

# SHORE LINE CHANGE ATLAS OF THE INDIAN COAST

(Volume – 1)

## Gujarat, Daman and Diu



**Space Applications Centre (ISRO)  
Ahmedabad 380015**

**and**

**Coastal Erosion Directorate, Central Water Commission,  
Ministry of Water Resources,  
Govt. of India, New Delhi 110606**

**May, 2014**

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Abstract	This Atlas comprises of shoreline change maps prepared using satellite data of 1989-91 and 2004-06 time-frame on 1:25,000 scales for the entire country (Volume – 1 show maps of Gujarat, Daman and Diu). The maps show eroding, stable and accreting coast. Data used, methodology, results, area under erosion and accretion and status of coastal protection measures are briefly described.
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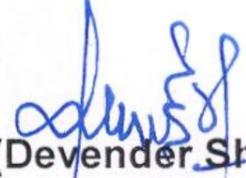
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## PREFACE

Coastal erosion is one of the most significant coastal hazards leading to loss of valuable land and property along the coastal zone. It is serious problem for the Indian coast, especially during monsoon and cyclonic storms and storm surge events. Developmental activities along the coast as well in the catchment areas of rivers draining into the sea cause changes in the equilibrium of sediment transport along the coast and induce coastal erosion. Climate Change and consequent threat due to predicted sea level rise is expected to further accelerate coastal erosion. Measures have been undertaken for protecting the coast by maritime States and Union Territories of the country at several places. It is required that a proper inventory of current status of coastal erosion and protection measures undertaken so far be made, so that effective planning for protecting the coast can be carried out.

Due to dynamic nature of the coast, baseline data at National level on current status of coastal erosion as well measures taken by maritime States and UTs is lacking and it is in this context and based on recommendations of Coastal Protection and Development Advisory Committee (CPDAC), present work of preparation of Shoreline Change Atlas of India has been undertaken by the Space Applications Centre (ISRO), Ahmedabad and Coastal Erosion Directorate of Central Water Commission (CWC), Ministry of Water Resources, New Delhi. The shoreline change maps depict changes mapped on 1:25,000 scale using satellite images of 1989-91 and 2004-06 time frame and status of coastal protection measures taken up by maritime states and Union Territories. The entire database is digitized and put under GIS platform. The Atlas is brought out in Six Volumes and highlights type of satellite data used, methodology adopted and salient observations.

This Atlas provides a baseline data for initiating appropriate action for protecting the Indian coast by concerned maritime States and Union Territories besides use by the scientific community as well decision makers of the country. I appreciate efforts put by all those who have made contributions to this significant task.

  
(Devender Sharma)

Member (RM), CWC &  
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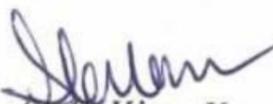
## **Foreword**

Coastal Zone is one of the most fragile and dynamic ecosystem having the interface of sea and land. Interactions between various natural processes and human activities are important factors in the coastal areas. About 40% of the world's population lives within 100 km of the coastline and this proportion is increasing. There has been increasing anthropogenic pressure on the coastal ecosystem. In addition, the coastal ecosystems are vulnerable to natural phenomenon such as waves, tides, storm surges, erosion etc.

India has a long coastline of 7516 km including that of its Island territories. Coastal Zone in India, assumes its importance because of high population pressure, development of various industries and spurt in recreational activities, exploitation of renewable and non renewable natural resources, discharge of waste effluents and municipal sewage etc. Periodic storms and cyclones as well as erosion further adds to the problems in the coastal areas. In view of the dynamic nature of the coast, it needs to be monitored regularly.

Taking appropriate coastal protection measures require spatial information on the status of the shoreline and its dynamic behavior including the areas undergoing erosion and accretion. The spatial information on the change in shoreline over a period of time and the associated processes active along the Indian coast are not available. Thus, Space Applications Centre, at the behest of Central Water Commission, Ministry of Water Resources, Government of India has taken up the task of preparation of shoreline change inventory of Indian coast based on maps prepared using satellite data of 1989-91 and 2004-06 on 1:25,000 scale. These maps depict areas under erosion, accretion as well as stable coast. In addition, the status of coastal protection measures taken by states are also depicted. This is for the first time a spatial inventory on shoreline changes using satellite data has been created for the entire country.

I am sure, the present atlas will be useful to the scientific community and decision makers in investigating the coastal changes as well as in taking appropriate action for protecting the Indian coast and thus will go a long way in conserving the coastal environment of the country. I would like to place on record my deep appreciation to all those who have made contributions for the success of this project.

  
(A.S. Kiran Kumar)

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The baseline data on coastal landuse including delineation of HTL and LTL on 1:25,000 scale has been prepared for 1989-91 and 2004-06 time-frames using satellite data under two separate projects funded by Ministry of Environment and Forests (MoEF), Government of India, New Delhi. We gratefully acknowledge the funding support provided by MoEF and to all the participating agencies who have contributed in these projects.

The project on preparation of shoreline change for the Indian coast has been carried out jointly by Space Applications Centre and Central Water Commission, Ministry of Water Resources (MWR), Government of India. Ministry of Water Resources (MWR), Government of India is thankfully acknowledged for providing funds for preparing A-3 size Shoreline change Atlas of India using the available baseline data. We are thankful to Chairman CWC for his guidance and support. Our special thanks are due to Chairman and Members of Coastal Protection and Development Advisory Committee (CPDAC) for necessary support. Sub-Committee members of the Coastal Atlas are acknowledged for their useful suggestions and time to time guidance. Special thanks are to Director, Coastal Erosion Directorate, Central Water Commission, Ministry of Water Resources for his constant support and organizing collection of coastal protection measures data from all the maritime States and U.T. of India.

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## INTRODUCTION

Coastal zone is the area of interaction between land and sea. It includes both terrestrial as well as marine resources, which are renewable as well as non-renewable. In addition, interactions between various natural processes and human activities are important factors in the coastal area. India has a long shoreline of about 7500 km including its island territories. Coastal zone in India assumes its importance because of high productivity of its ecosystems, concentration of population, exploitation of natural resources, discharge of waste effluent and municipal sewage, development of various industries, increasing load on harbors, spurt in recreational activities and above all petroleum exploration activities.

The destruction and loss of land due to sea erosion is a severe problem, particularly for a country like India facing explosive population growth. Shoreline is a dynamic geomorphological entity, which responds to the external forces exerted by waves, tides, nearshore currents and the resultant sediment transport. When the resultant sediment transport entering a particular area is greater than the sediment going out from the area, accretion or beach development takes place. On the other hand, when there is a deficit of the incoming sediment supply into a particular area with reference to the sediment going out of the same area, beach erosion takes place. Beaches act as constant absorbers of the wave energy of water and though subject to small disturbances, remain in equilibrium. However, sometimes this equilibrium gets disturbed due to either natural phenomena or human intervention. When shore structures are constructed, it is quite likely that equilibrium condition is altered. Since this can cause considerable damage and reduce the effectiveness of such structures, it is necessary to study the equilibrium condition of shores before constructing such structures. Therefore, it is of utmost importance to get information on accreting, eroding and stable coasts so that effective measures to combat sea erosion may be taken.

Major concern of coastal zone management is to ensure a rational development of area and judicious use of its resources, which is consistent with the surrounding natural systems and environment. Environmentally effective policy decisions pertaining to coastal zone management depends upon accurate and comprehensive scientific data. A basic problem confronting our country is limited availability of geographic data on coastal zone. Accurate and updated scientific data is required on coastal wetlands/landform/land use, shoreline changes, sediment transport and water quality of near shore waters.

Satellite data have proved to be extremely useful in creating baseline inventory of the entire Indian shoreline at 1:250,000, 1:50,000 and 1:25,000 scale (Nayak et al. 1991, SAC, 2012). The prepared landuse/wetland maps show

wetland features between high and low water lines and land use features of the adjoining shore (up to 1.5 km from high waterline).

Coastal Protection and Development Advisory Committee (CPDAC) constituted by Ministry of Water Resources, Govt. of India in April, 1995 is the apex body responsible for formulating policies/ programmes, providing technical guidelines, monitoring, reviewing and co-ordinating coastal zone protection and developmental activities executed by different Central and State Departments along the Indian coastline. The committee recommended the need for preparation of Coastal Atlas showing information related to coastal erosion derived from satellite data and protection measures undertaken by all maritime states of India. A subcommittee was constituted for the purpose. The subcommittee met several times, discussed and finalised the contents of the Atlas. It was decided that shoreline change atlas of the entire Indian coast would be prepared based on Highest High Tide Line depicted on coastal landuse/landcover maps of 1989-91 and 2004-06 time-frame on 1:25,000 scale. The baseline data has been generated under two projects funded by Ministry of Environment and Forests (MoEF) with Space Applications Centre, Ahmedabad as a nodal agency with active participation of several related Central & State Government Departments and Academic Institutes.

The entire database of coastal thematic maps prepared using satellite data for the period 1989-91 and 2004-06 time-frames has been digitised and put as part of Coastal Zone Information System (CZIS) in GIS environment developed at Space Applications Centre (ISRO), Ahmedabad. Coastal Zone Information System for entire India (CZIS-India) is developed to include and update all the coastal information viz. landuse, wetland, shoreline, coral reef etc. for all maritime states including Union Territories in ARC/INFO environment. The information is catalogued as per Survey of India topographical map indexing. This data has been used as a baseline data for preparing the shoreline change atlas of India.

The major task involved preparation of a digital shoreline change atlas in GIS environment using existing databases of coastal landuse/landcover maps prepared on 1:25,000 scale (1989-91 and 2004-06 time-frame), depict and quantify shoreline changes as eroding/accreting/stable, show status of shoreline protection measures taken by respective States and generate A3 size State-wise Coastal Atlas of all the maritime states of India.

The detailed tasks taken up are:

- i. Quantify and classify the shoreline as shoreline under erosion, stable and accretion for all the maritime states by integrating shoreline using existing database of 1989-91 and 2004-06 period.

- ii. Integrate the field information on coastal erosion and shoreline protection measures of all the maritime states of India in GIS environment.
- iii. Analyse satellite data of 2011-12 period for selected hotspot areas (areas showing large shoreline changes) and understand coastal processes responsible for such changes.
- iv. Generate Six Volumes of A-3 size coloured digital as well as hard copy Coastal Atlas of India (Volume 1 covering Gujarat, Daman & Diu, Volume 2 covering Maharashtra & Goa, Volume 3 covering Karnataka & Kerala, Volume 4 covering Tamilnadu, Puducherry & Andhra Pradesh, Volume 5 covering Odisha & West Bengal and Volume 6 covering Lakshadweep & Andaman & Nicobar islands).

## DATA USED

Primarily, landuse/landcover maps on 1:25,000 prepared using IRS-P6 LISS-IV data of 2004-06 period and SPOT-1 & 2 Multispectral and IRS-1A & IRS-1B LISS-II data of 1989-91 period available at Space Applications Centre, Ahmedabad have been utilized. In few cases where suitable data were not available, the data of nearest time frame were used. These maps depict shoreline as Highest High Tide Line (HTL) and Low Tide Line (LTL). Shoreline changes with respect to Highest High Tide Line have been taken up for the present work. The entire database has been put in GIS environment as part of Coastal Zone Information System (CZIS) developed at Space Applications Centre (ISRO), Ahmedabad. Landsat TM, ETM and Resourcesat-1 AWiFS data of corresponding time frames was used for rechecking and confirming the continuity of HTL in adjoining map sheets. Status of coastal protection measures taken up by respective maritime states and UT were prepared in spatial format and were put in the GIS database.

List of the satellite data used is summarised in the Annexure-III (Table 2 and Table 3).

The status of coastal protection measures taken up by maritime states and UTs was provided by them through Central Water Commission (CWC), New Delhi. These were prepared in spatial format and were put in the GIS database. Details are provided in Annexure-III (Table 4 and Table 5).

## METHODOLOGY

Following steps were undertaken:

- i. The existing Coastal Zone Information System (CZIS) developed at Space Applications Centre (ISRO), Ahmedabad has been primarily used. Coastal landuse maps for the entire Indian coast prepared on 1:25,000 scale for 1989-91 and 2004-06 time-frame available in CZIS have been used for shoreline change mapping.
- ii. National Spatial framework from NRDB has been used for organizing and creating the database. The basic framework of CZIS-India is prepared for all maritime states and Union territories of India on 1:25,000 scale. One degree consists of 8X8 rectangular grids or cells. Each rectangular grid or cell represents one SOI topographic area on 1:25,000 scale (M.C Gupta et al., 2000).
- iii. Spatial layer of Line (LN25) of 1989-91 time-frame (containing High Water Line, rail, road, drainage) has been taken from the CZIS database.
- iv. Spatial layer of Line (LN25N) of 2004-06 (containing High Water Line, rail, road, drainage) has been taken from CZIS database.
- v. Spatial layer of Point of habitation has been taken from CZIS database.
- vi. Registration of two time-frame data sets considering rail, road and HTL of 1989-91 as base has been done.
- vii. Output spatial layer showing shoreline changes using overlay of rectified coverage and base coverage is created.
- viii. Maps were rechecked using Landsat TM, ETM, AWiFS and LISS-IV data to make it seamless in database.
- ix. Polygons for areas under erosion and accretion were created.
- x. Areas under erosion and accretion were measured for the main shoreline (excluding creeks, river mouths, estuaries). Shore length under erosion, accretion and stable categories were measured for the main shoreline (excluding creeks, river mouths, estuaries).
- xi. A table containing all the above statistics has been generated for each maritime state and U.T.

- xii. Status of shoreline protection measures have been depicted as per the information provided by the maritime State/UT agencies through Central Water Commission.
- xiii. A standard map composition and layout were finalised and have been used for final map composition of each map.
- xiv. Field checks were carried out and based on field observations, corrections were incorporated while finalizing the map. Field photographs were also taken during the field visits.

Accuracy Assessment: Classification as well as planimetric accuracy of the maps was assessed while carrying out the field work. Overall the classification accuracy of these maps range from 90-95% at 90% confidence level. The Planimetric Accuracy of these maps is 6.25 m as per Survey of India (SOI) standard.

- xv. Hotspots were identified based on the magnitude of shoreline dynamics. Recent satellite images (2011-12) were acquired and analysed.
- xvi. Finalised maps depicting shoreline changes were utilized for preparing shore line change Atlas of the Indian coast (Six Volumes). Volume 1 covers Gujarat, Daman & Diu, Volume 2 covers Maharashtra & Goa, Volume 3 covers Karnataka & Kerala, Volume 4 covers Tamilnadu, Puducherry & Andhra Pradesh, Volume 5 covers Odisha & West Bengal and Volume 6 covers Lakshadweep & Andaman & Nicobar islands. Digital Atlas in form of CD was prepared.

## RESULTS

### Gujarat

Gujarat coast is the northern part of west coast of India located between  $20^{\circ} 00'$  -  $24^{\circ} 45'$  N latitudes and  $68^{\circ} 00'$  -  $73^{\circ} 30'$  E longitudes. It is the longest coast amongst the nine coastal states of India. It is bounded by the Arabian Sea in the west and has two Gulfs i.e. Gulf of Khambhat aligned in N-S direction and Gulf of Kachchh aligned in the E-W direction. The two major indentations, Gulf of Kachchh and Gulf of Khambhat, account for over 60 percent of the coastline. The tidal range upto 8-11 m is observed with strong tidal currents in these regions. These regions show wide intertidal zone. In general, the coast is characterized with wider continental shelf and vast stretches of saline and tidal mudflats. Tide dominating, wave dominating and fluvio-marine coastal processes have shaped the major coastal landforms viz., sub-tidal mudflats, inter-tidal mudflats, high-tidal mudflats, palaeo-mudflats, shoals, islands, salt flats, salt marshes, beaches, sand dunes, coastal plains, creeks, estuary, mangroves, coral reefs, coral islands, rocky/cliffy coasts etc. Besides the natural coastal processes, large industrial and developmental activities along the coast such as salt industries, cement industries, oil & natural gas exploration, brackish water aquaculture, ports and harbours is altering the coastal landforms, land use and land cover causing changes in the coastal dynamics and shoreline changes.

The shoreline of Gujarat is 1482.14 km (It does not include length of mouth of estuary, rivers, creeks and their inner parts) and is the longest shoreline among all the maritime states of India. It is observed that 486.43 km length of the Gujarat coast has eroded, 297.99 km has accreted and 697.71 km has been stable during the time frame 1989-91 and 2004-06 (Table-1, Fig. 1). The total area eroded is 27.28 sq km and area accreted is 43.45 sq km (Table-1). Details for each individual map sheet are provided in Table-1.

Five regions along Gujarat coast are identified based on coastal processes, coastal configuration, geological and geomorphological characteristics and shoreline dynamics viz., coastal stretches along North-West parts of Gujarat coast in Kachchh district, the Gulf of Kachchh coast, the Southern Saurashtra coast, the Gulf of Khambhat coast and South Gujarat coast.

Coastal stretches along North-West parts of Gujarat coast mapped for the purpose of shoreline changes include coastal segment of Lakhpat – Jakhau-Mandvi region in Kachchh district. Kori Creek is the westernmost part of the Gujarat coast. It forms parts of the lower Indus deltaic plain. The adjoining coast is characterised by a network of tidal creeks with luxuriant mangroves. Coast from Lakhpat upto Mandvi shows eroding, accreting and stable nature. Area adjoining Lakhpat upto Narayan Sarovar forms eastern parts of the Kori creek. Area south of Narayan Sarovar upto Jakhau is eroding with few

segments under accretion (Map Sheet No. 41A11NW, 41A11SE). Area from Jakhau upto Mandvi shows predominantly stable nature (Map Sheet No. 41A12NE, 41A12SE, 41A16SW, 41F01NW, 41F05SW). Plate 1 shows 2011-12 LISS-IV images overlaid with HTL for the time frame 1989-91 and HTL of 2004-06, showing the stable and eroding coastal stretch near Mandvi (Map sheet no. 41F05SW). Plate 12 shows field photograph depicting stable nature of beach at Mandvi.

The Gulf of Kachchh coast extends from Mandvi (Kachchh district) upto Okha (Jamnagar district). The shoreline of the Gulf of Kachchh has extensive mudflats with a large area under mangroves and coral reefs. Some of its coastal stretches with rich biodiversity (coral reefs and mangroves in particular) are protected such as Marine National Park in the Gulf of Kachchh. The coast is also showing a large number of developmental activities with construction of ports, harbors, jetties, pipe lines, industries, salt pans etc. There are few seasonal small rivers draining into the Gulf of Kachchh. Tidal range upto 8 m with strong tidal currents have formed extensive inter-tidal coastal landforms along major parts. In general the coast is stable (Map Sheet No. 41F11NE, 41J02SE, 41F03NE, 41F03NW) with minor segments under erosion and accretion (Map Sheet No. 41F13NE, 41F13SW, 41F09SE, 41F09SW, 41F05SE, 41F15NW, 41F11SW and 41F07SE). LISS-IV image of 2011-12 is overlaid with HTL of 1989-91 and 2004-06 near Sachana (Map Sheet no. 41J02SE; Plate 2) and at Positra (Map Sheet no. 41F0NE; Plate 3) showing eroding and stable coastal length of the Gulf Kachchh.

Saurashtra coast is in general rocky and wave dominating. Bhader, Ojat and Shetrunji are major rivers draining into the Arabian Sea and is further divided into two sectors based on coastal geomorphic features and coastal alignment viz coastal line from Okha (Map sheet No. 41F03NW) to Veraval (Map sheet No. 41L05NW) trending NW-SE and from Veraval to Gopnath (Map sheet No. 46C04NW) trending NE-SW. Coast from Okha to Veraval is less indented and linear with narrow strips of sandy beaches and small inlets. The coast is fringed with degraded coral reefs (Plate no. 13-14) near Okha. Tetra-pod protection structures are laid near Dwarka (Map sheet No. 41B16NE, Plate no. 15). Coast is characterized with corals, algae and sponges along its rocky substratum in region south of Dwaraka Temple, at Baradia (Map sheet no. 41F04NW) (Plate no. 16-18). Plate 19 and 20 shows stable nature of coast near Okhamadhi (Map Sheet no. 41F04SW) where as at Navadra (Map sheet no. 41G05NW), towards the sea side, rocky substratum are observed (Plate no. 21). Mangroves are observed at the creeks near Kuchhdi (Map sheet no. 41G10NW, Plate no. 22) and to its south at Oddar (Map sheet no. 41G10SE), coast is of rocky in nature (Plate no. 23). Further south, near Pata (Map sheet no. 41G15SE), sea shore is observed with potholes filled with algae and shells (Plate no. 24-25) and cliff with wave cut caves and pocket beaches are observed (Plate no. 26-28). The breakwater constructed for Mangrol Port (Map

sheet no. 41K04SW) is shown in Plate no. 29. The entire coast between Okha to Veraval is observed to be stable where marginal dynamics of accretion and erosions are observed along the mouths of creeks/rivers (Map sheet No. 41B15SE, 41G05SW, 41G10NW, 41G10SE). LISS-IV image of 2011-12 is overlaid with HTL of 1989-91 and 2004-06 near Porbandar (Map Sheet no. 41G10NW; Plate 4) showing stable coastal length.

The coastal segment between Veraval to Gopnath is highly indented and is predominantly stable in nature. Accretion is observed to the south of Mul Dwaraka (Map sheet no. 41L09SE), due to the construction of Breakwater. At Mul Dwaraka the coast is characterized by rocky coast with algal growth (Plate no. 30). Stable coast is observed at Sarkhadi (Map sheet no. 41L14NW) characterized with beach, coastal promontory and dune ridges (Plate no. 31-32). Long stretches of cliffs are observed at Balana (Map sheet no. 41P05SW, Plate no. 33). Accretions are observed at Babarkot (Map sheet no. 41P05SE) and to east of Varahsvarup (Map sheet no. 41P05NE), mainly due to anthropogenic causes. The coast is rocky in nature at Kalsar (Map sheet no. 41O16SE) where wave cut caves are observed along the rocky cliffs (Plate no. 34). Wide beaches are observed at Uncha Nicha Kotda (Map sheet no. 41O16NE), with minor erosion near mouth of the creek (Plate 35-36). The creek near Uncha Nicha Kotda is characterized with mangroves and marshes (plate 37-39). In general the entire coast is stable with slight erosion and accretions observed at few pockets, probably due to anthropogenic causes. LISS-IV image of 2011-12 is overlaid with HTL of 1989-91 and 2004-06 near Diu (Map Sheet no. 41L14NE; Plate 5) and Madhuvan Map Sheet no. 46C04NW; Plate 5) showing stable coastal length.

The Gulf of Khambhat coastal segment extending from Gopnath (Bhavnagar district) in west to Surat in east and shows shoreline dynamics around river mouths or estuaries in general. Extensive mudflats indicating large inter-tidal zone are observed. Mangrove patches along Bhavnagar coast and salt pans at several coastal segments are observed. It is observed that western part of the Gulf of Khambhat shows stable to accreting nature from Sultanpur upto the Sabarmati estuary and the eastern part shows coastal segments with erosion around mouths of major rivers like the Mahi, the Tapi and the Narmada. Along the main coastline, major areas under erosion occur in coastal segments of Bharuch district (Map Sheet No. 46B12NW, 46B12SW, 46C10NW). Plate 7 shows eroding areas south of Dahej (Map Sheet No. 46C10NW). Plates 40-43 show eroding areas along northern parts of Narmada estuary, south of Dahej, Bharuch district (Map Sheet No. 46C10NW).

The South Gujarat coast, extending from Olpad taluka (Surat district) upto Umargam (Valsad district) in south is comparatively uniform and broken by few indentions. This region is mostly under the influence of strong tidal currents accompanied by wave action. Narrow sandy beach is present between the

Mindhola and the Purna rivers and extends up to Daman. Heavy minerals, quartz and mica make up the beach sand. Along the estuaries of the Mindhola, the Purna, the Ambica, the Auranga and the Damanganga, mudflats are with marsh and mangrove vegetation. Numerous small tidal creeks also occur along the coast. South of the Auranga estuary, coast is rocky.

South Gujarat coast shows major erosion all along from Dandi in Surat district to Umargam in Valsad district for around 140 km (Map Sheet No. 46C11SE, 46C12SE, 46D13NW, 46D13SW, 46D14SE, 46D15NW, 46D12NE). It has been observed that the entire alluvium cover has been eroded, exposing bed rocks at several places. Casuarina is planted at several locations to check erosion. However continued erosion has led to uprooting at few locations. Several segments of the South Gujarat coast have been protected by means of sea walls and rubble dumping. The eroding nature of these areas and protection measures constructed is depicted in Plates 44-52. Some of the coastal segments have been identified as hot spots due to the magnitude and severity of the shoreline changes. Satellite data of 2011-12 period for these regions have been acquired and analysed to understand coastal processes responsible for such changes. Plates 8 to Plate 11 show these hotspot areas like; north of Purna Estuary, Onjal, Kosamba and Tithal in South Gujarat. The large scale erosion all along the coast is due to changes in the river discharges, strong tidal currents and wave actions particularly during monsoons. In addition tectonic movements and probable sea level rise may have accelerated the erosion.

Table-1: Map sheet wise results of shoreline changes for 1989-91 and 2004-06 time-frame for Gujarat coast.

Sr. No.	Map Sheet No.	Erosion Area (sq. km)	Erosion Length (km)	Accretion Area (sq. km)	Accretion length (km)	Stable Length (km)
1	41A11NW	0.96	12.82	0.56	9.59	0
2	41A11SW	0.1	1.66	0.15	2.27	0
3	41A11SE	0.41	10.27	5.04	16.01	0
4	41A12NE	1	12.81	13.38	23.43	9.78
5	41A12SE	0	0	0	0	6.2
6	41A16SW	0	0	0.01	0.64	14.31
7	41A16SE	0.14	3.37	0	0	0
8	41B13NE	0.25	8.18	0.03	2.96	0
9	41F01NW	0.01	1.75	0	0	15.48
10	41F01NE	0.03	0.62	0	0	0
11	41F01SE	0.56	12.56	0.04	3.33	0
12	41F05SW	0.05	0.78	0.18	6	5.85

13	41F05SE	0.63	18.97	1.74	30.98	0
14	41F13SE	0.05	0.51	0.03	1.08	0
15	41F13NE	0.89	15.27	0.86	14.45	0
16	41J01NW	0.52	13.76	1.59	19.65	0
17	41J05SE	0.3	16.07	0.19	15.03	0
18	41J06NW	0.27	4.32	0.6	7.42	0
19	41J02NE	0.12	3.07	0.07	1.69	0
20	41J02SE	0.16	5.7	0	0	11.75
21	41J02SW	0.38	5.79	0.03	1.98	6.46
22	41J03NW	0.1	1.98	0	0	1.88
23	41F15NE	0.84	16	0.33	4.05	2.35
24	41F15NW	0.34	5.96	0	0	4.42
25	41F11NE	0.08	1.22	0	0	16.41
26	41F11SE	0	0	0	0	5.78
27	41F11SW	0.71	6.87	0.36	5.9	9.66
28	41F07SE	0.79	5.12	0	0	9.46
29	41F07SW	1.52	12.77	0	0	0
30	41F03SE	0.53	10.39	0.11	3.95	2.09
31	41F03NE	0	0	0	0	15.84
32	41F03NW	0.02	2.08	0.11	5.72	8.98
33	41B15NE	0.03	3.50	0.04	2.85	3.01
34	41B15SE	0.03	0.95	0.01	0.42	15.55
35	41B16NE	0.00	0.00	0.00	0.00	8.60
36	41F04NW	0.00	0.00	0.00	0.00	10.06
37	41F04SW	0.00	0.00	0.00	0.00	10.16
38	41F04SE	0.00	0.00	0.00	0.00	8.42
39	41G01NE	0.00	0.00	0.00	0.00	11.15
40	41G05NW	0.00	0.00	0.00	0.00	8.51
41	41G05SW	0.05	0.68	0.02	0.90	7.20
42	41G05SE	0.00	0.00	0.00	0.00	11.93
43	41G06NE	0.00	0.00	0.00	0.00	6.34
44	41G10NW	0.02	0.97	0.04	0.72	14.71
45	41G10SW	0.00	0.00	0.00	0.00	1.39
46	41G10SE	0.10	2.06	0.00	0.00	16.14
47	41G11NE	0.00	0.00	0.00	0.00	1.69
48	41G15NW	0.00	0.00	0.00	0.00	15.11
49	41G15SW	0.00	0.00	0.00	0.00	3.88
50	41G15SE	0.00	0.00	0.00	0.00	14.10
51	41G16NE	0.00	0.00	0.00	0.00	6.25
52	41K04NW	0.00	0.00	0.00	0.00	11.70

53	41K04SW	0.00	0.00	0.00	0.00	6.73
54	41K04SE	0.00	0.00	0.00	0.00	14.57
55	41L01NE	0.00	0.00	0.02	0.47	2.75
56	41L05NW	0.00	0.00	0.00	0.00	16.91
57	41L05NE	0.02	0.65	0.02	1.11	4.30
58	41L05SE	0.00	0.00	0.00	0.00	11.73
59	41L09SW	0.00	0.00	0.00	0.00	15.85
60	41L09SE	0.00	0.00	0.08	1.23	5.49
61	41L10NE	0.00	0.00	0.00	0.00	7.79
62	41L14NW	0.00	0.00	0.00	0.00	17.35
63	41L14NE	0.00	0.00	0.00	0.00	20.22
64	41P02NW	0.01	0.35	0.00	0.00	11.20
65	41P01SW	0.00	0.00	0.01	0.35	4.28
66	41P01SE	0.09	5.11	0.00	0.00	10.22
67	41P05SW	0.03	1.97	0.00	0.00	13.24
68	41P05SE	0.00	0.00	0.10	3.51	3.59
69	41P05NE	0.02	0.73	0.66	1.87	7.94
70	41P09NW	0.06	2.94	0.15	0.86	10.40
71	41P09NE	0.10	4.95	0.00	0.00	2.90
72	41O12SE	0.06	3.37	0.00	0.00	3.72
73	41O16SW	0.01	0.87	0.02	1.23	19.32
74	41O16SE	0.01	0.27	0.00	0.00	13.37
75	41O16NE	0.01	0.61	0.00	0.00	3.13
76	46C04NW	0.13	6.18	0.03	3.06	12.99
77	46C03SW	0.37	4.45	0.16	3.87	0
78	46C03SE	0.17	4.04	0.18	4.96	0
79	46C03NE	0.36	15.2	0	0	0
80	46C07NW	0.01	0.97	0	0	0
81	46C06SW	0.39	15.48	0	0	0
82	46C06NW	0	0	0	0	6.81
83	46C02NE	0.18	2.01	0	0	12.18
84	46C01SE	0.91	2.86	1.01	3.01	12.45
85	46C01NE	0	0	0.92	4.12	11.76
86	46C01NW	0	0	0	0	10.4
87	46B04SE	0	0	0.79	5.5	28.7
88	46B08NW	0	0	0	0	12.01
89	46B04NE	0	0	0	0	6.82
90	46B07SW	0	0	1.83	10.48	3.98
91	46B07NW	0	0	0.25	1.89	4.83
92	46B07NE	0	0	0	0	4.53

93	46B07SE	0.27	4.97	1.44	9.62	5.92
94	46B12NW	1.21	15.73	0.02	1.84	0
95	46B12SW	1.3	12.8	0.3	3.23	0
96	46C09NW	0.32	4.14	2.69	13.58	0
97	46C09SW	0.23	1.2	2.98	9.74	0
98	46C09SE	0.16	0.75	2.61	9.12	0
99	46C10NW	0.92	8.79	0.3	3.01	0
100	46C10SE	0	0	0.91	11.29	0
101	46C11NE	0.65	12.98	0.27	4.36	0
102	46C11SE	0.69	18.43	0	0	0
103	46C12NE	1.04	15.06	0	0	0
104	46C12SE	0.64	11.15	0	0	0
105	46D09NE	0.19	5.44	0	0	0
106	46D13NW	0.51	9.26	0	0	0
107	46D13SW	0.49	8.65	0	0	0
108	46D14NW	0.25	8.8	0	0	0
109	46D14NE	0.03	0.87	0	0	0
110	46D14SE	0.88	13.14	0.01	0.2	0
111	46D15NW	0.49	10.15	0.18	3.46	3.49
112	46D11SE	0.02	0.85	0	0	0
113	46D15SW	1.19	16.29	0	0	1.24
114	46D12NE	0.89	15.14	0	0	0
	<b>TOTAL</b>	<b>27.28</b>	<b>486.43</b>	<b>43.45</b>	<b>297.99</b>	<b>697.71</b>

Figure 1 shows the accreting length, eroding length and stable shoreline of Gujarat coast.

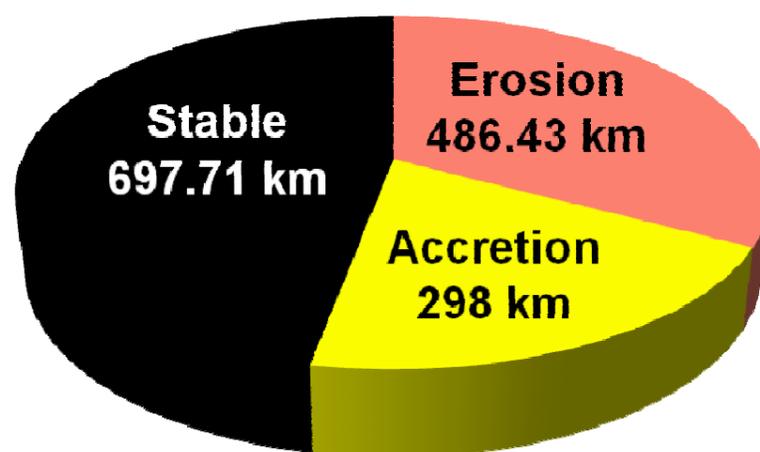


Figure 1: Status of coastal erosion, accretion and stable nature of Gujarat coast (Total coastal length of 1482.14 km does not include length of mouth of estuary, rivers, creeks and their inner parts).

## **END USE**

The Atlas can be used as a reference material for obtaining information on status of shoreline changes during 1989-91 and 2004-06 time-frames along entire Indian coastline. Areas under coastal erosion and status of coastal protection measures taken up by respective maritime State and Union Territory are depicted and can be used for planning coastal protection measures.

The Atlas is extremely useful to Coastal Erosion Directorate, Central Water Commission for providing guidance towards coastal protection works in maritime states of India.

All the State Public Works Departments, Ports and Harbour Authorities, Coastal Regulation Zone Authorities shall be able to have better management of the shorelines in respective states.

## REFERENCES

Gupta M.C. et. al., 2000, Coastal Zone Management Information System for Gujarat, Technical Report, SAC/MWRD/TR/04/2000.

Nayak, S. R., Bahuguna, A., Shaikh, M., Rao, R. S., Trivedi, C. R., Prasad, K. N., Kadri, S. A., Vaidya, P. H., Patel, V. B., Oza, S. H., Patel, S. S., Rao, T. A., Shereiff, A. N. and Suresh, P. V., 1991, *Manual for mapping of coastal wetlands/landforms and shoreline changes using satellite data*: Technical Note, IRS-UP/SAC/MCE/TN/32/91 (Space Applications Centre, Ahmedabad), 63 p.

SAC, 2012, *Coastal Zones of India*, Space Applications Centre (ISRO), 2012, 597 p. ISBN: 978-81-909978-9-8.

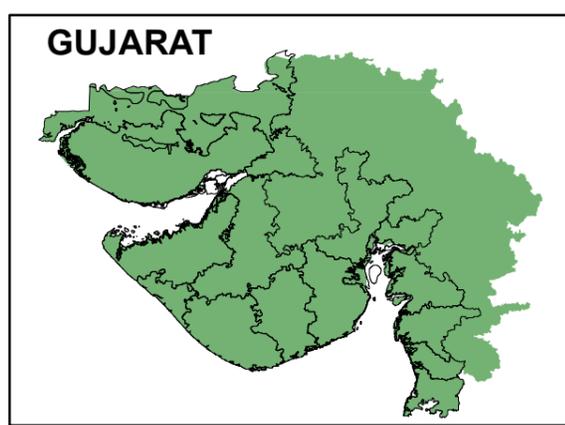
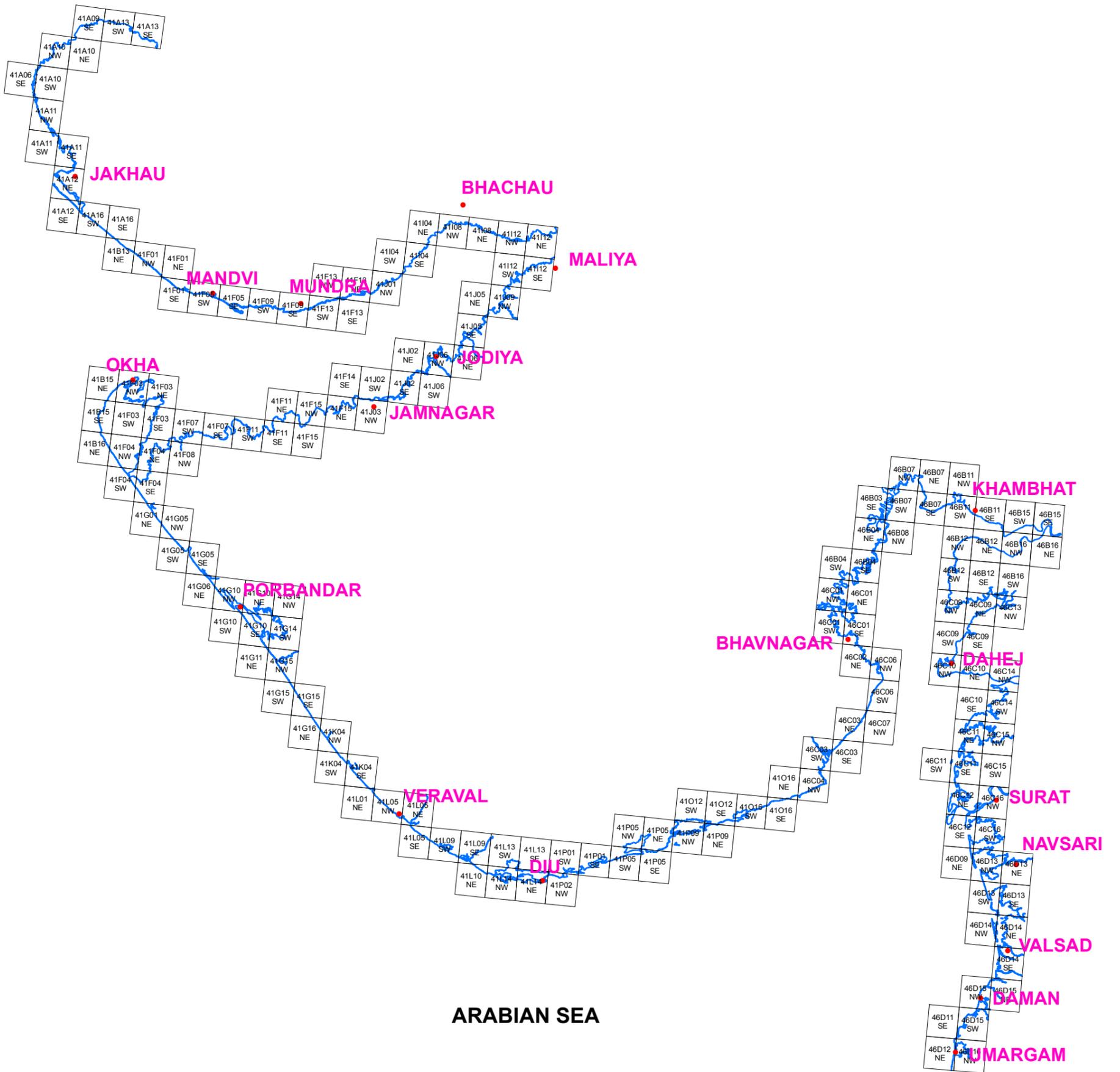
**Annexure-I**  
(GUJARAT, DAMAN AND DIU  
Shoreline Change Maps)

# COMPLETE LEGEND TO SHORELINE CHANGE MAPS

	EROSION
	ACCRETION
	ROAD
	STABLE
	HIGH-TIDE LINE 2004-06
	HIGH-TIDE LINE 1989-91
	HABITATION
	SEA WALL/ANTI SEA EROSION WORKS
	GROYNES
	JETTY
	BREAKWATER

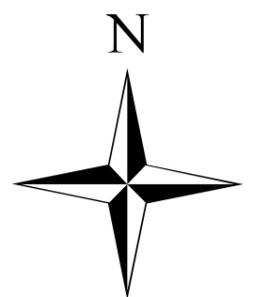
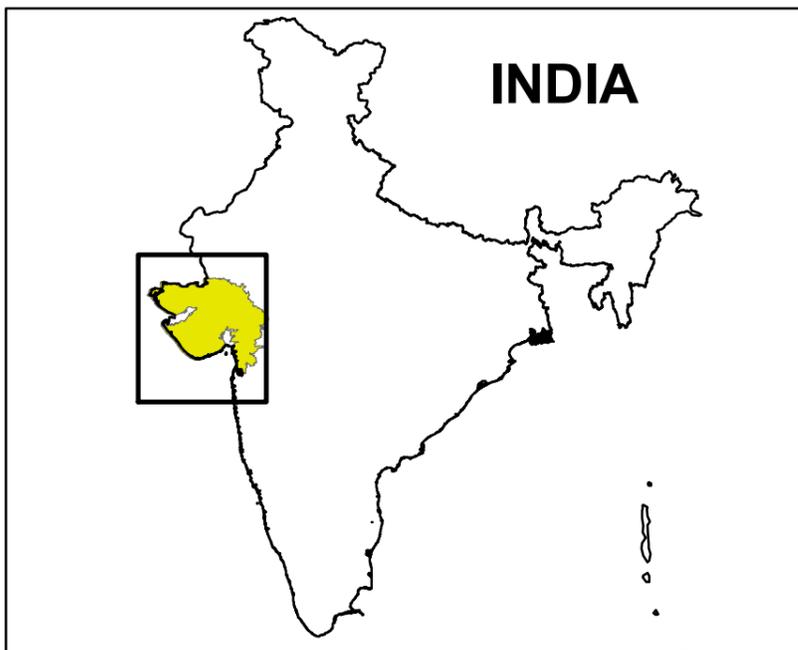
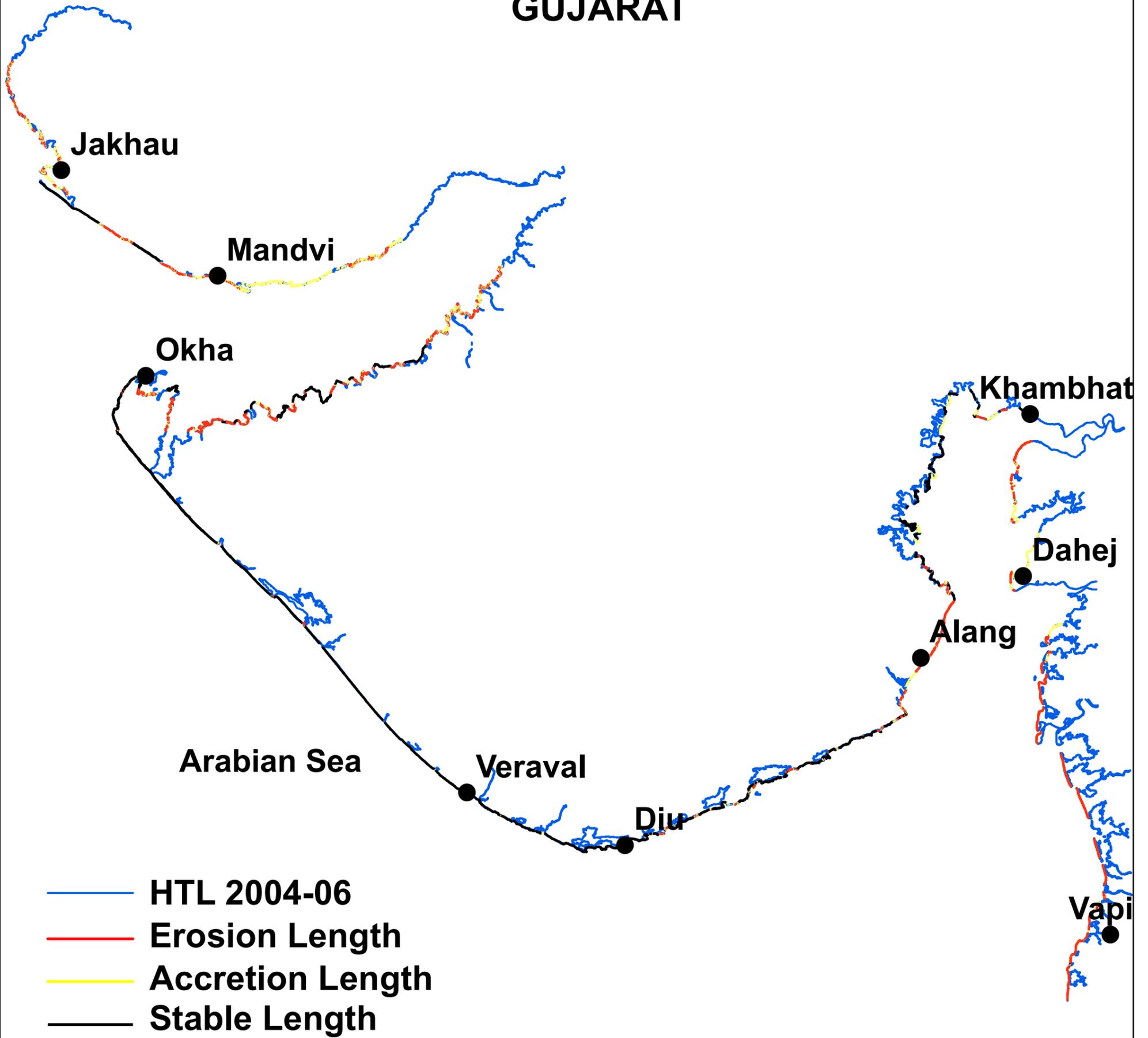
# SHORELINE CHANGE INDEX MAP

## GUJARAT



# SHORELINE CHANGE MAP

## GUJARAT



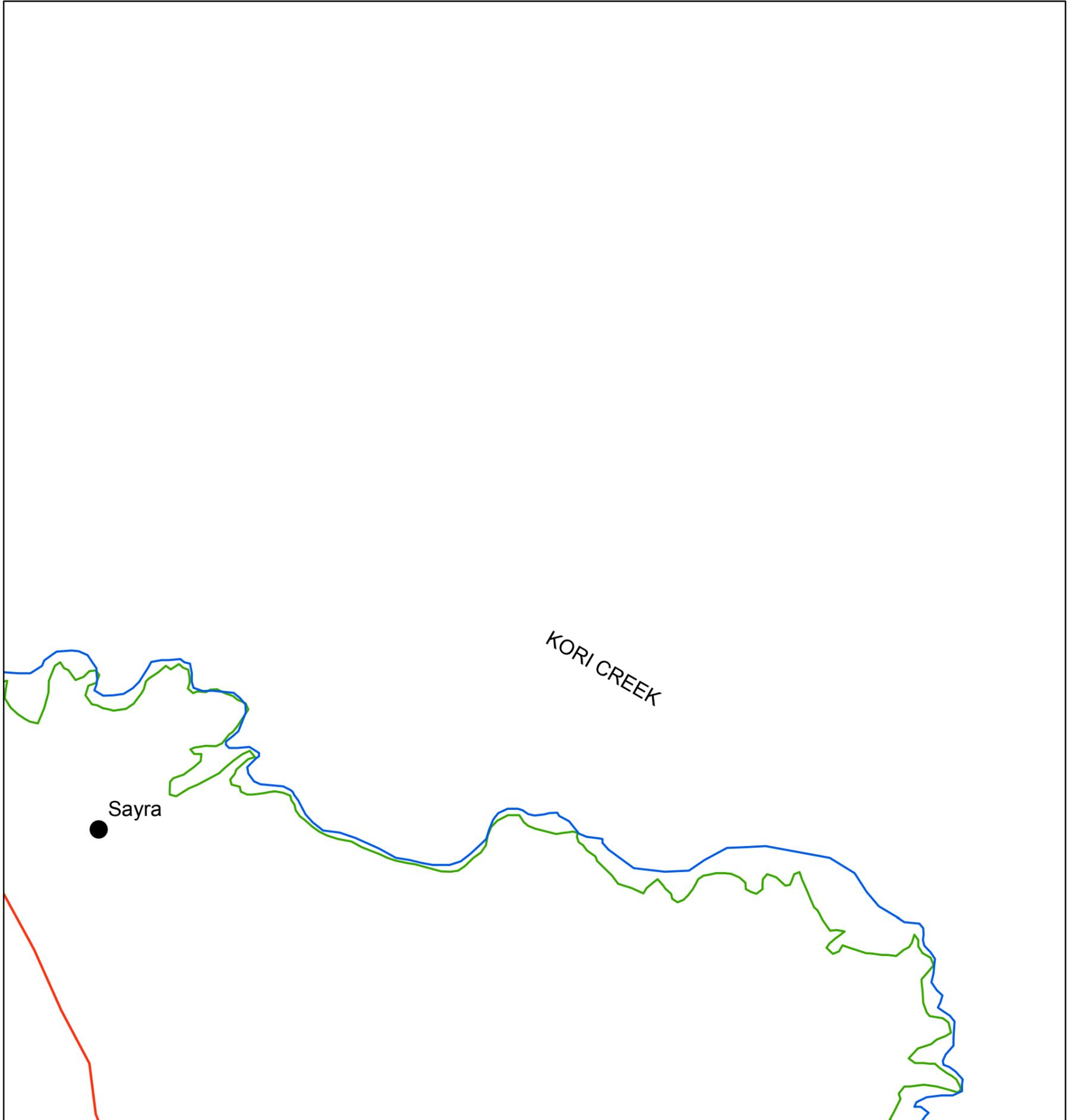
# SHORELINE CHANGE MAP

## GUJARAT

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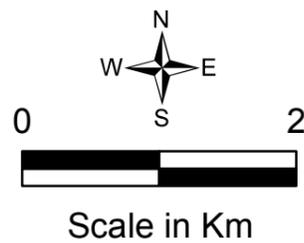
KACHCHH DISTRICT

SHEET NO. 41A13SE



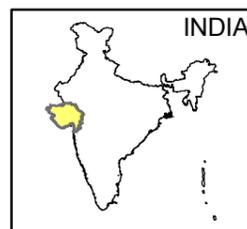
### Legend

-  ROAD
-  HIGH-TIDE LINE 2004-06
-  HIGH-TIDE LINE 1989-91
-  HABITATION



### INDEX TO SHEETS

41A13 NW	41A13 NE	41E01 NW
41A13 SW		41E01 SW
41A14 NW	41A14 NE	41E02 NW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

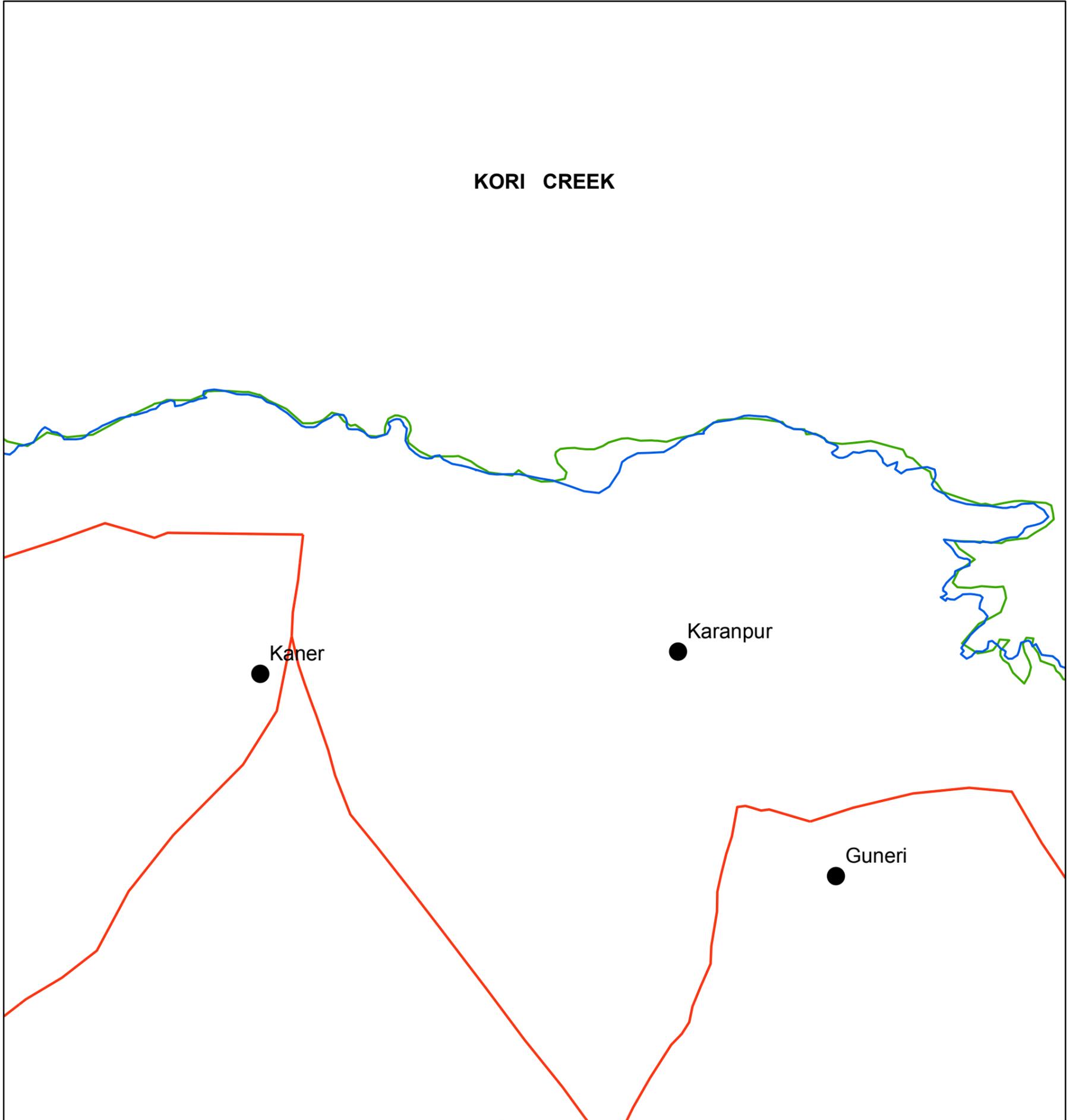
## GUJARAT

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KACHCHH DISTRICT

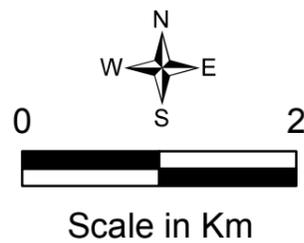
SHEET NO. 41A13SW

KORI CREEK



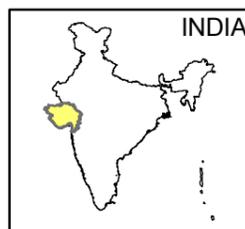
### Legend

- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



INDEX TO SHEETS

41A09 NE	41A13 NW	41A13 NE
41A09 SE		41A13 SE
41A10 NE	41A14 NW	41A14 NE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

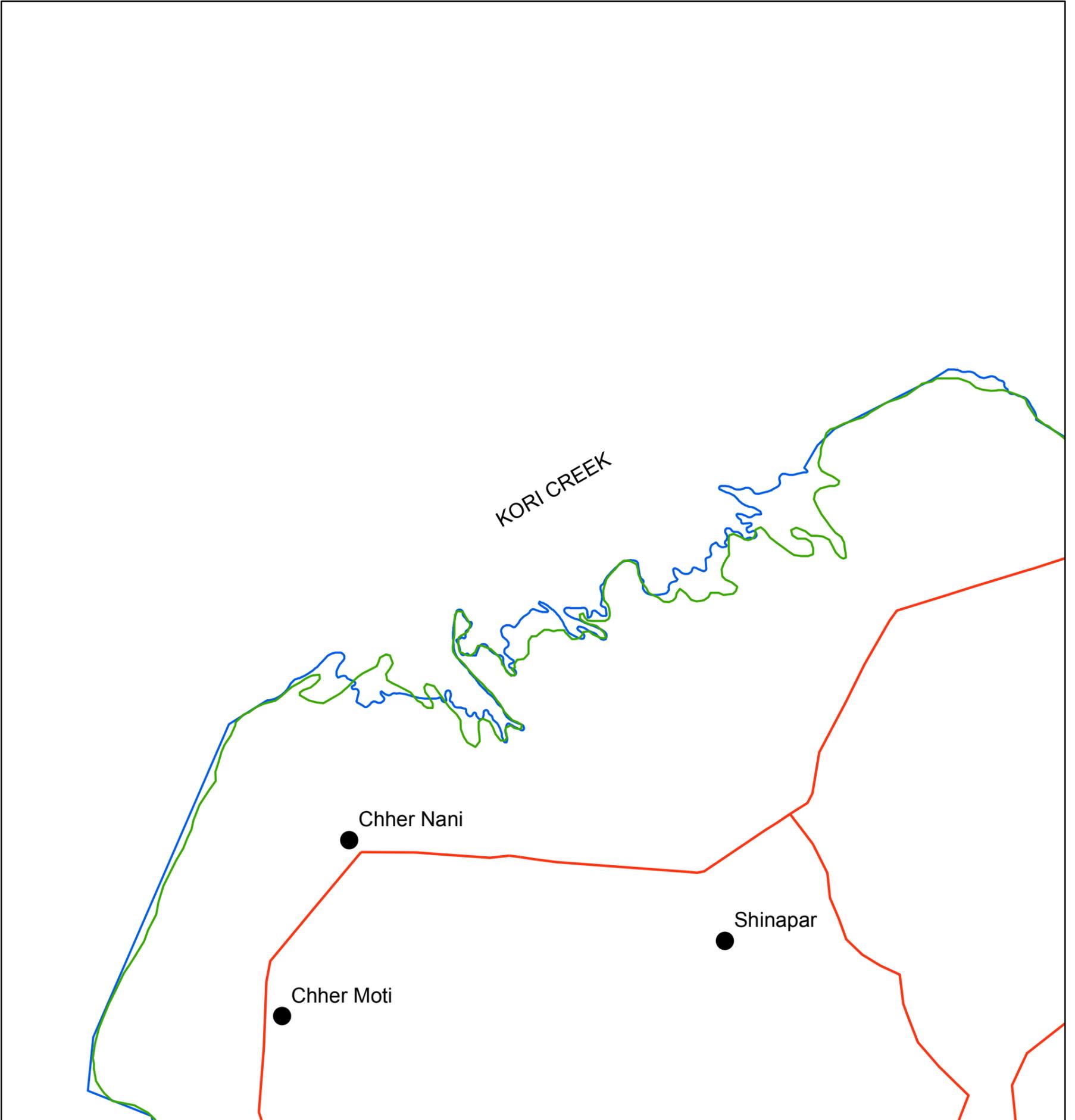
# SHORELINE CHANGE MAP

## GUJARAT

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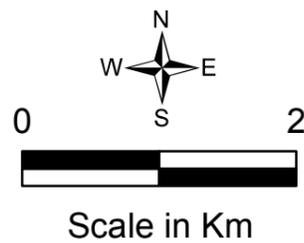
KACHCHH DISTRICT

SHEET NO. 41A09SE



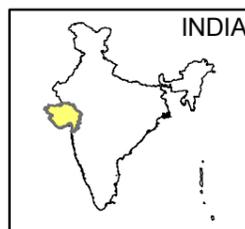
### Legend

- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

41A09 NW	41A09 NE	41A13 NW
41A09 SW		41A13 SW
41A10 NW	41A10 NE	41A14 NW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

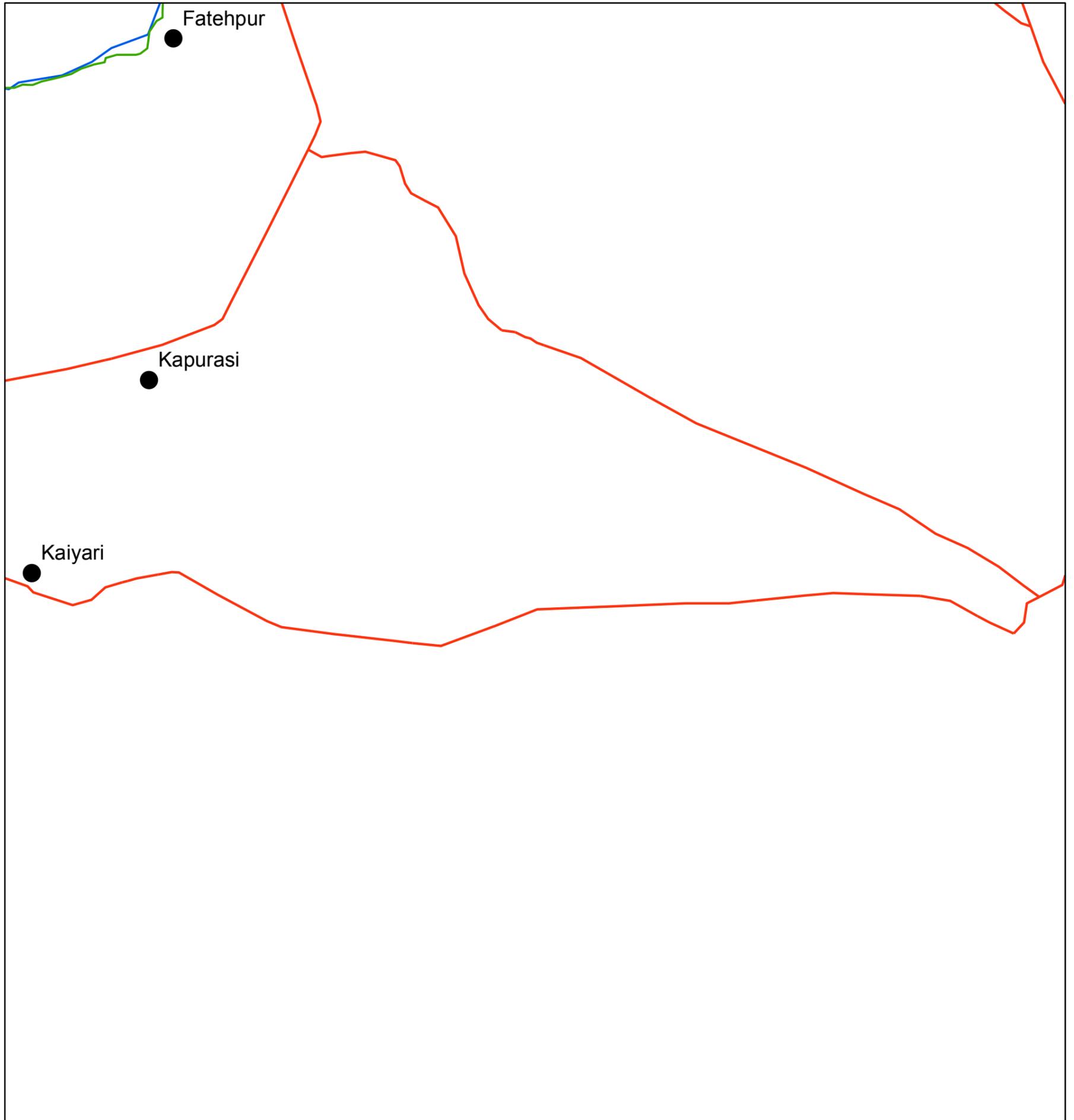
# SHORELINE CHANGE MAP

## GUJARAT

FOR OFFICIAL USE ONLY

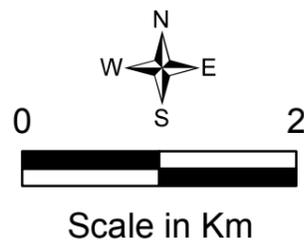
SHEET NO. 41A10NE

KACHCHH DISTRICT



### Legend

- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



INDEX TO SHEETS

41A09 SW	41A09 SE	41A13 SW
41A10 NW		41A14 NW
41A10 SW	41A10 SE	41A14 SW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

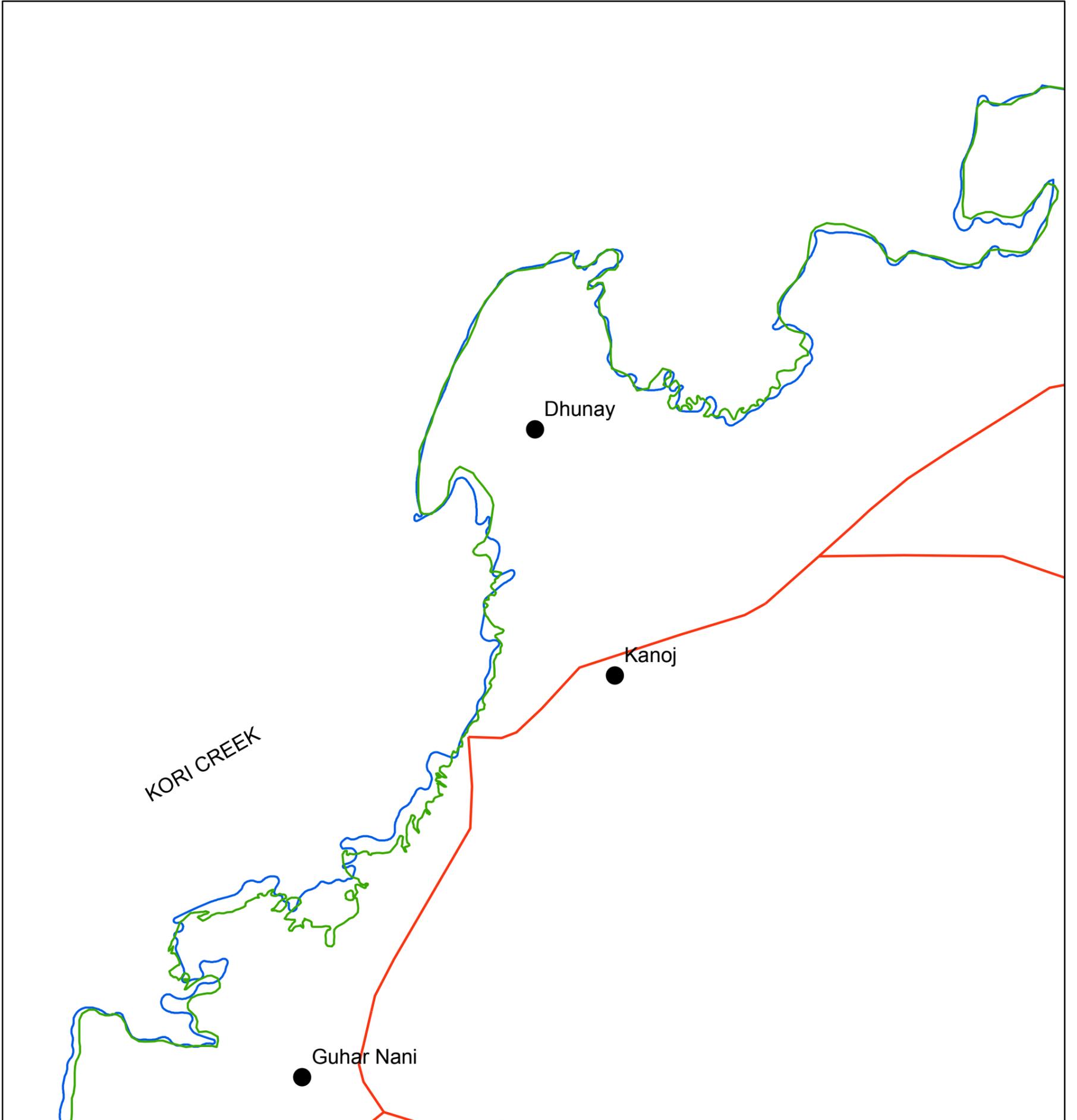
# SHORELINE CHANGE MAP

## GUJARAT

FOR OFFICIAL USE ONLY

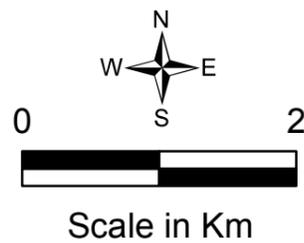
KACHCHH DISTRICT

SHEET NO. 41A10NW



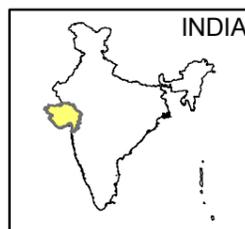
### Legend

- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

41A05 SE	41A09 SW	41A09 SE
41A06 NE		41A10 NE
41A06 SE	41A10 SW	41A10 SE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

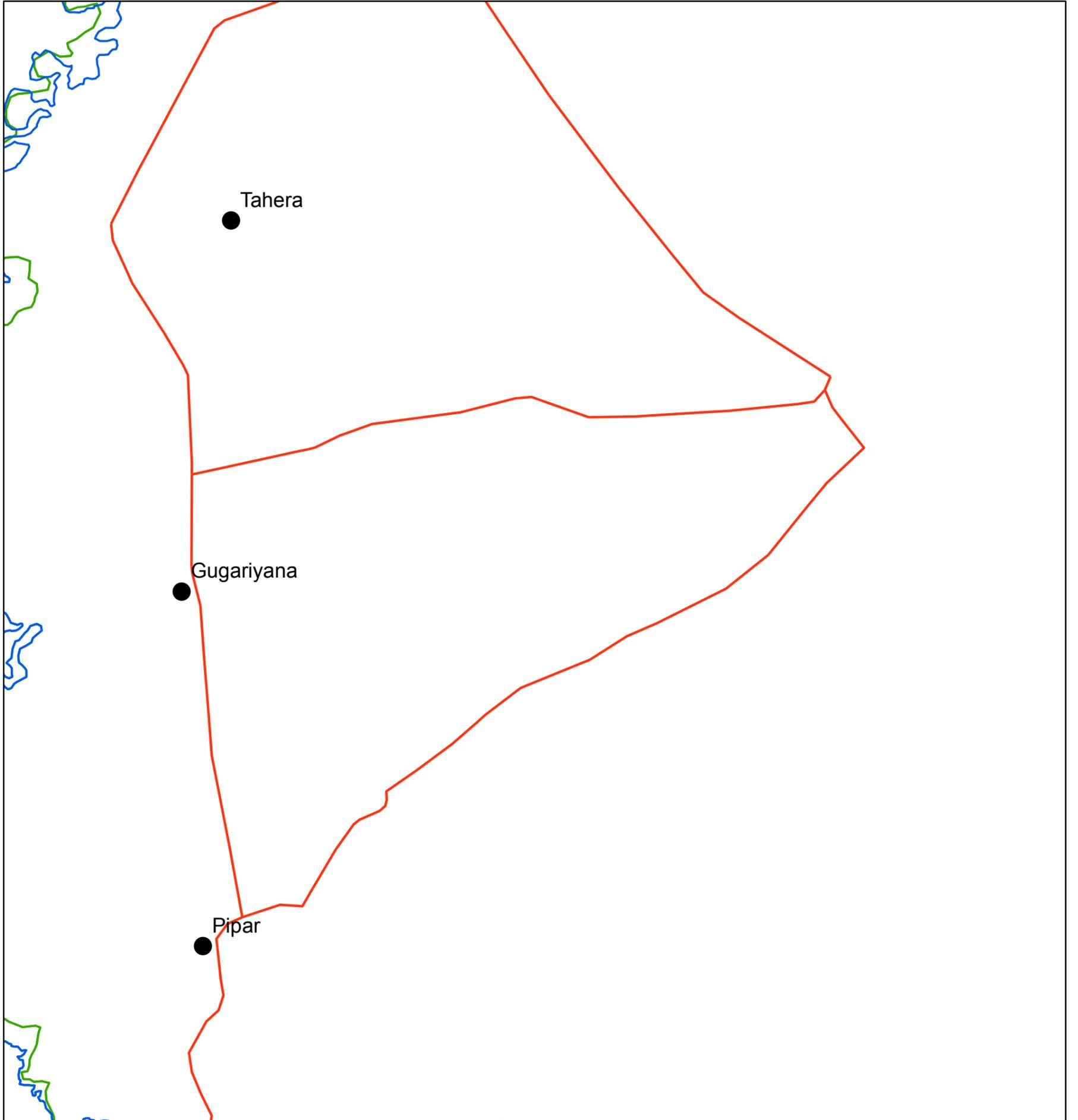
# SHORELINE CHANGE MAP

## GUJARAT

FOR OFFICIAL USE ONLY

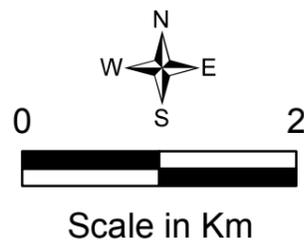
KACHCHH DISTRICT

SHEET NO. 41A10SW



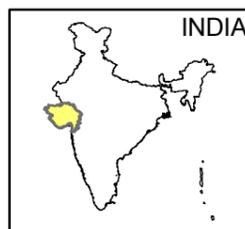
### Legend

- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



#### INDEX TO SHEETS

41A06 NE	41A10 NW	41A10 NE
41A06 SE		41A10 SE
41A07 NE	41A11 NW	41A11 NE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

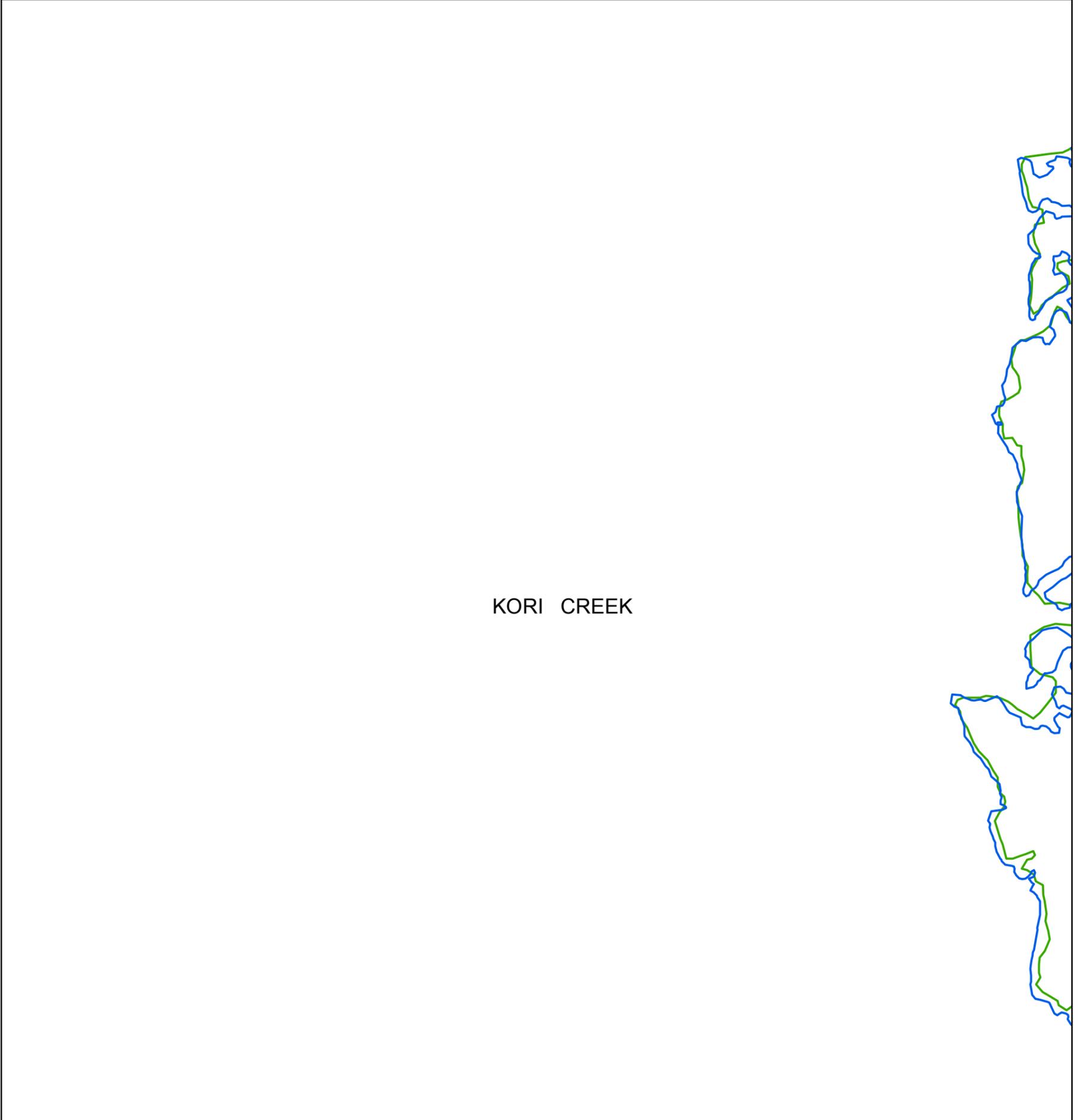
# SHORELINE CHANGE MAP

## GUJARAT

FOR OFFICIAL USE ONLY

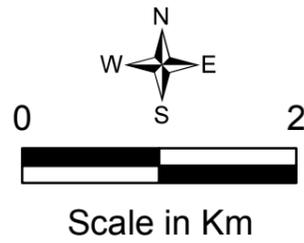
KACHCHH DISTRICT

SHEET NO. 41A06SE



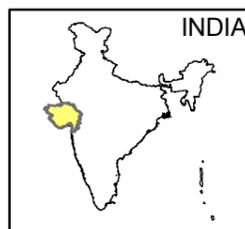
### Legend

-  HIGH-TIDE LINE 2004-06
-  HIGH-TIDE LINE 1989-91



### INDEX TO SHEETS

41A06 NW	41A06 NE	41A10 NW
41A06 SW		41A10 SW
41A07 NW	41A07 NE	41A11 NW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

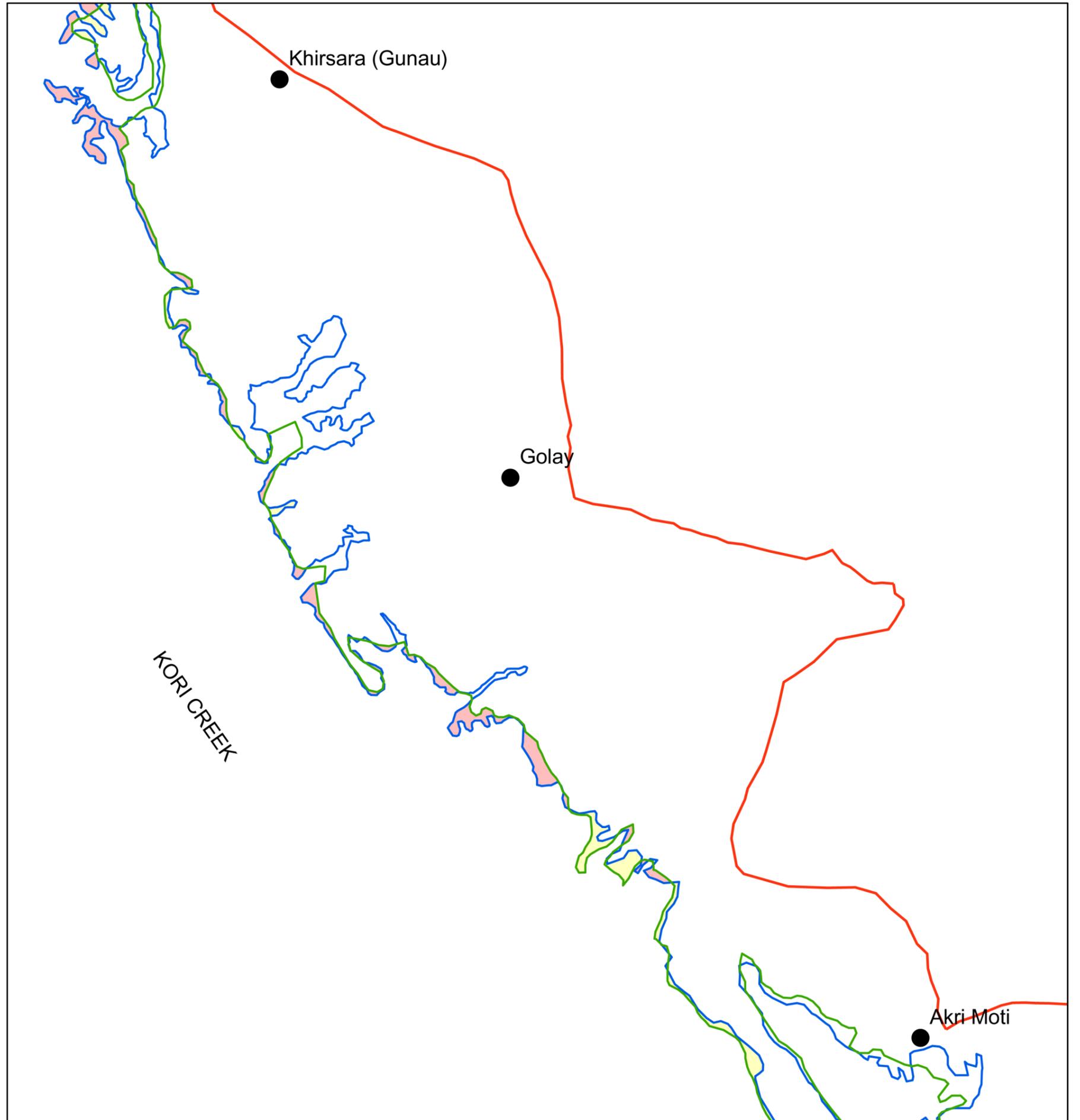
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

## GUJARAT

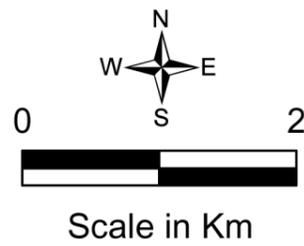
FOR OFFICIAL USE ONLY  
SHEET NO. 41A11NW

KACHCHH DISTRICT



### Legend

- EROSION
- ACCRETION
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



#### INDEX TO SHEETS

41A06 SE	41A10 SW	41A10 SE
41A07 NE		41A11 NE
41A07 SE	41A11 SW	41A11 SE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

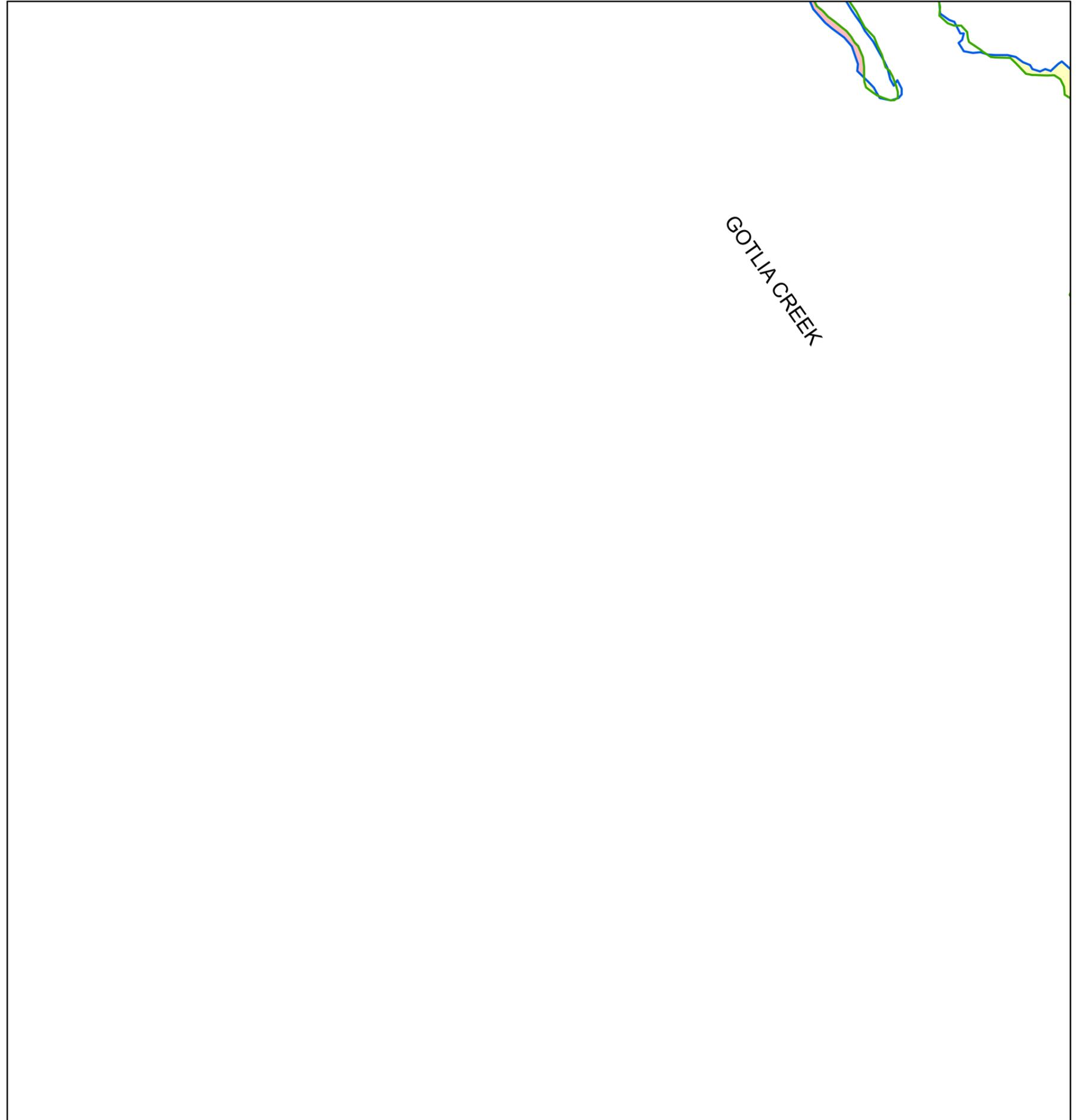
PREPARED BY:  
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AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

## GUJARAT

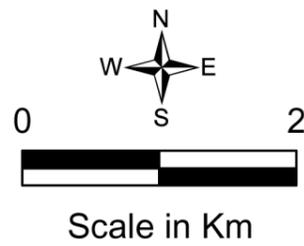
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SHEET NO. 41A11SW

KACHCHH DISTRICT



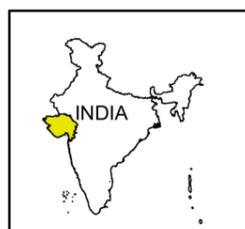
### Legend

-  EROSION
-  ACCRETION
-  HIGH-TIDE LINE 2004-06
-  HIGH-TIDE LINE 1989-91



### INDEX TO SHEETS

SEA	SEA	41A11 NE
SEA		SEA
SEA	SEA	SEA



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

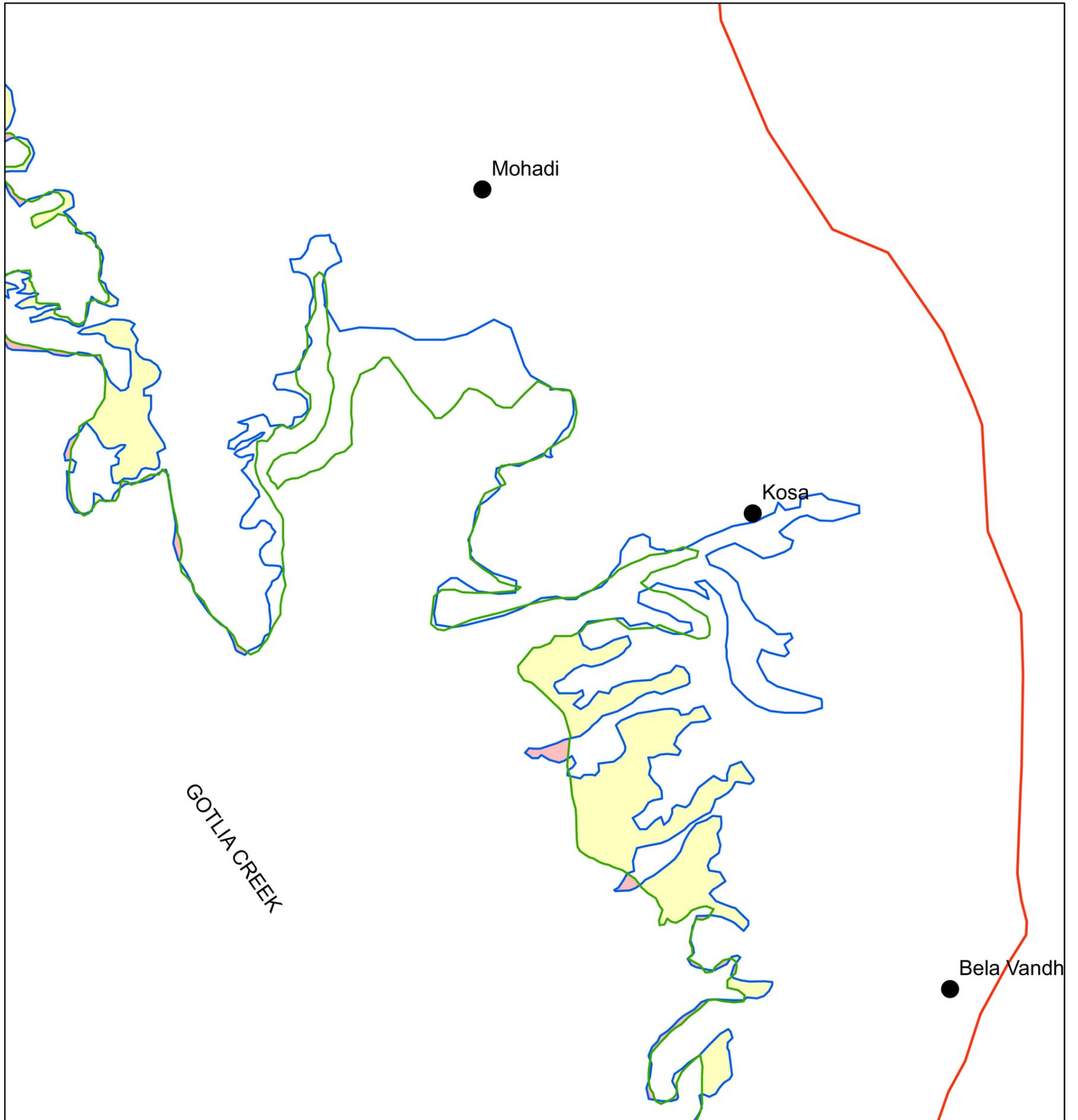
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

## GUJARAT

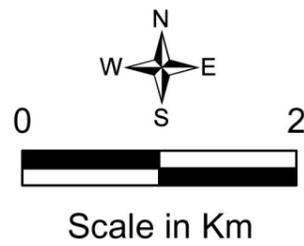
FOR OFFICIAL USE ONLY  
SHEET NO. 41A11SE

KACHCHH DISTRICT



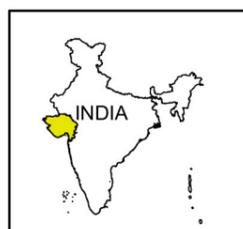
### Legend

- EROSION
- ACCRETION
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



#### INDEX TO SHEETS

41A11 NW	41A11 NE	41A15 NW
41A11 SW		41A15 SW
41A12 NW	41A12 NE	41A16 NW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

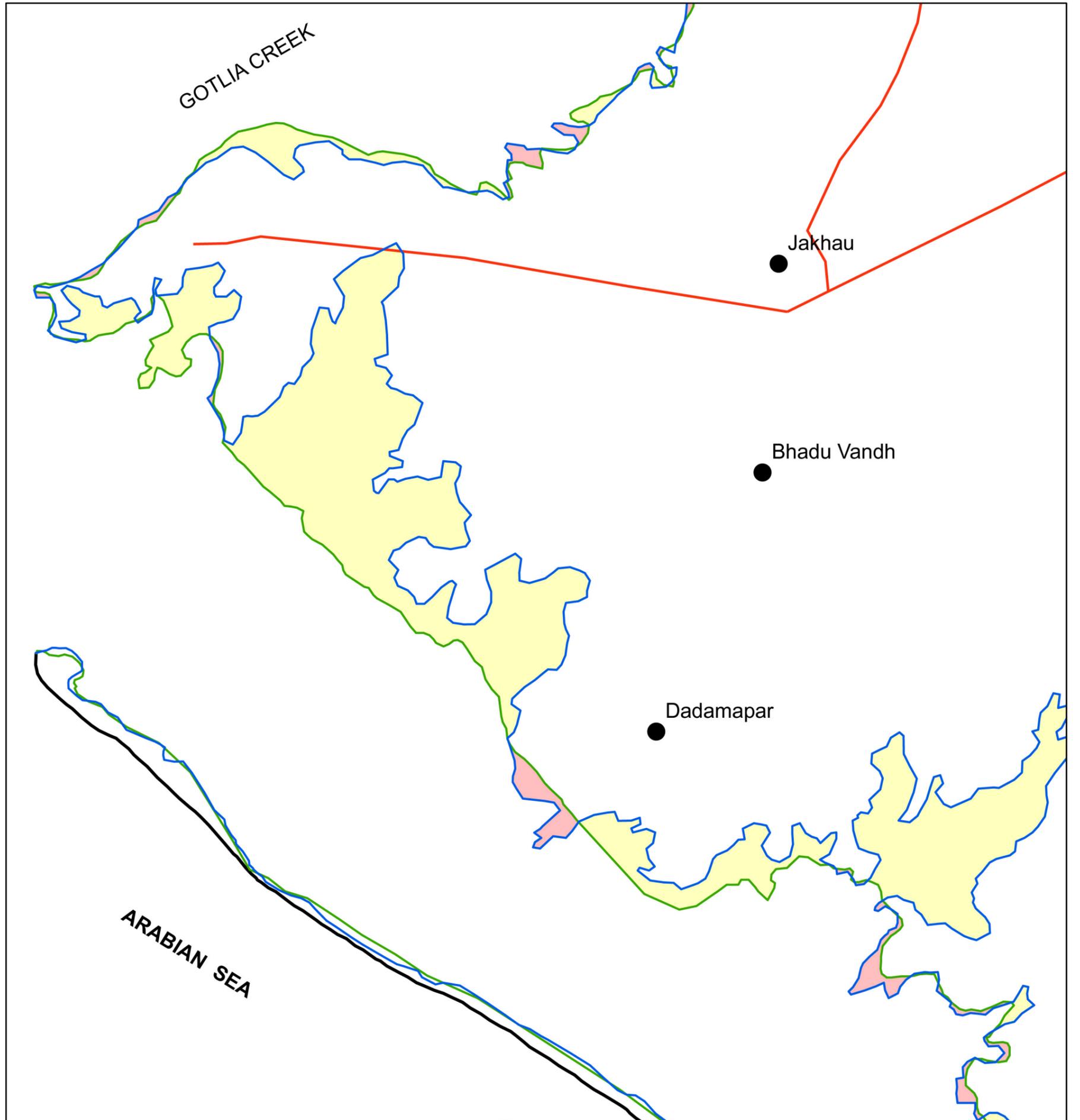
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

## GUJARAT

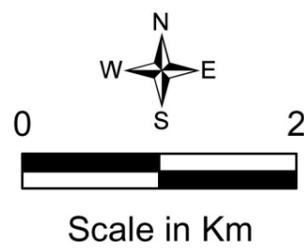
FOR OFFICIAL USE ONLY  
SHEET NO. 41A12NE

KACHCHH DISTRICT



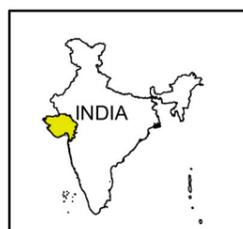
### Legend

- EROSION
- ACCRETION
- STABLE
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

41A11 SW	41A11 SE	41A15 SW
41A12 NW		41A16 NW
SEA	41A12 SE	41A16 SW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

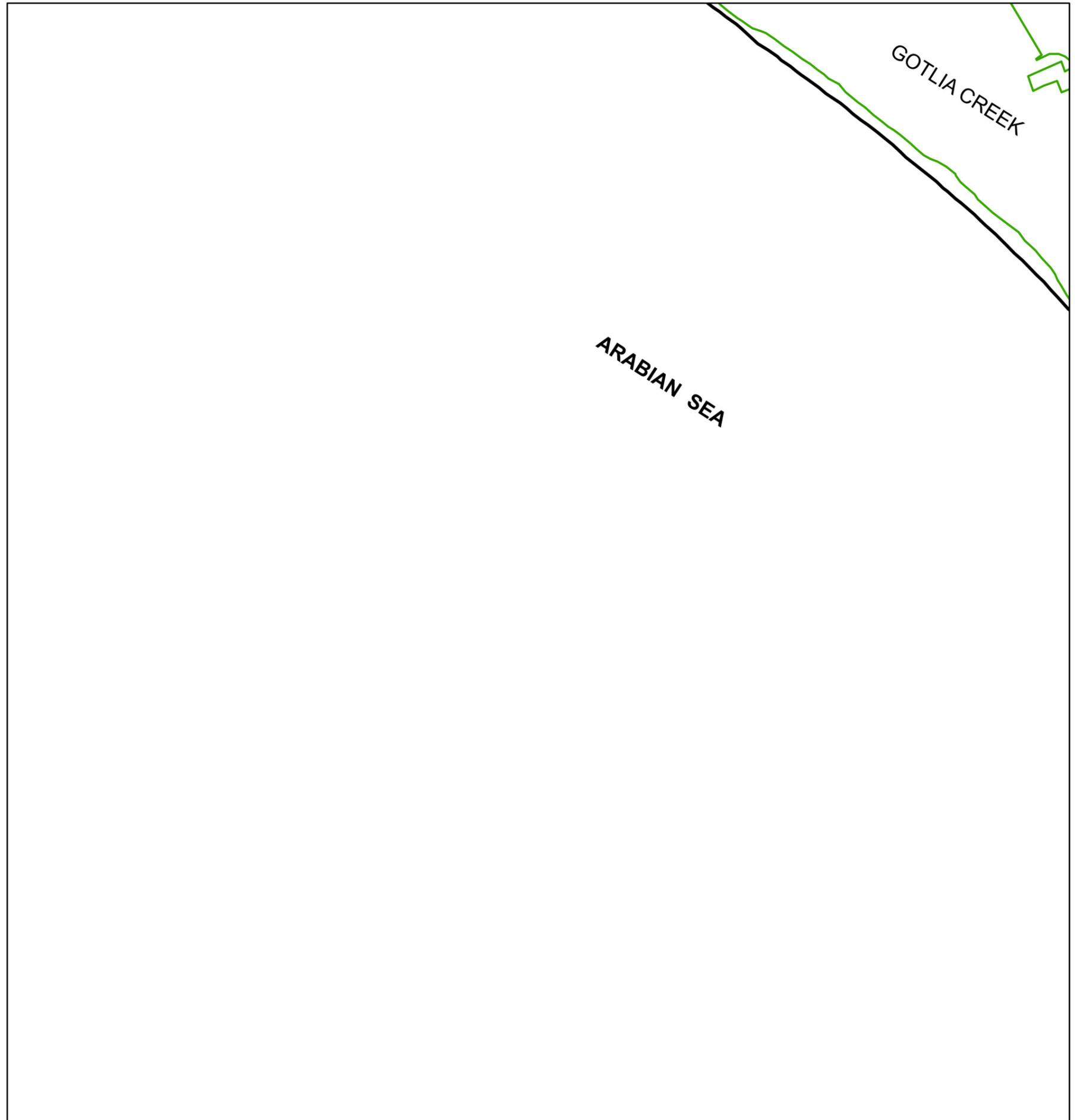
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

## GUJARAT

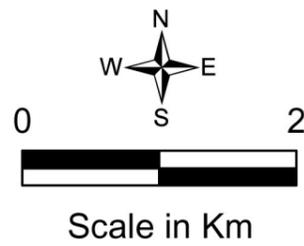
FOR OFFICIAL USE ONLY  
SHEET NO. 41A12SE

KACHCHH DISTRICT



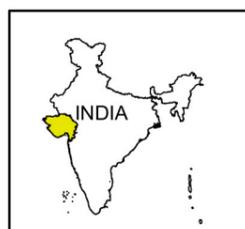
### Legend

-  STABLE
-  HIGH-TIDE LINE 2004-06
-  HIGH-TIDE LINE 1989-91



#### INDEX TO SHEETS

41A12 NW	41A12 NE	41A16 NW
SEA		41A16 SW
SEA	SEA	SEA



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

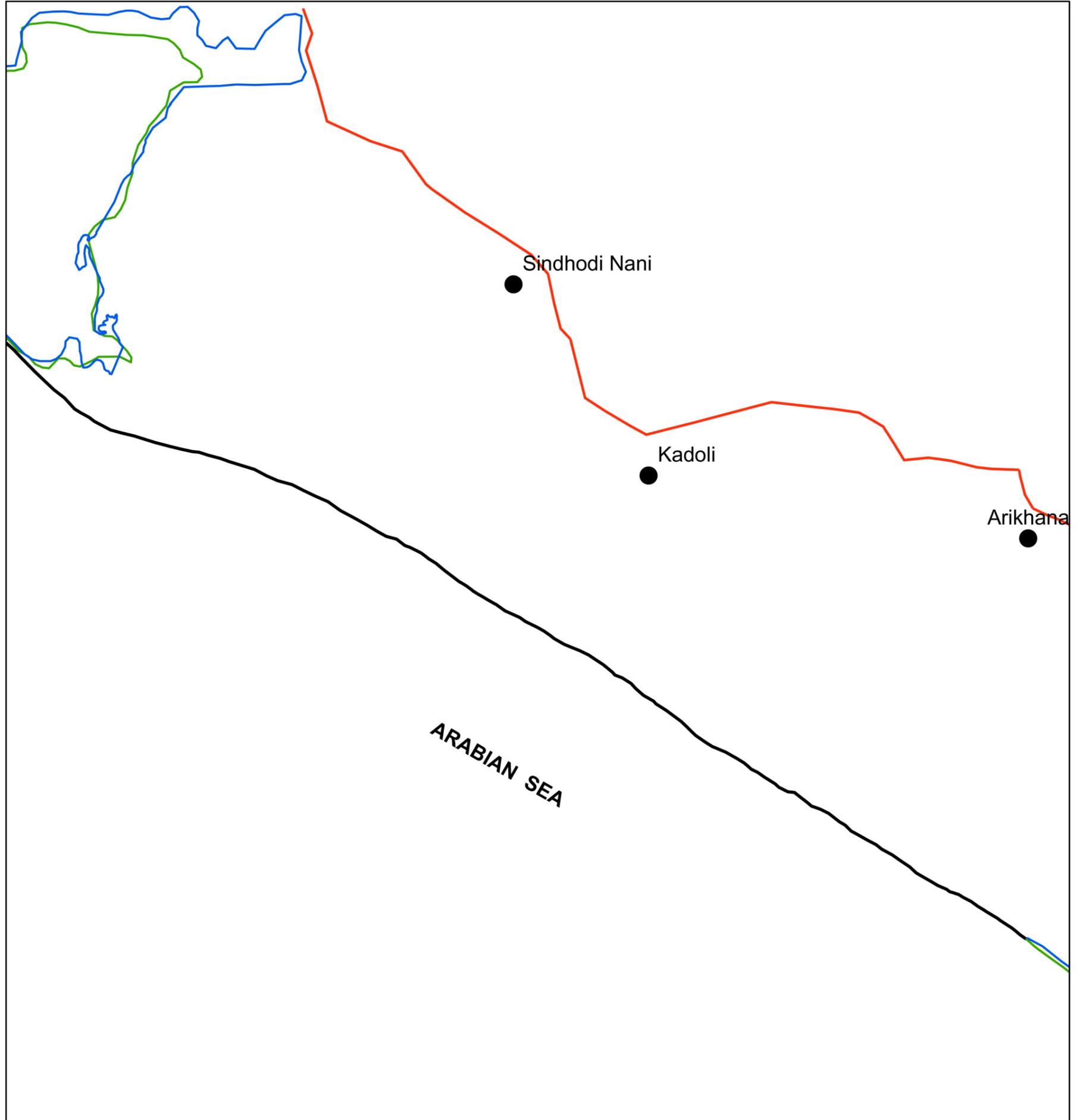
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AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

## GUJARAT

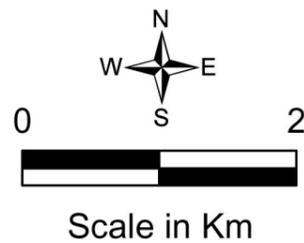
FOR OFFICIAL USE ONLY  
SHEET NO. 41A16SW

KACHCHH DISTRICT



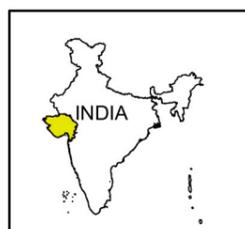
### Legend

- ACCRETION
- STABLE
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



#### INDEX TO SHEETS

41A12 NE	41A16 NW	41A16 NE
41A12 SE		41A16 SE
SEA	SEA	41B13 NE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

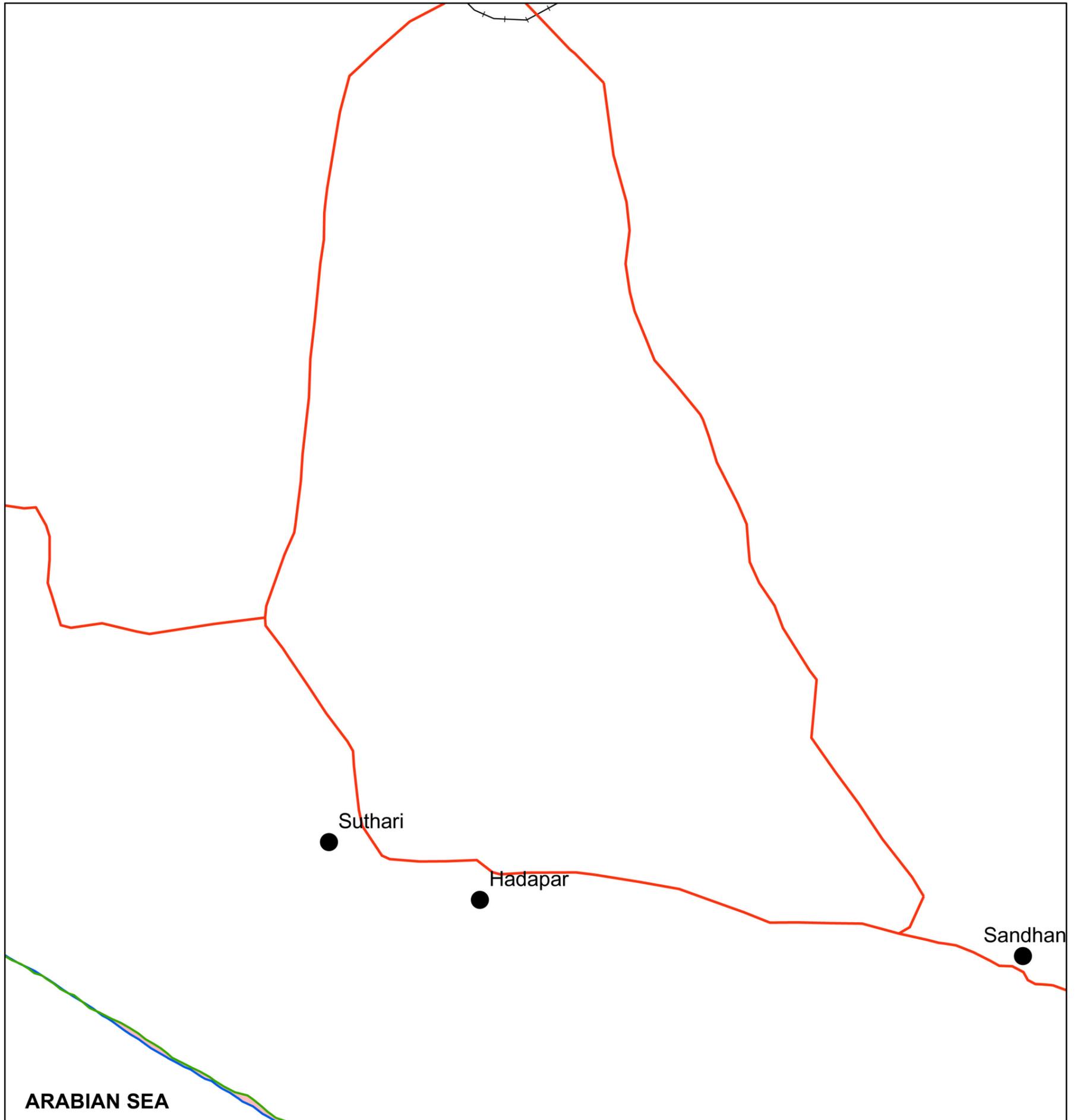
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

## GUJARAT

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SHEET NO. 41A16SE

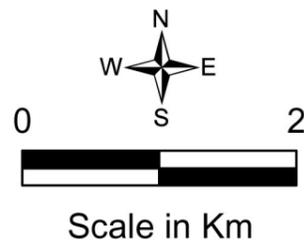
KACHCHH DISTRICT



ARABIAN SEA

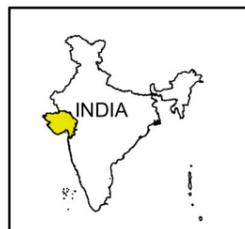
### Legend

- EROSION
- ROAD
- RAIL
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



#### INDEX TO SHEETS

41A16 NW	41A16 NE	41E04 NW
41A16 SW		41E04 SW
SEA	41B13 NE	41F01 NW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

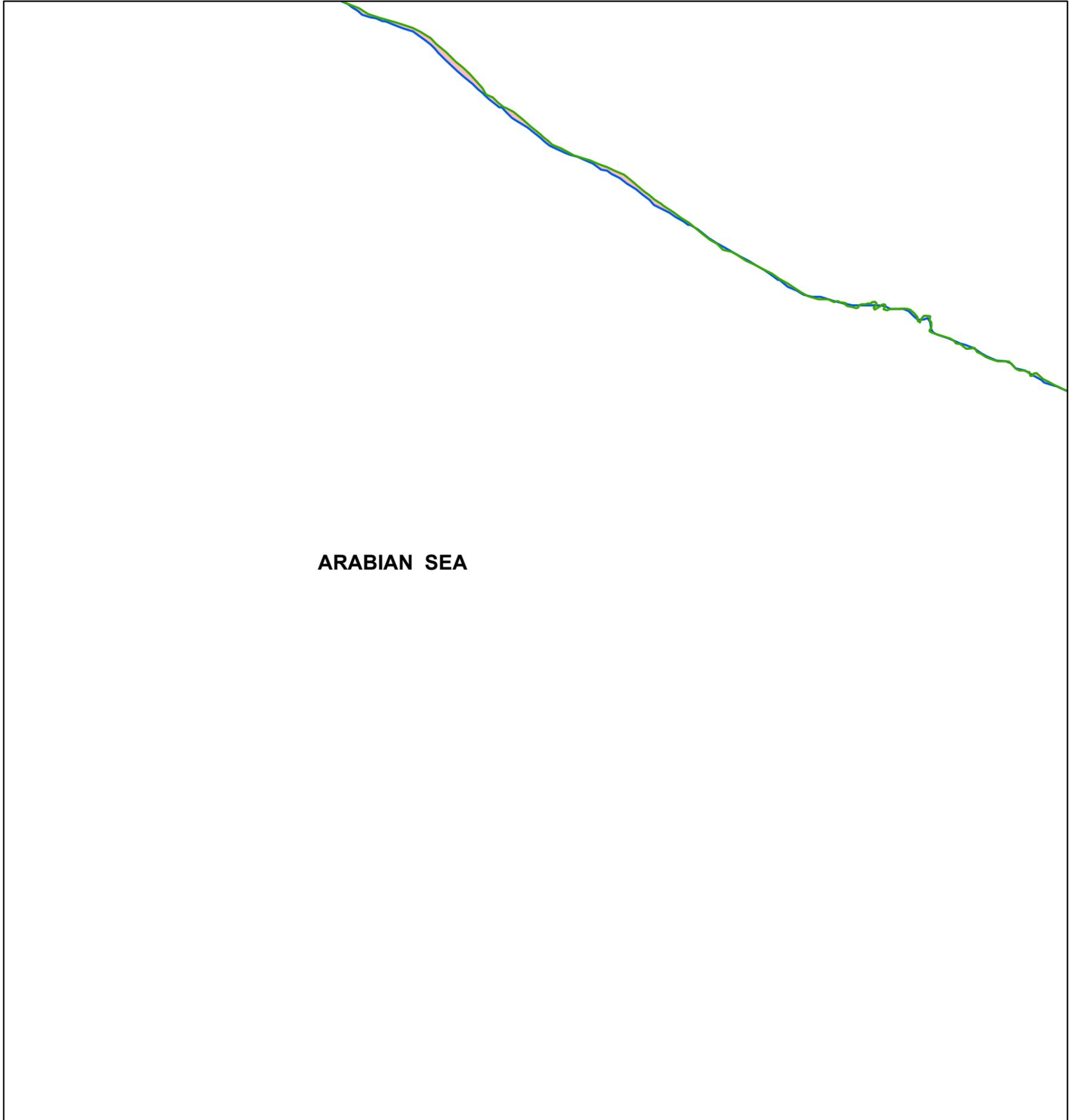
# SHORELINE CHANGE MAP

## GUJARAT

FOR OFFICIAL USE ONLY

KACHCHH DISTRICT

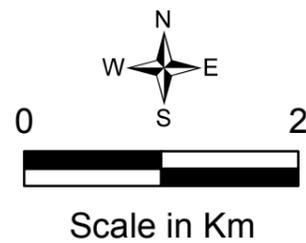
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ARABIAN SEA

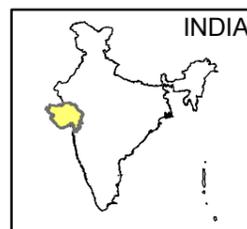
### Legend

- EROSION
- ACCRETION
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91



INDEX TO SHEETS

SEA	SEA	41E04 SW
SEA		SEA
SEA	SEA	SEA



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

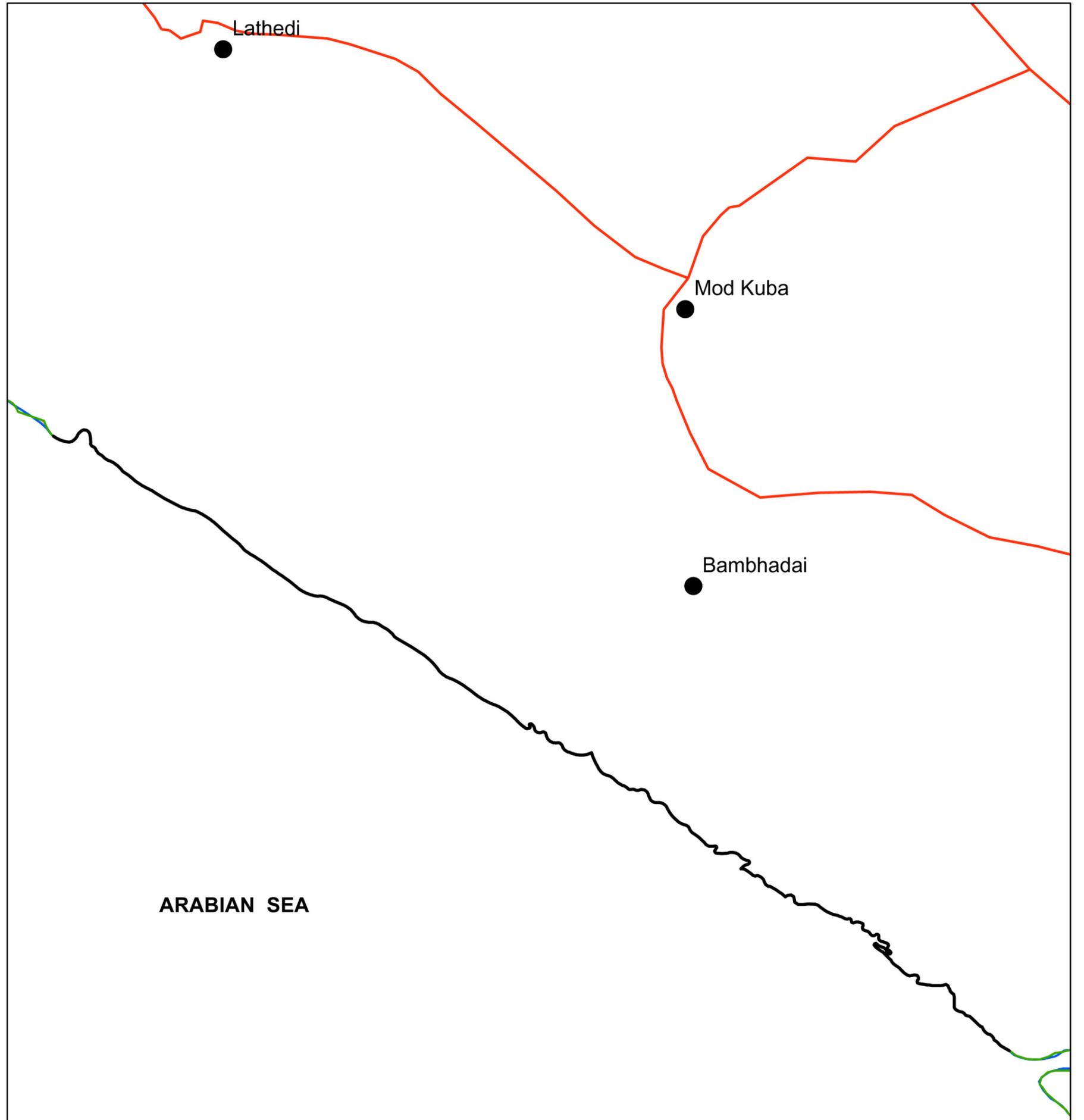
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

## GUJARAT

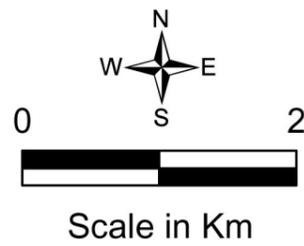
FOR OFFICIAL USE ONLY  
SHEET NO. 41F01NW

KACHCHH DISTRICT



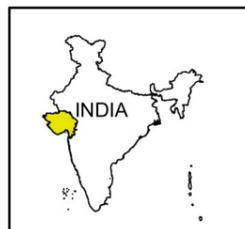
### Legend

- EROSION
- STABLE
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



#### INDEX TO SHEETS

41A16 SE	41E04 SW	41E04 SE
41B13 NE		41F01 NE
SEA	41F01 SW	41F01 SE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

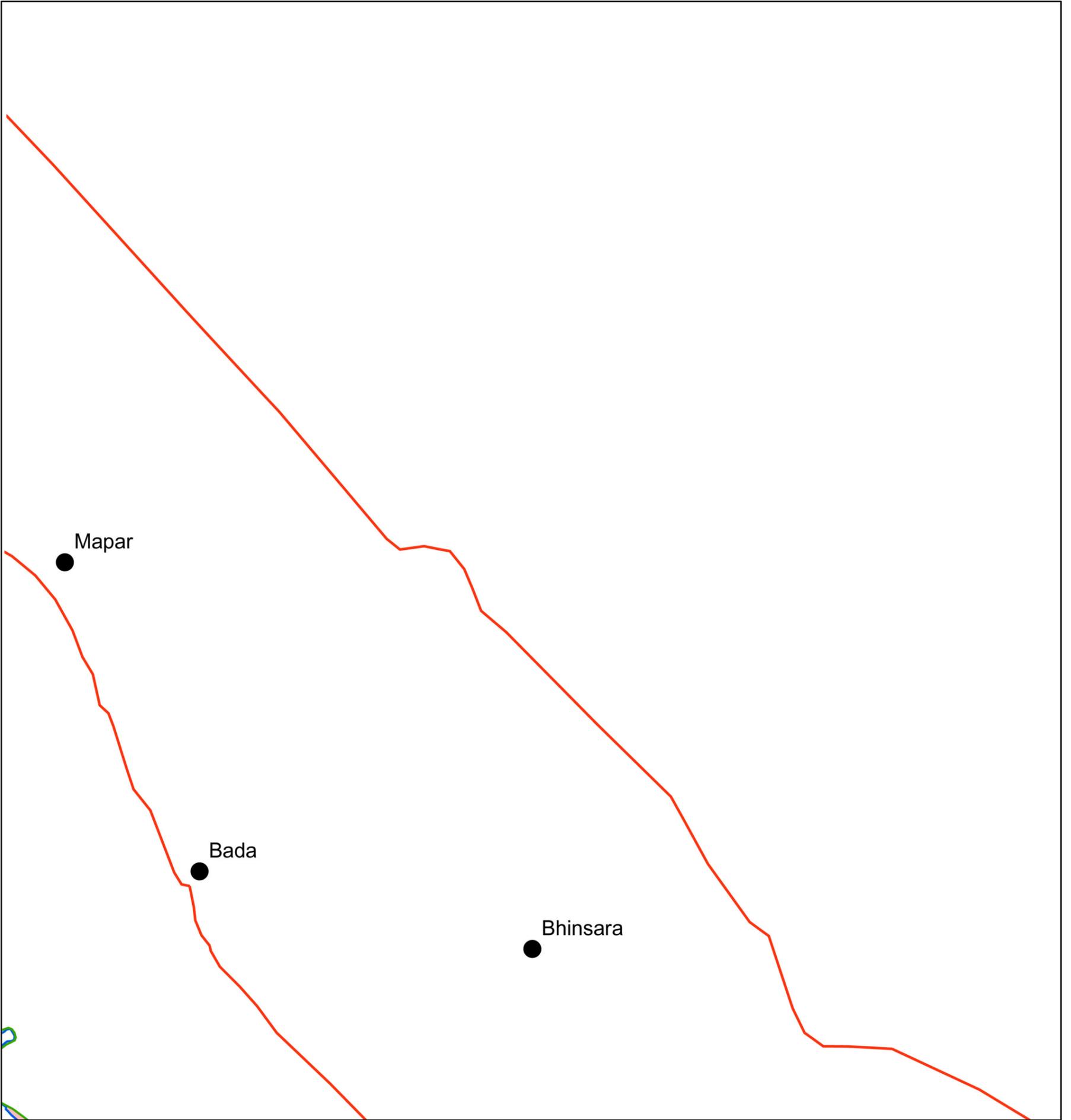
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SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

## GUJARAT

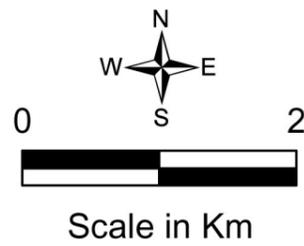
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SHEET NO. 41F01NE

KACHCHH DISTRICT



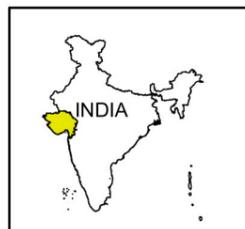
### Legend

- EROSION
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



#### INDEX TO SHEETS

41E04 SW	41E04 SE	41E08 SW
41F01 NW		41F05 NW
41F01 SW	41F01 SE	41F05 SW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

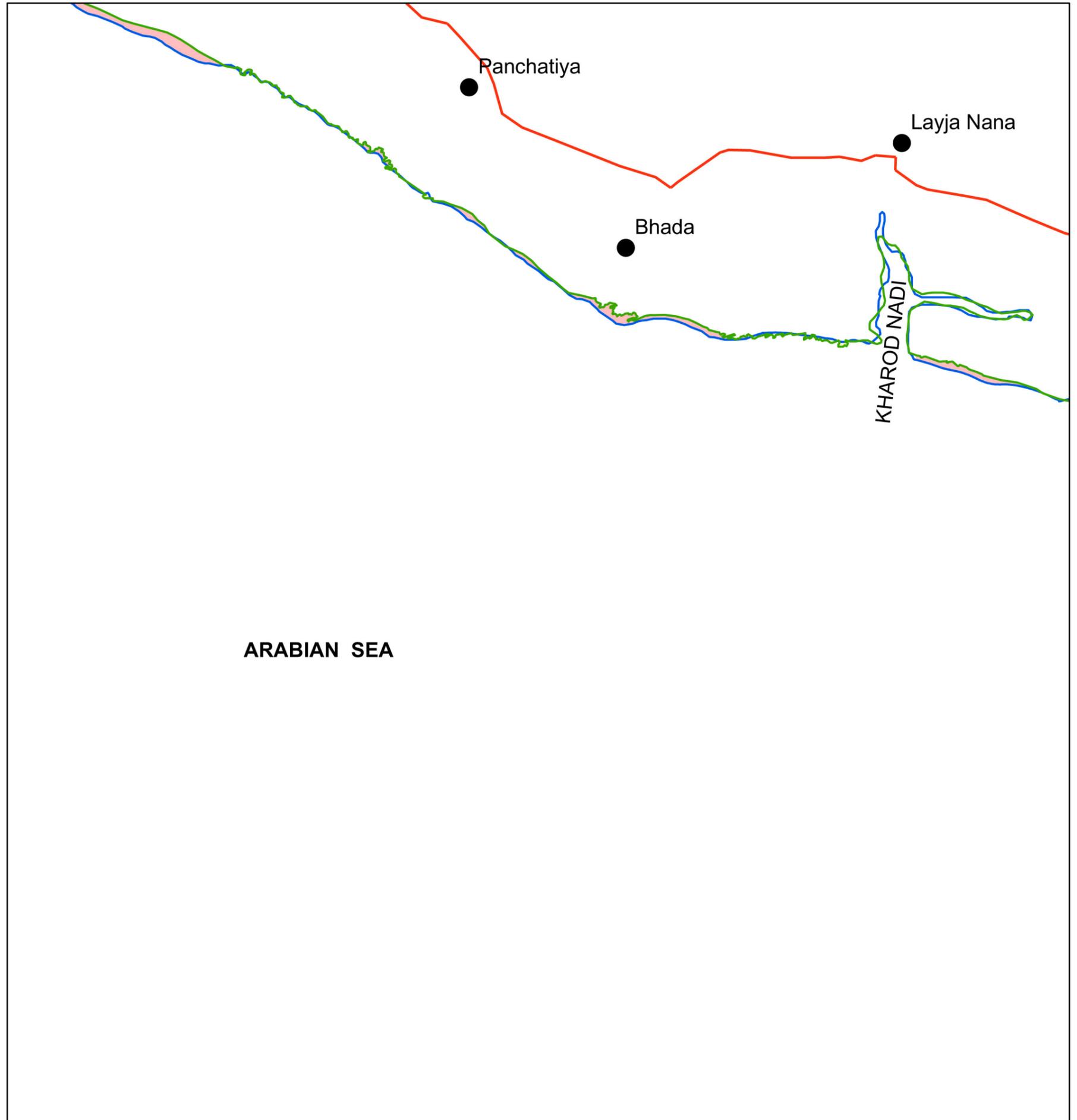
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

GUJARAT

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SHEET NO. 41F01SE

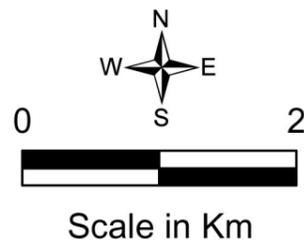
KACHCHH DISTRICT



ARABIAN SEA

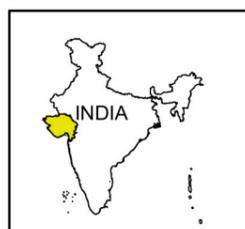
## Legend

- EROSION
- ACCRETION
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

41F01 NW	41F01 NE	41F05 NW
41F01 SW		41F05 SW
SEA	SEA	SEA



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

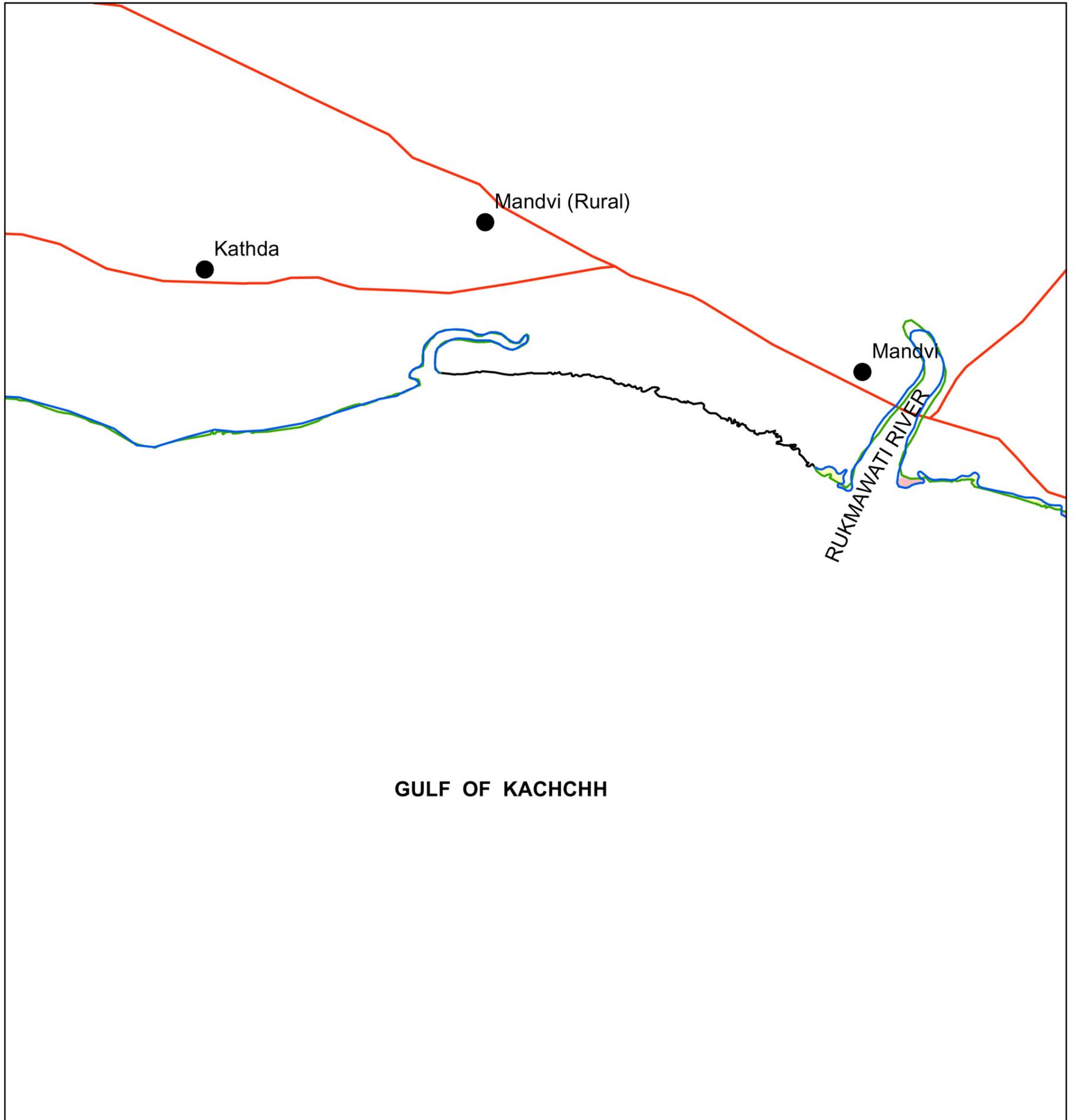
PREPARED BY:  
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AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

## GUJARAT

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SHEET NO. 41F05SW

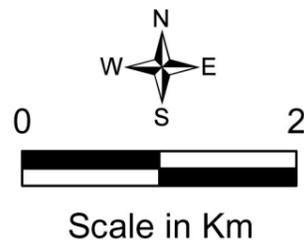
KACHCHH DISTRICT



GULF OF KACHCHH

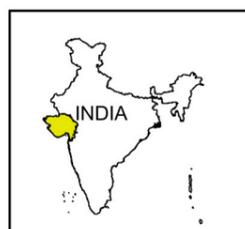
### Legend

- EROSION
- ACCRETION
- ROAD
- STABLE
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



#### INDEX TO SHEETS

41F01 NE	41F05 NW	41F05 NE
41F01 SE		41F05 SE
SEA	SEA	SEA



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

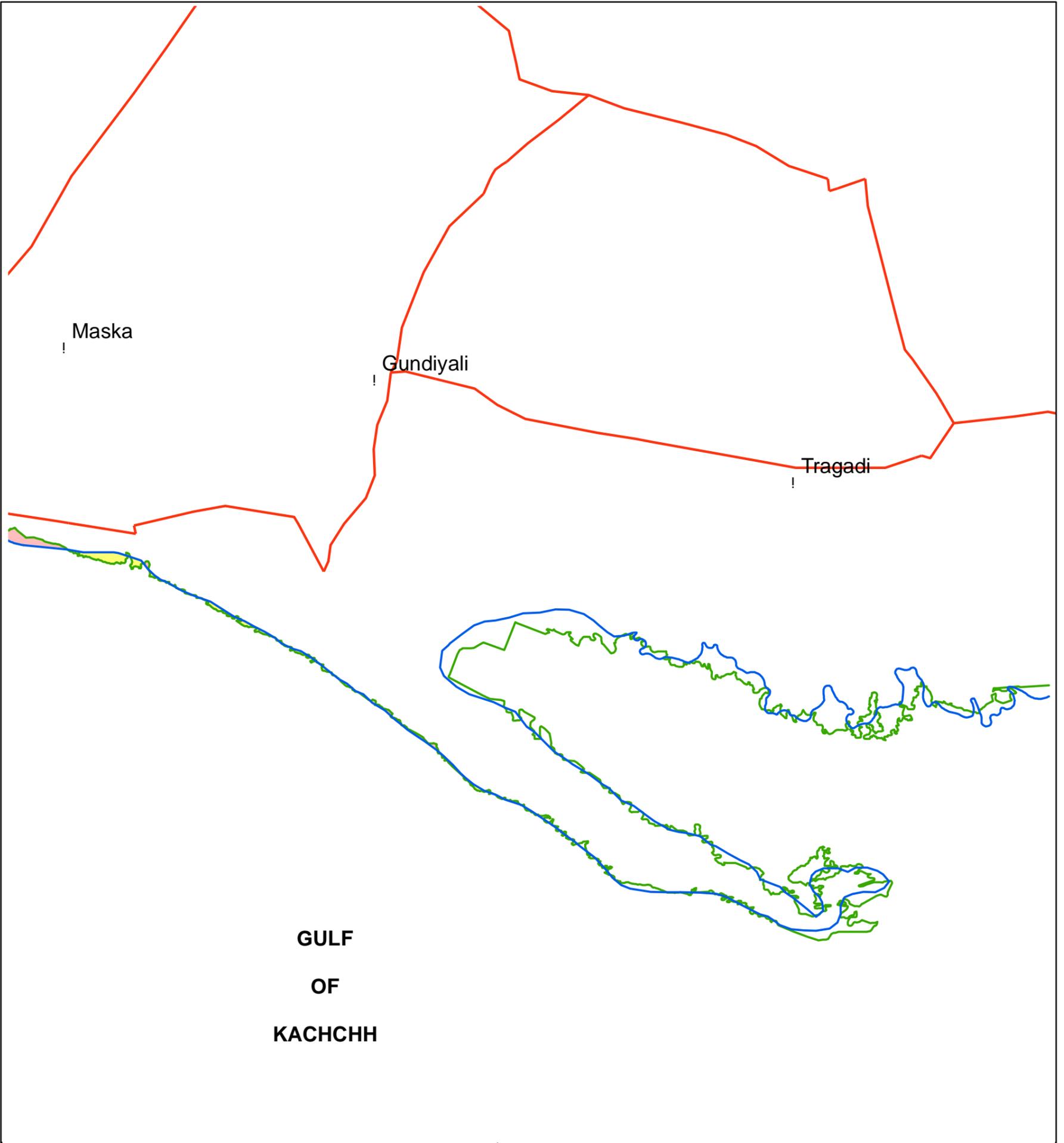
PREPARED BY:  
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AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

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SHEET NO. 41F05SE

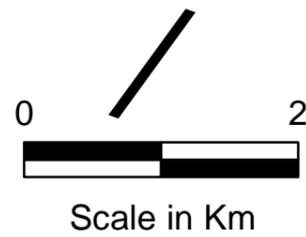
KACHCHH DISTRICT

GUJARAT



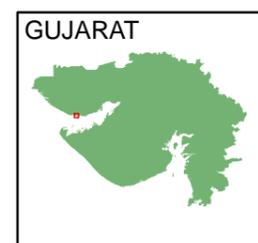
## Legend

- EROSION
- ACCRETION
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

41F05 NW	41F05 NE	41F09 NW
41F05 SW		41F09 SW
SEA	SEA	SEA



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

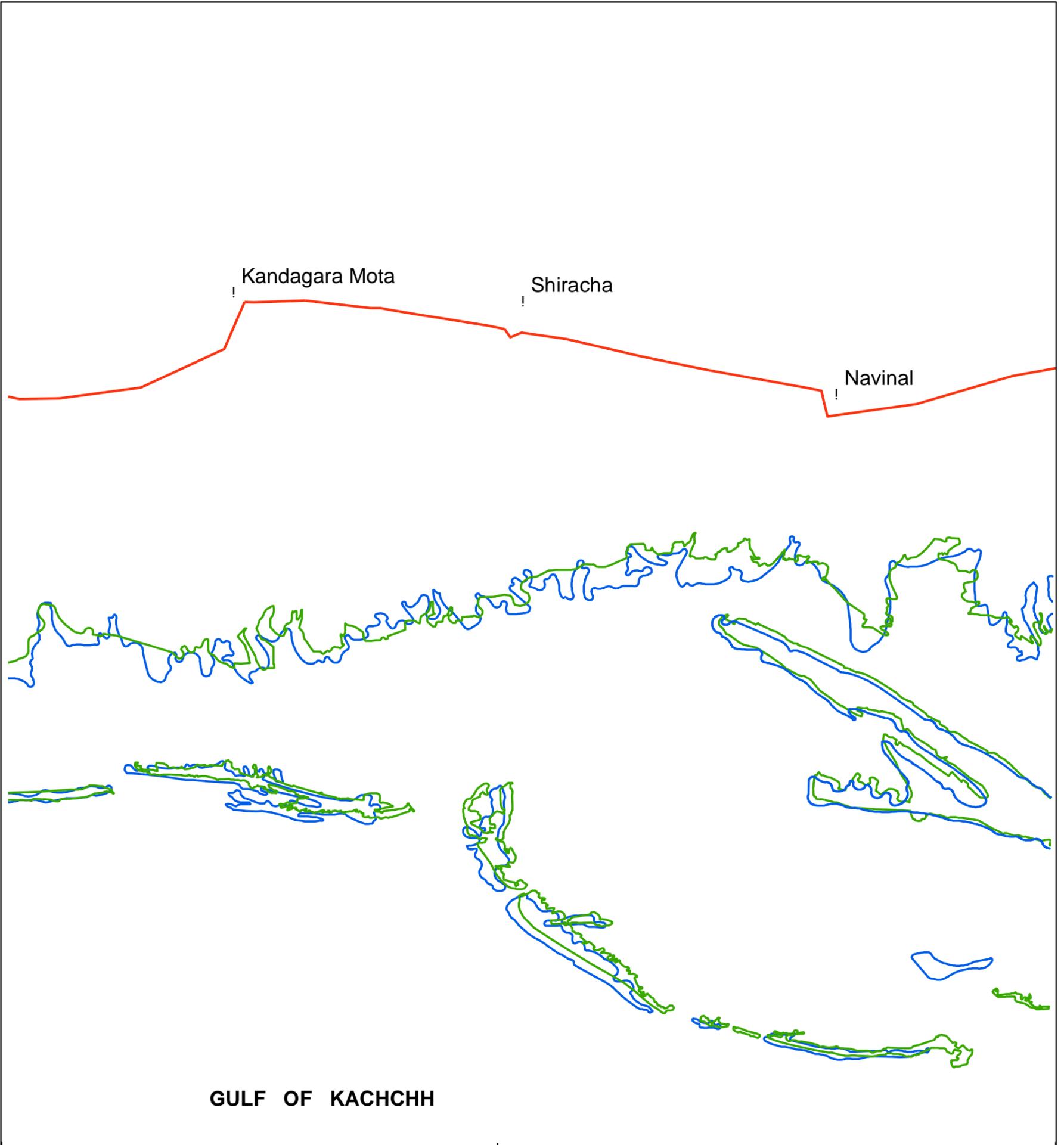
PREPARED BY:  
SPACE APPLICATIONS CENTRE, AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

KACHCHH DISTRICT

GUJARAT

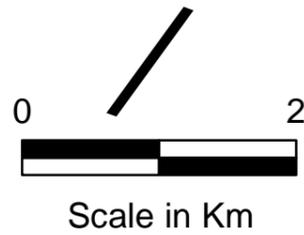
FOR OFFICIAL USE ONLY  
SHEET NO. 41F09SW



GULF OF KACHCHH

## Legend

- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- ! HABITATION



### INDEX TO SHEETS

41F05 NE	41F09 NW	41F09 NE
41F05 SE		41F09 SE
SEA	SEA	SEA



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

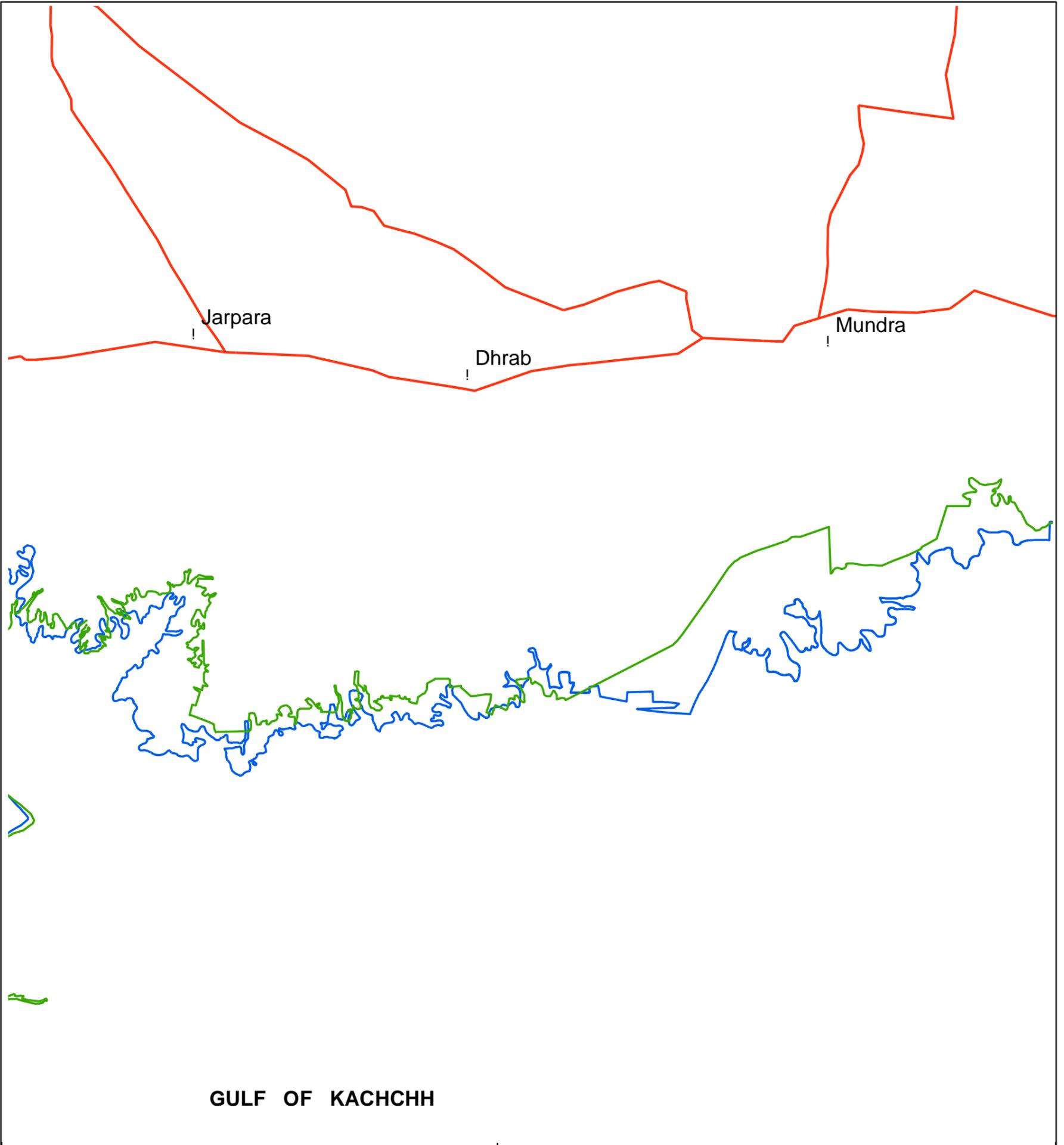
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SPACE APPLICATIONS CENTRE, AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

KACHCHH DISTRICT

GUJARAT

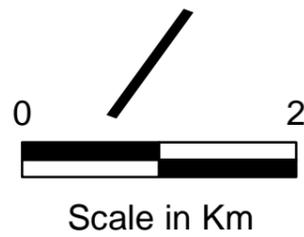
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SHEET NO. 41F09SE



GULF OF KACHCHH

## Legend

- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- ! HABITATION



### INDEX TO SHEETS

41F09 NW	41F09 NE	41F13 NW
41F09 SW		41F13 SW
SEA	41F10 NE	SEA



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

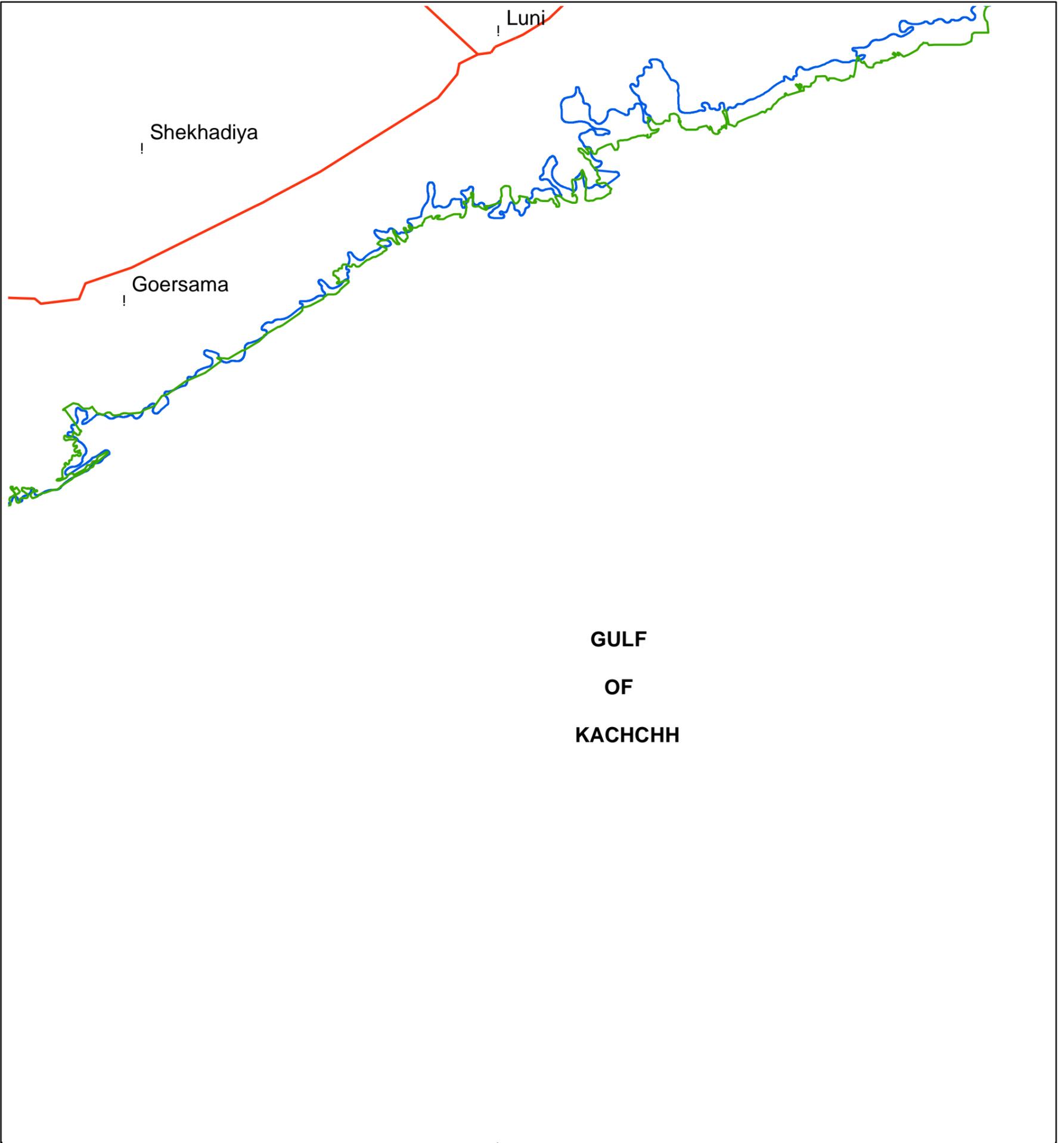
PREPARED BY:  
SPACE APPLICATIONS CENTRE, AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

KACHCHH DISTRICT

GUJARAT

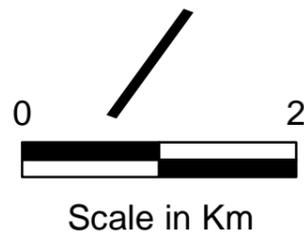
FOR OFFICIAL USE ONLY  
SHEET NO. 41F13SW



GULF  
OF  
KACHCHH

## Legend

- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- ! HABITATION



### INDEX TO SHEETS

41F09 NE	41F13 NW	41F13 NE
41F09 SE		41F13 SE
SEA	SEA	SEA



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

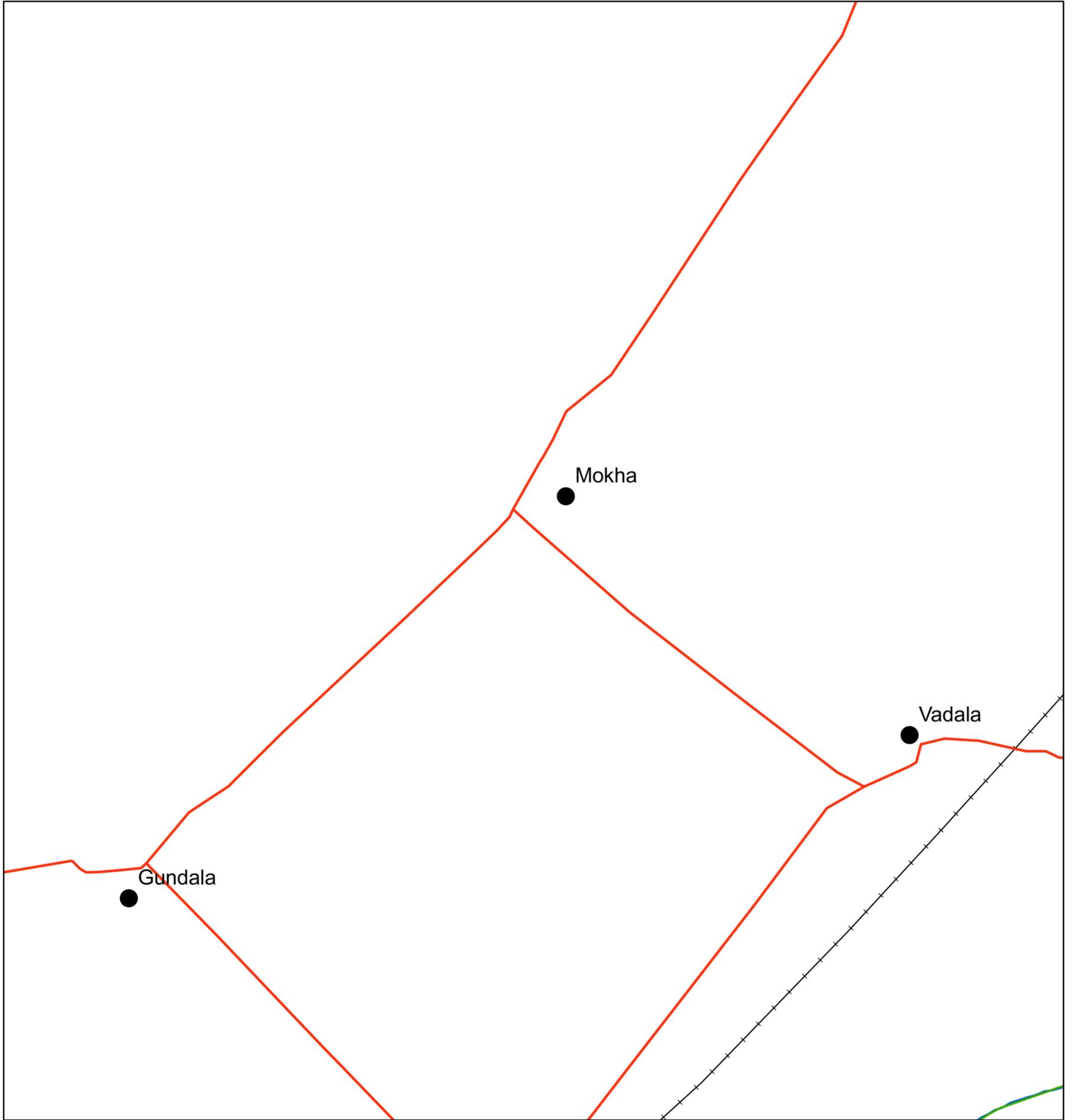
PREPARED BY:  
SPACE APPLICATIONS CENTRE, AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

## GUJARAT

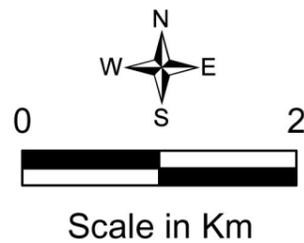
FOR OFFICIAL USE ONLY  
SHEET NO. 41F13NW

KACHCHH DISTRICT



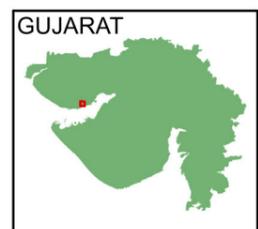
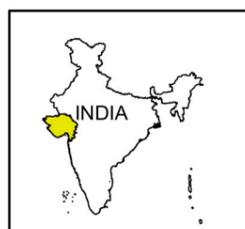
### Legend

- ROAD
- - - RAIL
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

41E12 SE	41E16 SW	41E16 SE
41F09 NE		41F13 NE
41F09 SE	41F13 SW	41F13 SE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

## GUJARAT

FOR OFFICIAL USE ONLY

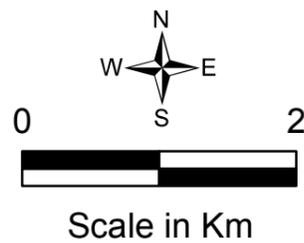
KACHCHH DISTRICT

SHEET NO. 41F13SE

GULF OF KACHCHH

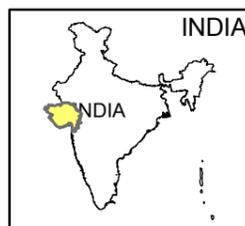
### Legend

- EROSION
- ACCRETION
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91



#### INDEX TO SHEETS

41F13 NW	41F13 NE	41J01 NW
41F13 SW		41J01 SW
41F14 NW	41F14 NE	41J02 NW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

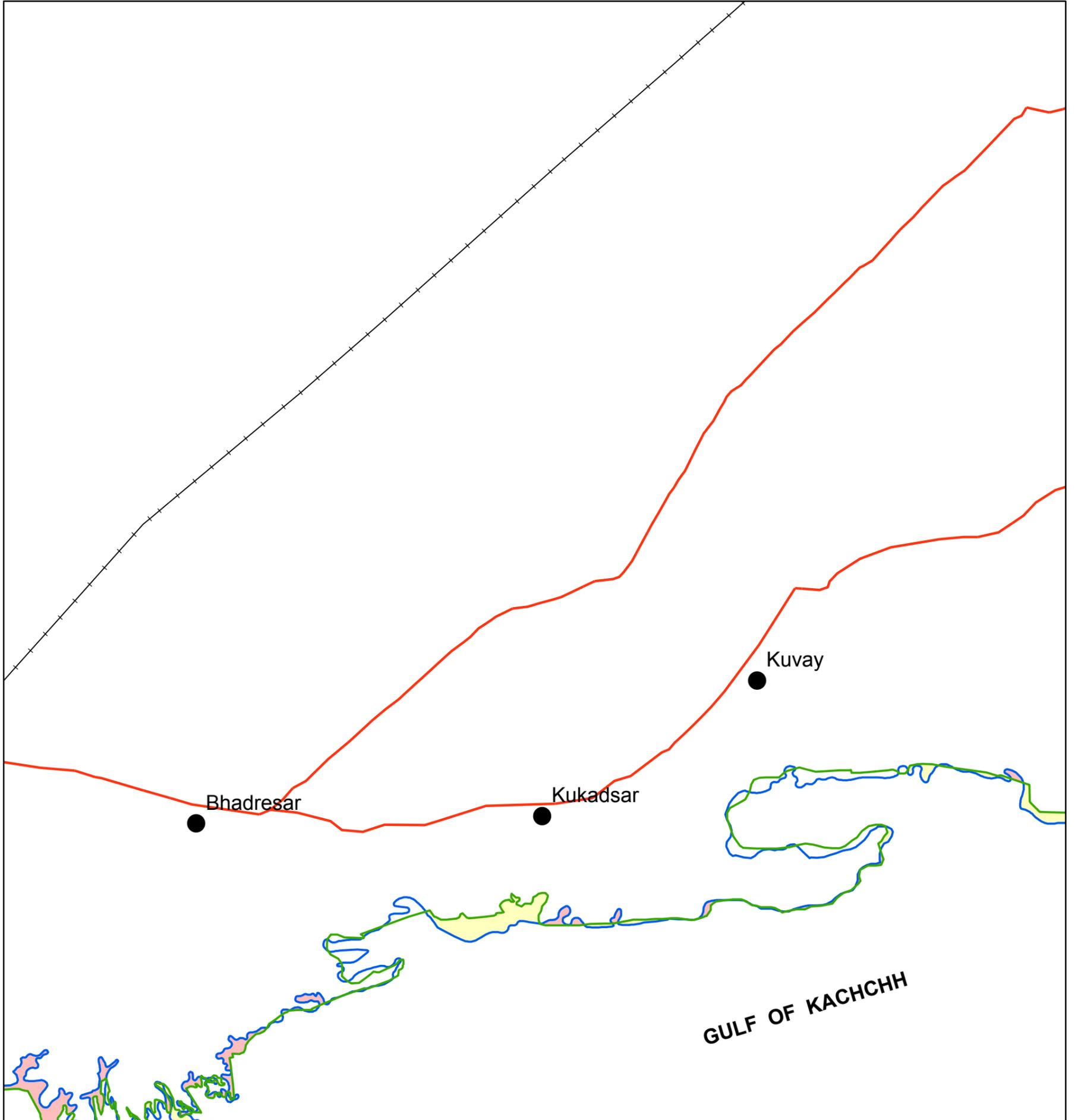
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

## GUJARAT

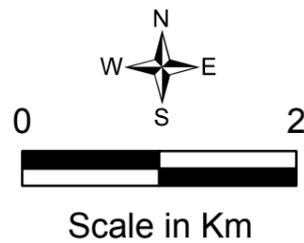
FOR OFFICIAL USE ONLY  
SHEET NO. 41F13NE

KACHCHH DISTRICT



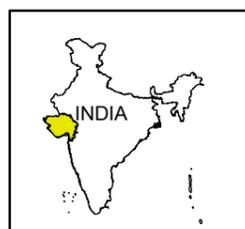
### Legend

- EROSION
- ACCRETION
- ROAD
- RAIL
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



#### INDEX TO SHEETS

41E16 SW	41E16 SE	41I04 SW
41F13 NW		41J01 NW
41F13 SW	41F13 SE	41J01 SW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

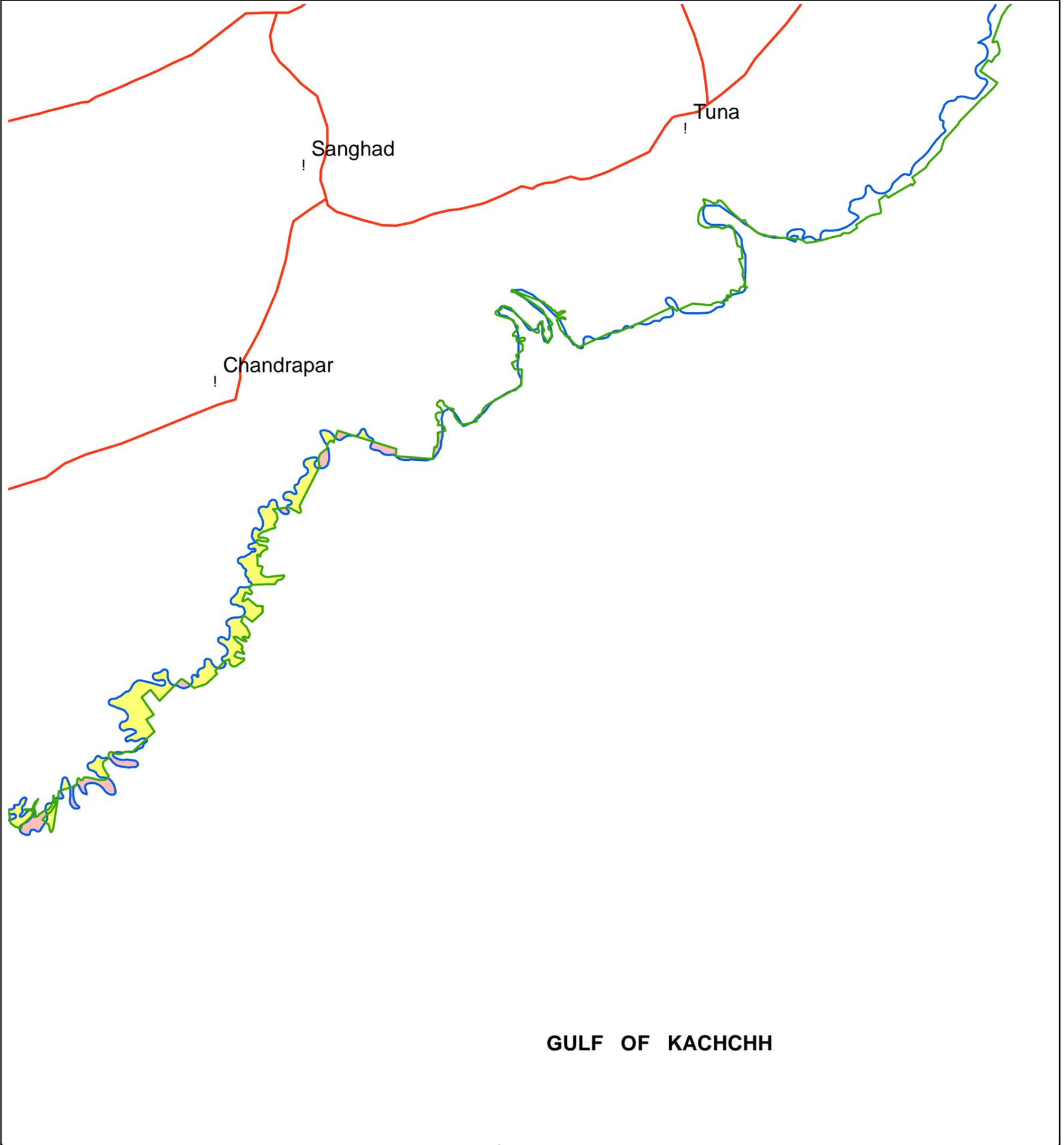
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

KACHCHH DISTRICT

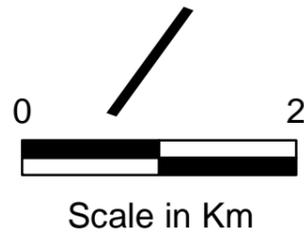
GUJARAT

FOR OFFICIAL USE ONLY  
SHEET NO. 41J01NW



## Legend

- EROSION
- ACCRETION
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- ! HABITATION



### INDEX TO SHEETS

41E16 NE	41104 SW	41104 SE
41F13 NE		41J01 NE
41F13 SE	SEA	SEA



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

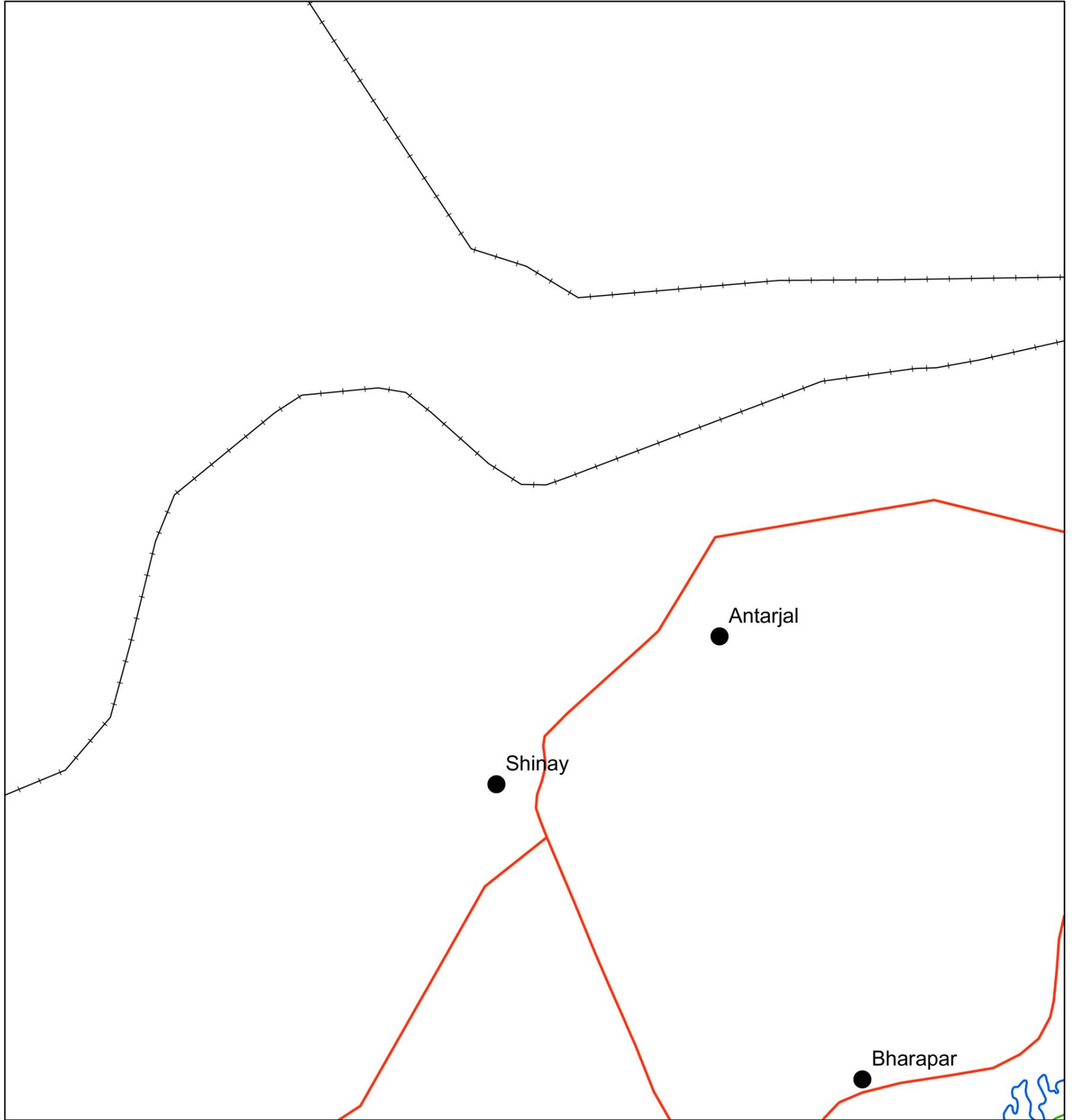
PREPARED BY:  
SPACE APPLICATIONS CENTRE, AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

## GUJARAT

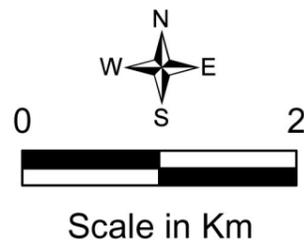
FOR OFFICIAL USE ONLY  
SHEET NO. 41I04SW

KACHCHH DISTRICT



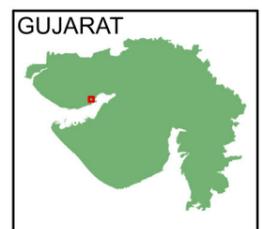
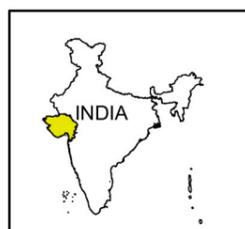
### Legend

- ROAD
- + RAIL
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

41E16 NE	41I04 NW	41I04 NE
41E16 SE		41I04 SE
41F13 NE	41J01 NW	41J01 NE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

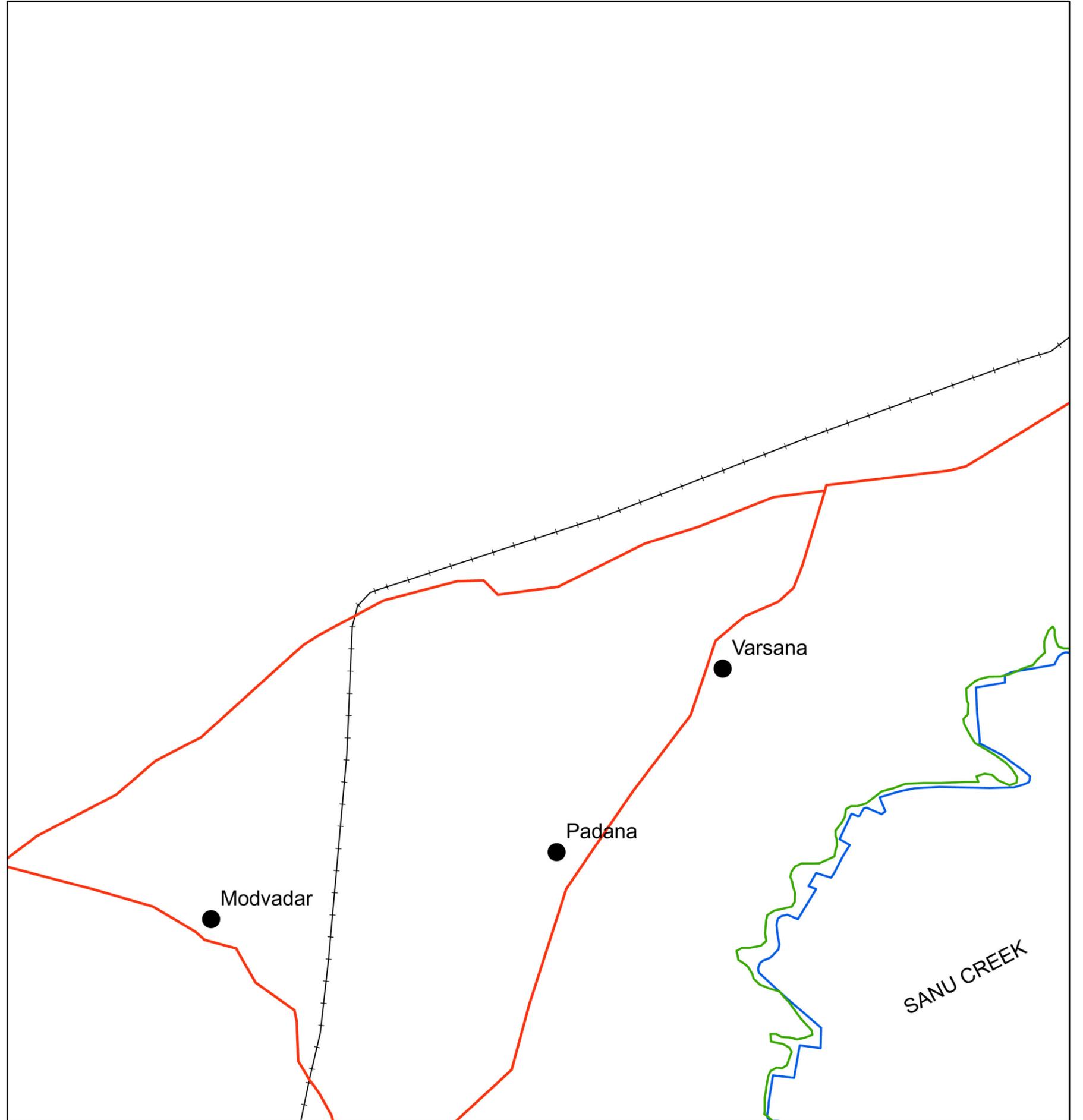


# SHORELINE CHANGE MAP

## GUJARAT

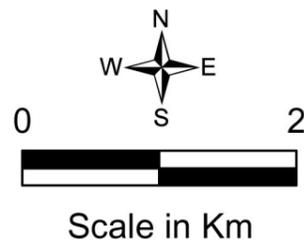
FOR OFFICIAL USE ONLY  
SHEET NO. 41104NE

KACHCHH DISTRICT



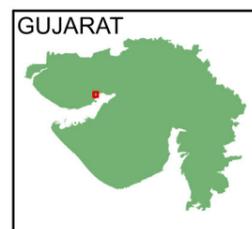
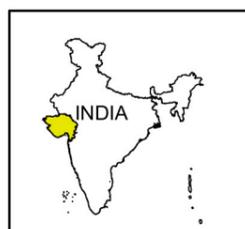
### Legend

- ROAD
- - - RAIL
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

41103 SW	41103 SE	41107 SW
41104 NW		SEA
41104 SW	SEA	SEA



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

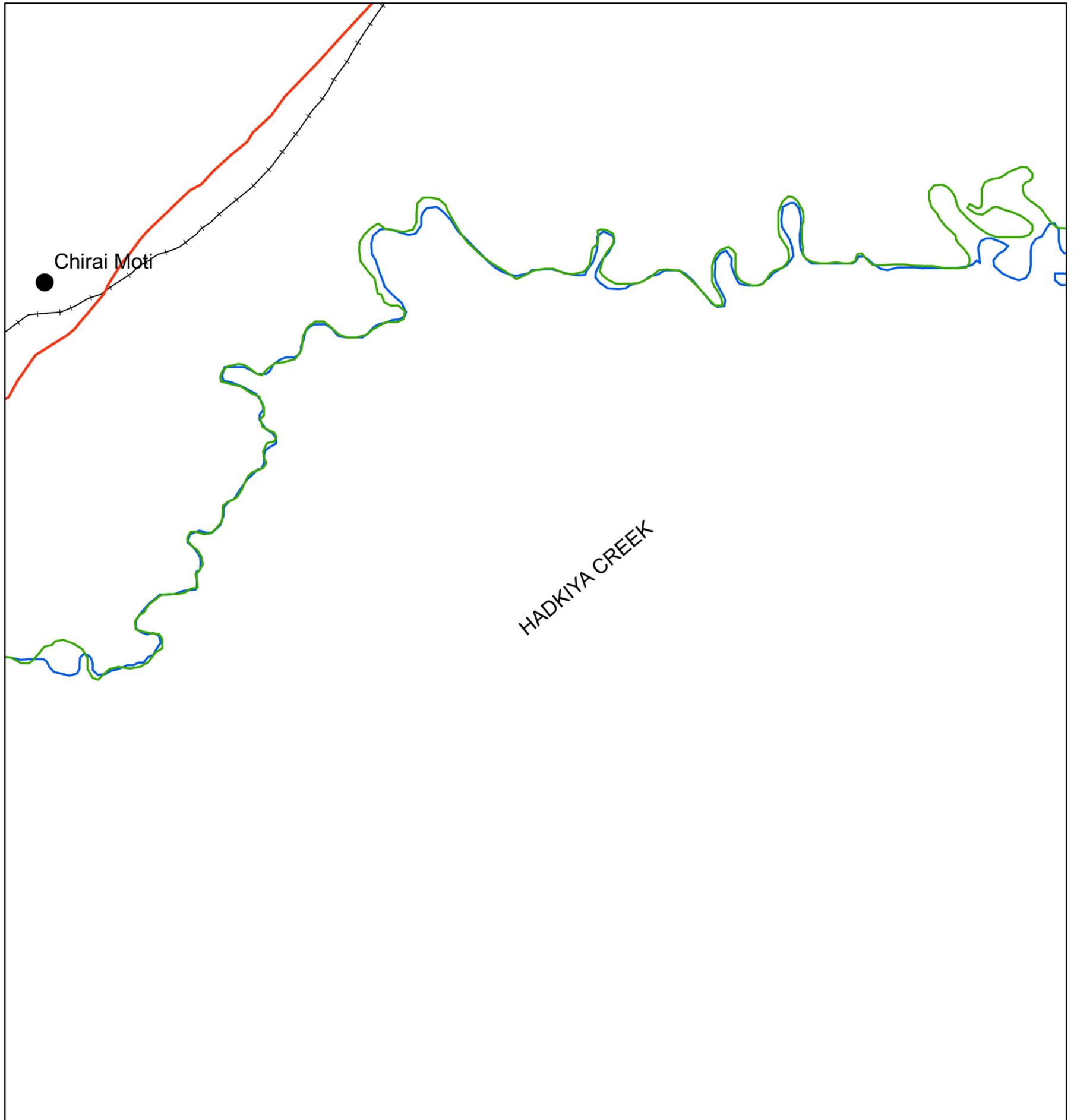
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

## GUJARAT

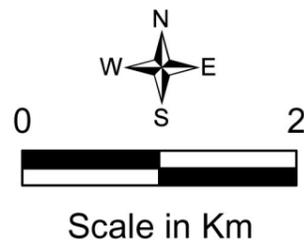
FOR OFFICIAL USE ONLY  
SHEET NO. 41108NW

KACHCHH DISTRICT



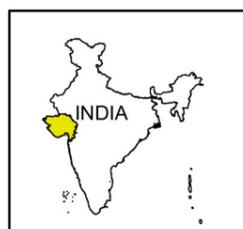
### Legend

- ROAD
- + -+ -+ -+ RAIL
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



#### INDEX TO SHEETS

41103 SE	41107 SW	41107 SE
41104 NE		41108 NE
41104 SE	41108 SW	41108 SE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

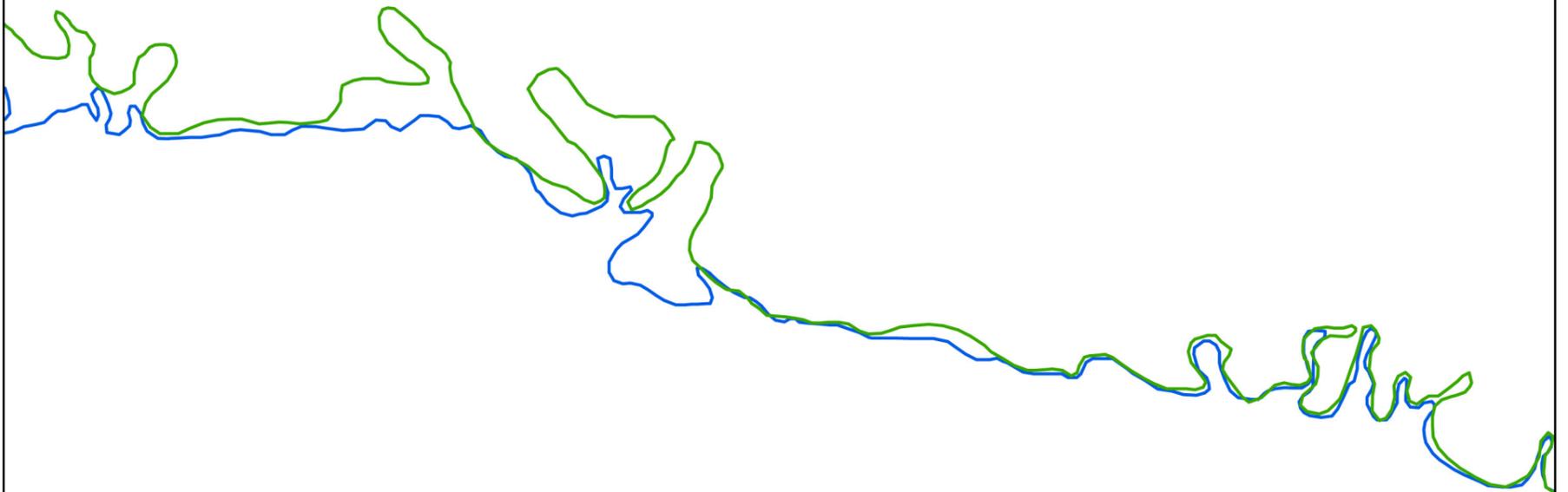
# SHORELINE CHANGE MAP

## GUJARAT

FOR OFFICIAL USE ONLY  
SHEET NO. 41108NE

KACHCHH DISTRICT

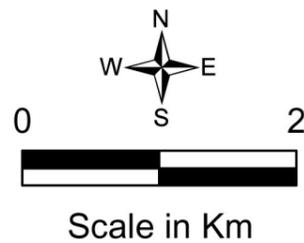
● Amaliyara



HADKIYA CREEK

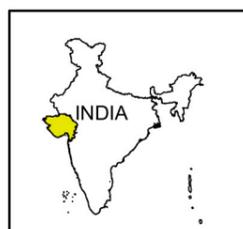
### Legend

-  ROAD
-  HIGH-TIDE LINE 2004-06
-  HIGH-TIDE LINE 1989-91
-  HABITATION



### INDEX TO SHEETS

41107 SW	41107 SE	41111 SW
41108 NW		41112 NW
41108 SW	41108 SE	41112 SW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

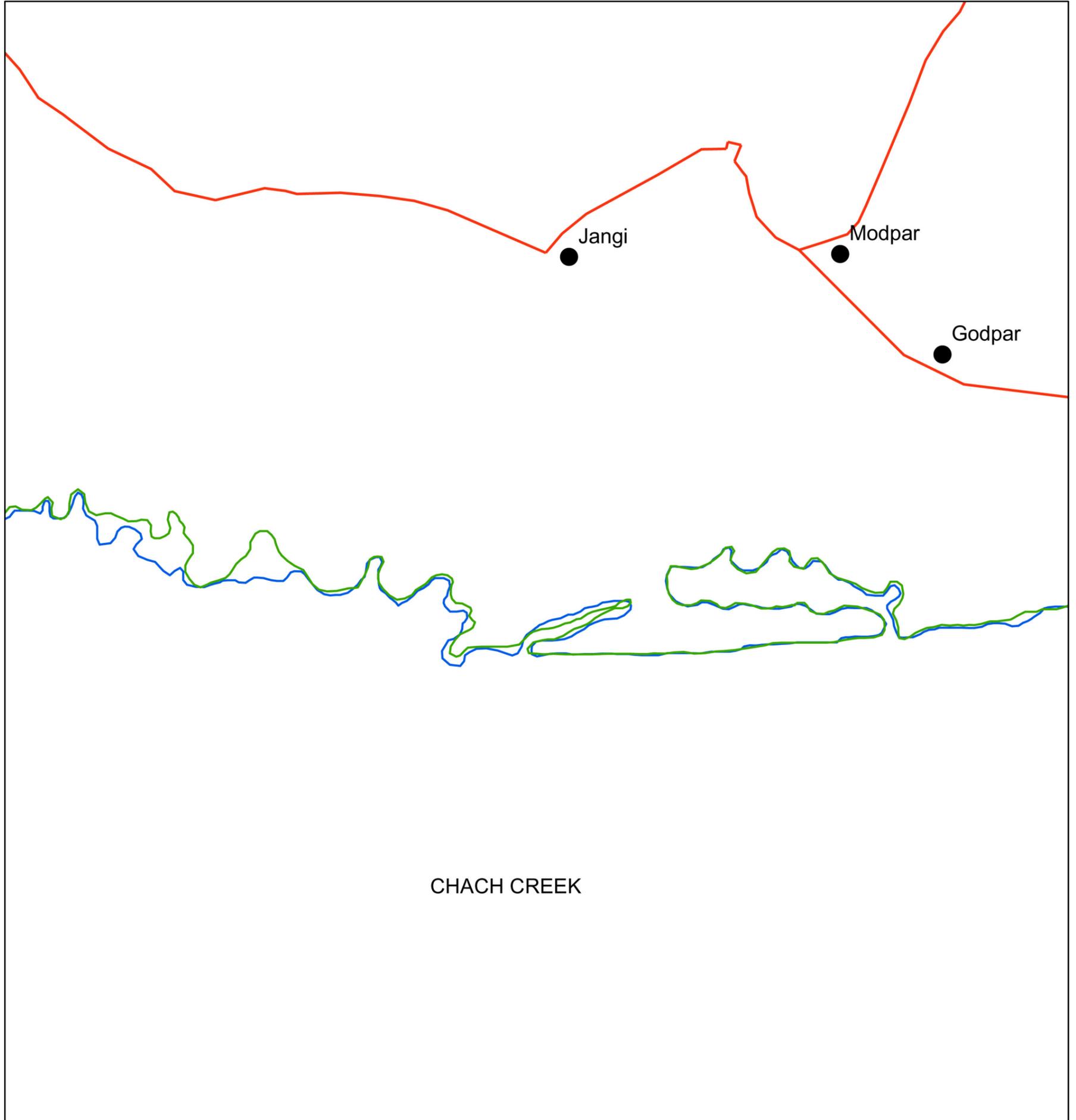
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

## GUJARAT

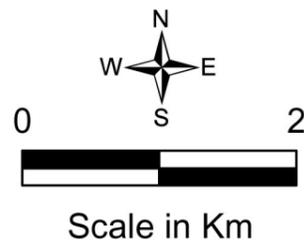
FOR OFFICIAL USE ONLY  
SHEET NO. 41112NW

KACHCHH DISTRICT



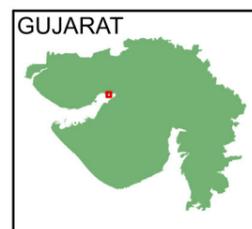
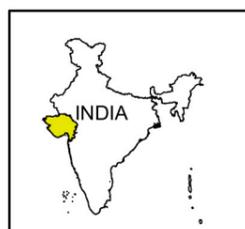
### Legend

- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



#### INDEX TO SHEETS

41107 SE	41111 SW	41111 SE
41108 NE		41112 NE
41108 SE	41112 SW	41112 SE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

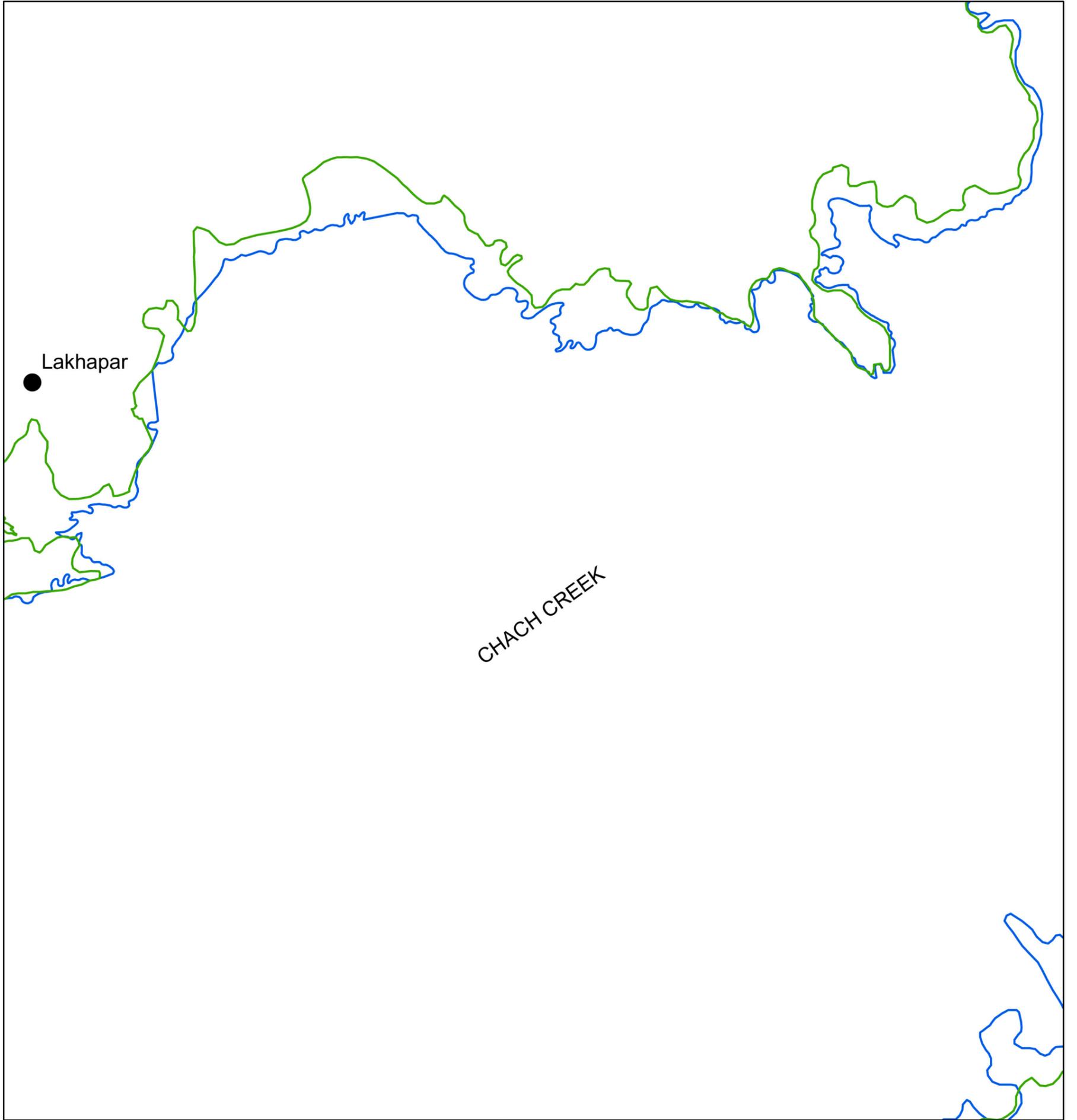
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

## GUJARAT

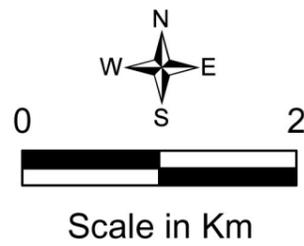
FOR OFFICIAL USE ONLY  
SHEET NO. 41112NE

KACHCHH DISTRICT



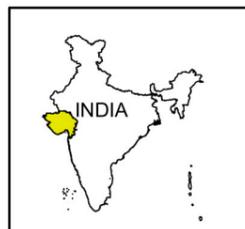
### Legend

- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

4111 SW	4111 SE	4115 SW
4112 NW		4116 NW
4112 SW	4112 SE	4116 SW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

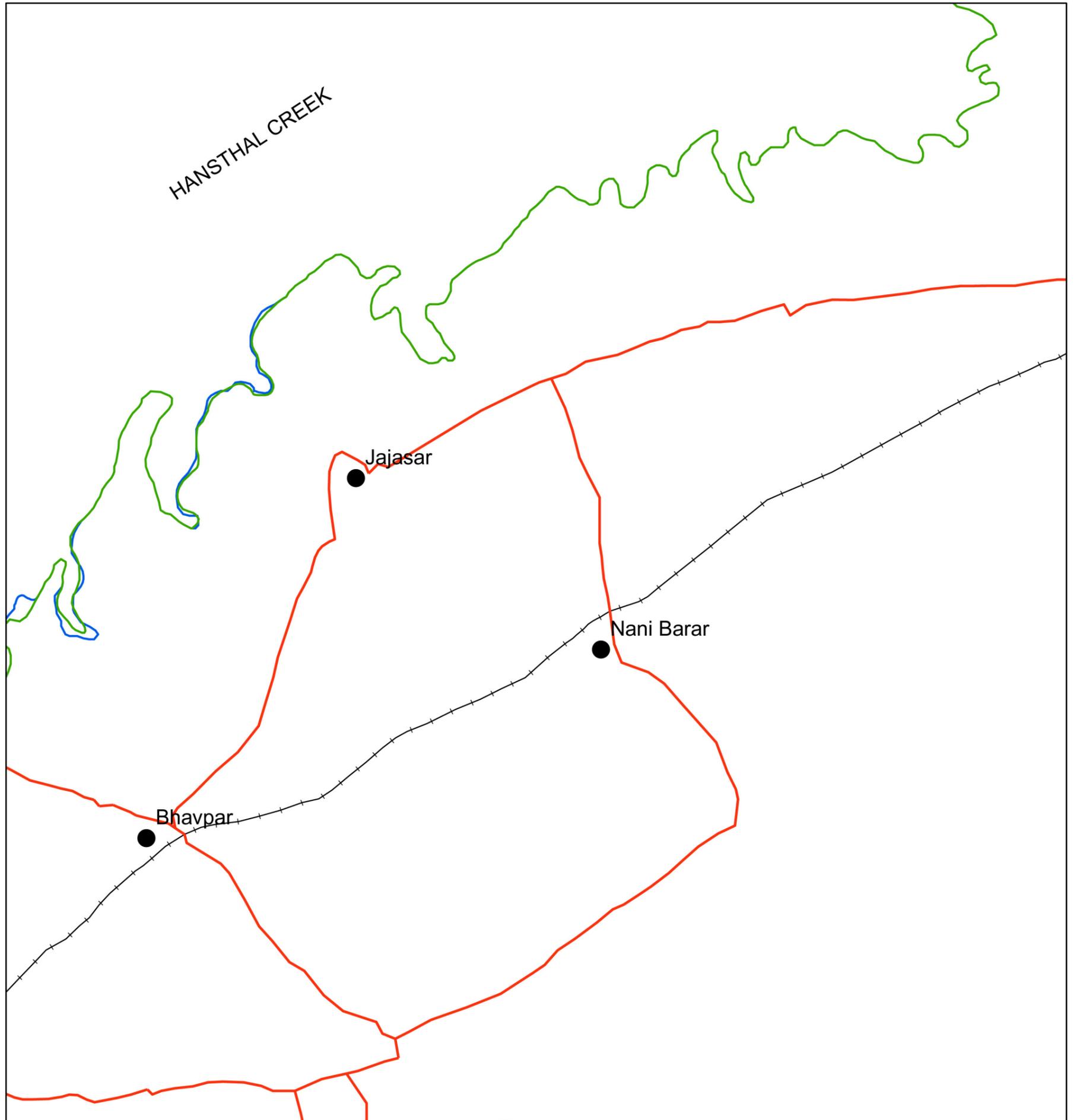
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

## GUJARAT

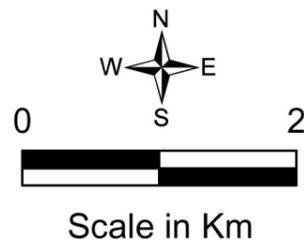
FOR OFFICIAL USE ONLY  
SHEET NO. 41112SE

RAJKOT DISTRICT



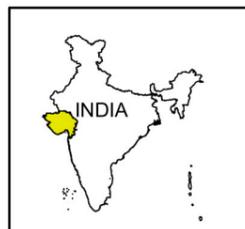
### Legend

- ROAD
- + RAIL
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

41112 NW	41112 NE	41116 NW
41112 SW		41116 SW
41J09 NW	41J09 NE	41J13 NW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

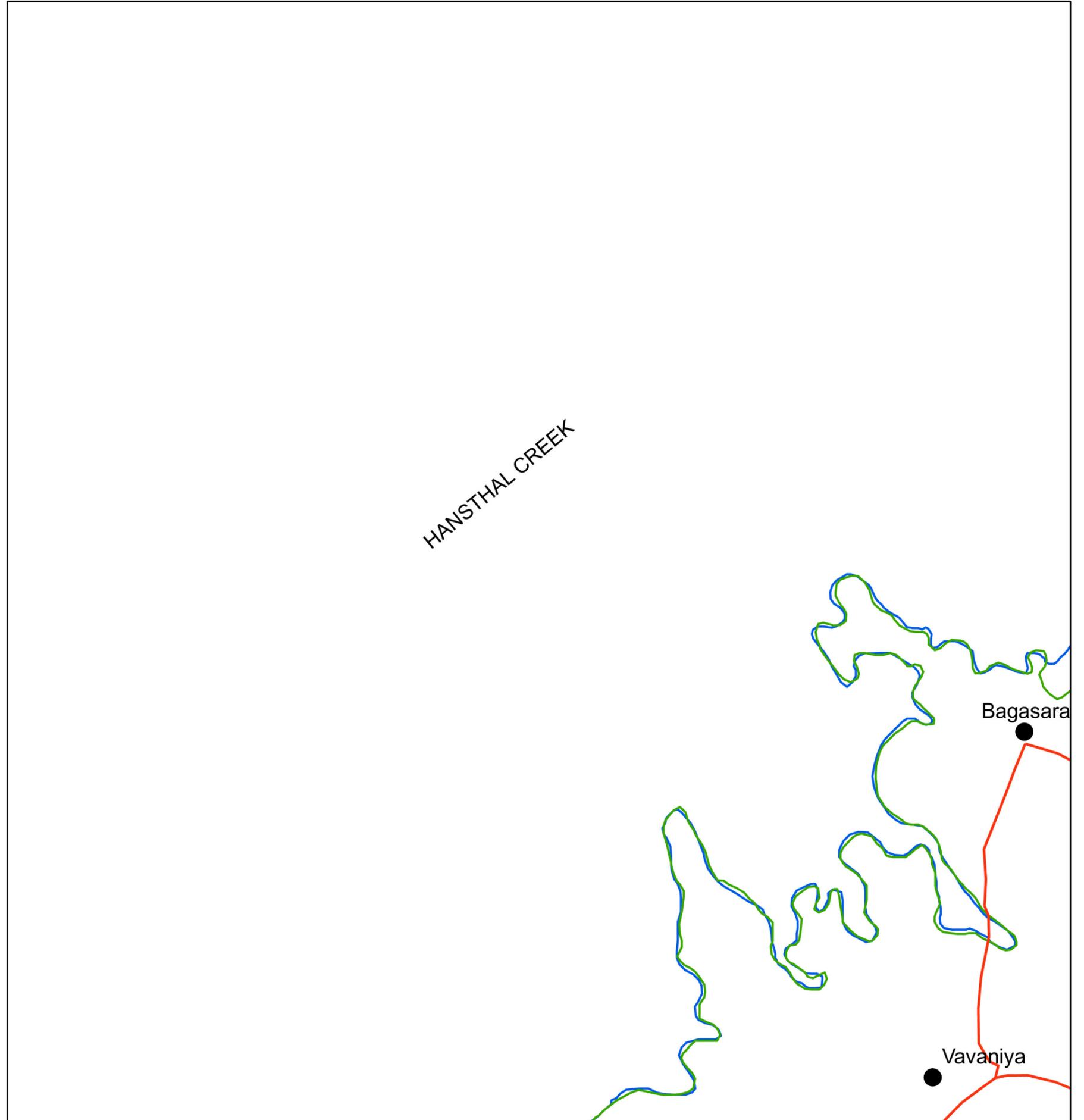
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SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

## GUJARAT

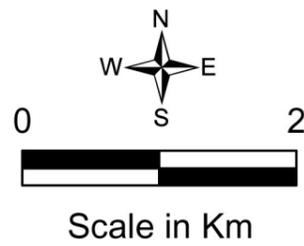
FOR OFFICIAL USE ONLY  
SHEET NO. 41112SW

RAJKOT DISTRICT



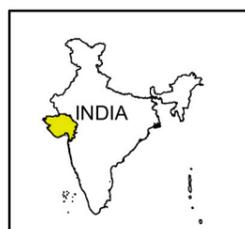
### Legend

- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

41108 NE	41112 NW	41112 NE
41108 SE		41112 SE
41J05 NE	41J09 NW	41J09 NE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

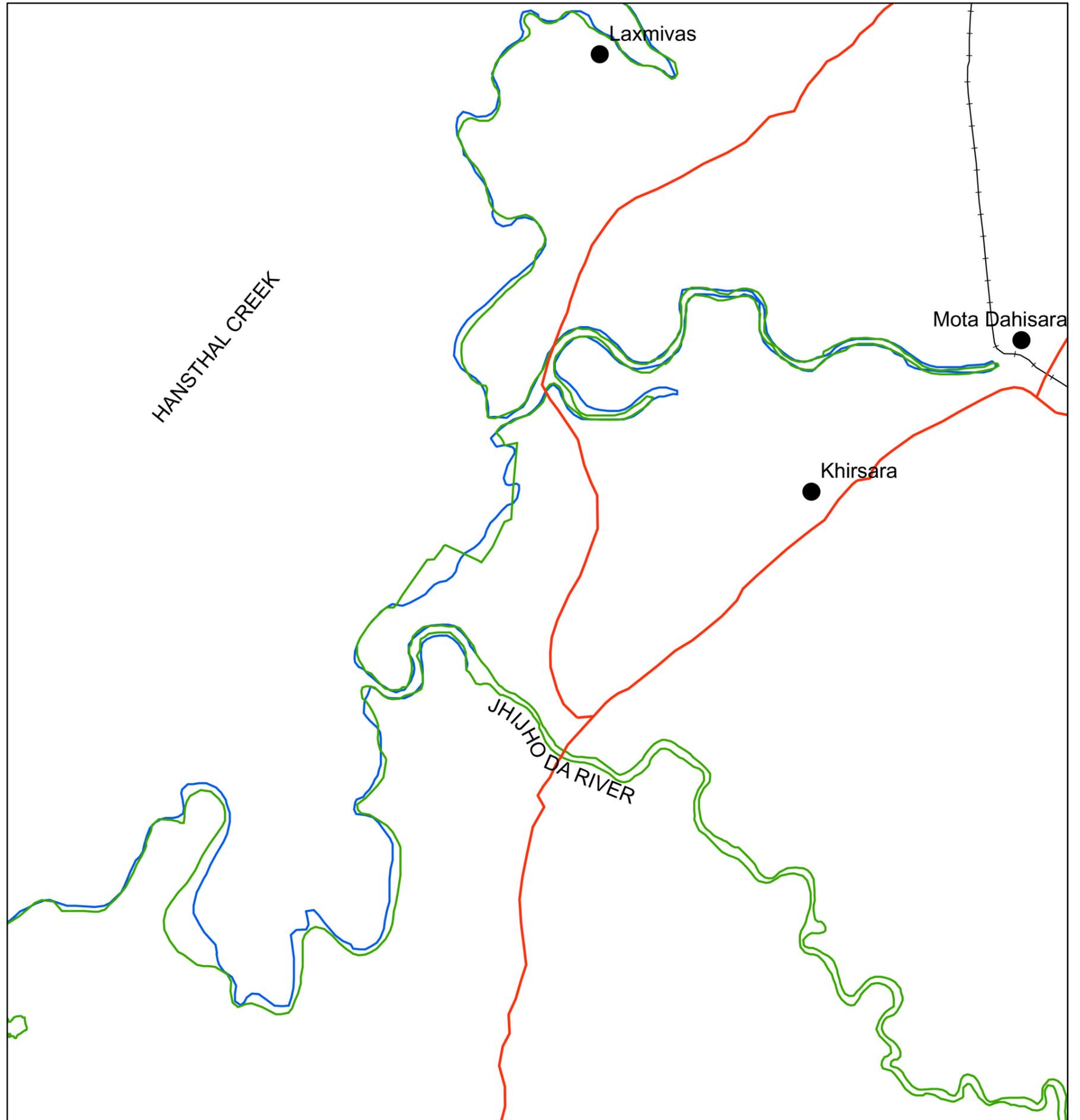
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

## GUJARAT

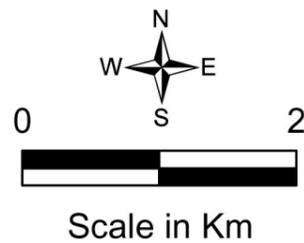
FOR OFFICIAL USE ONLY  
SHEET NO. 41J09NW

RAJKOT DISTRICT



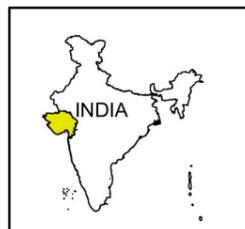
### Legend

- ROAD
- + -+ -+ -+ RAIL
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

41108 SE	41112 SW	41112 SE
41J05 NE		41J09 NE
41J05 SE	41J09 SW	41J09 SE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

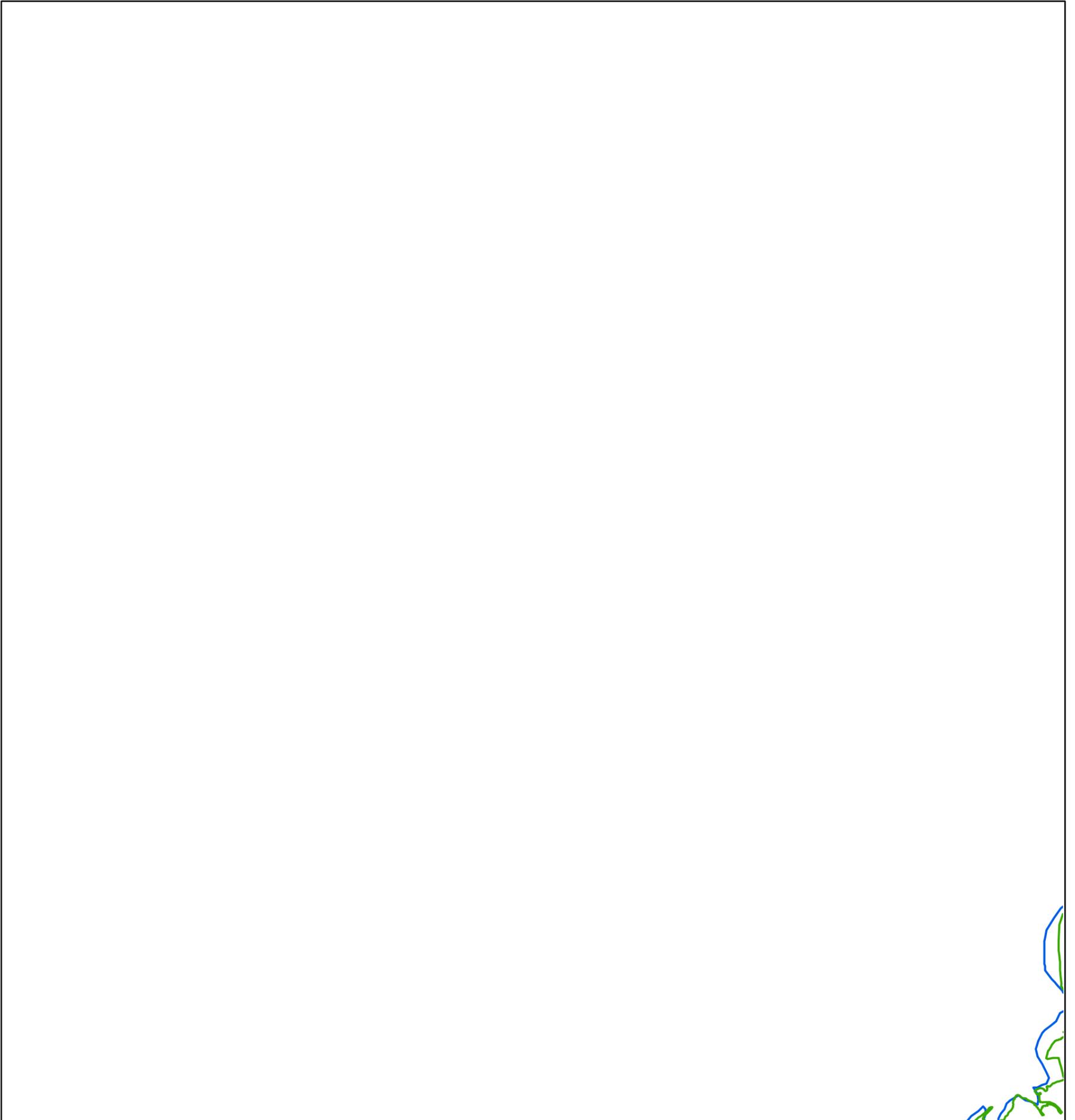
# SHORELINE CHANGE MAP

## GUJARAT

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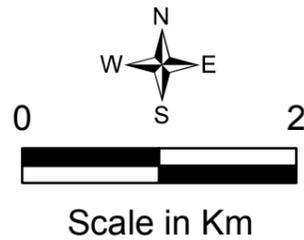
JAMNAGAR DISTRICT

SHEET NO. 41J05NE



### Legend

-  HIGH-TIDE LINE 2004-06
-  HIGH-TIDE LINE 1989-91



### INDEX TO SHEETS

41108 SW	41108 SE	41112 SW
41J05 NW		41J09 NW
41J05 SW	41J05 SE	41J09 SW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

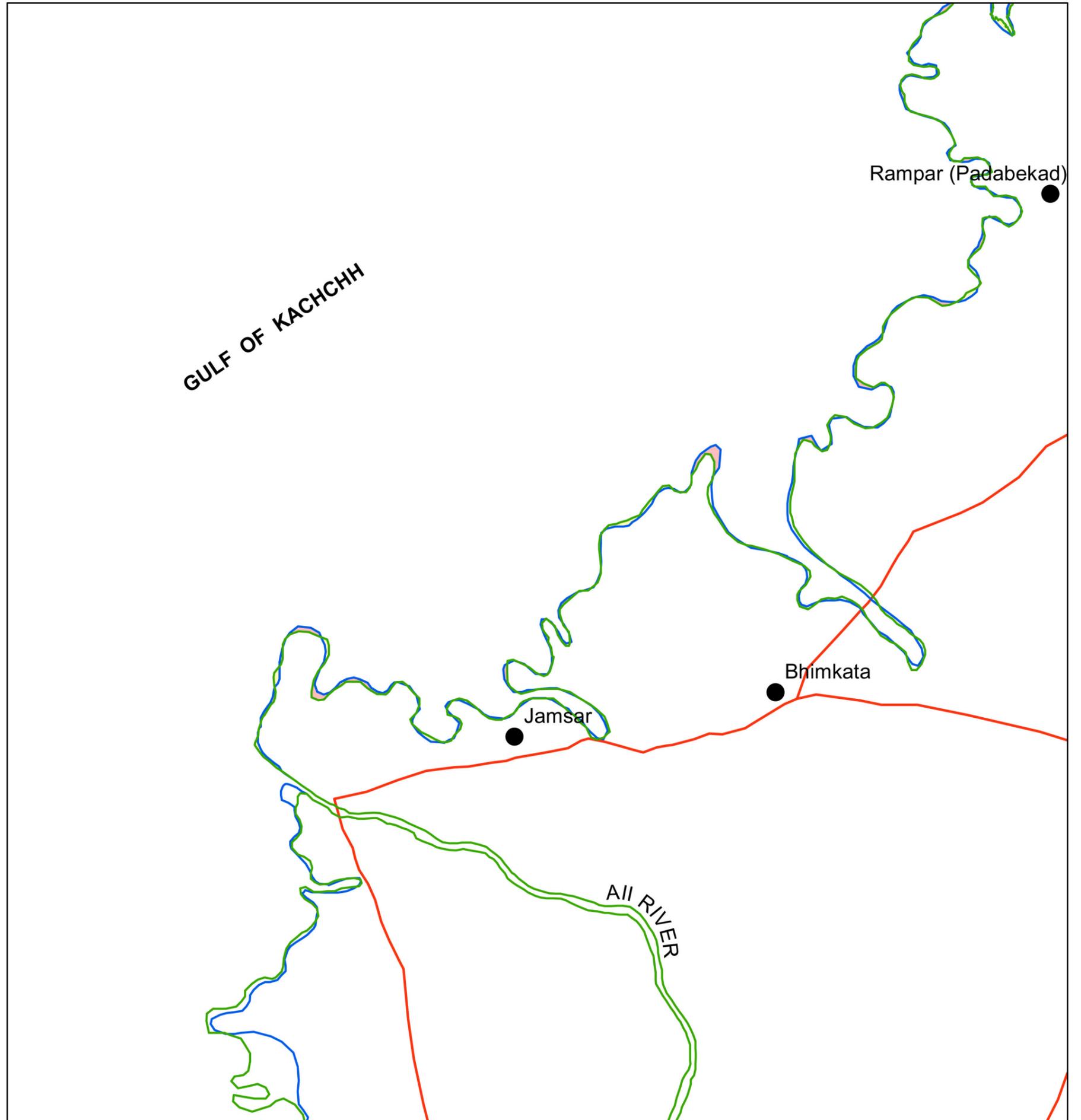
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

## GUJARAT

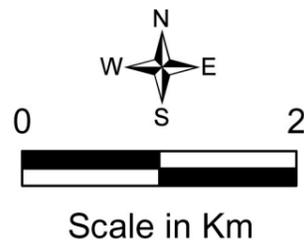
FOR OFFICIAL USE ONLY  
SHEET NO. 41J05SE

JAMNAGAR DISTRICT



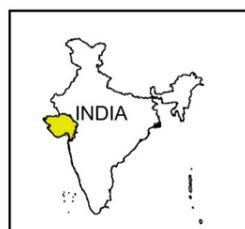
### Legend

- EROSION
- ACCRETION
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

41J05 NW	41J05 NE	41J09 NW
41J05 SW		41J09 SW
41J06 NW	41J06 NE	41J10 NW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

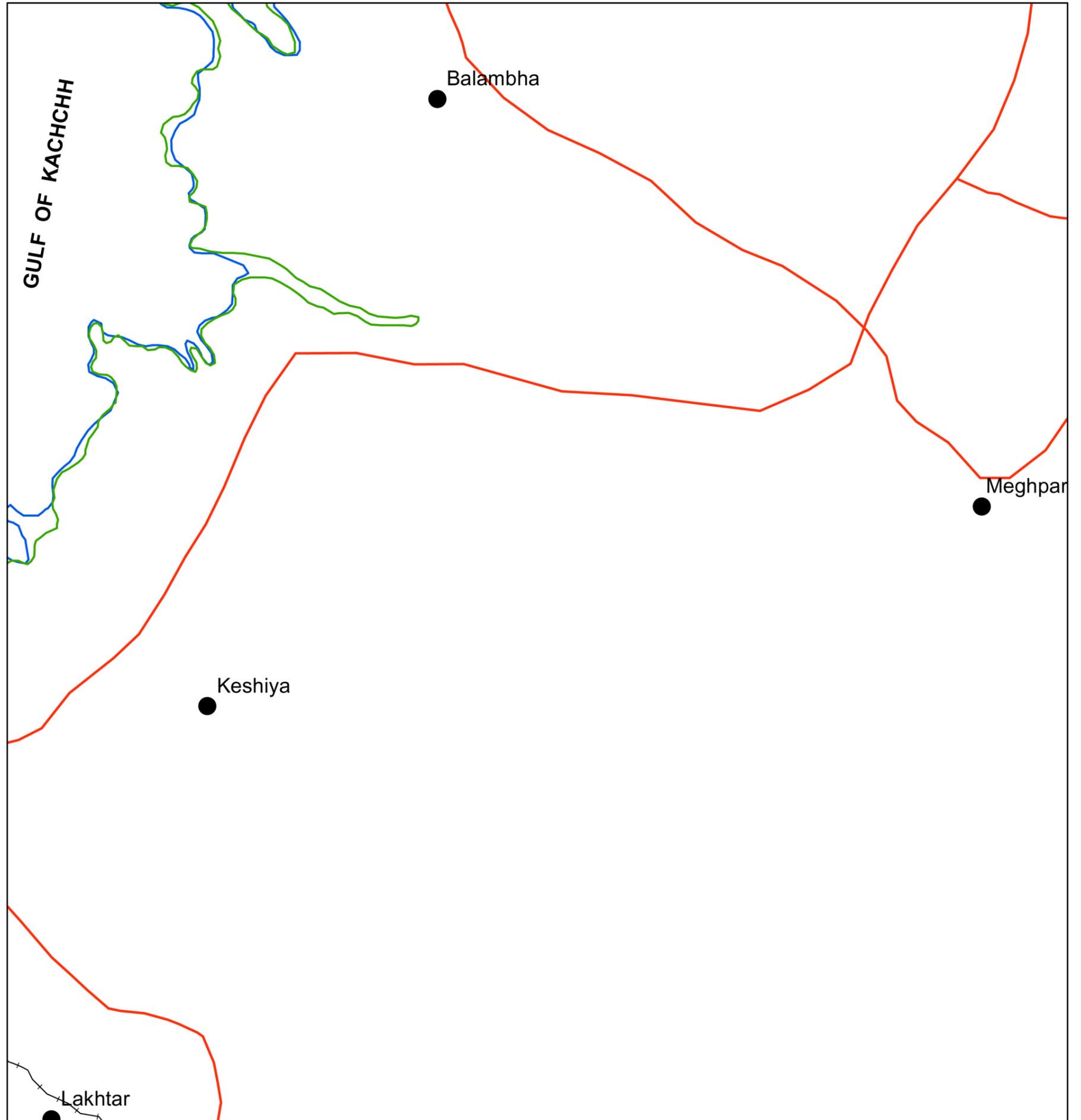
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SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

## GUJARAT

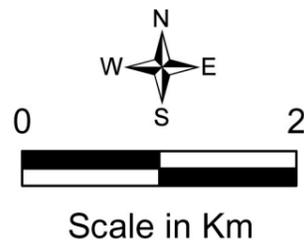
FOR OFFICIAL USE ONLY  
SHEET NO. 41J06NE

JAMNAGAR DISTRICT



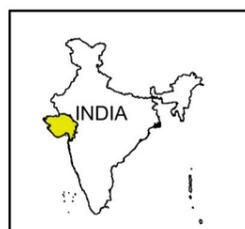
### Legend

- ROAD
- +—+ RAIL
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

41J05 SW	41J05 SE	41J09 SW
41J06 NW		41J10 NW
41J06 SW	41J06 SE	41J10 SW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

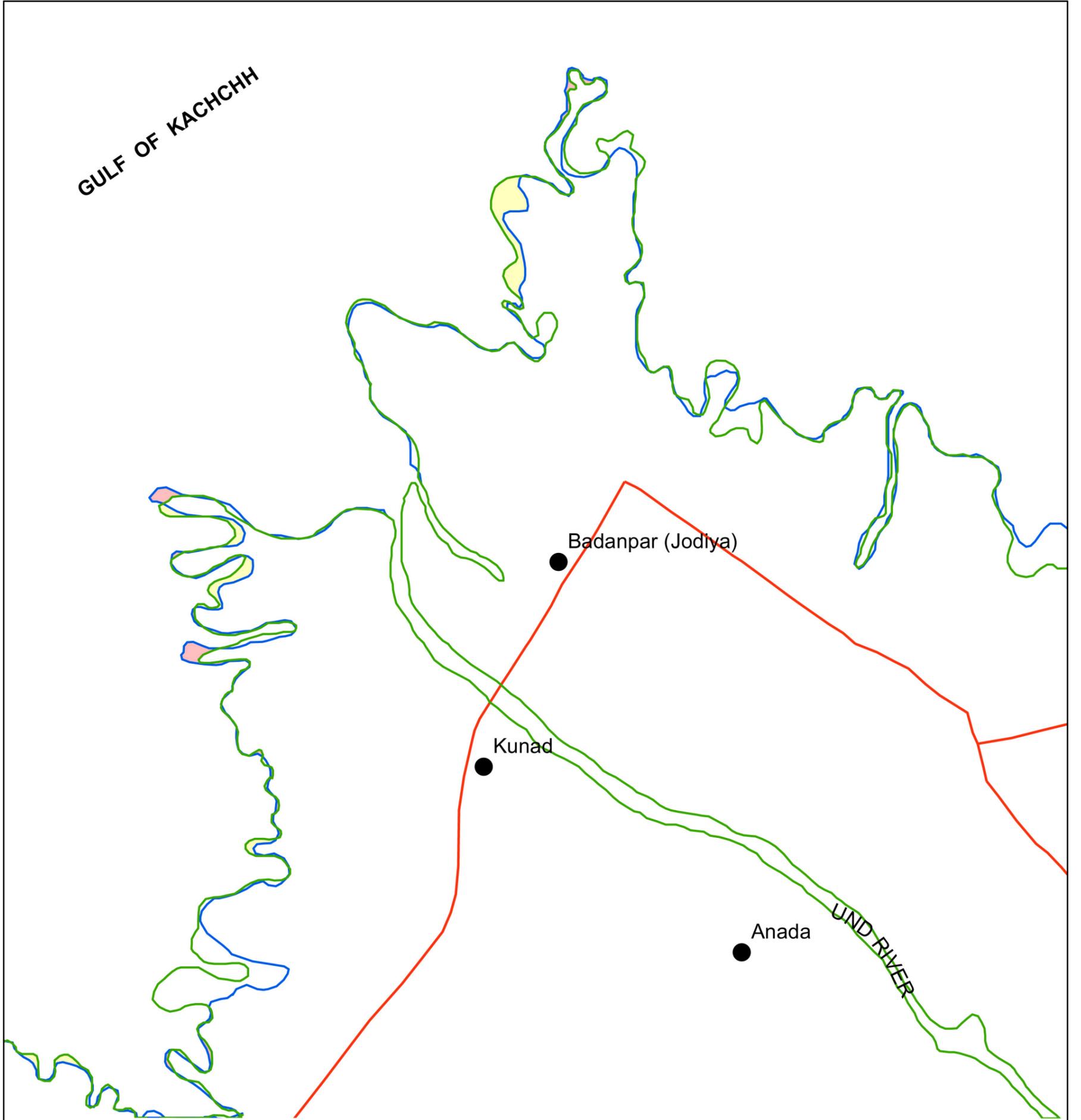
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

## GUJARAT

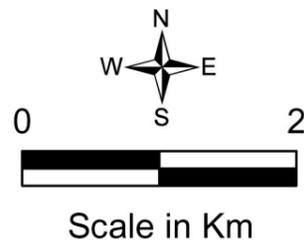
FOR OFFICIAL USE ONLY  
SHEET NO. 41J06NW

JAMNAGAR DISTRICT



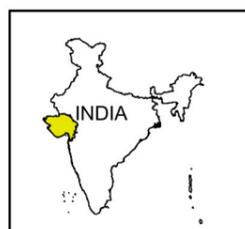
### Legend

- EROSION
- ACCRETION
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

SEA	41J05 SW	41J05 SE
41J02 NE		41J06 NE
41J02 SE	41J06 SW	41J06 SE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

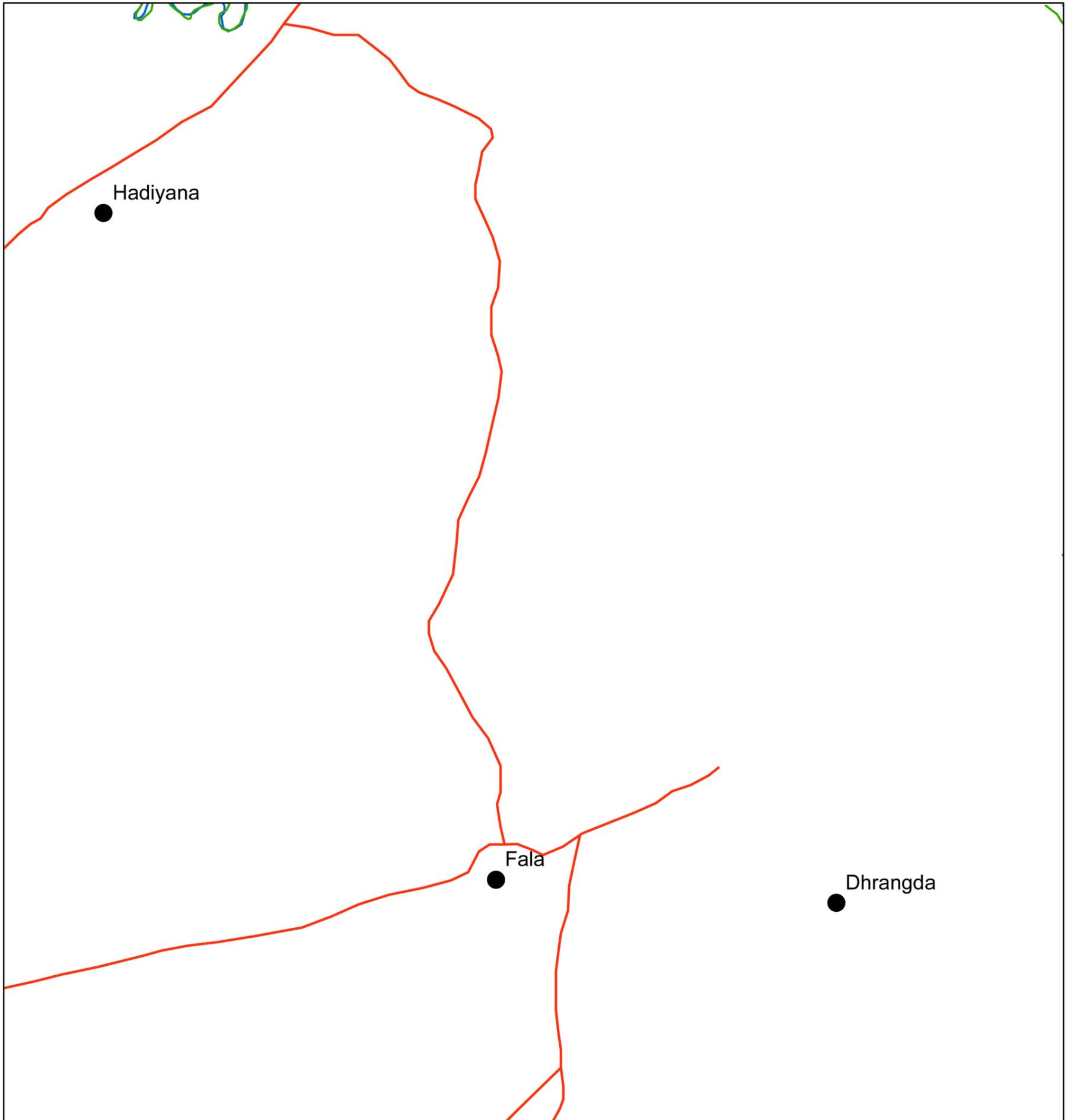
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

## GUJARAT

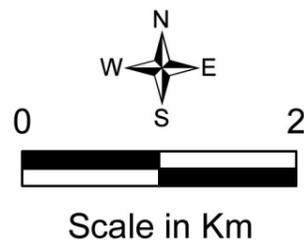
FOR OFFICIAL USE ONLY  
SHEET NO. 41J06SW

JAMNAGAR DISTRICT



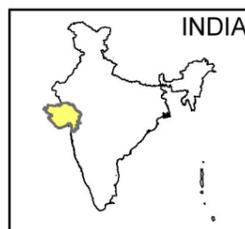
### Legend

- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



#### INDEX TO SHEETS

41J02NE	41J06NW	41J06NE
41J02SE		41J06SE
41J03NE	41J07NW	41J07NE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

## GUJARAT

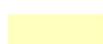
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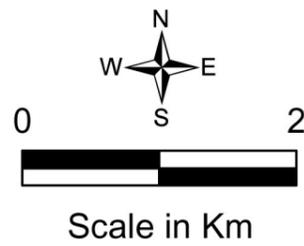
JAMNAGAR DISTRICT

GULF OF KACHCHH



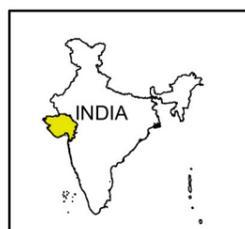
### Legend

-  EROSION
-  ACCRETION
-  HIGH-TIDE LINE 2004-06
-  HIGH-TIDE LINE 1989-91



### INDEX TO SHEETS

SEA	SEA	41J05 SW
SEA		41J06 NW
41J02 SW	41J02 SE	41J06 SW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

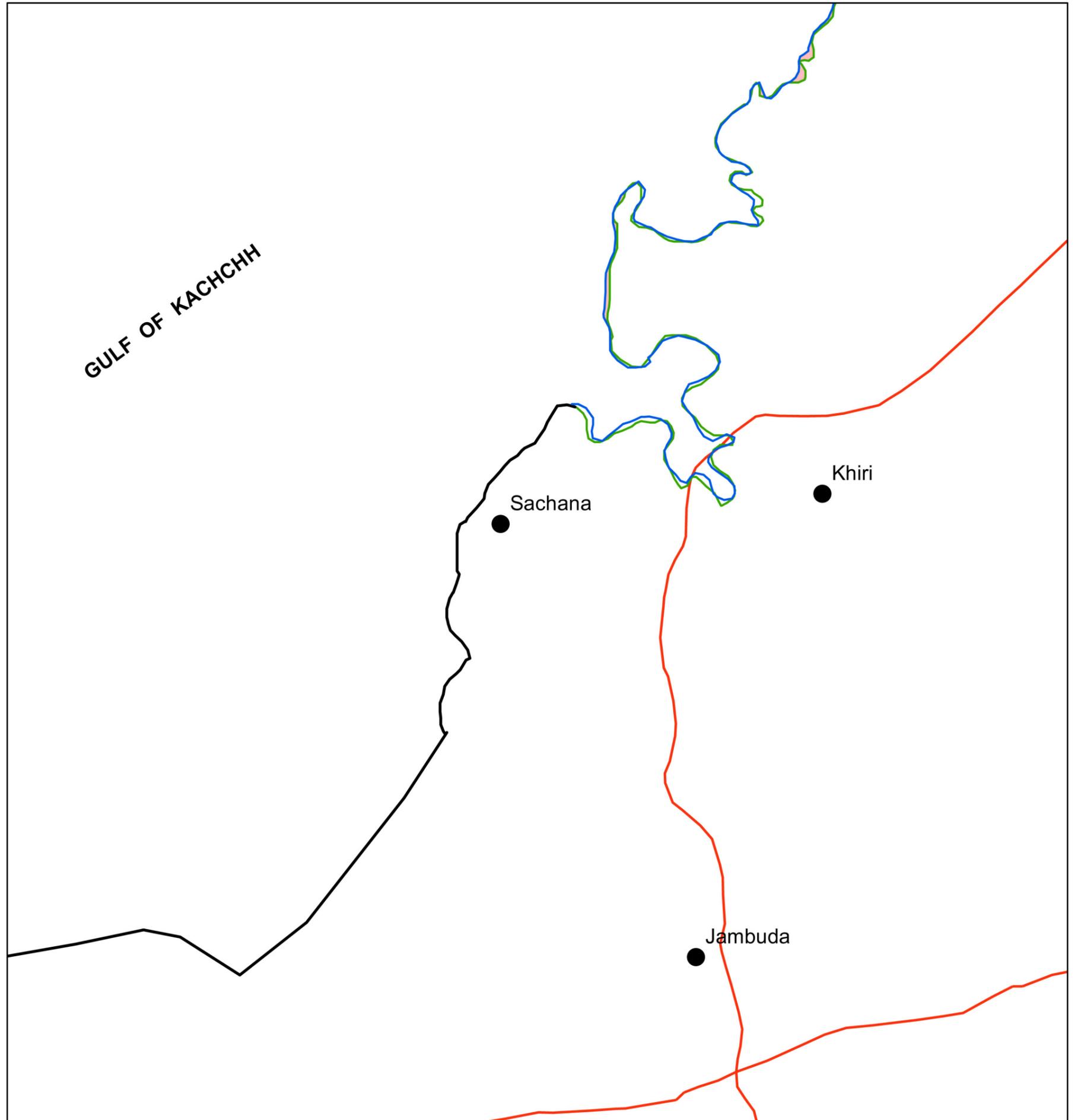
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

## GUJARAT

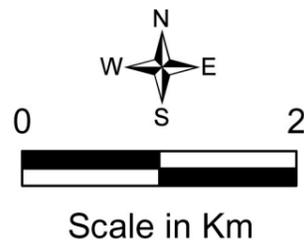
FOR OFFICIAL USE ONLY  
SHEET NO. 41J02SE

JAMNAGAR DISTRICT



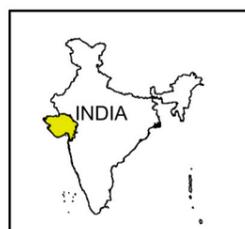
### Legend

- EROSION
- STABLE
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



#### INDEX TO SHEETS

SEA	41J02 NE	41J06 NW
41J02 SW		41J06 SW
41J03 NW	41J03 NE	41J07 NW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

## GUJARAT

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SHEET NO. 41J02SW

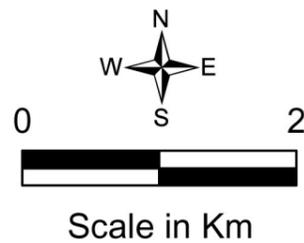
JAMNAGAR DISTRICT

GULF OF KACHCHH

Navagam Ghed

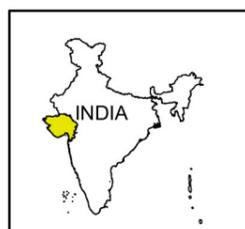
### Legend

- EROSION
- STABLE
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



#### INDEX TO SHEETS

SEA	SEA	41J02 NE
41F14 SE		41J02 SE
41F15 NE	41J03 NW	41J03 NE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

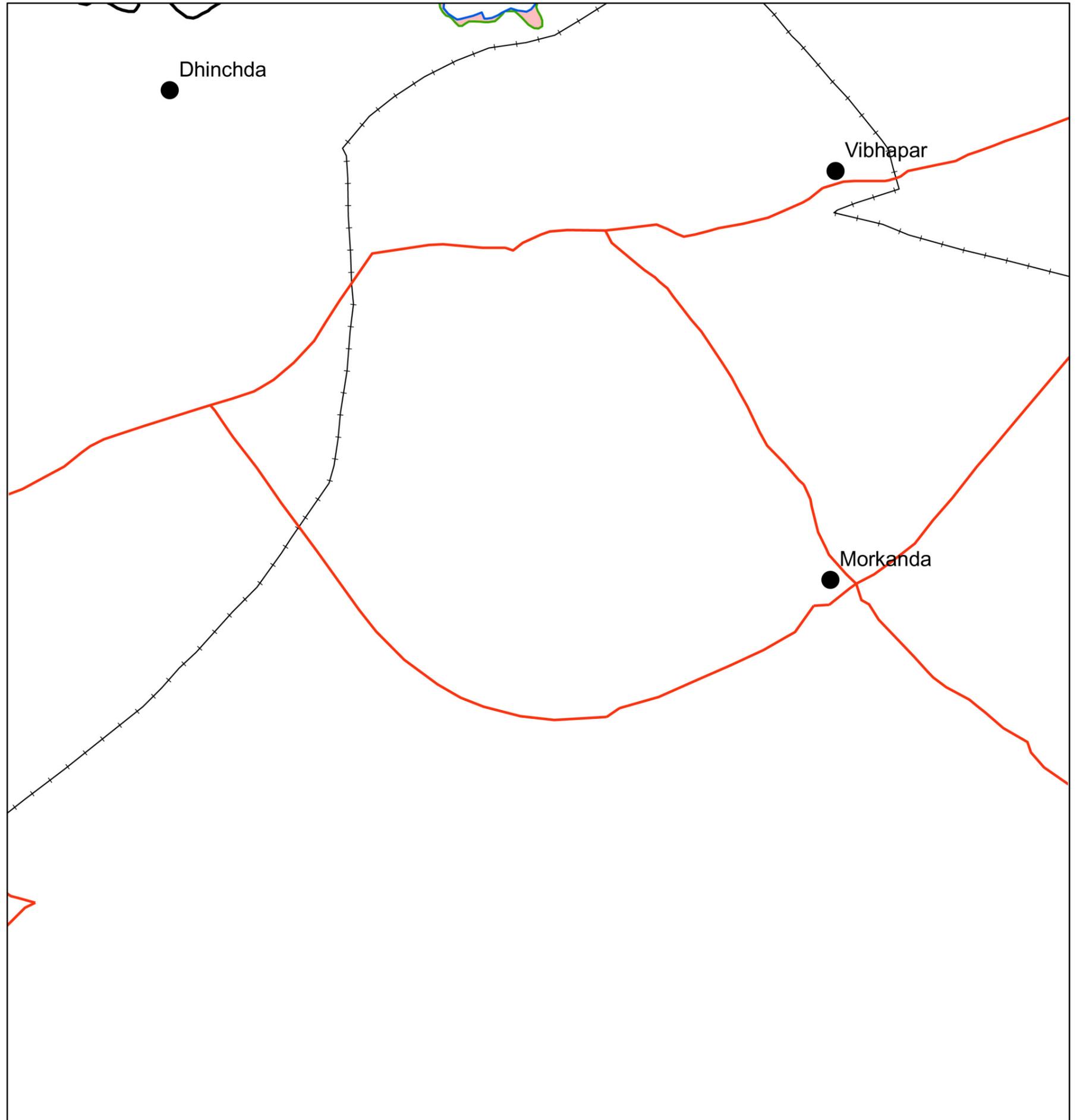
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

## GUJARAT

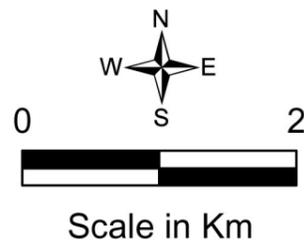
FOR OFFICIAL USE ONLY  
SHEET NO. 41J03NW

JAMNAGAR DISTRICT



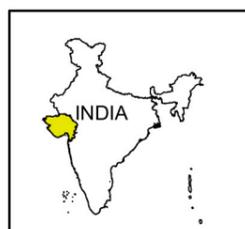
### Legend

- EROSION
- STABLE
- ROAD
- RAIL
- HABITATION



#### INDEX TO SHEETS

41F14 SE	41J02 SW	41J02 SE
41F15 NE		41J03 NE
41F15 SE	41J03 SW	41J03 SE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

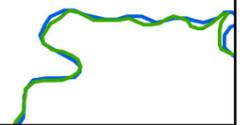
# SHORELINE CHANGE MAP

## GUJARAT

FOR OFFICIAL USE ONLY  
SHEET NO. 41F14SE

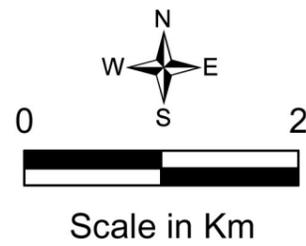
JAMNAGAR DISTRICT

GULF OF KACHCHH



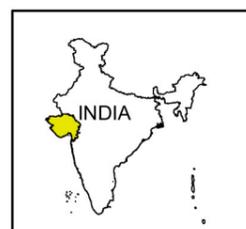
### Legend

-  HIGH-TIDE LINE 2004-06
-  HIGH-TIDE LINE 1989-91



### INDEX TO SHEETS

SEA	SEA	SEA
SEA		41J02 SW
41F15 NW	41F15 NE	41J03 NW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

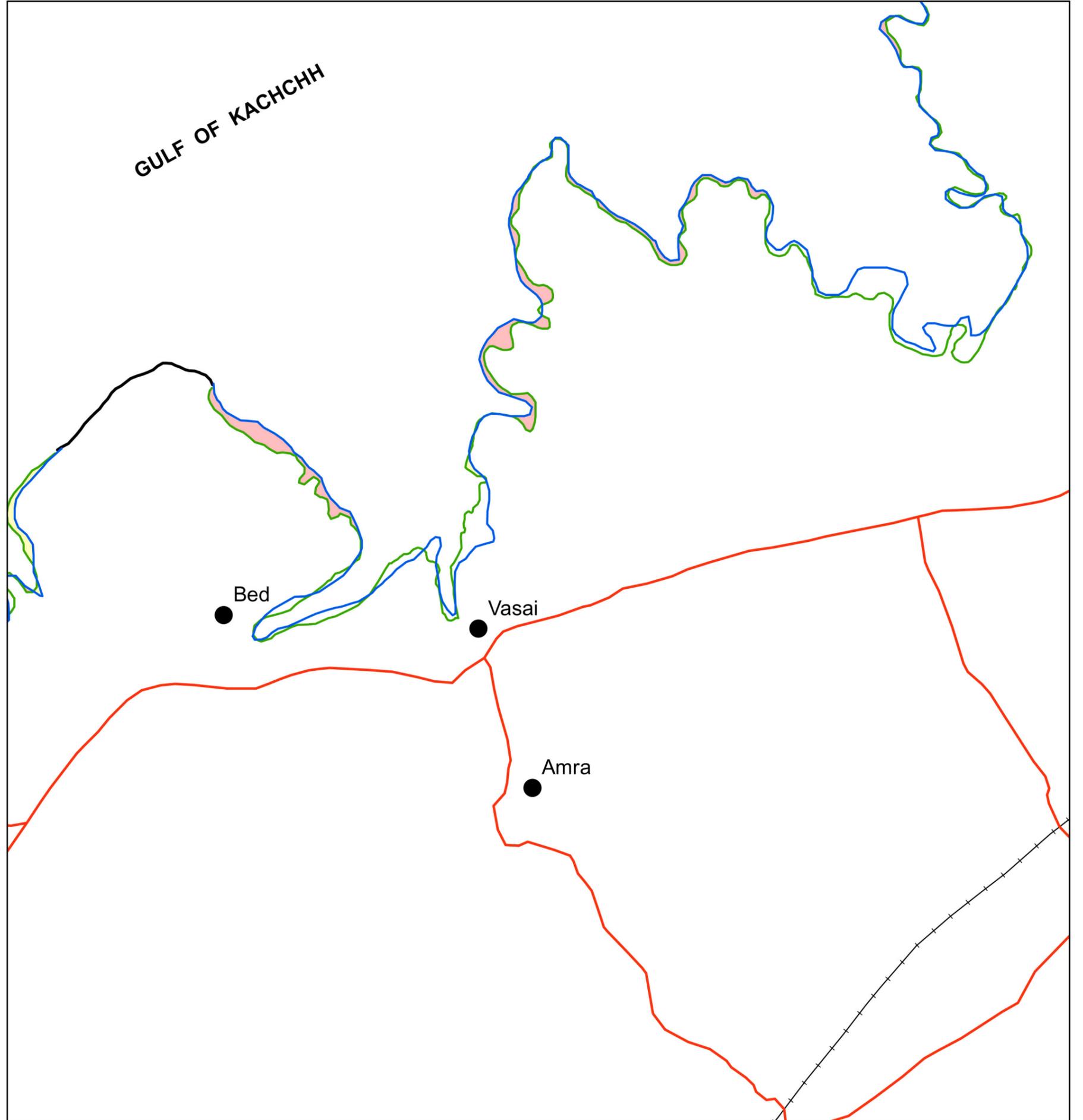
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

## GUJARAT

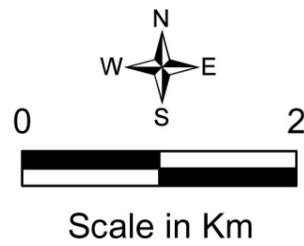
FOR OFFICIAL USE ONLY  
SHEET NO. 41F15NE

JAMNAGAR DISTRICT



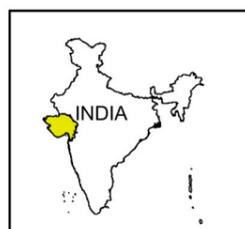
### Legend

- EROSION
- ACCRETION
- STABLE
- ROAD
- RAIL
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



#### INDEX TO SHEETS

41F14 SW	41F14 SE	41J02 SW
41F15 NW		41J03 NW
41F15 SW	41F15 SE	41J03 SW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

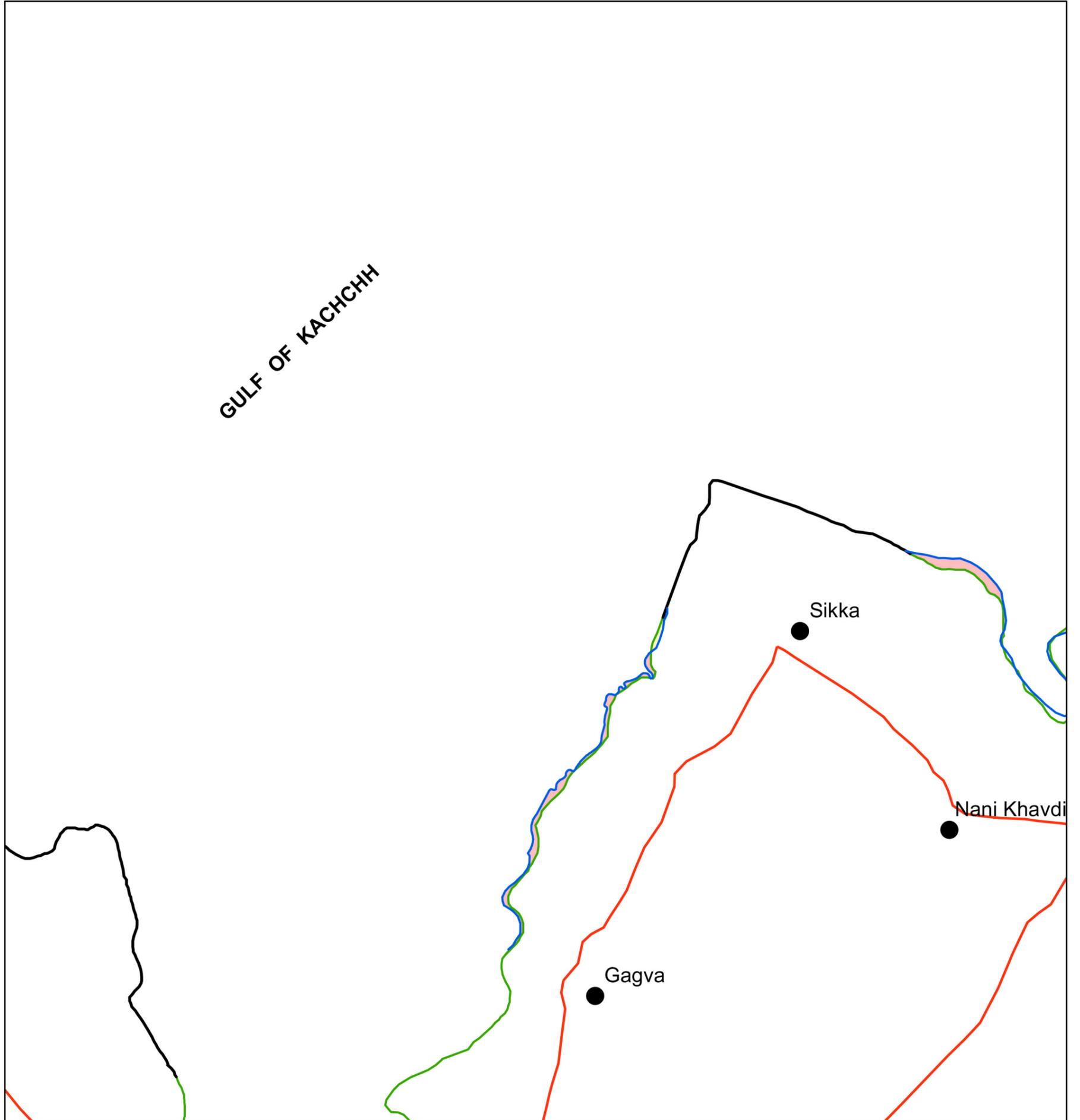
# SHORELINE CHANGE MAP

## GUJARAT

FOR OFFICIAL USE ONLY  
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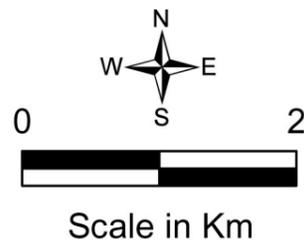
JAMNAGAR DISTRICT

GULF OF KACHCHH



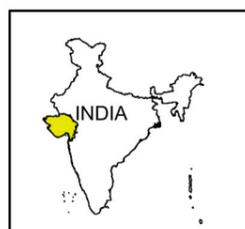
### Legend

- EROSION
- STABLE
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

41F10 SE	41F14 SW	41F14 SE
41F11 NE		41F15 NE
41F11 SE	41F15 SW	41F15 SE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

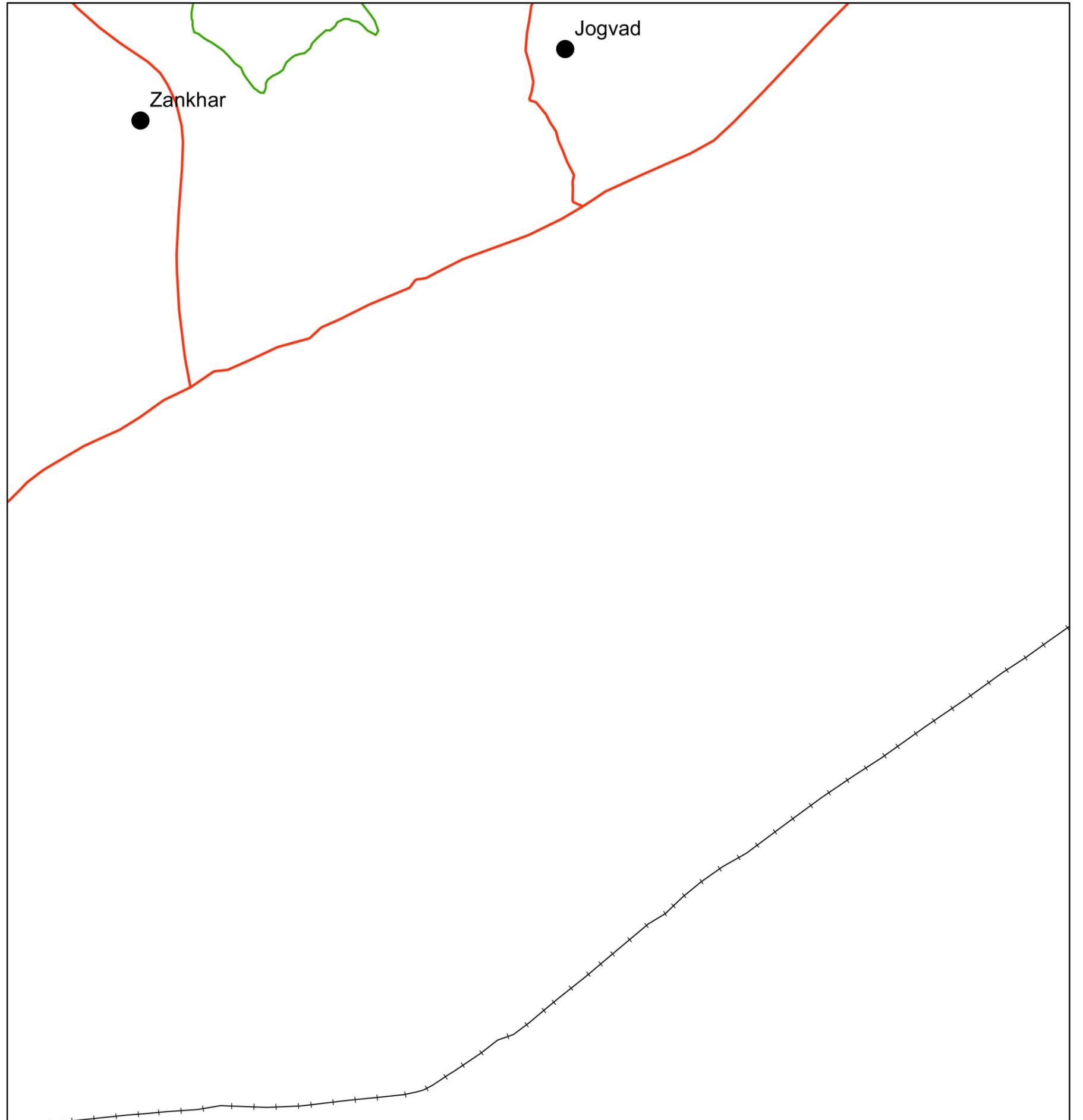
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

## GUJARAT

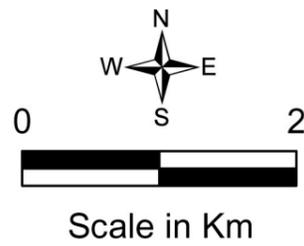
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SHEET NO. 41F15SW

JAMNAGAR DISTRICT



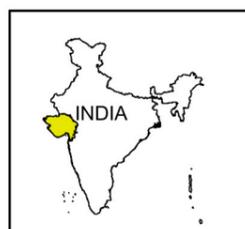
### Legend

- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- ROAD
- +—+— RAIL
- HABITATION



### INDEX TO SHEETS

41F11 NE	41F15 NW	41F15 NE
41F11 SE		41F15 SE
41F12 NE	41F16 NW	41F16 NE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

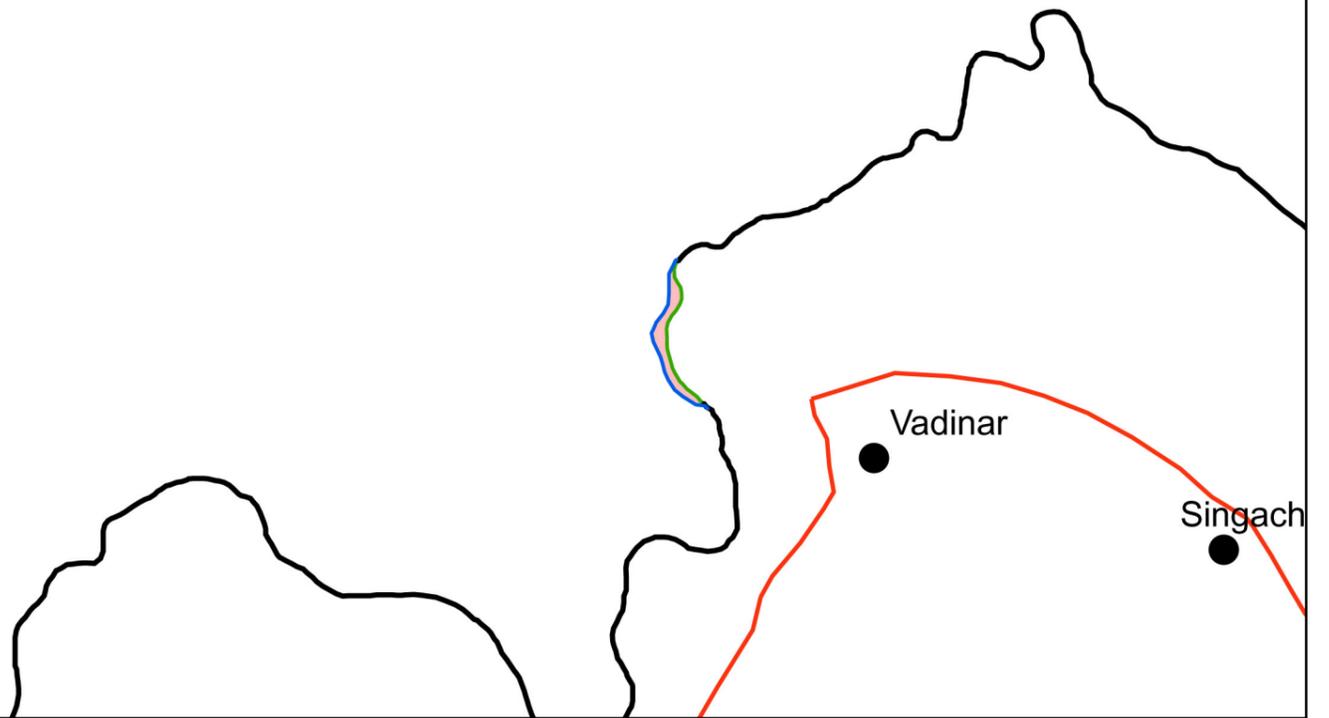
# SHORELINE CHANGE MAP

## GUJARAT

FOR OFFICIAL USE ONLY  
SHEET NO. 41F11NE

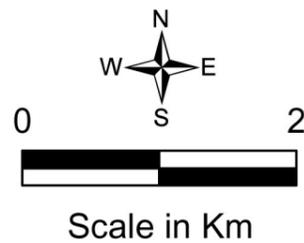
JAMNAGAR DISTRICT

GULF OF KACHCHH



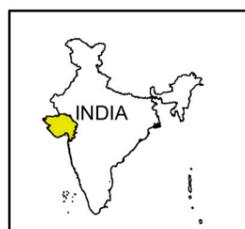
### Legend

- EROSION
- STABLE
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



#### INDEX TO SHEETS

41F10 SW	41F10 SE	41F14 SW
41F11 NW		41F15 NW
41F11 SW	41F11 SE	41F15 SW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

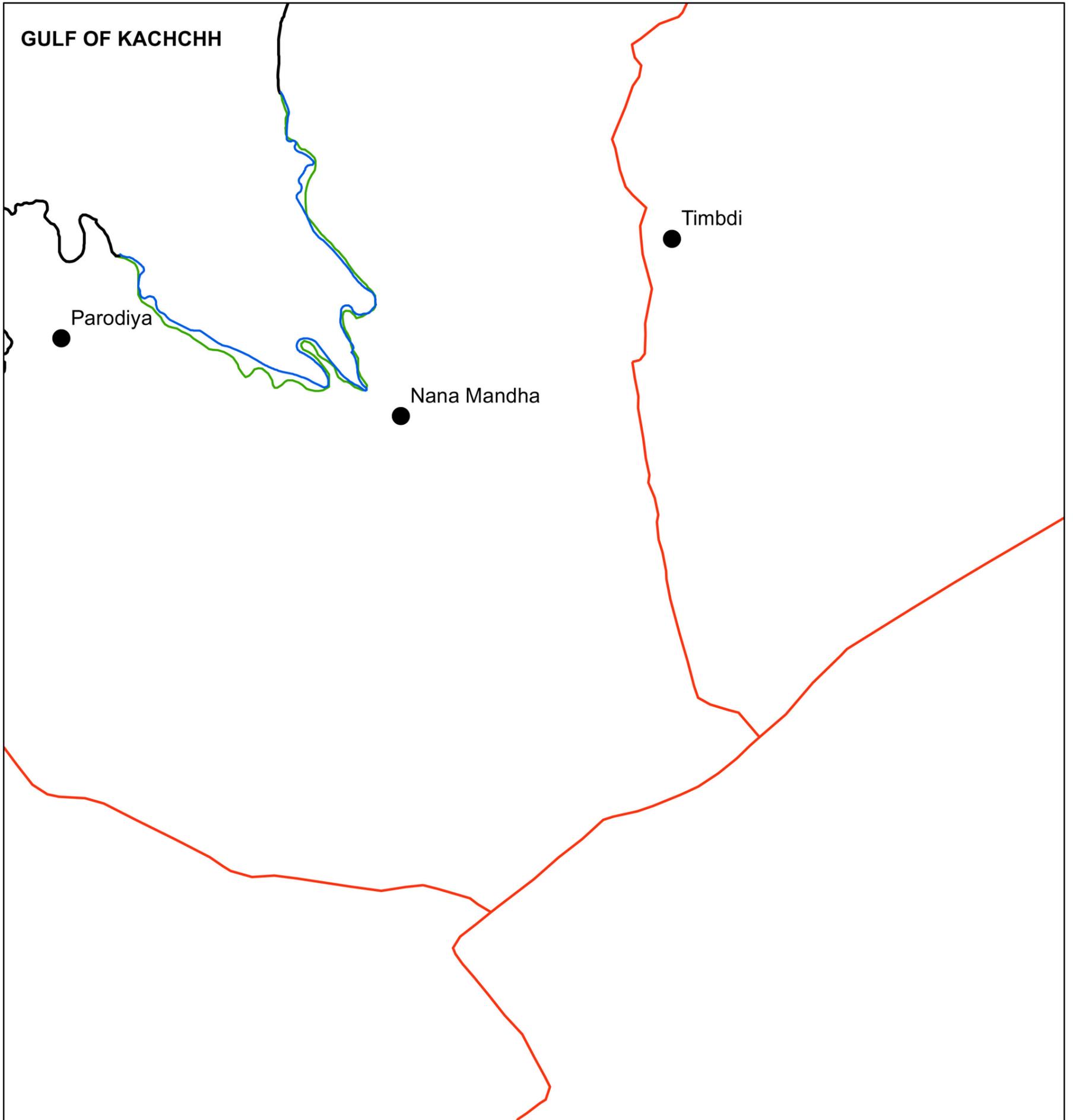
# SHORELINE CHANGE MAP

## GUJARAT

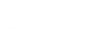
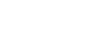
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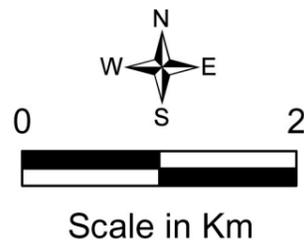
JAMNAGAR DISTRICT

GULF OF KACHCHH



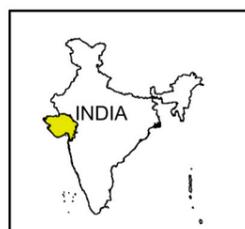
### Legend

-  STABLE
-  ROAD
-  HIGH-TIDE LINE 2004-06
-  HIGH-TIDE LINE 1989-91
-  HABITATION



### INDEX TO SHEETS

41F11 NW	41F11 NE	41F15 NW
41F11 SW		41F15 SW
41F12 NW	41F12 NE	41F16 NW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

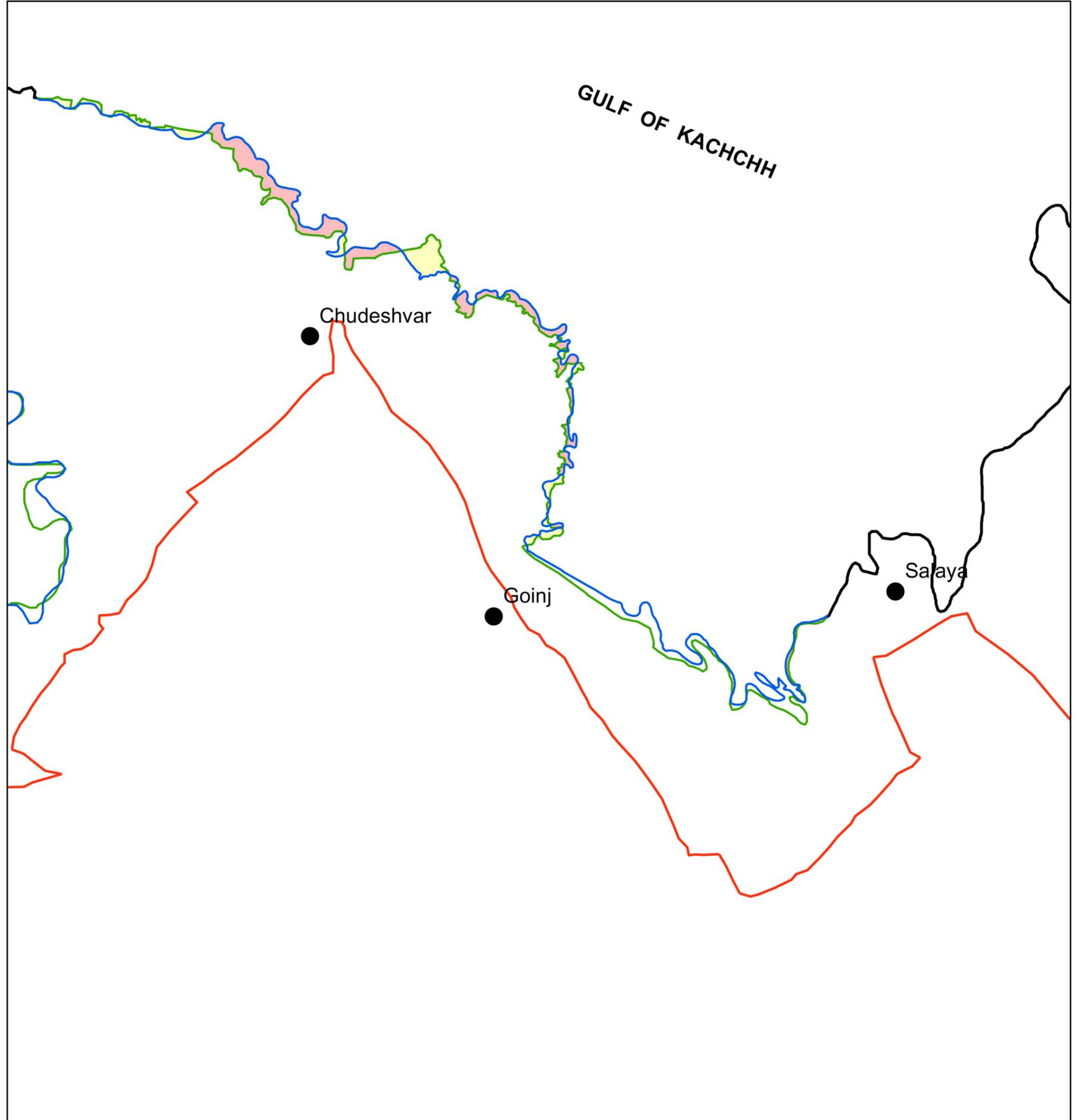
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

## GUJARAT

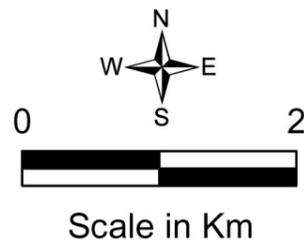
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JAMNAGAR DISTRICT



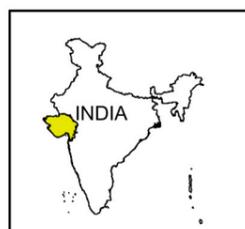
### Legend

- EROSION
- ACCRETION
- STABLE
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



#### INDEX TO SHEETS

41F07 NE	41F11 NW	41F11 NE
41F07 SE		41F11 SE
41F08 NE	41F12 NW	41F12 NE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

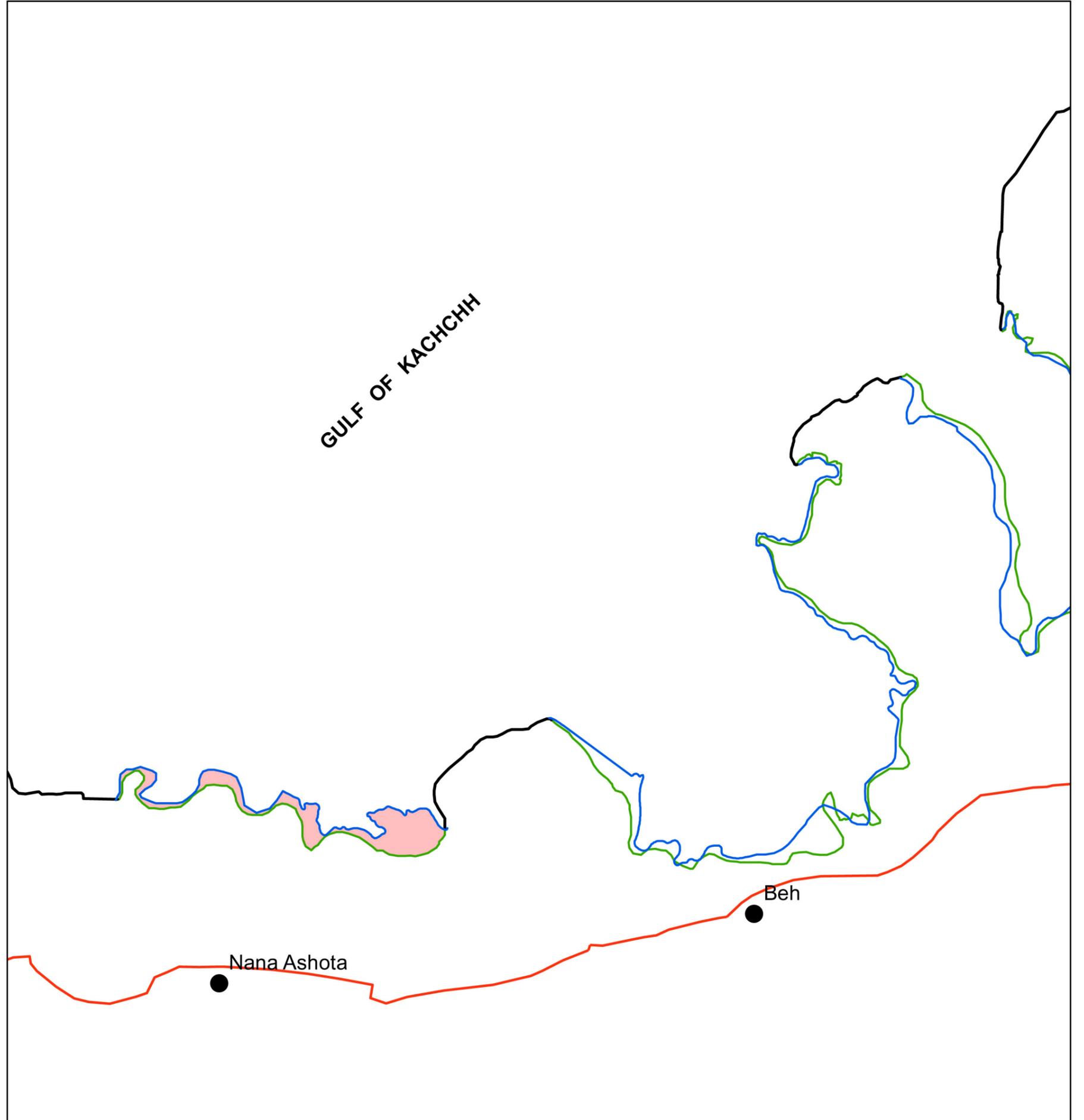
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

## GUJARAT

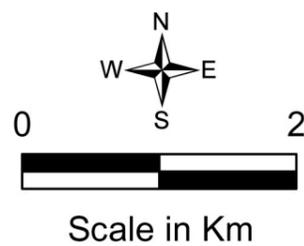
FOR OFFICIAL USE ONLY  
SHEET NO. 41F07SE

JAMNAGAR DISTRICT



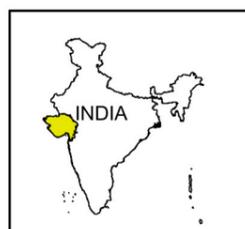
### Legend

- EROSION
- STABLE
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



#### INDEX TO SHEETS

SEA	SEA	41F11 NW
41F07 SW		41F11 SW
41F08 NW	41F08 NE	41F12 NW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

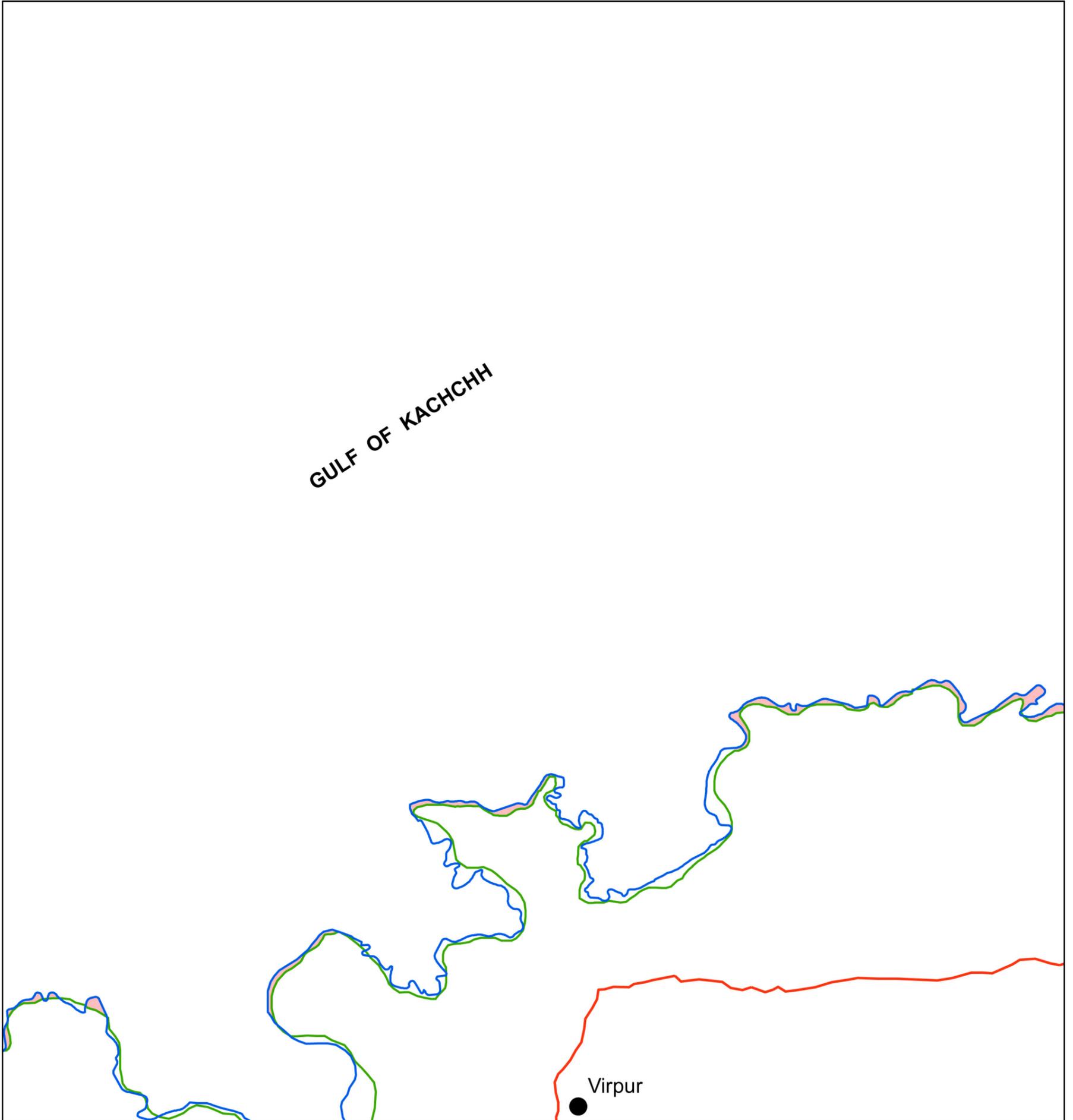
# SHORELINE CHANGE MAP

## GUJARAT

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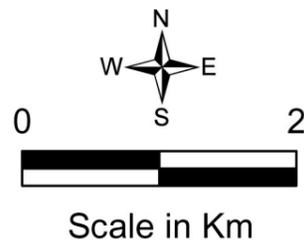
JAMNAGAR DISTRICT

GULF OF KACHCHH



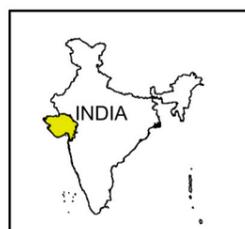
### Legend

- EROSION
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

41F03 NE	SEA	SEA
41F03 SE		41F07 SE
41F04 NE	41F08 NW	41F08 NE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

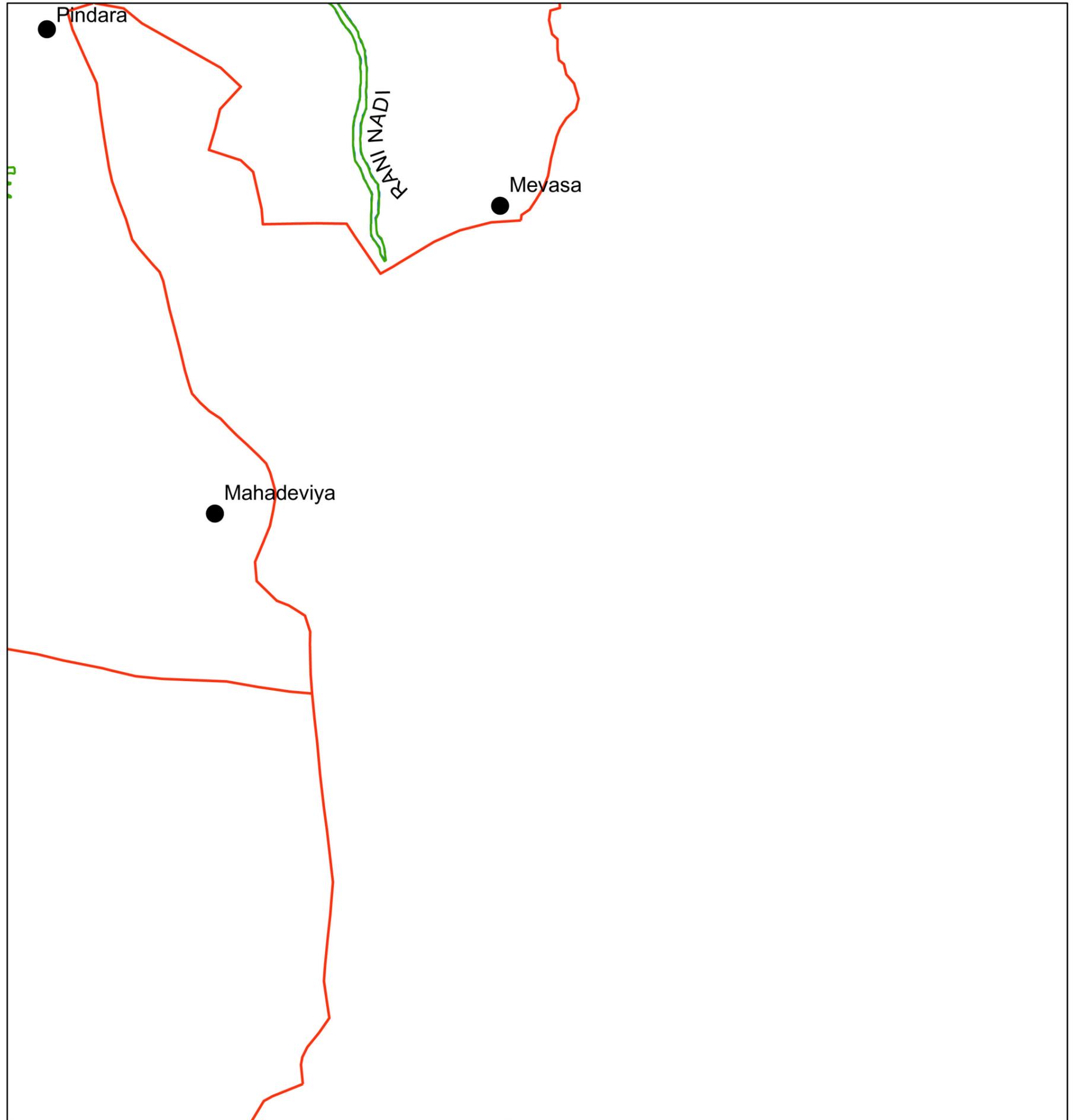
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

## GUJARAT

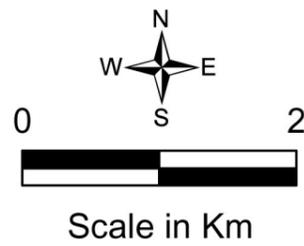
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JAMNAGAR DISTRICT



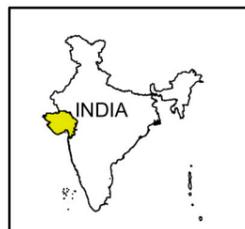
### Legend

- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



#### INDEX TO SHEETS

41F03 SE	41F07 SW	41F07 SE
41F04 NE		41F08 NE
41F04 SE	41F08 SW	41F08 SE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

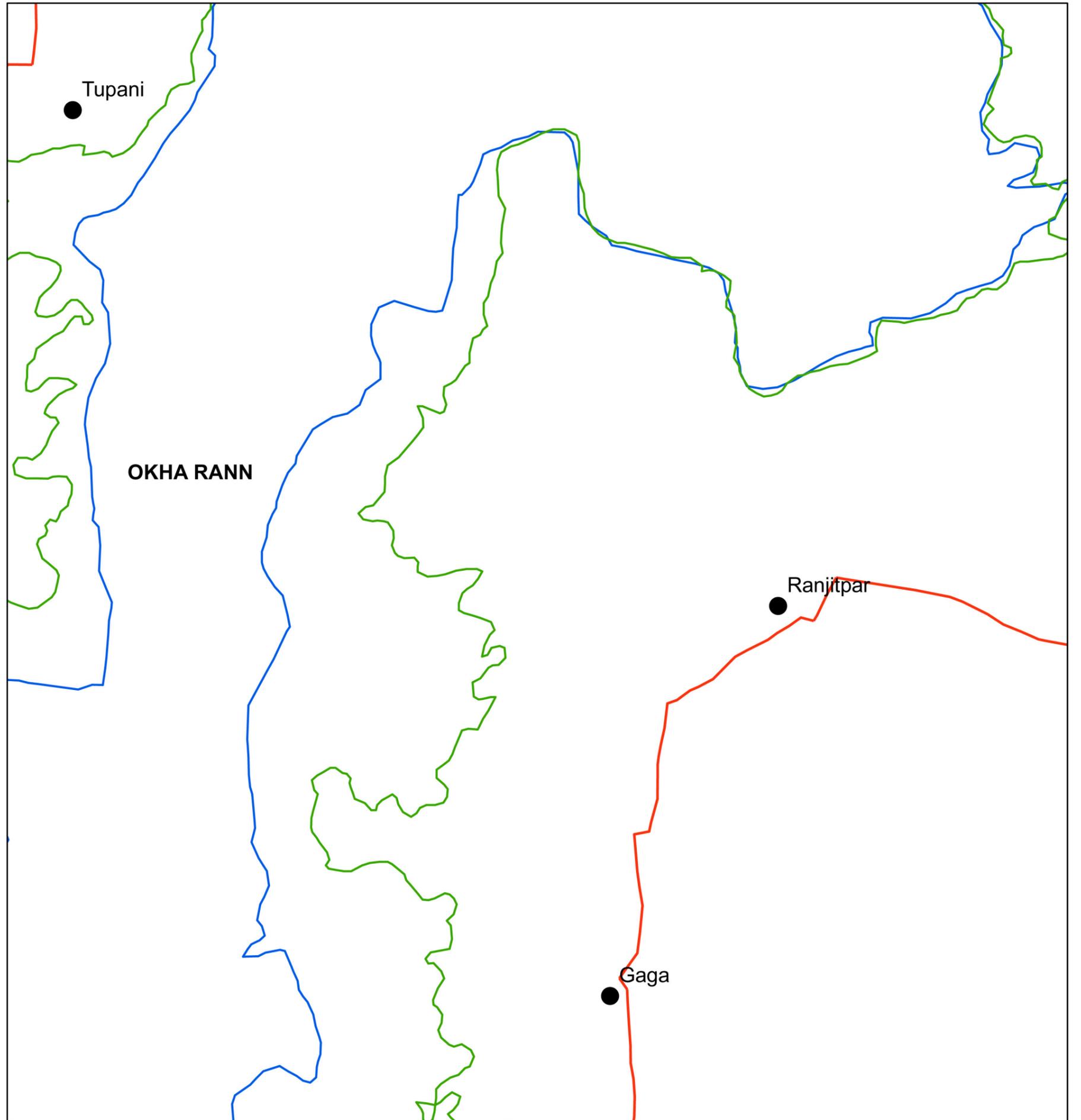
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

## GUJARAT

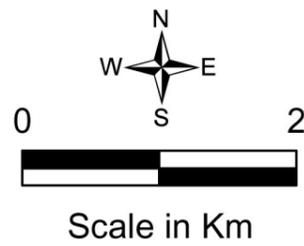
FOR OFFICIAL USE ONLY  
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JAMNAGAR DISTRICT



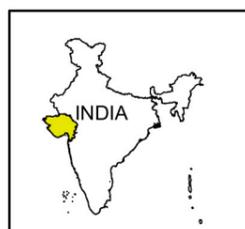
### Legend

- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

41F03 SW	41F03 SE	41F07 SW
41F04 NW		41F08 NW
41F04 SW	41F04 SE	41F08 SW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

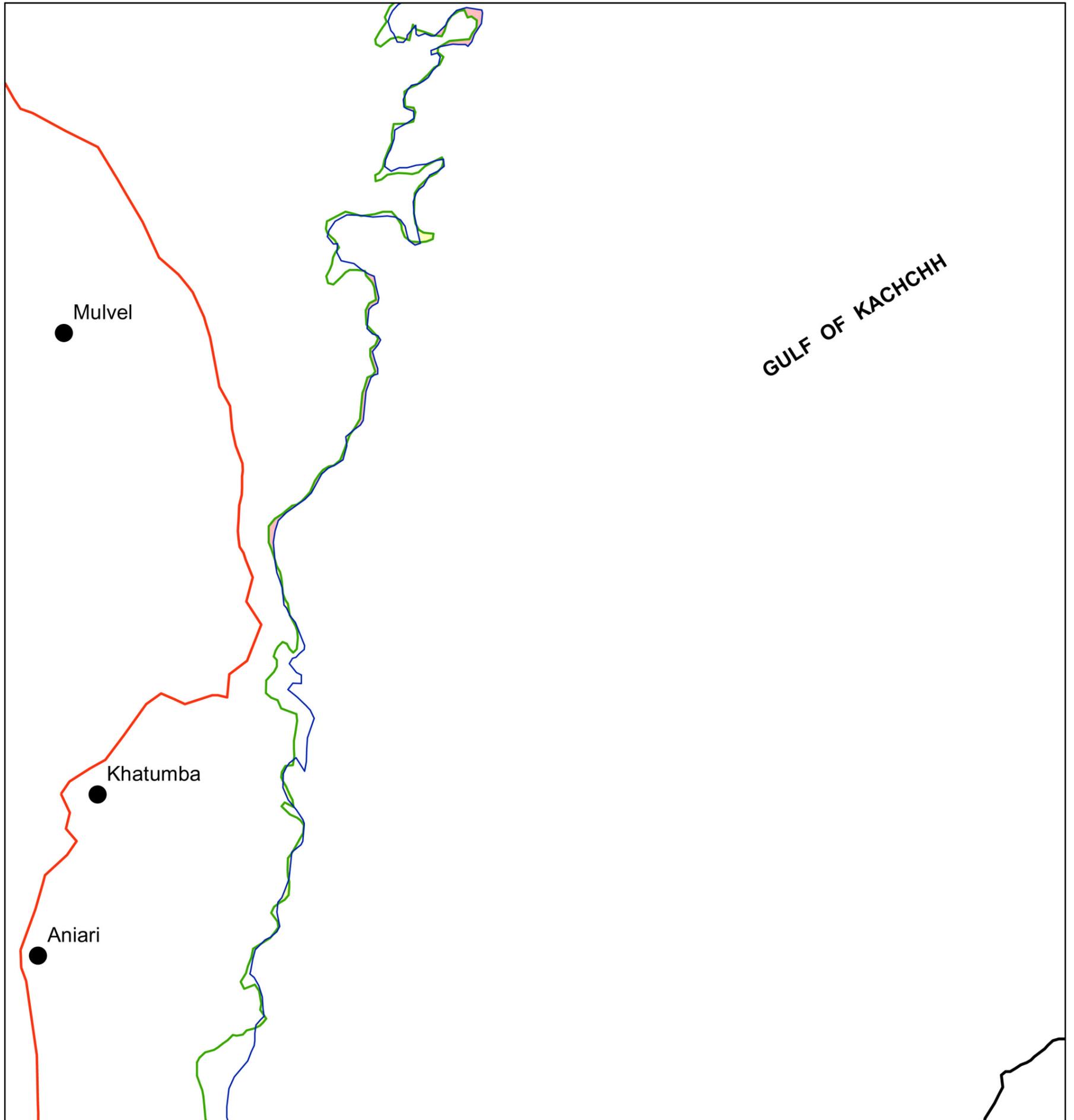
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

## GUJARAT

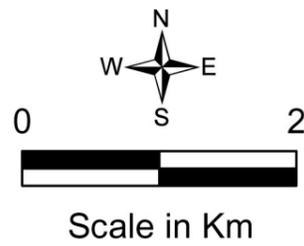
FOR OFFICIAL USE ONLY  
SHEET NO. 41F03SE

JAMNAGAR DISTRICT



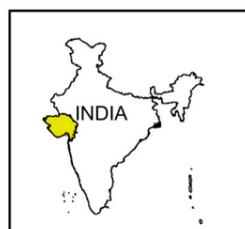
### Legend

- EROSION
- ACCRETION
- STABLE
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



#### INDEX TO SHEETS

41F03 NW	41F03 NE	SEA
41F03 SW		41F07 SW
41F04 NW	41F04 NE	41F08 NW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

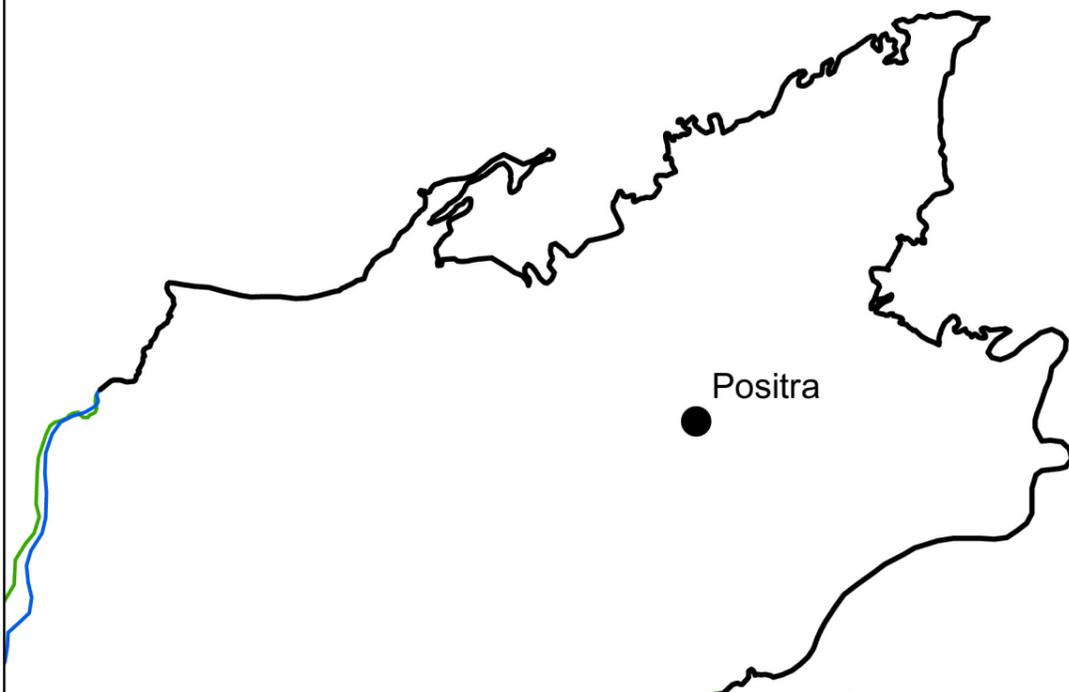
# SHORELINE CHANGE MAP

## GUJARAT

FOR OFFICIAL USE ONLY  
SHEET NO. 41F03NE

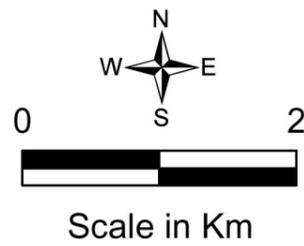
JAMNAGAR DISTRICT

GULF OF KACHCHH



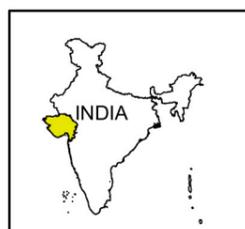
### Legend

- STABLE
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

SEA	SEA	SEA
41F03 NW		SEA
41F03 SW	41F03 SE	41F07 SW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

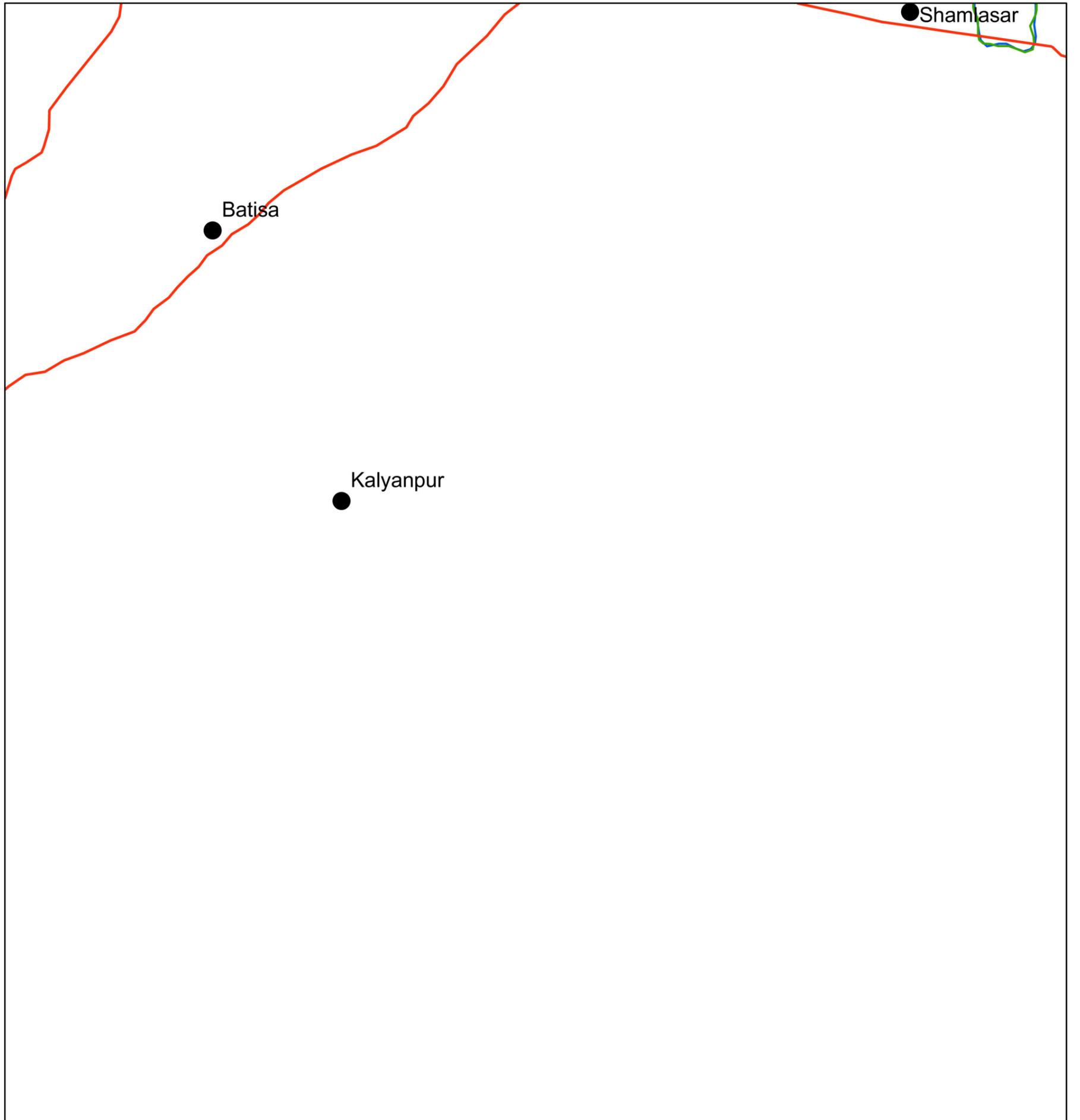
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

## GUJARAT

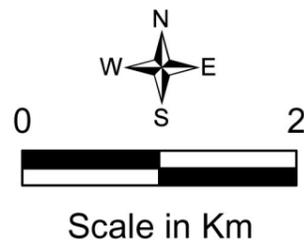
FOR OFFICIAL USE ONLY  
SHEET NO. 41F03SW

JAMNAGAR DISTRICT



### Legend

- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



#### INDEX TO SHEETS

41B15 NE	41F03 NW	41F03 NE
41B15 SE		41F03 SE
41B16 NE	41F04 NW	41F04 NE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

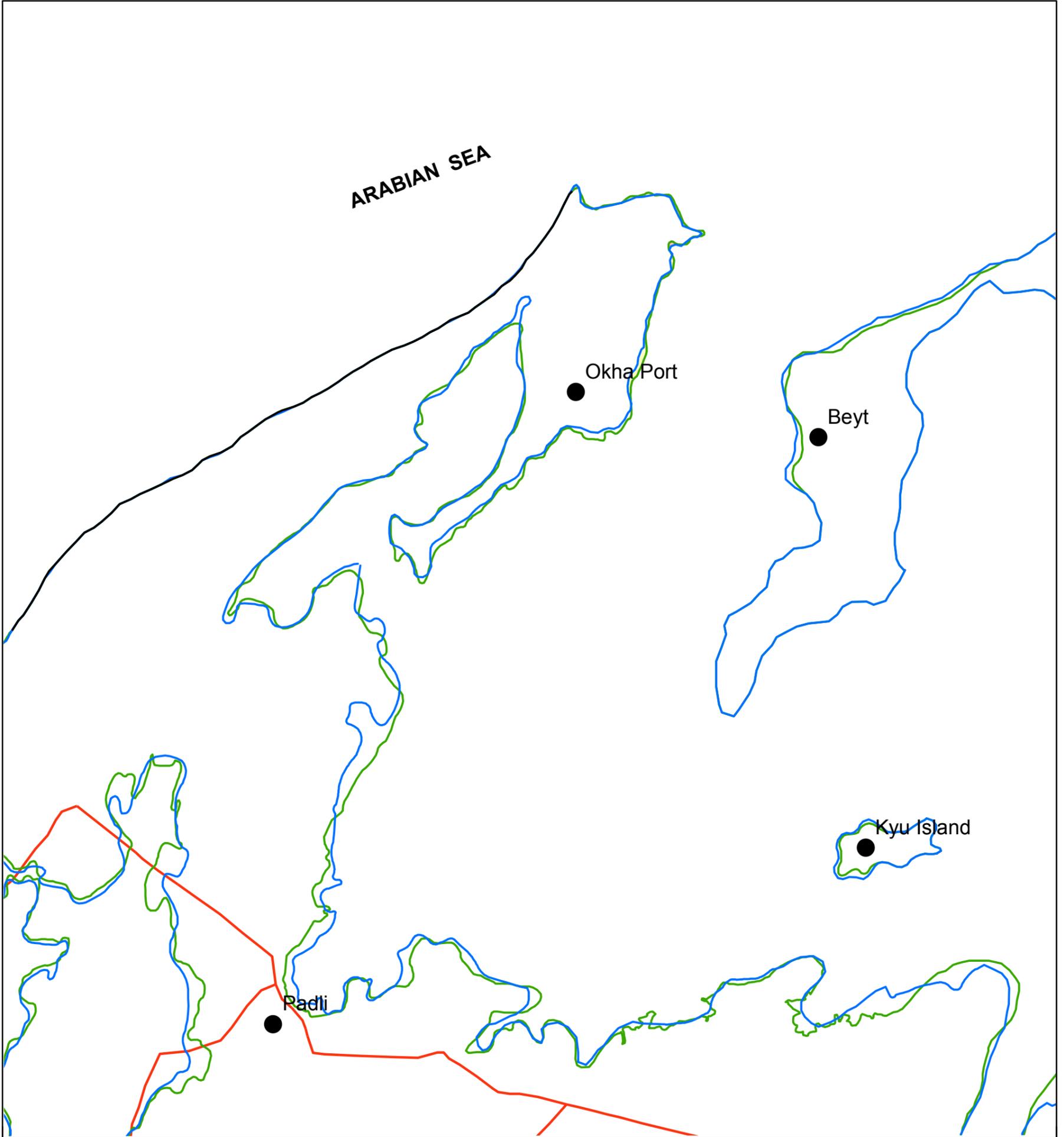
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

## GUJARAT

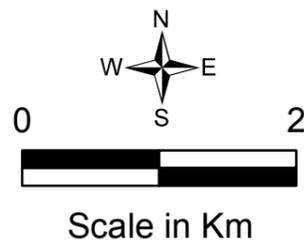
FOR OFFICIAL USE ONLY  
SHEET NO. 41F03NW

JAMNAGAR DISTRICT



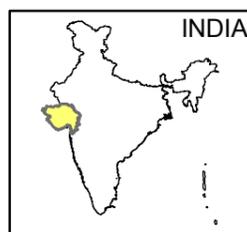
### Legend

- ACCRETION
- STABLE
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



#### INDEX TO SHEETS

SEA	SEA	SEA
41B15 NE		41F03 NE
41B15 SE	41F03 SW	41F03 SE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

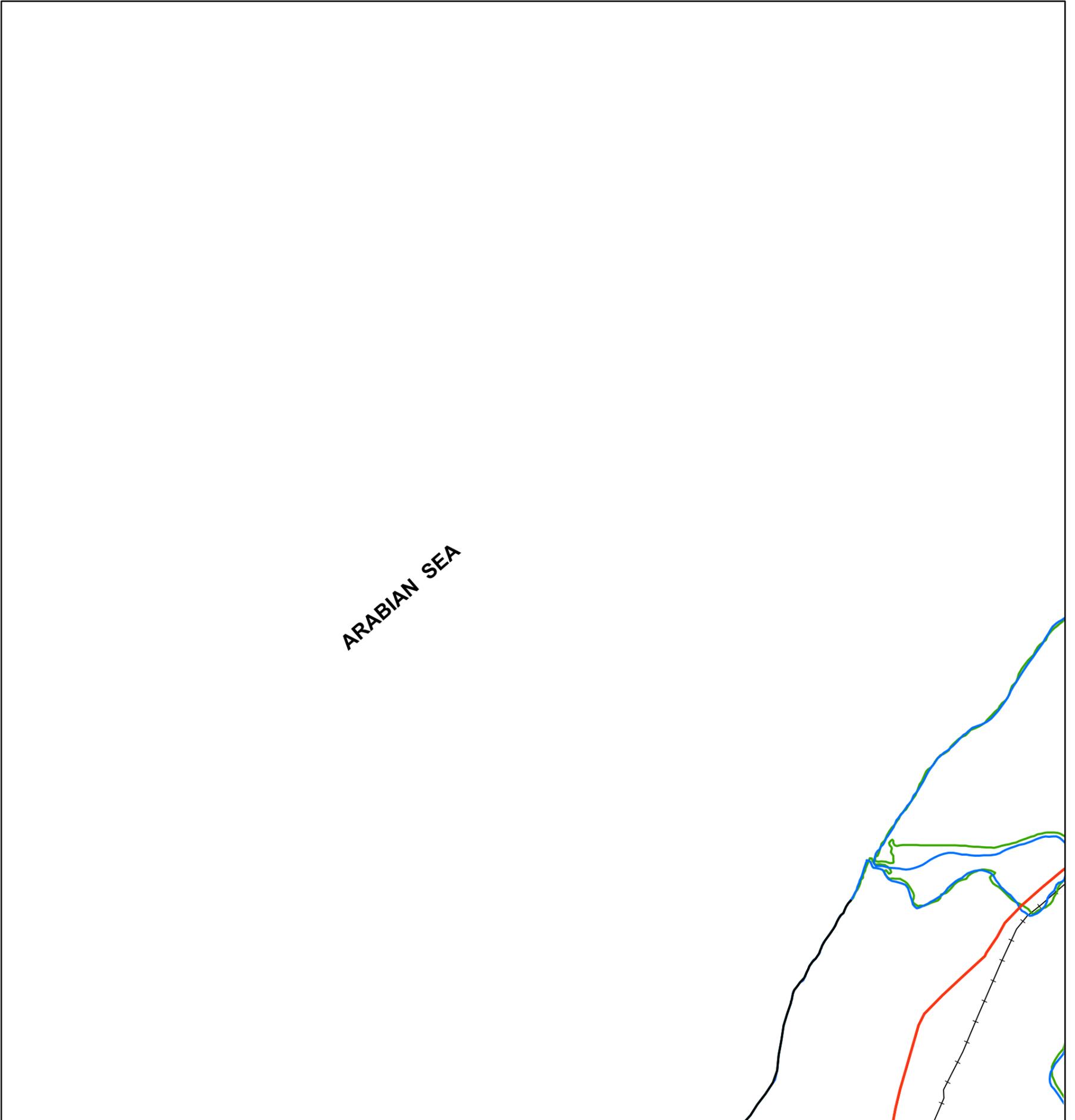
# SHORELINE CHANGE MAP

## GUJARAT

FOR OFFICIAL USE ONLY

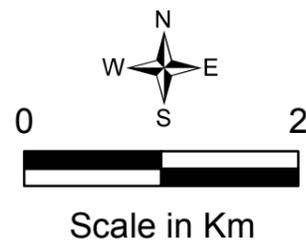
JAMNAGAR DISTRICT

SHEET NO. 41B15NE



### Legend

- ACCRETION
- EROSION
- STABLE
- ROAD
- RAIL
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91



#### INDEX TO SHEETS

SEA	SEA	SEA
SEA		41F03 NW
SEA	41B15 SE	41F03 SW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

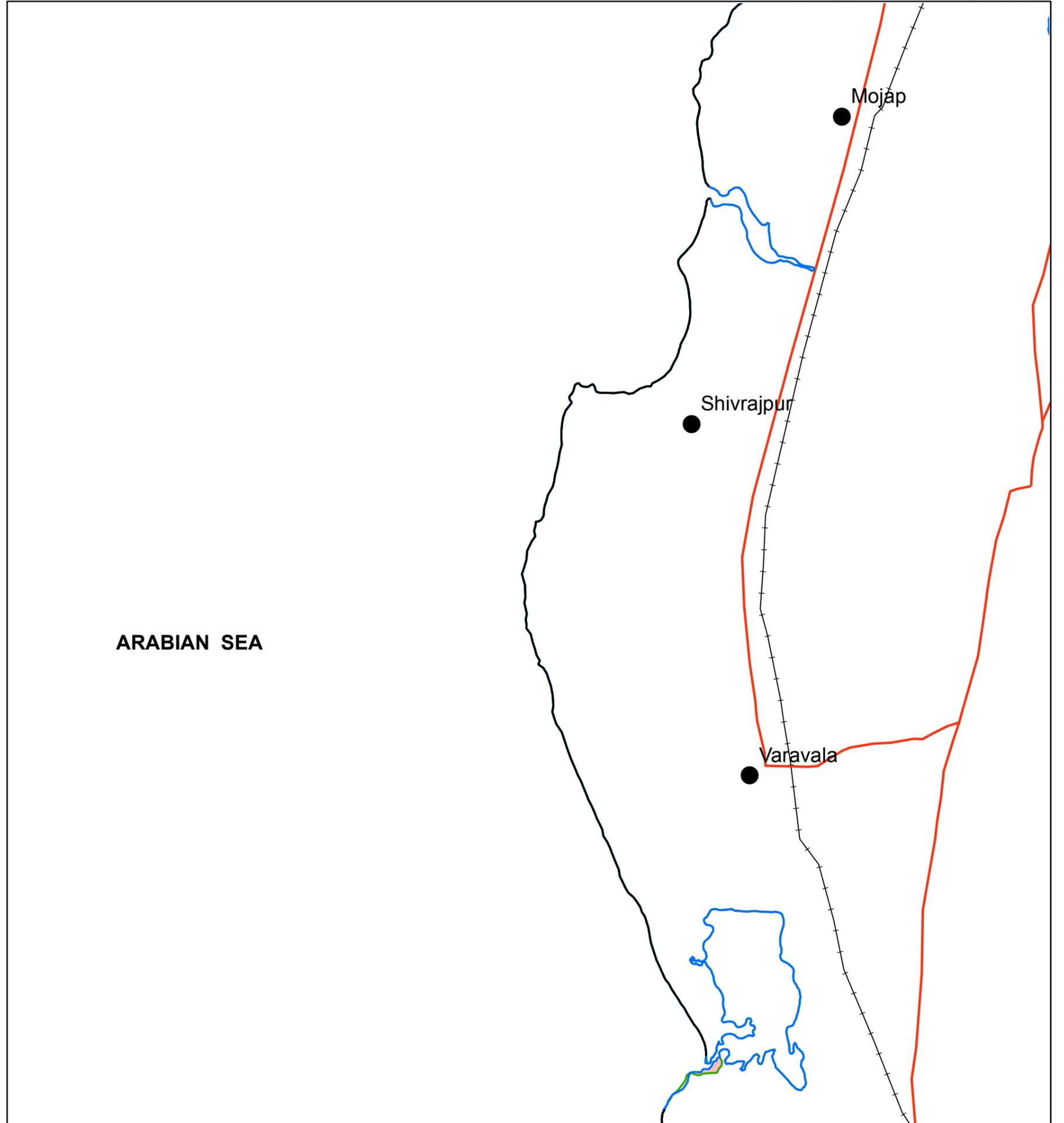
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

JAMNAGAR DISTRICT

GUJARAT

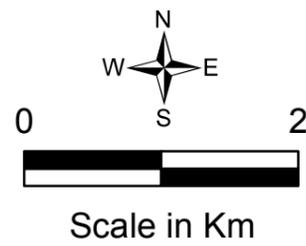
FOR OFFICIAL USE ONLY  
SHEET NO. 41B15SE



ARABIAN SEA

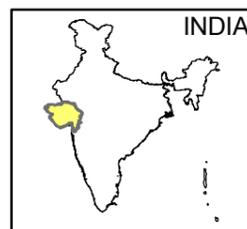
## Legend

- ACCRETION
- EROSION
- STABLE
- ROAD
- RAIL
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



INDEX TO SHEETS

SEA	41B15 NE	41F03 NW
SEA		41F03 SW
SEA	41B16 NE	41F04 NW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

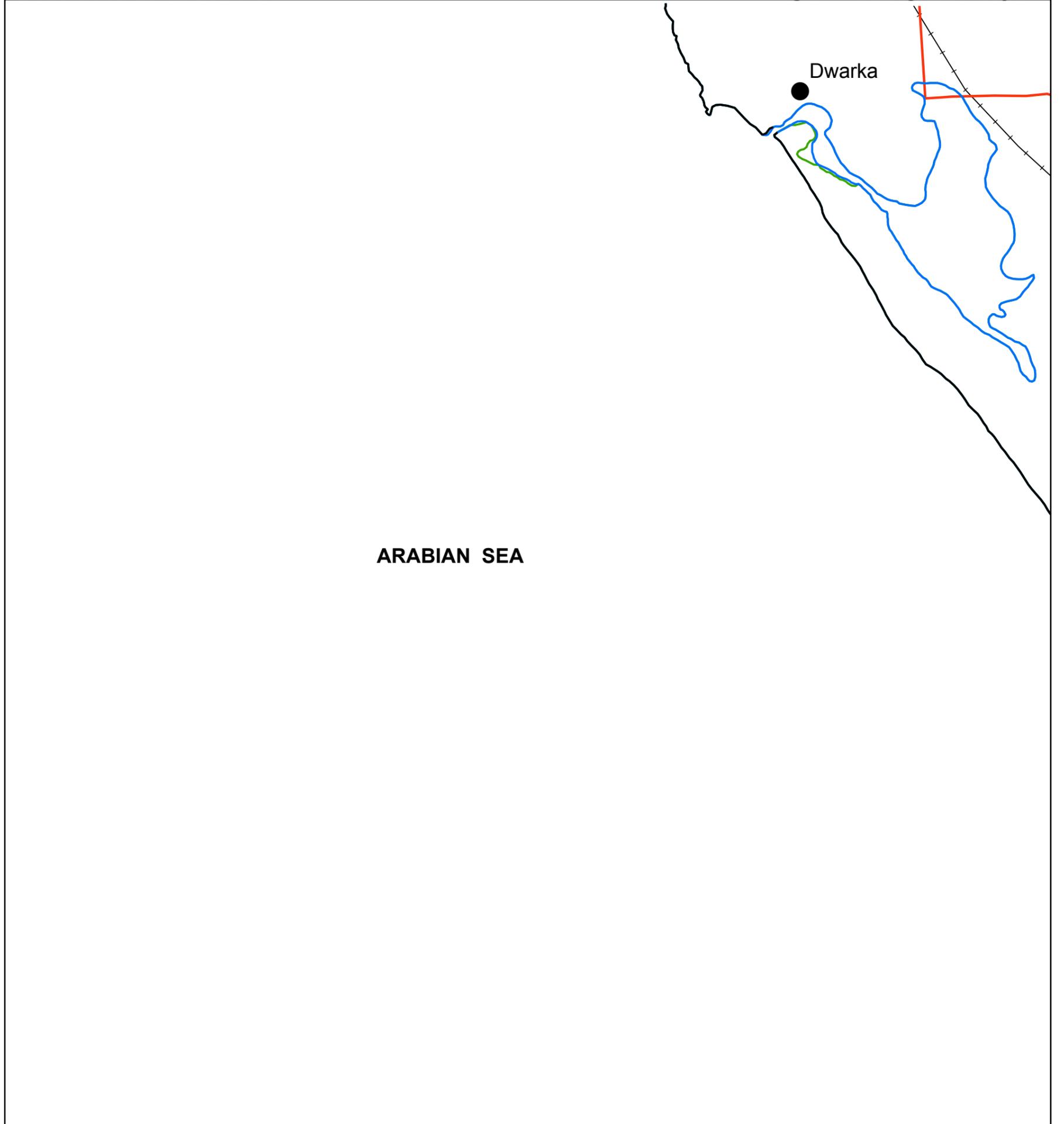
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

JAMNAGAR DISTRICT

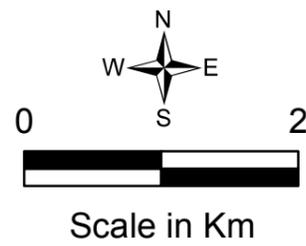
GUJARAT

FOR OFFICIAL USE ONLY  
SHEET NO. 41B16NE



## Legend

- STABLE
- ROAD
- - - RAIL
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

SEA	41B15 SE	41F03 SW
SEA		41F04 NW
SEA	SEA	41F04 SW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

JAMNAGAR DISTRICT

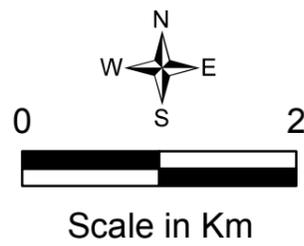
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SHEET NO. 41F04NW



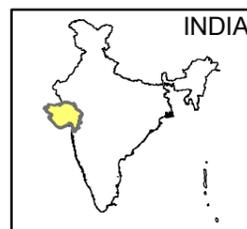
## Legend

- STABLE
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- ROAD
- - - RAIL
- HABITATION



### INDEX TO SHEETS

41B15SE	41F03SW	41F03SE
41B16NE		41F04NE
SEA	41F04SW	41F04SE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

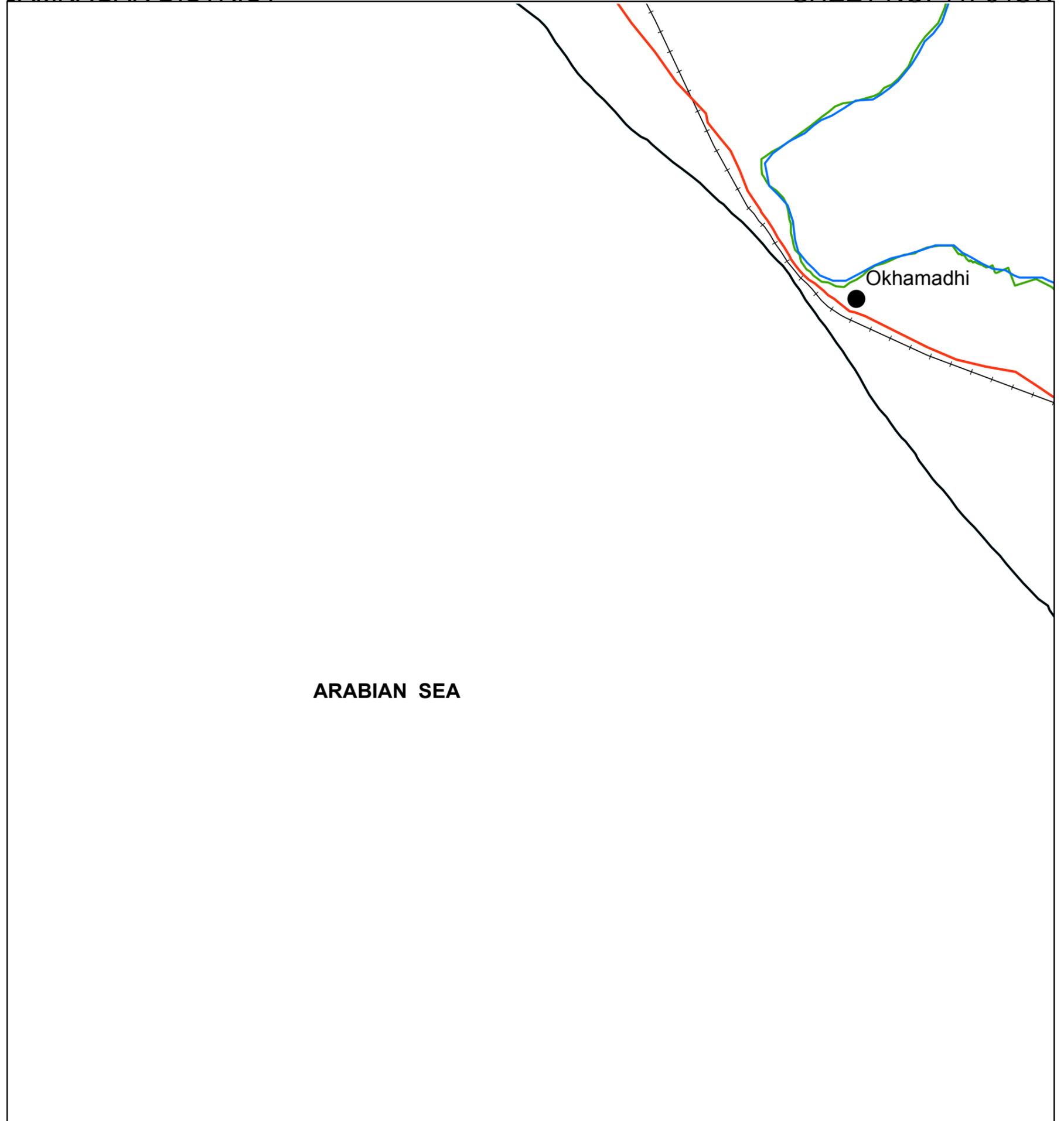
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

JAMNAGAR DISTRICT

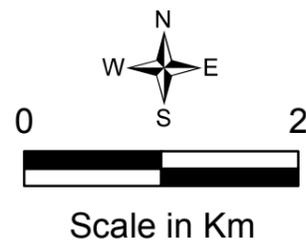
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SHEET NO. 41F04SW



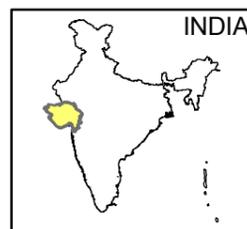
## Legend

-  STABLE
-  ROAD
-  RAIL
-  HIGH-TIDE LINE 2004-06
-  HIGH-TIDE LINE 1989-91
-  HABITATION



### INDEX TO SHEETS

41B16 NE	41F04 NW	41F04 NE
SEA		41F04 SE
SEA	SEA	41G01 NE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

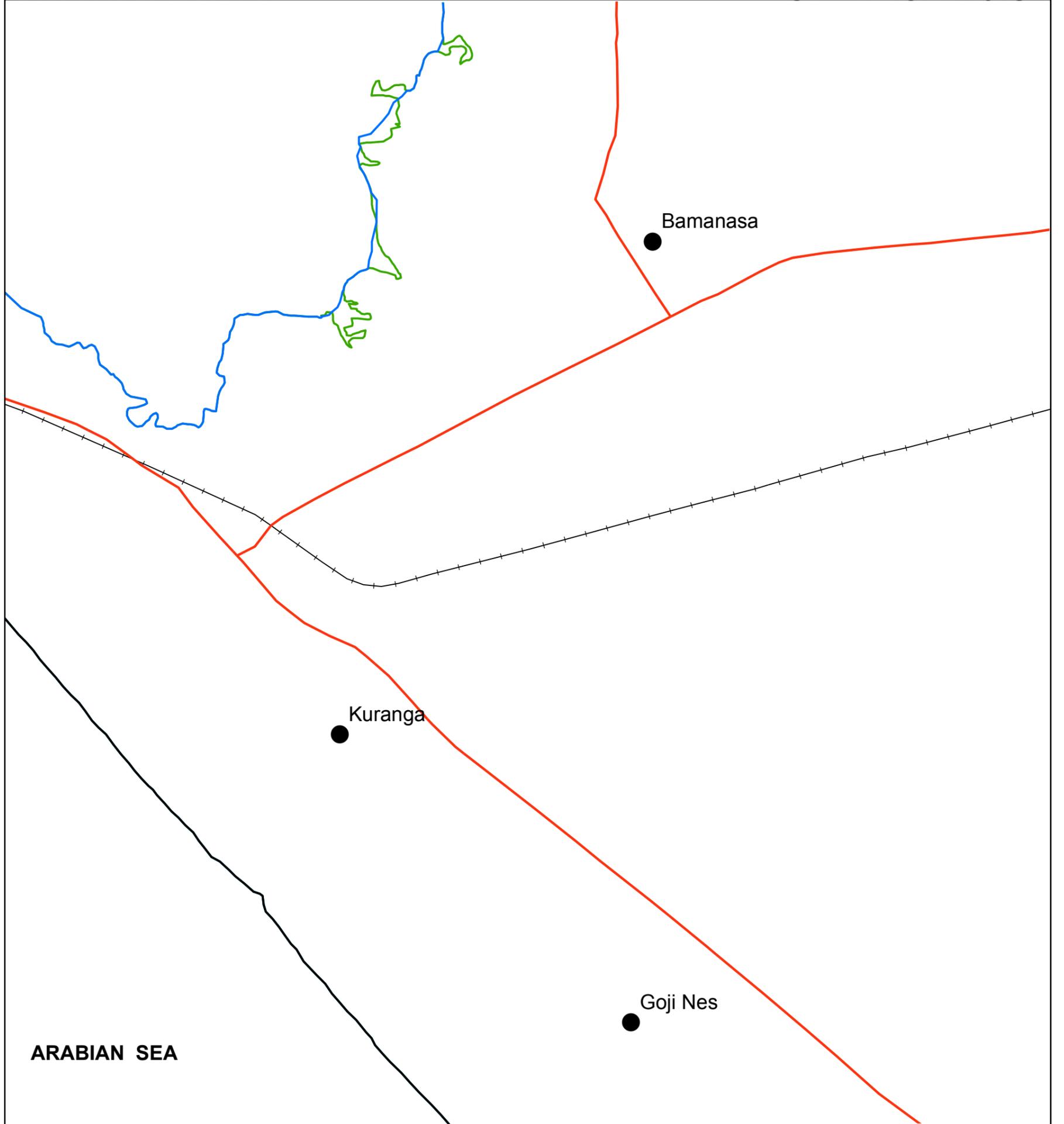
PREPARED BY:  
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AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

JAMNAGAR DISTRICT

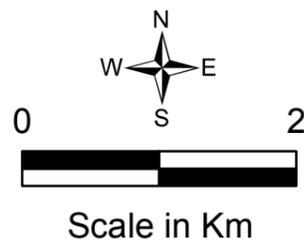
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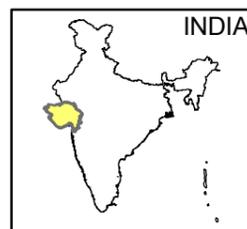
## Legend

- STABLE
- ROAD
- - - RAIL
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

41F04 NW	41F04 NE	41F08 NW
41F04 SW		41F08 SW
SEA	41G01 NE	41G05 NW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
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AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

JAMNAGAR DISTRICT

GUJARAT

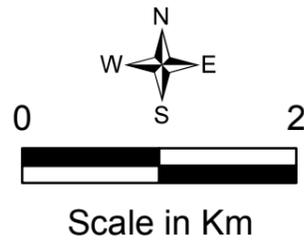
FOR OFFICIAL USE ONLY  
SHEET NO. 41G01NE

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ARABIAN SEA

## Legend

-  STABLE
-  ROAD
-  HIGH-TIDE LINE 2004-06
-  HIGH-TIDE LINE 1989-91
-  HABITATION



### INDEX TO SHEETS

41F04 SW	41F04 SE	41F08 SW
SEA		41G05 NW
SEA	SEA	41G05 SW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

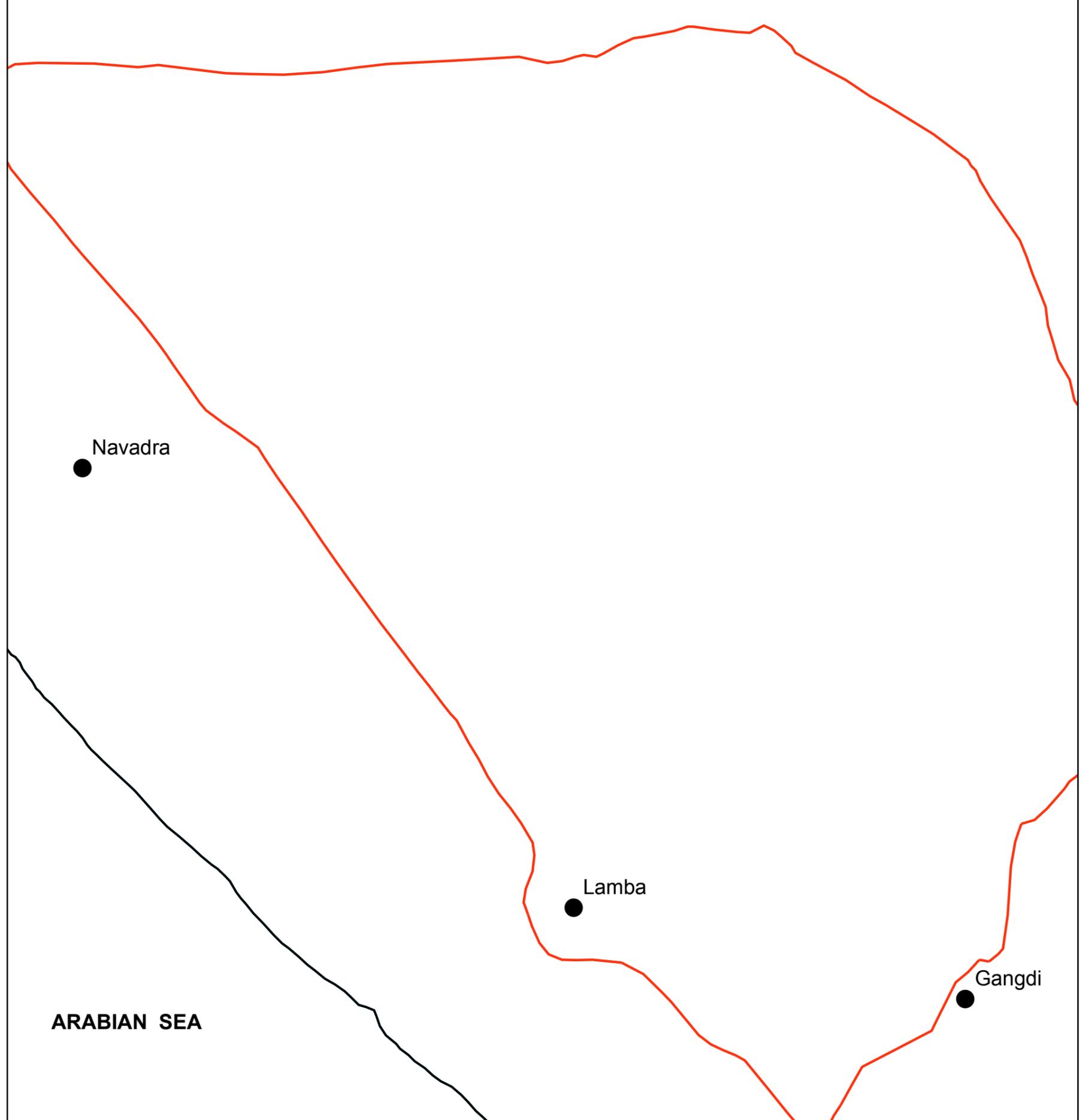
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SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

JAMNAGAR DISTRICT

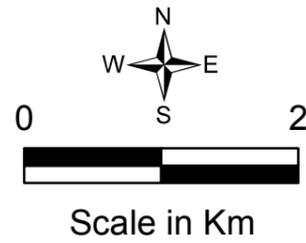
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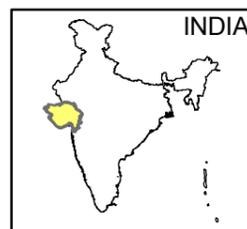
## Legend

-  STABLE
-  ROAD
-  HIGH-TIDE LINE 2004-06
-  HIGH-TIDE LINE 1989-91
-  HABITATION



### INDEX TO SHEETS

41F04 SE	41F08 SW	41F08 SE
41G01 NE		41G05 NE
SEA	41G05 SW	41G05 SE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

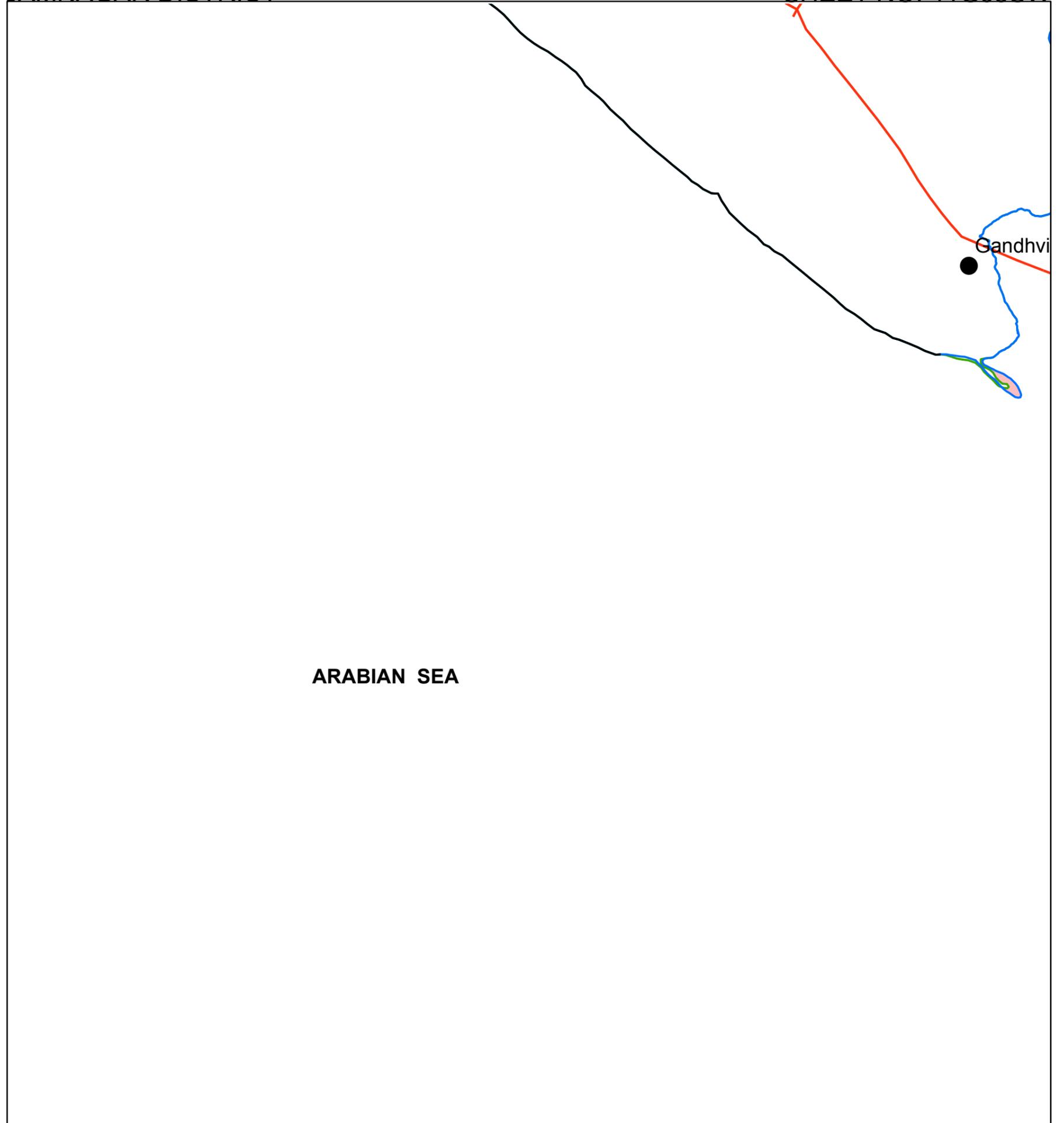
PREPARED BY:  
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AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

JAMNAGAR DISTRICT

GUJARAT

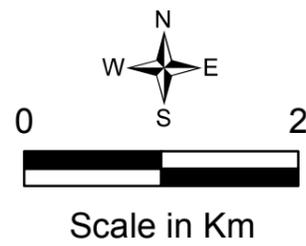
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SHEET NO. 41G05SW



ARABIAN SEA

## Legend

- ACCRETION
- EROSION
- STABLE
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

41G01 NE	41G05 NW	41G05 NE
SEA		41G05 SE
SEA	SEA	41G06 NE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

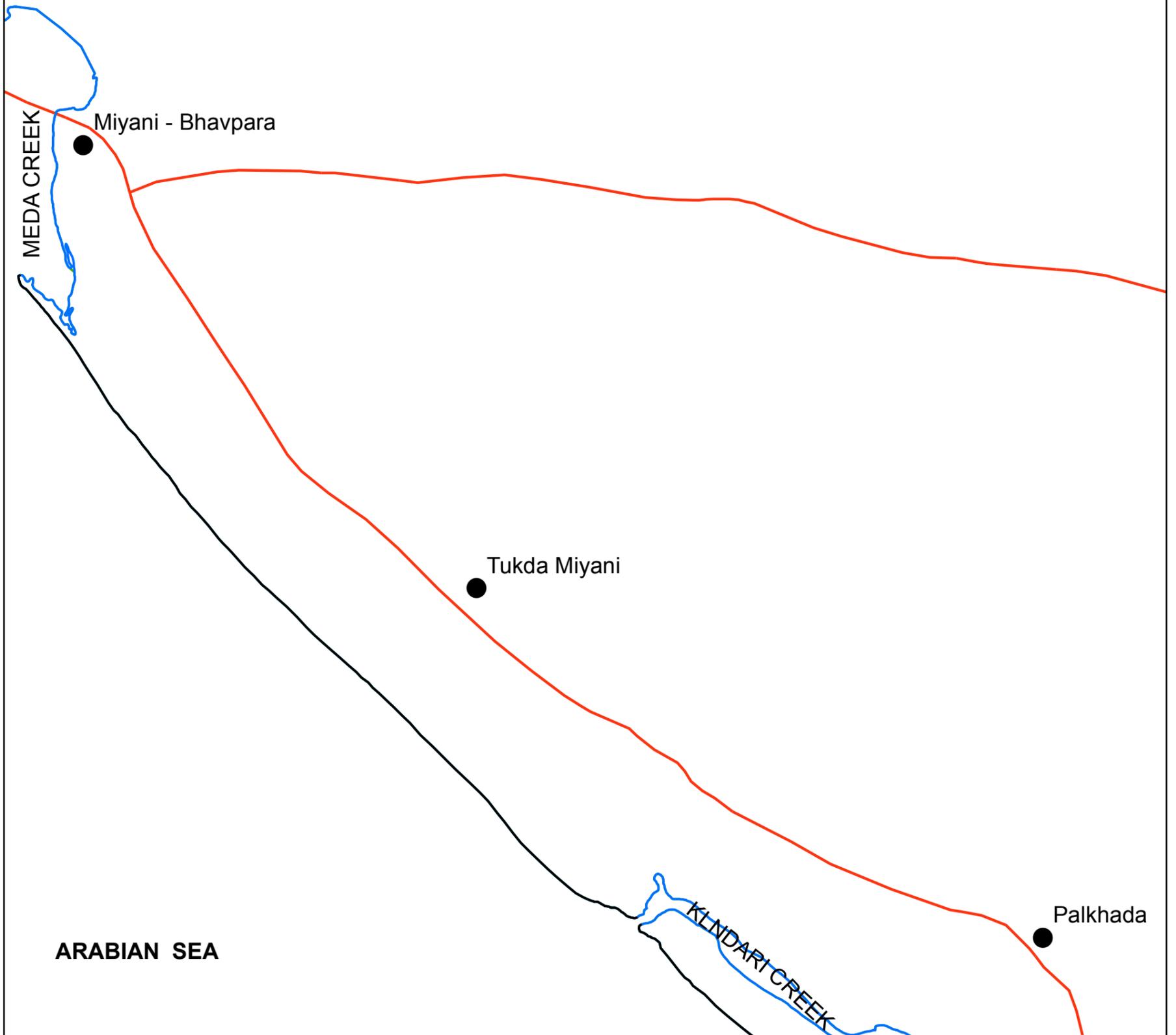
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

PORBANDAR DISTRICT

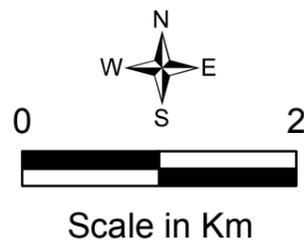
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SHEET NO. 41G05SE



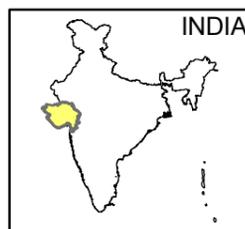
## Legend

-  STABLE
-  ROAD
-  HIGH-TIDE LINE 2004-06
-  HIGH-TIDE LINE 1989-91
-  HABITATION



### INDEX TO SHEETS

41G05 NW	41G05 NE	41G09 NW
41G05 SW		41G09 SW
SEA	41G06 NE	41G10 NW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

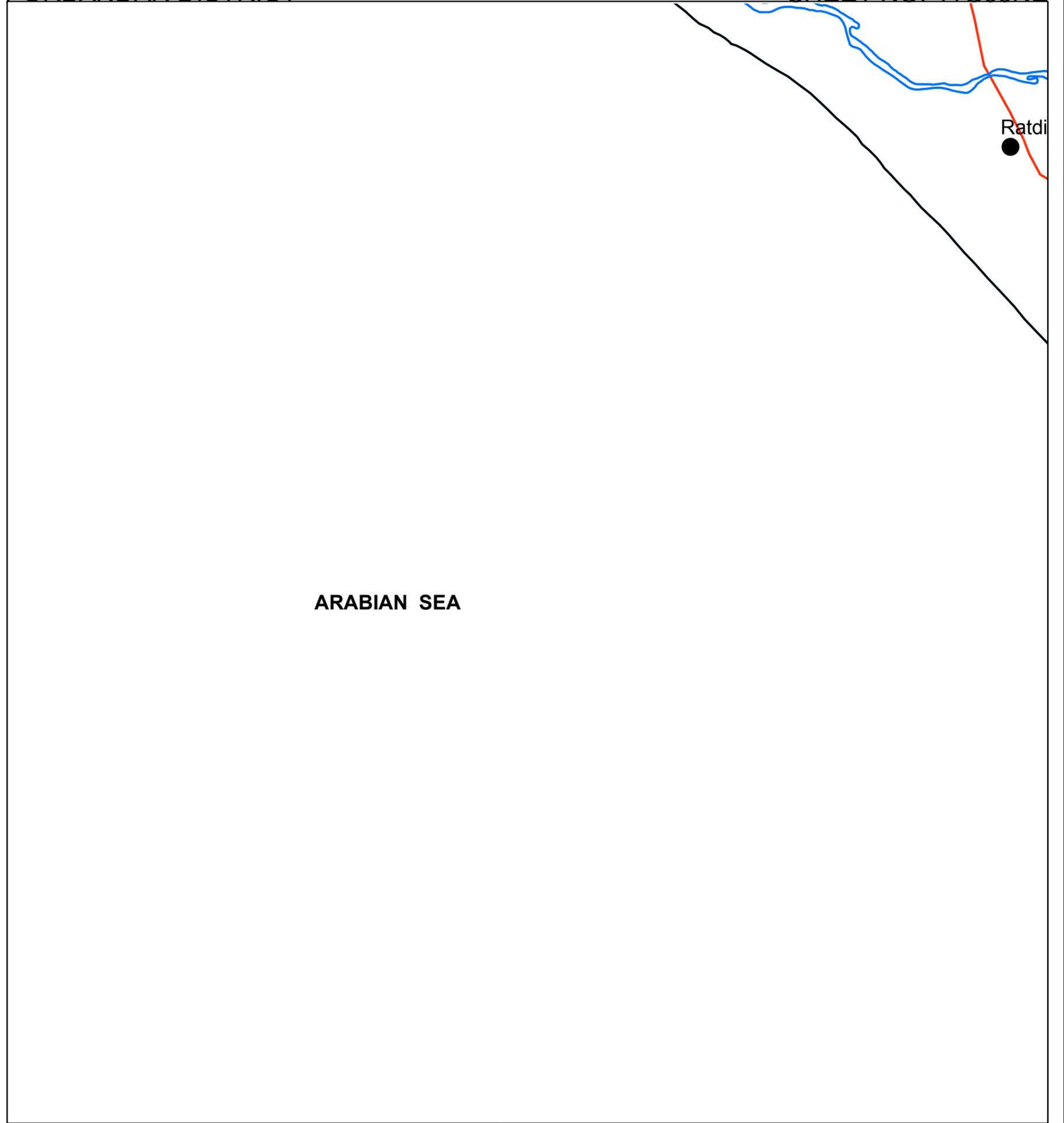
PREPARED BY:  
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AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

PORBANDAR DISTRICT

GUJARAT

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SHEET NO. 41G06NE

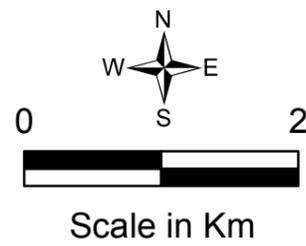


ARABIAN SEA

Ratdi

## Legend

-  STABLE
-  ROAD
-  HIGH-TIDE LINE 2004-06
-  HIGH-TIDE LINE 1989-91
-  HABITATION



### INDEX TO SHEETS

41G05 SW	41G05 SE	41G09 SW
SEA		41G10 NW
SEA	SEA	41G10 SW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

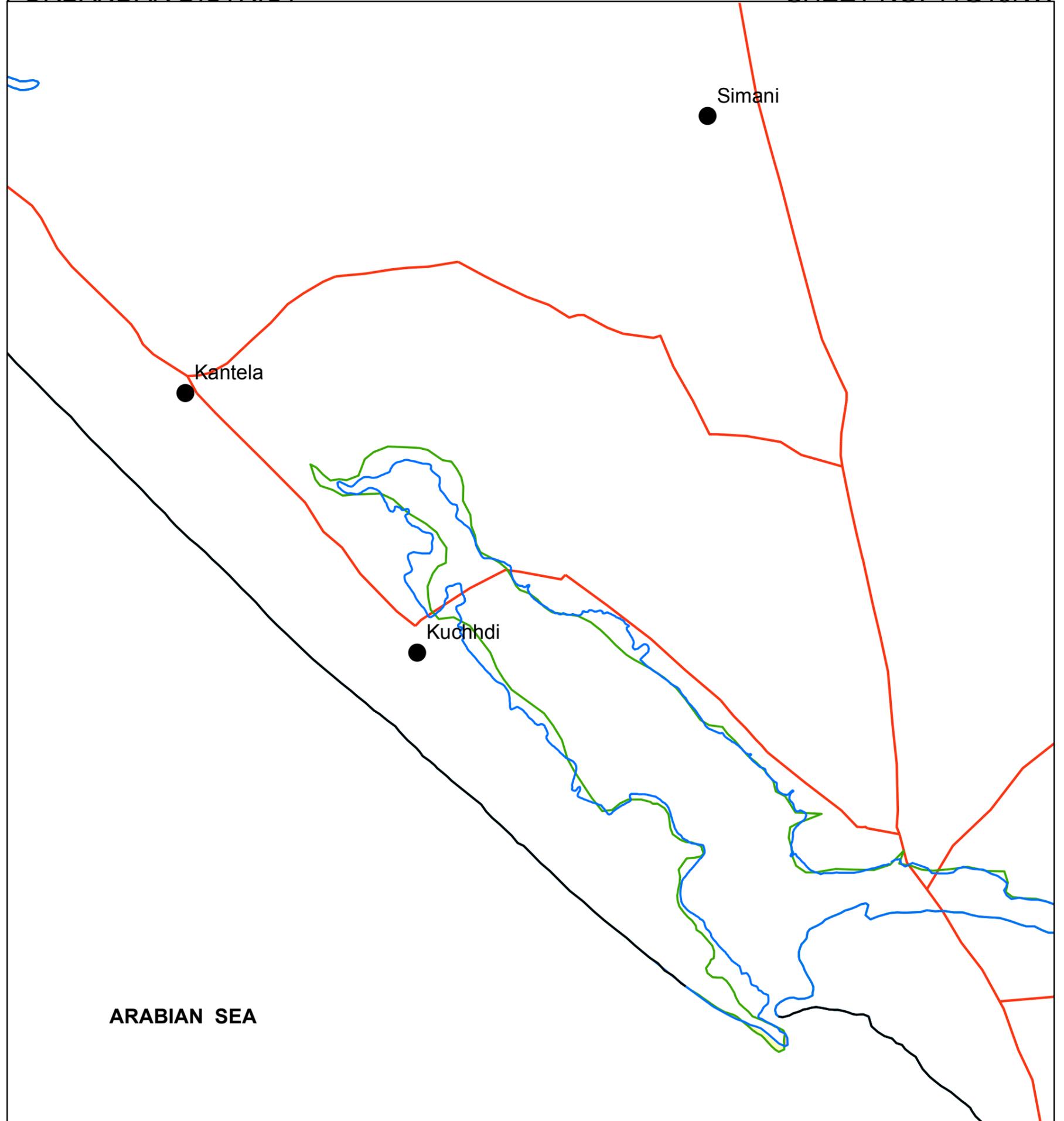
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

PORBANDAR DISTRICT

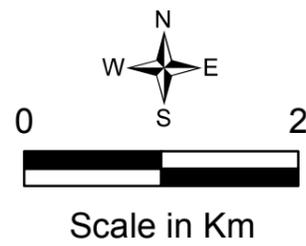
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SHEET NO. 41G10NW



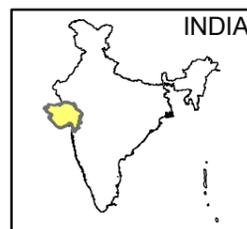
## Legend

- ACCRETION
- EROSION
- STABLE
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

41G05 SE	41G09 SW	41G09 SE
41G06 NE		41G10 NE
SEA	41G10 SW	41G10 SE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
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AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

PORBANDAR DISTRICT

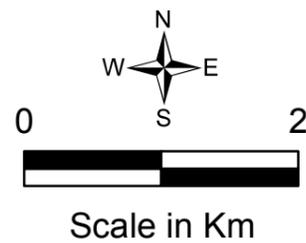
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SHEET NO. 41G10SW

ARABIAN SEA

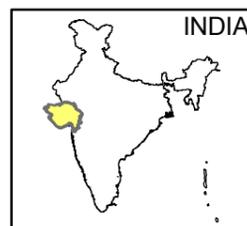
## Legend

- STABLE
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91



### INDEX TO SHEETS

41G06 NE	41G10 NW	41G10 NE
SEA		41G10 SE
SEA	SEA	41G11 NE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

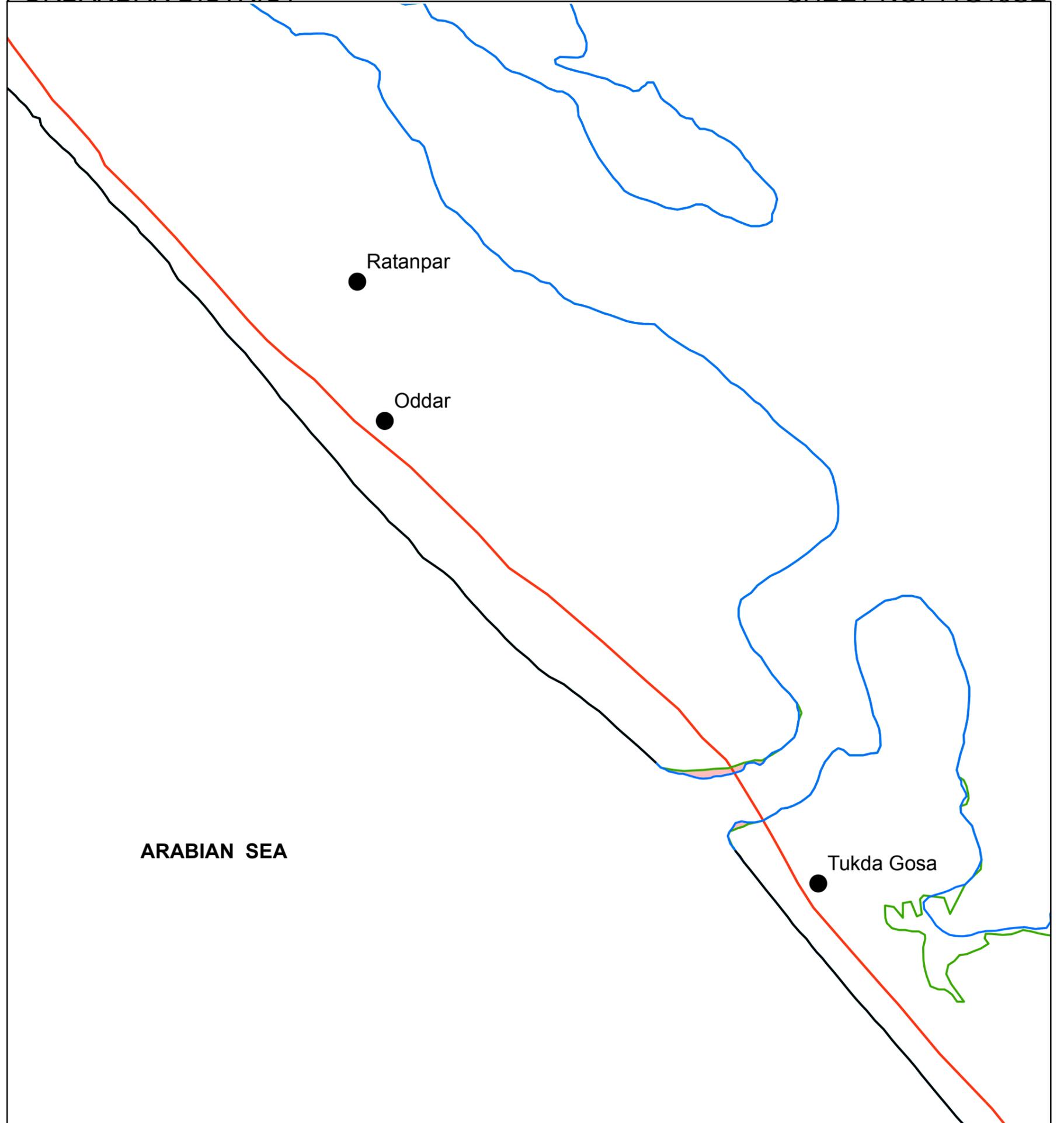
PREPARED BY:  
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AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

PORBANDAR DISTRICT

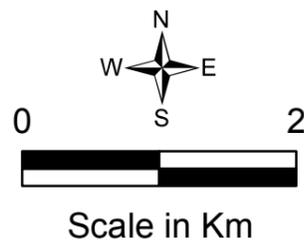
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SHEET NO. 41G10SE



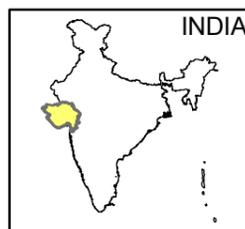
## Legend

- EROSION
- STABLE
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

41G10 NW	41G10 NE	41G14 NW
41G10 SW		41G14 SW
SEA	41G11 NE	41G15 NW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

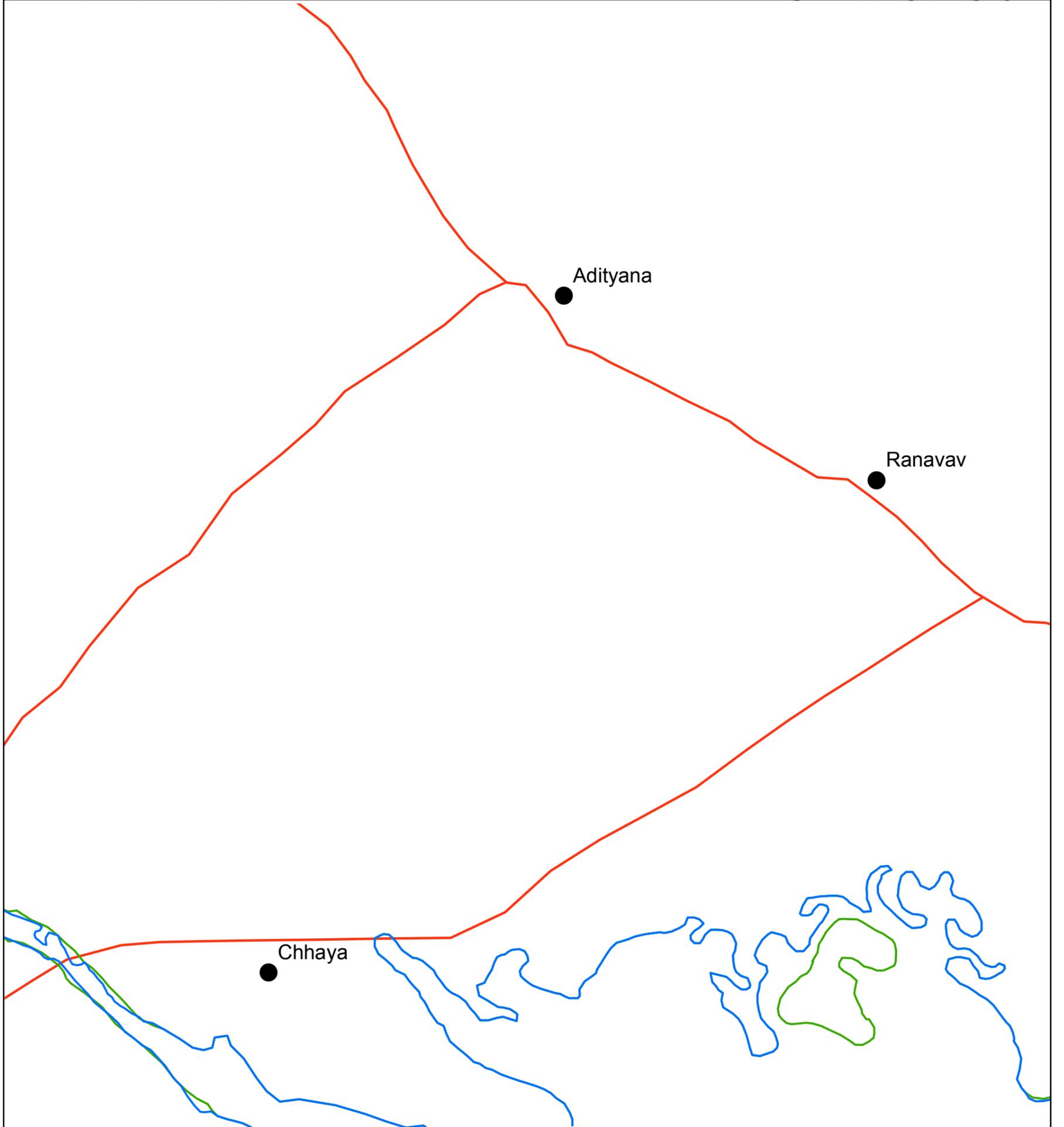
PREPARED BY:  
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AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

PORBANDAR DISTRICT

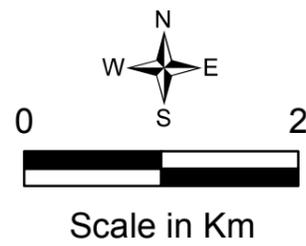
GUJARAT

FOR OFFICIAL USE ONLY  
SHEET NO. 41G10NE



## Legend

- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

41G09 SW	41G09 SE	41G13 SW
41G10 NW		41G14 NW
41G10 SW	41G10 SE	41G14 SW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

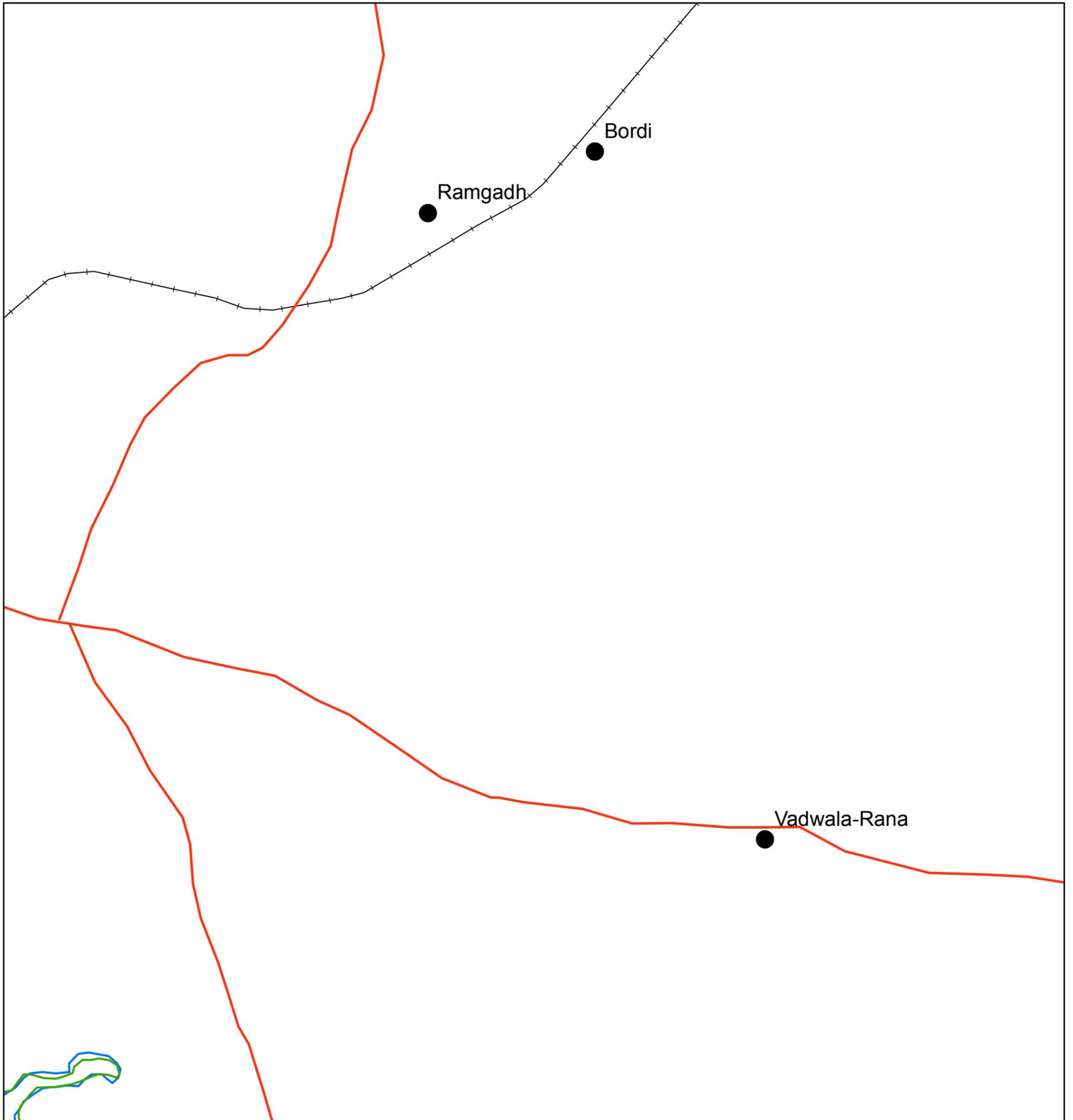
# SHORELINE CHANGE MAP

## GUJARAT

FOR OFFICIAL USE ONLY

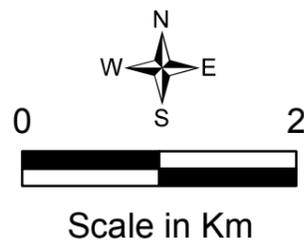
PORBANDAR DISTRICT

SHEET NO. 41G14NW



### Legend

- ROAD
- RAIL
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

41G09 SE	41G13 SW	41G13 SE
SEA		41G14 NE
SEA	SEA	41G14 SE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

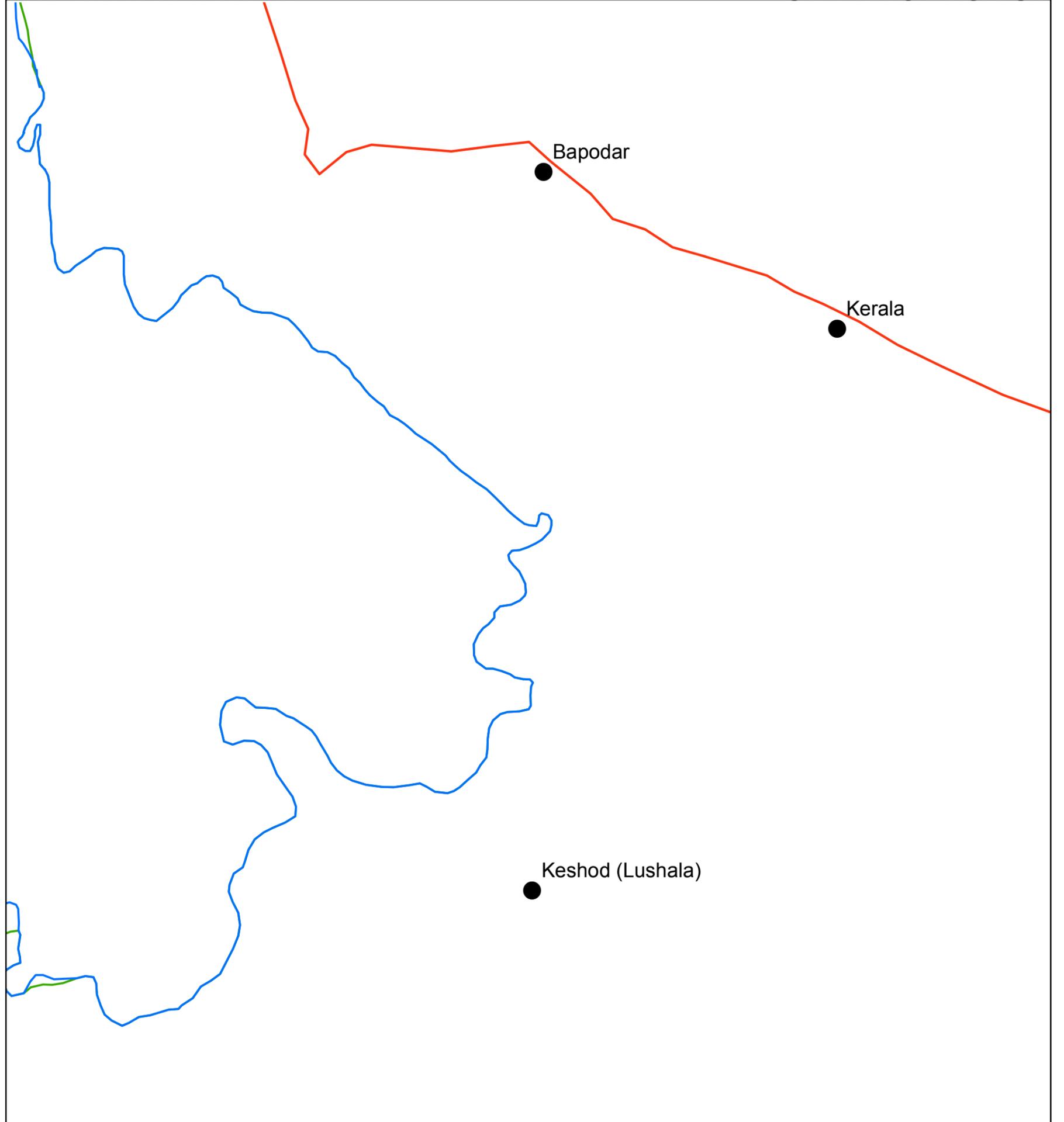
PREPARED BY:  
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AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY  
SHEET NO. 41G14SW

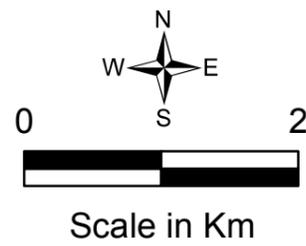
PORBANDAR DISTRICT

GUJARAT



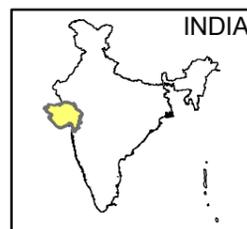
## Legend

- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

41G10NE	41G14 NW	41G14 NE
41G10SE		41G14 SE
41G11NE	41G15NW	41G15 NE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
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AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

## GUJARAT

FOR OFFICIAL USE ONLY

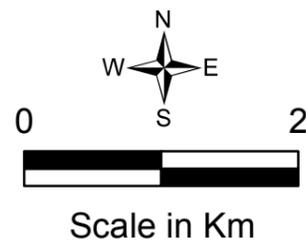
PORBANDAR DISTRICT

SHEET NO. 41G11NE

ARABIAN SEA

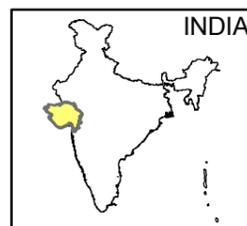
### Legend

- STABLE
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91



#### INDEX TO SHEETS

41G10 SW	41G10 SE	41G14 SW
SEA		41G15 NW
SEA	SEA	41G15 SW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

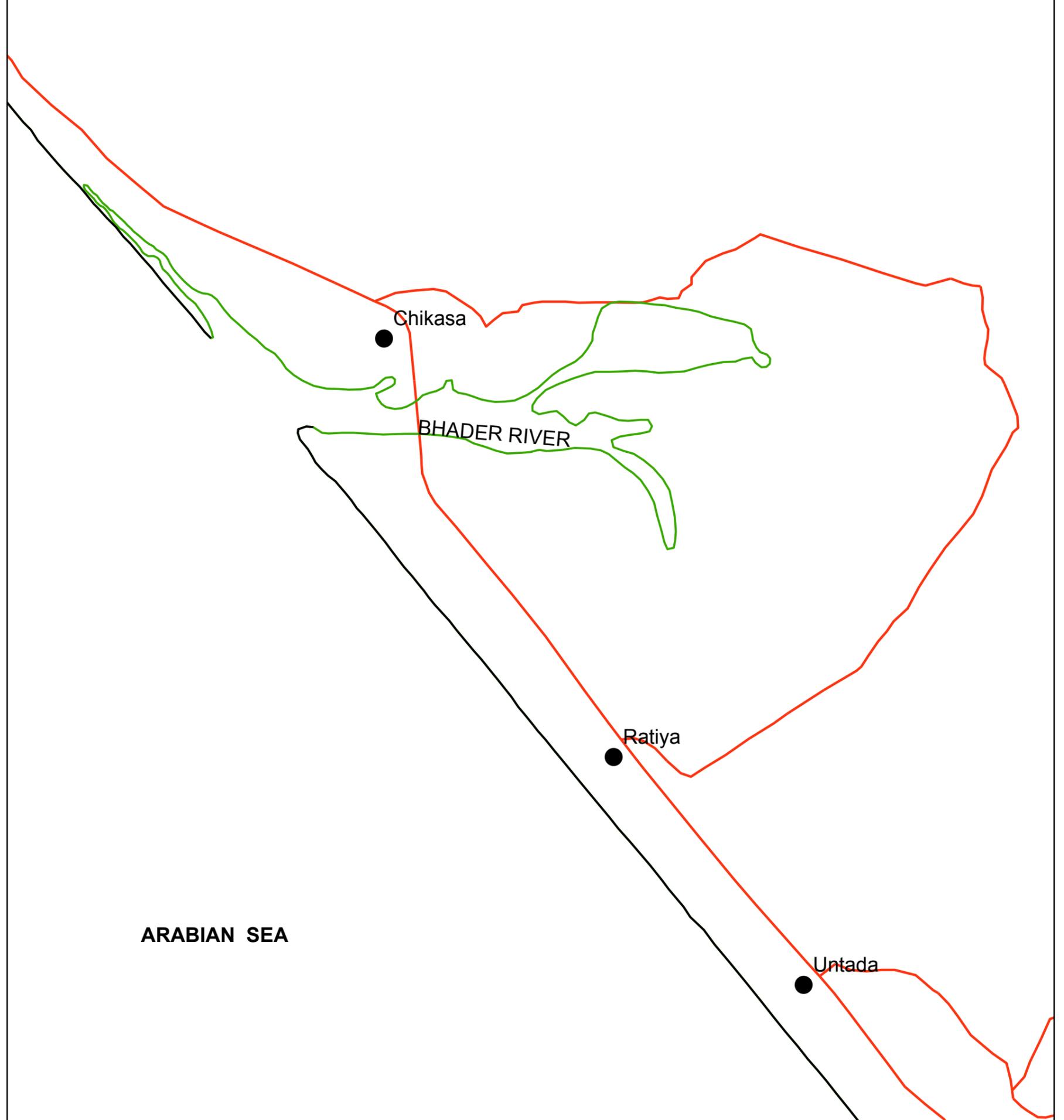
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

PORBANDAR DISTRICT

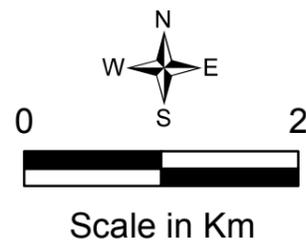
GUJARAT

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SHEET NO. 41G15NW



## Legend

-  STABLE
-  ROAD
-  HIGH-TIDE LINE 2004-06
-  HIGH-TIDE LINE 1989-91
-  HABITATION



### INDEX TO SHEETS

41G10 SE	41G14 SW	41G14 SE
41G11 NE		41G15 NE
SEA	41G15 SW	41G15 SE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

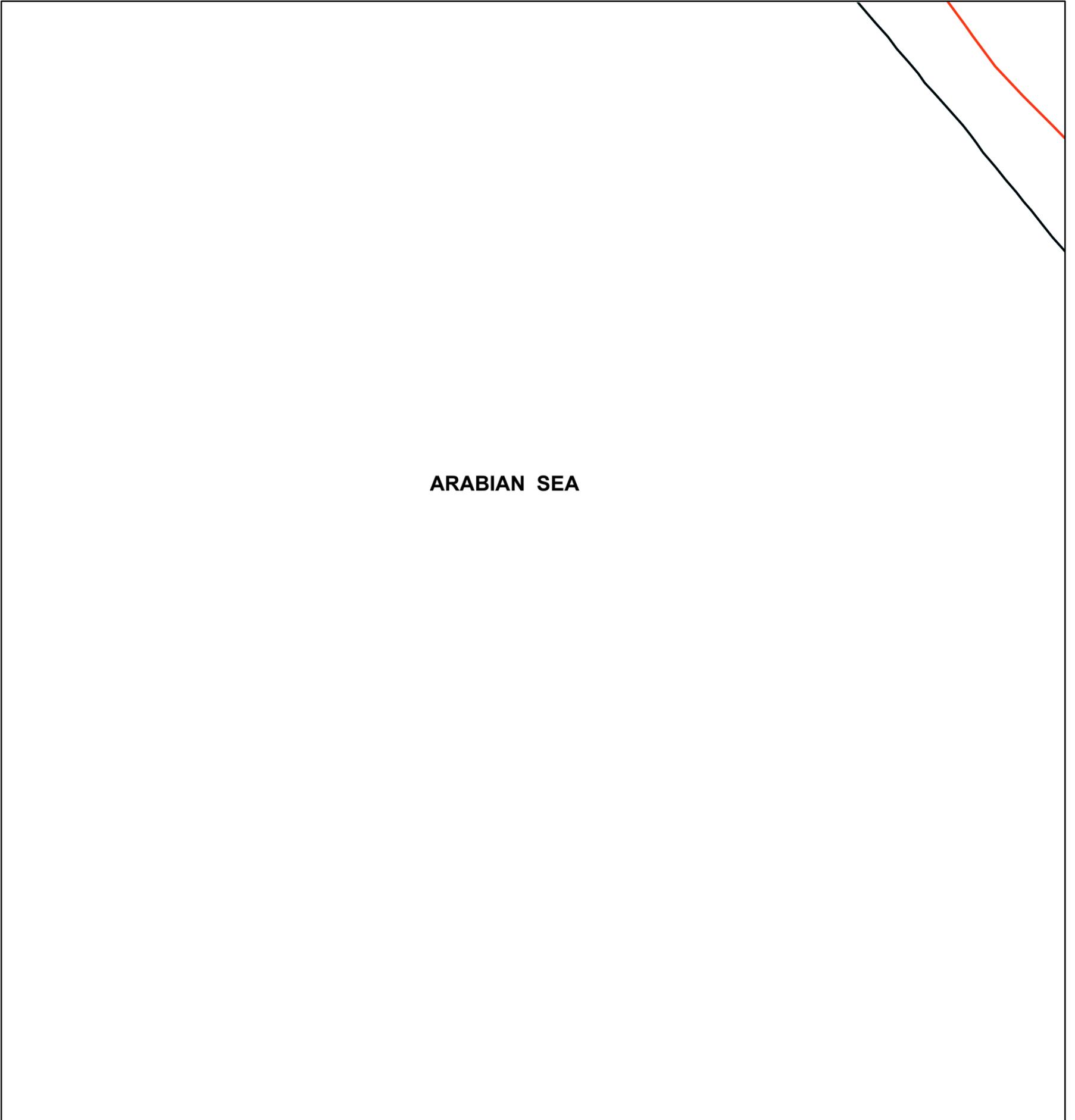
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

## GUJARAT

PORBANDAR DISTRICT

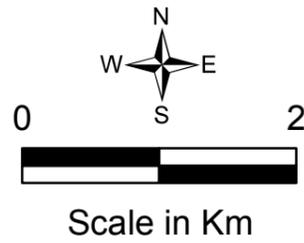
SHEET NO. 41G15SW



ARABIAN SEA

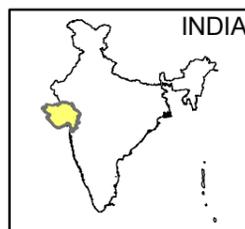
### Legend

- STABLE
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91



#### INDEX TO SHEETS

41G11 NE	41G15 NW	41G15 NE
SEA		41G15 SE
SEA	SEA	41G16 NE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

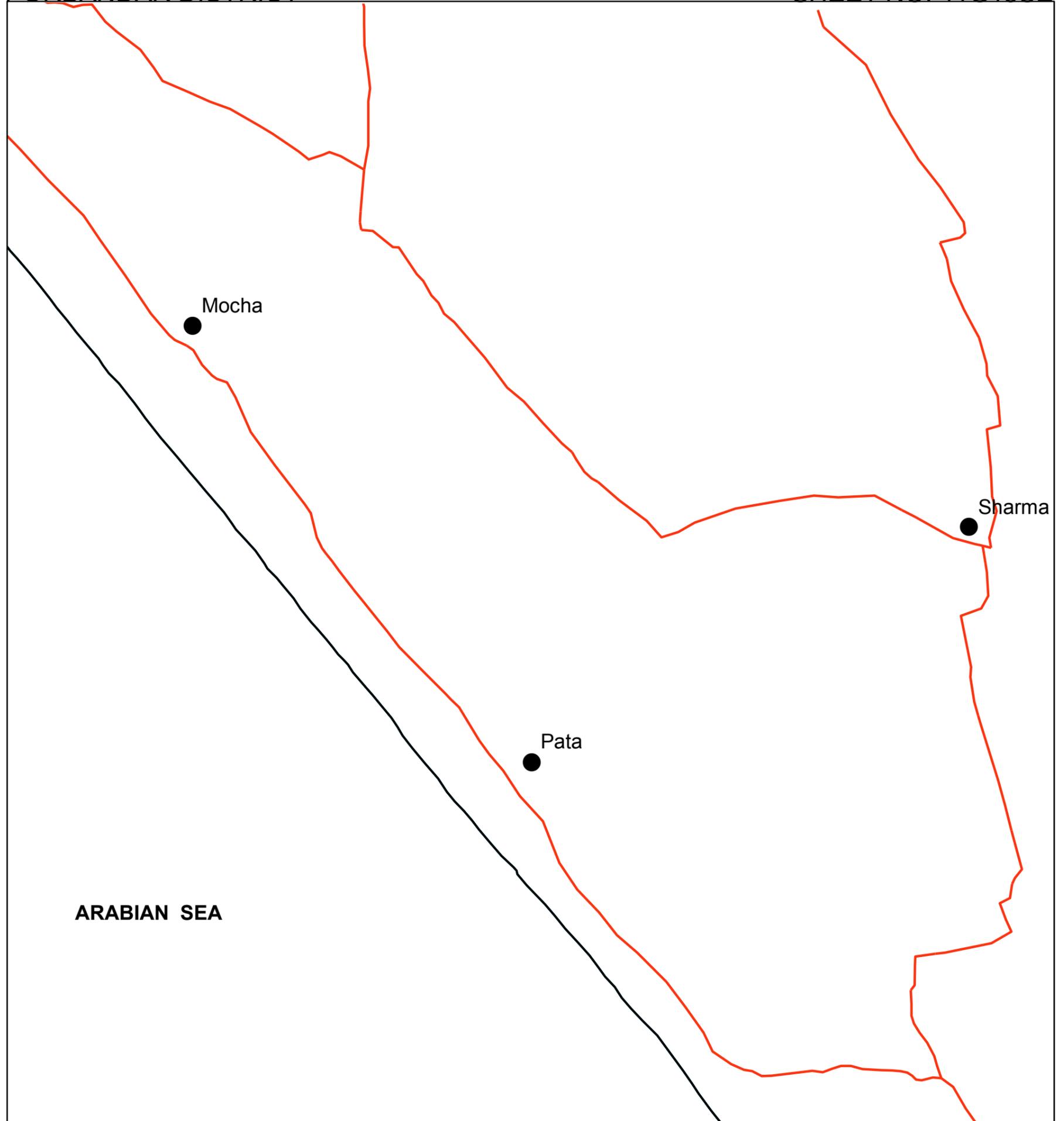
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

PORBANDAR DISTRICT

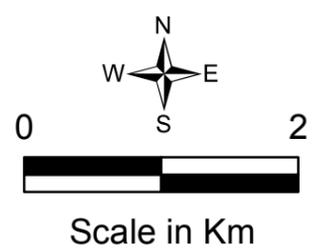
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SHEET NO. 41G15SE



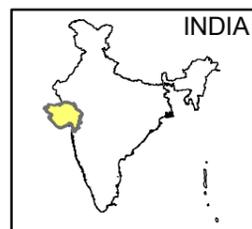
## Legend

-  STABLE
-  ROAD
-  HIGH-TIDE LINE 2004-06
-  HIGH-TIDE LINE 1989-91
-  HABITATION



### INDEX TO SHEETS

41G15 NW	41G15 NE	41K03 NW
41G15 SW		41K03 SW
SEA	41G16 NE	41K04 NW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

JUNAGADH DISTRICT

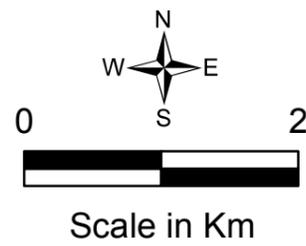
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SHEET NO. 41G16NE

ARABIAN SEA

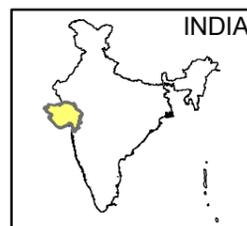
## Legend

-  STABLE
-  ROAD
-  HIGH-TIDE LINE 2004-06
-  HIGH-TIDE LINE 1989-91



### INDEX TO SHEETS

41G15 SW	41G15 SE	41K03 SW
SEA		41K04 NW
SEA	SEA	41K04 SW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

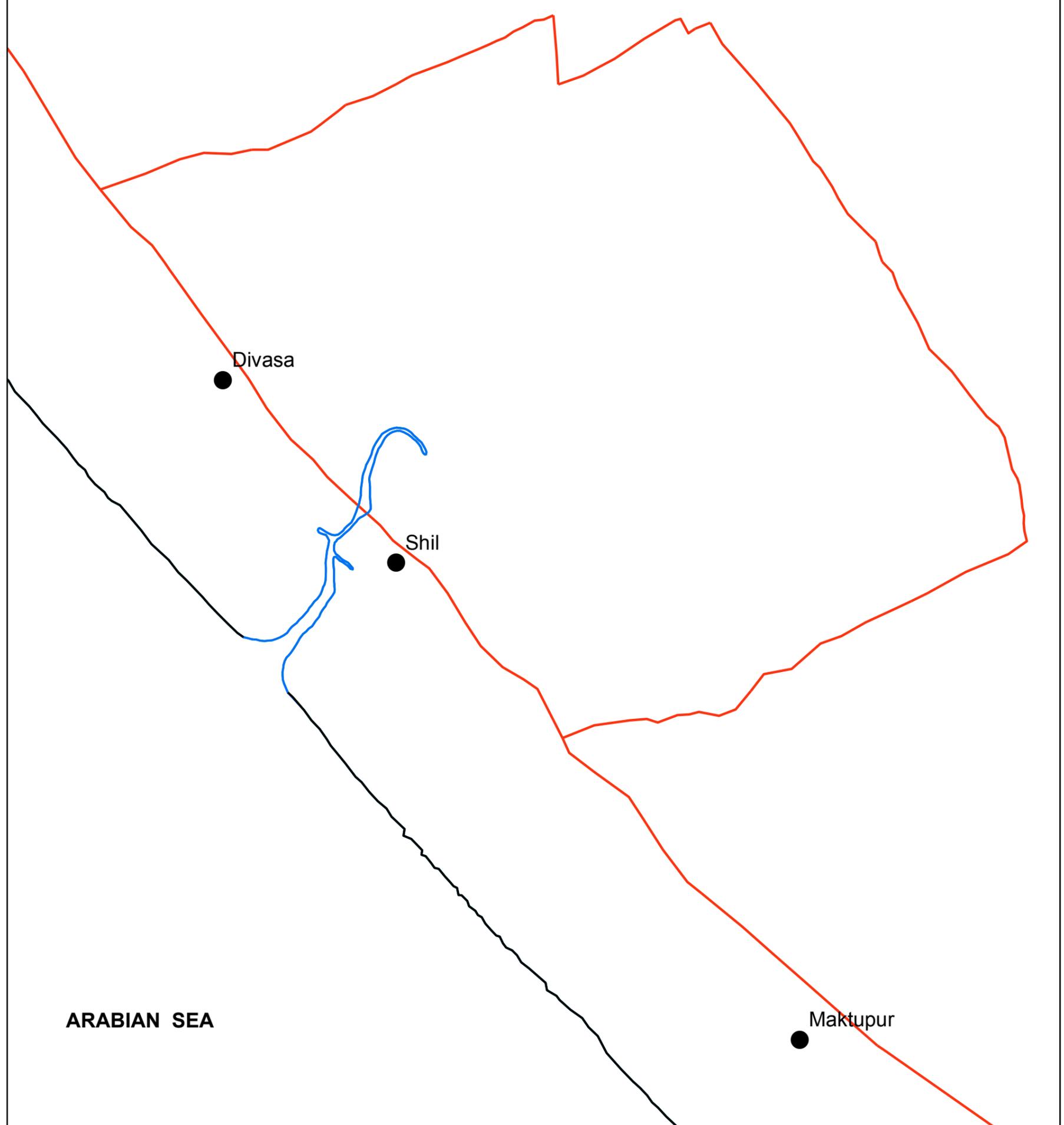
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

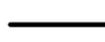
JUNAGADH DISTRICT

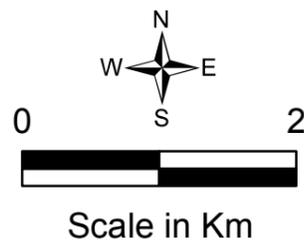
GUJARAT

FOR OFFICIAL USE ONLY  
SHEET NO. 41K04NW



## Legend

-  STABLE
-  ROAD
-  HIGH-TIDE LINE 2004-06
-  HIGH-TIDE LINE 1989-91
-  HABITATION



### INDEX TO SHEETS

41G15 SE	41K03 SW	41K03 SE
41G16 NE		41K04 NE
SEA	41K04 SW	41K04 SE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

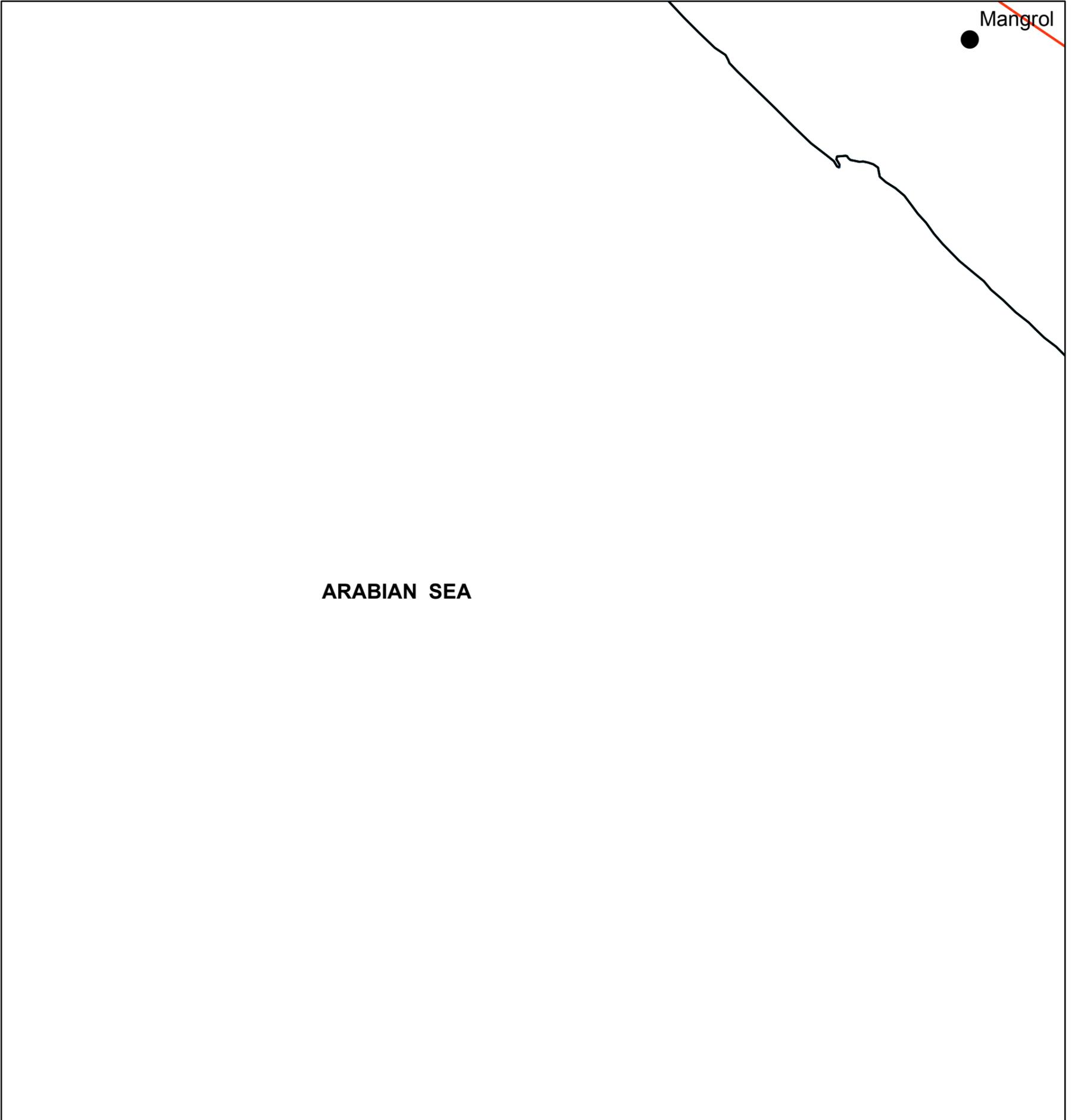
# SHORELINE CHANGE MAP

## GUJARAT

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JUNAGADH DISTRICT

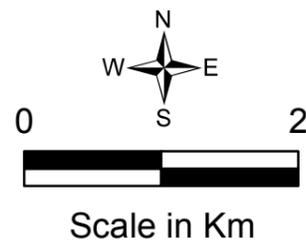
SHEET NO. 41K04SW



ARABIAN SEA

### Legend

-  STABLE
-  ROAD
-  HIGH-TIDE LINE 2004-06
-  HIGH-TIDE LINE 1989-91
-  HABITATION



#### INDEX TO SHEETS

41G16 NE	41K04 NW	41K04 NE
SEA		41K04 SE
SEA	SEA	41L01 NE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

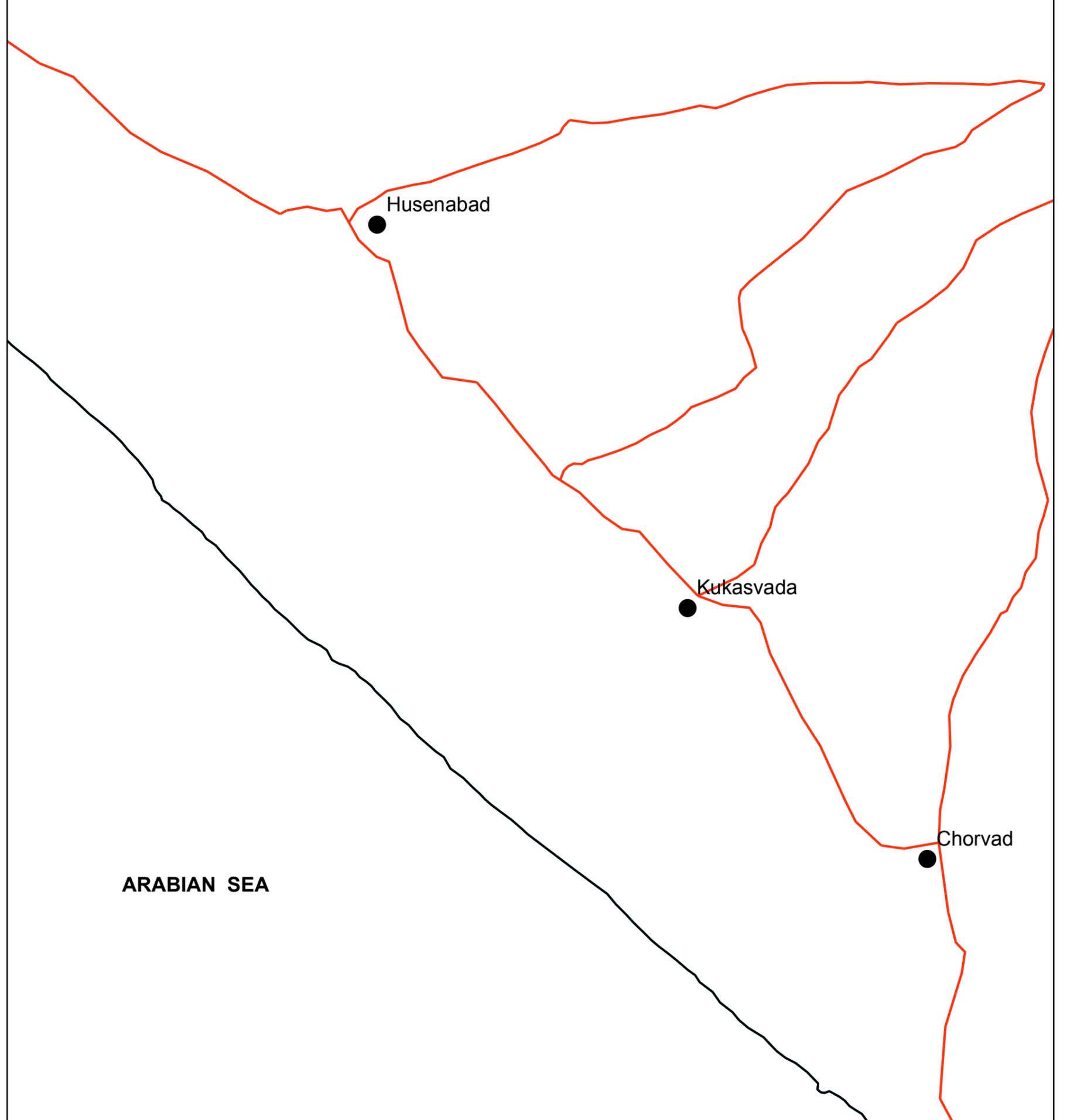
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

JUNAGADH DISTRICT

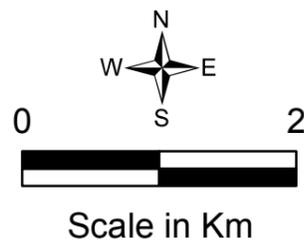
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FOR OFFICIAL USE ONLY  
SHEET NO. 41K04SE



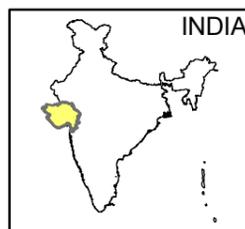
## Legend

-  STABLE
-  ROAD
-  HIGH-TIDE LINE 2004-06
-  HIGH-TIDE LINE 1989-91
-  HABITATION



### INDEX TO SHEETS

41K04 NW	41K04 NE	41K08 NW
41K04 SW		41K08 SW
SEA	41L01 NE	41L05 NW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

JUNAGADH DISTRICT

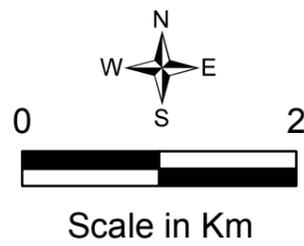
GUJARAT

FOR OFFICIAL USE ONLY  
SHEET NO. 41L01NE

ARABIAN SEA

## Legend

- ACCRETION
- STABLE
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91



### INDEX TO SHEETS

41K04 SW	41K04 SE	41K08 SW
SEA		41L05 NW
SEA	SEA	41L05 SW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

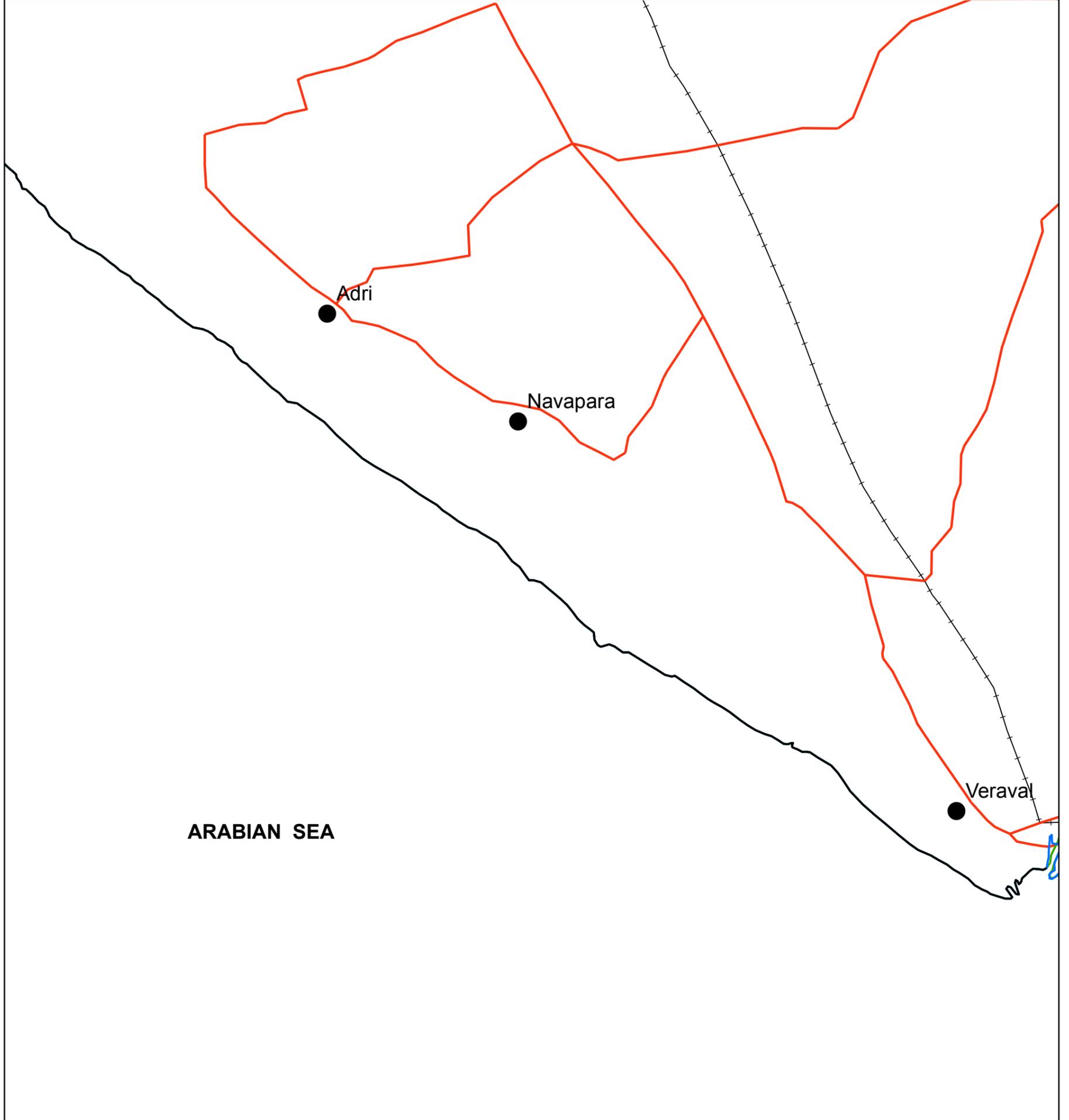
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

JUNAGADH DISTRICT

GUJARAT

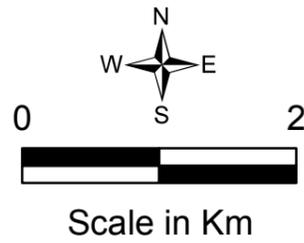
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SHEET NO. 41L05NW



ARABIAN SEA

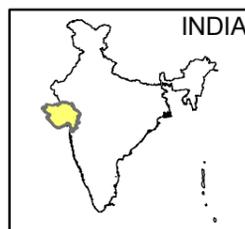
## Legend

- STABLE
- ROAD
- RAIL
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

41K04 SE	41K08 SW	41K08 SE
41L01 NE		41L05 NE
SEA	SEA	41L05 SE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

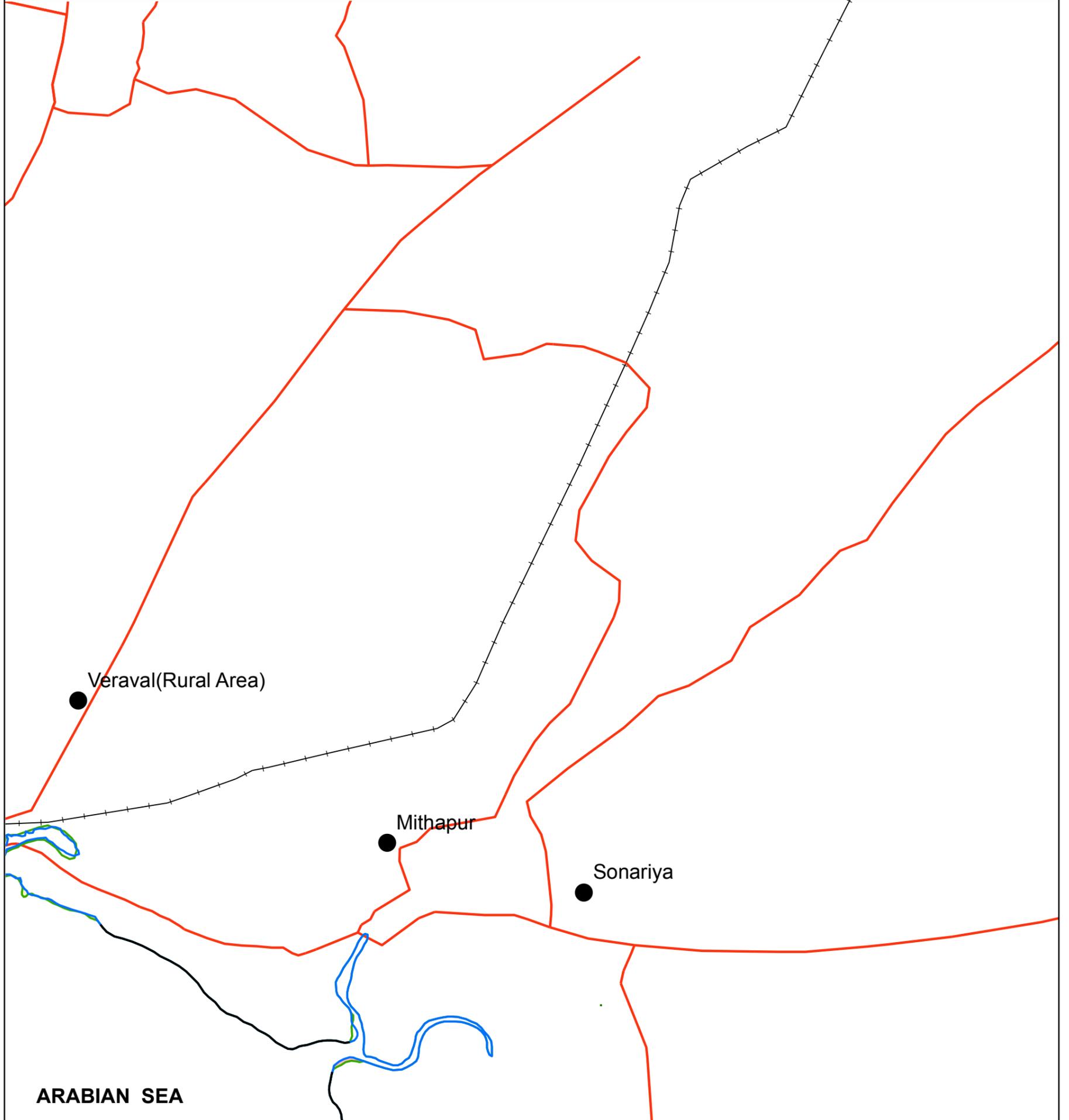
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

JUNAGADH DISTRICT

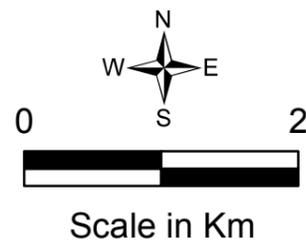
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SHEET NO. 41L05NE



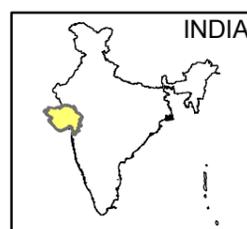
## Legend

- ACCRETION
- EROSION
- STABLE
- ROAD
- RAIL
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

41K08 SW	41K08 SE	41K12 SW
41L05 NW		41L09 NW
SEA	41L05 SE	41L09 SW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

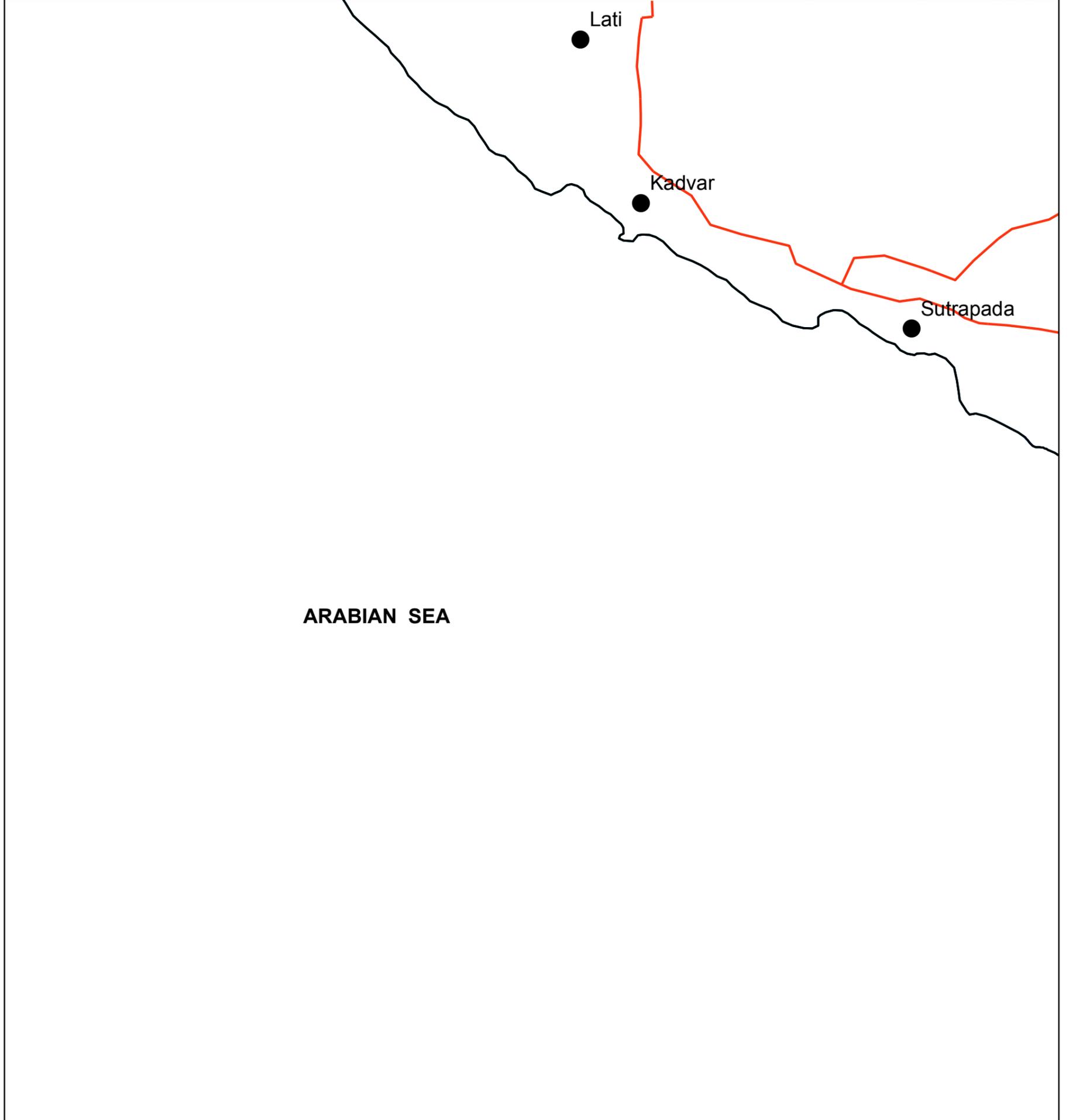
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

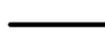
JUNAGADH DISTRICT

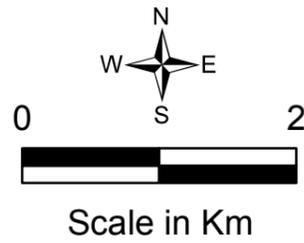
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FOR OFFICIAL USE ONLY  
SHEET NO. 41L05SE



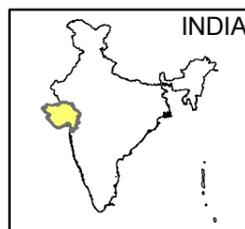
## Legend

-  STABLE
-  ROAD
-  HIGH-TIDE LINE 2004-06
-  HIGH-TIDE LINE 1989-91
-  HABITATION



### INDEX TO SHEETS

41L05 NW	41L05 NE	41L09 NW
SEA		41L09 SW
SEA	SEA	41L10 NW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

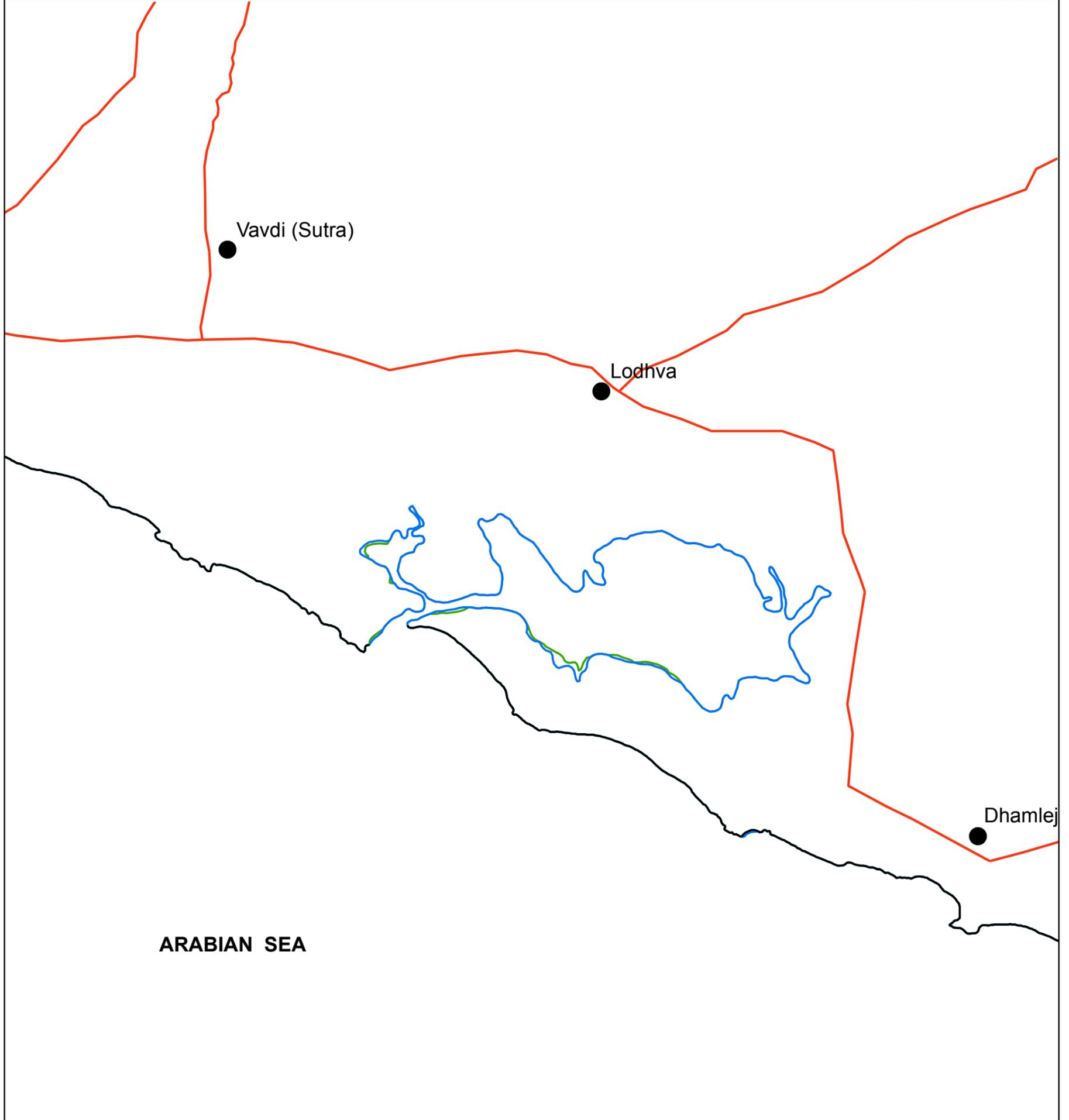
PREPARED BY:  
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AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

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SHEET NO. 41L09SW

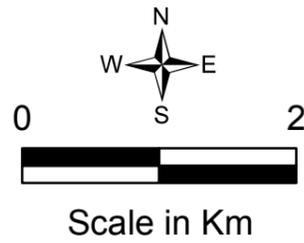
JUNAGADH DISTRICT

GUJARAT



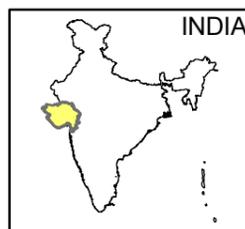
## Legend

- STABLE
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

41L05 NE	41L09 NW	41L09 NE
41L05 SE		41L09 SE
SEA	SEA	41L10 NE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

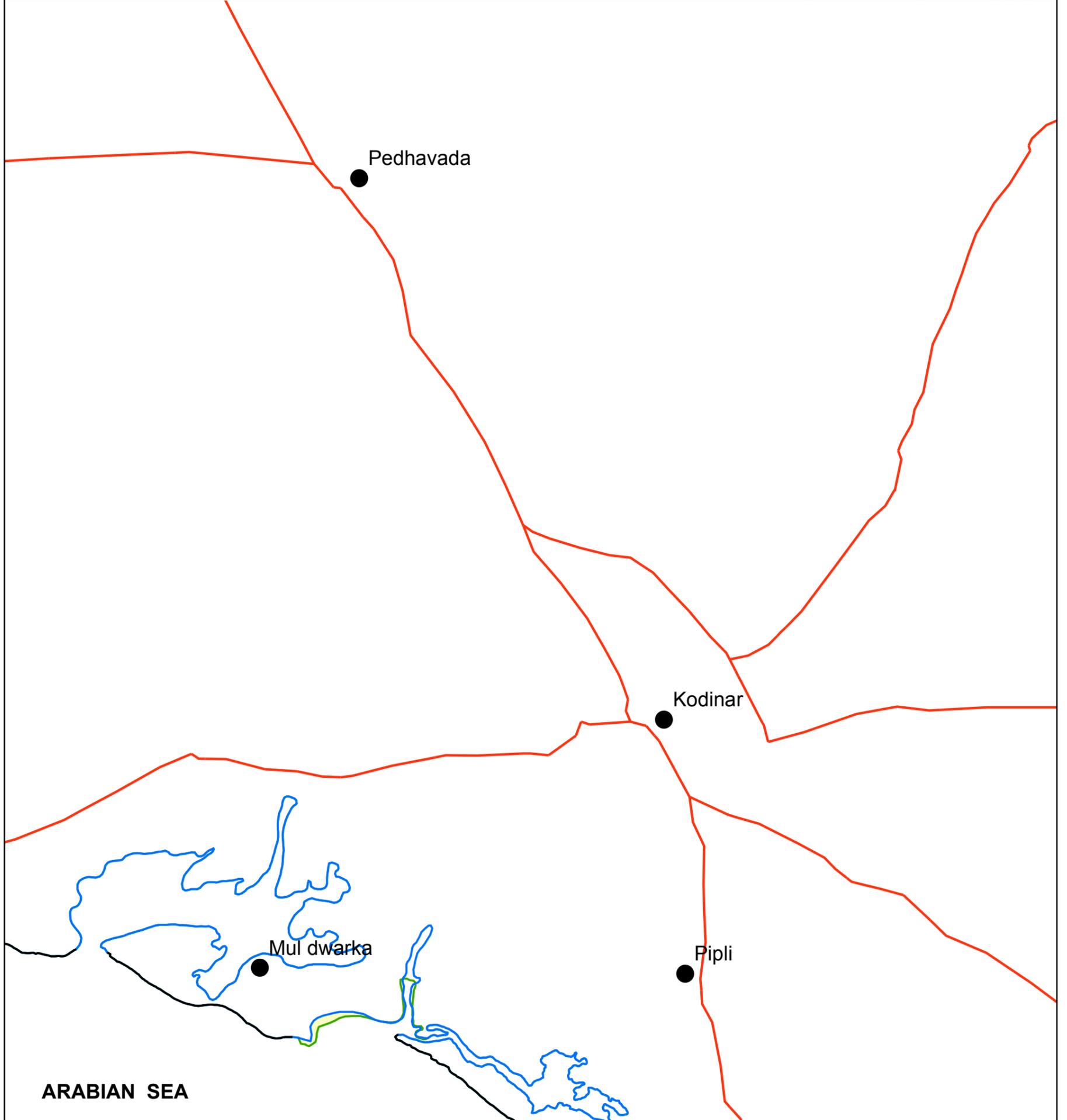
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

JUNAGADH DISTRICT

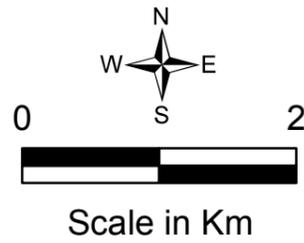
GUJARAT

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SHEET NO. 41L09SE



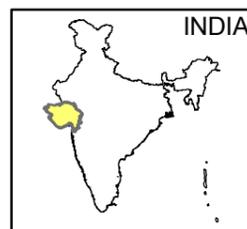
## Legend

- ACCRETION
- STABLE
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

41L09 NW	41L09 NE	41L13 NW
41L09 SW		41L13 SW
SEA	41L10 NE	41L14 NW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

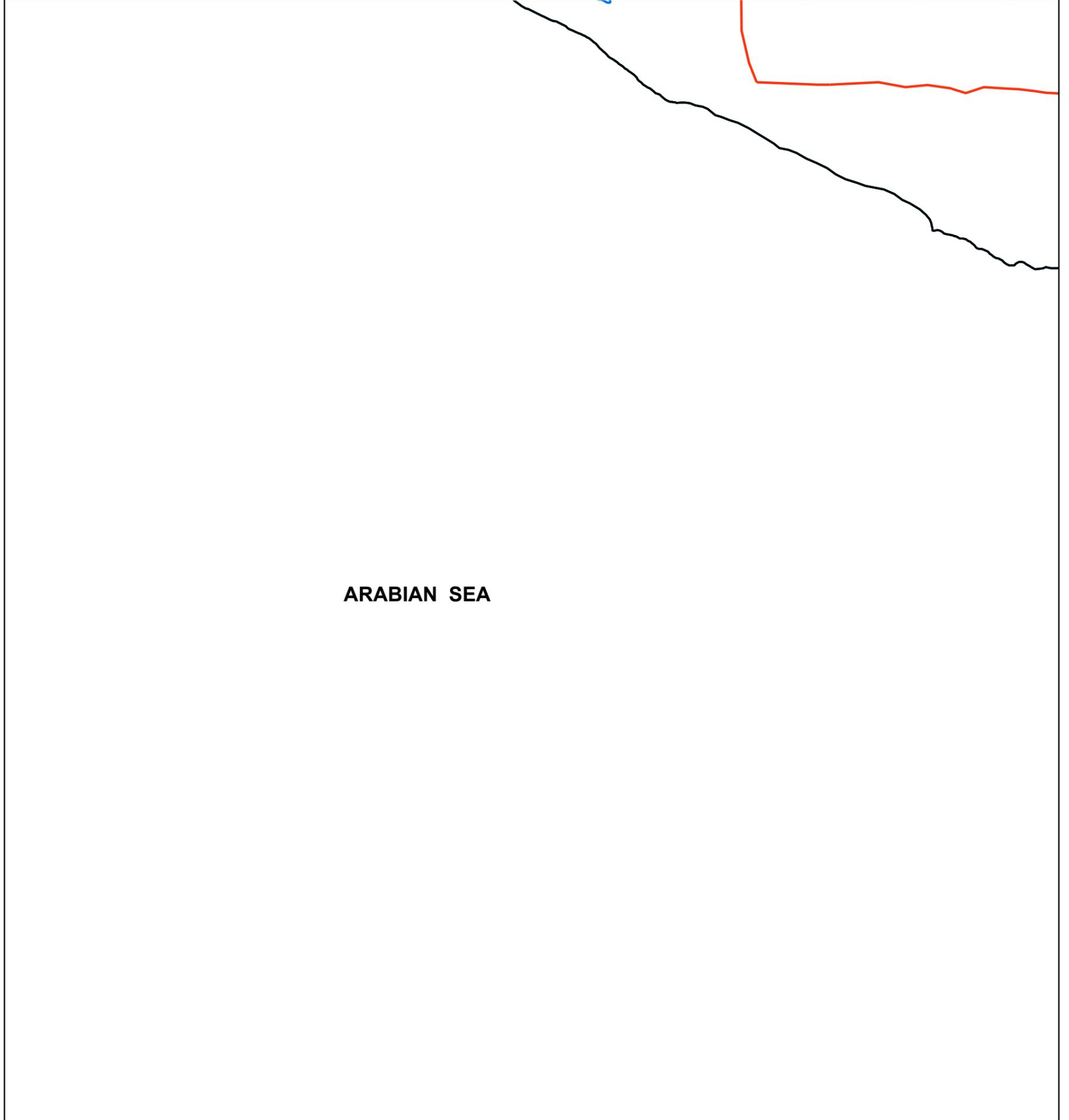
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

JUNAGADH DISTRICT

GUJARAT

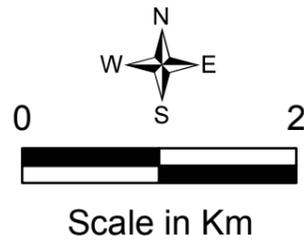
FOR OFFICIAL USE ONLY  
SHEET NO. 41L10NE



ARABIAN SEA

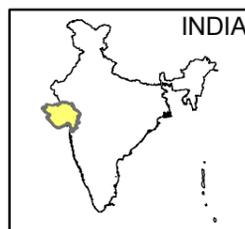
## Legend

-  STABLE
-  ROAD
-  HIGH-TIDE LINE 2004-06
-  HIGH-TIDE LINE 1989-91



### INDEX TO SHEETS

41L09 SW	41L09 SE	41L13 SW
SEA		41L14 NW
SEA	SEA	SEA



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

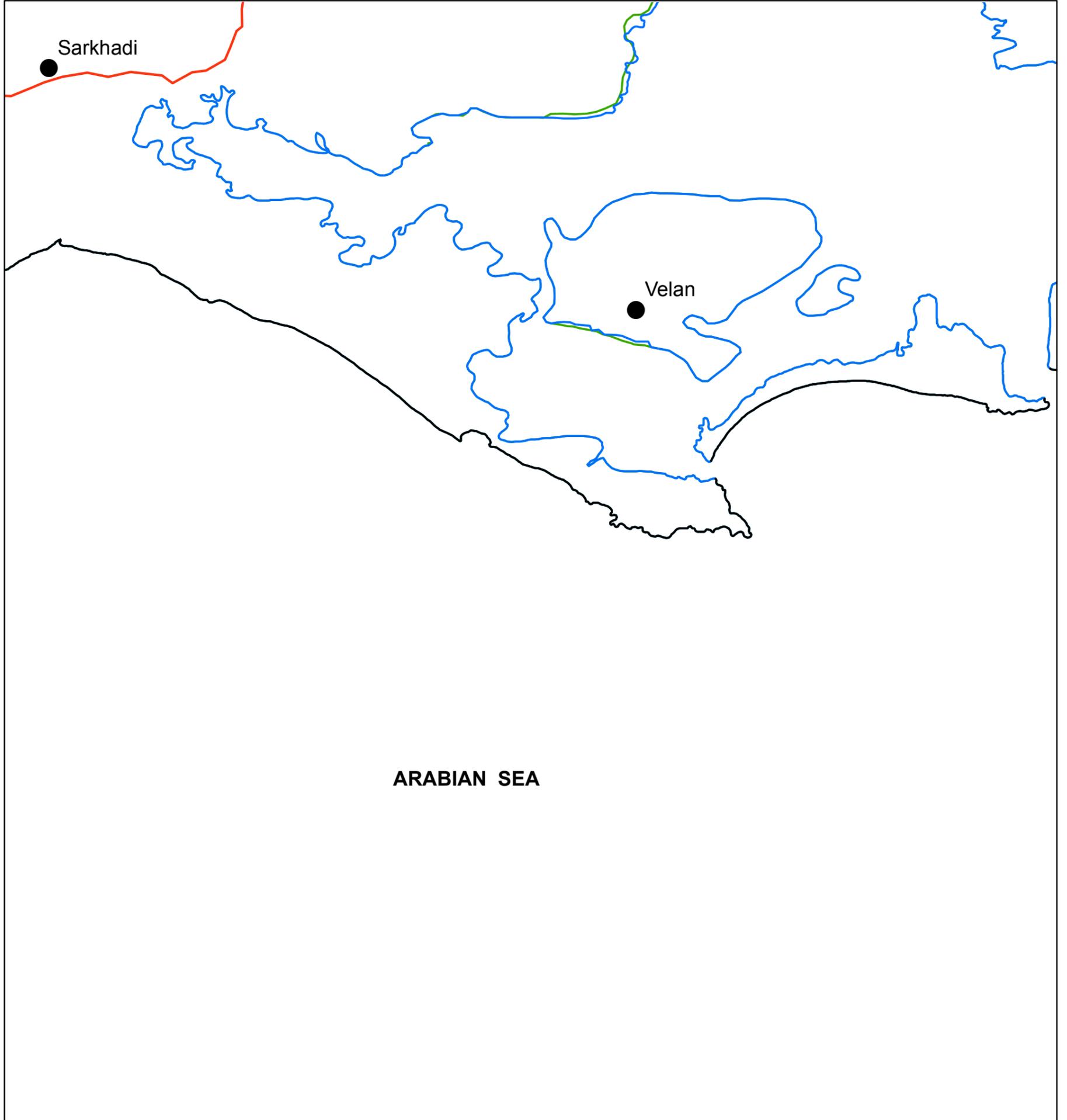
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

JUNAGADH DISTRICT

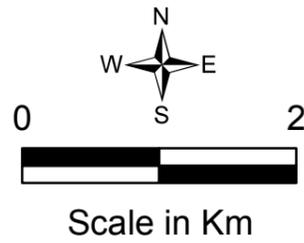
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SHEET NO. 41L14NW



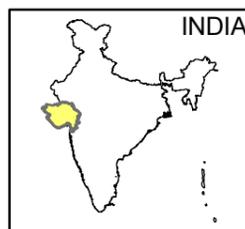
## Legend

- STABLE
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

41L09 SE	41L13 SW	41L13 SE
41L10 NE		41L14 NE
SEA	SEA	SEA



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

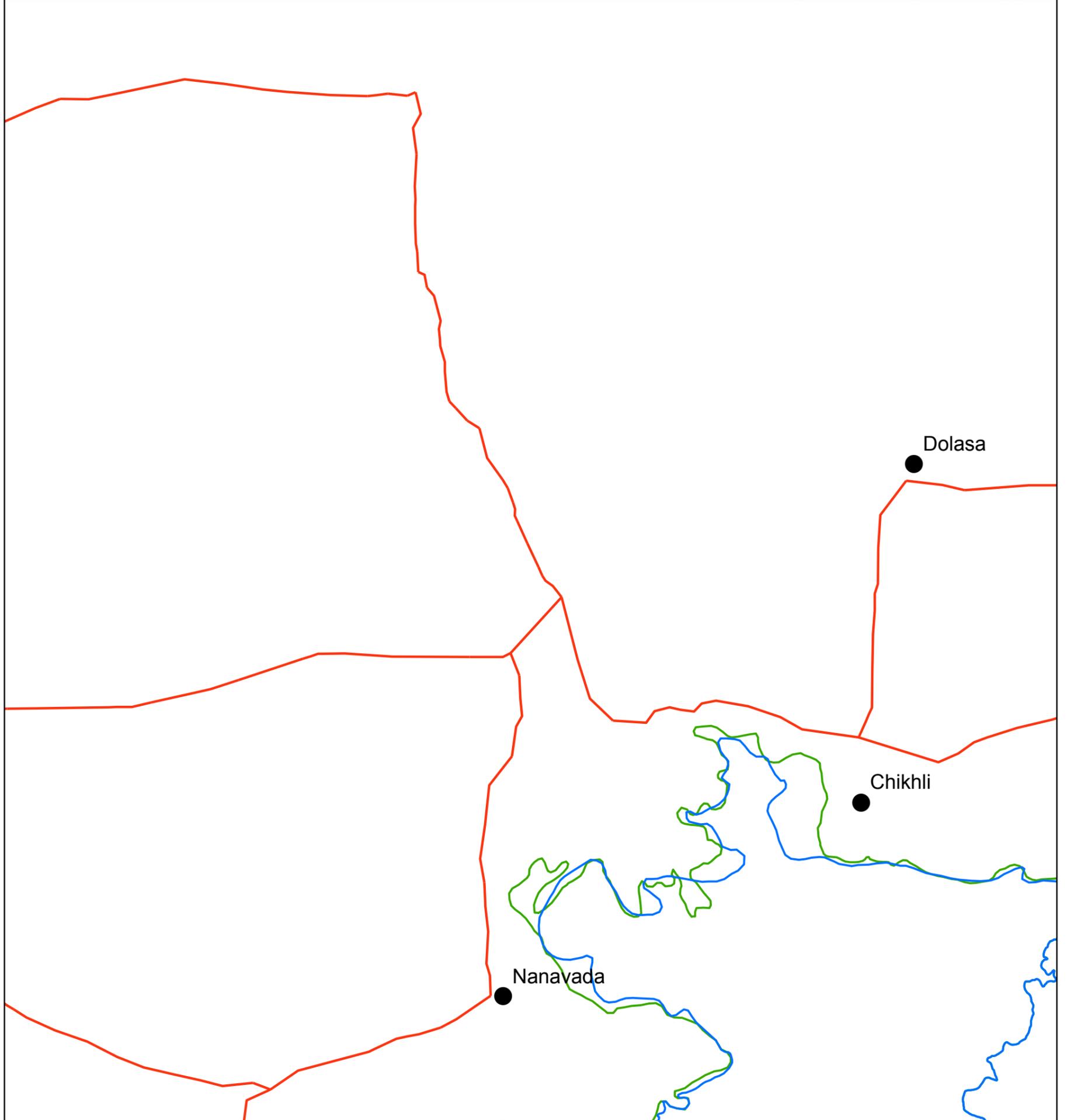
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

JUNAGADH DISTRICT

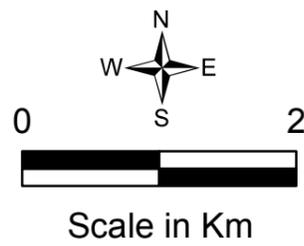
GUJARAT

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SHEET NO. 41L13SW



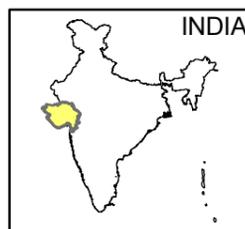
## Legend

- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

41L09 NE	41L13 NW	41L13 NE
41L09 SE		41L13 SE
41L10 NE	41L14 NW	41L14 NE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

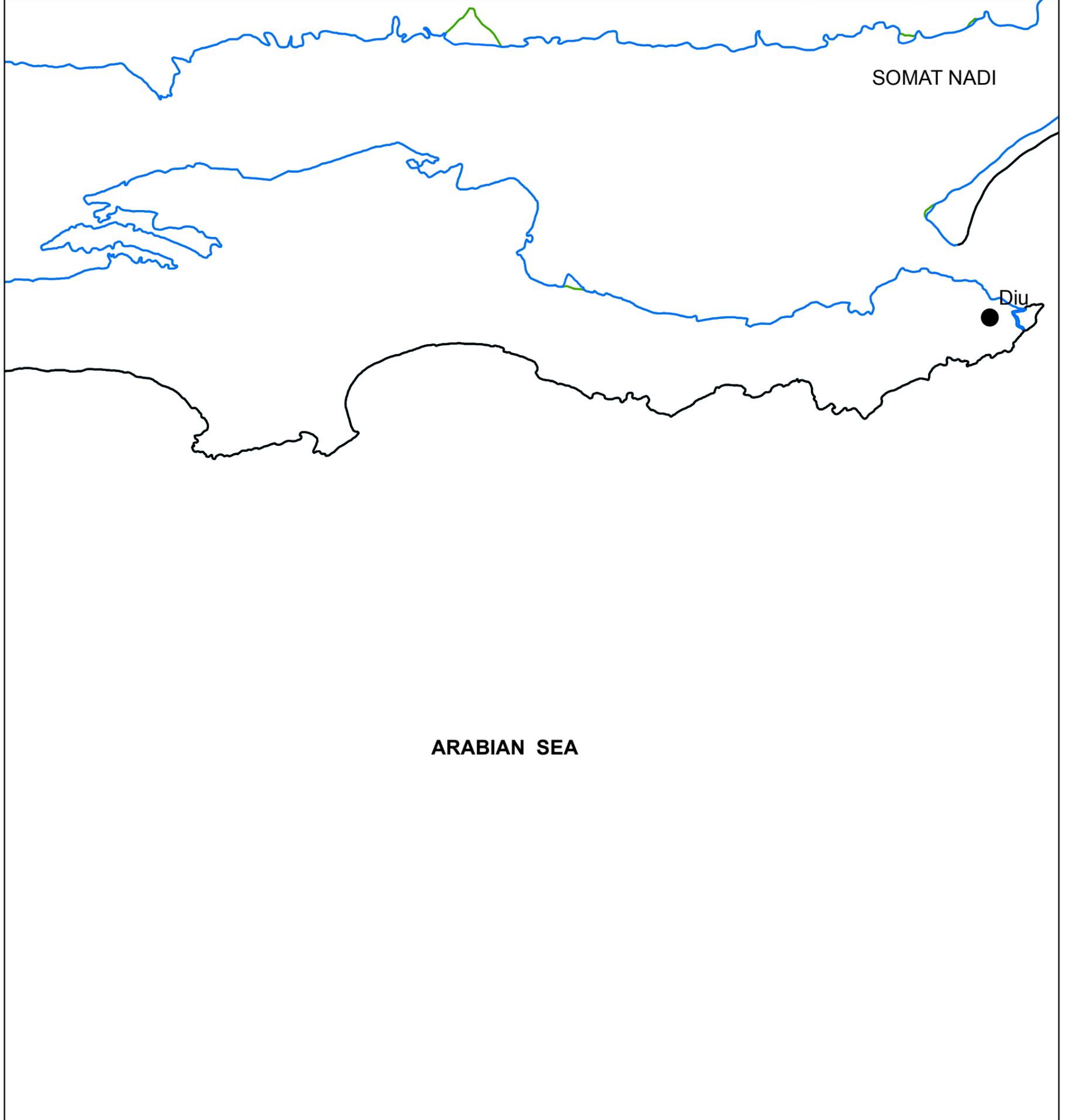
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

JUNAGADH DISTRICT

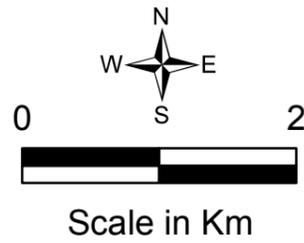
GUJARAT

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SHEET NO. 41L14NE



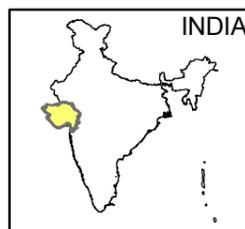
## Legend

-  STABLE
-  HIGH-TIDE LINE 2004-06
-  HIGH-TIDE LINE 1989-91
-  HABITATION



### INDEX TO SHEETS

41L13 SW	41L13 SE	41P01 SW
41L14 NW		41P02 NW
SEA	SEA	SEA



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

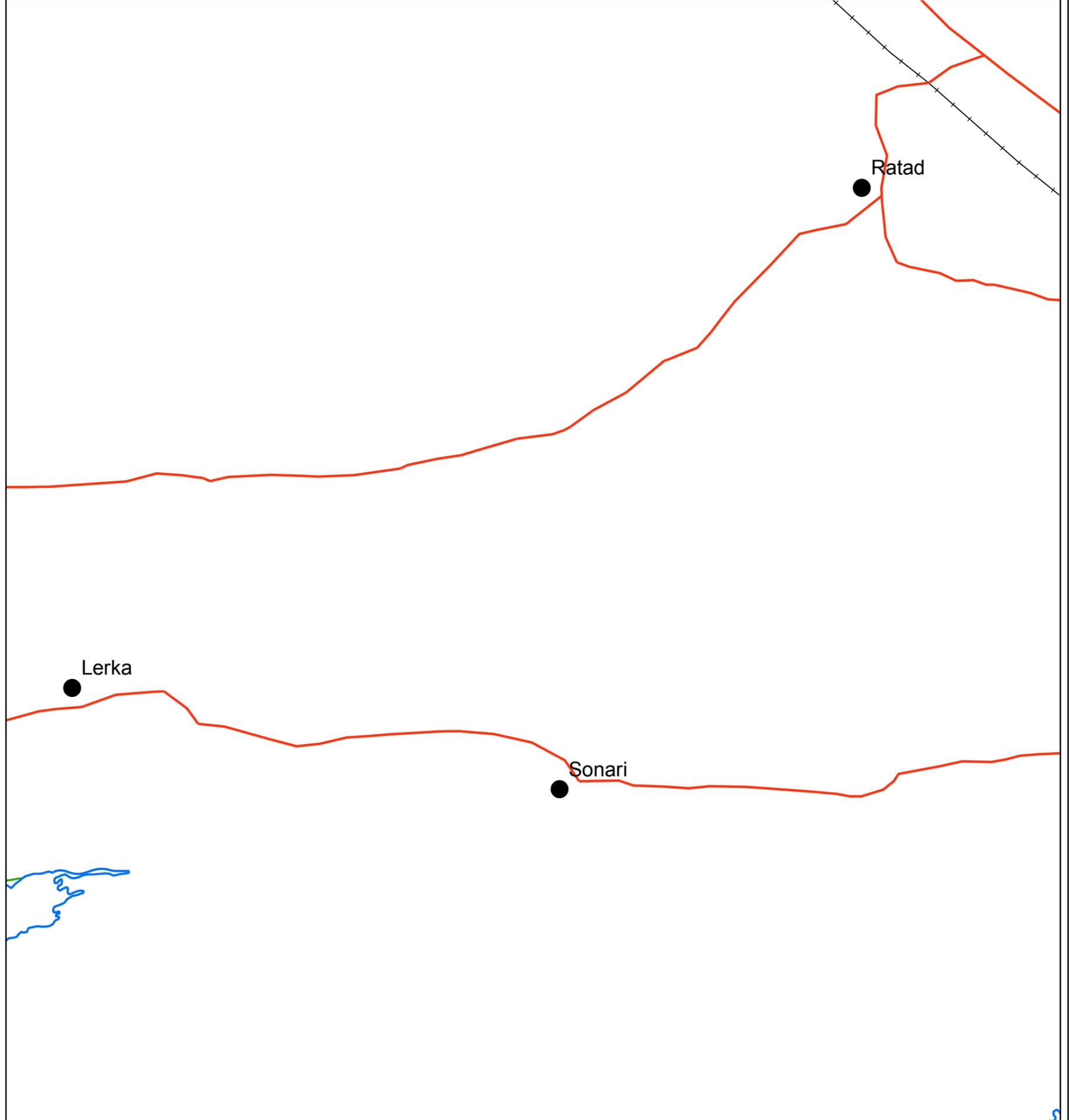
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

JUNAGADH DISTRICT

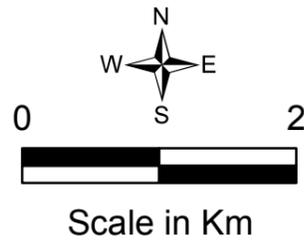
GUJARAT

FOR OFFICIAL USE ONLY  
SHEET NO. 41L13SE



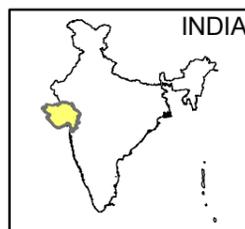
## Legend

- ROAD
- - - - RAIL
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

41L13 NW	41L13 NE	41P01 NW
41L13 SW		41P01 SW
41L14 NW	41L14 NE	41P02 NW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

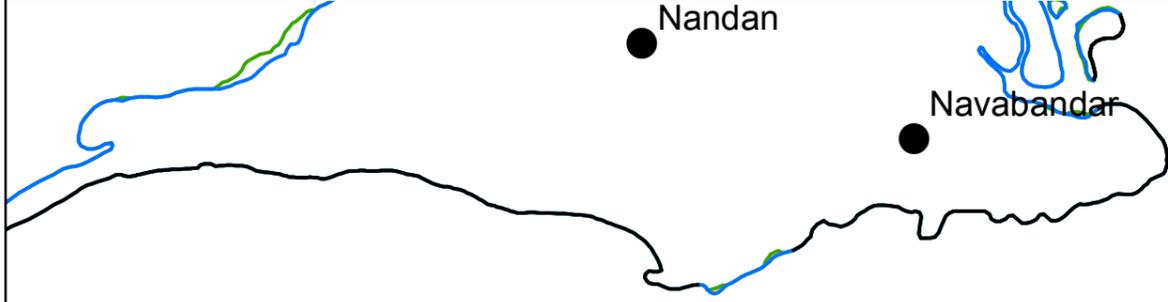
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY  
SHEET NO. 41P02NW

JUNAGADH DISTRICT

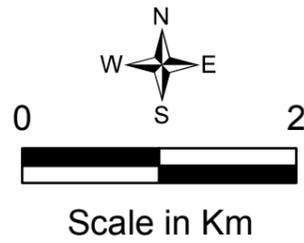
GUJARAT



ARABIAN SEA

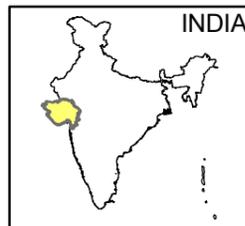
## Legend

- EROSION
- STABLE
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



INDEX TO SHEETS

41L13 SE	41P01 SW	41P01 SE
41L14 NE		SEA
SEA	SEA	SEA



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

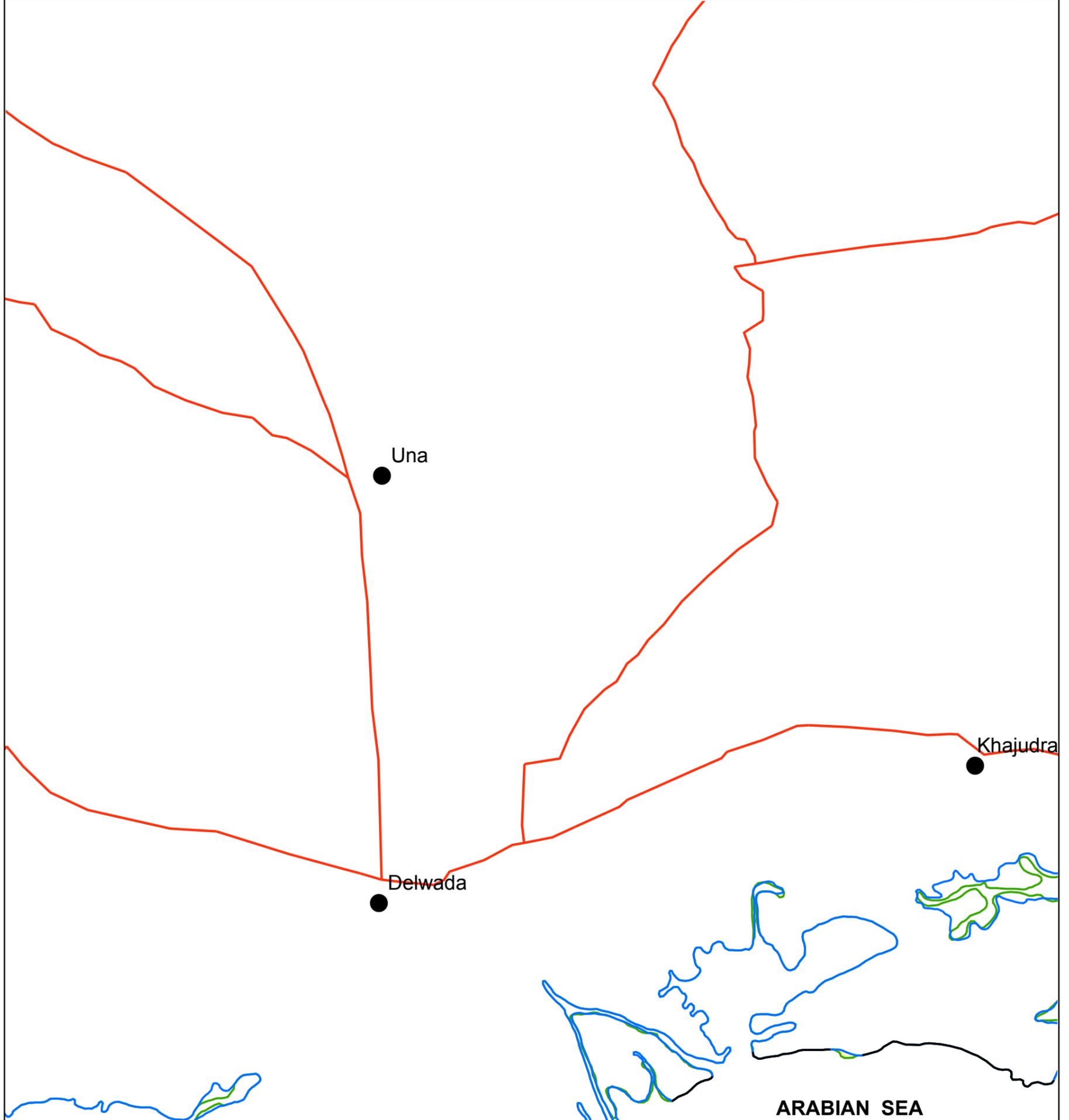
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

JUNAGADH DISTRICT

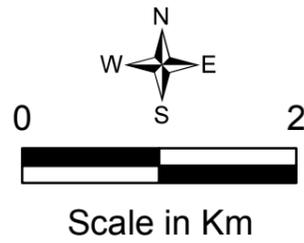
GUJARAT

FOR OFFICIAL USE ONLY  
SHEET NO. 41P01SW



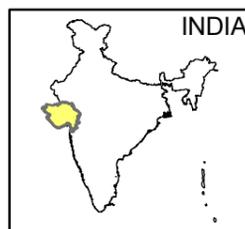
## Legend

- ACCRETION
- ROAD
- STABLE
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

41L13 NE	41P01 NW	41P01 NE
41L13 SE		41P01 SE
41L14 NE	41P02 NW	SEA



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

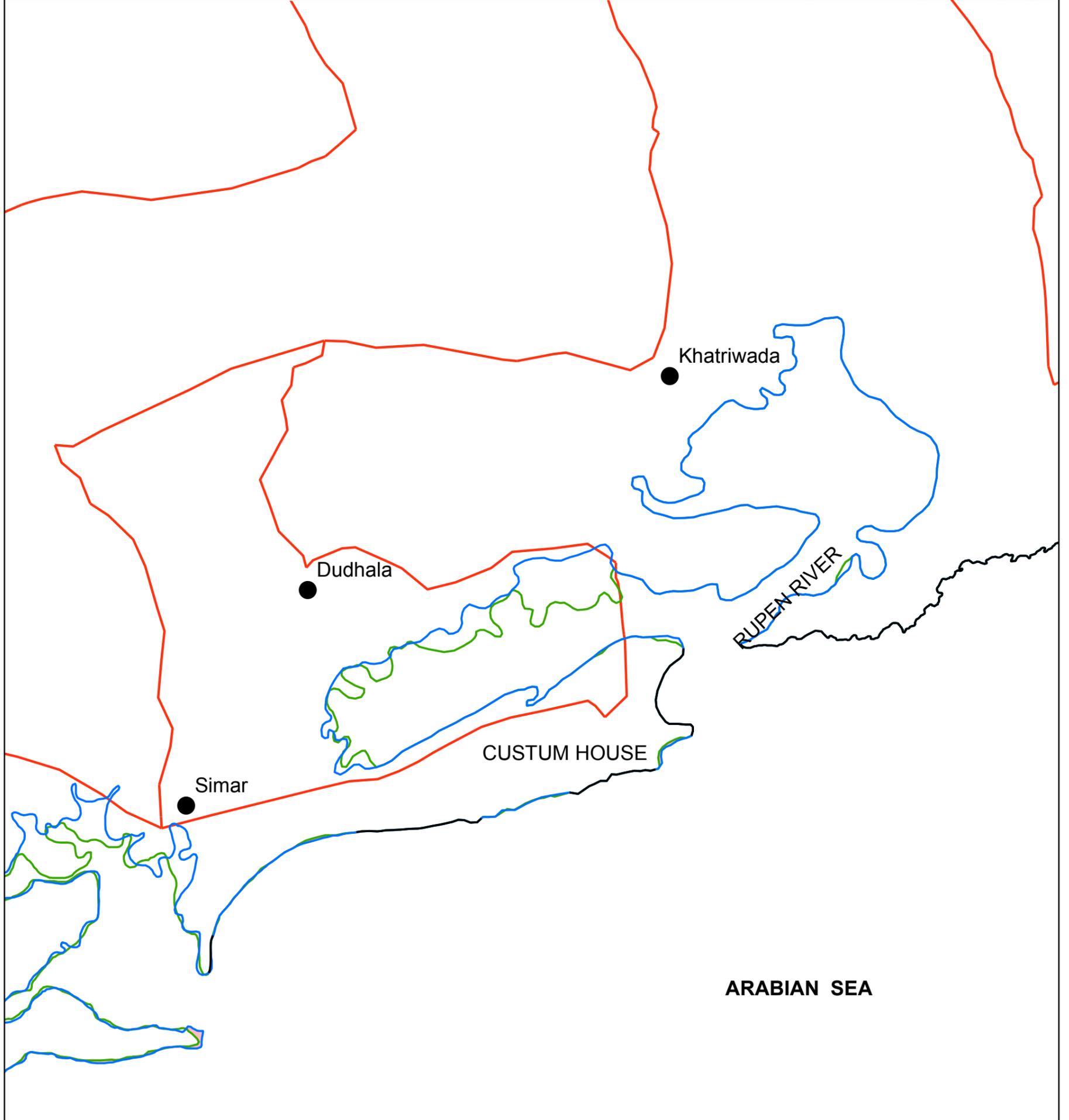
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

JUNAGADH DISTRICT

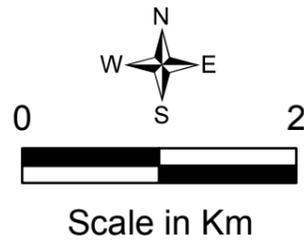
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FOR OFFICIAL USE ONLY  
SHEET NO. 41P01SE



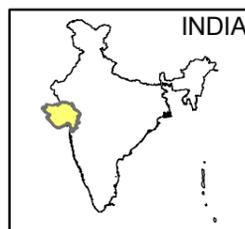
## Legend

- EROSION
- STABLE
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

41P01 NW	41P01 NE	41P05 NW
41P01 SW		41P05 SW
41P02 NW	SEA	SEA



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

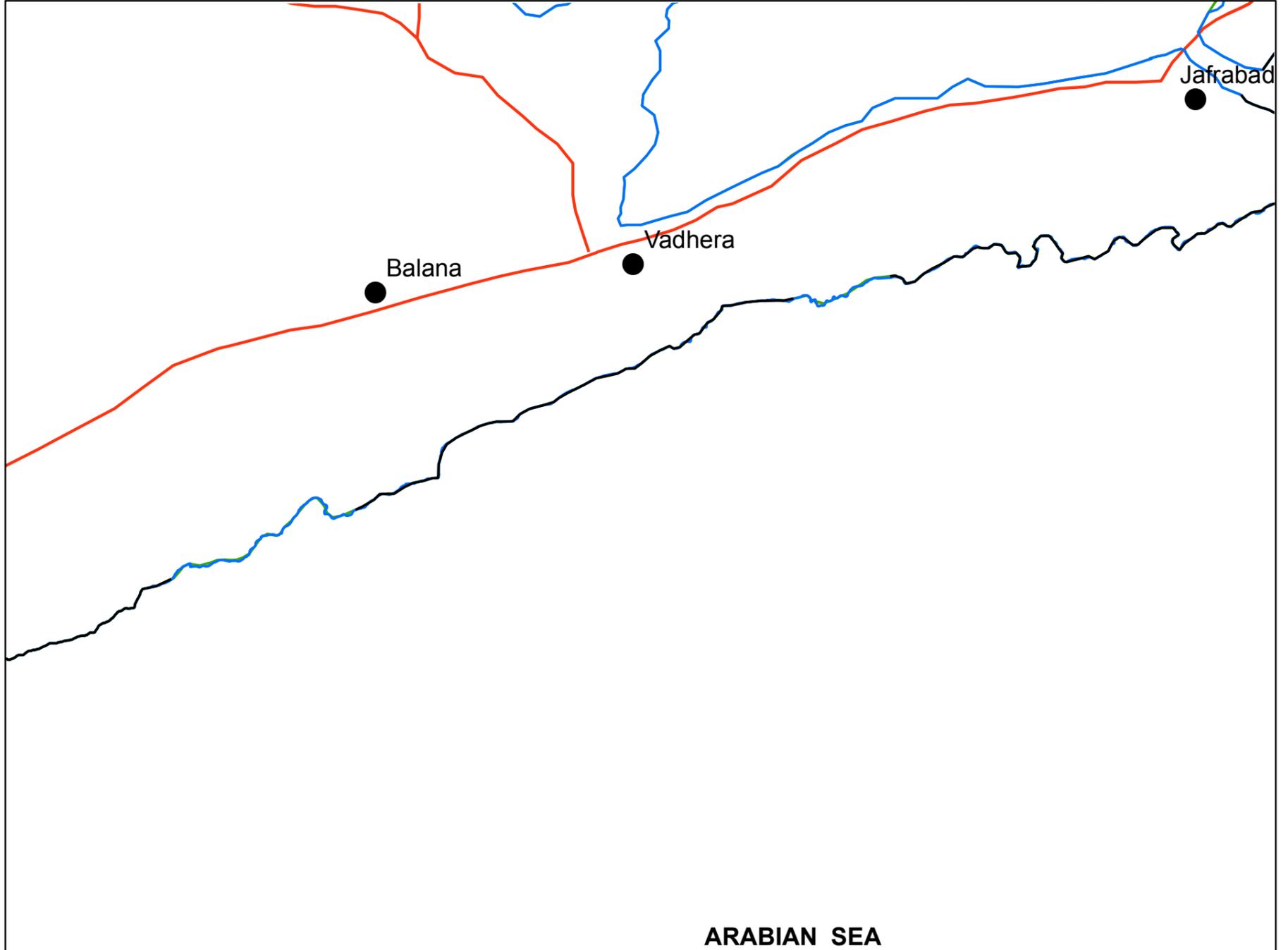
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

AMRELI DISTRICT

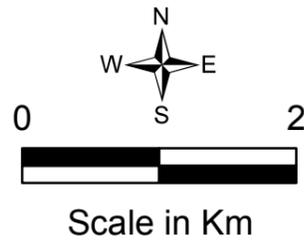
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FOR OFFICIAL USE ONLY  
SHEET NO. 41P05SW



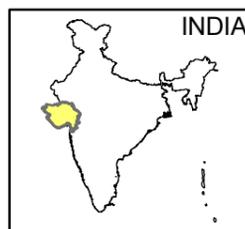
## Legend

- EROSION
- STABLE
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

41P01 NE	41P05 NW	41P05 NE
41P01 SE		41P05 SE
SEA	SEA	SEA



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

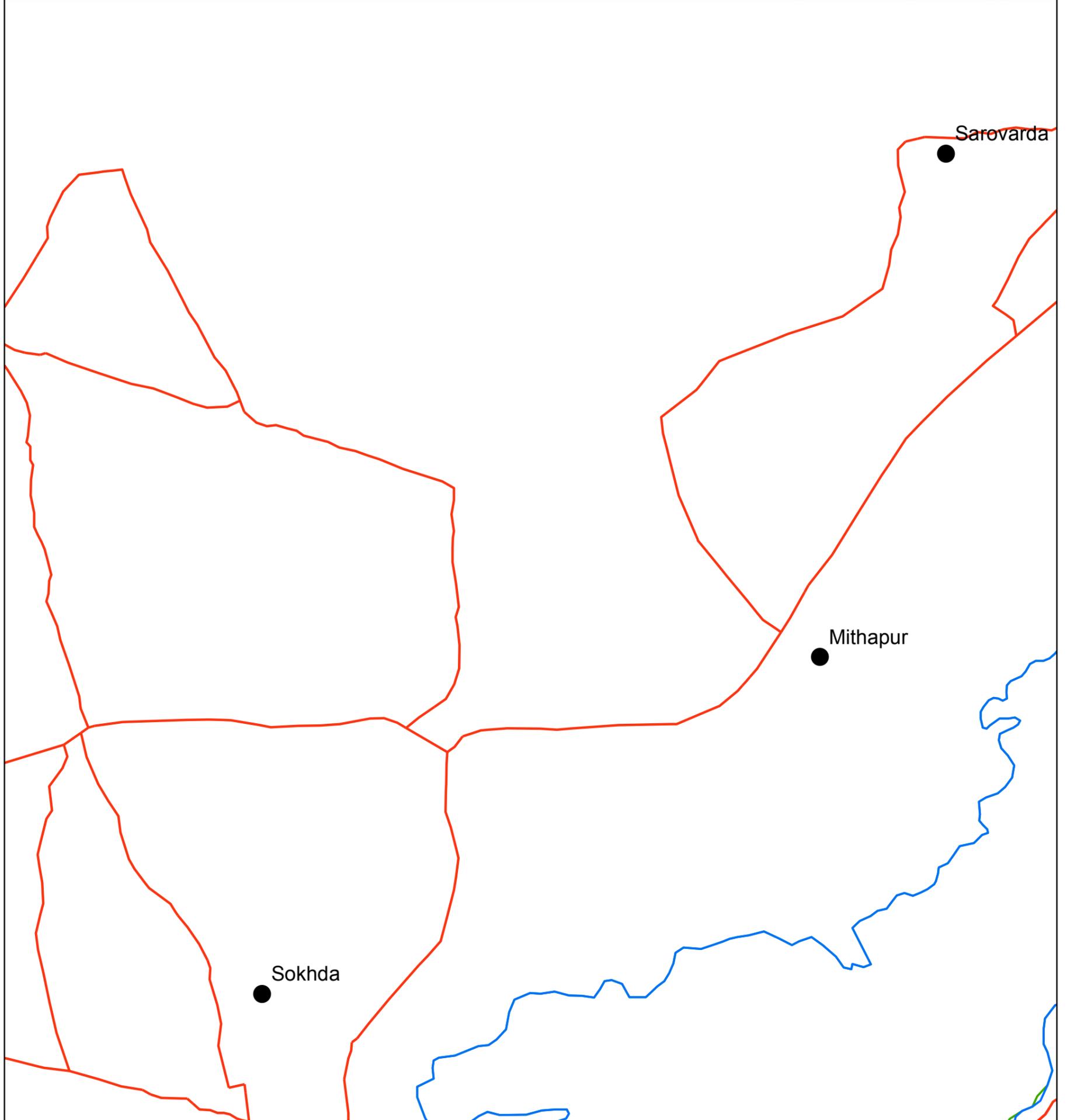
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

AMRELI DISTRICT

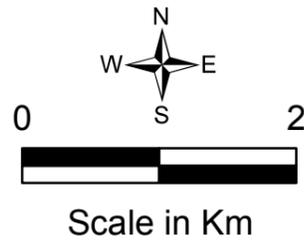
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FOR OFFICIAL USE ONLY  
SHEET NO. 41P05NW



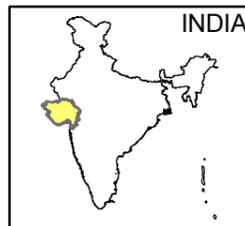
## Legend

- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

41O04 SE	41O08 SW	41O08 SE
41P01 NE		41P05 NE
41P01 SE	41P05 SW	41P05 SE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

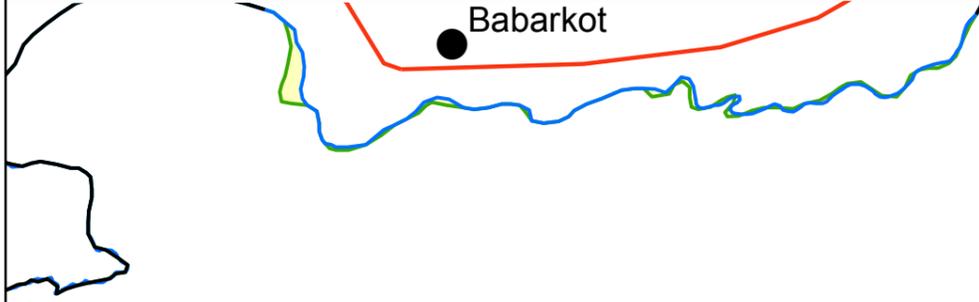
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

AMRELI DISTRICT

GUJARAT

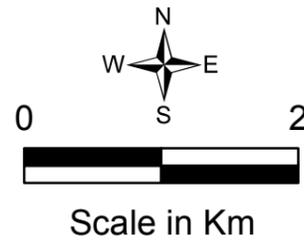
FOR OFFICIAL USE ONLY  
SHEET NO. 41P05SE



ARABIAN SEA

## Legend

- ACCRETION
- STABLE
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

41P05 NW	41P05 NE	41P09 NW
41P05 SW		SEA
SEA	SEA	SEA



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

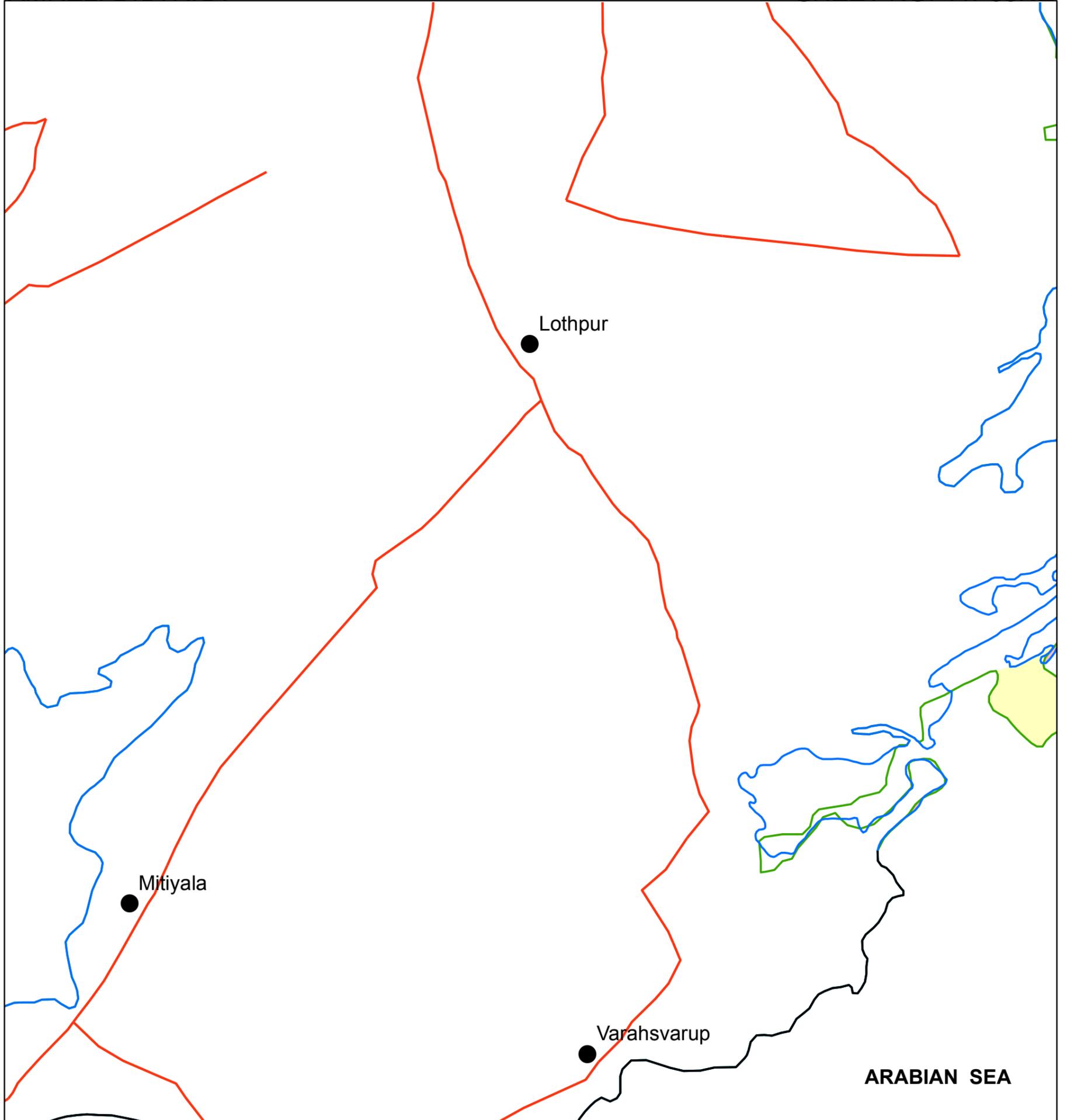
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

AMRELI DISTRICT

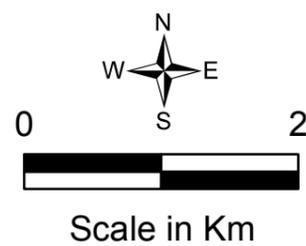
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FOR OFFICIAL USE ONLY  
SHEET NO. 41P05NE



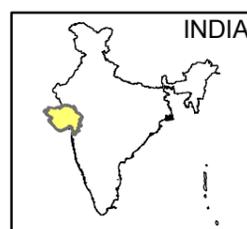
## Legend

- ACCRETION
- EROSION
- STABLE
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

41008 SW	41008 SE	41012 SW
41P05 NW		41P09 NW
41P05 SW	41P05 SE	SEA



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

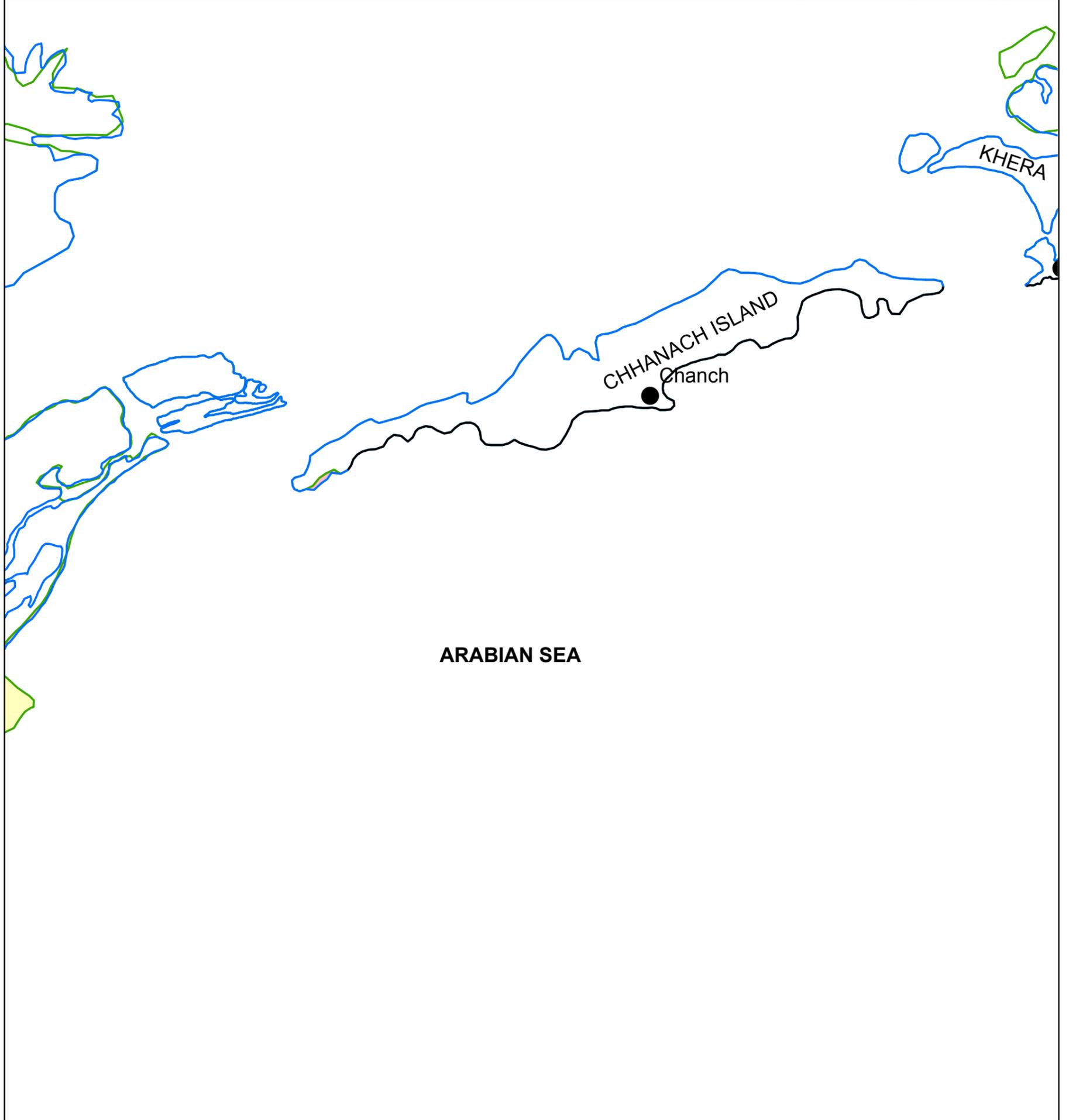
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

AMRELI DISTRICT

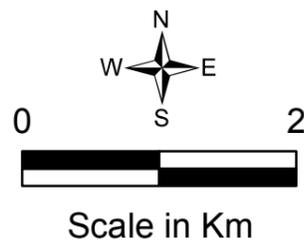
GUJARAT

FOR OFFICIAL USE ONLY  
SHEET NO. 41P09NW



## Legend

- ACCRETION
- EROSION
- STABLE
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

41008 SE	41012 SW	41012 SE
41P05 NE		41P09 NE
41P05 SE	SEA	SEA



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

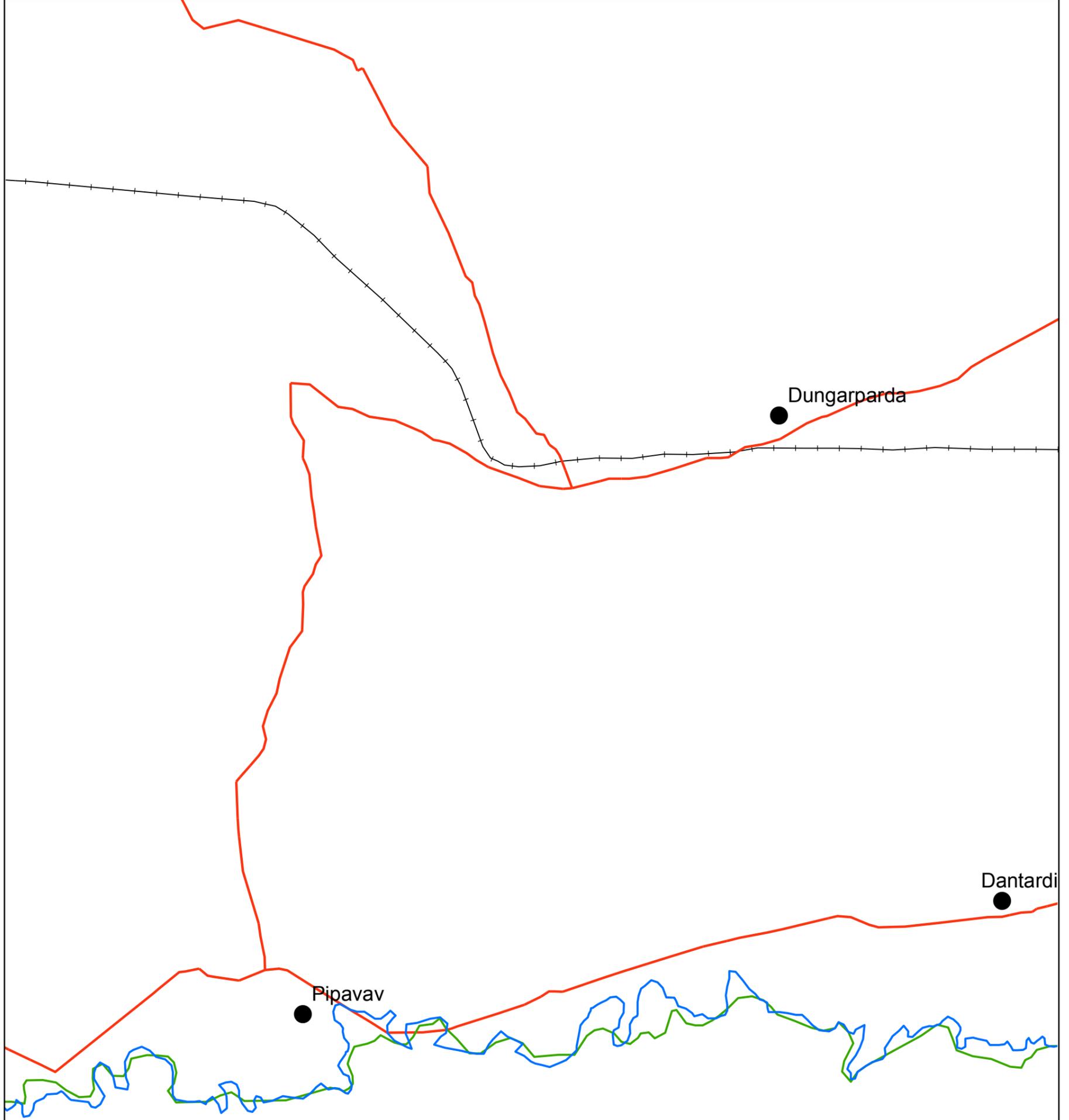
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

AMRELI DISTRICT

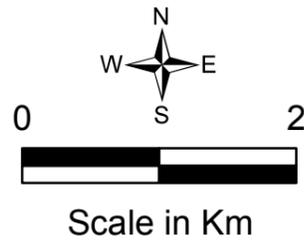
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FOR OFFICIAL USE ONLY  
SHEET NO. 41O12SW



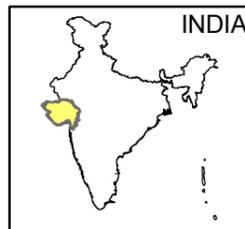
## Legend

- ROAD
- - - RAIL
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

41O08 NE	41O12 NW	41O12 NE
41O08 SE		41O12 SE
41P05 NE	41P09 NW	41P09 NE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY  
SHEET NO. 41P09NE

AMRELI DISTRICT

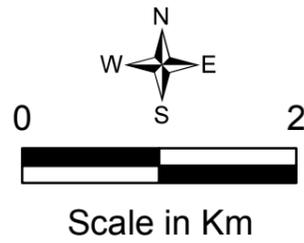
GUJARAT



ARABIAN SEA

## Legend

- EROSION
- STABLE
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91



INDEX TO SHEETS

41O12 SW	41O12 SE	41O16 SW
41P09 NW		SEA
SEA	SEA	SEA



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

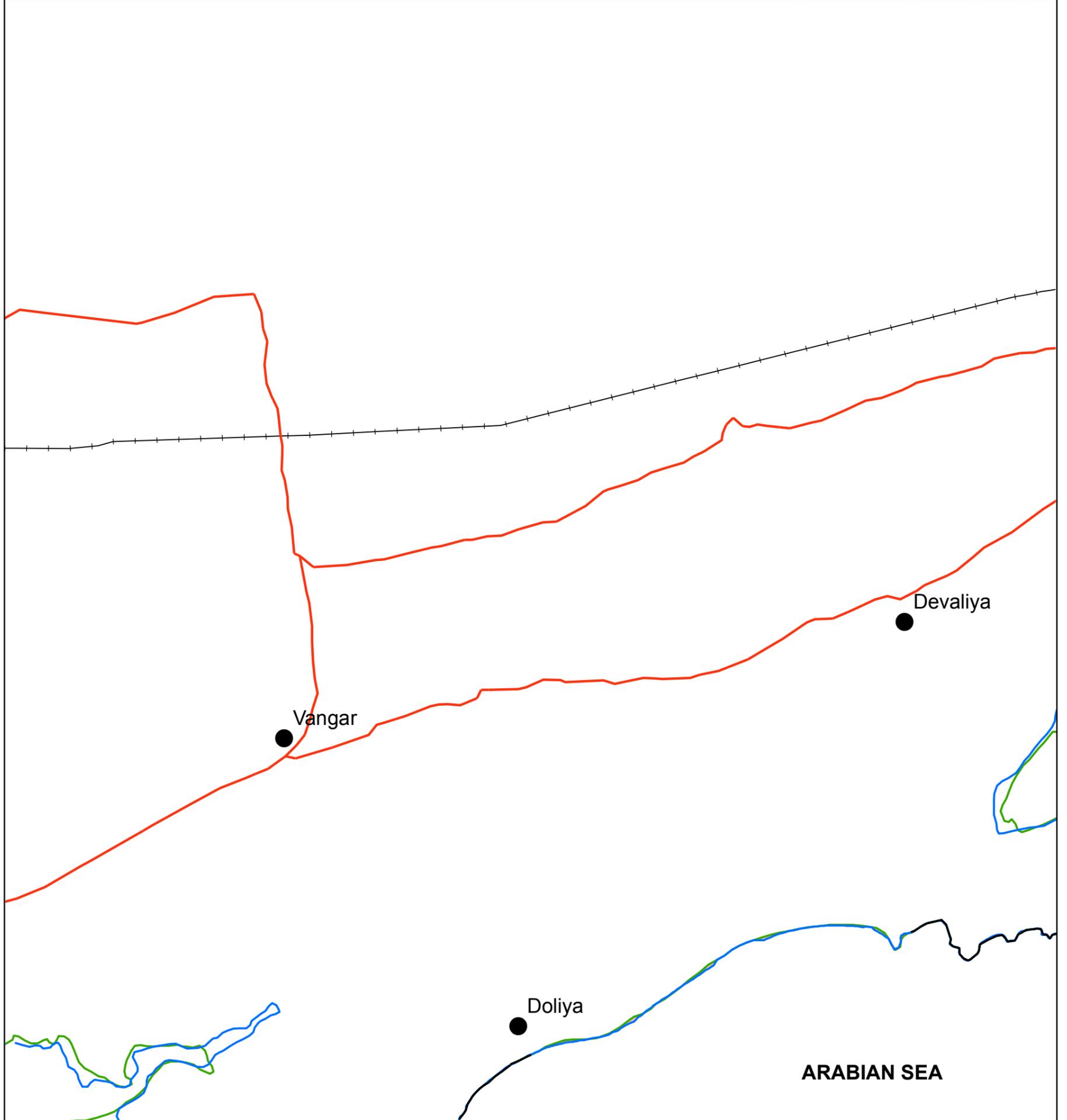
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

BHAVNAGAR DISTRICT

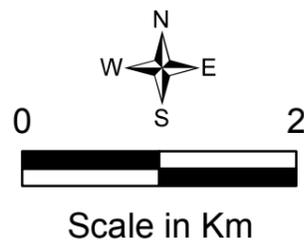
GUJARAT

FOR OFFICIAL USE ONLY  
SHEET NO. 41O12SE



## Legend

- EROSION
- STABLE
- ROAD
- RAIL
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

41O12 NW	41O12 NE	41O16 NW
41O12 SW		41O16 SW
41P09 NW	41P09 NE	SEA



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

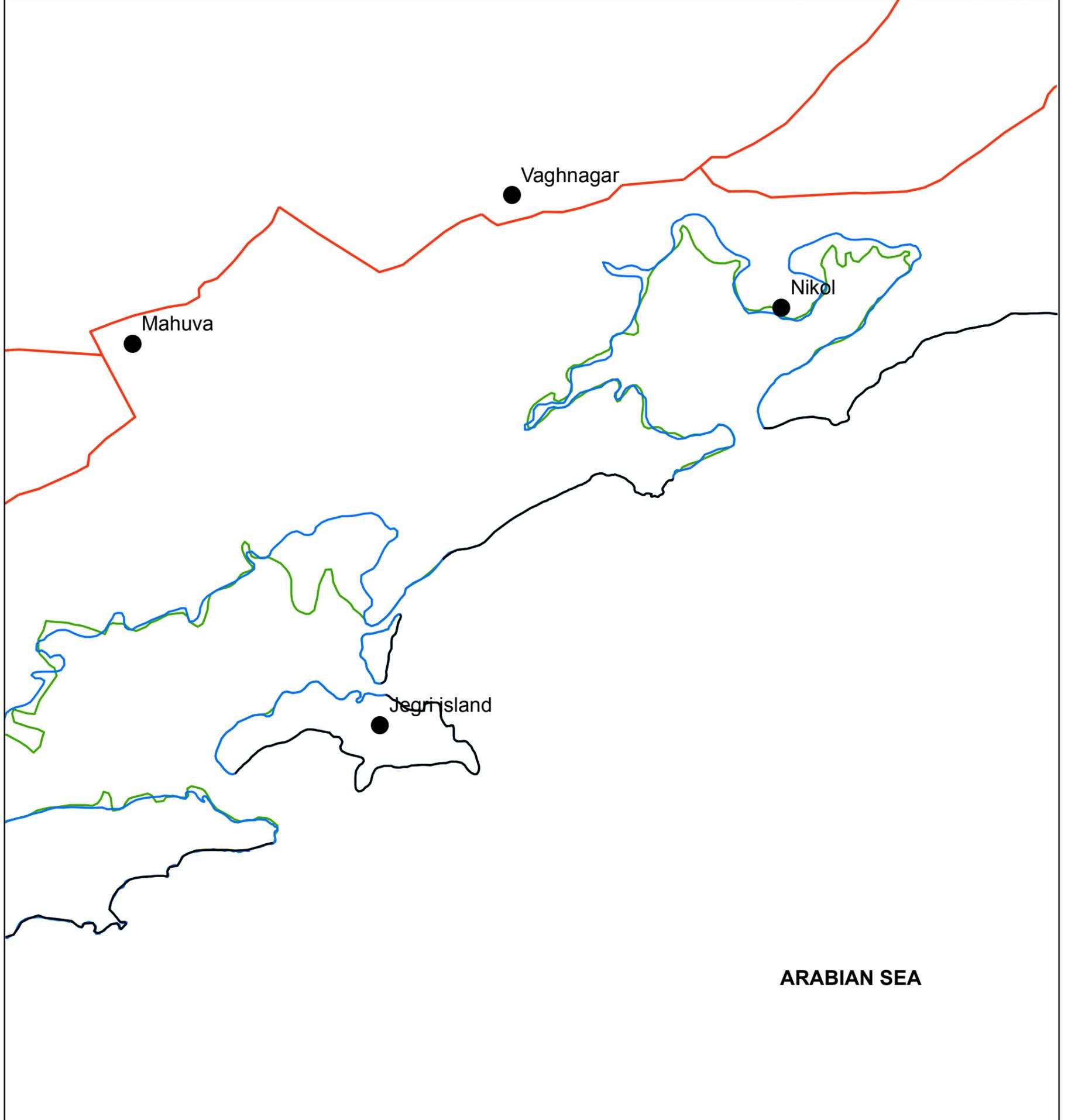
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

BHAVNAGAR DISTRICT

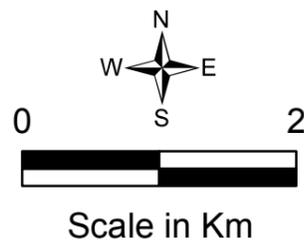
GUJARAT

FOR OFFICIAL USE ONLY  
SHEET NO. 41O16SW



## Legend

- EROSION
- ACCRETION
- STABLE
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

41O12 NE	41O16 NW	41O16 NE
41O12 SE		41O16 SE
41P09 NE	SEA	SEA



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

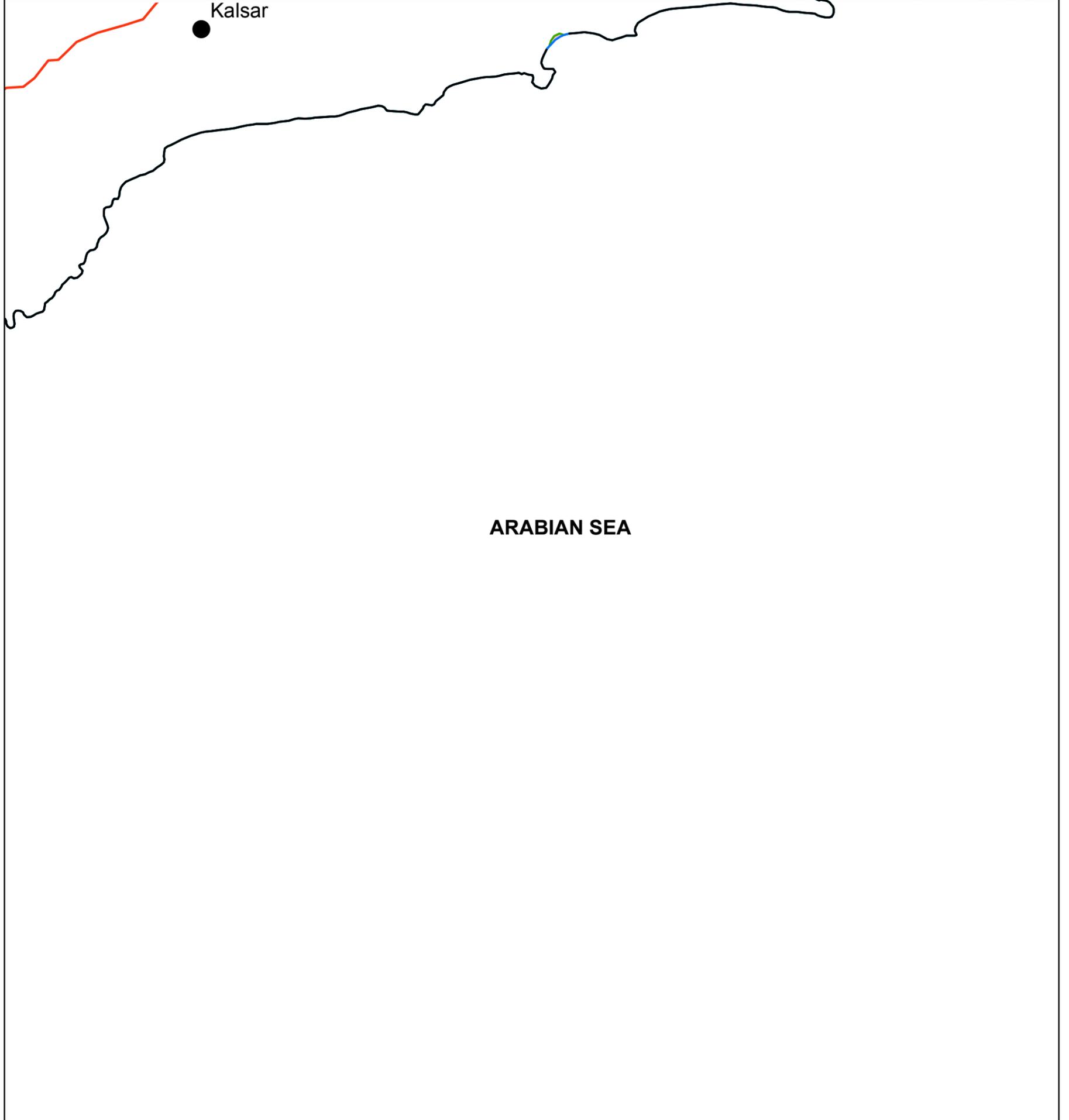
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

BHAVNAGAR DISTRICT

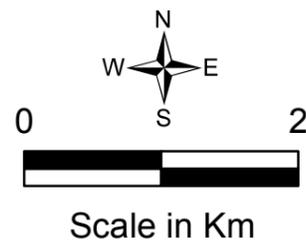
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FOR OFFICIAL USE ONLY  
SHEET NO. 41016SE



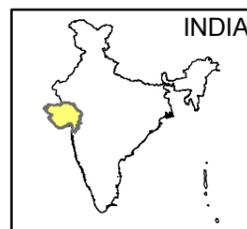
## Legend

- EROSION
- STABLE
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

41016 NW	41016 NE	46C04 NW
41016 SW		SEA
SEA	SEA	SEA



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

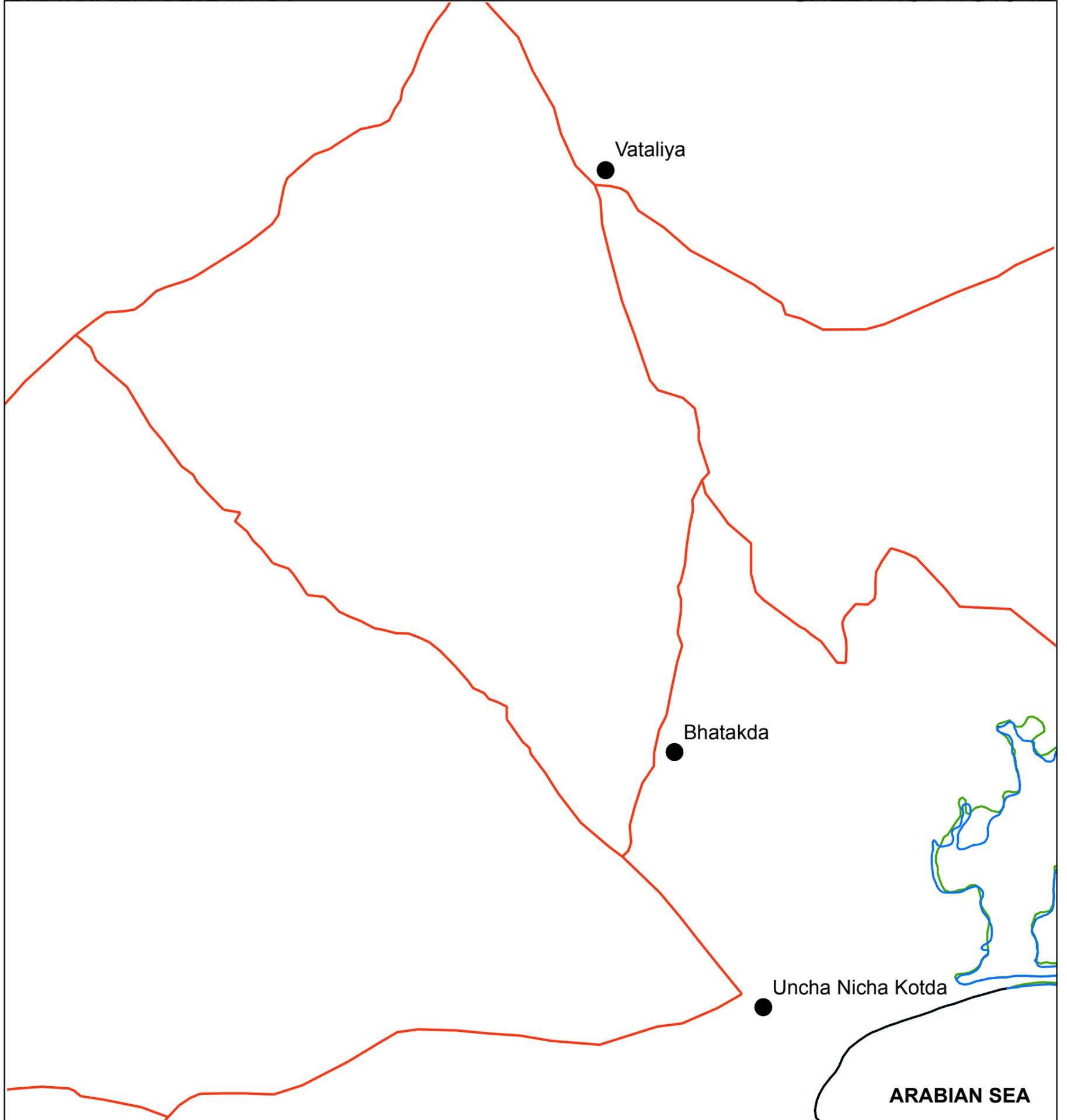
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

BHAVNAGAR DISTRICT

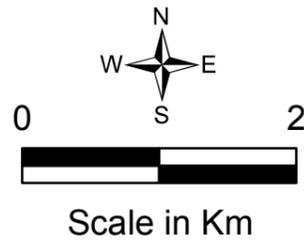
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FOR OFFICIAL USE ONLY  
SHEET NO. 41016NE



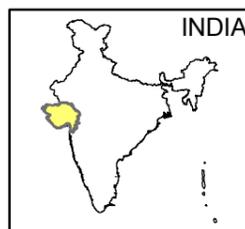
## Legend

- EROSION
- STABLE
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

41015 SW	41015 SE	46C03 SW
41016 NW		46C04 NW
41016 SW	41016 SE	SEA



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

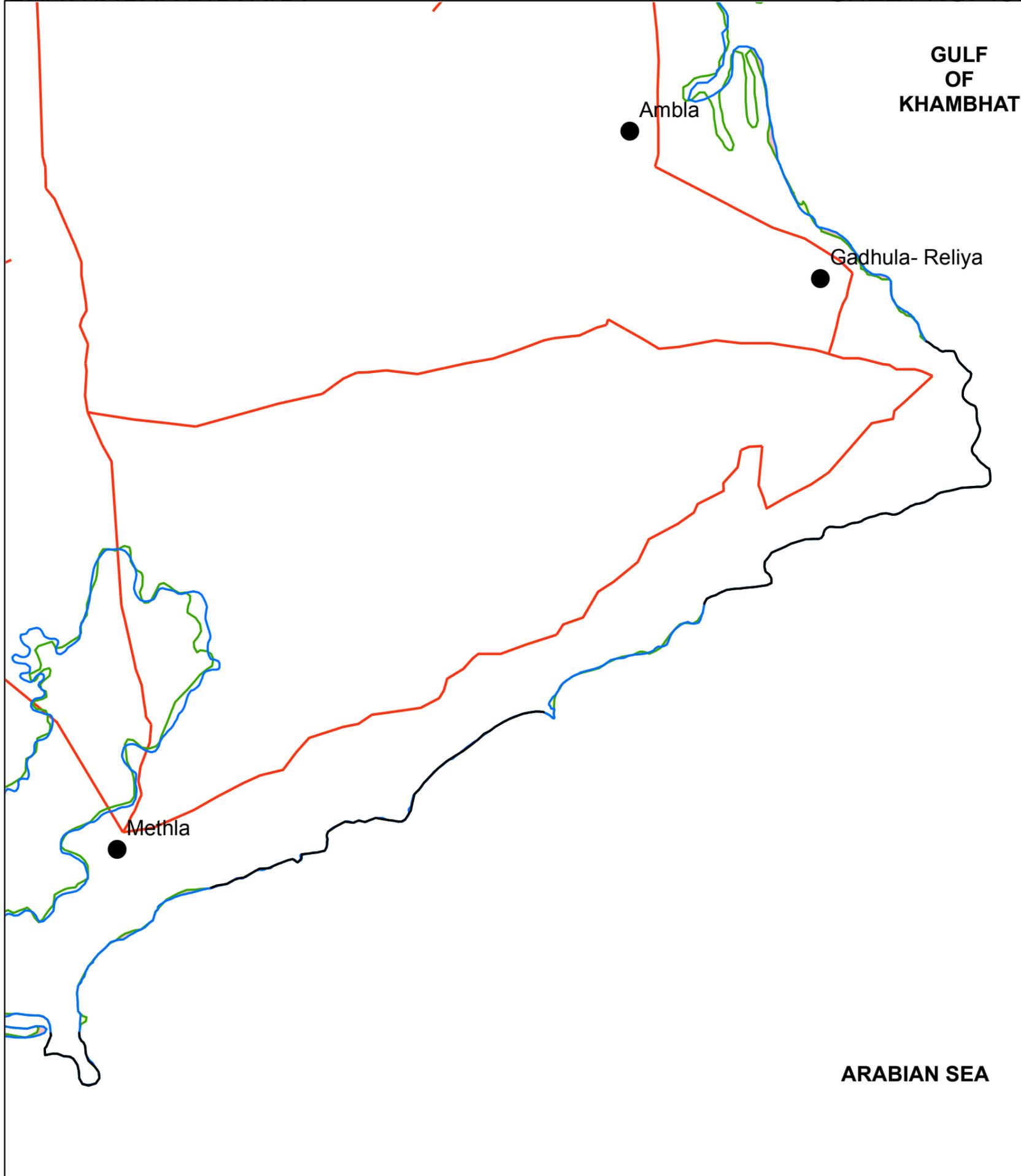
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

BHAVNAGAR DISTRICT

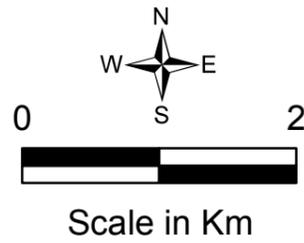
GUJARAT

FOR OFFICIAL USE ONLY  
SHEET NO. 46C04NW



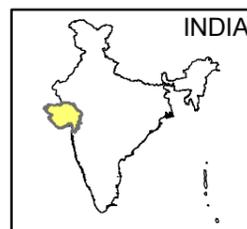
## Legend

- EROSION
- ACCRETION
- STABLE
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

41015 SE	46C03 SW	46C03 SE
41016 NE		SEA
41016 SE	46C04 SW	SEA



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

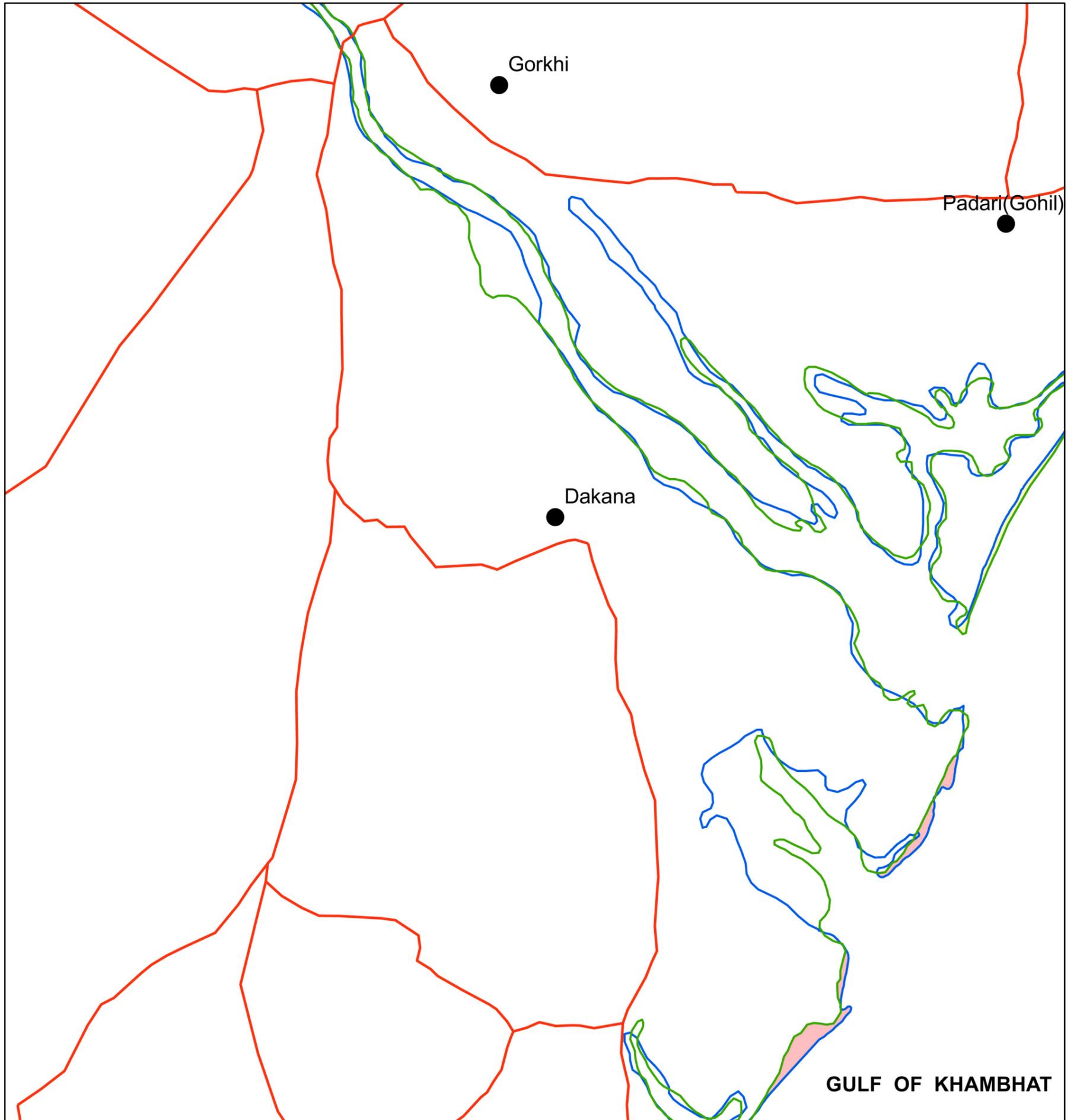
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

## GUJARAT

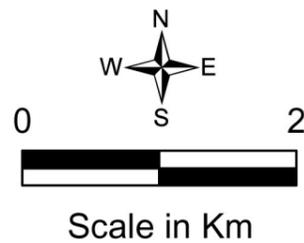
FOR OFFICIAL USE ONLY  
SHEET NO. 46C03SW

BHAVNAGAR DISTRICT



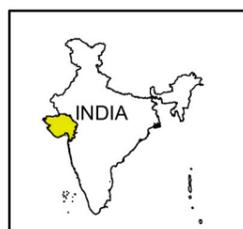
### Legend

- EROSION
- ACCRETION
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



#### INDEX TO SHEETS

41015 NE	46C03 NW	SEA
41015 SE		SEA
SEA	SEA	SEA



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

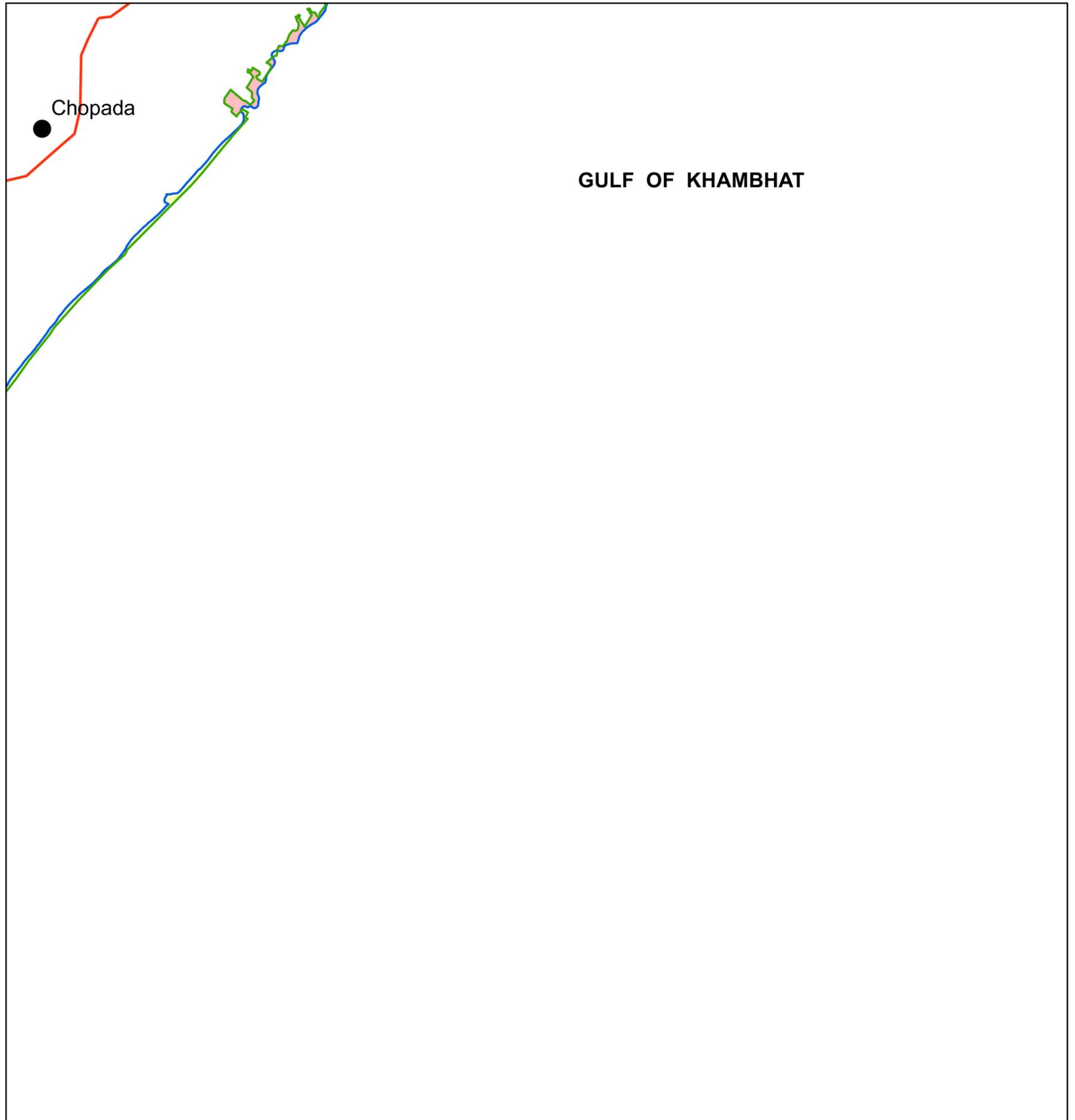
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

## GUJARAT

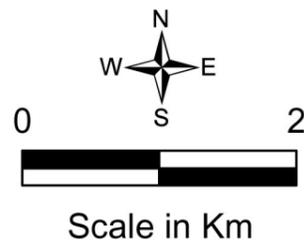
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SHEET NO. 46C03SE

BHAVNAGAR DISTRICT



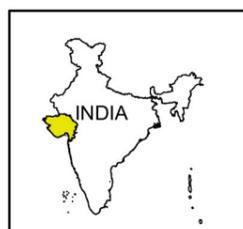
### Legend

- EROSION
- ACCRETION
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



#### INDEX TO SHEETS

46C03 NW	46C03 NE	46C07 NW
46C03 SW		SEA
46C04 NW	SEA	SEA



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

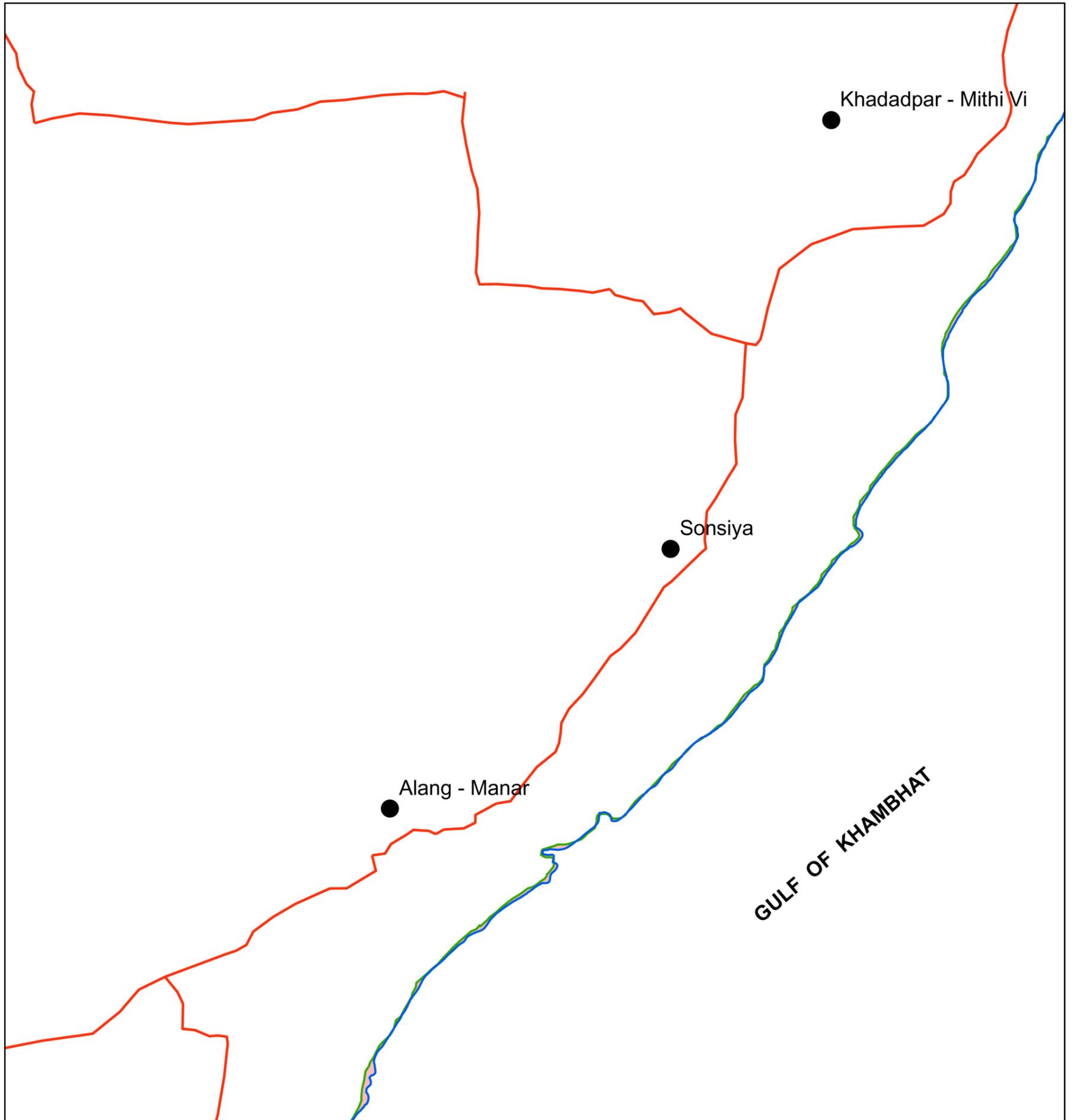
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

## GUJARAT

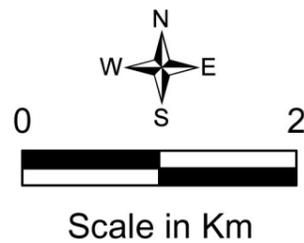
FOR OFFICIAL USE ONLY  
SHEET NO. 46C03NE

BHAVNAGAR DISTRICT



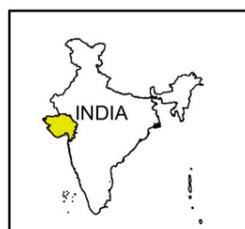
### Legend

- EROSION
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



#### INDEX TO SHEETS

46C02 SW	46C02 SE	46C06 SW
46C03 NW		46C07 NW
46C03 SW	46C03 SE	SEA



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

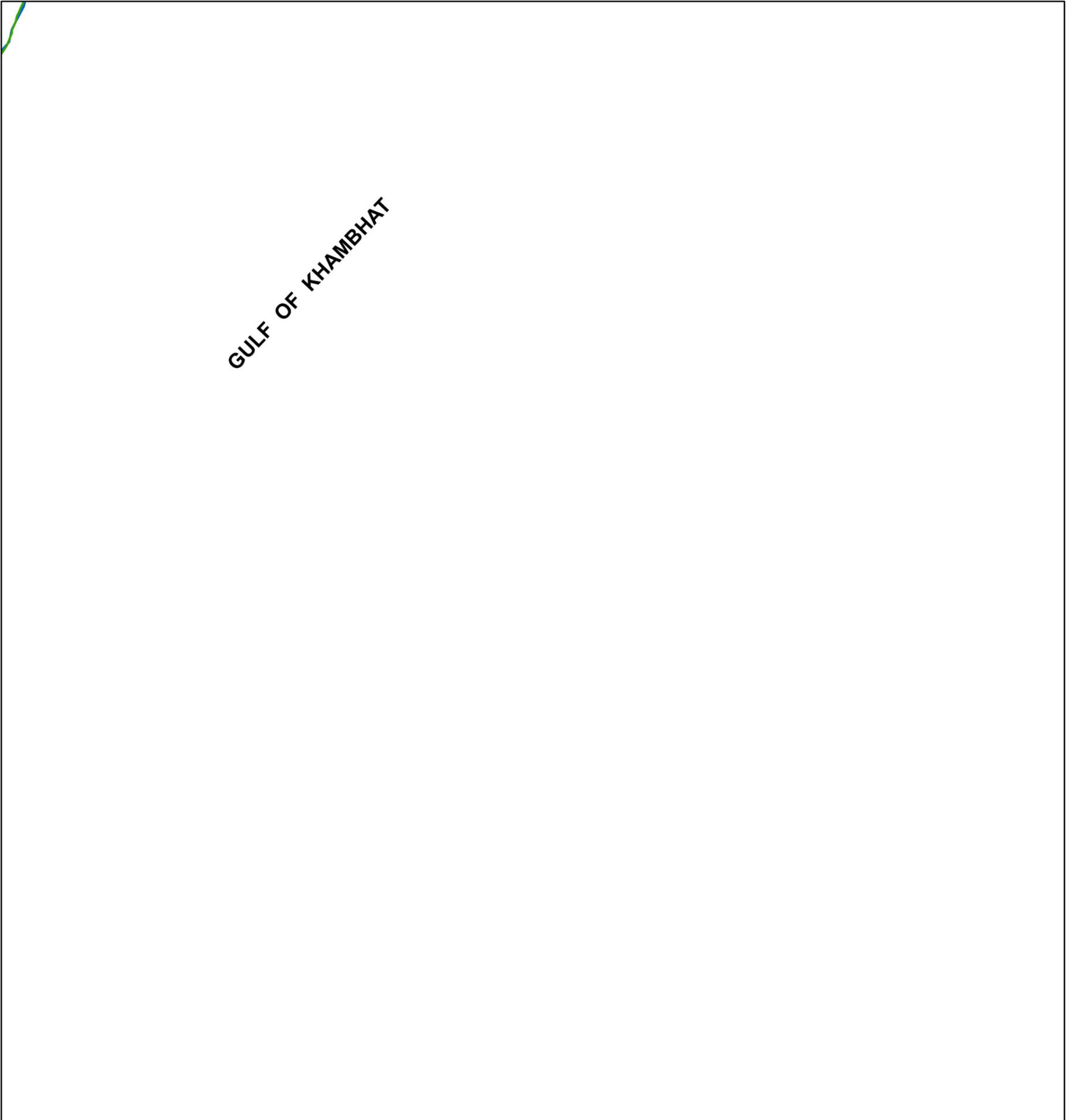
# SHORELINE CHANGE MAP

## GUJARAT

FOR OFFICIAL USE ONLY  
SHEET NO. 46C07NW

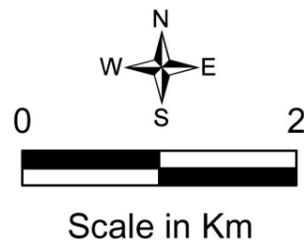
BHAVNAGAR DISTRICT

GULF OF KHAMBHAT



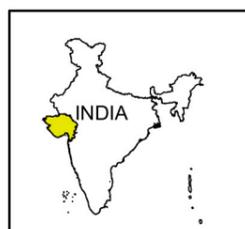
### Legend

-  EROSION
-  HIGH-TIDE LINE 2004-06
-  HIGH-TIDE LINE 1989-91



#### INDEX TO SHEETS

46C02 SE	46C06 SW	SEA
46C03 NE		SEA
46C03 SE	SEA	SEA



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

## GUJARAT

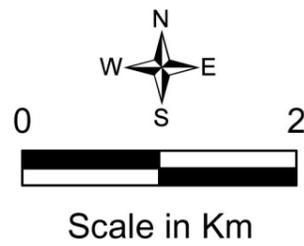
FOR OFFICIAL USE ONLY  
SHEET NO. 46C06SW

BHAVNAGAR DISTRICT



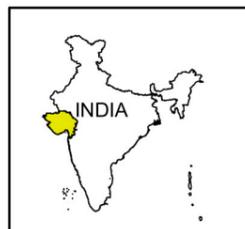
### Legend

- EROSION
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



#### INDEX TO SHEETS

46C02 NE	46C06 NW	SEA
46C02 SE		SEA
46C03 NE	46C07 NW	SEA



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

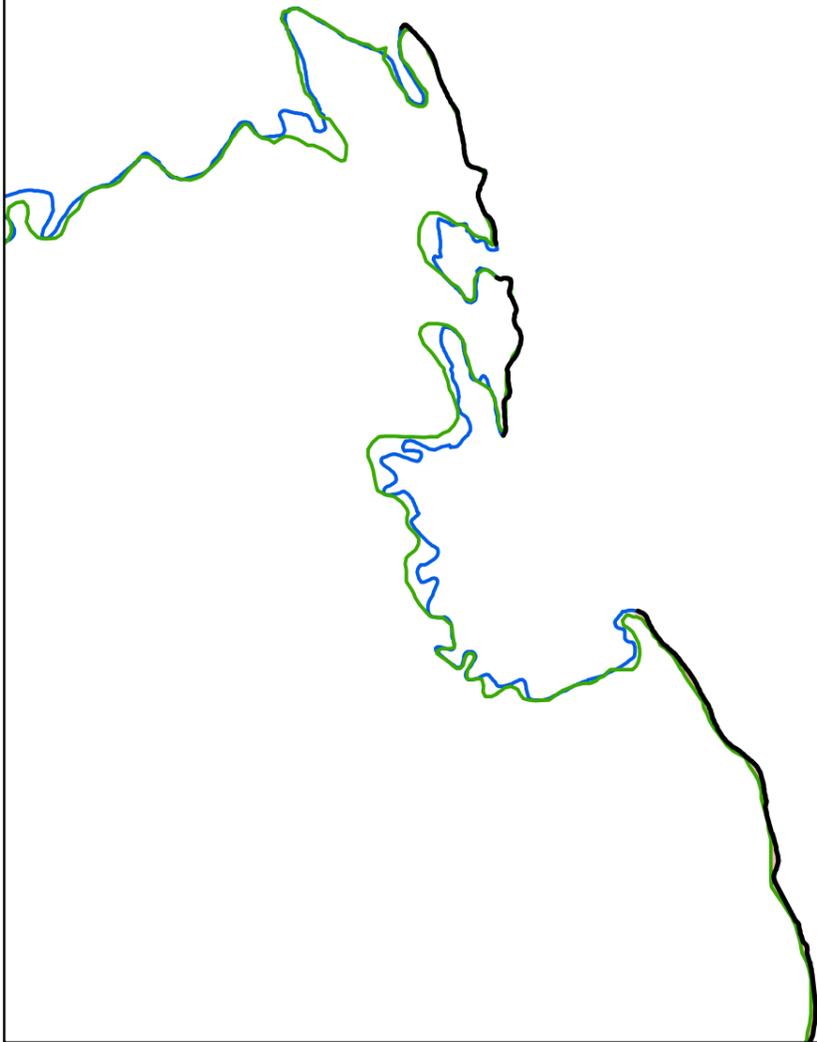
## GUJARAT

FOR OFFICIAL USE ONLY

BHAVNAGAR DISTRICT

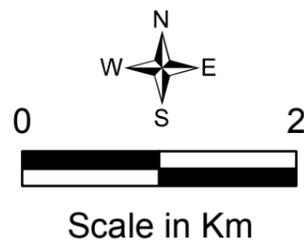
SHEET NO. 46C06NW

GULF OF KHAMBHAT



### Legend

-  STABLE
-  HIGH-TIDE LINE 2004-06
-  HIGH-TIDE LINE 1989-91



### INDEX TO SHEETS

46C01 SE	46C05 SW	SEA
46C02 NE		SEA
46C02 SE	46C06 SW	SEA



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

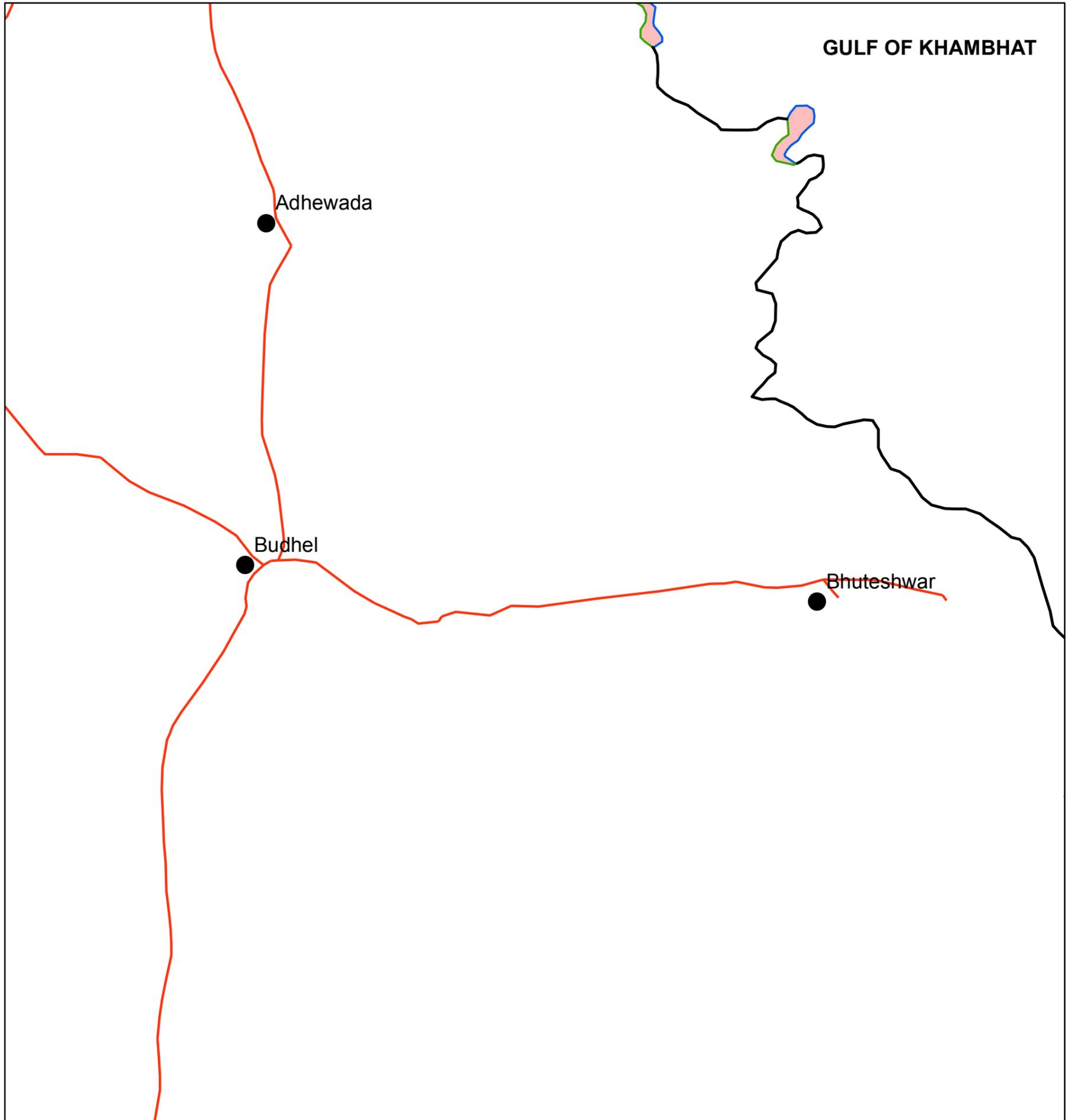
## GUJARAT

FOR OFFICIAL USE ONLY

BHAVNAGAR DISTRICT

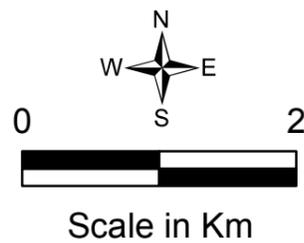
SHEET NO. 46C02NE

GULF OF KHAMBHAT



### Legend

- EROSION
- STABLE
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



#### INDEX TO SHEETS

46C01 SW	46C01 SE	46C05 SW
46C02 NW		46C06 NW
46C02 SW	46C02 SE	46C06 SW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

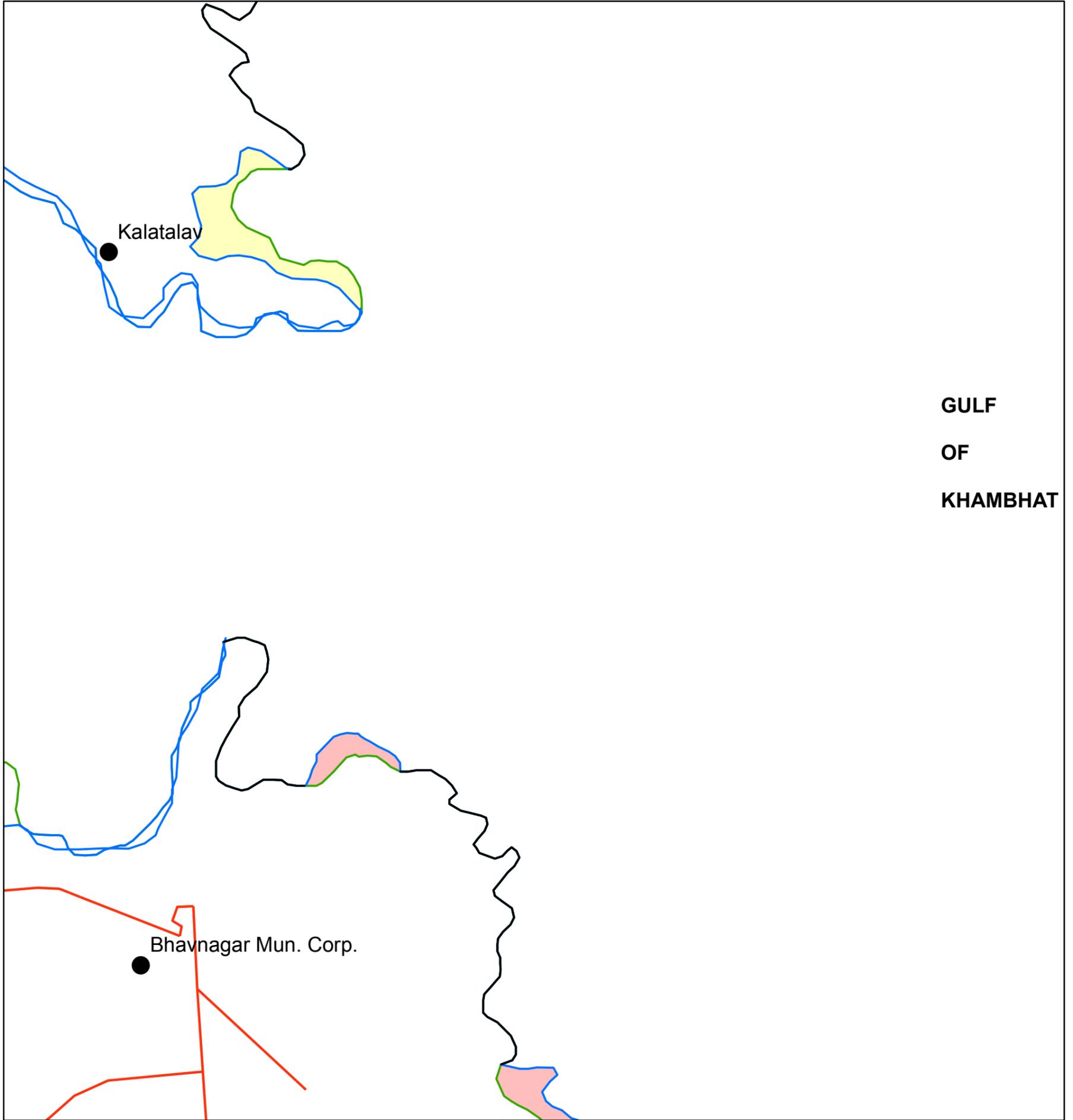
# SHORELINE CHANGE MAP

## GUJARAT

FOR OFFICIAL USE ONLY

SHEET NO. 46C01SE

BHAVNAGAR DISTRICT

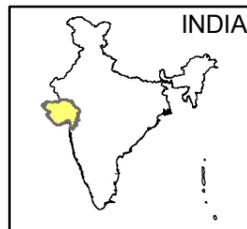
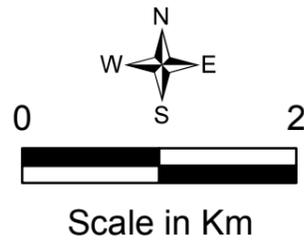


GULF  
OF  
KHAMBHAT

### Legend

-  EROSION
-  ACCRETION
-  STABLE
-  ROAD
-  HIGH-TIDE LINE 2004-06
-  HIGH-TIDE LINE 1989-91
-  HABITATION

INDEX TO SHEETS



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

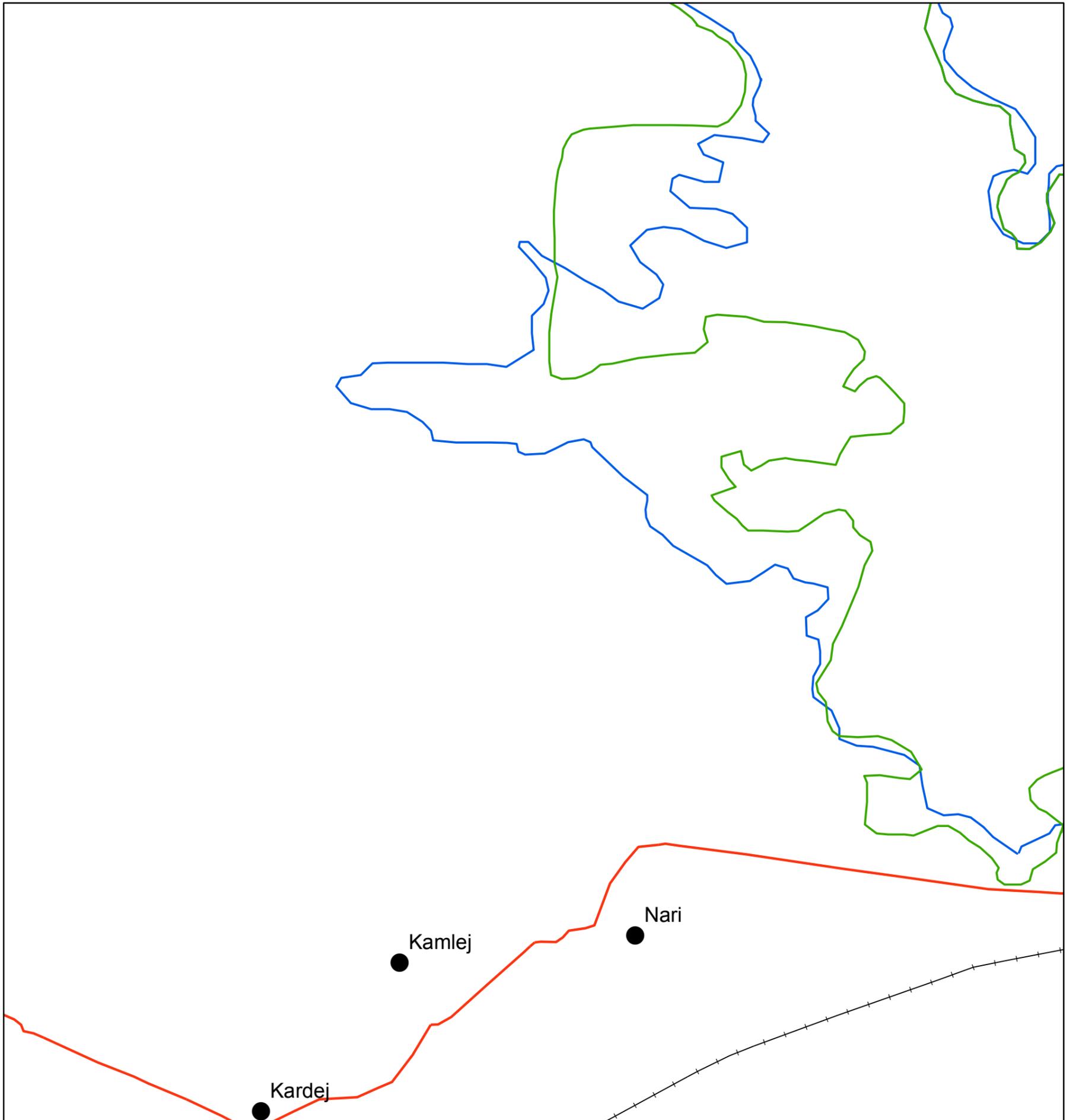
# SHORELINE CHANGE MAP

## GUJARAT

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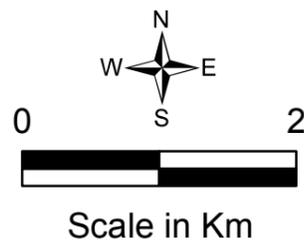
BHAVNAGAR DISTRICT

SHEET NO. 46C01SW



### Legend

- ROAD
- - - - RAIL
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

41O13 NE	46C01 NW	46C01 NE
41O13 SE		46C01 SE
41O14 NE	46C02 NW	46C02 NE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

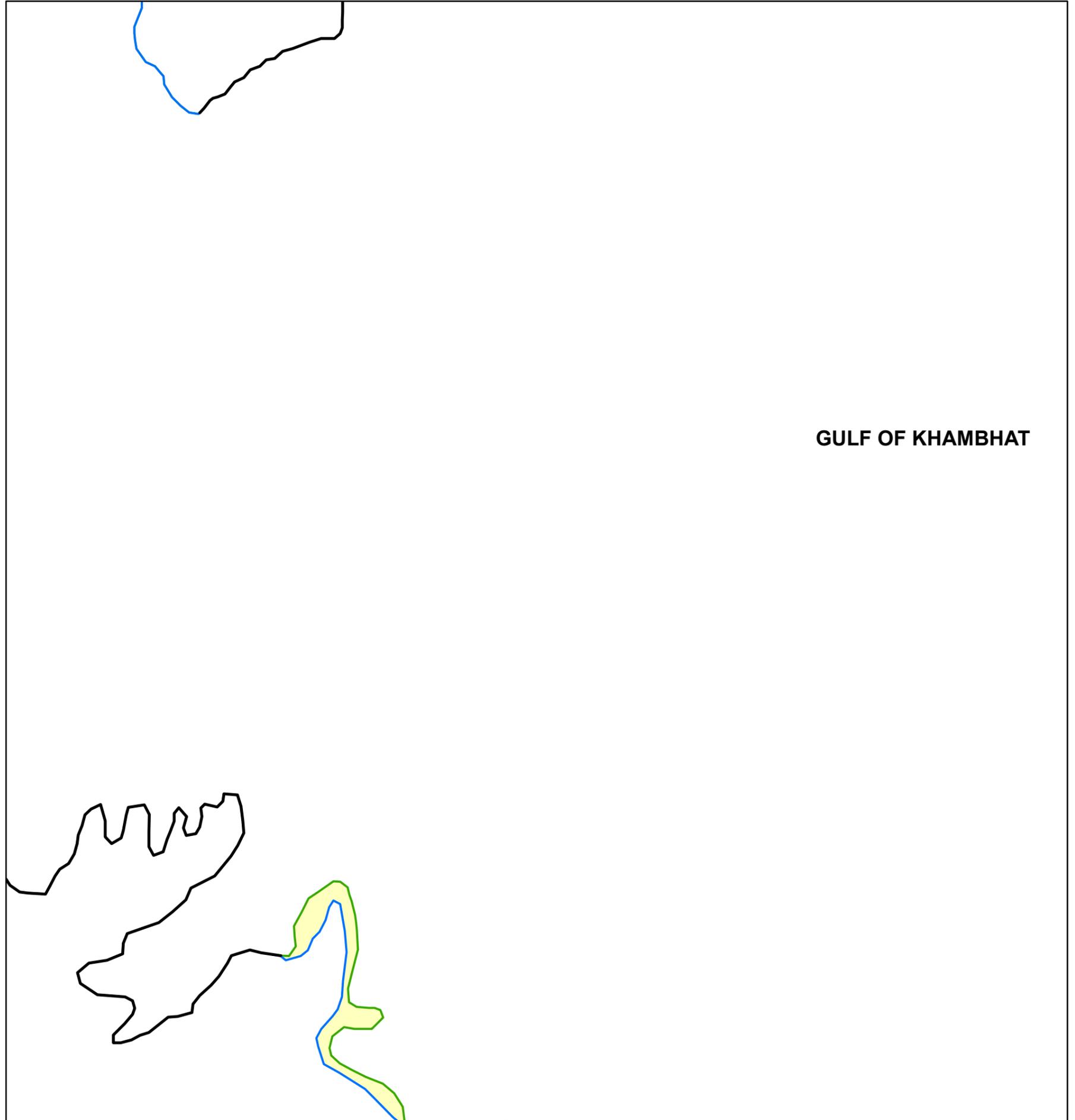
# SHORELINE CHANGE MAP

## GUJARAT

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SHEET NO. 46C01NE

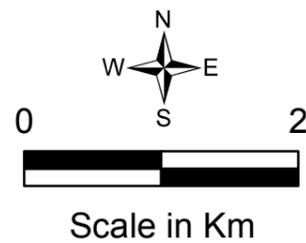
BHAVNAGAR DISTRICT



GULF OF KHAMBHAT

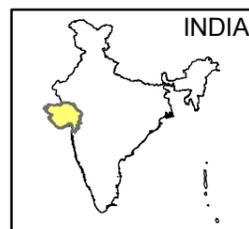
### Legend

-  ACCRETION
-  STABLE
-  HIGH-TIDE LINE 2004-06
-  HIGH-TIDE LINE 1989-91



INDEX TO SHEETS

46B04 SW	46B04 SE	46B08 SW
46C01 NW		46C05 NW
46C01 SW	46C01 SE	46C05 SW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

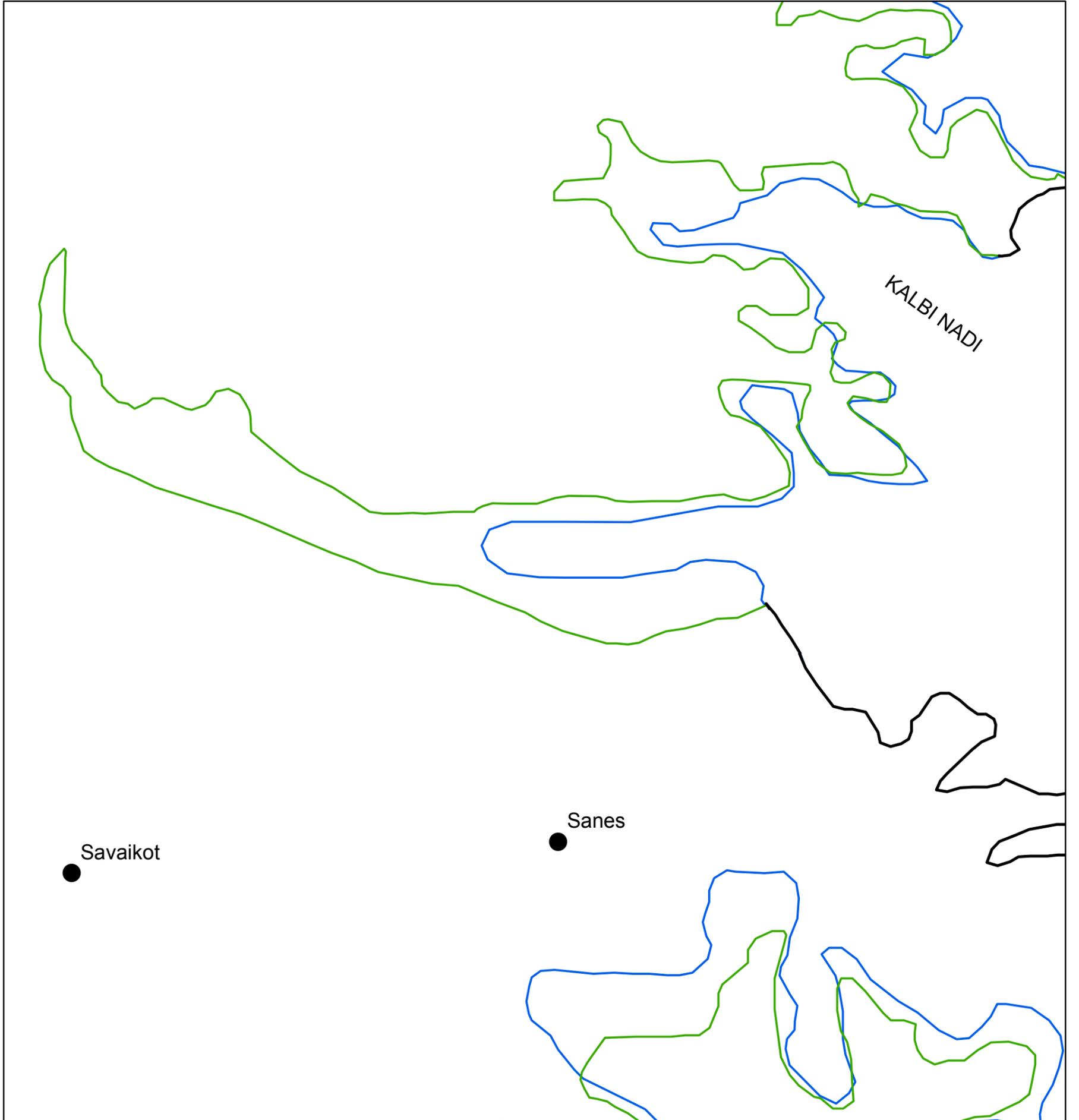
# SHORELINE CHANGE MAP

## GUJARAT

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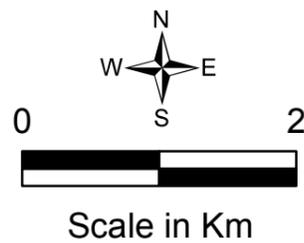
BHAVNAGAR DISTRICT

SHEET NO. 46C01NW



### Legend

-  STABLE
-  HIGH-TIDE LINE 2004-06
-  HIGH-TIDE LINE 1989-91
-  HABITATION



#### INDEX TO SHEETS

41N16 SE	46B04 SW	46B04 SE
41O13 NE		46C01 NE
41O13 SE	46C01 SW	46C01 SE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

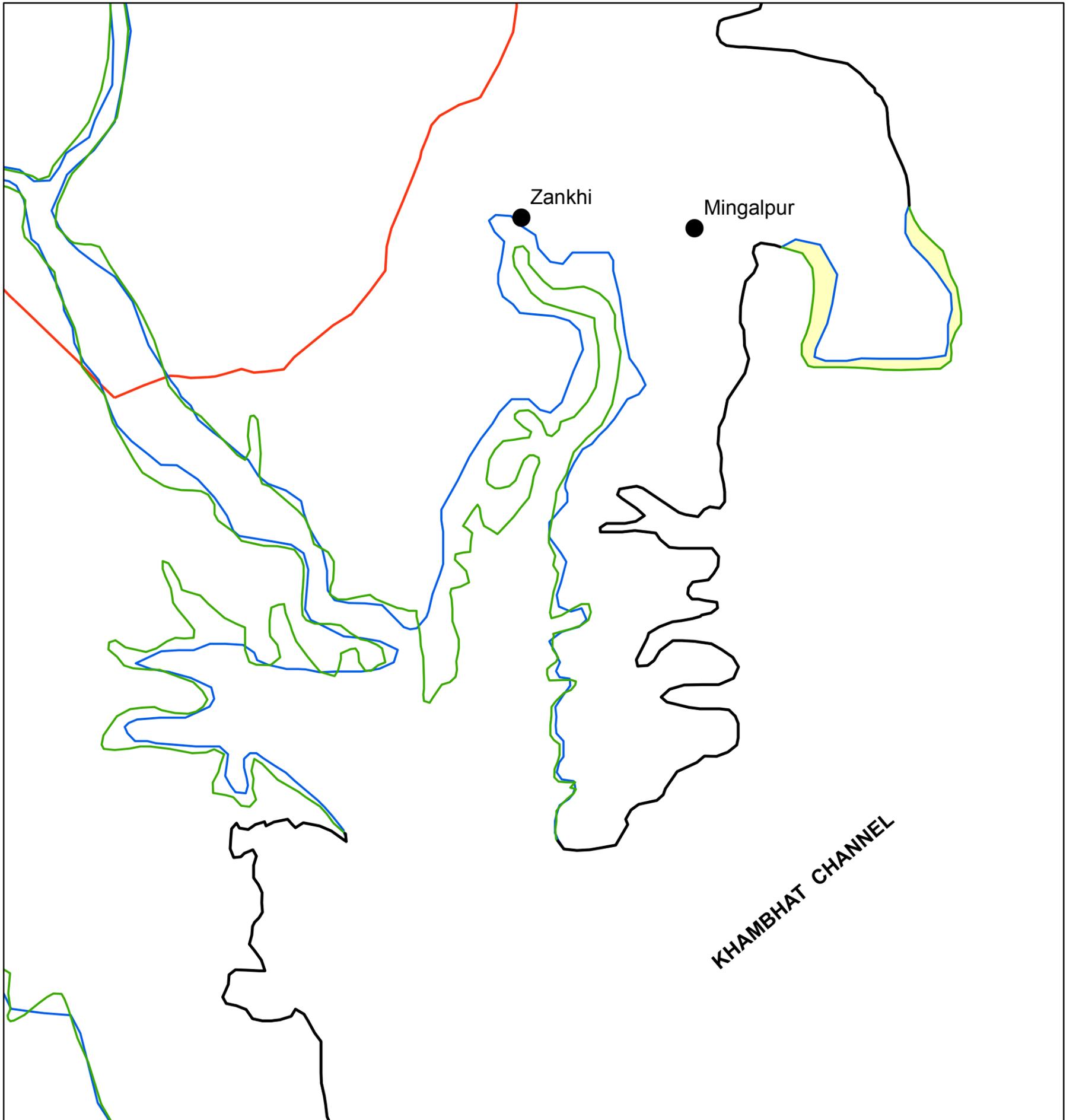
# SHORELINE CHANGE MAP

## GUJARAT

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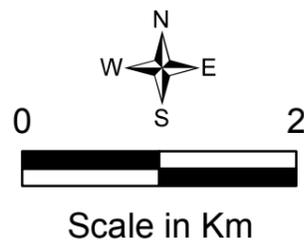
AHMEDABAD DISTRICT

SHEET NO. 46B04SE



### Legend

- ACCRETION
- STABLE
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



#### INDEX TO SHEETS

46B04 NW	46B04 NE	46B08 NW
46B04 SW		46B08 SW
46C01 NW	46C01 NE	46C05 NW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

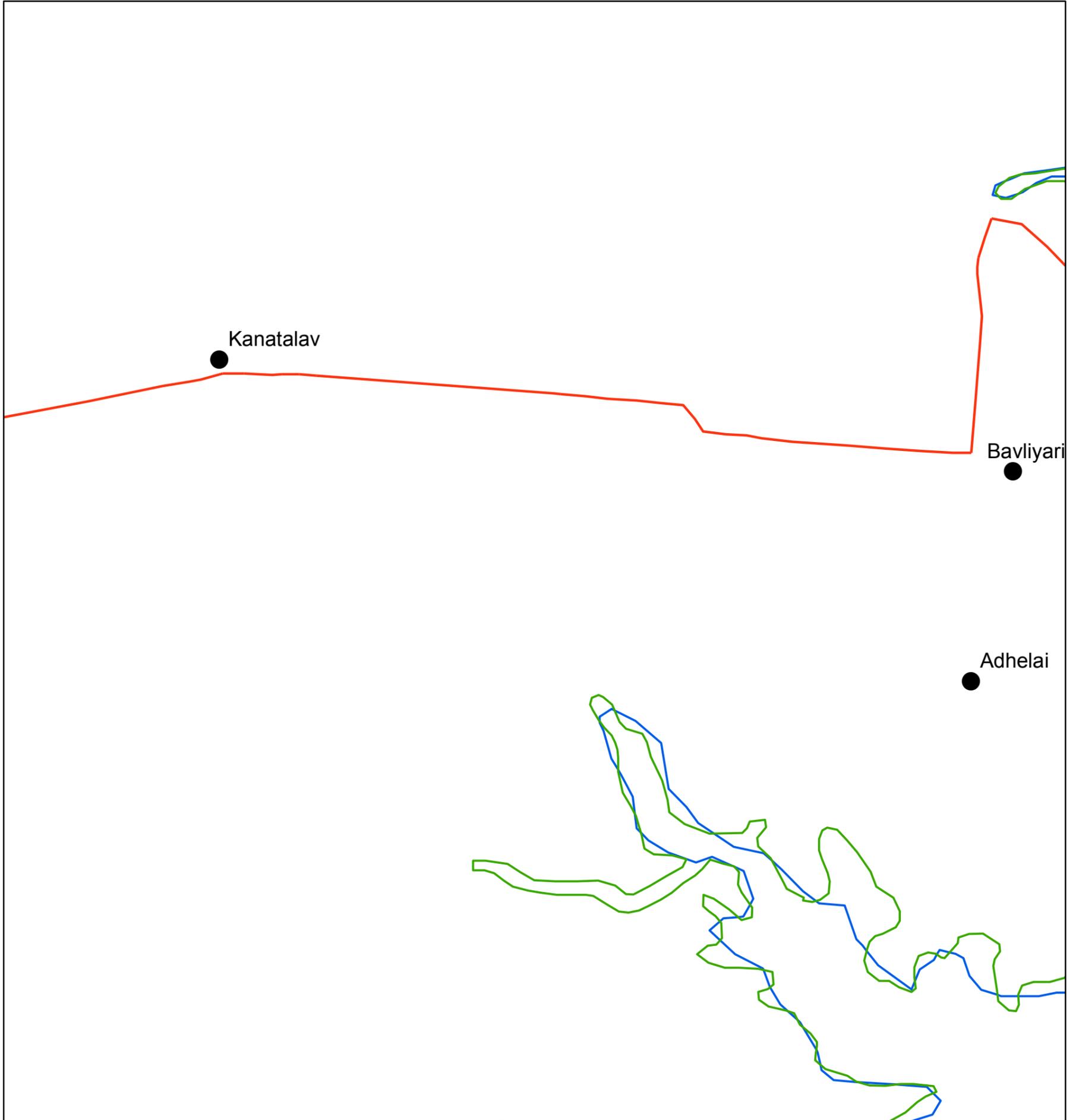
# SHORELINE CHANGE MAP

## GUJARAT

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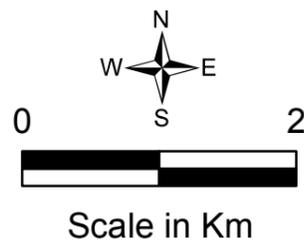
BHAVNAGAR DISTRICT

SHEET NO. 46B04SW



### Legend

- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



#### INDEX TO SHEETS

41N16 NE	46B04 NW	46B04 NE
41N16 SE		46B04 SE
41O13 NE	46C01 NW	46C01 NE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

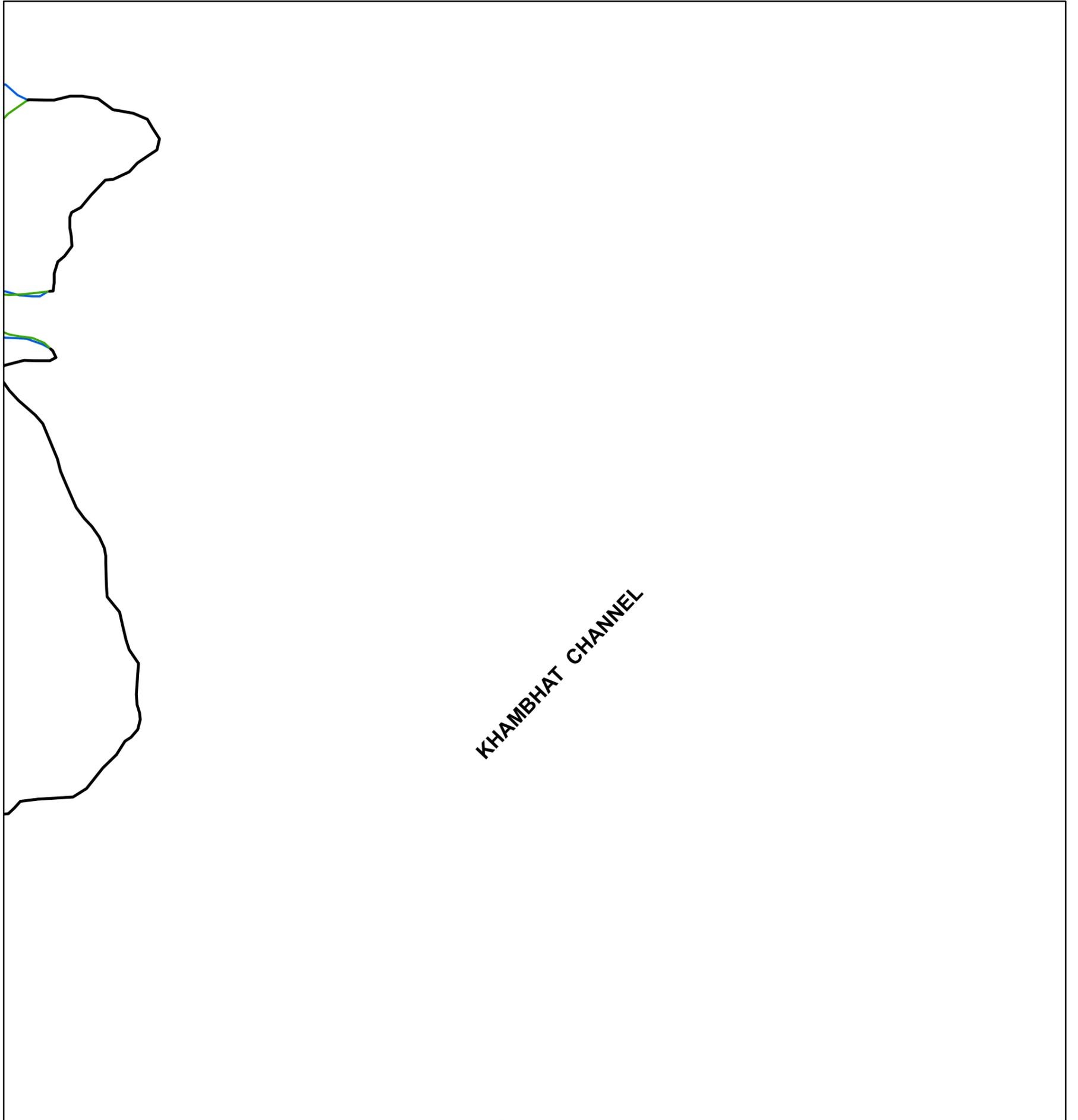
# SHORELINE CHANGE MAP

## GUJARAT

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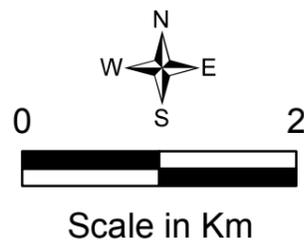
AHMEDABAD DISTRICT

SHEET NO. 46B08NW



### Legend

-  STABLE
-  HIGH-TIDE LINE 2004-06
-  HIGH-TIDE LINE 1989-91



### INDEX TO SHEETS

46B03 SE	46B07 SW	46B07 SE
46B04 NE		SEA
46B04 SE	SEA	SEA



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

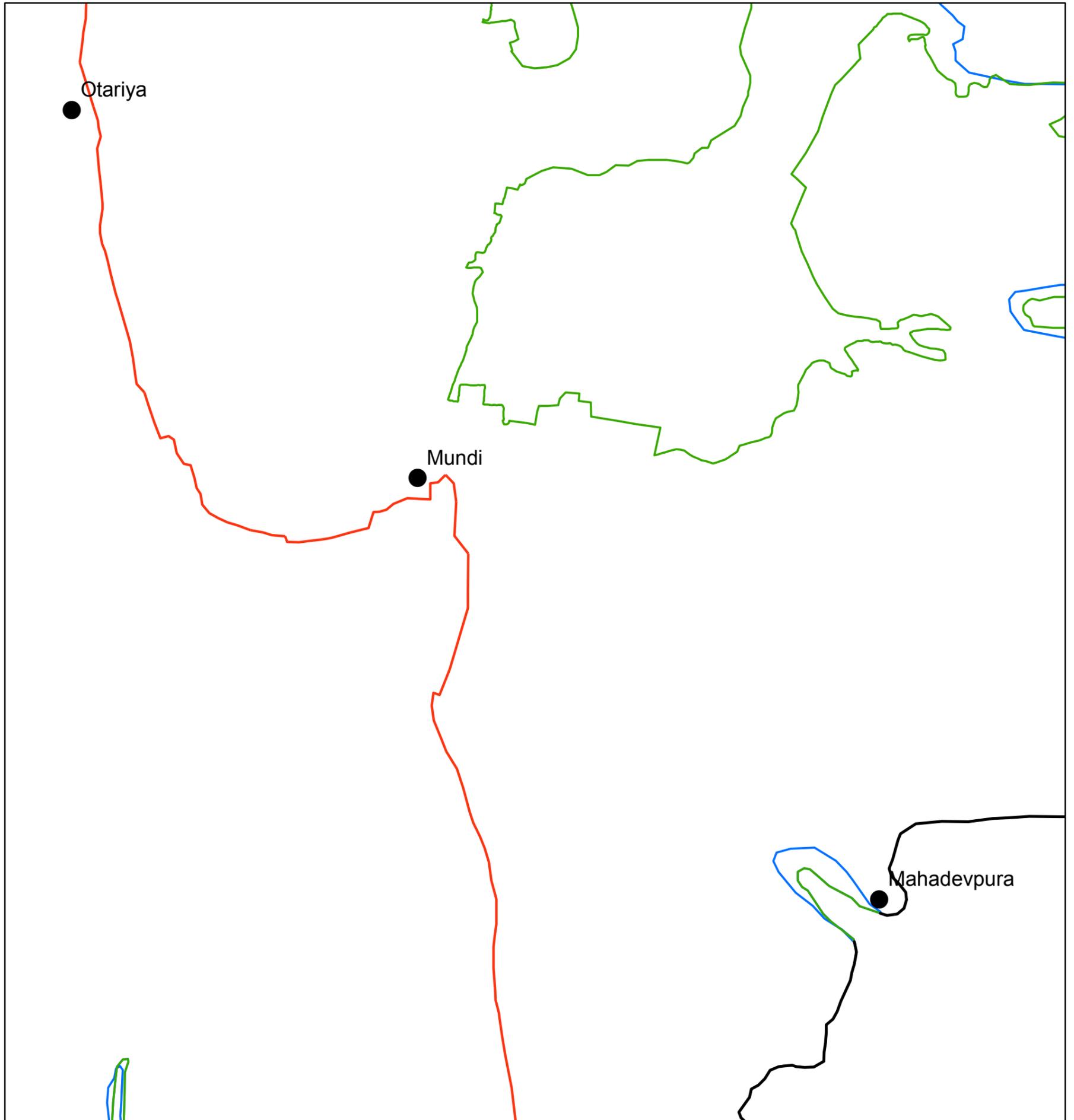
# SHORELINE CHANGE MAP

## GUJARAT

FOR OFFICIAL USE ONLY

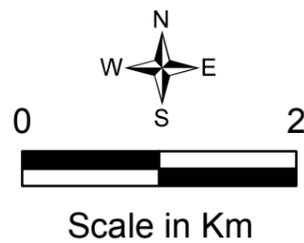
AHMEDABAD DISTRICT

SHEET NO. 46B04NE



### Legend

-  STABLE
-  ROAD
-  HIGH-TIDE LINE 2004-06
-  HIGH-TIDE LINE 1989-91
-  HABITATION



#### INDEX TO SHEETS

46B03 SW	46B03 SE	46B07 SW
46B04 NW		46B08 NW
46B04 SW	46B04 SE	46B08 SW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

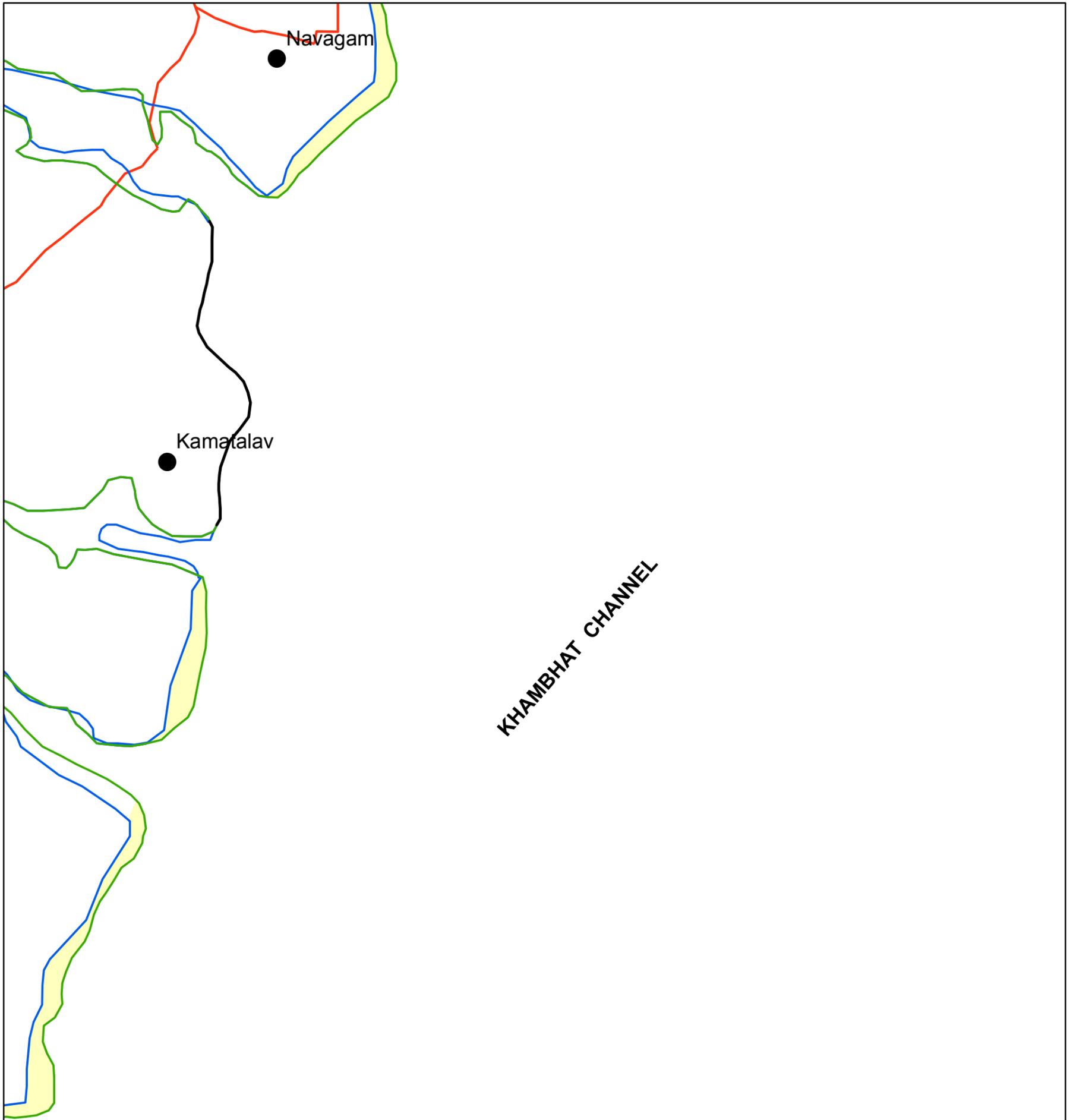
# SHORELINE CHANGE MAP

## GUJARAT

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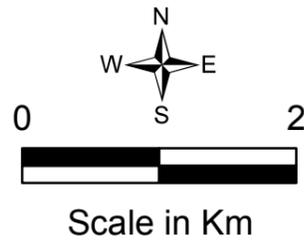
AHMEDABAD DISTRICT

SHEET NO. 46B07SW



### Legend

- ACCRETION
- STABLE
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



#### INDEX TO SHEETS

46B03 NE	46B07 NW	46B07 NE
46B03 SE		46B07 SE
46B04 NE	46B08 NW	46B08 NE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

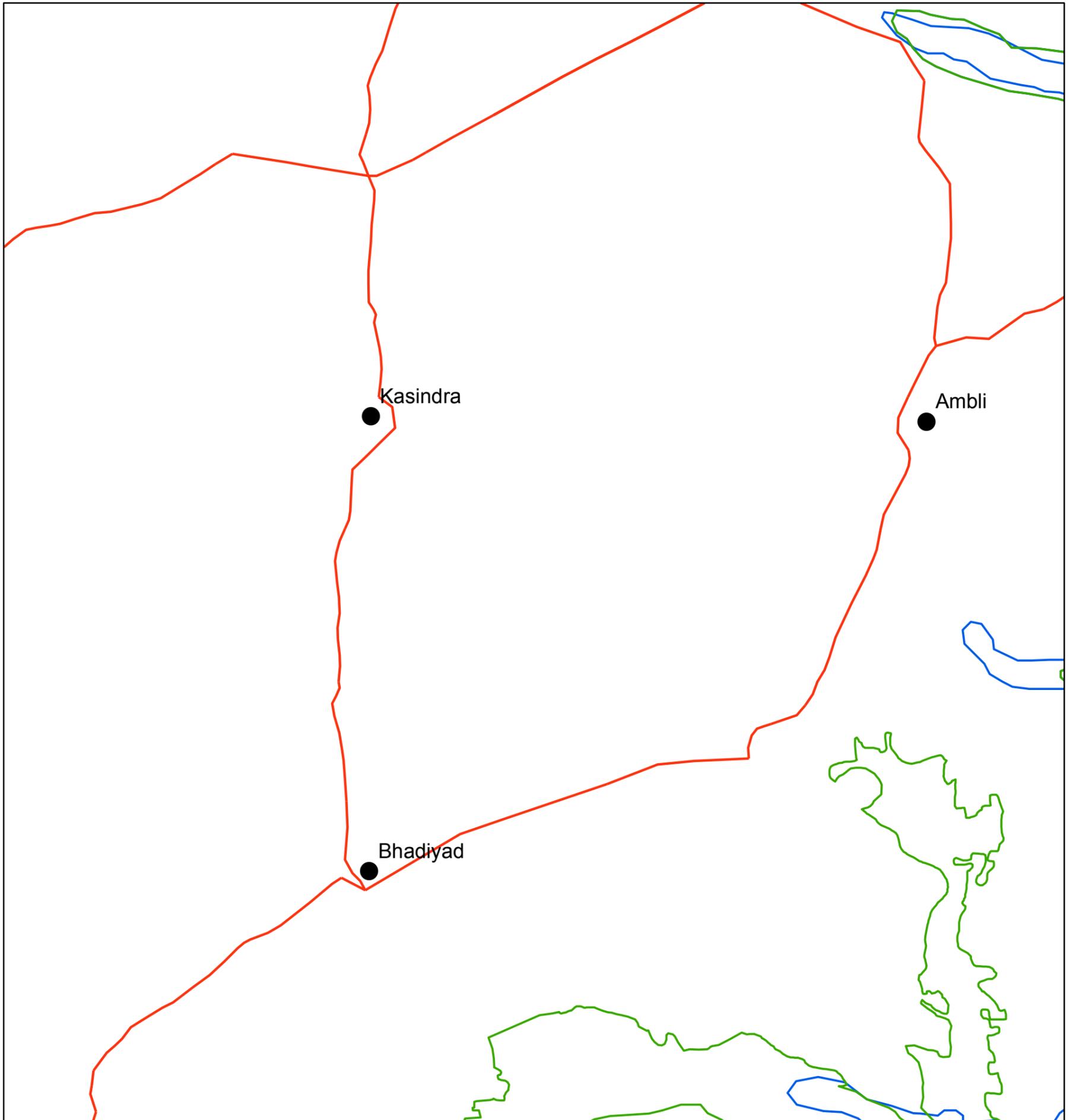
# SHORELINE CHANGE MAP

## GUJARAT

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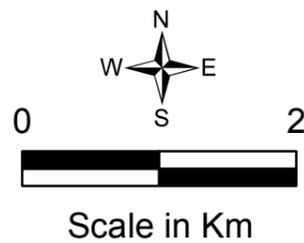
AHMEDABAD DISTRICT

SHEET NO. 46B03SE



### Legend

- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



INDEX TO SHEETS

46B03 NW	46B03 NE	46B07 NW
46B03 SW		46B07 SW
46B04 NW	46B04 NE	46B08 NW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

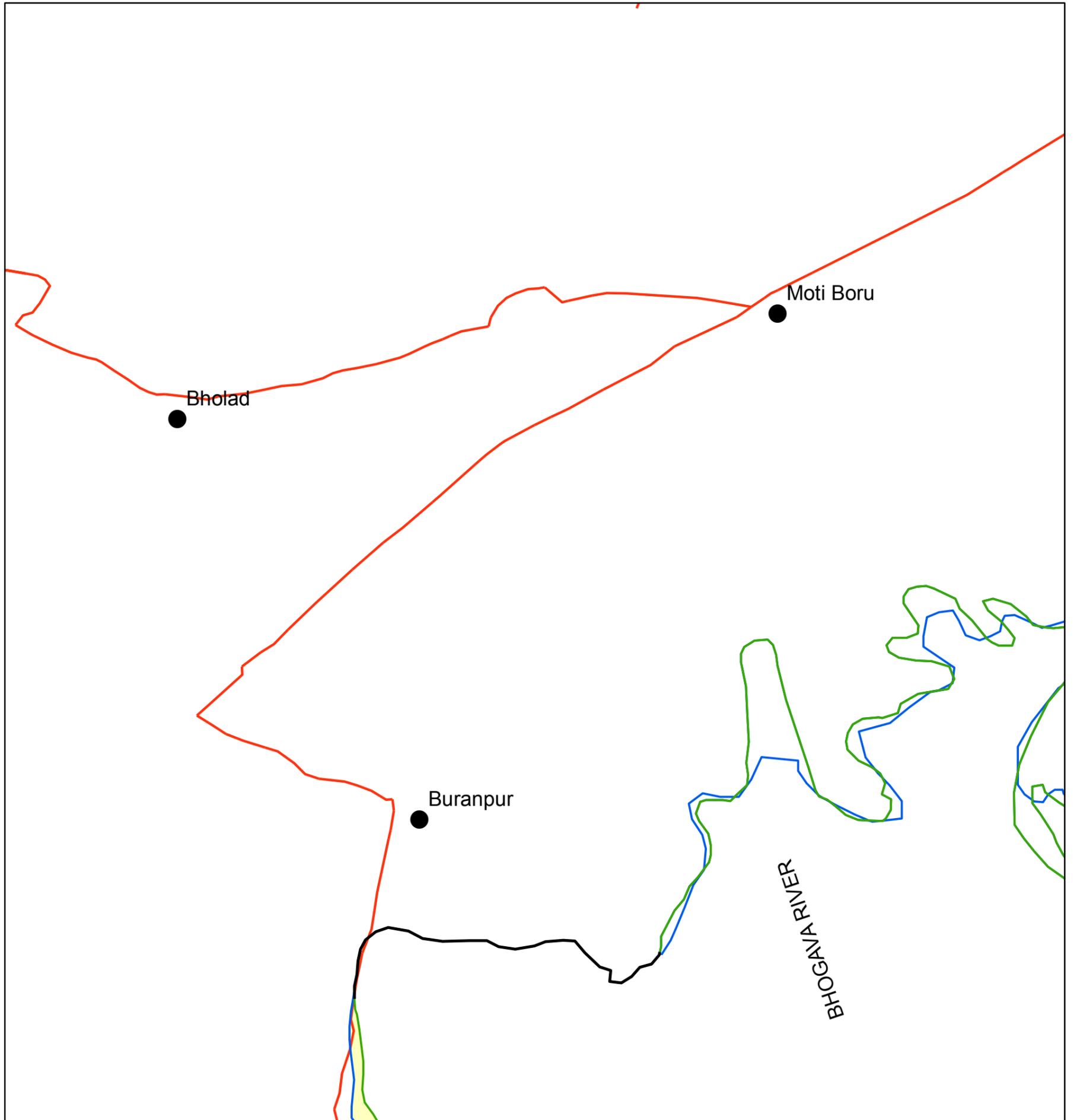
# SHORELINE CHANGE MAP

## GUJARAT

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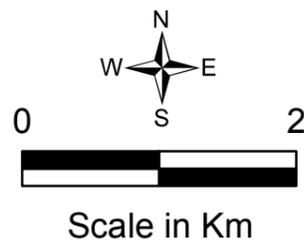
AHMEDABAD DISTRICT

SHEET NO. 46B07NW



### Legend

- ACCRETION
- STABLE
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



#### INDEX TO SHEETS

46B02 SE	46B06 SW	46B06 SE
46B03 NE		46B07 NE
46B03 SE	46B07 SW	46B07 SE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

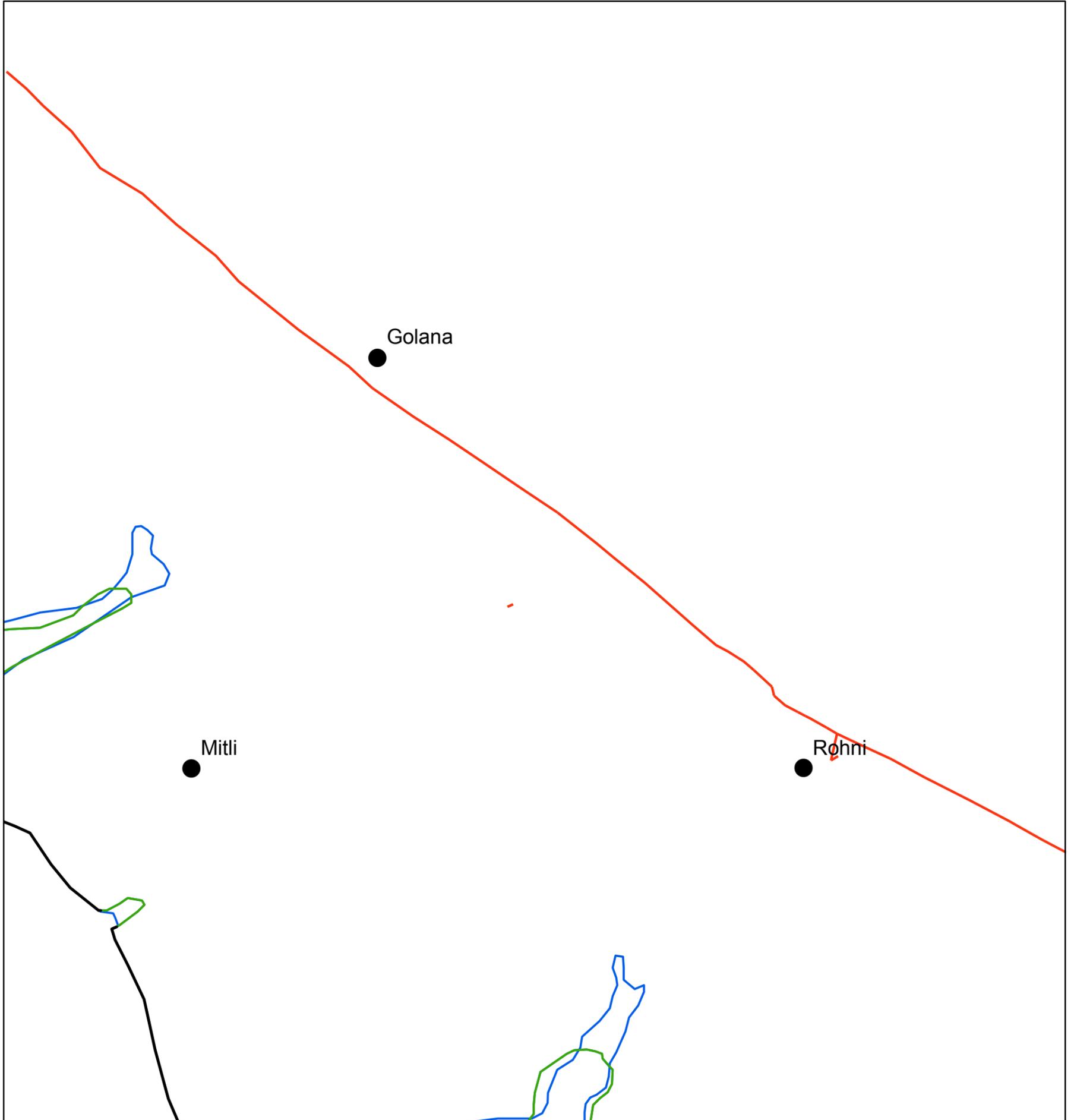
# SHORELINE CHANGE MAP

## GUJARAT

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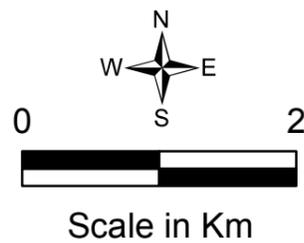
ANAND DISTRICT

SHEET NO. 46B07NE



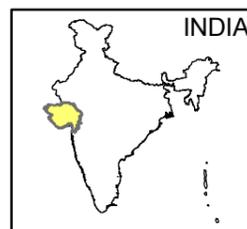
### Legend

-  STABLE
-  ROAD
-  HIGH-TIDE LINE 2004-06
-  HIGH-TIDE LINE 1989-91
-  HABITATION



### INDEX TO SHEETS

46B06 SW	46B06 SE	46B10 SW
46B07 NW		46B11 NW
46B07 SW	46B07 SE	46B11 SW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

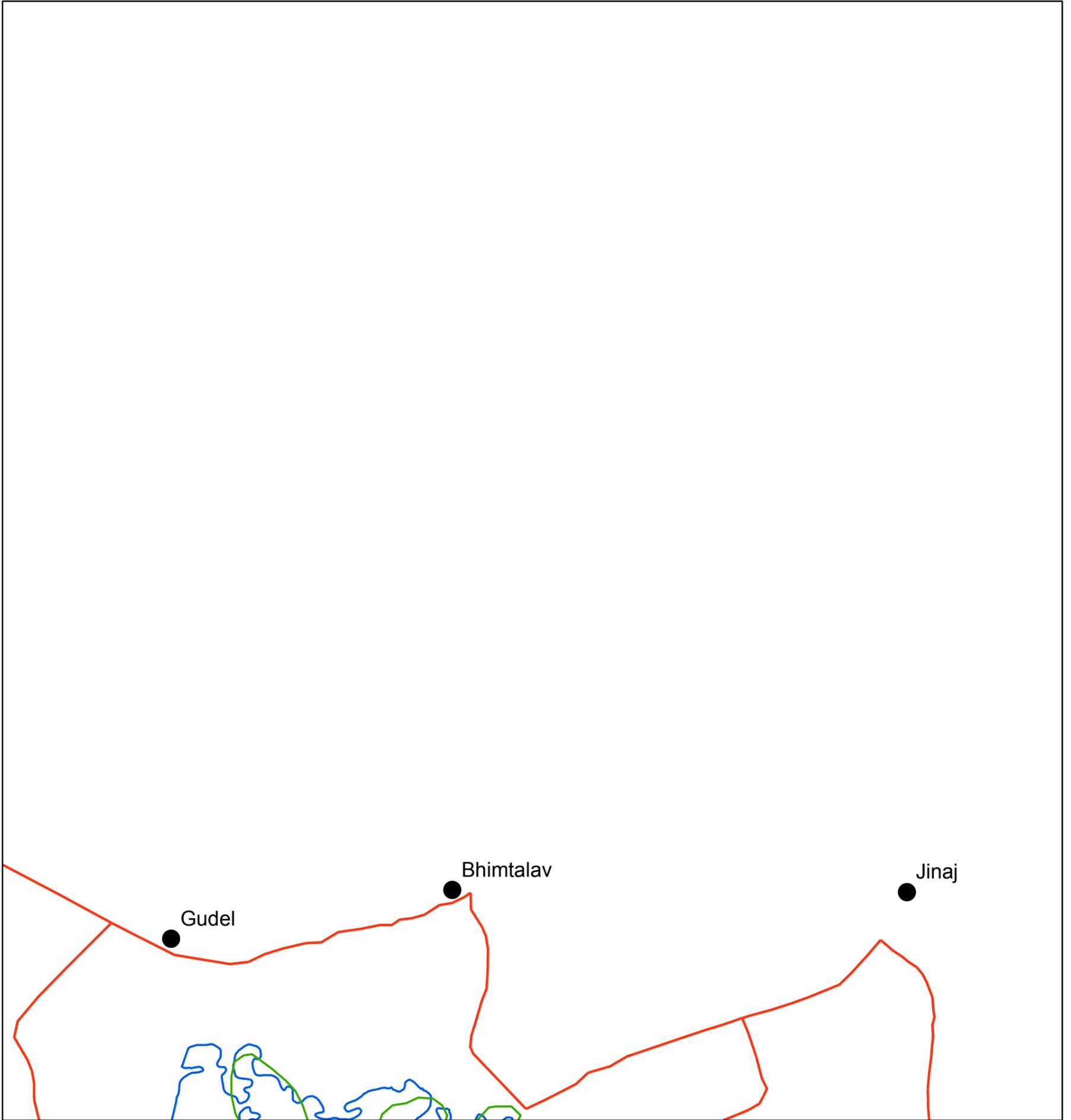
# SHORELINE CHANGE MAP

## GUJARAT

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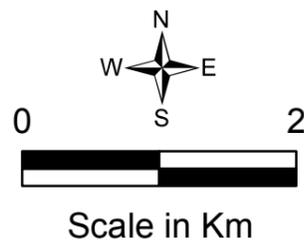
ANAND DISTRICT

SHEET NO. 46B11NW



### Legend

-  ROAD
-  HIGH-TIDE LINE 2004-06
-  HIGH-TIDE LINE 1989-91
-  HABITATION



### INDEX TO SHEETS

46B06 SE	46B10 SW	46B10 SE
46B07 NE		46B11 NE
46B07 SE	46B11 SW	46B11 SE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

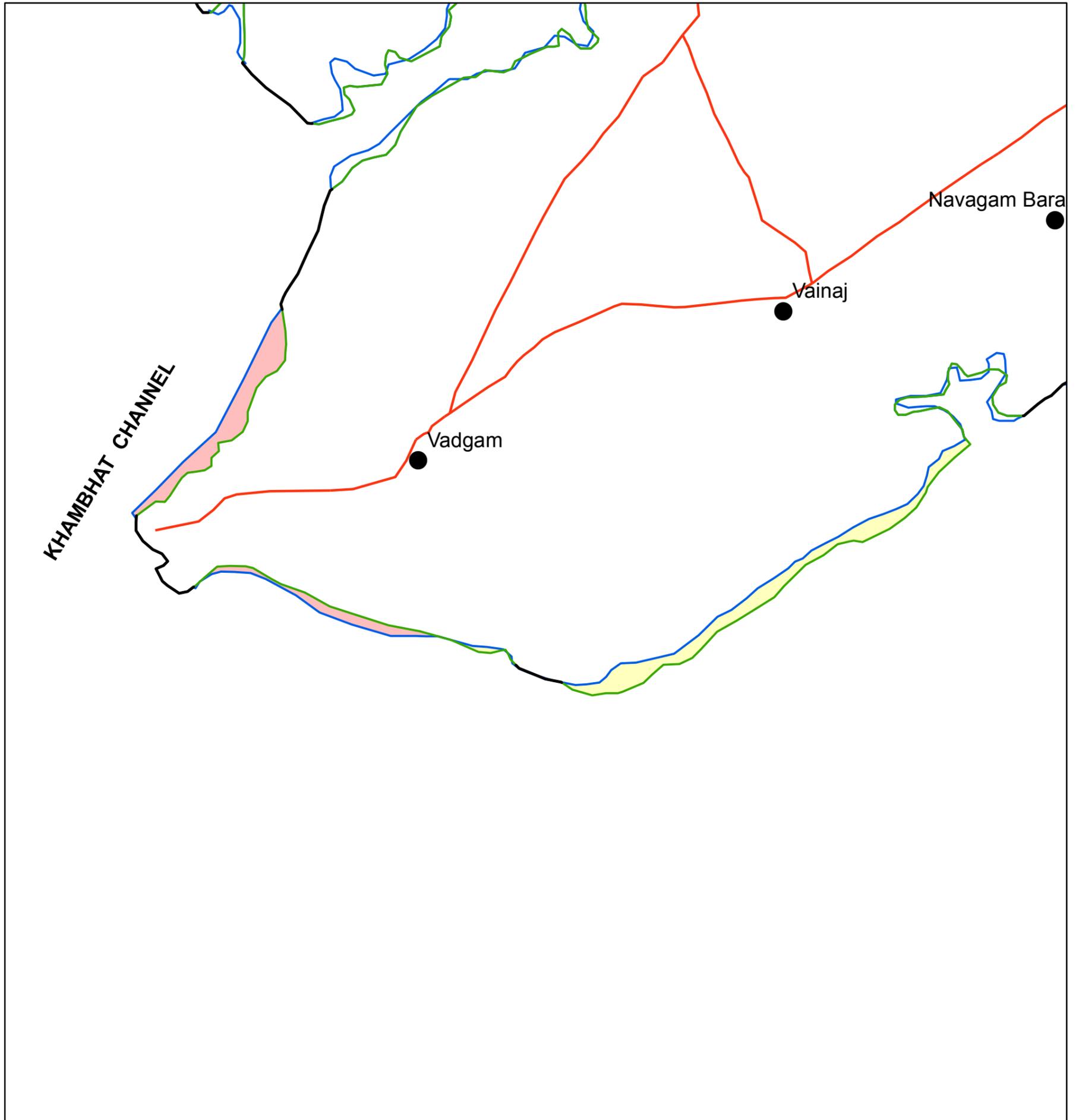
# SHORELINE CHANGE MAP

## GUJARAT

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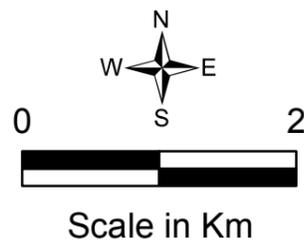
ANAND DISTRICT

SHEET NO. 46B07SE



### Legend

- EROSION
- ACCRETION
- STABLE
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



#### INDEX TO SHEETS

46B07 NW	46B07 NE	46B11 NW
46B07 SW		46B11 SW
46B08 NW	46B08 NE	46B12 NW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

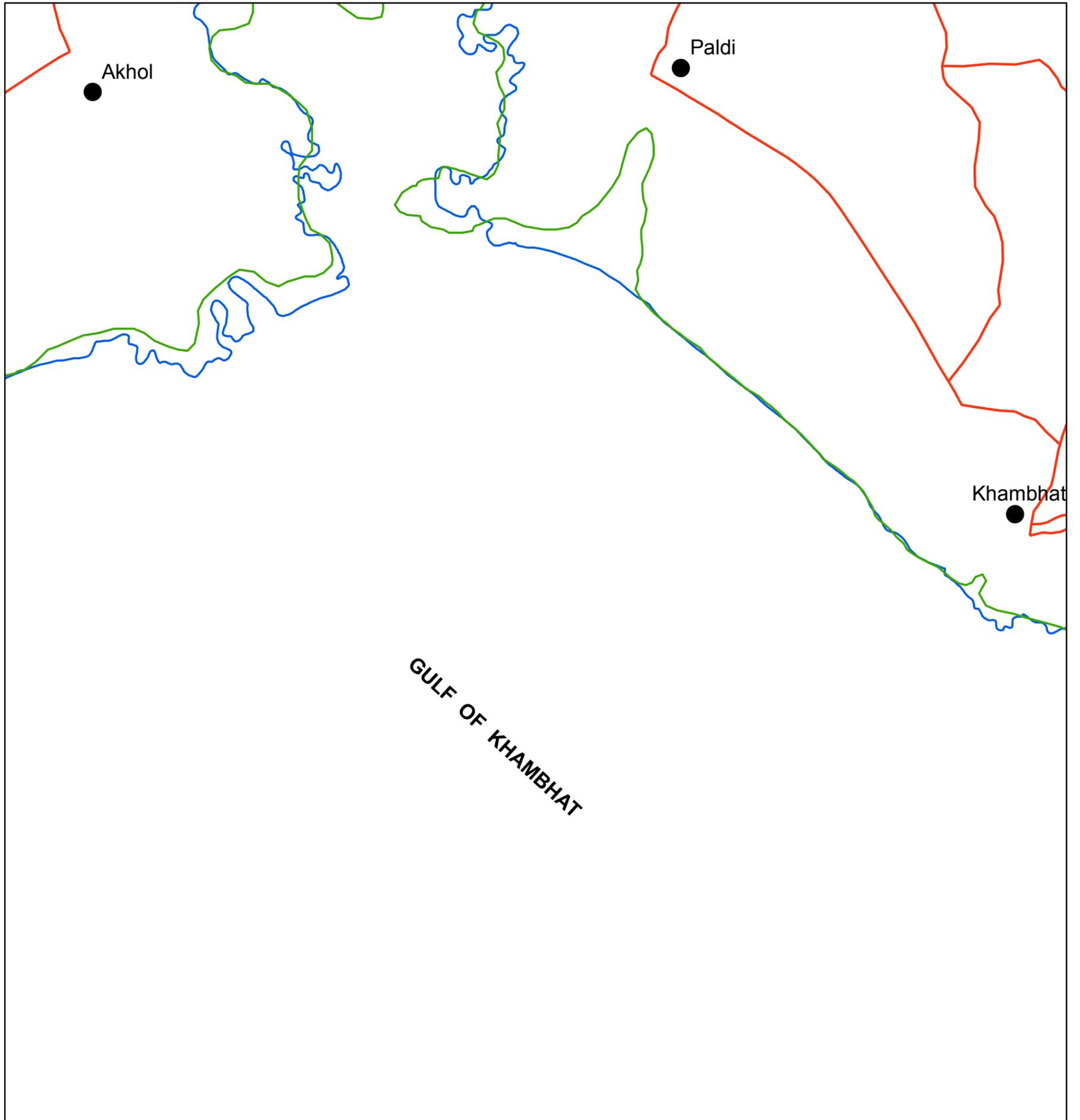
# SHORELINE CHANGE MAP

## GUJARAT

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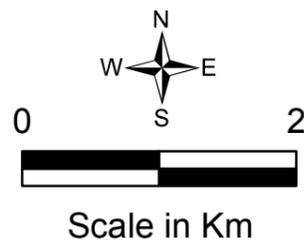
ANAND DISTRICT

SHEET NO. 46B11SW



### Legend

- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



#### INDEX TO SHEETS

46B07 NE	46B11 NW	46B11 NE
46B07 SE		46B11 SE
SEA	46B12 NW	46B12 NE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

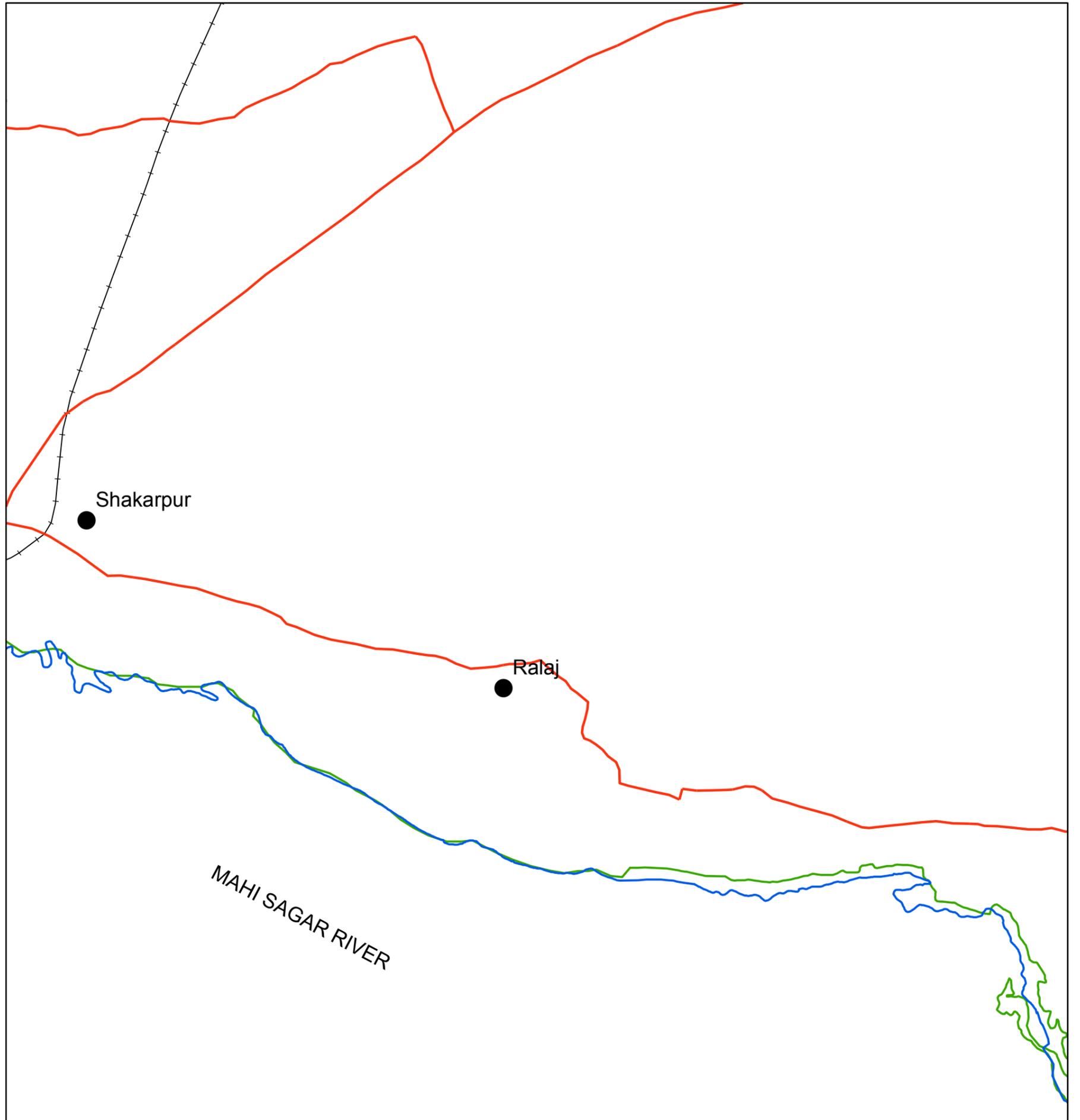
# SHORELINE CHANGE MAP

## GUJARAT

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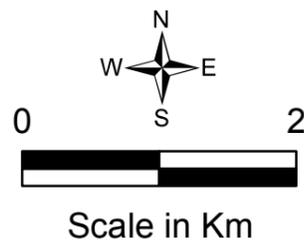
ANAND DISTRICT

SHEET NO. 46B11SE



### Legend

- ROAD
- - - RAIL
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

46B11 NW	46B11 NE	46B15 NW
46B11 SW		46B15 SW
46B12 NW	46B12 NE	46B16 NW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

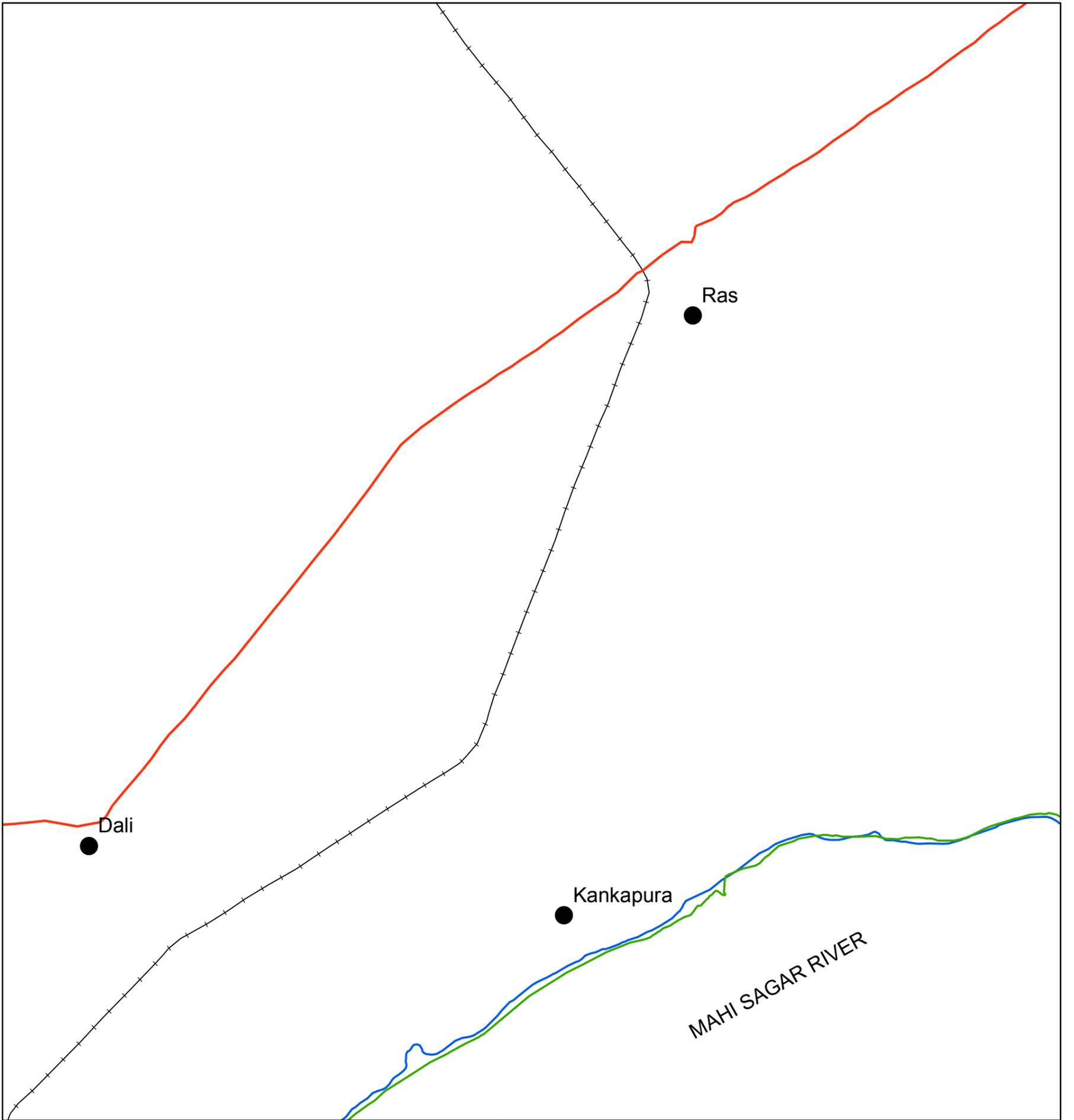
# SHORELINE CHANGE MAP

## GUJARAT

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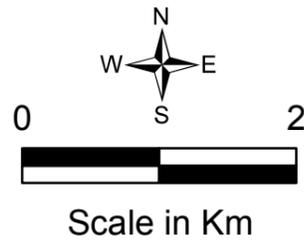
ANAND DISTRICT

SHEET NO. 46B15SW



### Legend

- ROAD
- - - RAIL
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

46B11 NE	46B15 NW	46B15 NE
46B11 SE		46B15 SE
46B12 NE	46B16 NW	46B16 NE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

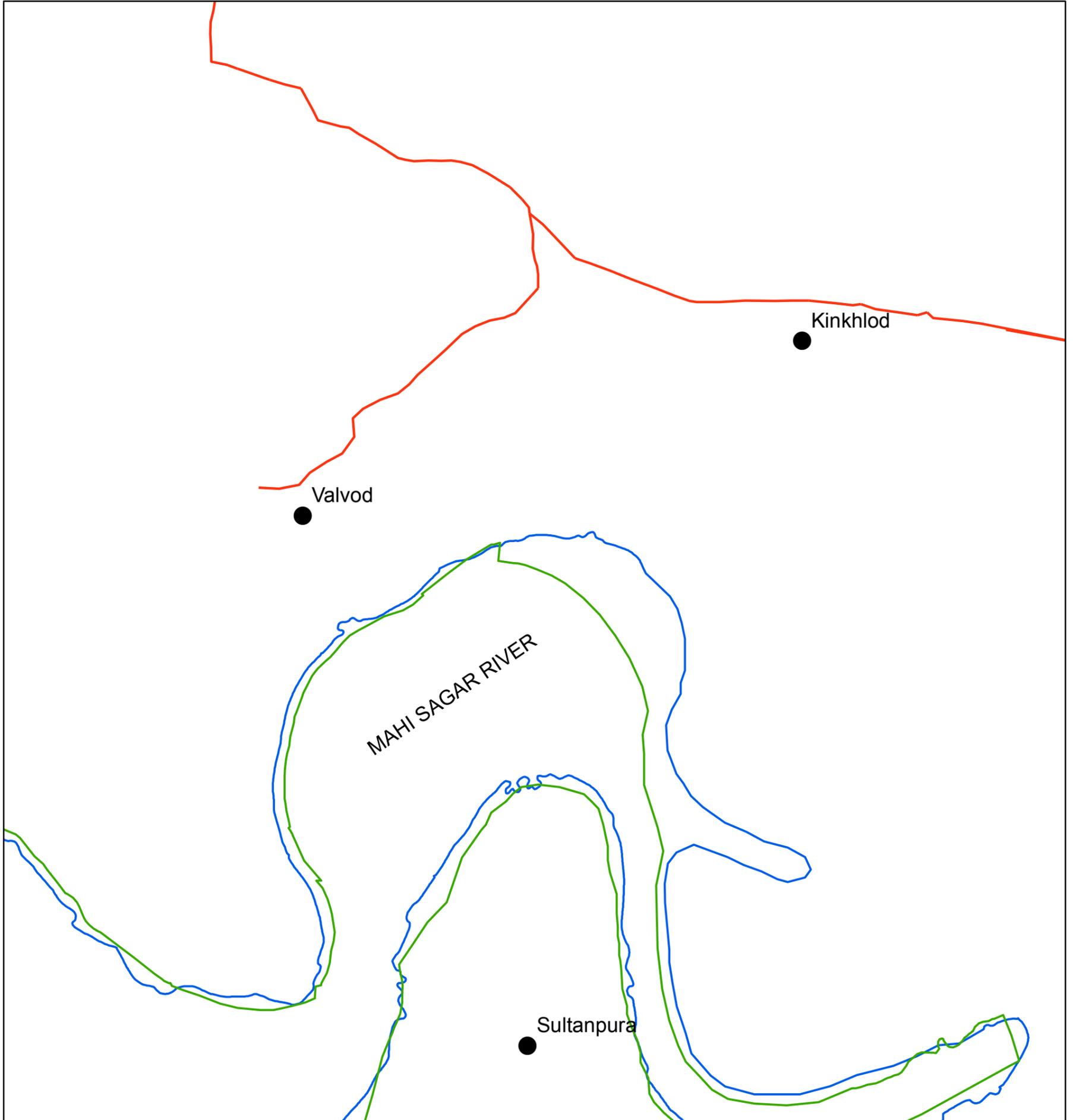
# SHORELINE CHANGE MAP

## GUJARAT

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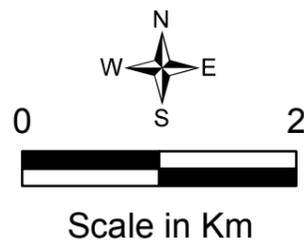
ANAND DISTRICT

SHEET NO. 46B15SE



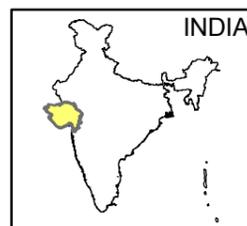
### Legend

- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

46B15 NW	46B15 NE	46F03 NW
46B15 SW		46F03 SW
46B16 NW	46B16 NE	46F04 NW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

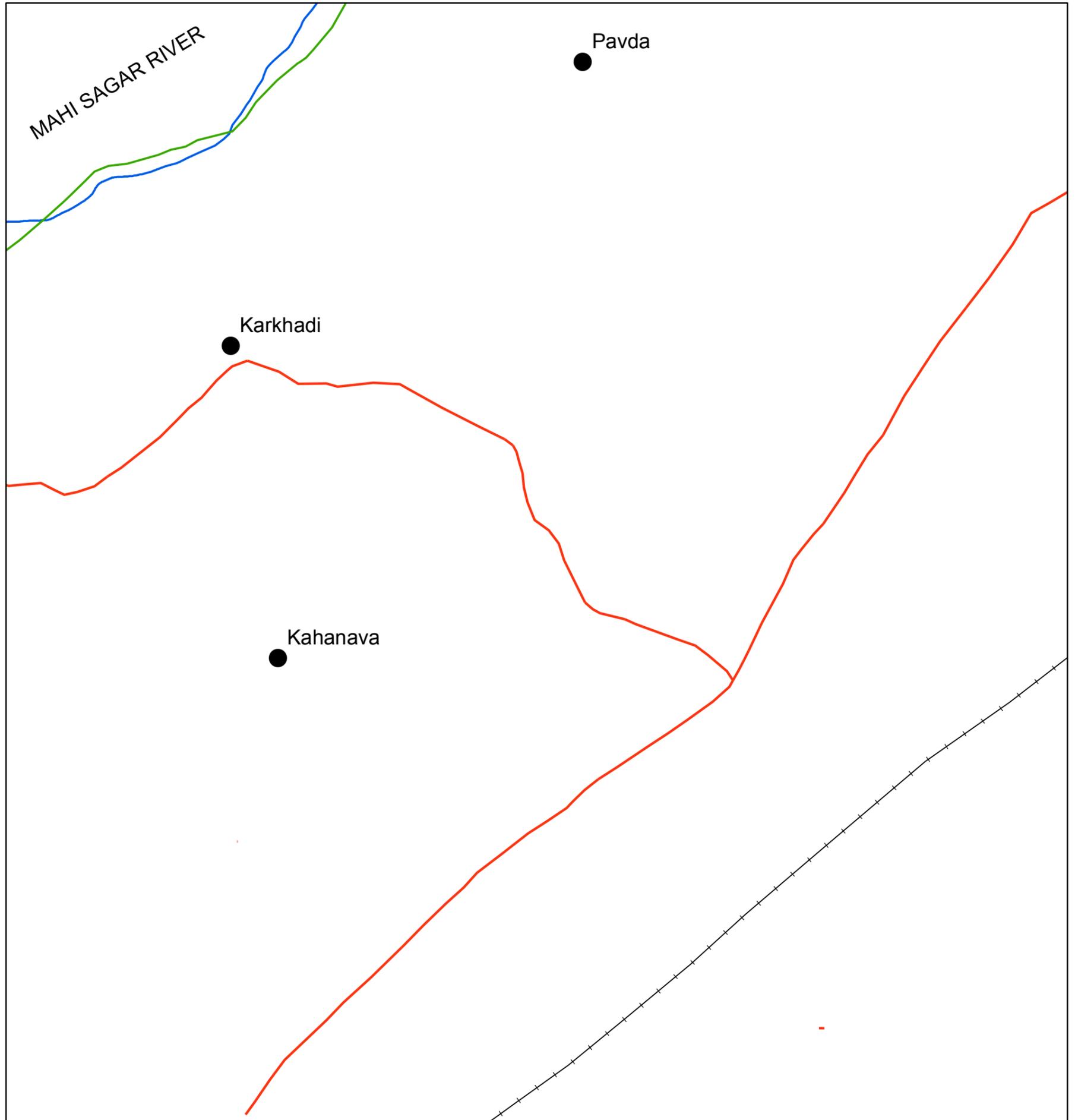
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

## GUJARAT

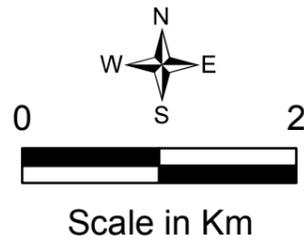
FOR OFFICIAL USE ONLY  
SHEET NO. 46B16NE

BHARUCH DISTRICT



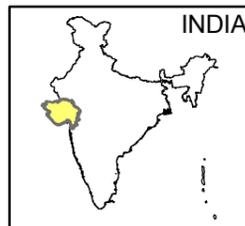
### Legend

- ROAD
- RAIL
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

46B15 SW	46B15 SE	46F03 SW
46B16 NW		46F04 NW
46B16 SW	46B16 SE	46F04 SW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

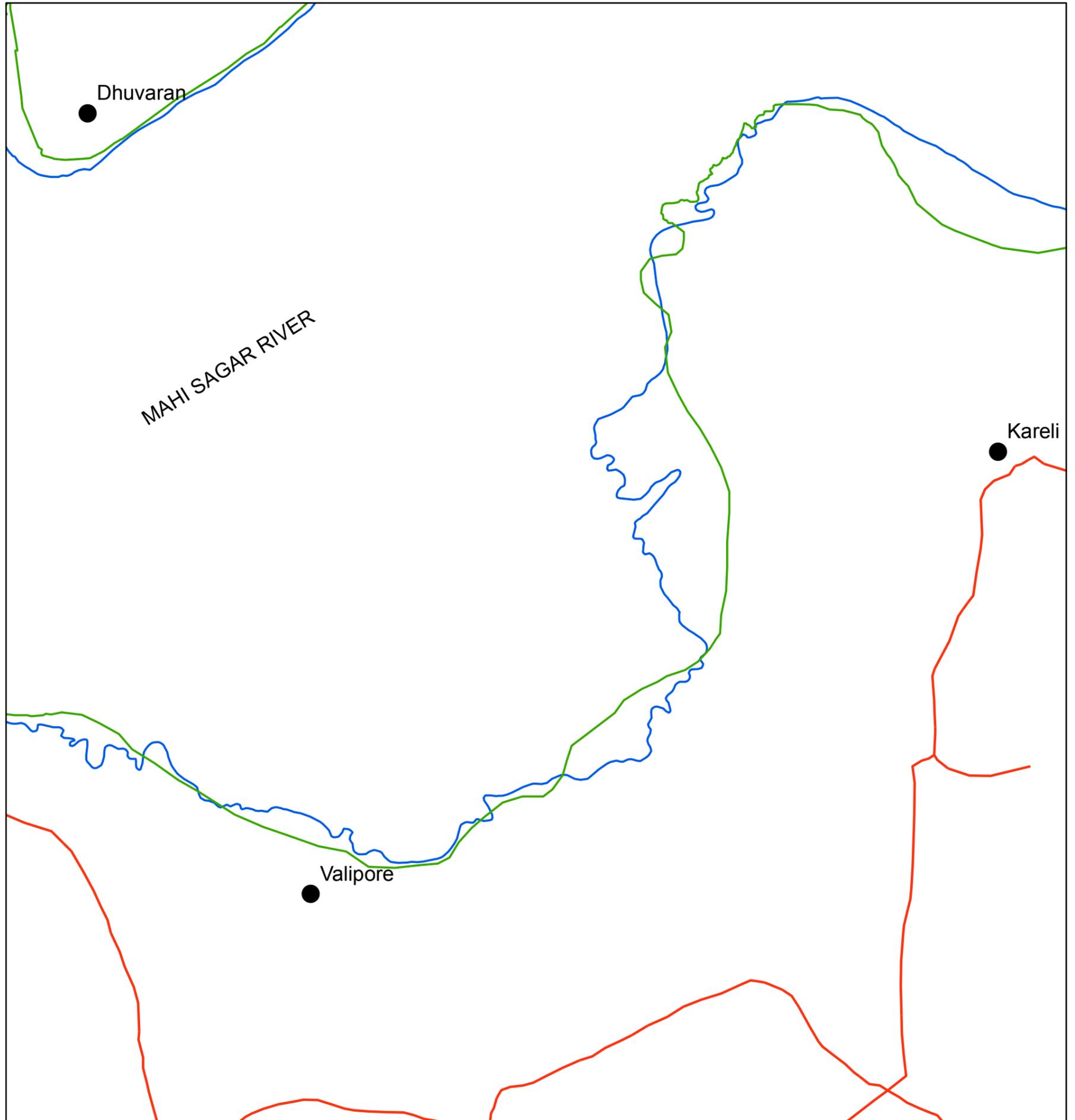
PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

## GUJARAT

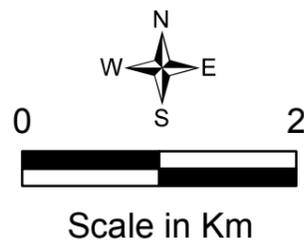
FOR OFFICIAL USE ONLY  
SHEET NO. 46B16NW

BHARUCH DISTRICT



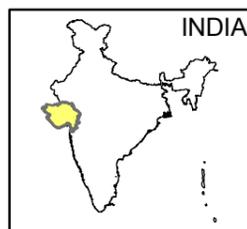
### Legend

-  ROAD
-  HIGH-TIDE LINE 2004-06
-  HIGH-TIDE LINE 1989-91
-  HABITATION



### INDEX TO SHEETS

46B11 SE	46B15 SW	46B15 SE
46B12 NE		46B16 NE
46B12 SE	46B16 SW	46B16 SE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

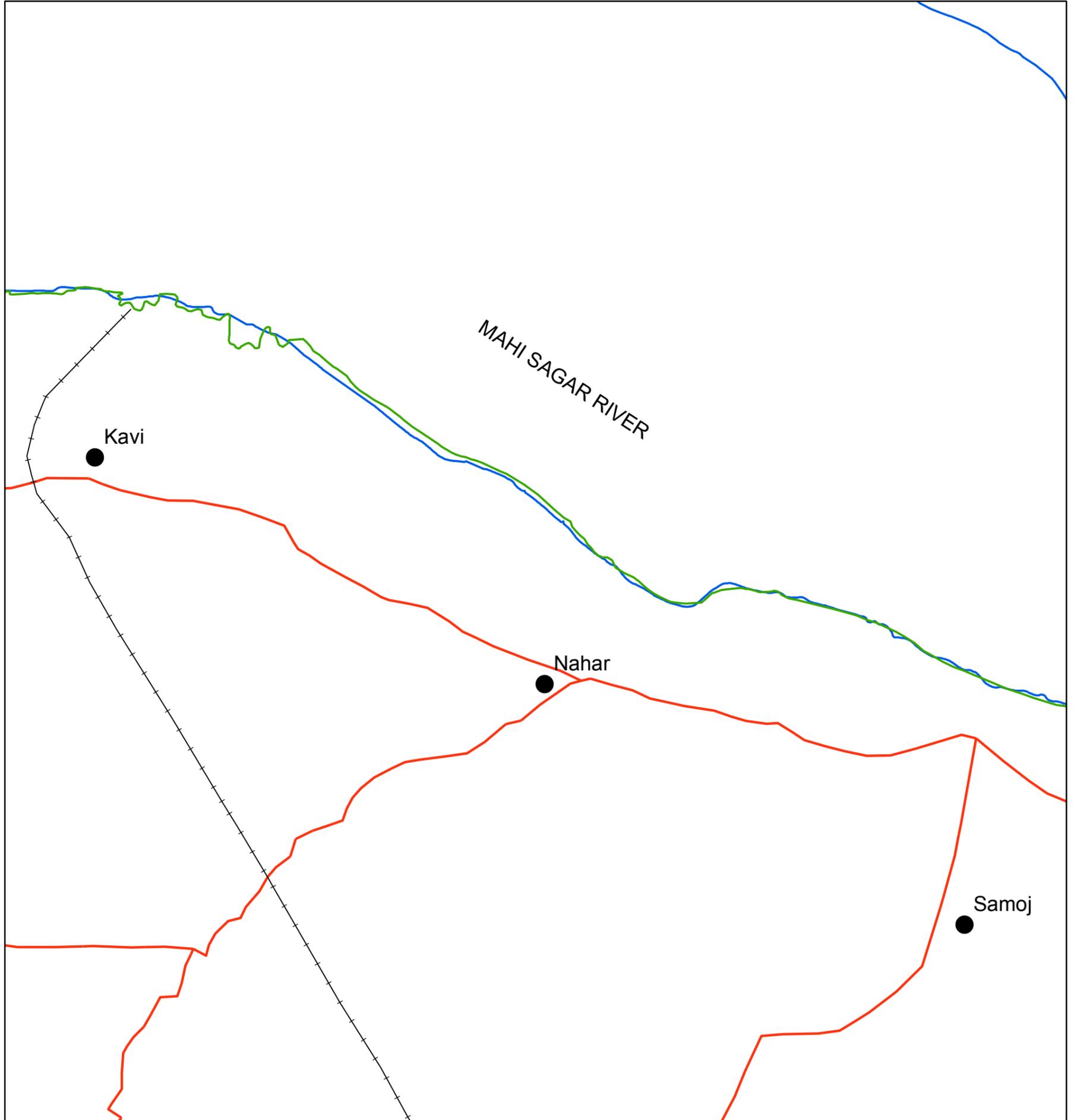
# SHORELINE CHANGE MAP

## GUJARAT

FOR OFFICIAL USE ONLY

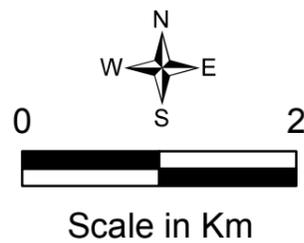
BHARUCH DISTRICT

SHEET NO. 46B12NE



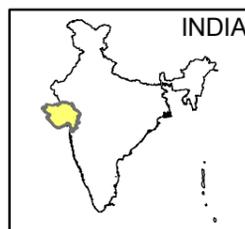
### Legend

- ROAD
- - - RAIL
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

46B11 SW	46B11 SE	46B15 SW
46B12 NW		46B16 NW
46B12 SW	46B12 SE	46B16 SW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

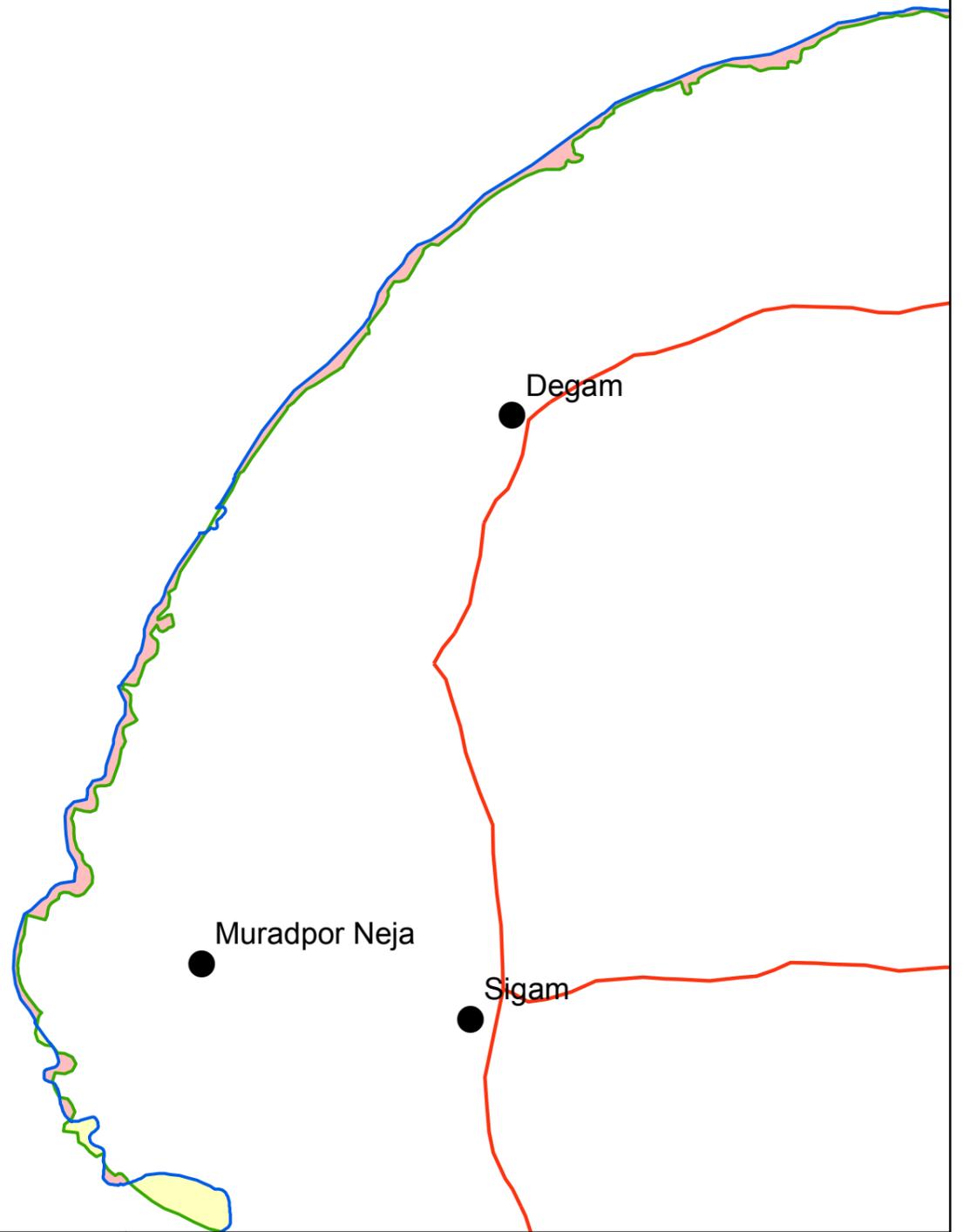
## GUJARAT

FOR OFFICIAL USE ONLY

BHARUCH DISTRICT

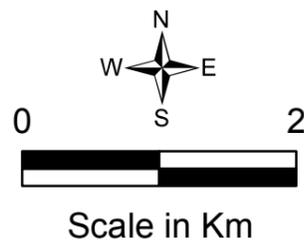
SHEET NO. 46B12NW

KHAMBHAT CHANNEL



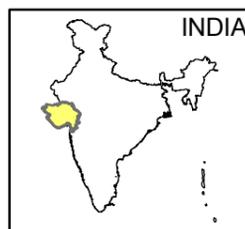
### Legend

- EROSION
- ACCRETION
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



#### INDEX TO SHEETS

46B07 SE	46B11 SW	46B11 SE
SEA		46B12 NE
SEA	46B12 SW	46B12 SE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

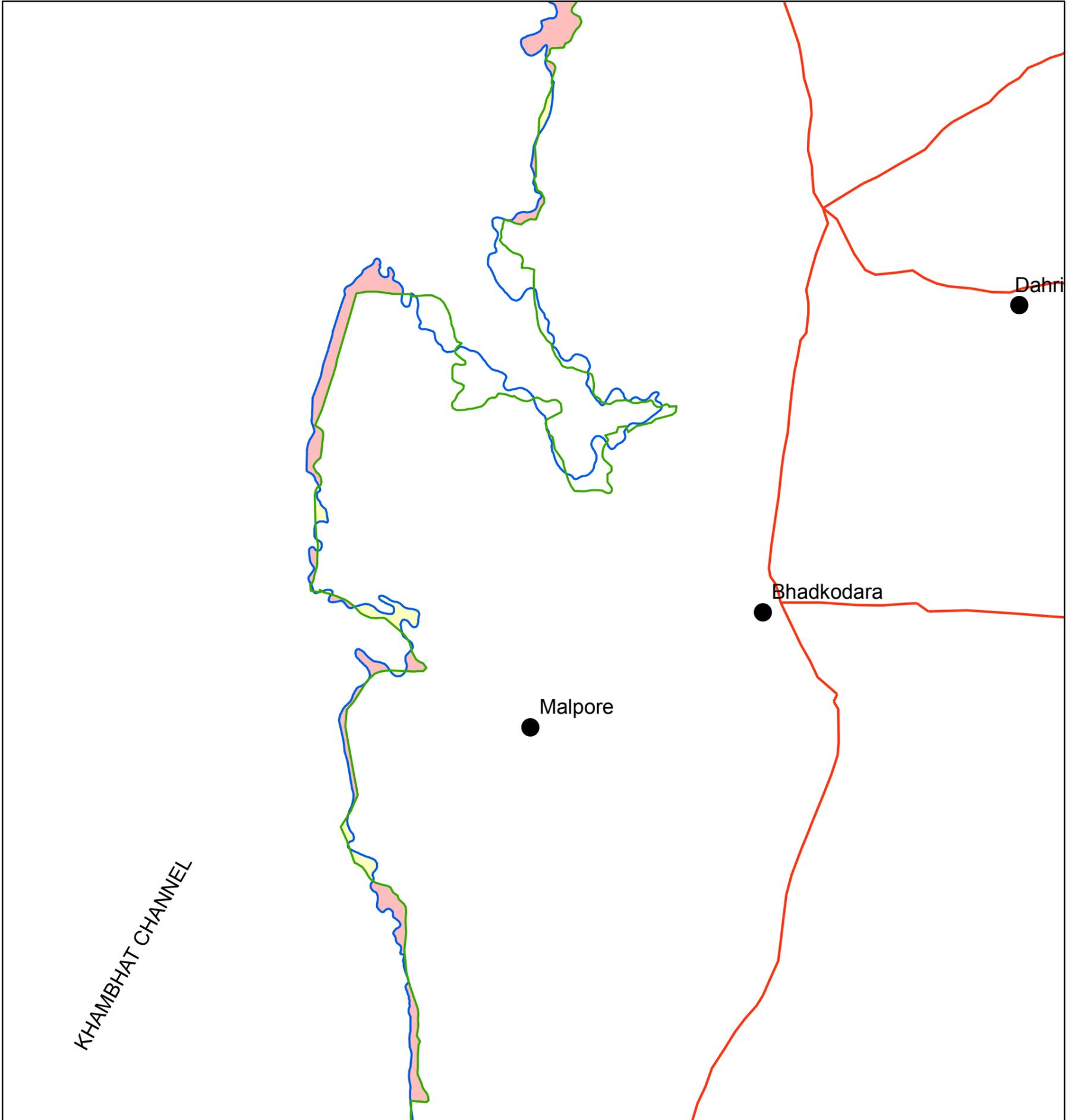
# SHORELINE CHANGE MAP

## GUJARAT

FOR OFFICIAL USE ONLY

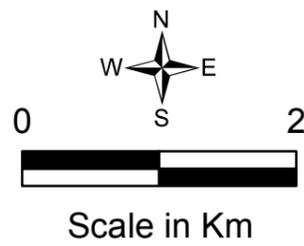
BHARUCH DISTRICT

SHEET NO. 46B12SW



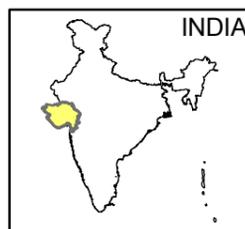
### Legend

- EROSION
- ACCRETION
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



#### INDEX TO SHEETS

46B08 NE	46B12 NW	46B12 NE
SEA		46B12 SE
SEA	46C09 NW	46C09 NE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

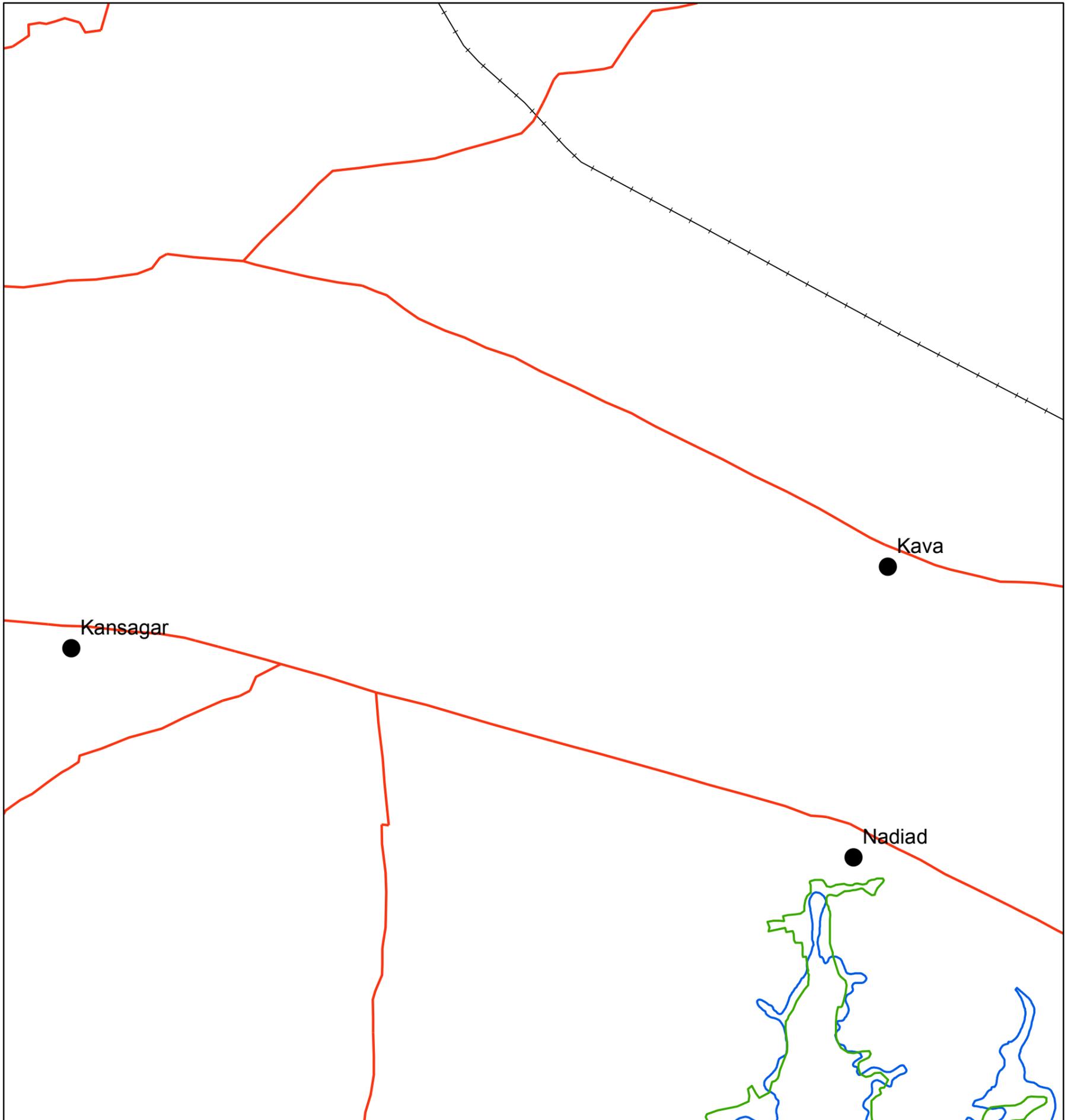
# SHORELINE CHANGE MAP

## GUJARAT

FOR OFFICIAL USE ONLY

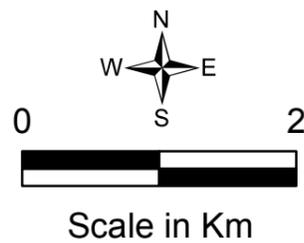
BHARUCH DISTRICT

SHEET NO. 46B12SE



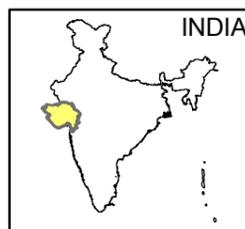
### Legend

- ROAD
- - - RAIL
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

46B12NW	46B12NE	46B16NW
46B12SW		46B16SW
46C09NW	46C09NE	46C13NW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

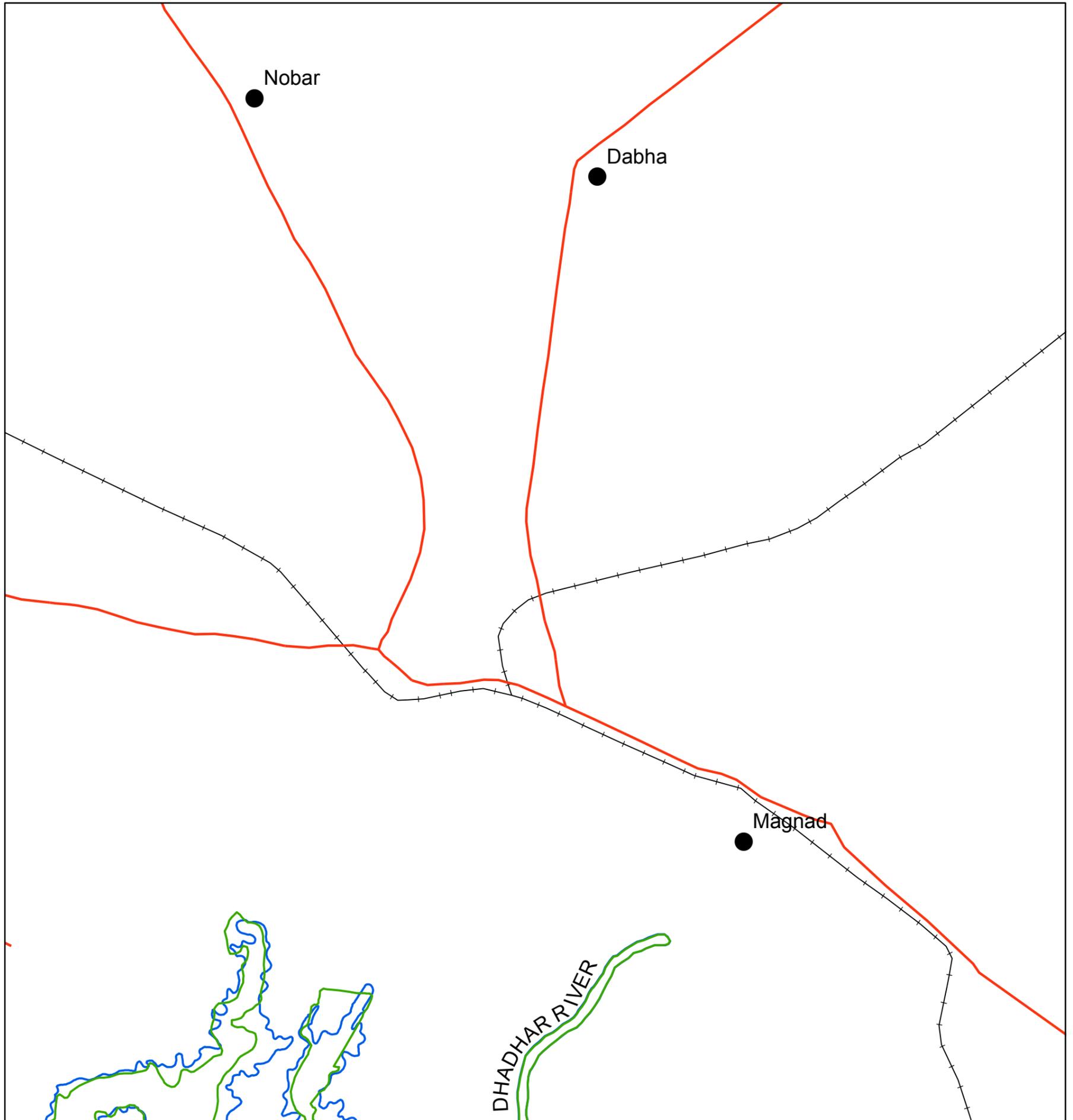
# SHORELINE CHANGE MAP

## GUJARAT

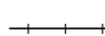
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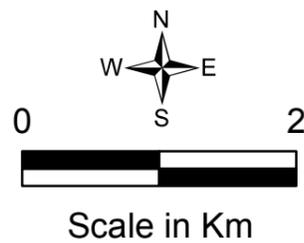
BHARUCH DISTRICT

SHEET NO. 46B16SW



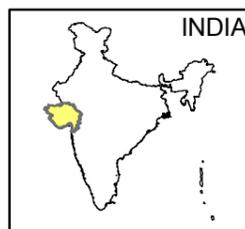
### Legend

-  ROAD
-  RAIL
-  HIGH-TIDE LINE 2004-06
-  HIGH-TIDE LINE 1989-91
-  HABITATION



### INDEX TO SHEETS

46B12NE	46B16NW	46B16NE
46B12SE		46B16SE
46C09NE	46C13NW	46C13NE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

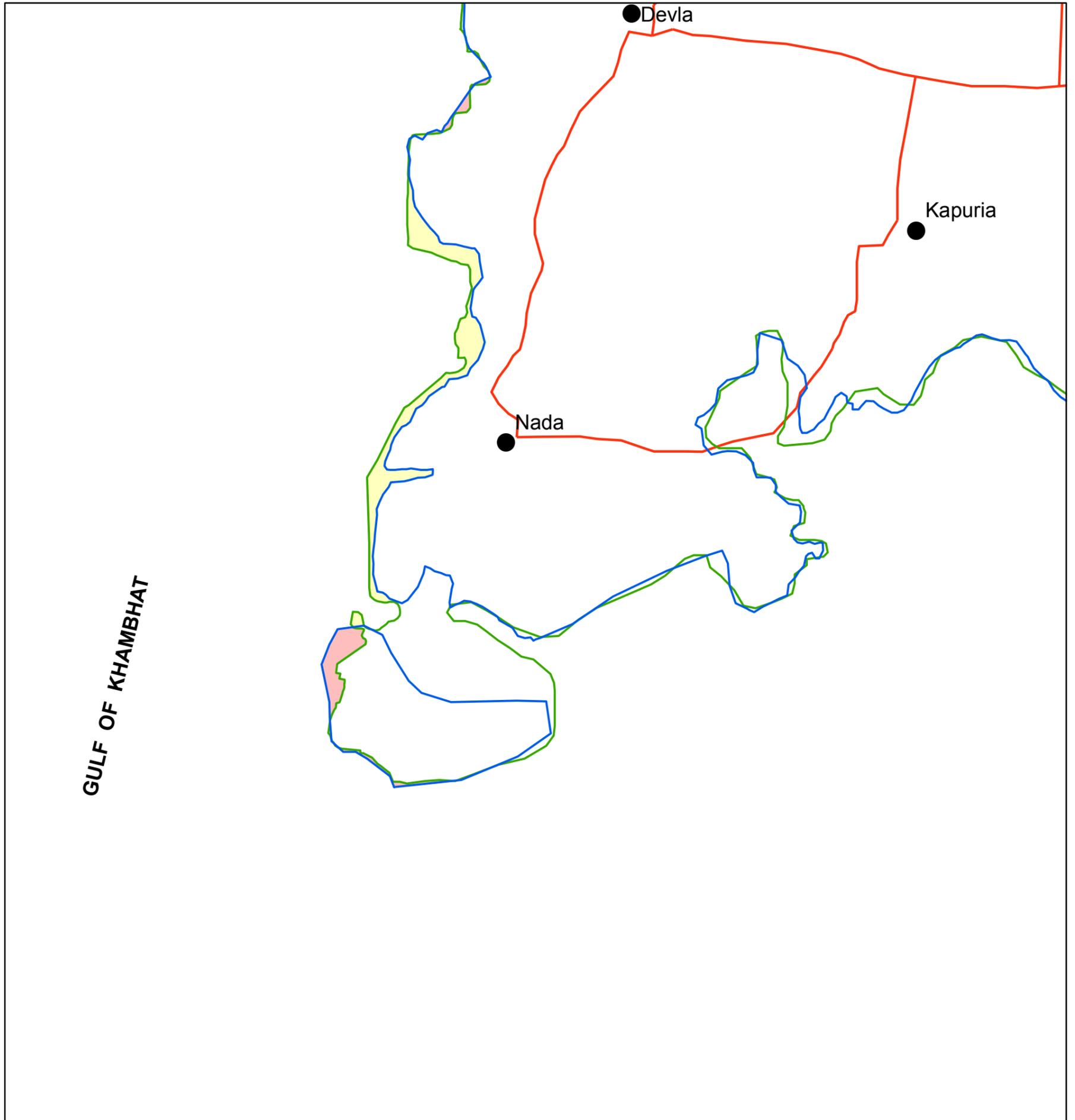
# SHORELINE CHANGE MAP

## GUJARAT

FOR OFFICIAL USE ONLY

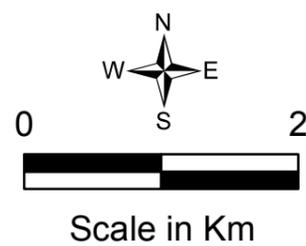
BHARUCH DISTRICT

SHEET NO. 46C09NW



### Legend

- EROSION
- ACCRETION
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- ROAD
- HABITATION



#### INDEX TO SHEETS

SEA	46B12 SW	46B12 SE
SEA		46C09 NE
SEA	46C09 SW	46C09 SE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

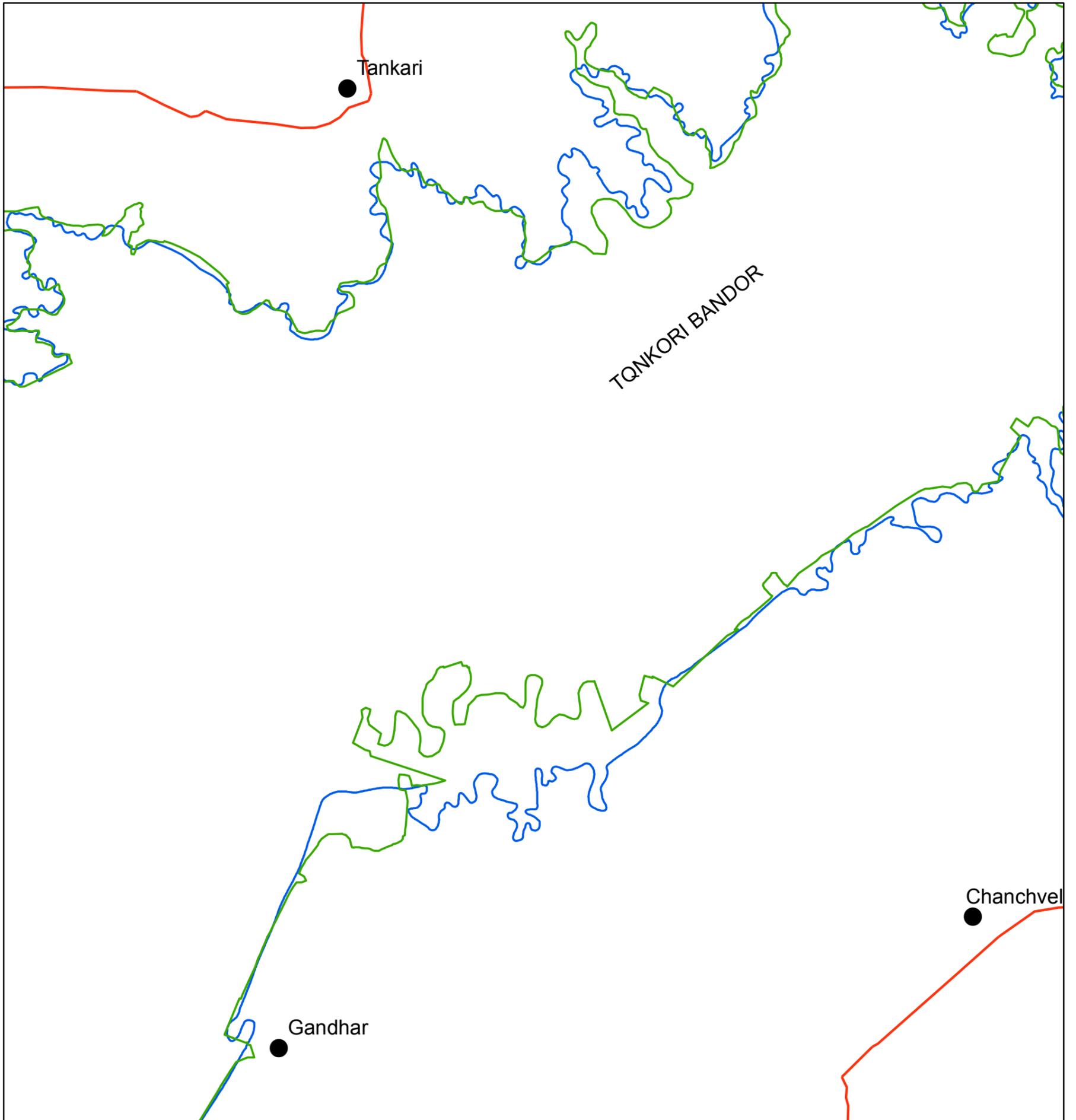
# SHORELINE CHANGE MAP

## GUJARAT

FOR OFFICIAL USE ONLY

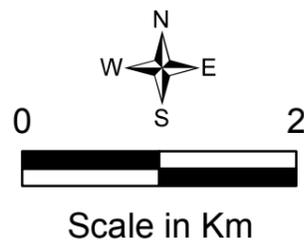
BHARUCH DISTRICT

SHEET NO. 46C09NE



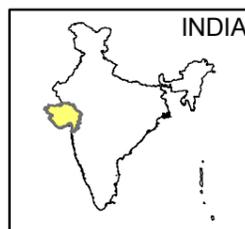
### Legend

- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

46B12 SW	46B12 SE	46B16 SW
46C09 NW		46C13 NW
46C09 SW	46C09 SE	46C13 SW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

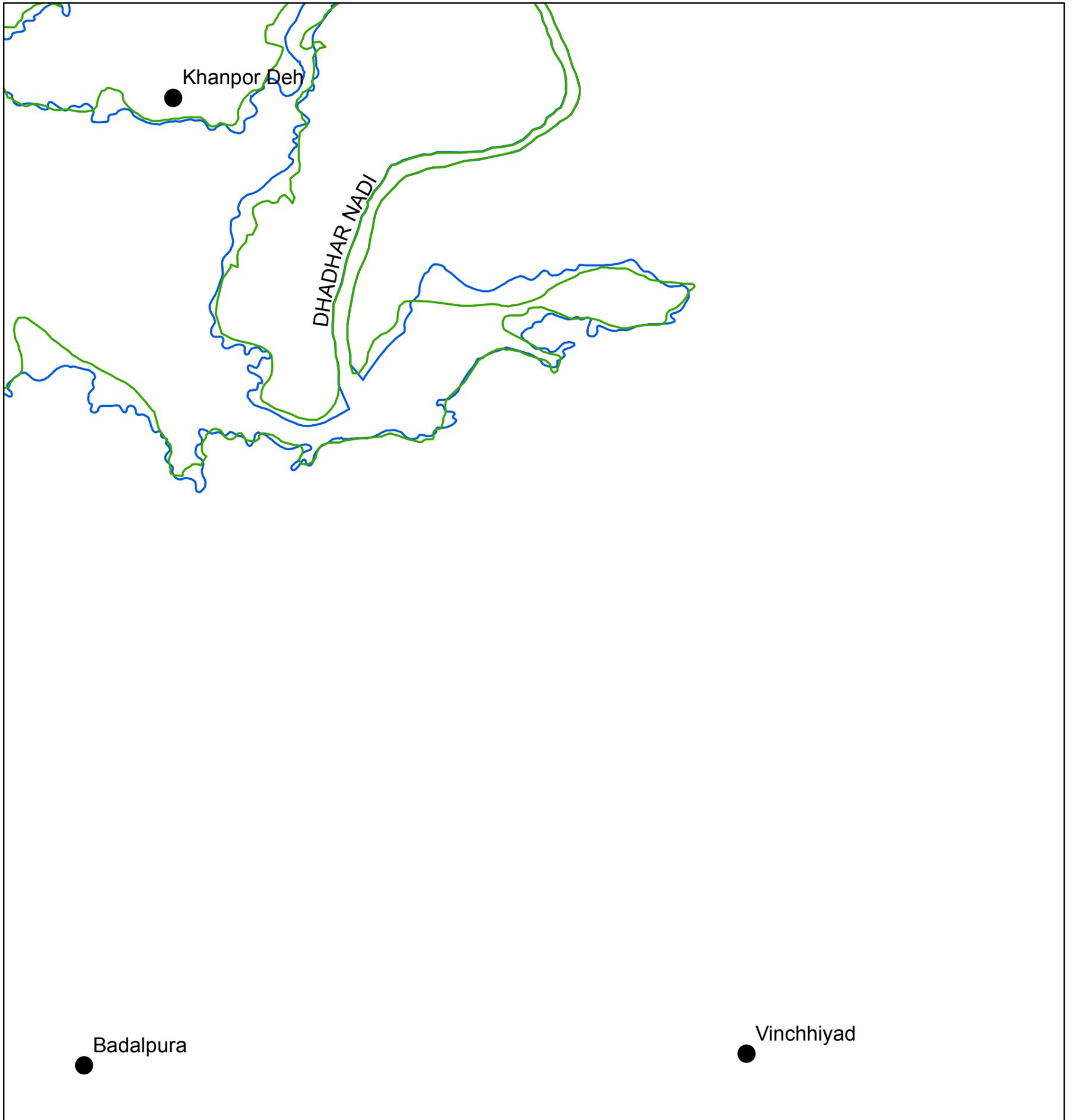
# SHORELINE CHANGE MAP

## GUJARAT

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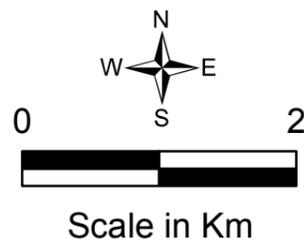
BHARUCH DISTRICT

SHEET NO. 46C13NW



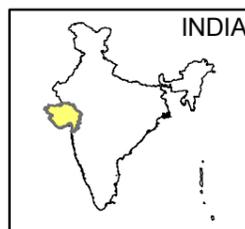
### Legend

- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



#### INDEX TO SHEETS

46B12 SE	46B16 SW	46B16 SE
46C09 NE		46C13 NE
46C09 SE	46C13 SW	46C13 SE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

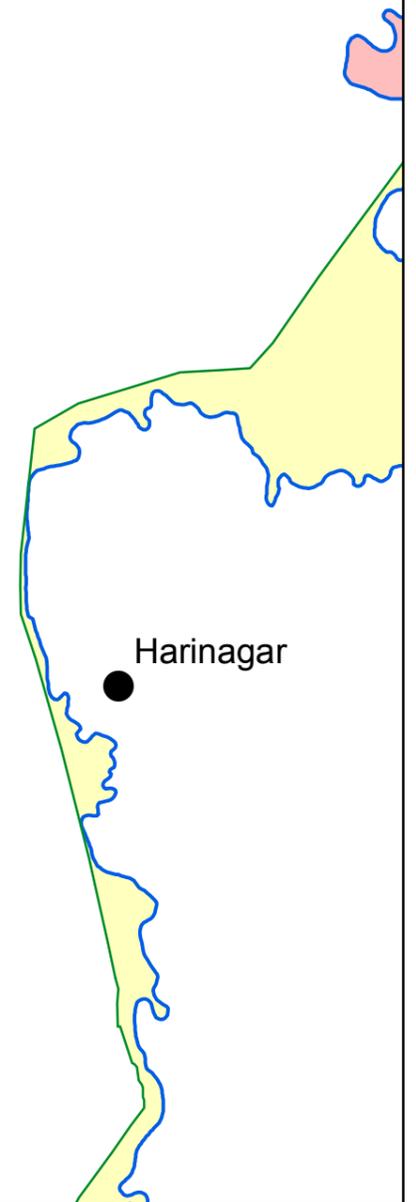
## GUJARAT

FOR OFFICIAL USE ONLY

BHARUCH DISTRICT

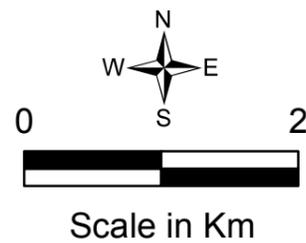
SHEET NO. 46C09SW

GULF OF KHAMBHAT



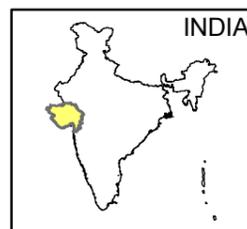
### Legend

- EROSION
- ACCRETION
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



INDEX TO SHEETS

SEA	46C09 NW	46C09 NE
SEA		46C09 SE
SEA	46C10 NW	46C10 NE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

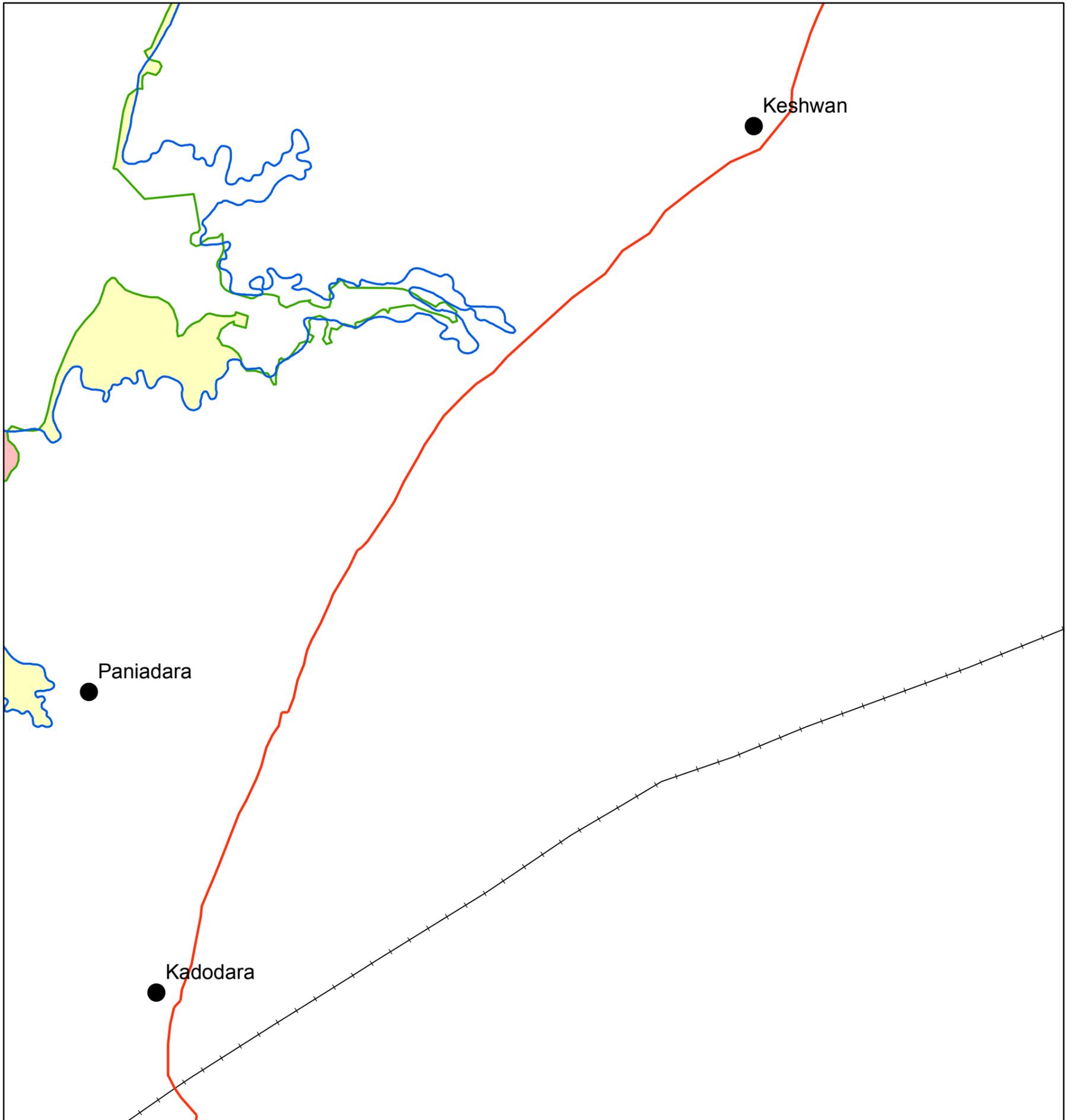
# SHORELINE CHANGE MAP

## GUJARAT

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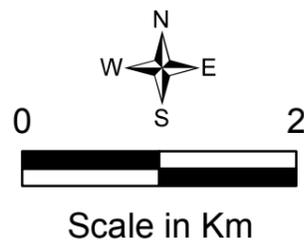
BHARUCH DISTRICT

SHEET NO. 46C09SE



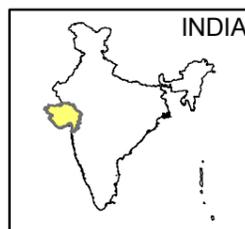
### Legend

- EROSION
- ACCRETION
- ROAD
- RAIL
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



#### INDEX TO SHEETS

46C09 NW	46C09 NE	46C13 NW
46C09 SW		46C13 SW
46C10 NW	46C10 NE	46C14 NW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

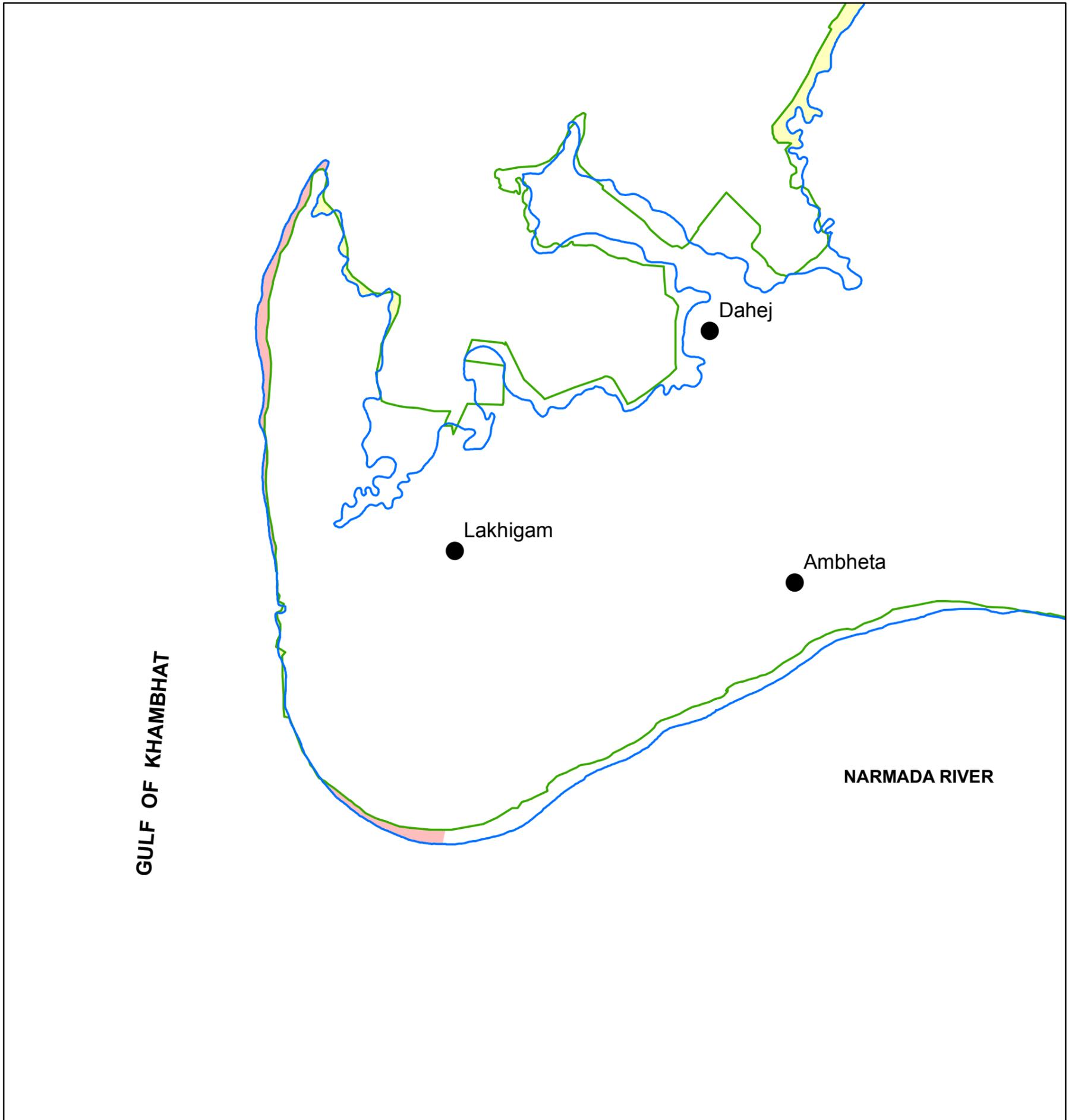
# SHORELINE CHANGE MAP

## GUJARAT

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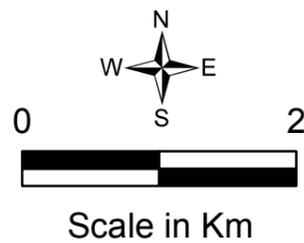
BHARUCH DISTRICT

SHEET NO. 46C10NW



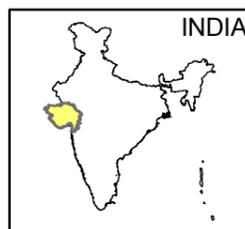
### Legend

- EROSION
- ACCRETION
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



#### INDEX TO SHEETS

SEA	46C09 SW	46C09 SE
SEA		46C10 NE
SEA	46C10 SW	46C10 SE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

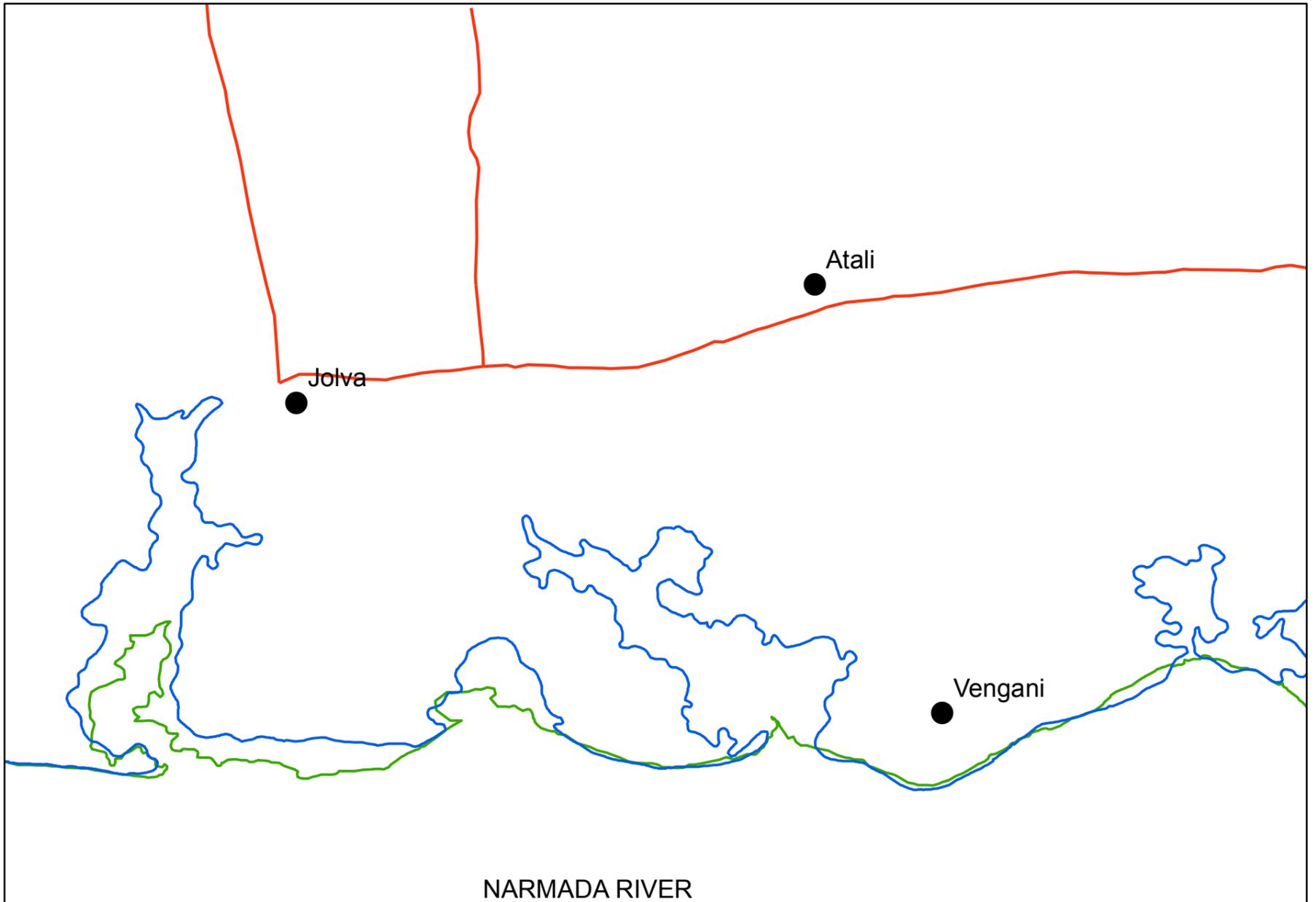
# SHORELINE CHANGE MAP

## GUJARAT

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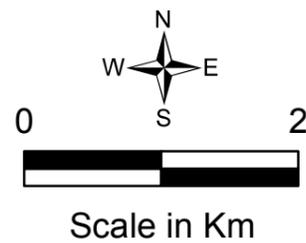
BHARUCH DISTRICT

SHEET NO. 46C10NE



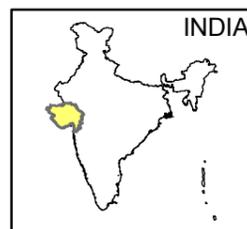
### Legend

-  ROAD
-  HIGH-TIDE LINE 2004-06
-  HIGH-TIDE LINE 1989-91
-  HABITATION



### INDEX TO SHEETS

46C09 SW	46C09 SE	46C13 SW
46C10 NW		46C14 NW
46C10 SW	46C10 SE	46C14 SW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

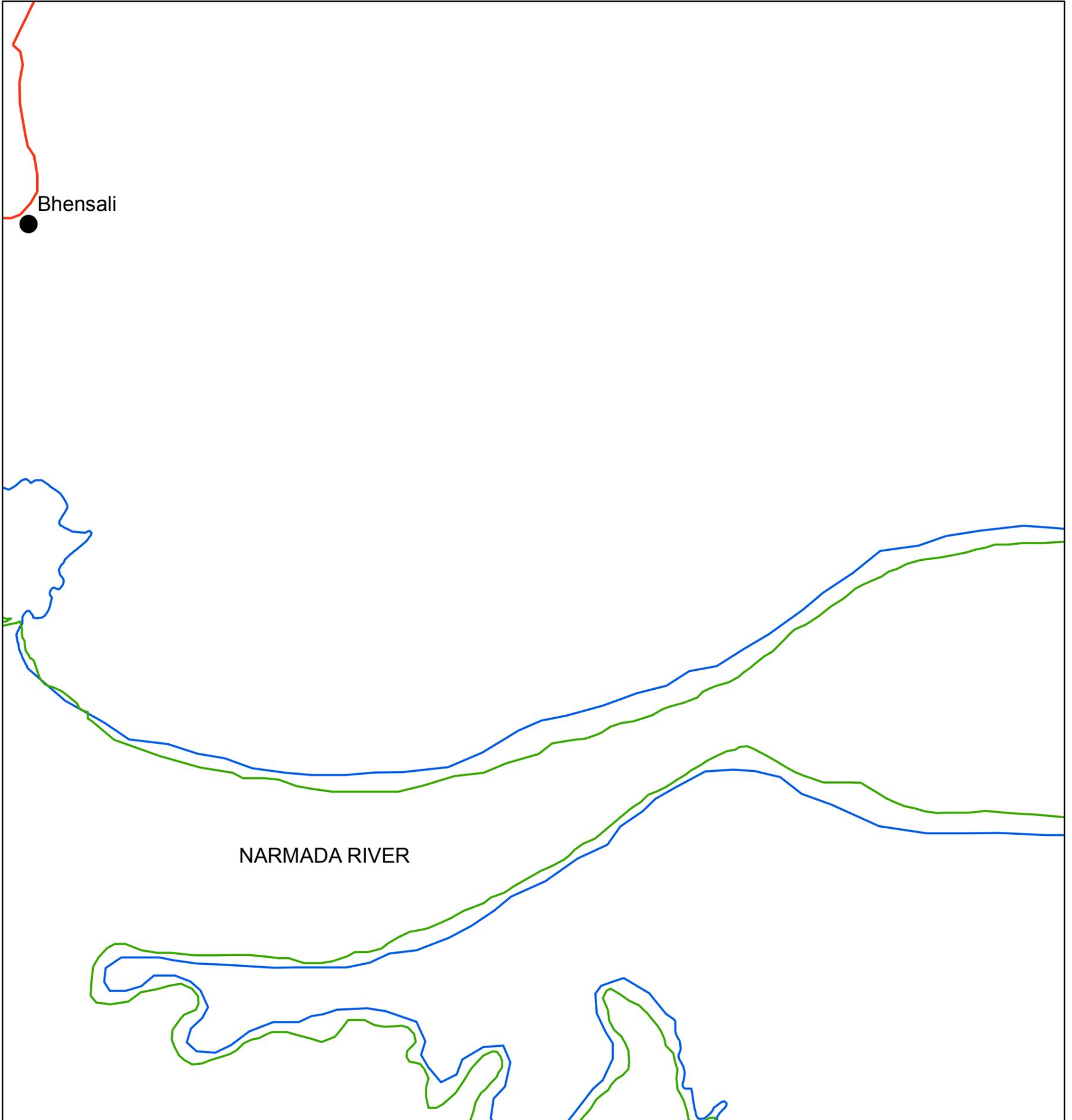
# SHORELINE CHANGE MAP

## GUJARAT

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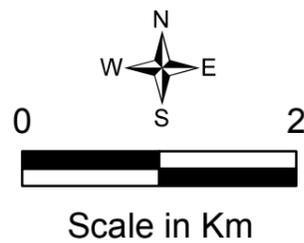
BHARUCH DISTRICT

SHEET NO. 46C14NW



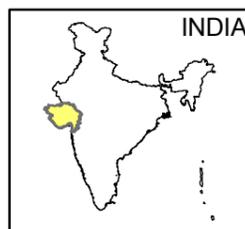
### Legend

- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



#### INDEX TO SHEETS

46C09 SE	46C13 SW	46C13 SE
46C10 NE		46C14 NE
46C10 SE	46C14 SW	46C14 SE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

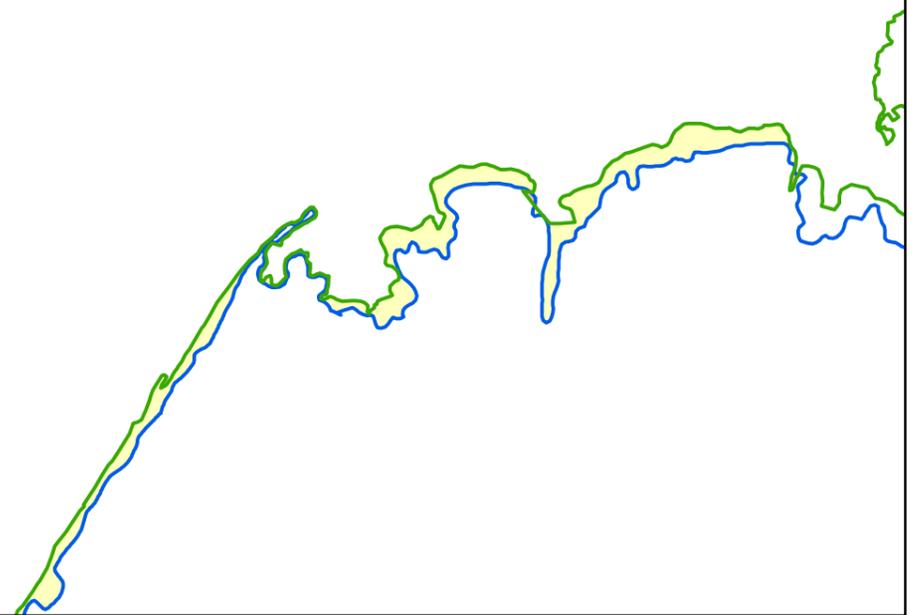
## GUJARAT

FOR OFFICIAL USE ONLY

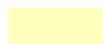
BHARUCH DISTRICT

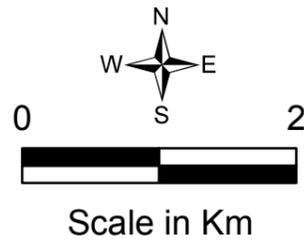
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GULF OF KAMBHAT



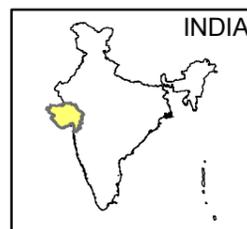
### Legend

-  ACCRETION
-  HIGH-TIDE LINE 2004-06
-  HIGH-TIDE LINE 1989-91



### INDEX TO SHEETS

46C10 NW	46C10 NE	46C14 NW
46C10 SW		46C14 SW
SEA	46C11 NE	46C15 NW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

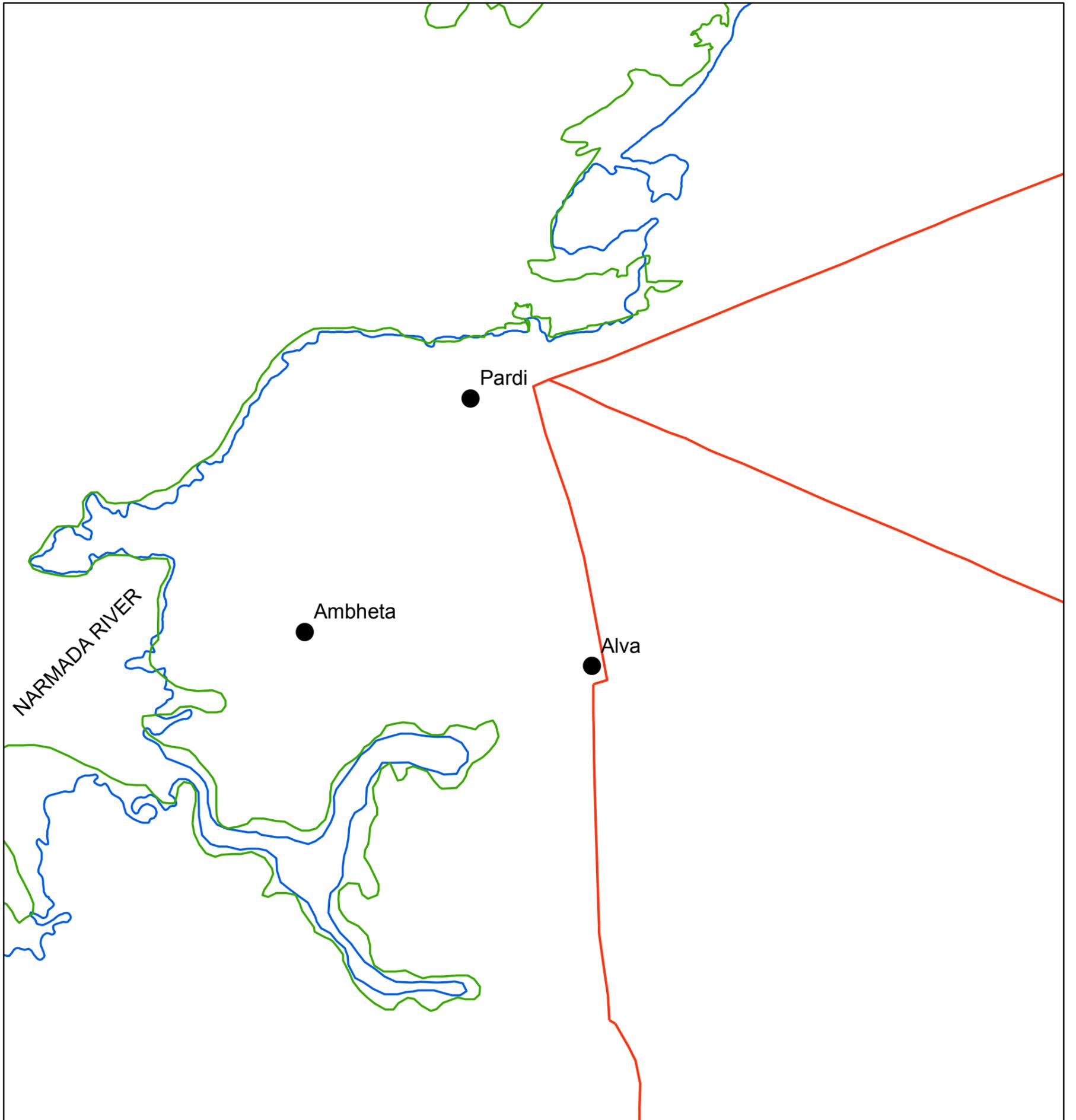
# SHORELINE CHANGE MAP

## GUJARAT

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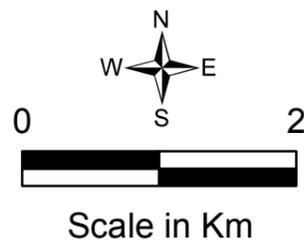
BHARUCH DISTRICT

SHEET NO. 46C14SW



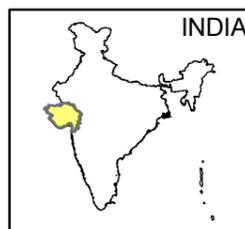
### Legend

- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



#### INDEX TO SHEETS

46C10 NE	46C14 NW	46C14 NE
46C10 SE		46C14 SE
46C11 NE	46C15 NW	46C15 NE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

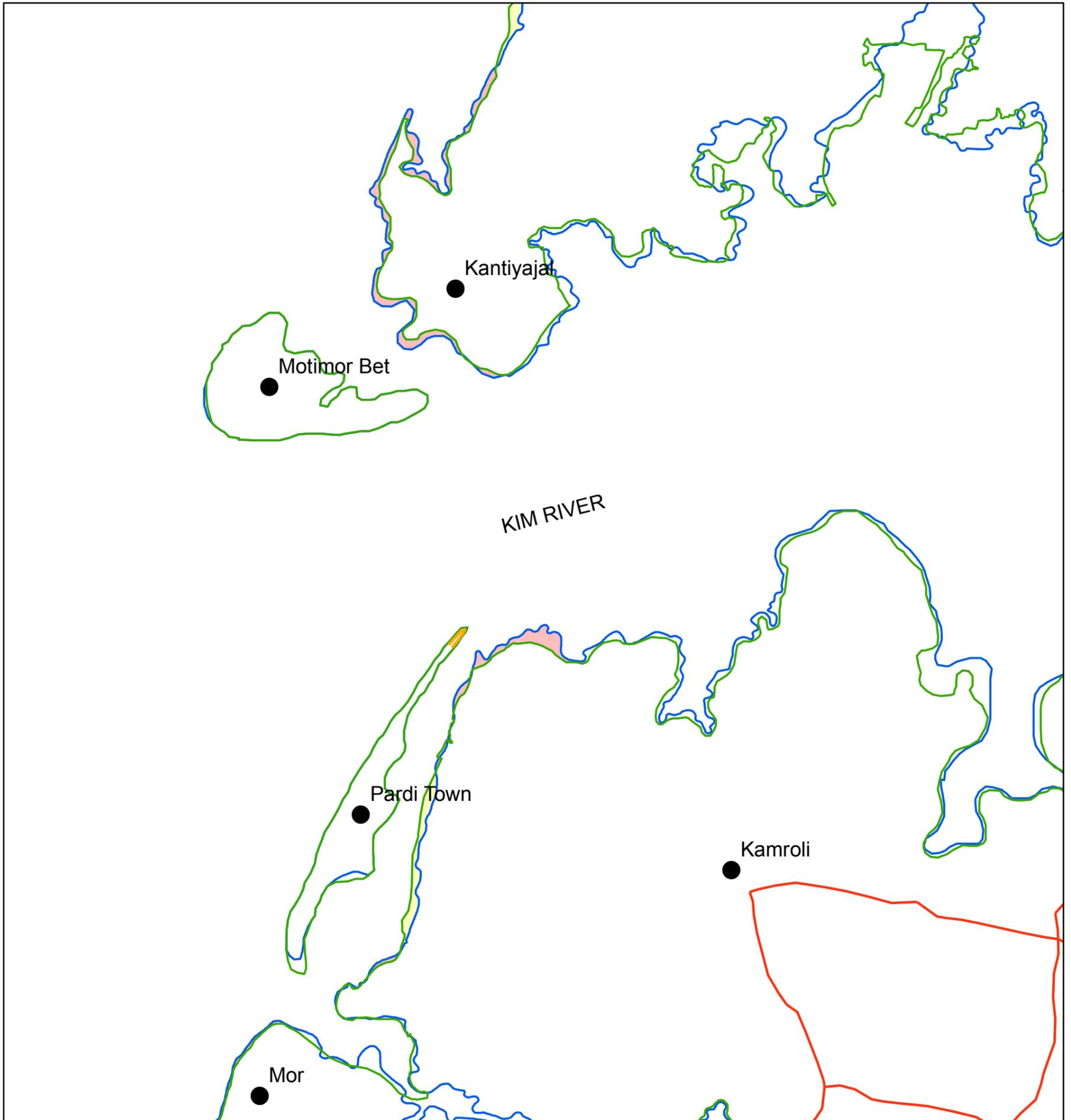
# SHORELINE CHANGE MAP

## GUJARAT

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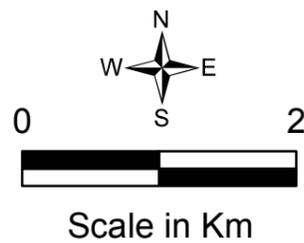
SURAT DISTRICT

SHEET NO. 46C11NE



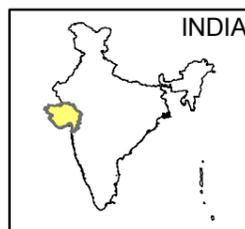
### Legend

- EROSION
- ACCRETION
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION
- SEA WALL



### INDEX TO SHEETS

SEA	46C10 SE	46C14 SW
SEA		46C15 NW
46C11 SW	46C11 SE	46C15 SW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

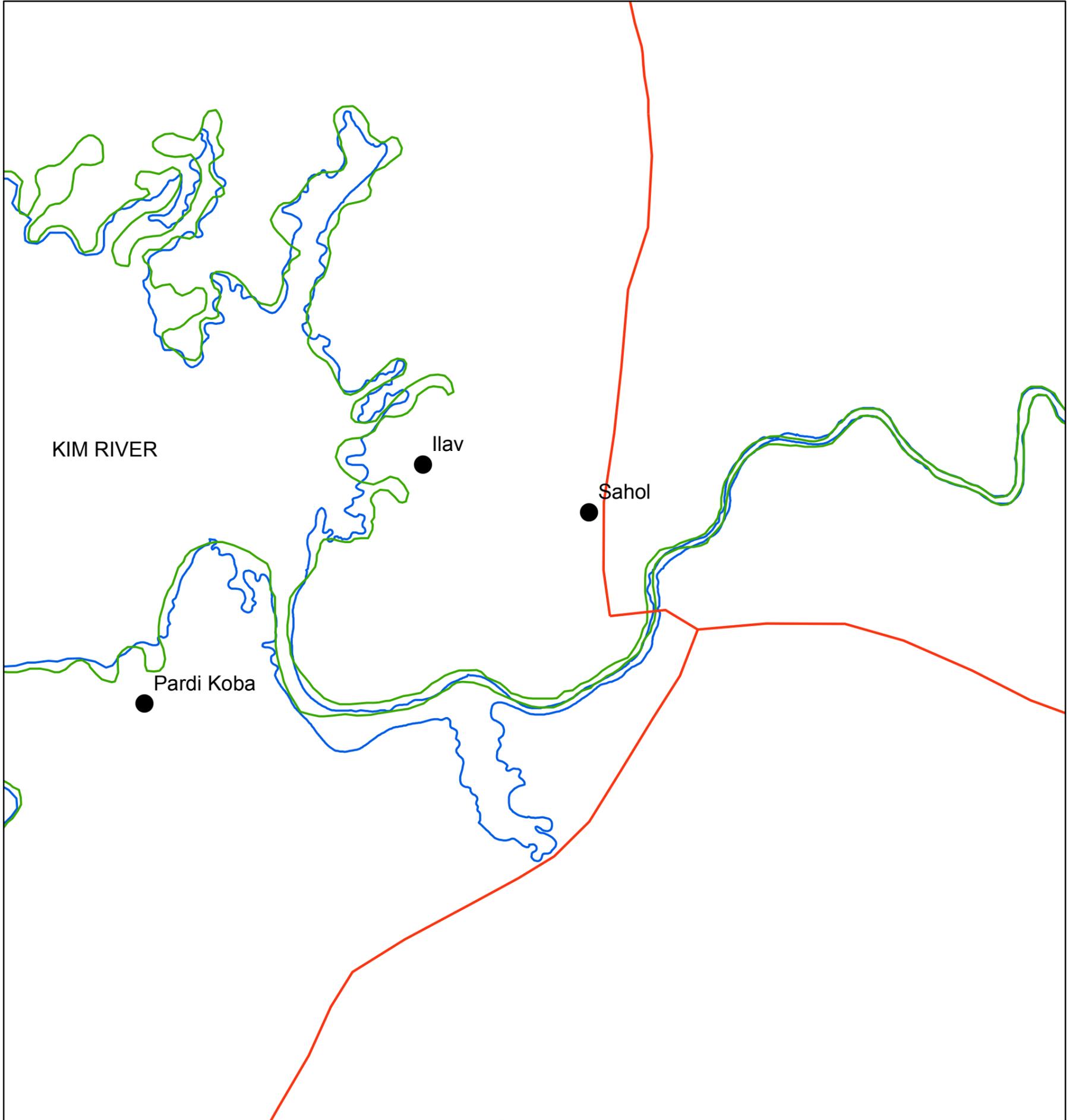
# SHORELINE CHANGE MAP

## GUJARAT

FOR OFFICIAL USE ONLY

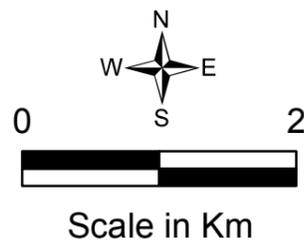
SURAT DISTRICT

SHEET NO. 46C15NW



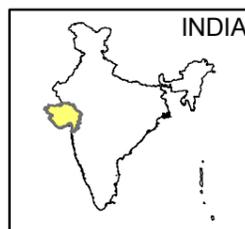
### Legend

- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

46C10 SE	46C14 SW	46C14 SE
46C11 NE		46C15 NE
46C11 SE	46C15 SW	46C15 SE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

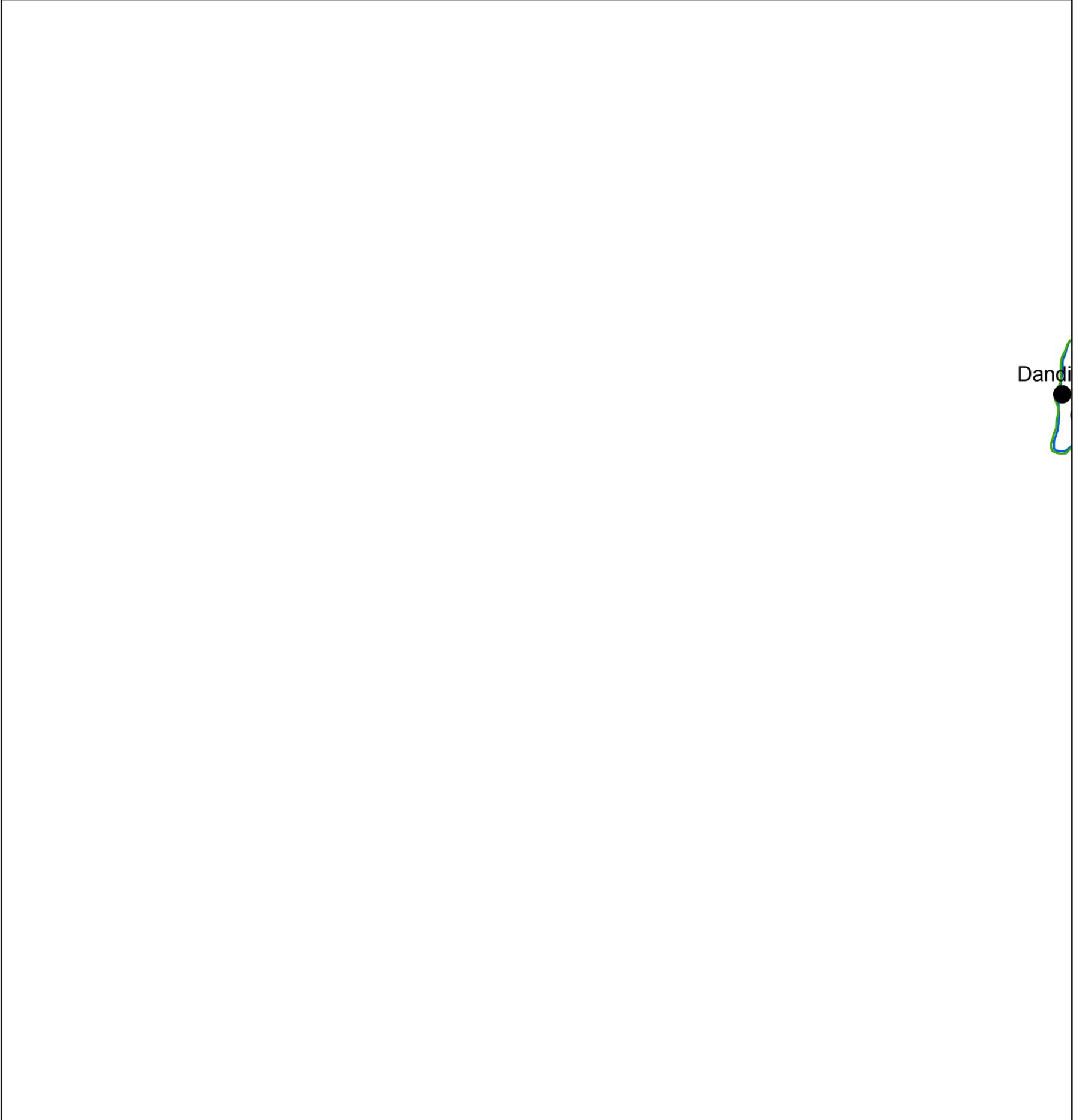
# SHORELINE CHANGE MAP

## GUJARAT

FOR OFFICIAL USE ONLY

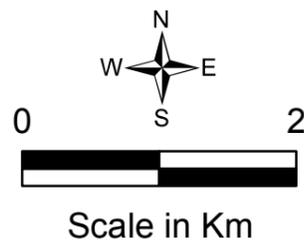
SURAT DISTRICT

SHEET NO. 46C11SW



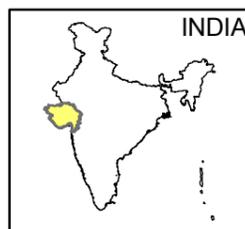
### Legend

-  HIGH-TIDE LINE 2004-06
-  HIGH-TIDE LINE 1989-91
-  HABITATION



### INDEX TO SHEETS

SEA	SEA	46C11 NE
SEA		46C11 SE
SEA	SEA	46C12 NE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

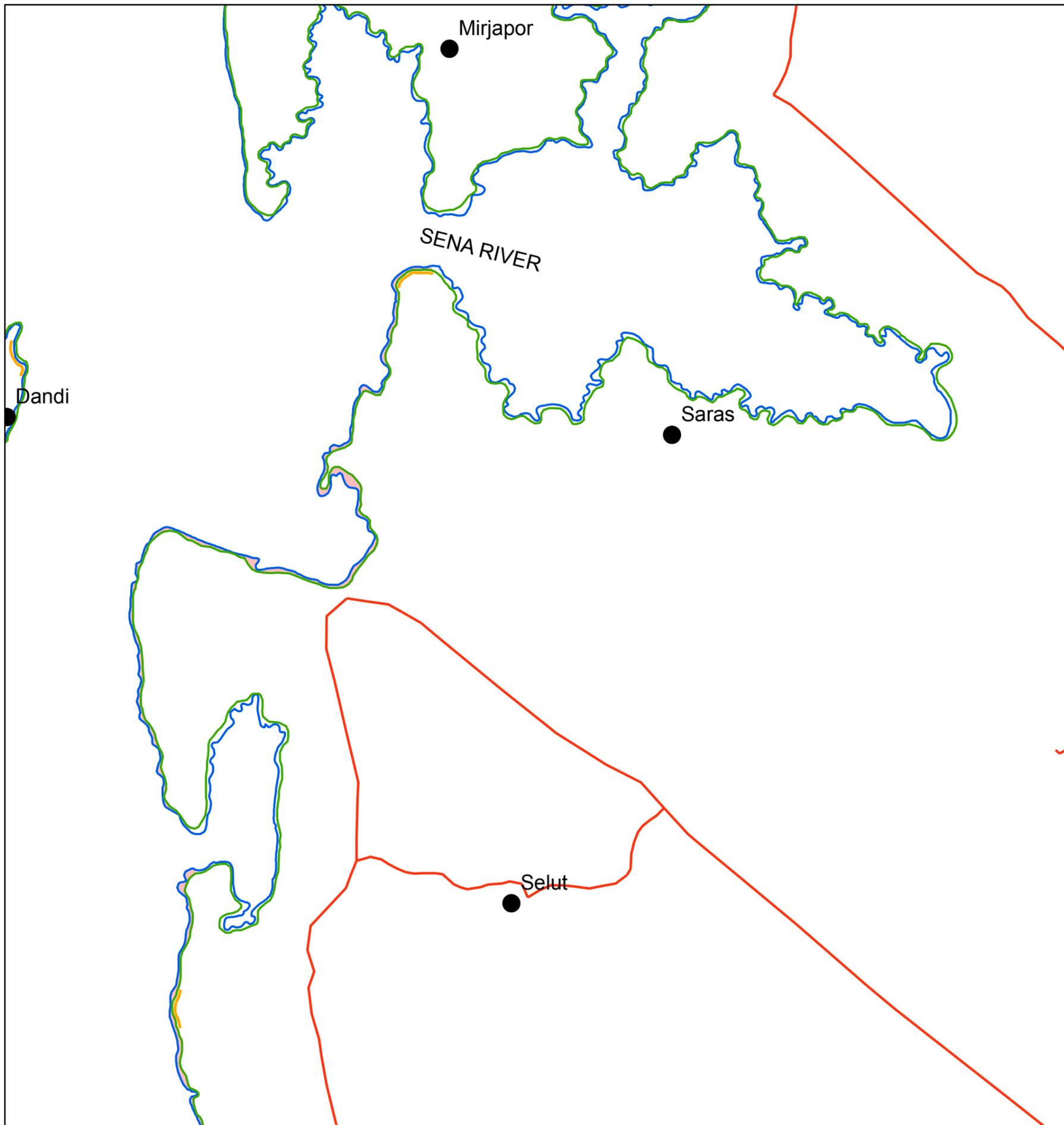
# SHORELINE CHANGE MAP

## GUJARAT

FOR OFFICIAL USE ONLY

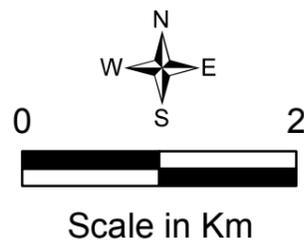
SURAT DISTRICT

SHEET NO. 46C11SE



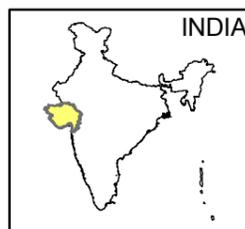
### Legend

- EROSION
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION
- SEA WALL



#### INDEX TO SHEETS

SEA	46C11 NE	46C15 NW
46C11 SW		46C15 SW
46C12 NW	46C12 NE	46C16 NW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

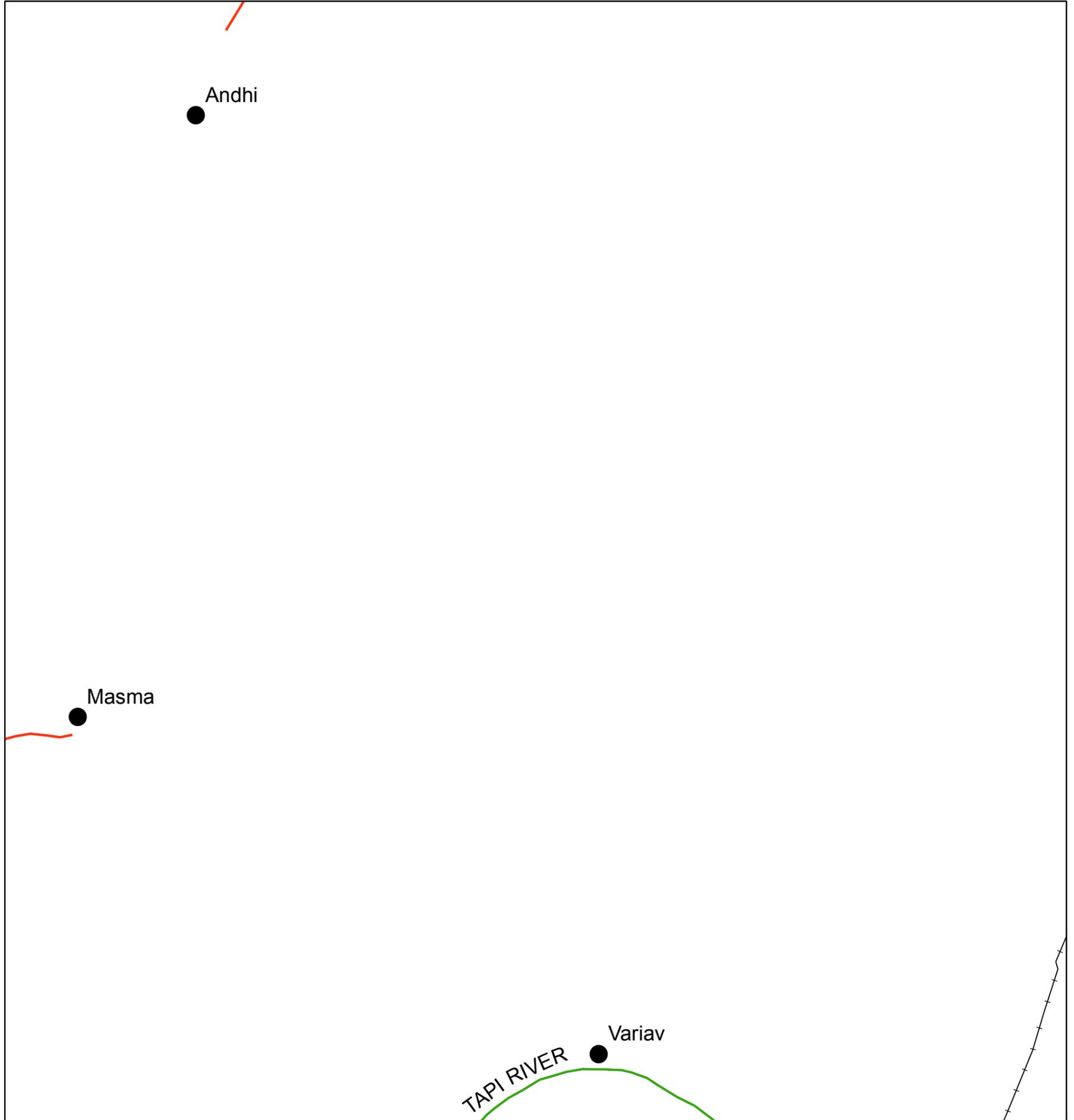
# SHORELINE CHANGE MAP

## GUJARAT

FOR OFFICIAL USE ONLY

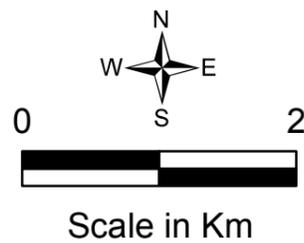
SURAT DISTRICT

SHEET NO. 46C15SW



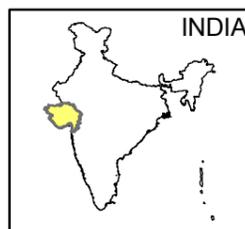
### Legend

-  ROAD
-  RAIL
-  HIGH-TIDE LINE 2004-06
-  HIGH-TIDE LINE 1989-91
-  HABITATION



### INDEX TO SHEETS

46C11NE	46C15NW	46C15 NE
46C11SE		46C15 SE
46C12NE	46C16 NW	46C16 NE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

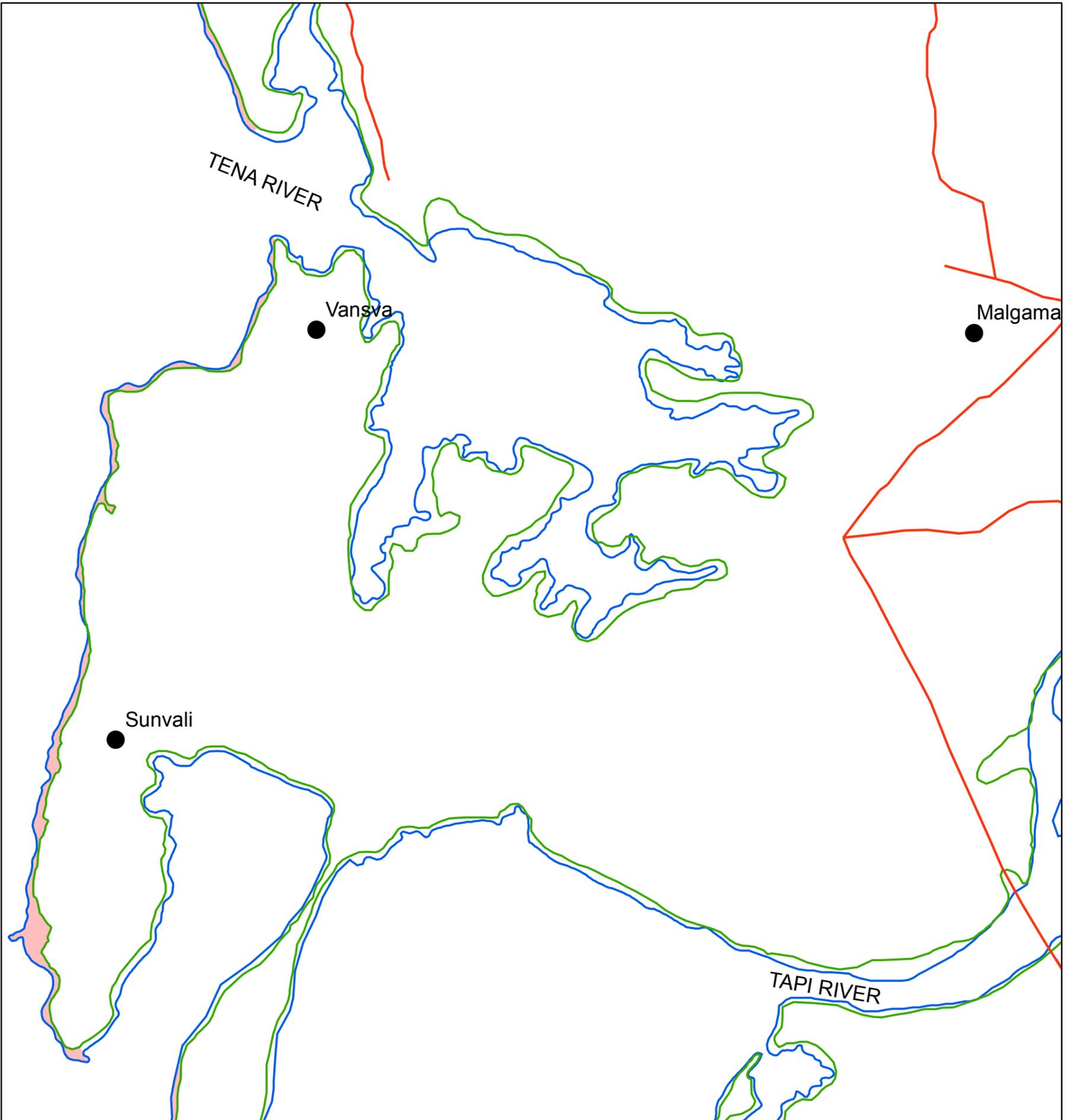
# SHORELINE CHANGE MAP

## GUJARAT

FOR OFFICIAL USE ONLY

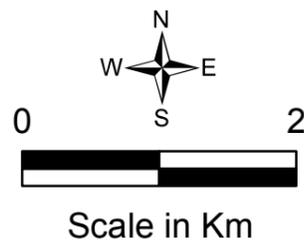
SURAT DISTRICT

SHEET NO. 46C12NE



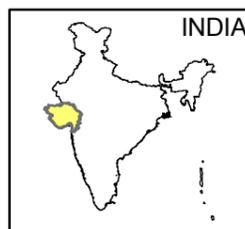
### Legend

- EROSION
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



#### INDEX TO SHEETS

46C11 SW	46C11 SE	46C15 SW
SEA		46C16 NW
SEA	46C12 SE	46C16 SW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

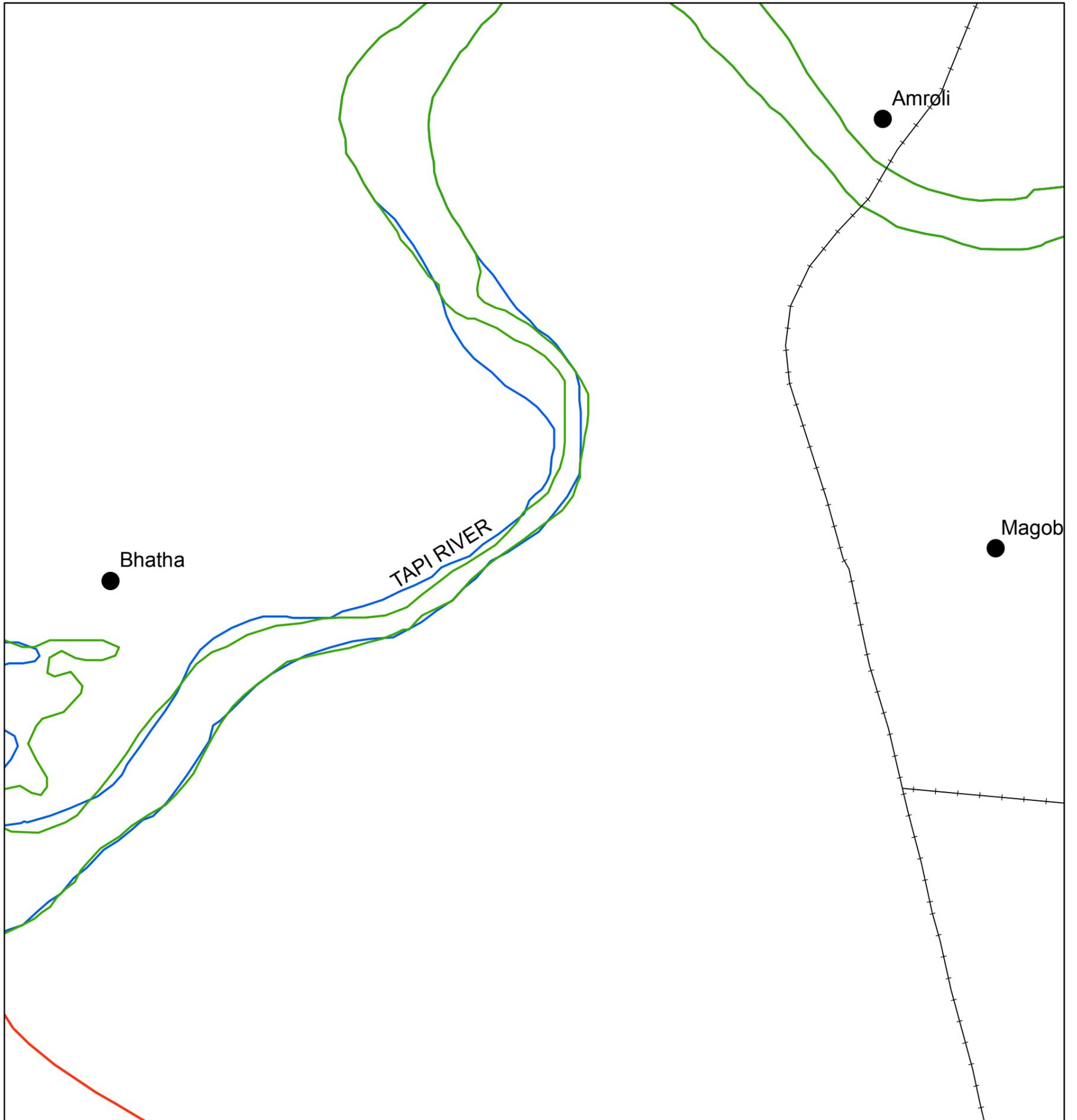
# SHORELINE CHANGE MAP

## GUJARAT

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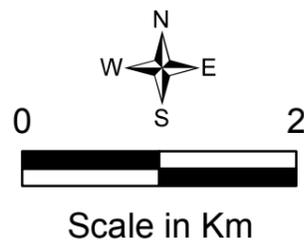
SURAT DISTRICT

SHEET NO. 46C16NW



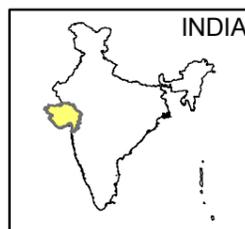
### Legend

- ROAD
- + -+ RAIL
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



#### INDEX TO SHEETS

46C11 SE	46C15 SW	46C15 SE
46C12 NE		46C16 NE
46C12 SE	46C16 SW	46C16 SE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

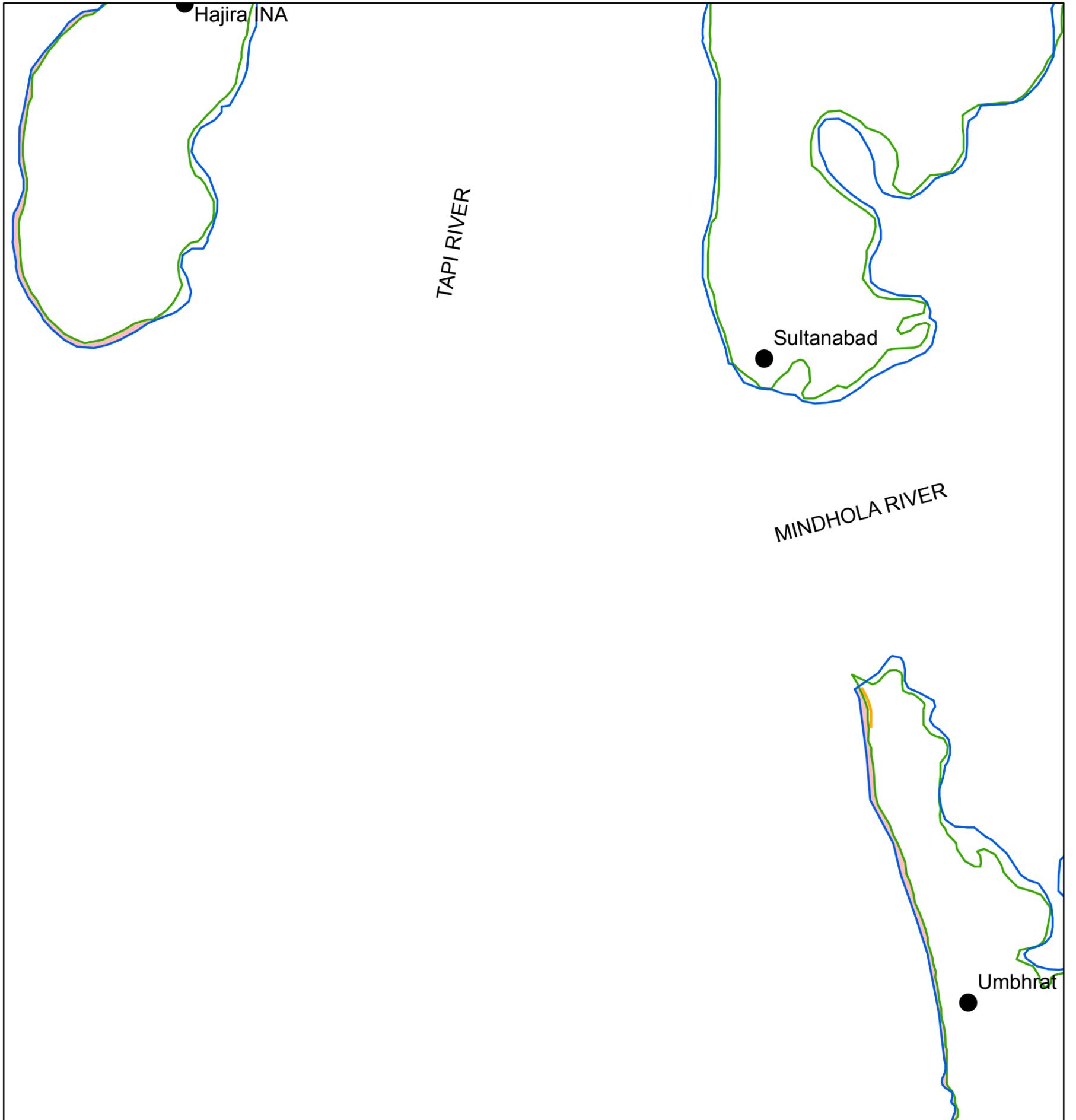
# SHORELINE CHANGE MAP

## GUJARAT

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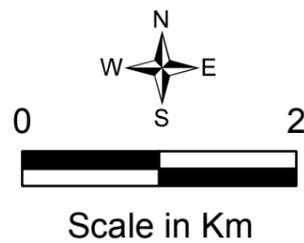
SURAT DISTRICT

SHEET NO. 46C12SE



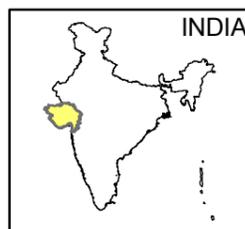
### Legend

- EROSION
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION
- SEA WALL



#### INDEX TO SHEETS

46C12 NW	46C12 NE	46C16 NW
46C12 SW		46C16 SW
SEA	46D09 NE	46D13 NW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
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AND CENTRAL WATER COMMISSION, NEW DELHI

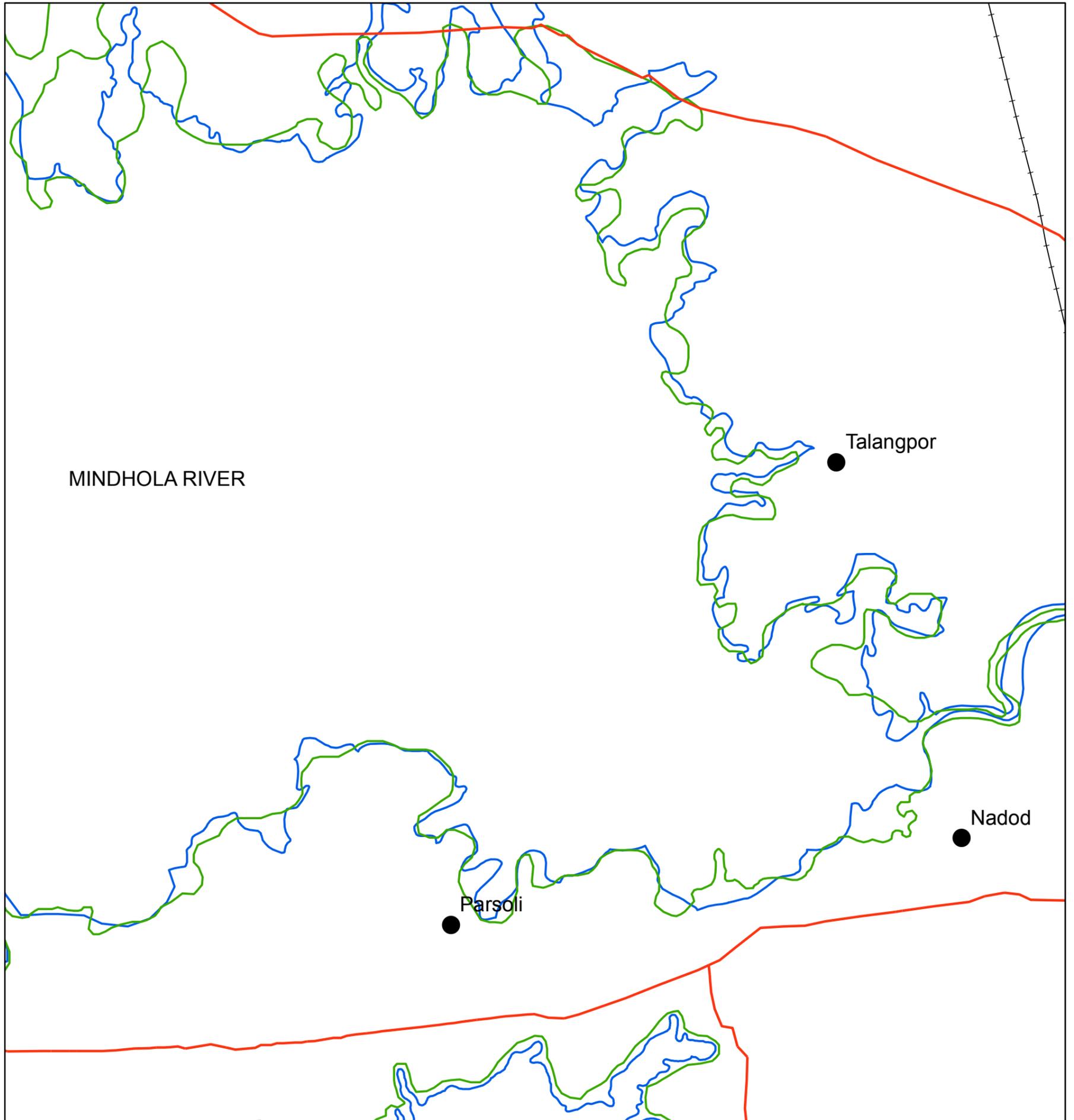
# SHORELINE CHANGE MAP

## GUJARAT

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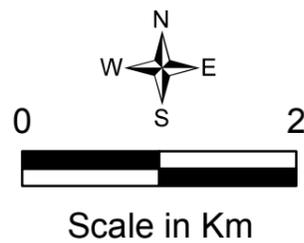
SURAT DISTRICT

SHEET NO. 46C16SW



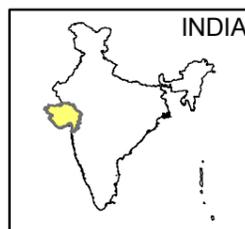
### Legend

- ROAD
- + + + RAIL
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

46C12 NE	46C16 NW	46C16 NE
46C12 SE		46C16 SE
46D09 NE	46D13 NW	46D13 NE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

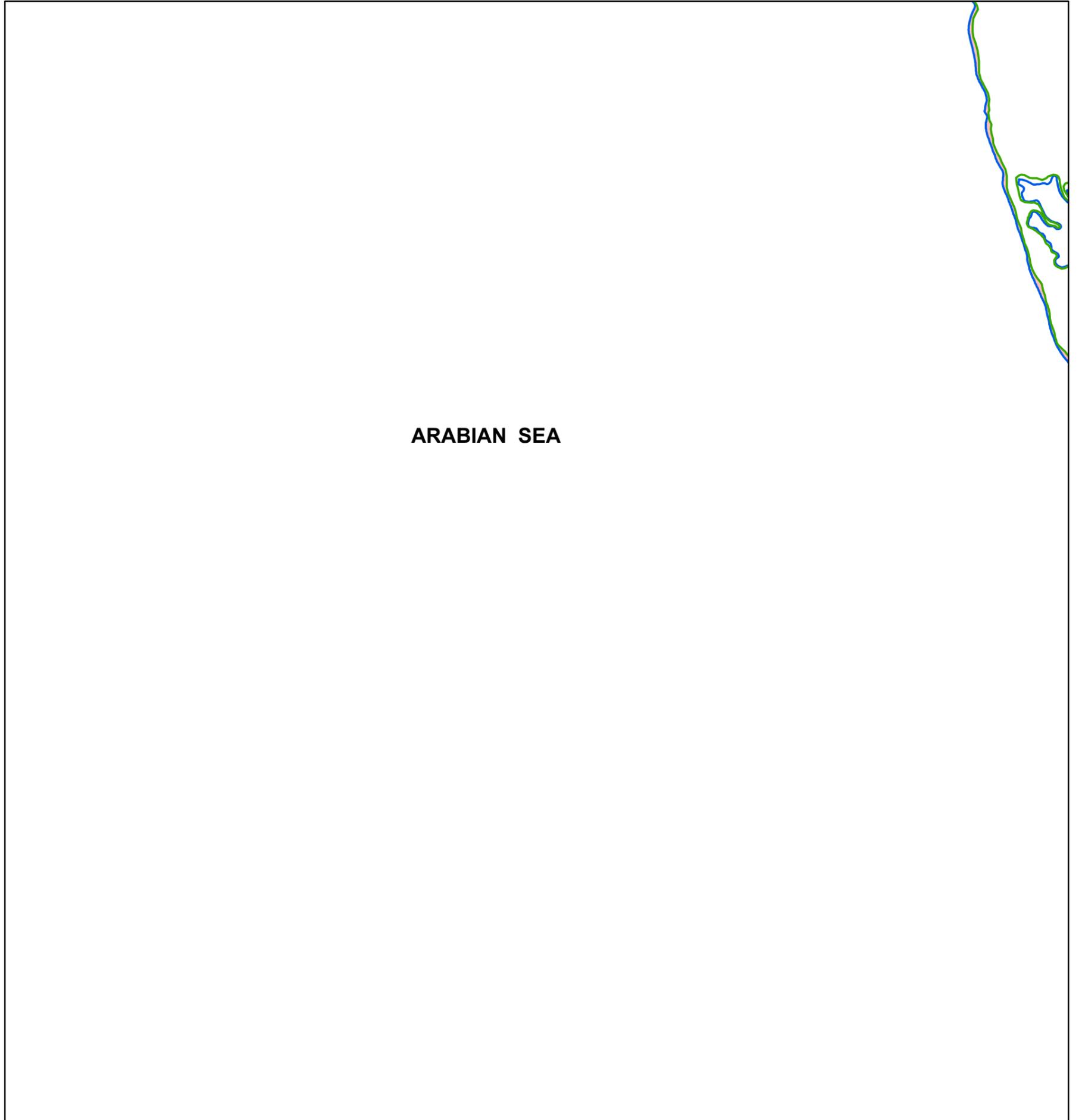
# SHORELINE CHANGE MAP

## GUJARAT

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NAVSARI DISTRICT

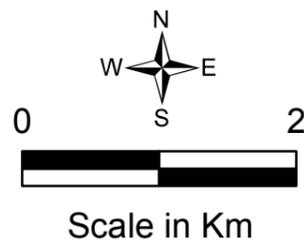
SHEET NO. 46D09NE



ARABIAN SEA

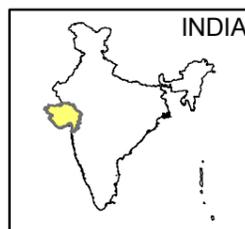
### Legend

- EROSION
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91



#### INDEX TO SHEETS

46C12 SW	46C12 SE	46C16 SW
SEA		46D13 NW
SEA	SEA	46D13 SW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

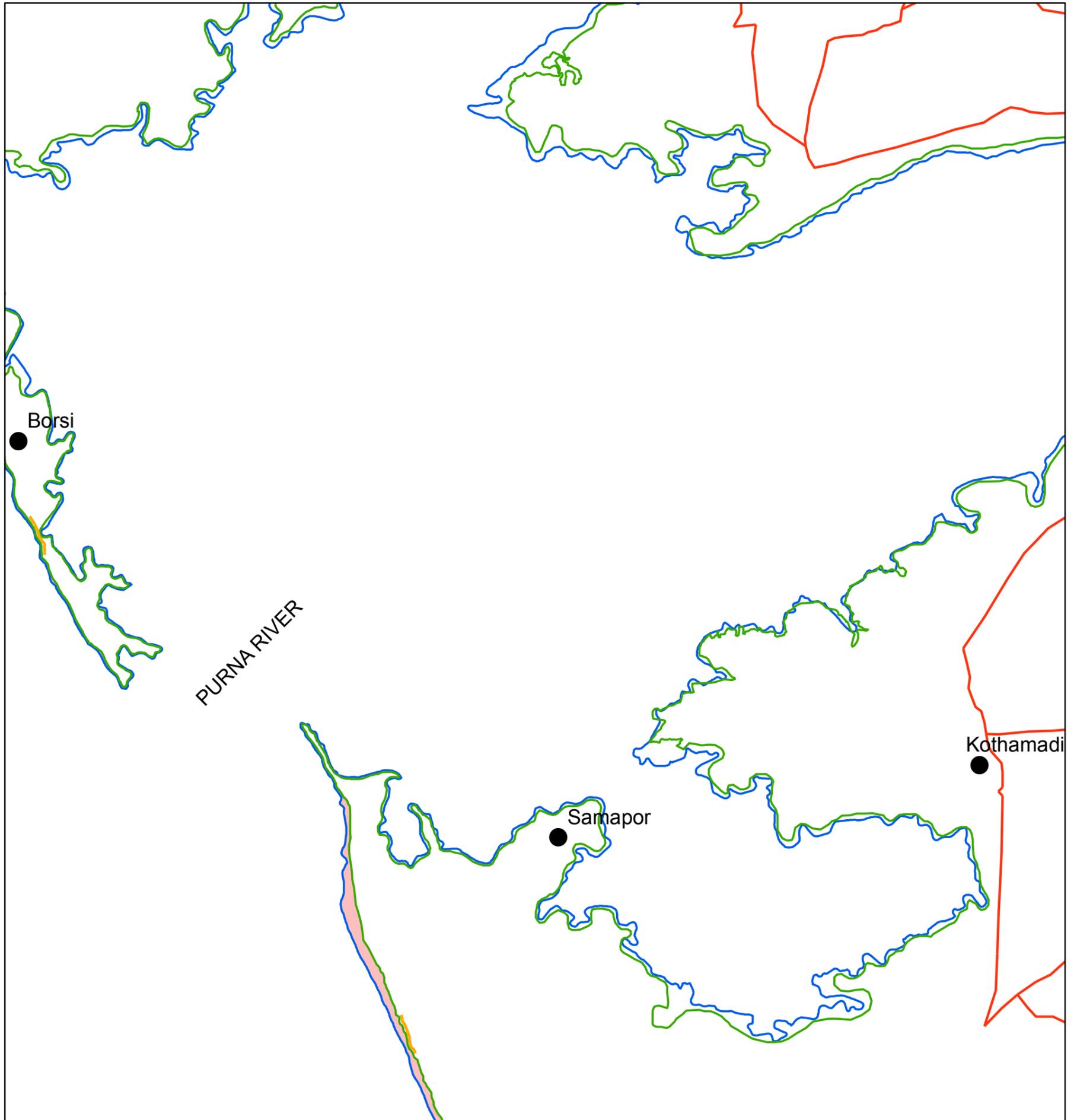
# SHORELINE CHANGE MAP

## GUJARAT

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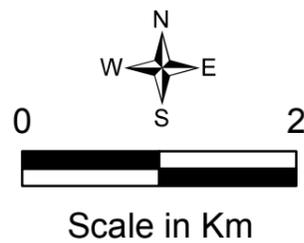
NAVSARI DISTRICT

SHEET NO. 46D13NW



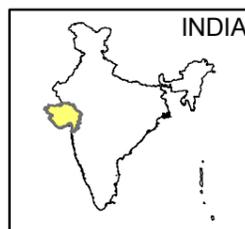
### Legend

- EROSION
- ROAD
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION
- SEA WALL



#### INDEX TO SHEETS

46C12 SE	46C16 SW	46C16 SE
46D09 NE		46D13 NE
SEA	46D13 SW	46D13 SE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

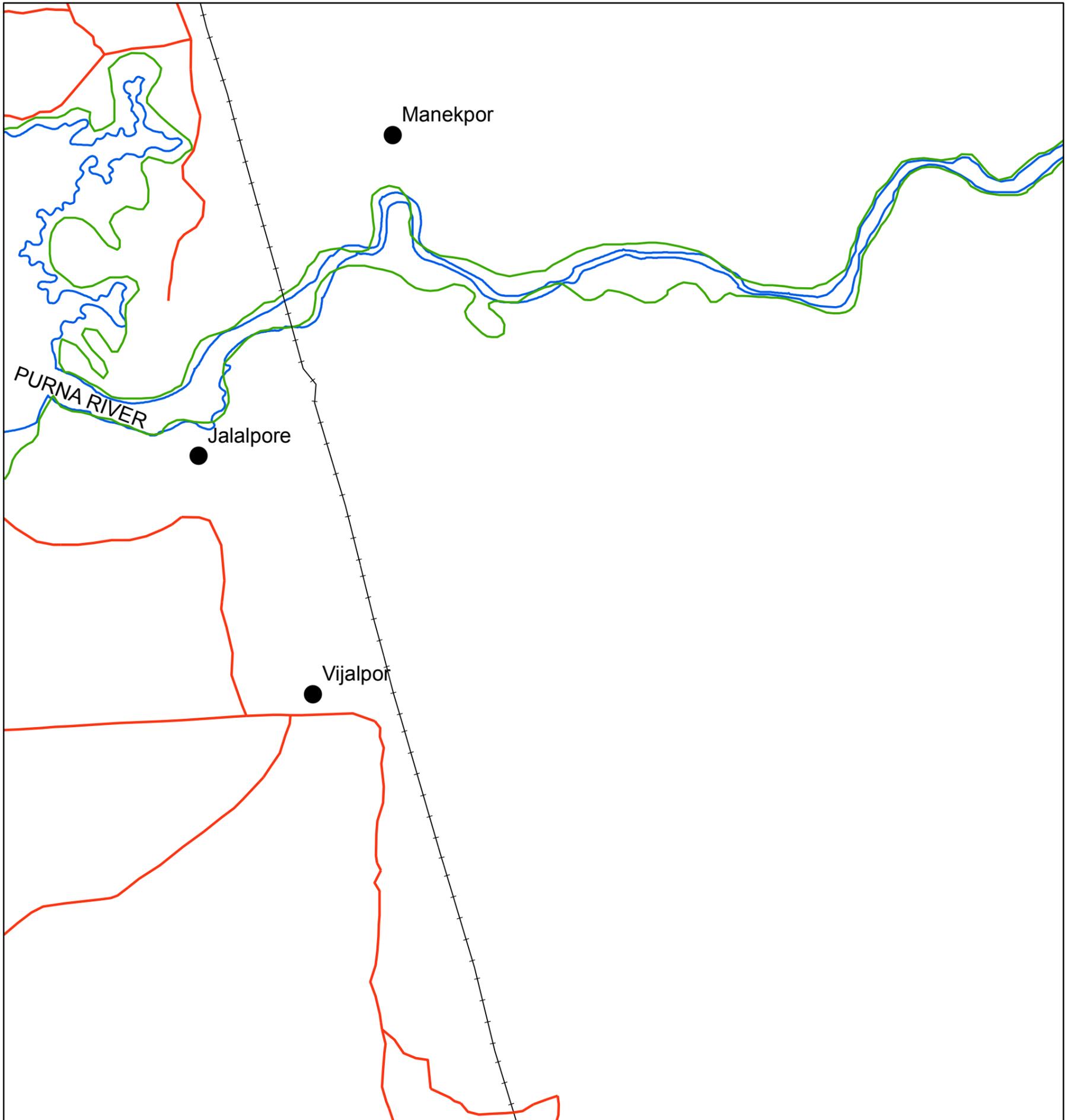
# SHORELINE CHANGE MAP

## GUJARAT

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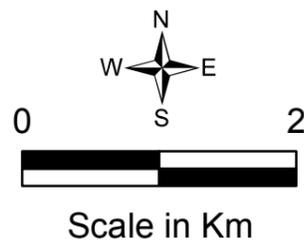
SHEET NO. 46D13NE

NAVSARI DISTRICT



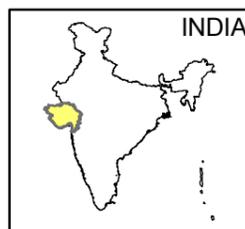
### Legend

- ROAD
- - - RAIL
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



INDEX TO SHEETS

46C16 SW	46C16 SE	46G04 SW
46D13 NW		46H01 NW
46D13 SW	46D13 SE	46H01 SW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

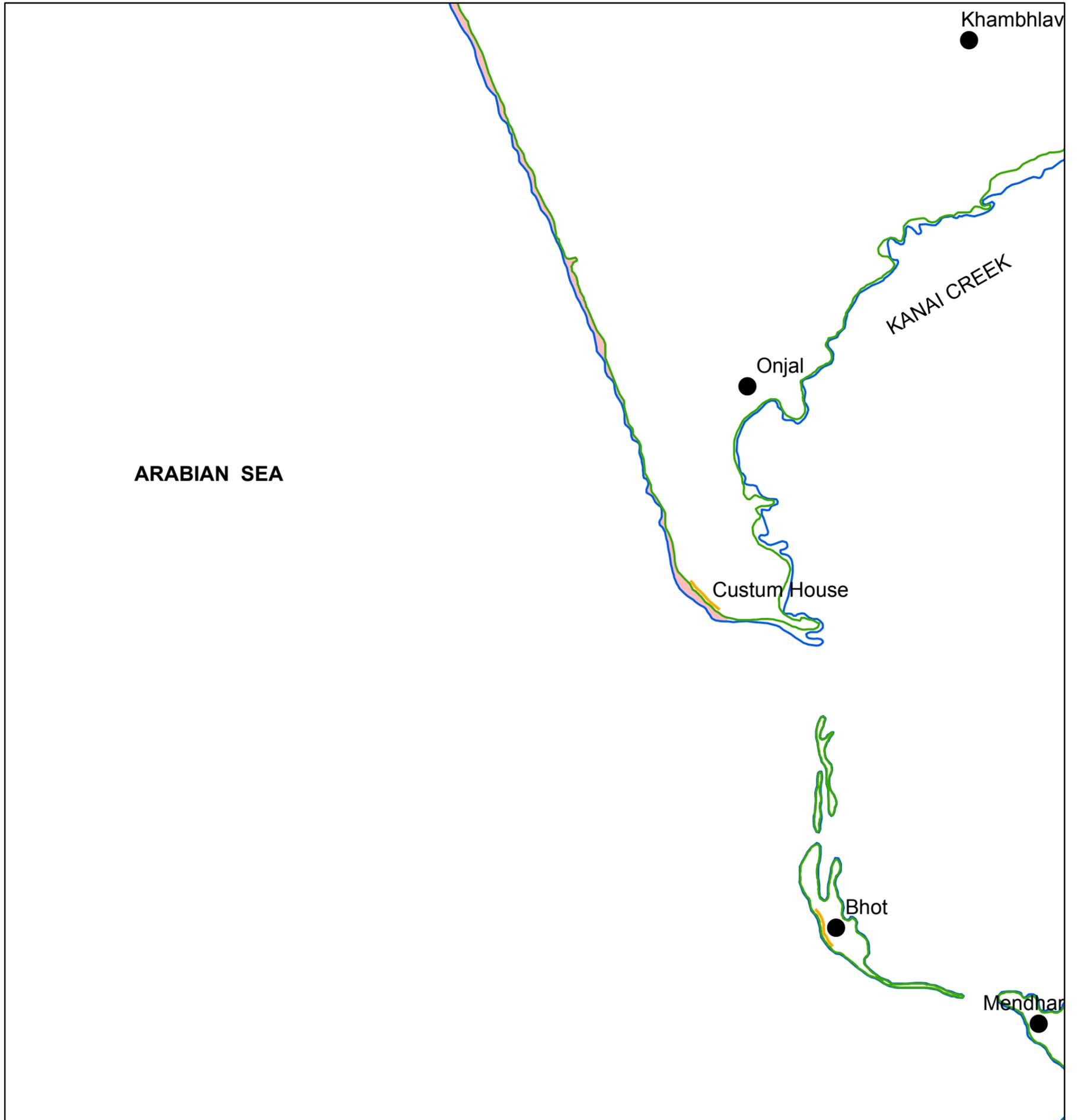
# SHORELINE CHANGE MAP

## GUJARAT

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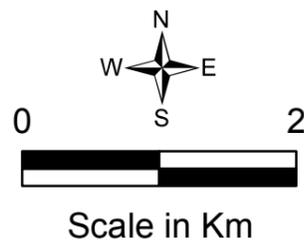
NAVSARI DISTRICT

SHEET NO. 46D13SW



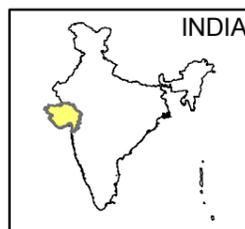
### Legend

- EROSION
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION
- SEA WALL



#### INDEX TO SHEETS

46D09 NE	46D13 NW	46D13 NE
SEA		46D13 SE
SEA	46D14 NW	46D14 NE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

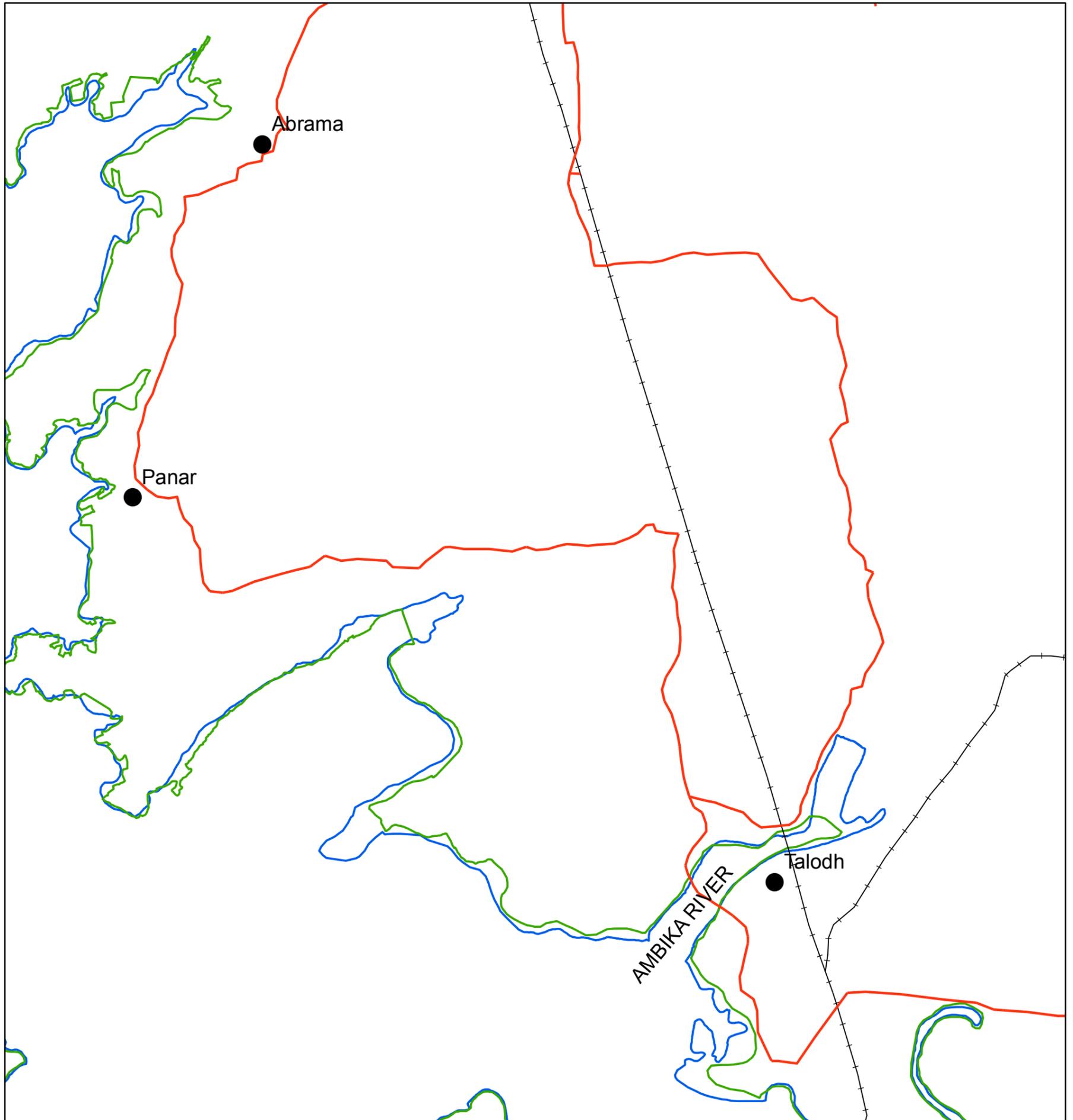
# SHORELINE CHANGE MAP

## GUJARAT

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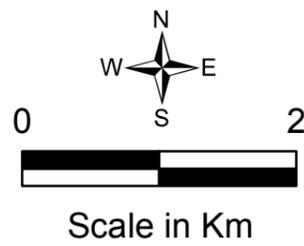
NAVSARI DISTRICT

SHEET NO. 46D13SE



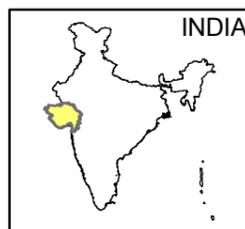
### Legend

- ROAD
- RAIL
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



#### INDEX TO SHEETS

46D13 NW	46D13 NE	46H01 NW
46D13 SW		46H01 SW
46D14 NW	46D14 NE	46H02 NW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

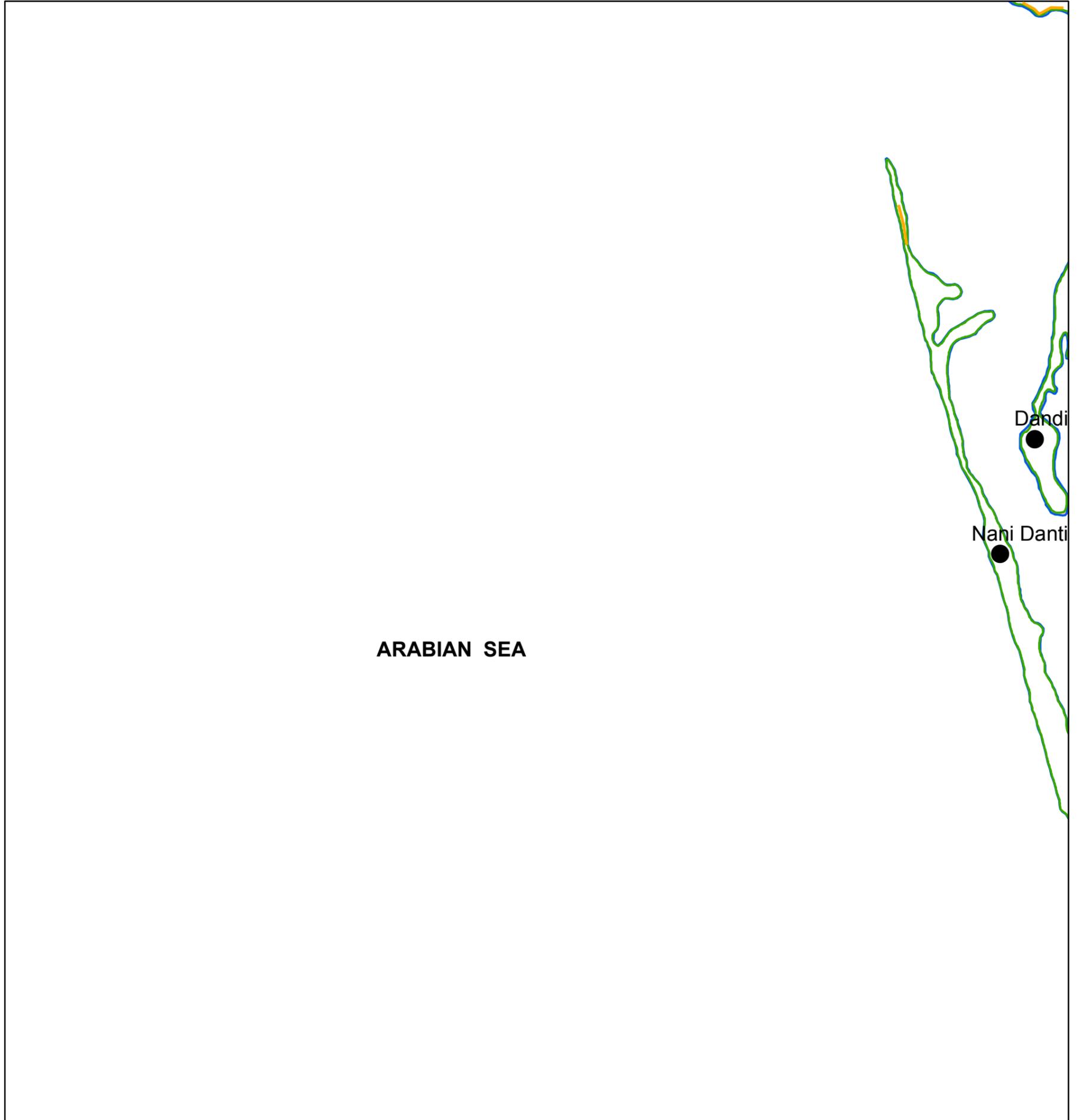
# SHORELINE CHANGE MAP

## GUJARAT

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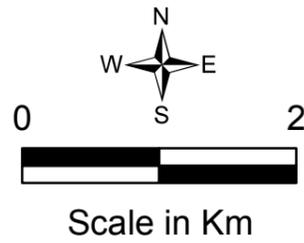
VALSAD DISTRICT

SHEET NO. 46D14NW



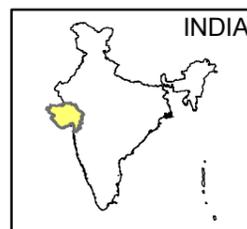
### Legend

- EROSION
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION
- SEA WALL



#### INDEX TO SHEETS

SEA	46D13 SW	46D13 SE
SEA		46D14 NE
SEA	46D14 SW	46D14 SE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

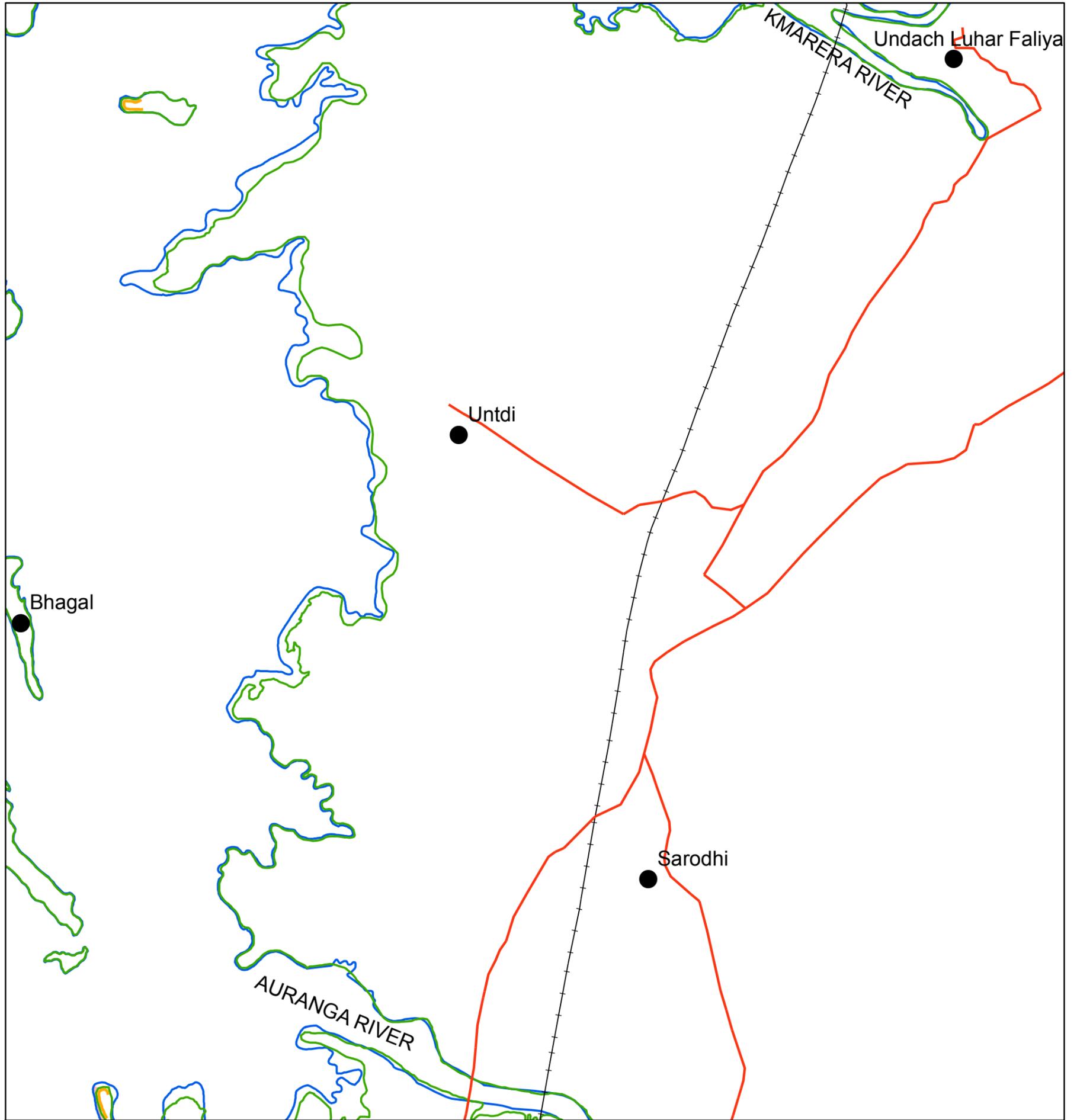
# SHORELINE CHANGE MAP

## GUJARAT

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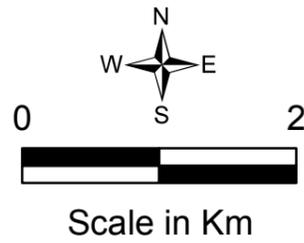
VALSAD DISTRICT

SHEET NO. 46D14NE



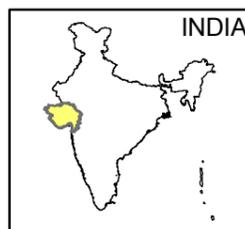
### Legend

- EROSION
- ROAD
- RAIL
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION
- SEA WALL



#### INDEX TO SHEETS

46D13 SW	46D13 SE	46H01 SW
46D14 NW		46H02 NW
46D14 SW	46D14 SE	46H02 SW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

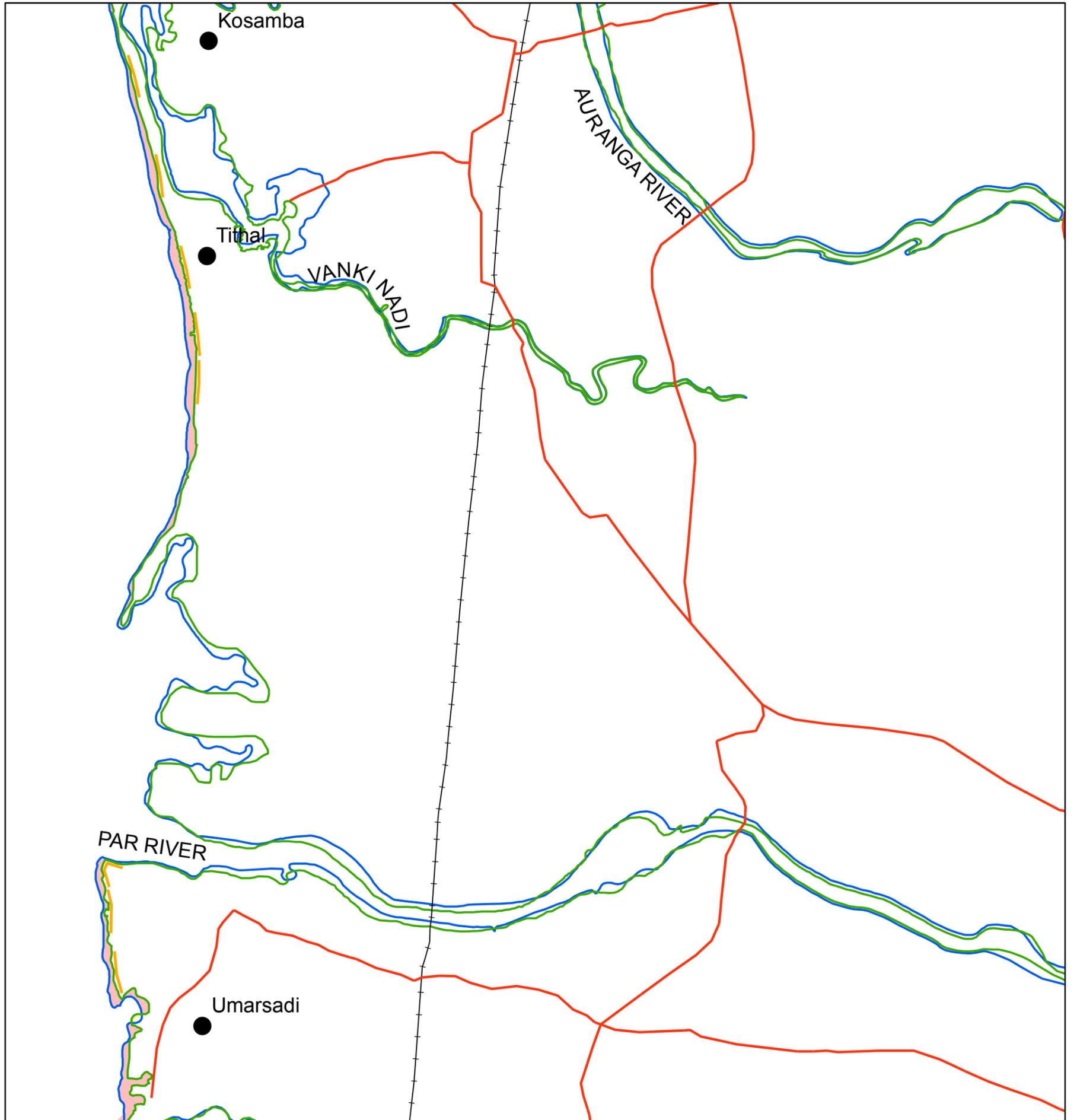
# SHORELINE CHANGE MAP

## GUJARAT

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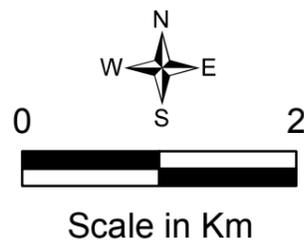
VALSAD DISTRICT

SHEET NO. 46D14SE



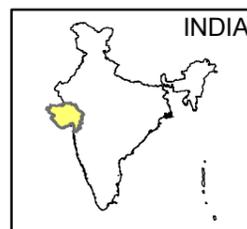
### Legend

- EROSION
- ACCRETION
- ROAD
- RAIL
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION
- SEA WALL



INDEX TO SHEETS

46D14 NW	46D14 NE	46H02 NW
46D14 SW		46H02 SW
46D15 NW	46D15 NE	46H03 NW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

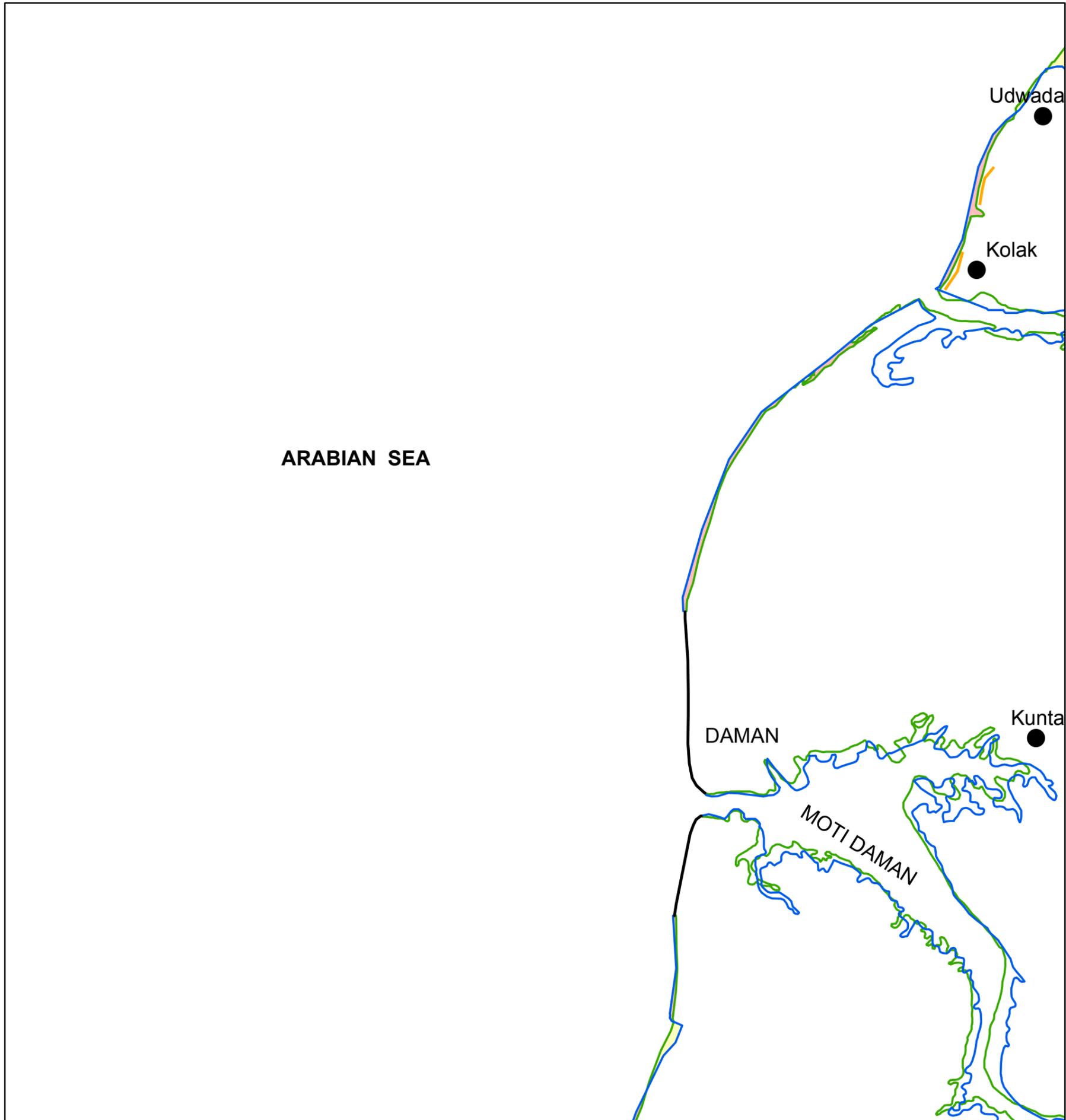
# SHORELINE CHANGE MAP

## GUJARAT

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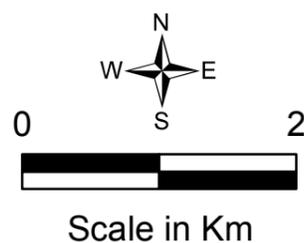
VALSAD DISTRICT

SHEET NO. 46D15NW



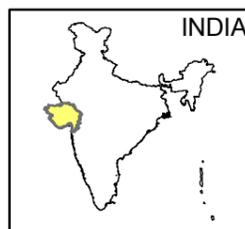
### Legend

- EROSION
- ACCRETION
- STABLE
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION
- SEA WALL



#### INDEX TO SHEETS

SEA	46D14 SW	46D14 SE
SEA		46D15 NE
46D11 SE	46D15 SW	46D15 SE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

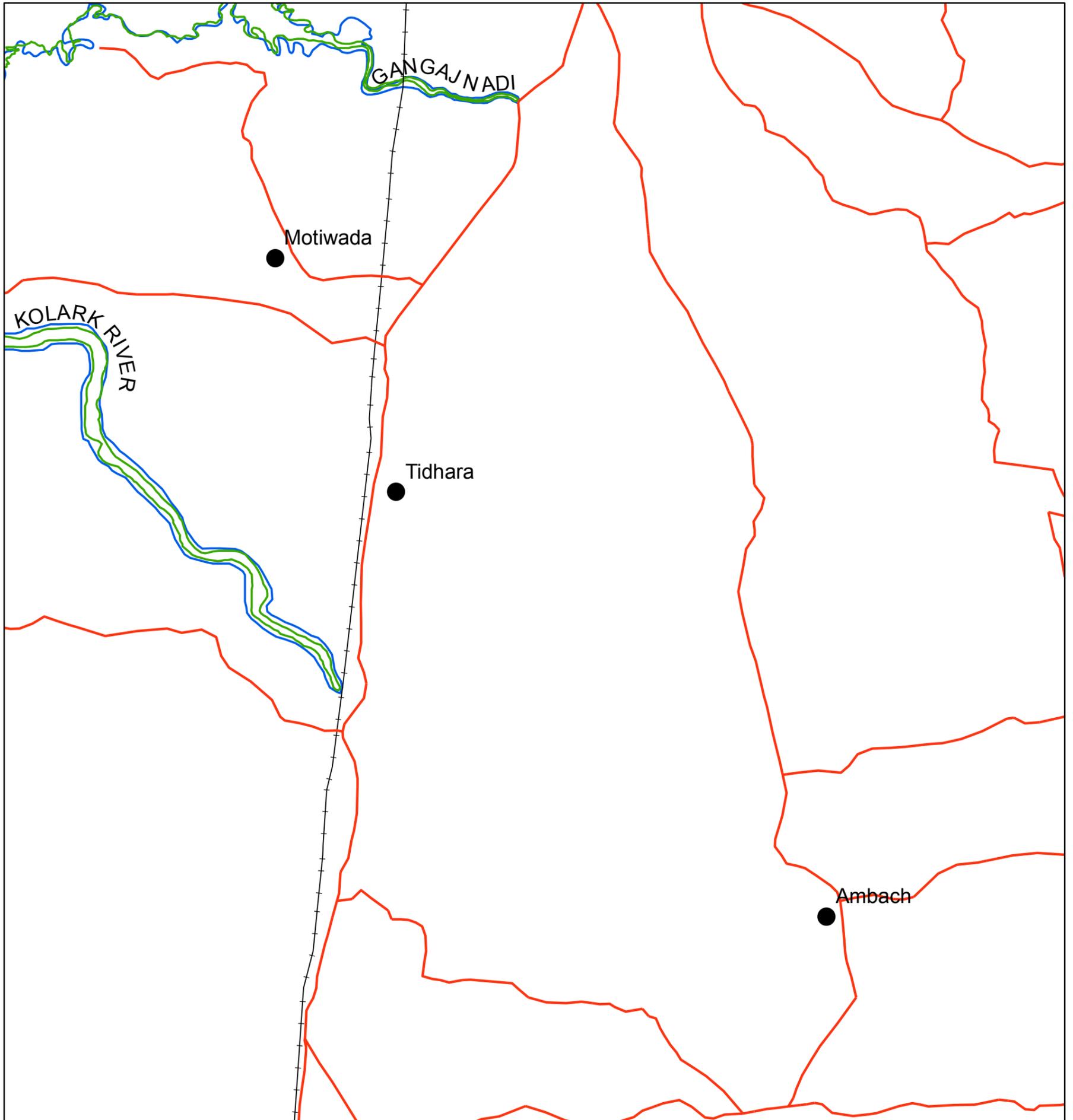
# SHORELINE CHANGE MAP

## GUJARAT

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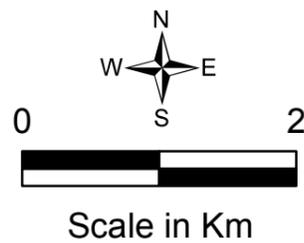
VALSAD DISTRICT

SHEET NO. 46D15NE



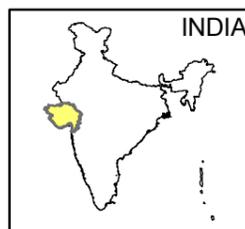
### Legend

- ROAD
- RAIL
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION



### INDEX TO SHEETS

46D14 SW	46D14 SE	46H02 SW
46D15 NW		46H03 NW
46D15 SW	46D15 SE	46H03 SW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# SHORELINE CHANGE MAP

## GUJARAT

FOR OFFICIAL USE ONLY

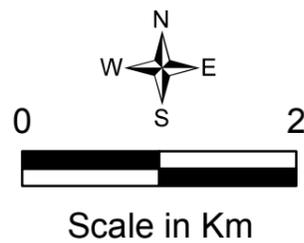
VALSAD DISTRICT

SHEET NO. 46D11SE

ARABIAN SEA

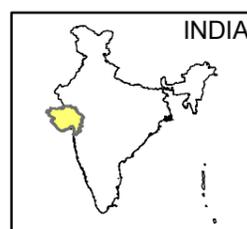
### Legend

-  EROSION
-  HIGH-TIDE LINE 2004-06
-  HIGH-TIDE LINE 1989-91



#### INDEX TO SHEETS

SEA	SEA	46D15 NW
SEA		46D15 SW
SEA	46D12 NE	46D16 NW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

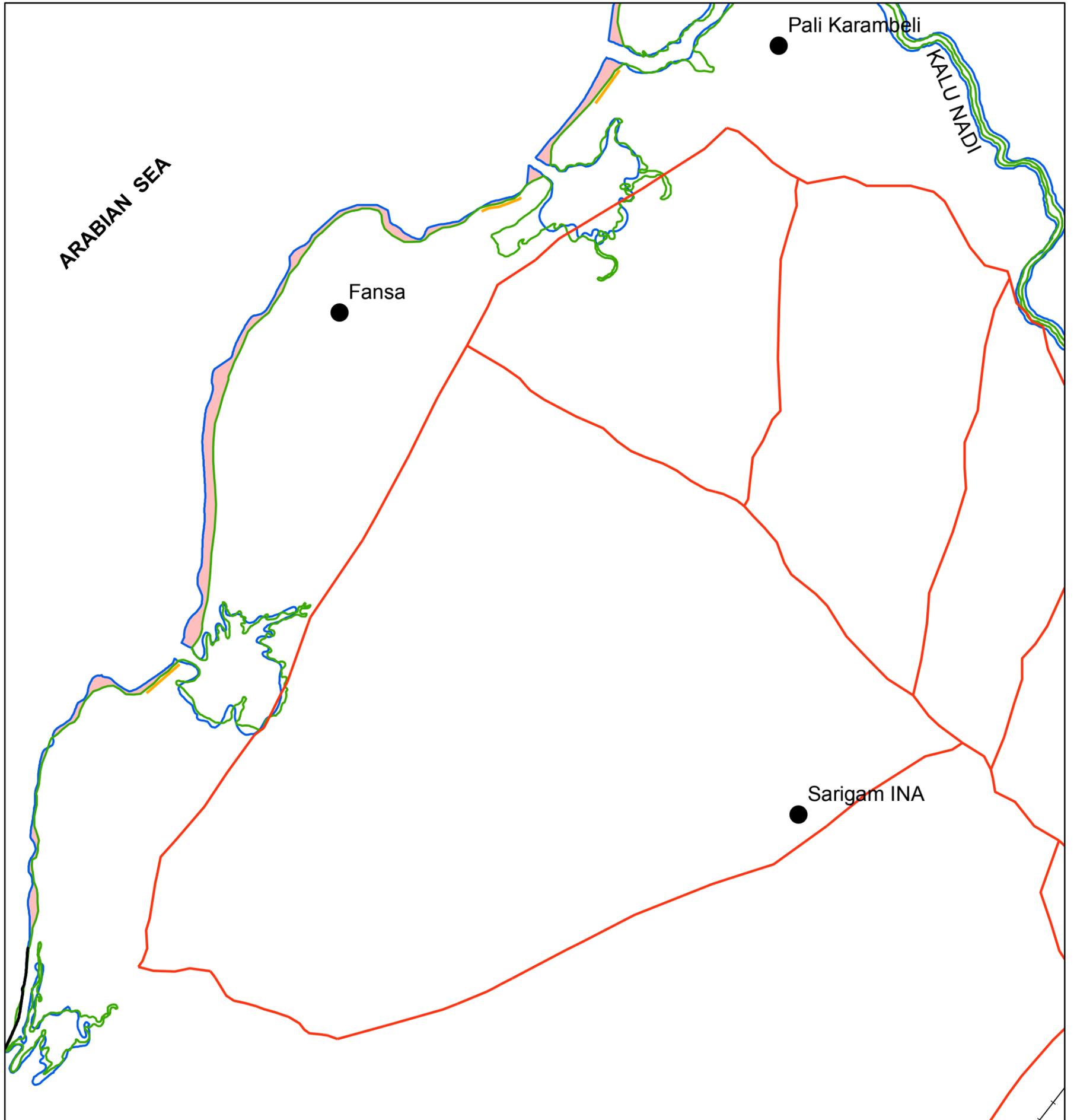
# SHORELINE CHANGE MAP

## GUJARAT

FOR OFFICIAL USE ONLY

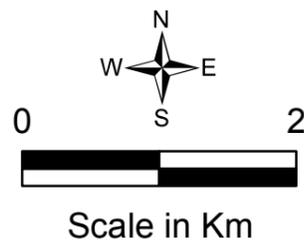
VALSAD DISTRICT

SHEET NO. 46D15SW



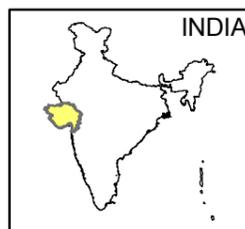
### Legend

- EROSION
- STABLE
- ++ RAIL
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION
- SEA WALL
- ROAD



#### INDEX TO SHEETS

SEA	46D15 NW	46D15 NE
46D11 SE		46D15 SE
46D12 NE	46D16 NW	46D16 NE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

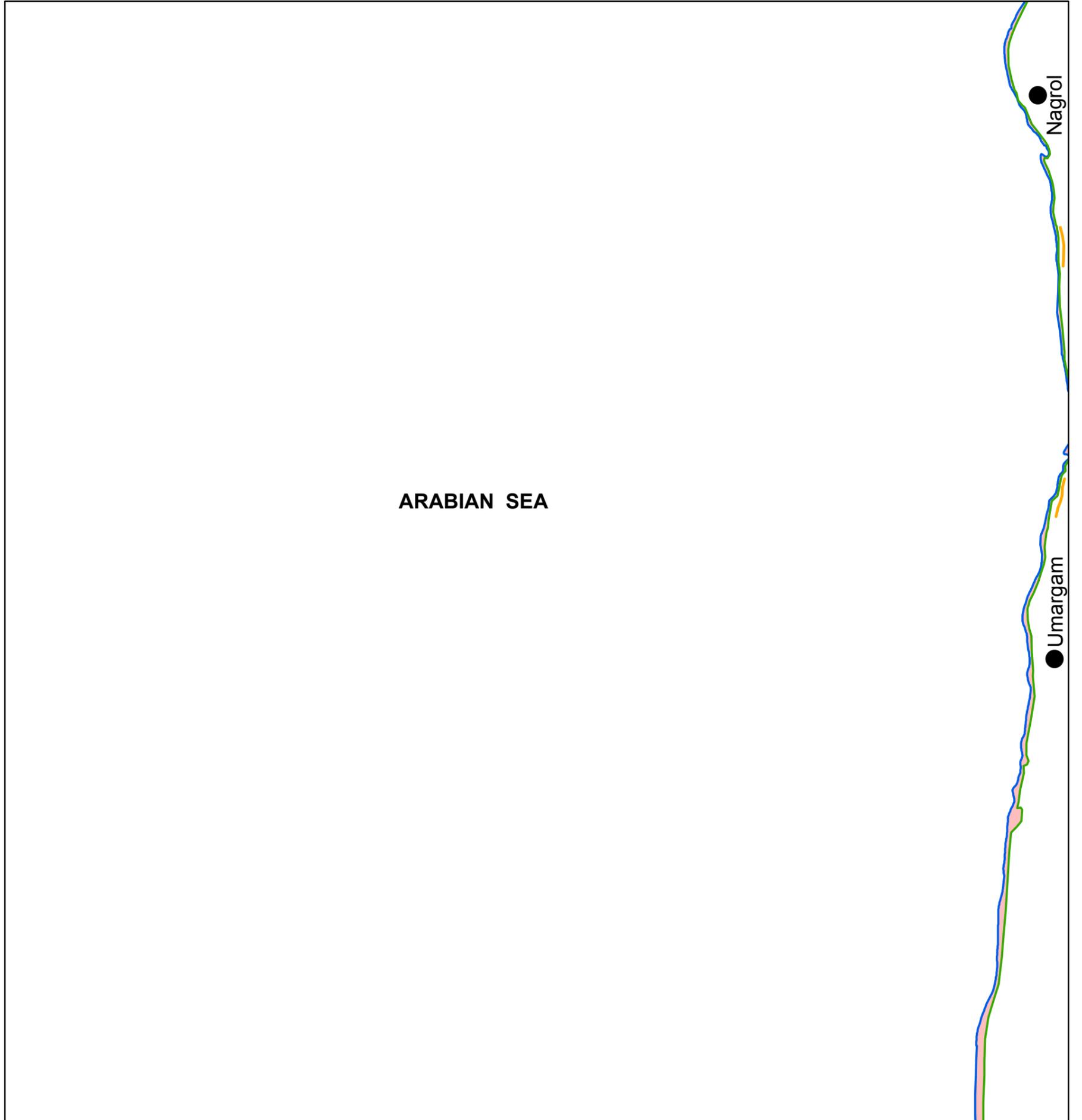
# SHORELINE CHANGE MAP

## GUJARAT

FOR OFFICIAL USE ONLY

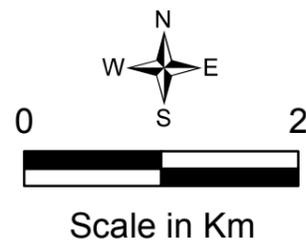
VALSAD DISTRICT

SHEET NO. 46D12NE



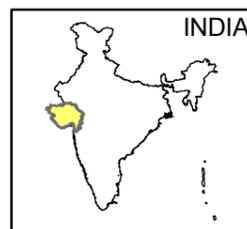
### Legend

- EROSION
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION
- SEA WALL



#### INDEX TO SHEETS

SEA	46D11 SE	46D15 SW
SEA		46D16 NW
SEA	46D12 SE	46D16 SW



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

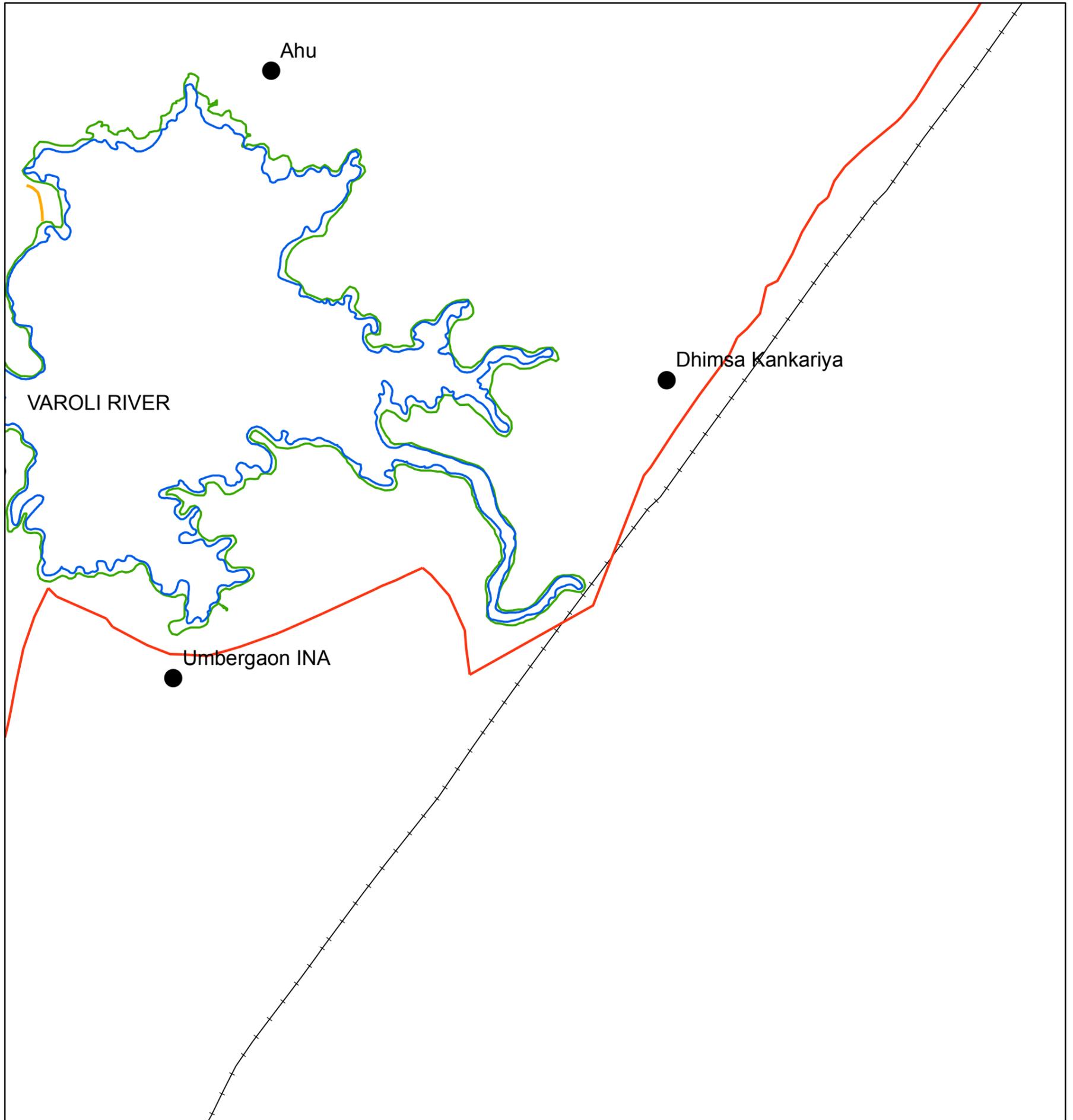
# SHORELINE CHANGE MAP

## GUJARAT

FOR OFFICIAL USE ONLY

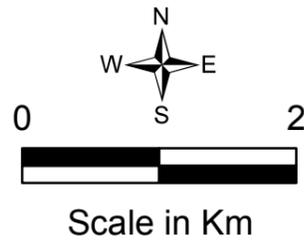
VALSAD DISTRICT

SHEET NO. 46D16NW



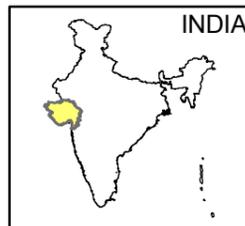
### Legend

- ROAD
- RAIL
- HIGH-TIDE LINE 2004-06
- HIGH-TIDE LINE 1989-91
- HABITATION
- SEA WALL



### INDEX TO SHEETS

46D11 SE	46D15 SW	46D15 SE
46D12 NE		46D16 NE
46D12 SE	46D16 SW	46D16 SE



DATA SOURCE:  
SATELLITE IMAGES OF 1989-91 & 2004-06

PREPARED BY:  
SPACE APPLICATIONS CENTRE , AHMEDABAD  
AND CENTRAL WATER COMMISSION, NEW DELHI

# **Annexure-II**

(Plates)

**GUJARAT, DAMAN & DIU**

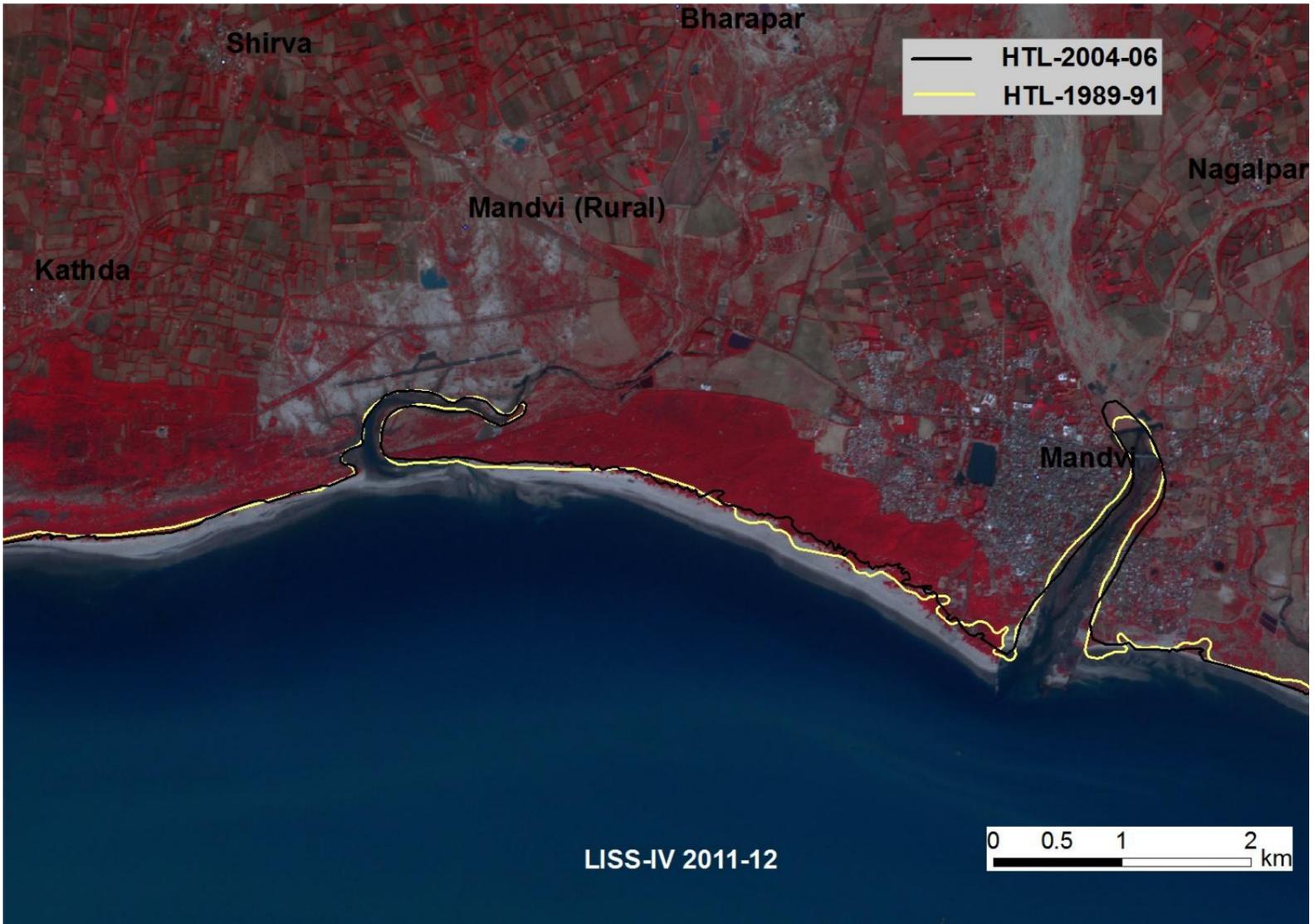


Plate No. 1: Coastal stretch near Mandvi, Kachchh (Map Sheet no. 41F05SW) showing eroding areas (Image: 2011 LISS IV).

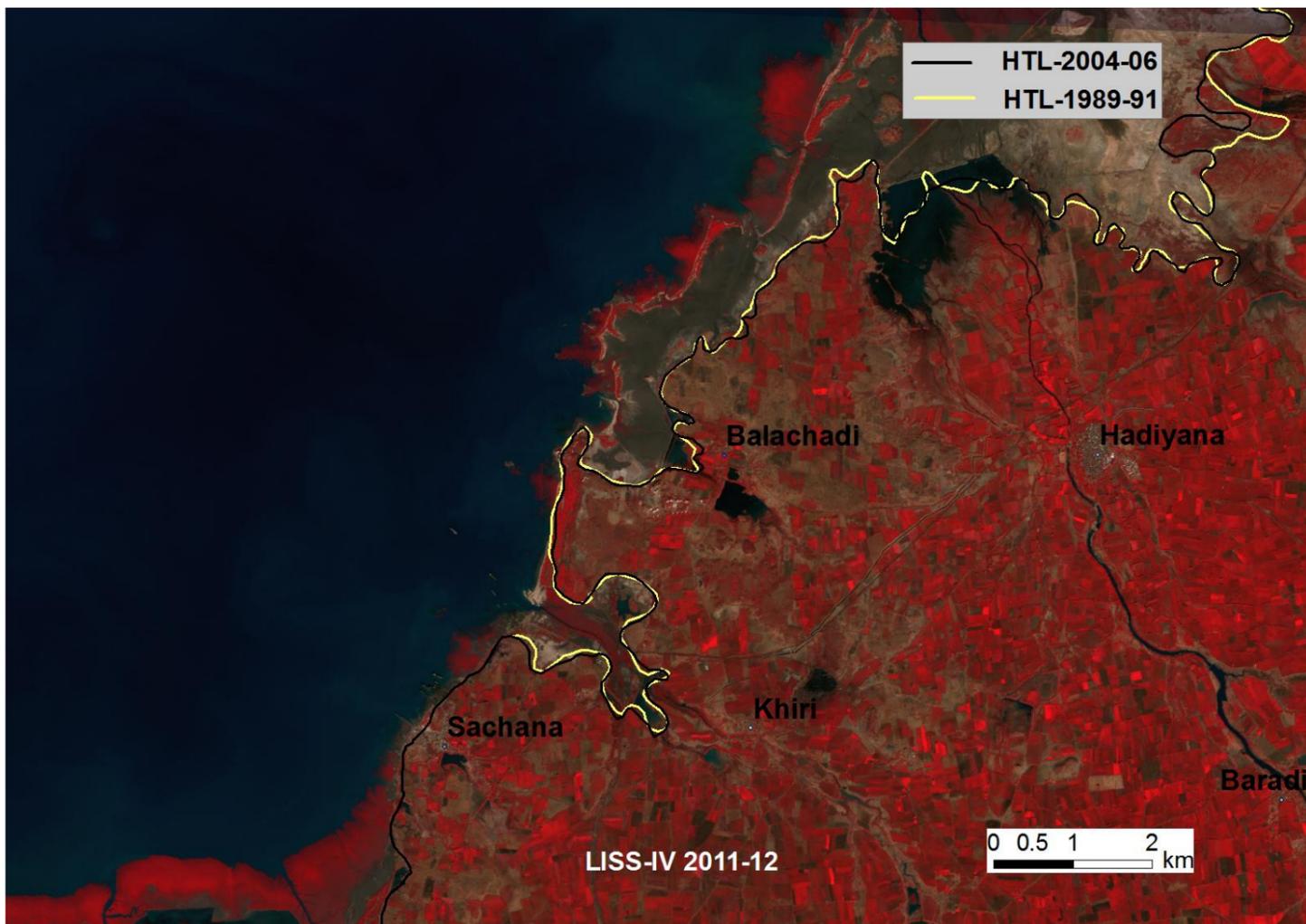


Plate No. 2: Coastal stretch near Sachana, Jamnagar district (Map Sheet no. 41J02SE) showing stable and eroding areas (Image: 2011 LISS IV).

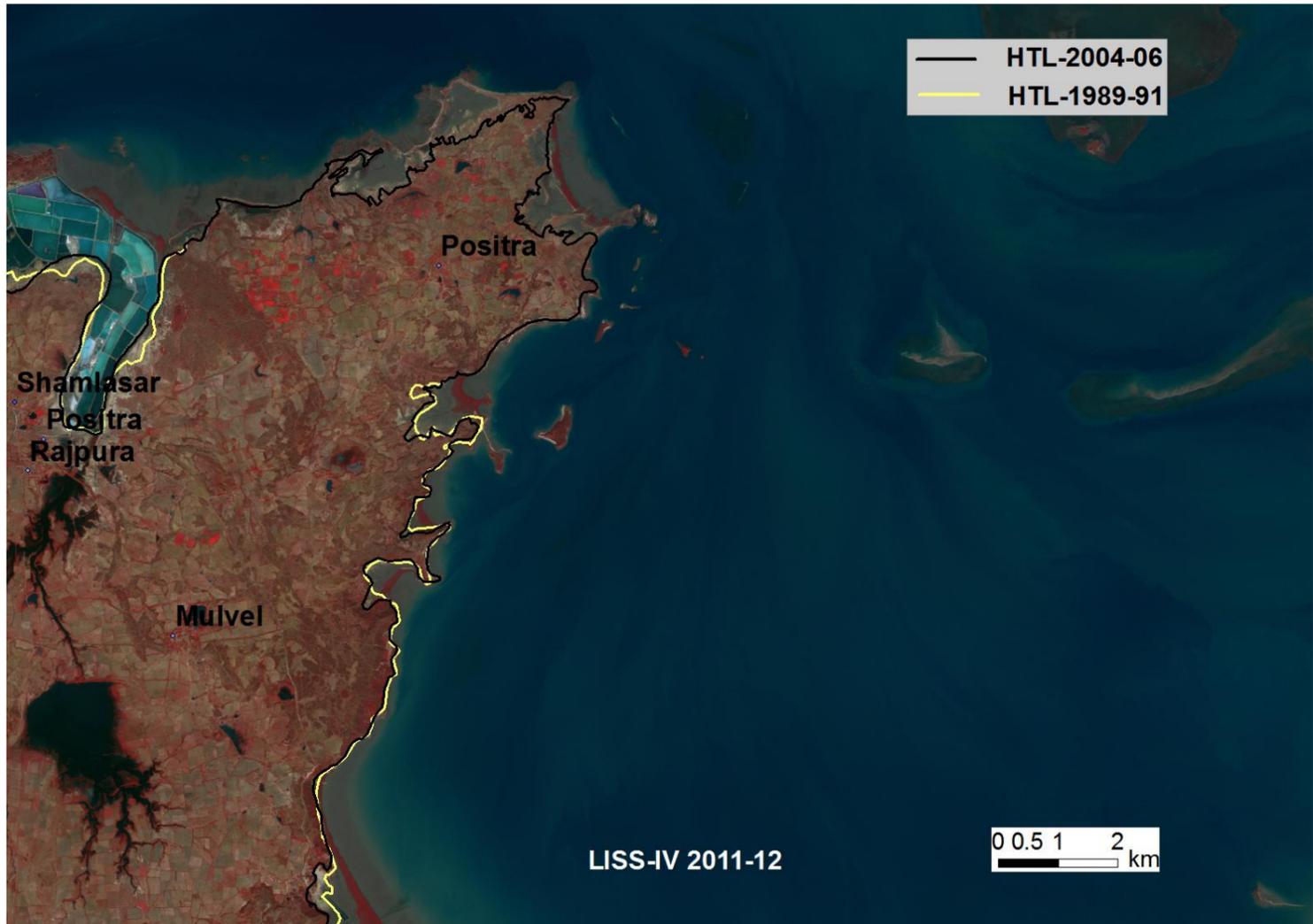


Plate No. 3: The stable coastal stretch at Positra, Jamnagar district (Map Sheet no. 41F0NE; Image: 2011 LISS IV).

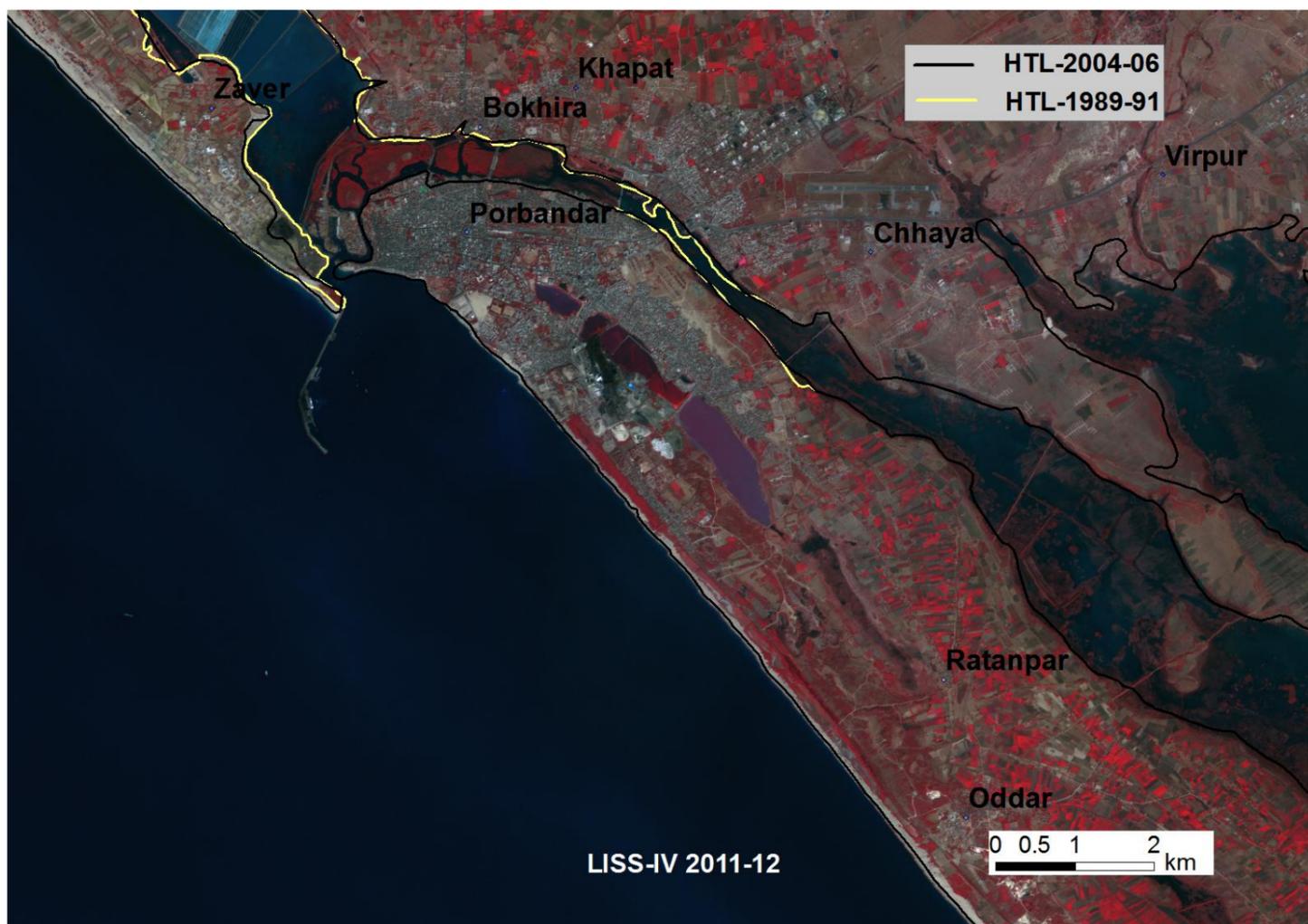


Plate No. 4: Coastal stretch along Porbandar, Saurashtra coast (Map Sheet no. 41G10NW) showing stable coastal length (Image: 2011 LISS IV).

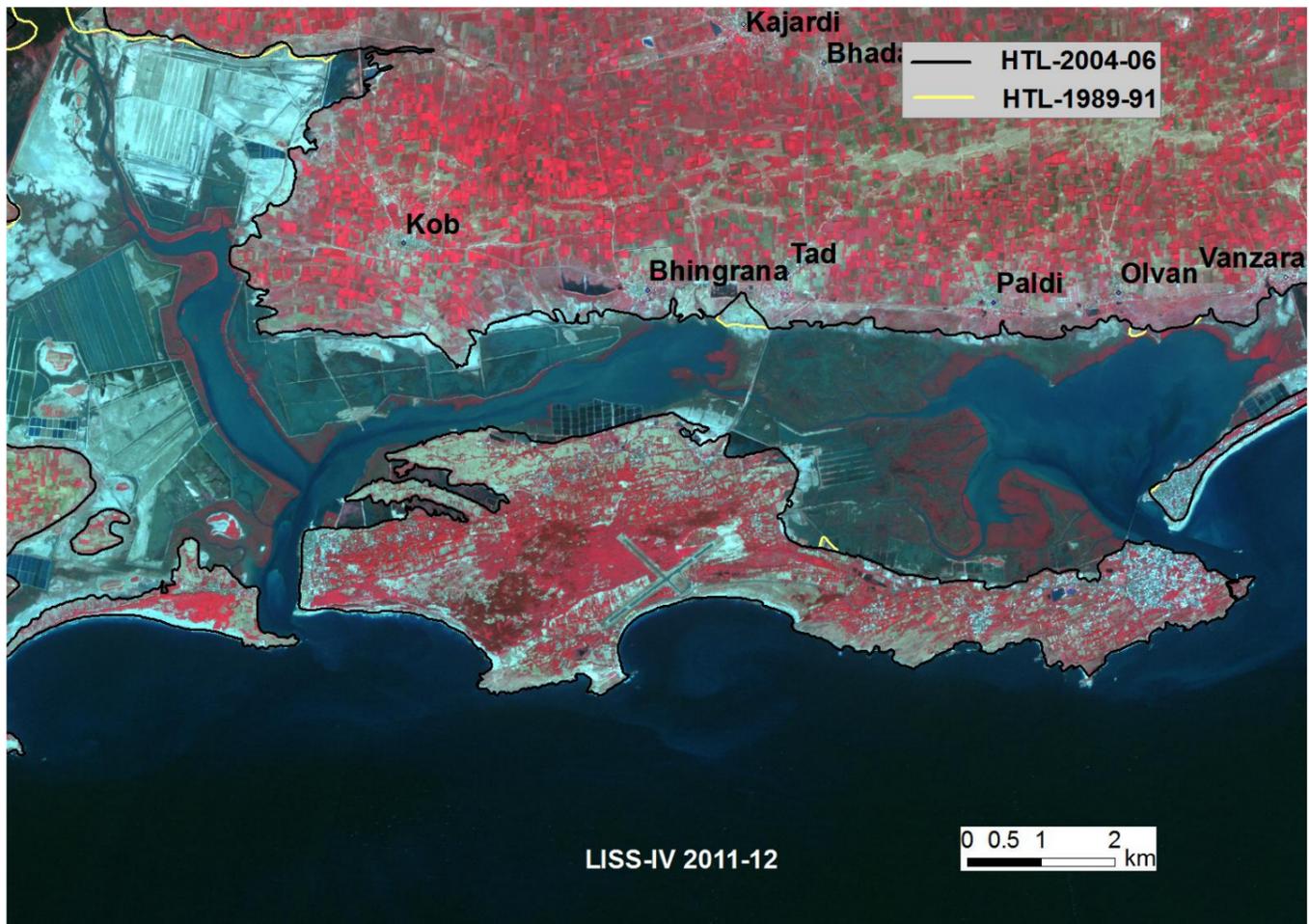


Plate No. 5: Stable coastal stretch at Diu (Map Sheet no. 41L14NE; Image: 2011 LISS IV).

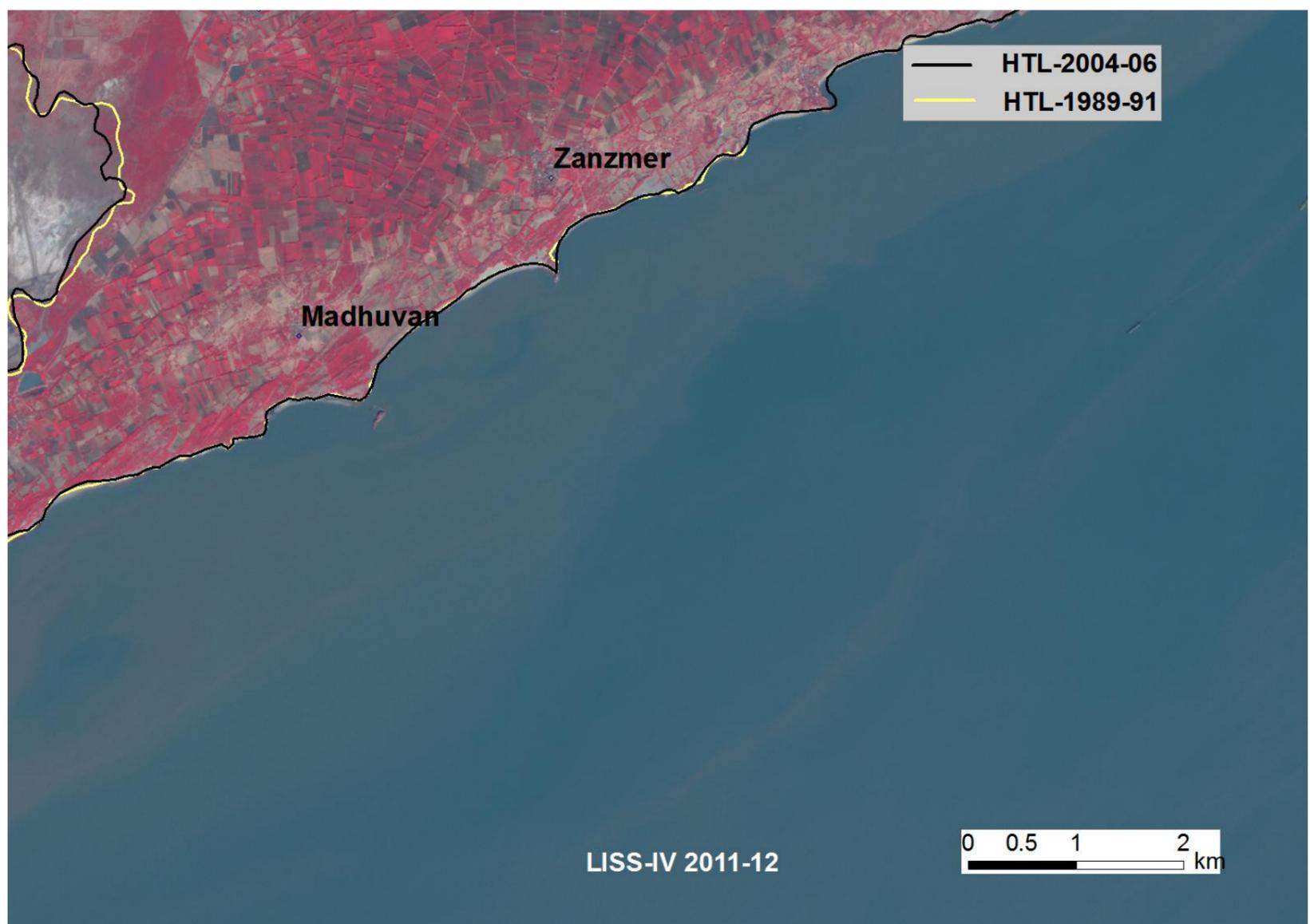


Plate No. 6: Stable coastal length along Madhuvan, Bhavnagar district (Map Sheet no. 46C04NW; Image: 2011 LISS IV).



Plate No. 7: Coastal stretch along south of Dahej, Bharuch district (Map Sheet no. 46C10NW) showing eroding areas (Image: 2011 LISS IV).

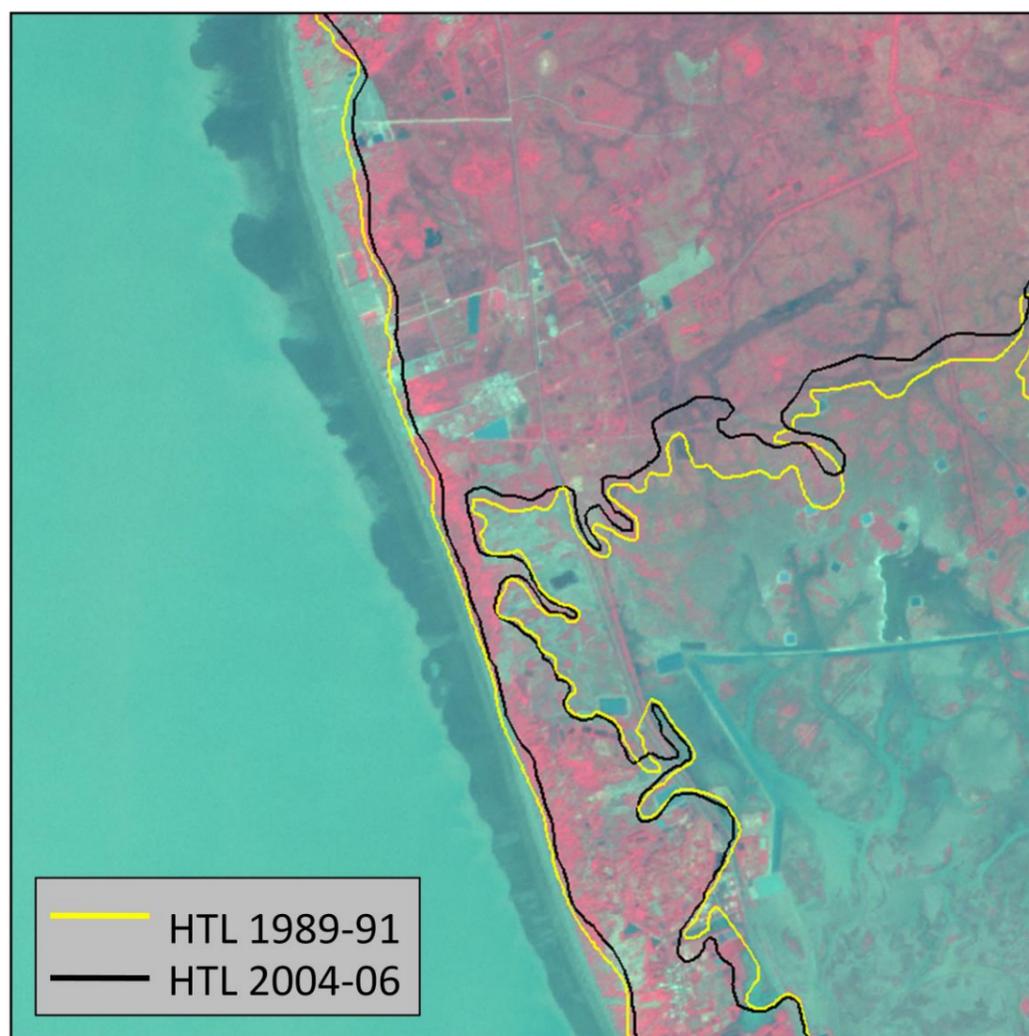


Plate No. 8: Coastal stretch north of Purna estuary, Valsad district (Map Sheet no. 46D09NE & 46D13NW) showing eroding areas (Image: 2011 LISS IV).

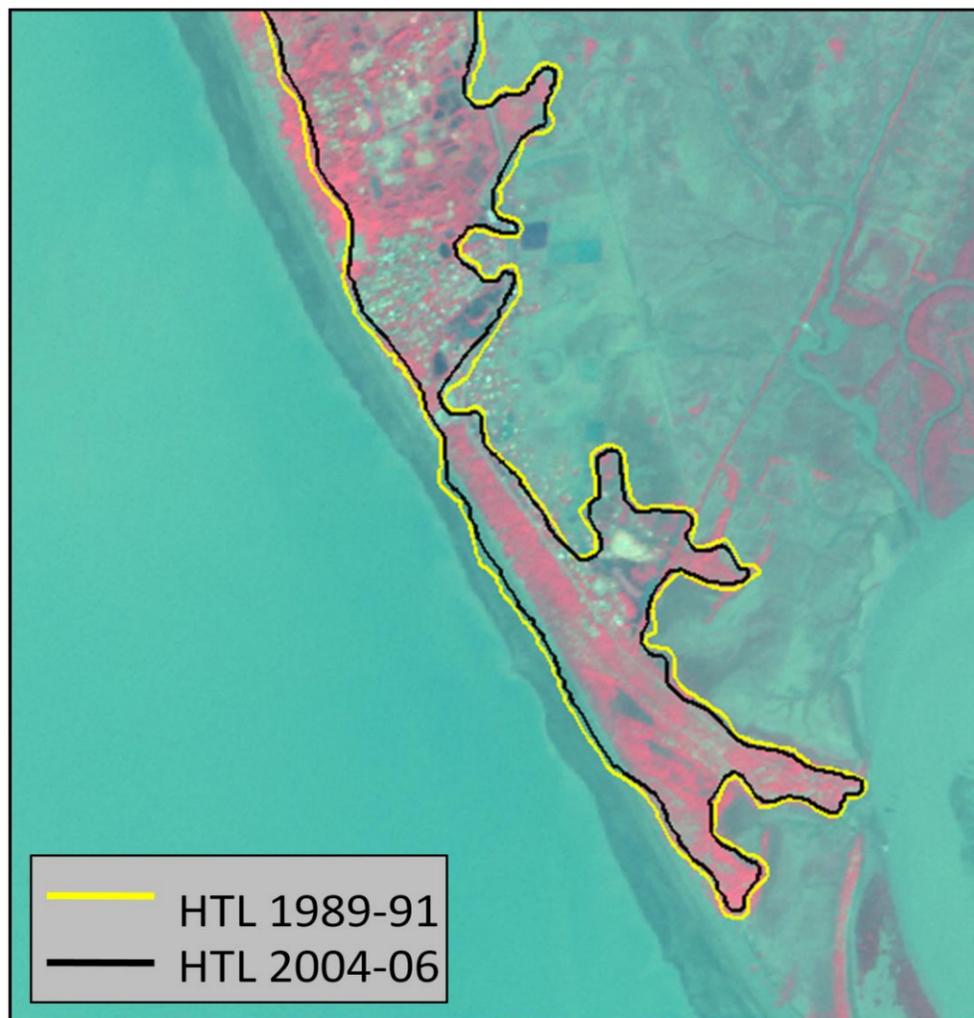


Plate No. 9: Coastal stretch north of Purna estuary around Borsi, Valsad district (Map Sheet no. 46D13NW) showing eroding areas (Image: 2011 LISS IV).

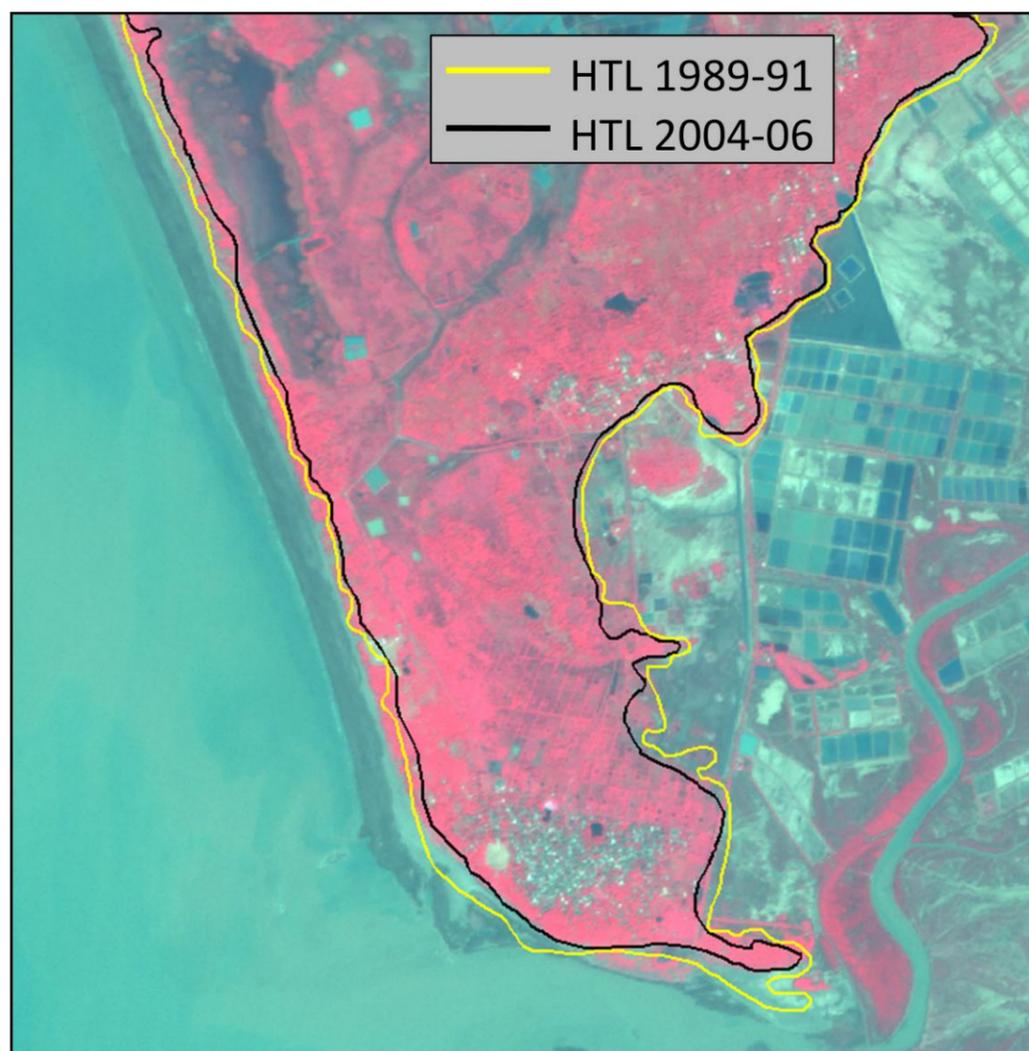


Plate No. 10. Coastal stretch near Onjal, Valsad district (Map Sheet no. 46D13SW) showing eroding areas (Image: 2011 LISS IV).



Plate No. 11: Coastal stretch along Kosamba & Tithal, Valsad district (Map Sheet no. 46D14SE) showing eroding areas (Image: 2011 LISS-IV).



Plate No. 12: Stable coast around Mandvi, Kachchh (Map Sheet no. 41F05SW)



Plate No. 13. Degraded Coral Reef along stable coast near Okha in Jamnagar District (Map sheet no. 41F03NW)



Plate No. 14. Degraded Coral Reef along the beaches near Okha in Jamnagar District (Map sheet no. 41F03NW)



Plate No. 15. Protection measures behind Dwarka Temple in Jamnagar District (Map sheet no. 41B16NE)



Plate No. 16. Stable rocky coast at Baradia in Jamnagar District (Map sheet no. 41F04NW)



Plate No. 17. Coral at Baradia in Jamnagar District (Map sheet no. 41F04NW)



Plate No. 18. Algae and Sponges at Baradia in Jamnagar District (Map sheet no. 41F04NW)



Plate No. 19: Stable coast around Okhamadhi, Jamnagar district (Map Sheet no. 41F04SW)



Plate No. 20. Stable sandy beach at Okhamadhi, Jamnagar district (Map Sheet no. 41F04SW)



Plate No. 21. Rocky coast followed by dune ridge at Navadra, Jamnagar district (Map sheet no. 41G05NW)



Plate No. 22. Mangroves at Kuchhdi, Porbandar district (Map sheet no. 41G10NW)



Plate No. 23. Rocky coast at Oddar, Porbandar district (Map sheet no. 41G10SE)



Plate No. 24. Pothole formations along the beach near Pata, Porbandar District (Map sheet no. 41G15SE)



Plate No. 25. Algae, shells within the pot hole near Pata, Porbandar District (Map sheet no. 41G15SE)



Plate No. 26. Cliff near Pata, Porbandar District (Map sheet no. 41G15SE)



Plate No. 27. Wave cut caves along the cliffs near Pata, Porbandar District (Map sheet no. 41G15SE)



Plate No. 28. Sandy pocket beach near Pata, Porbandar District (Map sheet no. 41G15SE)



Plate No. 29. Southern breakwater at Mangrol Port, Junagadh District (Map sheet no. 41K04SW)



Plate No. 30. Rocky coast with profuse algal growth, sandy beach, *Prosopis* and *Casuarina* at Mul Dwarka, Junagadh District (Map sheet no. 41L09SE)



Plate No. 31. Stable coast at Sarkhadi characterised by Beach and coastal promontory, Junagadh District (Map sheet no. 41L14NW)



Plate No. 32. Dune ridge at Sarkhadi, Junagadh District (Map sheet no. 41L14NW)



Plate No. 33. Long stretch of cliffs at Balana, Amreli District (Map sheet no. 41P05SW)



Plate No. 34. Wave cut caves along the cliff at Kalsar, Bhavnagar District (Map sheet no. 41O16SE)



Plate No. 35. Wide beaches at Uncha Nicha Kotda, Bhavnagar District (Map sheet no. 41O16NE)



Plate No. 36. Minor erosions along sand dunes at Uncha Nicha Kotda, Bhavnagar District (Map sheet no. 41O16NE)



Plate No. 37. Creek opening at Uncha Nicha Kotda, Bhavnagar District (Map sheet no. 41O16NE)



Plate No. 38. Creek and Mangrove at Uncha Nicha Kotda, Bhavnagar District (Map sheet no. 41O16NE)



Plate No. 39. Marsh at Uncha Nicha Kotda, Bhavnagar District (Map sheet no. 41O16NE)



Plate No. 40: Severe erosion and sea wall collapse along northern parts of Narmada estuary, south of Dahej, Bharuch district (Map Sheet no. 46C10NW)



Plate No. 41: Severe erosion along northern parts of Narmada estuary, south of Dahej, Bharuch district (Map Sheet no. 46C10NW)



Plate No. 42: Coastal protection structure constructed along northern parts of Narmada estuary, south of Dahej, Bharuch district (Map Sheet no. 46C10NW)



Plate No. 43: Severe erosion seen as undercutting and vertical scarps along northern parts of Narmada estuary, south of Dahej, Bharuch district (Map Sheet no. 46C10NW)



Plate No. 44: Uprooting of plantation near Dandi coast, Surat district (Map Sheet no. 46C11SW)



Plate No. 45: Onjal-Macchiwad Sea wall, South Gujarat (Map Sheet no. 46D13SW)



Plate No. 46: Erosion at Sai Temple beach, Tithal, south Gujarat (Map Sheet no. 46D14SE)



Plate No. 47: Swaminarayan Temple Sea wall, Tithal, south Gujarat (Map Sheet no. 46D14SE)



Plate No. 48: Collapse of Sea wall near Umarsadi, south Gujarat (Map Sheet no. 46D14SE)



Plate No. 49: Kolak-Udwada Sea wall, South Gujarat (Map Sheet no. 46D15NW)



Plate No. 50: Bed rock exposed following severe erosion near Udwada, South Gujarat (Map Sheet no. 46D15NW)



Plate No. 51. Erosion at Nargol, South Gujarat (Map Sheet no. 46D12NE)



Plate No. 52: Sea wall at Umargam, South Gujarat (Map Sheet no. 46D12NE)

# **Annexure-III**

(List of Data Used)

Table-2: Satellite data used for Gujarat Coast (1989-91 time-frame).

Sr. No.	Map Sheet No.	Satellite	Path	Row	Date
1	41A06SE	LANDSAT	151	44	21-10-1989
2	41A09SE				
3	41A10NE				
4	41A10NW				
5	41A10SW				
6	41A11NW				
7	41A11SE				
8	41A11SW				
9	41A12NE				
10	41A12SE				
11	41A13SE				
12	41A13SW				
13	41A16SE				
14	41A16SW				
15	41B13NE				
16	41F01NE				
17	41F01NW				
18	41F01SE				
19	41B15NE	LANDSAT	151	45	21-10-1989
20	41B15SE				
21	41B16NE				
22	41F03NE				
23	41F03NW				
24	41F03SW				
25	41F04NW				
26	41F04SW				
27	41F05SE	LANDSAT	150	44	02-11-1991
28	41F05SW				
29	41F09SE				
30	41F09SW				
31	41F11NE				
32	41F13NE				
33	41F13NW				
34	41F13SE				
35	41F13SW				
36	41F14SE				

37	41F15NE				
38	41F15NW				
39	41I04NE				
40	41I04SE				
41	41I04SW				
42	41I08NE				
43	41I08NW				
44	41I12NE				
45	41I12NW				
46	41I12SE				
47	41I12SW				
48	41J01NW	LANDSAT	150	44	02-11-1991
49	41J02NE				
50	41J02SE				
51	41J02SW				
52	41J03NW				
53	41J05NE				
54	41J05SE				
55	41J06NE				
56	41J06NW				
57	41J06SW				
58	41J09NW				
59	41F03SE	LANDSAT	150	45	13-05-1991
60	41F04NE				
61	41F04SE				
62	41F07SE				
63	41F07SW				
64	41F08NW				
65	41F11SE				
66	41F11SW				
67	41F15SW				
68	41G01NE				
69	41G05NW				
70	41G05SE				
71	41G05SW				
72	41G06NE				
73	41G10NE				
74	41G10NW				
75	41G10SE				
76	41G10SW				
77	41G11NE				
78	41G14NW				
79	41G14SW				

80	41G15NW				
81	41G15SE				
82	41G15SW				
83	41G16NE				
84	41K04NW				
85	41K04SE	LANDSAT	150	45	13-05-1991
86	41K04SW				
87	41L01NE				
88	41L05NW				
89	41L05NE				
90	41L05SE				
91	41L09SE				
92	41L09SW				
93	41L10NE	LANDSAT	149	46	31-10-1992
94	41L13SE				
95	41L13SW				
96	41L14NE				
97	41L14NW				
98	41P01SW				
99	41P02NW				
100	41O12SE				
101	41O12SW				
102	41O16NE				
103	41O16SW				
104	41P01SE				
105	41P05NE				
106	41P05NW	LANDSAT	149	45	31-10-1992
107	41P05SE				
108	41P05SW				
109	41P09NE				
110	41P09NW				
111	46B04SW				
112	46C01NW				
113	46C01SW				
114	46B03SE	LANDSAT	149	44	15-10-1992
115	46B04NE				
116	46B07NW				
117	41O16SE	LANDSAT	148	45	19-10-1990
118	46B04SE				
119	46B07NE				

120	46B07SE			
121	46B07SW			
122	46B08NW			
123	46B11NW			
124	46B11SE			
125	46B11SW			
126	46B12NE			
127	46B12NW			
128	46B12SE			
129	46B12SW			
130	46B15SW			
131	46B16NW			
132	46B16SW			
133	46C01NE			
134	46C01SE			
135	46C02NE			
136	46C03NE			
137	46C03SE			
138	46C03SW			
139	46C04NW			
140	46C06NW			
141	46C06SW			
142	46C07NW	LANDSAT	148	45
143	46C09NE			19-10-1990
144	46C09NW			
145	46C09SE			
146	46C09SW			
147	46C10NE			
148	46C10NW			
149	46C10SE			
150	46C11NE			
151	46C11SE			
152	46C11SW			
153	46C12NE			
154	46C12SE			
155	46C13NW			
156	46C14NW			
157	46C14SW			
158	46C15NW			
159	46C15SW			
160	46C16NW			
161	46C16SW			
162	46D09NE			
163	46D13NE			

164	46D13NW				
165	46D11SE	LANDSAT	148	46	19-10-1990
166	46D12NE				
167	46D13SE				
168	46D13SW				
169	46D14NE				
170	46D14NW				
171	46D14SE				
172	46D15NE				
173	46D15NW				
174	46D15SW				
175	46D16NW				

Table-3: Satellite data (IRS-P6 LISS IV) used for Gujarat Coast (2004-06 time-frame).

Sr. No.	Map Sheet	Orbit No.	Segment	Strip	Scene	Date of Pass
1	41E16	10402	2	2	68	18-10-05
		10402	2	2	70	18-10-05
		10402	2	2	71	18-10-05
2	41F13	11709	2	2	73	18-01-06
		11709	2	2	74	18-01-06
3	41I03	10402	2	2	67	18-10-05
		11709	2	2	71	18-01-06
4	41I04	10402	2	2	70	18-10-05
		11709	2	2	73	18-01-06
5	41I08	10402	2	2	70	18-10-05
6	41I12	10274	2	2	74	09-10-05
		11226	2	1	94	15-12-05
		11226	2	1	95	15-12-05
7	41J01	10402	2	2	70	18-10-05
		10402	2	2	71	18-10-05
		11709	2	2	74	18-01-06
8	41J05	11226	2	1	95	15-12-05
		11226	2	1	96	15-12-05
9	41I16	10274	2	2	73	09-10-05
		10274	2	2	74	09-10-05
10	41J13	10416	2	2	79	19-10-05
11	41I15	10274	2	2	72	09-10-05
		10274	2	2	73	09-10-05
12	41M03	10274	2	2	72	09-10-05

		10274	2	2	73	09-10-05
13	41M04	10274	2	2	73	09-10-05
		10274	2	2	74	09-10-05
14	41A06	11439	2	1	97	30-12-05
		11439	2	1	98	30-12-05
15	41A05	11439	2	1	96	30-12-05
		11439	2	1	97	30-12-05
		11439	2	1	98	30-12-05
16	41I11	11226	2	1	94	15-12-05
17	41N02	10416	2	2	80	19-10-05
18	41F09	10402	2	2	71	18-10-05
19	41F10	10402	2	2	71	18-10-05
		10402	2	2	72	18-10-05
20	41J09	11226	2	1	95	15-12-05
		11226	2	1	96	15-12-05
21	41J06	11226	2	1	96	15-12-05
22	41J10	11226	2	1	96	15-12-05
23	41M02	10274	2	2	71	09-10-05
		10274	2	2	72	09-10-05
		10416	2	2	75	19-10-05
		10416	2	2	77	19-10-05
24	41E14	10402	2	2	67	18-10-05
		10473	2	2	61	23-10-05
25	41F14	10402	2	2	71	18-10-05
		10402	2	2	72	18-10-05
		11709	2	2	74	18-01-06
		11709	2	2	75	18-01-06
26	41A02	11709	2	2	76	18-01-06
		11709	2	1	89	24-12-05
		11354	2	1	98	30-12-05
		11439	2	1	87	24-12-05
27	41A01	11354	2	1	88	24-12-05
		11354	2	1	89	24-12-05
		11139	2	1	96	30-12-05
		11439	2	1	98	30-12-05
28	41F14	10402	2	2	71	18-10-05
		10402	2	2	72	18-10-05
		11709	2	2	74	18-01-06
		11709	2	2	75	18-01-06
29	41F15	11709	2	2	76	18-01-06
		10402	2	2	72	18-10-05
		10473	2	2	68	23-10-05
		11709	2	2	76	18-01-06

30	41J03	11709	2	2	75	18-01-06
		11709	2	2	76	18-01-06
31	41J02	10402	2	2	71	18-10-05
		11709	2	2	74	18-01-06
		11709	2	2	75	18-01-06
		11709	2	2	76	18-01-06
32	41J01	10402	2	2	70	18-10-05
33	41J13	10416	2	2	79	19-10-05
34	41J06	11226	2	1	96	15-12-05
35	41J05	11226	2	1	95	15-12-05
		11226	2	1	96	15-12-05
36	41F10	10402	2	2	71	18-10-05
		10402	2	1	72	18-10-05
37	41F11	10473	2	2	67	23-10-05
		10473	2	2	68	23-10-05
38	41F12	10473	2	2	68	23-10-05
39	46C05	11510	2	2	98	04-01-06
		11510	2	2	99	04-01-06
		10487	2	2	85	24-10-05
40	46B08	10487	2	2	82	24-10-05
		10885	2	2	72	21-11-05
		11510	2	2	97	04-01-06
		11510	2	2	98	04-01-06
41	46B11	10615	2	2	54	02-11-05
		10487	2	2	82	24-10-05
42	46B12	10487	2	2	83	24-10-05
43	46B15	10615	2	3	54	02-11-05
44	46B16	10615	2	3	54	02-11-05
45	46C13	10956	2	3	56	26-11-05
46	46C15	10956	2	3	59	26-11-05
		10956	2	3	57	26-11-05
47	46C16	10629	2	3	59	03-11-05
		10956	2	3	58	26-11-05
		10956	2	3	59	26-11-05
		10956	2	3	60	26-11-05
48	46F03	10956	2	3	54	26-11-05
49	46F04	10956	2	3	55	26-11-05
50	46G01	10956	2	3	55	26-11-05
51	46C15	10956	2	3	59	26-11-05
52	46C16	10629	2	3	59	03-11-05
		10956	2	3	58	26-11-05
		10956	2	3	59	26-11-05
		10956	2	3	60	26-11-05

53	46D10	10629	2	3	61	03-11-05
54	46D13	10629	2	3	59	03-11-05
55	46D14	10629	2	3	61	03-11-05
56	46H01	10629	2	3	59	03-11-05
57	46H04	10757	2	3	63	12-11-05
58	41O16	11969	2	2	88	11-12-05
		11510	2	2	101	04-01-06
		11510	2	2	102	04-01-06
59	41N16	10828	2	2	82	17-11-05
60	41O12	10885	2	2	78	21-11-05
61	41O13	10885	2	2	74	21-11-05
62	41P01	10203	2	2	80	04-10-05
63	41P02	10203	2	2	80	04-10-05
64	41P05	10203	2	2	80	04-11-05
		10686	2	2	86	07-11-05
65	41P09	10885	2	2	78	21-11-05
66	41P13	11169	2	2	88	11-12-05
67	46B03	11510	2	2	97	04-01-06
		11510	2	2	96	04-01-06
68	46B04	10487	2	2	83	24-10-05
		11510	2	2	97	04-01-06
		11510	2	2	98	04-01-06
69	46B06	10828	2	2	80	17-11-05
		11510	2	2	96	04-01-06
70	46B07	10487	2	2	82	24-10-05
		11510	2	2	96	04-01-06
		11510	2	2	97	04-01-06
71	46B08	10487	2	2	82	24-10-05
		10487	2	2	83	24-10-05
		11510	2	2	97	04-01-06
		11510	2	2	98	04-01-06
72	46B11	10487	2	2	82	24-10-05
		10615	2	2	54	02-11-05
73	46B12	10487	2	2	83	26-11-05
74	46B14	10956	2	2	52	26-11-05
75	46B15	10615	2	2	54	02-11-05
76	46B16	10615	2	2	54	02-11-05
		10956	2	2	54	26-11-05
77	46C01	10487	2	2	83	24-10-05
		10487	2	2	84	24-10-05
		10487	2	2	85	24-10-05
		11510	2	2	98	04-01-06
		11510	2	2	99	04-01-06

78	46C02	10487	2	2	85	24-10-05
		10487	2	2	86	24-10-05
		11510	2	2	99	04-01-06
79	46C05	10487	2	2	85	24-10-05
		11510	2	2	98	04-01-06
		11510	2	2	99	04-01-06
80	46C06	11510	2	2	99	04-01-06
		10487	2	2	85	24-10-05
		10487	2	2	86	24-10-05
81	46F03	10956	2	3	54	26-11-05
82	46F04	10956	2	3	55	26-11-05
83	41O16	11169	2	2	88	11-12-05
		11510	2	2	101	04-01-06
		11510	2	2	102	04-01-06
84	41O12	10885	2	2	78	21-11-05
85	41O15	11510	2	2	101	04-01-06
86	41P05	10203	2	2	80	04-10-05
87	41P09	10885	2	2	78	21-11-05
88	41P13	11169	2	2	88	11-12-05
89	46C02	10487	2	2	85	24-10-05
		10487	2	2	86	24-10-05
		11510	2	2	99	04-01-06
90	46C03	10487	2	2	86	24-10-05
		10487	2	2	87	24-10-05
		11510	2	2	101	04-01-06
91	46C04	10487	2	2	87	24-10-05
		11510	2	2	101	04-01-06
		11510	2	2	102	04-01-06
92	46C06	11510	2	2	99	04-01-06
		10487	2	2	85	24-10-05
		10487	2	2	86	24-10-05
93	46C07	10487	2	2	86	24-10-05
94	46C09	10615	2	3	55	02-11-05
95	46C10	10615	2	3	57	02-11-05
96	46C14	10629	2	3	55	03-11-05
97	41F12	10473	2	2	68	23-10-05
98	41G05	10473	2	2	70	23-10-05
99	41G06	10487	2	2	71	23-10-05
100	41G09	11709	2	2	79	18-01-06
101	41G10	10473	2	2	71	23-10-05
102	41G11	10473	2	2	71	23-10-05
		11709	2	2	80	18-01-06
		11709	2	2	81	18-01-06

103	41G14	11709	2	2	80	18-01-06
104	41G15	11226	2	2	103	15-12-05
		11709	2	2	80	18-01-06
		11709	2	2	81	18-01-06
105	41G16	11226	2	1	103	15-12-05
		11226	2	1	104	15-12-05
		11709	2	2	81	18-01-06
106	41K02	11226	2	1	102	15-12-05
107	41K03	11226	2	1	103	15-12-05
108	41K04	10274	2	2	84	09-10-05
		11226	2	2	103	15-12-05
109	41K08	10274	2	2	84	09-10-05
110	41L01	10274	2	2	84	09-10-05
111	41L05	10274	2	2	84	09-10-05
		10416	2	2	89	19-10-05
112	41L06	10416	2	2	89	19-10-05
113	41L09	10416	2	2	89	19-10-05
114	41L10	10416	2	2	89	19-10-05
115	41P01	10203	2	2	80	04-10-05
116	41P02	10203	2	2	80	04-10-05

Table-4: Details of protected reaches and vulnerable reaches constructed along Gujarat coast, provided by Central Water Commission (CWC).

Sr. No	Name of Scheme	Protected reaches			Vulnerable reaches (Remaining length)		
		Latitude	Longitude	Length (in m)	Latitude	Longitude	Length (in m)
1	Danti Jalalpore	21 <sup>0</sup> 02' 46.46"	72 <sup>0</sup> 44' 08.27"	1300			
2	Dandi Samapore				20 <sup>0</sup> 53' 12.96"	72 <sup>0</sup> 47' 49.34"	1000.00
3	Borsi Machhiwad				20 <sup>0</sup> 56' 28.71"	72 <sup>0</sup> 45' 20.56"	2500.00
4	Bhat	20 <sup>0</sup> 46' 23.62"	72 <sup>0</sup> 50' 39.57"	2700			
5	Nani Danti-Moti Danti	20 <sup>0</sup> 43' 28.06"	72 <sup>0</sup> 51' 13.52"	1640			
6	Dholai				20 <sup>0</sup> 44' 19.41"	72 <sup>0</sup> 53' 18.16"	700.00

7	Bhadeli Jagalala				20° 38' 05.12"	72° 53' 16.53"	600.00
8	Onjal Machiwad	20° 48' 30.22"	72° 49' 53.95"	1400.00			
9	Movasa	20° 44' 53.02"	72° 52' 04.44"	1700.00			
10	Dumas Sea Wall	20° 5' 59"	72° 42' 6.46"	0.00	20° 44' 53.02"	72° 42' 6.46"	0
		20° 5' 42.97"	72° 42' 10.51"	200.00	20° 5' 59"	72° 42' 6.46"	752
					21° 6' 4.27"	72° 42' 5.86"	752
					21° 4' 46.33"	72° 42' 23.43"	1957
11	Mor-Bhawa/Ta. Olpad	21° 20' 45"	72° 39' 55"	1350	21° 19' 45"	72° 30' 45"	650
12	Dandi Village/Ta. Olpad	21° 20' 07"	72° 37' 50"	2690	21° 19' 45"	72° 30' 45"	310
13	Tapi palaa works River traing walls/Brea kwaters	21° 14'	72° 51'	3920	21° 14'	72° 51'	
14	Tapi works Revatment s, eastern bunds.	21° 14'	72° 48'	18673	21° 14'	72° 48'	23000
		21° 17'	72° 57'	1050	21° 17'	72° 57'	5000
15	Dbhari ASE wall	21° 15' 57"	72° 38' 08"	4130	21° 15' 57"	72° 38' 08"	
16	Nesh Karanj ASE wall	21° 25' 48"	72° 40' 44"	3270	21° 25' 48"	72° 40' 44"	
17		20° 36' 53"	72° 53' 26"	0-690	20° 36' 53"	72° 53' 26"	690-1100
18	Kosamba protection wall	20° 37' 39"	72° 53' 12"	1100-1850	20° 37' 39"	72° 53' 12"	1850-2330

19	Umarsadi macchhiwa d	20° 31'	72° 53' 13"	460	20° 35' 37"	72° 53' 51"	0-785 Tithal protection wall
20	Umarsadi macchhiwa d	20° 31' 33"	72° 53' 14"	325	20° 34' 58"	72° 53' 51"	1500- 1740 m Surwada protection wall
21	Kolak- Udwada Sea wall	20° 28' 4"	72° 51' 33"	830	20° 36' 14"	72° 53' 37"	0-1357 m Tithal- Bhagdaw ada (Sw. temple) protection wall
22	Maroli	20° 18' 01"	72° 46' 11"	1935	20° 35' 13"	72° 53' 51"	785-1450 m Tithal Sai temple protection wall
23	Fansa	20° 37' 39"	72° 53' 12"	900	20° 28' 38"	72° 51' 42"	565mUdv ada Sea wall
24	Umargam Sea wall	20° 12' 78"	72° 44' 49"	285	20° 31' 03"	72° 53' 18"	1860m- Umrsadi- Mangelw ad riverside wall
							780m- Umrsadi- Mangelw ad riverside wall
26	Nargol River side wall	20° 13' 36"	72° 45' 17"	484	20° 28' 30"	72° 51' 41"	570m- Udvada Sea wall
27	Fansa- Tatawadi Creek side wall	20° 21' 06"	72° 48' 30"	300	20° 12' 78"	72° 44' 49"	320m- Umargam River side wall

							600m- Maroli- Dandi Sea Wall
29	Umargam Sea wall	20° 11' 76"	72° 44' 48"	700	20° 21' 58"	72° 49' 23"	650m Kalai (Sea side)
					20° 21' 58"	72° 49' 23"	650m Kalai (Sea side)

Table-5: Details of type of protection work constructed along Gujarat coast, provided by Central Water Commission (CWC)

Sr. No.	Name of Scheme	Location (Taluka/ District)	Type of protection work	Specificati on	Latitude	Longitude
1	Danti Jalalpure	Jalalpure/ Navsari	Anti Sea Erosion work	Earth work, 1:3:6 concrete, Geofabric, core with Gabions wall.	21° 02' 46.46" N	72° 44' 08.27" E
2	Dandi Samapore	Jalalpure/ Navsari	Anti Sea Erosion work	Geofabric, core & Tetrapod in Armor layer	20° 53' 12.96" N	72° 47' 49.34" E
3	Borsi Machhiwad	Jalalpure/ Navsari	Anti Sea Erosion work	Geofabric, core & Heavy Stone in Aemore layer	20° 56' 28.71" N	72° 45' 20.56" E
4	Bhat	Gandevi/ Navsari	Anti Sea Erosion work	Geofabric, core & Heavy Stone in Armor	20° 46' 23.62" N	72° 50' 39.57" E

				layer		
5	Nani Danti – moti Danti	Valsad / Valsad	Anti Sea Erosion work	Geofabric, core & Tetrapod in Armor layer	20° 43' 28.06" N	72° 51' 13.52" E
6	Dholai	Gandevi / Navsari	Anti Sea Erosion work	Earth work, Toe wall, Pitching, C.D work and Flap Gate	20° 44' 19.41" N	72° 53' 18.16" E
7	Bhadeli Jagalala	Valsad / Valsad	Anti Sea Erosion work	Geofabric, core & Heavy Stone in Armor layer	20° 38' 05.12" N	72° 53' 16.53" E
8	Onjal Machhiwa d	Jalalpore / Navsari	Anti Sea Erosion work	Gabion Type A.S.E wall	20° 48' 30.22" N	72° 49' 53.95" E
9	Movasa	Gandevi / Navsari	Anti Sea Erosion work	Earth work, Toe wall, Pitching, C.D work and Flap Gate	20° 44' 53.02" N	72° 52' 04.44" E
10	Vill: Dumas Sultana bad, Bhimpore Ta, Choryasi	Choryasi	Sea Erosion Scheme	The modified design of seawall consist of 2.0 TO 2.5 Stones place on 1.:2.5 slope from el. +5.0m to el. +10.5 , 5.0 m wide toe-berm is provided	20° 5' 59" N	72° 42' 6.46" E

				at el. +5.0 m. The toe consist of 1.0 to 1.5 t stones below 2.0 to 2.5 t Stone of 50 to 200 kg weight (double layer). The core consist of 5 to 20 kg stones. A retaining wall at the lee side. A 0.15 m thick single layer of Gunny/nylon bags filled with stone grit (6 mm size) is provided on the geo-fabric filter layer.		
11	Mor-Bhagwa Ta. Olpad	Olpad/Dist. Surat	Gabion wall	9 mm dia polipropelene rope gabion size 1x1.5x0.5 m and 1x2.0x0.5 m having stone 20.0 to 40.0 kg weight.	21° 20' 45"	72° 39' 55"
12	Dandi Village	Ta. Olpad, Dist. Surat	Gabion Wall ch. 690 to 900	9mm dia polipcopelene rope	21° 20' 07"	72° 37' 50"

			m and ch. 1600 to 2690m	gabion size 1×1.5×0.5 m and 1×20×0.5 m having stone 20.0 to 40.0 kg weight		
			Earthen bund ch. 0 to 525m and ch. 900 to 1600m	Earthen bund with stone pitching in cement mortar		
13	Tapi Palaa works River training walls/ Breakwaters	Choryasi / Surat	Flood protection work	Concrete R.T. wall	21° 14' N	72° 51' E
14	Tapi Palaa works Revetments, eastern bunds.	Choryasi / Surat	Flood protection work	U/S slope 3:1 D/S slope 2:1 Earthen embankment with Gabion Pitching.	21° 14' N	72° 48' E
		Kamerj / Surat	Flood protection work	U/S slope 3:1 D/S slope 2:1 Earthen embankment with Gabion Pitching.	21° 17' N	72° 57' E
15	Dabhari ta: Olpad , Dist: Surat	Olpad Dist: Surat	Anti Sea erosion wall @ Vill: Dabhari	Providing Geo fabric over earthen bund with dry rubble pitching including	21° 15' 57" N	72° 38' 08" E

				Toe wall with concrete panel at every 30 m interval.		
16	Nesh Karanj ta: Olpad Dist: Surat	Olpad Dist: Surat	Anti Sea erosion wall @ Vill:Nesh Karanj	Providing Geo fabric over earthen bund with dry rubble pitching including Toe wall with concrete panel at every 30 m interval.	21° 25' 48" N	72° 40' 44" E
17	Kosamba	Kosamba – Valad	Protection wall	Gabion type	21° 36' 53" N	72° 53' 26" E
18	Kosamba	Kosamba-Valsad	Protection wall	Gabion type	20° 37' 39" N	72° 53' 12" E
19	Kosamba	Kosamba-Valsad	Protection wall	Big Rubble up to 2.0 MT	20° 36' 53" N	72° 53' 26" E
20	Kosamba	Kosamba-Valsad	Protection wall	Big Rubble up to 2.0 MT	20° 37' 39" N	72° 53' 12" E
21	Tithal	Tithal-Valsad	Protection wall	Big Rubble up to 1.5 MT	20° 35' 37" N	72° 53' 46" E
22	Surwada	Surwada-Valsad	Protection wall	Big Rubble up to 1.5 MT	20° 34' 58" N	72° 53' 51" E
23	Tithal-Bhagwada (Swaminarayan Temple)	Valsad/Valsad	Protection wall	Big Rubble up to 1.5 MT	20° 36' 14" N	72° 53' 37" E
24	Tithal-Valsad (Sai temple)	Valsad/Valsad	Protection wall	Big Rubble up to 1.5 MT	20° 35' 13" N	72° 53' 51" E

25	Maroli Umargam – Valsad	Umargam/ Valad	Protection wall	Big Rubble up to 400kg	20° 18' 01" N	72° 46' 11" E
26	Fansa Umargam	Umargam/ Valad	Protection wall	Big Rubble up to 400kg	20° 37' 39" N	72° 53' 12" E
27	Umarsdi machhiwad	Umargam/ Valad	Protection wall	Gabion type	20° 31' N	72° 53' 13" E
28	Umarsadi machhiwad	Umargam/ Valsad	Protection wall	Big Rubble up to 2.0 MT	20° 31' 33" N	72° 53' 14" E
29	Kalai (Sea side)	Valasd	Protection wall	Big Rubble up to 600kg	20° 21' 58" N	72° 49' 23" E
30	Kalai (River side)	Valsad	Protection wal	Big Rubble up to 400kg	20° 21' 58" N	72° 49' 23" E
31	Kolak-Udvada	Pardi-Valsad	Sea Wall	Gabion type	20° 28' 4" N	72° 51' 33" E
32	Udvada	Pardi-Valsad	Sea Wall	Big stone	20° 28' 38" N	72° 51' 42" E
33	Umarsadi-mangelwad	Pardi-Valsad	River side wall	Earthen bund with pitching & conc.	20° 31' 03" N	72° 53' 18" E
34	Umarsadi-mangelwad	Pardi-Valsad	River side wall	Stone with 50 to 100kg	20° 31' 50" N	72° 53' 18" E
35	Udvada	Pardi-Valsad	Sea Wall	Big stone	20° 28' 30" N	72° 51' 41" E
36	Umargam	Umargam-Valsad	Sea Wall	Gabion type	20° 12' 78" N	72° 44' 49" E
37	Nargol	Umargam-Valsad	River side wall	Gabion type + Big stone	20° 13' 36" N	72° 45' 17" E
38	Fansa-Tatawadi	Umargam-Valsad	Creek side wall	Stone with 50 to 100kg	20° 21' 06" N	72° 48' 30" E
39	Umargam	Umargam-Valsad	Sea Wall	Big stone + M-30	20° 11' 76" N	72° 44' 48" E

				Grade Concrete		
40	Umargam	Umargam- Valsad	River Side Wall	Big stone	20 <sup>0</sup> 12' 78" N	72 <sup>0</sup> 44' 49" E
41	Maroli- Dandi	Umargam- Valsad	Sea Wall	Big stone	20 <sup>0</sup> 17' 72" N	72 <sup>0</sup> 45' 17" E