Surveying and Mapping coastal zones and local level coastal zone management plans (CZMP)

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Steps involved

- **Demarcation of High Tide Line and Low Tide Line for coastal stretches and tidal influenced inland water bodies**

- **Superimposition of HTL and LTL onto digital Cadastral Maps at 1:3,960 along with 100m and 200m, 500m buffer lines**

- **Demarcation of Mangroves of more than 1000sq.mts.**

Other maps for planning

Superimposition of Hazard Maps, locations of cyclone shelters, rain shelters, helipads and other infrastructure Including road network for rescue and relief operations

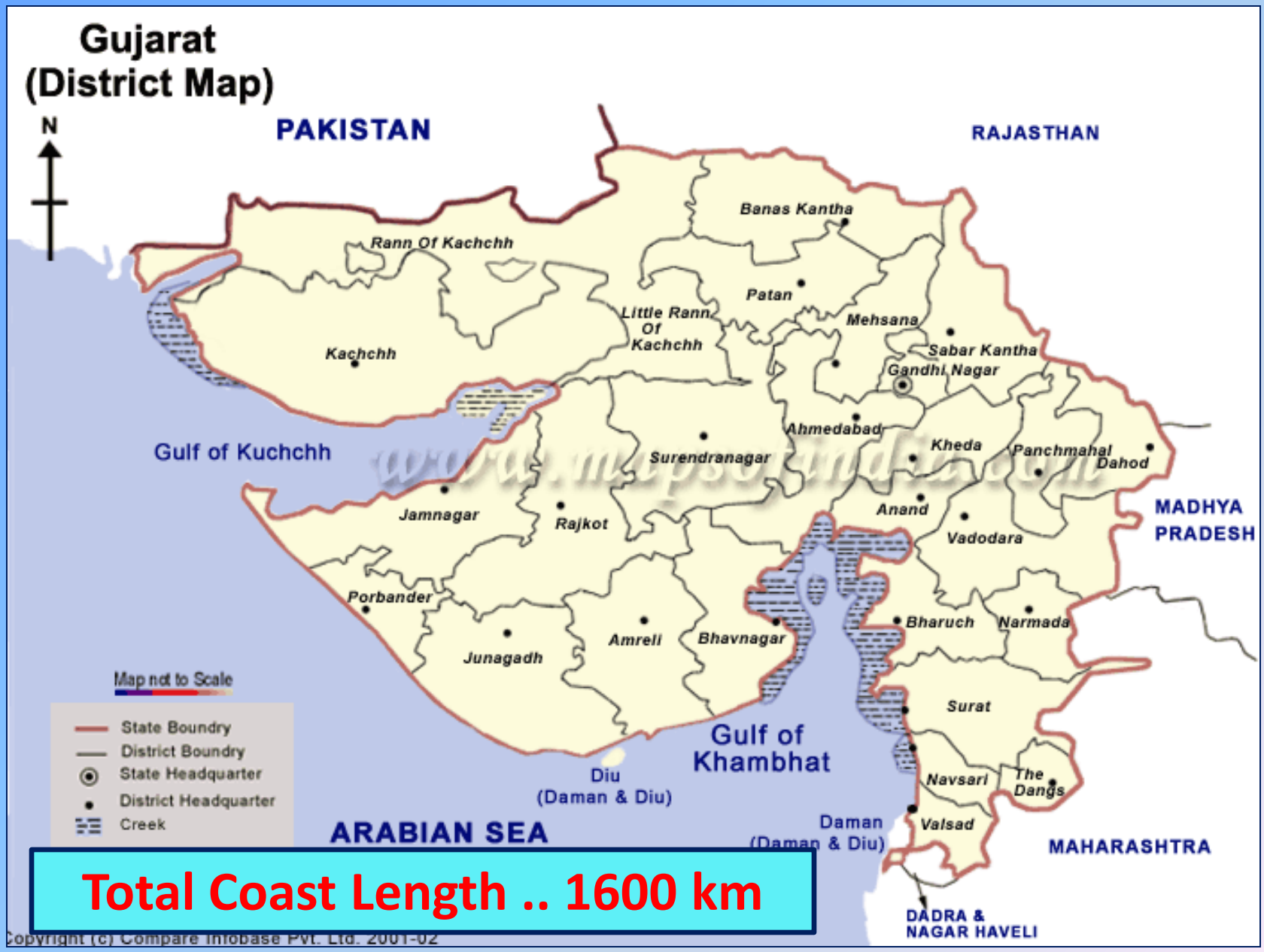
Methodology

- Step 1: Collection of Cadastral Maps for the village/ Ward maps for town or city and Topographic map
- Step 2: Extraction of High Water Level (HWL) and Low Water Level (LWL) marked on base maps
- Step 3: Updation of base maps using georeferenced satellite images
- Step 4: Extraction of Levels of Highest High and Lowest Low Tide from tidal tables of nearest port(s) along for the last 19 years

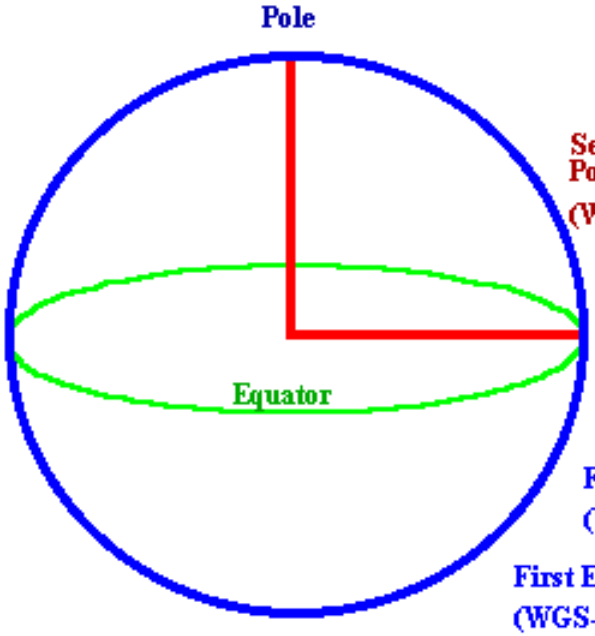
- Step 5: Demarcation of Highest High Tide line on the ground using GPS survey by datum transformation
- Step 6: Demarcation of High Tide Line by appropriate adjustment of High Water Level Line using ground verified coastal geomorphology for coast.
- Step 7: Demarcation of High Tide Line using ground verified geomorphological features with DGPS upto the influence of tide measured as 5 ppt and presence of mangroves for tidal influenced water bodies
- Step 8: Delineation of Low Tide Line using field verified Low Water Level Line and bathymetry chart.

- Step 9: Mapping ecologically sensitive areas like mangroves, sand dunes, turtle breeding sites, archeological sites, marsh/salt flats, based on satellite image/secondary data as on date of notification,2011
- Step 10: Superimposition of HTL, LTL, ecologically sensitive areas,100m,200m,500m buffer lines along coast and tidal influenced inland water bodies onto cadastral maps at 1:3,960 or nearest scale
- Step 11: Classification of CRZ as per CRZ-2011 Notification using standard color codes and symbols
- Step 12: Generation of local level CZMPs and CZMP at 1:25000 Scale from local level CZMPs

Gujarat Coast



Total Coast Length .. 1600 km



Semi-Minor Axis =
Polar Radius = b

(WGS-84 value = 6356752.3142 meters)

Semi-Major Axis =
Equatorial Radius = a

(WGS-84 value = 6378137.0 meters)

Flattening = f = (a-b)/a

(WGS-84 value = 1/298.257223563)

First Eccentricity Squared = e^2 = 2f-f^2

(WGS-84 value = 0.00669437999013)

Ellipsoidal Parameters

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Selected Reference Ellipsoids

Ellipse	Semi-Major Axis (meters)	1/Flattening
Airy 1830	6377563.396	299.3249646
Bessel 1841	6377397.155	299.1528128
Clarke 1866	6378206.4	294.9786982
Clarke 1880	6378249.145	293.465
Everest 1830	6377276.345	300.8017
Fischer 1960 (Mercury)	6378166.0	298.3
Fischer 1968	6378150.0	298.3
G R S 1967	6378160.0	298.247167427
G R S 1975	6378140.0	298.257
G R S 1980	6378137.0	298.257222101
Hough 1956	6378270.0	297.0
International	6378388.0	297.0
Krassovsky 1940	6378245.0	298.3
South American 1969	6378160.0	298.25
WGS 60	6378165.0	298.3
WGS 66	6378145.0	298.25
WGS 72	6378135.0	298.26
WGS 84	6378137.0	298.257223563

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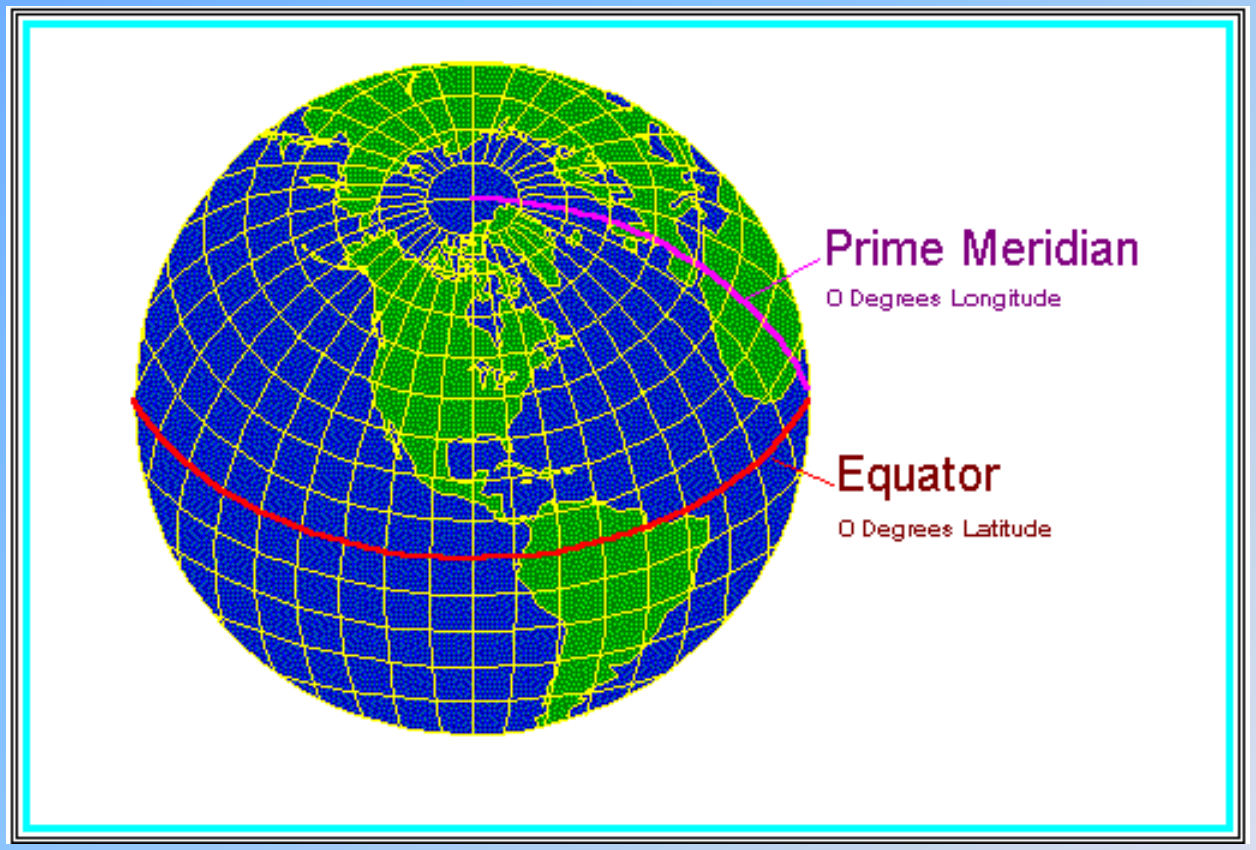
Geodetic Datums

•Geodetic datums define the reference systems that describe the size and shape of the earth. Hundreds of different datums have been used to frame position descriptions since the first estimates of the earth's size were made by Aristotle. Datums have evolved from those describing a spherical earth to ellipsoidal models derived from years of satellite measurements.

•Modern geodetic datums range from flat-earth models used for plane surveying to complex models used for international applications which completely describe the size, shape, orientation, gravity field, and angular velocity of the earth. While cartography, surveying, navigation, and astronomy all make use of geodetic datums, the science of geodesy is the central discipline for the topic.

Referencing geodetic coordinates to the wrong datum can result in position errors of hundreds of meters. Different nations and agencies use different datums as the basis for coordinate systems used to identify positions in geographic information systems, precise positioning systems, and navigation systems. The diversity of datums in use today and the technological advancements that have made possible global positioning measurements with sub-meter accuracies requires careful datum selection and careful conversion between coordinates in different datum.


Prime Meridian
0 Degrees Longitude
Equator
0 Degrees Latitude

Global Systems

•Latitude, Longitude, Height

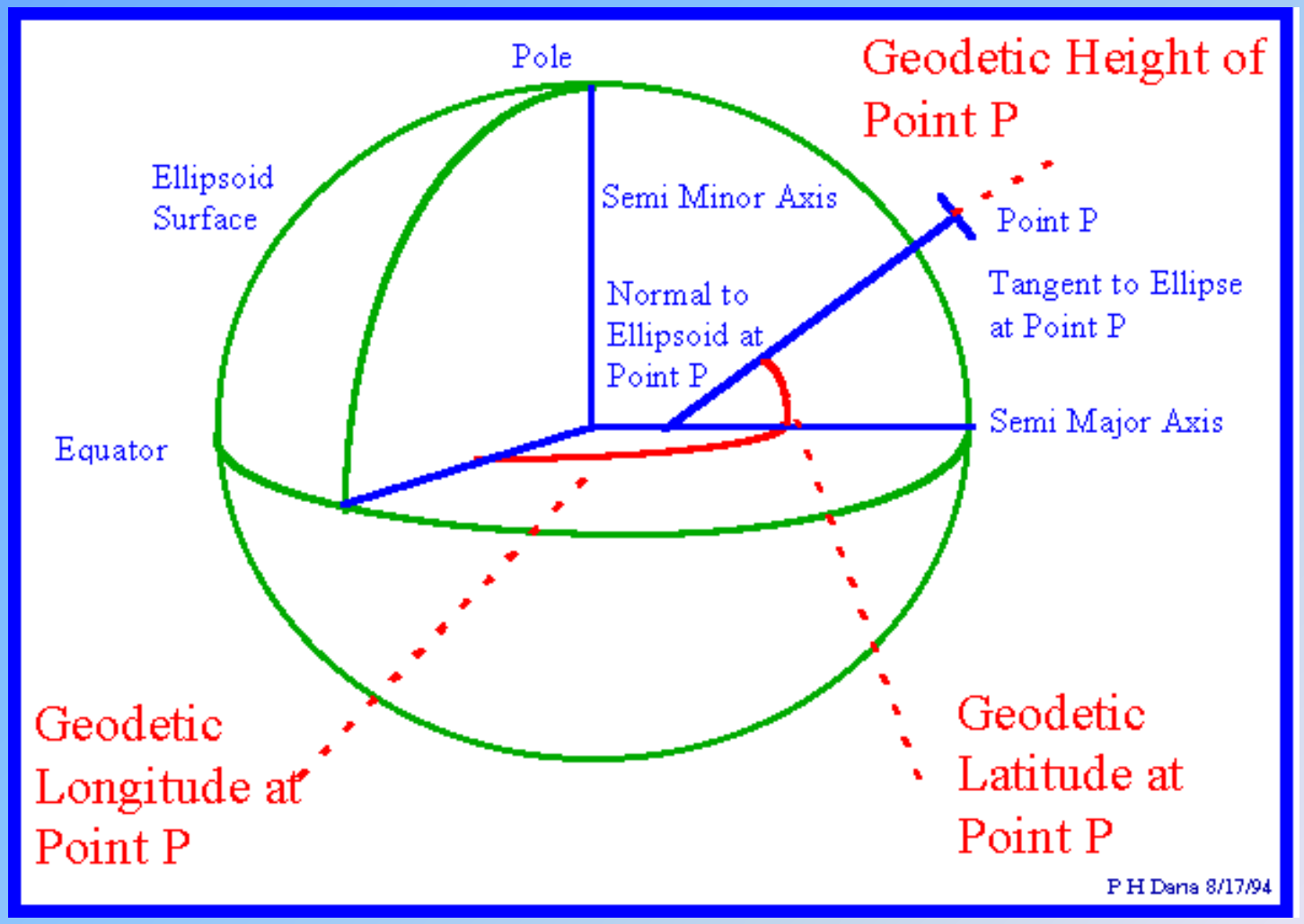
oThe most commonly used coordinate system today is the latitude, longitude, and height system.

oThe Prime Meridian and the Equator are the reference planes used to define latitude and longitude.

oThe geodetic latitude (there are many other defined latitudes) of a point is the angle from the equatorial plane to the vertical direction of a line normal to the reference ellipsoid.

oThe geodetic longitude of a point is the angle between a reference plane and a plane passing through the point, both planes being perpendicular to the equatorial plane.

The geodetic height at a point is the distance from the reference ellipsoid to the point in a direction normal to the ellipsoid.


Pole
Geodetic Height of Point P
Ellipsoid Surface
Semi Minor Axis
Point P
Tangent to Ellipse at Point P
Normal to Ellipsoid at Point P
Semi Major Axis
Equator
Geodetic Longitude at Point P
Geodetic Latitude at Point P
P H Dana 8/17/94

•ECEF X, Y, Z

oEarth Centered, Earth Fixed Cartesian coordinates are also used to define three dimensional positions.

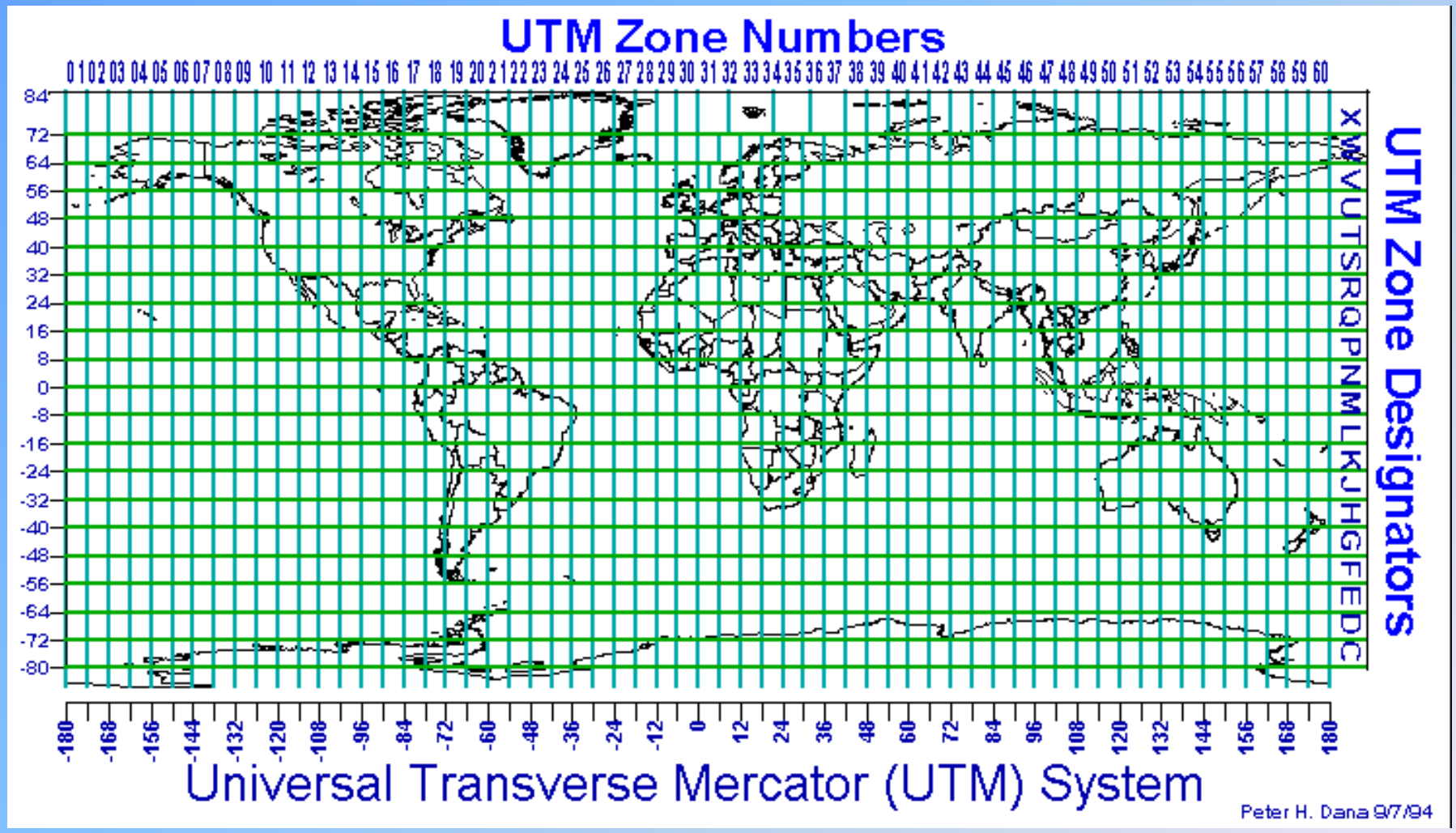
oEarth centered, earth-fixed, X, Y, and Z, Cartesian coordinates (XYZ) define three dimensional positions with respect to the center of mass of the reference ellipsoid.

oThe Z-axis points toward the North Pole.

oThe X-axis is defined by the intersection of the plane define by the prime meridian and the equatorial plane.

The Y-axis completes a right handed orthogonal system by a plane 90 degrees east of the X-axis and its intersection with the equator.

- Universal Transverse Mercator (UTM)
  - Universal Transverse Mercator (UTM) coordinates define two dimensional, horizontal, positions.
  - UTM zone numbers designate 6 degree longitudinal strips extending from 80 degrees South latitude to 84 degrees North latitude.
  - UTM zone characters designate 8 degree zones extending north and south from the equator.
  - There are special UTM zones between 0 degrees and 36 degrees longitude above 72 degrees latitude and a special zone 32 between 56 degrees and 64 degrees north latitude.


UTM Zone Numbers
0 1 0 2 0 3 0 4 0 5 0 6 0 7 0 8 0 9 10 11 12 13 14 15 16 17 18 19 20 2 1 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60
84 72 64 56 48 40 32 24 16 8 0 -8 -16 -24 -32 -40 -48 -56 -64 -72 -80
X W V U T S R Q P N M L K J H G F E D C
UTM Zone Designators
-180 -168 -156 -144 -132 -120 -108 -96 -84 -72 -60 -48 -36 -24 -12 0 12 24 36 48 60 72 84 96 108 120 132 144 156 168 180
Universal Transverse Mercator (UTM) System
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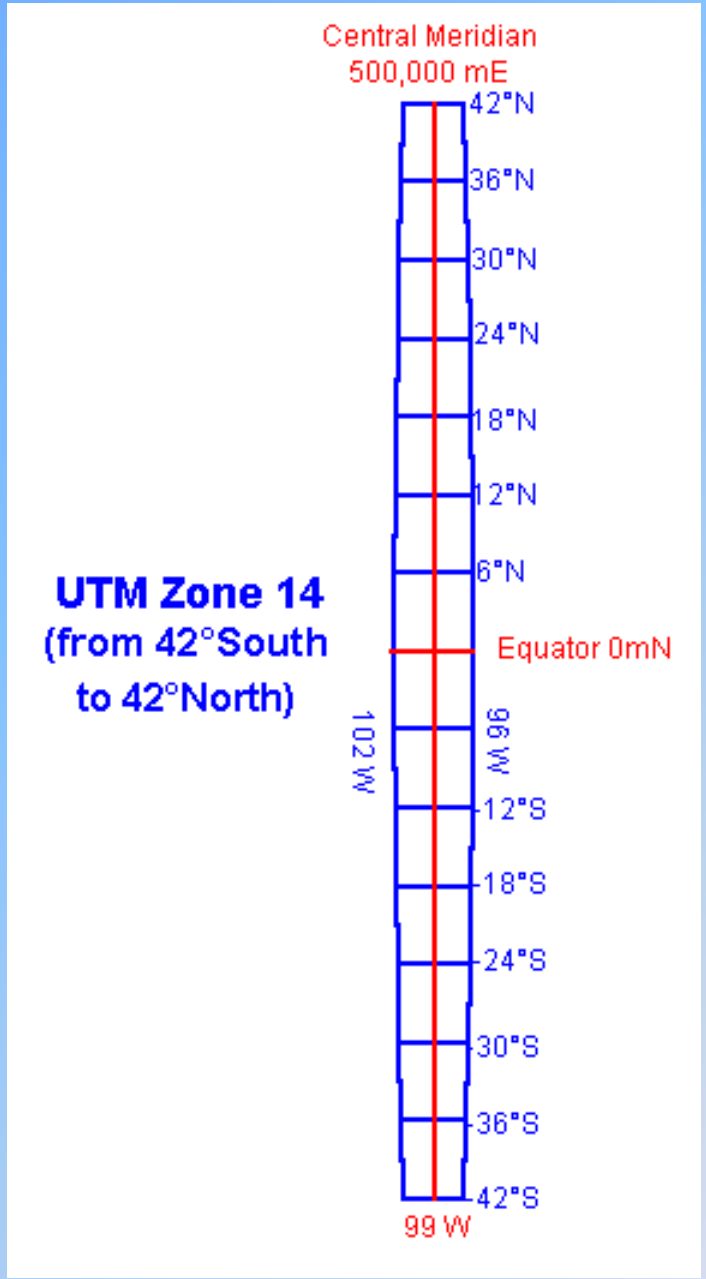
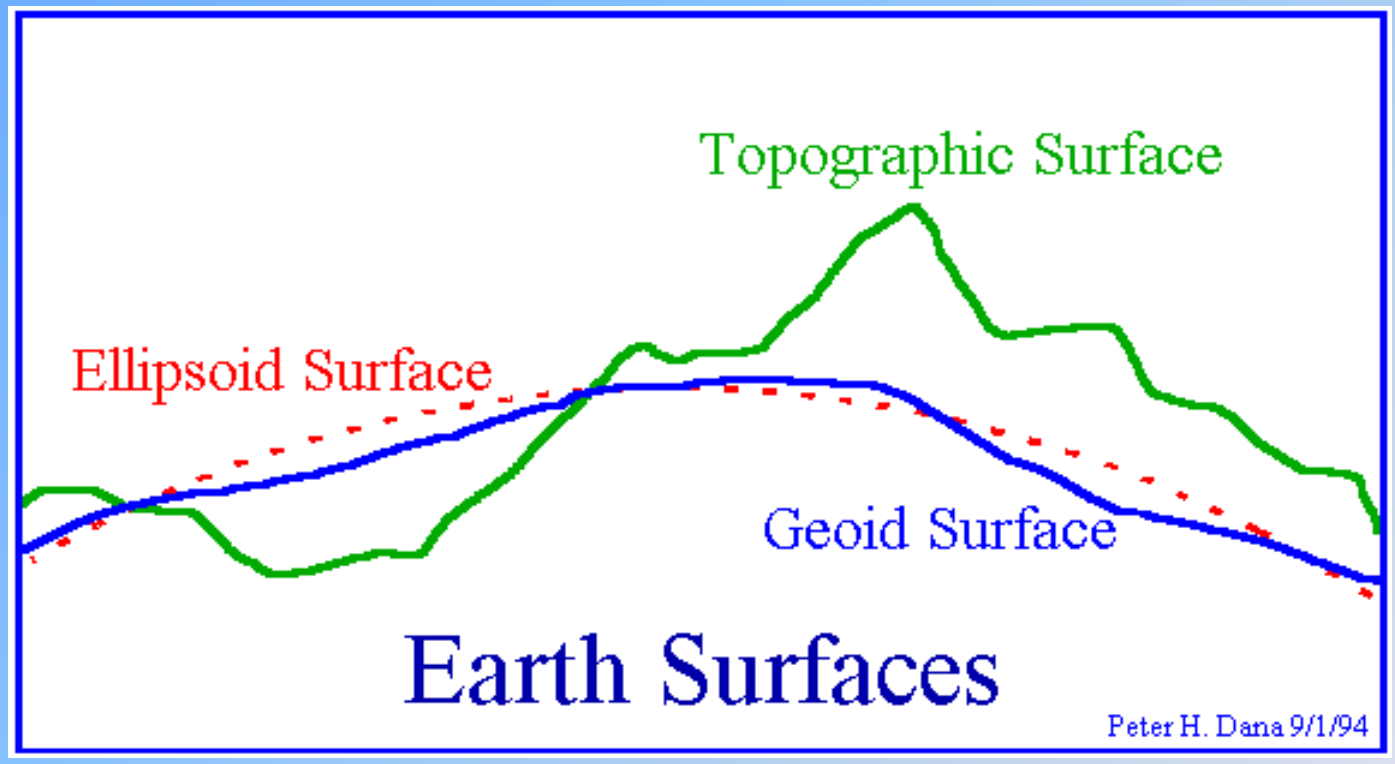
Each zone has a central meridian. Zone 14, for example, has a central meridian of 99 degrees west longitude. The zone extends from 96 to 102 degrees west longitude.


Central Meridian
500,000 mE
42°N
36°N
30°N
24°N
18°N
12°N
6°N
Equator 0mN
102 W
96 W
12°S
18°S
24°S
30°S
36°S
42°S
99 W
UTM Zone 14
(from 42°South
to 42°North)


Topographic Surface
Ellipsoid Surface
Geoid Surface
Earth Surfaces
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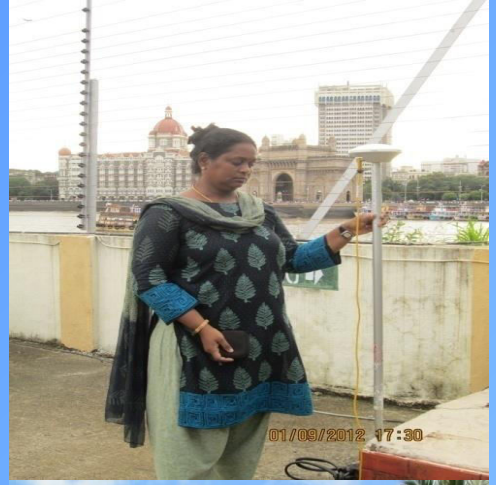
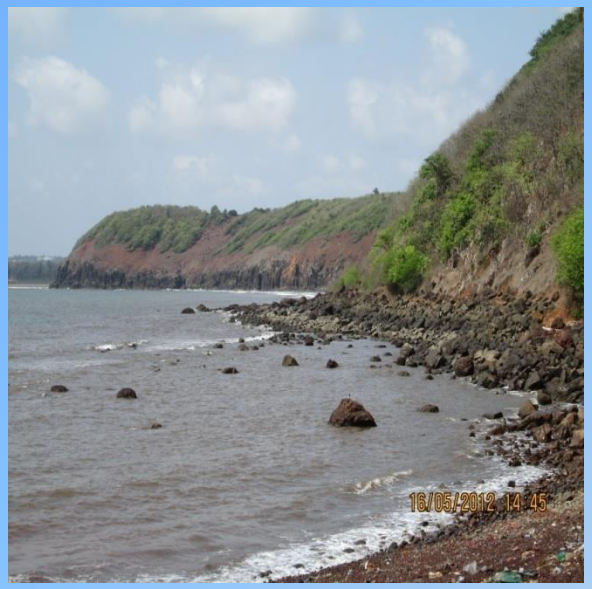
Data Collection

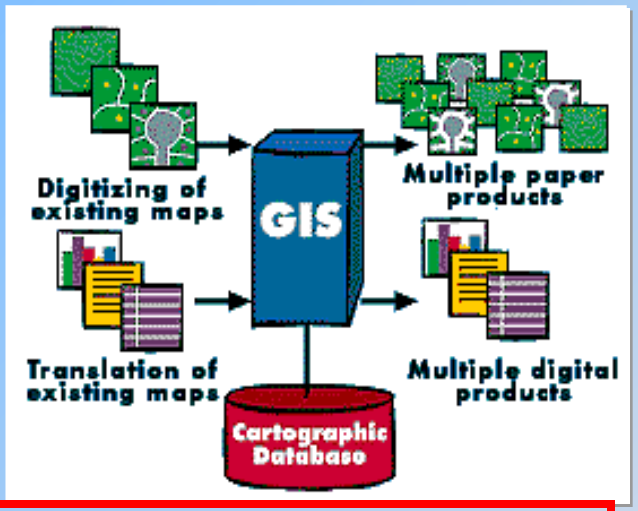




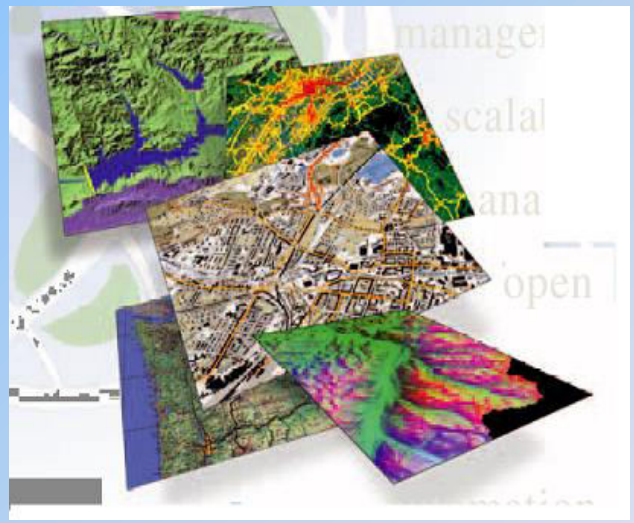
INDIAN IMAGING CAPABILITY

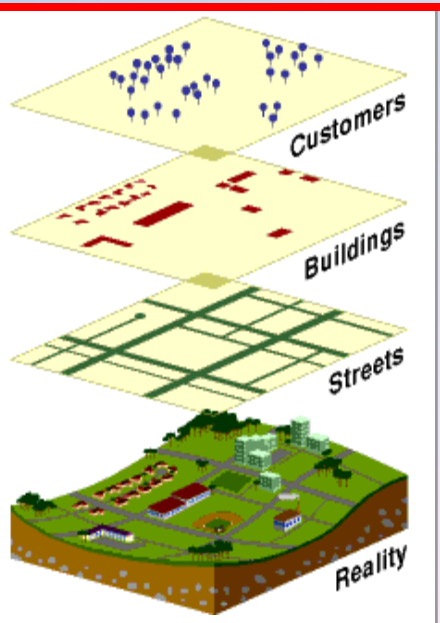
- 1 Km to 1 m spatial Resolution
- 22 Days to every 30 mts. Repetitivity
- 1 Million scale to Cadastral Level

WHAT IS A GIS ?



GIS *is a collection of hardware and software which can store, retrieve, analyse and manipulate geographically referenced data.*



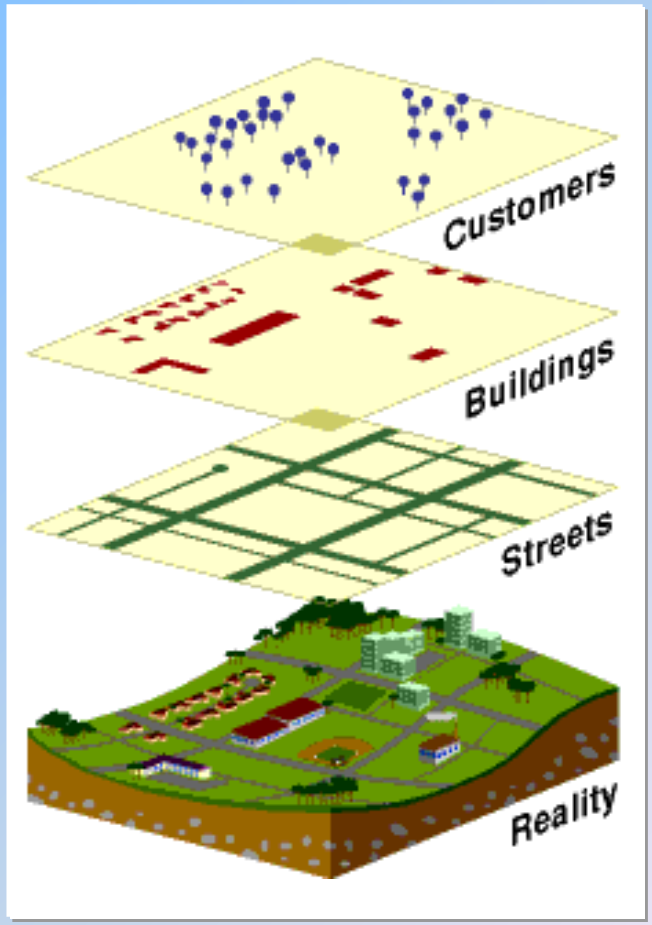


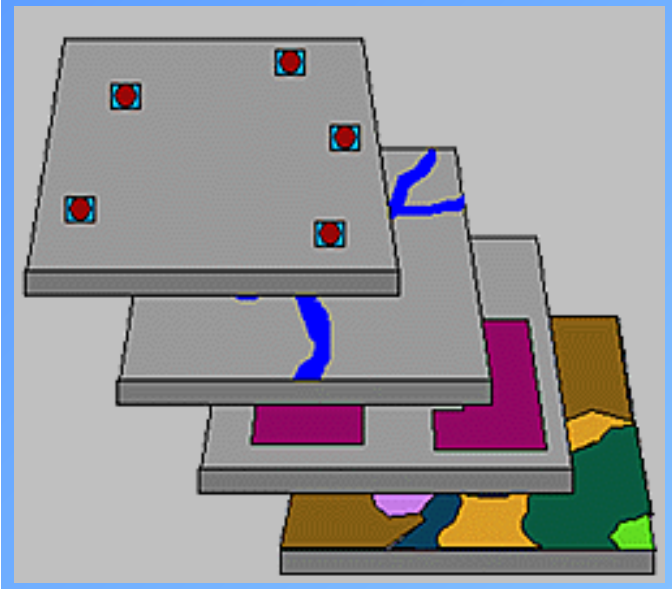
How GIS Works ?

A GIS stores information about the world as a collection of thematic layers that can be linked together by geography.

This simple but extremely powerful and versatile concept has proven invaluable for solving many real-world problems.

- Tracking delivery vehicles
- Recording details of planning applications
- Modelling global atmospheric circulation.





Overlay Analysis

- The integration of different data layers involves a process called overlay.

- At its simplest, this could be a visual operation, but analytical operations require one or more data layers to be joined physically.

- This overlay, or spatial join, can integrate data on soils, slope, and vegetation, or land ownership with tax assessment.

SOFTWARE

GIS

ARC INFO
ARCVIEW
MAPINFO
AUTOCAD MAP
IDRISI
GRASS
INTERGRAPH
CARIS

IMAGING SOFTWARE

ERADAS IMAGINE
EASYPACE
ENVI
ER MAPPER

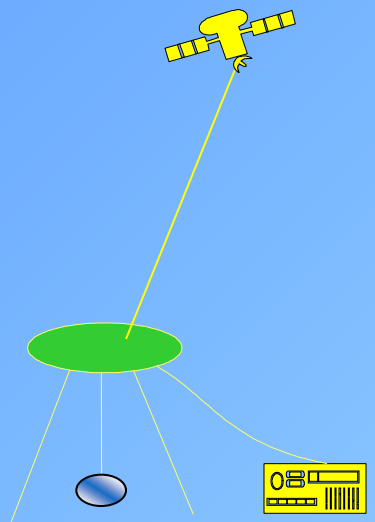
GLOBAL POSITIONING SYSTEM

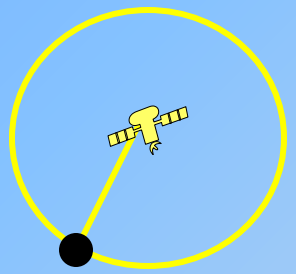
Global Positioning System, as known GPS or NAVSTAR-GPS (NAVstar System with Timing And Ranging-Global Positioning System), is a radio navigation positioning system developed by the Department of Defence (DoD) to meet the military needs in 1974.

Civilians were allowed to use GPS system in 1980.

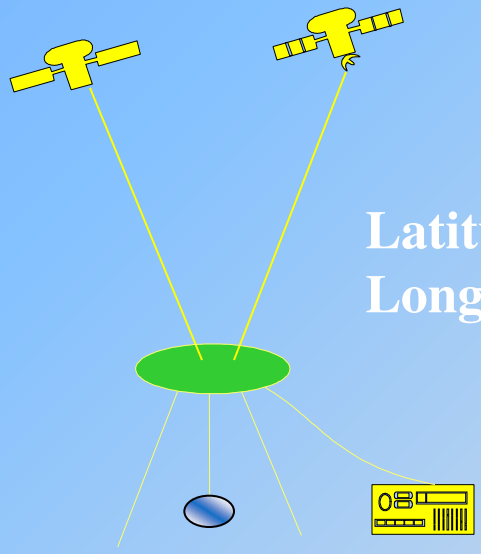
Satellite Positioning

1 satellite

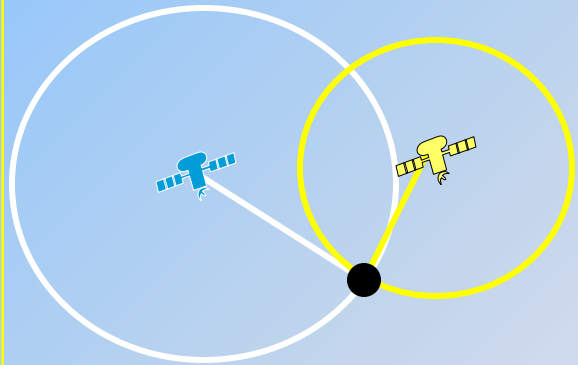




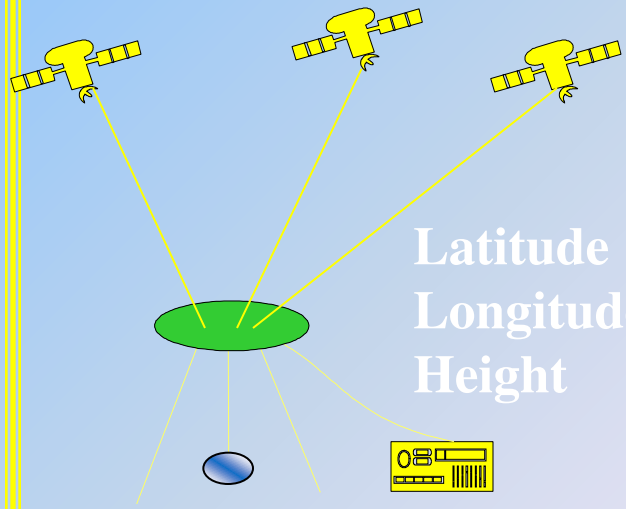
2 satellites



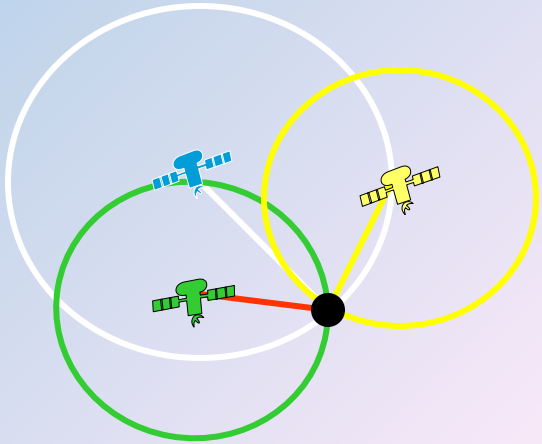
Latitude
Longitude



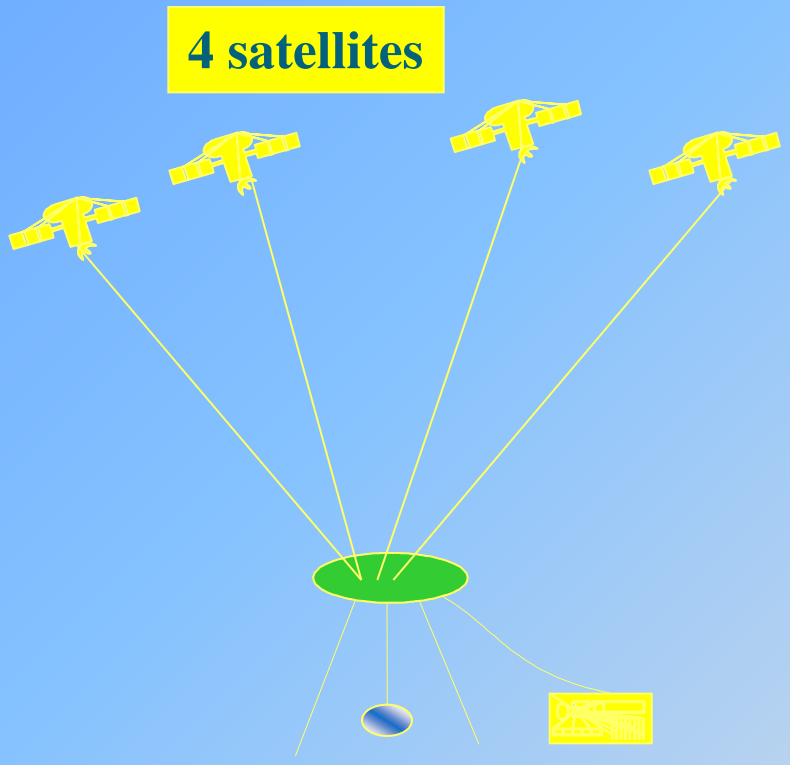
3 satellites



Latitude
Longitude
Height



Satellite Positioning



Latitude

Longitude

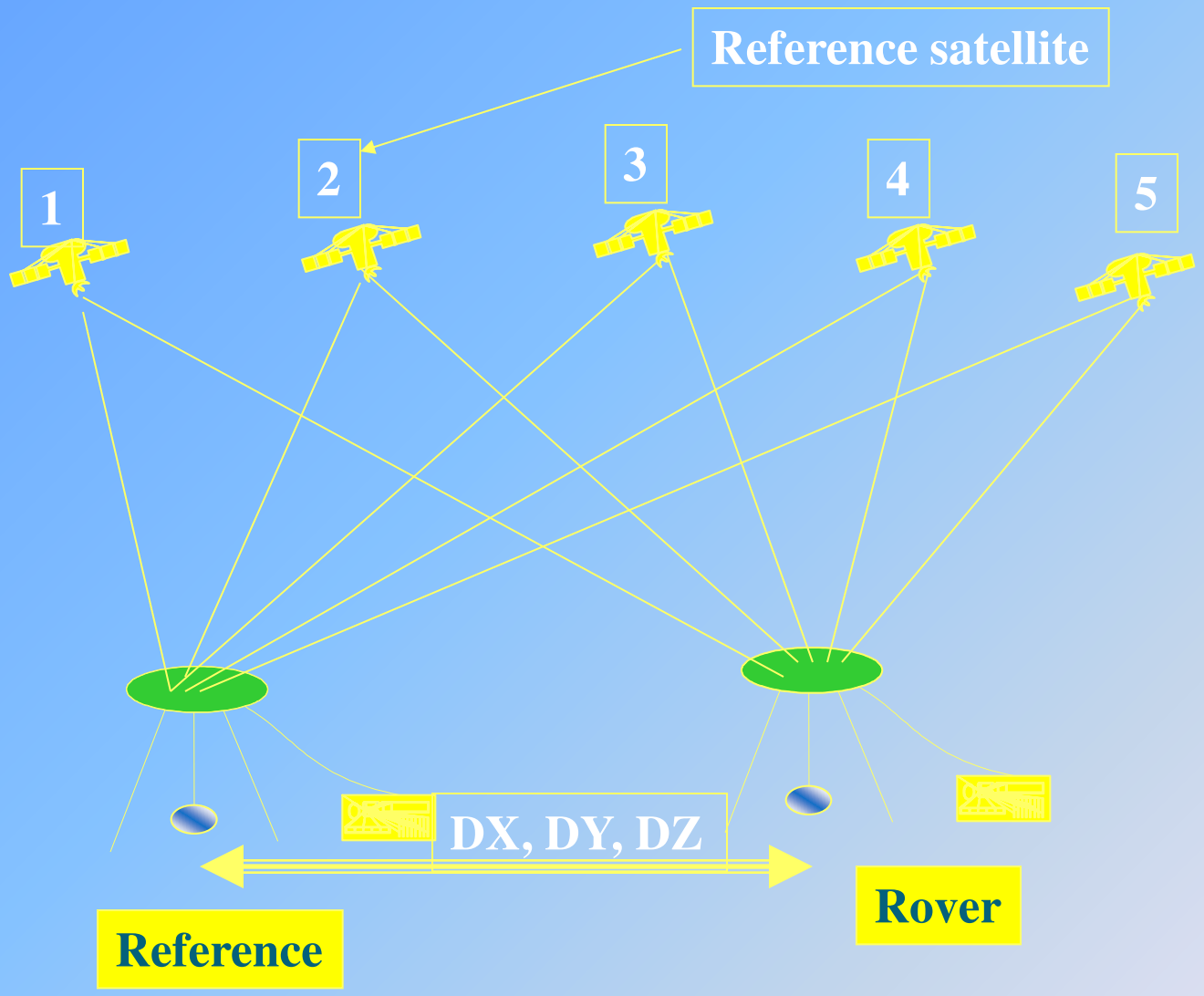
Height

Time

or

X, Y, Z, t

Differential GPS



2 - 1
2 - 3
2 - 4
2 - 5

GPS Segments

Space Segment

Control Segment

User Segment

GPS Space Segment

24 satellites

6 orbiting planes

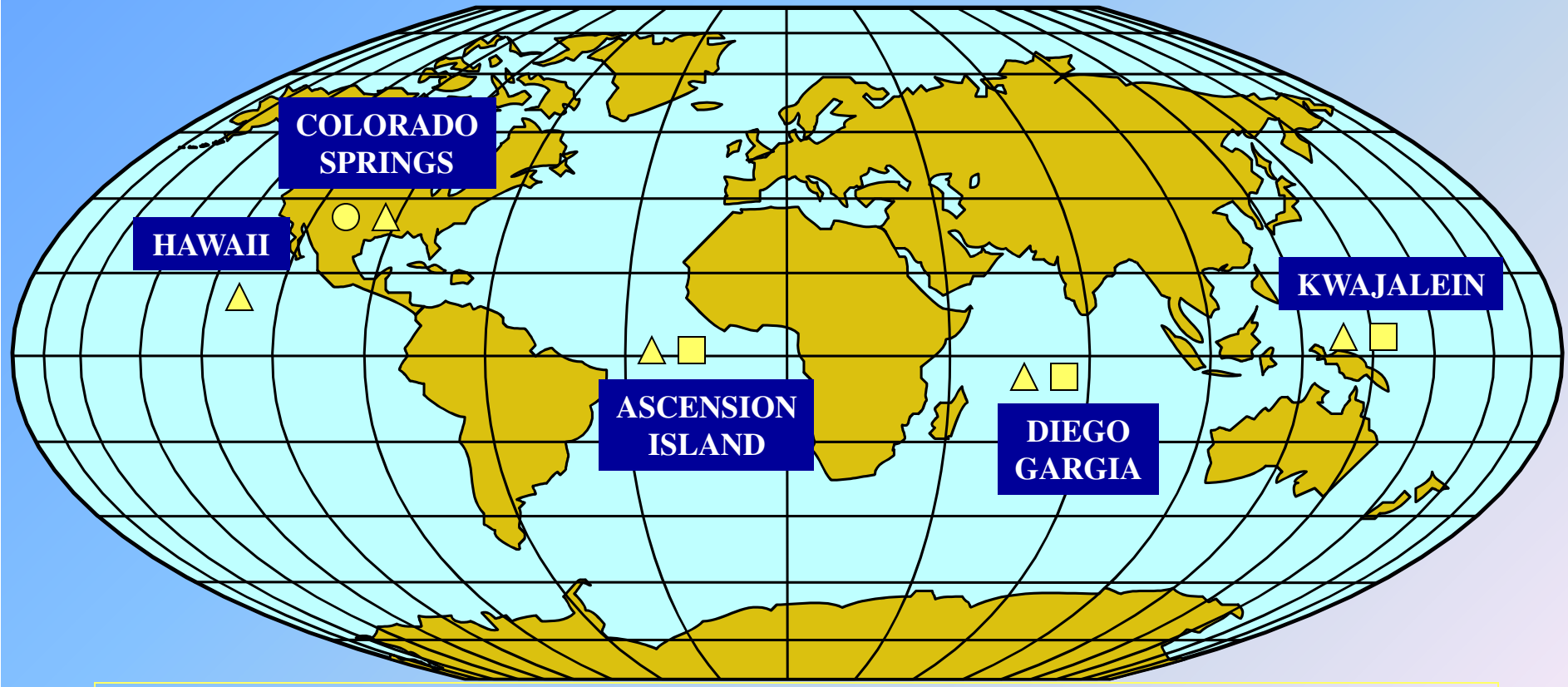
55 degree inclination

20200 km above Earth

12 hours of orbit

5 hours view in horizon

Control Segment



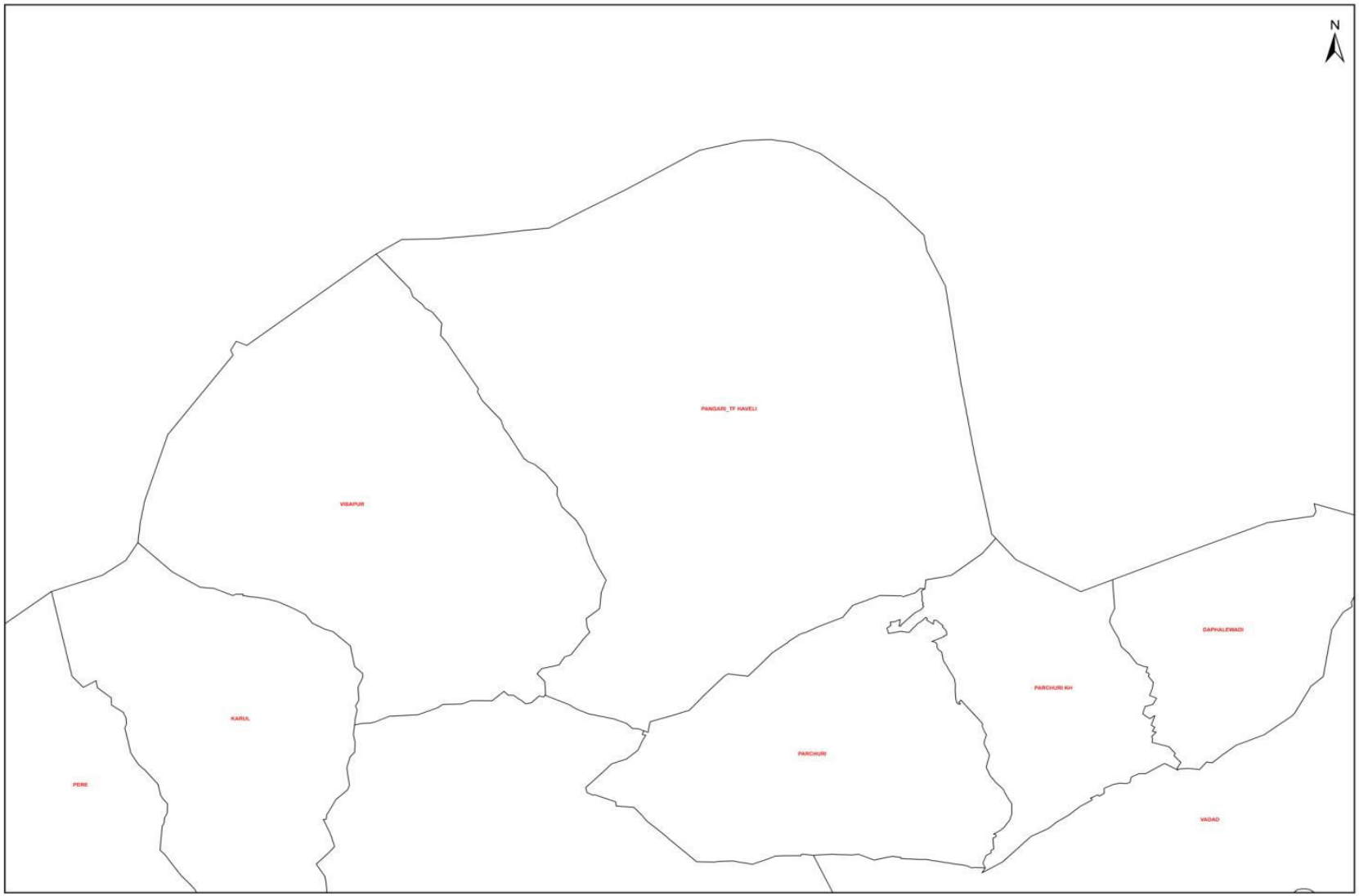
○ MASTER CONTROL △ MONITORING □ UPLOAD & DOWNLOAD


SEASHORE HOSPITAL

SATELLITE IMAGE

IMAGE FIELD CONTROL

VILLAGE BOUNDARY



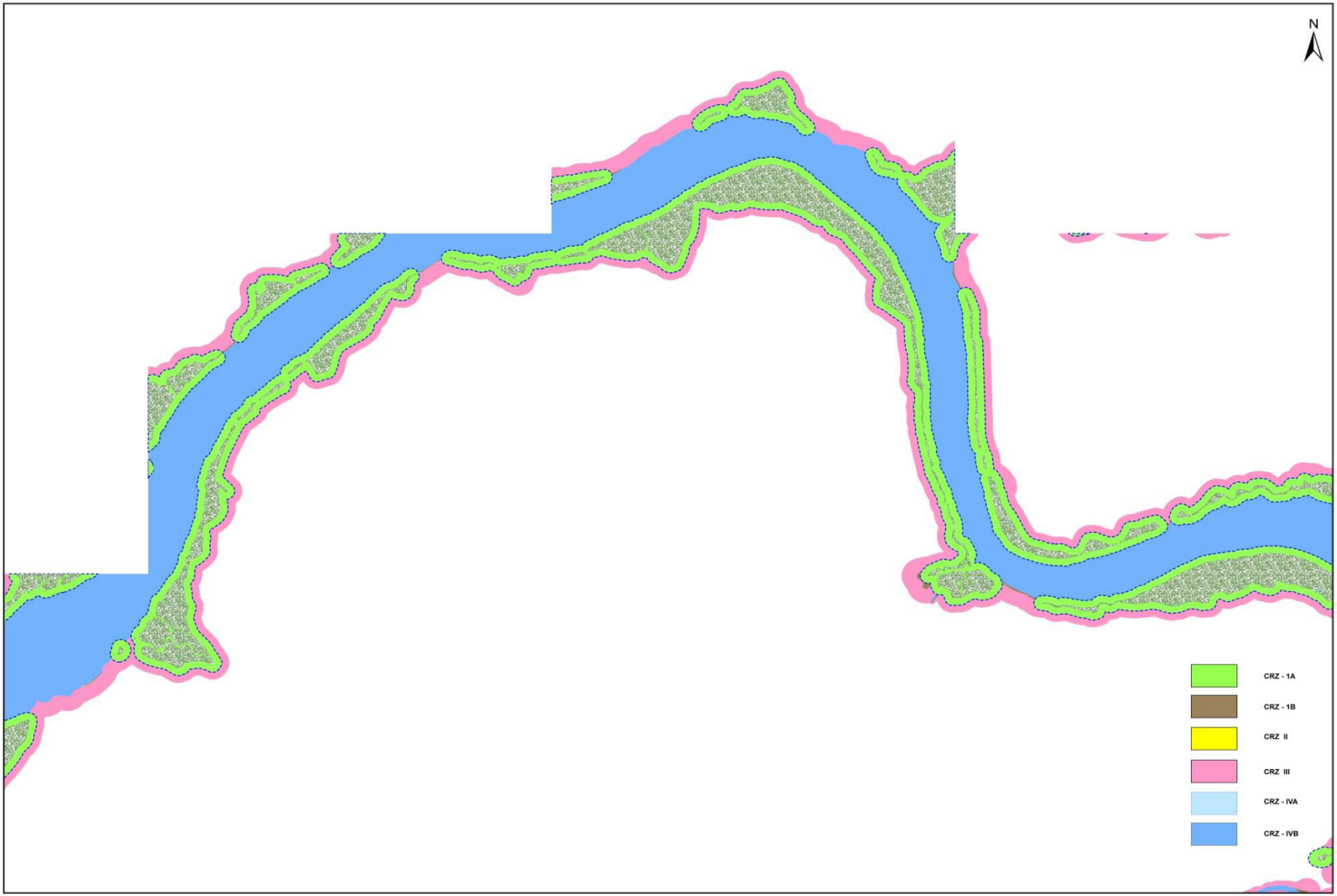
CADASTRAL VILLAGE MAP

IMAGE WITH VILLAGE

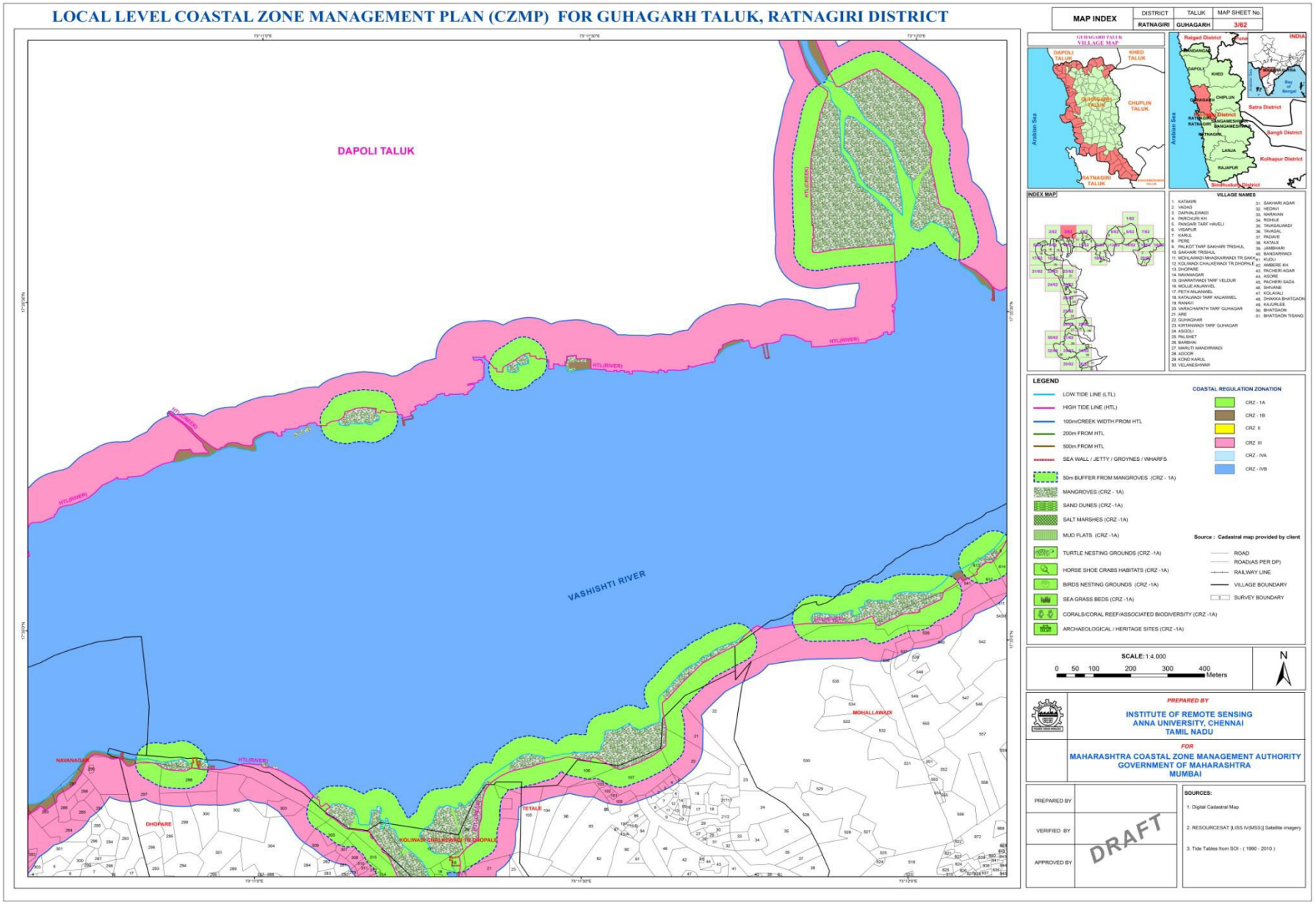
IMAGE WITH HTL & LTL

IMAGE WITH MANGROVES

CRZ MAP



FINAL OUTPUT



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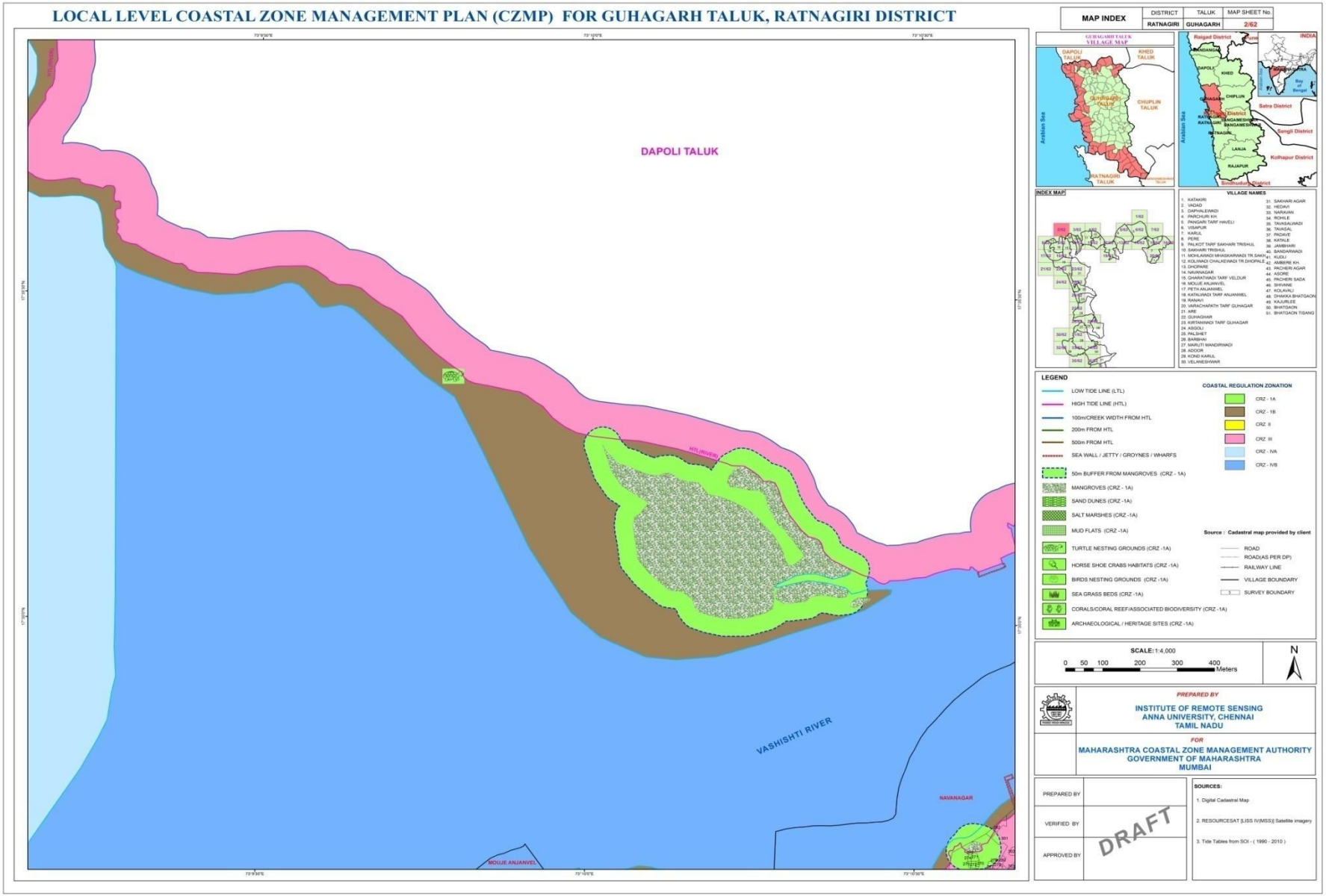

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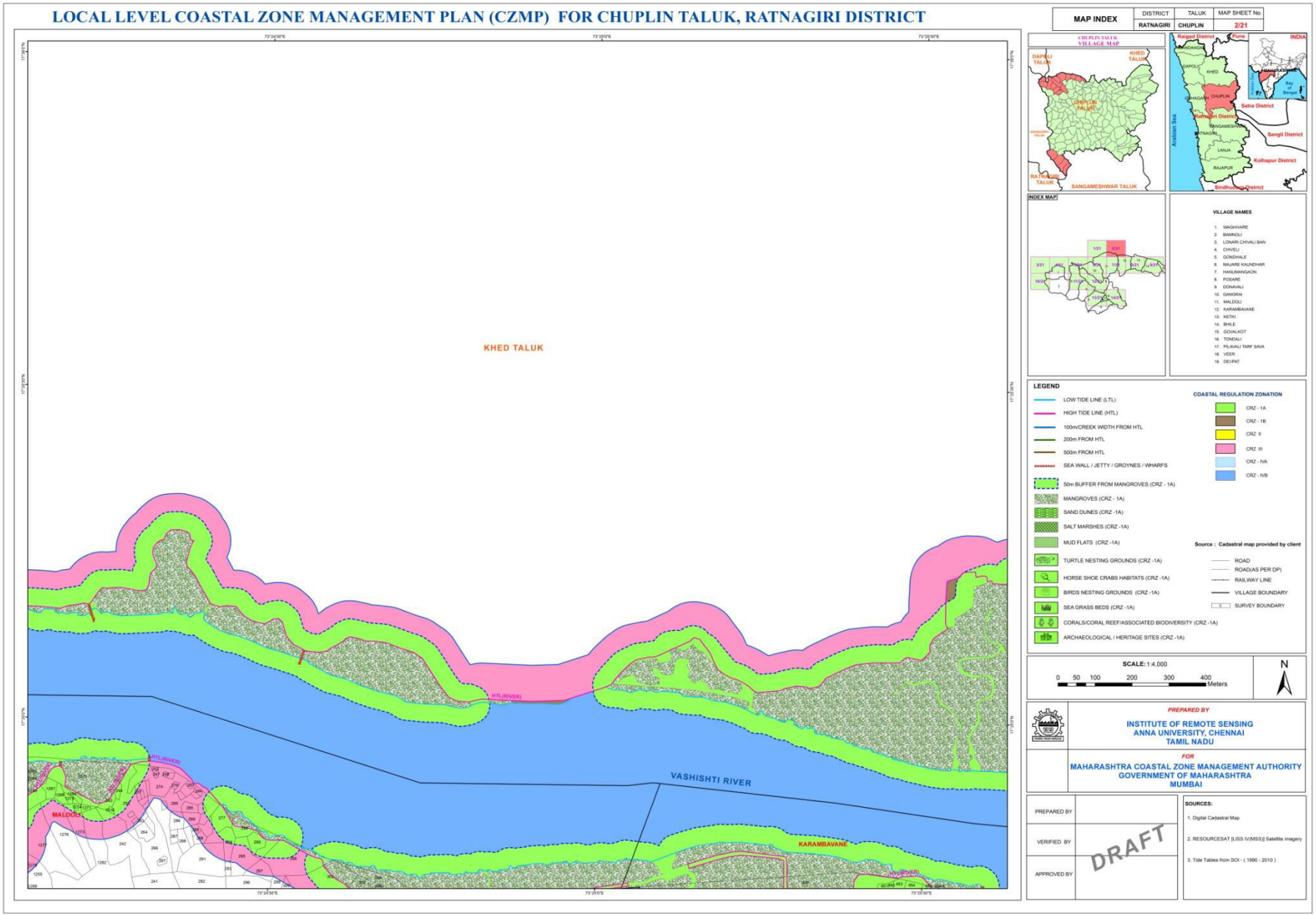
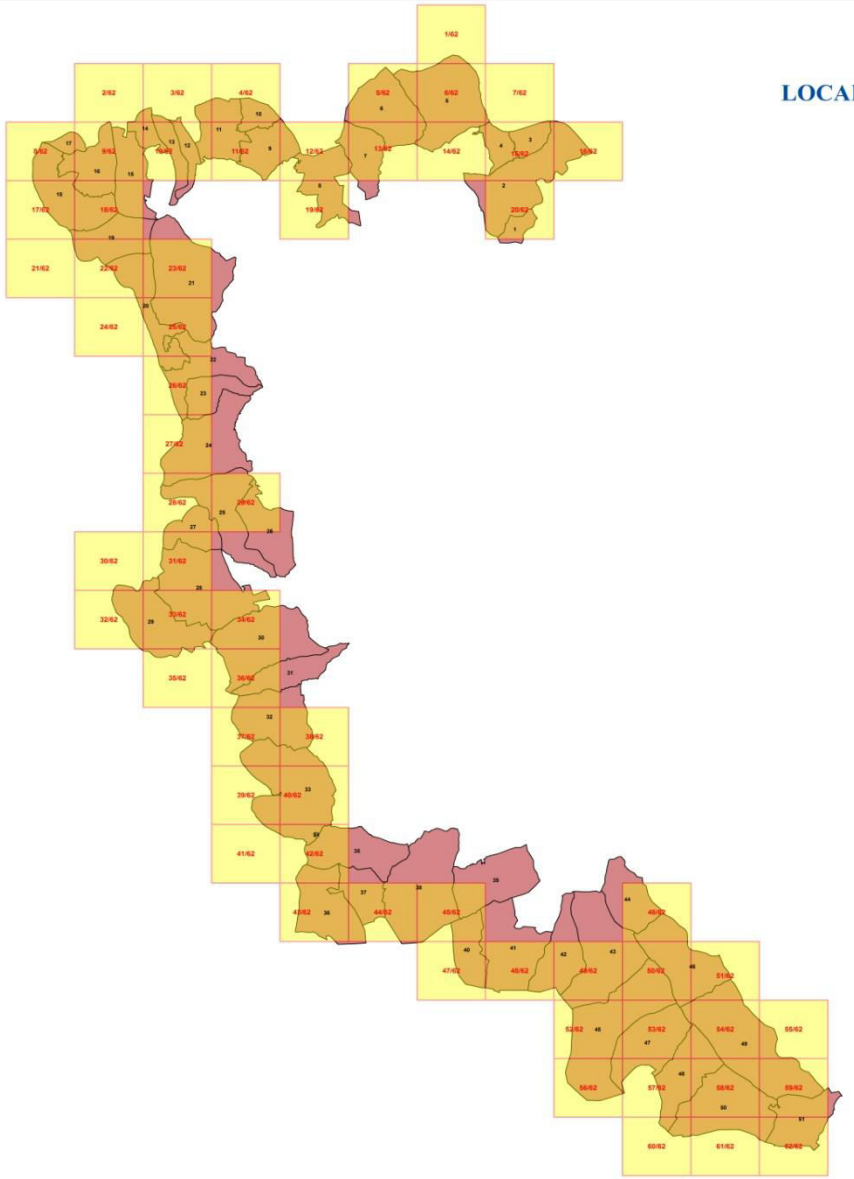


FINAL INDEX MAP



INDEX MAP

LOCAL LEVEL COASTAL ZONE MANAGEMENT PLAN (CZMP) FOR GUHAGARH TALUK, RATNAGIRI DISTRICT

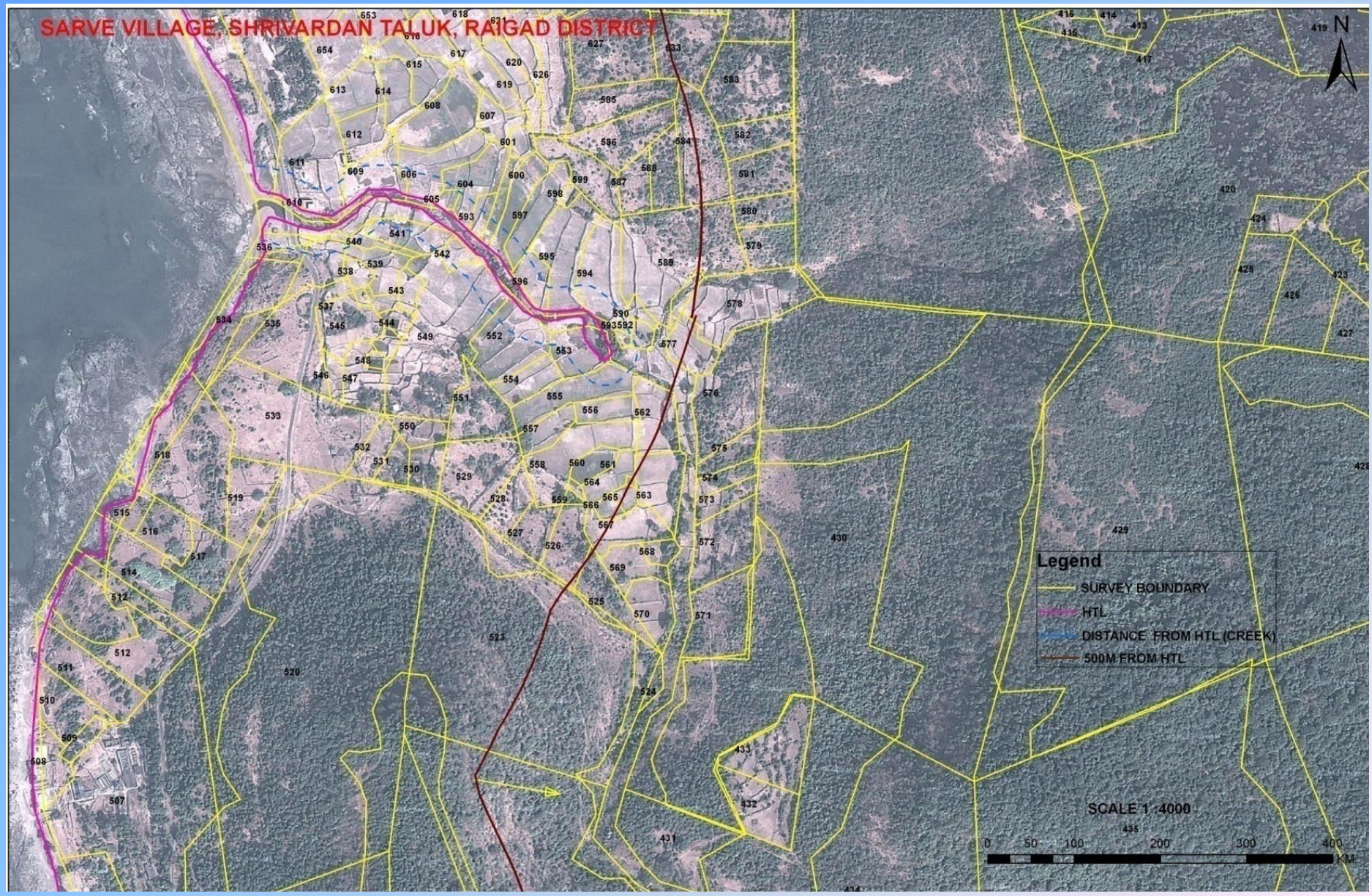
N

VILLAGE NAMES

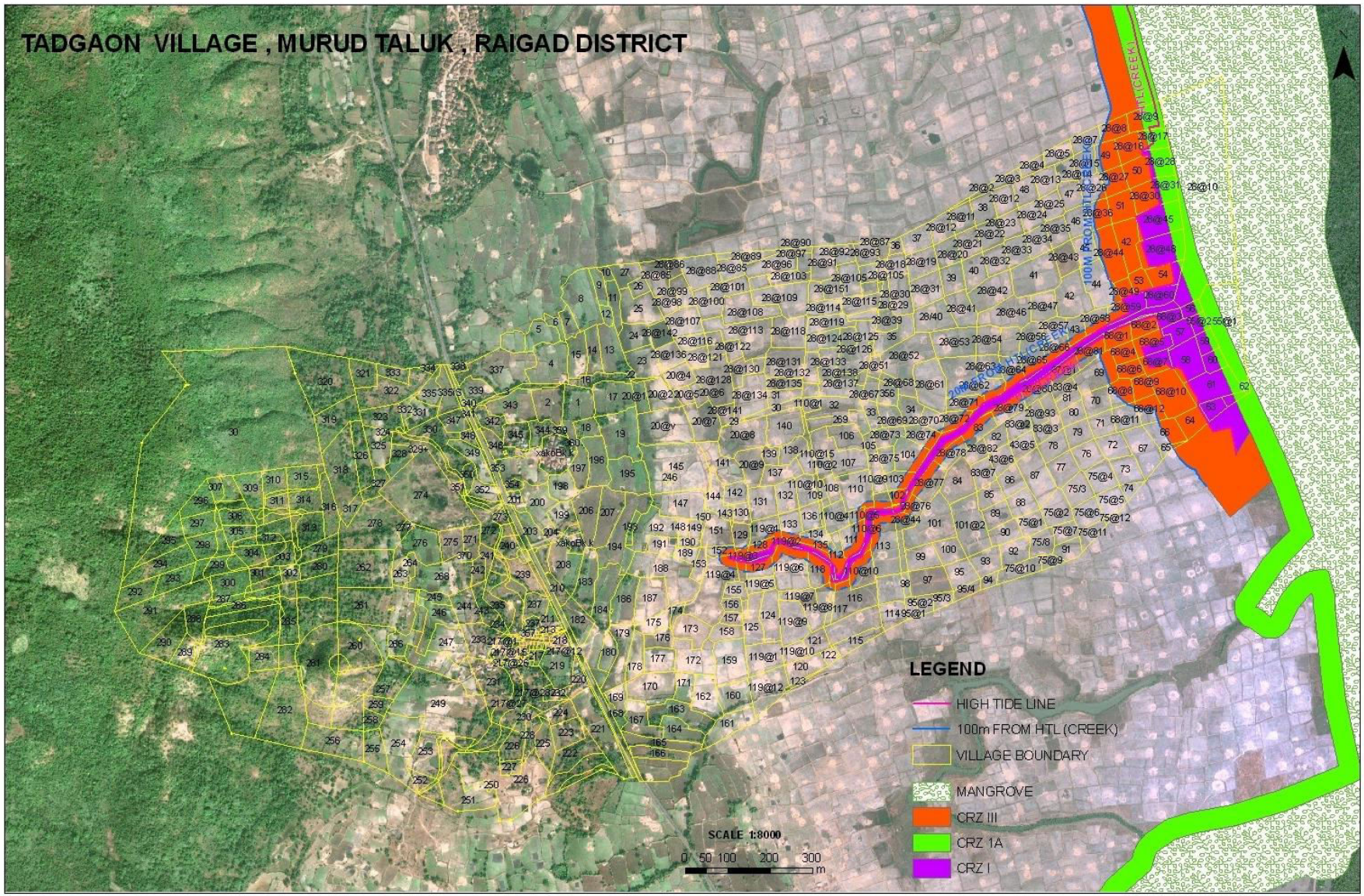
1. KATAKIRI
2. VADAD
3. DAPHALEWADI
4. PARCHURI KH.
5. PANGARI TARF HAVELI
6. VISAPUR
7. KARUL
8. PERE
9. PALKOT TARF SAKHARI TRISHUL
10. SAKHARI TRISHUL
11. MOHLAWADI MHASKARWADI TR.SAKH.
12. KOLIWADI CHALKEWADI TR.DHOPALE
13. DHOPARE
14. NAVANAGAR
15. GHARATWADI TARF VELDUR
16. MOUJE ANJANVEL
17. PETH ANJANWEL
18. KATALWADI TARF ANJANWEL
19. RANAVI
20. VARACHAPATH TARF GUHAGAR
21. ARE
22. GUHAGHAR
23. KIRTANWADI TARF GUHAGAR
24. ASGOLI
25. PALSHET
26. BARBHAI
27. MARUTI MANDIRWADI
28. ADOOR
29. KOND KARUL
30. VELANESHWAR
31. SAKHARI AGAR
32. HEDAVI
33. NARAVAN
34. ROHILE
35. TAVASALWADI
36. TAVASAL
37. PADAVE
38. KATALE
39. JAMBHARI
40. BANDARWADI
41. KUDLI
42. AMBERE KH.
43. PACHERI AGAR
44. ASORE
45. PACHERI SADA
46. SHIVANE
47. KOLAVALI
48. DHAKKA BHATGAON
49. KAJURLEE
50. BHATGAON
51. BHATGAON TISANG

Georeferencing of Cadastral Map

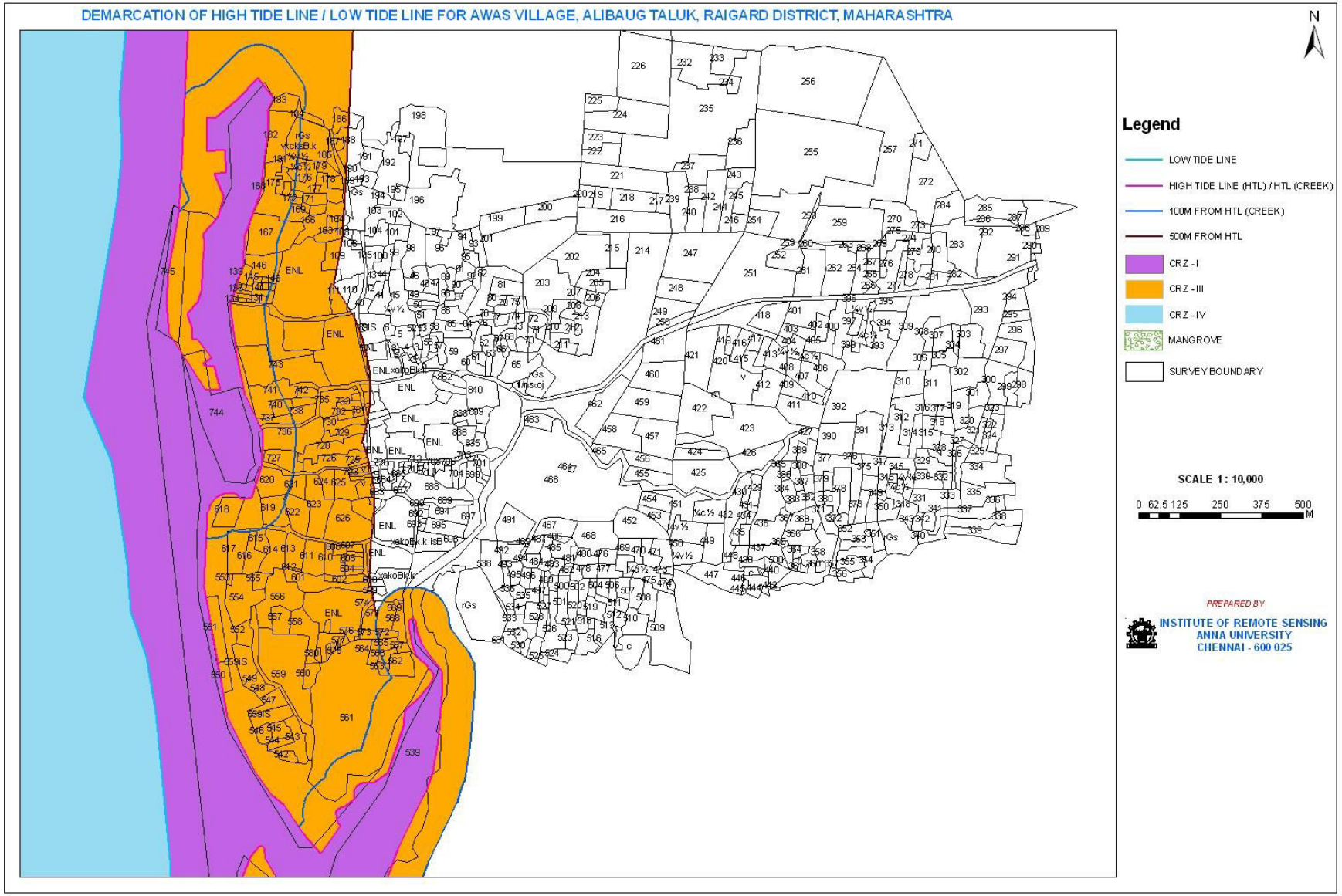
HTL Demarcation



Coastal Regulation Zone with Mangroves



Final Map Composition




THANK YOU