entranceway • UPCL access roads to substations to be repaired (Lamgarah, Rudrapur) before any works at the substation commences • Remove any stored distribution poles/lines from road side (Rudrapur, Talla Ramgarh) • Maintain vegetation at the SS that poses a health and safety hazard e.g., because gaps/channels/broken covers are hidden due to vegetation growth or snakes may be hidden within the grass etc.	UPCL/PTCUL SS Manager with support PIUs/Electrical Sub-Division under guidance of PIU ESSOs (either as a separate undertaking or to be included in the scope of EPC contract)	Before access to SS given to contractor, or if including corrective action in contract this is to be completed by contractor before they commence works	UPCL/ PTCUL
LONG TERM CORRECTIVE ACTIONS				

Non-Compliance Issue	Corrective Action	By whom	By when	Budget (source)
General	• Develop and adopt corporate wide EHS policy and manuals/procedures (SOP) for SS operation • SOP developed to include guidelines for pollution prevention including management or handling procedures for oil spills, spillage, runoff from leaks off equipment, and waste management, including for hazardous waste management • SOP developed to include guidelines for H&S management including emergency preparedness • Ensure copy of EHS policy and SOP available at all SS • Provide SS managers/workers on training with respect implementation of the SOP • Submit a status report for each SS confirming the implementation status of long-term corrective action plan to ADB for clearance prior to commissioning of the SS in question by the contractor	PIU ESSOs with support of PISC	Prior to commissioning by the EPC contractor	UPCL/ PTCUL with guidance of ADB TA Consultant in preparing the SOP
Housekeeping/waste management	• In SS where a locked, under cover material and waste storage area with an impermeable floor bunded to 110% capacity of the volume stored are not available in the short-term for the storage of fuel/oil/chemicals and solid/hazardous waste construct such a storage area	UPCL/PTCUL SS Manager with support PIUs/Electrical Sub-Division under guidance of PIU ESSOs (either as a separate undertaking or to be included in the scope of EPC contract)	Prior to commissioning by the contractor	UPCL/ PTCUL
Transformers and oil leakage	• In SS where existing transformers are at risk of containing PCBs ensure they are tested[75] (such testing is included in IEE EMoP scope)	UPCL/PTCUL SS Manager with support PIUs/Electrical Sub-Division	By 31/12/2025 [76]	UPCL/ PTCUL

[75] The most suitable way to determine if PCB is present is for a suitably qualified institute to sample and analyze the oil in accordance with United Nations Environment Protection Agency (UNEP) Guidelines (PCB_ID_1st_print-2.PDF (unep.org)) following a health and safety risk assessment and plan referring to PCB Transformers and Capacitors: From Management to Reclassification and Disposal - First Issue (unep.org). It is not recommended to take an oil sample from hermetically sealed oil distribution transformers since the transformer itself is fully closed to the environmental condition, but a sample for PCB testing can be taken by experienced staff. Conservator type transformers can be readily tested. Once transformers have been found to contain PCBs they must be labelled as such, any PCB storage areas should also be marked to allow expeditious identification and response to a PCB accident. Similarly, transformers found to be PCB free should be marked as such for future reference of compliance with GoI regulations and the log of test results to support this kept by UPCL.

[76] Government of India Regulation of Use, Handling and Disposal of Polychlorinated Biphenyls permits the use of existing PCB containing equipment up until 31.12.2025 provided it is within its certified lifetime and properly maintained without possibility of leakage or release of PCBs into the environment with disposal of waste PCBs or contaminated equipment by 2028 in accordance with the Stockholm Convention.

Non-Compliance Issue	Corrective Action	By whom	By when	Budget (source)
	• For those transformers confirmed as containing PCBs ensure these are dechlorinated or removed from site with storage, transport, and disposal as per the Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 • In SS where bund of 110% capacity extending beyond the transformer footprint is not available in the short-term retrofit such a bund to existing transformers	under guidance of PIU ESSOs (either as a separate undertaking or to be included in the scope of EPC contract)		
Escape of SF6	• Install SF6 leakage warning alarm for existing equipment containing SF6	UPCL/PTCUL SS Manager with support PIUs/Electrical Sub-Division under guidance of PIU ESSOs (either as a separate undertaking or to be included in the scope of EPC contract)	Prior to commissioning by the contractor	UPCL
Noise, EMF, lighting, and ventilation	• Control panel and other equipment within SS control buildings to be rearranged and placed in a manner to maximizing natural ventilation and light • Switch yard lightening system to be improved so all areas well-lit at night when required	UPCL/PTCUL SS Manager with support PIUs/Electrical Sub-Division under guidance of PIU ESSOs (either as a separate undertaking or to be included in the scope of EPC contract)	Prior to commissioning by the contractor	UPCL
Fire safety equipment	• Ensure automatic fire alarm, fire suppression systems and firewalls installed	UPCL/PTCUL SS Manager with support PIUs/Electrical Sub-Division under guidance of PIU ESSOs (either as a separate undertaking or to be included in the scope of EPC contract)	Prior to commissioning by the EPC contractor	UPCL
Handling emergencies	• Ensure a SS specific emergency preparedness plan is developed including the communication system and protocols for response to a fire, earthquake, flood, medical emergency etc. and followed for SS operation with regular fire drills and alarm tests conducted (copy kept on site)	UPCL/PTCUL SS Manager with support PIUs/Electrical Sub-Division	Prior to commissioning by the contractor	UPCL

Non-Compliance Issue	Corrective Action	By whom	By when	Budget (source)
	• Ensure all SS workers receive basic first aid and firefighting training with annual refreshers • Ensure that at least one staff at SS is fully trained as a first aider and fire marshal	under guidance of PIU ESSOs		
H&S of staff	• Ensure H&S risk assessment is completed for the SS operation and maintenance works undertaken and that appropriate H&S management actions identified including a system of issuing permits for work at height etc. (copy of risk assessment and the action plan to be kept on site) • Building structural status – ensure building repairs are undertaken to maintain the integrity of control buildings especially in the event of an earthquake	UPCL/PTCUL SS Manager with support PIUs/Electrical Sub-Division under guidance of PIU ESSOs (either as a separate undertaking or to be included in the scope of EPC contract)	Prior to commissioning by the contractor	UPCL
Drainage	• Ensure SS has adequate drainage to avoid damp and wet conditions • Provide storm drainage at the SS with oil-water separator on all drains • Construct a storm water drainage at Sahiya SS the area between the SS compound and the nearest house is flooded during monsoon. • Retention wall is required 250m upstream of the Garampani substation on the river to divert the heavy water flow away from the substation (although design to not exacerbate flooding elsewhere)	UPCL/PTCUL SS Manager with support PIUs/Electrical Sub-Division under guidance of PIU ESSOs	Prior to commissioning by the contractor	UPCL

VIII. ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

8.1. Preamble

466. This portion of the report identifies the environmental and social impacts of the Project (all Components and sub-activities) and proposes mitigation measures to eliminate the impacts, or where this is not possible, reduce their significance. Cumulative, induced and transboundary impacts are addressed at the end of the section under individual headings.

8.2. Physical Resources

8.2.1. Air Quality and Greenhouse Gases

467. This section discusses emissions of atmospheric pollutants and greenhouse gases during construction and operation of the Project and associated mitigation measures to be adopted.

Potential Impacts

Construction Phase

468. Project activities include excavation and earthworks for substation and HV tower / MLV pole foundations as well as trenching for underground cables, movement of vehicles carrying the construction materials and operation of equipment and plant. Exhaust emissions will be generated by construction equipment and plant during construction. Motor vehicles that will be used to carry construction materials and complete line stringing would cause air quality impact by emitting pollutants (e.g., NOx, SOx, PM) through exhaust emissions.

469. These project activities will also give rise to emission of dust particles. However, the volume of soil being excavated at any site is relatively small (with the possible exception of Lohaghat SS) and therefore impacts are only anticipated up to 150m from the construction site with impact being greatest immediately adjacent and diminishing with distance. In the absence of mitigation to control air pollution, short term, localized exceedance of national air quality standards, especially for particulate matter, may occur although impacts are readily mitigated and reversible in short term.

470. OHLs are mainly located in rural areas with good air quality and will involve limited excavation and earthworks with few sensitive receptors immediately adjacent, so in the main un-mitigated impacts on ambient air quality will be minor in magnitude and of low significance.

471. However, underground cabling work will involve open trenching in urban/semi-urban locations where sensitive receptors are immediately adjacent to work zones, although in general the alignment runs along main roads where commercial properties are dominant. Impacts of dust emissions associated with un-mitigated UG works will be of moderate significance along the alignments and particular attention must be paid to dust control, especially in Dehradun where there have been issues raised by the community about other ongoing UG works by UPCL (not part of ADB Project) which were observed during site visits in March 2023, this includes trenches left open and long delays in repairing pathways after completion of UG works. Figure 79 and Figure 80 show the dry and dusty nature of the open excavations which can lead to elevated dust levels during works.

472. For new substations in the 150m area of impact, impacts will be more significant where sensitive human receptors are present at those substations requiring excavation earthworks, e.g., Lohaghat SS.

Figure 79: Ongoing HDD Works in Dehradun, March 2023

Figure 80: Ongoing Open Trench Works in Dehradun, March 2023

Source: Consultants own photos, 2023

473. Upgrading of existing substations is unlikely to result in significant air quality impacts due to the limited scope of works at these sites with the main air quality impacts being associated with installation of new transformers and their associated bunding (requiring foundations) and the movement of construction vehicles to and from site, but the number of vehicles arriving and working at the sites will be relatively low and intermittent.

474. Sensitive receptors within 150m of the sites are shown in Tables 71 and 72.

Table 70: Sensitive Air Quality Receptors

#	Sub-activity	Distance to nearest residential receptor	Approximate Number of Receptors within 150m
PTCUL LILO			
1	Kathgodam - Rudrapur	40m	20
2	Khatima - Sitarganj	29m	60
3	Manglaur - Nara	38m	100+
4	Kashipur - Mahuakheraganj	32m	100+
PTCUL OHL			
1	Mahuakheraganj - Jaspur	32m	100+
PTCUL Substations			
1	Dhaulkhera	90m	5
2	Sarvarkhera	100m	5
3	Selaqui	80m	35
5	Araghar	10m	100+
6	Khatima-II	10m	50
PTCUL Second Stringing Line			
1	Pithrogarh – Champawat	Within 10m	50+ (not possible to accurately define number of receptors along this power line through the hills)
PTCUL UG LILO			
1	Majra-Laltappar	10m	100+

#	Sub-activity	Distance to nearest residential receptor	Approximate Number of Receptors within 150m
2	Khodri-Jhajra	70m	35
UPLC UG			
1	Dehradun	Sensitive receptors within 150m along all alignments	100+
UPCL Substations			
1	Near Collectorate	150	25
2	Bharauni	160m	2
3	Kaniya	12m	35
UPCL OHL			
1	Near Collectorate	15m	100
2	Bharauni	5m	100+
3	Kaniya	5m	100+

Table 71: Sensitive Air Quality Receptors – Existing UPCL Substations

#	Audited substation	Buildings in 50m, including community facilities	Distance to Nearest Residential Property
1	Sahastradhara	Private houses (3), crematorium (SS boundary) UPCL staff quarter	3m
2	Hatibarakala	Two hotels adjacent to site	50m
3	Sahiya	Two private houses and UPCL staff quarter	2m
4	Rudrapur	One shop & one poultry farm	25m
5	Ramnagar Danda	One school- 3m, Village Panchayat Office- 3m (Located opposite SS, across access road)	Isolated house – 175m
6	Lal Tappar	Five houses/huts – labour & family working in the industries	Labour hut - 3m
7	Tarikhet	Vacant UPCL staff quarter, private houses & shops, temple, hospital	0m
8	Bajol Ranikhet	One temple inside SS	>50m
9	Lamgarah	Vacant UPCL staff quarter, 2 houses, 1 Monk's hut being built – 45m	40m
10	Kamalwaganja	UPCL staff quarters, private house, shop, temple	0m
11	Transport Nagar	Commercial offices, private house, shops	30m
12	Phoolchaur	Private houses, shops, school – adjacent to SS	20m
13	Garampani	Private houses, UPCL Staff quarters, primary school	2m
14	Talla Ramgarh	Private residence, School – 30m	0m
15	Sarghakhet	UPCL staff quarters, one private residence and multiple hotels	10m
16	Pines		20m
17	Matkota	Private house, UPCL staff quarter, community hall, temple, medical college & hospital (under construction)	UPCL staff quarter with SS area, private residence - 60m
18	Bhadaipura	Private house -4 nos, Hospital -60m	Adjacent to SS

#	Audited substation	Buildings in 50m, including community facilities	Distance to Nearest Residential Property
19	Lalpur	School compound- adjacent to SS, private house- 2nos	45m
20	Sitarganj	UPCL staff quarters, private houses- 2nos	50m
21	Jhankat	UPCL staff quarter, private residence-03, school-10m, health centre-30m	0m
22	Kashipur	UPCL staff quarter, private residence, government office-0m, Hospital-5m	0m
23	Doraha	UPCL staff quarters, private house 4	5m

475. To supplement the current baseline data and to provide a basis for monitoring the contractor will undertake air quality monitoring per the EMoP to confirm current background levels in the subproject area prior to the commencement of any activity on-site. Further on-going air quality monitoring will be completed at the baseline locations throughout construction and at areas where any complaints from residents are received.

476. No significant climate change impacts anticipated during construction.

Operational Phase

477. The air quality impact of the operational phase will be minimal.

478. In relation to climate change, SF_6 is a non-toxic greenhouse gas used as a dielectric in gas insulated substations (GIS) as well as switch gear and other electrical equipment. 1kg has a global warming potential of 22,800 carbon dioxide equivalent (CO_2e) i.e., equivalent to an average car covering 160,000 km. Due to high global warming potential, SF_6 contributes to climate change if it is released into the atmosphere during operation, maintenance or during end of-life disposal. The SF_6 contained in GIS and switchgear equipment varies greatly according to type and manufacturer.

479. Major leak of SF_6 from project-installed equipment is the worst-case scenario but could easily occur during operation if equipment is not well maintained, or at end of life if the equipment is not appropriately disposed. Climate change is a global concern, however, the impact of a worst-case SF_6 release from the project will be negligible in percentage terms compared to the 36 billion annual global CO_2e emissions.

Impact summary and assessment of significance

480. **Error! Reference source not found.** Table 72 provides an assessment of the significance of potential air quality impacts before implementation of the proposed mitigation measures that are discussed in the rest of this section.

Table 72: Potential Impacts to Air Quality and Greenhouse Gases

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	*Release of exhaust gases*	Airshed, nearby communities, and sensitive ecological sites	*H*	*H*	*M*	*L*	*MAJ*	*MT*	*SMA*	*MED*	*DEF*	***M***
C	*Dust*	Airshed, nearby communities and sensitive ecological sites	*H*	*H*	*H*	*H*	*MAJ*	*MT*	*SMA*	*MED*	*DEF*	***M***

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / SMA: Small/ H/F: High Frequency / M/F: Low Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely. Cells shaded in blue are positive impacts.

Air Quality Mitigation and Management Measures

Design Phase

481. Although no significant impacts relating to climate change from leaks of SF6 are anticipated it is still prudent to manage SF_6 at substations and RMUs according to best practice as follows:

- If no alternative the use of SF_6 in gas insulated equipment must be minimized as part of design requirements.
- Design of any gas insulated equipment will comply with international norms and standards for handling, storage, and management of SF_6.
- Equipment to be hermetically pressure sealed “sealed for life” units and be tested and guaranteed by the supplier at less than 0.1% leakage rate.
- Installation designed and operated so that any leakage will trigger an alarm at the nearest concerned staffed substation requiring O&M staff to rectify the situation immediately.
- Provide SF6 leakage detector at each substation, or the nearest substation for CSS/RMU
- SF6 in fire extinguishers provided at substations to be avoided.

Pre-construction Phase

482. During the pre-construction phase EPC Contractors, as part of their SEMP, will be responsible for the preparation and implementation of a **Pollution Prevention Plan** covering dust and emissions to air management.

483. An **Emergency Response Plan** comprising specific requirements to manage SF_6 will be prepared and implemented to deal with event of an accidental leak.

Construction Phase

484. To manage dust and combustion emissions a range of good practice measures will be applied to all project components. These measures are outlined in detail in the Project EMPs as found in **Appendices Q and R**. Specific measures to manage dust in Dehradun where the impacts will be most significant, include:

- Where ground conditions permit, use HDD instead of open trenching.
- Adopt a rolling construction approach to open trenching to ensure that open lengths of trenches are minimized.
- Ensure an adequate supply of bowsers and carry out watering for dust control at least twice a day within 50m of work sites but more often if needed: in dry weather with temperatures of over 25°C, or in windy weather. Dust control measures will also be implemented on all access roads within 50m of residential / sensitive receptors. Avoid overwatering as this may make the surrounding muddy.
- For UG cables entry/exit pits will be refilled with temporary repaving of the excavated area done manually immediately once cable installation is completed.
- Soil scattered on pavements and roads shall be immediately swept up to avoid windblown dust.
- Vehicle movements will be restricted to defined access routes and demarcated working areas (unless in the event of an emergency).
- A strict Project speed limit of at most 30km/hr will be enforced for Project vehicles using unmade tracks.
- Excavated materials will be stockpiled where practical away from sensitive receptors, such as homes, schools, and health facilities. Where this is not possible, ensure regular watering of stockpiles to prevent dust impacts.
- Keep stockpiles of soil, aggregate and waste materials covered with canvas or tarpaulin when spoil heaps are not active to avoid suspension or dispersal of fine soil particles during windy days and to prevent disturbance by stray animals.
- Vehicles carrying fine aggregate materials will be sheeted with canvas or tarpaulin to help prevent dust blow and spillages.
- Only use cutting, grinding, or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g., suitable local exhaust ventilation systems.
- Undertake weekly dust soiling checks of surfaces of adjacent properties during earthworks and help with cleaning of external surfaces of property if dust is evident.

- If there is an increase in existing background air pollution or complaints are received contractor will be required to implement additional dust mitigation e.g., barricading/isolating sources of dust, use of wheel wash etc.

- Ensure all pavements and excavated areas are restored as soon as construction activities within each works section are completed (within 15 days).

Operational Phase

485. Operational phase mitigation will focus on the management of SF_6. Specific requirements for substations and RMUs, include:

- SF_6 in fire extinguishers provided at substations to be avoided.

- During operation, regular visual and technical inspections will be undertaken, SF_6 leakage detection kits will be provided at each substation, and remote gas pressure alarms are to be installed where daily inspection is not an option, such that any leaks can be immediately addressed.

- Regular monitoring of CSS will also be undertaken to ensure no leaks of SF6, in line with national regulations.

486. Further, UPCL and PTCUL do not currently have procedures for safe disposal of SF_6. Therefore, on disposal at end-of-life UPCL and PTCUL must ensure SF_6 is first removed in accordance with International Electrotechnical Commission (IEC) standard 61634 to a very low pressure so losses of SF6 are less than 0.5% at end of life and then reused, recycled, or destroyed in a high-temperature incinerator. UPCL and PTCUL will need to define a safe SF6 retrieval arrangement, with appropriate handling, storage, disposal process for end of life equipment in accordance with international good practice.

Residual Impacts

Table 73: Project Air Quality and Greenhouse Gas Residual Impacts

Phase	Potential Impact	Potential Impact Significance	Residual Impact	Residual Impact Significance
C	*Release of exhaust gases*	***Medium***	*Generic mitigation measures will ensure residual impacts will be reduced to low significance*	***Low***
C	*Dust*	***Medium***	*Generic mitigation measures will ensure residual impacts will be reduced to low significance, mainly due to the potential impacts associated with UG works.*	***Low***

8.2.2. Climate Change Risk

487. This section discusses potential impacts climate change risk may have on the Project during construction and operation phases and associated adaptation measures to be adopted. The section summarizes the findings prepared as part of the Project's Climate Risk Assessment (CRA) 2023.

Screening

488. Climate and disaster risk screening was performed as part of the CRA based on the ADB guidelines for climate proofing,[77] technical assessments and using World Bank climate and disaster risk screening tools.[78] Table 75 summarizes the findings.

Table 74: Climate and Disaster Risk Screening

Physical Component	Climate Risk / Hazard						Exposure Rating	Impact Rating
	A	B	C	D	E	F		
Substations	*	*					High	High
			*	*		*	Moderate	Moderate
					*		Low	Low
HV Component (400/220/132 KV)								
HV Power Lines		*					High	High
			*	*		*	Moderate	High
	*				*		Low	Low
MLV Component (33/11/0.4 kV)								
Underground cabling of MLV networks in Dehradun City			*	*	*	*	Low	Low
	*						Low	Moderate
		*					High	Moderate

A – Flooding / Landslides B – Earthquakes C – Wind and gust/ Cyclones D- Thunderstorms / lightning E – Temperature F – Precipitation

Source: Project CRA. 2023

Climate Disaster and Risk Adaptation

489. Table 76 indicates adaptation measures proposed by the CRA to minimize exposure and impacts to climate and disaster risks. These adaptation measures include measures already incorporated in project components during the feasibility stage and measures that are planned to be executed during pre-construction and construction.

Table 75: Climate Adaptation Measures

Target Risk	Component	Adaptation Measure	Remarks
Floods / landslides / earthquakes and extreme winds	A1, A2	Climate and disaster risk adaptation measures to be executed during technical design and implementation stages of the project as indicated below (Table 77).	Adaptation Level: pre-construction and construction
Floods / landslides / earthquakes and extreme winds	B1	Dehradun city is the commercial hub of Uttarakhand hence reliable electricity supply is a necessity. However, the city is subject to frequent disaster risks such as floods and landslides. The exiting overhead MLV network is highly vulnerable to these risks due to	Adaptation Level: already incorporated into feasibility design

[77] *Asian Development Bank (2013) Guidelines for Climate Proofing Investment in the Energy Sector*
[78] *The World Bank (2023) Climate and disaster risk screening tools, https://climatescreeningtools.worldbank.org/#*

Target Risk	Component	Adaptation Measure	Remarks
		damages caused in such events. The proposed underground cabling of Dehradun MLV networks will minimize exposure and impact of these risks significantly.	
Floods / landslides / earthquakes and extreme winds	B1	Climate and disaster risk adaptation measures to be executed during technical design and implementation stages of the project as indicated below (Table 77).	Adaptation Level: pre-construction and construction

Source: Project CRA. 2023

Climate Change Adaptation Measures

490. Based on the above, the CRA recommended climate change adaptation measures for the Project components. Some of these requirements are also included in the Project EMP as mitigation for impacts and risks, however, others such as requirements for construction of fire walls, are not specifically included in this assessment and are considered recommendations that can be included in the detailed design and construction phases if warranted by UPCL/PTCUL and ADB.

Table 76: Climate Change Adaptation and Disaster Risk Mitigation Measures – Design and Implementation

Project Component	Proposed Adaptation Measures
Substations (A1)	(a) Locate or relocate substations away from areas highly susceptible to flooding/landslides when selecting substation sites. (b) Conducting geotechnical investigations at substation sites. (c) Designing strong foundations with higher elevation and safety factors for substation equipment including power transformers. (d) Building parapet walls, drainage systems, embankments as required at substation sites. (e) Building fire walls between power transformers at substations. (f) Providing proper lightning protection measures including station class surge arresters, equipment earthing, earth mesh etc. to minimize risks due to lightening. (g) Providing firefighting equipment at substations. (h) Implementing GIS substations at required locations to save space and minimize climate and disaster risks. (i) Using power transformers with higher efficiency ratings at substations. (j) Providing test facilities and equipment for transformer oil testing and other testing requirements (k) Capacity building for operation staff to use modern technologies for monitoring and evaluation of the system's operations.
HV Power Lines (A2)	(a) Designing strong foundations with higher safety factors for towers

Project Component	Proposed Adaptation Measures
	(b) Conducting geotechnical investigations at tower locations. (c) Designing towers to provide high strength with appropriate grade steel and higher safety factors. (d) Providing Emergency Restoration System (ERS) for towers to facilitate temporary bypass for tower failures.
Underground Cables	(a) Use of tree retardant XLPE cables to minimize long term water treeing effects. (b) Installation of cables inside HDPE pipes. (c) Using Horizontal Directional Drilling for installation of cables at feasible locations. (d) Providing inspection and joint points for cable joints. (e) Providing high rating surge arrestors to prevent lightning surges penetrating into the underground system. (f) Sealing of openings in cable ducts. (g) Supplying cable fault location and testing equipment with O&M support. (h) Providing practical on the job training to O&M staffs on cable jointing and fault location techniques.
Aboveground switchgear (RMUs and Compact Substations)	(a) Designing elevated foundations for aboveground switchgear (b) Providing dry type transformers for compact substation. (c) Providing motorized operation and provision for remote operation of the switchgear. (d) Providing fault passage indicators to detect faults. (e) Providing chemical earthing using chemical earthing compounds for switchgear. (f) Providing advanced microprocessor-controlled breakers for low voltage switchgear in transformers and ring main units. (g) Providing training to O&M staffs.

Source: Project CRA. 2023

8.2.3. Soils

491. This section discusses potential impacts on soils during construction and operation of the Project and associated mitigation measures to be adopted.

Potential Impacts

Pre-construction / Construction Phase

Historical Contaminated Land

492. Soil conditions at the 25 existing substations were similar with some degree of contamination of oil from spillage/leaks in one or more spots, mostly under the transformers. In Pines SS defunct transformers were observed to be stored along the main road (outside SS) with significant oil leakage and flow along the road as the site is on steep terrain. Oil leaks from transformers were noted at the following locations:

- Moderate: Hatiberakala SS, Sawra SS, Tahriket SS, Bajol SS, Doraha SS, Garampani SS, Kashipur SS, Phoolchaur SS.

- High – Badhaipura SS, Jhankat SS, Lalpur SS, Pines SS, Matkota SS, Siratganj SS.

493. In addition, the following PTCUL sites have been identified where existing soil contamination may be present:

- Selaqui SS – Sited on old UPCL site and surrounded by industrial premises.

- Araghar SS – Sited on old UPCL site. Hazardous and non-hazardous waste scattered across the site. Oil leaks noted below transformers.

Figure 81: Old Transformers and Equipment at Araghar SS

Source: Consultants own photo, March 2023

- Dhaulakhera SS – Sited on old UPCL site. Hazardous and non-hazardous waste scattered across the site. Oil leaks noted below transformers. It is possible that transformer oil could be contaminated with PCBs.

Soil Properties and Compaction

494. Soil compaction of topsoil and subsoil may occur around tower pad sites and areas beneath lines during stringing – although methods can be employed to ensure that disturbance beneath lines is kept to a minimum during stringing.

Soil Erosion and Soil Loss

495. Erosion is a natural process by which wind and rain wear away soils that have poor cohesion or are steeply sloping. Where the land surface is disturbed and when vegetation and topsoil are removed, erosion rates increase. After reinstatement of topsoil temporarily removed from the worksites during construction or at the temporary storage areas, the soil is less cohesive and is much more easily erodible in wet weather. This is a specific issue on sites located on steep slopes, including:

- Pithrogarh – Champawat Second Stringing.
- Lohoghat SS – new substation
- Sahiya SS – existing substation
- Sawra SS – existing substation
- Bajol SS – existing substation
- Lamgarah SS – existing substation
- Sairaghat SS – existing substation
- Tala Ranmgarh SS – existing substation
- Sarghakhet SS – existing substation
- Pines SS – existing substation

Soil Contamination During Construction

496. The principal potential contaminants associated with the construction activities are the same as those listed below for hydrology. The soil can also be contaminated if substances from hazardous waste storage leach into the ground or if raw sewage is discharged onto the ground. This can occur at both work sites and camp sites. Impact significance will be greater in agricultural areas.

Aggregate Requirements

497. Any aggregate required for construction of tower foundations (e.g., fill material beneath tower pads), UG trench filling or for substation works will be obtained from state licensed

quarries and/or borrow pits. Extraction and use of aggregates constitutes a depletion of non-renewable natural resources.

Spoil Disposal

498. Excavated material from tower / pole footings will be backfilled into the excavated area and compacted. Any excess spoil material will be spread around the base of the tower/pole on GoI land. Spoil disposal from substations (including contaminated soils) are discussed below under waste management.

Operational Phase

Leaks and Spills

499. Without suitable containment measures, it is possible that leaks of oil from oil containing equipment could impact upon soils (and groundwater). However, all new substations will be constructed and existing substations upgraded (with corrective action) in accordance with the specific national guidelines discussed in Section 3.3.2. Broadly, these guidelines require an oil soak pit to be designed and provided below each oil filled transformer / reactor to accommodate at least 150% of total quantity of oil contained in the transformer. However, there remains a risk that spills and leaks of oil could occur from oil storage areas and old oil containing equipment.

Impact summary and assessment of significance

500. Table 78 provides an assessment of the significance of potential impacts to soil before implementation of the proposed mitigation measures that are discussed in the rest of this section.

Table 77: Potential Impacts to Soils

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	*Soil Compaction*	*Soils including agricultural land*	*M*	*M*	*L*	*-*	*MOD*	*MT*	*SMA*	*LOW*	*POSS*	***L***
C	*Soil Erosion*	*Soils including agricultural land, and local vegetation*	*L*	*M*	*L*	*-*	*MOD*	*ST*	*SMA*	*LOW*	*POSS*	***L***
C	*Soil contamination from spills and leaks*	*Soils including agricultural land, local vegetation*	*L*	*H*	*L*	*L*	*MAJ*	*LF*	*SMA*	*MED*	*POSS*	***M***

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
		and community										
C	*Aggregate requirements*	*Natural resources*	*L*	*M*	*L*	*-*	*MOD*	*ST*	*SMA*	*LOW*	*POSS*	***L***
C	*Disturbance of contaminated land from existing substations*	*Substation soils and surrounding environment*	*L*	*M*	*L*	*M*	*MOD*	*LT*	*SMA*	*MED*	*POSS*	***M***
O	*Soil contamination from spills and leaks at substations*	*Substation soils and surrounding environment and community*	*L*	*H*	*L*	*M*	*MAJ*	*LT*	*SMA*	*HIG*	*POSS*	***H***

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / SMA: Small/ H/F: High Frequency / M/F: Low Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely. Cells shaded in blue are positive impacts.

Mitigation and Management Measures

Design Phase

501. Existing substations (and PTCUL substations listed above) will be surveyed during the design phase to assess the potential for contaminated land to be present in the proposed installation works area. If signs of potential contamination are present in this area, e.g., oil storage tanks, operational or old leaking transformers, oil staining, etc. further soil sampling and testing shall be undertaken in the work area to determine the level of soil contamination (for oil/hydrocarbons and PCBs). If soil contamination is noted in the work area, a method statement for the management and disposal of the contaminated soil will be prepared and submitted to PTCUL/UPCL. The method statement will follow the requirements for disposal as noted below under waste management.

502. To manage leaks from oil containing equipment substations designs will include at minimum 110% impermeable bunds to transformers/storage areas used for oils etc. and follow the Draft Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2021, including Soak Pit and Oil collecting pit as follows:

- An oil soak pit shall be designed and provided below each oil filled transformer / reactor to accommodate at least 150% of total quantity of oil contained in the transformer / reactor with minimum 300 mm thick layer of gravels / pebbles of approximately 40 mm size (spread over a steel iron grating / trans rack) providing free space below the grating.

- Alternatively, an oil soak pit shall be provided below each transformer or reactor, to accommodate one third of total quantity of oil contained in the transformer / reactor with minimum 300 mm thick layer of gravels/ pebbles of approximately 40 mm size (spread over a steel iron grating/ trans rack) providing free space below the grating provided a common remote oil collecting pit of capacity at least equal to oil quantity in the largest size transformer or reactor is provided for a group of transformers or reactors and bottom of the soak pit below the transformer or reactor shall be connected to the common remote oil collecting pit with drain pipe of minimum 150 mm diameter with a slope not less than 1/96 for fast draining of oil or water through gravity from soak pit to the common remote oil collecting pit.

- Every soak pit below a transformer or reactor shall be designed to contain oil dropping from any part of the transformer or reactor.

- The common remote oil collecting pit and soak pit shall be provided with automatic pumping facility, to always keep the pit empty and available for an emergency.

- The disposal of transformer oil shall be carried out in an environmentally friendly manner.

503. A 110% bunded, secure storage area will also be provided at SS sites for oil.

504. CSS will be designed with air insulated transformers and therefore no requirements for internal bunding to capture any leak from the transformer within the unit are needed.

Pre-construction

505. EPC Contractors for all components will be responsible for the preparation and implementation of a **Pollution Prevention Plan** covering and environmentally sound and safe storage, use, and disposal of all fuels, chemicals and oils used on site and an emergency preparedness and response plan in the event of any leaks or spills (e.g., of oil, etc.). The plan should also include procedures for surveying and sampling potentially contaminated sites. They will also prepare and implement a **Reinstatement Plan** to cover all disturbed work zones beyond the boundary of sub-activity sites. Both plans will form part of CSEMPs.

Construction

506. During the construction phase all soil contamination will be managed in accordance with the Pollution Prevention Plan.

507. To manage topsoil and prevent soil erosion and pollution from hazardous materials a range of international good practice measures will be applied to all project components. These measures are outlined in detail in **Appendices Q and R**.

508. Some substations and OHLs are in steep terrain. In these areas additional mitigation measures are required, including:

- Stability of slopes over 30% shall be checked and approved by the Engineer prior to selection of foundation to be used.

509. As part of the overall management process EPC Contractors for all components shall conduct bi-monthly training of workers on pollution prevention control including good

housekeeping and how to clean up oil/fuel/chemical spills and dispose of contaminated sorbent material which would be treated as a hazardous waste. This will include emergency preparedness and response procedures (drills) in case of spill. Training for subcontractors before commencement of works will also be completed.

Residual Impacts

Table 78: Soils Residual Impacts

Phase	Potential Impact	Potential Impact Significance	Residual Impact	Residual Impact Significance
C	*Soil Compaction*	***Low***	*Soil compaction and soil erosion is not likely to result in significant impacts during the construction phase. Implementation of the proposed mitigation measures will further limit the potential for impacts to occur.*	***Not significant***
C	*Soil Erosion*	***Low***		***Not significant***
C	*Soil contamination*	***Medium***	*Mitigation will ensure that any residual impacts are of low significance.*	***Low***
C	*Aggregate requirements*	***Low***	*No residual impacts are anticipated if licensed existing sources are used.*	***Not significant***
C	*Contaminated land from Substations*	***Medium***	*The measures outlined above will ensure that any potentially significant soil contamination is identified and removed from the site to authorized disposal locations. No highly significant residual impacts are identified as long as these procedures are followed.*	***Low***
O	*Spills and leaks at substations*	***High***	*Construction of containment measures according to GIIP will ensure that leaks and spills at substations do not result in highly significant impacts.*	***Low***

8.2.4. Hydrology, Water Resources and Water Quality

510. This section discusses potential impacts on hydrology, water resources and water quality during construction and operation of the Project and associated mitigation measures to be adopted.

Potential Impacts

Pre-construction / Construction Phase

511. The Project will involve the use or generation of some or all the following materials that have the potential to contaminate surface waters:

- Fuels and lubricating oils.
- Paints and solvents.
- Leachate from hazardous waste storage areas at camp sites and work zones.

- Raw sewage from camp sites.

- Impacts to a diverted irrigation channel at the site of Kaniya SS.[79]

512. Some substation sites are located more than 100m from surface water courses and it is considered unlikely that significant contamination of water courses from these materials during construction is likely in these locations. However, some sites are located close to surface waters and groundwater sources, per Table 80 and may be affected by sediment laden surface water runoff, spills, leaks of hazardous materials and untreated sanitary wastewater – open defecation may also be an issue during construction if toilets are not provided for workers. There may also be wastewater from washing of construction equipment and vehicles. There is also a risk that there could be untreated disposal of sanitary wastewater and spills and leaks of oil and other hazardous liquids during substation works and any pollution could impact upon any local groundwater users. However, the risk of major spills and leaks during construction is relatively low.

Table 79: Ground and Surface Water Receptors

#	Location	Groundwater	Surface water
1	Kaniya SS	Tubewell 50m	Irrigation channel within the site
2	Near Collectorate SS	Borewell 150m	Irrigation channel, 35m
3	Bharauni SS	Tubewell 25m	River 1.3km
4	Sahastrahera SS		Rispana River, 70m
5	Sahiya SS		Amlawa River, 60m
6	Rudrapur SS	Tubewell, 25m	Moti River, 100m
7	Transport Nagar SS		Teenpani Stream, 0m
8	Garampani SS	Handpump, 50m	Sipra River, 0m
9	Tala Ramgarh SS	Handpump, 5m	Ramgarh River, 10m
10	Sarghakhet SS	Borewell, 15m	
11	Matkota SS	Borewell inside SS	Stream along site boundary
12	Bhadaipura SS	Handpump inside SS	
13	Lalpur Rudraue SS	Handpump in SS	Stream adjacent
14	Jhankat Khatima SS	Handpump in SS	Stream adjacent
15	Kashipur SS	Handpumps in SS	Drona Sagar Lake, 100m
16	Doraha SS	Handpumps in SS	Stream, 100m
17	Araghar SS	Tubewell in SS	
18	Khatima II SS	Adjacent tubewell	Adjacent drain
19	Saverkhera SS	Tubewell in SS	

513. A number of OHL lines cross rivers and streams, but this is not considered a significant issue in terms of hydrology as the lines can easily be designed to cross over the rivers and streams with no impacts to these areas. UG lines in Dehradun and Kaniya will also cross man made and natural water courses. Again, this is not anticipated to be a significant issue with

[79] Irrigation Channel (Gul) carries water from Dabka river/tank and is regulated water passing to the Sawaldey village. It is a 2 ft wide channel, used for irrigation purposes and controlled as per requirement for irrigation in the cropping season. It is proposed the water will be carried through a conduit (CI or GI) alongside the stretch of the proposed SS so there will be no impact on the irrigation water received by users.

respect to hydrology as the UG cables will be laid across the rivers and canals in a pipeline on existing bridges or with HDD with no in river works required.

514. No towers, or poles are planned to be constructed in rivers. However, some OHL tower sites and MLV poles may be located closer than 10m to the water courses and in these locations the potential for contamination of surface water from sediment laden surface water runoff and spills or leaks of hazardous materials is greater. The possibility of minor groundwater contamination also exists from any spills or leaks of hazardous liquids. HDD equipment will use water as a drilling fluid to reduce the noise level. Discharge of the water if not carefully controlled may impact on surface water.

515. Although large volumes of water are not anticipated to be required at each worksite, there will be the need for technical and drinking water supplies during the construction phase. For the substations new borewells will be provided. Uncontrolled exploitation of water resources could impact upon the existing users of the water resources.

516. Consultations in Dehradun indicated that some stakeholders were concerned about impacts to water pumps and water supply networks during the construction phase of the UG network. Specifically, they thought that works could temporarily affect them, or even permanently damage them.

Operational Phase

517. Extreme flood events associated with climate change could impact upon project infrastructure. This issue is addressed through climate change adaptation measures to be included in the detailed design and below under geohazards.

518. Leaks of oil from substation equipment and stores could impact upon groundwater, but the requirements outlined above under Soils will ensure that leaks and spills are managed in accordance with national guidelines and best practice.

519. Adequate drainage needs to be provided at new SS to manage site run-off during the operational phase.

Impact summary and assessment of significance

520. Table 81 provides an assessment of the significance of potential impacts to hydrology, water resources and water quality before implementation of the proposed mitigation measures that are discussed in the rest of this section.

Table 80: Potential Impacts to Hydrology, Water Resources and Water Quality

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	*Contamination of surface water*	*Ground and surface water, local community, wildlife*	*L*	*H*	*L*	*L*	*MAJ*	*ST*	*SMA*	*MED*	*POSS*	***M***
C	*Water use*	*Ground water, local community*	*L*	*M*	*L*	*-*	*MOD*	*ST/LT*	*SMA*	*LOW*	*DEF*	***L***
C	*Contamination of groundwater*	*Groundwater*	*L*	*M*	*L*	*L*	*MOD*	*ST/LT*	*SMA*	*LOW*	*POSS*	***L***
C	*Damage to water supply*	*Local community*	*M*	*H*	*H*	*-*	*MAJ*	*ST*	*SMA*	*MED*	*POSS*	***M***
O	*Contamination of water resources*	*Ground and surface water, local community, wildlife*	*L*	*H*	*L*	*L*	*MAJ*	*LT*	*SMA*	*HIG*	*POSS*	***H***

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Low Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely. Cells shaded in blue are positive impacts.

Mitigation and Management Measures

Design Phase

521. At substations all new transformers; oil and waste storage areas; and septic tanks/soak aways shall be located at least 50m from waterbodies and borewells to reduce pollution risk. If closer proximity is required due to site layout further assessment will be carried out to demonstrate using a source-pathway-receptor model there will be no adverse impact on aquatic ecology or human health. Wastewater will be connected to existing sewerage system or septic tank with soak away so no untreated wastewater will be disposed of to surface water or ground in operation, septic tank/soakaway effluent to meet national general wastewater standards.

522. For all UG works crossing rivers they must be in conduit attached to bridge or buried beneath the river using HDD.

523. During the design phase the EPC Contractor will identify all water supply systems and water pumps and ensure that alignments avoid any interference with these areas. However, it is possible that temporary disruptions could occur.

524. Regarding drainage, adequate drainage design will be provided at the substations to manage runoff during operation.

Pre-construction Phase

525. At this stage the EPC Contractors for all components will prepare and implement their **Pollution Prevention Plan** covering the protection of water resources and environmentally sound and safe storage, use, and disposal of all fuels, chemicals and oils used on site and an emergency preparedness and response plan in the event of any leaks or spills (e.g., of oil, etc.) or an incident such as flood.

526. For surface waterbodies or groundwater sources within 50m of any sub-activity (except 2nd circuit stringing), baseline water quality sampling will be required (per EMoP) to confirm their current water quality status at least one week prior to the commencement of any actively onsite. Section 6.2.4 Hydrology lists the identified sources, but this should be confirmed by the EPC Contractor as part of this activity. Any drilling or excavation works within 50m of boreholes and wells for any component sub-activity will require pre-construction and post construction water quality monitoring against national drinking water standards to ensure no contamination of the local community supply. If any water pumps and water supply networks are damaged during works the contractor must provide the affected users with an adequate, alternative drinking water supply meeting national standards whilst immediately repairing the damage caused.

527. Permissions for any new borewell installation at any new substation shall be obtained including NOC from CGWB together with agreement of local communities before drilling and abstraction. A water meter will be provided on the borewell for monitoring of water abstracted.

528. The irrigation channel at Kaniya SS will be diverted away from the site. Consultation with community undertaken to confirm routing site and works schedule to avoid loss of irrigation water.

Construction Phase

529. To manage potential impacts to hydrological resources during construction of all components a range of good practice measures will be applied to all project components. These measures are outlined in detail in **Appendices Q and R**.

530. Where HDD is used for UG works use of oil or bentonite clay as a drilling fluid will be prohibited. Where water is used, any excess must be disposed of to open ground for percolation, or if no open ground to waiting tanker trucks for proper disposal, it must not be disposed of to surface water.

Residual Impacts

Table 81: Residual Impacts – Hydrology, Water Resources and Water Quality

Phase	Potential Impact	Potential Impact Significance	Residual Impact	Residual Impact Significance
C	*Contamination of surface water*	***Medium***	*The mitigation measures outlined above will ensure that residual impacts are not significant.*	***Not significant***

C	*Water use*	***Low***	*The mitigation measures outlined above will ensure that residual impacts are not significant.*	***Not significant***
C	*Contamination of groundwater*	***Low***	*The mitigation measures outlined above will ensure that residual impacts are not significant.*	***Not significant***
C	*Disruption of water supply*	***Medium***	*Temporary disruptions may still occur. Residual impacts will be low as impacts will be short term.*	***Low***
O	*Contamination of water resources*	***High***	*Measures adopted as part of designs should ensure there are no leaks and spills that would affect surface and groundwater*	***Not significant***

8.2.5. Geohazards

531. This section therefore discusses potential impacts geohazards may have on the Project during construction and operation phases and associated mitigation measures to be adopted. It is also possible that at excavation works at Lohaghat SS in steep terrain may trigger landslides.

Potential Impacts

Floods

532. Mapping provided by Uttarakhand State Disaster Management Authority indicates that generally the state is free of floods. However, several sub-activity sites are located close to rivers, or in low lying areas. No specific information has come to light during site visits which indicates that new infrastructure is in flood prone areas. However, the environmental audit noted flooding risk/SS inundation at Garampani SS and Rudrapur SS which are in the river valley of the flood prone Gona River. Flash floods are recorded every year along the SS compounds.

Seismic Events

533. Much of the Project area is highly seismic. Seismic activity could damage project infrastructure leading to secondary impacts such as power outages and accidents involving people living close to damaged lines.

Landslides

534. Landslides are located mainly in the mountainous areas, although there are localized areas close to Dehradun. Sairaghat SS is prone to landslide during monsoon. Lohaghat SS is in steep terrain and excavation works into the slope will be required to level the site. This could trigger small landslides if not considered during the design phase.

Forest Fires

535. Forest fires are reported at Pines SS every year. The presence of the dry pine needles accelerates the spread of fire. Multiple burnt trees were observed inside the SS compound. It

is possible that forest fires could also affect the Project sub-activities located in and around forest areas, e.g., Lohaghat SS.

536. No other sub-activity sites have been reported as being affected by forest fires. Mapping (Figure 29) does however suggest that regions south (Rajaji NP) and west of Dehradun, and the southeast portions of Uttarakhand are prone to forest fires.

Impact summary and assessment of significance

537. Table 83 provides an assessment of the significance of potential geohazards before implementation of the proposed mitigation measures that are discussed in the rest of this section.

Table 82: Potential Geohazard Impacts

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
O	*Floods*	*Project infrastructure*	*L*	*H*	*L*	*-*	*MAJ*	*LF*	*SMA*	*MED*	*POSS*	***M***
O	*Seismic Events*	*Project infrastructure*	*L*	*H*	*L*	*-*	*MAJ*	*LF*	*SMA*	*MED*	*POSS*	***M***
O	*Landslides*	*Project infrastructure*	*L*	*H*	*L*	*-*	*MAJ*	*LF*	*SMA*	*MED*	*POSS*	***M***
O	*Forest Fires*	*Project infrastructure*	*L*	*H*	*L*	*-*	*MAJ*	*LF*	*SMA*	*MED*	*DEF*	***M***

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Medium Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely. Cells shaded in blue are positive impacts.

Mitigation and Management Measures

Design Phase

538. In the first instance all designs will incorporate specific measures, as required by national design and construction codes, to mitigate the risk of damage from seismic events, and other natural hazards including flooding and landslides. All structural designs will be checked for building and seismic safety by an independent expert, separate to the design team, to confirm national and international good practice standards are met.

539. The EPC Contractor's design team will identify presence of any unstable land and where SS, RMU and CSS are not on flat land conduct geotechnical/slope stability analysis with slopes to be graded with drainage installed to minimize landslide risk. Designs will ensure the resulting slope design/topography does not exacerbate surface erosion and/or trigger a landslide. Project components on slopes (including Lohaghat SS) will incorporate slope stability measures such as bioengineering and retaining walls and adequate drainage with designs checked to confirm that international good practice slope stability design is followed.

540. During topographic and route surveys for OHL the EPC Contractor will identify the presence of any unstable land, steep slopes or any depressions that get waterlogged in the rainy season and in the first instance avoid these areas by adjusting the design. Tower foundation designs will incorporate slope stability measures such as bioengineering and retaining walls and adequate drainage with designs checked to confirm that international good practice slope stability design is followed.

541. At substations and OHL tower sites the EPC Contractors design team will conduct flood and drainage risk assessment and incorporate effective drainage design (allowing for climate change) to prevent possible flooding or waterlogging during the wet season, whilst ensuring that surface runoff from the project site is no more than the greenfield runoff rate. The areas requiring special foundations and those prone to flooding should be avoided. Further, per Draft Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2021:

- The substation or switchyard shall be constructed above the highest flood level and, wherever required, flood protection walls shall also be provided.
- The substation shall be designed for seismic requirement of the site as per relevant IS.
- Gas insulated substation (GIS) shall be constructed in seismic prone areas, coastal areas, high altitude areas, very heavily polluted areas and for locations where space is major constraint.

542. The final surface level of tower sites shall be at least 0.5 m above the existing ground level and highest flood level and shall be constructed in such a way as to be adequately drained to prevent washouts and flooding impacts to adjacent properties. The surface level shall also consider the findings of the climate change assessment prepared by ADB (final version in progress).

Operational Phase

543. UPCL and PTCUL will ensure pine needles are regularly cleared from substations and the areas immediately around them.

Residual Impacts

Table 83: Residual Impacts - Geohazards

Phase	Potential Impact	Potential Impact Significance	Residual Impact	Residual Impact Significance
O	*Floods*	***Medium***	*Ensuring designs account for potential flood risks will help reduce potential impacts, but given the uncertainties associated with climate change impacts in mountainous areas cannot be ruled out.*	***Low***
O	*Seismic Events*	***Medium***	*None identified, as long as earthquake loading, and national design standards are considered.*	***Not significant***

Phase	Potential Impact	Potential Impact Significance	Residual Impact	Residual Impact Significance
O	*Landslides*	***Medium***	*Ensuring designs account for potential landslide risks will help reduce potential impacts, but given the uncertainties associated with climate change impacts in mountainous areas cannot be rules out.*	***Low***
O	*Forest Fires*	***Medium***	*Number of forest fires may increase in the future and impacts to substations and other infrastructure in rural areas cannot be ruled out.*	***Low***

8.3. Biodiversity

8.3.1. Designated Sites, Critical Habitat and Wildlife Corridors

544. This section discusses potential impacts on designated sites, reserve forest, critical habitat and wildlife corridors (tiger and elephant) during construction and operation of the Project and associated mitigation measures to be adopted.

Potential Impacts

545. Screening of Project sub-activities has shown that:

- None of the proposed project sub-activities are in Environmentally Sensitive Zones (ESZ); notified and draft notified, except for portions of Dehradun UPCL UG works which are in the Rajaji NP 10km draft notified ESZ Buffer and one existing substation in Binsar WLS ESZ. No sub-activities are located within the 10km buffer for non-notified sites except for Kaniya SS and UG and two existing substations. However, UG works are regulated (allowed) within the ESZ buffer per guidelines. No official government clearance is required, but written permission to proceed will be obtained by the EPC Contractors prior to the commencement of work.

- The UG works in Dehradun are partially located within the Doon Valley Ecologically Sensitive Area (ESA). The Department of Forests and the State Pollution Control Board have confirmed that for MLV works within the Doon Valley ESA no official government clearance is required, but written permission to proceed will be obtained by the EPC Contractors prior to the commencement of work.

- None of the sub-activity sites are located within any other Protected Areas. UPCL UG works in Dehradun are located within 1km of Rajaji National Park, but not within its ESZ. None of the sub-activities are in critical habitat (as mapped by the UNEP) except for Kaniya SS and Kaniya UG Cable which are in 'likely' critical habitat.

- No sub-activities are located within a Key Biodiversity Area (KBA) or Important Bird Areas (IBA). Dehradun UG works will be excluded from the New Forest Campus KBA and Kaniya SS and Kaniya UG Cable are 250m outside of the Corbet Tiger Reserve KBA/IBA. Three other sub-activities are located within 10km of KBAs. Two of these sites are new substations and they are not considered to represent a significant risk to the KBAs. The remaining site is the

1.0km Khatima - Sitarganj LILO. This very short section of OHL is not considered to represent a significant risk to the KBA, or species within it due to its short distance.

- No sub-activities are located within tiger corridors or elephant corridors. Khatima-II SS and Khatima - Sitarganj LILO are located within 1km of a tiger corridor. Construction and operation of the SS and LILO in this area is not considered to represent a significant risk to tiger movements as the facilities will be in a semi-rural environment dominated by agriculture and residential properties.

- No projects are in forest areas requiring forest clearances (Reserve Forest (RF)). One activity (second circuit stringing) is partially located in RF. Forest clearances were obtained by PTCUL for the existing overhead line and Department of Forests has provided their written approval for the second stringing works. Several other sub-activities are located close to Reserve Forests (closest site at 120m), but not within the RF themselves. This issue is discussed further below under the topic of flora and fauna.

Impact summary and assessment of significance

546. Table 85 provides an assessment of the significance of potential impacts to critical habitat and designated sites before implementation of the proposed mitigation measures that are discussed in the rest of this section.

Table 84: Potential Impacts to Critical Habitat and Designated Sites

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C/O	*Impacts to PAs*	*PA*	*L*	*H*	*M*	*L*	*MAJ*	*L/F*	*SMA*	*MED*	*UN*	***L***
C/O	*Impacts to KBA*	*KBA*	*L*	*H*	*M*	*-*	*MAJ*	*L/F*	*SMA*	*MED*	*UN*	***L***
C/O	*Impacts to Tiger Corridor*	*Tigers*	*L*	*H*	*M*	*L*	*MAJ*	*L/F*	*SMA*	*MED*	*UN*	***L***

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Medium Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely. Cells shaded in blue are positive impacts.

Mitigation and Management Measures

Design Phase

547. To ensure there are no impacts to designated sites of ecological importance UPCL UG works in Dehradun must avoid impacts to Rajaji NP and New Forest Campus KBA. To achieve this the following mitigation measures will be applied:

- A project buffer zone of 100m from Rajaji National Park to be applied by UPCL in approving detailed designs to ensure no encroachment into the protected area from UG cabling works.

- UPCL cabling works shall not be permitted within 100m of the New Forest Campus KBA.

548. Additionally, Kaniya SS and UG cable will be permitted within 250m of the Corbett Tiger Reserve KBA/IBA due to the fact the MLV line with be UG.

Construction and Operation Phase

549. Awareness training for workers will help limit potential construction phase impacts to the tiger reserve / corridor and the KBA/IBA close to Kaniya SS and UG cable, and FR close to Khatima - Sitarganj LILO / and Khatima II SS but it is still possible that they could stray into these areas due to its proximity to the proposed SS, UG cable and OHL.

Residual Impacts

Table 85: Residual Impacts – Critical Habitat and Designated Sites

Phase	Potential Impact	Potential Impact Significance	Residual Impact	Residual Impact Significance
C/O	*Impacts to PAs*	***Low***	*Although UPCL have already agreed to remove from the scope UG works from the Rajaji NP additional requirements for a 100m buffer zone should ensure that there are no significant residual impacts to PAs.*	***Not significant***
C/O	*Impacts to KBA*	***Low***	*Ensuring no works are allowed in the KBAs/IBAs. Further, awareness training for workers will help limit potential project impacts to this area, but it is still possible that they could stray into this area due to its proximity.*	***Low***
C/O	*Impacts to Tiger Corridor*	***Low***	*Awareness training for workers will help limit potential project impacts to this area, but it is still possible that they could stray into this area due to its proximity.*	***Low***

8.3.2. Flora and Fauna

550. This section discusses potential impacts on flora and fauna during construction and operation of the Project and associated mitigation measures to be adopted.

Construction Phase

551. During the construction phase, the key potential impacts to flora and fauna relate to vegetation clearance within the working corridors and work sites, vehicle movements, the siting of construction camps and the presence of workers. Table 87 discusses these generic impacts in more detail.

Table 86: Generic Construction Phase Impacts

Activity	Impact
Habitat loss, degradation, fragmentation and simplification	**HV OHL** - Impacts will arise because of vegetation clearance for the preparation of the tower sites; construction of camp facilities / laydown areas etc. Impacts associated with vehicle use include soil compaction, dust emissions from vehicles affecting flora and habitats. However, the total length of new lines is under 70km, nearly all which traverses agricultural land and modified habitat. Further most of the LILO lines are less than 1km long. The exceptions are: • 220 KV Manglaur – Nara (25km) • 132 kV Kashipur – Mahuakheraganj (9.7km) Both of these lines traverse agricultural land. Approximately 0.8ha of trees are within the 35m RoW of Manglaur – Nara alignment. Mahuakheraganj – Jaspur (20km) also traverses agricultural land. An estimated 1.6ha of trees are within the 27m RoW. None of these areas of trees are classified as Reserve Forest. The trees are located on private land and are commercial plantations, mainly poplar species. Pithrogarh – Champawat OHL involves installation of an additional conductor on an existing OHL. Confirmation from Champawat DFO has been provided to PTCUL requiring that: 1. No new forest land will be utilized. 2. No new poles, towers will be constructed other than the approved. 3. Stringing of the 2nd circuit line will be done on the double circuit towers already erected. 4. No new tree felling will be done. However, as part of the original single circuit project a requirement to replant cleared areas within the RoW plantation of dwarf conifers is still to be implemented. PTCUL has paid the Forest Department the required compensation money for this activity and is awaiting the Forest Department to commence the planting. Current status of the plantation is provided in Appendix W which states that plantation shall be completed in 2025-26. Most habitats will be restored naturally around OHL towers and substations following construction resulting in effects of short-term degradation and disturbance only. Only minor long-term habitat loss is expected to occur in the immediate areas beneath towers although many of these areas are already modified due to the setting of existing towers in these locations **MLV OHL –** Both MLV OHL lines traverse modified habitat and agricultural land and no significant impacts to habitat are anticipated. **UG Cabling** – UG alignments are located within urban areas and follow road alignments. Discussions with UPCL indicate that tree felling is not required during UG cabling works in either Dehradun or Kaniya, although this risk cannot be entirely ruled out. PTCUL have not confirmed this is also the case for their UG cabling but the situation is anticipated to be similar. **Substations** – Most substations are open land. However, some trees are present on sites and they will be cleared for construction. Number of trees to potentially be cut are listed in **Error! Reference source not found.**. Birds have been observed nesting in within mud crevices/holes of small hillocks at Landhora SS.
Direct mortality of fauna	Vegetation clearance can lead to direct fatalities of fauna. In particular nesting birds, which in the study area includes some threatened species, may be impacted during vegetation clearance and burrowing animals during earthworks. Indirect fatalities can also occur when excavations (for foundations or cable trenches) are left open.

Activity	Impact
	Impacts are likely to be at individual not population level. Collisions with construction vehicles can also occur.
Disturbance to sensitive species	Construction dust, noise and visual disturbance can result in short term, localised effects, although many animals will become habituated to the noise. The nosiest activities associated with the development are those from static plant used to excavate trenches and clear vegetation. This may result in a short-term adverse effect. Impacts are likely to be at an individual level, not a population level.
Spread of non-native or invasive species	Spread of non-native or invasive species will reduce the ecological value of an area.
Poaching and deliberate killing of animals	The introduction of a temporary workforce to the area may increase the risk of poaching / deliberate killing of animals by workers at or near temporary construction camps. This is a specific potential impact at Khatima-II substation and Khatima-Sitarganj LILO and Kaniya SS and UG cable due to the proximity to the tiger corridor and KBA. Impacts are likely to be at individual not population level.

Table 87: Substation Tree Cutting Requirements

#	Project Details	Trees
PTCUL Substations		
1	220/33 KV (2x50 MVA) GIS Substation, Selaqui	Mango, Banyan, Neem, Jamun, present inside the SS premises, but tree felling not needed.
2	132/33 KV (2x40 MVA) GIS Substation,Araghar, Dehradun	Guava, neem, mango tree within the premises, but the proposed site for SS has no trees so no felling needed.
3	132/33 KV (2x40 MVA) GIS Substation, Dhaulakhera, Nainital	5-7 trees within premises. Neem, jamun, sal, banyan. 1-2 tree felling may be needed. Permission from FD needed for tree felling.
4	132/33 KV (2x40 MVA) GIS Substation,Khatima-II, US Nagar	Eucalyptus along site boundary. No tree cutting needed for SS.
5	132/33 KV (2x20 MVA) GIS Substation,Lohaghat, Champawat	No trees or vegetation at site.
6	220/132/33 KV (2x160 MVA+ 2x40 MVA) AIS Substation,Manglore, Haridwar	Felling of 2-3 trees of *Syzygium jambos* (jamoya) at the entry of the site may be needed for which permission from Forest Department needs to be taken.
7	Landhora	105 trees at site, all small sized fruit trees Guava – 78 Mango – 5 Lemon – 1 Mulberry – 1 Semal - 1 Shisham – 14 Siris – 1 Approximately 90 small trees may need to be felled for which permission from the Forest Department/ DHO needs to be taken under Uttar Pradesh Tree (Protection), Act 1976, as adopted in Uttarakhand[80] For the fruit trees in urban areas application is forwarded by the DFO to District Horticulture Officer who examines the case

[80] Standing Operating Procedure(SOP) for Ease of Doing Business, For Tree Felling Permission on Land (except Reserved Forest, Protected Forest, Cantonment Area, Government Gardens)- (Under Uttarakhand Enterprises Single Window Facilitation & Clearance Act-2012) https://forest.uk.gov.in/tree-felling-orders

#	Project Details	Trees
		and submits report. Case is examined depending on tree size and girth.
8	Sarvarkhera	Trees of Royal Palm (*Roystonea regia*), 1 tree of Ficus, Mango and few ornamental trees. Tree felling of 9-10 ornamental Royal Palm trees envisaged in the project. permission from the Forest Department/ DHO needs to be taken under Uttar Pradesh Tree (Protection), Act 1976, as adopted in Uttarakhand.[81] For the fruit trees in urban areas application is forwarded by the DFO to District Horticulture Officer who examines the case and submits report. Case is examined depending on tree size and girth.
UPCL Substations		
1	33/11 KV, (2 X 10 MVA), Near Collectorate	Vegetation clearance needed but no trees, only grass and shrubs at site.
2	33/11 KV, (2 X 5 MVA), Bharauni	No trees.
3	33/11 KV, (2 X 5 MVA), Kaniya	Semal (*Bombax ceiba*), Sheesham, 7-8 tree cutting may be required for which permission from Forest Department needs to be taken.

Operational Phase

Bat Collisions

552. Impacts to bats have been excluded from further study based on a review of recent literature which suggests there is no national or international (published, peer reviewed) literature on bat fatalities from power line collision. [82] In addition, Orbach & Fenton (2010) cite only *'anecdotal reports'* of bats colliding with other stationary objects including television towers. One bird study in California did however report a single (unidentified) bat found during a search for bird carcasses surrounding a 110 kV power line (Dedon *et al.*, 1989).

Bat and Bird Electrocutions / Other Wildlife Electrocutions

553. Electrocutions occur when a bird or bat completes a circuit by simultaneously touching two energized parts or an energized part and a grounded part of electrical equipment on a power pole, specifically with the span of its wings. According to the America Eagle Foundation the majority of electrocutions occur on MLV lines (4kV to 34.5kV),[83] the reason being that the spacing between conductors are oftentimes narrow enough to be bridged by a bird's wingspan. Also, poles that contain closely spaced energized parts (such as transformers) can be especially hazardous to birds of all sizes. This finding corresponds with that of the US Fish and Wildlife Service (FWS) which state that most bird electrocutions occur on MLV lines and poles compared with HV lines. Birds can be electrocuted on HV lines; however, it is rare and there is a lack of data on the scale

[81] Standing Operating Procedure(SOP) for Ease of Doing Business, For Tree Felling Permission on Land (except Reserved Forest, Protected Forest, Cantonment Area, Government Gardens)- (Under Uttarakhand Enterprises Single Window Facilitation & Clearance Act-2012) https://forest.uk.gov.in/tree-felling-orders

[82] EirGrid Evidence Based Environmental Studies. Study 3: Bats. December 2015

[83] American Eagle Foundation. Promote Avian Friendly Power Lines. https://www.eagles.org/take-action/avian-friendly-power-lines/

of this problem. [84],[85] This information correlates with that collected within the Project area where bird electrocutions have been observed in large numbers on MLV poles and few, if any, electrocutions have occurred on HV lines. Only two above ground MLV lines are planned under this Project:

- Near Collectorate (4km)
- Bharauni (10km)

554. Kaniya was planned to be an OHL, but as described in Section 3.4.3, this line has now been undergrounded to avoid issues such as bird electrocution.

555. Near Collectorate traverses an urban setting for almost all its four kilometers and Near Collectorate passes through agricultural land. Vultures are most likely absent from the Near Collectorate area, but it is likely that raptors, such as, the Steppe Eagle, could be at risk. All vultures and raptors identified in this report could potentially be found at the Bharauni site and are therefore at risk of electrocution on lines, especially if there are carcass dumps within close proximity to the lines.

556. Regarding other wildlife, all OHLs shall be designed in accordance with MOEF&CC guidelines that in the case of overhead lines, the clearance of 11kV and 33kV should be per the CEA regulation 58(3) and 58(4) of above the maximum trunk height of the elephant, whichever is higher. This is important as elephants are particularly at risk of electrocution with several reported electrocutions in Uttarakhand in the last five years, notably on sagging MLV lines (11kV). [86,87]

Power Line Bird Collisions

557. Collisions occur when birds fly into wires. Bird size, agility, experience, flocking, territorial or courtship activities, weather, time of day, human activities, configuration and location of the line, line placement, and line size can all contribute to these collisions. Many species of birds are especially vulnerable to collisions with HV power lines because of the height of these structures with respect to flight altitude, and because of their low visibility, whereas many species are potentially less vulnerable to collisions with MLV lines. [88]

558. New LILO lines and HV OHLs are in agricultural land more than 10km from IBAs or critical habitat – most of the lines are less than 1km in length and represent an almost negligible risk to birds from collisions with conductors. Khatima - Sitarganj is located approximately 7km from an IBA, but this line is also only 1km long and does not represent any significant risk to birds. Pithrogarh – Champawat second stringing is in a mountainous area of Uttarakhand and although it is not located close to an IBA or PA, it is in forest land, and it is possible, according to IBAT screening, that special status birds could be found in this area. This line could potentially impact upon birds through collisions with conductors. Further, as noted earlier in this report, Pithrogarh – Champawat requires as part of the original Forest Clearance bird diverters in areas passing

[84] https://www.fws.gov/birds/bird-enthusiasts/threats-to-birds/electrocutions.php

[85] Guidance on appropriate means of impact assessment of electricity power grids on migratory soaring birds in the Rift Valley / Red Sea Flyway. GEF, UNDP, Birdlife International. 2015

[86] https://www.hindustantimes.com/cities/dehradun-news/elephant-electrocuted-in-uttarakhand-s-haldwani-2nd-such-incident-in-one-month-101673341961867.html

[87] https://timesofindia.indiatimes.com/city/dehradun/uttarakhand-elephant-found-dead-in-kaladhungi-range/articleshow/95108883.cms

[88] Avian mortalities due to transmission line collisions: a review of current estimates and field methods with an emphasis on applications to the Canadian electric network. Avian Conservation and Ecology, 2013

through forest land (about 3km), and this has not currently been completed on the single circuit recently installed.

Impact summary and assessment of significance

559. Table 89 provides an assessment of the significance of impacts to flora and fauna before implementation of the proposed mitigation measures that are discussed in the rest of this section.

Table 88: Potential Impacts to Flora and Fauna

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	*Loss, degradation/ fragmentation of habitat*	*Terrestrial wildlife – birds, bats, etc.*	*L*	*H*	*M*	*-*	*MAJ*	*MT*	*SMA*	*MED*	*DEF*	***M***
C	*Physical damage (road kills, accident, loss of roosts/nesting sites, etc.)*	*Terrestrial wildlife – birds, bats, etc.*	*L*	*H*	*M*	*-*	*MAJ*	*MT*	*SMA*	*MED*	*POSS*	***M***
C/O	*Poaching*	*Terrestrial wildlife*	*L*	*H*	*L*	*-*	*MAJ*	*MT*	*SMA*	*MED*	*UN*	***L***
C	*Vehicle Movements*	*Terrestrial wildlife*	*L*	*H*	*L*	*-*	*MAJ*	*MT*	*SMA*	*MED*	*UN*	***L***
C	*Spread of non-native / invasive species*	*Terrestrial Habitats*	*L*	*M*	*L*	*-*	*MAJ*	*MT*	*SMA*	*MED*	*POSS*	***M***
O	*Bird Electrocution*	*Birds*	*L*	*H*	*M*	*-*	*MAJ*	*LF*	*SMA*	*MED*	*UN*	***L***
O	*Bird Collisions*	*Birds*	*L*	*H*	*M*	*-*	*MAJ*	*LT*	*SMA*	*HIGH*	*POSS*	***H***
O	*Other wildlife electrocution*	*Other wildlife e.g., elephants*	*L*	*H*	*M*	*-*	*MAJ*	*LT*	*SMA*	*HIG*	*POSS*	***H***

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Medium Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely. Cells shaded in blue are positive impacts.

Mitigation and Management Measures

Design Phase

Habitat Surveys and Tree Cutting

560. During the design phase the EPC Contractor shall complete a habitat survey in order to confirm the area and type of modified and natural habitat situated beneath towers and right of

ways. The detailed survey shall include the number and species of trees and the quality of forest cover lost, to calculate the compensatory reforestation required for the detailed design. During the detailed route surveys of all power lines a field ecologist will also record any fauna observed in the project area. In particular, these surveys will be required for the following PTCUL OHL given their length:

- 220 KV Manglaur – Nara (25km)
- 132 kV Kashipur – Mahuakheraganj (9.7km)

561. None of the PTCUL substations are within natural habitat, they are all located within modified landscapes, e.g., agricultural land, existing substations, or urban areas – as such no specific ecological studies of these sites are required, other than confirming the number and types of trees to be felled at these sites. The exception is Landhora SS where birds are nesting in hillocks on the site. Land clearing activities at Landhora shall be undertaken outside the nesting season to avoid impacts to birds.

562. Alignment designs and the locations of all UG associated infrastructure in Dehradun shall follow the measures outlined below:

- Contractor to employ field ecologists to undertake ROW walkover, map habitat and species encountered, and enumerate the number and species of trees requiring to be cut and lopped, submit survey report alongside design.
- Presence or absence of sensitive receptors and critical habitat species identified in IEE to be confirmed by field ecologists during route surveys. Adaptive management measures to be applied according to the findings of the surveys, e.g., realignment of route towards road center to avoid tree roots, etc.
- Carefully select the UG alignment and areas for installation within substation sites including CSS/RMU/LTFP locations to avoid or at least minimize the need to cut/trim trees by avoiding areas with a high concentration of trees.
- Entry/exit pits to be placed to avoid the area beneath tree crowns (zone for root protection) and other vegetation. UG cable alignment placed to avoid the tree crowns especially mature trees.

563. Prior to the cutting of any tree field for any UPCL / PTCUL activity ecologists will survey the tree to ensure there are no nesting birds present in the tree. If nests are present the Contractor will consult with Ecologists to determine the most suitable actions to avoid harm to the nests and birds. If any special status species (IUCN VU, CR, EN) are observed in the trees ADB will be informed by PTCUL/UPCL and tree cutting ceased until appropriate mitigation plans have been prepared by the Contractor.

<u>Electrocutions</u>

564. The FWS have indicated that electrocutions from HV power lines are rare nonetheless the project will take a precautionary approach. According to recent technical papers electrocution can be far more controlled than collision since the problem is a physical one, whereby a bird bridges certain clearances on a pole structure, the solution is relatively straightforward, and

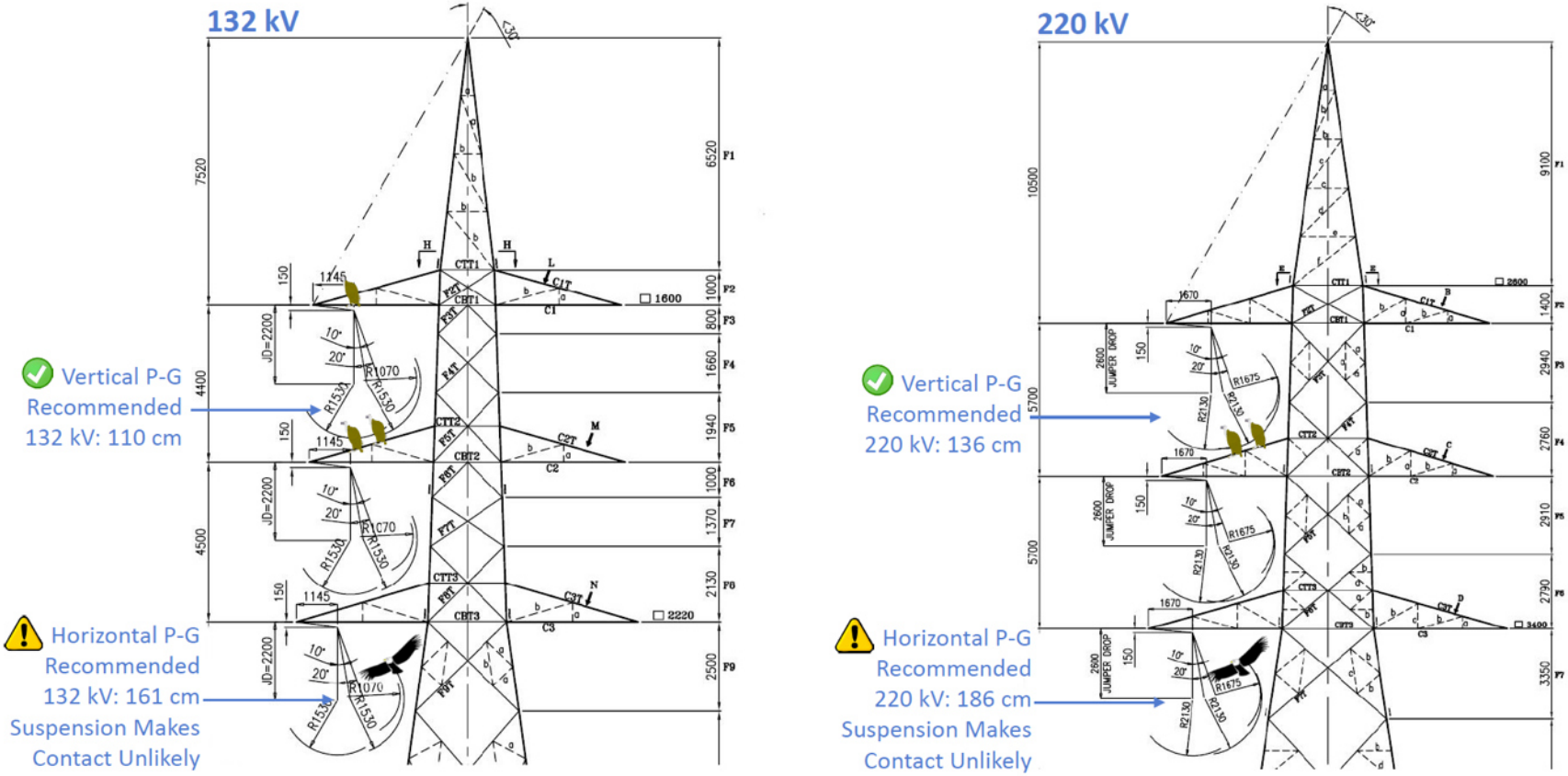
involves ensuring that a bird cannot touch the relevant components.[89] The Project will ensure OHL tower designs are adapted to ensure that additional clearances are provided between live wires and grounded surfaces to accommodate the largest at-risk species identified by IBAT – the White Rumped Vulture. Figures 82 and 83 illustrate the recommended clearances for 132kV and 220kV lines.

Figure 82: Required Clearances between Conductors and Grounded Surface

Phase-To-Phase (Line) Voltage (kV)	Phase-To-Ground Voltage (kV)	Phase-to-Phase Spacing Horizontal (cms)	Phase-to-Phase Spacing Vertical (cms)	Phase-to-Ground Spacing Horizontal (cms)	Phase-to-Ground Spacing Vertical (cms)
132	76	**189**	**138**	**161**	**110**
220	127	**234**	**183**	**186**	**136**

[89] Guidelines on How to Avoid or Mitigate Impact of Electricity Power Grids on Migratory Birds in the African-Eurasian Region. AEWA Conservation Guidelines No. 14. 2012

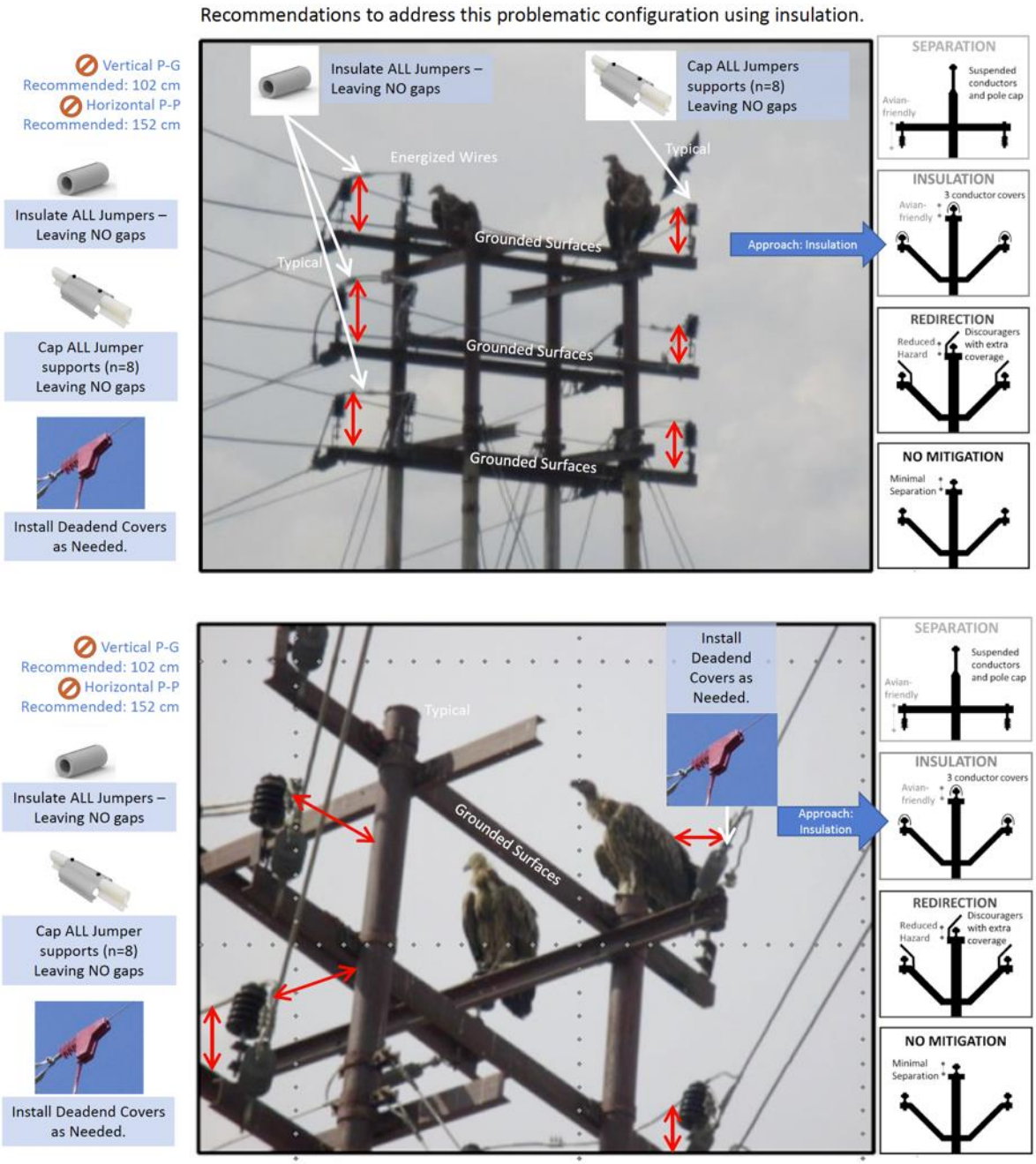
Figure 83: Required Phases to Phase Clearances Based on PTCUL Standard Design



Phase-To-Phase (Line) Voltage (kV)	Phase-To-Ground Voltage (kV)	Phase-to-Phase Spacing Horizontal (cms)	Phase-to-Phase Spacing Vertical (cms)	Phase-to-Ground Spacing Horizontal (cms)	Phase-to-Ground Spacing Vertical (cms)
132	76	✓ **189**	✓ **138**	⚠ **161**	✓ **110**
220	127	✓ **234**	✓ **183**	⚠ **186**	✓ **136**

565. Electrocutions are more likely on MLV lines, and as noted above, two Project lines represent a risk of bird electrocutions. In the first instance these lines must be designed to prevent electrocutions using the following design measures which are illustrated in Figure 84 and included in the Project design phase EMP. Covered conductors are also required for the two MLV OHL.

Figure 84: Bird Protection Requirements for MLV OHL



Bird Collisions

566. Diurnal bird species, including vultures and raptors identified in the Project area are at low collision risk. However, certain locations within the Project area are more likely to see bird activity, including areas around surface waters, carcass dumps, communal roosts and historic nests. In these areas, the risk of collisions with HV power lines is greater. In these locations bird divertors (wire markers) are recommended. This assessment has identified all locations on HV power lines over 3km where wire marking is required due to their locations close to or above surface water. The locations of required markers are provided in **Appendix C**. Bird divertors shall be spaced at 10m intervals and designed and installed according to CEA guidelines. [90] It is vitally important that the markers are placed on the earth line on the top of the tower. According to some reports, this can reduce collision accidents by 50-85%. [91] Diverters shall also be included in all forest land through which the Pithrogarh – Champawat line passes.

567. During detailed design phase the EPC Contractor shall also complete a survey of the lines to identify any carcass dumps, communal roosts and historic nests close to the site. In these areas bird divertors will also be added.

Pre-construction Phase

Bird Electrocutions

568. To further reduce the potential for electrocutions in general, i.e., both on HV and MLV power lines, it is recommended to identify, and if possible, move carcass dumps away from Project alignments (but not closer to other lines). A two-step approach is required as follows:

c) UPCL consult with local village heads and any 'skinners' in Bharauni and Near Collectorate to identify the presence of any carcass dumps in relation to the proposed alignments.

d) If carcass dumps are identified in proximity (within 500m) of the lines recommend to the village heads / skinners that the dumps be moved away from the line, but not closer to other lines. It is noted that these recommendations may not be actioned by village heads, or the skinners that use the dumps.

569. In addition, the Project, through UPCL, will provide community awareness raising with the support of an NGO in relation to vulture conservation and the need to avoid carcass dumps near power lines.

Construction Phase

570. Any trees cut, not within private land, but within the RoW alignment will need to be compensated according to national requirements as set out in Section 2.6 **Error! Reference source not found.**. No new tree felling will be permitted associated with the Pithoragarh – Champawat second stringing works.

[90] https://cea.nic.in/wp-content/uploads/pse___td/2021/01/Technical_Specifications_for_Bird_Flight_Diverter.pdf
[91] http://birdsandpowerlines.org/cm/media/Protecting_birds_on_powerlines.pdf

571. Tree felling at PTCUL and UPCL substations (and at existing UPCL substations – if required) will be completed in accordance with national requirements as set out in Section 2.6 **Error! Reference source not found.**.

572. Locating construction camps away from sensitive areas and enforcing a poaching/hunting/fishing ban on construction workers will help ensure that there are no significant adverse effects (as described above in Section 8.3.1 **Error! Reference source not found.**). Speed limits on vehicles and restriction to existing and/or dedicated haul routes will prevent direct mortality and disturbance from vehicles. Pre-clearance site surveys and the movement of animals out of the working corridor will prevent direct mortality. There may be some low level unavoidable direct mortality, but this would not be significant in the short or long term.

573. Monitoring by EPC Contractors Biodiversity Specialist will ensure that should notable species be identified breeding in an area, additional mitigation measures (e.g., regarding timing of works) will be implemented as required (e.g., for birds so that the young have successfully fledged).

574. Pre-clearance surveys of invasive species combined with the demarcation and treatment of non-native species will prevent their spread. Monitoring post-construction will ensure that newly restored areas are not inundated with non-native species from adjacent areas. Use of GIIP such as cleaning of machinery before import to site, wheel washes on site, etc. will avoid import of invasive species.

575. This risk relating to poaching can be reduced by appropriate worker training sessions and implementation of a strict code of conduct with regards to treatment of local fauna.

Residual Impacts

Table 89: Residual Flora and Fauna Impacts

Phase	Potential Impact	Potential Impact Significance	Residual Impact	Residual Impact Significance
C	*Loss, degradation/ fragmentation of habitat*	***Medium***	*Revegetation and tree compensation payments should help ensure that there are no significant residual impacts in the project area which is generally a modified environment.*	***Not significant***
C	*Physical damage (road kills, accident, loss of roosts/nesting sites, etc.)*	***Medium***	*The proposed mitigation measures should ensure that residual impacts are low.*	***Low***
C/O	*Poaching*	***Low***	*Awareness training for workers will help limit potential project impacts, but it is still possible that they could stray into sensitive areas.*	***Low***
C	*Vehicle Movements*	***Low***	*The proposed mitigation measures should ensure that impacts are not significant.*	***Not significant***
C	*Spread of non-native /*	***Medium***		***Not significant***

	invasive species			
O	*Bird Electrocution*	***Low***	*Risk pre-mitigation is low, adoption of additional mitigation measures should ensure that impacts are not significant.*	***Not significant***
O	*Bird Collisions*	***High***	*Bird diverters should help reduce the impact significance, but not entirely eliminate the possibility of bird collisions on the line.*	***Low***
O	*Other wildlife electrocution*	***High***	*Following national regulations for OHL clearances should ensure that impacts are minimized. Residual impacts will not be significant*	***Not significant***

8.4. Socioeconomic

8.4.1. Social Infrastructure (including Utilities)

Potential Impacts

576. Construction works in urban areas are likely to impact upon physical infrastructure, such as roads, rail and utilities. Construction of HV OHL and LILO are less likely to impact upon physical infrastructure as towers can be sited to avoid sensitive sites or pass over them. However, impacts such as safety beneath lines during construction still needs to be considered. Further, checks will need to be completed around tower bases to be excavated to ensure they are free of utilities. Traffic impacts from OHL are likely, but the volumes of construction traffic moving between tower sites will be low. Impacts associated with second stringing of Pithrogarh – Champawat line will be limited and only low levels of impacts relating to traffic are anticipated.

577. UG HV LILO and UG MLV activities will generate more significant impacts as works will be undertaken in urban areas, including Dehradun. Here there will be multiple potential impacts such as damage / disruption to below ground and above ground utilities, especially if open trench works are undertaken. Stakeholders in Dehradun have indicated that impacts to water supply networks has occurred during previous and on-going UPCL UG works and this is a potential risk associated with the proposed Project.

578. Works are likely to encroach into roadways and this will impact upon the urban traffic flow resulting in traffic congestion. Numerous educational facilities have been identified close to the UG sites in Dehradun and works can also affect these sites in terms of access and health impacts (noise and dust) as well as traffic safety issues. Works in Dehradun will impact significantly on areas adjacent to the roadside, specifically sidewalks where UG cables are often laid, this can impact upon access to business. UPCL have mentioned that they only open 100-250m sections of trench per day and then close them when works are completed in these sections at the end of the day, however, stakeholders have commented that excavated areas can remain open for several weeks and their repair after closing is still not completed in many locations around the city.

579. Consultations have indicated that the community are concerned that streetlights connected to existing UPCL poles will no longer function during the operational phase of the

Project. It is therefore vital to ensure that replacement streetlights are installed before existing poles and lights are removed.

580. Substation construction / rehabilitation in urban areas will have similar impacts to UG works in urban areas. However, outside of the urban impacts to social infrastructure are likely to be relatively minor.

581. No significant pressure on social infrastructure such as hospitals and clinics are anticipated as the number of workers at any one sub-activity will not be significant and it is unlikely that the health facilities would be impacted by periodic visits resulting from accidents at work sites.

582. No significant impacts to water supply are anticipated if permits are obtained for the drilling of boreholes and associated water extraction.

583. No significant impacts to social infrastructure and utilities are anticipated during the operational phase. No impacts to power supply are foreseen. Potential impacts from noise and EMF are discussed in other parts of this report.

Impact summary and assessment of significance

584. Table 91 provides an assessment of the significance of potential impacts before implementation of the proposed mitigation measures that are discussed in the rest of this section.

Table 90: Potential Impacts to Social Infrastructure

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	*Impacts to utilities, road and rail*	*Local community, road and rail users*	*H*	*M*	*M*	-	*MAJ*	*ST*	*SMA*	*MED*	*DEF*	***M***
C	*Impacts to sidewalks/roads*	*Local community*	*H*	*M*	*H*	-	*MAJ*	*ST*	*SMA*	*MED*	*DEF*	***M***
C	*Access*	*Local community*	*H*	*M*	*H*	-	*MAJ*	*ST*	*SMA*	*MED*	*DEF*	***M***
C	*Impacts to streetlights*	*Local community*	*H*	*M*	*H*	-	*MAJ*	*ST*	*SMA*	*MED*	*DEF*	***M***
C/O	*Impacts to water supply*	*Local community*	*H*	*M*	*H*	-	*MAJ*	*ST*	*SMA*	*MED*	*POS*	***M***
C	*Impacts to schools and other social infrastructure*	*Local community*	*M*	*H*	*H*	-	*MAJ*	*ST*	*SMA*	*MED*	*DEF*	***M***

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Medium Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely. Cells shaded in blue are positive impacts.

Mitigation and Management Measures

Pre-construction Phase

585. During this phase the EPC Contractors for all components will be responsible for preparing and implementing a **Traffic Management Plan.** They will also provide information to the public about the scope and schedule of construction activities and expected disruptions and access restrictions at least 72 hours before the disruptions.

586. Through a request via a Project high-level committee which will be established to coordinate the Project, Uttarakhand Public Works Department (PWD) must appoint a dedicated contractor for the PTCUL and UPCL resurfacing work in Dehradun to ensure timely reinstatement. The high-level committee must also be requested to cooperate with PTCUL and UPCL to enable them to meet their environmental safeguard obligations including prompt reinstatement of damaged utilities etc. No undergrounding must commence until these, and other pre-construction requirements have been met. PWD must also ensure that all public spaces are restored to their original condition within 15 days of works completion.

587. Prior to the start of works the EPC Contractor will survey poles to see what utilities are on them, then agreements will be made with providers to remove them. Streetlights, those located on MLV poles, do not come under the remit of UPCL. However, UPCL have stated that they can keep the existing poles in-situ for at least six months while the agency responsible for street lighting prepare alternative street lighting.

588. Prior to the commencement of works all activities will be announced in local papers, at least one month in advance of works.

Construction Phase

589. During construction mitigation measures relating to maintaining access to properties, schools, businesses, etc. and managing access roads according to best practice will be implemented by all EPC Contractors (**Appendix Q and R**). They will also be responsible for liaising with utilities to identify, avoid and maintain their operation throughout the construction period, e.g.; by obtaining necessary clearances from other utilities that could be affected by the Project (water, sewerage, telecommunications, road, rail etc.), and checking with relevant local authorities (water, telecoms) whether there are known pipes, cables, or other utility lines and carry out a scan using cable avoidance tool to identify any unknown underground utilities prior to excavation.

590. Road safety will also be a key aspect during the construction phase, specifically in areas of UG cabling. Of specific relevance to these types of works the following measures shall be applied:

- Stockpiling of spoil and any new equipment (conductor reels, etc.) shall be away from properties and only in designated areas where no access will be blocked.

- Where the execution of the works requires single-lane operation on/beside the public road the contractor will provide and maintain all necessary barriers, warning signs and traffic control signals per the EMP and to the satisfaction of the local authority. Wherever traffic diversions, warning signs, traffic control signals, barriers and the like are required, the contractor will install them prior to commencing work in that area.

Residual Impacts

Table 91: Social Infrastructure Residual Impacts

Phase	Potential Impact	Potential Impact Significance	Residual Impact	Residual Impact Significance
C	*Impacts to utilities, road and rail*	***Medium***	*Implementation of the Traffic Management Plan and other mitigation measures should ensure that no significant residual impacts remain.*	***No significant impact***
C	*Impacts to sidewalks*	***Medium***	*The High-level committee coordination and agreements with PWD should ensure that sidewalk impacts and access are not significant, but a 15 day period after works are completed may still result in low level residual impacts.*	***Low***
C	*Access*	**Medium**		***Low***
C	*Impacts to streetlights*	***Medium***	*Keeping poles in-situ for at least six months should help the transition to new streetlights, but it is still possible that streetlights may not be replaced after this time.*	***Low***
C/O	*Impacts to water supply*	***Medium***	*Mitigation measures included in this IEE should ensure that all utilities are identified and impacts to them, including water supply networks, are avoided.*	***No significant impact***
C	*Impacts to schools and other social infrastructure*	***Medium***	*Implementation of the Traffic Management Plan and other mitigation measures should ensure that no significant residual impacts remain.*	***No significant impact***

8.4.2. Land Acquisition and Temporary Damages

591. This section discusses the issue of land acquisition and compensation and associated mitigation measures to be adopted.

Potential Impacts

MLV UPCL Activities

592. The construction of the three new sub-stations will require only 0.4384 ha land which was government land. The rehabilitation of twenty-five existing sub-stations will not require any additional land. The construction of the two over-head low voltage power lines on mono or double poles and one underground cable totaling 24km will be using the edge of the public road, and the impact will be restricted to unintentional damage to crop, trees and other properties during the construction phase.

593. The UG cable laying work for 381km and installation of 99 CSSs and 354 RMUs above ground is spread across 45 wards of Dehradun Municipality and 3 villages in its suburbs.

594. The open trench construction method in sensitive spots used by street vendors and small business owners has potential to cause temporary income loss. The field visit and consultation with elected representatives has identified area where works can cause disturbance to the

street vendors and small business owners and can have adverse impact on their income for a short time. It is not possible to provide an estimate of unintended temporary livelihood and income loss to street vendors and small business owners. Therefore, it is recommended to set aside a contingency fund to cover such expenses.

HV PTCUL Activities

595. The total land required for eight sub-stations to be constructed by PTCUL is 12.0208 ha of land, out of which 5.142ha is private land the remaining 6.8788ha belonged to Government. The private land is acquired through sale deeds after a process of negotiation. Hence, there is no involuntary resettlement impact for obtaining land for these eight grid sub-stations.

596. Two high voltage under-ground LILOs, with a length of 4.3km which will be constructed along the margins of the public road, will involve neither acquisition of land nor imposition of ROW. However, temporary construction stage impacts are anticipated. The construction stage impacts will be avoided by scheduling construction in off-peak business hours or post-harvest seasons.

597. The total area which will come under the high voltage power line corridor is 185 ha. Out of this 8.11 ha of land will be covered under tower bases. The remaining 168.87 ha of land will come under imposition of ROW restrictions.

598. Out of the total land within the power line corridor, 180.72 ha (98%) is private land the remaining 4.19 ha (2%) is government land. The high voltage power line corridor will impact 1522 land owners, which includes 213 affected land owners for tower base areas and 1309 affected land owners for areas under the ROW corridor. These impacted land owners will be paid one-time compensation as per provisions of MOP Guidelines 2015 and 2020.

599. The construction stage impact on agricultural land and damage to the crops will be at two stages, i.e. (i) during construction of towers, and (ii) during stringing of conductors between towers. In the first stage, during construction of towers it is estimated to be 12.97ha of agriculture land and standing crops. In the second stage, during stringing of conductors, the total estimated crop area to be impacted is 84.65ha.

600. *Vulnerable Affected Land Owners:* The affected land owners of the towers are expected to experience the following impacts:

- Severe loss of access to tower-base area which will be in the range of 350 sqm to 450 sqm depending on the voltage level and tower design for each tower.

- Damage to agriculture land and standing crops in an area of 575sqm to 675 sqm area during construction of each tower.

- Any affected land owner whose total land holding is less than 4,000 sqm (approximately less than 1 acre or is a marginal farmer) is expected to experience the impact for more than 10% of their land holding. Therefore, any affected land owner for tower base area whose total land holding is less than an acre shall be treated as vulnerable.

601. The alignment of high voltage power lines pass through predominantly agricultural areas which are privately owned. Although, women are given equal rights in inheritance, land ownership (single or jointly) among women is very low in project area. Hence, it is anticipated

that the compensation paid for the ROW will mostly go to men. The project should carry out consultation with women of the project affected families and inform them about the compensation amount and understand their concerns and feedback. Where a woman is the land owner and she needs assistance for completing the required procedures for receiving the compensation, the project shall provide such special assistance.

Impact summary and assessment of significance

602. Table 93 provides an assessment of the significance of potential land acquisition and compensation impacts before implementation of the proposed mitigation measures that are discussed in the rest of this section.

Table 92: Potential Impacts of Land Acquisition and Temporary Damages

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	*Land Acquisition and Crop and tree loss*	*Land owners and users*	*L*	*H*	*H*	*-*	*HIGH*	*LT*	*Small*	*MED*	*DEF*	***M***
C	*Unintentional private property damage*	*Land owners and users*	*L*	*H*	*H*	*L*	*HIGH*	*LT*	*Small*	*MED*	*DEF*	***M***

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Medium Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely. Cells shaded in blue are positive impacts.

Mitigation and Management Measures

Design Phase

603. To avoid land acquisition and resettlement the EPC Contractor's design team shall carefully select the route/siting to minimize impacts on existing structures (e.g., buildings) etc. and avoid or minimize crop disturbance where power lines cross private land.

604. In urban areas above ground infrastructure associated with underground cables (CSS/RMU) will be placed so they do block the footpath/road or sites used by informal settlers, street vendors etc. Any temporary disturbance related to this issue will be compensated for in accordance with the RP and its entitlements matrices.

Pre-construction Phase

605. Where properties cannot be avoided in the design and where they are present within national safety clearances the properties will be expropriated following the procedures outlined in the Project RP.

606. All temporary construction facilities required, including laydown and storage areas, will be located within the boundaries of UPCL/PTCUL land (substations) except for overnight accommodation that could be provided in existing properties off-site. Where this is not possible the EPC Contractor will provide a central covered warehouse for storage of construction materials. No public or private land requiring clearance of vegetation or supporting forest habitat or having waterbodies is to be used.

607. Temporary impacts (e.g., land rentals) that are not within the assessed corridor of impact to be compensated based on negotiations between the Contractor and affected persons.

Construction Phase

608. In this phase a range of mitigation shall be applied to limit the significance of impacts:

609. <u>UG Cables</u>

- Underground cables will be bored and laid using trenchless method through Horizontal Directional Drilling (HDD) machine as the preferred option.

- Open trenching will only be used with the permission of UPCL/PTCUL where sufficient open space is available away from narrow and congested roads, there will be no disturbance to vegetation and no social safeguard constraints, and the trench will be open and backfilled within a single day.

610. <u>LILO / OHL</u>

- Where the Project results in loss of loss of fruit-bearing trees that have economic value compensate in accordance with the entitlement matrix in the Project RP; the contractor will pay any subsequent compensation for loss or damage to private trees due to the fault of the contractor's work

- Schedule works to avoid or minimize crop disturbance where lines cross private land, such as undertaking works in between crops.

- Provide advance notice to harvest the crops and where feasible, adjust the construction schedule harvest crops; construction works shall not exceed more than one crop season at a particular stretch.

- Repair any temporary damage caused to agricultural fields after construction is completed.

- Saving the top-soil and restoration of land will be done by the Contractor to previous use and farmers will be allowed to continue their cultivation post the construction.

611. Further, it is very important that continuous consultation with affected households and residents continues throughout the construction phase.

612. In addition to the advance payment to civic authorities for reinstating the damaged civic properties, the unintentional damage to the private properties during construction process will be compensated by the EPC contractor.

Residual Impacts

Table 93: Land Acquisition and Temporary Damages Residual Impacts

Phase	Potential Impact	Potential Impact Significance	Residual Impact	Residual Impact Significance
C	*Land Acquisition and Crop and tree loss*	***Medium***	*No significant impacts are anticipated if the RP is implemented correctly. A GRM has been prepared to manage complaints received during this process. Other temporary impacts during the construction phase will be managed by the RP as noted above.*	***Not significant***
C	*Unintentional private property damage*	***Medium***	*No significant residual impacts are anticipated if the RP is implemented correctly.*	***Not significant***

Monitoring

613. No specific monitoring is required other than that outlined in the EMP.

8.4.3. Waste Management and Hazardous Materials

614. This section discusses the impacts of waste management during construction and operation of the Project and associated mitigation measures to be adopted.

Potential Impacts

Waste

615. Disposal of waste materials, both hazardous and non-hazardous, from linear power line worksites can be difficult to manage due to the de-centralized nature of the works along the alignments. Without suitable waste containers and without adequate training, workers could dump waste materials haphazardly around the work sites which could create pollution events. Waste management is, however, easier to control at the substations.

616. Various waste types will be generated at worksites during the construction phase, including:

- Inert construction waste – e.g., concrete, bricks, soil, packaging waste (cardboard, plastic, wood)
- Domestic waste – e.g., food waste.
- Liquid waste, some of which will be classed as hazardous – e.g., waste oil (non-PCB), sanitary discharge.
- Contaminated soil from existing substations. Soil conditions at the 25 existing substations show some degree of contamination of oil from spillage/leaks in one or more spots, mostly under the transformers. Heavy contamination was observed at Lalpur and Sitargang substations.
- Old electrical equipment from existing substations, some of which will be classed as hazardous – e.g., old transformers, lead acid batteries, and some may contain PCBs. The exact, or estimated volumes of each waste type will vary from substation to substation.

Some of the electrical equipment to be replaced may also be removed and sent to other substations for re-use at these sites. PTCUL/UPCL will make the decision on the equipment to be re-used based on the functionality of the equipment to be replaced and the needs of other substations.

617. In addition, some new substation sites will be established at existing substations (Selaqui SS, Araghar SS and Dhaulkhera SS). Site visits to these sites has indicated that old electrical equipment is stored in these areas. This equipment will need to be removed by PTCUL/UPCL. At this stage, it is not possible to say that any such equipment should be disposed of as it is possible that they are still classified as assets by the utility, and it is possible that they could be used for spare parts in the future. Any equipment for disposal must be done in an environmentally safe and sound manner with no debris and residual contamination from oil spills and leaks on handover.

618. This Project does not include the requirement for the EPC Contractors to remove and dispose of existing MLV poles and lines. This activity is the responsibility of UPCL who will be responsible for following national waste management regulations relating to disposal of the waste.

619. There are 25 companies in Uttarakhand to whom authorization for collection/transportation/disposal of hazardous waste is issued by UKPCB, of which 10 Units are in the Uttarakhand. [92]

Hazardous Materials

Sulphur Hexafluoride (SF_6)

620. SF_6 can have impacts to health of workers and the environment, all of which is discussed above under air quality.

PCBs

621. Polychlorinated Biphenyls (PCBs) are a persistent organic pollutant; a highly hazardous chemical. PCBs can potentially be found in oil containing equipment at substations, specifically in older equipment such as transformers and circuit breakers. PCBs, when they leak from equipment, are hazardous to human health as well as an environmental pollutant.

622. Environmental audit of the 25 existing substations identified the presence of old equipment, particularly transformers that leak and which may contain PCB oil, depending on the date of manufacture and schedule of oil replacement. Based on assessment against United Nations Industrial Development Organization (UNIDO) guidance at least one substation was identified as being at risk of having transformers containing PCBs. The old transformers stored at the UPCL substations to be used by PTCUL may also be containing PCBs.

[92] https://ueppcb.uk.gov.in/pages/show/147-list-of-authorized-recyclers

Other Hazardous Liquids

623. Other general hazardous liquids will be stored at work sites and at substations, e.g., fuel, solvents, etc. Spills and leaks of these liquids can result in soil and water pollution. This issue is discussed above under Soils and Hydrology.

Lead Acid Batteries

624. Batteries in substations are used for back-up power supply. The environmental audit of 25 existing substations identifies the presence of batteries (usually lead acid type) in many of the substation. Laws and regulations related to battery use are relevant. There is a risk of pollution incidents and health impacts from the use and management of lead acid cadmium nickel batteries at substations as well as this resulting in hazardous waste for disposal. For example, the audit of 25 existing substations identified that batteries (anticipated to be lead-acid) were stored on open ground.

Impact summary and assessment of significance

625. Table 95 provides an assessment of the significance of potential waste management and spoil disposal impacts before implementation of the proposed mitigation measures that are discussed in the rest of this section.

Table 94: Waste and Spoil Disposal Potential Impacts

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	*Improper management and disposal of solid / liquid waste*	*Local community / water bodies/ agricultural land*	*L*	*M*	*L*	*L*	*MIN*	*ST*	*SMA*	*LOW*	*POSS*	***L***
C	*Improper management and disposal of hazardous waste (including contaminated soil)*	*Local community / water bodies/ agricultural land*	*L*	*H*	*L*	*H*	*MAJ*	*ST*	*SMA*	*MED*	*POSS*	***M***
O	*Management of batteries*	*Local community / water bodies/ agricultural land*	*L*	*H*	*L*	*H*	*MAJ*	*ST*	*SMA*	*MED*	*POSS*	***M***

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Medium Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely. Cells shaded in blue are positive impacts.

Mitigation and Management Measures

Design Phase

626. In the design phase it will be important to ensure that substation waste management / hazardous materials storage areas are well designed, and that consideration is given to the battery types and battery room design.

627. The EPC Contractor for substations will provide a well-designed, covered area where materials can be segregated. The waste storage area will be of sufficient size to accommodate all anticipated storage requirements and can be locked, is well-ventilated and will not reach extreme temperatures. Fuel/oil/chemical/waste storage areas must have an impervious floor and be bunded so that the capacity of each bund is sufficient to contain at least 110% of the maximum design storage capacity within storage area, not connected to the surface water drainage system.

628. 24V, 30V, 48V, 110V, 220V DC batteries will ideally be lithium-ion type instead of lead acid or nickel cadmium to reduce hazardous waste generation although all battery types are e-waste. The batteries will conform to relevant Indian standards. A separate room for substation batteries will be provided with ventilation and exhaust fan for taking out fume gases and provision of remote monitoring of substation batteries (if not staffed) and exhaust fan will also be made.

Pre-construction Phase

629. The EPC Contractors for all components will prepare and implement a **Waste Management Plan** dealing with all solid and hazardous waste as well as wastewater generated in an environmentally sound and safe manner. Where possible it will ensure surplus materials will be reused or recycled, disposal will be the last resort.

630. Old electrical and mechanical equipment will need to be removed from some sites. This equipment will be transported to UPCL designated workshop/store for reuse or recycling using SPCB authorized vendors as per the condition of the equipment, if fit for use they will be stored for reuse by UPCL or they will be auctioned off as scrap material. Disposal of old transformers and other hazardous wastes shall be per national regulations. Other wastes will be recycled using SPCB authorized vendors or suitably engineered and licensed waste management facilities for inert or solid waste. If any PCB contaminated transformers are to be disposed the use of facilities capable of safely transporting (closed trucks) and disposing of hazardous waste containing PCBs will be a requirement.

631. UPCL will also be responsible for implementing the corrective actions specified in the corrective action plan (Table 69).

Construction Phase

632. During the construction phase, typical waste management issues can be managed through simple mitigation measures outlined in **Appendix Q and R**. Waste materials will be disposed of at licensed facilities in Uttarakhand.

633. Regarding spoil material, two specific mitigation measures are required to be implemented by EPC Contractors:

- Any spoil material from trenches and substation foundations which cannot be re-used will be removed from the site and sent to an appropriate state licensed waste management facility.

- Any areas of oil leaks beneath existing equipment to be removed will be excavated, stored in labelled metal drums and returned to the Contractors facilities for storage according to **method statements**. The labelled containers will include a reference number which correlates with the removed transformer which will be tested for PCBs using rapid test kits. If the PCB tests indicate that the transformer oil is contaminated, the container containing the soils will be labelled as PCB waste. PCB waste shall be stored, handled and disposed of in line with national regulations. Oil contaminated waste, not PCB contaminated, will be disposed of according to national regulations.

Operation Phase

634. During this phase UPCL / PTCUL will be responsible for ensuring waste management and disposal in line with national waste management regulations. They will also be responsible for implementing the corrective actions specified in the corrective action plan (Table 69).

Residual Impacts

Table 95: Waste and Spoil Material Residual Impacts

Phase	Potential Impact	Potential Impact Significance	Residual Impact	Residual Impact Significance
C	*Improper management and disposal of solid / liquid waste*	***Low***	*No significant residual impacts anticipated.*	***Not significant***
C	*Improper management and disposal of hazardous waste (including contaminated soil)*	***Medium***	*Following the requirements of this IEE and the need to audit waste management contractors will ensure that there will be no significant residual hazardous waste impacts.*	***Not significant***
O	*Management of lead acid batteries*	***Medium***	*No significant residual impacts anticipated.*	***Not significant***

8.5. Social and Cultural Aspects

8.5.1. Community Health & Safety

635. This section discusses potential health and safety impacts to the local community during construction and operation of the Project and associated mitigation measures to be adopted.

Potential Impacts

Construction Phase

636. The Project has the potential to increase the threats to community safety and security during the construction phase. The key types of impacts are likely to be:

- Potential conflict between workers, security personnel and local community members resulting in upset or injuries, in particular, SAEH issues due to interaction between Project workers and women in the local communities.
- Increased hazards (e.g., open excavations and worksites) and increased risk of accidents, specifically relating to UG works. Children are specifically vulnerable to these types of hazards.
- Increased risk of road/traffic accidents causing injuries or fatalities. Project activities will result in increased traffic flows on certain roads that are used by local residents (e.g., where such roads are used as haul routes, for UG cables). Children are also specifically vulnerable to road accidents.

637. All these impacts are likely to be most significant in Dehradun where UG and SS works will be undertaken and population density is high. In other semi-urban and rural areas, the risk of impacts to the community will be lower, but still needs to be managed.

638. The most likely potential impacts on community health in the construction phase are:

- Increase in dust, noise and water pollution (see Sections 8.2.1, 8.2.4 and 8.5.3)
- Increase in disease vectors such as rodents (if food/drink is not stored properly and solid/liquid wastes are not managed adequately) with accompanying increased incidence of vector-borne diseases.
- Increased risk of enhanced incidences of communicable diseases arising from interaction between workers living in the construction camps with local people. There will be a risk of communicable diseases (e.g., COVID-19, TB, and sexually transmitted diseases such as HIV/AIDS) passing through the workforce and possibly into the community.
- Increased risk of water-borne diseases if liquid and solid waste management is not implemented effectively.

Operational Phase

639. Due to the presence of security staff and security perimeter fencing, no operational phase impacts are anticipated relating to the substations as long as they are maintained.

640. However, measures should be put in place to warn the public about the dangers of other electrical equipment in public spaces, e.g., towers, CSS, etc. to avoid potential accident and fatalities during the operational phase, specifically relating to the issue of kite flying.

Electromagnetic Field (EMF)

641. Based on a recent in-depth review of the scientific literature, the World Health Organization (WHO) concluded that current evidence does not confirm the existence of any health consequences from exposure to low level electromagnetic fields. [93] However, to be prudent, this issue has been considered further as part of this IEE.

642. OHL HV – All of the OHL HV power line voltages range from 132kV to 220kV with the exception of the 2.5km Kashipur – Puhana 400kV line which is located in agricultural land with no human receptors within 100m of the line. According to data provided by the United

[93] https://www.who.int/peh-emf/about/WhatisEMF/en/index1.html

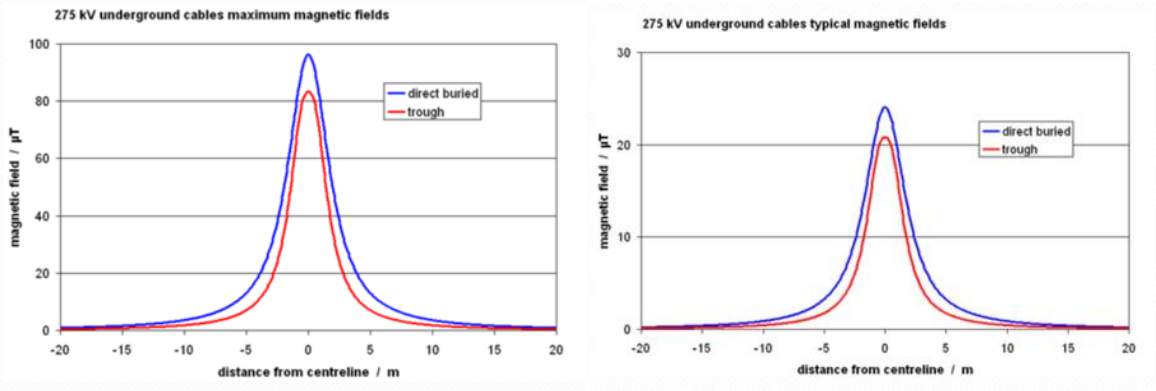
Kingdom National Grid[94] maximum fields beneath a 132kV line are below GIIP exposure levels. However, maximum electric field beneath a 275kV line at a clearance of 7.6m would be 7.8 kVm and typical field about 2.9 kVm.[95] ICNIRP exposure levels for public exposure are 5kVm. Maximum magnetic fields beneath 275 – 400kV lines may also exceed GIIP exposure levels. The maximum magnetic field beneath a 275kV line at a clearance of 7.6m will be around 108 µT, with the typical field being in the range of 4-10 µT. ICNIRP exposure levels[96] for the general public at 50 hertz are 100 µT. As a reference point it is also noted that there is no restriction in the United Kingdom on EMF grounds on how close a house can be to an overhead line.

643. Minimum ground clearance for conductor shall be maintained as per requirement of Central Electricity Authority (Measures relating to Safety and Electric Supply) Regulations. However, requirement of maintaining electrostatic and electromagnetic interference, radio interference voltage, audible noise etc. **within acceptable limits becomes ruling condition specifically for HV power lines of 400 kV and above voltage class**. Further, all OHL will be designed to account for safety zones which for 220kV power lines is 5.8m vertical and 4.1m horizontal.

644. Given the fact that all new lines will be constructed to respect safety zones (with no people living directly beneath lines) and the typical fields referenced above no significant EMF impacts are anticipated from OHL HV power lines, including the 400kV Kashipur – Puhana line.

645. UG Cables (HV & MLV) – UG cables range from 11/33kV to 220kV. Underground cables do not produce any external electric fields. Magnetic fields at a maximum voltage of 275kV produce a maximum magnetic field of 96µT and a typical magnetic field of 24 µT at a height of 1m immediately above a cable buried at 0.5m depth. Typical fields are lower than the maximum field because the loads are usually lower. Typical fields for 33kV cables are 1µT and 0.75 µT for 11kV lines. All these values are well below ICNIRP exposure levels in the WBG EHS guidelines.

Figure 85: Magnetic Field for UG Cables



[94] https://www.nationalgrid.com/sites/default/files/documents/13791-Electric%20and%20Magnetic%20Fields%20-%20The%20facts.pdf)

[95] https://www.emfs.info/sources/overhead/specific/275-kv/

[96] WBG EHS Guidelines although ICNRIP has issued revisions in 2010 and 2020. The newer guidelines outline reference levels; simply guidance figures for when it is necessary to investigate the basic restriction. The reference levels are based on both CNS and PNS effects, whichever is the more onerous at the frequency concerned, which at 50 Hz is the CNS limit. The reference levels are deliberately set below the field required to produce the basic restriction.

Source: https://www.emfs.info/sources/overhead/specific/275-kv/

646. Substations - Beyond the substation fence, the magnetic field produced by the equipment within the station is typically indistinguishable from the background levels from other sources. Studies undertaken in the United Kingdom showed mean values of 1.1 μT at substation boundaries and 0.2 up to 1.5m from the boundary.[97]

647. Further, there is a misconception that the transformers within substations are a high source of magnetic field. Modern power transformers are built to keep the magnetic field in the core of the transformer to maximize its efficiency.[98] Accordingly, no significant impacts to residential receptors is anticipated. However, a precautionary approach has been taken to this issue and additional checks during the design phase will be undertaken.

Impact summary and assessment of significance

648. The following table provides an assessment of the significance of potential impacts to local community before implementation of the proposed mitigation measures that are discussed in the rest of this section.

Table 96: Potential Impacts to Community Health and Safety

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	*Accidents at work sites (including traffic accidents)*	*Local community / Livestock*	*M*	*M*	*H*	*-*	*MAJ*	*ST*	*SMALL*	*MED*	*POSS*	***M***
C	*Social conflicts*	*Local community*	*M*	*M*	*H*	*-*	*MAJ*	*ST*	*SMALL*	*MED*	*POSS*	***M***
O	*Accidents involving electrical equipment*	*Local Community*	*M*	*M*	*H*	*-*	*MAJ*	*LT*	*SMALL*	*HIG*	*POSS*	***H***

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Medium Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely. Cells shaded in blue are positive impacts.

Mitigation and Management Measures

Design Phase

[97] Gajsek P, Ravazzani P, Grellier J, Samaras T, Bakos J, Thuroczy G. Review of studies concerning Electromagnetic Field (EMF) exposure assessment in Europe: low frequency fields (50 Hz-100 kHz). Int J Environ Res Public Health. 2016 Sep;13(9):14. Available from: https://www.ncbi.nlm.nih.gov/pubmed/27598182

[98] Source: Understanding Electric and Magnetic Field. https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/corporate/safety/understanding-emf-booklet.pdf

649. During the design phase it is important that all infrastructure is designed with the safety of the community in mind. The design requirements will be different for the various sub-activities, however, the general theme of design phase is that all Project infrastructure will be constructed in accordance with national safety codes and safety clearances. On a sub-activity basis the following safety measures will need to be followed by the EPC Contractors designers.

650. Substations

- The separation walls or fire barrier walls shall be provided between the transformers / reactors or between transformer / reactor & nearby building as per Central Electricity Authority (Measures relating to Safety and Electric Supply) Regulations.

- Designs will ensure that there can be no illegal access to substations.

- Include a secure boundary fence or wall around the substations that is sufficiently high it cannot be climbed over, provide a gated, surfaced vehicular access for entry/exit off public highway having adequate sight lines for all drivers and warning signs of entranceway for road users. Ensure this is applicable to all substations to be rehabilitated, per the Corrective Action Plan.

651. UG Cabling

- To prevent against cable break incident of new UG cables, cable markings will be installed above the cable to inform those who may be excavating in future. In case the armor is broken by a third party and the core damaged, protection relays to which the UG cables connect will be designed to detect this and stop sending electricity immediately by automatically opening switchgear to prevent a live shock to the person.

- CSS/RMU located in the public domain will be in a secured cabinet that automatically locks shut so that members of the public cannot access electrical equipment, fence and kiosk to feature written and visual warning signs that meet the IEEE standards to include the ISO 7010 "Hazard Type: Electrical Symbol" warning of the risk of electrocution.

- If not already in-situ install around the base of all ground mounted transformers to which UG cables connect a fence with locked gate and for pole mounted transformers a fence or suitable anti-climbing deterrent, together with provision of hazard warning signs.

- Designs will ensure that there can be no illegal access to substations, CSS, RMU or to UG connection chambers.

652. OHL

- Barbed wire type anti-climbing device shall be provided and installed by the Contractor for all pole structures. The height of the anticlimbing device shall be provided approximately 3 m above ground level. The barbed wire shall conform to IS: 278 (size designation A1). The barbed wires shall be given chromating dip as per procedure laid down in IS: 1340.

- Include in the design of all poles and towers anti-climb features together with posting of written and visual warning signs to include the ISO 7010 “Hazard Type: Electrical Symbol” warning of the risk of electrocution.

- Each tower shall be fitted with a number plate, danger plate and a set of phase plates per circuit. The arrangement for fixing these accessories shall not be more than 4.5 m above the ground level.

653. EMF

- The EPC Contractor for the OHL will provide EMF calculations to PTCUL for review. If the results show that EMF levels above ICNIRP reference levels at properties close to the substation the use of shielding equipment/materials to decrease electromagnetic field exposure included will be provided.

Pre-construction Phase

654. Pre-construction is another important phase for community health and safety. During this phase the EPC Contractors for all phases will be responsible for the preparation and implementation of a **Community Health and Safety Plan** outlining all of the relevant measures in this EMP relating to community health and safety. The Community Health and Safety Plan shall include flow chart and contact details to deal with that situation should any community member be impacted during the works. Additionally, a **Traffic Management Plan** will be prepared considering both the safety of pedestrians and vehicles and need to avoid traffic congestion; it is to be developed in consultation with relevant local authorities to ensure proper execution of traffic controls including where temporary blockage of one lane of the road or footpath is needed for installation.

655. Communications with the community will be critical to the success of the Project. Specific mitigation measures to ensure communications with the community are effective and on-going, include:

- Local disclosure of the IEE including an executive summary translated into Hindi via the PTCUL website, PTCUL offices, existing substations, and other construction site offices.

- Provide brochures and posters on the main findings of the IEE and where the full version can be accessed, as well as a translation of the executive summary of the IEE, will be printed in Hindi and made available/displayed for public scrutiny at places easily accessible to affected persons.

- Provide notice boards at all substations, construction site offices and active work sites including details of the GRM including the name, designation, contact numbers, address of both the UPCL/PTCUL and contractor's GRM focal persons plus the timeline and process of redressal together with a suggestion box that will be regularly checked for any grievances received.

- Prepare a Project Safety Awareness leaflet to be distributed to all homes within the vicinity of the work sites. The leaflets shall provide information relating to the risks of interfering with the HV network. The leaflets will be written in Non-Technical language and will provide illustrations where practical. Leaflets will also explain the risk of kite flying close to OHLs and SS.

- Provide EMF awareness sessions at villages within 500m of LILO OHL and Substations. The awareness sessions should provide information regarding the findings of the IEE on

EMF and specifically discuss best practice reference limits for EMF and how they have been applied to the Project.

- Local communities as well as individual property owners within 500m are to be consulted when selecting sites for temporary construction facilities outside of substations prior to finalization of their location.

- Directly liaise one-on-one with receptors in the RoW or in the vicinity of entry/exit pits and above ground infrastructure footprint for underground cables including informal settlers/street vendors and specifically notify them about the commencement of work etc.

- UPCL will create a WhatsApp Group of Ward member. Before construction community leaders/ ward members will be informed through WhatsApp messages

Construction Phase

656. During construction phase EPC Contractors for all components will review measures to mitigate community health and safety impacts on a regular basis, and consult community leaders every six months (and monthly in Dehradun), informing them on the status of implementation and results, and discussing any changes needed to the Pollution Prevention Plan or the Community Health and Safety Plan in advance of proposed changes. They will undertake face-to-face with all communities/residents and schools, health centers, places of worship and community centers within 50m of the substations and ROW of HV lines to keep them fully informed of the nature of works and latest schedule, notifying them individually at least one month prior to the commencement of works of the intended start date and schedule.

657. Construction near schools will be completed in the summer and construction in commercial area, crowded area, religious places and public area will be done at night and after prior consultation with stakeholder groups.

658. A range of other general good practice measures (see **Appendix Q and R**) will be employed by the EPC Contractors for all sub-components relating to the provision of access, which is key for all UG works, and road safety. These measures will be supplemented by specific measures relating to LILO / OHL works such as erecting guard structures over roads and other infrastructure.

659. Implementation of the GRM will be a key focus of the EPC Contractors activities. The EPC Contractor's safeguards team will act as site GRM Focal and keep affected persons and local communities informed of the status of work and be readily available onsite to receive, document and deal with grievances at site level. The Project will also encourage use of the GRM and clarify that this does not prevent affected persons from pursuing any legal action, if they feel it is needed, and inform communities about the ADB Accountability Mechanism and their possibility to resort to it if any grievance is not resolved by the project level.

Operational Phase

660. During the operational phase UPCL will be responsible to ensure that all required operational phase corrective actions for existing substations to be rehabilitated are completed per the Corrective Action Plan (Table 69). Although no significant impacts have been identified associated with EMF UPCL and PTCUL should still undertake periodic monitoring of EMF at substations to ensure ICNRP occupational and community EMF exposure levels (reference

and peak values) are be achieved within the substation and outside of the fence line respectively.

Residual Impacts

Table 97: Community Health and Safety Residual Impacts

Phase	Potential Impact	Potential Impact Significance	Residual Impact	Residual Impact Significance
C	*Accidents at work sites (including traffic accidents)*	***Medium***	*A range of mitigation measures have been provided to help manage the risk of accidents occurring. However, despite these measures it is still possible that accidents could occur due to unforeseen circumstances.*	***Low***
C	*Social conflicts*	***Medium***	*Proposed mitigation measures, including the development of and implementation of a community health and safety plan should ensure that social conflicts are minimized during the construction and operational phases. No significant impacts anticipated.*	***No significant impact***
O	*Accidents involving electrical equipment*	***High***	*The safety measures recommended in this IEE, coupled with national safety standards, should ensure that all infrastructure is constructed and maintained to a standard which prevents significant impacts to community health and safety.*	***No significant impact***

8.5.2. Workers' Rights and Occupational Health and Safety (OHS)

661. The main Project-related activities that may result in OHS issues are:

- Accidents involving the use of heavy equipment.
- Accidents involving working at height.
- Accidents involving live power lines and equipment.
- Accidents involving construction vehicles.
- Accidents due to lack of, or poor application of, personal protective equipment (PPE).
- Accidents involving wildlife e.g. snake bites, leopard attacks
- Interaction with hazardous materials e.g. PCBs or asbestos
- Poor sanitary and welfare conditions at camps and work sites.
- Lack of first aid and medical facilities.
- Lack of fire fighting equipment.
- SEAH
- Exposure to EMF and SF_6.

662. Workers' rights including occupational health and safety need to be considered to avoid accidents and injuries, loss of man-hours, labor abuses and to ensure fair treatment, remuneration and working and living conditions. These issues need to be considered not only for workers who are directly employed by the Project but also sub-contractors and those that maybe informally employed including daily labor.

Potential Impacts

Construction Phase

663. The Project is expected create at least 50-100 direct employment opportunities per HV power line and 50 per substation during the peak of the construction period. Most workers will be engaged by the EPC Contractor and will consist of an unskilled, semi-skilled to skilled workforce. During the operational phase maintenance works will be undertaken by existing UPCL / PTCUL staff.

664. The expected impacts on worker rights and H&S because of construction, activities and Project operation are as follows:

- Risk to workers H&S due to hazardous construction activities and inadequate living conditions; and

- Violation of workers' rights.

665. Risks exist to construction workers particularly those who have not have received adequate training or are familiar with the hazards associated construction of electrical infrastructure projects or medically unfit for the work involved. Inexperience workers under the age of 18 would be particularly vulnerable from working on a hazardous construction site. Health and safety hazards faced while working at construction sites, handling machines, plant and equipment, driving vehicles etc. could result in minor or major injuries, potentially in the worst-case even death. In particular, work at heights and work with electricity are particularly dangerous activities required to implement the project. Only trained, medically fit workers are permitted to work with electricity and at height. Construction workers will be required to handle materials such as cement, chemicals, fuels, etc. which will increase health risks if personal protective equipment is not used.

666. Poorly designed temporary worker camp/overnight accommodation and sanitation and welfare facilities may pose a health threat and nuisance to the workers due to unsanitary and unhealthy conditions. Uncontrolled vending of food and drinking water at worksites may also pose a risk with respect to the transmission of diseases like typhoid, diarrhea, and dengue fever. Migrant and illiterate workers can be particularly vulnerable.

Operational Phase

667. The National Institute for Occupational Safety and Health (NIOSH) and other US government agencies do not consider EMF a proven health hazard.[99] However, according to the WBG electric utility workers typically have a higher exposure to EMF than the general public due to working in proximity to electric power lines.[100]

668. Spot EMF reading using smartphone-based app undertaken for the environmental audit of 25 substations indicated that levels were mostly low at all locations, inside office and near gates, varying between 21 uT – 52 uT. In one case the EMF levels were recorded to exceed

[99] https://www.cdc.gov/niosh/docs/96-129/default.html
[100] WBG EHS Guidelines. Electric Power Transmission and Distribution. 2007.

190 uT near the transformer and are likely in mid to high range. However, this is compared to ICNIRP exposure limits for occupational exposure of 415-500 uT.

669. Working with live equipment during maintenance of lines and operation of the substations also involves safety risks specifically relating to working at height and electrocution. The environmental audit completed for 25 substations noted that safety requirements and training and awareness of UPCL staff was found to be woefully inadequate. There are no written hazardous materials or solid and hazardous waste management systems and guidelines for substation personnel; there were no written Environment, Health and Safety procedures or trainings to prepare staff for emergencies. Inadequate Personal Protective Equipment (PPE) and first aid was recorded at all substations.

670. When an arc is formed in SF_6 gas small quantities of lower order gases are formed. Some of these by-products are toxic and can cause irritation to eyes and respiratory systems. This is a concern if the interrupters are opened for maintenance or at disposal of the interrupters. Normally these impacts only occur in enclosed areas.

671. Leopard attacks have been noted at several substations in rural areas. Fencing around substations should prevent leopards from entering substations, but this issue cannot be entirely ruled out.

Impact summary and assessment of significance

672. Table 99 provides an assessment of the significance of potential impacts to workers before implementation of the proposed mitigation measures that are discussed in the rest of this section.

Table 98: Potential Impacts to Workers

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	*Accidents involving workers*	*Contractors staff / sub-contractors*	*M*	*M*	*L*	*M*	*MOD*	*ST*	*SMALL*	*MED*	*POSS*	***M***
C/O	*Inadequate sanitation and welfare*	*Contractors staff / sub-contractors*	*M*	*M*	*L*	*M*	*MOD*	*ST*	*SMALL*	*MED*	*POSS*	***M***
C	*Workers' rights ignored.*	*Contractors staff / sub-contractors*	*M*	*L*	*L*	*L*	*MOD*	*ST*	*SMALL*	*MED*	*POSS*	***M***
O	*Health and Safety of Workers*	*Staff*	*M*	*M*	*L*	*M*	*MOD*	*LF*	*SMALL*	*MED*	*POSS*	***M***

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Medium Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely. Cells shaded in blue are positive impacts.

Mitigation and Management Measures

Design Phase

673. Most mitigation measures for the design phase relate to EMF and the safe design of substation buildings to protected workers. The provided mitigation measures (**Appendix Q and R**) are based primarily on national safety standards and the requirements of WBG EHS Guidelines. The measure ensure that such as fire safety, sanitation and noise levels are all accounted for in building designs.

674. Further, for all component construction works EPC Contractors will be required to undertake a health and safety risk assessment through a workshop during the design (and at other key stages) so it can inform both design and pre-construction preparations, considering both occupational and community H&S risks resulting from subsequent stages of the project. The facilitated workshop will involve the design and construction team of the EPC Contractors and operational (UPCL/PTCUL) staff.

675. A range of design measures have been proposed to ensure the safe management of SF6 under the topic of air quality, above.

Pre-construction Phase

676. During the pre-construction phase an important focus will be on the establishment of plans and workers contracts to ensure that provisions are in place to manage the health and safety of workers and ensure workers' rights are respected. Specifically, the following are required:

677. **Occupational Health and Safety Plan & Emergency Response Plan(s).** H&S plan to include emergency preparedness and response plan including flow chart and contact details to deal with situation should any construction worker or community member in the event of an incident during the works. The requirements of OHS Plan are included in **Appendix K**. The plan will also include an **OHS training Plan.**

678. **Labor Management Plan** addressing employment of migrant workers, sanitation and welfare, gender-based violence/sexual exploitation, abuse, and harassment prevention etc.

679. **Camp / Accommodation Management Plans** depending upon the site location and requirements of EPC Contractor.

680. **Code of Conduct (CoC)** and information video/brochure/leaflet for distribution to all workers during induction addressing culturally acceptable practices etc. CoC must be informed by the SEMP and address the following aspects:

- Zero tolerance in respect of health and safety.
- Requirement on always wearing PPE on site.
- Zero tolerance of bribery or corruption.
- Respect for local community and customs, avoiding community conflict situations.

- Zero tolerance of illegal and unacceptable activities/behavior, including but not limited to engagement in: prostitution; gender-based violence/sexual exploitation, abuse, and harassment; illegal sale or purchase of alcohol; sale, purchase, or consumption of drugs; gambling; fighting.

- Alcohol and drugs policy and testing regime.

- Role of workers in good housekeeping.

- Role of workers in maintaining good hygiene including COVID-19 measures e.g., social distancing.

- Respect of wildlife and the environment.

- Description of disciplinary measures for infringement of the code of conduct and other employer rules (e.g., immediate removal from site, fine etc.) will be included in staff contracts.

681. During pre-construction EPC Contractors shall also establish, through their Labour Management Plan, procedures for engagement of the workforce, for example through setting targets for local employment based on initial assessment of the labor market for unskilled and semi-skilled work force. EPC Contractors shall also ensure mitigation measures included in **Appendix Q and R** are included in workers contracts, including measures relating to working hours and salary and provision of insurance for workers.

682. If during the route survey existing transformers not maintained in good condition and to which the MLV lines must connect are identified these are to be reported to UPCL who will need to either remove or maintain/repair the transformer, so it is left in good condition. Health and safety risk assessment for exposure to PCBs to be undertaken before removal/maintenance/repair/connection work is undertaken on any existing transformers.[101]

Construction Phase

683. Extensive provisions for the health and safety of workers during the construction phase are included in **Appendix Q and R.** These measures are based on the requirements of national regulations and WBG EHS Guidelines. The measures relate to all components, except for the following items which focus more specifically on certain sub-activities:

- OHL - Require workers to test the structural integrity of poles/towers prior to proceeding with the work and use fall protection measures when working on poles/towers, i.e. mobile

[101] In the absence of documentary evidence (e.g., contract specification or certification for supply of original transformer, maintenance records for oil replacement including material safety data sheet, or transformer oil test results etc.) for given transformers confirming they are PCB-free, all old transformers must be considered by the staff at risk of containing PCBs. Mineral oil-filled transformers were not designed to use PCBs, but many have been found to be contaminated with PCBs due to oil changes etc. If existing transformers are at risk of containing PCBs UPCL will request the contractors to test them to inform their compliance with the Government of India Regulation of Use, Handling and Disposal of Polychlorinated Biphenyls by 31.12.25 (such testing by contractor is included in EMoP scope). In UPCL dechlorinating or removing those confirmed as containing PCBs from the distribution network by 31.12.25 follow national regulations for transport, storage, and disposal through facilities capable of safely transporting (closed trucks) and disposing of hazardous waste containing PCBs.

elevated working platform. All workers are also required to wear body harness when working at height.

- Existing Substations - Unless transformers have been certified PCB free workers interacting with them must wear suitable chemical and/or oil resistant gloves, goggles, and protective clothing whilst taking samples and/or working with transformers. Water supply to sink/shower and eye wash station to be provided on-site during works due to risk of PCB meeting skin.

- High Altitude Sites - Complete a risk assessment of all sites at high altitudes and design include specific measures to address any risks identified as part of the OHS Plan. Specific sites for action include:

    a. Lohaghat SS

    b. Pithrogarh – Champawat Second Stringing

    c. Existing SS Sites (Pines, Sarghakhet, Talla Ramgarh, Lamgarah, Tarikhet, Sawra)

Operational Phase

684. During the Operational phase UPCL / PTCUL will be responsible for following all national labour laws and health and safety laws and regulations (including those for sanitation and welfare). Other best practice measures will also be employed during the operational phase at substations, such as ensuring all electrical hazards feature written and visual warning signs that meet the IEEE standards to include the ISO 7010 "Hazard Type: Electrical Symbol" warning of the risk of electrocution and that potable water will be supplied that meets national drinking water standards and ISO 10500 drinking water parameters (full suite).

Residual Impacts

Table 99: Worker Residual Impacts

Phase	Potential Impact	Potential Impact Significance	Residual Impact	Residual Impact Significance
C	*Accidents involving workers*	***Medium***	*Inclusion of specific mitigation measures recommended by the WBG for power line projects as well as the requirements for preparation and implementation of an OHS plan, training of staff and provision of health and safety specialist on the EPC Contractors team should ensure that no significant residual OHS impacts remain during the construction phase. In addition, the EPC Contractor will be responsible for following all of the relevant national health and safety standards.*	***Not significant***
C	*Workers' rights ignored.*	***Medium***	*Impacts anticipated not to be significant after application of mitigation measures.*	***Not significant***

C/O	*Inadequate sanitation and welfare*	***Medium***	*Provision of adequate sanitation and worker welfare conditions should ensure that there are no significant residual impacts.*	***Not significant***
O	*Accidents involving workers*	***Medium***	*Mitigation measures proposed should help reduce the potential for accidents to occur. However, accidents cannot be completely ruled out during the lifecycle of the Project.*	***Low***

8.5.3. Noise and Vibration

685. This section discusses the impacts of noise and vibration during construction and operation of the Project and associated mitigation measures to be adopted.

Potential Impacts

686. General

687. During construction noise will be generated from the removal and/or cutting of vegetation, during the movement of construction vehicles, the operation of plant, equipment, and machinery on-site, presence of construction workers at the construction site, temporary worker camps and any overnight accommodation etc. Depending on ground conditions encountered piling could be required for PTCUL HV tower foundation construction (specifically near rivers and marshy areas), resulting in a large increase compared to the background noise level as well as ground vibration. These project activities will create noise impacts and in the absence of mitigation, short term, localized exceedance of noise standards/guidelines may occur although impacts are readily mitigated and reversible with ease in short term. Per the Government of India noise standards and WHO community noise guidelines, noise levels should not exceed 50 dBA (daytime) and 40 dBA (nighttime) in 'silent zones', 55 dBA (daytime) and 45 dBA (nighttime) in residential settings, 65 dBA (daytime) and 55dBA (nighttime) in commercial areas, and 70dBA in both the day and night time in industrial areas.

688. LILO / OHL Construction Noise - The combination of machinery being used at any one time during the construction phase will vary and noise levels will fluctuate accordingly. Table 101 indicates the timescale for various activities and the types of equipment required.

Table 100: Construction Activities and Sound Levels

#	Activity	Timescale Per Tower	Equipment	Typical Sound Level Data at 10m*
1	Clearing and grading activities	2 days	Grader**	82
			Bulldozer (20t)	81
			Pick-up truck	75
2	Transporting materials to the tower site	2 days	Pick-up truck	78
			Lorry (4 axle)	80
3	Constructing foundations and anchors	2 weeks	Excavator (22t)	71
			Bulldozer (20t)	81
			Backhoe (8t)	88
			Pneumatic Tools	95
			Pick-up truck	75

			Lorry (4 axle)	80
4	Assembling and raising the towers	1 week	Crane (110t)	67
			Pick-up truck	75
			Lorries (4 axle)	80
5	Earthing tower	2 days	Auger drill	79
			Pick-up truck	75
			Backhoe (8t)	88
6	Unreeling and Installing the Conductors	2/3 days	Mobile Bullwheel tensioners	85
			Crane (110t)	67
			Mobile Winch	85
			Pick -up trucks	75
			Lorries (4 axle)	80
7	Restoring the Site	2 days	Bulldozer (20t)	81
			Backhoe (8t)	88

* Based on BS 5228 – 1:2009 – Assumes each piece of equipment working 25% of the day
** Based on data from US DOT FHA (https://www.nrc.gov/docs/ML1805/ML18059A141.pdf)

689. Based on these activities the following noise levels can be assumed based on each piece of equipment in operation for 25% of a ten-hour working day. [102]

Table 101: Estimated Noise Levels for Various Construction Activities

Activity	Sound Level dBA LAEQ 10 HR		
	10m	100m	150m
1/ Clearing and Grading	**79**	**59**	55
2 / Transporting materials to the tower site	**75**	**56**	53
3 / Constructing foundations and anchors	**90**	**70**	**67**
4 / Assembling and Raising the towers	**75**	55	52
5 / Earthing Tower	**83**	**63**	**59**
6 / Unreeling and Installing the Conductors	**83**	**63**	**59**
7 / Restoring the Site	**83**	**63**	**59**

690. Table 102 indicates that most of the construction activities are likely to result in some intermittent elevated noise levels for short periods of time (approximately 8 weeks in the location of each tower), especially during foundation works.

691. It is possible that piling could be required at some tower sites, this could result in high levels of localized vibration around the work sites.

692. Underground Cabling - For underground cables in urban areas whilst background noise levels may already be high, there are a many sensitive receptors that could be affected by the loud construction noise and vibration that will result from drilling or open trenching within the roadway immediately adjacent to properties; the activity that will result in greatest disturbance will be the use breakers generating noise levels of 80-95 dBA at 10m. Unmitigated, and ignoring other sources of urban noise, noise levels of 70dBA would be experienced up to about 175m and in the absence of any barriers to propagation it would be 1km before they reduced to 55dBA. Suitably designed mufflers or sound reduction equipment and ensuring all

[102] Assumptions are based on the IEE consultants experience of High Voltage transmission line construction projects in Uzbekistan (Northwest Region Power Transmission Line Project). Construction noise levels are also aligned with other recent ESIAs prepared by NEGU for EBRD (Navoi - Besopan Transmission Line Upgrade, Uzbekistan).

leaks in the air line are sealed can reduce their noise level by up to 15dBA meaning noise levels could be reduced to 55dBA within 200m. No blasting or piling is required for UG works.

693. Substation Construction / Rehabilitation Noise - The combination of machinery being used at any one time during the substation works phase will vary and noise levels will fluctuate accordingly. In general noise levels at 15m distance from the source are anticipated to be no greater than 85 dBA [103], and around 66 dBA at 100m, based on equipment operation for 50% of a ten-hour working day. Substation works may take approximately 6 months to complete at each site, meaning that elevated noise levels during the construction phase can be anticipated for at least 6 months at the identified receptors in Table 103. No piling or blasting is required.

Table 102: Sensitive Noise Receptors – New Construction

#	Sub-activity	Distance to nearest receptor	Approximate Number of Receptors within 150m
PTCUL LILO			
1	Kathgodam - Rudrapur	40m	20
2	Khatima - Sitarganj	29m	60
3	Manglaur - Nara	38m	100+
4	Kashipur - Mahuakheraganj	32m	100+
PTCUL OHL			
1	Mahuakheraganj - Jaspur	32m	100+
PTCUL Substations			
1	Dhaulkhera	90m	5
2	Sarvarkhera	100m	5
3	Selaqui	80m	35
5	Araghar	10m	100+
6	Khatima-II	10m	50
PTCUL Second Stringing Line			
1	Pithrogarh – Champawat	Within 10m	50+ (not possible to accurately define number of receptors along this line through the mountains)
PTCUL UG LILO			
1	Majra-Laltappar	10m	100+
2	Khodri-Jhajra	70m	35
UPLC UG			
1	Dehradun	Sensitive receptors along all alignments	100+
UPCL Substations			
1	Near Collectorate	150	25
2	Bharauni	160m	2
3	Kaniya	12m	35
UPCL OHL			
1	Near Collectorate	15m	100
2	Bharauni	5m	100+
3	Kaniya	5m	100+

[103] *https://ia.cpuc.ca.gov/environment/info/ene/mesa/attachment/A1503003%20ED-SCE-01%20Q.PD-01%20Attachment%20(Revised%20Noise%20Levels%20Construction%20Equipment).pdf*

Table 103: Sensitive Noise Receptors – Substation Upgrades

#	Audited substation	Buildings in 50m, including community facilities	Distance to Nearest Residential Property
1	Sahastradhara	Private houses (3), crematorium (SS boundary) UPCL staff quarter	3m
2	Hatibarakala	Two hotels adjacent to site	50m
3	Sahiya	Two private houses and UPCL staff quarter	2m
4	Rudrapur	One shop & one poultry farm	25m
5	Ramnagar Danda	One school- 3m, Village Panchayat Office- 3m (Located opposite SS, across access road)	Isolated house – 175m
6	Lal Tappar	Five houses/huts – labour & family working in the industries	Labour hut - 3m
7	Tarikhet	Vacant UPCL staff quarter, private houses & shops, temple, hospital	0m
8	Bajol Ranikhet	One temple inside SS	
9	Lamgarah	Vacant UPCL staff quarter, 2 houses, 1 Monk's hut being built – 45m	40m
10	Kamalwaganja	UPCL staff quarters, private house, shop, temple	0m
11	Transport Nagar	Commercial offices, private house, shops	30m
12	Phoolchaur	Private houses, shops, school – adjacent to SS	20m
13	Garampani	Private houses, UPCL Staff quarters, primary school	2m
14	Talla Ramgarh	Private residence, School – 30m	0m
15	Sarghakhet	UPCL staff quarters, one private residence and multiple hotels	10m
16	Pines		20m
17	Matkota	Private house, UPCL staff quarter, community hall, temple, medical college & hospital (under construction)	UPCL staff quarter with SS area, private residence- 60m
18	Bhadaipura	Private house -4 nos, Hospital -60m	Adjacent to SS
19	Lalpur	School compound- adjacent to SS, private house- 2nos	45m
20	Sitarganj	UPCL staff quarters, private houses- 2nos	50m
21	Jhankat	UPCL staff quarter, private residence-03, school-10m, health centre-30m	0m
22	Kashipur	UPCL staff quarter, private residence, government office-0m, Hospital-5m	0m
23	Doraha	UPCL staff quarters, private house 4	5m

Operational Phase

694. OHL / LILO Corona Noise - Literature studies undertaken by EirGrid indicates that "Corona Noise" only becomes a significant issue from 350-500 kilovolts (kV) and above. The Public Utilities Commission of California also indicate that corona noise is usually not a problem over 230kV. [104] This would suggest that significant "Corona Noise" impacts may only be likely on the 400 kV Kashipur-Puhana (2.48km). [105] However, there are no sensitive receptors close to this LILO (**Error! Reference source not found.**).

695. New Substation Noise - Large zone substations typically have at least two step-down transformers that emit noise most commonly in the low frequencies between 100Hz and 200Hz. In addition, the noise hum is specific to each site. During the day the noise hum from the transformer is typically hidden, or masked, behind noise from traffic and industry. At night, when the background noise drops, the hum becomes more perceptible, annoying residents and in some cases impacting on their health.

696. Baseline noise monitoring at substations shows an average of 59dB daytime and 47dB nighttime at the substation boundary. The difference in ambient noise levels is assumed to be associated with daytime human activities around the substation as substation noise is not anticipated to change throughout the day (unless for maintenance). It can therefore be assumed that the average noise levels at the boundary of substations is around 47dB, two dB higher than IFC guideline limits and national standards for nighttime noise in a residential area. Several of the new substations are to be located close to residential receptors including:

- Araghar SS – 10m
- Khatima-II SS – 10m
- Kaniya SS – 12m

697. At these locations it is possible that nighttime noise limits could be exceeded by approximately 2dB.

698. Existing Substation Noise - For existing substations the Project involves the installation of new modern equipment which will have noise levels lower than, or at a maximum, the same as existing equipment meaning that there is unlikely to be an increase in noise levels from the SS of more than 3dBA above existing ambient noise levels.

699. The Project will take a precautionary approach to operational noise to ensure that operational noise levels do not impact negatively upon residential receptors.

Impact summary and assessment of significance

700. **Error! Reference source not found.**Table 105 provides an assessment of the significance of potential noise and vibration impacts before implementation of the proposed mitigation measures that are discussed in the rest of this section.

[104] *https://ia.cpuc.ca.gov/Environment/info/aspen/tri-valley/17%20-%20Corona%20and%20Induced%20Current%20Effects.pdf*

[105] EirGrid Evidence Based Environmental Studies Study 8: Noise. Literature review and evidence based field study on the noise effects of high voltage transmission development. EIRGrid, 2016

Table 104: Noise and Vibration Potential Impacts

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	*General construction activities*	*Local community*	*H*	*M*	*L*	*M*	*MAJ*	*ST*	*SMA*	*MOD*	*DEF*	***M***
O	*New Substation Noise*	*Local community*	*L*	*M*	*L*	*M*	*MOD*	*LT*	*SMA*	*MOD*	*DEF*	***M***

Key: *H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Medium Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely. Cells shaded in blue are positive impacts.*

Mitigation and Management Measures

Design

701. Key mitigation during the design phase relates to siting of equipment within substations and selecting equipment that guarantees noise levels. Specifically, EPC Contractors will ensure that the design enables operation to always comply with 1-hour LAeq 70 dB(A) at the site boundary, 55dB(A) outside the fence line if located within a commercial zone, 45 dB(A) at the nearest residential properties including located those in commercial zones, and 40dB(A) within100m distance from silent zones. This shall be achieved by:

- Use low noise generating equipment e.g., less than 55dBA sound pressure level at 1m; and
- Layout substations so transformers are the furthest distance possible from the adjacent receptors to minimize corona noise/transformer hum experienced.

702. However, as a precautionary approach, an acoustically designed enclosure or fence will be installed around transformers to enable the required noise level to be met as a permanent installation as part of the design. Specific substations where receptors have been identified within 50m include for installation:

- Araghar SS
- Kahtima-II SS
- Kaniya SS

Pre-construction

703. EPC Contractors for all components will be responsible for the preparation and implementation of a **Pollution Prevention Plan** covering noise management.

Construction

704. To manage potential noise impacts during construction of all components a range of good practice measures will be applied to all project components. These measures will be particularly important in urban areas such as Dehradun. Here the important mitigation measures will be to inform people in advance of noisy activities and to ensure that construction in residential areas is only undertaken during daytime periods. Where practical works should avoid the weekend. Work close to schools will be scheduled for holiday periods to avoid disturbance to students.

705. Other measures such as installation of temporary noise barriers can also be applied. All the proposed construction phase measures are outlined in detail in **Appendices Q and R**.

706. Where possible EPC Contractors will avoid soil compaction, piling, and other vibration inducing activities as much as possible. In locations where this is unavoidable the EPC Contractor will identify properties within the zone of influence and undertake pre-construction structural surveys to identify level of risk. If risk of structural damage to properties identified due to current condition consideration of alternative construction methods or temporary relocation of occupants during works if at risk shall be undertaken. During any piling works the EPC Contractor shall install monitors during construction to monitor structural movement. Structural or cosmetic damage to be repaired by the EPC Contractor to at least pre-project condition at their own cost.

Residual Impacts

Table 105: Residual Noise and Vibration Impacts

Phase	Potential Impact	Potential Impact Significance	Residual Impact	Residual Impact Significance
C	*General construction activities*	***Medium***	*Some short-term elevated noise impacts may occur during the daytime. Keeping work to short durations and the use of temporary mobile noise barriers should reduce the noise levels to acceptable levels during the working day.*	***Low***
O	*New Substation Noise*	***Medium***	*Noise barriers will reduce noise levels to within acceptable limits.*	***Not significant***

8.5.4. Physical Cultural Resources

707. This section discusses the impacts upon physical cultural resources (PCR) during construction and operation of the Project and associated mitigation measures to be adopted.

Potential Impacts

708. There are no international, national or state important archaeological, historical, religious or cultural sites at the substation sites or along the indicative OHL / UG alignments, or close to new and existing substations. Local PCRs such as temples are however found in the wider project area as discussed in Section 6.4.5 Physical Cultural Resources. It is also possible that chance finds could occur during excavation works for all components.

Impact summary and assessment of significance

709. Table 107 provides an assessment of the significance of potential impacts to PCR and cultural landscape before implementation of the proposed mitigation measures that are discussed in the rest of this section.

Table 106: PCR Potential Impacts

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	*Damage to Local PCR*	*Local PCR*	*L*	*M*	*M*	*-*	*MOD*	*ST*	*SMA*	*LOW*	*POSS*	***L***
C	*Unanticipated PCR*	*Unidentified PCR*	*L*	*M*	*L*	*-*	*MOD*	*ST*	*SMA*	*LOW*	*POSS*	***L***

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Medium Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely. Cells shaded in blue are positive impacts.

Mitigation and Management Measures

Pre-construction Phase

710. EPC Contractor for all components will be required to conduct an inventory of physical cultural resources in and adjacent to the RoW and within 50m of substations prior to the start of any works. Where any PCR is identified within the RoW they will be demarcated and where any are found to be directly impacted, due to their presence within the RoW micro-alignment changes will be made to avoid impacts to the sites.

711. All local PCR adjacent to worksites will be identified and temporary barriers placed around them to ensure no damage by equipment and machinery.

Construction Phase

712. A **Chance Find Procedure** will be developed for implementation for all components in the event physical cultural resources are found. The procedure will include at least the following:

- If suspected physical cultural resources are encountered, all works at the find site should be immediately halted.
- The find should be assessed by a competent local official managing cultural issues, and procedures to avoid, minimize or mitigate impacts to such physical cultural objects should be agreed in writing with them.
- Work should not begin until the procedures to avoid, minimize or mitigate impacts to the physical cultural resources have been agreed and implemented in full.
- If avoidance is not feasible, and no alternatives to removal exist, and the Project benefits outweigh the anticipated cultural heritage loss from removal which is unlikely unless in case of resource of local value, following clearance of ADB the physical cultural resources should be removed and preserved using the best available technique in accordance with relevant provisions of national heritage protection laws and decrees.
- Records should be maintained of all finds, including chain of custody instructions for movable finds.
- All construction workers to be made aware of the chance-find procedure and types of finds to be reported.

Residual Impacts

Table 107: Residual PCR & Cultural Landscape Impacts

Phase	Potential Impact	Potential Impact Significance	Residual Impact	Residual Impact Significance
C	*Unanticipated PCR*	***Low***	*Implementation of a chance find procedure will ensure that residual impacts are not significant*	***Not significant***
C	*Local PCR*	***Low***	*Mitigation measures provided should ensure that there are no significant residual impacts*	***Not significant***

8.6. Cumulative and Induced Impacts

713. Given the wide coverage of the Project across Uttarakhand it is possible that other projects may be on-going at the time of sub-activity construction which could lead to cumulative impacts. However, it is not possible at this stage to make regional assessment of such projects without extensive consultations across the whole of the state.

714. One key cumulative impact of the Project relates to the cumulative nature of all the proposed sub-activities. Some of them will be constructed in close proximity to each other, e.g., substations and LILO / OHLs, but these activities will be completed by the same contractor or at least under the same PMU and therefore works at these sites can be closely coordinated, equipment and camp sites will be shared, and environmental and social issues can be managed by the same contractor's EHS staff. Thus, the risk of significant negative cumulative impacts occurring will minimal.

715. Another key cumulative impact will be that of air quality, dust and health and safety in Dehradun where other projects may be on-going close to Project sites. Here particular attention to dust management should be given and close coordination between UPCL / PTCUL and the PWD is needed to ensure that works in close proximity to one another are avoided as far as practical to reduce the potential for significant cumulative impacts.

716. The cumulative effect of all projects in the operational phase will be hugely beneficial to the local population and will induce growth in the regional economy.

717. No changes to land use are anticipated to be induced.

8.7. Transboundary Impacts

718. The Project will not result in any significant transboundary impacts.

IX. STAKEHOLDER ENGAGEMENT, INFORMATION DISCLOSURE AND GRIEVANCE MECHANISM

9.1. Public Consultation Requirements

719. According to the ADB Safeguard Policy Statement (2009):

"*The borrower/client will carry out meaningful consultation with affected people and other concerned stakeholders, including civil society, and facilitate their informed participation. Meaningful consultation is a process that:*

- *Begins early in the project preparation stage and is carried out on an ongoing basis throughout the project cycle;*
- *Provides timely disclosure of relevant and adequate information that is understandable and readily accessible to affected people;*
- *Is undertaken in an atmosphere free of intimidation or coercion;*
- *Is gender inclusive and responsive, and tailored to the needs of disadvantaged and vulnerable groups; and*
- *Enables the incorporation of all relevant views of affected people and other stakeholders into decision making, such as project design, mitigation measures, the sharing of development benefits and opportunities, and implementation issues.*

Consultation will be carried out in a manner commensurate with the impacts on affected communities. The consultation process and its results are to be documented and reflected in the environmental assessment report."

9.2. Stakeholder Engagement Activities

9.2.1. Key Stakeholder Engagement Findings to Date

720. To date over 75 different consultation sessions with 560 people (257 male, 303 female) have been undertaken for environmental and social safeguards on components 1 and 2 as follows. Of these 397 consultees were contacted in relation to the IEE (250 male, 147 female) whilst the rest were consulted for social safeguards:

- PTCUL HV Substation Consultations: 10 sessions comprising 105 people
- PTCUL HV Power Line Consultations: 11 sessions comprising 180 people
- PTCUL HV Power Line Consultations with Gram Panchayats: 8 sessions comprising 85 people
- UPCL Existing Substations: 17 sessions comprising 30 people

- UPCL UG, Dehradun: 23 sessions comprising 27 ward members as representatives of affected people

- UPCL UG, Dehradun Multi-stakeholder Consultation: 1 session comprising 40 people mostly Ward member representatives of affected people (Each ward member representing an average of 5,000 people).

- UPCL UG, Dehradun: One site walkover session consulting with 35 residents and business owners.

- UPCL New Substations: 3 sessions comprising 36 locals.

- Divisional Forest Officer (DFO) Champawat (12 December 2022) and Dehradun (25th November 2022) as well as the Wildlife Institute of India and the Archaeological Survey.

- No record is available of the balance of persons who have been consulted per the total.

721. The following section summarizes the findings from the environment safeguard consultations completed to date.

9.3. PTCUL HV Substation and HV Power Line Consultations

722. Consultations were completed at all PTCUL substations and at five HV power lines (separate consultations were not completed for 132 kV Kathgodam – Rudrapur, 132 kV Khatima - Sitarganj or 400 kV Kashipur-Puhana, as consultation for the associated substations covered these short LILO lines where few receptors are located).

723. Table 110 and

724.

725. Table 111 summarize the findings of the consultations, along with any IEE measures required to address identified concerns. Photos of meetings and attendance sheets are provided in **Appendix J**.

726. Consultations were also held with 39 Gram Panchayats along the routes of eight HV power lines. The consultations with Gram Panchayats between 8th and 19th December 2022 covered 85 participants in total. Table 108 provides the coverage of villages along each of the transmission line corridors.

Table 108: Coverage of Consultation along High Voltage Power Lines by PTCUL

#	TL Name	Number of Villages	Number of Gram Panchayats (GPs)	Number of GPs Consulted	Total Number of Participants
1	400 KV Kashipur-Puhana	4	2	2	4
2	220 KV Manglapur-Nara	24	16	14	31
3	220 KV Roorkee-Nara	2	2	2	3
4	132 kV Manglore-Asahi	2	2	2	3
5	132 KV Khatima-Sitarganj	2	2	2	4
6	132 KV Kashipur-Mahuakheraganj	7	7	6	15
7	132 KV Mahuakheraganj-Jaspur	15	12	10	23
8	132 KV Kathgodam-Rudapur	1	1	1	2
	Total	57	44	39	85

Source: PTCUL

727. The participants did not express any major objections or concerns on the power line alignment discussed with them. The feedback received from these consultations are summarized in Tables 110-112.

Table 109: Feedback from consultations with Gram Pradhans along overhead high voltage power lines

#	Issue or Impact	Feedback	IEE Follow-up
1	Route alignment	• The high-voltage power lines should be sufficiently away from the village habitation and house clusters. • The future expansion of the habitation should be kept in mind while determining the route as it puts long term constraints for villagers to meet	• Safety clearances required by law ensure that HV lines are not close to properties. • Efforts are made as part of any HV power line to optimize routes and avoid compensation for land impacts.

#	Issue or Impact	Feedback	IEE Follow-up
		their future land requirement for habitat expansion. • The route alignment should use existing or available ROW for other linear infrastructure such as National Highways, which will minimize requirement of imposing fresh ROW restrictions. • The tower locations should avoid productive agricultural land wherever possible.	
2	Information sharing and consultation with community	• The affected persons should receive notice or communication about the power line construction in advance. • The information sharing and consultations should be done on a continual basis.	• Measures to communicate with stakeholders prior to works and throughout construction are included in the IEE.
3	Compensation for land	• The compensation determined based on circle rate by District Magistrate is less than the actual market rate. • The payment of compensation is not done in time. • The compensation determined for peri-urban areas is very less compared to their actual market price. The ROW restrictions puts a larger economic loss to the owner.	• Compensation will be made according to the RP
4	Compensation for crops and other damages	• The communities should be consulted to schedule the construction work that will prevent damage to crops. • The delay in compensation payment to be avoided. • The area of crop damaged determined by the government officials is often less than the actual damage caused.	• The IEE includes the requirements to complete construction outside of the cropping season. • Other items addressed as part of the RP.
5	Local benefit sharing	• The local people should get opportunity to work during the construction phase, which will generate employment and income for some households. • The villages along the power line corridor should receive benefits such as providing street lighting through CSR fund utilization.	• Streetlighting is not provided as part of the HV power line activities. • Targets for local recruitment from the local communities will be agreed with PTCUL based on initial assessment of the labor market for unskilled and semi-skilled work force.
6	Grievance mechanism	• There should be a grievance mechanism (preferably a help-line number) on which affected persons or other community members can	• A GRM with help-line number has been prepared. • Notice boards at all substations, construction site offices and active work

#	Issue or Impact	Feedback	IEE Follow-up
		register their concerns and complaints. • Such complaint numbers should be displayed at all work sites as well as communicated to Gram Panchayats.	sites including details of the GRM including the name, designation, contact numbers including phone/SMS/What's App, address of both the PTCUL and contractor's GRM focal persons plus the timeline and process of redressal together with a suggestion box that will be regularly checked for any grievances received.
7	Trees, Ecological Features	• In the entire Project Area the line is not passing through any forest area. It is passing through agricultural fields. Timber trees (Poplar) have been planted on the agricultural fields in the 220 kV Roorkee Nara line, 132 kV Manglore- Asahi line, 220 KV Manglaur – Nara line and 132 kV Mahuakheraganj-Jaspur line. The Gram Pradhans informed that growing poplar is more profitable than cultivating crops owing to higher income and less efforts required. Farmers are switching to cultivation of timber trees due to the increased demand from paper and ply board industries located both around Roorkee industrial area and maximum around Kashipur region. The trees mature in a period of 7 years and can be sold anytime between 4-7. They do not require the permissions from DOF for cutting these trees. • All the consultees reported that they have not observed any significant fauna in their villages. Raptors have not been seen in the area for quite long time. • Earlier the carcass dumping was done in the vacant places in the village outskirts but now due to the growth of settlements, this practice has stopped. Land used for dumpsites have also been utilized in settlements and urban expansion process. • Generally, the villagers dump carcass in their own fields at a depth of more than 5 metres to avoid the risk of digging of soil by dogs, etc.	None

#	Issue or Impact	Feedback	IEE Follow-up
8	Community Health and Safety	• The excavations for the towers during construction stage should be barricaded or protected so that domestic animals and community members do not fall into it accidentally. • The tower bases should have protection that prevents climbing up on the tower by any person.	• All work sites will be appropriately signposted and isolated (through fencing or bunting) to prevent encroachment into these areas. Where there are open excavations then solid fencing barrier must be used. • Anti-climbing devices shall be installed on each transmission tower to prevent injury to anyone climbing the structure.

Table 110: PTCUL HV Substation Public Consultation

Consultation	Date	Number of Participants			Comments	IEE Follow-up
		Tot	M	F		
220 kV Selaqui, Dehradun	10.05.2022	38	33	5	A consultation was held with the PTCUL officials and industry representatives of Selaqui industrial area around the existing 33 kV Selaqui SS site on 10.05.2022. Following was discussed: • The proposed site is located in industrial area and this SS has been demanded by the Industry Association for quite long, since industries need continuous power supply and voltage for its operations. • They were not much concerned with the health and safety risks from SS. • They informed that power supply interruptions especially during the rainy season hampers their work. Industry representatives requested for immediate execution of this project.	None required
Araghar, Dehradun	25.11.2022	7	7	0	A consultation was held with the PTCUL officials at the SS site on 25.11.2022. Following was discussed: It was discussed that since the site is in possession of UPCL and presently being used as an open store for redundant electrical equipment, there is possibility of soil contamination through oil leaching into the soil and that contamination needs to be checked and treated. It was also discussed that local community is living close to the site, hence all safety risks should be ascertained and measures needs to be employed. PTCUL officials agreed to this.	Methods to manage soil contamination at substations are included in the EMP. Specific measures to help manage community safety risks have been included in the EMP.
132/33 kV Khatima-II, US Nagar	23.08.22	7	5	2	A Consultation was held with the PTCUL officials and the local community residing nearby the proposed SS site on 23.08.2022. Following was discussed: • The neighboring houses are not legal owners of the land. • They informed that agriculture is the main source of livelihood. There is a Piggery also nearby (Anil Sonkar). • Residents were aware of the project planning (new SS) but were not aware of the safety risks. During the site visit it was monsoon season and road condition/site water logged and damaged Community expected that construction of SS would trigger development of the area and basic amenities like roads.	Specific measures to help manage community safety risks have been included in the EMP.

Consultation	Date	Number of Participants			Comments	IEE Follow-up
		Tot	M	F		
132/33 kV Dhaulakhera, Nainital	24.08.22	7	6	1	A consultation was held with the UPCL, PTCUL officials and locals at the SS site on 24.08.2022. Following was discussed: • The proposed site is located in industrial area and is in the premises of an existing 33 kV SS of UPCL. It was discussed with PTCUL officials that there may be soil contamination due to existing storage of equipment and transformers at site, which needs to be assessed and treated. PTCUL officials agreed to this. • Discussion was also held with few workers of the neighboring Balaji stone crusher regarding the power supply situation. They informed that power supply situation is generally good and hampered only during weather disturbances. It is restored within few hours. • They informed that they stay at Bachhipur which is the nearest habitation and other amenities like school and hospital are in Bachipur which is 2 km from the SS. • They have not noticed any specific fauna and flora near the site. Common fruit trees are grown like guava, mango, etc. Sal trees are found in the forest which is quite far. • The workers were not aware of the safety and health risks due to SS in vicinity and were not much concerned.	Methods to manage soil contamination at substations are included in the EMP.
132 kV Substation Lohaghat, Champawat	21.09.22	12	9	0	A consultation was held with the PTCUL officials, local community near the proposed site and Contractor of ongoing works of 132 kV Pithoragarh-Champawat line (single circuit line double circuit tower). Following was discussed: • It was informed by the JE PTCUL that clearance for the single circuit on double tower stringing has been taken and accordingly works were started. Presently works on few towers is left. Tree felling has already been done. This line will connect the Lohaghat SS to the PGCIL grid. • Contractor of existing works informed that for the stringing works dedicated labour is employed from West Bengal. Now since few works are remaining so labour has been demobilized. A labour camp cum storage shed of the existing works was also shown. He was also questioned regarding sanitation facilities in the work sites and labor camps. It was	Provisions warning workers of risk relating to leopard attacks included in the EMP.

Consultation	Date	Number of Participants			Comments	IEE Follow-up
		Tot	M	F		
					informed that labor generally moves with the work stretch. Mobile toilets were provided. (Biodigester based) • Maximum unskilled labor was hired from nearby villages. • Community members were aware of the project. They were not aware/expecting any health/safety risk due to the SS. Village is at 1.5 km from the proposed site. • They informed that the main income source is agriculture but it is only subsistence agriculture. Agriculture yield is further shrinking due to monkeys and wild boar, etc. • Many people have migrated to the nearby cities to work. • They were also asked about any specific flora/ fauna noted in the region. It was replied that leopard siting is quite common during late hours, however, man animal conflict issue has not been reported in the area. • The area is sensitive to landslides especially during the rainy season when landslides occur due to heavy rain.	
220/132/33 kV Manglore, Haridwar	20.06.22	8	6	2	A Consultation was held with the PTCUL officials and the local community at the site of 220/132/33 kV Manglore SS on 20.06.2022 and 09.12.2022 regarding the construction of 220/132/33 kV Manglore SS. Following was discussed: • PTCUL officials informed that purchase of land has been completed and land has been acquired. • Discussion was held with the landowner from whom the land has been purchased. He informed that site is an agricultural land and the surrounding agricultural fields belong to the local community of Gadarjuda. • He submitted that he has willingly sold his land to PTCUL. There was standing crop on the site but he agreed that he is using the land for cultivation till PTCUL starts construction activity. • Regarding the presence of few trees at the boundary of site PTCUL officials informed that tree felling is not required. • The locals informed that they used to grow crops but now they are switching to timber cultivation. Poplar, eucalyptus are the preferred choices for timber cultivation, since Poplar matures	None required.

Consultation	Date	Number of Participants			Comments	IEE Follow-up
		Tot	M	F		
					in about 7 years, is low maintenance and earns a much better revenue. • On the question of safety and health risks from the SS and lines, the locals were not much aware. One person informed that they have been working in the area from past many years, but haven't seen any untoward incident. • The locals have not spotted any specific fauna in the region.	
Gadarjuda Mangalore (near SS site)	18.04.23	5	0	5	A one-to-one consultation was also held with the women at the village. Following was discussed: • It was informed that most of the women of the village work in agriculture and related activities. • Women were asked about the situation of electricity in their area. They informed that power supply is generally fine except for disturbances during bad weather. • Women were not much aware of the health and safety risks from the SS and associated lines. They have not noticed any accidents but humming from the lines. • They requested some capacity building and livelihood opportunities for them from the project, so that they can meet their daily needs.	No specific mitigation measures provided, but it is important to ensure that local community are provided with the opportunity to work on the Project.
400/220 kV Landhora	20.06.22	7	5	2	A Consultation was held with the local community at Landhora and the PTCUL officials regarding the construction of 400/220 kV SS at Landhora on 20.06.2022. Following was discussed: • The site is surrounded by agricultural fields of the local community. PTCUL officials informed that land is in their possession, but they need to acquire more land as they wanted to construct an AIS SS. However, they may go for GIS, if additional land is not procured. • It was found that lot of soil excavation has been done at the site leading to loose soil at site. The locals informed that soil has been excavated for road building activities leading to • Few locals were present at the site out of which there were 2 women, who informed that they live in the nearby Sundari village and come here for collecting grass for their animals and dry twigs for burning. They had a very faint idea of the project.	Recommendation to ensure designs account for soil conditions at this site included in the IEE.

Consultation	Date	Number of Participants			Comments	IEE Follow-up
		Tot	M	F		
					They had no concern with the safety and health risks. They informed that their village is quite far. They did not notice any specific fauna and flora in the area.	
132/33 kV Sarverkhera	18.03.23	12	11	1	A Consultation was held with the PTCUL officials and locals at the proposed site of Substation on 18.03.2023 regarding the construction of 132/33 kV Sarvakhera SS. PTCUL officials informed that purchase of land is in still in process. Following was discussed: • It was discussed that the land use of the site is industrial. • Emissions and noise from neighboring Industry Pashupati Laminators was noticed. It was informed by the Security guard that the noise is continuous as the factory operates continuously. • Locals informed that the workers of the nearby factories live in surrounding areas in rented accommodations. sometimes there is high smoke/ air pollution due to a rubber tyre industry which is also nearby. • When asked about forests and wildlife, it was informed that surrounding is all industrial and agricultural area, • They have not noticed any significant fauna or flora in the area. • There is also tree plantation of timber trees like eucalyptus, poplar, etc. by the locals on fields especially at the boundary of the fields which are sold when they gain maturity at the age of 6-7 years. • There was some waste at site in gunny bags. On asking from the guard, it was informed that waste may be of the industry which was earlier located on the site. The nature and type of waste was not known. • The consultees were not aware of any health and safety risk due to the SS. PTCUL officials also informed that the tapping shall be done from Kashipur Thakurdwara line which is approximately 2 km from the site.	Removal of waste from the site per the requirements of the IEE.
132/33 kV Sarverkhera	21.04.23	25	22	3	Consultation was held with the locals of village Hariyawala at the Community Hall. Following was discussed: • Locals were informed about the project scope and objectives. It was informed that a new 132/33 kV Substation of PTCUL is	None required.

Consultation	Date	Number of Participants			Comments	IEE Follow-up
		Tot	M	F		
(Gram Pradhan office Harriyawala and Community hall)					coming in their area. A brief on ADB safeguards requirements and compensation mechanism was also given to the villagers. • Discussion was held on the potential risks from the substation, the HV line and mitigation measures. • Locals were not aware of risks from SS and lines and informed that they have not encountered any problems due to the existing HV lines passing through their areas. • The Gram Pradhan (Village Head) informed that almost 70% of the population is landless and the average landholding is 10 acres. There is huge development in the region due to many industries located here. Main industries are Surya Lights, Naini Tissues, Sidharth paper mill, Pashupati Laminates, Shampoo and V guard cables. The main occupation of the villagers is agriculture but few people are also employed in nearby factories. Also, people from neighboring states come here to work in factories and stay in the village houses on rent. This has increased the income opportunities in the village. • Villagers were inquired regarding the electricity situation in their villages and the electrification status. Women informed that the village is 100% electrified. There are power cuts of 2-3hours daily which can happen anytime and it affects them especially during summer season and cropping season. It impacts their daily works since they have to wait for power to resume to continue their household jobs depending on electricity. • Locals were asked about the fauna and flora in the region. They informed that monkeys and nilgai ruin their crops, and the number is increasing. • They have not noticed any raptors in the area. Common birds are crows, sparrow, thrus, cuckoo. They were asked about any carcass dumping site nearby. They informed that earlier they used to dump in the nearby vacant areas, but now with the increase in the settlements this practice has stopped.	

Table 111: PTCUL HV Power Line Public Consultation

#	Date and Location	Participants	Male	Female	Total	Issues Discussed	IEE Follow-up
• 132 kV Manglore Asahi • 20kV Roorkee – Nara • 220 kV Manglore Nara lines							
1.	19.04.23 Office of Gram Pradhan Gadarjuda	Gram Pradhan, locals of village Gadarjuda	8	10	18	Consultation was held with the Gram Pradhan and locals of village Gadarjuda (within 1km of all three lines). The locals were informed of the project scope and objectives. Following was discussed: • A brief on ADB safeguards requirements and compensation mechanism was also given to the villagers. Discussion was held on the potential risks from the substation, the associated HV line and mitigation measures. • Locals were generally not aware of risks from SS and lines. Few locals opined that coming up of substation in the area discourages industries from establishing nearby. • One local also said that there is sometimes intense humming from the lines more so in the rainy season. • Others informed that they have not encountered any problems due to the existing HV lines passing through their areas. • Most of the females of the village are employed in pharma industries in jobs like packaging, etc. Main industries are pharmaceutical industries- Sun Pharma, Talwar Pharma, JS Pharma, Asahi Glass, Phinolex etc. • They informed that the main occupation of the villagers is agriculture but now people are preferring working in nearby factories. Also, farmers have started plantation of poplar and Eucalyptus on their fields rather than crops since it yields higher benefits.	None required.

#	Date and Location	Participants	Male	Female	Total	Issues Discussed	IEE Follow-up
						• Villagers were inquired regarding the electricity situation in their villages and the electrification status. Women informed that village is 100% electrified. There are power cuts of 2-3 hours daily which can happen anytime. Generally, the power supply is restored soon. • The locals were also asked if they practice dairy farming and where do they dispose the dead animals. The women informed that earlier they had a site on the outskirts of village but now habitations have come up in the area and due to resistance from the residents they cannot dump the carcass there. • They were asked about the fauna they have noticed in the area and if they have spotted any raptors. They informed that big birds are not seen in the area, since carcass dumping has stopped. Besides cattle, monkeys, crows, sparrows, cuckoo are seen.	
2.	18.04.23 Gadarjuda Mangalore (within 1km of all three lines)	Local Women	0	3	3	A one-to-one consultation was held with the women of village Gadarjuda. Following was discussed: • The women were engaged in cutting of wheat crop in the field next to the proposed Manglore SS site. • They were informed about the project scope and objectives, ADB safeguards requirements and compensation in case of standing crop being impacted, etc. • They were asked about the potential risks from the substation and associated OHLs. Women informed that they have been working in these fields from quite long and have not seen any issues due to the lines. • On asking about witnessing any bird collisions on these lines, they replied no such issue has been noticed by them.	None required.
3.	19.04.23	Locals	8	10	18	Consultation was held with the Gram Pradhan and locals of village Jhabiran. Following was discussed:	None required.

#	Date and Location	Participants	Male	Female	Total	Issues Discussed	IEE Follow-up
	Office of Gram Pradhan Jhabiran (6km from all three lines)					• Locals were informed of the project scope and objectives. It was informed that the proposed 200 kV Roorkee Nara line and Manglore Asahi line shall pass through some agricultural fields. Exact alignment shall be finalized at later stage. • A brief on ADB safeguards requirements and compensation mechanism was also discussed. • Locals wanted to know the compensation policy for land given for towers and line. • Discussion was held on the potential risks from the HV line and mitigation measures. Locals were not much aware of risks from HV lines and reflected that it is a developmental work and will trigger development in the region. • They were also expecting their power supply situation will improve once the project is established. • They have not experienced any problems due to the existing HV lines passing through their areas. • Women were inquired regarding the electricity situation in their villages and the electrification status. Women informed that there are power cuts of 4-5 hours daily which can happen anytime, more so in the sowing and harvesting season when power is required for pumps and machines. Power cuts also happen during bad weather situations which taken time to resume. • Power cuts affects them especially during summer season and children's exam times. They have to wait for power to resume to continue their household jobs depending on electricity. On being asked about the common electrical appliances they use, it was informed that refrigerators, TV, mixer grinder in the kitchen, air coolers, fans and lights are used. They used both fuelwood and gas in kitchen. • On being asked about the presence of raptors and other birds. They opined that raptors are not	

#	Date and Location	Participants	Male	Female	Total	Issues Discussed	IEE Follow-up
						usually seen in this area. Common birds like thrush, sparrow, crow, robin is noticed. • They informed that there is no dumping ground nearby. Deep burial of the cows and buffaloes in own fields are practiced. Other animals are picked by the slaughterhouses who charge INR 500-100 for an animal. The further disposal was not known to the people.	
4.	18.04.23 Office of Gram Pradhan Gopalpur (Manglore – Nara line)	Locals	2	5	7	Consultation was held with the Gram Pradhan and locals of village Gopalpur wherein they were informed of the project scope and objectives. Following was discussed: • It was informed that the proposed 220 kV Manglore Nara line shall pass through some agricultural fields. • The locals were already aware of the proposed Manglaur Nara line and wanted to know the exact alignment. PTCUL officials informed that exact alignment will be finalized at later stage. • A brief on ADB safeguards requirements and compensation mechanism was also presented to the locals. • The locals informed that the main source of livelihood in this region is agriculture while some people are engaged in neighboring brick kilns and jaggery making units also. • Rice, wheat, sugarcane are the major crops however, now people are more resorting to growing trees of Eucalyptus and Poplar at their fields rather than crops since trees fetch well and are more weather and pest resilient than crops. Trees also need less efforts. • On being asked about the power situation, it was informed that there is no fixed time of power cut and power is usually for 20 hours a day. • The locals wanted continuity in power supply and a fixed time for power cutting if at all is necessary.	The alignment has been selected to avoid impacts to properties and private land, where this is not possible people will be compensated per the RP.

#	Date and Location	Participants	Male	Female	Total	Issues Discussed	IEE Follow-up
						• Suggestions were also sought from the women. They were supportive of the project and requested that the lines should not pass through houses or structures. It was assured by PTCUL officials that due care will be taken during final alignment to avoid any impacts on the community and structures, and compensation for the crop and land loss is done as per prevalent policies and rules.	
132 kV Mahuakheraganj-Jaspur lines							
5.	21.04.23 Gram Pradhan's Office Haldua Sahu	Locals	9	8	17	Consultation was held with the Gram Pradhan and locals of village Haldua Sahu. Following was discussed: • Locals were informed of the project scope and objectives. It was informed that the proposed Mahuakheraganj-Jaspur line shall pass through the agricultural land of the villagers and around 10 towers are proposed. Exact alignment shall be finalized at later stage. • A brief on ADB safeguards requirements and compensation mechanism was also given to the villagers. • Discussion was held on the potential risks from the HV line and mitigation measures. Locals were not much aware of risks from HV lines and informed that they have not encountered any problems due to the existing HV lines passing through their areas. • Women were inquired regarding the electricity situation in their villages and the electrification status. Women informed that there are power cuts of 4-5 hours daily which can happen anytime, more so in the sowing and harvesting season when power is required for pumps and machines. Power cuts also happen during bad weather situations which taken time to resume. Power cuts affects them especially during summer season and children's exam times. They	None required.

#	Date and Location	Participants	Male	Female	Total	Issues Discussed	IEE Follow-up
						have to wait for power to resume to continue their household jobs depending on electricity. • On being asked about the common electrical appliances they use, it was informed that refrigerators, TV, mixer grinder in the kitchen, air coolers, fans and lights are used. They used both fuelwood and gas in kitchen. • One of the locals asked if they are going to get any direct benefits from the project like jobs. PTCUL officials informed that power is the basic necessity for development of a region. Other than that, they will have less power cuts and good voltage. On being asked about the presence of raptors and other birds. They opined that raptors are not seen in this area. Common birds near paddy fields like Sarus crane are noticed. They informed that there is no dumping ground nearby. They practice deep burial of the cows and buffaloes so that they are not dug up by other animals.	
6.	21.04.23 Haldua Sahu Village	7	0	7	7	Focussed consultation was held with women at Haldua Sahu village. The women were informed of the project scope and objectives. Following was discussed: • They were asked about the power supply condition in their village and any impacts they have witnessed due to the HV lines. • The women informed that power supply is erratic especially since multi cropping system is being practiced here. For paddy cultivated there is huge water demand, that is met from borewells run on electricity. • They requested that authorities should look into this type of cropping system as it is too much water intensive and can deplete the water table. • They were also asked about the trees grown on agricultural plots. It was informed that poplar is grown both on periphery and as a crop itself since it needs less maintenance and there is huge demand of poplar and timber trees in the region	None required.

#	Date and Location	Participants	Male	Female	Total	Issues Discussed	IEE Follow-up
						due to large number of paper and board industries. • On being asked about carcass dumping one woman informed that bury their cows in deep pits in their own fields due to religious beliefs. Earlier the people used to dump carcasses in some vacant plots or the forest but those practices have stopped now. They had not much concern with the project. They were not aware of the health and safety risks due to the subproject but wanted their power supply to improve.	
132 kV Kashipur Mahuakheraganj							
7.	22.04.23 Aanganwadi office Garhi Hussain	Villagers, Gram Pradhan and PTCUL officials	9	15	24	Consultation was held with the locals of Garhi Hussain wherein they were informed of the project scope and objectives. It was informed that few towers of the proposed Mahuakheraganj-Jaspur line shall pass through the agricultural land of the villagers and 2 towers are proposed. A brief on ADB safeguards requirements and compensation mechanism was also given to the villagers. Discussion was held on the potential risks from the HV line and mitigation measures. Villagers were inquired regarding the electricity situation in their villages and the electrification status. Women informed that there are power cuts of 4-5 hours daily which can happen anytime, more so in the summer season and during nights. This badly affects their sleep and children's study also They use gas stoves and firewood for cooking and electric appliances like fans, coolers, pumps for water. Few locals have washing machines and air conditioners too. Locals opined that already many existing towers pass through their fields. But still they have erratic power supply conditions. Also the 132 kV Mahuakheraganj SS is nearby, but they still do not have continuous power supply. They demanded for direct power supply from the PTCUL SS. PTCUL officials informed about the voltages for HV and MLV, and direct power supply cannot be given through their SS, since power is transmitted at a high voltage to the UPCL SS, which then distribute it. Locals	No specific mitigation measures required.

#	Date and Location	Participants	Male	Female	Total	Issues Discussed	IEE Follow-up
						requested for a new SS for their village. On asked about the risks from the lines, they were not much concerned as there are many lines passing through their fields, but they have not seen any impacts. However, they informed about crop damage from a line three years back. The standing crop caught fire. PTCUL officials discussed with the villagers and informed that the incident was due to MLV line and not due to HV line. Villagers agreed to this. On being asked about significant risks to birds, the women informed that big birds like vultures and even crows are not seen these days. They could not account any specific reason for it. There is no carcass dump in or nearby their villages. They informed that general practice is to either bury the cows in their own fields and get other animals picked and disposed elsewhere.	
132 kV Mahuakheraganj-Jaspur lines and Kashipur Mahuakheraganj line							
8.	21.04.23-22.04.23 Berkhera Pandey	Villagers, Gram Pradhan and PTCUL officials	12	46	58	Consultation was held with the locals of Berkhera Pandey wherein they were informed of the project scope and objectives. • It was informed that few towers of the proposed 132 kV Mahuakheraganj-Jaspur line shall pass through the agricultural land of the villagers and 6 towers are proposed. A brief on ADB safeguards requirements and compensation mechanism was also given to the villagers. • Discussion was held on the potential risks from the HV line and mitigation measures. Villagers were inquired regarding the electricity situation in their villages and the electrification status. • Women informed that there are power cuts of 4-5 hours daily which can happen anytime and it affects them especially during summer season and children's study time. • They use gas stoves and firewood for cooking and electric appliances like fans, coolers, pumps for water. Few locals have washing machines too.	No specific mitigation measures provided, but it is important to ensure that local community are provided with the opportunity to work on the Project.

#	Date and Location	Participants	Male	Female	Total	Issues Discussed	IEE Follow-up
						• Few women opined that they are least concerned with the impacts of a project since they have many basic issues like livelihood and food supply to be concerned about. They requested if project can provide them capacity building and trainings related to livelihood so that their basic demands are met. • Agriculture is the main source of the livelihoods of people. Some are land owners while others work as farm labours. Few males also work in nearby industries but the distance being relatively much, women in this village have less opportunity to work in factories. • On being asked about the citing of vultures and carcass dumps, it was informed that they have not seen these birds for quite a long time in their villages. The dead cows are generally buried in their own fields and the other animals are being picked by some people on payment of 500-1000 Rs. They were not sure of the end disposal but informed that due to coming up of habitations there are no carcass dumping grounds nearby. Women requested for Capacity building exercises in livelihood-oriented skills like tailoring, etc.	
Pithoragarh Champawat 2nd Circuit Stringing							
9.	21.09.22	Locals of village Patedhar and Dasli	12	5	17	• Consultation was also held with the PTCUL staff and villagers of the villages in the alignment of the Pithoragarh Champawat double circuit line to confirm any residual impacts of the line on environment, forest and the social issues related to compensation for land. • PTCUL officials informed that compensation for land acquired for towers and RoW of line has already been paid. • Any issues related to residual waste etc. were not seen around the few tower locations which were visited. Locals informed that during tower works some problems related to dumping of excess soil	None

#	Date and Location	Participants	Male	Female	Total	Issues Discussed	IEE Follow-up
						on the fields was there, but now works have completed and issues been resolved. • Locals were inquired regarding notable species in their area. They informed that the problems of monkeys spoiling all the agriculture yield has increased. During the late evenings and early mornings wild animals are spotted due to the surrounding forests. Wild animals like spotted deer, cheetal, sambhar, birds like jungle fowl, spotted dove are commonly spotted. There is a risk from leopards also.	

9.4. UPCL UG, SS and OHL Consultations

9.4.1. Dehradun Ward Members Consultation

728. Consultation with people's representatives (Ward Members) in Dehradun was completed in 28 Wards (out of 102 Wards within Dehradun Municipality) where the proposed UPCL UG works under this project will be carried out. Consultations were completed between September 30th 2022 and 15th March 2023.

729. In summary, the ward consultations indicated that there is broad support for the project and moving poles would reduce traffic issues and make the area look better. Ward members also noted that the chance of electrocutions will be eliminated. Very few 'environmental' concerns were raised with only noise issues being mentioned by two ward members.

730. Several potential issues were raised by ward members:

- Several areas were identified where traffic disruption would be possible during construction.
- Consultations with utilities (sewage, water supply) must be completed before works start and good coordination with them is needed to avoid disruptions. The IEE includes measures for liaising with utilities.
- Consultation with traffic police is needed. Traffic Management Plans will be approved by the police.
- Some footpaths may be damaged. The IEE includes requirements for restoration of disturbed areas to their former condition.
- The lines pass by various sensitive receptors, including schools. Provisions have been made in the IEE to manage works close to sensitive receptors.
- Streetlights are located on poles. These need to remain or be replaced. The IEE has included a specific measure to ensure that streetlights are replaced.
- Possibility of noise pollution. The IEE includes specific measures to manage noise from the construction and operational phases of the Project.
- Potential impacts to water supply utilities and water pumps. The IEE includes measures for liaising with utilities and ensuring that all water pumps are identified and protected during construction.
- Some narrow roads identified where works may cause more significant disruption. The IEE includes the requirement for a Traffic Management Plan for the UG works.

731. Key recommendations made by ward members:

- Develop a coordination committee keeping ward members in the loop. The IEE has included the requirement for regular meetings with Ward Members to keep them update on grievances and project progress.

- Works should avoid the weekend. Works should be completed at night, or construction during the day in residential areas and construction at night in commercial areas. The IEE makes a recommendation that avoidance of work at weekends is preferred. However, works will not be undertaken at night.

- Provide contact number of contractor. The IEE includes the requirement to ensure notice boards at work sites include the contact number of the EPC Contractor.

- Ensure work sites are rehabilitated. The IEE includes requirements for restoration of disturbed areas to their former condition.

- Construction near schools should be completed in the summer. The IEE includes a mitigation measure requiring works near schools to be scheduled for holiday periods.

- Establish GRM. The IEE includes the requirement for a GRM to be established.

9.4.2. Multi-Stakeholder Consultation at Dehradun City Level

732. A city level multi-stakeholder consultation meeting was held on 29th March 2023. The stakeholders invited to this consultation meeting included three broad groups, viz., (i) Government departments, (ii) Elected representatives of the affected Wards of Dehradun Municipality, and (iii) civil society or citizen groups.

733. The participants were sent formal invitation letters to attend this consultation meeting in advance. The consultation meeting was attended by 40 participants which included elected representatives in Dehradun Municipality, BSNL (telecom department), and Forest Department.

734. UPCL provided information about the scope of the project work proposed by them for ADB finance under different EDD zones and informed the participants about the intended project benefits for Dehradun residents.

735. This was followed by presentation from the ADB technical assistance consultant team assisting UPCL and PTCUL in preparing the IEE and RP documents that meets requirements of the national regulations as well as ADB safeguard requirements. The experts presented the key project benefits as well as adverse environment and social impacts. The participants were informed about how the planning process is avoiding some of the environmental and social impacts. The impacts which cannot be avoided are assessed in the Initial Environment Examination (IEE) Report prepared. The IEE has proposed to minimize and mitigate unavoidable environment and social impacts through an Environment Management Plan (EMP) and resettlement plan (RP).

Figure 86: Multi-Stakeholder Consultation

Source: Consultants own photo: 2023

736. The presentation identified a range of key environment and social impacts and the adopted mitigation measures on which feedback from the participants was sought during the Q&A session. The key environmental issues included, (i) reducing the impacts from construction noise, (ii) reducing impacts from fugitive dust during construction works, (iii) protecting the Rajaji National Park, (iv) protection of roadside trees, and (v) timely reinstatement of damaged pavements and public spaces. Similarly, the feedback on following social issues was sought from the participants: (i) how to improve advance notice and public awareness prior to and during construction, (ii) how to improve the grievance mechanism, (iii) how to improve coordination mechanism between EPC contractor, UPCL and Civil Authorities, (iv) how to improve traffic management, (v) how to avoid unintentional damage to civic properties including utilities, and (vi) how to maintain the aesthetic and cleanliness of the city.

737. In the Q&A session, participants asked following questions and UPCL responded to these questions.

Table 112: Questions asked by participants in multi-stakeholder workshop and responses

#	Question/ Query	UPCL Response
1	For how many years this underground cabling project will benefit the people of Dehradun?	This project is planned keeping population projections for 10 years. The construction will take 2.5 years to complete.
2	As a ward member we never receive any information on when the construction will get start and when it will complete in the specific area. Contractors starts digging without informing local people and ward members.	UPCL will publish the construction schedule (start and end date) of each cable line with ward number at-least before 15 days of construction. UPCL will also inform Ward members/Nagar Nigam on the construction schedule. UPCL will create a WhatsApp Group of Ward member. Before construction community leaders/ ward members will be informed through WhatsApp messages

#	Question/ Query	UPCL Response
3	Sani Mandi in Ward number 12 is a crowded and narrow area. How UPCL will do construction in such kind of locations.	Construction in commercial area, crowded area, religious places and public area will be done at night and after prior consultation with stakeholder groups.
4	Majority of the drinking water supply is underground on the roadside, where UPCL is proposing the construction of underground cable. There is a high chance/risk of water pipeline damage due to construction work.	UPCL in coordination and consultation with Nagar Nigam, Jal Nigam. UPCL will prepare a construction plan for each underground cable line after GPR scanning.
5	What is the process of underground trenching? In Dehradun lot of trenches are there. Why isn't government constructing a common permanent underground platform?	UPCL is preparing separate trench for underground cabling and it will allow other interested operators to use them where feasible.
6	In ward number 87, trenching may be tough due to narrow area (flyover and canal)	Construction here will be done using underground trenching using HDD machine
7	Normally we found that digging and trenching done by one department and repair, filling and construction of road / pathway done by other departments. It creates lot of problem to people as usually repair work got delayed. Give entire construction and repair work to the same contractor, so that work may be finished within 24 hours of construction.	Chief Minister has made a high-level committee to coordinate with other relevant departments. UPCL will pay for the entire repair amount to the relevant department before start of the work. UPCL will coordinate with the relevant line department to complete the repair work within stipulated time.
8	ADB gave the sewerage line construction directly to the contractor.	ADB is providing loan to UPCL and UPCL is engaging the contractor.
9	In Sharanpur road, ISBT area when UPCL is starting the construction work	UPCL cannot tell the exact time of construction, it will take some time. Tentatively planning to start construction work after rainy season around August/September 2023
10	Whether electricity will disrupt during underground cabling	No disruption of electricity during construction
11	What is the construction completion time in a specific area?	At a time, construction work (trenching and cabling) will be done for 150-200 meters, so same area will be disturbed for around 24-30 hours.
12	What type of trenching has been planned for underground cabling by UPCL?	It depends on the GPR scanning and survey. If no rocks, barriers UPCL will go for HDD trenching, if it is rocky or with construction barriers UPCL have to go for open trenching.
13	Majority of the street lights on the single road where dividers are not available are on the UPCL pole. How you are planning for street lights in the roads without dividers?	Street lights does not come under UPCL, Nagar Nigam may be consulted. UPCL can keep the poles for some time say six months, respective department/agency may be requested for street lights arrangement.

#	Question/ Query	UPCL Response
14	33 kV line pole is in Bindal River and it becomes dangerous during rainy season. UPCL is requested uninstall that pole and provide safe alternative.	UPCL will look this matter seriously.
15	What is your monitoring and quality assurance mechanism for construction and repair works?	Construction quality assurance has been planned. UPCL are also considering to make video before construct, during construction and after construction, to assure the construction and repair work as per work schedule. Creation of Ward members WhatsApp group to collect information (text, photographs and videos). Setting up a Help-line Number (1912) and constitute a Grievance Committee.

738. The participants though appreciated UPCL's efforts to share information with them and seek their feedback, but they were apprehensive if the interdepartmental coordination mechanism, grievance system, and continuous stakeholder consultations will really work during the construction phase. The key suggestions for improvement in these areas are summarized in Table 113.

Table 113: Stakeholders Feedback from Multi-Stakeholder Workshop

#	Area of Improvement	Suggestions for Improvement	Project Response
1	Inter-departmental coordination mechanism	In addition to the high level (Chief Secretary) coordination committee, a local (Ward level) coordination mechanism should be constituted. The Ward members should be part of these local committees to monitor compliance by EPC contractor. Where WhatsApp groups are formed with EPC contractor, line departments and UPCL, Ward Members too should be part of these groups.	A Project high-level committee will be established to coordinate the Project.
2	Grievance Mechanism	The grievance mechanism to be simple and responsive. The complainants should enjoy protection from any retaliatory action from government departments.	RP prepared in line with ADB SPS requirements
3	Reinstatement of damaged pavements and civic infrastructure	The reinstatement of damaged pavements and civic infrastructure is delayed as the contract for this work is issued by Dehradun Municipality (Nagar Nigam) and there is no coordination between EPC contractor of UPCL and civil contractor of the Nagar Nigam. It may work better if the same EPC contractor damaging the pavement is also made responsible for reinstating the pavement condition to pre-project condition.	Through a request via a Project high-level committee which will be established to coordinate the Project, Uttarakhand Public Works Department (PWD) must appoint a dedicated contractor for the PTCUL and UPCL resurfacing work in Dehradun to ensure timely reinstatement.

#	Area of Improvement	Suggestions for Improvement	Project Response
4	Continuous Stakeholder Consultation	These pre-project consultations should not be one-off events. The UPCL and EPC contractor to continue the stakeholder consultation and undertake public awareness initiatives throughout the construction period.	On-going consultations form part of the requirements of the EMP and are further discussed under Section 9.6 below.

9.4.3. Dehradun UG Consultations

739. Consultations were undertaken with Dehradun residents and business owners in the areas of the proposed UPCL UG works. Consultations were completed on 22 April 2023 with 35 participants (25 male, 10 female). The following issues were discussed:

- UPCL officials were asked about tree cutting involved in the project especially at EDD Rural. They informed that tree cutting is not expected as the works are planned in the existing utility corridors of roads.

- Consultees agreed that there are benefits from converting the overhead transmission lines to underground lines, in terms of aesthetics and reliability of power supply but opined that public faces a range of inconveniences during construction phase, such as impacts to road traffic.

- Locals were keen to know when the works will execute and for how long will the restoration work take.

- Locals also pointed out that they have a bad experience with the past works of utility laying for water supply, cables etc. and suggested that the trenches should not be kept open and unprotected for long time since it causes safety risks.

- They also suggested that the damaged pavements and footpaths should be reinstated quickly. The removal of construction debris should be prompt and contractor should clean up the construction area properly.

- Few shopkeepers wanted to know at what time of the day works will be taken up and suggested that works in commercial areas should be taken up in night.

- One shopkeeper said that he is not concerned about the Project impacting upon his shop and the construction issues but requested that at least one month notice should be provided prior to the commencement of works. He preferred works to be completed during the daytime as this was mainly a residential area, although he noted that traffic issues would be problematic with daytime works due to the narrow roadway.

- Consultees inquired whether any plan has been prepared to avoid service Disruption of other utilities sharing the same infrastructure. They informed that there are local cable services and CCTVs etc. who now use the electric poles as shared infrastructure. Notices to these operators should be made in advance so that they can make alternate arrangements.

- They also requested that some of these poles are also used for street lighting which is provided by Dehradun Nagar Nigam. If these poles are to be removed, the Municipality needs to make alternate arrangements so that dark stretches are not created which may be unsafe for public.

- Few locals suggested that works should be avoided during the festival and wedding season.

- One consultee asked whether the works will be taken up in the rainy season also, and is there any plan for taking works in the rainy season.

- One vegetable vendor asked if she would need to shift somewhere. PTCUL official informed that this will be temporary.

740. In addition to the above, several discussions were held with local shopkeepers and residents during site visits to portions of the UG alignment in Dehradun. The interviews provided a chance to understand how the community had been affected by on-going UPCL UG works and the potential issues that might be faced in other areas. The following table summarizes the points raised by the stakeholders, which in general indicated that the works had not had a significant effect on them or their businesses, although it is recognized that the interview sample size is low and the opinions raised may not reflect the views of all stakeholders.

Table 114: Dehradun UG Consultations

	Shopkeeper Stated that UG works took two months, with all works completed at night. Continuous access was provided to the shop. He noted that barricades were placed in front of excavated areas to ensure nobody fell into the excavated areas- They were informed of the works, via print media, one month in advance. Noted that the area looks much better now.
	Shopkeeper He was not concerned about the Project impacting upon his shop and was not concerned about construction issues. He noted that at least one month notice should be provided prior to the commencement of works. He preferred works to be completed during the daytime as this was mainly a residential area, although he noted that traffic issues would be problematic with daytime works due to the narrow roadway.

	Stallholders Located adjacent to HDD works, the male stallholders commented that the HDD works had not affected them as they simply moved their stall to the other side of the road.

9.4.4. UPCL New Substations

741. Table 116 summarizes the consultations undertaken at the three proposed new UPCL substations.

Table 115: UPCL New Substation Consultations

Location	Participants	Total	Male	Female	Issues discussed
33/11 kV, (2x5 MVA) SS, Kaniya, Ramnagar, Haldwani	24.08.22	7	7	0	Consultation was held with the stakeholders including UPCL and local people wherein the project scope, objectives, components, probable risks were discussed. Community's opinion and suggestions were also sought on the project. Following was discussed: • The power supply is fine but there is a heavy demand during tourist season, due to which a dedicated SS is needed. • Locals were inquired regarding any wild animals in the area. They informed that wild animals are seen only in the Forest area. They have not noted any wild animal in this area, due to road traffic and settlements around animals are not spotted. • Consultees were not aware of any health and safety risks from the SS. • Community welcomed the project and opined that continuous power supply is needed in the area.
Near Collectorate	22.08.22	8	8	0	Consultation was held with the UPCL officials and the residents near the proposed SS site. Locals were briefed about the project scope and objectives. Following was discussed: • Locals informed that most of the houses (10 m from proposed site) are

Location	Participants	Total	Male	Female	Issues discussed
					Government quarters. Many of which are vacant and only few people are staying. • Locals informed that they are not permanent residents as they are government employees who are on transferable positions. So, they were not much concerned with the project. • Locals were not aware of the health and safety risks from the SS. One consultee asked about the commencement of the construction works. UPCL officials informed that it will take time. • Locals were also inquired regarding any notable species in the area. They informed that since it is an industrial area the common animals sighted are domestic animals, monkeys, birds like crow, pigeon, cuckoo, etc. They have not noted any raptors in the area. • Locals in general were not concerned with the project but agreed that it is a development work and will encourage the growth of industries and livelihood opportunities to the area.
33/11 KV, (2 X 5 MVA) SS, Bharauni, Sitarganj, Rudrapur	23.08.22	19	17	2	Consultation was held with the UPCL officials and the residents near the proposed SS site. Locals were briefed about the project scope and objectives. Following was discussed: • Locals informed that this is an agriculture belt and good power supply is needed for irrigation through tube wells. The existing power supply is erratic and power cuts are very frequent, more so in the sowing season when water requirement is more for irrigation. This impacts agriculture too. • The farmer Harzindeer Singh is cultivating crops (agriculture activities) on the land (as a Kabjedaar) since last 15 years. But it was informed that he has provided NOC for the construction of substation. • Community was not concerned with the health and safety risks from SS and associated lines. They just wanted reliable power supply for their agriculture activities. • Locals were inquired regarding any notable species in the area. They informed that Nilgai and wild boar

Location	Participants	Total	Male	Female	Issues discussed
					spoil their crops many times. Besides farm and domestic animals, other animals sighted are, monkeys, birds like crow, pigeon, cuckoo, etc. • Community welcomed the project and opined that they were in immediate and dire need of the SS and this SS should be given priority in execution. They also assured to provide full support to the project.

9.4.5. UPCL Existing Substations

742. Consultations were completed with stakeholders at the UPCL substations to be rehabilitated. Table 117 summarizes the findings of these consultations.

Table 116: UPCL Existing Substation Consultations

Consultation Location/Date	Participant	Issues Raised/ Concerns	Project Response/Inputs to project design
Shastradhara Substation, Dehradun, 8.06.2022	2 males (service) /2 female one service & 1 housewife)	• Kids playing near substation road • Storm water heavy flow during monsoon • General public scale house boundary and pass thorough compound	• Consultation and disclosure before work starts
Sahiya Substation, Dehradun 21.6.2022	1 male (business), 3 females (housewife)	• Storm water during monsoon creates havoc near the house and the substation • Sparks and fire in the substation as windblown branches fall on the electrical equipment • Provide higher substations fencing and wall – to mitigate fire hazards • Wall to prevent cattle entre substation • Road is washed away during monsoon	• Consultation and disclosure before work starts • Higher and better-quality fencing around substation • Build a storm water drain • Repair the access road
Rudrapur Substation, Dehradun 21.6.2022	1 male (Poultry farm owner)	• High E.coli in bore well water • Area inundated during monsoons and heavy rainfall	• Water testing before work starts to confirm potability as this source is also used by substation staff • Repair the access road
Lal Tappar Substation, Dehradun 9.6.2022	1 male (worker)/ 3 female (worker /housewife)	• Recent fire in the substation during monsoon – was controlled by substation staff • Provide employment	• Consultation and disclosure before work starts • Hire for labour works if feasible and approved by UPCL SDO/HO

Consultation Location/Date	Participant	Issues Raised/ Concerns	Project Response/Inputs to project design
Tarikhet Substation, Almora, 13.6.2022	1 female (housewife)	• Area has seen many leopard attacks • Provide CCTV in area • Provide higher walls around substation to prevent leopard entry	• Consultation and disclosure before work starts • Orientation for workers in relation to working in high altitude areas and human-wildlife conflict management • Remove the transformers that are adjacent to the house and move towards the control room or as suitable within the compound • Higher fence/wall around substation
Lamgarah Substation, Almora, 12.6.2022	1 male (business/ shop)	• Repair the front road • Manage leopard attack if possible • Minimal damage to the temple when renovation of substation takes place (already affected by vehicle movements)	• Consultation and disclosure before work starts • Since there is a history of conflict between locals vs UPCL regarding the road repair as it is adjacent to the temple – orientation of workers and approval from village head through consultation to be done • Orientation for workers in relation to working in high altitude areas and human-wildlife conflict management
Transport Nagar Substation, Almora, 17.6.2022	2 male (1 service, 1 roadside vendor)	• Vendor impacted by heavy traffic and congestion on the substation access road	• Traffic management • Consultation with local shops and business and disclosure before work starts
Phoolchaur Substation, Almora, 17.6.2022	1 male (farmer/ business)	• School adjacent - no incidents took place • Low voltage in the area	• Relocate switchyard to vacant available land within substation and away from the school • Project will mitigate the voltage issue
Garampani Substation, Nainital, 13.6.2022	2 males (shop & retired businessman)	• Major flooding and risk of area washed away due to flooding of the adjacent river in the river valley • Leopard sighted nearby, takes way domestic animals	• Retention wall is required 250m upstream of the substation on the river to divert the heavy flow away from the substation • Consultation and disclosure before work starts

Consultation Location/Date	Participant	Issues Raised/ Concerns	Project Response/Inputs to project design
			• Orientation of workers in relation to working in high altitude areas and human-wildlife conflict management
Talla Ramgarh Substation, Nainital, 16.6.2022	1 male (business/wife local village council member)	• Removal of the poles and electrical system from the roadside	• Consultation and disclosure before work starts • Pole removal not part of the Project.
Sarghakhet Substation, Nainital, 13.6.2022	1 male (service)	• Heavy snowfall in the area • Wildlife electrocutions observed – must prevent • Landslide during heavy rain/cyclones damaging crops	• Traffic management along narrow and steep road surrounded by hotels and tourists • Consultation with locals and hotel owners and disclosure before work starts
Matkota Substation, US Nagar, 18.6.2022	1 male (service)	• Water scarcity	• Not relevant to the Project
Badhaipura Substation, US Nagar, 18.6.2022	1 male (business)	• Municipal wastes dumped along roadside • Poor sanitation and public health	• Not relevant to the Project
Lalpur Substation, US Nagar, 17.6.2022	1 male (service/shop)	• Road is damaged • Water scarcity in the area	• Not relevant to the Project
Jhankat Substation, US Nagar, 17.6.2022	1 male (service)	• Temple is adjacent and disturbed due to substation vehicles/repairs	• Provide additional fence around temple and limit works/noise during major festival/gathering
Kashipur Substation, US Nagar, 18.6.2022	1 male (journalist)	• Not observed any accidents/incidents in the substation • There will be improvement in electrical supply after the renovation	• None

9.5. Other Consultations

743. Consultations were undertaken with Champawat DFO (12 December 2022) and Dehradun DFO (25 November 2022). There was also a consultation with Wildlife Institute of India (25 November 2022) to enquire about bird sensitives and the ASI (25 November 2022) to enquire about archaeological sensitivities. The following summarizes the discussions with the DFO:

744. DFO Champawat:

- It was informed that Forest Clearance has been accorded for the Pithrogarh - Champawat single circuit line and all tree cutting for the said line has been done.

- DFO was requested to confirm if double circuit stringing works are permitted by the Forest Department since the Forest Clearance is given for Single Circuit on Double tower. The DFO suggested that since the approval clearly mentions "Single Circuit line Double Circuit Tower", further clarification/guidance needs to be obtained by PTCUL from the Nodal Officer, Forest Department, Dehradun. He opined that Forest Clearances stands applicable only for the components proposed, which in this case is a single circuit line.

- However, because the tower is for a double circuit line, the RoW remains the same and tree cutting has already been done. Any confirmation in this regard needs to be taken from the Nodal Officer.

745. Since this consultation, confirmation regarding the forest clearance has been given for second stringing as discussed previously in this report.

746. DFO Dehradun Mr. Nitish Mani Tripathi.

- DFO asked about the locations where works are proposed. He was inquired regarding any clearance needed for the works since part of project area lies in the ESZ of Rajaji National Park. DFO asked if any works are proposed in the Protected areas. UPCL officials informed that no works are proposed in Protected areas. The UG cabling is proposed in the utility corridor of existing roads. DFO said that UG cabling will improve the aesthetics of the city. He suggested UPCL to inform the DOF before the work starts.

- DFO asked about tree cutting etc., and suggested to take permissions for tree cutting, if tree cutting is needed.

9.6. Continuous Consultation

747. One of the essential elements of a meaningful consultation is that the consultations take place during all stages of the project. The consultation and disclosure process for the Project will need to address the entire range of stakeholders, including but not limited to the stakeholders identified and consulted during preparation of this IEE. In order to ensure that the consultations held during this project preparatory phase also continue during construction and operation phase, it is important to allocate responsibilities clearly. The responsibility of consultation with local community and project affected persons will be handled by the EPC contractors. The EPC contractor will prepare a site level information disclosure and stakeholder engagement plan with a calendar spread across the construction period. For each site (substations/power lines) the consultation proforma in **Appendix H** is to be completed during detailed design.

748. The information to be shared with local communities and affected persons by the EPC contractor will include the following:

- Project design (substation sites, locations of towers, power line ROWs) and their potential impacts.

- Construction/implementation schedule.

- Measures taken by the project to avoid and minimize these potential impacts such as re-routing, adjusting tower locations, adoption of better tower design etc.

- Grievance Redress Mechanism which affected persons and local communities can use to register their concerns and seek appropriate redress.

9.7. Information Disclosure

749. PTCUL and UPCL with support from EPC contractor and PISC, will provide relevant information in a timely manner, in an accessible place, and in a form and language understandable to affected persons and other stakeholders. The IEE will be made available in corporate and site offices of PTCUL and UPCL and at the project site office of concerned EPC contractor. The executive summary of the IEE will also be made available to the district revenue offices and be made available in local languages (Hindi) in the form of leaflet for distribution during consultation. The draft IEE will be disclosed on the website of ADB and in PTCUL and UPCL websites. Subsequently, the updated IEE as per the final design will also be disclosed on ADB's website and in PTCUL and UPCL websites. The environmental monitoring reports on EMP implementation will also be posted on the ADB website and on the websites of PTCUL and UPCL.

9.8. Grievance Redress Mechanism

9.8.1. Background

750. A grievance redress mechanism (GRM) will assist the affected persons in resolving queries and complaints. The project is being implemented by three different implementing agencies (PTCUL, UPCL and UREDA) with PTCUL and UPCL responsible for substation and power line components respectively. Although, all three implementing agencies will have common executing agency, the complaints expected to be different nature and therefore, it is proposed that the GRM will be established separately at each implementing agency for their respective components, however, will follow the same four tier GRM process. The PTCUL and UPCL GRM is set out below. The UREDA GRM will also follow a similar process. Neither the PTCUL and UREDA components entail any major land acquisition or physical displacement or involuntary resettlement; therefore, this is a less sensitive project. However, power lines components may have some issues related to tower footings and RoWs. Similarly underground cabling in urban areas, especially in Dehradun, may raise certain concerns among the people during construction, especially given the feedback during consultation. As safeguard requirement the implementing agencies (both UPCL and PTCUL) must establish a project-specific grievance redress mechanism to receive, evaluate, and facilitate the resolution of concerns, complaints, and grievances about the social and environmental performances of the project. Due to its critical role in smooth project implementation, this GRM shall be constituted upon loan effectiveness and prior to the commencement of construction of project components if earlier.

9.8.2. Need of the Grievance Redress Mechanism for the Project

751. PTCUL and UPCL will institute a transparent and timebound GRM to receive and resolve the affected persons' grievances and complaints. GRM is an accessible and trusted platform

for all the affected persons to seek solutions and relief for their project-related problems and grievances, without resorting to lengthy and costly judicial process. The GRM will not deal with matters pending in a court of law. Its success and legitimacy will depend on the affected persons' capacity for consultations and desire to resolve grievances through discussion and negotiation. Culturally appropriate, gender responsive, and accessible mechanisms formulated but shall not impede access to the country's judicial or administrative remedies. The presence of GRM or seeking relief from GRM is not a bar to take grievances and complaints to courts for arbitration. This includes ADB Accountability Mechanism[106] whereby people adversely affected by ADB-financed projects can express their grievances; seek solutions; and report alleged violations of ADB's operational policies and procedures, including safeguard policies.

752. ADB Safeguard Policy Statement (2009) requires the establishment of a responsive, readily accessible, and culturally appropriate grievances redress mechanism capable of receiving and facilitating the resolution of affected persons' concerns and grievances about the physical, social and economic impacts of the projects. The GRM aims to: (i) reduce conflict, risk of undue delay and complication in project implementation; (ii) improve quality of project activities and outputs; (iii) ensure that the rights of affected parties are respected; (iv) identify and respond to unintended impacts of projects on individuals; and (v) maximize participation, support, and benefit to local communities.

9.8.3. Objectives

753. Inconveniences and dissatisfactions, if not managed appropriately at the beginning may snowball into a bigger issue. In order to manage these risks, an internal mechanism is required to be in place where the aggrieved parties can lodge their complaints and get it amicably settled prior to approaching the formal mode of solution (i.e., access to legal system through courts) available to them. Hence, one of the important objectives of the GRM is to provide a formal forum to the aggrieved parties to deal with issues arising out of project. The GRM will help to establish accountability towards the stakeholders' concerns. There will be a single grievance redress mechanism for both environmental and social related issues. The objective of the GRM shall be to provide an accessible mechanism to the affected people, community or any stakeholder(s) having a stake in the project to raise their issues and grievances in regard to project functioning. The GRM will resolve any social (including design or route alignment issues, compensation, inconveniencies during construction, labour, contractor, community relation issues amongst others) and environmental related grievances, locally in consultation with the aggrieved party to facilitate smooth implementation of project related work activities.

754. The fundamental objectives of the Grievance Redress Mechanism are:

- To provide an accessible mechanism to the affected people, community or any stakeholder(s) having a stake in the project to raise their issues and grievances in regard to project functioning;

[106] There are two parts to ADB's Accountability Mechanism, (i) problem solving led by ADB's special project facilitator can assist the complainant in finding solutions to their problems, (ii) providing a process through which those affected by projects can file requests for compliance review by ADB's Compliance Review Panel.

- To reach mutually agreed solutions satisfactory to both, the project and the affected persons, and to resolve any project-related grievance locally, in consultation with the aggrieved party;

- To facilitate the smooth implementation of the Environmental Management Plan and prevent delay in project implementation;

- To democratize the development process at the local level, while maintaining transparency as well as to establish accountability to the affected people;

- To facilitate an effective dialogue and open communication between the project stakeholders; and

- To have clear definition of roles and responsibilities

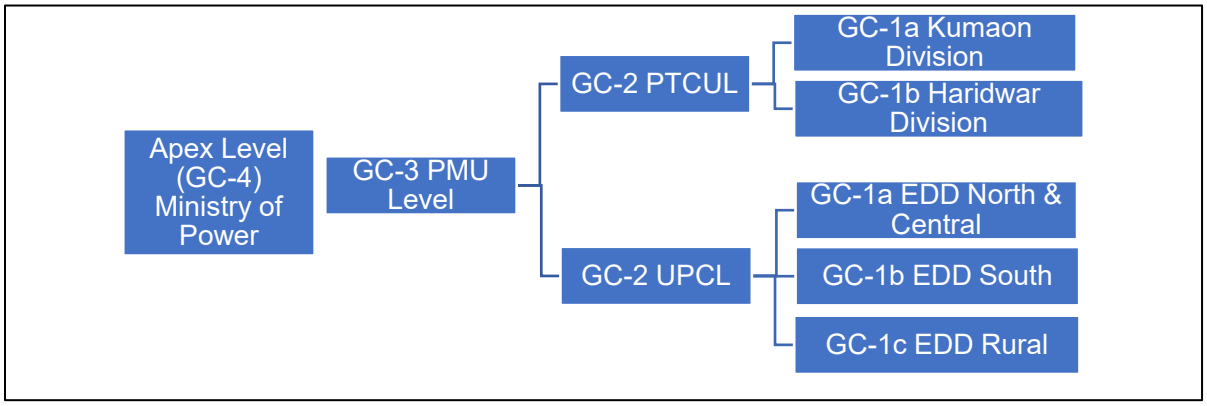
9.8.4. GRM Structure

755. The grievance redressal will be a multi-tier structure for the project having grievance redress committee (GRC) at each tier/level as described below and shown in

756. Figure 86 for PTCUL and UPCL.

- **Tier-1:** EPC Contractor/Division level where project sub-activities are executed;
- **Tier-2:** PIUs (PTCUL and UPCL), the apex level of each of the implementation agency;
- **Tier-3:** PMU (supported by PISCs), at the overall project level; and
- **Tier-4:** Ministry of Power, Government of Uttarakhand (Steering Committee)

Figure 86: Multi-tier Structure of the Grievance Mechanism



9.8.5. GRM Process and GRC in the Project

757. The GRM process followed by subsequent formation of the grievance redress committee (GRC) at each tier/level is described in Table 117. Grievances will be redressed within latest a month from the date of lodging the complaints, except for pollution and, health and safety issues which will be redressed immediately and complaints that are raised to Tier 3 or 4 of the GRM.

758. Before a formal grievance is submitted to the four-tier system, the EPC contractors will have the opportunity to informally resolve grievances. For grievances that are immediate and urgent (e.g., dust, noise, spills, inappropriate behaviour, worker conflict, community health and safety etc.) they are best resolved informally. If informal resolution is not sufficient, the Tier-1 site/division level GRC as the first formal tier will be involved to find solutions to the problem.

Table 117: GRM Process and GRC formation

Tier/Level	GRM Process	Grievance Redress Committee
Tier-1: EPC Contractor/Division level	• The complaints /grievances will be received by the Junior Engineer in charge of the site or at the Divisional/Sub-Divisional Offices or by a site-supervisor of the EPC Contractor executing the work verbally or through written communications (both on paper and electronic). • The complaints will be reviewed at this level and efforts will be made to resolve them in consultation with the affected persons or any other stakeholder who has lodged the grievance/complaint. • At this level there will be efforts to resolve the grievance/ complaint within a period of 15 days from the date of receipt of the complaint. In case the aggrieved is not satisfied with the solution provided Tier 1 he may escalate it to Tier 2, PIU level	The Grievance Redress Committee (GRC-1) at this level will comprise of four members, i.e., (i) Superintending Engineer (SE), (ii) Junior Engineer (JE), (iii) Project Manager of EPC Contractor, (iv) a community representative from the project affected area.
Tier-2: PIUs (PTCUL and UPCL) Level	• Both UPCL and PTCUL will establish a PIU which will have a team of safeguard experts (Environment, Health and Safety, and Social). Complaints /grievances that cannot be resolved at tier-1 or if the aggrieved is not satisfied with the decision of the Tier 1 and appeals for redressal would be taken up at Tier 2 • The Tier-2 Grievance Committee will examine the documents (copy of the complaint, investigation report, minutes of meetings of GRC-1, response to complainant all other relevant documentation submitted to them) and will hear the aggrieved. The GRC-2 will make an effort to provide relief to the aggrieved. • The CE will hold a meeting of the GRC-2 within one week of receiving	The Grievance Committee at Tier-2 (GRC-2) will comprise of (i) the Chief Engineer (CE) of the respective Zone (acts as the secretary), (ii) A senior officer deputed by Managing Director (PTCUL/UPCL), (iii) Superintendent Engineers executing project components of the Zone, (iv) representative from land revenue, agricultural and horticultural department and (v) elected representative of each Panchayat including women members

Tier/Level	GRM Process	Grievance Redress Committee
	the complaint and the entire process should be completed within 15 days of the complaint being referred to Tier 2. If unsatisfied with the solution provided by GRC-2, the complainant can approach the Tier 3 of the GM level. If the GRC-2 finds that the potential solution to the complaint is beyond their official powers and authority, they will communicate this to the complainant and send the complaint to Tier 3 and inform the complainant about this decision and reason for the elevation of complaint to Tier 3 of the GRM.	
Tier-3: PMU (supported by PISC) Level	• The 3rd level will be the Grievance Committee (GC-3) to be constituted at PMU level. The PMU is supported by the Project Implementation Support Consultant (PISCs) who will have safeguard team with experts from all subjects (Environment, Health & Safety, Biodiversity, Social, Labour, and Gender). Any grievances that cannot be addressed or resolved at Tier 2 may be brought up to GC-3. • The secretary of GRC-3 will convene a meeting within 15 days of receiving the complaint. The secretary will lead the process of investigation and take help from the subject experts in PISCs to find likely solutions. All such solutions will be discussed during the meeting of the GRC-3. If required multiple GRC-3 meetings will be held and the complainants will be requested to appear before the GRC-3. The GRC-3 will resolve the matter within a time period of 30 days from receiving the complaint.	The GC-3 at PMU will be comprised of (i) PMU Project Director (acts as the secretary), (ii) Managing Director PTCUL, (iii) Managing Director UPCL, (iv) Managing Director, UREDA and (v) a senior lawyer from High Court or social worker of high reputation. It is expected that most of the complaints are resolved by GC-2 and the meetings of the GC-3 will be held only when an unresolved complaint is referred to them. The respective Chief Engineer of the Zone from where the complaint has been lodged would be an invited member.
Tier-4: Ministry of Power Level	It is expected that most of the grievances will be resolved at GRC-1 and GC-2 and GRC-2 level only. The complaints referred to this apex level will be the matters that have wider policy implications or of high financial consequences. The efficient functioning of the GC-1 and GC-2 can prevent escalation of such	Grievance Committee at the fourth level (GC-4) will comprise of (i) Secretary Power Department (as convenor), (ii) Managing Director PTCUL, (iii) Managing Director UPCL, (iv) Managing Director UREDA, and (v) Chief Secretary, Government of Uttarakhand.

Tier/Level	GRM Process	Grievance Redress Committee
	complaints. The PMU with support from PISC will monitor their functioning	

9.8.6. Process of Registering Complaint

759. **How to file a Grievance or Complaint:** Grievances or complaints can be lodged verbally (in person or through telephone calls) or through written applications to the Junior Engineers (JE) at site, Site Supervisor of the EPC Contractor or Sub-Divisional Offices. The existence of the grievance mechanism and the numbers of the responsible persons to register complaints will be displayed at all work site as well as on notice boards of the site offices or PTCUL and UPCL. UPCL has an existing toll-free helpline number (1912) for its customers. This channel is popular and can be used to register grievances related to execution of the project components. Grievances pertaining to implementation of the project can also be filed online at the website of the implementation agency (PTCUL and UPCL) on the designated e-mail id for sending grievances.

760. **Who can complain:** A complaint may be brought by one or more people who are, or could be, "directly, indirectly, materially, and adversely" affected by the project. A complaint can be submitted on behalf of the affected person/people by a representative, provided that he or she identifies the affected person/people and includes evidence of the authority to act on their behalf.

761. **Record Keeping:** All the complaints (informal and formal, no matter how minor and readily resolved, including the actions/resolutions taken) received by the EPC Contractor Site Supervisor, Junior Engineer/Divisional or Sub-Divisional Offices either verbally or through written communication shall be documented in a Grievance Register maintained at Tier-1 or Division Level. It must contain name of the complainant, date of receipt of the complaint, address/contact details of the person, location of the problem area and how the problem is addressed. The Grievance Register will help to track cases, respond to grievances in a timely manner, check the status of complaints and track progress, measure effectiveness, and report on results. The grievances received and their status will be compiled in the first week of every month at GRC-2 or PIU level of both UPCL and PTCUL and shared with GRC-3 at the PMU/PISCs. The PISCs will provide a summary of functioning of the GRM to ADB as part of the environmental monitoring reports to be submitted during the project implementation period. It is recommended that a project-wide grievance handling database be set up by the PMU GRM focal replicating the PIU logs at project-level, and by the PIU GRM focal replicating the logs at site-level. Once a resolution has been proposed to the complainant, they will be asked to sign a form acknowledging receipt of that proposal and providing their approval or refusal, as applicable; this form will be added to the grievance/complaint register and once all actions are taken the associated entry will be closed but not deleted. All GRC meeting deliberations and decisions will be recorded and will be available for public reference. The log must be publicly available and the number of grievances recorded and resolved and the outcomes will be displayed/disclosed at the PIU/PMU offices.

762. All complaint-related documentation such as minutes of the meetings and decisions will be summarized and become part of the quarterly reports and environmental monitoring reports submitted to ADB.

763. Dehradun Ward members shall also be updated monthly regarding the status of grievances and the progress of works.

9.8.7. Disclosure on GRM

764. The formation and effectiveness of GRM will be communicated to the affected people across the project area as part of overall consultation and disclosure process of the project. It will be publicized widely through community meetings and pamphlets and information on focal contact persons, how to file grievance etc. will be placed on the billboards of the construction sites/project site offices in Hindi and any other local languages so that people are aware of their rights and obligations, and procedure of grievance redress. The EPC contractors and PISCs will assist PTCUL and UPCL in disseminating the GRM related information to the people. Special efforts should be made to ensure that poor and vulnerable households are made aware of grievance redress procedures and entitlements. Grievances will be filed without any fear and stress and stakeholders may also raise grievances anonymously if they so wish through a drop box on site. ADB's accountability mechanism will also be informed to the Affected People by PPIU/UPIU.

765. All costs involved in resolving the complaints/grievances (meetings, consultations, communication, and reporting/information dissemination) will be borne by PTCUL and UPCL and any complaints resolution pertaining to EPC contractors and the EMP related complaints will be borne by the EPC contractors.

X. ENVIRONMENTAL MANAGEMENT PLAN

10.1. Introduction

766. ADB's Safeguard Policy Statement (SPS) 2009 requires that an Environmental Management Plan (EMP) be prepared to ensure construction and operation of the project will be undertaken in accordance with its safeguard requirements. The project-level EMP is an overarching document that will guide environmental management implementation, supervision, and monitoring of PTCUL, UPCL, UREDA[107] and their contractor's activities under the project. It aims to ensure compliance with (i) ADB's Safeguard Policy Statement 2009 requirements and international good practice as set out in the related International Finance Corporation (IFC) Environment, Health and Safety (EHS) general and Electric Power Transmission and Distribution guidelines, and (ii) applicable environmental, health and safety requirements of the Government of India (GoI) and Government of Uttarakhand (GoUK), including the international agreements which the GoI is a signatory too, as well as having cognizance of the sensitivity of local ecological and human receptors in the project area of influence.

767. The EMP provides summary information of the types of impacts and risks anticipated because of the project and provides detailed information about the required mitigation and monitoring measures with respect to the following stages: (i) design, (ii) pre-construction, (iii) construction, and (iv) operation and maintenance, as well as implementation arrangements and reporting requirements. Prior to the approval of designs PTCUL and UPCL will consult ADB regarding the need to update the IEE based on the final route alignments put forward by the contractors. As required, the IEE will be updated for clearance and disclosure by ADB before design approval and the start of any related works including construction site establishment. To ensure the mitigation and monitoring measures are implemented a program of environmental supervision and monitoring will be undertaken during the project implementation by the Project Implementation Unit (PIUs) and their Project Implementation Support Consultants (PISCs) (Engineer).

768. The definitive version of the project-level EMP cleared by ADB is the most recent version disclosed on its website. The EMP is dynamic and can be updated as appropriate during the project implementation. However, any update to the EMP will first need to be cleared by ADB. The EMP (the environmental measures in the case of UREDA) will form part of all bidding and contract documents for all contract packages/lots and during design and pre-construction, and construction the contractors will be responsible for implementing all relevant measures for the works in their contract package/lot under supervision and monitoring of PTCUL, UPCL or UREDA. Any updates to it will be incorporated into the contract document. The contractors must always follow the definite version of the EMP which is the version disclosed on ADB's website. This includes any updates in response to unanticipated impacts. In addition, for any requirements for corrective action due to non-compliance, appropriate action will be agreed with ADB and taken by PTCUL, UPCL or UREDA and their contractors to bring project implementation back on track. The contractors will cover the costs where corrective action is required due to non-compliance on behalf of the contractor, its subcontractors or third parties with the EMP.

[107] Environmental measures are included for UREDA PIU to ensure this component has no more than minimal environmental impact.

10.2. Corrective Action Plans

769. This EMP sets out a broad framework for the management of potential impacts and risks that may occur at substation sites. Where necessary, site-specific actions will be required, including corrective actions for any existing substations to be implemented through a corrective action plan (CAP). UPCL and PTCUL will be responsible for applying any short-term corrective actions or delegating them to the contractor through the scope of the contract before access is granted for works on substations located within existing substations. UPCL and PTCUL will be responsible for submitting a report on the status of the short-term corrective actions to ADB for clearance prior to the contractor being given access to the existing substation in question to undertake works including site establishment. UPCL and PTCUL will also be responsible for complying with any long-term corrective actions before commissioning of the substations by the contractors; UPCL and PTCUL will undertake corrective actions that may involve works as either a separate undertaking or include it in the scope of the contract so that the contractor is responsible to address them. UPCL and PTCUL will submit a report on status of long-term corrective actions to ADB prior to commissioning of substations by the contractors. Contractors will be responsible for implementing any site-specific actions required at substations as part of their contractual obligations, including corrective actions delegated to them, in addition to the general requirements of this EMP which are to be followed for the substations.

770. PTCUL: the second circuit stringing will terminate within the existing Pithoragarh substation of PGCIL. Site inspections of the existing substation has not yet been undertaken since access was not granted by PGCIL to PTCUL for an environmental audit and as such there is the possibility that some unknown environmental issues exist at the site, for example, presence of contaminated land. Environmental audit of the existing substation will need to be undertaken by PTCUL (PISC) in due course when access is granted and where necessary corrective actions will be required and implemented through a corrective action plan (CAP) – as the Pithoragarh substation is owned by PGCIL, PTCUL will need to collaborate with PGCIL as a third party to ensure the CAP requirements are followed. The contractor for the second circuit stringing will be responsible for implementing any corrective actions for the existing substation delegated to them by PTCUL as part of their contractual obligations, in addition to the general requirements of this EMP which are to be followed whilst undertaking works at existing substations.

771. UPCL: there will be 25no. existing 33/11 kV substations renovated/updated with new equipment constructed at selected existing substations connecting to the new UG cables/OHL lines. Site inspections/environmental audit of the existing substations of UPCL and PTCUL have been undertaken and findings are documented in the IEE – Appendix P and V. A corrective action plan (CAP) has been developed and forms part of this EMP – refer to Section III, Table 70. Since one of the connecting substations is operated by PTCUL, UPCL will need to liaise with PTCUL to implement the CAP. Contractors will be responsible for implementing any corrective actions delegated to them by UPCL as part of their contractual obligations, in addition to the general requirements of this EMP which are to be followed whilst undertaking works at existing substations.

10.3. Environmental Mitigation Plan

772. The tables in **Appendix Q** and **Appendix R** provide the feasible and cost-effective environmental mitigation and project standards required during the design, pre-construction, construction and operational phases for all project components/activities to reduce potentially

significant, adverse environmental impacts and risks to acceptable levels and generally ensure international good practice, and national environmental, health and safety requirements are followed.

773. Some commitments that must be commenced during the design and pre-construction phase will continue to be implemented by the contractor during the construction phase. Operational phase mitigation measures are primarily for PTCUL / UPCL. However, all maintenance works during this phase including by the EPC Contractor during their defect liability period and operation/maintenance obligations will be undertaken following the construction measures.

10.4. Environmental Monitoring Plan (EMoP)

774. The EMoP (**Appendix T and Appendix U**) sets out the minimum provisions for quantitative environmental monitoring and performance standards to be achieved.

775. Monitoring activities including laboratory analysis for air quality, noise, surface water and groundwater quality, and soil are to be carried out by accredited suitably qualified and experienced third-party monitoring experts. Quantitative monitoring activities may be modified during project implementation, depending on the EPC contractors' performance and analytical results obtained. If performance is worse than expected, corrective action will be identified, and environmental monitoring activities adjusted accordingly by PTCUL / UPCL to help resolve any unsatisfactory performance.

776. In addition to quantitative monitoring there will also be supervision and monitoring of EMP implementation, the performance standard being all EMP measures are implemented in full at the appropriate time.

10.5. Construction Specific EMP (CSEMP)

777. The CSEMP is the document that the EPC Contractor will prepare outlining how they intend to implement the project-level EMP and ensure that all the mitigation and monitoring is completed according to the implementation arrangements specified in the EMP and the IEE as a whole.

778. The CSEMP will describe the precise location of the required mitigation / monitoring, the persons at the contractor responsible for the mitigation / monitoring, the schedule and reporting methodology etc. The CSEMP and all its topic and site-specific plans will be submitted to the relevant Project Implementation Supervision Consultant (PISC, or 'Engineer') and UPCL PIU (UPIU) or PTCUL PIU (PPIU) for their approval at least 30 days before the contractor taking possession of any work site. No access to the site will be allowed until the CSEMP is approved by the PISC and UPIU/PPIU. The CSEMP will include the following topic specific plans:

Table 118: CSEMP Topic Specific Plans

Plan	PTCUL Approvals		UPCL Approvals	
	PPIU	PISC	UPIU	PISC
Construction Method Statement	Yes	Yes	Yes	Yes

Plan	PTCUL Approvals		UPCL Approvals	
	PPIU	PISC	UPIU	PISC
Pollution Prevention Plan & Emergency Response Plan (including SF6 measures)	Yes	Yes	Yes	Yes
Occupational Health and Safety Plan & Emergency Response Plan	Yes	Yes	Yes	Yes
Community Health and Safety Plan & Emergency Response Plan	Yes	Yes	Yes	Yes
Biodiversity and PCR Plan including Chance Find Procedure	Yes	Yes	Yes	Yes
Waste Management Plan	Yes	Yes	Yes	Yes
Traffic Management Plan	Yes	Yes	Yes	Yes
Labour Management Plan	Yes	Yes	Yes	Yes
Communication Plan	Yes	Yes	Yes	Yes
Training Plan	Yes	Yes	Yes	Yes
Contaminated Land Management Plan (if necessary)	Yes	Yes	Yes	Yes
Asbestos Management Plan (if necessary)	Yes	Yes	Yes	Yes
Piling Management Plan (if necessary)	Yes	Yes	Yes	Yes

779. The following site-specific plans will also be required, including:

Table 119: CSEMP Site Specific Plans

Plan	Approvals	
	UPIU / PPIU	PISC
Construction Camp / Labor Accommodation Management Plan	Yes	Yes

780. In addition to the plans provided in the CSEMP, the EPC Contractor will also be responsible for the following documents:

- Code of Conduct.

10.6. Design Phase Environmental Assessment for MLV Lines

781. To complement the IEE, environmental and social screening of the UPCL UG works is required. The EPC Contractor will be required to complete the environmental assessment checklist included in **Appendix H** for each UPCL underground cable/overhead line including CSS, RMU etc. If the routing of any PTCUL or UPCL OHL also changes from that assessed in this IEE, the same environmental assessment checklist can be used as a basis for updating the IEE.

782. As part of the environmental assessment, EPC Contractors will ensure field ecologists complete walkover surveys of the UG cables, CSS and RMU sites. They will also undertake and document meaningful consultations with potentially affected persons and local communities within 50m of UG/OHL RoWs, RMU and CSS as well as other stakeholders including local authorities and public utilities during the design in order that any concerns raised during consultations can be reflected in the choice of site layout, route alignment and construction method – consultation proforma in **Appendix H** to be completed during detailed design.

783. The checklist and consultation proforma shall be provided to the PISC for validation in the field and UPIU for approval alongside the detailed design, confirming all components meet the subproject component selection criteria in the IEE and do not have any worse impact than that predicted in the IEE. Prior to UPIU approval of the designs and commencement of construction they will seek ADB clearance of the consolidated environmental assessment forms/consultation proformas and update the IEE as required, confirming no change from the impacts and risks described and assessed in the IEE, or undertaking site-specific assessment and develop the site-specific EMP if required, seeking ADB clearance of any updated IEE before works start.

10.7. Overarching Implementation Arrangements

784. The Project Management Units (PIUs) of PTCUL, UPCL and UREDA will be responsible for ensuring correct implementation of the Environmental Management Plan (EMP) and approving the EPC Contractors CSEMP to comply with ADB's safeguards requirements and environmental, health and safety (labor) national regulations. For this, the PIUs will include environment, health and safety safeguard staff of PTCUL and UPCL. The PIUs will be assisted by environmental, health and safety specialists of the PISCs in supervising the implementation of the EMP / CSEMP who will provide environment, biodiversity, social, labor, health and safety and gender expertise.

785. The cost for implementing mitigation and monitoring measures as outlined in this EMP will be included in the EPC contract, unless specifically assigned to PTCUL or UPCL to implement.

786. If any change in design including sites/routes or other unanticipated environmental or social impacts become apparent during project implementation, PPIU or UPIU will be required to immediately inform ADB and (i) assess the significance of such unanticipated impacts; (ii) evaluate the options available to address them; and (iii) update the IEE and EMP taking corrective action where necessary.

787. The following sections provide the specific implementation requirements for all parties.

10.8. Implementing Agency Management and Project Implementation Units

788. The management of the implementing agencies notably their established PIUs are responsible for supervising their PISCs, EPC Contractors and EMP implementation for overall compliance with ADBs SPS (2009) requirements and project environment-related legal covenants.

789. To support the PIUs in meeting these responsibilities PTCUL and UPCL must both establish an environmental and social safeguards team under their PIU to include (i) environment, (ii) health and safety, and (iii) social staff under a SE, these EE nodal officers in the PIUs will be supported by field staff dedicated to the EHS supervision and responsible for implementing the EMP with respect to PTCUL and UPCL responsibilities and supervising and monitoring the contractor's implementation. This PIU set up will be the basis for establishing long term Environment and Social Units in PTCUL and UPCL ensuring capacity gained during the project is not lost.

10.8.1. Primary Responsibilities

790. The PIUs' responsibilities include the following, but not limited to:

- Implement and update the EMP developed within the IEE (if required). All updates are subject to ADB clearance.
- Locally disclosing the IEE and other environmental safeguards documents, including publication on the PTCUL / UPCL website. Help with translation of the IEE into local languages or an explanation of its content will be extended free of charge to affected persons on request.
- Incorporating the EMP into the bidding and contract documents before issuing tenders and contract awards.
- Reviewing bids to ensure they are in accordance with the EMP requirements prior to contract award.
- Reviewing and approving the contractor's detailed designs as well as CSEMP and EMP sub-plans to ensure they incorporate and are in accordance with the EMP requirements.
- Preparing and submitting semi-annual environmental monitoring reports (annual during operation) to ADB for disclosure on their websites.
- Ensuring adherence to all applicable national and state environment, health, safety, and labor laws and regulations in force at the time.
- Ensuring adherence to ADB's Safeguard Policy Statement (2009) and the related WBG Environment, Health and Safety (EHS) general and power transmission and distribution guidelines (2007).
- Ensuring adequate management support, budget, staff, and other resources are allocated to satisfactorily implement, supervise, and monitor implementation of the EMP during all phases.
- Appointing suitably qualified and experienced E&S officer and H&S officer to the Safeguards Unit to support EMP implementation during construction and operation.
- Preparing a detailed training plan, providing training venues, and providing with support of PISC a suite of training activities for PTCUL / UPCL staff and contractors in relation awareness raising on EMP implementation.
- Ensuring that all PMU/O&M staff support and attend all capacity development and training activities provided for them.

- Adopting a zero-tolerance approach to OHS and enforcing all PTCUL/UPCL staff to comply with OHS requirements of the EMP including wearing of appropriate PPE on site to set a good example to the contractor and their workers.
- Implementing the EMP throughout all phases or, if responsibilities are delegated, supervising, and monitoring its implementation by the contractor.
- Ensuring that necessary compensation is paid to the forest department for cutting of trees before the commencement of related work.
- Ensuring the contractor secures all necessary CTE, CTO and other permissions before the commencement of related work, maintain records with copies of all the clearances, permits, licenses, and insurances obtained.
- Ensuring the contractor provides adequate training to their subcontractors and all workers including daily EHS toolbox talks and emergency response drills; suggesting topics for the trainings based on site observations.
- Reporting to ADB of any non-compliance or breaches with ADB safeguard requirements in a timely manner and take corrective actions promptly.
- Updating the IEE/EMP as required in consultation with ADB prior to approval of the contractor's route alignments with respect to any changes from the indicative routes assessed. Obtaining ADB's clearance for the IEE/EMP update prior to the commencement of any work, including site establishment and vegetation clearance. Once cleared, ADB will disclose the updated IEE on its website whilst PTCUL/UPCL will locally disclose it;
- Building up and sustaining institutional capacity in environmental management, health and safety, including conducting public awareness programs.
- Preparing a community liaison plan to elaborate on ongoing consultation and information disclosure in relation to EMP implementation considering gender, vulnerable groups, and indigenous peoples; preparing consultation materials for distribution to affected communities.
- Undertaking and documenting all ongoing consultation, details of consultations such as minutes of the meetings, photographs to be documented in the EMRs submitted to ADB.
- Establishing and operationalizing the GRM for affected persons (construction workers and local community members) in line with the IEE, including appointing GRM Focals and establishing a GRC, disseminating contacts, recording and promptly resolving grievances received. All ongoing grievance-related information will be documented in the EMRs submitted to ADB.
- Once operational, any contractors hired for maintenance works or decommissioning will be supervised and monitored by PTCUL/UPCL with roles and responsibilities the same as those of the contractor for construction
- Undertaking environmental monitoring as set out in the EMoP during all phases, documenting quantitative and qualitative monitoring results; for quantitative monitoring hire accredited, and quality assured, third-party laboratories.
- Undertaking with the support of PISC monthly EHS meetings including site walkover inspection to determine the status of EMP implementation by the contractor during construction as well as random "spot check" site visits to audit their EMP implementation. Minutes of meetings and findings of site walkover inspections will be attached to the EMRs to be submitted to ADB.
- Identifying areas for improvement, unsafe acts, and any non-compliances with the EMP by the contractor and/or PTCUL staff and instructing for corrective actions to be taken by them to bring implementation back on track.
- Thoroughly investigating all unanticipated impacts, near-misses, accidents, and chance finds; preparing a detailed incident report where applicable, identifying and instructing on corrective actions particularly to avoid any repetition of near-misses and accidents.

- Monitoring and reporting on EMP implementation including reporting on EMP implementation in quarterly progress reports and preparing semi-annual EMRs for submission to ADB up until the completion of construction, reverting to annual up until the ADB project completion report, or for longer period if it is required by the ADB PCR.
- Reporting any unanticipated impacts, accidents, and chance finds to ADB within 48 hours of them occurring along with a corrective action plan.
- Reporting to ADB any grievances submitted to the third formal stage of the GRM upon receipt.
- Developing and taking all requisite corrective action in case of any non-compliance with the EMP including repair of any property damages and financial compensation (insurance) for health and safety incidents.

10.8.2. Reporting

791. PPIU / UPIU will be responsible for the following documents and reports:

Table 120: Reporting Responsibilities

Documents	Responsible Person	Destination of the documents	Submission timing		
			Design period	Construction period	Operation period
Bid and Contract Documents (addition of environmental, health and safety requirements per EMP)	PIU ESO with support HSO and SO	ADB	X		
Updated IEE /EMP	PIU ESO with support SO	ADB	X (When IEE is finalized in response to final route alignments and substation layouts)	X (When any changes are made to IEE / EMP due to unanticipated impacts)	
Training Plan	PIU ESO with support HSO and SO	PTCUL / UPCL / EPC Contractor	X		
Community Liaison Plan	PIU SO with support ESO and HSO	PTCUL / UPCL / EPC Contractor	X		
Consultation Reporting (included in Quarterly Progress Reports (QPRs))	PIU SO with support ESO	ADB	X (Quarterly)	X (Quarterly)	
Incident Reports (included in QPRs)	PIU HSO and ESO	ADB		X (Quarterly)	
QPR	PIU ESO with support	ADB	X (Quarterly)	X (Quarterly)	

Documents	Responsible Person	Destination of the documents	Submission timing		
			Design period	Construction period	Operation period
	ESO and HSO				
Fatalities and Chance Find Reports (immediate reporting with 48 hours of occurrence)	PIU HSO and ESO	ADB		X	X
Semi-annual environmental monitoring reports (EMR) semiannual up until completion of construction reverting to annual on operation, including details of grievances	PIU ESO with support ESO and SO	ADB	X (every 6 months)	X (every 6 months)	X (annual)

10.8.3. EMRs

792. Following loan effectiveness, environmental monitoring reports (EMRs) will be submitted to ADB on a semi-annual basis by PTCUL/UPCL up to the completion of construction reverting to an annual basis during operation up to the ADB project completion report with safeguards inputs provided to quarterly progress reports. EMRs will be due for submission to ADB within 15 days of the month following period end, e.g., before mid-July and mid-January each year. EMRs will be submitted until the ADB Project Completion Report is issued, or later if required therein. The EMRs will describe project implementation progress, any scope or design changes, compliance against safeguard requirements that are covenanted in the legal agreements, progress with environment mitigation and offset implementation, quantitative monitoring results in accordance with the EMoP, and grievances received. UREDA will report through the quarterly progress report.

793. EMRs, CAP if prepared by PTCUL/UPCL separately to their EMR submission, and updated IEE, if any, submitted by PTCUL/UPCL during project implementation will first be reviewed by ADB to ensure quality and acceptability and then, once cleared by ADB, are to be disclosed locally (in the same places as the IEE report was originally disclosed) by PTCUL/UPCL and on the ADB website upon receipt.

10.9. Safeguards Units

794. PTCUL and UPCL will create a dedicated environmental and social safeguards unit at their headquarters (corporate) level to manage the above-mentioned tasks and environment, health and safety risks (and any social impacts) of its activities in general. The unit will sit under an SE and be staffed by a qualified and experienced Environment Safeguards Officer (ESO) and a qualified and experienced Health and Safety Officer (HSO) with IOSH/NEBOSH certification, both with 12-15 years of experience. There will also be a qualified and experience Social Officer (SO) in relation to resettlement. The environmental and social safeguards unit staff will be at EE level.

795. In the first instance the dedicated ESOs, HSOs and SOs will work directly for the PPIU and UPIU to help them deliver on their responsibilities. Upon completion of construction, since EMP implementation is ongoing they will need to continue with their role into operation with

the safeguard's unit sitting within the PTCUL and UPCL organization structure to provide corporate EHS support to all its activities and over time the staffing of the safeguard's unit can be expanded.

796. PTCUL and UPCL may source the dedicated staff through direct hiring (either on a contractual or permanent employment basis) or through deputation from another department. Since there may be shortage of suitably qualified and experienced EHS professionals presently employed in PTCUL and UPCL given the focus on electrical engineering, making a direct hiring is the advised approach.

797. In addition, EHS site supervision needs to be assured at the PIU level for which the capacity of Electrical Divisions to take on responsibility for environment, health and safety compliance matters needs to be built. The staff nominated for support at PIU level will form the basis of EHS units which will be established by management at Electrical Division level and which will continue into operation of the project.

10.10. EPC Contractors

798. Through the contract, PTCUL, UPCL and UREDA will delegate responsibility for implementing all relevant measures during design, pre-construction, and construction. The EPC contractors will be required to comply with the EMP during the design, preconstruction, and construction phases, closely supervised and monitored by PTCUL, UPCL and UREDA. The EPC Contractors will be responsible for reporting environmental safeguards progress and performance at least monthly to the PIUs including record data required by the EMoP and providing necessary inputs to the quarterly progress reports and semi-annual EMRs for the duration of their contract. The requirement to undertake relevant mitigation and monitoring actions as set out in this EMP applies to the construction sites as well as to any temporary workers camps or overnight accommodation provided by them.

799. The EPC contractors have the responsibility for EMP implementation. However, the EPC Contractors are required to ensure that the EMP requirements are cascaded down to all sub-contractors undertaking works relating to the project, regardless they are formally or informally employed, and to be responsible for supervising and monitoring their sub-contractors in turn. Construction workers will need to abide, in their behavior and work, to directives issued by their employer with regards to environmental, health and safety management.

800. The EPC Contractors will be responsible for the preparation of their CSEMP. The CSEMP will need to be fully compliant with the project-level EMP and the IEE and will need to be prepared within 30 days of Contract award and approved 30 days prior to access to the site.

10.10.1. Specific Responsibilities

801. In addition to the above, the EPC Contractors will be responsible for:

- Implementing all measures and responsibilities allocated to the EPC Contractor under the EMP for the full duration of the contractor's involvement.
- Ensuring adherence to all applicable national and state environment, health, safety, and labor laws and regulations in force at the time.
- Ensuring adherence to ADB's Safeguard Policy Statement (2009) and the related WBG Environment, Health and Safety (EHS) general and power transmission and distribution guidelines (2007).

- Ensuring the detailed design reflects the EMP requirements; seeking to ensure it has the same or no worse impact than the indicative designs/route alignments which were assessed in the IEE.
- Supporting PTCUL and UPCL to update (as required) the IEE in respect of the detailed design by providing sufficient details to inform a revised project description and any subsequent reassessment of impacts and risks.
- Undertaking and documenting a facilitated health and safety (H&S) risk assessment considering for all phases and including consideration of COVID-19 risks amongst others.
- Preparing a CSEMP and sub-plans as specified in the EMP for review and approval by PTCUL / UPCL prior to the commencement of works including site establishment – sub-plans will include a Pollution Prevention Plan, Construction Waste Management Plan, Occupational Health and Safety Plan, Community Health and Safety Plan, and Traffic Management Plan plus Emergency Response Plans etc.
- Ensuring adequate budget, staff and other resources are allocated to comply with and implement the contractor's responsibilities under the EMP and to supervise and monitor the active construction site to protect the environment and ensure the health and safety of all workers and affected communities.
- Ensuring suitably qualified and experienced environment, health and safety safeguard officers, as per the EMP requirements have been appointed to undertake regular on-site supervision and monitoring activities before the commencement of works.
- Adopting a zero-tolerance approach to OHS on the project, enforce all workers to comply with the OHS requirements of the EMP including the wearing of appropriate PPE on the construction site.
- Obtaining all necessary CTE, CTO and other permissions before the commencement of related work, share copies of all clearances, permits, licenses, and insurances obtained.
- Providing – in part with the support from PTCUL/UPCL – and ensuring attendance at EHS trainings for formal and informal construction workers and other personnel as required.
- Ensuring that all construction workers including all formal and informal employees and subcontractors understand their responsibilities to implement the EMP and mitigate environmental impacts and risks associated with pre-construction and construction activities.
- Supporting PTCUL/UPCL in undertaking ongoing consultation and implementing the site-level GRM; in particular, the contractor's GRM Focal shall thoroughly document details of complaints and make its best efforts to resolve the complaints at project site level; all this information is to be included in the contractor's monthly reports to PTCUL/UPCL.
- Undertaking environmental monitoring as set out in the EMoP during pre-construction and construction and documenting qualitative and quantitative monitoring results; for quantitative monitoring the contractor is to hire accredited, and quality assured, third party laboratories.
- Submitting monthly environmental management reports to PTCUL/UPCL (monthly EMP reports will be stand-alone but included as part of the contractors' monthly progress reports) relating to the work undertaken over the reporting period and documenting the environmental measures including monitoring activities that have been carried out, problems encountered, record data including near misses and accidents, grievances received, and follow-up actions that were taken (or will be taken) to correct the problems.
- Informing PTCUL/UPCL immediately in case of any approved detailed design changes or unanticipated environmental impacts occurring during implementation, and as required, provide any information needed to PTCUL/UPCL to enable them to promptly update the IEE/EMP for clearance by ADB before any changes are implemented.

- Informing PTCUL/UPCL within 24 hours in case of chance find or accident on site and providing within 48 hours an incident report with corrective action detailing how reoccurrence will be prevented.
- Informing PTCUL/UPCL immediately in case of any non-compliance and help them to prepare as necessary a corrective action plan for clearance by ADB, the contractor is required to implement all necessary corrective action requested by PTCUL/UPCL to ensure the project remains in compliance with national and state regulatory requirements, ADB's SPS 2009, the project's loan covenants and EMP requirements.

10.10.2. EPC Contractor Reporting

802. The EPC Contractors will establish their own internal systems for monitoring and reporting their EMP implementation. The EPC Contractors will formally submit monthly summary environmental management reports per an agreed template to the respective PIUs. Complete photographic records will be kept by the contractor covering all activities on site as well as key locations such as the construction site, receptors adjacent to the substations and RoWs, off-site access roads, stores, sanitation and welfare facilities, temporary worker camps or overnight accommodation etc. Photographs of key areas will be taken prior to construction activities beginning, to provide the environmental baseline. Copies of all geo-referenced photographs will be submitted to PPIU/UPIU along with the contractor's monthly report. Specifically, the EPC Contractors will be responsible for the following documents and reports:

Table 121: EPC Contractor Reporting Responsibilities

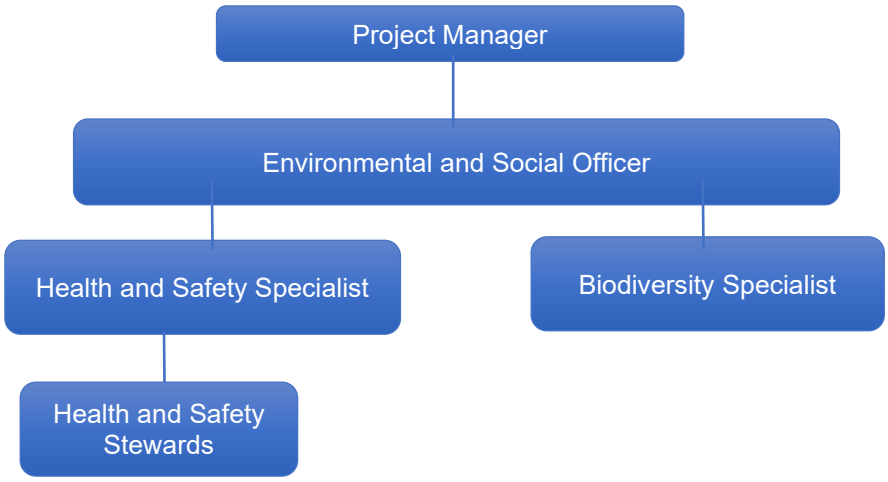
Documents	Responsible Person	Destination of the documents	Submission timing		
			Design period	Construction period	Operation period
Site Specific Checklist and Consultation Proforma (UPCL COMPONENTS)	ESO (for MLV Component)	PISC, UPIU, ADB	X (Once, prior to design approval and the start of construction)		
Health and Safety Risk Assessment	HSS	PISC, PPIU / UPIU	X	X (annually updated)	
Final design/ alignments for approval	ESO	PISC, PPIU / UPIU	X (Once, prior to the start of construction)		
CESMP (including OHS plan, waste management plan, etc.)		PISC, PPIU / UPIU	X (once, prior to the start of construction)	X (updated through construction as needed)	
Environmental, health and safety checklists		PISC, PPIU / UPIU		X (every week. to be completed daily)	
Monthly progress reports		PISC, PPIU / UPIU	X (every month)	X (every month)	
Record of monthly training and daily toolbox training		PISC, PPIU / UPIU	X	X	

Documents	Responsible Person	Destination of the documents	Submission timing		
			Design period	Construction period	Operation period
			(every month)	(every month)	

10.10.3. EPC Contractors Staff

To prepare and implement the CSEMP and to supervise and monitor the EMP/CSEMP implementation a team of specialists will be required as part of the EPC contractor's team as illustrated in Figure 87 and described in detail below. If an EPC contractor is awarded more than one contract package/lot then an entirely separate EHS team is to be employed for each of them.

Figure 87: EPC Contractors Environmental, Social, Health and Safety Team



10.10.4. Environmental and Social Officer

803. During construction, EPC Contractors must retain the expertise of an Environmental and Social Officer (ESO), one for each contract package/lot, to implement and continually update the CSEMP and to oversee and report on the operation of the EMP/CSEMP throughout the contract period. The ESO will be the EPC Contractors main focal point for all environmental, social, labor, gender, health and safety issues associated with the Project and will lead the other team members listed below.[108]

804. The ESO will be a suitably qualified and experienced full-time member of staff on the EPC Contractors roster and should be on site at least five days per week. The required qualifications of the ESO are as follows:

- Degree in environmental sciences and related expertise.
- At least 5 years' experience in on-site environment supervision.
- Experience of at least five construction projects of a similar type, location, size and scale.

[108] In addition to the core ESHS team the contractor must also have HR staff responsible for maintaining labor records per GoI requirements and to assist with labor and gender issues including those of sub-contractors etc.

805. Specifically, the ESO shall be responsible for:

- Identifying any areas of ecological sensitivity that may need to be avoided with support of field ecologists.
- Translate mitigation requirements written in the CSEMP and its sub-plans into practical measures on the ground.
- Ensure that all staff are fully aware of the environmental sensitivities of the site and their responsibilities, as outlined in the management plans (e.g., via practical toolbox talks ahead of the construction).
- Take field notes and photographs to demonstrate compliance with the management plans.

806. The contractor's ESO will act as their GRM focal to keep affected persons informed of works and be available to receive and deal with any grievances at the project site level. The ESO will also act as the GRM focal at the construction camp site/overnight accommodation for receiving and fixing grievances in the logbook. The ESO shall also manage all social and labor-related issues.

807. In addition, the ESO will be responsible for the preparation of weekly environmental checklists and an environmental section of the EPC Contractor's monthly progress reports that shall be submitted to the PISC and PMUs for review. The PISC shall provide a template of the checklist to the EPC Contractor.

808. The monthly reports, which will include the weekly environmental checklists, shall contain sections relating to:

- General Progress of the Project.
- Environmental Incidents, e.g., spills of liquids, accidents, etc.
- Progress of any environmental initiatives, e.g., energy savings, recycling, etc.
- Records of any environmental monitoring.
- Conclusions and Recommendations (corrective action).

809. The ESO shall provide daily toolbox training at the construction camp and at construction sites. The ESO shall keep a record of all monthly training and toolbox training undertaken.

10.10.5. Biodiversity Specialist

810. For any works in areas within 500m of international/national biodiversity sites (as detailed in the IEE, excluding UG cabling in the existing road ROW of urban Dehradun and existing substations) or otherwise passing through forest habitat even if not notified by government, the EPC Contractors shall engage a Biodiversity Specialist for the period of works in these areas (part-time basis). The Biodiversity Specialist will have a degree in ecology or similar, and at least ten years' experience of biodiversity surveys (flora and fauna) and supervision of similar projects in forest area/habitat. The specialist will report directly to the ESO and will be responsible for the following:

- Pre-clearance surveys.
- Oversight of land clearing activities and removal of vegetation.

10.10.6. Health and Safety Specialists

811. The EPC Contractors shall hire a suitably qualified and experienced Health and Safety Specialist (HSS), one for each contract package/lot, for the Project duration. The HSS shall have at least ten years on-site experience of supervising similar type and sized electrical infrastructure Projects with NEBOSH/IOSH certification or similar qualification. The HSS shall report directly to the ESO. The main responsibilities of the HSS will be:

- Provide H&S training, including daily toolbox training sessions at each work site.
- Approve H&S Plans for specific work activities.
- Conduct routine site inspections and issue internal stop notices, if necessary, for unsafe activities.
- Maintain H&S statistics log for near misses, as well as incidents.
- Provide H&S input to EPC Contractor reports.

812. Further, each active construction site is to have adequate health and safety supervision to ensure the health and safety of all workers and local communities. This is to include a suitably qualified and experienced Senior Engineer having NEBOSH/IOSH certification or similar qualification who is based on-site full-time and nominated to the role of EHS Supervisor with responsibility for ensuring EMP implementation, acting on the advice of, and reporting to their environment safeguards team. Each Senior Engineer nominated to the role of EHS Supervisor will be supported by full-time, dedicated, on-site Health and Safety steward(s) with at least one steward to each 50 persons.

10.10.7. Management Systems

813. EPC Contractors will have a corporate EHS policy and environmental management certifications preferably such as ISO 14001 (or equivalent) and EHS certification such as OHSAS 18001 or equivalent.

10.10.8. Staff Costs

814. Table 123 provides a summary of the anticipated staff costs.

Table 122: EPC Contractor Environmental, Social, Health and Safety Staff Costs (BOQ) – per Lot (14 Lots in Total)

#	Position	Estimated No. of Months	Month Cost ($)	Total Cost ($)
1	Environmental and Social Officer	36	800	28,800
2	Health and Safety Specialist	36	800	28,800

3	Health and Safety Steward(s)	144	800	115,200
4	Biodiversity Specialist (part time) including on: • LILO of 132 KV Khatima - Sitarganj line at proposed 132/33 KV Substation Khatima-II within 500m of reserve forest • Second circuit stringing OHL passing through forest habitat • Kaniya SS and UG cabling within 200m of protected area	12	800	9,600

10.10.9. Control of Records

815. The list of records that must be available by the EPC Contractor for review must include:

- Definitive IEE and EMP (as disclosed on the ADB website)
- Legal register (of applicable national and state legislation)
- Tree felling permits, vehicle emission test certificates etc.
- Training plan and training records (including inductions)
- Community liaison plan, community awareness documentation and records of all consultations undertaken
- Records of emergency preparedness and response drills
- Document review and approval records
- Contractor's CSEMP and sub-plans and copies of approval records
- Contractor's certifications and insurances
- Completed site checklists and photographic records
- Corrective action instructions
- Corrective and preventive action request records
- OHS Risk Assessment
- Contractor's and operational accident record and incident reports
- GRM register

- Work program and schedule
- Environmental permits and licenses
- List of equipment
- List of mitigation measures
- Route/program of construction material transportation
- Copies of correspondence related to environmental issues
- Records of maintenance and cleaning schedules for sediment and oil/grease traps
- Records of sewage disposal (if relevant)
- Records of quantity of discharged wastewater and concentration of pollutants
- Waste disposal records
- Written designation of waste disposal sites and instructions for waste transportation from local authorities
- Log of material inventories and consumption
- Chance find records (if any)
- Equipment control and maintenance log
- Staff contracts and timesheets
- Campsite / Accommodation Audits
- Water Quality sampling results
- Air Quality and Noise test results
- EMF measurement results
- Property surveys
- Pre-construction biodiversity surveys
- Tree inventory

816. These records shall be kept on-site by the EPC Contractors ESO and available for inspection at any time.

10.11. PISCs

817. The PISCs will support the PIUs in ensuring the correct implementation of the Project's EMP, and all related documents. The PISCs will have environment, biodiversity, social, labor, health and safety and gender expertise who will support supervision and monitoring and provide safeguards capacity building for PTCUL and UPCL to help ensure satisfactory EMP implementation. For the UPCL cable undergrounding in Dehradun PISC must include sufficient health and safety staff to enable each cable stretch to be supervised.

10.11.1. Specific Responsibilities Prior to commencement of the works

818. The PISCs shall be responsible for the following:

- Support PPIU/UPIU in preparing a detailed training plan.
- Support delivery of safeguard training and capacity building activities and provide on-the-job guidance to PPIU/UPIU safeguards staff and the contractors on ensuring compliance with the EMP requirements.
- Supporting PPIU/UPIU in reviewing the contractor's detailed designs, their CSEMP and EMP subplans for compliance with the EMP to ensure these documents incorporate and are in accordance with EMP requirements.
- Provide guidance to the PPIU/UPIU Safeguard Specialists on the environmental and social aspects of the project with emphasis on compliance monitoring and reporting.
- Assist the PPIU/UPIU with establishing and operating the grievance redress mechanism, including creating a grievance chart which is to be updated on a weekly basis.
- Evaluate the environmental aspects of the EPC Contractors' method statements and working drawings and recommend corrective actions needed, if any, to ensure compliance with the project's environmental and social requirements.
- Review the EPC Contractors' CSEMP and all topic specific (such as waste) and site-specific plans; recommend modifications to these documents to be compliant with: (a) the environmental and social requirements of the construction contracts as reflected in the EMP, and (b) the conditions of environmental approvals of the Government, where required.
- Develop the compliance monitoring system to be used during the construction period for monitoring the contractors' performance relative to environmental requirements, including the preparation of: (a) monitoring and corrective action forms and checklists, (b) inspection procedures, and (c) documentation procedures.
- Conduct orientation sessions with the EPC Contractor on the compliance monitoring system to be used, notification of non-compliance, and the process of requiring contractors to implement corrective measures when necessary.
- Provide guidance to the EPC Contractor on how their respective CSEMP will be implemented including the: (a) requirements for each mitigation measure, and (b) implementation schedule of each mitigation measure taking into consideration the general

requirement that no specific construction activity will be approved to be commenced if the associated mitigation measures for such activity are not ready before work commences.

- Supporting PPIU/UPIU in ensuring the contractor provides adequate EHS training to their subcontractors and all workers including communication of emergency plans, daily EHS toolbox talks and emergency mock response drills; topics for the trainings to be suggested based on site observations.

- Supporting PPIU/UPIU in updating the IEE/EMP as required in consultation with ADB prior to approval of the detailed designs to reflect any national environment clearance conditions and any changes from the indicative route alignments assessed by the IEE.

- Supporting PPIU/UPIU in ensuring that their contractors secure all necessary CTE, CTO and other permissions before the commencement of related work, maintain records with copies of all the clearances, permits, licenses, and insurances obtained. Checking laborers have valid ID cards to access the site and contractor has valid labour licenses and insurances including provisions for community liability during the period of construction.

- Supporting PPIU/UPIU in preparing a community liaison plan.

- Developing formal systems and templates for PTCUL staff, contractor, and PMC safeguard staff to supervise, monitor and report on day-to-day implementation all aspects of EMP implementation, including the immediate reporting of non-compliances, unanticipated impacts, accidents, chance finds, grievances etc.

10.11.2. During implementation of the works

819. The PISC shall be responsible for the following:

- Guiding PPIU/UPIU on the implementation of the EMP during the pre-construction and construction.

- Following the formal systems and templates developed for supervision and monitoring support PPIU/UPIU safeguards staff to undertake day-to-day supervision to ensure that contractors adhere to all the provisions in the EMP as well as their CSEMPs and sub-plans as approved by PPIU/UPIU.

- Keep daily records and photo logs of site observations to inform preparation of the semi-annual EMRs.

- Supporting monthly EHS meetings including site walkover inspection to determine the status of EMP implementation by the contractor during construction as well as random “spot check” site visits to audit their EMP implementation.

- Reporting any unanticipated impacts, grievances, unsafe acts, or EMP violations to PPIU/UPIU, identifying areas for improvement, and assisting them in implementing solutions and remedial measures.

- Supporting PPIU/UPIU in reporting on EMP implementation within the quarterly progress reports and preparing semi-annual EMRs for submission to ADB.

- Supporting PPIU/UPIU with updating of the IEE/EMP as necessary if any unanticipated impacts (including project scope or design changes) occur during implementation

- Supporting PPIU/UPIU to undertake ongoing meaningful consultation with affected communities to keep them informed of progress and with local disclosure of the findings of the EIA report and EMRs etc.

- Supporting operationalization of the GRM and assisting PPIU/UPIU in resolving grievances received.

10.11.3. Upon completion of the works

820. The PISCs shall prepare a report on the Project's environmental and social compliance performance, including lessons learned that may help PPIU/UPIU in their environmental monitoring of future projects. The report will be an input to the overall project completion report.

10.11.4. Reporting

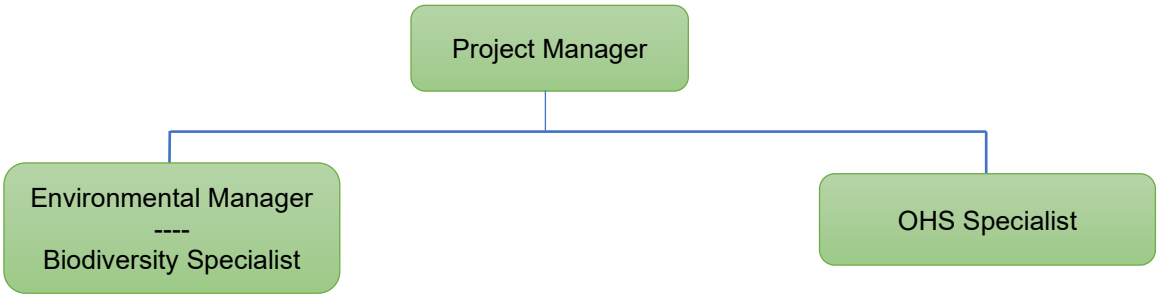
Table 123: PISC Reporting Responsibilities

Documents	Responsible Person	Destination of the documents	Submission timing		
			Design period	Construction period	Operation period
Compliance reports	EM, OHSS	PPIU/UPIU, ADB	X (every month)	X (every month)	
Lessons report	EM, OHSS	PPIU/UPIU, ADB		X (at completion)	

10.11.5. PISC Staff

821. The PISC (Engineer) shall have the following staff on their roster to support EMP implementation, other staff will be there for social safeguards support etc. They will also be able to call upon external experts to support these more generalist consultants with resolving any site-specific issues and to deliver the capacity building trainings with respect to PCBs management, SF_6 etc.

Figure 88: PISC (Engineer) Environmental, Social, Health and Safety Team



10.11.6. Environmental Manager (EM)

822. The EM will work closely with the EPC Contractor's ESO and the PPIU/UPIU ESO and work on general environment focused tasks such as conducting environmental trainings and briefings to provide environmental awareness on ADB and government environmental safeguards policies, requirements and standard operating procedures; ensure baseline monitoring and reporting of EPC Contractor's compliance with contractual environmental mitigation measures during the construction phase.

823. The EM will (i) review all documents and reports regarding the integration of environment aspects including EPC Contractor's CSEMP, (ii) supervise the EPC Contractor's compliance to the EMP/CSEMP, and (iii) prepare monthly compliance reports.

824. Qualified with a degree or diploma in environmental sciences or equivalent. Preferably fifteen years' experience in conducting environmental impact assessments and implementation of environment mitigation plans and/or monitoring implementation of environmental mitigation measures and health and safety plans during implementation of projects including electricity HV projects funded by developing partners.

10.11.7. Biodiversity Specialist

825. The Biodiversity Specialist will have at least ten years' experience of biodiversity surveys and supervision of similar projects. The specialist will report to the EM and will be responsible for supporting the following:

- Review of detailed designs and pre-clearance surveys especially for second circuit stringing OHL in forest habitat
- Oversight of land clearing activities and removal of vegetation

10.11.8. Occupational Health and Safety Specialist

826. Professionally qualified specialist in all health and safety aspects of major civil works construction, preferably with 5 years of experience with HV and MLV substation and power line projects. The specialist will be responsible to the Project Manager for ensuring that all aspects of the project comply with the health and safety provisions of the project's civil works contracts, EMP/CSEMP, and with relevant national laws and regulations.

10.11.9. Staff Costs

827. The following table provides a summary of the anticipated staff costs.

Table 124: PISC (Engineer) Environmental, Social, Health and Safety Staff Costs

#	Position	Estimated No. of Months	Month Cost ($)	Total Cost ($)
1	Environmental Manager	36	3,300	118,800
2	Occupational Health and Safety Specialist	36	3,300	118,800

#	Position	Estimated No. of Months	Month Cost ($)	Total Cost ($)
3	Biodiversity Specialist	36	3,300	118,800

10.12. EMP/CSEMP Review and Update

828. The contents of the EMP/CSEMP will be reviewed and updated periodically to evaluate the environmental controls and procedures therein to make sure they are still applicable to the activities being carried out and effective. Reviews will be undertaken by the EPC Contractor and PISC (Engineer) as follows:

- The full EMP/CSEMP will be reviewed in detail on an annual basis;
- Relevant parts of the EMP/CSEMP will be reviewed following a reportable incident;
- Relevant parts of the EMP/CSEMP will be reviewed in case of any issues/grievances or failure of mitigation to reduce impacts occurs;
- Relevant parts of the EMP/CSEMP will be reviewed following the receipt of an updated site specific or topic specific plan; and
- At the request of stakeholders.

829. The review will include analysis of the monitoring data, monitoring reports, incident reports, complaints/grievances, and feedback from stakeholders. Any update to the project-level EMP requires ADB review and clearance, whilst any update to the CSEMP requires PPIU/UPIU review and clearance.

10.13. Corrective Actions

830. If any performance standards are breached or any of the safeguard requirements that are covenanted in the loan agreements are found not to be satisfactorily complied with by PPIU/UPIU and their contractors, an appropriate, time bound, budgeted, corrective action plan (CAP) will be developed and implemented as agreed upon with ADB to rectify unsatisfactory performance or safeguard noncompliance.

10.14. Meetings and Site Visits

831. PPIU/UPIU will convene monthly EHS meetings to be attended by the contractor's management and safeguard team to discuss progress; initially progress will be discussed in relation to design actions and as the project progresses will move onto pre-construction and contraction actions. During the monthly EHS meetings areas for improvement, unsafe acts, and any non-compliances, time-bound corrective actions and responsibilities to address them will be discussed, agreed, and documented. PPIU/UPIU ESO and HSO will be given delegated authority to instruct the contractor to take corrective action at any time in relation to EMP implementation.

832. For any ADB supervision missions to ongoing construction works contractors will provide all ADB staff with a project site health and safety induction and adequate PPE in accordance

with Table 2.7.1 of the WBG EHS General Guidelines - Occupational Health and Safety Section.

10.15. Capacity Development

833. To build capacity of both PPIU/UPIU and the contractors for implementation of the EMP and other safeguard requirements, a training program will be delivered. The training program will be implemented as per training modules provided in Table 125, training needs will be further determined and elaborated in a training plan prepared by PPIU/UPIU. Training modules can be changed during construction phase based on requirements of the contractors. The basic objective of giving training to the different stakeholder is to enhance their capabilities for implementation of the EMP and EMoP during construction and operation.

834. Delivery of the training program is part of the project cost that includes institutional strengthening, capacity building and training whilst the contractor will factor in their attendance within the contract amount. It is recommended that the training be given:

- Upon the award of contracts to the contractor
- Before the start of construction work
- Refresher during construction
- Before demobilization of contractor and commencement of O&M

Table 125: Training Requirements

Training Session	Required Attendees/Recipients	Delivery Mode/Duration	Training Conducted by	Budget Source
Introduction to ADB's Safeguard Policy Statement (2009),WBG EHS Guidelines, GOI requirements, and Project EMP including EMOP	PPIU/UPIU, EPC Contractors' Management and Environment Safeguards Teams	Lecture session, presentation, and discussion. In Person/ 1 day	Safeguard Unit of PPIU/UPIU / PISC EM & HSO	PISC Budget
EMP implementation for detailed design	PPIU/UPIU, EPC Contractors' Design Teams and Environment Safeguards Teams	Lecture session, presentation, and discussion. In Person/ 1 day	Safeguard Unit of PPIU/UPIU / PISC EM & HSO	PISC Budget
Bird sensitive design awareness raising	Power line staff of PPIU/UPIU, EPC Contractors' Management, Design Teams and Environment Safeguards Teams	Lecture session, presentation, and discussion. Online/ 0.5 day	Safeguard Unit of PPIU/UPIU / PISC Biodiversity Specialist	PMC Budget
PCB awareness raising	SS staff of PPIU/UPIU, EPC Contractors' Management, Design Teams and Environment Safeguards Teams	Lecture session, presentation, and discussion. Online/ 0.5 day	Safeguard Unit of PPIU/UPIU / PISC EM & HSO	PISC Budget

Training Session	Required Attendees/Recipients	Delivery Mode/Duration	Training Conducted by	Budget Source
SF_6 awareness raising	SS staff of PPIU/UPIU, EPC Contractors' Management, Design Teams and Environment Safeguards Teams	Lecture session, presentation, and discussion. Online/ 0.5 day	Safeguard Unit of PPIU/UPIU / PISC EM & HSO	PISC Budget
GRM operation (initial run at start of project, and then again on handover to operational staff)	All GRM levels- GRM Focal Points, GRC, PPIU/UPIU, Contractors Management, Environment Safeguards Team, Local Government Representatives GRM Focal Points of Contractors	Lecture session, presentation, and discussion. In Person/ 1 day	Safeguard Unit of PPIU/UPIU / PISC EM	PISC Budget
EMP implementation for pre-construction and construction, including workshop on CSEMP preparation	PPIU/UPIU, Contractors' Construction Teams and Environment Safeguards Teams	Lecture session, presentation, and discussion. In Person/ 1 day	Safeguard Unit of PPIU/UPIU / PISC EM & HSO	PISC Budget
Environmental assessment checklist and consultation proforma completion for IEE update	PPIU/UPIU, Contractors' Construction Teams and Environment Safeguards Teams	Lecture session, presentation, and discussion. In Person/ 1 day	Safeguard Unit of PPIU/UPIU / PISC EM & HSO	PISC Budget
Facilitated H&S workshop (construction stage)	PPIU/UPIU, Contractors Management, Construction, and Environment Safeguards Staff	Facilitated workshop In Person/ 1 day	PISC HSO	PISC Budget
Environmental quality monitoring requirements; site supervision and monitoring including use of detailed monitoring framework (checklists) and preparing period Environmental Monitoring Reports	PPIU/UPIU, Contractors Management and Environment Safeguards Teams	Lecture session, presentation, and discussion. In Person/ 2 days	Safeguard Unit of PPIU/UPIU / PISC EM & HSO	PISC Budget
Site restoration	PPIU/UPIU, Contractors Management, Construction, and Environment Safeguards Staff	Lecture session, presentation, and discussion. Online/ 0.5 day	Safeguard Unit of PPIU/UPIU / PISC EM	PISC Budget

10.16. EMP Implementation Schedule

835. Strictly no contracts will be awarded before the EMP has been incorporated into the contract documentation. Further, no site establishment or construction activity is to take place before PPIU/UPIU has received and approved the contractor's CSEMP including all sub-plans. Tentative implementation schedule of the project is listed in the following table. The

contractors will submit a more detailed implementation schedule for the detailed design, pre-construction, and construction once the contract is awarded.

Table 126: Key EMP Milestones in Implementation Schedule

#	Description	Indicative Time Frame
1	**Project Implementation PTCUL/UPCL**	
A	Bidding Documents	Ongoing - Q4 2023
B	Procurement	Q4 2023 – Q3 2024
C	Construction commencement	Q2 2024
D	Construction Completion	Q3 2028
E	Defects Liability Period	12 months
2	**Pre-Construction Phase**	
A	Implementation of mitigation measures and conduct environmental monitoring for which PPIU/UPIU is responsible	Immediate implementation, noting EMP requirements must be reflected in contract for which bidding documents may be issued prior to ADB project approval
B	Establishment of GRM	Immediate implementation, latest within one month of loan effectiveness
C	Appointment of PPIU/UPIU E&S safeguards officers (safeguards unit)	Latest within one month of loan effectiveness for the PPIU/UPIU safeguard support, before start of works on site.
D	Appointment of PISCs	PISCs must be appointed within three months of loan effectiveness and prior to the approval of detailed design, CSEMP approval, site establishment, site preparation, etc.
E	Implementation of mitigation measures and conduct environmental monitoring for which contractor is responsible	Upon award of the contract
F	Updating the IEE/EMP to reflect final route alignments and obtaining ADB clearance of update	Prior to approval of the detailed design
G	Submission and approval of the Contractor's Specific Environmental Management Plan (CSEMP)	One month before the start of works including any site establishment, site preparation, demolition, and earthworks
3	**Construction Phase**	
A	Implementation of mitigation measures and conduct of environmental effects monitoring following the EMP.	After award of the contract
B	Monthly EMR for Project's Monthly Progress Report	5th day after effective month (covering the month prior)
C	Semi-Annual EMR during construction for submission to ADB	15th day after effective 6-months; the last construction EMR will be submitted after the commissioning and DLP of all works by the implementing agency documenting in depth how all pre-construction and construction activities were complied with
D	Restoration of construction sites	Before demobilization of contractor
4	**Operation Phase**	

#	Description	Indicative Time Frame
A	Implementation of mitigation measures and monitoring activities for operational period	Upon commissioning
B	Annual EMR during construction for submission to ADB	15th day after effective 6-months; the first operational EMR will be submitted 12 months after the last construction EMR was submitted up until the ADB PCR is issued

10.17. Budget

836. Costs will be associated with implementation of the mitigation plan, EMoP and capacity development. Necessary budgetary provisions must be planned and allocated by PTCUL / UPCL for implementing the environmental measures of their components as part of the EMP. The main EMP budget items have been identified for implementing the environmental management and monitoring and capacity development activities required, and an indicative budget allocated for each. The budget will be refined during project implementation but enables preparedness for financial requirements.

837. For contract/consultant related costs these are only an estimate based on an estimate of the construction and installation cost, since the contracts are subject to competitive bidding it will be for the contractor/consultants to reflect in their BOQ and ensure adequate budget is provided in their bids for the EMP implementation. The construction EMoP will be part of the Contractor's contract, whereas the operational EMoP will be the responsibility of PTCUL / UPCL O&M team. Operational cost is an annual cost, it will be incurred annually for each year the HV components are in operation.

Table 127: Indicative Implementation Budget

Item	Quantity	Estimated Rate ($)	Estimated Total Amount ($)	Budget Source
CONSTRUCTION				
PPIU Safeguard Unit during construction				
ESO	36 months	1,200	43,200	PTCUL
HSO	36 months	1,200	43,200	PTCUL
SO	36 months	1,200	43,200	PTCUL
Training session expenses	500/session x 10	-	5,000	PTCUL
Expenses for consultation, GRM etc.	100/36 months	-	3,600	PTCUL
UPIU Safeguard Unit during construction				
ESO	36 months	1,200	43,200	UPCL
HSO	36 months	1,200	43,200	UPCL
SO	36 months	1,200	43,200	UPCL
Training session expenses	500/session x 10	-	5,000	UPCL
Printing for consultation, GRM etc.	100/36 months	-	3,600	PTCUL
PISC Safeguard Specialists				

Item	Quantity	Estimated Rate ($)	Estimated Total Amount ($)	Budget Source
Environmental Manager	36 months	3,300	118,800	PISC Contract
Occupational Health and Safety Specialist	36 months	3,300	118,800	PISC Contract
Biodiversity Specialist	36 months	3,300	118,800	PISC Contract
EPC Contractor's Environment Safeguards Team (per lot, 14 lots in total)				
Environment and Social Officer	36 months x 14	800	403,200	Construction Contract
Health and Safety Specialist with NEBOSH/IOSH	36 months x 14	800	403,200	Construction Contract
Health and Safety Steward(s)	108 months x 14	800	403,200	Construction Contract
Biodiversity Specialist (as needed)	12 months x 3	800	28,800	Construction Contract
EMP Implementation Costs				
Implementation of CAP at Existing SS	5,000/SS	1	5,000	PTCUL
Implementation of CAP at Existing SS	5,000/SS	25	125,000	UPCL
Contractor's EMP implementation cost (including PPE provision and bird divertors) – estimated at 1% of civil works costs	Lump sum	-	2,490,000	Construction Contract
Pre-construction/construction/commissioning environmental quality monitoring EMoP (Table 130)	Lump sum	-	97,595	Construction Contract
Tree Compensation[109]	105 trees (in PTCUL SS)	20-25	2,000	PTCUL
Tree Compensation	8 trees (in UPCL SS)	60	500	UPCL
Construction Sub-Total			**4,591,295**	
OPERATION				
PTCUL Safeguard Units during operation	Annual Cost per Unit	43,200	43,200	PTCUL
Operational Monitoring SS	Annual Cost per SS x 8	54	432	PTCUL
UPCL Safeguard Units during operation	Annual Cost per Unit	43,200	43,200	UPCL

[109] Estimate tree cutting costs and calculations provided in appendix

Item	Quantity	Estimated Rate ($)	Estimated Total Amount ($)	Budget Source
Operational Monitoring SS	Annual Cost per SS x 28	54	1,512	UPCL
Operation Sub-Total			**88,344**	

Table 128: Environmental quality monitoring budget

Parameters per Monitoring Plan	Sites	Rate in USD	Quantity/ location[110]	Frequency	Total in $
Pre-Construction					
Noise	Substations	36	34	1	1,224
Air quality		157	11	1	1,727
Surface water quality		54	20	1	1,080
Ground water quality		54	18	1	972
Soil quality		72	34	1	2,448
PCB Testing	Existing transformers	100	3, number at substations and on power lines TBC	1	300
Drinking water source for potability	Substations for operational supply and construction sites (worker supply)	60	36 substations, number at power line sites TBC	1	2,160
Construction					
Noise	Substations	36	34	12	14,688
Air quality		157	11	12	20,724
Surface water quality		54	20	12	12,960
Ground water quality		54	18	12	11,664
Drinking water source for potability	Construction sites (worker supply)	60	36 substations, number at power line sites TBC	3 times during construction	6,480
Commissioning					
Noise	Substations	36	34 substations	1	1,224
EMF		500 per Monitor	All substations	N/A – Monitors purchased for all substations	18,000

[110] For purposes of budget estimation, exact numbers to be determined by the contractors in accordance with EMoP requirements

Parameters per Monitoring Plan	Sites	Rate in USD	Quantity/ location[110]	Frequency	Total in $
Drinking water source for potability		54	All substations	1	1,944
		Total Monitoring Budget for Contract Cost			**97,595**
Operation (annual cost)					
Drinking water source for potability		54	All substations	1	1,944

XI. CONCLUSIONS AND RECOMMENDATIONS

11.1. Conclusions

838. This IEE has established that, except for the residual impacts mentioned below, there are no significant environmental issues that cannot be either totally prevented or adequately mitigated to levels acceptable to the national standards and international guidelines for Project activities.

839. The key identified significant residual impacts are as follows:

- Construction Phase: Community Safety - a range of mitigation measures have been provided to help manage the risk of accidents occurring and affecting the local community. However, despite these measures it is still possible that accidents could occur due to unforeseen circumstances.

- Construction Phase: Dust and Emissions - as with any project involving excavations, dust impacts cannot be entirely eliminated. Generic mitigation measures will, however, ensure residual impacts will be reduced to low significance.

- Construction and Operational Phase: Soil Contamination – good practice mitigation measures will ensure that residual impacts are low during construction. Construction of containment measures according to GIIP will ensure that leaks and spills at substations do not result in highly significant impacts. Regarding existing soil contamination, the measures outlined in the IEE will ensure that any potentially significant soil contamination is identified and removed from the site to authorized disposal locations before works. No highly significant residual impacts are identified as long as these procedures are followed.

- Construction Phase: Disruption to Water Supply - during the design phase the EPC Contractor will identify all borewells, water supply systems and water pumps and ensure that alignments avoid any interference with these areas. However, it is possible that temporary disruptions could occur.

- Construction Phase: Impacts to Sidewalks/Roads and Access - the high-level committee coordination activities and agreements with PWD should ensure that sidewalk impacts and access issues are not highly significant, but a 15-day period after works are completed may still result in low level residual impacts.

- Construction Phase: Removal of Streetlights - keeping poles in-situ for at least six months should help the transition to new streetlights, but it is still possible that streetlights may not be replaced after this time.

- Construction Phase: Noise - some short-term elevated noise impacts may occur during the daytime. Keeping work to short durations and the use of temporary mobile noise barriers should reduce the noise levels to acceptable levels during the working day. Residual impacts will be low.

- Construction / Operational Phase: Physical Damage and Poaching of Fauna - awareness training for workers in the most sensitive locations will help limit potential construction

phase impacts to the Corbett Tiger Reserve KBA/IBA close to Kaniya substation and UG cable, and FR and tiger corridor close to Khatima - Sitarganj LILO / SS but it is still possible that they could stray into these areas due to its proximity to the proposed substation, UG cable and OHL.

- Operational Phase: Geohazards – floods, landslides and forest fires are all potential issues which, despite adoption of good practice mitigation measures, may continue to occur and affect project infrastructure in the future mainly due to climate change, e.g., increased temperatures, drought and extreme rainfall events.

- Operational Phase: Bird Collisions: like electrocutions, the proposed solutions to limit bird collisions may not entirely eliminate this issue. Residual impacts will, however, be of low significance.

11.2. Recommendations

840. Mitigation and monitoring measures have been included in the Project Environmental Management Plan (EMP) incorporated into the IEE. PTCUL, UPCL and UREDA will implement the EMP measures ensuring adequate budget and human resources are allocated to this. UPCL and PTCUL will also complete the activities outlined in the Corrective Action Plan (CAP) for existing substations, per the timetable included in the CAP.

841. The EMP, its mitigation and monitoring programs, contained herewith will be included within the Bidding documents for project works for all Project components. The Bid documents will state that the EPC Contractor will be responsible for the implementation of the requirements of the EMP allocated to them (including specific design phase actions) through their own CSEMP which will adopt all the conditions of the EMP and add site specific elements that are not currently known, such as the EPC Contractor's storage and camp locations. This will ensure that all potential bidders are aware of the environmental requirements of the Project and its associated environmental costs. The EMP and all its requirements will then be added to the EPC Contractor's Contract, thereby making implementation of the EMP a legal requirement according to the Contract.

842. The EPC contractors will then prepare their detailed designs and CSEMP which will be approved and monitored by PTCUL and UPCL. Before the detailed designs are approved the IEE will need to be updated to reflect the final cable routes, reviewed and cleared by ADB for disclosure on the ADB website and locally. Should they note any non-conformance with the EMP (and CSEMP) the EPC Contractor can be held liable for breach of the contractual obligations of the EMP. To ensure compliance with the CSEMP the EPC Contractor is required to employ an Environmental and Social Officer and a team of experts to monitor and report Project activities throughout the Project Construction phase. Project implementation supervision consultants will also include environment, health and safety experts to support supervision and monitoring of Project EMP implementation and to build the capacity of PTCUL and UPCL.