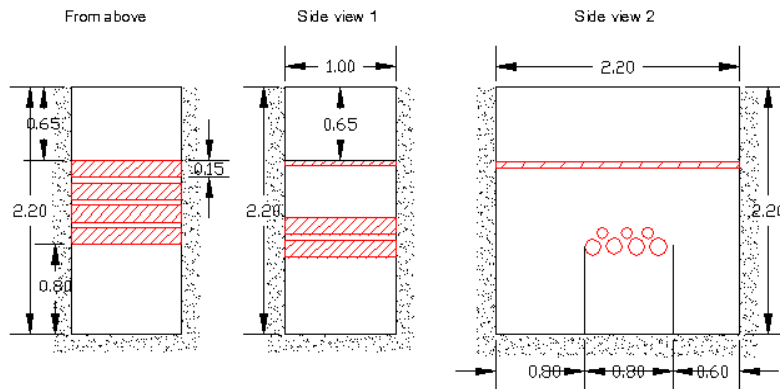


Investigation table of the underground utilities

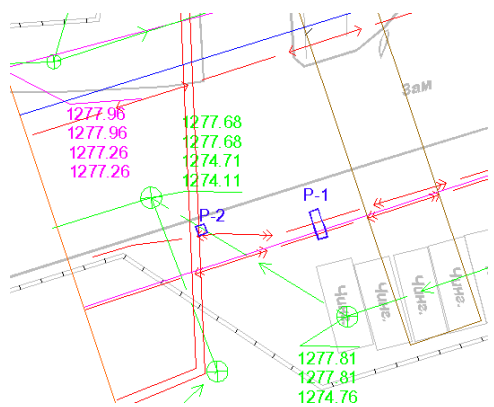
Number 1

1.	Location number:	D-1	2.	Pit number:	P-1
-----------	-------------------------	-----	-----------	--------------------	-----

3. Scheme:



4. Note: There is an electric cable in 0.65 m and are 7 piped cables in 1.10 m from the edge of pit.



5. Executed engineer: D.Otgon
Ts.Sainbayr

6. Organization: "TOP SURVEY" LLC

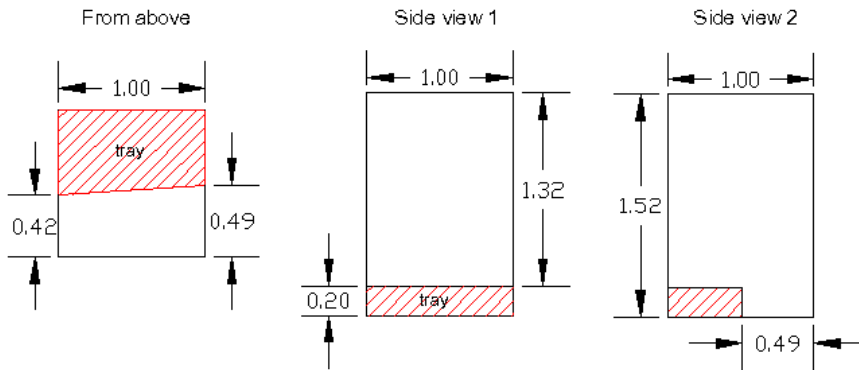
7.Date: 2012.07.04

Investigation table of the underground utilities

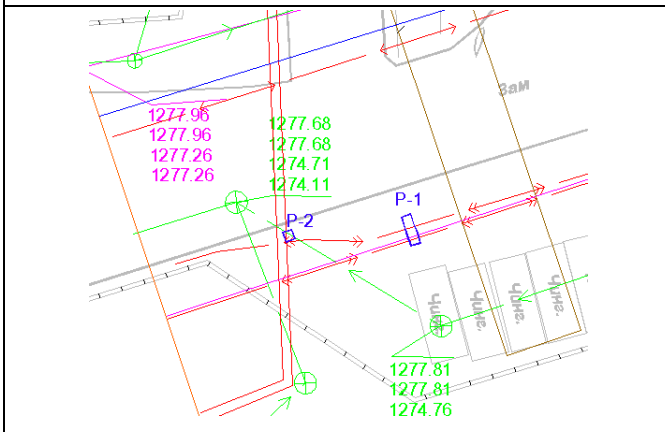
Number 2

1.	Location number:	D-1	2.	Pit number:	P-2
-----------	-------------------------	-----	-----------	--------------------	-----

3. Scheme:



4. Note: The heat pipe tray is appeared in 1.32m below the pit brim.



5. Executed engineer: *D.Otgon*
Ts.Sainbayr

6. Organization: "TOP SURVEY" LLC

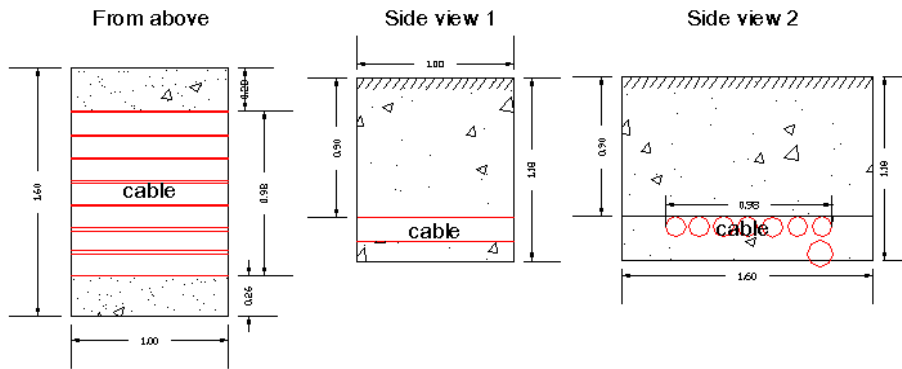
7.Date: 2012.07.04

Investigation table of the underground utilities

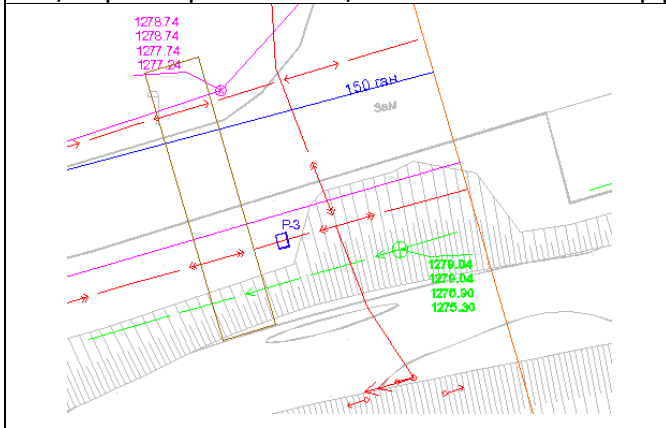
Number 3

1.	Location number:	D-2	2.	Pit number:	P-3
-----------	-------------------------	-----	-----------	--------------------	-----

3. Scheme:



4. Note: There are 7 parallel piped cables. The depth of head pipe is 0.98 m, diameter of pipe is 13 cm, depth of pit is 1.18 m, diameter of a bottom pipe is 17 cm, and width of pit is 1.0 m.



5. Executed engineer: *D.Otgon*
Ts.Sainbayr

6. Organization: "TOP SURVEY" LLC

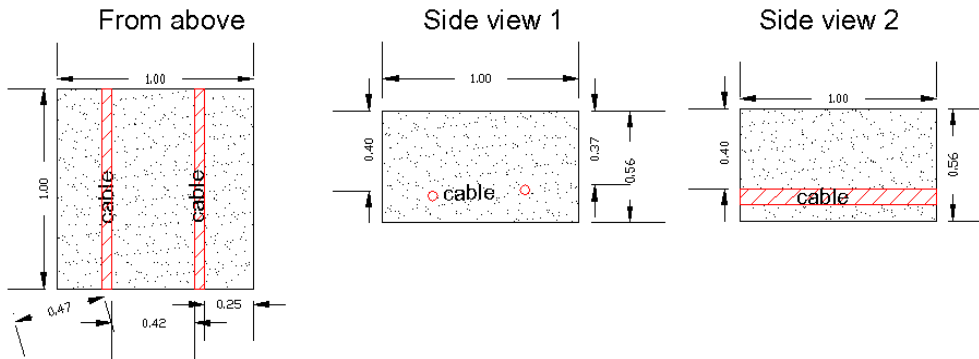
7.Date: 2012.07.04

Investigation table of the underground utilities

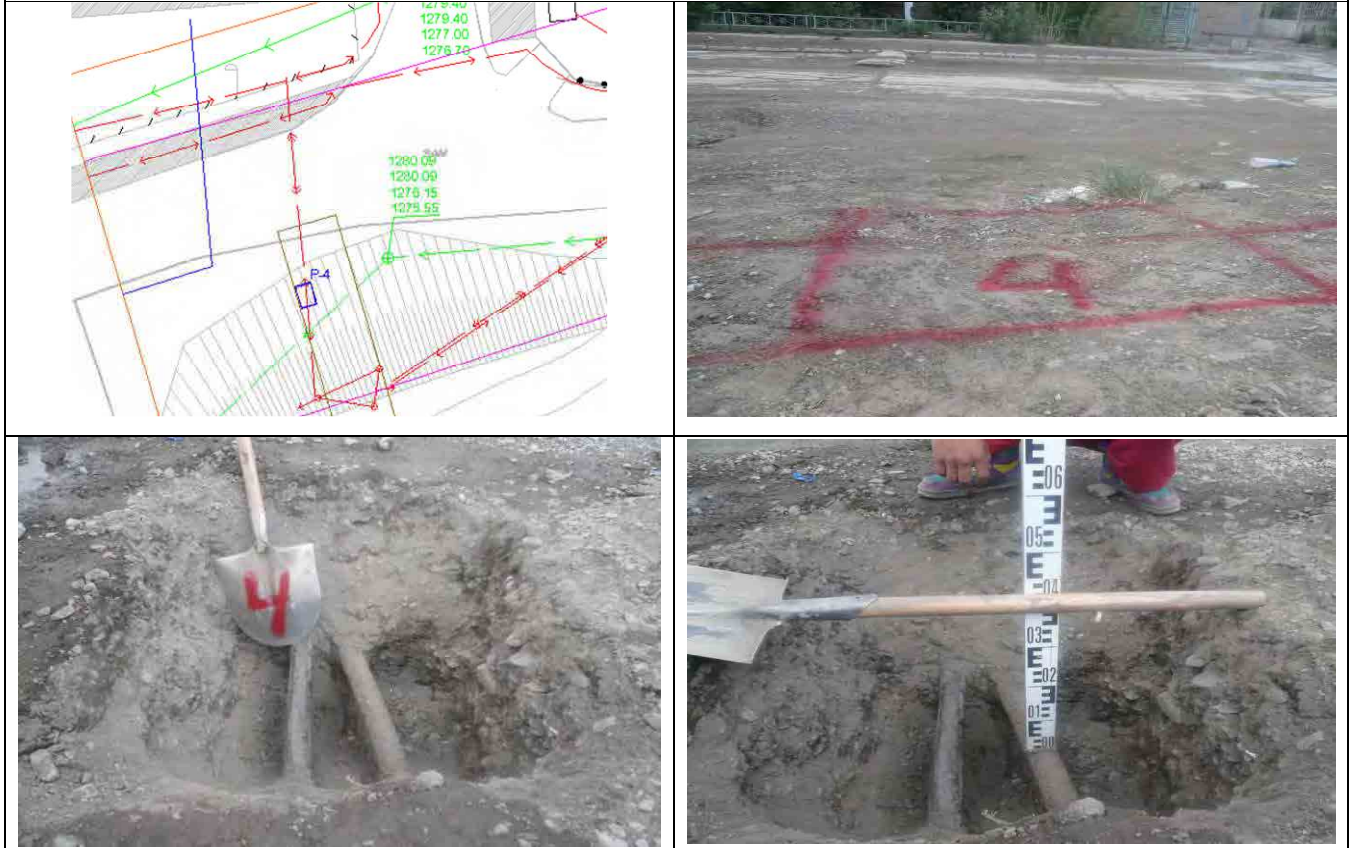
Number 4

1.	Location number:	D-3	2.	Pit number:	P-4
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3. Scheme: Electric line and cable



4. Note: There are 2 electric cables in 40-41 cm from the edge of pit. The left cable's depth is 0.40 m and right cable's depth is 0.41 m. The width is 5 cm.



5. Executed engineer: *D.Otgon*
Ts.Sainbayr

6. Organization: "TOP SURVEY" LLC

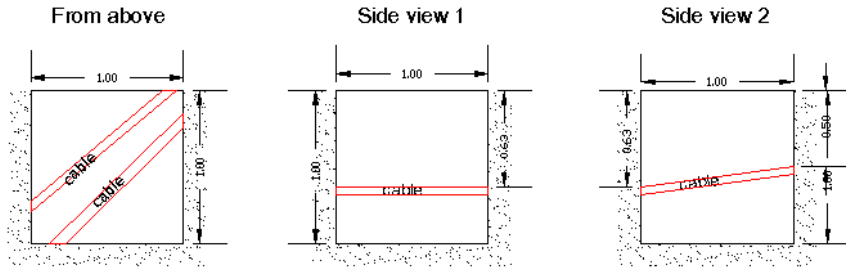
7.Date: 2012.07.04

Research table of underground utilities

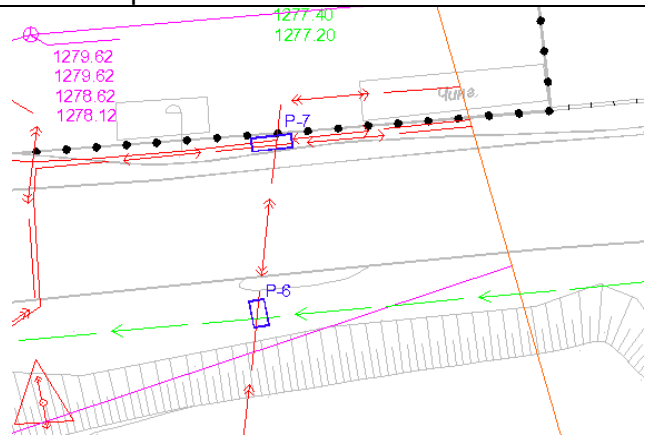
Number 5

1.	Location number:	D-3	2. Pit number:	P-6
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3. Scheme:



4. Note: The left cable's depth is 0.56 m and diameter is 5 cm. The right cable's depth is 0.56 m and diameter is 15 cm. The distance between them is 15 cm. They placed from southwest to north east corner of pit.



5. Executed engineer: D.Otgon
Ts.Sainbayr

6. Organization: "TOP SURVEY" LLC

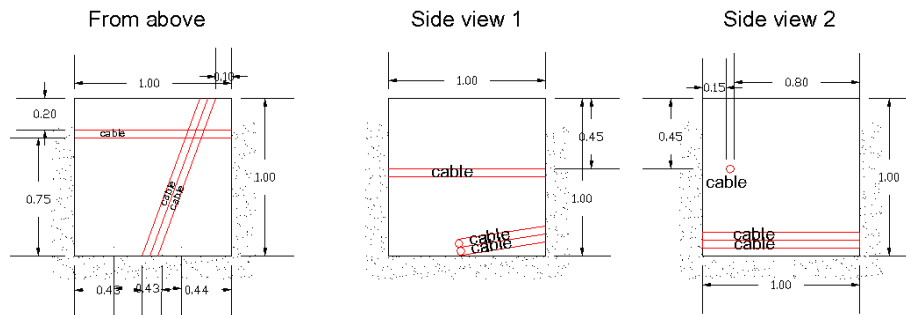
7.Date: 2012.07.04

Investigation table of the underground utilities

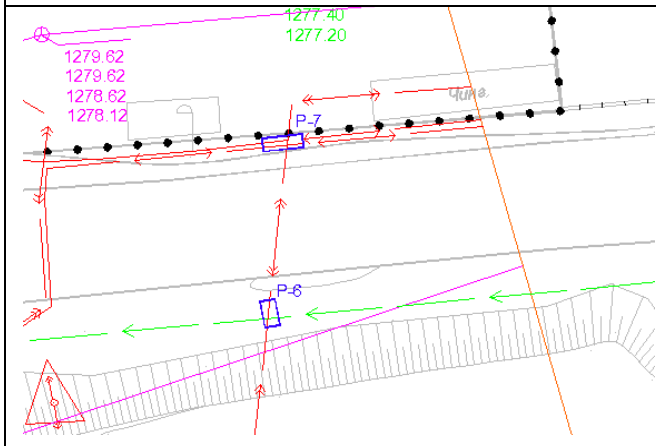
Number 6

1.	Location number:	D-3	2.	Pit number:	P-7
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3. Scheme:



4. Note: The head cable's depth is 0.45 m and diameter is 5 cm. The pair of bottom cables' depth are 0.85 m and diameter are 5 cm.



5. Executed engineer: *D.Otgon*
Ts.Sainbayr

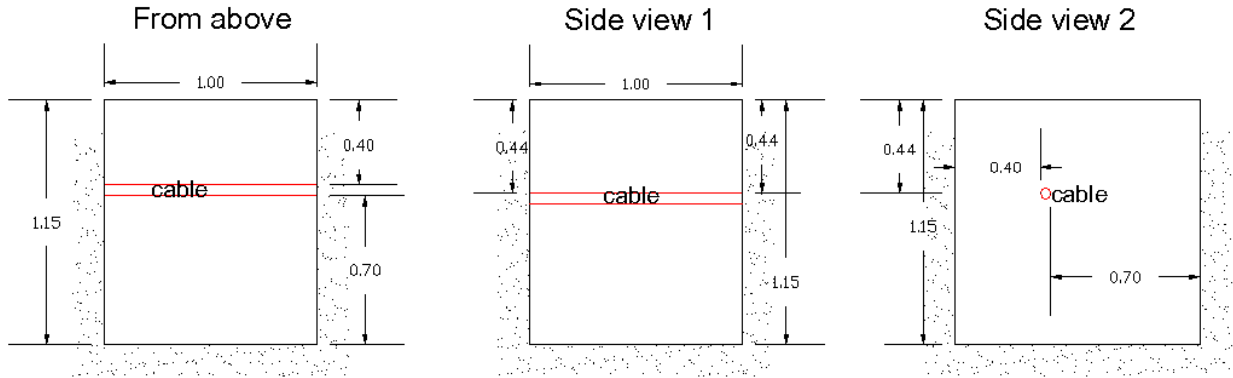
6. Organization: "TOP SURVEY" LLC

7.Date: 2012.07.04

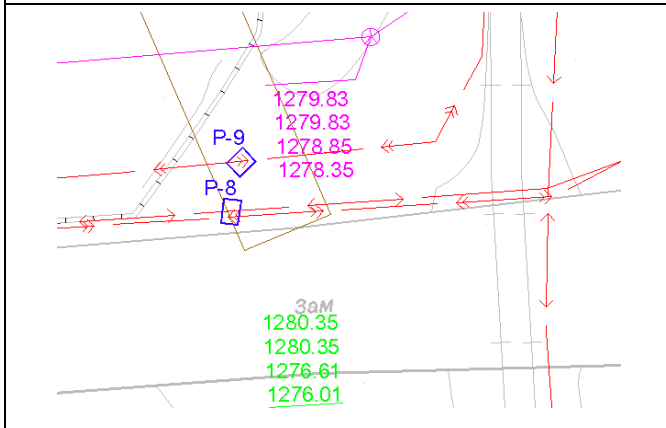
Investigation table of the underground utilities

1.	Location number:	D-4	2.	Pit number:	P-8
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3. Scheme:



4. Note: The electric cable's depth is 0.40 m and diameter is 5 cm.



5. Executed engineer: D.Otgon
Ts.Sainbayr

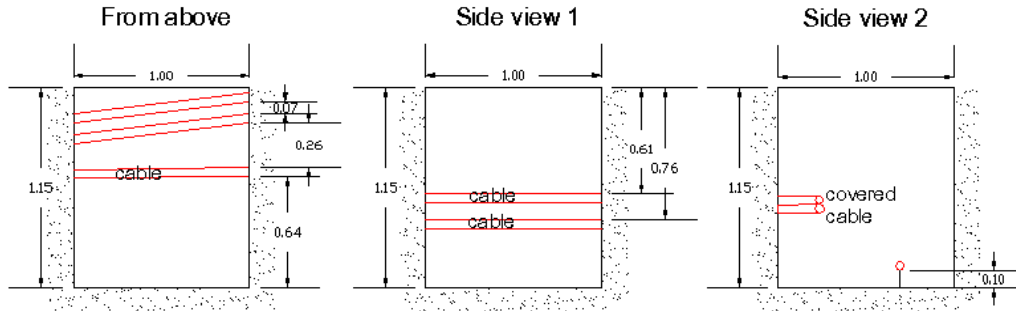
6. Organization: "TOP SURVEY" LLC

7.Date: 2012.07.04

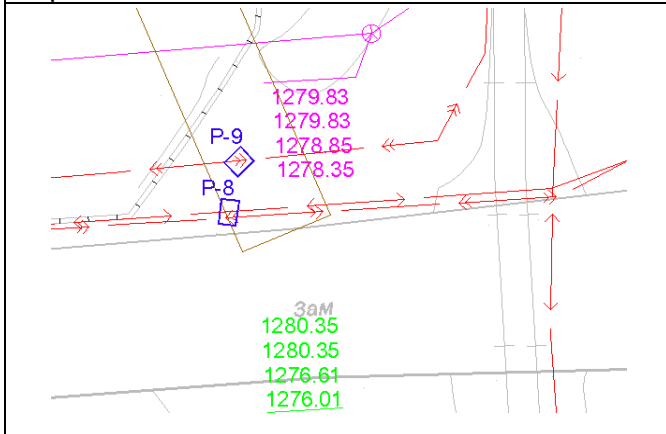
Number 8

1.	Location number:	D-4	2.	Pit number:	P-9
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3. Scheme:



4. Note: The pair of head cables' depths are 0.60 m and diameters are 5 cm. The bottom cable's depth is 0.75 m and diameter is 4 cm.



5. Executed engineer: *D.Otgon*
Ts.Sainbayr

6. Organization: "TOP SURVEY" LLC

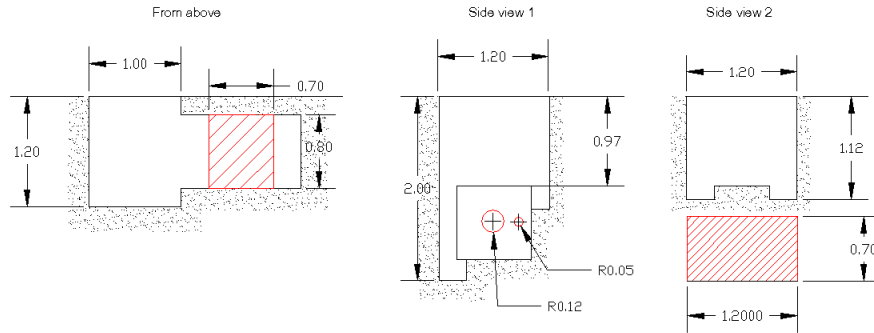
7.Date: 2012.07.04

Investigation table of the underground utilities

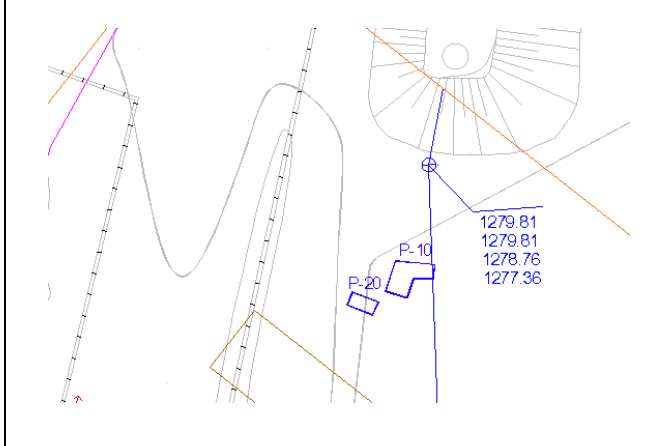
Number 9

1.	Location number:	D-5	2.	Pit number:	P-10
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3. Scheme: No operated drainage pipe



4. Note: It is no operated drainage pipe in fence of Oil. The tray's depth is 0.97 m and pit depth is 2.0 m. The tray's width is 0.84 m.



5. Executed engineer: *D.Otgon*
Ts.Sainbayr

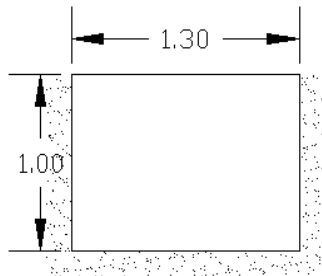
6. Organization: "TOP SURVEY" LLC

7.Date: 2012.07.04

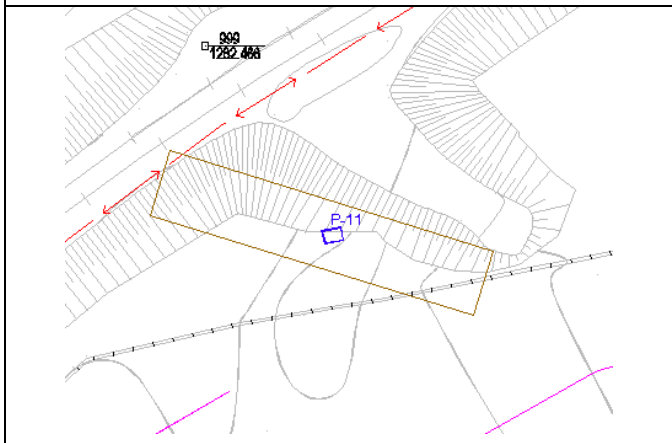
Investigation table of the underground utilities

1.	Location number:	D-6	2. Pit number:	P-11
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3. Scheme: The south pit of railway dam



4. Note: The pit depth is 2.0 m. There is no network.



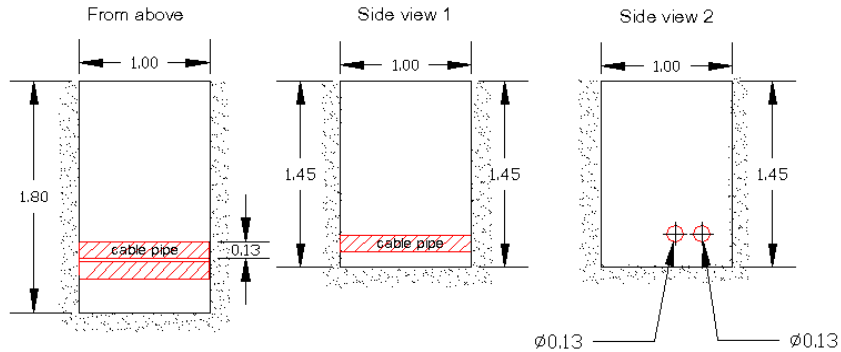
5. Executed engineer: D.Otgon
Ts.Sainbayr

6. Organization: "TOP SURVEY" LLC

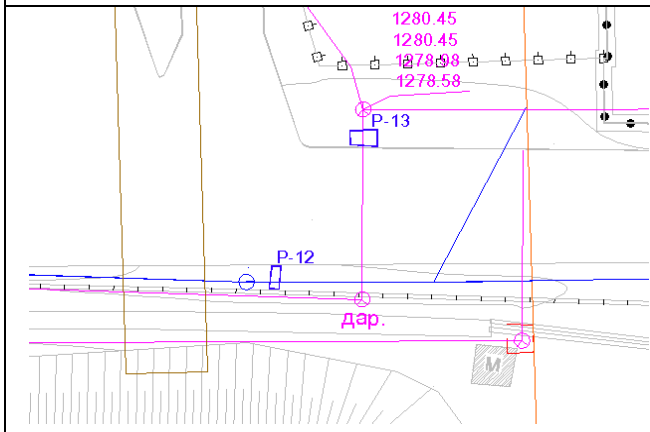
7.Date: 2012.07.04

1.	Location number:	D-8	2.	Pit number:	P-12
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3. Scheme: A pair of cable pipes



4. Note: There is a pair of cable pipes. The pit depth is 1.45 m. The pipe depth is 1.36 m and diameter is 13 cm.



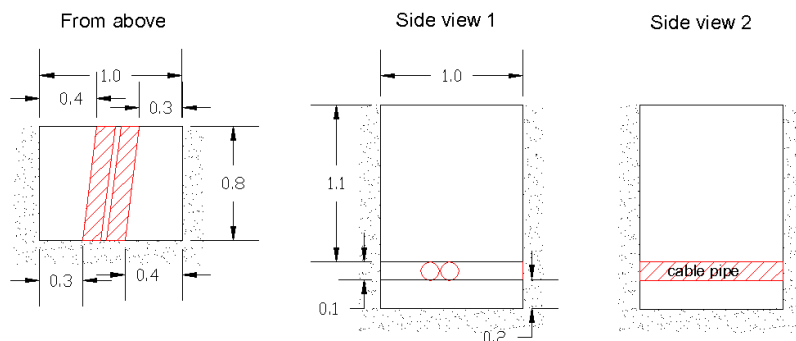
5. Executed engineer: *D.Otgon*
Ts.Sainbayr

6. Organization: "TOP SURVEY" LLC

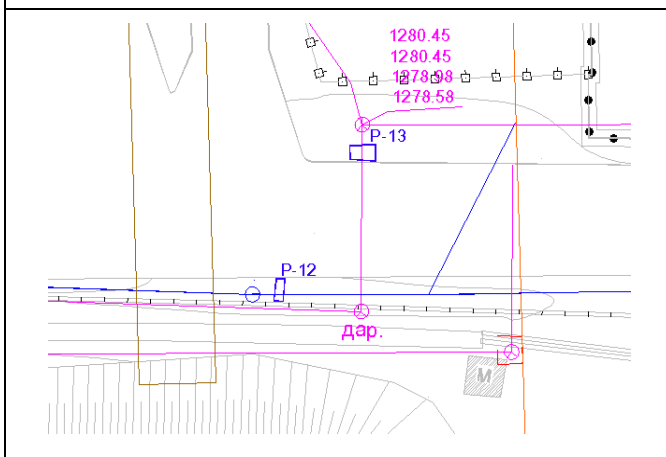
7.Date: 2012.07.04

1.	Location number:	D-8	2.	Pit number:	P-13
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3. Scheme: Cable pipe



4. Note: The cable pipe's depth is 10 m and diameter is 13 cm.



5. Executed engineer: *D.Otgon*
Ts.Sainbayr

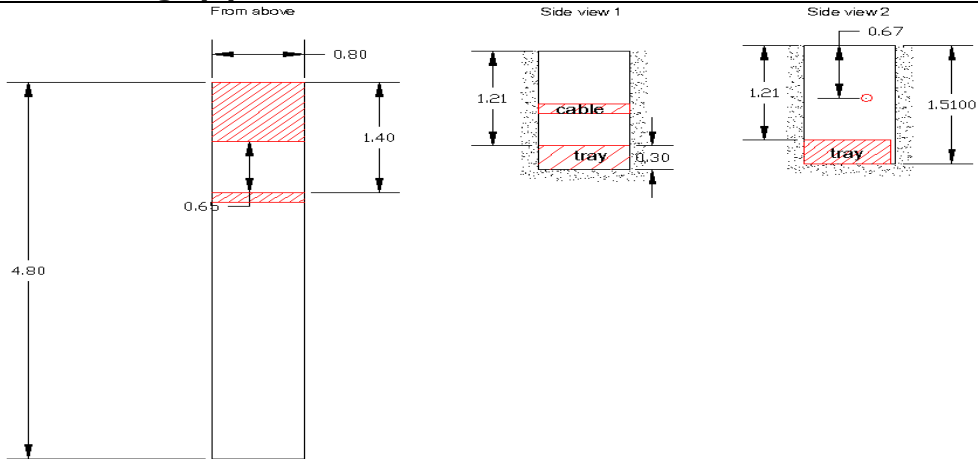
6. Organization: "TOP SURVEY" LLC

7.Date: 2012.07.04

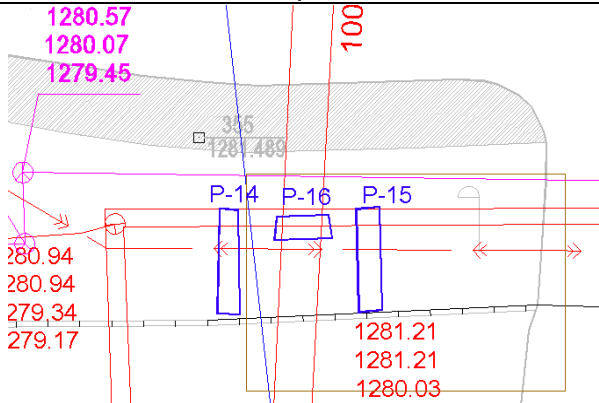
Investigation table of the underground utilities

1.	Location number:	D-10	2.	Pit number:	P-14
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3. Scheme: Drainage pipe and electric cable



4. Note: The cable's depth is 67 cm and diameter is 1 cm. The tray of heat pipe's depth is 1.21 m.



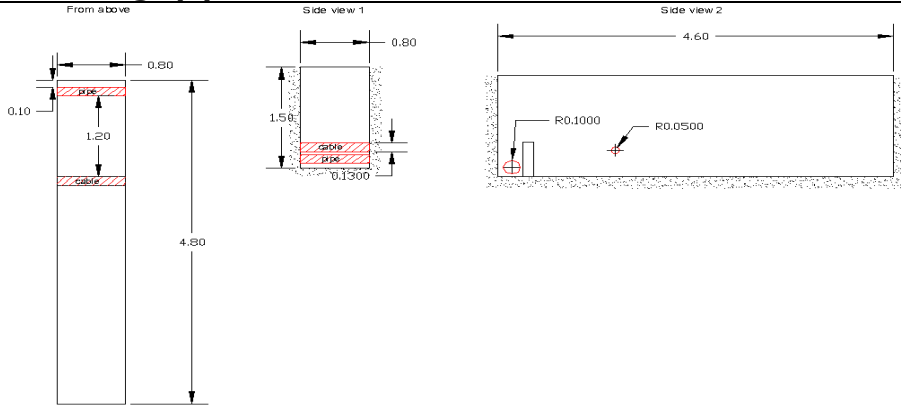
5. Executed engineer: *D.Otgon*
Ts.Sainbayr

6. Organization: "TOP SURVEY" LLC

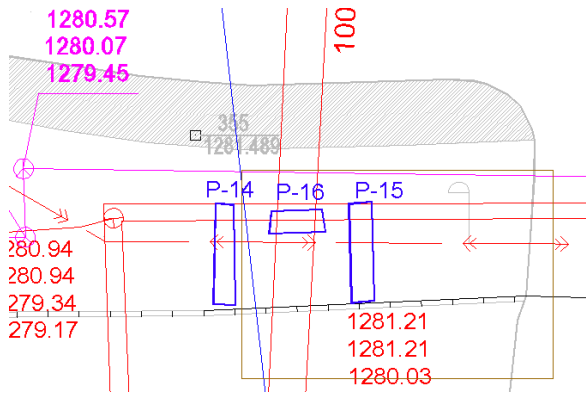
7.Date: 2012.07.04

1.	Location number:	D-10	2.	Pit number:	P-15
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3. Scheme: Drainage pipe and electric cable



4. Note: The cable's depth is 1.11 m and diameter is 5 cm. The pipe depth is 1.36 m and diameter is 10 cm.



5. Executed engineer: D.Otgon
Ts.Sainbayr

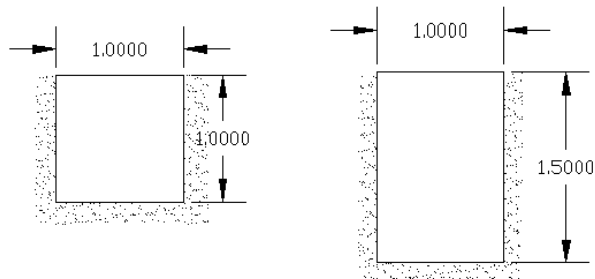
6. Organization: "TOP SURVEY" LLC

7.Date: 2012.07.04

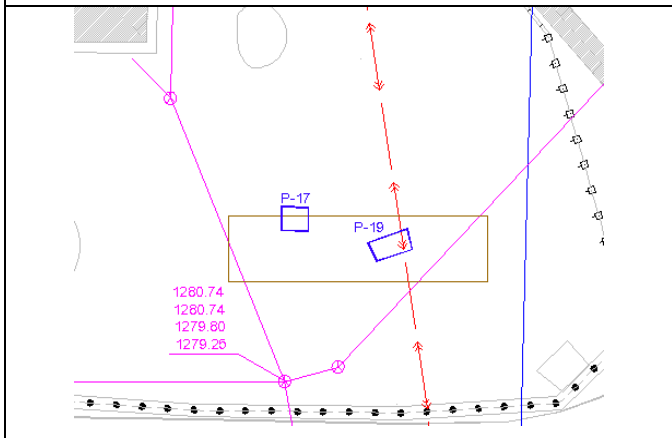
Investigation table of the underground utilities

1.	Location number:	D-9	2. Pit number:	P-17
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3. Scheme: An empty pit



4. Note: There is no network.



5. Executed engineer: *D.Otgon*
Ts.Sainbayr

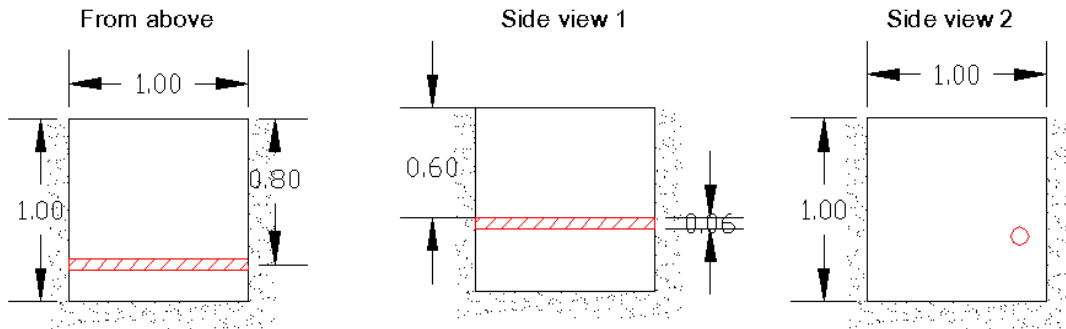
6. Organization: "TOP SURVEY" LLC

7.Date: 2012.07.04

Investigation table of the underground utilities

1.	Location number:	D-7	2.	Pit number:	P-18
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3. Scheme: Electric cable



4. Note: The electric cable's depth is 0.60 m and diameter is



5. Executed engineer: *D.Otgon
Ts.Sainbayr*

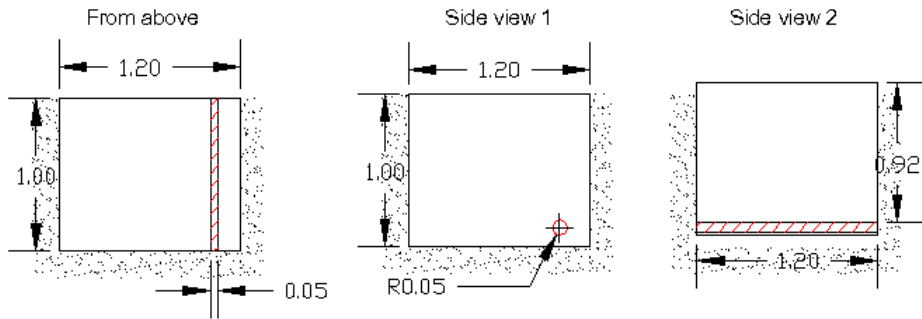
6. Organization: *"TOP SURVEY" LLC*

7.Date: 2012.07.04

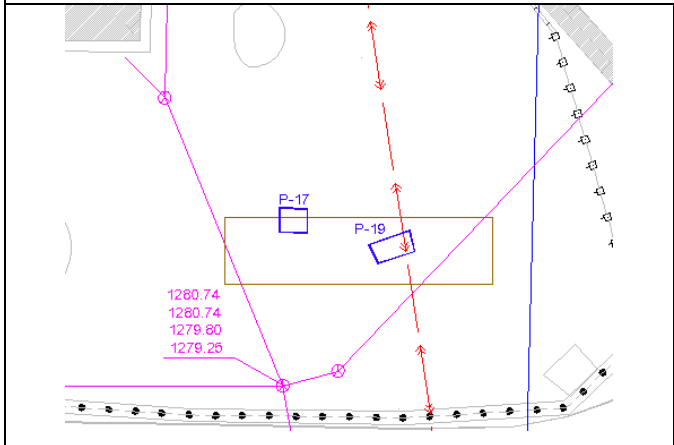
Investigation table of the underground utilities

1.	Location number:	D-9	2.	Pit number:	P-19
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3. Scheme: Electric cable



4. Note: The cable depth is 0.84 m and diameter is 5 cm.



5. Executed engineer: *D.Otgon*
Ts.Sainbayr

6. Organization: "TOP SURVEY" LLC

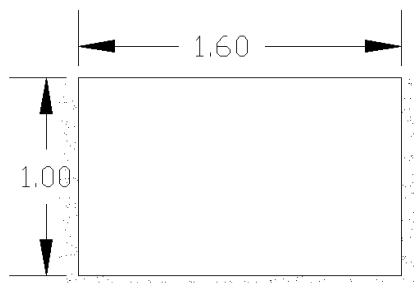
7.Date: 2012.07.04

Investigation table of the underground utilities

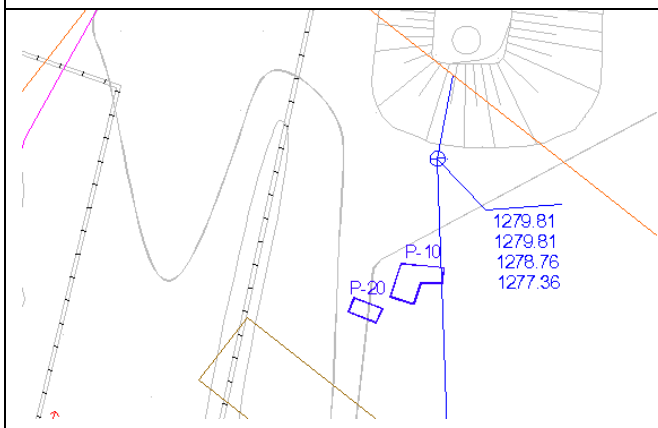
Numberz 19

1.	Location number:	D-5	2.	Pit number:	P-20
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3. Scheme: Pit



4. Note: The pit depth is 1.2 m. There is no network.



5. Executed engineer: D.Otgon
Ts.Sainbayr

6. Organization: "TOP SURVEY" LLC

7.Date: 2012.07.04

付属資料-3

地形測量調査報告書

"TOP SURVEY" LLC

REPORT OF TOPOGRAPHIC SURVEY UNDER "THE
PREPARATORY STUDY FOR AJILCHIN FLYOVER PROJECT"
IN ULAANBAATAR CITY

ULAANBAATAR 2012

AN-345

"TOP SURVEY" LLC

**REPORT OF TOPOGRAPHIC SURVEY UNDER
"THE PREPARATORY STUDY FOR AJILCHIN FLYOVER PROJECT"
IN ULAANBAATAR CITY**

Client: CTI Engineering Co., Ltd

Executer: "TOP SURVEY" LLC

Director:  ERDENEBAATAR.B

Engineer:  MUNKH-OD.B 

Ulaanbaatar 2012

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 - 1. Introduction
 - 2. Scope of works
 - 3. Datum
- II. TOPOGRAPHIC SURVEY
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 - 2.1.1 Establishment of new control points
 - 2.1.2 Measurement of control network
 - 2.1.3 Leveling
 - 2.2 Plan survey
 - 2.3 Longitudinal survey
 - 2.3.1 Centerline survey
 - 2.3.2 Profile survey
 - 2.4 Cross section survey
- III. REPORTING

APPENDIXES

- 1. The site area of work
- 2. The location of Control points
- 3. Description sheet of Control point and Bench mark
- 4. The sketch of control networks measurement
- 5. The coordinate list of Control points
- 6. Leveling source data
- 7. The sketch of leveling measurement
- 8. The sketch of Centerline and Cross section survey
- 9. The coordinate list of profiling points

I. GENERAL

1.1 Introduction

In response to the contract Local Consultant "TOP SURVEY" LLC and Study Team of CTI Engineering Co.,Ltd of Japan International Cooperation Agency (JICA), "TOP SURVEY" executed topographic surveying works for "The preparatory study for Ajilchin flyover project" in Ulaanbaatar city, which was done from 13 June 2012 to 10 July 2012.

All topographic survey field and office works had done in accordance with specification of Study Team and national specification within surveying and mapping accuracy.

There were worked 12 people and used 3 vehicles for the field work and 5 people for office work for long and short term.

1.2 Scope of works

The detailed scope of the work is shown in the following table.

Table 1

No	Works	Unit	
<u>1. Control point and benchmark survey</u>			
1.1	Establishment of new control points	Point	7
1.2	Measurement of control network	Point	7
1.3	Leveling	km	4.31
<u>2. Plan survey</u>			
2.1	Plan survey 1/500	m ²	550 000
<u>3. Longitudinal survey</u>			
3.1	Centerline survey	km	2.7
3.2	Profile survey	km	2.7
<u>4. Cross section survey</u>			
4.1	Cross section survey		121
<u>5. Reporting</u>		LS	1

Survey was carried out 2 stretches:

- Stretch 1: 1.2 km
- Stretch 2: 0.4 km
- Stretch 3: 0.7 km

- Stretch 4: 0.8 km

The site area of the work, which was executed under the agreement, is shown in Appendix 1.

1.3 Datum

All the topographic surveying works done in National Positioning and Leveling Networks, which are in below datum:

Reference ellipsoid:	GRS-80 (Monref 97) a=6378137.000 (Semi-Major Axis) f=1/298.257222101 (Flattening Reciprocal)
Map projection:	Gauss-Kruger's projection 18th Zone (Transverse Mercator)
False Easting:	500000
Datum height:	Mean sea level of the Baltic Sea

II. TOPOGRAPHIC SURVEY

2.1 Control point and benchmark survey

2.1.1 Establishment of new control points

Monuments of survey control network were prepared in accordance with "Instruction of establishment of the survey points". Totally 7 points were established in site area of the work because existing control points, which were established in 2003, was destroyed.

In order to choose the position of new control points, we provided the conditions of not be destroying, overseeing more area as possible, and having good aspect with other points. The location sketches of new established points are shown in Appendix 2.

These monuments were prepared by welding special points on steel lengthening 0.7 according to the instructions and standards.



Description sheets, which contain point name, number, long and shouting distance photos, adumbration, note of location sketch, and studied date of new control points, were attached to this report. Studied and established points' description sheets are shown in Appendix 3.

2.1.2 Measurement of control network

Control network survey were observed on the new control points by Static method using five sets of TOPCON HiperPro (GNSS) receivers with L1 and L2 antennas. Measurement of control network was continued for three hours and based on point named "Sapporo". The measurement's sketch is shown in Appendix 4.

Technical condition of measurement was:

- Number of satellite at least 4
- Signal interval 15"
- Elevation mask 10°
- Antenna type Geodetic

The coordinates of control points were post processed in GRS80 ellipsoid (Monref 97) by "Pinnacle" /TOPCON/ and converted to plane coordinate using Transverse Mercator's projection (6°). The coordinate list of points, which was post processed, is shown in Appendix 5.

2.1.3 Leveling

We have determined the height of established benchmarks based on marks named Bm-528 and Bm-246 which are included in Leveling network in Ulaanbaatar city by 4th class program of Leveling. For the measuring process, we have used DL-101C level of TOPCON. Post processed benchmarks heights are shown in Table 2. The measurement's source data and sketch are attached in Appendix 6 and Appendix 7 respectively.

Table 2

Point number	Distance, m	Measured elevation	Adjusted elevation	Height	Point number
Bm-528				1277.416	Bm-528
352	0.4085	1.5960	1.5960	1279.012	352
337	0.6944	1.1529	1.1539	1280.166	337
359	0.5963	1.5532	1.5532	1281.719	359
999	0.6256	0.7467	0.7467	1282.466	999
351	0.4429	-1.8573	-1.8573	1280.609	351
355	0.3705	0.8809	0.8809	1281.489	355
350	0.4365	0.2959	0.2959	1281.785	350
Bm-246	0.7326	1.7987	1.7987	1283.584	Bm-246
Total	4.3073	6.1670	6.168	6.168	

The coordinate list and elevation of control points and bench marks, which are used for survey, is shown in following Table 3.

Table 3

Point No	Coordinate (ITRF97)		Height	Geodetic coordinate (WGS84)	
	X	Y		B	L
350	5310062.733	640739.252	1281.785	47 54 45.97030	106 51 15.81490
359	5309586.588	639819.064	1281.719	47 54 18.91961	106 52 12.80976
351	5310040.644	639940.614	1280.609	47 54 17.95711	106 51 48.85605
337	5309544.833	639322.357	1280.166	47 54 10.56521	106 51 24.28479
352	5309304.245	638817.597	1279.012	47 54 11.66263	106 52 17.23146
355	5310034.333	640309.319	1281.489	47 54 33.60367	106 52 57.65452
999	5309885.202	639929.205	1282.466	47 54 33.51752	106 52 19.18961

2.2 Plan survey

Plans with 1:500 scale are done in the 550000 km² area in accordance with client. According to the "Instruction of topographic surveying works with 1:5000, 1:2000, 1:1000 and 1:500 scale", we have executed plan survey.

Some photographs of measurement are shown as following.



Therefore, land use features such as house, buildings, cables, and pipes are measured with appropriate accuracy in plan survey. TOPCON HiperPro RTK GPS and GTS-752 total station were used for plan survey.

Measured objects were drawn by using special points, which is for topographic plan, and in accordance with "Legend brochure of topographic surveying works with 1:5000, 1:2000, 1:1000 and 1:500 scale", SAGac, 2001. Contour line interval for 1:500 scale mapping has been selected as 0.5m.

AutoCad Civil 3D, AutoCad 2010, and AutoCad Land Development programs were used for processing.

2.3 Longitudinal survey

2.3.1 Centerline survey

According to the Study Team instruction, the centerline alignment was marked at every 20m, BP, EP, and IP by iron pegs, nails and paint.

Marks are shown as following.



There was used TOPCON HiperPro RTK GPS and GTS-752 total station with 2" in angle and $\pm 2\text{mm} + 2\text{ppm} \cdot D$ in distance accuracy respectively.

The location sketch of Centerline points is shown in Appendix 8.

2.3.2 Profile survey

The profile was done along the Centerline based on coordinates and elevations of all every 20 m chainages, BP, EP of curves and break points of elevation. Centerline points were started numbering from Narnii zam.

The horizontal and vertical scales for profiling are 1:500 and 1:200 respectively. The profile is drawn in AutoCad format.

Same as centerline survey, TOPCON HiperPro RTK GPS and GTS-752 total station are used for measuring process.

Some photographs of measurement are shown as following.



The coordinate list of profiling points is shown in Appendix 9.

2.4 Cross section survey

Cross sections were done at every 20m, BP, and EP along to the proposed Centerline of the all Stretches.

Cross section width was in 30m from Centerline in 2 sides respectively, (Stretch 2, Stretch 3, and Stretch 4) and 30m and 90-100m (on the Dundgol River) from Centerline in 2 sides (Stretch 1).

The location sketch of Cross section survey is attached in Appendix 8.

III. REPORTING

According to the Study Team instruction, all surveying data, which have included field notes and photographs of site survey, was submitted to the report. All survey results were drawn in AutoCad format and drawings have presented range of street, features of land use along the centerlines, and sized as agreement.

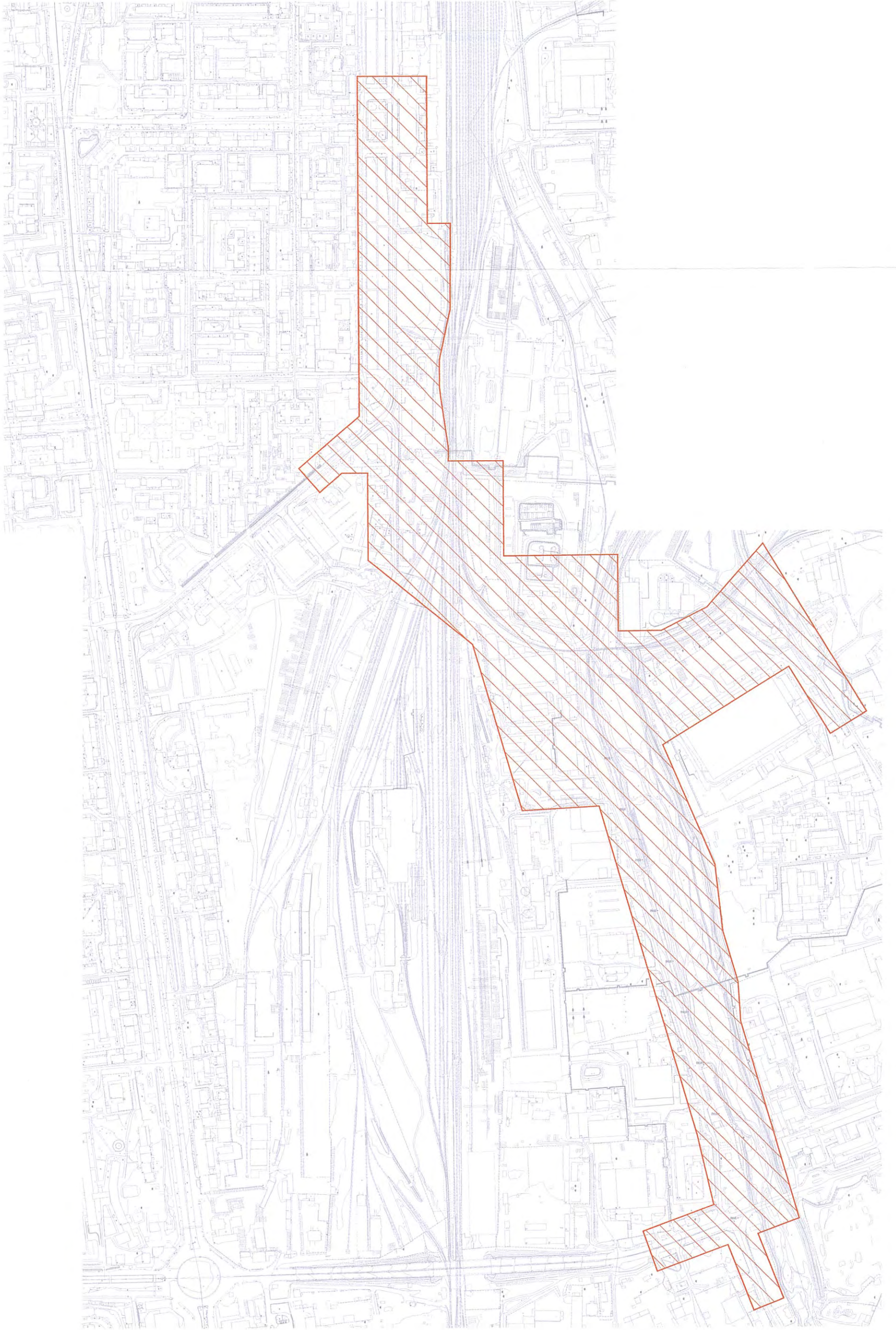
According to the contract, we prepared and delivered the following drawings to the Study team:

Table 4

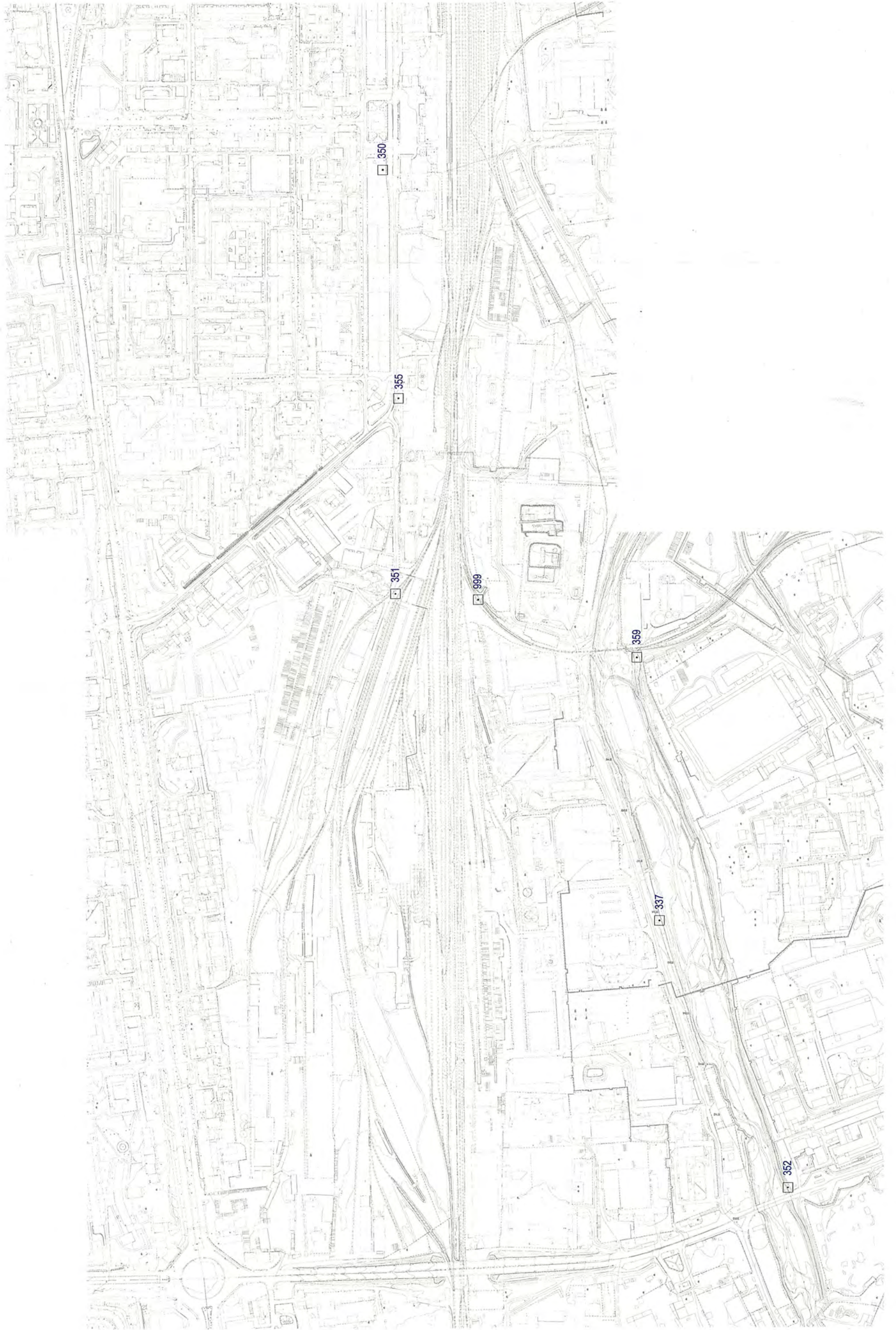
No	Items	Scale	Size	Original
1	Sheet of Plan survey	1/500	A3	11 / sheets/
2	Sheet of Profile survey - Horizontal - Vertical	1/500 1/200	A3	2 /sheets/
3	Sheet of Cross section survey	1/100	A3	13 /sheets/
4	Report of Topographic survey		A4	3
5	CD, which is written all data			3

APPENDIXES

THE SITE AREA OF SURVEY



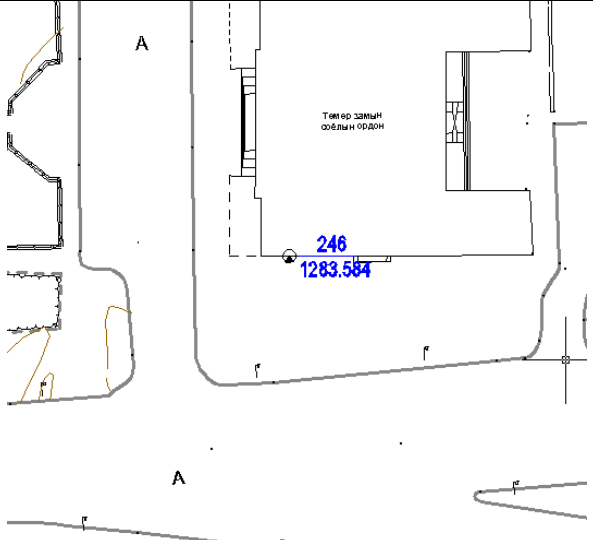
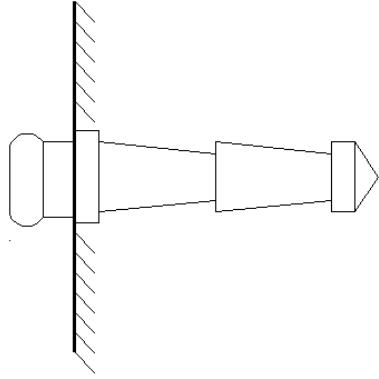


THE LOCATION OF CONTROL POINTS



**Description sheet of
CONTROL POINT AND BENCH MARK**

1

1.	Point name:	<i>XM-246</i>	2.	Center number:	<i>246</i>
3.	Sheet number: (1:1000)	<i>61-c</i>	4.	Network type:	Leveling
5.	Position	<i>Ulaanbaatar city, Bayangol district</i>			
6.	Coordinate:	B=	L=	X=	Y=
7. Photo:					
					
8. Note: Found on front wall of The cultural palace of Railway.					
9. Location map:			10. Center type:		
					
11. a. <input checked="" type="radio"/> Reconnoitre b. <input type="radio"/> Establsihed			12. Date: <i>2012-06-14</i>		
13. Surveyor: <i>B.Batmunkh</i>					
14. Chief Surveyor: <i>B.Munkh-Od</i>					

**Description sheet of
CONTROL POINT AND BENCH MARK**

2

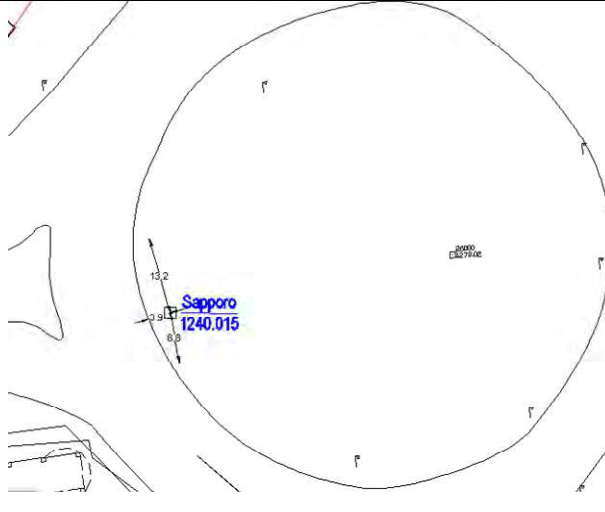
1.	Point name:	<i>Sapporo</i>	2.	Center number:	<i>0004</i>
3.	Sheet number: (1:1000)	<i>76-a</i>	4.	Network type:	GPS
5.	Position	<i>Ulaanbaatar city, Songinokhairkhan district</i>			
6.	Coordinate:	B=47 54 45.97	L=106 51 15.81	X= 5310393.458	Y=638615.330

7. Photo:

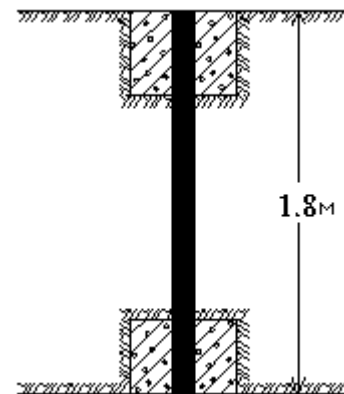


8. Note: Found on traffic island named Sapporo, which was standing back in 3.9 m from the edge of the traffic island, 13.2 m and 8.8 m from electricity posts.

9. Location map:



10. Center type:



11. a. Reconnoitre b. Establsihed



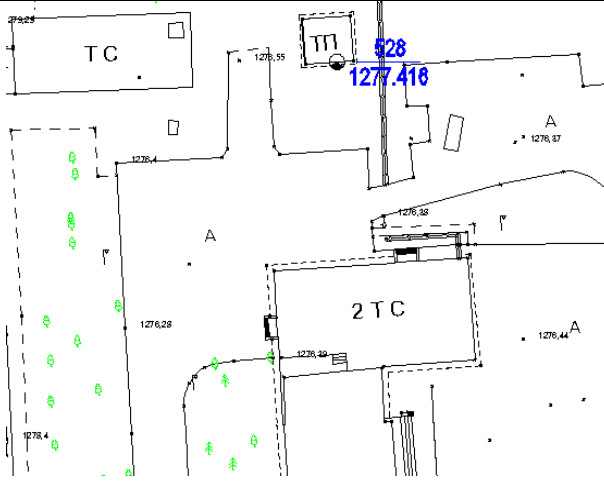
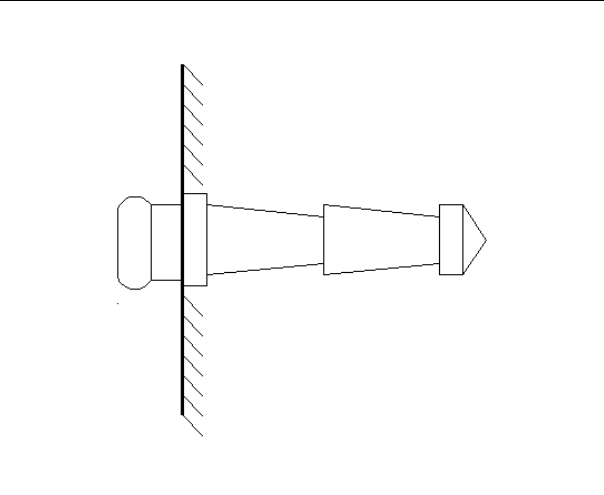
12. Date: *2012-06-14*

13. Surveyor: *B.Batmunkh*

14. Chief Surveyor: *B.Munkh-Od*

**Description sheet of
CONTROL POINT AND BENCH MARK**

3

1.	Point name:	<i>XM-528</i>	2.	Center number:	<i>528</i>
3.	Sheet number: (1:1000)	<i>76-a</i>	4.	Network type:	Leveling
5.	Position	<i>Ulaanbaatar city, Khan-Uul district</i>			
6.	Coordinate:	B=	L=	X=	Y=
7. Photo:					
					
8. Note: Found on front wall of a small white house, that locates behind of The benefit society of Defense.					
9. Location map:			10. Center type:		
					
11. a. Reconnoitre b. Establsihed			12. Date: <i>2012-06-14</i>		
13. Surveyor: <i>B.Batmunkh</i>					
14. Chief Surveyor: <i>B.Munkh-Od</i>					

**Description sheet of
CONTROL POINT AND BENCH MARK**

4

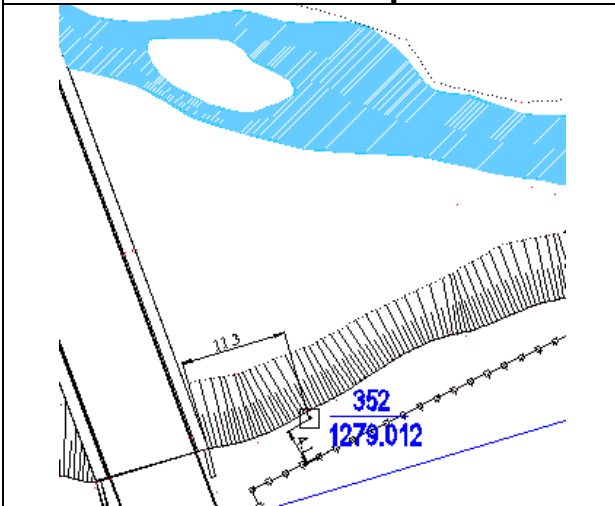
1.	Point name:	352	2.	Center number:	352
3.	Sheet number: (1:1000)	76-a	4.	Network type:	Traverse
5.	Position	<i>Ulaanbaatar city, Khan-Uul district</i>			
6.	Coordinate:	B=47 54 10.57	L=106 51 24.28	X= 5310062.733	Y=640739.252

7. Photo:

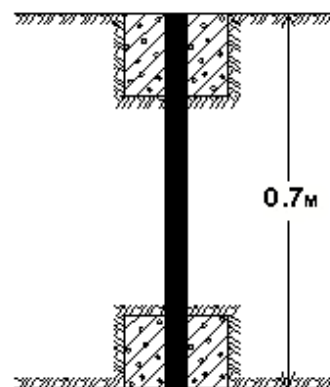


8. Note: It locates in front of Dundgol river and on the dam, which was standing back in 4.1 m from fence and 11.3 m from front edge of "Gurveljin" bridge.

9. Location map:



10. Center type:



11. a. Reconnoitre **(b) Establisheed**

12. Date: 2012-06-14

13. Surveyor: B.Batmunkh

14. Chief Surveyor: B.Munkh-Od

**Description sheet of
CONTROL POINT AND BENCH MARK
5**

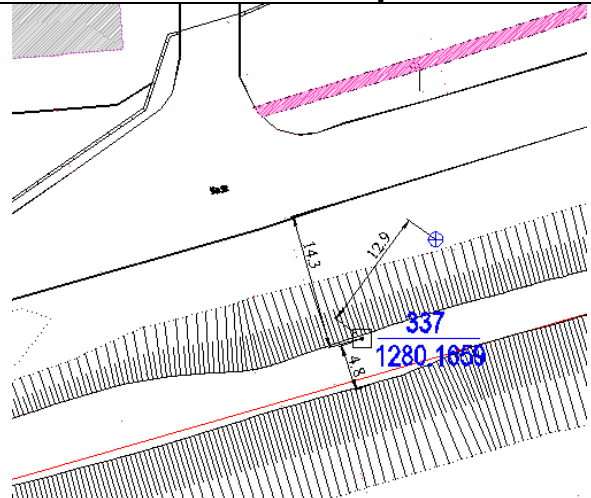
1.	Point name:	<i>337</i>		2.	Center number:	<i>337</i>	
3.	Sheet number: (1:1000)	<i>76-a</i>		4.	Network type:	Traverse	
5.	Position	<i>Ulaanbaatar city, Bayangol district</i>					
6.	Coordinate:	B=47 54 17.96	L=106 51 48.86	X=5309544.833	Y=639322.357		

7. Photo:

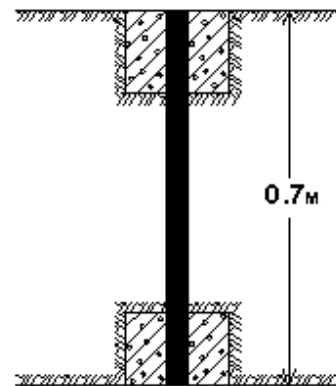


8. Note: It locates on the dam, which was standing back in 14.3 m from paved way, 12.9 m from well and 4.8 m from edge of the dam.

9. Location map:



10. Center type:



11. a. Reconnoitre (b) Established

12. Date: 2012-06-14

13. Surveyor: *B.Batmunkh*

14. Chief Surveyor: *B.Munkh-Od*

**Description sheet of
CONTROL POINT AND BENCH MARK
6**

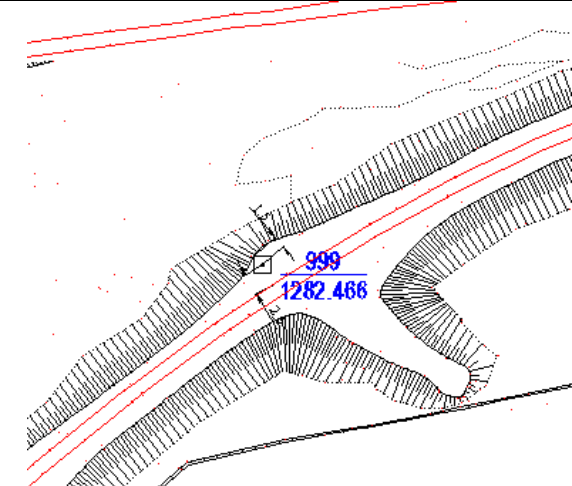
1.	Point name:	<i>999</i>	2.	Center number:	<i>999</i>
3.	Sheet number: (1:1000)	<i>76-b</i>	4.	Network type:	Traverse
5.	Position	<i>Ulaanbaatar city, Bayangol district</i>			
6.	Coordinate:	B=47 54 28.50	L=106 52 18.46	X=5309855.202	Y=639929.205

7. Photo:

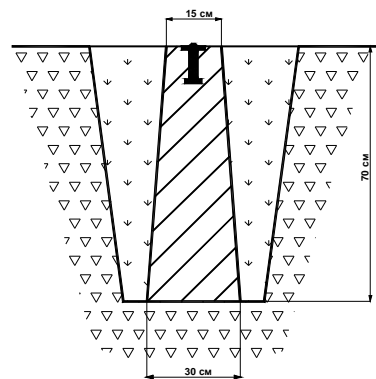


8. Note: It locates next to railway, which was standing back in 2.6 m from railway line, and 1.5 m from edge of the dam.

9. Location map:



10. Center type:



11. a. Reconnoitre **(b) Established**

12. Date: *2012-06-14*

13. Surveyor: *B.Batmunkh*

14. Chief Surveyor: *B.Munkh-Od*

**Description sheet of
CONTROL POINT AND BENCH MARK**

7

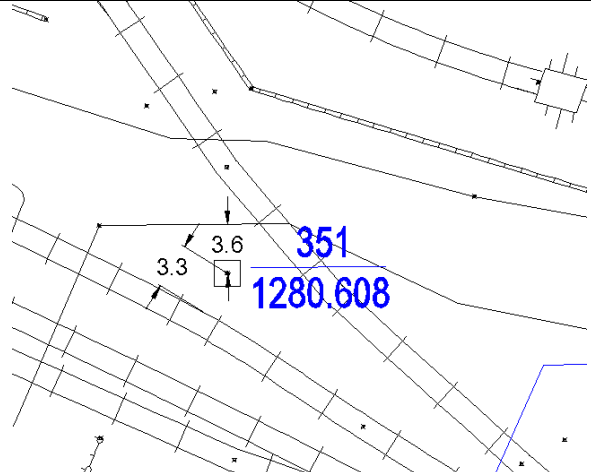
1.	Point name:	<i>351</i>	2.	Center number:	<i>351</i>
3.	Sheet number: (1:1000)	<i>76-b</i>	4.	Network type:	Traverse
5.	Position	<i>Ulaanbaatar city, Bayangol district</i>			
6.	Coordinate:	B=47 54 33.52	L=106 52 19.19	X=5310040.644	Y=639940.614

7. Photo:

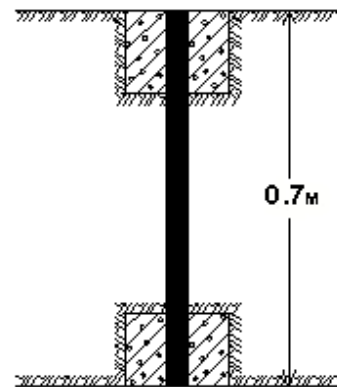


8. Note: It locates between railway branch lines, which was standing back in 3.6 m from paved way, and 3.3 m from the south railway line.

10. Location map:



10. Center type:



11. a. Reconnoitre (b) Establisheed

12. Date: *2012-06-14*

13. Surveyor: *B.Batmunkh*

14. Chief Surveyor: *B.Munkh-Od*

Description sheet of
CONTROL POINT AND BENCH MARK

8

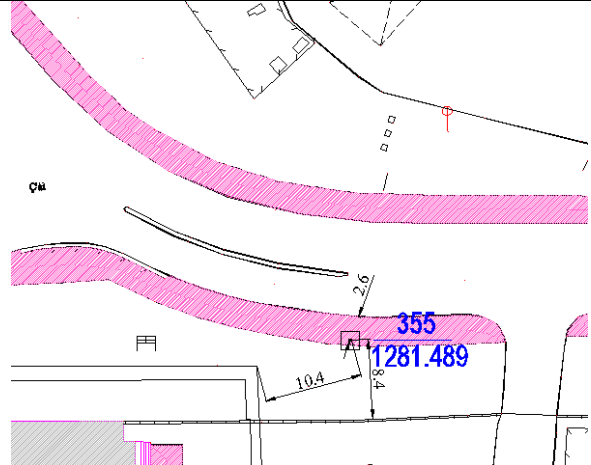
1.	Point name:	<i>355</i>	2.	Center number:	<i>355</i>
3.	Sheet number: (1:1000)	<i>76-b</i>	4.	Network type:	Traverse
5.	Position	<i>Ulaanbaatar city, Bayangol district</i>			
6.	Coordinate:	B=47 54 33.02	L=106 52 36.93	X=5310034.333	Y=640309.319

7. Photo:

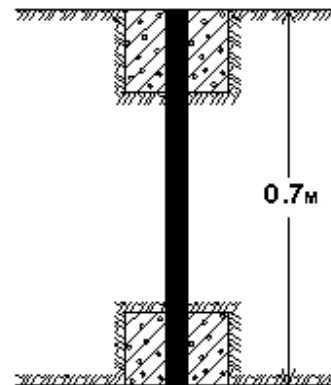


8. Note: It locates in the turning from Narnii zam to 10th khorooolol, which was standing back in 10.4 m from heat pipe turn, 2.6 m from traffic lane, and 8.4 m from fence.

10. Location map:



10. Center type:



11. a. Reconnoitre **(b) Establihed**

12. Date: 2012-06-14

13. Surveyor: *B.Batmunkh*

14. Chief Surveyor: *B.Munkh-Od*

Description sheet of CONTROL POINT AND BENCH MARK

9

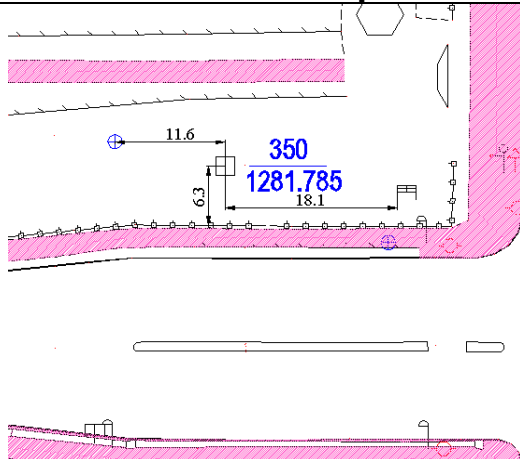
1.	Point name:	<i>350</i>	2.	Center number:	<i>350</i>
3.	Sheet number: (1:1000)	<i>77-c</i>	4.	Network type:	Traverse
5.	Position	<i>Ulaanbaatar city, Bayangol district</i>			
6.	Coordinate:	B=47 54 33.60	L=106 52 57.65	X=5310062.733	Y=640739.252

7. Photo:

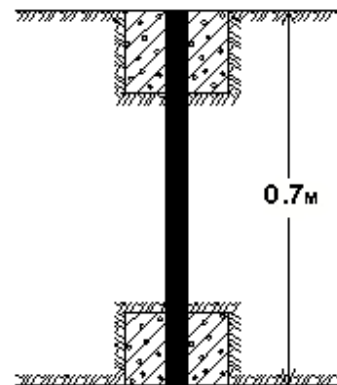


8. Note: It locates in the north garden of Railway Station, which was standing back in 6.3 m from fence, 18.1 m from advertisement board, and 11.6 m from well.

9. Location map:



10. Center type:



11. a. Reconnoitre **(b) Established**

12. Date: *2012-06-14*

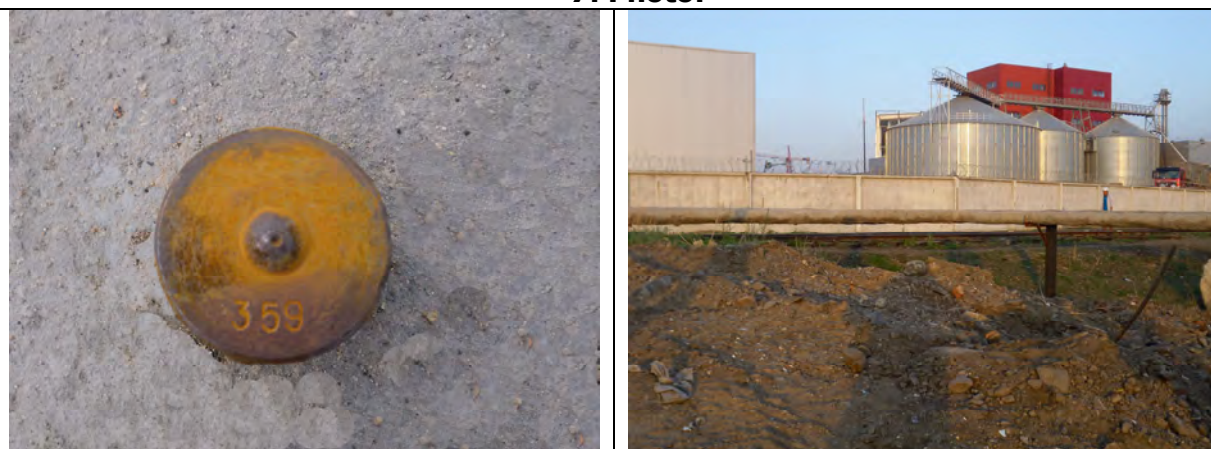
13. Surveyor: *B.Batmunkh*

14. Chief Surveyor: *B.Munkh-Od*

**Description sheet of
CONTROL POINT AND BENCH MARK
10**

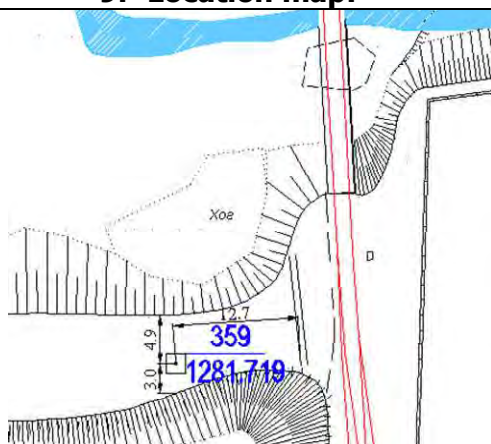
1.	Point name:	<i>359</i>		2.	Center number:	<i>359</i>	
3.	Sheet number: (1:1000)	<i>76-b</i>		4.	Network type:	Traverse	
5.	Position	<i>Ulaanbaatar city, Bayangol district</i>					
6.	Coordinate:	B=47 54 18.92	L=106 52 12.81	X=5309586.588	Y=639819.064		

7. Photo:

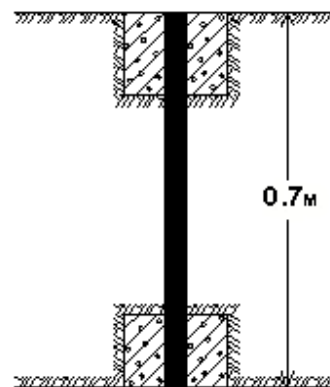


8. Note: It locates on the dam, which was standing back in 3.0 m from south edge and 4.9 m from north edge of the dam, and 12.7 m from heat pipe.

9. Location map:



10. Center type:



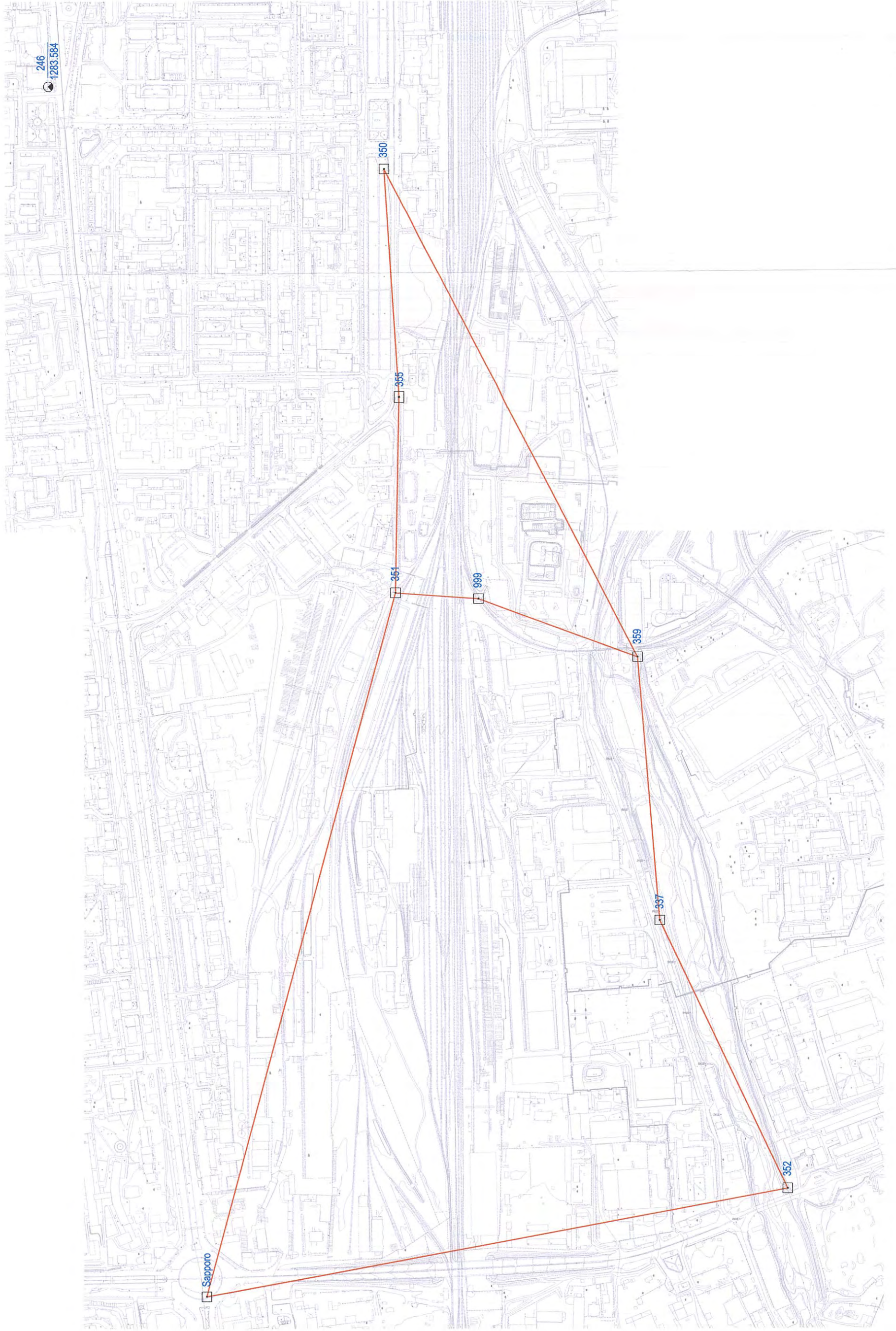
11. a. Reconnoitre **(b) Establisied**

12. Date: *2012-06-14*

13. Surveyor: *B.Batmunkh*

14. Chief Surveyor: *B.Munkh-Od*

THE SKETCH OF CONTROL NETWORK'S MEASUREMENT



SUBNET New Subnet POINTS: ADJUSTED COORDINATES in WGS84(BLH)

Point		Coordinates				Signmas(mmm)			Corr.(%)		
#	Name	Comment	Latitude	Longitude	height(m)	s(N)	s(E)	s(U)	N-E	N-U	E-U
1	0003-nambah		47°54'45.97030"N	106°51'15.81490"E	1240.0152	0.2	0.1	0.5	-7	-4	9
2	336-od		47°54'18.91961"N	106°52'12.80976"E	1243.9806	0.2	0.1	0.4	-8	-5	8
3	337-riko		47°54'17.95711"N	106°51'48.85605"E	1242.4041	0.1	0.1	0.4	-9	-7	8
4	ebo_253		47°54'10.56521"N	106°51'24.28479"E	1241.2235	0.3	0.2	0.6	-11	-1	11
5	galsan		47°54'11.66263"N	106°52'17.23146"E	1243.3027	0.2	0.2	1.2	12	-11	-22
6	nambah		47°54'33.60367"N	106°52'57.65452"E	1244.0638	0.5	0.4	1.5	-11	-1	10
7	riko		47°54'33.51752"N	106°52'19.18961"E	1242.8552	0.4	0.4	1.5	-14	1	14

Coordinate list of new Control points

Point ID	Coordinates (ITRF97)		Height
	X	Y	
350	5310062.733	640739.252	1281.785
359	5309586.588	639819.064	1281.719
351	5310040.644	639940.614	1280.609
337	5309544.833	639322.357	1280.166
352	5309304.245	638817.597	1279.012
355	5310034.333	640309.319	1281.489
999	5309885.202	639929.205	1282.466

DL-100 LEVELING TEXT

Company: Topsurvey

JOB#:0614 START BM#:528 14/6/2012 14:10
 GH(m): 1277.416

Dist.(m)	Staf.(m)				
528	19	0.3819		14:10	
1	20.79	1.2605	1276.5374	14:11	
1	32.76	1.5719		14:12	
2	29.48	0.5638	1277.5455	14:13	
2	42.58	2.1555		14:15	
3	46.95	1.3504	1278.3506	14:16	
3	55.37	1.7111		14:18	
4	54.27	1.3023	1278.7594	14:19	
4	35.92	1.461		14:21	
5	44.37	1.2293	1278.9911	14:21	
5	13.62	1.4907		14:23	
6	13.39	1.4698	1279.012	14:24	

CHANGING#:352 14/6/2012 14:25
 Relative Height(m): 1.596 Total Relative Height(m): 1.596
 Distance(m): 408.5 Total Distance(m): 408.5
 GH(m): 1279.012

6	72.61	1.3141		14:28	
7	44.17	1.9074	1278.4187	14:29	
7	39.69	0.6864		14:31	
8	40.43	1.5109	1277.5942	14:31	
8	58.5	1.1076		14:34	
9	53.42	0.97	1277.7318	14:35	
9	40.62	1.4923		14:37	
10	40.77	0.8879	1278.3362	14:38	
10	55.81	0.7843		14:41	
11	44.41	0.7161	1278.4044	14:42	
11	12.83	2.1917		14:44	
12	14.99	0.9406	1279.6555	14:45	
12	37.73	0.8782		14:47	
13	41.83	0.9168	1279.6169	14:47	
13	45.79	1.5106		14:50	
14	50.81	0.9626	1280.1649	14:50	

CHANGING#:337 14/6/2012 14:51
 Relative Height(m): 1.1529 Total Relative Height(m): 2.7489
 Distance(m): 694.41 Total Distance(m): 1102.91
 GH(m): 1280.1649

14	45.46	1.249	14:54	
15	43.68	1.0341	1280.3798	14:54
15	51.63	1.4733	14:57	
16	55.3	1.2388	1280.6143	14:58
16	63.31	2.0023	15:02	
17	54.9	1.456	1281.1606	15:03
17	55.29	0.9069	15:05	
18	47.34	2.4936	1279.5739	15:06
18	32.89	0.1153	15:09	
19	37.29	1.4492	1278.24	15:12
19	44.49	1.6913	15:17	
20	19.96	0.0494	1279.8819	15:18
20	20.77	2.3885	15:20	
21	23.95	0.5523	1281.7181	15:21

CHANGING#:359 14/6/2012 15:21
 Relative Height(m): 1.5532 Total Relative Height(m): 4.3021
 Distance(m): 596.26 Total Distance(m): 1699.17
 GH(m): 1281.7181

21	25.85	0.3342	15:24	
22	34.18	1.1221	1280.9302	15:24
22	38.76	1.2011	15:26	
23	52.17	1.3052	1280.8261	15:28
23	42.73	1.1338	15:42	
24	56.07	1.0336	1280.9263	15:42
24	60.95	1.551	15:46	
25	66.46	1.4667	1281.0106	15:47
25	57.75	0.9338	15:52	
26	61.21	0.963	1280.9814	15:52
26	61.7	2.1485	15:56	
27	67.8	0.6651	1282.4648	15:56

CHANGING#:999 14/6/2012 15:56
 Relative Height(m): 0.7467 Total Relative Height(m): 5.0488
 Distance(m): 625.63 Total Distance(m): 2324.8
 GH(m): 1282.465

27	49.86	0.7842	17:27	
28	75.69	1.8928	1281.3562	17:27
28	41.25	1.6857	17:30	
29	49.06	1.7832	1281.2587	17:31
29	58.43	1.1971	17:33	
30	51.13	1.8733	1280.5825	17:33
30	54.15	1.2248	17:36	
31	63.34	1.1998	1280.6075	17:36

CHANGING#:351 14/6/2012 17:36
 Relative Height(m): -1.8573 Total Relative Height(m): 3.1915
 Distance(m): 442.91 Total Distance(m): 2767.71
 GH(m): 1280.608

31	46.89	1.3241	17:38
32	39	1.3138	1280.6178 17:39
32	38.59	1.5396	17:41
33	44.5	1.3061	1280.8513 17:41
33	44.36	1.4804	17:43
34	45.56	1.5224	1280.8093 17:44
34	46.91	1.7399	17:46
35	64.66	1.0608	1281.4884 17:46

CHANGING#:355 14/6/2012 17:47
 Relative Height(m): 0.8809 Total Relative Height(m): 4.0724
 Distance(m): 370.47 Total Distance(m): 3138.18
 GH(m): 1281.488

35	47.87	1.0907	17:50
36	49.15	1.3167	1281.2624 17:50
36	40.26	1.4499	17:53
37	42.47	1.3765	1281.3358 17:54
37	54.72	1.4675	17:56
38	54.64	1.3366	1281.4667 17:56
38	50.39	1.4767	18:00
39	53.28	1.2816	1281.6618 18:00
39	21.29	1.4569	18:03
40	22.43	1.3344	1281.7843 18:03

CHANGING#:350 14/6/2012 18:04
 Relative Height(m): 0.2959 Total Relative Height(m): 4.3683
 Distance(m): 436.5 Total Distance(m): 3574.68
 GH(m): 1281.7843

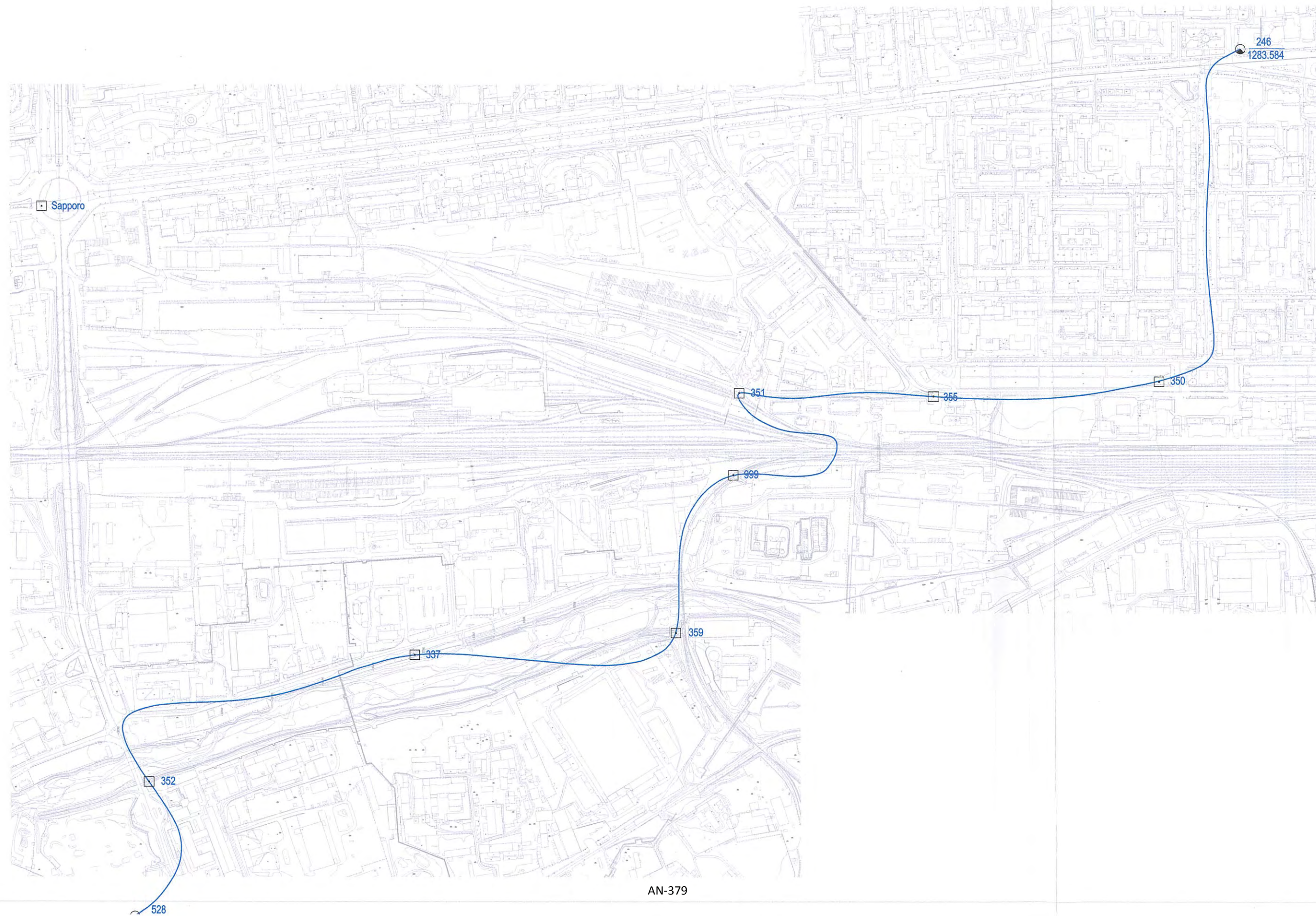
40	23.48	1.3082	18:05
41	23.38	1.5031	1281.5894 18:05
41	45.55	1.635	18:08
42	46.15	1.1248	1282.0996 18:08
42	37.19	1.4516	18:10
43	42.33	1.4585	1282.0927 18:11
43	39.29	1.5487	18:14
44	42	1.3511	1282.2903 18:14
44	46.15	1.3968	18:16
45	43.68	1.3102	1282.3769 18:17
45	48.35	1.4276	18:19

46	40.45	1.2373	1282.5672	18:19
46	39.45	1.524	18:21	
47	49.93	1.4173	1282.6739	18:22
47	32.31	1.3868	18:24	
48	36.68	0.9366	1283.1241	18:25
48	33.94	1.4785	18:29	
49	32.26	1.3805	1283.2221	18:30
49	16.6	1.4155	18:32	
50	13.47	1.0546	1283.583	18:32

CHANGING#:1 14/6/2012 18:33
 Relative Height(m): 1.7987 Total Relative Height(m): 6.167
 Distance(m): 732.64 Total Distance(m): 4307.32
 GH(m): 1283.583

END JOB#:0614 14/6/2012 19:21

THE SKETCH OF LEVELING MEASUREMENT



THE SKETCH OF CENTERLINE AND CROSS SECTION SURVEY



The coordinate list of profiling points

No	X	Y	H	Ch
1	5309394.049	638759.856	1278.668	STA0
2	5309400.333	638778.838	1278.417	0+20
3	5309404.872	638797.245	1277.152	KE1
4	5309408.358	638817.987	1277.192	0+60
5	5309410.586	638837.861	1277.343	0+80
6	5309412.382	638859.249	1276.898	KA1
7	5309414.184	638877.696	1277.588	1+20
8	5309416.894	638897.511	1277.431	1+40
9	5309420.395	638917.201	1277.352	1+60
10	5309424.680	638936.735	1277.690	1+80
11	5309429.742	638956.082	1277.700	SA2
12	5309432.049	638963.979	1277.696	EC2
13	5309435.442	638975.252	1277.735	2+20
14	5309441.207	638994.403	1277.613	2+40
15	5309446.972	639013.555	1277.641	2+60
16	5309452.737	639032.706	1277.636	2+80
17	5309458.502	639051.857	1277.995	STA3
18	5309464.266	639071.008	1278.470	3+20
19	5309470.031	639090.159	1277.522	3+40
20	5309475.796	639109.310	1277.548	3+60
21	5309481.561	639128.462	1276.521	3+80
22	5309487.326	639147.613	1277.828	STA4
23	5309493.091	639166.764	1278.484	4+20
24	5309498.855	639185.915	1278.004	4+40
25	5309504.620	639205.066	1278.768	4+60
26	5309510.385	639224.217	1279.114	4+80
27	5309516.150	639243.369	1279.187	STA5
28	5309521.915	639262.520	1279.202	5+20
29	5309527.680	639281.671	1279.723	5+40
30	5309533.444	639300.822	1279.791	5+60
31	5309539.209	639319.973	1279.875	5+80
32	5309544.974	639339.124	1279.938	STA6
33	5309550.739	639358.275	1279.983	6+20
34	5309556.504	639377.427	1280.264	6+40
35	5309562.268	639396.578	1280.485	6+60
36	5309568.033	639415.729	1280.232	6+80
37	5309573.798	639434.880	1280.240	STA7
38	5309579.563	639454.031	1280.488	7+20
39	5309585.328	639473.182	1280.577	7+40
40	5309591.093	639492.334	1280.505	7+60
41	5309596.857	639511.485	1280.522	7+80

42	5309602.622	639530.636	1280.683	STA8
43	5309608.387	639549.787	1280.939	8+20
44	5309614.152	639568.938	1281.285	8+40
45	5309619.917	639588.089	1281.332	8+60
46	5309625.682	639607.240	1281.637	8+80
47	5309631.446	639626.392	1280.862	STA9
48	5309637.211	639645.543	1280.584	9+20
49	5309642.976	639664.694	1279.561	9+40
50	5309648.741	639683.845	1278.889	9+60
51	5309654.506	639702.996	1279.357	9+80
52	5309660.271	639722.147	1279.127	STA10
53	5309662.200	639728.558	1279.428	KA3-1
54	5309666.073	639741.287	1281.063	10+20
55	5309672.387	639760.262	1281.153	10+40
56	5309678.582	639775.761	1280.642	KE3-1
57	5309679.947	639778.772	1280.373	10+60
58	5309689.248	639796.468	1280.158	10+80
59	5309700.270	639813.147	1280.490	STA11
60	5309712.901	639828.643	1280.833	11+20
61	5309727.016	639842.800	1280.373	11+40
62	5309742.474	639855.477	1280.260	11+60
63	5309759.121	639866.548	1280.366	11+80
64	5309776.790	639875.901	1280.036	STA12
65	5309795.304	639883.444	1279.910	12+20
66	5309802.382	639885.776	1279.884	KE3-2
67	5309814.470	639889.133	1279.736	12+40
68	5309834.011	639893.379	1280.013	12+60
69	5309851.183	639896.498	1282.011	KA3-2
70	5309873.353	639900.603	1280.452	STA13
71	5309892.826	639905.148	1280.461	13+20
72	5309899.984	639907.221	1280.210	KE4-1
73	5309911.849	639911.298	1280.739	13+40
74	5309930.165	639919.310	1281.117	13+60
75	5309947.589	639929.110	1280.489	13+80
76	5309963.948	639940.601	1280.134	STA14
77	5309979.079	639953.668	1280.320	14+20
78	5309992.829	639968.180	1280.392	14+40
79	5310005.061	639983.992	1280.500	14+60
80	5310015.654	640000.947	1283.259	14+80
81	5310024.502	640018.874	1282.462	STA15
82	5310031.515	640037.595	1280.894	15+20
83	5310036.624	640056.923	1280.566	15+40
84	5310039.295	640072.606	1280.713	KE4-2
85	5310039.780	640076.664	1280.717	15+60
86	5310041.179	640096.611	1280.721	15+80
87	5310041.543	640116.607	1280.747	STA16
88	5310041.570	640122.519	1280.745	KA4-2

89	5310041.624	640136.606	1280.752	16+20
90	5310041.702	640156.606	1280.769	16+40
91	5310041.780	640176.606	1280.816	16+60
92	5310041.857	640196.606	1280.863	16+80
93	5310041.935	640216.606	1280.894	STA17
94	5310042.012	640236.606	1280.978	17+20
95	5310042.090	640256.606	1281.027	17+40
96	5310042.168	640276.605	1281.221	17+60
97	5310042.245	640296.605	1281.051	17+80
98	5310042.323	640316.605	1281.016	STA18
99	5310042.400	640336.605	1281.041	18+20
100	5310042.478	640356.605	1281.064	18+40
101	5310042.556	640376.605	1281.081	18+60
102	5310042.633	640396.605	1281.100	18+80
103	5310042.711	640416.604	1281.117	STA19
104	5310042.788	640436.604	1281.146	19+20
105	5310042.866	640456.604	1281.148	19+40
106	5310042.944	640476.604	1281.179	19+60
107	5310043.021	640496.604	1281.196	19+80
108	5310043.099	640516.604	1281.238	STA20
109	5310043.177	640536.603	1281.272	20+20
110	5310043.254	640556.603	1281.277	20+40
111	5310043.332	640576.603	1281.338	20+60
112	5310043.409	640596.603	1281.334	20+80
113	5310043.487	640616.603	1281.380	STA21
114	5310043.565	640636.603	1281.393	21+20
115	5310043.642	640656.603	1281.406	21+40
116	5310043.720	640676.602	1281.429	21+60
117	5310043.797	640696.602	1281.460	21+80
118	5310043.875	640716.602	1281.506	STA22
119	5310043.953	640736.602	1281.760	22+20
120	5310044.030	640756.602	1281.572	22+40
121	5310044.108	640776.602	1281.573	22+60

