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Boundary Delineation of Hingol National Park

Boundary Demarcation and Renotification of Protected Areas Project

March 2009

GIS Laboratory, WWF - Pakistan

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List of Abbreviations/Acronyms

ASTER	Advanced Spaceborne Thermal Emission and Reflection Radiometer
ASC	Area Specific Committee
Dept.	Department
DFO	Divisional Forest Officer
ERDAS	Earth Resources Data Analysis System
FCC	False Color Composites
Ft.	Feet
GCP	Ground Control Point
GEF	Global Environmental Facility
GIS	Geographical Information System
GPS	Global Positioning System
GRs	Game Reserves
Ha	Hectare
HDF	Hierarchical Data Format
HNP	Hingol National Park
IUCN	International Union for Conservation of Nature
LC	Land Cover
LPS	Leica Photogrammetry Suite
LU	Land Use
MCHW	Makran Coastal Highway
MoE	Ministry of Environment
NPs	National Parks
PAMP	Protected Areas Management Plan
PPEPCA	Pakistan Petroleum Exploration & Production Companies Association
RFO	Range Forest Officer
RS	Remote Sensing
SoP	Survey of Pakistan
SWIR	Short Wave Infrared
TIR	Thermal Infrared
UC	Union Council
VNIR	Visible to Near Infrared
WS	Wildlife Sanctuary
WWF - P	World Wide Fund for Nature - Pakistan

Acknowledgement

This report would have not been possible without the handwork and enthusiasm of the following team members;

Hammad Gilani, RS Analyst
Hassan Ali, GIS Analyst (Species)
Irfan Ashraf, GIS Associate
Kaif Gill, GIS Analyst
Sara Ambreen, RS Associate
Naeem Shahzad, RS Associate

I wish to express my gratitude to Mr. Manzoor Ahmad (Chief Conservator, Forest and Wildlife Department, Balochistan) and Dr. Ghulam Akbar (Regional Director, WWF - Pakistan) for their kind support. Special thanks are due to Mr. Muhammad Mazhar Liaquat (Park Manager, Forest and Wildlife Department, Balochistan) for the cooperation throughout the boundary delineation activities. I would like thank the Executive District Officers i.e. Mr. Abdul Waheed Sasoli, Mr. Ehtsham-ul-Haq and Mr. Masood Ahmad Rind from Revenue Department of Gwadar, Lasbela and Awaran districts respectively. They were very supportive for the provision of *latha* maps and identification of land ownerships at problematic areas.

I would like to offer sincere thanks to Mr. Abdul Rehman (Range Forest Officer, HNP), Mr. Gohar Khan (Deputy Range Officer, HNP), Mr. Abdul Aziz (Deputy Range Officer, HNP) and Mr. Tawakal Hussain (Game Watcher, HNP) who helped in field navigation and identification of NP extent.

I am greatly indebted to Dr. Ejaz Ahmed, Deputy Director General of WWF-Pakistan and Ms. Uzma Khan, Manager Conservation Programme for their constructive comments and guidance throughout the formulation of this report.

Urooj Saeed
GIS Coordinator

Summary

The study deals with the boundary delineation of Hingol National Park (HNP) by using GIS/RS techniques. WWF – Pakistan has conducted this study in collaboration with the Federal Ministry of Environment (MoE) and Pakistan Petroleum Exploration and Production Companies Association (PPEPCA) for the project "Boundary Demarcation and Renotification of Protected Areas".

HNP situated in Balochistan is one of the largest National Parks of Pakistan. It hosts a highly diverse ecosystem with mixed landscape that includes rocks, clay mountain ranges, sand dunes and beaches. It is a significant ecological area with treasures of flora and fauna.

For the accurate boundary delineation of HNP an Area Specific Committee (ASC) was formulated which consists of representatives from Forest & Wildlife and Revenue Departments of Balochistan and WWF – Pakistan.

Seven orthorectified ASTER images and topological data layers were used to define extent of the National Park (NP). For this purpose references from existing HNP notification were used to translate the boundary into a GIS format. Maps on different scales and paper size were developed to conduct field surveys. During the surveys Global Positioning System (GPS) coordinates were collected for the boundary references and land cover mapping.

Land cover (LC) map of HNP was developed by on screen digitization of ASTER images at a scale of 1:50,000. Eleven major land cover classes were identified on the satellite images. The output thematic map is much simplified and provides a general idea about the land cover classes of the area.

Hingol National Park has diversified habitat. Despite of the availability of limited literature on the species distribution in HNP, maps of different wildlife species were produced. The distribution and habitats of these species along with the attribute information were mapped using data collected from available reports including Protected Area Management Plan (PAMP). These distribution maps provide an overview of the wildlife distribution within the Park.

Topographic data layers, field data, LC maps and habitat maps were used to delineate HNP boundary. Delineated boundary significantly defines HNP extent considering physical as well geographical references. Water channels, ridges and mountains are the main boundary references on north, east and west where it follows five fathom water mark southwards. The boundary covers an area of 616,118 hectares.

ASC meetings were arranged to finalize the boundary. A draft notification format was developed and approved by the ASC members. As the

boundary was the outcome of GIS based scientific study so it is recommended to renotify the HNP boundary with geographical coordinates.

1 INTRODUCTION

1.1 Background

Protected Area is defined as “An area of land and/or sea especially dedicated to the protection and maintenance of biological diversity and of natural and associated cultural resources and managed through legal or other effective means” (IUCN, 1994).

In Pakistan, there are more than 230 Protected Areas (PAs) which cover almost 11% land (2,753,357 hectares) of the country. These PAs represent almost every ecological, terrestrial and aquatic ecosystem and are considerably important for their ecological and socio-economic services.

Currently available information about PAs boundaries are only in the form of notifications and sketch maps. Most of the notifications are without any reference whereas in some notifications localities, roads, water channels or any other landmark are considered as a reference. Such references are not reliable in the long run as the land conditions change with the passage of time i.e. shift in water channel or migration of certain locality. These references are much generalized, hence cause inaccuracies in position as well as in areas. On the other hand, GIS provides an opportunity to define boundary of certain region with geographic information. Hence to avoid ambiguities and errors, need of a GIS based notification was identified.

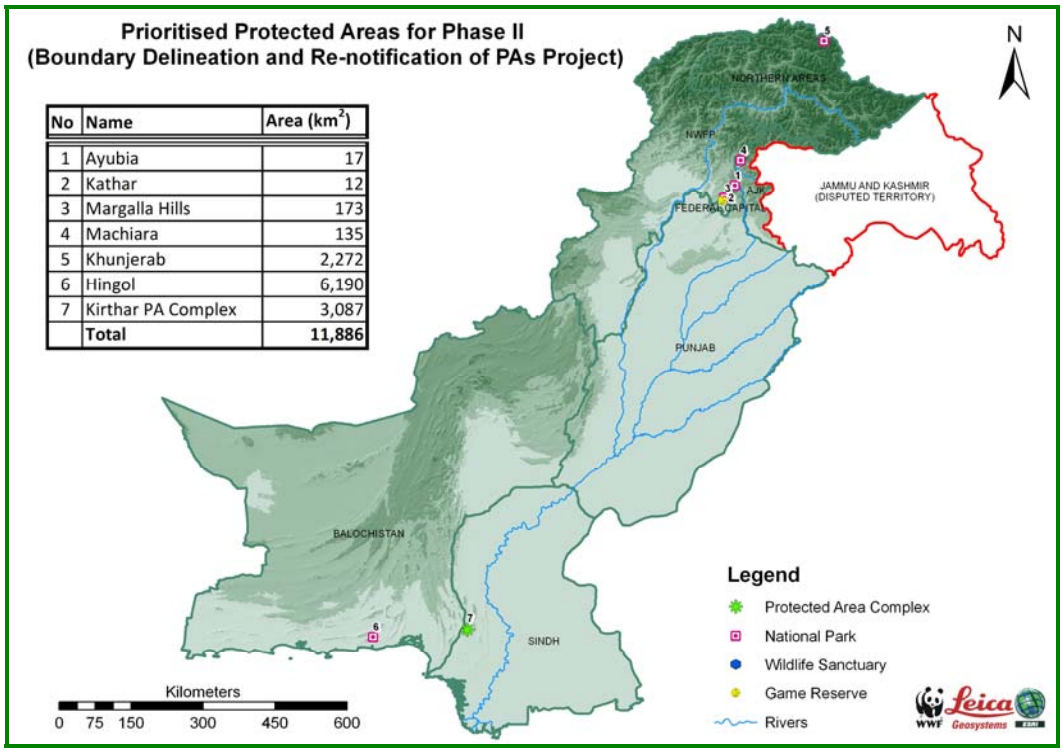


Figure 1: Seven prioritized PAs

Considering all these issues, WWF – Pakistan (WWF – P) in collaboration with the Federal Ministry of Environment (MoE) and with financial assistance of Pakistan Petroleum Exploration & Production Companies Association (PPEPCA) organized a three day National Consultative Workshop on “Boundary

Demarcation and Renotification of Protected Areas". Key stakeholders and partners of the workshop included senior and mid-career government officials from Ministry of Environment, Provincial/Territorial Wildlife and Forestry Departments, Survey of Pakistan (SoP), Capital Development Authority, Ministry of Petroleum – DGPC, Petroleum exploration and production companies, independent consultants and Pakistan Environmental Protection Agency.

As an outcome of this workshop, WWF – P and PPEPCA launched "Boundary Delineation and Renotification of Protected Areas" Project. Under this Project, WWF - P is delineating boundaries of seven selected PAs (Figure 1). So far boundaries and notifications of Ayubia and Machiara National Parks have been approved. This report describes the procedures adopted for the GIS based boundary delineation of HNP.

1.2 Study Area

HNP is the second largest National Park of Pakistan with an area of 6,190km^2 (619,043 hectares). The Park lies in three districts Lesbela, Gwadar and Awaran of Balochistan province. HNP is named at the Hingol River which flows in the centre of the NP and enters into the Arabian Sea. The geographical coordinates of its centroid are 65.51E and 25.72N, with an elevation ranges from 100 to 1,600m. Location map of HNP is shown in Figure 2.

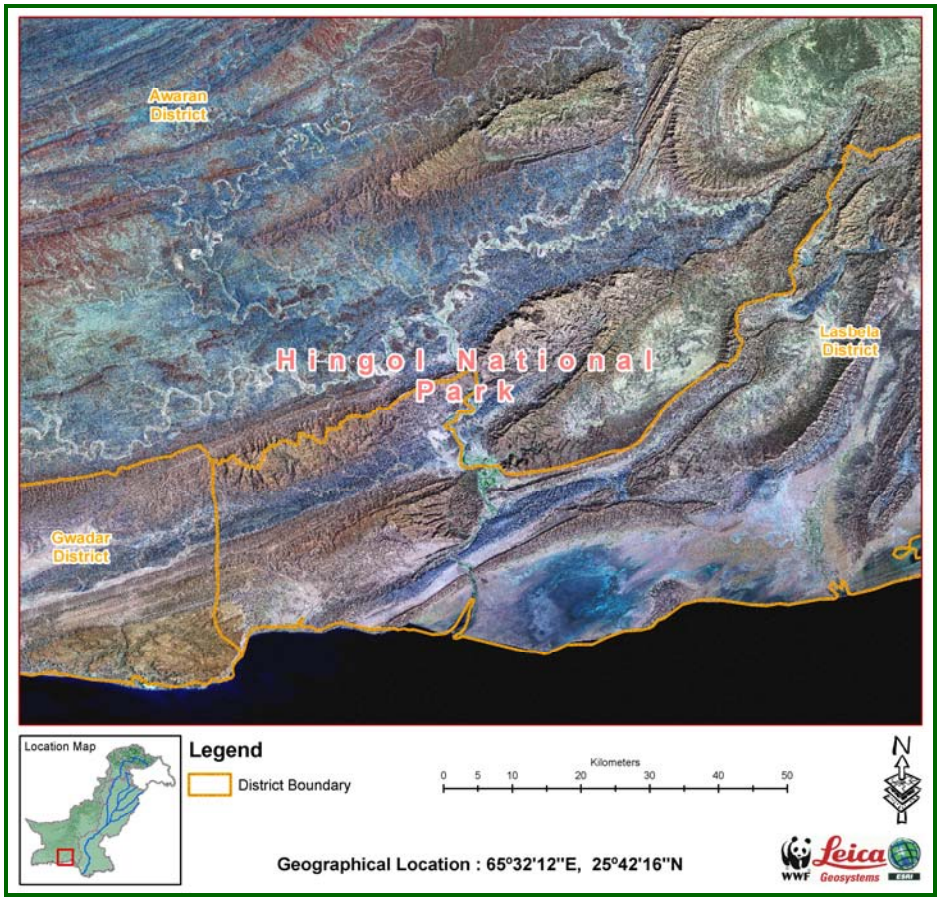


Figure 2: Location map of Hingol National Park

In 1969, the Government of Balochistan notified Dhrun as a Wildlife Sanctuary (WS) with an area of 24,356ha [(Ref. Government of Balochistan no C-1 (20) 6,850 Fll dated 23rd Feb. 1969)]. A few months later in 1989 the HNP was established. The two areas were near each other, but not connected, leaving out the area of Rodani-Kacho, and northern plains which were used for hunting.

During the preparation of the GEF-Protected Area Management Plan (PAMP), several studies were undertaken by IUCN[1], while a number of field surveys had been conducted by WWF in the eighties.[2]. IUCN and WWF recommended the Provincial Government to notify HNP with areas including Dhrun, estuary, shallow sea and the in-between area of the two Parks (Draft Management Plan HNP, 2008)

As an outcome, in 1997 Dhrun, Hingol and the area in between Rodani-Kacho were declared as a National Park i.e. Hingol National Park (Ref. Notification No.SO (Dev) 12-VIII/92-93/FST/422-85 dated 04th March, 1997).

HNP comprises of diverse landscapes which include rocks, clay mountain ranges sand dunes and beaches. It is a significant ecological area with various flora (Tamarix spp. *Haloxylon* spp. *Aerva* spp, and *Salsola* spp.etc) and fauna (Orphean Warbler (*Sylvia hortensis)*, *Ovis vignei*, *Gazella bennettii*, *Capra aegagrus*, *Crocodylus palustris* and Marine Dolphins etc).

The climate of the area is moderate sub-tropical arid. Summer days are generally very hot (>40ºC) while due to sea moisture, temperature falls down in the nights. In winter, season temperature varies day to night from 5 ºC to 35 ºC respectively. An average annual rainfall of 50-150mm has been recorded.

Communities living inside and around the NP have direct or indirect dependency on the Park. The main sources of livelihood for local communities are livestock, fishing, cultivation, wood cutting and hunting. A famous Hindu religious place named Hinglaj resides in the center of the Park. Throughout the year, thousands of Hindus visit the Hinglaj Mata Mandir out of which more than 5,000 come in the month of April at their religious gathering known as "Hinglaj Mata Teerath Yatra and Shri Hinlaj Seva Mandli". The Makran Coastal Highway (MCHW) passes though the NP that provides the travelers a great view of the mountains at the southern side and sea view at the northern side.

[1] IUCN (1997) Protected Area Management Project Vol 1-7 (Vol 1 could not be traced yet even at IUCN Office.)

[2] Ashiq Ahmad Khan PFI field reports; Ashiq Ahmad Khan and A.R.Baig (PFI) 1993, Gul Mohammad Satakzai (1994), Forest & Wildlife Department, Balochistan

2 MATERIALS

For boundary delineation and mapping, seven ASTER sensor images of TERRA satellite with a ground resolution of 15m were acquired from the United State Geological Survey (Table 1 & Figure 3). An ASTER image is captured in fourteen spectral bands of electromagnetic spectrum i.e. Visible to Near Infrared (VNIR), Short Wave Infrared (SWIR) and Thermal Infrared (TIR) with spatial resolutions 15m, 30m and 90m respectively.

Table 1: Satellite data characteristics

No	Acquisition Date	No of Scenes
1	20-04-2007	3
2	10-10-2006	2
3	11-11-2006	2

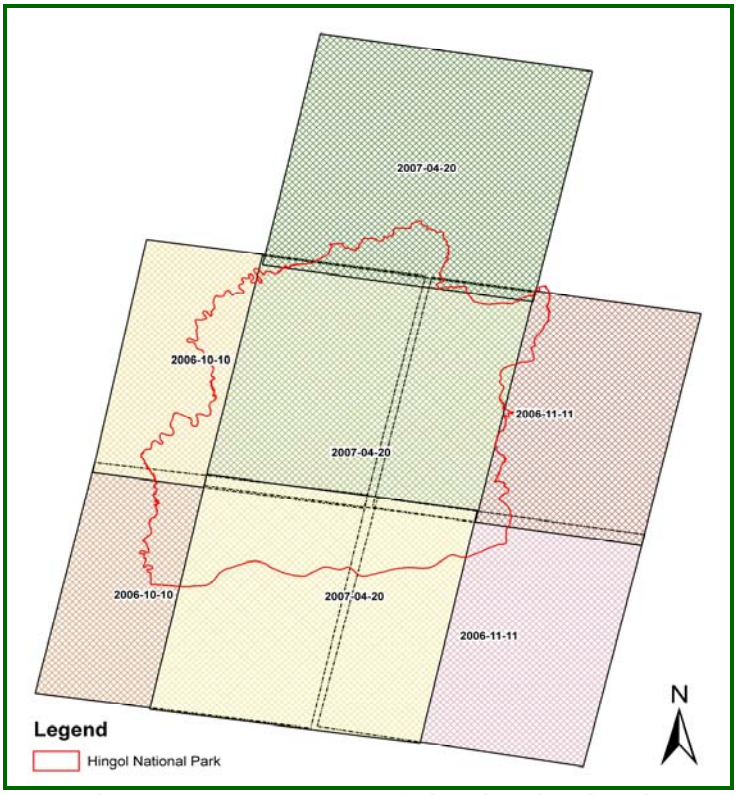


Figure 3: ASTER Scenes of Hingol National Park

Topographic layers (populated places, drainages, spot heights etc) were extracted from the 1: 250,000 scale maps of Survey of Pakistan (SoP). ERDAS IMAGINE 8.7®, ArcView 3.1®, ArcGIS 9.0® and Map Source 4.0® were used for image processing, GIS mapping and GPS data retrieving respectively.

Field maps, Garmin GPS 76 CSX receiver and digital camera were used for field navigation and data recording.

3 METHODOLOGY

Field data, topographic layers and landcover/landuse maps were used to delineate the draft HNP boundary. Work flow diagram is shown in Figure. 4.

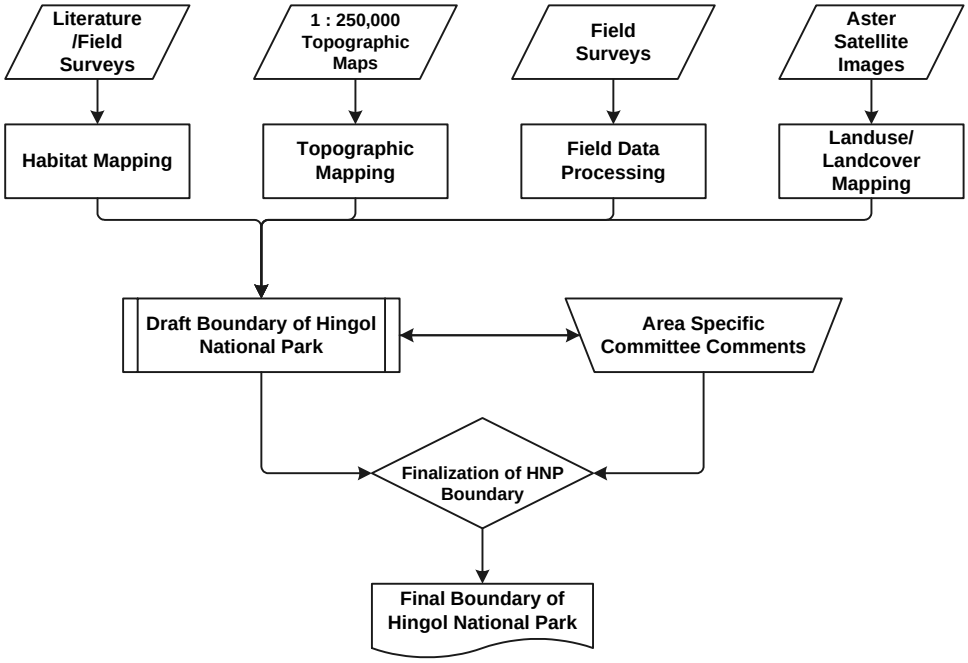


Figure 4: Flow chart

3.1 Preprocessing

L1A (unprocessed and un-rectified) ASTER images were acquired in Hierarchical Data Format **(**HDF).

For easy data handling, VNIR bands (1, 2 and 3N) were imported in *.img* format. Lieca Photogrammetry Suite (LPS) which is an add-on module of ERDAS Imagine 8.7® was used for orthorectification. Orthorectification is an advanced form of rectification which filters the geometric and terrain distortions from the images. In mountainous areas orthorectified images are strongly recommended to minimize the terrain effects. As the elevation of the study area ranges from 100-1,600 m, all the images were orthorectified to get accurate results in terms of boundary delineation and area calculation.

Image enhancement algorithms were applied on satellite data to achieve a better contrast. 'Histogram Equalize' and 'Standard Deviation Stretch' were applied for the extraction of meaningful information regarding different land cover classes.

3.2 Topographic Mapping

Spot heights, populated places, drainages, roads, catchments area and sea water marks were digitized from 1:250 000 topographic sheet (Figure 5). The attribute information was attached with each feature and output file was saved in GIS format.

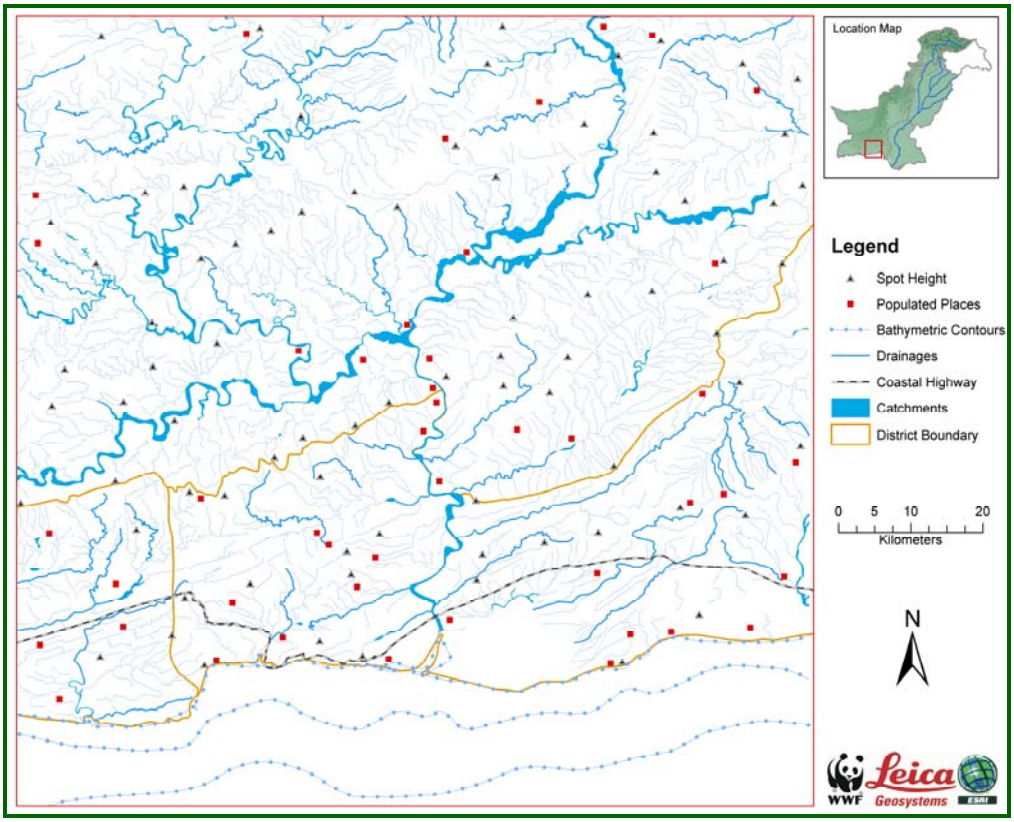


Figure 5: Topographic layers of HNP

3.3 Ground Truth and Field Data Collection

Two field visits of HNP were conducted in the year 2008. Survey team comprised of member from the following departments/organizations;

1. Forest and Wildlife Department, Balochistan
2. GIS Laboratory, WWF – Pakistan
3. Revenue Department, Balochistan

The main objectives of the surveys were data collection and on ground verification of the draft boundary. One hundred and sixty four GPS points were collected out of which 78 were collected during 1st field visit (11th – 20th May, 2008) while 86 were collected during 2nd field visit (15th – 26th October, 2008) as shown in Figure 6. (Annexure 1)

Figure 7 shows one of the maps that were used in the surveys.

Figure 6: Track and field observation point of HNP

Figure 7: Satellite image based A3 size field map

3.4 Field Observation Points

Some of the field observations are as follows;

- HNP has mixed geology in terms of physical features. It is a mountainous region having patterns of sand dunes, rivers, mud volcanoes and coastal belt (Figure 8-a and 8-b).
- Most commonly found plant species were *Tamarix* spp. *Saccharum* spp. *Euphorbia* spp., *Prosopis* spp, where as seasonal grasses and shrubs also exist on the beds along the major water channels (Figure 8-c and 8-d).

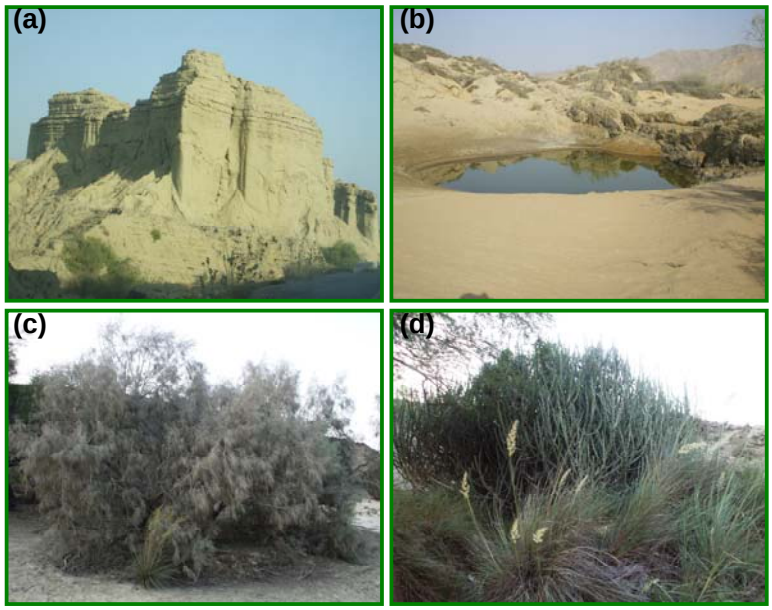


Figure 8: Digital photograph of (a) Mud mountain (b) Brackish water (c) *Tamarix* spp. (d) *Saccahrum* spp.

- In the NP there were three sacred places of Hindus named as “Hinglaj Mata Mandar”, Chandragup and Khandewari volcanoes. Many Hindus visit these areas each year (Figure 9).

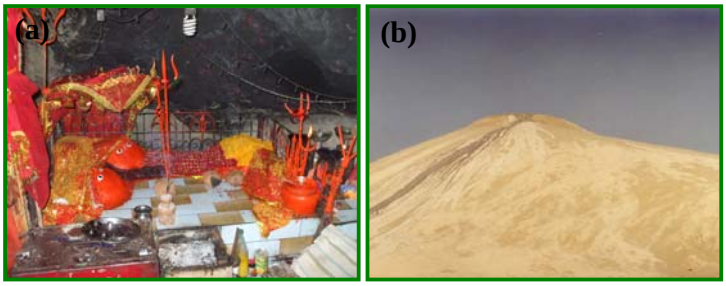


Figure 9: Digital photograph of (a) Hinglaj Mata Mandar (b) Chandragup and

- MCHW passes through the southern side of the HNP. Beautiful landscape, wildlife and sea breeze fascinate the travelers of MCHW (Figure 10).

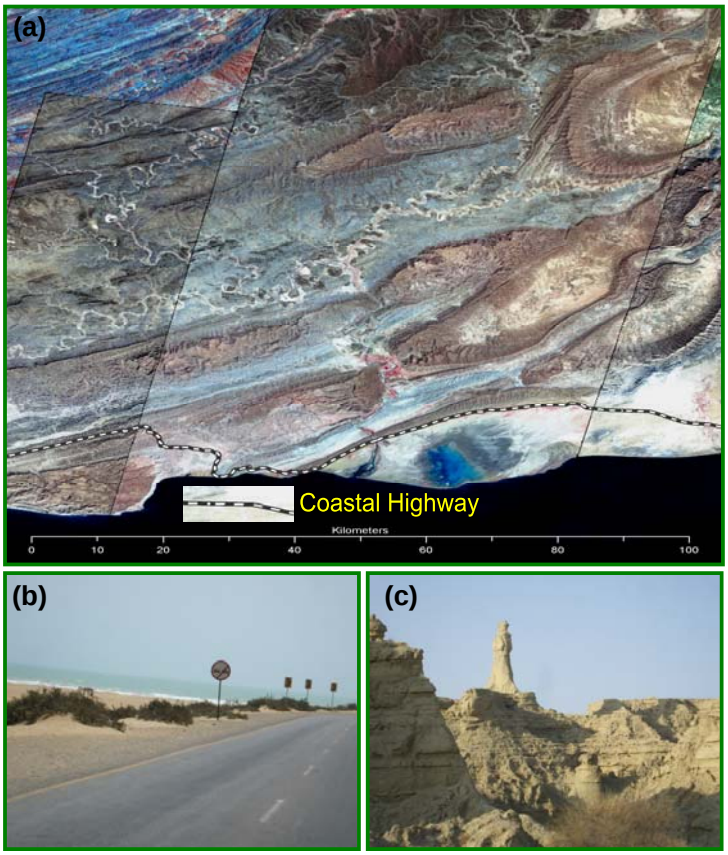


Figure 10: Coastal highway (a) satellite image and (b) digital photograph; (c) Digital photograph of Princes of Hope

3.5 Visual Image Interpretation

Satellite image is composed of brightness values that represent reflectance of landcover/landuse features in the form of digital numbers (DN values). Variations in brightness within single satellite imagery give an idea about the existence of different earth features. Specific landcover/landuse classes were identified and assigned on the basis of interpretation elements (tone, texture, pattern, association etc).

The description of landcover/landuse classes of HNP using ASTER data (FCC of 321) on the bases of their visual characteristic are discussed as follows;

Coastal Plains

A coastal plain is an area of flat, low-lying land adjacent to a seacoast and separated from the interior by other features (http://en.wikipedia.org/wiki /Coastal_plain, March 2009). In the satellite image this class is identified by applying different enhancement techniques. This class appears in bluish tone and is mostly present along the high water line in the sea.

Desert valleys with steep slope

A large area of HNP consists of sandy mountains. In the satellite image these valleys were easily identified due to the shadowing impact. This land cover class was classified on the basis of high contrast grey appearance with rough texture due to variation in elevation values.

 **Estuarine**

An estuary is semi-enclosed coastal area with one or more rivers or streams flowing into it (Pritchard, D. W., 1967). Estuarine are generally associated with high levels of biodiversity. In the area, it was present where Hingol River enters in the Arabian Sea. During the image interpretation process, greyish tone and the river-ocean association were used for the identification of this class.

 **Land Soil**

Land soil of the area was sandy and saline. The variation in grayish to yellow tone provides an idea about the soil types. In the study, land soil was classified as a single land cover class.

 **Natural Water Bodies**

Natural water bodies include river, water channels, oceanic water, small lakes and streams. In the area, secondary water channels were of non-perennial nature i.e. remains dry throughout the years except the rainy season.

 Open Grasses/Shrubs Land

This class is season dependent. This class, in varying red tones, was commonly present in plain areas on the eastern side of the Park.

 **Riparian Belt**

“Riparian Belt” is the dried river bed near the river or main water channels commonly called river bed. These areas were identified from the satellite images due to bright white tone.

 Sand Dunes / Flood Plains

Sand dunes are basically ridges of sand created by the wind; found in the deserts or near the oceans. There are some flood plains (A floodplain is a part of land in which flooded water remains over a particular period of time). Rippled texture in the satellite imagery refers to sand dunes.

 **Steep Cliff Mountains**

Contains the area of mountains with steep slope. These can easily be identified by overlaying contours and analyzing variation in shadowed areas.

 **Subtropical Vegetation**

“Subtropical Vegetation” class was mostly present along the dried water channels or streams mostly present in the hilly area. Reddish tone along the water channels within the periphery of the valleys confirms the existence of this class.

 **White Clay Mountains**

“White Clay Mountains” was another major class of the area. In the image, it appeared in a bright grey tone. It was identified due to its coarser texture which is due to the mixing of clay and gravels.

3.6 Landuse/Landcover Mapping

Land Cover Map

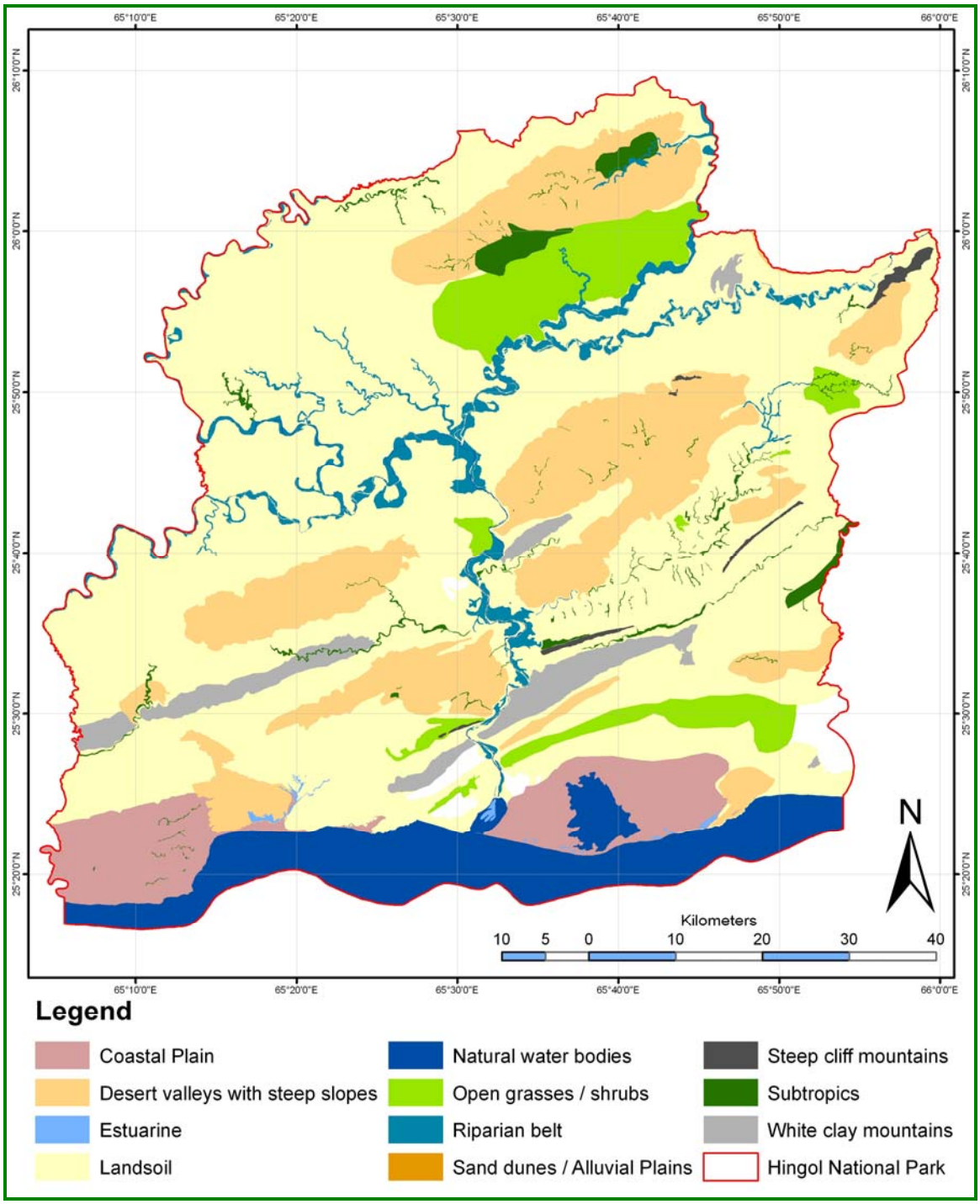


Figure 11: Landcover/Landuse map of HNP

Land cover map of HNP was developed by on screen digitization at a scale of 1:50,000. Eleven major land cover classes were identified on the satellite images. Field data were used to identify different spectral abnormalities in the satellite image.

Table 2: Area of landcover classes

S. No	Class Name	Area (ha)
1	Coastal Plains	34,072
2	Desert valley With Steep Slope	103,433
3	Estuarine	8,52
4	Landsoil	339,179
5	Natural Water Bodies	49,727
6	Open Grasses/Shrubs	34,154
7	Riparian Belt	19,007
8	Sand Dunes/Flood Plains	6,527
9	Subtropics	9,776
10	White Clay Mountains	17,317
11	Steep Cliff Mountains	2,074

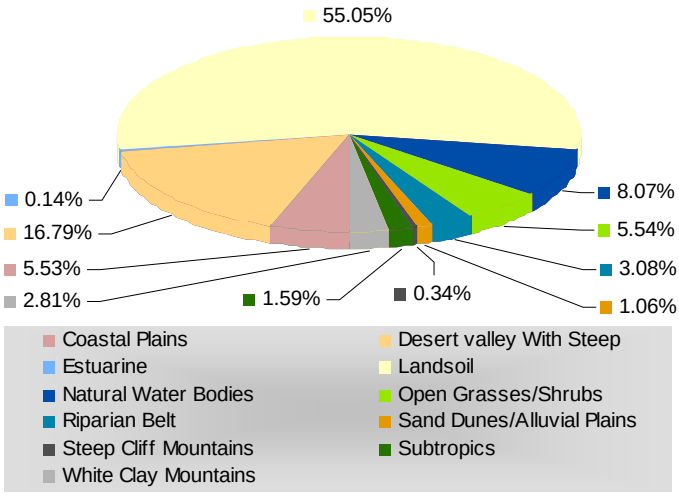


Figure 12: Percentage pie chart of landcover classes

3.7 Habitat Mapping

As mentioned before HNP has diversified habitat and dominant plants species of the area are *Acacia senegal, Acacia nilotica, Prosopis cineraria, Salvadora sp., Ziziphus jujuba, Euphorbia, Tamarix* spp. Owing to its versatile habitat types the Hingol National Park has rich biota. Information on the animals inhabiting in the area is limited (Brohi, M.A. and Fakhri, S. 2006).

Detailed inventories of wildlife were undertaken in 2006 and according to this data Hingol is known to support at least 35 species of mammals, 65 species of amphibians and reptiles and 185 species of birds. Some 250 plant species were recorded in the initial surveys including seven yet not described species. Detailed surveys are still required.

The Park is also in an exceptional situation by being located at converging area of three zoogeographical regions including the African (Ethiopian) Region with species such as *Acacia senegal, Euphorbia caducifolia, Zizyphus nummularia and Commiphora,* Chinkara Gazelle, Cairo Spiny Mouse, Sandgrouse and Larks; the Palarctic Region which includes Europe-North Africa-Northern Asia with species such as Sindh Ibex, Afghan Urial, Partridges, Houbara Bustard, Brown-

necked Raven and the large number of wintering migrant birds, and third region the Oriental Region including the area of South East Asia to Pakistan with species such as the Bengal Fox, Indian Porcupine, Pangolin, Indian Roller, Indian Cobra and Royal Snake. A few species also find their origin in the area itself including the Sindh Woodpecker, Sindh Sparrow and the genetically rather distinct Peninsular Desert Wolf.

Several species of international and national values are found in the Park such as the Green and Olive Ridley Turtle, Dalmatian and Spot-billed Pelicans, Sociable Lapwing, Eastern Imperial and Pallas Fish Eagle, White-backed Vultures, Marsh Crocodile, Spiny-tail Lizard, Sindh Ibex, Afghan Urial, Chinkara Gazelle, Common Leopard, Caracal, Hyena, Honey Badger, Afghan Hedgehog, Pangolin and Plumbeous Dolphin.

The Park is still in a relative good condition, although it lost the Balochistan Black Bear some 50-100 years ago, the Onager or Wild Donkey some 50-75 years ago and the Cheetah 25-50 years ago, while currently several species are critically in low numbers including Desert Wolf, Hyena, Leopard, Caracal, Spiny-tailed Lizard, and in low numbers Urial and Wild Boar (Draft Management plan HNP, 2008).

A limited number of reports are available on the species distribution in HNP but up till now no proper maps based on the geographical distribution and habitats of these species have not been developed. Maps and attributed information on the geographical distribution of the wildlife species of HNP, collected through different reports including PAMP is discussed below.

Data and information on the occurrence and distribution of wildlife species was collected from different sources. Wildlife survey reports (compiled by different consultants) were obtained from the Balochistan Wildlife Department. Geographical coordinates of observes species were extracted from the reports. These geographical coordinates along with the localities of the distribution of wildlife species were imported into ArcGIS 9.0 software for mapping the distribution of species within the Park.

Figure 13 shows the mammal distribution map of HNP.

Major Ungulates and other Mammals Distribution Mapping

There are no concise and comprehensive data/maps available on the spatial distribution of the mammals within HNP region. Nonetheless, there are a number of wildlife ecologists and biologists who have studied and surveyed HNP with more or less account of the spatial distribution.

The data for mapping the spatial information of eight mammal species, out of the recorded mammals, were obtained from different data sources namely:

A. Aleem, Ch. 2007, Large Mammals at Hingol National Park, Balochistan. (Approx 133PP.) Forest and Wildlife Department, Quetta, Balochistan.

B. Brohi, M. A. and Fakhri, S. 2006, urvey of Small Mammals of Hingol National Park Balochistan. Rec. Zool. Surv. Pakistan, 17:7 – 10

C. Management Plan Hingol National Park (Draft), 2008

Figure 14 shows the major ungulate species distribution map of HNP.

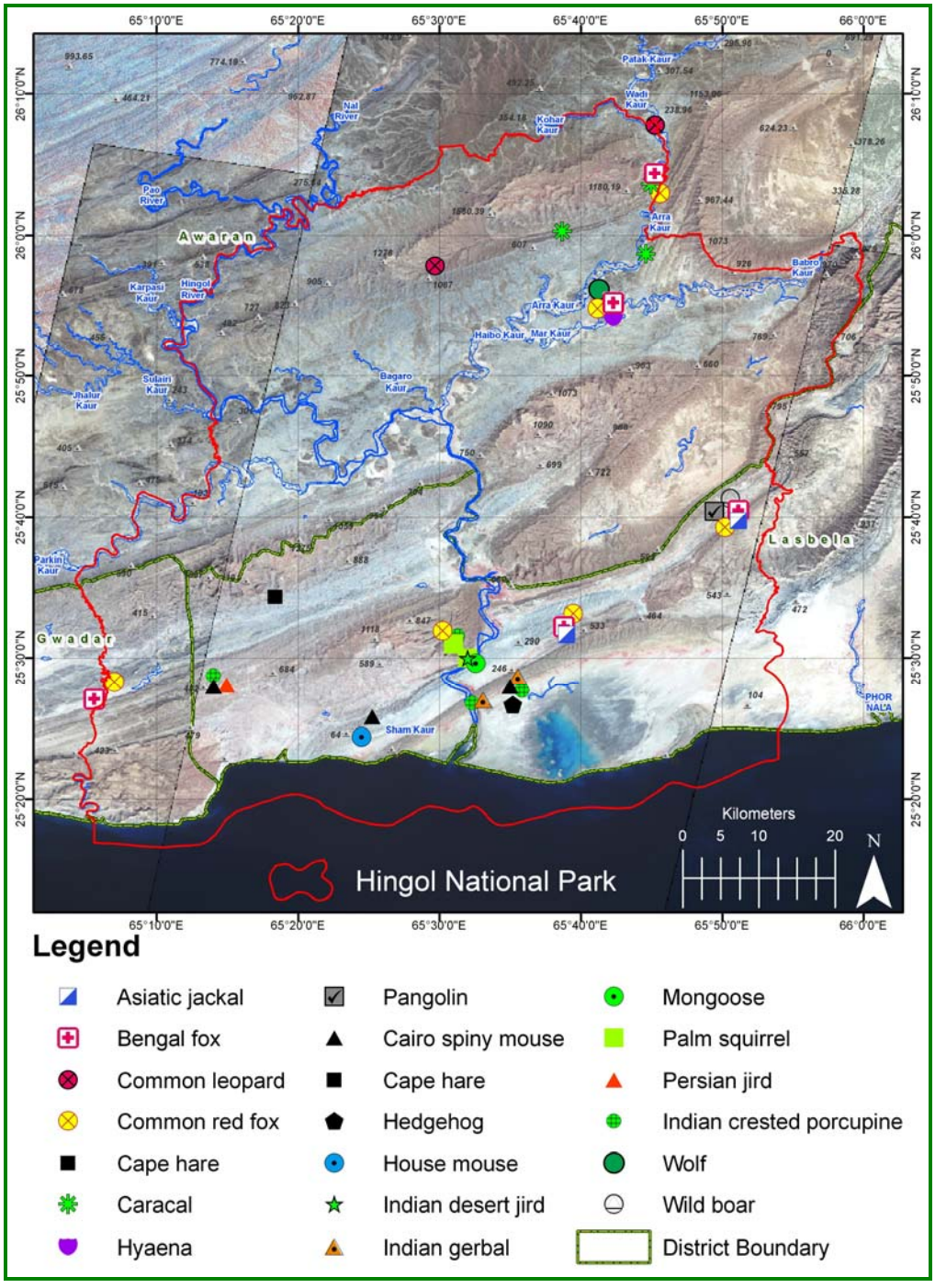


Figure 13: Mammals distribution map

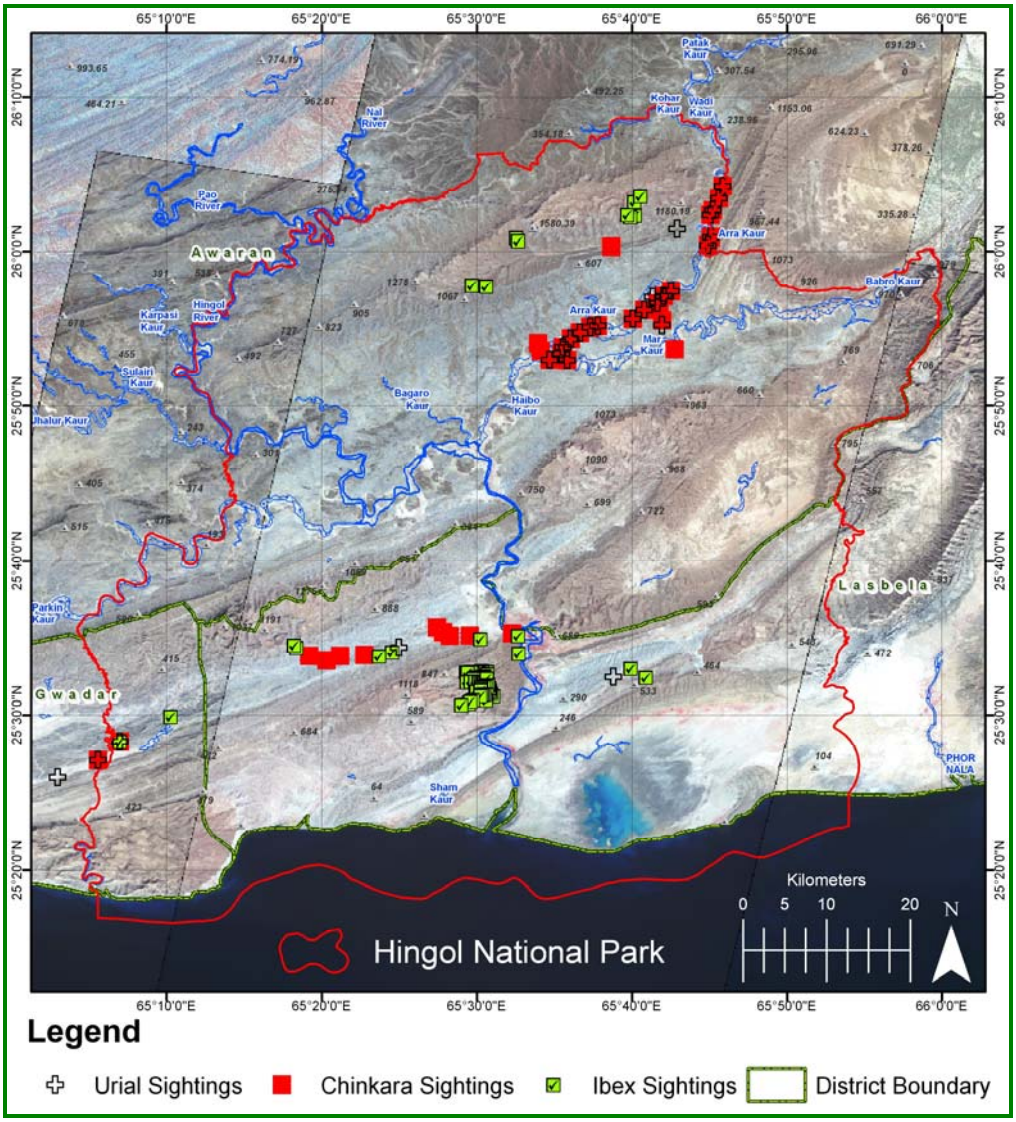


Figure 14: Distribution map of major ungulate species

3.8 Boundary Delineation

As mentioned earlier, HNP was legally notified as a National Park under the notification number SO(DEV) 12 - VIII / 92 – 93 / FST / 422 - 85 dated 4th March, 1997 covering an area of 619,043 hectares (15303281 acres).

For the accurate boundary delineation, an Area Specific Committee (ASC) for HNP was formulated which comprises of following members; (Figure 15)

- Mr. Abdul Waheed Sasoli, Executive District Officer,
  Revenue Department, District Gwadar
- Mr. Ehtsham-ul-Haq, Executive District Officer,
  Revenue Department, District Lasbela
- Dr. Ghulam Akbar, Director/Regional Head,
  Indus for All Programme, WWF – Pakistan, Karachi

- Mr. Manzoor Ahmad, Chief Conservator,
  Forest and Wildlife Department, Balochistan
- Mr. Masood Ahmad Rind, Executive District Officer,
  Revenue Department, District Awaran
- Mr. Muhammad Mazhar Liaquat, Park Manager,
  Hingol National Park, Forest and Wildlife Department, Balochistan

Team members involved in the boundary delineation and field data collection activities were Mr. Muhammad Mazhar Liaquat (Park Manager, Hingol National Park), Mr. Abdul Rehman (Range Forest Officer, Forest and Wildlife Dept., Lasbela) Mr. Muhammad Gohar Khan (Deputy Range Officer, Hingol National Park), Mr. Hammad Gilani and Mr. Irfan Ashraf from the GIS Laboratory of WWF - Pakistan, Lahore.

Figure 15: Digital photograph of ASC meeting and its participants

A number of meetings with the Park management staff and revenue officials were arranged. These meetings did not raise any major issue or conflict regarding the NP boundary. Main issues discussed in the meetings are as follows;

a) Names of localities recorded from the topographic sheets were corrected in the meeting.

b) According to the current notification, the eastern side of the Park boundary does not have any ground reference. It was decided by the ASC to finalize the boundary extent after a detailed survey of the Park.

c) GPS points of the boundary pillars (if any) should be recorded. The coordinates of the pillars will be helpful in the delineation process.

d) Names of water channels in the database are needed to be corrected after the survey.

To resolve these issues, a couple of field surveys and meetings with ASC members were arranged. GPS points along with attribute data were collected for the major water courses (Figure16). At some places the boundary pillars were also observed. A field survey was conducted to finalize the eastern side of draft boundary. As the HNP boundary in the eastern side does not have any physical reference, it was delineated with the mutual understanding of the ASC members by taking references as water channels and the 5km buffer of Chandar Gup (a live mud volcano).

Figure 16: Digital photograph of the meetings and field activities

The western and northeastern sides of the boundary were also visited and GPS data about different boundary references were collected. The local names of nullahs were also confirmed and corrected after discussions with the Park management staff and locals (Figure 17).

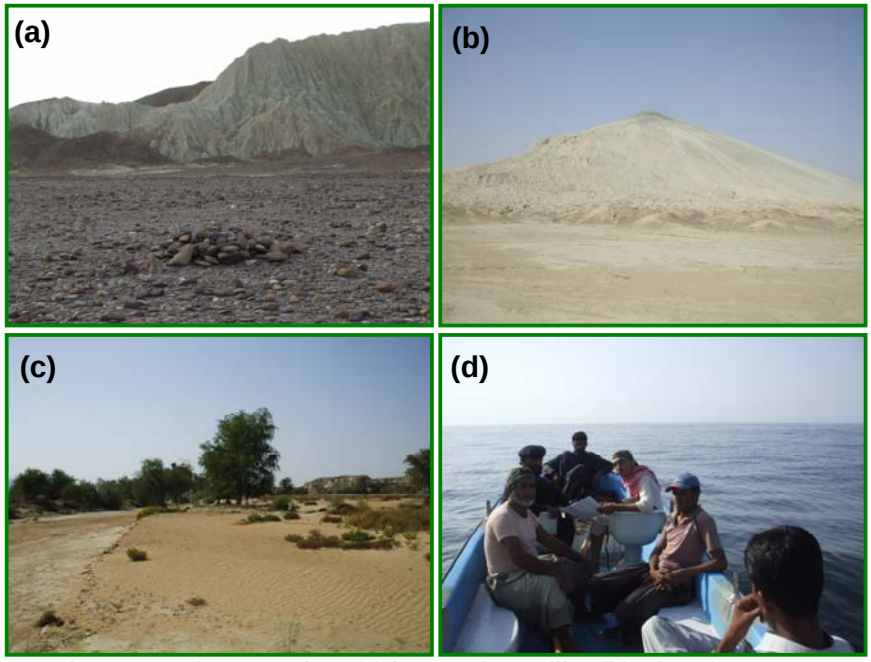


Figure 17. Photographs of (a) Boundary pillar (b) Chandar Gup (c) Deokoh Wyaro Kaur (d) Boundary data collection along Malan Bandar

4 RESULTS AND DISCUSSION

Boundary delineated by incorporating field information and other ancillary data is described in detail on the basis of North, East, South and West side of the boundary (Figure 18).

North

In the North, Park boundary has very clear references. It starts from the junction of Pao River and Null River and moves eastwards following the Nal River, Nali Kohar Kaur, Kohar Kaur, and Arra Kaur. Then it follows the ridge line of Kund Mountain and ends on Babro Kaur which is the north-east corner on the boundary.

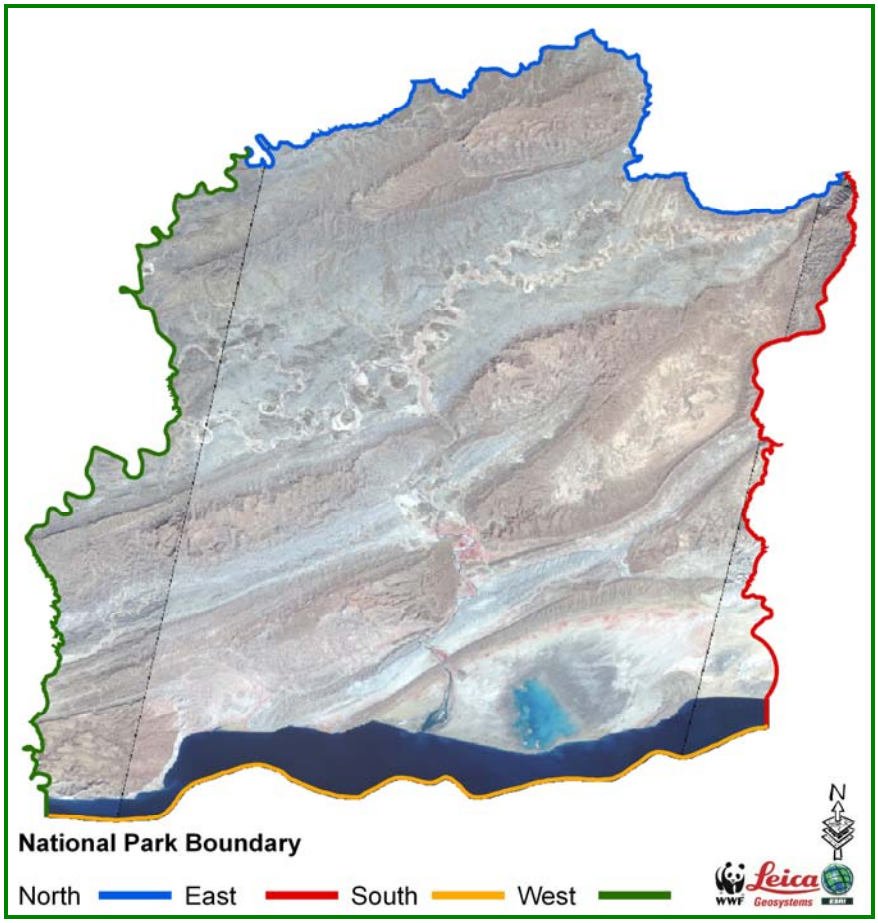


Figure 18: HNP Boundary

East

In the east of HNP boundary it extends southwards following Awaran/ Lasbela district boundary, Garrai Kaur, Pachhri Kaur, Deokoh Wyaro Kaur, Rayen Kaur, and passing through Manjwani Pass, Manjwani Kaur and then a 5km buffer of Chander Gup volcano and enters in sea up to 5 fathom mark.

South

In the sea it follows the 5 fathom mark having reference from SoP 1:250,000 topographic maps.

West

In the west, boundary passes through Gaz Ab Kaur, Manneji Kaur, Koh Sarri Kaur, Parkin Kaur and junction of Solari Kaur and Hingol River. From this point it follows Hingol River up to the junction of Pao River and Nul River which is the northwestern corner of the Park.

The copy of draft notification is also attached with the report as Annexure 2

5 CONCLUSION AND RECOMMENDATIONS

GIS boundary and notification format significantly defines HNP extent with the help of ground references i.e. land features and geographic coordinates. Water channels, ridges and mountains are the main boundary references on north, east and west where as boundary follows 5 fathom water mark in south. Positions of water channels and 5 fathom mark can change with the passage of time, however the geographic coordinates provides a constant reference.

The boundary has been delineated and finalized in close consultation with the ASC which comprises of major stakeholders. As an output of this GIS based study a notification format was developed which has been approved by ASC.

The HNP boundary covers an area of 616,118 hectares, whereas the area given in the notification is 619,043 hectares. These values indicate a comparatively less area of 2,925 ha (29.25 sq Km) in the proposed boundary. As the draft proposed notification format is an outcome of a GIS based scientific study, therefore it is recommended to renotify the HNP boundary with geographical coordinates.

It is recommended to organize a basic level GPS training for the Park management staff. It will help the staff to translate the boundary on ground with the help of a GPS. It will help to introduce the emerging GIS/GPS technology for the management of the natural resources of the Park.

It is also recommended that the draft management plan of the HNP should be revised by incorporating maps and figures according to the proposed boundary. This management plan should then be approved for implementation.

ANNEXURE 1 (Field observation points)

No.	Longitude	Latitude	Height	Description
1	66.61060	25.67586	70 ft	Zero Point Coastal Highway
2	66.62420	25.79296	107 ft	Wild Life Office, Uthal
3	66.02764	25.46869	78 ft	Syed Ismail Shah Ghazi
4	65.97440	25.47961	49 ft	Board of HNP indicating start of boundary
5	65.95807	25.48432	51 ft	Goth Sardar Hassan (Way to Butan)
6	65.95017	25.48795	61 ft	Ridge Line near Butan Village
7	65.86552	25.44545	316 ft	Chandar Gup (Live Mud Volcanoe)
8	65.86552	25.44545	316 ft	Salsola, common bushes, Tamarix (very sparse)
9	65.78753	25.51660	102 ft	Sangal Area (Babu Goth)
10	65.54608	25.44673	34 ft	HNP info center, Aghor Chowki
11	65.45784	25.39126	4 ft	Sea Shore near Kund Malir
12	65.44952	25.38854	26 ft	Kund Malir
13	65.46899	25.39661	58 ft	Viper was sighted
14	65.54151	25.44574	35 ft	Bridge on Hingol River
15	65.46135	25.39312	32 ft	Hingol River
16	65.46045	25.39245	30 ft	Sand Dunes along coastal highway
17	65.46011	25.39241	30 ft	Sand Dunes along coastal highway
18	65.45982	25.39243	28 ft	Sea Shore
19	65.33960	25.38003	67 ft	Bushes on seaside, rocky terrain on opposite
20	65.33274	25.37783	0 ft	Sea shore at Malan Bundar
21	65.31391	25.39263	33 ft	Muskit, Tamrix
22	65.30759	25.39219	34 ft	Goth Malan
23	65.32299	25.39487	58 ft	Ras Malan
24	65.29997	25.43053	124 ft	Princes Of Hope
25	65.24841	25.44194	888 ft	Buzi Pass
26	65.24842	25.44749	977 ft	Buzi Check Post- HNP
27	65.24843	25.20982	0 ft	Ormara
28	65.24844	25.27428	4 ft	bushes (very small)
29	65.24845	25.35253	29 ft	bushes (very small)
30	65.24846	25.38368	22 ft	sand on both side of MCHW
31	65.24847	25.37191	37 ft	Manaj Canal
32	65.24848	25.39059	214 ft	Soil Rocks
33	65.24849	25.40998	197 ft	Soling Nala
34	65.24850	25.43101	388 ft	Sar Bhat Nala (Small)
35	65.24851	25.45262	437 ft	Sar Bhat Nala (Big)
36	65.24852	25.47103	820 ft	Ghoran Ghatti Top (in North)
37	65.24853	25.44170	988 ft	Buzi Top From Road
38	65.24854	25.41914	103 ft	Sham Valley Area
39	65.24855	25.48787	17 ft	Way to Nani Mandar 7km ahead
40	65.24856	25.47180	57 ft	Sharan Goth
41	65.24857	25.47292	41 ft	Grasses and Bushes along the Road
42	65.24858	25.49293	37 ft	VCC Sangal School (North)
43	65.24859	25.50939	91 ft	Manjwani Bridge
44	65.24860	25.50700	105 ft	Manjwani Pass (in East)
45	65.24861	26.19738	242 ft	Purali River
46	65.24862	26.20723	251 ft	Kanki River
47	65.24863	26.20445	1335 ft	Goko Check Post HNP
48	65.24864	26.20452	1331 ft	Mar kour Nala

49	65.24865	26.25043	976 ft	Aara Kour Nala
50	65.24866	26.36331	1219 ft	Jhao Village
51	65.24867	26.38891	1222 ft	Hingol River
52	65.24868	26.45566	1734 ft	EDO-Community Development Office, Awara
53	65.24869	26.46110	1763 ft	EDO-Revenue Office, Awaran
54	65.24870	26.46082	1736 ft	Mushke River
55	65.24871	26.28410	942 ft	Hassan Goth
56	65.24872	26.26976	896 ft	Goko Check Post HNP
57	65.24873	26.26671	897 ft	Wadi Nadi 1
58	65.24874	26.25081	948 ft	Wadi Dhand
59	65.24875	26.23179	896 ft	Hani Kour/Wadi Nadi 2
60	65.24876	26.20852	837 ft	Wadi Nadi 3
61	65.24877	26.20021	805 ft	Ibex was Sighted (in HNP 5km Buffer Zone)
62	65.24878	26.17904	774 ft	Lag Nadi
63	65.24879	26.16967	787 ft	Dali Hinj Check Post
64	65.24880	26.16716	792 ft	Dali Hinj Village (Near HNP boundary)
65	65.24881	26.14296	770 ft	Boundary Pillar
66	65.24882	26.14307	772 ft	Boundary Pillar
67	65.24883	26.13367	716 ft	Inside Kohar kour
68	65.24884	26.13364	717 ft	Inside Kohar kour
69	65.24885	26.13337	712 ft	Junction of Aara Kaur, Kohar kaur and Babro Kaur
70	65.24886	26.21245	1349 ft	Goko Village
71	65.24887	26.19264	1317 ft	Lwari Goth
72	65.24888	26.18819	1313 ft	Hawaldar Husain Goth
73	65.24889	26.14445	1218 ft	Ghulam Hassan Goth/Check Post
74	65.24890	26.08787	994 ft	Goko Kaur
75	65.24891	26.03715	894 ft	Rodai valley
76	65.24892	25.43096	406 ft	Sar Bhat, Lakri Ghar
77	65.24893	25.46500	557 ft	Jakki to Sar Bhat Nala
78	65.24894	25.45387	953 ft	Leopard Sighting
79	66.610535	25.676594	66 ft	Zero Point, Coastal Highway Gawadar
80	65.974380	25.479658	18 ft	Board of HNP
81	65.891883	25.458438	15 ft	Point on Draft Boundary
82	65.831640	25.433571	42 ft	Point on School Boundary in Latha Map
83	65.831637	25.433866	40 ft	Point on School Boundary in Latha Map
84	65.831340	25.433339	22 ft	Primary School Goth Sapat (Not functional, Destroyed)
85	65.831668	25.433309	51 ft	Point on Draft Boundary
86	65.849187	25.439106	45 ft	Point to rectify Latha
87	65.847813	25.440480	36 ft	Point to rectify Latha
88	65.831092	25.509704	108 ft	Manjwani Bridge
89	65.819568	25.517168	127 ft	Mile Stone [Gawadar(440Km),Aghore(23Km)]
90	65.866038	25.504380	87 ft	Mile Stone[Karachi(198Km), Uthal(105Km)]
91	65.868248	25.504165	80 ft	Point to rectify Latha
92	65.888903	25.503347	83 ft	On Draft Park Boundary
93	65.887560	25.516050	128 ft	On Draft Park Boundary standing on a Small Mountain
94	65.800612	25.516543	66 ft	hand pump and well for water supply
95	65.838169	25.517045	89 ft	Shanndi Kaur Branch 1
96	65.839805	25.517761	94 ft	Shanndi Kaur Branch 2
97	65.853856	25.523788	138 ft	Maiski Kaur (not sure)
98	65.868311	25.529123	151 ft	Landdeini Kaur (Landdan herbal)
99	65.872979	25.532263	145 ft	Manjwani Kaur
100	65.875668	25.534949	144 ft	Manjwani Kaur

101	65.877309	25.537658	149 ft	Manjwani Kaur
102	65.879386	25.540110	196 ft	Jikki Roungan (Balochi: small Pass)
103	65.880480	25.544475	160 ft	Manjwani Kaur
104	65.886885	25.560487	216 ft	Point on Draft Boundary
105	65.893569	25.578721	235 ft	Manjwani Kaur
106	65.892228	25.594252	1118 ft	Manjwani Pass
107	65.883540	25.599123	1023 ft	Raayen Kaur
108	65.883845	25.599041	1038 ft	300 meter Manjwani Pass
109	65.877714	25.611831	1010 ft	Raayen Kaur
110	65.877713	25.614420	993 ft	Raayen Kaur
111	65.871661	25.620417	954 ft	Machi Takar Mountain
112	65.870519	25.632890	669 ft	Garibo Goth (8-10 Houses with 50-60 people, livelihood on livestock i.e Goats)
113	65.873669	25.639789	496 ft	Washi Chakul (balochi: Mitha Chashma)
114	65.874412	25.640418	480 ft	Deokoh Kaur (Khabrri)
115	65.879217	25.645935	470 ft	Douddar (Plain Area) (N : Taja)
116	65.880666	25.646050	470 ft	Vegetation lush green (Khajoor, Kekar, Kandi, Gaz)
117	65.883217	25.649147	469 ft	Flow directon is East to West along Douddar(Bank of Kaur)
118	65.885801	25.651039	468 ft	Deokoh Bonddi (Bank of Kaur)
119	65.891423	25.652460	457 ft	Deokoh Kaur/ Deokoh Barra Kaur
120	65.892739	25.654104	452 ft	Jouj Ka Bent
121	65.897368	25.667655	427 ft	Shahden Kaur enters in Deokoh Kaur
122	65.897294	25.681373	434 ft	Kunrri Kaur (headed forward to Deokoh Kaur)
123	65.897930	25.690638	432 ft	Deokoh Kaur/ Deokoh Bara Kaur
124	65.904481	25.693816	420 ft	Deokoh Kaur/ Deokoh Bara Kaur
125	65.909605	25.698753	406 ft	Deokoh Kaur/ Deokoh Bara Kaur
126	65.904587	25.701930	399 ft	Junction of Deokoh Kaur and Karpasi Kaur
127	65.902854	25.702676	392 ft	Deokoh Dot (junction of two Mountains)
128	65.900514	25.695002	529 ft	Ibex Foot Marks
129	65.870508	25.632901	651 ft	Machi Kaur
130	65.871548	25.627639	693 ft	Machi Kaur
131	65.877696	25.614356	963 ft	Raayen Kaur
132	65.838242	25.515597	129 ft	Shanndi Kaur
133	65.837369	25.514846	122 ft	Shanndi Kaur
134	65.803955	25.513217	77 ft	Drabi Kaur
135	65.798531	25.513399	88 ft	Akkri Kaur
136	65.793363	25.514226	77 ft	Guzzyun Kaur
137	65.791776	25.514503	78 ft	Chigarrdi Kaur
138	65.527551	25.471939	71 ft	Shamm Goth
139	65.518161	25.514374	123 ft	Hinglaj Mndar
140	65.522802	25.488334	0 ft	Hingol River
141	65.457948	25.391618	19 ft	Kund Malir Suryabi Bandar
142	65.443942	25.316362	0 ft	Water Depth 66ft
143	65.442352	25.311645	0 ft	Point on Draft Boundary, Water Depth 58ft
144	65.546077	25.446799	44 ft	Aghore Check Post
145	65.248484	25.441915	928 ft	Buzi Pass
146	65.248432	25.441977	932 ft	Jaki Check Post
147	65.246499	25.447480	938 ft	Jaki Check Post
148	65.229781	25.473436	745 ft	Jaki Kaur
149	65.198876	25.464069	567 ft	Kanddigi Kaur
150	64.982375	25.403359	197 ft	Karri Kaur
151	64.785606	25.388451	46 ft	Gorhad Kaur

152	65.008756	25.423913	126 ft	Junction of Manneji Kaur and Solangi Kaur
153	64.982814	25.419381	122 ft	Ghulam Qadir Goth / Kahuri Bent
154	65.107515	25.457993	200 ft	Koh Sarri Kaur
155	65.110223	25.483135	255 ft	Koh Sarri Kaur
156	65.095381	25.492266	345 ft	Gorhad Kaur on North 2,3 Km away.
157	65.162394	25.480499	265 ft	Gorangatti Kaur
158	65.162574	25.480386	274 ft	Haaryan Kaur
159	65.104171	25.454916	198 ft	Gaddagar Kaur enters in Manneji Kaur
160	65.096891	25.434970	392 ft	Boundary on Western side, Nala Leads to Gazab Kaur on south
161	65.456217	25.391752	97 ft	Ibex Sighting 1 Km west
162	65.541014	25.445479	25 ft	Aghore Check Post
163	65.638757	26.364334	1215 ft	Jal Jhaoo
164	65.987931	25.999840	863 ft	Garri Kaur

ANNEXURE 2 (HNP Draft Notification)

DRAFT

GOVERNMENT OF BALOCHISTAN
FOREST, WILDLIFE & ENVIRONMENT DEPARTMENT

Dated: 27-01-2009

NOTIFICATION

No. Soft-I (DEV) 12 – VIII / 92 – 93 / FST / 422 - 2008

In exercise of the powers conferred by section 16 of the Balochistan Wildlife Protection Act 1974 (Act No. xix of 1974), the Government of Balochistan is pleased to revise the boundaries of Hingol National Park specified in the schedule given below with immediate effect.

SCHEDULE

1) District(s) : Lasbela, Awaran & Gwadar
2) Tehsil(s) : Liari, Jahal Jahoo & Ormarah
3) Locality : Hingol National Park (Spat, Sarbat, Jabal Ghurab, Dak, Sangal, Wyaro Deokoh, Aghore, Kund Maleer, Jabal Hinglach, Kundrach Ghat Katari, Sher Kumb, Malan, Buzi Pass, Gazab, Jhikain Shoor, Sarbhat, Sorian Chakul, Goran Ghatti, Daud, Sumarnan, Rudia, Dhrun, Kullit, Jogan Koh, Tranchik, Ghari Koh, Jabal Haro, Kahurri and Chander Gup)
4) Area : 616118 hectare
5) Coordinates : 65º 03' 45.42" to 65º 57' 56.40" E and 25º 16' 36.05" to 26º 09' 32.35" N

BOUNDARIES

North:
It starts from the junction of Pao River and Nal River at grid reference point N1/W10 (65º 18' 54.59", 26º 01' 36.42") and moves towards east along the centerline of Nal River up to the junction of Nal River and Nali Kohar Kaur (Nullah) at grid reference point N2 (65º 22' 37.80", 26º 01' 54.84"). From N2 it follows the center line of Nali Kohar Kaur up to grid reference point N3 (65º 26' 41.70", 26º 03' 17.35"). From N3 the boundary moves northeastwards and then follows ridge line eastwards between Nali Kohar Kaur and a tributary of Kohar Kaur up to grid reference point N4 (65º 31' 53.50", 26º 05' 53.89") and extends to grid reference point N5 (65º 36' 40.61", 26º 06' 43.25"). From N5 it moves on the centerline of Kohar Kaur to the junction of Kohar Kour and Wadi Kour up to grid reference point N6 (65º 45' 09.22", 26º 08' 03.93") at. From N6 it moves southwards along the centerline of Arra Kaur to grid reference point N7 (65º 46' 06.78", 26º 05' 23.71") and extends up to grid reference point N8 (65º 44' 44.16", 25º 59' 44.63"). From N8 it moves eastwards following a tributary of Mar Kaur to high point 1073m/3520ft on ridgeline to grid reference point N9 (65º 48' 29.87", 26º 00' 04.13"). From N9 it moves in southeastern direction on the ridge line of Kund Mountain passing through the height point 926m/3038ft and then bends eastward leading to the centerline of Babro Kaur up to grid reference point N10 (65º 57' 04.80", 25º 58' 39.01"). From N10 it extends eastwards along the

centerline of Babro Kaur and up to grid reference point N11/E1 (65º 59' 23.81", 26º 00' 08.37") which is the northeastern corner of the Park.

East:
Eastern side of the boundary starts from grid reference point E1 (65º 59' 23.81", 26º 00' 08.37") at the centerline of Babro Kaur and moves towards south on its tributary coming from Garri Mountain. It shifts southwards to another tributary of Babro Kaur and reaches Awaran/Lasbela district boundary at grid reference point E2 (65º 59' 47.64", 25º 55' 10.77"). Then it further extends in southwestern direction along Awaran/Lasbela district boundary and up to grid reference point E3 (65º 53' 04.95", 25º 44' 06.75"). From E3 it moves southwards along the centerline of Garrai Kaur and reaches the center line of Pachhri Kaur at grid reference point E4 (65º 53' 34.56", 25º 42' 20.67"). Then it runs along the center line of Pachri Kaur in the eastern direction to the junction of Karpasi Kaur and Deokoh Wyaro Kaur, and moves on the centerline up to the bend of Deokoh Wyaro Kaur at grid reference point E5 (65º 54' 56.09", 25º 41' 55.15"). From E5 it moves in southwestern direction along the centerline of Deokoh Wyaro Kaur up to grid reference point E6 (65º 52' 54.14", 25º 38' 43.20"), where Rayen Kaur enters in it. Moving on the centerline of Rayen Kaur it forwards in southern direction to the location called “Manjwani Pass” at grid reference point E7 (65º 53' 34.22", 25º 35' 41.71"). From E7 it follows Manjwani Kaur heading to the south up to grid reference point E8 (65º 52' 23.20", 25º 31' 51.35"). From E8 it bends in eastern direction including moderately broken mountains up to the Sharan Wali Kaur then it bends to south including white clay area of approximate 340 ha passing through grid reference point E9 (65º 54' 01.12", 25º 30' 10.34") up to grid reference point E10 (65º 53' 01.98", 25º 29' 14.73"). From E10 it moves on the 5 kilometer buffer line of live mud volcano named “Chander Gup” up to the high water mark of shore line at the grid reference point E11 (65º 53' 58.61", 25º 24' 57.79") at. Then it moves in southern direction and reaches the grid reference point E12/S1 (65º 53' 58.17", 25º 22' 54.69") at the 5 fathom water mark, which is the southeastern corner of the Park.

South:
Starting from grid reference point S1 (65º 53' 58.17", 25º 22' 54.69"), southern boundary runs in western direction along the 5 fathom (9.14m) line on the Arabian Sea up to the grid reference point S2/W1 (65º 05' 34.81", 25º 16' 56.22").

West:
Western boundary starts form grid reference point W1 (65º 05' 34.81", 25º 16' 56.22") located at 5 fathom mark and extends northwards to the high water mark on shore line where Gazab Kaur enters in the sea at grid reference point W2 (65º 05' 34.81", 25º 18' 34.96"). From W2 the boundary follows the centerline of Gazab Kaur up to grid reference point W3 (65º 05' 29.12", 25º 25' 17.44"). From W3 it moves northwards and then northeastwards along the center line of Manneji Kaur to the point where Koh Sarri Kaur enters in it at grid reference point W4 (65º 06' 25.82", 25º 27' 26.24"). From W4 it moves northwards along the centerline and then on a tributary of Koh Sarri Kaur to grid reference point W5 (65º 05' 56.22", 25º 30' 01.50"). From W5 it moves along the centerline of Gurab Kaur and then on its tributary to the Awaran/Gawadar district Boundary at grid reference point W6 (65º 04' 33.53", 25º 35' 04.59"). From W6 it moves

northwards on a tributary and then centerline of Parkin Kaur to grid reference point W7 (65º 04' 43.27", 25º 36' 23.31"). From W7 it moves northeastwards along the centerline of Parkin Kaur to the grid reference W8 (65º 14' 12.86", 25º 43' 34.62"). From W8 it moves along the tributary of Parkin Kaur in northern direction to the junction of Sulari Kaur and Hingol River at grid reference point W9 (65º 13' 55.00", 25º 46' 59.71"). From W9 it moves along the centerline of Hingol River to the junction of Pao River and Nal River at grid reference point W10/N1 (65º 18' 54.59", 26º 01' 36.42"), which is the northwestern corner of the Park.

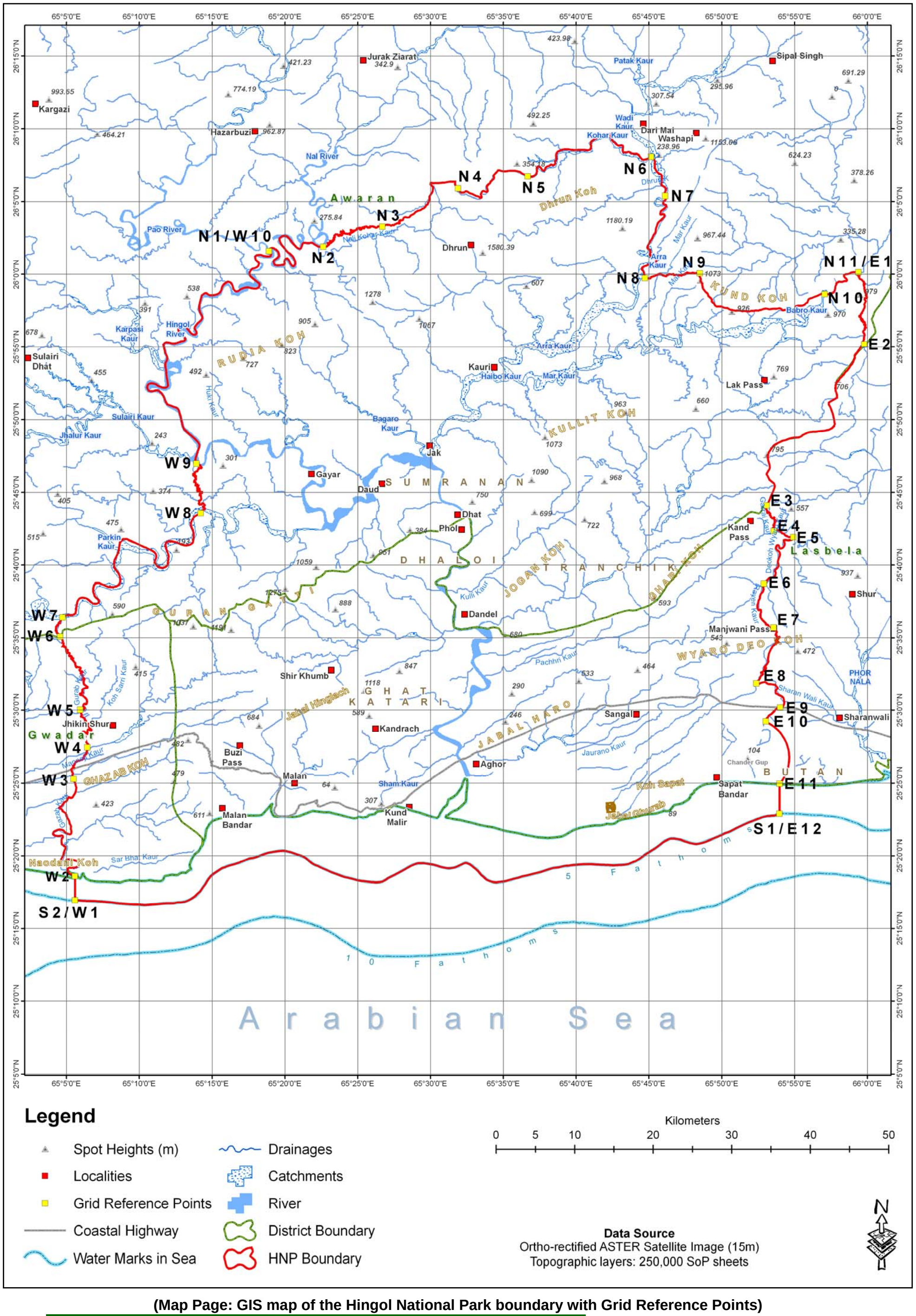
REFERENCE

Ortho-rectified ASTER (15 m) Satellite Image
1: 250,000 Survey of Pakistan Maps
Projection: Geographic Coordinate System
Spheroid & Datum: World Geodetic System (WGS) 84
(Singe frequency GPS receiver was used for the field data collection)

(Authority)
Government of Balochistan

A copy is forwarded to the:-

1. _____
2. _____
3. _____
4. _____



(Map Page: GIS map of the Hingol National Park boundary with Grid Reference Points)

List of selective boundary coordinates

No.	Longitude	Latitude	No.	Longitude	Latitude
1	65º 53' 24.69"	25º 48' 00.59"	274	65º 13' 52.95"	25º 45' 54.13"
2	65º 53' 10.26"	25º 47' 34.36"	275	65º 13' 49.54"	25º 46' 02.60"
3	65º 53' 18.37"	25º 46' 44.60"	276	65º 13' 52.70"	25º 46' 07.60"
4	65º 53' 05.66"	25º 46' 14.40"	277	65º 13' 41.55"	25º 46' 12.14"
5	65º 53' 16.70"	25º 45' 51.69"	278	65º 13' 49.42"	25º 46' 24.89"
6	65º 53' 35.44"	25º 45' 36.83"	279	65º 13' 59.31"	25º 46' 29.11"
7	65º 53' 38.38"	25º 45' 22.04"	280	65º 14' 04.44"	25º 46' 41.10"
8	65º 53' 02.09"	25º 43' 53.35"	281	65º 14' 16.92"	25º 46' 42.96"
9	65º 53' 07.71"	25º 43' 36.59"	282	65º 14' 10.70"	25º 46' 52.30"
10	65º 53' 14.96"	25º 43' 38.31"	283	65º 13' 55.24"	25º 46' 59.59"
11	65º 53' 18.92"	25º 43' 33.73"	284	65º 13' 50.52"	25º 47' 09.86"
12	65º 53' 23.72"	25º 43' 16.77"	285	65º 14' 06.08"	25º 48' 02.91"
13	65º 53' 36.27"	25º 43' 16.68"	286	65º 14' 06.00"	25º 48' 19.25"
14	65º 53' 34.53"	25º 43' 11.50"	287	65º 13' 03.75"	25º 49' 21.39"
15	65º 53' 43.37"	25º 43' 02.85"	288	65º 12' 45.22"	25º 50' 28.35"
16	65º 53' 32.68"	25º 42' 44.21"	289	65º 12' 35.95"	25º 50' 46.02"
17	65º 53' 34.33"	25º 42' 21.22"	290	65º 11' 55.56"	25º 51' 01.50"
18	65º 53' 53.78"	25º 42' 22.72"	291	65º 11' 37.80"	25º 51' 38.23"
19	65º 54' 33.45"	25º 41' 56.41"	292	65º 11' 21.15"	25º 51' 57.51"
20	65º 54' 52.96"	25º 41' 57.13"	293	65º 10' 38.77"	25º 51' 58.67"
21	65º 54' 56.19"	25º 41' 53.36"	294	65º 10' 32.60"	25º 52' 09.98"
22	65º 54' 46.16"	25º 41' 43.95"	295	65º 10' 33.61"	25º 52' 20.81"
23	65º 54' 16.39"	25º 41' 41.89"	296	65º 10' 38.27"	25º 52' 27.22"
24	65º 54' 18.51"	25º 41' 23.97"	297	65º 10' 51.24"	25º 52' 29.96"
25	65º 54' 09.46"	25º 41' 10.72"	298	65º 11' 33.07"	25º 52' 12.84"
26	65º 54' 00.21"	25º 41' 09.87"	299	65º 11' 55.28"	25º 52' 16.27"
27	65º 53' 52.15"	25º 41' 22.65"	300	65º 11' 46.88"	25º 53' 43.94"
28	65º 53' 44.91"	25º 41' 18.45"	301	65º 11' 55.24"	25º 54' 12.34"
29	65º 53' 44.71"	25º 41' 07.96"	302	65º 11' 39.26"	25º 55' 10.22"
30	65º 53' 59.89"	25º 40' 46.75"	303	65º 11' 50.56"	25º 55' 18.74"
31	65º 53' 51.52"	25º 40' 16.87"	304	65º 12' 24.58"	25º 55' 14.53"
32	65º 53' 52.70"	25º 39' 53.93"	305	65º 13' 05.66"	25º 55' 26.19"
33	65º 53' 39.97"	25º 39' 38.99"	306	65º 13' 09.12"	25º 55' 34.33"
34	65º 53' 39.31"	25º 39' 14.68"	307	65º 12' 41.23"	25º 56' 07.28"
35	65º 53' 15.77"	25º 39' 05.34"	308	65º 12' 41.87"	25º 56' 17.42"
36	65º 53' 01.13"	25º 38' 50.81"	309	65º 12' 50.89"	25º 56' 26.25"
37	65º 53' 01.47"	25º 38' 42.61"	310	65º 13' 10.20"	25º 56' 24.96"
38	65º 52' 53.89"	25º 38' 42.59"	311	65º 13' 41.40"	25º 55' 51.39"
39	65º 52' 52.46"	25º 38' 17.89"	312	65º 13' 54.86"	25º 55' 55.12"
40	65º 52' 38.91"	25º 37' 55.27"	313	65º 13' 48.21"	25º 56' 21.64"
41	65º 52' 26.84"	25º 37' 10.99"	314	65º 14' 19.56"	25º 56' 59.22"
42	65º 52' 30.52"	25º 36' 53.89"	315	65º 14' 09.28"	25º 57' 24.61"
43	65º 52' 41.08"	25º 36' 52.46"	316	65º 14' 06.55"	25º 57' 47.01"
44	65º 52' 41.03"	25º 36' 20.90"	317	65º 14' 18.66"	25º 58' 34.68"
45	65º 53' 15.83"	25º 35' 42.55"	318	65º 14' 31.62"	25º 58' 42.88"

46	65º 53' 36.68"	25º 35' 40.15"	319	65º 14' 50.69"	25º 58' 34.19"
47	65º 53' 46.57"	25º 35' 24.19"	320	65º 15' 22.09"	25º 58' 39.12"
48	65º 53' 42.44"	25º 35' 12.04"	321	65º 15' 33.93"	25º 58' 48.80"
49	65º 53' 47.59"	25º 35' 02.27"	322	65º 15' 46.72"	25º 59' 17.40"
50	65º 53' 58.10"	25º 35' 02.83"	323	65º 16' 05.40"	25º 59' 29.37"
51	65º 53' 42.99"	25º 34' 49.72"	324	65º 16' 18.30"	25º 59' 22.57"
52	65º 53' 51.90"	25º 34' 41.01"	325	65º 16' 27.69"	25º 58' 59.73"
53	65º 53' 22.33"	25º 34' 11.87"	326	65º 16' 39.11"	25º 58' 50.05"
54	65º 53' 13.99"	25º 33' 51.10"	327	65º 17' 17.00"	25º 59' 05.82"
55	65º 53' 11.30"	25º 33' 18.32"	328	65º 18' 00.58"	25º 59' 01.78"
56	65º 52' 55.52"	25º 32' 57.92"	329	65º 18' 09.99"	25º 59' 05.35"
57	65º 53' 01.65"	25º 32' 51.43"	330	65º 18' 13.49"	25º 59' 22.54"
58	65º 52' 42.56"	25º 32' 36.56"	331	65º 17' 37.26"	25º 59' 51.95"
59	65º 52' 49.20"	25º 32' 28.49"	332	65º 17' 34.62"	26º 00' 08.20"
60	65º 52' 23.13"	25º 31' 53.59"	333	65º 17' 44.13"	26º 00' 22.50"
61	65º 52' 32.50"	25º 31' 49.17"	334	65º 18' 03.31"	26º 00' 28.92"
62	65º 52' 56.78"	25º 31' 56.44"	335	65º 18' 11.64"	26º 00' 40.24"
63	65º 53' 11.19"	25º 31' 48.76"	336	65º 18' 11.22"	26º 00' 48.96"
64	65º 53' 39.66"	25º 31' 45.58"	337	65º 17' 57.92"	26º 01' 03.89"
65	65º 53' 50.15"	25º 31' 31.85"	338	65º 17' 59.75"	26º 01' 16.62"
66	65º 53' 42.15"	25º 31' 21.13"	339	65º 18' 16.47"	26º 01' 20.44"
67	65º 53' 42.74"	25º 31' 09.42"	340	65º 18' 59.71"	26º 01' 15.78"
68	65º 54' 10.64"	25º 30' 54.28"	341	65º 19' 03.36"	26º 01' 24.58"
69	65º 54' 15.85"	25º 30' 43.98"	342	65º 18' 54.64"	26º 01' 40.59"
70	65º 54' 16.94"	25º 30' 26.77"	343	65º 19' 03.95"	26º 01' 48.75"
71	65º 54' 10.35"	25º 30' 13.41"	344	65º 19' 13.87"	26º 01' 48.61"
72	65º 53' 43.41"	25º 30' 03.50"	345	65º 19' 26.88"	26º 01' 39.57"
73	65º 53' 13.84"	25º 29' 37.97"	346	65º 19' 34.44"	26º 01' 24.85"
74	65º 53' 00.91"	25º 29' 18.17"	347	65º 19' 30.73"	26º 01' 09.53"
75	65º 53' 06.52"	25º 29' 09.62"	348	65º 19' 13.59"	26º 00' 56.35"
76	65º 53' 44.35"	25º 28' 44.09"	349	65º 19' 17.10"	26º 00' 39.60"
77	65º 54' 08.17"	25º 28' 17.33"	350	65º 19' 54.80"	26º 00' 40.29"
78	65º 54' 26.73"	25º 27' 43.10"	351	65º 19' 59.70"	26º 00' 59.12"
79	65º 54' 36.35"	25º 27' 07.00"	352	65º 20' 08.19"	26º 01' 05.38"
80	65º 54' 37.66"	25º 26' 32.70"	353	65º 20' 28.87"	26º 00' 36.01"
81	65º 54' 30.94"	25º 25' 56.33"	354	65º 20' 38.09"	26º 00' 35.23"
82	65º 54' 19.20"	25º 25' 27.98"	355	65º 20' 42.50"	26º 00' 50.22"
83	65º 53' 58.66"	25º 24' 57.12"	356	65º 20' 34.85"	26º 01' 08.99"
84	65º 53' 57.51"	25º 22' 54.52"	357	65º 20' 06.18"	26º 01' 36.97"
85	65º 52' 32.91"	25º 22' 33.86"	358	65º 19' 38.41"	26º 02' 17.74"
86	65º 48' 32.07"	25º 20' 51.62"	359	65º 19' 38.15"	26º 02' 29.11"
87	65º 48' 09.64"	25º 20' 49.30"	360	65º 19' 46.86"	26º 02' 35.79"
88	65º 47' 09.02"	25º 21' 06.38"	361	65º 20' 08.71"	26º 02' 36.13"
89	65º 46' 22.95"	25º 21' 08.73"	362	65º 20' 56.89"	26º 01' 46.60"
90	65º 45' 58.68"	25º 20' 56.63"	363	65º 21' 04.92"	26º 01' 47.69"
91	65º 44' 18.14"	25º 19' 45.44"	364	65º 21' 12.48"	26º 02' 07.32"
92	65º 43' 35.40"	25º 19' 25.36"	365	65º 21' 18.54"	26º 02' 11.00"
93	65º 42' 33.07"	25º 19' 19.92"	366	65º 21' 50.57"	26º 02' 11.40"

94	65º 40' 32.16"	25º 19' 25.17"	367	65º 22' 23.84"	26º 01' 53.80"
95	65º 39' 17.33"	25º 19' 18.65"	368	65º 22' 51.84"	26º 01' 55.44"
96	65º 38' 16.15"	25º 19' 06.91"	369	65º 23' 02.54"	26º 02' 05.76"
97	65º 35' 09.28"	25º 18' 14.88"	370	65º 22' 55.80"	26º 02' 10.28"
98	65º 34' 31.14"	25º 18' 09.79"	371	65º 23' 08.00"	26º 02' 10.28"
99	65º 33' 50.19"	25º 18' 21.79"	372	65º 23' 06.25"	26º 02' 16.63"
100	65º 33' 06.69"	25º 19' 04.96"	373	65º 23' 17.73"	26º 02' 17.55"
101	65º 32' 41.55"	25º 19' 24.69"	374	65º 23' 28.71"	26º 02' 44.34"
102	65º 32' 25.48"	25º 19' 30.35"	375	65º 23' 42.18"	26º 02' 38.94"
103	65º 31' 21.31"	25º 19' 07.84"	376	65º 23' 45.70"	26º 02' 43.72"
104	65º 30' 05.93"	25º 19' 24.20"	377	65º 23' 55.47"	26º 02' 42.00"
105	65º 29' 07.79"	25º 19' 28.70"	378	65º 23' 50.67"	26º 02' 56.91"
106	65º 28' 36.24"	25º 19' 17.04"	379	65º 23' 59.52"	26º 02' 49.43"
107	65º 26' 41.56"	25º 18' 12.97"	380	65º 24' 00.99"	26º 02' 56.41"
108	65º 26' 16.95"	25º 18' 09.62"	381	65º 24' 07.98"	26º 02' 47.68"
109	65º 25' 01.66"	25º 18' 17.09"	382	65º 24' 27.40"	26º 02' 44.51"
110	65º 24' 02.22"	25º 18' 32.28"	383	65º 24' 29.31"	26º 02' 50.57"
111	65º 22' 03.82"	25º 19' 21.52"	384	65º 24' 36.73"	26º 02' 52.71"
112	65º 21' 10.93"	25º 19' 58.49"	385	65º 24' 32.05"	26º 03' 02.60"
113	65º 19' 49.95"	25º 20' 20.92"	386	65º 24' 42.51"	26º 02' 56.37"
114	65º 18' 50.89"	25º 20' 12.64"	387	65º 25' 05.69"	26º 03' 11.77"
115	65º 15' 40.53"	25º 19' 08.13"	388	65º 25' 12.04"	26º 03' 04.65"
116	65º 14' 54.00"	25º 18' 35.03"	389	65º 25' 19.62"	26º 03' 13.76"
117	65º 14' 10.06"	25º 17' 32.46"	390	65º 25' 26.69"	26º 03' 11.55"
118	65º 13' 47.06"	25º 17' 10.99"	391	65º 25' 34.50"	26º 03' 17.99"
119	65º 13' 07.92"	25º 16' 49.74"	392	65º 25' 41.80"	26º 03' 12.81"
120	65º 10' 22.35"	25º 16' 36.10"	393	65º 25' 52.80"	26º 03' 18.23"
121	65º 05' 35.01"	25º 16' 56.74"	394	65º 26' 15.59"	26º 03' 12.17"
122	65º 05' 34.68"	25º 18' 34.59"	395	65º 26' 57.75"	26º 03' 24.49"
123	65º 05' 09.71"	25º 18' 47.47"	396	65º 27' 18.11"	26º 03' 21.24"
124	65º 05' 04.05"	25º 19' 03.22"	397	65º 27' 51.29"	26º 03' 30.34"
125	65º 05' 08.67"	25º 19' 09.08"	398	65º 27' 51.07"	26º 03' 41.40"
126	65º 05' 41.84"	25º 19' 13.38"	399	65º 28' 04.77"	26º 03' 44.04"
127	65º 05' 47.54"	25º 19' 31.25"	400	65º 28' 12.01"	26º 03' 56.10"
128	65º 05' 38.70"	25º 19' 39.42"	401	65º 28' 31.55"	26º 03' 56.25"
129	65º 05' 10.89"	25º 19' 45.11"	402	65º 28' 57.84"	26º 04' 18.13"
130	65º 04' 58.73"	25º 19' 42.31"	403	65º 29' 32.28"	26º 04' 33.90"
131	65º 04' 46.70"	25º 19' 26.68"	404	65º 29' 47.41"	26º 04' 48.61"
132	65º 04' 35.30"	25º 19' 29.60"	405	65º 30' 09.68"	26º 05' 49.69"
133	65º 04' 34.25"	25º 19' 40.02"	406	65º 30' 09.91"	26º 05' 57.70"
134	65º 04' 56.06"	25º 20' 34.97"	407	65º 29' 59.98"	26º 06' 10.51"
135	65º 04' 39.36"	25º 20' 50.85"	408	65º 30' 01.56"	26º 06' 16.48"
136	65º 04' 42.92"	25º 21' 21.87"	409	65º 31' 40.71"	26º 06' 20.70"
137	65º 04' 13.45"	25º 21' 23.04"	410	65º 31' 41.65"	26º 06' 07.66"
138	65º 04' 04.38"	25º 21' 31.91"	411	65º 32' 04.03"	26º 05' 38.05"
139	65º 04' 11.85"	25º 21' 41.74"	412	65º 32' 28.09"	26º 05' 41.49"
140	65º 04' 29.96"	25º 21' 47.89"	413	65º 33' 28.14"	26º 05' 16.17"
141	65º 04' 44.91"	25º 21' 44.77"	414	65º 33' 28.30"	26º 05' 33.61"

142	65º 05' 03.51"	25º 21' 30.69"	415	65º 33' 35.62"	26º 05' 42.84"
143	65º 05' 18.67"	25º 21' 32.44"	416	65º 33' 53.90"	26º 05' 40.23"
144	65º 05' 17.71"	25º 22' 02.08"	417	65º 33' 53.23"	26º 06' 03.31"
145	65º 04' 57.65"	25º 22' 52.00"	418	65º 34' 19.89"	26º 06' 32.76"
146	65º 04' 29.17"	25º 23' 18.20"	419	65º 34' 20.43"	26º 06' 48.54"
147	65º 04' 59.16"	25º 23' 46.59"	420	65º 34' 38.18"	26º 07' 07.99"
148	65º 05' 06.66"	25º 24' 00.16"	421	65º 35' 50.65"	26º 07' 06.74"
149	65º 05' 24.07"	25º 24' 01.60"	422	65º 36' 06.72"	26º 07' 02.90"
150	65º 05' 35.08"	25º 24' 19.00"	423	65º 36' 42.01"	26º 06' 42.74"
151	65º 05' 39.90"	25º 24' 41.79"	424	65º 37' 00.63"	26º 06' 42.34"
152	65º 05' 19.28"	25º 25' 56.95"	425	65º 37' 16.19"	26º 06' 56.47"
153	65º 05' 29.06"	25º 26' 04.85"	426	65º 37' 20.78"	26º 07' 24.28"
154	65º 05' 26.44"	25º 26' 11.73"	427	65º 37' 28.55"	26º 07' 24.38"
155	65º 05' 37.77"	25º 26' 27.44"	428	65º 37' 46.17"	26º 07' 07.92"
156	65º 06' 10.36"	25º 26' 41.25"	429	65º 37' 59.15"	26º 07' 23.75"
157	65º 06' 22.32"	25º 27' 04.27"	430	65º 38' 16.78"	26º 07' 31.94"
158	65º 06' 30.44"	25º 27' 35.65"	431	65º 38' 30.20"	26º 07' 31.11"
159	65º 06' 14.48"	25º 27' 59.72"	432	65º 38' 38.58"	26º 07' 54.88"
160	65º 06' 17.38"	25º 28' 13.32"	433	65º 38' 38.04"	26º 08' 15.54"
161	65º 06' 03.41"	25º 28' 27.69"	434	65º 38' 49.02"	26º 08' 27.57"
162	65º 06' 11.55"	25º 28' 31.50"	435	65º 39' 16.65"	26º 08' 34.91"
163	65º 06' 24.67"	25º 28' 22.84"	436	65º 40' 54.43"	26º 08' 32.18"
164	65º 06' 27.09"	25º 28' 38.32"	437	65º 41' 00.73"	26º 08' 40.29"
165	65º 06' 42.01"	25º 28' 38.11"	438	65º 40' 59.68"	26º 09' 00.32"
166	65º 06' 32.94"	25º 28' 49.99"	439	65º 41' 04.75"	26º 09' 08.76"
167	65º 06' 33.76"	25º 29' 04.59"	440	65º 42' 04.27"	26º 09' 38.63"
168	65º 06' 22.46"	25º 28' 53.27"	441	65º 42' 18.87"	26º 09' 37.96"
169	65º 06' 06.33"	25º 28' 55.91"	442	65º 42' 33.62"	26º 09' 05.72"
170	65º 06' 14.76"	25º 29' 00.46"	443	65º 42' 53.12"	26º 08' 50.60"
171	65º 06' 13.09"	25º 29' 11.25"	444	65º 43' 12.47"	26º 08' 48.70"
172	65º 06' 19.33"	25º 29' 15.51"	445	65º 43' 14.71"	26º 08' 22.47"
173	65º 06' 12.83"	25º 29' 26.92"	446	65º 43' 38.03"	26º 08' 23.85"
174	65º 05' 58.93"	25º 29' 34.75"	447	65º 44' 09.41"	26º 08' 15.80"
175	65º 06' 01.97"	25º 29' 41.20"	448	65º 44' 35.15"	26º 07' 52.23"
176	65º 05' 57.07"	25º 30' 05.19"	449	65º 44' 55.69"	26º 07' 56.35"
177	65º 06' 12.50"	25º 30' 02.37"	450	65º 45' 06.47"	26º 08' 03.91"
178	65º 06' 09.15"	25º 30' 20.80"	451	65º 45' 15.39"	26º 07' 59.72"
179	65º 06' 21.47"	25º 30' 24.84"	452	65º 45' 24.66"	26º 07' 45.21"
180	65º 06' 23.91"	25º 30' 34.06"	453	65º 45' 24.79"	26º 07' 16.24"
181	65º 06' 18.88"	25º 30' 48.55"	454	65º 45' 32.86"	26º 07' 02.10"
182	65º 05' 54.96"	25º 31' 05.07"	455	65º 45' 52.37"	26º 06' 45.87"
183	65º 06' 07.08"	25º 31' 12.25"	456	65º 45' 51.43"	26º 06' 07.90"
184	65º 06' 05.86"	25º 31' 25.25"	457	65º 46' 09.77"	26º 05' 53.11"
185	65º 06' 26.04"	25º 31' 34.47"	458	65º 46' 04.88"	26º 05' 31.77"
186	65º 06' 11.29"	25º 31' 48.54"	459	65º 46' 09.82"	26º 05' 12.62"
187	65º 06' 12.13"	25º 32' 11.58"	460	65º 45' 57.88"	26º 04' 54.40"
188	65º 06' 04.04"	25º 32' 08.33"	461	65º 46' 10.93"	26º 04' 41.53"
189	65º 06' 05.88"	25º 32' 24.94"	462	65º 45' 50.54"	26º 04' 22.30"

190	65º 05' 57.94"	25º 32' 33.03"	463	65º 45' 46.82"	26º 04' 12.09"
191	65º 06' 06.14"	25º 32' 38.40"	464	65º 45' 49.39"	26º 04' 07.82"
192	65º 05' 54.17"	25º 32' 43.88"	465	65º 46' 01.91"	26º 04' 08.44"
193	65º 05' 55.93"	25º 32' 55.59"	466	65º 46' 03.47"	26º 04' 01.17"
194	65º 05' 38.63"	25º 32' 58.29"	467	65º 45' 37.01"	26º 03' 31.33"
195	65º 05' 35.05"	25º 33' 14.07"	468	65º 45' 25.44"	26º 02' 51.08"
196	65º 05' 24.14"	25º 33' 27.10"	469	65º 44' 53.20"	26º 01' 53.17"
197	65º 05' 25.13"	25º 33' 34.48"	470	65º 45' 04.26"	26º 01' 41.48"
198	65º 05' 18.60"	25º 33' 32.79"	471	65º 45' 06.33"	26º 01' 16.80"
199	65º 05' 21.16"	25º 33' 41.43"	472	65º 45' 29.41"	26º 01' 16.16"
200	65º 05' 10.58"	25º 33' 43.57"	473	65º 45' 35.26"	26º 01' 05.29"
201	65º 05' 10.63"	25º 33' 56.10"	474	65º 45' 21.10"	26º 00' 46.49"
202	65º 05' 00.81"	25º 33' 56.26"	475	65º 44' 55.92"	26º 00' 40.08"
203	65º 05' 04.64"	25º 34' 07.10"	476	65º 44' 31.26"	26º 00' 26.12"
204	65º 04' 58.56"	25º 34' 07.96"	477	65º 44' 44.33"	25º 59' 44.93"
205	65º 04' 51.54"	25º 34' 24.26"	478	65º 45' 04.10"	25º 59' 42.73"
206	65º 04' 44.26"	25º 34' 24.39"	479	65º 45' 43.24"	26º 00' 01.37"
207	65º 04' 47.43"	25º 34' 35.85"	480	65º 46' 09.41"	25º 59' 51.86"
208	65º 04' 41.82"	25º 34' 54.17"	481	65º 46' 22.30"	26º 00' 00.77"
209	65º 04' 18.63"	25º 35' 22.38"	482	65º 47' 14.06"	25º 59' 54.56"
210	65º 04' 16.27"	25º 35' 44.31"	483	65º 47' 37.26"	26º 00' 06.44"
211	65º 04' 43.89"	25º 36' 23.55"	484	65º 48' 27.79"	26º 00' 04.71"
212	65º 04' 59.19"	25º 36' 31.84"	485	65º 48' 43.06"	25º 59' 01.52"
213	65º 05' 25.31"	25º 36' 32.97"	486	65º 49' 16.69"	25º 58' 19.86"
214	65º 05' 35.91"	25º 36' 40.18"	487	65º 49' 33.34"	25º 57' 50.28"
215	65º 05' 43.81"	25º 37' 28.23"	488	65º 50' 48.47"	25º 57' 30.39"
216	65º 05' 53.90"	25º 37' 41.91"	489	65º 51' 48.17"	25º 57' 25.97"
217	65º 06' 19.42"	25º 37' 42.63"	490	65º 53' 02.00"	25º 57' 37.98"
218	65º 06' 49.41"	25º 37' 20.05"	491	65º 53' 57.14"	25º 57' 39.14"
219	65º 07' 12.09"	25º 37' 23.14"	492	65º 54' 13.37"	25º 57' 31.30"
220	65º 07' 11.94"	25º 37' 34.10"	493	65º 54' 53.25"	25º 57' 34.41"
221	65º 06' 55.77"	25º 37' 51.83"	494	65º 55' 08.84"	25º 57' 48.71"
222	65º 06' 50.26"	25º 38' 08.86"	495	65º 55' 41.22"	25º 57' 54.08"
223	65º 06' 51.08"	25º 38' 29.31"	496	65º 56' 02.01"	25º 58' 19.66"
224	65º 06' 59.44"	25º 38' 44.55"	497	65º 56' 55.71"	25º 58' 42.18"
225	65º 07' 14.74"	25º 38' 45.16"	498	65º 57' 16.28"	25º 58' 37.87"
226	65º 08' 01.94"	25º 38' 28.58"	499	65º 57' 36.56"	25º 58' 43.28"
227	65º 08' 22.96"	25º 38' 31.35"	500	65º 57' 44.79"	25º 58' 53.07"
228	65º 08' 37.07"	25º 38' 40.77"	501	65º 57' 53.31"	25º 59' 23.53"
229	65º 08' 40.61"	25º 39' 05.59"	502	65º 58' 02.31"	25º 59' 29.32"
230	65º 08' 34.14"	25º 39' 25.37"	503	65º 58' 34.16"	25º 59' 32.01"
231	65º 08' 16.43"	25º 39' 50.64"	504	65º 58' 35.52"	25º 59' 37.99"
232	65º 08' 16.11"	25º 40' 14.13"	505	65º 58' 24.38"	25º 59' 56.29"
233	65º 08' 33.40"	25º 40' 55.21"	506	65º 58' 55.68"	26º 00' 07.65"
234	65º 08' 39.48"	25º 41' 32.75"	507	65º 59' 24.26"	26º 00' 07.84"
235	65º 08' 52.57"	25º 41' 46.44"	508	65º 59' 17.80"	25º 59' 58.35"
236	65º 09' 09.76"	25º 41' 46.21"	509	65º 59' 26.61"	25º 59' 53.00"
237	65º 10' 57.81"	25º 40' 56.55"	510	65º 59' 29.03"	25º 59' 41.44"

238	65º 11' 09.61"	25º 40' 38.52"	511	65º 59' 45.29"	25º 59' 28.74"
239	65º 11' 03.40"	25º 40' 09.53"	512	65º 59' 49.19"	25º 58' 50.01"
240	65º 11' 17.84"	25º 39' 51.64"	513	65º 59' 58.90"	25º 58' 25.36"
241	65º 11' 34.83"	25º 39' 47.91"	514	65º 59' 49.45"	25º 58' 19.47"
242	65º 11' 49.93"	25º 39' 53.38"	515	65º 59' 53.25"	25º 58' 08.93"
243	65º 11' 56.94"	25º 40' 05.96"	516	65º 59' 47.60"	25º 57' 39.95"
244	65º 11' 59.85"	25º 40' 33.76"	517	65º 59' 26.74"	25º 57' 06.20"
245	65º 11' 48.13"	25º 41' 16.16"	518	65º 59' 32.97"	25º 57' 02.16"
246	65º 11' 51.45"	25º 41' 33.59"	519	65º 59' 33.98"	25º 56' 53.17"
247	65º 12' 17.88"	25º 41' 37.36"	520	65º 59' 39.77"	25º 56' 53.33"
248	65º 13' 15.01"	25º 41' 21.15"	521	65º 59' 41.20"	25º 56' 43.00"
249	65º 13' 30.44"	25º 41' 25.25"	522	65º 59' 48.88"	25º 56' 41.49"
250	65º 13' 39.79"	25º 41' 33.84"	523	65º 59' 47.12"	25º 56' 32.59"
251	65º 13' 43.55"	25º 42' 05.22"	524	65º 59' 52.57"	25º 56' 30.03"
252	65º 13' 32.46"	25º 42' 44.52"	525	65º 59' 50.04"	25º 56' 24.82"
253	65º 13' 34.84"	25º 43' 01.63"	526	65º 59' 54.06"	25º 56' 19.96"
254	65º 13' 47.57"	25º 43' 21.14"	527	65º 59' 42.47"	25º 56' 03.03"
255	65º 14' 12.00"	25º 43' 33.78"	528	65º 59' 48.63"	25º 55' 50.25"
256	65º 14' 29.19"	25º 43' 54.58"	529	65º 59' 41.87"	25º 55' 21.48"
257	65º 14' 22.32"	25º 44' 01.58"	530	65º 59' 47.59"	25º 55' 09.55"
258	65º 14' 27.43"	25º 44' 06.94"	531	65º 59' 32.29"	25º 54' 59.80"
259	65º 14' 24.66"	25º 44' 14.15"	532	65º 59' 09.43"	25º 54' 28.11"
260	65º 14' 05.46"	25º 44' 12.31"	533	65º 59' 08.42"	25º 54' 13.11"
261	65º 14' 05.52"	25º 44' 26.13"	534	65º 58' 57.61"	25º 53' 50.01"
262	65º 14' 14.62"	25º 44' 34.44"	535	65º 57' 49.38"	25º 52' 23.64"
263	65º 14' 08.74"	25º 44' 51.53"	536	65º 57' 54.62"	25º 51' 29.54"
264	65º 14' 17.39"	25º 44' 59.95"	537	65º 57' 21.33"	25º 51' 06.97"
265	65º 14' 07.32"	25º 45' 07.05"	538	65º 57' 42.96"	25º 50' 01.40"
266	65º 13' 58.55"	25º 45' 06.52"	539	65º 57' 42.56"	25º 49' 32.54"
267	65º 14' 06.94"	25º 45' 15.09"	540	65º 57' 19.10"	25º 49' 16.76"
268	65º 13' 58.16"	25º 45' 17.68"	541	65º 55' 57.05"	25º 49' 06.33"
269	65º 14' 02.85"	25º 45' 25.86"	542	65º 55' 19.78"	25º 48' 46.56"
270	65º 13' 59.97"	25º 45' 31.47"	543	65º 54' 46.52"	25º 48' 42.85"
271	65º 13' 51.39"	25º 45' 29.16"	544	65º 54' 09.59"	25º 48' 31.57"
272	65º 13' 51.77"	25º 45' 40.49"	545	65º 53' 35.79"	25º 48' 13.78"
273	65º 13' 45.60"	25º 45' 44.30"	546	65º 53' 25.18"	25º 48' 01.23"

ANNEXURE 3 (References)

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