

SINHA MINING CONSULTANCY

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REPORT ON

DGPS SURVEY FOR CHHATTISGARH MINERAL
DEVELOPMENT CORPORATION LTD. PATHARAI
(MAINPAT)-BAUXITE MINE, MINING LEASE AREA
99.35Ha VILLAGE - PATHARAI, TAHSIL SITAPUR
DIST.SURGUJA (CG)

SUBMITTED BY

SINHA MINING CONSULTANCY(N.P.SINHA-Prop)

REG.NO.F-7 14/2015/123

SUBMITTED TO

DIRECTORATE OF GEOLOGY & MINING

GOVT.OF CHHATTISGARH

INDRAVATI BHAWAN,2ND FLOOR,BLOCK4

NAYA RAIPUR(C.G)

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INTRODUCTION

The mineral and mining industry is a key segment for development of the Indian Economy,Chattisgarh is one of the important mineral bearing state in India which has approximately 360 operating mines and firms involved in mining or trading in mineral product, To prevent the illegal activities of mining in India as well as in the state Department of Geology and Mining Gov. of Chhattisgarh has begun verification of the mining lease boundary, by conducting DGPS survey in mining lease area.

The conventional method of survey to delineate and demarcate the mining lease boundary with reference to the earlier cadastral based mining lease map have limitations and area surveyed by these method are unprotected hence linking them to GIS platform is a challenging task. The modern survey technique using Differential Global Positioning System With Geo Referenced Victories' Cadastral Map use of high resolution satellite image can overcome this limitation in a GIS environment and with the help of such accurate instrument and high resolution image victories' cadastral map can be geo-referenced on uniform co-ordinate system .

PURPOSE OF SURVEY

Deriving Co-ordinate of each boundary pillars using DGPS in the world geodetic system 1984(WGS-84)Datum for **PATHARAI Bauxite Mine** Preparation of Geo referenced mining lease boundary map using DGPS Victimization of cadastral map integration of Geo referenced mining lease boundary map on victories cadastral and forest compartment map and check the accuracy.

Merging of Cartosat-2 and Liss-1 image by purchase NRSC Hyderabad, Scale 1:5000 both image superimpose geo referenced mining lease map on high resolution satellite image(Merged product)

GIS Data base creation and analysis'

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CONCEPT OF DGPS

DGPS System Consist a reference receiver located on a known position that has been previously surveyed and one or more receivers, the antenna differential correction processing system and data link equipment. Single Star Fire Licence receiver Very Accuracy $\pm 2\text{mm}$ collect store data for later Resolution processing DGPS System is based on the principle that receiver in the same vicinity will simultaneously experience common error on a particular satellite ranging signal. in the user receiver, measurements are taken from the reference receiver to remove common errors. Based on this principle the Licence receiver must use the same set of satellite as the reference station then the DGPS Equation is formulated to remove the common error get cancel. The common error are signal path delay through atmosphere and satellite clock.

PROCEDURE ADOPTED FOR SURVEY

(A) DGPS SURVEY MINING LEASE BOUNDARY:

To prepare the map of Mining Lease Boundary and to assess the present situation of the lease boundary, the survey was carried out by the dual frequency DGPS to establish position of pillar point on the ground, within the mining lease area through static mode of observation, precise geo -Coordinates of cadastral area to be diverted for mining activity has been taken for fixing the pillar at 50mts interval.

(B) Digitization and geo referencing of cadastral maps

A Cadastral map of the area digitized and geo referenced with the image taking the junction road etc of the nearby mining lease.

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(C) Geo-Referenced of Mining Lease Boundary

The mining lease boundary vector in the form of shape file has been prepared using the Co-ordinate of the pillars in the geographic Lat/Long as well as UTM projection with WGS-84 spheroid and datum. Mining lease boundary geo-referenced with the help of Co ordinates and superimposed on cartosat-2 image(merged product)

(D) GIS Analysis.

The surveyed boundary shape file from DGPS survey,Geo-Referenced Cadastral Map,Geo refrenced mining lease boundary are suprimposed on the image using ERDAS SOFTWARE(9.2Version),area calculated and statistics of the mine area was generated.

INPUT DATA

ANNEXURE NO

DESCRIPTION

- 1.Covering Letter of Submission Application
- 2.Project Report of DGPS Survey.
- 3.DGPS Instrument Data Report in PNG File
- 4DGPS Survey Reading Data Report in CSV File
- 5.NRSC Hyderabad Satelite Cartosat-2 image Text Report
- 6.Cadastral map of Govt. mining Lease Scale 1:4000
- 7.Lease Boundary on Cartosat 2,NRSC Hyderabad Image
- 8.Lease Boundary on Liss4,NRSC Hyderabad Image
- 9 Lease Boundary on Cartosat-2 and Liss-4 Merge Map,NRSC Hyderabad Image
- 10 Lease Boundary on Certified Govt.Village Map,
- 11.Report of All Data Soft Copy on CD

SINHA MINING CONSULTANCY

PROP.N.P.SINHA

SINHA MINING CONSULTANCY

Prop -N.P. Sinha(Surveyor)

Chhattisgarh DGPS Authorisation

Reg.No.: F7-14/2015/123

Dated 10th Nov 2014

Mine Name of Job:CMDC Ltd(Mainpat-Pathrai)
Start Date: 08-28-2015
Start Time: 7:28:10AM
Occupied Pt:1
Backsight Pt.
Backsight Azi:0.0000
Metric
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pro_file_offsetstakeout=0
Backsight Circle:0.0000
Fl Zenith Angle:0.0000
Last Date: 08-30-2015
Last Time: 6:32:36PM
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SINHA MINING CONSULTANCY
P.O. Box 24, Mainpat, Pathrai
Dist. Nandurbar, Maharashtra
Regd. No. 14/2013-14
Date: 14/08/2015

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Licence Companies Name:SINHA MINING CONSULTANCY


SINHA MINING CONSULTANCY
 Prop -N.P. Sinha(Surveyor)
 Chhattisgarh DGPS Authorisation
 Reg.No.: F7-14/2015/123
 Dated 10th Nov 2014

CMDC Ltd MAINPAT Bauxite Mine Area 99.35Ha, Village Patharai, Tahsil Sitapur

1	2522640.12	732265.611	221.011	5874992	890387	2310659	22.47432	83.15454	BP-1
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3	2522634.22	732179.497	221.094	5875050	890404	2310507	22.4743	83.15423	BP-3
4	2522630.81	732129.605	221.487	5875024	890553	2310517	22.47429	83.15406	BP-4
5	2522627.39	732079.712	220.738	5875042	890569	2310462	22.47429	83.15388	BP-5
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117	2523064.95	731451.927	215.387	5874265	890601	2312398	22.47574	83.15171	BP-117
118	2523033.5	731405.79	215.164	5874231	890683	2312452	22.47564	83.15154	BP-118
119	2522995.37	731383.494	214.795	5874200	890757	2312500	22.47552	83.15146	BP-119
120	2522947.22	731374.154	214.108	5874169	890831	2312550	22.47536	83.15143	BP-120
121	2522909.69	731384.774	214.062	5874113	890962	2312639	22.47524	83.15146	BP-121
122	2522868.11	731417.682	214.4	5874042	891134	2312754	22.4751	83.15158	BP-122
123	2522826.86	731450.329	214.212	5873931	891406	2312928	22.47496	83.15169	BP-123
124	2522787.66	731498.982	213.024	5873871	891554	2313021	22.47483	83.15186	BP-124
125	2522756.11	731538.146	211.472	5873759	891830	2313194	22.47473	83.15199	BP-125
126	2522724.39	731577.51	211.148	5873690	891999	2313301	22.47463	83.15213	BP-126
127	2522712.7	731602.533	210.933	5873682	892016	2313316	22.47459	83.15222	BP-127
128	2522691.49	731647.936	204.731	5873427	891058	2314308	22.47451	83.15237	BP-128
129	2522670.27	731693.338	205.466	5873388	891052	2314409	22.47444	83.15253	BP-129
130	2522649.09	731738.686	208.72	5873385	891027	2314435	22.47437	83.15269	BP-130
131	2522646.67	731768.205	209.316	5873373	891034	2314465	22.47436	83.15279	BP-131
132	2522667.36	731792.287	209.119	5873375	891013	2314467	22.47443	83.15288	BP-132
133	2522722.68	731793.989	209.529	5873361	891002	2314508	22.47461	83.15289	BP-133
134	2522772.71	731795.527	209.655	5873373	890935	2314505	22.47477	83.1529	BP-134
135	2522822.64	731797.063	209.593	5873352	890918	2314563	22.47493	83.1529	BP-135
136	2522798.05	731862.801	209.695	5873370	890835	2314549	22.47485	83.15313	BP-136
137	2522775.19	731923.903	210.015	5873383	890804	2314530	22.47477	83.15335	BP-137
138	2522757.61	731993.098	208.915	5873363	890790	2314583	22.47471	83.15359	BP-138
139	2522745.28	732041.589	208.69	5873407	890697	2314507	22.47467	83.15376	BP-139
140	2522732.96	732090.08	208.929	5873422	890713	2314464	22.47463	83.15393	BP-140

141	2522720.64	732138.571	210.823	5873410	890781	2314472	22.47459	83.1541	BP-141
142	2522708.32	732187.062	207.996	5873425	890779	2314427	22.47454	83.15427	BP-142
143	2522689.46	732249.213	204.084	5873433	890777	2314399	22.47448	83.15448	BP-143
144	2522660.2	732272.789	207.43	5873498	890845	2314218	22.47438	83.15456	BP-144


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Chhattisgarh DGPS Authorisation
Reg.No.: F7-14/2015/123
Dated 10th Nov 2014

**CARTOSAT-2
DATA PRODUCTS SYSTEM**

**GeoTIFF Format for
IRS Digital Data Products
(Version-2.1)**

Blagmora - Manupat

July 2009


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GeoTIFF format for IRS Digital Data Products

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1.0 Introduction

The spaceborne remote sensing images in digital form has gained wide spread popularity, over the last decade with the advances in the field of Digital Image Processing and Geographical Information System (GIS) and evolution of computer hardware and software. Although currently various data formats (e.g. PGM, GIF, BMP, TIFF) are in use for storage of raster image data, they have a common limitation in cartographic applications. The main problem is that, it is almost impossible to store any geographic information together with image data in a unified and well-defined way in the above mentioned formats. There was a requirement to develop a new standard or the extension of an existing one, by adding a formalism to store information about geo location of the image, the underlying cartographic model, a set of tie points and other relevant data. This new format was required to have platform independency, flexibility and extensibility. The Aldus-Adobe's public domain Tagged Image File Format (TIFF) is one of the widely used raster file formats, which is platform independent and has provision for extension. In 1990 one positive initiative was started by the Intergraph Corp. and the JPL Cartographic Working Group, based on the TIFF standard. The basic idea was to exploit the extensibility feature of TIFF which allows to officially register new TIFF Tags in order to create a well established structured format/space for a variety of geographic information.

Though it is very difficult to standardize remote sensing satellite digital image data products' formats and its contents, GeoTIFF format is an effort for this considering widespread application of GIS packages worldwide. The basic idea behind this file format is to supplement the bare image data with all information necessary for the transformation from image space into a geographic or cartographic coordinate system.

This document contents are applicable for all IRS series of Data Products. **The aim of this document is not to give complete TIFF or GeoTIFF specification, but only the fields used to give details of a given IRS data product. For a full understanding of GeoTIFF, this document has to be read along with the original GeoTIFF (Revision 1.0) specification. The GeoTIFF specification can be down loaded from the site given in section 3.4.**

2.0 TIFF (Tagged Image File Format)

TIFF (Tagged Image File Format), is a tag-based file format for storing and interchanging raster images. The first version of TIFF specification was published by Aldus Corporation in 1986, after a series of meetings with various scanner manufactures and software developers. TIFF is to describe and store raster image data. *The main advantages of TIFF is its suitability for a wide range of applications and its independence of computer's architecture, operating system, and graphics hardware.* It is reasonably compact and handles black-and-white, grayscale, and color images, allowing a user to adjust for the unique characteristics of a scanner, monitor, or printer. TIFF allows color resolution up to 48 bits (a 16-bit field each for R, G, and B), either as full RGB color or in a 64k-color palette. *The TIFF 6.0 specification, released in June 1992 is taken as reference by GeoTIFF.*

There are two variants in revision 6.0 of TIFF: *baseline* and *extended* TIFF. Within both these variants, there are many optional capabilities. Furthermore, TIFF data vary according to photometric type and compression method. All TIFF 6.0 readers and writers must handle the baseline set of data fields. The way in which these data fields are handled, depends on whether they are mandatory or optional.

2.1 Overview of TIFF File Structure

The TIFF format has a three-level hierarchy. From highest to lowest, the levels are:

- 1) A file Header.
- 2) One or more directories called IFDs, containing codes and their data, or pointer to the data.
- 3) Data.

The graphical view of TIFF file structure is given in Fig.1.

The File Header

The TIFF file begins with an 8-byte header, which gives basic information about the file such as byte order (Little Endian or Big Endian), TIFF file ID or Version Number (which is always 42) and a pointer to first Image File Directory (IFD). The structure of TIFF file header is as follows:

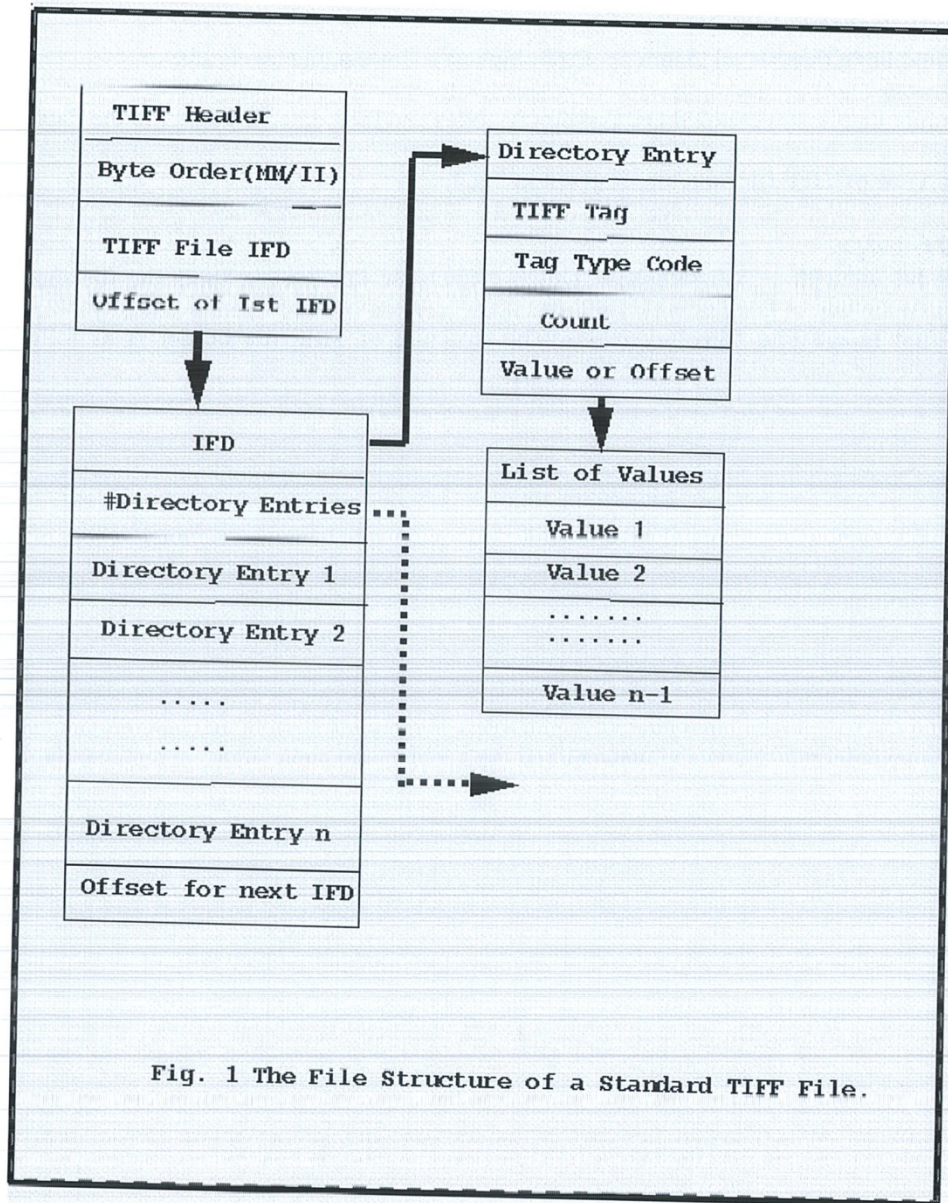


Fig. 1 The File Structure of a Standard TIFF File.

TABLE : 1 TIFF file Header

Offset	Length	Description
0	2	Byte Order: MM or II
2	2	"Version number": which is always 42
4	4	Pointer to first IFD

* **Byte Order Field :** The first header entry is in byte counts 0 and 1. It is a two-letter ASCII record containing the codes for the letters MM or II (4D4D hex or 4949 hex, respectively). MM stands for Motorola architecture, signifying that bytes comprising 16, 32 or 64 bit numbers are stored in the order of most-to-least significant (big endian). II denotes file created in the Intel Architecture, where bytes are stored in the least-to-most significant order (little endian). By reading this record, a Mac or UNIX workstation-based file reader can detect a file created on a PC or vice versa, and interpret it properly.

* **Version field :** The second header entry, a two byte number termed Version in the specification, actually has nothing to do with any version number or with the revision number of the specification. It is always the decimal number 42 (2A hex). For practical purposes, this code identifies the file as a TIFF file.

* **First IFD Offset pointer :** The final header entry is a 4-byte pointer to the location of the first Image File Directory (IFD). The order of bytes here, as elsewhere, depends on the MM or II designation in the first entry. This pointer begins at an offset of 4, the fifth byte in the file.

Image File Directories (IFDs)

Most Likely, the next structure in the file after the header will be the first (or only) IFD, but not necessarily. From here on, everything is found by following pointers. So, to locate the first IFD, use the header's pointer.

An IFD consists of 12-byte entries, typically tagged pointers. The structure of an IFD and its entries are as follows:

TABLE : 2 TIFF IFD Structure

Offset	Length	Description
0	2	Entry Count
2	12	Entry 0
14	12	Entry 1
.	.	.
.	.	.
$n*12 + 2$	12	Entry n
$n*12 + 2 + 12$	4	Pointer to subsequent IFD, if any, or 0000

* **Entry Count field** : Since there may be any number of IFD entries, the first field in an IFD is a 2-byte count of number of entries,

* **IFD entries** : IFD entries are 12-byte fields, beginning with the tag code that specifies what type of data are present. The entries are ordered numerically within the IFD, according to the tag numbers, a feature that helps TIFF readers quickly determine which fields are present and which are not.

* **Terminating field** : The last entry in an IFD will be four bytes of zero, unless there is more than one IFD. If there is more than one IFD, the last entry of the preceding IFD contains a 4-byte pointer to the next one.

TABLE: 3 TIFF IFD Entry Structure

Offset	Length	Description
0	2	Tag
2	2	Type of Data
4	4	Count field
8	4	Data pointer or data field

* **Tag** : The first two bytes are tag, which, if public, may be looked up in the specification. These codes are assigned by the TIFF administrator (Aldus Developer's Desk), in blocks of five.

* **Type code** : The next two bytes comprise a code indicating the type of data in the pointed field. Note that some tags allow variety types, so TIFF readers should always check this code. TIFF 6.0 supports a variety of data types; the codes, the data types, and their names are as follows:

TABLE: 4 TIFF 6.0 DATA TYPES

Data Code	Type	No of Bytes	Standard Data Type
1		1-byte integer	type BYTE
2		1-byte integer, ASCII	type ASCII
3		2-byte integer	type SHORT
4		4-byte integer	type LONG
5		8-byte fraction	type RATIONAL (4-byte numerator followed by 4-byte denominator)
6		1-byte signed integer	type SBYTE
7		1-byte of anything	type UNDEFINED, e.g. a pointer to a complex data structure.
8		2-byte signed integer	type SSHORT
9		4-byte signed long	type SLONG
10		8-byte signed fraction	type SRATIONAL, SLONG numerator, SLONG denominator.
11		4-byte floating point	type FLOAT, IEEE format
12		8-byte floating point	type DOUBLE, double-precision IEEE

* **Count field :** The 4-byte field specifies the *number of values in the data field, not the number of bytes*. The number of bytes can be computed by multiplying the count by the number of bytes in the data type. For example, a count of 64 with a data type of LONG means there will be 256 bytes. (The count was referred to as the *length* in earlier revisions of TIFF.)

* **Data pointer or data field :** The final four bytes are usually a pointer to the start of a data field. Sometimes, however, this field contains not a pointer, but the actual data. If there are four bytes of data or less, as computed by the product of *count* and the byte count indicated by *type*, then the field contains data. Otherwise, the field is a pointer (the offset in bytes from the start of the file to the start of the data field).

2.2 Baseline TIFF

Baseline TIFF specification mostly affects TIFF readers. TIFF readers must be able to process all the fields given in *baseline table* or must assume the specified default, if the field is not present, regardless of the image-type expected. TIFF writers must include all fields required for the type of image data written, except where the default value is desired. Refer Table 5 and Table 6 for details of TIFF 6.0 Tags.

2.3 Extended TIFF

TIFF 6.0 defines numerous extensions. These allow TIFF to offer the following general capabilities.

- * Alternative compression schemes: CCITT, LZW (with and without differencing), and JPEG.
- * Alternative color-representation schemes: CMYK, YCbCr, and CIE L*a*b*
- * Image-quality enhancements: Halftone "hinting," RGB colorimetry.
- * Special image effects: Alpha data (matting, masks and overlays), tiled images.
- * Document storage and retrieval aids: document and page names, page numbers, and position on the page.

These extensions take the form of additional tags and/or special codes for baseline tags.

Baseline TIFF Tags and its usage in IRS DPS

IRS-DPS uses both Grayscale and RGB model to store image data as per product code and number of bands present. For each band of data a separate file with band name is given. In the following table the relevant/used fields of TIFF in context of IRS has been indicated.

Following additional TIFF tag fields contain information specific to each IRS satellite data product. *Extra Fields.*

Software (305), *DateTime*(306), *Artist*(315), *HostComputer*(316).