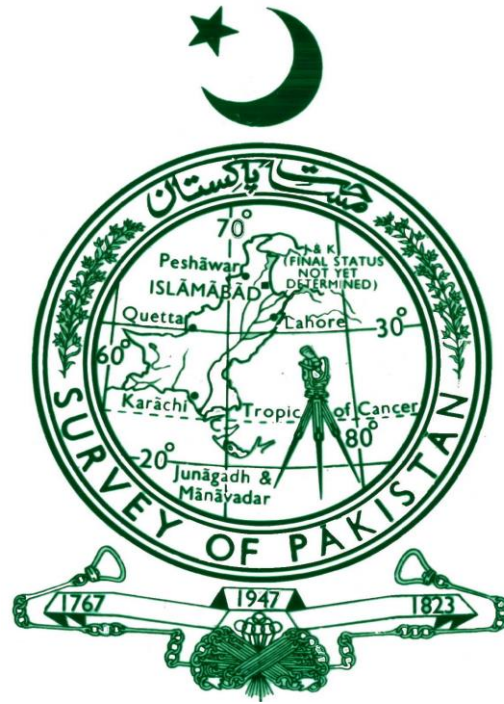


# Survey of Pakistan



# SHAHEED BENAZIRABAD MAP

## YEAR OF SUREVEY 2018

*The boundary demarcation of two forests in Shaheed Benazirabad division, covering an area of 15957 Acres, was carried out in year 2018 as indented by sustainable forest management department. A total of 112 pillars were erected on ground.*

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# Introduction

## RIVERINE BELT

The riverine forest belt of Pakistan occurs on both side of the river Indus and its major tributaries. This belt contributes a lot when flood water spills over the river banks and is restricted on both sides of rivers by embankments. The riverine belt of Sindh initiating from Guddu Barrage continues till Indus Delta. This makes a strip along the sides of river Indus duly protected through embankments along river banks. The width of the riverine belt varies from 05 mile to 14 mile between embankments. Out of this huge area, the substantial riverine area of **140333.8 acres** is legally declared as reserved Forest under section 20 of the Forest Act, 1927, which prohibits all acts except permitted under contract/agreement in the best Forestry interest.

Due to fluctuation in flood frequency, the prolonged droughts were observed which have badly affected the riverine Forests as a whole. Besides, the manifold population increment during last 2-3 decades, worst law and order regime from late 70s and weak governance were the core reasons which have paved way for peoples intrusion in reserved forests causing heavy encroachments, unauthorized cultivations and boundary alternations/defacing over the years.

## SUSTAINABLE FOREST MANAGEMENT PROJECT

Sustainable forest management project is a joint project of Government of Pakistan, UNDP and GEF. Taking cognizance of heavy damages during 2010 super flood, honorable Supreme Court has ordered to remove all encroachments, to raze zamindaree bands and undertake massive Afforestation in riverine belt to avert/control flood damages in future. The federal flood commission is monitoring the compliance of court orders through a committee headed by one MNA. However, in compliance of court orders and under the provisions of GEF-UNDP assisted Sustainable Forest Management Project, the massive reforestation is to be carried out for which detail topographic survey of specific riverine forests is included as major

project activity and Survey of Pakistan, Karachi was entrusted the Topographic Survey and Demarcation of BPs, detailed as below.

DETAIL OF FOREST SURVEYED				
DISTRICT	TALUKA	NAME	AREA PROPOSED (ACRES)	AREA SURVEYED (ACRRS)
<b>Shaheed Benazirabad</b>	Sakrand	Kot Dhingano	3876.1	3909.030
<b>Shaheed Benazirabad</b>	Sakrand	Lakhat	13151.75	12053.246


#### INTRODUCTION OF EXECUTING AGENCY

Survey of Pakistan is an attached department of Ministry of Defense, Government of Pakistan. Its head office is located at Rawalpindi and regional offices at provincial capitals. The superintendence of Survey of Pakistan is vested with federal government and administration is vested and exercised by the Surveyor General of Pakistan. The task of this project was assigned and falls under the jurisdiction of Directorate of Southern Circle, Survey of Pakistan, Karachi

## RESPONSIBILITIES OF SURVEY OF PAKISTAN

Survey of Pakistan being sole national mapping organization is authorized to carry out survey work in view of SURVEY AND MAPPING ACT-2014. Survey of Pakistan is actively participating in the national development project and thus fulfilling the ever growing surveying and mapping demands of various government / semi-government and autonomous bodies. Over the years the department has gradually switched over from conventional to the digital production line by adopting modern surveying and mapping techniques methods and equipment. Some of the responsibilities of Survey of Pakistan are given as under.

- To provide Geodetic Control Points and Geographical Positions all over Pakistan
- To carry out topographic survey, updation and printing of topographic maps / sheets of National Map Series on scale 1:50000
- To delineate International Borders and demarcate and relocate Border Pillars
- To compile Derived Maps on scale 1:250000, 1: ½ M, 1:1M 1:2M and Aeronautical & ICAO Charts on scale 1:1M
- To generate maps on any scale through Aerial Photography and Remote Sensing through analytical and digital methods
- To develop GIS for Govt. / Semi Govt. departments, organizations and private sector according to their requirements on payment
- To survey & prepare Cantonment Maps
- To prepare and print Guide Maps, Atlas of Pakistan, District Maps and Road Maps
- To train departmental employees and potential candidates from public / private sectors in various disciplines of surveying and mapping at Survey Training Institute in Certificate, Diploma and Short Courses
- To monitor the surveying and Mapping activities in Pakistan and to check the quality of data captured and to restrict / bound the unauthorized personnel's /



organization / departments and individuals those who are not register with SoP and involved in spatial data collection

#### SEQUENCE OF THE REPORT

The report consist of three parts Introduction, Field results and recommendations. The first part Introduction consists of three sections, Introduction, Objectives and Methodologies. The section Introduction has brief introduction of Riverine Belt, Sustainable Forest Management (SFM) program. The section Objectives is describing the objectives of this specific project and deliverables that were agreed in ToR signed by both the departments. The section Methodologies is related to methods and procedures adopted to carry out this project.

The second part of the report is field results it consists of two sections Field Activities & Results and constraints and lessons learnt. The section Field activities and Results describe the type of usage of equipment / instruments and results obtained in the shape of provision of Ground Control Points (GCPs) and forest boundary delineated and demarcated. The section Constraints and lessons learnt is specifically about the learning and experience of our team. The third part of the report is Recommendations this chapter consists of some suggestions for betterment of SFM projects.

## Objectives


In the beginning Terms of Reference (ToR) was signed for the project topographic survey and mapping of sustainable forest management (SFM) landscape forest areas of afforestation division Shaheed Benazirabad. The ToR was signed between the Conservator of Forests, Afforestation Circle, Saheed Benazirabad and Directorate of Southern Circle, Survey of Pakistan, Karachi. In the ToR the scope of work, objectives deliverables, estimated time and cost was mentioned. The ToR is attached as Annex A at the end of the report. In accordance with ToR the demarcation and topographic survey of two riverine forest of afforestation circle Shaheed Benazirabad, was carried out in May 2018. The objectives and deliverables as agreed in ToR are listed below.

### OBJECTIVES

- To carry out topographic survey of above listed two riverine forests of Afforestation Division, Shaheed Benazirabad and demarcation of boundaries.
- To identify /demarcate the appropriate locations along boundaries for fixation of Geo referenced boundary pillars.
- To design, construct and fix 112 boundary pillars on geo referred locations.
- To provide Ground Control Point (GCPs) using Dual; Frequency GPs to establish Bench mark/ Reference Points for using to rectify satellite images on scale 8"=1Mile (1:7920), 1" = 2 Mile (1:31680) and 1"=1 Mile (1:633601).
- To digitize surveyed forest areas on scale 2"=1Mile (1:31680) 01 sheet and 8" = 1Mile (1:7920) 12 sheets with standard colours and Symbology of Survey of Pakistan.

### DELIVERABLES

The deliverables were also agreed upon in the ToR signed in the beginning of the project, deliverables are listed below.

- 
- Five hard copies of each Map / Sheet to be provided to indenter.
  - One soft copy in shape file / mixed format to be provided to indenter.
  - Draft notification for each Forest with geo referenced boundaries / limits shall be prepared by vendor for issuing fresh notifications by the Government of Sindh in suppression of earlier notifications and valid to be used in litigations and re-surveying.
  - Geo-Spatial data / technical document shall be prepared by Vendor for Indenter.
  - Re-alignment of duly geo-referenced forest compartment (160 acre sized areas) lines shall be made on 1"=1 mile scale map for facilitating in locating the compartment line as and when needed.



## Methodology

The execution of the project could be segregated into three parts establishing geodetic control, demarcating the forest boundaries and digitizing the topographic detail. The field activities started in mid of April 2018 and completed by the first of June 2018.

The geodetic control from Sucho Minahijo SBM was shifted to two Benchmarks (BMs) established at Dhingano Forest and Lakhat police Station (PS), by using dual frequency GPS set. Sucho Minahijo SBM are connected with national geodetic network of high accuracy order. During field activities 135 GCPs have been established where the initial planning is was at 160 GCPs and 112 FBP's have been erected on ground where 100 FBP's is were initial planning as per TOR.

### PROVIDING CONTROL POINTS IN THE FIELD

#### Bench Marks

The establishment of base points with reference to any high accuracy national grid point is very essential to have the high precision and accuracy in any survey work. In this regard 02 BMs were established in the area of work referenced to



Sucho Minahijo SBM, which are high order national geodetic network points in our country. These 02 BMs were established

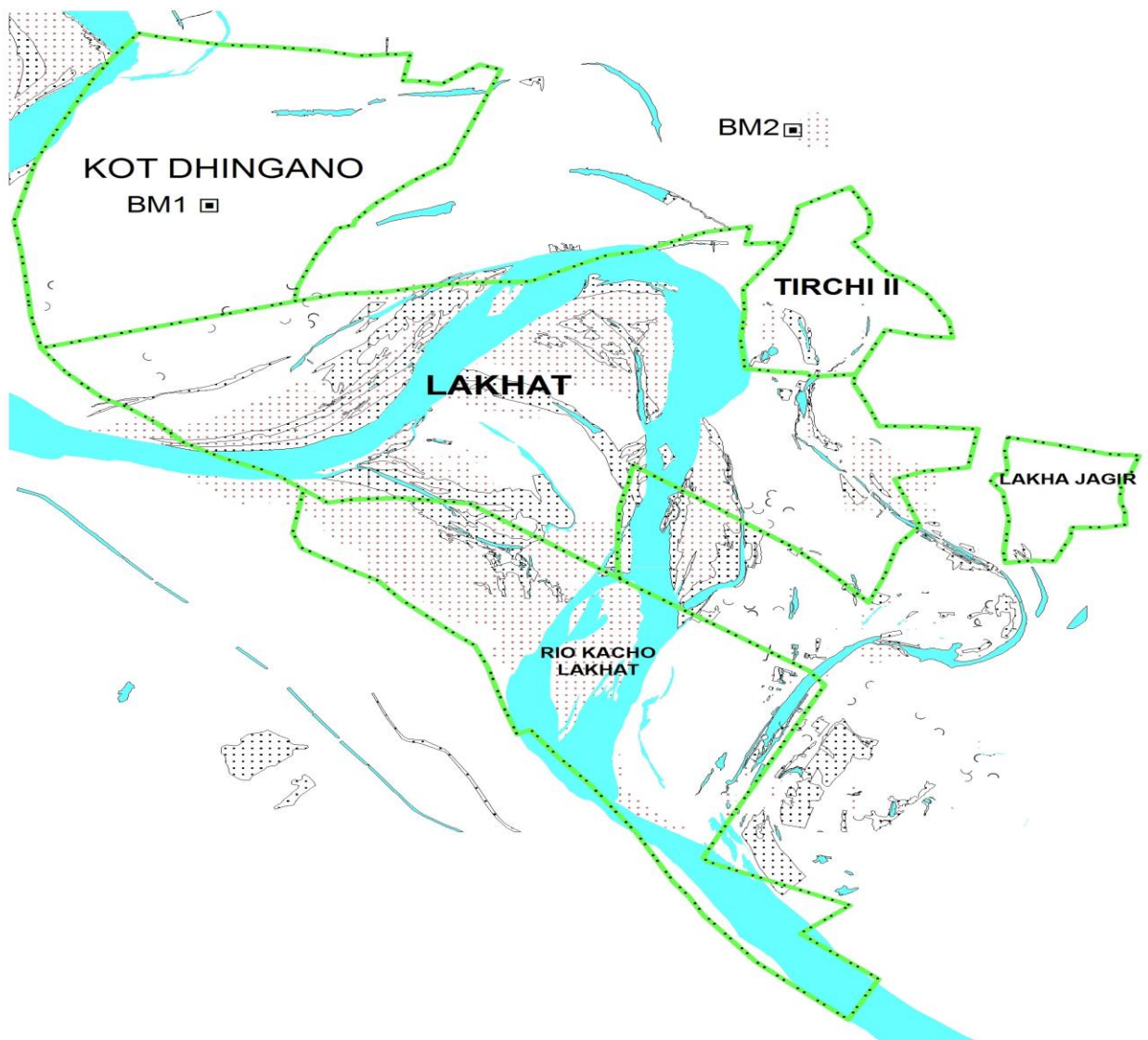
with 07 to 08 hours observation at Dhaigano Forest and Lakhat police Station (PS). One BM are situated in sheet 1 of scale 8"= 1 mile and the other BM is situated in sheet 8.

The detail of the BMs is provided in following table.



## BENCH MARKS ESTABLISHED IN FIELD

SL. NO	FOREST	BM
1	Kot Dhigano	BM 01
2	Lokhat	BM 02



These BMs were then used to provide the supplementary control and demarcation of forest boundary pillars. The points were observed using dual

frequency GPS in WGS-84 system. The forest boundaries have been demarcated physically on the ground as per documents provided by DFO Forest Afforestation Division Shaheed Benazirabad and further identified by the representatives of the forest department.

### Ground Control Point

Combined map of Two Forest Kot Dhigano and Lakhat provided by the forest department was geo-referenced and control points were planned on that map. The control points were provided having BM as the base station and rover on the control points. A total of 135 Ground control points were observed in the field, for all the control points the duration of observation was around half an hour for each GCP. The GCPs are used to provide the geo referenced coordinate to Forest Boundary Pillars and to provide the control to the satellite imagery. The detail of GCPs is given in following table.


DETAIL OF GCP AND FOREST BOUNDARY PILLAR IN EACH FOREST				
FOREST	AREA	GCP <sub>s</sub>	FBP <sub>s</sub>	COMPRMENTS
<b>Kot Dhigano</b>	3904.030	66	33	17
<b>Lakhat</b>	12053.246	69	79	116

### DEMARICATION OF BOUNDARIES

#### Boundary Pillars

The boundary pillars are of length 3 feet, width and about 1.5 foot of which is buried in ground and half shown above, surface whereas the surface area of each pillar is one square foot, as shown in the image. The final GPS reading was observe





after the erection of the Forest Boundary Pillars. A total of 112 boundary pillars have been erected on ground in two forest.

#### IDENTIFICATION OF FOREST BOUNDARY PILLAR ON GROUND

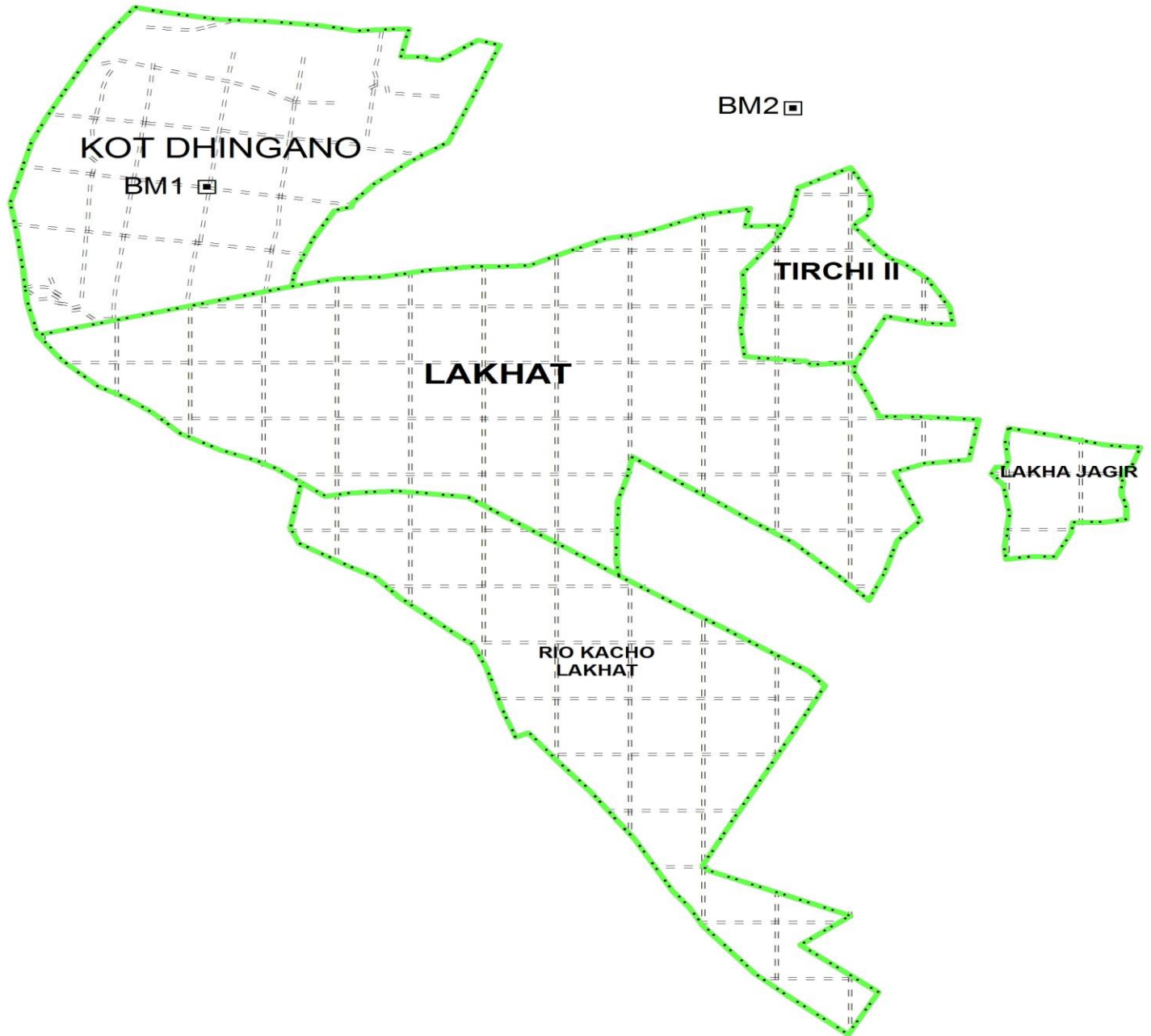
The Forest boundaries were firstly identified on Deh Maps provided by the forest department and then the proper Forest Boundary Pillar positions were marked on the deh maps with the assistance of representatives of forest departments. To locate/ relay the pointed position on the ground different soft wares were used, later the position on ground was physically identified by representatives of forest department.

#### DIGITIZATION OF DETAIL

The digitization of the forest area has been carried by using IKONOS Mono Satellite Imagery of 0.5 m resolution already available with Survey of Pakistan. The maps are projected in UTM projection on the scale 2"=1 mile (1:31680), 1"=1 mile (1: 63000) and 8"= 1 mile (1: 7920). The Forest Compartment having an area of 160 acres have been shown on the maps

The forest boundary shown on the map is true to ground with respect to Forest Boundary Pillars, straight from one pillar to next pillar. The compartment lines are drawn keeping the area fixed as 160 acres in most of the compartments. The lines are drawn arbitral in horizontal and vertical direction to North. The sketche of the compartments given as under.. The detail like dense forest, cultivation and other topographic features have been digitized using 0.5m resolution I KONOS Mono satellite imagery 12 sheets on scale 1:7920,

## Sketch of Compartments



sheet on scale 1:31680, 01 and sheet on scale 1:63360 have been prepared.

## Detail of layers in digitized map

LAYERS	TYPE	DESCRIPTION
<b>Bondary pillar</b>	Point	This layer consists of Boundary pillar. It is a type of control point with ID 1
<b>Boundary line</b>	Line	This layer is connecting all the FBPs and is categorized as Forest Boundary and Internal Boundary
<b>Control Point</b>	Point	It consists of all the control points except FBPs. It includes Bench Mark and Control Points
<b>Water feature poly</b>	Polygon	It is categorized as Drain-non-perennial, Island, Lake, Pond-Perennial, River bed and River filling
<b>Water feature line</b>	Line	It describes the outer limits of all the water bodies. It also describes the perennial and non-perennial nalas
<b>Road</b>	Line	This layer contains all types of roads
<b>Service</b>	Line	This layer contains inform about features line electric power line and railway track.

<b>Cultivation</b>	Polygon	It describes cultivated area dense forest area.
<b>Cultivation limit</b>	Line	This layer is used to give the outer limit to cultivated areas
<b>Compartments</b>	Line	This layer consist of almost equidistant line forming sized compartments. So that Every compartment is comprising of 160 acres.
<b>Embankment</b>	Line	It describes embankment and hedges.
<b>Block</b>	Polygon	It represents dense population, like cities
<b>Block point</b>	Point	Permanent huts and Mosques are shown in this layer
<b>Tree</b>	Point	It describes different types of trees

#### EQUIPMENTS AND SOFTWARES USED

- Lieca Dual Frequency GPS set
- Arc GIS (9.3)
- Data processing Software (Skypro)
- Prolink

## Field activities and summary

Field activities commenced on April 2018, the Camp Head Quarter was established at forest Rest House in Shaheed Benazirabad Mr. Muhammad Ikram, T.A (F) performed the duties as Camp Officer in supervision of Mr. Muhammad Sohaib, Officer-in-Charge and Mr. Asad Ali Behlar, Director Southern Circle. The field activities were spread over around two months and accomplished on 07-06-2018. During the period the progress of field activities were regularly submitted to the all the concerned departments and the Surveyor General Office.

Detail of field activities as planned and executed are given in the following table with reasons for increase in the Quantum. The area to be surveyed was initially estimated as 17027.8 acres however during the field activities as per physical verification of ground features the area was calculated to be 15957.3 acres. The 100 number of FBPs planned were whereas 112 boundary pillars were erected on the ground. However 160 Ground control Points were planned but the number GCPs decreased to 135 points. The agreed tasks and accomplished task comparison is drawn in the following table.

DETAIL FOR QUANTUM OF WORK				
ITEM	AGREED	ACOMPLISHED	DIFFERENCE	REASONS
<b>Area</b>	17028	15957	1071	Decrease in area is based on actual measurement
<b>GCPs</b>	160	135	25	Because of decreased area
<b>FBPs</b>	100	112	12	Internal limits between forests have not been demarcated



## TERRAIN TYPE

The terrain of the area is almost plain with height difference of 05meter to the maximum. Most of the area is covered with dense forest, and in some parts cultivation is also present. The weather in the area is hot and humid, tree shades are very dense and create obstacle in GPs observation. Movability in the area is difficult because of dense forest and not much tracks were there. The river Indus flows in between the forest area and only viable way to cross the Indus River is through boats.

Two forests that are demarcated and surveyed falls with-in the jurisdiction of District Shaheed Benazirabad, the detail of each forest is mentioned in Table “Detail of Forest Surveyed”. The forests in the north, Kot Dhigaro, are shown on Sheet 1 and the forest in the South, Lakhat is shown on same Sheet .

## DEMARCATION OF FOREST BOUNDARY PILLARS

Total of 112 forest boundary pillars were erected on the ground. The pillar position was initially marked by the representatives of forest on the deh maps provided by revenue department and from there on the same were identified on ground and the coordinates were provided to it using dual frequency GPS. Initially as per ToR total number FBPs to be erected were 100, however the excess number of boundary pillars were demarcated as the internal limits between the forests were not distinguishable on ground. At the initial stage it was proposed to be 100 FBPs but during the field 112 FBPs were erected. There were some pillars that were required to be destroyed, and are not counted for as erected pillars. However one can see in the Table “Detail for Quantum of Work” that in all other field activities the quantum of work has decreased due to other reasons.

## DETAIL OF GCP

A total of 135 GCPs were picked up on ground using dual frequency GPS every GCP sketch were prepared and the description of the point was mentioned. The GCPs were established using dual frequency GPS having base at one of the Bench Marks BM established in the forest area. There were total two Bench Marks are established in the forest areal the detail is shown in Table “Bench Marks established in the field”.

Initially as per ToR 160 GCPs were planned however some 135 GCPs were established during the field activities. The number of GCPs decreased mainly because of the decrease in area and to provide better accuracy in the topographic survey. The detail of decrease in Quantum of work is mentioned in Table “Detail of Quantum of Work”.

## RESULTS

### **Ground Control Points**

Two Bench Marks (BMs) of high accuracy were established in the area of field. All the BMs were established using dual frequency GPS and are referred to National Geodetic Grid. The detail of BMs is given in section “Methodology”. In the field area survey team established around 135 GCPs for establishment of control, demarcation of Forest Boundary Pillars. The detail of GCPs is provided in section “Methodology”.

### **Forest Boundary Pillars**

112 Forest Boundary Pillars have been erected in the field for two forests. Kot Dhangano and lakhat share the internal limits with each other and are not demarcated in the field. However the external limits of both the forests are delineated in the field. The detail of Forest Boundary Pillars with reference to respective forests is given in draft notification.



### **Area Surveyed and recovered**

Initially the tentative area planned was 17028 Acres, however after the field activities it was found to be as 15957 Acres. The reason is actual measurements on ground, that is to say that the initial plan was made on small scale maps, whereas on conclusion of Original survey / demarcation of limits of forest the substantive decrease in the area was accrued.

## Project Teams

The success and failure of project depends upon the employment of manpower for executing by having the right place, at the right time.

We are lucky having all the desired attributes with our project team. As a recognition of their valuable contribution and positive involvement in this project their names, designation & Organisations are mentioned for future record & references.

### Indentor agency

Sr. No.	Name	Designation	Organisation	Remarks
1.	Mr. Muhammad Ayaz Khan	National Country Manager SFM	UNDP/SFM	
2.	Mr. Ghulam Qadir Shah	Project Manager	-do-	
3.	Mr. Abdul Haque Shaikh	Provincial Coordinator SFM	-do-	
4.	Mr. Gul Hassan Daud poto	Conservator Forest Afforestation Circle	Forest Deptt. Govt. of Sindh	
5.	Mr. Gul Junejo	DFO, Afforestation Division Shaheed Benazirabad	-do-	

### Executive Agency

1.	Mr. Noor Ellahi	Deputy surveyor General-II	SoP	
2.	Mr. Asad Ali Bhellar	Director Southern Circle	-do-	
3.	Mr. Muhammad Sohaib	Assistant Director/Office-in- Charge No. 9 Party	-do-	
4.	Mr. Khalid Tufail	Assistant Director /Technical Officer to Director Southern Circle	-do-	
5.	Mr. Muhammad Ikram	TA(F)/Camp Officer	-do-	



## Constraints and lessons learnt

### INTERACTION WITH REVENUE DEPARTMENT

The Revenue Department Govt. of Sindh shared the desired revenue record but they left the field at very early stage of work. We felt some personal, organizational and capacities issues with Revenue Department officials. We also observed lack of dedication and determination with them. The main issue must be their traditional working practices and were not comfortable with our latest methods of using advance equipment.

The efforts shall be made to take them onboard with the use advanced methods of Land Measurements, so that a healthy participation of both the departments could be seen in future.

### TRAVELING ON BOAT

The Indus river falls in between the forest, hence to cross the river was only way so we used the boat to cross the river very oftenly.

## Recommendation and Suggestions

As this project has now been completed and all the deliverables have been delivered to the Indentor, here are some recommendations and suggestions to be considered at appropriate level.

- It's better to have all the forest area got demarcated and notified.
- There should be a routine exercise to check the boundary pillars, if they are damaged or destroyed then their repairs be carried out.
- Some of your Officials of SFD be trained for routine field activities. Survey Training Institute, Survey of Pakistan can arrange a suitable training sessions for your department.
- SFD should digitize historical records of reverence forest. These records must by well documented.
- Develop automated methods of companies of long term record using current computer based techniques.
- Utilization of emerging technologies like GIS Remote Sense & Satellite imageries quantative analysis.

## Contact Information

To replace a photo with your own, right-click it and then choose Change Picture.

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## Comments

Over all work and report is excellent

There is difference in total area area surveyed

Total area of 595114 acres of riverine forest declared as reserved forest

