कार्यालय कार्यपालन अभियन्ता,लोक निर्माण विभाग

राष्ट्रीय राजमार्ग संभाग क्रमांक 01,पेंशन बाड़ा रायपुर (छ.ग.)

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चेक लिस्ट क्र. 38

"A detailed note on Soil Productivity or the lack of it"

(भारत सरकार, पर्यावरण एवं वन मंत्रालय, क्षेत्रीय कार्यालय, भोपाल का पत्र कमाक 6-MPC013/2008BHO/357 दिनांक 06.01.2011)

कार्यापालन अभियंता राष्ट्रीय राजमार्ग, लोक निर्माण विभाग संभाग क्रमांक 01 रायपुर (छ.ग.) द्वारा राष्ट्रीय राजमार्ग कमांक–930 झलमला–बालोद–कुसुमकसा–मानपुर मार्ग (छ.ग./ महाराष्ट्र सीमा) में 2/4 लेन मय पेव्हड शोल्डर मार्ग का चौड़ीकरण/उन्नयनीकरण कार्य प्रस्तावित है। इस हेतु बालोद वनमण्डल अंतर्गत परिक्षेत्र बालोद के आर.एफ. कक्ष क्रमांक 99,98,97,92,पी.एफ. 257 रकबा 17.772 हे. , परिक्षेत्र दल्ली के वनक्षेत्र आर.एफ. कक्ष कं. 148,170 रकबा 5.935 हे. , परिक्षेत्र डौंडी के वनक्षेत्र आर.एफ. कक्ष कं. 163,164 रकबा 1.714 हे. एवं राजस्व वन क्षेत्र दानीटोला खसरा नं. 307 रकबा 1.050 हे. कुल रकबा 26.471 हे. क्षेत्र में वन भूमि/राजस्व वन भूमि का चयन किया गया है।

आवेदित क्षेत्र की भूमि की दशा Soil Productivity रिपोर्ट संलग्न है।

(बी. श्रीनिवास राव)
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(एस. पी. पैकरा)
वन संरक्षक
प्रभारी वन मंडलाधिकारी
बालोद वनमंडल,बालोद

CHAPTER - 4

INVESTIGATION OF BORROW AREAS FOR EMBANKMENT AND SUBGRADE

4.1 General

Investigation of borrow areas for road construction has been carried out to identify the potential sources of embankment fill material and subgrade material for the reconstruction of carriageway/new alignment and to assess their general availability and suitability for use in road and construction works.

4.2 Objectives

The investigation on borrow areas were carried out with the following basic objectives:

- Source location indicating places, kilometre stone and lead distances and the status whether in operation or new source.
- To assess source, indicating the direction and nature of the access road i.e. left/right of Project Road, approximate lead distance.
- Ownership of land (Government or Private).
- Testing of borrow area soils to assess the quality of materials along with their classification details and evaluation for their suitability.
- Probable use indicating the likely use of soils at various stages of construction work, i.e. fill material/ subgrade.

4.3 Borrow Areas

The fill materials are basically required for constructing new subgrade and embankment for bypass, re-aligned or raised stretches, widening of existing road stretches and backfills around cross drainage and bridge structures.

In order to assess the availability, quality and quantity of fill materials, the existing and potential material sources have been surveyed and investigated.

During the process of investigation, due consideration was given to locally available materials for reducing the cost of construction. The possible borrow areas were approximately measured for their quantities and overburden was determined by visual inspection. The Consultant has identified several borrow areas along the project corridor. All the borrow areas are within a lead distance.

Location details of prospective borrow areas along with lead and approximate quantity available is shown in **Fig. 4.1.** Based on visual classification of the materials, representative samples were collected from these borrow areas and tested in the laboratory.

TABLE 4.1 Test Results for Borrow Area Material

Sample ID	Description of Soil	Location / Chainage	Grain Size Analysis			Atterberg's Limit (%) IS:2720 (Part-5)			Modified Proctor Test IS:2720 (Part - 7)		C.B.R. (4 days Soaked) at Three Energy Level (%) As Per AASHTO T-194			CBR at 97% of MDD
			Gravel (%)	Sand (%)	Silt & Clay (%)	L.L. (%)	P.L. (%)	P.I. (%)	M.D.D. gm/c.c.	O.M.C. (%)	15 Blows	35 Blows	65 Blows	
2/ Borrow Area / NH-930	Clay of low Plasticity (CL)	NH 930- Borrow Area	21.80	37.90	40.30	NP			1.925	10.56	6.9	10.5	10.2	11.80
4/ Borrow Area / NH-930	Clay of low Plasticity (CL)	NH 930- Borrow Area	23.70	34.60	41.70	NP			1.983	10.19	7.5	11.2	17	12.90

4.3.1 Laboratory Testing

About 40 kg of representative samples were collected from each borrow area after removing the upper 300mm of natural ground.

Laboratory tests carried out on each borrow sample are as follows:

-	*Grain size analysis*	*As per IS:2720*	*Part-IV - 1985*
-	*Atterberg Limits*	*As per IS:2720*	*Part-V – 1985*
-	*Maximum Laboratory Dry Density*	*As per IS:2720*	*Part-VIII - 1983*
-	*Optimum Moisture Content*	*As per IS:2720*	*Part -VIII - 1983*
-	*CBR (4 days soaked) at the specified compaction level of 97% MDD*	*As per IS:2720*	*Part-XVI - 1987*

4.3.2 Results

Laboratory test results of soil samples from borrow areas are provided in **Table 4.1**. It is found that the type of soil found in all the quarry area is to CL i.e. clayey soil of low plasticity. Summary of quantity of materials available from different borrow areas are given in **Table 4.2.**

Table 4.2 Summary of Borrow area Quantities

Sl. No.	Borrow Area Sample No.	Village Name	Side	Location	Lead (km)	Quantity (m3)
1	BA-02	Manpur Chowk	Right	57+800	0.180	157200
2	BA-04	Boria	Right	83+300	0.470	102300

4.4 Evaluation of Test Results

The laboratory test results show that the materials from all the borrow areas fall under CL class as per IS classification. Compaction test (heavy compaction) results indicate that maximum dry density is 1.925 gm/cc and 1.983 gm/cc and Optimum Moisture Content is 10.56% and 10.16%. Laboratory California Bearing Ratio test was carried out on the soaked (4 days) samples compacted to 97% MDD, and the value is found to be 11.80 and 12.90 respectively.

From the type of soil locally available in the area, and their engineering characteristics ascertained from laboratory test results (**Tables 4.1 and 4.2**), the following inferences / recommendations are made:

- Considering the engineering characteristics and the range of CBR values of the material from the prospective borrow areas, and to allow for some variability in the construction operations, a soaked CBR value of 7% is considered appropriate for designing pavement for new carriageway/new alignment.
- Giving due allowance for possible variability during construction operations, it is recommended that soil from borrow areas which have shown a soaked CBR of 7% or more be used for both embankment and subgrade construction as indicated in **Table 4.1**.
- Soil from borrow area BA-02 and BA-04 of MDD > 17.5 kN/m^3 and thus can be used for subgrade construction as well as for embankment.

- Adequate quantities of soil for constructing embankments/subgrade for road widening or new alignment, are available from the prospected borrow areas within a lead distance of 10 km along the project road.
- The identified borrow areas fall within a maximum lead of 10 km from the Project Road. It is recommended that soil available from the nearer borrow areas should be exploited to the maximum extent possible before resorting to hauling from the two borrow areas at further distance.
- Adequate quantities of soil for constructing embankment and subgrade for road widening are available from the identified borrow areas.

कार्यपालन अभियन्ता
राष्ट्रीय राजमार्ग संभाग क्र.1
लोक निर्माण विभाग, रायपुर (छ.ग.)

JHALMALA

KOHKA

To Durg

JHALMALA

To Dhamtari

30+000
30+600

Start of Project Road
Existing Km 30+600

40+000

Jamani

0.400Km

Area=0.0081Km^2

Borrow Area No.01
Km 46+800

50+000

Manpur Chowk

0.180Km

Area=0.0524Km^2

Borrow Area No.02
Km 57+800

60+000

Bitejhar

0.590Km

Area=0.0380Km^2

Borrow Area No.03
Km 69+100

70+000

80+000

Boria

0.407Km

Area=0.0341Km^2

Borrow Area No.04
Km 83+300

Kahdabri

Borrow Area No.05
Km 92+900

Area=0.0578Km^2

3.000Km

90+000

100+000

110+000

115+300

End of Project Road
Existing Km 115+300

KOHKA

DATE: 29/05/2017 - 3:36pm
Path: Y:\HIGHWAY\2015\DPR\1231579\Highways\WORKING DATA\DRAWING\FFR_MARCH 2017\Other Drawing\Borrow Chart\Borrow Chart.dwg

REV	DATE	DESCRIPTION OF REVISIONS	INITIALS
	MAY 2017	DRAFT DETAILED PROJECT REPORT	
	DEC 2016	FINAL FEASIBILITY REPORT	
	FEB 2016	DRAFT FEASIBILITY REPORT	
	SEP 2015	FINAL INCEPTION REPORT	
	AUG 2015	DRAFT INCEPTION REPORT	A B C D

Consultant:

S.A. Infrastructure Consultants Pvt. Ltd.

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Plot No. 7A/1, Sector 142, Noida-201301 (Uttar Pradesh)
Phone No- 0120-6148000 Fax-0120-6148090
Email: info@sainfra.com

Client: PUBLIC WORK DEPARTMENT (NH DIVISION) CHHATTISGARH

Project: Consultancy services for project management phase-I including preparation of detailed project report of selected stretches/corridors of national highways for up-gradation to two/four lane with paved shoulders configuration (Jhalmala-Bilaid-Kusumkasa-Mirumgaon-Dhamara-Gadchiroli-Mul-Chandrapur of NH-930 in the state of Chhattisgarh and Maharashtra package no. NH/INE/11)

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