

Extraction of Volume of Black Stone from inside and outside of the leased quarry areas of Bajabati Hill, Dharmasala Tahasil, Jajpur District, Odisha for the period 07-11-2005 to 01-01-2019 to comply the Directorate of Vigilance, Odisha, Cuttack arising out of Hon'ble Lokayukta Case NoL.Y-670/2021

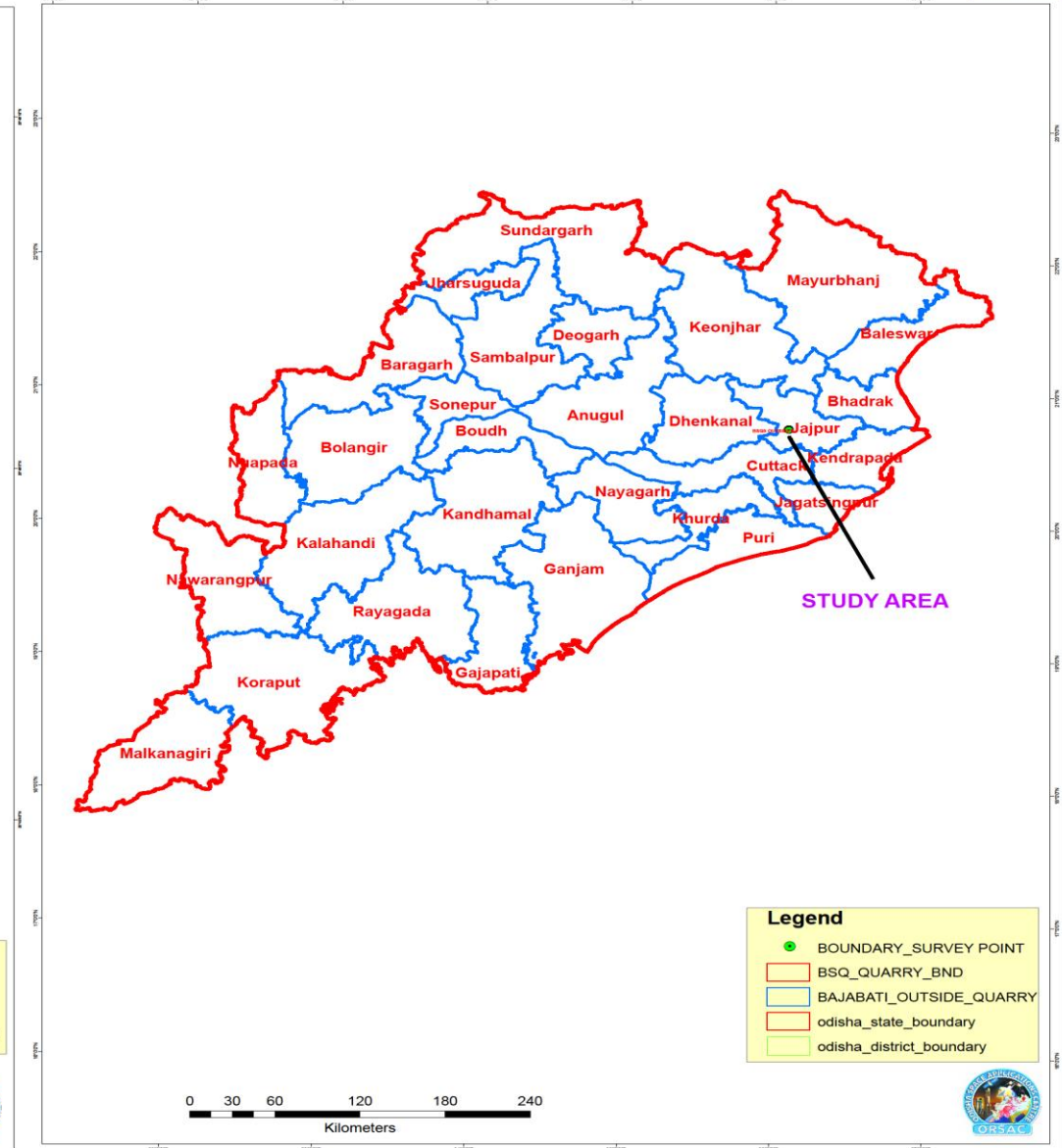
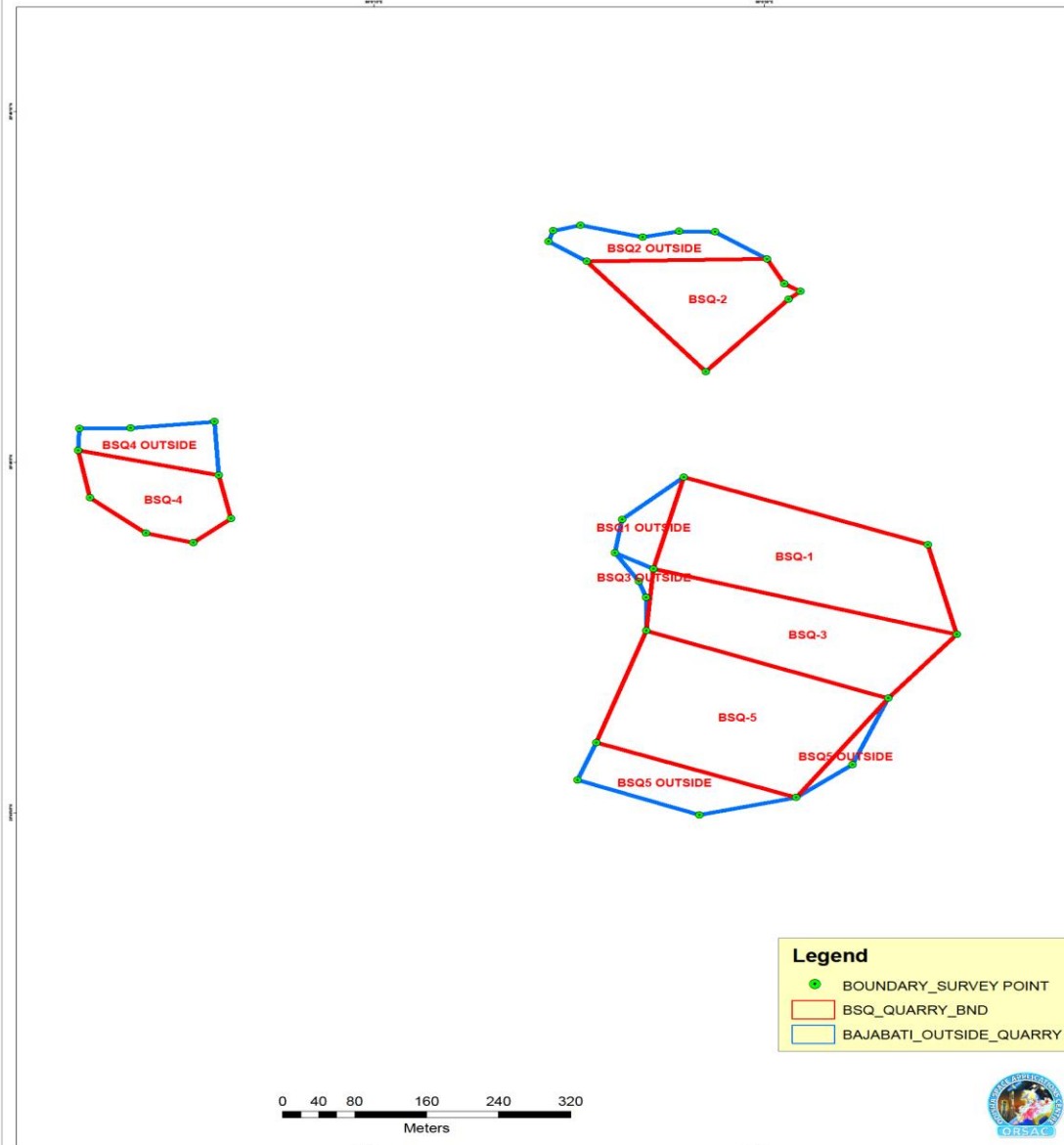
**Using
CARTOSAT-1 Stereo Data and Photogrammetric Technique.**

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STUDY AREA

STUDY AREA MAP OF BAJABATI HILLOCK ,JAJPUR DISTRICT, ODISHA



DATA USED

CARTOSAT -1 STEREO PAIR FOR THE YEARS 2005 – 2019

YEAR	IMAGE PAIR - PATH _ ROW	DOP
2005	580 - 301	7 NOV 2005
2006	580 - 301	20 NOV 2006
2007	580 - 301	22 NOV 2007
2008	580 - 301	26 DEC 2008
2009	581 - 301	1 MAY 2009
2010	580 - 301	14 MAY 2010
2011	580 - 301	10 JAN 2011
2012	580 - 301	23 JAN 2012
2014	580 - 301	11 NOV 2014
2015	580 - 301	17 MAR 2015
2018	580 - 301	24 APR 2018
2019	580 - 301	1 JAN 2019

CARTOSAT–1 is the first Indian Remote Sensing Satellite capable of providing in-orbit stereo images. The images were used for Cartographic applications meeting the global requirements. Cameras of this satellite have a resolution of 2.5m (can distinguish a small car).

The Cartosat–1 provided stereo pairs required for generating Digital Elevation Models, Ortho Image products, and Value added products for various applications of Geographical Information System (GIS).

IRS-P5 (also known as Cartosat-1) was an Indian Earth-imaging satellite that launched on 5 May 2005 and ended operations on **5 May 2019**.

DATA USED

DGPS SURVEY OF THE QUARRIES

POINT -ID	Latitude	Longitude	Elevation
1	20°45'52.81162"	86°06'37.66492"	28.968
2	20°45'56.64912"	86°06'36.53081"	26.545
3	20°45'59.49045"	86°06'27.13760"	26.697
4	20°45'55.55853"	86°06'25.99503"	25.305
5	20°46'08.70331"	86°06'23.35717"	15.419
6	20°46'08.84734"	86°06'30.28136"	16.628
7	20°46'07.78636"	86°06'30.95051"	16.525
8	20°46'07.12393"	86°06'31.11586"	17.406
9	20°46'07.46327"	86°06'31.56949"	15.455
10	20°46'04.01224"	86°06'27.95675"	19.935
11	20°45'50.05997"	86°06'35.04461"	30.326
12	20°45'57.61514"	86°06'09.75098"	17.916
13	20°45'56.58692"	86°06'08.30364"	16.544
14	20°45'56.98067"	86°06'06.47981"	17.292
15	20°45'58.48676"	86°06'04.32896"	16.582
16	20°46'00.51409"	86°06'03.86372"	15.63
17	20°45'59.47582"	86°06'09.27213"	16.953
18	20°45'52.90068"	86°06'25.73540"	28.264

19	20°45'45.79713"	86°06'31.53985"	28.396
20	20°45'48.11068"	86°06'23.84299"	25.182
21	20°45'57.66557"	86°06'24.77818"	27.177
22	20°45'56.23747"	86°06'24.51012"	27.618
23	20°46'09.55151"	86°06'21.88017"	16.414
24	20°46'10.00133"	86°06'22.05512"	16.293
25	20°45'54.33837"	86°06'25.71872"	26.386
26	20°45'45.03286"	86°06'27.82298"	26.539
27	20°45'46.50315"	86°06'23.13049"	23.963
28	20°45'55.02401"	86°06'25.43455"	26.124
29	20°45'47.21392"	86°06'33.69237"	30.306
30	20°46'10.25283"	86°06'23.10257"	16.046
31	20°46'09.75210"	86°06'25.49831"	12.864
32	20°46'10.01101"	86°06'26.89680"	15.866
33	20°46'09.98663"	86°06'28.27906"	15.49
34	20°46'01.45149"	86°06'03.90273"	15.357
35	20°46'01.47904"	86°06'05.87638"	16.952
36	20°46'01.76584"	86°06'09.09275"	14.782

DATA USED

GROUND CONTROL POINT (GCP) SURVEY USING DGPS & SURVEY OF INDIA HORIZONTAL & VERTICAL CONTROLS FOR THE STUDY AREA

POINT -ID	Longitude	Latitude	Height
1	86.0477	86.0477	37
2	86.1704	86.1704	18
3	85.9538	85.9538	63
4	86.1425	86.1425	20
5	86.1146	86.1146	29
6	85.9404	85.9404	54
7	86.1041	86.1041	16
8	86.0295	86.0295	19
9	85.9959	85.9959	45
10	86.0726	86.0726	24
11	86.2674	86.2674	15
12	86.3126	86.3126	15
13	86.2713	86.2713	14
14	86.1953	86.1953	13
15	86.27	86.27	14
16	86.1882	86.1882	15
17	86.274	86.274	11
18	85.9449	85.9449	39

METHODOLOGY

- Photogrammetric Principle

The fundamental principle used by photogrammetry is triangulation. By taking photographs from at least two different locations, so-called "lines of sight" can be developed from each camera to points on the object. These lines of sight (sometimes called rays owing to their optical nature) are mathematically intersected to produce the 3-dimensional coordinates of the points of interest.

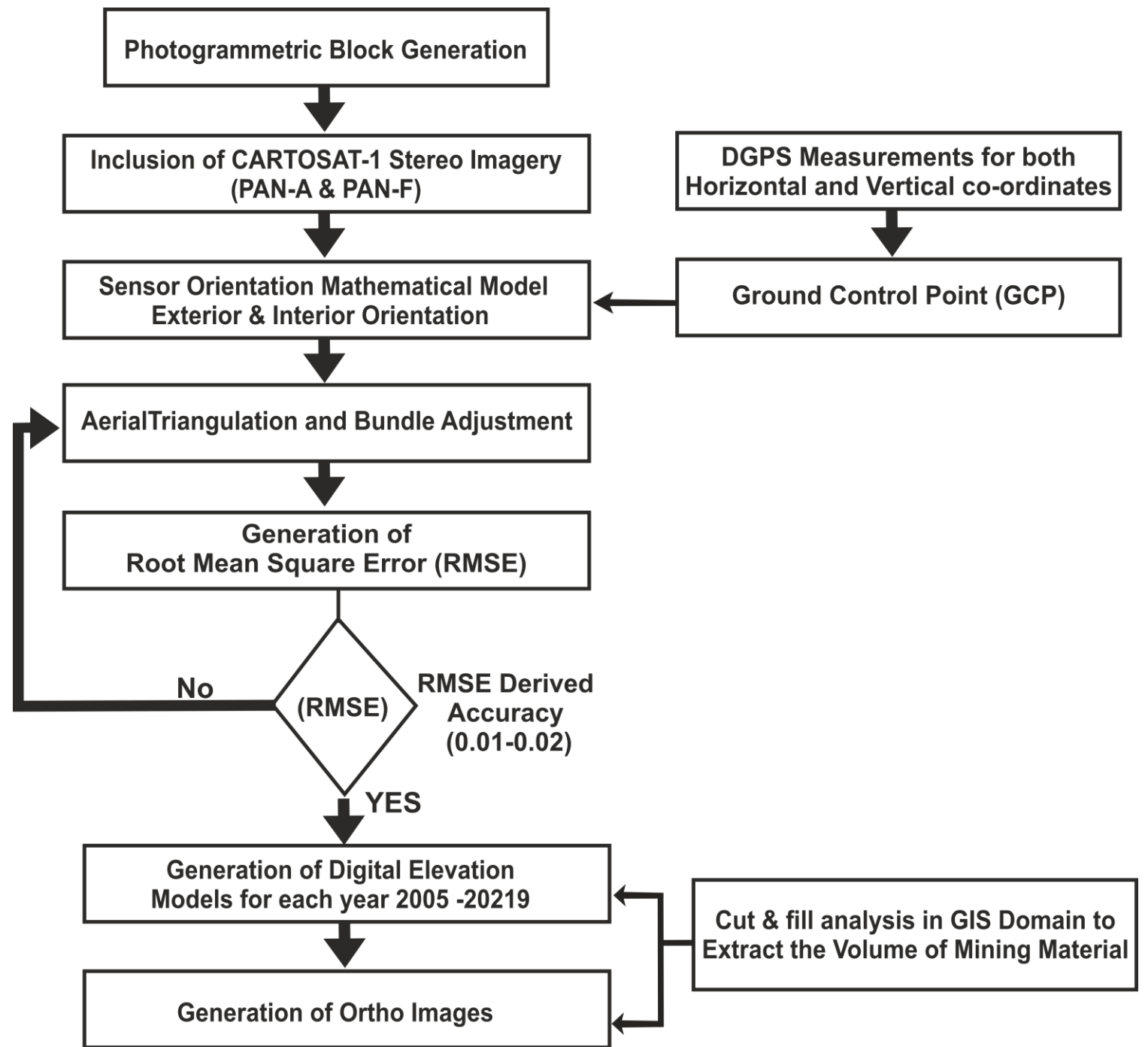
- Bundle Adjustment

The Bundle Adjustment is the program that processes the photographic measurements to produce the final XYZ coordinates of all the measured points. In order to do this, it must Triangulate the target points, Resect the pictures and Self-calibrate the camera. The Bundle Adjustment program is called STAR, which stands for Self-Calibration, Triangulation and Resection.

- **Generation of DEM**

- **Cut & Fill Volume Calculation, taking the DEMs of each year by subtracting it with the previous Year In GIS Domain.**

Process Flow



Tools Used

- LEICA Photogrammetric Suite
- ARC GIS

PHOTOGRAMMETRY BLOCK OF THE STUDY AREA 2005

ERDAS IMAGINE 2018 - Photogrammetry

2D View #1: f92_580_301_7nov_2005.bik

CLASS: N/A - 'banda.tif' - Country: N/A, Date: -----

Images

Row #	Image ID	Description	Image Name	Active	Pix	Int.	Ext.	DTM	Ortho	Online
1	1		e:\vigilance_2\catosat_data\225516593\product1\banda.tif	✓	✓	✓	✓	✓	✓	✓
2	2		e:\vigilance_2\catosat_data\225516593\product1\bandf.tif	✓	✓	✓	✓	✓	✓	✓

RMSE ERROR OF THE BLOCK YEAR 2005

Point Measurement (Left view: banda.tif; Right view: bandf.tif)

Left Image: e:\vigilance_2\catosat_data\225516593\product1\banda.tif

Right Image: e:\vigilance_2\catosat_data\225516593\product1\bandf.tif

Refinement Summary

Total Image RMSE: 0.1746316 pixels

Control Point RMSE: Check Point RMSE:

Ground X: 0.0000000 (10)	Ground X: 0.0000000 (0)
Ground Y: 0.0000000 (10)	Ground Y: 0.0000000 (0)
Ground Z: 0.0000000 (10)	Ground Z: 0.0000000 (0)
Image X: 1.0717118 (20)	Image X: 0.0000000 (0)
Image Y: 1.2380736 (20)	Image Y: 0.0000000 (0)

Point #	Point ID	Description	Type	Usage	Active	X Reference	Y Reference	Z Reference
1	1		None	Tie	✓	392443.161	2305840.347	28.830
2	2		None	Tie	✓	405319.715	2299429.588	32.376
3	3		None	Tie	✓	414528.586	2300755.926	16.829
4	4		None	Tie	✓	389075.252	2298775.081	51.527
5	5		None	Tie	✓	389693.896	2298901.437	72.076
6	6		None	Tie	✓	402748.804	2289520.343	52.497
7	7		None	Tie	✓	400058.979	2290895.711	42.465
8	8		None	Tie	✓	412520.134	2287807.895	11.393

Image #	Image Name	Active	X File	Y File
1	banda	✓	1374.118	350.990
2	bandf	✓	1524.212	372.105

PHOTOGRAMMETRY BLOCK OF THE STUDY AREA 2007

The main interface shows a 2D view of a photogrammetry block with numerous green tie points. A 3D view of the terrain is visible on the right. The software includes a menu bar with options like File, Home, Manage Data, Raster, Vector, Terrain, Toolbox, Help, Google Earth, and Photogrammetry. A toolbar contains various tools such as Add, Properties, Interior Orientation, Point Measurement, Block Triangulation, Generate, Terrain Editor, Terrain Prep, Calibrate, Ortho Resample, MosaicPro, Reports, Stereo Analyst, PRO600, Import ISAT, and Export to ISAT. The Contents panel on the left lists layers like 2D View #1, 182_580_301_22-nov-07.bl, Images, Orthos, Terrains, Points, and Background. The Retriever panel is also visible.

Row #	Image ID	Description	Image Name	Active	Pyx	Int	Ext	DTM	Ortho	Online
1	1		e:\vigilance_2\catosak data\225516582\product1\banda.tif	✓	✓	✓	✓	✓	✓	✓
2	2		e:\vigilance_2\catosak data\225516582\product1\band.tif	✓	✓	✓	✓	✓	✓	✓

RMSE ERROR OF THE BLOCK YEAR 2007

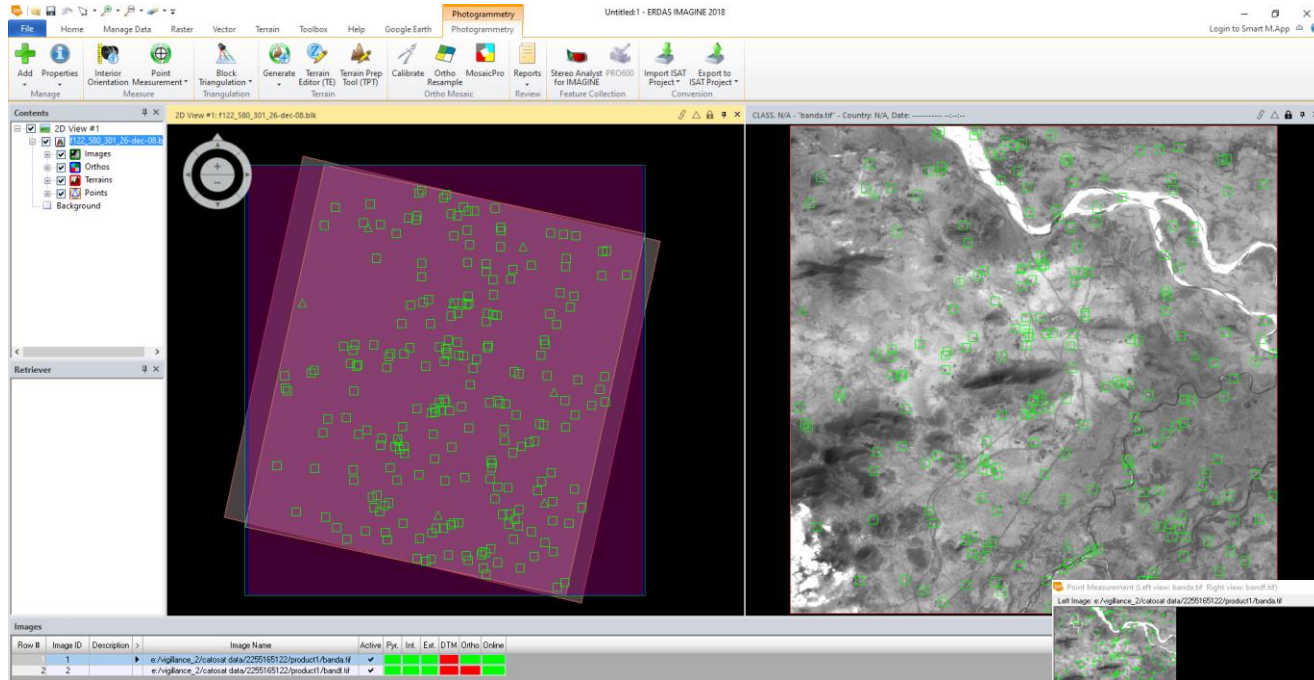
The Point Measurement dialog box shows the left and right images being compared. The Refinement Summary dialog box displays the following RMSE values:

- Total Image RMSE: 0.3471442 pixels
- Control Point RMSE:
 - Ground X: 0.000000 (20)
 - Ground Y: 0.000000 (20)
 - Ground Z: 0.000000 (20)
 - Image X: 0.7016898 (40)
 - Image Y: 1.2687142 (40)
- Check Point RMSE:
 - Ground X: 0.000000 (0)
 - Ground Y: 0.000000 (0)
 - Ground Z: 0.000000 (0)
 - Image X: 0.000000 (0)
 - Image Y: 0.000000 (0)

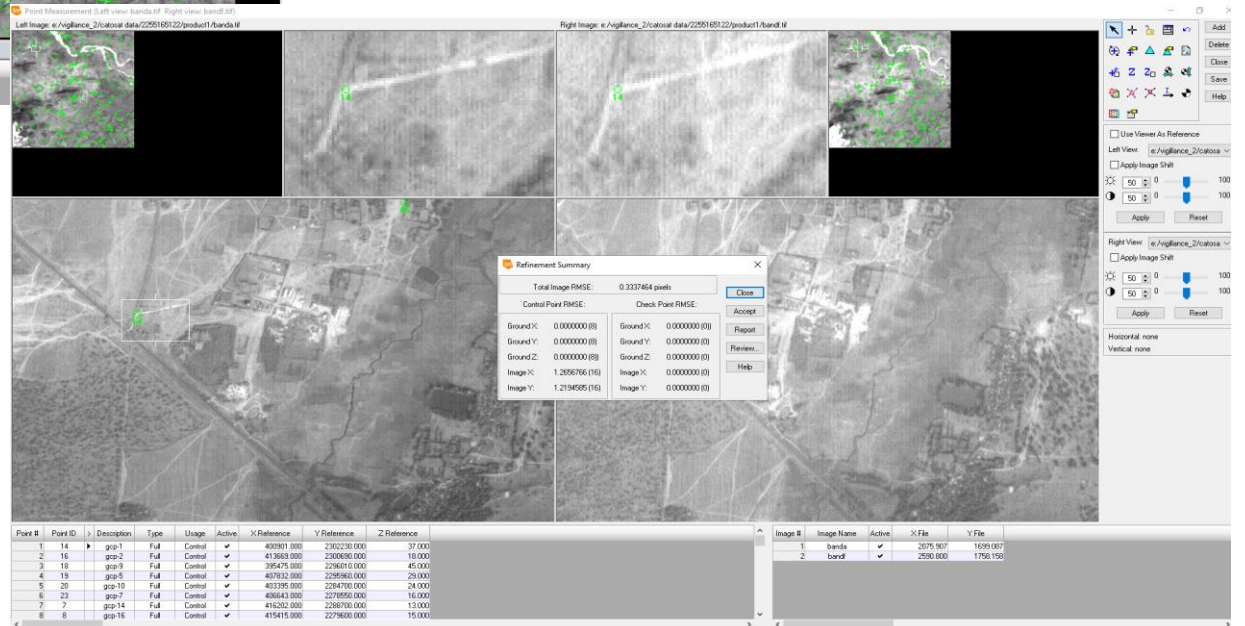
Point #	Point ID	Description	Type	Usage	Active	X Reference	Y Reference	Z Reference
1	1		Full	Control	✓	352443.161	2295940.347	20.838
2	2		Full	Control	✓	495313.715	2296429.988	32.376
3	4		Full	Control	✓	389075.252	2298775.081	51.627
4	5		Full	Control	✓	389893.895	2296301.437	72.076
5	6		Full	Control	✓	482748.804	2298820.343	52.407
6	7		Full	Control	✓	400058.978	2296895.711	42.465
7	9		Full	Control	✓	408316.170	2292899.934	40.703
8	10		Full	Control	✓	387413.850	2281406.266	50.506

Image #	Image Name	Active	X File	Y File
1	banda	✓	2535.625	223.625
2	band	✓	2978.787	137.815

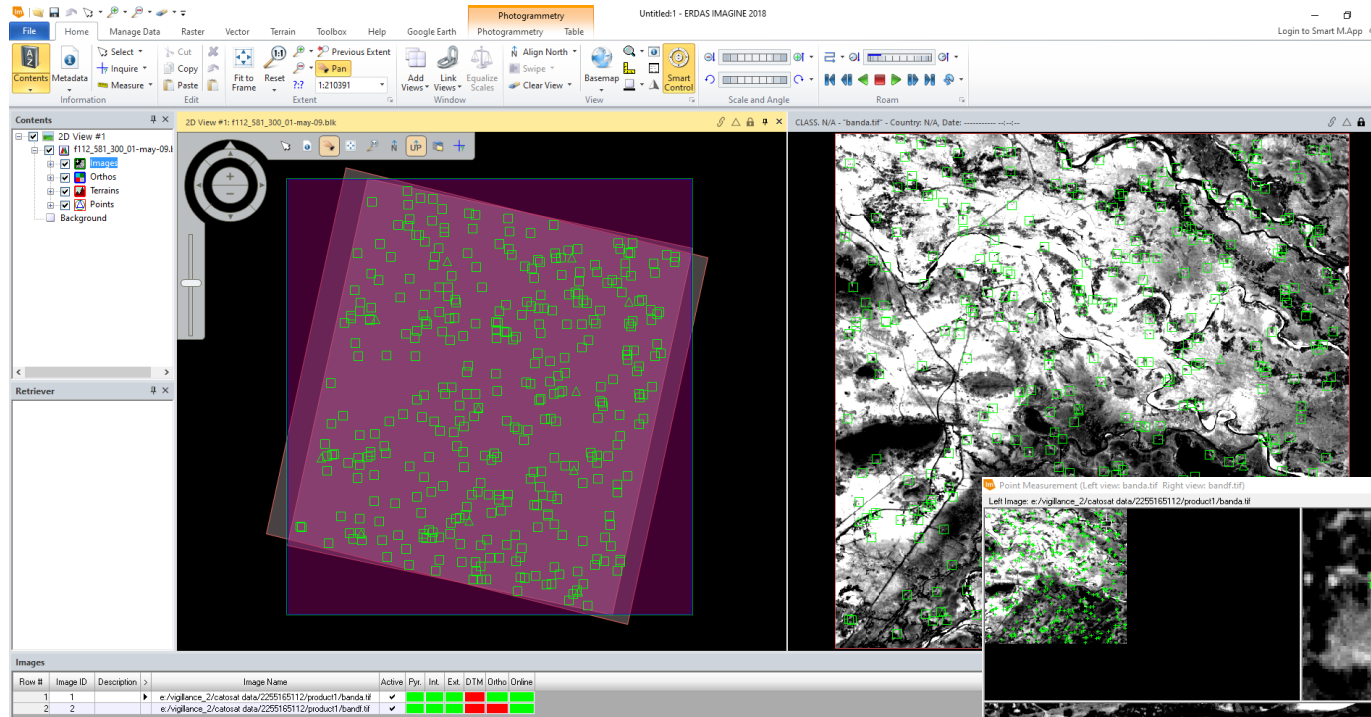
PHOTOGRAMMETRY BLOCK OF THE STUDY AREA 2008



RMSE ERROR OF THE BLOCK YEAR 2008



PHOTOGRAMMETRY BLOCK OF THE STUDY AREA 2009



RMSE ERROR OF THE BLOCK YEAR 2009

The screenshot shows the Refinement Summary dialog box in ERDAS IMAGINE 2018. The dialog displays the following information:

- Total Image RMSE: 0.3296752 pixels
- Control Point RMSE:

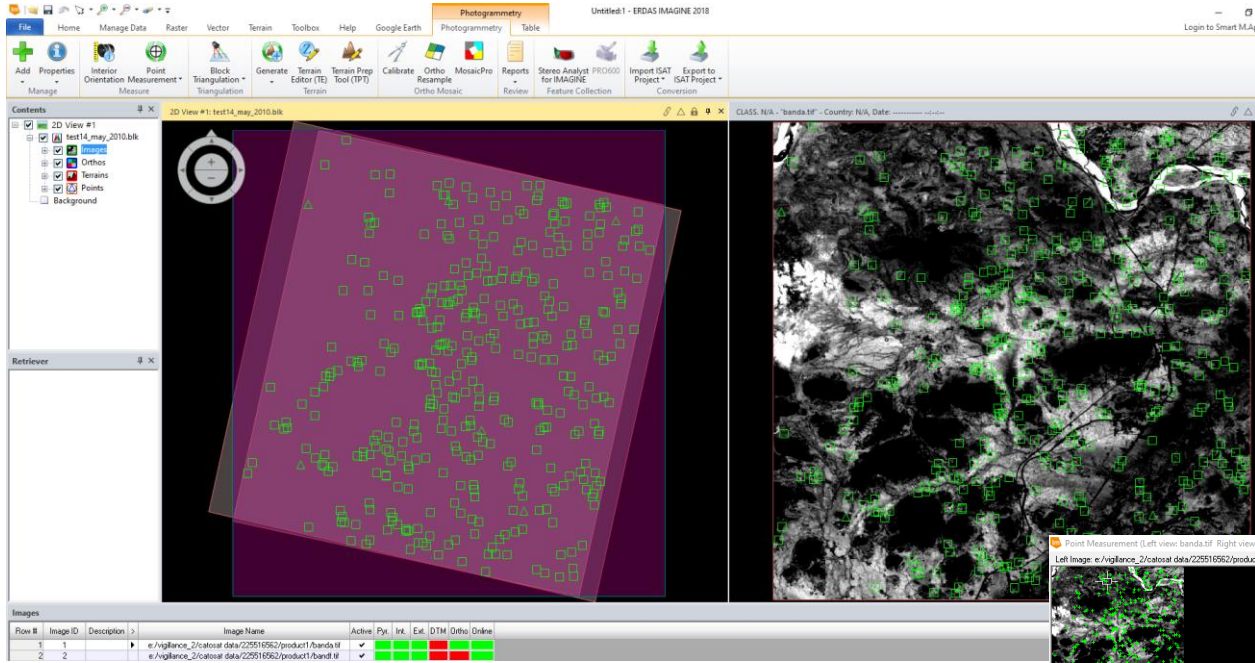
Ground X: 0.000000 (11)	Ground X: 0.000000 (0)
Ground Y: 0.000000 (11)	Ground Y: 0.000000 (0)
Ground Z: 0.000000 (11)	Ground Z: 0.000000 (0)
Image X: 0.8271602 (22)	Image X: 0.000000 (0)
Image Y: 2.0126791 (23)	Image Y: 0.000000 (0)

Buttons for 'Close', 'Accept', 'Report', 'Review', and 'Help' are visible. The background shows a 3D view of the photogrammetry block with a wireframe overlay.

Point #	Point ID	Description	Type	Usage	Active	X Reference	Y Reference	Z Reference
1	1		None	Tie	✓	428639.163	2299487.253	11.841
2	2		None	Tie	✓	432198.888	2300648.541	7.198
3	3		None	Tie	✓	408197.922	2303063.466	33.259
4	4		None	Tie	✓	413441.510	2303063.878	16.643
5	5		None	Tie	✓	408691.030	2293039.013	31.786
6	6		None	Tie	✓	423315.160	2289592.438	5.883
7	7		None	Tie	✓	414861.721	2287729.473	15.734
8	8		None	Tie	✓	401801.051	2279063.446	30.459

Image #	Image Name	Active	X File	Y File
1	band1	✓	9719.018	1138.257
2	bands	✓	10045.583	1290.246

PHOTOGRAMMETRY BLOCK OF THE STUDY AREA 2010



RMSE ERROR OF THE BLOCK YEAR 2010

The screenshot shows a 'Refinement Summary' dialog box overlaid on the software interface. The dialog box displays the following information:

- Total Image RMSE: 0.1309554 pixels
- Control Point RMSE:
 - Ground X: 0.000000 (8)
 - Ground Y: 0.000000 (8)
 - Ground Z: 0.000000 (8)
 - Image X: 0.9441159 (12)
 - Image Y: 0.6883038 (12)
- Check Point RMSE:
 - Ground X: 0.000000 (0)
 - Ground Y: 0.000000 (0)
 - Ground Z: 0.000000 (0)
 - Image X: 0.000000 (0)
 - Image Y: 0.000000 (0)

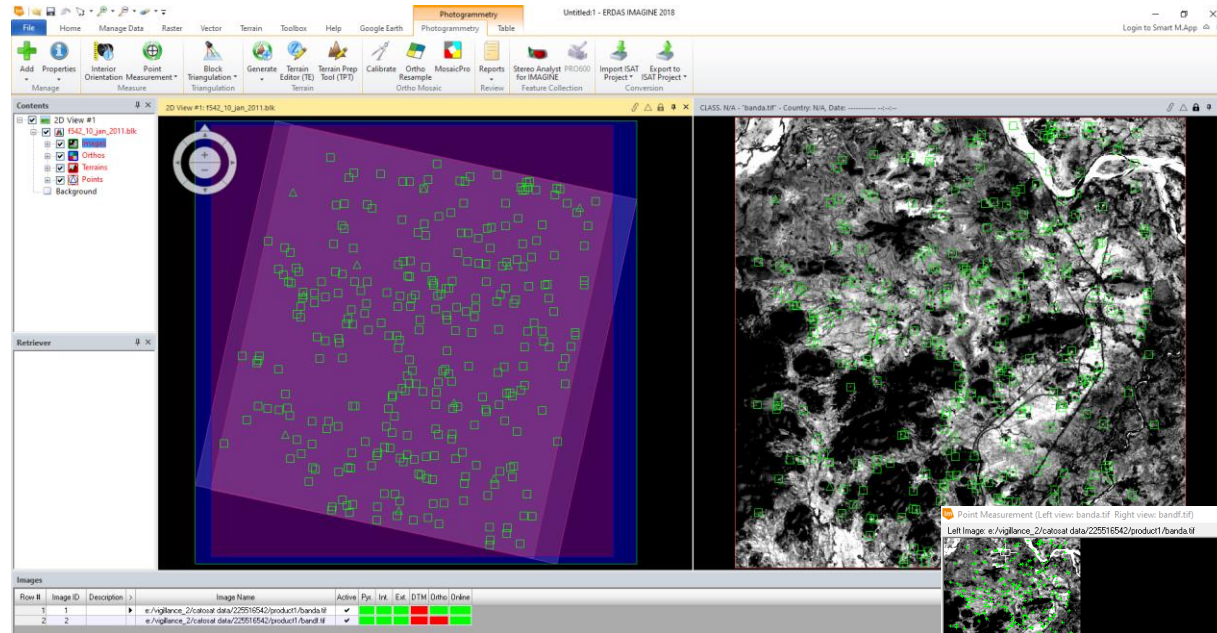
Below the dialog box, there is a table of point data:

Point #	Point ID	Description	Type	Usage	Active	X Reference	Y Reference	Z Reference
1	14	GCP_1	Full	Control	✓	40901.000	230220.000	37.000
2	15	GCP_18	Full	Control	✓	396206.000	2301503.000	39.000
3	16	GCP_2	Full	Control	✓	413620.000	2300691.000	18.000
4	17	GCP_3	Full	Control	✓	391077.000	2285610.000	63.000
5	18	GCP_9	Full	Control	✓	395475.000	2296010.000	45.000
6	19	GCP_5	Full	Control	✓	407632.000	2289950.000	29.000
7	20	GCP_10	Full	Control	✓	403395.000	2284700.000	24.000
8	21	GCP_6	Full	Control	✓	389608.000	2282090.000	54.000

At the bottom right, there is another table showing image information:

Image #	Image Name	Active	X File	Y File
1	abanda	✓	4809.001	1241.140
2	band1	✓	5073.699	1254.419

PHOTOGRAMMETRY BLOCK OF THE STUDY AREA 2011



RMSE ERROR OF THE BLOCK YEAR 2011

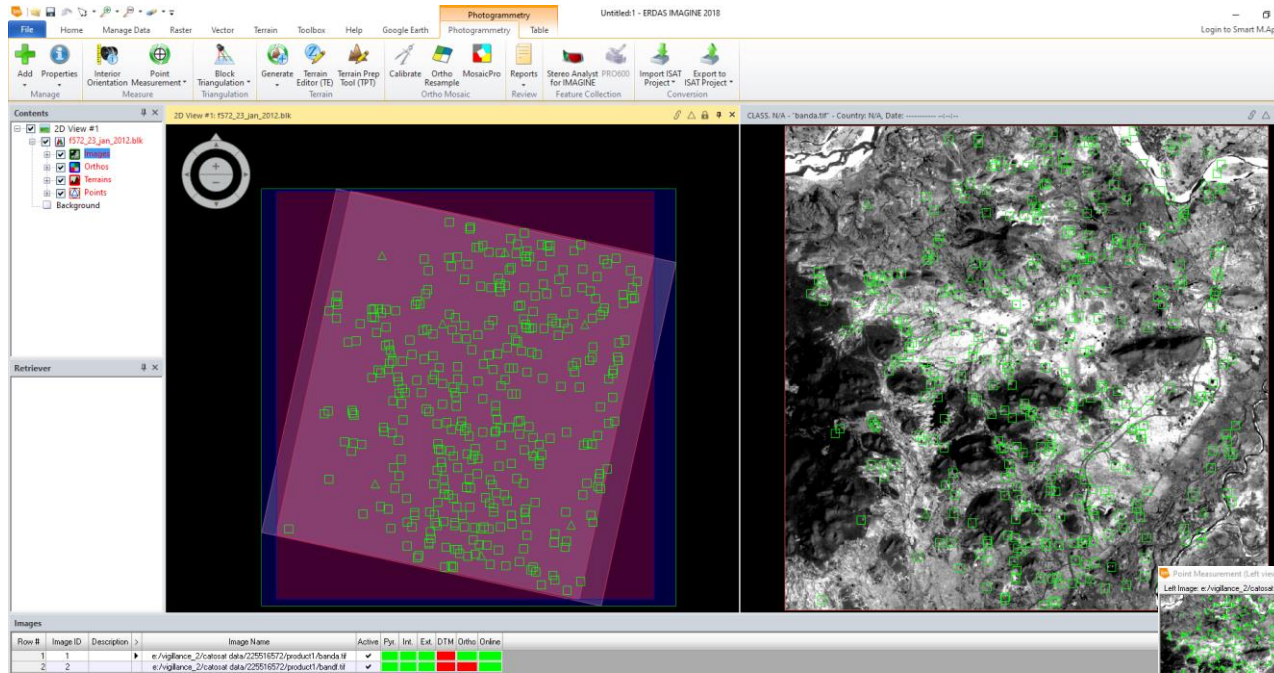
Refinement Summary

Total Image RMSE: 0.2477451 pixels

Control Point RMSE: Check Point RMSE:

Point #	Point ID	Description	Type	Usage	Active	X Reference	Y Reference	Z Reference
1	14	GCP_1	Full	Control	✓	400301.000	2302230.000	37.000
2	15	GCP_18	Full	Control	✓	390206.000	2301920.000	39.000
3	16	GCP_2	Full	Control	✓	413669.000	2300690.000	18.000
4	17	GCP_3	Full	Control	✓	391077.000	2295810.000	63.000
5	19	GCP_46	Full	Control	✓	356475.000	2296010.000	45.000
6	19	GCP_5	Full	Control	✓	407832.000	2295960.000	29.000

PHOTOGRAMMETRY BLOCK OF THE STUDY AREA 2012



RMSE ERROR OF THE BLOCK YEAR 2012

The screenshot shows a detailed view of the photogrammetry block. A 'Point Measurement' window is open, showing a close-up of a point on the block. The 'Refinement Summary' dialog box is also open, displaying the following data:

Refinement Summary			
Total Image RMSE: 0.152251 pixels			
Control Point RMSE:		Check Point RMSE:	
Ground X:	0.000000 (8)	Ground X:	0.000000 (8)
Ground Y:	0.000000 (8)	Ground Y:	0.000000 (8)
Ground Z:	0.000000 (8)	Ground Z:	0.000000 (8)
Image X:	1.0611775 (18)	Image X:	0.000000 (8)
Image Y:	1.2501954 (18)	Image Y:	0.000000 (8)

The 'Point Measurement' window shows the following data for the selected point:

Point #	Point ID	Description	Type	Usage	Active	X Reference	Y Reference	Z Reference
1	14	GCP_1	Full	Control	✓	400901.000	2322230.000	37.000
2	15	GCP_18	Full	Control	✓	396206.000	2301920.000	39.000
3	17	GCP_3	Full	Control	✓	391077.000	2293910.000	63.000
4	18	GCP_9	Full	Control	✓	395475.000	2298010.000	45.000
5	19	GCP_5	Full	Control	✓	407632.000	2295860.000	29.000
6	20	GCP_10	Full	Control	✓	403395.000	2294700.000	24.000
7	21	GCP_6	Full	Control	✓	399906.000	2292780.000	54.000
8	22	GCP_8	Full	Control	✓	398850.000	2278910.000	19.000

The 'Images' table at the bottom right shows the following data:

Image #	Image Name	Active	X File	Y File
1	banda	✓	6168.826	325.733
2	band.tif	✓	6334.250	841.348

PHOTOGRAMMETRY BLOCK OF THE STUDY AREA 2014

The screenshot shows the ERDAS IMAGINE 2018 Photogrammetry workspace. The main view displays a 2D view of a block with a purple background and numerous green tie points. A grayscale aerial image is overlaid on the block. The interface includes a menu bar, a toolbar with various photogrammetry tools, and a contents pane on the left. The status bar at the bottom indicates the current project and image details.

RMSE ERROR OF THE BLOCK YEAR 2014

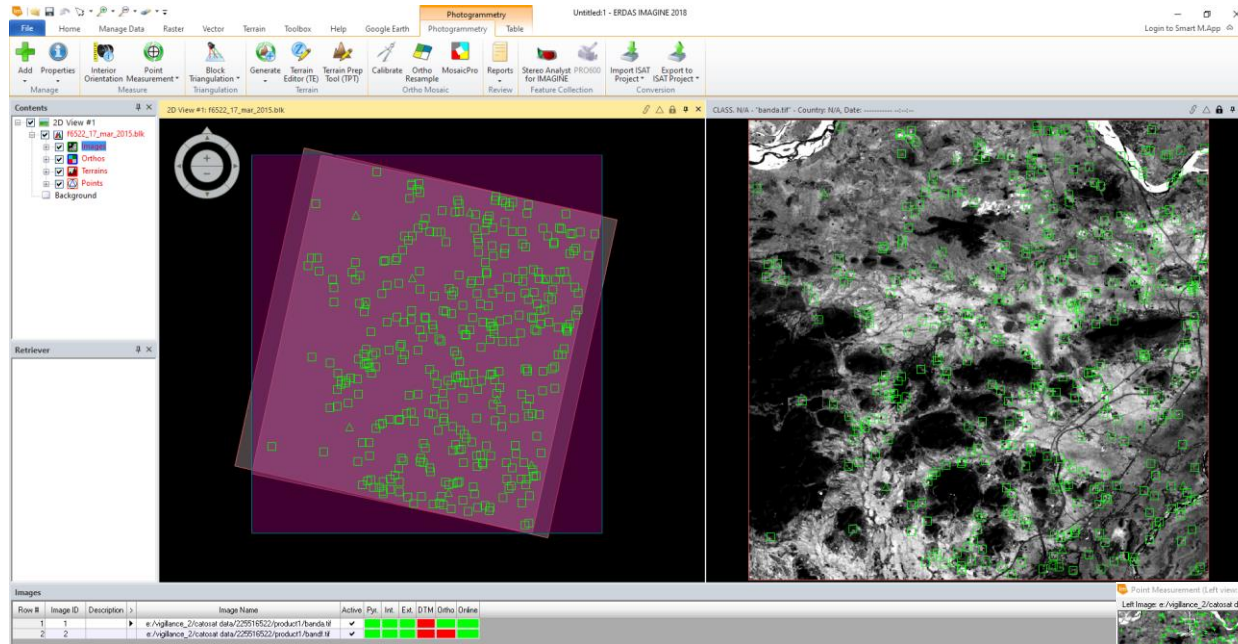
The screenshot shows the Refinement Summary dialog box and the Point List table. The Refinement Summary dialog displays the following information:

Total Image RMSE:		Check Point RMSE:	
0.1185756 pixels			
Ground X:	0.000000 (9)	Ground X:	0.000000 (9)
Ground Y:	0.000000 (9)	Ground Y:	0.000000 (9)
Ground Z:	0.000000 (9)	Ground Z:	0.000000 (9)
Image X:	1.0113657 (18)	Image X:	0.000000 (9)
Image Y:	1.5856493 (18)	Image Y:	0.000000 (9)

The Point List table at the bottom shows the following data:

Point #	Point ID	Description	Type	Usage	Active	X Reference	Y Reference	Z Reference
1	14	GCP_1	Full	Control	✓	405901.000	2302230.000	37.000
2	15	GCP_18	Full	Control	✓	386206.000	2301500.000	39.000
3	17	GCP_3	Full	Control	✓	391577.000	2329510.000	63.000
4	18	GCP_9	Full	Control	✓	395475.000	2328610.000	45.000
5	19	GCP_5	Full	Control	✓	407632.000	2329560.000	29.000
6	20	GCP_10	Full	Control	✓	403296.000	2326130.000	24.000
7	21	GCP_6	Full	Control	✓	386406.000	2326390.000	54.000
8	22	GCP_8	Full	Control	✓	386650.000	2279910.000	19.000

PHOTOGRAMMETRY BLOCK OF THE STUDY AREA 2015



RMSE ERROR OF THE BLOCK YEAR 2015

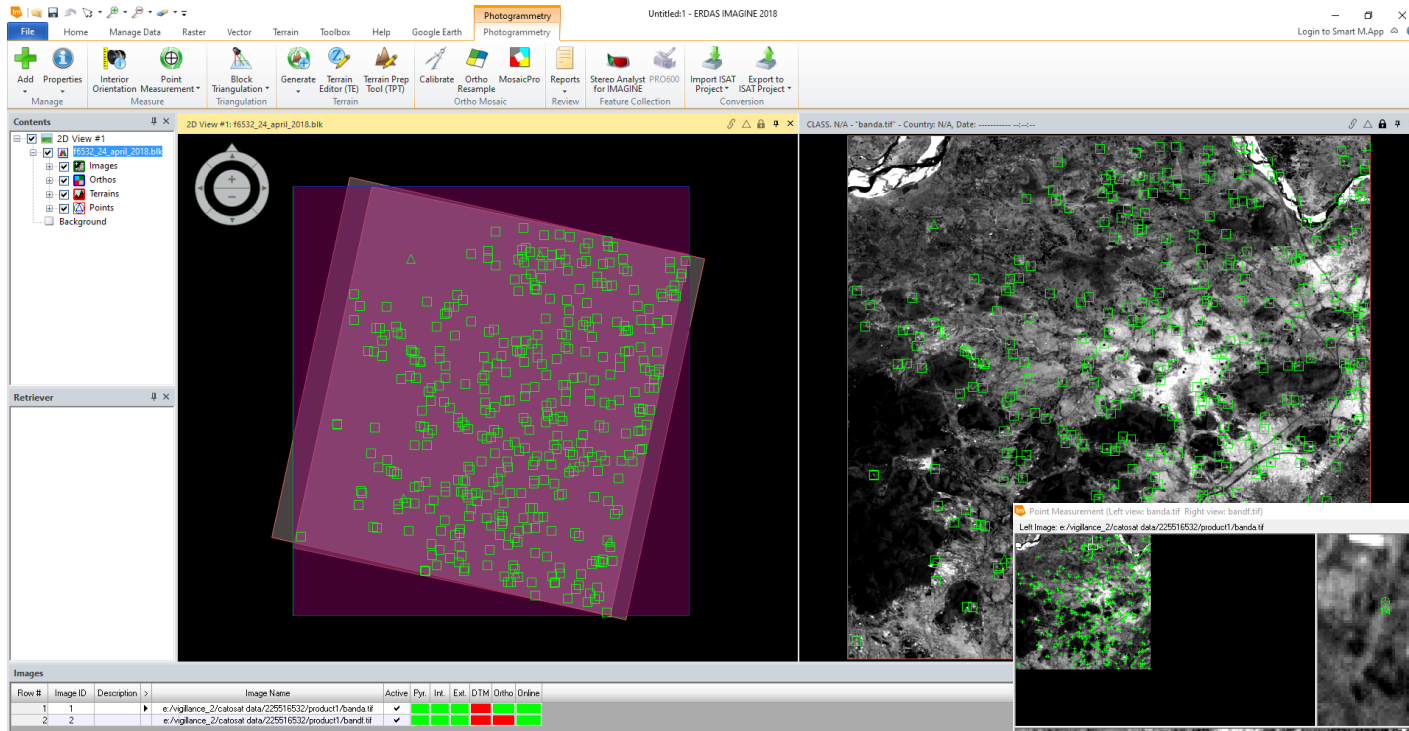
The screenshot shows the Agisoft Metashape software interface with a refinement summary dialog box open. The dialog box displays the following information:

- Total Image RMSE: 0.2014883 pixels
- Control Point RMSE:
 - Ground X: 0.000000 (0)
 - Ground Y: 0.000000 (0)
 - Ground Z: 0.000000 (0)
 - Image X: 1.1544719 (18)
 - Image Y: 1.2634741 (18)
- Check Point RMSE:
 - Ground X: 0.000000 (0)
 - Ground Y: 0.000000 (0)
 - Ground Z: 0.000000 (0)
 - Image X: 0.000000 (0)
 - Image Y: 0.000000 (0)

The background shows a 3D view of the photogrammetry block with control points. The bottom status bar shows the current project name and coordinates.

Point #	Point ID	Description	Type	Usage	Active	X Reference	Y Reference	Z Reference
1	14	GCP_1	Full	Control	✓	40561.000	2302230.000	37.000
2	15	GCP_18	Full	Control	✓	380206.000	2381820.000	39.000
3	17	GCP_3	Full	Control	✓	39107.000	229510.000	63.000
4	18	GCP_5	Full	Control	✓	384475.000	2288010.000	45.000
5	19	GCP_5	Full	Control	✓	407832.000	2295860.000	29.000
6	20	GCP_10	Full	Control	✓	403355.000	2284700.000	24.000
7	21	GCP_4	Full	Control	✓	386618.000	2302390.000	54.000
8	22	GCP_8	Full	Control	✓	388850.000	2275910.000	19.000

PHOTOGRAMMETRY BLOCK OF THE STUDY AREA 2018



RMSE ERROR OF THE BLOCK YEAR 2018

The screenshot displays the 'Refinement Summary' dialog box, which provides a detailed overview of the block's accuracy. The dialog shows the total image RMSE and control point RMSE, along with a table of ground and image coordinates for each control point. Below the dialog, a table lists the control points used in the block, including their IDs, descriptions, types, usages, and active status, along with their X, Y, and Z reference coordinates.

Point #	Point ID	Description	Type	Usage	Active	X Reference	Y Reference	Z Reference
1	14	GCP_1	Full	Control	✓	40091.000	230220.000	27.000
2	15	GCP_10	Full	Control	✓	39026.000	200190.000	39.000
3	17	GCP_3	Full	Control	✓	39107.000	229350.000	63.000
4	18	GCP_9	Full	Control	✓	39545.000	229610.000	45.000
5	19	GCP_5	Full	Control	✓	40783.000	229590.000	29.000
6	20	GCP_10	Full	Control	✓	40336.000	228470.000	24.000
7	21	GCP_6	Full	Control	✓	38996.000	228209.000	54.000
8	22	GCP_0	Full	Control	✓	38990.000	227951.000	19.000

PHOTOGRAMMETRY BLOCK OF THE STUDY AREA 2019

The screenshot displays the ERDAS IMAGINE 2018 Photogrammetry software interface. The main window shows a 2D view of a block with a purple overlay and a stereo pair of images. A 'Refinement Summary' dialog box is open, showing the following data:

Total Image RMSE:		0.2544118 pixels	
Control Point RMSE:		Check Point RMSE:	
Ground X:	0.000000 (8)	Ground X:	0.000000 (0)
Ground Y:	0.000000 (8)	Ground Y:	0.000000 (0)
Ground Z:	0.000000 (8)	Ground Z:	0.000000 (0)
Image X:	1.1814004 (18)	Image X:	0.000000 (0)
Image Y:	1.6505556 (18)	Image Y:	0.000000 (0)

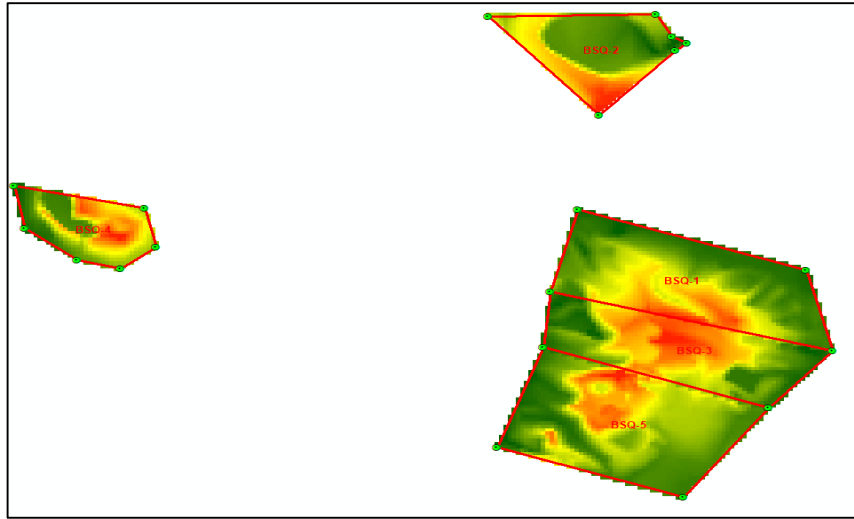
Below the dialog box, there are two tables:

Point #	Point ID	Description	Type	Usage	Active	X Reference	Y Reference	Z Reference
1	14	GCP_1	Full	Control	✓	409501.000	230220.000	37.000
2	15	GCP_18	Full	Control	✓	391206.000	230150.000	38.000
3	17	GCP_3	Full	Control	✓	391077.000	229150.000	63.000
4	18	GCP_9	Full	Control	✓	395475.000	228600.000	45.000
5	19	GCP_5	Full	Control	✓	407832.000	228560.000	29.000
6	20	GCP_10	Full	Control	✓	402355.000	228470.000	24.000
7	21	GCP_6	Full	Control	✓	398606.000	228200.000	54.000
8	22	GCP_8	Full	Control	✓	398850.600	227590.000	19.000

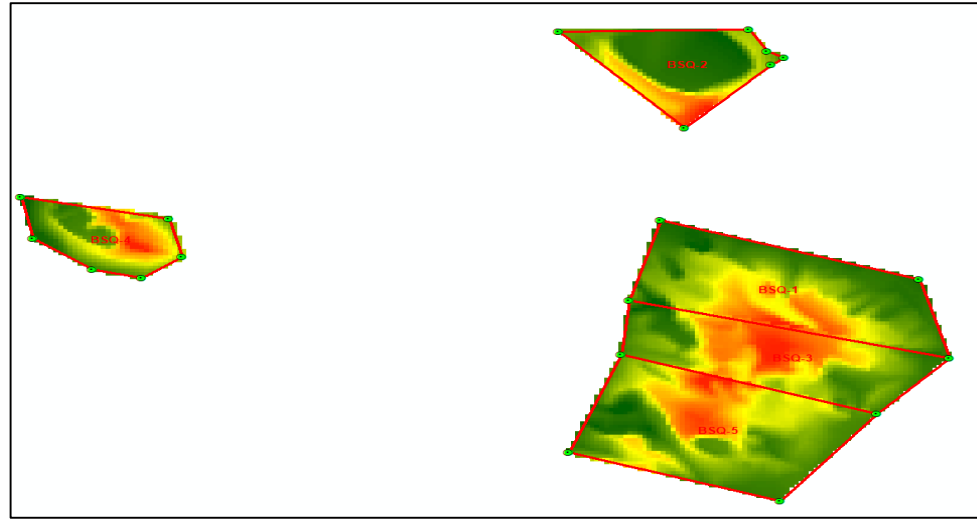
Image #	Image Name	Active	X File	Y File
1	bands	✓	6424.619	1095.787
2	band	✓	8510.147	1125.676

RMSE ERROR OF THE BLOCK YEAR 2019

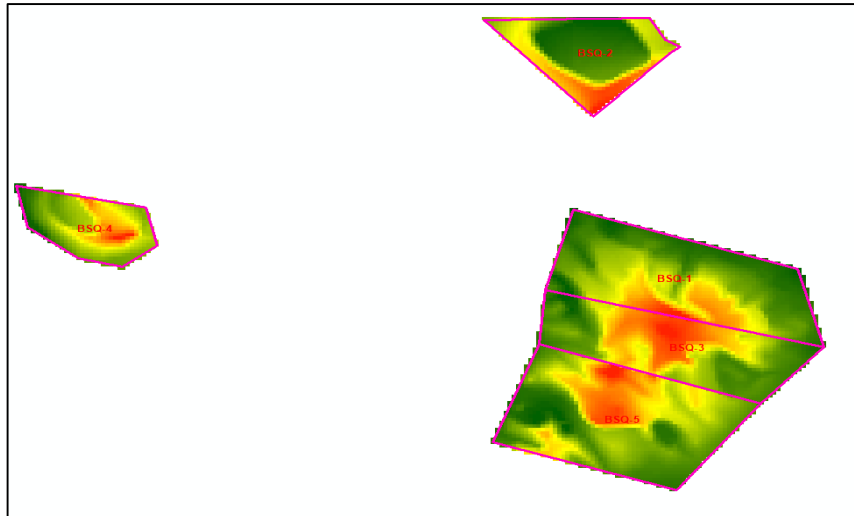
DEM IMAGES OF QUARRY BOUNDARIES 07 NOV 2005



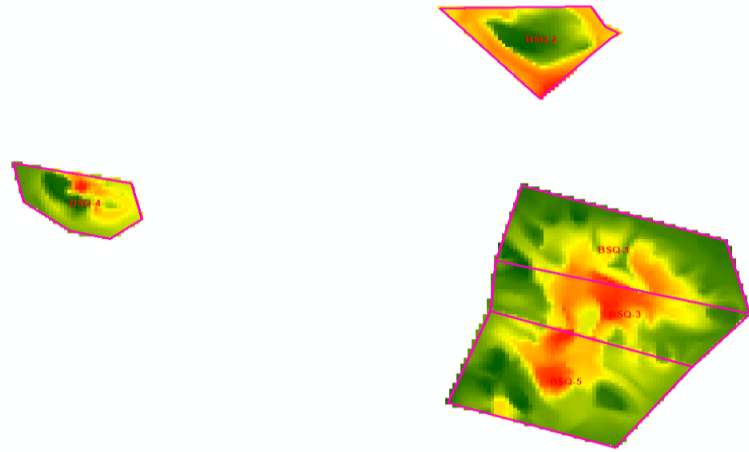
DEM IMAGES WITH QUARRY BOUNDARY 20NOV2007



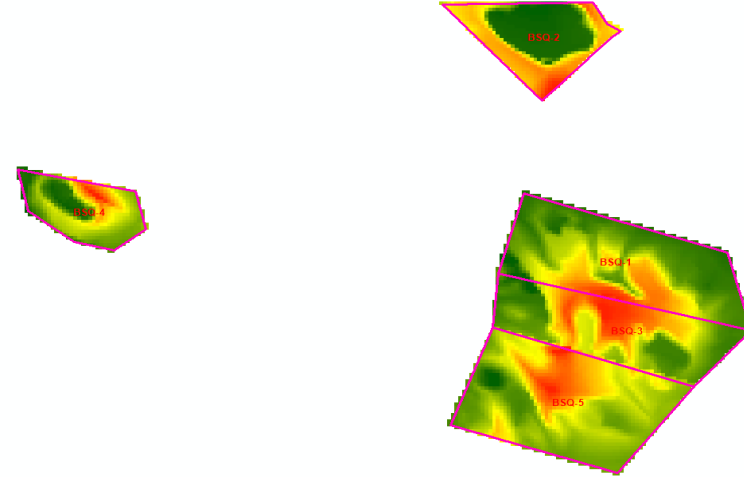
DEM IMAGES WITH QUARRY BOUNDARY 26 DEC 2008



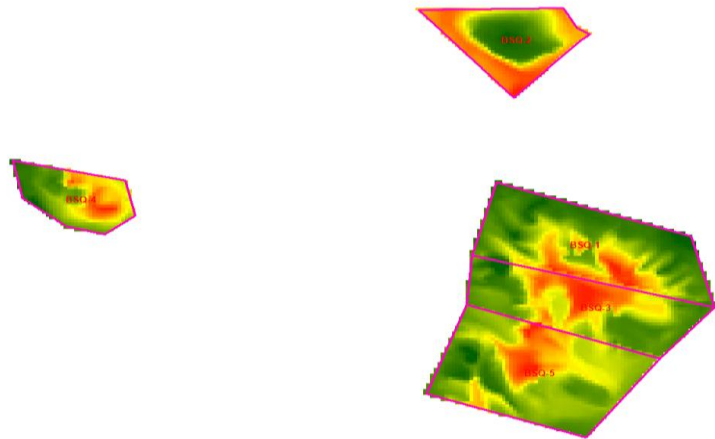
DEM IMAGES WITH QUARRY BOUNDARY 01 MAY 2009



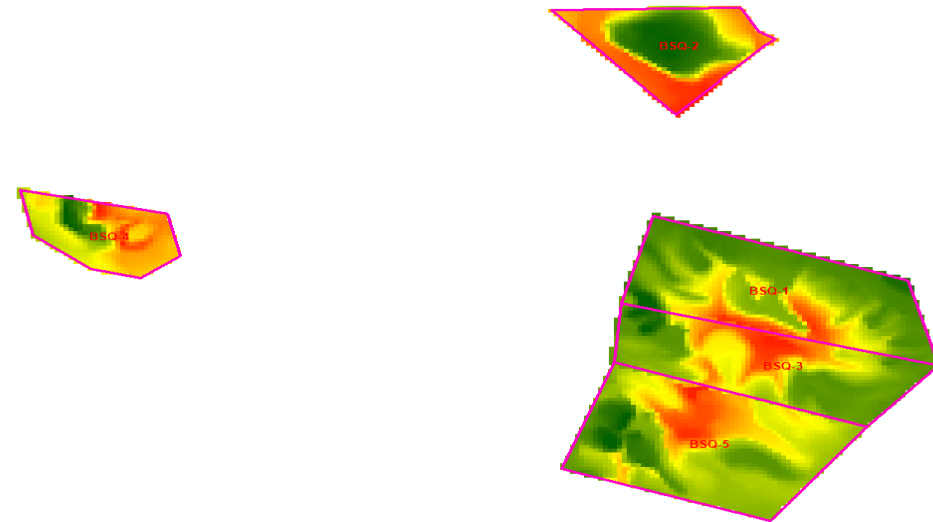
DEM IMAGES WITH QUARRY BOUNDARY 14 MAY 2010



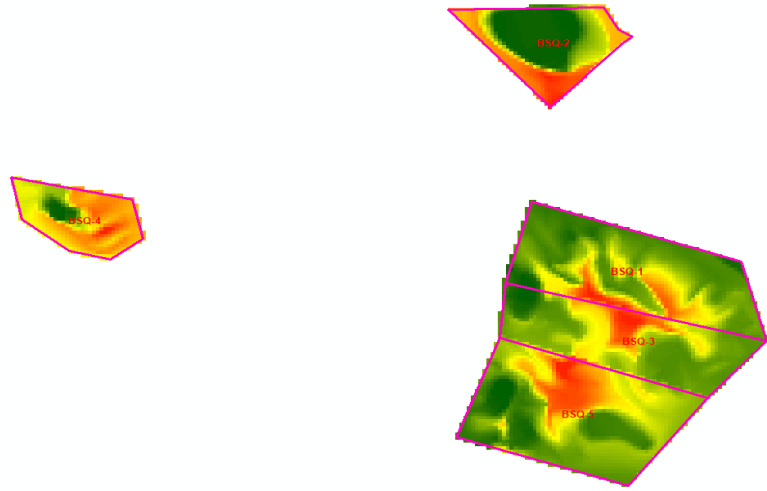
DEM IMAGES WITH QUARRY BOUNDARY 10 JAN 2011



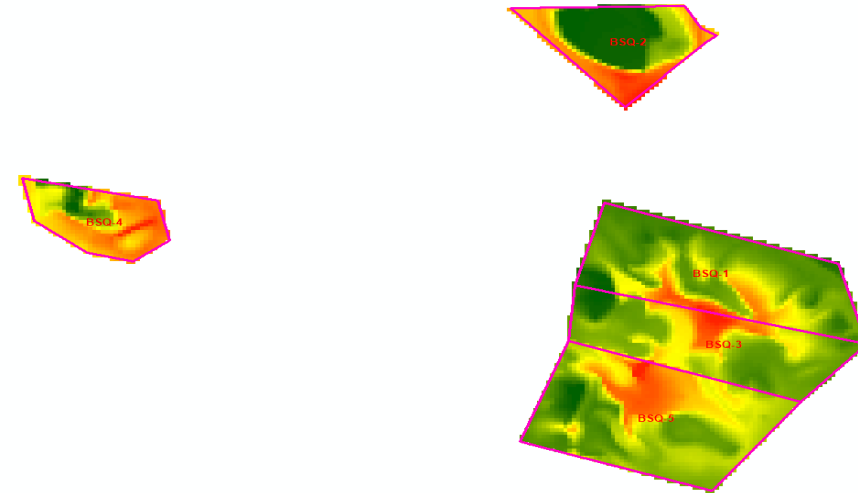
DEM IMAGES WITH QUARRY BOUNDARY 23 JAN 2012



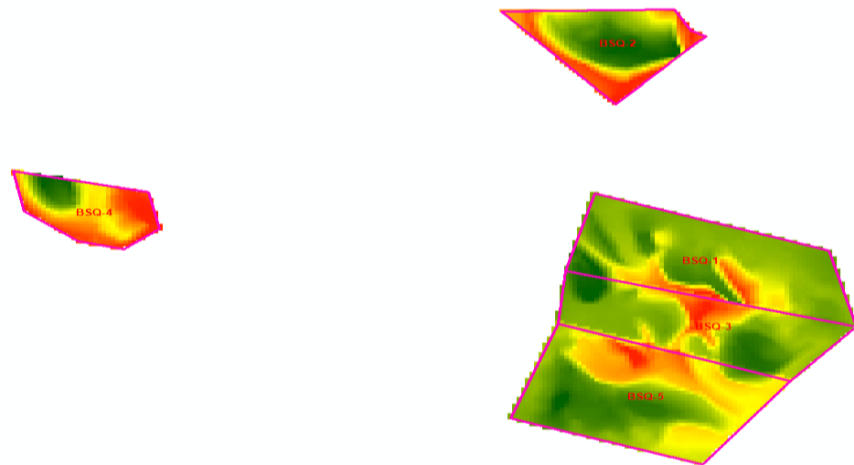
DEM IMAGES WITH QUARRY BOUNDARY 11NOV 2014



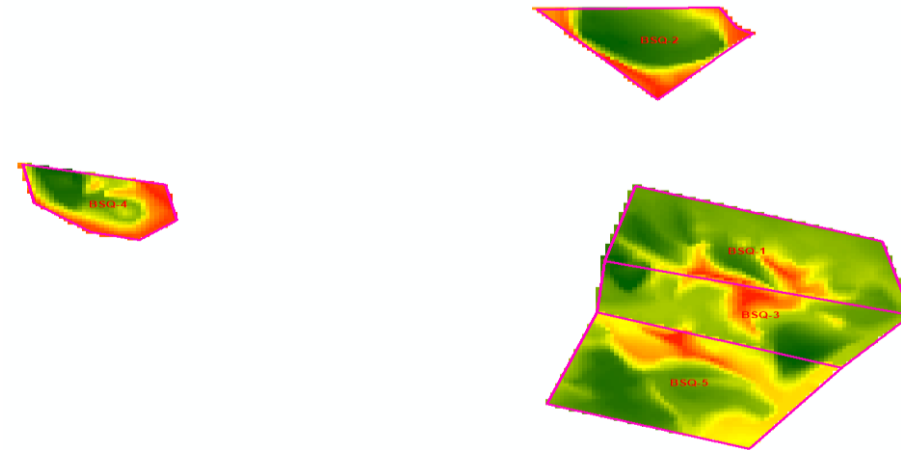
DEM IMAGES WITH QUARRY BOUNDARY 17 MAR 2015



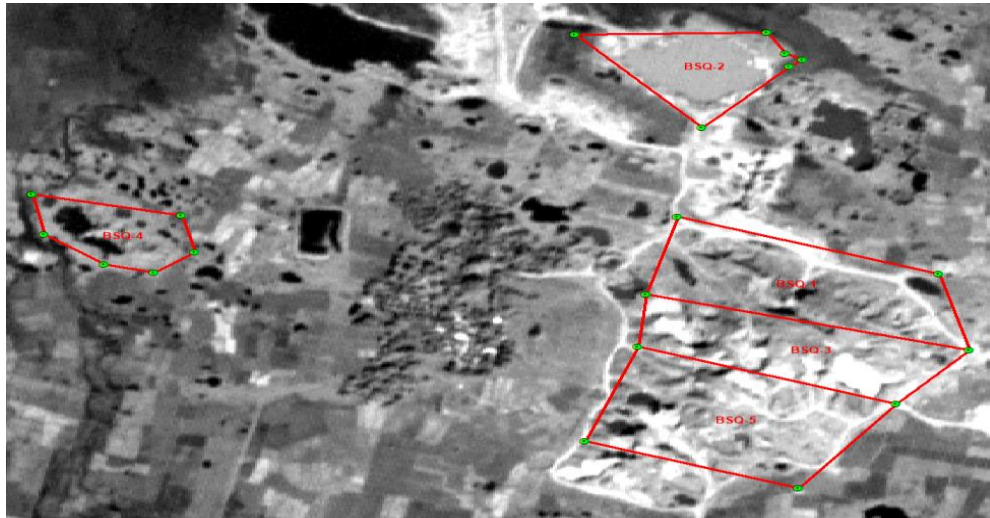
DEM IMAGES WITH QUARRY BOUNDARY 21APR 2018



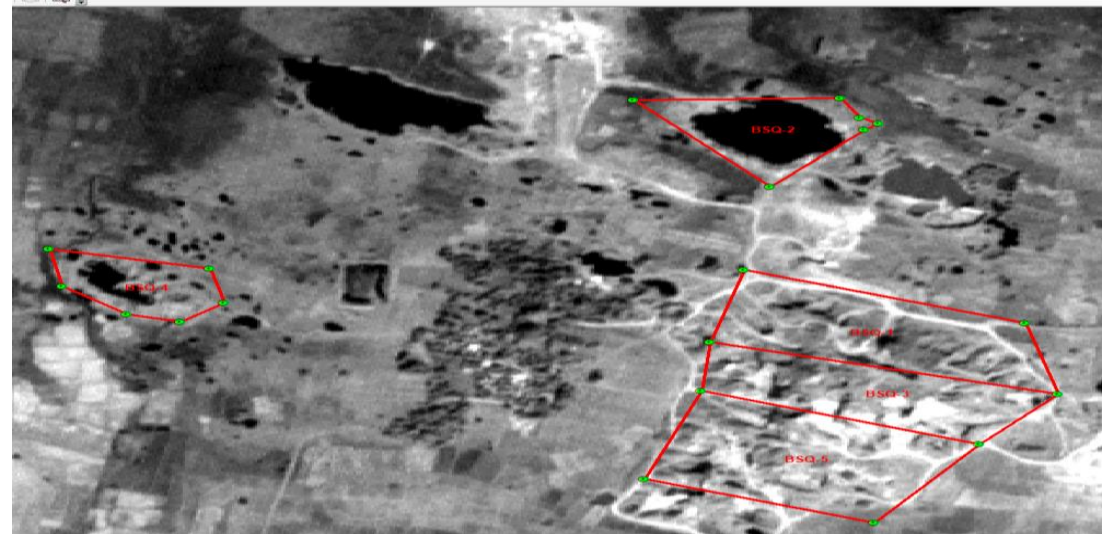
DEM IMAGES WITH QUARRY BOUNDARY 01 JAN 2019



ORTHO IMAGES WITH QUARRY BOUNDARY 07NOV2005



ORTHO IMAGES WITH QUARRY BOUNDARY 20NOV2007



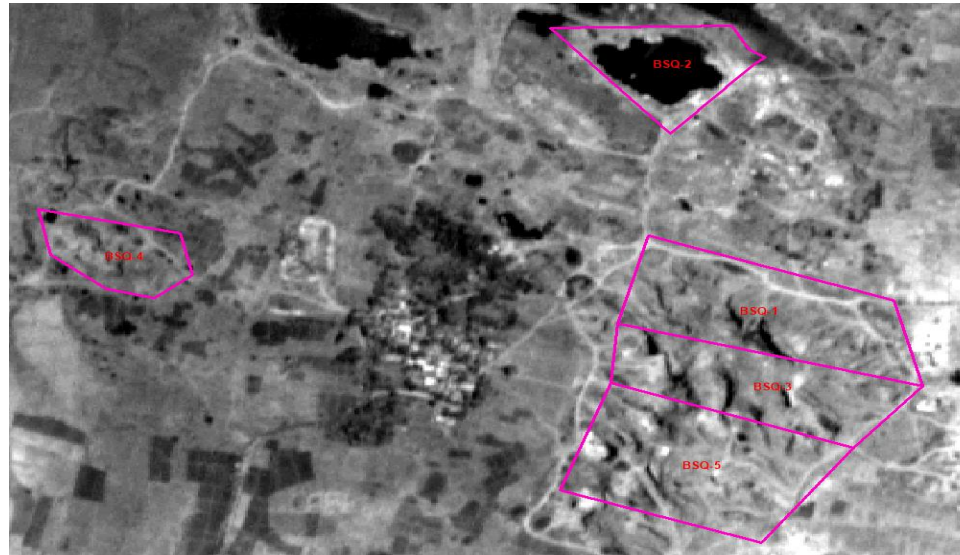
ORTHO IMAGES WITH QUARRY BOUNDARY 26 DEC 2008



DEM IMAGES WITH QUARRY BOUNDARY 01 MAY 2009



DEM IMAGES WITH QUARRY BOUNDARY 14 MAY 2010



DEM IMAGES WITH QUARRY BOUNDARY 10 JAN 2011



DEM IMAGES WITH QUARRY BOUNDARY 23 JAN 2012



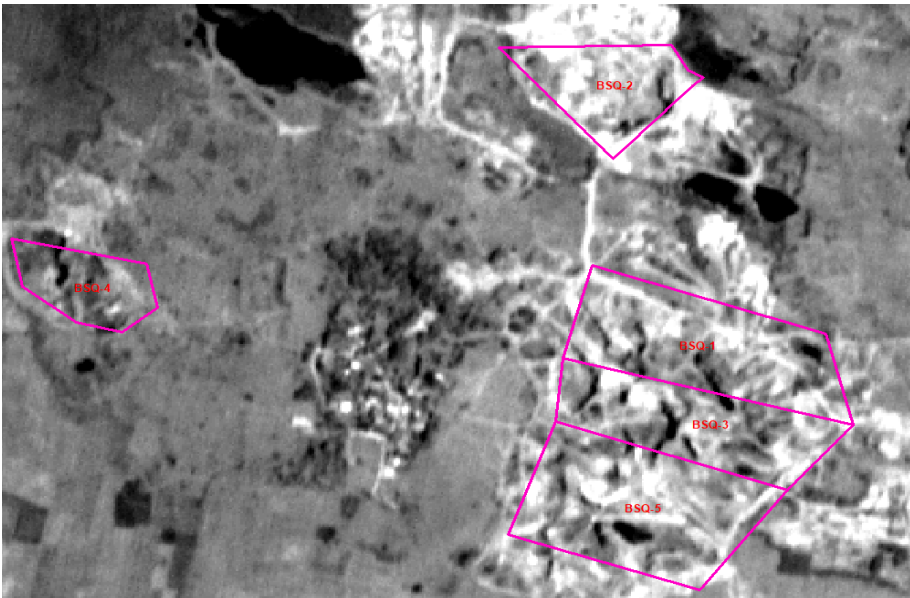
ORTHO IMAGES WITH QUARRY BOUNDARY 11NOV 2014



ORTHO IMAGES WITH QUARRY BOUNDARY 17 MAR 2015



ORTHO IMAGES WITH QUARRY BOUNDARY 21APR 2018

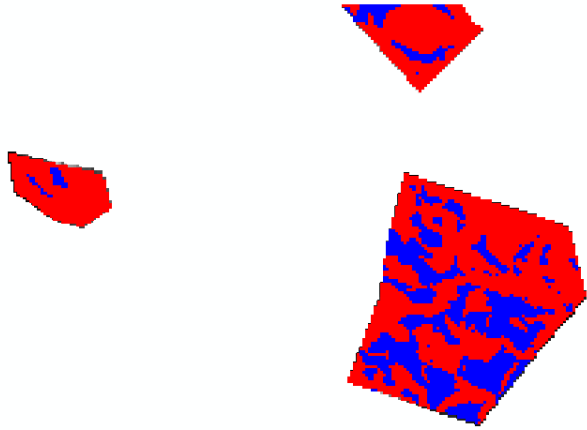


ORTHO IMAGES WITH QUARRY BOUNDARY 01 JAN 2019

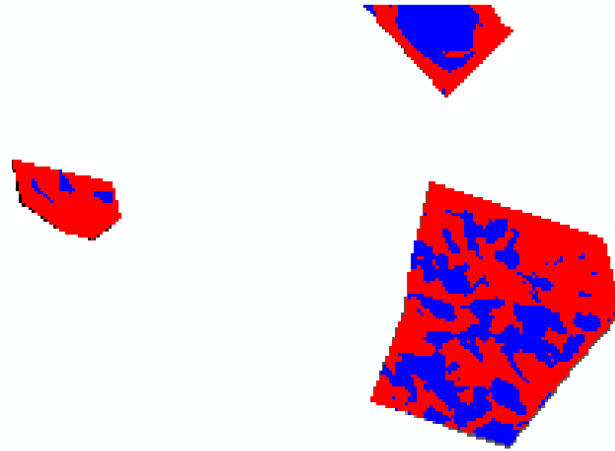


CUT AND FILL VALUE

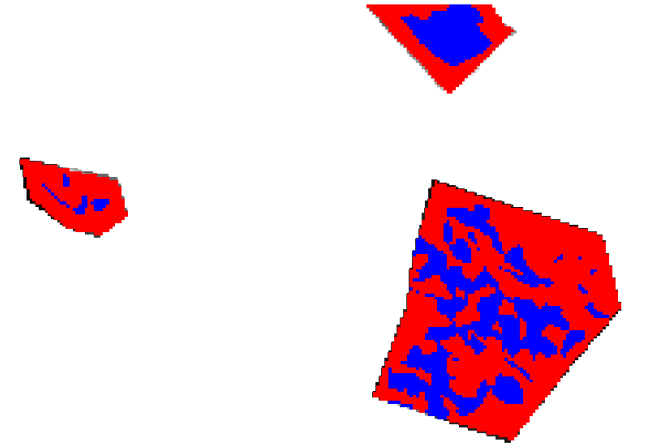
CUT VALUE OF BAJABATI HILLOCK 2005_2006



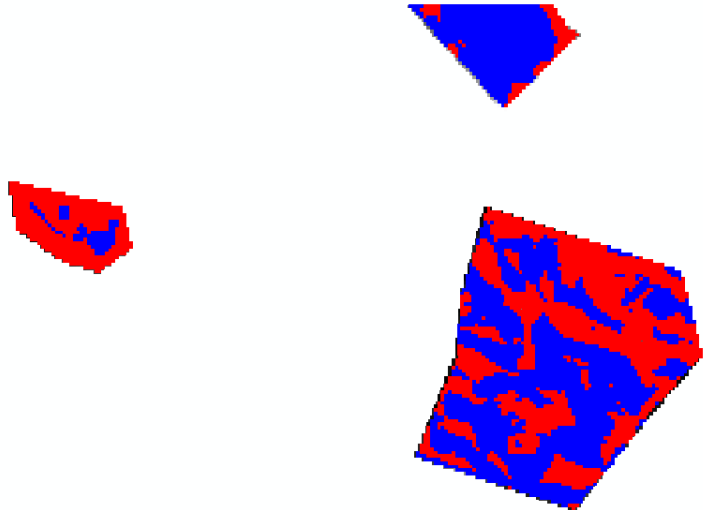
CUT VALUE OF BAJABATI HILLOCK 2005_2008



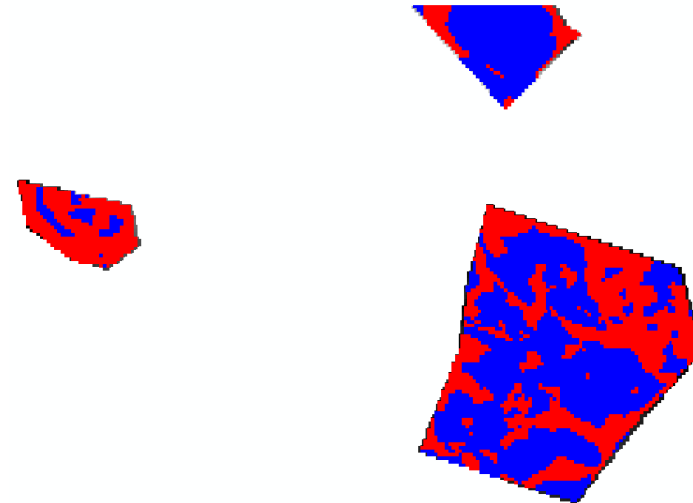
CUT VALUE OF BAJABATI HILLOCK 2005_2009



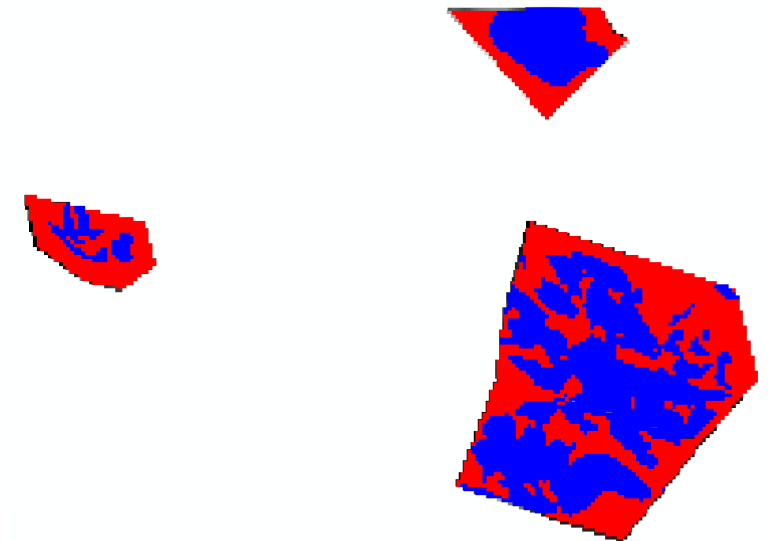
CUT VALUE OF BAJABATI HILLOCK 2005_2010



CUT VALUE OF BAJABATI HILLOCK 2005_2011

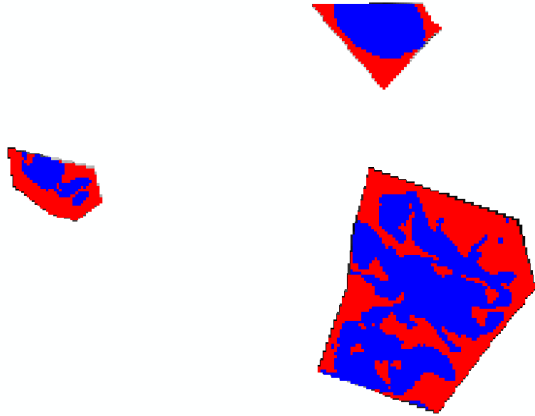


CUT VALUE OF BAJABATI HILLOCK 2005_2012

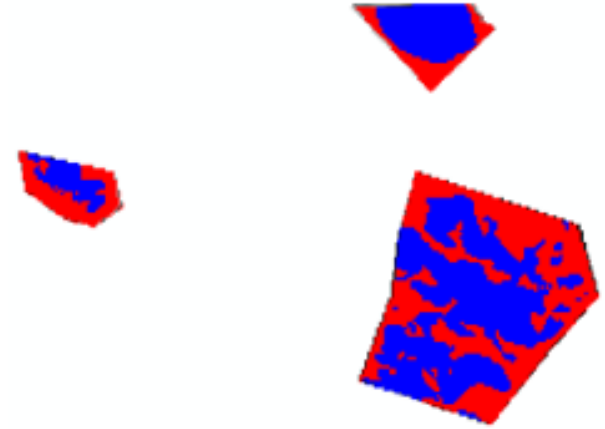


8. CUT AND FILL VALUE

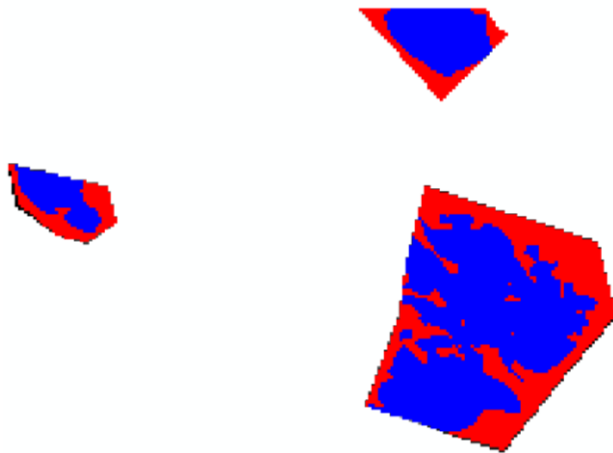
CUT VALUE OF BAJABATI HILLOCK 2005_2014



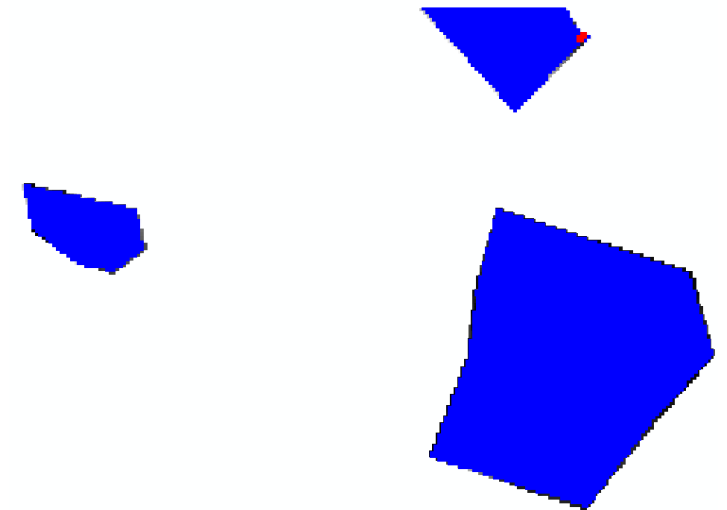
CUT VALUE OF BAJABATI HILLOCK 2005_2015



CUT VALUE OF BAJABATI HILLOCK 2005_2018



CUT VALUE OF BAJABATI HILLOCK 2005_2019



YEARWISE CUT VOLUME ESTIMATION 2005-2019 OF BICHAKHANDI HILLOCK

Extracted Volume of the BSQ (PIT - 1) Under BAJABATI Hillock for the Period 2005-2019

SL NO	BASE YEAR	STUDY YEAR	EXTRACTED VOLUME IN Meter Cube(M ³) PIT-1(Study Year - Base Year)	ANNUAL EXTRACTION	VOLUME IN Meter Cube(M3) OF PIT-1
1	2005	2007	11306.46	-	-
2	2005	2008	11975.169	2007-2008	668.709
3	2005	2009	25859.209	2008-2009	13884.04
4	2005	2010	39854.671	2009-2010	13995.462
5	2005	2011	47520.294	2010-2011	7665.623
6	2005	2012	55085.51	2011-2012	7565.216
7	2005	2014	66655.471	2012-2014	11569.961
8	2005	2015	72568.358	2014-2015	5912.887
9	2005	2018	114072.845	2015-2018	41504.487
10	2005	2019	376110.775	2018-2019	262037.93

Extracted Volum of the BSQ (PIT - 2) Under BAJABATI Hillock for the Period 2005-2019

SL NO	BASE YEAR	STUDY YEAR	EXTRACTED VOLUME IN Meter Cube(M ³)PIT-2 (Study Year - Base Year)	ANNUAL EXTRACTION	VOLUME IN Meter Cube(M3) OF PIT-2
1	2005	2007	2166.936	-	-
2	2005	2008	7311.224	2007-2008	5144.288
3	2005	2009	34604.675	2008-2009	27293.451
4	2005	2010	55964.011	2009-2010	21359.336
5	2005	2011	67722.727	2010-2011	11758.716
6	2005	2012	68140.107	2011-2012	417.38
7	2005	2014	70076.511	2012-2014	1936.404
8	2005	2015	71563.983	2014-2015	1487.472
9	2005	2018	106959.268	2015-2018	35395.285
10	2005	2019	302238.076	2018-2019	195278.808

Extracted Volum of the BSQ (PIT - 3) Under BAJABATI Hillock for the Period 2005-2019

SL NO	BASE YEAR	STUDY YEAR	EXTRACTED VOLUME IN Meter Cube(M ³)PIT-3 (Study Year - Base Year)	ANNUAL EXTRACTION	VOLUME IN Meter Cube(M3) OF PIT-3
1	2005	2007	42992.582	–	–
2	2005	2008	55927.36	2007-2008	12934.778
3	2005	2009	60450.262	2008-2009	4522.902
4	2005	2010	94767.954	2009-2010	34317.692
5	2005	2011	99356.815	2010-2011	4588.861
6	2005	2012	127153.861	2011-2012	27797.046
7	2005	2014	177738.091	2012-2014	50584.23
8	2005	2015	181152.177	2014-2015	3414.086
9	2005	2018	250741.829	2015-2018	69589.652
10	2005	2019	504653.411	2018-2019	253911.582

Extracted Volum of the BSQ (PIT - 4) Under BAJABATI Hillock for the Period 2005-2019

SL NO	BASE YEAR	STUDY YEAR	EXTRACTED VOLUME IN Meter Cube(M ³)PIT-4 (Study Year - Base Year)	ANNUAL EXTRACTION	VOLUME IN Meter Cube(M3) OF PIT-1
1	2005	2007	769.817	–	–
2	2005	2008	1025.411	2007-2008	255.594
3	2005	2009	1199.025	2008-2009	173.614
4	2005	2010	1954.666	2009-2010	755.641
5	2005	2011	1997.602	2010-2011	42.936
6	2005	2012	2865.334	2011-2012	867.732
7	2005	2014	9934.296	2012-2014	7068.962
8	2005	2015	10437.832	2014-2015	503.536
9	2005	2018	40162.053	2015-2018	29724.221
10	2005	2019	151176.638	2018-2019	111014.585

Extracted Volum of the BSQ (PIT - 5) Under BAJABATI Hillock for the Period 2005-2019

SL NO	BASE YEAR	STUDY YEAR	EXTRACTED VOLUME IN Meter Cube(M ³)PIT-5 (Study Year - Base Year)	ANNUAL EXTRACTION	VOLUME IN Meter Cube(M3) OF PIT-5
1	2005	2007	34383.293	–	–
2	2005	2008	40538.816	2007-2008	6155.523
3	2005	2009	44314.767	2008-2009	3775.951
4	2005	2010	75402.367	2009-2010	31087.6
5	2005	2011	76245.378	2010-2011	843.011
6	2005	2012	78051.658	2011-2012	1806.28
7	2005	2014	79714.835	2012-2014	1663.177
8	2005	2015	83033.478	2014-2015	3318.643
9	2005	2018	171601.819	2015-2018	88568.341
10	2005	2019	526524.247	2018-2019	354922.428



Thank
you!