People's Republic of Bangladesh
Power Grid Company of Bangladesh Limited (PGCB)

People's Republic of Bangladesh
Preparatory Survey on
Dhaka - Chittagong Main Power Grid
Strengthening Project

Final Report

BOOK-2
Appendices
For Publishing

September 2015

Japan International Cooperation Agency (JICA)

Tokyo Electric Power Company
Tokyo Electric Power Services Co., Ltd.

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Appendix I

Proposed 400 kV Transmission Line Route (Meghnaghat – Madunaghat)

LEGEND

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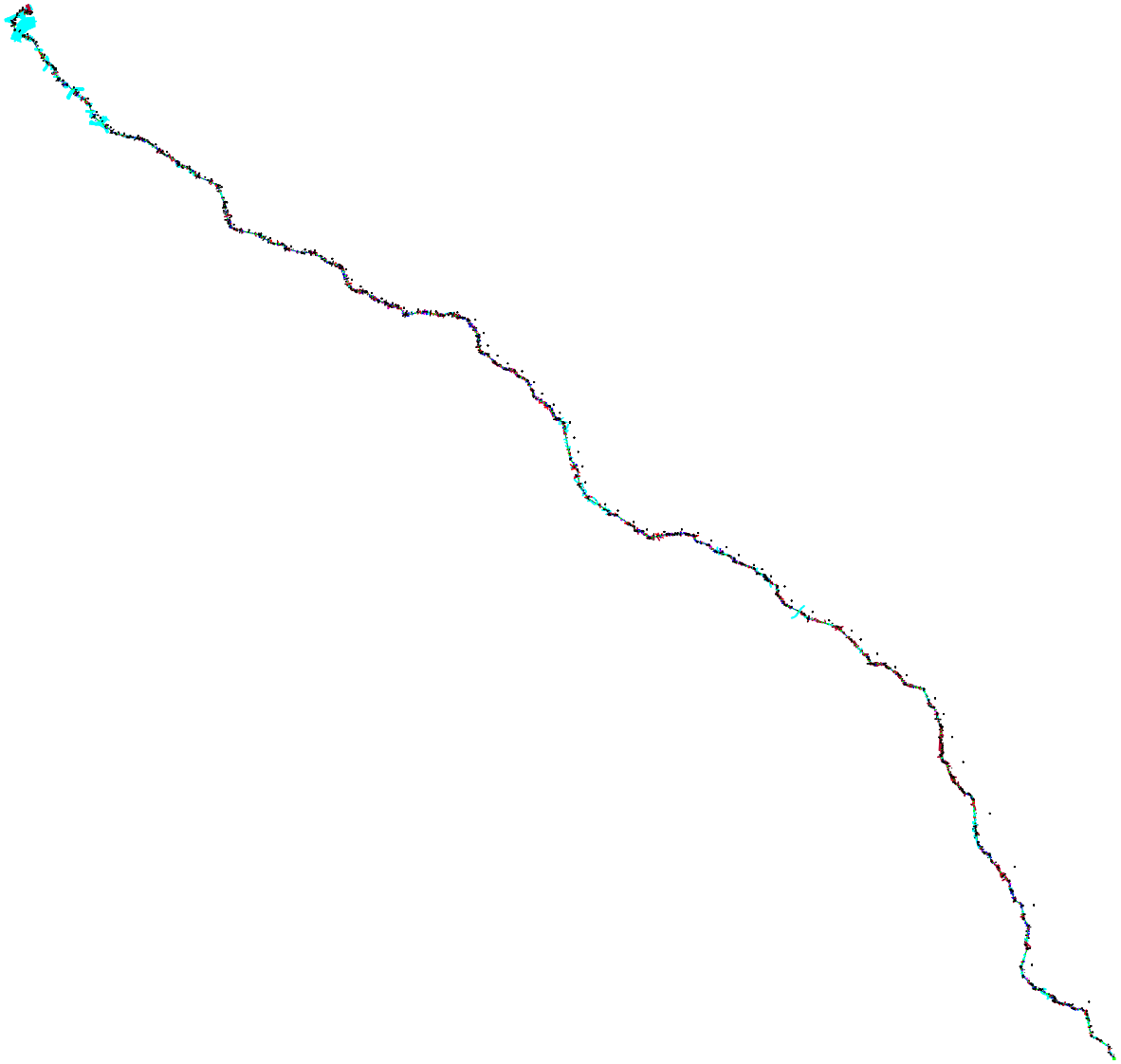
- Khal / River
- Tower
- Angle Tower
- Tree

ROUTE ALIGNMENT SURVEY OF PROPOSED 400kV
TRANSMISSION LINE FROM MEGHNAGHAT TO MADHUNAGHAT



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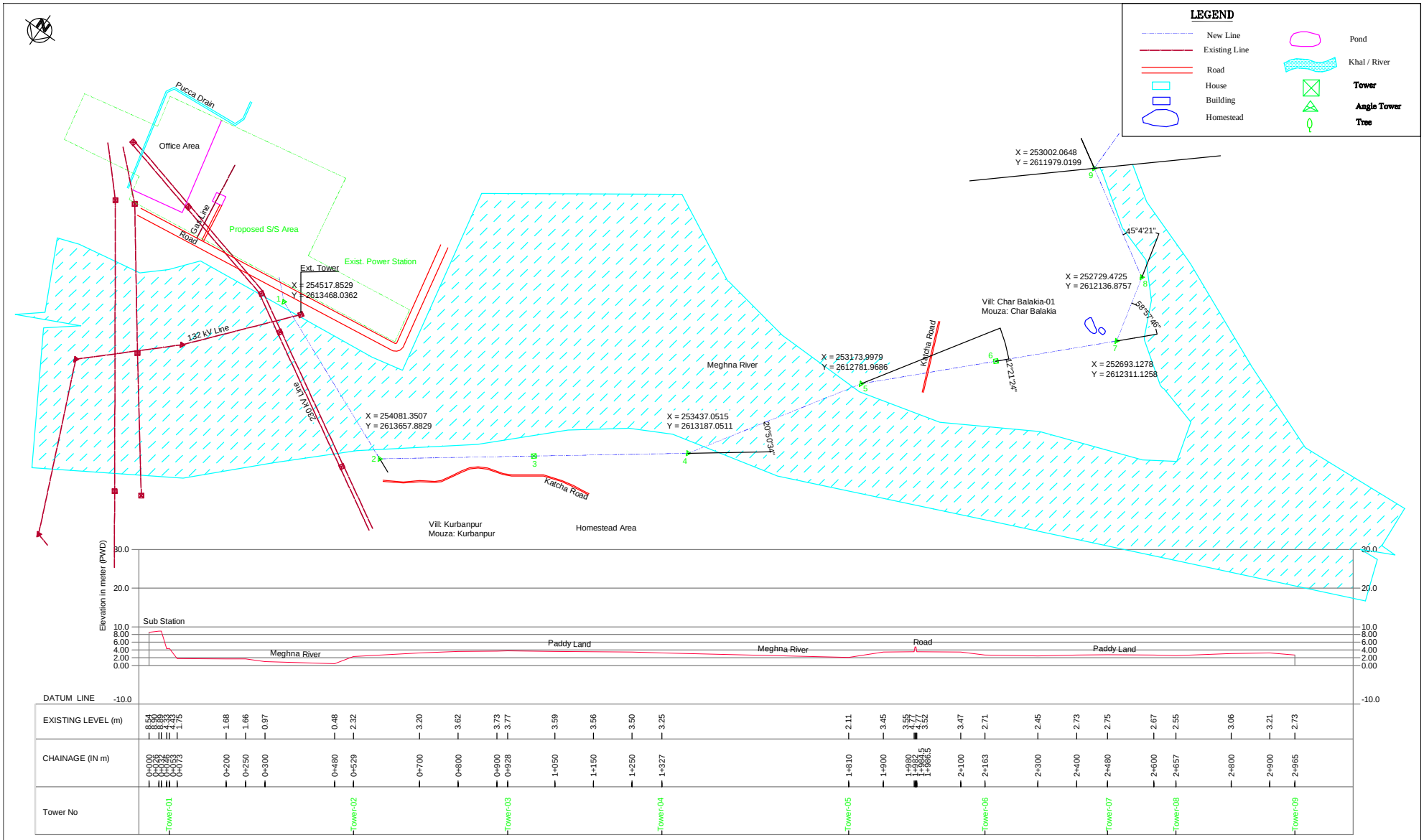

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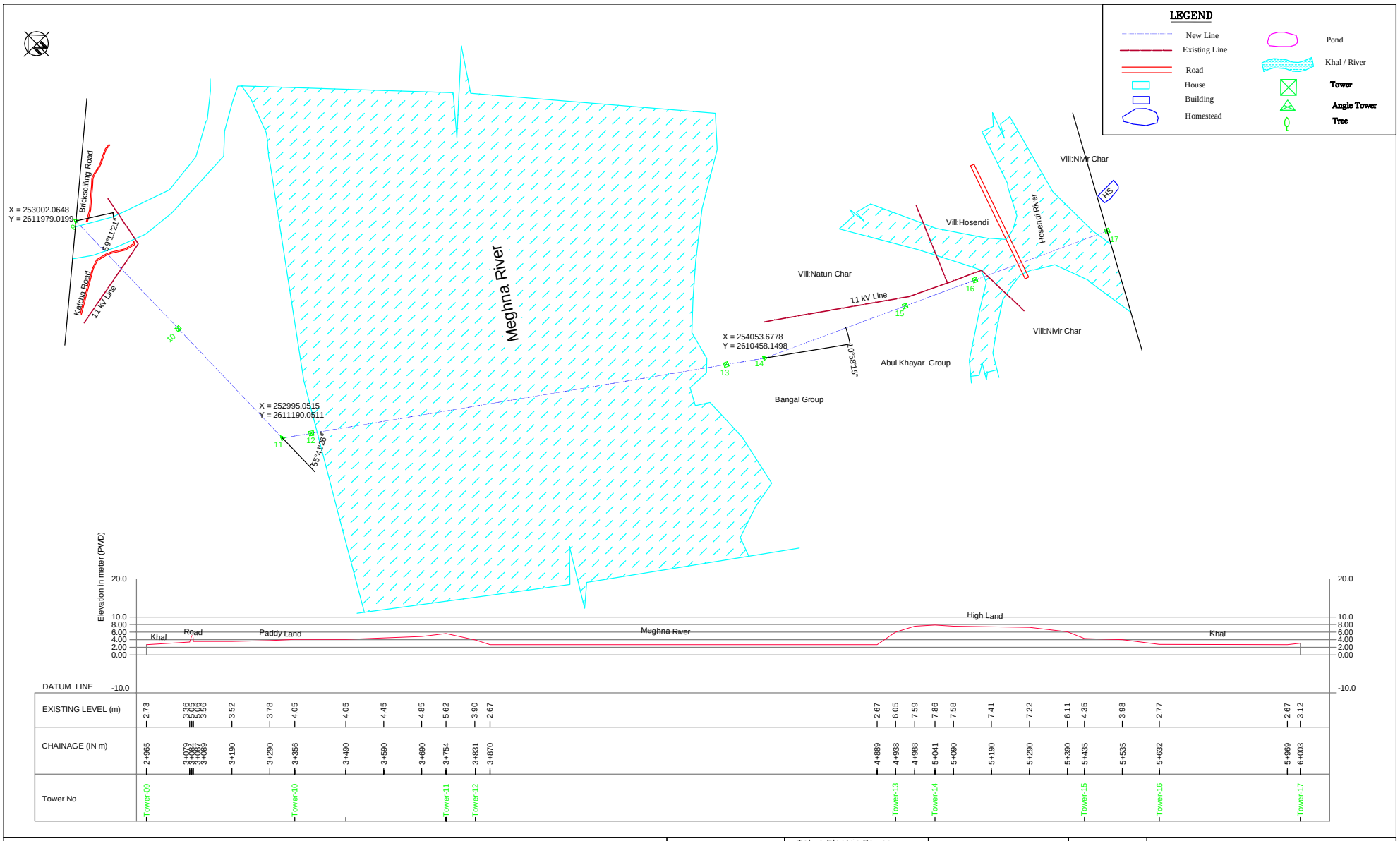

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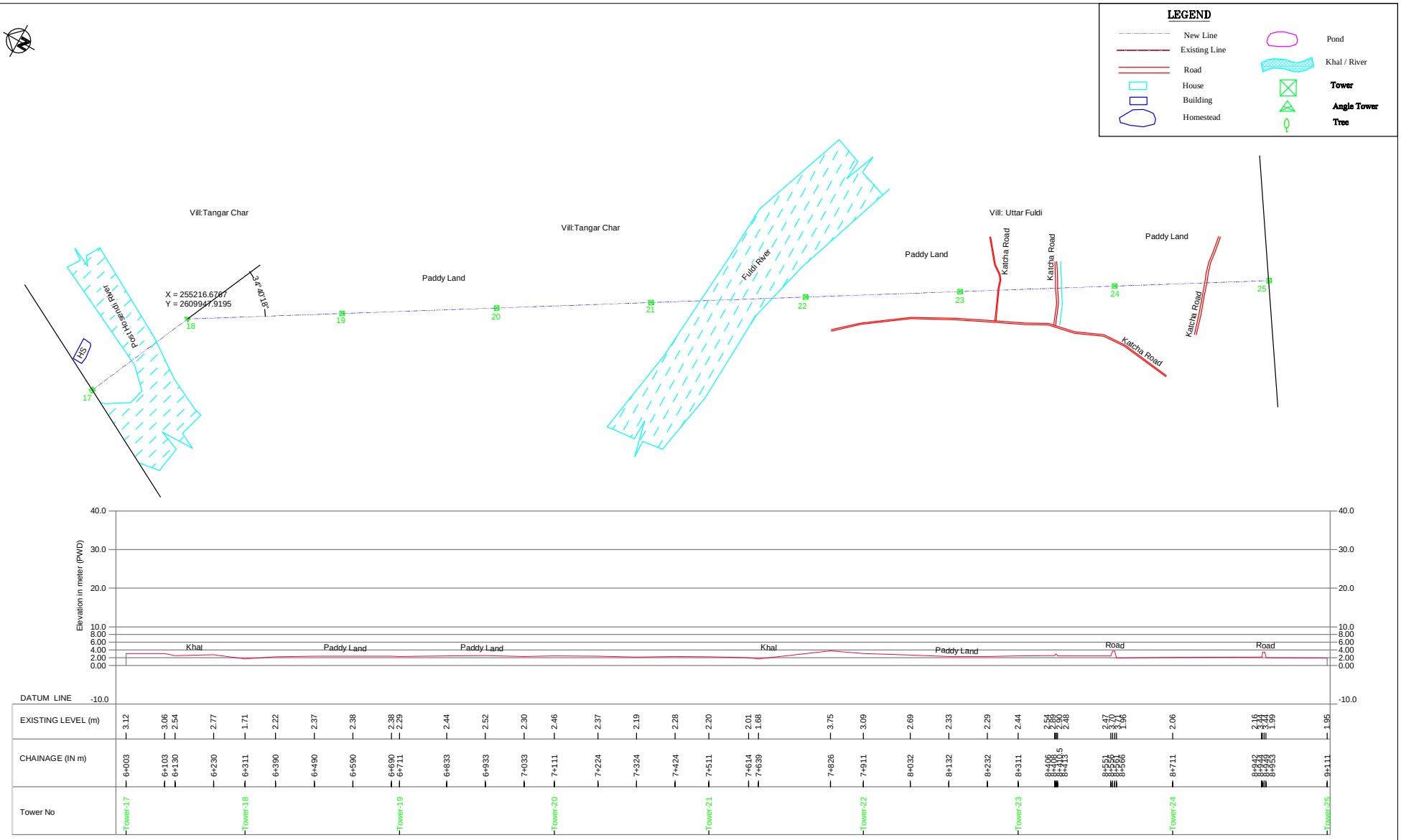

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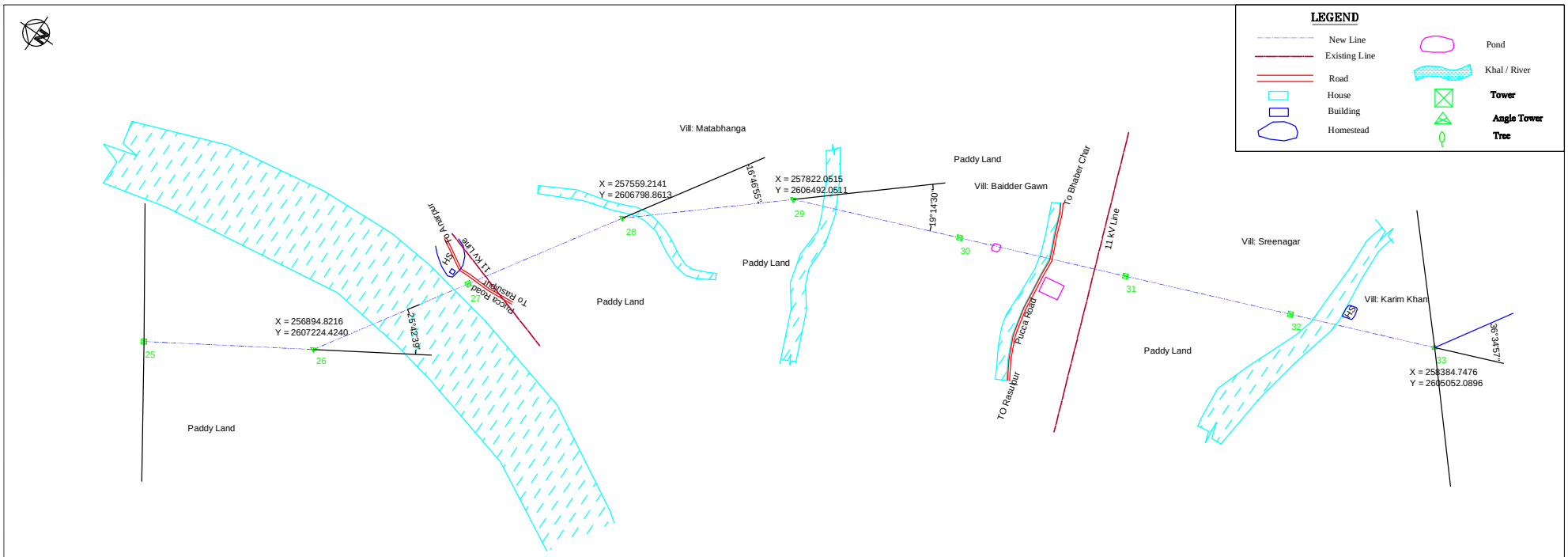

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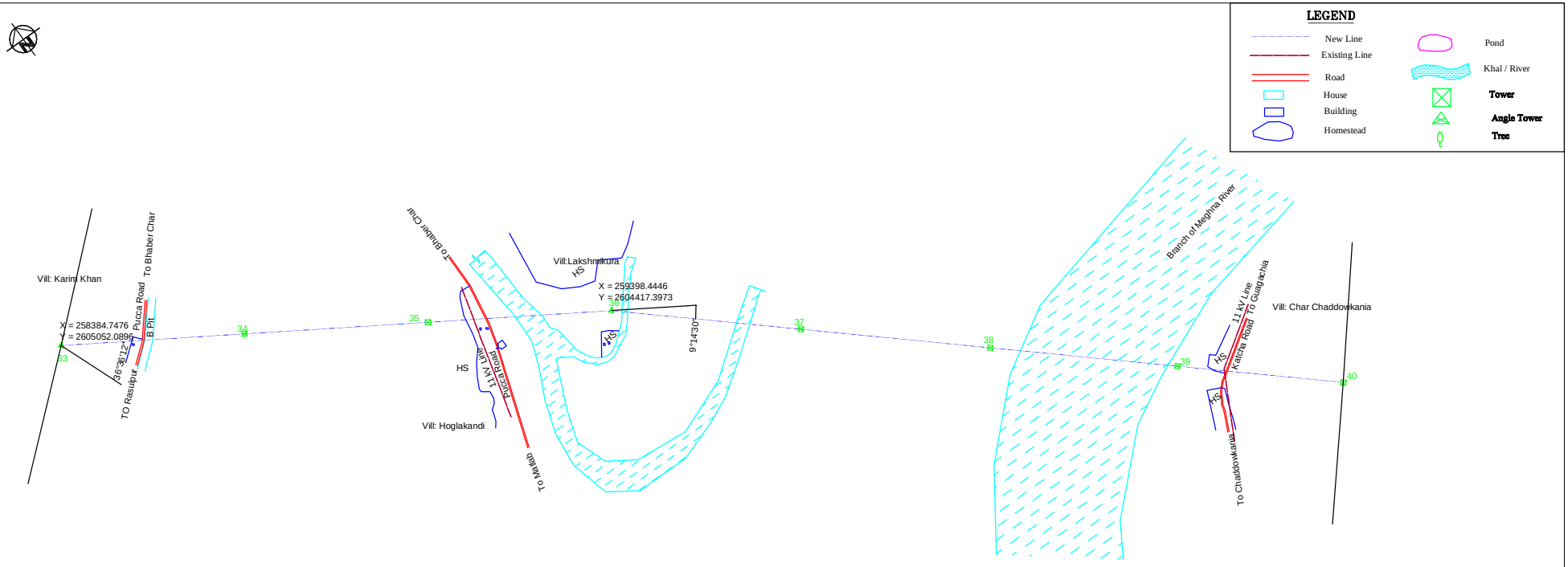

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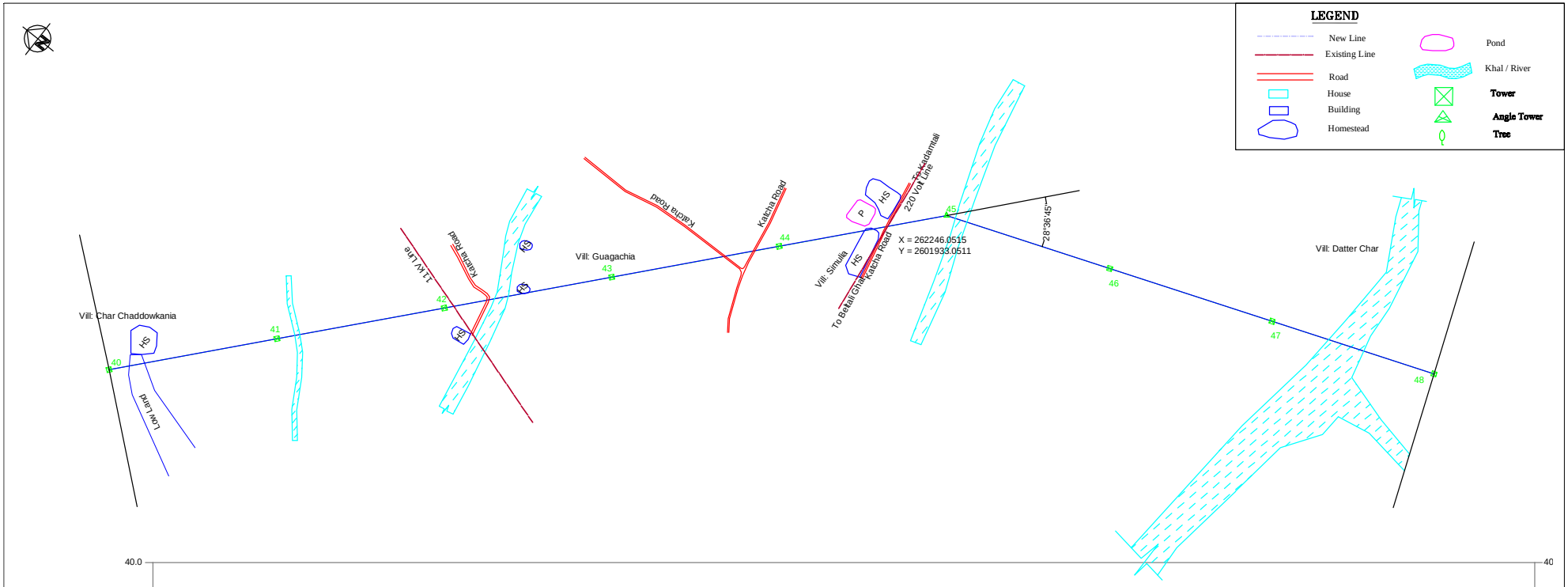

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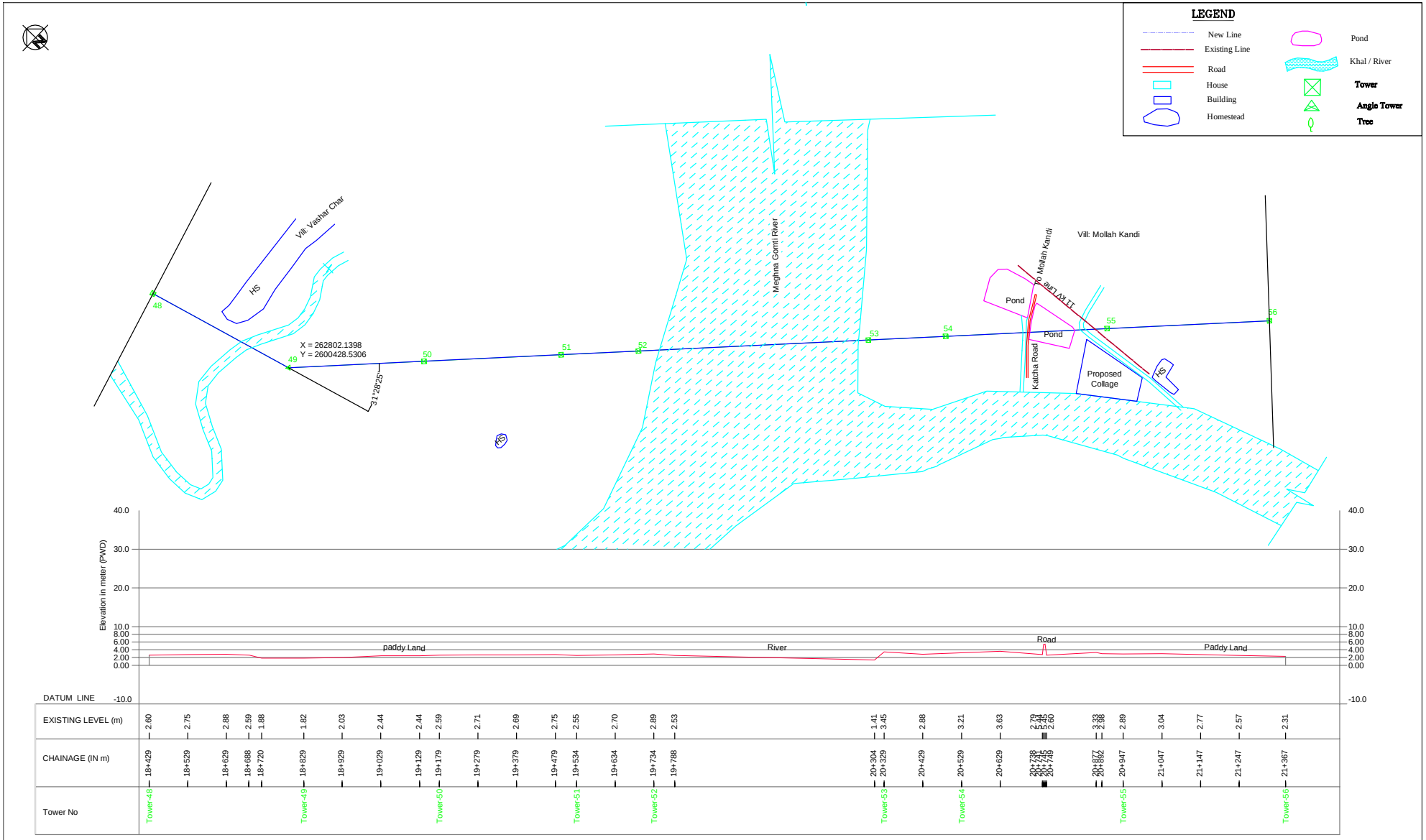

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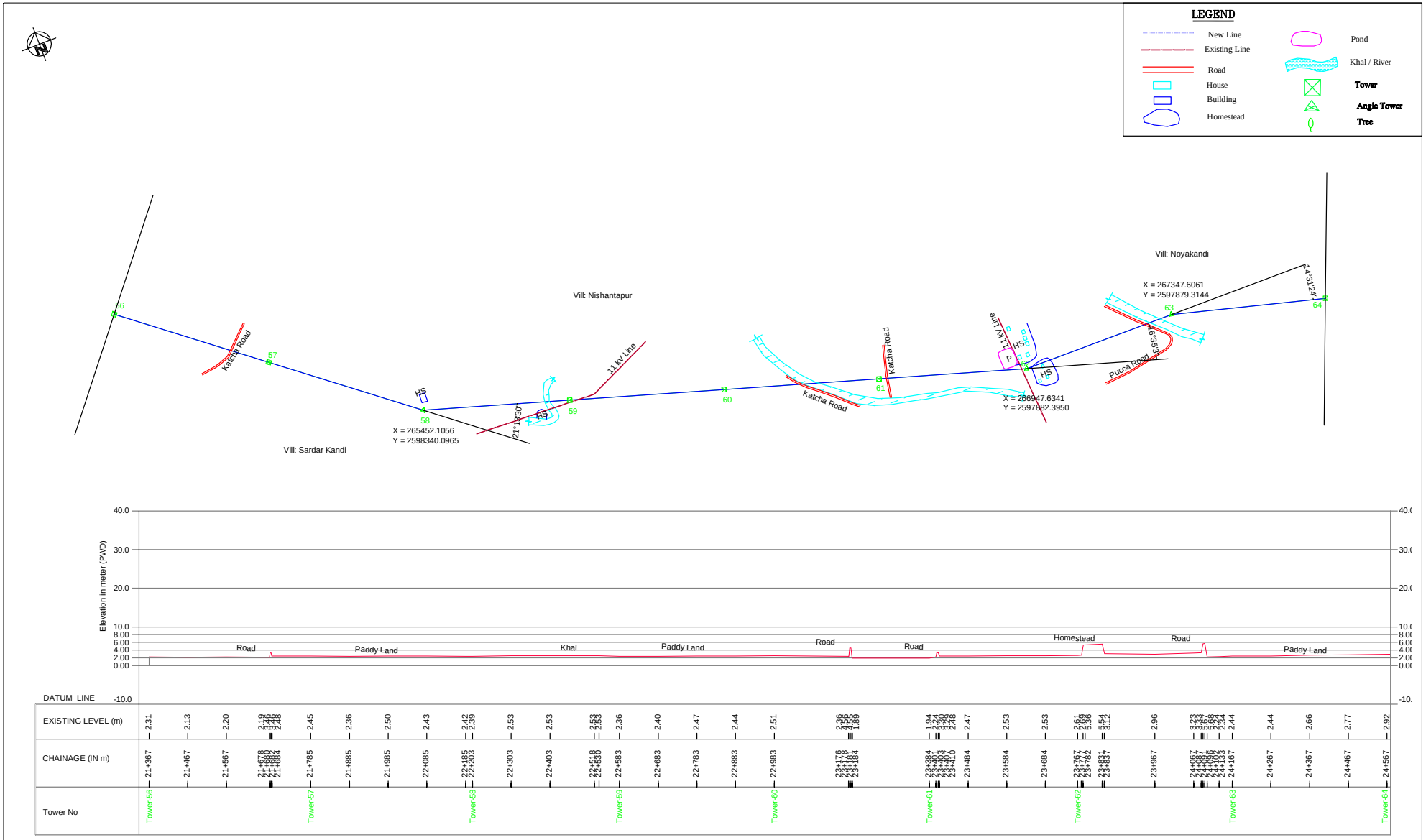

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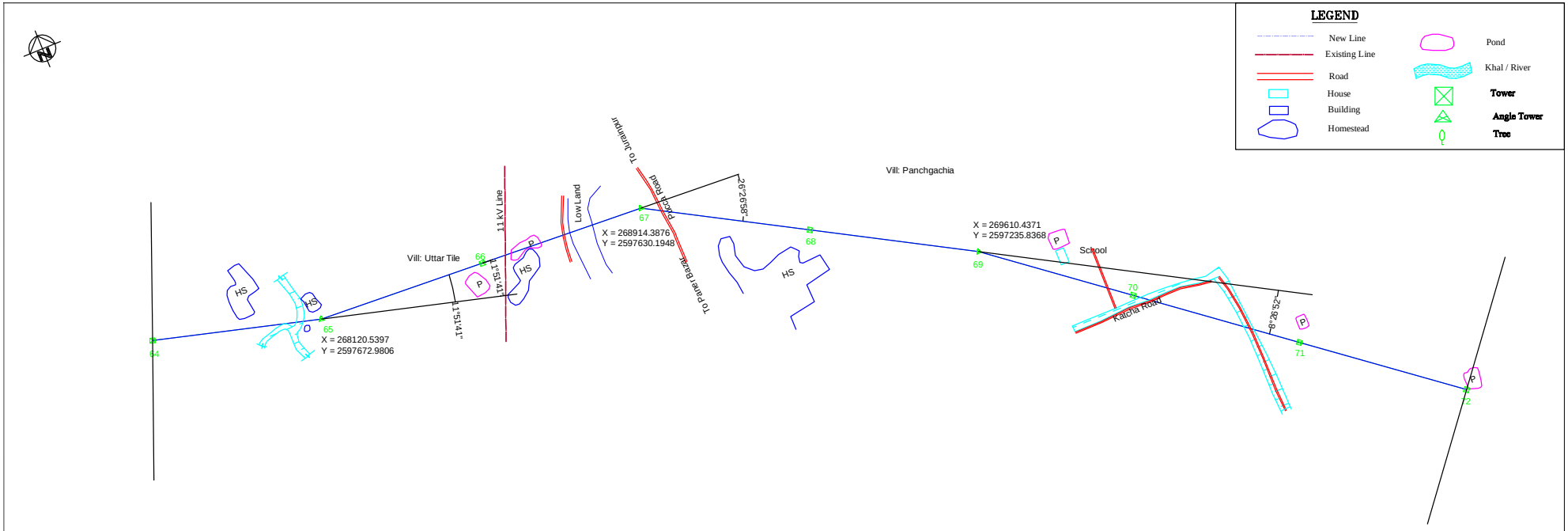

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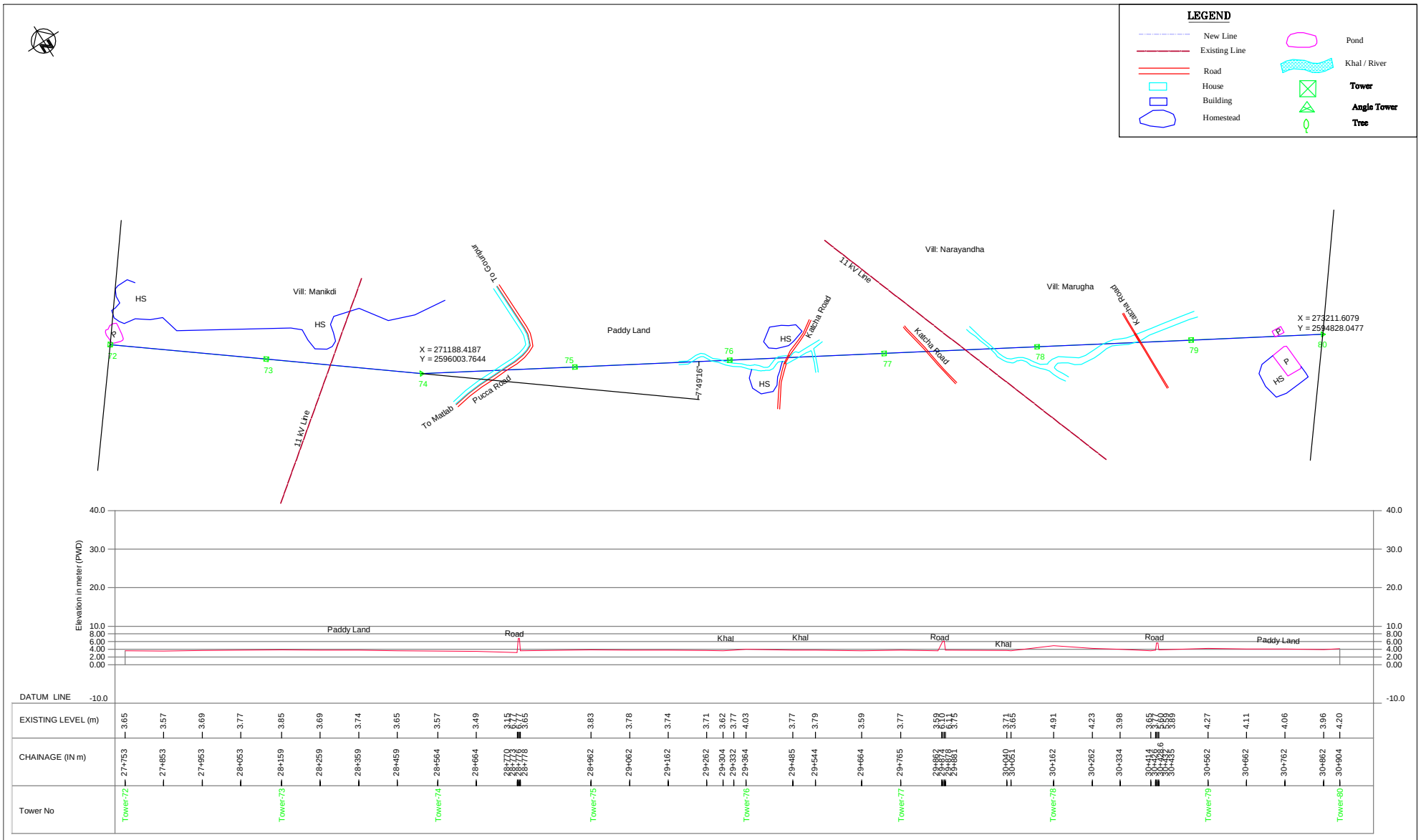

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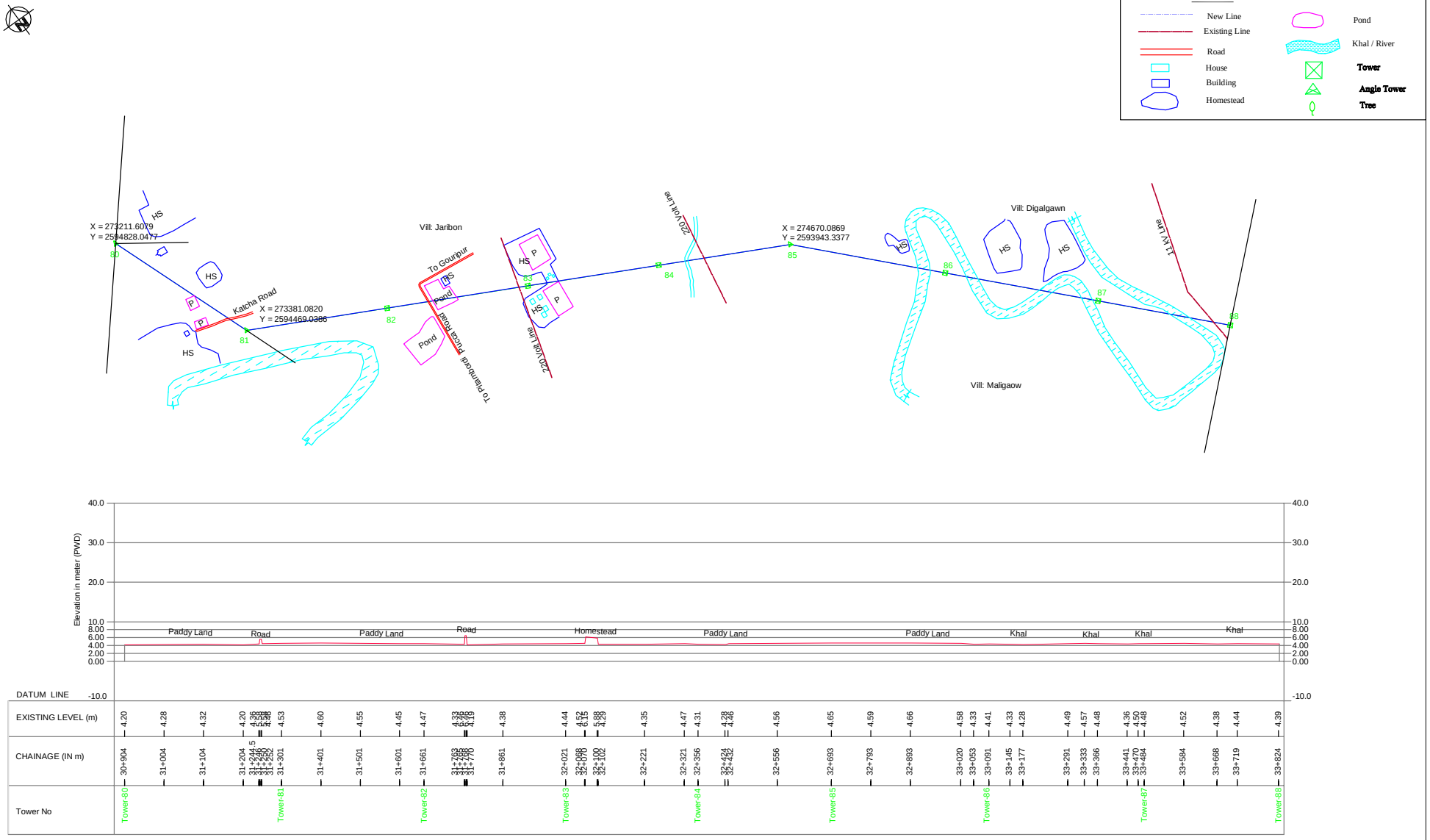

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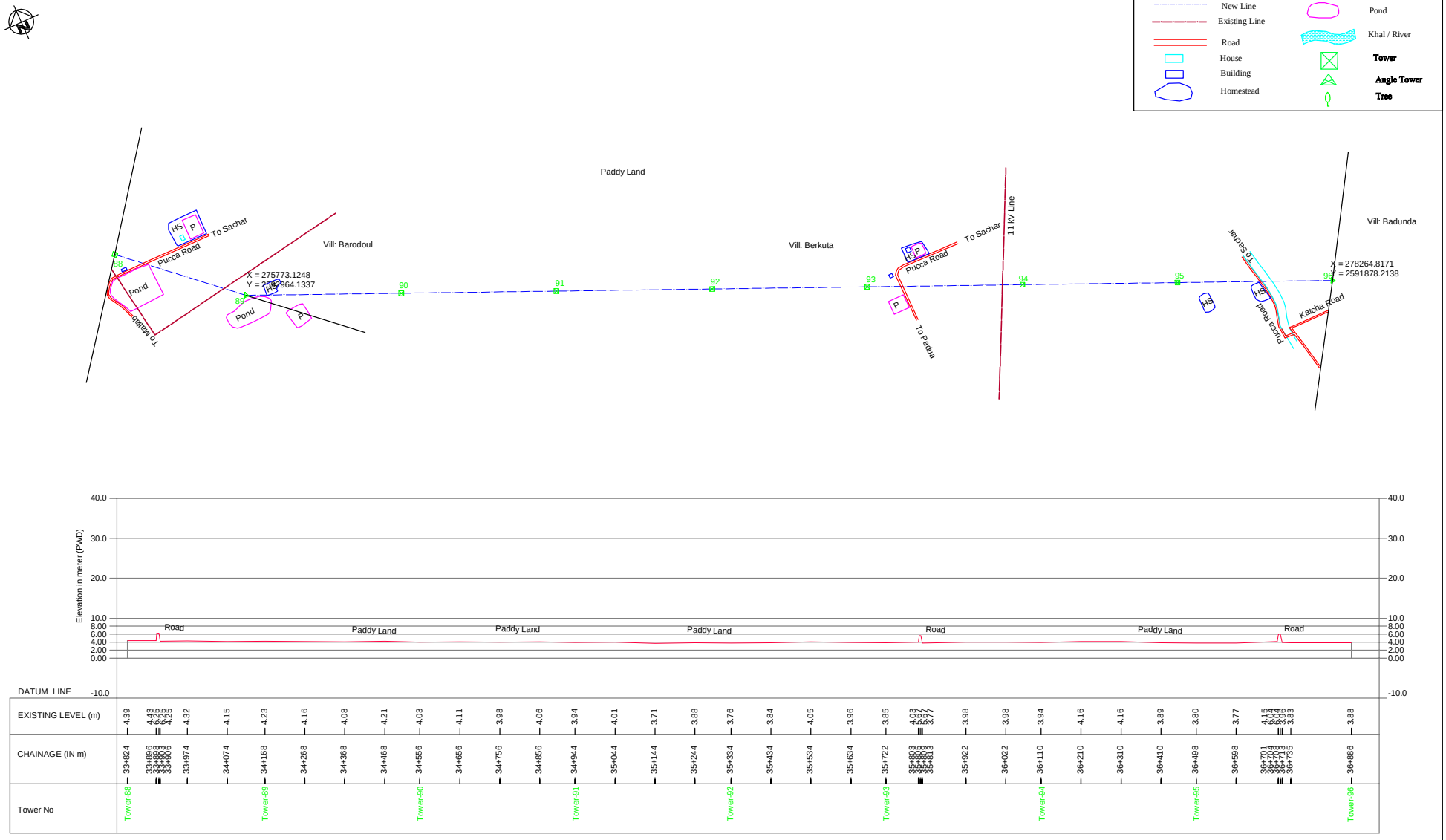

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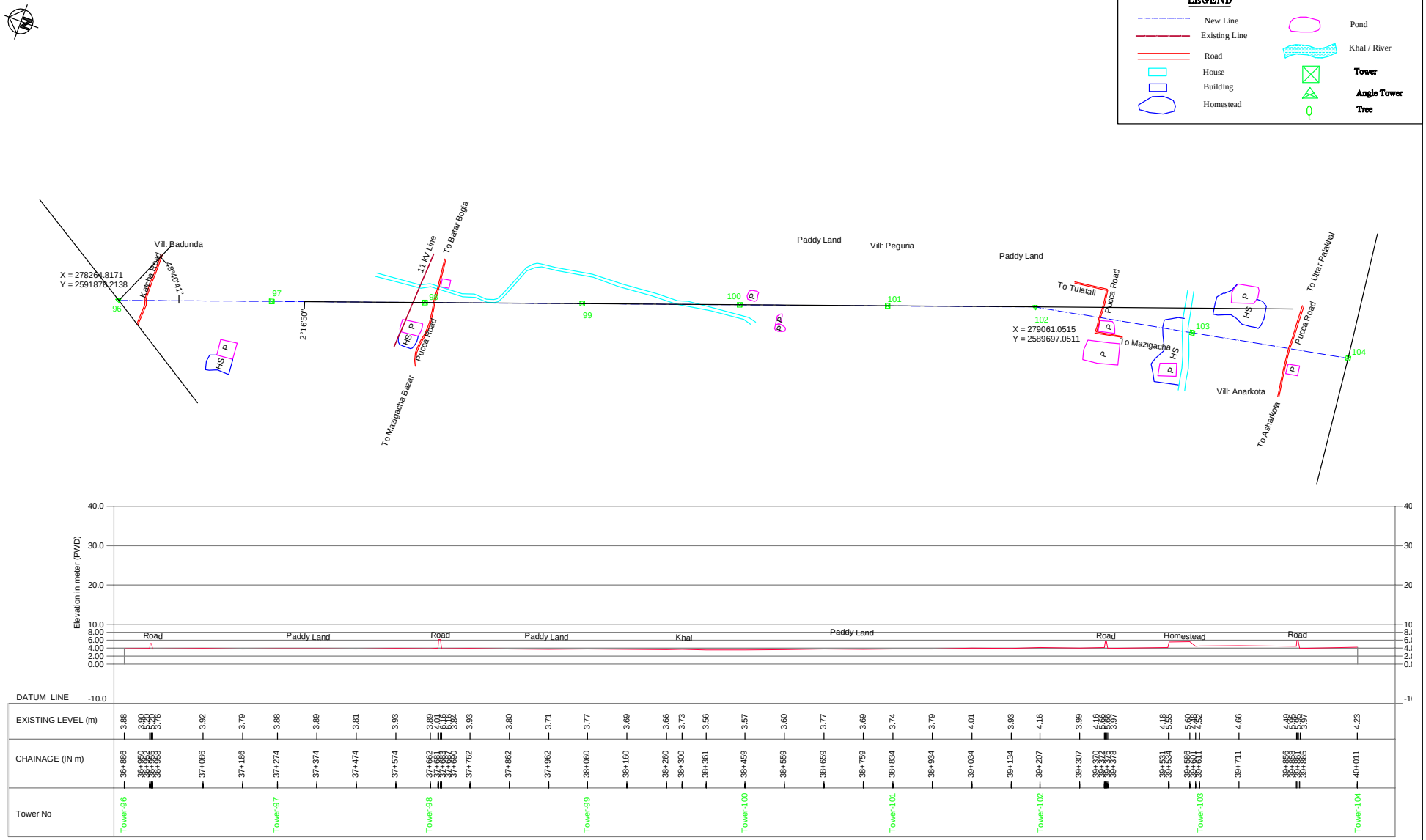

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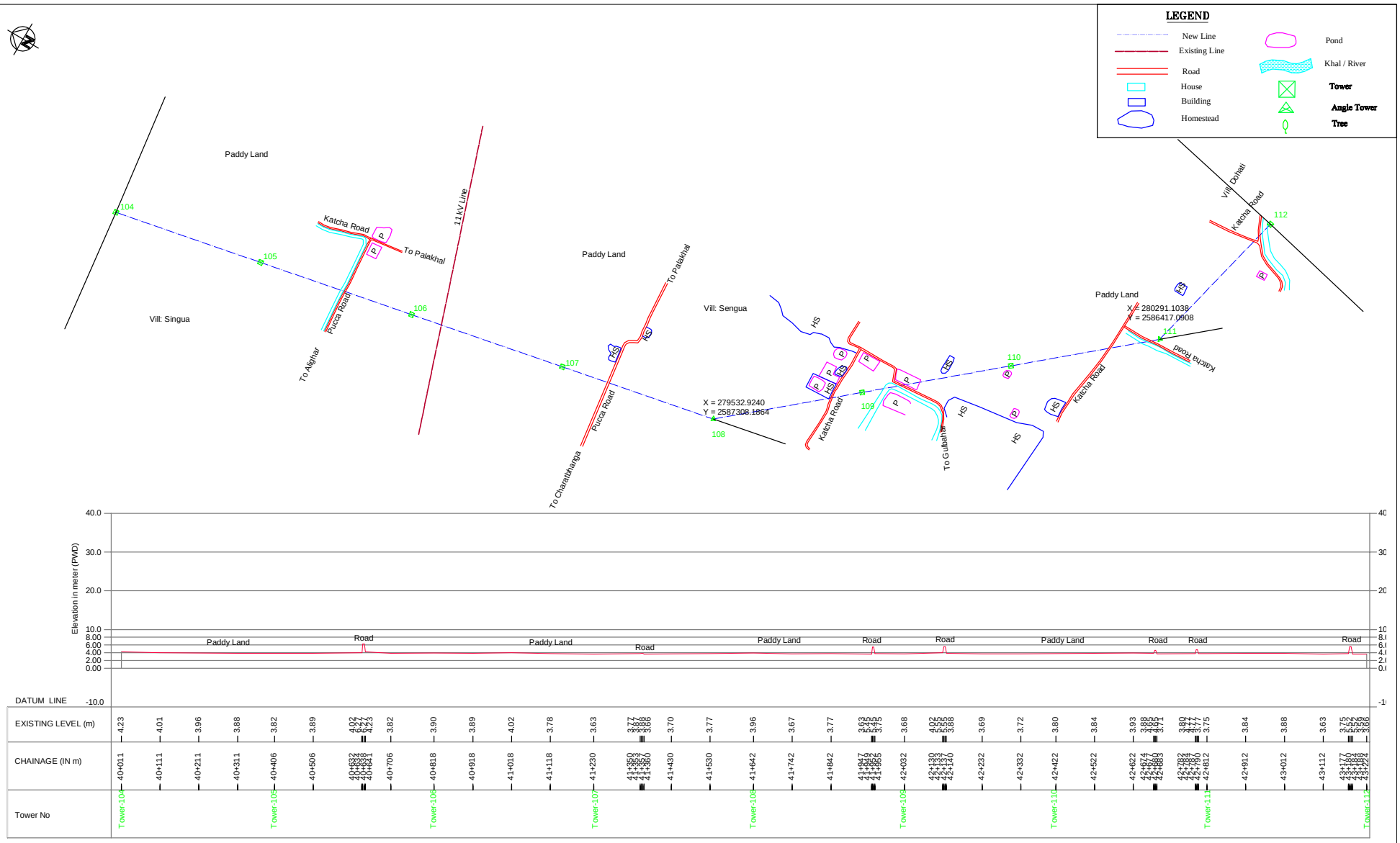

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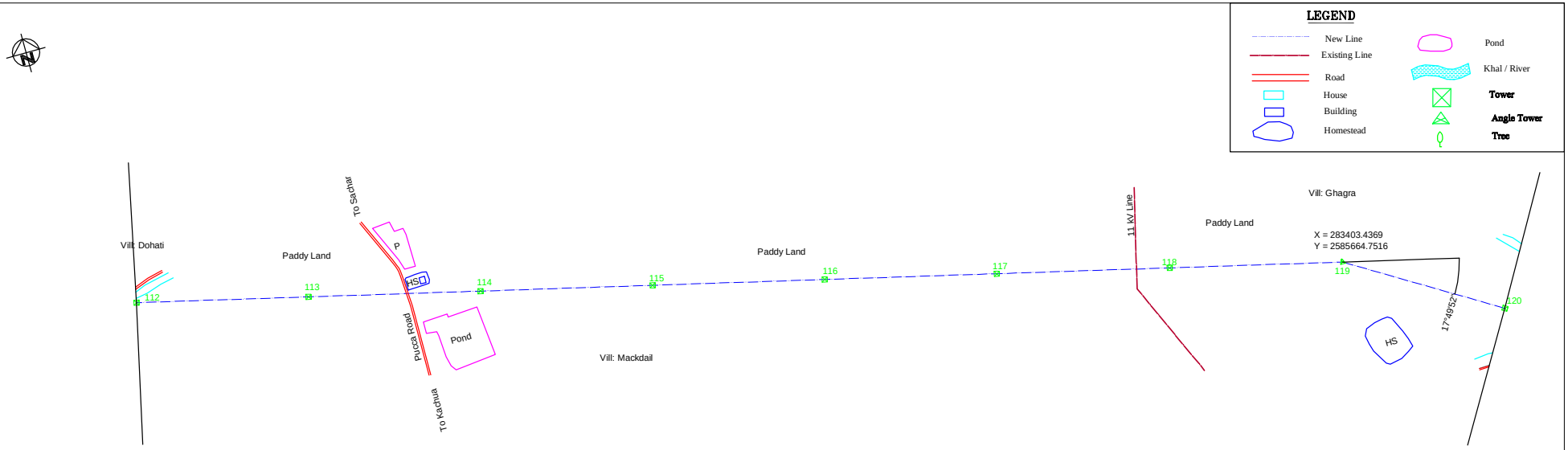

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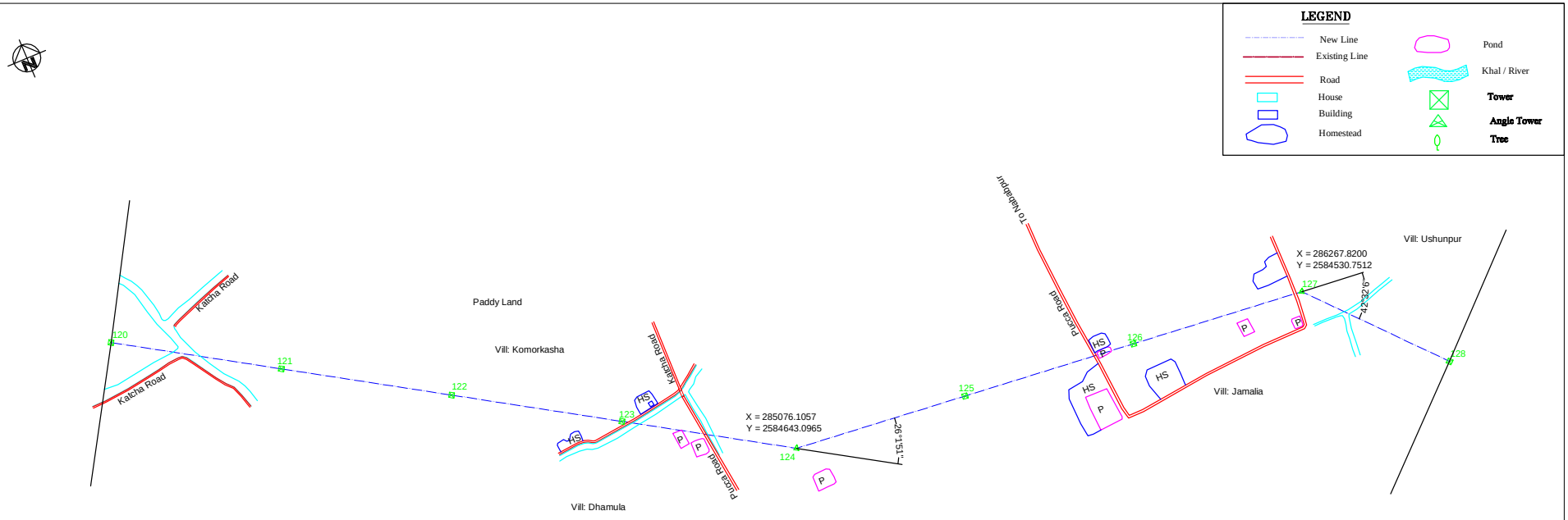

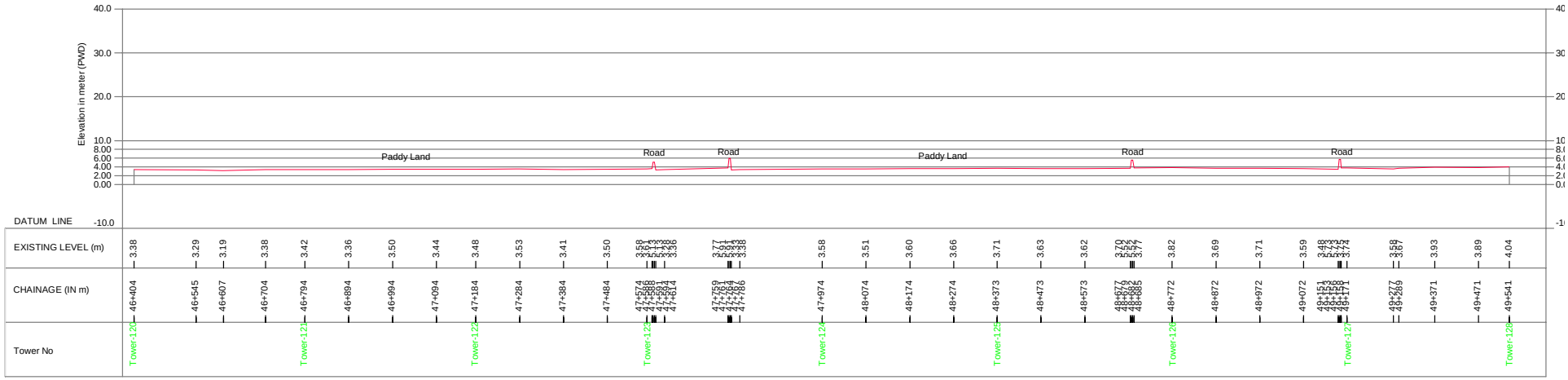

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LOCAL CONSULTANT	Engineers Associates Ltd. (EAL)	TEPCO / JICA	
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PROJECT NAME	PREPARATORY SURVEY ON DHAKA - CHITTAGONG MAIN POWER GRID STRENGTHENING PROJECT	
TITLE	ROUTE ALIGNMENT SURVEY OF PROPOSED 400kV TRANSMISSION LINE FROM MEGHNA GHAT TO MATARBARI,	
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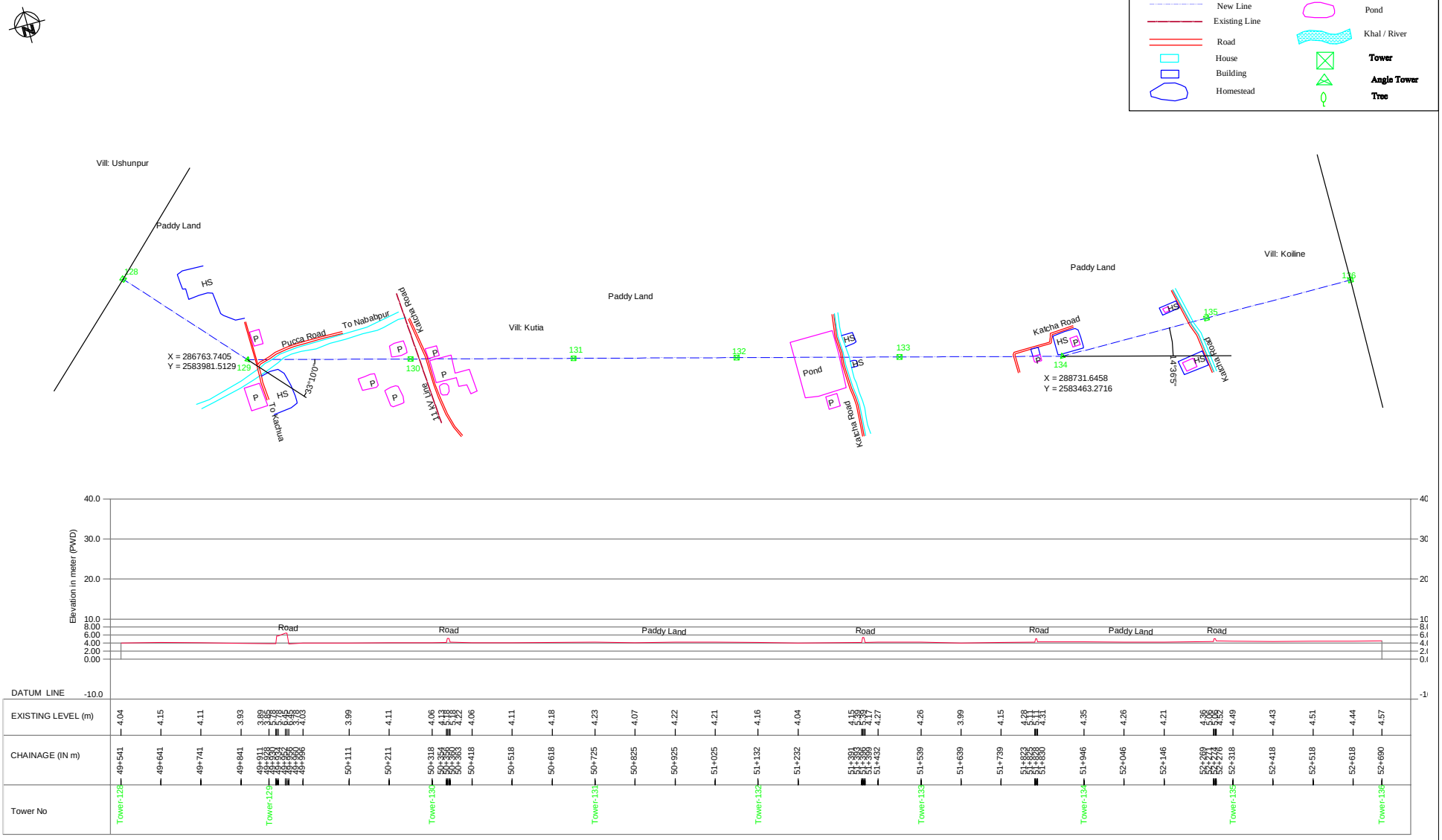

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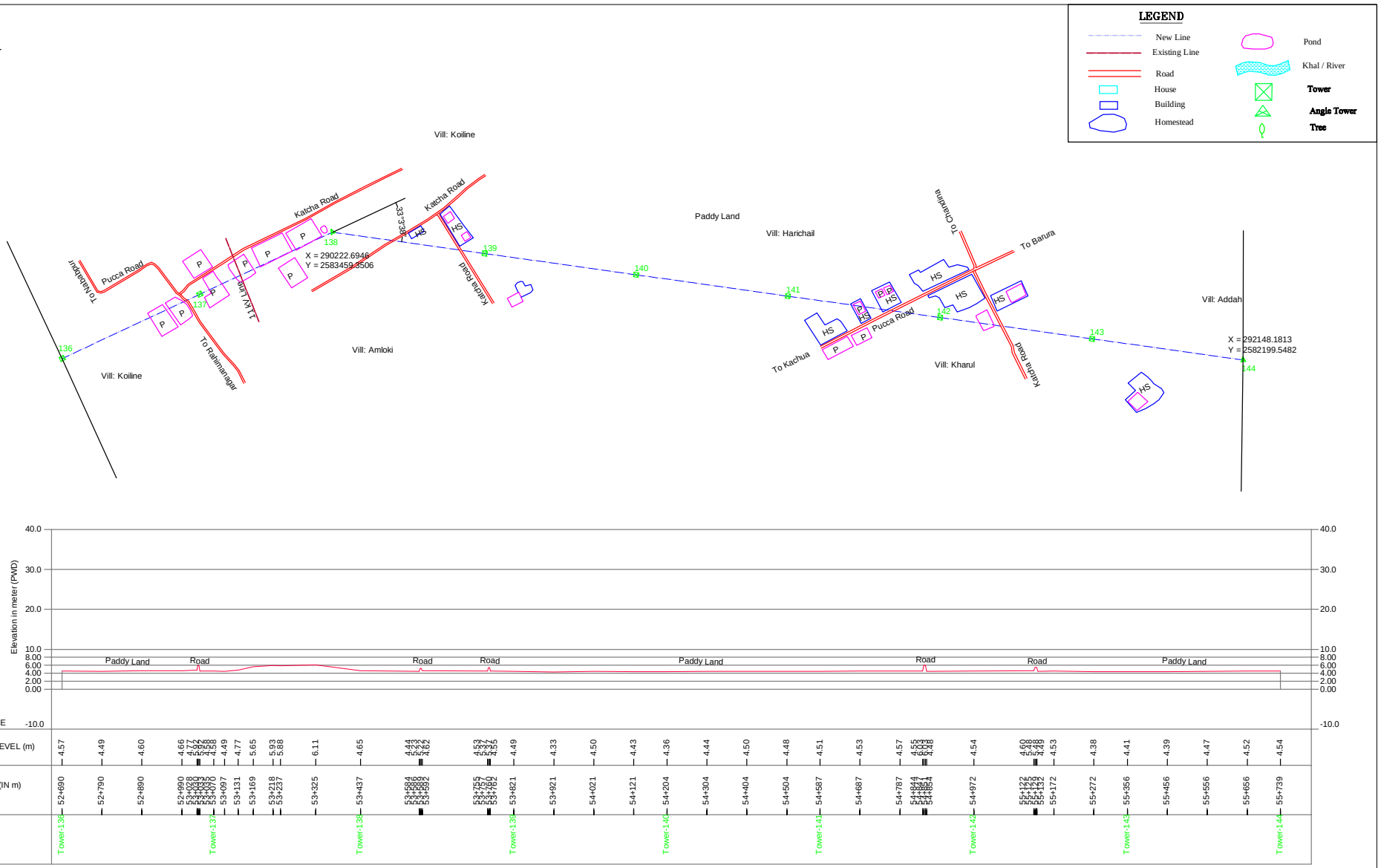

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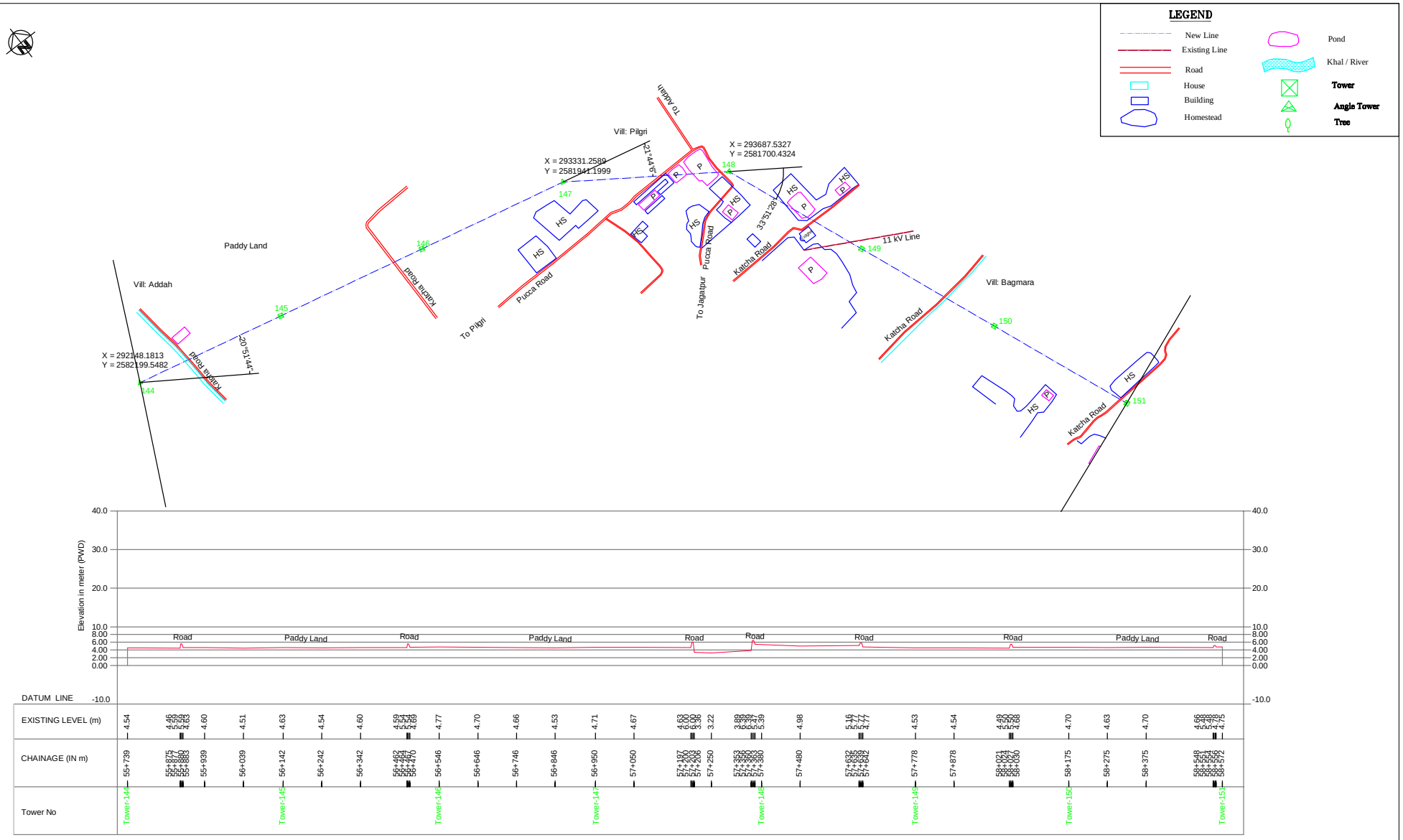

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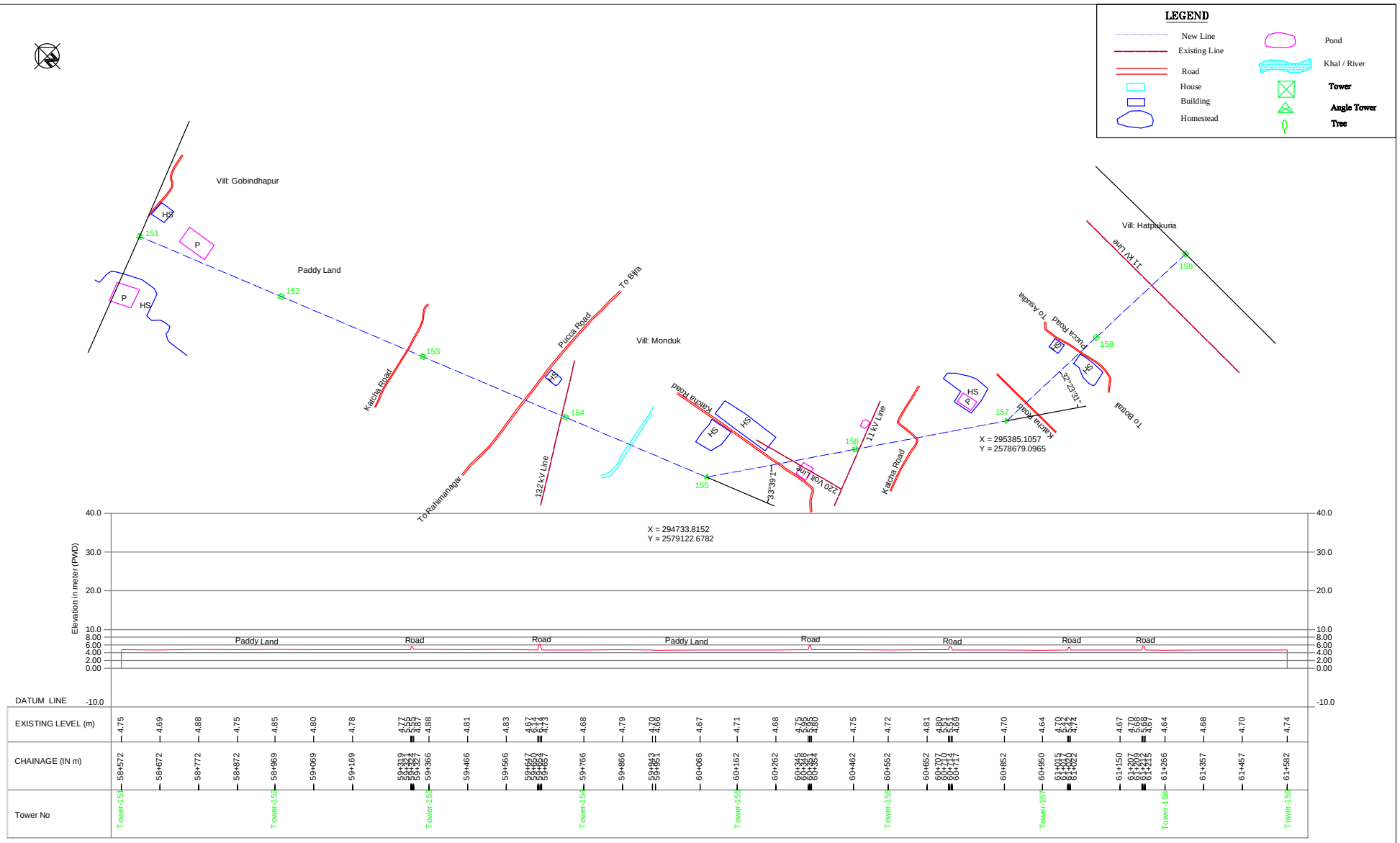

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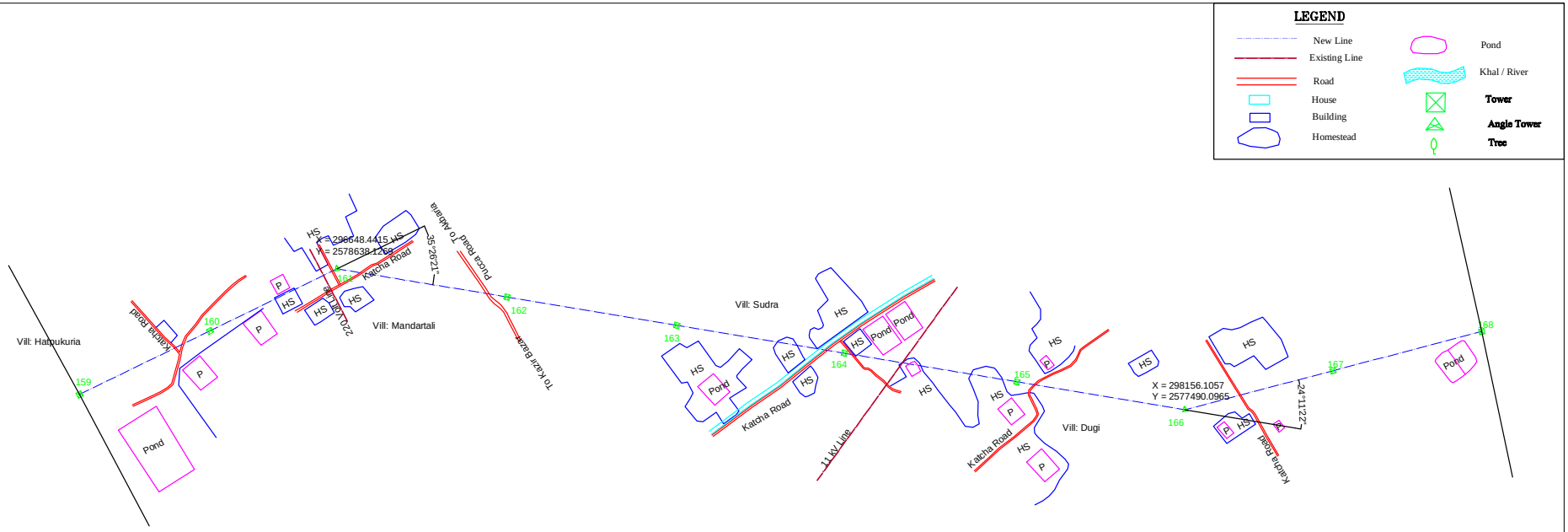

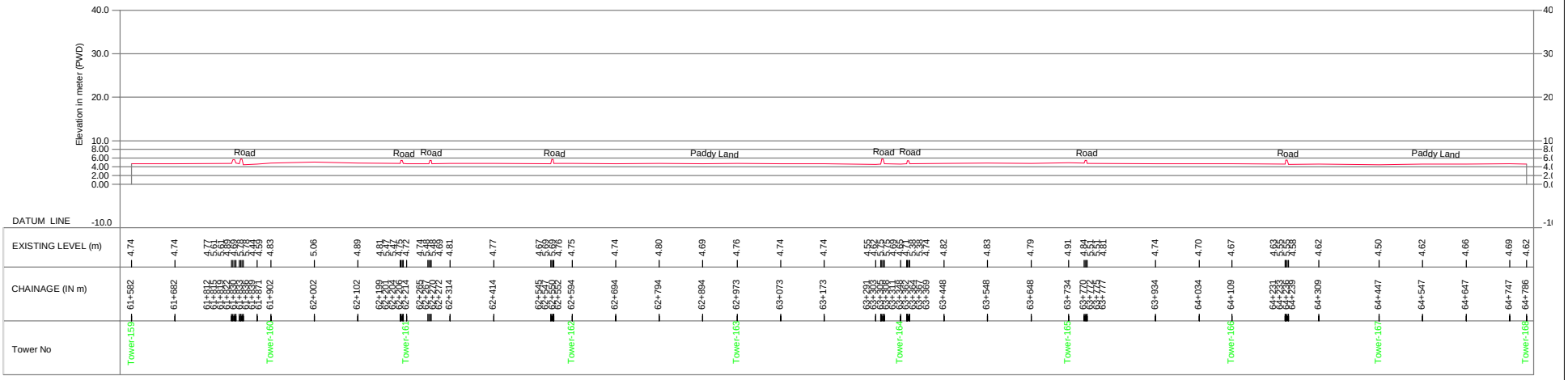

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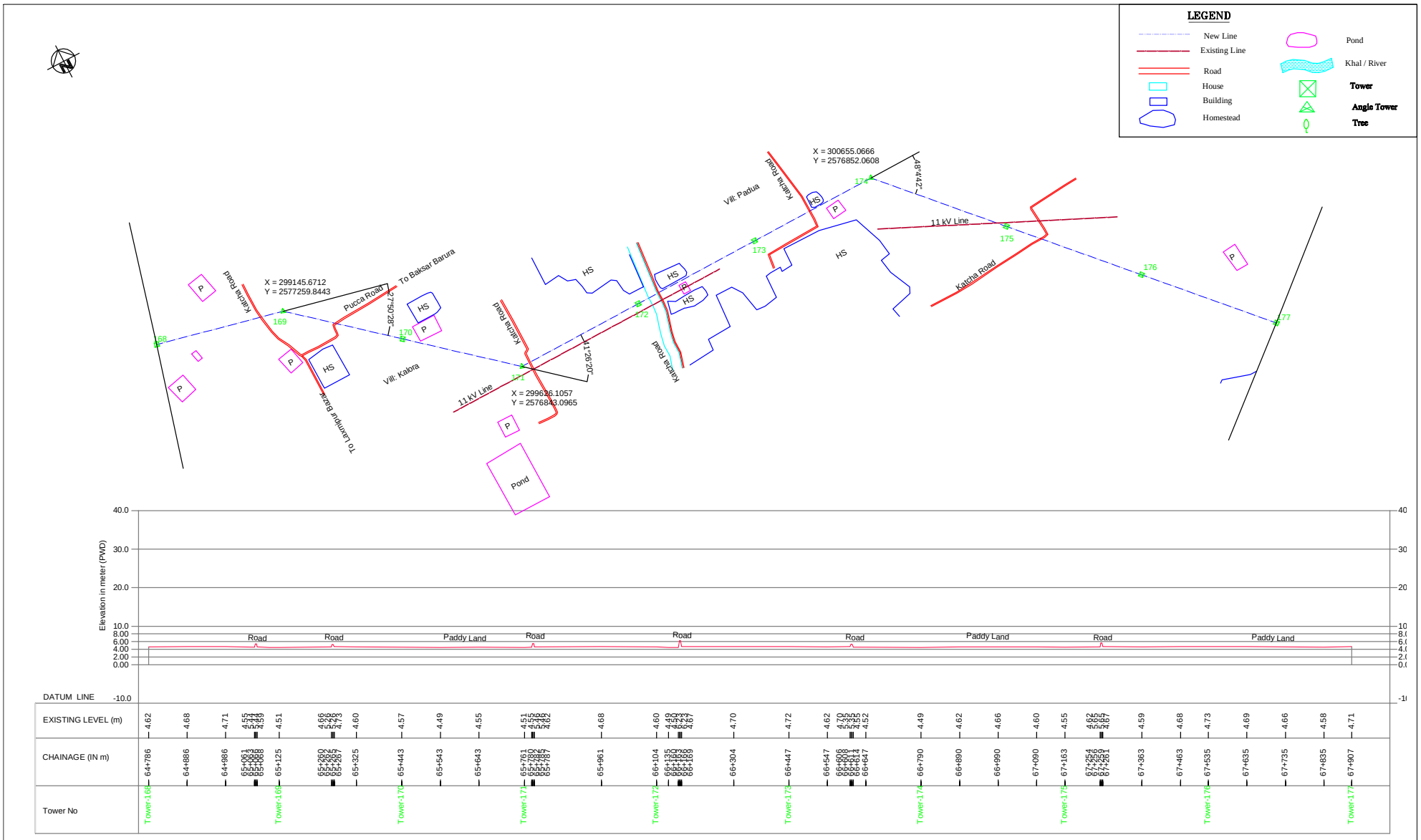

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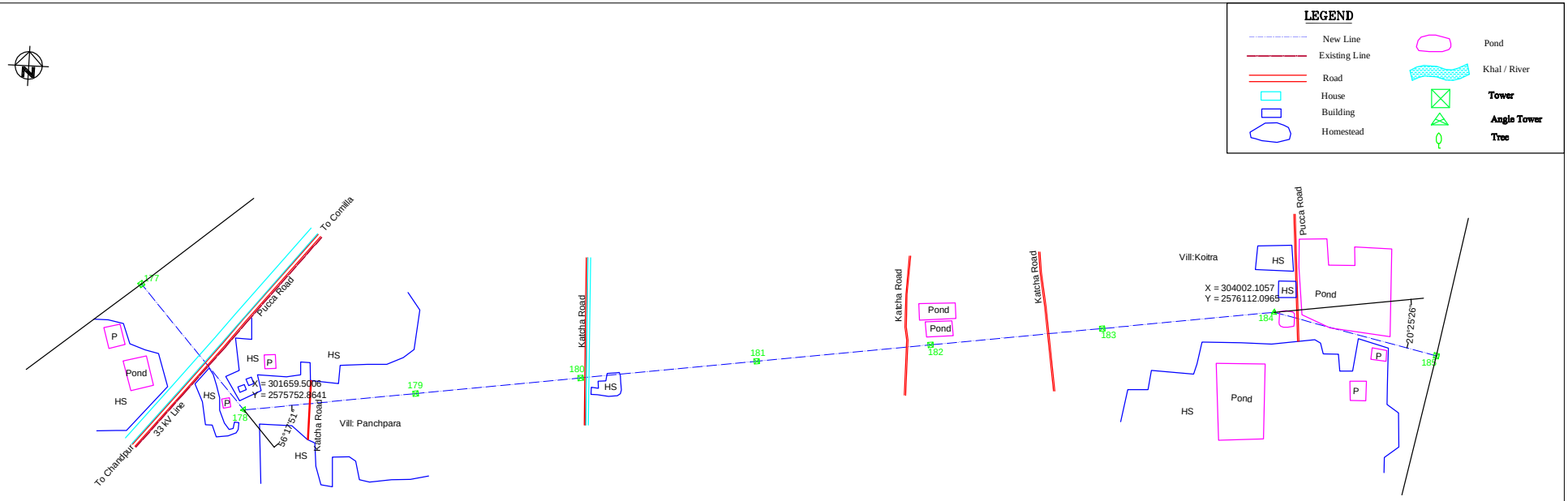

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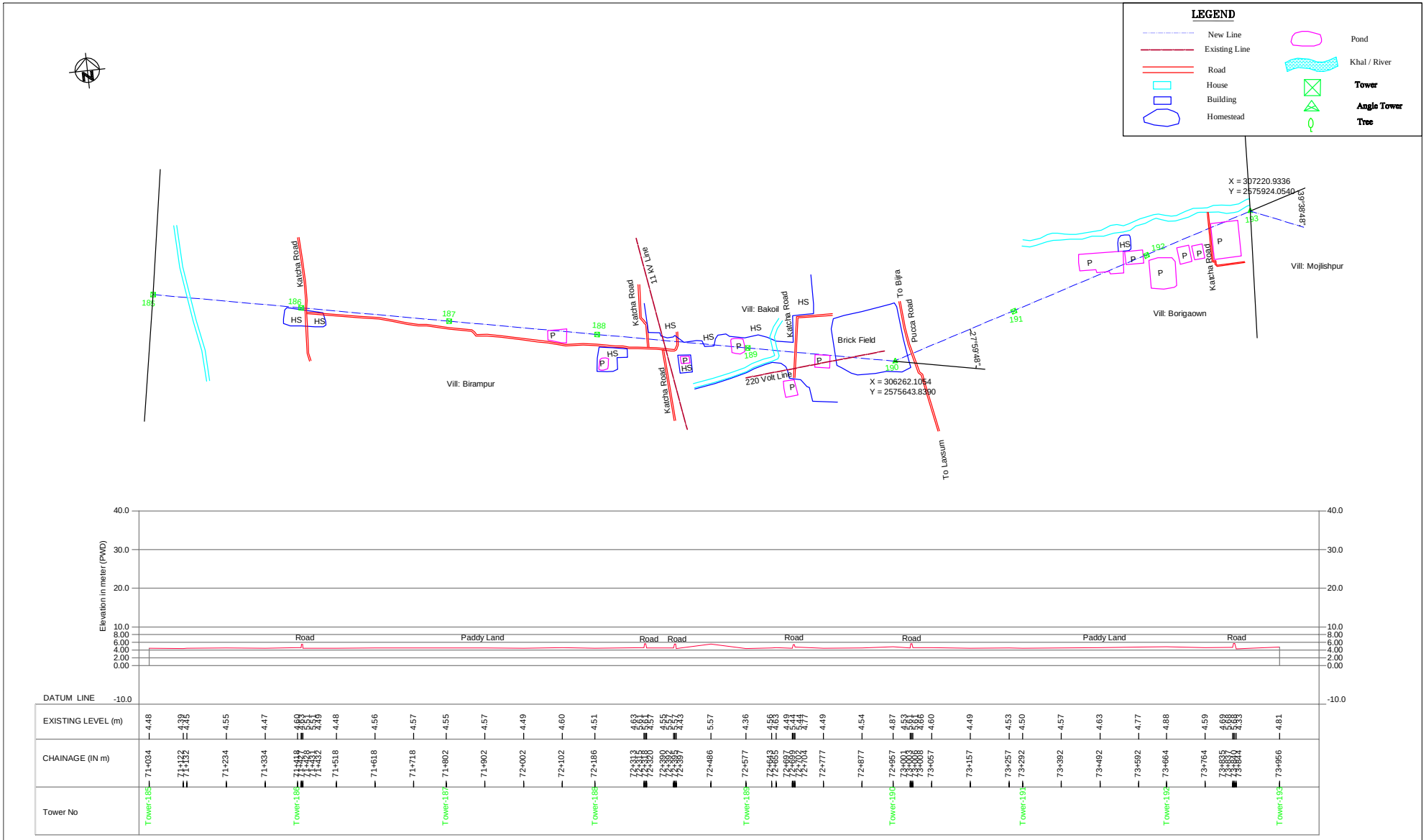

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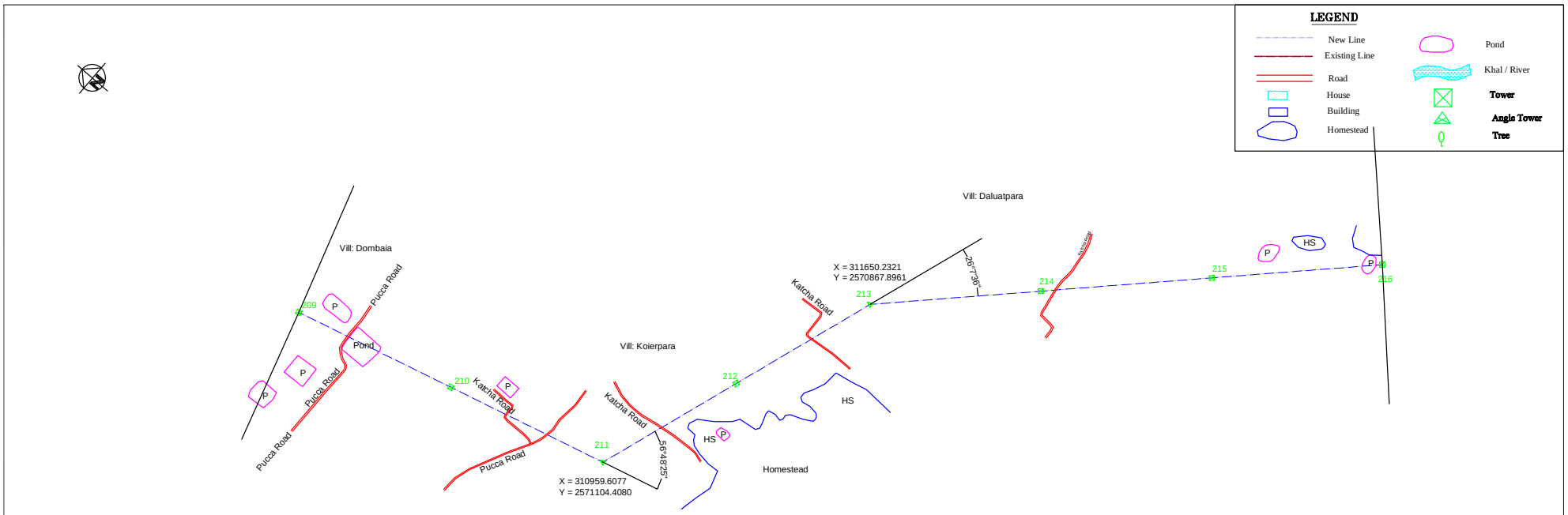

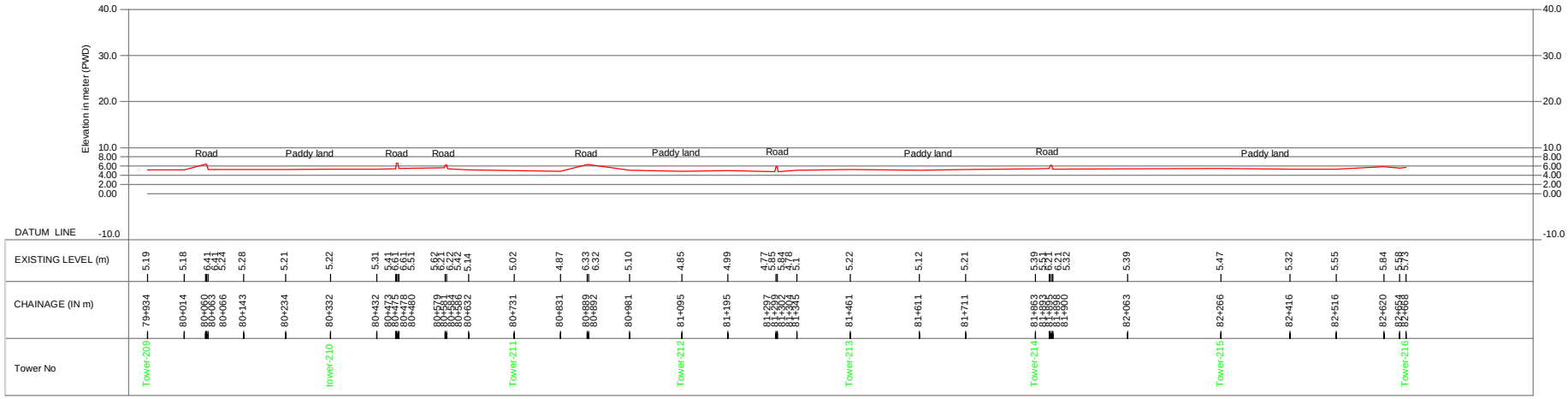

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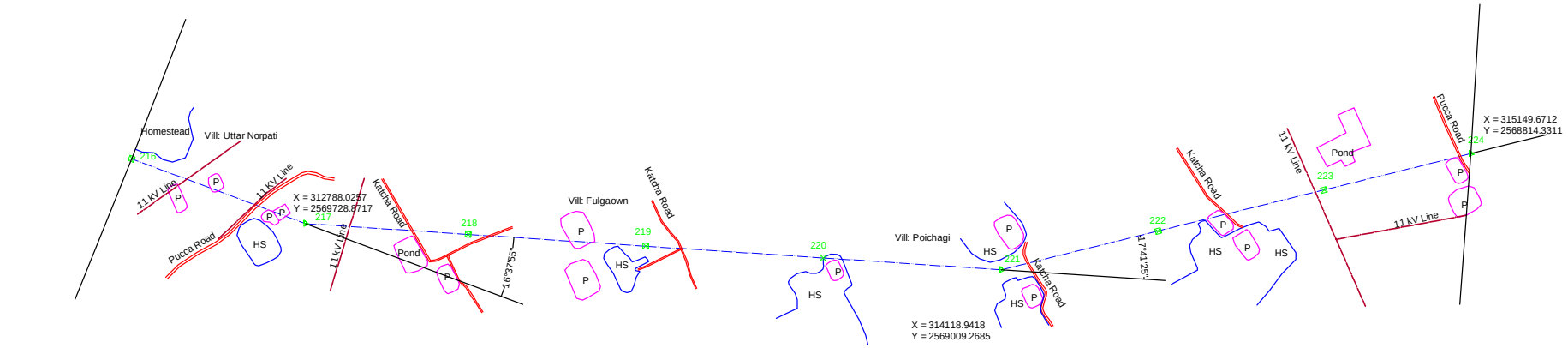

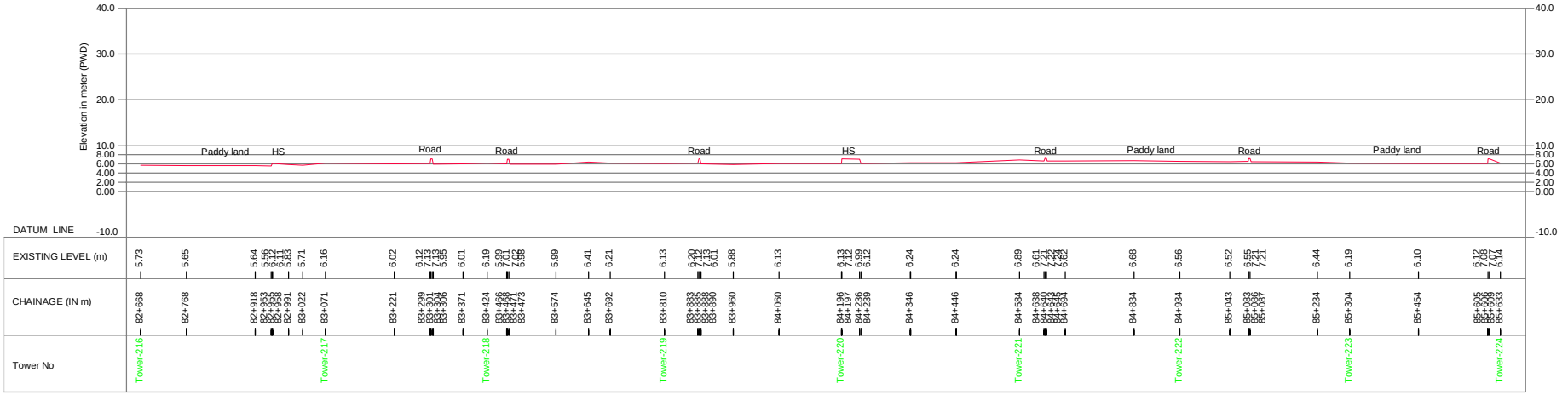

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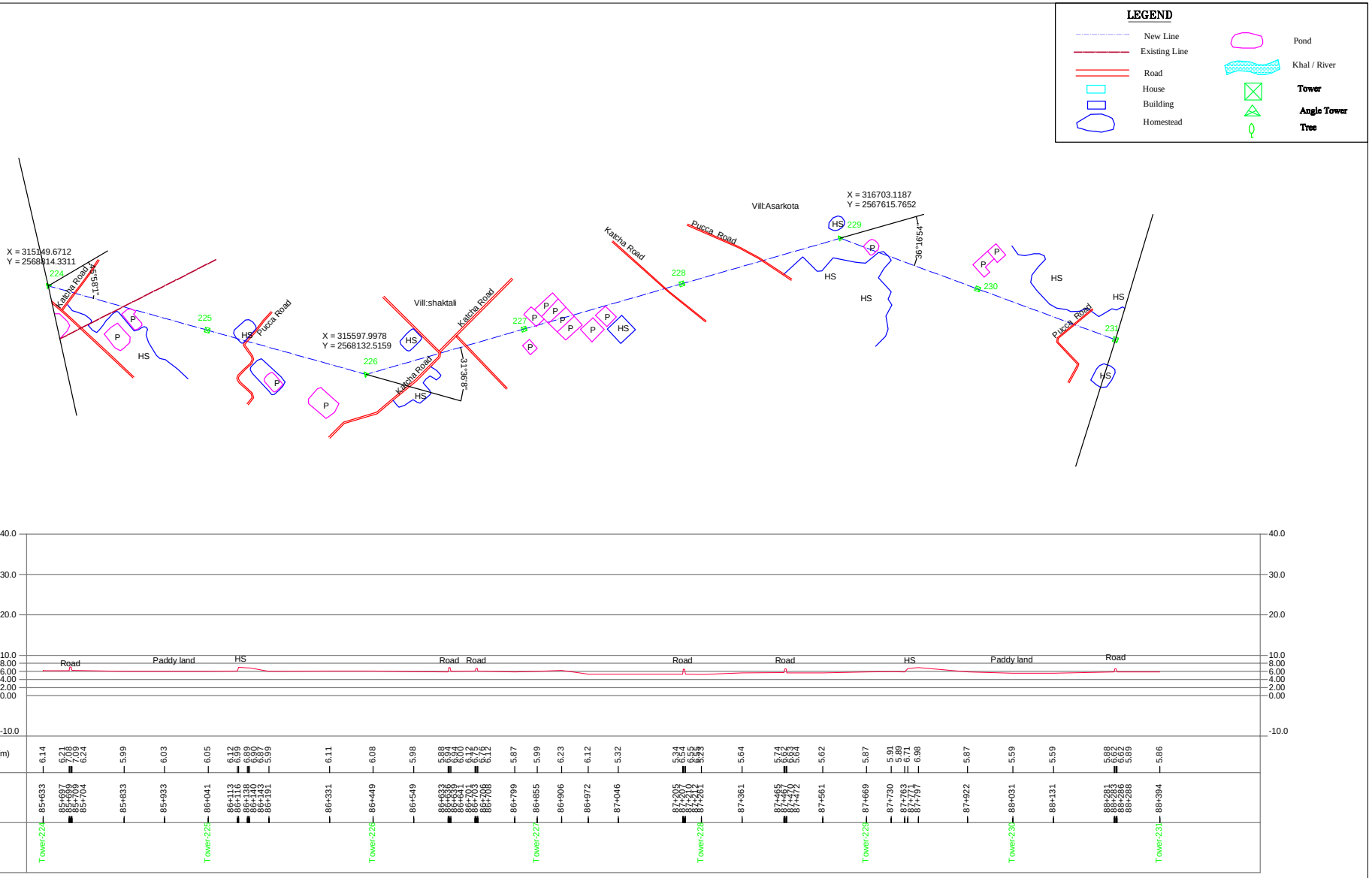

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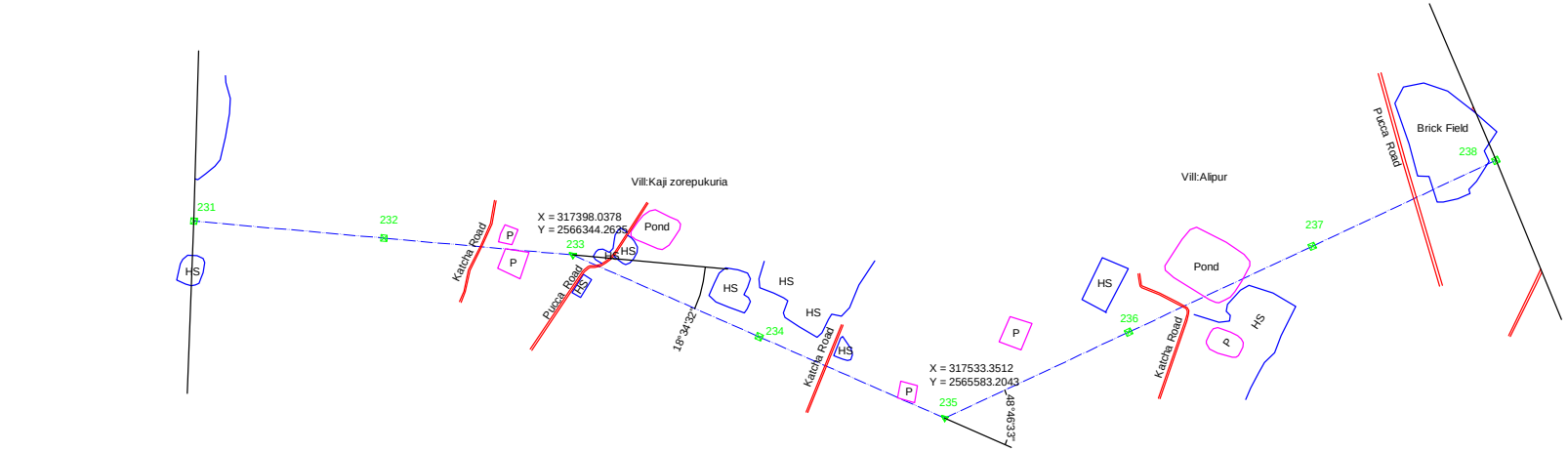
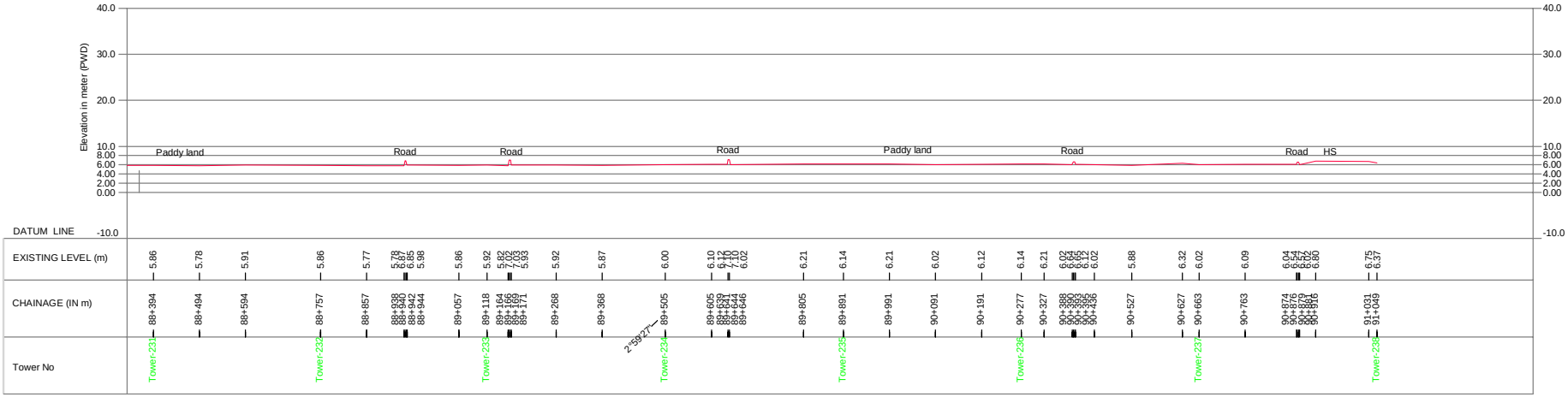
New Line
Existing Line
Road
House
Building
Homestead
Pond
Khal / River
Tower
Angle Tower
Tree





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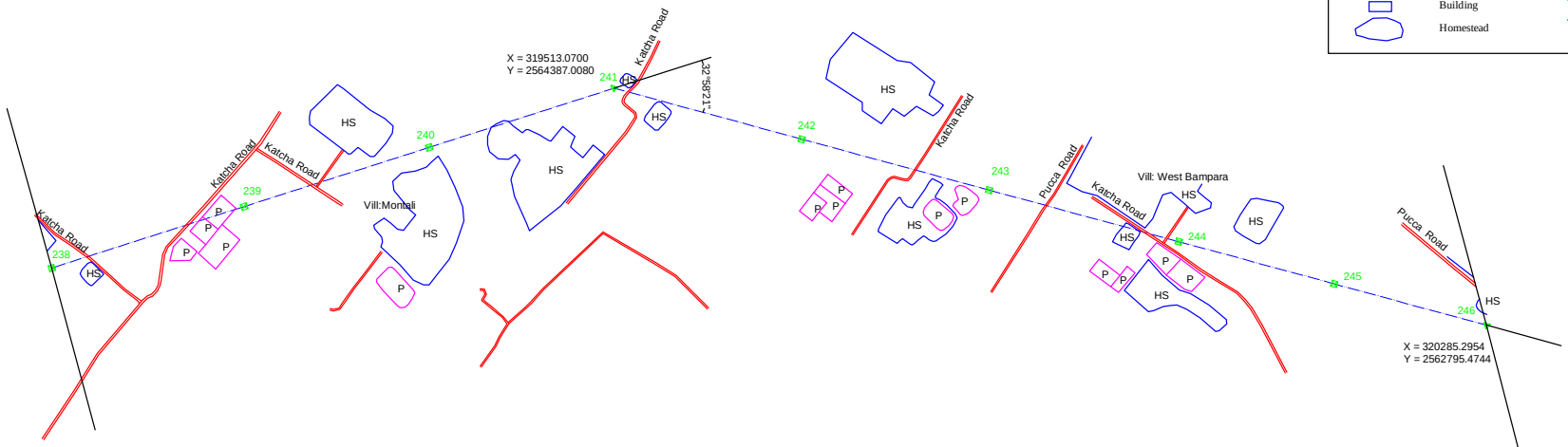

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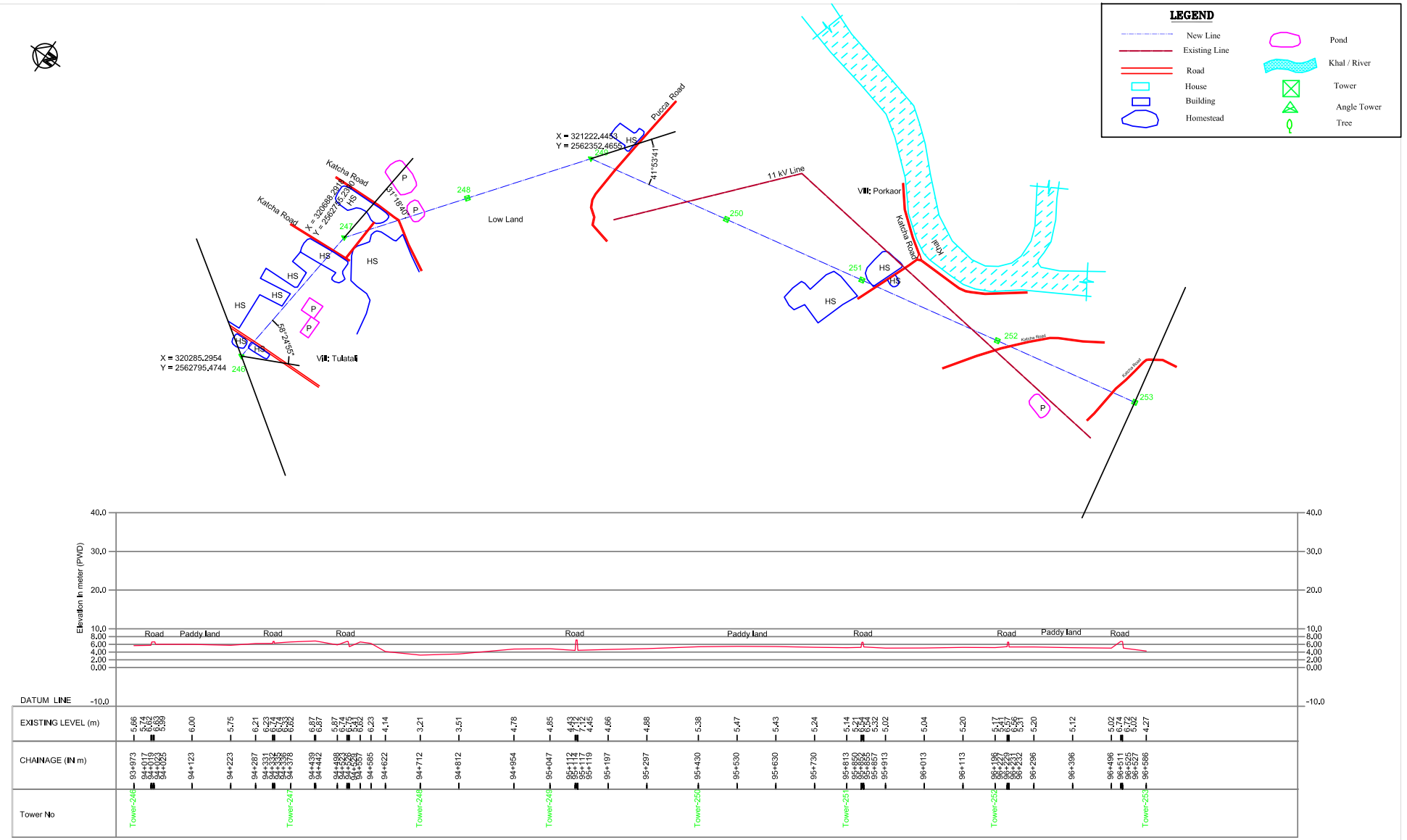

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LOCAL CONSULTANT	Engineers Associates Ltd. (EAL)	TEPCO / JICA		TITLE	ROUTE ALIGNMENT SURVEY OF PROPOSED 400kV TRANSMISSION LINE FROM MEGHNA GHAT TO MATARBARI,
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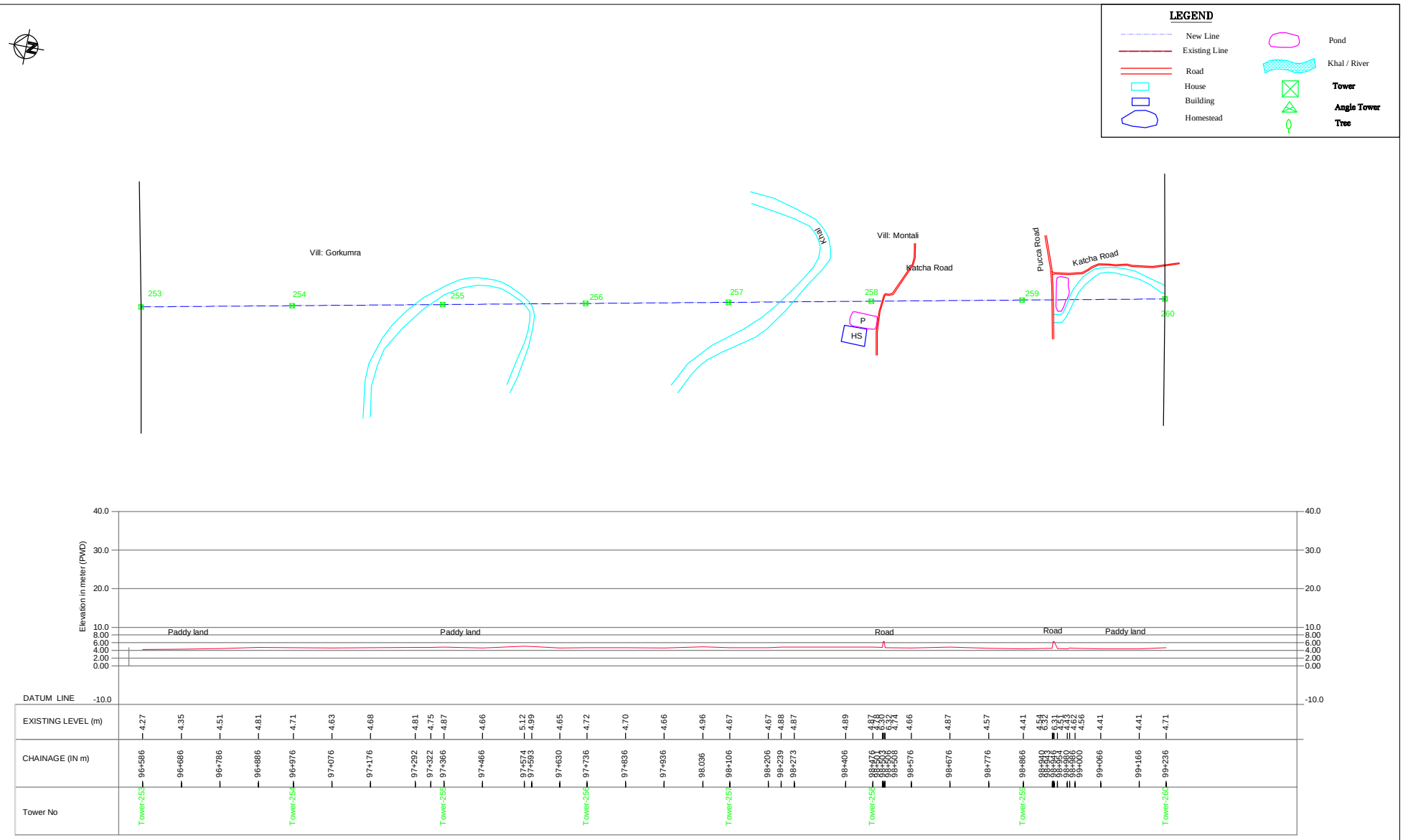

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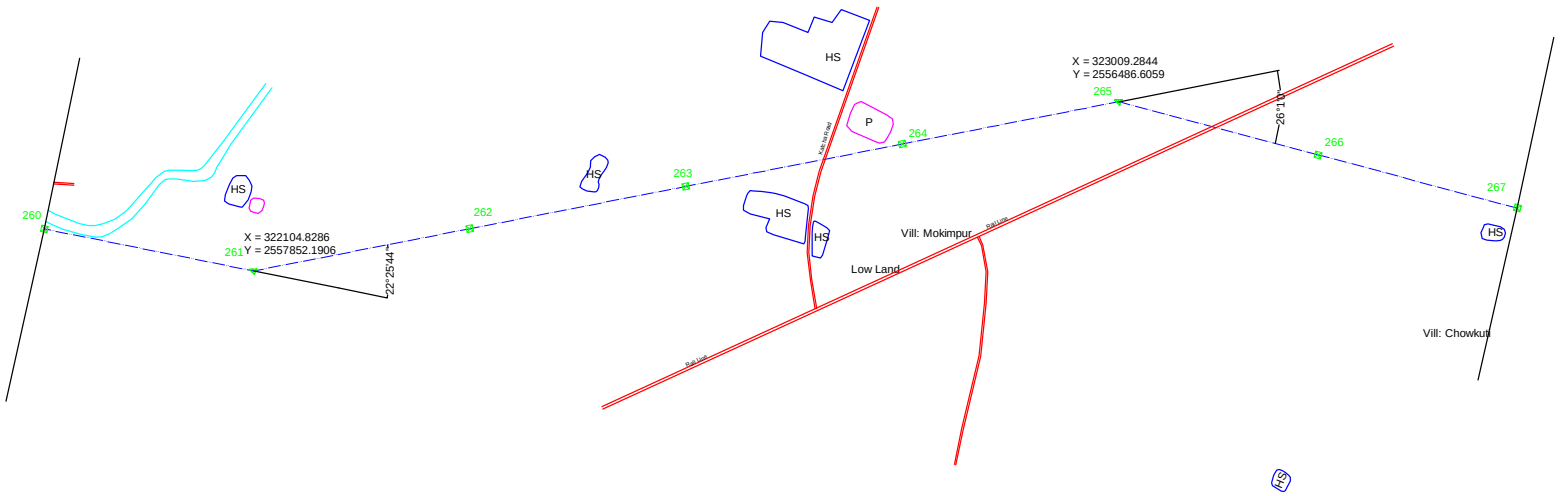

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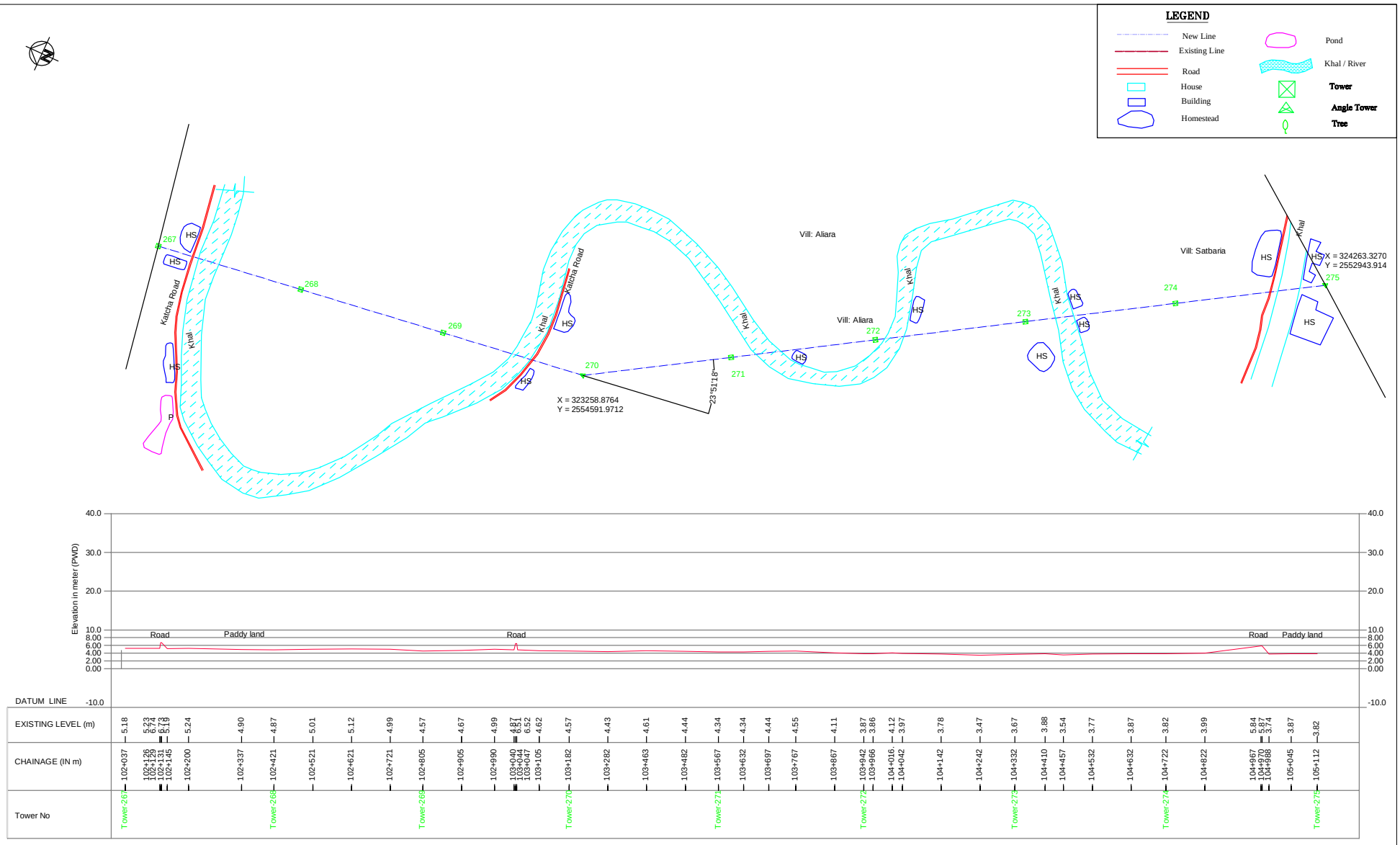

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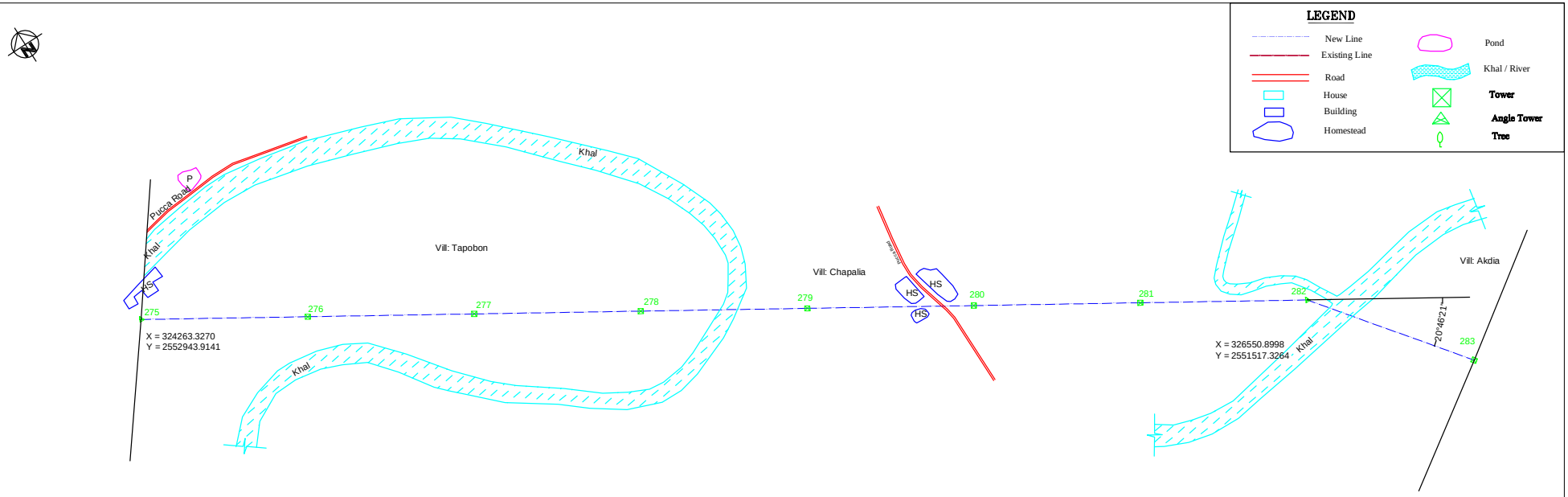

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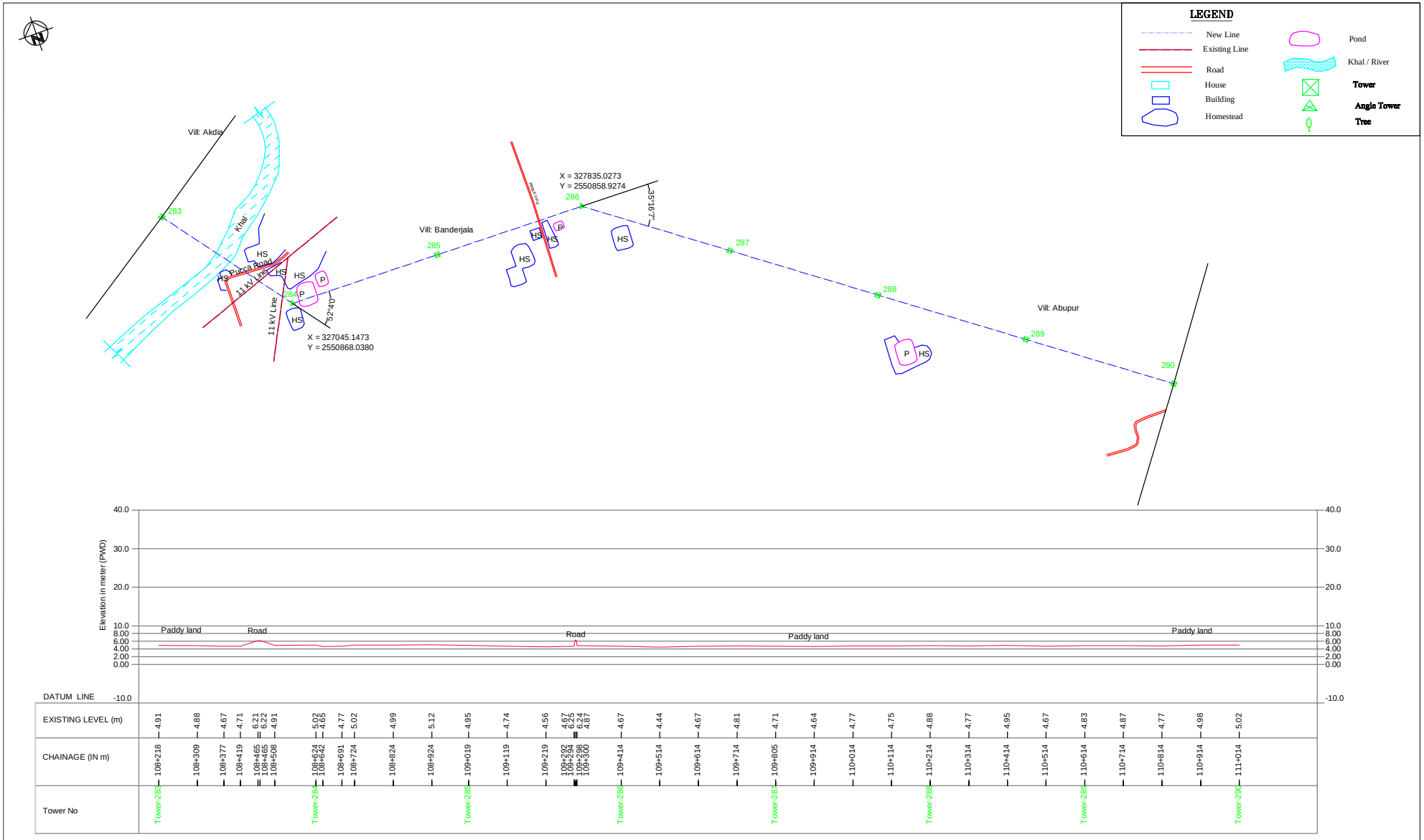

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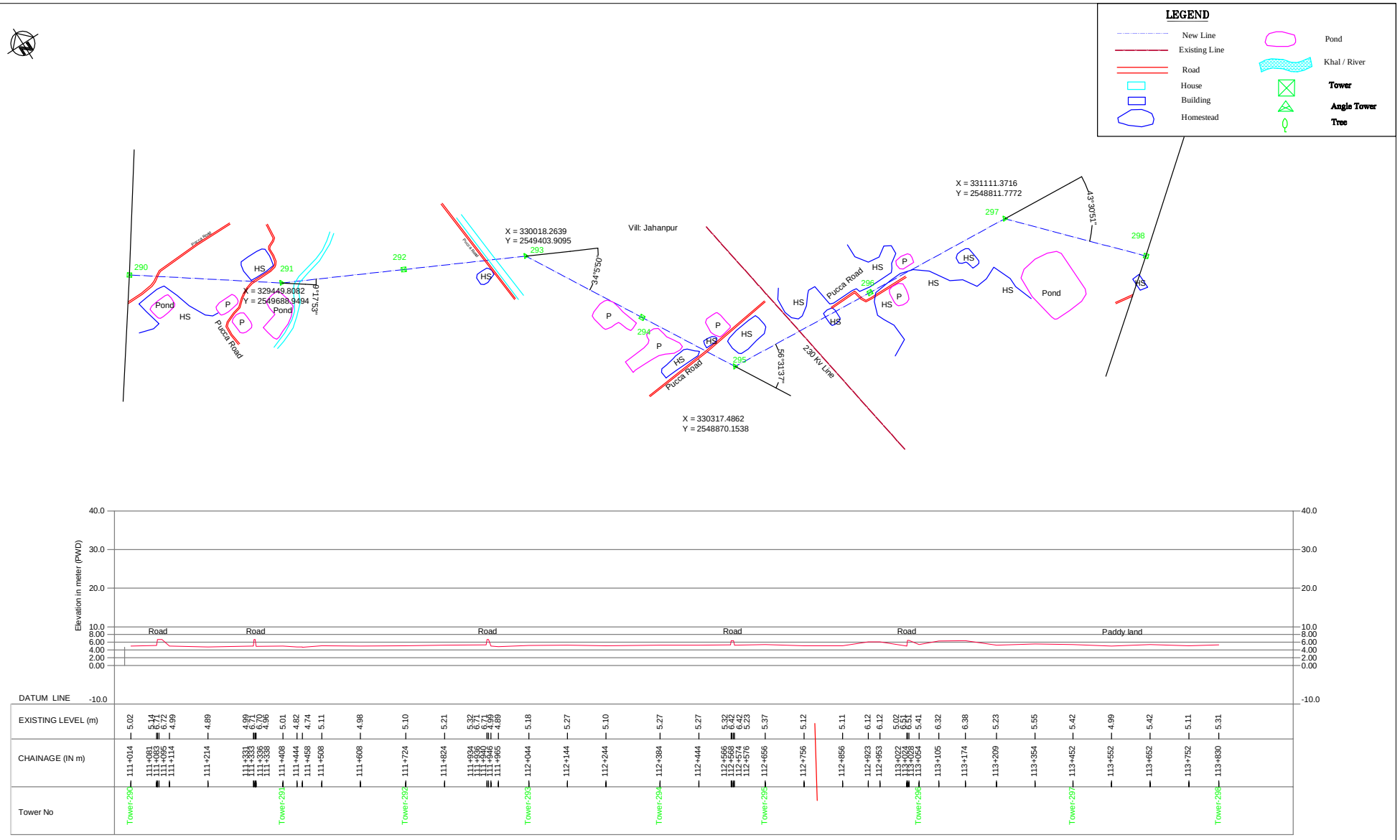

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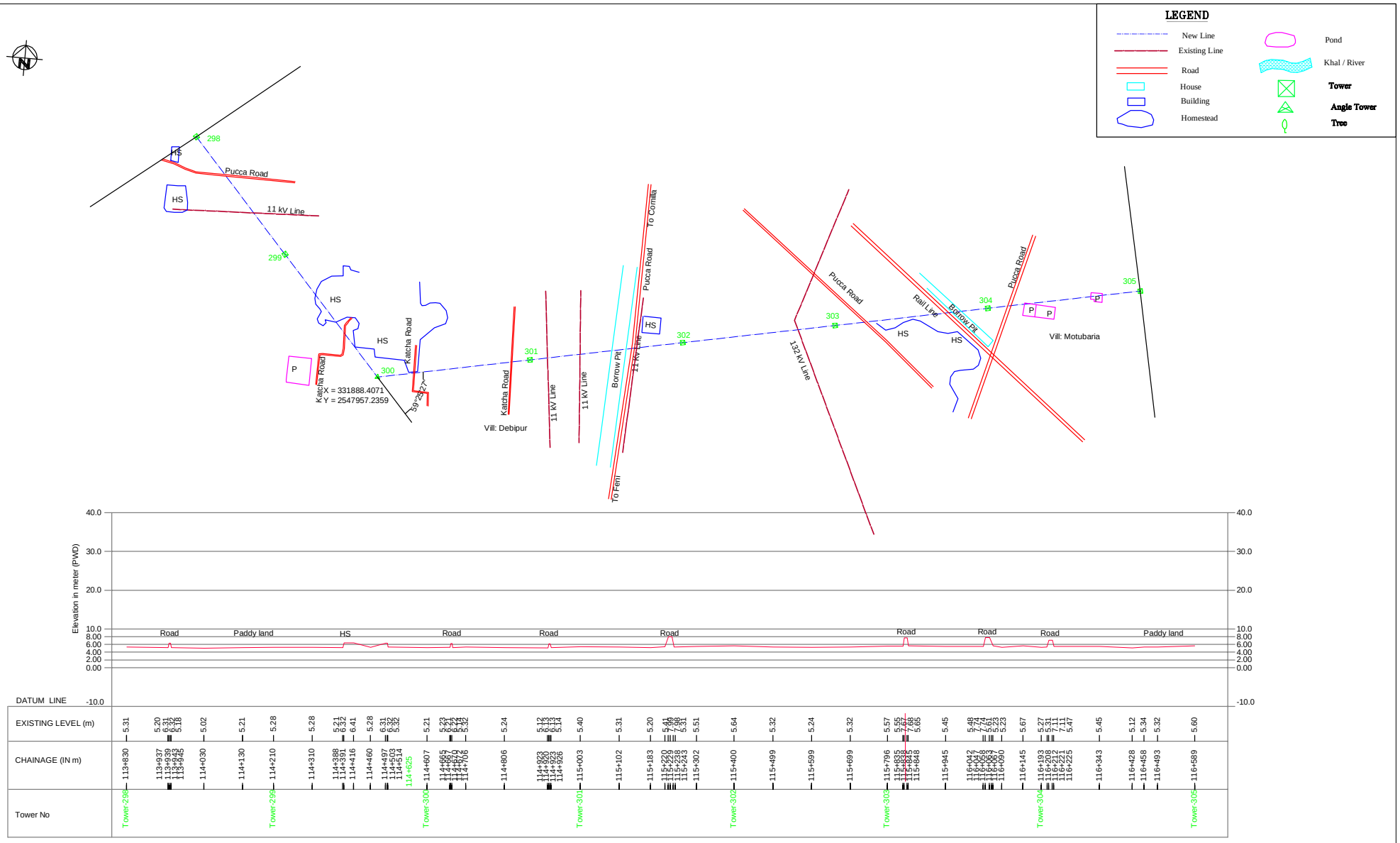

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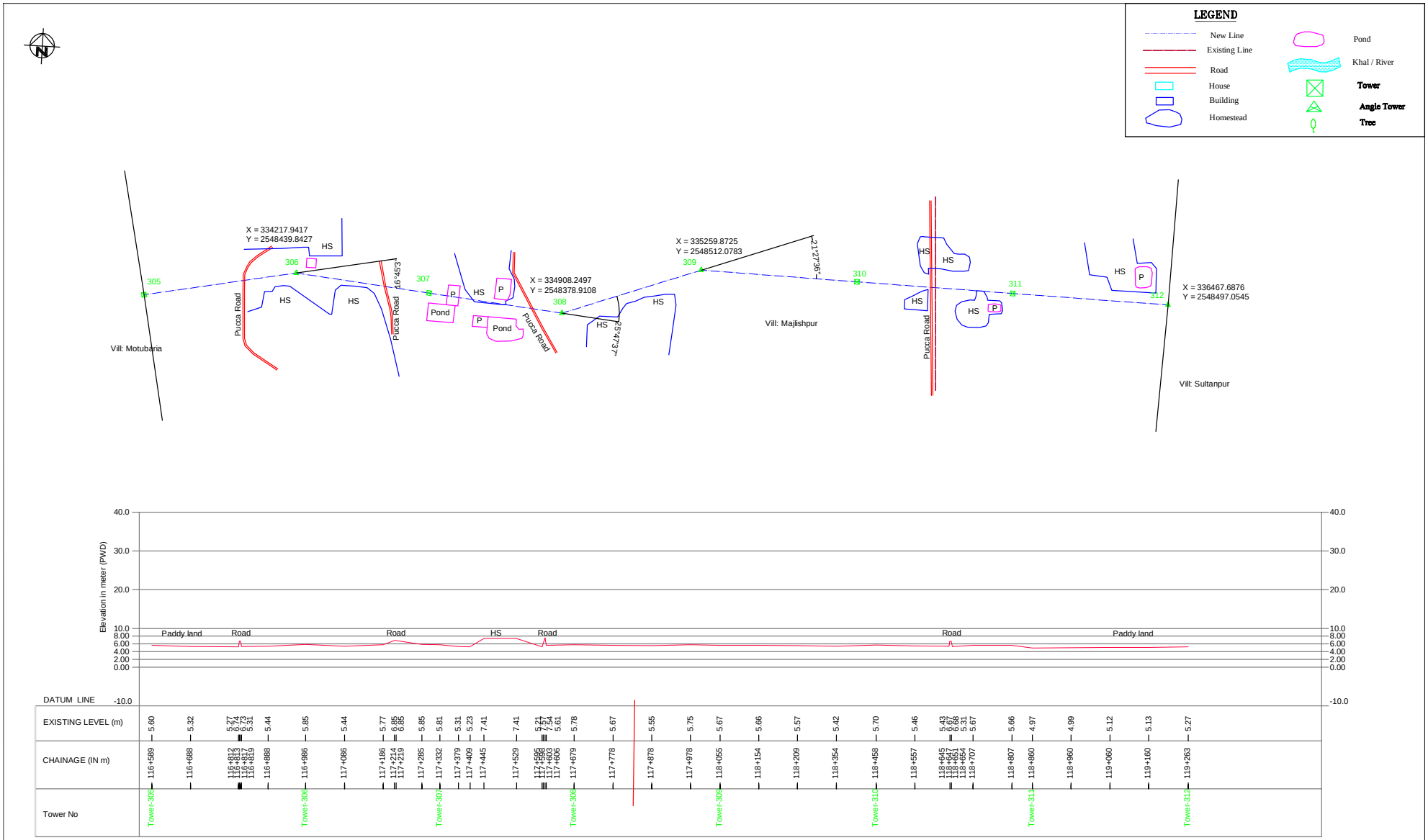

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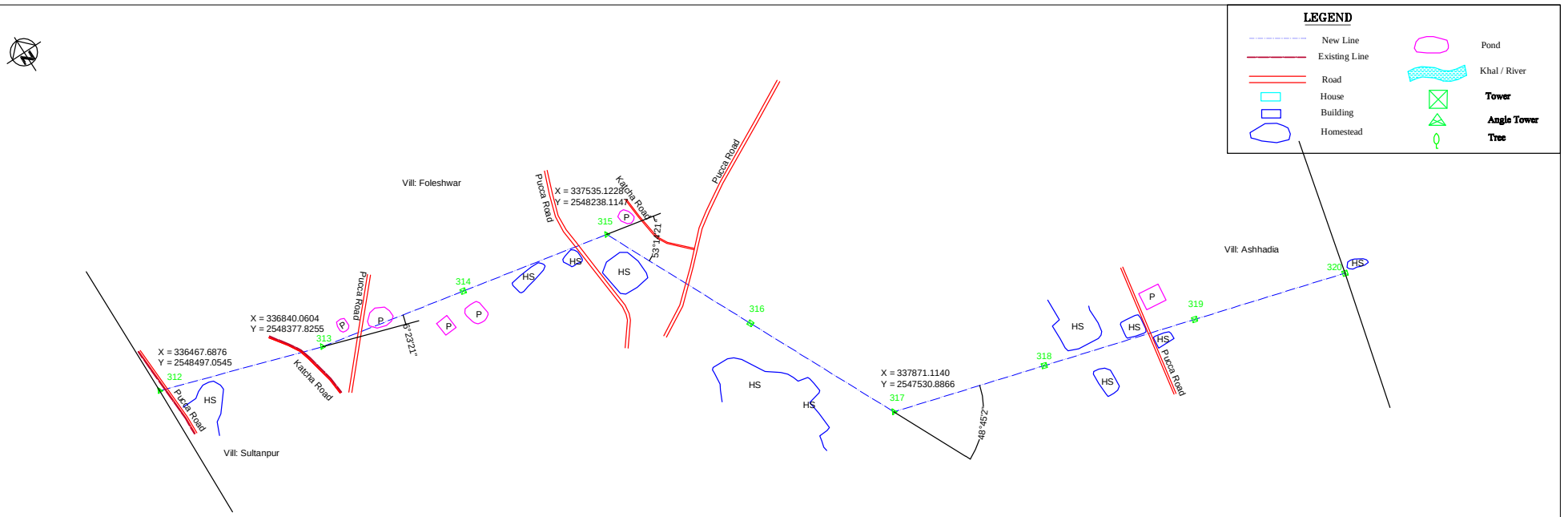

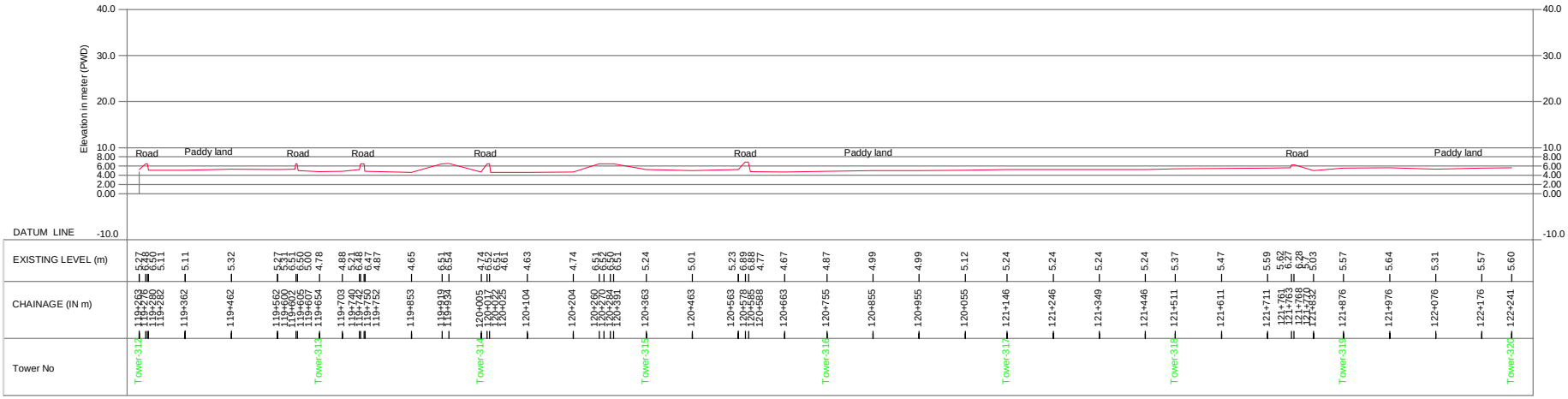

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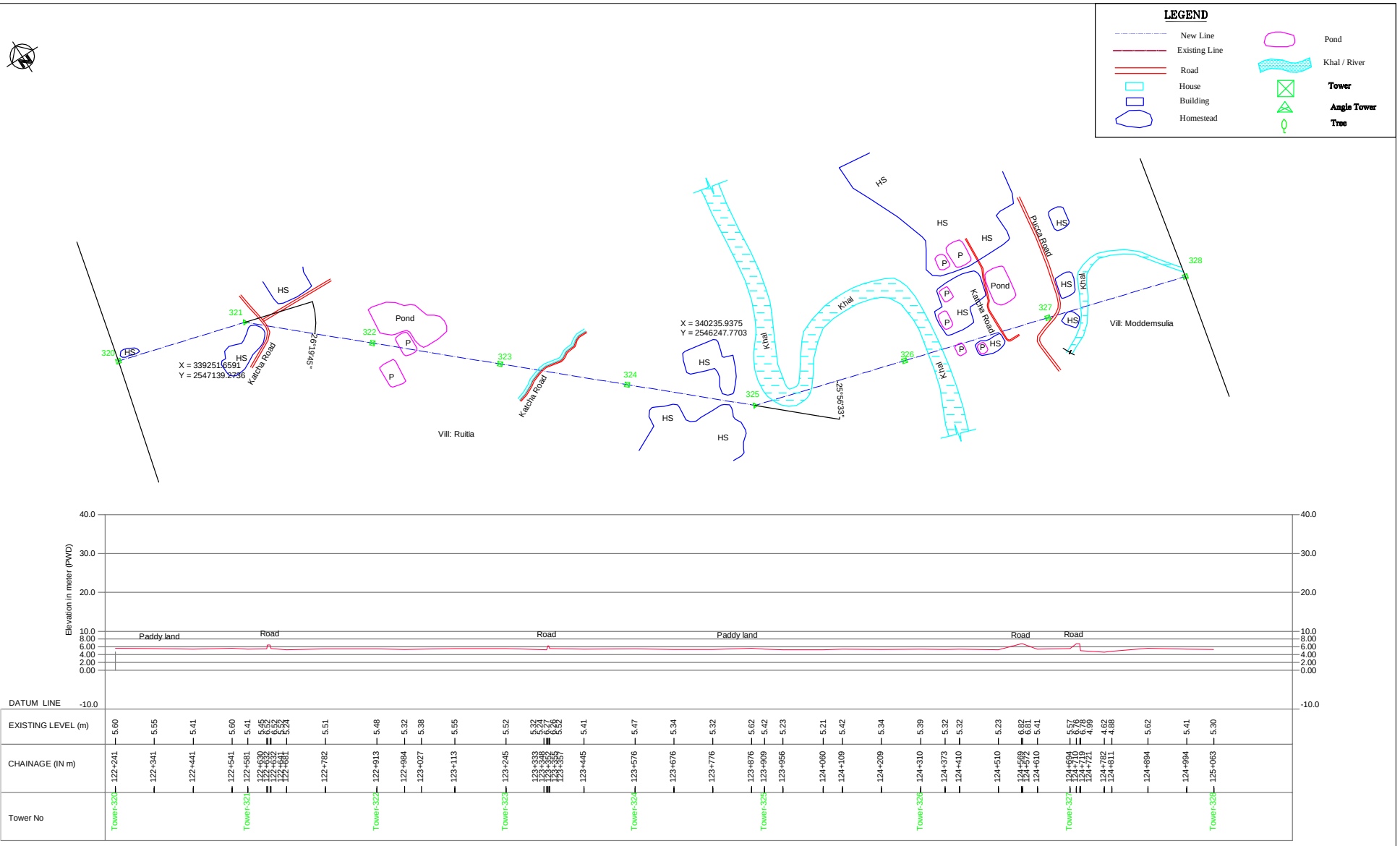

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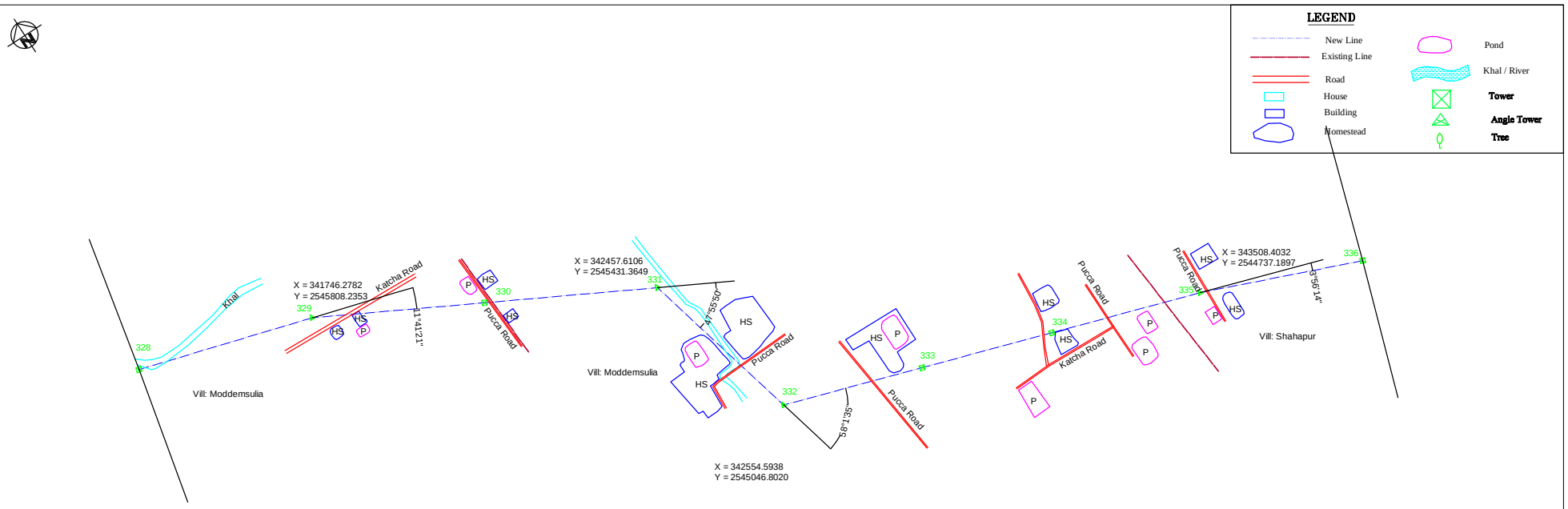

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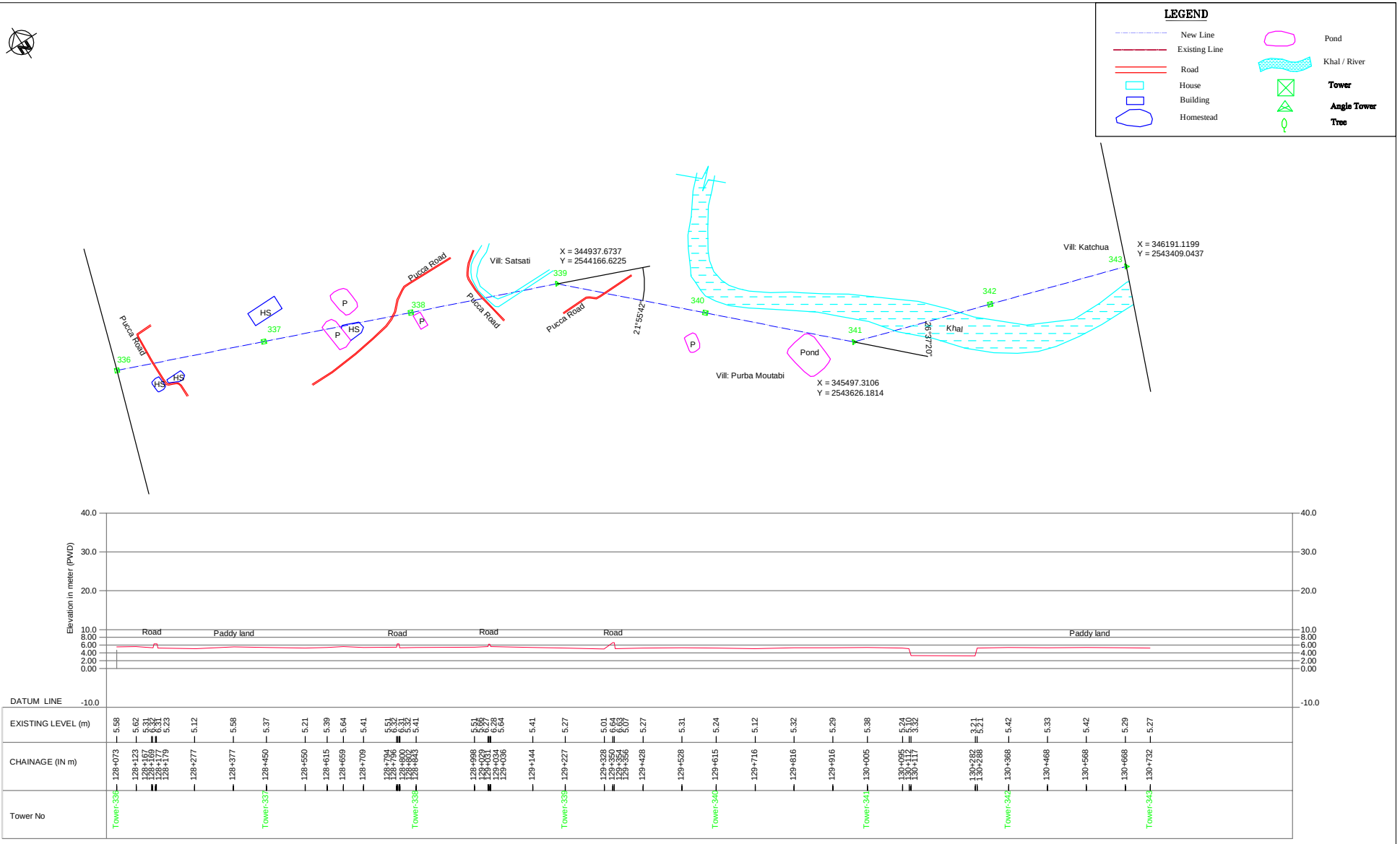

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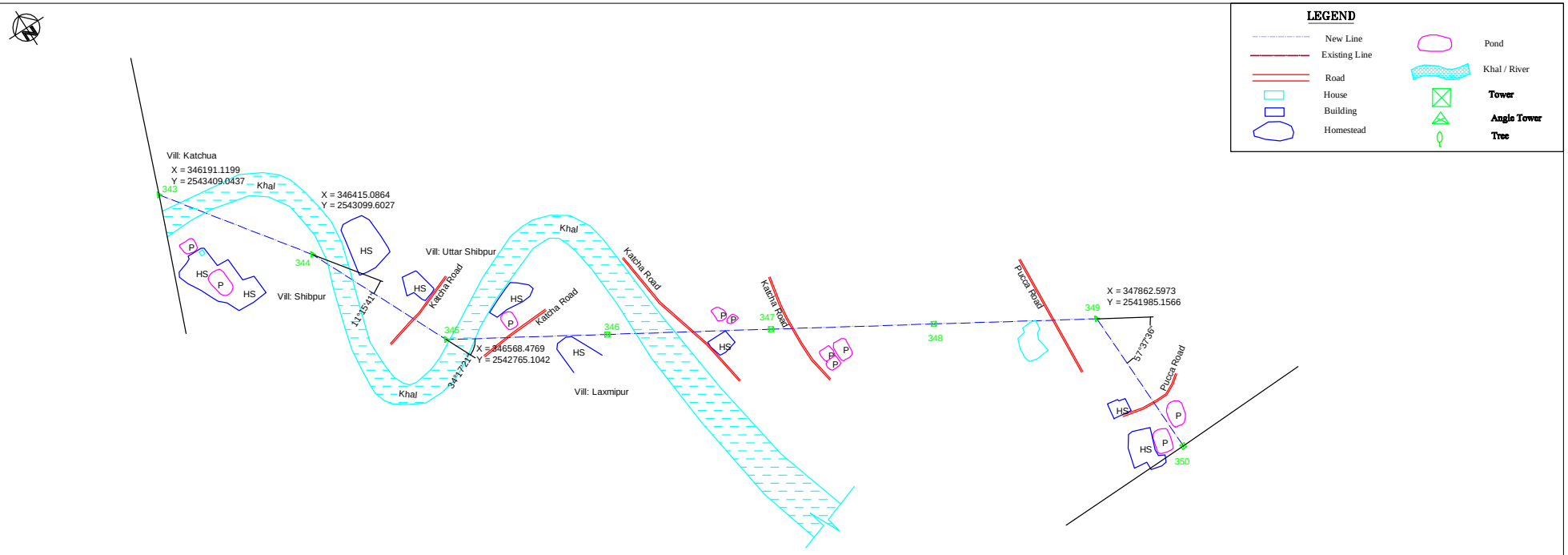

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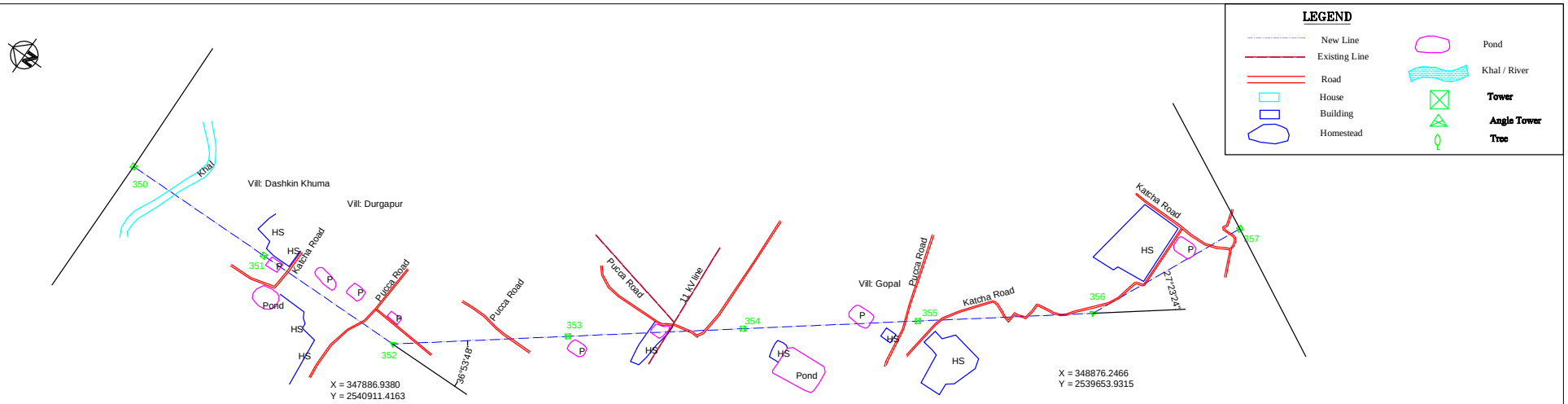

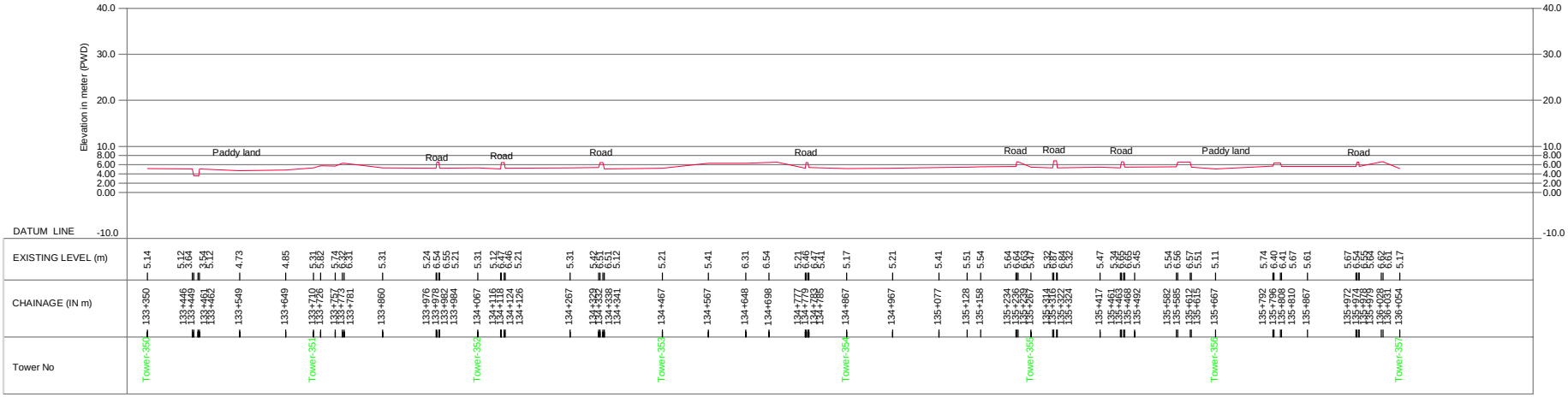

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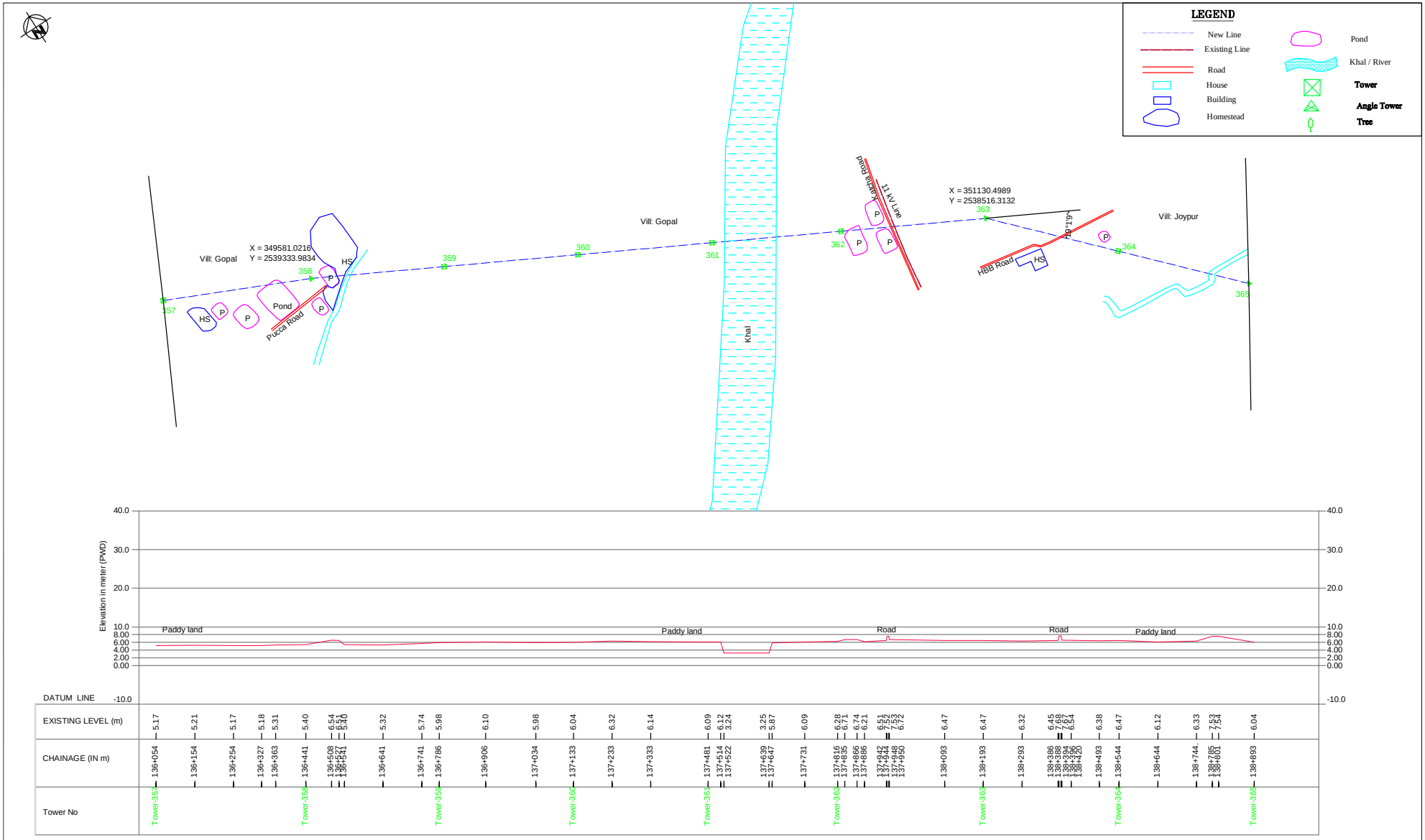

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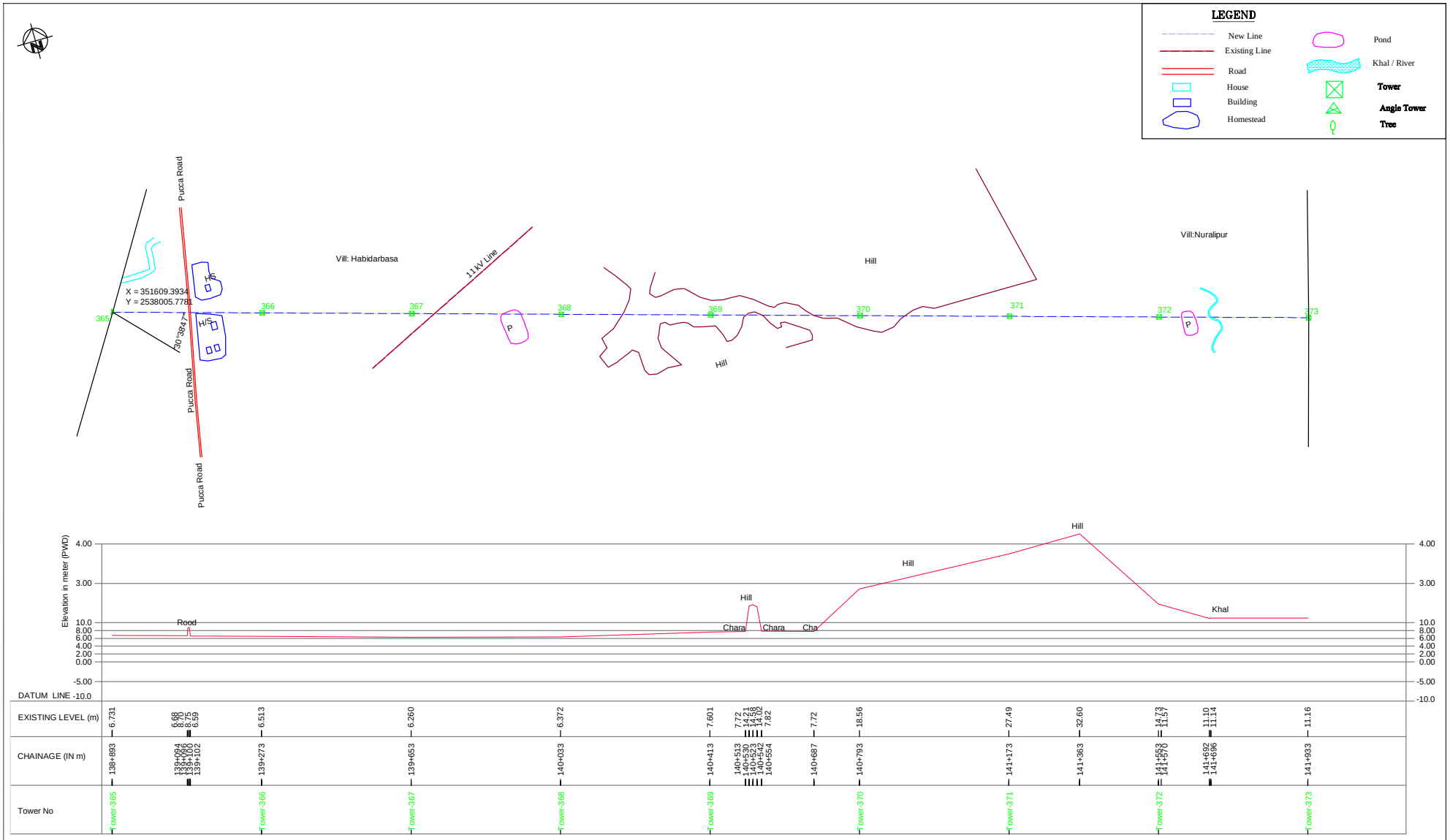

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LOCAL CONSULTANT	Engineers Associates Ltd. (EAL)	TEPCO / JICA		TITLE	ROUTE ALIGNMENT SURVEY OF PROPOSED 400kV TRANSMISSION LINE FROM MEGHNA GHAT TO MATARBARI,
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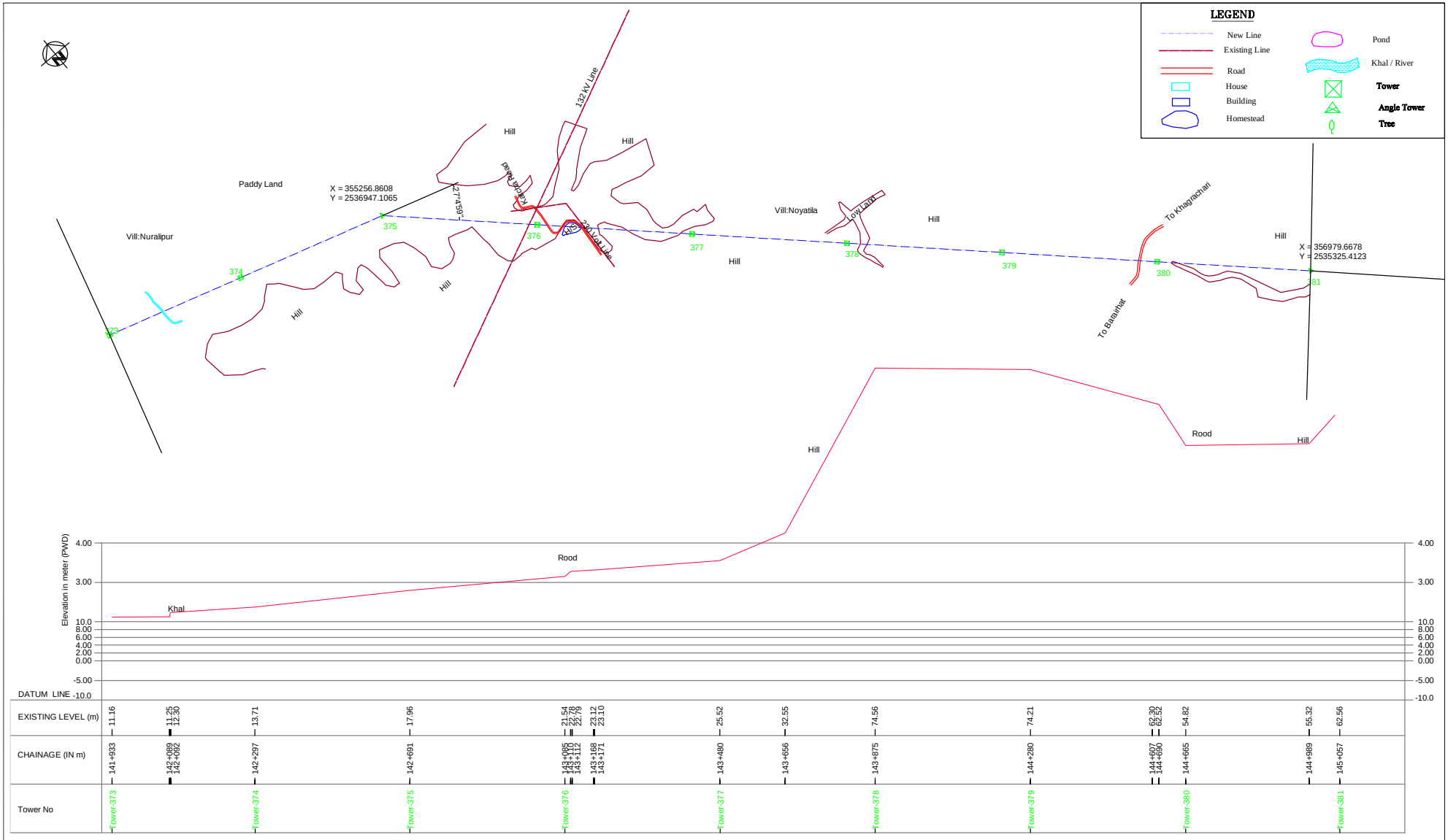

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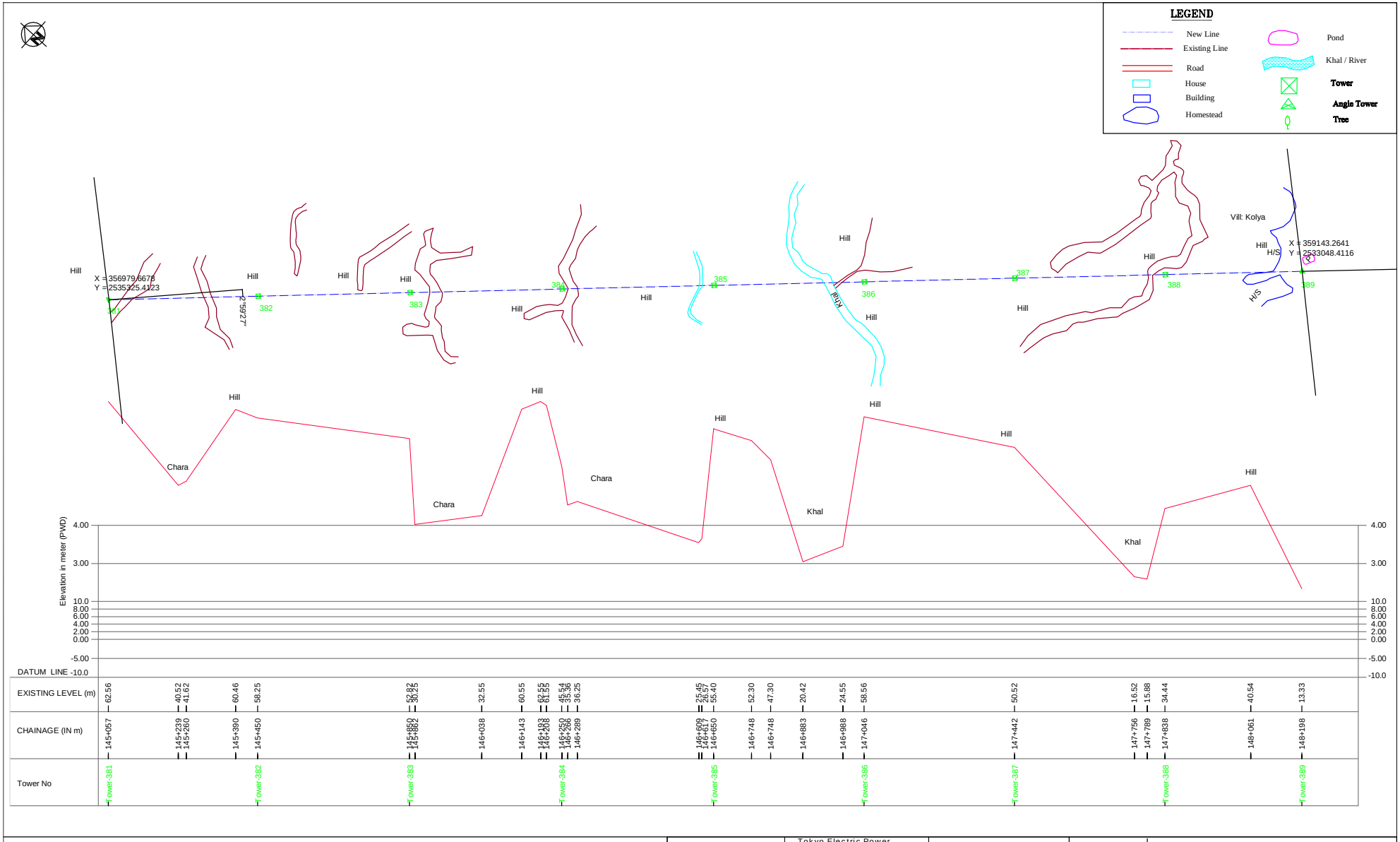

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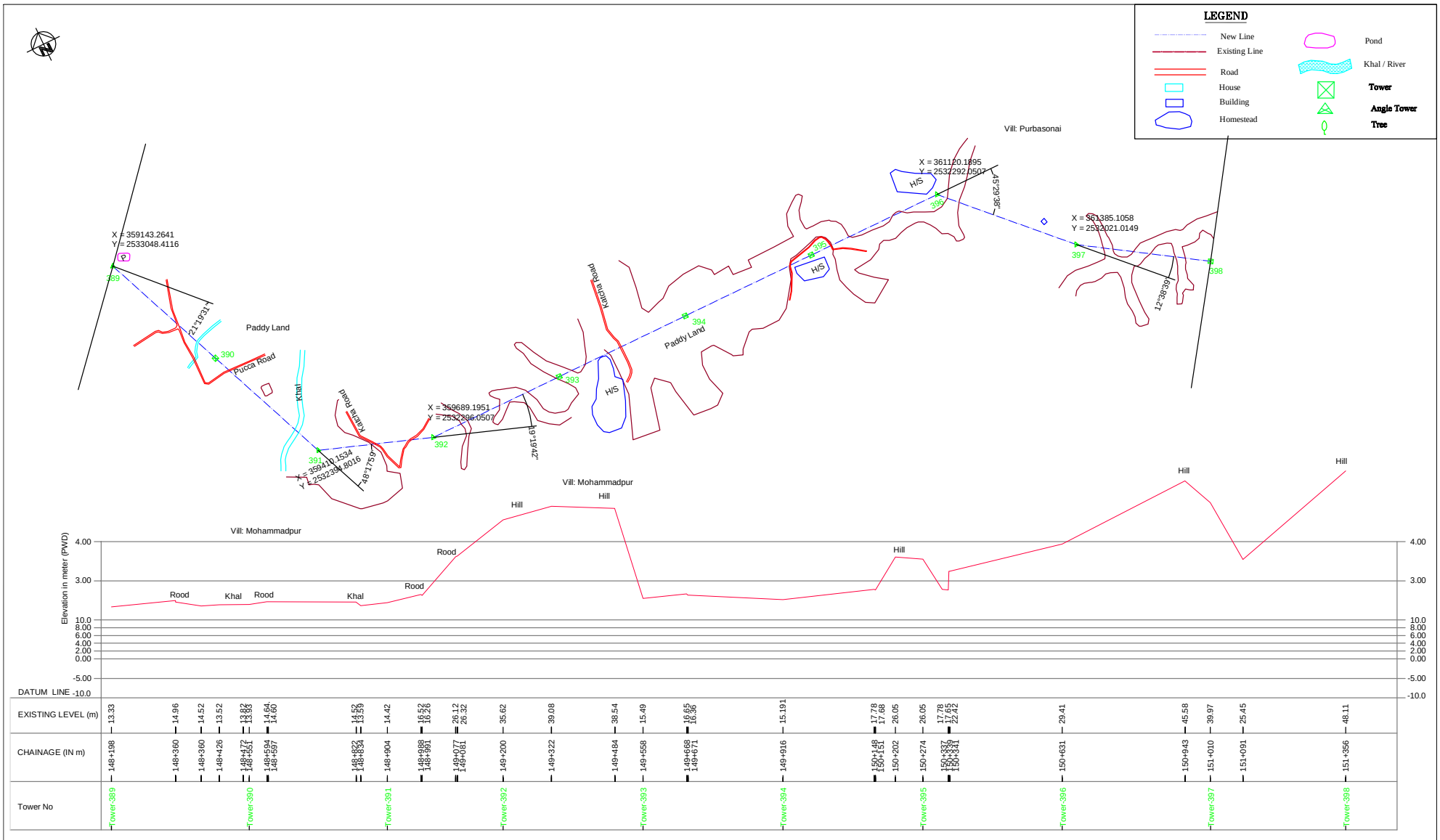

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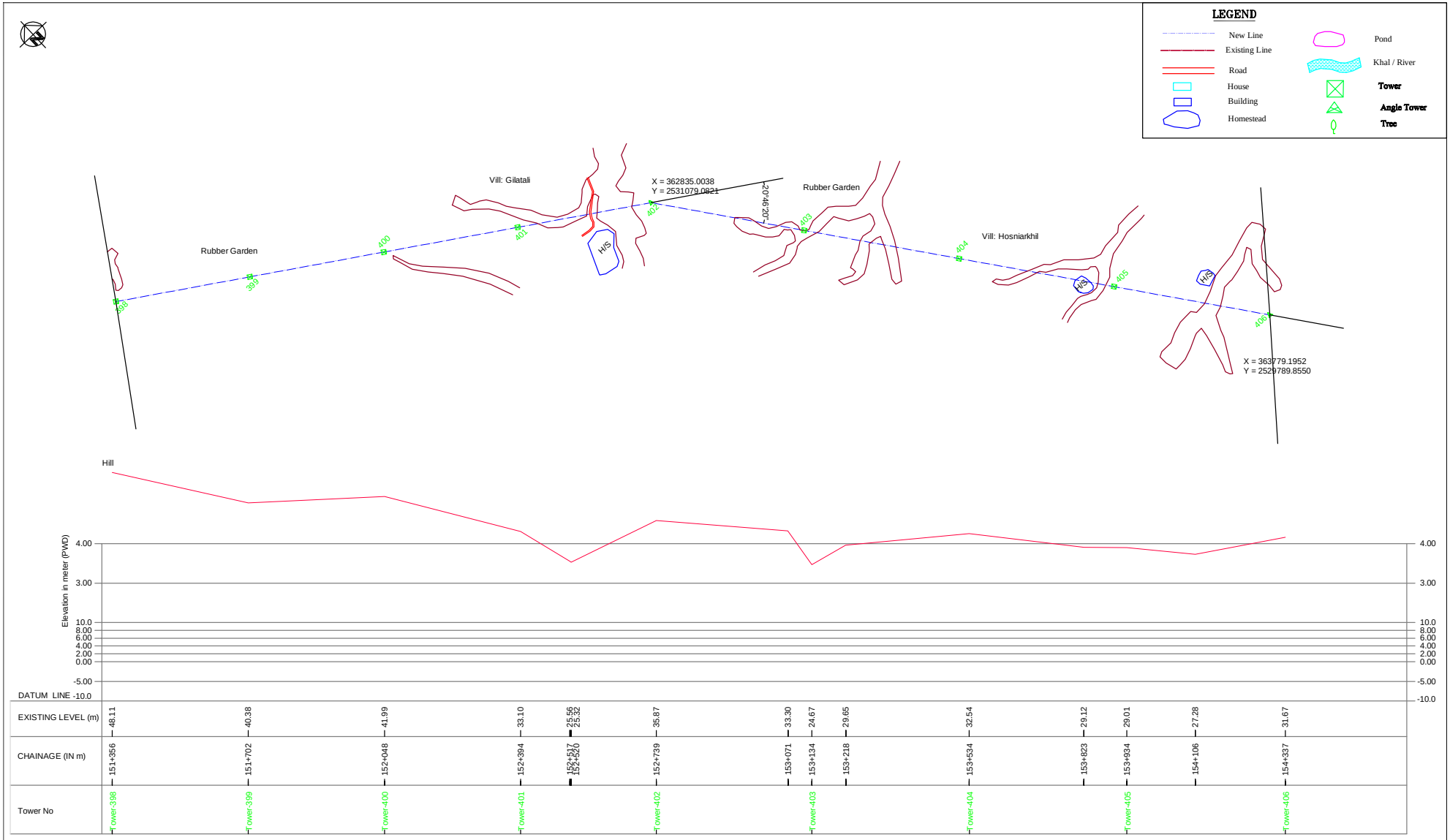

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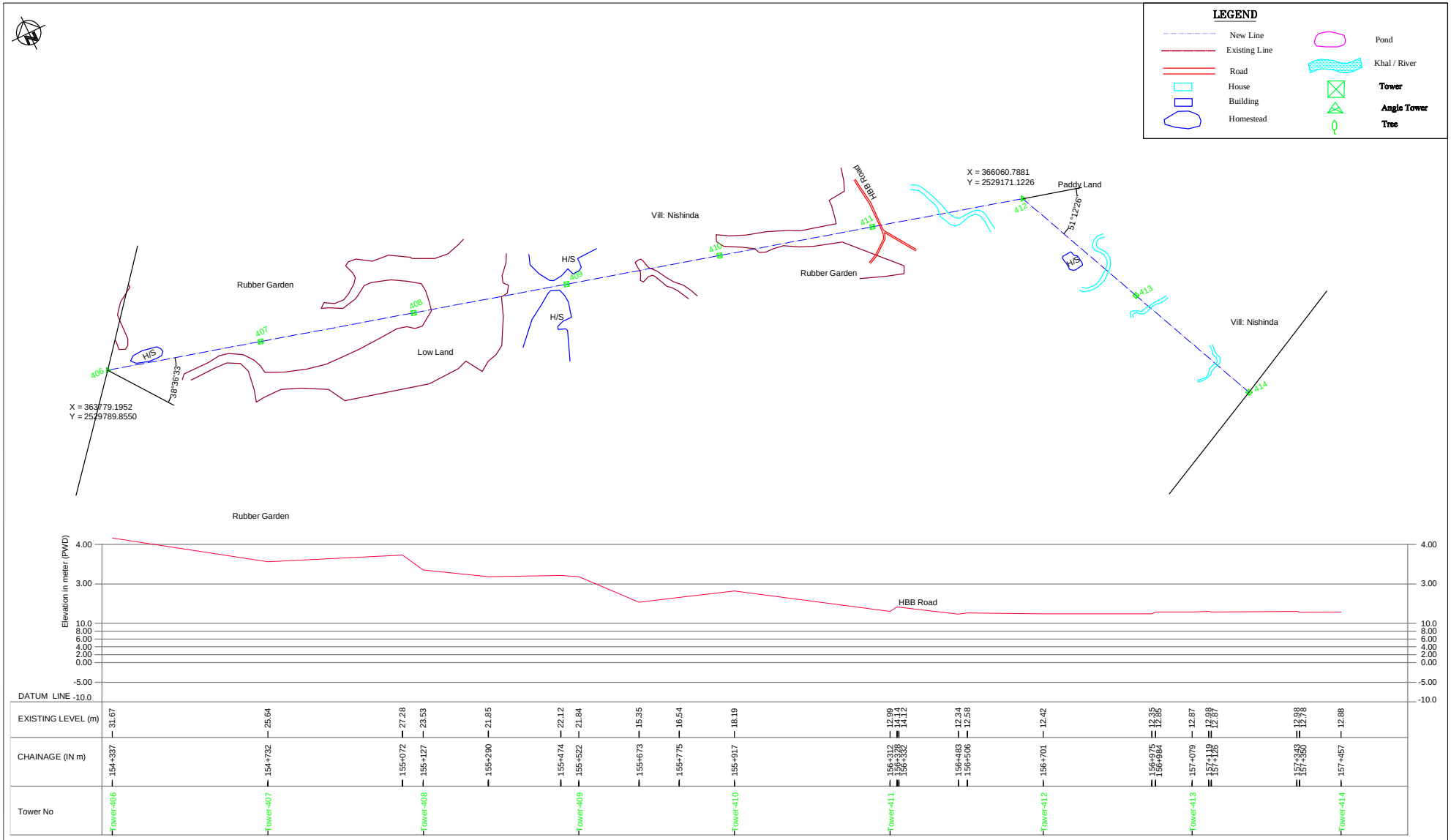

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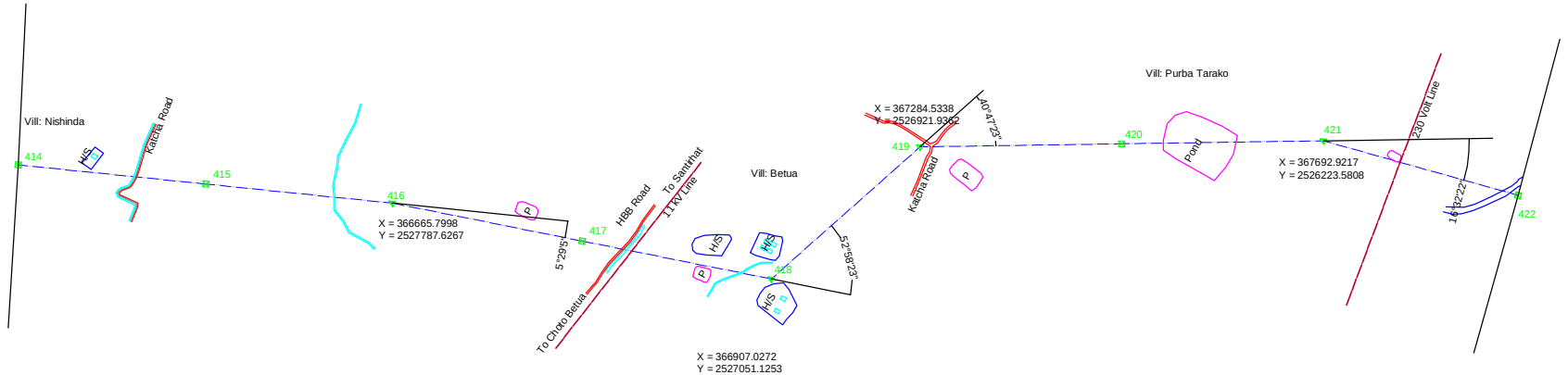
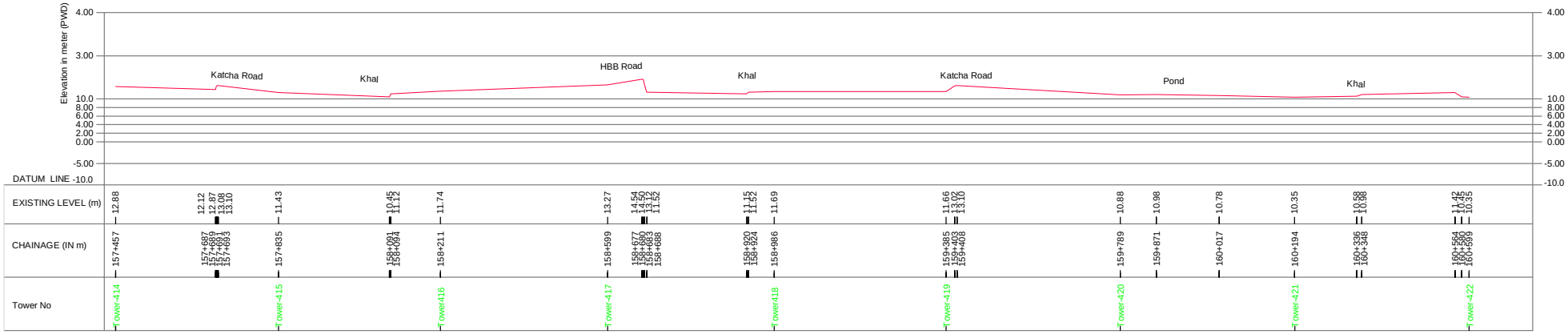
LEGEND

New Line
Existing Line
Road
House
Building
Homestead
Pond
Khal / River
Tower
Angle Tower
Tree





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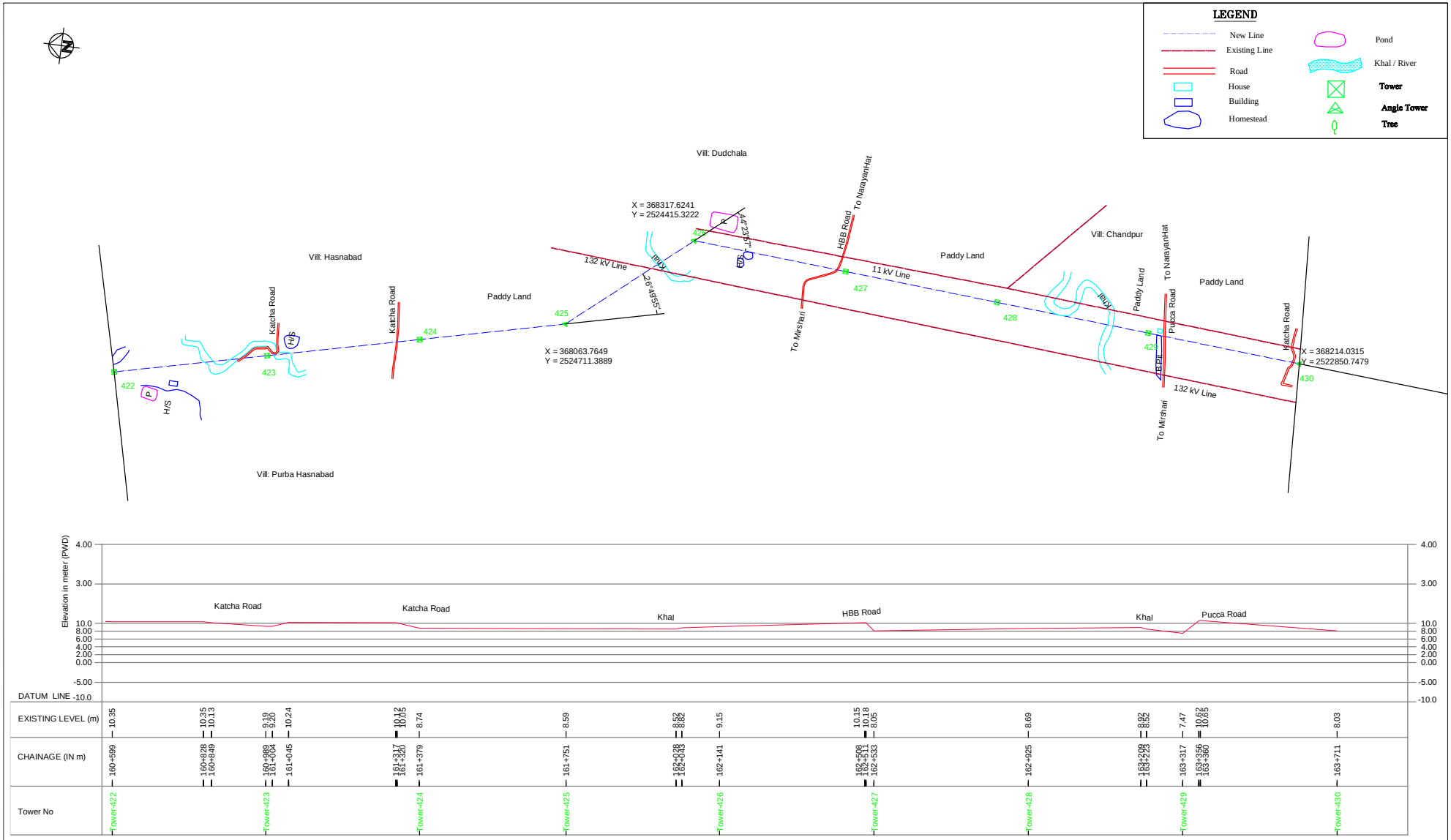

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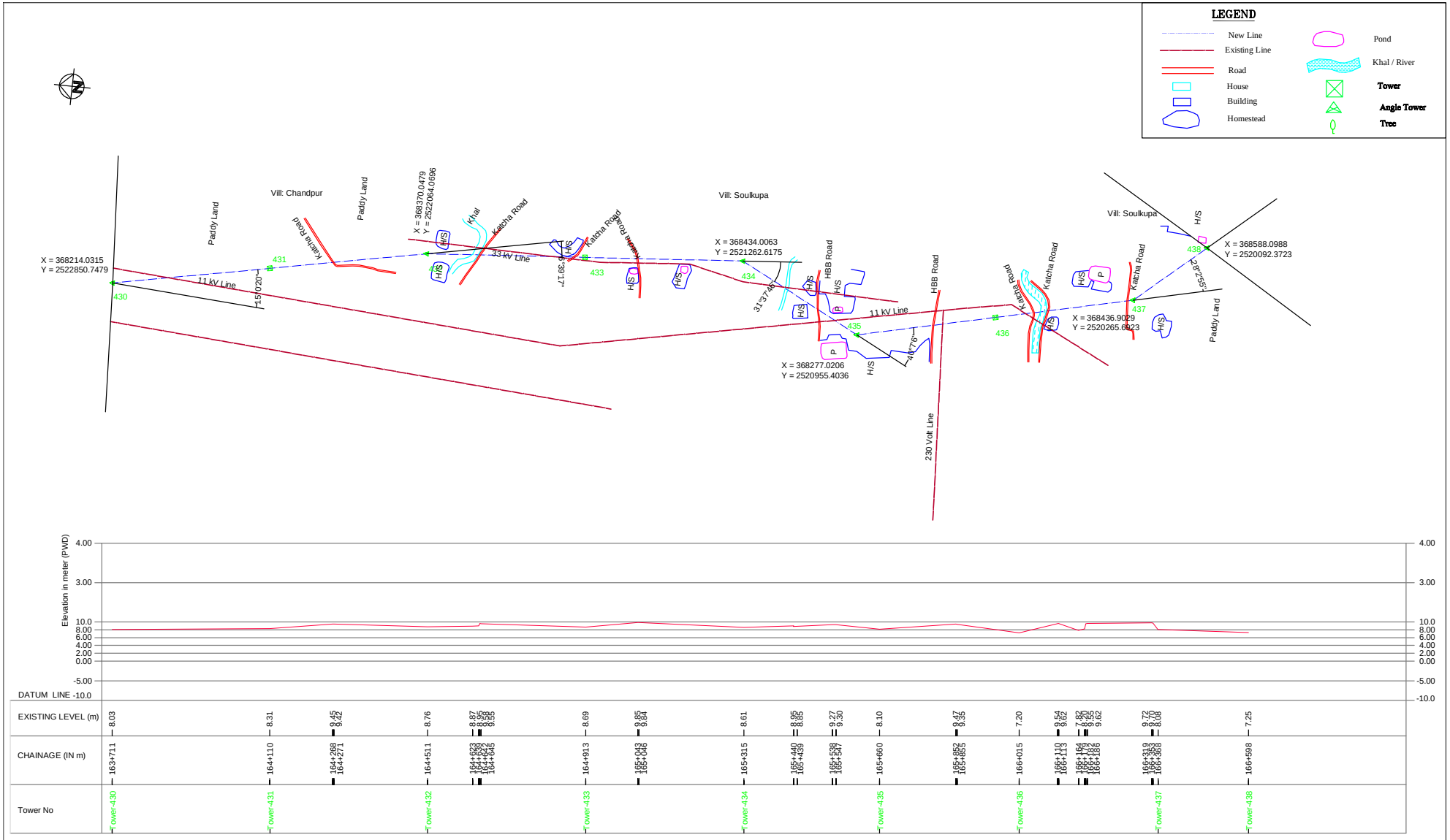

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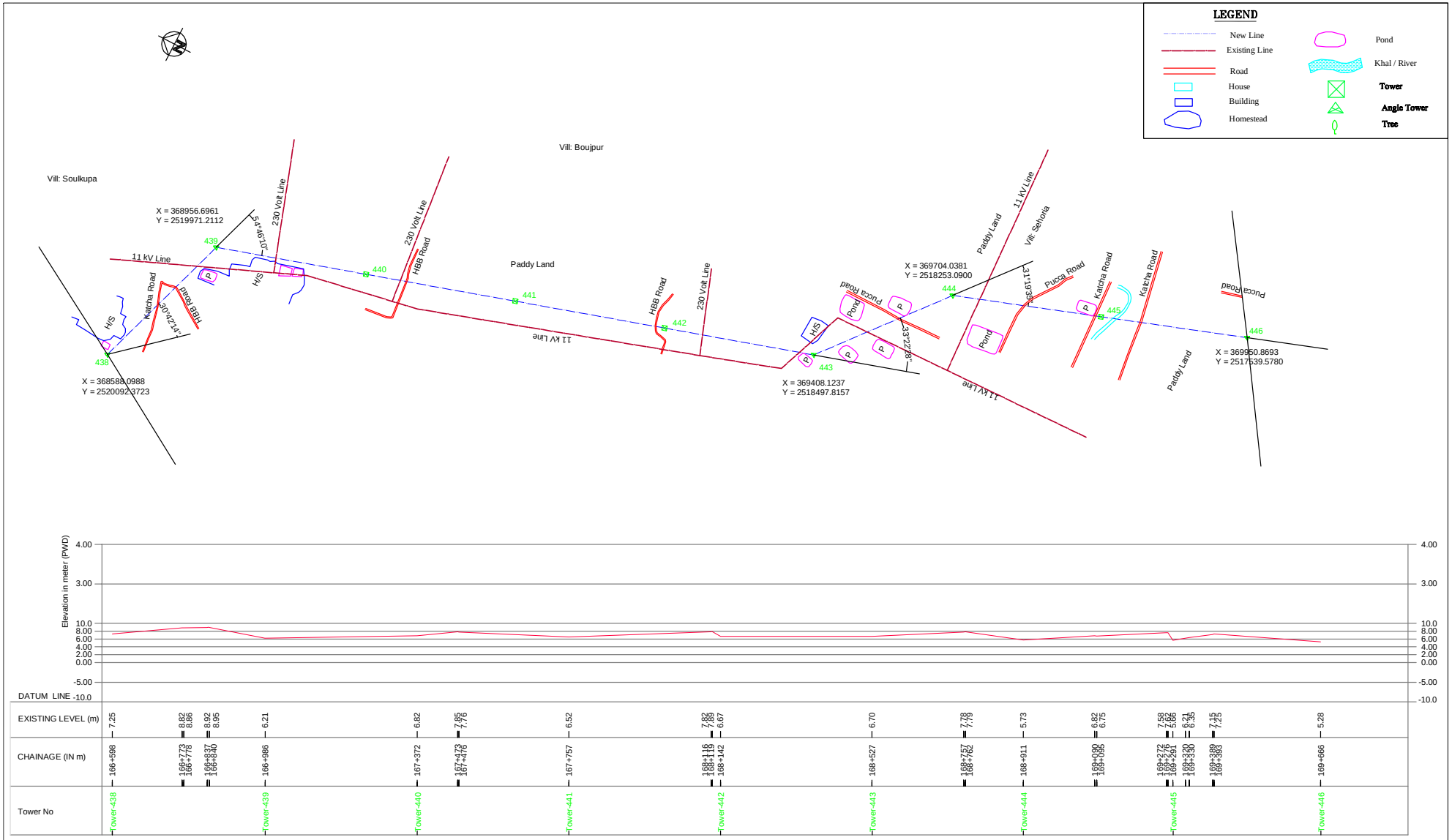

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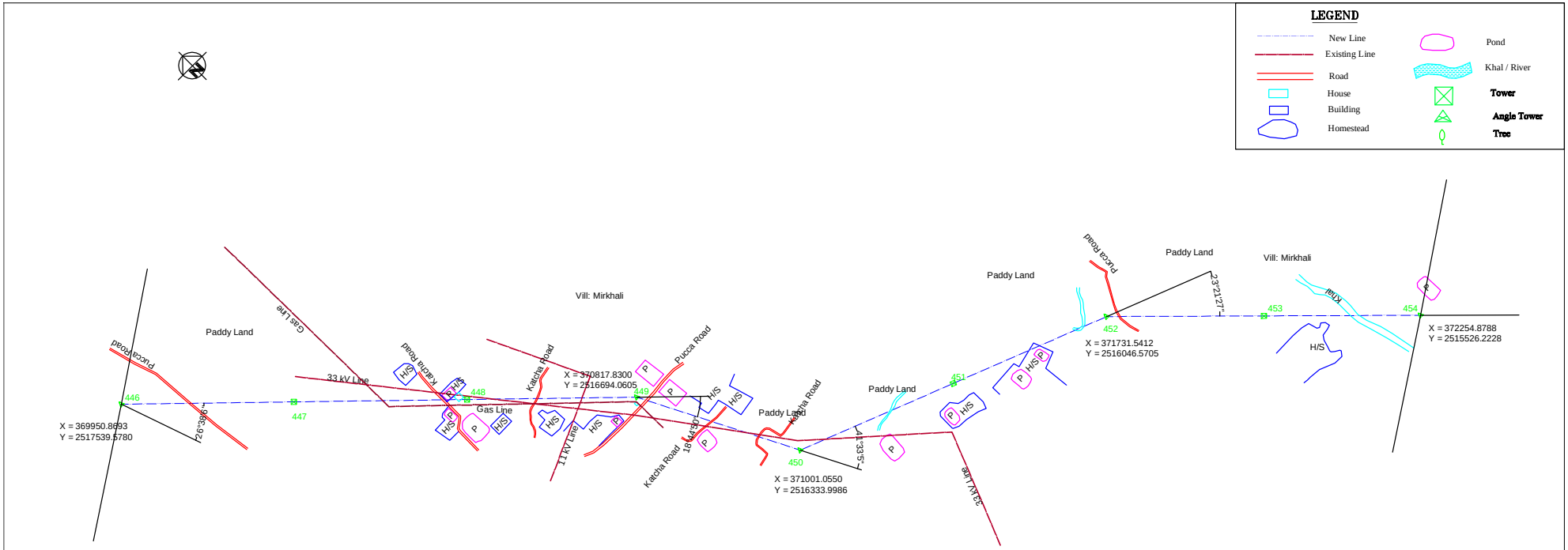

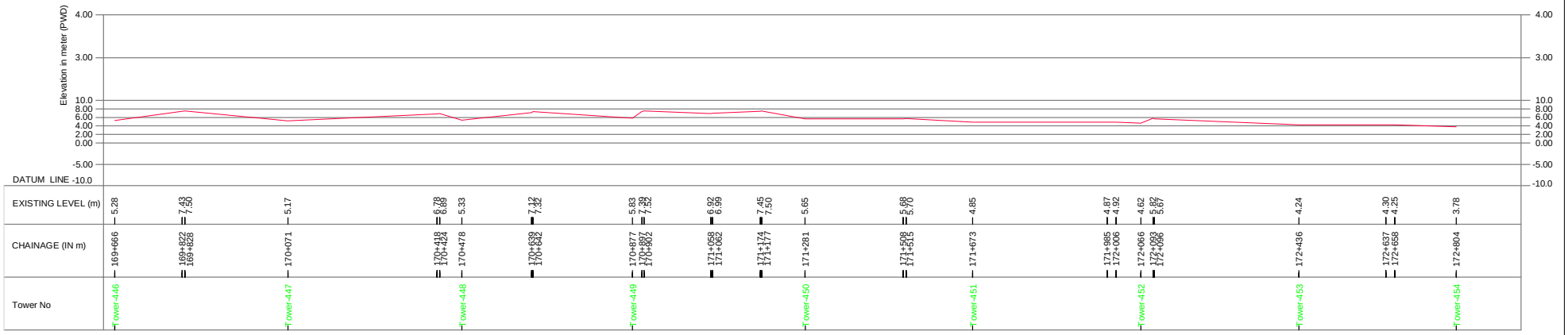

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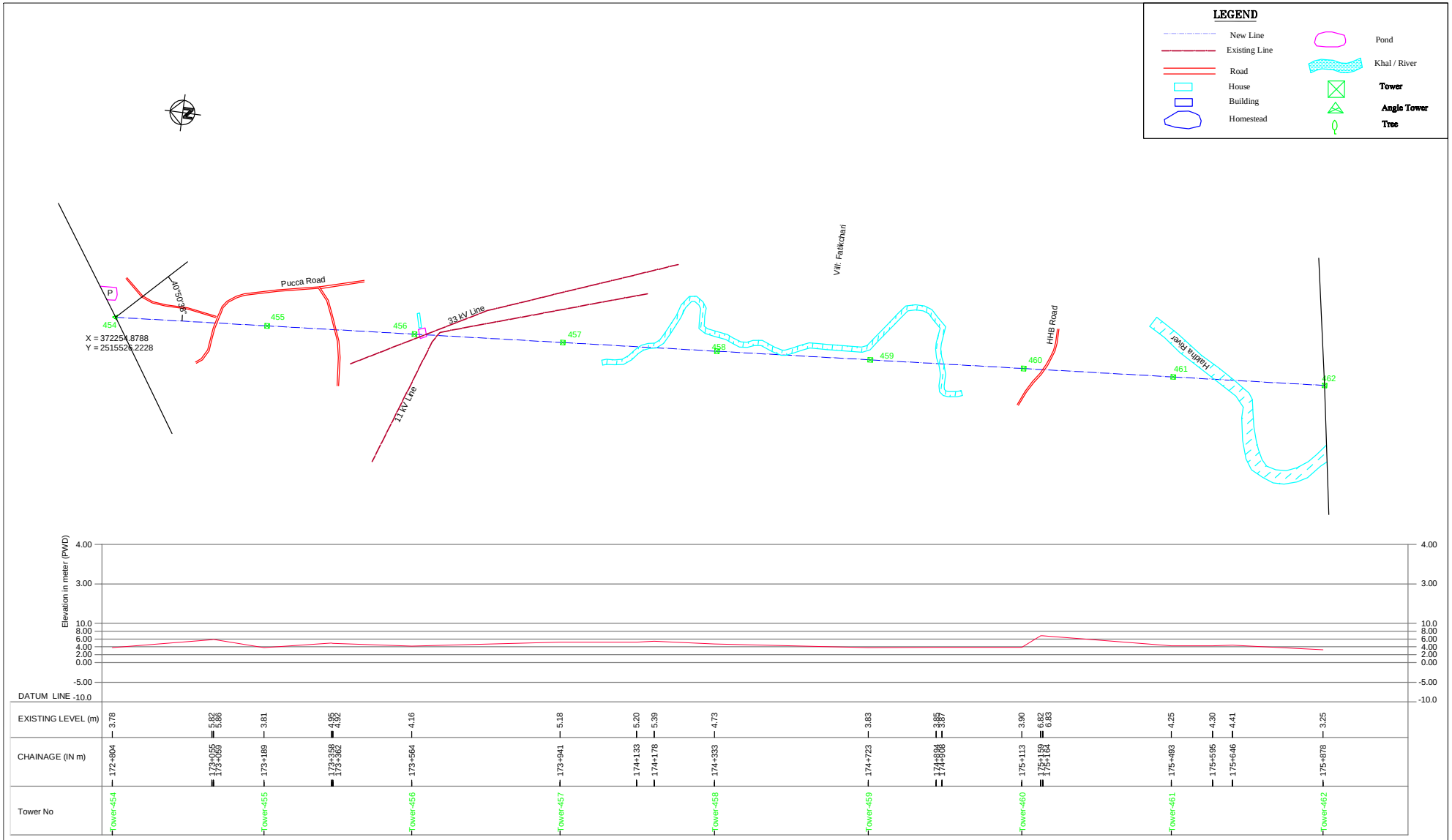

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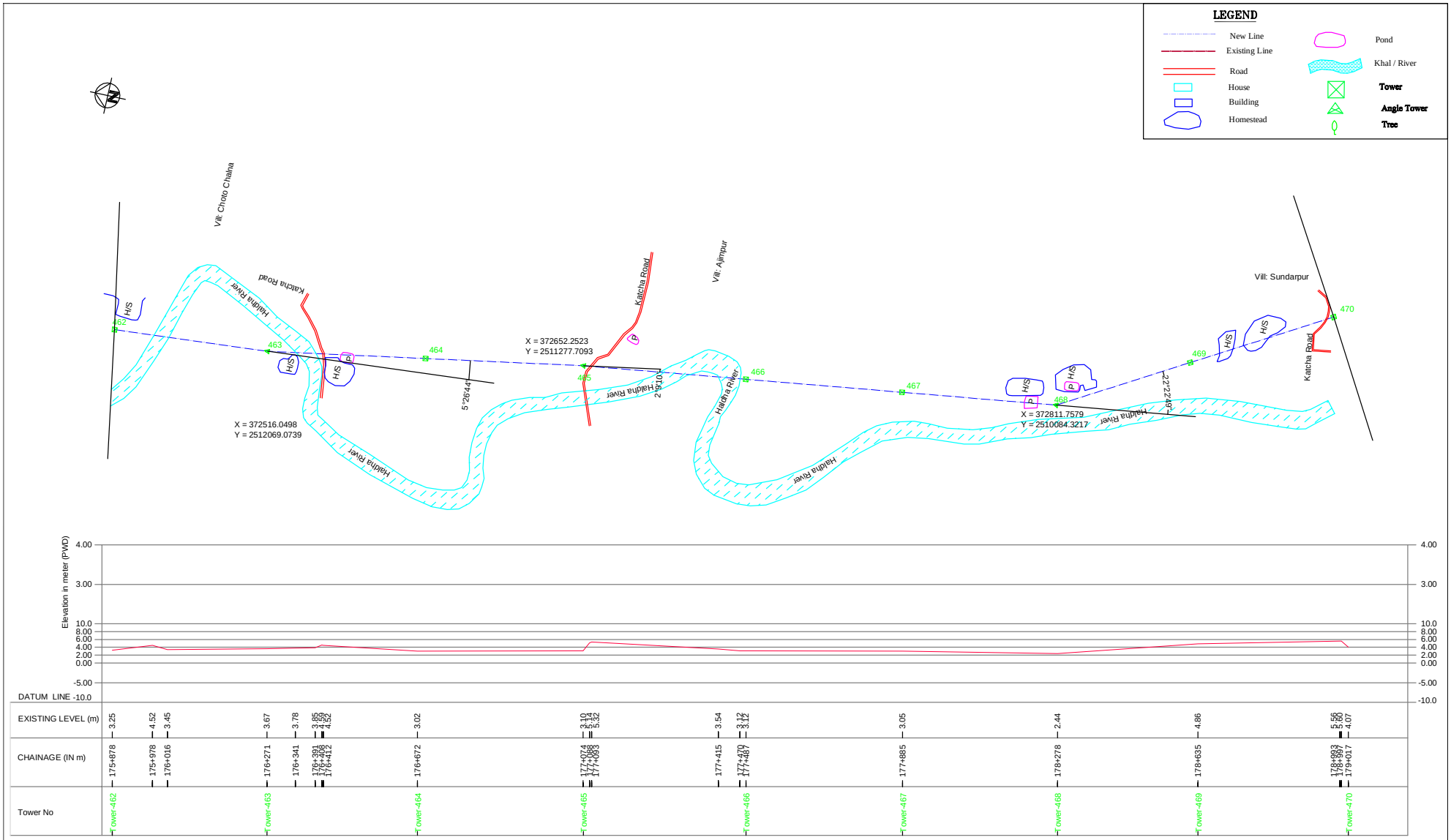

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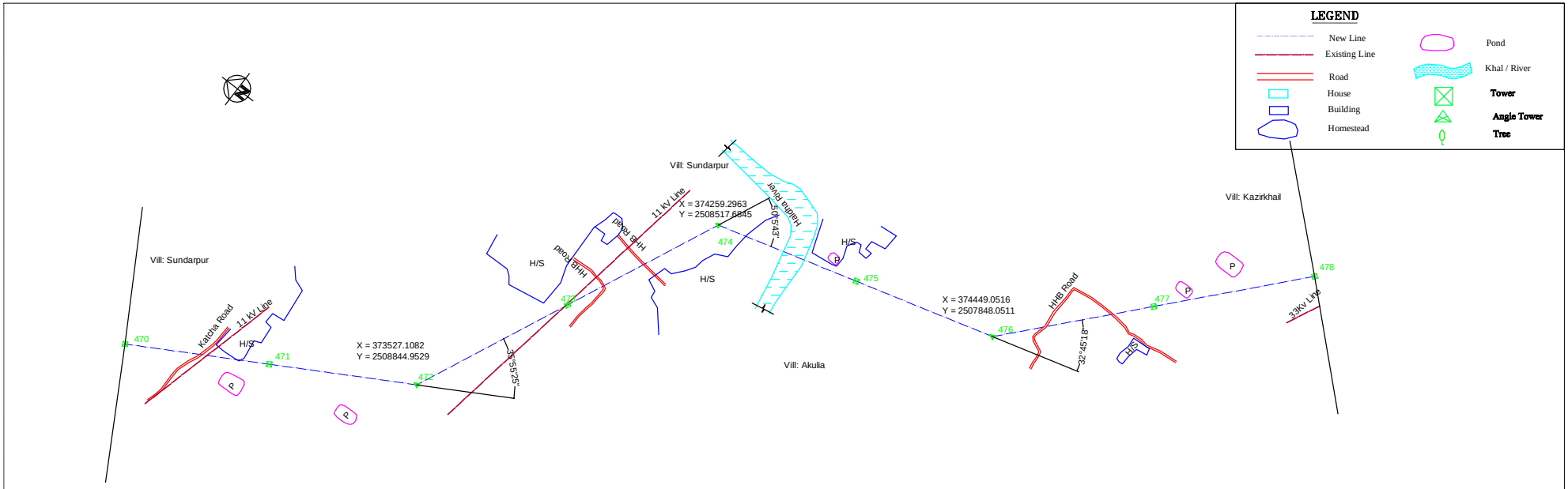

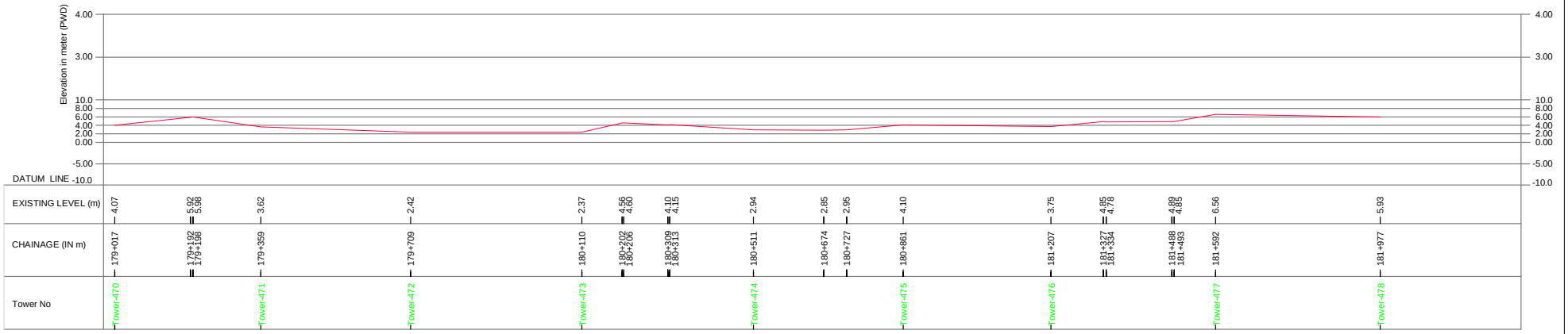

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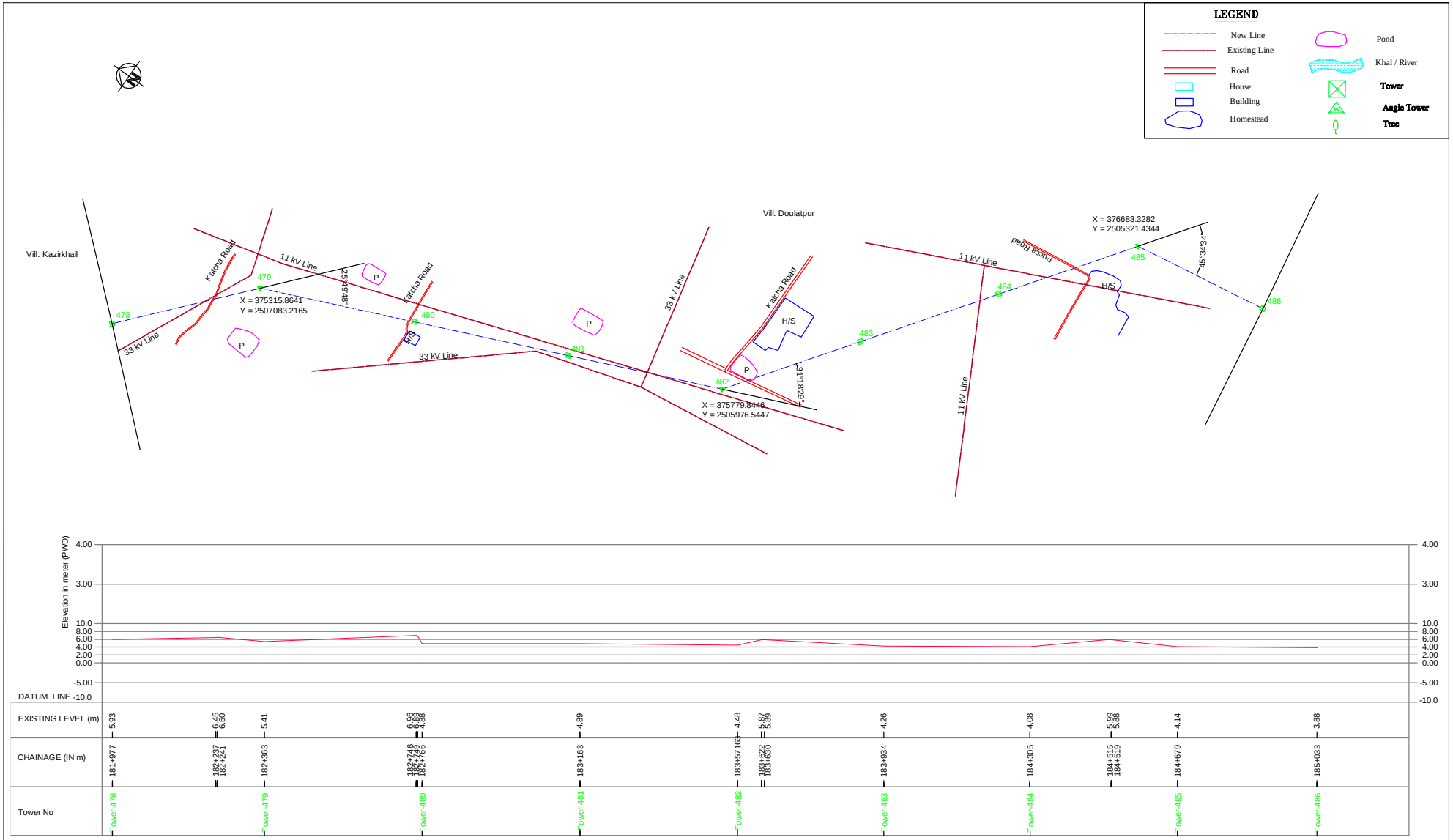

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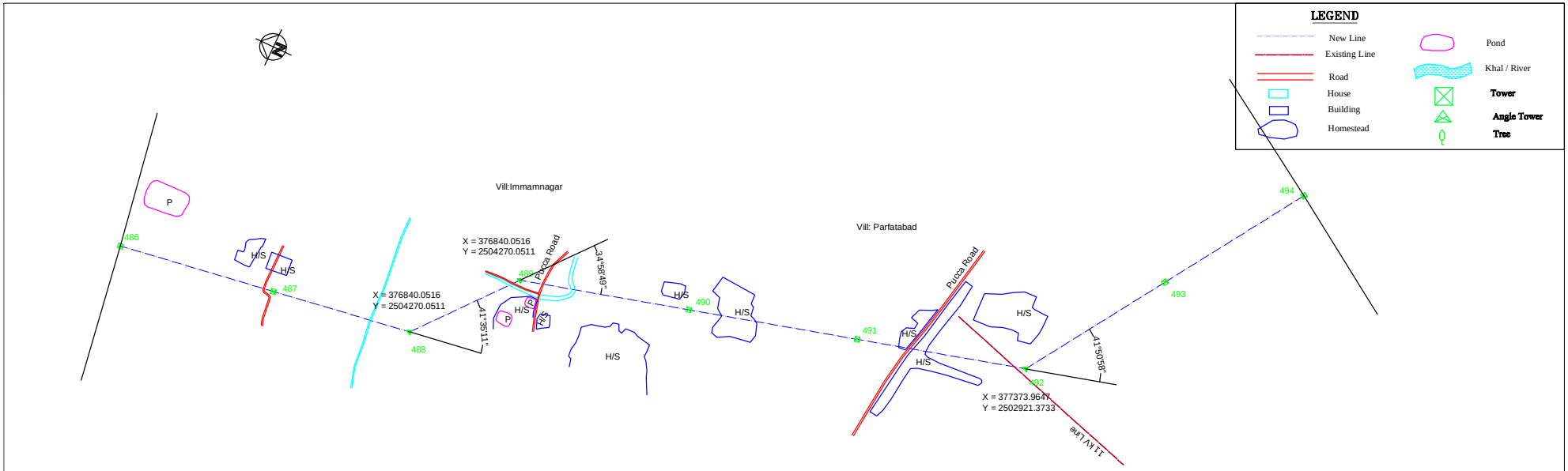

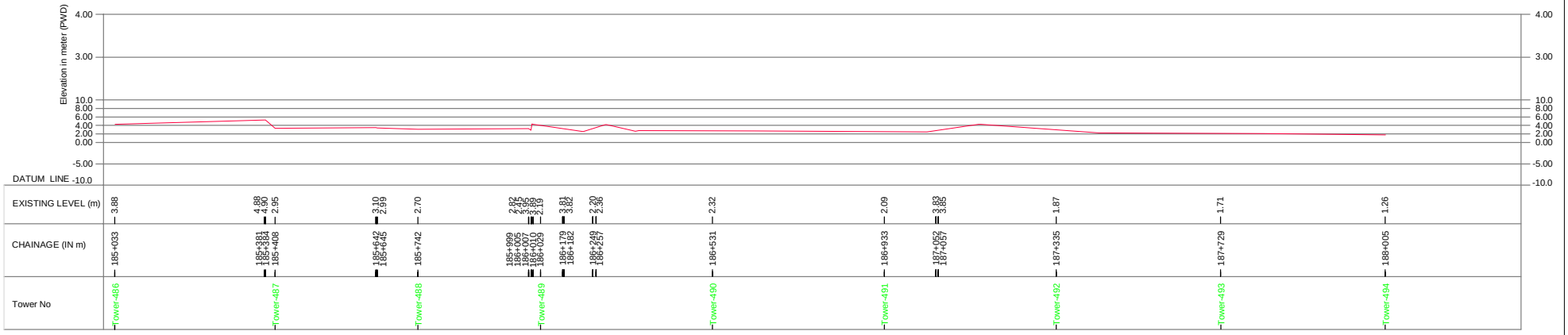

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PROJECT NAME	PREPARATORY SURVEY ON DHAKA - CHITTAGONG MAIN POWER GRID STRENGTHENING PROJECT	
TITLE	ROUTE ALIGNMENT SURVEY OF PROPOSED 400kV TRANSMISSION LINE FROM MEGHNA GHAT TO MATARBARI,	
	DATE OF PREPARATION	DESCRIPTION
	NOVEMBER 2014	
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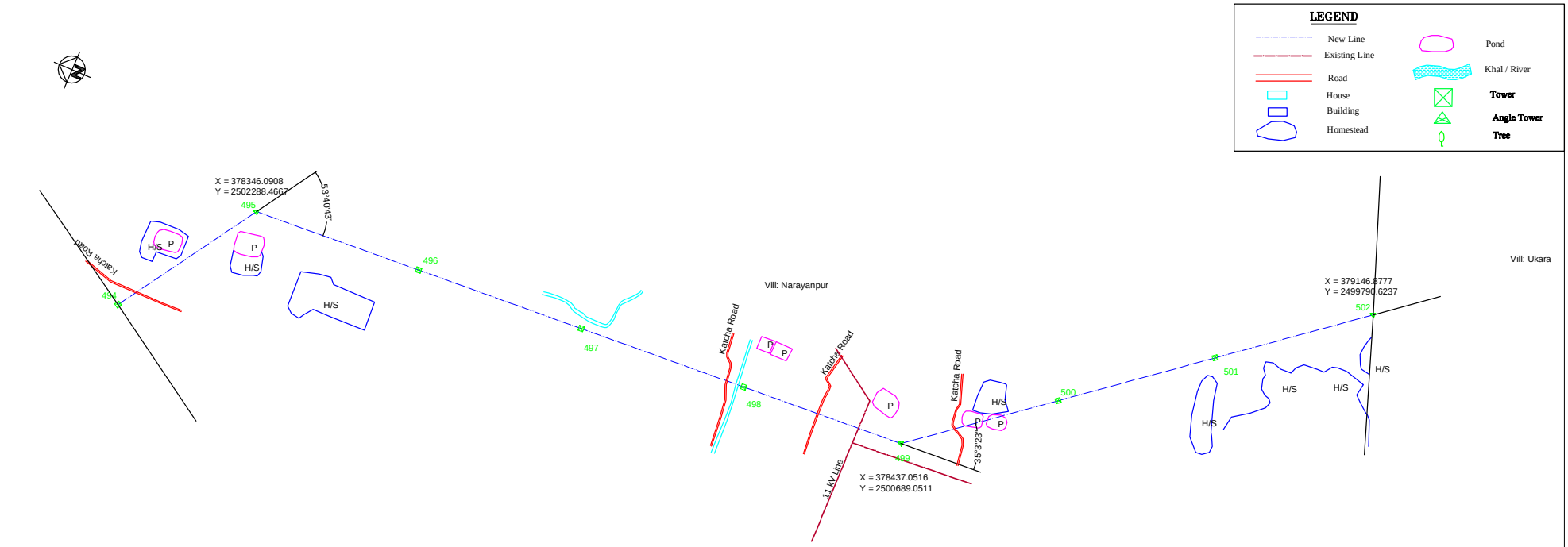

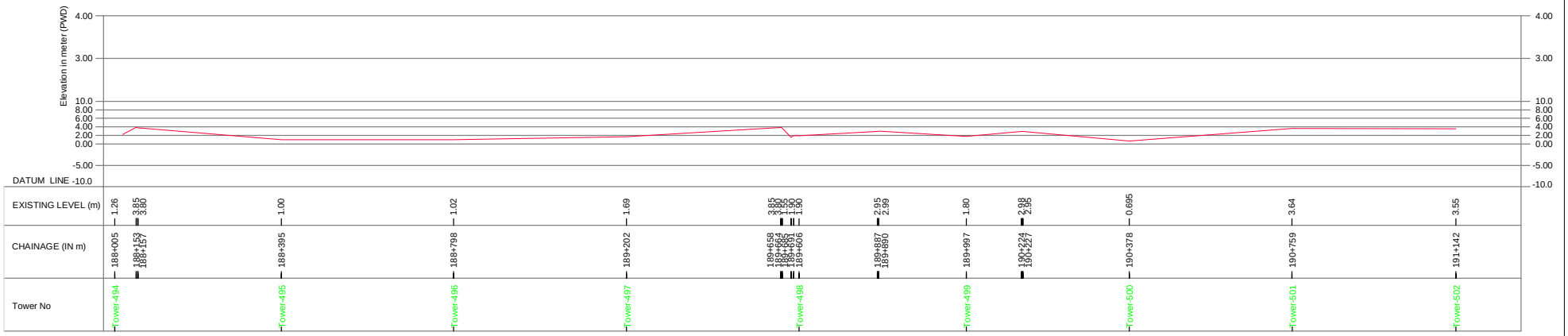

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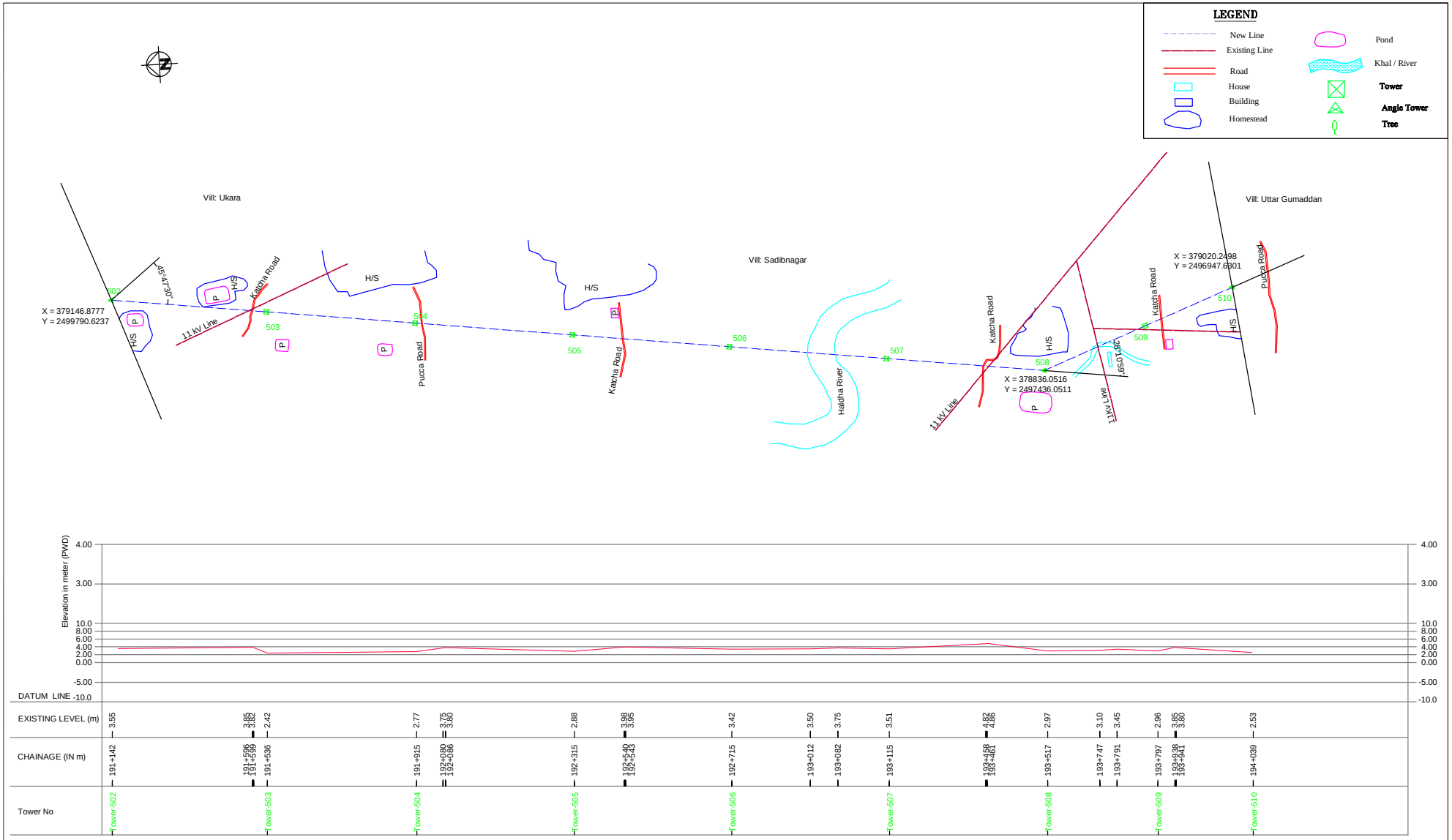
CONSULTANT	Tokyo Electric Power Company, Incorporated (TEPCO)	APPROVED BY	SIGNATURE	PROJECT NAME	PREPARATORY SURVEY ON DHAKA - CHITTAGONG MAIN POWER GRID STRENGTHENING PROJECT
LOCAL CONSULTANT	Engineers Associates Ltd. (EAL)	TEPCO / JICA		TITLE	ROUTE ALIGNMENT SURVEY OF PROPOSED 400kV TRANSMISSION LINE FROM MEGHNA GHAT TO MATARBARI,
SURVEYED BY					DATE OF PREPARATION: NOVEMBER 2014 / DESCRIPTION
CHECKED BY				REVISIONS	1.



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CHECKED BY					NOVEMBER 2014
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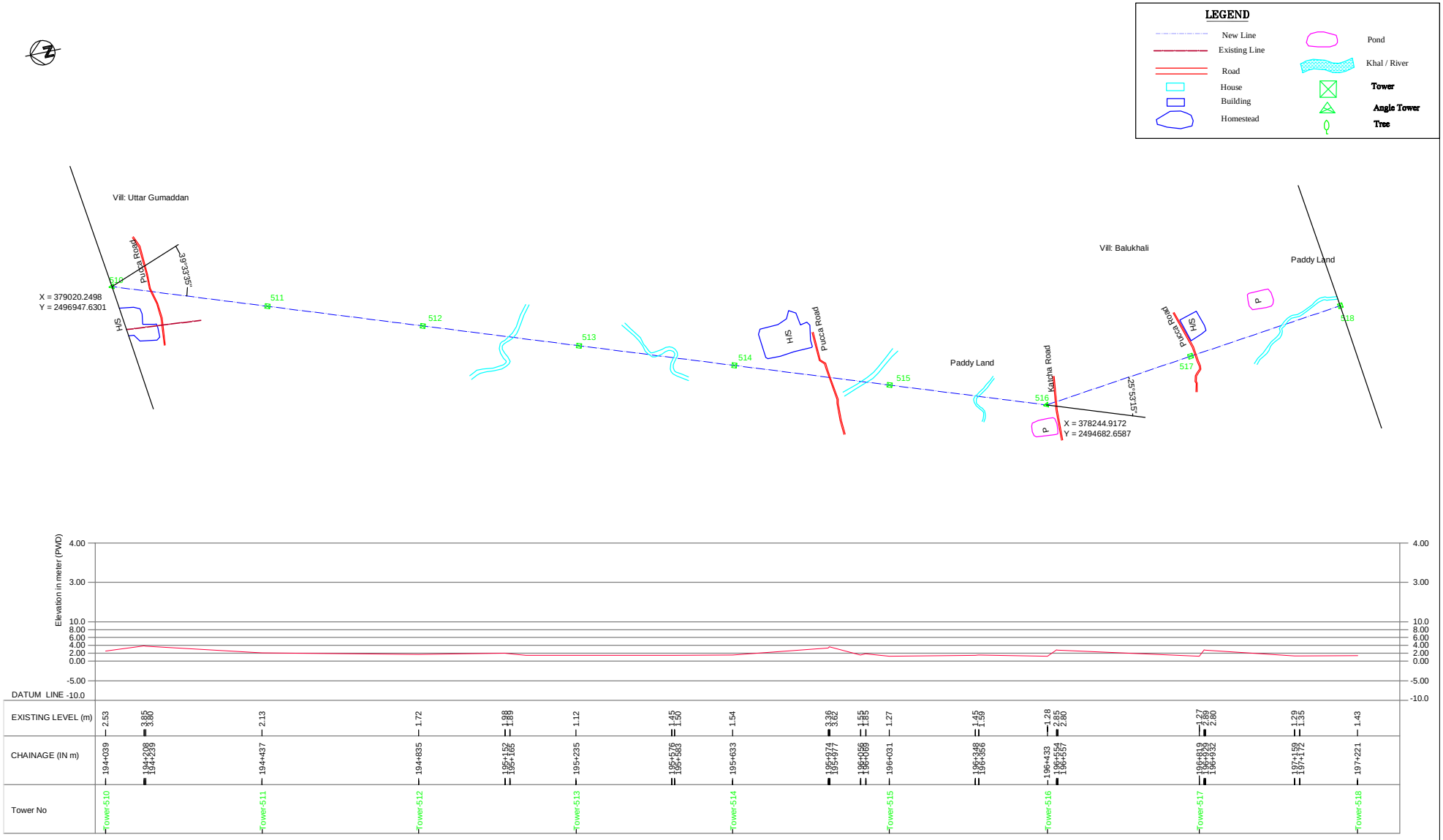

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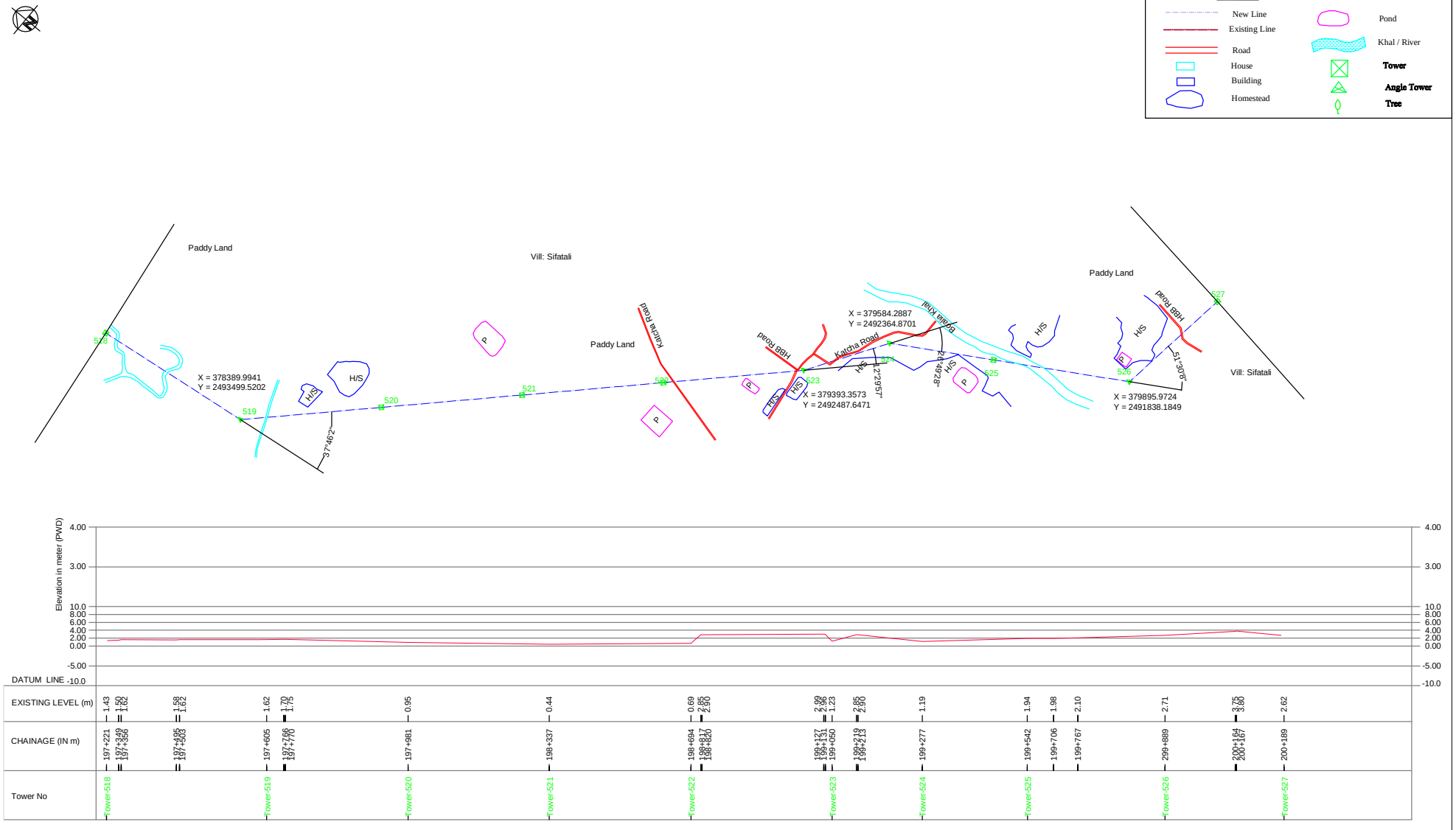

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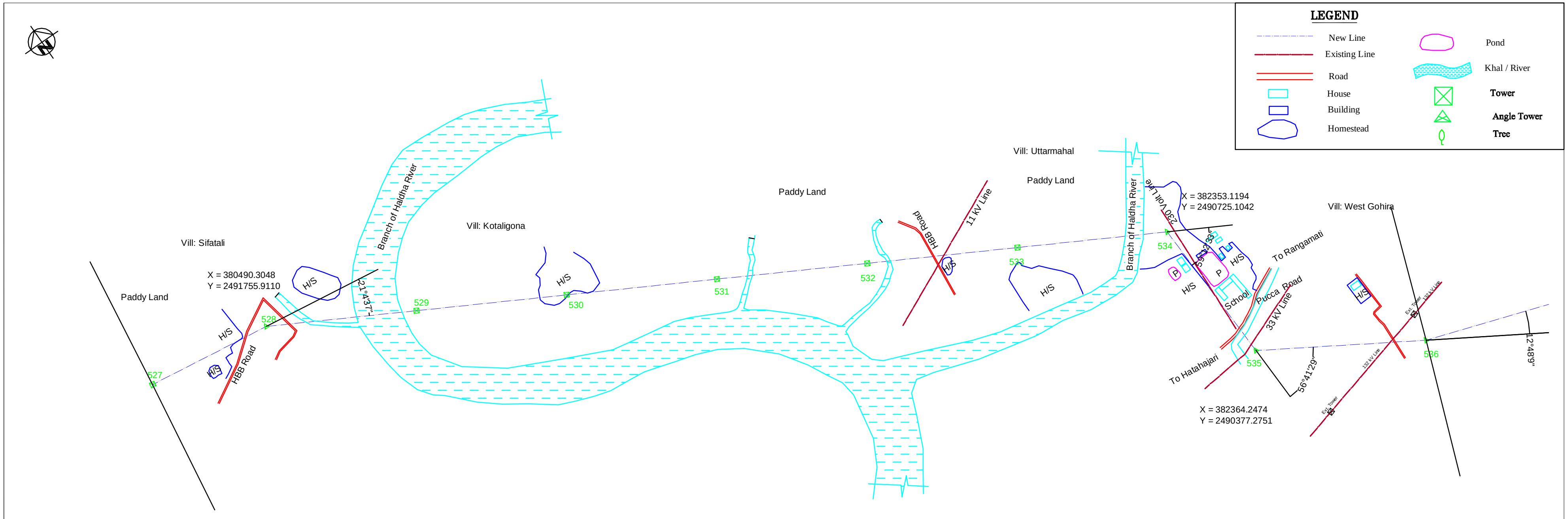

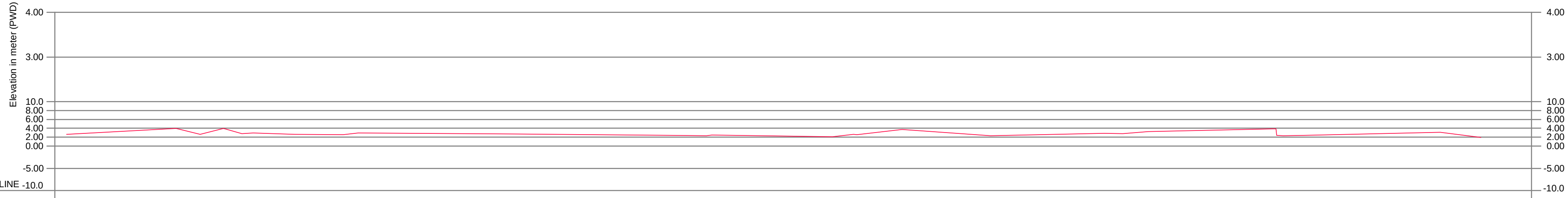

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3.95	200+530	
3.98	200+534	
2.67	200+489	Tower-528
3.92	200+639	
3.90	200+643	
2.82	200+681	
2.96	200+706	
2.62	200+800	
2.59	200+906	
2.93	200+844	Tower-529
2.70	201+199	Tower-530
2.42	201+554	Tower-531
2.31	201+724	
2.50	201+756	
2.13	201+909	Tower-532
2.65	202+054	
2.56	202+062	
3.73	202+162	
3.75	202+165	
2.31	202+264	Tower-533
2.85	202+617	
2.80	202+659	
3.28	202+618	Tower-534
3.85	202+998	
3.89	203+004	
2.40	203+004	
2.31	203+019	
2.37	202+966	Tower-535
3.13	203+372	
3.15	203+375	
1.88	203+367	Tower-536

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PROJECT NAME	PREPARATORY SURVEY ON DHAKA - CHITTAGONG MAIN POWER GRID STRENGTHENING PROJECT	
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	DATE OF PREPARATION	DESCRIPTION
	NOVEMBER 2014	
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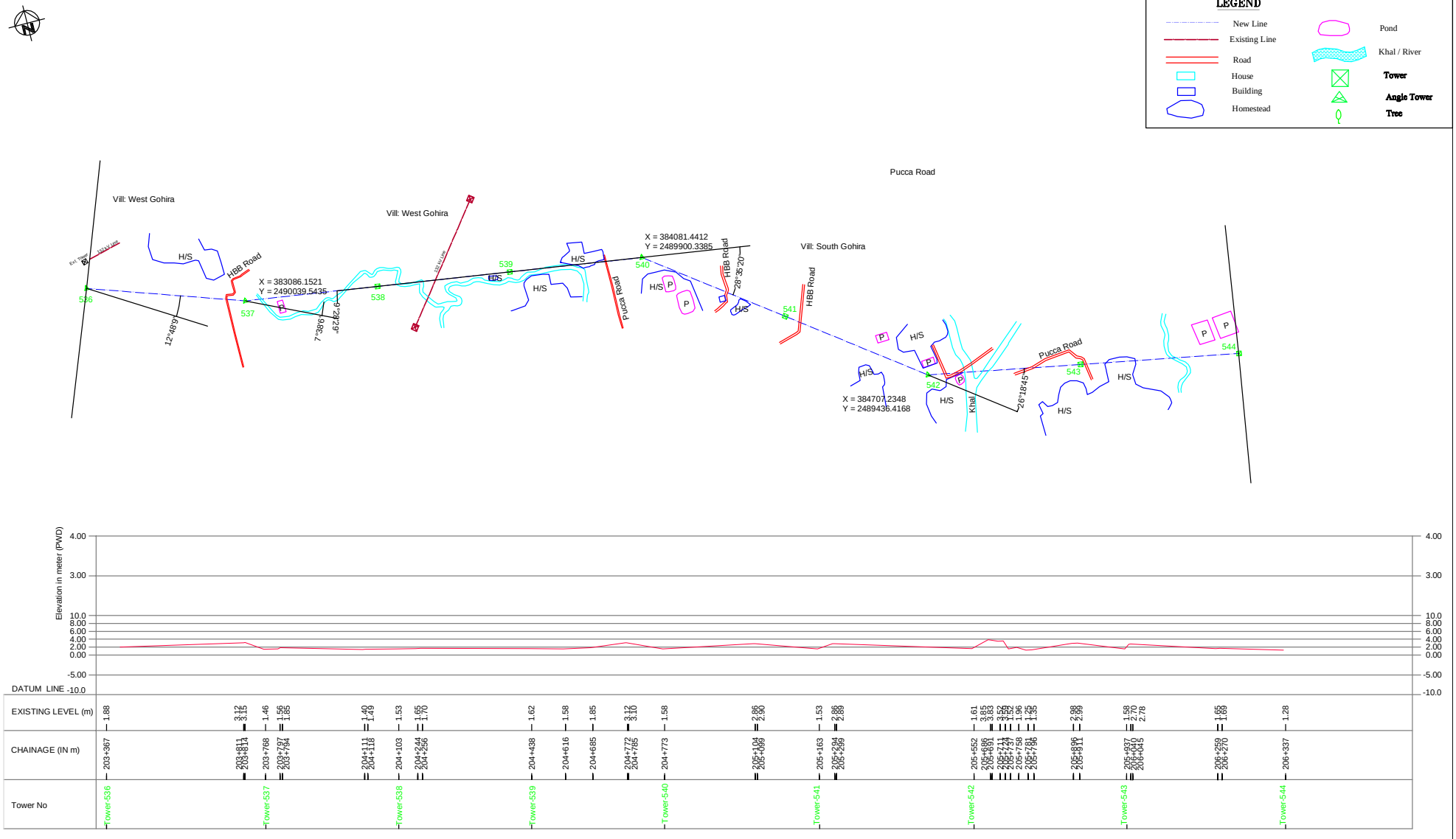

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LOCAL CONSULTANT	Engineers Associates Ltd. (EAL)	TEPCO / JICA		TITLE	ROUTE ALIGNMENT SURVEY OF PROPOSED 400kV TRANSMISSION LINE FROM MEGHNA GHAT TO MATHERBARI,
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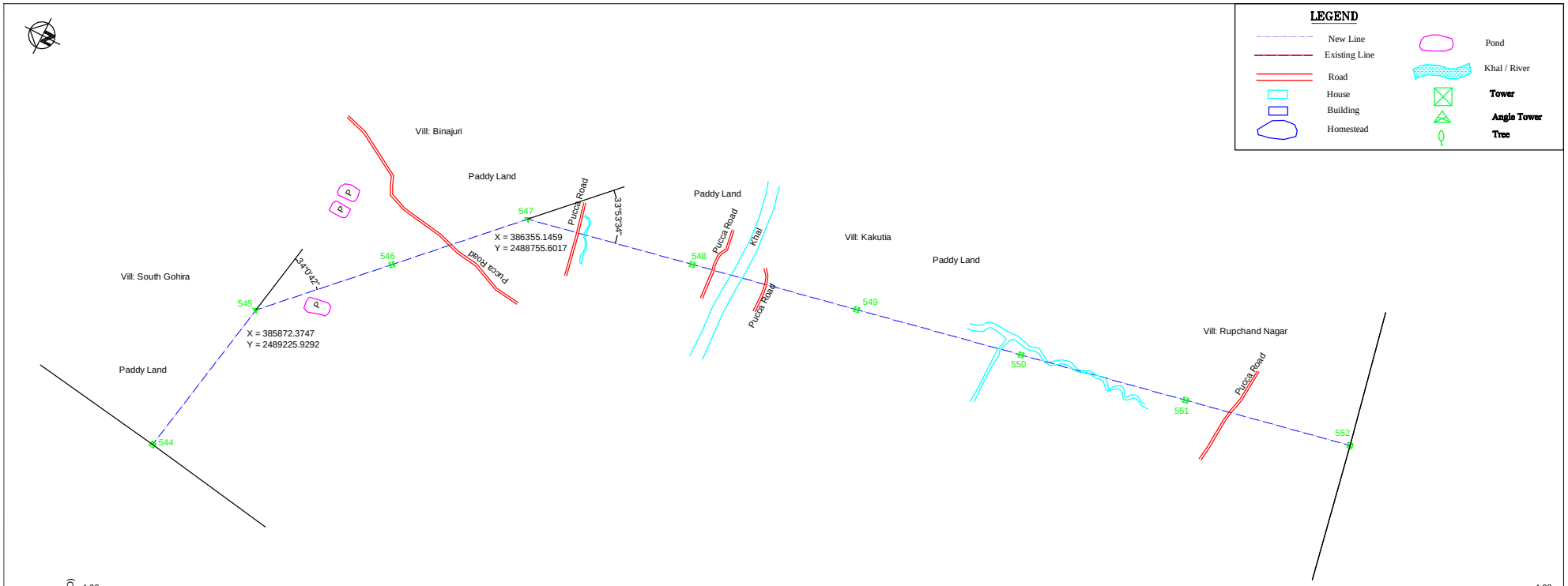

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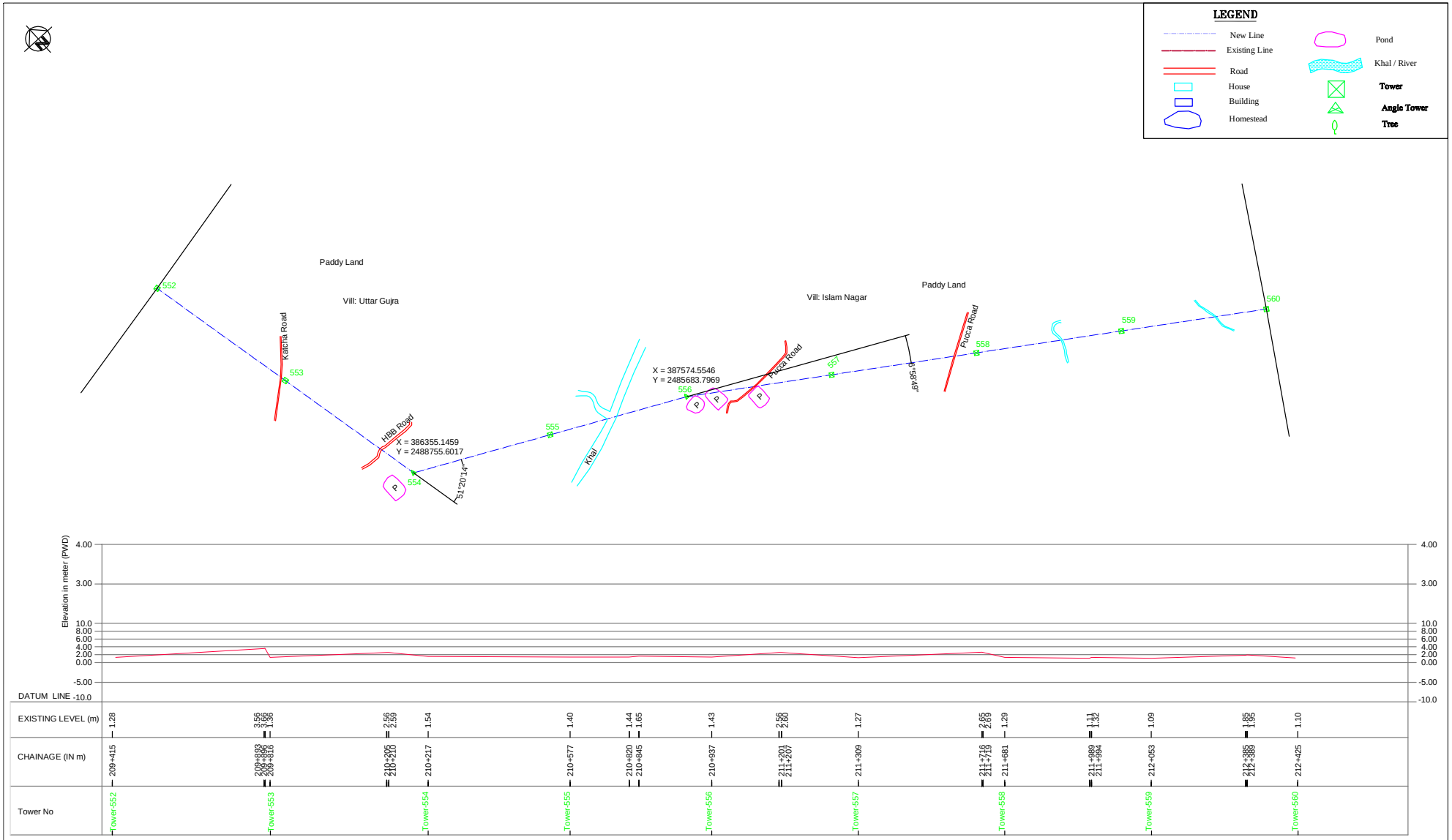

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SURVEYED BY					DATE OF PREPARATION / DESCRIPTION
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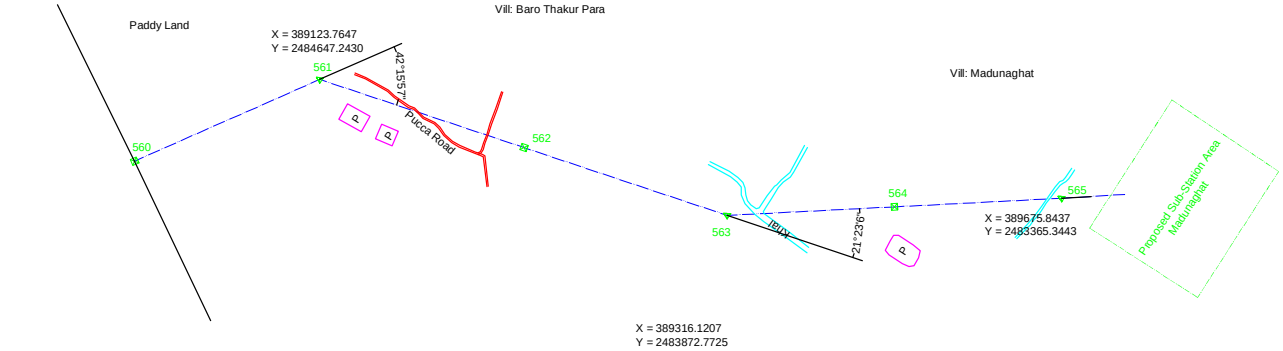
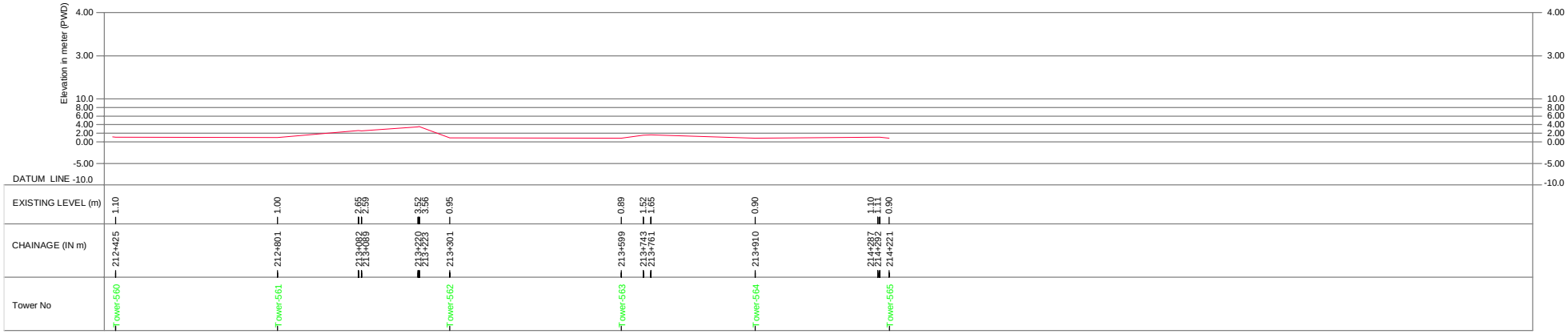
				REVISIONS	
				1.	

LEGEND

New Line
Existing Line
Road
House
Building
Homestead
Pond
Khal / River
Tower
Angle Tower
Tree





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SURVEYED BY					DATE OF PREPARATION / DESCRIPTION
CHECKED BY					NOVEMBER 2014
				REVISIONS	
				1.	

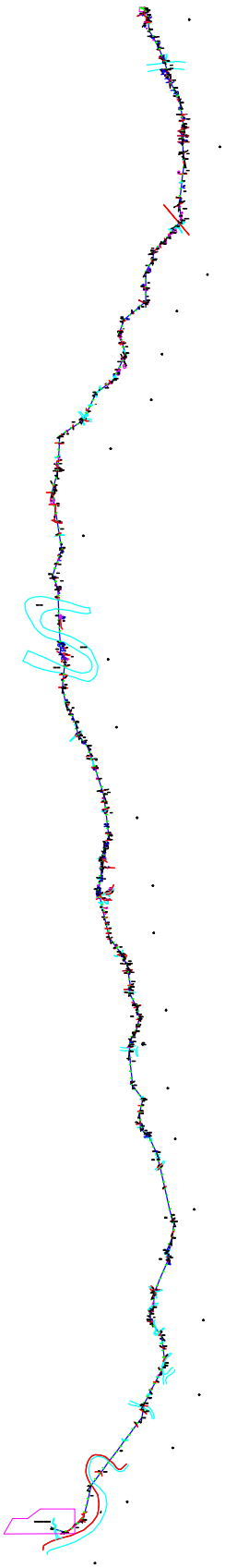
Appendix II

Proposed 400 kV Transmission Line Route (Madunaghat – Matarbari)

LEGEND

- New Line
- Existing Line
- Road
- House
- Building
- Homestead
- Pond
- Khal / River
- Tower
- Angle Tower
- Tree

ROUTE ALIGNMENT SURVEY OF PROPOSED 400kV
TRANSMISSION LINE FROM MADHUNAGHAT TO MATARBARI,



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PROJECT NAME	PREPARATORY SURVEY ON DHAKA - CHITTAGONG MAIN POWER GRID STRENGTHENING PROJECT
TITLE	ROUTE ALIGNMENT SURVEY OF PROPOSED 400kV TRANSMISSION LINE FROM MADHUNAGHAT TO MATARBARI

REVISIONS	DATE OF PREPARATION	DESCRIPTION
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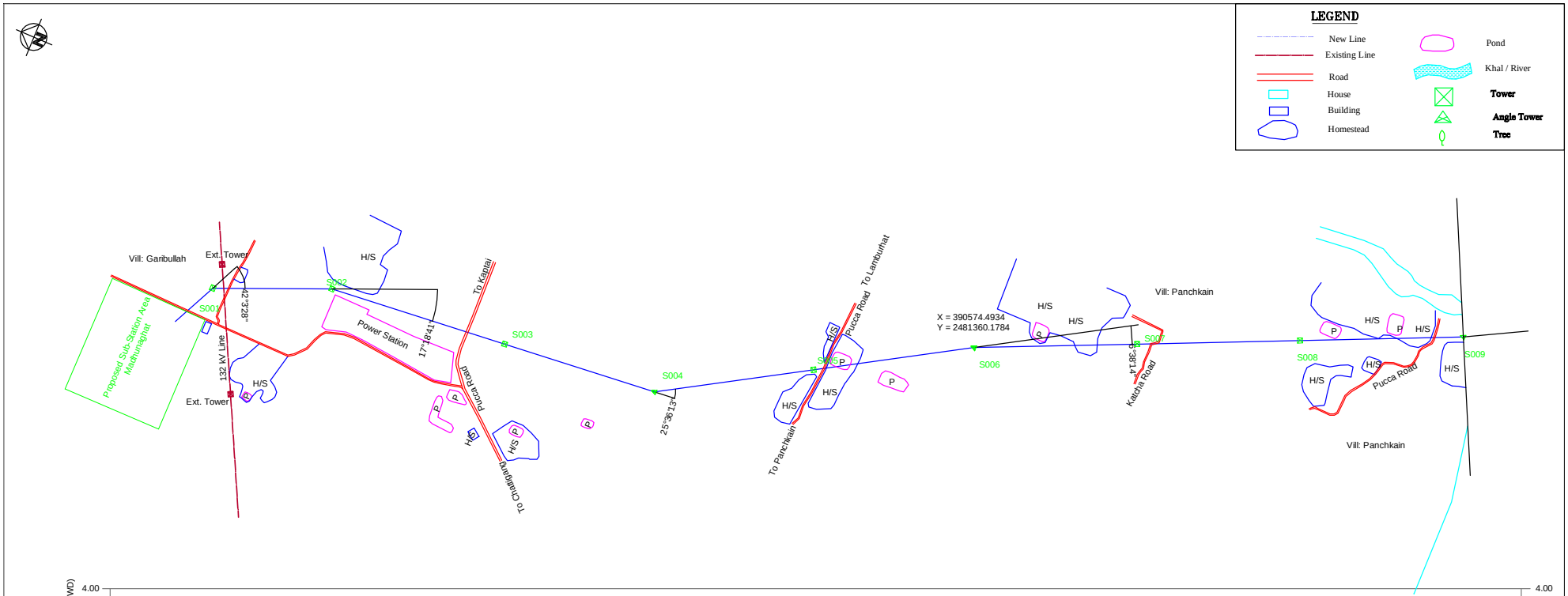

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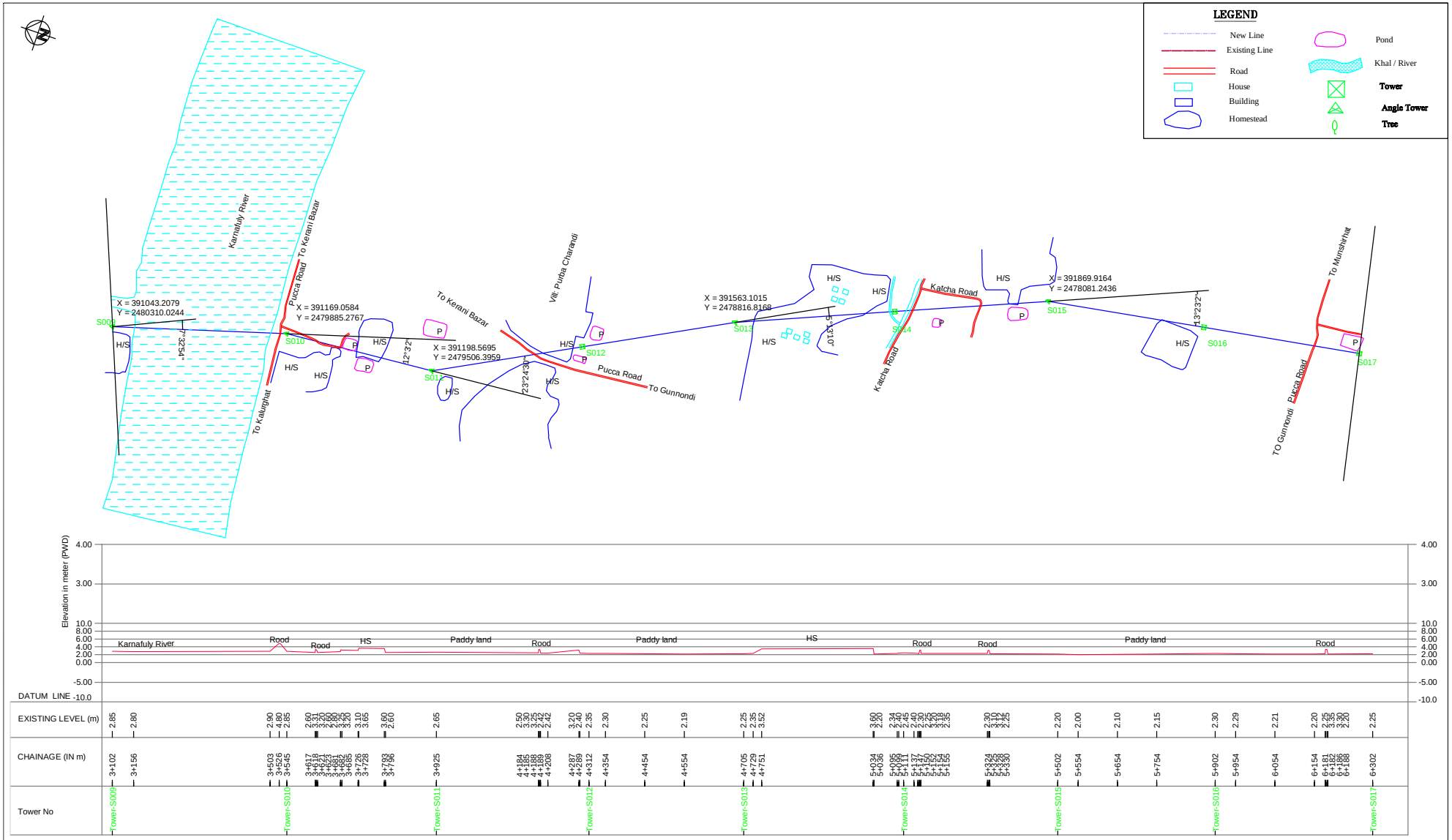

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CHECKED BY			REVISIONS: 1.

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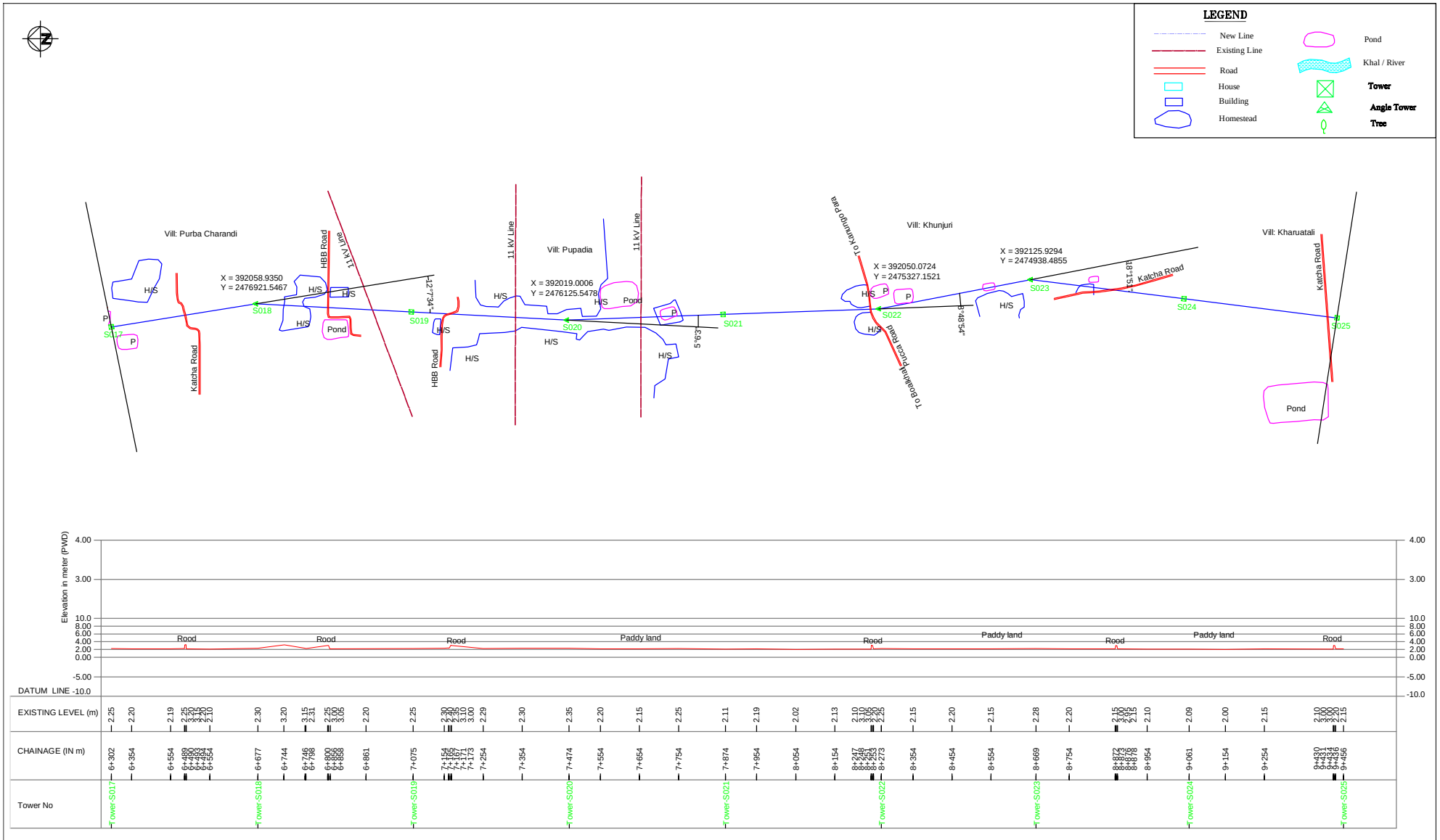

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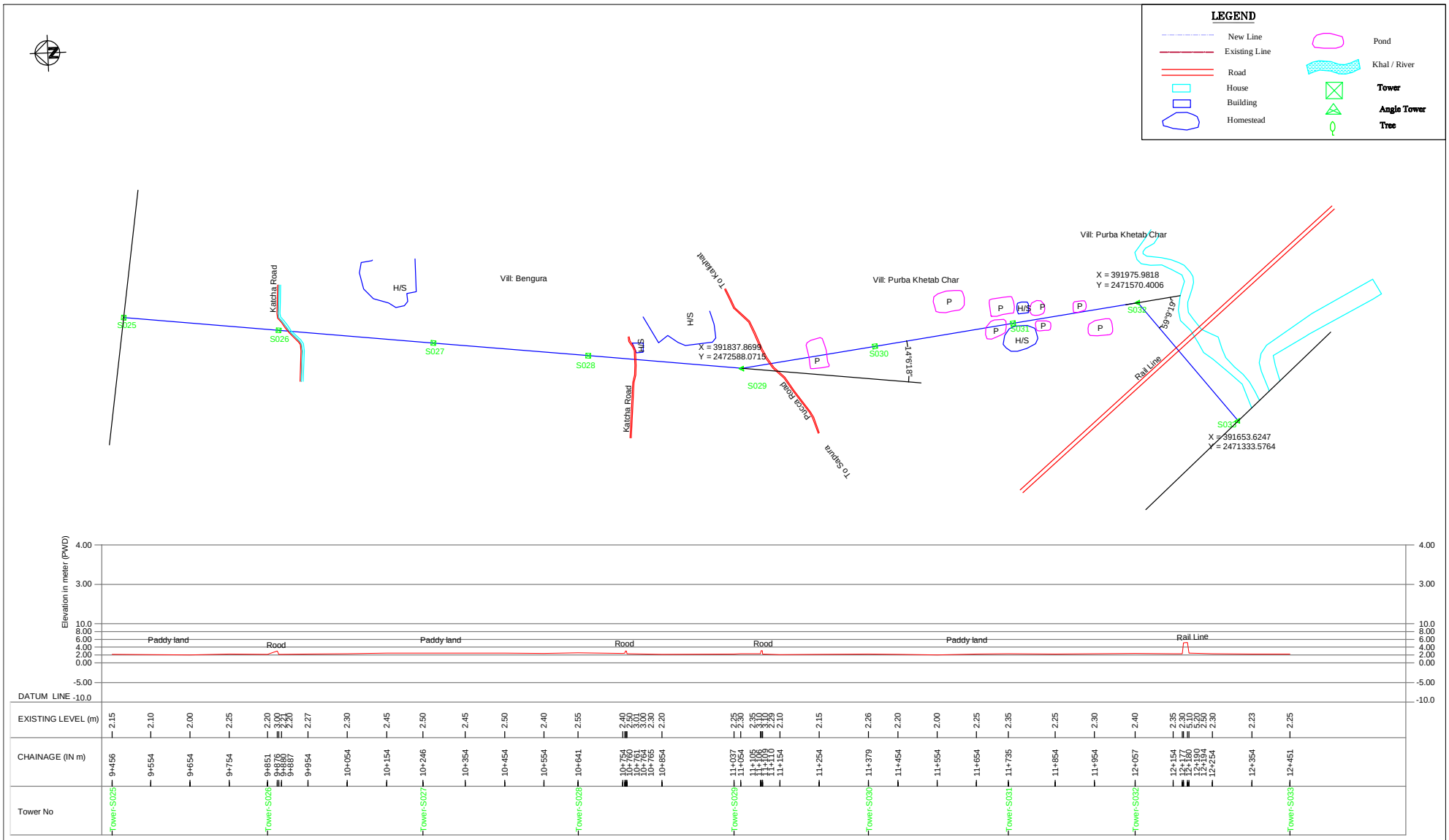

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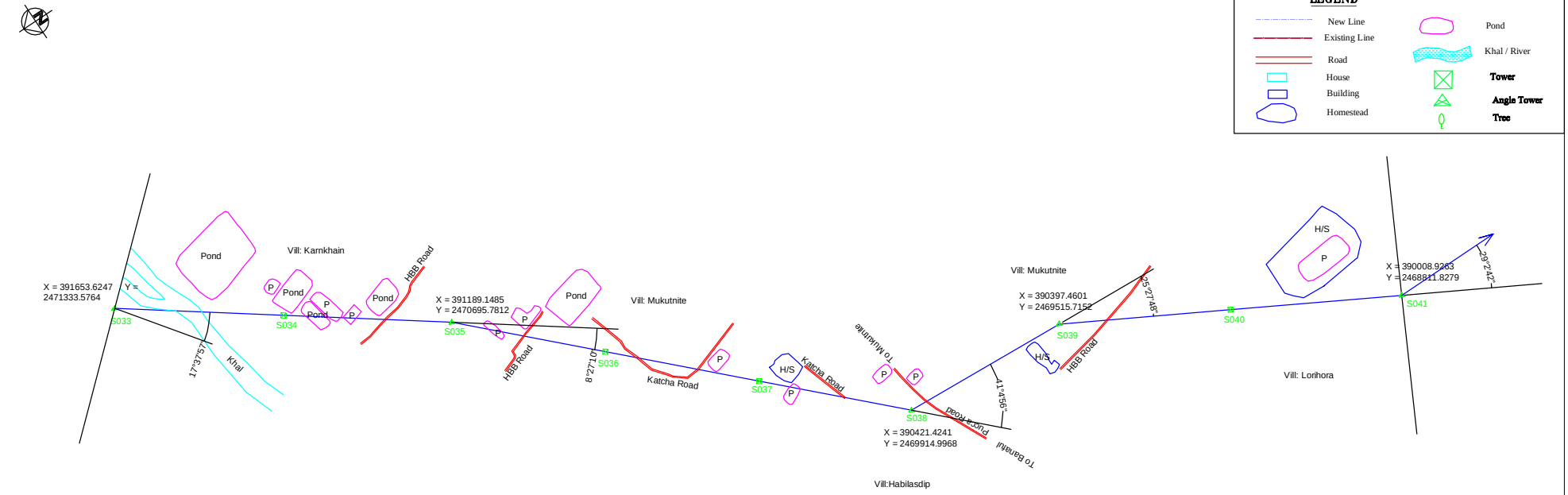

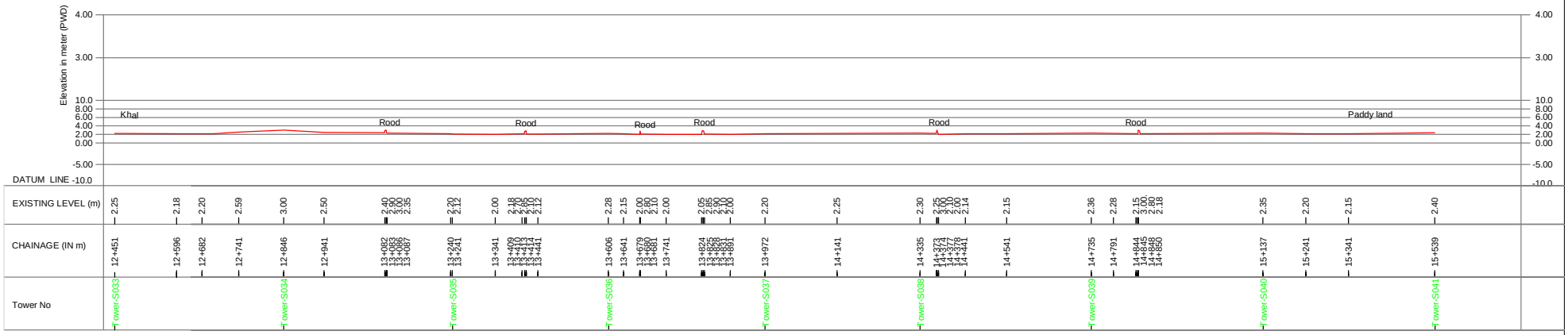

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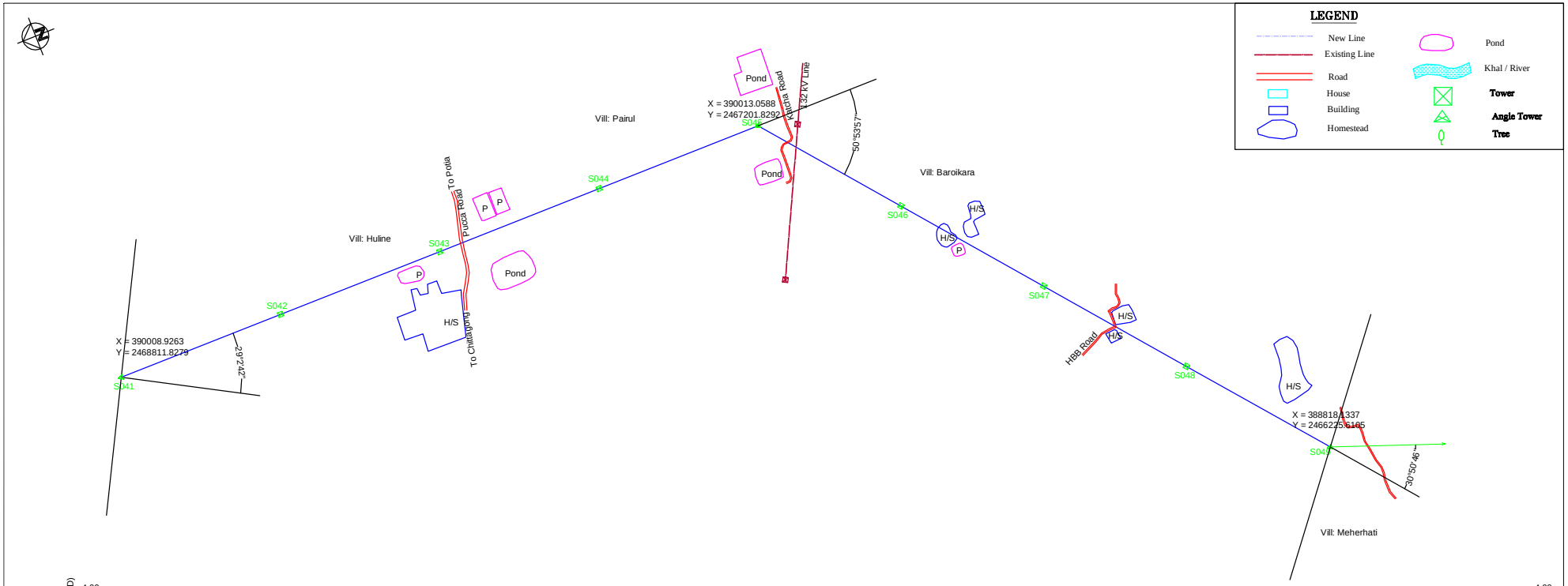

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LOCAL CONSULTANT	Engineers Associates Ltd. (EAL)	TEPCO / JICA	
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PROJECT NAME	PREPARATORY SURVEY ON DHAKA - CHITTAGONG MAIN POWER GRID STRENGTHENING PROJECT	
TITLE	ROUTE ALIGNMENT SURVEY OF PROPOSED 400kV TRANSMISSION LINE FROM MEGHNA GHAT TO MATARBARI,	
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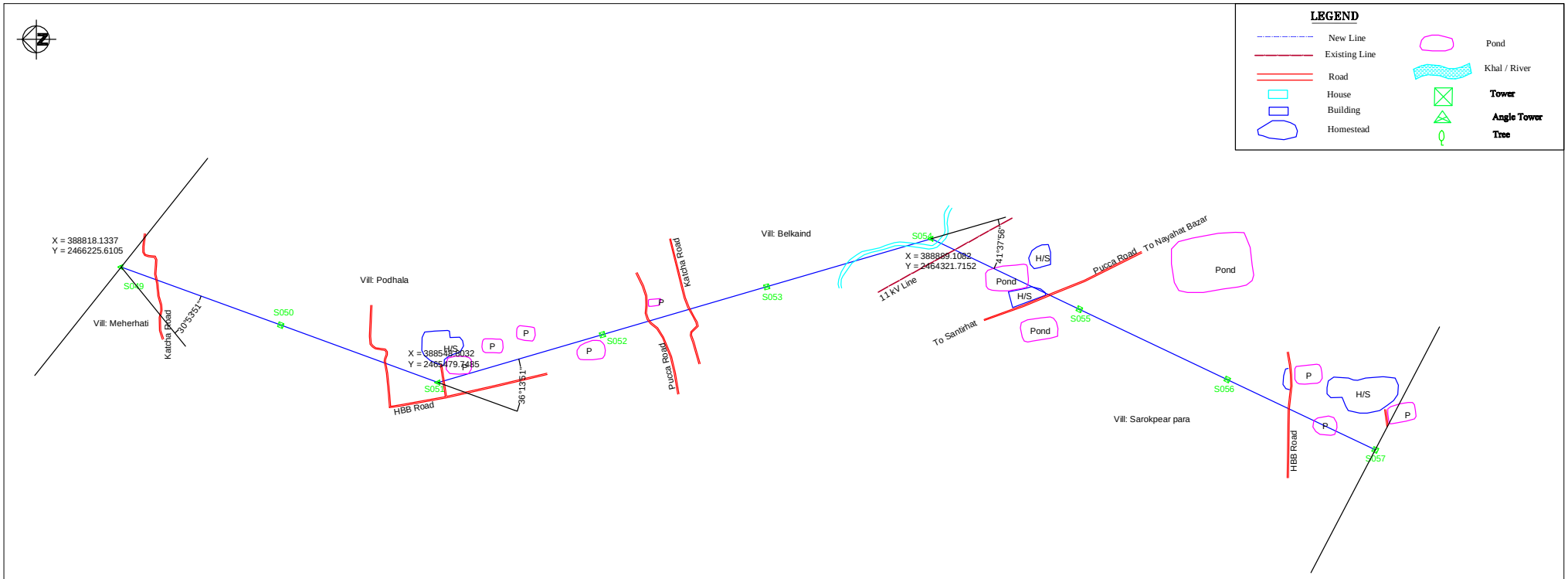

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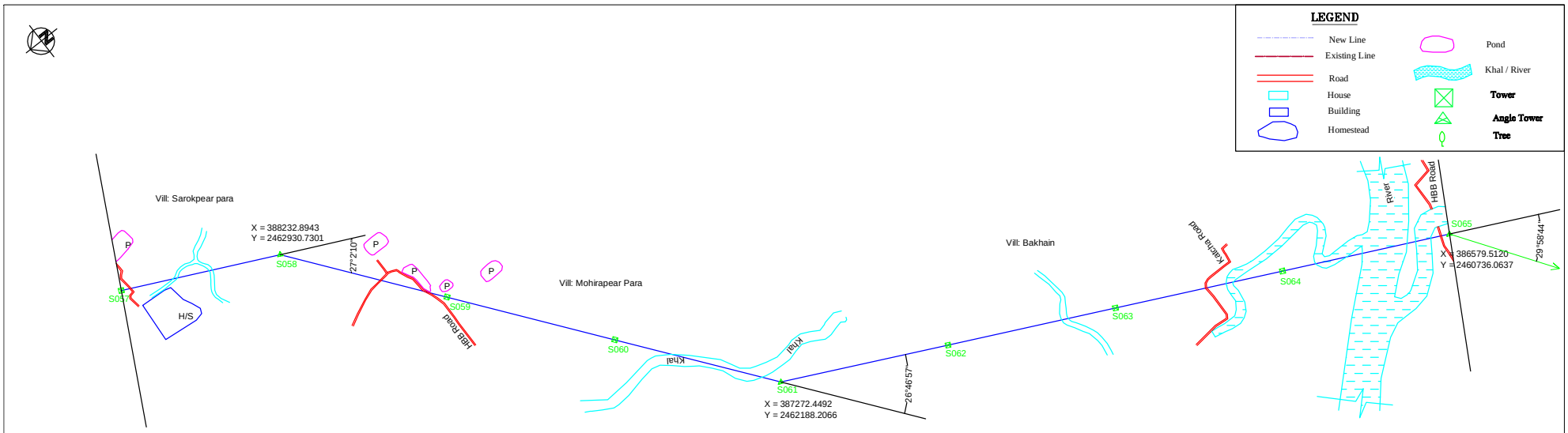

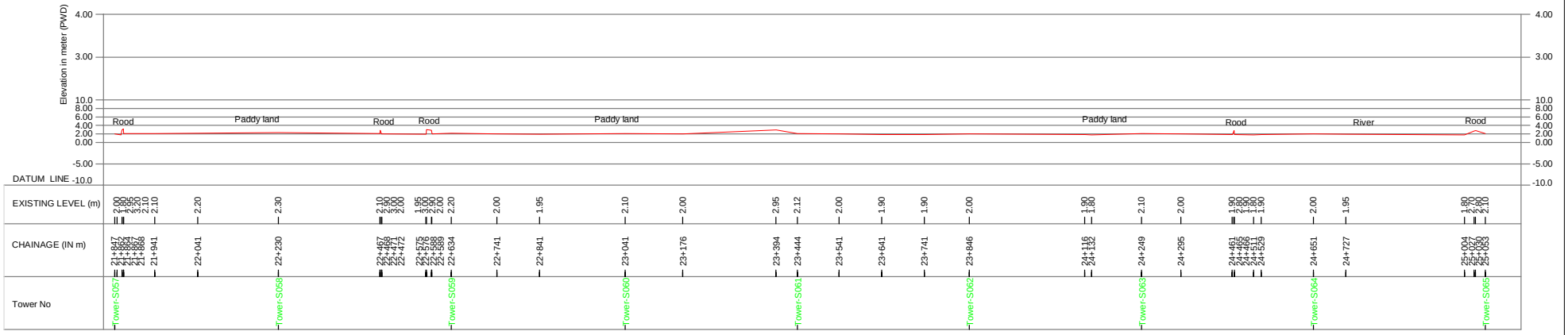

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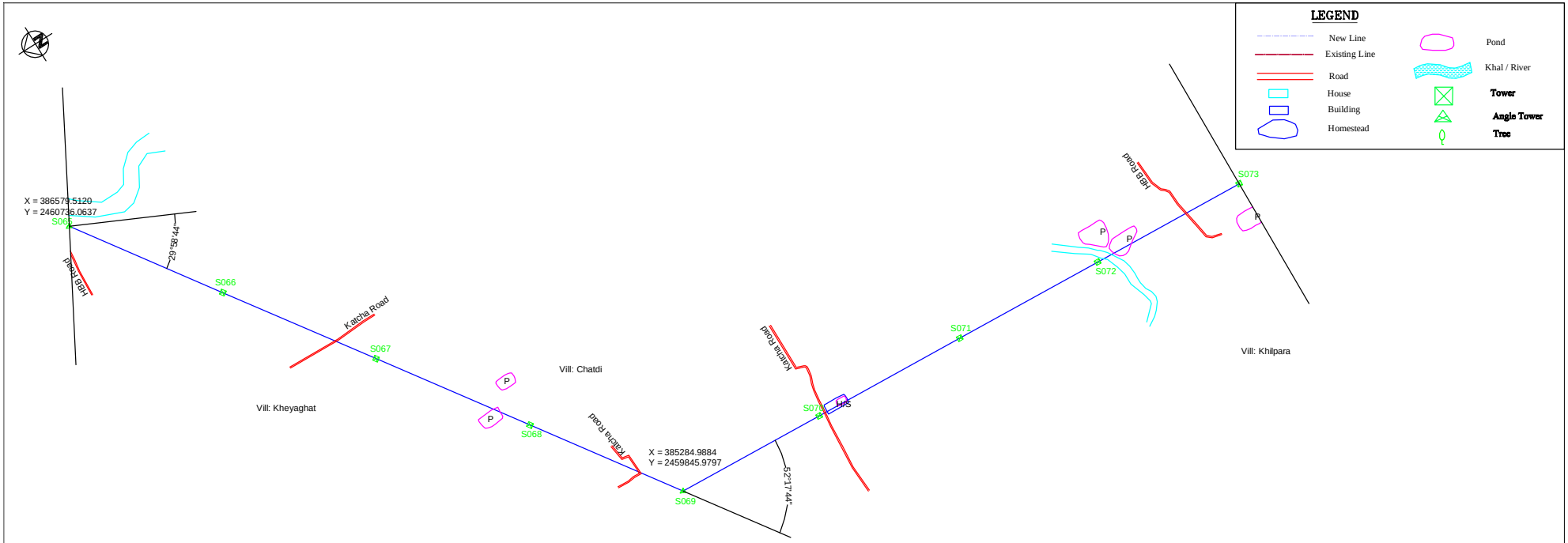

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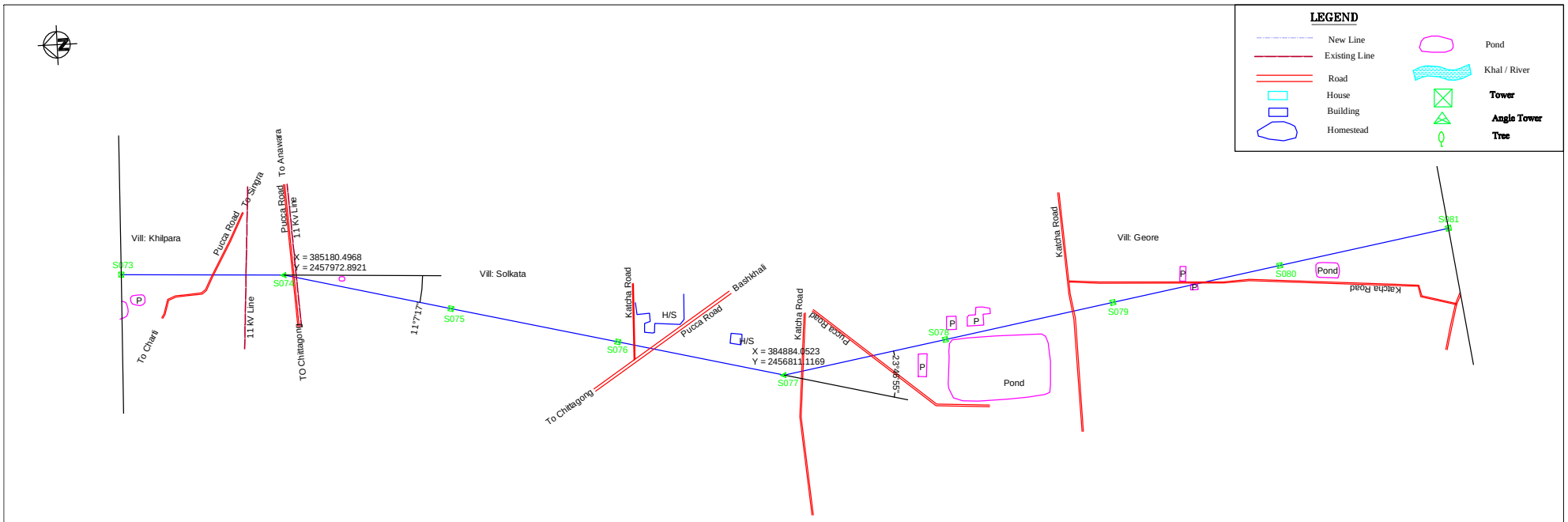

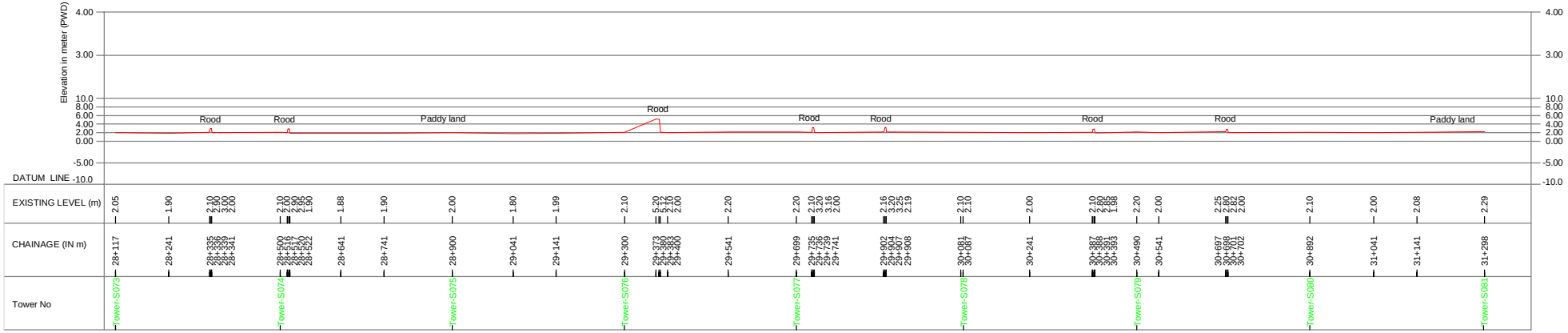

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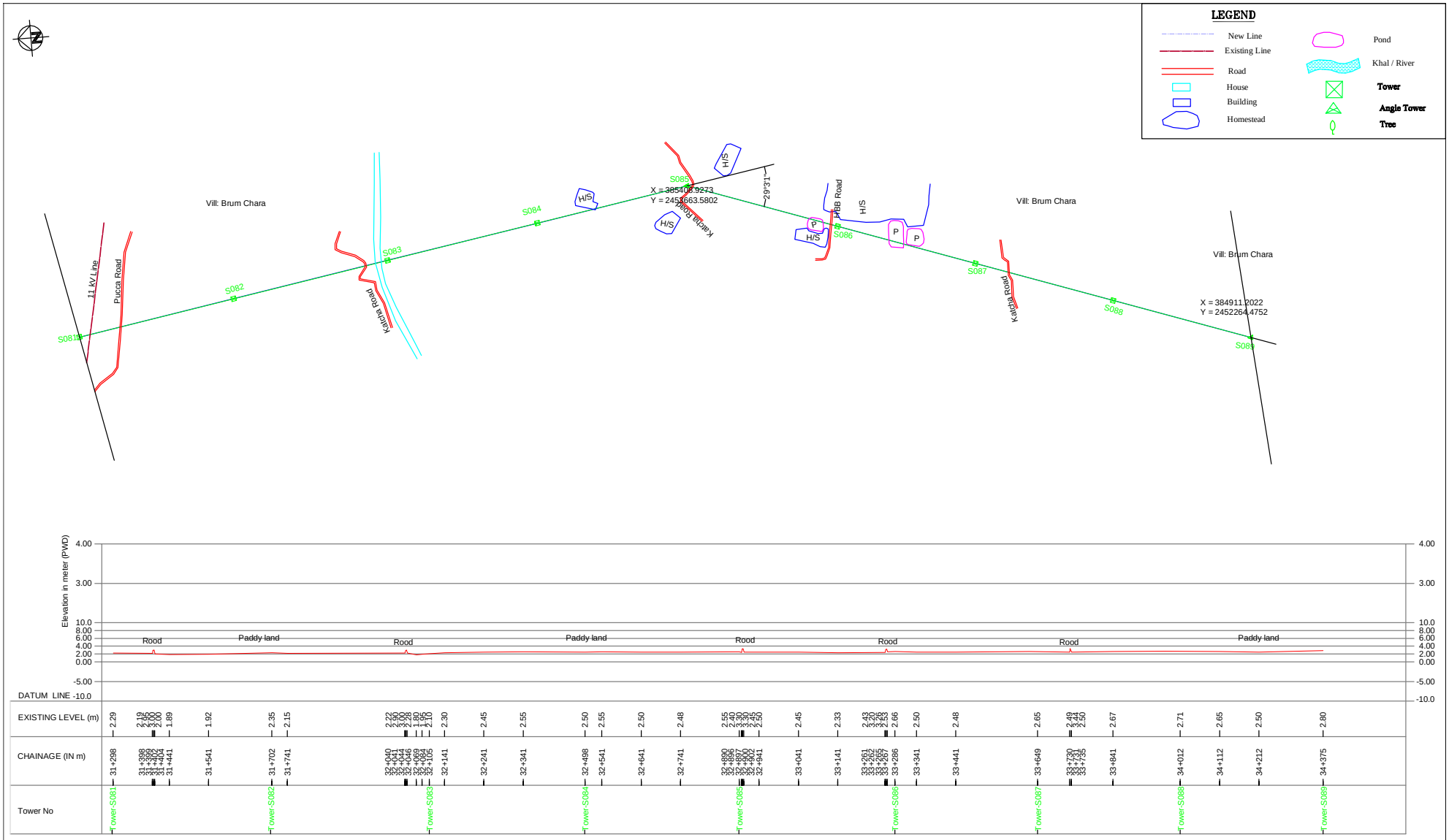

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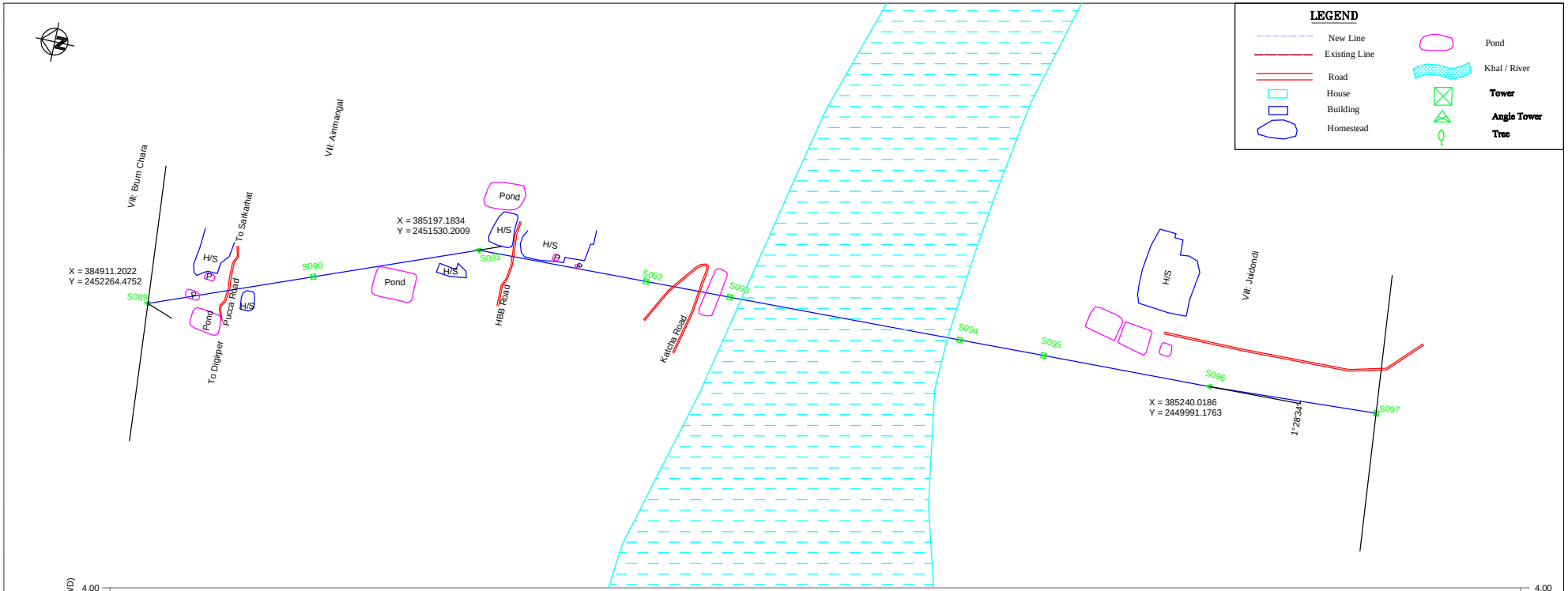

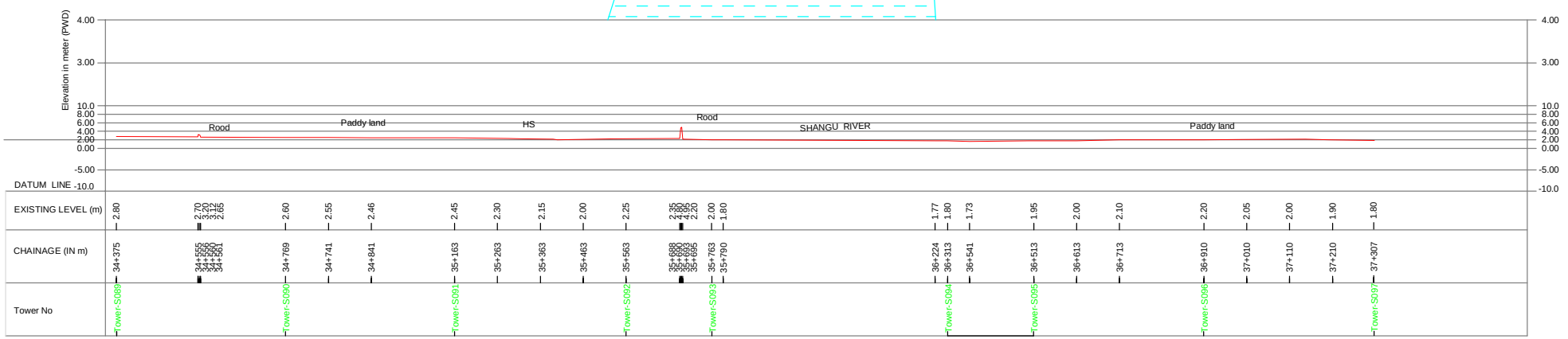

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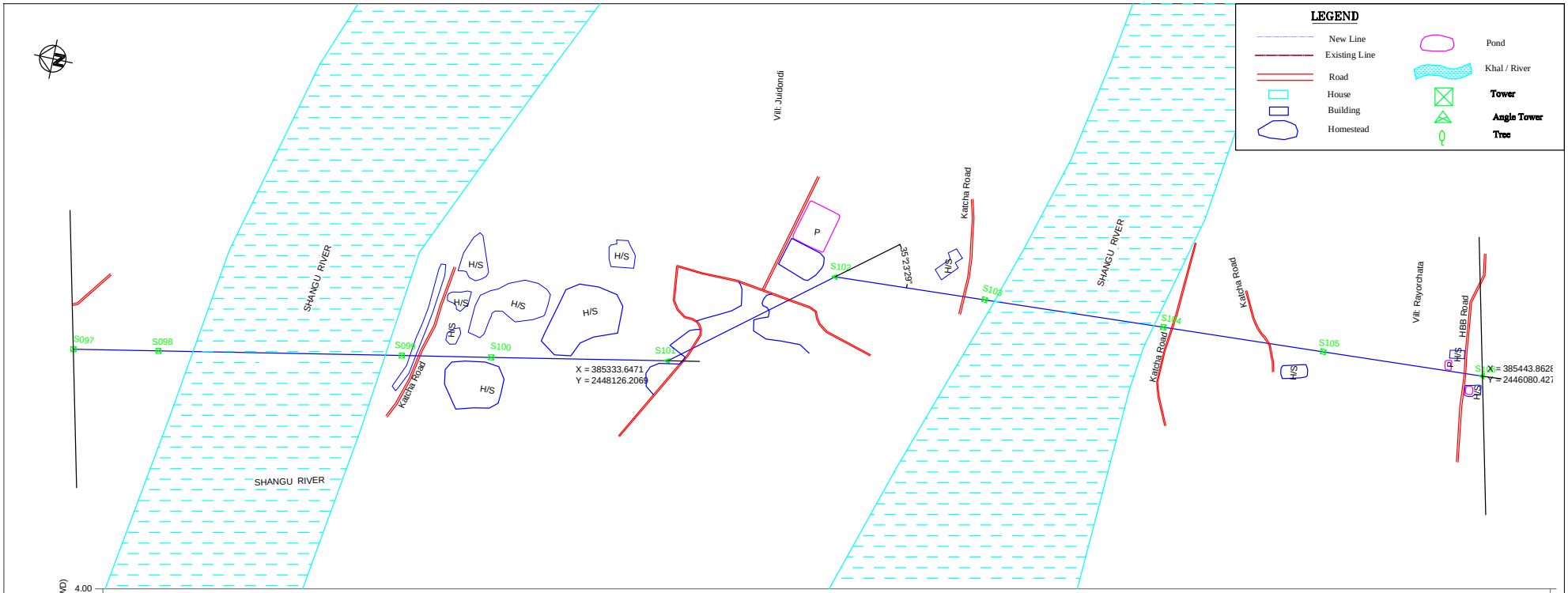

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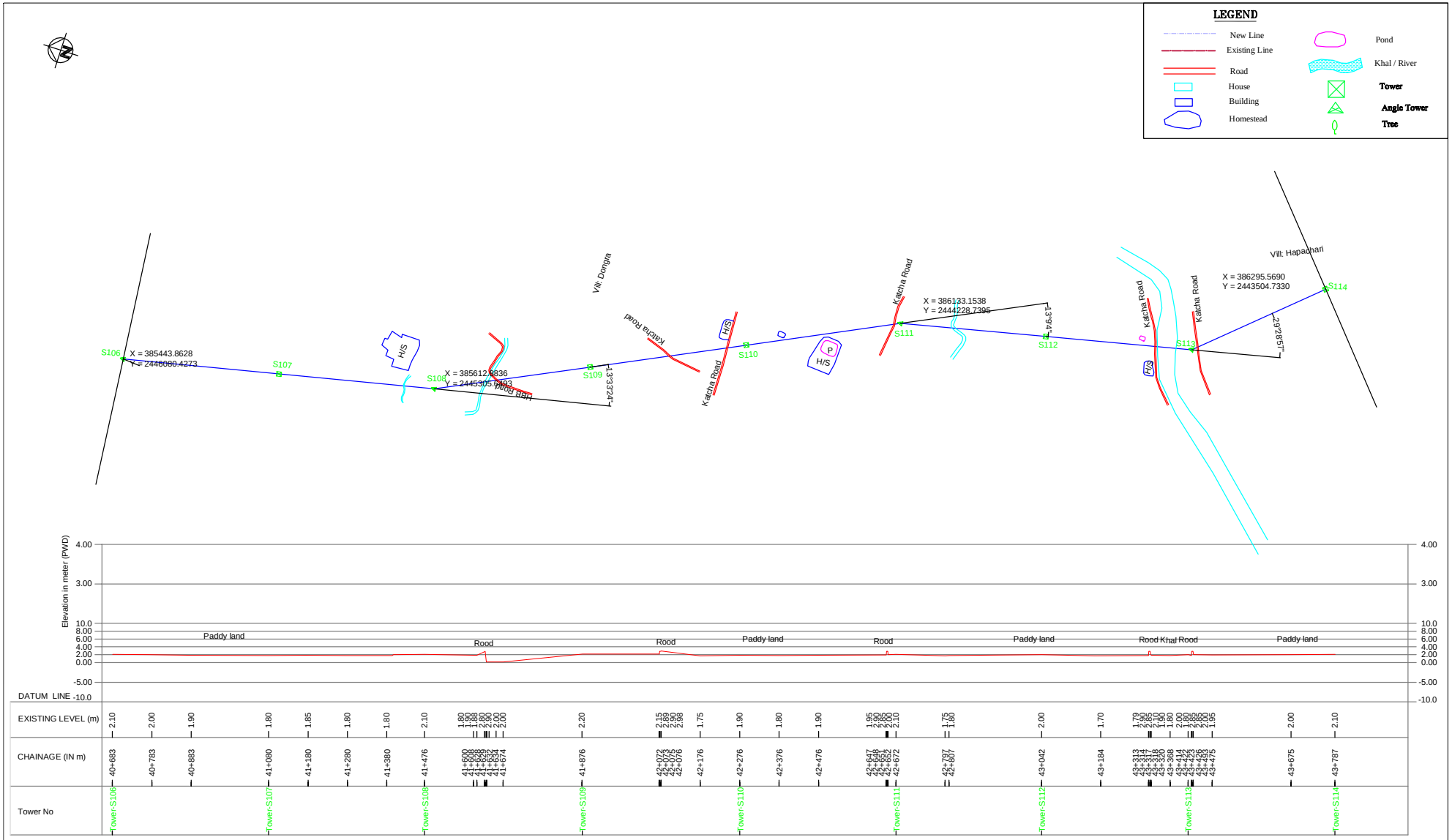

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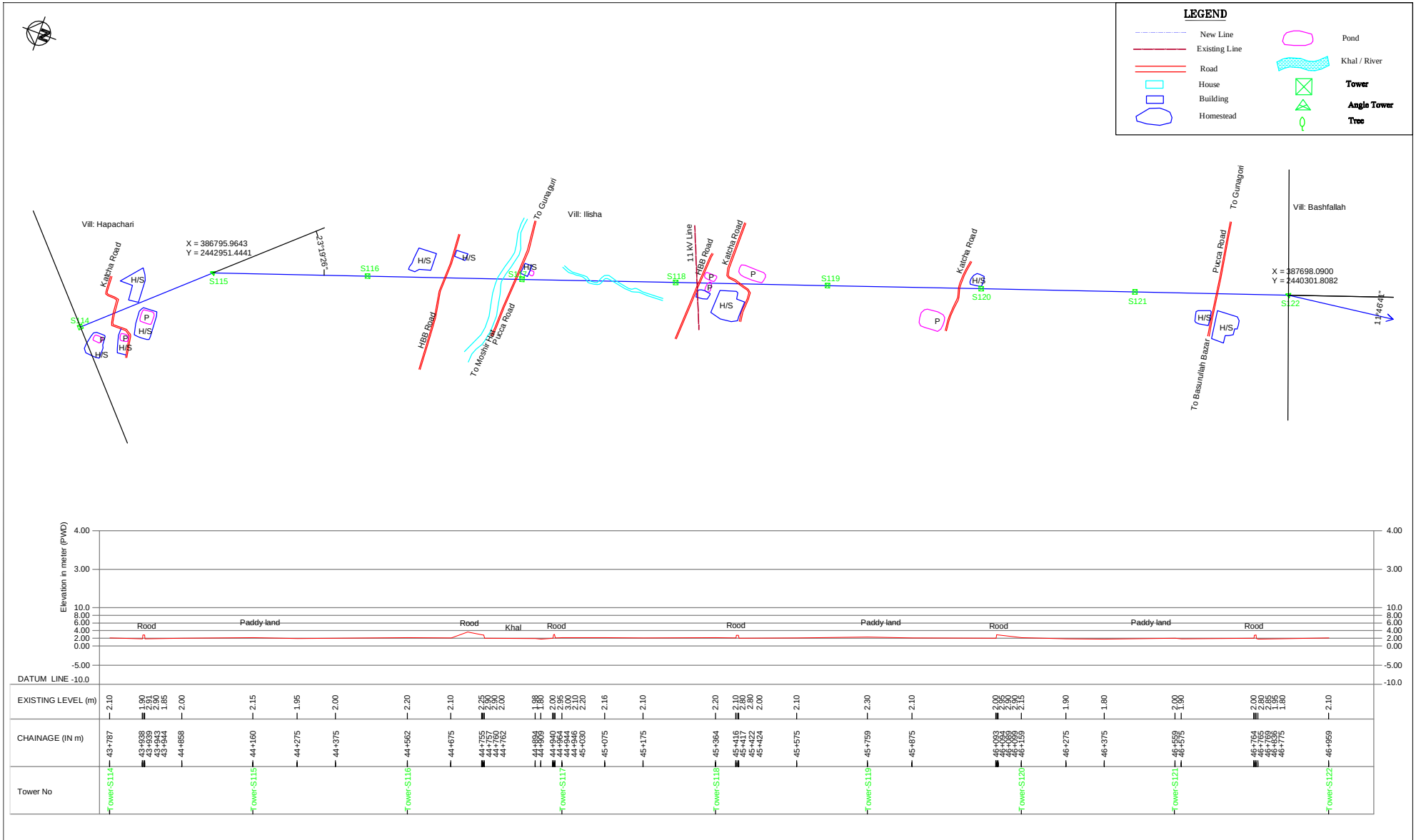

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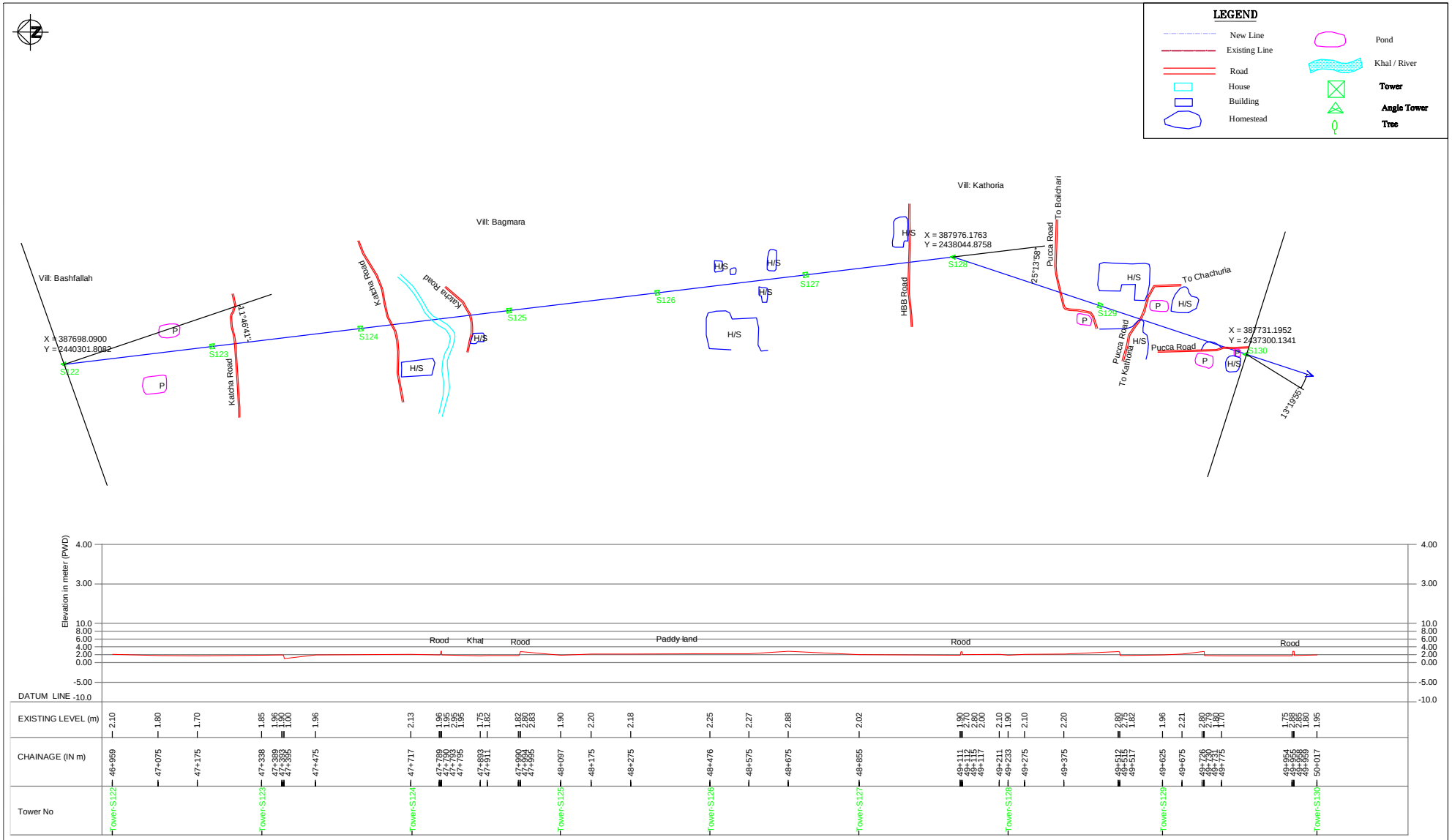

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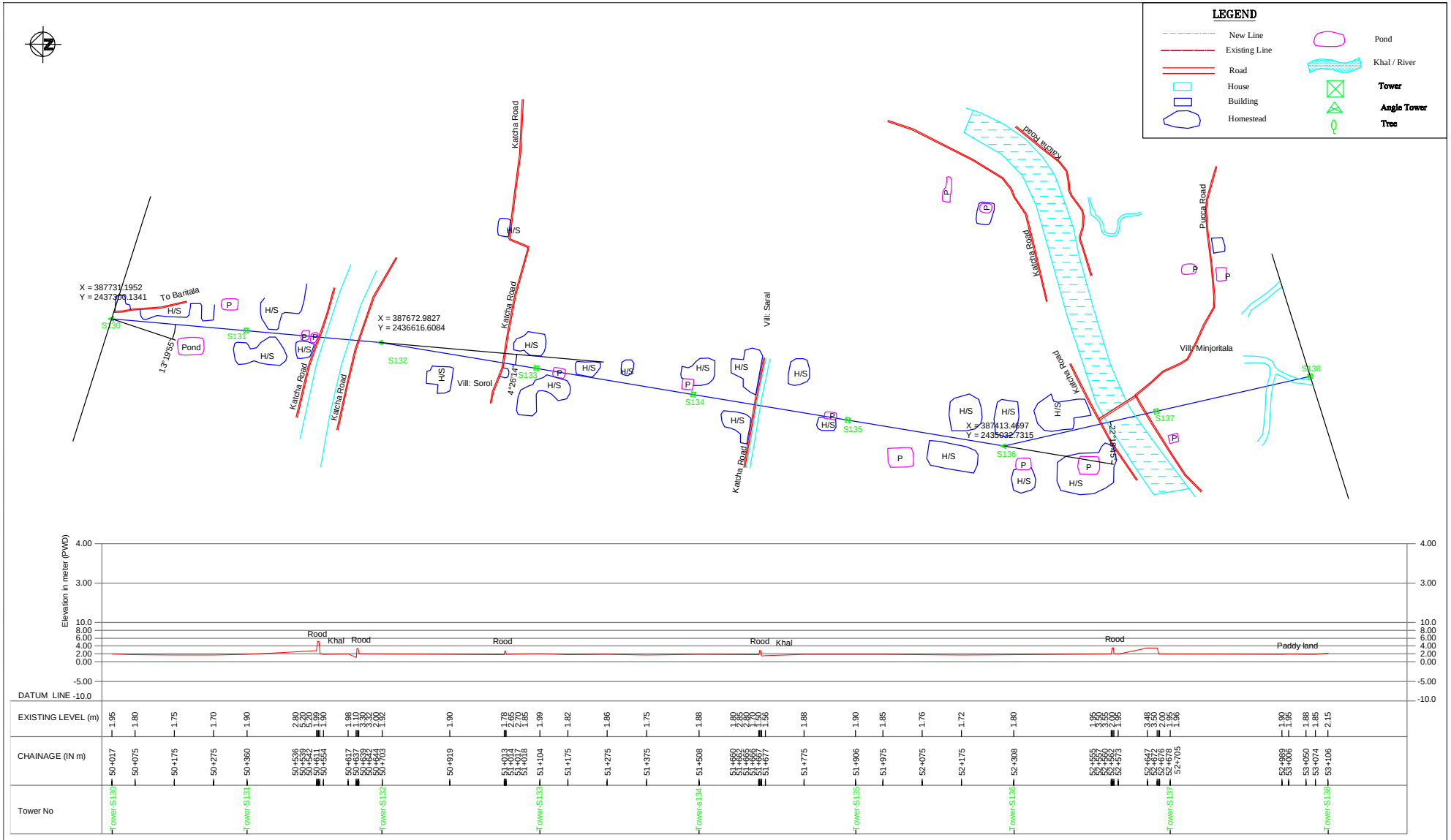

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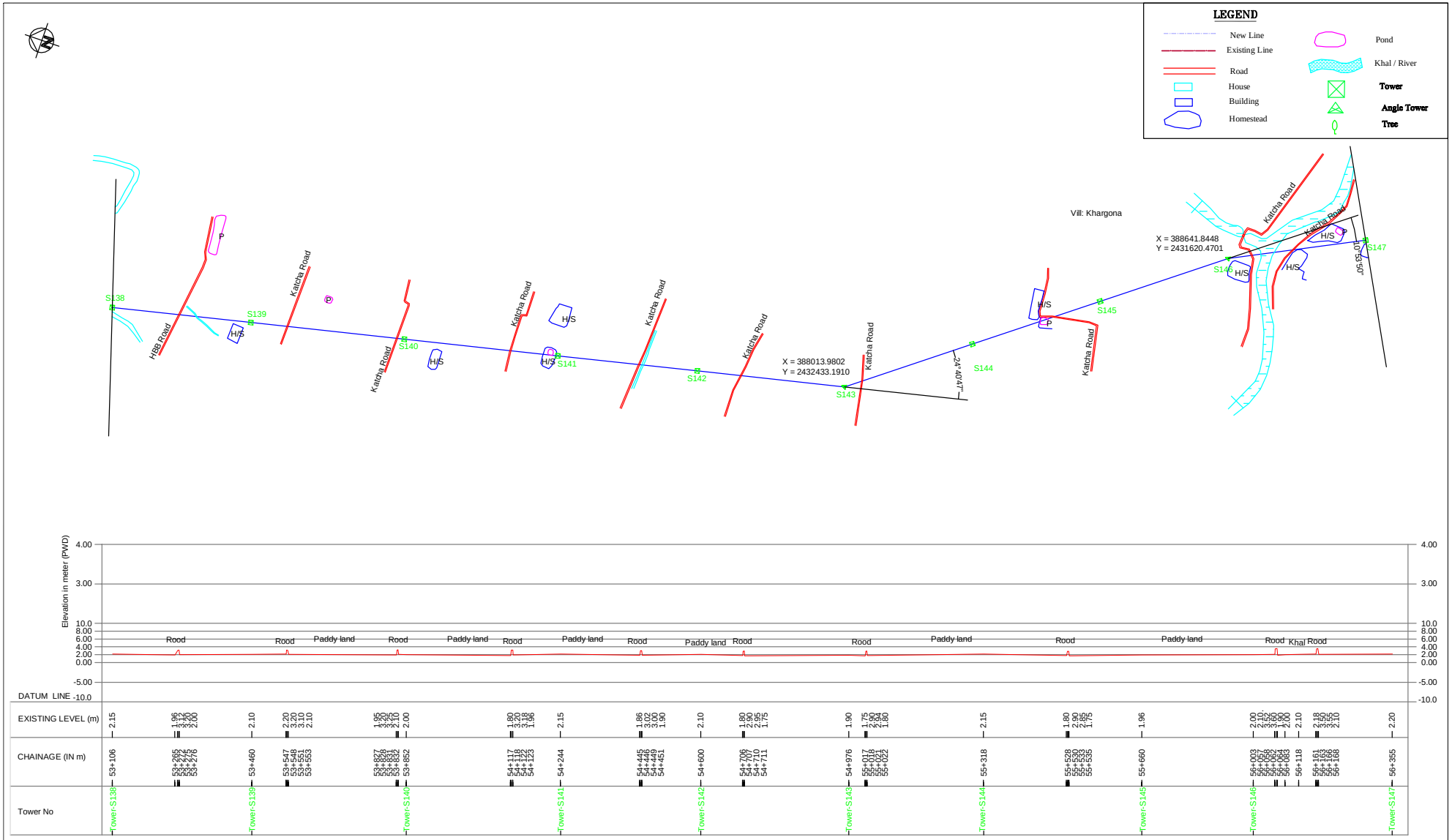

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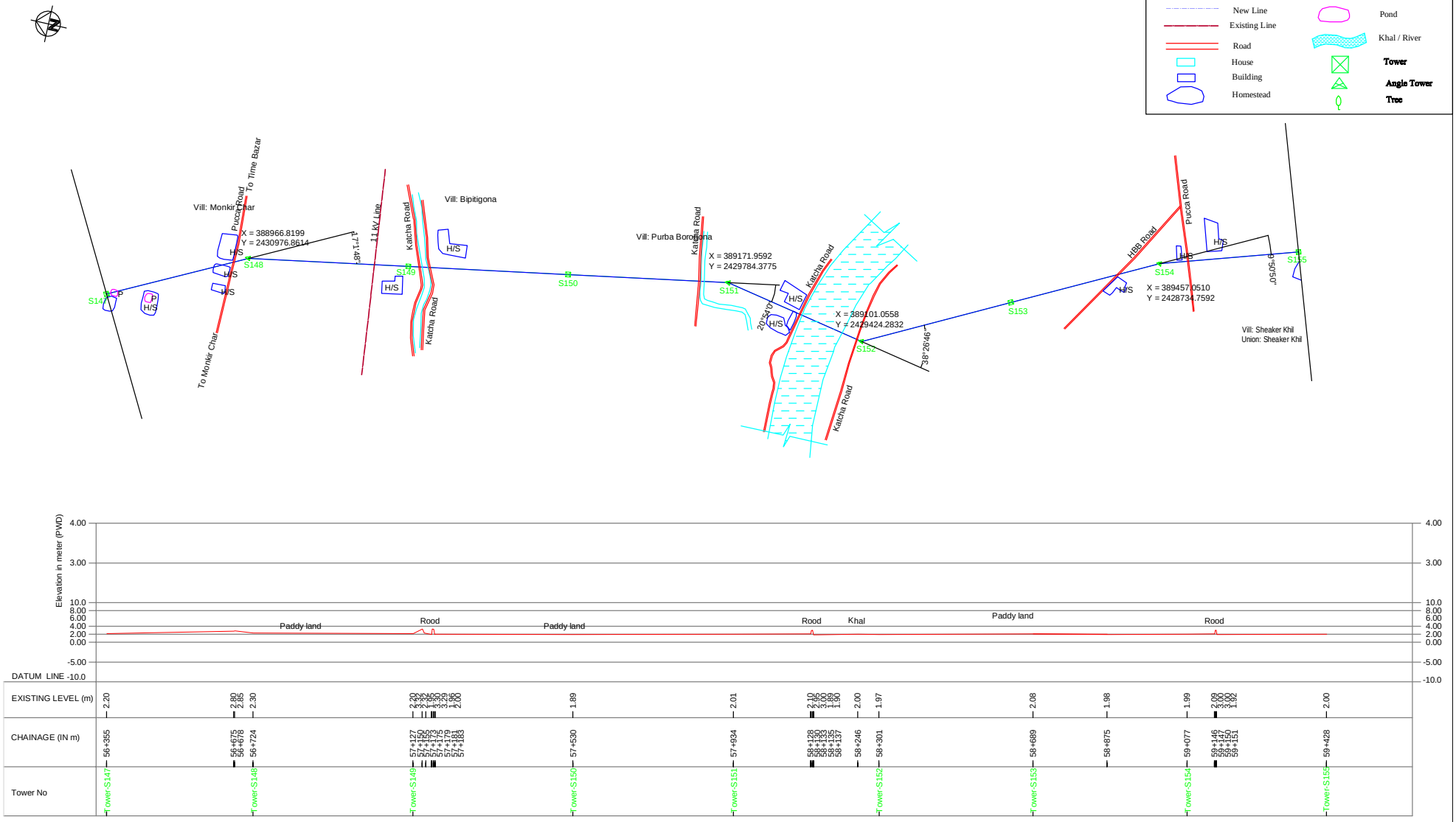

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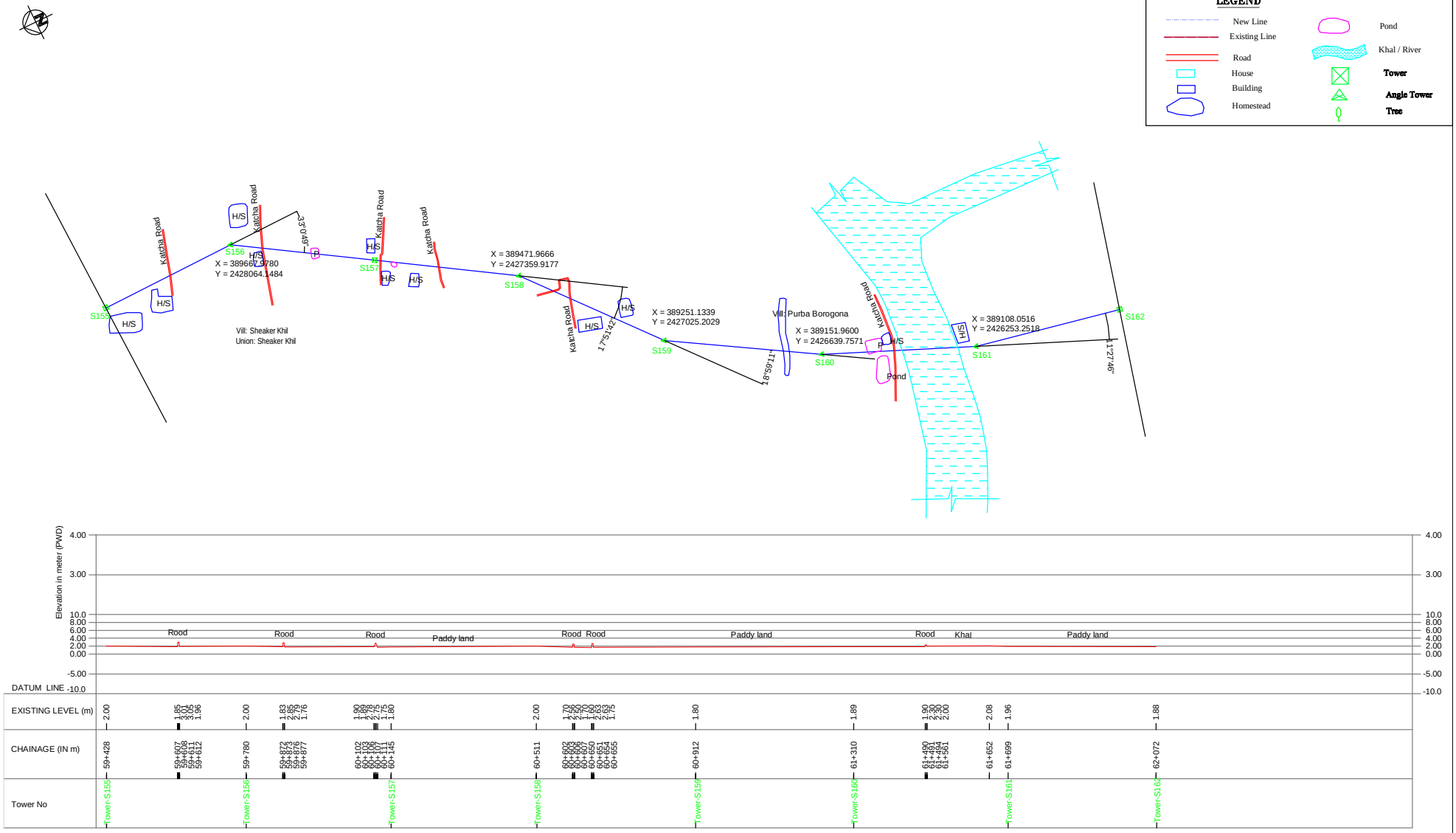

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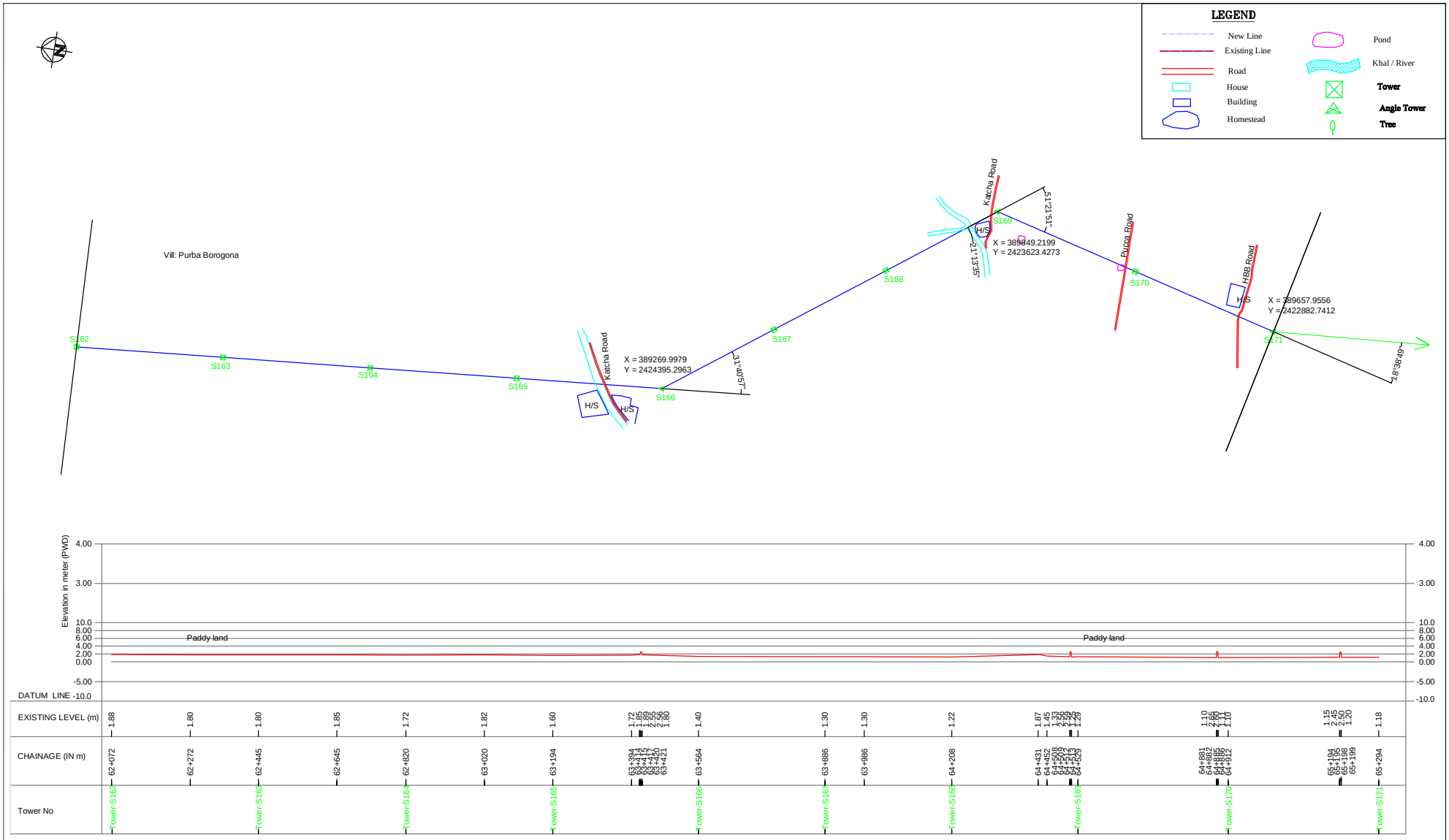

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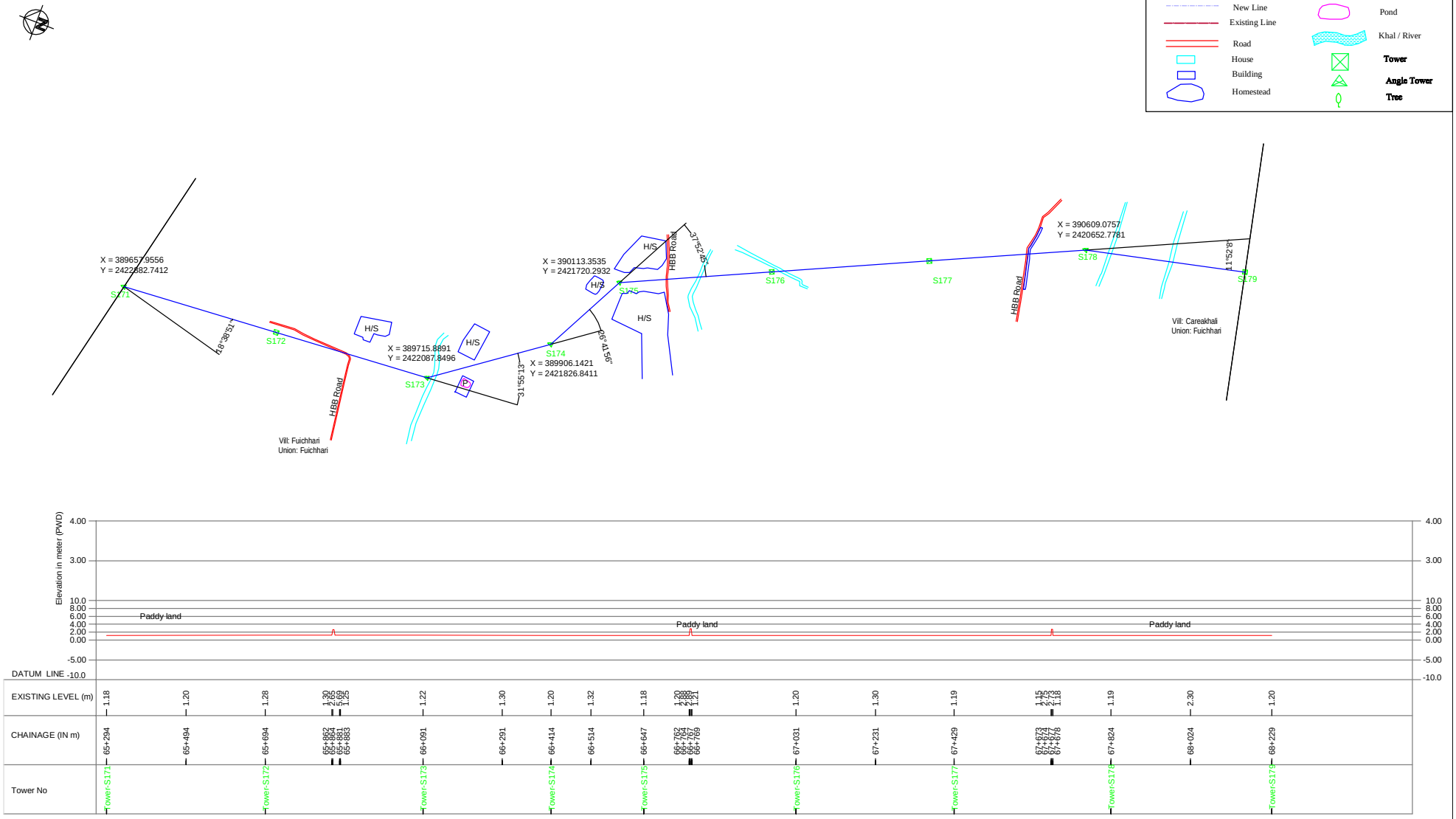

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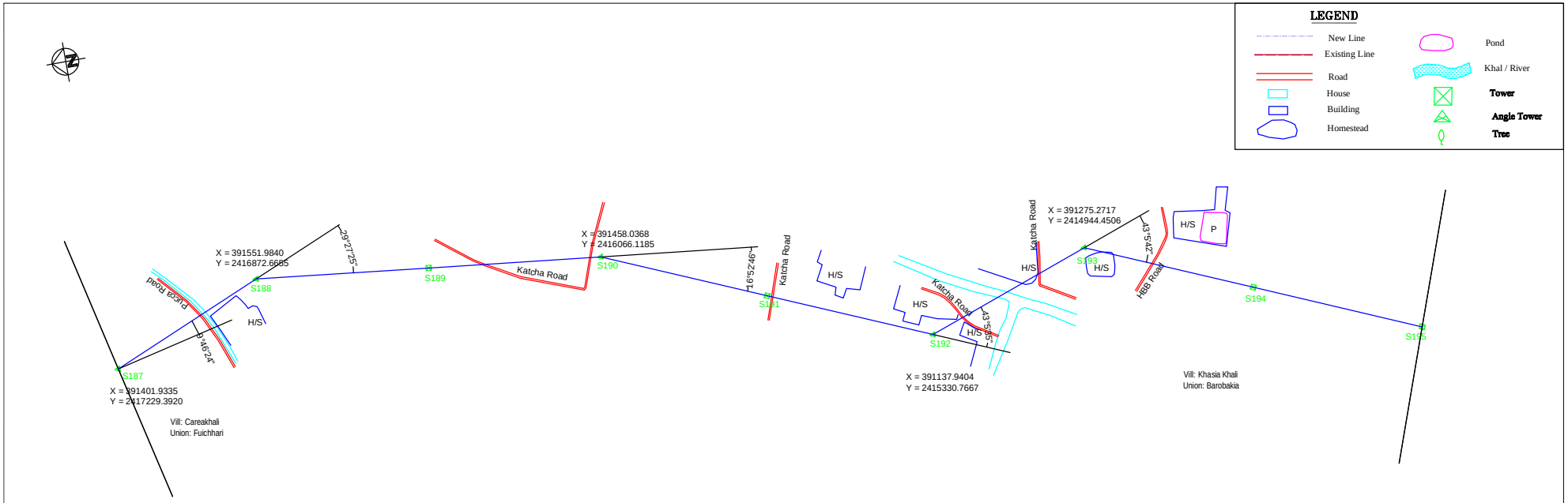

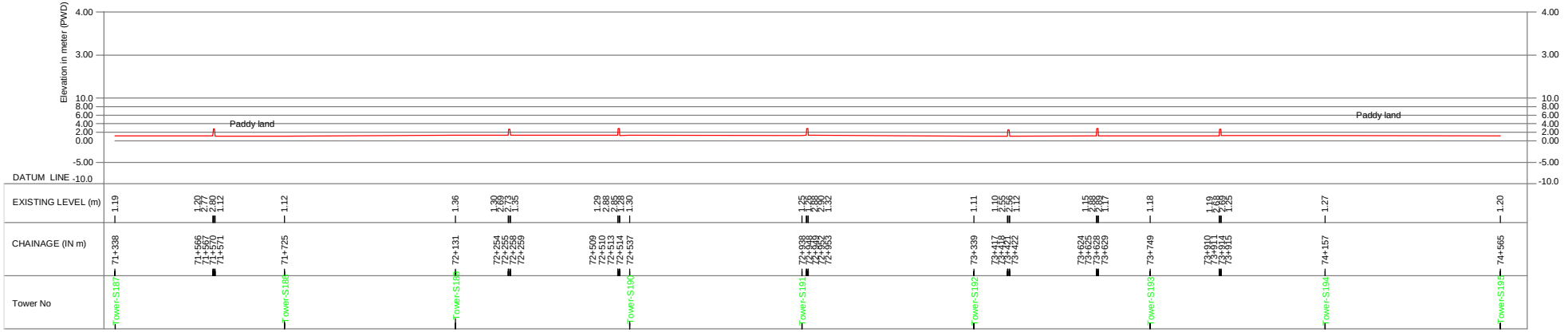

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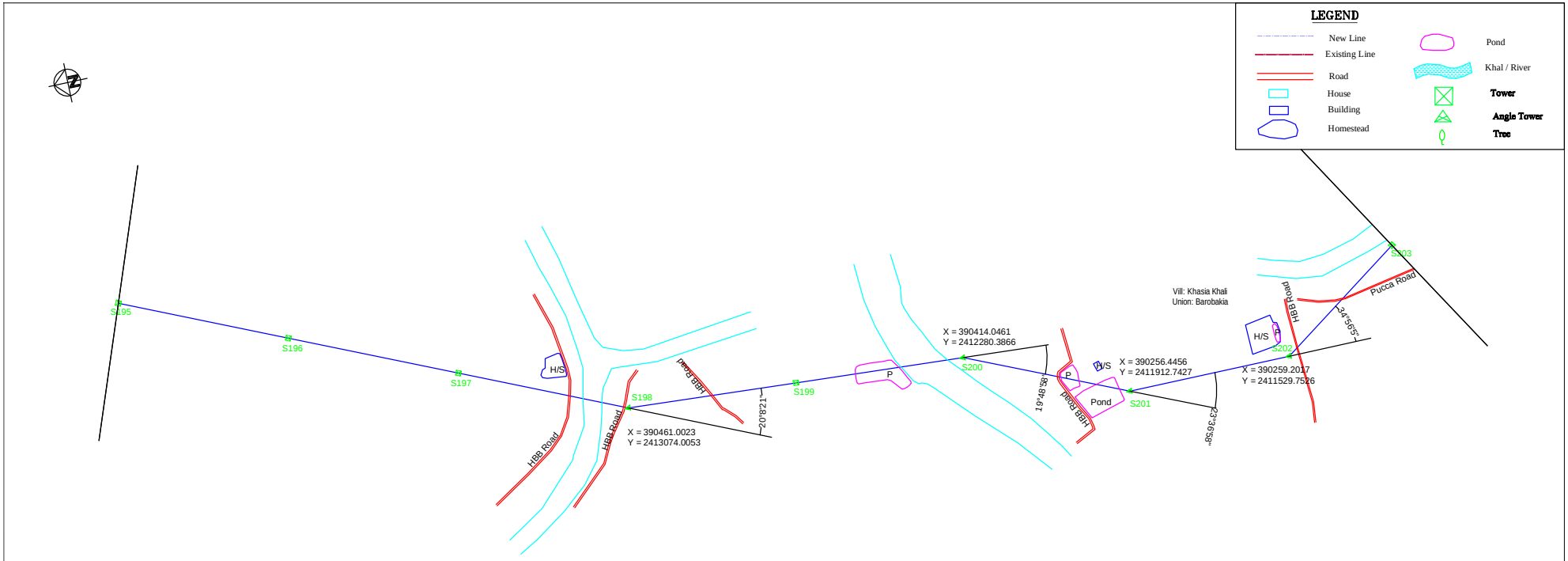

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LOCAL CONSULTANT	Engineers Associates Ltd. (EAL)	TEPCO / JICA		TITLE	ROUTE ALIGNMENT SURVEY OF PROPOSED 400KV TRANSMISSION LINE FROM MEGHNA GHAT TO MATARBARI,
SURVEYED BY					DATE OF PREPARATION / DESCRIPTION
CHECKED BY					NOVEMBER 2014
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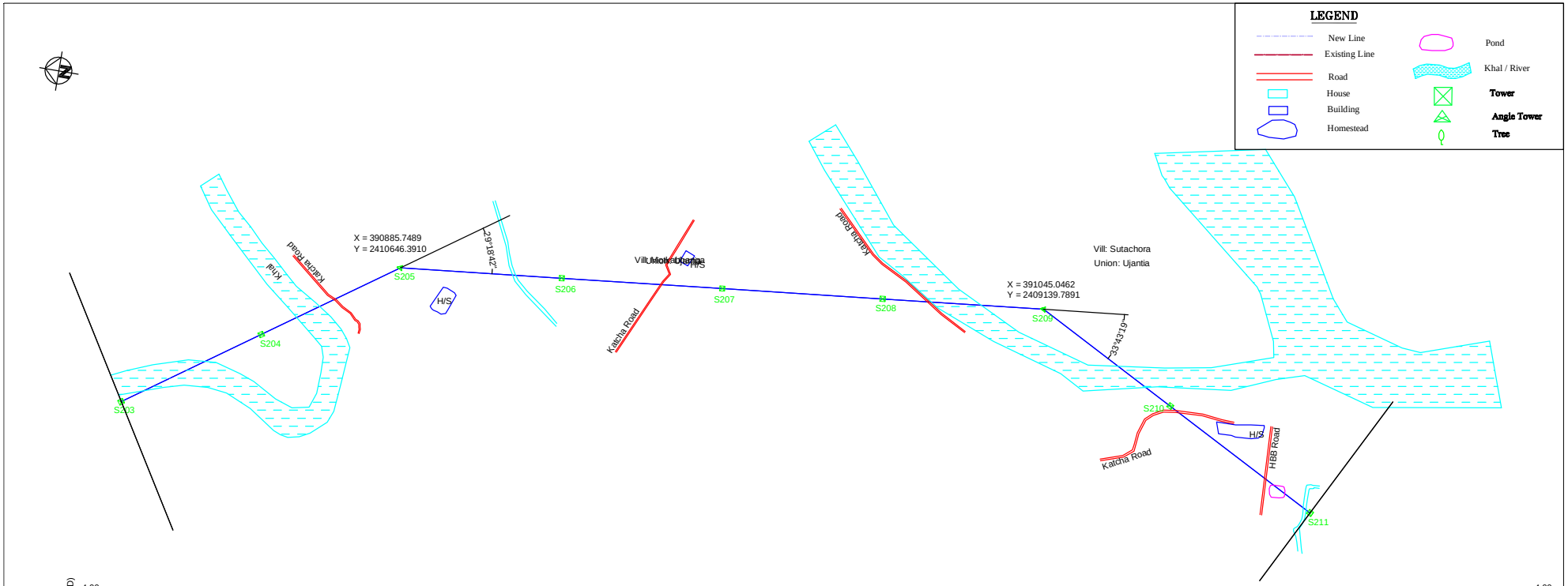

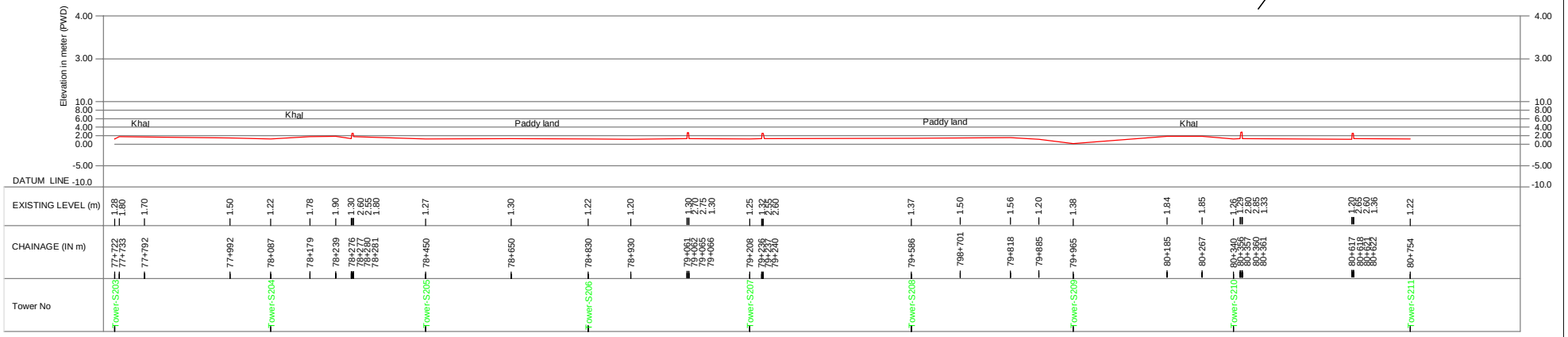

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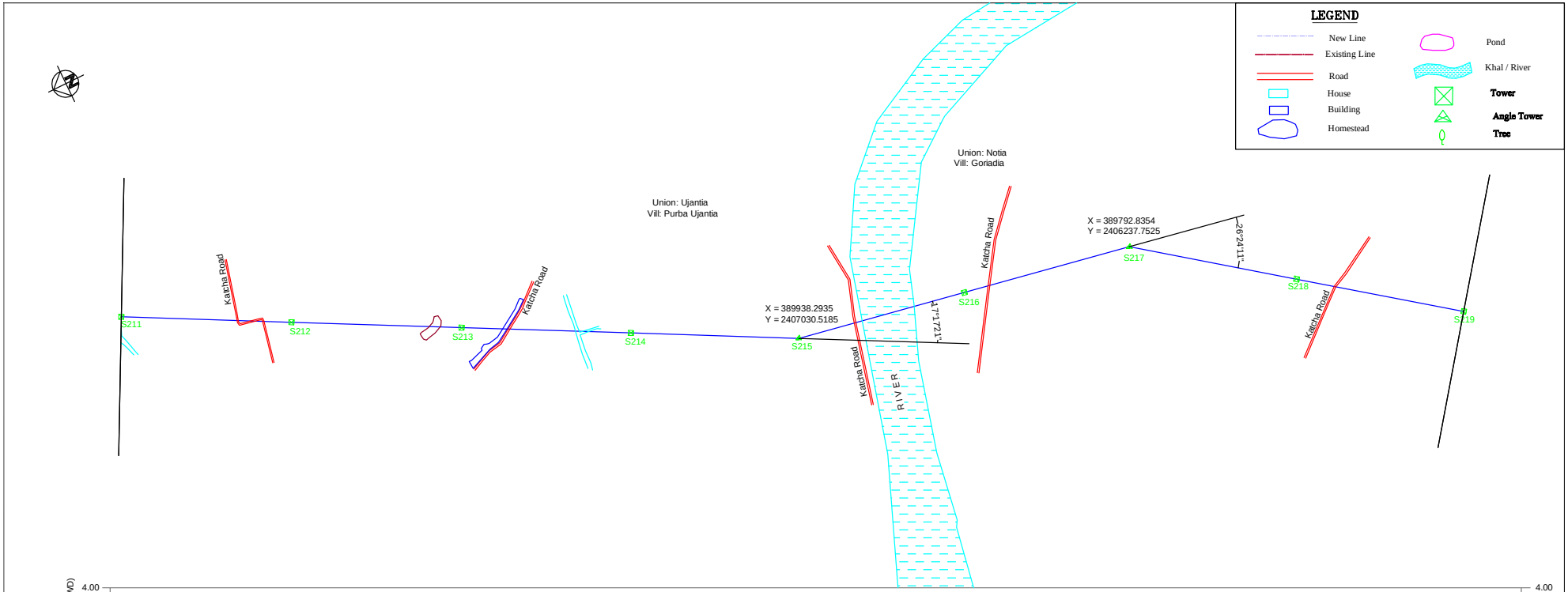

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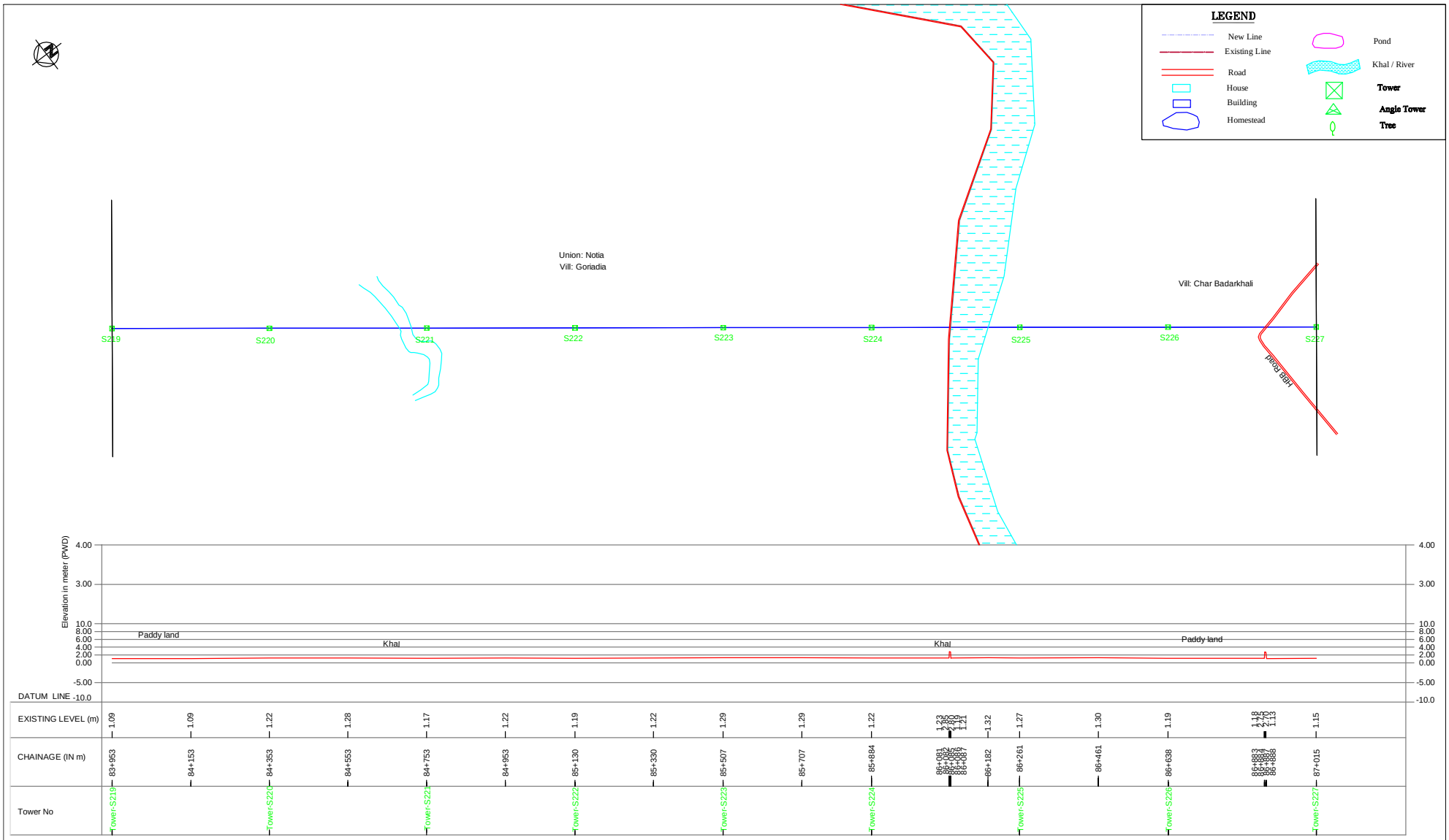

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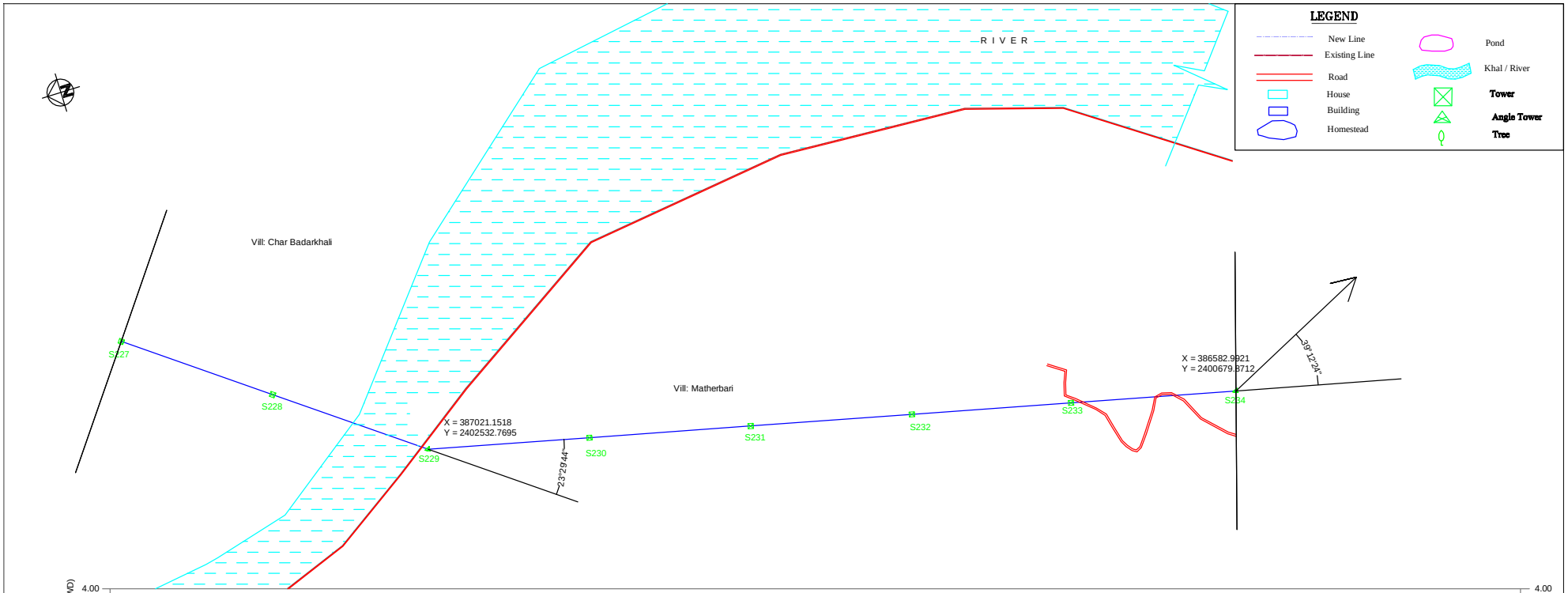

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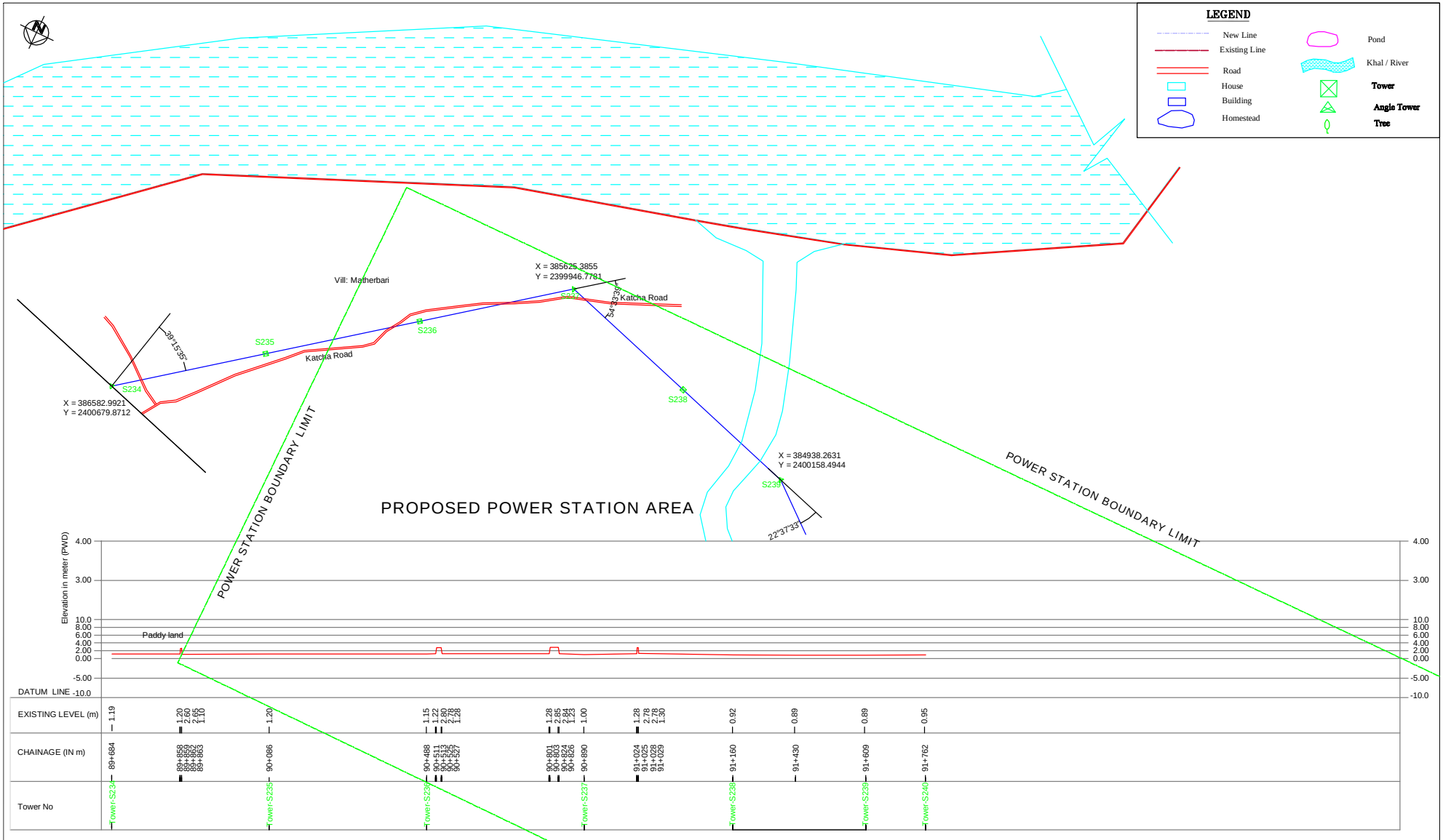

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	DATE OF PREPARATION	DESCRIPTION
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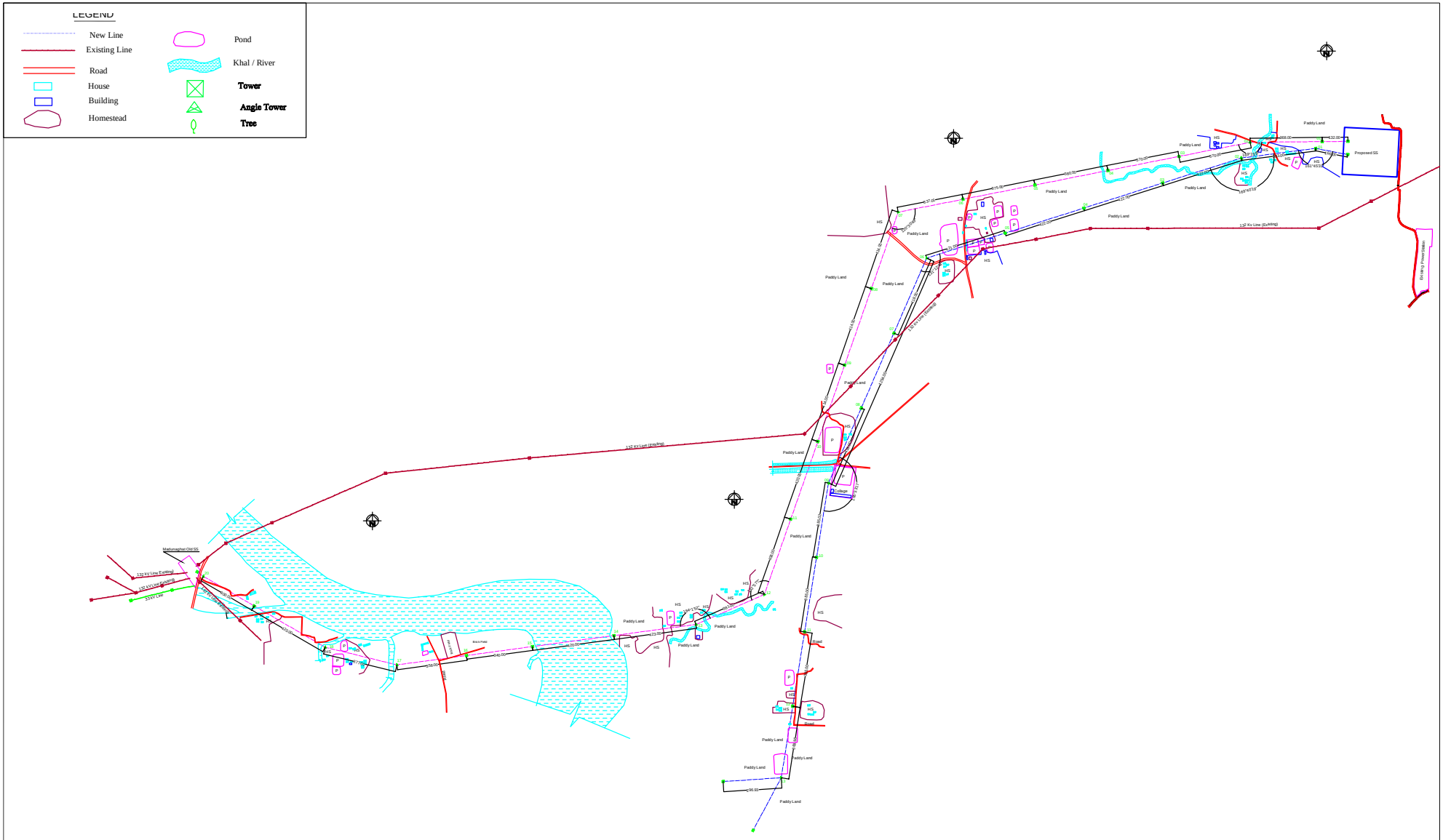
Appendix III

Proposed 230 kV Transmission Line Routes (LILO & Madunaghat – Old Madunaghat)



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LOCAL CONSULTANT	Engineers Associates Ltd. (EAL)	TEPCO / JICA		TITLE	ROUTE ALIGNMENT SURVEY OF PROPOSED 230kV TRANSMISSION LINE FROM MADUNAGHAT NEW SS TOHATAZARI-SIKALBAHA LINE AND MADUNAGHAT NEW SS
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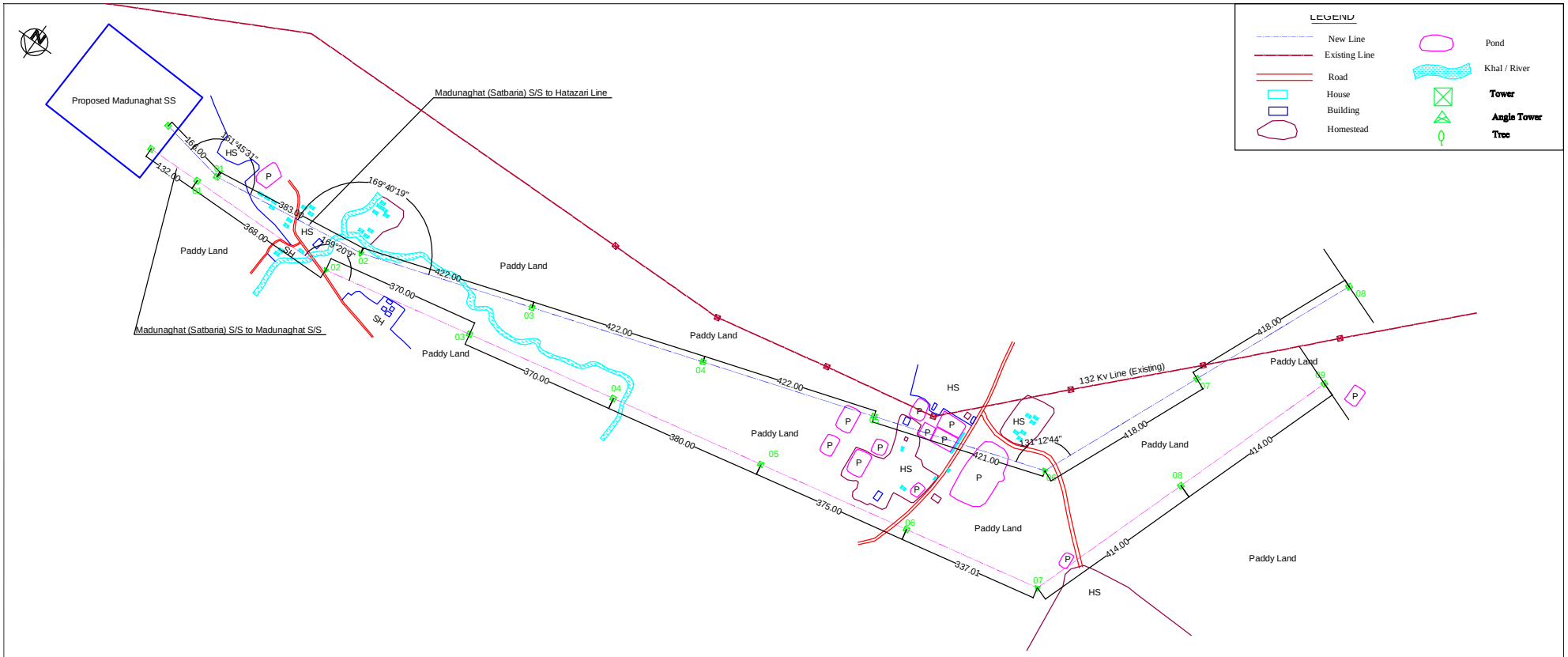

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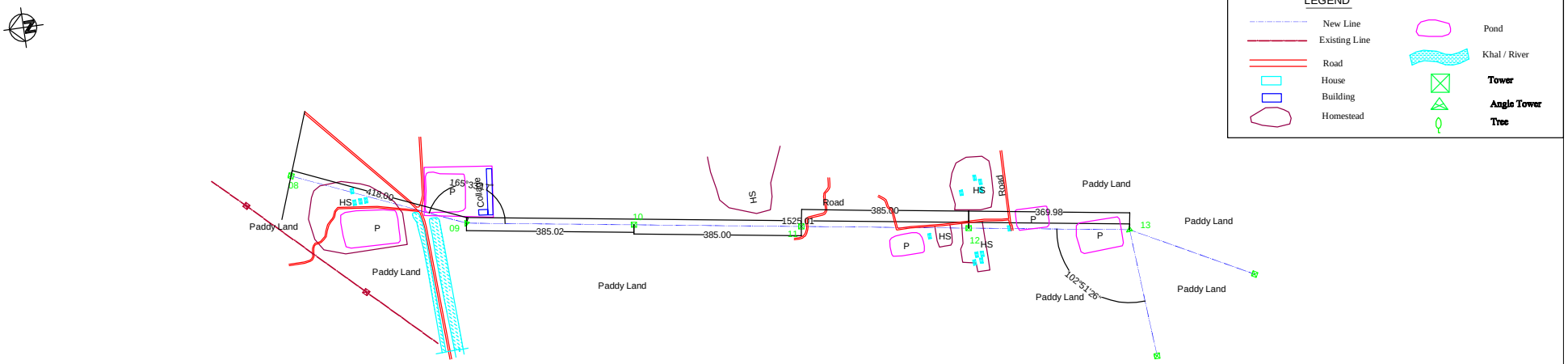

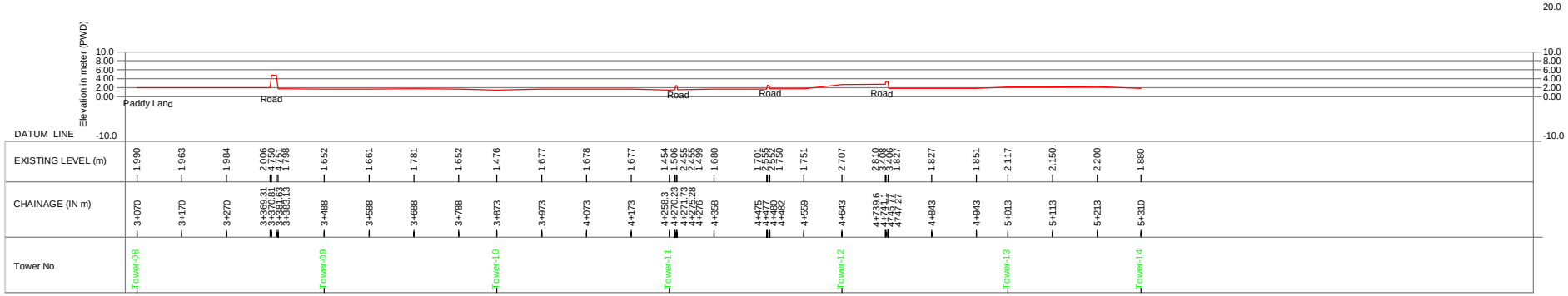

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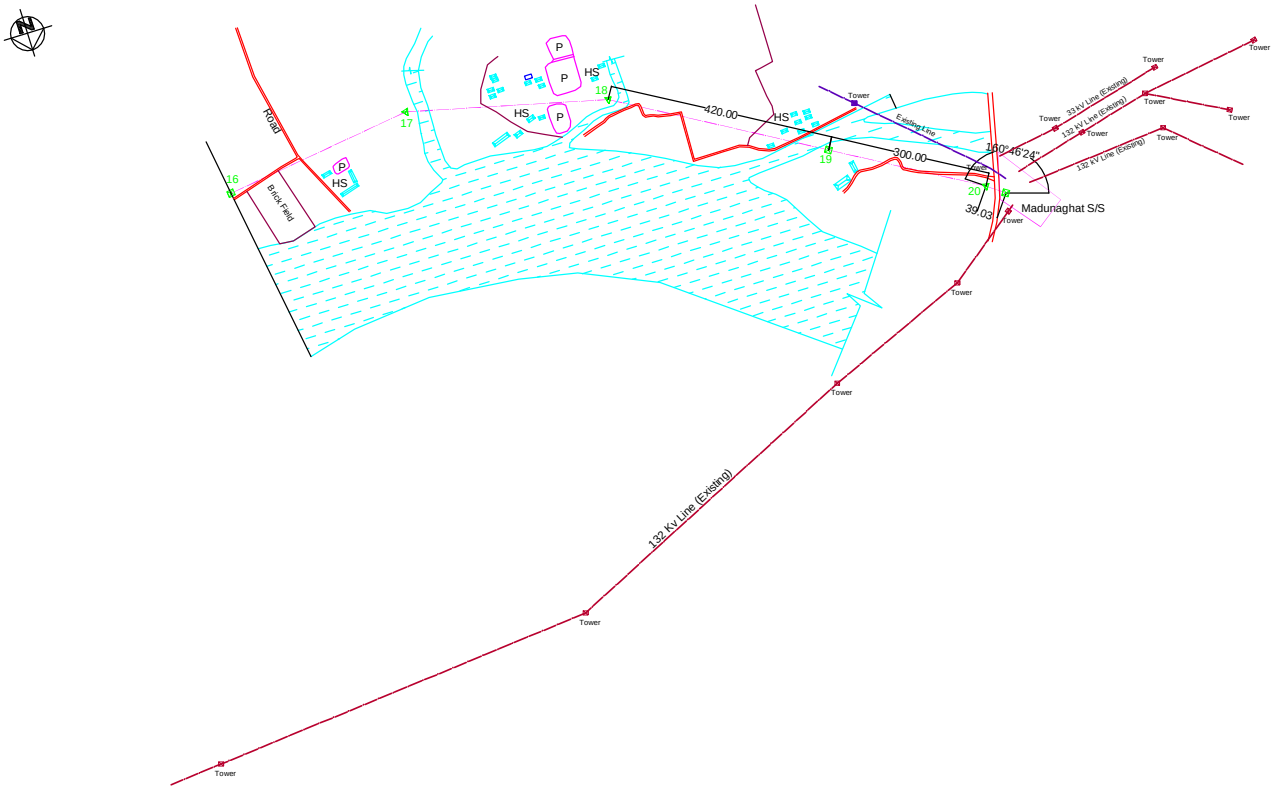

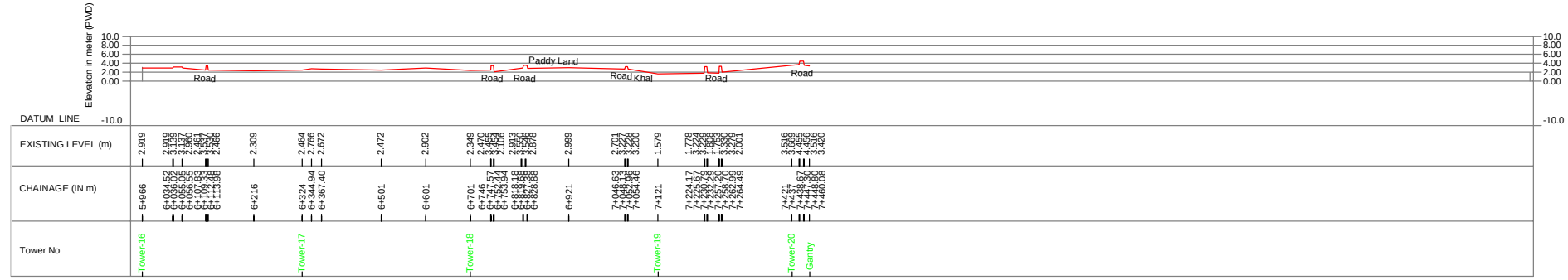

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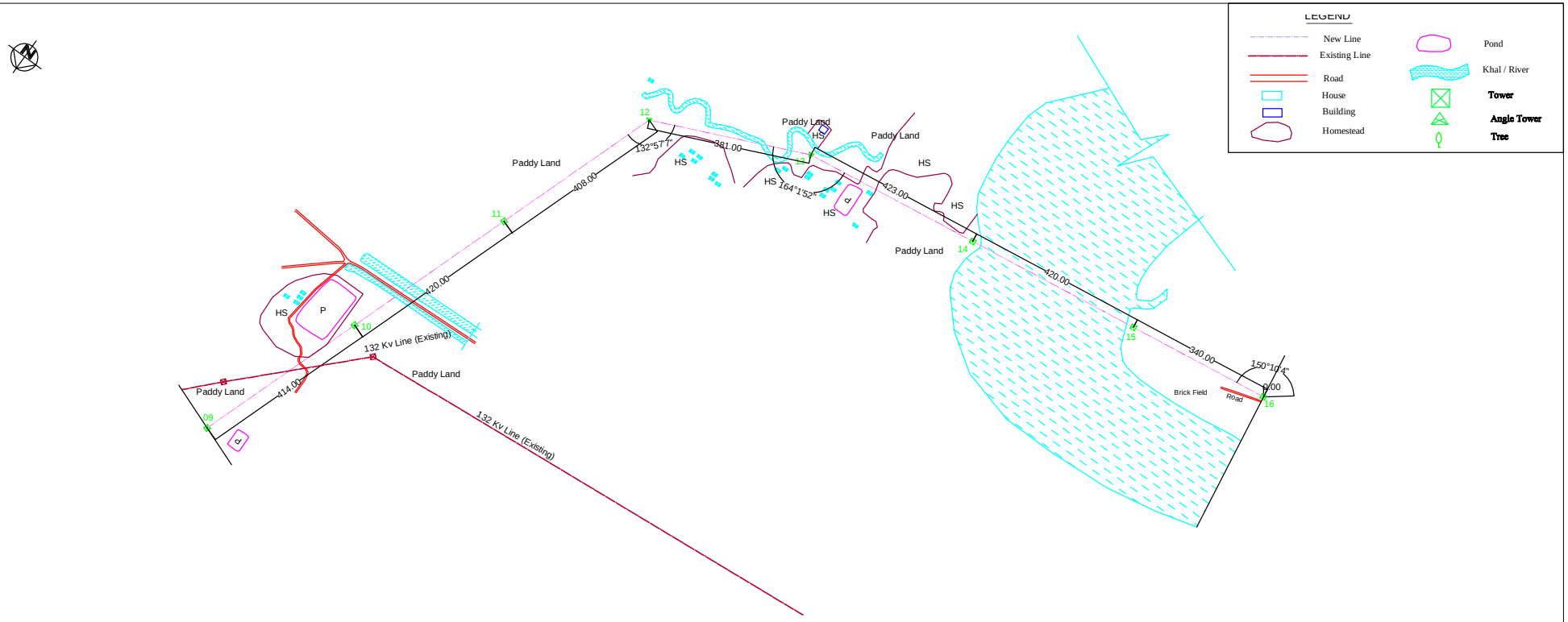

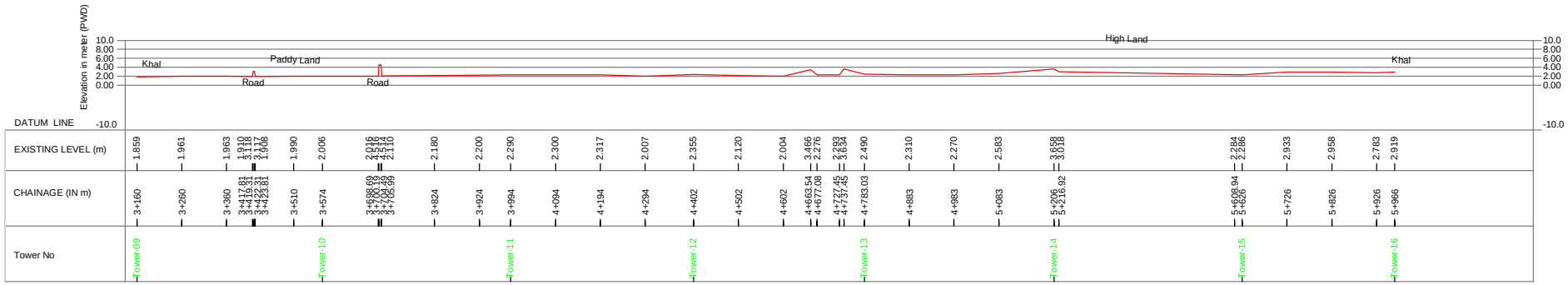

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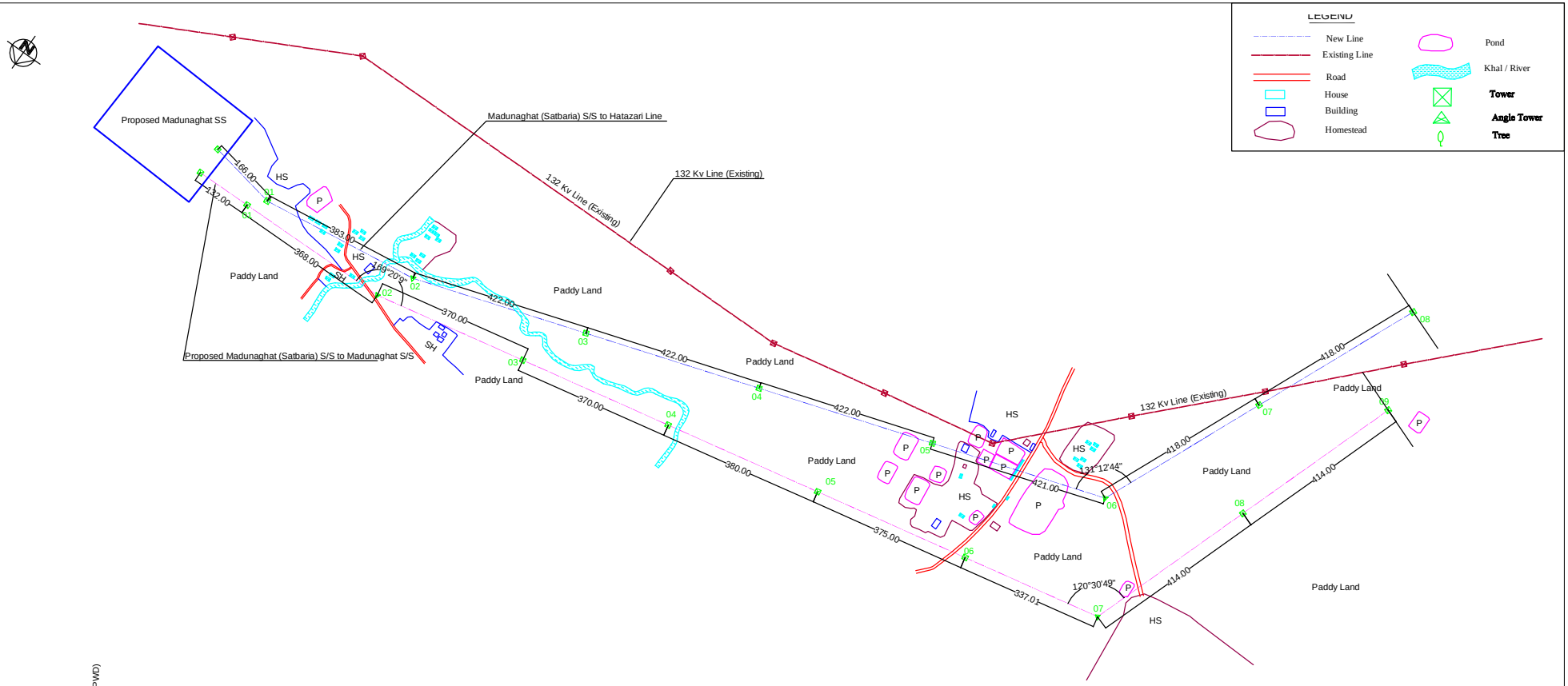

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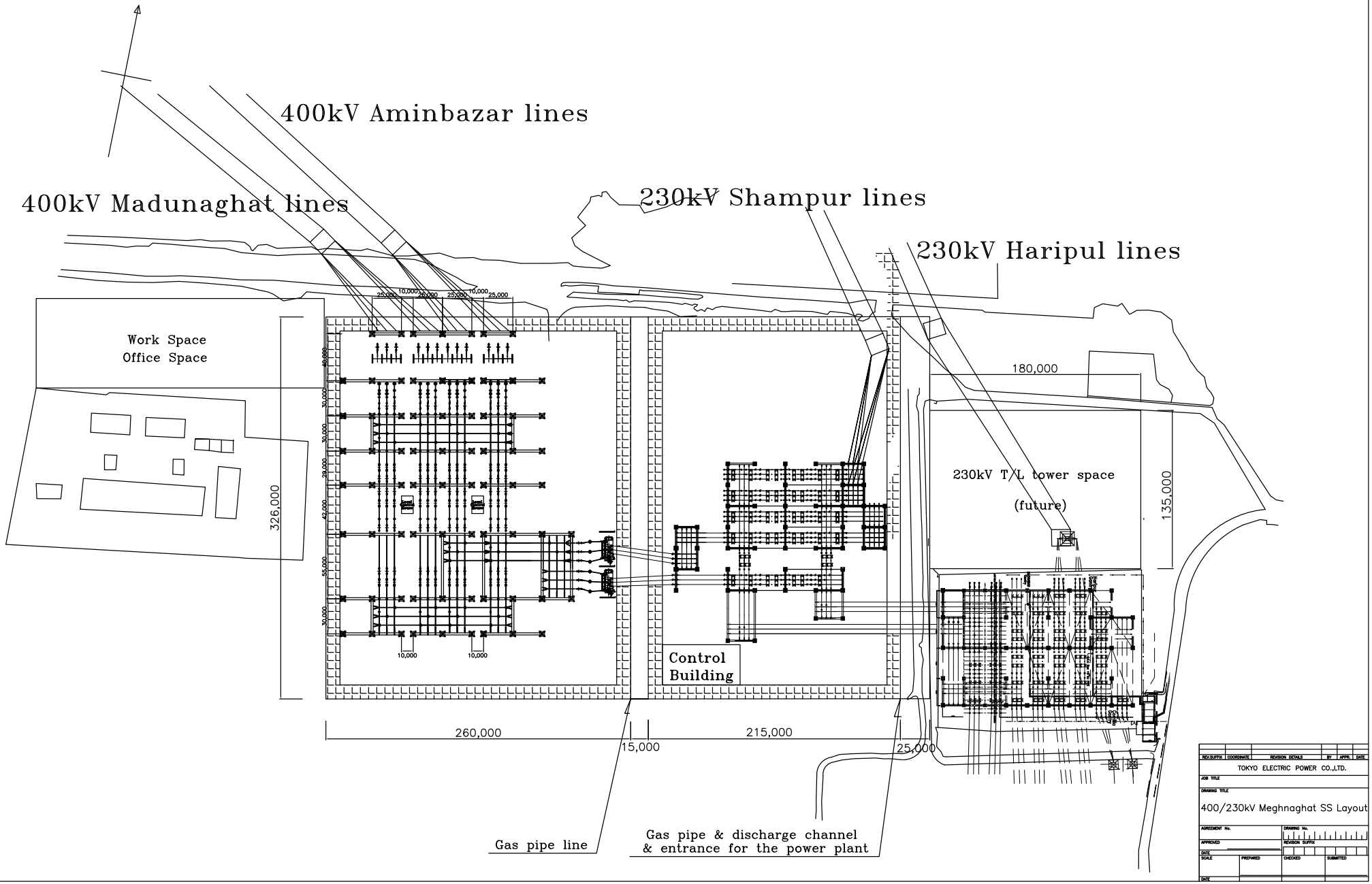
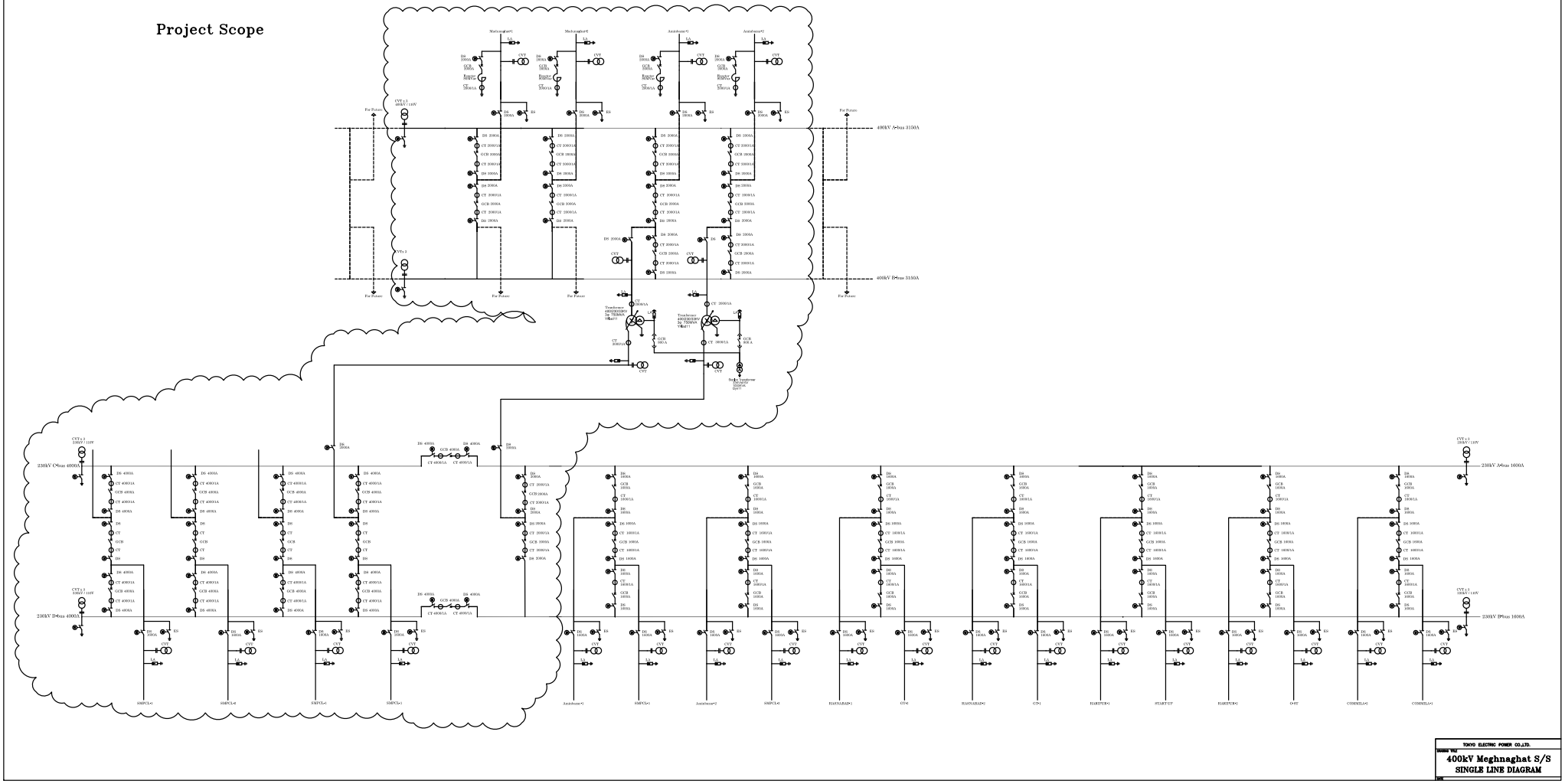
Appendix IV

Layout and SLD of Substations


400kV Aminbazar lines
400kV Madunaghat lines
230kV Shampur lines
230kV Haripul lines
Work Space
Office Space
326,000
180,000
230kV T/L tower space
(future)
135,000
Control
Building
260,000
15,000
215,000
25,000
Gas pipe line
Gas pipe & discharge channel
& entrance for the power plant
TOKYO ELECTRIC POWER CO.,LTD.
400/230kV Meghnaghat SS Layout

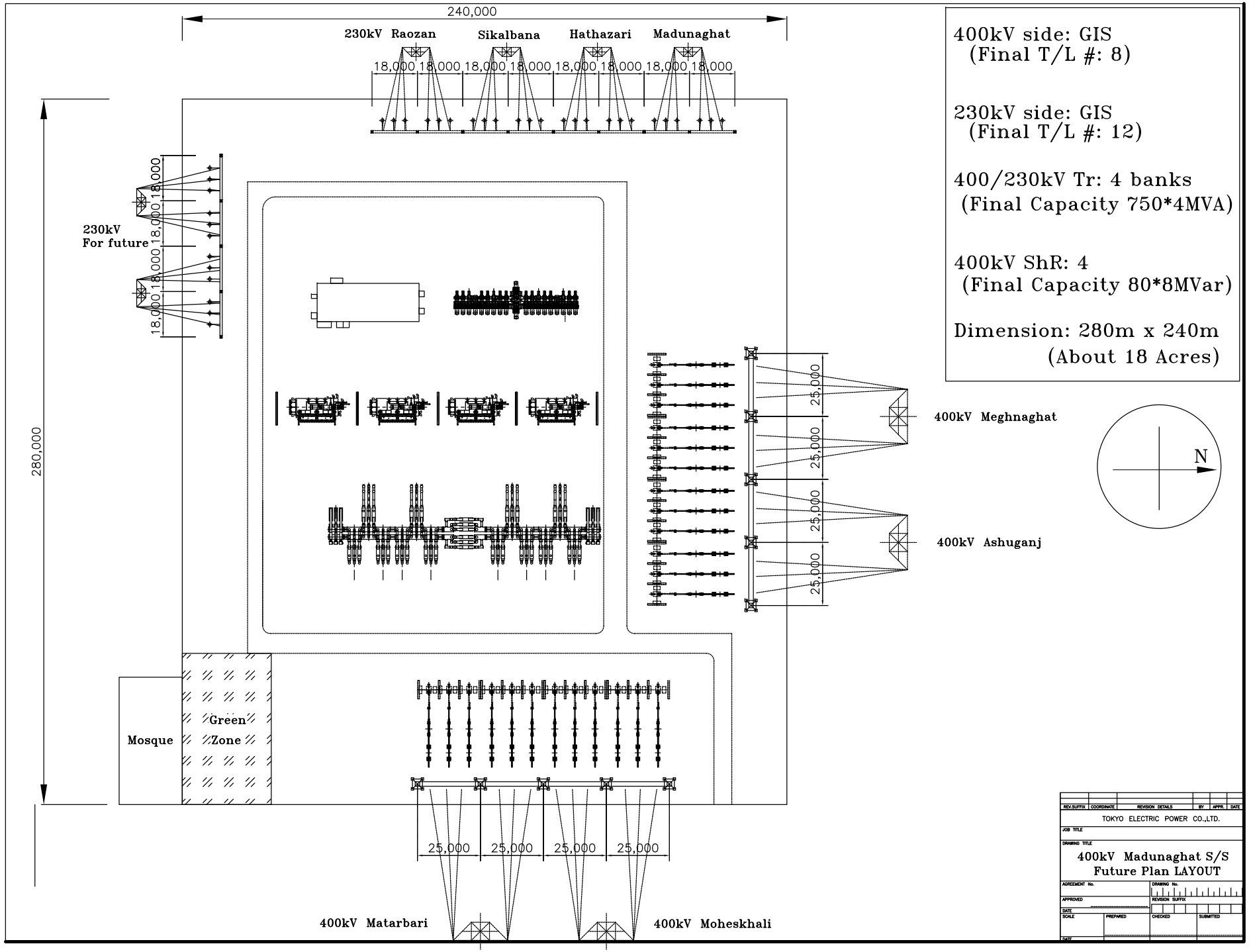
Project Scope



TOKYO ELECTRIC POWER CO.,LTD.

400kV Meghnaghat S/S

SINGLE LINE DIAGRAM



400kV side: GIS
(Final T/L #: 8)

230kV side: GIS
(Final T/L #: 12)

400/230kV Tr: 4 banks
(Final Capacity 750*4MVA)

400kV ShR: 4
(Final Capacity 80*8MVar)

Dimension: 280m x 240m
(About 18 Acres)

REV.SUFFIX	COORDINATE	REVISION DETAILS	BY	APPR.	DATE

TOKYO ELECTRIC POWER CO.,LTD.

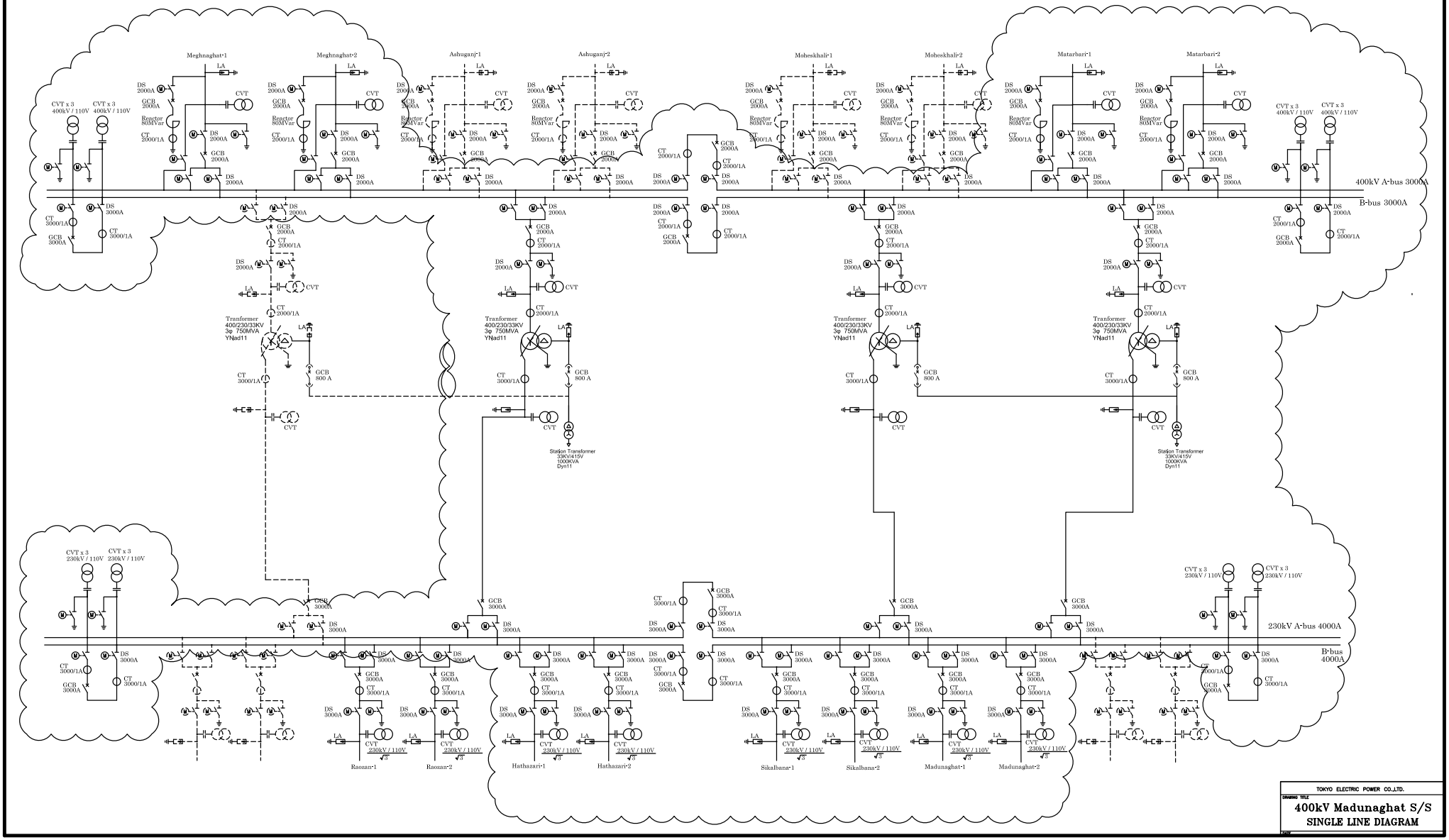
JOB TITLE

DRAWING TITLE

400kV Madunaghat S/S
Future Plan LAYOUT

AGREEMENT No.	DRAWING No.
APPROVED	REVISION SUFFIX
DATE	
SCALE	PREPARED / CHECKED / SUBMITTED
DATE	

Project Scope



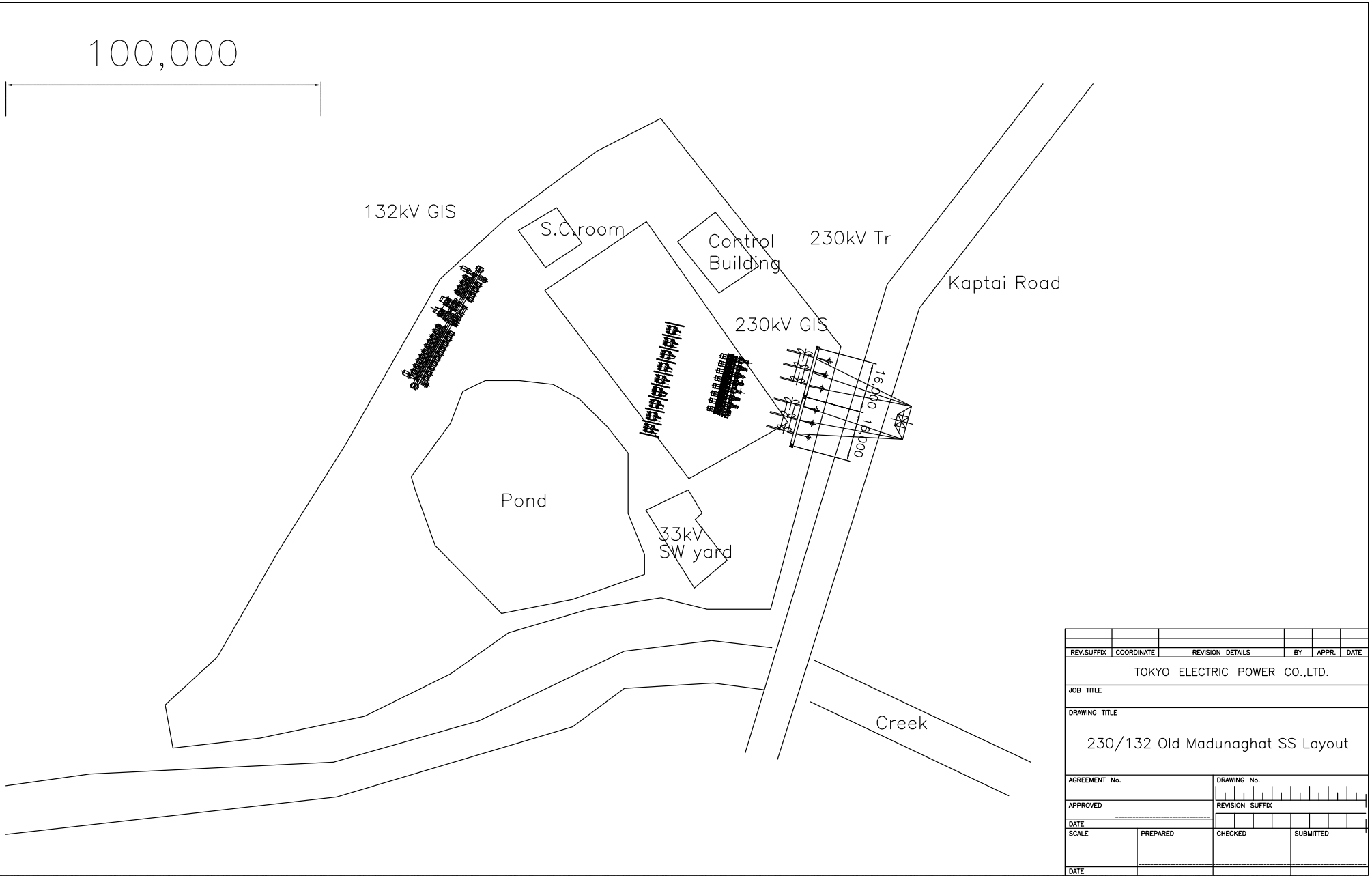
TOKYO ELECTRIC POWER CO.,LTD.

DRAWING TITLE

400kV Madunaghat S/S

SINGLE LINE DIAGRAM

DATE



REV.SUFFIX	COORDINATE	REVISION DETAILS	BY	APPR.	DATE

TOKYO ELECTRIC POWER CO.,LTD.

JOB TITLE

DRAWING TITLE

230/132 Old Madunaghat SS Layout

AGREEMENT No.		DRAWING No.	
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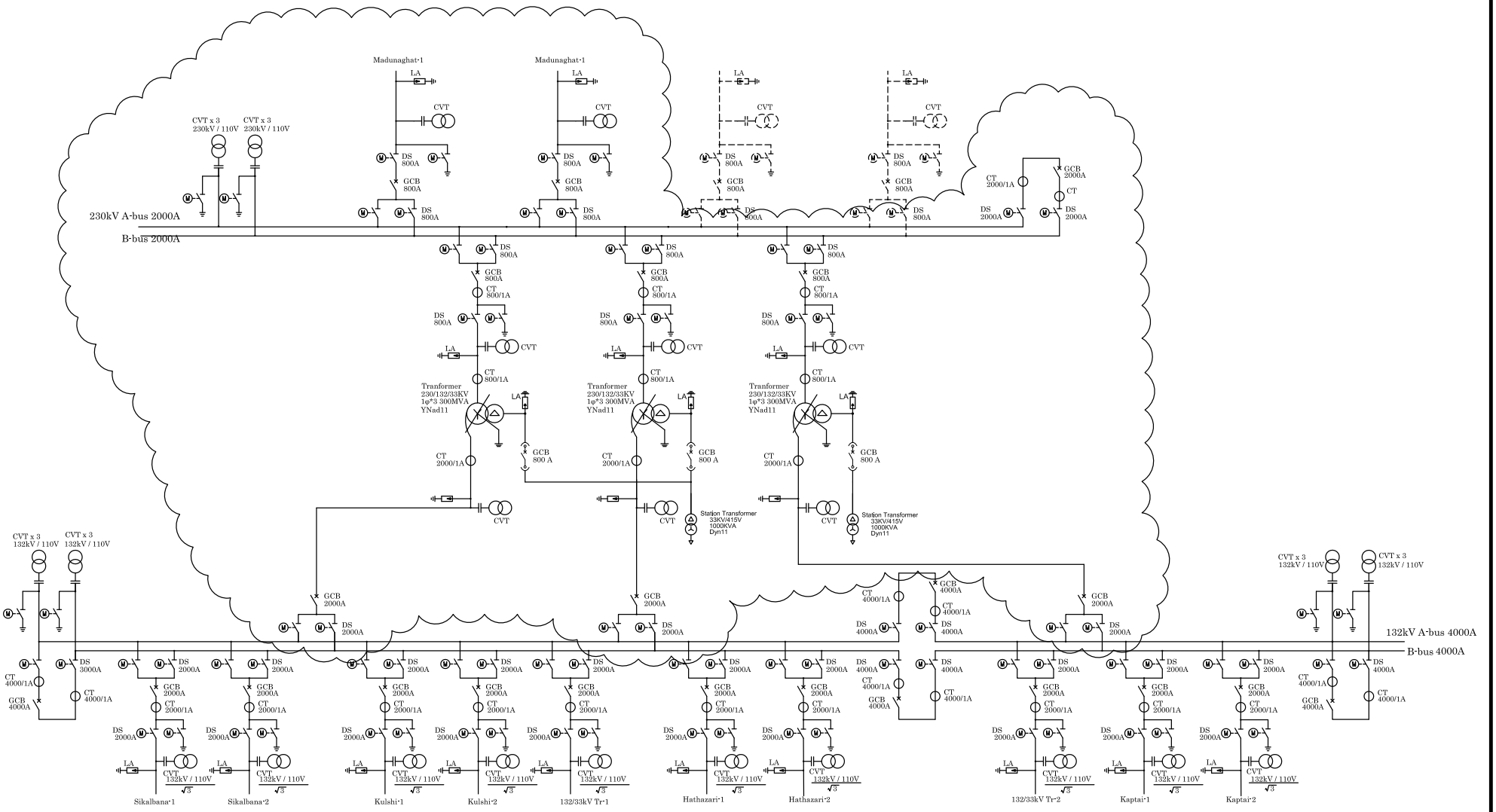
Project Scope



TOKYO ELECTRIC POWER CO.,LTD.

DRAWING TITLE

230kV Madunaghat S/S

SINGLE LINE DIAGRAM

SCALE

Appendix V

TOR

of

Survey on Natural Resources (Flora and Fauna)

TOR of the Flora and Fauna Survey

1. Scope of Work

Following evaluation will be cleared in report:

a. To evaluate potential impact of Transmission line extension (including substations) to the rare, endangered and protected species*
b. To assess adaptability of rare, endangered and protected species against the impact
c. To estimate how many rare, endangered and protected trees* will be cut or dried up
d. To recommend available mitigation countermeasures to minimize impact to the rare, endangered, protected species*.

(*)=including not only species categorized as rare, endangered and protected species listed on IUCN Red List of 2013 and by Bangladesh's Law but species of limited distribution (endemic), and important economic and cultural use to local people.

2. Output

Following items will be included in report,

a. A list of Flora (clarifying rare, endangered, protected, endemic and important economically or culturally uses species to local people impacted by the project.
b. A list of Fauna (clarifying rare, endangered, protected, endemic and important economically or culturally uses species to local people impacted by the project.
c. A distribution map (1/10000) of rare, endangered, protected, endemic and important economically or culturally uses species to local people impacted by the project.
d. An evaluation of impact to rare, endangered, protected species based on their ecological requirements and limitation.
e. A list of adaptability assessment of rare, endangered, protected species against the Project impact.
f. Estimation of numbers of rare, endangered and protected trees will be cut or dried up.
g. Recommendation of available mitigation countermeasures to minimize project Impacts to the rare, endangered, protected species.

3. Methods

(1) General methods

A list of fauna and flora (including rare, endangered, and protected species) potentially found in the project area will be prepared before field survey conducted. Broad survey or opportunistic survey will be employed to identify and record fauna and flora in the project site and surround habitat. GPS will be used to record geographic coordinate and plotted to the map of it identified plots. In addition, interview to the local people will

be done to gain information about species will be also taken as documentation. Information concerning on rare, endangered, and protected species will be collected through analyses of various sources of scientific reports, interviews with beneficiaries, partner agencies(including international natural conservation organizations), project staff and local people.

(2) Sampling station and its each unit

To cover representative habitat impacted by the Project, the Consultant defines 7 main sampling stations (including access road, these points will be defined after consultation with JICA Survey Team). Number of sampling unit or observation point vary, with range 2 - 4 unit or point, within taxa group depend on specification of taxa and representative of microhabitat. For example, mammal observation might need more observation point or transect rather than amphibian observation. Detail of sampling unit or observation point explained in each taxa methodology section.

(3) Time of survey

The time of survey vary on taxa and type of project, it is required 2 times of Rainy season and Dry season, but some taxa of Mammal and Avian will be done 4 times of Spring, Summer, Autumn and Winter. To cover each station, the Consultant will need about XX days or weeks for field observation including time needed for preliminary survey, sample preservation, coordination to local authority, move from one station to another, and to anticipate bad weather, team at least need XXX times in the field.

4. Detailed survey methods on each Taxa

(1) Flora

For vegetation assessment, the consultant will use broad survey and quadrate sampling.

Broad survey will be used to record species of plants in the area. Quadrate sampling will be used to determine a vegetation profile and to estimate number of important tree* (with Diameter at Breast High or DBH more than 35 cm) that will be cut during the construction of facilities. Quadrates will be placed with XXX m interval along XX km transects line crossing to the right and left of it. In each station the consultant will set up 20 quadrates (minimum number of quadrate), therefore the consultant will have totally 120 quadrates in six stations. The quadrate dimension used for tree (DBH $\geq$ 35 cm) is 20 m x 20 m, for pole (10 cm $\leq$ DBH $<$ 35 cm) is 10 m x 10 m, for sapling (DBH $<$ 10 cm) is 5 m x 5 m, and for seedling (height $<$ 50 cm) and undergrowth (grasses, vines, herbs, shrubs, ferns species) is 1 m x 1 m (Figure 1). Individual plants will be identified to their corresponding taxon (family, genus, and species). In term of vegetation analyze, the consultant will assess the habitat type, stratum, biometric, and ecology. Quadrate method will allow the consultant to calculate density and dominance to compute the biodiversity indices. Unidentified plant will be collected and brought to the laboratory of Botany at (University of XXX or research centers) for processing, verification, and authentication.

(*)=trees which are protected by Treaty or local Law

Figure2: Size of Quadrat

(2) Mammals

Broad survey combined with scan observation, and line transect will be employed to record medium-large size of mammals (particularly primates). Survey will be done in existing walk path in the field used by local to perform line transect. This method allows the consultant to calculate density estimation of mammals observed. Survey will be done twice, once in the morning start at 6 am—10 am to record diurnal mammals and second in the night start at 6 pm—10pm to record nocturnal mammals. Spotlighting will especially perform at night survey. Volant mammals (bats) will be captured by using net. A total of XX net will be accumulated for the survey periods. Checking starts at 6 pm and ends at around 10pm. All the nets for this study will be placed two

to three meters from the ground along suspected fly path and near feeding trees in series of three or four. All capture bats will be released after processing.

Small non-volant mammal (rodents and shrews) will be captured using live trap baited with butter. The consultant will use XX live traps each station. A total of XX trap will be accumulated for the survey periods in six sampling units. Traps will be set starting at 4 pm and checked the following morning at 7 am. They will be positioned five to ten meters apart in strategic areas suspected to be most productive such us root tangles, tree buttresses, rotting logs, small crevices, etc. Individuals trapped will be measured, photograph, and identified. All identified individuals will be released. Any unidentified one or not ascertained is automatically collected. They will be properly catalogued and tagged, and will be fixed in 10% formalin and stored in 70% ethanol.

Medium sized to large sized non-volant mammals will be identified and their perceive abundance primarily based on interviews with knowledgeable local residents. Pictures will be used to aid the interview process but are only shown at the last minute. This will be combined other secondary indicators such as scats, skeletal remain, foot prints, etc. For captured individuals, sex is determined followed by approximate age (adult, sub-adult, and juvenile). This is followed by standard biometric measurements: total length (TL), tail-vent (TV), hind foot (HF), ear (E), forearm for bats (FA) and weight. Qualitative descriptions are also noted to document morphological features when alive and to aid the photographs taken. Indirect observation base on footprint, scratch, nest, and feces will also note.

(3) Avian (Birds)

Broad survey will be employed to record bird species which strongly associate with stream ecosystem as well as forest around the stream. Point observation placed with 100 m interval along 1 km line transect parallel the streams (500m to the right and left of stream) will also employed to count number, density, and biodiversity indices of bird's communities. All individuals observed and/or heard will be noted by following information: species name, numbers of individuals, habitat type, elevation, geographic coordinate, fly singly or in flocks, and other information needed. Rare and protected species will be listed and mapped. The ecology of rare and protected species, such as breeding site, feeding site, nesting site, and breeding season, will be also specifically observed and record.

(4) Amphibians and Reptiles

Opportunistic broad survey will be used to collect and record herpeto-fauna in the sampling areas. This method include spotlighting in the stream and along stream side, forest hiking, transect count, point observation and checking of traps. Individuals will be captured by hands and/or sticks. Some pith fall traps will also establish in some potential area to capture the litter frog. Various suspected microhabitats (i.e. puddles, sections of streams, tree holes, and forest floor, with significant decaying leaf litter cover, tree buttress, logs, leaf axils, epiphytes, tree fern and others) were thoroughly examined with help from local researchers. Darts and blow pipe will be also employed to capture small gecko and lizards. Observation will be carried out twice at 7—11 am and 6—12

pm. Interview will be also performs but only to conspicuous and easily identifiable species. Standard biometric measurements will be used to captured individuals, then photograph and note the qualitative description of individuals. Additional data on microhabitat, altitude, date, weather, time observed and behavior prior to capture will be noted. All identified individuals will be released. Unidentified individuals or new record on site will be sampled and preserved in 30% formalin and then bring it to Laboratory of University or Research centers for further investigation.

(5) Insects

Opportunistic sweeping using insect net will be employed near or around the river side, and surround shrub and under story vegetation to collect flying insect particularly dragonfly (Odonata), butterfly and moths (*Lepidoptera*) and beetles (*Coleopterans*) might have been designated as rare,
endangered, and protected species. Any rare and protected species will be noted include additional information of its microhabitat and ecology. Unidentified individuals will be sampled and preserved and then bring it to the Laboratory of University or Research centers for further information. Freshwater insect (include nymph of Odonata and Coleopterans) captured during the macro benthic sampling will be also examined.

Appendix VI-a

Copy of Official Letter from PGCB to DOE on Submission of IEE Report

OF-HRM-47

Office of the
Project Director (Chief Engineer), NPTND Project

পাওয়ার গ্রীড কোম্পানী অব বাংলাদেশ লিঃ
POWER GRID COMPANY OF BANGLADESH LTD.
(An Enterprise of Bangladesh Power Development Board)

No. PGCB/Project Director(CE)/NPTND Project/2014/ 149 Date: 08/07/2014

To
Director General
Department of Environment
E-16, Agargaon, Dhaka.

Subject: Submission of IEE (Initial Environmental Examination) report and Approval of TOR **(Terms of Reference)** for the Environmental Screening/Assessment with EMP Project under PGCB.

Dear Sir,

Please find attached herewith a copy of IEE Report for the Environmental Screening/Assessment of Meghnaghat-Madunaghat-Matarbari 400 kV Transmission Line Project under Power Grid Company of Bangladesh Ltd. (PGCB).

It is to be noted here that, based on details assessment and baseline study management plan are been prepared by Japan International Cooperation Agency Study Team. In this context, we are requesting you to take earliest necessary action so that we will submit the detail Environment assessment report in due time for your clearance.

Your co-operation in this regard would be appreciated highly.

Thanking you,

Sincerely yours,

8-7-14
Project Director (Chief Engineer)
NPTND Project, PGCB
17, Mohakhali, Dhaka

Copy to:
1. Managing Director, PGCB, Dhaka.
2. Executive Director (P & D), PGCB, Dhaka.
3. Tokyo Electric Power CO.LTD (TEPCO), JICA Study Team, Kind Attn: Mr.Yohei Takashima.
4. Eastern Associates Ltd.1/3 Asad Gate Road,Block-A,Mohammadpur,Dhaka.
5. Office copy.

Office: National Power Transmission Network Development Project, Red Crescent Concord Tower, 17 Mohakhali C/A, Dhaka-1212
Mobile No. 01714-016290, Fax: 02-9888501, E-mail: pd-nptnd@pgcb.org.bd
Head Office: IEB Bhaban, 3rd & 4th floor, Ramna, Dhaka-1000, Tel: 02-9550514, 02-9558054, 02-9553663, Fax: 02-7171833

Appendix VI-b

Copy of Official Letter from DOE to PGCB

on

Approval of IEE Report

Government of the People's Republic of Bangladesh
Department of Environment
Head Office, E-16 Agargaon
Dhaka-1207
www.doe.gov.bd

Memo No: DoE/Clearance/5339/2014/ 229 Date: 11 /09/2014

Subject: Exemption of IEE and Approval of Terms of Reference (TOR) for EIA of Meghnaghat-Madunaghat-Matarbari 400KV Transmission Line Project.

Ref: Your Application dated 08/07/2014.

With reference to the above, the undersigned is directed to convey the exemption of IEE and approval of the Terms of Reference (TOR) for Environmental Impact Assessment (EIA) of Meghnaghat-Madunaghat-Matarbari 400KV Transmission Line Project.

I. Power Grid Company of Bangladesh Ltd. shall submit a comprehensive Environmental Impact Assessment (EIA) considering the overall activity of the proposed Rural Electricity Transmission and Distribution activity in accordance with the TOR and time schedule submitted to the Department of Environment (DOE).

II. The EIA shall incorporate the following components/items in addition to the issues mentioned in the proposed TOR for EIA.

(a) There shall be a new Section on 'Analysis of Suitability for Alternative Routes' this analysis shall be performed, among other approaches, in a GIS based Spatial Decision Support System (SDSS) presenting the suitability of different options for both the interventions;

(b) Refer to Section-8; a detail technical and financial proposal shall be included for developing an in-house environmental monitoring system to be operated by the proponent's own resources (equipments and expertise);

(c) Specific formats for Environmental monitoring shall be included under Section 8.

III. Without approval of EIA report by the Department of Environment, Power Grid Company of Bangladesh Ltd. shall not be able to open L/C in favor of importable machineries.

IV. Without obtaining Environmental Clearance, Power Grid Company of Bangladesh Ltd. shall not be able to start the physical activity of the project.

V. Power Grid Company of Bangladesh Ltd. shall submit the EIA along with a filled-in application for Environmental Clearance in prescribed form, the applicable fee in a treasury chalan, the no objection certificates (NOCs) from the local authority, NOCs from forest department (if it is required in case of cutting any forested plant, private or public) and NOC from other relevant agencies for operational activity etc. to the Head Office of DOE with a copy to concerned Divisional offices of DOE.

11.09.2014

(**Syed Nazmul Ahsan**)
Deputy Director (Environmental Clearance)
and
Member Secretary
Environmental Clearance Committee
Phone # 8181778

Project Director
Meghnaghat-Madunaghat-Matarbari 400KV Transmission Line Project
Power Grid Company of Bangladesh (PGCB) Ltd.
Institution of Engineers Bangladesh (IEB) Bhaban (New) 3rd & 4th Floor
Ramna, Dhaka-1000

Copy Forwarded to :

1) Private Secretary to the Hon'ble Secretary, Ministry of Environment and Forests, Bangladesh Secretariat, Dhaka.
3) Director, Department of Environment, Dhaka/Chittagong Divisional Office, Dhaka/Chittagong.
4) Assistant Director, Office of the Director General, Department of Environment, Head Office, Dhaka.

Appendix VII

Results of the Survey

on

Natural Environment

(List of Terrestrial Flora and Fauna)

Table-1: Terrestrial Flora List in the Rainy season

Sl. No.	*Scientific name*	Local name	English name	Family	Survey sites No. (A,B,C=Number of quadrat)														Conservation Sites			Remarks
					7		**6**	**5**	**4**			**3**		**2**		**1**			IUCN	CITES	Local Law	
					A	B	A		A	B	C	A	B	A	B	A	B	C				
1	*Acanthus ilicifolius* L.	Hargoza	Holy-leaved acanthus	Acanthaceae	√																	
2	*Abelmoschus moschatus* Medik	Bannoderos	Musk mallow	Malvaceae					√													
3	*Acacia auriculiformis Benth.*	Akashi	Ear-pod wattle	Mimosaceae	√			√			√											
4	*Acacia catechuoides (Roxb.)* Benth.	Khoira		Mimosaceae								√										
5	*Acacia mangium* Willd.	Akashi	Wattle	Mimosaceae			√	√	√													
6	*Achyranthes aspera* L.	Apang	Red chaff tree	Amaranthaceae	√		√	√		√	√		√					√				
7	*Alstonia macrophylla* Wall. *ex* G.Don	BaroChhatim	Devil's tree	Apocynaceae	√						√								NT			
8	*Ageratum conyzoides* (L.) L.	Fulkuri	Tropical white weed	Asteraceae				√	√		√											
9	*Albizia procera* (Roxb.) Benth.	Silkorai	White siris	Mimosaceae		√		√	√													
10	*Albizia saman* (Jacq.) Merr.	Rain tree	Rain tree	Mimosaceae		√	√		√									√				
11	*Alstonia scholaris* (L.) R.Br.	Chatim	Dita bark tree	Apocynaceae										√					LC			
12	*Alternanthera philoxeroides* (Mart.) Griseb.	Helencha	Alligator weed	Amaranthaceae		√			√	√	√				√			√				
13	*Alternanthera sessilis* (L.) R.Br. *ex* DC.	Sachishak	Sessile joywood	Amaranthaceae														√	LC			
14	*Amaranthus spinosus L.*	Kantamairra	Spiny pigweed	Amaranthaceae											√							
15	*Amaranthus viridis* L.	MairraShak	Green amaranth	Amaranthaceae					√	√												
16	*Ananus comosus*(L.) Merr.	Anaros	Pineapple	Bromeliaceae	√			√											LC			
17	*Artocarpus heterophyllus* Lam.	Kathal	Jack fruit	Moraceae	√	√		√			√											

Table-1: Terrestrial Flora List in the Rainy season

Sl. No.	*Scientific name*	Local name	English name	Family	Survey sites No. (A,B,C=Number of quadrat)														Conservation Sites			Remarks
					7		**6**	**5**	**4**			**3**		**2**		**1**			IUCN	CITES	Local Law	
					A	B	A		A	B	C	A	B	A	B	A	B	C				
18	*Artocarpus lacucha* Buch.-Ham.	Barta	Monkey jack	Moraceae	√																	
19	*Averrhoa carambola* L.	Kamranga shim	Carambola apple	Fabaceae	√																	
20	*Avicennia alba* Blume	Barabaen		Verbenaceae	√														LC			
21	*Azadirachta indica* A. Juss.	Nim	Neem tree	Meliaceae		√		√														
22	*Bambusa tulda* Roxb.	Mitinga	Indian bamboo	Poaceae	√						√											
23	*Bambusa vulgaris Schrad.*	Bangla bans	Common bamboo	Poaceae	√				√		√		√									
24	*Barringtonia acutangula* (L.) Gaertn.	Hizal	Indian oak	Lecythidaceae			√		√													
25	*Bombax ceiba* L.	Simul	Red silk cotton tree	Bombacaceae					√													
26	*Borassus flabellifer* L.	Tal	Barb tree	Arecaceae	√	√	√	√			√								EN			
27	*Bougainvillea glabra* Choisy	Baganbilas	Bougainvillea	Nyctaginaceae	√																	
28	*Calotropis gigantea* (L.) Ait.f.	Akand	Swallow tree	Asclepiadaceae												√						
29	*Carica papaya* L.	Pepe	Papaya	Caricaceae	√	√		√			√											
30	*Casuarina equisetifolia* L.	Jau	Beefwood	Casuarinaceae											√							
31	*Catunaregam spinosa* (Thunb.) Tirveng	Mankanta	Common emetic nut	Rubiaceae	√																	
32	*Centella asiatica* (L.) Urban.	Thankuni	Spadeleaf	Apiaceae					√									√	LC			
33	*Cheilocostus speciosus* (J.Konig) C.Specht	Kew shak	Canereed	Costaceae								√										
34	*Chromolaena odorata* (L.) R.M.King & H.Rob.	Asamlata	Paraffin weed	Asteraceae	√		√				√	√										

Table-1: Terrestrial Flora List in the Rainy season

Sl. No.	*Scientific name*	Local name	English name	Family	Survey sites No. (A,B,C=Number of quadrat)														Conservation Sites			Remarks
					7		**6**	**5**	**4**			**3**		**2**		**1**			IUCN	CITES	Local Law	
					A	B	A		A	B	C	A	B	A	B	A	B	C				
35	*Citrus maxima* (Burm.f.) Merr.	Jambura	Pummelo	Rutaceae		√																
36	*Clerodendrum viscosum* Vent.	Vat		Verbenaceae	√		√	√				√		√								
37	*Coccinia grandis* (L.) Voigt	Kelakachupata	Ivy gourd	Cucurbitaceae		√	√											√				
38	*Cocos nucifera* L.	Nairkel	Coconut palm	Arecaceae		√	√	√			√											
39	*Colocasia esculenta* (L.) Schott	Kachu	Cocoyam	Araceae	√		√	√	√		√		√						LC			
40	*Canna indica L.*	Kalaboti	Canna lily	Cannaceae		√	√	√										√				
41	*Commelina benghalensis* L.	Kanaialata	Blue commelina	Commelinaceae	√				√		√				√				LC			
42	*Corchorus capsularis* L.	Deshi pat	Jute	Tiliaceae													√					
43	*Crateva magna* (Lour.) DC.	Barun	Three leaved caper	Capparaceae														√				
44	*Crotalaria pallidaAiton*	Jhunjhuni		Fabaceae						√												
45	*Croton bonplandianus* Baill.	Paglamarich	Bonplant's croton	Euphorbiaceae			√	√	√					√		√						
46	*Curcuma zedoaria (Christm.)* Roscoe	Soti	Indian arrowroot	Zingiberaceae										√								
47	*Cuscuta reflexa* Roxb.	Sunnalata	Dodder	Cuscutaceae											√							
48	*Cyanthillium cinereum* (L.) H.Rob.	Sialimutra	Purple fleabane	Asteraceae					√													
49	*Cynodon dactylon* (L.) Pers.	Durba grass	Star grass, Couch grass	Poaceae		√												√				
50	*Cyperus rotandus* L.	Nagarmutha	Nut grass	Cyperaceae	√				√													
51	*Desmodium gangeticum* (L.) DC.	Chalani		Fabaceae								√										

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Sl. No.	*Scientific name*	Local name	English name	Family	Survey sites No. (A,B,C=Number of quadrat)														Conservation Sites			Remarks
					7		**6**	**5**	**4**			**3**		**2**		**1**			IUCN	CITES	Local Law	
					A	B	A		A	B	C	A	B	A	B	A	B	C				
52	*Dioscorea alata* L.	Banga alu	Asiatic yam	Dioscoreaceae											√							
53	*Dioscorea bulbifera* L.	Banalu	Air potato	Dioscoreaceae										√								
54	*Dioscorea pentaphylla* L.	Jum alu	Five-leafyam	Dioscoreaceae								√										
55	*Diplazium esculentum* (Retz.) Sw.	Dhekishak		Woodsiaceae						√									LC			
56	*Dipterocarpus turbinatus* Gaertn.	Garjan	The eng tree	Dipterocarpaceae							√								CR			
57	*Eclipta prostrata* (L.) L.	Kesraj	False daisy	Asteraceae		√													DD			
58	*Eichhornia crassipes* (Mart.) Solms	Kachuripana	Water-hyacinth	Pontederiaceae		√				√					√		√	√				
59	*Elaeocarpus floribundus* Blume	Jalpai	Indian olive	Elaeocarpaceae	√				√		√											
60	*Elephantopus scaber* L.	Shamdalan	Elephant's foot	Asteraceae					√	√												
61	*Enhydra fluctuans* Lour.	Hinchashak	Marsh herb	Asteraceae		√																
62	*Erythrina variegta var. picta* Maheshw.	Mandar	Indian coral tree	Fabaceae		√		√	√		√				√							
63	*Eucalyptus globules* Labill	Globu eucalyptus		Myrtaceae	√	√																
64	*Eupatorium antiquorum* L.	Tesramansa	Malayan spurge	Euphorbiaceae		√		√			√											
65	*Euphorbia hirta* L.	Dudialata	Snake weed	Euphorbiaceae												√						
66	*Ficus erecta* Thunb.	Ballagota	Japanese fig	Moraceae						√									LC			
67	*Ficus hispida* L.f.	Dumur	opposite leave fig	Moraceae	√					√	√	√										
68	*Ficus rumphii* Blume	Jhula bot	Weeping fig	Moraceae													√					

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Sl. No.	*Scientific name*	Local name	English name	Family	Survey sites No. (A,B,C=Number of quadrat)														Conservation Sites			Remarks
					7		**6**	**5**	**4**			**3**		**2**		**1**			IUCN	CITES	Local Law	
					A	B	A		A	B	C	A	B	A	B	A	B	C				
69	*Gmelina arborea* Roxb.	Gamari	White teak	Verbenaceae	√		√	√	√		√											
70	*Glycosmis pentaphylla* (Retz.) A.DC	Datmagan	Motar tree	Rutaceae			√				√		√									
71	*Heliotropicum indicum* L.	Hatishur	Indian heliotrope	Boraginaceae			√															
72	*Hibiscus rosasinensis* L.	Joba	China rose	Malvaceae		√																
73	*Ipomoea fistulosa* Mart.*ex* Choisy	Dolkolmi		Convolvulaceae		√			√		√						√	√				
74	*Ipomoea aquatica* Forssk.	Kalmi	Water spinach	Convolvulaceae		√											√	√	LC			
75	*Ixora paevetta* Andr.	Gandhalrangan	The torch tree	Rubiaceae		√		√														
76	*Justicia gendarussa* Burm.f.*	Jagatmadan		Convolvulaceae		√			√		√											
77	*Lagerstroemia speciosa* (L.) Pers.	Jarul		Lythraceae									√									
78	*Lannea coromandelica* (Houtt.) Merr.	Badi		Anacardiaceae					√						√							
79	*Lantana camara* L.	Khutuskanta	Lantana	Verbenaceae	√		√	√	√													
80	*Lepisanthes rubiginosa* (Roxb.) Leenh.	Rubihorina		Sapindaceae	√							√										
81	*Lindernia antipoda* (L.) Alston	Zai ghas	Sparrow false pimpernel	Linderniaceae														√	LC			
82	*Lippia alba* (P.Mill.) N.E.Br. ex Britt. & Wilson	Shunk		Verbenaceae						√								√				
83	*Ludwigia adscendens* (L.) Hara	Mulcha		Onagraceae											√							
84	*Ludwigia hyssopifolia* (G.Don) Exell.	Zaikura	Seedbox	Onagraceae						√					√				LC			

Table-1: Terrestrial Flora List in the Rainy season

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					7		**6**	**5**	**4**			**3**		**2**		**1**			IUCN	CITES	Local Law	
					A	B	A		A	B	C	A	B	A	B	A	B	C				
85	*Lygodium japonicum* (Thunb.) Sw.	Japanilata fern		Schizaeaceae	√							√										
86	*Mangifera indica* L.	Aam	Mango	Anacardiaceae	√	√		√			√								DD			
87	*Marsilea minuta* L.	Susnishak	Marshy fern	Marsileaceae		√			√		√								LC			
88	*Melastoma malabathricum* L.	Bon tejpata	Indian rhododendron	Melastomaceae	√							√										
89	*Melia azederach* L.	Ghoranim	Bead tree	Meliaceae			√															
90	*Mikania micrantha* kunth	Asamlata	Heartleaf	Asteraceae	√	√		√			√											
91	*Merremia gangetica*	Indukanipana		Convolvulaceae	√														LC			
92	*Microcos paniculata* L.	Asargula		Tiliaceae	√																	
93	*Mikania micrantha* Kunth	Tufainnalata	Heratleafhempvine	Asteraceae	√		√		√	√	√	√	√									
94	*Mimosa himalayna* Gamble*	Borosarmida	Giant sensitive plant	Mimosaceae	√																	
95	*Mimosa pudica* L.	Lajjabati	Sensitive plant	Mimosaceae	√	√		√			√	√							LC			
96	*Momordica charantia* L. *var. charantia*	Titakorolla	Bitter melon	Cucurbitaceae	√				√													
97	*Moringa olifera* Lam.	Sajna	Horse radish tree	Moringaceae	√																	
98	*Momordica cochinensis* (Lour.) Sprengel	Kakrul, Akri	Sweet gourd	Cucurbitaceae							√											
99	*Monochoria hastata* (L.) Solms.	Fena	Arrowleaf false pickereweed	Pontederiaceae						√									LC			

Table-1: Terrestrial Flora List in the Rainy season

Sl. No.	*Scientific name*	Local name	English name	Family	Survey sites No. (A,B,C=Number of quadrat)														Conservation Sites			Remarks
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					A	B	A		A	B	C	A	B	A	B	A	B	C				
100	*Musa paradisiaca* L.	Kacha kola	Banana	Musaceae	√	√		√			√											
101	*Neolamarckia cadamba* (Roxb.) Bosser	Kadam		Rubiaceae										√								
102	*Nymphaea nouchali* Burm.f.	Shapla	Water lily	Nymphaeaceae														√	LC			
103	*Oryza sativa* L.	Dhan	Paddy	Poaceae										√	√		√					
104	*Pandanus foetidus* Roxb.	Koikikanta	Screw pine	Pandanaceae					√													
105	*Passiflora foetida* L.	Jumkolata	Wild passion fruit	Passifloraceae								√										
106	*Persicaria orientalis* (L.) Spach	Biskatali	The garden gate	Polygonaceae			√															
107	*Phoenix sylvestris* (L.) Roxb.	Khajur	Date sugar palm	Arecaceae					√													
108	*Phyllanthus acidus* (L.) Skeels	Horboroi	Country gooseberry	Euphorbiaceae	√						√											
109	*Phyllanthus emblica* L.	Amloki	Indian gooseberry	Euphorbiaceae	√						√											
110	*Phyllanthus reticulatus* Poir.	Cirkuti	Reticulated leaf-flaver	Euphorbiaceae					√	√	√			√								
111	*Phyllanthus sikkimensis* Mull.Arg.*	Sikimamla		Euphorbiaceae		√																
112	*Piper retrofractum* Vahl	Chai lata	Javanese long pepper	Piperaceae											√							
113	*Piper peepuloides* Roxb.	Pipul		Piperaceae							√											
114	*Pistia stratiotes* L.	Futihena	Tropical duckweed	Araceae		√									√				LC			
115	*Pongamia pinnata* (L.) Pierre	Koronja	indian beach	Fabaceae		√													LC			
116	*Pouzolzia zeylanica* (L.) Benn.	Kullaruki	Pouzolzia	Urticaceae		√			√		√											

Table-1: Terrestrial Flora List in the Rainy season

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					7		**6**	**5**	**4**			**3**		**2**		**1**			IUCN	CITES	Local Law	
					A	B	A		A	B	C	A	B	A	B	A	B	C				
117	*Premna esculenta* Roxb.	Lalana		Verbenaceae																		
118	*Psidium guajava*L.	Peyara	Guava	Myrtaceae	√			√	√		√											
119	*Raphanus sativus* L.	Mula	Radish	Brassicaceae		√																
120	*Ricinus communis* L.	Verenda	Castor	Euphorbiaceae														√				
121	*Schumannianthus dichotomus* (Roxb.) Gagnep.	Sitolpati		Marantaceae	√				√		√											
122	*Scoparia dulcis* L.	Bondhone	Goat weed	Scrophulariaceae			√		√													
123	*Senna tora* (L.) Roxb.	Chotokaloke shunde	Metal seed	Caesalpiniaceae					√		√		√									1
124	*Senna sophera* (L.) Roxb.	Barokalokes hunde	Pepper-leaved senna	Caesalpiniaceae												√						
125	*Sesamum indicum* L.	Til	Sesame	Pedaliaceae														√				
126	*Sesbania sesban* (L.) Merr.	Hola	Common sesban	Fabaceae													√	√				
127	*Sida acuta* Burm.f.	Kureta, Ururia	Broom weed	Malvaceae					√	√	√	√						√				
128	*Sida cordifolia* L.	Shet-berela	Flannel weed	Malvaceae			√															
129	*Sida rhombifolia* L.	Kureta	Cuba jute	Malvaceae								√						√				
130	*Smilax ovalifolia* Roxb. *ex* D.Don	Kumairralata	Black creeper	Smilacaceae	√																	
131	*Solanum americanum* Mill.	Tit begun		Solanaceae	√	√					√											
132	*Solanum melongena* L.	Begun	Brinjal	Solanaceae	√	√		√			√											
133	*Solanum nigrum* L.	Futibegun	Black night	Solanaceae											√			√				
134	*Solanum sisymbrifolium* Lam.	Kantikari	Prickly brinjal	Solanaceae												√						

Table-1: Terrestrial Flora List in the Rainy season

Sl. No.	*Scientific name*	Local name	English name	Family	Survey sites No. (A,B,C=Number of quadrat)														Conservation Sites			Remarks
					7		**6**	**5**	**4**			**3**		**2**		**1**			IUCN	CITES	Local Law	
					A	B	A		A	B	C	A	B	A	B	A	B	C				
135	*Solanum torvum Sw.*	Titbegun	Cherry eggplant	Solanaceae						√					√							
136	*Spermacoce articularis* L.f.	Atharogia		Rubiaceae						√												
137	*Sphagneticola calendulacea* (L.) Pruski	Vimraj	Trailing daisy	Asteraceae						√												
138	*Spilanthes acmella* (L.) L.	Maricha		Asteraceae			√			√	√											
139	*Stephania japonica* (Thunb.) Miers	Musarralata	Snake vine	Menispermaceae					√		√				√			√				
140	*Streblus asper* Lour.	Horba	Toothbrush tree	Moraceae	√		√	√	√		√											
141	*Swietenia mahagoni* (L.) Jacq.	Mahogany	Spanish mahogony	Meliaceae	√				√		√								EN			
142	*Synedrella nodiflora* (L.) Gaertn.	Relanodi	Nodeweed	Asteraceae			√		√	√					√							
143	*Syzygium cuminii* (L.) Skeels		Java plum	Myrtaceae					√		√	√										
144	*Syzygium fruticosum* (Roxb.) DC.	Kawyagajam		Myrtaceae	√																	
145	*Tabernaemontana alternifolia* L.	Janglitagar		Apocynaceae	√																	
146	*Tectona grandis* L.f.	Segun	Teak	Verbenaceae	√							√	√									
147	*Tamarindus indica* L.	Tetul	Tamarind tree	Tamaricaceae		√																
148	*Terminalia catappa* L.	Katbadam	Indian almond	Combretaceae					√					√								
149	*Urena lobata* L.	Jangligagra	Congo jute	Malvaceae	√																	
150	*Vitex negundo* L.	Nishinda	Chaste tree	Verbenaceae		√																
151	*Ziziphus mauritiana* Lam.	Kul	Plum	Rhamnaceae		√	√		√													

Table-1: Terrestrial Flora List in the Rainy season

Sl. No.	*Scientific name*	Local name	English name	Family	Survey sites No. (A,B,C=Number of quadrat)														Conservation Sites			Remarks
					7		**6**	**5**	**4**			**3**		**2**		**1**			IUCN	CITES	Local Law	
					A	B	A		A	B	C	A	B	A	B	A	B	C				
152	*Ziziphus oenoplia* (L.) Mill.	Bonboroi	Jackal jujube	Rhamnaceae	√																	

Table-2 Terrestrial Fauna (Insects) in the Rainy season

Sampling stations		1			2		3		4			5	6	7		
		A	B	C	A	B	A	B	A	B	C	A	A	A	B	
Name of the site		Meghnaghat power station Narayangonj	Hosendy, 1 no union,Gojaria, Munshigonj	Lukhipur, Voberchar union, Gojaria, Munshigonj	Zur kezur gasch, Poishakhi, 8 no union, Laksam, Comilla	Shirpulia, 2 no pidia union, langolkut, Comilla	Gamari Bagan, Noi tila majarer upor, Korerhut Union, Joralgonj, Mirsharai	Segun Bagan, Korerhut Union, Jorajgonj, mirsharai, Chittagong	Purba Guzara, Raozan	Garibullah para, Raozan.	Lambur hat, Raozan	Mudhunaghat, Chittagong	Banunchara, Banshkhali	Laichata union, Banshkhali	Janghal Pyron, Chechuria, Banshkhali	IUCN Global status
Species Name																
Common Name	Scientific Name															
Order: Odonata	Family: Coenagriidae															
Narrow-winged Damselfly (Foring)	*Agriocnemis femina* (Brauer), 1890	√			√	√			√	√	√	√	√	√	√	LC
Damselfly (Foring)	*Agriocnemis pygmaea* (Rambur)				√	√			√	√	√			√	√	LC
Damselfly (Foring)	*Ceriagrion cerinorubellum* (Brauer)				√				√	√	√	√	√	√	√	LC
Damselfly (Foring)	*Pseudagrion microcephalum* Rambur, 1842								√	√	√			√	√	LC
Narrow-winged Damselfly (Foring	*Copera vittata* Selys, 1863								√	√	√			√	√	LC
Fork-tail Daselfly (Foring)	*Ischnura senegalensis* Rambur				√											LC
Family: Libellulidae																

Table-2 Terrestrial Fauna (Insects) in the Rainy season

Sampling stations		1			2		3		4			5	6	7		
		A	B	C	A	B	A	B	A	B	C	A	A	A	B	
Name of the site		Meghnaghat power station Narayangonj	Hosendy, 1 no union,Gojaria, Munshigonj	Lukhipur, Voberchar union, Gojaria, Munshigonj	Zur kezur gasch, Poishakhi, 8 no union, Laksam, Comilla	Shirpulia, 2 no pidia union, langolkut, Comilla	Gamari Bagan, Noi tila majarer upor, Korerhut Union, Joralgonj, Mirsharai	Segun Bagan, Korerhut Union, Jorajgonj, mirsharai, Chittagong	Purba Guzara, Raozan	Garibullah para, Raozan.	Lambur hat, Raozan	Mudhunaghat, Chittagong	Banunchara, Banshkhali	Laichata union, Banshkhali	Janghal Pyron, Chechuria, Banshkhali	IUCN Global status
Species Name																
Common Name	Scientific Name															
Evening Skimmer (Foring)	*Tholymis tillarga* Fabricius, 1798								√	√	√			√	√	LC
Slender skimmer (Foring)	*Orthetrum sabina* Drury, 1770				√				√	√	√	√	√	√	√	LC
Common red skimmer (Foring)	*Orthetrum pruinosum neglectum* Rambur, 1842								√	√	√	√		√	√	LC
Black-tailed skimmer Dragonfly (Foring)	*Orthetrum cancellatum* Linnaeus, 1758								√	√	√			√	√	LC
Skimmer (Foring)	*Neurothemis fulvia* Kirby, 1889								√	√	√	√	√	√	√	LC
Common Skimmer (Foring)	*Hydrobasileus croceus* Brauer, 1867								√	√	√	√	√	√	√	LC
Blue darter (Foring)	*Diplacodes trivialis*								√	√	√			√	√	LC
Black-tipped percher (Foring)	*Diplacodes nebulosa* Fabricius,1793								√	√	√	√	√	√	√	LC
Skimmer (Foring)	*Brachythemis contaminata* Fabricius,1793								√	√	√	√	√	√	√	LC

Table-2 Terrestrial Fauna (Insects) in the Rainy season

Sampling stations		1			2		3		4			5	6	7		
		A	B	C	A	B	A	B	A	B	C	A	A	A	B	
Name of the site		Meghnaghat power station Narayangonj	Hosendy, 1 no union,Gojaria, Munshigonj	Lukhipur, Voberchar union, Gojaria, Munshigonj	Zur kezur gasch, Poishakhi, 8 no union, Laksam, Comilla	Shirpulia, 2 no pidia union, langolkut, Comilla	Gamari Bagan, Noi tila majarer upor, Korerhut Union, Joralgonj, Mirsharai	Segun Bagan, Korerhut Union, Jorajgonj, mirsharai, Chittagong	Purba Guzara, Raozan	Garibullah para, Raozan.	Lambur hat, Raozan	Mudhunaghat, Chittagong	Banunchara, Banshkhali	Laichata union, Banshkhali	Janghal Pyron, Chechuria, Banshkhali	IUCN Global status
Species Name																
Common Name	Scientific Name															
Skimmer (not known)	*Brachydiplax chalybea* Brauer, 1868								√	√	√	√	√	√	√	LC
Wandering Glider (Foring)	*Pantala flavescens* Fabricius					√										LC
Order: Orthoptera Family: Gryllidae																
Cricket (Urchunga)	*Gryllus* spp.						√	√	√	√	√			√	√	LC
Family: Acrididae																
Small Rice Grasshopper	*Oxya chinensis*				√	√			√	√	√	√		√	√	LC
(Ghas Foring)	(Thunberg)															
Short horned Grasshopper (Ghas Foring)	*Oxya hyla* Serville				√	√										LC
Short Horned Grasshopper (Ghas	*Trilophidia annulata* (Thunberg)				√	√										LC

Table-2 Terrestrial Fauna (Insects) in the Rainy season

Sampling stations		1			2		3		4			5	6	7		
		A	B	C	A	B	A	B	A	B	C	A	A	A	B	
Name of the site		Meghnaghat power station Narayangonj	Hosendy, 1 no union,Gojaria, Munshigonj	Lukhipur, Voberchar union, Gojaria, Munshigonj	Zur kezur gasch, Poishakhi, 8 no union, Laksam, Comilla	Shirpulia, 2 no pidia union, langolkut, Comilla	Gamari Bagan, Noi tila majarer upor, Korerhut Union, Joralgonj, Mirsharai	Segun Bagan, Korerhut Union, Jorajgonj, mirsharai, Chittagong	Purba Guzara, Raozan	Garibullah para, Raozan.	Lambur hat, Raozan	Mudhunaghat, Chittagong	Banunchara, Banshkhali	Laichata union, Banshkhali	Janghal Pyron, Chechuria, Banshkhali	IUCN Global status
Species Name																
Common Name	Scientific Name															
Foring)																
Short horned grasshopper (Ghas foring)	*Locusta danica*								√	√	√	√			√	LC
Order: Dictyoptera Family: Mantidae																
Praying mantis (Shikari mantis)	*Mantis religiosa* Linnaeus, 1758						√	√	√	√	√	√	√	√	√	LC
Order: Diptera Family: Culicidae																
Aedes mosquito (Mosha)	*Aedes aegypti* Linnaeus, 1762								√				√		√	LC
Culex mosquito (Mosha)	*Culex* spp.								√				√		√	LC
Family: Syrphidae																
Hoverfly	*Eristalinus quinquelineatus* (Fabricius)								√	√	√				√	LC
Hover fly	*Episyrphus spp.*								√	√	√				√	LC

Table-2 Terrestrial Fauna (Insects) in the Rainy season

Sampling stations		1			2		3		4			5	6	7		
		A	B	C	A	B	A	B	A	B	C	A	A	A	B	
Name of the site		Meghnaghat power station Narayangonj	Hosendy, 1 no union,Gojaria, Munshigonj	Lukhipur, Voberchar union, Gojaria, Munshigonj	Zur kezur gasch, Poishakhi, 8 no union, Laksam, Comilla	Shirpulia, 2 no pidia union, langolkut, Comilla	Gamari Bagan, Noi tila majarer upor, Korerhut Union, Joralgonj, Mirsharai	Segun Bagan, Korerhut Union, Jorajgonj, mirsharai, Chittagong	Purba Guzara, Raozan	Garibullah para, Raozan.	Lambur hat, Raozan	Mudhunaghat, Chittagong	Banunchara, Banshkhali	Laichata union, Banshkhali	Janghal Pyron, Chechuria, Banshkhali	IUCN Global status
Species Name																
Common Name	Scientific Name															
Family: Muscidae																
House fly	*Musca domestica* Linn.	√	√	√	√				√	√	√	√	√	√	√	LC
Order: Homoptera Family: Delphacidae																
Brown planthopper (Badami gachh foring)	*Nilaparvata lugens*, Stal, 1924								√	√	√	√	√	√	√	LC
Family: Cicadellidae																
Rice green leaf (Dhaner sabuj pata foring)	*Nephotettix nigropictus*			√	√	√			√	√	√			√	√	LC
Spotted jassid	*Nephotettix cincticeps* Matsumura								√	√	√				√	LC
Family: Alydidae																
Rice bug (Dhaner Gandhi poka)	*Leptocorisa acuta* Thunberg, 1904			√	√	√			√	√	√			√	√	LC

Table-2 Terrestrial Fauna (Insects) in the Rainy season

Sampling stations		1			2		3		4			5	6	7		
		A	B	C	A	B	A	B	A	B	C	A	A	A	B	
Name of the site		Meghnaghat power station Narayangonj	Hosendy, 1 no union,Gojaria, Munshigonj	Lukhipur, Voberchar union, Gojaria, Munshigonj	Zur kezur gasch, Poishakhi, 8 no union, Laksam, Comilla	Shirpulia, 2 no pidia union, langolkut, Comilla	Gamari Bagan, Noi tila majarer upor, Korerhut Union, Joralgonj, Mirsharai	Segun Bagan, Korerhut Union, Jorajgonj, mirsharai, Chittagong	Purba Guzara, Raozan	Garibullah para, Raozan.	Lambur hat, Raozan	Mudhunaghat, Chittagong	Banunchara, Banshkhali	Laichata union, Banshkhali	Janghal Pyron, Chechuria, Banshkhali	IUCN Global status
Species Name																
Common Name	Scientific Name															
Family:Pentatomida																
Radish bug (Not available)	*Eurydema pulchrum* Westwood, 1837								√	√	√	√			√	LC
Order: Lepidoptera Family: Pieridae																
Common Grass Yellow (Holud)	*Eurema hecabe contubernalis* Moore			√	√	√	√	√	√	√	√	√	√	√	√	LC
Common Emigrant (Pairachali)	*Catopsilia Pomona* (Fabricius)						√	√								LC
Red spot Jezebel (Kanka)	*Delias descombesi descombesi* (Boisduval)								√	√	√	√	√			LC
The spot puffin (not available)	*Appias lalage lalage* Doubleday, 1842								√	√	√	√	√	√	√	LC
Family: Amathusiidae																
Common Duffer (Kotkote)	*Discophora sondaica zal* Westwood						√	√								LC

Table-2 Terrestrial Fauna (Insects) in the Rainy season

Sampling stations		1			2		3		4			5	6	7		
		A	B	C	A	B	A	B	A	B	C	A	A	A	B	
Name of the site		Meghnaghat power station Narayangonj	Hosendy, 1 no union,Gojaria, Munshigonj	Lukhipur, Voberchar union, Gojaria, Munshigonj	Zur kezur gasch, Poishakhi, 8 no union, Laksam, Comilla	Shirpulia, 2 no pidia union, langolkut, Comilla	Gamari Bagan, Noi tila majarer upor, Korerhut Union, Joralgonj, Mirsharai	Segun Bagan, Korerhut Union, Jorajgonj, mirsharai, Chittagong	Purba Guzara, Raozan	Garibullah para, Raozan.	Lambur hat, Raozan	Mudhunaghat, Chittagong	Banunchara, Banshkhali	Laichata union, Banshkhali	Janghal Pyron, Chechuria, Banshkhali	IUCN Global status
Species Name																
Common Name	Scientific Name															
Family: Danaidae																
White Tiger (Shushama)	*Danaus melanippus indicus* (Fruhstorfer)						√									LC
Glassy Tiger (Shetalkuchi)	*Parantica aglea aglea* (Stoll)						√	√								LC
Family: Nymphalidae																
Powdered Baron (Tomosha)	Euthalia monina kesava Moore						√	√								LC
The grey pansy	*Junonia atlites* (Linn.)						√	√	√	√	√				√	LC
The lemon pansy	*Junonia lemonias* Linnaeus, 1758								√	√	√	√	√	√	√	LC
Family: Satyridae																
Dark Evening Brown	*Melanitis phedima bela* Moore						√	√	√	√	√			√	√	LC
The long- brand bushbrown (not available)	*Mycalesis visala visala* Moore, 1857								√	√	√	√	√	√	√	LC
Family: Papilionidae																

Table-2 Terrestrial Fauna (Insects) in the Rainy season

Sampling stations		1			2		3		4			5	6	7		
		A	B	C	A	B	A	B	A	B	C	A	A	A	B	
Name of the site		Meghnaghat power station Narayangonj	Hosendy, 1 no union,Gojaria, Munshigonj	Lukhipur, Voberchar union, Gojaria, Munshigonj	Zur kezur gasch, Poishakhi, 8 no union, Laksam, Comilla	Shirpulia, 2 no pidia union, langolkut, Comilla	Gamari Bagan, Noi tila majarer upor, Korerhut Union, Joralgonj, Mirsharai	Segun Bagan, Korerhut Union, Jorajgonj, mirsharai, Chittagong	Purba Guzara, Raozan	Garibullah para, Raozan.	Lambur hat, Raozan	Mudhunaghat, Chittagong	Banunchara, Banshkhali	Laichata union, Banshkhali	Janghal Pyron, Chechuria, Banshkhali	IUCN Global status
Species Name																
Common Name	Scientific Name															
Common mormon (not available)	*Papilio plytes laertias Romulus* Cramer, 1775								√	√	√	√	√	√	√	LC
Common Birdwing (Shonal)	*Troides Helena Cerberus* (Felder & Felder)						√	√								LC
Family: Hesperioidea																
Smaller Darlet	*Oriens goloides* Moore								√	√	√			√	√	LC
Order: Coleoptera Family: Chrysomelidae																
Red pumpkin beetle	*Aulacophora foveicollis* Lucas	√	√	√	√	√	√	√	√	√	√			√	√	LC
Pumpkin beetle	*Aulacophora frontalis* Baly	√	√	√	√	√	√	√	√	√	√			√	√	LC
Order: Hymenoptera Family: Aphidae																
Aphis	*Rhopalosiphum sp.*				√	√			√	√	√	√	√	√	√	LC
Family: Anthophoridae																

Table-2 Terrestrial Fauna (Insects) in the Rainy season

Sampling stations		1			2		3		4			5	6	7		
		A	B	C	A	B	A	B	A	B	C	A	A	A	B	
Name of the site		Meghnaghat power station Narayangonj	Hosendy, 1 no union,Gojaria, Munshigonj	Lukhipur, Voberchar union, Gojaria, Munshigonj	Zur kezur gasch, Poishakhi, 8 no union, Laksam, Comilla	Shirpulia, 2 no pidia union, langolkut, Comilla	Gamari Bagan, Noi tila majarer upor, Korerhut Union, Joralgonj, Mirsharai	Segun Bagan, Korerhut Union, Jorajgonj, mirsharai, Chittagong	Purba Guzara, Raozan	Garibullah para, Raozan.	Lambur hat, Raozan	Mudhunaghat, Chittagong	Banunchara, Banshkhali	Laichata union, Banshkhali	Janghal Pyron, Chechuria, Banshkhali	IUCN Global status
Species Name																
Common Name	Scientific Name															
	Amegilla spp.	√	√				√	√	√	√	√				√	LC
Family: Halictidae																
Solitary Bee	*Lasioglossum* sp.	√	√				√	√	√	√	√				√	LC
	Nomia sp.		√													LC
Family: Trigonidae																
Sweat bee	*Trigona* sp.								√	√	√				√	LC
Family: Apidae																
Western Honey bee (Momachhi)	*Apis mellifera* Linn.								√	√	√				√	LC
Wild Honey bee (Bonno Momachhi)	*Apis dorsata*Linn.						√	√								LC
Family: Vespoidae																
Bolta	*Vespa* sp.								√	√	√	√	√	√	√	LC

Table-2 Terrestrial Fauna (Insects) in the Rainy season

Sampling stations		1			2		3		4			5	6	7		
		A	B	C	A	B	A	B	A	B	C	A	A	A	B	
Name of the site		Meghnaghat power station Narayangonj	Hosendy, 1 no union,Gojaria, Munshigonj	Lukhipur, Voberchar union, Gojaria, Munshigonj	Zur kezur gasch, Poishakhi, 8 no union, Laksam, Comilla	Shirpulia, 2 no pidia union, langolkut, Comilla	Gamari Bagan, Noi tila majarer upor, Korerhut Union, Joralgonj, Mirsharai	Segun Bagan, Korerhut Union, Jorajgonj, mirsharai, Chittagong	Purba Guzara, Raozan	Garibullah para, Raozan.	Lambur hat, Raozan	Mudhunaghat, Chittagong	Banunchara, Banshkhali	Laichata union, Banshkhali	Janghal Pyron, Chechuria, Banshkhali	IUCN Global status
Species Name																
Common Name	Scientific Name															
Order: Coleoptera Family: Coccinellidae																
Lady beetle	*Micraspis crocea* (Mulsant)								√	√	√			√	√	LC
Order: Dictyoptera Family: Blattellidae																
German Cockroach (Telapoka)	*Blattella germanica* Linn.						√	√								LC
Family: Mantidae																LC
Praying Mantis (Praying Mantis)	*Mantis religiosa* (Linnaeus)						√	√								LC

Table-3 Terrestrial Fauna (Amphibian) in the Rainy season

Sampling stations		1			2		3		4			5	6	7		
		A	B	C	A	B	A	B	A	B	C	A	A	A	B	
Name of the site		Meghnaghat power station Narayangonj	Hosendy, 1 no union,Gojaria, Munshigonj	Lukhipur, Voberchar union, Gojaria, Munshigonj	Zur kezur gasch, Poishakhi, 8 no union, Laksam, Comilla	Shirpulia, 2 no pidia union, langolkut, Comilla	Gamari Bagan, Noi tila majarer upor, Korerhut Union, Joralgonj, Mirsharai	Segun Bagan, Korerhut Union, Jorajgonj, mirsharai, Chittagong	Purba Guzara, Raozan	Garibullah para, Raozan.	Lambur hat, Raozan	Mudhunaghat, Chittagong	Banunchara, Banshkhali	Laichata union, Banshkhali	Janghal Pyron, Chechuria, Banshkhali	IUCN Global status
Species Name																
Common Name	Scientific Name															
Order: Anura	Family: Bufonidae															
Southeast Asian toad	*Duttaphrynus (Bufo) melanostictus*		√	√	√	√	√	√	√	√	√	√	√	√	√	LC
	Family: Dicroglossidae															
Asiatic Bull Frog	*Hoplobatrachus tigerinus*		√	√	√	√	√	√	√		√	√	√	√	√	LC
Skipper Frog	*Euphlyctis cyanophlyctis*		√	√	√			√		√	√	√	√	√	√	LC
Indian Cricket frog	*Fejervarya limnocharis*	√	√	√		√	√	√			√				√	LC
Nepal Cricket frog	*Fejervarya nepalensis*			√		√	√								√	LC
Forest Cricket frog	*Fejervarya syhadrensis*		√		√	√	√			√					√	LC
Pierre's cricket frog	*Fejervarya pierrei*					√	√									LC
	Family: Rhacophoridae															
Common Indian tree frog	*Polypedates leucomystax*			√	√	√	√						√			LC

Table-3 Terrestrial Fauna (Amphibian) in the Rainy season

Sampling stations		1			2		3		4			5	6	7		
		A	B	C	A	B	A	B	A	B	C	A	A	A	B	
Name of the site		Meghnaghat power station Narayangonj	Hosendy, 1 no union,Gojaria, Munshigonj	Lukhipur, Voberchar union, Gojaria, Munshigonj	Zur kezur gasch, Poishakhi, 8 no union, Laksam, Comilla	Shirpulia, 2 no pidia union, langolkut, Comilla	Gamari Bagan, Noi tila majarer upor, Korerhut Union, Joralgonj, Mirsharai	Segun Bagan, Korerhut Union, Jorajgonj, mirsharai, Chittagong	Purba Guzara, Raozan	Garibullah para, Raozan.	Lambur hat, Raozan	Mudhunaghat, Chittagong	Banunchara, Banshkhali	Laichata union, Banshkhali	Janghal Pyron, Chechuria, Banshkhali	IUCN Global status
Species Name																
Common Name	Scientific Name															
	Family:Microhylidae															
Painted Bull Frog	*Kaloula pulchra*			√		√	√	√								LC
Ornate Narrow- mouthed Frog	*Microhyla ornata*		√	√	√	√	√	√								LC
	Family:Ranidae															
Two-striped Grass Frog	*Hylarana taipehensis*		√													LC

Table-4Terrestrial Fauna (Reptile) in the Rainy season

Sampling stations		1			2		3		4			5	6	7		
		A	B	C	A	B	A	B	A	B	C	A	A	A	B	
Name of the site		Meghnaghat power station Naravangoni	Hosendy, 1 no union,Gojaria, Munshigoni	Lukhipur, Voberchar union, Gojaria, Munshigoni	Zur kezur gasch, Poishakhi, 8 no union Laksam. Comilla	Shirpulia, 2 no pidia union, langolkut. Comilla	Gamari Bagan, Noi tila majarer upor, Korerhut Union, Joralgonj, Mirsharai	Segun Bagan, Korerhut Union, Joraigoni, mirsharai, Chittagong	Purba Guzara, Raozan	Garibullah para, Raozan.	Lambur hat, Raozan	Mudhunaghat, Chittagong	Banunchara, Banshkhali	Laichata union, Banshkhali	Janghal Pyron, Chechuria, Banshkhali	IUCN Global status
Species Name																
Common Name	Scientific Name															
Garden Lizard	*Calotes versicolor*				√	√	√	√	√	√	√		√	√	√	LC
Green garden lizard	*Calotes jerdoni*		√													LC
South Asian Giant House Gekko	*Gekko gecko*								√	√				√	√	LC
Spotted house Lizard	*Hemidactylus brookii*								√	√	√		√		√	LC
Garnot’s Gecko	*H. garnotii*								√	√	√		√	√	√	LC
Spotted house Lizard	*H. frenatus*	√		√					√	√	√		√	√	√	LC
Brooke's house gecko	*Hemidactylus brookii*			√			√	√								LC
Common Skink	*Eutropis carinatus*				√	√			√		√		√	√	√	LC
Stripped shink	*Mabuya dissimilis*															LC
Bengle Monitor	*Varanus bengalensis*		√	√	√	√	√	√		√				√		LC
Yellow Monitor	*V. flavescens*								√	√	√		√	√	√	LC

Table-4Terrestrial Fauna (Reptile) in the Rainy season

Sampling stations		1			2		3		4			5	6	7		
		A	B	C	A	B	A	B	A	B	C	A	A	A	B	
Name of the site		Meghnaghat power station Naravangoni	Hosendy, 1 no union,Gojaria, Munshigoni	Lukhipur, Voberchar union, Gojaria, Munshigoni	Zur kezur gasch, Poishakhi, 8 no union Laksam. Comilla	Shirpulia, 2 no pidia union, langolkut. Comilla	Gamari Bagan, Noi tila majarer upor, Korerhut Union, Joralgonj, Mirsharai	Segun Bagan, Korerhut Union, Joraigoni, mirsharai, Chittagong	Purba Guzara, Raozan	Garibullah para, Raozan.	Lambur hat, Raozan	Mudhunaghat, Chittagong	Banunchara, Banshkhali	Laichata union, Banshkhali	Janghal Pyron, Chechuria, Banshkhali	IUCN Global status
Species Name																
Common Name	Scientific Name															
Water monitor	*V.salvator*		√		√	√			√	√	√		√	√	√	LC
Common Whipe Snake	*Ahaetulla nasuta*								√	√	√				√	LC
Diard's blind snake	*Typhlops diardii*			√												LC
Striped keelback	*Amphiesma stolata*								√	√	√		√	√	√	LC
Keelback	*Tropidonophis mairii*		√	√												LC
Cat snake							√	√								LC
Green Bronzedback tree snake	*Dendrelaphis tritis*						√	√		√	√		√	√		LC
Painted Bronzeback	*Dendrelaphis pictus*						√	√								LC
White-lipped Pit Viper	*Trimeresurus albolabris*						√	√								LC
Copper-headed Trinket Snake	*Coelognathus radiatus*			√			√	√								LC

Table-4Terrestrial Fauna (Reptile) in the Rainy season

Sampling stations		1			2		3		4			5	6	7		
		A	B	C	A	B	A	B	A	B	C	A	A	A	B	
Name of the site		Meghnaghat power station Naravangoni	Hosendy, 1 no union,Gojaria, Munshigoni	Lukhipur, Voberchar union, Gojaria, Munshigoni	Zur kezur gasch, Poishakhi, 8 no union Laksam. Comilla	Shirpulia, 2 no pidia union, langolkut. Comilla	Gamari Bagan, Noi tila majarer upor, Korerhut Union, Joralgonj, Mirsharai	Segun Bagan, Korerhut Union, Joraigoni, mirsharai, Chittagong	Purba Guzara, Raozan	Garibullah para, Raozan.	Lambur hat, Raozan	Mudhunaghat, Chittagong	Banunchara, Banshkhali	Laichata union, Banshkhali	Janghal Pyron, Chechuria, Banshkhali	IUCN Global status
Species Name																
Common Name	Scientific Name															
Trinket snake	*Coelognathus Helena*	√		√												LC
Common Wolf Snake	*Lycodon aulicus*								√	√						LC
Indian rat snake	*Ptyas mucosa*			√	√	√	√	√								LC
Indo-chinese Rat Snake	*Ptyas korros*								√	√	√		√	√	√	LC
Red-necked Keelback	*Rhabdophis subminiatus*										√		√			LC
Dark-bellied Marsh Snake	*Xenochrophis cerasogaster*								√	√	√		√	√	√	LC
Banded Krait	*Bungarus fasciatus*								√	√	√			√	√	LC
Binocellate Cobra	*Naja naja*			√	√	√			√	√	√		√	√	√	LC
Monocelate Cobra	*Naja kaouthia*			√												LC

Table-4 Terrestrial Fauna (Reptile) in the Rainy season

Sampling stations		1			2		3		4			5	6	7		
		A	B	C	A	B	A	B	A	B	C	A	A	A	B	
Name of the site		Meghnaghat power station Naravangoni	Hosendy, 1 no union,Gojaria, Munshigoni	Lukhipur, Voberchar union, Gojaria, Munshigoni	Zur kezur gasch, Poishakhi, 8 no union Laksam. Comilla	Shirpulia, 2 no pidia union, langolkut. Comilla	Gamari Bagan, Noi tila majarer upor, Korerhut Union, Joralgonj, Mirsharai	Segun Bagan, Korerhut Union, Joraigoni, mirsharai, Chittagong	Purba Guzara, Raozan	Garibullah para, Raozan.	Lambur hat, Raozan	Mudhunaghat, Chittagong	Banunchara, Banshkhali	Laichata union, Banshkhali	Janghal Pyron, Chechuria, Banshkhali	IUCN Global status
Species Name																
Common Name	Scientific Name															
King cobra	*Ophiophagus Hannah*				√	√										LC

Table-5 Terrestrial Fauna (Bird) in the Rainy season

Sampling stations	1	2	3	4	5	6	7	

		A	B	C	S	B	A	B	A	B	C	A	A	A	B	
Name of the site		Meghnaghat power station Naravangoni	Hosendy, 1 no union,Gojaria, Munshigoni	Lukhipur, Voberchar union, Goiaria, Munshigoni	Zur kezur gasch, Poishakhi, 8 no union, Laksam, Comilla	Shirpulia, 2 no pidia union, langolkut, Comilla	Gamari Bagan, Noi tila majarer upor, Korerhut Union, Joralgonj, Mirsharai	Segun Bagan, Korerhut Union, Joraigoni, mirsharai, Chittagong	Purba Guzara, Raozan	Garibullah para, Raozan.	Lambur hat, Raozan	Mudhunaghat, Chittagong	Banunchara, Banshkhali	Laichata union, Banshkhali	Janghal Pyron, Chechuria, Banshkhali	IUCN Global status
Species Name																
Common Name	Scientific Name															
House Sparrow	*Passer domesticus*	√	√	√	√	√	√	√	√	√	√		√	√	√	LC
Black Drongo	*Dicrurus macrocercus*	√	√	√	√	√	√	√	√	√	√		√	√	√	LC
Pied Myna	*Sturnus contra*	√	√	√	√	√	√	√	√	√	√		√	√	√	LC
Chestnut-tailed Starling	*Sturnus malabaricus*								√		√					LC
Common Myna	*Acridotheres tristis*	√			√	√	√	√	√	√	√		√	√	√	LC
Jungle Myna	*Acridotheres fuscus*						√	√	√	√	√		√	√	√	LC
Great Tit	*Parus major*						√	√	√	√			√	√	√	LC
Oriental Magpie-Robin	*Copsychus saularis*	√	√	√	√	√	√	√	√	√	√		√	√	√	LC
Common Tailorbird	*Orthotomus sutorius*	√	√	√	√	√	√	√	√	√	√		√	√	√	LC
Common Pigeon	*Columba livia*	√	√	√	√	√	√	√	√	√	√				√	LC
Eurasian Collared Dove	*Streptopelia decaocto*	√													√	LC
Spotted Dove	*Streptopelia chinensis*	√	√	√	√	√	√	√	√	√	√		√	√	√	LC
Red Turtle Dove	*Streptopelia*		√			√									√	LC

Table-5 Terrestrial Fauna (Bird) in the Rainy season

Sampling stations		1			2		3		4			5	6	7		
		A	B	C	S	B	A	B	A	B	C	A	A	A	B	
Name of the site		Meghnaghat power station Naravangoni	Hosendy, 1 no union,Gojaria, Munshigoni	Lukhipur, Voberchar union, Goiaria, Munshigoni	Zur kezur gasch, Poishakhi, 8 no union Laksam, Comilla	Shirpulia, 2 no pidia union, langolkut, Comilla	Gamari Bagan, Noi tila majarer upor, Korerhut Union, Joralgonj, Mirsharai	Segun Bagan, Korerhut Union, Joraigoni, mirsharai, Chittagong	Purba Guzara, Raozan	Garibullah para, Raozan.	Lambur hat, Raozan	Mudhunaghat, Chittagong	Banunchara, Banshkhali	Laichata union, Banshkhali	Janghal Pyron, Chechuria, Banshkhali	IUCN Global status
Species Name																
Common Name	Scientific Name															
	tranquebarica															
Red-vented Bulbul	*Pycnonotus cafer*	√	√	√	√	√	√	√	√	√	√		√	√	√	LC
Red-whiskered Bulbul	*Pycnonotus jocosus*	√	√		√			√	√	√	√		√		√	LC
House Crow	*Corvus splendens*	√	√	√	√	√	√	√	√	√	√		√	√	√	LC
Large-billed Crow	*Corvus macrorhynchos*	√	√	√	√	√	√	√	√	√	√			√	√	LC
Black-hooded Oriole	*Oriolus xanthornus*	√	√	√	√			√	√	√	√		√		√	LC
Ashy Woodswallow	*Artamus fuscus*	√	√	√	√		√								√	LC
Rufous Treepie	*Dendrocitta vagabunda*	√	√	√	√			√	√		√		√		√	LC
Scarlet-backet Flowerpecker	*Dicaeum cruentatum*		√					√							√	LC
Purple-rumped Sunbird	*Nectarinia zeylonica*	√	√	√	√			√	√						√	LC
Purple Sunbird	*Nectarinia asiaticus*	√	√	√				√							√	LC

Table-5 Terrestrial Fauna (Bird) in the Rainy season

Sampling stations		1			2		3		4			5	6	7		
		A	B	C	S	B	A	B	A	B	C	A	A	A	B	
Name of the site		Meghnaghat power station Naravangoni	Hosendy, 1 no union,Gojaria, Munshigoni	Lukhipur, Voberchar union, Goiaria, Munshigoni	Zur kezur gasch, Poishakhi, 8 no union Laksam, Comilla	Shirpulia, 2 no pidia union, langolkut, Comilla	Gamari Bagan, Noi tila majarer upor, Korerhut Union, Joralgonj, Mirsharai	Segun Bagan, Korerhut Union, Joraigoni, mirsharai, Chittagong	Purba Guzara, Raozan	Garibullah para, Raozan.	Lambur hat, Raozan	Mudhunaghat, Chittagong	Banunchara, Banshkhali	Laichata union, Banshkhali	Janghal Pyron, Chechuria, Banshkhali	IUCN Global status
Species Name																
Common Name	Scientific Name															
Baya Weaver	*Ploceus philippinus*			√	√		√	√	√	√	√			√	√	LC
Scaly-breasred Munia	*Lonchura punctulata*	√	√	√	√			√			√				√	LC
Paddyfield Pipit	*Anthus rufulus*			√		√			√					√	√	LC
Common Iora	*Aegithina tiphia*		√	√	√				√	√			√		√	LC
White-throated Fantail	*Rhipidura albicollis*			√	√				√				√			LC
Common Kingfisher	*Alcedo atthis*			√	√	√	√	√	√	√	√		√	√	√	LC
White-throated kingfisher	*Halcyon smyrnensis*			√	√	√	√	√	√	√	√		√	√	√	LC
Plaintive Cuckoo	*Cacomantis merulinus*									√					√	LC
Asian Koel	*Eudynamys scolopaceus*			√	√			√	√	√					√	LC
Lesser goldenback	*Dinopium bengalensis*		√	√				√	√		√					LC
Fulvous-breasted Woodpecker	*Dendrocopos macei*	√	√	√	√			√	√	√	√		√			LC

Table-5 Terrestrial Fauna (Bird) in the Rainy season

Sampling stations		1			2		3		4			5	6	7		
		A	B	C	S	B	A	B	A	B	C	A	A	A	B	
Name of the site		Meghnaghat power station Naravangoni	Hosendy, 1 no union,Gojaria, Munshigoni	Lukhipur, Voberchar union, Goiaria, Munshigoni	Zur kezur gasch, Poishakhi, 8 no union, Laksam, Comilla	Shirpulia, 2 no pidia union, langolkut, Comilla	Gamari Bagan, Noi tila majarer upor, Korerhut Union, Joralgonj, Mirsharai	Segun Bagan, Korerhut Union, Joraigoni, mirsharai, Chittagong	Purba Guzara, Raozan	Garibullah para, Raozan.	Lambur hat, Raozan	Mudhunaghat, Chittagong	Banunchara, Banshkhali	Laichata union, Banshkhali	Janghal Pyron, Chechuria, Banshkhali	IUCN Global status
Species Name																
Common Name	Scientific Name															
Lineated Barbet	*Megalaima lineata*			√					√	√			√			LC
Greater Coucal	*Centropus sinensis*	√														
Lesser Coucal	*Centropus bengalensis*	√	√								√		√	√		LC
Long-tailed shrike	*Lanius schach*	√	√	√	√	√		√	√	√			√			LC
Red-breasrted Parakeet	*Psittacula alexandri*			√	√					√	√				√	LC
Asian Palm Swift	*Cypsiurus balasiensis*			√	√				√	√			√		√	LC
Spotted Owlet	*Athene brama*	√	√	√	√			√	√	√			√		√	LC
Brahminy Kite	*Haliastur indus*			√	√	√	√	√	√	√	√				√	LC
Black Kite	*Milvus migrans*					√	√									
Grey-headed Fish Eagle	*Ichthyophaga ichthyaetus*			√	√								√		√	NT
Crested Serpent Eagle	*Spilornis Cheela*				√		√		√	√	√		√			LC

Table-5 Terrestrial Fauna (Bird) in the Rainy season

Sampling stations		1			2		3		4			5	6	7		
		A	B	C	S	B	A	B	A	B	C	A	A	A	B	
Name of the site		Meghnaghat power station Naravangoni	Hosendy, 1 no union,Gojaria, Munshigoni	Lukhipur, Voberchar union, Goiaria, Munshigoni	Zur kezur gasch, Poishakhi, 8 no union Laksam, Comilla	Shirpulia, 2 no pidia union, langolkut, Comilla	Gamari Bagan, Noi tila majarer upor, Korerhut Union, Joralgonj, Mirsharai	Segun Bagan, Korerhut Union, Joraigoni, mirsharai, Chittagong	Purba Guzara, Raozan	Garibullah para, Raozan.	Lambur hat, Raozan	Mudhunaghat, Chittagong	Banunchara, Banshkhali	Laichata union, Banshkhali	Janghal Pyron, Chechuria, Banshkhali	IUCN Global status
Species Name																
Common Name	Scientific Name															
Little Cormorant	*Phalacrocorax niger*				√	√	√	√	√	√	√		√	√	√	LC
Little Egret	*Egretta garzetta*						√	√	√	√	√		√	√	√	LC
Great Egret	*Casmerudias albus*						√		√							LC
Cattle Egret	*Bubulcus ibis*		√	√	√	√	√	√	√	√	√		√	√	√	LC
Indian Pond Heron	*Ardeola grayii*		√	√	√	√	√	√	√	√	√		√	√	√	LC
Cinnamon Bittern	*Ixobrychus cinnamomeus*						√	√	√				√	√		LC
Yellow Bittern	*Ixobrychus sinensis*							√	√							
Asian Openbill	*Anastomus oscitans*								√							LC
White-breasted Waterhen	*Amaurornis phoenicurus*			√	√		√	√	√	√	√		√	√		LC
Common Snipe	*Gallinago gallinago*			√	√		√	√	√					√	√	LC
Wood Sandpiper	*Tringa glareola*								√					√		LC

Table-5 Terrestrial Fauna (Bird) in the Rainy season

Sampling stations		1			2		3		4			5	6	7		
		A	B	C	S	B	A	B	A	B	C	A	A	A	B	
Name of the site		Meghnaghat power station Naravangoni	Hosendy, 1 no union,Gojaria, Munshigoni	Lukhipur, Voberchar union, Goiaria, Munshigoni	Zur kezur gasch, Poishakhi, 8 no union Laksam Comilla	Shirpulia, 2 no pidia union, langolkut, Comilla	Gamari Bagan, Noi tila majarer upor, Korerhut Union, Joralgonj, Mirsharai	Segun Bagan, Korerhut Union, Joraigoni, mirsharai, Chittagong	Purba Guzara, Raozan	Garibullah para, Raozan.	Lambur hat, Raozan	Mudhunaghat, Chittagong	Banunchara, Banshkhali	Laichata union, Banshkhali	Janghal Pyron, Chechuria, Banshkhali	IUCN Global status
Species Name																
Common Name	Scientific Name															
Common Sandpiper	*Actitis hypoleucos*								√	√			√	√		LC
Bronzed-winged jacana	*Metopidius indicus*						√	√	√	√	√		√	√	√	LC
Red-wattled Lapwing	*Vanellus indicus*													√		LC
Rufous-neck laughingthrush	*Garrulax ruficollis*	√							LC							
Common Green Magpie	*Cissa chinensis*	√														LC

Table-6 Terrestrial Fauna (Mammals) in the Rainy season

Sampling stations		1			2		3		4			5	6	7		
		A	B	C	A	B	A	B	A	B	C	A	A	A	B	
Name of the site		Meghnaghat power station Naravangoni	Hosendy, 1 no union,Gojaria, Munshigoni	Lukhipur, Voberchar union, Goiaria, Munshigoni	Zur kezur gasch, Poishakhi, 8 no union. Laksam. Comilla	Shirpulia, 2 no pidia union, langolkut, Comilla	Gamari Bagan, Noi tila majarer upor, Korerhut Union, Joralgonj, Mirsharai, Chittagong	Segun Bagan, Korerhut Union, Joraigoni, mirsharai, Chittagong	Purba Guzara, Raozan	Garibullah para, Raozan.	Lambur hat, Raozan	Mudhunaghat, Chittagong	Banunchara, Banshkhali	Laichata union, Banshkhali	Janghal Pyron, Chechuria, Banshkhali	IUCN Global status
Species Name																
Common Name	Scientific Name															
Order: Insectivora	Family: Soricidae															
Grey Musk Shrew	*Suncus murinus* (Linnaeus 1766)								√	√	√	√	√	√	√	
Order: Chiroptera	Family: Pteropidae															
Short-nosed Fruit Bat	*Cynopterus sphinx* (Vahl 1797)		√	√	√	√	√	√	√	√	√		√	√	√	LC
Indian Flying Fox	*Pteropus giganteus* Brunnich 1782		√	√	√	√	√	√	√	√	√		√	√	√	LC
Greater Asiatic Yellow House Bat	*Scotophilus heathii* (Horsfield, 1831)			√	√	√	√	√								LC

Table-6 Terrestrial Fauna (Mammals) in the Rainy season

Sampling stations		1			2		3		4			5	6	7		
		A	B	C	A	B	A	B	A	B	C	A	A	A	B	
Name of the site		Meghnaghat power station Naravangoni	Hosendy, 1 no union,Gojaria, Munshigoni	Lukhipur, Voberchar union, Goiaria, Munshigoni	Zur kezur gasch, Poishakhi, 8 no union, Laksam, Comilla	Shirpulia, 2 no pidia union, langolkut, Comilla	Gamari Bagan, Noi tila majarer upor, Korerhut Union, Joralgonj, Mirsharai, Chittagong	Segun Bagan, Korerhut Union, Joraigoni, mirsharai, Chittagong	Purba Guzara, Raozan	Garibullah para, Raozan.	Lambur hat, Raozan	Mudhunaghat, Chittagong	Banunchara, Banshkhali	Laichata union, Banshkhali	Janghal Pyron, Chechuria, Banshkhali	IUCN Global status
Species Name																
Common Name	Scientific Name															
Greater False Vampire	*Megaderma lyra* É. Geoffroy, 1810						√	√								LC
Order: Primates	Family: Cercopithecidae															
Rhesus Monkey*	*Macaca mulatta* (Zimmermann 1780)						√	√								LC
Order: Carnivora	Family: Canidae															
Asiatic Jackal	*Canis aureus* Linnaeus 1758		√		√	√			√	√	√		√	√	√	LC
Bengal Fox	*Vulpes bengalensis* (Shaw 1800)		√		√	√										LC
	Family: Felidae															

Table-6 Terrestrial Fauna (Mammals) in the Rainy season

Sampling stations		1			2		3		4			5	6	7		
		A	B	C	A	B	A	B	A	B	C	A	A	A	B	
Name of the site		Meghnaghat power station Naravangoni	Hosendy, 1 no union,Gojaria, Munshigoni	Lukhipur, Voberchar union, Goiaria, Munshigoni	Zur kezur gasch, Poishakhi, 8 no union, Laksam, Comilla	Shirpulia, 2 no pidia union, langolkut, Comilla	Gamari Bagan, Noi tila majarer upor, Korerhut Union, Joralgonj, Mirsharai, Chittagong	Segun Bagan, Korerhut Union, Joraigoni, mirsharai, Chittagong	Purba Guzara, Raozan	Garibullah para, Raozan.	Lambur hat, Raozan	Mudhunaghat, Chittagong	Banunchara, Banshkhali	Laichata union, Banshkhali	Janghal Pyron, Chechuria, Banshkhali	IUCN Global status
Species Name																
Common Name	Scientific Name															
Wildcat	*Felis chaus* Schreber 1777				√	√	√	√	√	√	√		√	√	√	LC
Leopard Cat	*Prionailurus bengalensis* (Bennett 1833) *(=Felis bengalensis)*						√	√					√	√	√	LC
Black Panther* (Leopard)	*Panthera pardus* (Linnaeus 1758)												√		√	NT
	Family: Herpestidae															
Common Mongoose	*Herpestes edwardsi* (E.Geoffroy-Saint-Hillare 1818)						√	√	√	√	√	√	√	√	√	LC
	Family: Mustelidae															

Table-6 Terrestrial Fauna (Mammals) in the Rainy season

Sampling stations		1			2		3		4			5	6	7		
		A	B	C	A	B	A	B	A	B	C	A	A	A	B	
Name of the site		Meghnaghat power station Naravangoni	Hosendy, 1 no union,Gojaria, Munshigoni	Lukhipur, Voberchar union, Goiaria, Munshigoni	Zur kezur gasch, Poishakhi, 8 no union, Laksam, Comilla	Shirpulia, 2 no pidia union, langolkut, Comilla	Gamari Bagan, Noi tila majarer upor, Korerhut Union, Joralgonj, Mirsharai, Chittagong	Segun Bagan, Korerhut Union, Joraigoni, mirsharai, Chittagong	Purba Guzara, Raozan	Garibullah para, Raozan.	Lambur hat, Raozan	Mudhunaghat, Chittagong	Banunchara, Banshkhali	Laichata union, Banshkhali	Janghal Pyron, Chechuria, Banshkhali	IUCN Global status
Species Name																
Common Name	Scientific Name															
Hog Badger*	*Arctonyx collaris* F.G.Cuvier 1825								√	√	√			√	√	NT
Common Otter*	*Lutra lutra* (Linnaeus 1758)								√	√	√		√	√	√	NT
	Family: Viverridae															
Large Indian Civet	*Viverra zibetha* Linnaeus 1758			√			√	√	√	√	√		√	√	√	NT
Order: Artiodactyla	Family: Cervidae															
Barking Deer	*Muntiacus vaginalis* (Boddaest 1785) (=*M. muntjak*)						√	√					√	√	√	LC

Table-6 Terrestrial Fauna (Mammals) in the Rainy season

Sampling stations		1			2		3		4			5	6	7		
		A	B	C	A	B	A	B	A	B	C	A	A	A	B	
Name of the site		Meghnaghat power station Naravangoni	Hosendy, 1 no union,Gojaria, Munshigoni	Lukhipur, Voberchar union, Goiaria, Munshigoni	Zur kezur gasch, Poishakhi, 8 no union, Laksam, Comilla	Shirpulia, 2 no pidia union, langolkut, Comilla	Gamari Bagan, Noi tila majarer upor, Korerhut Union, Joralgonj, Mirsharai, Chittagong	Segun Bagan, Korerhut Union, Joraigoni, mirsharai, Chittagong	Purba Guzara, Raozan	Garibullah para, Raozan.	Lambur hat, Raozan	Mudhunaghat, Chittagong	Banunchara, Banshkhali	Laichata union, Banshkhali	Janghal Pyron, Chechuria, Banshkhali	IUCN Global status
Species Name																
Common Name	Scientific Name															
	(Zimmermann 1780)															
Order: Rodentia	Family: Sciuridae															
Hoary-bellied Himalayan Squirrel	*Callosciurus pygerythrus* (I. Geoffroy Saint Hilarie 1832)		√	√	√	√	√	√	√	√	√	√	√	√	√	LC
	Family: Muridae															
Indian Mole Rat	*Bandicota bengalensis* (Gray & Hardwicke 1823)								√	√	√		√	√	√	LC
Common House Rat	*Rattus rattus* (Linnaeus 1758)			√	√	√			√	√	√	√	√	√	√	LC

Dry Season

Table-1 Terestrial Flora in the Dry season

Sl. No.	*Scientific name*	English name	Local name	Family	Survey sites No. (A,B,C=Number of quadrat)														Conservation Sites			Remarks
					7		**6**	**5**	**4**			**3**		**2**		**1**			IUCN	CITES	Local Law	
					A	B	A		A	B	C	A	B	A	B	A	B	C				
1	*Acanthus ilicifolius* L.	Holy-leaved acanthus	Hargoza	Acanthaceae	√																	
2	*Abelmoschus moschatus* Medik	Musk mallow	Bannoderos	Malvaceae					√													
3	*Acacia auriculiformis Benth.*	Ear-pod wattle	Akashi	Mimosaceae	√			√			√											
4	*Acacia catechuoides (Roxb.)* Benth.		Khoira	Mimosaceae								√										
5	*Acacia mangium* Willd.	Wattle	Akashi	Mimosaceae			√	√	√													
6	*Achyranthes aspera* L.	Red chaff tree	Apang	Amaranthaceae	√		√	√		√	√		√					√				
7	*Alstonia macrophylla* Wall. *ex* G.Don	Devil's tree	BaroChhatim	Apocynaceae	√						√								NT			
8	*Ageratum conyzoides* (L.) L.	Tropical white weed	Fulkuri	Asteraceae				√	√		√											
9	*Albizia procera* (Roxb.) Benth.	White siris	Silkorai	Mimosaceae		√		√	√													
10	*Albizia saman* (Jacq.) Merr.	Rain tree	Rain tree	Mimosaceae		√	√		√									√				
11	*Alstonia scholaris* (L.) R.Br.	Dita bark tree	Chatim	Apocynaceae										√					LC			
12	*Alternanthera philoxeroides* (Mart.) Griseb.	Alligator weed	Helencha	Amaranthaceae		√			√	√	√				√			√				
13	*Alternanthera sessilis* (L.) R.Br. *ex* DC.	Sessile joywood	Sachishak	Amaranthaceae														√	LC			
14	*Amaranthus spinosus L.*	Spiny pigweed	Kantamairra	Amaranthaceae											√							
15	*Amaranthus viridis* L.	Green amaranth	MairraShak	Amaranthaceae					√	√												
16	*Artocarpus heterophyllus* Lam.	Jack fruit	Kathal	Moraceae	√	√		√			√											
17	*Artocarpus lacucha* Buch.-Ham.	Monkey jack	Barta	Moraceae	√																	

Table-1 Terestrial Flora in the Dry season

Sl. No.	*Scientific name*	English name	Local name	Family	Survey sites No. (A,B,C=Number of quadrat)														Conservation Sites			Remarks
					7		**6**	**5**	**4**			**3**		**2**		**1**			IUCN	CITES	Local Law	
					A	B	A		A	B	C	A	B	A	B	A	B	C				
18	*Averrhoa carambola* L.	Carambola apple	Kamranga shim	Fabaceae	√																	
19	*Avicennia alba* Blume		Barabaen	Verbenaceae	√														LC			
20	*Azadirachta indica* A. Juss.	Neem tree	Nim	Meliaceae		√		√														
21	*Bambusa tulda* Roxb.	Indian bamboo	Mitinga	Poaceae	√						√											
22	*Bambusa vulgaris Schrad.*	Common bamboo	Bangla bans	Poaceae	√				√		√		√									
23	*Barringtonia acutangula* (L.) Gaertn.	Indian oak	Hizal	Lecythidaceae			√		√													
24	*Bombax ceiba* L.	Red silk cotton tree	Simul	Bombacaceae					√													
25	*Borassus flabellifer* L.	Barb tree	Tal	Arecaceae	√	√	√	√			√								EN			
26	*Bougainvillea glabra* Choisy	Bougainvillea	Baganbilas	Nyctaginaceae	√																	
27	*Calotropis gigantea* (L.) Ait.f.	Swallow tree	Akand	Asclepiadaceae												√						
28	*Carica papaya* L.	Papaya	Pepe	Caricaceae	√	√		√			√											
29	*Casuarina equisetifolia* L.	Beefwood	Jau	Casuarinaceae											√							
30	*Catunaregam spinosa* (Thunb.) Tirveng	Common emetic nut	Mankanta	Rubiaceae	√																	
31	*Centella asiatica* (L.) Urban.	Spadeleaf	Thankuni	Apiaceae					√									√	LC			
32	*Cheilocostus speciosus* (J.Konig) C.Specht	Canereed	Kew shak	Costaceae								√										
33	*Chromolaena odorata* (L.) R.M.King & H.Rob.	Paraffin weed	Asamlata	Asteraceae	√		√				√	√										
34	*Citrus maxima* (Burm.f.) Merr.	Pummelo	Jambura	Rutaceae		√																

Table-1 Terestrial Flora in the Dry season

Sl. No.	*Scientific name*	English name	Local name	Family	Survey sites No. (A,B,C=Number of quadrat)														Conservation Sites			Remarks
					7		**6**	**5**	**4**			**3**		**2**		**1**			IUCN	CITES	Local Law	
					A	B	A		A	B	C	A	B	A	B	A	B	C				
35	*Clerodendrum viscosum* Vent.		Vat	Verbenaceae	√		√	√				√		√								
36	*Coccinia grandis* (L.) Voigt	Ivy gourd	Kelakachupata	Cucurbitaceae		√	√											√				
37	*Cocos nucifera* L.	Coconut palm	Nairkel	Arecaceae		√	√	√			√											
38	*Canna indica L.*	Canna lily	Kalaboti	Cannaceae		√	√	√										√				
39	*Commelina benghalensis* L.	Blue commelina	Kanaialata	Commelinaceae	√				√		√				√				LC			
40	*Crateva magna* (Lour.) DC.	Three leaved caper	Barun	Capparaceae														√				
41	*Crotalaria pallidaAiton*		Jhunjhuni	Fabaceae						√												
42	*Croton bonplandianus* Baill.	Bonplant's croton	Paglamarich	Euphorbiaceae			√	√	√					√		√						
43	*Curcuma zedoaria (Christm.)* Roscoe	Indian arrowroot	Soti	Zingiberaceae										√								
44	*Cyanthillium cinereum* (L.) H.Rob.	Purple fleabane	Sialimutra	Asteraceae					√													
45	*Cynodon dactylon* (L.) Pers.	Star grass, Couch grass	Durba grass	Poaceae		√												√				
46	*Cyperus rotandus* L.	Nut grass	Nagarmutha	Cyperaceae	√				√													
47	*Desmodium gangeticum* (L.) DC.		Chalani	Fabaceae								√										
48	*Dioscorea alata* L.	Asiatic yam	Banga alu	Dioscoreaceae											√							
49	*Dioscorea bulbifera* L.	Air potato	Banalu	Dioscoreaceae										√								
50	*Dioscorea pentaphylla* L.	Five-leafyam	Jum alu	Dioscoreaceae								√										
51	*Diplazium esculentum* (Retz.) Sw.		Dhekishak	Woodsiaceae						√									LC			

Table-1 Terestrial Flora in the Dry season

Sl. No.	*Scientific name*	English name	Local name	Family	Survey sites No. (A,B,C=Number of quadrat)														Conservation Sites			Remarks
					7		**6**	**5**	**4**			**3**		**2**		**1**			IUCN	CITES	Local Law	
					A	B	A		A	B	C	A	B	A	B	A	B	C				
52	*Dipterocarpus turbinatus* Gaertn.	The eng tree	Garjan	Dipterocarpaceae							√								CR			
53	*Eclipta prostrata* (L.) L.	False daisy	Kesraj	Asteraceae		√													DD			
54	*Eichhornia crassipes* (Mart.) Solms	Water-hyacinth	Kachuripana	Pontederiaceae		√				√					√		√	√				
55	*Elaeocarpus floribundus* Blume	Indian olive	Jalpai	Elaeocarpaceae	√				√		√											
56	*Elephantopus scaber* L.	Elephant's foot	Shamdalan	Asteraceae					√	√												
57	*Enhydra fluctuans* Lour.	Marsh herb	Hinchashak	Asteraceae		√																
58	*Erythrina variegta var. picta* Maheshw.	Indian coral tree	Mandar	Fabaceae		√		√	√		√				√							
59	*Eucalyptus globules* Labill		Globu eucalyptus	Myrtaceae	√	√																
60	*Eupatorium antiquorum* L.	Malayan spurge	Tesramansa	Euphorbiaceae		√		√			√											
61	*Euphorbia hirta* L.	Snake weed	Dudialata	Euphorbiaceae												√						
62	*Ficus erecta* Thunb.	Japanese fig	Ballagota	Moraceae						√									LC			
63	*Ficus hispida* L.f.	opposite leave fig	Dumur	Moraceae	√					√	√	√										
64	*Ficus rumphii* Blume	Weeping fig	Jhula bot	Moraceae													√					
65	*Gmelina arborea* Roxb.	White teak	Gamari	Verbenaceae	√		√	√	√		√	√										
66	*Glycosmis pentaphylla* (Retz.) A.DC	Motar tree	Datmagan	Rutaceae			√				√		√									
67	*Heliotropicum indicum* L.	Indian heliotrope	Hatishur	Boraginaceae			√															
68	*Hibiscus rosasinensis* L.	China rose	Joba	Malvaceae		√																

Table-1 Terestrial Flora in the Dry season

Sl. No.	*Scientific name*	English name	Local name	Family	Survey sites No. (A,B,C=Number of quadrat)														Conservation Sites			Remarks
					7		**6**	**5**	**4**			**3**		**2**		**1**			IUCN	CITES	Local Law	
					A	B	A		A	B	C	A	B	A	B	A	B	C				
69	*Ipomoea fistulosa* Mart.*ex* Choisy		Dolkolmi	Convolvulaceae		√			√		√						√	√				
70	*Ipomoea aquatica* Forssk.	Water spinach	Kalmi	Convolvulaceae		√											√	√	LC			
71	*Ixora paevetta* Andr.	The torch tree	Gandhalrangan	Rubiaceae		√		√														
72	*Justicia gendarussa* Burm.f.*		Jagatmadan	Convolvulaceae		√			√		√											
73	*Lagerstroemia speciosa* (L.) Pers.		Jarul	Lythraceae									√									
74	*Lannea coromandelica* (Houtt.) Merr.		Badi	Anacardiaceae					√						√							
75	*Lantana camara* L.	Lantana	Khutuskanta	Verbenaceae	√		√	√	√													
76	*Lepisanthes rubiginosa* (Roxb.) Leenh.		Rubihorina	Sapindaceae	√							√										
77	*Lindernia antipoda* (L.) Alston	Sparrow false pimpernel	Zai ghas	Linderniaceae														√	LC			
78	*Lippia alba* (P.Mill.) N.E.Br. ex Britt. & Wilson		Shunk	Verbenaceae						√								√				
79	*Ludwigia adscendens* (L.) Hara		Mulcha	Onagraceae											√							
80	*Ludwigia hyssopifolia* (G.Don) Exell.	Seedbox	Zaikura	Onagraceae						√					√				LC			
81	*Lygodium japonicum* (Thunb.) Sw.		Japanilata fern	Schizaeaceae	√							√										
82	*Mangifera indica* L.	Mango	Aam	Anacardiaceae	√	√		√			√								DD			
83	*Marsilea minuta* L.	Marshy fern	Susnishak	Marsileaceae		√			√		√								LC			
84	*Melastoma malabathricum* L.	Indian rhododendron	Bon tejpata	Melastomaceae	√							√										

Table-1 Terestrial Flora in the Dry season

Sl. No.	*Scientific name*	English name	Local name	Family	Survey sites No. (A,B,C=Number of quadrat)														Conservation Sites			Remarks
					7		**6**	**5**	**4**			**3**		**2**		**1**			IUCN	CITES	Local Law	
					A	B	A		A	B	C	A	B	A	B	A	B	C				
85	*Mikania micrantha* kunth	Heartleaf	Asamlata	Asteraceae	√	√		√			√											
86	*Merremia gangetica*		Indukanipana	Convolvulaceae	√														LC			
87	*Microcos paniculata* L.		Asargula	Tiliaceae	√																	
88	*Mikania micrantha* Kunth	Heratleafhempvine	Tufainnalata	Asteraceae	√		√		√	√	√	√	√									
89	*Mimosa himalayna* Gamble*	Giant sensitive plant	Borosarmida	Mimosaceae	√																	
90	*Mimosa pudica* L.	Sensitive plant	Lajjabati	Mimosaceae	√	√		√			√	√							LC			
91	*Momordica charantia* L. *var. charantia*	Bitter melon	Titakorolla	Cucurbitaceae	√				√													
92	*Moringa olifera* Lam.	Horse radish tree	Sajna	Moringaceae	√																	
93	*Momordica cochinensis* (Lour.) Sprengel	Sweet gourd	Kakrul, Akri	Cucurbitaceae							√											
94	*Monochoria hastata* (L.)5Solms.	Arrowleaf false pickereweed	Fena	Pontederiaceae						√									LC			
95	*Musa paradisiaca* L.	Banana	Kacha kola	Musaceae	√	√		√			√											
96	*Neolamarckia cadamba* (Roxb.) Bosser		Kadam	Rubiaceae										√								
97	*Nymphaea nouchali* Burm.f.	Water lily	Shapla	Nymphaeaceae														√	LC			
98	*Oryza sativa* L.	Paddy	Dhan	Poaceae										√	√		√					
99	*Pandanus foetidus* Roxb.	Screw pine	Koikikanta	Pandanaceae					√													
100	*Passiflora foetida* L.	Wild passion	Jumkolata	Passifloraceae								√										

Table-1 Terestrial Flora in the Dry season

Sl. No.	*Scientific name*	English name	Local name	Family	Survey sites No. (A,B,C=Number of quadrat)														Conservation Sites			Remarks
					7		**6**	**5**	**4**			**3**		**2**		**1**			IUCN	CITES	Local Law	
					A	B	A		A	B	C	A	B	A	B	A	B	C				
		fruit																				
101	*Persicaria orientalis* (L.) Spach	The garden gate	Biskatali	Polygonaceae			√															
102	*Phoenix sylvestris* (L.) Roxb.	Date sugar palm	Khajur	Arecaceae					√													
103	*Phyllanthus acidus* (L.) Skeels	Country gooseberry	Horboroi	Euphorbiaceae	√						√											
104	*Phyllanthus emblica* L.	Indian gooseberry	Amloki	Euphorbiaceae	√						√											
105	*Phyllanthus reticulatus* Poir.	Reticulated leaf-flaver	Cirkuti	Euphorbiaceae					√	√	√			√								
106	*Phyllanthus sikkimensis* Mull.Arg.*		Sikimamla	Euphorbiaceae		√																
107	*Piper retrofractum* Vahl	Javanese long pepper	Chai lata	Piperaceae											√							
108	*Piper peepuloides* Roxb.		Pipul	Piperaceae							√											
109	*Pistia stratiotes* L.	Tropical duckweed	Futihena	Araceae		√									√				LC			
110	*Pongamia pinnata* (L.) Pierre	indian beach	Koronja	Fabaceae		√													LC			
111	*Pouzolzia zeylanica* (L.) Benn.	Pouzolzia	Kullaruki	Urticaceae		√			√		√											
112	*Premna esculenta* Roxb.		Lalana	Verbenaceae		√																
113	*Psidium guajava*L.	Guava	Peyara	Myrtaceae	√			√	√		√											
114	*Ricinus communis* L.	Castor	Verenda	Euphorbiaceae														√				
115	*Schumannianthus dichotomus* (Roxb.) Gagnep.		Sitolpati	Marantaceae	√				√		√											
116	*Scoparia dulcis* L.	Goat weed	Bondhone	Scrophulariaceae			√		√													

Table-1 Terestrial Flora in the Dry season

Sl. No.	*Scientific name*	English name	Local name	Family	Survey sites No. (A,B,C=Number of quadrat)														Conservation Sites			Remarks
					7		**6**	**5**	**4**			**3**		**2**		**1**			IUCN	CITES	Local Law	
					A	B	A		A	B	C	A	B	A	B	A	B	C				
117	*Senna tora* (L.) Roxb.	Metal seed	Chotokalokeshunde	Caesalpiniaceae					√		√		√									
118	*Senna sophera* (L.) Roxb.	Pepper-leaved senna	Barokalokeshunde	Caesalpiniaceae												√						
119	*Sesamum indicum* L.	Sesame	Til	Pedaliaceae														√				
120	*Sida acuta* Burm.f.	Broom weed	Kureta, Ururia	Malvaceae					√	√	√	√						√				
121	*Sida cordifolia* L.	Flannel weed	Shet-berela	Malvaceae			√															
122	*Sida rhombifolia* L.	Cuba jute	Kureta	Malvaceae								√						√				
123	*Smilax ovalifolia* Roxb. *ex* D.Don	Black creeper	Kumairralata	Smilacaceae	√																	
124	*Solanum americanum* Mill.		Tit begun	Solanaceae	√	√					√											
125	*Solanum melongena* L.	Brinjal	Begun	Solanaceae	√	√		√			√											
126	*Solanum nigrum* L.	Black night	Futibegun	Solanaceae											√			√				
127	*Solanum sisymbrifolium* Lam.	Prickly brinjal	Kantikari	Solanaceae												√						
128	*Solanum torvum Sw.*	Cherry eggplant	Titbegun	Solanaceae						√					√							
129	*Spermacoce articularis* L.f.		Atharogia	Rubiaceae						√												
130	*Sphagneticola calendulacea* (L.) Pruski	Trailing daisy	Vimraj	Asteraceae						√												
131	*Spilanthes acmella* (L.) L.		Mariccha	Asteraceae			√			√	√											
132	*Stephania japonica* (Thunb.) Miers	Snake vine	Musarralata	Menispermaceae					√		√				√			√				
133	*Streblus asper* Lour.	Toothbrush tree	Horba	Moraceae	√		√	√	√		√											

Table-1 Terestrial Flora in the Dry season

Sl. No.	*Scientific name*	English name	Local name	Family	Survey sites No. (A,B,C=Number of quadrat)														Conservation Sites			Remarks
					7		6	5	4			3		2		1			IUCN	CITES	Local Law	
					A	B	A		A	B	C	A	B	A	B	A	B	C				
134	*Swietenia mahagoni* (L.) Jacq.	Spanish mahogany	Mahogany	Meliaceae	√				√		√								EN			
135	*Synedrella nodiflora* (L.) Gaertn.	Nodeweed	Relanodi	Asteraceae			√		√	√					√							
136	*Syzygium cuminii* (L.) Skeels	Java plum		Myrtaceae					√		√	√										
137	*Syzygium fruticosum* (Roxb.) DC.		Kawyagajam	Myrtaceae	√																	
138	*Tabernaemontana alternifolia* L.		Janglitagar	Apocynaceae	√																	
139	*Tectona grandis* L.f.	Teak	Segun	Verbenaceae	√							√	√									
140	*Tamarindus indica* L.	Tamarind tree	Tetul	Tamaricaceae		√																
141	*Terminalia catappa* L.	Indian almond	Katbadam	Combretaceae					√					√								
142	*Urena lobata* L.	Congo jute	Jangligagra	Malvaceae	√																	
143	*Vitex negundo* L.	Chaste tree	Nishinda	Verbenaceae		√																
144	*Ziziphus mauritiana* Lam.	Plum	Kul	Rhamnaceae		√	√		√													
145	*Ziziphus oenoplia* (L.) Mill.	Jackal jujube	Bonboroi	Rhamnaceae	√																	

Table – 2 Terrestrial Fauna (Insects) in the Dry season

	7		6	5	4			3		2		1					
	A	**B**	A		**A**	**B**	**C**	**A**	**B**	**A**	**B**	**A**	**B**	**C**	IUCN	CITES	

	Species Name		Order, Family																	
No.	Scientific Name	Common Name																		
			Order: Odonata, Family: Coenagriidae																	
1	*Agriocnemis pygmaea* (Rambur)	Damselfly (Foring)		√	√			√	√	√			√	√				LC		
2	*Ceriagrion cerinorubellum,* (Brauer)	Damselfly (Foring)		√	√	√	√	√	√	√			√					LC		
3	*Copera vittata* Selys, 1863	Narrow-winged Damselfly, (Foring)		√	√			√	√	√								LC		
			Family: Libellulidae																	
4	*Tholymis tillarga* Fabricius, 1798	Evening Skimmer, (Foring)		√	√			√	√	√								LC		
5	*Orthetrum cancellatum* Linnaeus, 1758	Black-tailed skimmer Dragonfly (Foring)		√	√			√	√	√								LC		
6	*Neurothemis fulvia* Kirby, 1889	Skimmer (Foring)		√	√	√	√	√	√	√								LC		
7	*Diplacodes trivialis*	Blue darter (Foring)		√	√			√	√	√								LC		

8	*Diplacodes nebulosa* Fabricius,1793	Black-tipped percher (Foring)		√	√	√	√	√	√	√								LC		
9	*Brachythemis contaminata* Fabricius,1793	Skimmer (Foring)		√	√	√	√	√	√	√								LC		
10	*Pantala flavescens, Fabricius*	Wandering Glider, (Foring)												√				LC		
			Order: Orthoptera , Family: Gryllidae																	
11	*Gryllus spp.*	Cricket (Urchunga)		√	√			√	√	√	√	√						LC		
			Family: Acrididae																	
12	*Oxya chinensis(Thunberg)*	Small Rice Grasshopper, (Ghas Foring)		√	√		√	√	√	√			√	√				LC		
			Order: Dictyoptera , Family: Mantidae																	
13	*Periplaneta Americana* Linn.	American Cockroach		√	√	√	√	√	√	√	√	√	√	√	√	√	√			
14	*Mantis religiosa* Linnaeus, 1758	(Telapoka)		√	√	√	√	√	√	√	√	√						LC		
			Order: Diptera , Family: Culicidae																	

15	*Culex* spp.	Culex mosquito (Mosha)			√	√		√										LC		
			Family: Syrphidae																	
16	*Eristalinus quinquelineatus(Fabricius)*	Hoverfly			√			√	√	√								LC		
17	*Episyrphus spp.*	Hover fly			√			√	√	√								LC		
			Family: Muscidae																	
18	*Musca domestica* Linn.	House fly		√	√	√	√	√	√	√			√		√	√	√	LC		
			Family: Calliphoridae																	
19	*Chrysomya megacephala (Fabricius)*	Oriental latrine fly		√	√	√	√						√		√	√	√			
			Order: Homoptera , Family: Aphidae																	
20	*Rhopalosiphum sp.*	Aphis			√	√	√	√		√				√				LC		
			Family: Halictidae																	
21	*Lasioglossum* sp.	Solitary Bee		√	√			√	√	√			√	√			√	LC		
			Family: Alydidae																	

22	*Leptocorisa acuta* Thunberg, 1904	Rice bug (Dhaner Gandhi poka)		√	√			√	√	√			√	√			√	LC		
			Family:Pentatomida																	
23	*Eurydema pulchrum* Westwood, 1837	Radish bug (Not available)			√		√	√	√	√								LC		
			Order: Lepidoptera , Family: Pieridae																	
24	*Eurema hecabe contubernalis* Moore	Common Grass Yellow, (Holud)		√	√	√	√	√	√	√	√	√	√	√			√	LC		
			Family: Danaidae																	
25	*Danaus melanippus indicus* (Fruhstorfer)	White Tiger (Shushama)									√				√			LC		
26	*Parantica aglea aglea* (Stoll)	Glassy Tiger (Shetalkuchi)					√				√	√						LC		
			Family: Nymphalidae																	
27	*Euthalia monina kesava* Moore	Powdered Baron (Tomosha)									√	√						LC		
28	*Junonia atlites* (Linn.)	The grey pansy			√			√	√	√	√	√						LC		

			Family: Satyridae																	
29	*Melanitis phedima bela* Moore	Dark Evening Brown		√	√			√	√	√	√	√						LC		
			Family: Papilionidae																	
30	*Troides Helena Cerberus* (Felder & Felder)	Common Birdwing (Shonal)				√					√	√						LC		
			Family: Hesperioidea																	
31	*Oriens goloides* Moore	Smaller Darlet		√	√			√	√	√								LC		
32	*Parnara guttatus mangala* Moore	Straight Swift (Nillbijuri)					√			√	√	√					√			
			Order: Coleoptera , Family: Chrysomelidae																	
33	*Aulacophora foveicollis* Lucas	Red pumpkin beetle		√	√			√	√	√	√	√	√	√	√	√	√	LC		
34	*Aulacophora frontalis* Baly	Pumpkin beetle		√	√			√	√	√	√	√	√	√	√	√	√	LC		
			Order: Hymenoptera , Family: Aphidae																	
35	*Rhopalosiphum sp.*	Aphis		√	√	√	√	√	√	√			√	√				LC		

			Family: Anthophoridae																	
36	*Amegilla* spp.				√			√	√	√	√	√			√	√		LC		
			Family: Halictidae																	
37	*Lasioglossum* sp.	Solitary Bee			√			√	√	√	√	√			√	√		LC		
38	*Nomia* sp.															√		LC		
			Family: Trigonidae																	
39	*Trigona* sp.	Sweat bee			√			√	√	√								LC		
			Family: Apidae																	
40	*Apis mellifera* Linn.	Western Honey bee			√			√	√	√								LC		
41	*Apis dorsata*Linn.	Wild Honey bee, (Bonno Momachhi)									√	√						LC		
			Family: Vespoidae																	
42	*Vespa* sp.	Bolta		√	√	√	√	√	√	√								LC		
			Order: Coleoptera , Family: Coccinellidae																	
43	*Micraspis crocea* (Mulsant)	Lady beetle		√	√			√	√	√								LC		
			Order: Homoptera Family: Deltocephalidae				√		√	√				√			√			

44	*Nephotettix cincticeps* Matsumura	Spotted jassid																		
			Order: Hemiptera Family: Coreidae																	
45	*Leptocorisa acuta Thunb.*	Rice bug				√			√		√	√		√	√		√	LC		
			Order: Dictyoptera , Family: Blattellidae																	
46	*Blattella germanica* Linn.	German Cockroach (Telapoka)									√	√						LC		
			Family: Mantidae															LC		
47	*Mantis religiosa* (Linnaeus)	Praying Mantis (Praying Mantis)									√	√						LC		

Table-3 Terrestrial Fauna (Amphibian n) in the Dry season

				7		6	5	4			3		2		1					
				A	**B**	A	B	**A**	**B**	**C**	**A**	**B**	**A**	**B**	**A**	**B**	**C**	IUCN	CITES	
	Species Name																			
	Scientific Name	Common Name	Order, Family																	

			Order: Anura, Family: Bufonidae																	
1	*Duttaphrynus (Bufo) melanostictus*	Southeast Asian toad		√	√	√	√	√	√	√	√	√	√	√		√	√	LC		
			Family: Dicroglossidae																	
2	*Hoplobatrachus tigerinus*	Asiatic Bull Frog			√	√		√		√	√	√	√	√		√	√	LC		
3	*Euphlyctis cyanophlyctis*	Skipper Frog		√	√	√	√	√	√	√		√	√	√	√	√	√	LC		
4	*Fejervarya limnocharis*	Indian Cricket frog					√			√	√		√	√	√			LC		
5	*Fejervarya nepalensis*	Nepal Cricket frog		√			√	√			√				√	√		LC		
			Family:Microhylidae																	
6	*Microhyla ornata*	Ornate Narrow-mouthed Frog				√	√				√			√		√	√	LC		
7	*Microhyla berdmori*	Bardmori Narrow-mouthed Frog		√			√		√						√	√				

Table-4 Terrestrial Fauna (Reptile) in the Dry season

	7		6	5	4			3		2		1					
	A	**B**	A	B	**A**	**B**	**C**	**A**	**B**	**A**	**B**	**A**	**B**	**C**	IUCN	CITES	

	Species Name																			
	Scientific Name	Common Name																		
1	*Calotes versicolor*	Garden Lizard		√	√	√		√	√	√	√	√	√	√				LC		
2	*Calotes jerdoni*	Green garden lizard													√		LC			
3	*Hemidactylus brookii*	Spotted house Lizard			√	√		√	√	√								LC		
4	*H. frenatus*	Spotted house Lizard		√	√	√		√	√	√					√		√	LC		
5	*Hemidactylus brookii*	Brooke's house gecko									√	√					√	LC		
6	*Mabuya mabuya*	Shink																LC		
7	*Varanus bengalensis*	Bengle Monitor		√					√		√	√	√	√		√	√	LC	I	
8	*Amphiesma stolata*	Striped keelback		√	√	√		√	√	√								LC		
9	*Dendrelaphis pictus*	Painted Bronzeback									√	√						LC		
10	*Lycodon jara*	Common Wolf Snake						√	√									LC		
11	*Ptyas mucosa*	Indian rat snake									√	√	√	√			√	LC		
12	*Rhabdophis subminiatus*	Red-necked Keelback				√				√								LC		

Table-5 Terrestrial Fauna (Bird) in the Dry season

				7		6	5	4			3		2		1					
				A	B	A	B	A	B	C	A	B	A	B	A	B	C	IUCN	CITES	
	Species Name																			
	Scientific Name	Common Name																		
1	*Passer domesticus*	House Sparrow			√	√		√		√	√	√				√	√	LC		
2	*Dicrurus macrocercus*	Black Drongo		√		√		√	√	√	√	√	√	√		√	√	LC		
3	*Sturnus contra*	Pied Myna		√		√		√	√	√				√	√	√	√	LC		
4	*Sturnus malabaricus*	Chestnut-tailed Starling		√				√		√								LC		
5	*Acridotheres tristis*	Common Myna		√	√			√	√		√	√		√				LC		
6	*Acridotheres fuscus*	Jungle Myna		√	√	√		√	√	√		√			√	√	√	LC		
7	*Parus major*	Great Tit		√	√	√		√	√		√	√			√	√	√	LC		
8	*Copsychus saularis*	Oriental Magpie-Robin		√	√	√	√	√	√	√	√	√	√	√	√	√	√	LC		
9	*Orthotomus sutorius*	Common Tailorbird			√	√		√	√	√	√	√	√	√	√	√	√	LC		
10	*Columba livia*	Common Pigeon			√						√	√		√	√	√	√	LC		
11	*Treron bicintus*	Orenge-breasted Green Pigeon							√	√			√			√	√			

12	*Treron phoenicopterus*	Yellow-footed Green Pigeon				√	√								√	√	√	√			
13	*Streptopelia decaocto*	Eurasian Collared Dove			√											√			LC		
14	*Streptopelia chinensis*	Spotted Dove						√	√	√	√			√	√	√	√	LC			
15	*Pycnonotus cafer*	Red-vented Bulbul		√	√	√		√		√	√	√	√	√	√	√	√	LC			
16	*Pycnonotus jocosus*	Red-whiskered Bulbul				√						√	√		√	√		LC			
17	*Corvus splendens*	House Crow		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	LC		
18	*Corvus macrorhynchos*	Large-billed Crow		√	√	√		√	√	√	√	√		√	√	√		LC			
19	*Oriolus xanthornus*	Black-hooded Oriole			√	√		√		√		√	√		√	√		LC			
20	*Phalacrocorax niger*	Little Cormorant			√	√					√		√		√	√					
21	*Phalacrocorax fuscicollis*	Indian Cormorant		√							√										
22	*Artamus fuscus*	Ashy Woodswallow			√				√		√		√	√	√			LC			

23	*Dendrocitta vagabunda*	Rufous Treepie			√	√		√		√		√	√		√	√	√	LC		
24	*Dicaeum cruentatum*	Scarlet-backet Flowerpecker			√							√				√		LC		
25	*Dicaeum erythrorhynchos*	Pale-billed Flowerpecker		√				√	√	√				√						
26	*Nectarinia zeylonica*	Purple-rumped Sunbird			√			√				√	√		√	√	√	LC		
27	*Ploceus philippinus*	Baya Weaver		√				√	√			√	√		√	√	√	LC		
28	*Lonchura punctulata*	Scaly-breasred Munia			√					√		√	√		√	√	√	LC		
29	*Lonchura straiata*	White-rumped Munia				√	√	√							√					
30	*Anthus rufulus*	Paddyfield Pipit		√	√			√						√			√	LC		
31	*Rhipidura albicollis*	White-throated Fantail				√		√					√				√	LC		
32	*Alcedo atthis*	Common Kingfisher		√	√	√		√		√	√			√			√	LC		
33	*Halcyon smyrnensis*	White-throated kingfisher			√	√		√			√	√	√	√	√	√	√	LC		

34	*Eudynamys scolopaceus*	Asian Koel			√			√	√			√	√				√	LC		
35	*Dinopium bengalensis*	Lesser goldenback						√		√		√				√	√	LC		
36	*Hirundo rustica*	Barn Swallow		√		√		√	√	√					√					
37	*Centropus sinensis*	Greater Coucal													√					
38	*Centropus bengalensis*	Lesser Coucal		√	√	√				√		√	√		√	√		LC		
39	*Athene brama*	Spotted Owlet			√			√	√			√	√		√		√	LC		
40	*Haliastur indus*	Brahminy Kite			√			√				√		√			√	LC		
41	*Milvus migrans*	Black Kite							√			√								
42	*Egretta garzetta*	Little Egret		√	√	√	√	√	√	√	√	√		√	√			LC		
43	*Casmerudias albus*	Great Egret		√							√							LC		
44	*Bubulcus ibis*	Cattle Egret			√	√		√						√		√	√	LC		
45	*Ardeola grayii*	Indian Pond Heron		√	√	√	√	√	√	√	√	√	√	√	√	√	√	LC		
46	*Anastomus oscitans*	Asian Openbill						√										LC		
47	*Amaurornis phoenicurus*	White-breasted Waterhen				√		√	√	√		√	√				√	LC		
48	*Gallinago gallinago*	Common Snipe		√	√	√					√						√	LC		

49	*Metopidius indicus*	Bronzed-winged jacana			√	√		√	√	√		√						LC		
50	*Vanellus indicus*	Red-wattled Lapwing					√							√	√			LC		
51	*Cissa chinensis*	Common Green Magpie													√			LC		
52	*Lanius schach*	Long-tail Shrike			√				√						√	√				
53	*Lanius cristatus*	Brown Shrike			√				√						√	√	√			

Table-6 Terrestrial Fauna (Mammals) in the Dry season

				7		6	5	4			3		2		1					
				A	B	A	B	A	B	C	A	B	A	B	A	B	C	IUCN	CITES	
	Species Name																			
	Scientific Name	Common Name	Order, Family																	
			Order: Insectivora, Family: Soricidae																	
1	*Suncus murinus* (Linnaeus 1766)	Grey Musk Shrew		√	√	√	√	√	√	√										
			Order: Chiroptera, Family: Pteropidae																	
2	*Pteropus giganteus* Brunnich 1782	Indian Flying Fox		√	√	√		√	√	√	√	√	√	√		√	√	LC		

3	*Rousettus leschenaulti* (Desmarest, 1820)	Leschenault's Rousette									√	√	√	√			√	LC		
4	*Pipistrellus coromandra* (Gray, 1838)	Indian Pipistrelle									√	√						LC		
			Order: Carnivora, Family: Canidae																	
5	*Canis aureus* Linnaeus 1758	Asiatic Jackal		√	√	√		√	√	√			√	√		√		LC	III	
			Family: Felidae																	
6	*Felis chaus* Schreber 1777	Wildcat		√	√	√		√	√	√	√	√	√	√				LC		
			Family: Herpestidae																	
7	*Herpestes edwardsi*, (E.Geoffroy-Saint-Hillare 1818)	Common Mongoose		√	√	√	√	√	√	√	√	√						LC	III	
			Family: Mustelidae																	
8	*Arctonyx collaris* F.G.Cuvier 1825	Hog Badger		√	√			√	√	√								NT		
9	*Lutra lutra* (Linnaeus 1758)	Common Otter		√	√	√		√	√	√								NT	I	
			Family: Viverridae																	
10	*Viverra zibetha* Linnaeus 1758	Large Indian Civet		√	√	√		√	√	√	√	√					√	NT	III	

			Order: Rodentia, Family: Sciuridae																		
11	*Callosciurus pygerythrus*, (I. Geoffroy Saint Hilarie 1832)	Hoary-bellied Himalayan Squirrel		√	√	√	√	√	√	√	√	√	√	√		√	√	LC		
			Family: Muridae																		
12	*Bandicota bengalensis*, (Gray & Hardwicke 1823)	Indian Mole Rat		√	√	√		√	√	√								LC		
13	*Rattus rattus* (Linnaeus 1758)	Common House Rat		√	√	√	√	√	√	√			√	√			√	LC		

Appendix VIII

Action Plan
for
Land Acquisition and Livelihood Compensation

People's Republic of Bangladesh
Power Grid Company of Bangladesh Limited (PGCB)

Dhaka - Chittagong Main Power Grid Strengthening Project

Action Plan for Land Acquisition and Livelihood Compensation

January 2015

Japan International Cooperation Agency (JICA)
Tokyo Electric Power Company
Tokyo Electric Power Services Co., Ltd.

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Annexes

Abbreviations

BFD	Forest Department
BPDB	Bangladesh Power Development Board
CUL	Compensation under the Law
DAM	Department of Agricultural Marketing
DC	Deputy Commissioner
DOE	Department of Environment
DOF	Department of Fisheries
DPP	Development Project Performa
EMF	Electric Magnetic Field
EMaP	Environmental Management Plan
EMoP	Environmental Monitoring Plan
EP	Entitled Person
GOB	Government of Bangladesh
GRC	Grievance Redress Committee
HH	Household
IOL	Inventory of Losses
JICA	Japan International Cooperation Agency
LA	Land Acquisition
LAO	Land Acquisition Officer
MOPEMR	Ministry of Power, Energy and Mineral Resources
NGO	Non-Governmental Organization
PAPs	Project Affected Persons
PGCB	Power Grid Company of Bangladesh Limited
PWD	Public Works Department
ROW	Right of Way
RPF	Resettlement Policy Framework
RV	Replacement Value
TL	Transmission Line

Definitions

Resettlement Plan (RP) or **Resettlement Action Plan (RAP)**: A resettlement plan (or resettlement action plan) is the planning document that describes what will be done to address the direct social and economic impacts associated with the involuntary taking of land.

Project Affected Person (PAP): Any person (household) that loses their home, land, or business interests because of land acquisition.

Compensation: A payment in kind, cash or other assets given in exchange for the taking of land, or loss of other assets, including fixed assets thereon, in part or whole.

Cut-off Date: This is the date on and beyond which any persons who encroach on the area are not entitled to compensation or any other form of resettlement assistance. It is often established on the commencement date or last date of the census of PAPs.

Eligibility: The criteria for qualification to receive benefits under a resettlement program.

Resettlement Entitlements: Resettlement entitlements with respect to a particular eligibility category are the sum total of compensation and other forms of assistance provided to displaced persons in the respective eligibility category.

Replacement Cost: In determining the replacement cost, depreciation of the asset and the value of salvage materials are not taken into account, nor is the value of benefits to be derived from the project deducted from the valuation of an affected asset.
For agricultural land, it is the pre-project or pre-displacement, whichever is higher, market value of land of equal productive potential or use located in the vicinity of the affected land, plus the cost of preparing the land to levels similar to those of the affected land, plus the cost of any registration and transfer taxes.
For land in urban areas, it is the pre-displacement market value of land of equal size and use, with similar or improved public infrastructure facilities and services and located in the vicinity of the affected land, plus the cost of any registration and transfer taxes.
For houses and other structures, it is the market cost of the materials to build a replacement structure with an area and quality similar to or better than those of the affected structure, or to repair a partially affected structure, plus the cost of transporting building materials to the construction site, plus the cost of any labor and contractors' fees, plus the cost of any registration and transfer taxes.

Grievance Procedures: The processes established under law, local regulations, or administrative decision to enable property owners and other displaced persons to redress issues related to acquisition, compensation, or other aspects of resettlement.

Population Census: A complete and accurate count of the population that will be affected by land acquisition and related impacts. When properly conducted, the population census provides the basic information necessary for determining eligibility for compensation.

Asset Inventory: A complete count and description of all property that will be acquired.

Household Survey: A complete and accurate survey of the project-affected population. The survey focuses on income-earning activities and other socioeconomic indicators.

Socioeconomic Survey: The population census, asset inventory, and household survey together constitute the socioeconomic survey of the affected population.

Note: Definitions are taken from the JICA Guidelines for Environmental and Social Consideration, or subsequently from the World Bank OP4.12 and glossary of *the Involuntary Resettlement Sourcebook, Planning and Implementation in Development Projects* (2004).

1. General

1.1 Project Description

The objective of the proposed Dhaka – Chittagong Main Power Grid Strengthening Project is to ensure stable power supply in Bangladesh by constructing high voltage power transmission lines between Dhaka and Chittagong and rehabilitating its central load dispatching center, thereby contributing to the country's economic growth and climate change mitigation.

1.2 Project Components

To achieve the above objective, the project components will be as follows:

- Construction of double circuit 400 kV transmission line (214 km from Meghnaghat to Madunaghat, and 92 km from Matarbari to Madunaghat)
- Expansion of 400 kV / 230 kV substations
- Construction of 230 kV / 132 kV substations
- Construction of double circuit 230 kV (5.2 km from LILO at Madunaghat SS to Hathazari-Sikalbaha)
- Construction of double circuit 230 kV (8 km from new Madunaghat SS to the existing Madunaghat SS)
- Rehabilitation of the Central Load Dispatching Center
- Their related facilities including access roads
- Consulting Services (detailed design, support for bidding, or construction supervision, etc.)

1.3 Project Catchment Area

Dhaka District and Chittagong District

1.4 Project Proponent

Power Grid Company of Bangladesh Limited (hereinafter "PGCB")

1.5 Anticipated Land Acquisition and Resettlement

There is no involuntary resettlement both on the TL routes and substation sites anticipated in the Project. However, land acquisition both permanently and temporarily is anticipated as described below:

(1) Transmission Line Route

Number of towers constructed for 400kV TL from Meghnaghat to Matarbari is approximately 800 in total. It requires 2m2 of land per one suspension tower base (approximately 550 nos) and 3m2 of land per one tension tower base (approximately 250 nos): in total 1,860 m2 of paddy land and certain trees will be permanently affected by the tower construction[1]. Construction of one tower base for 230kV requires 1m2 of land per one suspension tower (approximately 20 nos) and 1m2 of land per one tension tower (approximately 10 nos). Number of towers for 230 kV TL in total will be 30 in total, and it will be 80 m2 of land permanently acquired. In conclusion, it is approximately required not more than 2,000 m2 in total to acquire the land for tower foundation.

The construction period of each tower is expected to last 30 days, during which the construction site (700 m2 per tower) and temporary access road (200 m2) will be blocked where farm activities will be disturbed. It is long enough to lose the income opportunity for land owners for one crop season, and job opportunity and crop share for sharecroppers and cultivators too.

As for the right of way (hereinafter "ROW"), wiring work will last 3 weeks per 3 km, which will require safety instruction for local farmers. It is however not anticipated to hinder their farming activities. Settlements and homesteads have been avoided when the route map was drafted so that no land acquisition or involuntary resettlement is anticipated.

(2) Substations

As large as 220 acres (equivalent to 89 ha) of land for the candidate site for new Meghnaghat Substation is within Meghnaghat Power Station Complex presently owned by BPDB. BPDB and PGCB will take all official procedures for transferring ownership, so that no acquisition of private land is anticipated.

On the contrary, not more than 20 acres (10 ha) of land will be acquired for the construction of 400 kV / 230 kV Madunaghat Substation including road expansion in the surrounding area. The affected area is mainly East Gujra Union and Groche Union of Raozan Upazila of Chittagong District. The existing road is planned to be widened for 2m, as long as 1,000 m from the nearest jetty to the substation site, which will require land acquisition of paddy land and gardens of homesteads by the road. The details of losses by the expansion of access road have not been finalized yet as the road design including route selection has not been fixed yet as of January 2015.

There is no land acquisition for the expansion of other substations anticipated.

[1] 19 Upazilas under 7 Districts: Sonargaon Upazila (Narayanganj District), Gazaria (Munshiganj), Daudkandi 8Comilla), Kachua (Chandpur), Barura (Comilla), Laksam (Comilla), Nangolkot (Comilla), Feni-S (Feni), Chhagolnaiya 8Feni), Mirsarai (Chittagong), Fatikchhari (Chittagong), Hathazari (Chittagong), Raozan (Chittagong), Boalkhali (Chittagong), Patiya (Chittagong), Anowara (Chittagong), Banshkhali (Chittagong), Pekua (Cox's Bazar), and Moheshkhali (Cox's Bazar).

1.6 Entitlement Matrix

(1) Transmission Line Route

The following types of losses (permanently and temporarily) are foreseen on the 400 kV and 230 kV / 132 kV TL routes, and entitlements have been drafted based on the legislations in Bangladesh and JICA Guidelines.

Approximately 600 out of approximately 800 tower bases are owned by private land owners, which will be affected permanently. If the land for tower bases is acquired involuntarily, compensation shall be paid at replacement cost. On the other hand, fully given an informed consent and power of choice to the land owners for their possible land use for the tower bases, PGCB, together with contractors of the transmission lines, will conclude agreements in writing with them with regard to the land use to avoid possible misunderstandings and disputes in the future in case they agree to voluntary land acquisition.

Those land owners of ROW will be temporarily affected during the construction period and compensation for the damages to their standing crops and trees shall be paid. Sharecroppers will temporarily lose their means of livelihoods during the construction period and their such losses also be compensated. PGCB shall restore the land to its original conditions after construction period is over.

Table 1-1: Entitlement Matrix (Transmission Line Route)

	Type of Loss	Entitled Persons (EP)	Entitlements (Compensation Package)	Responsible Organizations
1	Permanent loss of paddy land at tower foundations*	Legal land owner	Cash compensation under Law (CCL) market value of land area plus 50% premium	Implementation: Deputy Commissioner (DC)'s Office (Land Acquisition Officer, LAO) Monitoring: PGCB
			Top-up grant to cover 1) Gap between the average of last 12 months' sales values of same kind of land, and the current market value of private land 2) Max allowable replacement value (RV) to purchase new land (and trees) with equal productive value, preparation cost, and registration cost (such as stamp duty and tax)	Implementation: contractors Supervision and monitoring: PGCB Advise given by DC Office (LAO)
			One time assistance for annual cropping volume (3 years)	
2	Permanent loss of trees / perennials / fruit trees at tower foundations*	Owners	- Timber trees: The value equals that of the lumber - Fruit or fodder trees: the value equal to the vumlative value of the fruit crop for its productive life	
3	Temporary loss of access to paddy land and trees during construction period (=Temporary loss of	Legal land owner	Profit loss for 1 crop season	
		Cultivator	One time assistance for crop share	

	standing crops, trees and job opportunities)	Sharecropper	One time assistance for 3 months of wage and crop share	

(Note) In case the land owners for their possible land use for the tower bases agree to voluntary land acquisition, the above 1 and 2 will be excluded from the entitlements.
(Source) developed by JICA Survey Team.

(2) New Madunaghat Substation

Permanent losses of the following types are foreseen for the construction of new Madunaghat Substation and entitlements have been drafted as follows. According to the information given at the East Gujra Union Parishad Office, there are 46 land owners of 82 land plots at the substation site who will lose their land permanently, and their cultivators and sharecroppers will also permanently lose their means of livelihood.

Table 1-2: Entitlement Matrix (new Madunaghat Substation)

	Type of Loss	Entitled Persons (EP)	Entitlements (Compensation Package)	Responsible Organizations
1	Permanent loss of paddy land	Legal land owner	Cash compensation under Law (CCL) market value land area plus 50% premium	Implementation: DC Office (LAO) Monitoring: PGCB
			Top-up grant to cover 1) Gap between the average of last 12 months' sales values of same kind of land, and the current market value of private land 2) Max allowable replacement value (RV) to purchase new land with equal productive value, preparation cost, and registration cost (such as stamp duty and tax)	Implementation: contractors Supervision and monitoring: PGCB Advise given by DC Office (LAO)
			One time assistance for annual cropping volume (3 years)	
2	Permanent loss of access to paddy land (=Permanent loss of income from crop sales and livelihood means)	Legal land owner	- One time assistance for annual cropping volume (3 years) - Support in transitional period	
		Cultivtor	- One time assistance for crop share - Support in transitional period	
		Sharecropper	- One time assistance for 3 months of wage - Support in transitional period	

(Source) developed by JICA Survey Team.

(3) Access Road Expansion to New Madunaghat Substation

Permanent and temporary losses of the following types are anticipated for the expansion of access road to new Madunaghat Substation and entitlements have been drafted as follows. The number of land plots reaches 4 along the access road as long as 1,000 m.

Table 1-3: Entitlement Matrix (Road Expansion to Madunaghat Substation)

	Type of Loss	Entitled Persons (EP)	Entitlements (Compensation Package)	Responsible Organizations
1	Permanent loss of paddy land	Legal land owner	Cash compensation under Law (CCL) market value land area plus 50% premium	Implementation: DC Office (LAO) Monitoring: PGCB
			Top-up grant to cover 1) Gap between the average of last 12 months' sales values of same kind of land, and the current market value of private land 2) Max allowable replacement value (RV) to purchase new land with equal productive value, preparation cost, and registration cost (such as stamp duty and tax)	Implementation: contractors Supervision and monitoring: PGCB Advise given by DC Office (LAO)
2	Permanent loss of access to paddy land (=loss of income from crop sales and livelihood means)	Legal land owner	One time assistance for annual cropping volume (3 years)	
		Sharecropper	One time assistance for 3 months of wage	
3	Permanent loss of trees / perennials / fruit trees*	Owners	- Timber trees: The value equals that of the lumber - Fruit or fodder trees: the value equal to the vumlative value of the fruit crop for its productive life	
4	Permanent loss of certain homestead area*	Legal land owner	Cash compensation under Law (CCL) market value of land area plus 50% premium	Implementation: DC Office (LAO) Monitoring: PGCB
			Top-up grant to cover 1) Gap between the average of last 12 months' sales values of same kind of land, and the current market value of private land 2) Max allowable **r**eplacement value (RV) to purchase new land with equal productive value, preparation cost, and registration cost (such as stamp duty and tax)	Implementation: contractors Supervision and monitoring: PGCB Advise given by DC Office (LAO)
5	Permanent loss of houses and other structures in homestead*	Legal land owner and family members	- Market cost of materials to build a replacement structure with an area and quality up to similar level (or better), or to repair a partially affected structure - Cost of transporting building materials to the site - Cost of labor and contractors' fee - Cost of registration and taxes (if any)	
6	Temporary loss of access to homestead during construction period*	Legal land owner and family members	- Provision of temporary access and relocation where possible - Restoration of access to the land, structure, utilities	

(Note) As of January 2015, the inclusion of the above 3, 4, 5 and 6 has not been finalized yet since the road design including route selection remains unfinalized.
(Source) developed by JICA Survey Team.

1.7 Land Acquisition and Compensation Budget and Financial Plan

In addition to the compensation stipulated by the Ordinance 1982 and the Electricity Act 1910, all the compensation will be done according to the principle of the replacement cost, which will require PGCB to pay the gap between CUL and the replacement value (top-up). The total cost

for land acquisition and compensation is estimated 515.98 million Taka. Adequate budgetary support will be fully committed and made available to cover the costs of land acquisition and compensation within the agreed implementation period.

Table 1-4: Land Acquisition and Compensation Cost

(Unit: BDT)

Division		Land acquisition		Livelihood / ROW Compensation				TOTAL
				Permannet Loss		Temporary Loss		
		CUL	Top-up	Crop	Labor	Crop	Labor	
1	400kV from Meghnaghat to Madunaghat SS	1,610,703	241,605	74,402	0	8,628,674	8,079,898	18,635,282
2	400kV from Madunaghat SSn to Matarbari CFPP	435,938	65,391	23,947	0	2,728,933	3,436,113	6,690,322
3	230 kV TL from new Madunaghat SS - existing Madunaghat SS	56,069	8,410	2,082	0	213,499	287,541	567,601
4	230 kV TL from LILO at Madunaghat SS from Hathazari-Sikalbaha TL	32,347	4,852	1,201	0	138,774	186,902	364,076
5	New Madunaghat SS	402,521,898	60,378,285	11,457,784	1,207,672	0	0	475,565,638
6	Road Expantion to Madunaghat SS	11,979,818	1,796,973	341,005	35,943	0	0	14,153,739
TOTAL		416,636,774	62,495,516	11,900,421	1,243,614	11,709,880	11,990,453	515,976,658

(Source) developed by JICA Survey Team.

1.8 Grievance Redress Mechanism

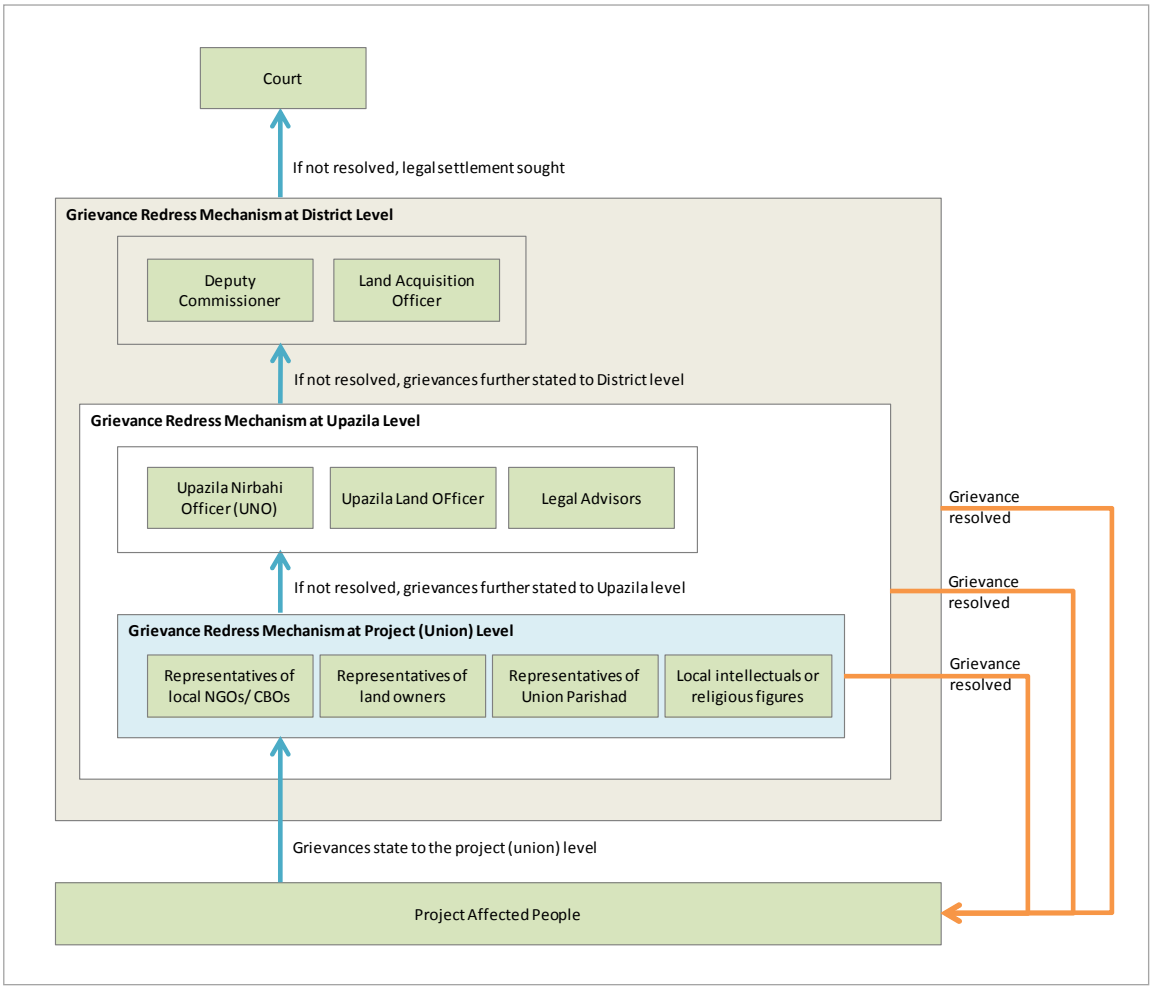
As soon as the budget for land acquisition and livelihood compensation becomes available, PGCB will make a payment to the Deputy Commissioner's Office of Chittagong District to initiate the payment procedure as stipulated in the Ordinance 1982 and Land Acquisition Act 1870.

Endorsed by the Ministry of Power, Energy and Mineral Resources (MOPEMR), a formal grievance redress committees (GRC) will be formed then at union level for any grievances involving resettlement benefits, relocation and other assistance. The purpose of establishing GRCs is to promptly address the concerns and complaints using an accessible and transparent process to the PAPs. GRCs can be comprised of the following members whose standing is neutral and independent:

- PGCB
- Project staff in charge of the Action Plan for Land Acquisition and Livelihood Compensation
- Local NGO
- Chairman of Union Parishad
- Representatives from the Project Affected Persons (PAPs)
- Local intellectuals

- Legal advisors

The structure of GRC is described in the figure below. The core function of GRC will be further discussed and determined in due course of time.



(Source: Developed by JICA Survey Team)

Figure 1-1 Grievance Redress Mechanism

1.9 Public Consultation and Participation

The PAPs and their communities will be consulted about the project, the rights and options available to them, and proposed mitigation measures for adverse effects, and to all extents possible be involved in the decision-making process concerning the land acquisition.

PAPs will be involved in the process of developing and implementing the Action Plan for Land Acquisition and Livelihood Compensation. The PAPs will receive prior notification of the compensation, relocation and other assistance available to them.

PGCB will be responsible, in close coordination with the Deputy Commissioner and contractors, to hold and conduct a number of consultations with primary and secondary stakeholders and information dissemination on the following issues:

- The relevant details of the project
- The RP and various degrees of project impact
- Details of entitlements under the Action Plan and what is required of PAPs in order to claim their entitlements
- Compensation process and compensation rates
- Relocation and resettlement site development operation in order to obtain agreement and support of affected people in participating in these operations
- Implementation schedule and timetable for the delivery of entitlements

Public participation will be spontaneously performed and information will be made available during preparation and implementations of the RP and at the minimum include community meetings and focus groups discussions.

1.10 Application of Exception

In case of voluntary resettlement, which refers to any resettlement not attributable to eminent domain or other forms of land acquisition backed by powers of the state, the operative principles are informed consent and power of choice. PGCB will, together with the contractor of the transmission lines, inform the land owners of their possible land use for the tower base, duly take into account the land owners' responses when conducting surveys and determining the final route alignment, and conclude agreements in writing with the land owners with regard to the land use for the tower base to avoid possible misunderstanding and disputes in the future. PGCB will duly inform the land owners that they have the right to express objection to the possible land use.

1.11 Implementation Schedule

The implementation schedule of ROW compensation and acquisition of land for new Madunaghat SS and its access road is shown in the ANNEX I.

1.12 Monitoring Arrangements

Appropriate reporting (including auditing and redress functions), monitoring and evaluation mechanisms, will be identified and set in place as part of the management system of land

acquisition and livelihood restoration. An external monitoring group will be hired by the Project and will evaluate the whole process and final outcome.

An Environmental Management Plan (EMaP) has been prepared to provide guidelines for the monitoring during pre-construction, construction and operation activities of 1) transmission lines, 2) substations and 3) access road expansion.

The purposes of creating an EMaP are to:

- Confirm that mitigation measures shall reduce any negative impacts on the environment to allowable levels during the construction and operation phase.
- Set up an organization that is responsible for the implementation of monitoring the plan.
- Perform appropriate monitoring during the construction and operation phase.

The environmental components that will be monitored are those that will be positively or negatively affected, or expected to be affected.

The Environmental Management Plan and the Environmental Monitoring Plan concerning social aspects including ROW compensation and land acquisition is shown in the ANNEX II and ANNEX III respectively.

1.13 Further Arrangements

For acquiring the land for new Madunaghat Substation, As stipulated in the Acquisition and Requisition of Immovable Property Ordinance 1982, the PGCB will submit an application of land acquisition to the Government of Bangladesh (hereinafter "GOB"), with sufficient data and information regarding the project design and cost, through the Deputy Commissioner of Chittagong District. The DC Office will follow all the official procedures to acquire land and provide compensation as stipulated in the Ordinance 1982.

In order to activate the budget for land acquisition and livelihood compensation, it is necessary for the Planning Commission to approve the Development Project Proforma (hereinafter "DPP). To complete all the procedures from the PGCB's application to the payment of compensation through the DC Office to the project affected persons (PAPs), it will take over 12 months.

This Action Plan for Land Acquisition and Livelihood Compensation is to be translated into Bengalese and disclosed for the reference of PAPs as well as other interested groups.

2. Legislations in Bangladesh and Gaps from JICA's Policy

2.1 Key legislations

The Acquisition and Requisition of Immovable Property Ordinance of 1982 and its subsequent amendments in 1993 and 1994 provide the key legal instrument for the acquisition of private land for development activities in Bangladesh.

Salient provisions of the Ordinance which show tangible gaps with the JICA Guidelines are as follows:

Avoiding / minimizing land acquisition: The Ordinance only implicitly discourages unnecessary acquisition as land acquired for one purpose cannot be used for a different purpose. There are however no mechanisms to monitor if this condition is actually adhered to.

Eligibility for Compensation: The Ordinance stipulates compensation only for the persons who appear in the land administration records as the owners (=titleholders). It does not recognize the rights of those without legal title to the lands who live in or make a living from.

Compensation paid for: The Ordinance provides for compensation of lands and other objects built and grown on them (structures, trees and orchards, crops and any other developments like ponds, built amenities etc.). No provisions are there to assess and restore lost income stream or income sources caused by the land acquisition to the PAPs.

Compensation standards: Landowners receive compensation under the law (CUL) as per the market value of the property at the publication date of the notice[2] with a premium of 50 percent on the assessed price. Any damage to standing crops or trees on the property, the expenses incidental to compelled change to the residence or place of business, and reduction of the profits of the property in the acquisition period are also entitled to a sum of 50 percent on top of such market value[3]. The 1994 amendment made provisions for payment of crop compensation to tenant cultivators (*"bargadar"*).

Although the Ordinance stipulates 'market prices' of the acquired lands as the just compensation, the legal assessment method almost always results in prices far below the actual market prices. Certain pricing standards, which are regarded as unrealistic, are used to assess other losses like structures and various built amenities, trees, crops, and the like.

Relocation of Homestead Losers: No legal obligation is there to relocate, or assist with relocation of, those whose homesteads have been acquired.

[2] The average value of the properties of similar description and with similar advantages in the vicinity during the last twelve months prior to the publication date of the notice. (Section 8 (1) of the Acquisition and Requisition of Immovable Property Ordinance 1982.)
[3] The market value thus determined does not always reflect the actual market value.

Ensuring Payment / Receipt of the Compensation: Even with the given legal provision, the compensation process is time-consuming. There is, moreover, no certainty as to when an affected landowner would get the stipulated compensation or whether he would at all get it.

Lands are legally acquired and handed over to the project proponent as soon as the acquisition authority identifies the owners ('awardees') by examining the records, and sends a legal notice advising them to claim compensation ('awards'). And it turns out to be an obligation of the PAPs to prove that the acquired land legally belong to them.

Socio-economic rehabilitation: The provisions are so restricted that the Ordinance shows no concern about the long-term socio-economic changes the PAPs might undergo in the post-acquisition period. Except for the compensation at the legal 'market price', there are no other provisions in the acquisition or other-laws that require the government to mitigate the resultant adverse impacts caused by the acquisition. Socio-economic rehabilitation of the involuntarily displaced persons is absent in the legal regime of Bangladesh.

2.2 JICA's policy on land acquisition and resettlement

The key principles of JICA policies on involuntary resettlement are summarized below.

a Avoidance or minimization of land acquisition and involuntary resettlement
Land acquisition and involuntary resettlement will be avoided where feasible, or minimized, by identifying possible alternative project designs that have the least adverse impact on the communities in the project area.

b Entitlement and assistance for restoration and improvement in social and economic conditions.
Where displacement of households is unavoidable, all PAPs (including communities) losing assets, livelihoods or resources will be fully compensated and assisted so that they can improve, or at least restore, their former economic and social conditions.

c Compensation and rehabilitation support
People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported, so that they can improve or at least restore their standards of living, income opportunities and production levels to pre-project levels.

c. Application of the principle of the replacement cost
Compensation must be based on the full replacement cost as much as possible.

d. Actions prior to displacement

Compensation and other assistance required for relocation should be given prior to displacement. Acquisition of assets, payment of compensation, and the resettlement and start of the livelihood rehabilitation activities of PAPs, should be completed prior to construction activities, except when a court of law orders so in expropriation cases. Sufficient civic infrastructure must also be provided at relocation sites before displacement takes place.

e. Assistance in transition period

Resettlement assistance will be provided not only for immediate loss, but also for a transition period needed to restore livelihoods and standards of living of PAPs. Such support could take the form of short-term jobs, subsistence support, salary maintenance, or similar arrangements.

f. Assistance to the Vulnerable

The needs of those most vulnerable to the adverse impacts of resettlement are to be well considered. Assistance should be provided to help them improve their socio-economic status.

g. Consultation and Participation of the Affected People

In preparing a resettlement plan, consultations must be held with the affected people and their communities based on sufficient information made available to them in advance. When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people.

Appropriate participation of affected people must be promoted in planning, implementation, and monitoring of resettlement action plans.

h. Grievance Mechanism

Appropriate and accessible grievance mechanisms must be established for the affected people and their communities.

In terms of categories of PAPs and types of lost assets, the gaps in the existing legal framework of Bangladesh and requirements of the JICA Guidelines are identified as presented in the table below.

Table 2-1 Gap Analysis between Bangladeshi Laws and JICA Guidelines

No	Category of PAPs / Types of lost assets	Bangladesh Laws	JICA Guidelines
1	For lands of all types and other assets for legal land	Acquired by DC as per legal requirements / procedures	Preference should be given to land-based resettlement strategies for displaced persons whose livelihoods are land-based
2	Land tenants	Compensation for the standing crops if harvesting of crops is not possible	People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported.
3	Land Users	Squatters, encroachers and unauthorized users / occupiers are not recognized	ditto
4	Owners of temporary structures	Only compensation under law (CUL)	Compensation must be based on the full replacement cost as much as possible.
5	Owners of permanent structure buildings	ditto	ditto
6	Perennials crops	Market prices of the standing crops with value of plants	Compensation must be based on the full replacement cost as much as possible.
7	Timing for payment of entitled compensation by the PAPs	No concern on the part of the project proponent. Land is handed over to the project proponent as soon as the fund is placed to the DC.	On the completion of payment of compensation to the PAPs the land to be vacated and handed over to the project proponent.
8	The issue of relocation and income generation activities	No concern about relocation and income generation activities.	People who must be resettled involuntarily and whose means of livelihood will be hindered or lost must be sufficiently compensated and supported, so that they can improve or at least restore their standards of living, income opportunities and production levels to pre-project levels.
9	Vulnerability of PAPs	No distinction between the PAPs	Particular attention must be paid to the needs of the vulnerable groups among those displaced, especially those below the poverty line, the landless, elderly, women and children, ethnic minorities, etc.
10	Role of DC, project proponent and PAPs	DC to acquire lands, the project proponent to use the land, and PAPs to seek compensation from the DC.	DC and project proponent to assist the PAPs in getting the compensation, assist to collect the legal and required documents, and provide support for the transition period between displacement and livelihood restoration.

(Source) JICA Survey Team

2.3 Procedures of land acquisition

Under the Ordinance of 1982, the DC at District level is entrusted to acquire land for agencies requiring land for any public or private infrastructure projects. The procedures of land acquisition will follow the following steps:

Step 1: After identifying and selecting the exact ground locations of the required land, the project proponent will carry out detailed engineering surveys and design the construction works and lay them on the mauza maps. The project proponent will prepare the land acquisition proposals to obtain an administrative approval by the line ministry.

Step 2: The project proponent, after obtaining the approval of the administrative ministry, makes a request to the DC, with sufficient information including the amount of land to be acquisitioned from each plot, the ownership status such as private and public lands, for the acquisition of the land as per the proposal.

Step 3: Within 90 days, the DC will appraise the application through a) site observation, b) consultation with local politicians and residents, c) develop project profile, d) cost estimate. The DC will then develop and submit proposal on land acquisition to the Ministry of Land for the appraisal by the central government within 90 days.

- The DC will publish a notice as stipulated in Section 3 of the Ordinance of 1982 stating that there is a proposal for the property to be acquired. The persons to be displaced may submit an objection to the land acquisition to the DC within 15 days after the notice is served.

  Al the legal titleholders will be advised to show their ID cards and other documents that verify their rights. For those with no registration, the DC Office will call for circumstantial evidence from community leaders, local elite people, and religious leaders, etc., to add them to the list.

- The DC consults with the Public Works Department (PWD), Forest Department (BFD), Department of Agricultural Marketing (DAM) and Department of Fisheries (DOF) to assess the value of structures, trees, crops and aqua products for their existing rates.

- Under Section 6, a second public notice is served stating the GOB's decision of land acquisition and taking possession thereof. The DC Office will confirm the PAPs, exact land area and size for acquisition, number of relocated houses, agriculture land, forestry and fishing areas that will be lost. The persons to be displaced are requested to submit their statements of property, amounts and particulars of the claims to compensation after 15 days of the second notice being served. The DC Office will respond to any grievances made by the PAPs in order to agree to the assistance package.

- The project proponent shall deposit the estimated amount of the award of compensation with the DC within 60 days from the receipt of the estimate given by the DC.

- Upon serving the last notice (Section 7), the DC shall pay the amount to the owners of the acquired property within another 60 days from the date of deposit by the project proponent. The DC will take possession of the property after completion of the compensation payment to the PAPs and immediately declare this in the official gazette, and hand the property over to the project proponent.

3. Social Impact Survey

3.1 Survey Outline

The JICA Survey Team and PGCB have worked on three basic types of surveys needed: population census, asset inventory, and household survey prior to the project appraisal. The census and asset inventory will cover all the potential PAPs regardless of entitlement of land ownership. The household survey will cover at least 20 % of affected / displaced PAPs in order to collect typical features of the affected households, basic data of their livelihoods and living standard, vulnerable groups.

(1) Population Census

A complete and accurate count of the population will be made in the population census to confirm who and how many of the people would be affected by land acquisition and related impacts. The population census provides the basic information necessary for determining eligibility for compensation.

(2) Asset Inventory

In the asset inventory survey, a complete count and description of all property will be undertaken for the property to be acquired. An asset inventory of losses (IOL) will involve a mapping of all households affected by land acquisition: homesteads, trees, standing crops, structures and other kinds of losses i.e. wages and income. A listing of their losses will be remunerated into a database.

The IOL for each PAP record the following:

- amount and type of land to be acquired
- type of trees and / or standing crops acquired
- homesteads and other structures to be acquired
- loss of livelihood (type and income loss)
- other types of losses
- types of community infrastructure or common property resources to be acquired

In conjunction with the population census and IOL of the PAPs, household data will collected on:

- size, sex and age composition of each affected household
- types of occupation / livelihood for each economically active household member
- assessment of income levels for each economically active household member
- number of school age children attending school
- ethnic, language, and religious identity of each affected household

- PAPs attitudes (intentions / opinions) towards the project, land acquisition and resettlement

(3) Household Survey

The household survey will focus on income-earning activities and other socioeconomic indicators to observe the social and economic conditions of PAPs, such as income, expenditure, employment, education, skills, livelihood, utilities, health services facilities, social services, and other socio-economic and cultural aspects that prevail in the targeted areas. The household survey also included an inventory of formal and informal community level organizations that represent the PAPs, and that can be engaged in information dissemination and consultation related to the preparation of a resettlement plan and its implementation.

3.2 Survey Results

3.2.1 400 kV Transmission Lines

The land owners of the proposed tower locations of 400kV transmission line have been identified during the route survey in June and July 2014 as listed in the ANNEX IV.

The lands of 597 tower locations are owned by the private land owners. The lands of the remaining tower locations are government lands.

Downbelow is the summary of socioeconomic survey, focus group discussion and key informant interviews conducted en route.

Socioeconomic survey comprised of population census, asset inventory, and household survey using a set of questionnaire was conducted in seven Upazillas (Mirsarai, Anowara, Banskhali, Raozan, Laksam, Gozaria and Sonargaon) along the proposed 400kV transmission line. Total 184 household heads have been interviewed. The findings are summarized as below:

Table 3-1 Summary of Interviewed Households on Transmission Line Route

Division	District	Upazila	No of interviewee	No. of Family Member	Sex		Occupation										
					Male	Female	Farmer	Business	Service	student	House wife	Agriculture Labor/ Day Labor	Unemployed	Teacher	Retired/Elder	Driver	others
Chittagong	Chittagong	Anowara	35	177	101	76	10	13	2	1	6	0	3	0	0	0	0
		Banshkhali	31	164	77	87	9	8	3	0	4	5	0	1	0	1	0

		Raozan	27	115	64	51	5	2	1	0	12	1	0	0	0	2	4
	Comilla	Laksam	29	130	67	63	5	6	1	0	11	1	0	0	2	2	1
Dhaka	Munshiganj	Gazaria	32	133	78	55	6	17	3	0	1	1	0	0	1	0	3
	Narayanganj	Sonargaon	30	125	67	58	3	13	7	0	1	0	0	0	4	0	2
Total			184	844	454	390	38	59	17	1	35	8	3	1	7	5	10

(Source: developed by the JICA Survey Team)

(1) Occupation

59 respondents (32.1%) are businessmen, 38 are farmers (20.65%), 35 (19.0%) are housewives, 17 (9.2%) are service providers, 8 (4.4%) are daily labourers, 7 (3.8%) are retired persons, and 20 (10.9%) are others.

(2) Family Size:

The average family size among 184 respondets is **4.64.**

(3) Monthly Income:

The average monthly incomes of the respondents are as follows. 113 respondents (60 %) of the total respondents have family income below Tk.10,000 per month, out of which 40 (21.7%) are in poverty.

Income range	No of resondents	%	Average monthly income
< Tk.5,000	40	21.7%	Tk. 612
Tk. 5,000 – Tk. 10,000	73	39. 7%	Tk. 9,075
Tk. 10,000 – Tk. 15,000	21	11.4%	Tk. 12,047
Tk. 15,000 – Tk. 20,000	23	12.5%	Tk. 14,913
Tk.20,000 <	27	14.7%	Tk. 34,703

(Source) socioeconomic survey

(4) Houses

The roofs of 156 houses (84.7%) are made of tin, 12 (6.5%) are of concrete and 16 (8.8%) are of thatch / hay.

The walls of 84 houses (45.7%) are made of tin, 46 (25.0%) are of clay, 34 (18.5%) are of concrete and the rest 20 (10.9%) are of bamboo.

Similarly, 146 houses (79.3%) have clay-made floor, 35 (19.0%) are of concrete and 3 (1.6%)

are of bamboo.

(5) Source of Drinking Water

The main source of drinking water for all 184 households is tube well water. Besides, ponds and river water are also used in various purposes like, bathing, cooking, cleaning etc.

(6) Electricity

140 households (76.1%) are electrified with grid system and 4 (2.2%) are with sloar system. The remaining 40 houses (21.7%) are not electrified.

(7) Fuels for cooking

154 households (83.7%) use wood for cooking purpose, 24 (13.0%) use LPG / Natural gas, 14 (7.6%) use cow dung, 13 (7.1%) use leaves and 10 (5.4%) use natural garbage.

(8) Medical Treatment

Most of the respondents go to Government Hospital for their medical treatment. Some of them go to such places as private clinic, quack doctor, MBBS Doctors etc. to seek medical attention.

3.2.2 400kV Substations

There are two 400kV substations to be constructed under this project: Meghnaghat 400kV Substation located in Sonargaon Upazila, and Madunaghat 400kV Substation in Raozan Upazila of Chittagong District.

The location of the proposed Meghnaghat 400kV SS is within Meghnaghat power station complex. The land of this complex was acquired and developed by BPDB. Subsequently the lands are being used by different IPPs for power generation and also by PGCB for grid substations. Therefore there is no need of land acquisition for the proposed Meghnaghat 400kV SS and no resettlement is expected to be required.

The proposed Madunaghat 400kV SS is located at East Gujra Union of Raojan Upazila of Chittagong district in the North West side of a 25MW power station operated by the Rural Power Company Limited (RPCL) located on the north side of Chittagong – Kaptai road. Less than 10 acres of land will be required to construct the proposed Madunaghat 400kV SS. For this, a survey team was sent to the proposed location of Madunaghat SS from October 8 to 16, and from November 12 to 21, 2014 to demarcate the area of the proposed substation and identify the land owners of the substation area.

The latest list of the affected land owners for the proposed Madunaghat SS has been developed based on the data collected at East Gujra Union Land office as in the ANNEX V**.** Downbelow is the summary of socioeconomic survey, focus group discussion and key informant interviews

conducted on site late November 2014.

Socioeconomic survey using a set of questionnaire was conducted, and 36 out of total 50 land owners for 86 plots were interviewed. Among them, 34 of them are genuine land owners, and two were sharecroppers and the total area of the lands possessed by the 36 people is 1,867.5 decimals. Among the remaining 14 land owners, names of two land owners were not found in the list provided from the land office. Their addresses were not found in the list either. The other two refused to give their opinions in the interviews. The remaining ten farm land owners were not found during the survey. Their addresses are also not known to others. The area of land acquired by these 14 people is 631 decimals in total. The findings are summarized as below:

Table 3-2 Summary of Interviewed Households on new Madunaghat SS

Division	District	Upazila	No of interviewee	No. of Family Member	Sex		Occupation									
					Male	Female	Farmer	Business	Service	student	House wife	Teacher	Retired/Elder	Driver	Electrician	Foreign service	others
Chittagong	Chittagong	Raozan	36	151	81	70	6	10	3	1	5	2	6	1	1	1	0

(Source: developed by the JICA Survey Team)

(1) Occupation

Among the 36 respondents, those engaged in business were the most (27.77%). The percentage of retired and old man were the second most (16.66%) followed by housewife (14%), service (8.33%), teacher (5.55%). The remaining (driver, electrician, foreign service, and student) shares equal (2.77%).

(2) Family Size

The total number of family members for all 36 respondents are 151. Among them there are 81 Male and 70 Female. Their average family size is 4.19.

(3) Monthly Income

The monthly income of the 36 respondents has been categorized in 4 categories:

Range Tk. 5,000-8,000: 17 respondents, their monthly income average: Tk.6,941 per month

Range Tk. 8,001-11,000: 12 respondents, their average monthly income: Tk.9,916

Range Tk.11,001-14,000: 2 respondents, and their monthly income: Tk.12,000

Range Tk.14,001-30,000: 5 respondents, their average monthly income: Tk.20,000

The average 36 respondents average monthly income Tk.10,027.77.

Income range	No of resondents	%	Average monthly income
Tk. 5,000-8,000/=	17	47.2	6,941.17
Tk. 8,001- 11,000/=	12	33.3	9,916.68
Tk. 11,001- 14,000/=	2	5.6	12,000
Tk. 14,001-30,000/=	5	13.9	20,000
Total	**36**	**100.0**	**10,027.77**

(Source) socioeconomic survey

(4) Houses

According to the remarks of the respondents, the materials that are being used in their respected households are as follows. Among the 36 respondents, the materials used for roof are: Tin 20 and Concrete 16. Those used for wall are: Tin 1, Concrete 23, Bamboo 10, and Clay 2. Those for floor are, Concrete 20 and Clay 16. 36 respondents say that they use safety tank (modern 44%) and the remaining (56%) use Water Log/Slave Latrine.

(5) Assets

The numbers and kids of assets of the total 36 respondents are listed below.

SL. No.	House hold Assets found	No. of Assets
1	TV	29
2	Fan	31
3	By Cycle	01
4	Al Mira	36
5	Computer	01
6	Bed	32
7	Chair/Bench	35
8	Watch	2
9	Mobile	36
10	Refrigerator	23

(Source) socioeconomic survey

(6) Source of Drinking Water

Total 36 (100%) respondents said they use and drink the tube well water and also said that there is no arsenic in the tube well water and it is completely pure. Besides, ponds and channel water is also used by the respondents in various purposes like, bathing, cooking, cleaning etc. But, they use only tube well water as their only source of drinking water.

(7) Electricity

Among the 36 respondents, there are 36(100%) respondents that have electricity in their households. There are so many respondents who use the electricity for different purposes such as fan, light, television, refrigerator, mobile charge, irrigation, small factory, computer, business centre, office, school, college etc.

(8) Fuels for cooking

Among the total 36 respondents all of them use wood as the material to act as a fuel in their cooking in their respected households.

(9) Medical Treatment

Among the total 36 respondents, the maximum number of respondents go to Govt. Hospital for their medical treatment, and the number of respondents going there are 34. The rest of the respondents go to M.B.B.S doctors (20) and Quack Doctors (16) respectively.

(10) Land Tenure

The total quantity of land in residential land for all the 36 respondents are 495 decimal of TK.161,000,000 present value. Average per decimal residential land value is Tk. 325,252. The total another quantity of cultivated land for the all the 36 respondents are 1,867.5 decimal of Tk.30,179,140 present value. Average per decimal cultivated land vale is Tk.161,602.

Number of Respondent	Residential land		Cultivable Land of the site	
	Quantity of Land (dec)	Present value (Tk.)	Quantity of Land (dec)	Present value (Tk.)
36	495	161,000,000	1,867.5	301,791,940

(Source) socioeconomic survey

(11) Production of Paddy

The total quantity of cultivated land is 1,867.5 decimal, where 93,375Kg crops are produced two times in a year. The total types of paddy (Tk. 30 per Kg) is Tk. 2,801,250.

Quantity of Cultivated Land (dec)	Production of paddy crops a year (twice) (Kg)	Total Price of Paddy (Tk.30 per Kg)
1,867.5	93,375	2,801,250

(Source) socioeconomic survey

3.2.3 Access Road

The access road will be constructed by expanding of existing farm road with 3.5 meter to 5.5 meter width and 1,000 meter length from the nearest jetty to the substation site, which will require land acquisition of paddy land and gardens of homesteads by the road.

The socioeconomic survey and FGD were conducted at the same time as those for the new Madunaghat SS. All the details are included in the above.

4. Detailed Description of Impacts and Category of PAPs

This section describes that the results of predictions and impact evaluations of the major environmental impact items for the proposed transmission line, substation and access road. There is no item evaluated as "A" (significant positive/negative impact is expected).
These predictions and impact evaluations have been made studying mitigation measures for avoiding or mitigating impacts with respect to various forms of environmental items.

4.1 Transmission line

(1) Pre-construction Phase

a. Land Acquisition

Findings: Number of towers constructed for 400kV TL from Meghnaghat to Matarbari is approximately 800 in total. It requires 2m2 of land per one suspension tower base (approximately 550 nos) and 3m2 of land per one tension tower base (approximately 250 nos): in total 1,860 m2 of paddy land and certain trees will be permanently affected by the tower construction[4]. Construction of one tower base for 230kV requires 1m2 of land per one suspension tower (approximately 20 nos) and 1m2 of land per one tension tower (approximately 10 nos). Number of towers for 230 kV TL in total will be 30 in total, and it will be 80 m2 of land permanently acquired. In conclusion, it is approximately required not more than 2,000 m2 in total to acquire the land for tower foundation.

Mitigation Measures: Such permanent land acquisition for the above tower bases shall be conducted on the basis of compensation at replacement cost. Trees within clearance distance from cables will be removed. Standing crops and trees will be compensated at market price. However, given an informed consent, the land owners have the right to fully exercise their power of choice: to voluntarily or involuntarily provide their land for tower bases. If PGCB does not purchase the land under the proposed transmission towers, PGCB shall restore the land to its original conditions after construction of the transmission towers.

b. Right of Way (ROW)

The construction period of each tower is expected to last 30 days, during which the construction site (700 m2 per tower) and temporary access road (200 m2) will be blocked where farm activities will be disturbed. It is long enough to lose the income opportunity for land owners for

[4] 19 Upazilas under 7 Districts: Sonargaon Upazila (Narayanganj District), Gazaria (Munshiganj), Daudkandi 8Comilla), Kachua (Chandpur), Barura (Comilla), Laksam (Comilla), Nangolkot (Comilla), Feni-S (Feni), Chhagolnaiya 8Feni), Mirsarai (Chittagong), Fatikchhari (Chittagong), Hathazari (Chittagong), Raozan (Chittagong), Boalkhali (Chittagong), Patiya (Chittagong), Anowara (Chittagong), Banshkhali (Chittagong), Pekua (Cox's Bazar), and Moheshkhali (Cox's Bazar).

one crop season, and job opportunity and crop share for sharecroppers and cultivators too.
Wiring work will last 3 weeks per 3 km, which will require safety instruction for local farmers. It is however not anticipated to hinder their farming activities. Settlements and homesteads have been avoided when the route map was drafted so that no land acquisition or involuntary resettlement is anticipated.
Mitigation Measures: ROW compensation shall be conducted to replace their crop income for one season, one time assistance for three months' of their wages.

(2) Construction Phase

a. Disturbance to Poor People

Findings: Livelihood means of cultivators and sharecroppers will be temporary lost during construction period due to the blockage of farm land for the construction purpose. They work on daily basis and they are not well-paid.
Mitigation Measures: Compensation for their income for one season shall be offered to them in order for them to sustain their living and find other job opportunities.

b. Disturbance to Ethnic Minority Groups and Indigenous People

Findings: According to the results of Population Census of 2011 and interview survey conducted during the field survey, no ethnic minority groups or indigenous people have been identified along the transmission line route.

c. Deterioration of Local Economy such as Losses of Employment and Livelihood Means

Findings: Land owners, cultivators and sharecroppers will temporarily lose their means of livelihood during construction period due to the construction blockage of farm land. The period for such blockage will last for 30 days, and in the worst scenario their loss can last for the whole season.
Mitigation Measures: Compensation for such income loss for one season shall be offered for sustaining their living and seeking other job opportunities.

d. Land Use and Utilization of Local Resources

Findings: Farm activities will be disturbed temporarily due to the construction work. It is approximately estimated that 800m2 per tower bases will be blocked exclusively for the construction, where farm activities will be disturbed for 30 days, which may affect their standing crops for a whole season.
Mitigation Measures: Compensation for such income loss for one season shall be offered for sustaining their living and seeking other job opportunities.

e. Disturbance to Water Usage, Water Rights, etc.

Findings: Transmission line route has been selected avoiding any steep sloping land. Any slopes shall be reinforced with concrete, plantation or other means to minimize soil runoff and turbid water generation.

f. Infectious Diseases

Findings: Temporary influx of migrant labor during construction period may increase risk of infection.

Mitigation Measures: Local people will be put priority as laborers for simple work during construction period, which will help lower the risk of infectious diseases brought by external workers. Pre-employment and periodic medical check-ups will be conducted for external workers (technical workers, etc).

g. Work Conditions (Including Work Safety)

Findings: Labor accidents may occur anytime without prevention measures including safety education and training, allocation of protective equipment and distribution of protection clothes to laborers and workers.

Mitigation Measures: The contractor shall establish a work safety plan and submit it to PGCB to obtain approval. The work safety plan shall stipulate mitigation measures on such aspects as safety training, etc., and those as provision of protective equipment, etc.

h. Right of Way

Findings: Farm activities will be disturbed temporarily due to the construction work. Land owners, cultivators and sharecroppers will temporarily lose their means of livelihood during construction period due to the construction blockage of farm land. The period for such blockage will last for 30 days, which may affect their standing crops for a whole season.

Mitigation Measures: Compensation for such income loss for one season shall be offered for sustaining their living and seeking other job opportunities.

i. Accidents

Findings: Traffic and labor accidents can occur at any time which does harm to local residents living in surrounding areas and workers involved in construction work.

Mitigation Measures: As prevention measures for land traffic accidents, observation of traffic regulations, installation of traffic signs and training and education on safe driving will be implemented.

(3) Operation Phase

a. Work Conditions (Including Work Safety)

Findings: Labor accidents such as electric shocks while in construction period may occur at any time if there are no protection measures.

Mitigation Measures: The work safety plan shall stipulate mitigation measures on such aspects as safety education and training, allocation of protective equipment and distribution of protective clothes to laborers and workers.

b. Accidents

Findings: The transmission line route was selected avoiding any steep sloped areas. - Preventing soil loss by stabilizing any slopes of the construction area with concrete as necessary based on geological survey. Tower breakdown by cyclones will not occur as wind pressure is taken into account in the design. Land traffic accidents may also occur during construction phase.

Mitigation Measures: As prevention measures for land traffic accidents, observation of traffic regulations, installation of traffic signs and training and education on safe driving will be implemented.

4.2 Substation (Madunaghat)

(1) Pre-construction Phase

a. Land Acquisition

Findings: Approximately 7 ha of farm land will be required for the construction of new Madunaghat substation in Raozan Upazila of Chittagong District.

Mitigation Measures: It is the Deputy Commissioner of Chittagong District conducting land acquisition and payment of compensation in accordance with the Ordinance 1982. PGCB shall pay to DC Office when the budget is allocated from the Government of Bangladesh. A top-up payment shall be made on the basis of compensation at replacement cost. Trees within clearance distance from cables shall be removed. And standing crops and trees shall be compensated at market price.

b. Social Institutions such as Social Infrastructure and Local Decision-making Institutions

Findings: Land acquisition at new Madunaghat substation will cause permanent loss of land, standing crops and livelihood means of cultivators and sharecroppers.

Mitigation Measures: The Deputy Commissioner's Office of Chittagong District will take responsibility for initiatives to conduct local consultations concerning compensation in accordance with the Ordinance 1982, on top of which compensation at replacement cost shall be

added as agreed between PGCB and JICA.

c. Misdistribution of Benefits and Compensation

Findings: Equality of compensation and fair treatment among the project affected people must be assured.

Mitigation Measures: Landowners and other affected people must be legitimately identified for proper payment of compensation.

d. Local Conflicts of Interest

Findings: In case equality of compensation and fair treatment among the project affected people is not assured, disputes and conflicts among them can occur at any time.

Mitigation Measures: Regulations of Bangladesh stipulate that public consultation must be held in the land acquisition process, and their complaints or suggestions must stay heard for immediate action.

(2) Construction Phase

e. Disturbance to Poor People

Findings: Livelihood means of sharecroppers will be permanently lost. Sharecroppers work on daily basis and they are not well-paid.

Mitigation Measures: Compensation for their income shall be offered to them in order for them to sustain their living and bridging support shall be given until they find other job opportunities.

f. Disturbance to Ethnic Minority Groups and Indigenous People

Findings: According to the results of Population Census of 2011 and interview survey conducted during JICA survey, no ethnic minority groups or indigenous people have been identified in the substation site of Raozan Upazila.

g. Deterioration of Local Economy such as Losses of Employment and Livelihood Means

Findings: Land owners will permanently lose their land and their sharecroppers will permanently lose their means of livelihood.

Mitigation Measures: Compensation for such income loss shall be offered at replacement cost for their losses, sustaining their living and seeking other job opportunities. As mitigation measures, employing as many local residents as possible, and using the services and products offered by the local community.

h. Land Use and Utilization of Local Resources

Findings: Farm activities will be disturbed permanently due to the permanent acquisition of land as large as 7 ha at new Madunaghat substation site. Land owners will permanently lose their land and their sharecroppers will permanently lose their means of livelihood.
Mitigation Measures: Compensation for such losses shall be offered, sustaining their living and seeking other job opportunities.

a. Infectious Diseases

Findings: Temporary influx of migrant labor during construction period may increase risk of infection.
Mitigation Measures: Local people will be put priority as laborers for simple work during construction period, which will help lower the risk of infectious diseases brought by external workers. Pre-employment and periodic medical check-ups will be conducted for external workers (technical workers, etc).

b. Work Conditions (Including Work Safety)

Findings: Labor accidents may occur anytime without prevention measures including safety education and training, allocation of protective equipment and distribution of protection clothes to laborers and workers.
Mitigation Measures: The contractor shall establish a work safety plan and submit it to PGCB to obtain approval. The work safety plan shall stipulate mitigation measures on such aspects as safety training, etc., and those as provision of protective equipment, etc.

c. Accidents

Findings: Accidents can occur at any time which does harm to local residents living in surrounding areas and workers involved in construction work.
Mitigation Measures: As prevention measures for land traffic accidents, observation of traffic regulations, installation of traffic signs and training and education on safe driving will be implemented.

(3) Operation Phase

a. Disturbance to Poor People

Findings: Sharecroppers who permanently lost their means of livelihood during construction work may not be able to find other job opportunities in the surrounding area even after the construction work.
Mitigation Measures: Bridging support shall be given to them until they find new jobs.

b. Deterioration of Local Economy such as Losses of Employment and Livelihood Means

Findings: Sharecroppers who permanently lost their means of livelihood during construction work may not be able to find other job opportunities in the surrounding area even after the construction work.
Mitigation Measures: Bridging support shall be given to them until they find new jobs.

c. Land Use and Utilization of Local Resources

Findings: Changing the traditional land usage patterns and utilization of local resources may last even after the construction work is over.
Mitigation Measures: Bridging support shall be given to them until they find new jobs and new land.

d. Electromagnetic Field

Findings: Negative impact of electromagnetic fields on human health is not anticipated if local residents keep out of the substation complex.

e. Work Conditions (Including Work Safety)

Findings: Labor accidents may occur anytime without prevention measures including safety education and training, allocation of protective equipment and distribution of protection clothes to laborers and workers.
Mitigation Measures: The contractor shall establish a work safety plan and submit it to PGCB to obtain approval. The work safety plan shall stipulate mitigation measures on such aspects as safety training, etc., and those as provision of protective equipment, etc.

f. Accidents

Findings: Accidents can occur at any time which does harm to local residents living in surrounding areas and workers involved in construction work.
Mitigation Measures: As prevention measures for land traffic accidents, observation of traffic regulations, installation of traffic signs and training and education on safe driving will be implemented.

4.3 Access Road

(1) Pre-construction Phase

a. Land Acquisition

Findings: The existing road will be expanded for 2m for 1,000m up to the new substation, for which approximately 2,000m2 of land will be required.
Mitigation Measures: It is the Deputy Commissioner of Chittagong District who will conduct

land acquisition and payment of compensation in accordance with the Ordinance 1982. PGCB will pay to DC Office when the budget is allocated from the Government of Bangladesh. A top-up payment shall be made on the basis of compensation at replacement cost to bridge the gap with the JICA Guidelines. Trees within clearance distance from cables will be removed. And standing crops and trees will be compensated at market price.

b. Social Institutions such as Social Infrastructure and Local Decision-making Institutions

Findings: Land acquisition for expanding the existing road will cause permanent loss of land, standing crops and livelihood means of cultivators and sharecroppers to some extent.

Mitigation Measures: The Deputy Commissioner's Office of Chittagong District will take responsibility for initiatives to conduct local consultations concerning compensation in accordance with the Ordinance 1982, on top of which compensation at replacement cost shall be added as agreed between PGCB and JICA.

g. Misdistribution of Benefits and Compensation

Findings: Equality of compensation and fair treatment among the project affected people must be assured.

Mitigation Measures: Landowners and other affected people must be legitimately identified for proper payment of compensation.

h. Local Conflicts of Interest

Findings: In case equality of compensation and fair treatment among the project affected people is not assured, disputes and conflicts among them can occur at any time.

Mitigation Measures: Regulations of Bangladesh stipulate that public consultation must be held in the land acquisition process, and their complaints or suggestions must stay heard for immediate action.

(2) Construction Phase

a. Disturbance to Poor People

Findings: Livelihood means of sharecroppers will be permanently lost. Sharecroppers work on daily basis and they are not well-paid.

Mitigation Measures: Compensation for their income shall be offered to them in order for them to sustain their living and bridging support shall be given until they find other job opportunities.

b. Disturbance to Ethnic Minority Groups and Indigenous People

Findings: According to the results of Population Census of 2011 and interview survey

conducted during JICA survey, no ethnic minority groups or indigenous people have been identified in the substation site of Raozan Upazila.

c. Deterioration of Local Economy such as Losses of Employment and Livelihood Means

Findings: Land owners will permanently lose their land and their sharecroppers will permanently lose their means of livelihood.

Mitigation Measures: Compensation for such income loss shall be offered at replacement cost for their losses, sustaining their living and seeking other job opportunities. As mitigation measures, employing as many local residents as possible, and using the services and products offered by the local community.

e. Land Use and Utilization of Local Resources

Findings: Land acquisition for road expansion may hinder specific activities at homesteads and farm land along the road. Land owners will permanently lose their land and their sharecroppers will permanently lose their means of livelihood.

Mitigation Measures: Compensation for such losses shall be offered, sustaining their living and seeking other job opportunities.

i. Infectious Diseases

Findings: Temporary influx of migrant labor during construction period may increase risk of infection.

Mitigation Measures: Local people will be put priority as laborers for simple work during construction period, which will help lower the risk of infectious diseases brought by external workers. Pre-employment and periodic medical check-ups will be conducted for external workers (technical workers, etc).

j. Work Conditions (Including Work Safety)

Findings: Labor accidents may occur anytime without prevention measures including safety education and training, allocation of protective equipment and distribution of protection clothes to laborers and workers.

Mitigation Measures: The contractor shall establish a work safety plan and submit it to PGCB to obtain approval. The work safety plan shall stipulate mitigation measures on such aspects as safety training, etc., and those as provision of protective equipment, etc.

k. Accidents

Findings: Accidents can occur at any time which does harm to local residents living in surrounding areas and workers involved in construction work.

Mitigation Measures: As prevention measures for land traffic accidents, observation of traffic regulations, installation of traffic signs and training and education on safe driving will be implemented.

(3) Operation Phase

Not applicable.

5. Entitlement matrix

(1) Transmission Line Route

The following types of losses (permanently and temporarily) are foreseen on the 400 kV and 230 kV / 132 kV TL routes, and entitlements have been drafted based on the legislations in Bangladesh and JICA Guidelines.

Approximately 600 out of approximately 800 tower bases are owned by private land owners, which will be affected permanently. If the land for tower bases is acquired involuntarily, compensation shall be paid at replacement cost. On the other hand, fully given an informed consent and power of choice to the land owners for their possible land use for the tower bases, PGCB, together with contractors of the transmission lines, will conclude agreements in writing with them with regard to the land use to avoid possible misunderstandings and disputes in the future in case they agree to voluntary land acquisition.

Those land owners of ROW will be temporarily affected during the construction period and compensation for the damages to their standing crops and trees shall be paid. Sharecroppers will temporarily lose their means of livelihoods during the construction period and their such losses also be compensated. PGCB shall restore the land to its original conditions after construction period is over.

Table 5-1: Entitlement Matrix (Transmission Line Route)

	Type of Loss	Entitled Persons (EP)	Entitlements (Compensation Package)	Responsible Organizations
1	Permanent loss of paddy land at tower foundations*	Legal land owner	Cash compensation under Law (CCL) market value of land area plus 50% premium	Implementation: Deputy Commissioner (DC)'s Office (Land Acquisition Officer, LAO) Monitoring: PGCB
			Top-up grant to cover 1) Gap between the average of last 12 months' sales values of same kind of land, and the current market value of private land 2) Max allowable replacement value (RV) to purchase new land (and trees) with equal productive value, preparation cost, and registration cost (such as stamp duty and tax)	Implementation: contractors Supervision and monitoring: PGCB Advise given by DC Office (LAO)
			One time assistance for annual cropping volume (3 years)	
2	Permanent loss of trees / perennials / fruit trees at tower foundations*	Owners	- Timber trees: The value equals that of the lumber - Fruit or fodder trees: the value equal to the vumlative value of the fruit crop for its productive life	
3	Temporary loss of access to paddy land and trees during construction period (=Temporary loss of	Legal land owner	Profit loss for 1 crop season	
		Cultivator	One time assistance for crop share	

	standing crops, trees and job opportunities)	Sharecropper	One time assistance for 3 months of wage and crop share	

(Note) In case the land owners for their possible land use for the tower bases agree to voluntary land acquisition, the above 1 and 2 will be excluded from the entitlements.
(Source) developed by JICA Survey Team.

(2) New Madunaghat Substation

Permanent losses of the following types are foreseen for the construction of new Madunaghat Substation and entitlements have been drafted as follows. According to the information given at the East Gujra Union Parishad Office, there are 46 land owners of 82 land plots at the substation site who will lose their land permanently, and their cultivators and sharecroppers will also permanently lose their means of livelihood.

Table 5-2: Entitlement Matrix (new Madunaghat Substation)

	Type of Loss	Entitled Persons (EP)	Entitlements (Compensation Package)	Responsible Organizations
1	Permanent loss of paddy land	Legal land owner	Cash compensation under Law (CCL) market value land area plus 50% premium	Implementation: DC Office (LAO) Monitoring: PGCB
			Top-up grant to cover 1) Gap between the average of last 12 months' sales values of same kind of land, and the current market value of private land 2) Max allowable replacement value (RV) to purchase new land with equal productive value, preparation cost, and registration cost (such as stamp duty and tax)	Implementation: contractors Supervision and monitoring: PGCB Advise given by DC Office (LAO)
			One time assistance for annual cropping volume (3 years)	
2	Permanent loss of access to paddy land (=Permanent loss of income from crop sales and livelihood means)	Legal land owner	- One time assistance for annual cropping volume (3 years) - Support in transitional period	
		Cultivtor	- One time assistance for crop share - Support in transitional period	
		Sharecropper	- One time assistance for 3 months of wage - Support in transitional period	

(Source) developed by JICA Survey Team.

(3) Access Road Expansion to New Madunaghat Substation

Permanent and temporary losses of the following types are anticipated for the expansion of access road to new Madunaghat Substation and entitlements have been drafted as follows. The number of land plots reaches 4 along the access road as long as 1,000 m.

Table 5-3: Entitlement Matrix (Road Expansion to Madunaghat Substation)

	Type of Loss	Entitled Persons (EP)	Entitlements (Compensation Package)	Responsible Organizations
1	Permanent loss of paddy land	Legal land owner	Cash compensation under Law (CCL) market value land area plus 50% premium	Implementation: DC Office (LAO) Monitoring: PGCB
			Top-up grant to cover 1) Gap between the average of last 12 months' sales values of same kind of land, and the current market value of private land 2) Max allowable replacement value (RV) to purchase new land with equal productive value, preparation cost, and registration cost (such as stamp duty and tax)	Implementation: contractors Supervision and monitoring: PGCB Advise given by DC Office (LAO)
2	Permanent loss of access to paddy land (=loss of income from crop sales and livelihood means)	Legal land owner	One time assistance for annual cropping volume (3 years)	
		Sharecropper	One time assistance for 3 months of wage	
3	Permanent loss of trees / perennials / fruit trees*	Owners	- Timber trees: The value equals that of the lumber - Fruit or fodder trees: the value equal to the vumlative value of the fruit crop for its productive life	
4	Permanent loss of certain homestead area*	Legal land owner	Cash compensation under Law (CCL) market value of land area plus 50% premium	Implementation: DC Office (LAO) Monitoring: PGCB
			Top-up grant to cover 3) Gap between the average of last 12 months' sales values of same kind of land, and the current market value of private land 4) Max allowable **r**eplacement value (RV) to purchase new land with equal productive value, preparation cost, and registration cost (such as stamp duty and tax)	Implementation: contractors Supervision and monitoring: PGCB Advise given by DC Office (LAO)
5	Permanent loss of houses and other structures in homestead*	Legal land owner and family members	- Market cost of materials to build a replacement structure with an area and quality up to similar level (or better), or to repair a partially affected structure - Cost of transporting building materials to the site - Cost of labor and contractors' fee - Cost of registration and taxes (if any)	
6	Temporary loss of access to homestead during construction period*	Legal land owner and family members	- Provision of temporary access and relocation where possible - Restoration of access to the land, structure, utilities	

(Note) As of January 2015, the inclusion of the above 3, 4, 5 and 6 has not been finalized yet since the road design including route selection remains unfinalized.
(Source) developed by JICA Survey Team.

6. Methods of Valuing Affected Assets

Compensation for legal land owners will be based on the principle of replacement costs. Replacement costs are the amounts calculated before displacement which are needed to replace any affected assets without depreciation and without deduction for taxes and/or costs of transaction.

The Land Acquisition Officer (LAO) of Deputy Commissioner's Office and Land Officer of Upazila Nirbahi Office will support the sub-registrar's office for determining the price of land. Land price averages from the sub-registrar's office for the previous one year from the date of the notice given under Section 3 of the Ordinance of 1982 are considered for the land valuation. The transacted price, recorded price, existing prices and expected prices should be averaged to reach the replacement value (RV).

A land and property valuation survey based on the prices recorded from formal and informal sources as below will determine the RV of land and structures:

- Government price
- Potential sales price
- Potential buyer price
- Enumerated price collected in the socioeconomic survey
- Price deemed appropriate as quoted by a retired government officer living in the vicinity
- Price deemed appropriate as quoted by local intellectuals
- Price deemed appropriate as quoted by religious leaders

PGCB will allocate budget to fill the difference between the RV and the cash compensation under law (CUL) as the top-up payment. In the case of any depreciation costs deducted from affected structures in the CUL by the DC, PGCB will pay the same as additional construction grants to re-settlers. It will also pay stamp duty and land registration fees when replacement land purchase is confirmed.

7. Organizational Responsibilities and Implementation Procedures

The following figure shows the implementation schedule of the Action Plan. Major actions taken by PGCB are summarized down below:

7.1 Finalization of Action Plan for Land Acquisition and Livelihood COmpensation

PGCB is the implementing agency of the project, and the Deputy Commissioner's Office of Chittagong District is the immediate organization for affected people to consult for compensation as stipulated in the Ordinance 1982.

PGCB will prepare and submit an application for administrative approval to MOPEMR and make a request to DC of Chittagong. It will also prepare and submit the Action Plan for Land Acquisition and Livelihood Compensation to MOPEMR.

It will allocate the required budget for additional grant on top of DC's payment for land ast 'top-up payment', which shall be approved by the GOB.

7.2 Data collection and EP identification

PGCB will deploy adequate human resources for supervision, consultation, and monitoring of land acquisition and livelihood compensation during project implementation.

PGCB, in line with the DC, will design and conduct a socioeconomic survey and collect data. A supplemental survey can be conducted to obtain additional key information and update all the data, and the Action Plan should be revised if required.

ID cards, EP files, and Entitlement Cards will be issued at this stage. It is desirable to formulate an inventory verification committee to ensure if this procedure is properly implemented among the affected people.

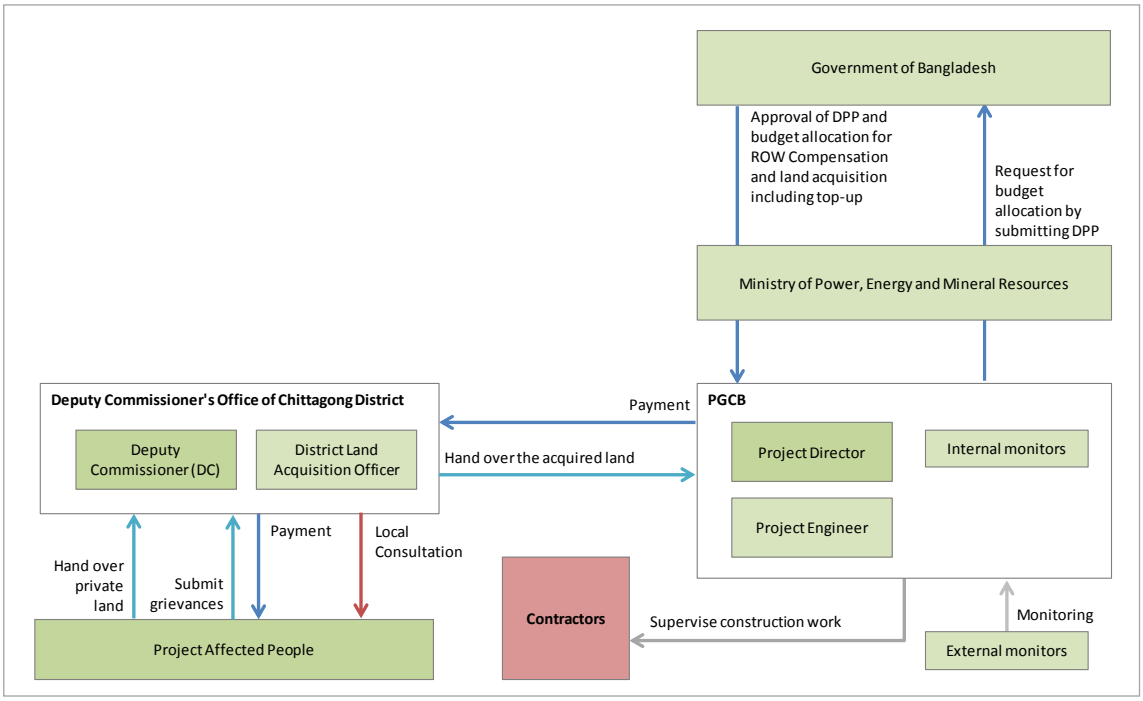
7.3 Local consultation and information management

Local consultations such as public consultation meetings and focus group discussion shall be organized to ensure if PAPs keep informed of the project implementation process, benefits and losses, environmental and social impact, and etc.

For effective information sharing, it is recommended to conduct such meetings not only for the affected people but local residents living in the surrounding area. Meetings can be conducted and brochure be distributed at local markets.

7.4 Implementation of land acquisition

The following figure shows the implementation schedule of the Action Plan. Major actions taken by PGCB are summarized below:



(Source: Developed by JICA Survey Team)

Figure 7-1 Implementation Arrangements

(1) Budget Application for CUL and top-up payment

PGCB is the implementing agency of the project, and the Deputy Commissioner's Office of Chittagong District is the immediate organization for affected people to consult for compensation as stipulated in the Ordinance 1982.

PGCB will prepare and submit an application for administrative approval to MOPEMR and make a request to DC of Chittagong for taking necessary actions for estimating the degree of land acquisition and cost. It will also prepare and submit the Action Plan for Land Acquisition and Livelihood Compensation to MOPEMR.

PGCB will submit the DPP to the GOB for allocation of the required budget for cash compensation under law (CCL) and an additional grant for 'top-up payment', which shall be approved by the GOB.

(2) Local consultation and information management

The Deputy Commissioner's Office of Chittagong District will conduct a series of local consultations as stipulated by law to ensure that PAPs are kept informed of the project implementation process, benefits and losses, environmental and social impact, etc.

(3) Implementation of land acquisition

The Deputy Commissioner will pay the cash compensation under law (CCL) and top-up payment or the affected lands, structures crops and trees to the PAPs.
A grievance redress mechanism will be established at Union level, Upazila level and District level for the affected people to address grievances.

(4) Monitoring

Appropriate reporting, including auditing and redress functions, monitoring and evaluation mechanisms, will be identified and set in place. In addition to internal monitoring conducted by PGCB, an external monitoring group should be hired that will evaluate the resettlement process and final outcome.

7.5 Monitoring

Appropriate reporting including auditing and redress functions, monitoring and evaluation mechanisms will be identified and set in place. In addition to an internal monitoring conducted by PGCB, an external monitoring group should be hired that will evaluate the resettlement process and final outcome (see the last chapter for further details).

7.6 Implementation Schedule

The implementation schedule of ROW compensation and acquisition of land for new Madunaghat SS and its access road is shown in the ANNEX I.

8. Land Acquisition and Compensation Budget and Financial Plan

The total cost for land acquisition and compensation is estimated 515.98 million Taka. Adequate budgetary support will be fully committed and made available to cover the costs of land acquisition and compensation within the agreed implementation period.
In addition to the compensation stipulated by the Ordinance 1982 and the Electricity Act 1910, all the compensation will be done according to the principle of the replacement cost, which will require PGCB to pay the gap between CUL and the replacement value (top-up).

Table 8-1: Land Acquisition and Compensation Cost

(Unit: BDT)

Division		Land acquisition		Livelihood / ROW Compensation				TOTAL
				Permannet Loss		Temporary Loss		
		CUL	Top-up	Crop	Labor	Crop	Labor	
1	400kV from Meghnaghat to Madunaghat SS	1,610,703	241,605	74,402	0	8,628,674	8,079,898	18,635,282
2	400kV from Madunaghat SSn to Matarbari CFPP	435,938	65,391	23,947	0	2,728,933	3,436,113	6,690,322
3	230 kV TL from new Madunaghat SS - existing Madunaghat SS	56,069	8,410	2,082	0	213,499	287,541	567,601
4	230 kV TL from LILO at Madunaghat SS from Hathazari-Sikalbaha TL	32,347	4,852	1,201	0	138,774	186,902	364,076
5	New Madunaghat SS	402,521,898	60,378,285	11,457,784	1,207,672	0	0	475,565,638
6	Road Expantion to Madunaghat SS	11,979,818	1,796,973	341,005	35,943	0	0	14,153,739
TOTAL		416,636,774	62,495,516	11,900,421	1,243,614	11,709,880	11,990,453	**515,976,658**

(Source) developed by JICA Survey Team.

9. Grievance Redress Mechanism

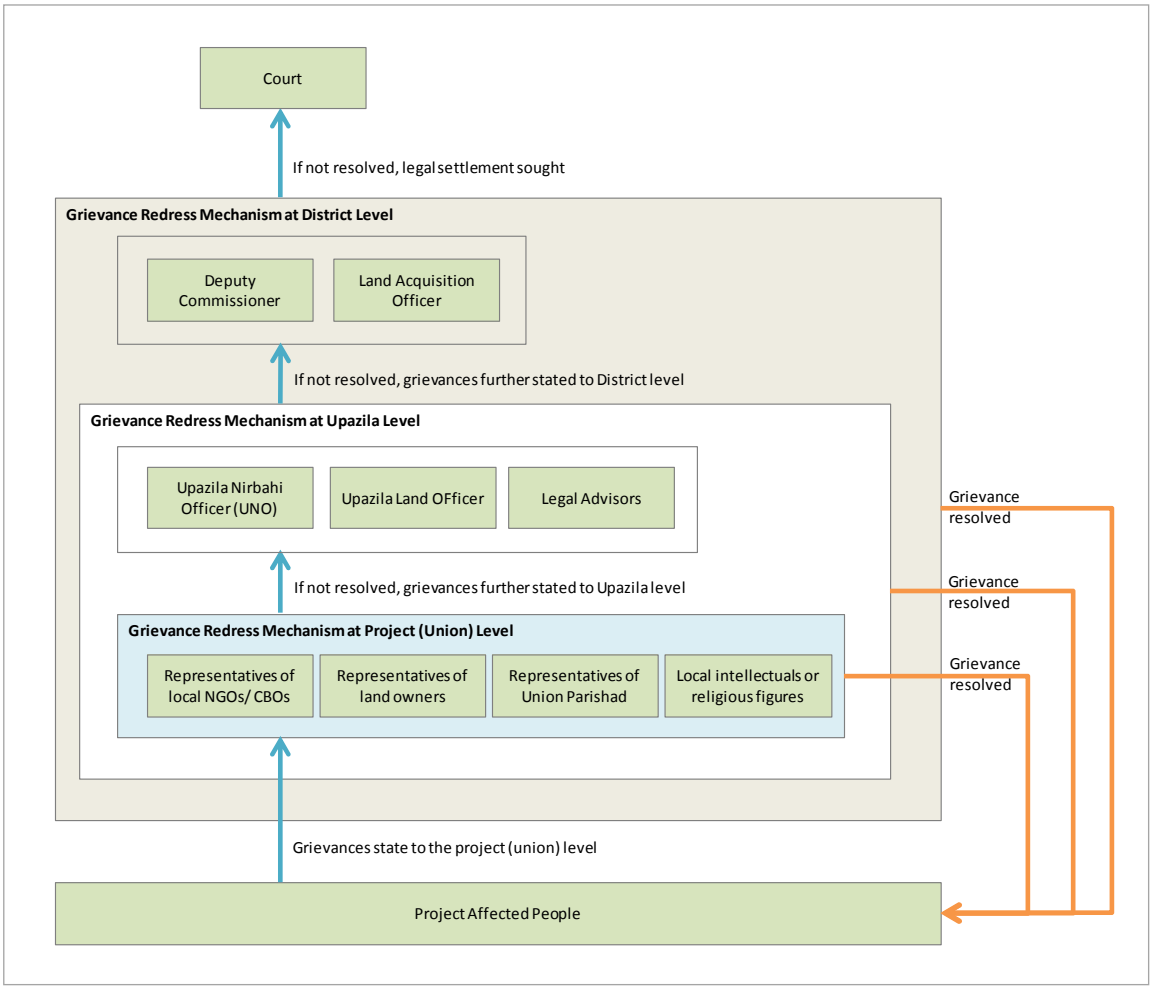
As soon as the budget for land acquisition and livelihood compensation becomes available, PGCB will make a payment to the Deputy Commissioner's Office of Chittagong District to initiate the payment procedure as stipulated in the Ordinance 1982 and Land Acquisition Act 1870.

Endorsed by the Ministry of Power, Energy and Mineral Resources (MOPEMR), a formal grievance redress committees (GRC) will be formed at union level for any grievances involving resettlement benefits, relocation and other assistance. The purpose of establishing GRCs is to promptly address the concerns and complaints using an accessible and transparent process to the PAPs. GRCs can be comprised of the following members whose standing is neutral and independent:

- PGCB
- Project staff in charge of the Action Plan for Land Acquisition and Livelihood Compensation
- Local NGO
- Chairman of Union Parishad
- Representatives from the Project Affected Persons (PAPs)
- Local intellectuals
- Legal advisors

The core function of GRC will be further discussed and determined in due course of time.

The structure of GRC is described in the figure below. The core function of GRC will be further discussed and determined in due course.



(Source: Developed by JICA Survey Team)

Figure 9-1 Grievance Redress Mechanism

10. Public Consultation and Participation

The PAPs and their communities will be consulted about the project, the rights and options available to them, and proposed mitigation measures for adverse effects, and to all extents possible be involved in the decision-making process concerning the land acquisition.

PAPs will be involved in the process of developing and implementing the Action Plan for Land Acquisition and Livelihood Compensation. The PAPs will receive prior notification of the compensation, relocation and other assistance available to them.

PGCB will be responsible, in close coordination with the Deputy Commissioner and contractors, to hold and conduct a number of consultations with primary and secondary stakeholders and information dissemination on the following issues:

- The relevant details of the project
- The RP and various degrees of project impact
- Details of entitlements under the Action Plan and what is required of PAPs in order to claim their entitlements
- Compensation process and compensation rates
- Relocation and resettlement site development operation in order to obtain agreement and support of affected people in participating in these operations
- Implementation schedule and timetable for the delivery of entitlements

Public participation will be spontaneously performed and information will be made available during preparation and implementations of the RP and at the minimum include community meetings and focus groups discussions.

11. Monitoring Arrangements

Appropriate reporting (including auditing and redress functions), monitoring and evaluation mechanisms, will be identified and set in place as part of the management system of land acquisition and livelihood restoration. An external monitoring group will be hired by the Project and will evaluate the whole process and final outcome.

An Environmental Management Plan (EMaP) has been prepared to provide guidelines for the monitoring during pre-construction, construction and operation activities of 1) transmission lines, 2) substations and 3) access road expansion.

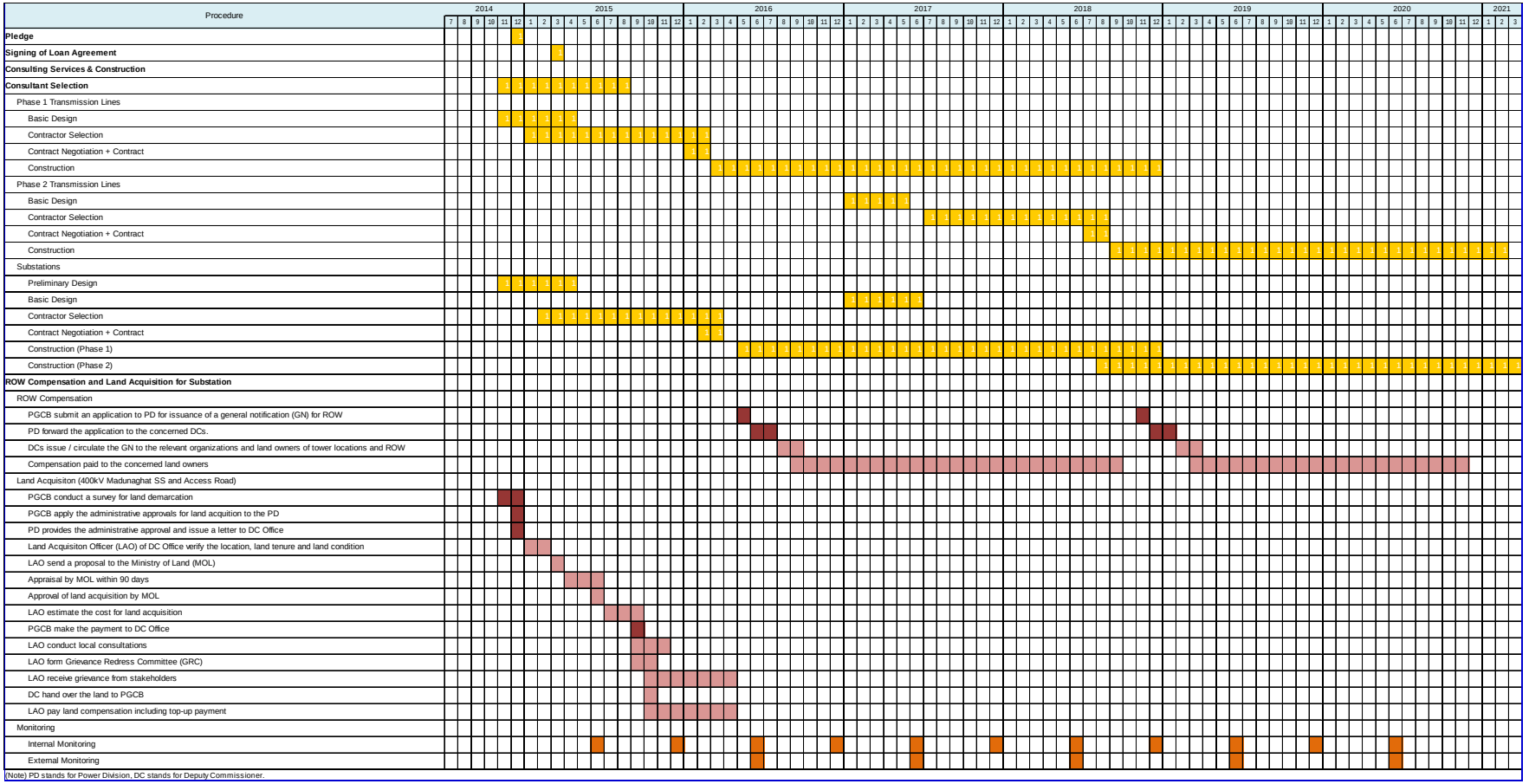
The purposes of creating an EMaP are to:

- Confirm that mitigation measures shall reduce any negative impacts on the environment to allowable levels during the construction and operation phase.
- Set up an organization that is responsible for the implementation of monitoring the plan.
- Perform appropriate monitoring during the construction and operation phase.

The environmental components that will be monitored are those that will be positively or negatively affected, or expected to be affected.

The Environmental Management Plan and the Environmental Monitoring Plan concerning social aspects including ROW compensation and land acquisition is shown in the ANNEX II and ANNEX III respectively.

ANNEX I: Implementation Schedule of ROW Compensation and Land Acquisition of Madunaghat Substation and Access Road



(Note) PD stands for Power Division, DC stands for Deputy Commissioner.

ANNEX II-1: Environmental Management Plan (Transmission Line)

No	Potential Impact to be Managed	Sources of Potential Impact	Standard of Impact	Objectives	Management Effort	Management Location	Period of Management	Management Institution	Cost
Pre-construction Phase									
1	Land acquisition	- Loss of land at tower bases (permanent) - Kept out of the construction zone (temporary) - Livelihood means (temporary)	- the Acquisition and Requisition of Immovable Property Ordinance 1982 - JICA Guidelines for Environmental and Social Considerations (2010)	- Consideration for land owners, sharecroppers and compensation for standing agriculture products	- Towers are constructed in non-residential areas - Land acquisition shall be conducted on the basis of compensation at replacement cost - Standing crops and trees shall be compensated at market price - Temporary block out during construction period will occur for safety and security	- Tower bases	- During land acquisition process	- Implementation: Office of the Deputy Commissioner - Monitoring: PGCB	Expenses to be paid by PGCB
2	ROW	- Kept out of the construction zone - Trees will be removed if they are within clearance distance - Standing crops and trees will be affected	- Electricity Act 1910	- Consideration for land owners, sharecroppers and compensation for standing agriculture products	- Compensation shall be conducted in compliance with relevant laws and regulations	- ROW	- During the official procedure	- Implementation and monitoring:PGCB	Expenses to be paid by PGCB
Construction Stage									
3	Disturbance to the Poor	- Loss of farmlands, being kept out of construction zones	- Employment of local residents	- Consideration of local residents' feelings	- Employ as many local residents as possible - Use the services and products	- Villages along the transmission line route	- During construction phase	- Implementation: Contractor/ Environmental Consultant - Supervisor:	Expenses included in contract cost by Contractor
4	Deterioration of								

No	Potential Impact to be Managed	Sources of Potential Impact	Standard of Impact	Objectives	Management Effort	Management Location	Period of Management	Management Institution	Cost
	Local Economy such as Losses of Employment and Means of Livelihood	- Changing the traditional land usage patterns and utilization of local resources			offered by the local community			PGCB/ Supervision Consultant	
5	Land Use and Utilization of Local Resources								
6	Infectious Diseases	- Temporary influx of migrant labor during construction may increase risk of infection	-----	- Consideration of hygiene and sanitation of local residents	- Establish medical center and implementation of periodic medical check-ups - Education and training on workers' health care	- Construction area	- During construction phase	- Implementation: Contractor - Supervisor: PGCB	Expenses included in contract cost by Contractor
7	Work Conditions (including work safety)	Labor accidents	- Handling heavy loads - Working at heights - Electric shocks	- Prevention measures against labor accidents, accidents, and health problems	- Prepare a manual for labor accident prevention including safety education and training - Provide workers with appropriate protective equipment - Inspect and ensure that any lifting devices, such as cranes, are appropriate for expected loads - Keep lifting devices well maintained and perform maintenance checks as appropriate - Use facilities and	- Construction area	- During construction phase	- Implementation: Contractor - Supervisor: PGCB	Expenses included in contract cost by Contractor

No	Potential Impact to be Managed	Sources of Potential Impact	Standard of Impact	Objectives	Management Effort	Management Location	Period of Management	Management Institution	Cost
					equipment that protects against electric shocks				
8	ROW	- Loss of standing crops - Loss of trees	-Electricity Act 1910	- Consideration to affected peoples' socioeconomic conditions	- Compensation should be conducted in compliance with relevant laws and regulations	- ROW	- During construction	- Implementation: Contractor - Supervision: PGCB	Expenses included in contract cost by Contractor
9	Accidents	- Land traffic accidents	- Land traffic	- Prevention of land traffic accidents	- Observation of traffic regulations, installation of traffic signs and education on safe driving - Training safe operation of vehicles	- Construction area - Roads near the construction area	- During construction phase	- Implementation : Contractor - Supervisor: PGCB	Expenses included in contract cost by Contractor
Operational Stage									
10	Work Conditions (including work safety)	Labor accidents	- Handling heavy loads - Working at heights - Electric shocks	- Prevention measures against labor accidents, accidents, and health problems	- Prepare a manual for labor accident prevention including safety education and training - Provide workers with appropriate protective equipment - Use facilities and equipment that protects against electric shocks	- Along the transmission line route and towers	- During the inspection work	PGCB	PGCB

(Source: the JICA Survey Team)

ANNEX II-2: Environmental Management Plan (New Madunaghat Substation)

No	Potential Impact to be Managed	Sources of Potential Impact	Standard of Impact	Objectives	Management Effort	Management Location	Period of Management	Management Institution	Cost
Pre-construction Phase									
1	Land acquisition	- Land acquisition at new Madunaghat substation - Loss of land - Kept out of the construction zone - Standing crops - Livelihood means - Changing peoples` thinking through interacting with local government officers, local residents and others in the land acquisition procedure	- the Acquisition and Requisition of Immovable Property Ordinance 1982 - JICA Guidelines for Environmental and Social Considerations (2010)	- Consideration for land owners, sharecroppers and compensation for standing agriculture products	-- Land acquisition shall be conducted in compliance with relevant laws and regulations - DC Office will take responsibility to conduct local consultations concerning compensation by law. - Top-up payment and livelihood compensation shall be made	- Site of Madunaghat Substation - Affected people	- During land acquisition process - Once after compensation	- Implementation: Office of the Deputy Commissioner - Monitoring: PGCB	Expenses to be paid by PGCB
2	Social Institutions								
3	Misdistribution of Benefits and Compensation	- Can occur among residents, workers, government officers, and local politicians	-----	- Consideration for land owners, sharecroppers and compensation for standing agriculture products	- Monitor the progress of Government procedure for land acquisition - Interviewing affected people	- Areas to be acquired - Affected people	- Once after the compensation is paid	- Implementation and Monitoring: PGCB	PGCB
4	Local Conflicts of Interest								
Construction Stage									
5	Disturbance to the Poor	- Loss of farmlands, being kept out of construction zones - deterioration of the poor's living standard due to the temporary loss of job in ROW	- Employment of local residents	- Consideration of local residents' feelings and socioeconomic status	- Employ as many local residents as possible - Use the services and products offered by the local community	- Villages along the transmission line route	- During construction phase	- Implementation: Contractor/ Environmental Consultant - Supervisor: PGCB/ Supervision Consultant	Expenses included in contract cost by Contractor
6	Deterioration of Local Economy	- deterioration of local							

No	Potential Impact to be Managed	Sources of Potential Impact	Standard of Impact	Objectives	Management Effort	Management Location	Period of Management	Management Institution	Cost
	such as Losses of Employment and Means of Livelihood	socioeconomic status due to the temporary loss of job in ROW							
7	Land Use and Utilization of Local Resources	- Changing the traditional land usage patterns and utilization of local resources							
8	Infectious Diseases	- deterioration of labor health - Spreads of infectious diseases	-	- Consideration of hygiene and sanitation of workers	- Establish medical center and implementation of periodic medical check-ups - Education and training on workers' health care	- Contractor's office	- During construction phase	- Implementation: Contractor - Supervisor: PGCB	Expenses included in contract cost by Contractor
9	Work Conditions (including work safety)	Labor accidents	- Handling heavy loads - Working at heights - Electric shocks	- Prevention measures against labor accidents and health problems	- Prepare a manual for labor accident prevention including safety education and training - Provide workers with appropriate protective equipment - Inspect and ensure that any lifting devices, such as cranes, are appropriate for expected loads - Keep lifting devices well maintained and perform maintenance	- Construction area	- During construction phase	- Implementation: Contractor - Supervisor: PGCB	Expenses included in contract cost by Contractor

No	Potential Impact to be Managed	Sources of Potential Impact	Standard of Impact	Objectives	Management Effort	Management Location	Period of Management	Management Institution	Cost
					checks as appropriate - Use facilities and equipment that protects against electric shocks				
10	Accidents	- Land traffic accidents	- Land traffic	- Prevention of traffic accidents	- Land traffic accidents - Observation of traffic regulations, installation of traffic signs and education on safe driving - Training safe operation of vehicles	- Construction area - Roads near the construction area	- During construction phase	- Implementation: Contractor - Supervisor: PGCB	Expenses included in contract cost by Contractor
Operational Stage									
11	Disturbance to the Poor	- Changing the traditional land usage patterns and utilization of local resources	- Employment of local residents	- Consideration of local residents' socioeconomic conditions	- Support transition period to find alternative jobs	- Villages nearby the substation site	- Transition period	- Implementation and Supervision: PGCB	PGCB
12	Deterioration of Local Economy such as Losses of Employment and Means of Livelihood								
13	Land use and utilization of local resources								
14	Work Conditions (including work safety)	Labor accidents	- Handling heavy loads - Working at heights - Electric shocks	- Prevention measures against labor accidents during operation and maintenance works, accidents, and health	- Prepare a manual for labor accident prevention including safety education and training	- Substation	- During operation and maintenance works	- Implementation and supervision: PGCB	PGCB

No	Potential Impact to be Managed	Sources of Potential Impact	Standard of Impact	Objectives	Management Effort	Management Location	Period of Management	Management Institution	Cost
				problems	- Provide workers with appropriate protective equipment - Use facilities and equipment that protects against electric shocks				

(Source: the JICA Survey Team)

ANNEX II-3: Environmental Management Plan (Access Road Expansion to New Madunaghat Substation)

No	Potential Impact to be Managed	Sources of Potential Impact	Standard of Impact	Objectives	Management Effort	Management Location	Period of Management	Management Institution	Cost
Pre-construction Phase									
1	Land acquisition	- Land acquisition at along the existing road as long as 1,000m - Kept out of the construction zone - Standing crops - Livelihood means - Changing peoples` thinking through interacting with local government officers, local residents and others in the land acquisition procedure	- the Acquisition and Requisition of Immovable Property Ordinance 1982 - JICA Guidelines for Environmental and Social Considerations (2010)	- Consideration for land owners, sharecroppers and compensation for standing agriculture products - Confirmation of affected peoples' feelings	-- Land acquisition shall be conducted in compliance with relevant laws and regulations - DC Office will take responsibility to conduct local consultations concerning compensation by law. - Top-up payment and livelihood compensation shall be made	- Access road - Affected people	- During land acquisition process - Once after compensation	- Implementation: Office of the Deputy Commissioner - Monitoring: PGCB	Expenses to be paid by PGCB
2	Social Institutions								
3	Misdistribution of Benefits and Compensation	- Can occur among residents, workers, government officers, and local politicians	-----	- Consideration for land owners, sharecroppers and compensation for standing agriculture products	- Monitor the progress of Government procedure for land acquisition - Interviewing affected people	- Areas to be acquired - Affected people	- Once after the compensation is paid	- Implementation and Monitoring: PGCB	PGCB
4	Local Conflicts of Interest								
Construction Stage									
5	Disturbance to the Poor	- deterioration of the poor's living standard due to the permanent loss of livelihood means	- Employment of local residents	- Consideration of local residents' socioeconomic conditions and feelings	- Employ as many local residents as possible - Use the services and products offered by the local community	- Villages along the road	- During construction phase	- Implementation: Contractor/ Environmental Consultant - Supervisor: PGCB/ Supervision Consultant	Expenses included in contract cost by Contractor
6	Deterioration of Local Economy such as Losses of Employment and Means of	- deterioration of local socioeconomic status due to the permanent loss							

No	Potential Impact to be Managed	Sources of Potential Impact	Standard of Impact	Objectives	Management Effort	Management Location	Period of Management	Management Institution	Cost
	Livelihood	of livelihood means							
7	Land Use and Utilization of Local Resources	- Changing the traditional land usage patterns and utilization of local resources							
8	Infectious Diseases	- deterioration of labor health - Spreads of infectious diseases	-----	- Consideration of hygiene and sanitation of local residents	- Establish medical center and implementation of periodic medical check-ups - Education and training on workers' health care	- Construction area	- During construction phase	- Implementation: Contractor - Supervisor: PGCB	Expenses included in contract cost by Contractor
9	Work Conditions (including work safety)	Labor accidents	- Handling heavy loads	- Prevention measures against labor accidents, accidents, and health problems	- Prepare a manual for labor accident prevention including safety education and training - Provide workers with appropriate protective equipment - Inspect and ensure that any lifting devices, such as cranes, are appropriate for expected loads - Keep lifting devices well maintained and perform maintenance checks as appropriate	- Construction area	- During construction phase	- Implementation: Contractor - Supervisor: PGCB	Expenses included in contract cost by Contractor
10	Accidents	- Land traffic accidents	- Land traffic	- Prevention of traffic accidents	- Traffic accidents - Observation of	- Construction area	- During construction	- Implementation: Contractor	Expenses included in contract cost by

No	Potential Impact to be Managed	Sources of Potential Impact	Standard of Impact	Objectives	Management Effort	Management Location	Period of Management	Management Institution	Cost
					traffic regulations, installation of traffic signs and education on safe driving - Training safe operation of vehicles	- Roads near the construction area	phase	- Supervisor: PGCB	Contractor
Operational Stage									
	N/A								

(Source: the JICA Survey Team)

ANNEX III-1: Environmental Monitoring Plan (Transmission Line)

No	Significant Impact to be Monitored	Source of Significant Impact	Monitored Parameter	Purpose of the Monitoring	Monitoring Method			Responsible Organization	Cost
					Method of Collecting and Analyzing Data	Location	Duration and Frequency		
Pre-Construction									
1	Land acquisition	- Loss of land at tower bases (permanent) - Kept out of the construction zone (temporary) - Livelihood means (temporary)	- the Acquisition and Requisition of Immovable Property Ordinance 1982 - JICA Guidelines for Environmental and Social Considerations (2010)	- Confirmation of compensation process	- Monitor the progress of Government procedure for land acquisition of 1) tower basis and 2) substation site	- Areas to be acquired	- Quarterly during the official process	- Implementation: Deputy Commissioner's Office - Monitoring: PGCB	PGCB
2	ROW Compensation	- Kept out of the construction zone - Trees will be removed if they are within clearance distance - Standing crops will be affected	- Electricity Act 1910 - JICA Guidelines for Environmental and Social Considerations (2010)	- Confirmation of compensation process	- Monitor the progress of Government procedure for general notification of ROW.	- ROW	- Quarterly during the official process	- Implementation and Monitoring: PGCB	PGCB
Construction Phase									
3	Disturbance to the Poor	- deterioration of the poor's living standard due to the temporary loss of job in ROW	--	- Confirmation of affected peoples' economic situation	- Interviewing affected people	- Affected people	- Simultaneously	- Implementation: Contractor - Monitoring: PGCB	Expenses included in contract cost by Contractor
4	Deterioration of local economy	- deterioration of local socioeconomic status due to the temporary loss of job in ROW	--	- Confirmation of affected peoples' economic situation	- Interviewing affected people	- Affected people	- Simultaneously	- Implementation: Contractor - Monitoring: PGCB	Expenses included in contract cost by Contractor
5	Land Use and Utilization of Local Resources	- Changing the traditional land usage patterns and utilization of local resources	-	- Consideration of local residents' feelings	- Interviewing affected people	- Villages along the transmission line route and substation	- Simultaneously	- Implementation: Contractor/ Environmental Consultant - Supervisor: PGCB/	Expenses included in contract cost by Contractor

No	Significant Impact to be Monitored	Source of Significant Impact	Monitored Parameter	Purpose of the Monitoring	Monitoring Method			Responsible Organization	Cost
					Method of Collecting and Analyzing Data	Location	Duration and Frequency		
								Supervision Consultant	
6	Infectious disease	- deterioration of labor health - Spreads of infectious diseases	- health condition	- Monitor the health condition	- Medical check-ups	- Contractor's office	- Once a year	- Implementation: Contractor - Supervisor: PGCB	Expenses included in contract cost by Contractor
7	Work Environment (Including Work Safety)	- Labor accidents	- Handling heavy loads - Working at heights - Electric shocks	- Evaluation of effect of the work safety plan	- Record of accidents	- Contractor's office	- Once a year	- Implementation: Contractor - Supervisor: PGCB	Expenses included in contract cost by Contractor
8	ROW Compensation	- Kept out of the construction zone - Trees will be removed if they are within clearance distance - Standing crops will be affected	- Electricity Act 1910 - JICA Guidelines for Environmental and Social Considerations (2010)	- Confirmation of compensation process	- Monitor the payment of ROW Compensation by the contractor for the entitled people.	- ROW	- Simultaneously	- Implementation: Contractor - Monitoring: PGCB	PGCB
9	Accidents	- Land traffic accidents	- Land traffic	- Evaluation of effect of traffic schedule	- Record of accidents	- Contractor's office	- Once a year	- Implementation: Contractor - Supervisor: PGCB	Expenses included in contract cost by Contractor.
Operation Stage									
10	Work Environment (Including Work Safety)	1) Labor accidents	- Handling heavy loads - Working at heights - Electric shocks	- Evaluation of effect of the work safety plan	- Record of accidents	- PGCB office	- Once a year	Implementation and Monitoring: PGCB	PGCB

(Source: the JICA Survey Team)

ANNEX III-2: Environmental Monitoring Plan (New Madunaghat Substation)

No	Significant Impact to be Monitored	Source of Significant Impact	Monitored Parameter	Purpose of the Monitoring	Monitoring Method			Responsible Organization	Cost
					Method of Collecting and Analyzing Data	Location	Duration and Frequency		
Pre-Construction									
1	Land acquisition and Land Use	- Loss of land - Kept out of the construction zone - Standing crops - Livelihood means	- the Acquisition and Requisition of Immovable Property Ordinance 1982 - JICA Guidelines for Environmental and Social Considerations (2010)	- Confirmation of compensation process	- Monitor the progress of Government procedure for land acquisition	- Areas to be acquired	- Quarterly during the official process	- Implementation: Deputy Commissioner's Office - Monitoring: PGCB	PGCB
2	Social Institutions	- Changing peoples` thinking through interacting with local government officers, local residents and others in the land acquisition procedure	-----	- Confirmation of affected peoples' feelings	- Interviewing affected people	- Affected people	- Once after compensation	- Implementation and Monitoring: PGCB	PGCB
3	Misdistribution of Benefits and Compensation	- Can occur among residents, workers, government officers, and local politicians	-----	- Confirmation of compensation process	- Monitor the progress of Government procedure for land acquisition - Interviewing affected people	- Areas to be acquired	- Once after the compensation is paid	- Implementation and Monitoring: PGCB	PGCB
4	Local Conflicts of Interest	- Can occur among residents, workers, government officers, and local politicians	-----	- Confirmation of affected peoples' feelings	- Interviewing affected people	- Affected people	- Once after compensation	- Implementation and Monitoring: PGCB	PGCB
Construction Phase									
5	Disturbance to the Poor	- deterioration of the poor's living standard due to the permanent loss of	--	- Confirmation of affected peoples' economic situation	- Interviewing affected people	- Affected people	- Simultaneously	- Implementation: Contractor - Monitoring: PGCB	PGCB

No	Significant Impact to be Monitored	Source of Significant Impact	Monitored Parameter	Purpose of the Monitoring	Monitoring Method			Responsible Organization	Cost
					Method of Collecting and Analyzing Data	Location	Duration and Frequency		
		livelihood means							
6	Deterioration of local economy	- deterioration of local socioeconomic status due to the permanent loss of livelihood means	--	- Confirmation of affected peoples' economic situation	- Interviewing affected people	- Affected people	- Simultaneously	- Implementation: Contractor - Monitoring: PGCB	PGCB
7	Land Use and Utilization of Local Resources	- Changing the traditional land usage patterns and utilization of local resources	-	- Confirmation of affected peoples' socio-economic situation	- Interviewing affected people	- Affected people	- Simultaneously	- Implementation: Contractor - Monitoring: PGCB	PGCB
8	Infectious disease	- deterioration of labor health - Spreads of infectious diseases	- health condition	- Monitor the health condition	- Medical check-ups	- Contractor's office	- Once a year	- Implementation: Contractor - Supervisor: PGCB	Expenses included in contract cost by Contractor
9	Work Environment (Including Work Safety)	- Labor accidents	- Handling heavy loads - Working at heights - Electric shocks	- Evaluation of effect of the work safety plan	- Record of accidents	- Contractor's office	- Once a year	- Implementation: Contractor - Supervisor: PGCB	Expenses included in contract cost by Contractor
10	Accidents	- Land traffic accidents	- Land traffic	- Evaluation of effect of traffic schedule	- Record of accidents	- Contractor's office	- Once a year	- Implementation: Contractor - Supervisor: PGCB	Expenses included in contract cost by Contractor.
Operation Stage									
11	Disturbance to the Poor	- deterioration of the poor's living standard lasting after the construction	--	- Confirmation of affected peoples' economic situation	- Interviewing affected people	- Affected people	- Simultaneously	- Implementation and Monitoring: PGCB	PGCB
12	Deterioration of local economy	- deterioration of local socioeconomic status due to the permanent loss of livelihood means continue after the construction	--	- Confirmation of affected peoples' economic situation	- Interviewing affected people	- Affected people	- Simultaneously	- Implementation and Monitoring: PGCB	PGCB
1	Land Use and	- Impact of change	-	- Confirmation of	- Interviewing	- Affected people	- Simultaneously	- Implementation	PGCB

No	Significant Impact to be Monitored	Source of Significant Impact	Monitored Parameter	Purpose of the Monitoring	Monitoring Method			Responsible Organization	Cost
					Method of Collecting and Analyzing Data	Location	Duration and Frequency		
3	Utilization of Local Resources	in the traditional land usage patterns and utilization of local resources continue after construction		affected peoples' socio-economic situation	affected people			and Monitoring: PGCB	
14	Work Environment (Including Work Safety)	1) Labor accidents	- Nos of accident	- Evaluation of effect of the work safety plan	- Record of accidents	- On-site	- Once a year	- Implementation and Monitoring: PGCB	PGCB

(Source: the JICA Survey Team)

ANNEX III-3: Environmental Monitoring Plan (Road Expansion to Maduhaghat Substation)

No	Significant Impact to be Monitored	Source of Significant Impact	Monitored Parameter	Purpose of the Monitoring	Monitoring Method			Responsible Organization	Cost
					Method of Collecting and Analyzing Data	Location	Duration and Frequency		
Pre-Construction									
1	Land acquisition and Land Use	- Loss of land - Kept out of the construction zone - Standing crops - Livelihood means	- the Acquisition and Requisition of Immovable Property Ordinance 1982 - JICA Guidelines for Environmental and Social Considerations (2010)	- Confirmation of compensation process	- Monitor the progress of Government procedure for land acquisition	- Areas to be acquired	- Quarterly during the official process	- Implementation: Deputy Commissioner's Office - Monitoring: PGCB	PGCB
6	Social Institutions	- Changing peoples` thinking through interacting with local government officers, local residents and others in the land acquisition procedure	-----	- Confirmation of affected peoples' feelings	- Interviewing affected people	- Affected people	- Once after compensation	- Implementation and Monitoring: PGCB	PGCB
7	Misdistribution of Benefits and Compensation	- Can occur among residents, workers, government officers, and local politicians	-----	- Confirmation of compensation process	- Monitor the progress of Government procedure for land acquisition	- Areas to be acquired	- Once after the compensation is paid	- Implementation and Monitoring: PGCB	PGCB
8	Local Conflicts of Interest	- Can occur among residents, workers, government officers, and local politicians	-----	- Confirmation of affected peoples' feelings	- Interviewing affected people	- Affected people	- Once after compensation	- Implementation and Monitoring: PGCB	PGCB
Construction Phase									
4	Disturbance to the Poor	- deterioration of the poor's living standard due to the permanent loss of livelihood means	--	- Confirmation of affected peoples' economic situation	- Interviewing affected people	- Affected people	- Simultaneously	- Implementation: Contractor - Monitoring: PGCB	PGCB
5	Deterioration of	- deterioration of	--	- Confirmation of	- Interviewing	- Affected people	- Simultaneously	- Implementation:	PGCB

No	Significant Impact to be Monitored	Source of Significant Impact	Monitored Parameter	Purpose of the Monitoring	Monitoring Method			Responsible Organization	Cost
					Method of Collecting and Analyzing Data	Location	Duration and Frequency		
	local economy	local socioeconomic status due to the permanent loss of livelihood means		affected peoples' economic situation	affected people			Contractor - Monitoring: PGCB	
	Land Use and Utilization of Local Resources	- Impact of change in the traditional land usage patterns and utilization of local resources continue after construction	-	- Confirmation of affected peoples' socio-economic situation	- Interviewing affected people	- Affected people	- Simultaneously	- Implementation and Monitoring: PGCB	PGCB
9	Infectious disease	- deterioration of labor health - Spreads of infectious diseases	- health condition	- Monitor the health condition	- Medical check-ups	- Contractor's office	- Once a year	- Implementation: Contractor - Supervisor: PGCB	Expenses included in contract cost by Contractor
0	Work Environment (Including Work Safety)	- Labor accidents	- Handling heavy loads - Working at heights - Electric shocks	- Evaluation of effect of the work safety plan	- Record of accidents	- Contractor's office	- Once a year	- Implementation: Contractor - Supervisor: PGCB	Expenses included in contract cost by Contractor
11	Accidents	- Land traffic accidents	- Land traffic	- Evaluation of effect of traffic schedule	- Record of accidents	- Contractor's office	- Once a year	- Implementation: Contractor - Supervisor: PGCB	Expenses included in contract cost by Contractor.
Operation Stage									
	N/A								

(Source: the JICA Survey Team)

Appendix IX

Questionnaire of the Socioeconomic Survey

Questionnaire for Preparatory Survey on Dhaka -Chittagong Main Power Grid Strengthening Project.

Name of the Site.....Name of the Place.....Time...../...../.....

Date: ☐☐☐☐☐☐ Photograph No: ☐☐☐ **I**D No. ☐☐☐

Respondent Identification

Greetings. My name.....I.....came from a research organization. Now, we are collecting data for the purpose of construction of 400 kV Power Transmission Line.

Name of household head	Father's Name
Mother's Name	Wife's Name
Village	Union
Mauza (JL No)	Post office
Upazila	District
Indigenous People (mention tribe)	Religion
Membership of organization if any	

Land Acquisition and crop compensation of the directly affected respondent * Yes ☐ No ☐

Land marked (details) :.....

.....

.....

Name of Interviewer.....Signature.....Date.....

Name of Supervisor.....Signature.....Date.....

BACKGROUND OF THE RESPONDENT

01) Please fill out your family profile.

Q	Name	Status	Sex	Age	Education	Occupation	Income source
						Main	Secondary

02) What is the monthly income of your family in total.....Taka

03) What is the monthly expenditure of your family in total.....Taka

MIGRATION IN AND OUT

04) You live in this area for how long? .....

05) Where did you live before here (Probe)?.....

06) What is the reason you live here?.....

LAND OWNERSHIP OF THE RESPONDENT

07) Do you own any land? Yes [1] No [2] (If "No" skip to Q No. 09)

08) Own house.....decimal| Present Value.....Taka

09) Cultivated land.....decimal| Present Value.....Taka

10) Other land (for.....decimal Total: .....

11) Type of House: your roof, wall and floor Record Properly									
	Tin	Concrete	Tiles	Soil	Bamboo	Thatch/ Golpata	Jute stick	Wood	Others
Roof	1	2	3		5	6	7	8	
Wall	1	2		4	5	6	7	8	
Floor		2		4	5			8	

ACTIVITIES

12) Type of Land…….. 13) Quantity of Land……

14) Market Value of Land…..... 15) Type of Crops……...

16) Price of Crops (unit price.....(Market Value)…….

MEDICAL TREATMENT OF THE FAMILY MEMBERS AND HOUSE HOLD ASSET

17) Where you and your family go for medical treatment ?

I)Village Doctor (Quack)	II) MBBS Doctor
III) Pharmacy	IV) Family Welfare Centre
V) Rural Dispensary	VI) upazilla Health Complex
VII) Private Clinic	VIII) Others……

18) What types of material in your households?

a. Bicycle	b. Van	c Rickshaw
d. mobile phone	e. Radio	f. TV
g. Computer	h. refrigerator	i. washing machine
j. motor cycle	k. car	l. table fan
m. ceiling fan	n. Fishing net	o. Agriculture tool
p. Country Boat	q. Engine Boat.	r. Water purify machine.
s. Others…….....		

KNOWLEDGE, ATTITUDE, ABOUT THE ELECTRICITY WATER AND SANITATION

19) What is the main source of drinking water in your family?

a. Pipe inside house.....01	b. Pipe outside house.....02
c. Tube well/deep tube well.... 03	d. Well.....04
e. Pond/canal.....05	f. River.....06
g. Others.....07	

20) Is there any arsenic contamination in the water source of your locality? Yes [1] No [2]

21) What type of toilet do you have in your house?

a. safety tank/modern toilet.....01	b. Water logged/slab latrine.....02
c. Pit latrine.....03	d. Open latrine.....04
e. Hanging latrine.....05	f. Bushes/open field.....06
g. Others.....07	

22) Is there electricity in your house? Yes [1] No [2]

23) If “yes”, what do you use electricity for in your household?.....

24) What is the monthly expenditure for electricity? Taka.....

25) Would you please say, in your area, electricity is used in what purposes?

.....

.....

.....

26) What are the advantages do you get in your area due to the supply of electricity from the organizations like PDB/POLLI BIDDUTH ?

.....

.....

.....

27) What are the disadvantages?

.....

.....

28) What will be your reaction if a new power Transmission line over the installed in your village/Locality?

.....

.....

29) What material do you use to ignite the flame for cooking purposes?

a. Wood.....01	b. Natural garbage.....02
c. Cow’s dung.....03	d. LP/ liquid gas.....04
e. Electric heater.....05	f. Gas.....06
g. Kerosene.....07	h. Others 08

30) What is the monthly expenditure for fuel purposes? Taka……

INFORMATION ABOUT MIGRATORY BIRDS

31) Do you know about migrated birds? Yes [1] No [2]

32) In your locality is there any sanctuary for the migrated birds? ?

Yes [1] No [2] (skip to Q No 34)

33) What is the name and address of the Sanctuary…….……..…….

……...……

……..(Verbatim)

34) What would be your reaction, if a high voltage power transmission line is installed over your village/locality? Do you think there would be any environmental hazards?

……..

……..

……...

(Verbatim)

Be thankful to the respondent and end the discussion.

Appendix X

The Bore Logs of 13 Holes

RECORD OF BORING AND TESTING (BORE LOG)

Project: Dhaka - Chitagong main Power Grid Strengthening project.

Client: LGED

Soil Strata Legend: Sand, Silt, Clay, Grit/ Stone, Peat / Organic, Mica, Disturb Sample (D), Undisturb Sample (UD)

Bore Hole No : BH 01
Method of Boring : WASH
Boring Depth : 32.0m

Ground Water Level (GWL) : 0.0m.Below
Date of Starting :22/06/2014
Date of Completion :23/06/2014

Location of Boring : Tower No. 05 (N 23°36'23.66" E 90°34'52.18")

Sample No.	Type of Sample	Depth below E.G.L (m)	Thickness (m)	Description of Soil Strata	Soil Strata Legend	Picture of Soil Sample	SPT Intervals (meter)	Blows on Spoon per 15 cm Penetration 15 cm	15 cm	15 cm	N- Value
D1		1	2.0m	Gray fine Silty SAND with Clay.			1	1	1	1	2
D2		2					2	1	1	2	3
D3		3	5.0m	Gray fine Silty SAND .			3	1	1	2	3
D4		4					4	1	1	3	4
D5		5					5	1	2	3	5
D6		6					6	2	3	3	6
D7		7					7	2	3	3	6
D8		8	7.0m	Light gray fine Silty SAND .			8	2	3	5	8
D9		9					9	3	4	5	9
D10		10					10	3	4	6	10
D11		11					11	3	4	7	11
D12		12					12	2	4	6	10
D13		13					13	2	3	4	7
D14		14					14	2	3	4	7
D15		15	2.0m	Gray fine Silty SAND .			15	2	3	5	8
D16		16					16	2	3	5	8
D17		17					17	3	4	6	10
D18		18					18	4	4	6	10
D19		19					19	5	7	9	16
D20		20					20	6	10	14	24
D21		21	11.0m	Light gray fine Silty SAND .			21	7	14	16	30
D22		22					22	7	15	17	32
D23		23					23	8	16	19	35
D24		24					24	8	18	20	38
D25		25					25	9	20	22	42
D26		26					26	10	21	23	44
D27		27					27	10	21	24	45
D28		28	2.0m	Light brown Dense Corse SAND .			28	12	22	24	46
D29		29					29	14	24	26	50
D30		30	2.9m	Gray Dense medium SAND .			30	15	28	22	> 50
D31		31					31	16	30	20	> 50
D32		32					32	16	32	18	> 50

Graphical representation of N values: 00 10 20 30 40 50

Engineers Associate Ltd.

Fig: 2

RECORD OF BORING AND TESTING (BORE LOG)

Project: Dhaka - Chitagong main Power Grid Strengthening project.

Client: LGED

Soil Strata Legend: Sand, Silt, Clay, Grit/ Stone, Peat / Organic, Mica, Disturb Sample (D), Undisturb Sample (UD)

Bore Hole No : BH 02
Method of Boring : WASH
Boring Depth : 30.0m

Ground Water Level (GWL) : 0.45m.Below
Date of Starting :23/06/2014
Date of Completion :24/06/2014

Location of Boring :Tower No.11(N 23°35'32.80" E 90°34'45.68")

Sample No.	Type of Sample	Depth below E.G.L (m)	Thickness (m)	Description of Soil Strata	Soil Strata Legend	Picture of Soil Sample	SPT Intervals (meter)	Blows on Spoon per 15 cm Penetration 15 cm	15 cm	15 cm	N- Value
D1		1	3.0m	Light gray loose fine silty SAND trace Clay.			1	1	1	1	2
D2		2					2	1	1	2	3
D3		3					3	1	2	2	4
D4		4	9.0m	Gray Loose fine Silty SAND .			4	1	1	2	3
D5		5					5	1	1	1	2
D6		6					6	1	1	2	3
D7		7					7	2	2	2	4
D8		8					8	2	3	3	6
D9		9					9	2	3	4	7
D10		10					10	3	4	4	8
D11		11					11	3	4	5	9
D12		12	7.0m	Gray Medium fine Silty SAND .			12	4	5	7	12
D13		13					13	5	7	9	16
D14		14					14	5	8	11	19
D15		15					15	6	10	12	22
D16		16					16	6	12	13	25
D17		17					17	7	13	14	27
D18		18					18	7	13	14	27
D19		19	4.0m	Light gray Dense fine Silty SAND .			19	8	14	15	29
D20		20					20	8	15	16	31
D21		21					21	8	14	17	31
D22		22					22	8	15	18	33
D23		23	7.0m	Gray Dense fine Silty SAND .			23	9	17	20	37
D24		24					24	10	19	22	41
D25		25					25	12	21	24	45
D26		26					26	12	23	24	47
D27		27					27	13	24	26	50
D28		28					28	14	25	25	> 50
D29		29					29	14	27	23	> 50
D30		30					30	15	30	20	> 50

Graphical representation of N values: 00 10 20 30 40 50

RECORD OF BORING AND TESTING (BORE LOG)

Project: Dhaka - Chitagong main Power Grid Strengthening project.

Client: LGED

Soil Strata Legend: Sand, Silt, Clay, Grit/ Stone, Peat / Organic, Mica, Disturb Sample (D), Undisturb Sample (UD)

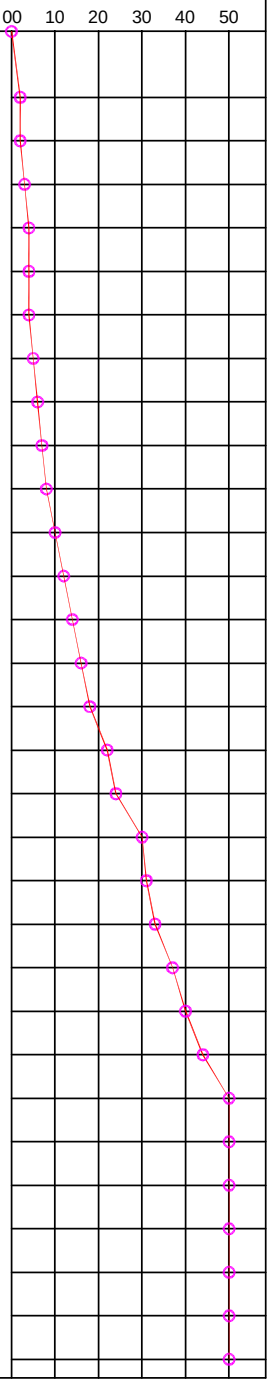
Bore Hole No : BH 03
Method of Boring : WASH
Boring Depth : 30.0m

Ground Water Level (GWL) : 0.30m.Below
Date of Starting :07/07/2014
Date of Completion :08/07/2014

Location of Boring :Tower No.52(N 23°29'26.93" E 90°40'59.76")

Sample No.	Type of Sample	Depth below E.G.L (m)	Thickness (m)	Description of Soil Strata	Soil Strata Legend	Picture of Soil Sample	SPT Intervals (meter)	Blows on Spoon per 15 cm Penetration 15 cm	15 cm	15 cm	N- Value
D1		1	2.0m	Gray fine Silt SAND with Clay.			1	1	1	1	2
D2		2					2	1	1	1	2
D3		3	5.0m	Gray Loose fine Silty SAND .			3	1	1	2	3
D4		4					4	1	2	2	4
D5		5					5	2	2	2	4
D6		6					6	2	2	2	4
D7		7					7	2	2	3	5
D8		8	7.0m	Light gray fine Silty SAND .			8	2	3	3	6
D9		9					9	2	3	4	7
D10		10					10	3	4	4	8
D11		11					11	3	4	6	10
D12		12					12	3	5	7	12
D13		13					13	3	6	8	14
D14		14	2.0m	Gray fine Silty SAND .			14	4	7	9	16
D15		15					15	4	8	10	18
D16		16					16	5	10	12	22
D17		17	14.0m	Light gray fine Silty SAND .			17	6	11	13	24
D18		18					18	7	14	16	30
D19		19					19	8	14	17	31
D20		20					20	9	15	18	33
D21		21					21	6	17	20	37
D22		22					22	7	18	22	40
D23		23					23	8	20	24	44
D24		24					24	10	23	27	50
D25		25					25	12	24	26	50
D26		26					26	14	25	25	> 50
D27		27					27	15	27	23	> 50
D28		28					28	16	30	20	> 50
D29		29					29	17	35	15	> 50
D30		30					30	18	36	14	> 50

Graphical representation of N values



RECORD OF BORING AND TESTING (BORE LOG)

Project: Dhaka - Chitagong main Power Grid Strengthening project.

Client: LGED

Soil Strata Legend: Sand, Silt, Clay, Grit/ Stone, Peat / Organic, Mica, Disturb Sample (D), Undisturb Sample (UD)

Bore Hole No : BH 04
Method of Boring : WASH
Boring Depth : 24.0m

Ground Water Level (GWL) : 0.45m.Below
Date of Starting :25/06/2014
Date of Completion :25/06/2014

Location of Boring :Tower No.96(N 23°25'16.03" E 90°49'47.02")

Sample No.	Type of Sample	Depth below E.G.L (m)	Thickness (m)	Description of Soil Strata	Soil Strata Legend	Picture of Soil Sample	SPT Intervals (meter)	Blows on Spoon per 15 cm Penetration 15 cm	15 cm	15 cm		N- Value
D1		1	3.0m	Gray Soft Clayey Silt.			1	1	1	1		2
D2		2					2	1	1	1		2
D3		3					3	1	1	1		2
D4		4	3.0m	Gray loose fine Silty SAND .			4	U	D	S		
D5		5					5	1	3	4		7
D6		6					6	4	5	8		13
D7		7	5.0m	Gray fine Silty SAND .			7	4	6	10		16
D8		8					8	6	8	12		20
D9		9					9	8	12	16		28
D10		10					10	8	14	14		30
D11		11	8.0m	Gray fine SAND .			11	9	15	17		32
D12		12					12	7	10	20		30
D13		13					13	9	11	21		32
D14		14					14	10	13	22		35
D15		15					15	12	15	23		38
D16		16					16	12	16	24		40
D17		17					17	13	18	26		44
D18		18					18	14	20	26		46
D19		19					19	14	21	28		49
D20		20	5.0m	Gray Silty SAND			20	15	24	26		50
D21		21					21	14	30	20	>	50
D22		22					22	16	32	18	>	50
D23		23					23	17	35	15	>	50
D24		24					24	18	40	10	>	50
D25		25					25					
D26		26					26					
D27		27					27					
D28		28					28					
D29		29					29					
D30		30					30					

Graphical representation of N values: 00 10 20 30 40 50

RECORD OF BORING AND TESTING (BORE LOG)

Project: Dhaka - Chitagong main Power Grid Strengthening project.

Client: LGED

Soil Strata Legend: Sand, Silt, Clay, Grit/ Stone, Peat / Organic, Mica, Disturb Sample (D), Undisturb Sample (UD)

Bore Hole No : BH 05
Method of Boring : WASH
Boring Depth : 31.0m

Ground Water Level (GWL) : 0.30m.Below
Date of Starting :26/06/2014
Date of Completion :26/06/2014

Location of Boring :Tower No.285(N 23°03'26.59" E 91°18'42.23")

Sample No.	Type of Sample	Depth below E.G.L (m)	Thickness (m)	Description of Soil Strata	Soil Strata Legend	Picture of Soil Sample	SPT Intervals (meter)	Blows on Spoon per 15 cm Penetration 15 cm	15 cm	15 cm	N- Value
D1		1	2.5m	Brown Soft Clayey Silt.			1	1	1	1	2
D2		2					2	1	1	1	2
D3		3	2.0m	Gray Soft Clayey Silt.			3	1	1	2	3
D4		4					4	2	2	2	4
D5		5	1.5m	Gray fine Silty SAND .			5	2	2	3	5
D6		6					6	2	3	3	6
D7		7	3.1m	Gray fine Silty SAND with clay.			7	2	3	4	7
D8		8					8	3	4	4	8
D9		9					9	3	3	4	7
D10		10	9.9m	Light brown Silty SAND .			10	4	5	6	11
D11		11					11	4	6	7	13
D12		12					12	5	7	8	15
D13		13					13	6	8	10	18
D14		14					14	6	8	10	18
D15		15					15	7	9	11	20
D16		16					16	7	10	12	22
D17		17					17	7	10	13	23
D18		18					18	7	11	14	25
D19		19	11.9m	Gray fine Silty SAND .			19	8	13	16	29
D20		20					20	8	15	18	33
D21		21					21	8	14	16	30
D22		22					22	9	15	18	33
D23		23					23	10	16	20	36
D24		24					24	11	17	21	38
D25		25					25	12	20	22	42
D26		26					26	13	22	24	46
D27		27					27	14	23	25	48
D28		28					28	15	24	26	50
D29		29					29	16	28	22 >	50
D30		30					30	17	30	20 >	50
D31		31					31	20	35	15 >	50

Graphical representation of N values

00 10 20 30 40 50

Engineers Associate Ltd.

Fig: 2

RECORD OF BORING AND TESTING (BORE LOG)

Project: Dhaka - Chitagong main Power Grid Strengthening project.

Client: LGED

Soil Strata Legend: Sand, Silt, Clay, Grit/ Stone, Peat / Organic, Mica, Disturb Sample (D), Undisturb Sample (UD)

Bore Hole No : BH 06
Method of Boring : WASH
Boring Depth : 30.0m

Ground Water Level (GWL) : 0.0m.Below
Date of Starting :27/06/2014
Date of Completion :27/06/2014

Location of Boring :Tower No.327(N 23°1'27.03" E 91°26'35.84")

Sample No.	Type of Sample	Depth below E.G.L (m)	Thickness (m)	Description of Soil Strata	Soil Strata Legend	Picture of Soil Sample	SPT Intervals (meter)	Blows on Spoon per 15 cm Penetration 15 cm	15 cm	15 cm		N- Value
D1		1	2.0m	Brown Clayey Silt.			1	1	1	2		3
D2		2					2	1	1	2		3
D3		3	4.0m	Gray fine Silty SAND .			3	2	2	2		4
D4		4					4	2	2	3		5
D5		5					5	4	5	6		11
D6		6	6.0m	Gray fine Silty SAND .			6	4	6	7		13
D7		7					7	4	6	7		13
D8		8					8	5	6	8		14
D9		9					9	5	6	9		15
D10		10					10	6	10	12		22
D11		11					11	10	13	15		28
D12		12	4.0m	Gray fine Sandy Silty .			12	11	14	16		30
D13		13					13	12	14	17		31
D14		14					14	14	16	18		34
D15		15					15	14	17	20		37
D16		16	3.0m	Gray fine SAND .			16	15	18	22		40
D17		17					17	16	20	22		42
D18		18					18	16	20	22		42
D19		19	11.0m	Gray fine SAND .			19	17	22	24		46
D20		20					20	17	22	25		47
D21		21					21	17	23	25		48
D22		22					22	18	24	25		49
D23		23					23	18	27	23	>	50
D24		24					24	19	28	22	>	50
D25		25					25	20	30	20	>	50
D26		26					26	22	32	18	>	50
D27		27					27	23	35	15	>	50
D28		28					28	23	35	14	>	50
D29		29					29	24	40	10	>	50
D30		30					30	24	50	-	>	50

Graphical representation of N values: 00 10 20 30 40 50

RECORD OF BORING AND TESTING (BORE LOG)

Project: Dhaka - Chitagong main Power Grid Strengthening project.

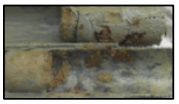
Client: LGED

Soil Strata Legend: Sand, Silt, Clay, Grit/ Stone, Peat / Organic, Mica, Disturb Sample (D), Undisturb Sample (UD)

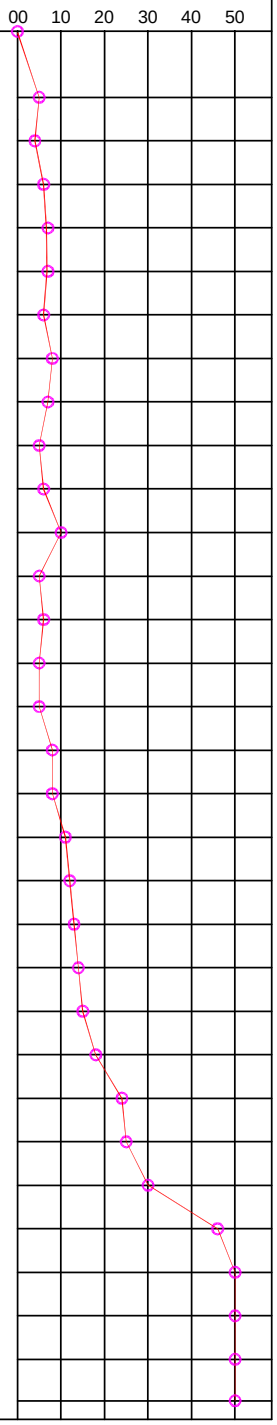
Bore Hole No : BH 07
Method of Boring : WASH
Boring Depth : 31.0m

Ground Water Level (GWL) : 0.0m.Below
Date of Starting :28/06/2014
Date of Completion :28/06/2014

Location of Boring :Tower No.349(N 22°59'6.43" E 91°30'18.89")

Sample No.	Type of Sample	Depth below E.G.L (m)	Thickness (m)	Description of Soil Strata	Soil Strata Legend	Picture of Soil Sample	SPT Intervals (meter)	Blows on Spoon per 15 cm Penetration 15 cm	15 cm	15 cm	N- Value
D1		1	12.0m	Gray medium Silt Clay.			1	1	2	3	5
D2		2					2	1	2	2	4
D3		3					3	2	3	3	6
D4		4					4	2	3	4	7
D5		5					5	2	3	4	7
D6		6					6	2	3	3	6
D7		7					7	2	3	5	8
D8		8					8	2	3	4	7
D9		9					9	2	2	3	5
D10		10					10	3	3	3	6
D11		11					11	3	4	6	10
D12		12					12	1	2	3	5
D13		13	5.0m	Gray loose Silty SAND .			13	2	3	3	6
D14		14					14	2	2	3	5
D15		15					15	2	2	3	5
D16		16					16	2	3	3	6
D17		17					17	3	4	4	8
D18		18	8.0m	Gray medium fine Silty SAND.			18	3	5	6	11
D19		19					19	3	6	6	12
D20		20					20	3	6	7	13
D21		21					21	3	6	8	14
D22		22					22	4	7	9	15
D23		23					23	5	8	10	18
D24		24					24	6	10	14	24
D25		25					25	6	11	14	25
D26		26	5.9m	Gray dense fine SAND.			26	7	14	16	30
D27		27					27	8	20	26	46
D28		28					28	10	24	26	50
D29		29					29	13	27	23	> 50
D30		30					30	14	28	22	> 50
D31		31					31	16	31	19	> 50

Graphical representation of N values



Engineers Associate Ltd.

Fig: 2

RECORD OF BORING AND TESTING (BORE LOG)

Project: Dhaka - Chitagong main Power Grid Strengthening project.

Client: LGED

Soil Strata Legend: Sand, Silt, Clay, Grit/ Stone, Peat / Organic, Mica, Disturb Sample (D), Undisturb Sample (UD)

Bore Hole No : BH 08
Method of Boring : WASH
Boring Depth : 23.0m

Ground Water Level (GWL) : 0.0m.Below
Date of Starting :29/06/2014
Date of Completion :29/06/2014

Location of Boring :Tower No.428(N 22°49'40.53." E 91°42'48.74")

Sample No.	Type of Sample	Depth below E.G.L (m)	Thickness (m)	Description of Soil Strata	Soil Strata Legend	Picture of Soil Sample	SPT Intervals (meter)	Blows on Spoon per 15 cm Penetration 15 cm	15 cm	15 cm	N- Value
D1		1	8.0m	Brown Clayey silt			1	1	1	1	2
D2		2					2	1	1	2	3
D3		3					3	1	2	2	4
D4		4					4	2	3	4	7
D5		5					5	1	2	3	5
D6		6					6	2	3	4	7
D7		7					7	1	2	2	4
D8		8					8	1	2	3	5
D9		9	8.0m	Brown fine Silty SAND.			9	12	14	14	29
D10		10					10	11	15	16	31
D11		11					11	12	16	17	33
D12		12					12	14	17	18	35
D13		13					13	13	17	18	35
D14		14					14	14	18	20	38
D15		15					15	15	20	22	42
D16		16					16	15	21	22	43
D17		17	7.0m	Brown medium dense SAND.			17	16	22	23	45
D18		18					18	17	23	24	47
D19		19					19	18	24	25	49
D20		20					20	18	30	20 >	50
D21		21					21	22	35	15 >	50
D22		22					22	22	38	12 >	50
D23		23					23	24	40	10 >	50
D24		24					24				
D25		25					25				
D26		26					26				
D27		27					27				
D28		28					28				
D29		29					29				
D30		30					30				
D31		31					31				

Graphical representation of N values: 00 10 20 30 40 50

Engineers Associate Ltd.

Fig: 2

RECORD OF BORING AND TESTING (BORE LOG)

Project: Dhaka - Chitagong main Power Grid Strengthening project.

Client: LGED

Soil Strata Legend: Sand, Silt, Clay, Grit/ Stone, Peat / Organic, Mica, Disturb Sample (D), Undisturb Sample (UD)

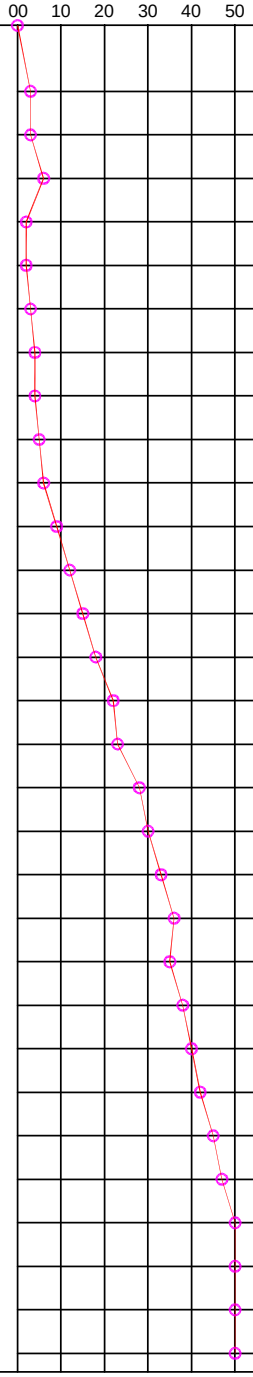
Bore Hole No : BH 09
Method of Boring : WASH
Boring Depth : 30.0m

Ground Water Level (GWL) : 0.0m.Below
Date of Starting :30/06/2014
Date of Completion :30/06/2014

Location of Boring :Tower No.009(N 22°25'30.82" E 91°56'28.69")

Sample No.	Type of Sample	Stratification: Depth below E.G.L (m)	Stratification: Thickness (m)	Description of Soil Strata	Soil Strata Legend	Picture of Soil Sample	SPT Intervals (meter)	Standard Penetration Test (SPT): Blows on Spoon per 15 cm Penetration 15 cm	15 cm	15 cm	N- Value
D1		1	3.0m	Gray Soft Clayey Silt.			1	1	1	2	3
D2		2					2	1	2	2	3
D3		3					3	2	3	3	6
D4		4	10.0m	Light brown Clayey Silt.			4	U	D	S	
D5		5					5	1	1	1	2
D6		6					6	1	1	1	2
D7		7					7	1	1	2	3
D8		8					8	1	2	2	4
D9		9					9	2	2	3	5
D10		10					10	2	3	3	6
D11		11					11	2	4	5	9
D12		12					12	3	5	7	12
D13		13	17.0m	Gray medium fine Silty SAND.			13	4	7	8	15
D14		14					14	5	8	10	18
D15		15					15	6	10	12	22
D16		16					16	6	10	13	23
D17		17					17	7	13	15	28
D18		18					18	8	14	16	30
D19		19					19	9	15	18	33
D20		20					20	10	16	20	36
D21		21					21	10	15	20	35
D22		22					22	11	17	21	38
D23		23					23	12	18	22	40
D24		24					24	13	20	22	42
D25		25					25	14	22	23	45
D26		26					26	15	23	24	47
D27		27					27	16	24	26	50
D28		28					28	17	26	24	> 50
D29		29					29	18	27	23	> 50
D30		30					30	18	30	20	> 50

Graphical representation of N values



Engineers Associate Ltd.

Fig: 2

RECORD OF BORING AND TESTING (BORE LOG)

Project: Dhaka - Chitagong main Power Grid Strengthening project.

Client: LGED

Soil Strata Legend: Sand, Silt, Clay, Grit/ Stone, Peat / Organic, Mica, Disturb Sample (D), Undisturb Sample (UD)

Bore Hole No : BH 10
Method of Boring : WASH
Boring Depth : 32.0m

Ground Water Level (GWL) : 0.30m.Below
Date of Starting :01/07/2014
Date of Completion :01/07/2014

Location of Boring :Tower No.099(N 22°08'18.0" E 91°53'17.6")

Sample No.	Type of Sample	Depth below E.G.L (m)	Thickness (m)	Description of Soil Strata	Soil Strata Legend	Picture of Soil Sample	SPT Intervals (meter)	Blows on Spoon per 15 cm Penetration 15 cm	15 cm	15 cm	N- Value
D1		1	1.0m	Light brown clay silt			1	1	1	2	3
D2		2					2	U	D	S	
D3		3	6.0m	Gray Silty Sand With Clay .			3	1	0	1	1
D4		4					4	1	0	1	1
D5		5					5	1	1	1	2
D6		6					6	1	1	1	2
D7		7					7	1	1	1	2
D8		8	3.0m	Gray fine Silty SAND .			8	2	3	3	6
D9		9					9	2	4	5	9
D10		10	2.0m	Gray medium SAND			10	3	5	10	15
D11		11					11	4	8	12	20
D12		12	19.9m	Gray fine Silty SAND .			12	5	7	10	17
D13		13					13	5	8	12	20
D14		14					14	6	9	13	22
D15		15					15	6	10	14	24
D16		16					16	7	12	15	27
D17		17					17	8	12	17	29
D18		18					18	8	12	17	29
D19		19					19	9	13	18	31
D20		20					20	9	14	17	31
D21		21					21	10	15	18	33
D22		22					22	10	16	19	35
D23		23					23	12	18	20	38
D24		24					24	12	20	21	41
D25		25					25	13	21	22	43
D26		26					26	13	22	23	45
D27		27					27	13	22	24	46
D28		28					28	14	23	25	48
D29		29					29	14	24	26	50
D30		30					30	15	27	23	> 50
D31		31					31	16	30	20	> 50
D32		32					32	17	32	18	> 50

Graphical representation of N values: 00 10 20 30 40 50

Engineers Associate Ltd.

Fig: 2

RECORD OF BORING AND TESTING (BORE LOG)

Project: Dhaka - Chitagong main Power Grid Strengthening project.

Client: LGED

Soil Strata Legend: Sand, Silt, Clay, Grit/ Stone, Peat / Organic, Mica, Disturb Sample (D), Undisturb Sample (UD)

Bore Hole No : BH 11
Method of Boring : WASH
Boring Depth : 33.0m

Ground Water Level (GWL) : 0.30m.Below
Date of Starting :02/07/2014
Date of Completion :03/07/2014

Location of Boring :Tower No.231(N 21°43'21.52"E 91°54'27.12")

Sample No.	Type of Sample	Depth below E.G.L (m)	Thickness (m)	Description of Soil Strata	Soil Strata Legend	Picture of Soil Sample	SPT Intervals (meter)	Blows on Spoon per 15 cm Penetration 15 cm	15 cm	15 cm	N- Value
		1	1.0m	Light Brown clay silt.			1	1	1	1	2
D1		1					1	1	1	1	2
D2		2					2	1	0	1	1
D3		3					3	1	1	2	3
D4		4		Light Brown Silty sand .			4	1	1	2	3
D5		5					5	1	1	3	4
D6		6					6	1	1	2	3
D7		7	11.0m				7	1	1	2	3
D8		8					8	2	2	3	5
D9		9					9	2	3	5	8
D10		10		Light Brown Silty sand .			10	3	6	8	14
D11		11					11	4	8	11	19
D12		12					12	4	6	9	15
D13		13					13	4	7	10	17
D14		14					14	5	8	10	18
D15		15					15	6	10	12	22
D16		16					16	6	10	12	22
D17		17	9.0m	Gray corse SAND .			17	7	11	12	23
D18		18					18	7	12	13	25
D19		19					19	8	13	15	28
D20		20					20	8	14	16	30
D21		21					21	8	14	17	31
D22		22					22	8	15	18	33
D23		23					23	9	16	20	36
D24		24					24	9	16	21	37
D25		25					25	10	17	22	39
D26		26					26	10	18	22	40
D27		27	11.9m	Gray corse SAND .			27	11	20	22	42
D28		28					28	12	21	23	44
D29		29					29	13	23	25	48
D30		30					30	14	23	26	49
D31		31					31	15	24	26	50
D32		32					32	16	27	23	> 50
D33		33					33	17	28	22	> 50

Graphical representation of N values

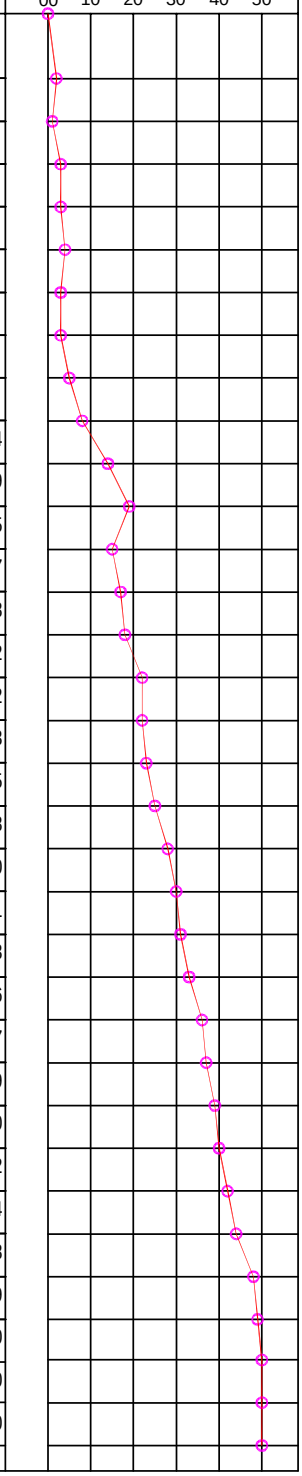


Fig: 2

Engineers Associate Ltd.

RECORD OF BORING AND TESTING (BORE LOG)

Project: Dhaka - Chitagong main Power Grid Strengthening project.

Client: LGED

Soil Strata Legend: Sand, Silt, Clay, Grit/ Stone, Peat / Organic, Mica, Disturb Sample (D), Undisturb Sample (UD)

Bore Hole No : BH 12
Method of Boring : WASH
Boring Depth : 27.0m

Ground Water Level (GWL) : 0.30m.Below
Date of Starting :04/07/2014
Date of Completion :05/07/2014

Location of Boring :Tower No.395(N 22°53'36.85"E 91°37'45.58")

Sample No.	Type of Sample	Depth below E.G.L (m)	Thickness (m)	Description of Soil Strata	Soil Strata Legend	Picture of Soil Sample	SPT Intervals (meter)	Blows on Spoon per 15 cm Penetration 15 cm	15 cm	15 cm	N- Value
D1		1	3.0m	Brown Clayey Silt.			1	2	2	3	5
D2		2					2	2	3	5	8
D3		3					3	3	4	6	10
D4		4					4	4	6	8	14
D5		5					5	4	7	8	15
D6		6					6	4	8	8	16
D7		7					7	4	9	11	20
D8		8					8	4	10	11	21
D9		9					9	4	11	12	23
D10		10					10	5	12	13	25
D11		11					11	6	13	14	27
D12		12					12	7	14	16	30
D13		13					13	7	15	17	32
D14		14	24.0m	Brown Dense SAND .			14	7	16	18	34
D15		15					15	8	17	18	35
D16		16					16	8	18	20	38
D17		17					17	8	18	21	39
D18		18					18	9	20	22	42
D19		19					19	9	21	23	44
D20		20					20	10	22	24	46
D21		21					21	12	22	25	47
D22		22					22	12	23	25	48
D23		23					23	13	24	25	49
D24		24					24	14	25	25	50
D25		25					25	16	26	24	50
D26		26					26	16	29	21	50
D27		27					27	17	30	20	50
D28		28									
D29		29									
D30		30									
D31		31									
D32		32									
D33		33									

Graphical representation of N values

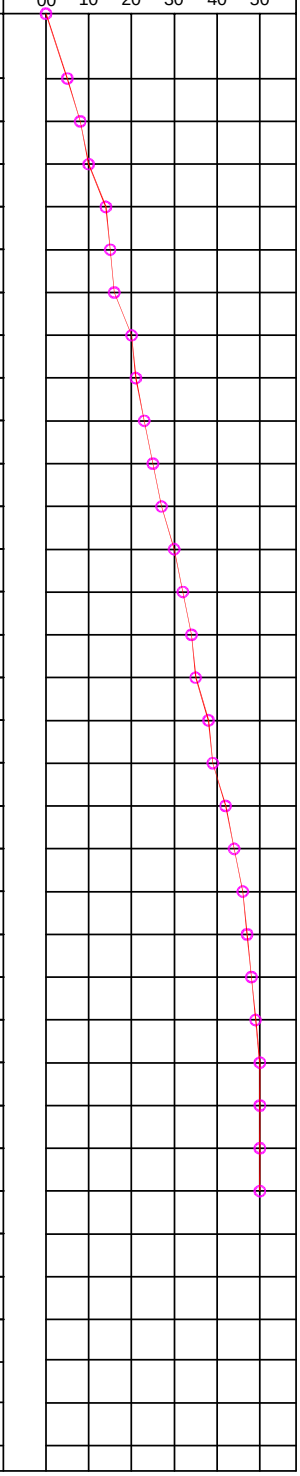


Fig: 2

Engineers Associate Ltd.

RECORD OF BORING AND TESTING (BORE LOG)

Project: Dhaka - Chitagong main Power Grid Strengthening project.

Client: LGED

Soil Strata Legend: Sand, Silt, Clay, Grit/ Stone, Peat / Organic, Mica, Disturb Sample (D), Undisturb Sample (UD)

Bore Hole No : BH 13
Method of Boring : WASH
Boring Depth : 27.0m

Ground Water Level (GWL) : 4.50m.Below
Date of Starting :05/07/2014
Date of Completion :06/07/2014

Location of Boring :Tower No.410 N 22°52'13.54" E 91°40'19.51")

Sample No.	Type of Sample	Depth below E.G.L (m)	Thickness (m)	Description of Soil Strata	Soil Strata Legend	Picture of Soil Sample	SPT Intervals (meter)	Blows on Spoon per 15 cm Penetration 15 cm	15 cm	15 cm	N- Value
D1		1	5.0m	Light brown clay silt			1	1	2	6	8
D2		2					2	2	4	6	10
D3		3					3	3	5	8	13
D4		4					4	3	6	7	13
D5		5					5	4	8	9	17
D6		6					6	3	5	7	12
D7		7					7	4	6	8	14
D8		8					8	4	7	9	16
D9		9					9	5	8	10	18
D10		10					10	6	10	12	22
D11		11					11	6	10	12	22
D12		12					12	7	11	13	24
D13		13					13	8	12	14	26
D14		14					14	7	13	15	28
D15		15					15	7	14	16	30
D16		16	22.0m				16	8	16	18	34
D17		17					17	8	18	20	38
D18		18					18	8	18	20	38
D19		19					19	9	20	21	41
D20		20		Brown Dense SAND .			20	10	22	23	45
D21		21					21	11	23	24	47
D22		22					22	11	23	24	47
D23		23					23	12	24	25	49
D24		24					24	14	24	26	50
D25		25					25	15	28	22	50
D26		26					26	16	30	20	50
D27		27					27	17	32	18	50
D28		28									
D29		29									
D30		30									
D31		31									
D32		32									
D33		33									

Graphical representation of N values

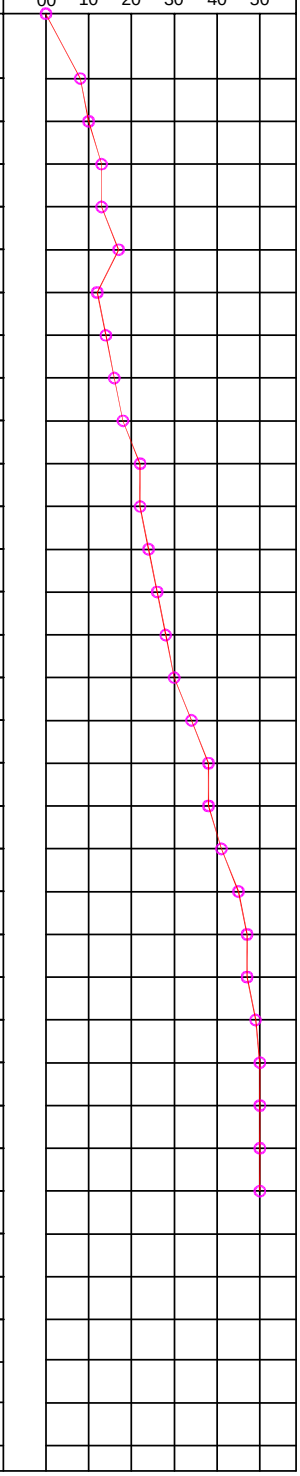


Fig: 2

Engineers Associate Ltd.

Appendix XI

Bulk Supply Tariff

People's Republic of Bangladesh Government

Bangladesh Energy Regulatory Commission

TCB Building (3rd Floor), 1 Karwan Bazar, Dhaka – 1215.

Mass Circulation

No – BERC/Tariff/BST-05/BIUBO/2012/2437 Date: 20th September, 2012

As per the power given by section 22(b) and 34 of Bangladesh Regulatory Commission Act 2003, Bangladesh Regulatory Commission has redefined the wholesale electricity tariff for different power distributor agencies/companies/rural electricity development board getting electricity supplied by Bangladesh Electricity Development Board to be effective from 1st September, 2012 as following:

Serial no	Customer class	Agencies	Approved wholesale (bulk) electricity tariff taka/kwh
1	Class: G-1	Dhaka Power Distribution Company Limited (DPDC) (a) 132 KV (b) 33 KV	 5.3250 5.4050
2	Class: I-1	Rural Electricity Development Board (REB) (a) 132 KV (b) 33 KV	 5.3250 4.0325
3	Class: I-2	Dhaka Electric Supply Company Limited (DESCO) (a) 132 KV (b) 33 KV	 5.3250 5.4050
4	Class: I-3	West Zone Power Distribution Company Limited (WOZOPADIKO) (a) 133 KV	 5.3250

		(b) 33 KV	4.4300
5	Class: I-4	Bangladesh Electricity Development Board (PDB) (a) 133 KV (b) 33 KV	 5.3250 4.9775
6	Class: I-5	North West Zone Power Distribution Company Limited (a) 133 KV (b) 33 KV	 5.3250 4.9775
7	Class: I-6	Future constructed power distribution company (a) 132 KV (b) 33 KV	 5.3250 4.9775

- * Considering the socio-financial situation of the rural people this reduced tariff has been set up. BIUBO will bill to all PABIS at this wholesale rate. By considering financial, geographical and other situations PABIBO will propose retail tariff of different PABIS for approval of the commission. But, for an affluent PABIS, tariff of DPDC/DESCO won't be greater than 33 KV stage of tariff.

2. This approved wholesale tariff on electricity usage will be effective from 1st September, 2012.

3. The whiling charge which is being pain to Power Grid Company of Bangladesh (PGBC) will remain unchanged.

4. Other conditions will remain unchanged in case of wholesale electricity supply.

5. This statement will remain effective until further notice.

Order by Commission

Mohammad Abu Faroque

Manager (Economy and Accounts)

And

Secretary (Extra Responsibility)

Appendix XII

Final Users Tariff

People's Republic of Bangladesh Government

Bangladesh Energy Regulatory Commission

TCB Building (3rd Floor), 1 Karwan Bazar, Dhaka – 1215.

Mass Circulation

No – BERC/Tariff/ SUPPLY-12/ BUBO/2012/Sec-01/0720 Date: 13th March, 2014

As per the power given by section 22(b) and 34 of Bangladesh Regulatory Commission Act 2003, Bangladesh Regulatory Commission has reselected the electricity tariff for different customers getting electricity supplied by Bangladesh Electricity Development Board to be effective from 14th March, 2014 as following:

Serial No	Customers	Approved electricity tariff Taka/ KWH
1	2	3
(1)	**Class-A: Residence**	
	Lifeline : 1-50 unit	**3.33**
	1st Phase: 1-75 unit	3.53
	2nd Phase: 76-200 unit	5.01
	3rd Phase: 201-300 unit	5.19
	4th Phase: 301-400 unit	5.42
	5th Phase: 401-600 unit	8.51
	6th Phase: More than 600 unit	9.93
(2)	**Class B: Pump used on agriculture**	2.51
(3)	**Class C: Small Industry**	
	Flat	7.42
	Off-peak hour	6.64

	Peak hour	9.00
(4)	**Class D: Nonresidential lights and electricity**	4.98
(5)	**Class E: Commercial and Office**	
	Flat	9.58
	Off-peak hour	8.16
	Peak hour	11.85
(6)	**Class F: Medium Pressure General Use (11 KV)**	
	Flat	7.32
	Off-peak hour	6.62
	Peak hour	9.33
(7)	**Class G-2: Too High Pressure General Use (132 KV)**	
	Flat	6.16
	Off-peak hour	6.35
	Peak hour	9.19
(8)	**Class H: High Pressure General Use (33 KV)**	
	Flat	7.20
	Off-peak hour	6.55
	Peak hour	9.28
(9)	**Class J: Street Lights and water pumps**	6.93

2. No other customers of residence class will get the privilege of lifeline (1-50 unit) tariff.

3. All customers from residence class using electricity from 1st phase to 3rd phase will get the tariff privilege of earlier phase/phases.

4. The tariff for all customers using irrigation for agriculture will remain the same.

5. For all customers' current minimum charge, service charge, demand charge and late fee punishment will remain all the same.

6. Current value added tax and other conditions for electricity supply will remain the same for all customers.

7. This statement will remain effective further statement.

By order of the commission

Abdul Khalek

Secretary