Geoinformatics

in

Infrastructure

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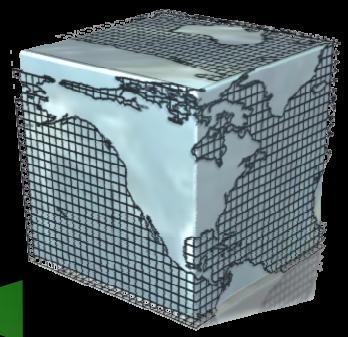
GEOSPATIAL TECHNOLOGY

ENRICH THE DECISION MAKING PROCESS BY PROVIDING THE KNOWLEDGE OF

"WHERE"

THUS, PROVIDING AN UNSCRAMBLED VIEW OF THE EARTH, ITS SYSTEMS & PROCESSES



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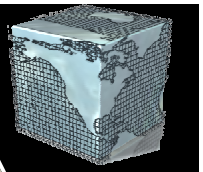
GEOSPATIAL TECHNOLOGY



HOLDS EVEN GREATER RELEVANCE IN INFRASTRUCTURE PROJECTS.

WHERE SITE-SPECIFIC INFORMATION IS THE CRITICAL BACKBONE FOR SUCCESSFUL EXECUTION

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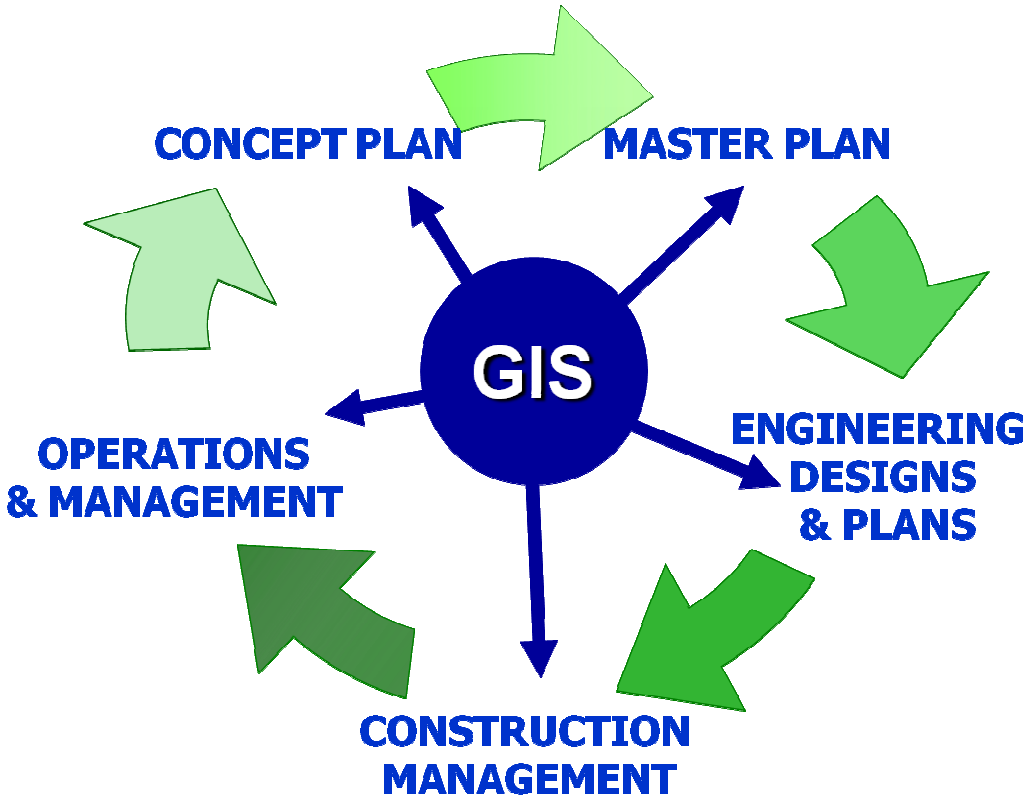
A technology / system that has efficacy across the Project Life Cycle



From
site planning to
asbuilts,
GEOINFORMATICS
allows you to **manage**
and **integrate**
disparate data types.

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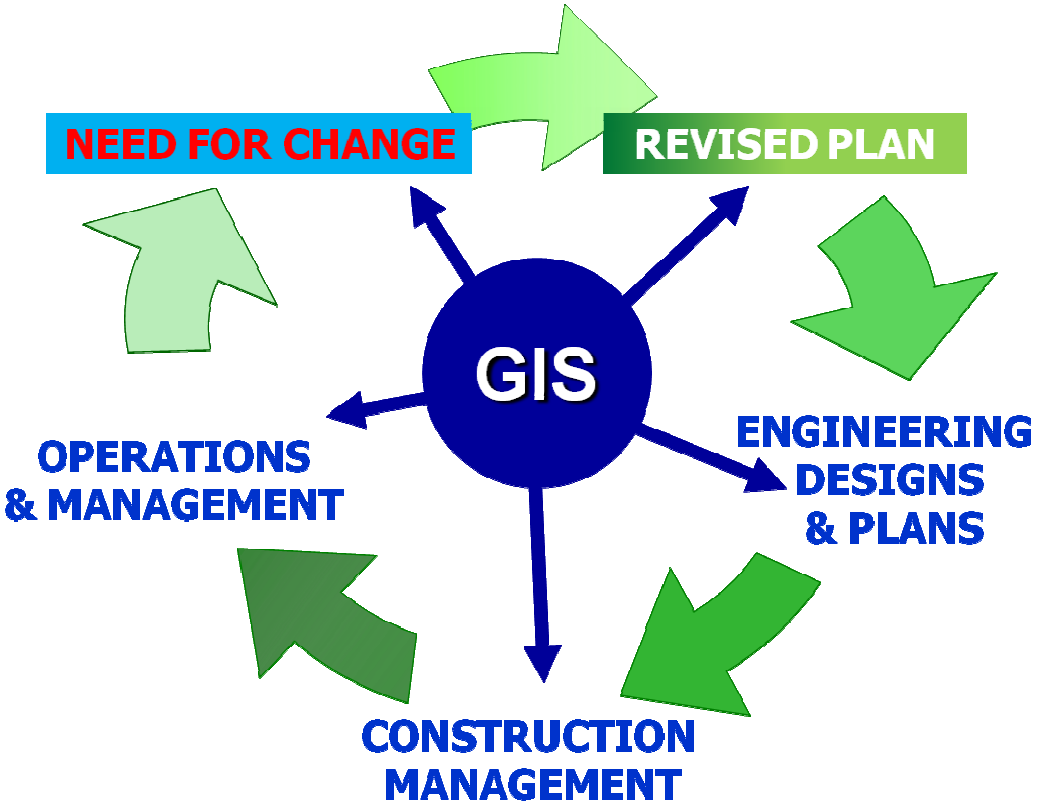
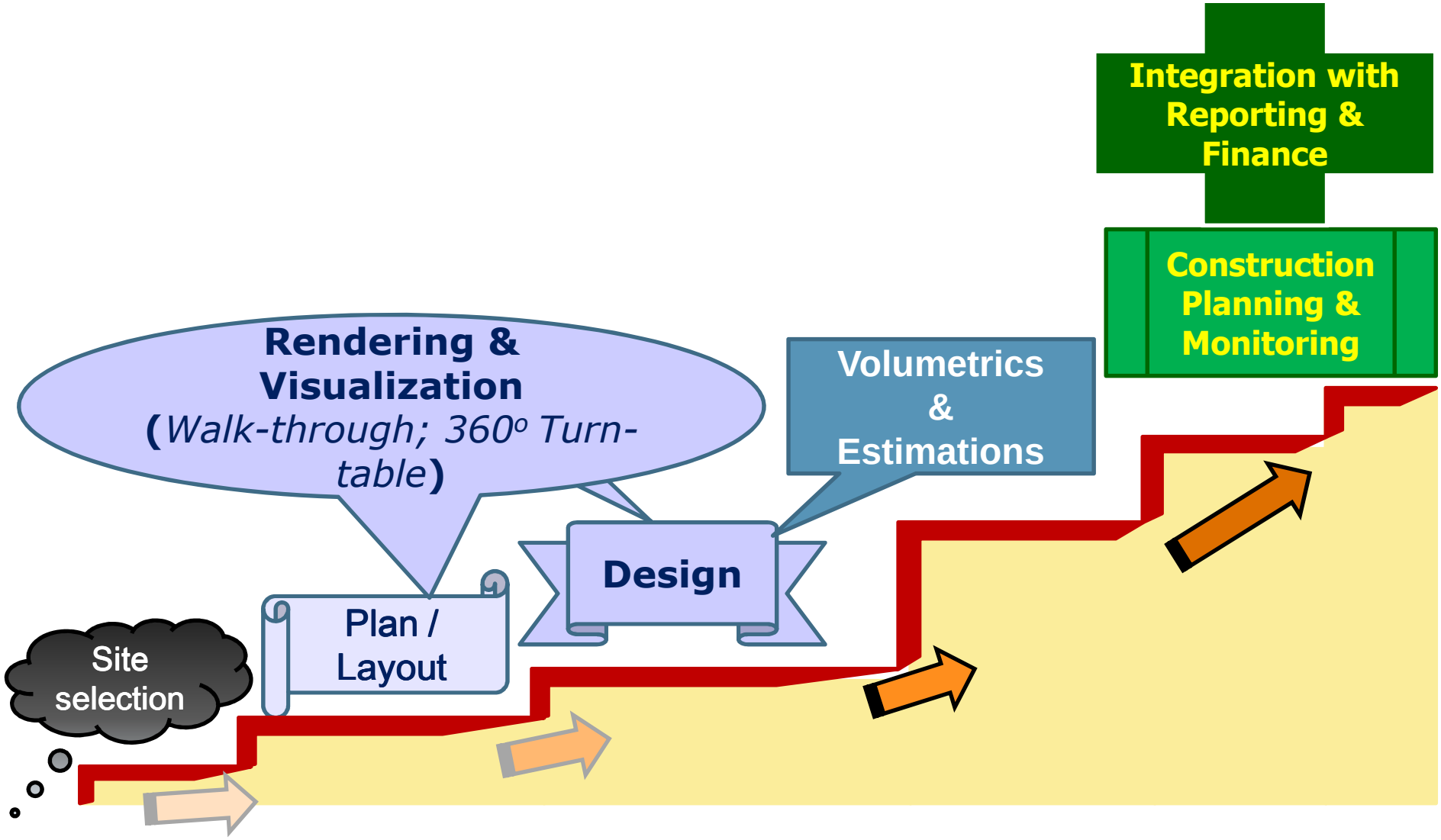
A technology / system that has efficacy across the Project Life Cycle

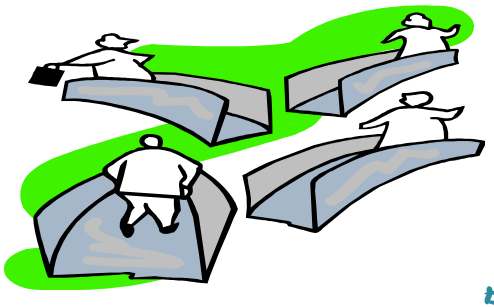


With direct data **access, transformation & export** capabilities, one can easily use & distribute your data in many formats thus serving **MULTIPLE USERS & USER NEEDS.**

3-D DESIGN & BIM : The value chain.



ROAD-BLOCKS



- **User ignorance……..**
- **User resistance…….**
- **User indifference**

  (intuitive / threat perception)

- **Cost fear……..??**

IS STRONGEST IN

CONSTRUCTION INDUSTY !!

And finally….

Has this technology tried to reach out to the Construction industry and demonstrate the benefits?

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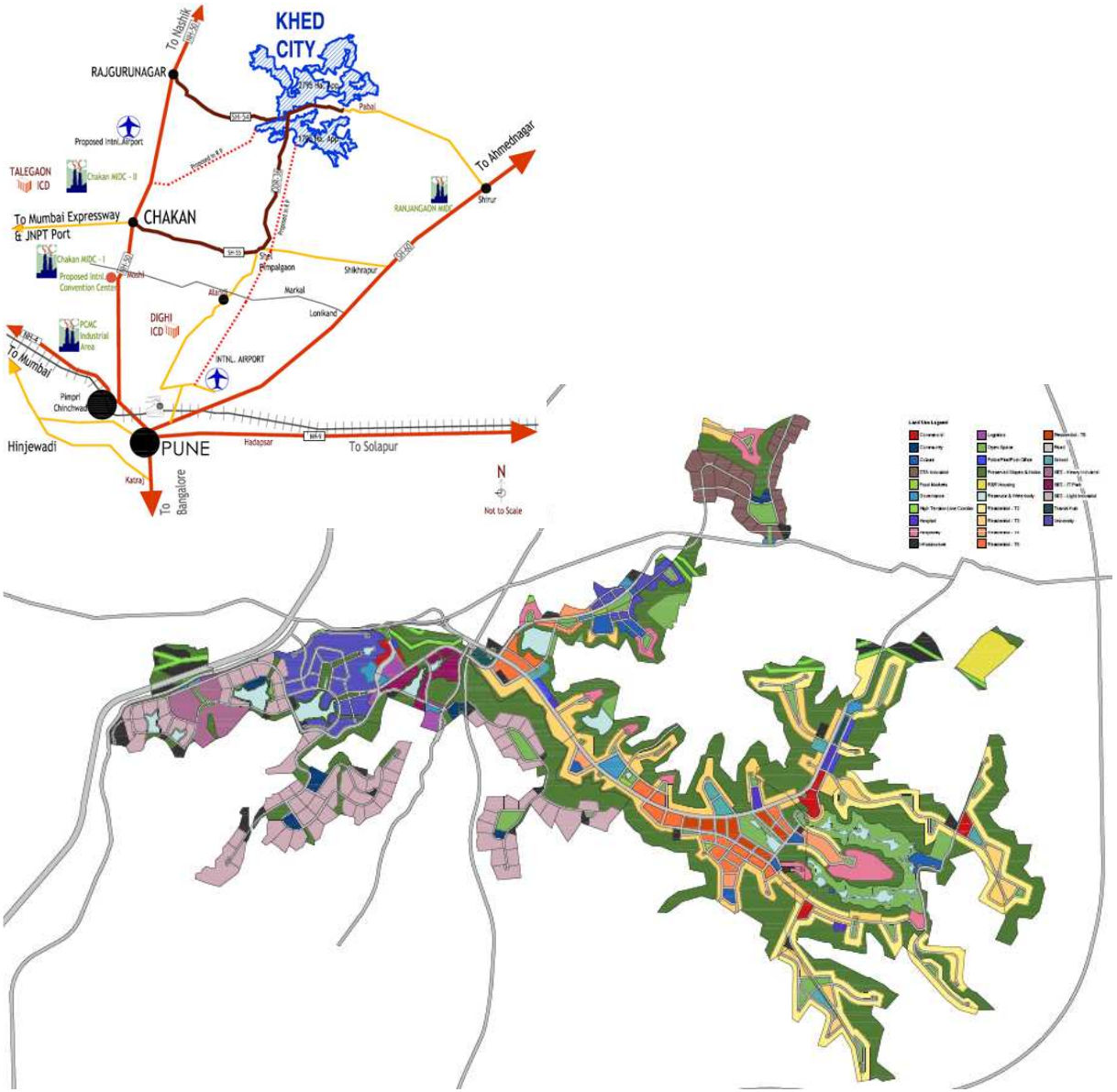
CASE STUDY 1: KHED CITY



KHED CITY is one of India's largest integrated development projects spread over 4500 hectares in northern Pune District.

KHED CITY is being developed by Khed Economic Infrastructure Pvt. Ltd. (KEIPL), a Kalyani Group – MIDC joint venture. The Project, developed with a core infrastructure investment of about Rs. 12,500 crore (for phase I) is expected generate 120,000 new employment opportunities, host an integrated township with a population of more than 10 million.

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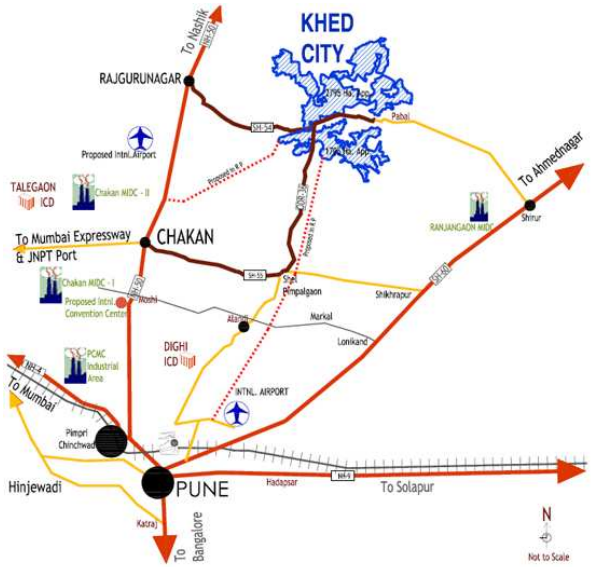
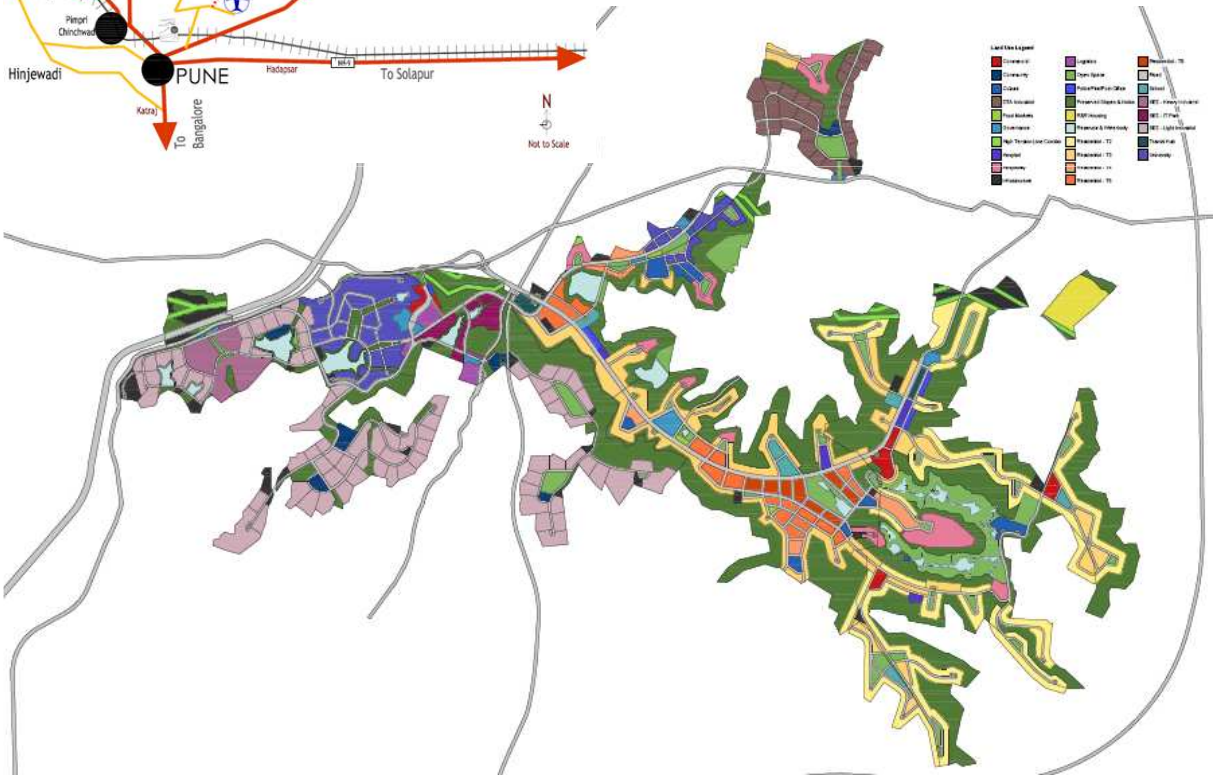
CASE STUDY 1: KHED CITY





The importance of geospatial technology was appreciated from the time of site-selection and all 'best-practices' were deployed (*from surveys though facilities & town-planning*) from Day 1.

One of the first lessons in this was that the entire Geospatial team had to learn the language of town-planners, construction industry and contractors!!

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CASE STUDY 1: KHED CITY

KEY CHALLENGE:

A rough, undulating terrain, essentially a barren grass-land.

Very high requirement of land-grading, which could have seen costs spiral out of control at the start of the project itself.

CASE STUDY 1: KHED CITY

KEY CHALLENGE:

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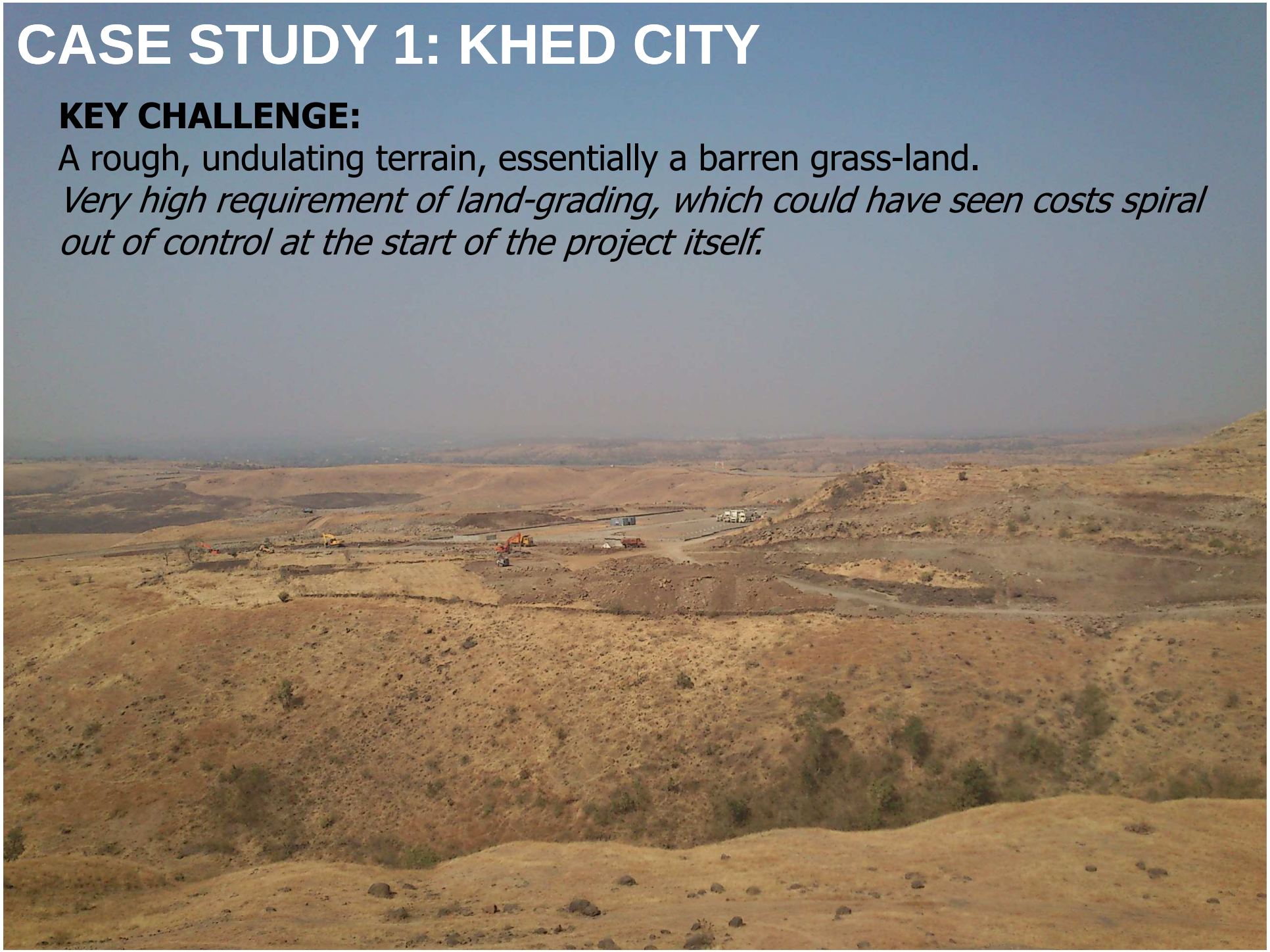
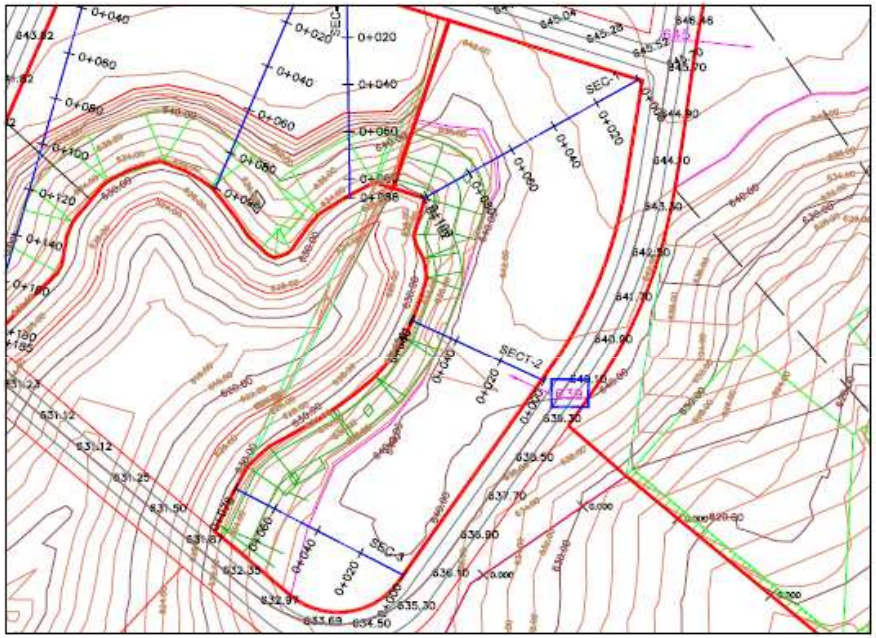
Very high requirement of land-grading, which could have seen costs spiral out of control at the start of the project itself.



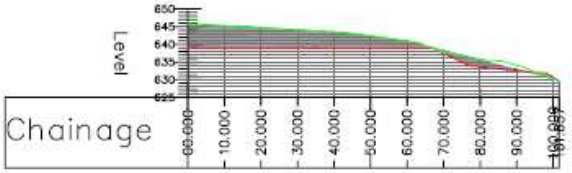
KHED CITY: Plot-wise grading plans

GRADING PLAN

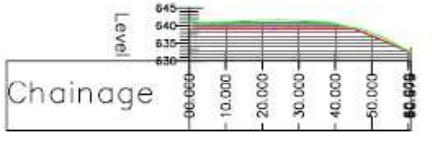
S.NO.	PLOT NAME	Cut (Cu.m)	Fill (Cu.m)	Net (Cu.m)
10	A9	39401.00	9546.00	29856.00



PLAN



SECTION 1 PLOT A9



SECTION 2 PLOT A9

SECTION 3 PLOT A9

key plan

legend

Plan

- GRADED PLOT BOUNDARY
- PLOT ENTRY
- SECTION LINE
- ROAD CENTER LINE
- TERRACE LINE
- COUNTER LINE MAJOR
- COUNTER LINE MINOR
- GRADING IN SLOPE 1:10
- GRADING IN SLOPE 1:1

Section

- NATURAL GROUND PROFILE
- GRADED GROUND PROFILE
- CUT–FILL HATCH

Note:–
DRAWING IS TO BE READ NOT MEASURED

NORTH

PLOT -A 9

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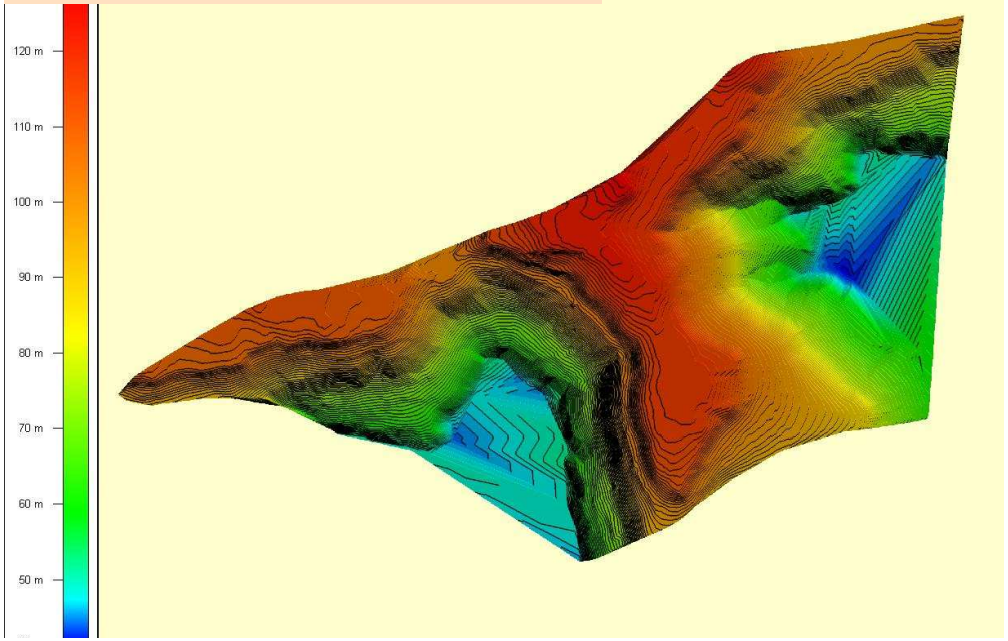
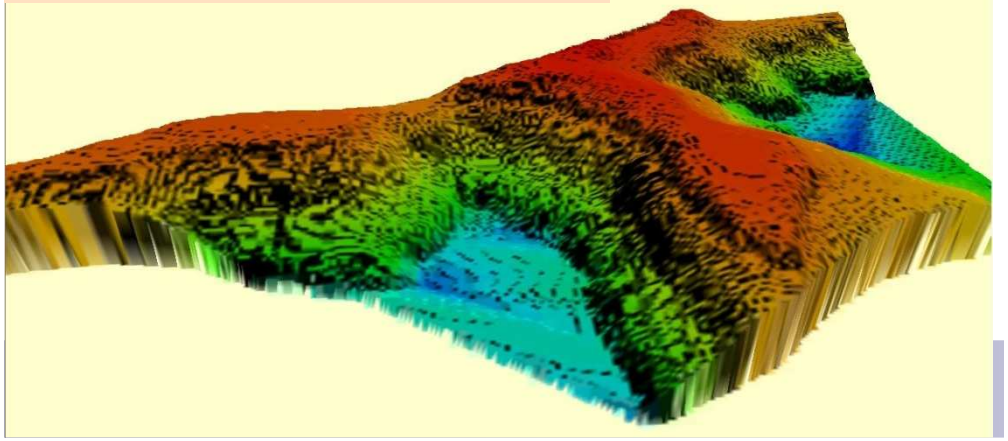
KHED CITY : Spine Road in Phase I

DEM FROM CONTOURS



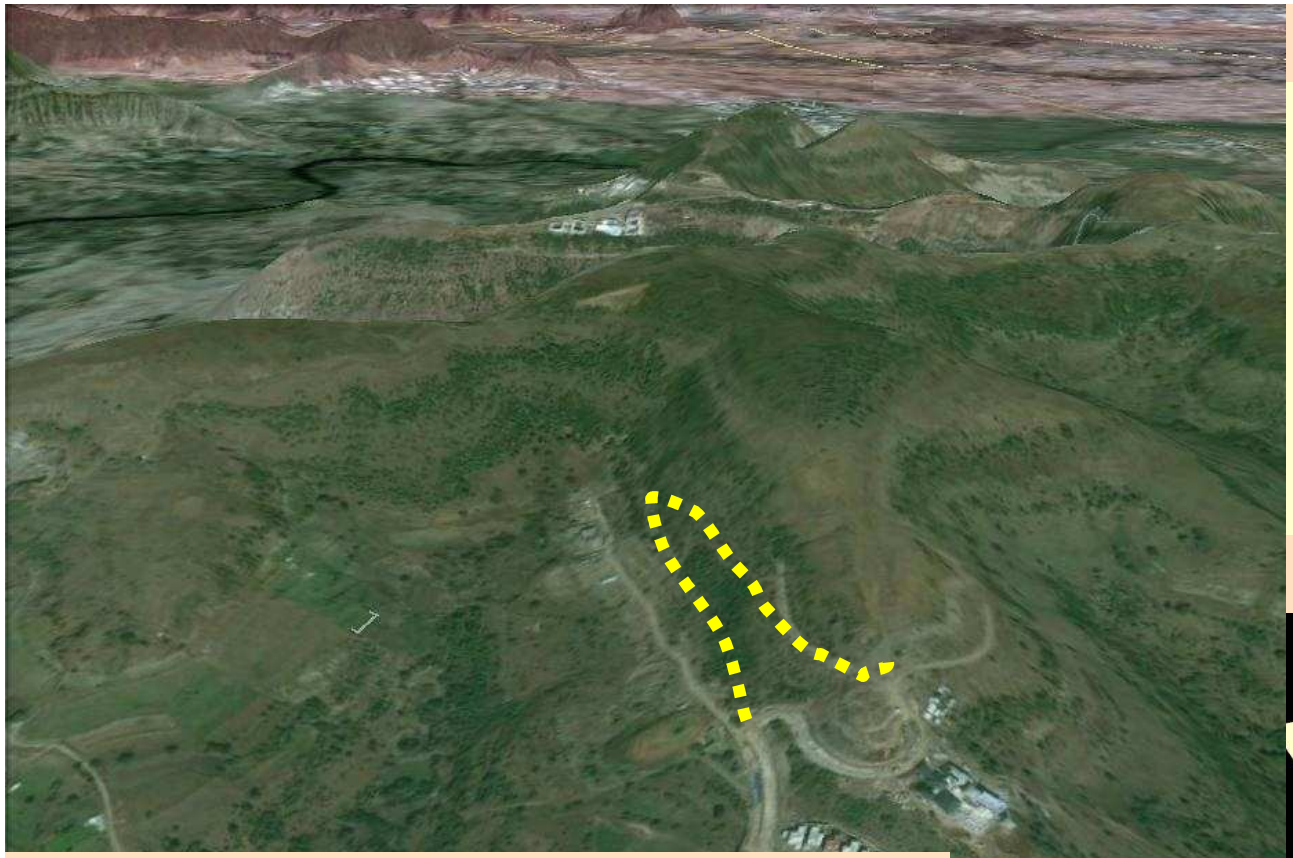
SATELLITE IMAGE

SIDE ELEVATION VIEW

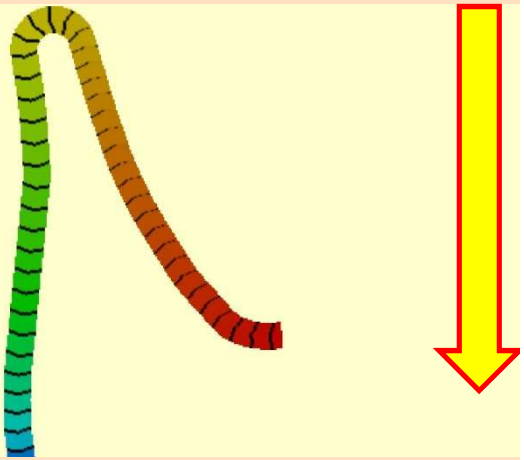


SIDE ELEVATION VIEW

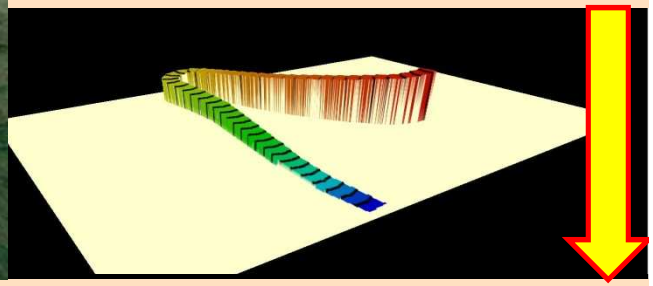
KHED CITY : Spine Road in Phase I



LAYOUT PLAN

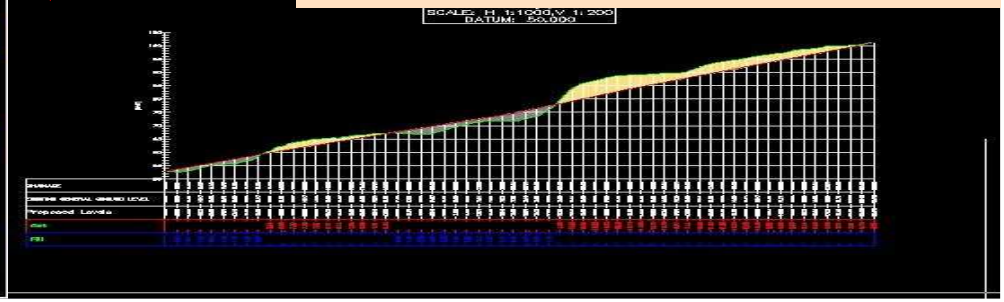


GRADIENT VIEW



EXCAVATION TRACKING & BILLING

CUT-FILL OPTIMISATION

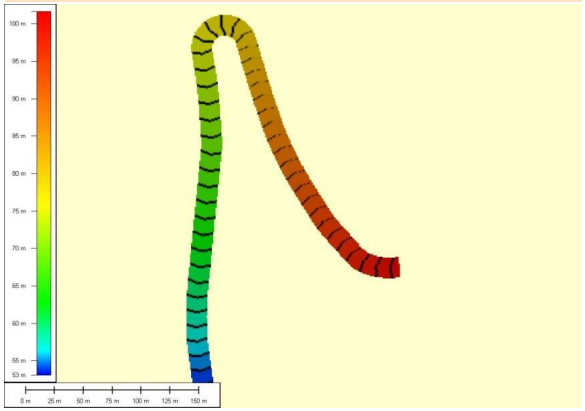


KHED CITY : Spine Road in Phase I

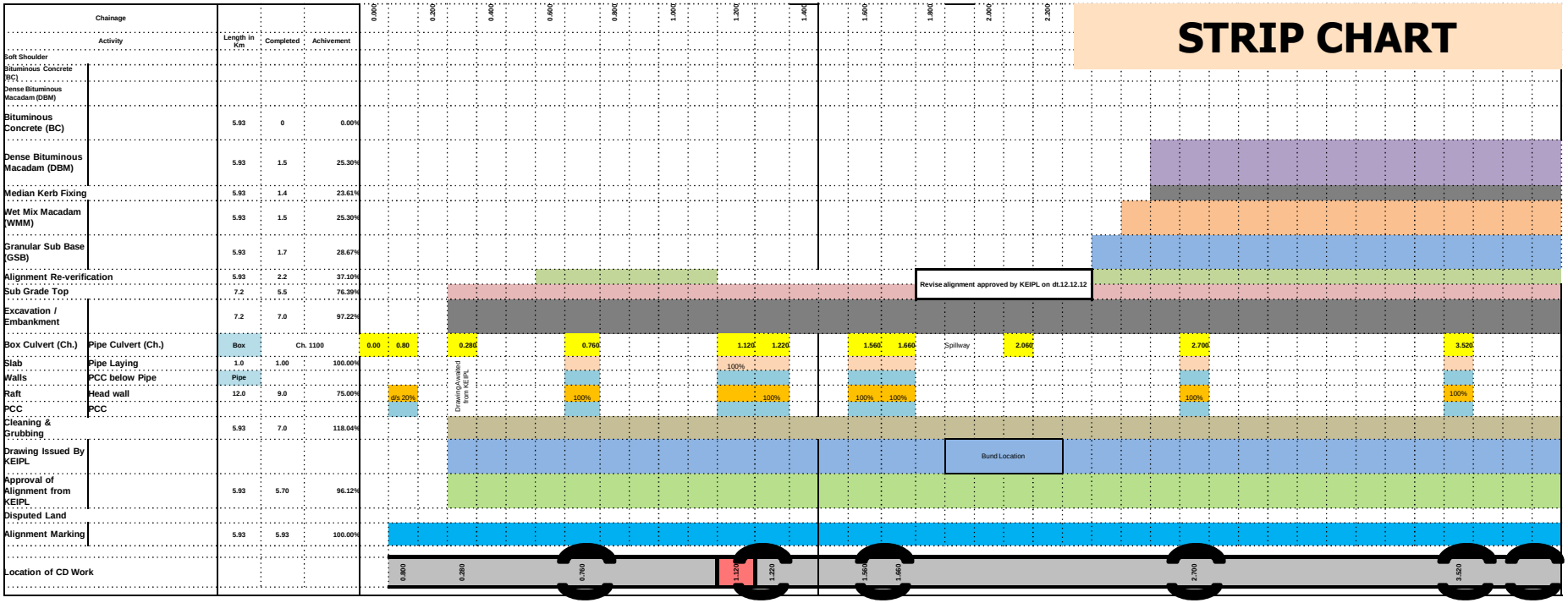
Tools used:

AUTODESK IDS
BENTLEY ROAD MX
PRIMAVERA
SAP
TRIMBLE ETS
+ MS PROJECTS / OFFICE

LAYOUT PLAN



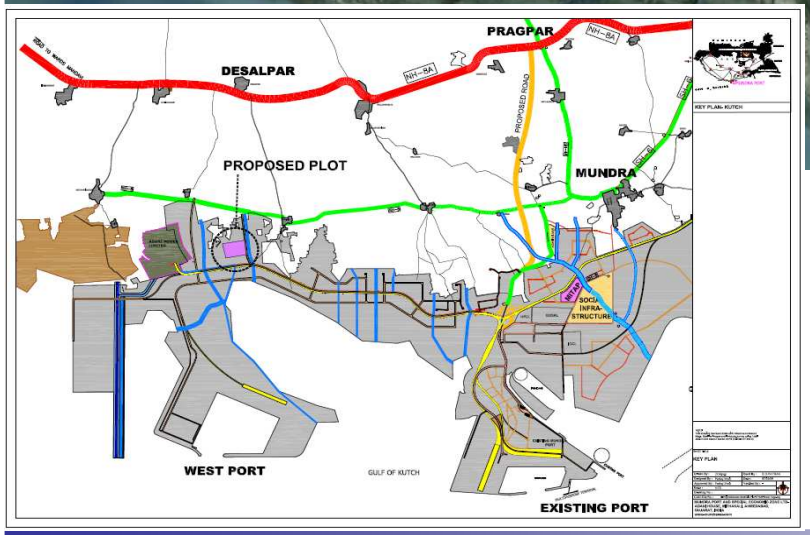
STRIP CHART



Monthly Status Report for Construction – Sept. 2011

Sr. No.	Description of Activity	Start Date	Finish Date	Status	Remark
1	Issue of GFC Drawing	-	25-Aug-11		GFC Drawing Issued
2	Site Clearance	14-Jul-11	11-Aug-11		Encroachment Removal Completed
3	Utility Shifting	14-Jul-11	15-Oct-11		Electrical Line, Water supply line shifting in progress. Tree cutting Permission Received. PWD Auction for Tree Cutting on 19-Sep-11.
4 A	Earth Work – One Side	26-Jul-11	31-Aug-11		Earth work – LHS 3.1 Km Completed Earth work – RHS 2.1 Km Completed
4 B	Earth Work - Balance Side	01-Sep-11	25-Sep-11		
5	Sub-Base / Base Course	15-Sep-11	25-Nov-11		GSB – LHS 2.5 Km Completed GSB – RHS 2.1 Km Completed
6	Bituminous Work	11-Oct-11	17-Dec-11		-
7	Widening of Pipe Culvert - 7 Nos.	14-Jul-11	25-Oct-11		6 Culvert Pipe Culvert Completed.
8	Drainage & Protection Work	02-Sep-11	07-Dec-11		-
9	Road Furniture	16-Nov-11	09-Jan-12		-

CASE STUDY 2: MUNDRA



- BFL – ALSTOM JV is setting up a manufacturing plant for Power Plant Equipment at a 120 acres plot in Mundra SEZ, Gujarat.
- Plant and equipment of the unit would be sensitive to temperature, humidity and salinity conditions and hence appropriate protective measures required.
- Amongst other critical requirements, a strut-mounted crane with a capacity of 5000 Tons had to be installed within the plant.
- Foundation and design requirements were designed on this basis.

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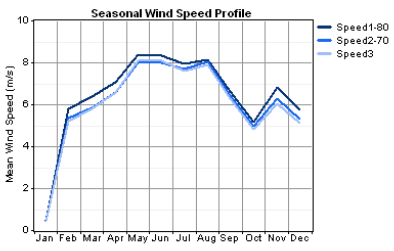
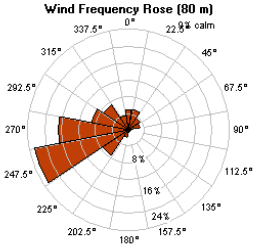
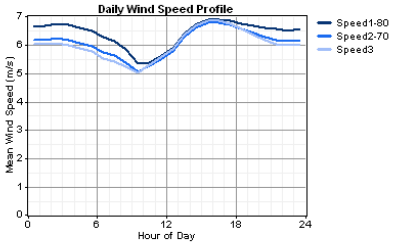
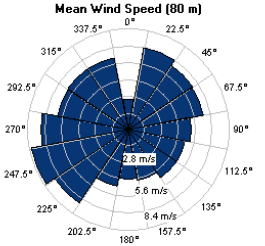
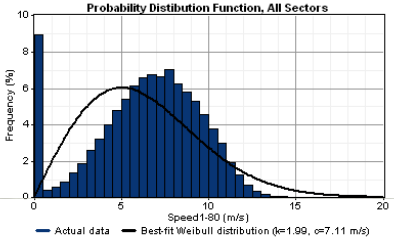
ENVIRONMENTAL FACTORS: WIND

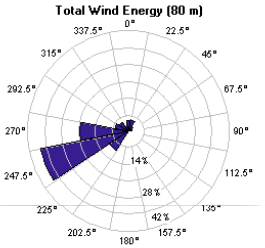








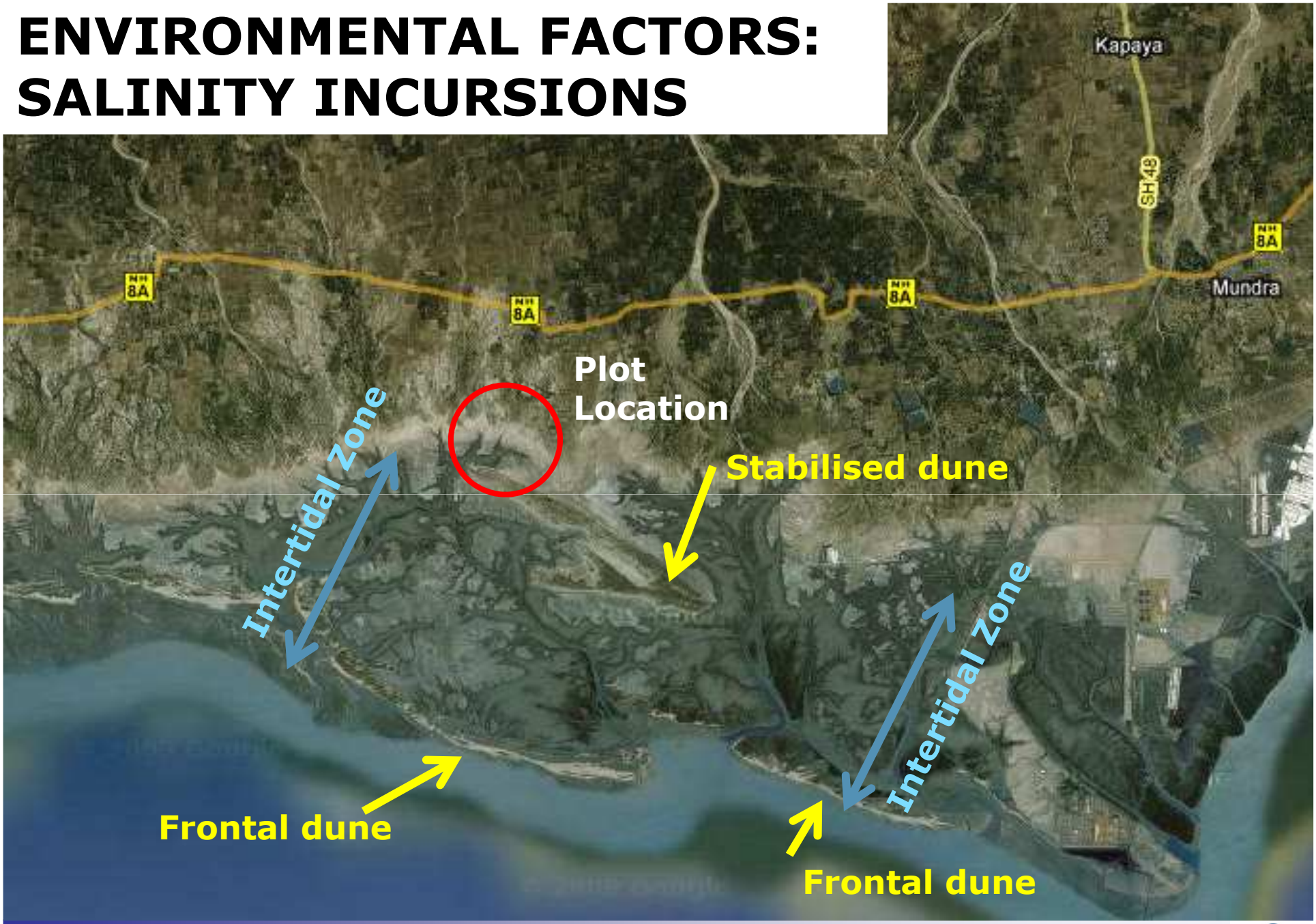




Location of Coal Handling West Port

COASTAL WINDS

ENVIRONMENTAL FACTORS: SALINITY INCURSIONS



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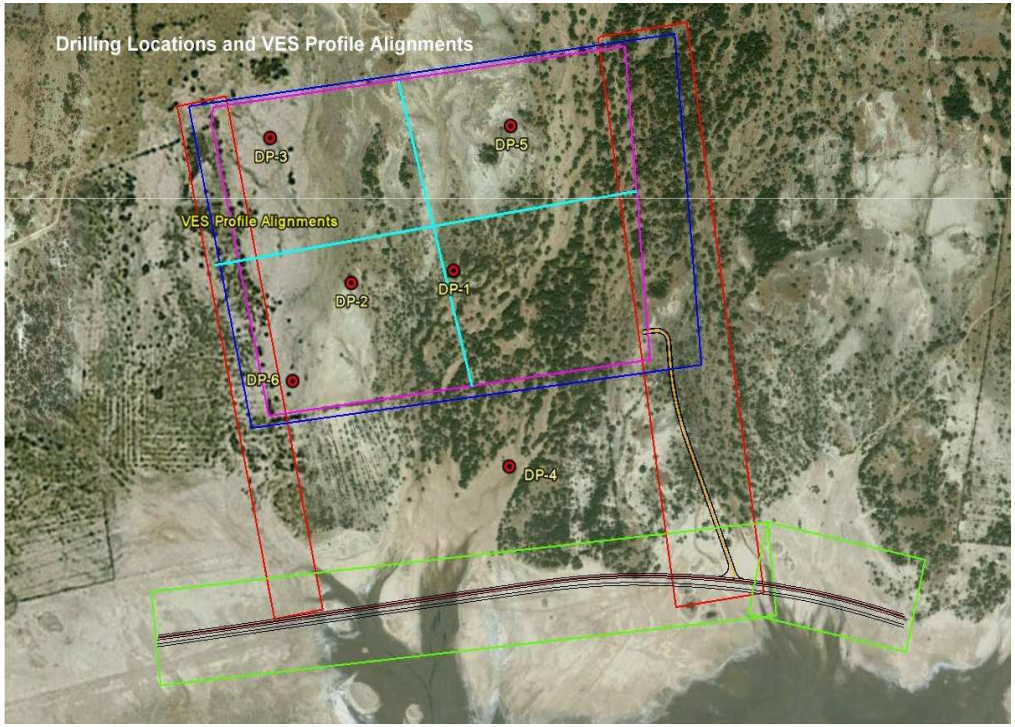
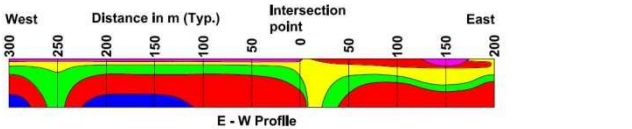
GEOTECHNICAL INVESTIGATIONS:

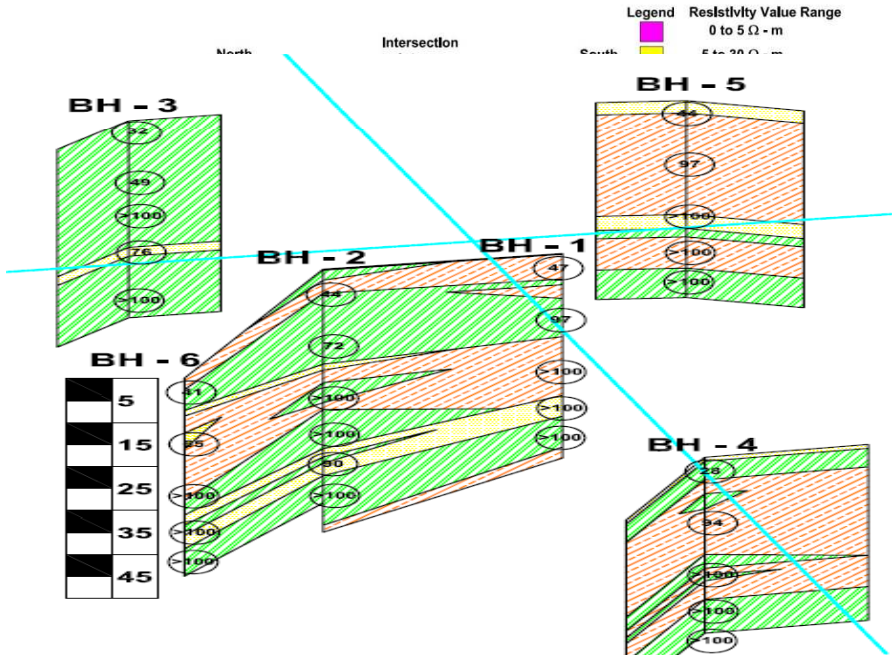
TEST DRILLING : 12 initial bore-holes for sampling (45 m depth each) + 7 subsequent 'foundation specific' bore-holes (up to 78 m depth).

PLATE-LOAD TESTING : 2 Dynamic loading tests up to 300 T point load

RESISTIVITY SOUNDING: 2 mutually perpendicular soundings for validation of the drilling results and extrapolation of the same.







No solid rock encountered up to depth of 75 m BGL

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STRUCTURAL DESIGN:

BASIC PARAMETER:

Land grading (including fill of up to 7 m thickness) to remain above HFL. All roads / drains / etc have to have reinforced lining to ensure structural stability.

All structural foundations had to be located on "Piles". A total of 2400 piles (max depth =28 m, 600 mm / 750 mm dia).

All ground level plinths will rest on RCC slabs that in turn rest on Pre-cast pile-caps (9m x 9 m).

ERECTION PLAN :

All superstructures to be PEB structures (to ensure speed of erection = 24 months to commissioning)

THE CHALLENGE : PRECISION IN POSITIONING

In land fill and grading & from individual pile locations upwards.

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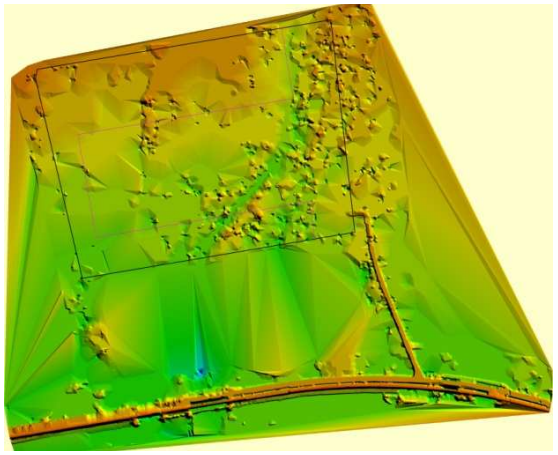
LAND GRADING

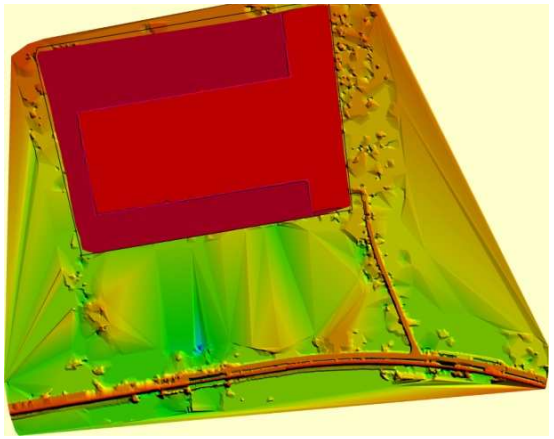
SATELLITE IMAGERY OF THE PLOT when acquired

DEM Generated from topographic contours



SATELLITE IMAGERY APRIL, 2011 After land grading & filling

DEM Generated after grading and filling of plot



ACCURATE COMPUTATION AND EXECUTION MONITORING OF LAND GRADING AND FILLING YIELDED A SAVING OF > Rs. 3.0 Million in cost of filling material alone (est Rs. 54 M.

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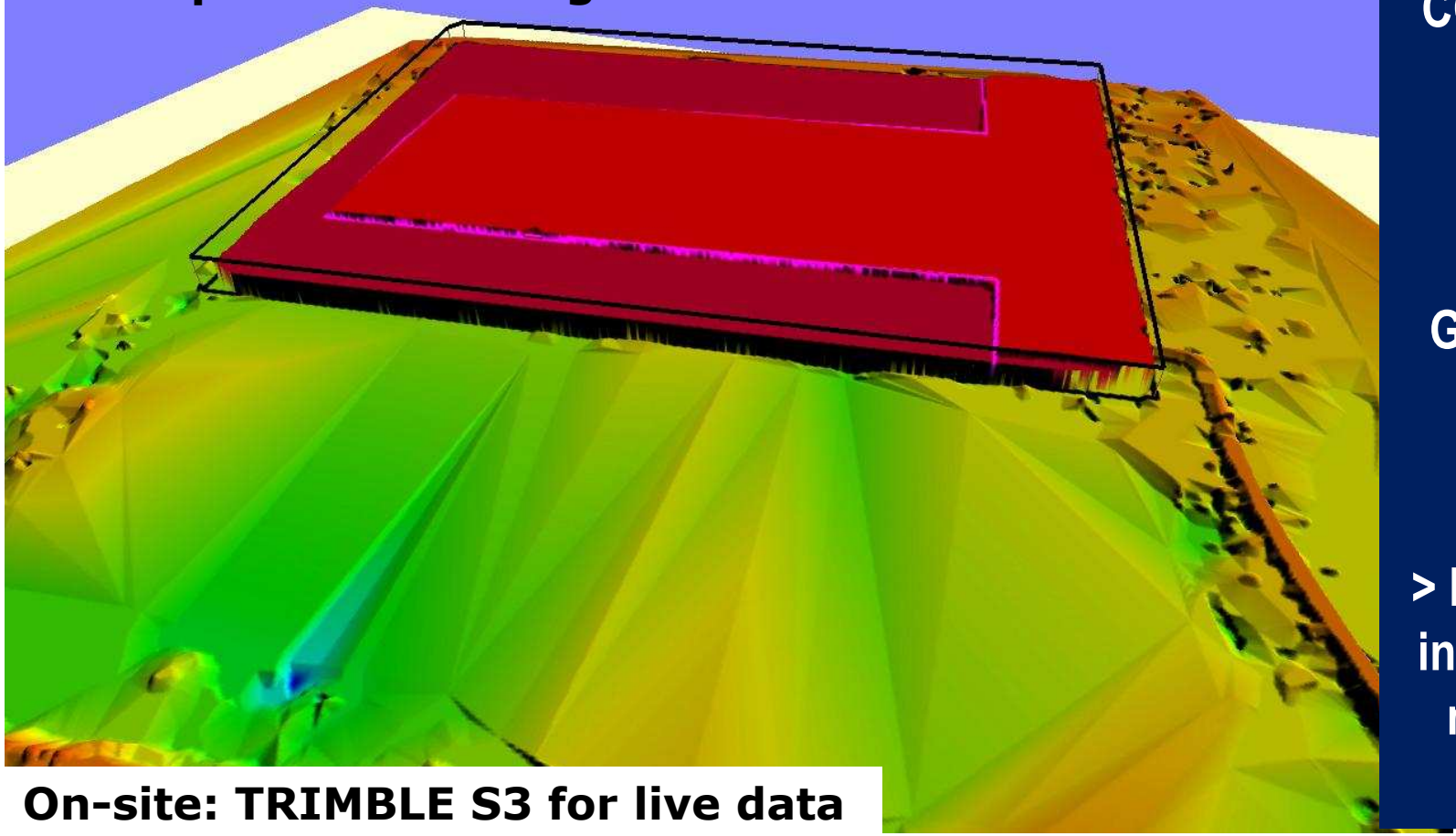
LAND GRADING

Land grading included fill of up to 7 m thickness.

Completed in 9 weeks including compaction & curing.



ACCURATE COMPUTATION AND EXECUTION MONITORING OF LAND GRADING AND FILLING YIELDED A SAVING OF > Rs. 3.0 Million in cost of filling material alone (est Rs. 42 M.

On-site: TRIMBLE S3 for live data

Back-end: AUTODESK 3D Civil.

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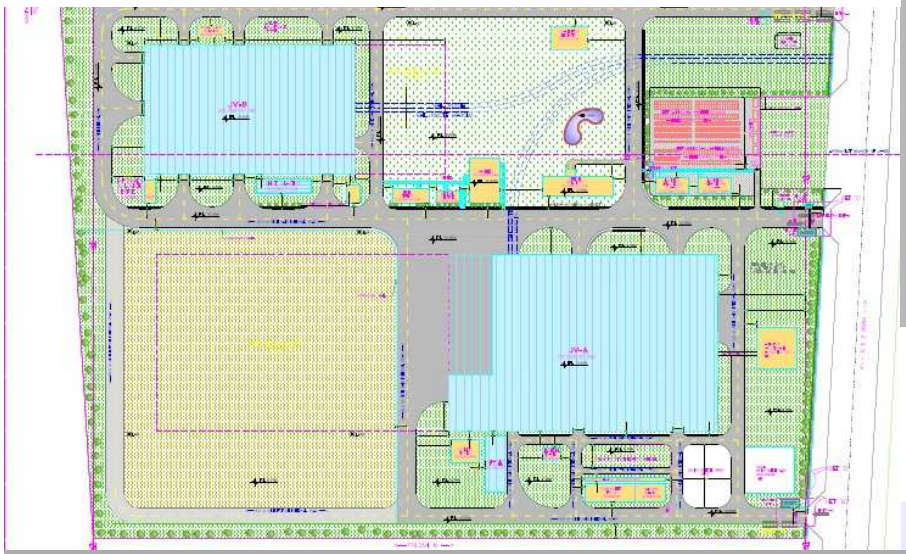
PLOT PLAN & BUILDING DESIGNS :

BASIC LAYOUT



2D / TURN-TABLE RENDERING

3D ELEVATIONS

3D MODEL & BOQ GENERATION

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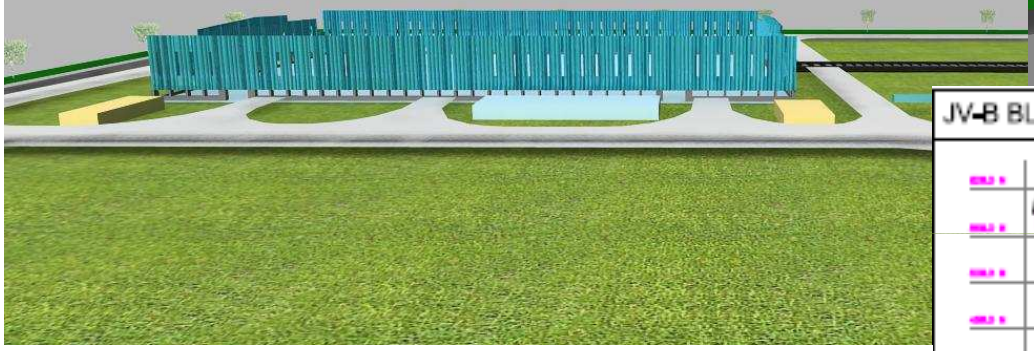
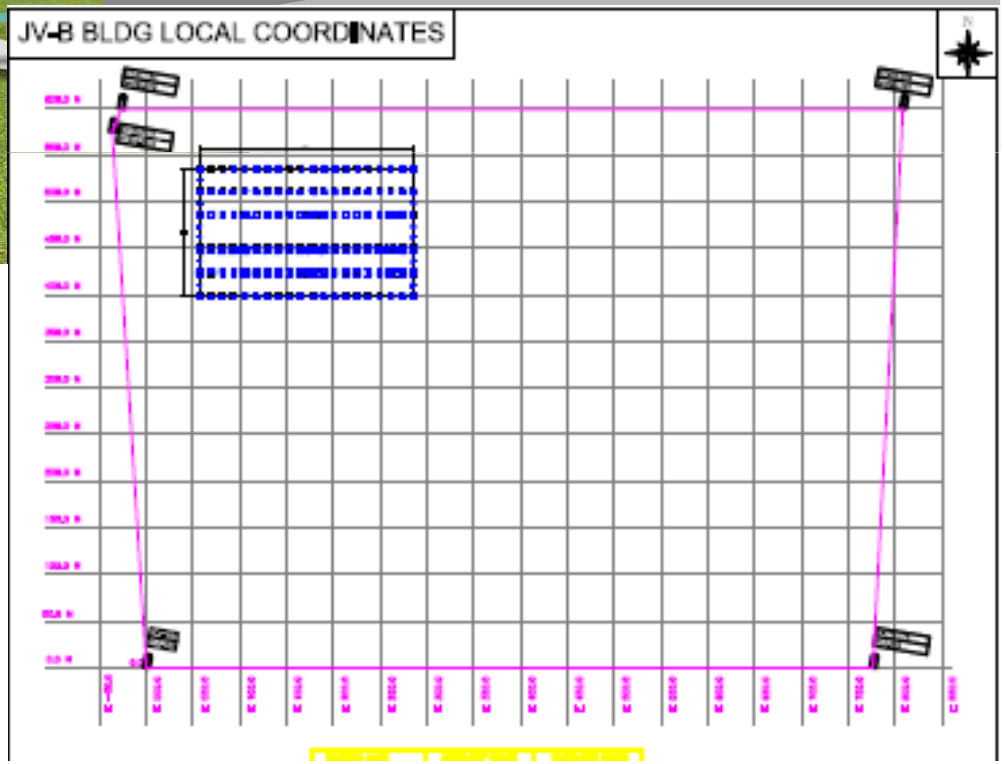
BUILDING DESIGNS :





3D MODEL & BOQ :

For both the subsurface s & pile caps as well as the superstructures.

The basic superstructure consists of pre-erected / pre-constructed columns, struts and walls for the entire plant, including the crane-trolleys.

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BUILDING ERECTION

Work started in Sept, 2011 with the first pile-drilling rig installed.

Scaling up to an average of 20 piles per day (note each pile takes a total of 72 hours from start to finish.) :

BUILDING ERECTION

Tolerance of positional error was +/- 32 mm

At peak time, 39 piles were laid in parallel on a single day!

1600 piles (including test-piles) completed in 100 days

BUILDING ERECTION

Managing the drilling slurry was a major operational challenge as well as an environmental issue

BUILDING ERECTION

Clusters of 9 / 6 / 4 piles were clubbed under single pile-caps.

Bolts erected at centres of each pile-cap

Tolerance of positional error for Pile-cap centre was +/- 20 mm

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BUILDING ERECTION

Bolts ready for erection 153 days from 1st drilled pile.

JV-B building occupying an area of 610 m X 320 m

Tolerance of positional error for BOLTS was +/- 10 mm

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BUILDING ERECTION

Day 154 from first drill.

All super-structure elements are pre-fabricated outside the site.

Bolt positions had to match PRECISELY; For each column and each beam!!!

Tolerance of positional error for BOLTS was +/- 10 mm

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BUILDING ERECTION

Day 180.

BEFORE THE FIRST HEAVY RAINS of 2012!!!

Tolerance of positional error for BOLTS was +/- 10 mm

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BUILDING ERECTION : FIRST TIME RIGHT

All measurements, markings, validations on-site carried out using TRIMBLE Robotic ETS.
All data transferred live (with a 2 hour delay) to PUNE (HQ) for processing.
Validated using AUTODESK 3D Civil and IDS suites

Available live on web-enabled communicators to all stake-holders.
Integrated with billing and MIS within 24 hours of validation.

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Success enablers :

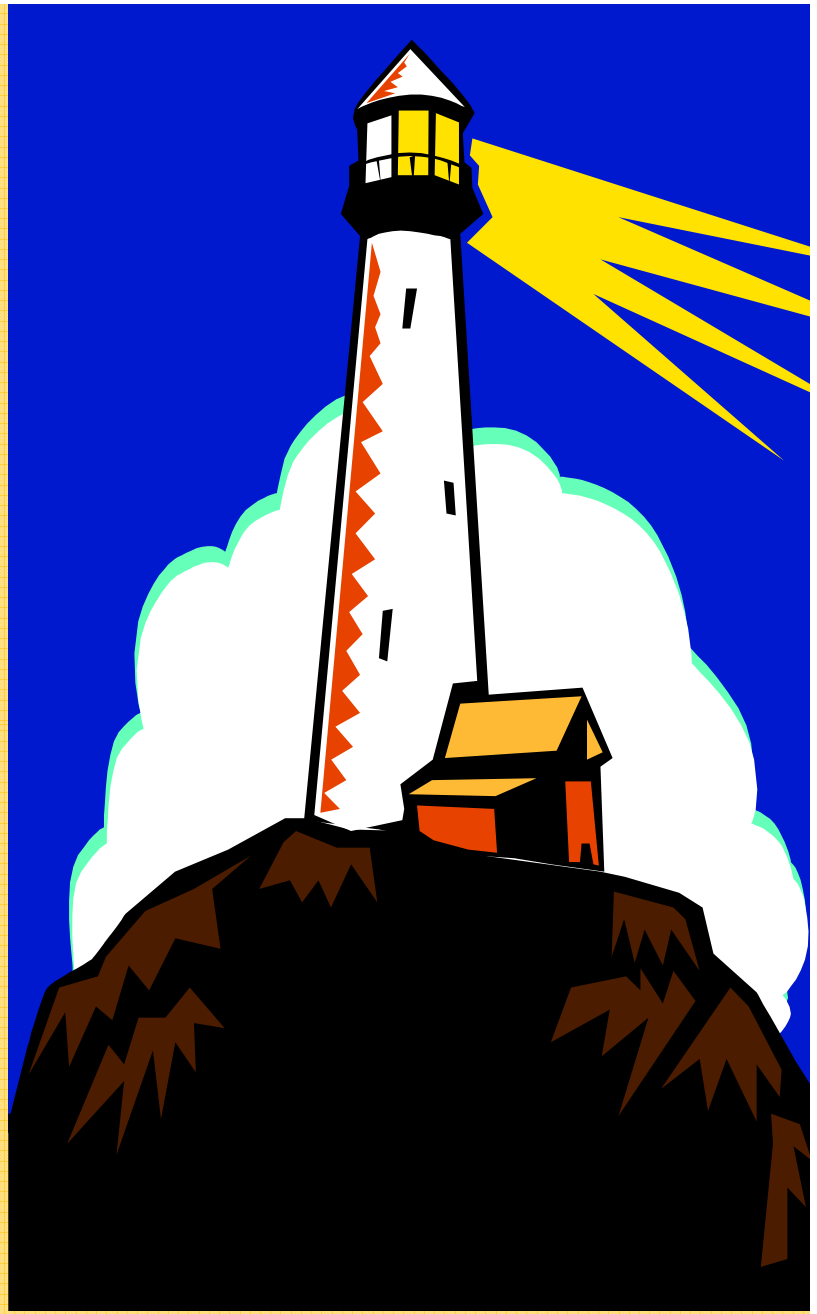
Key functional aspects that were introduced in the system (after extensive consultations with the stake-holders):

- Same data delivered to users (mgmt, accounts, billing, site engineers, contractors, etc) in formats understood by them.
- Live updates enabled.
- Central data repository and processing enabled accuracy, interoperability and integrity.

Worked as Game changers, making the system a MISSION CRITICAL DECISION SUPPORT SYSTEM

WAY AHEAD .....

- ✓ INFORM
- ✓ DEMONSTRATE
- ✓ CO-OPERATE
- ✓ SYNERGISE
- ✓ STANDARDISE
- ✓ INTEGRATE



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