

Hands-On

Mapping of Shoreline

**Training Course on
'Marine GIS for Operational Oceanography'**

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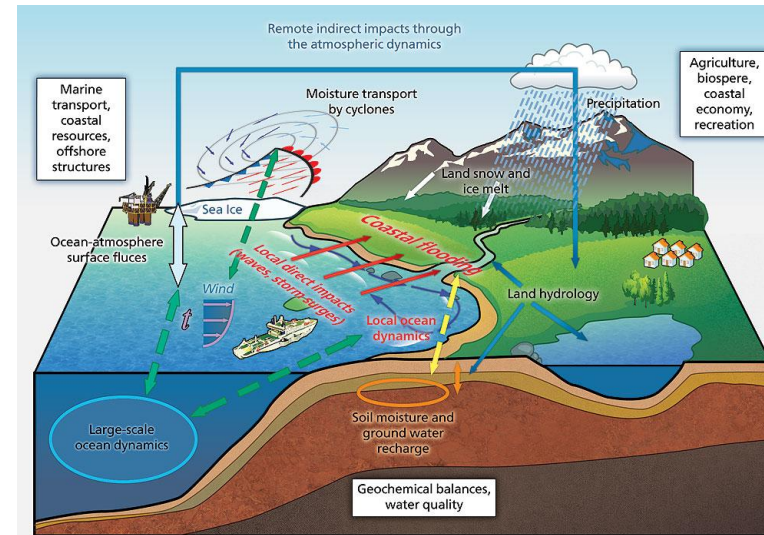
International Training Centre for operational Oceanography(ITCO),

INCOIS, Hyderabad, India



Introduction

- The shoreline is the place where a large body of water, like an ocean or lake meets the land.
- Due to the dynamic nature of shoreline boundary, its important to understand the Long- and short-term shoreline changes rate for coastal vulnerabilities point of view.



Overview

- I. Download satellite data
- II. Band Combination
- III. Shoreline Digitization
- IV. Estimation of Shoreline Rate Using Shoreline Analysis System (DSAS)
- V. Shoreline Changes map

Download Landsat data from <http://earthexplorer.usgs.gov/>

The screenshot shows the Earth Explorer website interface. The top navigation bar includes the USGS logo, the text "science for a changing world", and links for "USGS Home", "Contact USGS", and "Search USGS". The main header area displays "EarthExplorer" and a "Page Expires In 1:59:14" timer. Below the header, there are links for "Home", "Save Criteria", "Load Favorite", and "Manage Criteria". The "Search Criteria" tab is active, showing a "Data Sets" section with a "2. Select Your Data Set(s)" heading. This section includes instructions on how to select data sets and a "Data Set Search" input field. A list of data sets is displayed, with "Landsat Archive" highlighted by a red box. Under "Landsat Archive", the "L8 OLI/TIRS" and "L8 OLI/TIRS Pre-WRS-2" options are checked. The "Search Criteria Summary" section on the right shows a map of the search area, with a red polygon indicating the selected area. The map includes a "Map" button, a "Satellite" button, and a "Clear Criteria" link. The map also displays coordinates (12° 57' 18" N, 092° 29' 07" E) and a "223" marker. The map is labeled "North Reef Island" and "Interview".

EE EarthExplorer

earthexplorer.usgs.gov

USGS science for a changing world

USGS Home Contact USGS Search USGS

EarthExplorer

Page Expires In 1:59:14

Home Save Criteria Load Favorite Manage Criteria

Item Basket (0) prakash.marine Feedback Help

Search Criteria Data Sets Additional Criteria Results

2. Select Your Data Set(s)

Check the boxes for the data set(s) you want to search. When done selecting data set(s), click the *Additional Criteria* or *Results* buttons below. Click the plus sign next to the category name to show a list of data sets.

☐ Use Data Set Prefilter (What's This?)

Data Set Search:

- Digital Elevation
- Digital Line Graphs
- Digital Maps
- EO-1
- Global Fiducials
- Global Land Survey
- HCMM
- ISERV
- Landsat Archive
 - ☒ L8 OLI/TIRS
 - ☒ L8 OLI/TIRS Pre-WRS-2
 - ☐ Landsat Surface Reflectance - L8 OLI/TIRS
 - ☐ L7 ETM+ SLC-off (2003-present)
 - ☐ L7 ETM+ SLC-on (1999-2003)
 - ☐ Landsat Surface Reflectance - L7 ETM+
 - ☐ L4-5 TM
 - ☐ Landsat Surface Reflectance - L4-5 TM
 - ☐ L1-5 MSS
- Landsat Legacy
- Landsat MRLC
- NASA LPDAAC Collections
- Radar

Search Criteria Summary (Show)

Map Satellite

(12° 57' 18" N, 092° 29' 07" E) Options Overlays

North Reef Island

Interview

Mayabunder

Download Landsat data

The screenshot displays the EarthExplorer.usgs.gov web interface. On the left, a sidebar shows search results for a specific data set, including details like Entity ID (LC81340512015295LGN00), Coordinates (13.01236, 82.73085), Acquisition Date (22-OCT-15), Path (134), and Row (51). The main map area shows a satellite image of a coastal region. A 'Download Options' dialog box is open on the right, listing several download choices:

- Download** LandsatLook "Natural Color" Image (4.8 MB)
- Download** LandsatLook "Thermal" Image (1.7 MB)
- Download** LandsatLook "Quality" Image (1.0 MB)
- Download** LandsatLook images with Geographic Reference (7.6 MB)
- Download** Level 1 GeoTIFF Data Product (772.9 MB)

A Windows 'Save As' dialog box is also open in the foreground, showing the file name 'LC81340512015295LGN00.tar' and the save type 'WinRAR archive'. The dialog is set to save in the 'ADCIRC' folder. The Windows taskbar at the bottom shows the time as 11:24 AM on 20-Nov-15.

Spectral bands of Landsat 7 & 8

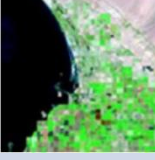
Landsat 4-5 Thematic Mapper (TM) and Landsat 7 Enhanced Thematic Mapper Plus (ETM+)

Landsat 7	Wavelength (micrometer)	Resolution (meters)
Band 1	0.45-0.52	30
Band 2	0.52-0.60	30
Band 3	0.63-0.69	30
Band 4	0.77-0.90	30
Band 5	1.55-1.75	30
Band 6	10.40-12.50	60 * (30)
Band 7	2.09-2.35	30
Band 8	.52-.90	15

Landsat 8 Operational Land Imager (OLI) and Thermal Infrared Sensor (TIRS)

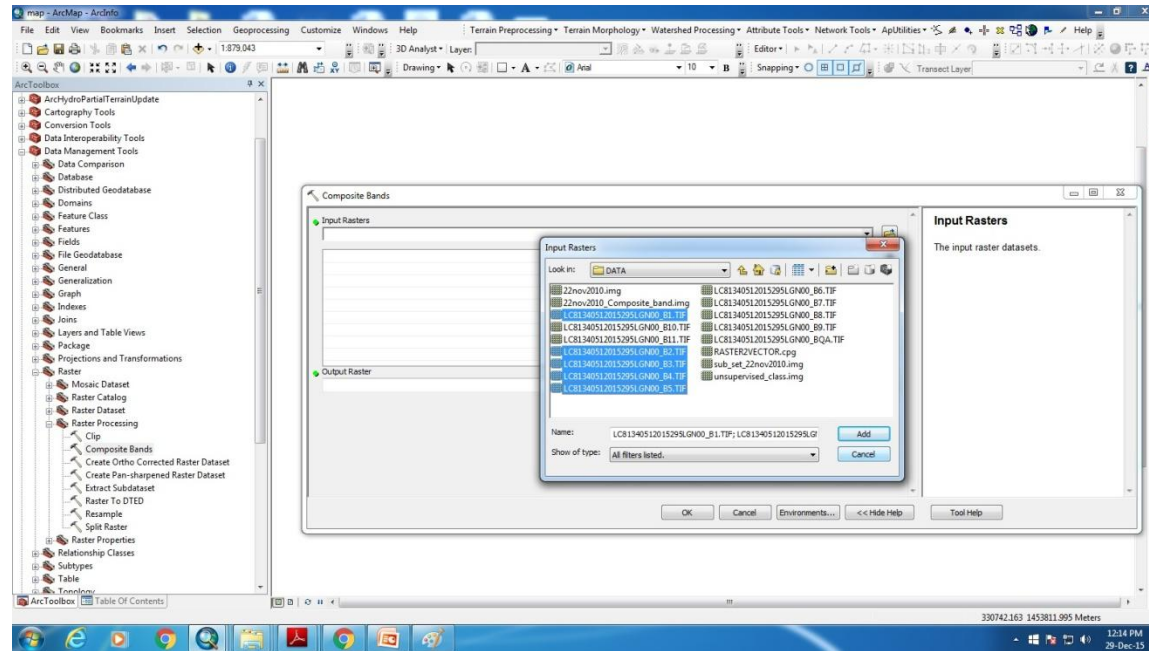
Band	Wavelength	Useful for mapping
Band 1 – coastal aerosol	0.43 - 0.45	coastal and aerosol studies
Band 2 – blue	0.45 - 0.51	Bathymetric mapping, distinguishing soil from vegetation and deciduous from coniferous vegetation
Band 3 - green	0.53 - 0.59	Emphasizes peak vegetation, which is useful for assessing plant vigor
Band 4 - red	0.64 - 0.67	Discriminates vegetation slopes
Band 5 - Near Infrared (NIR)	0.85-0.88	Emphasizes biomass content and shorelines
Band 6 - Short-wave Infrared (SWIR) 1	1.57 - 1.65	Discriminates moisture content of soil and vegetation; penetrates thin clouds
Band 7 - Short-wave Infrared (SWIR) 2	2.11 - 2.29	Improved moisture content of soil and vegetation and thin cloud penetration
Band 8 - Panchromatic	0.50 - 0.68	15 meter resolution, sharper image definition
Band 9 – Cirrus	1.36 - 1.38	Improved detection of cirrus cloud contamination
Band 10 – TIRS 1	10.60 – 11.19	100 meter resolution, thermal mapping and estimated soil moisture
Band 11 – TIRS 2	11.5 - 12.51	100 meter resolution, Improved thermal mapping and estimated soil moisture

Common band combinations in RGB comparisons for Landsat 7 & 8.

Color map	Color	Band Combination of Landsat 7	Landsat 8
	Infrared	5,4,3	6,5,4
	Natural	3,2,1	4,3,2
	False	5,4,3	6,5,4
	False	7,5,3	7,6,4
	False	7,4,2	7,5,3

Band Composite

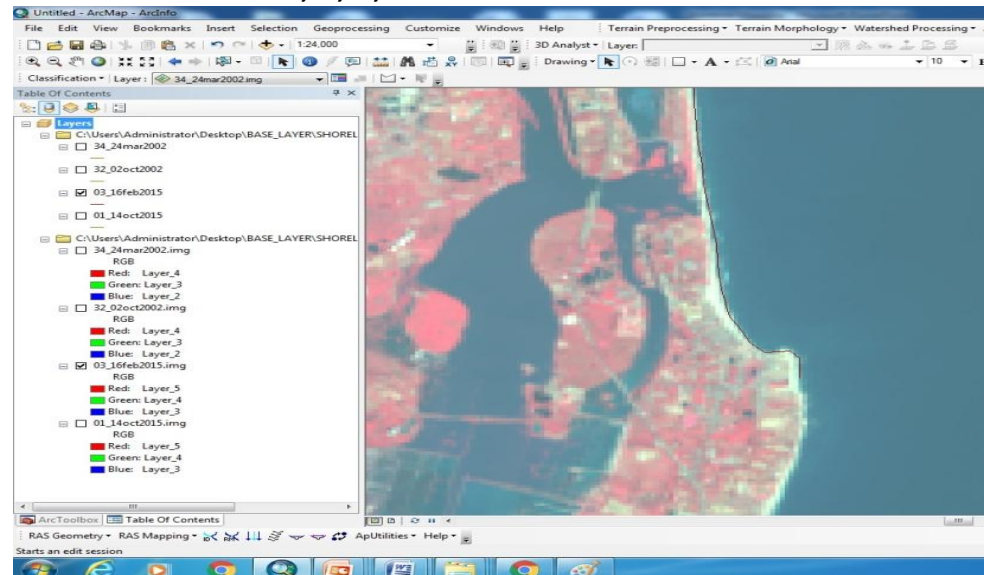
Input:
Geotiff satellite data



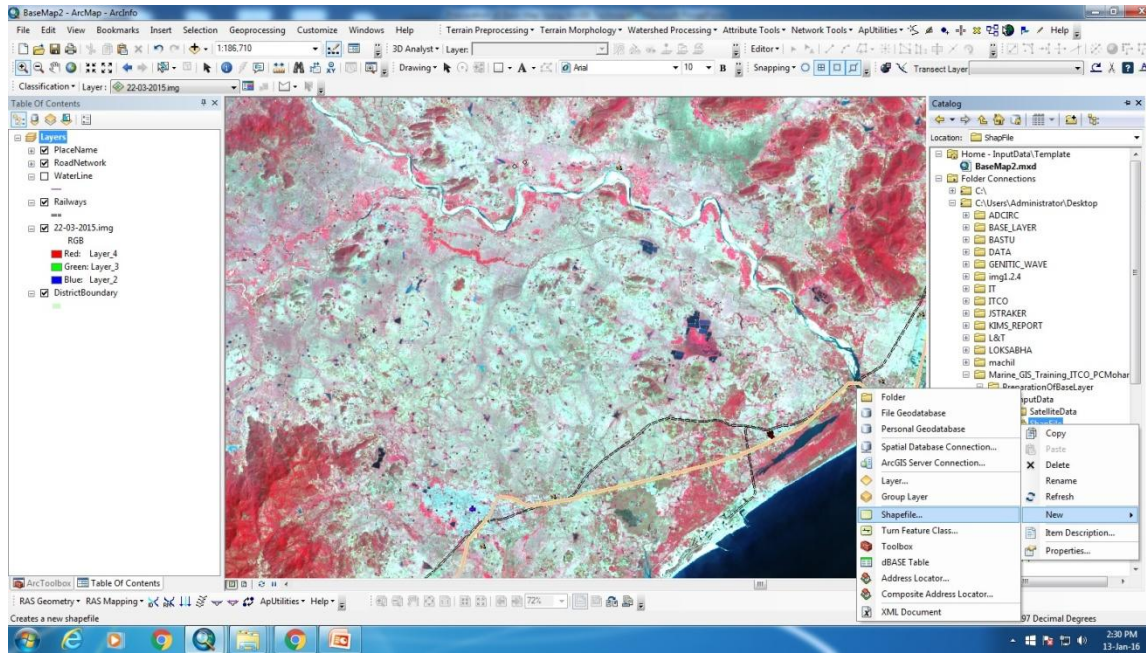
Output:
BandComposite data

Go to Data Management Tool → Raster → Raster Processing →
Composite Bands then select band1,2,3,4 and 5

FCC Landsat Image



Create New feature shapfile

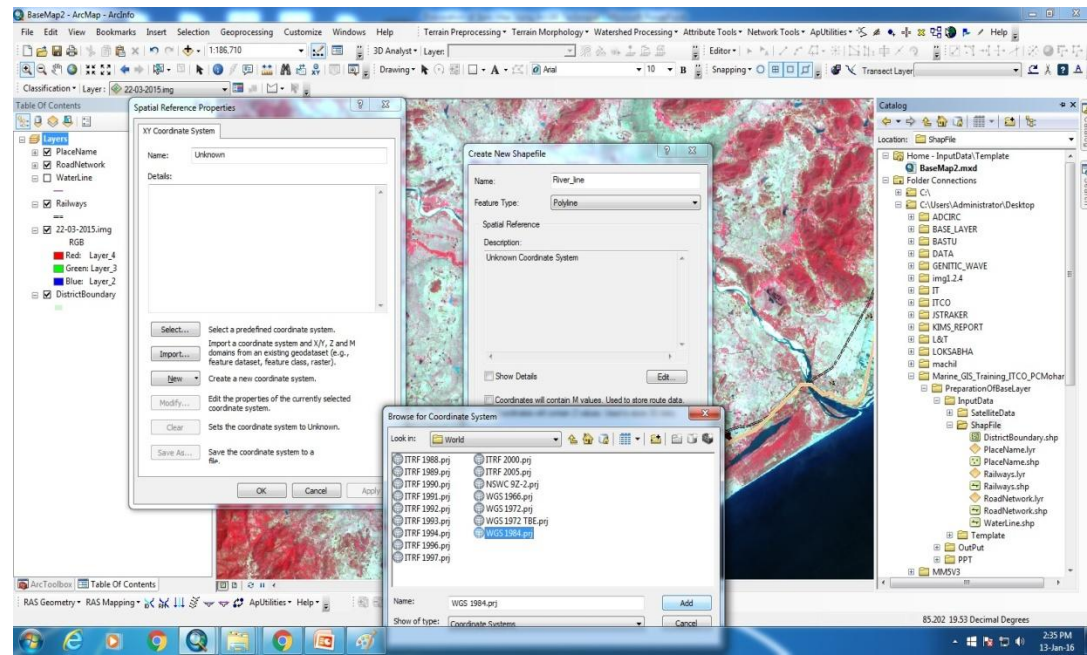


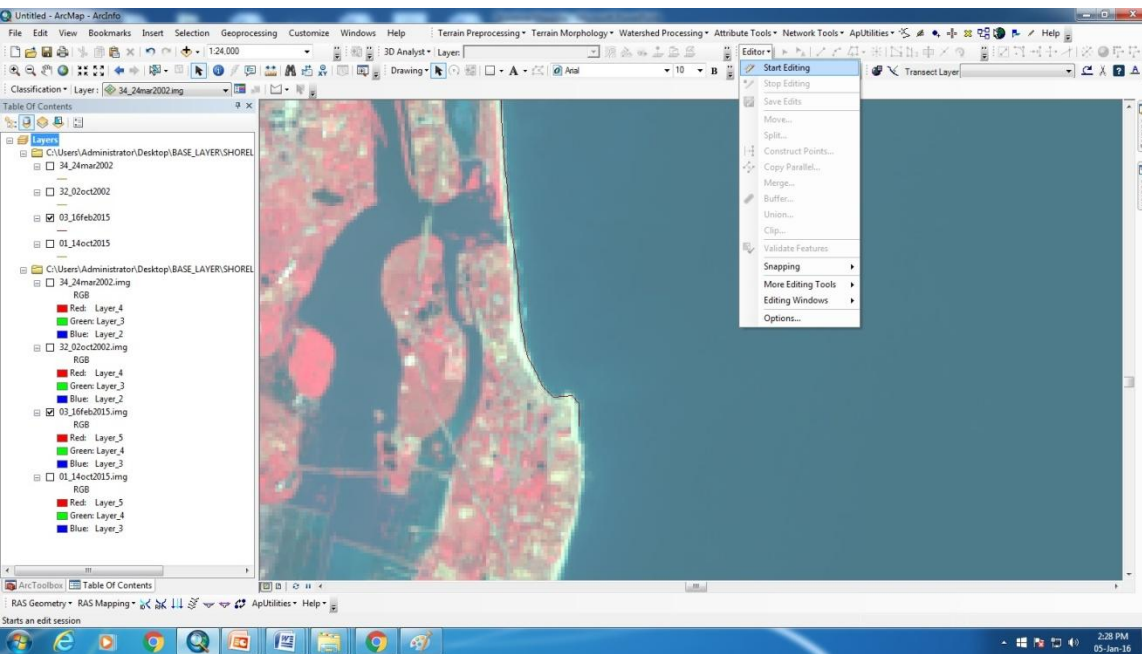
Go to Catalog → Navigate to Working folder → Right click on folder and Create Shapfile

Assign projection to shapfile

- Create New shapfile window will popup.
- Insert File Name and feature type as polyline.
- Go to edit button, then select Import button and assign to UTM projection.

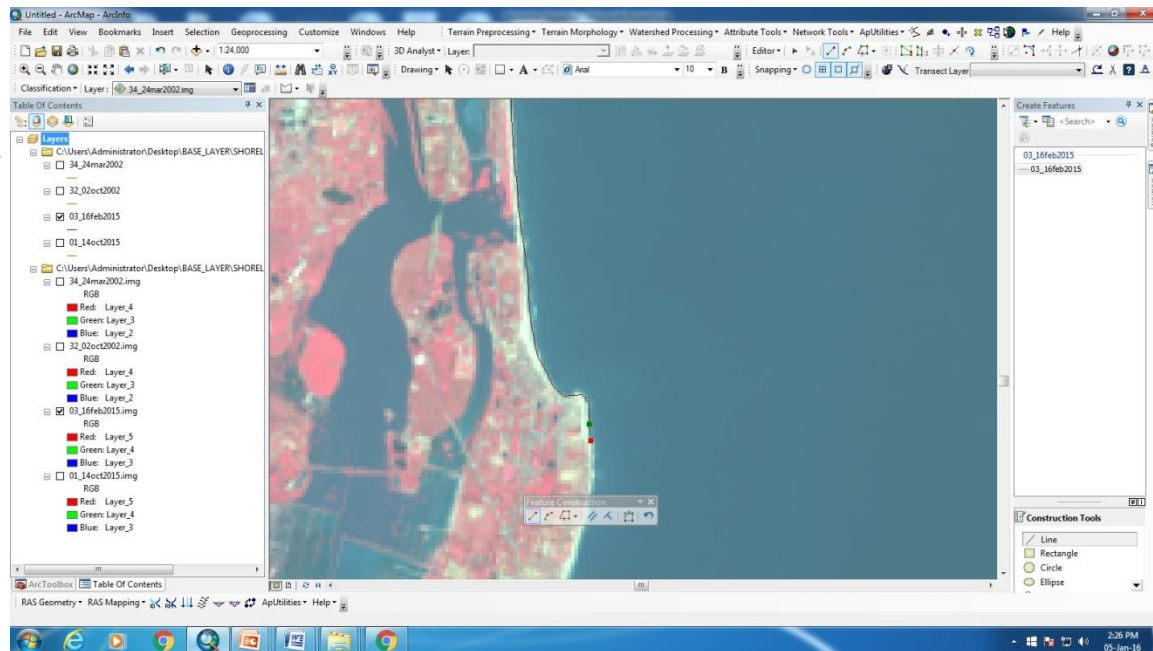
Create individual year shapfile and put at
D:\Marine_GIS_Training_ITCO_PCMohanty\ShorelineMapping\InputData\ShapFile folder



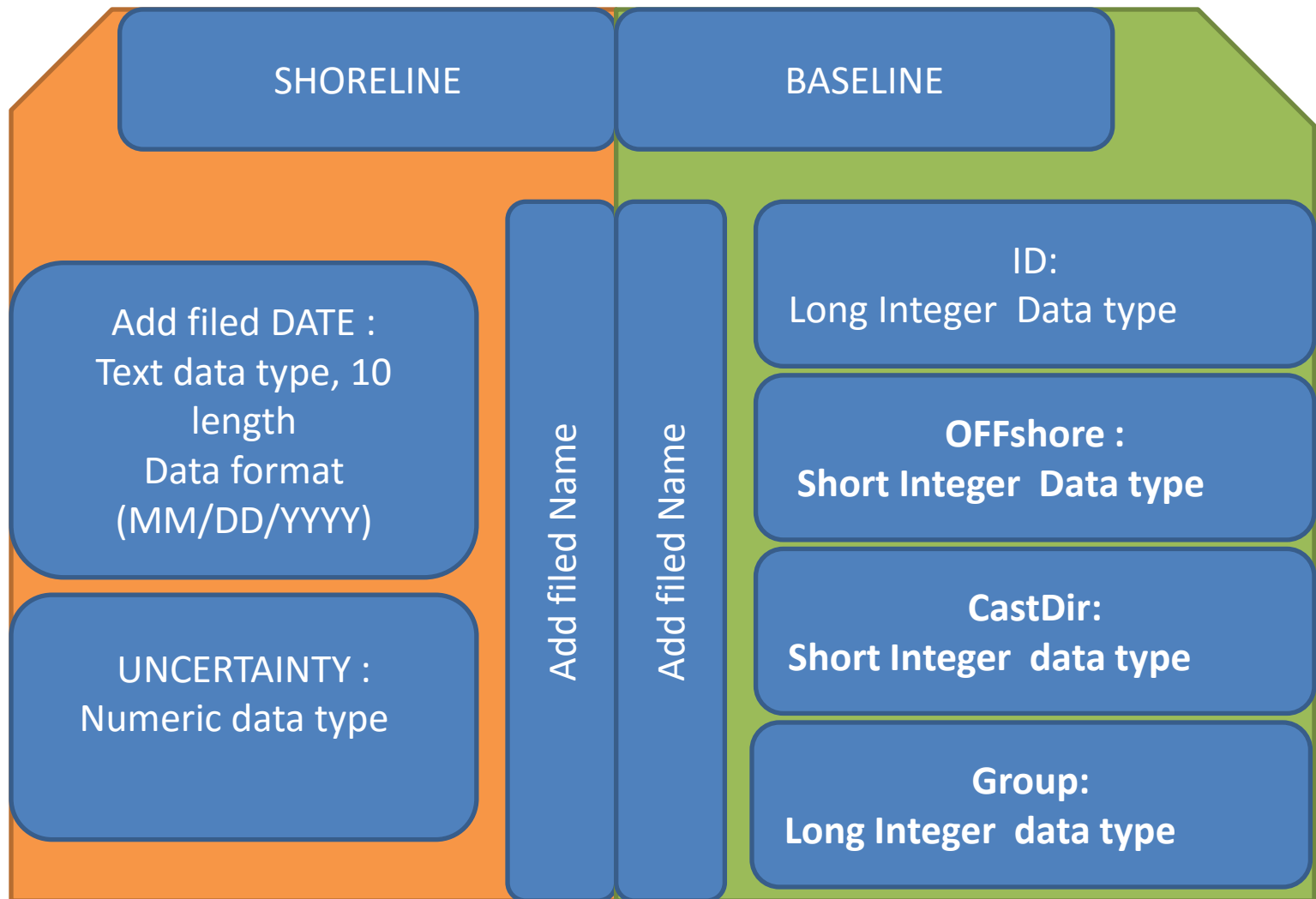


Add all the blank shoreline.
Go to Customise → click on Toolbars
→ Editor → Start editing

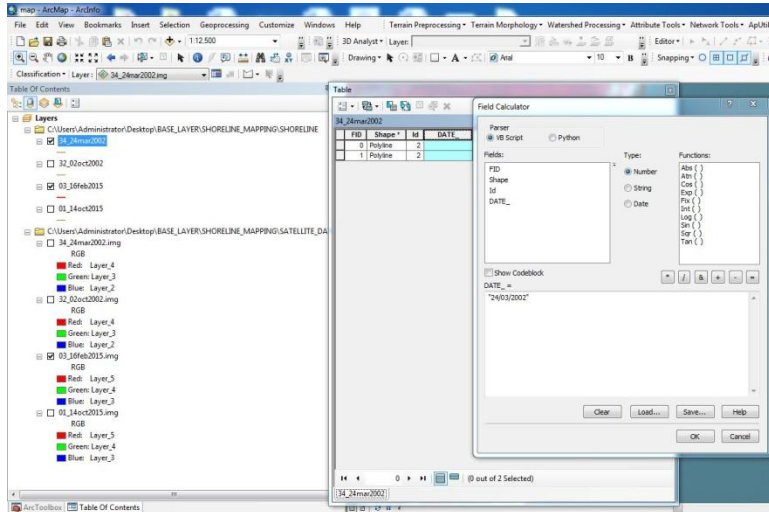
- Arrange band 4,3,2 for landsat 7 & 5,4,3 for landsat 8 then fix the map Scale 1:25,000 for digitization
- digitize shoreline



Input File for DSAS

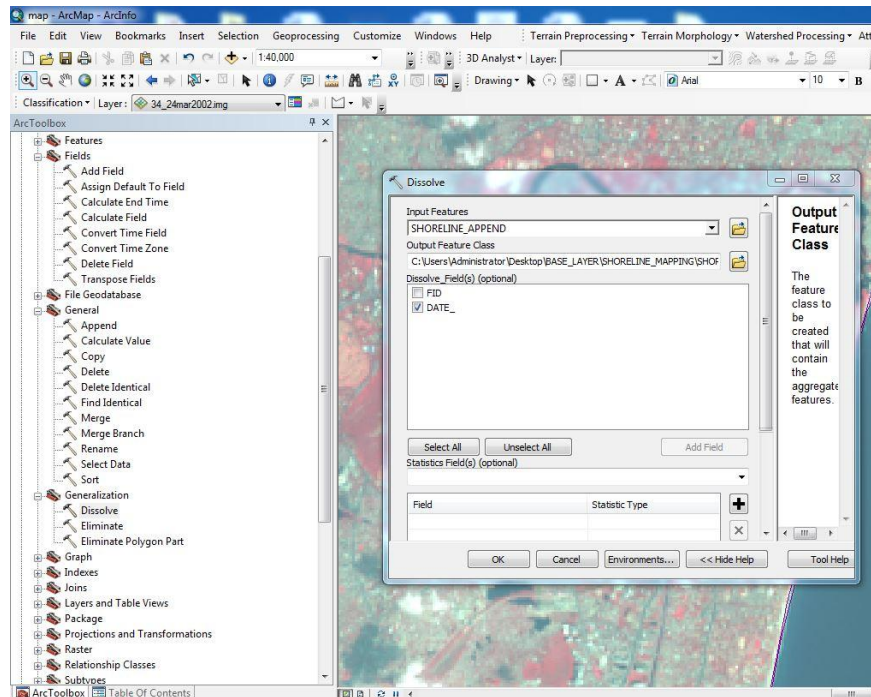
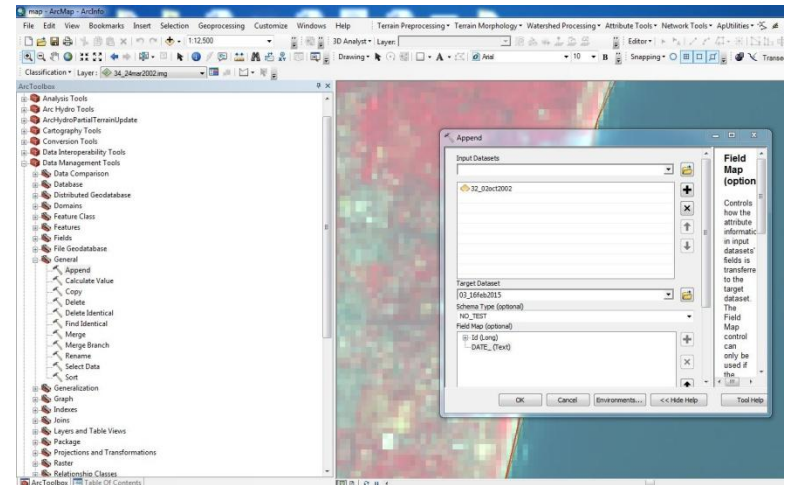


Add DATE & UNCERTAINTY Field



Shoreline

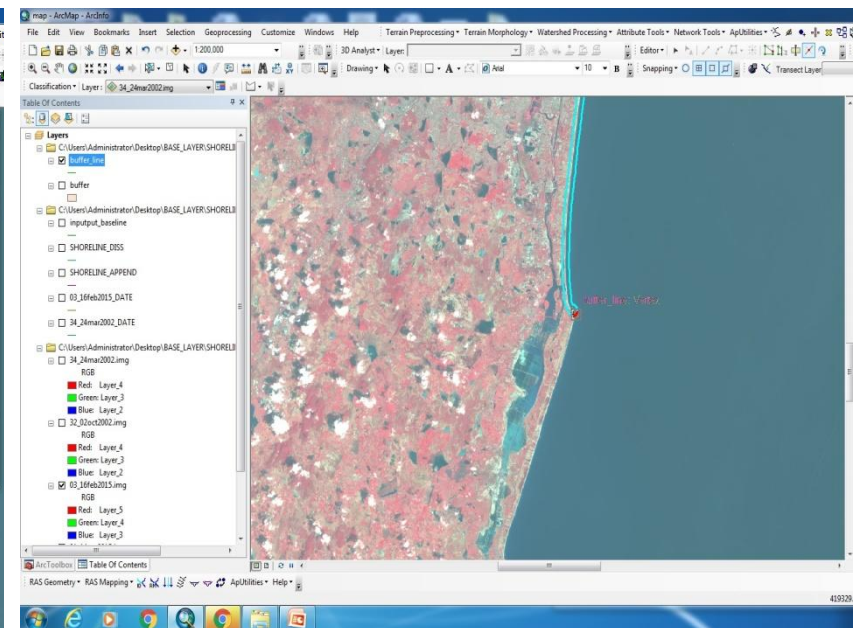
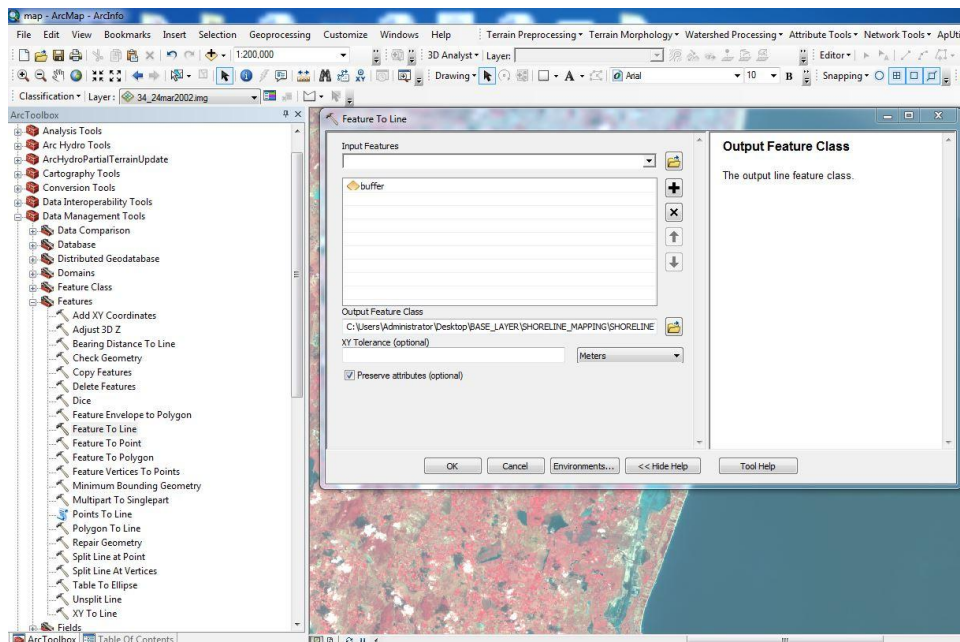
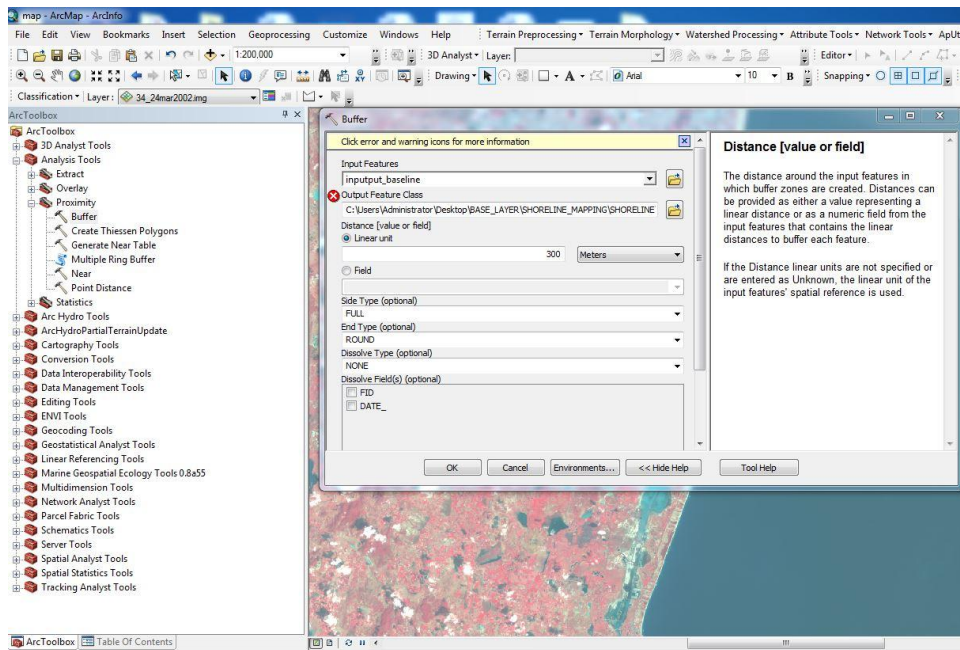
Append All the Shoreline



Dissolved Shoreline based on DATE field

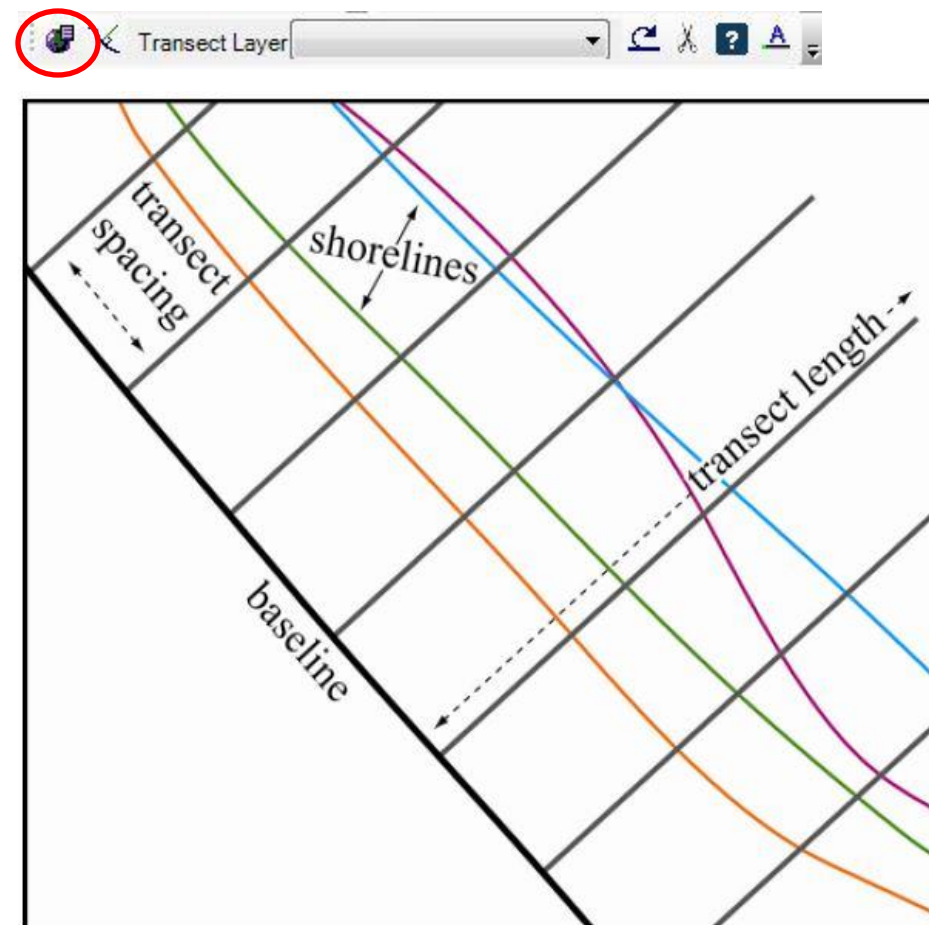
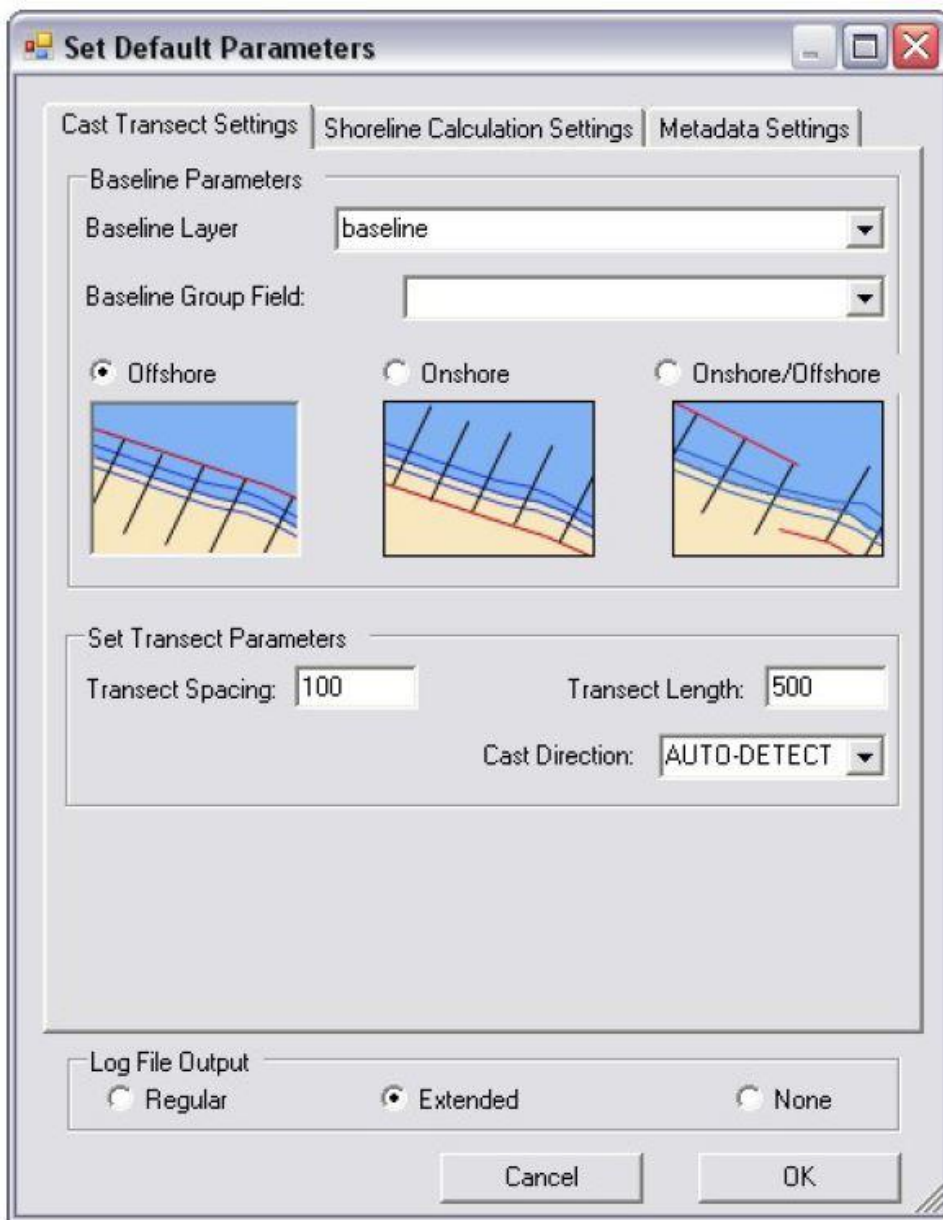
Baseline

- Copy latest year Dissolved Shoreline
- Create Buffer



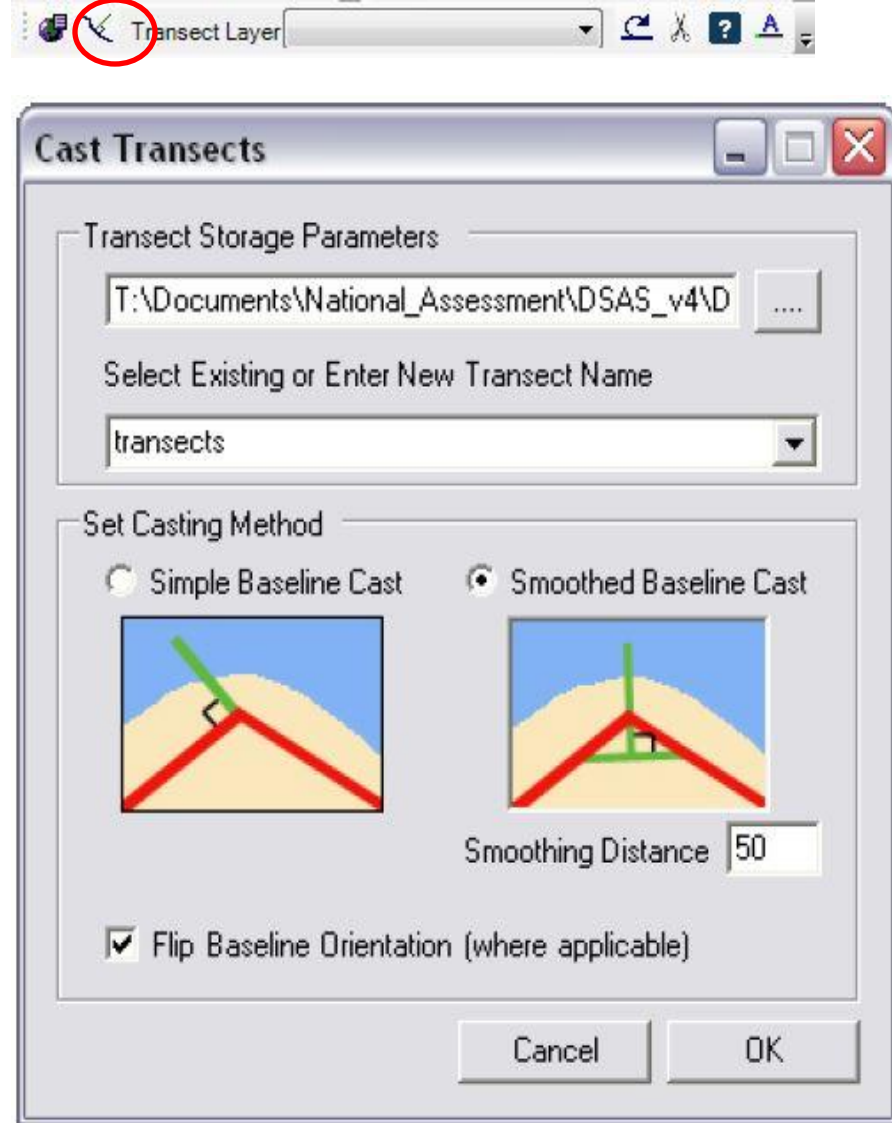
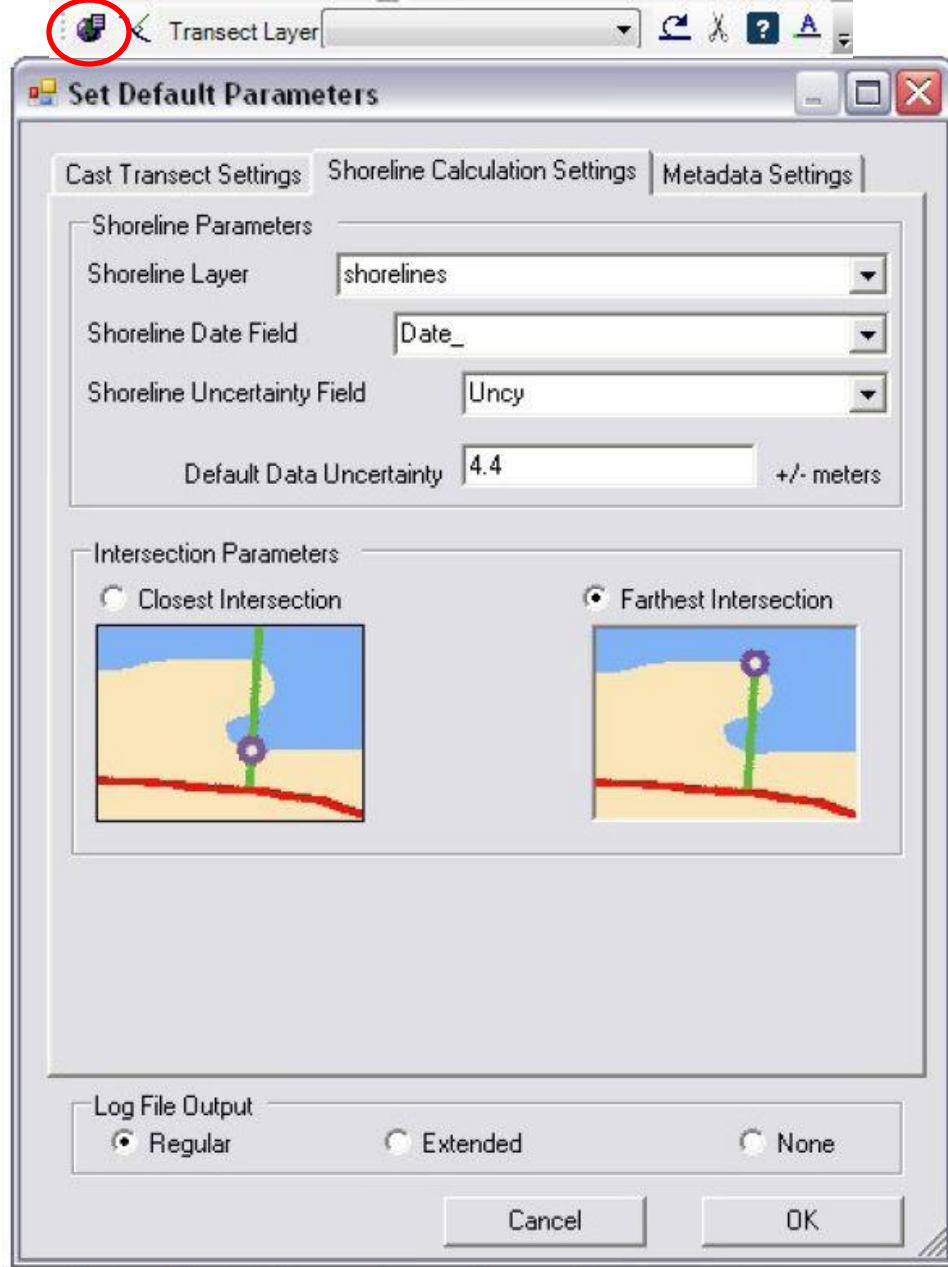
Converted to Polygon to Polyline

Remove Sea ward side line



User-specified output parameters include transect spacing and transect length.

Screenshot showing the DSAS Set Default Parameters window and the Cast Transect Settings tab.



Screenshot showing the DSAS Cast Transects window.

Screenshot showing the DSAS Set Default Parameters window and the Shoreline Calculation Settings tab.

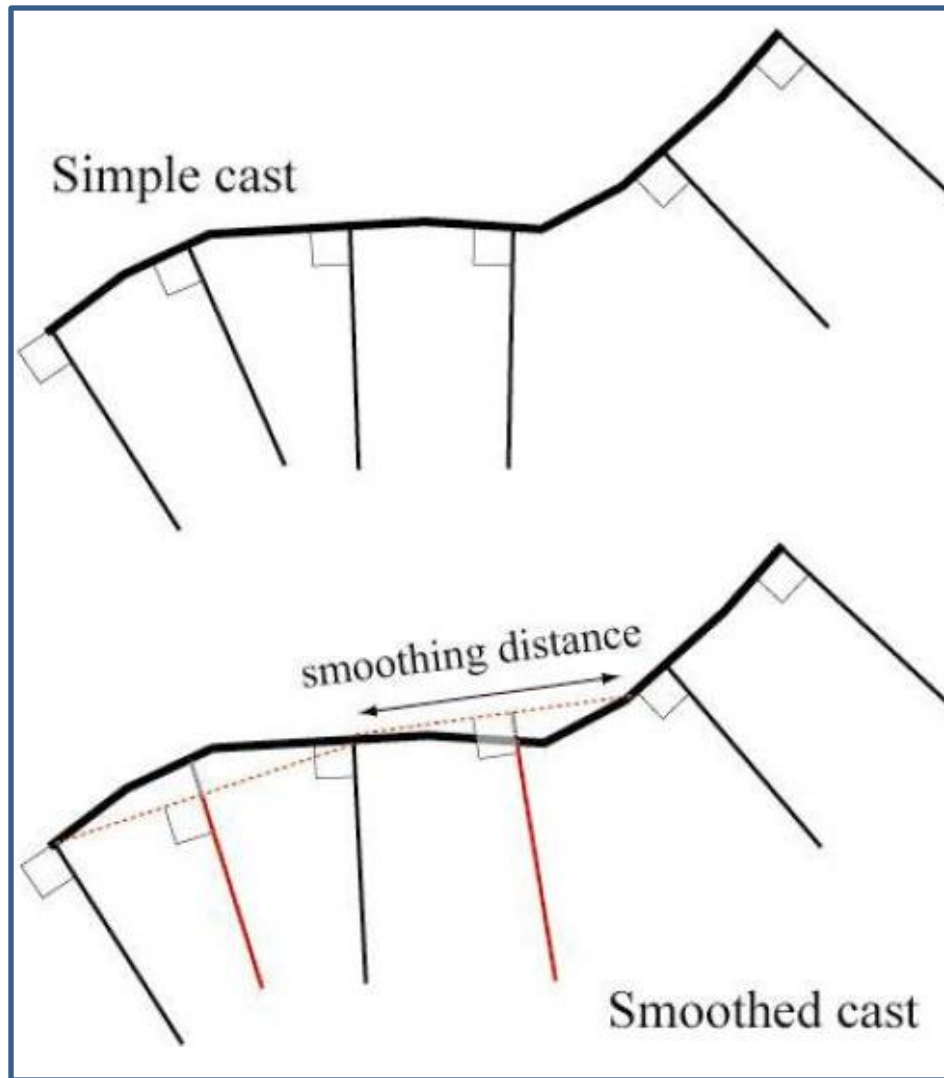
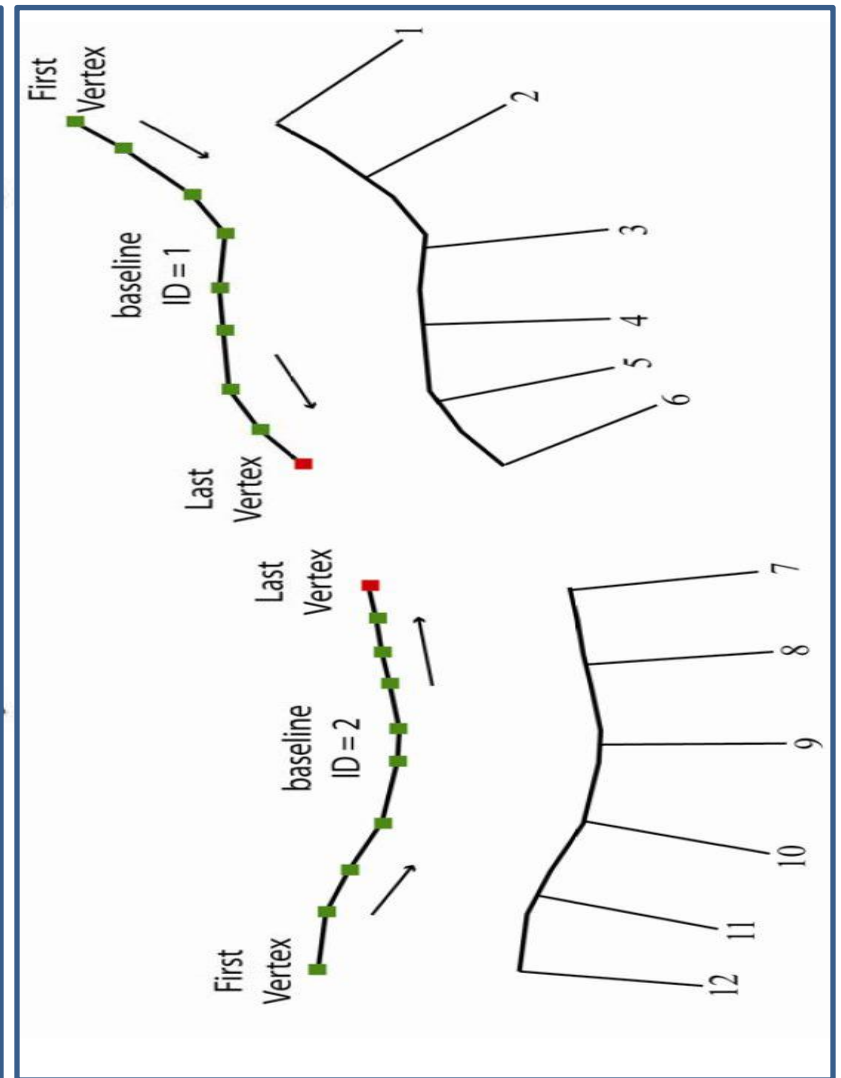
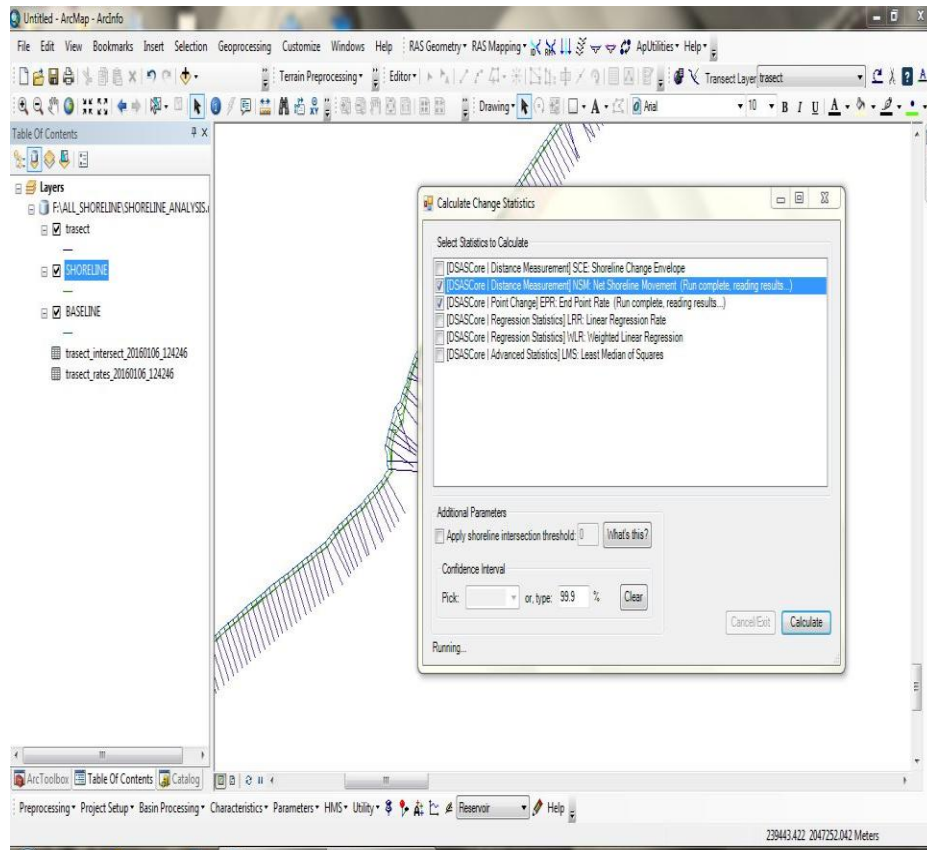


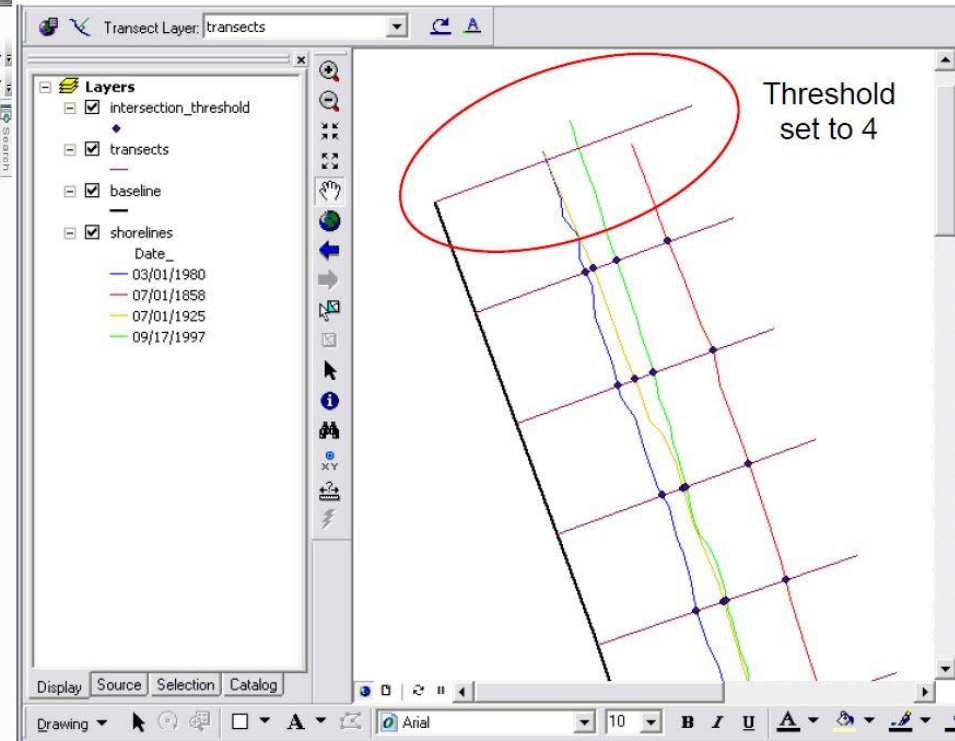
Illustration of simple and smoothed transect casts.



Transect order based on ID number

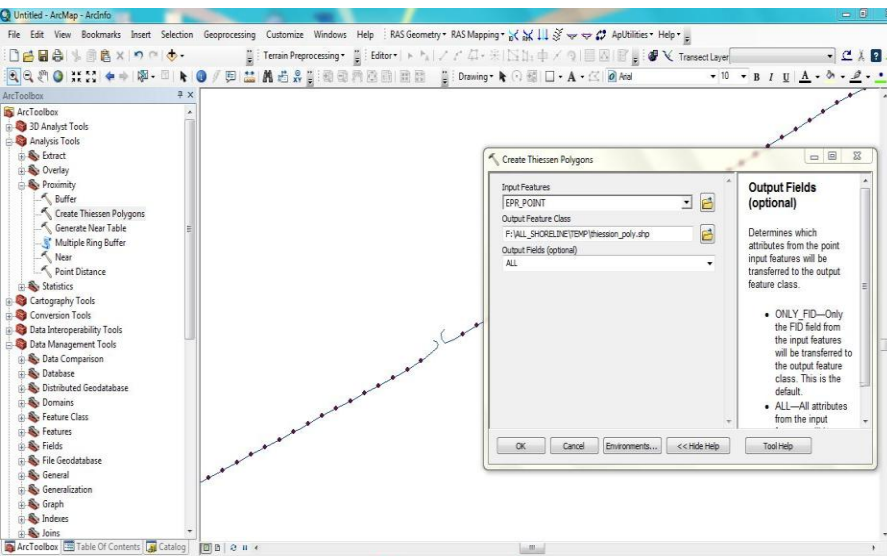


EPR statistics calculation

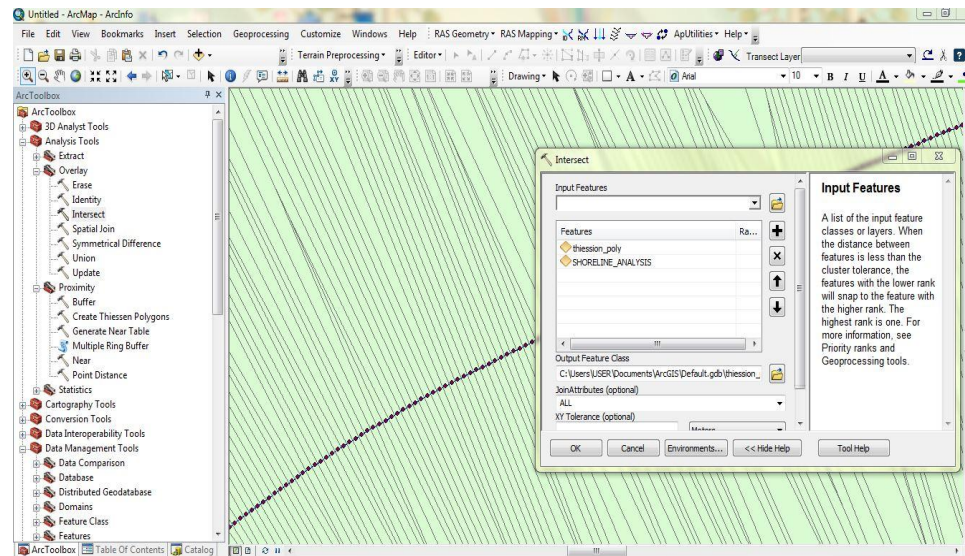


Screenshot of ArcMap project illustrating the transect-shoreline intersection points used in selected rate-change calculations.

Transfer EPR value into Shoreline

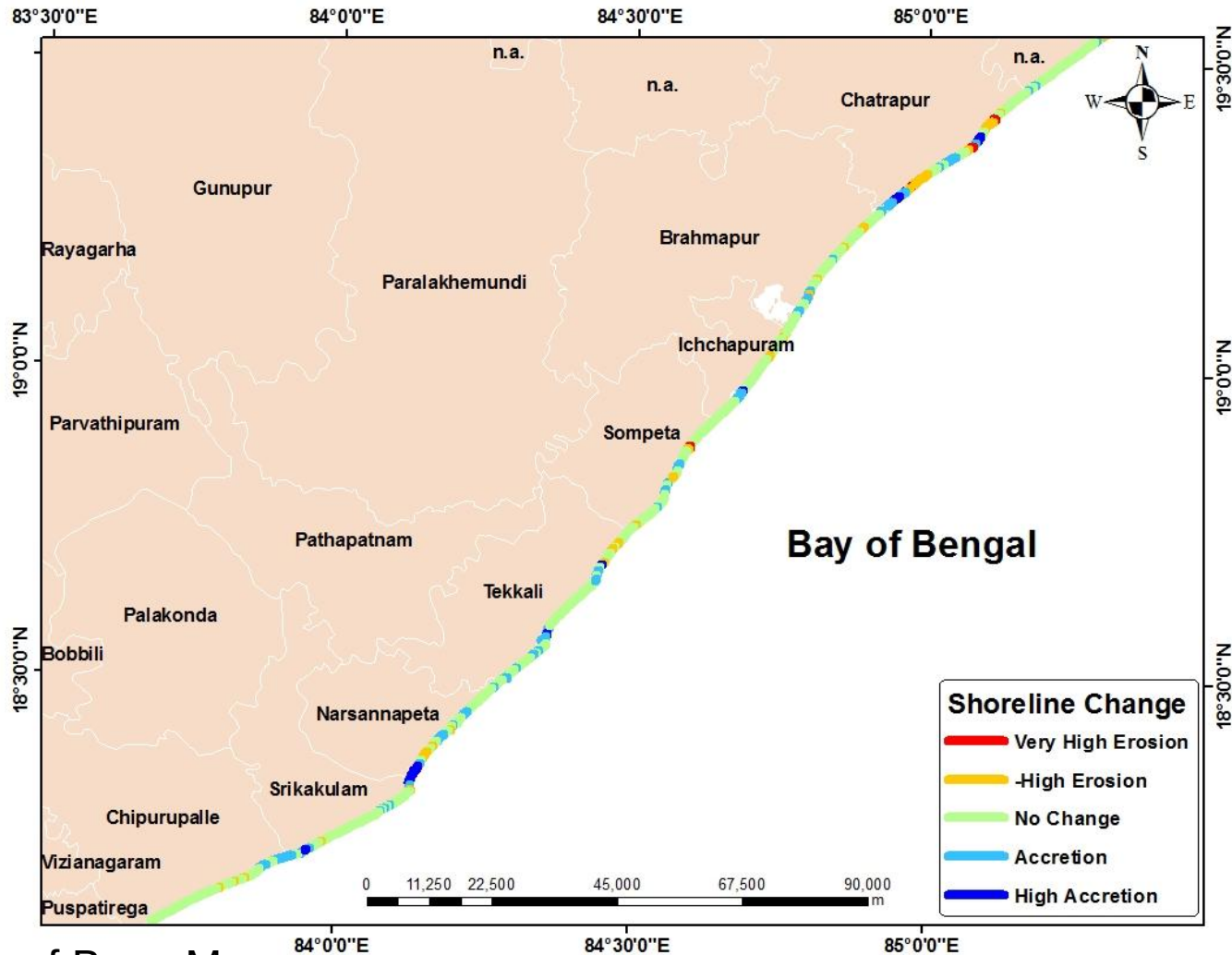


Convert transect line to Vertices point then
Create Thiessen Polygon



Intersect Thiessen polygon and Shoreline

Shoreline Change Map



Generation of Base Map:

- Click on Layout View → Right click on layout window → go to properties and click on grid.
- Insert → click on legend, North Arrow and scale bar and other marginal details.
- File → export map to generate final Shoreline Change map

Thank you