Volume.2

1. Water Supply Plan

1. Water Supply Plan
Data 2.1.1 :Population Projection by Each Kebele

Sr No.	Zone	Woreda	No.	Kebele	Population Projection								
					2012	2013	2014	2015	2016	2017	2018	2019	2020
1	Fafan	Kabribeyah	1	Aleybadey	5,089	5,237	5,389	5,546	5,707	5,873	6,044	6,220	6,401
2	Fafan	Kabribeyah	2	Bariisle	5,000	5,146	5,296	5,450	5,609	5,772	5,940	6,113	6,291
3	Fafan	Kabribeyah	3	Calandhgeley	3,000	3,087	3,177	3,269	3,364	3,462	3,563	3,667	3,774
4	Fafan	Kabribeyah	4	Dalaandhige	3,000	3,087	3,177	3,269	3,364	3,462	3,563	3,667	3,774
5	Fafan	Kabribeyah	5	Daynaba	5,058	5,205	5,356	5,512	5,672	5,837	6,007	6,182	6,362
6	Fafan	Kabribeyah	6	Dhurwale	6,117	6,295	6,478	6,667	6,861	7,061	7,266	7,477	7,695
7	Fafan	Kabribeyah	7	Dibiile	5,366	5,522	5,683	5,848	6,018	6,193	6,373	6,558	6,749
8	Fafan	Kabribeyah	8	Duriya	7,226	7,436	7,652	7,875	8,104	8,340	8,583	8,833	9,090
9	Fafan	Kabribeyah	9	Eegato	5,118	5,267	5,420	5,578	5,740	5,907	6,079	6,256	6,438
10	Fafan	Kabribeyah	10	Fadeyge	5,144	5,294	5,448	5,607	5,770	5,938	6,111	6,289	6,472
11	Fafan	Kabribeyah	11	Farda	7,519	7,738	7,963	8,195	8,433	8,678	8,931	9,191	9,458
12	Fafan	Kabribeyah	12	Ganbi	5,043	5,190	5,341	5,496	5,656	5,821	5,990	6,164	6,343
13	Fafan	Kabribeyah	13	Garbiile	7,314	7,527	7,746	7,971	8,203	8,442	8,688	8,941	9,201
14	Fafan	Kabribeyah	14	Gitlo	6,006	6,181	6,361	6,546	6,736	6,932	7,134	7,342	7,556
15	Fafan	Kabribeyah	15	Golgeno	5,010	5,156	5,306	5,460	5,619	5,783	5,951	6,124	6,302
16	Fafan	Kabribeyah	16	Guyow	5,046	5,193	5,344	5,500	5,660	5,825	5,995	6,169	6,349
17	Fafan	Kabribeyah	17	Harre	5,243	5,396	5,553	5,715	5,881	6,052	6,228	6,409	6,596
18	Fafan	Kabribeyah	18	Hartasheekha	12,981	13,359	13,748	14,148	14,560	14,984	15,420	15,869	16,331
19	Fafan	Kabribeyah	19	Horo Khalif	8,488	8,735	8,989	9,251	9,520	9,797	10,082	10,375	10,677
20	Fafan	Kabribeyah	20	Jingadle	5,013	5,159	5,309	5,463	5,622	5,786	5,954	6,127	6,305
21	Fafan	Kabribeyah	21	Kabribayah	40,045	41,210	42,409	43,643	44,913	46,220	47,565	48,949	50,373
22	Fafan	Kabribeyah	22	Labashaag	5,009	5,155	5,305	5,459	5,618	5,781	5,949	6,122	6,300
23	Fafan	Kabribeyah	23	Mara-gaaji	5,013	5,159	5,309	5,463	5,622	5,786	5,954	6,127	6,305
24	Fafan	Kabribeyah	24	Oomen	3,000	3,087	3,177	3,269	3,364	3,462	3,563	3,667	3,774
25	Fafan	Kabribeyah	25	Qaaxa	5,012	5,158	5,308	5,462	5,621	5,785	5,953	6,126	6,304
26	Fafan	Kabribeyah	26	Qabri Hanteen	4,840	4,981	5,126	5,275	5,429	5,587	5,750	5,917	6,089
27	Fafan	Kabribeyah	27	Qooraan	5,004	5,150	5,300	5,454	5,613	5,776	5,944	6,117	6,295
28	Fafan	Kabribeyah	28	Qoto-roble	5,015	5,161	5,311	5,466	5,625	5,789	5,957	6,130	6,308
29	Fafan	Kabribeyah	29	Risle	5,489	5,649	5,813	5,982	6,156	6,335	6,519	6,709	6,904
30	Fafan	Kabribeyah	30	Warabogiro	5,119	5,268	5,421	5,579	5,741	5,908	6,080	6,257	6,439
31	Jarar	Araarso	1	Arrarso	21,000	21,611	22,240	22,887	23,553	24,238	24,943	25,669	26,416
32	Jarar	Araarso	2	Dhigrilley	2,500	2,573	2,648	2,725	2,804	2,886	2,970	3,056	3,145
33	Jarar	Araarso	3	Dhiinta Cab	2,500	2,573	2,648	2,725	2,804	2,886	2,970	3,056	3,145
34	Jarar	Araarso	4	Garbadiinle	2,500	2,573	2,648	2,725	2,804	2,886	2,970	3,056	3,145
35	Jarar	Araarso	5	Halgriid	2,500	2,573	2,648	2,725	2,804	2,886	2,970	3,056	3,145
36	Jarar	Araarso	6	Laf-Galooli	2,500	2,573	2,648	2,725	2,804	2,886	2,970	3,056	3,145

Data 2.1.1 :Population Projection by Each Kebele

Sr No.	Zone	Woreda	No.	Kebele	Population Projection								
					2012	2013	2014	2015	2016	2017	2018	2019	2020
37	Jarar	Araarso	7	Magalo Cad	2,500	2,573	2,648	2,725	2,804	2,886	2,970	3,056	3,145
38	Jarar	Araarso	8	Mooyahe	3,100	3,190	3,283	3,379	3,477	3,578	3,682	3,789	3,899
39	Jarar	Araarso	9	Ubaxle	2,500	2,573	2,648	2,725	2,804	2,886	2,970	3,056	3,145
40	Jarar	Dagahbur	1	Bodhley	1,410	1,451	1,493	1,536	1,581	1,627	1,674	1,723	1,773
41	Jarar	Dagahbur	2	Bullele	6,030	6,205	6,386	6,572	6,763	6,960	7,163	7,371	7,585
42	Jarar	Dagahbur	3	Coobale	16,080	16,548	17,030	17,526	18,036	18,561	19,101	19,657	20,229
43	Jarar	Dagahbur	4	Dagahbur	69,500	71,522	73,603	75,745	77,949	80,217	82,551	84,953	87,425
44	Jarar	Dagahbur	5	Dhakabaxaro	1,740	1,791	1,843	1,897	1,952	2,009	2,067	2,127	2,189
45	Jarar	Dagahbur	6	Dhuumodke	1,470	1,513	1,557	1,602	1,649	1,697	1,746	1,797	1,849
46	Jarar	Dagahbur	7	Felfel	1,310	1,348	1,387	1,427	1,469	1,512	1,556	1,601	1,648
47	Jarar	Dagahbur	8	Garawo	9,380	9,653	9,934	10,223	10,520	10,826	11,141	11,465	11,799
48	Jarar	Dagahbur	9	Geliori	870	895	921	948	976	1,004	1,033	1,063	1,094
49	Jarar	Dagahbur	10	Gosolaley	2,010	2,068	2,128	2,190	2,254	2,320	2,388	2,457	2,528
50	Jarar	Dagahbur	11	Higolaley	10,720	11,032	11,353	11,683	12,023	12,373	12,733	13,104	13,485
51	Jarar	Dagahbur	12	Hoodale	12,060	12,411	12,772	13,144	13,526	13,920	14,325	14,742	15,171
52	Jarar	Dagahbur	13	Losgolol	220	226	233	240	247	254	261	269	277
53	Jarar	Dagahbur	14	Sandhore	140	144	148	152	156	161	166	171	176
54	Jarar	Dagahbur	15	Sandixiile	1,610	1,657	1,705	1,755	1,806	1,859	1,913	1,969	2,026
55	Jarar	Dagahbur	16	Sasabane	2,680	2,758	2,838	2,921	3,006	3,093	3,183	3,276	3,371
56	Jarar	Dagahbur	17	Towlene	560	576	593	610	628	646	665	684	704
57	Jarar	Birqod	1	Baka	2,307	2,374	2,443	2,514	2,587	2,662	2,739	2,819	2,901
58	Jarar	Birqod	2	Birqod	10,000	10,291	10,590	10,898	11,215	11,541	11,877	12,223	12,579
59	Jarar	Birqod	3	Cellxaer	1,500	1,544	1,589	1,635	1,683	1,732	1,782	1,834	1,887
60	Jarar	Birqod	4	Gorgain	1,500	1,544	1,589	1,635	1,683	1,732	1,782	1,834	1,887
61	Jarar	Birqod	5	Goomaar	1,500	1,544	1,589	1,635	1,683	1,732	1,782	1,834	1,887
62	Jarar	Birqod	6	Hiigley	1,500	1,544	1,589	1,635	1,683	1,732	1,782	1,834	1,887
63	Jarar	Birqod	7	Xidhgalool	1,500	1,544	1,589	1,635	1,683	1,732	1,782	1,834	1,887
64	Korahe	Shaygosh	1	Biyooley	11,550	11,886	12,232	12,588	12,954	13,331	13,719	14,118	14,529
65	Korahe	Shaygosh	2	Duumaale	11,550	11,886	12,232	12,588	12,954	13,331	13,719	14,118	14,529
66	Korahe	Shaygosh	3	Goomaar	13,920	14,325	14,742	15,171	15,612	16,066	16,534	17,015	17,510
67	Korahe	Shaygosh	4	Shaygosh	12,500	12,864	13,238	13,623	14,019	14,427	14,847	15,279	15,724
68	Korahe	Shaygosh	5	Wejiweji	13,920	14,325	14,742	15,171	15,612	16,066	16,534	17,015	17,510
69	Korahe	Kabridahar	1	Buundat	13,600	13,996	14,403	14,822	15,253	15,697	16,154	16,624	17,108
70	Korahe	Kabridahar	2	Carabacite	13,600	13,996	14,403	14,822	15,253	15,697	16,154	16,624	17,108
71	Korahe	Kabridahar	3	Ceelxaar	13,600	13,996	14,403	14,822	15,253	15,697	16,154	16,624	17,108
72	Korahe	Kabridahar	4	Dalaad	13,600	13,996	14,403	14,822	15,253	15,697	16,154	16,624	17,108
73	Korahe	Kabridahar	5	Dhuure	13,600	13,996	14,403	14,822	15,253	15,697	16,154	16,624	17,108

Data 2.1.1 :Population Projection by Each Kebele

Sr No.	Zone	Woreda	No.	Kebele	Population Projection								
					2012	2013	2014	2015	2016	2017	2018	2019	2020
74	Korahe	Kabridahar	6	Galadiid	10,200	10,497	10,802	11,116	11,439	11,772	12,115	12,468	12,831
75	Korahe	Kabridahar	7	Kabridahar	51,000	52,484	54,011	55,583	57,200	58,865	60,578	62,341	64,155
76	Korahe	Kabridahar	8	Karanbicite	13,600	13,996	14,403	14,822	15,253	15,697	16,154	16,624	17,108
77	Korahe	Kabridahar	9	Lasdhankheyre	21,300	21,920	22,558	23,214	23,890	24,585	25,300	26,036	26,794
78	Korahe	Kabridahar	10	Maraato	10,200	10,497	10,802	11,116	11,439	11,772	12,115	12,468	12,831
79	Korahe	Dova Wein	1	Dova Wein	33,750	34,732	35,743	36,783	37,853	38,955	40,089	41,256	42,457
80	Korahe	Dova Wein	2	Jidale	9,000	9,262	9,532	9,809	10,094	10,388	10,690	11,001	11,321
81	Korahe	Dova Wein	3	Haaraano	9,750	10,034	10,326	10,626	10,935	11,253	11,580	11,917	12,264
82	Korahe	Dova Wein	4	Higloley	15,000	15,437	15,886	16,348	16,824	17,314	17,818	18,337	18,871
83	Korahe	Dova Wein	5	Nagar Weyne	7,500	7,718	7,943	8,174	8,412	8,657	8,909	9,168	9,435
84	Shebele	East Ime	1	Abagorooy	6,910	7,111	7,318	7,531	7,750	7,976	8,208	8,447	8,693
85	Shebele	East Ime	2	Balaay	5,180	5,331	5,486	5,646	5,810	5,979	6,153	6,332	6,516
86	Shebele	East Ime	3	Boraanka	11,290	11,619	11,957	12,305	12,663	13,031	13,410	13,800	14,202
87	Shebele	East Ime	4	Daay	5,310	5,465	5,624	5,788	5,956	6,129	6,307	6,491	6,680
88	Shebele	East Ime	5	East Ime	9,315	9,586	9,865	10,152	10,447	10,751	11,064	11,386	11,717
89	Shebele	East Ime	6	Makule	8,630	8,881	9,139	9,405	9,679	9,961	10,251	10,549	10,856
90	Shebele	East Ime	7	Mukuy	5,310	5,465	5,624	5,788	5,956	6,129	6,307	6,491	6,680
91	Shebele	East Ime	8	Qaruud	8,640	8,891	9,150	9,416	9,690	9,972	10,262	10,561	10,868
92	Shebele	East Ime	9	Qudhacle	5,310	5,465	5,624	5,788	5,956	6,129	6,307	6,491	6,680
93	Shebele	East Ime	10	Siigadheere	7,970	8,202	8,441	8,687	8,940	9,200	9,468	9,744	10,028
94	Shebele	East Ime	11	Siigaley	7,970	8,202	8,441	8,687	8,940	9,200	9,468	9,744	10,028
95	Shebele	East Ime	12	Xidigta	8,630	8,881	9,139	9,405	9,679	9,961	10,251	10,549	10,856
96	Shebele	Danan	1	Burqayar	3,956	4,071	4,189	4,311	4,436	4,565	4,698	4,835	4,976
97	Shebele	Danan	2	Danan	9,800	10,085	10,378	10,680	10,991	11,311	11,640	11,979	12,328
98	Shebele	Danan	3	Dambarweyne	5,409	5,566	5,728	5,895	6,067	6,244	6,426	6,613	6,805
99	Shebele	Danan	4	Qore	5,335	5,490	5,650	5,814	5,983	6,157	6,336	6,520	6,710
100	Shebele	Danan	5	Shinile	5,637	5,801	5,970	6,144	6,323	6,507	6,696	6,891	7,092
101	Shebele	Beeraano	1	Beeraano	6,300	6,483	6,672	6,866	7,066	7,272	7,484	7,702	7,926
102	Shebele	Beeraano	2	Garbo Xandre	3,500	3,602	3,707	3,815	3,926	4,040	4,158	4,279	4,404
103	Shebele	Beeraano	3	Laab	4,500	4,631	4,766	4,905	5,048	5,195	5,346	5,502	5,662
104	Shebele	Beeraano	4	Raranle	8,200	8,439	8,685	8,938	9,198	9,466	9,741	10,024	10,316
105	Shebele	Beeraano	5	Sangabar	4,700	4,837	4,978	5,123	5,272	5,425	5,583	5,745	5,912
106	Shebele	Godey	1	Baarguun	7,912	8,142	8,379	8,623	8,874	9,132	9,398	9,671	9,952
107	Shebele	Godey	2	Badiilaced	5,043	5,190	5,341	5,496	5,656	5,821	5,990	6,164	6,343
108	Shebele	Godey	3	Carmaare	3,583	3,687	3,794	3,904	4,018	4,135	4,255	4,379	4,506
109	Shebele	Godey	4	Cilaan	7,120	7,327	7,540	7,759	7,985	8,217	8,456	8,702	8,955
110	Shebele	Godey	5	Digino	3,777	3,887	4,000	4,116	4,236	4,359	4,486	4,617	4,751

Data 2.1.1 :Population Projection by Each Kebele

Sr No.	Zone	Woreda	No.	Kebele	Population Projection								
					2012	2013	2014	2015	2016	2017	2018	2019	2020
111	Shebele	Godey	6	Duudcade	7,375	7,590	7,811	8,038	8,272	8,513	8,761	9,016	9,278
112	Shebele	Godey	7	Gabicas	7,515	7,734	7,959	8,191	8,429	8,674	8,926	9,186	9,453
113	Shebele	Godey	8	Godey	29,379	30,234	31,114	32,019	32,951	33,910	34,897	35,913	36,958
114	Shebele	Godey	9	Haarwayn	2,931	3,016	3,104	3,194	3,287	3,383	3,481	3,582	3,686
115	Shebele	Godey	10	Hadhaave	10,542	10,849	11,165	11,490	11,824	12,168	12,522	12,886	13,261
116	Shebele	Adadle	1	Bohelxagare	15,000	15,437	15,886	16,348	16,824	17,314	17,818	18,337	18,871
117	Shebele	Adadle	2	Biyoolow	6,958	7,160	7,368	7,582	7,803	8,030	8,264	8,504	8,751
118	Shebele	Adadle	3	Buursareedo	8,402	8,646	8,898	9,157	9,423	9,697	9,979	10,269	10,568
119	Shebele	Adadle	4	Gabal	9,943	10,232	10,530	10,836	11,151	11,475	11,809	12,153	12,507
120	Shebele	Adadle	5	Higlow	6,967	7,170	7,379	7,594	7,815	8,042	8,276	8,517	8,765
121	Shebele	Adadle	6	Hilaguduudo	7,510	7,729	7,954	8,185	8,423	8,668	8,920	9,180	9,447
122	Shebele	Adadle	7	Jeeray	8,352	8,595	8,845	9,102	9,367	9,640	9,921	10,210	10,507
123	Shebele	Adadle	8	Maka Salar	13,518	13,911	14,316	14,733	15,162	15,603	16,057	16,524	17,005
124	Shebele	Adadle	9	Maroodile	9,799	10,084	10,377	10,679	10,990	11,310	11,639	11,978	12,327
125	Shebele	Adadle	10	Siigoole	6,982	7,185	7,394	7,609	7,830	8,058	8,292	8,533	8,781
126	Shebele	Adadle	11	Todob	11,196	11,522	11,857	12,202	12,557	12,922	13,298	13,685	14,083
127	Shebele	Kalafo	1	Af-duub	10,697	11,008	11,328	11,658	11,997	12,346	12,705	13,075	13,455
128	Shebele	Kalafo	2	Alow-i-gadhsii	7,910	8,140	8,377	8,621	8,872	9,130	9,396	9,669	9,950
129	Shebele	Kalafo	3	Baargun	6,756	6,953	7,155	7,363	7,577	7,797	8,024	8,257	8,497
130	Shebele	Kalafo	4	Boholo-Aways	10,134	10,429	10,732	11,044	11,365	11,696	12,036	12,386	12,746
131	Shebele	Kalafo	5	Buurgaado	6,756	6,953	7,155	7,363	7,577	7,797	8,024	8,257	8,497
132	Shebele	Kalafo	6	Dariiqo	9,295	9,565	9,843	10,129	10,424	10,727	11,039	11,360	11,691
133	Shebele	Kalafo	7	Deba-ka-tur	10,414	10,717	11,029	11,350	11,680	12,020	12,370	12,730	13,100
134	Shebele	Kalafo	8	Kabxan	6,756	6,953	7,155	7,363	7,577	7,797	8,024	8,257	8,497
135	Shebele	Kalafo	9	Kalafo	26,908	27,691	28,497	29,326	30,179	31,057	31,961	32,891	33,848
136	Shebele	Kalafo	10	Libro (Niki Niki)	7,460	7,677	7,900	8,130	8,367	8,610	8,861	9,119	9,384
137	Shebele	Mustahil	1	Budul	7,527	7,746	7,971	8,203	8,442	8,688	8,941	9,201	9,469
138	Shebele	Mustahil	2	Cadar-Dhurwa (Fa	5,386	5,543	5,704	5,870	6,041	6,217	6,398	6,584	6,776
139	Shebele	Mustahil	3	Darbane	5,253	5,406	5,563	5,725	5,892	6,063	6,239	6,421	6,608
140	Shebele	Mustahil	4	Dhanyane	5,253	5,406	5,563	5,725	5,892	6,063	6,239	6,421	6,608
141	Shebele	Mustahil	5	Eeyoole	6,323	6,507	6,696	6,891	7,092	7,298	7,510	7,729	7,954
142	Shebele	Mustahil	6	God-Caro	4,953	5,097	5,245	5,398	5,555	5,717	5,883	6,054	6,230
143	Shebele	Mustahil	7	Mirdhis	7,661	7,884	8,113	8,349	8,592	8,842	9,099	9,364	9,636
144	Shebele	Mustahil	8	Mustahil	23,480	24,163	24,866	25,590	26,335	27,101	27,890	28,702	29,537
145	Shebele	Mustahil	9	Saba-Xume	7,394	7,609	7,830	8,058	8,292	8,533	8,781	9,037	9,300
146	Shebele	Rasso	1	Rasso	7,900	8,130	8,367	8,610	8,861	9,119	9,384	9,657	9,938
147	Shebele	Rasso	2	Kebele01	5,500	5,660	5,825	5,995	6,169	6,349	6,534	6,724	6,920

Data 2.1.1 :Population Projection by Each Kebele

Sr No.	Zone	Woreda	No.	Kebele	Population Projection								
					2012	2013	2014	2015	2016	2017	2018	2019	2020
148	Shebele	Rasso	3	Kebele02	5,500	5,660	5,825	5,995	6,169	6,349	6,534	6,724	6,920
149	Shebele	Rasso	4	Kebele03	5,500	5,660	5,825	5,995	6,169	6,349	6,534	6,724	6,920
150	Shebele	Rasso	5	Kebele04	5,500	5,660	5,825	5,995	6,169	6,349	6,534	6,724	6,920
151	Afder	West Ime	1	Abagarow	2,934	3,019	3,107	3,197	3,290	3,386	3,485	3,586	3,690
152	Afder	West Ime	2	Barashibo	2,445	2,516	2,589	2,664	2,742	2,822	2,904	2,989	3,076
153	Afder	West Ime	3	Bilow	1,956	2,013	2,072	2,132	2,194	2,258	2,324	2,392	2,462
154	Afder	West Ime	4	Budshe	2,445	2,516	2,589	2,664	2,742	2,822	2,904	2,989	3,076
155	Afder	West Ime	5	Burdaxor	2,445	2,516	2,589	2,664	2,742	2,822	2,904	2,989	3,076
156	Afder	West Ime	6	Dawin	1,956	2,013	2,072	2,132	2,194	2,258	2,324	2,392	2,462
157	Afder	West Ime	7	Dhaley Bula (Buw	1,467	1,510	1,554	1,599	1,646	1,694	1,743	1,794	1,846
158	Afder	West Ime	8	Finjaawe	1,956	2,013	2,072	2,132	2,194	2,258	2,324	2,392	2,462
159	Afder	West Ime	9	Golbalayo	3,423	3,523	3,626	3,732	3,841	3,953	4,068	4,186	4,308
160	Afder	West Ime	10	Jiiq	1,956	2,013	2,072	2,132	2,194	2,258	2,324	2,392	2,462
161	Afder	West Ime	11	Sufley	1,467	1,510	1,554	1,599	1,646	1,694	1,743	1,794	1,846
162	Afder	West Ime	12	West Ime	6,900	7,101	7,308	7,521	7,740	7,965	8,197	8,436	8,681

Data 2.1.2 : Water Demand Projection by Each Kebele (1/16)

No. **1**
Zone **FAFAN**
Wareda **Kebribeyah**

9 Rural Water Supply in 2015 Unit: m^3/day

No	Item	Population	Domestic Water	Livestock Water	Sub-total	Water Loss	Total
Water demand by each kebele		person	15 l/cap/d	20%		20%	
9.1	Aleybadey	5,546	83.19	16.64	99.83	19.97	119.80
9.2	Bariisle	5,450	81.75	16.35	98.10	19.62	117.72
9.3	Calandhgeley	3,269	49.04	9.81	58.85	11.77	70.62
9.4	Dalaandhige	3,269	49.04	9.81	58.85	11.77	70.62
9.5	Daynaba	5,512	82.68	16.54	99.22	19.84	119.06
9.6	Dhurwale	6,667	100.01	20.00	120.01	24	144.01
9.7	Dibiile	5,848	87.72	17.54	105.26	21.05	126.31
9.8	Duriya	7,875	118.13	23.63	141.76	28.35	170.11
9.9	Eegato	5,578	83.67	16.73	100.40	20.08	120.48
9.10	Fadeyge	5,607	84.11	16.82	100.93	20.19	121.12
9.11	Farda	8,195	122.93	24.59	147.52	29.5	177.02
9.12	Ganbi	5,496	82.44	16.49	98.93	19.79	118.72
9.13	Garbiile	7,971	119.57	23.91	143.48	28.7	172.18
9.14	Gitlo	6,546	98.19	19.64	117.83	23.57	141.40
9.15	Golgeno	5,460	81.90	16.38	98.28	19.66	117.94
9.16	Guyow	5,500	82.50	16.50	99.00	19.8	118.80
9.17	Harre	5,715	85.73	17.15	102.88	20.58	123.46
9.18	Hartasheekha	14,148	212.22	42.44	254.66	50.93	305.59
9.19	Horo Khalif	9,251	138.77	27.75	166.52	33.3	199.82
9.20	Jingadle	5,463	81.95	16.39	98.34	19.67	118.01
9.21	Labashaag	5,459	81.89	16.38	98.27	19.65	117.92
9.22	Mara-gaaji	5,463	81.95	16.39	98.34	19.67	118.01
9.23	Oomen	3,269	49.04	9.81	58.85	11.77	70.62
9.24	Qaaxa	5,462	81.93	16.39	98.32	19.66	117.98
9.25	Qabri Hanteen	5,275	79.13	15.83	94.96	18.99	113.95
9.26	Qooraan	5,454	81.81	16.36	98.17	19.63	117.80
9.27	Qoto-roble	5,466	81.99	16.40	98.39	19.68	118.07
9.28	Risle	5,982	89.73	17.95	107.68	21.54	129.22
9.29	Warabogiro	5,579	83.69	16.74	100.43	20.09	120.52
	Total	175,775	2,636.70	527.36	3,164.06	632.82	3,796.88

10 Urban water supply in 2015 Unit: m^3/day

No	Item	Population	Domestic Water	Institutional Water	Commercial Water	Industrial Water	Livestock Water	Water Loss
Water demand by each kebele		person	Item1	Item2	Item3	Item4	20%(1~4)	30%
10.1	Kabribayah	43,643	992.87	19.44	2.50	1.58	203.28	365.90
10.2	Kabribayah refugee camp	16,340	326.80	0.00	0.00	0.00	0.00	98.04
							Total	2,010.41

Data 2.1.2 : Water Demand Projection by Each Kebele (1/16)

No. **1**
Zone **FAFAN**
Wareda **Kebribeyah**

9 Rural Water Supply in 2020 Unit: m^3/day

No	Item	Population	Domestic Water	Livestock Water	Sub-total	Water Loss	Total
Water demand by each kebele		person	15 l/cap/d	20%		20%	
9.1	Aleybadey	6,401	96.02	19.20	115.22	23.04	138.26
9.2	Bariisle	6,291	94.37	18.87	113.24	22.65	135.89
9.3	Calandhgeley	3,774	56.61	11.32	67.93	13.59	81.52
9.4	Dalaandhige	3,774	56.61	11.32	67.93	13.59	81.52
9.5	Daynaba	6,362	95.43	19.09	114.52	22.9	137.42
9.6	Dhurwale	7,695	115.43	23.09	138.52	27.7	166.22
9.7	Dibiile	6,749	101.24	20.25	121.49	24.3	145.79
9.8	Duriya	9,090	136.35	27.27	163.62	32.72	196.34
9.9	Eegato	6,438	96.57	19.31	115.88	23.18	139.06
9.10	Fadeyge	6,472	97.08	19.42	116.50	23.3	139.80
9.11	Farda	9,458	141.87	28.37	170.24	34.05	204.29
9.12	Ganbi	6,343	95.15	19.03	114.18	22.84	137.02
9.13	Garbiile	9,201	138.02	27.60	165.62	33.12	198.74
9.14	Gitlo	7,556	113.34	22.67	136.01	27.2	163.21
9.15	Golgeno	6,302	94.53	18.91	113.44	22.69	136.13
9.16	Guyow	6,349	95.24	19.05	114.29	22.86	137.15
9.17	Harre	6,596	98.94	19.79	118.73	23.75	142.48
9.18	Hartasheekha	16,331	244.97	48.99	293.96	58.79	352.75
9.19	Horo Khalif	10,677	160.16	32.03	192.19	38.44	230.63
9.20	Jingadle	6,305	94.58	18.92	113.50	22.7	136.20
9.21	Labashaag	6,300	94.50	18.90	113.40	22.68	136.08
9.22	Mara-gaaji	6,305	94.58	18.92	113.50	22.7	136.20
9.23	Oomen	3,774	56.61	11.32	67.93	13.59	81.52
9.24	Qaaxa	6,304	94.56	18.91	113.47	22.69	136.16
9.25	Qabri Hanteen	6,089	91.34	18.27	109.61	21.92	131.53
9.26	Qooraan	6,295	94.43	18.89	113.32	22.66	135.98
9.27	Qoto-roble	6,308	94.62	18.92	113.54	22.71	136.25
9.28	Risle	6,904	103.56	20.71	124.27	24.85	149.12
9.29	Warabogiro	6,439	96.59	19.32	115.91	23.18	139.09
	Total	202,882	3,043.30	608.66	3,651.96	730.39	4,382.35

10 Urban water supply in 2020 Unit: m^3/day

No	Item	Population	Domestic Water	Institutional Water	Commercial Water	Industrial Water	Livestock Water	Water Loss
Water demand by each kebele		person	Item1	Item2	Item3	Item4	20%(1~4)	30%
10.1	Kabribayah	50,373	1,146.00	19.44	2.50	1.58	233.90	421.03
10.2	Kabribayah refugee camp	16,340	326.80	0.00	0.00	0.00	0.00	98.04
							Total	2,249.29

Data 2.1.2 : Water Demand Projection by Each Kebele (2/16)

No. **2**
Zone **JARAR**
Wareda **Araarso**

9 Rural Water Supply in 2015 Unit: m^3/day

No	Item	Population	Domestic Water	Livestock Water	Sub-total	Water Loss	Total
Water demand by each kebele		person	15 l/cap/d	20%		20%	
9.1	Dhigrilley	2,725	40.88	8.18	49.06	9.81	58.87
9.2	Dhiinta Cab	2,725	40.88	8.18	49.06	9.81	58.87
9.3	Garbadiinle	2,725	40.88	8.18	49.06	9.81	58.87
9.4	Halgriid	2,725	40.88	8.18	49.06	9.81	58.87
9.5	Laf-Galooli	2,725	40.88	8.18	49.06	9.81	58.87
9.6	Magalo Cad	2,725	40.88	8.18	49.06	9.81	58.87
9.7	Mooyahe	3,379	50.69	10.14	60.83	12.17	73.00
9.8	Ubaxle	2,725	40.88	8.18	49.06	9.81	58.87
	Total	22,454	336.85	67.40	404.25	80.84	485.09

10 Urban water supply in 2015 Unit: m^3/day

No	Item	Population	Domestic Water	Institutional Water	Commercial Water	Industrial Water	Livestock Water	Water Loss
Water demand by each kebele		person	20 l/cap/d	Item2	Item3	Item4	30%(1~4)	30%
10.1	Arrarso	22,887	457.74	7.24	0.25	0.80	93.21	167.77

Total 727.01

No. **2**
Zone **JARAR**
Wareda **Araarso**

9 Rural Water Supply in 2020 Unit: m^3/day

No	Item	Population	Domestic Water	Livestock Water	Sub-total	Water Loss	Total
Water demand by each kebele		person	15 l/cap/d	20%		20%	
9.1	Dhigrilley	3,145	47.18	9.44	56.62	11.32	67.94
9.2	Dhiinta Cab	3,145	47.18	9.44	56.62	11.32	67.94
9.3	Garbadiinle	3,145	47.18	9.44	56.62	11.32	67.94
9.4	Halgriid	3,145	47.18	9.44	56.62	11.32	67.94
9.5	Laf-Galooli	3,145	47.18	9.44	56.62	11.32	67.94
9.6	Magalo Cad	3,145	47.18	9.44	56.62	11.32	67.94
9.7	Mooyahe	3,899	58.49	11.70	70.19	14.04	84.23
9.8	Ubaxle	3,145	47.18	9.44	56.62	11.32	67.94
	Total	25,914	388.75	77.78	466.53	93.28	559.81

10 Urban water supply in 2020 Unit: m^3/day

No	Item	Population	Domestic Water	Institutional Water	Commercial Water	Industrial Water	Livestock Water	Water Loss
Water demand by each kebele		person	20 l/cap/d	Item2	Item3	Item4	30%(1~4)	30%
10.1	Arrarso	26,416	528.32	7.24	0.25	0.80	107.32	193.18

Total 837.11

Data 2.1.2 : Water Demand Projection by Each Kebele (3/16)

No. **3**
Zone **JARAR**
Wareda **Dagahbur**

9 Rural Water Supply in 2015 Unit: m^3/day

No	Item	Population	Domestic Water	Livestock Water	Sub-total	Water Loss	Total
Water demand by each kebele		person	15 l/cap/d	20%		20%	
9.1	Bodhley	1,536	23.04	4.61	27.65	5.53	33.18
9.2	Bullele	6,572	98.58	19.72	118.30	23.66	141.96
9.3	Coobale	17,526	262.89	52.58	315.47	63.09	378.56
9.4	Dhakabaxaro	1,897	28.46	5.69	34.15	6.83	40.98
9.5	Dhuumodke	1,602	24.03	4.81	28.84	5.77	34.61
9.6	Felfel	1,427	21.41	4.28	25.69	5.14	30.83
9.7	Garawo	10,223	153.35	30.67	184.02	36.8	220.82
9.8	Geliori	948	14.22	2.84	17.06	3.41	20.47
9.9	Gosolaley	2,190	32.85	6.57	39.42	7.88	47.30
9.10	Higolaley	11,683	175.25	35.05	210.30	42.06	252.36
9.11	Hoodale	13,144	197.16	39.43	236.59	47.32	283.91
9.12	Losgolol	240	3.60	0.72	4.32	0.86	5.18
9.13	Sandhore	152	2.28	0.46	2.74	0.55	3.29
9.14	Sandixiile	1,755	26.33	5.27	31.60	6.32	37.92
9.15	Sasabane	2,921	43.82	8.76	52.58	10.52	63.10
9.16	Towlene	610	9.15	1.83	10.98	2.2	13.18
	Total	74,426	1,116.42	223.29	1,339.71	267.94	1,607.65

10 Urban water supply in 2015 Unit: m^3/day

No	Item	Population	Domestic Water	Institutional Water	Commercial Water	Industrial Water	Livestock Water	Water Loss
Water demand by each kebele		person	20 l/cap/d	Item2	Item3	Item4	30%(1~4)	30%
10.1	Dagahbur	75,745	1,514.90	42.29	1.50	1.20	311.98	561.56

Total 2,433.43

Data 2.1.2 : Water Demand Projection by Each Kebele (3/16)

No. **3**
Zone **JARAR**
Wareda **Dagahbur**

9 Rural Water Supply in 2020 Unit: m^3/day

No	Item	Population	Domestic Water	Livestock Water	Sub-total	Water Loss	Total
Water demand by each kebele		person	15 l/cap/d	20%		20%	
9.1	Bodhley	1,773	26.60	5.32	31.92	6.38	38.30
9.2	Bullele	7,585	113.78	22.76	136.54	27.31	163.85
9.3	Coobale	20,229	303.44	60.69	364.13	72.83	436.96
9.4	Dhakabaxaro	2,189	32.84	6.57	39.41	7.88	47.29
9.5	Dhuumodke	1,849	27.74	5.55	33.29	6.66	39.95
9.6	Felfel	1,648	24.72	4.94	29.66	5.93	35.59
9.7	Garawo	11,799	176.99	35.40	212.39	42.48	254.87
9.8	Geliori	1,094	16.41	3.28	19.69	3.94	23.63
9.9	Gosolaley	2,528	37.92	7.58	45.50	9.1	54.60
9.10	Higolaley	13,485	202.28	40.46	242.74	48.55	291.29
9.11	Hoodale	15,171	227.57	45.51	273.08	54.62	327.70
9.12	Losgolol	277	4.16	0.83	4.99	1	5.99
9.13	Sandhore	176	2.64	0.53	3.17	0.63	3.80
9.14	Sandixiile	2,026	30.39	6.08	36.47	7.29	43.76
9.15	Sasabane	3,371	50.57	10.11	60.68	12.14	72.82
9.16	Towlene	704	10.56	2.11	12.67	2.53	15.20
	Total	85,904	1,288.61	257.72	1,546.33	309.27	1,855.60

10 Urban water supply in 2020 Unit: m^3/day

No	Item	Population	Domestic Water	Institutional Water	Commercial Water	Industrial Water	Livestock Water	Water Loss
Water demand by each kebele		person	20 l/cap/d	Item2	Item3	Item4	30%(1~4)	30%
10.1	Dagahbur	87,425	1,748.50	42.29	1.50	1.20	358.70	645.66

Total 2,797.85

Data 2.1.2 : Water Demand Projection by Each Kebele (4/16)

No. **4**
Zone **JARAR**
Wareda **Birqod**

9 Rural Water Supply in 2015 Unit: m^3/day

No	Item	Population	Domestic Water	Livestock Water	Sub-total	Water Loss	Total
Water demand by each kebele		person	15 l/cap/d	20%		20%	
9.1	Baka	2,514	37.71	7.54	45.25	9.05	54.30
9.2	Cellxaer	1,635	24.53	4.91	29.44	5.89	35.33
9.3	Gorgain	1,635	24.53	4.91	29.44	5.89	35.33
9.4	Goomaar	1,635	24.53	4.91	29.44	5.89	35.33
9.5	Hiigley	1,635	24.53	4.91	29.44	5.89	35.33
9.6	Xidhgalool	1,635	24.53	4.91	29.44	5.89	35.33
	Total	10,689	160.36	32.09	192.45	38.50	230.95

10 Urban water supply in 2015 Unit: m^3/day

No	Item	Population	Domestic Water	Institutional Water	Commercial Water	Industrial Water	Livestock Water	Water Loss
Water demand by each kebele		person	20 l/cap/d	Item2	Item3	Item4	30%(1~4)	30%
10.1	Birqod	10,898	217.96	18.17	0.00	2.50	47.73	85.91

Total 372.27

No. **4**
Zone **JARAR**
Wareda **Birqod**

9 Rural Water Supply in 2020 Unit: m^3/day

No	Item	Population	Domestic Water	Livestock Water	Sub-total	Water Loss	Total
Water demand by each kebele		person	15 l/cap/d	20%		20%	
9.1	Baka	2,901	43.52	8.70	52.22	10.44	62.66
9.2	Cellxaer	1,887	28.31	5.66	33.97	6.79	40.76
9.3	Gorgain	1,887	28.31	5.66	33.97	6.79	40.76
9.4	Goomaar	1,887	28.31	5.66	33.97	6.79	40.76
9.5	Hiigley	1,887	28.31	5.66	33.97	6.79	40.76
9.6	Xidhgalool	1,887	28.31	5.66	33.97	6.79	40.76
	Total	12,336	185.07	37.00	222.07	44.39	266.46

10 Urban water supply in 2020 Unit: m^3/day

No	Item	Population	Domestic Water	Institutional Water	Commercial Water	Industrial Water	Livestock Water	Water Loss
Water demand by each kebele		person	20 l/cap/d	Item2	Item3	Item4	30%(1~4)	30%
10.1	Birqod	12,579	251.58	18.17	0.00	2.50	54.45	98.01

Total 424.71

Data 2.1.2 : Water Demand Projection by Each Kebele (5/16)

No. **5**
Zone **KORAHE**
Wareda **Shaygosh**

9 Rural Water Supply in 2015 Unit: m^3/day

No	Item	Population	Domestic Water	Livestock Water	Sub-total	Water Loss	Total
Water demand by each kebele		person	15 l/cap/d	20%		20%	
9.1	Biyooley	12,588	188.82	37.76	226.58	45.32	271.90
9.2	Duumaale	12,588	188.82	37.76	226.58	45.32	271.90
9.3	Goomaar	15,171	227.57	45.51	273.08	54.62	327.70
9.4	Wejiweji	15,171	227.57	45.51	273.08	54.62	327.70
	Total	55,518	832.78	166.54	999.32	199.88	1,199.20

10 Urban water supply in 2015 Unit: m^3/day

No	Item	Population	Domestic Water	Institutional Water	Commercial Water	Industrial Water	Livestock Water	Water Loss
Water demand by each kebele		person	20 l/cap/d	Item2	Item3	Item4	30%(1~4)	30%
10.1	Shaygosh	13,623	272.46	50.25	0.25	2.38	65.07	117.12

Total 507.53

No. **5**
Zone **KORAHE**
Wareda **Shaygosh**

9 Rural Water Supply in 2020 Unit: m^3/day

No	Item	Population	Domestic Water	Livestock Water	Sub-total	Water Loss	Total
Water demand by each kebele		person	15 l/cap/d	20%		20%	
9.1	Biyooley	14,529	217.94	43.59	261.53	52.31	313.84
9.2	Duumaale	14,529	217.94	43.59	261.53	52.31	313.84
9.3	Goomaar	17,510	262.65	52.53	315.18	63.04	378.22
9.4	Wejiweji	17,510	262.65	52.53	315.18	63.04	378.22
	Total	64,078	961.18	192.24	1,153.42	230.70	1,384.12

10 Urban water supply in 2020 Unit: m^3/day

No	Item	Population	Domestic Water	Institutional Water	Commercial Water	Industrial Water	Livestock Water	Water Loss
Water demand by each kebele		person	20 l/cap/d	Item2	Item3	Item4	30%(1~4)	30%
10.1	Shaygosh	15,724	314.48	50.25	0.25	2.38	73.47	132.25

Total 573.08

Data 2.1.2 : Water Demand Projection by Each Kebele (6/16)

No. **6**
Zone **KORAHE**
Wareda **Kabridahar**

9 Rural Water Supply in 2015 Unit: m^3/day

No	Item	Population	Domestic Water	Livestock Water	Sub-total	Water Loss	Total
Water demand by each kebele		person	15 l/cap/d	20%		20%	
9.1	Buundat	14,822	222.33	44.47	266.80	53.36	320.16
9.2	Carabacite	14,822	222.33	44.47	266.80	53.36	320.16
9.3	Ceelxaar	14,822	222.33	44.47	266.80	53.36	320.16
9.4	Dalaad	14,822	222.33	44.47	266.80	53.36	320.16
9.5	Dhuure	14,822	222.33	44.47	266.80	53.36	320.16
9.6	Galadiid	11,116	166.74	33.35	200.09	40.02	240.11
9.7	Karanbicite	14,822	222.33	44.47	266.80	53.36	320.16
9.8	Lasdhankheyre	23,214	348.21	69.64	417.85	83.57	501.42
9.9	Maraato	11,116	166.74	33.35	200.09	40.02	240.11
	Total	134,378	2,015.67	403.16	2,418.83	483.77	2,902.60

10 Urban water supply in 2015 Unit: m^3/day

No	Item	Population	Domestic Water	Institutional Water	Commercial Water	Industrial Water	Livestock Water	Water Loss
Water demand by each kebele		person	20 l/cap/d	Item2	Item3	Item4	30%(1~4)	30%
10.1	Kabridahar	55,583	1,111.66	16.86	1.50	2.10	226.42	407.56

Total 1,766.10

No. **6**
Zone **KORAHE**
Wareda **Kabridahar**

9 Rural Water Supply in 2020 Unit: m^3/day

No	Item	Population	Domestic Water	Livestock Water	Sub-total	Water Loss	Total
Water demand by each kebele		person	15 l/cap/d	20%		20%	
9.1	Buundat	17,108	256.62	51.32	307.94	61.59	369.53
9.2	Carabacite	17,108	256.62	51.32	307.94	61.59	369.53
9.3	Ceelxaar	17,108	256.62	51.32	307.94	61.59	369.53
9.4	Dalaad	17,108	256.62	51.32	307.94	61.59	369.53
9.5	Dhuure	17,108	256.62	51.32	307.94	61.59	369.53
9.6	Galadiid	12,831	192.47	38.49	230.96	46.19	277.15
9.7	Karanbicite	17,108	256.62	51.32	307.94	61.59	369.53
9.8	Lasdhankheyre	26,794	401.91	80.38	482.29	96.46	578.75
9.9	Maraato	12,831	192.47	38.49	230.96	46.19	277.15
	Total	155,104	2,326.57	465.28	2,791.85	558.38	3,350.23

10 Urban water supply in 2020 Unit: m^3/day

No	Item	Population	Domestic Water	Institutional Water	Commercial Water	Industrial Water	Livestock Water	Water Loss
Water demand by each kebele		person	20 l/cap/d	Item2	Item3	Item4	30%(1~4)	30%
10.1	Kabridahar	64,155	1,283.10	16.86	1.50	2.10	260.71	469.28

Total 2,033.55

Data 2.1.2 : Water Demand Projection by Each Kebele (7/16)

No. **7**
Zone **KORAHE**
Wareda **Doba Wein**

9 Rural Water Supply in 2015 Unit: m^3/day

No	Item	Population	Domestic Water	Livestock Water	Sub-total	Water Loss	Total
Water demand by each kebele		person	15 l/cap/d	20%		20%	
9.1	Jidale	9,809	147.14	29.43	176.57	35.31	211.88
9.2	Haaraano	10,626	159.39	31.88	191.27	38.25	229.52
9.3	Higloley	16,348	245.22	49.04	294.26	58.85	353.11
9.4	Nagar Weyne	8,174	122.61	24.52	147.13	29.43	176.56
	Total	44,957	674.36	134.87	809.23	161.84	971.07

10 Urban water supply in 2015 Unit: m^3/day

No	Item	Population	Domestic Water	Institutional Water	Commercial Water	Industrial Water	Livestock Water	Water Loss
Water demand by each kebele		person	20l/cap/d	Item2	Item3	Item4	30%(1~4)	30%
10.1	Dova Wein	36,783	735.66	75.23	1.00	1.80	162.74	292.93

Total 1,269.36

No. **7**
Zone **KORAHE**
Wareda **Doba Wein**

9 Rural Water Supply in 2020 Unit: m^3/day

No	Item	Population	Domestic Water	Livestock Water	Sub-total	Water Loss	Total
Water demand by each kebele		person	15 l/cap/d	20%		20%	
9.1	Jidale	11,321	169.82	33.96	203.78	40.76	244.54
9.2	Haaraano	12,264	183.96	36.79	220.75	44.15	264.90
9.3	Higloley	18,871	283.07	56.61	339.68	67.94	407.62
9.4	Nagar Weyne	9,435	141.53	28.31	169.84	33.97	203.81
	Total	51,891	778.38	155.67	934.05	186.82	1,120.87

10 Urban water supply in 2020 Unit: m^3/day

No	Item	Population	Domestic Water	Institutional Water	Commercial Water	Industrial Water	Livestock Water	Water Loss
Water demand by each kebele		person	20 l/cap/d	Item2	Item3	Item4	30%(1~4)	30%
10.1	Doba Wein	42,457	849.14	75.23	1.00	1.80	185.43	333.78

Total 1,446.38

Data 2.1.2 : Water Demand Projection by Each Kebele (8/16)

No. **8**
Zone **SHEBELE**
Wareda **East Ime**

9 Rural Water Supply in 2015 Unit: m^3/day

No	Item	Population	Domestic Water	Livestock Water	Sub-total	Water Loss	Total
Water demand by each kebele		person	15 l/cap/d	20%		20%	
9.1	Abagorooy	7,531	112.97	22.59	135.56	27.11	162.67
9.2	Balaay	5,646	84.69	16.94	101.63	20.33	121.96
9.3	Boraanka	12,305	184.58	36.92	221.50	44.3	265.80
9.4	Daay	5,788	86.82	17.36	104.18	20.84	125.02
9.5	Kbaxley	0	0.00	0.00	0.00	0	0.00
9.6	Makule	9,405	141.08	28.22	169.30	33.86	203.16
9.7	Mukuy	5,788	86.82	17.36	104.18	20.84	125.02
9.8	Qaruud	9,416	141.24	28.25	169.49	33.9	203.39
9.9	Qudhacle	5,788	86.82	17.36	104.18	20.84	125.02
9.10	Siigadheere	8,687	130.31	26.06	156.37	31.27	187.64
9.11	Siigaley	8,687	130.31	26.06	156.37	31.27	187.64
9.12	Xidigta	9,405	141.08	28.22	169.30	33.86	203.16
	Total	88,446	1,326.72	265.34	1,592.06	318.42	1,910.48

10 Urban water supply in 2015 Unit: m^3/day

No	Item	Population	Domestic Water	Institutional Water	Commercial Water	Industrial Water	Livestock Water	Water Loss
Water demand by each kebele		person	20 l/cap/d	Item2	Item3	Item4	30%(1~4)	30%
10.1	East Ime	10,152	203.04	3.78	0.00	1.70	41.70	75.07

Total 325.29

Data 2.1.2 : Water Demand Projection by Each Kebele (8/16)

No. **8**
Zone **SHEBELE**
Wareda **East Ime**

9 Rural Water Supply in 2020 Unit: m^3/day

No	Item	Population	Domestic Water	Livestock Water	Sub-total	Water Loss	Total
Water demand by each kebele		person	15 l/cap/d	20%		20%	
9.1	Abagorooy	8,693	130.40	26.08	156.48	31.3	187.78
9.2	Balaay	6,516	97.74	19.55	117.29	23.46	140.75
9.3	Boraanka	14,202	213.03	42.61	255.64	51.13	306.77
9.4	Daay	6,680	100.20	20.04	120.24	24.05	144.29
9.5	Kbaxley	0	0.00	0.00	0.00	0	0.00
9.6	Makule	10,856	162.84	32.57	195.41	39.08	234.49
9.7	Mukuy	6,680	100.20	20.04	120.24	24.05	144.29
9.8	Qaruud	10,868	163.02	32.60	195.62	39.12	234.74
9.9	Qudhacle	6,680	100.20	20.04	120.24	24.05	144.29
9.10	Siigadheere	10,028	150.42	30.08	180.50	36.1	216.60
9.11	Siigaley	10,028	150.42	30.08	180.50	36.1	216.60
9.12	Xidigta	10,856	162.84	32.57	195.41	39.08	234.49
	Total	102,087	1,531.31	306.26	1,837.57	367.52	2,205.09

10 Urban water supply in 2020 Unit: m^3/day

No	Item	Population	Domestic Water	Institutional Water	Commercial Water	Industrial Water	Livestock Water	Water Loss
Water demand by each kebele		person	20 l/cap/d	Item2	Item3	Item4	30%(1~4)	30%
10.1	East Ime	11,717	234.34	3.78	0.00	1.70	47.96	86.33

Total 374.11

Data 2.1.2 : Water Demand Projection by Each Kebele (9/16)

No. **9**
Zone **SHEBELE**
Wareda **Danan**

9 Rural Water Supply in 2015 Unit: m^3/day

No	Item	Population	Domestic Water	Livestock Water	Sub-total	Water Loss	Total
Water demand by each kebele		person	15 l/cap/d	20%		20%	
9.1	Burqayar	4,311	64.67	12.93	77.60	15.52	93.12
9.2	Dambarweyne	5,895	88.43	17.69	106.12	21.22	127.34
9.3	Qore	5,814	87.21	17.44	104.65	20.93	125.58
9.4	Shinile	6,144	92.16	18.43	110.59	22.12	132.71
	Total	22,164	332.47	66.49	398.96	79.79	478.75

10 Urban water supply in 2015 Unit: m^3/day

No	Item	Population	Domestic Water	Institutional Water	Commercial Water	Industrial Water	Livestock Water	Water Loss
Water demand by each kebele		person	20 l/cap/d	Item2	Item3	Item4	30%(1~4)	30%
10.1	Danan	10,680	213.60	10.09	0.00	1.30	45.00	81.00

Total 350.99

No. **9**
Zone **SHEBELE**
Wareda **Danan**

9 Rural Water Supply in 2020 Unit: m^3/day

No	Item	Population	Domestic Water	Livestock Water	Sub-total	Water Loss	Total
Water demand by each kebele		person	15l/cap/d	20%		20%	
9.1	Burqayar	4,976	74.64	14.93	89.57	17.91	107.48
9.2	Dambarweyne	6,805	102.08	20.42	122.50	24.5	147.00
9.3	Qore	6,710	100.65	20.13	120.78	24.16	144.94
9.4	Shinile	7,092	106.38	21.28	127.66	25.53	153.19
	Total	25,583	383.75	76.76	460.51	92.10	552.61

10 Urban water supply in 2020 Unit: m^3/day

No	Item	Population	Domestic Water	Institutional Water	Commercial Water	Industrial Water	Livestock Water	Water Loss
Water demand by each kebele		person	20 l/cap/d	Item2	Item3	Item4	30%(1~4)	30%
10.1	Danan	12,328	246.56	10.09	0.00	1.30	51.59	92.86

Total 402.40

Data 2.1.2 : Water Demand Projection by Each Kebele (10/16)

No. **10**
Zone **SHEBELE**
Wareda **Beercaano**

9 Rural Water Supply in 2015 Unit: m^3/day

No	Item	Population	Domestic Water	Livestock Water	Sub-total	Water Loss	Total
Water demand by each kebele		person	15 l/cap/d	20%		20%	
9.1	Garbo Xandre	3,815	57.23	11.45	68.68	13.74	82.42
9.2	Laab	4,905	73.58	14.72	88.30	17.66	105.96
9.3	Raranle	8,938	134.07	26.81	160.88	32.18	193.06
9.4	Sangabar	5,123	76.85	15.37	92.22	18.44	110.66
	Total	22,781	341.73	68.35	410.08	82.02	492.10

10 Urban water supply in 2015 Unit: m^3/day

No	Item	Population	Domestic Water	Institutional Water	Commercial Water	Industrial Water	Livestock Water	Water Loss
Water demand by each kebele		person	20 l/cap/d	Item2	Item3	Item4	30%(1~4)	30%
10.1	Beeraano	6,866	137.32	0.23	0.00	0.50	27.61	49.70

Total 215.36

No. **10**
Zone **SHEBELE**
Wareda **Beercaano**

9 Rural Water Supply in 2020 Unit: m^3/day

No	Item	Population	Domestic Water	Livestock Water	Sub-total	Water Loss	Total
Water demand by each kebele		person	15 l/cap/d	20%		20%	
9.1	Garbo Xandre	4,404	66.06	13.21	79.27	15.85	95.12
9.2	Laab	5,662	84.93	16.99	101.92	20.38	122.30
9.3	Raranle	10,316	154.74	30.95	185.69	37.14	222.83
9.4	Sangabar	5,912	88.68	17.74	106.42	21.28	127.70
	Total	26,294	394.41	78.89	473.30	94.65	567.95

10 Urban water supply in 2020 Unit: m^3/day

No	Item	Population	Domestic Water	Institutional Water	Commercial Water	Industrial Water	Livestock Water	Water Loss
Water demand by each kebele		person	20 l/cap/d	Item2	Item3	Item4	30%(1~4)	30%
10.1	Beeraano	7,926	158.52	0.23	0.00	0.50	31.85	57.33

Total 248.43

Data 2.1.2 : Water Demand Projection by Each Kebele (11/16)

No. **11**
Zone **SHEBELE**
Wareda **Godey**

9 Rural Water Supply in 2015 Unit: m^3/day

No	Item	Population	Domestic Water	Livestock Water	Sub-total	Water Loss	Total
Water demand by each kebele		person	15 l/cap/d	20%		20%	
9.1	Baarguun	8,623	129.35	25.87	155.22	31.04	186.26
9.2	Badiilaced	5,496	82.44	16.49	98.93	19.79	118.72
9.3	Carmaare	3,904	58.56	11.71	70.27	14.05	84.32
9.4	Cilaan	7,759	116.39	23.28	139.67	27.93	167.60
9.5	Digino	4,116	61.74	12.35	74.09	14.82	88.91
9.6	Duudcade	8,038	120.57	24.11	144.68	28.94	173.62
9.7	Gabicas	8,191	122.87	24.57	147.44	29.49	176.93
9.8	Haarwayn	3,194	47.91	9.58	57.49	11.5	68.99
9.9	Hadhaave	11,490	172.35	34.47	206.82	41.36	248.18
9.10	Kunka	0	0.00	0.00	0.00	0	0.00
	Total	60,811	912.18	182.43	1,094.61	218.92	1,313.53

10 Urban water supply in 2015 Unit: m^3/day

No	Item	Population	Domestic Water	Institutional Water	Commercial Water	Industrial Water	Livestock Water	Water Loss
Water demand by each kebele		person	Item1	Item2	Item3	Item4	20%(1~4)	30%
10.1	Godey	32,019	728.43	62.40	2.25	3.40	159.30	286.73
							Total	1,242.51

No. **11**
Zone **SHEBELE**
Wareda **Godey**

9 Rural Water Supply in 2020 Unit: m^3/day

No	Item	Population	Domestic Water	Livestock Water	Sub-total	Water Loss	Total
Water demand by each kebele		person	15 l/cap/d	20%		20%	
9.1	Baarguun	9,952	149.28	29.86	179.14	35.83	214.97
9.2	Badiilaced	6,343	95.15	19.03	114.18	22.84	137.02
9.3	Carmaare	4,506	67.59	13.52	81.11	16.22	97.33
9.4	Cilaan	8,955	134.33	26.87	161.20	32.24	193.44
9.5	Digino	4,751	71.27	14.25	85.52	17.1	102.62
9.6	Duudcade	9,278	139.17	27.83	167.00	33.4	200.40
9.7	Gabicas	9,453	141.80	28.36	170.16	34.03	204.19
9.8	Haarwayn	3,686	55.29	11.06	66.35	13.27	79.62
9.9	Hadhaave	13,261	198.92	39.78	238.70	47.74	286.44
9.10	Kunka	0	0.00	0.00	0.00	0	0.00
	Total	70,185	1,052.80	210.56	1,263.36	252.67	1,516.03

10 Urban water supply in 2020 Unit: m^3/day

No	Item	Population	Domestic Water	Institutional Water	Commercial Water	Industrial Water	Livestock Water	Water Loss
Water demand by each kebele		person	Item1	Item2	Item3	Item4	20%(1~4)	30%
10.1	Godey	36,958	840.81	62.40	2.25	3.40	181.77	327.19
							Total	1,417.82

Data 2.1.2 : Water Demand Projection by Each Kebele (12/16)

No. **12**
Zone **SHEBELE**
Wareda **Adadle**

9 Rural Water Supply in 2015 Unit: m^3/day

No	Item	Population	Domestic Water	Livestock Water	Sub-total	Water Loss	Total
Water demand by each kebele		person	15 l/cap/d	20%		20%	
9.1	Biyoolow	7,582	113.73	22.75	136.48	27.3	163.78
9.2	Buursareedo	9,157	137.36	27.47	164.83	32.97	197.80
9.3	Gabal	10,836	162.54	32.51	195.05	39.01	234.06
9.4	Higlow	7,594	113.91	22.78	136.69	27.34	164.03
9.5	Hilaguduudo	8,185	122.78	24.56	147.34	29.47	176.81
9.6	Jeeray	9,102	136.53	27.31	163.84	32.77	196.61
9.7	Maka Salar	14,733	221.00	44.20	265.20	53.04	318.24
9.8	Maroodile	10,679	160.19	32.04	192.23	38.45	230.68
9.9	Siigoole	7,609	114.14	22.83	136.97	27.39	164.36
9.10	Todob	12,202	183.03	36.61	219.64	43.93	263.57
	Total	97,679	1,465.21	293.06	1,758.27	351.67	2,109.94

10 Urban water supply in 2015 Unit: m^3/day

No	Item	Population	Domestic Water	Institutional Water	Commercial Water	Industrial Water	Livestock Water	Water Loss
Water demand by each kebele		person	20 l/cap/d	Item2	Item3	Item4	30%(1~4)	30%
10.1	Bohelxagare	16,348	326.96	9.26	0.00	0.50	67.34	121.22
							Total	525.28

No. **12**
Zone **SHEBELE**
Wareda **Adadle**

9 Rural Water Supply in 2020 Unit: m^3/day

No	Item	Population	Domestic Water	Livestock Water	Sub-total	Water Loss	Total
Water demand by each kebele		person	15 l/cap/d	20%		20%	
9.1	Biyoolow	8,751	131.27	26.25	157.52	31.5	189.02
9.2	Buursareedo	10,568	158.52	31.70	190.22	38.04	228.26
9.3	Gabal	12,507	187.61	37.52	225.13	45.03	270.16
9.4	Higlow	8,765	131.48	26.30	157.78	31.56	189.34
9.5	Hilaguduudo	9,447	141.71	28.34	170.05	34.01	204.06
9.6	Jeeray	10,507	157.61	31.52	189.13	37.83	226.96
9.7	Maka Salar	17,005	255.08	51.02	306.10	61.22	367.32
9.8	Maroodile	12,327	184.91	36.98	221.89	44.38	266.27
9.9	Siigoole	8,781	131.72	26.34	158.06	31.61	189.67
9.10	Todob	14,083	211.25	42.25	253.50	50.7	304.20
	Total	112,741	1,691.16	338.22	2,029.38	405.88	2,435.26

10 Urban water supply in 2020 Unit: m^3/day

No	Item	Population	Domestic Water	Institutional Water	Commercial Water	Industrial Water	Livestock Water	Water Loss
Water demand by each kebele		person	20 l/cap/d	Item2	Item3	Item4	30%(1~4)	30%
10.1	Bohelxagare	18,871	377.42	9.26	0.00	0.50	77.44	139.39
							Total	604.01

Data 2.1.2 : Water Demand Projection by Each Kebele (13/16)

No. **13**
Zone **SHEBELE**
Wareda **Kalafo**

9 Rural Water Supply in 2015 Unit: m^3/day

No	Item	Population	Domestic Water	Livestock Water	Sub-total	Water Loss	Total
Water demand by each kebele		person	15 l/cap/d	20%		20%	
9.1	Af-duub	11,658	174.87	34.97	209.84	41.97	251.81
9.2	Alow-i-gadhsii	8,621	129.32	25.86	155.18	31.04	186.22
9.3	Baargun	7,363	110.45	22.09	132.54	26.51	159.05
9.4	Boholo-Aways	11,044	165.66	33.13	198.79	39.76	238.55
9.5	Buurgaado	7,363	110.45	22.09	132.54	26.51	159.05
9.6	Dariiqo	10,129	151.94	30.39	182.33	36.47	218.80
9.7	Deba-ka-tur	11,350	170.25	34.05	204.30	40.86	245.16
9.8	Kabxan	7,363	110.45	22.09	132.54	26.51	159.05
9.9	Libro (Niki Niki)	8,130	121.95	24.39	146.34	29.27	175.61
	Total	83,021	1,245.34	249.06	1,494.40	298.90	1,793.30

10 Urban water supply in 2015 Unit: m^3/day

No	Item	Population	Domestic Water	Institutional Water	Commercial Water	Industrial Water	Livestock Water	Water Loss
Water demand by each kebele		person	20 l/cap/d	Item2	Item3	Item4	30%(1~4)	30%
10.1	Kalafo	29,326	586.52	39.57	1.00	3.00	126.02	226.83
							Total	982.94

No. **13**
Zone **SHEBELE**
Wareda **Kalafo**

9 Rural Water Supply in 2020 Unit: m^3/day

No	Item	Population	Domestic Water	Livestock Water	Sub-total	Water Loss	Total
Water demand by each kebele		person	15 l/cap/d	20%		20%	
9.1	Af-duub	13,455	201.83	40.37	242.20	48.44	290.64
9.2	Alow-i-gadhsii	9,950	149.25	29.85	179.10	35.82	214.92
9.3	Baargun	8,497	127.46	25.49	152.95	30.59	183.54
9.4	Boholo-Aways	12,746	191.19	38.24	229.43	45.89	275.32
9.5	Buurgaado	8,497	127.46	25.49	152.95	30.59	183.54
9.6	Dariiqo	11,691	175.37	35.07	210.44	42.09	252.53
9.7	Deba-ka-tur	13,100	196.50	39.30	235.80	47.16	282.96
9.8	Kabxan	8,497	127.46	25.49	152.95	30.59	183.54
9.9	Libro (Niki Niki)	9,384	140.76	28.15	168.91	33.78	202.69
	Total	95,817	1,437.28	287.45	1,724.73	344.95	2,069.68

10 Urban water supply in 2020 Unit: m^3/day

No	Item	Population	Domestic Water	Institutional Water	Commercial Water	Industrial Water	Livestock Water	Water Loss
Water demand by each kebele		person	20 l/cap/d	Item2	Item3	Item4	30%(1~4)	30%
10.1	Kalafo	33,848	676.96	39.57	1.00	3.00	144.11	259.39
							Total	1,124.03

Data 2.1.2 : Water Demand Projection by Each Kebele (14/16)

No. **14**
Zone **SHEBELE**
Wareda **Mustahil**

9 Rural Water Supply in 2015 Unit: m^3/day

No	Item	Population	Domestic Water	Livestock Water	Sub-total	Water Loss	Total
Water demand by each kebele		person	15 l/cap/d	20%		20%	
9.1	Budul	8,203	123.05	24.61	147.66	29.53	177.19
9.2	Cadar-Dhurwa (Faguug)	5,870	88.05	17.61	105.66	21.13	126.79
9.3	Darbane	5,725	85.88	17.18	103.06	20.61	123.67
9.4	Dhanyane	5,725	85.88	17.18	103.06	20.61	123.67
9.5	Eeyoole	6,891	103.37	20.67	124.04	24.81	148.85
9.6	God-Caro	5,398	80.97	16.19	97.16	19.43	116.59
9.7	Mirdhis	8,349	125.24	25.05	150.29	30.06	180.35
9.8	Saba-Xume	8,058	120.87	24.17	145.04	29.01	174.05
	Total	54,219	813.31	162.66	975.97	195.19	1,171.16

10 Urban water supply in 2015 Unit: m^3/day

No	Item	Population	Domestic Water	Institutional Water	Commercial Water	Industrial Water	Livestock Water	Water Loss
Water demand by each kebele		person	20 l/cap/d	Item2	Item3	Item4	30%(1~4)	30%
10.1	Mustahil	25,590	511.80	5.88	0.25	0.50	103.69	186.64
							Total	808.76

No. **14**
Zone **SHEBELE**
Wareda **Mustahil**

9 Rural Water Supply in 2020 Unit: m^3/day

No	Item	Population	Domestic Water	Livestock Water	Sub-total	Water Loss	Total
Water demand by each kebele		person	15 l/cap/d	20%		20%	
9.1	Budul	9,469	142.04	28.41	170.45	34.09	204.54
9.2	Cadar-Dhurwa (Faguug)	6,776	101.64	20.33	121.97	24.39	146.36
9.3	Darbane	6,608	99.12	19.82	118.94	23.79	142.73
9.4	Dhanyane	6,608	99.12	19.82	118.94	23.79	142.73
9.5	Eeyoole	7,954	119.31	23.86	143.17	28.63	171.80
9.6	God-Caro	6,230	93.45	18.69	112.14	22.43	134.57
9.7	Mirdhis	9,636	144.54	28.91	173.45	34.69	208.14
9.8	Saba-Xume	9,300	139.50	27.90	167.40	33.48	200.88
	Total	62,581	938.72	187.74	1,126.46	225.29	1,351.75

10 Urban water supply in 2020 Unit: m^3/day

No	Item	Population	Domestic Water	Institutional Water	Commercial Water	Industrial Water	Livestock Water	Water Loss
Water demand by each kebele		person	20 l/cap/d	Item2	Item3	Item4	30%(1~4)	30%
10.1	Mustahil	29,537	590.74	5.88	0.25	0.50	119.47	215.05
							Total	931.89

Data 2.1.2 : Water Demand Projection by Each Kebele (15/16)

No. **15**
Zone **AFDER**
Wareda **Rasso**

9 Rural Water Supply in 2015 Unit: m^3/day

No	Item	Population	Domestic Water	Livestock Water	Sub-total	Water Loss	Total
Water demand by each kebele		person	15 l/cap/d	20%		20%	
9.1	Kebele01	5,995	89.93	17.99	107.92	21.58	129.50
9.2	Kebele02	5,995	89.93	17.99	107.92	21.58	129.50
9.3	Kebele03	5,995	89.93	17.99	107.92	21.58	129.50
9.4	Kebele04	5,995	89.93	17.99	107.92	21.58	129.50
	Total	23,980	359.72	71.96	431.68	86.32	518.00

10 Urban water supply in 2015 Unit: m^3/day

No	Item	Population	Domestic Water	Institutional Water	Commercial Water	Industrial Water	Livestock Water	Water Loss
Water demand by each kebele		person	20 l/cap/d	Item2	Item3	Item4	30%(1~4)	30%
10.1	Rasso	8,610	172.20	3.32	0.25	0.30	35.21	63.38

Total 274.66

No. **15**
Zone **AFDER**
Wareda **Rasso**

9 Rural Water Supply in 2020 Unit: m^3/day

No	Item	Population	Domestic Water	Livestock Water	Sub-total	Water Loss	Total
Water demand by each kebele		person	15 l/cap/d	20%		20%	
9.1	Kebele01	6,920	103.80	20.76	124.56	24.91	149.47
9.2	Kebele02	6,920	103.80	20.76	124.56	24.91	149.47
9.3	Kebele03	6,920	103.80	20.76	124.56	24.91	149.47
9.4	Kebele04	6,920	103.80	20.76	124.56	24.91	149.47
	Total	27,680	415.20	83.04	498.24	99.64	597.88

10 Urban water supply in 2020 Unit: m^3/day

No	Item	Population	Domestic Water	Institutional Water	Commercial Water	Industrial Water	Livestock Water	Water Loss
Water demand by each kebele		person	20 l/cap/d	Item2	Item3	Item4	30%(1~4)	30%
10.1	Rasso	9,938	198.76	3.32	0.25	0.30	40.53	72.95

Total 316.11

Data 2.1.2 : Water Demand Projection by Each Kebele (16/16)

No. **16**
Zone **AFDER**
Wareda **West Ime**

9 Rural Water Supply in 2015 Unit: m^3/day

No	Item	Population	Domestic Water	Livestock Water	Sub-total	Water Loss	Total
Water demand by each kebele		person	15 l/cap/d	20%		20%	
9.1	Abagarow	3,197	47.96	9.59	57.55	11.51	69.06
9.2	Barashibo	2,664	39.96	7.99	47.95	9.59	57.54
9.3	Bilow	2,132	31.98	6.40	38.38	7.68	46.06
9.4	Budshe	2,664	39.96	7.99	47.95	9.59	57.54
9.5	Burdaxor	2,664	39.96	7.99	47.95	9.59	57.54
9.6	Dawin	2,132	31.98	6.40	38.38	7.68	46.06
9.7	Dhaley Bula (Buwaweyndhage)	1,599	23.99	4.80	28.79	5.76	34.55
9.8	Finjaawe	2,132	31.98	6.40	38.38	7.68	46.06
9.9	Golbalayo	3,732	55.98	11.20	67.18	13.44	80.62
9.10	Jiiq	2,132	31.98	6.40	38.38	7.68	46.06
9.11	Sufley	1,599	23.99	4.80	28.79	5.76	34.55
	Total	26,647	399.72	79.96	479.68	95.96	575.64

10 Urban water supply in 2015 Unit: m^3/day

No	Item	Population	Domestic Water	Institutional Water	Commercial Water	Industrial Water	Livestock Water	Water Loss
Water demand by each kebele		person	20 l/cap/d	Item2	Item3	Item4	30%(1~4)	30%
10.1	West Ime	7,521	150.42	8.21	0.00	0.40	31.81	57.25
							Total	248.09

No. **16**
Zone **AFDER**
Wareda **West Ime**

9 Rural Water Supply in 2020 Unit: m^3/day

No	Item	Population	Domestic Water	Livestock Water	Sub-total	Water Loss	Total
Water demand by each kebele		person	15 l/cap/d	20%		20%	
9.1	Abagarow	3,690	55.35	11.07	66.42	13.28	79.70
9.2	Barashibo	3,076	46.14	9.23	55.37	11.07	66.44
9.3	Bilow	2,462	36.93	7.39	44.32	8.86	53.18
9.4	Budshe	3,076	46.14	9.23	55.37	11.07	66.44
9.5	Burdaxor	3,076	46.14	9.23	55.37	11.07	66.44
9.6	Dawin	2,462	36.93	7.39	44.32	8.86	53.18
9.7	Dhaley Bula (Buwaweyndhage)	1,846	27.69	5.54	33.23	6.65	39.88
9.8	Finjaawe	2,462	36.93	7.39	44.32	8.86	53.18
9.9	Golbalayo	4,308	64.62	12.92	77.54	15.51	93.05
9.10	Jiiq	2,462	36.93	7.39	44.32	8.86	53.18
9.11	Sufley	1,846	27.69	5.54	33.23	6.65	39.88
	Total	30,766	461.49	92.32	553.81	110.74	664.55

10 Urban water supply in 2020 Unit: m^3/day

No	Item	Population	Domestic Water	Institutional Water	Commercial Water	Industrial Water	Livestock Water	Water Loss
Water demand by each kebele		person	20 l/cap/d	Item2	Item3	Item4	30%(1~4)	30%
10.1	West Ime	8,681	173.62	8.21	0.00	0.40	36.45	65.60
							Total	284.28

Data 2.1.3 : Rural Water Supply Facility Plan (1/9)

1. Kabribeyah Woreda Rural Water Supply Facility Plan

ID	Kebele Name	Served pop	Design water supply volume	Water supply Facility design	Water supply facilities	Number of WS facilities	Water supply facilities' specifications										
							H	Q	Gen.	Riser P	Tra D	Tra L	Rev.	Dis D	Dis L	WP	Cattle
		person	m^3/day	m^3/day		nos	m	m^3/min	kVA	inch	mm	m	m^3	mm	m	nos.	nos.
1	Aleybadey	1,964	71.71	107.56	Borehole	1	210	0.20	59	2-1/2	65	100	10	65	600	3	1
2	Bariisle	1,931	70.49	105.74	Borehole	1	210	0.20	59	2-1/2	65	100	10	65	600	3	1
3	Calandhgeley	1,159	42.29	63.43	Borehole	1	210	0.10	37	1-1/4	40	100	10	40	400	2	1
4	Dalaandhige	1,159	42.29	63.43	Borehole	1	210	0.10	37	1-1/4	40	100	10	40	400	2	1
5	Daynaba	1,952	71.28	77.78	Birka	7											
6	Dhurwale	2,361	86.21	129.32	Borehole	1	210	0.25	74	2-1/2	65	100	10	65	600	3	1
7	Dibiile	2,071	75.61	113.42	Birka	7											
8	Duriya	2,790	101.84	266.67	Haffir dam Birka	1 1											
9	Eegato	1,976	72.12	77.78	Birka	7											
10	Fadeyge	1,986	72.51	77.78	Birka	7											
11	Farda	2,902	105.95	158.92	Borehole	1	210	0.30	81	3	80	100	10	80	800	4	1
12	Ganbi	1,946	71.07	77.78	Birka	7											
13	Garbiile	2,824	103.08	154.63	Borehole	1	210	0.30	81	3	80	100	10	80	800	4	1
14	Gitlo	2,319	84.66	88.89	Birka	8											
15	Golgeno	1,934	70.61	77.78	Birka	7											
16	Guyow	1,949	71.15	77.78	Birka	7											
17	Harre	2,024	73.90	77.78	Birka	7											
18	Hartasheekha	5,013	182.97	533.33	Haffir dam	2											
19	Horo Khalif	3,276	119.61	179.42	Borehole	2	210	0.20	59	2-1/2	65	100	10	65	400	2	1
20	Jingadle	1,935	70.64	77.78	Birka	7											
22	Labashaag	1,933	70.57	77.78	Birka	7											
23	Mara-gaaji	1,935	70.64	77.78	Birka	7											
24	Oomen	1,159	42.29	44.44	Birka	4											
25	Qaaxa	1,934	70.62	105.92	Borehole	1	210	0.20	59	2-1/2	65	100	10	65	600	3	1
26	Qabri Hanteen	1,869	68.23	77.78	Birka	7											
27	Qooraan	1,932	70.53	77.78	Birka	7											
28	Qoto-roble	1,935	70.66	77.78	Birka	7											
29	Risle	2,118	77.34	88.89	Birka	8											
30	Warabogiro	1,976	72.14	77.78	Birka	7											

Note Borehole depth average 220m
Maximum yield 5.0lit/sec

Data 2.1.3 : Rural Water Supply Facility Plan (2/9)

2. Araarso Woreda Rural Water Supply Facility Plan

ID	Kebele Name	Served pop	Design water supply volume	Water supply Facility design	Water supply facilities	Number of WS facilities	Water supply facilities' specifications										
							H	Q	Gen.	Riser P	Tra D	Tra L	Rev.	Dis D	Dis L	WP	Cattle
		person	m^3/day	m^3/day		nos	m	m^3/min	kVA	inch	mm	m	m^3	mm	m	nos.	nos.
2	Dhigrilley	965	20.84	33.33	Birka	4											
3	Dhiinta Cab	965	20.84	33.33	Birka	4											
4	Garbadiinle	965	20.84	33.33	Birka	4											
5	Halgriid	965	20.84	33.33	Birka	4											
6	Laf-Galooli	965	20.84	33.33	Birka	4											
7	Magalo Cad	965	20.84	33.33	Birka	4											
8	Mooyahe	1,196	25.83	33.33	Birka	4											
9	Ubaxle	965	20.84	31.27	Borehole	1	240	0.10	40	1-1/4	40	100	10	40	400	2	1

Note Borehole depth average 250m
Maximum yield 1.7lit/sec

Data 2.1.3 : Rural Water Supply Facility Plan (3/9)

3. Dagahbur Woreda Rural Water Supply Facility Plan

ID	Kebele Name	Served pop	Design water supply volume	Water supply Facility design	Water supply facilities	Number of WS facilities	Water supply facilities' specifications										
							H	Q	Gen.	Riser P	Tra D	Tra L	Rev.	Dis D	Dis L	WP	Cattle
		person	m^3/day	m^3/day		nos	m	m^3/min	kVA	inch	mm	m	m^3	mm	m	nos.	nos.
1	Bodhley	544	11.76	16.67	Birka	2											
2	Bullele	2,327	50.28	75.42	Borehole	1	60	0.20	27	2-1/2	65	100	10	65	600	3	1
3	Coobale	6,208	134.11	400.00	Haffir dam	2											
					Birka	4											
5	Dhakabaxaro	671	14.51	25.00	Birka	3											
6	Dhuumodke	567	12.26	16.67	Birka	2											
7	Felfel	506	10.93	16.39	Borehole	1	60	0.10	17	1-1/4	40	100	10	40	200	1	1
8	Garawo	3,621	78.21	200.00	Haffir dam	1											
					Birka	6											
9	Geliori	336	7.25	16.67	Birka	2											
10	Gosolaley	776	16.76	25.00	Birka	3											
11	Higolaley	4,139	89.40	200.00	Haffir dam	1											
					Birka	4											
12	Hoodale	4,656	100.57	150.86	Borehole	1	60	0.30	37	3	80	100	10	80	1200	6	2
13	Losgolol	85	1.85	8.33	Birka	1											
14	Sandhore	54	1.17	8.33	Birka	1											
15	Sandixiile	622	13.42	25.00	Birka	3											
16	Sasabane	1,034	22.34	33.51	Borehole	1	60	0.10	17	1-1/4	40	100	10	40	400	2	1
17	Towlene	216	4.66	6.98	Borehole	1	60	0.10	17	1-1/4	40	100	10	40	200	1	1

Note Borehole depth average 70m
Maximum yield 5.0lit/sec

Data 2.1.3 : Rural Water Supply Facility Plan (4/9)

4. Birqod Woreda Rural Water Supply Facility Plan

ID	Kebele Name	Served pop	Design water supply volume	Water supply Facility design	Water supply facilities	Number of WS facilities	Water supply facilities' specifications										
							H	Q	Gen.	Riser P	Tra D	Tra L	Rev.	Dis D	Dis L	WP	Cattle
		person	m^3/day	m^3/day		nos	m	m^3/min	kVA	inch	mm	m	m^3	mm	m	nos.	nos.
1	Baka	890	19.22	28.83	Borehole	1	50	0.10	8	1-1/4	40	100	10	40	200	1	1
3	Cellxaer	579	12.50	16.67	Birka	2											
4	Goomaar	579	12.50	18.74	Borehole	1	50	0.10	8	1-1/4	40	100	10	40	200	1	1
5	Gorgain	579	12.50	18.74	Borehole	1	50	0.10	8	1-1/4	40	100	10	40	200	1	1
6	Hiigley	579	12.50	18.74	Borehole	1	50	0.10	8	1-1/4	40	100	10	40	200	1	1
7	Xidhgalool	579	12.50	16.67	Birka	2											

Note Borehole depth average 60m
Maximum yield 3.3lit/sec

5. Shaygosh Woreda Rural Water Supply Facility Plan

ID	Kebele Name	Served pop	Design water supply volume	Water supply Facility design	Water supply facilities	Number of WS facilities	Water supply facilities' specifications										
							H	Q	Gen.	Riser P	Tra D	Tra L	Rev.	Dis D	Dis L	WP	Cattle
		person	m^3/day	m^3/day		nos	m	m^3/min	kVA	inch	mm	m	m^3	mm	m	nos.	nos.
1	Biyooley	4,459	96.32	200.00	Haffir dam Birka	1 7											
2	Duumaale	4,459	96.32	200.00	Haffir dam Birka	1 7											
3	Goomaar	5,373	116.06	174.09	Borehole	2	130	0.20	35	2-1/2	65	100	10	65	600	3	1
4	Shaygosh	4,826	167.06	250.58	BH	2	130	0.25	44	65							
5	Wejiweji	5,373	116.06	400.00	Hafir dam Birka	2 2											

Note Borehole depth average 140m
Maximum yield 4.0lit/sec

Data 2.1.3 : Rural Water Supply Facility Plan (5/9)

6. Kabridahar Woreda Rural Water Supply Facility Plan

ID	Kebele Name	Served pop	Design water supply volume	Water supply Facility design	Water supply facilities	Number of WS facilities	Water supply facilities' specifications										
							H	Q	Gen.	Riser P	Tra D	Tra L	Rev.	Dis D	Dis L	WP	Cattle
		person	m^3/day	m^3/day		nos	m	m^3/min	kVA	inch	mm	m	m^3	mm	m	nos.	nos.
1	Buundat	5,250	113.40	400.00	Haffir dam	2											
					Birka	1											
2	Carabacite	5,250	113.40	400.00	Haffir dam	2											
					Birka	1											
3	Ceelxaar	5,250	113.40	170.10	Borehole	2	120	0.20	32	2-1/2	65	100	10	65	600	3	1
4	Dalaad	5,250	113.40	400.00	Haffir dam	2											
					Birka	1											
5	Dhuure	5,250	113.40	400.00	Haffir dam	2											
					Birka	1											
6	Galadiid	3,938	85.06	127.59	Borehole	1	120	0.25	40	2-1/2	65	100	10	65	1000	5	1
8	Karanbicite	5,250	113.40	170.10	Borehole	2	120	0.20	32	2-1/2	65	100	10	65	600	3	1
9	Lasdhankheyre	8,223	177.61	600.00	Haffir dam	3											
					Birka	3											
10	Maraato	3,938	85.06	200.00	Haffir dam	1											
					Birka	5											

Note Borehole depth average 130m
Maximum yield 4.0lit/sec

7. Doba wein Woreda Rural Water Supply Facility Plan

ID	Kebele Name	Served pop	Design water supply volume	Water supply Facility design	Water supply facilities	Number of WS facilities	Water supply facilities' specifications										
							H	Q	Gen.	Riser P	Tra D	Tra L	Rev.	Dis D	Dis L	WP	Cattle
		person	m^3/day	m^3/day		nos	m	m^3/min	kVA	inch	mm	m	m^3	mm	m	nos.	nos.
1	Doba wein	13,031	430.89	646.34	Shallow well	18	20	0.06	3	1	32	100	10	32	200	1	1
2	Jidale	3,474	75.04	112.55	Shallow well	3	20	0.06	3	1	32	100	10	32	400	2	1
3	Haaraano	3,763	81.28	121.93	Shallow well	3	20	0.06	3	1	32	100	10	32	400	2	1
4	Higloley	5,793	125.13	187.70	Shallow well	5	20	0.06	3	1	32	100	10	32	400	2	1
5	Nagar Weyne	2,896	62.56	200.00	Haffir dam	1											
					Birka	1											

Note Shallow well average 25m
Maximum yield 1.0lit/sec

Data 2.1.3 : Rural Water Supply Facility Plan (6/9)

8. East Ime Woreda Rural Water Supply Facility Plan

ID	Kebele Name	Served pop	Design water supply volume	Water supply Facility design	Water supply facilities	Number of WS facilities	Water supply facilities' specifications													
							Sed. Pond	Q1	Filter	Rev. V1	H2	Q2	Gen.	PipeD1	Pipe L1	Rev. V2	Dis D2	Dis L2	WP	Cattle
		person	m^3/day	m^3/day		nos	m^3	m^3/min	Nos	m^3	m	m^3/min	kVA	mm	m	m^3	mm	m	nos.	nos.
1	Abagorooy	8,693	187.78	309.84	River intake	1	144	0.80	3	80	20	0.80	25	90	200	50	90	2,000	10	2
2	Balaay	6,516	140.75	232.24	River intake	1	100	0.60	2	60	30	0.60	25	90	500	40	90	1,600	8	2
3	Boraanka	14,202	306.77	506.17	River intake	1	196	1.10	3	120	30	1.10	44	110	500	80	90	3,200	16	4
4	Daay	6,680	144.29	238.08	River intake	1	100	0.60	2	60	30	0.60	25	90	500	40	90	1,600	8	2
5	East Ime	11,717	374.11	617.28	River intake	1	256	1.20	4	140	20	1.20	36	200	1,900	300	90	7,000	14	3
6	Makule	10,856	234.49	386.91	River intake	1	144	0.80	3	80	40	0.80	41	90	500	60	90	2,600	13	3
7	Mukuy	6,680	144.29	238.08	River intake	1	100	0.60	2	60	30	0.60	25	90	500	40	90	1,600	8	2
8	Qaruud	3,335	72.03	100.00	Birka	12														
9	Qudhacle	2,050	44.27	58.33	Birka	7														
10	Siigadheere	3,078	66.49	91.67	Birka	11														
11	Siigaley	3,078	66.49	91.67	Birka	11														
12	Xidigta	3,332	71.96	100.00	Birka	12														

9. Danan Woreda Rural Water Supply Facility Plan

ID	Kebele Name	Served pop	Design water supply volume	Water supply Facility design	Water supply facilities	Number of WS facilities	Water supply facilities' specifications								
							H	Q	Riser P	Tra D	Tra L	Rev.	Dis L	WP	Cattle
		person	m^3/day	m^3/day		nos	m	m^3/min	inch	mm	m	m^3	m	nos.	nos.
1	Burqayar	1,527	32.98	50.00	Birka	6									
2	Dambarweyne	2,089	45.13	58.33	Birka	7									
3	Danan	3,784	121.61	182.41	Shallow well	5	25	0.06	1	32	100	10	200	1	1
4	Qore	2,059	44.48	66.71	Shallow well	2	25	0.06	1	32	100	10	400	2	1
5	Shinile	2,177	47.02	70.53	Shallow well	2	25	0.06	1	32	100	10	400	2	1

Note Borehole depth average 30m
Maximum yield 1.0lit/sec

10. Beeraano Woreda Rural Water Supply Facility Plan

ID	Kebele Name	Served pop	Design water supply volume	Water supply Facility design	Water supply facilities	Number of WS facilities	Water supply facilities' specifications													
							Sed. Pond	Q1	Filter	Rev. V1	H2	Q2	Gen.	PipeD1	Pipe L1	Rev. V2	Dis D2	Dis L2	WP	Cattle
		person	m^3/day	m^3/day		nos	m^3	m^3/min	Nos	m^3	m	m^3/min	kVA	mm	m	m^3	mm	m	nos.	nos.
1	Beeraano	7,926	248.43	409.91	River intake	1	196	0.90	3	100	20	0.90	27	110	500	200	90	4,500	9	2
2	Garbo Xandre	1,352	29.18	41.67	Birka	5														
3	Laab	5,662	122.30	201.80	River intake	1	100	0.60	2	60	70	0.60	51	110	3,800	40	90	1,400	7	2
4	Raranle	10,316	222.83	367.67	River intake	1	144	0.80	3	80	30	0.80	33	90	300	60	90	2,400	12	3
5	Sangabar	1,814	39.17	58.33	Birka	7														

Data 2.1.3 : Rural Water Supply Facility Plan (7/9)

11. Godey Woreda Rural Water Supply Facility Plan

ID	Kebele Name	Served pop	Design water supply volume	Water supply Facility design	Water supply facilities	Number of WS facilities	Water supply facilities' specifications													
							Sed. Pond	Q1	Filter	Rev. V1	H2	Q2	Gen.	PipeD1	Pipe L1	Rev. V2	Dis D2	Dis L2	WP	Cattle
		person	m^3/day	m^3/day		nos	m^3	m^3/min	Nos	m^3	m	m^3/min	kVA	mm	m	m^3	mm	m	nos.	nos.
1	Baarguun	3,054	65.96	91.67	Birka	11														
2	Badiilaced	6,343	137.02	226.08	River intake	1	100	0.60	2	60	30	0.60	25	90	500	40	90	1,600	8	2
3	Carmaare	1,383	29.87	44.81	Shallow well	1					25	0.06	4	32	100	10	32	400	2	1
4	Cilaan	8,955	193.44	319.18	River intake	1	144	0.80	3	80	40	0.80	41	90	500	50	90	2,000	10	2
5	Digino	4,751	102.62	169.32	River intake	1	64	0.40	2	40	20	0.40	14	90	500	30	90	1,200	6	2
6	Duudcade	9,278	200.40	330.66	River intake	1	144	0.80	3	80	40	0.80	41	90	500	50	90	2,200	11	3
7	Gabicas	2,900	62.65	83.33	Birka	10														
9	Haarwayn	1,131	24.43	33.33	Birka	4														
10	Hadhaave	4,069	87.90	116.67	Birka	14														

Note Borehole depth average 30m
Maximum yield 1.0lit/sec

12. Adadle Woreda Rural Water Supply Facility Plan

ID	Kebele Name	Served pop	Design water supply volume	Water supply Facility design	Water supply facilities	Number of WS facilities	Water supply facilities' specifications													
							Sed. Pond	Q1	Filter	Rev. V1	H2	Q2	Gen.	PipeD1	Pipe L1	Rev. V2	Dis D2	Dis L2	WP	Cattle
		person	m^3/day	m^3/day		nos	m^3	m^3/min	Nos	m^3	m	m^3/min	kVA	mm	m	m^3	mm	m	nos.	nos.
1	Bohelxagare	5,793	183.79	191.67	Birka	23														
2	Biyoolow	2,685	30.78	75.00	Birka	9														
3	Buursareedo	10,568	228.26	376.63	River intake	1	144	0.80	3	80	110	0.80	99	90	1,400	60	90	2,400	12	3
4	Gabal	12,507	270.16	445.76	River intake	1	196	0.90	3	100	100	0.90	101	90	1,000	70	90	2,800	14	3
5	Higlow	2,690	58.12	75.00	Birka	9														
6	Hilaguduudo	2,899	62.61	83.33	Birka	10														
7	Jeeray	3,225	69.67	91.67	Birka	11														
8	Maka Salar	5,219	112.73	150.00	Birka	18														
9	Maroodile	3,784	81.73	108.33	Birka	13														
10	Siigoole	2,694	58.18	75.00	Birka	9														
11	Todob	4,321	93.34	125.00	Birka	15														

Data 2.1.3 : Rural Water Supply Facility Plan (8/9)

13. Kalafo Woreda Rural Water Supply Facility Plan

ID	Kebele Name	Served pop	Design water supply volume	Water supply Facility design	Water supply facilities	Number of WS facilities	Water supply facilities' specifications													
							Sed. Pond	Q1	Filter	Rev. V1	H2	Q2	Gen.	PipeD1	Pipe L1	Rev. V2	Dis D2	Dis L2	WP	Cattle
		person	m^3/day	m^3/day		nos	m^3	m^3/min	Nos	m^3	m	m^3/min	kVA	mm	m	m^3	mm	m	nos.	nos.
1	Af-duub	4,129	89.19	116.67	Birka	14														
2	Alow-i-gadhsii	3,053	65.94	91.67	Birka	11														
3	Baargun	8,497	183.54	302.84	River intake	1	144	0.80	3	80	40	0.80	41	90	500	50	90	2,000	10	2
4	Boholo-Aways	3,911	84.48	116.67	Birka	14														
5	Buurgaado	8,497	183.54	302.84	River intake	1	144	0.80	3	80	70	0.80	66	90	800	50	90	2,000	10	2
6	Dariiqo	3,588	77.49	100.00	Birka	12														
7	Deba-ka-tur	13,100	282.96	466.88	River intake	1	196	0.90	3	100	10	0.90	18	90	100	80	90	3,000	15	3
8	Kabxan	8,497	183.54	302.84	River intake	1	144	0.80	3	80	40	0.80	41	90	500	50	90	2,000	10	2
9	Kalafo	33,848	1124.03	1,854.65	River intake	1	576	3.20	8	380	30	3.20	116	160	400	700	90	19,000	38	8
10	Libro	9,384	202.69	334.44	River intake	1	144	0.80	3	80	40	0.80	41	90	500	60	90	2,200	11	3

14. Mustahil Woreda Rural Water Supply Facility Plan

ID	Kebele Name	Served pop	Design water supply volume	Water supply Facility design	Water supply facilities	Number of WS facilities	Water supply facilities' specifications													
							Sed. Pond	Q1	Filter	Rev. V1	H2	Q2	Gen.	PipeD1	Pipe L1	Rev. V2	Dis D2	Dis L2	WP	Cattle
		person	m^3/day	m^3/day		nos	m^3	m^3/min	Nos	m^3	m	m^3/min	kVA	mm	m	m^3	mm	m	nos.	nos.
1	Budul	9,469	204.54	337.49	River intake	1	144	0.80	3	80	30	0.80	33	110	800	60	90	2,200	11	3
2	Cadar-Dhurwa	2,080	44.93	58.33	Birka	7														
3	Darbane	2,028	43.79	58.33	Birka	7														
4	Dhanyane	6,608	142.73	235.50	River intake	1	100	0.60	2	60	30	0.60	25	90	500	40	90	1,600	8	2
5	Eeyoole	7,954	171.80	283.47	River intake	1	100	0.60	2	60	30	0.60	25	90	500	50	90	1,800	9	2
6	God-Caro	6,230	134.57	222.04	River intake	1	100	0.60	2	60	10	0.60	12	90	200	40	90	1,400	7	2
7	Mirdhis	2,957	63.86	83.33	Birka	10														
8	Mustahil	29,537	931.89	1,537.62	River intake	1	484	2.70	7	320	40	2.70	124	160	800	600	90	16,500	33	7
9	Saba-Xume	9,300	200.88	331.45	River intake	1	144	0.80	3	80	40	0.80	41	90	500	50	90	2,200	11	3

15. Rasso Woreda Rural Water Supply Facility Plan

ID	Kebele Name	Served pop	Design water supply volume	Water supply Facility design	Water supply facilities	Number of WS facilities	Water supply facilities' specifications								
							H	Q	Riser P	Tra D	Tra L	Rev.	Dis L	WP	Cattle
		person	m^3/day	m^3/day		nos	m	m^3/min	inch	mm	m	m^3	m	nos.	nos.
1	Bakool	2,124	45.87	66.67	Birka	8									
2	Deli Mendayo	2,124	45.87	66.67	Birka	8									
3	Hargeysa-Yar	2,124	45.87	66.67	Birka	8									
4	Kebele04	2,124	45.87	66.67	Birka	8									
5	Rasso	3,050	96.38	100.00	Birka	12									

Data 2.1.3 : Rural Water Supply Facility Plan (9/9)

16. West Ime Woreda Rural Water Supply Facility Plan

ID	Kebele Name	Served pop	Design water supply volume	Water supply Facility design	Water supply facilities	Number of WS facilities	Water supply facilities' specifications													
							Sed. Pond	Q1	Filter	Rev. V1	H2	Q2	Gen.	PipeD1	Pipe L1	Rev. V2	Dis D2	Dis L2	WP	Cattle
		person	m^3/day	m^3/day		nos	m^3	m^3/min	Nos	m^3	m	m^3/min	kVA	mm	m	m^3	mm	m	nos.	nos.
1	Abagarow	3,690	79.70	131.51	River intake	1	64	0.40	2	40	20	0.40	14	90	700	20	90	1,000	5	1
2	Barashibo	945	20.41	33.33	Birka	4														
3	Bilow	756	16.33	25.00	Birka	3														
4	Budshe	3,076	66.44	109.63	River intake	1	64	0.40	2	40	40	0.40	23	90	1,500	20	90	800	4	1
5	Burdaxor	945	20.41	33.33	Birka	4														
6	Dawin	756	16.33	25.00	Birka	3														
7	Dhaley Bula	567	12.24	16.67	Birka	2														
8	Finjaawe	756	16.33	25.00	Birka	3														
9	Golbalayo	4,308	93.05	153.53	River intake	1	64	0.40	2	40	20	0.40	14	90	500	30	90	1,000	5	1
10	Jiiq	2,462	53.18	87.75	River intake	1	36	0.20	2	20	10	0.20	6	90	700	20	90	600	3	1
11	Sufley	1,846	39.88	65.80	River intake	1	36	0.20	2	20	10	0.20	6	90	100	10	90	600	3	1
12	West Ime	8,681	284.28	469.06	River intake	1	196	0.90	3	100	40	0.90	46	110	900	200	90	5,000	10	2

Data 2.1.4 : Urban Piped Water Supply System (1/10)

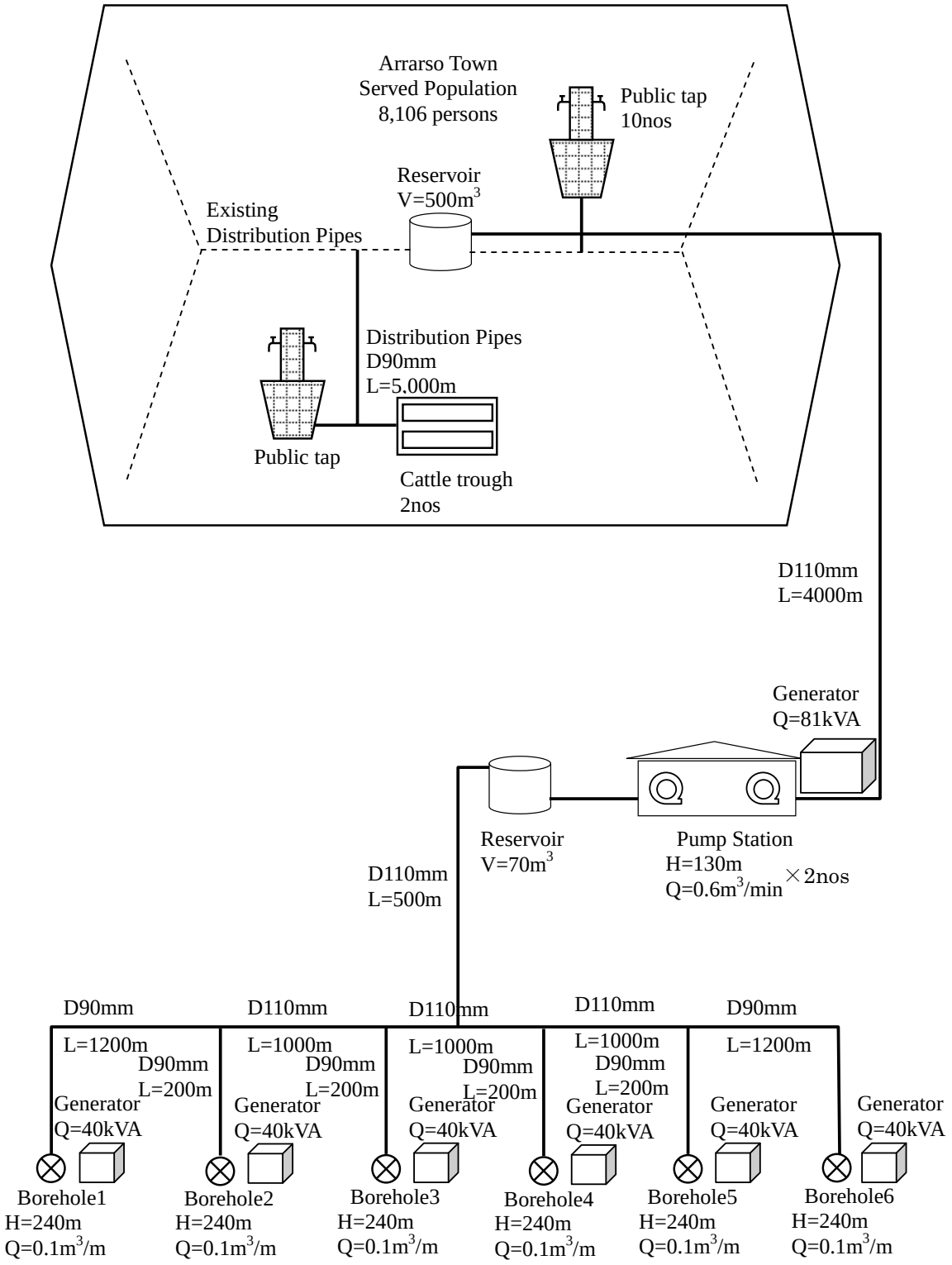


Figure 1: Araarso Town Water Supply System Plan

Data 2.1.4 : Urban Piped Water Supply System (2/10)

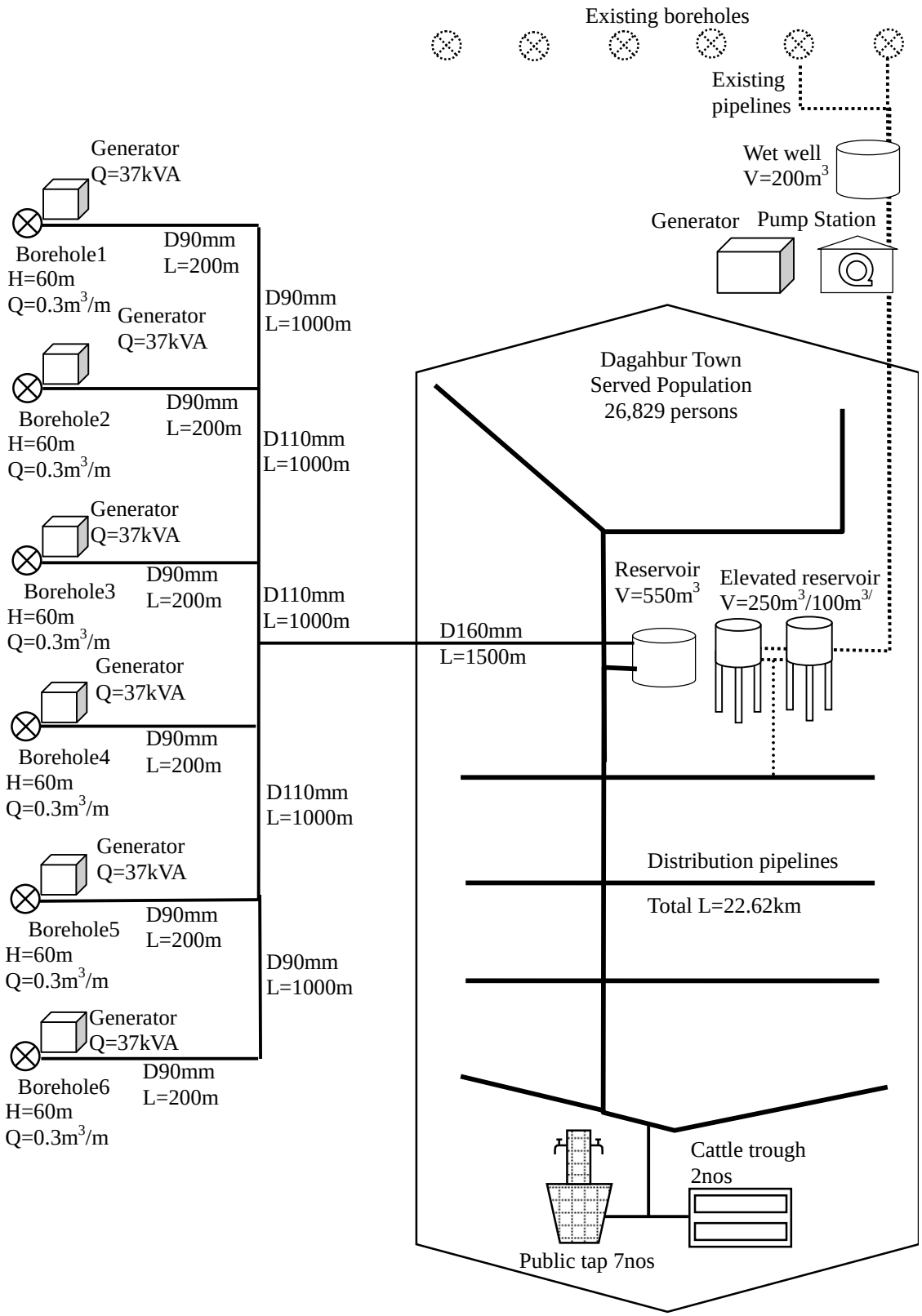


Figure 2: Dagahbur Town Water Supply System Plan

Data 2.1.4 : Urban Piped Water Supply System (3/10)

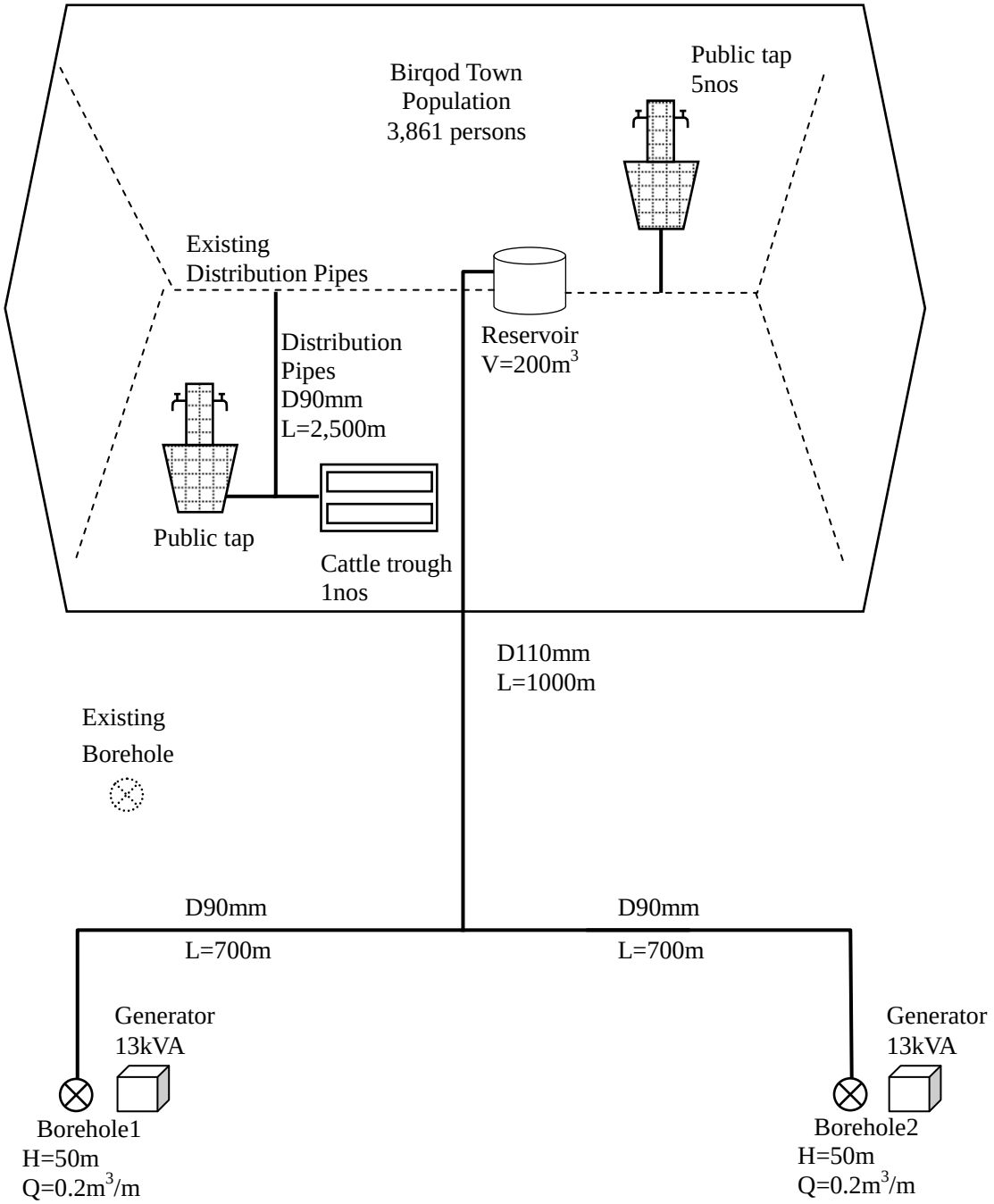


Figure 3: Birqod Town Water Supply System Plan

Data 2.1.4 : Urban Piped Water Supply System (4/10)

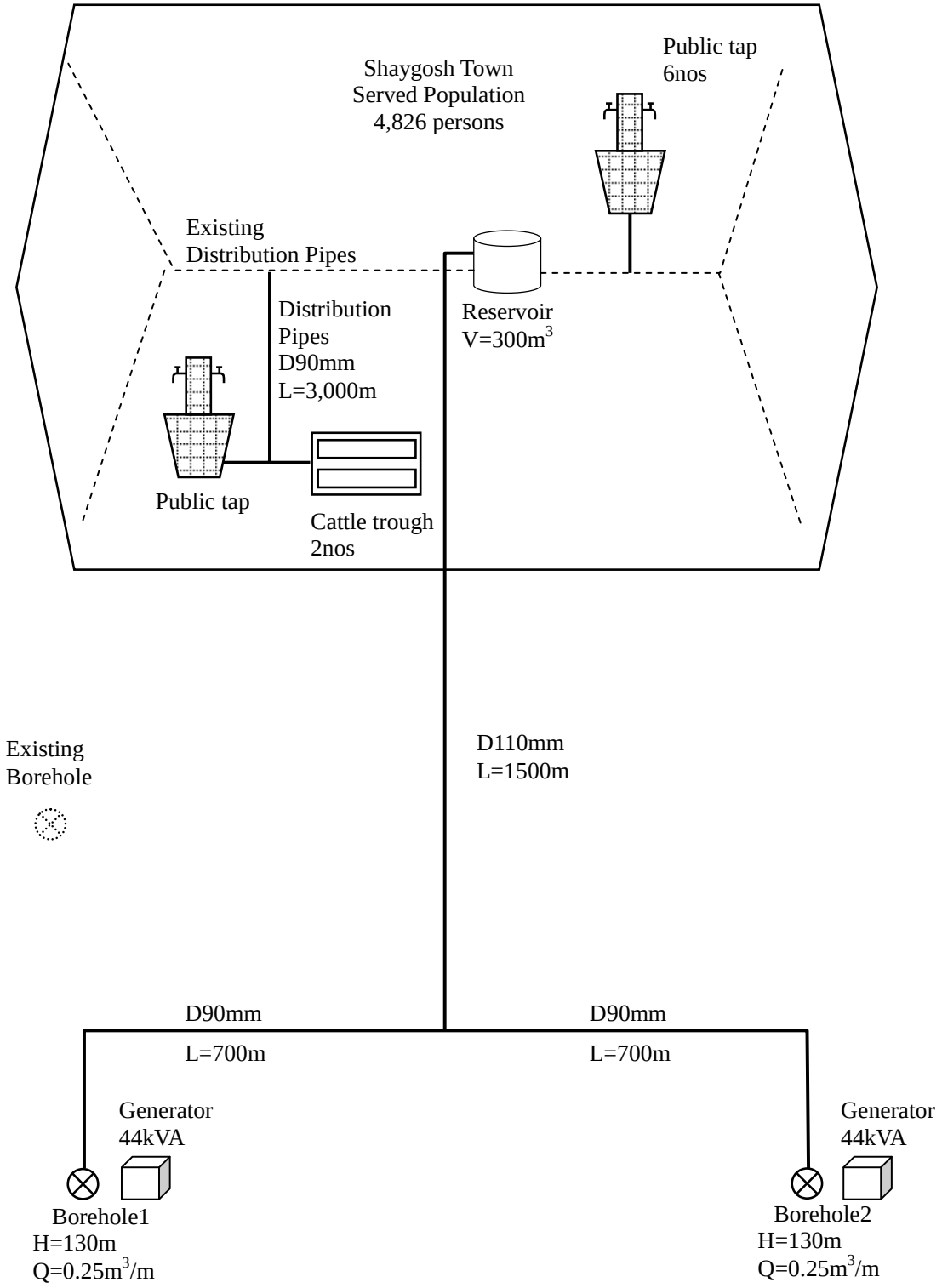


Figure 4 : Shaygosh Town Water Supply System Plan

Data 2.1.4 : Urban Piped Water Supply System (5/10)

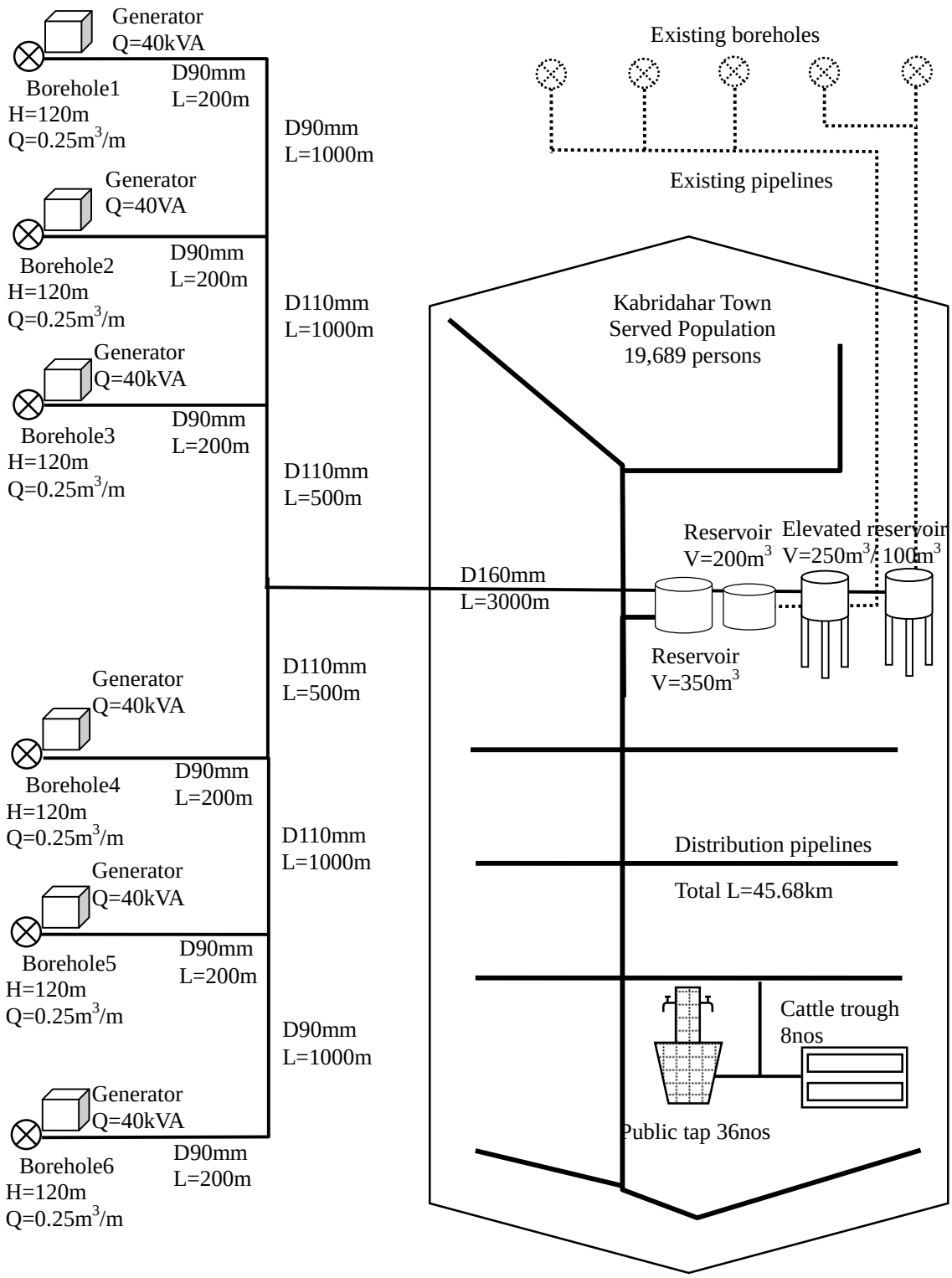


Figure 5: Kabridahar Town Water Supply System Plan

Data 2.1.4 : Urban Piped Water Supply System (6/10)

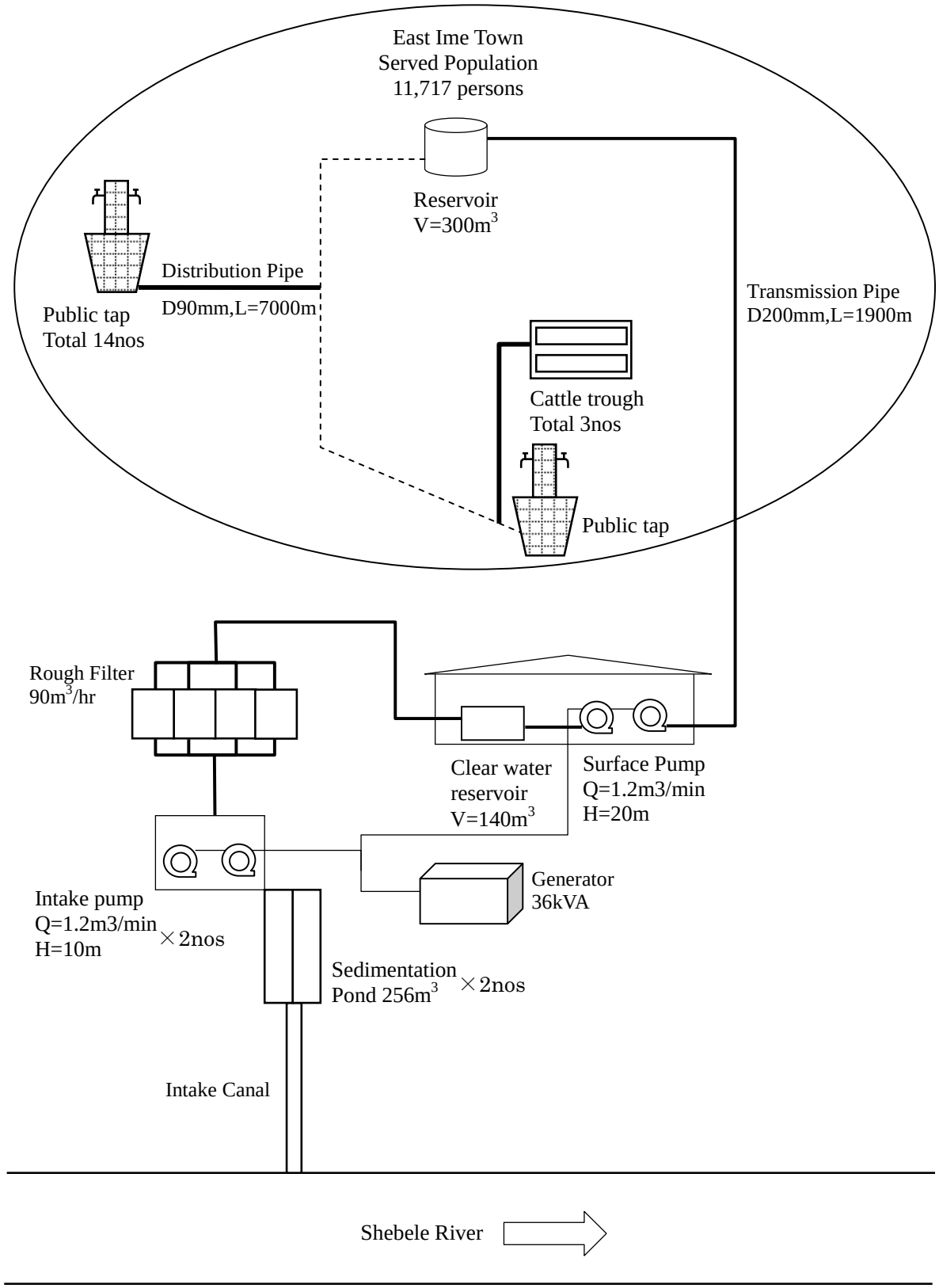


Figure 6: East Ime Town Water Supply System Plan

Data 2.1.4 : Urban Piped Water Supply System (7/10)

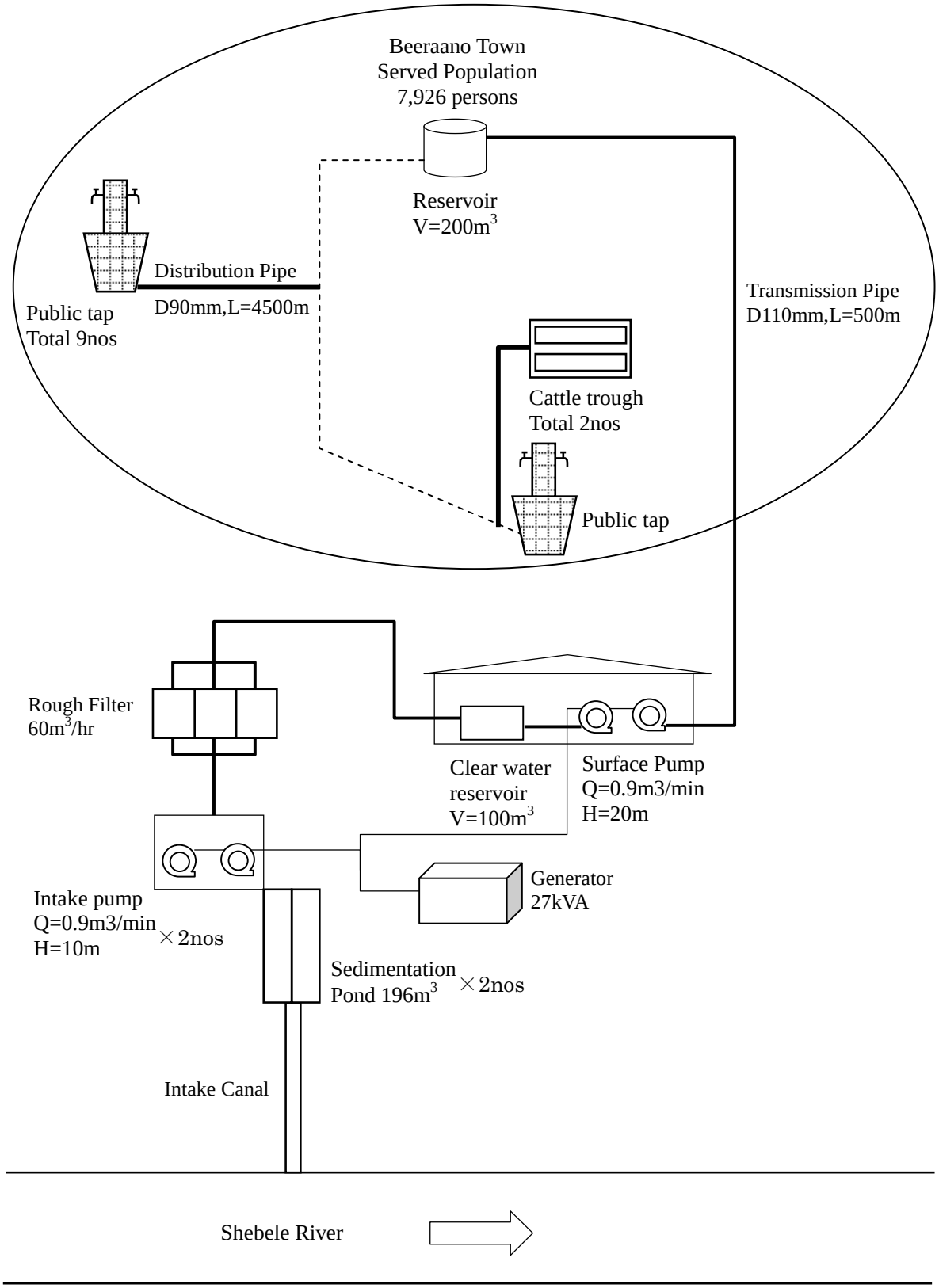


Figure 7: Beercaano Town Water Supply System Plan

Data 2.1.4 : Urban Piped Water Supply System (8/10)

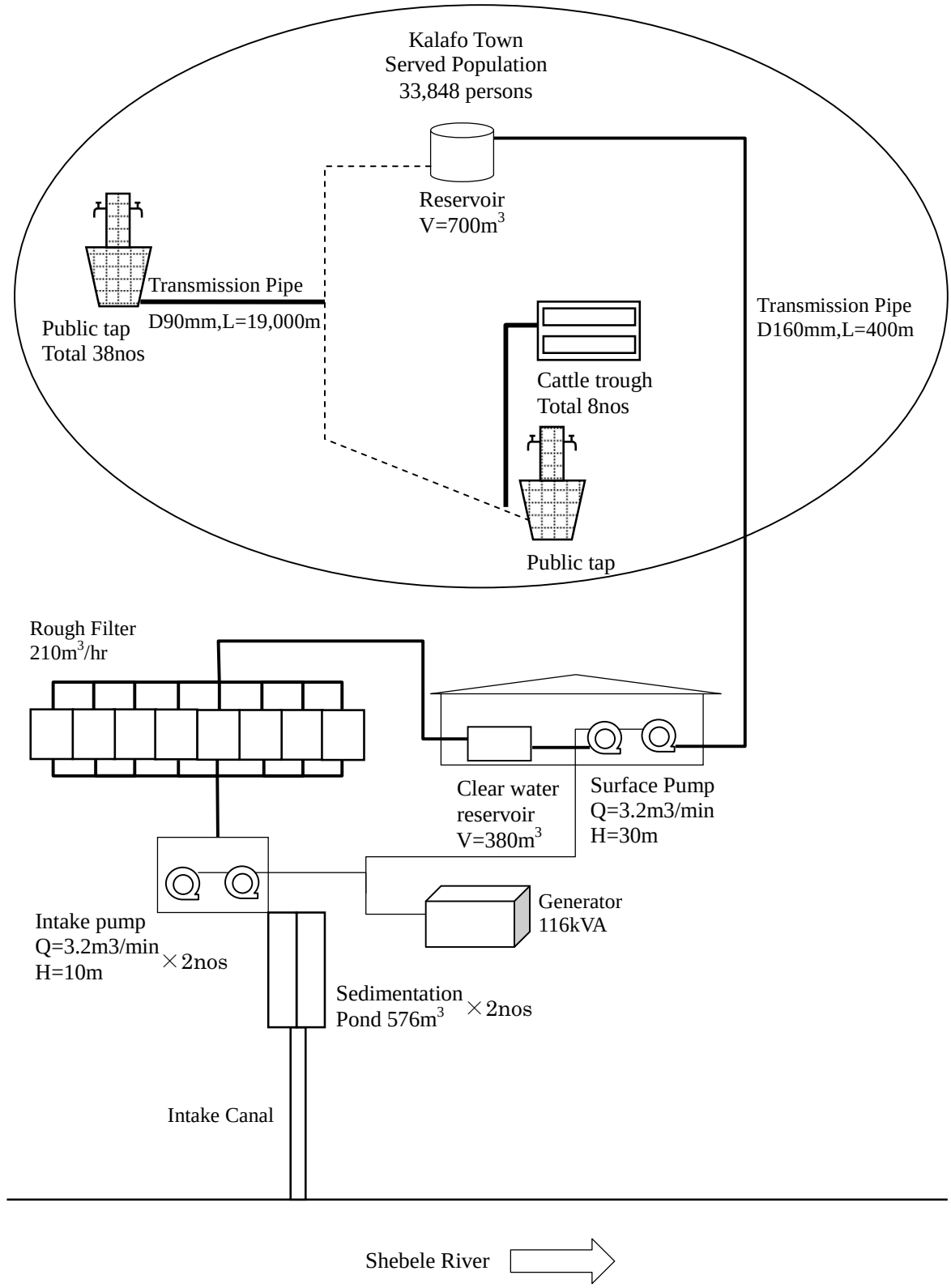


Figure 8: Kalafo Town Water Supply System Plan

Data 2.1.4 : Urban Piped Water Supply System (9/10)

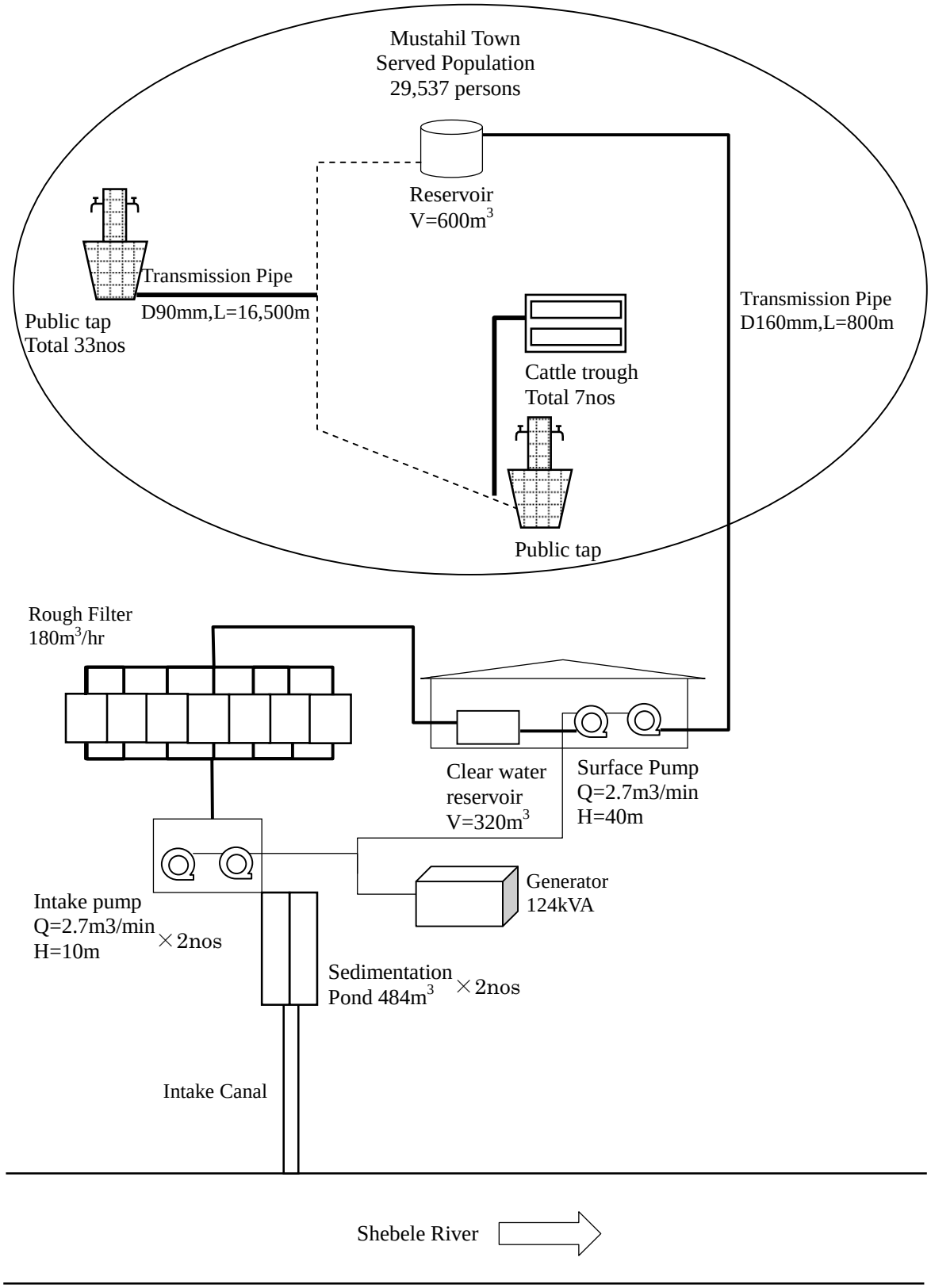


Figure 9: Mustahil Town Water Supply System Plan

Data 2.1.4 : Urban Piped Water Supply System (10/10)

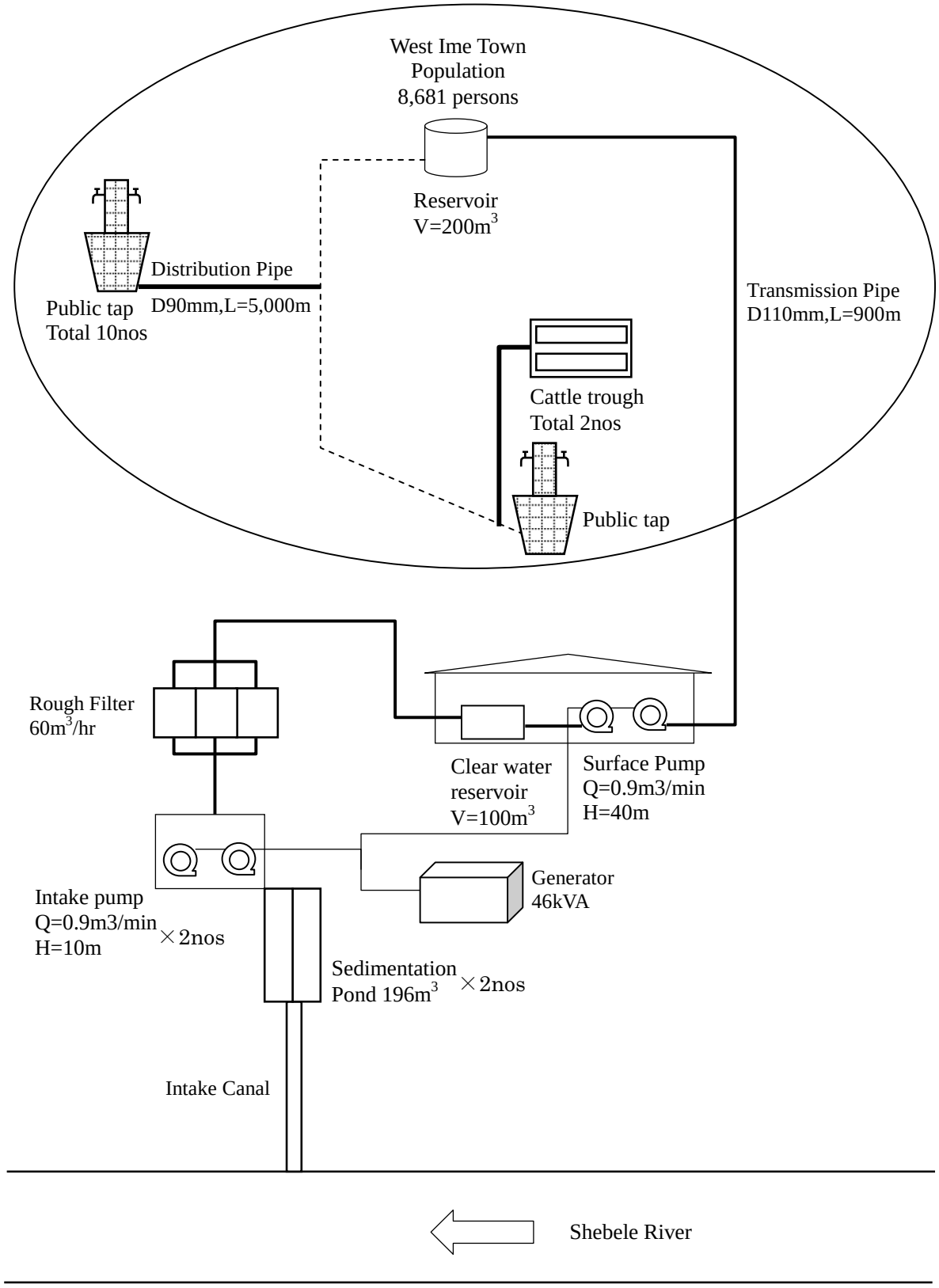


Figure 10: West Ime Town Water Supply System Plan

THE STUDY ON JARAR VALLEY AND SHEBELLE SUB-BASIN WATER SUPPLY DEVELOPMENT PLAN AND EMERGENCY WATER SUPPLY IN THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA

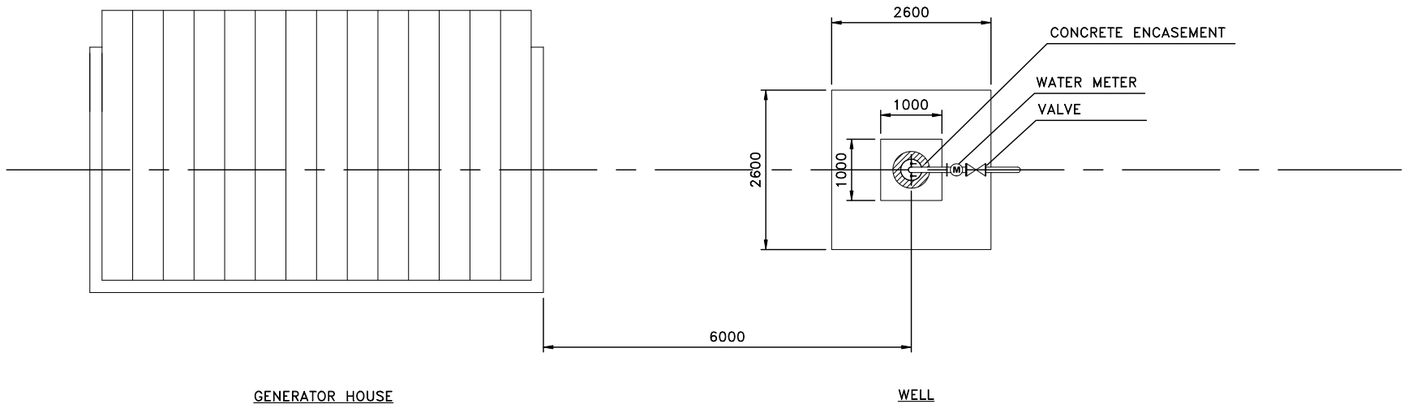
FINAL REPORT
VOLUME 2 WATER SUPPLY PLAN
KABRIBAYAH TOWN

AUGUST 2013

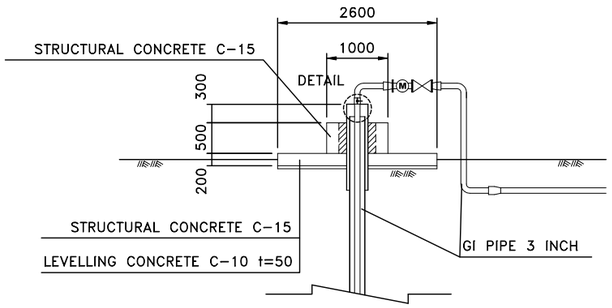
KOKUSAI KOGYO CO., LTD.

LIST OF DRAWINGS

NO.	DRAWING TITLE	DWG. NO.
001	BOREHOLE DEVELOPMENT	FS001
002	GENERATOR HOUSE	FS002
003	TRANSMISSION PIPELINE PLAN	FS003
004	ELEVATED RESERVOIR	FS004
005	DISTRIBUTION PIPELINE PLAN	FS005



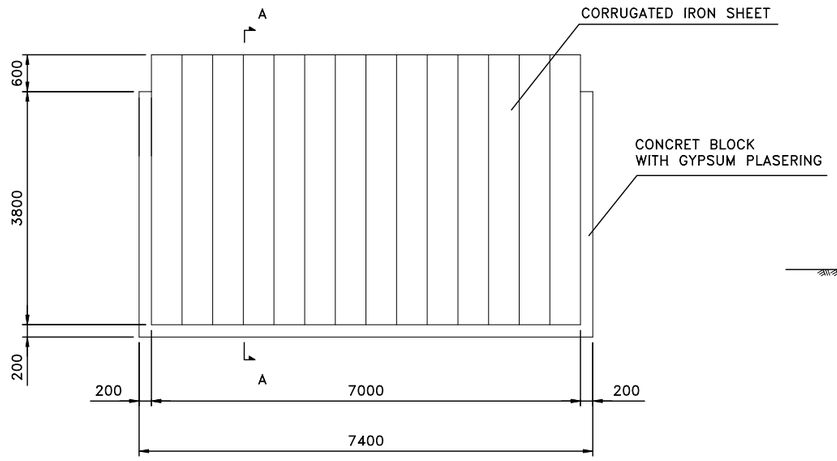
GENERAL LAYOUT



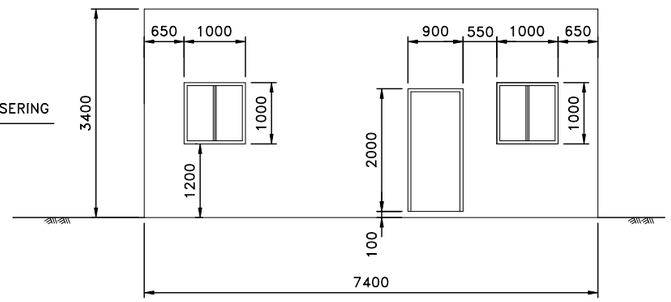
ELEVATION

SCALE 0 1 2 3 4 5 m

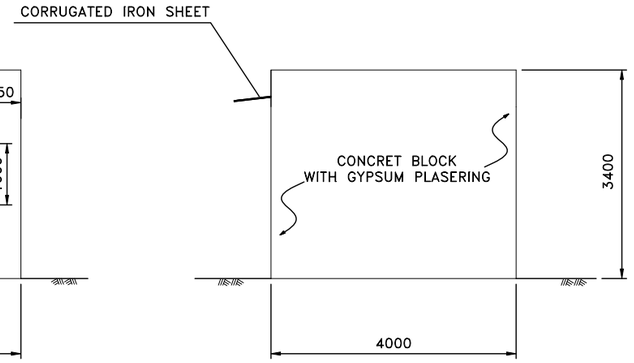
THE STUDY ON JARAR VALLEY AND SHEBELE SUB-BASIN WATER SUPPLY DEVELOPMENT PLAN, AND EMERGENCY WATER SUPPLY IN THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA VOLUME2 WATER SUPPLY PLAN KABRIBAYAH TOWN			
TITLE	BOREHOLE DEVELOPMENT		
DATE	AUG.2013	DWG No.	FS001
CONSULTANT	KOKUSAI KOGYO CO., LTD.		
CLIENT	JAPAN INTERNATIONAL COOPERATION AGENCY		



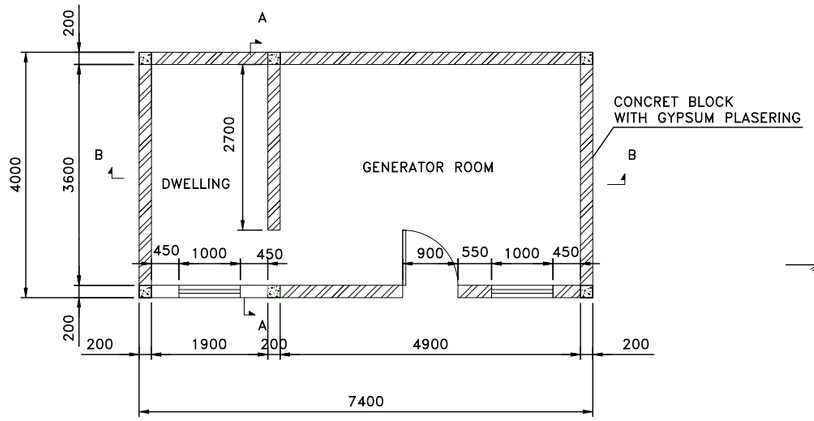
ROOF PLAN



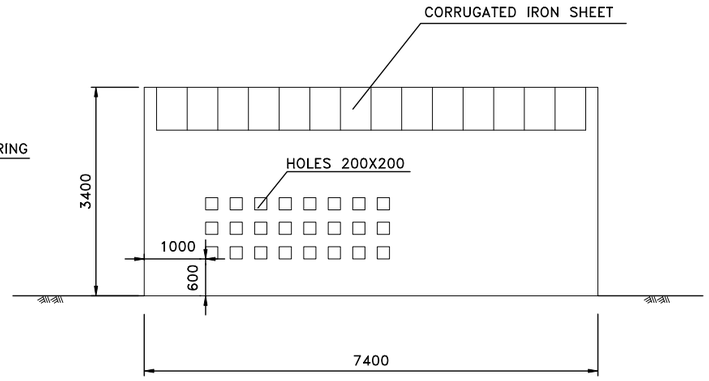
FRONT ELEVATION



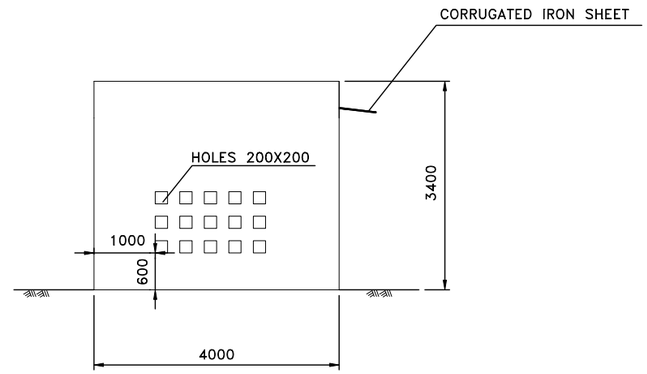
SIDE ELEVATION



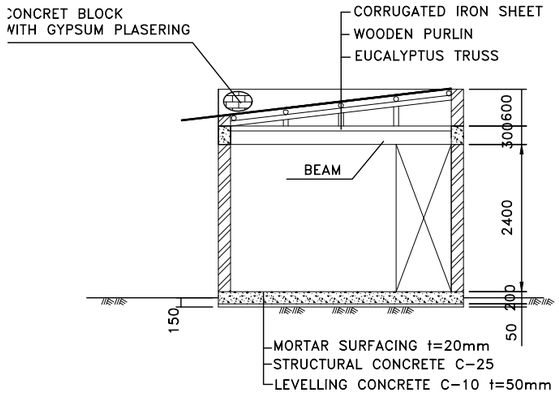
FLOOR PLAN



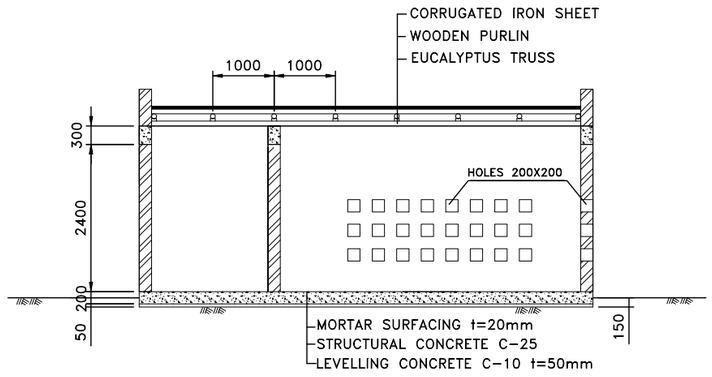
BACK ELEVATION



SIDE ELEVATION



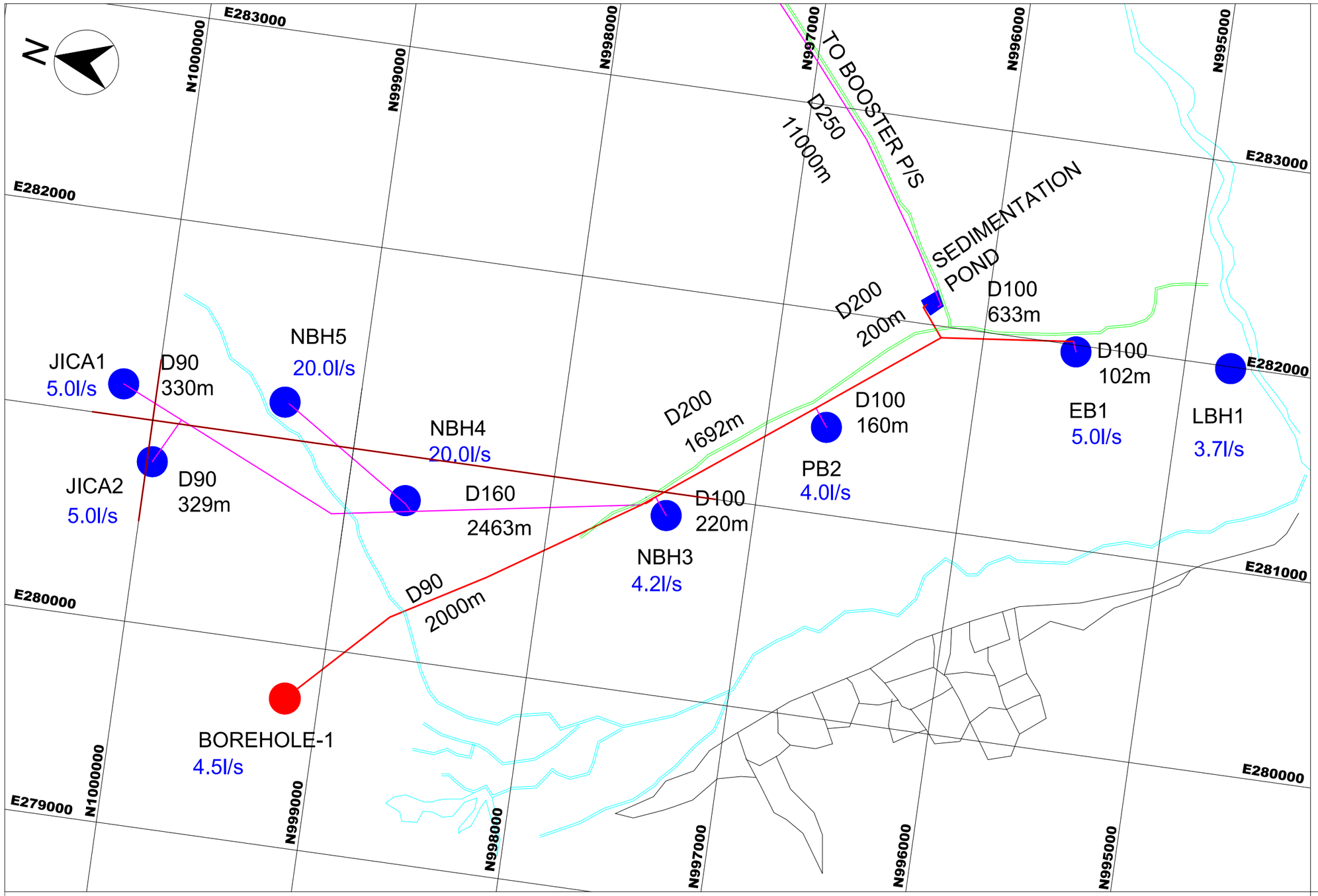
SECTION A-A



SECTION B-B

SCALE 0 1 2 3 4 5 m

THE STUDY ON JARAR VALLEY AND SHEBELE SUB-BASIN WATER SUPPLY DEVELOPMENT PLAN, AND EMERGENCY WATER SUPPLY IN THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA VOLUME2 WATER SUPPLY PLAN KABRIBAYAH TOWN			
TITLE	GENERATOR HOUSE		
DATE	AUG.2013	DWG No.	FS002
CONSULTANT	KOKUSAI KOGYO CO., LTD.		
CLIENT	JAPAN INTERNATIONAL COOPERATION AGENCY		



LEGEND

Diameter / Length	Pipeline
	Existing pipeline
	Planned pipeline
	Planned borehole
	Existing borehole
	Wadi river
	Truck

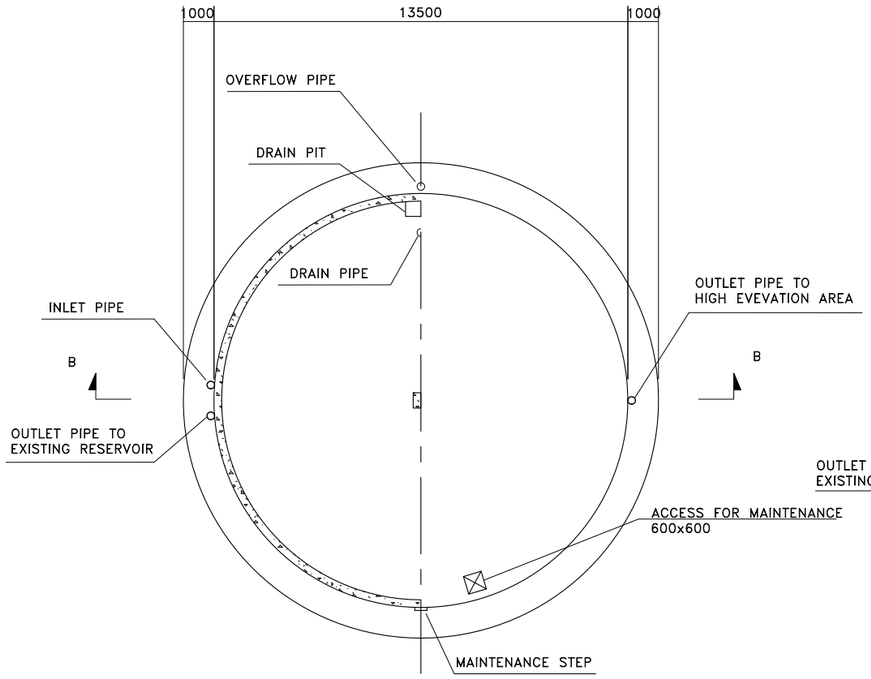
SCALE 0 200 400 600 800 1000m

THE STUDY ON JARAR VALLEY AND SHEBELE SUB-BASIN WATER SUPPLY DEVELOPMENT PLAN, AND EMERGENCY WATER SUPPLY IN THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA

VOLUME2 WATER SUPPLY PLAN

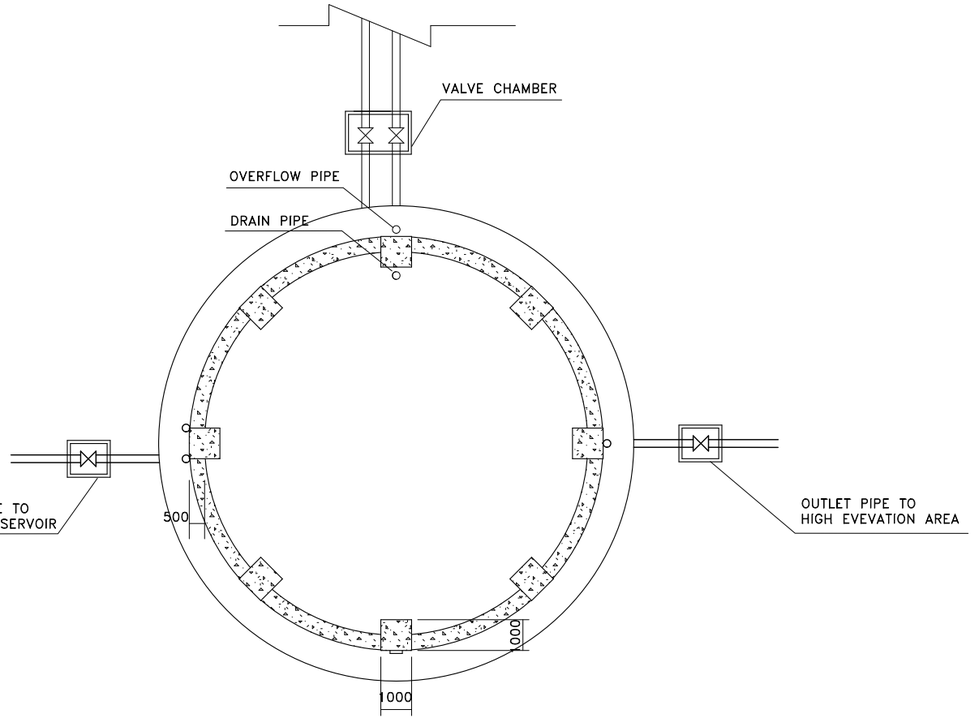
KABRIBAYAH TOWN

TITLE	TRANSMISSION PIPELINE PLAN		
DATE	AUG.2013	DWG No.	FS003
CONSULTANT	KOKUSAI KOGYO CO., LTD.		
CLIENT	JAPAN INTERNATIONAL COOPERATION AGENCY		

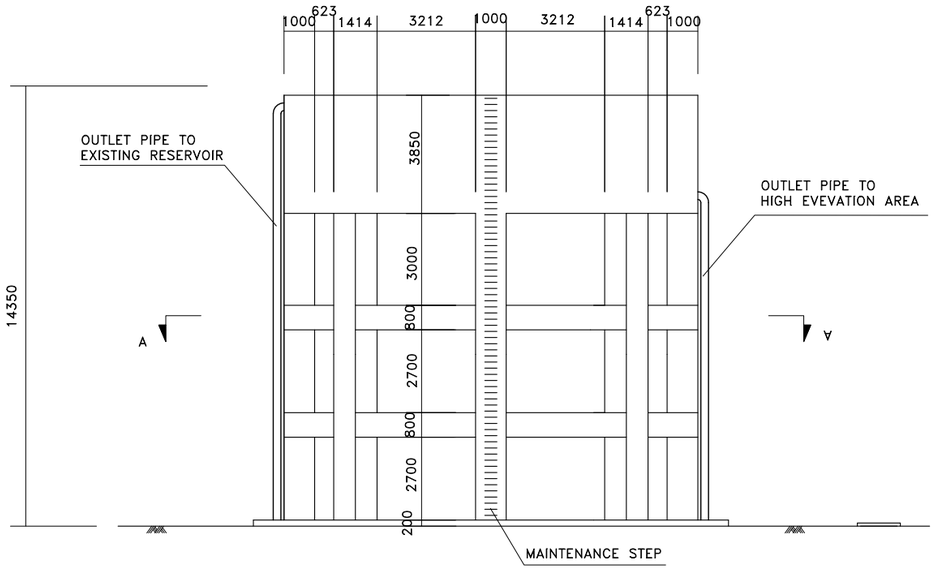


TANK PLAN

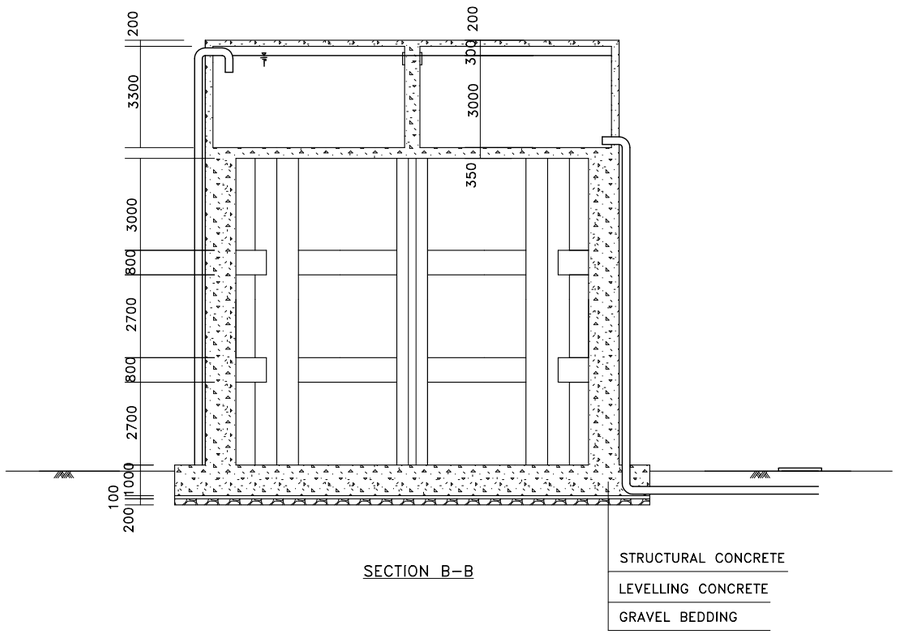
ROOF PLAN



SECTION A–A



ELEVATION



SECTION B–B

LEGEND

WATER SUPPLY PIPE

DRAIN PIPE

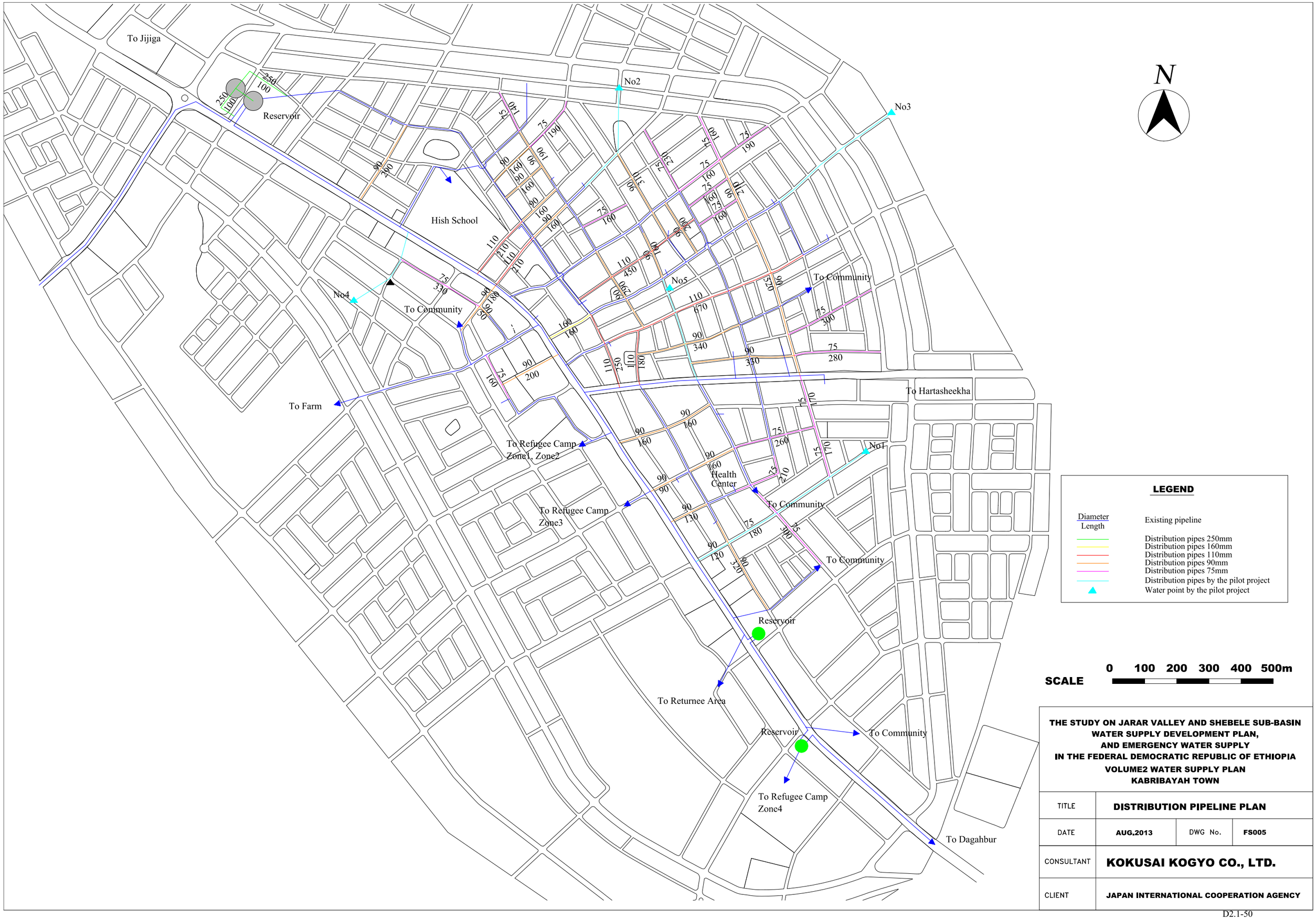
SCALE 0 2 4 6 8 10 m

THE STUDY ON JARAR VALLEY AND SHEBELE SUB-BASIN WATER SUPPLY DEVELOPMENT PLAN, AND EMERGENCY WATER SUPPLY IN THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA

VOLUME2 WATER SUPPLY PLAN

KABRIBAYAH TOWN

TITLE	**ELEVATED RESERVOIR**		
DATE	**AUG.2013**	DWG No.	**FS004**
CONSULTANT	**KOKUSAI KOGYO CO., LTD.**		
CLIENT	**JAPAN INTERNATIONAL COOPERATION AGENCY**		



THE STUDY ON JARAR VALLEY AND SHEBELE SUB-BASIN WATER SUPPLY DEVELOPMENT PLAN, AND EMERGENCY WATER SUPPLY IN THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA

VOLUME2 WATER SUPPLY PLAN

KABRIBAYAH TOWN

TITLE	DISTRIBUTION PIPELINE PLAN		
DATE	AUG.2013	DWG No.	FS005
CONSULTANT	KOKUSAI KOGYO CO., LTD.		
CLIENT	JAPAN INTERNATIONAL COOPERATION AGENCY		

Volume.2

2. Cost Estimation

Data 2.2.1 : Consumer price change for cost estimation

1. ETB

Consumer price change of Ethiopia (ETB) is 11.3 % per year on average.

(Source: the Central Statistical Agency of Ethiopia, Country and regional level consumer price indices)

Year/Month	CPI
2012/1	220.3
2012/2	223.0
2012/3	228.1
2012/4	227.3
2012/5	229.4
2012/6	237.6
2012/7	238.7
2012/8	240.6
2012/9	248.2
2012/10	248.1
2012/11	246.6
2012/12	245.1
Average/per year	11.3%

በኢትዮጵያ ፌዴራላዊ ዴሞክራሲያዊ ሪፐብሊክ
የማዕከላዊ ስታቲስቲክስ ኤጀንሲ

THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA
CENTRAL STATISTICAL AGENCY

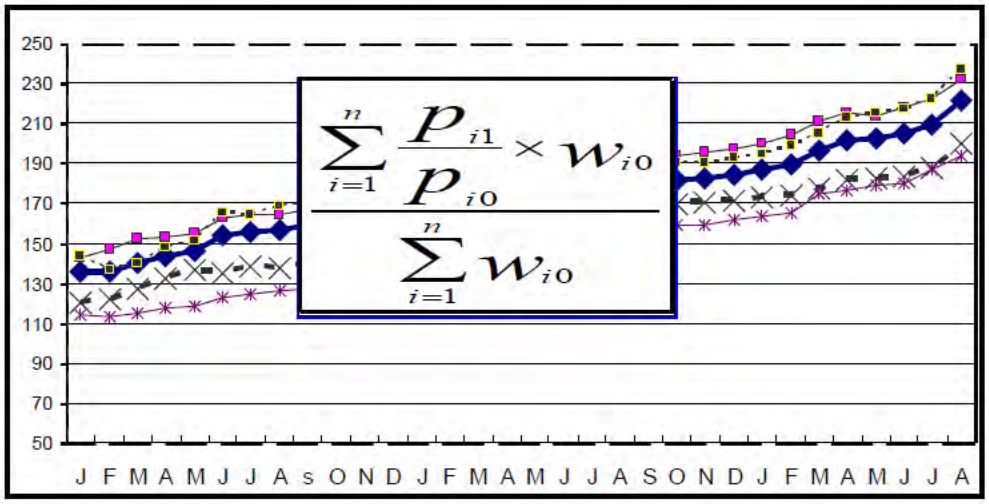
የአገር አቀፍና የክልሎች የሸማቾች ዋጋ መመዘኛ ኢንዴክሶች

ጥር ወር 2005 ዓ.ም.

[ታህሳስ 1999 = 100]

መረጃ ቁጥር 64

COUNTRY AND REGIONAL LEVEL CONSUMER PRICE INDICES



$$\frac{\sum_{i=1}^{n} \frac{p_{i1}}{p_{i0}} \times w_{i0}}{\sum_{i=1}^{n} w_{i0}}$$

[December 2006 =100]

For the month of January 2013

Information No. 64

Tel: 251-11-1 553011
Fax: 251-11-1550334.
Email: csa@ethionet.et

አዲስ አበባ
ጥር 27 ቀን 2005 ዓ.ም.
ADDIS ABABA
04 February 2013

ሠንጠረዥ 1ሀ፡- ጠቅላላ የሸማቾች ዋጋ መመለከቻ ኢንዴክስና በሥሩ የተካተቱ ክፍሎች በሀገር አቀፍ ደረጃ

ታህሳስ 1999=□□□

Table 1a: General Consumer Price Index and its Components at Country Level

December 2006 = 100

ወርና ዓመት	ጠቅላላ □□□□□ General Index	ጠቅላላ □□□ □□□□□ Food Total	ጠቅላላ ምግብ ነክ ያልሆኑ □□□□□ Non-Food Total	ምግብ ነክ ያልሆኑ የኢንዴክስ ክፍሎች Non-food Consumer Price Index Components □□□ Beverages	ሲጃራና ትምባሆ Cigarettes and Tobacco	ልብስና መጫሚያ Clothing and Footwear	የቤት ኪራይ፡ የቤት መሥሪያ ዕቃዎች፡ ውሃ፣ ነዳጅና ሃይል House Rent, Construction Materials, Water, and Fuel and Power	የቤት ዕቃዎች የቤት ማስጌጫዎች የቤት ቁሳቁስና የቤት ሠራተኛ □□□ Furniture, Furnishings, Household Equipment and Operation	ሕክምና Medical Care and Health	ትራንስፖርትና መገናኛ Transport and Communication	መዝናኛና □□□□ Recreation, Entertainment and Education	የግል ንጽህናና የግል ቋሚ ዕቃዎች Personal Care and Effects	ሌሎች ዕቃዎች Miscellaneous Goods	Month and Year
ታህሳስ 1999	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	December 2006
ሐምሌ 1999 - ሰኔ 2000	126.9	137.2	113.3	113.6	107.8	117.0	112.0	125.5	111.9	105.3	106.9	112.6	104.7	July 2007 - June 2008
ሐምሌ 2000 - ሰኔ 2001	173.1	198.0	140.1	175.8	141.2	149.8	136.6	159.8	128.2	112.8	124.9	142.2	115.5	July 2008 - June 2009
ሐምሌ 2001 - ሰኔ 2002	177.9	187.2	165.6	187.1	169.4	188.5	159.1	190.9	149.2	134.9	144.6	181.8	126.4	July 2009 - June 2010
ሐምሌ 2002 - ሰኔ 2003	210.2	216.6	201.7	207.9	222.0	242.2	191.1	234.6	187.2	171.0	179.6	234.6	136.7	July 2010 - June 2011
ሐምሌ 2003 - ሰኔ 2004	281.0	307.0	246.5	278.1	256.7	323.4	219.4	299.4	186.1	202.9	218.5	312.5	162.4	July 2011 - June 2012
2004														2011/2012
□□□□□□□□	276.9	298.7	248.0	283.3	249.4	327.4	220.3	301.2	186.4	200.5	221.9	318.7	160.3	January 2012
የካቲት 2004	284.6	308.7	252.7	286.2	254.7	338.5	223.0	309.5	188.5	202.1	221.9	324.6	162.4	February "
መጋቢት 2004	297.7	328.4	256.9	295.5	261.8	342.5	226.1	316.2	186.3	203.1	226.2	331.1	155.1	March "
ሚያዝያ 2004	303.8	336.4	260.5	297.6	252.0	353.9	227.3	325.8	193.2	204.8	230.4	316.8	171.4	April "
ግንቦት 2004	306.5	338.0	264.8	302.3	257.5	364.6	229.4	331.0	194.1	205.3	231.6	331.0	171.8	May "
□□□□□□□	305.6	332.9	269.5	304.4	258.2	367.2	237.6	332.2	196.5	204.4	228.7	336.8	173.0	June "
2005														2012/2013
□□□□□□□	306.0	332.3	271.1	304.1	269.2	369.3	238.7	338.9	196.8	200.8	232.1	336.4	174.6	July 2012
□□□□□□□	311.7	340.5	273.5	306.5	263.5	372.9	240.6	342.5	197.7	199.4	236.3	350.5	177.2	August "
መስከረም □□□□	316.3	343.7	279.9	315.3	265.3	383.0	248.2	343.2	195.4	199.6	244.0	349.0	180.6	September "
ጥቅምት □□□□	314.1	338.5	281.9	313.6	258.3	389.0	248.1	349.1	199.5	196.4	251.0	352.1	187.6	October "
ኅር □□□□□□	312.7	335.2	282.8	315.5	261.7	394.6	246.8	355.6	200.7	196.4	233.4	355.3	192.0	November "
ታህሳስ 2005	310.5	331.3	283.1	319.8	263.8	399.9	245.1	354.5	202.1	195.0	238.0	357.0	186.1	December "
□□□□□□□	311.5	332.4	283.7	321.2	264.3	401.8	247.0	355.5	201.0	195.0	237.8	359.1	171.0	January 2013

2. USD

Consumer price change of major advanced economics is 1.8 % per year on average.

{1.6 % (2013) + 2.0 % (2014)} / 2 = 1.8 %

(Source: International Monetary Fund, World Economic Outlook April 2013)

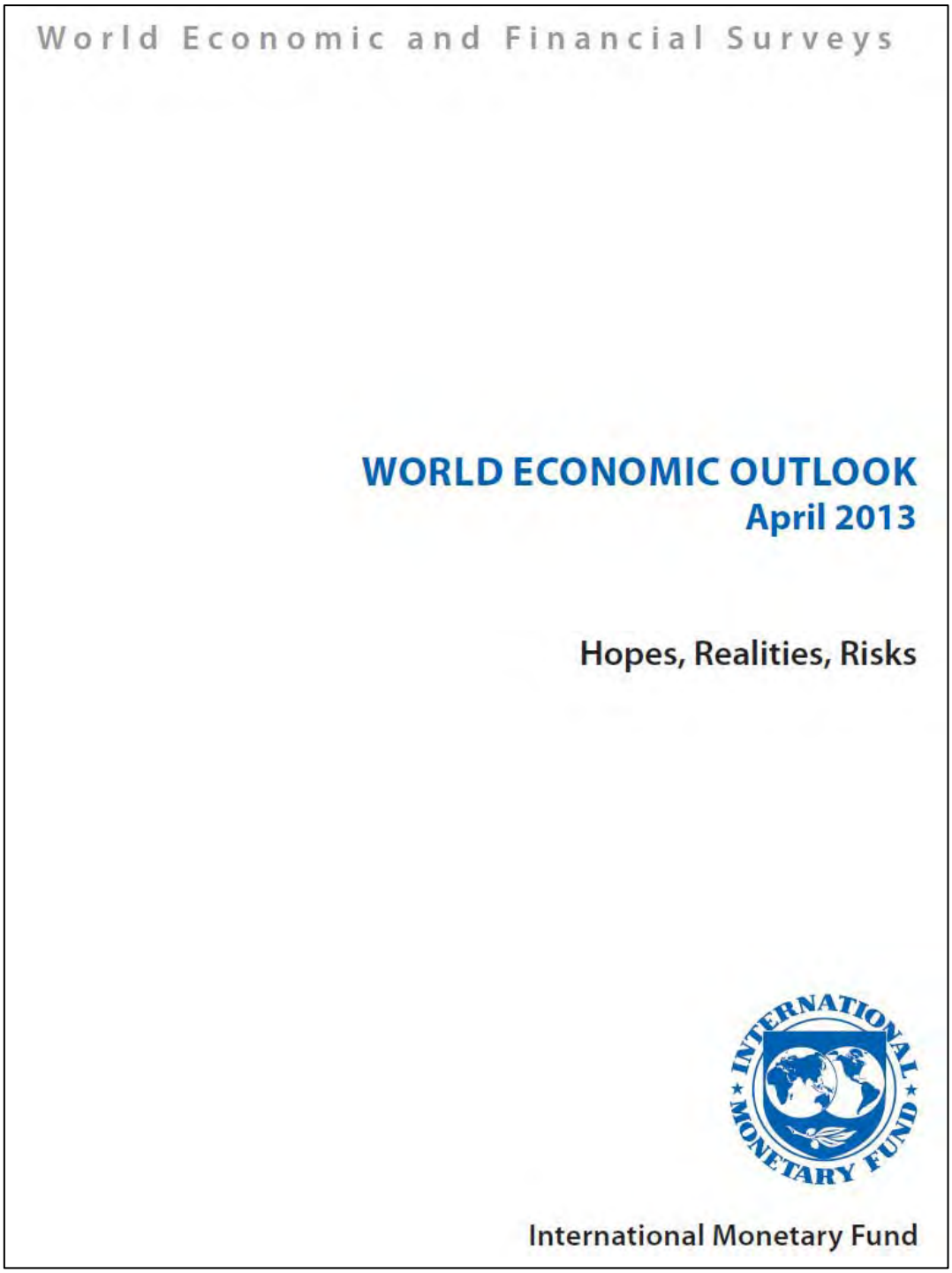


Table A6. Advanced Economies: Consumer Prices[1]

(Annual percent change)

	Average									Projections			End of Period[2]	Projections	
	1995–2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2018	2012	2013	2014
Advanced Economies	**2.0**	**2.3**	**2.3**	**2.2**	**3.4**	**0.1**	**1.5**	**2.7**	**2.0**	**1.7**	**2.0**	**2.1**	**2.0**	**1.7**	**2.1**
United States	2.5	3.4	3.2	2.9	3.8	–0.3	1.6	3.1	2.1	1.8	1.7	2.3	1.8	1.7	1.8
Euro Area[3]	1.9	2.2	2.2	2.1	3.3	0.3	1.6	2.7	2.5	1.7	1.5	1.7	2.2	1.6	1.4
Germany	1.3	1.9	1.8	2.3	2.8	0.2	1.2	2.5	2.1	1.6	1.7	1.9	2.0	1.6	1.7
France	1.6	1.8	1.7	1.5	2.8	0.1	1.5	2.1	2.0	1.6	1.5	1.8	1.3	1.6	1.5
Italy	2.7	2.2	2.2	2.0	3.5	0.8	1.6	2.9	3.3	2.0	1.4	1.5	2.4	2.0	0.8
Spain	3.0	3.4	3.6	2.8	4.1	–0.2	2.0	3.1	2.4	1.9	1.5	1.5	3.0	1.3	1.4
Netherlands	2.4	1.5	1.7	1.6	2.2	1.0	0.9	2.5	2.8	2.8	1.7	1.4	2.8	2.3	1.6
Belgium	1.7	2.5	2.3	1.8	4.5	0.0	2.3	3.4	2.6	1.7	1.4	1.2	2.1	1.5	1.2
Austria	1.5	2.1	1.7	2.2	3.2	0.4	1.7	3.6	2.6	2.2	1.9	1.9	2.9	2.2	1.9
Greece	4.6	3.5	3.3	3.0	4.2	1.3	4.7	3.1	1.0	–0.8	–0.4	1.3	0.3	–0.6	–0.1
Portugal	3.0	2.1	3.0	2.4	2.7	–0.9	1.4	3.6	2.8	0.7	1.0	1.5	2.1	0.7	1.5
Finland	1.5	0.8	1.3	1.6	3.9	1.6	1.7	3.3	3.2	2.9	2.5	2.0	3.5	2.8	2.5
Ireland	3.1	2.2	2.7	2.9	3.1	–1.7	–1.6	1.2	1.9	1.3	1.3	1.8	1.5	1.8	1.2
Slovak Republic	7.7	2.8	4.3	1.9	3.9	0.9	0.7	4.1	3.7	1.9	2.0	2.3	3.4	1.9	2.1
Slovenia	8.0	2.5	2.5	3.6	5.7	0.9	1.8	1.8	2.6	1.8	1.9	2.1	2.5	1.5	2.0
Luxembourg	2.0	3.8	3.0	2.7	4.1	0.0	2.8	3.7	2.9	1.9	1.9	2.0	2.5	2.0	2.3
Estonia	8.9	4.1	4.4	6.6	10.4	–0.1	2.9	5.1	4.2	3.2	2.8	2.5	3.8	3.2	2.8
Cyprus[4]	2.7	2.0	2.3	2.2	4.4	0.2	2.6	3.5	3.1	. . .	. . .	. . .	1.5	. . .	. . .
Malta	2.9	2.5	2.6	0.7	4.7	1.8	2.0	2.5	3.2	2.4	2.0	2.2	2.8	2.4	2.2
Japan	–0.1	–0.3	0.2	0.1	1.4	–1.3	–0.7	–0.3	0.0	0.1	3.0	2.0	–0.2	0.7	3.6
United Kingdom[3]	1.6	2.0	2.3	2.3	3.6	2.1	3.3	4.5	2.8	2.7	2.5	2.0	2.6	2.6	2.4
Canada	2.0	2.2	2.0	2.1	2.4	0.3	1.8	2.9	1.5	1.5	1.8	2.0	0.9	1.9	1.9
Korea	3.8	2.8	2.2	2.5	4.7	2.8	2.9	4.0	2.2	2.4	2.9	3.0	1.4	2.8	3.0
Australia	2.7	2.7	3.6	2.3	4.4	1.8	2.9	3.3	1.8	2.5	2.5	2.4	2.2	2.3	2.9
Taiwan Province of China	1.2	2.3	0.6	1.8	3.5	–0.9	1.0	1.4	1.9	2.0	2.0	2.0	15.3	2.0	2.0
Sweden	1.2	0.5	1.4	2.2	3.4	–0.5	1.2	3.0	0.9	0.3	2.3	2.0	1.0	–0.2	2.5
Hong Kong SAR	0.8	0.9	2.0	2.0	4.3	0.6	2.3	5.3	4.1	3.5	3.5	3.5	3.8	3.5	3.5
Switzerland	0.9	1.2	1.1	0.7	2.4	–0.5	0.7	0.2	–0.7	–0.2	0.2	1.0	–0.4	0.5	1.0
Singapore	0.9	0.5	1.0	2.1	6.6	0.6	2.8	5.2	4.6	4.0	3.4	2.3	4.0	4.0	3.5
Czech Republic	. . .	1.8	2.5	2.9	6.3	1.0	1.5	1.9	3.3	2.3	1.9	2.0	2.4	2.4	2.0
Norway	2.1	1.5	2.3	0.7	3.8	2.2	2.4	1.3	0.7	1.5	1.5	2.5	1.4	1.5	1.5
Israel	4.8	1.3	2.1	0.5	4.6	3.3	2.7	3.5	1.7	1.6	2.0	2.0	1.6	2.0	2.0
Denmark	2.1	1.8	1.9	1.7	3.4	1.3	2.3	2.8	2.4	2.0	2.0	2.0	2.0	2.0	2.0
New Zealand	2.0	3.0	3.4	2.4	4.0	2.1	2.3	4.0	1.1	1.4	2.2	2.0	0.9	2.2	2.2
Iceland	3.2	4.0	6.7	5.1	12.7	12.0	5.4	4.0	5.2	4.7	4.0	2.5	4.2	5.0	3.5
San Marino	. . .	1.7	2.1	2.5	4.1	2.4	2.6	2.0	2.8	1.6	0.9	1.5	2.8	1.6	0.9
Memorandum															
Major Advanced Economies	1.8	2.3	2.3	2.2	3.2	–0.1	1.4	2.6	1.9	1.6	1.9	2.1	1.6	1.6	2.0

[1]Movements in consumer prices are shown as annual averages.
[2]Monthly year-over-year changes and for several countries, on quarterly basis.
[3]Based on Eurostat's harmonized index of consumer prices.
[4]Projections for Cyprus are excluded due to the ongoing crisis.

3. Exchange rate

US $ → Birr

Period : 1-Nov-12 30-Apr-13

Nov		Dec		Jan		Feb		Mar		Apr	
day	US$→Birr	day	US$→Birr	day	US$→Birr	day	US$→Birr	day	US$→Birr	day	US$→Birr
11/1	18.2999	12/1		1/1		2/1	18.5087	3/1	18.5932	4/1	18.6730
11/2	18.3651	12/2		1/2		2/2		3/2		4/2	18.6730
11/3		12/3	18.4200	1/3		2/3		3/3		4/3	18.6950
11/4		12/4	18.4088	1/4	18.5260	2/4	18.5350	3/4	18.6100	4/4	18.7133
11/5	18.3949	12/5	18.3781	1/5		2/5	18.5360	3/5	18.6138	4/5	18.6869
11/6	18.3662	12/6	18.3919	1/6		2/6	18.5969	3/6	18.5949	4/6	
11/7	18.3260	12/7	18.4069	1/7	18.3840	2/7	18.5313	3/7	18.6189	4/7	
11/8	18.3350	12/8		1/8	18.4263	2/8	18.5585	3/8	18.6817	4/8	18.7100
11/9	18.3717	12/9		1/9	18.4151	2/9		3/9		4/9	18.7170
11/10		12/10	18.4150	1/10	18.5209	2/10		3/10		4/10	18.7192
11/11		12/11	18.4154	1/11	18.4841	2/11		3/11	18.7840	4/11	18.6838
11/12	18.3569	12/12	18.3928	1/12		2/12	18.5530	3/12	18.6290	4/12	18.7427
11/13	18.3553	12/13	18.4033	1/13		2/13	18.5481	3/13	18.6052	4/13	
11/14	18.3528	12/14	18.3815	1/14		2/14	18.5640	3/14	18.6268	4/14	
11/15	18.3680	12/15		1/15	18.4218	2/15	18.6042	3/15	18.7049	4/15	18.6630
11/16	18.3649	12/16		1/16	18.4875	2/16		3/16		4/16	18.7250
11/17		12/17	18.3260	1/17	18.5372	2/17		3/17		4/17	18.7473
11/18		12/18	18.3672	1/18	18.5238	2/18	18.5309	3/18	18.6270	4/18	18.6758
11/19	18.3530	12/19	18.4199	1/19		2/19	18.5663	3/19	18.6550	4/19	18.8206
11/20	18.3518	12/20	18.3975	1/20		2/20	18.5794	3/20		4/20	
11/21	18.3625	12/21	18.4856	1/21	18.5576	2/21	18.5428	3/21	18.7324	4/21	
11/22	18.3676	12/22		1/22	18.5371	2/22	18.6804	3/22	18.4404	4/22	18.8020
11/23		12/23		1/23	18.5121	2/23		3/23		4/23	18.7401
11/24		12/24		1/24	18.5282	2/24		3/24		4/24	18.7273
11/25		12/25	18.4547	1/25	18.5380	2/25	18.5674	3/25	18.6160	4/25	18.7447
11/26	18.2710	12/26	18.4930	1/26		2/26	18.5960	3/26	18.6423	4/26	18.7688
11/27	18.3158	12/27	18.4969	1/27		2/27	18.7662	3/27	18.7924	4/27	
11/28	18.3481	12/28	18.4446	1/28	18.4770	2/28	18.6168	3/28	18.6720	4/28	
11/29	18.3920	12/29		1/29	18.4940			3/29	18.6732	4/29	
11/30	18.3346	12/30		1/30	18.5066			3/30		4/30	18.7660
		12/31		1/31	18.4820			3/31			
sub-total	385.3531	sub-total	349.8991	sub-total	351.3593	sub-total	352.9819	sub-total	372.9131	sub-total	393.1945
	21days		19days		19days		19days		20days		21days

Source : OANDA

(Nov 385.35 + Dec 349.90 + Jan 351.36 + Feb 352.98 + Mar 372.91 + Apr 393.19)

÷ 119日 = 18.53 <US $: Birr>

Data 2.2.2 : Cost estimation of Unit price for construction works of water supply plan

Submersible pump (including equipment, transportation and installation)

No	Item	Unit	Price (Birr)	Note
P.1	Pump 1.0kw	set	220,000.00	Including pump, controle panel, cable and fittings
P.2	Pump 3.0kw	set	220,000.00	Including pump, controle panel, cable and fittings
P.3	Pump 7.5kw	set	300,000.00	Including pump, controle panel, cable and fittings
P.4	Pump 11.0kw	set	300,000.00	Including pump, controle panel, cable and fittings
P.5	Pump 15.0kw	set	380,000.00	Including pump, controle panel, cable and fittings
P.6	Pump 20.0kw	set	460,000.00	Including pump, controle panel, cable and fittings
P.7	Pump 25.0kw	set	540,000.00	Including pump, controle panel, cable and fittings
P.8	Pump 75.0kw	set	700,000.00	Including controle panel, cable. Not including fittings

Generator (including equipment, transportation and installation)

No	Item	Unit	Price (Birr)	Note
G.1	5kVA~	set	200,000.00	
G.2	10.5kVA~	set	215,000.00	
G.3	17kVA~	set	210,000.00	
G.4	25kVA~	set	235,000.00	
G.5	37kVA~	set	255,000.00	
G.6	50kVA~	set	280,000.00	
G.7	65kVA~	set	310,000.00	
G.8	100kVA~	set	445,000.00	
G.8	300kVA~	set	920,000.00	

Construction of Generator house

No	Item	Unit	Price (Birr)	Note
H.1	Pump and Generator house	set	200,000	Pilot project (4×7.4=29.6m)
H.2	Pump and Generator house	m2	6,800	200,000/29.6

Drilling borehole

No	Item	Unit	Price (Birr)	Note
D.1	Drilling borehole	m	8,000.00	

Riser pipe for borehole （material and installation)

No	Item	Unit	Price (Birr)	Note
R.1	1" (D32)	m	270.00	GI classB
R.2	1" 1/4 (D40)	m	270.00	GI classB
R.3	1" 1/2 (D50) 40A	m	360.00	GI classB
R.4	2" (D63)	m	400.00	GI classB
R.5	2"1/2 (D75) 65A	m	460.00	GI classB
R.6	3" (D90) 80A	m	600.00	GI classB
R.7	4" (D110)	m	810.00	GI classB
R.8	6" (D160)	m	1,070.00	GI classB

uPVC (material and installation, soil works)

No	Item	Unit	Price (Birr)	Note
U.1	1" (D32)	pc	250.00	uPVC, PN10
U.2	1" 1/4 (D40)	pc	250.00	uPVC, PN10
U.3	1" 1/2 (D50) 40A	pc	250.00	uPVC, PN10
U.4	2" (D63)	pc	300.00	uPVC, PN10
U.5	2"1/2 (D75) 65A	pc	360.00	uPVC, PN10
U.6	3" (D90) 80A	pc	420.00	uPVC, PN10
U.7	4" (D110)	pc	470.00	uPVC, PN10
U.8	6" (D160)	pc	520.00	uPVC, PN10
U.9	" (D200)	pc	600.00	uPVC, PN10, estimation
U.10	" (D250)	pc	650.00	uPVC, PN10, estimation
U.11	" (D300)	pc	700.00	uPVC, PN10, estimation
U.12	" (D350)	pc	740.00	uPVC, PN10, estimation

Civil works

No	Item	Unit	Price (Birr)	Note
Cw.1	Site Clearing in ordinary material	m^2	20.00	Site clearace t=200mm
Cw.2	Excavation by man power	m^3	72.00	
Cw.3	Backfill with excavated material by man power	m^3	64.00	
Cw.4	Levelling concrete	m^3	2,560.00	
Cw.5	Structural concrete	m^3	2,640.00	
Cw.6	Formwork	m^2	280.00	
Cw.7	Reinforcing bar D8～D16	kg	48.00	
Cw.8	Stone Pitching	m^3	1,080.00	
Cw.9	Wet stone masonry for body	m^3	1,120.00	
Cw.10	Mortar finishing	m^3	200.00	
Cw.11	Gravel bedding	m^3	382.00	Backfill +Gravel
Cw.12	Filter material D12-18mm	m^3	1,084.00	Backfill +sand 5-25mm 64+1,020
Cw.13	Filter material D8-12mm	m^3	1,084.00	Backfill +sand 5-25mm 64+1,020
Cw.14	Filter material D4-8mm	m^3	400.00	Backfill +sand 0-5mm 64+336
Cw.15	Sand	m^3	370.00	Backfill +sand 0-5mm 64+306

DIP (material and installation, soil works)

No	Item	Unit	Price (Birr)	Note
DI.1	DIP 200mm	m	3,400.00	
DI.2	DIP 250mm	m	4,100.00	
DI.3	DIP 300mm	m	5,300.00	
DI.4	DIP 350mm	m	6,200.00	
DI.5	DIP 90mm	m	1,900.00	
DI.6	DIP 160mm	m	2,600.00	
DI.7	DIP 400mm	m	7,400.00	

Gate Valve (only material)

No	Item	Unit	Price (Birr)	Note
V.1	Gate Valve 3"	set	21,600.00	

Water facilities constrction

No	Item	Unit	Price (Birr)	Note
Wp.1	Public tap	set	50,000.00	
Wp.2	Cattle trough	set	50,000.00	
Wp.3	Water tank	set	20,000.00	including material, installation
Wp.4	Gate valve 3 inch	set	35,000.00	including material, installation,chamver (21,600valve+12,000chamver)
Wp.5	Valve Chamber	set	12,000.00	Refer detail of Wp.5
Wp.6	Sedimentation pond Capacity 36m3	set	459,000.00	Refer detail of Wp.6
Wp.7	Sedimentation pond Capacity 64m3	set	558,000.00	Refer detail of Wp.7
Wp.8	Sedimentation pond Capacity 100m3	set	671,000.00	Refer detail of Wp.8
Wp.9	Sedimentation pond Capacity 144m3	set	797,000.00	Refer detail of Wp.9
Wp.10	Sedimentation pond Capacity 196m3	set	936,000.00	Refer detail of Wp.10
Wp.11	Sedimentation pond Capacity 256m3	set	1,089,000.00	Refer detail of Wp.11
Wp.12	Sedimentation pond Capacity 484m3	set	1,838,000.00	Refer detail of Wp.12
Wp.13	Sedimentation pond Capacity 576m3	set	2,059,000.00	Refer detail of Wp.13
Wp.14	Conveyance canal	set	194,000.00	Refer detail of Wp.14
Wp.15	Rough filter	set	377,000.00	Refer detail of Wp.15
Wp.16	Clear water reservoir Capacity 20m3	set	285,000.00	Refer detail of Wp.16
Wp.17	Clear water reservoir Capacity 40m3	set	496,000.00	Refer detail of Wp.17
Wp.18	Clear water reservoir Capacity 60m3	set	649,000.00	Refer detail of Wp.18
Wp.19	Clear water reservoir Capacity 80m3	set	777,000.00	Refer detail of Wp.19
Wp.20	Clear water reservoir Capacity 100m3	set	863,000.00	Refer detail of Wp.20
Wp.21	Clear water reservoir Capacity 120m3	set	1,001,000.00	Refer detail of Wp.21
Wp.22	Clear water reservoir Capacity 140m3	set	1,111,000.00	Refer detail of Wp.22
Wp.23	Clear water reservoir Capacity 160m3	set	1,206,000.00	Refer detail of Wp.23
Wp.24	Clear water reservoir Capacity 190m3	set	1,365,000.00	Refer detail of Wp.24
Wp.25	Clear water reservoir Capacity 330m3	set	1,968,000.00	Refer detail of Wp.25
Wp.26	Elevated tank Capacity 10m3	set	102,000.00	Refer detail of Wp.26
Wp.27	Elevated tank Capacity 200m3	set	618,000.00	Refer detail of Wp.27
Wp.28	Elevated tank Capacity 300m3	set	840,000.00	Refer detail of Wp.28
Wp.29	Elevated tank Capacity 350m3	set	958,000.00	Refer detail of Wp.29
Wp.30	Elevated tank Capacity 400m3	set	1,084,000.00	Refer detail of Wp.30
Wp.31	Elevated tank Capacity 500m3	set	1,242,000.00	Refer detail of Wp.31
Wp.32	Elevated tank Capacity 550m3	set	1,370,000.00	Refer detail of Wp.32
Wp.33	Elevated tank Capacity 600m3	set	1,397,000.00	Refer detail of Wp.33
Wp.34	Elevated tank Capacity 700m3	set	1,675,000.00	Refer detail of Wp.34
Wp.35	Elevated tank Capacity 800m3	set	1,679,000.00	Y=21994×X^(0.6485)
Wp.36	Elevated tank Capacity 900m3	set	1,812,000.00	Y=21994×X^(0.6485)
Wp.37	Elevated tank Capacity 40m3	set	241,000.00	Y=21994×X^(0.6485)
Wp.38	Elevated tank Capacity 50m3	set	278,000.00	Y=21994×X^(0.6485)
Wp.39	Elevated tank Capacity 60m3	set	313,000.00	Y=21994×X^(0.6485)
Wp.40	Elevated tank Capacity 80m3	set	377,000.00	Y=21994×X^(0.6485)
Wp.41	Elevated tank Capacity 20m3	set	153,000.00	Y=21994×X^(0.6485)
Wp.42	Elevated tank Capacity 30m3	set	200,000.00	Y=21994×X^(0.6485)
Wp.43	Overhead crane munual type with chain block	set	224,000.00	Overhead steel = 15.0m(84,000birr), Winch 1.0t H=6m (140,000birr)
Wp.44	Gate valve D250mm	set	69,000.00	including material, installation
Wp.45	Gate valve D350mm	set	90,000.00	including material, installation

1. Detail of unit price of construction works Wp.5 ~Wp.34

1.1. Wp.5 Valve chamber

Valve Chamber

No	Work item	Unit	Q'ty	Unit price	Amount	Note
1						Wp.5
1.1	Clearing	m^2	5.28	20.00	105.60	Cw.1
1.2	Excavation	m^3	3.65	72.00	262.80	Cw.2
1.3	Backfilling	m^3	1.89	64.00	120.96	Cw.3
1.4	Levelling concrete	m^3	0.08	2,560.00	204.80	Cw.4
1.5	Structural concrete	m^3	1.22	2,640.00	3,220.80	Cw.5
1.6	Re-bar	kg	95.19	48.00	4,569.12	Cw.7
1.7	Formwork	m^2	10.84	280.00	3,035.20	Cw.6
	Total (Direct Cost)				12,000.00	

1.2. Wp.6 ~ Wp.13 Sedimentation pond

Sedimentation pond

No	Work item	Unit	Q'ty	Unit price	Amount	Note
1	Capacity 36m^3					Wp.6
1.1	Clearing	m^2	122.16	20.00	2,443.20	Cw.1
1.2	Excavation	m^3	4.90	72.00	352.80	Cw.2
1.3	Levelling concrete	m^3	4.90	2,560.00	12,544.00	Cw.4
1.4	Structural concrete	m^3	23.76	2,640.00	62,726.40	Cw.5
1.5	Re-bar	kg	2,138.40	48.00	102,643.20	Cw.7
1.6	Formwork	m^2	158.54	280.00	44,391.20	Cw.6
1.7	PVC pipe D50mm for hole	m	3.00	250.00	750.00	U.3
1.8	GI Pipe 3 inch	m	38.00	600.00	22,800.00	R.6
1.9	Gate valve 3 inch	nos	6.00	35,000.00	210,000.00	Wp.4
	Total				459,000.00	
2	Capacity 64m^3					Wp.7
2.1	Clearing	m^2	191.76	20.00	3,835.20	Cw.1
2.2	Excavation	m^3	8.10	72.00	583.20	Cw.2
2.3	Levelling concrete	m^3	8.10	2,560.00	20,736.00	Cw.4
2.4	Structural concrete	m^3	34.40	2,640.00	90,816.00	Cw.5
2.5	Re-bar	kg	3,096.00	48.00	148,608.00	Cw.7
2.6	Formwork	m^2	207.34	280.00	58,055.20	Cw.6
2.7	PVC pipe D50mm for hole	m	3.60	250.00	900.00	U.3
2.8	GI Pipe 3 inch	m	40.00	600.00	24,000.00	R.6
2.9	Gate valve 3 inch	nos	6.00	35,000.00	210,000.00	Wp.4
					558,000.00	
3	Capacity 100m^3					Wp.8
3.1	Clearing	m^2	277.36	20.00	5,547.20	Cw.1
3.2	Excavation	m^3	12.10	72.00	871.20	Cw.2
3.3	Levelling concrete	m^3	12.10	2,560.00	30,976.00	Cw.4
3.4	Structural concrete	m^3	46.64	2,640.00	123,129.60	Cw.5
3.5	Re-bar	kg	4,197.60	48.00	201,484.80	Cw.7
3.6	Formwork	m^2	256.14	280.00	71,719.20	Cw.6
3.7	PVC pipe D50mm for hole	m	4.80	250.00	1,200.00	U.3
3.8	GI Pipe 3 inch	m	42.00	600.00	25,200.00	R.6
3.9	Gate valve 3 inch	nos	6.00	35,000.00	210,000.00	Wp.4
					671,000.00	
4	Capacity 144m^3					Wp.9
4.1	Clearing	m^2	378.96	20.00	7,579.20	Cw.1
4.2	Excavation	m^3	16.90	72.00	1,216.80	Cw.2
4.3	Levelling concrete	m^3	16.90	2,560.00	43,264.00	Cw.4
4.4	Structural concrete	m^3	60.48	2,640.00	159,667.20	Cw.5
4.5	Re-bar	kg	5,443.20	48.00	261,273.60	Cw.7
4.6	Formwork	m^2	304.94	280.00	85,383.20	Cw.6
4.7	PVC pipe D50mm for hole	m	5.40	250.00	1,350.00	U.3
4.8	GI Pipe 3 inch	m	44.00	600.00	26,400.00	R.6
4.9	Gate valve 3 inch	nos	6.00	35,000.00	210,000.00	Wp.4
					797,000.00	

Sedimentation pond

No	Work item	Unit	Q'ty	Unit price	Amount	Note
5	Capacity 196m^3					Wp.10
5.1	Clearing	m^2	496.56	20.00	9,931.20	Cw.1
5.2	Excavation	m^3	22.50	72.00	1,620.00	Cw.2
5.3	Levelling concrete	m^3	22.50	2,560.00	57,600.00	Cw.4
5.4	Structural concrete	m^3	75.92	2,640.00	200,428.80	Cw.5
5.5	Re-bar	kg	6,832.80	48.00	327,974.40	Cw.7
5.6	Formwork	m^2	353.74	280.00	99,047.20	Cw.6
5.7	PVC pipe D50mm for hole	m	6.00	250.00	1,500.00	U.3
5.8	GI Pipe 3 inch	m	46.00	600.00	27,600.00	R.6
5.9	Gate valve 3 inch	nos	6.00	35,000.00	210,000.00	Wp.4
					936,000.00	
6	Capacity 256m^3					Wp.11
6.1	Clearing	m^2	630.16	20.00	12,603.20	Cw.1
6.2	Excavation	m^3	28.90	72.00	2,080.80	Cw.2
6.3	Levelling concrete	m^3	28.90	2,560.00	73,984.00	Cw.4
6.4	Structural concrete	m^3	92.96	2,640.00	245,414.40	Cw.5
6.5	Re-bar	kg	8,366.40	48.00	401,587.20	Cw.7
6.6	Formwork	m^2	402.54	280.00	112,711.20	Cw.6
6.7	PVC pipe D50mm for hole	m	7.20	250.00	1,800.00	U.3
6.8	GI Pipe 3 inch	m	48.00	600.00	28,800.00	R.6
6.9	Gate valve 3 inch	nos	6.00	35,000.00	210,000.00	Wp.4
					1,089,000.00	
7	Capacity 484m^3					Wp.12
7.1	Clearing	m^2	1,324.56	20.00	26,491.20	Cw.1
7.2	Excavation	m^3	62.50	72.00	4,500.00	Cw.2
7.3	Levelling concrete	m^3	62.50	2,560.00	160,000.00	Cw.4
7.4	Structural concrete	m^3	177.12	2,640.00	467,596.80	Cw.5
7.5	Re-bar	kg	15,940.80	48.00	765,158.40	Cw.7
7.6	Formwork	m^2	597.74	280.00	167,367.20	Cw.6
7.7	PVC pipe D50mm for hole	m	10.80	250.00	2,700.00	U.3
7.8	GI Pipe 3 inch	m	56.00	600.00	33,600.00	R.6
7.9	Gate valve 3 inch	nos	6.00	35,000.00	210,000.00	Wp.4
					1,838,000.00	
8	Capacity 576m^3					Wp.13
8.1	Clearing	m^2	1,538.16	20.00	30,763.20	Cw.1
8.2	Excavation	m^3	72.90	72.00	5,248.80	Cw.2
8.3	Levelling concrete	m^3	72.90	2,560.00	186,624.00	Cw.4
8.4	Structural concrete	m^3	202.16	2,640.00	533,702.40	Cw.5
8.5	Re-bar	kg	18,194.40	48.00	873,331.20	Cw.7
8.6	Formwork	m^2	646.54	280.00	181,031.20	Cw.6
8.7	PVC pipe D50mm for hole	m	11.40	250.00	2,850.00	U.3
8.8	GI Pipe 3 inch	m	58.00	600.00	34,800.00	R.6
8.9	Gate valve 3 inch	nos	6.00	35,000.00	210,000.00	Wp.4
	Total(Direct Cost)				2,059,000.00	

1.3. Wp. 14 Conveyance canal

Conveyance canal

No	Work item	Unit	Q'ty	Unit price	Amount	Note
						Wp.14
1	Coffering	m^3	10.17	64.00	650.88	Cw.3
2	Stone pitching	m^3	3.00	1,080.00	3,240.00	Cw.8
3	Excavation	m^3	61.99	72.00	4,463.28	Cw.2
4	Backfill	m^3	40.27	64.00	2,577.28	Cw.3
5	Levelling concrete	m^3	1.40	2,560.00	3,584.00	Cw.4
6	Structural concrete	m^3	20.32	2,640.00	53,644.80	Cw.5
7	Formwork	m^2	133.13	280.00	37,276.40	Cw.6
8	Re-bar	kg	1828.80	48.00	87,782.40	Cw.7
	Total(Direct Cost)				194,000.00	

1.4. Wp.15 Rough filter

Rough filter

No	Work item	Unit	Q'ty	Unit price	Amount	Note
						Wp.15
1	Clearing	m^2	79.92	20.00	1,598.40	Cw.1
2	Excavation	m^3	4.75	72.00	342.00	Cw.2
3	Levelling concrete	m^3	4.75	2,560.00	12,160.00	Cw.4
4	Structural concrete	m^3	19.02	2,640.00	50,212.80	Cw.5
5	Re-bar	kg	1171.80	48.00	56,246.40	Cw.7
6	Formwork	m^2	102.60	280.00	28,728.00	Cw.6
7	Gravel 4~8mm for filter	m^3	18.00	400.00	7,200.00	Cw.14
8	GI Pipe 3 inch	m	16.00	600.00	9,600.00	R.6
9	Gate valve 3 inch	nos	6.00	35,000.00	210,000.00	Wp.4
	Total(Direct Cost)				377,000.00	

1.5. Wp.16 ~ Wp.25 Clear water reservoir

Clear water reservoir

No	Work item	Unit	Q'ty	Unit price	Amount	Note
1	Capacity 20m^3					Wp.16
1.1	Structural Concrete	m^3	38.80	2640.00	102,432.00	Cw.5
1.2	Re-bar	kg	3,492.00	48.00	167,616.00	Cw.7
1.3	Formwork	m^2	50.84	280.00	14,235.20	Cw.6
	Total (Direct Cost)				285,000.00	
2	Capacity 40m^3					Wp.17
2.1	Structural Concrete	m^3	67.80	2640.00	178,992.00	Cw.5
2.2	Re-bar	kg	6,102.00	48.00	292,896.00	Cw.7
2.3	Formwork	m^2	84.68	280.00	23,710.40	Cw.6
	Total (Direct Cost)				496,000.00	
3	Capacity 60m^3					Wp.18
3.1	Structural Concrete	m^3	88.60	2640.00	233,904.00	Cw.5
3.2	Re-bar	kg	7,974.00	48.00	382,752.00	Cw.7
3.3	Formwork	m^2	112.04	280.00	31,371.20	Cw.6
	Total (Direct Cost)				649,000.00	
4	Capacity 80m^3					Wp.19
4.1	Structural Concrete	m^3	106.00	2640.00	279,840.00	Cw.5
4.2	Re-bar	kg	9,540.00	48.00	457,920.00	Cw.7
4.3	Formwork	m^2	137.24	280.00	38,427.20	Cw.6
	Total (Direct Cost)				777,000.00	
5	Capacity 100m^3					Wp.20
5.1	Structural Concrete	m^3	117.60	2640.00	310,464.00	Cw.5
5.2	Re-bar	kg	10,584.00	48.00	508,032.00	Cw.7
5.3	Formwork	m^2	157.88	280.00	44,206.40	Cw.6
	Total (Direct Cost)				863,000.00	
6	Capacity 120m^3					Wp.21
6.1	Structural Concrete	m^3	136.20	2640.00	359,568.00	Cw.5
6.2	Re-bar	kg	12,258.00	48.00	588,384.00	Cw.7
6.3	Formwork	m^2	186.28	280.00	52,158.40	Cw.6
	Total (Direct Cost)				1,001,000.00	
7	Capacity 140m^3					Wp.22
7.1	Structural Concrete	m^3	151.40	2640.00	399,696.00	Cw.5
7.2	Re-bar	kg	13,626.00	48.00	654,048.00	Cw.7
7.3	Formwork	m^2	201.00	280.00	56,280.00	Cw.6
	Total (Direct Cost)				1,111,000.00	
8	Capacity 160m^3 2nos for Mustahil town					Wp.23
8.1	Structural Concrete	m^3	164.20	2640.00	433,488.00	Cw.5
8.2	Re-bar	kg	14,778.00	48.00	709,344.00	Cw.7
8.3	Formwork	m^2	224.84	280.00	62,955.20	Cw.6
	Total (Direct Cost)				1,206,000.00	
9	Capacity 190m^3 2nos for Kalafo town					Wp.24
9.1	Structural Concrete	m^3	185.60	2640.00	489,984.00	Cw.5
9.2	Re-bar	kg	16,704.00	48.00	801,792.00	Cw.7
9.3	Formwork	m^2	258.04	280.00	72,251.20	Cw.6
	Total (Direct Cost)				1,365,000.00	
10	Capacity 330m^3 4nos for Godey town					Wp.25
10.1	Structural Concrete	m^3	267.40	2640.00	705,936.00	Cw.5
10.2	Re-bar	kg	24,066.00	48.00	1,155,168.00	Cw.7
10.3	Formwork	m^2	381.00	280.00	106,680.00	Cw.6
	Total (Direct Cost)				1,968,000.00	

1.6. Wp.26 ~ Wp.34 Elevated tank

Elevated tank

No	Work item	Unit	Q'ty	Unit price	Amount	Note
	Capacity 10m^3					Wp.26
1	Clearing	m^2	21.00	20.00	420.00	Cw.1
2	Excavation	m^3	3.92	72.00	282.24	Cw.2
3	Backfilling	m^3	0.79	64.00	50.56	Cw.3
4	Levelling concrete	m^3	0.63	2,560.00	1,612.80	Cw.4
5	Structural concrete	m^3	9.25	2,640.00	24,420.00	Cw.5
6	Re-bar	kg	832.50	48.00	39,960.00	Cw.7
7	Formwork	m^2	33.90	280.00	9,492.00	Cw.6
8	Steel ladder	kg	114.84	48.00	5,512.32	Cw.7
9	Water tank	nos	1.00	########	20,000.00	Pilot
	Total (Direct cost)				102,000.00	
No	Work item	Unit	Q'ty	Unit price	Amount	Note
1	Capacity 200m^3					Wp.27
1.1	Clearing	m^2	98.00	20.00	1,960.00	Cw.1
1.2	Excavation	m^3	8.49	72.00	611.28	Cw.2
1.3	Backfilling	m^3	0.64	64.00	40.96	Cw.3
1.4	Levelling concrete	m^3	7.85	2,560.00	20,096.00	Cw.4
1.5	Structural concrete	m^3	73.86	2,640.00	194,990.40	Cw.5
1.6	Re-bar	kg	6,647.40	48.00	319,075.20	Cw.7
1.7	Formwork	m^2	268.34	280.00	75,135.20	Cw.6
1.8	Steel ladder	kg	107.59	48.00	5,164.32	Cw.7
	Total (Direct Cost)				618,000.00	
2	Capacity 300m^3					Wp.28
2.1	Clearing	m^2	128.00	20.00	2,560.00	Cw.1
2.2	Excavation	m^3	12.07	72.00	869.04	Cw.2
2.3	Backfilling	m^3	0.77	64.00	49.28	Cw.3
2.4	Levelling concrete	m^3	11.30	2560.00	28,928.00	Cw.4
2.5	Structural concrete	m^3	101.16	2640.00	267,062.40	Cw.5
2.6	Re-bar	kg	9,104.40	48.00	437,011.20	Cw.7
2.7	Formwork	m^2	348.65	280.00	97,622.00	Cw.6
2.8	Steel ladder	kg	110.43	48.00	5,300.64	Cw.7
	Total (Direct Cost)				840,000.00	
3	Capacity 350m^3					Wp.29
3.1	Clearing	m^2	144.50	20.00	2,890.00	Cw.1
3.2	Excavation	m^3	14.10	72.00	1,015.20	Cw.2
3.3	Backfilling	m^3	0.83	64.00	53.12	Cw.3
3.4	Levelling concrete	m^3	13.27	2560.00	33,971.20	Cw.4
3.5	Structural concrete	m^3	115.76	2640.00	305,606.40	Cw.5
3.6	Re-bar	kg	10,418.40	48.00	500,083.20	Cw.7
3.7	Formwork	m^2	388.06	280.00	108,656.80	Cw.6
3.8	Steel ladder	kg	110.43	48.00	5,300.64	Cw.7
	Total (Direct Cost)				958,000.00	
4	Capacity 400m^3					Wp.30
4.1	Clearing	m^2	162.00	20.00	3,240.00	Cw.1
4.2	Excavation	m^3	16.28	72.00	1,172.16	Cw.2
4.3	Backfilling	m^3	0.89	64.00	56.96	Cw.3
4.4	Levelling concrete	m^3	15.39	2560.00	39,398.40	Cw.4
4.5	Structural concrete	m^3	131.30	2640.00	346,632.00	Cw.5
4.6	Re-bar	kg	11,817.00	48.00	567,216.00	Cw.7
4.7	Formwork	m^2	429.04	280.00	120,131.20	Cw.6
4.8	Steel ladder	kg	110.43	48.00	5,300.64	Cw.7
	Total (Direct Cost)				1,084,000.00	

Elevated tank

No	Work item	Unit	Q'ty	Unit price	Amount	
5	Capacity 500m^3					Wp.31
5.1	Clearing	m^2	180.50	20.00	3,610.00	Cw.1
5.2	Excavation	m^3	18.62	72.00	1,340.64	Cw.2
5.3	Backfilling	m^3	0.96	64.00	61.44	Cw.3
5.4	Levelling concrete	m^3	17.66	2560.00	45,209.60	Cw.4
5.5	Structural concrete	m^3	150.57	2640.00	397,504.80	Cw.5
5.6	Re-bar	kg	13,551.30	48.00	650,462.40	Cw.7
5.7	Formwork	m^2	490.29	280.00	137,281.20	Cw.6
5.8	Steel ladder	kg	116.10	48.00	5,572.80	Cw.7
	Total (Direct Cost)				1,242,000.00	
6	Capacity 550m^3					Wp.32
6.1	Clearing	m^2	200.00	20.00	4,000.00	Cw.1
6.2	Excavation	m^3	21.11	72.00	1,519.92	Cw.2
6.3	Backfilling	m^3	1.01	64.00	64.64	Cw.3
6.4	Levelling concrete	m^3	20.10	2560.00	51,456.00	Cw.4
6.5	Structural concrete	m^3	166.70	2640.00	440,088.00	Cw.5
6.6	Re-bar	kg	15,003.00	48.00	720,144.00	Cw.7
6.7	Formwork	m^2	525.68	280.00	147,190.40	Cw.6
6.8	Steel ladder	kg	113.26	48.00	5,436.48	Cw.7
	Total (Direct Cost)				1,370,000.00	
7	Capacity 600m^3					Wp.33
7.1	Clearing	m^2	200.00	20.00	4,000.00	Cw.1
7.2	Excavation	m^3	21.11	72.00	1,519.92	Cw.2
7.3	Backfilling	m^3	1.01	64.00	64.64	Cw.3
7.4	Levelling concrete	m^3	20.10	2560.00	51,456.00	Cw.4
7.5	Structural concrete	m^3	169.68	2640.00	447,955.20	Cw.5
7.6	Re-bar	kg	15,271.20	48.00	733,017.60	Cw.7
7.7	Formwork	m^2	545.64	280.00	152,779.20	Cw.6
7.8	Steel ladder	kg	118.94	48.00	5,709.12	Cw.7
	Total (Direct Cost)				1,397,000.00	
8	Capacity 700m^3					Wp.34
8.1	Clearing	m^2	242.00	20.00	4,840.00	Cw.1
8.2	Excavation	m^3	26.58	72.00	1,913.76	Cw.2
8.3	Backfilling	m^3	1.15	64.00	73.60	Cw.3
8.4	Levelling concrete	m^3	25.43	2560.00	65,100.80	Cw.4
8.5	Structural concrete	m^3	204.57	2640.00	540,064.80	Cw.5
8.6	Re-bar	kg	18,411.30	48.00	883,742.40	Cw.7
8.7	Formwork	m^2	619.88	280.00	173,566.40	Cw.6
8.8	Steel ladder	kg	113.26	48.00	5,436.48	Cw.7
	Total (Direct Cost)				1,675,000.00	

Data 2.2.3 : **Construction cost of Birka and Haffir dam**

1. Birka

S. No.	Materials	Unit	Qty	Unit Cost (in Birr)	Total Cost (ETB)	note
1	**General**					
1.1	Mobilization of Manpower,Equipment,and construction material.	Ls	1		0	In-direct cost
1.2	Demobilization of Manpower,Equipment and construction material.	Ls	1		0	In-direct cost
	Subtotal				**0**	
2	**Earth Work**					
2.1	Site clearing to a depth of 20cm to remove top loose & vegetation.	m^2	391	20	7,820	Cw.1
2.2	Excavation of the main birka from 0m-2m	m^3	432	72	31,104	Cw.2
2.3	Ditto but from 2m-4m for hard formation	m^3	432	72	31,104	Cw.2
2.4	Filling under hard core with selected non-expansive site material & compact in layers not exceeding 25cm	m^3	54	550	29,700	other
	Subtotal				**99,728**	
3	**Masonry Work**					
3.1	20cm thick bassaltic stone hardcore well rolled consolidated and blinded with crushed stone.	m^2	324	150	48,600	other
3.2	Hard stone masonry work in walls for the birka bedded with mortar c:s=1:3(including stair case).	m^3	200	1,120	224,000	Cw.9
	Subtotal				**272,600**	
4	**Concrete Work**					
4.1	3cm lean concrte 1:3:5	m^2	324	345	111,780	other
4.2	RCC 1:2:4 work for the floor slab	m^3	19	2,640	50,160	Cw.5
4.3	Ditto in top tie beam	m^3	5	2,640	13,200	Cw.5
4.4	Ditto in grade beam	m^3	3	2,640	7,920	Cw.5
4.5	Ditto in columns	m^3	1	2,640	2,640	Cw.5
4.6	5cm thick cement screed evenly all of floor area in cement sand moratr 1:3	m^3	187	125	23,375	other
4.7	Plastering the floor area and the walls ofthe main birka with cenent sand mortar 1:3 upto fine finish.	m^2	384	200	76,800	Cw.10
	Subtotal				**285,875**	
5	**Reinforcement work**					
	Prices includes supply,cutting,bending placing in position and tying.					
5.1	Ø6mm plain bar	kg	120	48	5,760	Cw.7
5.2	Ø10mm plain bar(37pcs)	kg	700	48	33,600	Cw.7
5.3	Chicken Wire (1.8m*3m)	roll	3	600	1,800	other
	Subtotal				**41,160**	
6	**Roof Work**					
6.1	Upper and Lower Truss member of Ø10cm Eucalyptus wood,well seasoned & free of defects.	m	294	46	13,524	other
6.2	Vertical and diagonal Truss member of Ø8cm Eucalyptus wood,well seasoned & free of defects.	m	320	25	8,000	other
6.3	Roofing with G-30 corrugate iron sheet.	m^2	287	440	126,280	other
	Subtotal				**147,804**	

7	**Over flow**					
7.1	Remove top 20cm soil and vegetation.	m2	64	20	1,280	Cw.1
7.2	Filling under hardcore with selected non-expansive site material & compact in layerrs not exceeding 15cm.	m3	1	850	850	other
7.3	Masonry semi dressed stone & pavement work joined and pointed with cement sand mortar 1:3.	m3	4	260	1,040	other
	Subtotal				**3,170**	
8	**Silt Trap**					
8.1	Earth Work					
8.1.1	Excavation of the silt trap 0m-3m	m3	24	72	1,728	Cw.2
	Subtotal				**1,728**	
9	**Masonry Work**					
9.1	15cm thick bassaltic stone hardcore bedded with cement sandmortar 1:3.	m2	14	150	2,100	other
9.2	Hard stone masonry work in walls for the silt trap bedded with mortar c:s=1:3	M3	18	1,120	20,160	Cw.9
	Subtotal				**22,260**	
10	**Concrete Work**					
10.1	3cm lean concrte 1:3:5	M2	14	345	4,830	other
10.2	5cm thick cement screed evenly all of floor area in cement sand moratr 1:3	M3	9	125	1,125	other
10.3	RCC 1:2:4 work for the floor slab	M3	3	2,640	7,920	Cw.5
	Subtotal				**13,875**	
11	**Inlet and Outlet Canal.**					
11.1	Site clearing to a depth of 20cm to remove remove top loose & vegetation.	m2	30	20	600	Cw.1
11.2	Excavation for the construction of inlet & outlet.	m3	5	72	360	Cw.2
11.3	Semi-dressed stone pavement work joined and pointed with cement sand mortar 1:2 for the inlet	m2	25	260	6,500	other
11.4	Ditto but outlet canal (from silt trap to the main reservior).	m2	15	260	3,900	other
11.5	Afridev Handpup with all accessories.	pcs	1	17,000	17,000	other
	Subtotal				**28,360**	other
	Direct cost Total				**916,560**	
	Direct and Indirect cost Total (Direct cost @ 1.15)				**1,050,000**	**birr**
	Direct and Indirect cost Total (Direct cost @ 1.15)				**57,000**	**USD**

USD	ETB
1	18.53

2. Haffir dam

Haffir dam

Bill No.	Description of work	Unit	qty	Unit Price	Total amount	note
A	**General**					
A1	Mobilization of man power equipment & construction materials	LS	1			In direct cost
A2	Demobilization if man power equipment & construction materials	LS	1			In direct cost
	Sub total					In direct cost
Total to bill No. A					**0**	
B	**Silt Trap**					
B1	**Earth work**					
B1.1	Site clearing to a depth of 20cm to remove the top loose soil and vegetation & use the excavated soil for constructing embankment around the reservoir as shown in the drawing	m^2	1,350	20	27,000	Cw.1
B1.2	Bulk Excavation of the silt trap reservoir area and & use the excavated soil for constructing embankment around the reservoir as shown in the drawing up to depth 1m	m^3	989	72	71,208	Cw.2
B1.3	Ditto but from 1 m up to 2.6m depth	m^3	1,582	72	113,904	Cw.2
B1.4	Filling under hard core with selected non expansive site material & compact in layers not exceeding 15 cm thickness	m^3	231	255	58,905	Other
	Sub total				**271,017**	
B2	**Masonry Work**					
B2.1	40 cm thick basaltic or equivalent stone hard core well rolled consolidated & blinded with crushed stone	m^2	924	850	785,400	Other
B2.2	Hard stone masonry work in walls for the silt trap bedded with cement sand mortar 1:3	m^3	191	1,120	213,920	Cw.9
	Sub Total				**999,320**	
B3	**Concrete Work**					
B3.1	3cm lean concrete 1:3:5	m^2	800	200	160,000	Other
B3.2	RCC work 1:1.5:3 in the floor slab for the silt trap	m^3	120	2,640	316,800	Cw.5
B3.3	5 cm thick cement screed evenly all over the floor area in cement sand mortar mix 1:3	m^2	800	200	160,000	Cw.10
B3.4	Apply two coats of 0.6mm thick plastering the floor area & the walls of the silt trap with cement sand mortar (1:3) up to fine finish	m^2	1,040	75	78,000	Other
	Sub Total				**714,800**	
B4	**Reinforcement Work**					
B4.1	Steel reinforcement according to structural drawing price includes supply, cutting, bending ,Placing in position & tying					
B4.1.1	Ø 6 mm plain bars	kg	120	48	5,760	Cw.7
B4.1.2	Ø 10 mm def bars	kg	5,076	48	243,648	Cw.7
B4.1.3	Ø 8 mm plain bars	kg	75	48	3,600	Cw.7
	Sub total				**253,008**	
Total to bill No. B					**2,238,145**	
C	**In let & out let canals**					
C1	**Earth work**					
C1.1	Site clearing to remove the top loose soil and vegetation & use the excavated soil for constructing embankment around the reservoir as shown in the drawing	m^2	222	20	4,440	Cw.1
C1.2	Excavation of trench for construction of inlet & out let cannels as shown in the drawing & use the excavated soil for constructing embankment around the reservoir as shown in the drawing	m^3	231	72	16,632	Cw.2
C1.3	Filling selected site material & compact in layers no exceeding 15cm thickness	m^2	74	64	4,736	Cw.3
	Sub total				**25,808**	
C2	**Masonry work**					
C2.1	Semi - dressed stone pavement work Joined & pointed with cement sand mortar 1:2 for the in let canal	m^2	78	850	66,300	Other
C2.2	Ditto but for out let canal (from the silt trap to the main reservoir	m^2	115	850	97,750	Other
	Sub total				**164,050**	
C3	**Concrete work**					
C3.1	Supply & lay 450mm in dia concrete pipe as per the drawing (cost includes trench excavation. Backfilling the trench & compacting construction of concrete cut off collars laying & joining to the sump) which is from the main pond to the sump	m	112	100	11,200	Other
C3.2	Ditto but from the silt trap to the main reservoir	m	36	100	3,600	Other
	Sub total				**14,800**	
Total to bill No. C					**204,658**	

D	**Over flow canal**					
D1	**Earth work**					
D1.1	Site clearing to remove the top loose soil and vegetation & use the excavated soil for constructing embankment around the reservoir as shown in the drawing	m^2	200	20	4,000	Cw.1
D1.2	Exaction of trench for construction of over flow canal use the excavated soil for constructing embankment around the reservoir as shown in the drawing	m^3	240	72	17,280	Cw.2
D1.3	Filling selected site material & compact in layers no exceeding 15cm thickness	m^2	200	64	12,800	Cw.3
	Sub total				**34,080**	
D2	**Masonry work**					
D2.1	Semi dressed stone pavement work joined & pointed with cement sand mortar 1:3 for the over flow canal	m^2	198	200	39,600	Cw.10
	Sub total				**39,600**	
Total to bill No. D					**73,680**	
E1	**Earth work**					
E1.1	site clearing to 20 cm depth to remove the loose soil and vegetation &use the excavated soil for constructing embankment around the reservoir as shown in the drawing	m^2	11,564	20	231,280	Cw.1
E1.2	Bulk Excavation of the main pond reservoir area and use the excavated soil for constructing embankment , put & compact layer by layer not exceeding 25cm thickness around the main pond as shown in the drawing					
E1.2.1	Excavation in ordinary soil 0m up to 2m depth	m^3	18,400	72	1,324,800	Cw.2
E1.2.2	Excavation in medium formation 2m up to 4.2m depth	m^3	16,800	72	1,209,600	Cw.2
	Sub total				**2,765,680**	
E2	**Lining**					
E2.1	Filling & compacting the whole floor area of the reservoir including the excavated embankment with selected soil & compacting in layers not exceeding 15cm thickness	m^2	8,000	55	440,000	Other
	Sub total				**440,000**	
E3	**Concrete Rings (for sumps)**					
E3.1	Supply & install 1.2m internal diameter 1.0m depth & 0.05m thickness reinforced concrete rings downstream of the main pond for the sump. Cost includes bulk excavation, carting away lowering of the rings & connecting it to the out let concrete pipes and canal.	Pcs	8	100	800	Other
	Sub total				**800**	
E4	**Fence work**					
E4.1	Fencing around the reservoir area with 10cm eucalyptus posts every 2m, height of 210cm above ground level with 40cm x 40cm x 50cm deep concrete foundation, bracing diagonals at an interval of 10m and corners. The fence shall be constructed with barbed wire	m	740	45	33,300	Other
	Sub total				**33,300**	
E5	**Miscellaneous works**					
E5.1	Construction of masonry deflector wall as shown in the drawing to dissipate the energy of flow of water to the main pond	No	1	1500	1,500	Other
E5.2	Construction of masonry out let chamber (100cm x 100cm x 60cm height)	No	3	2500	7,500	Other
E5.3	Construction of guide lines (earth channels) for diverting the surface runoff to the reservoir (50cm width x 70cm depth & 200 Meter length	No	3	3500	10,500	Other
	Sub total				**19,500**	
Total to bill No. E					**3,259,280**	
F	**Hand pump**					
F1	Hand pump	No	1	17,000	17,000	Other
Total to bill No. F					**17,000**	
	Direct total cost total				**5,792,763**	birr
	Direct cost and indirectcost (Direct cost @ 1.25)				**7,241,000**	birr
	Direct cost and indirectcost (Direct cost @ 1.25)				**391,000**	USD

USD	ETB
1	18.53

Data 2.2.4 : Cost estimation of water supply plan

a. Godey town (Urban water supply)

(Unit:USD)

Item	cost	Foreign Component	Foreign	Local
1. Construction cost				
1.1 Direct cost				
(1) Riverbed protection	5,500	40%	2,200	3,300
(2) Intake canal	37,500	40%	15,000	22,500
(3) Settling basin	26,300	40%	10,520	15,780
(4) Pump house				
1) Pump house	37,700	40%	15,080	22,620
2) Pump, pipe, fittings	245,900	97%	238,523	7,377
(5) Generator house				
1) Generator house	29,200	40%	11,680	17,520
2) Generator and fittings	72,800	97%	70,616	2,184
(6) Sedimentation pond				
1) Civil works	135,300	40%	54,120	81,180
2) Pipe and fittings	62,500	97%	60,625	1,875
(7) Rough filter				
1) Civil works	166,200	40%	66,480	99,720
2) Pipe and fittings	157,400	97%	152,678	4,722
(8) Slow sand filter				
1) Civil works	320,100	40%	128,040	192,060
2) Pipe and fittings	119,000	97%	115,430	3,570
(9) Clear water reservoir				
1) Civil works	132,000	40%	52,800	79,200
2) Pipe and fittings	47,000	97%	45,590	1,410
(10) Transmission pipeline	1,429,600	70%	1,000,720	428,880
(11) Elevated reservoir				
1) Civil works	229,500	40%	91,800	137,700
2) Pipe and fittings	32,200	70%	22,540	9,660
(12) Distribution pipeline	1,660,700	70%	1,162,490	498,210
(13) Public tap	56,700	40%	22,680	34,020
(14) Cattle trough	13,500	40%	5,400	8,100
(15) Other	251,400	70%	175,980	75,420
sub-total	5,268,000		3,520,992	1,747,008
Average			67%	33%
1.2 In-direct cost				
	1,775,000	67%	1,189,250	585,750
Construction cost total	**7,043,000**		**4,710,000**	**2,333,000**
2. Engineering service (15% of construction cost, rounding up of the last three digits)				
	1,057,000	**67%**	**708,000**	**349,000**
3. Administration and Contingency (15% of construction cost, rounding up of the last three digits)				
	705,000	**67%**	**472,000**	**233,000**
Total cost	**8,805,000**		**5,890,000**	**2,915,000**

Bill of quantities (Godey)

(1) Direct cost

No.	Item	Unit	Quantity	Unit price	Amount (Birr)	Note	Amount (USD)
1	**Riverbed protection**						
1.1	Coffering	m^3	33.90	64.00	2,170.00	Cw.3	
1.2	Excavation	m^3	145.63	72.00	10,485.00	Cw.2	
1.3	Stone pitching	m^3	29.00	1,080.00	31,320.00	Cw.8	
1.4	Levelling concrete	m^3	3.18	2,560.00	8,141.00	Cw.4	
1.5	Stone masonry	m^3	38.88	1,120.00	43,546.00	Cw.9	
1.6	Backfill	m^3	32.38	64.00	2,072.00	Cw.3	
1.7	Gravel bedding	m^3	0.60	382.00	229.00	Cw.11	
1.8	Structural concrete	m^3	0.36	2,640.00	950.00	Cw.5	
1.9	Reinforcing bar	kg	32.40	48.00	1,555.00	Cw.7	
1.10	Formwork	m^2	3.34	280.00	935.00	Cw.6	
					101,403.00		5,500.00
2	**Intake canal**						
2.1	Stripping	m^3	149.60	72.00	10,771.00	Cw.2	
2.2	Excavation	m^3	696.45	72.00	50,144.00	Cw.2	
2.3	Backfill	m^3	152.70	64.00	9,773.00	Cw.3	
2.4	Gravel bedding	m^3	37.47	382.00	14,314.00	Cw.11	
2.5	Levelling concrete	m^3	20.04	2,560.00	51,302.00	Cw.4	
2.6	Structural concrete	m^3	32.19	2,640.00	84,982.00	Cw.5	
2.7	Formwork	m^2	141.56	280.00	39,637.00	Cw.6	
2.8	Reinforcing bar	kg	2897.10	48.00	139,061.00	Cw.7	
2.9	Screen	kg	2138.90	48.00	102,667.00	Cw.7	
2.10	Stone masonry	m^3	170.10	1,120.00	190,512.00	Cw.9	
					693,163.00		37,500.00
3	**Settling basin**						
3.1	Stripping	m^3	55.78	72.00	4,016.00	Cw.2	
3.2	Excavation	m^3	187.93	72.00	13,531.00	Cw.2	
3.3	Backfill	m^3	45.93	64.00	2,940.00	Cw.3	
3.4	Gravel bedding	m^3	4.70	382.00	1,795.00	Cw.11	
3.5	Levelling concrete	m^3	2.35	2,560.00	6,016.00	Cw.4	
3.6	Structural concrete	m^3	59.29	2,640.00	156,526.00	Cw.5	
3.7	Formwork	m^2	160.16	280.00	44,845.00	Cw.6	
3.8	Reinforcing bar	kg	5336.10	48.00	256,133.00	Cw.7	
					485,802.00		26,300.00
4	**Pump house**						
	Area of Pump house	m^2	102.68	6,800.00	698,224.00	H.2	
4.1	Centrigugal horizontal pump Q=1.1mm^3/min, H=20m,4kW	set	3.00	300,000.00	900,000.00	P.3	
4.2	Centrigugal horizontal pump Q=1.9mm^3/min, H=60m, 30kW	set	3.00	540,000.00	1,620,000.00	P.7	
4.3	Vacuum pump 0.75kw, D20mm	set	1.00	220,000.00	220,000.00	P.1	
4.4	Overhead crane munual type with chain block	set	1.00	224,000.00	224,000.00	Wp.43	
4.5	Pipe installation D250mm	m	353.00	4,100.00	1,447,300.00	DI.2	
	Fittings (10% of pipe installation)				144,730.00		
	Pump house				698,224.00		37,700.00
	Pump fittings				4,556,030.00		245,900.00
5	**Generator house**						
	Area of Pump house	m^2	79.38	6,800.00	539,784.00	H.2	
5.1	Generator 110kVA	set	3.00	445,000.00	1,335,000.00	G.8	
5.2	Fuel tank	kg	259.05	48.00	12,434.00	Cw.7	
	Pump house				539,784.00		29,200.00
	Pump fittings				1,347,434.00		72,800.00
6	**Sedimentation pond**						
6.1	Stripping	m^3	589.84	72.00	42,468.00	Cw.2	
6.2	Excavation	m^3	205.08	72.00	14,766.00	Cw.2	
6.3	Backfill	m^3	34.46	64.00	2,205.00	Cw.3	
6.4	Gravel bedding	m^3	103.17	382.00	39,411.00	Cw.11	
6.5	Levelling concrete	m^3	55.71	2,560.00	142,618.00	Cw.4	
6.6	Structural concrete	m^3	272.84	2,640.00	720,298.00	Cw.5	
6.7	Formwork	m^2	1165.25	280.00	326,270.00	Cw.6	
6.8	Reinforcing bar	kg	24555.60	48.00	1,178,669.00	Cw.7	
6.9	Wet masonry	m^3	22.69	1,120.00	25,413.00	Cw.9	
6.10	Gate	kg	299.48	48.00	14,375.00	Cw.7	
6.11	GI pipe 1inch	m	22.00	270.00	5,940.00	R.1	
6.12	uPVC pipe D90m	m	67.00	420.00	28,140.00	U.6	
6.13	Pipe installation D250mm	m	111.00	4,100.00	455,100.00	DI.2	
6.14	Pipe installation D160mm	m	27.00	2,600.00	70,200.00	DI.6	
6.15	Pipe installation D90mm	m	46.00	1,900.00	87,400.00	DI.5	
6.16	Valve D250mm	nos	4.00	69,000.00	276,000.00	Wp.44	
6.17	Valve D160mm	nos	2.00	50,000.00	100,000.00	Wp.46	
6.18	Valve D90mm	nos	3.00	35,000.00	105,000.00	Wp.4	
6.19	Water tank 5m^3	nos	1.00	20,000.00	20,000.00	Wp.3	
6.20	Water tank 3m^3	nos	1.00	10,000.00	10,000.00	Wp.3/2	
	Civil works				2,506,493.00		135,300.00
	Pipe and Fittings				1,157,780.00		62,500.00
7	**Rough filter**						
7.1	Stripping	m^3	396.06	72.00	28,516.00	Cw.2	
7.2	Excavation	m^3	504.55	72.00	36,328.00	Cw.2	
7.3	Backfill	m^3	250.68	64.00	16,044.00	Cw.3	
7.4	Gravel bedding	m^3	67.67	382.00	25,850.00	Cw.11	
7.5	Levelling concrete	m^3	33.86	2,560.00	86,682.00	Cw.4	
7.6	Structural concrete	m^3	278.94	2,640.00	736,402.00	Cw.5	
7.7	Formwork	m^2	1661.86	280.00	465,321.00	Cw.6	
7.8	Reinforcing bar	kg	25104.60	48.00	1,205,021.00	Cw.7	
7.9	Filter material D12-18mm	m^3	60.00	1,084.00	65,040.00	Cw.12	
7.10	Filter material D8-12mm	m^3	48.00	1,084.00	52,032.00	Cw.13	
7.11	Filter material D4-8mm	m^3	36.00	400.00	14,400.00	Cw.14	
7.12	Steel plate	kg	7065.00	48.00	339,120.00	Cw.7	
7.13	Step ladder	kg	166.86	48.00	8,009.00	Cw.7	
7.14	GI Pipe 3inch	m	111.00	600.00	66,600.00	R.6	
7.15	Pipe installation D250mm	m	228.00	4,100.00	934,800.00	DI.2	
7.16	Pipe installation D160mm	m	62.00	2,600.00	161,200.00	DI.6	
7.17	Pipe installation D90mm	m	48.00	1,900.00	91,200.00	DI.5	
7.18	Valve D250mm	nos	18.00	69,000.00	1,242,000.00	Wp.44	
7.19	Valve D90mm	nos	12.00	35,000.00	420,000.00	Wp.4	
	Civil works				3,078,765.00		166,200.00
	Pipe and Fittings				2,915,800.00		157,400.00

8	**Slow sand filter**						
8.1	Stripping	m^3	1423.40	72.00	102,485.00	Cw.2	
8.2	Excavation	m^3	521.27	72.00	37,531.00	Cw.2	
8.3	Backfill	m^3	110.51	64.00	7,073.00	Cw.3	
8.4	Gravel bedding	m^3	245.36	382.00	93,728.00	Cw.11	
8.5	Levelling concrete	m^3	122.68	2,560.00	314,061.00	Cw.4	
8.6	Structural concrete	m^3	631.78	2,640.00	1,667,899.00	Cw.5	
8.7	Formwork	m^2	2150.85	280.00	602,238.00	Cw.6	
8.8	Reinforcing bar	kg	56,860.20	48.00	2,729,290.00	Cw.7	
8.9	Filter material D4-8mm	m^3	200.00	400.00	80,000.00	Cw.14	
8.10	Sand	m^3	800.00	370.00	296,000.00	Cw.15	
8.11	GI Pipe 3inch	m	35.00	600.00	21,000.00	R.6	
8.12	Pipe installation D250mm	m	130.00	4,100.00	533,000.00	DI.2	
8.13	Pipe installation D160mm	m	297.00	2,600.00	772,200.00	DI.6	
8.14	Pipe installation D90mm	m	15.00	1,900.00	28,500.00	DI.5	
8.15	Valve D160mm	nos	10.00	50,000.00	500,000.00	Wp.46	
8.16	Valve D90mm	nos	10.00	35,000.00	350,000.00	Wp.4	
	Civil works				5,930,305.00		320,100.00
	Pipe and Fittings				2,204,700.00		119,000.00
9	**Clear water reservoir**						
9.1	Stripping	m^3	645.58	72.00	46,482.00	Cw.2	
9.2	Excavation	m^3	231.36	72.00	16,658.00	Cw.2	
9.3	Backfill	m^3	34.61	64.00	2,215.00	Cw.3	
9.4	Gravel bedding	m^3	124.56	382.00	47,582.00	Cw.11	
9.5	Levelling concrete	m^3	62.28	2,560.00	159,437.00	Cw.4	
9.6	Structural concrete	m^3	242.57	2,640.00	640,385.00	Cw.5	
9.7	Formwork	m^2	1690.66	280.00	473,385.00	Cw.6	
9.8	Reinforcing bar	kg	21831.30	48.00	1,047,902.00	Cw.7	
9.9	GI pipe 1inch	m	44.00	270.00	11,880.00	R.1	
9.10	Step ladder	kg	212.35	48.00	10,193.00	Cw.7	
9.11	Water tank 300lit	nos	1.00	7,000.00	7,000.00		
9.12	Pipe installation D160mm	m	155.00	2,600.00	403,000.00	DI.6	
9.14	Pipe installation D300mm	m	28.00	5,300.00	148,400.00	DI.3	
9.15	Valve D160mm	nos	6.00	50,000.00	300,000.00	Wp.46	
	Civil works				2,444,239.00		132,000.00
	Pipe and Fittings				870,280.00		47,000.00
10	**Transmission pipeline**						
10.1	Pipe installation D300mm	m	4998.00	5,300.00	26,489,400.00	DI.3	
					26,489,400.00		1,429,600.00
11	**Elevated reservoir**						
11.1	Stripping	m^3	234.18	72.00	16,861.00	Cw.2	
11.2	Excavation	m^3	293.25	72.00	21,114.00	Cw.2	
11.3	Backfill	m^3	33.42	64.00	2,139.00	Cw.3	
11.4	Gravel bedding	m^3	42.85	382.00	16,369.00	Cw.11	
11.5	Levelling concrete	m^3	20.92	2,560.00	53,555.00	Cw.4	
11.6	Structural concrete	m^3	537.59	2,640.00	1,419,238.00	Cw.5	
11.7	Formwork	m^2	1312.36	280.00	367,461.00	Cw.6	
11.8	Reinforcing bar	kg	48358.80	48.00	2,321,222.00	Cw.7	
11.9	Step ladder	kg	695.80	48.00	33,398.00	Cw.7	
11.10	Pipe installation D250mm	m	78.00	4,100.00	319,800.00	DI.2	
11.11	Valve D250mm	nos	4.00	69,000.00	276,000.00	Wp.44	
	Civil works				4,251,357.00		229,500.00
	Pipe and Fittings				595,800.00		32,200.00
12	**Distribution pipeline**						
12.1	Pipe installation D300mm	m	2797.00	5,300.00	14,824,100.00	DI.3	
12.2	Pipe installation D200mm	m	1384.00	600.00	830,400.00	U.9	
12.3	Pipe installation D160mm	m	1884.00	520.00	979,680.00	U.8	
12.4	Pipe installation D110mm	m	4187.00	470.00	1,967,890.00	U.7	
12.5	Pipe installation D90mm	m	7218.00	420.00	3,031,560.00	U.6	
12.6	Pipe installation D63mm	m	23751.00	300.00	7,125,300.00	U.4	
12.7	Valve and fittings (7% of pipe installation)	lot			2,013,125.00		
					30,772,055.00		1,660,700.00
13	**Public tap**						
	Number of public taps	nos	21.00	50,000.00	1,050,000.00	Wp.1	
					1,050,000.00		56,700.00
14	**Cattle trough**						
	Number of cattle trough	nos	5.00	50,000.00	250,000.00	Wp.2	
					250,000.00		13,500.00

Direct cost total	92,938,814		5,016,600
Others (7%)	4,646,941		250,830
Ground total	**97,590,000**		**5,268,000**

(2) Direct and In-direct cost

Direct cost total (USD)	**5,267,000**		5,268,000
In Direct cost (USD)	1,776,000	0.25	1,775,000
Total (USD)	7,043,000		7,043,000

b. Kabribeyah woreda town and rural water supply

b.1. Urban water supply

(Unit:USD)

Item		Cost
1. Construction cost		
	1.1 Direct cost	
	(1) Drilling borehole	84,000
	(2) Pump house	11,000
	(3) Pump and generator etc. procurement and installation	48,000
	(4) Reservoir	58,000
	(5) Transmission and distribution pipeline	715,000
	(6) Other	137,000
	sub-total	1,053,000
	1.2 In-direct cost	
		442,000
	Construction cost total	**1,495,000**
2. Engineering service (15% of construction cost, rounding up of the lase three digits)		
		225,000
3. Administration and Contingency (15% of construction cost, rounding up of the lase three digits)		
		150,000
Total cost		**1,870,000**

1. Urban water supply (BH)

(1) Direct Cost

		1.Kabribeyah	Note
BH	(nos.)	1	
	(m)	195	
	Price (birr/m)	8,000	D.1
	Total	1,560,000	
Pump	(nos.)	1	
	Price (birr/no)	460,000	23kw, P6
	Total	460,000	
Gen.	(nos.)	1	
	Price (birr/no)	310,000	68kVA,G7
	Total	310,000	
Pump house	(nos.)	1	
	Price (birr/no)	200,000	H1
	Total	200,000	
Riser P	(m)	185	80
	Price (birr/m)	600	R.6
	Total	111,000	
Tra L.1	(m)	2,000	90
	Price (birr/m)	420	U.6
	Total	840,000	
Tra L.2	(m)	1,892	200
	Price (birr/m)	3,400	DI.1
	Total	6,432,800	
Rev.	(nos.)	1	400m3
	Price (birr/no)	1,084,000	Wp.30
	Total	1,084,000	
Dis L.1	(m)	3,760	75
	Price (birr/m)	360	U.5
	Total	1,353,600	
Dis L.2	(m)	4,970	90
	Price (birr/m)	420	U.6
	Total	2,087,400	
Dis L.3	(m)	1,970	110
	Price (birr/m)	470	U.7
	Total	925,900	
Dis L.4	(m)	160	160
	Price (birr/m)	520	U.8
	Total	83,200	
Dis L.5	(m)	200	250
	Price (birr/m)	4,100	DI.2
	Total	820,000	
Dis L.6	(m)		
	Price (birr/m)		
	Total		
Dis L.7	(m)		
	Price (birr/m)		
	Total		
Chambar	(nos.)	20	
	Price (birr/no)	35,000	Wp.4
	Total	700,000	
WP	(nos.)		
	Price (birr/no)		
	Total		
Cattle	(nos.)		
	Price (birr/no)		
	Total		
Sub total		16,967,900	
Others (15%)		2,545,185	
Direct cost total (Birr)		**19,514,000**	

(2) Direct and In-direct cost

Direct cost total (USD)	**1,053,000**	
In Direct cost (USD)	**442,000**	0.30
Total (USD)	**1,495,000**	

b.2. Rural water supply

1. Kabribeyah

ID	Kebele	Structure	No. of facility	Project cost (USD)			
				Construction cost	Engineering service	Administration Contingency	Total
1	Aleybadey	BH	1	346,000	52,000	35,000	433,000
2	Bariisle	BH	1	346,000	52,000	35,000	433,000
3	Calandhgeley	BH	1	308,000	46,000	31,000	385,000
4	Dalaandhige	BH	1	308,000	46,000	31,000	385,000
5	Daynaba	Birka	7	399,000	60,000	40,000	499,000
6	Dhurwale	BH	1	351,000	53,000	35,000	439,000
7	Dibiile	Birka	7	399,000	60,000	40,000	499,000
8	Duriya	Harrif dam	1	391,000	59,000	39,000	489,000
		Birka	1	57,000	9,000	6,000	72,000
9	Eegato	Birka	7	399,000	60,000	40,000	499,000
10	Fadeyge	Birka	7	399,000	60,000	40,000	499,000
11	Farda	BH	1	373,000	56,000	37,000	466,000
12	Ganbi	Birka	7	399,000	60,000	40,000	499,000
13	Garbiile	BH	1	373,000	56,000	37,000	466,000
14	Gitlo	Birka	8	456,000	68,000	46,000	570,000
15	Golgeno	Birka	7	399,000	60,000	40,000	499,000
16	Guyow	Birka	7	399,000	60,000	40,000	499,000
17	Harre	Birka	7	399,000	60,000	40,000	499,000
18	Hartasheekha	Haffir dam	2	782,000	117,000	78,000	977,000
19	Horo Khalif	BH	2	621,000	93,000	62,000	776,000
20	Jingadle	Birka	7	399,000	60,000	40,000	499,000
22	Labashaag	Birka	7	399,000	60,000	40,000	499,000
23	Mara-gaaji	Birka	7	399,000	60,000	40,000	499,000
24	Oomen	Birka	4	228,000	34,000	23,000	285,000
25	Qaaxa	BH	1	346,000	52,000	35,000	433,000
26	Qabri Hanteen	Birka	7	399,000	60,000	40,000	499,000
27	Qooraan	Birka	7	399,000	60,000	40,000	499,000
28	Qoto-roble	Birka	7	399,000	60,000	40,000	499,000
29	Risle	Birka	8	456,000	68,000	46,000	570,000
30	Warabogiro	Birka	7	399,000	60,000	40,000	499,000
(1) BH			10	3,372,000	506,000	338,000	4,216,000
(2) Birka			126	7,182,000	1,079,000	721,000	8,982,000
(3) Haffir dam			3	1,173,000	176,000	117,000	1,466,000
Total				11,727,000	1,761,000	1,176,000	14,664,000

1. Kabribeyah 1USD= 18.53

(1) Direct Cost

		1.Aleybadey	note	2.Bariisle	note	3.Calandhgeley	note	4.Dalaandhige	note	6.Dhurwale	note	11.Farda	note	13.Garbiile	note	19.Horo Khalif	note	25.Qaaxa	note
BH	(nos.)	1		1		1		1		1		1		1		2		1	
	(m)	230		230		230		230		230		230		230		460		230	
	Price (birr/m)	8,000	D.1	8,000	D.1	8,000	D.1	8,000	D.1	8,000	D.1	8,000	D.1	8,000	D.1	8,000	D.1	8,000	D.1
	Total	1,840,000		1,840,000		1,840,000		1,840,000		1,840,000		1,840,000		1,840,000		3,680,000		1,840,000	
Pump	(nos.)	1		1		1		1		1		1		1		2		1	
	Price (birr/no)	460,000	20kw, P6	460,000	20kw, P6	300,000	11kw, P4	300,000	11kw, P4	540,000	24kw, P7	540,000	27kw, P7	540,000	27kw, P7	460,000	20kw, P6	460,000	20kw, P6
	Total	460,000		460,000		300,000		300,000		540,000		540,000		540,000		920,000		460,000	
Gen.	(nos.)	1		1		1		1		1		1		1		2		1	
	Price (birr/no)	280,000	59kVA,G6	280,000	59kVA,G6	255,000	37kVA,G5	255,000	37kVA,G5	310,000	74kVA,G7	310,000	81kVA,G7	310,000	81kVA,G7	280,000	59kVA,G6	280,000	59kVA,G6
	Total	280,000		280,000		255,000		255,000		310,000		310,000		310,000		560,000		280,000	
Pump house	(nos.)	1		1		1		1		1		1		1		2		1	
	Price (birr/no)	200,000	H1	200,000	H1	200,000	H1	200,000	H1	200,000	H1	200,000	H1	200,000	H1	200,000	H1	200,000	H1
	Total	200,000		200,000		200,000		200,000		200,000		200,000		200,000		400,000		200,000	
Riser P	(m)	220	65A	220	65A	220	40A	220	40A	220	65A	220	80A	220	80A	220	65A	220	65A
	Price (birr/m)	460	R.5	460	R.5	360	R.3	360	R.3	460	R.5	600	R.6	600	R.6	460	R.5	460	R.5
	Total	101,200		101,200		79,200		79,200		101,200		132,000		132,000		101,200		101,200	
Tra L	(m)	100	65	100	65	100	40	100	40	100	65	100	80	100	80	200	65	100	65
	Price (birr/m)	360	U.5	360	U.5	250	U.3	250	U.3	360	U.5	420	U.6	420	U.6	360	U.5	360	U.5
	Total	36,000		36,000		25,000		25,000		36,000		42,000		42,000		72,000		36,000	
Rev. (10m3,10m)	(nos.)	1		1		1		1		1		1		1		2		1	
	Price (birr/no)	102,000	Wp.26	102,000	Wp.26	102,000	Wp.26	102,000	Wp.26	102,000	Wp.26	102,000	Wp.26	102,000	Wp.26	102,000	Wp.26	102,000	Wp.26
	Total	102,000		102,000		102,000		102,000		102,000		102,000		102,000		204,000		102,000	
Dis L	(m)	600	65A	600	65A	400	40A	400	40A	600	65A	800	80A	800	80A	800	65A	600	65A
	Price (birr/m)	360	U.5	360	U.5	250	U.3	250	U.3	360	U.5	420	U.6	420	U.6	360	U.5	360	U.5
	Total	216,000		216,000		100,000		100,000		216,000		336,000		336,000		288,000		216,000	
Chambar	(nos.)	5		5		4		4		5		6		6		6		5	
	Price (birr/no)	35,000	Wp.4	35,000	Wp.4	35,000	Wp.4	35,000	Wp.4	35,000	Wp.4	35,000	Wp.4	35,000	Wp.4	35,000	Wp.4	35,000	Wp.4
	Total	175,000		175,000		140,000		140,000		175,000		210,000		210,000		210,000		175,000	
WP	(nos.)	3		3		2		2		3		4		4		4		3	
	Price (birr/no)	50,000	Wp.1	50,000	Wp.1	50,000	Wp.1	50,000	Wp.1	50,000	Wp.1	50,000	Wp.1	50,000	Wp.1	50,000	Wp.1	50,000	Wp.1
	Total	150,000		150,000		100,000		100,000		150,000		200,000		200,000		200,000		150,000	
Cattle	(nos.)	1		1		1		1		1		1		1		2		1	
	Price (birr/no)	50,000	Wp.2	50,000	Wp.2	50,000	Wp.2	50,000	Wp.2	50,000	Wp.2	50,000	Wp.2	50,000	Wp.2	50,000	Wp.2	50,000	Wp.2
	Total	50,000		50,000		50,000		50,000		50,000		50,000		50,000		100,000		50,000	
Sub total		3,610,200		3,610,200		3,191,200		3,191,200		3,720,200		3,962,000		3,962,000		6,735,200		3,610,200	
Others (15%)		541,530		541,530		478,680		478,680		558,030		594,300		594,300		1,010,280		541,530	
Direct cost total (Birr)		**4,152,000**		**4,152,000**		**3,670,000**		**3,670,000**		**4,279,000**		**4,557,000**		**4,557,000**		**7,746,000**		**4,152,000**	

(2) Direct and In-direct cost

Direct cost total (USD)		**224,000**		**224,000**		**198,000**		**198,000**		**231,000**		**246,000**		**246,000**		**418,000**		**224,000**	
In Direct cost (USD)		**122,000**	0.35	**122,000**	0.35	**110,000**	0.36	**110,000**	0.36	**120,000**	0.34	**127,000**	0.34	**127,000**	0.34	**203,000**	0.33	**122,000**	0.35
Total (USD)		**346,000**		**346,000**		**308,000**		**308,000**		**351,000**		**373,000**		**373,000**		**621,000**		**346,000**	

c. Araarso woreda urban and rural water supply

2. Araarso

ID	Kebele	Structure	No. of facility	Project cost (USD)			
				Construction cost	Engineering service	Administration Contingency	Total
1	**Araarso**	BH	1	2,526,000	379,000	253,000	3,158,000
2	Dhigrilley	Birka	4	228,000	34,000	23,000	285,000
3	Dhiinta Cab	Birka	4	228,000	34,000	23,000	285,000
4	Garbadiinle	Birka	4	228,000	34,000	23,000	285,000
5	Halgriid	Birka	4	228,000	34,000	23,000	285,000
6	Laf-Galooli	Birka	4	228,000	34,000	23,000	285,000
7	Magalo Cad	Birka	4	228,000	34,000	23,000	285,000
8	Mooyahe	Birka	4	228,000	34,000	23,000	285,000
9	Ubaxle	BH	1	319,000	48,000	32,000	399,000
(1)	Urban water supply		1	2,526,000	379,000	253,000	3,158,000
(2)	Borehole		1	319,000	48,000	32,000	399,000
(3)	Birka		28	1,596,000	238,000	161,000	1,995,000
Total				4,441,000	665,000	446,000	5,552,000

1. Urban water supply (BH)

(1) Direct Cost

		2.Araarso	Note
BH	(nos.)	6	
	(m)	1,500	
	Price (birr/m)	8,000	D.1
	Total	12,000,000	
Pump	(nos.)	6	
	Price (birr/no)	300,000	13kw, P4
	Total	1,800,000	
Gen.	(nos.)	6	
	Price (birr/no)	255,000	40kVA,G5
	Total	1,530,000	
Pump house	(nos.)	6	
	Price (birr/no)	200,000	H1
	Total	1,200,000	
Riser P	(m)	1,440	40
	Price (birr/m)	270	R.2
	Total	388,800	
Tra L.1	(m)	3,600	90
	Price (birr/m)	420	U.6
	Total	1,512,000	
Tra L.2	(m)	4,500	110
	Price (birr/m)	470	U.7
	Total	2,115,000	
Rev.	(nos.)	1	500m3
	Price (birr/no)	1,242,000	Wp.31
	Total	1,242,000	
Dis L.1	(m)	5,000	90
	Price (birr/m)	420	U.6
	Total	2,100,000	
Chambar	(nos.)	16	
	Price (birr/no)	35,000	Wp.4
	Total	560,000	
WP	(nos.)	10	
	Price (birr/no)	50,000	Wp.1
	Total	500,000	
Cattle	(nos.)	2	
	Price (birr/no)	50,000	Wp.2
	Total	100,000	
Sub total		29,294,800	
Others (15%)		4,394,220	
Direct cost total (Birr)		**33,690,000**	

(2) Direct and In-direct cost

Direct cost total (USD)	**1,818,000**	
In Direct cost (USD)	**708,000**	0.28
Total (USD)	**2,526,000**	

2. Araarso

(1) Direct Cost

		9.Ubaxle	note
BH	(nos.)	1	
	(m)	250	
	Price (birr/m)	8,000	D.1
	Total	2,000,000	
Pump	(nos.)	1	
	Price (birr/no)	300,000	13kw, P.4
	Total	300,000	
Gen.	(nos.)	1	
	Price (birr/no)	255,000	40kVA,G.5
	Total	255,000	
Pump house	(nos.)	1	
	Price (birr/no)	200,000	H1
	Total	200,000	
Riser P	(m)	240	40
	Price (birr/m)	360	R.3
	Total	86,400	
Tra L	(m)	100	40
	Price (birr/m)	250	U.3
	Total	25,000	
Rev. (10m3,10m)	(nos.)	1	
	Price (birr/no)	102,000	Wp.26
	Total	102,000	
Dis L	(m)	400	40
	Price (birr/m)	250	U.3
	Total	100,000	
Chambar	(nos.)	4	
	Price (birr/no)	35,000	Wp.4
	Total	140,000	
WP	(nos.)	2	
	Price (birr/no)	50,000	Wp.1
	Total	100,000	
Cattle	(nos.)	1	
	Price (birr/no)	50,000	Wp.2
	Total	50,000	
Sub total		3,358,400	
Others (15%)		503,760	
Direct cost total (Birr)		**3,863,000**	

(2) Direct and In-direct cost

Direct cost total (USD)	**208,000**	
In Direct cost (USD)	111,000	0.35
Total (USD)	319,000	

d. Dagahbur woreda urban and rural water supply

3. Dagahbur

ID	Kebele	Structure	No. of facility	Project cost (USD)			
				Construction cost	Engineering service	Administration Contingency	Total
1	Bodhley	Birka	2	114,000	17,000	11,000	142,000
2	Bullele	BH	1	233,000	35,000	23,000	291,000
3	Coobale	Haffir dam	2	782,000	117,000	78,000	977,000
		Birka	4	228,000	34,000	23,000	285,000
4	**Dagahbur**	BH	1	2,720,000	408,000	272,000	3,400,000
5	Dhakabaxaro	Birka	3	171,000	26,000	17,000	214,000
6	Dhuumodke	Birka	2	114,000	17,000	11,000	142,000
7	Felfel	BH	1	189,000	28,000	19,000	236,000
8	Garawo	Haffir dam	1	391,000	59,000	39,000	489,000
		Birka	6	342,000	51,000	34,000	427,000
9	Geliori	Birka	2	114,000	17,000	11,000	142,000
10	Gosolaley	Birka	3	171,000	26,000	17,000	214,000
11	Higolaley	Haffir dam	1	391,000	59,000	39,000	489,000
		Birka	4	228,000	34,000	23,000	285,000
12	Hoodale	BH	1	292,000	44,000	29,000	365,000
13	Losgolol	Birka	1	57,000	9,000	6,000	72,000
14	Sandhore	Birka	1	57,000	9,000	6,000	72,000
15	Sandixiile	Birka	3	171,000	26,000	17,000	214,000
16	Sasabane	BH	1	211,000	32,000	21,000	264,000
17	Towlene	BH	1	200,000	30,000	20,000	250,000
(1) Urban water supply			1	2,720,000	408,000	272,000	3,400,000
(2) Borehole			5	1,125,000	169,000	112,000	1,406,000
(3) Birka			31	1,767,000	266,000	176,000	2,209,000
(4) Haffir dam			4	1,564,000	235,000	156,000	1,955,000
Total				7,176,000	1,078,000	716,000	8,970,000

1. Urban water supply (BH)

(1) Direct Cost

		3.Dagahbur	Note
BH	(nos.)	6	
	(m)	660	
	Price (birr/m)	8,000	D.1
	Total	5,280,000	
Pump	(nos.)	6	
	Price (birr/no)	300,000	11kw, P4
	Total	1,800,000	
Gen.	(nos.)	6	
	Price (birr/no)	255,000	37kVA,G5
	Total	1,530,000	
Pump house	(nos.)	6	
	Price (birr/no)	200,000	H1
	Total	1,200,000	
Riser P	(m)	540	80
	Price (birr/m)	600	R.6
	Total	324,000	
Tra L.1	(m)	3,200	90
	Price (birr/m)	420	U.6
	Total	1,344,000	
Tra L.2	(m)	3,000	110
	Price (birr/m)	470	U.7
	Total	1,410,000	
Tra L.3	(m)	1,500	160
	Price (birr/m)	520	U.8
	Total	780,000	
Rev.	(nos.)	1	550m3
	Price (birr/no)	1,370,000	Wp.32
	Total	1,370,000	
Dis L.1	(m)	5,980	50
	Price (birr/m)	250	U.3
	Total	1,495,000	
Dis L.2	(m)	9,590	90
	Price (birr/m)	420	U.6
	Total	4,027,800	
Dis L.3	(m)	3,190	110
	Price (birr/m)	470	U.7
	Total	1,499,300	
Dis L.4	(m)	1,970	160
	Price (birr/m)	520	U.8
	Total	1,024,400	
Dis L.5	(m)	700	200
	Price (birr/m)	3,400	DI.1
	Total	2,380,000	
Dis L.6	(m)	870	250
	Price (birr/m)	4,100	DI.2
	Total	3,567,000	
Dis L.7	(m)	320	300
	Price (birr/m)	5,300	DI.3
	Total	1,696,000	
Chambar	(nos.)	13	
	Price (birr/no)	35,000	Wp.4
	Total	455,000	
WP	(nos.)	7	
	Price (birr/no)	50,000	Wp.1
	Total	350,000	
Cattle	(nos.)	2	
	Price (birr/no)	50,000	Wp.2
	Total	100,000	
Sub total		31,632,500	
Others (15%)		4,744,875	
Direct cost total (Birr)		**36,378,000**	

(2) Direct and In-direct cost

Direct cost total (USD)	**1,963,000**	
In Direct cost (USD)	**757,000**	0.28
Total (USD)	**2,720,000**	

3. Dagahbur

(1) Direct Cost

		2.Bullele	note	7.Felfel	note	12.Hoodale	note	16.Sasabane	note	17.Towlene	note
BH	(nos.)	1		1		1		1		1	
	(m)	110		110		110		110		110	
	Price (birr/m)	8,000	D.1	8,000	D.1	8,000	D.1	8,000	D.1	8,000	D.1
	Total	880,000		880,000		880,000		880,000		880,000	
Pump	(nos.)	1		1		1		1		1	
	Price (birr/no)	300,000	9kw, P.3	220,000	5kw, P.2	300,000	12kw, P.4	300,000	5kw, P.2	300,000	5kw, P.2
	Total	300,000		220,000		300,000		300,000		300,000	
Gen.	(nos.)	1		1		1		1		1	
	Price (birr/no)	235,000	27kVA,G.4	210,000	17kVA,G.3	255,000	37kVA,G.5	210,000	17kVA,G.3	210,000	17kVA,G.3
	Total	235,000		210,000		255,000		210,000		210,000	
Pump house	(nos.)	1		1		1		1		1	
	Price (birr/no)	200,000	H1	200,000	H1	200,000	H1	200,000	H1	200,000	H1
	Total	200,000		200,000		200,000		200,000		200,000	
Riser P	(m)	100	65	100	40	100	80	100	40	100	40
	Price (birr/m)	460	R.5	360	R.3	600	R.6	360	R.3	360	R.3
	Total	46,000		36,000		60,000		36,000		36,000	
Tra L	(m)	100	65	100	40	100	80	100	40	100	40
	Price (birr/m)	360	U.5	250	U.3	420	U.6	250	U.3	250	U.3
	Total	36,000		25,000		42,000		25,000		25,000	
Rev. (10m3,10m)	(nos.)	1		1		1		1		1	
	Price (birr/no)	102,000	Wp.26	102,000	Wp.26	102,000	Wp.26	102,000	Wp.26	102,000	Wp.26
	Total	102,000		102,000		102,000		102,000		102,000	
Dis L	(m)	600	65	200	40	1,200	80	400	40	200	40
	Price (birr/m)	360	U.5	250	U.3	420	U.6	250	U.3	250	U.3
	Total	216,000		50,000		504,000		100,000		50,000	
Chambar	(nos.)	5		3		8		4		3	
	Price (birr/no)	35,000	Wp.4	35,000	Wp.4	35,000	Wp.4	35,000	Wp.4	35,000	Wp.4
	Total	175,000		105,000		280,000		140,000		105,000	
WP	(nos.)	3		1		6		2		1	
	Price (birr/no)	50,000	Wp.1	50,000	Wp.1	50,000	Wp.1	50,000	Wp.1	50,000	Wp.1
	Total	150,000		50,000		300,000		100,000		50,000	
Cattle	(nos.)	1		1		2		1		1	
	Price (birr/no)	50,000	Wp.2	50,000	Wp.2	50,000	Wp.2	50,000	Wp.2	50,000	Wp.2
	Total	50,000		50,000		100,000		50,000		50,000	
Sub total		2,390,000		1,928,000		3,023,000		2,143,000		2,008,000	
Others (15%)		358,500		289,200		453,450		321,450		301,200	
Direct cost total (Birr)		**2,749,000**		**2,218,000**		**3,477,000**		**2,465,000**		**2,310,000**	

(2) Direct and In-direct cost

Direct cost total (USD)	**148,000**		**120,000**		**188,000**		**133,000**		**125,000**	
In Direct cost (USD)	85,000	0.36	69,000	0.37	104,000	0.36	78,000	0.37	75,000	0.38
Total (USD)	233,000		189,000		292,000		211,000		200,000	

e. Birqod woreda urban and rural water supply

4. Birqod

ID	Kebele	Structure	No. of facility	Project cost (USD)			
				Construction cost	Engineering service	Administration Contingency	Total
1	Baka	BH	1	152,000	23,000	15,000	190,000
2	**Birqud**	BH	1	513,000	77,000	51,000	641,000
3	Cellxaer	Birka	2	114,000	17,000	11,000	142,000
4	Goomaar	BH	1	152,000	23,000	15,000	190,000
5	Gorgain	BH	1	152,000	23,000	15,000	190,000
6	Hiigley	BH	1	152,000	23,000	15,000	190,000
7	Xidhgalool	Birka	2	114,000	17,000	11,000	142,000
(1) Urban water supply			1	513,000	77,000	51,000	641,000
(2) Borehole			4	608,000	92,000	60,000	760,000
(3) Birka			4	228,000	34,000	22,000	284,000
Total				1,349,000	203,000	133,000	1,685,000

1. Urban water supply (BH)

(1) Direct Cost

		4.Birqod	Note
BH	(nos.)	2	
	(m)	120	
	Price (birr/m)	8,000	D.1
	Total	960,000	
Pump	(nos.)	2	
	Price (birr/no)	220,000	4kw, P2
	Total	440,000	
Gen.	(nos.)	2	
	Price (birr/no)	215,000	13kVA,G2
	Total	430,000	
Pump house	(nos.)	2	
	Price (birr/no)	200,000	H1
	Total	400,000	
Riser P	(m)	100	65
	Price (birr/m)	460	R.5
	Total	46,000	
Tra L.1	(m)	1,400	90
	Price (birr/m)	420	U.6
	Total	588,000	
Tra L.2	(m)	1,000	110
	Price (birr/m)	470	U.7
	Total	470,000	
Rev.	(nos.)	1	200m3
	Price (birr/no)	618,000	Wp.27
	Total	618,000	
Dis L.1	(m)	2,500	90
	Price (birr/m)	420	U.6
	Total	1,050,000	
Chambar	(nos.)	7	
	Price (birr/no)	35,000	Wp.4
	Total	245,000	
WP	(nos.)	5	
	Price (birr/no)	50,000	Wp.1
	Total	250,000	
Cattle	(nos.)	1	
	Price (birr/no)	50,000	Wp.2
	Total	50,000	
Sub total		5,547,000	
Others (15%)		832,050	
Direct cost total (Birr)		**6,380,000**	

(2) Direct and In-direct cost

Direct cost total (USD)	**344,000**	
In Direct cost (USD)	**169,000**	0.33
Total (USD)	**513,000**	

4. Birqod

(1) Direct Cost

		1.Baka	note	4.Goomaar	note	5.Gorgain	note	6.Hiigley	note
BH	(nos.)	1		1		1		1	
	(m)	60		60		60		60	
	Price (birr/m)	8,000	D.1	8,000	D.1	8,000	D.1	8,000	D.1
	Total	480,000		480,000		480,000		480,000	
Pump	(nos.)	1		1		1		1	
	Price (birr/no)	220,000	3kw, P.2	220,000	3kw, P.2	220,000	3kw, P.2	220,000	3kw, P.2
	Total	220,000		220,000		220,000		220,000	
Gen.	(nos.)	1		1		1		1	
	Price (birr/no)	200,000	8kVA,G.1	200,000	8kVA,G.1	200,000	8kVA,G.1	200,000	8kVA,G.1
	Total	200,000		200,000		200,000		200,000	
Pump house	(nos.)	1		1		1		1	
	Price (birr/no)	200,000	H1	200,000	H1	200,000	H1	200,000	H1
	Total	200,000		200,000		200,000		200,000	
Riser P	(m)	50	40	50	40	50	40	50	40
	Price (birr/m)	360	R.3	360	R.3	360	R.3	360	R.3
	Total	18,000		18,000		18,000		18,000	
Tra L	(m)	100	40	100	40	100	40	100	40
	Price (birr/m)	250	U.3	250	U.3	250	U.3	250	U.3
	Total	25,000		25,000		25,000		25,000	
Rev. (10m3,10m)	(nos.)	1		1		1		1	
	Price (birr/no)	102,000	Wp.26	102,000	Wp.26	102,000	Wp.26	102,000	Wp.26
	Total	102,000		102,000		102,000		102,000	
Dis L	(m)	200	40	200	40	200	40	200	40
	Price (birr/m)	250	U.3	250	U.3	250	U.3	250	U.3
	Total	50,000		50,000		50,000		50,000	
Chambar	(nos.)	3		3		3		3	
	Price (birr/no)	35,000	Wp.4	35,000	Wp.4	35,000	Wp.4	35,000	Wp.4
	Total	105,000		105,000		105,000		105,000	
WP	(nos.)	1		1		1		1	
	Price (birr/no)	50,000	Wp.1	50,000	Wp.1	50,000	Wp.1	50,000	Wp.1
	Total	50,000		50,000		50,000		50,000	
Cattle	(nos.)	1		1		1		1	
	Price (birr/no)	50,000	Wp.2	50,000	Wp.2	50,000	Wp.2	50,000	Wp.2
	Total	50,000		50,000		50,000		50,000	
Sub total		1,500,000		1,500,000		1,500,000		1,500,000	
Others (15%)		225,000		225,000		225,000		225,000	
Direct cost total (Birr)		**1,725,000**		**1,725,000**		**1,725,000**		**1,725,000**	

(2) Direct and In-direct cost

Direct cost total (USD)	**93,000**		**93,000**		**93,000**		**93,000**	
In Direct cost (USD)	59,000	0.39	59,000	0.39	59,000	0.39	59,000	0.39
Total (USD)	152,000		152,000		152,000		152,000	

f. Shaygosh woreda urban and rural water supply

5. Shaygosh

ID	Kebele	Structure	No. of facility	Project cost (USD)			
				Construction cost	Engineering service	Administration Contingency	Total
1	Biyooley	Haffir dam	1	391,000	59,000	39,000	489,000
		Birka	7	399,000	60,000	40,000	499,000
2	Duumaale	Haffir dam	1	391,000	59,000	39,000	489,000
		Birka	7	399,000	60,000	40,000	499,000
3	Goomaar	BH	2	486,000	73,000	49,000	608,000
4	**Shaygosh**	BH	1	724,000	109,000	72,000	905,000
5	Wejiweji	Haffir dam	2	782,000	117,000	78,000	977,000
		Birka	2	114,000	17,000	11,000	142,000
(1) Urban water supply			1	724,000	109,000	72,000	905,000
(2) Borehole			2	486,000	73,000	49,000	608,000
(3) Birka			16	912,000	137,000	91,000	1,140,000
(4) Haffir dam			4	1,564,000	235,000	156,000	1,955,000
Total				3,686,000	554,000	368,000	4,608,000

1. Urban water supply (BH)

(1) Direct Cost

		5.Shaygosh	Note
BH	(nos.)	2	
	(m)	280	
	Price (birr/m)	8,000	D.1
	Total	2,240,000	
Pump	(nos.)	2	
	Price (birr/no)	300,000	14kw, P4
	Total	600,000	
Gen.	(nos.)	2	
	Price (birr/no)	255,000	44kVA,G5
	Total	510,000	
Pump house	(nos.)	2	
	Price (birr/no)	200,000	H1
	Total	400,000	
Riser P	(m)	260	65
	Price (birr/m)	460	R.5
	Total	119,600	
Tra L.1	(m)	1,400	90
	Price (birr/m)	420	U.6
	Total	588,000	
Tra L.2	(m)	1,500	110
	Price (birr/m)	470	U.7
	Total	705,000	
Rev.	(nos.)	1	300m3
	Price (birr/no)	840,000	Wp.28
	Total	840,000	
Dis L.1	(m)	3,000	90
	Price (birr/m)	420	U.6
	Total	1,260,000	
Chambar	(nos.)	8	
	Price (birr/no)	35,000	Wp.4
	Total	280,000	
WP	(nos.)	6	
	Price (birr/no)	50,000	Wp.1
	Total	300,000	
Cattle	(nos.)	2	
	Price (birr/no)	50,000	Wp.2
	Total	100,000	
Sub total		7,942,600	
Others (15%)		1,191,390	
Direct cost total (Birr)		**9,134,000**	

(2) Direct and In-direct cost

Direct cost total (USD)	**493,000**	
In Direct cost (USD)	**231,000**	0.32
Total (USD)	**724,000**	

5. Shaygosh

(1) Direct Cost

		3.Goomaar	note
BH	(nos.)	2	
	(m)	280	
	Price (birr/m)	8,000	D.1
	Total	2,240,000	
Pump	(nos.)	2	
	Price (birr/no)	300,000	11kw, P.4
	Total	600,000	
Gen.	(nos.)	2	
	Price (birr/no)	255,000	35kVA,G.4
	Total	510,000	
Pump house	(nos.)	2	
	Price (birr/no)	200,000	H1
	Total	400,000	
Riser P	(m)	260	65
	Price (birr/m)	460	R.5
	Total	119,600	
Tra L	(m)	200	65
	Price (birr/m)	360	U.5
	Total	72,000	
Rev. (10m3,10m)	(nos.)	2	
	Price (birr/no)	102,000	Wp.26
	Total	204,000	
Dis L	(m)	1,200	65
	Price (birr/m)	360	U.5
	Total	432,000	
Chambar	(nos.)	7	
	Price (birr/no)	35,000	Wp.4
	Total	245,000	
WP	(nos.)	6	
	Price (birr/no)	50,000	Wp.1
	Total	300,000	
Cattle	(nos.)	2	
	Price (birr/no)	50,000	Wp.2
	Total	100,000	
Sub total		5,222,600	
Others (15%)		783,390	
Direct cost total (Birr)		**6,006,000**	

(2) Direct and In-direct cost

Direct cost total (USD)	**324,000**	
In Direct cost (USD)	162,000	0.33
Total (USD)	486,000	

g. Kabridahar woreda urban and rural water supply

6. Kabridahar

ID	Kebele	Structure	No. of facility	Project cost (USD)			
				Construction cost	Engineering service	Administration Contingency	Total
1	Buundat	Haffir dam	2	782,000	117,000	78,000	977,000
		Birka	1	57,000	9,000	6,000	72,000
2	Carabacite	Haffir dam	2	782,000	117,000	78,000	977,000
		Birka	1	57,000	9,000	6,000	72,000
3	Ceelxaar	BH	2	470,000	71,000	47,000	588,000
4	Dalaad	Haffir dam	2	782,000	117,000	78,000	977,000
		Birka	1	57,000	9,000	6,000	72,000
5	Dhuure	Haffir dam	2	782,000	117,000	78,000	977,000
		Birka	1	57,000	9,000	6,000	72,000
6	Galadiid	BH	1	276,000	41,000	28,000	345,000
7	**Kabridahar**	BH	1	3,481,000	522,000	348,000	4,351,000
8	Karanbicite	BH	2	470,000	71,000	47,000	588,000
9	Lasdhankheyre	Haffir dam	3	1,173,000	176,000	117,000	1,466,000
		Birka	3	171,000	26,000	17,000	214,000
10	Maraato	Haffir dam	1	391,000	59,000	39,000	489,000
		Birka	5	285,000	43,000	29,000	357,000
(1) Urban water supply			1	3,481,000	522,000	348,000	4,351,000
(2) Borehole			5	1,216,000	183,000	122,000	1,521,000
(3) Birka			12	684,000	105,000	70,000	859,000
(4) Haffir dam			12	4,692,000	703,000	468,000	5,863,000
Total				10,073,000	1,513,000	1,008,000	12,594,000

1. Urban water supply (BH)

(1) Direct Cost

		6.Kabridahar	Note
BH	(nos.)	6	
	(m)	780	
	Price (birr/m)	8,000	D.1
	Total	6,240,000	
Pump	(nos.)	6	
	Price (birr/no)	300,000	13kw, P4
	Total	1,800,000	
Gen.	(nos.)	6	
	Price (birr/no)	255,000	40kVA,G5
	Total	1,530,000	
Pump house	(nos.)	6	
	Price (birr/no)	200,000	H1
	Total	1,200,000	
Riser P	(m)	720	65
	Price (birr/m)	460	R.5
	Total	331,200	
Tra L.1	(m)	3,200	90
	Price (birr/m)	420	U.6
	Total	1,344,000	
Tra L.2	(m)	3,000	110
	Price (birr/m)	470	U.7
	Total	1,410,000	
Rev.	(nos.)	1	350m3
	Price (birr/no)	958,000	Wp.29
	Total	958,000	
Dis L.1	(m)	7,200	50
	Price (birr/m)	250	U.3
	Total	1,800,000	
Chambar	(nos.)	42	
	Price (birr/no)	35,000	Wp.4
	Total	1,470,000	
WP	(nos.)	36	
	Price (birr/no)	50,000	Wp.1
	Total	1,800,000	
Cattle	(nos.)	8	
	Price (birr/no)	50,000	Wp.2
	Total	400,000	
Sub total		40,880,700	
Others (15%)		6,132,105	
Direct cost total (Birr)		**47,013,000**	

(2) Direct and In-direct cost

Direct cost total (USD)	**2,537,000**	
In Direct cost (USD)	**944,000**	0.27
Total (USD)	**3,481,000**	

6. Kabridahar

(1) Direct Cost

		3.Ceelxaar	根拠	6.Galadiid	根拠	8.Karanbicite	根拠
BH	(nos.)	2		1		2	
	(m)	260		130		260	
	Price (birr/m)	8,000	D.1	8,000	D.1	8,000	D.1
	Total	2,080,000		1,040,000		2,080,000	
Pump	(nos.)	2		1		2	
	Price (birr/no)	300,000	11kw,P.4	300,000	11kw,P.4	300,000	11kw,P.4
	Total	600,000		300,000		600,000	
Gen.	(nos.)	2		1		2	
	Price (birr/no)	235,000	32kVA,G.4	255,000	40kVA,G.5	235,000	32kVA,G.4
	Total	470,000		255,000		470,000	
Pump house	(nos.)	2		1		2	
	Price (birr/no)	200,000	H1	200,000	H1	200,000	H1
	Total	400,000		200,000		400,000	
Riser P	(m)	240	65	120	65	240	65
	Price (birr/m)	460	R.5	460	R.5	460	R.5
	Total	110,400		55,200		110,400	
Tra L	(m)	200	65	100	65	200	65
	Price (birr/m)	360	U.5	360	U.5	360	U.5
	Total	72,000		36,000		72,000	
Rev. (10m3,10m)	(nos.)	2		1		2	
	Price (birr/no)	102,000	Wp.26	102,000	Wp.26	102,000	Wp.26
	Total	204,000		102,000		204,000	
Dis L	(m)	1,200	65	1,000	65	1,200	65
	Price (birr/m)	360	U.5	360	U.5	360	U.5
	Total	432,000		360,000		432,000	
Chambar	(nos.)	7		6		7	
	Price (birr/no)	35,000	Wp.4	35,000	Wp.4	35,000	Wp.4
	Total	245,000		210,000		245,000	
WP	(nos.)	6		5		6	
	Price (birr/no)	50,000	Wp.1	50,000	Wp.1	50,000	Wp.1
	Total	300,000		250,000		300,000	
Cattle	(nos.)	2		1		2	
	Price (birr/no)	50,000	Wp.2	50,000	Wp.2	50,000	Wp.2
	Total	100,000		50,000		100,000	
Sub total		5,013,400		2,858,200		5,013,400	
Others (15%)		752,010		428,730		752,010	
Direct cost total (Birr)		**5,766,000**		**3,287,000**		**5,766,000**	

(2) Direct and In-direct cost

Direct cost total (USD)	**311,000**		**177,000**		**311,000**	
In Direct cost (USD)	159,000	0.34	99,000	0.36	159,000	0.34
Total (USD)	**470,000**		**276,000**		**470,000**	

h. Doba wein woreda urban and rural water supply

7. Doba wein

ID	Kebele	Structure	No. of facility	Project cost (USD)			
				Construction cost	Engineering service	Administration Contingency	Total
1	**Doba wein**	SW	18	1,906,000	286,000	191,000	2,383,000
2	Jidale	SW	3	384,000	58,000	38,000	480,000
3	Haaraano	SW	3	384,000	58,000	38,000	480,000
4	Higloley	SW	5	621,000	93,000	62,000	776,000
5	Nagar Weyne	Haffir dam	1	391,000	59,000	39,000	489,000
		Birka	1	57,000	9,000	6,000	72,000
(1) Urban water supply			18	1,906,000	286,000	191,000	2,383,000
(2) Shallow well			11	1,389,000	209,000	138,000	1,736,000
(3) Birka			1	57,000	9,000	6,000	72,000
(4) Haffir dam			1	391,000	59,000	39,000	489,000
Total				3,743,000	563,000	374,000	4,680,000

1. Urban water supply (BH)

(1) Direct Cost

		7.Doba wein	Note
BH	(nos.)	18	
	(m)	540	
	Price (birr/m)	8,000	D.1
	Total	4,320,000	
Pump	(nos.)	18	
	Price (birr/no)	220,000	1kw,P.1
	Total	3,960,000	
Gen.	(nos.)	18	
	Price (birr/no)	200,000	3kVA,G1
	Total	3,600,000	
Pump house	(nos.)	18	
	Price (birr/no)	200,000	H1
	Total	3,600,000	
Riser P	(m)	360	32
	Price (birr/m)	270	R.1
	Total	97,200	
Tra L.1	(m)	1,800	32
	Price (birr/m)	250	U.1
	Total	450,000	
Tra L.2	(m)		
	Price (birr/m)		
	Total		
Rev.	(nos.)	18	10m3
	Price (birr/no)	102,000	Wp.26
	Total	1,836,000	
Dis L.1	(m)	3,600	32
	Price (birr/m)	250	U.1
	Total	900,000	
Chambar	(nos.)	36	
	Price (birr/no)	35,000	Wp.4
	Total	1,260,000	
WP	(nos.)	18	
	Price (birr/no)	50,000	Wp.1
	Total	900,000	
Cattle	(nos.)	18	
	Price (birr/no)	50,000	Wp.2
	Total	900,000	
Sub total		21,823,200	
Others (15%)		3,273,480	
Direct cost total (Birr)		**25,097,000**	

(2) Direct and In-direct cost

Direct cost total (USD)	**1,354,000**	
In Direct cost (USD)	**552,000**	0.29
Total (USD)	**1,906,000**	

7. Doba wein

(1) Direct Cost

		2.Jidale	根拠	3.Haaraano	根拠	4.Higloley	根拠
Shallow well	(nos.)	3		3		5	
	(m)	90		90		150	
	Price (birr/m)	8,000	D.1	8,000	D.1	8,000	D.1
	Total	720,000		720,000		1,200,000	
Pump	(nos.)	3		3		5	
	Price (birr/no)	220,000	1kw,P.1	220,000	1kw,P.1	220,000	1kw,P.1
	Total	660,000		660,000		1,100,000	
Gen.	(nos.)	3		3		5	
	Price (birr/no)	200,000	3kVA,G.1	200,000	3kVA,G.1	200,000	3kVA,G.1
	Total	600,000		600,000		1,000,000	
Pump house	(nos.)	3		3		5	
	Price (birr/no)	200,000	H1	200,000	H1	200,000	H1
	Total	600,000		600,000		1,000,000	
Riser P	(m)	60	32	60	32	100	32
	Price (birr/m)	270	R.1	270	R.1	270	R.1
	Total	16,200		16,200		27,000	
Tra L	(m)	300	32	300	32	500	32
	Price (birr/m)	250	U.1	250	U.1	250	U.1
	Total	75,000		75,000		125,000	
Rev. (10m3,10m)	(nos.)	3		3		5	
	Price (birr/no)	102,000	Wp.26	102,000	Wp.26	102,000	Wp.26
	Total	306,000		306,000		510,000	
Dis L	(m)	1,200	32	1,200	40	2,000	40
	Price (birr/m)	250	U.1	250	U.1	250	U.3
	Total	300,000		300,000		500,000	
Chambar	(nos.)	9		9		15	
	Price (birr/no)	35,000	Wp.4	35,000	Wp.4	35,000	Wp.4
	Total	315,000		315,000		525,000	
WP	(nos.)	6		6		10	
	Price (birr/no)	50,000	Wp.1	50,000	Wp.1	50,000	Wp.1
	Total	300,000		300,000		500,000	
Cattle	(nos.)	3		3		5	
	Price (birr/no)	50,000	Wp.2	50,000	Wp.2	50,000	Wp.2
	Total	150,000		150,000		250,000	
Sub total		4,042,200		4,042,200		6,737,000	
Others (15%)		606,330		606,330		1,010,550	
Direct cost total (Birr)		**4,649,000**		**4,649,000**		**7,748,000**	

(2) Direct and In-direct cost

Direct cost total (USD)	**251,000**		**251,000**		**418,000**	
In Direct cost (USD)	133,000	0.35	133,000	0.35	203,000	0.33
Total (USD)	384,000		384,000		621,000	

i. East Ime woreda urban and rural water supply

8. East Ime

ID	Kebele	Structure	No. of facility	Project cost (USD)			
				Construction cost	Engineering service	Administration Contingency	Total
1	Abagorooy	River intake	1	627,000	94,000	63,000	784,000
2	Balaay	River intake	1	551,000	83,000	55,000	689,000
3	Boraanka	River intake	1	794,000	119,000	79,000	992,000
4	Daay	River intake	1	551,000	83,000	55,000	689,000
5	**East Ime**	River intake	1	1,166,000	175,000	117,000	1,458,000
6	Makule	River intake	1	707,000	106,000	71,000	884,000
7	Mukuy	River intake	1	551,000	83,000	55,000	689,000
8	Qaruud	Birka	12	684,000	103,000	68,000	855,000
9	Qudhacle	Birka	7	399,000	60,000	40,000	499,000
10	Siigadheere	Birka	11	627,000	94,000	63,000	784,000
11	Siigaley	Birka	11	627,000	94,000	63,000	784,000
12	Xidigta	Birka	12	684,000	103,000	68,000	855,000
(1) Urban water supply			1	1,166,000	175,000	117,000	1,458,000
(2) River intake			6	3,781,000	568,000	378,000	4,727,000
(3) Birka			53	3,021,000	454,000	302,000	3,777,000
Total				7,968,000	1,197,000	797,000	9,962,000

1. Urban water supply (river)

(1) Direct Cost

		8.East Ime	Note
Intake canal	(nos.)	1	
	Price (birr/m)	194,000	Wp.14
	Total	194,000	
Intake pump	(nos.)	2	
	Price (birr/no)	220,000	4kw, P.2
	Total	440,000	
Intake pump house	(nos.)	1	
	Price (birr/no)	200,000	H1
	Total	200,000	
Sedi pond	(nos.)	2	256m3
	Price (birr/no)	1,089,000	Wp.11
	Total	2,178,000	
Roughing Filter	(nos.)	4	
	Price (birr/no)	377,000	Wp.15
	Total	1,508,000	
Clear water reservoir	(nos.)	1	140m3
	Price (birr/no)	1,111,000	Wp.22
	Total	1,111,000	
Gen.	(nos.)	1	
	Price (birr/no)	255,000	36kVA,G5
	Total	255,000	
Gen. house	(nos.)	1	
	Price (birr/no)	200,000	H1
	Total	200,000	
Surface pump	(nos.)	2	
	Price (birr/no)	300,000	8kw, P.3
	Total	600,000	
Surface pump house	(nos.)	1	
	Price (birr/no)	200,000	H1
	Total	200,000	
Tra L.1	(m)	1,900	200
	Price (birr/m)	550	U.9
	Total	1,045,000	
Rev.	(nos.)	1	300m3
	Price (birr/no)	840,000	Wp.28
	Total	840,000	
Dis L.1	(m)	7,000	90
	Price (birr/m)	420	P.6
	Total	2,940,000	
Chambar	(nos.)	15	
	Price (birr/no)	35,000	Wp.4
	Total	525,000	
WP	(nos.)	14	
	Price (birr/no)	50,000	Wp.1
	Total	700,000	
Cattle	(nos.)	3	
	Price (birr/no)	50,000	Wp.2
	Total	150,000	
Sub total		13,086,000	
Others (15%)		1,962,900	
Direct cost total (Birr)		**15,050,000**	

(2) Direct and In-direct cost

Direct cost total (USD)	**812,000**	
In Direct cost (USD)	**354,000**	0.30
Total (USD)	**1,166,000**	

8. East Ime

(1) Direct Cost

		1.Abagorooy	note	2.Balaay	note	3.Boraanka	note	4.Daay	note	6.Makule	note	7.Mukuy	note
Intake canal	(nos.)	1		1		1		1		1		1	
	Price (birr/m)	194,000	Wp.14	194,000	Wp.14	194,000	Wp.14	194,000	Wp.14	194,000	Wp.14	194,000	Wp.14
	Total	194,000		194,000		194,000		194,000		194,000		194,000	
Intake pump	(nos.)	2		2		2		2		2		2	
	Price (birr/no)	220,000	3kw,P.2	220,000	3kw,P.2	220,000	4kw,P.2	220,000	3kw,P.2	220,000	5kw,P.2	220,000	3kw,P.2
	Total	440,000		440,000		440,000		440,000		440,000		440,000	
Intake pump house	(nos.)	1		1		1		1		1		1	
	Price (birr/no)	200,000	H1	200,000	H1	200,000	H1	200,000	H1	200,000	H1	200,000	H1
	Total	200,000		200,000		200,000		200,000		200,000		200,000	
Sedi pond	(nos.)	1	144m3	1	100m3	1	196m3	1	100m3	1	144m3	1	100m3
	Price (birr/no)	797,000	Wp.9	671,000	Wp.8	936,000	Wp.10	671,000	Wp.8	797,000	Wp.9	671,000	Wp.8
	Total	797,000		671,000		936,000		671,000		797,000		671,000	
Roughing Filter	(nos.)	3		2		3		2		3		2	
	Price (birr/no)	377,000	Wp.15	377,000	Wp.15	377,000	Wp.15	377,000	Wp.15	377,000	Wp.15	377,000	Wp.15
	Total	1,131,000		754,000		1,131,000		754,000		1,131,000		754,000	
Clear water reservoir	(nos.)	1	80m3	1	60m3	1	120m3	1	60m3	1	80m3	1	60m3
	Price (birr/no)	777,000	Wp.19	649,000	Wp.18	1,001,000	Wp.21	649,000	Wp.18	777,000	Wp.19	649,000	Wp.18
	Total	777,000		649,000		1,001,000		649,000		777,000		649,000	
Gen.	(nos.)	1		1		1		1		1		1	
	Price (birr/no)	235,000	25kVA,G4	235,000	25kVA,G4	255,000	44kVA,G5	235,000	25kVA,G4	255,000	41kVA,G5	235,000	25kVA,G4
	Total	235,000		235,000		255,000		235,000		255,000		235,000	
Gen. house	(nos.)	1		1		1		1		1		1	
	Price (birr/no)	200,000	H1	200,000	H1	200,000	H1	200,000	H1	200,000	H1	200,000	H1
	Total	200,000		200,000		200,000		200,000		200,000		200,000	
Surface pump	(nos.)	2		2		2		2		2		2	
	Price (birr/no)	220,000	5kw,P.2	220,000	5kw,P.2	300,000	11kw,P.4	220,000	5kw,P.2	300,000	8kw,P.3	220,000	5kw,P.2
	Total	440,000		440,000		600,000		440,000		600,000		440,000	
Surface pump house	(nos.)	1		1		1		1		1		1	
	Price (birr/no)	200,000	H1	200,000	H1	200,000	H1	200,000	H1	200,000	H1	200,000	H1
	Total	200,000		200,000		200,000		200,000		200,000		200,000	
Tra L.1	(m)	200	90mm	500	90mm	500	110mm	500	90mm	500	90mm	500	90mm
	Price (birr/m)	420	U.6	420	U.6	470	U.7	420	U.6	420	U.6	420	U.6
	Total	84,000		210,000		235,000		210,000		210,000		210,000	
Rev.	(nos.)	1	50m3	1	40m3	1	80m3	1	40m3	1	60m3	1	40m3
	Price (birr/no)	278,000	Wp.38	241,000	Wp.37	377,000	Wp.40	241,000	Wp.37	313,000	Wp.39	241,000	Wp.37
	Total	278,000		241,000		377,000		241,000		313,000		241,000	
Dis L.1	(m)	2,000	90mm	1,600	90mm	3,200	90mm	1,600	90mm	2,600	90mm	1,600	90mm
	Price (birr/m)	420	U.6	420	U.6	420	U.6	420	U.6	420	U.6	420	U.6
	Total	840,000		672,000		1,344,000		672,000		1,092,000		672,000	
Chambar	(nos.)	12		10		18		10		15		10	
	Price (birr/no)	35,000	Wp.4	35,000	Wp.4	35,000	Wp.4	35,000	Wp.4	35,000	Wp.4	35,000	Wp.4
	Total	420,000		350,000		630,000		350,000		525,000		350,000	
WP	(nos.)	10		8		16		8		13		8	
	Price (birr/no)	50,000	Wp.1	50,000	Wp.1	50,000	Wp.1	50,000	Wp.1	50,000	Wp.1	50,000	Wp.1
	Total	500,000		400,000		800,000		400,000		650,000		400,000	
Cattle	(nos.)	2		2		4		2		3		2	
	Price (birr/no)	50,000	Wp.2	50,000	Wp.2	50,000	Wp.2	50,000	Wp.2	50,000	Wp.2	50,000	Wp.2
	Total	100,000		100,000		200,000		100,000		150,000		100,000	
Sub total		6,836,000		5,956,000		8,743,000		5,956,000		7,734,000		5,956,000	
Others (15%)		1,025,400		893,400		1,311,450		893,400		1,160,100		893,400	
Direct cost total (Birr)		**7,862,000**		**6,850,000**		**10,055,000**		**6,850,000**		**8,895,000**		**6,850,000**	

(2) Direct and In-direct cost

Direct cost total (USD)	**424,000**		**370,000**		**543,000**		**370,000**		**480,000**		**370,000**	
In Direct cost (USD)	203,000	0.32	181,000	0.33	251,000	0.32	181,000	0.33	227,000	0.32	181,000	0.33
Total (USD)	627,000		551,000		794,000		551,000		707,000		551,000	

j. Danan woreda urban and rural water supply

9. Danan

ID	Kebele	Structure	No. of facility	Project cost (USD)			
				Construction cost	Engineering service	Administration Contingency	Total
1	Burqayar	Birka	6	342,000	51,000	34,000	427,000
2	Dambarweyne	Birka	7	399,000	60,000	40,000	499,000
3	**Danan**	SW	5	578,000	87,000	58,000	723,000
4	Qore	SW	2	281,000	42,000	28,000	351,000
5	Shinile	SW	2	281,000	42,000	28,000	351,000
(1) Urban water supply			5	578,000	87,000	58,000	723,000
(2) Shallow well			4	562,000	84,000	56,000	702,000
(3) Birka			13	741,000	111,000	74,000	926,000
Total				1,881,000	282,000	188,000	2,351,000

1. Urban water supply (BH)

(1) Direct Cost

		9.Danan	Note
BH	(nos.)	5	
	(m)	175	
	Price (birr/m)	8,000	D.1
	Total	1,400,000	
Pump	(nos.)	5	
	Price (birr/no)	220,000	1kw, P1
	Total	1,100,000	
Gen.	(nos.)	5	
	Price (birr/no)	200,000	4kVA,G1
	Total	1,000,000	
Pump house	(nos.)	5	
	Price (birr/no)	200,000	H1
	Total	1,000,000	
Riser P	(m)	125	32
	Price (birr/m)	270	R.1
	Total	33,750	
Tra L.1	(m)	500	32
	Price (birr/m)	250	U.1
	Total	125,000	
Tra L.2	(m)		
	Price (birr/m)		
	Total		
Rev.	(nos.)	5	10m3
	Price (birr/no)	102,000	Wp.26
	Total	510,000	
Dis L.1	(m)	1,000	32
	Price (birr/m)	250	U.6
	Total	250,000	
Chambar	(nos.)	10	
	Price (birr/no)	35,000	Wp.4
	Total	350,000	
WP	(nos.)	5	
	Price (birr/no)	50,000	Wp.1
	Total	250,000	
Cattle	(nos.)	5	
	Price (birr/no)	50,000	Wp.2
	Total	250,000	
Sub total		6,268,750	
Others (15%)		940,313	
Direct cost total (Birr)		**7,210,000**	

(2) Direct and In-direct cost

Direct cost total (USD)	**389,000**	
In Direct cost (USD)	**189,000**	0.33
Total (USD)	**578,000**	

9. Danan

(1) Direct Cost

		4.Qore	note	5.Shinile	note
BH	(nos.)	2		2	
	(m)	90		90	
	Price (birr/m)	8,000	D.1	8,000	D.1
	Total	720,000		720,000	
Pump	(nos.)	2		2	
	Price (birr/no)	220,000	1kw,P.1	220,000	1kw,P.1
	Total	440,000		440,000	
Gen.	(nos.)	2		2	
	Price (birr/no)	200,000	4kVA,G.1	200,000	4kVA,G.1
	Total	400,000		400,000	
Pump house	(nos.)	2		2	
	Price (birr/no)	200,000	H1	200,000	H1
	Total	400,000		400,000	
Riser P	(m)	50	32	50	32
	Price (birr/m)	270	R.1	270	R.1
	Total	13,500		13,500	
Tra L	(m)	200	32	200	32
	Price (birr/m)	250	U.1	250	U.3
	Total	50,000		50,000	
Rev. (10m3,10m)	(nos.)	2		2	
	Price (birr/no)	102,000	Wp.26	102,000	Wp.26
	Total	204,000		204,000	
Dis L	(m)	800	32	800	40
	Price (birr/m)	250	U.1	250	U.3
	Total	200,000		200,000	
Chambar	(nos.)	6		6	
	Price (birr/no)	35,000	Wp.4	35,000	Wp.4
	Total	210,000		210,000	
WP	(nos.)	4		4	
	Price (birr/no)	50,000	Wp.1	50,000	Wp.1
	Total	200,000		200,000	
Cattle	(nos.)	2		2	
	Price (birr/no)	50,000	Wp.2	50,000	Wp.2
	Total	100,000		100,000	
Sub total		2,937,500		2,937,500	
Others (15%)		440,625		440,625	
Direct cost total (Birr)		**3,379,000**		**3,379,000**	

(2) Direct and In-direct cost

Direct cost total (USD)	**182,000**		**182,000**	
In Direct cost (USD)	99,000	0.35	99,000	0.35
Total (USD)	281,000		281,000	

k. Beercaano woreda urban and rural water supply

10. Beercaano

ID	Kebele	Structure	No. of facility	Project cost (USD)			
				Construction cost	Engineering service	Administration Contingency	Total
1	Beercaano	River intake	1	869,000	130,000	87,000	1,086,000
2	Garbo Xandre	Birka	5	285,000	43,000	29,000	357,000
3	Laab	River intake	1	767,000	115,000	77,000	959,000
4	Raranle	River intake	1	680,000	102,000	68,000	850,000
5	Sangabar	Birka	7	399,000	60,000	40,000	499,000
(1) Urban water supply			1	869,000	130,000	87,000	1,086,000
(2) River intake			2	1,447,000	217,000	145,000	1,809,000
(3) Birka			12	684,000	103,000	69,000	856,000
Total				3,000,000	450,000	301,000	3,751,000

1. Urban water supply (river)

(1) Direct Cost

		10.Beercaano	Note
Intake canal	(nos.)	1	
	Price (birr/m)	194,000	Wp.14
	Total	194,000	
Intake pump	(nos.)	2	
	Price (birr/no)	220,000	3kw,P.2
	Total	440,000	
Intake pump house	(nos.)	1	
	Price (birr/no)	200,000	H1
	Total	200,000	
Sedi pond	(nos.)	2	196m3
	Price (birr/no)	936,000	Wp.10
	Total	1,872,000	
Roughing Filter	(nos.)	3	
	Price (birr/no)	377,000	Wp.15
	Total	1,131,000	
Clear water reservoir	(nos.)	1	100m3
	Price (birr/no)	863,000	Wp.20
	Total	863,000	
Gen.	(nos.)	1	
	Price (birr/no)	235,000	27kVA,G4
	Total	235,000	
Gen. house	(nos.)	1	
	Price (birr/no)	200,000	H1
	Total	200,000	
Surface pump	(nos.)	2	
	Price (birr/no)	300,000	6kw,P.3
	Total	600,000	
Surface pump house	(nos.)	1	
	Price (birr/no)	200,000	H1
	Total	200,000	
Tra L.1	(m)	500	110
	Price (birr/m)	470	U.7
	Total	235,000	
Rev.	(nos.)	1	200m3
	Price (birr/no)	618,000	Wp.27
	Total	618,000	
Dis L.1	(m)	4,500	90
	Price (birr/m)	420	P.6
	Total	1,890,000	
Chambar	(nos.)	10	
	Price (birr/no)	35,000	Wp.4
	Total	350,000	
WP	(nos.)	9	
	Price (birr/no)	50,000	Wp.1
	Total	450,000	
Cattle	(nos.)	2	
	Price (birr/no)	50,000	Wp.2
	Total	100,000	
Sub total		9,578,000	
Others (15%)		1,436,700	
Direct cost total (Birr)		**11,020,000**	

(2) Direct and In-direct cost

Direct cost total (USD)	**595,000**	
In Direct cost (USD)	**274,000**	0.32
Total (USD)	**869,000**	

10. Beercaano

(1) Direct Cost

		3.Laab	note	4.Raranle	note
Intake canal	(nos.)	1		1	
	Price (birr/m)	194,000	Wp.14	194,000	Wp.14
	Total	194,000		194,000	
Intake pump	(nos.)	2		2	
	Price (birr/no)	220,000	3kw, P.2	220,000	3kw, P.2
	Total	440,000		440,000	
Intake pump house	(nos.)	1		1	
	Price (birr/no)	200,000	H1	200,000	H1
	Total	200,000		200,000	
Sedi pond	(nos.)	2	100m3	1	144m3
	Price (birr/no)	671,000	Wp.8	797,000	Wp.9
	Total	1,342,000		797,000	
Roughing Filter	(nos.)	2		3	
	Price (birr/no)	377,000	Wp.15	377,000	Wp.15
	Total	754,000		1,131,000	
Clear water reservoir	(nos.)	1	60m3	1	80m3
	Price (birr/no)	649,000	Wp.18	777,000	Wp.19
	Total	649,000		777,000	
Gen.	(nos.)	1		1	
	Price (birr/no)	280,000	51kVA,G6	235,000	33kVA,G4
	Total	280,000		235,000	
Gen. house	(nos.)	1		1	
	Price (birr/no)	200,000	H1	200,000	H1
	Total	200,000		200,000	
Surface pump	(nos.)	2		2	
	Price (birr/no)	380,000	14kw,P.5	300,000	8kw, P.3
	Total	760,000		600,000	
Surface pump house	(nos.)	1		1	
	Price (birr/no)	200,000	H1	200,000	H1
	Total	200,000		200,000	
Tra L.1	(m)	3,800	110mm	300	90mm
	Price (birr/m)	470	U.7	420	U.6
	Total	1,786,000		126,000	
Rev.	(nos.)	1	40m3	1	60m3
	Price (birr/no)	241,000	Wp.37	313,000	Wp.39
	Total	241,000		313,000	
Dis L.1	(m)	1,400	90mm	2,400	90mm
	Price (birr/m)	420	U.6	420	U.6
	Total	588,000		1,008,000	
Chambar	(nos.)	9		14	
	Price (birr/no)	35,000	Wp.4	35,000	Wp.4
	Total	315,000		490,000	
WP	(nos.)	7		12	
	Price (birr/no)	50,000	Wp.1	50,000	Wp.1
	Total	350,000		600,000	
Cattle	(nos.)	2		3	
	Price (birr/no)	50,000	Wp.2	50,000	Wp.2
	Total	100,000		150,000	
Sub total		8,399,000		7,461,000	
Others (15%)		1,259,850		1,119,150	
Direct cost total (Birr)		**9,659,000**		**8,581,000**	

(2) Direct and In-direct cost

Direct cost total (USD)	**521,000**		**463,000**	
In Direct cost (USD)	246,000	0.32	217,000	0.32
Total (USD)	767,000		680,000	

l. Godey woreda rural water supply

11 Godey

ID	Kebele	Structure	No. of facility	Project cost (USD)			
				Construction cost	Engineering service	Administration Contingency	Total
1	Baarguun	Birka	11	627,000	94,000	63,000	784,000
2	Badiilaced	River intake	1	540,000	81,000	54,000	675,000
3	Carmaare	SW	1	146,000	22,000	15,000	183,000
4	Cilaan	River intake	1	691,000	104,000	69,000	864,000
5	Digino	River intake	1	529,000	79,000	53,000	661,000
6	Duudcade	River intake	1	707,000	106,000	71,000	884,000
7	Gabicas	Birka	10	570,000	86,000	57,000	713,000
9	Haarwayn	Birka	4	228,000	34,000	23,000	285,000
10	Hadhaave	Birka	14	798,000	120,000	80,000	998,000
(1)	Shallow well		1	146,000	22,000	15,000	183,000
(2)	River intake		4	2,467,000	370,000	247,000	3,084,000
(3)	Birka		39	2,223,000	334,000	223,000	2,780,000
Total				4,836,000	726,000	485,000	6,047,000

11 Godey (BH)

(1) Direct Cost

		3.Carmaare	note
SW	(nos.)	1	
	(m)	35	
	Price (birr/m)	8,000	D.1
	Total	280,000	
Pump	(nos.)	1	
	Price (birr/no)	220,000	1kW,P.1
	Total	220,000	
Gen.	(nos.)	1	
	Price (birr/no)	200,000	4kVA,G.1
	Total	200,000	
Pump house	(nos.)	1	
	Price (birr/no)	200,000	H1
	Total	200,000	
Riser P	(m)	25	32
	Price (birr/m)	270	R.3
	Total	6,750	
Tra L	(m)	100	32
	Price (birr/m)	250	U.1
	Total	25,000	
Rev. (10m3,10m)	(nos.)	1	
	Price (birr/no)	102,000	Wp.26
	Total	102,000	
Dis L	(m)	400	32
	Price (birr/m)	250	U.1
	Total	100,000	
Chambar	(nos.)	4	
	Price (birr/no)	35,000	Wp.4
	Total	140,000	
WP	(nos.)	2	
	Price (birr/no)	50,000	Wp.1
	Total	100,000	
Cattle	(nos.)	1	
	Price (birr/no)	50,000	Wp.2
	Total	50,000	
Sub total		1,423,750	
Others (15%)		213,563	
Direct cost total (Birr)		**1,638,000**	

(2) Direct and In-direct cost

Direct cost total (USD)	**88,000**	
In Direct cost (USD)	58,000	0.40
Total (USD)	146,000	

11 Godey (river)

(1) Direct Cost

		2.Badiilaced	note	4.Cilaan	note	5.Digino	note	6.Duudcade	note
Intake canal	(nos.)	1		1		1		1	
	Price (birr/m)	194,000	Wp.14	194,000	Wp.14	194,000	Wp.14	194,000	Wp.14
	Total	194,000		194,000		194,000		194,000	
Intake pump	(nos.)	2		2		2		2	
	Price (birr/no)	220,000	3kw, P.2	220,000	3kw, P.2	220,000	3kw, P.2	220,000	3kw, P.2
	Total	440,000		440,000		440,000		440,000	
Intake pump house	(nos.)	1		1		1		1	
	Price (birr/no)	200,000	H1	200,000	H1	200,000	H1	200,000	H1
	Total	200,000		200,000		200,000		200,000	
Sedi pond	(nos.)	1	100m3	1	144m3	1	64m3	1	144m3
	Price (birr/no)	671,000	Wp.8	797,000	Wp.9	558,000	Wp.7	797,000	Wp.9
	Total	671,000		797,000		558,000		797,000	
Roughing Filter	(nos.)	2		3		2		3	
	Price (birr/no)	377,000	Wp.15	377,000	Wp.15	377,000	Wp.15	377,000	Wp.15
	Total	754,000		1,131,000		754,000		1,131,000	
Clear water reservoir	(nos.)	1	60m3	1	80m3	1	40m3	1	80m3
	Price (birr/no)	649,000	Wp.18	777,000	Wp.19	496,000	Wp.17	777,000	Wp.19
	Total	649,000		777,000		496,000		777,000	
Gen.	(nos.)	1		1		1		1	
	Price (birr/no)	235,000	25kVA,G4	255,000	41kVA,G5	215,000	14kVA,G2	255,000	41kVA,G5
	Total	235,000		255,000		215,000		255,000	
Gen. house	(nos.)	2		2		2		2	
	Price (birr/no)	200,000	H1	200,000	H1	200,000	H1	200,000	H1
	Total	400,000		400,000		400,000		400,000	
Surface pump	(nos.)	2		2		2		2	
	Price (birr/no)	300,000	6kw, P.3	300,000	11kw, P.4	220,000	3kw, P.2	300,000	11kw, P.4
	Total	600,000		600,000		440,000		600,000	
Surface pump house	(nos.)	2		2		2		2	
	Price (birr/no)	200,000	H1	200,000	H1	200,000	H1	200,000	H1
	Total	400,000		400,000		400,000		400,000	
Tra L.1	(m)	500	90	500	90	500	90	500	90mm
	Price (birr/m)	420	U.6	420	U.6	420	U.6	420	U.6
	Total	210,000		210,000		210,000		210,000	
Rev.	(nos.)	1	40m3	1	50m3	1	30m3	1	50m3
	Price (birr/no)	241,000	Wp.37	278,000	Wp.38	200,000	Wp.42	278,000	Wp.38
	Total	241,000		278,000		200,000		278,000	
Dis L.1	(m)	1,600	90	2,000	90	1,200	90	2,200	90
	Price (birr/m)	420	U.6	420	U.6	420	U.6	420	U.6
	Total			840,000		504,000		924,000	
Chambar	(nos.)	10		12		8		13	
	Price (birr/no)	35,000	Wp.4	35,000	Wp.4	35,000	Wp.4	35,000	Wp.4
	Total	350,000		420,000		280,000		455,000	
WP	(nos.)	8		10		6		11	
	Price (birr/no)	50,000	Wp.1	50,000	Wp.1	50,000	Wp.1	50,000	Wp.1
	Total	400,000		500,000		300,000		550,000	
Cattle	(nos.)	2		2		2		3	
	Price (birr/no)	50,000	Wp.2	50,000	Wp.2	50,000	Wp.2	50,000	Wp.2
	Total	100,000		100,000		100,000		150,000	
Sub total		5,844,000		7,542,000		5,691,000		7,761,000	
Others (15%)		876,600		1,131,300		853,650		1,164,150	
Direct cost total (Birr)		**6,721,000**		**8,674,000**		**6,545,000**		**8,926,000**	

(2) Direct and In-direct cost

Direct cost total (USD)	**363,000**		**468,000**		**353,000**		**482,000**	
In Direct cost (USD)	177,000	0.33	223,000	0.32	176,000	0.33	225,000	0.32
Total (USD)	540,000		691,000		529,000		707,000	

m. Adadle woreda urban and rural water supply

12 Adadle

ID	Kebele	Structure	No. of facility	Project cost (USD)			
				Construction cost	Engineering service	Administration Contingency	Total
1	Biyoolow	Birka	9	513,000	77,000	51,000	641,000
2	**Bohelxagare**	Birka	23	1,311,000	197,000	131,000	1,639,000
3	Buursareedo	River intake	1	815,000	122,000	82,000	1,019,000
4	Gabal	River intake	1	859,000	129,000	86,000	1,074,000
5	Higlow	Birka	9	513,000	77,000	51,000	641,000
6	Hilaguduudo	Birka	10	570,000	86,000	57,000	713,000
7	Jeeray	Birka	11	627,000	94,000	63,000	784,000
8	Maka Salar	Birka	18	1,026,000	154,000	103,000	1,283,000
9	Maroodile	Birka	13	741,000	111,000	74,000	926,000
10	Siigoole	Birka	9	513,000	77,000	51,000	641,000
11	Todob	Birka	15	855,000	128,000	86,000	1,069,000
(1)	River intake		2	1,674,000	251,000	168,000	2,093,000
(2)	Birka		117	6,669,000	1,001,000	667,000	8,337,000
Total				8,343,000	1,252,000	835,000	10,430,000

12 Adadle(river)

(1) Direct Cost

		3.Buursareedo	note	4.Gabal	note
Intake canal	(nos.)	1		1	
	Price (birr/m)	194,000	Wp.14	194,000	Wp.14
	Total	194,000		194,000	
Intake pump	(nos.)	2		2	
	Price (birr/no)	220,000	3kw, P.2	220,000	3kw, P.2
	Total	440,000		440,000	
Intake pump house	(nos.)	1		1	
	Price (birr/no)	200,000	H1	200,000	H1
	Total	200,000		200,000	
Sedi pond	(nos.)	1	144m3	1	196m3
	Price (birr/no)	797,000	Wp.9	936,000	Wp.10
	Total	797,000		936,000	
Roughing Filter	(nos.)	3		3	
	Price (birr/no)	377,000	Wp.15	377,000	Wp.15
	Total	1,131,000		1,131,000	
Clear water reservoir	(nos.)	1	80m3	1	100m3
	Price (birr/no)	777,000	Wp.19	863,000	Wp.20
	Total	777,000		863,000	
Gen.	(nos.)	1		1	
	Price (birr/no)	445,000	99kVA,G8	445,000	101kVA,G8
	Total	445,000		445,000	
Gen. house	(nos.)	2		2	
	Price (birr/no)	200,000	H1	200,000	H1
	Total	400,000		400,000	
Surface pump	(nos.)	2		2	
	Price (birr/no)	540,000	30kw, P.7	540,000	30kw, P.7
	Total	1,080,000		1,080,000	
Surface pump house	(nos.)	2		2	
	Price (birr/no)	200,000	H1	200,000	H1
	Total	400,000		400,000	
Tra L.1	(m)	1,400	90	1,000	90
	Price (birr/m)	420	U.6	420	U.6
	Total	588,000		420,000	
Rev.	(nos.)	1	60m3	1	70m3
	Price (birr/no)	313,000	Wp.39	377,000	Wp.40
	Total	313,000		377,000	
Dis L.1	(m)	2,400	90	2,800	90
	Price (birr/m)	420	U.6	420	U.6
	Total	1,008,000		1,176,000	
Chambar	(nos.)	14		16	
	Price (birr/no)	35,000	Wp.4	35,000	Wp.4
	Total	490,000		560,000	
WP	(nos.)	12		14	
	Price (birr/no)	50,000	Wp.1	50,000	Wp.1
	Total	600,000		700,000	
Cattle	(nos.)	3		3	
	Price (birr/no)	50,000	Wp.2	50,000	Wp.2
	Total	150,000		150,000	
Sub total		9,013,000		9,472,000	
Others (15%)		1,351,950		1,420,800	
Direct cost total (Birr)		**10,365,000**		**10,893,000**	

(2) Direct and In-direct cost

Direct cost total (USD)	**559,000**		**588,000**	
In Direct cost (USD)	256,000	0.31	271,000	0.32
Total (USD)	815,000		859,000	

n. Kalafo woreda urban and rural water supply

13 Kalafo

ID	Kebele	Structure	No. of facility	Project cost (USD)			
				Construction cost	Engineering service	Administration Contingency	Total
1	Af-duub	Birka	14	798,000	120,000	80,000	998,000
2	Alow-i-gadhsii	Birka	11	627,000	94,000	63,000	784,000
3	Baargun	River intake	1	756,000	113,000	76,000	945,000
4	Boholo-Aways	Birka	14	798,000	120,000	80,000	998,000
5	Buurgaado	River intake	1	734,000	110,000	73,000	917,000
6	Dariiqo	Birka	12	684,000	103,000	68,000	855,000
7	Deba-ka-tur	River intake	1	761,000	114,000	76,000	951,000
8	Kabxan	River intake	1	691,000	104,000	69,000	864,000
9	**Kalafo**	River intake	1	2,202,000	330,000	220,000	2,752,000
10	Libro	River intake	1	713,000	107,000	71,000	891,000
(1) Urban water supply			1	2,202,000	330,000	220,000	2,752,000
(2) River intake			5	3,655,000	548,000	365,000	4,568,000
(3) Birka			51	2,907,000	437,000	291,000	3,635,000
Total				8,764,000	1,315,000	876,000	10,955,000

1. Urban water supply (river)

(1) Direct Cost

		13.Kalafo	Note
Intake canal	(nos.)	1	
	Price (birr/m)	194,000	Wp.14
	Total	194,000	
Intake pump	(nos.)	2	
	Price (birr/no)	300,000	10kw, P.3
	Total	600,000	
Intake pump house	(nos.)	1	
	Price (birr/no)	200,000	H1
	Total	200,000	
Sedi pond	(nos.)	2	576m3
	Price (birr/no)	2,059,000	Wp.13
	Total	4,118,000	
Roughing Filter	(nos.)	8	
	Price (birr/no)	377,000	Wp.15
	Total	3,016,000	
Clear water reservoir	(nos.)	1	380m3
	Price (birr/no)	1,968,000	Wp.25
	Total	1,968,000	
Gen.	(nos.)	1	
	Price (birr/no)	445,000	116kVA,G8
	Total	445,000	
Gen. house	(nos.)	1	
	Price (birr/no)	200,000	H1
	Total	200,000	
Surface pump	(nos.)	2	
	Price (birr/no)	460,000	20kw,P.6
	Total	920,000	
Surface pump house	(nos.)	1	
	Price (birr/no)	200,000	H1
	Total	200,000	
Tra L.1	(m)	400	160
	Price (birr/m)	520	U.8
	Total	208,000	
Rev.	(nos.)	1	700m3
	Price (birr/no)	1,675,000	Wp.34
	Total	1,675,000	
Dis L.1	(m)	19,000	90
	Price (birr/m)	420	P.6
	Total	7,980,000	
Chambar	(nos.)	39	
	Price (birr/no)	35,000	Wp.4
	Total	1,365,000	
WP	(nos.)	38	
	Price (birr/no)	50,000	Wp.1
	Total	1,900,000	
Cattle	(nos.)	8	
	Price (birr/no)	50,000	Wp.2
	Total	400,000	
Sub total		25,389,000	
Others (15%)		3,808,350	
Direct cost total (Birr)		**29,200,000**	

(2) Direct and In-direct cost

Direct cost total (USD)	**1,576,000**	
In Direct cost (USD)	**626,000**	0.28
Total (USD)	**2,202,000**	

13 Kalafo(river)

(1) Direct Cost

		3.Baargun	note	5.Buurgaado	note	7.Deba-ka-tur	note	8.Kabxan	note	10.Libro	note
Intake canal	(nos.)	1		1		1		1		1	
	Price (birr/m)	194,000	Wp.14	194,000	Wp.14	194,000	Wp.14	194,000	Wp.14	194,000	Wp.14
	Total	194,000		194,000		194,000		194,000		194,000	
Intake pump	(nos.)	2		2		2		2		2	
	Price (birr/no)	220,000	3kw, P.2	220,000	3kw, P.2	220,000	3kw, P.2	220,000	3kw, P.2	220,000	3kw, P.2
	Total	440,000		440,000		440,000		440,000		440,000	
Intake pump house	(nos.)	1		1		1		1		1	
	Price (birr/no)	200,000	H1	200,000	H1	200,000	H1	200,000	H1	200,000	H1
	Total	200,000		200,000		200,000		200,000		200,000	
Sedi pond	(nos.)	1	144m3	1	144m3	1	196m3	1	144m3	1	144m3
	Price (birr/no)	797,000	Wp.9	797,000	Wp.9	936,000	Wp.10	797,000	Wp.9	797,000	Wp.9
	Total	797,000		797,000		936,000		797,000		797,000	
Roughing Filter	(nos.)	3		3		3		3		3	
	Price (birr/no)	377,000	Wp.15	377,000	Wp.15	377,000	Wp.15	377,000	Wp.15	377,000	Wp.15
	Total	1,131,000		1,131,000		1,131,000		1,131,000		1,131,000	
Clear water reservoir	(nos.)	2	80m3	1	80m3	1	100m3	1	80m3	1	80m3
	Price (birr/no)	777,000	Wp.19	777,000	Wp.19	863,000	Wp.20	777,000	Wp.19	777,000	Wp.19
	Total	1,554,000		777,000		863,000		777,000		777,000	
Gen.	(nos.)	1		1		1		1		1	
	Price (birr/no)	255,000	41kVA,G.5	310,000	66kVA,G.7	210,000	18kVA,G.3	255,000	41kVA,G.5	255,000	41kVA,G.5
	Total	255,000		310,000		210,000		255,000		255,000	
Gen. house	(nos.)	2		2		2		2		2	
	Price (birr/no)	200,000	H1	200,000	H1	200,000	H1	200,000	H1	200,000	H1
	Total	400,000		400,000		400,000		400,000		400,000	
Surface pump	(nos.)	2		2		2		2		2	
	Price (birr/no)	300,000	11kw, P.4	460,000	20kw, P.6	220,000	3kw, P.2	300,000	11kw, P.4	300,000	11kw, P.4
	Total	600,000		920,000		440,000		600,000		600,000	
Surface pump house	(nos.)	2		2		2		2		2	
	Price (birr/no)	200,000	H1	200,000	H1	200,000	H1	200,000	H1	200,000	H1
	Total	400,000		400,000		400,000		400,000		400,000	
Tra L.1	(m)	500	90	800	90	100	90	500	90	500	90
	Price (birr/m)	420	U.6	420	U.6	420	U.6	420	U.6	420	U.6
	Total	210,000		336,000		42,000		210,000		210,000	
Rev.	(nos.)	1	50m3	1	50m3	1	80m3	1	50m3	1	60m3
	Price (birr/no)	278,000	Wp.38	278,000	Wp.38	377,000	Wp.40	278,000	Wp.38	313,000	Wp.39
	Total	278,000		278,000		377,000		278,000		313,000	
Dis L.1	(m)	2,000	90	2,000	90	3,000	90	2,000	90	2,200	90
	Price (birr/m)	420	U.6	420	U.6	420	U.6	420	U.6	420	U.6
	Total	840,000		840,000		1,260,000		840,000		924,000	
Chambar	(nos.)	12		12		17		12		13	
	Price (birr/no)	35,000	Wp.4	35,000	Wp.4	35,000	Wp.4	35,000	Wp.4	35,000	Wp.4
	Total	420,000		420,000		595,000		420,000		455,000	
WP	(nos.)	10		10		15		10		11	
	Price (birr/no)	50,000	Wp.1	50,000	Wp.1	50,000	Wp.1	50,000	Wp.1	50,000	Wp.1
	Total	500,000		500,000		750,000		500,000		550,000	
Cattle	(nos.)	2		2		3		2		3	
	Price (birr/no)	50,000	Wp.2	50,000	Wp.2	50,000	Wp.2	50,000	Wp.2	50,000	Wp.2
	Total	100,000		100,000		150,000		100,000		150,000	
Sub total		8,319,000		8,043,000		8,388,000		7,542,000		7,796,000	
Others (15%)		1,247,850		1,206,450		1,258,200		1,131,300		1,169,400	
Direct cost total (Birr)		**9,567,000**		**9,250,000**		**9,647,000**		**8,674,000**		**8,966,000**	

(2) Direct and In-direct cost

Direct cost total (USD)	**516,000**		**499,000**		**521,000**		**468,000**		**484,000**	
In Direct cost (USD)	240,000	0.32	235,000	0.32	240,000	0.32	223,000	0.32	229,000	0.32
Total (USD)	756,000		734,000		761,000		691,000		713,000	

o. Mustahil woreda urban and rural water supply

14 Mustahil

ID	Kebele	Structure	No. of facility	Project cost (USD)			
				Construction cost	Engineering service	Administration Contingency	Total
1	Budul	River intake	1	724,000	109,000	72,000	905,000
2	Cadar-Dhurwa	Birka	7	399,000	60,000	40,000	499,000
3	Darbane	Birka	7	399,000	60,000	40,000	499,000
4	Dhanyane	River intake	1	616,000	92,000	62,000	770,000
5	Eeyoole	River intake	1	637,000	96,000	64,000	797,000
6	God-Caro	River intake	1	578,000	87,000	58,000	723,000
7	Mirdhis	Birka	10	570,000	86,000	57,000	713,000
8	**Mustahil**	River intake	1	2,013,000	302,000	201,000	2,516,000
9	Saba-Xume	River intake	1	707,000	106,000	71,000	884,000
(1) Urban water supply			1	2,013,000	302,000	201,000	2,516,000
(2) River intake			5	3,262,000	490,000	327,000	4,079,000
(3) Birka			24	1,368,000	206,000	137,000	1,711,000
Total				6,643,000	998,000	665,000	8,306,000

1. Urban water supply (river)

(1) Direct Cost

		14.Mustahil	Note
Intake canal	(nos.)	1	
	Price (birr/m)	194,000	Wp.14
	Total	194,000	
Intake pump	(nos.)	2	
	Price (birr/no)	300,000	8kw, P.3
	Total	600,000	
Intake pump house	(nos.)	1	
	Price (birr/no)	200,000	H1
	Total	200,000	
Sedi pond	(nos.)	2	484m3
	Price (birr/no)	1,838,000	Wp.12
	Total	3,676,000	
Roughing Filter	(nos.)	7	
	Price (birr/no)	377,000	Wp.15
	Total	2,639,000	
Clear water reservoir	(nos.)	1	320m3
	Price (birr/no)	1,968,000	Wp.25
	Total	1,968,000	
Gen.	(nos.)	1	
	Price (birr/no)	445,000	124kVA,G8
	Total	445,000	
Gen. house	(nos.)	1	
	Price (birr/no)	200,000	H1
	Total	200,000	
Surface pump	(nos.)	2	
	Price (birr/no)	540,000	33kw, P.7
	Total	1,080,000	
Surface pump house	(nos.)	1	
	Price (birr/no)	200,000	H1
	Total	200,000	
Tra L.1	(m)	800	160
	Price (birr/m)	520	U.8
	Total	416,000	
Rev.	(nos.)	1	600m3
	Price (birr/no)	1,397,000	Wp.33
	Total	1,397,000	
Dis L.1	(m)	16,500	90
	Price (birr/m)	420	P.6
	Total	6,930,000	
Chambar	(nos.)	34	
	Price (birr/no)	35,000	Wp.4
	Total	1,190,000	
WP	(nos.)	33	
	Price (birr/no)	50,000	Wp.1
	Total	1,650,000	
Cattle	(nos.)	7	
	Price (birr/no)	50,000	Wp.2
	Total	350,000	
Sub total		23,135,000	
Others (15%)		3,470,250	
Direct cost total (Birr)		**26,610,000**	

(2) Direct and In-direct cost

Direct cost total (USD)	**1,436,000**	
In Direct cost (USD)	**577,000**	0.29
Total (USD)	**2,013,000**	

14 Mustahil(river)

(1) Direct Cost

		1.Budul	note	4.Dhanyane	note	5.Eeyoole	note	6.God-Caro	note	9.Saba-Xume	note
Intake canal	(nos.)	1		1		1		1		1	
	Price (birr/m)	194,000	Wp.14	194,000	Wp.14	194,000	Wp.14	194,000	Wp.14	194,000	Wp.14
	Total	194,000		194,000		194,000		194,000		194,000	
Intake pump	(nos.)	2		2		2		2		2	
	Price (birr/no)	220,000	3kw, P.2	220,000	2kw, P.2	220,000	2kw, P.2	220,000	2kw, P.2	220,000	3kw, P.2
	Total	440,000		440,000		440,000		440,000		440,000	
Intake pump house	(nos.)	1		1		1		1		1	
	Price (birr/no)	200,000	H1	200,000	H1	200,000	H1	200,000	H1	200,000	H1
	Total	200,000		200,000		200,000		200,000		200,000	
Sedi pond	(nos.)	1	144m3	1	100m3	1	100m3	1	100m3	1	144m3
	Price (birr/no)	797,000	Wp.9	863,000	Wp.20	863,000	Wp.20	863,000	Wp.20	797,000	Wp.9
	Total	797,000		863,000		863,000		863,000		797,000	
Roughing Filter	(nos.)	3		2		2		2		3	
	Price (birr/no)	377,000	Wp.15	377,000	Wp.15	377,000	Wp.15	377,000	Wp.15	377,000	Wp.15
	Total	1,131,000		754,000		754,000		754,000		1,131,000	
Clear water reservoir	(nos.)	1	80m3	1	60m3	1	60m3	1	60m3	1	80m3
	Price (birr/no)	777,000	Wp.19	649,000	Wp.18	649,000	Wp.18	649,000	Wp.18	777,000	Wp.19
	Total	777,000		649,000		649,000		649,000		777,000	
Gen.	(nos.)	1		1		1		1		1	
	Price (birr/no)	235,000	33kVA,G4	235,000	25kVA,G.4	235,000	25kVA,G.4	215,000	12kVA,G.2	255,000	41kVA,G.5
	Total	235,000		235,000		235,000		215,000		255,000	
Gen. house	(nos.)	2		2		2		2		2	
	Price (birr/no)	200,000	H1	200,000	H1	200,000	H1	200,000	H1	200,000	H1
	Total	400,000		400,000		400,000		400,000		400,000	
Surface pump	(nos.)	2		2		2		2		2	
	Price (birr/no)	300,000	8kw, P.3	300,000	6kw, P.3	300,000	6kw, P.3	220,000	2kw,P.1	300,000	11kw, P.4
	Total	600,000		600,000		600,000		440,000		600,000	
Surface pump house	(nos.)	2		2		2		2		2	
	Price (birr/no)	200,000	H1	200,000	H1	200,000	H1	200,000	H1	200,000	H1
	Total	400,000		400,000		400,000		400,000		400,000	
Tra L.1	(m)	800	110	500	90	500	90	200	90	500	90
	Price (birr/m)	470	U.7	420	U.6	420	U.6	420	U.6	420	U.6
	Total	376,000		210,000		210,000		84,000		210,000	
Rev.	(nos.)	1	60m3	1	40m3	1	50m3	1	40m3	1	50m3
	Price (birr/no)	313,000	Wp.39	241,000	Wp.37	278,000	Wp.38	241,000	Wp.37	278,000	Wp.38
	Total	313,000		241,000		278,000		241,000		278,000	
Dis L.1	(m)	2,200	90	1,600	90	1,800	90	1,400	90	2,200	90
	Price (birr/m)	420	U.6	420	U.6	420	U.6	420	U.6	420	U.6
	Total	924,000		672,000		756,000		588,000		924,000	
Chambar	(nos.)	13		10		11		9		13	
	Price (birr/no)	35,000	Wp.4	35,000	Wp.4	35,000	Wp.4	35,000	Wp.4	35,000	Wp.4
	Total	455,000		350,000		385,000		315,000		455,000	
WP	(nos.)	11		8		9		7		11	
	Price (birr/no)	50,000	Wp.1	50,000	Wp.1	50,000	Wp.1	50,000	Wp.1	50,000	Wp.1
	Total	550,000		400,000		450,000		350,000		550,000	
Cattle	(nos.)	3		2		2		2		3	
	Price (birr/no)	50,000	Wp.2	50,000	Wp.2	50,000	Wp.2	50,000	Wp.2	50,000	Wp.2
	Total	150,000		100,000		100,000		100,000		150,000	
Sub total		7,942,000		6,708,000		6,914,000		6,233,000		7,761,000	
Others (15%)		1,191,300		1,006,200		1,037,100		934,950		1,164,150	
Direct cost total (Birr)		**9,134,000**		**7,715,000**		**7,952,000**		**7,168,000**		**8,926,000**	

(2) Direct and In-direct cost

Direct cost total (USD)	**493,000**		**416,000**		**429,000**		**387,000**		**482,000**	
In Direct cost (USD)	231,000	0.32	200,000	0.32	208,000	0.33	191,000	0.33	225,000	0.32
Total (USD)	724,000		616,000		637,000		578,000		707,000	

p. Rasso woreda urban and rural water supply

15.Rasso

ID	Kebele	Structure	No. of facility	Project cost (USD)			
				Construction cost	Engineering service	Administration Contingency	Total
1	Bakool	Birka	8	456,000	68,000	46,000	570,000
2	Deli Mendayo	Birka	8	456,000	68,000	46,000	570,000
3	Hargeysa-Yar	Birka	8	456,000	68,000	46,000	570,000
4	Kebele04	Birka	8	456,000	68,000	46,000	570,000
5	**Rasso**	Birka	12	684,000	103,000	68,000	855,000
(1)	Birka		44	2,508,000	375,000	252,000	3,135,000
Total				2,508,000	375,000	252,000	3,135,000

q. West Ime woreda urban and rural water supply

16 West Ime

ID	Kebele	Structure	No. of facility	Project cost (USD)			
				Construction cost	Engineering service	Administration Contingency	Total
1	Abagarow	River intake	1	475,000	71,000	48,000	594,000
2	Barashibo	Birka	4	228,000	34,000	23,000	285,000
3	Bilow	Birka	3	171,000	26,000	17,000	214,000
4	Budshe	River intake	1	594,000	89,000	59,000	742,000
5	Burdaxor	Birka	4	228,000	34,000	23,000	285,000
6	Dawin	Birka	3	171,000	26,000	17,000	214,000
7	Dhaley Bula	Birka	2	114,000	17,000	11,000	142,000
8	Finjaawe	Birka	3	171,000	26,000	17,000	214,000
9	Golbalayo	River intake	1	475,000	71,000	48,000	594,000
10	Jiiq	River intake	1	416,000	62,000	42,000	520,000
11	Sufley	River intake	1	389,000	58,000	39,000	486,000
12	**West Ime**	River intake	1	913,000	137,000	91,000	1,141,000
(1) Urban water supply			1	913,000	137,000	91,000	1,141,000
(2) River intake			5	2,349,000	351,000	236,000	2,936,000
(3) Birka			19	1,083,000	163,000	108,000	1,354,000
Total				4,345,000	651,000	435,000	5,431,000

1. Urban water supply (river)

(1) Direct Cost

		16.West Ime	Note
Intake canal	(nos.)	1	
	Price (birr/m)	194,000	Wp.14
	Total	194,000	
Intake pump	(nos.)	2	
	Price (birr/no)	220,000	3kw,P.2
	Total	440,000	
Intake pump house	(nos.)	1	
	Price (birr/no)	200,000	H1
	Total	200,000	
Sedi pond	(nos.)	2	196m3
	Price (birr/no)	936,000	Wp.10
	Total	1,872,000	
Roughing Filter	(nos.)	3	
	Price (birr/no)	377,000	Wp.15
	Total	1,131,000	
Clear water reservoir	(nos.)	1	100m3
	Price (birr/no)	863,000	Wp.20
	Total	863,000	
Gen.	(nos.)	1	
	Price (birr/no)	255,000	46kVA,G5
	Total	255,000	
Gen. house	(nos.)	1	
	Price (birr/no)	200,000	H1
	Total	200,000	
Surface pump	(nos.)	2	
	Price (birr/no)	300,000	12kw, P.4
	Total	600,000	
Surface pump house	(nos.)	1	
	Price (birr/no)	200,000	H1
	Total	200,000	
Tra L.1	(m)	900	110
	Price (birr/m)	470	U.7
	Total	423,000	
Rev.	(nos.)	1	200m3
	Price (birr/no)	618,000	Wp.27
	Total	618,000	
Dis L.1	(m)	5,000	90
	Price (birr/m)	420	P.6
	Total	2,100,000	
Chambar	(nos.)	11	
	Price (birr/no)	35,000	Wp.4
	Total	385,000	
WP	(nos.)	10	
	Price (birr/no)	50,000	Wp.1
	Total	500,000	
Cattle	(nos.)	2	
	Price (birr/no)	50,000	Wp.2
	Total	100,000	
Sub total		10,081,000	
Others (15%)		1,512,150	
Direct cost total (Birr)		**11,600,000**	

(2) Direct and In-direct cost

Direct cost total (USD)	**626,000**	
In Direct cost (USD)	**287,000**	0.31
Total (USD)	**913,000**	

16 West Ime(river)

(1) Direct Cost

		1.Abagarow	note	4.Budshe	note	9.Golbalayo	note	10.Jiiq	note	11.Sufley	note
Intake canal	(nos.)	1		1		1		1		1	
	Price (birr/m)	194,000	Wp.14	194,000	Wp.14	194,000	Wp.14	194,000	Wp.14	194,000	Wp.14
	Total	194,000		194,000		194,000		194,000		194,000	
Intake pump	(nos.)	2		2		2		2		2	
	Price (birr/no)	220,000	2kw,P.2	220,000	2kw,P.2	220,000	2kw,P.2	220,000	1kw, P.1	220,000	1kw, P.1
	Total	440,000		440,000		440,000		440,000		440,000	
Intake pump house	(nos.)	1		1		1		1		1	
	Price (birr/no)	200,000	H1	200,000	H1	200,000	H1	200,000	H1	200,000	H1
	Total	200,000		200,000		200,000		200,000		200,000	
Sedi pond	(nos.)	1	64m3	1	64m3	1	64m3	1	36m3	1	36m3
	Price (birr/no)	558,000	Wp.7	558,000	Wp.7	558,000	Wp.7	459,000	Wp.6	459,000	Wp.6
	Total	558,000		558,000		558,000		459,000		459,000	
Roughing Filter	(nos.)	2		2		2		2		2	
	Price (birr/no)	377,000	Wp.15	377,000	Wp.15	377,000	Wp.15	377,000	Wp.15	377,000	Wp.15
	Total	754,000		754,000		754,000		754,000		754,000	
Clear water reservoir	(nos.)	1	40m3	1	40m3	1	40m3	1	20m3	1	20m3
	Price (birr/no)	496,000	Wp.17	496,000	Wp.17	496,000	Wp.17	285,000	Wp.16	285,000	Wp.16
	Total	496,000		496,000		496,000		285,000		285,000	
Gen.	(nos.)	1		1		1		1		1	
	Price (birr/no)	215,000	14kVA,G2	235,000	23kVA,G4	215,000	14kVA,G2	200,000	6kVA,G.1	200,000	6kVA,G.1
	Total	215,000		235,000		215,000		200,000		200,000	
Gen. house	(nos.)	1		6		1		1		1	
	Price (birr/no)	200,000	H1	200,000	H1	200,000	H1	200,000	H1	200,000	H1
	Total	200,000		1,200,000		200,000		200,000		200,000	
Surface pump	(nos.)	2		2		2		2		2	
	Price (birr/no)	220,000	3kw, P.2	300,000	6kw,P.3	220,000	3kw, P.2	220,000	1kw, P.1	220,000	1kw, P.1
	Total	440,000		600,000		440,000		440,000		440,000	
Surface pump house	(nos.)	1		1		1		1		1	
	Price (birr/no)	200,000	H1	200,000	H1	200,000	H1	200,000	H1	200,000	H1
	Total	200,000		200,000		200,000		200,000		200,000	
Tra L.1	(m)	700	90	1,500	90	500	90	700	90	100	90
	Price (birr/m)	420	U.6	420	U.6	420	U.6	420	U.6	420	U.6
	Total	294,000		630,000		210,000		294,000		42,000	
Rev.	(nos.)	1	20m3	1	20m3	1	30m3	1	20m3	1	10m3
	Price (birr/no)	153,000	Wp.41	153,000	Wp.41	200,000	Wp.42	153,000	Wp.41	102,000	Wp.26
	Total	153,000		153,000		200,000		153,000		102,000	
Dis L.1	(m)	1,000	90	800	90	1,000	90	600	90	600	90
	Price (birr/m)	420	U.6	420	U.6	420	U.6	420	U.6	420	U.6
	Total	420,000		336,000		420,000		252,000		252,000	
Chambar	(nos.)	7		6		7		5		5	
	Price (birr/no)	35,000	Wp.4	35,000	Wp.4	35,000	Wp.4	35,000	Wp.4	35,000	Wp.4
	Total	245,000		210,000		245,000		175,000		175,000	
WP	(nos.)	5		4		5		3		3	
	Price (birr/no)	50,000	Wp.1	50,000	Wp.1	50,000	Wp.1	50,000	Wp.1	50,000	Wp.1
	Total	250,000		200,000		250,000		150,000		150,000	
Cattle	(nos.)	1		1		1		1		1	
	Price (birr/no)	50,000	Wp.2	50,000	Wp.2	50,000	Wp.2	50,000	Wp.2	50,000	Wp.2
	Total	50,000		50,000		50,000		50,000		50,000	
Sub total		5,109,000		6,456,000		5,072,000		4,446,000		4,143,000	
Others (15%)		766,350		968,400		760,800		666,900		621,450	
Direct cost total (Birr)		**5,876,000**		**7,425,000**		**5,833,000**		**5,113,000**		**4,765,000**	

(2) Direct and In-direct cost

Direct cost total (USD)		**317,000**		**401,000**		**315,000**		**276,000**		**257,000**	
In Direct cost (USD)		158,000	0.33	193,000	0.32	160,000	0.34	140,000	0.34	132,000	0.34
Total (USD)		475,000		594,000		475,000		416,000		389,000	

Volume.3

1. Operation and Maintenance, Management

1. Operation and Maintenance, Management

Data 3.1.1 : Monthly Operational Cost Breakdown (1/2)

Godey Town

	Cost (Birr/month)	Remarks
Spare parts		
Oil filter for generator	400	2 time per year for 2 generators
Air filter for generator	200	2 time per year for 2 generators
Fan belt for generator	100	once per year for 2 generators
Pump gland packing	267	once per year for 4 ground pumps
Pump mechanical seal	667	once per year for 4 ground pumps
Pump bearing	222	once in 3 years for 4 ground pumps
Sub-total	1,856	
Power supply		
Diesel fuel	184,320	For 2 generators of 120kVA, 10 hour/day operation
Electricity (commercial)	0	
Sub-total	184,320	
Personnel		
Technician	8,500	Leader of operator team, Total 5 persons
Lab technician	3,000	2 persons
Operator	13,200	11 persons
Assistant operator	4,000	to assist operator in handling chemicals, 5 persons
Guard	16,200	27 people employed
Daily worker	34,608	Total 5191 day-person
Sub-total	79,508	
Chemical		
Coagulant agent	43,986	For 1418m3/day water at 100mg/L
pH adjusting agent	5,802	proportional to coagulant dose at 40mg/L
Chlorination agent	9,189	For 1418m3/day water, same dose thoughout the year of 3mg/L
Sub-total	58,977	
Consumable		
Engine oil for generator	583	2 times per year for 2 generators of 120kVA
Tools for cleaning	2,198	Shovels and scrapers for Max 15 workers, dewatering pump
Sub-total	2,781	
Others		
Transportation of sonsum	0	by 4-ton truck from Addis Ababa
Replacement of pump	0	replaced every 5 years assumed that they are inported duty free from overseas
Total	327,442	

Data 3.1.1 : Monthly Operational Cost Breakdown (2/2)

Kabribeyah Town

	Cost (Birr/month)	Remarks
Spare parts		
Oil filter for generator	1,000	2 time per year for 5 generators
Air filter for generator	500	2 time per year for 5 generators
Fan belt for generator	250	once per year for 5 generators
Pump gland packing	400	once per year for 6 ground pumps
Pump mechanical seal	1,000	once per year for 6 ground pumps
Pump bearing	333	once in 3 years for 6 ground pumps
sub-total	3,483	
Power supply		
Diesel fuel	130,977	1 new generator + 2 JICA generator + 2 UN generator
Electricity (commercial)	140,568	6 ground pumps of 75kW
sub-total	271,545	
Personnel		
Technician	7,500	5 technicians in 3 facilities work in shift
Operator	12,000	12 operators in 4 sites work in shift
Guard	7,500	15 guards in 4 sites work in shift
Daily worker	11,000	Total 1124 day-person employed
sub-total	38,000	
Chemical		
Chlorination agent	9,716	2mg/L for 2249m^3/day water
sub-total	9,716	
Consumable		
Engine oil for generator	600	2 times per year for 4 generators of 35kW + one 55kW
Tools for cleaning	2,986	Shovels and scrapers for Max 45 workers, dewatering pump
sub-total	3,586	
Others		
Transportation of sonsuma	0	by 4-ton truck from Addis Ababa
Replacement of pump	0	replaced every 5 years assumed that they are inported duty free from overseas
Total	316,614	

Data 3.1.2 : Annual O&M Cost Breakdown for Woredas (rural and urban area

	Q'ty	Unit cost (Birr/year)	Cost (Birr/year)	Remarks
Kabribeyah (excluding town				
Birka/Hafir dam	148	8,417	1,245,686	existing Hafir & Birka: 19 included, Birka:Hafir=9:1
Shallow hand-dug well	0	7,152	0	
Hand pump with borehole	0	13,164	0	
Borehole with motor pump M	4	353,904	1,415,616	existing BH: 11 included
Borehole with motor pump L	17	675,060	11,476,020	
Total			14,137,322	
Araarso				
Birka/Hafir dam	34	6,252	212,568	existing Hafir & Birka: 6 included, Birka : Hafir = 1:0
Shallow hand-dug well	0	7,152	0	
Hand pump with borehole	0	13,164	0	
Borehole with motor pump M	10	353,904	3,539,040	existing BH: 3 included, 6 are in urban area
Borehole with motor pump L	0	675,060	0	
Total			3,751,608	
Dagahbur				
Birka/Hafir dam	46	8,726	401,399	existing Hafir & Birka: 11 included, Birka : Hafir = 31 : 4
Shallow hand-dug well	0	7,152	0	
Hand pump with borehole	0	13,164	0	
Borehole with motor pump M	17	353,904	6,016,368	existing BH: 6 included, 6 are in urban area
Borehole with motor pump L	0	675,060	0	
Total			6,417,767	
Birqod				
Birka/Hafir dam	5	6,252	31,260	existing Hafir & Birka: 1 included, Birka : Hafir = 1 : 0
Shallow hand-dug well	0	7,152	0	
Hand pump with borehole	1	13,164	13,164	existing HP: 1 included
Borehole with motor pump S	8	108,132	865,056	existing BH: 5 included, 2 in urban area
Borehole with motor pump M	3	353,904	1,061,712	
Total			1,971,192	
Shaygosh				
Birka/Hafir dam	22	10,582	232,795	existing Hafir & Birka: 2 included, Birka : Hafir = 4 : 1
Shallow hand-dug well	0	7,152	0	
Hand pump with borehole	0	13,164	0	
Borehole with motor pump M	7	353,904	2,477,328	existing BH: 3 included, 2 in urban area
Borehole with motor pump L	0	675,060	0	
Total			2,710,123	
Kabridahar				
Birka/Hafir dam	26	17,076	443,976	existing Hafir & Birka: 2 included, Birka : Hafir = 12 : 12
Shallow hand-dug well	0	7,152	0	
Hand pump with borehole	2	13,164	26328	existing HP: 2 included
Borehole with motor pump M	17	353,904	6,016,368	existing BH: 6 included
Borehole with motor pump L	0	675,060	0	
Total			6,486,672	
Doba wein				
Birka/Hafir dam	3	13,468	40,404	existing Hafir & Birka: 1 included, Birka : Hafir = 2 : 1
Shallow hand-dug well	4	7,152	28,608	existing HDW: 4 included
Hand pump with borehole	0	13,164	0	
Borehole with motor pump S	36	108,132	3,892,752	7 borehole in urban area
Borehole with motor pump M	0	353,904	0	
Total			3,961,764	

Data 3.1.2 : Annual O&M Cost Breakdown for Woredas (rural and urban area

	Q'ty	Unit cost (Birr/year)	Cost (Birr/year)	Remarks
East Ime				
Birka/Hafir dam	55	6,252	343,860	existing Hafir & Birka: 2 included, Birka : Hafir = 1 : 0
Shallow hand-dug well	2	7,152	14,304	existing HDW 2 included (shallow well)
Hand pump with borehole	0	13,164	0	
Borehole with motor pump S	1	108,132	108,132	existing BH: 1 included (shallow well)
River intake system S	6	313,236	1,879,416	existing River intake 7 included (shallow well)
River intake system M	7	578,388	4,048,716	
River intake system L	1	1,280,004	1,280,004	
Total			7,674,432	
Danan				
Birka/Hafir dam	13	6,252	81,276	All Birka
Shallow hand-dug well	0	7,152	0	
Hand pump with borehole	0	13,164	0	
Borehole with motor pump S	14	108,132	1,513,848	existing BH: 5 included (one is shallow BH)
Borehole with motor pump M	0	353,904	0	
Total			1,595,124	
Beercaano				
Birka/Hafir dam	12	6,252	75,024	All Birka
Shallow hand-dug well	0	7,152	0	
Hand pump with borehole	0	13,164	0	
Borehole with motor pump S	1	108,132	108,132	existing BH: 2 included (one is shallow BH)
Borehole with motor pump M	1	353,904	353,904	
River intake system S	2	313,236	626,472	existing River intake 3 included
River intake system M	4	578,388	2,313,552	
Total			3,477,084	
Godey (excluding town)				
Birka/Hafir dam	39	6,252	243,828	All Birka
Shallow hand-dug well	0	7,152	0	
Hand pump with borehole	0	13,164	0	
Borehole with motor pump S	6	108,132	648,792	existing BH: 5 included (shallow BH)
River intake system S	4	313,236	1,252,944	existing River intake 5 included
River intake system M	5	578,388	2,891,940	
Total			5,037,504	
Adadle				
Birka/Hafir dam	125	6,252	781,500	existing Birka & Hafir dams: 8 included, All Birka
Shallow hand-dug well	0	7,152	0	
Hand pump with borehole	0	13,164	0	
Borehole with motor pump S	1	108,132	108,132	existing BH: 1 included (shallow BH)
River intake system M	4	578,388	2,313,552	existing River intake 2 included
River intake system L	0	1,280,004	0	
Total			3,203,184	
Kalafo				
Birka/Hafir dam	56	6,252	350,112	existing Birka: 5 included, All Birka
Shallow hand-dug well	0	7,152	0	
Hand pump with borehole	0	13,164	0	
Borehole with motor pump S	0	108,132	0	
River intake system M	10	578,388	5,783,880	existing River intake 5 included
River intake system L	1	1,280,004	1,280,004	
Total			7,413,996	

Data 3.1.2 : Annual O&M Cost Breakdown for Woredas (rural and urban area

	Q'ty	Unit cost (Birr/year)	Cost (Birr/year)	Remarks
Mustahil				
Birka/Hafir dam	25	6,252	156,300	existing Birka & Hafir dams: 1 included, All Birka
Shallow hand-dug well	2	7,152	14304	existing HDW 2 included
Hand pump with borehole	0	13,164	0	
Borehole with motor pump S	0	108,132	0	
River intake system S	5	313,236	1,566,180	existing River intake 6 included
River intake system M	6	578,388	3,470,328	
River intake system L	1	1,280,004	1,280,004	
Total			6,487,116	
Rasso				
Birka/Hafir dam	46	6,252	287,592	existing Birka & Hafir dams: 2 included, All Birka
Shallow hand-dug well	0	7,152	0	
Hand pump with borehole	0	13,164	0	
Borehole with motor pump S	0	108,132	0	
River intake system S	3	313,236	939,708	existing River intake 3 included
River intake system M	0	578,388	0	
Total			1,227,300	
West Ime				
Birka/Hafir dam	22	6,252	137,544	existing Birka: 3 included, All Birka
Shallow hand-dug well	2	7,152	14304	existing HDW 2 included
Hand pump with borehole	0	13,164	0	
Borehole with motor pump S	1	108,132	108,132	existing BH 1 included
River intake system S	12	313,236	3,758,832	existing River intake 7 included
River intake system M	1	578,388	578,388	
Total			4,597,200	

General assumptions

Those existing systems without information were assumed to be Birkas

Urban systems are separately calculated for Kabribeyah and Godey woredas

Data 3.1.3 : Calculation of Unit O&M Cost for one Water Supply System in Woredas

Birka	Qt'y	Unit（Birr/month）	Cost（Birr/ month）	Conditions
Personnel	1	67	67	One caretaker (not paid) + Day worker（5 persons, 1 time/year、2days each）
Material	1	208	208	Shovel for cleaning, Roof repair
Chemical	0.3	820	246	Water guard, 300 people/Birka
Energy	0	0	0	No electricity required
Total			521	

Hafir dam	Qt'y	Unit（Birr/month）	Cost（Birr/ month）	Conditions
Personnel	1	67	67	One caretaker (not paid) + Day worker（5 persons, 1 time/year、each 2 days）
Material	1	208	208	Shovel for cleaning, Pump spare partss
Chemical	2.5	820	2050	Water guard, 2500 people/dam
Energy	0	0	0	No electricity required
Total			2,325	

Hand dug well	Qt'y	Unit（Birr/month）	Cost（Birr/ month）	Conditions
Personnel	1	50	50	One caretaker (not paid) + Day worker（3 persons, 2 time/year、3 days each）
Material	1	300	300	Repair of wall, sludge removal in the bottom,（2 time /year、2 days each）, sement for repair
Chemical	0.3	820	246	Water guard, 300 people/HDW
Energy	0	0	0	No electricity required
Total			596	

BH with Hand pump	Qt'y	Unit（Birr/month）	Cost（Birr/ month）	Conditions
Personnel	1	57	57	One caretaker (not paid), Water office technical staf（1person, 1 time/year, 2days each）, Day worker（3 persons. 1 time/year, 2days each）
Material	1	40	40	500 Birr/year (chlorination 2 times/year)
Energy	0	0	0	No electricity required
Spare parts	1 set	1000	1000	1000 Birr/year (Foot valve,O-ring replacement)
Total			1,097	

BH with submersible pump (Small)	Qt'y	Unit（Birr/month）	Cost（Birr/ month）	Conditions
Personnel	1	2,887	2,887	2 caretakers (not paid), 1 operator (2 in shift), 1 Guard (2 in shift), Water office technical staf（1person, 2 time/year, 2 days each）
Material	1	103	103	Chlorination (2 time/year), Tools for cleaning
Energy	1	5,530	5,530	Diesel fuel for 5kVA generator (8 hours/day), 1.2 times of Godey unit price
Spare parts	1 set	492	492	Spare parts for generator（Oil, Oil & Air filters (2time/year), Belt (1time/2 year)）
Total			9,011	* Generator capacity less than 10kVA

BH with submersible pump (Medium)	Qt'y	Unit（Birr/month）	Cost（Birr/ month）	Conditions
Personnel	1	3,900	3,900	2 caretakers (not paid), 2 operator (3 in shift), 1 Guard (2 in shift), Water office technical staf（1 person, 2 time/year, 2 days each）
Material	1	217	217	Chlorination (2 time/year), Tools for cleaning
Energy	1	24,883	24,883	Diesel fuel for 30kVA generator (8 hours/day), 1.2 times of Godey unit price
Spare parts	1 set	492	492	Spare parts for generator（Oil, Oil & Air filters (2time/year), Belt (1time/2 year)）
Total			29,492	* Generator capacity 10～40kVA

BH with submersible pump (Large)	Qt'y	Unit（Birr/month）	Cost（Birr/ month）	Conditions
Personnel	1	5,500	5,500	2 caretakers (not paid), 3 operator (5 in shift), 1 Guard (2 in shift), Water office technical staf（1 person, 2 time/year, 2 days each）
Material	1	497	497	Chlorination (2 time/year), Tools for cleaning
Energy	1	49,766	49,766	Diesel fuel for 65kVA generator (8 hours/day), 1.2 times of Godey unit price
Spare parts	1 set	492	492	Spare parts for generator（Oil, Oil & Air filters (2time/year), Belt (1time/2 year）)
Total			56,255	* Generator capacity 40～90kVA

River intake system (Small)	Qt'y	Unit（Birr/month）	Cost（Birr/ month）	Conditions
Personel	1	4,133	4,133	2 caretakers (not paid), 2 operator:（3 in shift）, 1 guard（2 in shift）, Day worker（3 persons, 4 time/year, 1 day each） Water office technical staff（1 person, 2 time/year, 2 days each）
Chemical	1	4,575	4,575	Coagulant, Chlorination agent,pH adjustor, same dose as in Godey Town for water supply amount 110m^3/day
Material	1	125	125	Shovels for cleaning work
Energy	1	16,589	16,589	1 generator operation of 20kVA (8 hours/day), 1.2 times of Godey price
Spare part	1 set	681	681	Replacement of generator parts（Fuel, Oil & Air filter, 2 times/year）, Pump parts replacement（packing, 1 time/year）
Total			26,103	* Planned supply amount 40～150m^3/day

River intake system (Medium)	Qt'y	Unit（Birr/month）	Cost（Birr/ month）	Conditions
Personel	1	4,567	4,567	2 caretakers (not paid), 3 operator:（4 in shift）, 1 guard（2 in shift）, Day worker（5 persons, 4 time/year, 1 day each） Water office technical staff（1 person, 2 time/year, 2 days each）
Chemical	1	9,566	9,566	Coagulant, Chlorination agent,pH adjustor, same dose as in Godey Town for water supply amount 230m^3/day
Material	1	208	208	Shovels for cleaning work
Energy	1	33,178	33,178	1 generator operation of 45kVA (8 hours/day), 1.2 times of Godey price
Spare part	1 set	681	681	Replacement of generator parts（Fuel, Oil & Air filter, 2 times/year）, Pump parts replacement（packing, 1 time/year）
Total			48,199	* planned supply amount 170～370m^3/day

River intake system (Large)	Qt'y	Unit（Birr/month）	Cost（Birr/ month）	Conditions
Personel	1	7,920	7,920	2 caretakers (not paid), 4 operator:（6 in shift）, 2 guard（4 in shift）, Day worker（12 persons, 4 time/year, 1 day each） Water office technical staff（1 person, 2 time/year, 2 days each）
Chemical	1	41,590	41,590	Coagulant, Chlorination agent,pH adjustor, same dose as in Godey Town for water supply amount 1000m^3/day
Material	1	500	500	Shovels for cleaning work
Energy	1	55,296	55,296	1 generator operation of 120kVA (8 hours/day), 1.2 times of Godey price
Spare part	2 set	681	1,361	Replacement of generator parts（Fuel, Oil & Air filter, 2 times/year）, Pump parts replacement（packing, 1 time/year）
Total			106,667	* planned water supply amount 400～1200m^3/day

【Assumptions】
・Calculated as annual average over 10 year
・Only regular and direct O&M cost was calculated
・All equipment is new at the beginning, pump life is 5 years

Data 3.1.4 : Unit Cost Calculation Sheet for Basic Cost Items

1. Pump electric energy consumptior

	Pump rated power (kW)	Efficiency	Actual consumpation (kW)	Operation time (hour/day)	Monthly cost(Birr)	Remark
1)	35	0.8	43.75	10	9,108	Tariff category "general" of EEPCGeneral applied Base 35.258 Birr, up to 50kwh 0.6088,
2)	75	0.8	93.75	12	23,428	over 50kwh 0.6943

2. Pump fuel consumption (generator + pump)

		Fuel efficiency (L/h)	Operation time (hour/day)	Diesel fuel cost (Birr/L)	Monthly cost(Birr)	Remark
1)	New submersible pump in K/B Town (JICA)	5	11	14.7	24,255	Measured value 4-5L/h
2)	Exisgint submersible pump in K/B Town (UNHCR)	5	11	14.7	24,255	Reported measured value 5-6L/h
3)	Planned new well in K/B Town	7	11	14.7	33,957	Denyo catalogue spec
4)	Existing generator in Godey Town	5.8	10	19.2	33,408	Reported measureed (35kW)
5)	Planned generator in Godey Town L	130	10	19.2	748,800	Estimated (640kw)
6)	Planned generator in Godey Town M	75	10	19.2	432,000	Estimated (300kVA)
7)	Existing generator of Godey Town S	16	10	19.2	92,160	Estimated (120kVA)

3. Chemical cost for rural systems

	Dose concentration (powder)	Amount of water m^3/day	Amount of agent (kg)/day	Unit cost of agent (Birr/kg)	Monthly cost (Birr)	Remark
1)	Coagulant dosagee (woreda) 100.0 mg/L	1000	100	10.34	31,020	Example of use of Alminum sulphate at AAWSA, dose curve from Tokyo metropolitan water supply) Intake water turbidity 500-600NTU
2)	Chlorine dosagee (woreda) 3.0 mg/L	1000	3	72	6,480	Calcium hypochlorite powder Example of use at AAWSA
3)	pH adjustor dosagee (woreda) 40.0 mg/L	1000	40	3.41	4,092	Calcium hydroxicide powder Example of use at AAWSA

4. Chemical cost for Kabribeyah and Godey towns

	Dose concentration (powder)	Amount of water m^3/day	Amount of agent (kg)/day	Unit cost of agent (Birr/kg)	Monthly cost (Birr)	Remark
1)	Coagulant dosagee (average for Godey) 100.0 mg/L	1418	0	10.34	0	Example of use of Alminum sulphate at AAWSA, dose curve from Tokyo metropolitan water supply) Intake water turbidity 500-600NTU
2)	pH adjustor dosagee (average for Godey) 40.0 mg/L	1418	0	3.41	0	Calcium hypochlorite powder Example of use at AAWSA
3)	Chlorine dosagee (average for Godey) 3.0 mg/L	1418	0	72	0	Calcium hydroxicide powder Example of use at AAWSA
4)	Chlorine dosagee (average for Kabribeyah) 2.0 mg/L	2249	0	72	0	Calcium hydroxicide powder for cleaner water than Godey

5. Cost of water treatment chemical for household use

		Unit cost (Birr/package)	Treat volume (L/package)	Unit cost (Birr/m^3)	Monthly cost (Birr/ 1000 people)	Remark
1)	PSI Aqua guard (liguid)	3.44	1000	3.44	820	in 200ml bottle applied to 53% of water based on 15L/capita supply
2)	Bishan Gari (powder)	1.3	20	65	15,503	in small package applied to 53% of water based on 15L/capita supply

6. Cost of Day Workers for Godey Town System

		Facility and work	No. of worker	No. of days	Frequency (time/year)	Target facility/equipment	man-day	Monthly cost (Birr/month)
1	1)	Sludge removal	20	1	1	1	20	133
1	2)	screen cleaning	2	0.5	48	4	192	1,280
3	3)	Sludge and garbage removal	4	0.5	4	4	32	213
2	2)	Pump spare parts	2	1	1	4	8	53
2	2)	Pump spare parts	2	1	0.3	4	3	18
3	2)	Spare part replacement	1	0.5	2	2	2	13
3	2)	Spare part replacement	1	0.5	1	2	1	7
4	1)	Sludge removal Dry seasor	15	2	2	3	180	1,200
4	2)	Sludge removal Rainy seasor	30	5	6	3	2700	18,000
5	1)	Surface sludge removal	5	2	1	5	50	333
5	2)	Filter cleaning	5	5	0.5	5	63	417
6	1)	Sludge removal in slow sand filte	20	2	6	5	1200	8,000
6	2)	Sand washing and reuse	20	5	1	5	500	3,333
7	1)	Cleaning	20	1	1	1	20	133
8	1)	Cleaning	6	0.5	1	1	3	20
9	1)	Cleaning	12	0.5	1	3	18	120
11	1)	Pipeline repai	20	5	2	1	200	1,333
		Total					5191	34,608

7. Annual average cost of tools and equipment for O&M work in Godey Tow

		Unit price (Birr)	Life (year) or Qt'y	Qt'y 2	Monthly cost (Birr)	Remark
1)	Dewatering pump (engine type)	30,000	3	1	833	Capacity: H=15m, Q=2L/s
2)	Fuel for pump	19	30	5	240	30L fuel consumed per work
3)	Shovel, scraper, rake	500	15	1	625	For max number of workers
4)	Rope, butcket, soil carrier box	1,200	5	1	500	For 1/3 of max number of workers
	Total				2,198	

Data 3.1.5 : Unit Price List of Major Items

Item	Unit price (Birr)	Unit cost	Detail of item	Remarks
1. **Spare parts (generator of 75kw)**				10 year life, diesel 3 phase
Air filter for generator (75kw)	600 / piece			every 6 months
Oil filter for generator (75kw)	1,200 / piece			every 6 months
Engine Oil	1,000 / 20 L			every 6 months
Fan belt for generator(75kw)	600 / piece			every 2 years
2. **Spare parts (Surface pump)**				5 year life
Surface pump gland packing	600 / piece(3m)			One a year
Surface pump mechanical seal	1,000 / piece			One a year
Shaft bearing	2,000 / piece			every 3 years
3. **Large equipment**				
Ground pump unit for K/B	552,000 / set		75kw with control panel	EMU invoice
Submersible pump for K/B	220,000 / set		15kW with control panel	D&S invoice
Generator for K/B	332,000 / set		35kw (40kVA)	D&S invoice
Ground pump unit for Godey	500,000 / set		45kW equivalent	
Ground pump unit for Godey (revision)	400,000 / set		45kW and 15kWequivalent	
Generator for Godey	1,920,000 / set		300kVA	Denyo std price x 0.6
Generator for Godey (after revision)	1,200,000 / set		130kVA	Denyo std price x 0.6
Generator S	180,000 / set		10kVA	Denyo std price x 0.5
Generator S	250,000 / set		20kVA	
Generator M	332,000 / set		40kVA	D&S invoice
Generator L	680,000 / set		90kVA	
Generator L	820,000 / set		120kVA	Denyo std price x 0.5
Submersible pump S	160,000 / set		4kVA	
Submersible pump M	200,000 / set		12kVA	Kawamoto submersible pump
Submersible pump L	500,000 / set		30kVA	
Ground pump unit S	102,000 / set		8kVA	Japanese retailer's website(http://www.mizu-syori.com
Ground pump unit M	200,000 / set		15kVA	Japanese retailer's website(http://www.mizu-syori.com
Ground pump unit L	430,000 / set		40kVA	Japanese retailer's website(http://www.mizu-syori.com
4. **Power supply**				
Commercial electricity (base charge)	35.258 / month		Category general 3 phase 380V	for pump operation
Commercial electricity (block charge 1)	0.6088 / kwh		0 to 50 kwh	
Commercial electricity (block charge 2)	0.6943 / kwh		more than 51 kwh	
Diessel fuel 1 (Godey)	3830 / 200 L		19.2birr/L	for generator operation (data from Godey WD
Diessel fuel 2 (Jijiga)	14.7 / L			Jijiga GAS station (with VAT, it is 16.9birr
Gasoline	16.9 / L			Jijiga GAS station (with VAT it is 19.5birr
Fuel consumption of generator (Godey)	5.8 / L/h			Measured value, same for the two existing generator
JICA new wells	4.5 / L/h			Measured value

5. **Personnel (KB Proposed)**				
Manager	3,000 / month			
Water supply engineer from water desk	150 / day		only per diem for field worl	
Technician	1,500 / month			
Operator	1,000 / month			
Plumber	800 / month			
Security Guard	500 / month			
Daily labor	120 / day			
cleaner	420 / month			
Bill collector	750 / month			
Collector	600 / month			
Cashier	600 / month			
Meter reader	600 / month			
6. **Personnel (Godey Proposed)**				
Manager	5,670 / month			
Water supply engineer from water desk	150 / day		only per diem for field worl	
Technician	1,700 / month			
Lab technician	1,500 / month			
Operator	1,200 / month			
Assistant operator	800 / month			
Plumber	1,200 / month			
Security Guard	600 / month			
Daily labor	80 / day			
cleaner	570 / month			
Bill collector	1,200 / month			
Cashier	1,295 / month			
Meter reader	1,295 / month			
7. **Consumable**				
Chlorination chemical	2,200 / 40 kg	55 birr/kg	Calcium hypochlorite (powder	AGECA, effective Cl 65 %
Chlorination chemical	3,594 / 50 kg	72 birr/kg	Calcium hypochlorite (powder	WAGTECH (Cl purity 70%)
Coagulant	10,339 / 1000 kg	10.34 birr/kg	Alminum sulphate	AWASH Melkasa
Lime (pH adjustor)	341 / 100 kg	3.41 birr/kg	Calcium hydroxicide (power	Dakasos Industrial
Engine oil for generators	600 / 5L			
Water treatment agent (household use)	1300 / 1000 pack	1.3 birr/L	Bishan Gari sachets (powder)	Each pack good for 20L of dirty water, 0.065birr/l
WuhaAgar (water guard)	3.44 / bottle	0.0034 birr/L	Liquid 200ml	PSI, good for 1000L water, 0.00344birr/L
Dewatering pump with engine	40,000 / set		2L/s at 15m	
8. Transportation				
Packed chemical by truck	8000 / round trip		From Addis to K/B, full load 4 ton truck	truck can get another load back to Addis
Packed chemical by truck	14400 / round trip		From Addis to Godey, full load 4-ton truck	truck can get another load back to Addis
Packed chemical (for HH) by truck	/ round trip		From Jijiga to each woreda on average	Use 1 ton truck or single cabin pick up
Packed Bishan Gari 180 carton	20250 / round trip		If buy Bishan Gari, to Jijiga and Godey	

Data 3.1.6 : Breakdown of Training Cost Calculation for Target Woredas and Towns

Required module	Module cost (local ver.)	Module cost (Foreign ver.)	No of Training	Cost (local) (Birr)	Cost（foreign） (Birr)	Remark
SRWDB						
1 RWB-WS	58,900	NA	1	58,900	58,900	
16 RWB-MWS	278,500	391,900	1	278,500	391,900	
Total				337,400	450,800	
7 woredas in Jarar Valley						
2 WR-BHDM	79,750	NA	95	7,576,250	NA	
3 WR-HPM	129,600	NA	3	388,800	NA	
4 CM-BH&P-OM	553,240	NA	40	22,129,600	NA	
6 CM-WASH-T:	97,559	NA	200	19,511,800	NA	
7 CM-WASH-FT	27,330	NA	150	4,099,500	NA	
8 CM-WS-AT	39,050	NA	200	7,810,000	NA	
17 CM-ACF	29,750	NA	10	297,500	NA	
Total				61,813,450	NA	
9 woredas in Shebele River basin						
2 WR-BHDM	79,750	NA	135	10,766,250	NA	
3 WR-HPM	129,600	NA	70	9,072,000	NA	
4 CM-BH&P-OM	553,240	NA	10	5,532,400	NA	
5 CM-RIS-OM	519,430	NA	86	44,670,980	NA	
6 CM-WASH-T:	97,559	NA	200	19,511,800	NA	
7 CM-WASH-FT	27,330	NA	150	4,099,500	NA	
8 CM-WS-AT	39,050	NA	200	7,810,000	NA	
17 CM-ACF	29,750	NA	10	297,500	NA	
Total				101,760,430	NA	
Kabribeyah Town						
4 CM-BH&P-OM	553,240	NA	1	553,240	553,240	
6 CM-WASH-T:	97,559	NA	2	195,118	195,118	
7 CM-WASH-FT	27,330	NA	9	245,970	245,970	
8 CM-WS-AT	39,050	NA	5	195,250	195,250	
9 KB-PC	84,900	103,800	1	84,900	103,800	
10 KB-WT	136,185	173,985	1	136,185	173,985	
11 KB-WT-FUP	275,770	470,170	1	275,770	470,170	
17 CM-ACF	29,750	NA	1	29,750	29,750	
Total				1,716,183	1,967,283	
Godey Town						
5 CM-RIS-OM	519,430	NA	1	519,430	519,430	
6 CM-WASH-T:	97,559	NA	9	878,031	878,031	
7 CM-WASH-FT	27,330	NA	6	163,980	163,980	
8 CM-WS-AT	39,050	NA	6	234,300	234,300	
12 GD-WT	376,284	446,484	1	376,284	446,484	
13 GD-WT-FUP	341,688	536,088	1	341,688	536,088	
14 GD-PM	186,850	219,250	1	186,850	219,250	
15 GD-WQ	188,150	258,350	1	188,150	258,350	
17 CM-ACF	29,750	NA	1	29,750	29,750	
Total				2,918,463	3,285,663	

Conditions of calculation

- All cost inclusive of VAT and expressed in 2013 price
- Difference between local and foreign versions is only the personnel cost

Data 3.1.7 : Breakdown of Training Module Cost Calculation

	Q'ty (day)	Unit cost (Birr)	Local ver. (Birr)	ver. (Birr)	Remark
1 RWB-WS (Regional water bureau- woreda support)					
Trainer (foreign)					
Trainer (domestic)	17	1,000	17,000		1 person
Assistant 1 (technician)					
Assistant 2 (coordinator)	17	400	6,800		1 person
Transportation (trainer Air	6	2,500	15,000		from Addis 3 round trip by air
Transporation (trainees)					
Per-diem for participants 1	90	150	13,500		For SRWDB staff 6 people x 15 days
Per-diem for participants 2					
Refreshment	120	50	6,000		water, tea, cofee for 8 people for 15 days
Materials	6	100	600		Handouts for 6 people
Total			58,900	NA	
2 WR-BHDM (water resource-Birka and Hafir dam maintenance)					
Trainer (foreign)					
Trainer (domestic)	7	1,000	7,000		From Jijiga to woredas
Assistant 1 (technician)					
Assistant 2 (coordinator)	5	400	2,000		
Transportation (traine Land)	7	3,500	24,500		
Transporation (trainees Land)	10	3,500	35,000		2 from Jijiga to woredas, 4WD
1	10	150	1,500		Water office 2 people x 5 days
2	45	100	4,500		WASHCO member 3 people x 5 days
Refreshment	65	50	3,250		For 13 people for 5 days
Materials	1	2,000	2,000		Hand out, shovels, chlorine sample
Total			79,750	NA	
3 WR-HPM (water resource-Hand pump maintenance)					
Trainer (domestic)	12	1,000	12,000		1 person from Addis
Assistant 1 (technician)	12	600	7,200		1 person from Addis
Assistant 2 (coordinator)					
Transportation (traine Land)	12	3,500	42,000		
Transporation (trainees Land)	0	0	0		Join the trainer
Per-diem for participants 1	30	150	4,500		
Per-diem for participants 2	30	100	3,000		
Refreshment	60	50	3,000		
Materials	3	19,300	57,900		Pump spare parts, tool sets, tripod, chain block
Total			129,600	NA	
4 CM-BH&P-OM (common maintenance-Borehole and pump operation & maintenance					
Trainer (domestic)	24	1,000	24,000		1 person from Addis Ababa
Assistant 1 (technician)	24	600	14,400		1 from Addis Ababa
Assistant 2 (coordinator)	22	400	8,800		1 from Jijiga
Transportation (traine Land)	22	3,500	77,000		1 wagon from Jijiga
Air)	2	2,500	5,000		
Transporation (trainees Land)	44	3,500	154,000		2 wagon from Jijiga
Per-diem for participants 1	22	300	6,600		1 from Region
Per-diem for participants 2	60	150	9,000		3 from Water desk, water office
Per-diem for participants 3	180	100	18,000		residents x 3
Refreshment	320	50	16,000		total 16 people
Materials	3	73,480	220,440		Pipe tools, electric tools, generator, spare parts etc
Total			553,240	NA	

Data 3.1.7 : Breakdown of Training Module Cost Calculation

	Q'ty (day)	Unit cost (Birr)	Local ver. (Birr)	ver. (Birr)	Remark
5 CM-RIS-OM (common maintenance-River intake system operation & maintenance					
Trainer (domestic)	36	1,000	36,000		1 person from Addis Ababa
Assistant 1 (technician)	36	600	21,600		1 from Addis Ababa
Assistant 2 (coordinator)	34	400	13,600		1 from Jijiga
Transportation (traine Land)	34	3,500	119,000		1 wagon from Jijiga
Air)	2	2,500	5,000		
Transporation (trainees Land)	64	3,500	224,000		2 wagons from Jijiga
Per-diem for participants 1	30	300	9,000		1 from Region
Per-diem for participants 2	102	150	15,300		3 from Water desk, water office
Per-diem for participants 3	90	100	9,000		residents x 3
Refreshment	210	50	10,500		
Materials	1	56,430	56,430		Pipe tool set, generator, general tools, chlorine agent etc
Total			519,430	NA	
6 CM-WASH-T (common maintenance-WASHCO training)					
Trainer (domestic)	10	1,000	10,000		1 person from SRWDB
Assistant 1 (technician)	0	600	0		
Assistant 2 (coordinator)	12	400	4,800		1 from Jijiga
Transportation (trainer Land)	12	3,500	42,000		1 wagon from Jijiga
Air)	0	2,500	0		
Transporation (trainees Land)	0	3,500	0		4 wagons from Jijiga
Per-diem for participants 1	0	300	0		1 from Region
Per-diem for participants 2	30	200	6,000		3 from Water desk, water office
Per-diem for participants 3	210	100	21,000		residents x 7 x 3 sites
Rent of training room	10	150	1,500		
Refreshment	230	50	11,500		23 people x 10 days
Materials	23	33	759		Manual, flip chart, markers
Total			97,559	NA	
7 CM-WASH-FT (common maintenance-WASHCO follow-up training					
Trainer (domestic)	6	1,000	6,000		1 person from SRWDB
Assistant 1 (technician)	0	600	0		
Assistant 2 (coordinator)	0	400	0		1 from Jijiga
Transportation (trainer Land)	6	3,500	21,000		1 wagon from Jijiga
Air)	0	2,500	0		
Transporation (trainees Land)	0	3,500	0		2 wagons from Jijiga
Per-diem for participants 1	0	300	0		1 from Region
Per-diem for participants 2	0	200	0		3 from Water desk, water office
Per-diem for participants 3	0	100	0		residents x 7
Rent of training room	0	150	0		
Refreshment	0	50	0		
Materials	10	33	330		Manual, flip chart, markers
Total			27,330	NA	
8 CM-WS-AT (common maintenance-Water and sanitation awareness training					
Trainer (domestic)	5	1,000	5,000		1 person from SRWDB
Assistant 1 (technician)	0	600	0		
Assistant 2 (coordinator)	5	400	2,000		1 from Jijiga
Transportation (trainer Land)	5	3,500	17,500		1 wagon from Jijiga
Air)	0	2,500	0		
Transporation (trainees Land)	0	3,500	0		2 wagons from Jijiga
Per-diem for participants 1	0	300	0		1 from Region
Per-diem for participants 2	0	200	0		3 from Water desk, water office
Per-diem for participants 3	90	100	9,000		residents x 30
Rent of training room	3	150	450		
Refreshment	90	50	4,500		
Materials	30	20	600		Manual, flip chart, markers
Total			39,050	NA	

Data 3.1.7 : Breakdown of Training Module Cost Calculation

	Q'ty (day)	Unit cost (Birr)	Local ver. (Birr)	ver. (Birr)	Remark
9 KB-PC (Kabribeyah - Pipe Cleaning)					
Trainer (Foreign)	7	3,700		25,900	1 person from Addis Ababa
Trainer (domestic)	7	1,000	7,000		1 person from Addis Ababa
Assistant 1 (technician)	7	600	4,200	4,200	1 from Addis Ababa
Assistant 2 (coordinator)	5	400	2,000	2,000	1 from Jijiga
Transportation (trainer Land)	7	3,500	24,500	24,500	1 wagon from Jijiga
Air)	3	2,500	7,500	7,500	
Transporation (trainees Land)	0	3,500	0	0	
Per-diem for participants 1	0	300	0	0	1 from Region
Per-diem for participants 2	85	150	12,750	12,750	17 from Water desk, water office
Per-diem for participants 3	0	100	0	0	residents x 3
Room rent	3	150	450	450	
Refreshment	100	50	5,000	5,000	20 people for 5 days
Materials	5	4,300	21,500	21,500	Pipe tool set, scraper, hand out, metal brush for 5
Total			84,900	103,800	
10 KB-WT (Kabribeyah-Water treatment)					
Trainer (Foreign)	14	3,700		51,800	1 person from Addis Ababa
Trainer (domestic)	14	1,000	14,000		1 person from Addis Ababa
Assistant 1 (technician)	14	600	8,400	8,400	1 from Addis Ababa
Assistant 2 (coordinator)	10	400	4,000	4,000	1 from Jijiga
Transportation (trainer Land)	12	3,500	42,000	42,000	1 wagon from Jijiga
Air)	3	2,500	7,500	7,500	
Transporation (trainees Land)	0	3,500	0	0	
Per-diem for participants 1	0	300	0	0	1 from Region
Per-diem for participants 2	170	150	25,500	25,500	17 from Water desk, water office
Per-diem for participants 3	0	100	0	0	residents x 3
Room rent	5	150	750	750	
Refreshment	200	50	10,000	10,000	20 people for 10 days
Materials	1	24,035	24,035	24,035	Pipe tool set, scraper, hand out, metal brush for 5
Total			136,185	173,985	
11 KB-WT-FUP (Kabribeyah-Water treatment follow-up)					
Trainer (Foreign)	72	3,700	0	266,400	1 person from Addis Ababa
Trainer (domestic)	72	1,000	72,000	0	1 person from Addis Ababa
Assistant 1 (technician)	0	600	0	0	1 from Addis Ababa
Assistant 2 (coordinator)	36	400	14,400	14,400	1 from Jijiga
Transportation (trainer Land)	40	3,500	140,000	140,000	1 wagon from Jijiga
Air)	18	2,500	45,000	45,000	
Transporation (trainees Land)	0	3,500	0	0	
Per-diem for participants 1	0	300	0	0	1 from Region
Per-diem for participants 2	0	150	0	0	NA for follow up OJT
Per-diem for participants 3	0	100	0	0	residents x 3
Room rent	0	150	0	0	
Refreshment	0	50	0	0	20 people for 10 days
Materials	1	4,370	4,370	4,370	Anything deemed necessary
Total			275,770	470,170	

Data 3.1.7 : Breakdown of Training Module Cost Calculation

	Q'ty (day)	Unit cost (Birr)	Local ver. (Birr)	ver. (Birr)	Remark
12 GD-WT (Godey-Water Treatment)					
Trainer (Foreign)	26	3,700	0	96,200	1 person from Addis Ababa
Trainer (domestic)	26	1,000	26,000	0	1 person from Addis Ababa
Assistant 1 (technician)	26	600	15,600	15,600	1 from Addis Ababa
Assistant 2 (coordinator)	22	400	8,800	8,800	1 from Jijiga
Transportation (trainer Land)	24	3,500	84,000	84,000	1 wagon from Jijiga
Air)	3	2,500	7,500	7,500	
Transporation (trainees Land)	20	3,500	70,000	70,000	For staff from water desk
Per-diem for participants 1	0	300	0	0	1 from Region
Per-diem for participants 2	500	150	75,000	75,000	NA for follow up OJT
Per-diem for participants 3	0	100	0	0	residents x 3
Room rent	10	150	1,500	1,500	
Refreshment	560	50	28,000	28,000	20 people for 10 days
Materials	1	59,884	59,884	59,884	Anything deemed necessary
Total			376,284	446,484	
13 GD-WT-FUP (Godey Water Treatment Follow-up)					
Trainer (Foreign)	72	3,700	0	266,400	1 person from Addis Ababa
Trainer (domestic)	72	1,000	72,000	0	1 person from Addis Ababa
Assistant 1 (technician)	0	600	0	0	1 from Addis Ababa
Assistant 2 (coordinator)	72	400	28,800	28,800	1 from Jijiga
Transportation (trainer Land)	40	3,500	140,000	140,000	1 wagon from Jijiga
Air)	36	2,500	90,000	90,000	
Transporation (trainees Land)	0	3,500	0	0	For staff from water desk
Per-diem for participants 1	0	300	0	0	1 from Region
Per-diem for participants 2	0	150	0	0	NA for follow up OJT
Per-diem for participants 3	0	100	0	0	residents x 3
Room rent	0	150	0	0	
Refreshment	0	50	0	0	20 people for 10 days
Materials	1	10,888	10,888	10,888	Anything deemed necessary
Total			341,688	536,088	
14 GD-PM (Godey-Plant maintenance)					
Trainer (Foreign)	12	3,700	0	44,400	1 person from Addis Ababa
Trainer (domestic)	12	1,000	12,000	0	1 person from Addis Ababa
Assistant 1 (technician)	12	600	7,200	7,200	1 from Addis Ababa
Assistant 2 (coordinator)	12	400	4,800	4,800	1 from Jijiga
Transportation (trainer Land)	10	3,500	35,000	35,000	1 wagon from Jijiga
Air)	2	2,500	5,000	5,000	
Transporation (trainees Land)	0	3,500	0	0	For staff from water desk
Per-diem for participants 1	12	300	3,600	3,600	1 from Region
Per-diem for participants 2	150	150	22,500	22,500	(2 + 13) from water desk
Per-diem for participants 3	0	100	0	0	none
Room rent	3	150	450	450	
Refreshment	190	50	9,500	9,500	20 people for 10 days
Materials	1	86,800	86,800	86,800	Anything deemed necessary
Total			186,850	219,250	

Data 3.1.7 : Breakdown of Training Module Cost Calculation

	Q'ty (day)	Unit cost (Birr)	Local ver. (Birr)	ver. (Birr)	Remark
15 GD-WQ (Godey-Water quality)					
Trainer (Foreign)	26	3,700	0	96,200	1 person from Addis Ababa
Trainer (domestic)	26	1,000	26,000	0	1 person from Addis Ababa
Assistant 1 (technician)	26	600	15,600	15,600	1 from Addis Ababa
Assistant 2 (coordinator)	22	400	8,800	8,800	1 from Jijiga
Transportation (trainer Land)	22	3,500	77,000	77,000	1 wagon from Jijiga
Air)	3	2,500	7,500	7,500	
Transporation (trainees Land)	0	3,500	0	0	For staff from water desk
Per-diem for participants 1	0	300	0	0	1 from Region
Per-diem for participants 2	180	150	27,000	27,000	(2 + 13) from water desk
Per-diem for participants 3	0	100	0	0	none
Room rent	5	150	750	750	
Refreshment	240	50	12,000	12,000	20 people for 10 days
Materials	1	13,500	13,500	13,500	Jar test kit, basic water test aparatus, reagents
Total			188,150	258,350	
16 RWB-MWS (Regional water bureau-Mobile workshop)					
Trainer (Foreign)	42	3,700	0	155,400	1 person from Addis Ababa
Trainer (domestic)	42	1,000	42,000	0	1 person from Addis Ababa
Assistant 1 (technician)	42	600	25,200	25,200	1 from Addis Ababa
Assistant 2 (coordinator)	0	400	0	0	1 from Jijiga
Transportation (trainer Land)	30	3,500	105,000	105,000	1 wagon from Jijiga
Air)	18	2,500	45,000	45,000	6 times for 3 people
Transporation (trainees Land)	0	3,500	0	0	For staff from water desk
1	0	300	0	0	1 from Region
2	180	150	27,000	27,000	6 people for 30 days
3	0	100	0	0	none
Room rent	0	150	0	0	
Refreshment	270	50	13,500	13,500	9 people for 30 days
Materials	1	20,800	20,800	20,800	Fuel, oil, car spare parts, Gas
Total			278,500	391,900	
17 CM-ACT (common maintenance-Accounting and Finance)					
Trainer (Foreign)		3,700	0	0	1 person from Addis Ababa
Trainer (domestic)	7	1,000	7,000	0	1 person from Addis Ababa
Assistant 1 (technician)	0	600	0	0	1 from Addis Ababa
Assistant 2 (coordinator)	7	400	2,800	2,800	1 from Jijiga
Transportation (trainer Land)	0	3,500	0	0	1 wagon from Jijiga
Air)	2	3,600	7,200	7,200	6 times for 3 people
Transporation (trainees Land)	0	3,500	0	0	For staff from water desk
1	0	300	0	0	1 from Region
2	50	150	7,500	7,500	10 people for 5 days
3	0	100	0	0	none
Room rent	5	150	750	750	
Refreshment	60	50	3,000	3,000	12 people for 5 days
Materials	1	1,500	1,500	1,500	Flip chart, calculater, notebook, Manual
Total			29,750	NA	

Data 3.1.8 : Equipments list for Mobile Work Shop(MWS)

a. General Tools for Mobile Workshop

Item No	Item	Q'ty	Spec. Model number
L1- 1	Open wrench set	3 set	5mm - 42mm, two-head type 5.5x7-41x46 37pcs
L1- 2	Ring end spanner se	3 set	5mm - 32mm, two-head type 8x10-14x17,6pcs16x18-32x36,6pcs
L1- 3	Offset ring end spanner se	3 set	5mm - 32mm, two-head type, offset 45° 23pcs
L1- 4	Small size socket wrench se	3 set	5mm - 27mm, all-in one kit with carring case 12.7sq TB413
L1- 5	Adjustable wrench	3 pcs	10mm - 36mm opening range, normal thickness 375
L1- 6	Set of PhIlips screw drivers	6 set	6 different sizes with non-slip handle
L1- 7	Set of flat headed screw drivers	6 set	6 different sizes with non-slip handle
L1- 8	Metal files w/grip(flat)rough,medium,finish	3 set	width 20mm
L1- 9	Metal files w/grip(round)rough,medium,finish	3 set	width 15mm
L1- 10	Flat nose piler se	3 set	with plastic insuration grip, long nose (50mm)360A-150
L1- 11	Half round plier set	3 set	small (L 175mm) 193-16AVSE,Large (L 200mm)185.20AVSE
L1- 12	Combination plie	3 pcs	200mm
L1- 13	Diagonal plier se	3 set	small (L 125mm) and Large (L 200mm)
L1- 14	Plastic mallets	3 set	Nylon head, small (#1 1.2), large (#2)
L1- 15	Hack saw set	6 set	Blade length 250mm , compact frame
L1- 16	Threading tool se	3 set	Metric, dice and tap, 5mm - 24mm in carrying box
L1- 17	Soket set with ratchet head wrenc	3 set	complete set in a carrying case, 5mm -27mm TB413
L1- 18	Half round nose pliers	3 pcs	with plastic insuration grip, long nose (50mm)360A-150
L1- 19	Diagonal plier se	3 set	small (L 175mm) 193-16AVSE,Large (L 200mm)185.20AVSE
L1- 20	Universal pliers(Side cutting plier)	3 pcs	Short and thick flat nose pliers with wire cutter (approx. L 200mm) SPD-200
L1- 21	Set of Phillips screw drivers	3 set	6 different sizes with non-slip handle (Short handle)
L1- 22	Set of flat screw drivers	3 set	6 different sizes with non-slip handle
L1- 23	Flat nose pilers	3 pcs	with plastic insuration grip, long nose (50mm)360A-150
L1- 24	Allen key set	3 set	1.5mm - 10mm, L-shape with ball head, with holder
L1- 25	Fuel filter wrench	3 pcs	General use type with metal band clamping for dia. 150mm
L1- 26	Set of chisels for matal	3 set	Flat end, width 10mm, 16mm, 22mm
L1- 27	Set of cold chisels for meta	3 set	Pinted end (13mm) and flat end (16mm)
L1- 28	Center punch	3 pcs	Forged steel, approx. 150mm
L1- 29	Metal head hammer set	3 set	small (#3/4), medium (#1-1/2), Large (#2)
L1- 30	Metalfiles(halfround)rough,medium, finish	3 set	5 pcs/set file TZKF105

b. Welding Tools for Mobile Workshop

Item No	Item	Q'ty	Spec. Model number
L2- 1	Electric generator & welding machines	3 pcs	Generator: 230v - 380v, 10KVA, Welding: with cable (300A), Diesel, pull start
L2- 2	Welding glove(3finger)	3 pc	
L2- 3	Tipping hammer	3 pc	
L2- 4	Gas cutting torch with nozzle tip(No. 1,2,3)	3 set	
L2- 5	Gas welding torch with nozzle tip(7 kind	3 set	
L2- 6	Quick coupler male & female acetylene regulator-hose	6 sets	GSP2
L2- 7	Quick coupler male & female acetylene hose-torch	6 sets	OSP2
L2- 8	Quick coupler male & female oxygen legulator-hose	6 sets	GSP1
L2- 9	Quick coupler male & female oxygen hose-torch	6 sets	OSP1
L2- 10	torch nozzle tip cleaner	3 pc	
L2- 11	Handle for gas cylinder H-type	3 pc	

c. Electric Tools for Mobile Workshop

Item No	Item	Q'ty	Spec. Model number
L3- 1	Tool box for the following mechanical tools	3 pcs	Metal, H 880, W 880, D 500, 4 drawers WVR-L8W
L3- 2	Electric disc grinder	3 pcs	Hand held for 200V, disc size 150mm G-15SP
L3- 3	Electric drill	3 pcs	Hand held for 200V, with key Bul-SH3
L3- 4	Discs for grinder	3 set	For metal, 150mm, #24x 25, #36 x 25, #100 x 10
L3- 5	Electrical tool box	3 pcs	Metal, H 327, W 7200, D 280, double decker, double door
L3- 6	Hydrometer	3 pcs	Hydrometer
L3- 7	Digital clamp meter	3 pcs	For DC and AC currents, handy type, water resistant Range - 400A,600V with range switching DCM400AD
L3- 8	Digital multimeter	6 pcs	For DC and AC currents, handy type, water resistant Range - 10A and - 1000V, with ranage switchin
L3- 9	Wire stripper	3 pcs	For 10 - 24 AWG wires, self adjusting PA-11
L3- 10	Soldering kit	3 set	Solder ion (230V), soler, mini-pliers etc in carrying case
L3- 11	Terminal crimping too	3 pc	14 ~ 60sq AKH60N
L3- 12	Tie wrap band set	3 set	(small 100, medium 150, large 200) x 200 pcs
L3- 13	Battery cherger with starter	3 set	Compact type (max 20kg), with calbe, 110V to 220V input with starter function Output voltage 12 & 24 volts, at 20A or higher

d. Pipe Work Tools for Mobile Workshop

Item No	Item	Q'ty	Spec. Model number
L4- 1	Pipe Wrench 18"	6 pcs	Length 18" 450
L4- 2	Pipe Wrech 24"	6 pcs	Length 24" 600
L4- 3	Pipe wrench 36"	6 pcs	Length 36" 900
L4- 4	Pipe wrench 48"	6 pcs	Length 48" 1200
L4- 5	Pipe threading tool set	3 set	For 1/2"- 2" pipe (outer and inner), manual type with carrying case
L4- 7	Pipe cutter small	6 pcs	Manual type for 3/4"- 2" metal pipe C-2W
L4- 8	pipe stand 6A--80A	3 pcs	Metal, Tri-leg, folding type, with pipe holder VL-0101
L4- 9	Water pump pliers set	3 set	200, 300mm, Cr-V steel, forged WPD-250,300
L4- 10	Iron mallet set	3 set	small (#2), medium (#4), Large (#6)
L4- 11	Socket set 5mm-36mm	3 set	7 - 22mm+24-36mm TB310+holder+additional socket
L4- 12	Rachet head for sockets	3 pcs	Both direction, max torque 85N･m GX13-R3, C4
L4- 13	T-handle for sockets	3 pcs	handle span 200mm TH20
L4- 14	Extension bars for sockets	3 pcs	Long (270mm)BE3-270, Short (100mm)BE3-100
L4- 15	Univsersal joint for sockets	3 pcs	joint type 9.5sq BJ3, 12.7sq BJ4

Feasibility Study for Godey Town

1. *Water Supply Plan*
2. *Cost Estimation*
3. *Socio-economic Survey*
4. *Operation and Maintenance*

THE STUDY ON JARAR VALLEY AND SHEBELLE SUB-BASIN WATER SUPPLY DEVELOPMENT PLAN AND EMERGENCY WATER SUPPLY IN THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA

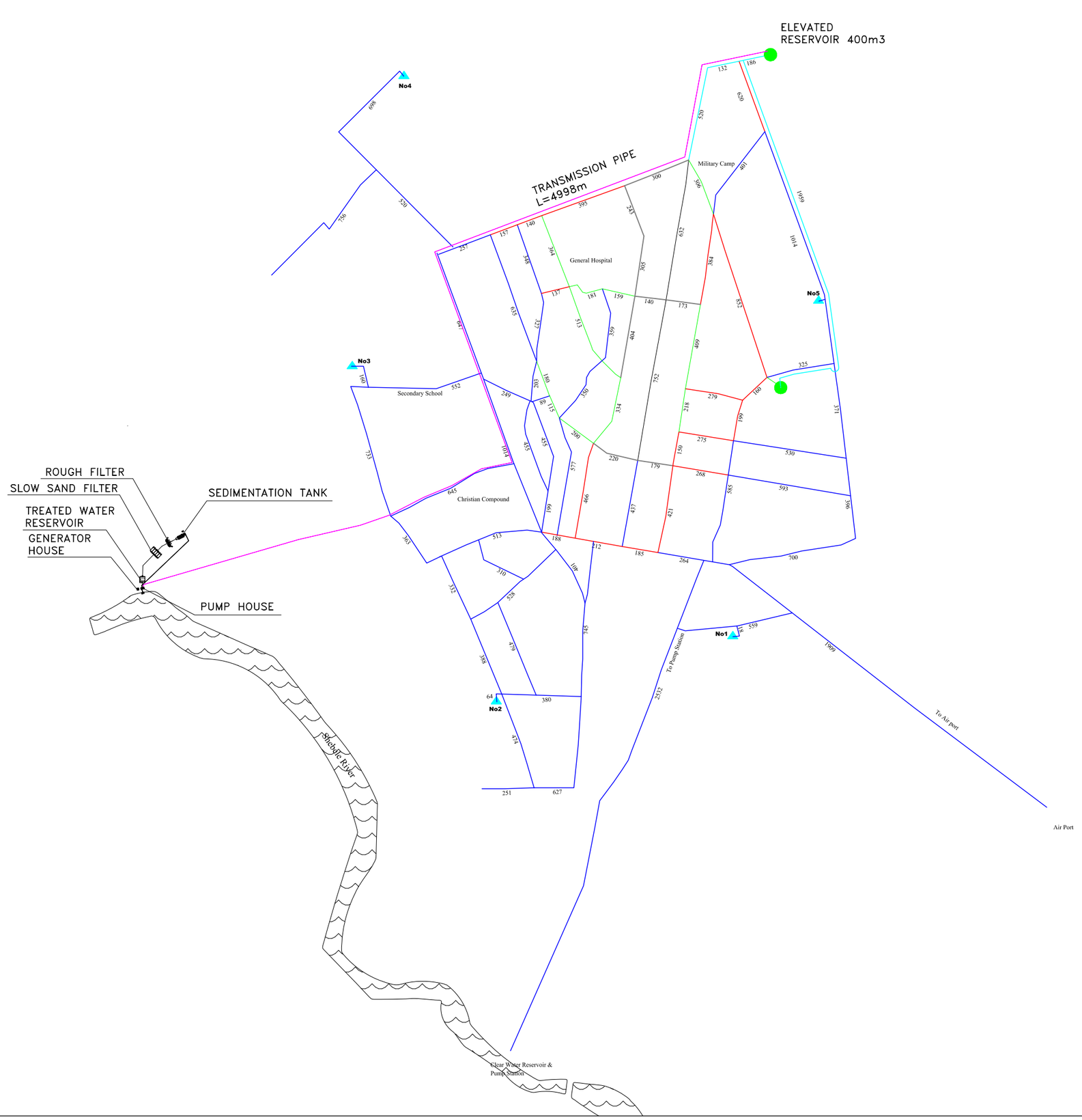
FEASIBILITY STUDY GODEY TOWN

AUGUST 2013

KOKUSAI KOGYO CO., LTD.

LIST OF DRAWINGS

1. GENERAL DRAWING			**5. SLOW SAND FILTER**		
001	GENERAL LAYOUT	FS001	018	SLOW SAND FILTER LAYOUT PLAN	FS018
002	INTAKE SITE FACILITIES LAYOUT	FS002	019	SLOW SAND FILTER	FS019
003	HYDRAULIC PROFILE	FS003	**6. TREATED WATER RESERVOIR**		
2. INTAKE CANAL AND PUMP STATION			020	TREATED WATER RESERVOIR	FS020
004	PUMP STATION LAYOUT PLAN	FS004	**7. TRANSMISSION PIPELINE**		
005	PUMP HOUSE PLAN	FS005	021	TRANSMISSION PIPELINE PLAN	FS021
006	PUMP HOUSE SUPERSTRUCTURE	FS006	**8. ELEVATED RESERVOIR**		
007	PUMP HOUSE SUBSTRUCTURE	FS007	022	ELEVATED RESERVOIR	FS022
008	PUMP HOUSE SUBSTRUCTURE2	FS008	**9. DISTRIBUTION PIPELINE**		
009	PUMP HOUSE SUBSTRUCTURE3	FS009	023	DISTRIBUTION PIPELINE PLAN	FS023
010	GENERATOR HOUSE	FS010	**10. WATER POINT**		
3. SEDIMENTATION TANK			024	WATER POINT LAYOUT	FS024
011	SEDIMENTATION TANK LAYOUT	FS011	025	PUBLIC TAP	FS025
012	RECEIVING WELL	FS012	026	CATTLE TROUGH	FS026
013	SEDIMENTATON TANK	FS013			
014	WAREHOUSE	FS014			
4. ROUGH FILTER					
015	ROUGHING FILTER LAYOUT PLAN	FS015			
016	ROUGHING FILTER	FS016			
017	CHAMBER DETAIL	FS017			



N

LEGEND

- Transmission pipe 300mm
- Distribution pipe 300mm
- Distribution pipe 200mm
- Distribution pipe 160mm
- Distribution pipe 110mm
- Distribution pipe 90mm
- Distribution pipe 63mm
- Constructed Water Point by JICA Study
- Reservoir

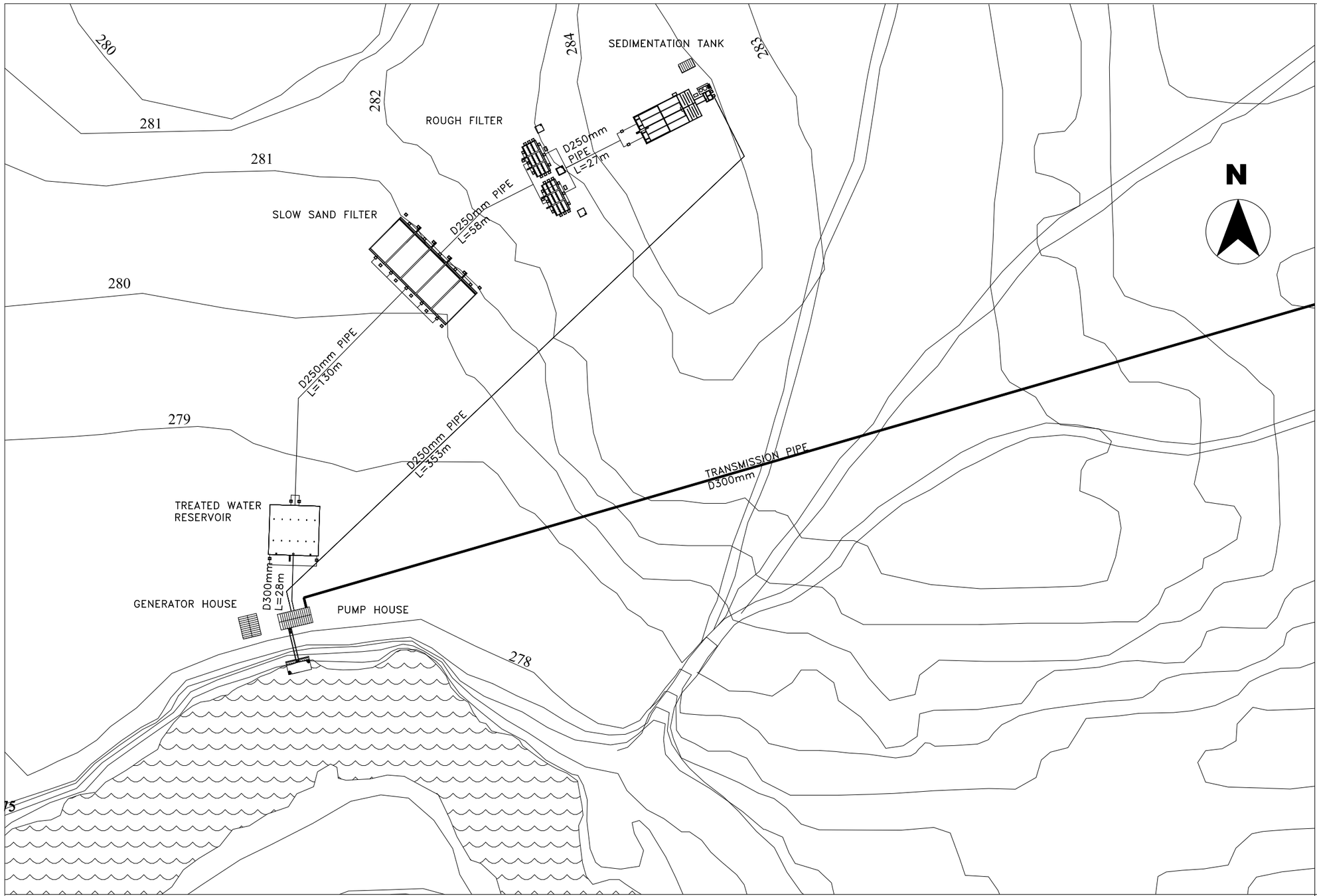
SCALE 0 200 400 600 800 1000 m

THE STUDY ON JARAR VALLEY AND SHEBELE SUB-BASIN WATER SUPPLY DEVELOPMENT PLAN, AND EMERGENCY WATER SUPPLY IN THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA

FEASIBILITY STUDY

GODEY TOWN

TITLE	**GENERAL LAYOUT**		
DATE	**AUG.2013**	DWG No.	**FS001**
CONSULTANT	**KOKUSAI KOGYO CO., LTD.**		
CLIENT	**JAPAN INTERNATIONAL COOPERATION AGENCY**		



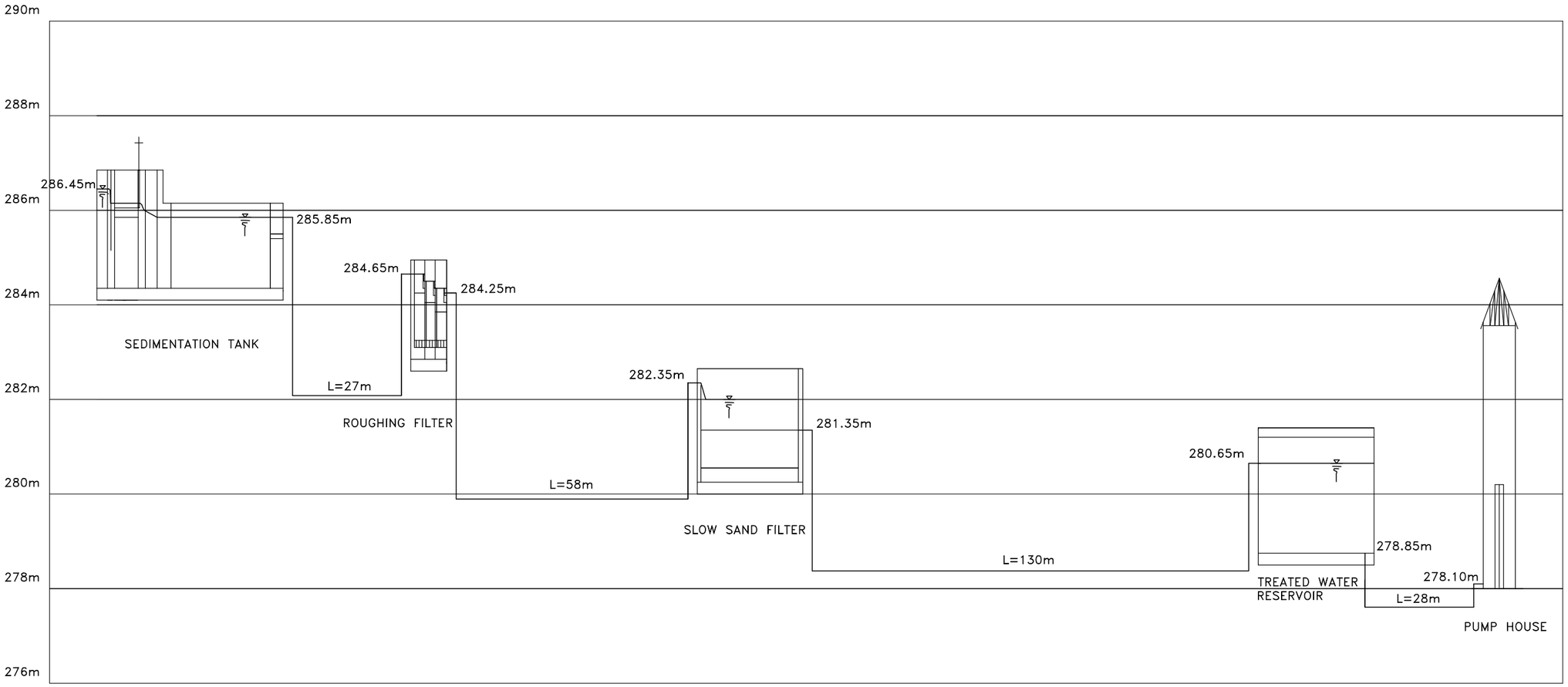
SCALE 0 20 40 60 80 100 m

THE STUDY ON JARAR VALLEY AND SHEBELE SUB-BASIN WATER SUPPLY DEVELOPMENT PLAN, AND EMERGENCY WATER SUPPLY IN THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA

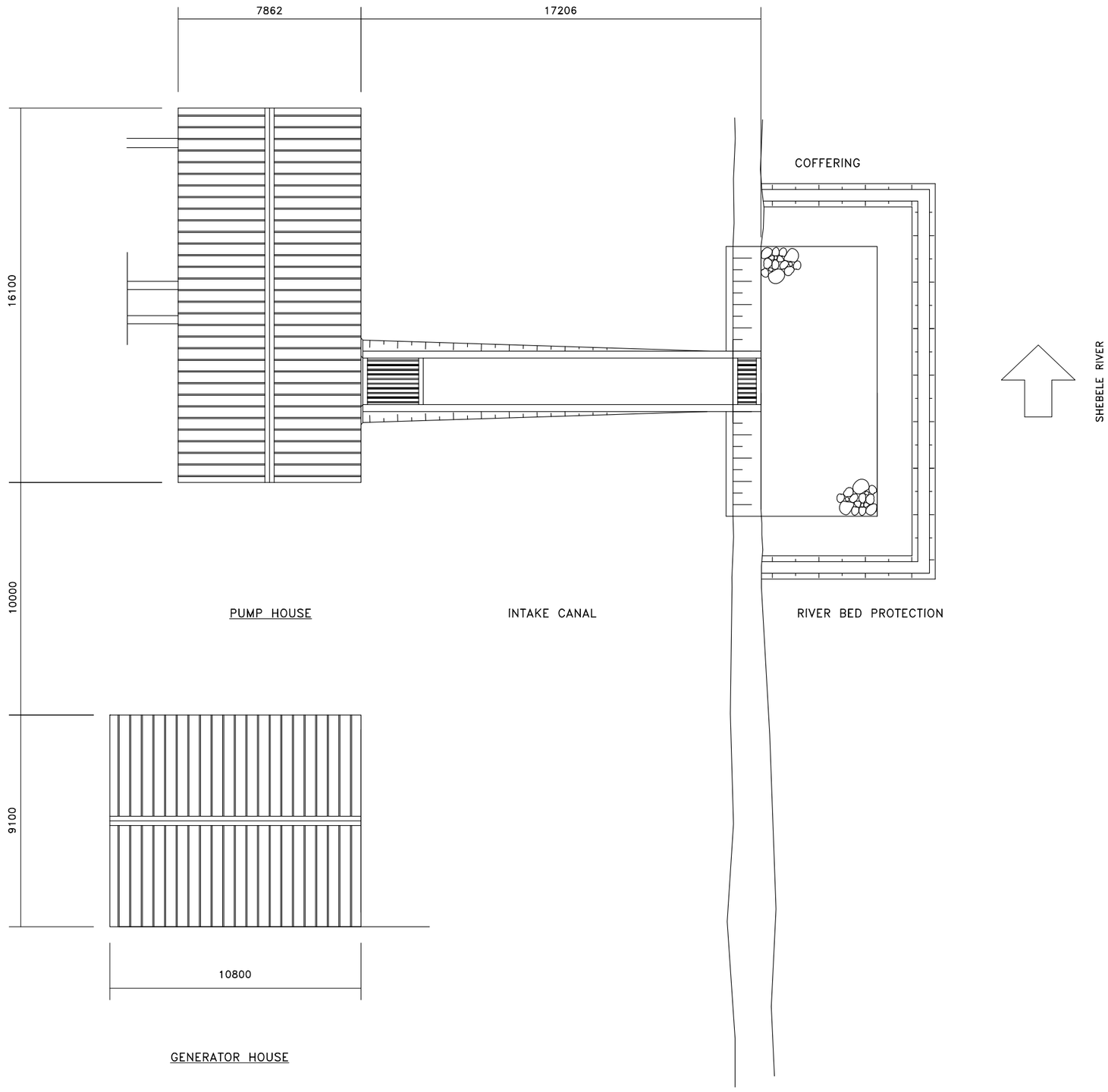
FEASIBILITY STUDY

GODEY TOWN

TITLE	INTAKE SITE FACILITIES LAYOUT		
DATE	AUG.2013	DWG No.	FS002
CONSULTANT	KOKUSAI KOGYO CO., LTD.		
CLIENT	JAPAN INTERNATIONAL COOPERATION AGENCY		

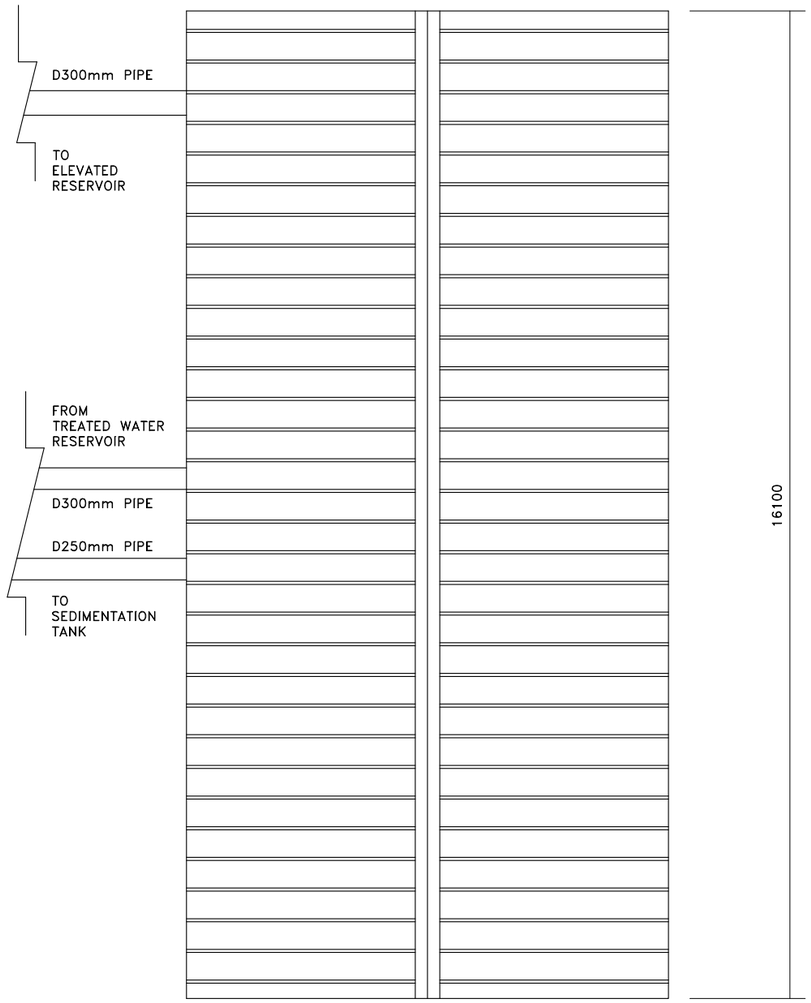


THE STUDY ON JARAR VALLEY AND SHEBELE SUB-BASIN WATER SUPPLY DEVELOPMENT PLAN, AND EMERGENCY WATER SUPPLY IN THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA FEASIBILITY STUDY GODEY TOWN			
TITLE	HYDRAULIC PROFILE		
DATE	AUG.2013	DWG No.	FS003
CONSULTANT	KOKUSAI KOGYO CO., LTD.		
CLIENT	JAPAN INTERNATIONAL COOPERATION AGENCY		

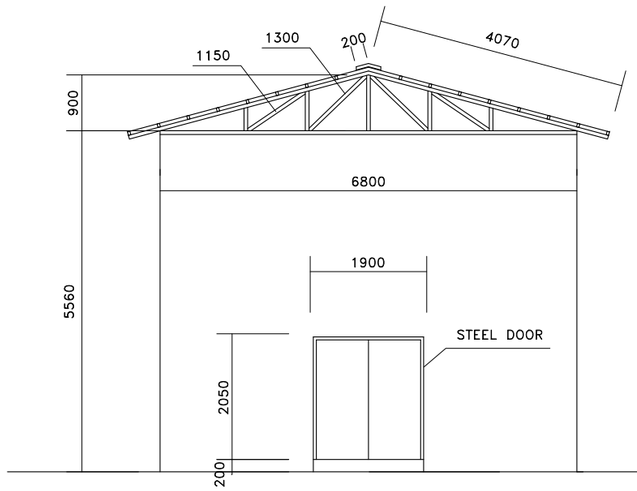


SCALE 0 2 4 6 8 10 m

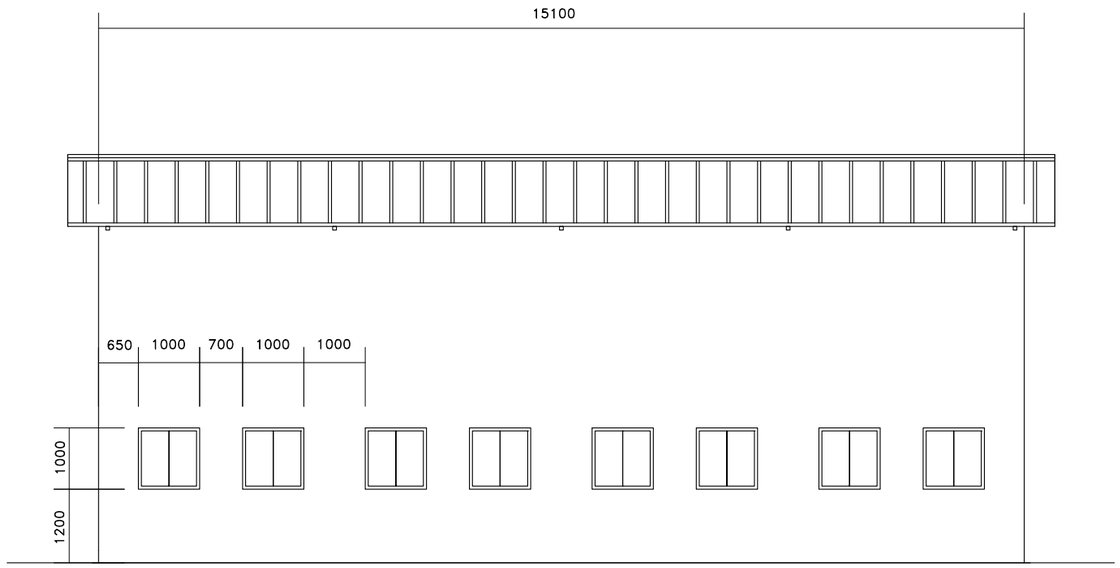
THE STUDY ON JARAR VALLEY AND SHEBELE SUB-BASIN WATER SUPPLY DEVELOPMENT PLAN, AND EMERGENCY WATER SUPPLY IN THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA FEASIBILITY STUDY GODEY TOWN			
TITLE	PUMP STATION LAYOUT PLAN		
DATE	AUG.2013	DWG No.	FS004
CONSULTANT	KOKUSAI KOGYO CO., LTD.		
CLIENT	JAPAN INTERNATIONAL COOPERATION AGENCY		



PLAN



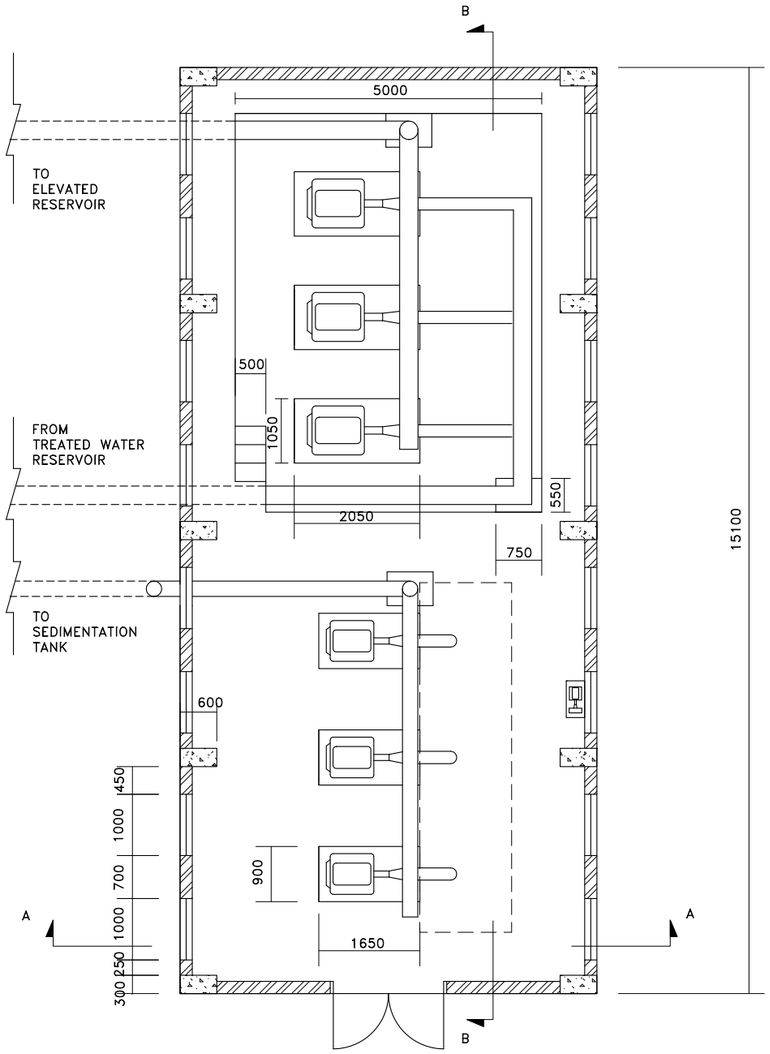
SECTION



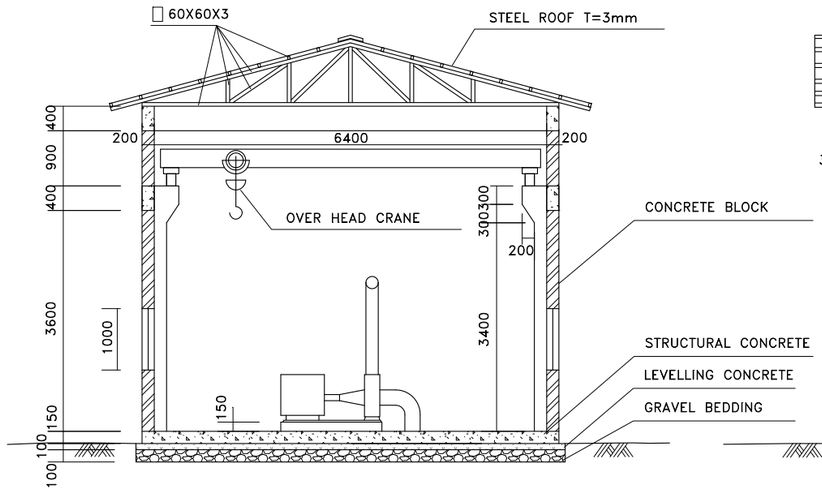
ELEVATION

SCALE 0 1 2 3 4 5 m

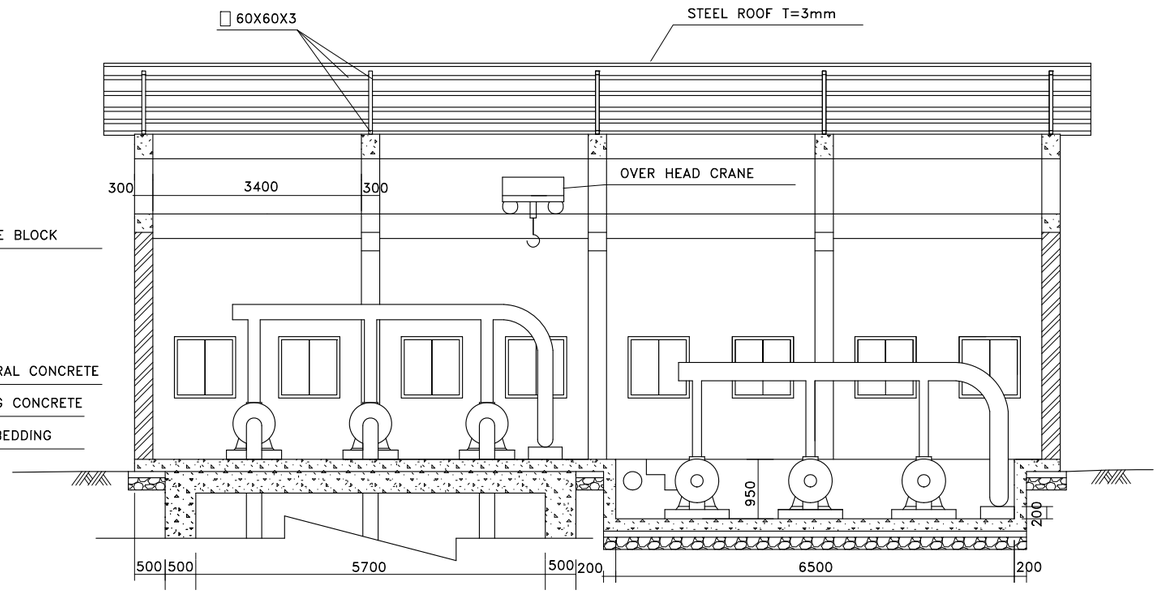
THE STUDY ON JARAR VALLEY AND SHEBELE SUB-BASIN WATER SUPPLY DEVELOPMENT PLAN, AND EMERGENCY WATER SUPPLY IN THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA FEASIBILITY STUDY GODEY TOWN			
TITLE	PUMP HOUSE PLAN		
DATE	AUG.2013	DWG No.	FS005
CONSULTANT	KOKUSAI KOGYO CO., LTD.		
CLIENT	JAPAN INTERNATIONAL COOPERATION AGENCY		



FLOOR PLAN



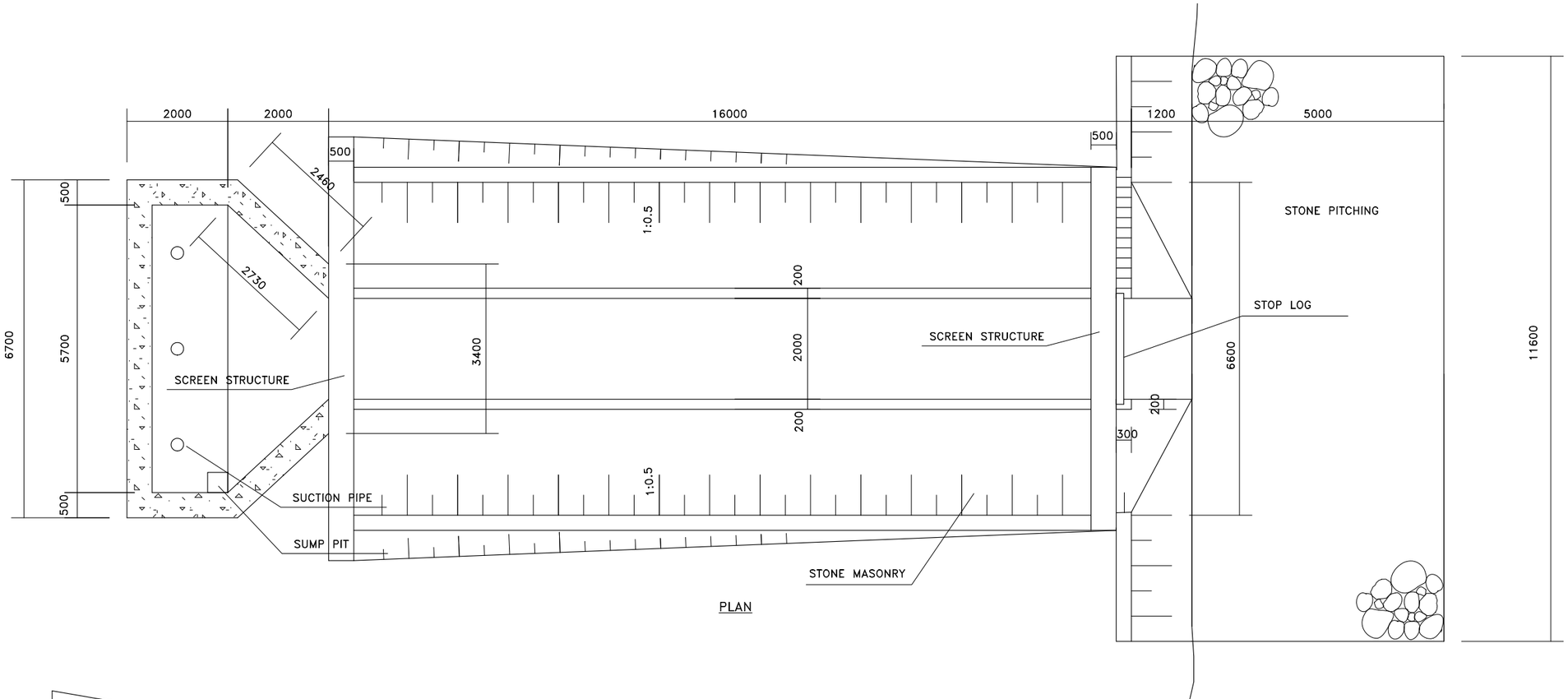
SECTION A–A



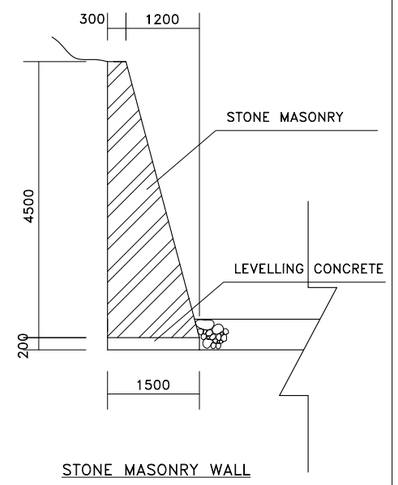
SECTION B–B

SCALE 0 1 2 3 4 5 m

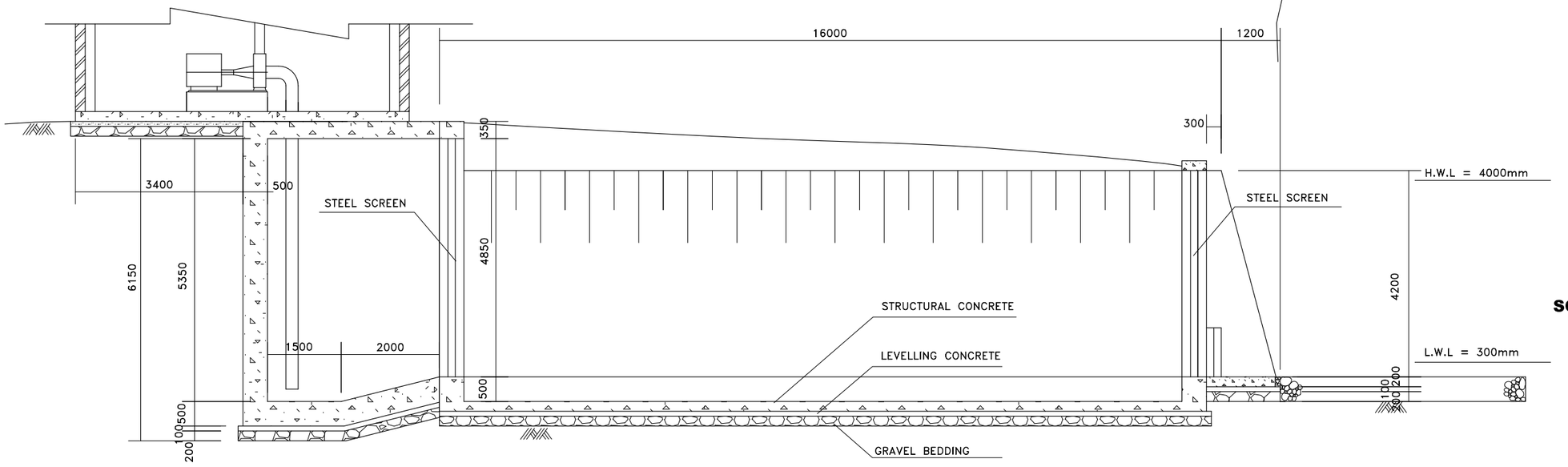
THE STUDY ON JARAR VALLEY AND SHEBELE SUB-BASIN WATER SUPPLY DEVELOPMENT PLAN, AND EMERGENCY WATER SUPPLY IN THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA FEASIBILITY STUDY GODEY TOWN			
TITLE	PUMP HOUSE SUPERSTRUCTURE		
DATE	AUG.2013	DWG No.	FS006
CONSULTANT	KOKUSAI KOGYO CO., LTD.		
CLIENT	JAPAN INTERNATIONAL COOPERATION AGENCY		



PLAN



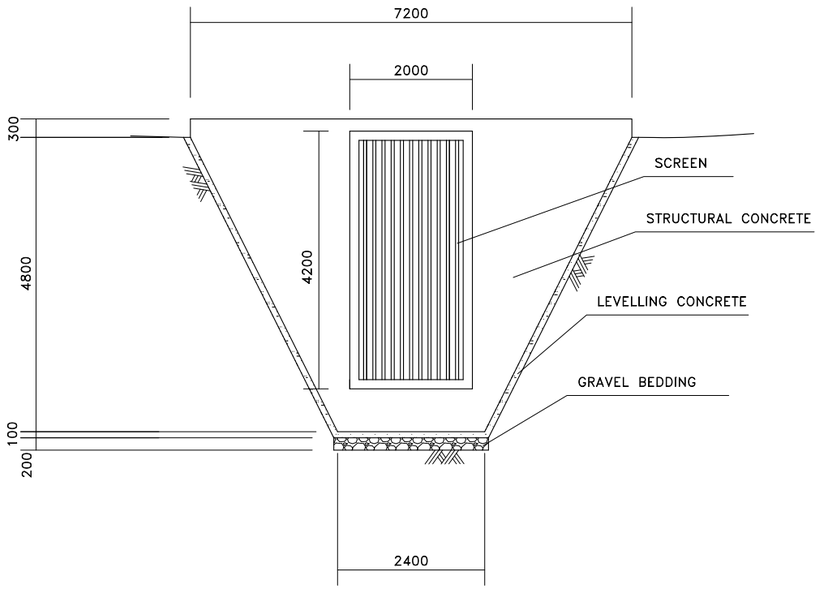
STONE MASONRY WALL



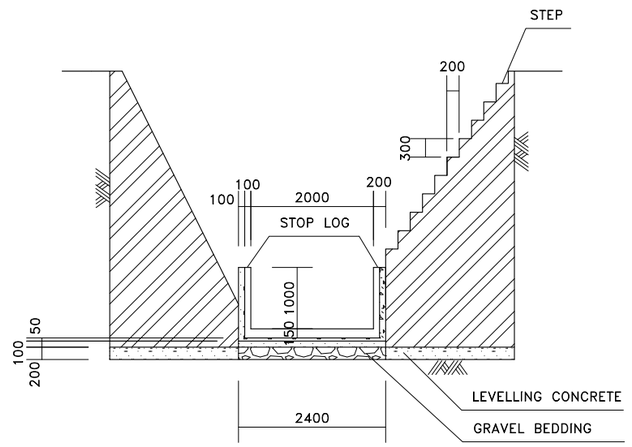
PROFILE

SCALE 0 1 2 3 4 5 m

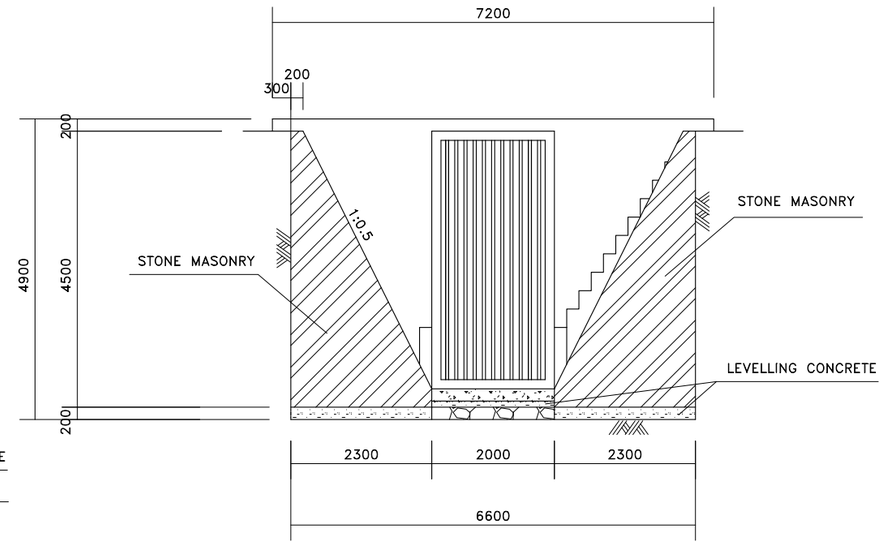
THE STUDY ON JARAR VALLEY AND SHEBELE SUB-BASIN WATER SUPPLY DEVELOPMENT PLAN, AND EMERGENCY WATER SUPPLY IN THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA FEASIBILITY STUDY GODEY TOWN			
TITLE	PUMP HOUSE SUBSTRUCTURE		
DATE	AUG.2013	DWG No.	FS007
CONSULTANT	KOKUSAI KOGYO CO., LTD.		
CLIENT	JAPAN INTERNATIONAL COOPERATION AGENCY		



SCREEN STRUCTURE



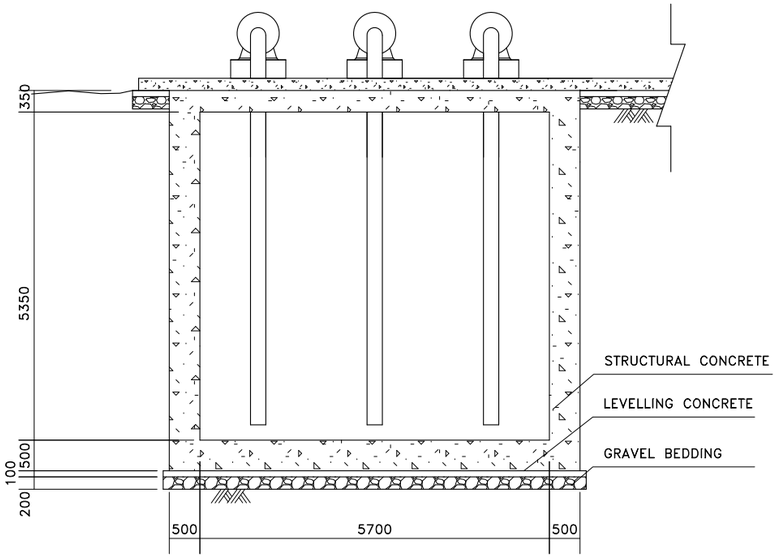
STOP LOG SECTION



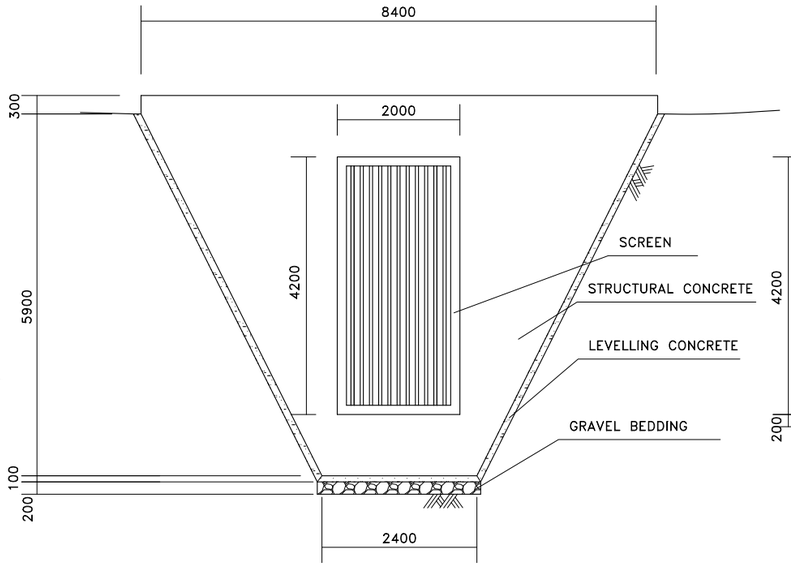
INLET SECTION

SCALE 0 1 2 3 4 5 m

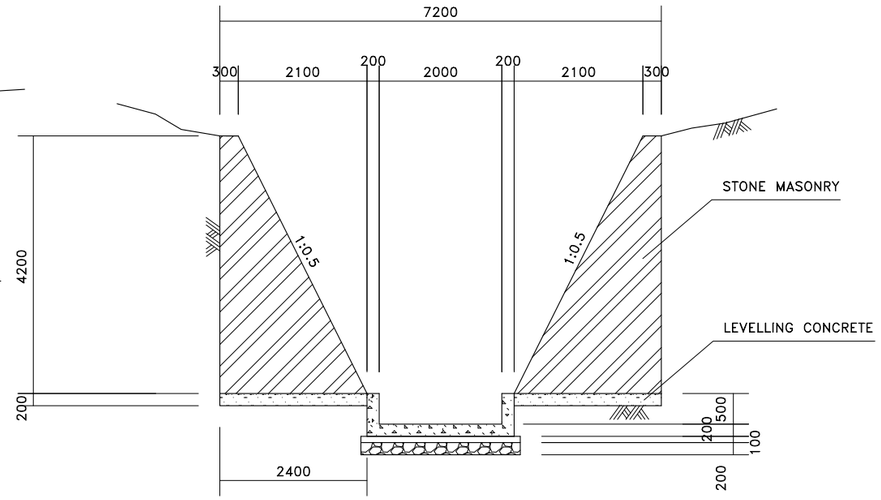
THE STUDY ON JARAR VALLEY AND SHEBELE SUB-BASIN WATER SUPPLY DEVELOPMENT PLAN, AND EMERGENCY WATER SUPPLY IN THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA FEASIBILITY STUDY GODEY TOWN			
TITLE	PUMP HOUSE SUBSTRUCTURE2		
DATE	AUG.2013	DWG No.	FS008
CONSULTANT	KOKUSAI KOGYO CO., LTD.		
CLIENT	JAPAN INTERNATIONAL COOPERATION AGENCY		



INTAKE CANAL SECTION



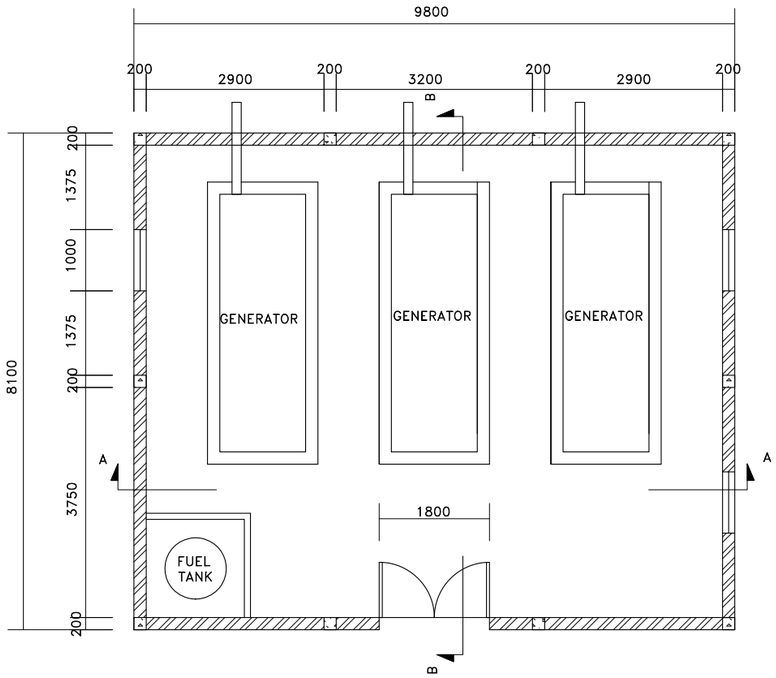
SCREEN STRUCTURE2



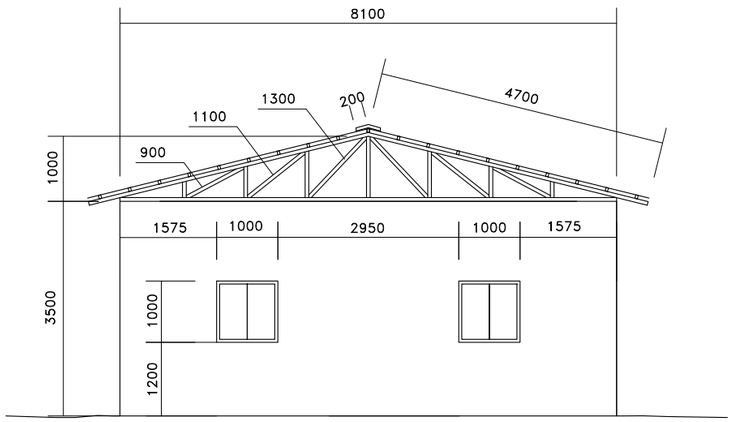
INTAKE CANAL SECTION

SCALE 0 1 2 3 4 5 m

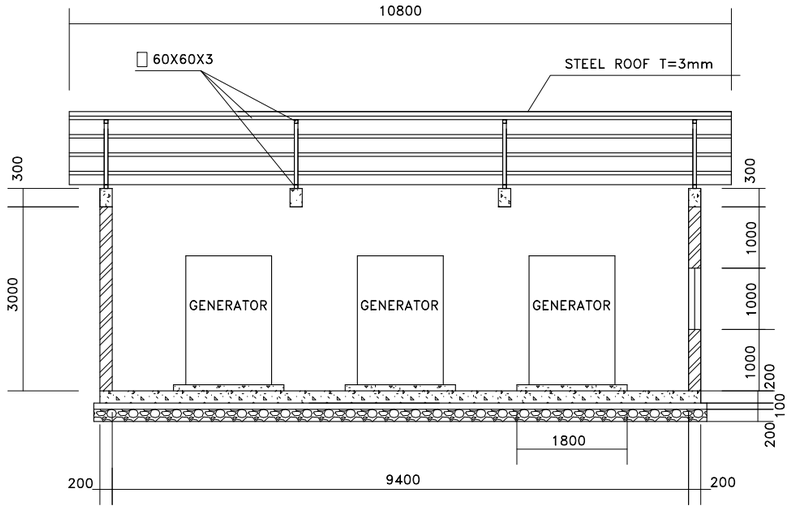
THE STUDY ON JARAR VALLEY AND SHEBELE SUB-BASIN WATER SUPPLY DEVELOPMENT PLAN, AND EMERGENCY WATER SUPPLY IN THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA FEASIBILITY STUDY GODEY TOWN			
TITLE	PUMP HOUSE SUBSTRUCTURE3		
DATE	AUG.2013	DWG No.	FS009
CONSULTANT	KOKUSAI KOGYO CO., LTD.		
CLIENT	JAPAN INTERNATIONAL COOPERATION AGENCY		



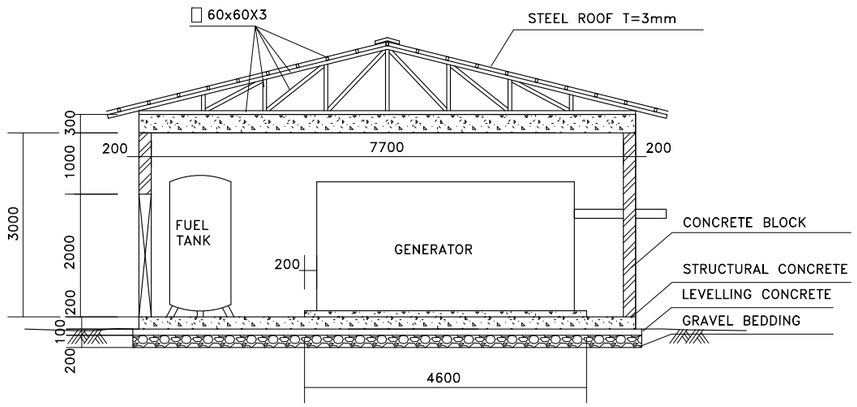
PLAN



ELEVATION



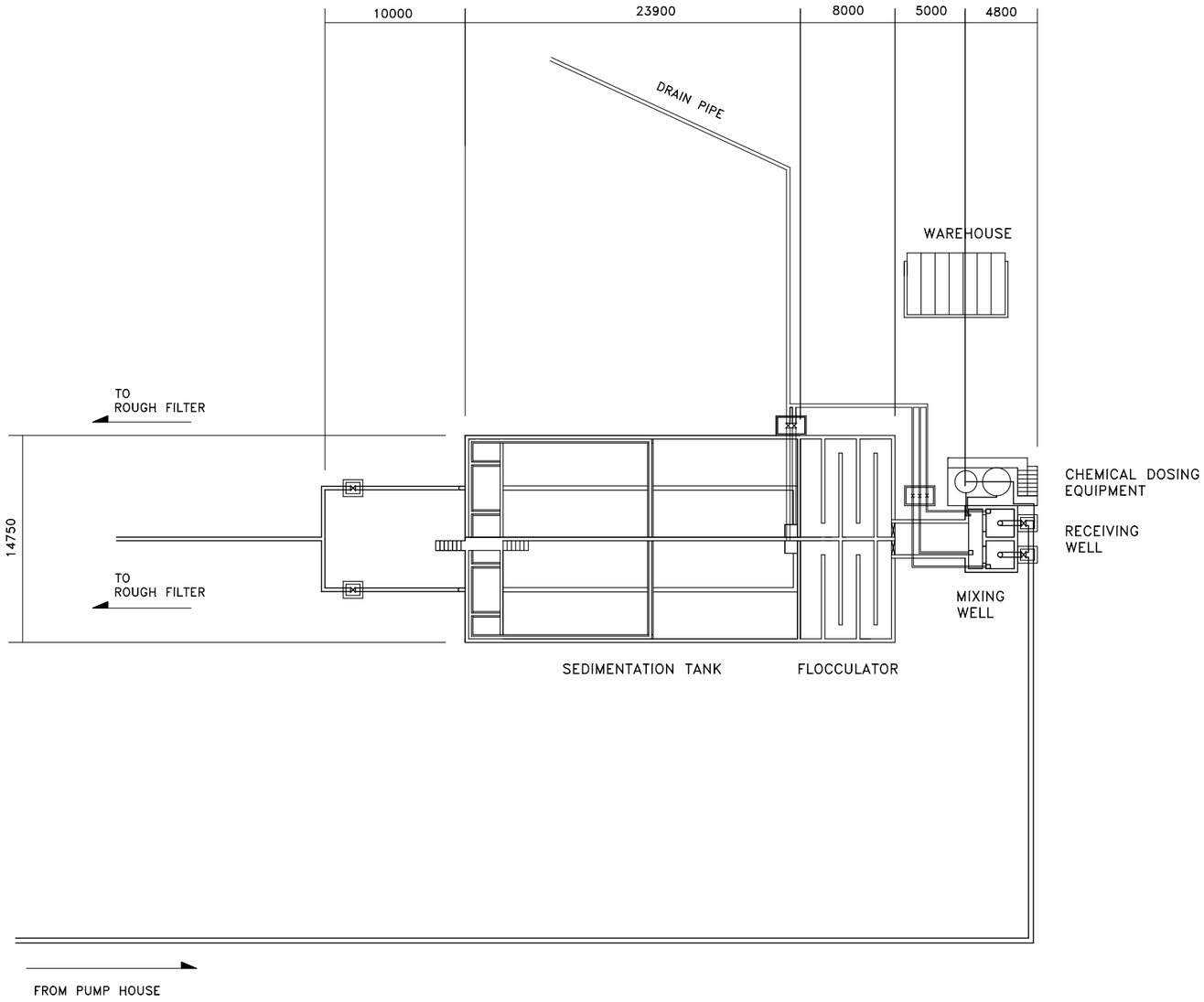
SECTION A–A



SECTION B–B

SCALE 0 1 2 3 4 5 m

THE STUDY ON JARAR VALLEY AND SHEBELE SUB-BASIN WATER SUPPLY DEVELOPMENT PLAN, AND EMERGENCY WATER SUPPLY IN THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA FEASIBILITY STUDY GODEY TOWN			
TITLE	GENERATOR HOUSE		
DATE	AUG.2013	DWG No.	FS010
CONSULTANT	KOKUSAI KOGYO CO., LTD.		
CLIENT	JAPAN INTERNATIONAL COOPERATION AGENCY		



SEDIMENTATION TANK

LEGEND

WATER SUPPLY PIPE

DRAIN PIPE

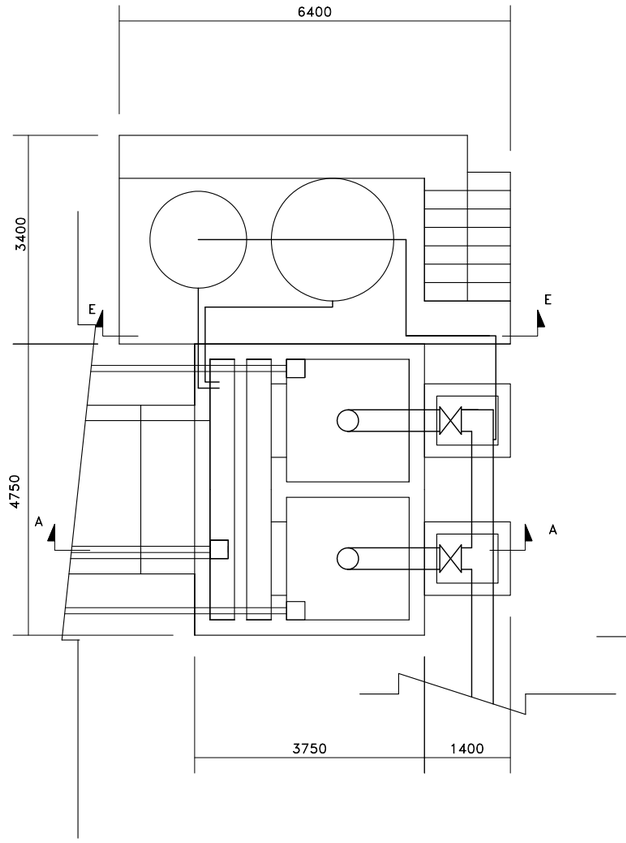
SCALE 0 4 8 12 16 20 m

THE STUDY ON JARAR VALLEY AND SHEBELE SUB-BASIN WATER SUPPLY DEVELOPMENT PLAN, AND EMERGENCY WATER SUPPLY IN THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA

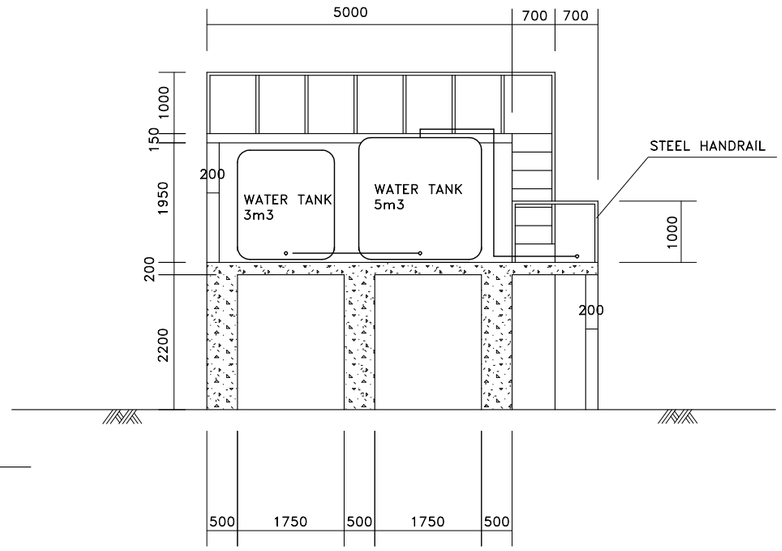
FEASIBILITY STUDY

GODEY TOWN

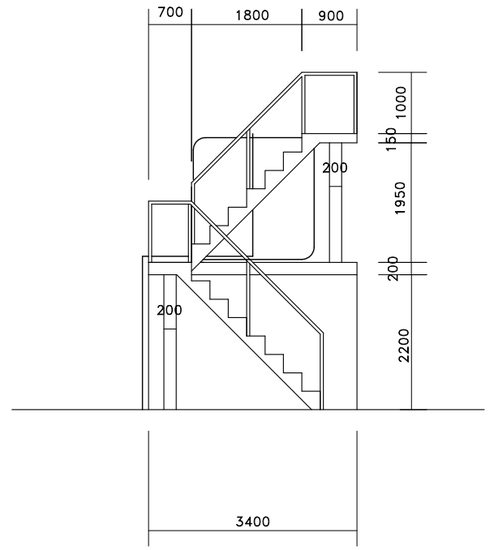
TITLE	**SEDIMENTATION TANK LAYOUT**		
DATE	**AUG.2013**	DWG No.	**FS011**
CONSULTANT	**KOKUSAI KOGYO CO., LTD.**		
CLIENT	**JAPAN INTERNATIONAL COOPERATION AGENCY**		

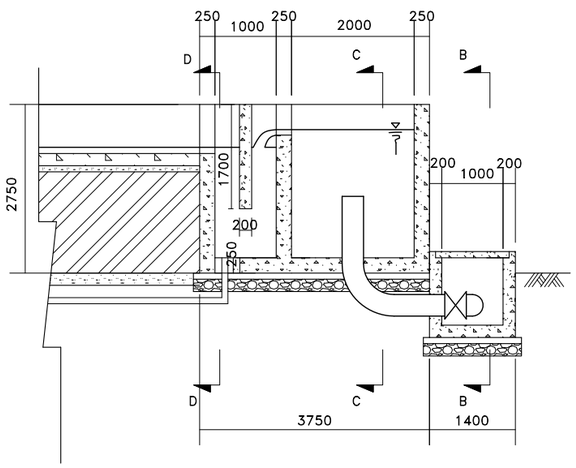


RECEIVING WELL PLAN

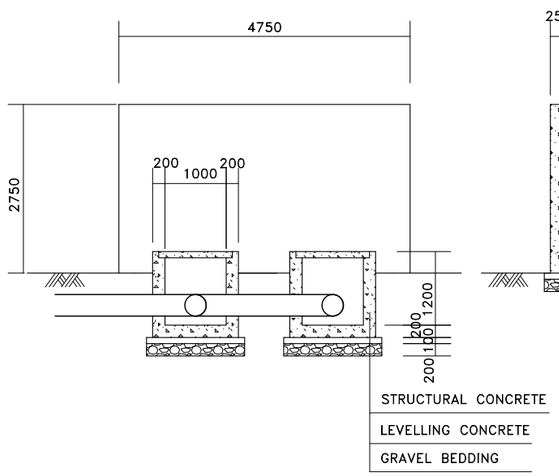


SECTION E–E

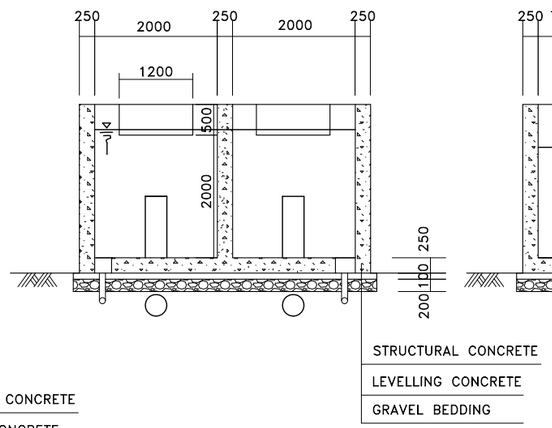




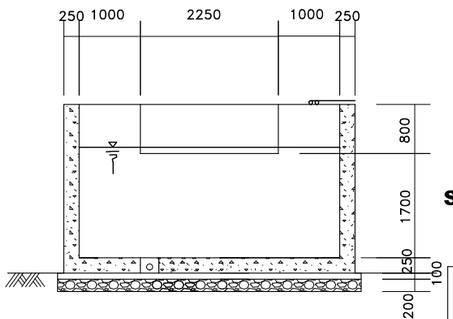
SECTION A–A



SECTION B–B



SECTION C–C



SECTION D–D

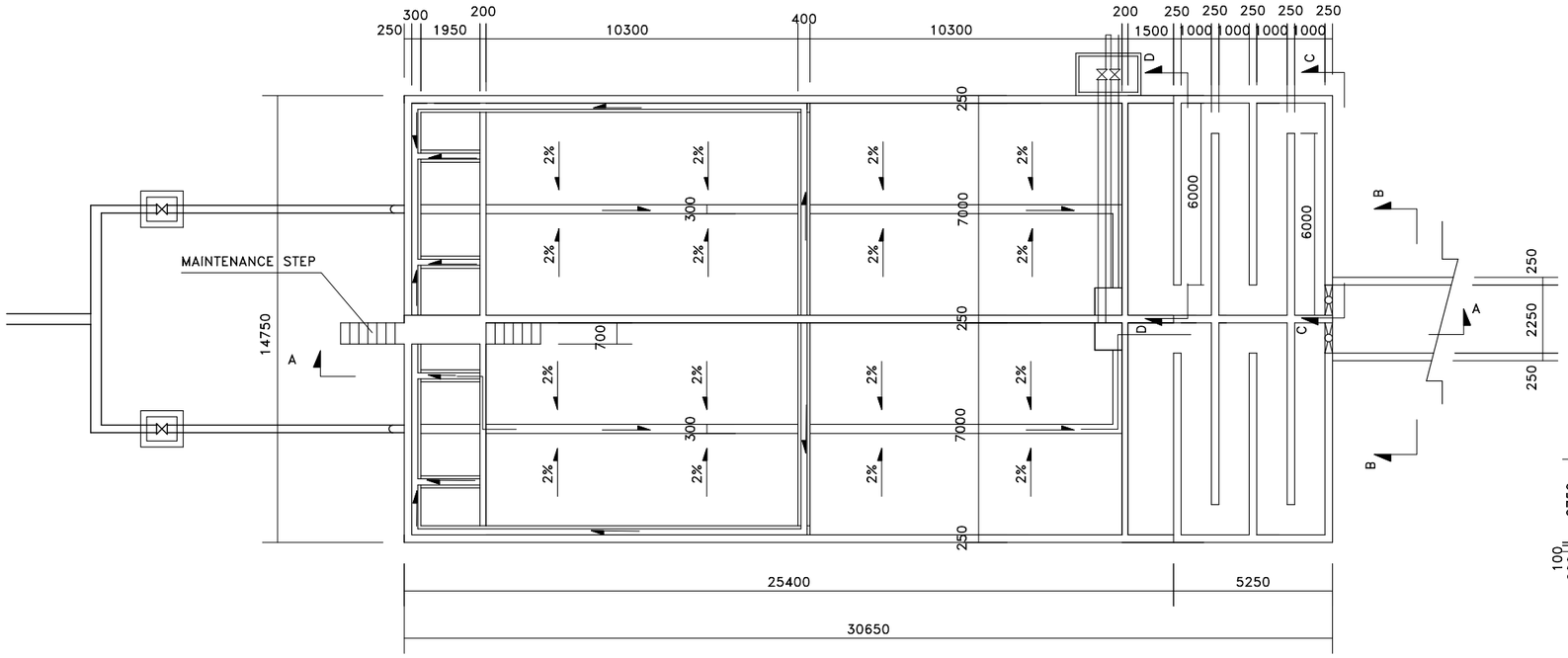
SCALE 0 1 2 3 4 5 m

THE STUDY ON JARAR VALLEY AND SHEBELE SUB-BASIN WATER SUPPLY DEVELOPMENT PLAN, AND EMERGENCY WATER SUPPLY IN THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA

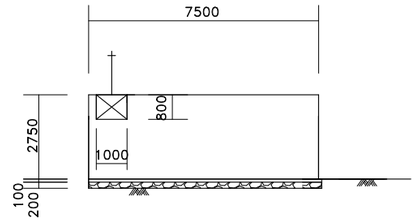
FEASIBILITY STUDY

GODEY TOWN

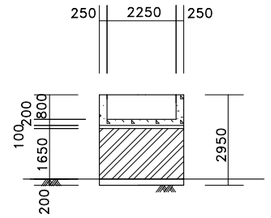
TITLE	**RECEIVING WELL**		
DATE	**AUG.2013**	DWG No.	**FS012**
CONSULTANT	**KOKUSAI KOGYO CO., LTD.**		
CLIENT	**JAPAN INTERNATIONAL COOPERATION AGENCY**		



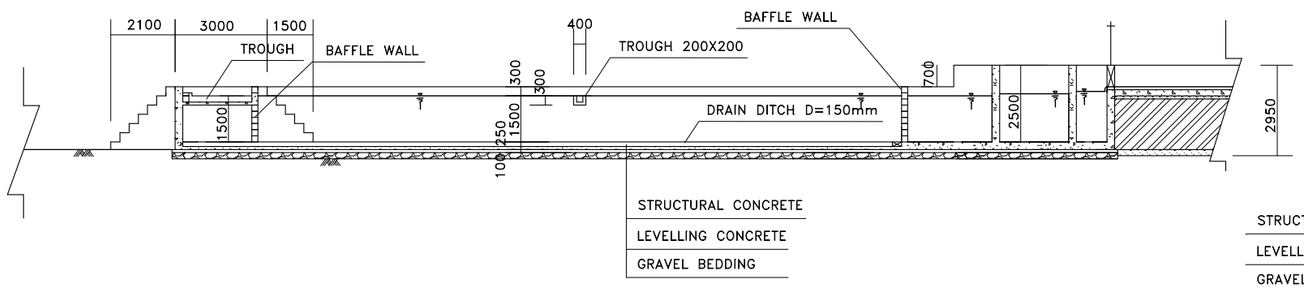
PLAN



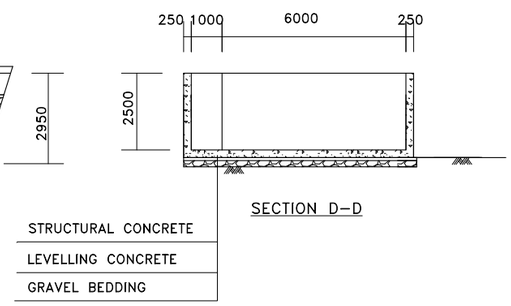
SECTION C–C



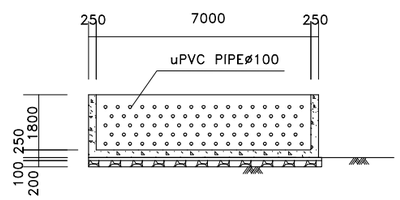
SECTION B–B



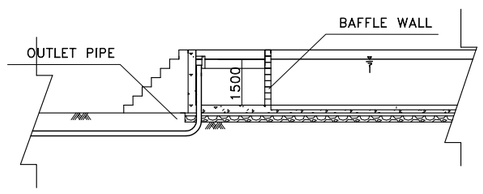
SECTION A–A



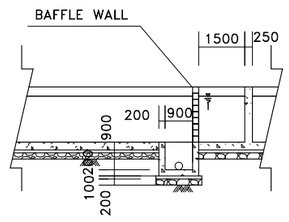
SECTION D–D



BAFFLE WALL



OUTLET DETAIL



DRAIN DETAIL

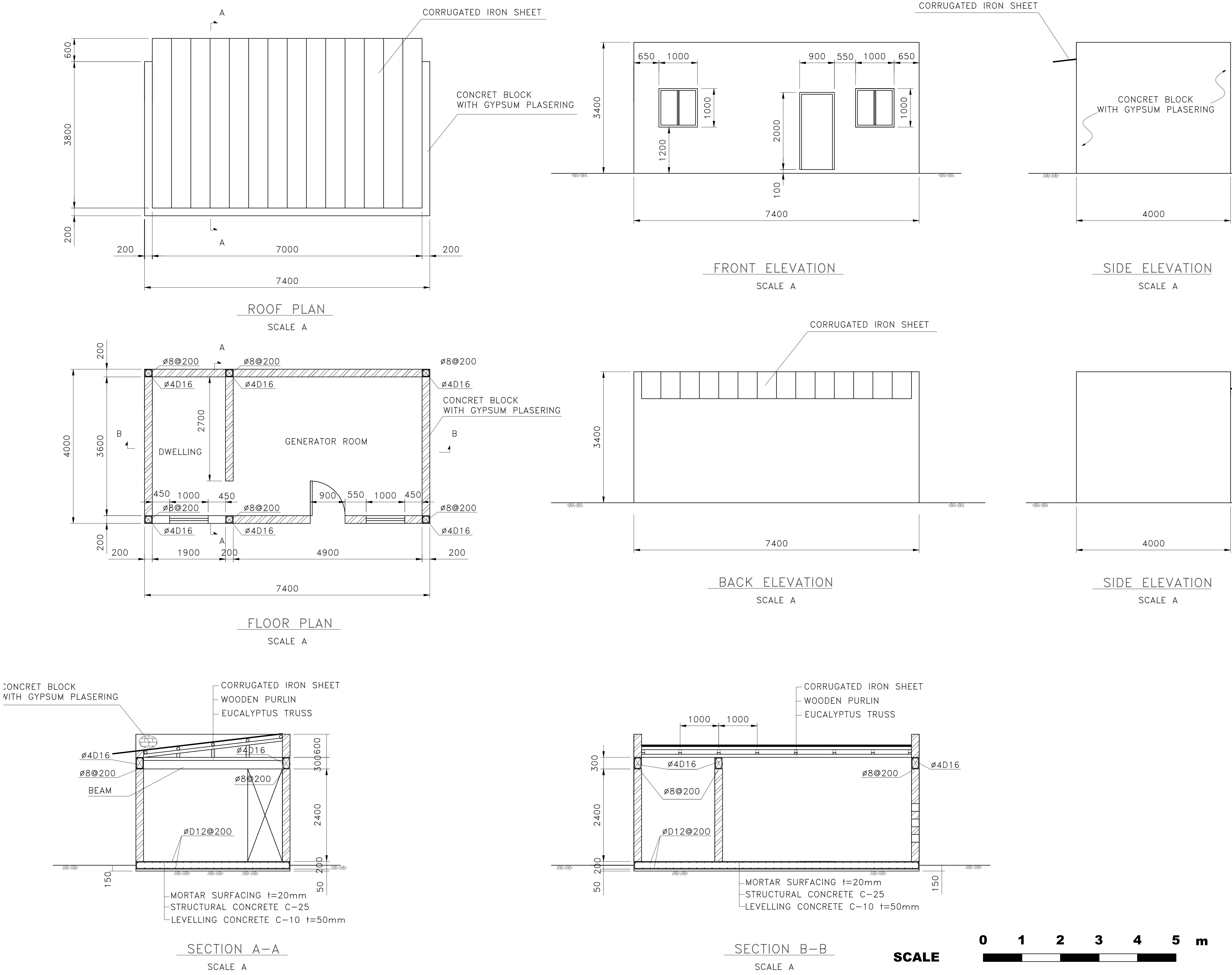
SCALE 0 2 4 6 8 10 m

THE STUDY ON JARAR VALLEY AND SHEBELE SUB-BASIN WATER SUPPLY DEVELOPMENT PLAN, AND EMERGENCY WATER SUPPLY IN THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA

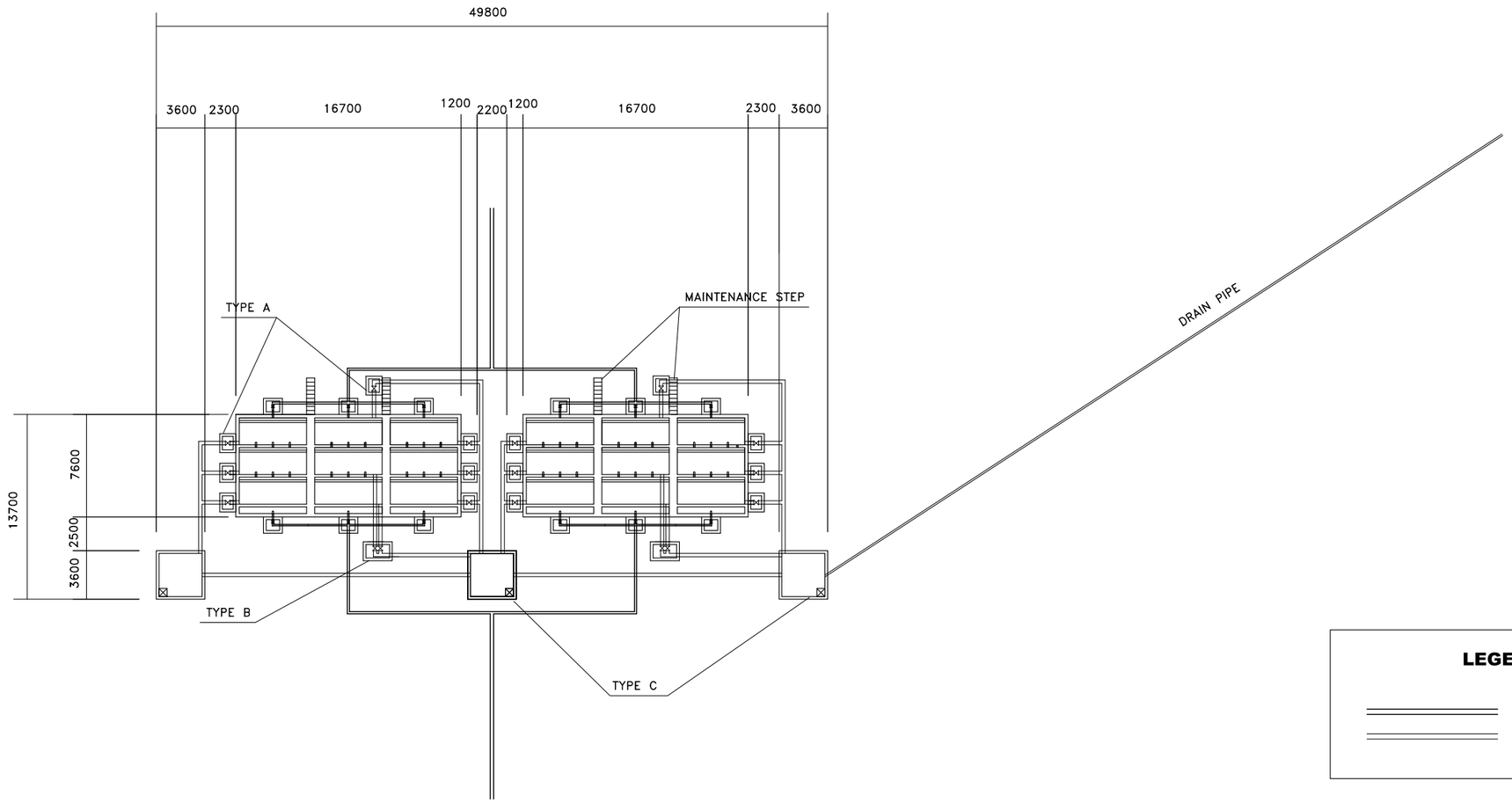
FEASIBILITY STUDY

GODEY TOWN

TITLE	**SEDIMENTATION TANK**		
DATE	**AUG.2013**	DWG No.	**FS013**
CONSULTANT	**KOKUSAI KOGYO CO., LTD.**		
CLIENT	**JAPAN INTERNATIONAL COOPERATION AGENCY**		



THE STUDY ON JARAR VALLEY AND SHEBELE SUB-BASIN WATER SUPPLY DEVELOPMENT PLAN, AND EMERGENCY WATER SUPPLY IN THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA FEASIBILITY STUDY GODEY TOWN			
TITLE	**WAREHOUSE**		
DATE	AUG.2013	DWG No.	FS014
CONSULTANT	**KOKUSAI KOGYO CO., LTD.**		
CLIENT	JAPAN INTERNATIONAL COOPERATION AGENCY		



LEGEND

WATER SUPPLY PIPE

DRAIN PIPE

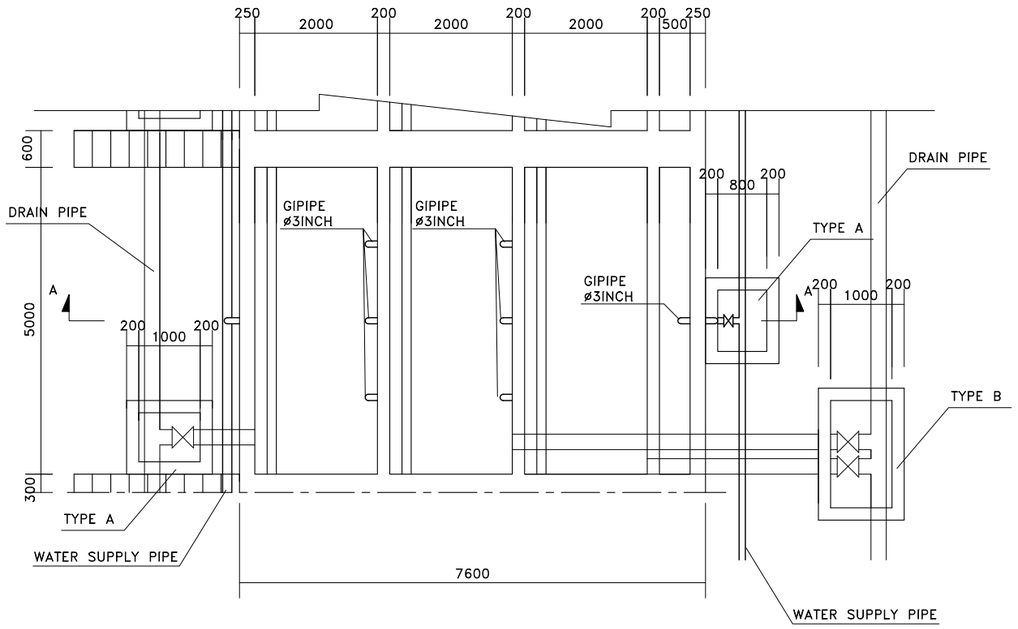
SCALE 0 4 8 12 16 20 m

THE STUDY ON JARAR VALLEY AND SHEBELE SUB-BASIN WATER SUPPLY DEVELOPMENT PLAN, AND EMERGENCY WATER SUPPLY IN THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA

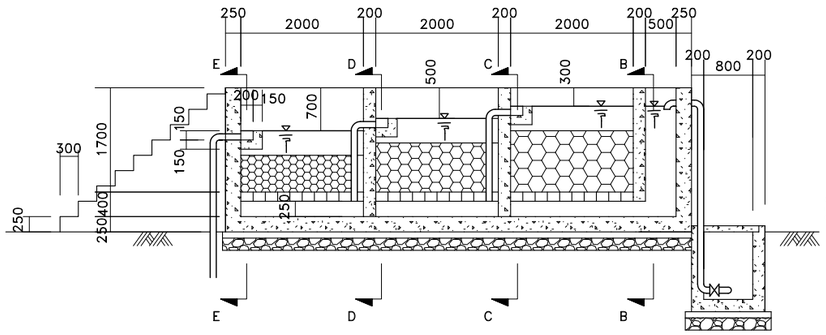
FEASIBILITY STUDY

GODEY TOWN

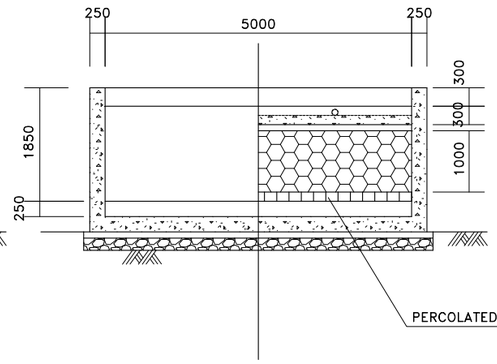
TITLE	**ROUGHING FILTER LAYOUT PLAN**		
DATE	**AUG.2013**	DWG No.	**FS015**
CONSULTANT	**KOKUSAI KOGYO CO., LTD.**		
CLIENT	**JAPAN INTERNATIONAL COOPERATION AGENCY**		



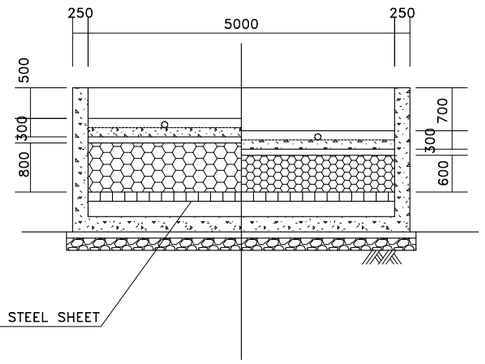
PLAN



SECTION A–A



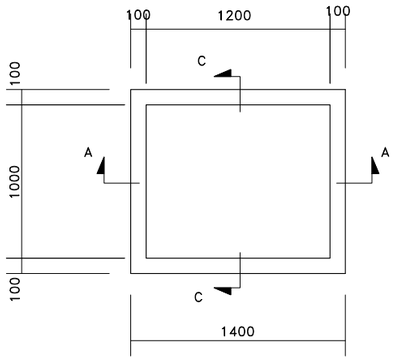
SECTION B–B SECTION C–C



SECTION D–D SECTION E–E

SCALE 0 1 2 3 4 5 m

THE STUDY ON JARAR VALLEY AND SHEBELE SUB-BASIN WATER SUPPLY DEVELOPMENT PLAN, AND EMERGENCY WATER SUPPLY IN THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA FEASIBILITY STUDY GODEY TOWN			
TITLE	ROUGHING FILTER		
DATE	AUG.2013	DWG No.	FS016
CONSULTANT	KOKUSAI KOGYO CO., LTD.		
CLIENT	JAPAN INTERNATIONAL COOPERATION AGENCY		



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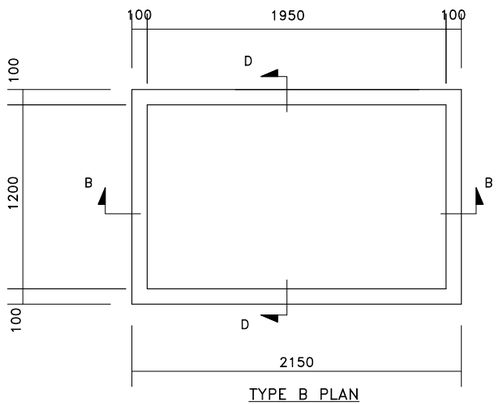
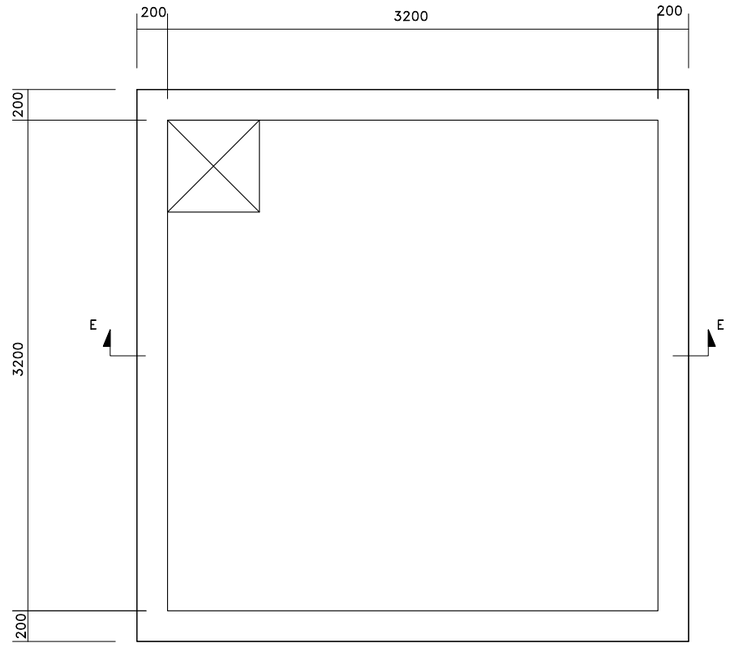
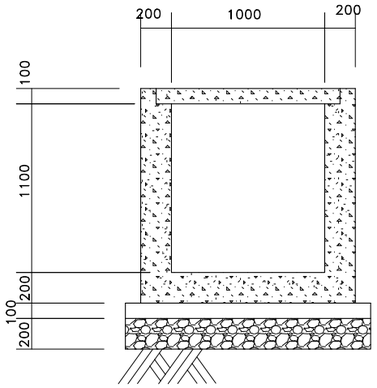


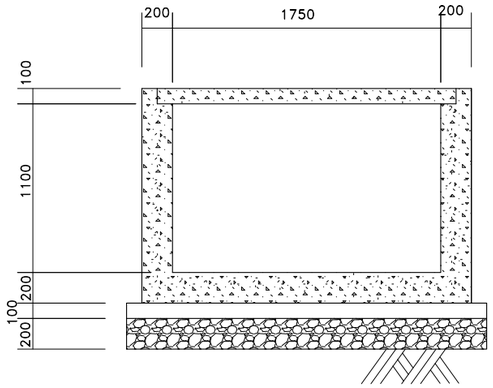
TYPE B PLAN



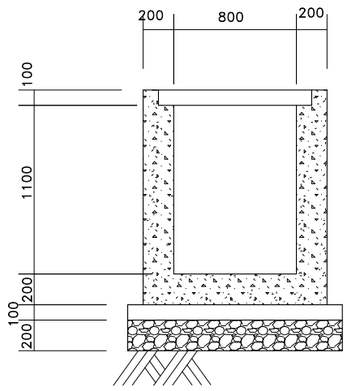
TYPE C PLAN



SECTION A–A



SECTION A–A



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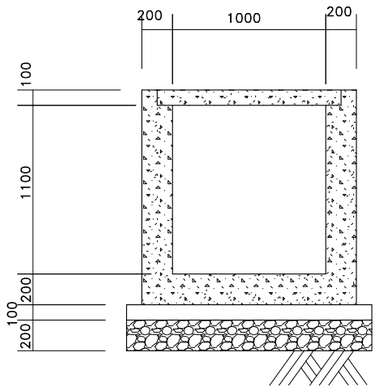
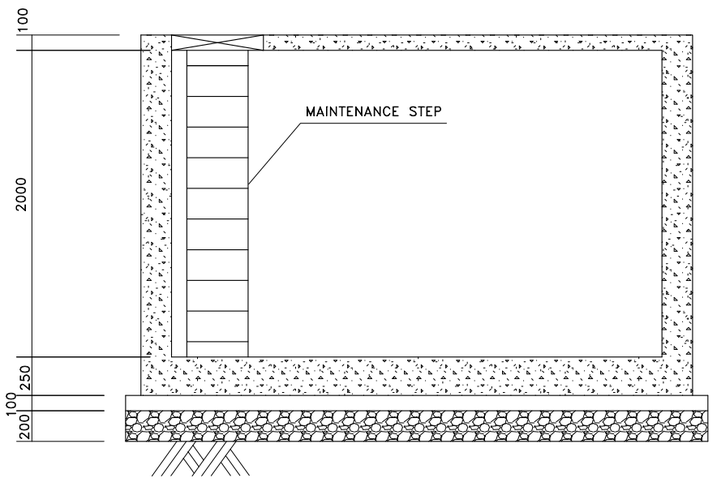


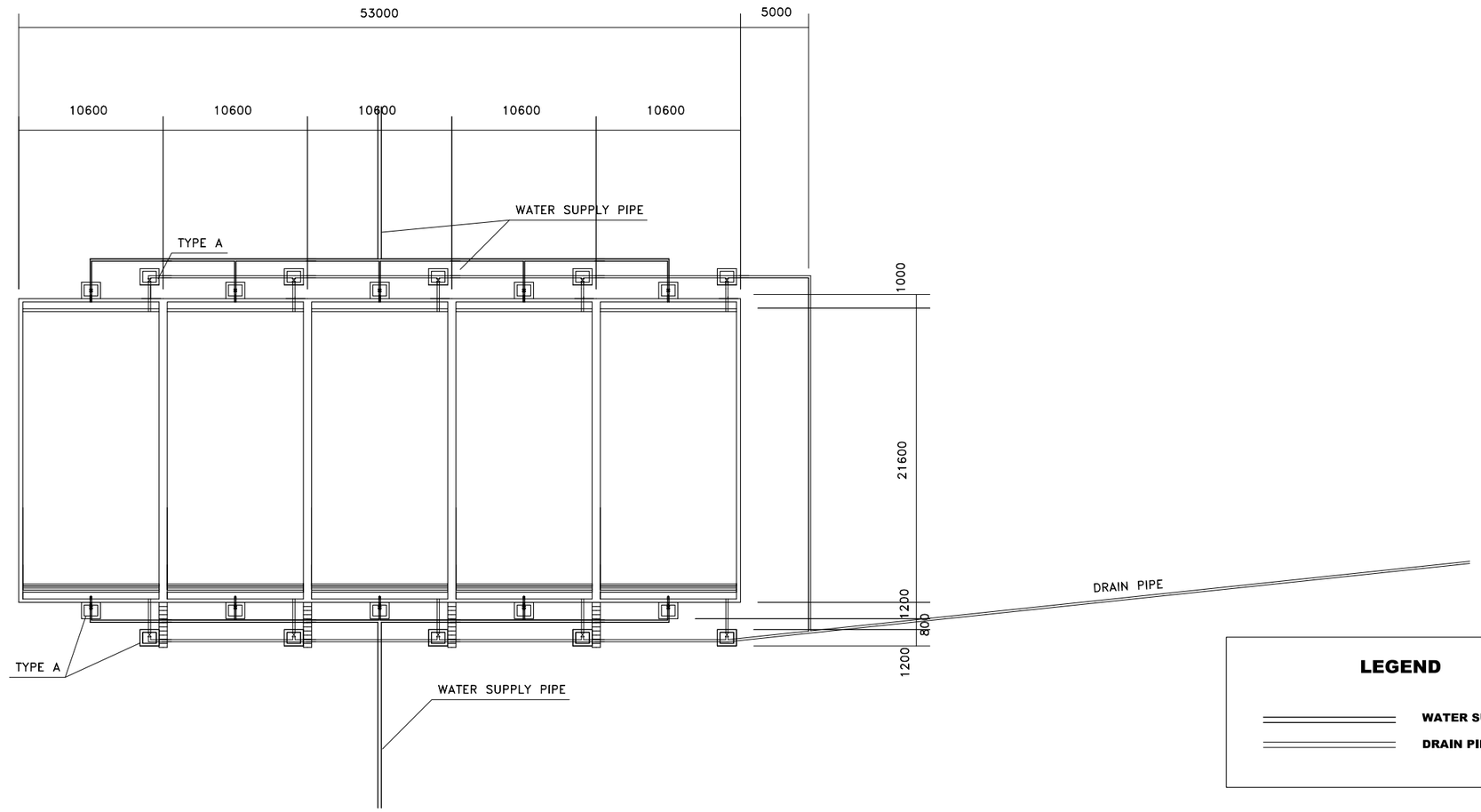
SECTION D–D



SECTION E–E

SCALE 0 0.4 0.8 1.2 1.6 2.0 m

THE STUDY ON JARAR VALLEY AND SHEBELE SUB-BASIN WATER SUPPLY DEVELOPMENT PLAN, AND EMERGENCY WATER SUPPLY IN THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA FEASIBILITY STUDY GODEY TOWN			
TITLE	CHAMBER DETAIL		
DATE	AUG.2013	DWG No.	FS017
CONSULTANT	KOKUSAI KOGYO CO., LTD.		
CLIENT	JAPAN INTERNATIONAL COOPERATION AGENCY		



LEGEND

WATER SUPPLY PIPE

DRAIN PIPE

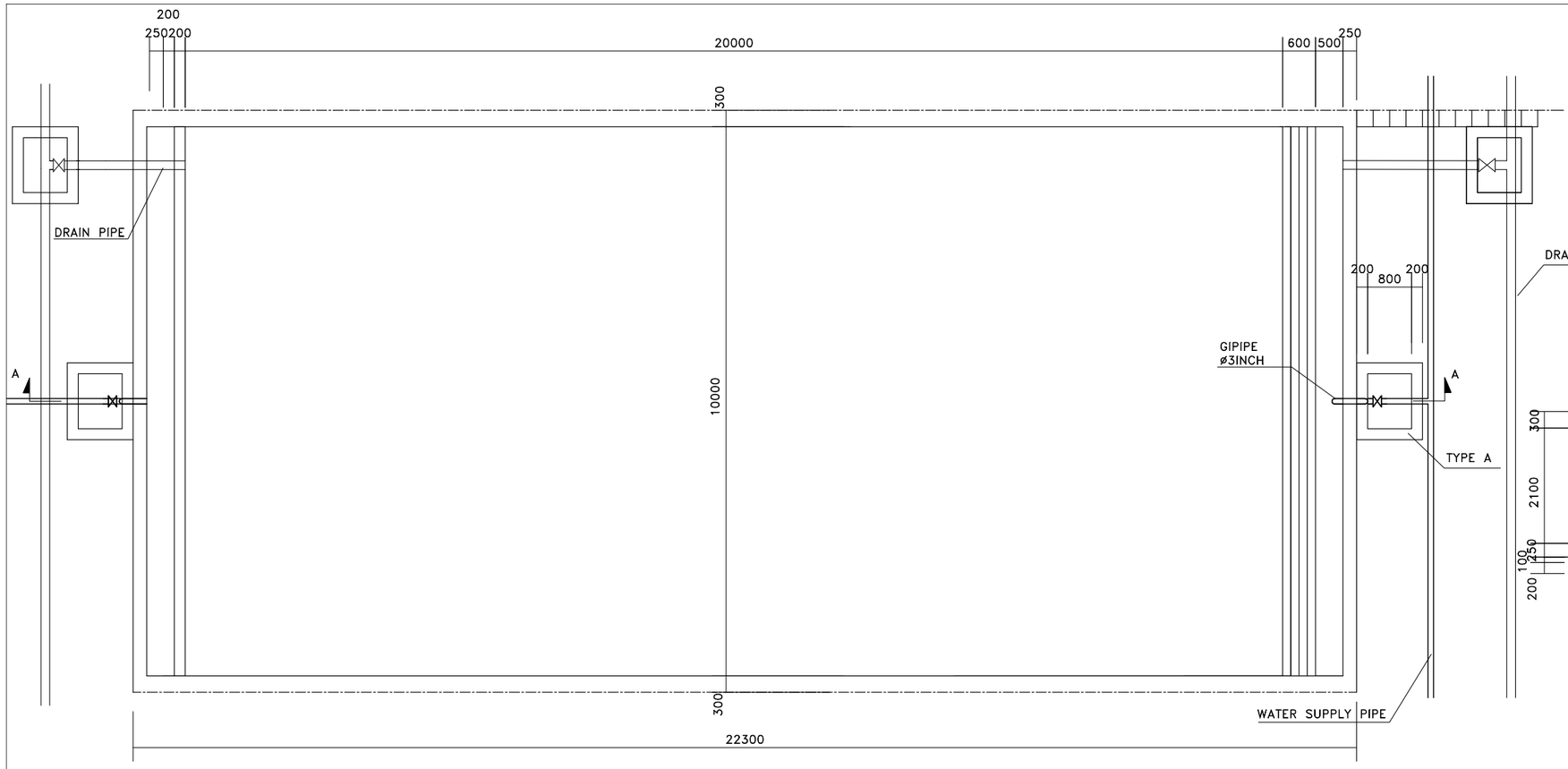
SCALE 0 4 8 12 16 20 m

THE STUDY ON JARAR VALLEY AND SHEBELE SUB-BASIN WATER SUPPLY DEVELOPMENT PLAN, AND EMERGENCY WATER SUPPLY IN THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA

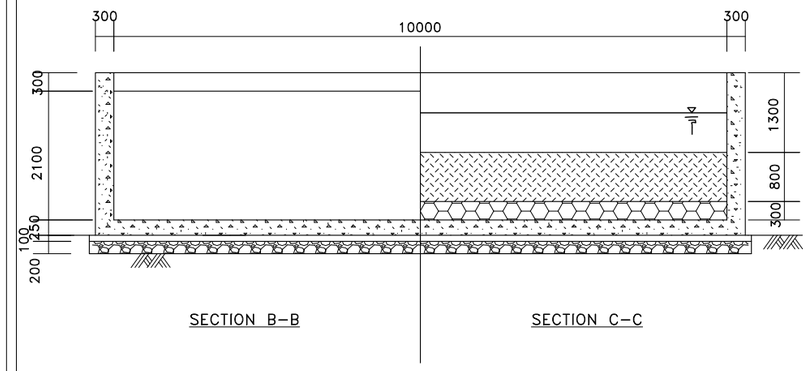
FEASIBILITY STUDY

GODEY TOWN

TITLE	**SLOW SAND FILTER LAYOUT PLAN**		
DATE	**JUN.2013**	DWG No.	**FS018**
CONSULTANT	**KOKUSAI KOGYO CO., LTD.**		
CLIENT	**JAPAN INTERNATIONAL COOPERATION AGENCY**		

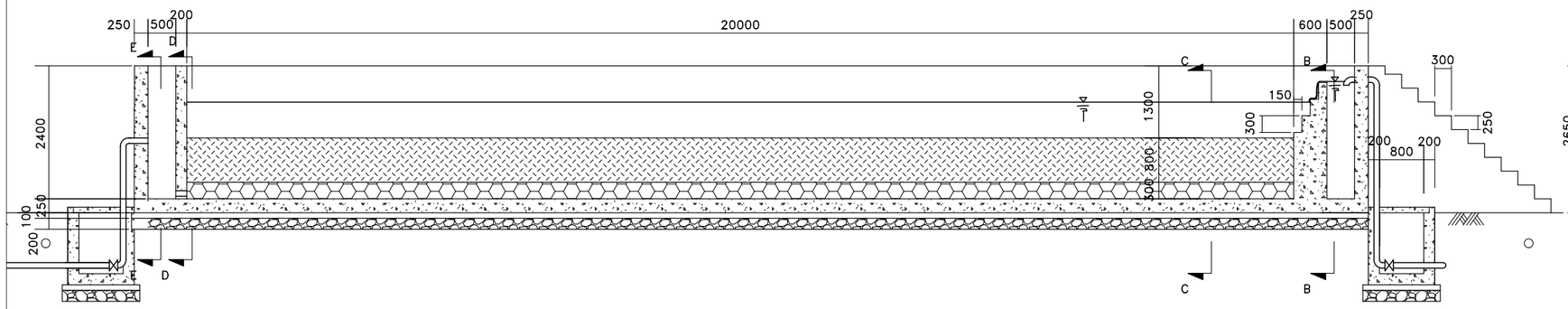


PLAN

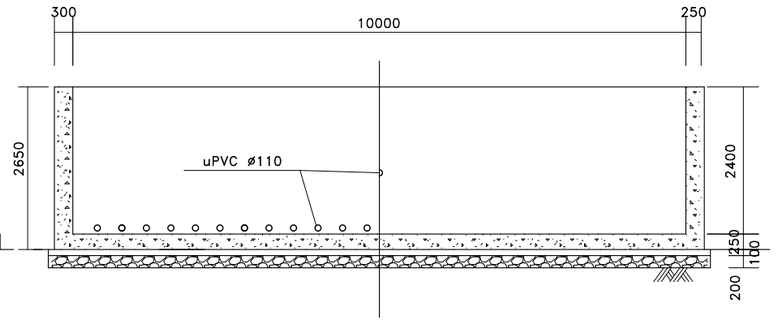


SECTION B–B

SECTION C–C



SECTION A–A

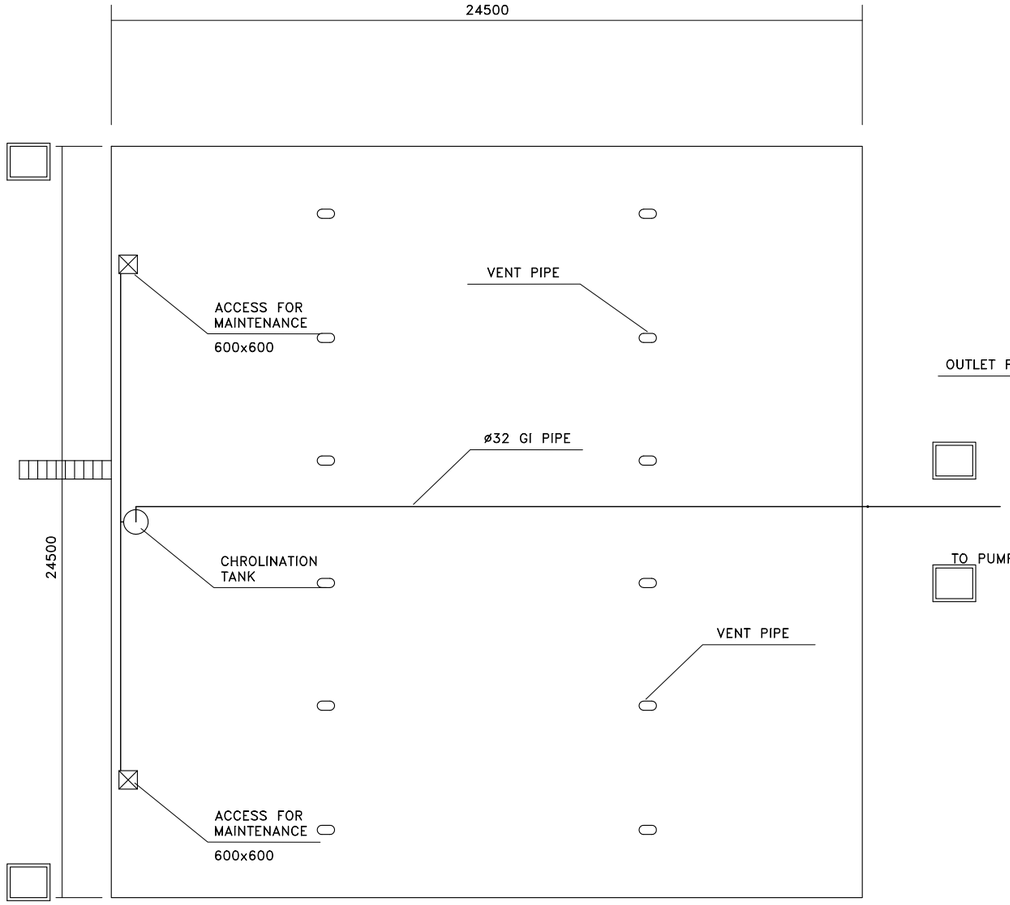


SECTION D–D

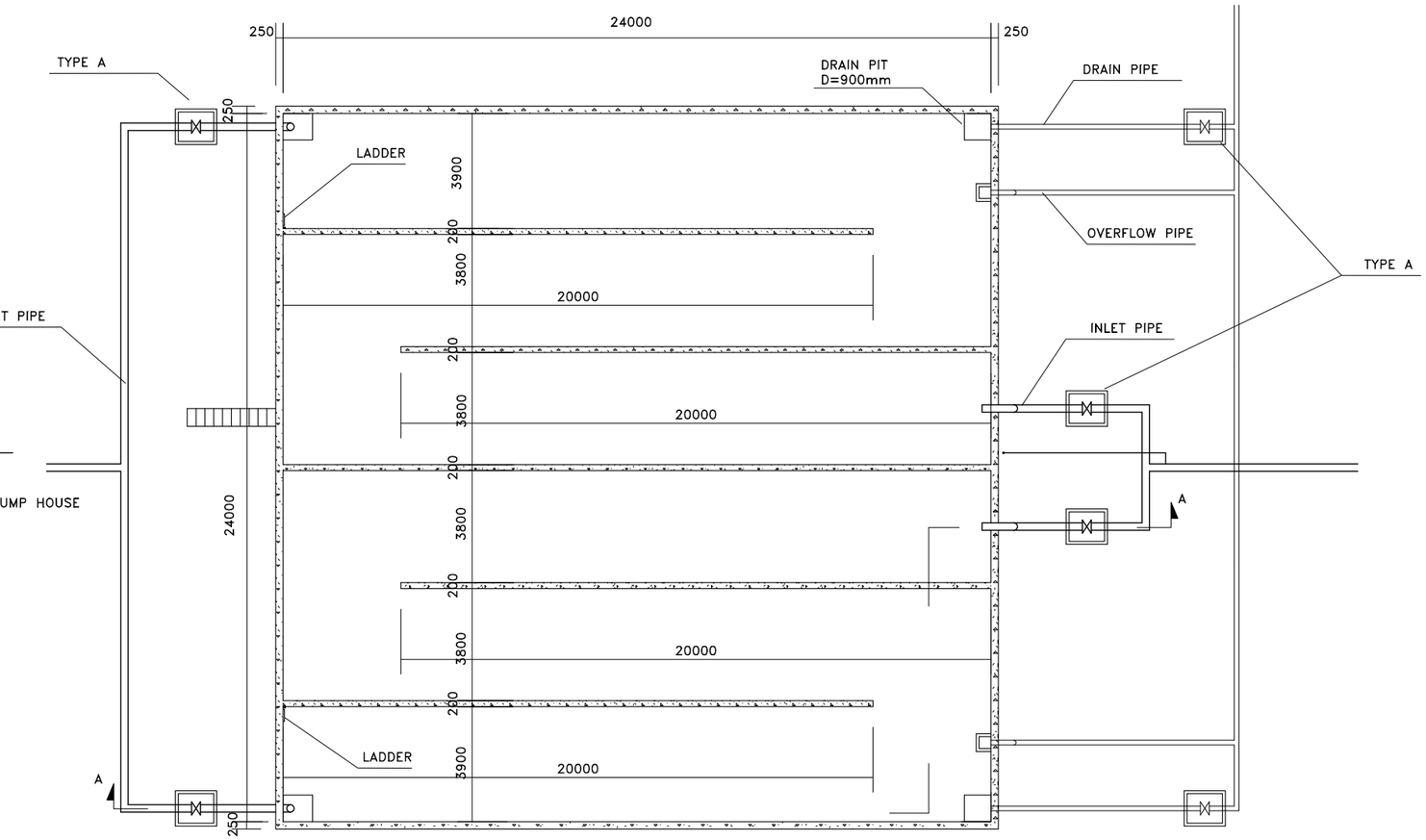
SECTION E–E

SCALE 0 1 2 3 4 5 m

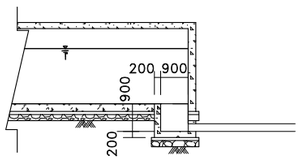
THE STUDY ON JARAR VALLEY AND SHEBELE SUB-BASIN WATER SUPPLY DEVELOPMENT PLAN, AND EMERGENCY WATER SUPPLY IN THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA FEASIBILITY STUDY GODEY TOWN			
TITLE	SLOW SAND FILTER		
DATE	JUN.2013	DWG No.	FS019
CONSULTANT	KOKUSAI KOGYO CO., LTD.		
CLIENT	JAPAN INTERNATIONAL COOPERATION AGENCY		



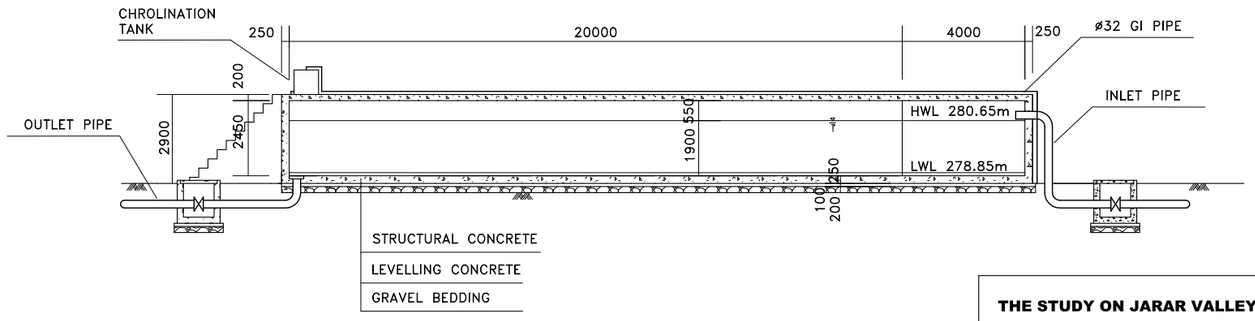
PLAN



FLOOR PLAN



DRAIN PIT DETAIL



SECTION

LEGEND

WATER SUPPLY PIPE

DRAIN PIPE

SCALE 0 2 4 6 8 10 m

THE STUDY ON JARAR VALLEY AND SHEBELE SUB-BASIN WATER SUPPLY DEVELOPMENT PLAN, AND EMERGENCY WATER SUPPLY IN THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA

FEASIBILITY STUDY

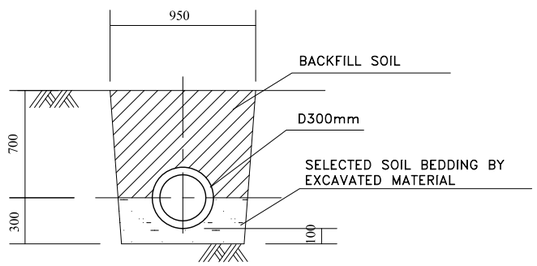
GODEY TOWN

TITLE	**TREATED WATER RESERVOIR**		
DATE	**AUG.2013**	DWG No.	**FS020**
CONSULTANT	**KOKUSAI KOGYO CO., LTD.**		
CLIENT	**JAPAN INTERNATIONAL COOPERATION AGENCY**		

N

280
285
290
295
300
295
300
280
285
290

IP1
B.P
0+500.00
IP2
1+000.00
IP3
IP4
IP5
1+500.00
IP6
2+000.00
IP7
IP8
2+500.00
IP9
3+000.00
3+500.00
4+000.00
IP10
4+500.00
IP11
E.P
4+998.00
El=304.3m



TRENCH EXCAVATION

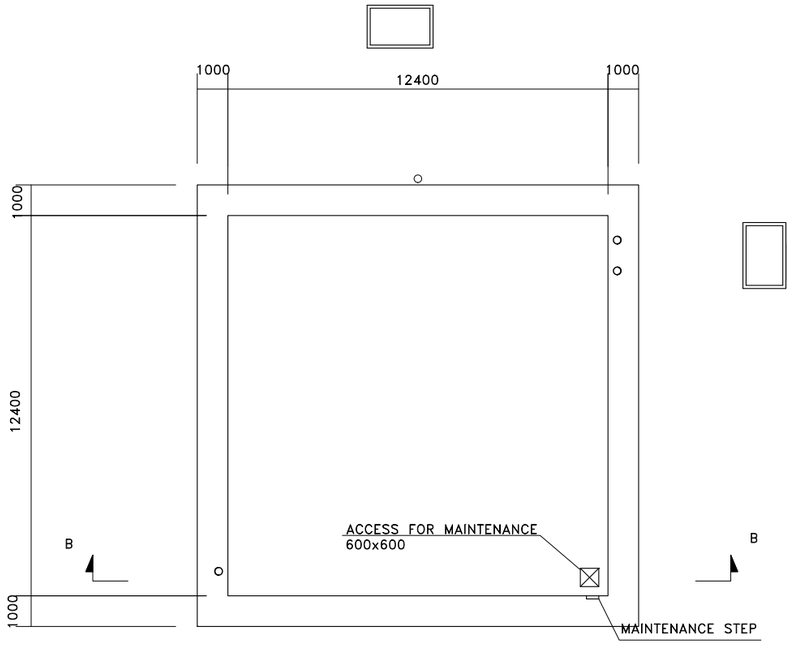
SCALE 0 100 200 300 400 500 m

THE STUDY ON JARAR VALLEY AND SHEBELE SUB-BASIN WATER SUPPLY DEVELOPMENT PLAN, AND EMERGENCY WATER SUPPLY IN THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA

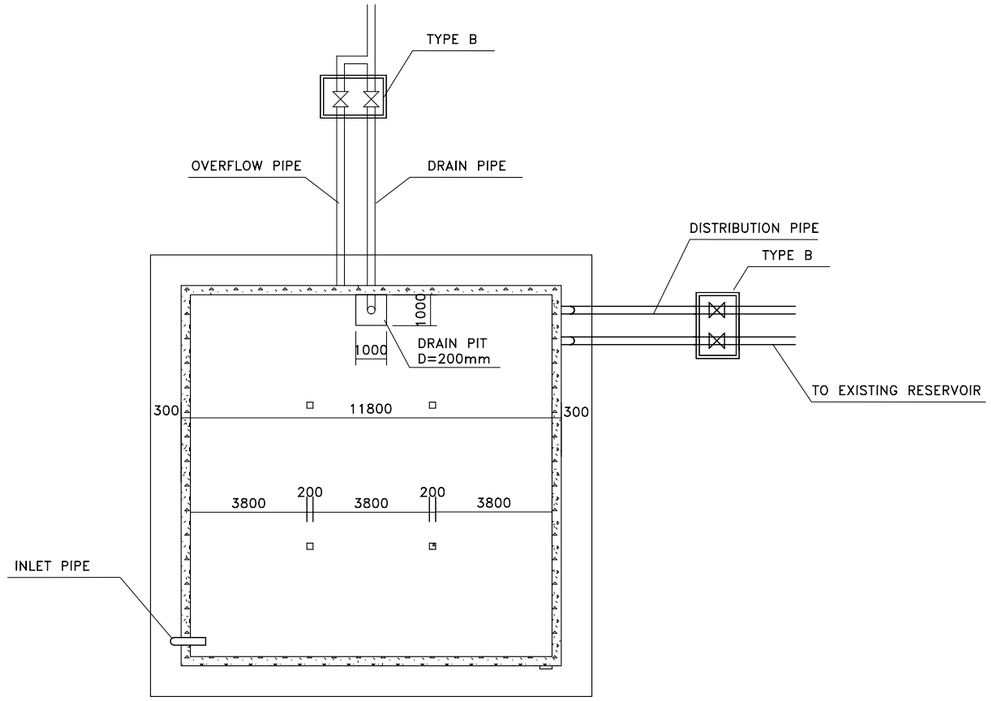
FEASIBILITY STUDY

GODEY TOWN

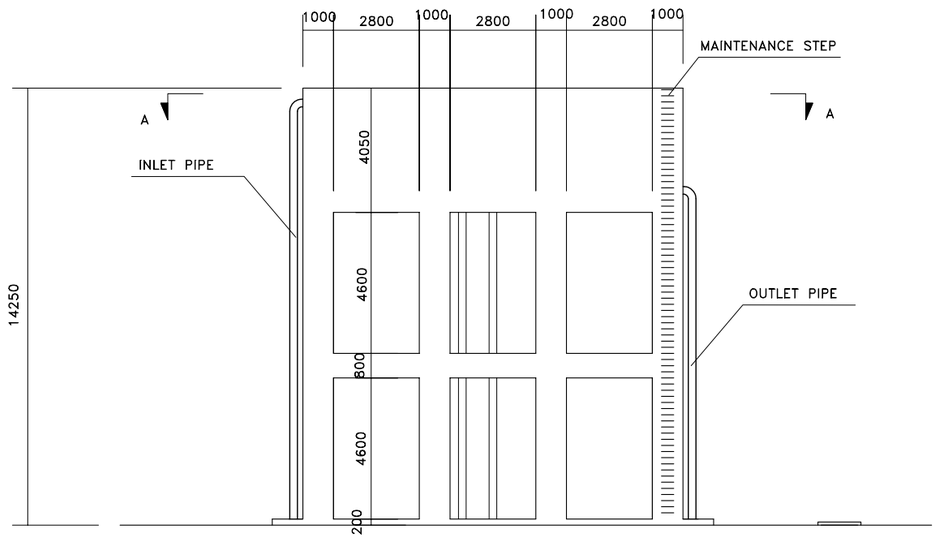
TITLE	**TRANSMISSION PIPELINE PLAN**		
DATE	**AUG.2013**	DWG No.	**FS021**
CONSULTANT	**KOKUSAI KOGYO CO., LTD.**		
CLIENT	**JAPAN INTERNATIONAL COOPERATION AGENCY**		



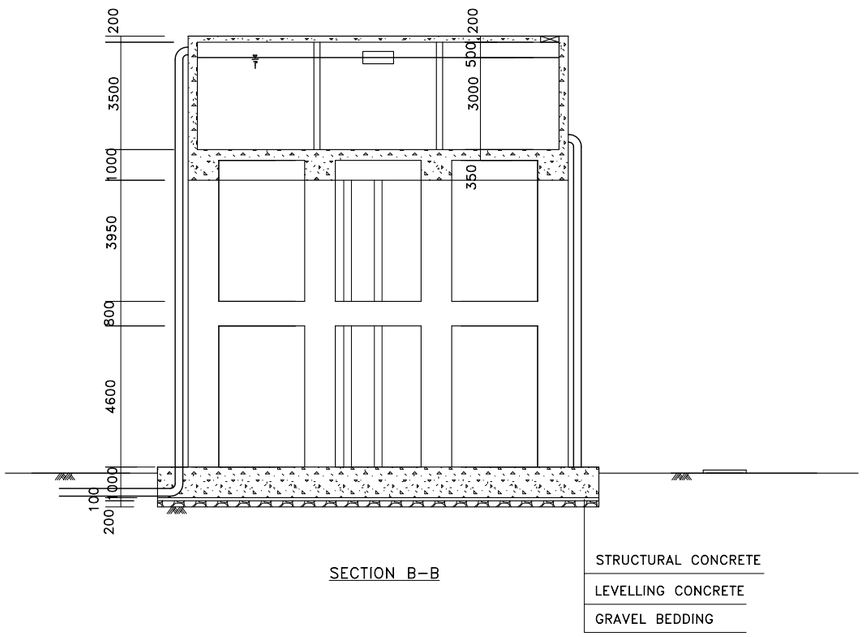
PLAN



SECTION A–A



ELEVATION



SECTION B–B

LEGEND

WATER SUPPLY PIPE

DRAIN PIPE

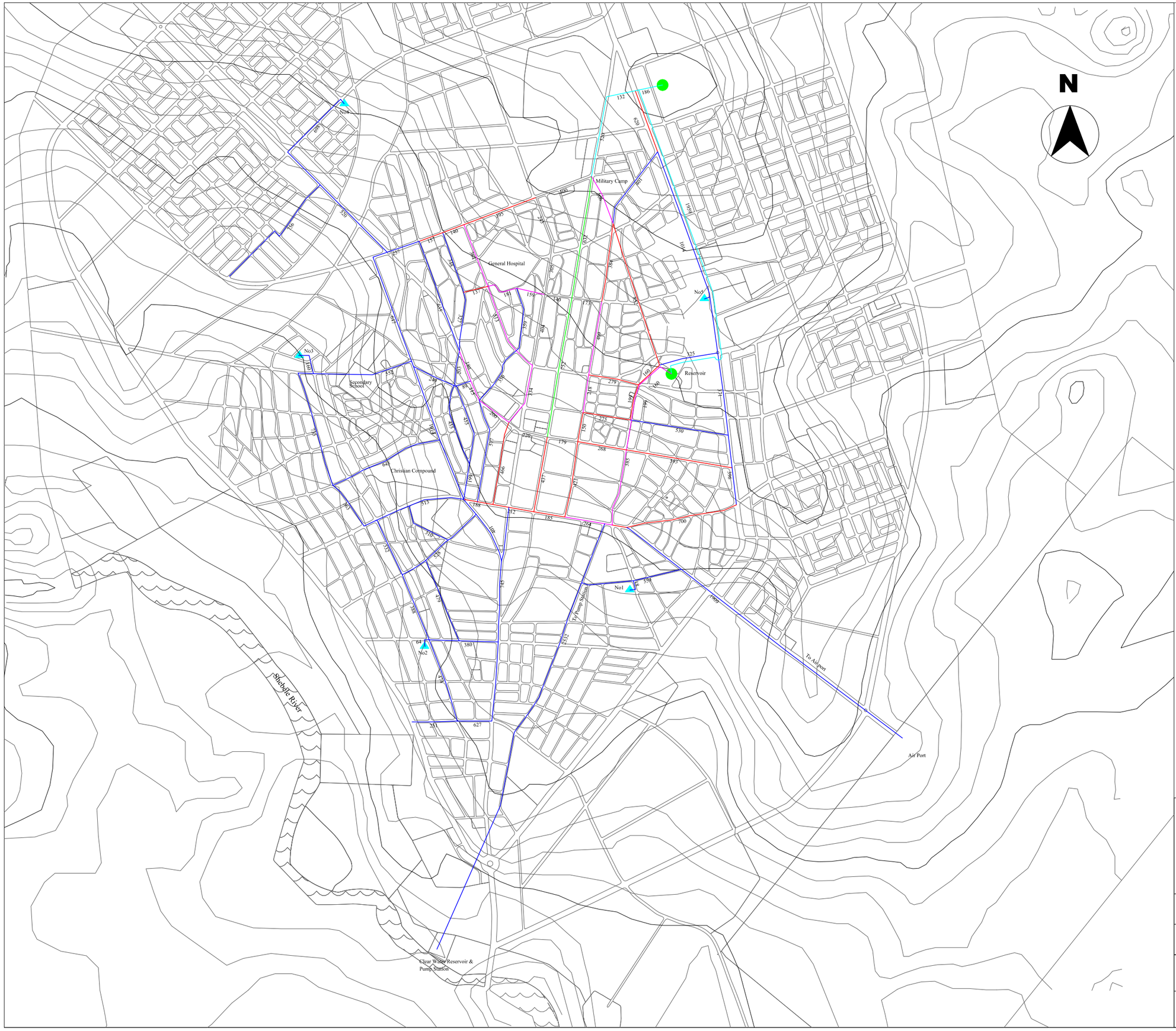
SCALE 0 4 8 12 16 20 m

THE STUDY ON JARAR VALLEY AND SHEBELE SUB-BASIN WATER SUPPLY DEVELOPMENT PLAN, AND EMERGENCY WATER SUPPLY IN THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA

FEASIBILITY STUDY

GODEY TOWN

TITLE	**ELEVATED RESERVOIR**		
DATE	**AUG.2013**	DWG No.	**FS022**
CONSULTANT	**KOKUSAI KOGYO CO., LTD.**		
CLIENT	**JAPAN INTERNATIONAL COOPERATION AGENCY**		



LEGEND

DISTRIBUTION PIPE

- Pipe 300mm
- Pipe 200mm
- Pipe 160mm
- Pipe 110mm
- Pipe 90mm
- Pipe 63mm

Length

Reservoir

Water points constructed by JICA Study

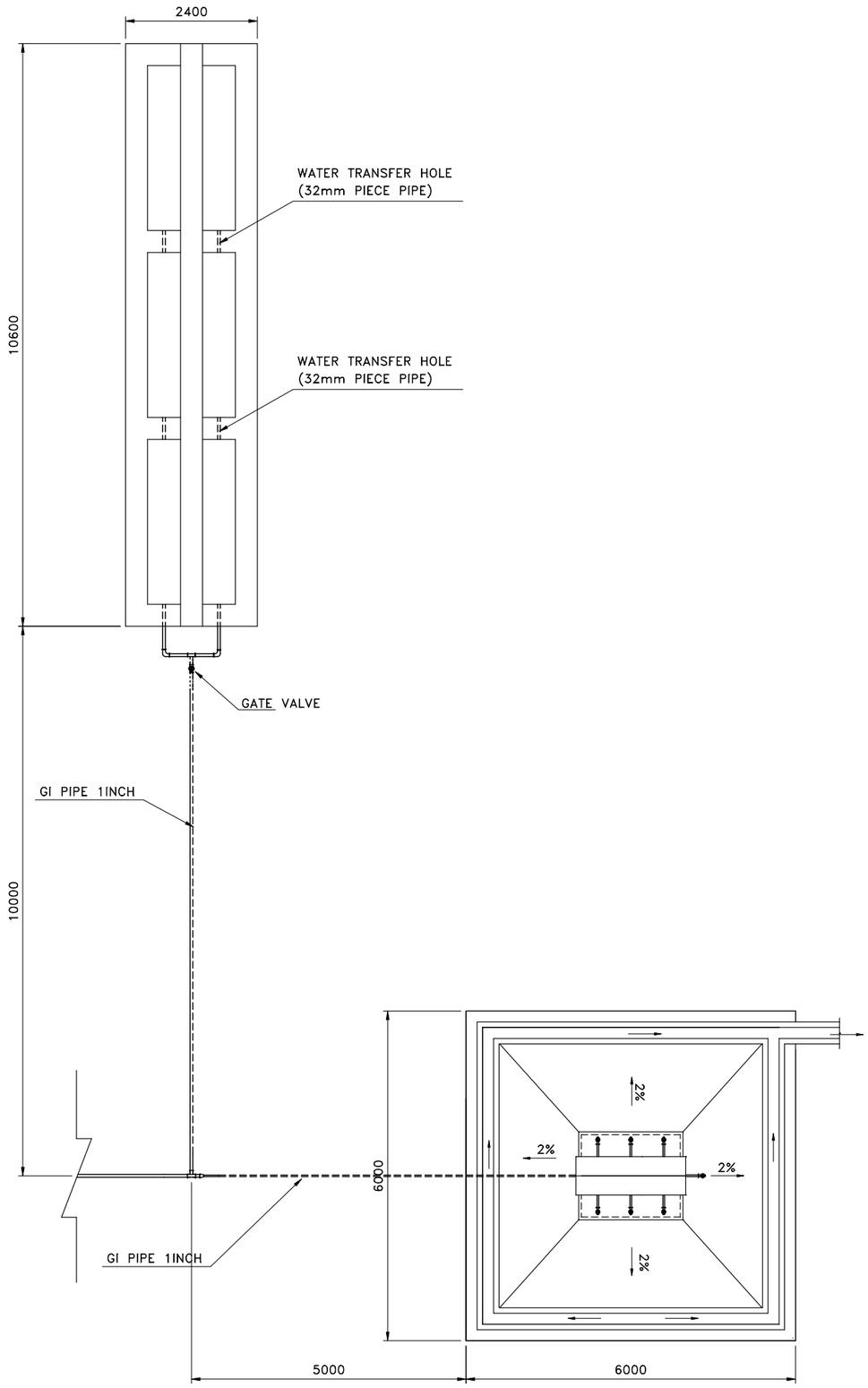
SCALE 0 200 400 600 800 1000m

THE STUDY ON JARAR VALLEY AND SHEBELE SUB-BASIN WATER SUPPLY DEVELOPMENT PLAN, AND EMERGENCY WATER SUPPLY IN THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA

FEASIBILITY STUDY

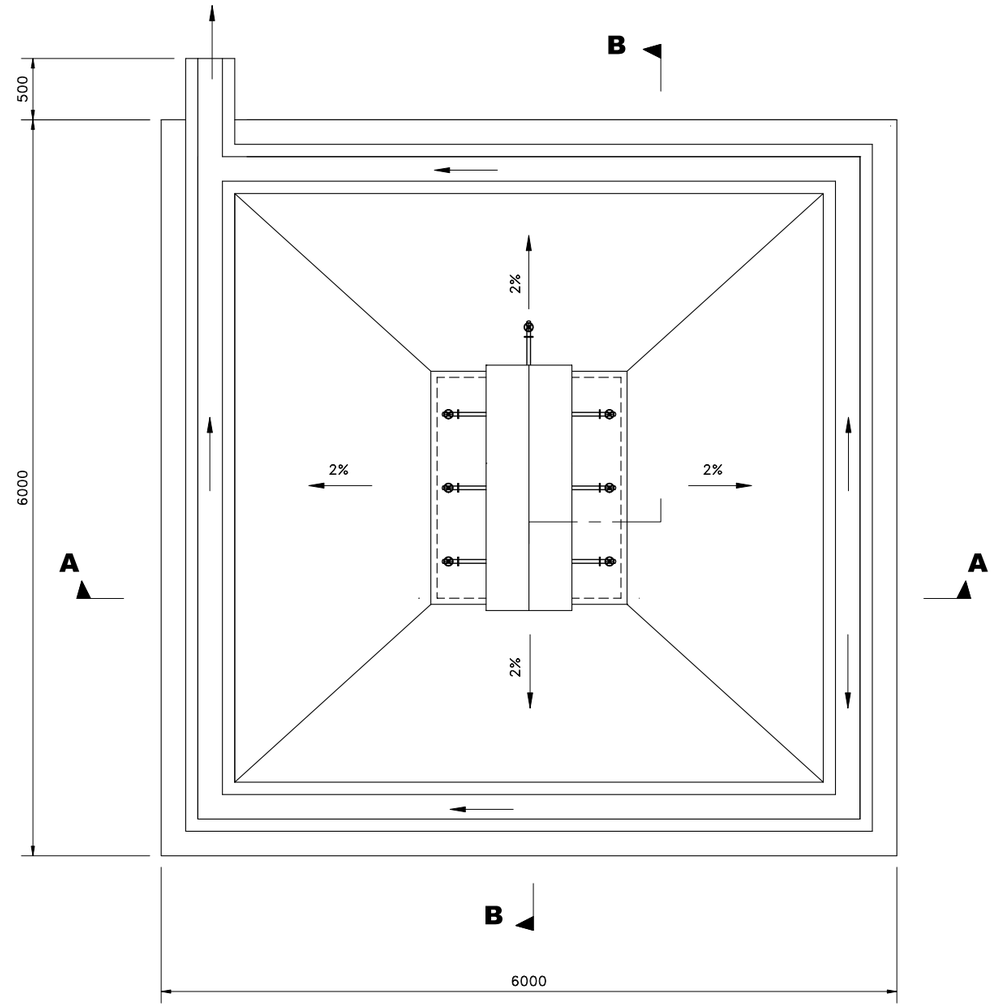
GODEY TOWN

TITLE	DISTRIBUTION PIPELINE PLAN		
DATE	AUG.2013	DWG No.	FS023
CONSULTANT	KOKUSAI KOGYO CO., LTD.		
CLIENT	JAPAN INTERNATIONAL COOPERATION AGENCY		

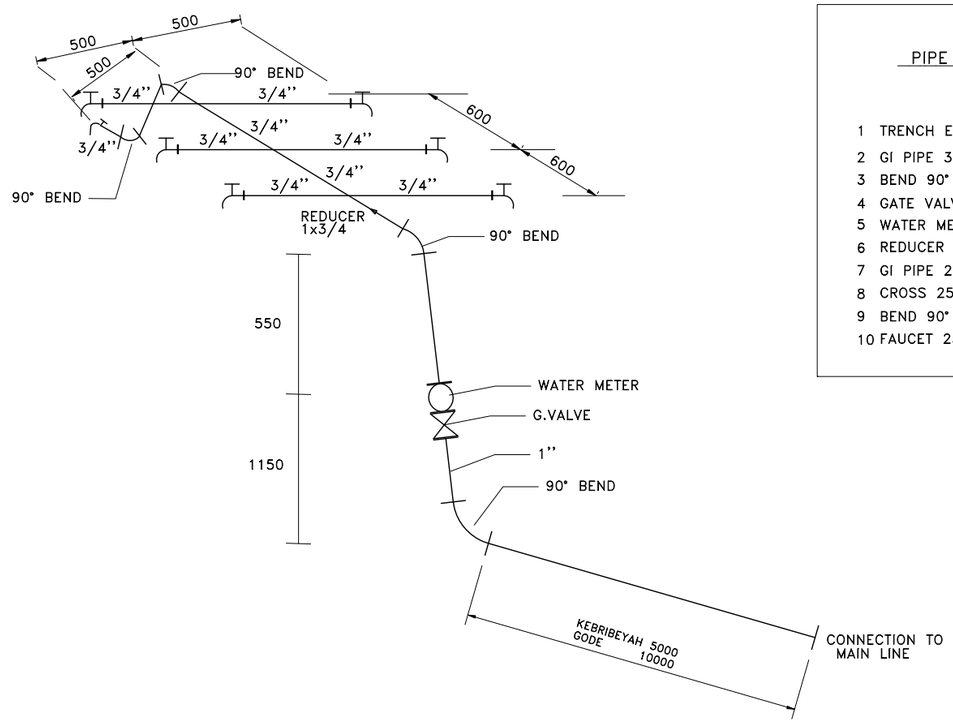


SCALE 0 1 2 3 4 5 m

THE STUDY ON JARAR VALLEY AND SHEBELE SUB-BASIN WATER SUPPLY DEVELOPMENT PLAN, AND EMERGENCY WATER SUPPLY IN THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA FEASIBILITY STUDY GODEY TOWN			
TITLE	WATER POINT LAYOUT		
DATE	AUG.2013	DWG No.	FS024
CONSULTANT	KOKUSAI KOGYO CO., LTD.		
CLIENT	JAPAN INTERNATIONAL COOPERATION AGENCY		



PLAN

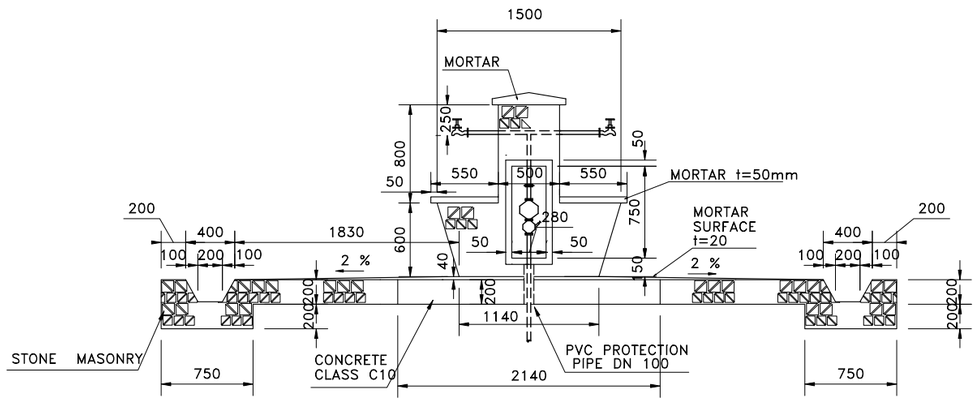


INSTALLATION SCHEME

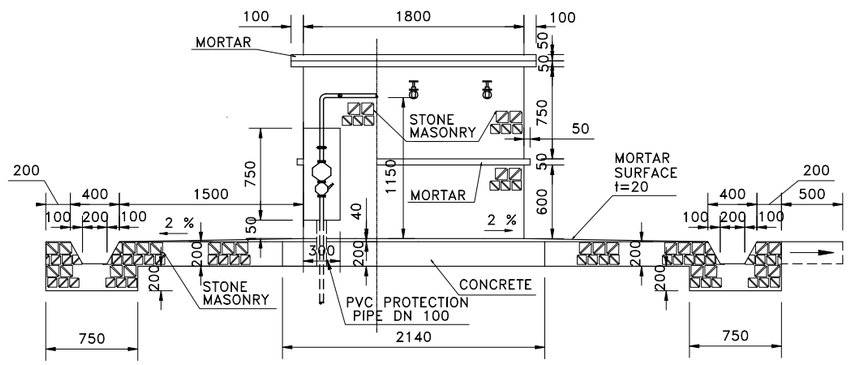
NOT TO SCALE

PIPE WORK ITEMS OF PUBLIC TAP

1	TRENCH EXCAVATION PE PIPE 32mm PN6	5 m
2	GI PIPE 32mm 6PN	1.7m
3	BEND 90° 32mm 6PN	2 nos
4	GATE VALVE 32mm PN6	1 nos
5	WATER METER 32mm 6PN	1 nos
6	REDUCER 32-25 (1-3/4 INCH) 6PN	1 nos
7	GI PIPE 25mm 6PN	4.7m
8	CROSS 25mm PN6	3 nos
9	BEND 90° 25mm 6PN	2 nos
10	FAUCET 25mm	7 nos



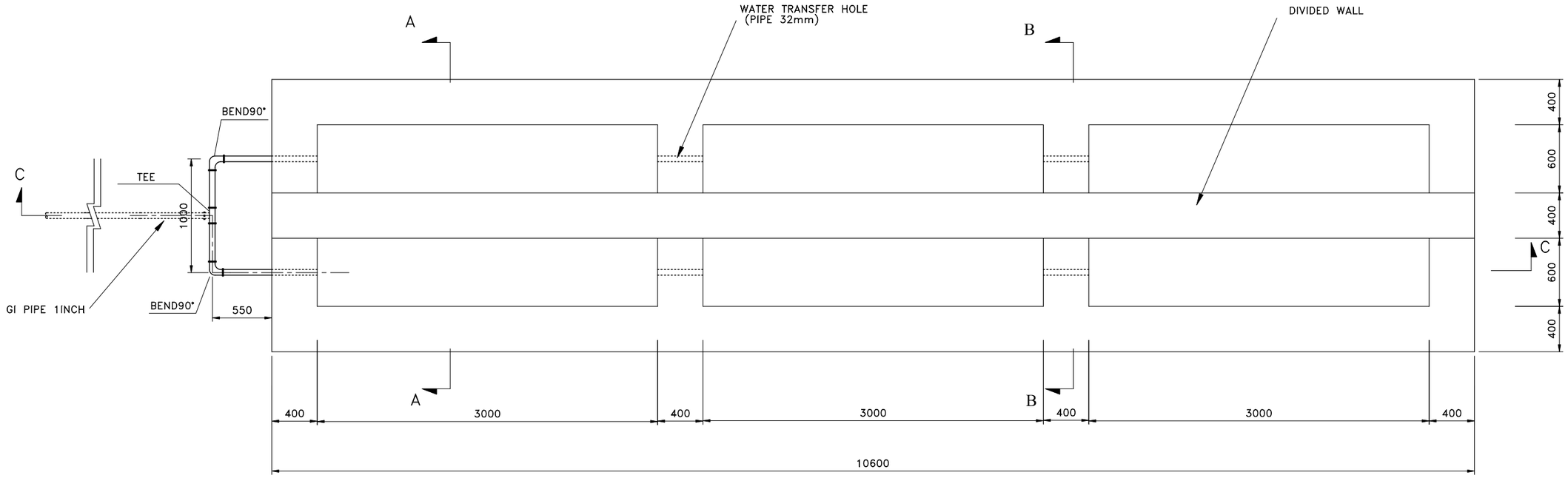
SECTION A–A



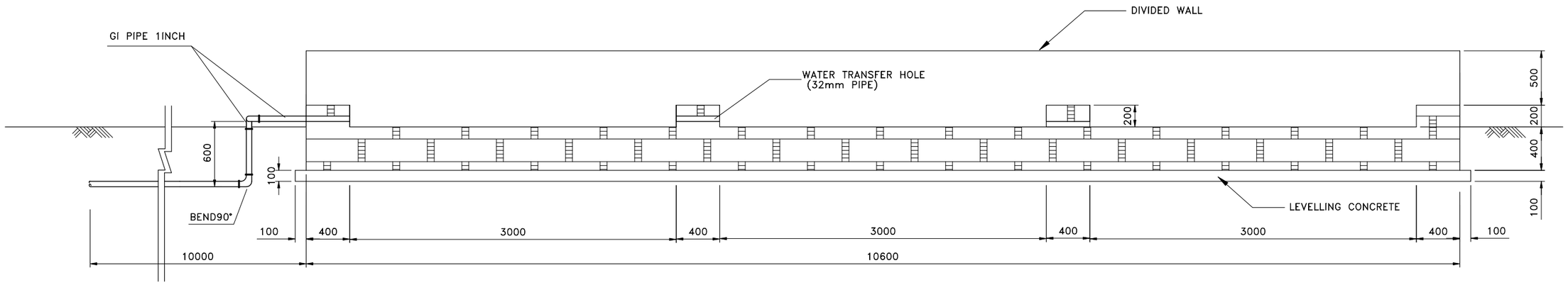
SECTION B–B

SCALE 0 500 1000 1500 2000 2500 mm

THE STUDY ON JARAR VALLEY AND SHEBELE SUB-BASIN WATER SUPPLY DEVELOPMENT PLAN, AND EMERGENCY WATER SUPPLY IN THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA FEASIBILITY STUDY GODEY TOWN			
TITLE	PUBLIC TAP		
DATE	AUG.2013	DWG No.	FS025
CONSULTANT	KOKUSAI KOGYO CO., LTD.		
CLIENT	JAPAN INTERNATIONAL COOPERATION AGENCY		



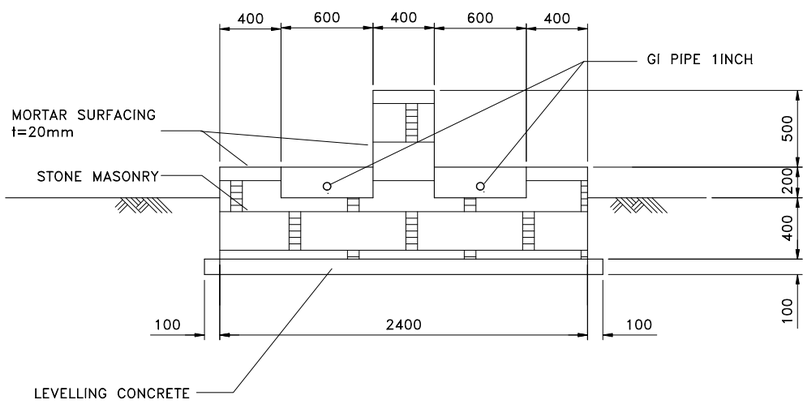
PLAN



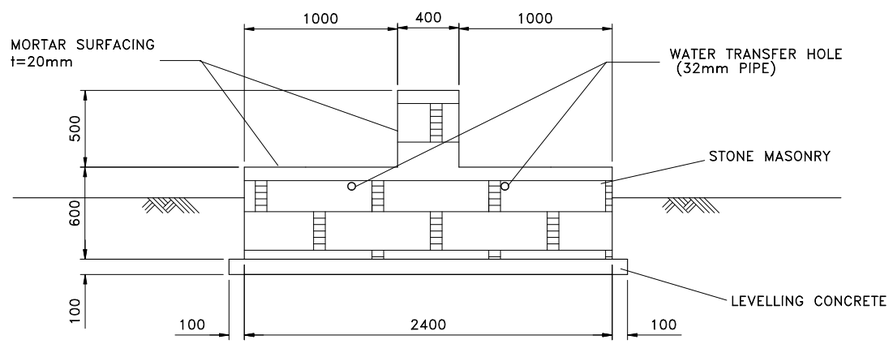
SECTION C–C

Note:

MORTAR SURFACE t=20mm SHALL BE APPLIED TO STRUCTURE'S SURFACE



SECTION A–A



SECTION B–B

SCALE 0 400 800 1200 1600 2000 mm

THE STUDY ON JARAR VALLEY AND SHEBELE SUB-BASIN WATER SUPPLY DEVELOPMENT PLAN, AND EMERGENCY WATER SUPPLY IN THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA FEASIBILITY STUDY GODEY TOWN			
TITLE	CATTLE TROUGH		
DATE	AUG.2013	DWG No.	FS026
CONSULTANT	KOKUSAI KOGYO CO., LTD.		
CLIENT	JAPAN INTERNATIONAL COOPERATION AGENCY		

Data.F.2 : Cost Estimation

(1) : Total operating cost estimation for Godey town feasibility study

(Unit:USD)

Item	cost	Foreign Component	Foreign	Local
Capital cost (Construction cost)				
1.1 Direct cost				
(1) Riverbed protection	5,500	40%	2,200	3,300
(2) Intake canal	37,500	40%	15,000	22,500
(3) Settling basin	26,300	40%	10,520	15,780
(4) Pump house				
1) Pump house	37,700	40%	15,080	22,620
2) Pump, pipe, fittings	245,900	97%	238,523	7,377
(5) Generator house				
1) Generator house	29,200	40%	11,680	17,520
2) Generator and fittings	72,800	97%	70,616	2,184
(6) Sedimentation pond				
1) Civil works	135,300	40%	54,120	81,180
2) Pipe and fittings	62,500	97%	60,625	1,875
(7) Rough filter				
1) Civil works	166,200	40%	66,480	99,720
2) Pipe and fittings	157,400	97%	152,678	4,722
(8) Slow sand filter				
1) Civil works	320,100	40%	128,040	192,060
2) Pipe and fittings	119,000	97%	115,430	3,570
(9) Clear water reservoir				
1) Civil works	132,000	40%	52,800	79,200
2) Pipe and fittings	47,000	97%	45,590	1,410
(10) Transmission pipeline	1,429,600	70%	1,000,720	428,880
(11) Elevated reservoir				
1) Civil works	229,500	40%	91,800	137,700
2) Pipe and fittings	32,200	70%	22,540	9,660
(12) Distribution pipeline	1,660,700	70%	1,162,490	498,210
(13) Public tap	56,700	40%	22,680	34,020
(14) Cattle trough	13,500	40%	5,400	8,100
(15) Other	251,400	70%	175,980	75,420
sub-total	5,268,000		3,520,992	1,747,008
Average			67%	33%
1.2 In-direct cost				
	1,775,000	67%	1,189,250	585,750
Construction cost total	**7,043,000**		**4,710,000**	**2,333,000**

(2): Detail of cost estimation for Godey feasibility study

*** Annual construction cost** (Unit:USD)

Western calendar (year)	2016	2017	2018	Total
Capital cost (Construction cost)	2,348,000	2,348,000	2,347,000	7,043,000

*** Price fluctuation for construction cost** (Unit:USD)

Western calendar (year)	2016	2017	2018	Total including price change	Total not including price change
1.Capital cost	2,680,000	2,680,000	2,669,000	8,029,000	7,043,000
Foreign	1,650,000	1,650,000	1,650,000	4,950,000	4,710,000
Local	1,030,000	1,030,000	1,019,000	3,079,000	2,333,000

*** Operating cost (total)** (Unit:USD)

Item	cost	Foreign Component	Foreign	Local
1. Engineering service expenses(15% of construction cost, rounding up of the last three digits)				
	1,057,000	67%	708,000	349,000
2. Administration expenses and Contingency(15% of construction cost, rounding up of the last three digits)				
	705,000	67%	472,000	233,000
Recurrent cost	1,762,000		1,180,000	582,000

*** Annual operating cost** (Unit:USD)

Western calendar (year)	2016	2017	2018	Total
Recurrent cost				
1. Engineering service expenses	264,000	264,000	265,000	1,057,000
2.Administration expenses and contingency	176,000	176,000	177,000	705,000
Total	440,000	440,000	442,000	1,762,000

*** Annual price fluctuation for construction cos** (Unit:USD)

Western calendar (year)		2015	2016	2017	2018	Total including price change	calculation	Total not including price change
Recurrent cost								
1.Engineering service expenses		282,000	282,000	282,000	297,000	1,143,000		1,057,000
	Foreign	182,000	182,000	182,000	183,000	729,000	standard operating cost×{1+（20months/12months）×0.018}	708,000
	Local	100,000	100,000	100,000	114,000	414,000	standard operating cost×{1+（20months/12months）×0.113}	349,000
2.Administration expenses and contingency		192,000	192,000	192,000	186,000	762,000		705,000
	Foreign	122,000	122,000	122,000	120,000	486,000	standard operating cost×{1+（20months/12months）×0.018}	472,000
	Local	70,000	70,000	70,000	66,000	276,000	standard operating cost×{1+（20months/12months）×0.113}	233,000
Total		474,000	474,000	474,000	483,000	1,905,000		1,762,000

* Total cost with annual price fluctuation

(Unit:USD)

Western calendar (year)	2015	2016	2017	2018	Total including price change	Total not including price change
Recurrent cost						
1.Engineering service expenses	282,000	282,000	282,000	297,000	1,143,000	1,057,000
Foreign	182,000	182,000	182,000	183,000	729,000	708,000
Local	100,000	100,000	100,000	114,000	414,000	349,000
2.Administration expenses and contingency	192,000	192,000	192,000	186,000	762,000	705,000
Foreign	122,000	122,000	122,000	120,000	486,000	472,000
Local	70,000	70,000	70,000	66,000	276,000	233,000
Total	474,000	474,000	474,000	483,000	1,905,000	1,762,000

Data.F.3 : Socio-economic Survey Data for Godey town Feasibility Study

(1) : Economic Project Costs for Godey Town

(Unit:USD)

Western calendar (year)	2015	2016	2017	2018	Total not including price change
Items					
1.Construction cost	0	2,348,000	2,348,000	2,347,000	7,043,000
2. Engineering services	264,000	264,000	264,000	265,000	1,057,000
3.Administration and Physical contingency	176,000	176,000	176,000	177,000	705,000
Base costs	440,000	2,788,000	2,788,000	2,789,000	8,805,000

(2) : Cash Flow for Calculation of Economic Indicators for Godey Town FS

(Unit:USD)

Year	Incremental Net Benefit			Incremental Costs			Net Cash Flow	Discount Factor at 10%	Present Value at 10%
	Time Savings	Health	Total	Investment Cost	O & M Cost	Total Cost			
2015	0	0	0	440,000	0	440,000	-440,000	0.909	-400,000
2016	0	0	0	2,788,000	0	2,788,000	-2,788,000	0.826	-2,304,132
2017	0	0	0	2,788,000	0	2,788,000	-2,788,000	0.751	-2,094,666
2018	0	0	0	2,789,000	0	2,789,000	-2,789,000	0.683	-1,904,925
2019	1,744,287	41,478	1,785,765	0	212,051	212,051	1,573,714	0.621	977,152
2020	1,795,046	42,685	1,837,730	0	212,051	212,051	1,625,679	0.564	917,654
2021	1,795,046	42,685	1,837,731	0	212,051	212,051	1,625,680	0.513	834,231
2022	1,795,046	42,685	1,837,731	0	212,051	212,051	1,625,680	0.467	758,392
2023	1,795,046	42,685	1,837,731	0	212,051	212,051	1,625,680	0.424	689,447
2024	1,795,046	42,685	1,837,731	0	212,051	212,051	1,625,680	0.386	626,770
2025	1,795,046	42,685	1,837,731	0	212,051	212,051	1,625,680	0.35	569,791
2026	1,795,046	42,685	1,837,731	0	212,051	212,051	1,625,680	0.319	517,992
2027	1,795,046	42,685	1,837,731	0	212,051	212,051	1,625,680	0.29	470,902
2028	1,795,046	42,685	1,837,731	0	212,051	212,051	1,625,680	0.263	428,092
2029	1,795,046	42,685	1,837,731	0	212,051	212,051	1,625,680	0.239	389,175
2030	1,795,046	42,685	1,837,731	0	212,051	212,051	1,625,680	0.218	353,795
2031	1,795,046	42,685	1,837,731	0	212,051	212,051	1,625,680	0.198	321,632
2032	1,795,046	42,685	1,837,731	0	212,051	212,051	1,625,680	0.18	292,393
2033	1,795,046	42,685	1,837,731	0	212,051	212,051	1,625,680	0.164	265,812
2034	1,795,046	42,685	1,837,731	0	212,051	212,051	1,625,680	0.149	241,647
Total	28,669,977	681,753	29,351,729	8,805,000	3,392,816	12,197,816	0.138		1,951,154

EIRR	13.8%
NPV	USD 2.0 million
B/C	1.2

* EIRR : Economic Internal Rate of Return, NPV : Net Present Value, B/C : Benefit-Cost Ratio

(3) : Financial Project Costs for Godey Town FS

(Unit:USD)

Item	2015	2016	2017	2018	Total
Construction cost	0	2,348,000	2,348,000	2,347,000	7,043,000
Engineering services	264,000	264,000	264,000	265,000	1,057,000
Administration and Physical contingency	176,000	176,000	176,000	177,000	705,000
Base costs *	440,000	2,788,000	2,788,000	2,789,000	8,805,000
Price contingency	34,000	366,000	366,000	363,000	1,129,000
Total	474,000	3,154,000	3,154,000	3,152,000	9,934,000

(4) : Comparison of recovery of Operation and Maintenance Costs

(unit)	rate for water sale revenue (Birr/m^3)	Annual O&M cost (US$)	Annual maximum collection (US$)	Recovery ratio at 100% of (%)
Case 1	10	448,648	145,598	308%
Case 2	15	448,648	218,397	205%
Case 3	32.5	448,648	473,194	95%
Case 4	50	448,648	729,990	62%

Data F.4 : Oparation and Maintenance cost of Water Supply Facilities for Godey FS

(1) : Monthly Operational Cost Breakdown for Godey Town feasibility study

Godey Town

	Cost (Birr/month)	Remarks
Spare parts		
Oil filter for generator	400	2 time per year for 2 generators
Air filter for generator	200	2 time per year for 2 generators
Fan belt for generator	100	once per year for 2 generators
Pump gland packing	267	once per year for 4 ground pumps
Pump mechanical seal	667	once per year for 4 ground pumps
Pump bearing	222	once in 3 years for 4 ground pumps
Sub-total	1,856	
Power supply		
Diesel fuel	184,320	For 2 generators of 120kVA, 10 hour/day operation
Electricity (commercial)	0	
Sub-total	184,320	
Personnel		
Technician	8,500	Leader of operator team, Total 5 persons
Lab technician	3,000	2 persons
Operator	13,200	11 persons
Assistant operator	4,000	to assist operator in handling chemicals, 5 persons
Guard	16,200	27 people employed
Daily worker	34,608	Total 5191 day-person
Sub-total	79,508	
Chemical		
Coagulant agent	43,986	For 1418m^3/day water at 100mg/L
pH adjusting agent	5,802	proportional to coagulant dose at 40mg/L
Chlorination agent	9,189	For 1418m^3/day water, same dose thoughout the year of 3mg/L
Sub-total	58,977	
Consumable		
Engine oil for generator	583	2 times per year for 2 generators of 120kVA
Tools for cleaning	2,198	Shovels and scrapers for Max 15 workers, dewatering pump
Sub-total	2,781	
Others		
Transportation of consumables	0	by 4-ton truck from Addis Ababa
Replacement of pump	0	replaced every 5 years assumed that they are inported duty free from overseas
Total	327,442	

Data F.4(2) : Unit Cost Calculation Sheet for Basic Cost Items for Godey town

1. Pump electric energy consumptior

	Pump rated power (kW)	Efficiency	Actual consumpation (kW)	Operation time (hour/day)	Monthly cost(Birr)	Remark
1)	35	0.8	43.75	10	9,108	Tariff category "general" of EEPCGeneral applie(Base 35.258 Birr, up to 50kwh 0.6088,
2)	75	0.8	93.75	12	23,428	over 50kWh 0.6943

2. Pump fuel consumption (generator + pump)

		Fuel efficiency (L/h)	Operation time (hour/day)	Diesel fuel cost (Birr/L)	Monthly cost(Birr)	Remark
1)	New submersible pump in Kabribeyah Town (JICA)	5	11	14.7	24,255	Measured value 4-5L/h
2)	Exisgint submersible pump ir Kabribeyah Town(UNHCR)	5	11	14.7	24,255	Reported measured value 5-6L/h
3)	Planned new well in Kabribeyah Town	7	11	14.7	33,957	Denyo catalogue spec
4)	Existing generator in Godey Town	5.8	10	19.2	33,408	Reported measureed (35kW)
5)	Planned generator in Godey Town L	130	10	19.2	748,800	Estimated (640kW)
6)	Planned generator in Godey Town M	75	10	19.2	432,000	Estimated (300kVA)
7)	Existing generator of Godey Town S	16	10	19.2	92,160	Estimated (120kVA)

3. Chemical cost for rural systems

	Dose concentration (powder)	Amount of water m^3/day	Amount of agent (kg)/day	Unit cost of agent (Birr/kg)	Monthly cost (Birr)	Remark
1)	Coagulant dosagee (woreda) 100.0 mg/L	1000	100	10.34	31,020	Example of use of Alminum sulphate at AAWSA, dose curve from Tokyo metropolitan water supply Intake water turbidity 500-600NTU
2)	Chlorine dosagee (woreda) 3.0 mg/L	1000	3	72	6,480	Calcium hypochlorite powder Example of use at AAWSA
3)	pH adjustor dosagee (woreda) 40.0 mg/L	1000	40	3.41	4,092	Calcium hydroxicide powder Example of use at AAWSA

4. Chemical cost for Kabribeyah and Godey towns

	Dose concentration (powder)	Amount of water m^3/day	Amount of agent (kg)/day	Unit cost of agent (Birr/kg)	Monthly cost (Birr)	Remark
1)	Coagulant dosagee (average for Godey) 100.0 mg/L	1418	141.8	10.34	43,986	Example of use of Alminum sulphate at AAWSA, dose curve from Tokyo metropolitan water supply Intake water turbidity 500-600NTU
2)	pH adjustor dosagee (average for Godey) 40.0 mg/L	1418	56.72	3.41	5,802	Calcium hypochlorite powder Example of use at AAWSA
3)	Chlorine dosagee (average for Godey) 3.0 mg/L	1418	4.254	72	9,189	Calcium hydroxicide powder Example of use at AAWSA
4)	Chlorine dosagee (average for Kabribeyah) 2.0 mg/L	2249	4	72	9,716	Calcium hydroxicide powder for cleaner water than Godey

5. Cost of water treatment chemical for household use

		Unit cost (Birr/package)	Treat volume (L/package)	Unit cost (Birr/m^3)	Monthly cost (Birr/ 1000 people)	Remark
1)	PSI Aqua guard (liguid)	3.44	1000	3.44	820	in 200ml bottle applied to 53% of water based on 15L/capita supply
2)	Bishan Gari (powder)	1.3	20	65	15,503	in small package applied to 53% of water based on 15L/capita supply

6. Cost of Day Workers for Godey Town System

		Facility and work	No. of worker	No. of days	Frequency (time/year)	Target facility/equipment	man-day	Monthly cost (Birr/month)
1	1)	Sludge removal	20	1	1	1	20	133
1	2)	screen cleaning	2	0.5	48	4	192	1,280
1	3)	Sludge and garbage removal	4	0.5	4	4	32	213
2	2)	Pump spare parts	2	1	1	4	8	53
2	2)	Pump spare parts	2	1	0.3	4	3	18
3	2)	Spare part replacement	1	0.5	2	2	2	13
3	2)	Spare part replacement	1	0.5	1	2	1	7
4	1)	Sludge removal Dry season	15	2	2	3	180	1,200
4	2)	Sludge removal Rainy season	30	5	6	3	2700	18,000
5	1)	Surface sludge removal	5	2	1	5	50	333
5	2)	Filter cleaning	5	5	0.5	5	63	417
6	1)	Sludge removal in slow sand filter	20	2	6	5	1200	8,000
6	2)	Sand washing and reuse	20	5	1	5	500	3,333
7	1)	Cleaning	20	1	1	1	20	133
8	1)	Cleaning	6	0.5	1	1	3	20
9	1)	Cleaning	12	0.5	1	3	18	120
11	1)	Pipeline repair	20	5	2	1	200	1,333
		Total					5191	34,608

7. Annual average cost of tools and equipment for O&M work in Godey Tow

		Unit price (Birr)	Life (year) or Q'ty	Q'ty 2	Monthly cost (Birr)	Remark
1)	Dewatering pump (engine type)	30,000	3	1	833	Capacity: H=15m, Q=2L/s
2)	Fuel for pump	19	30	5	240	30L fuel consumed per work
3)	Shovel, scraper, rake	500	15	1	625	For max number of workers
4)	Rope, butcket, soil carrier box	1,200	5	1	500	For 1/3 of max number of workers
	Total				2,198	

Data F.4(3) : Unit Price List of Major Items

Item	Unit price (Birr)	Unit cost	Detail of item	Remarks
1. **Spare parts (generator of 75kW)**				10 year life, diesel 3 phase
Air filter for generator (75kW)	600 / piece			every 6 months
Oil filter for generator (75kW)	1,200 / piece			every 6 months
Engine Oil	1,000 / 20 L			every 6 months
Fan belt for generator(75kW)	600 / piece			every 2 years
2. **Spare parts (Surface pump)**				5 year life
Surface pump gland packing	600 / piece(3m)			One a year
Surface pump mechanical seal	1,000 / piece			One a year
Shaft bearing	2,000 / piece			every 3 years
3. **Large equipment**				
Ground pump unit for K/B	552,000 / set		75kW with control panel	EMU invoice
Submersible pump for K/B	220,000 / set		15kW with control panel	D&S invoice
Generator for K/B	332,000 / set		35kW (40kVA)	D&S invoice
Ground pump unit for Godey	500,000 / set		45kW equivalent	
Ground pump unit for Godey (revision)	400,000 / set		45kW and 15kW equivalent	
Generator for Godey	1,920,000 / set		300kVA	Denyo std price x 0.6
Generator for Godey (after revision)	1,200,000 / set		130kVA	Denyo std price x 0.6
Generator S	180,000 / set		10kVA	Denyo std price x 0.5
Generator S	250,000 / set		20kVA	
Generator M	332,000 / set		40kVA	D&S invoice
Generator L	680,000 / set		90kVA	
Generator L	820,000 / set		120kVA	Denyo std price x 0.5
Submersible pump S	160,000 / set		4kVA	
Submersible pump M	200,000 / set		12kVA	Kawamoto submersible pump
Submersible pump L	500,000 / set		30kVA	
Ground pump unit S	102,000 / set		8kVA	Japanese retailer's website(http://www.mizu-syori.com
Ground pump unit M	200,000 / set		15kVA	Japanese retailer's website(http://www.mizu-syori.com
Ground pump unit L	430,000 / set		40kVA	Japanese retailer's website(http://www.mizu-syori.com
4. **Power supply**				
Commercial electricity (base charge)	35.258 / month		Category general 3 phase 380V	for pump operation
Commercial electricity (block charge 1)	0.6088 / kWh		0 to 50 kWh	
Commercial electricity (block charge 2)	0.6943 / kWh		more than 51 kWh	
Diessel fuel 1 (Godey)	3830 / 200 L		19.2birr/L	for generator operation (data from Godey WD)
Diessel fuel 2 (Jijiga)	14.7 / L			Jijiga GAS station (with VAT, it is 16.9birr)
Gasoline	16.9 / L			Jijiga GAS station (with VAT it is 19.5birr)
Fuel consumption of generator (Godey)	5.8 / L/h			Measured value, same for the two existing generators
JICA new wells	4.5 / L/h			Measured value

Item	Unit price (Birr)	Unit cost	Detail of item	Remarks
5. **Personnel (KB Proposed)**				
Manager	3,000 / month			
Water supply engineer from water desk	150 / day		only per diem for field work	
Technician	1,500 / month			
Operator	1,000 / month			
Plumber	800 / month			
Security Guard	500 / month			
Daily labor	120 / day			
cleaner	420 / month			
Bill collector	750 / month			
Collector	600 / month			
Cashier	600 / month			
Meter reader	600 / month			
6. **Personnel (Godey Proposed)**				
Manager	5,670 / month			
Water supply engineer from water desk	150 / day		only per diem for field work	
Technician	1,700 / month			
Lab technician	1,500 / month			
Operator	1,200 / month			
Assistant operator	800 / month			
Plumber	1,200 / month			
Security Guard	600 / month			
Daily labor	80 / day			
Cleaner	570 / month			
Bill collector	1,200 / month			
Cashier	1,295 / month			
Meter reader	1,295 / month			
7. **Consumable**				
Chlorination chemical	2,200 / 40 kg	55 birr/kg	Calcium hypochlorite (powder)	AGECA, effective Cl 65 %
Chlorination chemical	3,594 / 50 kg	72 birr/kg	Calcium hypochlorite (powder)	WAGTECH (Cl purity 70%)
Coagulant	10,339 / 1000 kg	10.34 birr/kg	Alminum sulphate	AWASH Melkasa
Lime (pH adjustor)	341 / 100 kg	3.41 birr/kg	Calcium hydroxicide (powder)	Dakasos Industrial
Engine oil for generators	600 / 5L			
Water treatment agent (household use)	1300 / 1000 pack	1.3 birr/L	Bishan Gari sachets (powder)	Each pack good for 20L of dirty water, 0.065birr/L
WuhaAgar (water guard)	3.44 / bottle	0.0034 birr/L	Liquid 200ml	PSI, good for 1000L water, 0.00344birr/L
Dewatering pump with engine	40,000 / set		2L/s at 15m	
8. Transportation				
Packed chemical by truck	8000 / round trip		From Addis to K/B, full load 4-ton truck	truck can get another load back to Addis
Packed chemical by truck	14400 / round trip		From Addis to Godey, full load 4-ton truck	truck can get another load back to Addis
Packed chemical (for HH) by truck	14400 / round trip		From Jijiga to each woreda on average	Use 1 ton truck or single cabin pick up
Packed Bishan Gari 180 carton	20250 / round trip		If buy Bishan Gari, to Jijiga and Godey	

Supporting Report

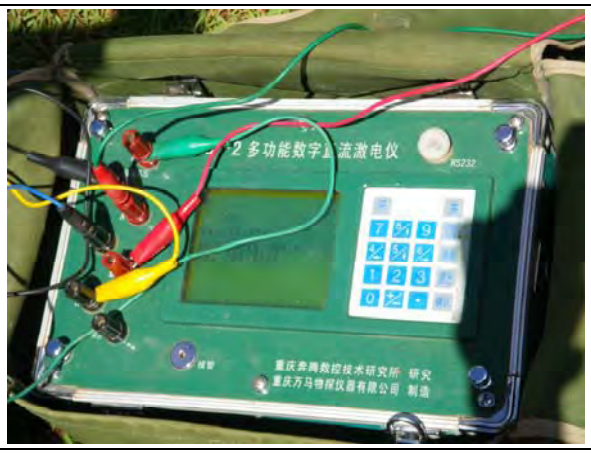
1. Geophysical Survey

Data S.1.1 : Photos of Geophysical Prospecting (TEM method)

EWTEC's TEM instruments	Condition of the road leading to the Qaaxo-North survey area
View of the study area (Qaaxo-North, near measuring point 5)	View of the study area (Qaaxo-North, near measuring point 18)
Preparing fuel for the generator (Qaaxo-North, near measuring point 5)	Setting up the transmission loop (Qaaxo-North, near measuring point 4)

Setting up the transmission loop （Qaaxo-North, near measuring point 18）	Study preparations (the Jerar Valley is in the distance) （Qaaxo-North, measuring point 24）
Measuring with electrical prospecting Receiver and measurement coil （Qaaxo-North, near measuring point 18）	Measuring with electrical prospecting Receiver and measurement coil （Qaaxo-East, near measuring point 1-1）
Measuring with electrical prospecting Receiver and generator （Qaaxo-East, measuring point 17）	Measuring with electrical prospecting Transmitterer and generator （Qaaxo-East, measuring point 4）

Data S.1.2 : Photos of Geophysical Prospecting (VES method)

	
PASI electric prospecting devices (Italy) L:Current; R : 16GL transmitter/receiver	Electric prospecting device (Chongging Wanman Geophysical Instrument Company, China) WDJD-2transmitter/receiver
Checking measurements (in UNHCR compound)	Moving to a measuring point (Qaaxo-North, near measuring point 6)
Preparing for measurements (Qaaxo-North, measuring point 6)	Preparing for measurements (Qaaxo-North, measuring point 6)

Preparing for measurements
（Qaaxo-North, measuring point 3-1）

Preparing for measurements
（Qaaxo-North, measuring point 28）

Preparing for measurements
（Qaaxo-North, measuring point 3-1）

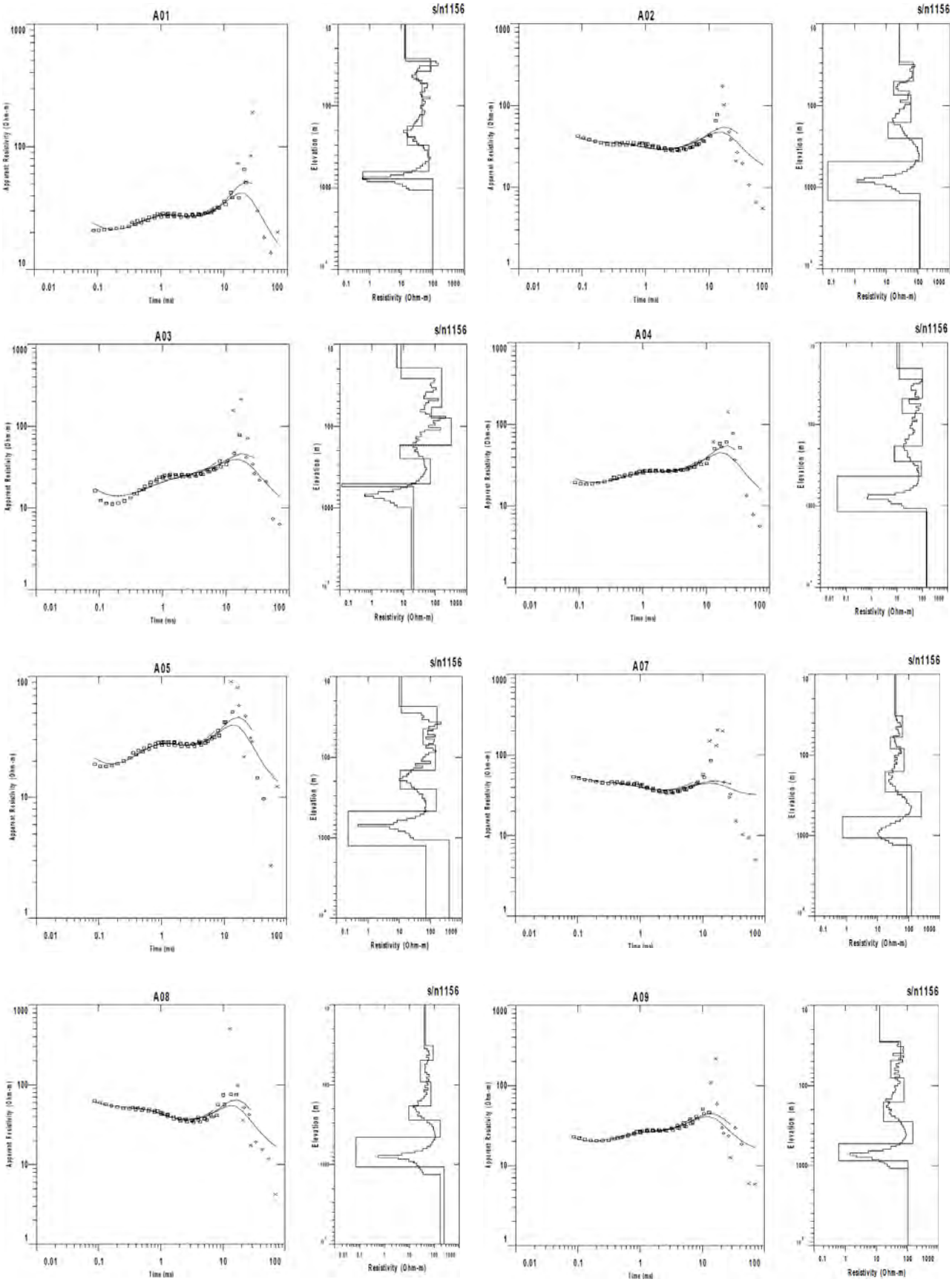
Taking measurements
（Qaaxo-North, measuring point 4）

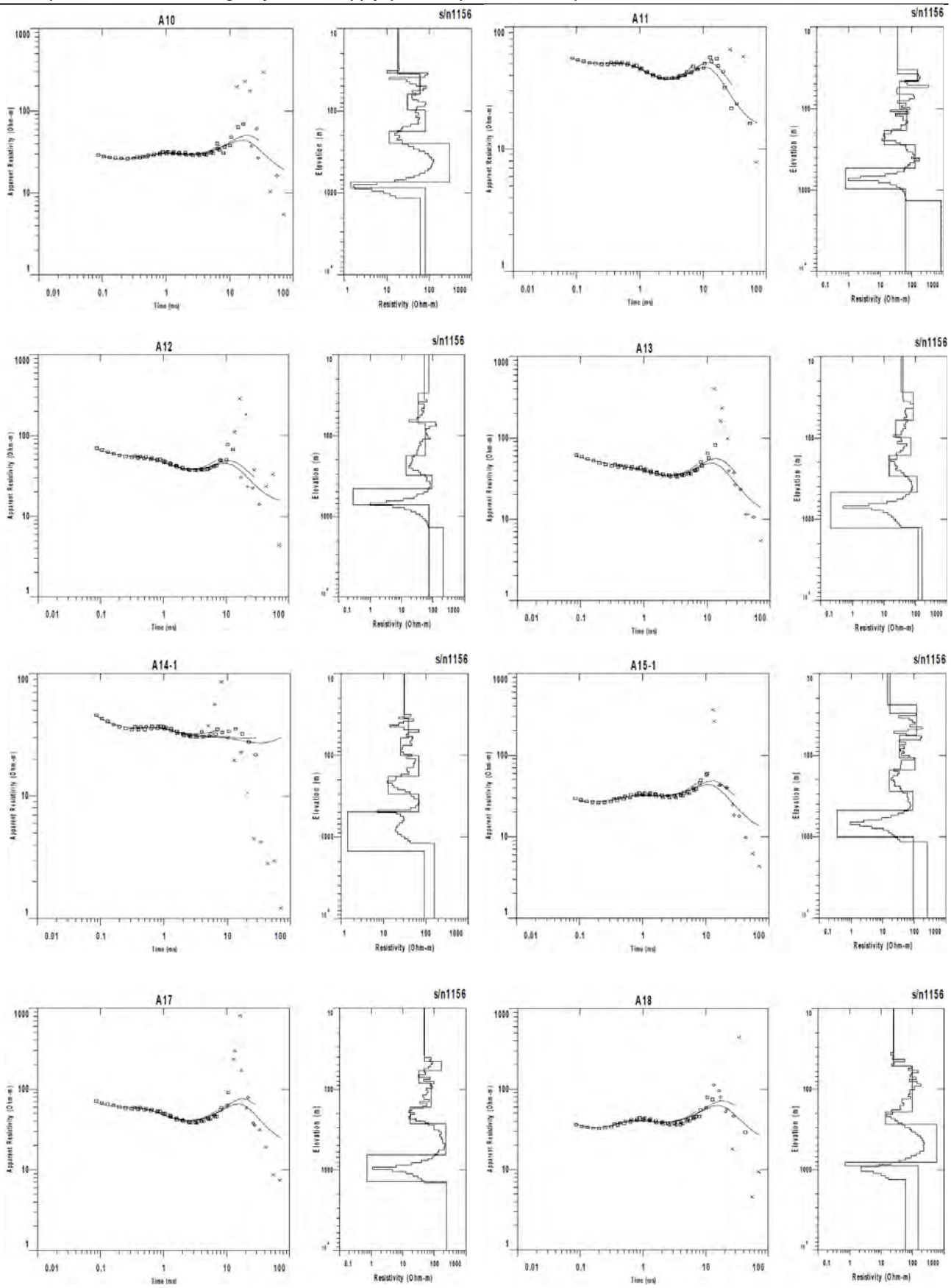
Preparing for measurements
（Qaaxo-East, measuring point 1）

Taking measurements
（Qaaxo-East, measuring point 1）

Data S.1.3 : TEM analytical results diagram

Qaaxo-North Area

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A18
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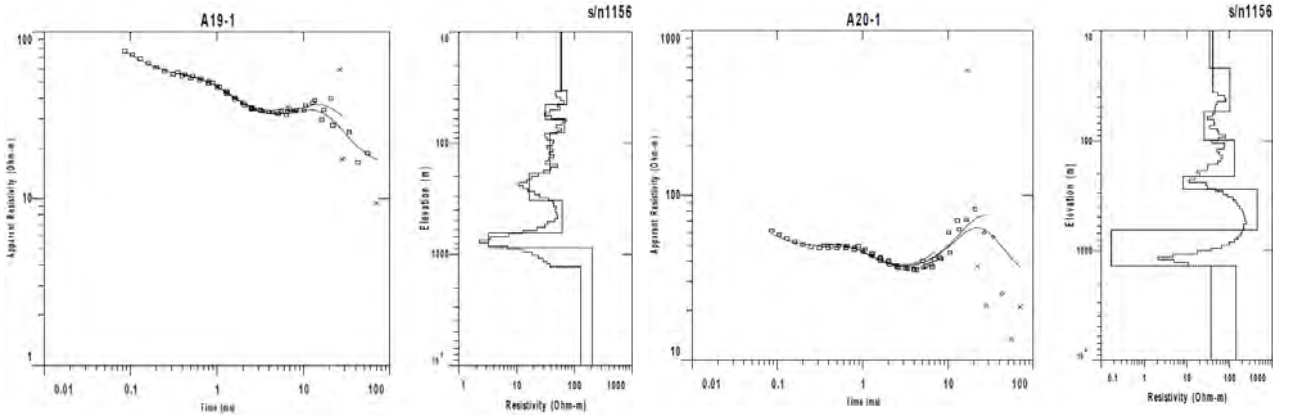
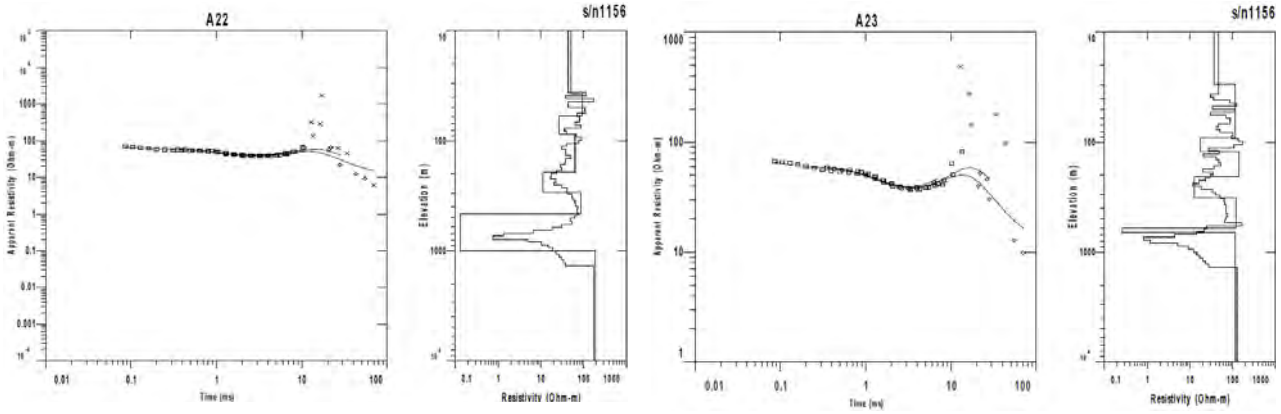
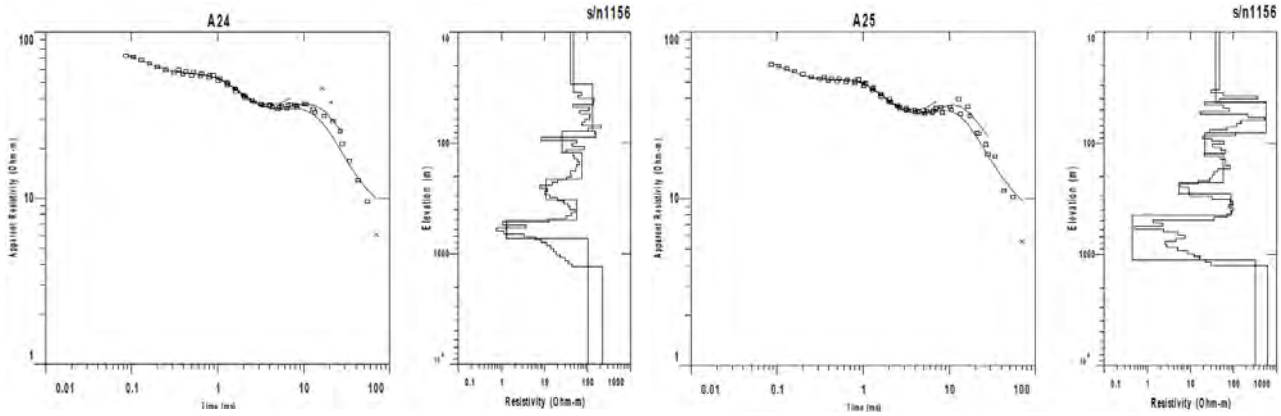
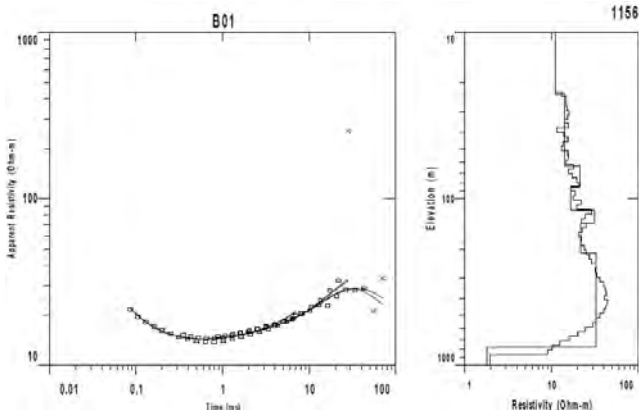
Apparent Resistivity (Ohm-m)
Time (ms)
Elevation (m)
Resistivity (Ohm-m)



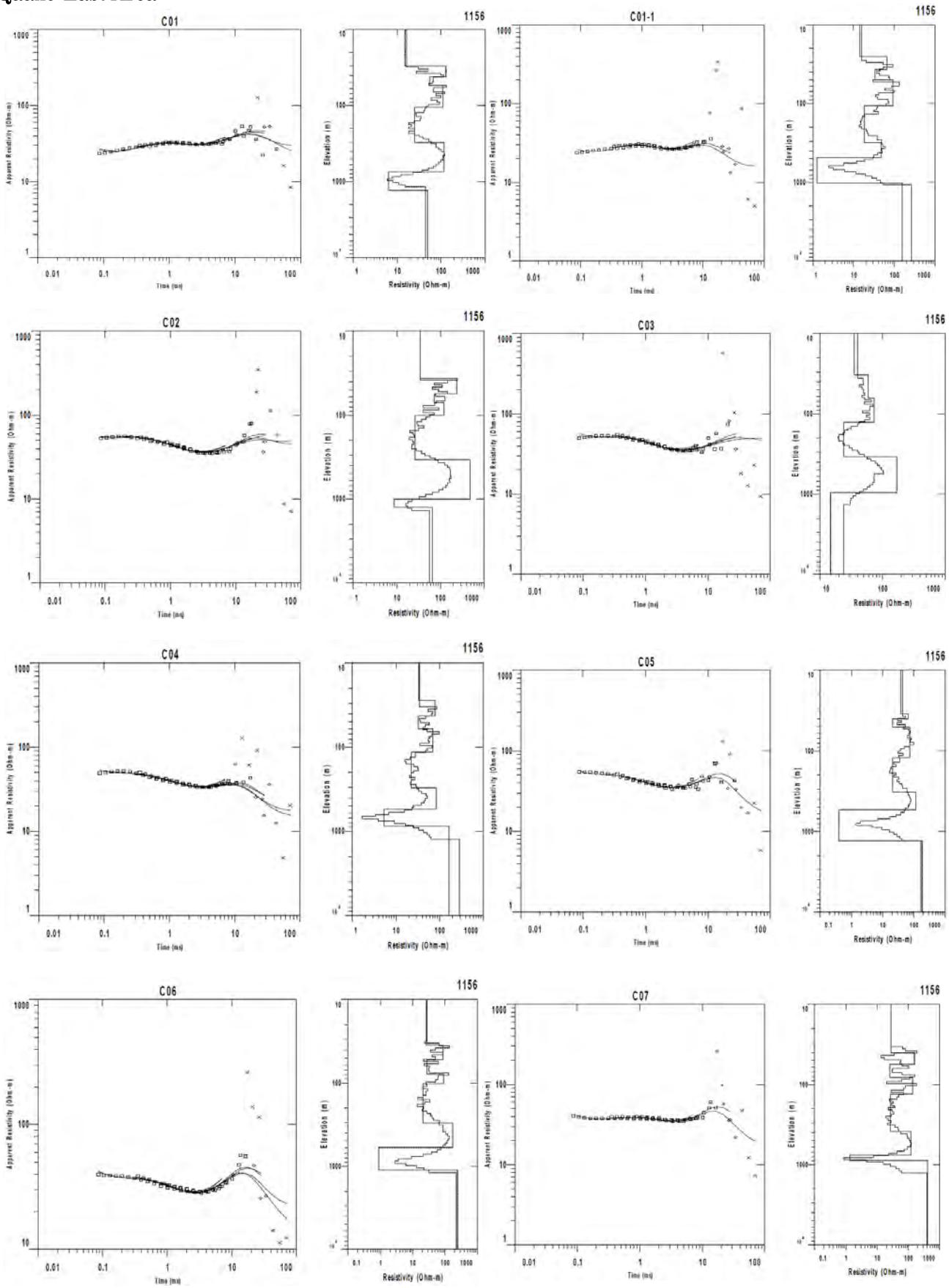


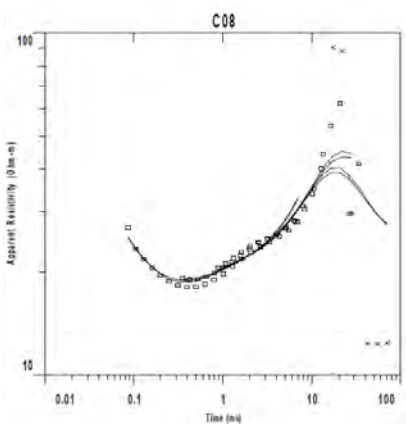


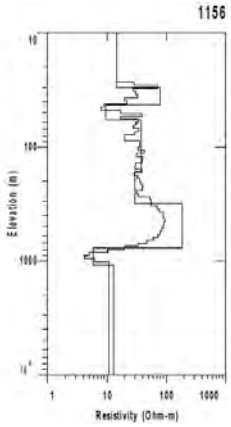
Qaaxo-South Area

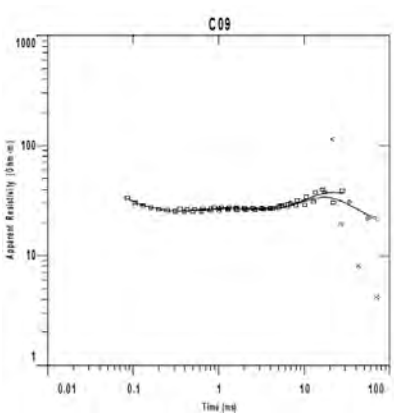


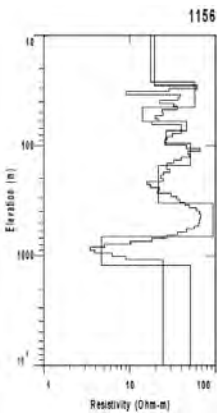
Qaaxo-East Area

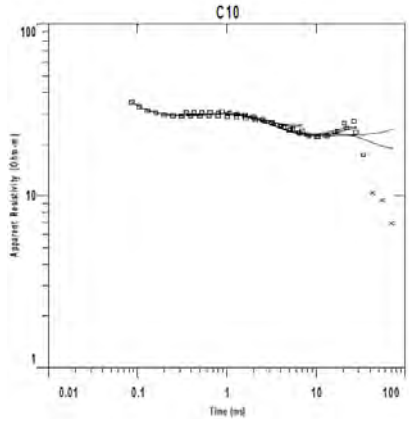


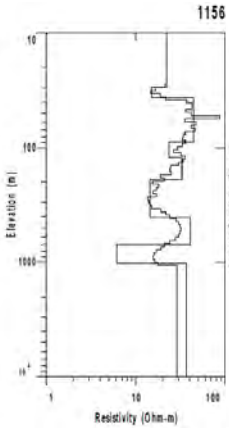

C08
Apparent Resistivity (Ohm-m)
Time (ms)

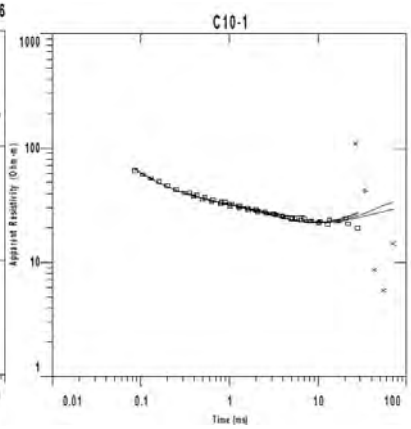

1156
Elevation (m)
Resistivity (Ohm-m)

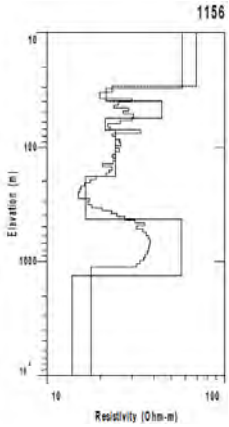

C09
Apparent Resistivity (Ohm-m)
Time (ms)

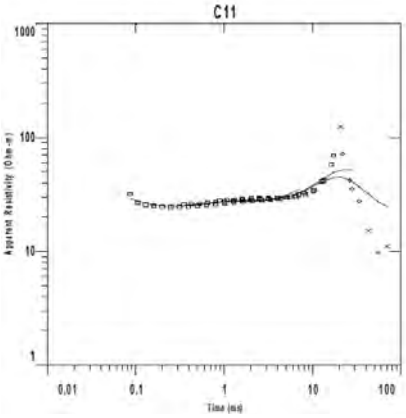

1156
Elevation (m)
Resistivity (Ohm-m)

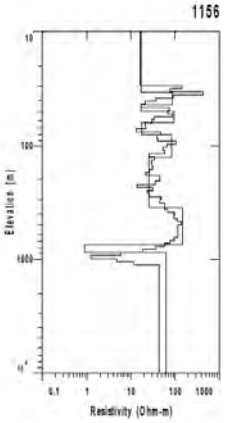

C10
Apparent Resistivity (Ohm-m)
Time (ms)

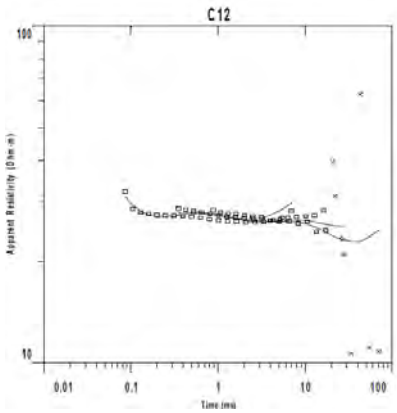

1156
Elevation (m)
Resistivity (Ohm-m)

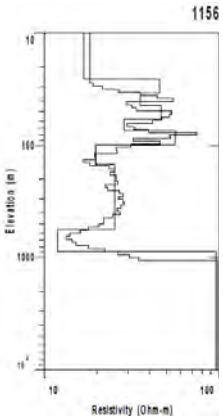

C10-1
Apparent Resistivity (Ohm-m)
Time (ms)

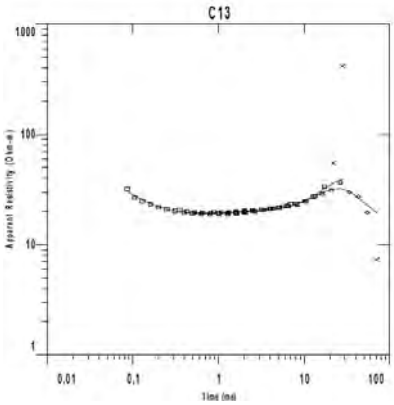

1156
Elevation (m)
Resistivity (Ohm-m)

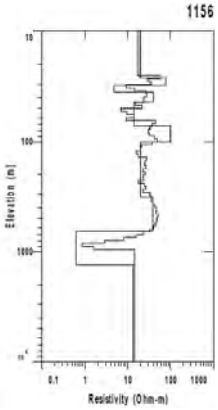

C11
Apparent Resistivity (Ohm-m)
Time (ms)

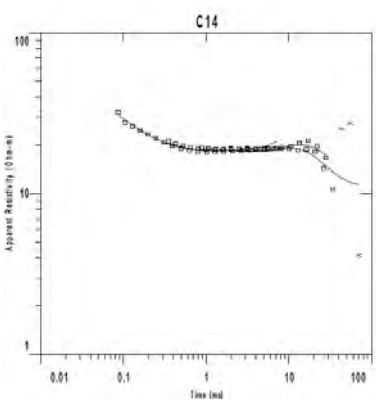

1156
Elevation (m)
Resistivity (Ohm-m)

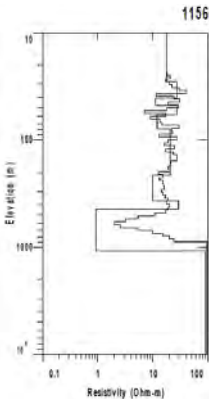

C12
Apparent Resistivity (Ohm-m)
Time (ms)

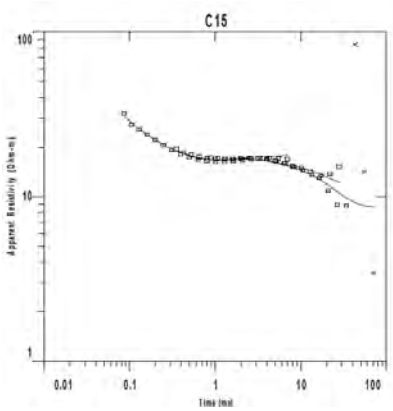

1156
Elevation (m)
Resistivity (Ohm-m)

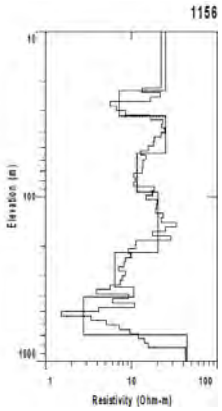

C13
Apparent Resistivity (Ohm-m)
Time (ms)

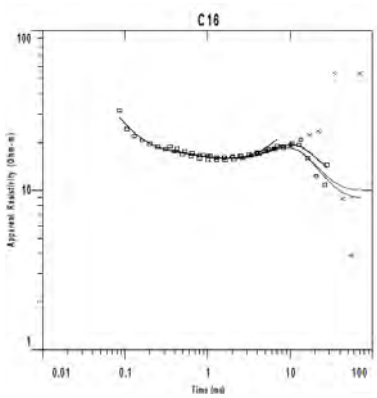

1156
Elevation (m)
Resistivity (Ohm-m)

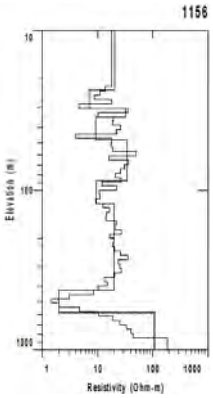

C14
Apparent Resistivity (Ohm-m)
Time (ms)

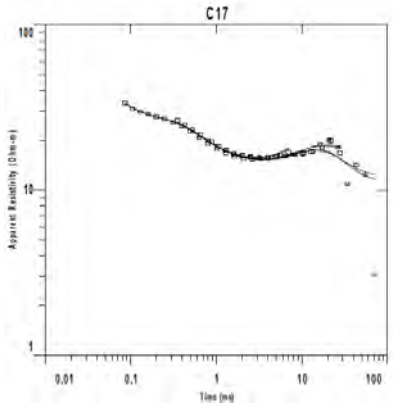

1156
Elevation (m)
Resistivity (Ohm-m)

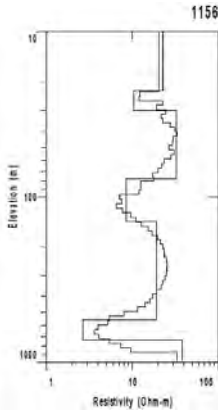

C15
Apparent Resistivity (Ohm-m)
Time (ms)


1156
Elevation (m)
Resistivity (Ohm-m)


C16
Apparent Resistivity (Ohm-m)
Time (ms)


1156
Elevation (m)
Resistivity (Ohm-m)


C17
Apparent Resistivity (Ohm-m)
Time (ms)


1156
Elevation (m)
Resistivity (Ohm-m)

Data S.1.4 : TEM Prospecting Measurement Data

A01

Central Loop TEM

Northing: 998525.0 Easting: 280565.0 Elevation: 1453.0

			Layered Model:		Smooth Model:	
No.	Time (ms)	Data Resistivity (ohm-m)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)
1	0.0859	20.78			23.88	-14.92
2	0.104	20.88			22.54	-7.93
3	0.129	21.10			21.67	-2.67
4	0.159	21.37			21.26	0.547
5	0.198	21.65			21.22	1.95
6	0.248	21.97			21.52	2.02
7	0.312	22.47			22.20	1.19
8	0.393	23.20			23.09	0.458
9	0.497	24.12			24.28	-0.674
10	0.629	25.18			25.48	-1.19
11	0.797	26.17			26.63	-1.77
12	1.01	26.83			27.45	-2.31
13	1.28	27.05			27.75	-2.56
14	1.63	26.93			27.69	-2.82
15	2.07	26.70			27.40	-2.63
16	2.64	26.71			27.31	-2.21
17	3.37	27.05			27.44	-1.44
18	4.29	27.73			28.29	-2.01
19	5.47	29.12			29.83	-2.43
20	6.97	30.53			32.40	-6.13
21	0.352	24.30			23.21	4.47
22	0.427	24.87			23.97	3.61
23	0.525	25.62			25.01	2.38
24	0.647	26.52			25.97	2.04
25	0.802	27.32			26.94	1.41
26	1.00	27.88			27.61	0.953
27	1.25	28.04			27.82	0.781
28	1.58	27.76			27.74	0.0452
29	1.99	27.59			27.33	0.949
30	2.52	27.34			27.08	0.943
31	3.19	27.69			26.92	2.76
32	4.05	27.94			27.44	1.77

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A01 Page 2

No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
33	5.14	29.02			28.26	2.60
34	6.54	29.99			30.04	-0.165
35	8.32	31.58			32.79	-3.82
36	10.59	33.88			36.70	-8.30
37	13.49	38.68			42.08	-8.77
38	17.19	38.34			48.07	-25.38
39	21.90	50.97			52.02	-2.05
40*	27.92	-190.4			50.16	126.3
41	0.881	28.40			27.30	3.86
42	1.06	28.64			27.70	3.25
43	1.31	28.65			27.86	2.78
44	1.61	28.58			27.70	3.06
45	2.00	27.94			27.32	2.18
46	2.50	27.74			27.08	2.40
47	3.14	28.09			26.88	4.28
48	3.95	28.31			27.33	3.48
49	4.99	29.04			27.96	3.72
50	6.31	29.25			29.55	-1.02
51	7.99	32.06			31.72	1.06
52	10.13	35.83			34.84	2.75
53	12.86	42.16			38.49	8.71
54*	16.35	72.97			41.50	43.13
55	20.80	65.35			41.77	36.08
56*	26.47	-84.30			37.47	144.4
57	33.72	-29.98			30.78	202.6
58	42.96	-18.16			24.68	235.9
59	54.74	-13.63			19.81	245.2
60*	69.77	20.14			16.50	18.07

"*" INDICATES MASKED DATA POINT

Prepared for s/n1156

A01

Central Loop TEM

Northing: 998525.0 Easting: 280565.0 Elevation: 1453.0

Layered Model

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
				1453.0		
1	13.04	26.49	26.49	1426.5	2.03	345.4
2	85.95	11.44	37.93	1415.0	0.133	983.3
3	30.75	10.75	48.68	1404.3	0.349	330.8
4	44.70	127.0	175.7	1277.2	2.84	5680.5
5	15.65	124.4	300.2	1152.7	7.95	1948.4
6	74.12	338.7	639.0	813.9	4.57	25112.4
7	0.615	139.7	778.7	674.2	227.1	85.98
8	98.74					

ALL PARAMETERS ARE FREE

Prepared for s/n1156

A01

Central Loop TEM

Northing: 998525.0 Easting: 280565.0 Elevation: 1453.0

Smooth Model: Ridge Regression

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
					1453.0		
1	14.05	28.54	28.54	*	1424.4	2.03	401.3
2	125.0	1.84	30.39	*	1422.6	0.0147	230.7
3	149.3	1.96	32.35	*	1420.6	0.0131	293.4
4	38.50	2.09	34.44	*	1418.5	0.0543	80.56
5	32.34	2.22	36.67	*	1416.3	0.0688	72.05
6	31.10	2.37	39.04	*	1413.9	0.0762	73.75
7	28.22	2.52	41.57	*	1411.4	0.0894	71.25
8	22.25	2.68	44.26	*	1408.7	0.120	59.81
9	24.84	2.86	47.12	*	1405.8	0.115	71.11
10	36.00	3.04	50.16	*	1402.8	0.0846	109.7
11	40.73	3.24	53.41	*	1399.5	0.0796	132.1
12	68.45	3.45	56.86	*	1396.1	0.0504	236.3
13	64.56	3.67	60.54	*	1392.4	0.0569	237.4
14	53.30	3.91	64.45	*	1388.5	0.0734	208.6
15	55.26	4.16	68.62	*	1384.3	0.0754	230.3
16	40.50	4.43	73.06	*	1379.9	0.109	179.7
17	43.67	4.72	77.78	*	1375.2	0.108	206.3
18	80.68	5.02	82.81	*	1370.1	0.0623	405.8
19	49.21	5.35	88.16	*	1364.8	0.108	263.5
20	57.19	5.70	93.87	*	1359.1	0.0996	326.0
21	52.09	6.06	99.93	*	1353.0	0.116	316.1
22	40.05	6.46	106.4	*	1346.5	0.161	258.7
23	44.51	6.87	113.2	*	1339.7	0.154	306.2
24	56.44	7.32	120.6	*	1332.3	0.129	413.4
25	53.15	7.79	128.4	*	1324.5	0.146	414.5
26	38.59	8.30	136.7	*	1316.2	0.215	320.3
27	35.58	8.83	145.5	*	1307.4	0.248	314.5
28	32.16	9.41	154.9	*	1298.0	0.292	302.6
29	27.35	10.01	164.9	*	1288.0	0.366	274.0
30	24.22	10.66	175.6	*	1277.3	0.440	258.3
31	23.55	11.35	186.9	*	1266.0	0.482	267.4
32	20.69	12.09	199.0	*	1253.9	0.584	250.2

Prepared for s/n1156

A01 Page 2

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
33	11.51	12.87	211.9	*	1241.0	1.11	148.2
34	15.21	13.70	225.6	*	1227.3	0.900	208.5
35	16.18	14.58	240.2	*	1212.7	0.901	236.1
36	27.79	15.53	255.7	*	1197.2	0.558	431.8
37	23.92	16.53	272.3	*	1180.6	0.691	395.5
38	31.33	17.60	289.9	*	1163.0	0.561	551.7
39	35.48	18.74	308.6	*	1144.3	0.528	665.0
40	50.39	19.95	328.6	*	1124.3	0.396	1005.7
41	53.71	21.24	349.8	*	1103.1	0.395	1141.3
42	68.92	22.62	372.4	*	1080.5	0.328	1559.2
43	68.97	24.08	396.5	*	1056.4	0.349	1661.1
44	69.02	25.64	422.2	*	1030.7	0.371	1769.9
45	85.12	27.29	449.5	*	1003.4	0.320	2323.7
46	73.84	29.06	478.5	*	974.4	0.393	2146.2
47	59.34	30.94	509.5	*	943.4	0.521	1836.2
48	47.27	32.94	542.4	*	910.5	0.696	1557.3
49	40.64	35.07	577.5	*	875.4	0.862	1425.6
50	29.94	37.34	614.8	*	838.1	1.24	1118.3
51	21.51	39.75	654.6	*	798.3	1.84	855.3
52	12.02	42.32	696.9	*	756.0	3.52	508.8
53	4.64	45.06	742.0	*	710.9	9.69	209.3
54	0.589	47.97	790.0	*	662.9	81.43	28.26
55	0.833	51.07	841.0	*	611.9	61.30	42.55
56	6.38	54.37	895.4	*	557.5	8.51	347.4
57	10.80	57.89	953.3	*	499.6	5.35	625.4
58	14.63	61.63	1014.9	*	438.0	4.21	902.3
59	17.30	65.62	1080.6	*	372.3	3.79	1135.3
60	98.09						

"*" INDICATES FIXED PARAMETER

Prepared for s/n1156

A02

Central Loop TEM

Northing: 999405.0 Easting: 281100.0 Elevation: 1454.0

			Layered Model:		Smooth Model:	
No.	Time (ms)	Data Resistivity (ohm-m)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)
1	0.0859	42.32			40.34	4.68
2	0.104	40.25			38.58	4.15
3	0.129	38.14			37.30	2.19
4	0.159	36.30			36.31	-0.0231
5	0.198	34.81			35.73	-2.64
6	0.248	33.73			35.32	-4.71
7	0.312	33.11			34.91	-5.42
8	0.393	32.95			34.44	-4.52
9	0.497	33.01			33.64	-1.90
10	0.629	33.12			32.66	1.37
11	0.797	32.90			31.51	4.21
12	1.01	32.14			30.45	5.25
13	1.28	30.99			29.62	4.42
14	1.63	29.68			29.16	1.75
15	2.07	28.61			29.12	-1.79
16	2.64	28.02			29.71	-6.01
17	3.37	28.18			30.83	-9.40
18	4.29	28.93			32.83	-13.45
19	5.47	31.14			35.81	-14.99
20	6.97	33.79			40.37	-19.46
21	0.352	34.76			35.22	-1.33
22	0.427	34.65			34.62	0.102
23	0.525	34.64			33.75	2.58
24	0.647	34.66			32.78	5.43
25	0.802	34.34			31.65	7.82
26	1.00	33.47			30.60	8.57
27	1.25	32.27			29.74	7.84
28	1.58	30.96			29.19	5.73
29	1.99	29.77			29.01	2.55
30	2.52	29.04			29.35	-1.04
31	3.19	28.84			30.12	-4.46
32	4.05	29.40			31.62	-7.55

Prepared for s/n1156

A02 Page 2

No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
33	5.14	30.74			33.75	-9.80
34	6.54	32.95			36.94	-12.12
35	8.32	36.58			41.15	-12.48
36	10.59	42.15			46.41	-10.11
37	13.49	77.07			51.55	33.11
38*	17.19	-101.5			54.39	153.5
39	21.90	-38.20			52.16	236.5
40	27.92	-26.65			46.05	272.8
41	0.881	34.52			31.20	9.59
42	1.06	33.48			30.35	9.34
43	1.31	32.46			29.60	8.79
44	1.61	30.96			29.16	5.80
45	2.00	29.95			29.01	3.16
46	2.50	29.10			29.31	-0.731
47	3.14	28.69			30.00	-4.58
48	3.95	29.43			31.35	-6.53
49	4.99	30.22			33.23	-9.96
50	6.31	33.72			36.03	-6.85
51	7.99	37.16			39.52	-6.35
52	10.13	43.73			43.51	0.488
53	12.86	65.21			46.64	28.47
54	16.35	-172.4			47.12	127.3
55	20.80	-47.53			43.15	190.7
56*	26.47	-20.77			36.72	276.7
57	33.72	-19.48			30.31	255.6
58	42.96	-10.66			25.13	335.7
59*	54.74	-6.49			21.48	430.8
60*	69.77	-5.48			18.94	445.7

"*" INDICATES MASKED DATA POINT

Prepared for s/n1156

A02

Central Loop TEM

Northing: 999405.0 Easting: 281100.0 Elevation: 1454.0

Layered Model

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
				1454.0		
1	26.03	29.51	29.51	1424.4	1.13	768.4
2	70.54	20.91	50.43	1403.5	0.296	1475.3
3	17.14	23.96	74.39	1379.6	1.39	410.8
4	59.73	87.17	161.5	1292.4	1.45	5206.8
5	11.10	89.80	251.3	1202.6	8.08	997.0
6	135.3	234.7	486.1	967.8	1.73	31770.7
7	0.143	988.7	1474.8	-20.85	6911.1	141.4
8	110.2					

ALL PARAMETERS ARE FREE

Prepared for s/n1156

A02

Central Loop TEM

Northing: 999405.0 Easting: 281100.0 Elevation: 1454.0

Smooth Model: Ridge Regression

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
					1454.0		
1	25.12	31.54	31.54	*	1422.4	1.25	792.7
2	78.76	2.03	33.58	*	1420.4	0.0259	160.6
3	62.85	2.17	35.75	*	1418.2	0.0345	136.5
4	54.56	2.31	38.07	*	1415.9	0.0423	126.1
5	66.39	2.46	40.53	*	1413.4	0.0370	163.4
6	70.00	2.62	43.15	*	1410.8	0.0374	183.4
7	64.01	2.79	45.94	*	1408.0	0.0435	178.5
8	52.63	2.97	48.91	*	1405.0	0.0564	156.3
9	43.90	3.16	52.07	*	1401.9	0.0720	138.8
10	25.49	3.36	55.44	*	1398.5	0.132	85.85
11	22.41	3.58	59.02	*	1394.9	0.159	80.34
12	19.69	3.81	62.84	*	1391.1	0.193	75.15
13	23.75	4.06	66.90	*	1387.0	0.171	96.53
14	53.11	4.32	71.23	*	1382.7	0.0814	229.7
15	49.22	4.60	75.84	*	1378.1	0.0935	226.6
16	49.13	4.90	80.74	*	1373.2	0.0998	240.9
17	46.46	5.22	85.96	*	1368.0	0.112	242.5
18	28.26	5.55	91.52	*	1362.4	0.196	157.0
19	54.55	5.91	97.43	*	1356.5	0.108	322.8
20	37.91	6.29	103.7	*	1350.2	0.166	238.8
21	36.17	6.70	110.4	*	1343.5	0.185	242.6
22	25.99	7.14	117.5	*	1336.4	0.274	185.6
23	25.19	7.60	125.1	*	1328.8	0.301	191.5
24	20.36	8.09	133.2	*	1320.7	0.397	164.8
25	19.13	8.61	141.9	*	1312.0	0.450	164.8
26	15.55	9.17	151.0	*	1302.9	0.589	142.7
27	16.64	9.76	160.8	*	1293.1	0.586	162.5
28	17.69	10.39	171.2	*	1282.7	0.587	184.0
29	27.85	11.07	182.3	*	1271.6	0.397	308.3
30	30.86	11.78	194.1	*	1259.8	0.381	363.7
31	33.17	12.54	206.6	*	1247.3	0.378	416.3
32	35.77	13.36	220.0	*	1233.9	0.373	477.9

Prepared for s/n1156

A02 Page 2

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
33	38.94	14.22	234.2	*	1219.7	0.365	554.0
34	44.87	15.14	249.3	*	1204.6	0.337	679.6
35	54.22	16.12	265.5	*	1188.4	0.297	874.3
36	64.24	17.16	282.6	*	1171.3	0.267	1102.8
37	70.88	18.27	300.9	*	1153.0	0.257	1295.4
38	83.57	19.45	320.4	*	1133.5	0.232	1626.2
39	96.32	20.71	341.1	*	1112.8	0.215	1995.5
40	93.63	22.05	363.1	*	1090.8	0.235	2065.1
41	101.2	23.48	386.6	*	1067.3	0.231	2378.4
42	108.8	24.99	411.6	*	1042.3	0.229	2720.1
43	105.1	26.61	438.2	*	1015.7	0.253	2798.3
44	105.5	28.33	466.6	*	987.3	0.268	2989.9
45	82.37	30.16	496.7	*	957.2	0.366	2485.2
46	79.14	32.11	528.8	*	925.1	0.405	2541.9
47	70.70	34.19	563.0	*	890.9	0.483	2417.7
48	58.07	36.40	599.5	*	854.4	0.626	2114.2
49	45.25	38.76	638.2	*	815.7	0.856	1754.2
50	31.38	41.26	679.5	*	774.4	1.31	1295.0
51	18.98	43.93	723.4	*	730.5	2.31	834.1
52	7.78	46.77	770.2	*	683.7	6.00	364.3
53	2.01	49.79	820.0	*	633.9	24.73	100.2
54	1.19	53.01	873.0	*	580.9	44.23	63.55
55	4.26	56.44	929.5	*	524.4	13.24	240.6
56	9.47	60.09	989.6	*	464.3	6.33	569.6
57	14.83	63.98	1053.5	*	400.4	4.31	949.1
58	20.29	68.11	1121.7	*	332.2	3.35	1382.2
59	25.92	72.52	1194.2	*	259.7	2.79	1880.0
60	116.8						

"*" INDICATES FIXED PARAMETER

Prepared for s/n1156

A03

Central Loop TEM

Northing: 999858.0 Easting: 281138.0 Elevation: 1455.0

			Layered Model:		Smooth Model:	
No.	Time (ms)	Data Resistivity (ohm-m)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)
1	0.0859	16.19			17.12	-5.73
2	0.104	12.32			15.66	-27.14
3	0.129	11.32			14.69	-29.84
4	0.159	11.17			14.16	-26.76
5	0.198	11.44			14.02	-22.56
6	0.248	12.14			14.26	-17.44
7	0.312	13.30			14.78	-11.10
8	0.393	14.91			15.67	-5.05
9	0.497	16.92			16.77	0.875
10	0.629	19.15			18.08	5.56
11	0.797	21.28			19.60	7.89
12	1.01	22.97			20.85	9.21
13	1.28	23.91			22.32	6.67
14	1.63	24.17			23.34	3.44
15	2.07	24.13			24.63	-2.05
16	2.64	24.18			25.65	-6.06
17	3.37	24.72			27.47	-11.11
18	4.29	25.74			29.15	-13.22
19	5.47	27.56			31.76	-15.21
20	6.97	30.27			35.85	-18.44
21	0.352	14.87			15.15	-1.83
22	0.427	16.44			16.03	2.47
23	0.525	18.36			17.01	7.34
24	0.647	20.47			18.24	10.90
25	0.802	22.47			19.60	12.74
26	1.00	24.09			20.75	13.88
27	1.25	25.03			22.18	11.40
28	1.58	25.41			23.07	9.21
29	1.99	25.37			24.30	4.23
30	2.52	25.31			25.13	0.713
31	3.19	25.61			26.73	-4.38
32	4.05	26.09			27.78	-6.48

Prepared for s/n1156

A03 Page 2

No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
33	5.14	27.70			30.10	-8.65
34	6.54	29.53			32.31	-9.38
35	8.32	31.91			35.29	-10.56
36	10.59	37.79			39.36	-4.15
37	13.49	46.40			42.97	7.39
38*	17.19	-213.6			46.07	121.5
39	21.90	-71.39			44.34	162.1
40	27.92	-26.45			41.42	256.5
41	0.881	23.92			20.00	16.37
42	1.06	24.97			21.15	15.29
43	1.31	25.74			22.29	13.42
44	1.61	25.56			23.15	9.42
45	2.00	25.78			24.28	5.82
46	2.50	25.27			25.06	0.838
47	3.14	25.69			26.56	-3.38
48	3.95	26.20			27.48	-4.87
49	4.99	29.33			29.70	-1.26
50	6.31	29.38			31.37	-6.77
51	7.99	37.44			34.15	8.78
52	10.13	34.17			36.77	-7.59
53*	12.86	156.4			38.93	75.10
54	16.35	78.71			38.87	50.62
55	20.80	-41.55			36.15	186.9
56	26.47	-34.50			30.93	189.6
57	33.72	-21.85			24.74	213.2
58	42.96	-20.97			20.47	197.6
59	54.74	-7.35			16.27	321.3
60	69.77	-6.34			13.91	319.1

"*" INDICATES MASKED DATA POINT

Prepared for s/n1156

A03

Central Loop TEM

Northing: 999858.0 Easting: 281138.0 Elevation: 1455.0

Layered Model

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
				1455.0		
1	6.20	19.23	19.23	1435.7	3.10	119.2
2	159.9	39.10	58.33	1396.6	0.244	6254.6
3	76.41	21.46	79.80	1375.1	0.280	1640.1
4	319.0	91.28	171.0	1283.9	0.286	29121.4
5	7.88	76.24	247.3	1207.6	9.66	601.5
6	70.93	257.6	504.9	950.0	3.63	18274.1
7	0.112	43.88	548.8	906.1	389.8	4.93
8	20.43					

ALL PARAMETERS ARE FREE

Prepared for s/n1156

A03

Central Loop TEM

Northing: 999858.0 Easting: 281138.0 Elevation: 1455.0

Smooth Model: Ridge Regression

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
					1455.0		
1	8.54	26.05	26.05	*	1428.9	3.05	222.5
2	96.98	1.68	27.74	*	1427.2	0.0173	163.4
3	90.39	1.79	29.53	*	1425.4	0.0198	162.1
4	70.85	1.90	31.44	*	1423.5	0.0269	135.3
5	78.12	2.03	33.48	*	1421.5	0.0260	158.8
6	105.3	2.16	35.64	*	1419.3	0.0205	228.1
7	88.09	2.30	37.94	*	1417.0	0.0261	203.0
8	51.88	2.45	40.40	*	1414.5	0.0472	127.3
9	49.74	2.61	43.01	*	1411.9	0.0525	129.9
10	44.30	2.78	45.79	*	1409.2	0.0627	123.2
11	124.7	2.96	48.75	*	1406.2	0.0237	369.3
12	63.69	3.15	51.90	*	1403.0	0.0494	200.7
13	50.48	3.35	55.26	*	1399.7	0.0664	169.4
14	45.95	3.57	58.83	*	1396.1	0.0777	164.2
15	46.72	3.80	62.64	*	1392.3	0.0814	177.7
16	33.61	4.05	66.69	*	1388.3	0.120	136.1
17	48.48	4.31	71.00	*	1383.9	0.0889	209.0
18	67.53	4.59	75.59	*	1379.4	0.0679	310.0
19	209.9	4.88	80.48	*	1374.5	0.0232	1025.9
20	135.6	5.20	85.68	*	1369.3	0.0383	706.0
21	86.96	5.54	91.22	*	1363.7	0.0637	481.7
22	97.70	5.89	97.12	*	1357.8	0.0603	576.2
23	63.12	6.27	103.4	*	1351.5	0.0994	396.3
24	150.0	6.68	110.0	*	1344.9	0.0445	1002.9
25	46.89	7.11	117.2	*	1337.7	0.151	333.8
26	33.80	7.57	124.7	*	1330.2	0.224	256.1
27	36.44	8.06	132.8	*	1322.1	0.221	294.0
28	24.83	8.58	141.4	*	1313.5	0.345	213.3
29	29.56	9.14	150.5	*	1304.4	0.309	270.3
30	25.27	9.73	160.3	*	1294.6	0.385	246.1
31	19.68	10.36	170.6	*	1284.3	0.526	204.0
32	20.01	11.03	181.7	*	1273.2	0.551	220.9

Prepared for s/n1156

A03 Page 2

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
33	26.64	11.74	193.4	*	1261.5	0.441	313.0
34	23.10	12.50	205.9	*	1249.0	0.541	289.0
35	29.12	13.31	219.3	*	1235.6	0.457	387.9
36	29.73	14.17	233.4	*	1221.5	0.476	421.5
37	41.81	15.09	248.5	*	1206.4	0.360	631.3
38	42.52	16.07	264.6	*	1190.3	0.377	683.4
39	46.09	17.11	281.7	*	1173.2	0.371	788.7
40	46.01	18.21	299.9	*	1155.0	0.395	838.2
41	46.79	19.39	319.3	*	1135.6	0.414	907.5
42	52.88	20.64	340.0	*	1114.9	0.390	1091.9
43	48.67	21.98	362.0	*	1092.9	0.451	1070.1
44	45.72	23.40	385.4	*	1069.5	0.511	1070.1
45	41.76	24.91	410.3	*	1044.6	0.596	1040.7
46	35.40	26.53	436.8	*	1018.1	0.749	939.2
47	31.20	28.24	465.1	*	989.8	0.905	881.3
48	24.36	30.07	495.1	*	959.8	1.23	732.7
49	17.76	32.01	527.2	*	927.7	1.80	568.7
50	13.39	34.08	561.2	*	893.7	2.54	456.5
51	8.12	36.28	597.5	*	857.4	4.46	294.9
52	4.67	38.63	636.2	*	818.7	8.26	180.6
53	1.59	41.13	677.3	*	777.6	25.75	65.69
54	0.603	43.79	721.1	*	733.8	72.58	26.42
55	1.14	46.62	767.7	*	687.2	40.85	53.21
56	2.48	49.63	817.4	*	637.5	19.97	123.3
57	3.82	52.84	870.2	*	584.7	13.82	202.0
58	5.12	56.26	926.5	*	528.4	10.98	288.1
59	6.28	59.90	986.4	*	468.5	9.52	376.6
60	17.73						

"*" INDICATES FIXED PARAMETER

A04

Central Loop TEM

Northing: 1000110.0 Easting: 281212.0 Elevation: 1464.0

			Layered Model:		Smooth Model:	
No.	Time (ms)	Data Resistivity (ohm-m)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)
1	0.0859	19.35			21.83	-12.82
2	0.104	18.67			20.55	-10.10
3	0.129	18.44			19.73	-6.97
4	0.159	18.66			19.38	-3.82
5	0.198	19.17			19.44	-1.40
6	0.248	19.91			19.80	0.542
7	0.312	20.77			20.54	1.14
8	0.393	21.70			21.49	0.969
9	0.497	22.71			22.58	0.535
10	0.629	23.76			23.83	-0.315
11	0.797	24.78			24.72	0.269
12	1.01	25.63			25.67	-0.144
13	1.28	26.16			25.97	0.721
14	1.63	26.34			26.34	0.0195
15	2.07	26.26			26.39	-0.489
16	2.64	26.43			26.96	-1.99
17	3.37	26.77			27.47	-2.62
18	4.29	27.76			28.98	-4.40
19	5.47	29.50			31.15	-5.60
20	6.97	33.07			34.33	-3.83
21	0.352	22.22			21.04	5.29
22	0.427	23.00			21.85	5.01
23	0.525	23.90			22.88	4.25
24	0.647	24.87			23.95	3.69
25	0.802	25.75			24.72	3.99
26	1.00	26.60			25.61	3.70
27	1.25	27.08			25.87	4.48
28	1.58	27.19			26.21	3.59
29	1.99	27.09			26.20	3.29
30	2.52	27.01			26.59	1.58
31	3.19	27.27			26.82	1.65
32	4.05	27.73			28.05	-1.17

Prepared for s/n1156

A04 Page 2

No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
33	5.14	28.85			29.36	-1.76
34	6.54	30.01			31.92	-6.36
35	8.32	32.45			35.52	-9.45
36	10.59	37.67			40.42	-7.30
37	13.49	50.45			46.73	7.38
38	17.19	52.94			52.71	0.430
39*	21.90	142.0			55.28	61.09
40	27.92	-36.61			48.98	233.7
41	0.881	26.62			25.17	5.42
42	1.06	27.17			25.71	5.35
43	1.31	27.35			25.95	5.09
44	1.61	27.31			26.23	3.95
45	2.00	26.90			26.20	2.58
46	2.50	26.71			26.56	0.551
47	3.14	27.00			26.75	0.930
48	3.95	28.08			27.87	0.735
49	4.99	27.96			28.94	-3.50
50	6.31	29.85			31.33	-4.95
51	7.99	34.71			34.11	1.73
52	10.13	33.18			38.10	-14.82
53*	12.86	61.12			42.05	31.19
54	16.35	57.85			45.34	21.61
55	20.80	60.83			43.28	28.84
56	26.47	-77.74			37.46	148.1
57	33.72	51.94			30.70	40.87
58	42.96	-13.44			23.91	277.8
59	54.74	-7.78			19.83	354.7
60	69.77	-5.64			16.37	389.8

"*" INDICATES MASKED DATA POINT

Prepared for s/n1156

A04

Central Loop TEM

Northing: 1000110.0 Easting: 281212.0 Elevation: 1464.0

Layered Model

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
				1464.0		
1	10.28	20.67	20.67	1443.3	2.01	212.6
2	100.1	27.98	48.65	1415.3	0.279	2802.6
3	15.85	24.31	72.97	1391.0	1.53	385.4
4	102.8	111.4	184.4	1279.5	1.08	11463.7
5	8.08	100.5	285.0	1178.9	12.44	813.0
6	92.72	148.1	433.1	1030.8	1.59	13739.1
7	0.0455	736.8	1170.0	293.9	16164.9	33.59
8	156.2					

ALL PARAMETERS ARE FREE

Prepared for s/n1156

A04

Central Loop TEM

Northing: 1000110.0 Easting: 281212.0 Elevation: 1464.0

Smooth Model: Ridge Regression

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
					1464.0		
1	12.26	28.02	28.02	*	1435.9	2.28	343.6
2	98.12	1.81	29.83	*	1434.1	0.0184	177.8
3	82.54	1.92	31.76	*	1432.2	0.0233	159.2
4	45.51	2.05	33.81	*	1430.1	0.0451	93.48
5	37.44	2.18	36.00	*	1427.9	0.0584	81.87
6	36.93	2.32	38.33	*	1425.6	0.0630	85.97
7	58.18	2.47	40.81	*	1423.1	0.0426	144.2
8	53.75	2.63	43.45	*	1420.5	0.0490	141.8
9	52.04	2.80	46.26	*	1417.7	0.0539	146.2
10	74.77	2.99	49.25	*	1414.7	0.0400	223.6
11	30.11	3.18	52.43	*	1411.5	0.105	95.88
12	31.79	3.39	55.82	*	1408.1	0.106	107.7
13	88.39	3.60	59.43	*	1404.5	0.0408	319.0
14	57.96	3.84	63.27	*	1400.7	0.0662	222.7
15	74.86	4.09	67.36	*	1396.6	0.0546	306.2
16	57.24	4.35	71.72	*	1392.2	0.0760	249.3
17	53.29	4.63	76.36	*	1387.6	0.0870	247.1
18	52.07	4.93	81.29	*	1382.6	0.0948	257.0
19	41.32	5.25	86.55	*	1377.4	0.127	217.2
20	61.20	5.59	92.15	*	1371.8	0.0914	342.4
21	39.85	5.95	98.11	*	1365.8	0.149	237.4
22	38.45	6.34	104.4	*	1359.5	0.164	243.9
23	33.13	6.75	111.2	*	1352.7	0.203	223.7
24	42.80	7.19	118.3	*	1345.6	0.167	307.7
25	48.96	7.65	126.0	*	1337.9	0.156	374.8
26	41.65	8.14	134.2	*	1329.7	0.195	339.5
27	29.83	8.67	142.8	*	1321.1	0.290	258.8
28	29.47	9.23	152.1	*	1311.8	0.313	272.2
29	20.50	9.83	161.9	*	1302.0	0.479	201.6
30	23.12	10.47	172.4	*	1291.5	0.452	242.1
31	18.47	11.14	183.5	*	1280.4	0.603	206.0
32	18.06	11.86	195.4	*	1268.5	0.657	214.3

Prepared for s/n1156

A04 Page 2

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
33	20.11	12.63	208.0	*	1255.9	0.628	254.2
34	25.33	13.45	221.5	*	1242.4	0.531	340.7
35	27.11	14.32	235.8	*	1228.1	0.528	388.3
36	25.88	15.24	251.1	*	1212.8	0.589	394.6
37	32.45	16.23	267.3	*	1196.6	0.500	526.9
38	34.07	17.28	284.6	*	1179.3	0.507	588.9
39	42.22	18.40	303.0	*	1160.9	0.435	777.0
40	49.35	19.59	322.6	*	1141.3	0.397	966.8
41	71.45	20.85	343.4	*	1120.5	0.291	1490.4
42	61.60	22.20	365.6	*	1098.3	0.360	1368.1
43	69.29	23.64	389.3	*	1074.6	0.341	1638.3
44	73.92	25.17	414.4	*	1049.5	0.340	1860.7
45	72.16	26.79	441.2	*	1022.7	0.371	1933.8
46	71.94	28.53	469.8	*	994.1	0.396	2052.7
47	70.61	30.37	500.2	*	963.7	0.430	2144.9
48	67.46	32.34	532.5	*	931.4	0.479	2181.8
49	60.07	34.43	566.9	*	897.0	0.573	2068.6
50	44.66	36.65	603.6	*	860.3	0.820	1637.3
51	34.19	39.02	642.6	*	821.3	1.14	1334.5
52	20.72	41.55	684.2	*	779.7	2.00	861.0
53	8.55	44.23	728.4	*	735.5	5.17	378.3
54	0.751	47.09	775.5	*	688.4	62.67	35.39
55	0.696	50.14	825.6	*	638.3	72.03	34.90
56	4.72	53.38	879.0	*	584.9	11.30	252.1
57	5.83	56.83	935.9	*	528.0	9.73	331.8
58	15.13	60.51	996.4	*	467.5	3.99	915.6
59	18.92	64.42	1060.8	*	403.1	3.40	1219.1
60	146.1						

"*" INDICATES FIXED PARAMETER

A05

Central Loop TEM

Northing: 1000501.0 Easting: 281602.0 Elevation: 1465.0

			Layered Model:		Smooth Model:	
No.	Time (ms)	Data Resistivity (ohm-m)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)
1	0.0859	18.88			21.15	-12.02
2	0.104	18.24			19.92	-9.20
3	0.129	18.10			19.18	-5.95
4	0.159	18.44			18.93	-2.70
5	0.198	19.11			19.21	-0.526
6	0.248	20.08			19.86	1.07
7	0.312	21.25			20.96	1.38
8	0.393	22.56			22.47	0.400
9	0.497	23.93			24.07	-0.588
10	0.629	25.26			25.94	-2.71
11	0.797	26.37			27.10	-2.75
12	1.01	27.09			28.05	-3.54
13	1.28	27.27			28.03	-2.78
14	1.63	26.97			27.84	-3.23
15	2.07	26.61			27.43	-3.07
16	2.64	26.50			27.53	-3.88
17	3.37	26.56			27.96	-5.27
18	4.29	27.27			29.23	-7.18
19	5.47	29.11			31.40	-7.87
20	6.97	31.52			35.19	-11.62
21	0.352	23.48			21.86	6.89
22	0.427	24.56			23.12	5.85
23	0.525	25.71			24.58	4.40
24	0.647	26.93			26.21	2.67
25	0.802	27.88			27.16	2.57
26	1.00	28.44			28.03	1.47
27	1.25	28.76			28.01	2.61
28	1.58	28.64			27.77	3.04
29	1.99	28.05			27.35	2.49
30	2.52	27.91			27.20	2.54
31	3.19	27.68			27.41	0.995
32	4.05	28.43			28.16	0.941

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A05 Page 2

No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
33	5.14	29.56			29.74	-0.609
34	6.54	31.61			32.15	-1.72
35	8.32	32.63			35.68	-9.33
36	10.59	42.24			40.51	4.08
37	13.49	51.03			44.66	12.48
38	17.19	-57.74			46.31	180.2
39	21.90	-47.33			43.06	190.9
40	27.92	-28.87			36.23	225.4
41	0.881	28.41			27.60	2.82
42	1.06	28.89			28.11	2.70
43	1.31	28.80			27.95	2.93
44	1.61	28.82			27.75	3.72
45	2.00	27.65			27.33	1.18
46	2.50	27.48			27.17	1.11
47	3.14	28.00			27.33	2.38
48	3.95	29.14			27.93	4.16
49	4.99	28.32			29.32	-3.54
50	6.31	30.48			31.25	-2.54
51	7.99	35.85			34.14	4.77
52	10.13	41.95			37.49	10.63
53*	12.86	91.29			39.63	56.58
54*	16.35	-81.17			39.31	148.4
55*	20.80	-21.74			34.58	259.0
56	26.47	-31.05			28.52	191.8
57	33.72	14.55			23.07	-58.52
58	42.96	9.72			18.56	-90.95
59*	54.74	-2.71			15.81	683.0
60*	69.77	-12.34			13.73	211.2

"*" INDICATES MASKED DATA POINT

Prepared for s/n1156

A05

Central Loop TEM

Northing: 1000501.0 Easting: 281602.0 Elevation: 1465.0

Layered Model

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
				1465.0		
1	9.87	23.24	23.24	1441.7	2.35	229.4
2	160.9	20.90	44.14	1420.8	0.129	3365.6
3	58.25	25.82	69.97	1395.0	0.443	1504.4
4	143.8	75.56	145.5	1319.4	0.525	10869.2
5	10.82	101.3	246.8	1218.1	9.36	1096.9
6	152.7	219.2	466.1	998.8	1.43	33490.5
7	0.234	792.3	1258.4	206.5	3372.9	186.1
8	70.74					

ALL PARAMETERS ARE FREE

Prepared for s/n1156

A05

Central Loop TEM

Northing: 1000501.0 Easting: 281602.0 Elevation: 1465.0

Smooth Model: Ridge Regression

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
					1465.0		
1	11.62	28.20	28.20	*	1436.7	2.42	327.8
2	51.02	1.82	30.02	*	1434.9	0.0357	93.03
3	59.97	1.94	31.96	*	1433.0	0.0323	116.4
4	54.07	2.06	34.03	*	1430.9	0.0382	111.7
5	89.15	2.20	36.23	*	1428.7	0.0246	196.1
6	213.6	2.34	38.57	*	1426.4	0.0109	500.4
7	135.5	2.49	41.07	*	1423.9	0.0184	338.1
8	89.02	2.65	43.72	*	1421.2	0.0298	236.4
9	121.2	2.82	46.55	*	1418.4	0.0233	342.9
10	78.74	3.00	49.56	*	1415.4	0.0382	237.0
11	81.48	3.20	52.76	*	1412.2	0.0393	261.1
12	139.2	3.41	56.18	*	1408.8	0.0244	475.2
13	70.41	3.63	59.81	*	1405.1	0.0515	255.7
14	131.3	3.86	63.68	*	1401.3	0.0294	507.8
15	125.9	4.11	67.79	*	1397.2	0.0326	518.6
16	85.71	4.38	72.18	*	1392.8	0.0511	375.7
17	72.02	4.66	76.84	*	1388.1	0.0647	336.1
18	119.2	4.96	81.81	*	1383.1	0.0416	592.3
19	149.2	5.28	87.10	*	1377.8	0.0354	789.4
20	85.97	5.63	92.73	*	1372.2	0.0655	484.1
21	68.58	5.99	98.73	*	1366.2	0.0874	411.2
22	57.53	6.38	105.1	*	1359.8	0.110	367.2
23	50.52	6.79	111.9	*	1353.0	0.134	343.4
24	100.3	7.23	119.1	*	1345.8	0.0721	726.1
25	32.55	7.70	126.8	*	1338.1	0.236	250.7
26	56.43	8.20	135.0	*	1329.9	0.145	462.8
27	29.29	8.73	143.7	*	1321.2	0.298	255.8
28	24.02	9.29	153.0	*	1311.9	0.386	223.3
29	19.90	9.89	162.9	*	1302.0	0.497	197.0
30	17.57	10.53	173.5	*	1291.4	0.599	185.1
31	12.67	11.21	184.7	*	1280.2	0.885	142.2
32	9.95	11.94	196.6	*	1268.3	1.19	118.9

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A05 Page 2

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
33	17.54	12.71	209.3	*	1255.6	0.724	223.0
34	23.67	13.53	222.9	*	1242.0	0.571	320.4
35	24.17	14.41	237.3	*	1227.6	0.596	348.4
36	29.99	15.34	252.6	*	1212.3	0.511	460.2
37	37.14	16.33	269.0	*	1195.9	0.439	606.8
38	41.30	17.39	286.4	*	1178.5	0.421	718.4
39	56.36	18.51	304.9	*	1160.0	0.328	1043.8
40	53.25	19.71	324.6	*	1140.3	0.370	1049.9
41	64.13	20.99	345.6	*	1119.3	0.327	1346.3
42	69.58	22.34	368.0	*	1096.9	0.321	1555.1
43	70.64	23.79	391.7	*	1073.2	0.336	1680.7
44	71.72	25.33	417.1	*	1047.8	0.353	1816.9
45	65.74	26.96	444.1	*	1020.8	0.410	1773.0
46	71.08	28.71	472.8	*	992.1	0.403	2041.1
47	63.60	30.56	503.3	*	961.6	0.480	1944.5
48	46.60	32.54	535.9	*	929.0	0.698	1516.7
49	32.68	34.65	570.5	*	894.4	1.06	1132.4
50	17.49	36.89	607.4	*	857.5	2.10	645.4
51	8.54	39.27	646.7	*	818.2	4.59	335.5
52	6.55	41.81	688.5	*	776.4	6.37	274.1
53	0.475	44.51	733.0	*	731.9	93.54	21.18
54	5.01	47.39	780.4	*	684.5	9.45	237.4
55	9.24	50.46	830.9	*	634.0	5.45	466.5
56	15.91	53.72	884.6	*	580.3	3.37	854.8
57	20.93	57.19	941.8	*	523.1	2.73	1197.4
58	22.98	60.89	1002.7	*	462.2	2.64	1399.6
59	28.72	64.83	1067.5	*	397.4	2.25	1862.0
60	395.9						

"*" INDICATES FIXED PARAMETER

Prepared for s/n1156

A07

Central Loop TEM

Northing: 999900.0 Easting: 280200.0 Elevation: 1475.0

			Layered Model:		Smooth Model:	
No.	Time (ms)	Data Resistivity (ohm-m)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)
1	0.0859	53.50			55.08	-2.95
2	0.104	51.57			52.38	-1.56
3	0.129	49.62			50.26	-1.28
4	0.159	47.93			48.57	-1.34
5	0.198	46.45			47.33	-1.88
6	0.248	45.33			46.31	-2.15
7	0.312	44.64			45.49	-1.90
8	0.393	44.32			44.68	-0.819
9	0.497	44.18			43.77	0.925
10	0.629	43.76			42.66	2.50
11	0.797	42.67			41.35	3.08
12	1.01	40.72			39.94	1.91
13	1.28	38.39			38.60	-0.551
14	1.63	36.09			37.54	-4.04
15	2.07	34.51			36.97	-7.14
16	2.64	33.86			37.01	-9.30
17	3.37	33.97			37.80	-11.26
18	4.29	35.44			39.44	-11.26
19	5.47	37.43			42.03	-12.27
20	6.97	41.76			45.81	-9.69
21	0.352	46.40			45.75	1.40
22	0.427	46.09			44.92	2.52
23	0.525	45.80			43.96	4.01
24	0.647	45.23			42.82	5.31
25	0.802	44.00			41.52	5.63
26	1.00	41.98			40.10	4.47
27	1.25	39.64			38.73	2.29
28	1.58	37.40			37.58	-0.501
29	1.99	35.67			36.81	-3.17
30	2.52	34.70			36.53	-5.27
31	3.19	34.20			36.82	-7.65
32	4.05	35.02			37.74	-7.74

Prepared for s/n1156

A07 Page 2

No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
33	5.14	37.02			39.22	-5.93
34	6.54	40.26			41.22	-2.37
35	8.32	45.89			43.54	5.12
36	10.59	52.86			45.80	13.35
37	13.49	85.22			47.20	44.61
38*	17.19	-204.0			47.33	123.2
39	21.90	-45.99			46.03	200.0
40	27.92	-32.77			43.94	234.0
41	0.881	44.87			40.95	8.72
42	1.06	42.92			39.72	7.45
43	1.31	39.97			38.50	3.67
44	1.61	38.59			37.49	2.84
45	2.00	36.27			36.79	-1.43
46	2.50	35.23			36.50	-3.62
47	3.14	35.22			36.73	-4.28
48	3.95	35.98			37.51	-4.24
49	4.99	38.35			38.81	-1.19
50	6.31	39.81			40.54	-1.85
51	7.99	44.25			42.48	4.00
52	10.13	57.02			44.18	22.50
53*	12.86	148.7			44.88	69.81
54*	16.35	131.2			44.22	66.30
55*	20.80	-199.0			41.96	121.0
56	26.47	-29.93			39.01	230.3
57*	33.72	-15.16			36.17	338.5
58*	42.96	-10.28			34.00	430.4
59*	54.74	-9.44			32.80	447.1
60*	69.77	-4.95			32.50	756.2

"*" INDICATES MASKED DATA POINT

Prepared for s/n1156

A07

Central Loop TEM

Northing: 999900.0 Easting: 280200.0 Elevation: 1475.0

Layered Model

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
				1475.0		
1	35.69	32.46	32.46	1442.5	0.909	1158.8
2	62.11	26.66	59.13	1415.8	0.429	1656.5
3	25.68	24.63	83.77	1391.2	0.959	632.9
4	71.03	74.51	158.2	1316.7	1.04	5293.1
5	17.32	129.2	287.4	1187.5	7.45	2238.5
6	254.0	300.9	588.4	886.5	1.18	76456.8
7	0.764	471.8	1060.2	414.7	617.0	360.7
8	86.35					

ALL PARAMETERS ARE FREE

Prepared for s/n1156

A07

Central Loop TEM

Northing: 999900.0 Easting: 280200.0 Elevation: 1475.0

Smooth Model: Ridge Regression

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
					1475.0		
1	38.28	34.87	34.87	*	1440.1	0.911	1335.0
2	40.82	2.25	37.13	*	1437.8	0.0552	92.05
3	43.89	2.40	39.53	*	1435.4	0.0546	105.3
4	53.91	2.55	42.08	*	1432.9	0.0474	137.7
5	56.83	2.72	44.80	*	1430.1	0.0478	154.6
6	38.34	2.89	47.70	*	1427.2	0.0755	111.0
7	44.63	3.08	50.78	*	1424.2	0.0691	137.6
8	46.82	3.28	54.07	*	1420.9	0.0701	153.7
9	51.89	3.49	57.56	*	1417.4	0.0673	181.4
10	31.38	3.72	61.29	*	1413.7	0.118	116.8
11	36.00	3.96	65.25	*	1409.7	0.110	142.6
12	36.19	4.21	69.47	*	1405.5	0.116	152.6
13	38.53	4.49	73.96	*	1401.0	0.116	173.0
14	40.06	4.78	78.74	*	1396.2	0.119	191.5
15	55.88	5.09	83.83	*	1391.1	0.0911	284.5
16	50.45	5.42	89.25	*	1385.7	0.107	273.4
17	58.55	5.77	95.03	*	1379.9	0.0985	337.9
18	46.34	6.14	101.1	*	1373.8	0.132	284.7
19	35.89	6.54	107.7	*	1367.2	0.182	234.7
20	43.22	6.96	114.6	*	1360.3	0.161	301.0
21	35.41	7.41	122.0	*	1352.9	0.209	262.5
22	40.81	7.89	129.9	*	1345.0	0.193	322.2
23	33.83	8.40	138.3	*	1336.6	0.248	284.3
24	35.70	8.94	147.3	*	1327.6	0.250	319.4
25	29.19	9.52	156.8	*	1318.1	0.326	278.1
26	31.03	10.14	167.0	*	1307.9	0.326	314.7
27	22.26	10.79	177.8	*	1297.1	0.485	240.3
28	30.01	11.49	189.3	*	1285.6	0.383	345.0
29	27.41	12.23	201.5	*	1273.4	0.446	335.5
30	23.07	13.03	214.5	*	1260.4	0.564	300.7
31	25.73	13.87	228.4	*	1246.5	0.539	357.0
32	29.62	14.77	243.2	*	1231.7	0.498	437.5

Prepared for s/n1156

A07 Page 2

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
33	36.43	15.72	258.9	*	1216.0	0.431	573.0
34	36.89	16.74	275.6	*	1199.3	0.453	617.6
35	45.50	17.82	293.5	*	1181.4	0.391	811.1
36	43.21	18.97	312.4	*	1162.5	0.439	820.0
37	60.97	20.20	332.6	*	1142.3	0.331	1231.8
38	72.79	21.51	354.1	*	1120.8	0.295	1565.9
39	87.97	22.90	377.1	*	1097.8	0.260	2014.7
40	83.31	24.38	401.4	*	1073.5	0.292	2031.4
41	102.0	25.95	427.4	*	1047.5	0.254	2649.0
42	119.2	27.63	455.0	*	1019.9	0.231	3296.4
43	114.4	29.42	484.4	*	990.5	0.257	3367.7
44	112.0	31.32	515.8	*	959.1	0.279	3510.9
45	102.8	33.35	549.1	*	925.8	0.324	3429.2
46	77.87	35.50	584.6	*	890.3	0.455	2765.2
47	65.55	37.80	622.4	*	852.5	0.576	2478.2
48	53.11	40.24	662.7	*	812.2	0.757	2137.5
49	36.39	42.84	705.5	*	769.4	1.17	1559.4
50	25.92	45.61	751.1	*	723.8	1.75	1182.7
51	18.77	48.56	799.7	*	675.2	2.58	911.7
52	13.55	51.70	851.4	*	623.5	3.81	700.9
53	11.17	55.05	906.5	*	568.4	4.92	615.0
54	9.87	58.61	965.1	*	509.8	5.93	578.8
55	10.63	62.40	1027.5	*	447.4	5.86	663.6
56	12.93	66.43	1093.9	*	381.0	5.13	859.2
57	17.35	70.73	1164.7	*	310.2	4.07	1227.8
58	22.87	75.30	1240.0	*	234.9	3.29	1722.8
59	29.62	80.17	1320.1	*	154.8	2.70	2375.3
60	121.4						

"*" INDICATES FIXED PARAMETER

Prepared for s/n1156

A08

Central Loop TEM

Northing: 1000139.0 Easting: 280555.0 Elevation: 1475.0

			Layered Model:		Smooth Model:	
No.	Time (ms)	Data Resistivity (ohm-m)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)
1	0.0859	62.52			60.32	3.51
2	0.104	59.88			57.74	3.55
3	0.129	57.12			55.84	2.24
4	0.159	54.67			54.43	0.433
5	0.198	52.57			53.51	-1.79
6	0.248	50.88			52.87	-3.91
7	0.312	49.66			52.37	-5.44
8	0.393	48.74			51.61	-5.88
9	0.497	48.07			50.35	-4.73
10	0.629	47.01			48.35	-2.86
11	0.797	45.25			45.79	-1.18
12	1.01	42.77			43.01	-0.566
13	1.28	40.00			40.48	-1.17
14	1.63	37.40			38.46	-2.84
15	2.07	35.39			37.21	-5.13
16	2.64	34.37			36.81	-7.11
17	3.37	34.02			37.38	-9.85
18	4.29	34.41			39.12	-13.70
19	5.47	36.25			42.39	-16.92
20	6.97	39.68			47.79	-20.42
21	0.352	51.90			51.88	0.0331
22	0.427	50.93			51.14	-0.407
23	0.525	50.31			49.87	0.888
24	0.647	49.34			47.98	2.75
25	0.802	47.41			45.61	3.78
26	1.00	45.19			43.00	4.86
27	1.25	42.10			40.54	3.69
28	1.58	39.79			38.51	3.22
29	1.99	37.58			37.10	1.25
30	2.52	36.03			36.45	-1.16
31	3.19	35.63			36.61	-2.73
32	4.05	36.13			37.76	-4.50

Prepared for s/n1156

A08 Page 2

No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
33	5.14	37.72			40.02	-6.09
34	6.54	39.77			43.77	-10.05
35	8.32	56.38			49.21	12.72
36	10.59	56.45			56.33	0.213
37	13.49	75.73			62.80	17.07
38*	17.19	-98.27			64.67	165.8
39	21.90	-51.99			58.73	212.9
40*	27.92	-17.41			48.78	380.1
41	0.881	47.32			44.40	6.17
42	1.06	44.32			42.18	4.83
43	1.31	43.16			40.04	7.23
44	1.61	39.70			38.26	3.62
45	2.00	37.46			37.02	1.19
46	2.50	37.23			36.37	2.29
47	3.14	36.15			36.45	-0.820
48	3.95	39.28			37.41	4.74
49	4.99	37.19			39.32	-5.72
50	6.31	42.45			42.48	-0.0698
51	7.99	41.49			46.74	-12.65
52	10.13	74.15			51.77	30.17
53*	12.86	-503.0			54.93	110.9
54	16.35	75.00			53.66	28.44
55*	20.80	-36.06			46.32	228.4
56	26.47	-42.38			37.46	188.4
57	33.72	-19.12			29.77	255.7
58	42.96	-15.51			23.95	254.4
59	54.74	-11.85			19.86	267.4
60*	69.77	-4.23			17.04	502.7

"*" INDICATES MASKED DATA POINT

Prepared for s/n1156

A08

Central Loop TEM

Northing: 1000139.0 Easting: 280555.0 Elevation: 1475.0

Layered Model

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
				1475.0		
1	44.26	32.14	32.14	1442.8	0.726	1423.1
2	92.54	17.14	49.29	1425.7	0.185	1586.5
3	28.84	42.71	92.01	1382.9	1.48	1232.2
4	74.38	92.80	184.8	1290.1	1.24	6902.6
5	9.51	91.41	276.2	1198.7	9.61	869.4
6	180.4	178.6	454.8	1020.1	0.990	32238.5
7	0.0729	613.0	1067.9	407.0	8407.0	44.70
8	255.2					

ALL PARAMETERS ARE FREE

Prepared for s/n1156

A08

Central Loop TEM

Northing: 1000139.0 Easting: 280555.0 Elevation: 1475.0

Smooth Model: Ridge Regression

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
					1475.0		
1	40.98	35.29	35.29	*	1439.7	0.861	1446.7
2	53.74	2.28	37.58	*	1437.4	0.0424	122.6
3	62.03	2.42	40.01	*	1434.9	0.0391	150.7
4	64.21	2.58	42.59	*	1432.4	0.0402	166.1
5	51.08	2.75	45.35	*	1429.6	0.0539	140.7
6	59.52	2.93	48.28	*	1426.7	0.0492	174.5
7	55.77	3.12	51.40	*	1423.5	0.0559	174.1
8	53.14	3.32	54.72	*	1420.2	0.0625	176.6
9	43.00	3.53	58.26	*	1416.7	0.0822	152.1
10	45.12	3.76	62.03	*	1412.9	0.0834	169.9
11	43.45	4.01	66.04	*	1408.9	0.0923	174.2
12	42.30	4.27	70.31	*	1404.6	0.100	180.6
13	52.79	4.54	74.86	*	1400.1	0.0861	240.0
14	63.35	4.84	79.70	*	1395.2	0.0764	306.6
15	49.42	5.15	84.85	*	1390.1	0.104	254.6
16	60.77	5.48	90.34	*	1384.6	0.0902	333.4
17	49.45	5.84	96.18	*	1378.8	0.118	288.8
18	59.03	6.21	102.4	*	1372.5	0.105	367.1
19	42.59	6.62	109.0	*	1365.9	0.155	281.9
20	56.97	7.04	116.0	*	1358.9	0.123	401.6
21	38.92	7.50	123.5	*	1351.4	0.192	292.1
22	51.33	7.98	131.5	*	1343.4	0.155	410.1
23	44.01	8.50	140.0	*	1334.9	0.193	374.3
24	38.15	9.05	149.1	*	1325.8	0.237	345.5
25	31.50	9.64	158.7	*	1316.2	0.306	303.8
26	22.27	10.26	169.0	*	1305.9	0.460	228.6
27	22.68	10.92	179.9	*	1295.0	0.481	247.9
28	14.40	11.63	191.6	*	1283.3	0.807	167.5
29	17.62	12.38	203.9	*	1271.0	0.702	218.3
30	20.01	13.18	217.1	*	1257.8	0.658	263.9
31	26.24	14.04	231.2	*	1243.7	0.535	368.4
32	21.62	14.94	246.1	*	1228.8	0.691	323.2

Prepared for s/n1156

A08 Page 2

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
33	31.75	15.91	262.0	*	1212.9	0.501	505.3
34	40.99	16.94	279.0	*	1195.9	0.413	694.7
35	51.29	18.04	297.0	*	1177.9	0.351	925.3
36	67.93	19.20	316.2	*	1158.7	0.282	1304.9
37	81.67	20.44	336.7	*	1138.2	0.250	1670.0
38	94.52	21.77	358.4	*	1116.5	0.230	2057.9
39	98.60	23.17	381.6	*	1093.3	0.235	2285.4
40	105.1	24.67	406.3	*	1068.6	0.234	2595.1
41	109.2	26.27	432.6	*	1042.3	0.240	2869.5
42	112.2	27.97	460.5	*	1014.4	0.249	3141.0
43	104.7	29.77	490.3	*	984.6	0.284	3120.0
44	93.85	31.70	522.0	*	952.9	0.337	2975.8
45	82.37	33.75	555.8	*	919.1	0.409	2780.6
46	69.83	35.93	591.7	*	883.2	0.514	2509.7
47	53.27	38.26	630.0	*	844.9	0.718	2038.4
48	34.36	40.73	670.7	*	804.2	1.18	1399.7
49	17.39	43.36	714.1	*	760.8	2.49	754.3
50	4.88	46.17	760.3	*	714.6	9.44	225.6
51	0.557	49.15	809.4	*	665.5	88.25	27.38
52	3.59	52.33	861.8	*	613.1	14.56	188.0
53	9.86	55.72	917.5	*	557.4	5.64	549.5
54	15.73	59.32	976.8	*	498.1	3.76	933.5
55	20.25	63.15	1040.0	*	434.9	3.11	1279.2
56	24.35	67.24	1107.2	*	367.7	2.76	1637.3
57	28.79	71.58	1178.8	*	296.1	2.48	2061.1
58	33.09	76.21	1255.0	*	219.9	2.30	2522.2
59	37.15	81.14	1336.2	*	138.7	2.18	3014.9
60	174.4						

"*" INDICATES FIXED PARAMETER

Prepared for s/n1156

A09

Central Loop TEM

Northing: 1000502.0 Easting: 281000.0 Elevation: 1471.0

			Layered Model:		Smooth Model:	
No.	Time (ms)	Data Resistivity (ohm-m)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)
1	0.0859	22.71			22.48	1.02
2	0.104	21.83			21.21	2.83
3	0.129	21.13			20.41	3.42
4	0.159	20.68			20.07	2.95
5	0.198	20.44			20.15	1.41
6	0.248	20.46			20.52	-0.288
7	0.312	20.76			21.24	-2.29
8	0.393	21.39			22.16	-3.58
9	0.497	22.35			23.16	-3.64
10	0.629	23.55			24.30	-3.19
11	0.797	24.87			25.06	-0.745
12	1.01	26.00			25.95	0.198
13	1.28	26.72			26.30	1.56
14	1.63	26.97			26.88	0.343
15	2.07	26.99			27.30	-1.17
16	2.64	27.24			28.42	-4.32
17	3.37	27.54			29.59	-7.45
18	4.29	29.03			31.98	-10.18
19	5.47	30.73			35.24	-14.66
20	6.97	34.58			39.74	-14.92
21	0.352	21.59			21.62	-0.172
22	0.427	22.20			22.40	-0.899
23	0.525	23.18			23.35	-0.719
24	0.647	24.33			24.34	-0.0421
25	0.802	25.52			25.01	2.01
26	1.00	26.62			25.85	2.91
27	1.25	27.32			26.17	4.22
28	1.58	27.80			26.70	3.96
29	1.99	27.70			27.03	2.41
30	2.52	28.02			27.89	0.451
31	3.19	28.79			28.71	0.277
32	4.05	29.30			30.67	-4.67

Prepared for s/n1156

A09 Page 2

No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
33	5.14	31.26			32.70	-4.59
34	6.54	33.47			35.98	-7.49
35	8.32	38.94			39.76	-2.10
36	10.59	44.31			43.36	2.14
37*	13.49	108.2			44.87	58.54
38	17.19	-58.67			42.99	173.2
39	21.90	-25.52			38.53	250.9
40*	27.92	-12.63			32.79	359.5
41	0.881	26.45			25.37	4.07
42	1.06	27.16			25.91	4.57
43	1.31	27.70			26.23	5.31
44	1.61	27.61			26.71	3.27
45	2.00	28.07			27.01	3.76
46	2.50	28.02			27.82	0.725
47	3.14	29.48			28.55	3.15
48	3.95	31.75			30.34	4.45
49	4.99	34.06			32.05	5.88
50	6.31	38.20			35.05	8.25
51	7.99	40.88			37.86	7.39
52	10.13	50.96			40.61	20.30
53	12.86	46.04			40.72	11.55
54*	16.35	216.2			38.38	82.24
55	20.80	-29.65			32.97	211.1
56	26.47	-23.52			27.77	218.0
57	33.72	-29.50			23.64	180.1
58	42.96	-18.50			20.16	208.9
59*	54.74	-5.96			18.28	406.4
60*	69.77	-5.86			16.83	387.2

"*" INDICATES MASKED DATA POINT

Prepared for s/n1156

A09

Central Loop TEM

Northing: 1000502.0 Easting: 281000.0 Elevation: 1471.0

Layered Model

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
				1471.0		
1	12.96	28.28	28.28	1442.7	2.18	366.6
2	60.11	19.84	48.13	1422.8	0.330	1193.0
3	29.04	32.25	80.38	1390.6	1.11	936.8
4	76.81	80.75	161.1	1309.8	1.05	6203.2
5	16.93	119.5	280.6	1190.3	7.05	2023.8
6	149.4	247.8	528.5	942.4	1.65	37053.0
7	0.607	337.9	866.4	604.5	556.3	205.2
8	101.0					

ALL PARAMETERS ARE FREE

Prepared for s/n1156

A09

Central Loop TEM

Northing: 1000502.0 Easting: 281000.0 Elevation: 1471.0

Smooth Model: Ridge Regression

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
					1471.0		
1	12.77	28.67	28.67	*	1442.3	2.24	366.3
2	51.21	1.85	30.53	*	1440.4	0.0362	94.97
3	46.65	1.97	32.50	*	1438.4	0.0423	92.11
4	73.88	2.10	34.60	*	1436.3	0.0284	155.3
5	69.82	2.23	36.84	*	1434.1	0.0320	156.2
6	74.72	2.38	39.23	*	1431.7	0.0318	178.0
7	34.05	2.53	41.76	*	1429.2	0.0744	86.37
8	75.57	2.70	44.46	*	1426.5	0.0357	204.0
9	54.21	2.87	47.34	*	1423.6	0.0530	155.8
10	69.50	3.06	50.40	*	1420.5	0.0440	212.7
11	53.21	3.25	53.66	*	1417.3	0.0612	173.4
12	42.69	3.46	57.13	*	1413.8	0.0812	148.1
13	50.87	3.69	60.82	*	1410.1	0.0726	187.9
14	38.82	3.93	64.75	*	1406.2	0.101	152.6
15	50.47	4.18	68.94	*	1402.0	0.0829	211.3
16	38.10	4.45	73.40	*	1397.5	0.116	169.8
17	55.13	4.74	78.14	*	1392.8	0.0860	261.6
18	40.21	5.05	83.20	*	1387.7	0.125	203.1
19	50.01	5.37	88.57	*	1382.4	0.107	269.0
20	58.29	5.72	94.30	*	1376.6	0.0982	333.8
21	48.82	6.09	100.4	*	1370.5	0.124	297.6
22	38.06	6.49	106.8	*	1364.1	0.170	247.1
23	42.40	6.91	113.8	*	1357.1	0.163	293.0
24	40.46	7.35	121.1	*	1349.8	0.181	297.7
25	33.67	7.83	128.9	*	1342.0	0.232	263.7
26	30.99	8.34	137.3	*	1333.6	0.269	258.5
27	31.19	8.87	146.2	*	1324.7	0.284	277.0
28	20.29	9.45	155.6	*	1315.3	0.465	191.8
29	26.91	10.06	165.7	*	1305.2	0.373	270.8
30	24.20	10.71	176.4	*	1294.5	0.442	259.3
31	20.76	11.40	187.8	*	1283.1	0.549	236.9
32	25.45	12.14	200.0	*	1270.9	0.477	309.1

Prepared for s/n1156

A09 Page 2

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
33	29.60	12.93	212.9	*	1258.0	0.436	382.8
34	26.49	13.76	226.7	*	1244.2	0.519	364.8
35	30.23	14.65	241.3	*	1229.6	0.484	443.1
36	39.35	15.60	256.9	*	1214.0	0.396	614.2
37	51.08	16.61	273.5	*	1197.4	0.325	848.7
38	57.37	17.68	291.2	*	1179.7	0.308	1014.9
39	63.93	18.83	310.1	*	1160.8	0.294	1204.0
40	69.75	20.04	330.1	*	1140.8	0.287	1398.5
41	76.08	21.34	351.5	*	1119.4	0.280	1624.1
42	83.20	22.72	374.2	*	1096.7	0.273	1890.9
43	87.94	24.19	398.4	*	1072.5	0.275	2127.9
44	91.54	25.75	424.1	*	1046.8	0.281	2358.2
45	85.37	27.42	451.6	*	1019.3	0.321	2341.3
46	76.77	29.19	480.8	*	990.1	0.380	2241.7
47	67.55	31.08	511.8	*	959.1	0.460	2100.0
48	58.31	33.09	544.9	*	926.0	0.567	1930.1
49	43.55	35.23	580.2	*	890.7	0.809	1534.6
50	29.19	37.51	617.7	*	853.2	1.28	1095.1
51	16.24	39.93	657.6	*	813.3	2.45	648.7
52	5.40	42.52	700.2	*	770.7	7.86	229.8
53	1.42	45.27	745.4	*	725.5	31.87	64.29
54	2.31	48.19	793.6	*	677.3	20.78	111.7
55	7.16	51.31	844.9	*	626.0	7.16	367.7
56	12.19	54.63	899.6	*	571.3	4.48	666.0
57	17.57	58.16	957.7	*	513.2	3.30	1022.1
58	22.78	61.92	1019.7	*	451.2	2.71	1411.1
59	26.91	65.92	1085.6	*	385.3	2.44	1774.2
60	104.0						

"*" INDICATES FIXED PARAMETER

Prepared for s/n1156

A10

Central Loop TEM

Northing: 1000900.0 Easting: 281300.0 Elevation: 1468.0

			Layered Model:		Smooth Model:	
No.	Time (ms)	Data Resistivity (ohm-m)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)
1	0.0859	28.84			29.68	-2.92
2	0.104	27.88			27.96	-0.275
3	0.129	27.10			26.77	1.21
4	0.159	26.54			26.05	1.85
5	0.198	26.19			25.83	1.36
6	0.248	26.06			26.00	0.196
7	0.312	26.24			26.55	-1.18
8	0.393	26.70			27.43	-2.74
9	0.497	27.52			28.44	-3.33
10	0.629	28.56			29.50	-3.27
11	0.797	29.56			30.22	-2.24
12	1.01	30.12			30.55	-1.43
13	1.28	30.10			30.41	-1.01
14	1.63	29.45			30.05	-2.04
15	2.07	28.96			29.73	-2.66
16	2.64	28.48			29.83	-4.74
17	3.37	28.43			30.47	-7.15
18	4.29	29.10			31.87	-9.52
19	5.47	30.53			34.21	-12.05
20	6.97	33.30			38.02	-14.17
21	0.352	27.28			26.92	1.30
22	0.427	27.81			27.73	0.294
23	0.525	28.66			28.63	0.0949
24	0.647	29.71			29.56	0.510
25	0.802	30.59			30.17	1.35
26	1.00	31.09			30.46	2.00
27	1.25	30.86			30.34	1.71
28	1.58	30.51			29.94	1.87
29	1.99	29.86			29.56	0.982
30	2.52	29.27			29.44	-0.568
31	3.19	29.25			29.77	-1.78
32	4.05	29.67			30.65	-3.32

Prepared for s/n1156

A10 Page 2

No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
33	5.14	31.88			32.29	-1.28
34	6.54	34.47			34.74	-0.774
35	8.32	36.30			38.15	-5.08
36	10.59	47.86			42.70	10.78
37	13.49	63.40			46.97	25.90
38*	17.19	-226.9			50.24	122.1
39	21.90	-37.13			49.56	233.4
40	27.92	-26.59			44.63	267.8
41	0.881	31.87			30.30	4.94
42	1.06	31.78			30.45	4.20
43	1.31	31.74			30.23	4.76
44	1.61	31.44			29.88	4.95
45	2.00	31.36			29.53	5.83
46	2.50	29.45			29.40	0.183
47	3.14	30.29			29.67	2.02
48	3.95	29.62			30.43	-2.70
49	4.99	30.90			31.88	-3.17
50	6.31	39.93			33.95	14.97
51	7.99	30.71			36.84	-19.95
52	10.13	37.63			40.28	-7.04
53*	12.86	194.5			43.00	77.89
54	16.35	68.92			44.20	35.86
55*	20.80	-176.1			41.54	123.5
56	26.47	-60.39			36.20	159.9
57*	33.72	297.2			30.49	89.74
58*	42.96	-10.38			25.44	345.1
59	54.74	-16.23			21.95	235.1
60*	69.77	-5.43			19.43	457.4

"*" INDICATES MASKED DATA POINT

Prepared for s/n1156

A10

Central Loop TEM

Northing: 1000900.0 Easting: 281300.0 Elevation: 1468.0

Layered Model

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
				1468.0		
1	18.06	35.03	35.03	1432.9	1.93	632.8
2	60.85	27.17	62.20	1405.7	0.446	1653.6
3	30.97	36.03	98.24	1369.7	1.16	1116.1
4	82.68	79.18	177.4	1290.5	0.957	6547.2
5	11.33	71.64	249.0	1218.9	6.32	811.7
6	305.9	492.7	741.8	726.1	1.61	150742.4
7	1.43	128.6	870.4	597.5	89.89	184.0
8	80.93					

ALL PARAMETERS ARE FREE

Prepared for s/n1156

A10

Central Loop TEM

Northing: 1000900.0 Easting: 281300.0 Elevation: 1468.0

Smooth Model: Ridge Regression

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
					1468.0		
1	19.47	30.33	30.33	*	1437.6	1.55	590.7
2	19.79	1.96	32.29	*	1435.7	0.0990	38.82
3	10.15	2.08	34.37	*	1433.6	0.205	21.20
4	91.74	2.22	36.60	*	1431.3	0.0242	203.9
5	79.41	2.36	38.96	*	1429.0	0.0298	187.9
6	11.43	2.51	41.48	*	1426.5	0.220	28.79
7	29.31	2.68	44.17	*	1423.8	0.0915	78.62
8	34.46	2.85	47.02	*	1420.9	0.0828	98.42
9	50.12	3.04	50.06	*	1417.9	0.0606	152.4
10	87.65	3.23	53.30	*	1414.6	0.0369	283.7
11	73.27	3.44	56.75	*	1411.2	0.0470	252.5
12	39.94	3.66	60.41	*	1407.5	0.0918	146.5
13	48.90	3.90	64.32	*	1403.6	0.0798	191.0
14	39.03	4.15	68.48	*	1399.5	0.106	162.3
15	40.13	4.42	72.91	*	1395.0	0.110	177.7
16	54.62	4.71	77.62	*	1390.3	0.0863	257.5
17	83.16	5.01	82.64	*	1385.3	0.0603	417.3
18	78.33	5.34	87.98	*	1380.0	0.0682	418.5
19	51.36	5.68	93.67	*	1374.3	0.110	292.2
20	49.55	6.05	99.73	*	1368.2	0.122	300.1
21	46.36	6.44	106.1	*	1361.8	0.139	298.9
22	56.35	6.86	113.0	*	1354.9	0.121	386.9
23	48.74	7.30	120.3	*	1347.6	0.149	356.2
24	59.16	7.78	128.1	*	1339.8	0.131	460.3
25	53.99	8.28	136.4	*	1331.5	0.153	447.3
26	55.53	8.82	145.2	*	1322.7	0.158	489.8
27	36.45	9.39	154.6	*	1313.3	0.257	342.3
28	23.64	9.99	164.6	*	1303.3	0.422	236.4
29	21.71	10.64	175.2	*	1292.7	0.490	231.0
30	18.08	11.33	186.6	*	1281.3	0.626	204.9
31	15.68	12.06	198.6	*	1269.3	0.769	189.2
32	20.23	12.84	211.5	*	1256.4	0.634	259.9

Prepared for s/n1156

A10 Page 2

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
33	17.66	13.67	225.1	*	1242.8	0.774	241.5
34	22.88	14.56	239.7	*	1228.2	0.636	333.2
35	23.03	15.50	255.2	*	1212.7	0.673	357.0
36	32.25	16.50	271.7	*	1196.2	0.511	532.2
37	43.41	17.57	289.3	*	1178.6	0.404	762.8
38	58.85	18.70	308.0	*	1159.9	0.317	1101.0
39	79.58	19.91	327.9	*	1140.0	0.250	1585.0
40	96.07	21.20	349.1	*	1118.8	0.220	2037.2
41	105.8	22.57	371.7	*	1096.2	0.213	2389.7
42	114.1	24.03	395.7	*	1072.2	0.210	2743.4
43	128.4	25.58	421.3	*	1046.6	0.199	3286.0
44	119.8	27.24	448.6	*	1019.3	0.227	3265.0
45	115.3	29.00	477.6	*	990.3	0.251	3346.5
46	111.3	30.87	508.4	*	959.5	0.277	3438.7
47	95.01	32.87	541.3	*	926.6	0.346	3123.6
48	78.66	35.00	576.3	*	891.6	0.444	2753.4
49	60.71	37.26	613.6	*	854.3	0.613	2262.6
50	44.50	39.67	653.3	*	814.6	0.891	1765.5
51	29.15	42.23	695.5	*	772.4	1.44	1231.6
52	15.83	44.97	740.5	*	727.4	2.84	712.0
53	5.84	47.87	788.3	*	679.6	8.18	279.8
54	1.64	50.97	839.3	*	628.6	31.04	83.70
55	1.75	54.26	893.6	*	574.3	30.94	95.16
56	4.40	57.77	951.4	*	516.5	13.11	254.5
57	8.31	61.51	1012.9	*	455.0	7.40	511.3
58	12.09	65.49	1078.4	*	389.5	5.41	792.3
59	16.00	69.72	1148.1	*	319.8	4.35	1115.8
60	61.74						

"*" INDICATES FIXED PARAMETER

Prepared for s/n1156

A11

Central Loop TEM

Northing: 1000070.0 Easting: 279530.0 Elevation: 1463.0

			Layered Model:		Smooth Model:	
No.	Time (ms)	Data Resistivity (ohm-m)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)
1	0.0859	55.68			55.00	1.21
2	0.104	53.95			53.25	1.29
3	0.129	52.36			52.01	0.661
4	0.159	51.11			51.03	0.145
5	0.198	50.20			50.51	-0.627
6	0.248	49.74			50.12	-0.765
7	0.312	49.70			50.17	-0.955
8	0.393	49.78			50.23	-0.903
9	0.497	49.85			50.22	-0.734
10	0.629	49.19			49.49	-0.595
11	0.797	47.50			47.81	-0.655
12	1.01	44.95			45.37	-0.931
13	1.28	42.09			42.53	-1.04
14	1.63	39.75			40.10	-0.903
15	2.07	38.07			38.41	-0.867
16	2.64	37.97			37.73	0.613
17	3.37	38.32			38.11	0.568
18	4.29	39.95			39.85	0.251
19	5.47	43.27			43.19	0.190
20	6.97	47.59			48.96	-2.88
21	0.352	51.67			50.93	1.44
22	0.427	51.64			50.76	1.70
23	0.525	51.45			50.60	1.65
24	0.647	50.51			49.63	1.74
25	0.802	48.74			47.94	1.64
26	1.00	46.18			45.55	1.35
27	1.25	43.25			42.75	1.15
28	1.58	40.74			40.31	1.05
29	1.99	38.99			38.40	1.51
30	2.52	37.79			37.41	0.985
31	3.19	38.02			37.29	1.91
32	4.05	39.18			38.24	2.39

Prepared for s/n1156

A11 Page 2

No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
33	5.14	40.70			40.31	0.963
34	6.54	42.93			43.58	-1.50
35	8.32	45.05			47.63	-5.71
36	10.59	50.26			51.06	-1.59
37	13.49	52.49			51.37	2.15
38	17.19	48.16			47.04	2.31
39	21.90	32.06			40.34	-25.82
40	27.92	21.60			34.09	-57.83
41	0.881	48.72			47.13	3.27
42	1.06	45.89			44.79	2.38
43	1.31	43.08			42.32	1.75
44	1.61	40.85			40.10	1.83
45	2.00	39.13			38.37	1.94
46	2.50	37.81			37.40	1.09
47	3.14	37.97			37.17	2.10
48	3.95	38.07			37.89	0.487
49	4.99	40.12			39.59	1.32
50	6.31	41.80			42.17	-0.891
51	7.99	45.21			45.23	-0.0303
52	10.13	46.48			47.16	-1.46
53	12.86	56.43			46.13	18.25
54	16.35	55.29			41.04	25.77
55	20.80	43.20			34.47	20.19
56*	26.47	65.67			28.27	56.94
57	33.72	23.61			23.46	0.644
58*	42.96	57.34			20.10	64.93
59	54.74	16.25			17.80	-9.53
60*	69.77	7.83			16.47	-110.3

"*" INDICATES MASKED DATA POINT

Prepared for s/n1156

A11

Central Loop TEM

Northing: 1000070.0 Easting: 279530.0 Elevation: 1463.0

Layered Model

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
				1463.0		
1	35.89	32.92	32.92	1430.0	0.917	1181.9
2	151.8	13.54	46.47	1416.5	0.0892	2056.7
3	40.48	54.13	100.6	1362.3	1.33	2191.4
4	68.19	85.49	186.0	1276.9	1.25	5829.9
5	13.28	91.48	277.5	1185.4	6.88	1215.6
6	123.2	265.8	543.4	919.5	2.15	32750.8
7	0.789	431.6	975.0	487.9	546.6	340.8
8	62.84					

ALL PARAMETERS ARE FREE

Prepared for s/n1156

A11

Central Loop TEM

Northing: 1000070.0 Easting: 279530.0 Elevation: 1463.0

Smooth Model: Ridge Regression

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
					1463.0		
1	35.58	35.53	35.53	*	1427.4	0.998	1264.5
2	35.67	2.29	37.83	*	1425.1	0.0644	81.96
3	160.4	2.44	40.28	*	1422.7	0.0152	392.6
4	178.9	2.60	42.88	*	1420.1	0.0145	466.0
5	167.6	2.77	45.65	*	1417.3	0.0165	464.7
6	61.35	2.95	48.61	*	1414.3	0.0481	181.1
7	71.33	3.14	51.75	*	1411.2	0.0440	224.1
8	341.4	3.34	55.09	*	1407.9	0.00980	1142.6
9	34.16	3.56	58.66	*	1404.3	0.104	121.7
10	32.33	3.79	62.45	*	1400.5	0.117	122.6
11	34.68	4.03	66.49	*	1396.5	0.116	140.0
12	111.7	4.29	70.79	*	1392.2	0.0384	480.3
13	118.8	4.57	75.36	*	1387.6	0.0385	543.8
14	83.41	4.87	80.24	*	1382.7	0.0584	406.4
15	35.51	5.18	85.42	*	1377.5	0.146	184.2
16	66.23	5.52	90.95	*	1372.0	0.0833	365.8
17	48.17	5.88	96.83	*	1366.1	0.122	283.2
18	87.57	6.26	103.0	*	1359.9	0.0714	548.2
19	20.84	6.66	109.7	*	1353.2	0.319	138.9
20	76.65	7.09	116.8	*	1346.1	0.0925	543.9
21	30.73	7.55	124.4	*	1338.5	0.245	232.2
22	53.49	8.04	132.4	*	1330.5	0.150	430.3
23	50.78	8.56	141.0	*	1321.9	0.168	434.8
24	74.04	9.11	150.1	*	1312.8	0.123	675.0
25	61.67	9.70	159.8	*	1303.1	0.157	598.6
26	45.75	10.33	170.1	*	1292.8	0.225	472.9
27	45.04	11.00	181.1	*	1281.8	0.244	495.5
28	23.57	11.71	192.8	*	1270.1	0.496	276.2
29	21.48	12.47	205.3	*	1257.6	0.580	267.9
30	12.92	13.27	218.6	*	1244.3	1.02	171.6
31	14.34	14.13	232.7	*	1230.2	0.985	202.7
32	11.12	15.05	247.8	*	1215.1	1.35	167.3

Prepared for s/n1156

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L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
33	31.62	16.02	263.8	*	1199.1	0.506	506.7
34	43.06	17.05	280.9	*	1182.0	0.396	734.6
35	63.81	18.16	299.0	*	1163.9	0.284	1159.1
36	66.61	19.33	318.4	*	1144.5	0.290	1288.0
37	71.65	20.58	339.0	*	1123.9	0.287	1475.1
38	102.6	21.91	360.9	*	1102.0	0.213	2250.8
39	117.5	23.33	384.2	*	1078.7	0.198	2742.5
40	97.29	24.84	409.1	*	1053.8	0.255	2417.1
41	171.7	26.45	435.5	*	1027.4	0.153	4543.3
42	113.7	28.16	463.7	*	999.2	0.247	3203.2
43	87.91	29.98	493.6	*	969.3	0.341	2635.7
44	73.73	31.91	525.6	*	937.3	0.432	2353.7
45	59.37	33.98	559.5	*	903.4	0.572	2017.8
46	56.87	36.18	595.7	*	867.2	0.636	2057.8
47	33.68	38.51	634.2	*	828.7	1.14	1297.3
48	14.22	41.01	675.3	*	787.6	2.88	583.4
49	2.38	43.66	718.9	*	744.0	18.30	104.1
50	0.954	46.48	765.4	*	697.5	48.71	44.35
51	8.71	49.49	814.9	*	648.0	5.67	431.5
52	20.98	52.69	867.6	*	595.3	2.51	1105.8
53	33.05	56.09	923.7	*	539.2	1.69	1854.4
54	42.44	59.72	983.4	*	479.5	1.40	2535.0
55	52.34	63.58	1047.0	*	415.9	1.21	3328.2
56	58.98	67.69	1114.7	*	348.2	1.14	3992.7
57	61.37	72.07	1186.8	*	276.1	1.17	4423.2
58	62.94	76.73	1263.5	*	199.4	1.21	4830.2
59	64.96	81.69	1345.2	*	117.7	1.25	5307.3
60	844.4						

"*" INDICATES FIXED PARAMETER

Prepared for s/n1156

A12

Central Loop TEM

Northing: 1000300.0 Easting: 279900.0 Elevation: 1492.0

			Layered Model:		Smooth Model:	
No.	Time (ms)	Data Resistivity (ohm-m)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)
1	0.0859	69.83			68.36	2.10
2	0.104	66.27			64.59	2.53
3	0.129	62.71			61.75	1.53
4	0.159	59.64			59.57	0.105
5	0.198	57.07			57.97	-1.57
6	0.248	55.09			56.78	-3.07
7	0.312	53.68			55.79	-3.91
8	0.393	52.67			54.72	-3.88
9	0.497	51.99			53.39	-2.69
10	0.629	50.89			51.47	-1.14
11	0.797	49.05			49.06	-0.0125
12	1.01	46.44			46.20	0.519
13	1.28	43.45			43.42	0.0632
14	1.63	40.77			41.04	-0.682
15	2.07	38.52			39.43	-2.36
16	2.64	37.38			38.73	-3.61
17	3.37	36.87			39.11	-6.07
18	4.29	37.70			40.79	-8.20
19	5.47	39.61			44.06	-11.22
20	6.97	42.59			49.65	-16.57
21	0.352	55.76			56.04	-0.499
22	0.427	54.89			54.97	-0.139
23	0.525	54.06			53.50	1.03
24	0.647	52.86			51.56	2.46
25	0.802	50.67			49.20	2.89
26	1.00	48.25			46.41	3.82
27	1.25	45.46			43.66	3.96
28	1.58	42.37			41.22	2.70
29	1.99	39.99			39.40	1.47
30	2.52	38.12			38.36	-0.634
31	3.19	37.53			38.21	-1.80
32	4.05	37.64			39.02	-3.66

Prepared for s/n1156

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No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
33	5.14	39.02			40.89	-4.79
34	6.54	42.20			43.74	-3.62
35	8.32	48.84			46.93	3.90
36	10.59	77.34			49.02	36.62
37*	13.49	-110.1			47.61	143.2
38	17.19	-30.22			42.73	241.3
39	21.90	-23.17			36.46	257.3
40*	27.92	37.59			30.89	17.81
41	0.881	50.97			48.06	5.71
42	1.06	48.04			45.62	5.02
43	1.31	44.78			43.16	3.62
44	1.61	42.58			40.99	3.74
45	2.00	39.89			39.33	1.39
46	2.50	38.57			38.30	0.681
47	3.14	37.58			38.05	-1.25
48	3.95	38.21			38.62	-1.08
49	4.99	38.11			40.12	-5.27
50	6.31	41.06			42.29	-3.00
51	7.99	50.00			44.58	10.83
52	10.13	49.84			45.39	8.93
53	12.86	67.90			43.06	36.58
54*	16.35	286.7			37.71	86.84
55*	20.80	-183.5			31.48	117.1
56	26.47	-22.47			25.96	215.4
57	33.72	-14.00			21.73	255.2
58*	42.96	-23.44			18.86	180.4
59*	54.74	-33.07			16.91	151.1
60*	69.77	-4.37			15.76	460.6

"*" INDICATES MASKED DATA POINT

Prepared for s/n1156

A12

Central Loop TEM

Northing: 1000300.0 Easting: 279900.0 Elevation: 1492.0

Layered Model

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
				1492.0		
1	74.27	29.51	29.51	1462.4	0.397	2192.0
2	33.61	41.37	70.89	1421.1	1.23	1390.8
3	57.01	106.9	177.8	1314.1	1.87	6095.9
4	13.65	131.6	309.4	1182.5	9.63	1798.1
5	95.20	143.5	453.0	1038.9	1.50	13666.2
6	0.285	265.4	718.4	773.5	930.8	75.71
7	75.28					

ALL PARAMETERS ARE FREE

Prepared for s/n1156

A12

Central Loop TEM

Northing: 1000300.0 Easting: 279900.0 Elevation: 1492.0

Smooth Model: Ridge Regression

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
					1492.0		
1	52.39	36.04	36.04	*	1455.9	0.687	1888.3
2	64.83	2.33	38.37	*	1453.6	0.0359	151.0
3	35.67	2.48	40.85	*	1451.1	0.0695	88.52
4	52.54	2.64	43.49	*	1448.5	0.0502	138.8
5	52.12	2.81	46.30	*	1445.6	0.0539	146.5
6	44.06	2.99	49.30	*	1442.6	0.0679	131.9
7	50.49	3.18	52.49	*	1439.5	0.0631	160.9
8	45.29	3.39	55.88	*	1436.1	0.0749	153.7
9	38.67	3.61	59.49	*	1432.5	0.0934	139.7
10	30.94	3.84	63.34	*	1428.6	0.124	119.0
11	17.56	4.09	67.43	*	1424.5	0.233	71.92
12	121.5	4.36	71.80	*	1420.1	0.0358	530.0
13	128.0	4.64	76.44	*	1415.5	0.0362	594.5
14	76.85	4.94	81.38	*	1410.6	0.0643	379.8
15	61.07	5.26	86.64	*	1405.3	0.0861	321.3
16	57.98	5.60	92.24	*	1399.7	0.0966	324.8
17	63.89	5.96	98.21	*	1393.7	0.0933	381.1
18	66.72	6.34	104.5	*	1387.4	0.0951	423.6
19	82.12	6.76	111.3	*	1380.6	0.0823	555.2
20	47.80	7.19	118.5	*	1373.4	0.150	344.1
21	38.35	7.66	126.1	*	1365.8	0.199	293.8
22	41.37	8.15	134.3	*	1357.6	0.197	337.5
23	35.36	8.68	143.0	*	1348.9	0.245	307.1
24	34.10	9.24	152.2	*	1339.7	0.271	315.4
25	31.58	9.84	162.1	*	1329.8	0.311	310.9
26	30.79	10.48	172.6	*	1319.3	0.340	322.7
27	25.09	11.15	183.7	*	1308.2	0.444	280.0
28	21.87	11.88	195.6	*	1296.3	0.543	259.9
29	22.21	12.64	208.2	*	1283.7	0.569	280.9
30	20.43	13.46	221.7	*	1270.2	0.659	275.1
31	19.61	14.33	236.0	*	1255.9	0.730	281.2
32	16.80	15.26	251.3	*	1240.6	0.908	256.4

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L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
33	22.81	16.25	267.6	*	1224.3	0.712	370.7
34	34.86	17.30	284.9	*	1207.0	0.496	603.1
35	39.24	18.42	303.3	*	1188.6	0.469	722.9
36	58.31	19.61	322.9	*	1169.0	0.336	1143.7
37	64.66	20.88	343.8	*	1148.1	0.322	1350.3
38	63.74	22.23	366.0	*	1125.9	0.348	1416.9
39	80.46	23.66	389.7	*	1102.2	0.294	1904.4
40	82.72	25.19	414.9	*	1077.0	0.304	2084.4
41	83.23	26.82	441.7	*	1050.2	0.322	2232.9
42	74.19	28.56	470.3	*	1021.6	0.384	2119.2
43	67.72	30.40	500.7	*	991.2	0.448	2059.5
44	51.45	32.37	533.0	*	958.9	0.629	1665.8
45	31.94	34.46	567.5	*	924.4	1.07	1100.9
46	25.89	36.69	604.2	*	887.7	1.41	950.1
47	11.19	39.06	643.3	*	848.6	3.49	437.2
48	3.35	41.59	684.9	*	807.0	12.38	139.6
49	0.992	44.28	729.2	*	762.7	44.62	43.94
50	5.21	47.14	776.3	*	715.6	9.03	246.0
51	12.13	50.19	826.5	*	665.4	4.13	609.0
52	20.33	53.44	879.9	*	612.0	2.62	1086.5
53	28.58	56.89	936.8	*	555.1	1.99	1626.2
54	37.91	60.57	997.4	*	494.5	1.59	2296.9
55	47.38	64.49	1061.9	*	430.0	1.36	3056.0
56	56.11	68.66	1130.6	*	361.3	1.22	3852.7
57	63.97	73.09	1203.7	*	288.2	1.14	4676.5
58	68.72	77.82	1281.5	*	210.4	1.13	5348.3
59	72.05	82.85	1364.3	*	127.6	1.14	5970.6
60	214.8						

"*" INDICATES FIXED PARAMETER

Prepared for s/n1156

A13

Central Loop TEM

Northing: 1000600.0 Easting: 280300.0 Elevation: 1492.0

			Layered Model:		Smooth Model:	
No.	Time (ms)	Data Resistivity (ohm-m)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)
1	0.0859	61.86			59.45	3.89
2	0.104	58.71			56.77	3.30
3	0.129	55.33			54.52	1.46
4	0.159	52.21			52.43	-0.411
5	0.198	49.40			50.58	-2.39
6	0.248	47.00			48.94	-4.11
7	0.312	45.12			47.43	-5.11
8	0.393	43.77			46.03	-5.16
9	0.497	42.75			44.55	-4.19
10	0.629	41.90			42.89	-2.36
11	0.797	40.83			41.09	-0.633
12	1.01	39.32			39.13	0.481
13	1.28	37.45			37.40	0.135
14	1.63	35.54			35.98	-1.21
15	2.07	33.96			35.15	-3.52
16	2.64	33.29			35.03	-5.21
17	3.37	33.15			35.80	-7.98
18	4.29	34.30			37.67	-9.83
19	5.47	36.33			41.10	-13.12
20	6.97	40.71			46.77	-14.88
21	0.352	46.80			47.23	-0.918
22	0.427	45.68			46.01	-0.718
23	0.525	44.66			44.52	0.310
24	0.647	43.83			42.94	2.02
25	0.802	42.69			41.21	3.47
26	1.00	41.06			39.29	4.30
27	1.25	39.23			37.57	4.21
28	1.58	37.27			36.08	3.18
29	1.99	35.67			35.11	1.58
30	2.52	34.70			34.71	-0.0467
31	3.19	34.07			35.07	-2.94
32	4.05	34.78			36.30	-4.36

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No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
33	5.14	36.10			38.65	-7.07
34	6.54	39.70			42.35	-6.65
35	8.32	45.30			47.40	-4.62
36	10.59	56.60			53.08	6.21
37	13.49	81.54			56.22	31.05
38*	17.19	-233.4			53.76	123.0
39	21.90	-39.55			46.21	216.8
40	27.92	-26.38			37.73	242.9
41	0.881	43.22			40.40	6.53
42	1.06	41.50			38.81	6.49
43	1.31	39.29			37.26	5.17
44	1.61	37.48			35.96	4.05
45	2.00	36.08			35.07	2.79
46	2.50	34.61			34.66	-0.151
47	3.14	35.33			34.92	1.15
48	3.95	35.36			35.93	-1.60
49	4.99	36.13			37.90	-4.89
50	6.31	40.38			40.90	-1.28
51	7.99	50.73			44.69	11.91
52	10.13	64.85			48.22	25.64
53*	12.86	401.9			48.72	87.87
54*	16.35	-162.1			44.57	127.4
55*	20.80	98.16			36.94	62.36
56	26.47	-37.23			29.43	179.0
57	33.72	-23.33			23.40	200.2
58	42.96	-11.41			19.02	266.6
59	54.74	-10.58			16.01	251.2
60*	69.77	-5.40			13.96	358.6

"*" INDICATES MASKED DATA POINT

Prepared for s/n1156

A13

Central Loop TEM

Northing: 1000600.0 Easting: 280300.0 Elevation: 1492.0

Layered Model

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
				1492.0		
1	35.89	27.23	27.23	1464.7	0.758	977.6
2	82.95	32.87	60.10	1431.8	0.396	2726.9
3	23.25	38.42	98.52	1393.4	1.65	893.4
4	71.80	65.41	163.9	1328.0	0.911	4697.4
5	14.69	129.6	293.5	1198.4	8.82	1904.9
6	112.4	174.7	468.3	1023.6	1.55	19646.7
7	0.206	815.0	1283.3	208.6	3956.2	167.8
8	120.5					

ALL PARAMETERS ARE FREE

Prepared for s/n1156

A13

Central Loop TEM

Northing: 1000600.0 Easting: 280300.0 Elevation: 1492.0

Smooth Model: Ridge Regression

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
					1492.0		
1	39.21	33.77	33.77	*	1458.2	0.861	1324.4
2	41.79	2.18	35.95	*	1456.0	0.0522	91.26
3	67.89	2.32	38.28	*	1453.7	0.0342	157.8
4	82.19	2.47	40.75	*	1451.2	0.0301	203.4
5	83.29	2.63	43.39	*	1448.6	0.0316	219.4
6	48.81	2.80	46.19	*	1445.8	0.0574	136.9
7	44.97	2.98	49.18	*	1442.8	0.0664	134.3
8	48.34	3.18	52.36	*	1439.6	0.0657	153.7
9	53.32	3.38	55.75	*	1436.2	0.0634	180.5
10	43.43	3.60	59.35	*	1432.6	0.0829	156.5
11	55.68	3.83	63.19	*	1428.8	0.0689	213.6
12	49.51	4.08	67.27	*	1424.7	0.0825	202.2
13	42.95	4.34	71.62	*	1420.3	0.101	186.8
14	48.47	4.63	76.25	*	1415.7	0.0955	224.5
15	39.31	4.93	81.18	*	1410.8	0.125	193.8
16	35.43	5.24	86.43	*	1405.5	0.148	186.0
17	34.79	5.58	92.02	*	1399.9	0.160	194.4
18	20.27	5.95	97.97	*	1394.0	0.293	120.6
19	33.47	6.33	104.3	*	1387.6	0.189	212.0
20	37.31	6.74	111.0	*	1380.9	0.180	251.6
21	26.17	7.18	118.2	*	1373.7	0.274	187.9
22	52.53	7.64	125.8	*	1366.1	0.145	401.5
23	43.67	8.13	134.0	*	1357.9	0.186	355.5
24	39.34	8.66	142.6	*	1349.3	0.220	340.9
25	33.40	9.22	151.9	*	1340.0	0.276	308.1
26	24.92	9.82	161.7	*	1330.2	0.394	244.8
27	25.77	10.45	172.1	*	1319.8	0.405	269.4
28	25.35	11.13	183.3	*	1308.6	0.439	282.2
29	16.59	11.85	195.1	*	1296.8	0.714	196.6
30	22.00	12.61	207.7	*	1284.2	0.573	277.7
31	22.17	13.43	221.2	*	1270.7	0.605	297.9
32	26.11	14.30	235.5	*	1256.4	0.547	373.5

Prepared for s/n1156

A13 Page 2

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
33	23.38	15.22	250.7	*	1241.2	0.651	356.1
34	35.45	16.21	266.9	*	1225.0	0.457	574.9
35	41.92	17.26	284.2	*	1207.7	0.411	723.7
36	46.25	18.37	302.6	*	1189.3	0.397	849.9
37	58.41	19.56	322.1	*	1169.8	0.334	1142.8
38	65.93	20.83	343.0	*	1148.9	0.315	1373.3
39	75.15	22.17	365.1	*	1126.8	0.295	1666.6
40	73.80	23.61	388.7	*	1103.2	0.319	1742.6
41	80.02	25.13	413.9	*	1078.0	0.314	2011.5
42	75.32	26.76	440.6	*	1051.3	0.355	2015.8
43	71.78	28.49	469.1	*	1022.8	0.396	2045.4
44	63.24	30.33	499.5	*	992.4	0.479	1918.4
45	49.06	32.29	531.8	*	960.1	0.658	1584.6
46	39.90	34.38	566.2	*	925.7	0.861	1372.0
47	25.11	36.60	602.8	*	889.1	1.45	919.4
48	12.43	38.97	641.7	*	850.2	3.13	484.7
49	3.50	41.49	683.2	*	808.7	11.85	145.2
50	0.507	44.17	727.4	*	764.5	87.06	22.41
51	4.06	47.03	774.4	*	717.5	11.56	191.2
52	9.01	50.07	824.5	*	667.4	5.55	451.2
53	13.50	53.31	877.8	*	614.1	3.94	719.8
54	16.97	56.75	934.6	*	557.3	3.34	963.5
55	19.92	60.42	995.0	*	496.9	3.03	1203.9
56	23.07	64.33	1059.4	*	432.5	2.78	1484.4
57	26.43	68.49	1127.8	*	364.1	2.59	1810.8
58	30.14	72.92	1200.8	*	291.1	2.41	2198.1
59	34.30	77.63	1278.4	*	213.5	2.26	2663.2
60	162.8						

"*" INDICATES FIXED PARAMETER

Prepared for s/n1156

A14-1

Central Loop TEM

Northing: 1001000.0 Easting: 280700.0 Elevation: 1487.0

			Layered Model:		Smooth Model:	
No.	Time (ms)	Data Resistivity (ohm-m)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)
1	0.0859	45.84			45.13	1.54
2	0.104	43.12			42.50	1.43
3	0.129	40.62			40.40	0.552
4	0.159	38.52			38.68	-0.420
5	0.198	36.87			37.45	-1.57
6	0.248	35.69			36.59	-2.53
7	0.312	35.00			36.12	-3.19
8	0.393	34.82			35.99	-3.36
9	0.497	35.08			36.06	-2.78
10	0.629	35.53			36.13	-1.70
11	0.797	35.75			35.94	-0.544
12	1.01	35.35			35.32	0.0868
13	1.28	34.26			34.36	-0.282
14	1.63	32.70			33.31	-1.85
15	2.07	31.30			32.51	-3.84
16	2.64	30.51			32.11	-5.23
17	3.37	30.40			32.17	-5.84
18	4.29	30.69			32.59	-6.19
19	5.47	32.23			33.37	-3.53
20	6.97	35.05			34.43	1.77
21	0.352	36.87			36.74	0.355
22	0.427	36.74			36.61	0.347
23	0.525	36.90			36.57	0.903
24	0.647	37.18			36.49	1.83
25	0.802	37.25			36.17	2.90
26	1.00	36.70			35.47	3.35
27	1.25	35.45			34.45	2.84
28	1.58	33.75			33.30	1.34
29	1.99	32.22			32.29	-0.198
30	2.52	31.12			31.56	-1.44
31	3.19	30.56			31.15	-1.94
32	4.05	30.59			30.95	-1.17

Prepared for s/n1156

A14-1 Page 2

No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
33	5.14	31.05			30.81	0.789
34	6.54	32.11			30.66	4.52
35	8.32	33.13			30.51	7.91
36	10.59	33.88			30.28	10.62
37	13.49	35.27			30.05	14.80
38	17.19	32.27			29.81	7.62
39	21.90	27.75			29.75	-7.18
40	27.92	21.67			29.97	-38.28
41	0.881	37.18			35.84	3.60
42	1.06	36.47			35.14	3.64
43	1.31	35.57			34.18	3.90
44	1.61	33.63			33.14	1.44
45	2.00	32.12			32.22	-0.324
46	2.50	31.60			31.53	0.232
47	3.14	31.46			31.10	1.15
48	3.95	33.56			30.85	8.05
49*	4.99	37.47			30.65	18.20
50*	6.31	56.17			30.43	45.81
51*	7.99	-85.67			30.11	135.1
52*	10.13	-29.89			29.69	199.3
53*	12.86	-19.56			29.13	248.9
54*	16.35	-22.68			28.51	225.7
55*	20.80	10.65			27.83	-161.1
56*	26.47	4.48			27.34	-509.5
57*	33.72	4.20			27.17	-545.6
58*	42.96	-2.80			27.41	1077.0
59*	54.74	-2.94			28.43	1065.0
60*	69.77	1.21			30.00	-2372.2

"*" INDICATES MASKED DATA POINT

Prepared for s/n1156

A14-1

Central Loop TEM

Northing: 1001000.0 Easting: 280700.0 Elevation: 1487.0

Layered Model

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
				1487.0		
1	30.50	35.54	35.54	1451.4	1.16	1084.4
2	38.75	25.39	60.94	1426.0	0.655	984.3
3	25.76	39.01	99.95	1387.0	1.51	1005.2
4	68.95	81.11	181.0	1305.9	1.17	5593.1
5	12.90	118.3	299.4	1187.5	9.17	1526.9
6	68.86	189.3	488.7	998.2	2.74	13038.1
7	1.40	1011.4	1500.1	-13.16	719.3	1422.1
8	91.61					

ALL PARAMETERS ARE FREE

Prepared for s/n1156

A14-1

Central Loop TEM

Northing: 1001000.0 Easting: 280700.0 Elevation: 1487.0

Smooth Model: Ridge Regression

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
					1487.0		
1	31.83	31.44	31.44	*	1455.5	0.987	1000.9
2	43.56	2.03	33.47	*	1453.5	0.0466	88.55
3	23.03	2.16	35.63	*	1451.3	0.0939	49.86
4	51.08	2.30	37.94	*	1449.0	0.0451	117.7
5	29.34	2.45	40.39	*	1446.6	0.0836	71.98
6	23.16	2.61	43.00	*	1443.9	0.112	60.49
7	14.27	2.78	45.78	*	1441.2	0.194	39.68
8	30.95	2.96	48.74	*	1438.2	0.0956	91.64
9	68.84	3.15	51.89	*	1435.1	0.0457	216.9
10	39.11	3.35	55.25	*	1431.7	0.0857	131.2
11	34.99	3.57	58.82	*	1428.1	0.102	125.0
12	49.06	3.80	62.63	*	1424.3	0.0775	186.6
13	47.62	4.04	66.68	*	1420.3	0.0850	192.8
14	42.63	4.31	70.99	*	1416.0	0.101	183.8
15	47.02	4.58	75.58	*	1411.4	0.0976	215.8
16	29.15	4.88	80.46	*	1406.5	0.167	142.4
17	27.63	5.20	85.67	*	1401.3	0.188	143.7
18	25.75	5.53	91.20	*	1395.7	0.215	142.6
19	29.58	5.89	97.10	*	1389.8	0.199	174.4
20	47.11	6.27	103.3	*	1383.6	0.133	295.8
21	35.22	6.68	110.0	*	1376.9	0.189	235.4
22	59.03	7.11	117.1	*	1369.8	0.120	420.1
23	55.03	7.57	124.7	*	1362.2	0.137	417.0
24	51.60	8.06	132.8	*	1354.1	0.156	416.2
25	51.52	8.58	141.4	*	1345.5	0.166	442.4
26	36.02	9.14	150.5	*	1336.4	0.253	329.3
27	36.49	9.73	160.2	*	1326.7	0.266	355.3
28	39.96	10.36	170.6	*	1316.3	0.259	414.1
29	26.46	11.03	181.6	*	1305.3	0.416	291.9
30	19.69	11.74	193.4	*	1293.5	0.596	231.3
31	19.57	12.50	205.9	*	1281.0	0.638	244.8
32	12.09	13.31	219.2	*	1267.7	1.10	161.0

Prepared for s/n1156

A14-1 Page 2

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
33	16.07	14.17	233.4	*	1253.5	0.882	227.8
34	17.48	15.09	248.5	*	1238.4	0.863	263.9
35	21.83	16.06	264.6	*	1222.3	0.735	350.8
36	32.66	17.10	281.7	*	1205.2	0.523	558.7
37	42.63	18.21	299.9	*	1187.0	0.427	776.5
38	45.25	19.39	319.3	*	1167.6	0.428	877.5
39	53.29	20.64	339.9	*	1147.0	0.387	1100.2
40	67.84	21.98	361.9	*	1125.0	0.324	1491.1
41	70.83	23.40	385.3	*	1101.6	0.330	1657.6
42	66.70	24.91	410.2	*	1076.7	0.373	1661.9
43	58.27	26.52	436.7	*	1050.2	0.455	1545.7
44	44.06	28.23	465.0	*	1021.9	0.640	1244.3
45	7.15	30.06	495.0	*	991.9	4.20	215.0
46	20.77	32.00	527.0	*	959.9	1.54	665.0
47	25.52	34.07	561.1	*	925.8	1.33	869.7
48	29.32	36.28	597.4	*	889.5	1.23	1063.8
49	30.66	38.62	636.0	*	850.9	1.25	1184.5
50	27.99	41.12	677.2	*	809.7	1.46	1151.3
51	24.11	43.78	720.9	*	766.0	1.81	1055.8
52	21.05	46.61	767.6	*	719.3	2.21	981.3
53	20.14	49.62	817.2	*	669.7	2.46	999.8
54	19.39	52.83	870.0	*	616.9	2.72	1024.9
55	21.49	56.25	926.3	*	560.6	2.61	1208.9
56	26.02	59.89	986.2	*	500.7	2.30	1558.6
57	31.70	63.76	1049.9	*	437.0	2.01	2021.4
58	38.35	67.88	1117.8	*	369.1	1.77	2603.5
59	42.77	72.27	1190.1	*	296.8	1.68	3091.5
60	161.4						

"*" INDICATES FIXED PARAMETER

Prepared for s/n1156

A15-1

Central Loop TEM

Northing: 1001300.0 Easting: 281100.0 Elevation: 1486.0

			Layered Model:		Smooth Model:	
No.	Time (ms)	Data Resistivity (ohm-m)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)
1	0.0859	29.45			28.72	2.46
2	0.104	28.14			27.52	2.18
3	0.129	27.11			26.85	0.935
4	0.159	26.43			26.68	-0.967
5	0.198	26.12			26.88	-2.91
6	0.248	26.19			27.41	-4.65
7	0.312	26.72			28.31	-5.94
8	0.393	27.64			29.23	-5.74
9	0.497	28.94			30.38	-4.99
10	0.629	30.40			31.13	-2.40
11	0.797	31.68			31.84	-0.475
12	1.01	32.36			31.95	1.27
13	1.28	32.18			31.90	0.862
14	1.63	31.42			31.70	-0.882
15	2.07	30.66			31.83	-3.81
16	2.64	30.18			32.29	-6.97
17	3.37	30.39			33.58	-10.49
18	4.29	31.52			35.75	-13.39
19	5.47	33.89			39.28	-15.89
20	6.97	38.20			44.77	-17.18
21	0.352	28.94			29.20	-0.890
22	0.427	29.88			29.98	-0.322
23	0.525	31.05			30.92	0.417
24	0.647	32.51			31.45	3.26
25	0.802	33.63			32.02	4.79
26	1.00	33.95			32.06	5.56
27	1.25	33.88			31.95	5.70
28	1.58	33.56			31.72	5.49
29	1.99	32.16			31.64	1.62
30	2.52	31.80			31.88	-0.264
31	3.19	31.45			32.74	-4.11
32	4.05	33.17			34.24	-3.22

Prepared for s/n1156

A15-1 Page 2

No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
33	5.14	35.84			36.67	-2.29
34	6.54	37.17			39.96	-7.49
35	8.32	49.15			43.87	10.74
36	10.59	59.48			47.30	20.47
37*	13.49	-260.8			48.46	118.5
38	17.19	-43.22			44.68	203.3
39	21.90	-40.14			38.37	195.6
40	27.92	-18.33			32.29	276.1
41	0.881	34.20			32.17	5.93
42	1.06	34.51			32.08	7.03
43	1.31	34.29			31.97	6.76
44	1.61	33.01			31.70	3.95
45	2.00	32.07			31.65	1.31
46	2.50	31.86			31.85	0.0265
47	3.14	31.29			32.58	-4.09
48	3.95	32.02			33.86	-5.75
49	4.99	33.98			35.94	-5.75
50	6.31	39.36			38.60	1.91
51	7.99	45.86			41.54	9.42
52	10.13	57.60			43.39	24.67
53*	12.86	-360.9			42.93	111.8
54	16.35	-42.60			38.06	189.3
55	20.80	-40.14			31.99	179.6
56	26.47	-24.40			25.90	206.1
57	33.72	-17.75			21.05	218.5
58	42.96	-9.72			17.67	281.6
59*	54.74	-6.17			15.16	345.4
60*	69.77	-4.33			13.65	415.2

"*" INDICATES MASKED DATA POINT

Prepared for s/n1156

A15-1

Central Loop TEM

Northing: 1001300.0 Easting: 281100.0 Elevation: 1486.0

Layered Model

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
				1486.0		
1	14.14	24.16	24.16	1461.8	1.70	341.7
2	120.1	32.83	56.99	1429.0	0.273	3946.5
3	34.60	50.79	107.7	1378.2	1.46	1757.8
4	105.2	43.42	151.2	1334.7	0.412	4571.1
5	16.37	127.4	278.6	1207.3	7.78	2086.5
6	91.84	196.0	474.7	1011.2	2.13	18009.0
7	0.361	534.2	1009.0	477.0	1478.0	193.1
8	94.44					

ALL PARAMETERS ARE FREE

Prepared for s/n1156

A15-1

Central Loop TEM

Northing: 1001300.0 Easting: 281100.0 Elevation: 1486.0

Smooth Model: Ridge Regression

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
					1486.0		
1	17.08	30.60	30.60	*	1455.3	1.79	522.8
2	114.2	1.97	32.58	*	1453.4	0.0173	226.0
3	32.02	2.10	34.69	*	1451.3	0.0657	67.48
4	71.15	2.24	36.93	*	1449.0	0.0315	159.6
5	88.76	2.38	39.32	*	1446.6	0.0269	212.0
6	105.3	2.54	41.87	*	1444.1	0.0241	267.8
7	72.69	2.70	44.57	*	1441.4	0.0372	196.8
8	175.0	2.88	47.45	*	1438.5	0.0164	504.4
9	61.39	3.06	50.52	*	1435.4	0.0499	188.3
10	22.90	3.26	53.79	*	1432.2	0.142	74.81
11	55.90	3.47	57.27	*	1428.7	0.0622	194.4
12	170.5	3.70	60.97	*	1425.0	0.0217	631.6
13	161.3	3.94	64.91	*	1421.0	0.0244	636.1
14	35.79	4.19	69.11	*	1416.8	0.117	150.2
15	53.36	4.46	73.58	*	1412.4	0.0837	238.4
16	34.45	4.75	78.34	*	1407.6	0.138	163.9
17	48.04	5.06	83.40	*	1402.5	0.105	243.3
18	36.25	5.39	88.79	*	1397.2	0.148	195.5
19	48.05	5.74	94.54	*	1391.4	0.119	275.9
20	39.49	6.11	100.6	*	1385.3	0.154	241.4
21	69.98	6.50	107.1	*	1378.8	0.0929	455.4
22	98.15	6.92	114.0	*	1371.9	0.0705	680.0
23	38.70	7.37	121.4	*	1364.5	0.190	285.4
24	39.56	7.85	129.3	*	1356.6	0.198	310.7
25	36.54	8.36	137.6	*	1348.3	0.228	305.5
26	37.13	8.90	146.5	*	1339.4	0.239	330.5
27	22.42	9.47	156.0	*	1329.9	0.422	212.5
28	33.92	10.09	166.1	*	1319.8	0.297	342.3
29	29.91	10.74	176.8	*	1309.1	0.359	321.4
30	21.82	11.43	188.3	*	1297.6	0.524	249.5
31	18.09	12.17	200.5	*	1285.4	0.672	220.3
32	23.02	12.96	213.4	*	1272.5	0.562	298.5

Prepared for s/n1156

A15-1 Page 2

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
33	24.61	13.80	227.2	*	1258.7	0.560	339.7
34	23.54	14.69	241.9	*	1244.0	0.623	346.0
35	36.12	15.64	257.6	*	1228.3	0.433	565.1
36	38.68	16.65	274.2	*	1211.7	0.430	644.3
37	42.52	17.73	291.9	*	1194.0	0.417	754.0
38	59.74	18.87	310.8	*	1175.1	0.316	1127.8
39	60.15	20.09	330.9	*	1155.0	0.334	1209.0
40	66.10	21.39	352.3	*	1133.6	0.323	1414.5
41	62.05	22.78	375.1	*	1110.8	0.367	1413.7
42	74.93	24.25	399.4	*	1086.5	0.323	1817.5
43	76.95	25.82	425.2	*	1060.7	0.335	1987.2
44	75.11	27.49	452.7	*	1033.2	0.366	2065.1
45	61.98	29.27	482.0	*	1003.9	0.472	1814.5
46	46.62	31.16	513.1	*	972.8	0.668	1453.0
47	31.88	33.17	546.3	*	939.6	1.04	1057.8
48	18.41	35.32	581.6	*	904.3	1.91	650.5
49	9.08	37.60	619.2	*	866.7	4.13	341.6
50	2.53	40.03	659.3	*	826.6	15.81	101.3
51	0.915	42.62	701.9	*	784.0	46.55	39.02
52	1.95	45.38	747.3	*	738.6	23.26	88.54
53	4.62	48.31	795.6	*	690.3	10.43	223.6
54	10.19	51.44	847.0	*	638.9	5.04	524.2
55	15.64	54.76	901.8	*	584.1	3.50	856.9
56	19.47	58.30	960.1	*	525.8	2.99	1135.6
57	23.93	62.07	1022.2	*	463.7	2.59	1486.1
58	29.73	66.09	1088.3	*	397.6	2.22	1965.1
59	36.04	70.36	1158.7	*	327.2	1.95	2536.2
60	258.1						

"*" INDICATES FIXED PARAMETER

Prepared for s/n1156

A17

Central Loop TEM

Northing: 1000700.0 Easting: 279600.0 Elevation: 1499.0

			Layered Model:		Smooth Model:	
No.	Time (ms)	Data Resistivity (ohm-m)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)
1	0.0859	71.15			67.41	5.25
2	0.104	68.26			64.67	5.26
3	0.129	65.30			62.67	4.02
4	0.159	62.63			61.22	2.25
5	0.198	60.32			60.37	-0.0950
6	0.248	58.51			59.81	-2.23
7	0.312	57.13			59.41	-3.98
8	0.393	56.15			58.60	-4.36
9	0.497	55.33			57.02	-3.06
10	0.629	54.01			54.41	-0.739
11	0.797	51.76			51.09	1.29
12	1.01	48.62			47.63	2.03
13	1.28	45.06			44.63	0.947
14	1.63	41.94			42.46	-1.22
15	2.07	39.63			41.29	-4.18
16	2.64	38.67			41.12	-6.33
17	3.37	38.21			42.03	-9.99
18	4.29	39.83			44.20	-10.97
19	5.47	43.12			47.88	-11.04
20	6.97	46.21			53.76	-16.34
21	0.352	59.15			59.82	-1.12
22	0.427	58.36			58.75	-0.671
23	0.525	57.32			56.96	0.627
24	0.647	56.03			54.34	3.01
25	0.802	53.63			51.18	4.56
26	1.00	50.46			47.85	5.18
27	1.25	47.03			44.89	4.56
28	1.58	43.73			42.64	2.49
29	1.99	41.08			41.25	-0.401
30	2.52	39.35			40.76	-3.57
31	3.19	39.08			41.19	-5.38
32	4.05	40.07			42.68	-6.50

Prepared for s/n1156

A17 Page 2

No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
33	5.14	42.36			45.29	-6.90
34	6.54	45.51			49.41	-8.56
35	8.32	59.25			55.28	6.69
36	10.59	90.57			63.25	30.16
37*	13.49	297.8			71.32	76.05
38	17.19	-168.6			76.77	145.5
39	21.90	-78.83			74.08	193.9
40	27.92	-35.72			64.71	281.1
41	0.881	52.91			49.79	5.90
42	1.06	49.85			46.96	5.79
43	1.31	46.50			44.42	4.48
44	1.61	43.68			42.46	2.79
45	2.00	41.29			41.22	0.153
46	2.50	39.18			40.74	-3.96
47	3.14	39.07			41.06	-5.10
48	3.95	39.90			42.36	-6.17
49	4.99	43.72			44.64	-2.09
50	6.31	47.05			48.21	-2.44
51	7.99	55.30			53.05	4.06
52	10.13	63.10			59.14	6.27
53*	12.86	234.9			64.15	72.68
54*	16.35	-813.9			65.93	108.1
55	20.80	-58.19			60.35	203.7
56	26.47	-37.92			51.16	234.9
57	33.72	-31.27			41.72	233.4
58	42.96	-19.16			34.21	278.4
59*	54.74	-8.66			28.89	433.3
60*	69.77	-7.41			25.26	440.5

"*" INDICATES MASKED DATA POINT

Prepared for s/n1156

A17

Central Loop TEM

Northing: 1000700.0 Easting: 279600.0 Elevation: 1499.0

Layered Model

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
				1499.0		
1	49.17	45.27	45.27	1453.7	0.920	2226.2
2	168.6	13.09	58.37	1440.6	0.0776	2208.5
3	32.08	26.19	84.57	1414.4	0.816	840.5
4	79.55	82.44	167.0	1331.9	1.03	6558.9
5	16.73	103.3	270.3	1228.6	6.17	1729.7
6	229.6	383.2	653.6	845.3	1.66	88024.8
7	0.733	739.9	1393.6	105.3	1009.1	542.6
8	244.4					

ALL PARAMETERS ARE FREE

Prepared for s/n1156

A17

Central Loop TEM

Northing: 1000700.0 Easting: 279600.0 Elevation: 1499.0

Smooth Model: Ridge Regression

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
					1499.0		
1	46.49	38.11	38.11	*	1460.8	0.819	1772.0
2	48.53	2.46	40.57	*	1458.4	0.0507	119.5
3	80.08	2.62	43.19	*	1455.8	0.0327	210.0
4	72.19	2.79	45.99	*	1453.0	0.0386	201.6
5	87.71	2.97	48.96	*	1450.0	0.0339	260.8
6	77.35	3.16	52.12	*	1446.8	0.0409	244.8
7	64.39	3.37	55.50	*	1443.4	0.0523	217.0
8	47.43	3.58	59.08	*	1439.9	0.0756	170.2
9	49.26	3.82	62.90	*	1436.0	0.0775	188.2
10	53.36	4.06	66.97	*	1432.0	0.0762	217.0
11	31.20	4.33	71.30	*	1427.6	0.138	135.1
12	72.37	4.61	75.91	*	1423.0	0.0637	333.6
13	45.74	4.90	80.82	*	1418.1	0.107	224.5
14	99.37	5.22	86.05	*	1412.9	0.0525	519.3
15	75.15	5.56	91.61	*	1407.3	0.0740	418.1
16	86.92	5.92	97.53	*	1401.4	0.0681	514.8
17	54.99	6.30	103.8	*	1395.1	0.114	346.7
18	63.50	6.71	110.5	*	1388.4	0.105	426.3
19	57.73	7.14	117.7	*	1381.2	0.123	412.6
20	42.68	7.61	125.3	*	1373.6	0.178	324.8
21	47.86	8.10	133.4	*	1365.5	0.169	387.8
22	68.86	8.62	142.0	*	1356.9	0.125	594.0
23	35.54	9.18	151.2	*	1347.7	0.258	326.4
24	57.17	9.77	161.0	*	1337.9	0.171	559.0
25	43.43	10.40	171.4	*	1327.5	0.239	452.1
26	19.31	11.08	182.5	*	1316.4	0.573	214.0
27	15.38	11.79	194.2	*	1304.7	0.766	181.5
28	23.57	12.56	206.8	*	1292.1	0.532	296.1
29	17.52	13.37	220.2	*	1278.7	0.763	234.4
30	15.76	14.23	234.4	*	1264.5	0.903	224.4
31	25.98	15.16	249.6	*	1249.3	0.583	393.9
32	50.14	16.14	265.7	*	1233.2	0.321	809.4

Prepared for s/n1156

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L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
33	65.75	17.18	282.9	*	1216.0	0.261	1129.8
34	97.79	18.29	301.2	*	1197.7	0.187	1789.0
35	97.64	19.47	320.7	*	1178.2	0.199	1901.8
36	140.9	20.73	341.4	*	1157.5	0.147	2922.2
37	167.1	22.07	363.5	*	1135.4	0.132	3690.2
38	151.8	23.50	387.0	*	1111.9	0.154	3568.1
39	166.9	25.02	412.0	*	1086.9	0.149	4178.6
40	178.6	26.64	438.7	*	1060.2	0.149	4759.9
41	178.1	28.36	467.0	*	1031.9	0.159	5052.8
42	214.0	30.19	497.2	*	1001.7	0.141	6463.2
43	212.9	32.15	529.4	*	969.5	0.150	6847.6
44	204.0	34.23	563.6	*	935.3	0.167	6984.6
45	138.8	36.44	600.1	*	898.8	0.262	5058.8
46	127.6	38.79	638.9	*	860.0	0.303	4953.9
47	104.4	41.30	680.2	*	818.7	0.395	4313.5
48	86.68	43.97	724.1	*	774.8	0.507	3812.4
49	61.74	46.82	771.0	*	727.9	0.758	2890.9
50	37.80	49.85	820.8	*	678.1	1.31	1884.5
51	19.05	53.07	873.9	*	625.0	2.78	1011.5
52	6.12	56.50	930.4	*	568.5	9.22	345.9
53	1.07	60.15	990.6	*	508.3	56.12	64.48
54	4.58	64.04	1054.6	*	444.3	13.96	293.8
55	12.61	68.18	1122.8	*	376.1	5.40	860.0
56	20.81	72.59	1195.4	*	303.5	3.48	1511.3
57	29.51	77.29	1272.7	*	226.2	2.61	2281.1
58	38.67	82.28	1355.0	*	143.9	2.12	3182.3
59	47.78	87.60	1442.6	*	56.37	1.83	4186.4
60	244.1						

"*" INDICATES FIXED PARAMETER

Prepared for s/n1156

A18

Central Loop TEM

Northing: 1001000.0 Easting: 280000.0 Elevation: 1496.0

			Layered Model:		Smooth Model:	
No.	Time (ms)	Data Resistivity (ohm-m)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)
1	0.0859	36.03			36.65	-1.69
2	0.104	34.49			34.86	-1.07
3	0.129	33.37			33.78	-1.24
4	0.159	32.78			33.29	-1.52
5	0.198	32.64			33.43	-2.42
6	0.248	33.02			34.16	-3.46
7	0.312	33.93			35.32	-4.10
8	0.393	35.40			36.91	-4.26
9	0.497	37.33			38.49	-3.10
10	0.629	39.32			39.80	-1.21
11	0.797	40.79			40.50	0.732
12	1.01	41.12			40.28	2.03
13	1.28	40.21			39.75	1.14
14	1.63	38.53			39.04	-1.30
15	2.07	36.86			38.75	-5.13
16	2.64	36.16			39.10	-8.12
17	3.37	35.95			40.45	-12.50
18	4.29	37.20			42.78	-14.99
19	5.47	39.91			46.45	-16.36
20	6.97	45.26			52.69	-16.42
21	0.352	36.52			36.74	-0.595
22	0.427	37.89			38.07	-0.470
23	0.525	39.57			39.26	0.784
24	0.647	41.37			40.29	2.59
25	0.802	42.64			40.75	4.42
26	1.00	42.71			40.45	5.28
27	1.25	41.74			39.91	4.38
28	1.58	39.97			39.07	2.27
29	1.99	38.64			38.66	-0.0648
30	2.52	37.42			38.66	-3.31
31	3.19	37.96			39.62	-4.35
32	4.05	38.37			41.11	-7.12

Prepared for s/n1156

A18 Page 2

No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
33	5.14	41.49			44.05	-6.16
34	6.54	44.12			47.91	-8.59
35	8.32	55.46			53.16	4.15
36	10.59	78.81			60.40	23.36
37	13.49	-113.2			67.04	159.2
38	17.19	-79.62			71.86	190.2
39	21.90	-56.54			70.11	224.0
40	27.92	-46.23			64.36	239.2
41	0.881	44.43			40.67	8.46
42	1.06	43.61			40.39	7.37
43	1.31	42.47			39.72	6.48
44	1.61	40.22			39.03	2.95
45	2.00	39.13			38.65	1.22
46	2.50	37.56			38.62	-2.82
47	3.14	37.44			39.48	-5.45
48	3.95	36.36			40.76	-12.10
49	4.99	40.09			43.50	-8.51
50	6.31	42.74			46.66	-9.16
51	7.99	46.00			51.43	-11.80
52	10.13	58.14			56.76	2.38
53	12.86	74.09			61.39	17.13
54	16.35	-95.41			62.73	165.7
55	20.80	-52.45			59.07	212.6
56*	26.47	-18.03			51.38	385.0
57*	33.72	436.8			42.83	90.19
58	42.96	29.07			36.20	-24.54
59*	54.74	-4.56			30.67	771.7
60*	69.77	-9.33			27.16	390.9

"*" INDICATES MASKED DATA POINT

Prepared for s/n1156

A18

Central Loop TEM

Northing: 1001000.0 Easting: 280000.0 Elevation: 1496.0

Layered Model

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
				1496.0		
1	24.90	51.89	51.89	1444.1	2.08	1292.2
2	96.87	140.7	192.6	1303.3	1.45	13639.6
3	14.03	80.68	273.3	1222.6	5.74	1132.7
4	600.6	536.0	809.4	686.5	0.892	321973.0
5	0.703	82.87	892.2	603.7	117.7	58.31
6	153.9					

ALL PARAMETERS ARE FREE

Prepared for s/n1156

A18

Central Loop TEM

Northing: 1001000.0 Easting: 280000.0 Elevation: 1496.0

Smooth Model: Ridge Regression

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
					1496.0		
1	25.01	35.48	35.48	*	1460.5	1.41	887.6
2	20.35	2.29	37.78	*	1458.2	0.112	46.70
3	25.20	2.44	40.22	*	1455.7	0.0969	61.56
4	23.34	2.60	42.82	*	1453.1	0.111	60.72
5	57.65	2.76	45.59	*	1450.4	0.0480	159.6
6	26.64	2.94	48.54	*	1447.4	0.110	78.55
7	21.84	3.13	51.68	*	1444.3	0.143	68.57
8	95.80	3.34	55.02	*	1440.9	0.0348	320.1
9	72.97	3.55	58.58	*	1437.4	0.0487	259.6
10	153.4	3.78	62.36	*	1433.6	0.0246	581.3
11	96.28	4.03	66.40	*	1429.5	0.0418	388.2
12	84.00	4.29	70.69	*	1425.3	0.0511	360.6
13	133.4	4.57	75.26	*	1420.7	0.0342	609.9
14	80.32	4.86	80.13	*	1415.8	0.0605	390.8
15	144.8	5.18	85.31	*	1410.6	0.0357	750.2
16	192.1	5.51	90.82	*	1405.1	0.0287	1059.9
17	114.7	5.87	96.70	*	1399.2	0.0511	673.6
18	116.4	6.25	102.9	*	1393.0	0.0536	728.1
19	84.04	6.65	109.6	*	1386.3	0.0792	559.4
20	85.11	7.08	116.6	*	1379.3	0.0832	603.1
21	74.84	7.54	124.2	*	1371.7	0.100	564.7
22	87.73	8.03	132.2	*	1363.7	0.0915	704.7
23	47.03	8.55	140.8	*	1355.1	0.181	402.2
24	46.74	9.10	149.9	*	1346.0	0.194	425.6
25	53.32	9.69	159.6	*	1336.3	0.181	516.8
26	39.26	10.32	169.9	*	1326.0	0.262	405.2
27	42.26	10.98	180.9	*	1315.0	0.260	464.3
28	21.51	11.69	192.6	*	1303.3	0.543	251.7
29	23.46	12.45	205.0	*	1290.9	0.530	292.2
30	15.22	13.25	218.3	*	1277.6	0.870	201.9
31	20.78	14.11	232.4	*	1263.5	0.679	293.4
32	27.59	15.03	247.4	*	1248.5	0.544	414.7

Prepared for s/n1156

A18 Page 2

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
33	34.54	16.00	263.4	*	1232.5	0.463	552.7
34	47.24	17.03	280.5	*	1215.4	0.360	804.9
35	57.62	18.13	298.6	*	1197.3	0.314	1045.1
36	84.10	19.31	317.9	*	1178.0	0.229	1624.0
37	95.66	20.55	338.5	*	1157.4	0.214	1966.7
38	124.9	21.88	360.4	*	1135.5	0.175	2734.8
39	147.5	23.30	383.7	*	1112.2	0.157	3437.9
40	180.6	24.81	408.5	*	1087.4	0.137	4482.3
41	208.8	26.41	434.9	*	1061.0	0.126	5517.2
42	226.2	28.12	463.0	*	1032.9	0.124	6364.0
43	240.8	29.94	493.0	*	1002.9	0.124	7212.0
44	227.3	31.87	524.8	*	971.1	0.140	7247.2
45	236.1	33.93	558.8	*	937.1	0.143	8015.8
46	230.8	36.13	594.9	*	901.0	0.156	8341.5
47	172.9	38.46	633.4	*	862.5	0.222	6651.2
48	128.9	40.95	674.3	*	821.6	0.317	5282.1
49	92.00	43.60	717.9	*	778.0	0.473	4011.8
50	60.69	46.42	764.4	*	731.5	0.764	2817.4
51	38.18	49.42	813.8	*	682.1	1.29	1886.9
52	20.93	52.61	866.4	*	629.5	2.51	1101.7
53	8.57	56.02	922.4	*	573.5	6.53	480.4
54	2.29	59.64	982.1	*	513.8	26.00	136.7
55	2.29	63.49	1045.6	*	450.3	27.71	145.4
56	5.63	67.60	1113.2	*	382.7	12.00	380.7
57	10.05	71.97	1185.1	*	310.8	7.15	723.8
58	13.97	76.62	1261.8	*	234.1	5.48	1070.5
59	17.14	81.58	1343.4	*	152.5	4.75	1398.7
60	59.54						

"*" INDICATES FIXED PARAMETER

Prepared for s/n1156

A19-1

Central Loop TEM

Northing: 1001300.0 Easting: 280300.0 Elevation: 1513.0

			Layered Model:		Smooth Model:	
No.	Time (ms)	Data Resistivity (ohm-m)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)
1	0.0859	76.66			76.36	0.390
2	0.104	73.08			71.81	1.73
3	0.129	68.97			67.90	1.54
4	0.159	64.96			64.38	0.897
5	0.198	61.32			61.44	-0.191
6	0.248	58.28			58.92	-1.10
7	0.312	55.90			56.88	-1.74
8	0.393	54.13			55.25	-2.05
9	0.497	52.77			53.75	-1.85
10	0.629	51.30			52.07	-1.51
11	0.797	49.15			49.83	-1.39
12	1.01	46.28			46.90	-1.33
13	1.28	42.85			43.53	-1.58
14	1.63	39.46			40.18	-1.82
15	2.07	36.48			37.35	-2.37
16	2.64	34.55			35.22	-1.93
17	3.37	33.45			34.02	-1.70
18	4.29	33.01			33.70	-2.11
19	5.47	33.37			34.45	-3.24
20	6.97	34.48			36.35	-5.43
21	0.352	57.19			56.78	0.709
22	0.427	55.65			55.35	0.534
23	0.525	54.31			53.87	0.801
24	0.647	52.69			52.16	1.01
25	0.802	50.48			49.93	1.08
26	1.00	47.41			47.03	0.806
27	1.25	44.18			43.72	1.04
28	1.58	40.43			40.35	0.184
29	1.99	37.50			37.36	0.354
30	2.52	35.12			34.97	0.425
31	3.19	33.72			33.36	1.07
32	4.05	33.11			32.44	1.99

Prepared for s/n1156

A19-1 Page 2

No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
33	5.14	32.54			32.33	0.639
34	6.54	33.36			32.86	1.51
35	8.32	34.14			34.10	0.102
36	10.59	36.30			35.53	2.12
37	13.49	38.80			36.77	5.23
38	17.19	34.23			36.42	-6.39
39	21.90	27.45			34.55	-25.86
40*	27.92	17.26			31.49	-82.45
41	0.881	49.52			48.79	1.47
42	1.06	46.96			46.13	1.77
43	1.31	43.73			43.07	1.51
44	1.61	40.37			40.02	0.851
45	2.00	37.57			37.29	0.756
46	2.50	34.78			34.98	-0.583
47	3.14	34.03			33.36	1.95
48	3.95	33.03			32.36	2.05
49	4.99	32.40			32.06	1.05
50	6.31	31.81			32.31	-1.57
51	7.99	33.55			33.08	1.39
52	10.13	33.77			33.86	-0.278
53	12.86	37.63			34.19	9.14
54	16.35	29.64			32.93	-11.06
55	20.80	40.06			30.27	24.44
56*	26.47	59.47			26.69	55.11
57	33.72	25.07			23.17	7.58
58	42.96	16.47			20.33	-23.43
59	54.74	18.70			18.44	1.38
60*	69.77	9.36			17.23	-84.07

"*" INDICATES MASKED DATA POINT

Prepared for s/n1156

A19-1

Central Loop TEM

Northing: 1001300.0 Easting: 280300.0 Elevation: 1513.0

Layered Model

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
				1513.0		
1	59.80	33.61	33.61	1479.3	0.562	2010.2
2	75.07	11.49	45.11	1467.8	0.153	863.2
3	31.44	15.97	61.09	1451.9	0.508	502.3
4	68.37	19.71	80.80	1432.1	0.288	1348.0
5	37.60	105.2	186.0	1326.9	2.79	3959.0
6	16.29	140.8	326.9	1186.0	8.64	2295.8
7	61.33	318.8	645.8	867.1	5.19	19553.5
8	3.22	227.8	873.6	639.3	70.72	734.2
9	205.9					

ALL PARAMETERS ARE FREE

Prepared for s/n1156

A19-1

Central Loop TEM

Northing: 1001300.0 Easting: 280300.0 Elevation: 1513.0

Smooth Model: Ridge Regression

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
					1513.0		
1	59.07	34.33	34.33	*	1478.6	0.581	2028.5
2	46.80	2.22	36.55	*	1476.4	0.0474	103.9
3	48.10	2.36	38.92	*	1474.0	0.0491	113.7
4	57.76	2.51	41.43	*	1471.5	0.0435	145.3
5	66.69	2.67	44.11	*	1468.8	0.0401	178.7
6	52.02	2.85	46.97	*	1466.0	0.0548	148.4
7	56.58	3.03	50.00	*	1462.9	0.0536	171.8
8	38.49	3.23	53.24	*	1459.7	0.0839	124.4
9	30.21	3.44	56.68	*	1456.3	0.113	104.0
10	40.15	3.66	60.34	*	1452.6	0.0912	147.1
11	72.56	3.90	64.25	*	1448.7	0.0537	283.1
12	61.33	4.15	68.40	*	1444.5	0.0677	254.7
13	48.67	4.42	72.82	*	1440.1	0.0908	215.2
14	59.48	4.70	77.53	*	1435.4	0.0791	280.0
15	50.52	5.01	82.54	*	1430.4	0.0992	253.3
16	30.21	5.33	87.88	*	1425.1	0.176	161.2
17	33.27	5.68	93.56	*	1419.4	0.170	189.0
18	43.95	6.04	99.61	*	1413.3	0.137	265.8
19	41.62	6.44	106.0	*	1406.9	0.154	268.1
20	33.47	6.85	112.9	*	1400.0	0.204	229.5
21	42.69	7.30	120.2	*	1392.7	0.170	311.7
22	36.89	7.77	127.9	*	1385.0	0.210	286.7
23	44.62	8.27	136.2	*	1376.7	0.185	369.2
24	35.28	8.81	145.0	*	1367.9	0.249	310.8
25	31.29	9.37	154.4	*	1358.5	0.299	293.5
26	50.75	9.98	164.4	*	1348.5	0.196	506.8
27	39.54	10.63	175.0	*	1337.9	0.268	420.4
28	29.57	11.31	186.3	*	1326.6	0.382	334.7
29	23.78	12.05	198.4	*	1314.5	0.506	286.6
30	17.97	12.83	211.2	*	1301.7	0.713	230.5
31	15.09	13.65	224.9	*	1288.0	0.904	206.2
32	10.65	14.54	239.4	*	1273.5	1.36	154.9

Prepared for s/n1156

A19-1 Page 2

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
33	12.94	15.48	254.9	*	1258.0	1.19	200.4
34	15.80	16.48	271.4	*	1241.5	1.04	260.5
35	20.54	17.55	288.9	*	1224.0	0.854	360.6
36	25.06	18.68	307.6	*	1205.3	0.745	468.2
37	35.19	19.89	327.5	*	1185.4	0.565	700.0
38	42.66	21.17	348.7	*	1164.2	0.496	903.6
39	44.47	22.54	371.2	*	1141.7	0.506	1002.9
40	49.03	24.00	395.3	*	1117.6	0.489	1177.1
41	46.94	25.55	420.8	*	1092.1	0.544	1199.8
42	50.64	27.21	448.0	*	1064.9	0.537	1377.9
43	50.83	28.97	477.0	*	1035.9	0.569	1472.8
44	44.98	30.84	507.8	*	1005.1	0.685	1387.6
45	34.64	32.83	540.7	*	972.2	0.947	1137.6
46	31.00	34.96	575.6	*	937.3	1.12	1084.0
47	22.53	37.22	612.9	*	900.0	1.65	838.9
48	12.90	39.62	652.5	*	860.4	3.06	511.5
49	7.25	42.18	694.7	*	818.2	5.81	306.2
50	3.50	44.91	739.6	*	773.3	12.80	157.6
51	2.27	47.82	787.4	*	725.5	20.98	108.9
52	3.21	50.91	838.3	*	674.6	15.83	163.7
53	7.10	54.20	892.5	*	620.4	7.62	385.0
54	12.66	57.70	950.2	*	562.7	4.55	730.7
55	18.55	61.44	1011.7	*	501.2	3.31	1139.7
56	24.03	65.41	1077.1	*	435.8	2.72	1572.3
57	28.84	69.64	1146.7	*	366.2	2.41	2009.0
58	33.38	74.14	1220.9	*	292.0	2.22	2475.5
59	37.48	78.93	1299.8	*	213.1	2.10	2958.7
60	128.0						

"*" INDICATES FIXED PARAMETER

Prepared for s/n1156

A20-1

Central Loop TEM

Northing: 1001600.0 Easting: 280700.0 Elevation: 1506.0

			Layered Model:		Smooth Model:	
No.	Time (ms)	Data Resistivity (ohm-m)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)
1	0.0859	61.22			58.61	4.25
2	0.104	57.91			55.72	3.77
3	0.129	54.84			53.46	2.51
4	0.159	52.31			51.75	1.07
5	0.198	50.36			50.71	-0.709
6	0.248	48.95			50.13	-2.42
7	0.312	48.15			50.09	-4.02
8	0.393	47.84			50.21	-4.93
9	0.497	47.91			50.13	-4.64
10	0.629	47.74			49.40	-3.47
11	0.797	47.00			47.66	-1.39
12	1.01	45.37			45.23	0.317
13	1.28	42.79			42.50	0.681
14	1.63	40.19			40.18	0.0201
15	2.07	37.89			38.52	-1.65
16	2.64	36.36			37.78	-3.90
17	3.37	35.69			37.91	-6.21
18	4.29	35.38			39.13	-10.58
19	5.47	37.32			41.44	-11.03
20	6.97	41.08			45.35	-10.37
21	0.352	49.77			50.84	-2.14
22	0.427	49.49			50.77	-2.59
23	0.525	49.56			50.48	-1.84
24	0.647	49.24			49.54	-0.608
25	0.802	48.44			47.78	1.37
26	1.00	46.50			45.40	2.35
27	1.25	44.18			42.71	3.32
28	1.58	41.53			40.35	2.85
29	1.99	39.37			38.51	2.19
30	2.52	36.68			37.48	-2.17
31	3.19	35.98			37.18	-3.33
32	4.05	35.49			37.81	-6.53

Prepared for s/n1156

A20-1 Page 2

No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
33	5.14	36.81			39.27	-6.67
34	6.54	36.94			41.82	-13.21
35	8.32	41.24			45.53	-10.41
36	10.59	44.95			50.98	-13.40
37	13.49	62.25			57.96	6.89
38*	17.19	-575.1			66.46	111.5
39*	21.90	-37.08			73.68	298.6
40*	27.92	-21.41			76.09	455.3
41	0.881	49.24			46.91	4.73
42	1.06	47.17			44.68	5.29
43	1.31	44.44			42.27	4.88
44	1.61	42.04			40.16	4.46
45	2.00	40.15			38.50	4.10
46	2.50	37.50			37.50	-0.00598
47	3.14	36.96			37.16	-0.516
48	3.95	35.77			37.66	-5.26
49	4.99	39.90			38.94	2.41
50	6.31	38.16			41.18	-7.90
51	7.99	42.04			44.43	-5.67
52	10.13	59.81			48.95	18.14
53	12.86	70.64			54.41	22.97
54	16.35	71.36			60.37	15.40
55	20.80	82.32			63.74	22.57
56	26.47	-59.47			62.49	205.0
57	33.72	-56.06			56.50	200.7
58	42.96	-25.43			48.74	291.6
59*	54.74	-13.44			41.90	411.7
60*	69.77	-21.09			36.73	274.1

"*" INDICATES MASKED DATA POINT

Prepared for s/n1156

A20-1

Central Loop TEM

Northing: 1001600.0 Easting: 280700.0 Elevation: 1506.0

Layered Model

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
				1506.0		
1	34.14	21.79	21.79	1484.2	0.638	744.2
2	103.9	32.11	53.91	1452.0	0.309	3336.9
3	25.00	45.59	99.50	1406.4	1.82	1139.9
4	131.3	112.5	212.0	1293.9	0.856	14780.9
5	8.15	66.82	278.8	1227.1	8.19	544.9
6	454.2	371.0	649.9	856.0	0.816	168536.9
7	0.170	737.8	1387.7	118.2	4325.3	125.8
8	142.9					

ALL PARAMETERS ARE FREE

Prepared for s/n1156

A20-1

Central Loop TEM

Northing: 1001600.0 Easting: 280700.0 Elevation: 1506.0

Smooth Model: Ridge Regression

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
					1506.0		
1	40.72	36.51	36.51	*	1469.4	0.896	1487.0
2	53.17	2.36	38.88	*	1467.1	0.0444	125.5
3	78.17	2.51	41.39	*	1464.6	0.0321	196.5
4	81.86	2.67	44.07	*	1461.9	0.0326	219.1
5	51.30	2.84	46.92	*	1459.0	0.0555	146.1
6	46.42	3.03	49.95	*	1456.0	0.0653	140.8
7	45.18	3.22	53.18	*	1452.8	0.0714	145.9
8	45.64	3.43	56.62	*	1449.3	0.0753	156.9
9	40.16	3.66	60.28	*	1445.7	0.0911	147.0
10	29.60	3.89	64.18	*	1441.8	0.131	115.4
11	43.06	4.14	68.33	*	1437.6	0.0963	178.7
12	44.36	4.41	72.74	*	1433.2	0.0995	195.9
13	34.52	4.70	77.45	*	1428.5	0.136	162.3
14	52.17	5.00	82.45	*	1423.5	0.0959	261.2
15	54.98	5.33	87.79	*	1418.2	0.0969	293.1
16	81.32	5.67	93.46	*	1412.5	0.0698	461.6
17	56.05	6.04	99.51	*	1406.4	0.107	338.7
18	38.08	6.43	105.9	*	1400.0	0.168	245.0
19	78.21	6.84	112.7	*	1393.2	0.0875	535.7
20	74.79	7.29	120.0	*	1385.9	0.0975	545.4
21	51.48	7.76	127.8	*	1378.1	0.150	399.7
22	58.12	8.26	136.1	*	1369.8	0.142	480.5
23	69.13	8.80	144.9	*	1361.0	0.127	608.4
24	63.15	9.36	154.2	*	1351.7	0.148	591.7
25	53.27	9.97	164.2	*	1341.7	0.187	531.4
26	31.31	10.62	174.8	*	1331.1	0.339	332.6
27	29.83	11.30	186.1	*	1319.8	0.379	337.3
28	17.61	12.03	198.2	*	1307.7	0.683	212.0
29	19.69	12.81	211.0	*	1294.9	0.650	252.3
30	15.58	13.64	224.6	*	1281.3	0.875	212.6
31	11.27	14.52	239.2	*	1266.7	1.28	163.7
32	28.25	15.46	254.6	*	1251.3	0.547	436.9

Prepared for s/n1156

A20-1 Page 2

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
33	30.37	16.46	271.1	*	1234.8	0.542	500.1
34	46.91	17.53	288.6	*	1217.3	0.373	822.5
35	71.10	18.66	307.3	*	1198.6	0.262	1327.1
36	90.30	19.87	327.2	*	1178.7	0.220	1794.4
37	119.9	21.15	348.3	*	1157.6	0.176	2538.2
38	137.1	22.52	370.8	*	1135.1	0.164	3089.5
39	154.1	23.98	394.8	*	1111.1	0.155	3697.6
40	175.6	25.53	420.4	*	1085.5	0.145	4484.9
41	193.4	27.18	447.5	*	1058.4	0.140	5258.4
42	211.4	28.93	476.5	*	1029.4	0.136	6120.0
43	226.2	30.80	507.3	*	998.6	0.136	6970.1
44	232.6	32.80	540.1	*	965.8	0.140	7632.4
45	248.0	34.92	575.0	*	930.9	0.140	8661.7
46	213.4	37.18	612.2	*	893.7	0.174	7936.7
47	219.2	39.58	651.8	*	854.1	0.180	8678.5
48	197.9	42.14	693.9	*	812.0	0.212	8342.8
49	181.9	44.86	738.8	*	767.1	0.246	8165.1
50	157.6	47.76	786.6	*	719.3	0.303	7529.9
51	130.1	50.85	837.4	*	668.5	0.390	6617.1
52	99.66	54.14	891.6	*	614.3	0.543	5396.3
53	65.71	57.64	949.2	*	556.7	0.877	3788.4
54	37.51	61.37	1010.6	*	495.3	1.63	2302.6
55	17.43	65.34	1075.9	*	430.0	3.74	1139.1
56	4.74	69.56	1145.5	*	360.4	14.66	330.0
57	2.11	74.06	1219.6	*	286.3	35.00	156.7
58	4.98	78.85	1298.4	*	207.5	15.81	393.1
59	10.80	83.95	1382.4	*	123.5	7.76	907.0
60	36.56						

"*" INDICATES FIXED PARAMETER

Prepared for s/n1156

A22

Central Loop TEM

Northing: 1001100.0 Easting: 279300.0 Elevation: 1504.0

			Layered Model:		Smooth Model:	
No.	Time (ms)	Data Resistivity (ohm-m)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)
1	0.0859	70.75			66.37	6.19
2	0.104	67.80			64.18	5.34
3	0.129	64.67			62.64	3.14
4	0.159	61.77			61.37	0.652
5	0.198	59.23			60.35	-1.89
6	0.248	57.27			59.47	-3.84
7	0.312	55.83			58.57	-4.90
8	0.393	54.85			57.45	-4.73
9	0.497	54.11			55.85	-3.21
10	0.629	52.96			53.59	-1.20
11	0.797	50.90			50.82	0.160
12	1.01	47.98			47.68	0.622
13	1.28	44.70			44.80	-0.213
14	1.63	41.68			42.37	-1.63
15	2.07	39.16			40.73	-3.99
16	2.64	38.15			39.98	-4.81
17	3.37	37.73			40.29	-6.78
18	4.29	38.69			41.82	-8.10
19	5.47	40.69			44.93	-10.41
20	6.97	45.67			50.16	-9.84
21	0.352	57.41			58.84	-2.48
22	0.427	56.51			57.67	-2.05
23	0.525	55.68			55.89	-0.366
24	0.647	54.43			53.65	1.44
25	0.802	52.25			50.96	2.46
26	1.00	49.30			47.91	2.81
27	1.25	46.06			45.06	2.16
28	1.58	42.90			42.57	0.768
29	1.99	40.44			40.75	-0.764
30	2.52	38.55			39.69	-2.94
31	3.19	37.94			39.51	-4.14
32	4.05	37.98			40.35	-6.22

Prepared for s/n1156

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No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
33	5.14	40.68			42.30	-3.98
34	6.54	43.29			45.57	-5.26
35	8.32	50.26			50.10	0.317
36	10.59	62.22			55.44	10.90
37*	13.49	135.2			58.84	56.50
38*	17.19	1709.4			57.24	96.65
39	21.90	-65.76			50.25	176.4
40	27.92	-21.79			41.57	290.7
41	0.881	52.75			49.69	5.79
42	1.06	49.63			47.10	5.10
43	1.31	46.51			44.55	4.21
44	1.61	43.79			42.34	3.30
45	2.00	41.54			40.69	2.03
46	2.50	39.61			39.65	-0.0870
47	3.14	39.52			39.38	0.370
48	3.95	39.39			39.99	-1.53
49	4.99	39.84			41.55	-4.29
50	6.31	45.25			44.16	2.40
51	7.99	51.49			47.47	7.81
52	10.13	66.19			50.73	23.35
53*	12.86	-319.2			51.40	116.1
54*	16.35	-288.0			47.79	116.5
55	20.80	-59.70			40.21	167.3
56*	26.47	62.55			32.40	48.19
57*	33.72	-45.65			25.89	156.7
58	42.96	-12.36			21.02	270.0
59	54.74	-9.28			17.64	290.1
60*	69.77	-6.11			15.35	350.9

"*" INDICATES MASKED DATA POINT

Prepared for s/n1156

A22

Central Loop TEM

Northing: 1001100.0 Easting: 279300.0 Elevation: 1504.0

Layered Model

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
				1504.0		
1	51.48	37.37	37.37	1466.6	0.725	1924.5
2	94.20	21.98	59.36	1444.6	0.233	2071.3
3	26.13	27.25	86.62	1417.3	1.04	712.2
4	64.09	104.6	191.2	1312.7	1.63	6704.7
5	11.06	103.3	294.5	1209.4	9.33	1143.7
6	85.49	163.3	457.8	1046.1	1.91	13962.3
7	0.131	550.7	1008.6	495.3	4175.9	72.64
8	188.6					

ALL PARAMETERS ARE FREE

Prepared for s/n1156

A22

Central Loop TEM

Northing: 1001100.0 Easting: 279300.0 Elevation: 1504.0

Smooth Model: Ridge Regression

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
					1504.0		
1	44.26	36.36	36.36	*	1467.6	0.821	1609.4
2	116.7	2.35	38.71	*	1465.2	0.0201	274.5
3	39.11	2.50	41.21	*	1462.7	0.0639	97.89
4	177.0	2.66	43.87	*	1460.1	0.0150	471.8
5	43.76	2.83	46.71	*	1457.2	0.0648	124.1
6	44.19	3.02	49.73	*	1454.2	0.0683	133.4
7	109.1	3.21	52.95	*	1451.0	0.0294	350.9
8	113.4	3.42	56.37	*	1447.6	0.0301	388.2
9	70.93	3.64	60.02	*	1443.9	0.0513	258.5
10	82.04	3.88	63.90	*	1440.0	0.0473	318.3
11	80.26	4.13	68.03	*	1435.9	0.0514	331.6
12	63.24	4.39	72.43	*	1431.5	0.0695	278.1
13	85.81	4.68	77.11	*	1426.8	0.0545	401.8
14	36.23	4.98	82.10	*	1421.8	0.137	180.6
15	39.26	5.30	87.40	*	1416.5	0.135	208.4
16	67.76	5.65	93.05	*	1410.9	0.0833	382.9
17	90.18	6.01	99.07	*	1404.9	0.0667	542.6
18	76.38	6.40	105.4	*	1398.5	0.0838	489.2
19	40.59	6.81	112.3	*	1391.6	0.167	276.8
20	31.20	7.26	119.5	*	1384.4	0.232	226.5
21	39.03	7.73	127.2	*	1376.7	0.198	301.7
22	38.90	8.23	135.5	*	1368.4	0.211	320.2
23	50.78	8.76	144.2	*	1359.7	0.172	444.9
24	38.34	9.32	153.6	*	1350.3	0.243	357.7
25	36.40	9.93	163.5	*	1340.4	0.272	361.6
26	28.76	10.57	174.1	*	1329.8	0.367	304.1
27	31.62	11.25	185.3	*	1318.6	0.355	356.0
28	23.47	11.98	197.3	*	1306.6	0.510	281.3
29	17.59	12.76	210.1	*	1293.8	0.725	224.4
30	16.78	13.58	223.7	*	1280.2	0.809	227.9
31	22.87	14.46	238.1	*	1265.8	0.632	330.8
32	20.33	15.39	253.5	*	1250.4	0.757	313.1

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L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
33	30.85	16.39	269.9	*	1234.0	0.531	505.8
34	40.98	17.45	287.4	*	1216.5	0.425	715.3
35	41.33	18.58	306.0	*	1197.9	0.449	768.1
36	52.68	19.78	325.7	*	1178.2	0.375	1042.3
37	56.42	21.06	346.8	*	1157.1	0.373	1188.5
38	63.95	22.42	369.2	*	1134.7	0.350	1434.1
39	66.30	23.87	393.1	*	1110.8	0.360	1583.1
40	72.81	25.41	418.5	*	1085.4	0.349	1850.9
41	70.12	27.06	445.6	*	1058.3	0.385	1897.7
42	72.71	28.81	474.4	*	1029.5	0.396	2095.0
43	62.06	30.67	505.1	*	998.8	0.494	1903.9
44	48.97	32.65	537.7	*	966.2	0.666	1599.3
45	54.35	34.77	572.5	*	931.4	0.639	1889.8
46	31.87	37.01	609.5	*	894.4	1.16	1180.0
47	18.28	39.41	648.9	*	855.0	2.15	720.6
48	6.52	41.96	690.9	*	813.0	6.43	273.7
49	1.35	44.67	735.6	*	768.3	32.94	60.57
50	0.758	47.56	783.1	*	720.8	62.70	36.07
51	5.03	50.63	833.8	*	670.1	10.05	254.8
52	10.21	53.91	887.7	*	616.2	5.27	550.9
53	15.02	57.39	945.1	*	558.8	3.82	862.3
54	18.94	61.10	1006.2	*	497.7	3.22	1157.6
55	22.56	65.05	1071.2	*	432.7	2.88	1468.2
56	26.37	69.26	1140.5	*	363.4	2.62	1826.9
57	30.18	73.74	1214.2	*	289.7	2.44	2225.8
58	34.03	78.50	1292.8	*	211.1	2.30	2672.2
59	38.41	83.58	1376.3	*	127.6	2.17	3210.6
60	172.1						

"*" INDICATES FIXED PARAMETER

Prepared for s/n1156

A23

Central Loop TEM

Northing: 1001480.0 Easting: 279575.0 Elevation: 1523.0

			Layered Model:		Smooth Model:	
No.	Time (ms)	Data Resistivity (ohm-m)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)
1	0.0859	66.67			66.27	0.607
2	0.104	66.10			63.76	3.54
3	0.129	64.60			62.05	3.95
4	0.159	62.65			60.74	3.04
5	0.198	60.38			59.90	0.800
6	0.248	58.13			59.16	-1.76
7	0.312	56.16			58.52	-4.20
8	0.393	54.75			57.79	-5.55
9	0.497	53.95			56.70	-5.09
10	0.629	53.26			55.12	-3.49
11	0.797	52.00			52.58	-1.10
12	1.01	49.76			49.54	0.443
13	1.28	46.56			46.16	0.853
14	1.63	43.06			43.18	-0.289
15	2.07	40.09			40.87	-1.92
16	2.64	38.06			39.55	-3.91
17	3.37	37.02			39.20	-5.89
18	4.29	37.45			40.07	-6.99
19	5.47	38.67			42.38	-9.59
20	6.97	41.88			46.57	-11.21
21	0.352	58.35			59.06	-1.20
22	0.427	57.17			58.15	-1.72
23	0.525	56.36			56.93	-1.00
24	0.647	55.64			55.24	0.725
25	0.802	54.11			52.73	2.55
26	1.00	52.01			49.76	4.31
27	1.25	48.34			46.43	3.93
28	1.58	45.04			43.42	3.59
29	1.99	41.53			40.95	1.39
30	2.52	39.03			39.32	-0.761
31	3.19	37.96			38.54	-1.52
32	4.05	37.38			38.78	-3.76

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A23 Page 2

No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
33	5.14	38.87			40.09	-3.14
34	6.54	40.24			42.67	-6.02
35	8.32	45.10			46.69	-3.51
36	10.59	50.81			51.85	-2.05
37	13.49	81.80			57.00	30.31
38*	17.19	143.7			58.75	59.13
39	21.90	-52.13			54.88	205.2
40	27.92	-30.25			47.06	255.5
41	0.881	53.81			51.56	4.17
42	1.06	51.52			48.83	5.20
43	1.31	48.68			45.83	5.84
44	1.61	44.70			43.15	3.47
45	2.00	41.97			40.89	2.57
46	2.50	39.30			39.31	-0.0361
47	3.14	38.37			38.48	-0.267
48	3.95	38.70			38.55	0.395
49	4.99	38.45			39.54	-2.83
50	6.31	42.57			41.60	2.27
51	7.99	40.85			44.63	-9.24
52	10.13	63.74			48.12	24.50
53*	12.86	-486.3			50.56	110.3
54*	16.35	-274.0			49.37	118.0
55	20.80	-39.88			43.77	209.7
56	26.47	-45.89			36.06	178.5
57*	33.72	-178.5			28.89	116.1
58*	42.96	-96.77			23.32	124.1
59	54.74	-12.82			19.31	250.5
60	69.77	-9.85			16.52	267.6

"*" INDICATES MASKED DATA POINT

Prepared for s/n1156

A23

Central Loop TEM

Northing: 1001480.0 Easting: 279575.0 Elevation: 1523.0

Layered Model

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
				1523.0		
1	36.92	29.80	29.80	1493.1	0.807	1100.6
2	115.6	62.05	91.86	1431.1	0.536	7174.1
3	17.51	29.35	121.2	1401.7	1.67	514.0
4	143.6	82.84	204.0	1318.9	0.576	11900.4
5	12.92	114.7	318.7	1204.2	8.87	1482.8
6	121.4	281.4	600.2	922.7	2.31	34179.5
7	0.265	58.76	658.9	864.0	221.5	15.58
8	117.6					

ALL PARAMETERS ARE FREE

Prepared for s/n1156

A23

Central Loop TEM

Northing: 1001480.0 Easting: 279575.0 Elevation: 1523.0

Smooth Model: Ridge Regression

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
					1523.0		
1	47.86	36.35	36.35	*	1486.6	0.759	1740.2
2	30.64	2.35	38.70	*	1484.2	0.0767	72.02
3	36.21	2.50	41.20	*	1481.7	0.0690	90.63
4	87.77	2.66	43.87	*	1479.1	0.0303	233.8
5	123.3	2.83	46.70	*	1476.2	0.0229	349.9
6	34.17	3.01	49.72	*	1473.2	0.0883	103.1
7	114.2	3.21	52.94	*	1470.0	0.0281	367.3
8	30.12	3.42	56.36	*	1466.6	0.113	103.1
9	70.19	3.64	60.00	*	1462.9	0.0519	255.7
10	88.80	3.87	63.88	*	1459.1	0.0436	344.5
11	87.29	4.13	68.01	*	1454.9	0.0473	360.6
12	47.79	4.39	72.41	*	1450.5	0.0920	210.1
13	42.48	4.68	77.09	*	1445.9	0.110	198.9
14	51.33	4.98	82.08	*	1440.9	0.0971	255.8
15	102.3	5.30	87.39	*	1435.6	0.0518	543.2
16	92.98	5.65	93.04	*	1429.9	0.0607	525.3
17	134.6	6.01	99.05	*	1423.9	0.0446	810.1
18	172.5	6.40	105.4	*	1417.5	0.0371	1104.8
19	108.9	6.81	112.2	*	1410.7	0.0626	742.6
20	27.53	7.25	119.5	*	1403.4	0.263	199.9
21	49.95	7.72	127.2	*	1395.7	0.154	386.0
22	21.17	8.22	135.4	*	1387.5	0.388	174.1
23	42.13	8.76	144.2	*	1378.7	0.207	369.0
24	48.17	9.32	153.5	*	1369.4	0.193	449.3
25	52.73	9.93	163.5	*	1359.4	0.188	523.6
26	36.78	10.57	174.0	*	1348.9	0.287	388.8
27	20.33	11.25	185.3	*	1337.6	0.553	228.9
28	36.03	11.98	197.3	*	1325.6	0.332	431.8
29	30.48	12.75	210.0	*	1312.9	0.418	388.8
30	23.00	13.58	223.6	*	1299.3	0.590	312.4
31	16.08	14.46	238.1	*	1284.8	0.898	232.6
32	11.65	15.39	253.5	*	1269.4	1.32	179.4

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A23 Page 2

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
33	18.28	16.39	269.9	*	1253.0	0.896	299.6
34	33.55	17.45	287.3	*	1235.6	0.520	585.5
35	40.13	18.57	305.9	*	1217.0	0.462	745.6
36	50.14	19.78	325.7	*	1197.2	0.394	991.9
37	63.98	21.05	346.7	*	1176.2	0.329	1347.5
38	64.91	22.42	369.2	*	1153.7	0.345	1455.3
39	71.33	23.87	393.0	*	1129.9	0.334	1702.9
40	71.74	25.41	418.4	*	1104.5	0.354	1823.2
41	69.90	27.05	445.5	*	1077.4	0.387	1891.4
42	76.49	28.80	474.3	*	1048.6	0.376	2203.4
43	71.35	30.66	505.0	*	1017.9	0.429	2188.4
44	66.27	32.65	537.6	*	985.3	0.492	2164.0
45	165.1	34.76	572.4	*	950.5	0.210	5741.8
46	24.83	37.01	609.4	*	913.5	1.49	919.2
47	21.31	39.40	648.8	*	874.1	1.84	839.7
48	14.48	41.95	690.8	*	832.1	2.89	607.4
49	4.33	44.66	735.4	*	787.5	10.29	193.6
50	0.811	47.55	783.0	*	739.9	58.56	38.61
51	1.18	50.62	833.6	*	689.3	42.57	60.19
52	5.18	53.90	887.5	*	635.4	10.40	279.3
53	9.01	57.38	944.9	*	578.0	6.36	517.4
54	12.00	61.09	1006.0	*	516.9	5.08	733.4
55	14.74	65.04	1071.0	*	451.9	4.41	959.1
56	17.09	69.25	1140.3	*	382.6	4.05	1183.9
57	20.00	73.72	1214.0	*	308.9	3.68	1474.7
58	23.53	78.49	1292.5	*	230.4	3.33	1847.4
59	27.71	83.57	1376.1	*	146.8	3.01	2316.3
60	128.0						

"*" INDICATES FIXED PARAMETER

Prepared for s/n1156

A24

Central Loop TEM

Northing: 1001700.0 Easting: 280100.0 Elevation: 1515.0

			Layered Model:		Smooth Model:	
No.	Time (ms)	Data Resistivity (ohm-m)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)
1	0.0859	72.53			73.39	-1.18
2	0.104	70.77			70.58	0.263
3	0.129	68.23			67.99	0.354
4	0.159	65.32			65.01	0.466
5	0.198	62.35			62.37	-0.0285
6	0.248	59.70			60.01	-0.507
7	0.312	57.56			58.10	-0.927
8	0.393	56.10			57.01	-1.62
9	0.497	55.34			56.22	-1.59
10	0.629	54.64			55.82	-2.16
11	0.797	53.51			54.76	-2.33
12	1.01	51.35			52.75	-2.72
13	1.28	48.11			49.47	-2.82
14	1.63	44.17			45.50	-3.00
15	2.07	40.72			41.63	-2.22
16	2.64	38.05			38.78	-1.92
17	3.37	36.53			37.07	-1.47
18	4.29	35.59			36.79	-3.37
19	5.47	36.05			37.77	-4.76
20	6.97	36.85			40.22	-9.13
21	0.352	59.66			58.29	2.30
22	0.427	58.48			57.42	1.81
23	0.525	57.78			56.63	2.00
24	0.647	56.82			56.13	1.20
25	0.802	55.57			54.92	1.17
26	1.00	53.36			52.86	0.940
27	1.25	50.11			49.66	0.895
28	1.58	45.85			45.67	0.389
29	1.99	42.21			41.73	1.12
30	2.52	39.08			38.53	1.40
31	3.19	37.12			36.31	2.17
32	4.05	36.61			35.24	3.72

Prepared for s/n1156

A24

No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
33	5.14	35.49			35.10	1.09
34	6.54	36.18			35.71	1.30
35	8.32	35.96			36.50	-1.51
36	10.59	36.96			37.15	-0.515
37	13.49	33.30			36.28	-8.94
38	17.19	31.42			33.75	-7.42
39	21.90	29.16			29.44	-0.986
40	27.92	21.37			24.89	-16.48
41	0.881	55.37			54.20	2.10
42	1.06	52.99			52.13	1.62
43	1.31	49.20			48.89	0.628
44	1.61	45.45			45.26	0.427
45	2.00	41.57			41.60	-0.0649
46	2.50	39.28			38.50	1.98
47	3.14	37.02			36.25	2.09
48	3.95	36.47			34.99	4.05
49	4.99	34.63			34.54	0.246
50	6.31	34.99			34.64	1.02
51	7.99	36.40			34.72	4.61
52	10.13	37.22			34.24	8.02
53	12.86	34.35			32.23	6.15
54*	16.35	46.03			28.77	37.49
55*	20.80	37.89			24.19	36.15
56	26.47	25.41			19.76	22.23
57	33.72	16.87			16.04	4.93
58	42.96	12.90			13.26	-2.78
59	54.74	9.62			11.26	-16.99
60*	69.77	6.03			9.91	-64.34

"*" INDICATES MASKED DATA POINT

A24

Central Loop TEM

Northing: 1001700.0 Easting: 280100.0 Elevation: 1515.0

Layered Model

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
				1515.0		
1	39.74	29.27	29.27	1485.7	0.736	1163.3
2	129.0	48.88	78.15	1436.8	0.378	6310.3
3	25.79	43.26	121.4	1393.5	1.67	1115.9
4	73.84	89.39	210.8	1304.1	1.21	6601.8
5	10.91	115.6	326.4	1188.5	10.58	1262.2
6	56.40	169.6	496.0	1018.9	3.00	9569.6
7	1.31	231.5	727.5	787.4	175.9	304.6
8	103.3					

ALL PARAMETERS ARE FREE

Prepared for s/n1156

A24

Central Loop TEM

Northing: 1001700.0 Easting: 280100.0 Elevation: 1515.0

Smooth Model: Ridge Regression

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
					1515.0		
1	46.45	34.68	34.68	*	1480.3	0.746	1611.1
2	74.57	2.24	36.92	*	1478.0	0.0300	167.2
3	60.84	2.38	39.30	*	1475.6	0.0392	145.2
4	141.6	2.54	41.85	*	1473.1	0.0179	359.8
5	135.3	2.70	44.55	*	1470.4	0.0199	366.2
6	44.76	2.88	47.43	*	1467.5	0.0643	128.9
7	109.0	3.06	50.50	*	1464.4	0.0281	334.4
8	64.33	3.26	53.77	*	1461.2	0.0507	210.0
9	117.8	3.47	57.24	*	1457.7	0.0295	409.6
10	110.1	3.70	60.94	*	1454.0	0.0336	407.6
11	88.35	3.94	64.88	*	1450.1	0.0446	348.1
12	75.43	4.19	69.08	*	1445.9	0.0556	316.4
13	208.7	4.46	73.55	*	1441.4	0.0214	932.4
14	101.8	4.75	78.30	*	1436.6	0.0467	484.1
15	151.4	5.06	83.36	*	1431.6	0.0334	766.7
16	153.0	5.39	88.75	*	1426.2	0.0352	824.9
17	8.17	5.73	94.49	*	1420.5	0.701	46.91
18	55.25	6.10	100.6	*	1414.3	0.110	337.6
19	44.22	6.50	107.1	*	1407.8	0.147	287.6
20	83.20	6.92	114.0	*	1400.9	0.0832	576.2
21	30.86	7.37	121.4	*	1393.5	0.238	227.5
22	45.69	7.84	129.2	*	1385.7	0.171	358.7
23	48.94	8.35	137.6	*	1377.3	0.170	409.0
24	57.82	8.89	146.5	*	1368.4	0.153	514.4
25	66.30	9.47	155.9	*	1359.0	0.142	628.0
26	56.32	10.08	166.0	*	1348.9	0.179	568.0
27	53.53	10.73	176.8	*	1338.1	0.200	574.8
28	40.18	11.43	188.2	*	1326.7	0.284	459.4
29	40.92	12.17	200.4	*	1314.5	0.297	498.1
30	32.72	12.95	213.3	*	1301.6	0.395	424.0
31	19.80	13.79	227.1	*	1287.8	0.696	273.1
32	14.76	14.68	241.8	*	1273.1	0.994	216.9

Prepared for s/n1156

A24 Page 2

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
33	7.79	15.63	257.4	*	1257.5	2.00	121.9
34	11.46	16.64	274.1	*	1240.8	1.45	190.8
35	9.87	17.72	291.8	*	1223.1	1.79	175.0
36	13.01	18.87	310.7	*	1204.2	1.44	245.6
37	20.35	20.09	330.8	*	1184.1	0.987	408.8
38	28.20	21.38	352.2	*	1162.7	0.758	603.2
39	34.72	22.77	374.9	*	1140.0	0.655	790.6
40	38.99	24.24	399.2	*	1115.7	0.621	945.5
41	51.17	25.81	425.0	*	1089.9	0.504	1320.9
42	41.16	27.48	452.5	*	1062.4	0.667	1131.3
43	31.36	29.25	481.7	*	1033.2	0.932	917.5
44	12.88	31.14	512.9	*	1002.0	2.41	401.3
45	1.05	33.16	546.1	*	968.8	31.52	34.88
46	3.72	35.30	581.4	*	933.5	9.49	131.3
47	0.775	37.59	618.9	*	895.9	48.47	29.15
48	1.12	40.02	659.0	*	855.9	35.43	45.20
49	3.37	42.60	701.6	*	813.3	12.64	143.6
50	6.14	45.36	746.9	*	768.0	7.37	278.9
51	8.33	48.29	795.2	*	719.7	5.79	402.4
52	11.14	51.41	846.7	*	668.2	4.61	573.0
53	13.84	54.74	901.4	*	613.5	3.95	757.7
54	16.08	58.28	959.7	*	555.2	3.62	937.7
55	18.71	62.05	1021.7	*	493.2	3.31	1161.4
56	23.07	66.06	1087.8	*	427.1	2.86	1524.1
57	29.65	70.33	1158.1	*	356.8	2.37	2085.7
58	36.26	74.88	1233.0	*	281.9	2.06	2715.8
59	42.81	79.72	1312.7	*	202.2	1.86	3413.7
60	224.1						

"*" INDICATES FIXED PARAMETER

Prepared for s/n1156

A25

Central Loop TEM

Northing: 1001975.0 Easting: 280300.0 Elevation: 1514.0

			Layered Model:		Smooth Model:	
No.	Time (ms)	Data Resistivity (ohm-m)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)
1	0.0859	63.90			65.45	-2.41
2	0.104	62.60			62.29	0.491
3	0.129	60.51			59.58	1.53
4	0.159	58.17			57.16	1.73
5	0.198	55.86			55.12	1.33
6	0.248	53.83			53.36	0.885
7	0.312	52.22			52.21	0.0265
8	0.393	51.18			51.54	-0.705
9	0.497	50.63			51.46	-1.62
10	0.629	50.23			51.42	-2.37
11	0.797	49.38			50.94	-3.15
12	1.01	47.54			49.16	-3.41
13	1.28	44.65			45.94	-2.89
14	1.63	40.98			41.96	-2.39
15	2.07	37.72			38.27	-1.45
16	2.64	35.15			35.55	-1.12
17	3.37	33.69			34.08	-1.15
18	4.29	33.24			33.96	-2.16
19	5.47	33.43			35.25	-5.47
20	6.97	34.74			38.14	-9.77
21	0.352	53.76			52.57	2.20
22	0.427	52.92			52.10	1.54
23	0.525	52.36			51.99	0.694
24	0.647	51.73			51.77	-0.0653
25	0.802	50.78			51.12	-0.653
26	1.00	48.93			49.28	-0.729
27	1.25	45.77			46.13	-0.799
28	1.58	42.39			42.23	0.372
29	1.99	38.48			38.40	0.210
30	2.52	35.70			35.40	0.825
31	3.19	34.05			33.44	1.79
32	4.05	33.18			32.64	1.61

Prepared for s/n1156

A25 Page 2

No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
33	5.14	32.59			32.78	-0.600
34	6.54	33.67			33.88	-0.622
35	8.32	32.97			35.35	-7.23
36	10.59	34.19			36.54	-6.88
37	13.49	32.27			35.73	-10.72
38	17.19	31.40			32.66	-4.03
39	21.90	24.64			28.11	-14.09
40	27.92	18.41			23.78	-29.17
41	0.881	51.82			50.53	2.50
42	1.06	49.20			48.49	1.45
43	1.31	46.29			45.42	1.87
44	1.61	42.69			41.78	2.13
45	2.00	39.55			38.27	3.21
46	2.50	36.34			35.38	2.64
47	3.14	34.70			33.37	3.81
48	3.95	34.09			32.41	4.90
49	4.99	33.70			32.23	4.37
50	6.31	32.91			32.84	0.222
51	7.99	35.26			33.53	4.92
52	10.13	35.32			33.64	4.77
53	12.86	39.46			31.78	19.44
54	16.35	35.59			28.08	21.09
55	20.80	24.81			23.35	5.89
56	26.47	21.14			19.09	9.70
57	33.72	17.91			15.64	12.65
58	42.96	11.18			13.02	-16.45
59	54.74	10.24			11.11	-8.53
60*	69.77	5.55			9.74	-75.48

"*" INDICATES MASKED DATA POINT

Prepared for s/n1156

A25

Central Loop TEM

Northing: 1001975.0 Easting: 280300.0 Elevation: 1514.0

Layered Model

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
				1514.0		
1	38.83	43.05	43.05	1470.9	1.10	1671.7
2	571.6	37.20	80.26	1433.7	0.0650	21268.8
3	21.76	44.05	124.3	1389.6	2.02	959.0
4	58.78	102.9	227.2	1286.7	1.75	6053.7
5	5.32	59.10	286.3	1227.6	11.08	315.0
6	85.86	159.2	445.6	1068.3	1.85	13672.9
7	0.449	679.4	1125.1	388.8	1511.4	305.4
8	319.1					

ALL PARAMETERS ARE FREE

Prepared for s/n1156

A25

Central Loop TEM

Northing: 1001975.0 Easting: 280300.0 Elevation: 1514.0

Smooth Model: Ridge Regression

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
					1514.0		
1	47.29	33.26	33.26	*	1480.7	0.703	1573.2
2	30.02	2.15	35.41	*	1478.5	0.0716	64.56
3	58.14	2.28	37.70	*	1476.2	0.0393	133.1
4	359.8	2.43	40.14	*	1473.8	0.00677	877.2
5	46.16	2.59	42.73	*	1471.2	0.0562	119.8
6	21.61	2.76	45.50	*	1468.4	0.127	59.72
7	57.50	2.94	48.44	*	1465.5	0.0511	169.1
8	80.35	3.13	51.57	*	1462.4	0.0389	251.6
9	17.28	3.33	54.91	*	1459.0	0.192	57.62
10	217.1	3.55	58.46	*	1455.5	0.0163	771.0
11	536.2	3.77	62.24	*	1451.7	0.00705	2026.9
12	150.9	4.02	66.26	*	1447.7	0.0266	607.4
13	122.1	4.28	70.54	*	1443.4	0.0350	523.3
14	70.91	4.56	75.11	*	1438.8	0.0643	323.4
15	27.19	4.85	79.96	*	1434.0	0.178	132.0
16	111.7	5.17	85.13	*	1428.8	0.0462	577.6
17	18.98	5.50	90.64	*	1423.3	0.289	104.4
18	31.56	5.86	96.50	*	1417.4	0.185	184.9
19	60.62	6.23	102.7	*	1411.2	0.102	378.2
20	32.80	6.64	109.3	*	1404.6	0.202	217.8
21	50.77	7.07	116.4	*	1397.5	0.139	359.0
22	66.59	7.52	123.9	*	1390.0	0.113	501.4
23	20.67	8.01	132.0	*	1381.9	0.387	165.7
24	52.03	8.53	140.5	*	1373.4	0.164	444.0
25	66.23	9.08	149.6	*	1364.3	0.137	601.8
26	64.86	9.67	159.2	*	1354.7	0.149	627.5
27	84.12	10.29	169.5	*	1344.4	0.122	866.4
28	43.78	10.96	180.5	*	1333.4	0.250	480.1
29	35.11	11.67	192.2	*	1321.7	0.332	409.9
30	32.88	12.42	204.6	*	1309.3	0.377	408.7
31	28.26	13.23	217.8	*	1296.1	0.468	373.9
32	14.78	14.08	231.9	*	1282.0	0.953	208.2

Prepared for s/n1156

A25 Page 2

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
33	5.94	14.99	246.9	*	1267.0	2.52	89.23
34	9.00	15.96	262.9	*	1251.0	1.77	143.7
35	9.23	17.00	279.9	*	1234.0	1.84	157.0
36	9.39	18.10	298.0	*	1215.9	1.92	170.0
37	31.18	19.27	317.3	*	1196.6	0.618	600.8
38	83.34	20.51	337.8	*	1176.1	0.246	1709.8
39	96.37	21.84	359.6	*	1154.3	0.226	2105.2
40	77.03	23.25	382.9	*	1131.0	0.301	1791.4
41	98.05	24.75	407.7	*	1106.2	0.252	2427.7
42	89.30	26.35	434.0	*	1079.9	0.295	2354.0
43	71.73	28.06	462.1	*	1051.8	0.391	2013.1
44	35.75	29.87	492.0	*	1021.9	0.835	1068.3
45	1.35	31.81	523.8	*	990.1	23.52	43.01
46	2.30	33.86	557.6	*	956.3	14.68	78.09
47	0.504	36.05	593.7	*	920.2	71.54	18.17
48	2.34	38.38	632.1	*	881.8	16.39	89.87
49	5.28	40.87	672.9	*	841.0	7.73	216.0
50	7.48	43.51	716.5	*	797.4	5.81	325.6
51	4.58	46.32	762.8	*	751.1	10.09	212.5
52	2.61	49.32	812.1	*	701.8	18.84	129.0
53	2.77	52.50	864.6	*	649.3	18.92	145.6
54	5.07	55.90	920.5	*	593.4	11.01	283.6
55	8.32	59.51	980.0	*	533.9	7.14	495.5
56	12.10	63.36	1043.4	*	470.5	5.23	767.3
57	16.62	67.46	1110.9	*	403.0	4.05	1121.5
58	22.52	71.82	1182.7	*	331.2	3.18	1618.2
59	30.21	76.47	1259.2	*	254.7	2.53	2310.2
60	614.8						

"*" INDICATES FIXED PARAMETER

Prepared for s/n1156

B01

Central Loop TEM

Northing: 994655.0 Easting: 282210.0 Elevation: 1424.0

No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
1	0.0859	21.72	21.89	-0.798	21.93	-0.963
2	0.104	19.59	19.84	-1.28	19.89	-1.56
3	0.129	18.18	18.20	-0.0957	18.27	-0.445
4	0.159	17.09	16.95	0.808	17.01	0.447
5	0.198	16.19	16.01	1.07	16.07	0.729
6	0.248	15.42	15.32	0.632	15.36	0.418
7	0.312	14.80	14.84	-0.251	14.85	-0.304
8	0.393	14.33	14.54	-1.46	14.53	-1.39
9	0.497	14.00	14.39	-2.79	14.36	-2.58
10	0.629	13.83	14.37	-3.93	14.34	-3.71
11	0.797	13.82	14.47	-4.71	14.43	-4.44
12	1.01	13.99	14.65	-4.70	14.63	-4.51
13	1.28	14.35	14.93	-4.05	14.90	-3.85
14	1.63	14.81	15.29	-3.29	15.26	-3.08
15	2.07	15.33	15.77	-2.86	15.72	-2.58
16	2.64	15.89	16.36	-2.92	16.31	-2.62
17	3.37	16.44	17.12	-4.10	17.07	-3.82
18	4.29	17.33	18.04	-4.09	18.04	-4.08
19	5.47	18.32	19.22	-4.92	19.31	-5.40
20	6.97	19.87	20.85	-4.89	21.01	-5.71
21	0.352	15.21	14.66	3.59	14.66	3.60
22	0.427	14.86	14.47	2.62	14.46	2.75
23	0.525	14.62	14.37	1.66	14.34	1.88
24	0.647	14.49	14.37	0.843	14.34	1.05
25	0.802	14.51	14.46	0.338	14.42	0.585
26	1.00	14.68	14.62	0.381	14.59	0.561
27	1.25	15.01	14.87	0.917	14.84	1.10
28	1.58	15.48	15.17	1.98	15.15	2.17
29	1.99	15.99	15.57	2.62	15.53	2.87
30	2.52	16.47	16.03	2.67	15.99	2.95
31	3.19	16.99	16.62	2.17	16.57	2.47
32	4.05	17.60	17.27	1.89	17.26	1.96

Prepared for 1156

B01 Page 2

No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
33	5.14	18.52	18.08	2.34	18.12	2.13
34	6.54	19.03	19.06	-0.125	19.16	-0.701
35	8.32	20.59	20.31	1.35	20.44	0.723
36	10.59	22.34	22.02	1.43	22.03	1.38
37	13.49	24.61	24.17	1.79	24.03	2.36
38	17.19	28.23	26.92	4.63	26.45	6.30
39	21.90	32.40	29.90	7.72	29.26	9.69
40*	27.92	255.9	32.75	87.20	32.09	87.46
41	0.881	14.93	14.59	2.30	14.56	2.51
42	1.06	15.08	14.75	2.17	14.72	2.35
43	1.31	15.35	14.97	2.47	14.94	2.65
44	1.61	15.72	15.25	2.93	15.22	3.12
45	2.00	16.21	15.61	3.66	15.57	3.91
46	2.50	16.58	16.05	3.23	16.00	3.51
47	3.14	17.05	16.59	2.70	16.54	3.00
48	3.95	17.47	17.19	1.56	17.18	1.66
49	4.99	18.32	17.96	1.95	17.99	1.80
50	6.31	18.90	18.84	0.324	18.95	-0.257
51	7.99	20.38	19.97	2.01	20.10	1.38
52	10.13	21.24	21.42	-0.858	21.47	-1.11
53	12.86	23.02	23.19	-0.734	23.12	-0.452
54	16.35	22.89	25.29	-10.47	25.00	-9.23
55	20.80	26.07	27.30	-4.71	26.90	-3.19
56	26.47	28.29	28.59	-1.06	28.40	-0.377
57	33.72	28.23	28.86	-2.21	29.14	-3.23
58	42.96	29.02	27.76	4.31	28.74	0.934
59*	54.74	-21.16	25.70	221.4	27.44	229.7
60*	69.77	-33.31	23.34	170.0	25.44	176.3

"*" INDICATES MASKED DATA POINT

Prepared for 1156

B01

Central Loop TEM

Northing: 994655.0 Easting: 282210.0 Elevation: 1424.0

Layered Model

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
				1424.0		
1	11.10	23.37	23.37	1400.6	2.10	259.5
2	14.26	40.08	63.46	1360.5	2.80	571.9
3	21.44	21.68	85.15	1338.8	1.01	465.0
4	16.50	31.43	116.5	1307.4	1.90	518.7
5	31.17	23.20	139.7	1284.2	0.744	723.1
6	21.74	71.34	211.1	1212.8	3.28	1551.2
7	32.80	565.2	776.4	647.5	17.23	18542.2
8	1.78					

ALL PARAMETERS ARE FREE

Prepared for 1156

B01

Central Loop TEM

Northing: 994655.0 Easting: 282210.0 Elevation: 1424.0

Smooth Model: Ridge Regression

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
					1424.0		
1	11.07	22.68	22.68	*	1401.3	2.04	251.3
2	12.94	1.46	24.15	*	1399.8	0.113	18.99
3	14.82	1.56	25.71	*	1398.2	0.105	23.15
4	14.61	1.66	27.37	*	1396.6	0.113	24.30
5	15.00	1.77	29.14	*	1394.8	0.117	26.55
6	15.88	1.88	31.03	*	1392.9	0.118	29.93
7	15.37	2.00	33.03	*	1390.9	0.130	30.84
8	14.16	2.13	35.17	*	1388.8	0.150	30.26
9	15.74	2.27	37.44	*	1386.5	0.144	35.81
10	11.43	2.42	39.86	*	1384.1	0.211	27.67
11	13.70	2.57	42.44	*	1381.5	0.188	35.32
12	15.48	2.74	45.19	*	1378.8	0.177	42.50
13	13.65	2.92	48.11	*	1375.8	0.213	39.90
14	12.93	3.11	51.22	*	1372.7	0.240	40.24
15	15.46	3.31	54.53	*	1369.4	0.214	51.20
16	15.64	3.52	58.06	*	1365.9	0.225	55.15
17	14.80	3.75	61.81	*	1362.1	0.253	55.56
18	17.95	3.99	65.81	*	1358.1	0.222	71.76
19	15.61	4.25	70.06	*	1353.9	0.272	66.42
20	17.19	4.53	74.59	*	1349.4	0.263	77.92
21	19.53	4.82	79.42	*	1344.5	0.246	94.20
22	21.07	5.13	84.55	*	1339.4	0.243	108.2
23	16.60	5.46	90.02	*	1333.9	0.329	90.78
24	18.78	5.82	95.84	*	1328.1	0.309	109.3
25	17.84	6.19	102.0	*	1321.9	0.347	110.6
26	22.02	6.59	108.6	*	1315.3	0.299	145.2
27	19.71	7.02	115.6	*	1308.3	0.356	138.4
28	29.18	7.47	123.1	*	1300.8	0.256	218.2
29	24.67	7.96	131.1	*	1292.8	0.322	196.4
30	22.27	8.47	139.5	*	1284.4	0.380	188.7
31	25.11	9.02	148.6	*	1275.3	0.359	226.6
32	22.38	9.60	158.2	*	1265.7	0.429	215.1

Prepared for 1156

B01 Page 2

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
33	20.23	10.22	168.4	*	1255.5	0.505	206.9
34	22.37	10.89	179.3	*	1244.6	0.486	243.6
35	21.66	11.59	190.9	*	1233.0	0.535	251.1
36	23.95	12.34	203.2	*	1220.7	0.515	295.7
37	25.24	13.14	216.4	*	1207.5	0.520	331.7
38	27.43	13.99	230.4	*	1193.5	0.510	383.8
39	28.66	14.89	245.3	*	1178.6	0.519	426.9
40	32.82	15.85	261.1	*	1162.8	0.483	520.6
41	31.75	16.88	278.0	*	1145.9	0.531	536.1
42	33.55	17.97	296.0	*	1127.9	0.535	603.2
43	36.23	19.13	315.1	*	1108.8	0.528	693.5
44	39.95	20.37	335.5	*	1088.4	0.509	814.2
45	41.57	21.69	357.2	*	1066.7	0.521	901.9
46	43.05	23.09	380.3	*	1043.6	0.536	994.3
47	40.72	24.59	404.9	*	1019.0	0.603	1001.3
48	44.68	26.18	431.1	*	992.8	0.585	1169.8
49	42.88	27.87	458.9	*	965.0	0.649	1195.2
50	39.71	29.67	488.6	*	935.3	0.747	1178.5
51	36.27	31.59	520.2	*	903.7	0.870	1146.0
52	32.76	33.63	553.8	*	870.1	1.02	1102.1
53	29.93	35.81	589.6	*	834.3	1.19	1072.0
54	24.64	38.12	627.8	*	796.1	1.54	939.5
55	20.22	40.59	668.4	*	755.5	2.00	821.0
56	15.86	43.21	711.6	*	712.3	2.72	685.5
57	12.47	46.00	757.6	*	666.3	3.68	573.7
58	10.25	48.98	806.6	*	617.3	4.77	502.1
59	8.95	52.15	858.7	*	565.2	5.82	466.8
60	1.93						

"*" INDICATES FIXED PARAMETER

Prepared for 1156

C01-1

Central Loop TEM

Northing: 996093.0 Easting: 281809.0 Elevation: 1423.0

No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
1	0.0859	23.77			26.40	-11.06
2	0.104	24.14			25.24	-4.53
3	0.129	24.67			24.64	0.102
4	0.159	25.28			24.51	3.02
5	0.198	25.79			24.78	3.91
6	0.248	26.26			25.50	2.89
7	0.312	26.70			26.49	0.784
8	0.393	27.16			27.63	-1.75
9	0.497	27.66			28.82	-4.17
10	0.629	28.21			29.51	-4.62
11	0.797	28.60			29.96	-4.74
12	1.01	28.67			29.45	-2.69
13	1.28	28.27			28.82	-1.92
14	1.63	27.52			27.82	-1.11
15	2.07	26.70			27.26	-2.11
16	2.64	26.11			26.83	-2.73
17	3.37	26.18			27.33	-4.36
18	4.29	26.42			28.21	-6.78
19	5.47	27.98			30.07	-7.47
20	6.97	30.33			33.17	-9.35
21	0.352	28.78			27.59	4.13
22	0.427	29.08			28.56	1.79
23	0.525	29.45			29.40	0.154
24	0.647	29.88			29.88	0.00474
25	0.802	30.13			30.15	-0.0679
26	1.00	30.07			29.57	1.66
27	1.25	29.65			28.93	2.43
28	1.58	28.85			27.87	3.39
29	1.99	27.92			27.16	2.72
30	2.52	27.23			26.50	2.66
31	3.19	26.62			26.64	-0.0704
32	4.05	26.59			26.84	-0.940

Prepared for 1156

C01-1

Page 2

No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
33	5.14	27.60			27.94	-1.24
34	6.54	28.38			29.12	-2.61
35	8.32	29.24			30.45	-4.15
36	10.59	32.89			31.14	5.33
37	13.49	35.54			30.55	14.02
38*	17.19	338.8			28.49	91.59
39	21.90	-24.57			25.81	205.0
40	27.92	-13.24			23.61	278.3
41	0.881	30.75			29.98	2.52
42	1.06	30.51			29.46	3.42
43	1.31	29.96			28.75	4.05
44	1.61	29.21			27.78	4.87
45	2.00	28.10			27.14	3.40
46	2.50	27.22			26.49	2.68
47	3.14	26.41			26.56	-0.571
48	3.95	27.41			26.64	2.81
49	4.99	27.80			27.61	0.681
50	6.31	28.61			28.44	0.601
51	7.99	32.71			29.56	9.62
52	10.13	32.48			29.73	8.45
53*	12.86	75.75			28.83	61.93
54*	16.35	263.9			26.31	90.02
55	20.80	-28.49			23.49	182.4
56	26.47	-26.87			20.73	177.1
57	33.72	-16.95			18.54	209.3
58*	42.96	-86.46			17.21	119.9
59*	54.74	-6.07			16.31	368.4
60*	69.77	-5.01			16.22	423.7

"*" INDICATES MASKED DATA POINT

Prepared for 1156

C01-1

Central Loop TEM

Northing: 996093.0 Easting: 281809.0 Elevation: 1423.0

Layered Model

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
				1423.0		
1	14.42	25.05	25.05	1397.9	1.73	361.2
2	65.56	11.48	36.53	1386.4	0.175	753.1
3	33.67	13.12	49.66	1373.3	0.389	442.0
4	92.48	56.91	106.5	1316.4	0.615	5264.1
5	18.25	203.2	309.8	1113.1	11.13	3710.8
6	47.26	175.0	484.9	938.0	3.70	8275.6
7	1.25	543.5	1028.5	394.4	432.6	682.8
8	153.7					

ALL PARAMETERS ARE FREE

Prepared for 1156

C01-1

Central Loop TEM

Northing: 996093.0 Easting: 281809.0 Elevation: 1423.0

Smooth Model: Ridge Regression

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
					1423.0		
1	15.76	28.35	28.35	*	1394.6	1.79	446.8
2	20.63	1.83	30.18	*	1392.8	0.0888	37.82
3	53.12	1.95	32.13	*	1390.8	0.0367	103.6
4	92.47	2.07	34.21	*	1388.7	0.0224	192.1
5	53.62	2.21	36.42	*	1386.5	0.0412	118.6
6	43.74	2.35	38.77	*	1384.2	0.0538	103.0
7	36.57	2.50	41.28	*	1381.7	0.0685	91.71
8	42.85	2.66	43.95	*	1379.0	0.0623	114.3
9	73.07	2.84	46.79	*	1376.2	0.0388	207.6
10	77.35	3.02	49.82	*	1373.1	0.0391	234.0
11	29.62	3.22	53.04	*	1369.9	0.108	95.43
12	133.8	3.42	56.47	*	1366.5	0.0256	459.1
13	128.7	3.65	60.12	*	1362.8	0.0283	470.0
14	83.37	3.88	64.01	*	1358.9	0.0466	324.1
15	58.73	4.13	68.15	*	1354.8	0.0704	243.0
16	96.90	4.40	72.55	*	1350.4	0.0454	426.9
17	41.70	4.69	77.24	*	1345.7	0.112	195.6
18	34.91	4.99	82.24	*	1340.7	0.143	174.3
19	38.67	5.31	87.56	*	1335.4	0.137	205.6
20	70.11	5.66	93.22	*	1329.7	0.0807	396.9
21	71.78	6.02	99.25	*	1323.7	0.0839	432.6
22	62.01	6.41	105.6	*	1317.3	0.103	397.9
23	38.66	6.83	112.4	*	1310.5	0.176	264.1
24	37.13	7.27	119.7	*	1303.2	0.195	270.0
25	31.97	7.74	127.5	*	1295.4	0.242	247.6
26	40.02	8.24	135.7	*	1287.2	0.205	329.9
27	18.46	8.77	144.5	*	1278.4	0.475	162.0
28	16.41	9.34	153.8	*	1269.1	0.569	153.3
29	15.97	9.94	163.8	*	1259.1	0.622	158.9
30	14.89	10.59	174.4	*	1248.5	0.711	157.7
31	15.01	11.27	185.7	*	1237.2	0.751	169.3
32	13.86	12.00	197.7	*	1225.2	0.865	166.4

Prepared for 1156

C01-1

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
33	15.69	12.78	210.4	*	1212.5	0.814	200.6
34	20.33	13.60	224.1	*	1198.8	0.669	276.7
35	21.75	14.48	238.5	*	1184.4	0.665	315.2
36	22.19	15.42	254.0	*	1168.9	0.694	342.4
37	38.15	16.42	270.4	*	1152.5	0.430	626.5
38	38.37	17.48	287.9	*	1135.0	0.455	670.9
39	49.25	18.61	306.5	*	1116.4	0.377	916.9
40	48.78	19.81	326.3	*	1096.6	0.406	966.8
41	52.31	21.10	347.4	*	1075.5	0.403	1103.8
42	59.28	22.46	369.9	*	1053.0	0.378	1331.9
43	48.86	23.91	393.8	*	1029.1	0.489	1168.7
44	49.65	25.46	419.3	*	1003.6	0.512	1264.3
45	39.31	27.11	446.4	*	976.5	0.689	1065.7
46	31.58	28.86	475.2	*	947.7	0.913	911.5
47	30.03	30.72	506.0	*	916.9	1.02	922.8
48	18.52	32.71	538.7	*	884.2	1.76	606.1
49	11.81	34.83	573.5	*	849.4	2.94	411.3
50	5.60	37.08	610.6	*	812.3	6.62	207.7
51	2.50	39.48	650.1	*	772.8	15.77	98.78
52	3.14	42.03	692.1	*	730.8	13.37	132.1
53	5.94	44.75	736.9	*	686.0	7.53	265.8
54	11.32	47.64	784.5	*	638.4	4.20	539.6
55	19.52	50.72	835.2	*	587.7	2.59	990.4
56	27.79	54.00	889.2	*	533.7	1.94	1501.1
57	36.75	57.49	946.7	*	476.2	1.56	2113.0
58	45.13	61.21	1007.9	*	415.0	1.35	2762.6
59	51.25	65.17	1073.1	*	349.8	1.27	3340.1
60	263.0						

"*" INDICATES FIXED PARAMETER

C01

Central Loop TEM

Northing: 996222.0 Easting: 282323.0 Elevation: 1441.0

No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
1	0.0859	23.58	26.09	-10.62	27.02	-14.54
2	0.104	23.99	25.10	-4.62	25.82	-7.62
3	0.129	24.72	24.65	0.291	25.17	-1.80
4	0.159	25.68	24.77	3.56	25.07	2.40
5	0.198	26.64	25.36	4.79	25.42	4.58
6	0.248	27.50	26.29	4.40	26.14	4.94
7	0.312	28.18	27.65	1.85	27.30	3.10
8	0.393	28.79	28.99	-0.706	28.55	0.846
9	0.497	29.39	30.41	-3.47	29.95	-1.90
10	0.629	30.15	31.46	-4.32	31.03	-2.92
11	0.797	30.92	32.04	-3.62	31.71	-2.55
12	1.01	31.47	32.29	-2.61	31.92	-1.43
13	1.28	31.56	31.85	-0.918	31.55	0.0508
14	1.63	31.19	31.46	-0.842	31.16	0.103
15	2.07	30.64	30.90	-0.851	30.79	-0.499
16	2.64	30.35	31.09	-2.43	31.01	-2.18
17	3.37	30.69	31.34	-2.11	31.50	-2.63
18	4.29	31.46	32.88	-4.50	32.98	-4.85
19	5.47	33.43	35.07	-4.92	35.21	-5.33
20	6.97	35.76	38.31	-7.12	38.38	-7.33
21	0.352	29.92	28.89	3.45	28.45	4.92
22	0.427	30.31	29.90	1.35	29.45	2.84
23	0.525	30.81	31.09	-0.905	30.63	0.611
24	0.647	31.50	31.82	-1.00	31.41	0.301
25	0.802	32.11	32.26	-0.463	31.93	0.575
26	1.00	32.59	32.42	0.509	32.04	1.65
27	1.25	32.69	31.91	2.37	31.60	3.30
28	1.58	32.24	31.50	2.26	31.20	3.21
29	1.99	31.64	30.79	2.69	30.65	3.12
30	2.52	30.84	30.75	0.293	30.65	0.621
31	3.19	30.99	30.58	1.32	30.71	0.899
32	4.05	30.75	31.72	-3.16	31.78	-3.35

Prepared for 1156

C01 Page 2

No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
33	5.14	32.06	32.77	-2.22	32.90	-2.63
34	6.54	33.77	35.07	-3.82	35.04	-3.73
35	8.32	36.10	37.72	-4.49	37.64	-4.27
36	10.59	40.98	40.88	0.230	40.47	1.24
37	13.49	40.11	43.97	-9.62	43.30	-7.94
38	17.19	52.80	46.43	12.06	44.93	14.90
39*	21.90	127.5	47.14	63.03	44.92	64.77
40	27.92	-52.31	45.97	187.8	43.45	183.0
41	0.881	33.13	32.52	1.86	32.15	2.96
42	1.06	33.34	32.32	3.06	31.97	4.11
43	1.31	33.09	31.91	3.54	31.60	4.47
44	1.61	32.55	31.46	3.35	31.16	4.26
45	2.00	31.89	30.80	3.40	30.67	3.82
46	2.50	31.17	30.75	1.34	30.65	1.67
47	3.14	31.45	30.54	2.89	30.66	2.50
48	3.95	31.00	31.57	-1.86	31.63	-2.04
49	4.99	32.05	32.39	-1.04	32.53	-1.48
50	6.31	31.25	34.57	-10.61	34.55	-10.55
51	7.99	36.66	36.65	0.0246	36.60	0.151
52	10.13	46.12	39.33	14.72	39.04	15.36
53	12.86	53.29	41.38	22.34	40.97	23.10
54	16.35	47.28	42.68	9.72	41.76	11.68
55	20.80	35.96	41.59	-15.65	40.57	-12.81
56	26.47	22.39	39.02	-74.29	38.11	-70.19
57	33.72	-53.09	35.51	166.8	35.13	166.1
58	42.96	26.96	31.56	-17.05	32.55	-20.72
59*	54.74	16.12	28.31	-75.55	30.94	-91.87
60*	69.77	-8.41	25.72	405.8	29.97	456.3

"*" INDICATES MASKED DATA POINT

Prepared for 1156

C01

Central Loop TEM

Northing: 996222.0 Easting: 282323.0 Elevation: 1441.0

Layered Model

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
				1441.0		
1	15.25	29.96	29.96	1411.0	1.96	457.2
2	130.4	11.83	41.79	1399.2	0.0906	1543.8
3	56.69	12.29	54.09	1386.9	0.216	697.2
4	110.5	50.96	105.0	1335.9	0.460	5636.9
5	25.12	202.4	307.5	1133.4	8.05	5086.7
6	119.1	435.7	743.3	697.6	3.65	51945.0
7	6.27	566.8	1310.1	130.8	90.34	3556.5
8	50.02					

ALL PARAMETERS ARE FREE

Prepared for 1156

C01

Central Loop TEM

Northing: 996222.0 Easting: 282323.0 Elevation: 1441.0

Smooth Model: Ridge Regression

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
					1441.0		
1	16.39	31.00	31.00	*	1409.9	1.89	508.2
2	31.07	2.00	33.01	*	1407.9	0.0645	62.30
3	50.89	2.13	35.14	*	1405.8	0.0419	108.6
4	27.54	2.27	37.41	*	1403.5	0.0824	62.58
5	99.62	2.41	39.83	*	1401.1	0.0242	241.0
6	114.3	2.57	42.41	*	1398.5	0.0225	294.4
7	66.95	2.74	45.15	*	1395.8	0.0409	183.6
8	66.85	2.91	48.07	*	1392.9	0.0436	195.1
9	64.80	3.10	51.18	*	1389.8	0.0479	201.4
10	53.21	3.30	54.49	*	1386.5	0.0621	176.1
11	131.7	3.52	58.01	*	1382.9	0.0267	464.1
12	68.85	3.75	61.76	*	1379.2	0.0544	258.2
13	66.38	3.99	65.75	*	1375.2	0.0601	265.0
14	120.4	4.25	70.01	*	1370.9	0.0353	511.9
15	77.45	4.52	74.53	*	1366.4	0.0584	350.6
16	98.86	4.81	79.35	*	1361.6	0.0487	476.4
17	59.08	5.13	84.48	*	1356.5	0.0868	303.1
18	82.69	5.46	89.94	*	1351.0	0.0660	451.7
19	93.35	5.81	95.76	*	1345.2	0.0622	542.9
20	51.99	6.19	101.9	*	1339.0	0.119	321.9
21	45.91	6.59	108.5	*	1332.4	0.143	302.6
22	43.55	7.01	115.5	*	1325.4	0.161	305.6
23	40.54	7.47	123.0	*	1317.9	0.184	302.9
24	26.99	7.95	130.9	*	1310.0	0.294	214.7
25	27.38	8.46	139.4	*	1301.5	0.309	231.9
26	35.75	9.01	148.4	*	1292.5	0.252	322.4
27	33.88	9.59	158.0	*	1282.9	0.283	325.3
28	24.57	10.22	168.3	*	1272.6	0.415	251.1
29	18.12	10.88	179.1	*	1261.8	0.600	197.1
30	21.15	11.58	190.7	*	1250.2	0.547	245.0
31	18.35	12.33	203.1	*	1237.8	0.671	226.4
32	24.96	13.13	216.2	*	1224.7	0.526	327.7

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C01 Page 2

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
33	18.20	13.98	230.2	*	1210.7	0.767	254.5
34	25.05	14.88	245.0	*	1195.9	0.593	372.9
35	32.35	15.84	260.9	*	1180.0	0.489	512.6
36	39.38	16.87	277.8	*	1163.1	0.428	664.5
37	53.53	17.96	295.7	*	1145.2	0.335	961.6
38	58.80	19.12	314.9	*	1126.0	0.325	1124.5
39	77.87	20.35	335.2	*	1105.7	0.261	1585.4
40	77.15	21.67	356.9	*	1084.0	0.280	1672.3
41	87.53	23.07	380.0	*	1060.9	0.263	2020.2
42	101.3	24.56	404.5	*	1036.4	0.242	2491.1
43	116.4	26.15	430.7	*	1010.2	0.224	3045.2
44	119.5	27.84	458.5	*	982.4	0.232	3330.3
45	112.8	29.65	488.2	*	952.7	0.262	3347.0
46	110.4	31.56	519.8	*	921.1	0.285	3488.0
47	99.01	33.60	553.4	*	887.5	0.339	3327.5
48	88.97	35.78	589.1	*	851.8	0.402	3183.5
49	78.75	38.09	627.2	*	813.7	0.483	3000.1
50	66.51	40.55	667.8	*	773.1	0.609	2697.5
51	51.49	43.17	711.0	*	729.9	0.838	2223.3
52	36.13	45.97	757.0	*	683.9	1.27	1661.1
53	23.28	48.94	805.9	*	635.0	2.10	1139.5
54	12.44	52.10	858.0	*	582.9	4.18	648.4
55	7.75	55.47	913.5	*	527.4	7.15	430.2
56	6.02	59.06	972.5	*	468.4	9.80	355.9
57	7.94	62.88	1035.4	*	405.5	7.91	499.7
58	10.99	66.94	1102.4	*	338.5	6.09	735.9
59	15.44	71.27	1173.7	*	267.2	4.61	1101.0
60	44.88						

"*" INDICATES FIXED PARAMETER

Prepared for 1156

C02

Central Loop TEM

Northing: 996794.0 Easting: 283242.0 Elevation: 1477.0

No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
1	0.0859	52.96	55.41	-4.61	55.12	-4.07
2	0.104	53.98	54.82	-1.55	54.21	-0.433
3	0.129	55.05	55.05	0.0136	53.96	1.99
4	0.159	55.86	55.28	1.04	53.84	3.62
5	0.198	55.89	55.58	0.555	54.14	3.12
6	0.248	54.92	55.57	-1.16	54.12	1.45
7	0.312	53.15	54.70	-2.91	53.88	-1.36
8	0.393	51.12	53.47	-4.59	53.06	-3.79
9	0.497	48.94	51.34	-4.91	51.51	-5.25
10	0.629	47.09	49.24	-4.56	49.42	-4.95
11	0.797	45.43	46.62	-2.60	46.70	-2.79
12	1.01	43.67	44.06	-0.897	43.97	-0.692
13	1.28	41.67	41.49	0.422	41.28	0.947
14	1.63	39.50	39.31	0.485	39.16	0.849
15	2.07	37.43	37.51	-0.212	37.64	-0.565
16	2.64	35.79	36.77	-2.72	37.04	-3.47
17	3.37	35.00	36.63	-4.65	37.13	-6.08
18	4.29	35.08	37.71	-7.48	38.25	-9.03
19	5.47	36.09	39.77	-10.20	40.33	-11.73
20	6.97	38.90	43.47	-11.75	43.74	-12.44
21	0.352	54.73	54.97	-0.440	54.51	0.404
22	0.427	52.65	53.57	-1.73	53.26	-1.14
23	0.525	50.55	51.33	-1.55	51.63	-2.14
24	0.647	48.82	49.35	-1.08	49.49	-1.38
25	0.802	47.03	46.79	0.524	46.87	0.353
26	1.00	45.29	44.28	2.23	44.20	2.42
27	1.25	43.20	41.75	3.34	41.50	3.92
28	1.58	40.95	39.45	3.66	39.32	3.97
29	1.99	38.70	37.57	2.91	37.61	2.81
30	2.52	36.78	36.46	0.869	36.68	0.288
31	3.19	35.72	35.94	-0.598	36.33	-1.71
32	4.05	35.54	36.38	-2.37	36.82	-3.60

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C02 Page 2

No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
33	5.14	35.62	37.56	-5.44	37.93	-6.48
34	6.54	36.72	39.79	-8.34	39.83	-8.47
35	8.32	39.79	42.87	-7.75	42.46	-6.71
36	10.59	46.14	47.27	-2.45	45.68	0.999
37	13.49	57.35	51.62	9.97	49.25	14.12
38	17.19	79.41	56.31	29.09	52.34	34.09
39*	21.90	347.6	58.79	83.08	54.98	84.18
40	27.92	-48.11	58.97	222.5	56.96	218.4
41	0.881	47.50	45.79	3.60	45.85	3.46
42	1.06	45.52	43.69	4.03	43.48	4.49
43	1.31	43.69	41.29	5.47	41.11	5.90
44	1.61	41.64	39.32	5.57	39.17	5.93
45	2.00	39.63	37.56	5.21	37.61	5.09
46	2.50	37.25	36.49	2.02	36.71	1.45
47	3.14	35.68	35.94	-0.724	36.32	-1.80
48	3.95	35.47	36.26	-2.22	36.70	-3.45
49	4.99	36.12	37.27	-3.18	37.66	-4.24
50	6.31	38.40	39.20	-2.07	39.33	-2.41
51	7.99	36.78	41.95	-14.03	41.63	-13.17
52	10.13	44.44	45.63	-2.67	44.35	0.198
53	12.86	48.00	49.11	-2.30	47.28	1.50
54	16.35	78.68	52.76	32.93	49.35	37.28
55*	20.80	-188.3	53.44	128.3	50.88	127.0
56	26.47	-36.32	52.57	244.7	50.85	239.9
57*	33.72	-112.5	50.45	144.8	49.85	144.2
58	42.96	-57.87	47.77	182.5	49.02	184.7
59*	54.74	-8.74	46.11	627.6	48.83	658.6
60*	69.77	-7.15	45.59	737.5	49.28	789.1

"*" INDICATES MASKED DATA POINT

Prepared for 1156

C02

Central Loop TEM

Northing: 996794.0 Easting: 283242.0 Elevation: 1477.0

Layered Model

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
				1477.0		
1	34.37	38.28	38.28	1438.7	1.11	1315.7
2	235.4	17.23	55.51	1421.4	0.0732	4057.4
3	72.11	15.00	70.51	1406.4	0.208	1081.8
4	122.7	29.50	100.0	1376.9	0.240	3621.7
5	26.40	238.1	338.1	1138.8	9.01	6288.4
6	483.3	672.0	1010.2	466.7	1.39	324849.6
7	8.58	241.1	1251.3	225.6	28.10	2069.1
8	66.37					

ALL PARAMETERS ARE FREE

Prepared for 1156

C02

Central Loop TEM

Northing: 996794.0 Easting: 283242.0 Elevation: 1477.0

Smooth Model: Ridge Regression

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
					1477.0		
1	34.54	36.17	36.17	*	1440.8	1.04	1249.3
2	248.1	2.33	38.50	*	1438.4	0.00942	580.3
3	146.8	2.48	40.99	*	1436.0	0.0169	365.5
4	71.32	2.65	43.64	*	1433.3	0.0371	189.0
5	111.4	2.82	46.47	*	1430.5	0.0253	314.5
6	65.54	3.00	49.47	*	1427.5	0.0458	196.9
7	90.68	3.19	52.67	*	1424.3	0.0352	290.0
8	146.7	3.40	56.08	*	1420.9	0.0232	499.9
9	78.02	3.62	59.70	*	1417.2	0.0464	282.9
10	124.6	3.86	63.56	*	1413.4	0.0309	481.1
11	127.9	4.10	67.67	*	1409.3	0.0321	525.9
12	81.73	4.37	72.05	*	1404.9	0.0535	357.6
13	73.78	4.65	76.71	*	1400.2	0.0631	343.7
14	40.19	4.95	81.67	*	1395.3	0.123	199.3
15	91.48	5.28	86.95	*	1390.0	0.0577	483.0
16	40.84	5.62	92.57	*	1384.4	0.137	229.6
17	72.40	5.98	98.55	*	1378.4	0.0826	433.3
18	57.11	6.37	104.9	*	1372.0	0.111	363.9
19	46.84	6.78	111.7	*	1365.2	0.144	317.7
20	37.38	7.22	118.9	*	1358.0	0.193	270.0
21	28.72	7.68	126.6	*	1350.3	0.267	220.8
22	30.08	8.18	134.8	*	1342.1	0.272	246.3
23	42.10	8.71	143.5	*	1333.4	0.207	367.0
24	31.39	9.28	152.8	*	1324.1	0.295	291.3
25	19.88	9.88	162.6	*	1314.3	0.496	196.4
26	23.82	10.51	173.2	*	1303.7	0.441	250.5
27	25.80	11.19	184.4	*	1292.5	0.433	289.0
28	19.59	11.92	196.3	*	1280.6	0.608	233.6
29	23.11	12.69	209.0	*	1267.9	0.549	293.4
30	24.83	13.51	222.5	*	1254.4	0.544	335.6
31	22.25	14.38	236.9	*	1240.0	0.646	320.2
32	21.83	15.31	252.2	*	1224.7	0.701	334.4

Prepared for 1156

C02 Page 2

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
33	28.06	16.30	268.5	*	1208.4	0.581	457.7
34	37.30	17.36	285.9	*	1191.0	0.465	647.7
35	44.73	18.48	304.4	*	1172.5	0.413	826.9
36	58.22	19.68	324.0	*	1152.9	0.338	1145.9
37	77.50	20.95	345.0	*	1131.9	0.270	1624.0
38	88.76	22.30	367.3	*	1109.6	0.251	1980.2
39	125.7	23.75	391.1	*	1085.8	0.188	2986.5
40	145.9	25.28	416.3	*	1060.6	0.173	3690.6
41	163.7	26.92	443.3	*	1033.6	0.164	4409.3
42	169.7	28.66	471.9	*	1005.0	0.168	4866.2
43	171.6	30.51	502.4	*	974.5	0.177	5238.6
44	169.8	32.48	534.9	*	942.0	0.191	5517.5
45	176.8	34.58	569.5	*	907.4	0.195	6116.4
46	158.3	36.82	606.3	*	870.6	0.232	5832.3
47	163.5	39.20	645.5	*	831.4	0.239	6410.9
48	148.1	41.74	687.3	*	789.6	0.281	6184.0
49	135.3	44.43	731.7	*	745.2	0.328	6015.8
50	112.6	47.31	779.0	*	697.9	0.419	5330.8
51	91.23	50.37	829.4	*	647.5	0.552	4595.5
52	66.06	53.62	883.0	*	593.9	0.811	3543.1
53	46.27	57.09	940.1	*	536.8	1.23	2642.1
54	32.70	60.78	1000.9	*	476.0	1.85	1988.3
55	22.57	64.71	1065.6	*	411.3	2.86	1460.8
56	17.94	68.90	1134.5	*	342.4	3.83	1236.6
57	16.28	73.35	1207.9	*	269.0	4.50	1194.7
58	17.50	78.09	1286.0	*	190.9	4.46	1366.9
59	21.86	83.14	1369.1	*	107.8	3.80	1817.8
60	56.06						

"*" INDICATES FIXED PARAMETER

Prepared for 1156

C03

Central Loop TEM

Northing: 997442.0 Easting: 283981.0 Elevation: 1500.0

No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
1	0.0859	49.93	53.66	-7.47	56.70	-13.57
2	0.104	50.87	52.29	-2.78	54.48	-7.09
3	0.129	51.98	51.72	0.491	53.00	-1.96
4	0.159	53.11	51.63	2.78	52.00	2.10
5	0.198	53.82	51.92	3.52	51.51	4.29
6	0.248	53.81	52.32	2.77	51.27	4.71
7	0.312	52.91	52.51	0.757	51.14	3.34
8	0.393	51.27	52.20	-1.81	50.78	0.967
9	0.497	49.38	51.24	-3.76	49.95	-1.14
10	0.629	47.46	49.68	-4.66	48.47	-2.13
11	0.797	45.61	47.56	-4.28	46.43	-1.80
12	1.01	43.72	45.05	-3.04	44.02	-0.686
13	1.28	41.74	42.41	-1.58	41.63	0.269
14	1.63	39.48	39.89	-1.05	39.54	-0.151
15	2.07	37.28	37.84	-1.49	38.01	-1.93
16	2.64	35.64	36.51	-2.43	37.10	-4.07
17	3.37	34.66	35.97	-3.79	36.93	-6.55
18	4.29	34.45	36.35	-5.50	37.49	-8.83
19	5.47	35.01	37.71	-7.71	38.88	-11.04
20	6.97	36.88	40.29	-9.24	41.23	-11.79
21	0.352	55.09	53.30	3.24	51.88	5.83
22	0.427	53.18	52.70	0.902	51.27	3.59
23	0.525	51.29	51.47	-0.342	50.20	2.12
24	0.647	49.34	49.84	-1.01	48.63	1.42
25	0.802	47.58	47.73	-0.328	46.60	2.04
26	1.00	45.54	45.24	0.661	44.21	2.92
27	1.25	43.45	42.63	1.89	41.82	3.75
28	1.58	41.10	40.05	2.53	39.64	3.53
29	1.99	38.79	37.85	2.41	37.91	2.25
30	2.52	36.90	36.23	1.81	36.69	0.553
31	3.19	35.42	35.27	0.424	36.07	-1.84
32	4.05	34.92	35.05	-0.389	35.99	-3.07

Prepared for 1156

C03 Page 2

No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
33	5.14	34.86	35.57	-2.05	36.49	-4.66
34	6.54	35.57	36.87	-3.64	37.46	-5.31
35	8.32	36.54	38.94	-6.55	38.93	-6.53
36	10.59	41.15	41.91	-1.84	40.93	0.550
37	13.49	57.18	45.41	20.58	43.29	24.28
38*	17.19	-575.0	49.56	108.6	46.09	108.0
39	21.90	-81.52	53.51	165.6	49.13	160.2
40	27.92	-36.48	56.39	254.5	52.22	243.1
41	0.881	47.72	46.76	2.00	45.67	4.29
42	1.06	45.73	44.57	2.54	43.57	4.72
43	1.31	43.72	42.15	3.60	41.42	5.27
44	1.61	41.63	39.85	4.29	39.47	5.18
45	2.00	39.59	37.83	4.44	37.90	4.26
46	2.50	37.42	36.27	3.06	36.72	1.85
47	3.14	36.04	35.30	2.04	36.08	-0.120
48	3.95	34.25	35.00	-2.18	35.92	-4.88
49	4.99	34.29	35.39	-3.19	36.31	-5.88
50	6.31	39.89	36.48	8.55	37.12	6.95
51	7.99	33.28	38.26	-14.97	38.37	-15.29
52	10.13	49.83	40.76	18.19	39.99	19.75
53	12.86	36.33	43.55	-19.89	41.81	-15.09
54	16.35	36.93	46.83	-26.80	43.86	-18.75
55	20.80	74.04	49.09	33.69	45.67	38.31
56*	26.47	103.5	50.49	51.21	47.24	54.35
57*	33.72	-18.15	50.68	379.2	48.41	366.7
58*	42.96	-12.75	49.38	487.1	49.03	484.3
59*	54.74	-23.00	48.47	310.7	49.58	315.5
60*	69.77	-9.33	46.73	600.5	50.01	635.5

"*" INDICATES MASKED DATA POINT

Prepared for 1156

C03

Central Loop TEM

Northing: 997442.0 Easting: 283981.0 Elevation: 1500.0

Layered Model

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
				1500.0		
1	34.99	32.57	32.57	1467.4	0.930	1140.0
2	58.73	30.84	63.42	1436.5	0.525	1811.8
3	73.89	64.02	127.4	1372.5	0.866	4731.2
4	23.90	211.8	339.3	1160.6	8.86	5064.5
5	171.1	621.0	960.3	539.6	3.62	106309.6
6	14.76					

ALL PARAMETERS ARE FREE

Prepared for 1156

C03

Central Loop TEM

Northing: 997442.0 Easting: 283981.0 Elevation: 1500.0

Smooth Model: Ridge Regression

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
					1500.0		
1	39.63	35.68	35.68	*	1464.3	0.900	1414.3
2	48.67	2.30	37.99	*	1462.0	0.0474	112.2
3	48.54	2.45	40.44	*	1459.5	0.0506	119.2
4	49.40	2.61	43.06	*	1456.9	0.0529	129.1
5	42.55	2.78	45.84	*	1454.1	0.0654	118.4
6	47.20	2.96	48.81	*	1451.1	0.0628	139.9
7	49.84	3.15	51.96	*	1448.0	0.0633	157.2
8	49.58	3.35	55.32	*	1444.6	0.0677	166.5
9	51.82	3.57	58.90	*	1441.0	0.0690	185.3
10	46.62	3.80	62.71	*	1437.2	0.0816	177.5
11	51.89	4.05	66.76	*	1433.2	0.0781	210.4
12	65.73	4.31	71.08	*	1428.9	0.0656	283.7
13	51.18	4.59	75.67	*	1424.3	0.0897	235.2
14	70.48	4.89	80.57	*	1419.4	0.0694	344.8
15	62.69	5.20	85.78	*	1414.2	0.0831	326.5
16	62.11	5.54	91.32	*	1408.6	0.0893	344.4
17	47.83	5.90	97.23	*	1402.7	0.123	282.4
18	62.24	6.28	103.5	*	1396.4	0.101	391.3
19	55.64	6.69	110.2	*	1389.7	0.120	372.4
20	61.88	7.12	117.3	*	1382.6	0.115	441.0
21	51.69	7.58	124.9	*	1375.0	0.146	392.1
22	42.36	8.07	133.0	*	1366.9	0.190	342.1
23	39.79	8.59	141.6	*	1358.3	0.216	342.2
24	31.30	9.15	150.7	*	1349.2	0.292	286.5
25	27.79	9.74	160.5	*	1339.4	0.350	270.9
26	24.67	10.37	170.8	*	1329.1	0.420	256.0
27	23.28	11.04	181.9	*	1318.0	0.474	257.2
28	19.84	11.76	193.6	*	1306.3	0.592	233.4
29	19.65	12.52	206.2	*	1293.7	0.637	246.1
30	20.02	13.33	219.5	*	1280.4	0.665	266.9
31	22.68	14.19	233.7	*	1266.2	0.625	322.0
32	24.38	15.11	248.8	*	1251.1	0.619	368.5

Prepared for 1156

C03 Page 2

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
33	29.14	16.08	264.9	*	1235.0	0.552	468.9
34	32.22	17.13	282.0	*	1217.9	0.531	552.0
35	39.85	18.23	300.3	*	1199.6	0.457	726.7
36	42.38	19.41	319.7	*	1180.2	0.458	823.0
37	50.36	20.67	340.4	*	1159.5	0.410	1041.2
38	56.89	22.00	362.4	*	1137.5	0.386	1252.2
39	65.30	23.43	385.8	*	1114.1	0.358	1530.2
40	76.69	24.94	410.7	*	1089.2	0.325	1913.3
41	83.11	26.55	437.3	*	1062.6	0.319	2207.4
42	89.51	28.27	465.6	*	1034.3	0.315	2531.2
43	96.01	30.10	495.7	*	1004.2	0.313	2890.5
44	101.3	32.05	527.7	*	972.2	0.316	3248.1
45	104.7	34.12	561.9	*	938.0	0.325	3573.8
46	72.78	36.32	598.2	*	901.7	0.499	2644.3
47	73.74	38.67	636.9	*	863.0	0.524	2852.3
48	73.46	41.17	678.0	*	821.9	0.560	3025.4
49	73.35	43.84	721.9	*	778.0	0.597	3215.9
50	69.32	46.67	768.6	*	731.3	0.673	3235.7
51	62.82	49.69	818.3	*	681.6	0.790	3122.0
52	56.74	52.90	871.2	*	628.7	0.932	3002.1
53	49.30	56.32	927.5	*	572.4	1.14	2777.2
54	42.80	59.97	987.5	*	512.4	1.40	2567.1
55	37.60	63.84	1051.3	*	448.6	1.69	2400.9
56	33.53	67.97	1119.3	*	380.6	2.02	2279.5
57	31.21	72.37	1191.7	*	308.2	2.31	2259.1
58	30.28	77.04	1268.7	*	231.2	2.54	2333.3
59	30.43	82.03	1350.7	*	149.2	2.69	2496.2
60	23.63						

"*" INDICATES FIXED PARAMETER

Prepared for 1156

C04

Central Loop TEM

Northing: 998131.0 Easting: 284694.0 Elevation: 1505.0

No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
1	0.0859	49.14	53.21	-8.28	53.27	-8.39
2	0.104	50.08	51.37	-2.58	51.45	-2.72
3	0.129	51.09	50.29	1.56	50.29	1.56
4	0.159	51.88	49.49	4.59	49.54	4.51
5	0.198	51.82	49.14	5.16	49.09	5.27
6	0.248	50.78	48.81	3.88	48.58	4.32
7	0.312	48.79	48.24	1.12	47.87	1.87
8	0.393	46.36	47.37	-2.17	46.74	-0.815
9	0.497	44.02	46.00	-4.48	45.25	-2.78
10	0.629	41.97	44.28	-5.49	43.48	-3.59
11	0.797	40.26	42.20	-4.83	41.59	-3.31
12	1.01	38.69	39.98	-3.33	39.65	-2.48
13	1.28	37.28	37.77	-1.31	37.82	-1.44
14	1.63	35.81	35.90	-0.254	36.16	-0.979
15	2.07	34.42	34.64	-0.626	34.94	-1.48
16	2.64	33.54	34.05	-1.51	34.22	-2.01
17	3.37	33.21	34.47	-3.78	34.26	-3.16
18	4.29	33.51	35.71	-6.56	35.12	-4.81
19	5.47	35.11	38.02	-8.29	37.08	-5.59
20	6.97	37.22	41.26	-10.83	40.38	-8.48
21	0.352	49.81	48.56	2.51	48.01	3.62
22	0.427	47.54	47.49	0.102	46.80	1.54
23	0.525	45.36	46.05	-1.50	45.27	0.212
24	0.647	43.46	44.34	-2.02	43.55	-0.218
25	0.802	41.73	42.32	-1.41	41.72	0.0297
26	1.00	40.23	40.14	0.224	39.80	1.05
27	1.25	38.77	37.93	2.17	37.97	2.07
28	1.58	37.17	35.99	3.18	36.23	2.53
29	1.99	35.77	34.51	3.50	34.84	2.60
30	2.52	34.64	33.60	3.01	33.83	2.34
31	3.19	33.88	33.48	1.18	33.42	1.35
32	4.05	33.94	33.92	0.0507	33.55	1.12

Prepared for 1156

C04 Page 2

No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
33	5.14	34.31	34.96	-1.90	34.39	-0.219
34	6.54	35.96	36.17	-0.583	35.73	0.658
35	8.32	36.61	37.17	-1.54	37.28	-1.85
36	10.59	37.62	37.12	1.31	38.23	-1.63
37	13.49	38.53	35.81	7.07	37.38	3.00
38	17.19	42.96	33.00	23.16	34.53	19.62
39*	21.90	-91.18	29.75	132.6	30.57	133.5
40	27.92	-15.38	26.89	274.7	26.79	274.1
41	0.881	41.85	41.47	0.903	40.95	2.15
42	1.06	40.32	39.52	1.97	39.32	2.48
43	1.31	38.78	37.56	3.14	37.64	2.95
44	1.61	37.41	35.82	4.24	36.08	3.55
45	2.00	36.34	34.48	5.12	34.79	4.26
46	2.50	34.57	33.57	2.87	33.80	2.21
47	3.14	33.57	33.37	0.604	33.32	0.733
48	3.95	33.22	33.66	-1.32	33.32	-0.277
49	4.99	35.03	34.48	1.57	33.90	3.22
50	6.31	36.67	35.41	3.45	34.86	4.95
51	7.99	39.47	35.98	8.84	35.86	9.14
52*	10.13	62.80	35.48	43.49	36.10	42.51
53*	12.86	128.3	33.67	73.75	34.58	73.05
54*	16.35	-61.03	30.45	149.8	31.29	151.2
55	20.80	-25.37	26.87	205.9	27.04	206.5
56	26.47	-24.33	23.56	196.8	23.09	194.8
57	33.72	-36.14	21.00	158.1	19.99	155.3
58	42.96	-12.48	19.26	254.3	17.78	242.4
59*	54.74	-4.82	18.20	477.5	16.41	440.3
60*	69.77	-20.25	17.84	188.1	15.67	177.3

"*" INDICATES MASKED DATA POINT

Prepared for 1156

C04

Central Loop TEM

Northing: 998131.0 Easting: 284694.0 Elevation: 1505.0

Layered Model

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
				1505.0		
1	33.43	27.78	27.78	1477.2	0.831	929.1
2	79.30	14.87	42.66	1462.3	0.187	1179.6
3	32.46	17.56	60.23	1444.7	0.541	570.3
4	69.35	53.93	114.1	1390.8	0.777	3740.7
5	22.42	193.0	307.1	1197.8	8.60	4328.0
6	83.96	239.7	546.9	958.0	2.85	20128.6
7	5.29	320.3	867.2	637.7	60.49	1696.6
8	165.0					

ALL PARAMETERS ARE FREE

Prepared for 1156

C04

Central Loop TEM

Northing: 998131.0 Easting: 284694.0 Elevation: 1505.0

Smooth Model: Ridge Regression

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
					1505.0		
1	34.96	33.04	33.04	*	1471.9	0.945	1155.6
2	86.59	2.13	35.18	*	1469.8	0.0246	185.0
3	55.42	2.27	37.45	*	1467.5	0.0410	126.0
4	69.45	2.42	39.88	*	1465.1	0.0348	168.2
5	66.41	2.57	42.46	*	1462.5	0.0388	171.2
6	48.84	2.74	45.20	*	1459.7	0.0562	134.0
7	34.11	2.92	48.12	*	1456.8	0.0856	99.71
8	36.85	3.11	51.23	*	1453.7	0.0844	114.6
9	58.87	3.31	54.55	*	1450.4	0.0562	195.0
10	46.42	3.52	58.08	*	1446.9	0.0759	163.7
11	42.25	3.75	61.83	*	1443.1	0.0888	158.6
12	51.93	3.99	65.83	*	1439.1	0.0769	207.6
13	99.28	4.25	70.08	*	1434.9	0.0428	422.6
14	64.99	4.53	74.62	*	1430.3	0.0697	294.5
15	59.26	4.82	79.44	*	1425.5	0.0814	285.9
16	55.35	5.13	84.58	*	1420.4	0.0927	284.3
17	58.73	5.46	90.05	*	1414.9	0.0931	321.1
18	36.06	5.82	95.87	*	1409.1	0.161	209.9
19	67.79	6.19	102.0	*	1402.9	0.0914	420.2
20	53.40	6.59	108.6	*	1396.3	0.123	352.4
21	47.79	7.02	115.6	*	1389.3	0.147	335.8
22	28.21	7.48	123.1	*	1381.8	0.265	211.0
23	28.25	7.96	131.1	*	1373.8	0.281	225.0
24	20.96	8.47	139.6	*	1365.3	0.404	177.7
25	16.06	9.02	148.6	*	1356.3	0.561	145.0
26	17.20	9.61	158.2	*	1346.7	0.558	165.3
27	25.52	10.23	168.4	*	1336.5	0.400	261.2
28	31.79	10.89	179.3	*	1325.6	0.342	346.4
29	32.50	11.59	190.9	*	1314.0	0.356	376.9
30	25.19	12.34	203.3	*	1301.6	0.490	311.0
31	22.27	13.14	216.4	*	1288.5	0.590	292.8
32	20.70	13.99	230.4	*	1274.5	0.675	289.8

Prepared for 1156

C04 Page 2

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
33	27.38	14.90	245.3	*	1259.6	0.544	408.0
34	22.53	15.86	261.2	*	1243.7	0.703	357.5
35	21.09	16.89	278.1	*	1226.8	0.800	356.2
36	28.65	17.98	296.1	*	1208.8	0.627	515.3
37	30.08	19.14	315.2	*	1189.7	0.636	575.9
38	33.88	20.38	335.6	*	1169.3	0.601	690.6
39	38.79	21.70	357.3	*	1147.6	0.559	841.7
40	49.26	23.10	380.4	*	1124.5	0.468	1138.3
41	52.33	24.59	405.0	*	1099.9	0.470	1287.3
42	47.08	26.18	431.2	*	1073.7	0.556	1233.0
43	44.37	27.88	459.1	*	1045.8	0.628	1237.2
44	37.69	29.68	488.7	*	1016.2	0.787	1118.9
45	25.00	31.60	520.3	*	984.6	1.26	790.0
46	22.84	33.64	554.0	*	950.9	1.47	768.7
47	15.74	35.82	589.8	*	915.1	2.27	563.8
48	6.86	38.13	628.0	*	876.9	5.55	261.6
49	3.35	40.60	668.6	*	836.3	12.09	136.2
50	1.67	43.22	711.8	*	793.1	25.83	72.33
51	3.93	46.02	757.8	*	747.1	11.69	181.1
52	9.18	48.99	806.8	*	698.1	5.33	449.8
53	16.66	52.16	859.0	*	645.9	3.13	869.1
54	25.09	55.54	914.5	*	590.4	2.21	1393.9
55	33.57	59.13	973.6	*	531.3	1.76	1985.3
56	42.41	62.95	1036.6	*	468.3	1.48	2670.3
57	51.53	67.02	1103.6	*	401.3	1.30	3454.2
58	58.52	71.35	1175.0	*	329.9	1.21	4176.3
59	64.00	75.97	1251.0	*	253.9	1.18	4862.9
60	287.1						

"*" INDICATES FIXED PARAMETER

Prepared for 1156

C05

Central Loop TEM

Northing: 998133.0 Easting: 285881.0 Elevation: 1495.0

No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
1	0.0859	54.98			55.93	-1.72
2	0.104	54.47			53.88	1.08
3	0.129	54.01			52.57	2.65
4	0.159	53.57			51.62	3.63
5	0.198	52.83			51.07	3.33
6	0.248	51.73			50.61	2.16
7	0.312	49.87			49.92	-0.0894
8	0.393	47.51			48.86	-2.84
9	0.497	44.84			47.16	-5.18
10	0.629	42.97			45.00	-4.70
11	0.797	40.88			42.56	-4.09
12	1.01	39.59			40.17	-1.45
13	1.28	37.86			38.13	-0.721
14	1.63	36.87			36.60	0.719
15	2.07	34.59			35.71	-3.21
16	2.64	33.48			35.54	-6.13
17	3.37	37.06			36.14	2.47
18	4.29	34.45			37.70	-9.41
19	5.47	43.98			40.42	8.09
20	6.97	33.67			44.81	-33.08
21	0.352	51.43			50.14	2.51
22	0.427	49.09			48.91	0.356
23	0.525	46.68			47.11	-0.918
24	0.647	44.51			45.02	-1.13
25	0.802	42.86			42.68	0.405
26	1.00	41.01			40.36	1.59
27	1.25	39.90			38.32	3.95
28	1.58	38.47			36.71	4.58
29	1.99	37.01			35.64	3.70
30	2.52	35.91			35.18	2.02
31	3.19	35.37			35.36	0.0251
32	4.05	35.35			36.29	-2.66

Prepared for 1156

C05 Page 2

No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
33	5.14	36.18			38.02	-5.09
34	6.54	38.97			40.73	-4.52
35	8.32	42.25			44.32	-4.88
36	10.59	47.94			48.65	-1.48
37	13.49	70.43			51.70	26.59
38*	17.19	130.0			51.81	60.15
39*	21.90	-91.37			47.52	152.0
40	27.92	-33.17			41.07	223.7
41	0.881	42.76			41.76	2.34
42	1.06	41.25			39.82	3.47
43	1.31	39.63			38.02	4.05
44	1.61	38.47			36.61	4.83
45	2.00	37.48			35.64	4.91
46	2.50	36.57			35.17	3.82
47	3.14	35.35			35.27	0.242
48	3.95	34.36			36.03	-4.84
49	4.99	38.96			37.47	3.81
50	6.31	35.38			39.71	-12.23
51	7.99	47.97			42.51	11.37
52	10.13	43.27			45.46	-5.06
53	12.86	69.38			46.69	32.70
54	16.35	40.74			45.13	-10.77
55	20.80	-34.35			39.77	215.7
56	26.47	43.15			33.45	22.47
57	33.72	-19.73			27.68	240.2
58	42.96	-16.86			23.23	237.8
59*	54.74	-22.40			20.17	190.0
60*	69.77	-5.80			18.11	411.8

"*" INDICATES MASKED DATA POINT

Prepared for 1156

C05

Central Loop TEM

Northing: 998133.0 Easting: 285881.0 Elevation: 1495.0

Layered Model

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
				1495.0		
1	43.29	34.52	34.52	1460.4	0.797	1494.5
2	65.57	5.55	40.07	1454.9	0.0847	364.3
3	20.70	11.18	51.26	1443.7	0.540	231.5
4	73.03	70.76	122.0	1372.9	0.968	5168.5
5	20.55	200.7	322.7	1172.2	9.76	4125.6
6	115.3	216.3	539.0	955.9	1.87	24956.3
7	0.390	765.9	1305.0	189.9	1960.0	299.3
8	185.2					

ALL PARAMETERS ARE FREE

Prepared for 1156

C05

Central Loop TEM

Northing: 998133.0 Easting: 285881.0 Elevation: 1495.0

Smooth Model: Ridge Regression

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
					1495.0		
1	39.02	34.59	34.59	*	1460.4	0.886	1350.3
2	43.38	2.23	36.83	*	1458.1	0.0515	97.05
3	53.08	2.38	39.21	*	1455.7	0.0448	126.4
4	30.43	2.53	41.75	*	1453.2	0.0833	77.16
5	40.32	2.69	44.45	*	1450.5	0.0669	108.8
6	28.68	2.87	47.32	*	1447.6	0.100	82.44
7	53.73	3.05	50.38	*	1444.6	0.0569	164.4
8	45.40	3.25	53.64	*	1441.3	0.0717	147.9
9	67.03	3.46	57.11	*	1437.8	0.0517	232.4
10	77.53	3.69	60.80	*	1434.1	0.0476	286.3
11	66.68	3.93	64.73	*	1430.2	0.0589	262.1
12	63.10	4.18	68.91	*	1426.0	0.0663	264.1
13	82.08	4.45	73.37	*	1421.6	0.0542	365.7
14	76.01	4.74	78.11	*	1416.8	0.0624	360.6
15	97.55	5.05	83.17	*	1411.8	0.0517	492.7
16	74.15	5.37	88.54	*	1406.4	0.0725	398.7
17	48.69	5.72	94.27	*	1400.7	0.117	278.7
18	36.81	6.09	100.3	*	1394.6	0.165	224.4
19	31.52	6.48	106.8	*	1388.1	0.205	204.5
20	45.58	6.90	113.7	*	1381.2	0.151	314.9
21	32.91	7.35	121.1	*	1373.8	0.223	242.1
22	35.58	7.83	128.9	*	1366.0	0.220	278.6
23	35.76	8.33	137.2	*	1357.7	0.233	298.1
24	22.87	8.87	146.1	*	1348.8	0.388	203.0
25	26.62	9.45	155.6	*	1339.3	0.355	251.5
26	18.78	10.06	165.6	*	1329.3	0.535	189.0
27	17.69	10.71	176.3	*	1318.6	0.605	189.5
28	16.15	11.40	187.7	*	1307.2	0.705	184.2
29	26.28	12.14	199.9	*	1295.0	0.461	319.1
30	22.48	12.92	212.8	*	1282.1	0.574	290.6
31	32.25	13.76	226.6	*	1268.3	0.426	443.9
32	29.07	14.65	241.2	*	1253.7	0.504	425.9

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C05 Page 2

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
33	33.45	15.59	256.8	*	1238.1	0.466	521.9
34	41.83	16.60	273.4	*	1221.5	0.396	694.8
35	44.08	17.68	291.1	*	1203.8	0.401	779.4
36	59.89	18.82	309.9	*	1185.0	0.314	1127.5
37	61.25	20.04	330.0	*	1164.9	0.327	1227.6
38	64.57	21.33	351.3	*	1143.6	0.330	1378.0
39	72.35	22.71	374.0	*	1120.9	0.313	1643.7
40	77.71	24.18	398.2	*	1096.7	0.311	1879.7
41	78.97	25.75	424.0	*	1070.9	0.326	2033.7
42	77.78	27.41	451.4	*	1043.5	0.352	2132.4
43	69.56	29.18	480.6	*	1014.3	0.419	2030.5
44	65.42	31.07	511.7	*	983.2	0.474	2033.2
45	53.09	33.08	544.7	*	950.2	0.623	1756.7
46	48.42	35.22	580.0	*	914.9	0.727	1705.7
47	38.08	37.50	617.5	*	877.4	0.984	1428.0
48	26.62	39.92	657.4	*	837.5	1.49	1062.9
49	16.78	42.50	699.9	*	795.0	2.53	713.3
50	6.99	45.25	745.2	*	749.7	6.46	316.7
51	1.97	48.18	793.3	*	701.6	24.44	94.97
52	1.40	51.29	844.6	*	650.3	36.54	71.99
53	4.56	54.61	899.3	*	595.6	11.95	249.5
54	9.67	58.14	957.4	*	537.5	6.00	562.7
55	16.19	61.90	1019.3	*	475.6	3.82	1002.6
56	22.58	65.90	1085.2	*	409.7	2.91	1488.4
57	29.17	70.16	1155.4	*	339.5	2.40	2047.0
58	35.72	74.70	1230.1	*	264.8	2.09	2668.9
59	41.41	79.53	1309.6	*	185.3	1.92	3293.5
60	164.0						

"*" INDICATES FIXED PARAMETER

Prepared for 1156

C06

Central Loop TEM

Northing: 998417.0 Easting: 286845.0 Elevation: 1508.0

No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
1	0.0859	39.79	41.95	-5.42	42.28	-6.24
2	0.104	39.43	40.23	-2.04	40.45	-2.60
3	0.129	39.08	39.11	-0.0700	39.13	-0.141
4	0.159	38.83	38.35	1.23	38.17	1.70
5	0.198	38.49	37.85	1.66	37.60	2.29
6	0.248	37.99	37.55	1.17	37.14	2.24
7	0.312	37.21	37.22	-0.0285	36.79	1.12
8	0.393	36.08	36.75	-1.85	36.31	-0.656
9	0.497	34.74	36.06	-3.78	35.65	-2.60
10	0.629	33.40	35.12	-5.16	34.67	-3.81
11	0.797	32.17	33.98	-5.61	33.44	-3.94
12	1.01	31.15	32.59	-4.60	32.06	-2.91
13	1.28	30.38	31.14	-2.51	30.74	-1.21
14	1.63	29.65	29.76	-0.368	29.69	-0.152
15	2.07	29.00	28.82	0.614	29.09	-0.309
16	2.64	28.44	28.38	0.209	29.00	-1.96
17	3.37	28.21	28.81	-2.14	29.57	-4.82
18	4.29	28.74	30.12	-4.78	30.85	-7.32
19	5.47	29.88	32.70	-9.42	33.07	-10.65
20	6.97	32.02	36.80	-14.94	36.58	-14.23
21	0.352	38.67	37.44	3.16	37.05	4.18
22	0.427	37.45	36.94	1.35	36.47	2.59
23	0.525	36.14	36.16	-0.0372	35.76	1.06
24	0.647	34.82	35.22	-1.13	34.74	0.223
25	0.802	33.59	34.08	-1.47	33.54	0.138
26	1.00	32.56	32.72	-0.482	32.18	1.15
27	1.25	31.69	31.28	1.29	30.86	2.63
28	1.58	30.92	29.87	3.40	29.76	3.75
29	1.99	30.16	28.80	4.48	29.00	3.83
30	2.52	29.55	28.15	4.73	28.69	2.93
31	3.19	29.08	28.24	2.90	28.92	0.555
32	4.05	29.35	29.01	1.18	29.69	-1.12

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C06 Page 2

No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
33	5.14	29.93	30.77	-2.81	31.15	-4.09
34	6.54	31.74	33.44	-5.38	33.29	-4.90
35	8.32	34.69	37.13	-7.01	36.26	-4.53
36	10.59	39.54	41.26	-4.33	39.75	-0.515
37	13.49	56.71	44.73	21.12	43.26	23.70
38*	17.19	261.9	45.58	82.60	44.84	82.88
39	21.90	-46.84	43.52	192.9	43.78	193.4
40	27.92	-25.71	39.37	253.0	40.79	258.6
41	0.881	33.71	33.59	0.357	33.05	1.95
42	1.06	32.73	32.37	1.09	31.84	2.71
43	1.31	31.96	31.04	2.86	30.68	4.00
44	1.61	31.17	29.77	4.48	29.69	4.73
45	2.00	30.50	28.80	5.54	29.01	4.87
46	2.50	29.50	28.17	4.51	28.69	2.72
47	3.14	28.99	28.18	2.77	28.86	0.425
48	3.95	29.14	28.81	1.12	29.51	-1.26
49	4.99	30.03	30.35	-1.05	30.80	-2.56
50	6.31	30.77	32.66	-6.14	32.64	-6.10
51	7.99	34.02	35.74	-5.05	35.16	-3.35
52	10.13	36.53	38.94	-6.58	37.88	-3.69
53	12.86	47.59	41.06	13.72	40.36	15.19
54	16.35	55.87	40.56	27.39	40.61	27.31
55*	20.80	138.4	37.14	73.17	38.73	72.03
56*	26.47	-114.7	32.37	128.2	34.67	130.2
57	33.72	-26.78	27.60	203.0	30.44	213.6
58*	42.96	-14.09	23.36	265.7	27.13	292.4
59*	54.74	-11.31	20.16	278.2	24.70	318.4
60*	69.77	-12.38	17.64	242.4	23.37	288.7

"*" INDICATES MASKED DATA POINT

Prepared for 1156

C06

Central Loop TEM

Northing: 998417.0 Easting: 286845.0 Elevation: 1508.0

Layered Model

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
				1508.0		
1	26.59	35.15	35.15	1472.8	1.32	934.7
2	86.87	17.31	52.47	1455.5	0.199	1504.4
3	27.92	25.43	77.90	1430.0	0.910	710.4
4	92.15	24.51	102.4	1405.5	0.266	2259.4
5	20.69	201.0	303.4	1204.5	9.71	4160.2
6	172.9	295.6	599.0	908.9	1.70	51126.7
7	0.903	520.2	1119.3	388.6	576.0	469.8
8	246.4					

ALL PARAMETERS ARE FREE

Prepared for 1156

C06

Central Loop TEM

Northing: 998417.0 Easting: 286845.0 Elevation: 1508.0

Smooth Model: Ridge Regression

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
					1508.0		
1	27.20	31.38	31.38	*	1476.6	1.15	853.9
2	23.65	2.02	33.41	*	1474.5	0.0857	48.00
3	66.01	2.16	35.57	*	1472.4	0.0327	142.6
4	134.9	2.30	37.87	*	1470.1	0.0170	310.3
5	51.64	2.44	40.32	*	1467.6	0.0474	126.4
6	34.93	2.60	42.93	*	1465.0	0.0746	91.07
7	86.45	2.77	45.70	*	1462.2	0.0321	239.9
8	39.75	2.95	48.66	*	1459.3	0.0743	117.4
9	50.92	3.14	51.81	*	1456.1	0.0617	160.2
10	21.56	3.34	55.16	*	1452.8	0.155	72.23
11	61.54	3.56	58.72	*	1449.2	0.0579	219.4
12	22.95	3.79	62.52	*	1445.4	0.165	87.15
13	32.55	4.04	66.56	*	1441.4	0.124	131.5
14	31.75	4.30	70.87	*	1437.1	0.135	136.6
15	32.84	4.58	75.45	*	1432.5	0.139	150.4
16	130.2	4.87	80.33	*	1427.6	0.0374	635.5
17	61.77	5.19	85.52	*	1422.4	0.0840	320.8
18	61.02	5.52	91.05	*	1416.9	0.0906	337.4
19	50.81	5.88	96.94	*	1411.0	0.115	299.1
20	25.15	6.26	103.2	*	1404.7	0.249	157.6
21	27.17	6.67	109.8	*	1398.1	0.245	181.3
22	20.54	7.10	116.9	*	1391.0	0.345	145.9
23	29.30	7.56	124.5	*	1383.4	0.258	221.6
24	25.17	8.05	132.6	*	1375.3	0.319	202.7
25	25.78	8.57	141.1	*	1366.8	0.332	221.0
26	20.45	9.12	150.3	*	1357.6	0.446	186.7
27	14.16	9.71	160.0	*	1347.9	0.685	137.6
28	33.83	10.34	170.3	*	1337.6	0.305	350.0
29	23.16	11.01	181.3	*	1326.6	0.475	255.1
30	13.79	11.72	193.1	*	1314.8	0.849	161.8
31	21.50	12.48	205.5	*	1302.4	0.580	268.5
32	19.77	13.29	218.8	*	1289.1	0.672	262.9

Prepared for 1156

C06 Page 2

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
33	27.20	14.15	233.0	*	1274.9	0.520	385.0
34	36.09	15.06	248.1	*	1259.8	0.417	543.8
35	39.61	16.04	264.1	*	1243.8	0.404	635.4
36	43.34	17.07	281.2	*	1226.7	0.393	740.3
37	66.91	18.18	299.4	*	1208.5	0.271	1216.6
38	64.50	19.35	318.7	*	1189.2	0.300	1248.6
39	85.94	20.60	339.3	*	1168.6	0.239	1771.3
40	87.52	21.94	361.3	*	1146.6	0.250	1920.4
41	86.80	23.36	384.6	*	1123.3	0.269	2027.8
42	106.4	24.87	409.5	*	1098.4	0.233	2648.1
43	121.2	26.47	436.0	*	1071.9	0.218	3210.8
44	137.8	28.19	464.2	*	1043.7	0.204	3886.7
45	123.3	30.01	494.2	*	1013.7	0.243	3701.7
46	116.7	31.95	526.1	*	981.8	0.273	3729.9
47	102.6	34.02	560.2	*	947.7	0.331	3491.6
48	87.04	36.22	596.4	*	911.5	0.416	3152.9
49	72.72	38.56	634.9	*	873.0	0.530	2804.6
50	57.99	41.05	676.0	*	831.9	0.707	2380.8
51	38.41	43.71	719.7	*	788.2	1.13	1679.3
52	21.02	46.53	766.2	*	741.7	2.21	978.2
53	9.17	49.54	815.8	*	692.1	5.40	454.4
54	3.57	52.74	868.5	*	639.4	14.75	188.5
55	2.85	56.15	924.7	*	583.2	19.67	160.3
56	6.08	59.78	984.5	*	523.4	9.81	364.0
57	13.45	63.65	1048.1	*	459.8	4.73	856.5
58	22.76	67.77	1115.9	*	392.0	2.97	1542.9
59	30.98	72.15	1188.1	*	319.8	2.32	2235.4
60	220.4						

"*" INDICATES FIXED PARAMETER

Prepared for 1156

C07

Central Loop TEM

Northing: 999018.0 Easting: 287791.0 Elevation: 1540.0

			Layered Model:		Smooth Model:	
No.	Time (ms)	Data Resistivity (ohm-m)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)
1	0.0859	40.65			42.05	-3.43
2	0.104	39.35			39.96	-1.56
3	0.129	38.44			38.51	-0.188
4	0.159	37.95			37.54	1.09
5	0.198	37.75			37.06	1.83
6	0.248	37.78			36.97	2.14
7	0.312	37.88			37.19	1.80
8	0.393	37.92			37.59	0.852
9	0.497	37.85			38.08	-0.596
10	0.629	37.66			38.47	-2.17
11	0.797	37.41			38.67	-3.36
12	1.01	37.25			38.52	-3.40
13	1.28	37.05			37.95	-2.43
14	1.63	36.78			37.09	-0.825
15	2.07	36.21			36.14	0.171
16	2.64	35.54			35.50	0.109
17	3.37	35.21			35.33	-0.332
18	4.29	35.20			36.06	-2.44
19	5.47	36.28			37.95	-4.59
20	6.97	37.67			41.36	-9.79
21	0.352	39.69			37.99	4.26
22	0.427	39.53			38.27	3.18
23	0.525	39.36			38.60	1.92
24	0.647	39.06			38.83	0.598
25	0.802	38.79			38.89	-0.264
26	1.00	38.41			38.66	-0.637
27	1.25	38.15			38.04	0.283
28	1.58	37.84			37.15	1.84
29	1.99	37.38			36.08	3.48
30	2.52	36.55			35.22	3.62
31	3.19	35.72			34.69	2.87
32	4.05	35.75			34.91	2.34

Prepared for 1156

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No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
33	5.14	36.25			35.89	0.979
34	6.54	36.83			37.99	-3.14
35	8.32	38.90			41.26	-6.06
36	10.59	44.59			45.76	-2.62
37	13.49	60.47			50.63	16.27
38*	17.19	-258.2			53.25	120.6
39	21.90	-57.01			51.37	190.1
40	27.92	-36.23			45.81	226.4
41	0.881	39.69			38.90	1.99
42	1.06	39.34			38.55	2.00
43	1.31	39.03			37.92	2.82
44	1.61	38.47			37.05	3.67
45	2.00	38.08			36.06	5.30
46	2.50	36.33			35.23	3.02
47	3.14	35.89			34.66	3.43
48	3.95	36.04			34.75	3.57
49	4.99	35.20			35.49	-0.830
50	6.31	37.61			37.23	1.00
51	7.99	37.77			39.76	-5.26
52	10.13	38.68			43.09	-11.38
53	12.86	51.04			46.04	9.79
54	16.35	51.11			46.44	9.14
55*	20.80	98.24			42.91	56.31
56	26.47	-35.57			36.87	203.6
57	33.72	-22.08			30.67	238.8
58*	42.96	47.17			25.66	45.58
59*	54.74	12.22			22.01	-80.03
60*	69.77	-7.30			19.71	369.9

"*" INDICATES MASKED DATA POINT

Prepared for 1156

C07

Central Loop TEM

Northing: 999018.0 Easting: 287791.0 Elevation: 1540.0

Layered Model

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
				1540.0		
1	27.22	40.32	40.32	1499.6	1.48	1097.8
2	157.4	15.40	55.73	1484.2	0.0978	2426.1
3	25.61	26.08	81.81	1458.1	1.01	668.1
4	135.4	50.21	132.0	1407.9	0.370	6799.2
5	26.96	255.8	387.8	1152.1	9.48	6897.7
6	120.6	361.1	749.0	790.9	2.99	43586.3
7	1.32	130.6	879.6	660.3	98.52	173.1
8	415.4					

ALL PARAMETERS ARE FREE

Prepared for 1156

C07

Central Loop TEM

Northing: 999018.0 Easting: 287791.0 Elevation: 1540.0

Smooth Model: Ridge Regression

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
					1540.0		
1	28.08	33.56	33.56	*	1506.4	1.19	942.8
2	64.84	2.17	35.73	*	1504.2	0.0334	140.7
3	80.54	2.31	38.04	*	1501.9	0.0286	186.1
4	190.6	2.45	40.50	*	1499.4	0.0129	468.9
5	35.79	2.61	43.12	*	1496.8	0.0731	93.75
6	13.26	2.78	45.91	*	1494.0	0.210	36.97
7	16.91	2.96	48.88	*	1491.1	0.175	50.20
8	58.04	3.16	52.04	*	1487.9	0.0544	183.4
9	52.63	3.36	55.40	*	1484.5	0.0639	177.1
10	61.68	3.58	58.99	*	1481.0	0.0580	220.9
11	102.3	3.81	62.80	*	1477.1	0.0372	390.3
12	31.11	4.06	66.86	*	1473.1	0.130	126.3
13	30.47	4.32	71.18	*	1468.8	0.141	131.7
14	63.38	4.60	75.79	*	1464.2	0.0726	291.7
15	163.3	4.90	80.69	*	1459.3	0.0300	800.2
16	111.6	5.21	85.90	*	1454.0	0.0467	582.2
17	59.09	5.55	91.46	*	1448.5	0.0940	328.2
18	20.22	5.91	97.37	*	1442.6	0.292	119.6
19	181.3	6.29	103.6	*	1436.3	0.0347	1141.8
20	79.91	6.70	110.3	*	1429.6	0.0838	535.6
21	71.19	7.13	117.5	*	1422.4	0.100	508.0
22	28.13	7.59	125.1	*	1414.8	0.270	213.7
23	70.56	8.08	133.1	*	1406.8	0.114	570.7
24	49.68	8.61	141.8	*	1398.1	0.173	427.8
25	42.69	9.16	150.9	*	1389.0	0.214	391.5
26	24.96	9.76	160.7	*	1379.2	0.391	243.6
27	32.07	10.39	171.1	*	1368.8	0.324	333.3
28	28.73	11.06	182.1	*	1357.8	0.385	317.9
29	36.07	11.78	193.9	*	1346.0	0.326	424.9
30	22.32	12.54	206.5	*	1333.4	0.561	279.9
31	29.94	13.35	219.8	*	1320.1	0.445	399.8
32	34.44	14.21	234.0	*	1305.9	0.412	489.7

Prepared for 1156

C07 Page 2

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
33	28.82	15.13	249.2	*	1290.7	0.525	436.2
34	19.32	16.11	265.3	*	1274.6	0.833	311.3
35	22.35	17.15	282.4	*	1257.5	0.767	383.5
36	27.66	18.26	300.7	*	1239.2	0.660	505.2
37	21.93	19.44	320.2	*	1219.7	0.886	426.5
38	36.81	20.70	340.9	*	1199.0	0.562	762.2
39	46.28	22.04	362.9	*	1177.0	0.476	1020.0
40	50.10	23.46	386.4	*	1153.5	0.468	1175.6
41	58.62	24.98	411.3	*	1128.6	0.426	1464.6
42	90.61	26.59	437.9	*	1102.0	0.293	2410.2
43	93.71	28.31	466.3	*	1073.6	0.302	2654.0
44	106.5	30.14	496.4	*	1043.5	0.283	3211.5
45	115.2	32.09	528.5	*	1011.4	0.278	3699.7
46	126.9	34.17	562.7	*	977.2	0.269	4337.9
47	113.5	36.38	599.1	*	940.8	0.320	4130.4
48	94.48	38.73	637.8	*	902.1	0.409	3659.8
49	72.94	41.24	679.0	*	860.9	0.565	3008.3
50	43.57	43.90	723.0	*	816.9	1.00	1913.0
51	23.66	46.74	769.7	*	770.2	1.97	1106.2
52	7.81	49.76	819.5	*	720.4	6.36	388.9
53	0.860	52.98	872.5	*	667.4	61.55	45.60
54	4.59	56.41	928.9	*	611.0	12.27	259.1
55	15.54	60.05	988.9	*	551.0	3.86	933.6
56	26.98	63.94	1052.9	*	487.0	2.36	1725.2
57	39.50	68.07	1120.9	*	419.0	1.72	2689.3
58	51.94	72.47	1193.4	*	346.5	1.39	3765.1
59	60.06	77.16	1270.6	*	269.3	1.28	4635.0
60	390.5						

"*" INDICATES FIXED PARAMETER

Prepared for 1156

C08

Central Loop TEM

Northing: 999854.0 Easting: 288405.0 Elevation: 1550.0

No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
1	0.0859	26.95	25.25	6.29	25.09	6.87
2	0.104	23.33	23.43	-0.451	23.24	0.371
3	0.129	21.75	21.89	-0.617	21.76	-0.0564
4	0.159	20.52	20.64	-0.587	20.65	-0.621
5	0.198	19.54	19.74	-1.01	19.81	-1.40
6	0.248	18.78	19.07	-1.51	19.25	-2.45
7	0.312	18.29	18.70	-2.20	18.94	-3.56
8	0.393	18.07	18.63	-3.11	18.84	-4.26
9	0.497	18.10	18.77	-3.67	18.98	-4.83
10	0.629	18.42	19.19	-4.17	19.26	-4.56
11	0.797	18.96	19.72	-3.99	19.72	-3.98
12	1.01	19.74	20.40	-3.35	20.28	-2.76
13	1.28	20.69	21.11	-2.06	20.95	-1.25
14	1.63	21.73	21.84	-0.489	21.70	0.155
15	2.07	22.75	22.61	0.616	22.60	0.650
16	2.64	23.68	23.58	0.451	23.68	0.0218
17	3.37	24.47	24.84	-1.49	25.11	-2.61
18	4.29	25.40	26.59	-4.65	26.93	-6.00
19	5.47	26.44	29.08	-9.98	29.39	-11.13
20	6.97	28.00	32.56	-16.29	32.83	-17.25
21	0.352	19.17	18.97	1.02	19.20	-0.180
22	0.427	19.01	18.95	0.325	19.15	-0.759
23	0.525	19.05	19.08	-0.139	19.28	-1.17
24	0.647	19.34	19.45	-0.563	19.51	-0.833
25	0.802	19.84	19.90	-0.310	19.89	-0.284
26	1.00	20.51	20.49	0.116	20.38	0.667
27	1.25	21.39	21.13	1.22	20.96	2.03
28	1.58	22.41	21.76	2.93	21.62	3.52
29	1.99	23.37	22.44	3.98	22.39	4.18
30	2.52	24.30	23.21	4.50	23.28	4.18
31	3.19	24.95	24.20	2.99	24.43	2.08
32	4.05	25.77	25.53	0.904	25.82	-0.198

Prepared for 1156

C08 Page 2

No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
33	5.14	26.97	27.37	-1.47	27.63	-2.45
34	6.54	28.12	29.75	-5.78	29.90	-6.32
35	8.32	30.53	32.86	-7.63	32.69	-7.07
36	10.59	35.00	36.41	-4.00	36.04	-2.95
37	13.49	44.26	40.50	8.47	39.44	10.88
38*	17.19	90.68	43.50	52.03	42.24	53.42
39*	21.90	-88.34	45.10	151.0	43.36	149.0
40	27.92	-29.61	44.28	249.5	43.19	245.8
41	0.881	20.51	20.16	1.68	20.12	1.88
42	1.06	21.11	20.71	1.92	20.55	2.64
43	1.31	21.94	21.26	3.10	21.10	3.81
44	1.61	22.81	21.84	4.25	21.70	4.86
45	2.00	23.74	22.46	5.40	22.42	5.58
46	2.50	24.42	23.18	5.06	23.26	4.75
47	3.14	25.05	24.11	3.74	24.33	2.88
48	3.95	25.72	25.34	1.49	25.62	0.412
49	4.99	26.74	27.03	-1.10	27.31	-2.12
50	6.31	28.23	29.21	-3.44	29.36	-3.98
51	7.99	31.22	31.95	-2.33	31.87	-2.05
52	10.13	33.85	34.99	-3.37	34.66	-2.40
53	12.86	40.04	38.20	4.60	37.32	6.78
54	16.35	53.40	40.12	24.85	39.07	26.82
55	20.80	62.21	40.35	35.13	39.04	37.23
56	26.47	29.57	38.20	-29.18	37.38	-26.40
57	33.72	41.52	35.39	14.76	34.64	16.57
58*	42.96	-12.33	32.05	359.7	31.83	357.9
59*	54.74	-12.29	29.46	339.7	29.34	338.7
60*	69.77	12.38	27.49	-121.9	27.81	-124.5

"*" INDICATES MASKED DATA POINT

Prepared for 1156

C08

Central Loop TEM

Northing: 999854.0 Easting: 288405.0 Elevation: 1550.0

Layered Model

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
				1550.0		
1	14.49	30.05	30.05	1519.9	2.07	435.7
2	79.06	12.36	42.41	1507.5	0.156	977.3
3	9.42	15.21	57.63	1492.3	1.61	143.4
4	38.27	105.8	163.4	1386.5	2.76	4051.2
5	29.54	149.3	312.8	1237.1	5.05	4412.2
6	186.9	457.6	770.4	779.5	2.44	85551.6
7	5.79	321.7	1092.2	457.7	55.48	1866.2
8	12.98					

ALL PARAMETERS ARE FREE

Prepared for 1156

C08

Central Loop TEM

Northing: 999854.0 Easting: 288405.0 Elevation: 1550.0

Smooth Model: Ridge Regression

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
					1550.0		
1	14.47	26.98	26.98	*	1523.0	1.86	390.6
2	28.44	1.74	28.73	*	1521.2	0.0613	49.63
3	71.26	1.85	30.59	*	1519.4	0.0260	132.3
4	28.16	1.97	32.56	*	1517.4	0.0702	55.70
5	30.46	2.10	34.67	*	1515.3	0.0691	64.15
6	33.05	2.24	36.91	*	1513.0	0.0678	74.11
7	19.78	2.38	39.30	*	1510.6	0.120	47.22
8	21.95	2.54	41.84	*	1508.1	0.115	55.78
9	8.89	2.70	44.55	*	1505.4	0.304	24.05
10	8.04	2.88	47.43	*	1502.5	0.358	23.16
11	16.94	3.06	50.49	*	1499.5	0.180	51.97
12	39.47	3.26	53.76	*	1496.2	0.0827	128.8
13	17.05	3.47	57.23	*	1492.7	0.203	59.27
14	33.31	3.70	60.93	*	1489.0	0.111	123.2
15	31.03	3.93	64.87	*	1485.1	0.126	122.2
16	28.31	4.19	69.07	*	1480.9	0.148	118.7
17	34.23	4.46	73.53	*	1476.4	0.130	152.8
18	29.66	4.75	78.29	*	1471.7	0.160	141.0
19	19.72	5.06	83.35	*	1466.6	0.256	99.85
20	19.63	5.38	88.74	*	1461.2	0.274	105.8
21	35.62	5.73	94.48	*	1455.5	0.161	204.4
22	35.71	6.10	100.5	*	1449.4	0.171	218.1
23	33.74	6.50	107.0	*	1442.9	0.192	219.4
24	43.09	6.92	114.0	*	1435.9	0.160	298.4
25	31.12	7.37	121.3	*	1428.6	0.236	229.4
26	40.64	7.84	129.2	*	1420.7	0.193	318.9
27	38.91	8.35	137.5	*	1412.4	0.214	325.1
28	30.80	8.89	146.4	*	1403.5	0.288	274.0
29	29.41	9.47	155.9	*	1394.0	0.322	278.5
30	38.87	10.08	166.0	*	1383.9	0.259	392.0
31	29.22	10.73	176.7	*	1373.2	0.367	313.7
32	33.00	11.42	188.2	*	1361.7	0.346	377.1

Prepared for 1156

C08 Page 2

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
33	36.04	12.16	200.3	*	1349.6	0.337	438.6
34	37.83	12.95	213.3	*	1336.6	0.342	490.2
35	40.30	13.79	227.1	*	1322.8	0.342	555.8
36	39.80	14.68	241.8	*	1308.1	0.368	584.5
37	31.13	15.63	257.4	*	1292.5	0.502	486.7
38	33.12	16.64	274.0	*	1275.9	0.502	551.3
39	53.47	17.72	291.8	*	1258.1	0.331	947.6
40	57.34	18.86	310.6	*	1239.3	0.328	1082.0
41	55.33	20.08	330.7	*	1219.2	0.363	1111.4
42	69.79	21.38	352.1	*	1197.8	0.306	1492.6
43	76.28	22.76	374.9	*	1175.0	0.298	1736.9
44	88.41	24.24	399.1	*	1150.8	0.274	2143.3
45	88.55	25.80	424.9	*	1125.0	0.291	2285.5
46	94.91	27.47	452.4	*	1097.5	0.289	2607.9
47	92.04	29.25	481.7	*	1068.2	0.317	2692.5
48	90.31	31.14	512.8	*	1037.1	0.344	2812.6
49	84.67	33.15	546.0	*	1003.9	0.391	2807.6
50	79.32	35.30	581.3	*	968.6	0.445	2800.3
51	73.42	37.58	618.8	*	931.1	0.511	2759.8
52	60.97	40.01	658.9	*	891.0	0.656	2439.7
53	47.67	42.60	701.5	*	848.4	0.893	2031.0
54	33.60	45.35	746.8	*	803.1	1.34	1524.2
55	20.08	48.28	795.1	*	754.8	2.40	969.9
56	10.27	51.41	846.5	*	703.4	5.00	528.4
57	5.01	54.73	901.3	*	648.6	10.91	274.5
58	4.22	58.27	959.5	*	590.4	13.80	246.0
59	6.14	62.04	1021.6	*	528.3	10.09	381.3
60	10.93						

"*" INDICATES FIXED PARAMETER

Prepared for 1156

C09

Central Loop TEM

Northing: 1000264.0 Easting: 289008.0 Elevation: 1545.0

			Layered Model:		Smooth Model:	
No.	Time (ms)	Data Resistivity (ohm-m)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)
1	0.0859	33.13	32.63	1.52	32.84	0.893
2	0.104	30.14	30.59	-1.49	30.55	-1.34
3	0.129	28.54	28.88	-1.16	28.70	-0.566
4	0.159	27.31	27.47	-0.596	27.29	0.0764
5	0.198	26.35	26.47	-0.457	26.28	0.282
6	0.248	25.65	25.73	-0.327	25.59	0.228
7	0.312	25.21	25.32	-0.450	25.23	-0.0666
8	0.393	25.02	25.27	-1.03	25.17	-0.608
9	0.497	25.04	25.40	-1.45	25.33	-1.18
10	0.629	25.20	25.83	-2.46	25.70	-1.95
11	0.797	25.41	26.21	-3.14	26.09	-2.67
12	1.01	25.63	26.64	-3.92	26.45	-3.19
13	1.28	25.83	26.83	-3.87	26.62	-3.04
14	1.63	25.98	26.86	-3.40	26.63	-2.52
15	2.07	26.01	26.66	-2.50	26.56	-2.10
16	2.64	26.05	26.65	-2.29	26.59	-2.06
17	3.37	26.20	26.80	-2.31	26.88	-2.60
18	4.29	26.75	27.58	-3.11	27.61	-3.24
19	5.47	27.95	29.01	-3.76	28.97	-3.64
20	6.97	29.73	31.46	-5.82	31.15	-4.77
21	0.352	26.49	25.66	3.09	25.56	3.50
22	0.427	26.32	25.63	2.59	25.54	2.95
23	0.525	26.29	25.75	2.03	25.68	2.31
24	0.647	26.41	26.10	1.18	25.97	1.69
25	0.802	26.53	26.38	0.567	26.26	1.02
26	1.00	26.66	26.72	-0.226	26.54	0.469
27	1.25	26.79	26.87	-0.287	26.64	0.538
28	1.58	26.86	26.80	0.226	26.59	1.01
29	1.99	26.87	26.55	1.18	26.41	1.70
30	2.52	26.84	26.32	1.93	26.26	2.18
31	3.19	26.79	26.21	2.17	26.26	1.97
32	4.05	27.14	26.53	2.26	26.57	2.08

Prepared for 1156

C09 Page 2

No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
33	5.14	28.13	27.26	3.07	27.26	3.07
34	6.54	29.21	28.59	2.12	28.43	2.68
35	8.32	31.63	30.38	3.97	30.17	4.62
36	10.59	34.19	32.65	4.49	32.29	5.54
37	13.49	37.57	34.80	7.36	34.84	7.24
38	17.19	37.65	36.66	2.62	36.89	2.00
39	21.90	30.25	37.40	-23.65	37.73	-24.72
40	27.92	38.74	37.32	3.65	36.74	5.13
41	0.881	27.33	26.61	2.62	26.48	3.11
42	1.06	27.40	26.87	1.91	26.66	2.71
43	1.31	27.35	26.90	1.66	26.70	2.40
44	1.61	27.41	26.84	2.09	26.61	2.90
45	2.00	27.19	26.57	2.29	26.43	2.78
46	2.50	27.12	26.34	2.88	26.27	3.14
47	3.14	27.04	26.20	3.11	26.24	2.95
48	3.95	26.90	26.43	1.75	26.48	1.56
49	4.99	27.31	27.05	0.950	27.05	0.942
50	6.31	27.65	28.17	-1.87	28.04	-1.42
51	7.99	28.60	29.68	-3.74	29.45	-2.94
52	10.13	28.92	31.45	-8.72	31.11	-7.56
53	12.86	30.83	32.92	-6.76	32.87	-6.61
54	16.35	39.77	33.77	15.08	33.92	14.72
55*	20.80	-114.3	33.23	129.0	33.58	129.3
56*	26.47	-19.47	31.58	262.2	31.50	261.7
57	33.72	-30.76	28.94	194.0	28.74	193.4
58*	42.96	8.01	26.02	-224.7	25.88	-222.9
59	54.74	-21.60	23.08	206.8	23.61	209.3
60*	69.77	-4.17	20.89	600.9	22.03	628.2

"*" INDICATES MASKED DATA POINT

Prepared for 1156

C09

Central Loop TEM

Northing: 1000264.0 Easting: 289008.0 Elevation: 1545.0

Layered Model

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
				1545.0		
1	17.74	26.50	26.50	1518.4	1.49	470.2
2	57.94	18.03	44.53	1500.4	0.311	1044.8
3	14.21	16.23	60.76	1484.2	1.14	230.7
4	46.13	12.83	73.59	1471.4	0.278	592.1
5	26.78	22.64	96.24	1448.7	0.845	606.5
6	51.61	55.98	152.2	1392.7	1.08	2889.7
7	21.58	181.0	333.2	1211.7	8.38	3907.4
8	94.37	343.2	676.4	868.5	3.63	32390.8
9	4.70	565.3	1241.7	303.2	120.1	2660.3
10	51.53					

ALL PARAMETERS ARE FREE

Prepared for 1156

C09

Central Loop TEM

Northing: 1000264.0 Easting: 289008.0 Elevation: 1545.0

Smooth Model: Ridge Regression

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
					1545.0		
1	19.48	28.46	28.46	*	1516.5	1.46	554.6
2	61.80	1.84	30.30	*	1514.6	0.0297	113.7
3	28.88	1.95	32.26	*	1512.7	0.0678	56.60
4	9.20	2.08	34.35	*	1510.6	0.226	19.21
5	39.36	2.22	36.57	*	1508.4	0.0564	87.43
6	36.94	2.36	38.94	*	1506.0	0.0640	87.37
7	22.79	2.51	41.45	*	1503.5	0.110	57.37
8	32.67	2.68	44.13	*	1500.8	0.0820	87.57
9	36.08	2.85	46.99	*	1498.0	0.0790	102.9
10	24.14	3.03	50.03	*	1494.9	0.125	73.35
11	24.34	3.23	53.26	*	1491.7	0.132	78.76
12	19.91	3.44	56.70	*	1488.2	0.172	68.56
13	21.33	3.66	60.37	*	1484.6	0.171	78.21
14	17.97	3.90	64.27	*	1480.7	0.217	70.16
15	39.88	4.15	68.43	*	1476.5	0.104	165.7
16	40.01	4.42	72.85	*	1472.1	0.110	177.0
17	39.92	4.71	77.57	*	1467.4	0.118	188.0
18	31.69	5.01	82.58	*	1462.4	0.158	158.9
19	27.06	5.33	87.92	*	1457.0	0.197	144.5
20	25.70	5.68	93.61	*	1451.3	0.221	146.1
21	26.28	6.05	99.66	*	1445.3	0.230	159.1
22	45.93	6.44	106.1	*	1438.8	0.140	295.9
23	67.19	6.86	112.9	*	1432.0	0.102	460.9
24	48.01	7.30	120.2	*	1424.7	0.152	350.7
25	50.48	7.77	128.0	*	1416.9	0.154	392.5
26	39.88	8.27	136.3	*	1408.6	0.207	330.1
27	32.37	8.81	145.1	*	1399.8	0.272	285.3
28	27.21	9.38	154.5	*	1390.4	0.344	255.3
29	27.01	9.99	164.5	*	1380.4	0.369	269.8
30	29.49	10.63	175.1	*	1369.8	0.360	313.6
31	25.22	11.32	186.4	*	1358.5	0.448	285.6
32	23.06	12.05	198.5	*	1346.4	0.522	278.0

Prepared for 1156

C09 Page 2

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
33	24.47	12.83	211.3	*	1333.6	0.524	314.1
34	15.82	13.66	225.0	*	1319.9	0.863	216.2
35	17.50	14.54	239.5	*	1305.4	0.831	254.6
36	22.01	15.49	255.0	*	1289.9	0.703	341.0
37	21.26	16.49	271.5	*	1273.4	0.775	350.6
38	30.51	17.55	289.1	*	1255.8	0.575	535.7
39	35.33	18.69	307.8	*	1237.1	0.529	660.4
40	38.66	19.90	327.7	*	1217.2	0.514	769.5
41	44.75	21.18	348.9	*	1196.0	0.473	948.3
42	49.98	22.55	371.4	*	1173.5	0.451	1127.5
43	60.26	24.01	395.4	*	1149.5	0.398	1447.3
44	65.07	25.56	421.0	*	1123.9	0.392	1664.0
45	68.14	27.22	448.2	*	1096.7	0.399	1855.1
46	66.78	28.98	477.2	*	1067.7	0.433	1935.7
47	66.12	30.85	508.1	*	1036.8	0.466	2040.2
48	63.99	32.85	540.9	*	1004.0	0.513	2102.5
49	56.49	34.97	575.9	*	969.0	0.619	1976.1
50	45.99	37.23	613.1	*	931.8	0.809	1712.7
51	36.06	39.64	652.8	*	892.1	1.09	1429.8
52	27.10	42.20	695.0	*	849.9	1.55	1144.0
53	18.24	44.93	739.9	*	805.0	2.46	819.9
54	10.30	47.84	787.8	*	757.1	4.64	492.9
55	5.04	50.93	838.7	*	706.2	10.10	256.7
56	3.44	54.22	892.9	*	652.0	15.72	187.0
57	3.92	57.73	950.7	*	594.2	14.71	226.5
58	6.22	61.46	1012.1	*	532.8	9.87	382.6
59	9.08	65.44	1077.6	*	467.3	7.20	594.7
60	24.65						

"*" INDICATES FIXED PARAMETER

Prepared for 1156

C10-1

Central Loop TEM

Northing: 1000725.0 Easting: 290515.0 Elevation: 1584.0

			Layered Model:		Smooth Model:	
No.	Time (ms)	Data Resistivity (ohm-m)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)
1	0.0859	63.19	65.20	-3.18	65.08	-2.97
2	0.104	59.14	59.48	-0.577	58.95	0.308
3	0.129	54.76	54.33	0.770	53.75	1.84
4	0.159	50.59	49.93	1.30	49.33	2.47
5	0.198	46.70	46.21	1.03	45.69	2.14
6	0.248	43.22	42.95	0.608	42.61	1.41
7	0.312	40.21	40.28	-0.164	40.01	0.507
8	0.393	37.69	38.04	-0.920	37.88	-0.502
9	0.497	35.63	36.22	-1.64	36.05	-1.19
10	0.629	33.85	34.67	-2.40	34.57	-2.11
11	0.797	32.33	33.35	-3.16	33.18	-2.64
12	1.01	30.97	32.11	-3.67	31.97	-3.21
13	1.28	29.83	30.94	-3.72	30.70	-2.93
14	1.63	28.78	29.79	-3.51	29.46	-2.36
15	2.07	27.77	28.63	-3.12	28.24	-1.72
16	2.64	26.74	27.55	-3.00	27.10	-1.34
17	3.37	25.77	26.51	-2.87	26.17	-1.57
18	4.29	24.94	25.71	-3.10	25.51	-2.30
19	5.47	24.45	25.22	-3.14	25.25	-3.25
20	6.97	24.20	25.27	-4.43	25.45	-5.18
21	0.352	40.79	39.48	3.22	39.29	3.69
22	0.427	38.71	37.69	2.64	37.53	3.04
23	0.525	36.81	36.09	1.96	35.94	2.36
24	0.647	35.14	34.66	1.34	34.56	1.63
25	0.802	33.65	33.39	0.744	33.23	1.24
26	1.00	32.25	32.14	0.343	32.00	0.766
27	1.25	31.01	30.92	0.271	30.69	1.01
28	1.58	29.84	29.67	0.541	29.38	1.51
29	1.99	28.70	28.38	1.11	28.01	2.38
30	2.52	27.52	27.07	1.61	26.67	3.07
31	3.19	26.31	25.74	2.16	25.43	3.36
32	4.05	25.03	24.53	1.99	24.35	2.73

Prepared for 1156

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No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
33	5.14	24.12	23.50	2.58	23.49	2.60
34	6.54	23.38	22.77	2.59	22.90	2.01
35	8.32	22.85	22.36	2.12	22.63	0.945
36	10.59	22.69	22.40	1.30	22.63	0.274
37	13.49	23.34	22.80	2.33	23.04	1.29
38	17.19	23.06	23.76	-3.03	23.79	-3.19
39	21.90	21.70	25.22	-16.23	24.96	-15.03
40	27.92	19.94	27.28	-36.78	26.61	-33.40
41	0.881	33.54	32.93	1.84	32.79	2.23
42	1.06	32.29	31.85	1.36	31.67	1.92
43	1.31	31.12	30.72	1.26	30.50	1.98
44	1.61	29.88	29.58	1.02	29.27	2.06
45	2.00	28.77	28.37	1.38	28.00	2.65
46	2.50	27.54	27.12	1.55	26.71	3.01
47	3.14	26.45	25.82	2.40	25.49	3.64
48	3.95	25.39	24.61	3.06	24.41	3.86
49	4.99	24.02	23.55	1.98	23.51	2.15
50	6.31	23.42	22.75	2.87	22.86	2.40
51	7.99	22.70	22.24	2.03	22.46	1.08
52	10.13	22.29	22.09	0.904	22.29	0.00908
53	12.86	21.46	22.25	-3.66	22.43	-4.51
54	16.35	22.75	22.87	-0.510	22.81	-0.257
55	20.80	24.33	23.78	2.23	23.46	3.55
56*	26.47	110.0	25.10	77.18	24.29	77.92
57	33.72	-42.07	26.82	163.7	25.29	160.1
58*	42.96	8.58	28.96	-237.2	26.55	-209.2
59*	54.74	5.67	31.38	-453.0	27.78	-389.7
60*	69.77	-14.50	33.49	330.9	29.11	300.7

"*" INDICATES MASKED DATA POINT

Prepared for 1156

C10-1

Central Loop TEM

Northing: 1000725.0 Easting: 290515.0 Elevation: 1584.0

Layered Model

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
				1584.0		
1	57.80	30.46	30.46	1553.5	0.527	1761.0
2	21.52	9.27	39.74	1544.2	0.431	199.7
3	44.25	15.97	55.72	1528.2	0.361	707.1
4	21.10	15.52	71.25	1512.7	0.735	327.6
5	24.26	109.9	181.2	1402.7	4.53	2669.2
6	16.43	242.0	423.2	1160.7	14.72	3976.9
7	56.94	917.2	1340.4	243.5	16.10	52227.8
8	13.79					

ALL PARAMETERS ARE FREE

Prepared for 1156

C10-1

Central Loop TEM

Northing: 1000725.0 Easting: 290515.0 Elevation: 1584.0

Smooth Model: Ridge Regression

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
					1584.0		
1	69.64	29.40	29.40	*	1554.5	0.422	2047.6
2	23.23	1.90	31.30	*	1552.6	0.0818	44.16
3	23.33	2.02	33.32	*	1550.6	0.0867	47.22
4	19.75	2.15	35.48	*	1548.5	0.109	42.55
5	19.68	2.29	37.77	*	1546.2	0.116	45.14
6	30.12	2.44	40.21	*	1543.7	0.0810	73.57
7	25.12	2.60	42.81	*	1541.1	0.103	65.32
8	23.81	2.76	45.58	*	1538.4	0.116	65.93
9	28.77	2.94	48.53	*	1535.4	0.102	84.82
10	26.78	3.13	51.67	*	1532.3	0.117	84.05
11	30.80	3.34	55.01	*	1528.9	0.108	102.9
12	29.91	3.55	58.56	*	1525.4	0.118	106.4
13	25.63	3.78	62.35	*	1521.6	0.147	97.08
14	21.91	4.03	66.38	*	1517.6	0.183	88.36
15	22.52	4.29	70.67	*	1513.3	0.190	96.67
16	33.65	4.56	75.24	*	1508.7	0.135	153.7
17	23.28	4.86	80.11	*	1503.8	0.208	113.2
18	24.16	5.17	85.29	*	1498.7	0.214	125.1
19	25.61	5.51	90.80	*	1493.1	0.215	141.2
20	25.99	5.87	96.67	*	1487.3	0.225	152.6
21	24.24	6.25	102.9	*	1481.0	0.257	151.5
22	25.47	6.65	109.5	*	1474.4	0.261	169.5
23	24.26	7.08	116.6	*	1467.3	0.291	171.9
24	23.36	7.54	124.2	*	1459.7	0.322	176.2
25	24.21	8.03	132.2	*	1451.7	0.331	194.4
26	23.48	8.55	140.7	*	1443.2	0.364	200.7
27	20.65	9.10	149.8	*	1434.1	0.440	188.0
28	23.15	9.69	159.5	*	1424.4	0.418	224.3
29	22.25	10.31	169.9	*	1414.0	0.463	229.6
30	21.40	10.98	180.8	*	1403.1	0.513	235.1
31	18.83	11.69	192.5	*	1391.4	0.620	220.3
32	17.47	12.45	205.0	*	1378.9	0.712	217.6

Prepared for 1156

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L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
33	16.25	13.25	218.2	*	1365.7	0.815	215.4
34	15.44	14.11	232.4	*	1351.5	0.913	217.9
35	15.33	15.02	247.4	*	1336.5	0.980	230.3
36	14.95	15.99	263.4	*	1320.5	1.06	239.2
37	14.95	17.03	280.4	*	1303.5	1.13	254.6
38	17.23	18.13	298.6	*	1285.3	1.05	312.4
39	16.87	19.30	317.9	*	1266.0	1.14	325.8
40	17.81	20.55	338.4	*	1245.5	1.15	366.2
41	20.41	21.88	360.3	*	1223.6	1.07	446.8
42	23.08	23.29	383.6	*	1200.3	1.00	537.9
43	24.73	24.80	408.4	*	1175.5	1.00	613.5
44	27.40	26.40	434.8	*	1149.1	0.963	723.7
45	31.35	28.11	462.9	*	1121.0	0.896	881.5
46	35.50	29.93	492.9	*	1091.0	0.843	1062.7
47	32.00	31.86	524.7	*	1059.2	0.995	1019.8
48	34.48	33.92	558.7	*	1025.2	0.983	1170.0
49	36.06	36.12	594.8	*	989.1	1.00	1302.7
50	37.23	38.45	633.2	*	950.7	1.03	1432.0
51	37.90	40.94	674.2	*	909.7	1.08	1551.8
52	37.80	43.59	717.8	*	866.1	1.15	1648.0
53	37.60	46.41	764.2	*	819.7	1.23	1745.1
54	37.30	49.41	813.6	*	770.3	1.32	1843.3
55	36.76	52.60	866.2	*	717.7	1.43	1934.2
56	35.74	56.00	922.2	*	661.7	1.56	2001.8
57	34.88	59.62	981.8	*	602.1	1.70	2080.4
58	33.24	63.48	1045.3	*	538.6	1.90	2110.3
59	31.76	67.58	1112.9	*	471.0	2.12	2146.7
60	17.57						

"*" INDICATES FIXED PARAMETER

Prepared for 1156

C10

Central Loop TEM

Northing: 1000859.0 Easting: 290023.0 Elevation: 1541.0

			Layered Model:		Smooth Model:	
No.	Time (ms)	Data Resistivity (ohm-m)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)
1	0.0859	35.13	35.11	0.0310	35.10	0.0802
2	0.104	32.96	33.06	-0.302	32.98	-0.0393
3	0.129	31.48	31.56	-0.249	31.44	0.134
4	0.159	30.43	30.57	-0.456	30.39	0.124
5	0.198	29.70	29.95	-0.823	29.73	-0.0886
6	0.248	29.29	29.55	-0.916	29.43	-0.487
7	0.312	29.12	29.43	-1.06	29.36	-0.828
8	0.393	29.12	29.39	-0.924	29.47	-1.20
9	0.497	29.20	29.53	-1.14	29.72	-1.77
10	0.629	29.24	29.74	-1.69	29.90	-2.25
11	0.797	29.17	29.90	-2.52	30.12	-3.25
12	1.01	28.99	30.06	-3.71	30.04	-3.62
13	1.28	28.76	29.86	-3.80	29.83	-3.69
14	1.63	28.42	29.47	-3.70	29.27	-2.99
15	2.07	27.90	28.70	-2.86	28.53	-2.28
16	2.64	27.16	27.80	-2.34	27.60	-1.59
17	3.37	26.27	26.71	-1.65	26.75	-1.81
18	4.29	25.31	25.85	-2.12	26.06	-2.93
19	5.47	24.59	25.36	-3.13	25.74	-4.69
20	6.97	23.96	25.43	-6.14	25.97	-8.38
21	0.352	30.71	29.79	2.96	29.77	3.03
22	0.427	30.65	29.73	3.01	29.89	2.49
23	0.525	30.63	29.85	2.57	30.02	1.99
24	0.647	30.59	29.95	2.11	30.12	1.54
25	0.802	30.41	30.02	1.28	30.23	0.609
26	1.00	30.16	30.09	0.233	30.06	0.329
27	1.25	29.80	29.78	0.0396	29.77	0.0824
28	1.58	29.36	29.32	0.122	29.12	0.808
29	1.99	28.66	28.41	0.878	28.25	1.43
30	2.52	27.80	27.34	1.65	27.12	2.43
31	3.19	26.61	25.98	2.38	25.98	2.37
32	4.05	25.40	24.76	2.50	24.83	2.24

Prepared for 1156

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No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
33	5.14	24.31	23.68	2.59	23.95	1.46
34	6.54	23.25	23.02	0.994	23.28	-0.139
35	8.32	22.38	22.79	-1.84	22.95	-2.53
36	10.59	22.10	23.00	-4.05	22.92	-3.71
37	13.49	22.53	23.60	-4.74	23.14	-2.74
38	17.19	23.82	24.35	-2.24	23.57	1.03
39	21.90	24.82	25.00	-0.739	24.15	2.68
40	27.92	23.46	25.31	-7.85	24.99	-6.49
41	0.881	30.93	30.16	2.46	30.24	2.24
42	1.06	30.51	30.06	1.49	30.06	1.48
43	1.31	30.08	29.77	1.04	29.71	1.26
44	1.61	29.57	29.27	1.03	29.07	1.70
45	2.00	28.88	28.40	1.65	28.25	2.19
46	2.50	27.98	27.36	2.19	27.15	2.96
47	3.14	26.79	26.04	2.80	26.03	2.81
48	3.95	25.64	24.82	3.20	24.87	3.00
49	4.99	24.25	23.67	2.40	23.96	1.19
50	6.31	23.33	22.93	1.69	23.20	0.553
51	7.99	22.79	22.50	1.29	22.74	0.223
52	10.13	22.21	22.45	-1.05	22.50	-1.28
53	12.86	22.36	22.64	-1.26	22.45	-0.407
54	16.35	23.54	22.88	2.79	22.47	4.52
55	20.80	26.49	22.84	13.79	22.57	14.80
56	26.47	27.24	22.35	17.92	22.64	16.89
57	33.72	17.43	21.44	-22.97	22.70	-30.19
58*	42.96	10.41	20.40	-95.93	23.07	-121.5
59*	54.74	9.42	19.49	-106.8	23.43	-148.6
60*	69.77	6.93	19.03	-174.3	24.29	-250.1

"*" INDICATES MASKED DATA POINT

Prepared for 1156

C10

Central Loop TEM

Northing: 1000859.0 Easting: 290023.0 Elevation: 1541.0

Layered Model

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
				1541.0		
1	22.09	29.83	29.83	1511.1	1.35	659.1
2	14.88	6.60	36.44	1504.5	0.443	98.41
3	44.39	52.65	89.10	1451.8	1.18	2337.4
4	23.48	32.69	121.7	1419.2	1.39	767.8
5	32.99	67.71	189.5	1351.4	2.05	2234.0
6	14.38	218.6	408.1	1132.8	15.20	3145.6
7	41.08	291.7	699.9	841.0	7.10	11987.9
8	6.11	316.0	1015.9	525.0	51.65	1933.5
9	37.04					

ALL PARAMETERS ARE FREE

C10

Central Loop TEM

Northing: 1000859.0 Easting: 290023.0 Elevation: 1541.0

Smooth Model: Ridge Regression

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
					1541.0		
1	22.08	27.97	27.97	*	1513.0	1.26	617.8
2	21.10	1.80	29.78	*	1511.2	0.0857	38.17
3	16.52	1.92	31.71	*	1509.2	0.116	31.82
4	14.79	2.05	33.76	*	1507.2	0.138	30.34
5	18.86	2.18	35.94	*	1505.0	0.115	41.19
6	21.54	2.32	38.27	*	1502.7	0.107	50.08
7	37.28	2.47	40.74	*	1500.2	0.0663	92.25
8	42.22	2.63	43.38	*	1497.6	0.0623	111.2
9	42.55	2.80	46.18	*	1494.8	0.0659	119.3
10	36.47	2.98	49.17	*	1491.8	0.0818	108.9
11	41.73	3.17	52.35	*	1488.6	0.0761	132.6
12	87.26	3.38	55.73	*	1485.2	0.0387	295.3
13	35.21	3.60	59.33	*	1481.6	0.102	126.8
14	47.54	3.83	63.17	*	1477.8	0.0806	182.4
15	42.01	4.08	67.25	*	1473.7	0.0972	171.6
16	46.66	4.34	71.60	*	1469.3	0.0931	202.9
17	35.78	4.62	76.23	*	1464.7	0.129	165.6
18	33.92	4.92	81.16	*	1459.8	0.145	167.2
19	33.63	5.24	86.41	*	1454.5	0.156	176.5
20	35.82	5.58	92.00	*	1448.9	0.155	200.1
21	33.27	5.94	97.95	*	1443.0	0.178	197.9
22	29.75	6.33	104.2	*	1436.7	0.212	188.4
23	26.66	6.74	111.0	*	1429.9	0.252	179.7
24	32.21	7.17	118.2	*	1422.7	0.222	231.2
25	35.23	7.64	125.8	*	1415.1	0.216	269.3
26	33.71	8.13	133.9	*	1407.0	0.241	274.3
27	30.07	8.66	142.6	*	1398.3	0.288	260.5
28	24.70	9.22	151.8	*	1389.1	0.373	227.8
29	23.86	9.81	161.6	*	1379.3	0.411	234.3
30	25.07	10.45	172.1	*	1368.8	0.416	262.1
31	18.77	11.12	183.2	*	1357.7	0.592	208.9
32	20.78	11.84	195.1	*	1345.8	0.569	246.3

Prepared for 1156

C10 Page 2

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
33	15.48	12.61	207.7	*	1333.2	0.814	195.3
34	18.07	13.43	221.1	*	1319.8	0.743	242.7
35	16.88	14.29	235.4	*	1305.5	0.847	241.4
36	15.61	15.22	250.6	*	1290.3	0.974	237.7
37	16.85	16.20	266.8	*	1274.1	0.961	273.1
38	13.46	17.25	284.1	*	1256.8	1.28	232.2
39	13.98	18.37	302.5	*	1238.4	1.31	256.8
40	14.30	19.55	322.0	*	1218.9	1.36	279.8
41	14.99	20.82	342.9	*	1198.0	1.38	312.3
42	19.06	22.17	365.0	*	1175.9	1.16	422.7
43	21.56	23.60	388.6	*	1152.3	1.09	508.9
44	23.97	25.13	413.8	*	1127.1	1.04	602.6
45	28.45	26.75	440.5	*	1100.4	0.940	761.3
46	30.42	28.48	469.0	*	1071.9	0.936	866.6
47	31.27	30.32	499.3	*	1041.6	0.969	948.5
48	32.24	32.28	531.6	*	1009.3	1.00	1041.2
49	31.52	34.37	566.0	*	974.9	1.09	1083.6
50	29.93	36.59	602.6	*	938.3	1.22	1095.4
51	28.02	38.96	641.6	*	899.3	1.39	1092.1
52	23.95	41.48	683.0	*	857.9	1.73	993.5
53	21.06	44.16	727.2	*	813.7	2.09	930.3
54	19.27	47.02	774.2	*	766.7	2.44	906.1
55	16.87	50.06	824.3	*	716.6	2.96	844.5
56	16.09	53.29	877.6	*	663.3	3.31	858.0
57	15.60	56.74	934.3	*	606.6	3.63	885.3
58	16.29	60.41	994.7	*	546.2	3.70	984.3
59	17.55	64.31	1059.1	*	481.8	3.66	1129.2
60	28.82						

"*" INDICATES FIXED PARAMETER

Prepared for 1156

C11

Central Loop TEM

Northing: 1001355.0 Easting: 290668.0 Elevation: 1584.0

			Layered Model:		Smooth Model:	
No.	Time (ms)	Data Resistivity (ohm-m)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)
1	0.0859	31.75			29.20	8.05
2	0.104	26.62			27.54	-3.47
3	0.129	25.61			26.34	-2.83
4	0.159	25.04			25.56	-2.04
5	0.198	24.70			25.06	-1.49
6	0.248	24.53			24.86	-1.33
7	0.312	24.56			24.97	-1.65
8	0.393	24.76			25.18	-1.70
9	0.497	25.07			25.68	-2.42
10	0.629	25.49			26.13	-2.48
11	0.797	25.94			26.73	-3.04
12	1.01	26.36			27.15	-2.96
13	1.28	26.83			27.47	-2.37
14	1.63	27.30			27.61	-1.15
15	2.07	27.71			27.81	-0.377
16	2.64	28.11			28.08	0.104
17	3.37	28.47			28.77	-1.05
18	4.29	29.05			29.92	-2.98
19	5.47	29.80			31.82	-6.76
20	6.97	31.57			34.88	-10.49
21	0.352	25.88			25.40	1.85
22	0.427	26.02			25.62	1.56
23	0.525	26.28			26.05	0.867
24	0.647	26.65			26.38	0.982
25	0.802	26.98			26.89	0.346
26	1.00	27.33			27.22	0.392
27	1.25	27.70			27.47	0.832
28	1.58	28.08			27.58	1.80
29	1.99	28.48			27.63	2.98
30	2.52	28.84			27.74	3.81
31	3.19	28.95			28.14	2.80
32	4.05	29.11			28.86	0.873

Prepared for 1156

C11 Page 2

No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
33	5.14	29.77			30.12	-1.19
34	6.54	30.13			32.07	-6.43
35	8.32	31.63			34.90	-10.32
36	10.59	34.45			38.85	-12.75
37	13.49	41.88			43.97	-4.99
38	17.19	68.89			49.22	28.55
39	21.90	-71.72			52.07	172.5
40	27.92	-35.40			51.98	246.8
41	0.881	27.96			27.12	3.00
42	1.06	28.15			27.34	2.87
43	1.31	28.48			27.56	3.23
44	1.61	28.74			27.60	3.95
45	2.00	29.09			27.66	4.90
46	2.50	29.40			27.75	5.59
47	3.14	29.40			28.09	4.45
48	3.95	29.40			28.72	2.29
49	4.99	29.85			29.85	0.0229
50	6.31	30.51			31.53	-3.34
51	7.99	32.78			33.98	-3.66
52	10.13	34.10			37.16	-8.98
53	12.86	41.23			41.04	0.446
54	16.35	58.09			44.12	24.05
55*	20.80	-123.8			45.05	136.3
56	26.47	-42.07			42.22	200.3
57	33.72	-27.55			36.90	233.9
58*	42.96	-15.12			32.01	311.7
59*	54.74	-9.77			27.37	379.9
60*	69.77	-11.06			24.70	323.2

"*" INDICATES MASKED DATA POINT

Prepared for 1156

C11

Central Loop TEM

Northing: 1001355.0 Easting: 290668.0 Elevation: 1584.0

Layered Model

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
				1584.0		
1	17.17	34.20	34.20	1549.7	1.99	587.3
2	85.60	9.52	43.73	1540.2	0.111	815.1
3	17.21	6.02	49.75	1534.2	0.349	103.6
4	93.09	12.36	62.11	1521.8	0.132	1150.7
5	17.70	18.12	80.24	1503.7	1.02	320.9
6	84.32	47.37	127.6	1456.3	0.561	3995.4
7	25.30	225.6	353.3	1230.6	8.91	5710.6
8	146.5	384.1	737.4	846.5	2.62	56287.3
9	0.903	131.5	868.9	715.0	145.5	118.8
10	62.92					

ALL PARAMETERS ARE FREE

Prepared for 1156

C11

Central Loop TEM

Northing: 1001355.0 Easting: 290668.0 Elevation: 1584.0

Smooth Model: Ridge Regression

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
					1584.0		
1	16.14	29.64	29.64	*	1554.3	1.83	478.8
2	142.0	1.91	31.56	*	1552.4	0.0135	272.2
3	76.11	2.04	33.60	*	1550.3	0.0268	155.3
4	433.7	2.17	35.77	*	1548.2	0.00501	942.3
5	91.58	2.31	38.09	*	1545.9	0.0252	211.8
6	37.25	2.46	40.55	*	1543.4	0.0661	91.75
7	21.20	2.62	43.17	*	1540.8	0.123	55.59
8	17.20	2.79	45.96	*	1538.0	0.162	48.03
9	73.93	2.97	48.94	*	1535.0	0.0402	219.7
10	68.80	3.16	52.10	*	1531.8	0.0459	217.7
11	87.49	3.36	55.47	*	1528.5	0.0385	294.7
12	34.31	3.58	59.06	*	1524.9	0.104	123.0
13	30.42	3.81	62.87	*	1521.1	0.125	116.1
14	20.77	4.06	66.94	*	1517.0	0.195	84.46
15	21.32	4.32	71.27	*	1512.7	0.202	92.30
16	13.28	4.60	75.88	*	1508.1	0.346	61.21
17	47.93	4.90	80.78	*	1503.2	0.102	235.1
18	38.74	5.22	86.01	*	1497.9	0.134	202.3
19	40.75	5.56	91.57	*	1492.4	0.136	226.6
20	107.6	5.92	97.49	*	1486.5	0.0549	637.5
21	65.14	6.30	103.7	*	1480.2	0.0967	410.6
22	52.47	6.71	110.5	*	1473.4	0.127	352.1
23	58.25	7.14	117.6	*	1466.3	0.122	416.2
24	26.02	7.60	125.2	*	1458.7	0.292	198.0
25	34.26	8.09	133.3	*	1450.6	0.236	277.4
26	29.00	8.62	141.9	*	1442.0	0.297	250.0
27	30.55	9.17	151.1	*	1432.8	0.300	280.4
28	31.76	9.77	160.9	*	1423.0	0.307	310.4
29	26.14	10.40	171.3	*	1412.6	0.397	272.0
30	21.40	11.07	182.4	*	1401.5	0.517	237.1
31	45.85	11.79	194.2	*	1389.7	0.257	540.8
32	45.25	12.55	206.7	*	1377.2	0.277	568.2

Prepared for 1156

C11 Page 2

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
33	35.41	13.36	220.1	*	1363.8	0.377	473.3
34	13.85	14.23	234.3	*	1349.6	1.02	197.1
35	30.96	15.15	249.5	*	1334.4	0.489	469.1
36	23.50	16.13	265.6	*	1318.3	0.686	379.1
37	25.93	17.17	282.8	*	1301.1	0.662	445.4
38	48.05	18.28	301.1	*	1282.8	0.380	878.7
39	45.26	19.46	320.5	*	1263.4	0.430	881.2
40	57.63	20.72	341.3	*	1242.6	0.359	1194.6
41	58.75	22.06	363.3	*	1220.6	0.375	1296.6
42	68.98	23.49	386.8	*	1197.1	0.340	1620.7
43	96.72	25.01	411.8	*	1172.1	0.258	2419.3
44	95.84	26.63	438.5	*	1145.4	0.277	2552.4
45	110.8	28.35	466.8	*	1117.1	0.255	3141.5
46	139.7	30.18	497.0	*	1086.9	0.215	4219.0
47	115.4	32.13	529.1	*	1054.8	0.278	3709.8
48	117.4	34.21	563.3	*	1020.6	0.291	4018.5
49	117.6	36.42	599.8	*	984.1	0.309	4285.5
50	116.2	38.78	638.6	*	945.3	0.333	4509.2
51	96.75	41.28	679.8	*	904.1	0.426	3994.7
52	76.67	43.95	723.8	*	860.1	0.573	3370.3
53	58.21	46.80	770.6	*	813.3	0.803	2724.4
54	37.29	49.82	820.4	*	763.5	1.33	1858.1
55	18.45	53.04	873.5	*	710.4	2.87	978.9
56	5.77	56.47	930.0	*	653.9	9.78	326.1
57	1.25	60.12	990.1	*	593.8	48.02	75.28
58	4.84	64.01	1054.1	*	529.8	13.21	310.1
59	11.55	68.15	1122.3	*	461.6	5.89	787.6
60	43.23						

"*" INDICATES FIXED PARAMETER

Prepared for 1156

C12

Central Loop TEM

Northing: 1002177.0 Easting: 291242.0 Elevation: 1599.0

			Layered Model:		Smooth Model:	
No.	Time (ms)	Data Resistivity (ohm-m)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)
1	0.0859	32.28			31.13	3.57
2	0.104	28.65			29.42	-2.68
3	0.129	28.02			28.23	-0.757
4	0.159	27.69			27.50	0.683
5	0.198	27.52			27.22	1.07
6	0.248	27.45			27.19	0.930
7	0.312	27.41			27.36	0.156
8	0.393	27.33			27.61	-1.01
9	0.497	27.18			27.72	-1.98
10	0.629	27.00			27.81	-3.00
11	0.797	26.76			27.61	-3.19
12	1.01	26.53			27.46	-3.52
13	1.28	26.37			27.13	-2.87
14	1.63	26.29			26.94	-2.48
15	2.07	26.22			26.75	-1.99
16	2.64	26.24			26.89	-2.45
17	3.37	26.29			27.09	-3.01
18	4.29	26.60			27.73	-4.21
19	5.47	27.04			28.60	-5.77
20	6.97	28.29			29.81	-5.39
21	0.352	28.70			27.88	2.84
22	0.427	28.51			27.97	1.90
23	0.525	28.29			27.99	1.04
24	0.647	28.04			27.98	0.191
25	0.802	27.76			27.73	0.116
26	1.00	27.46			27.52	-0.232
27	1.25	27.24			27.13	0.389
28	1.58	27.06			26.84	0.802
29	1.99	26.96			26.51	1.68
30	2.52	26.84			26.38	1.73
31	3.19	26.73			26.20	1.99
32	4.05	26.45			26.34	0.433

Prepared for 1156

C12 Page 2

No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
33	5.14	26.70			26.35	1.30
34	6.54	26.40			26.52	-0.474
35	8.32	25.99			26.54	-2.11
36	10.59	26.30			26.50	-0.764
37	13.49	24.53			26.15	-6.59
38	17.19	24.75			25.83	-4.33
39*	21.90	31.23			25.54	18.20
40	27.92	-21.00			25.45	221.1
41	0.881	28.41			27.72	2.40
42	1.06	28.04			27.46	2.08
43	1.31	27.73			27.10	2.24
44	1.61	27.67			26.84	2.98
45	2.00	27.47			26.51	3.48
46	2.50	27.22			26.38	3.10
47	3.14	27.07			26.17	3.30
48	3.95	26.49			26.26	0.856
49	4.99	26.32			26.19	0.469
50	6.31	27.02			26.31	2.64
51	7.99	27.20			26.17	3.77
52	10.13	27.29			25.95	4.89
53	12.86	27.48			25.32	7.84
54	16.35	28.42			24.71	13.05
55*	20.80	39.50			23.83	39.67
56	26.47	-23.39			23.24	199.3
57*	33.72	-10.67			22.98	315.2
58*	42.96	62.74			22.92	63.46
59*	54.74	11.09			23.73	-113.9
60*	69.77	10.79			24.78	-129.6

"*" INDICATES MASKED DATA POINT

Prepared for 1156

C12

Central Loop TEM

Northing: 1002177.0 Easting: 291242.0 Elevation: 1599.0

Layered Model

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
				1599.0		
1	16.72	25.82	25.82	1573.1	1.54	431.8
2	45.62	8.48	34.30	1564.6	0.185	386.8
3	35.24	9.63	43.94	1555.0	0.273	339.7
4	46.48	14.26	58.20	1540.7	0.306	663.0
5	28.43	15.15	73.35	1525.6	0.532	430.7
6	55.81	24.96	98.32	1500.6	0.447	1393.3
7	19.63	49.67	147.9	1451.0	2.52	975.6
8	25.28	406.2	554.2	1044.7	16.06	10270.4
9	11.85	324.9	879.1	719.8	27.40	3853.0
10	95.91					

ALL PARAMETERS ARE FREE

Prepared for 1156

C12

Central Loop TEM

Northing: 1002177.0 Easting: 291242.0 Elevation: 1599.0

Smooth Model: Ridge Regression

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
					1599.0		
1	18.12	27.96	27.96	*	1571.0	1.54	506.9
2	18.92	1.80	29.77	*	1569.2	0.0955	34.22
3	21.36	1.92	31.70	*	1567.2	0.0900	41.13
4	26.62	2.04	33.74	*	1565.2	0.0769	54.56
5	35.40	2.18	35.93	*	1563.0	0.0616	77.25
6	44.10	2.32	38.25	*	1560.7	0.0526	102.4
7	54.98	2.47	40.72	*	1558.2	0.0449	135.9
8	29.55	2.63	43.36	*	1555.6	0.0890	77.83
9	31.62	2.80	46.16	*	1552.8	0.0886	88.65
10	33.66	2.98	49.14	*	1549.8	0.0886	100.4
11	53.46	3.17	52.32	*	1546.6	0.0594	169.8
12	51.98	3.38	55.71	*	1543.2	0.0650	175.8
13	47.06	3.60	59.31	*	1539.6	0.0765	169.5
14	41.75	3.83	63.14	*	1535.8	0.0918	160.1
15	29.80	4.08	67.23	*	1531.7	0.136	121.6
16	32.61	4.34	71.57	*	1527.4	0.133	141.7
17	39.70	4.62	76.20	*	1522.7	0.116	183.7
18	74.25	4.92	81.13	*	1517.8	0.0663	365.8
19	52.36	5.24	86.37	*	1512.6	0.100	274.6
20	32.19	5.58	91.96	*	1507.0	0.173	179.7
21	46.09	5.94	97.90	*	1501.0	0.128	274.0
22	31.20	6.33	104.2	*	1494.7	0.202	197.5
23	25.84	6.73	110.9	*	1488.0	0.260	174.1
24	25.98	7.17	118.1	*	1480.8	0.276	186.4
25	19.37	7.63	125.7	*	1473.2	0.394	148.0
26	19.83	8.13	133.9	*	1465.0	0.410	161.2
27	16.81	8.65	142.5	*	1456.4	0.514	145.6
28	18.21	9.21	151.8	*	1447.1	0.506	167.9
29	23.48	9.81	161.6	*	1437.3	0.417	230.5
30	25.19	10.44	172.0	*	1426.9	0.414	263.2
31	23.76	11.12	183.1	*	1415.8	0.468	264.3
32	25.86	11.84	195.0	*	1403.9	0.457	306.3

Prepared for 1156

C12 Page 2

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
33	25.73	12.61	207.6	*	1391.3	0.490	324.4
34	26.33	13.42	221.0	*	1377.9	0.509	353.5
35	22.28	14.29	235.3	*	1363.6	0.641	318.4
36	23.00	15.21	250.5	*	1348.4	0.661	350.1
37	26.83	16.20	266.7	*	1332.2	0.603	434.7
38	28.20	17.24	284.0	*	1314.9	0.611	486.5
39	26.60	18.36	302.3	*	1296.6	0.690	488.5
40	28.35	19.55	321.9	*	1277.0	0.689	554.4
41	28.55	20.81	342.7	*	1256.2	0.729	594.3
42	27.36	22.16	364.9	*	1234.0	0.809	606.4
43	26.13	23.59	388.5	*	1210.4	0.902	616.5
44	27.09	25.11	413.6	*	1185.3	0.926	680.7
45	24.37	26.74	440.3	*	1158.6	1.09	651.9
46	21.81	28.47	468.8	*	1130.1	1.30	621.0
47	21.79	30.31	499.1	*	1099.8	1.39	660.7
48	20.54	32.27	531.4	*	1067.5	1.57	663.2
49	17.75	34.36	565.8	*	1033.1	1.93	610.2
50	16.00	36.58	602.3	*	996.6	2.28	585.3
51	13.94	38.94	641.3	*	957.6	2.79	543.2
52	13.22	41.46	682.7	*	916.2	3.13	548.2
53	14.35	44.14	726.9	*	872.0	3.07	633.6
54	15.18	47.00	773.9	*	825.0	3.09	713.8
55	17.88	50.03	823.9	*	775.0	2.79	895.1
56	21.99	53.27	877.2	*	721.7	2.42	1171.9
57	26.35	56.71	933.9	*	665.0	2.15	1494.7
58	30.71	60.38	994.3	*	604.6	1.96	1854.7
59	34.58	64.29	1058.6	*	540.3	1.85	2223.2
60	98.01						

"*" INDICATES FIXED PARAMETER

Prepared for 1156

C13

Central Loop TEM

Northing: 1002747.0 Easting: 292180.0 Elevation: 1621.0

			Layered Model:		Smooth Model:	
No.	Time (ms)	Data Resistivity (ohm-m)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)
1	0.0859	32.05			30.30	5.45
2	0.104	26.75			27.77	-3.81
3	0.129	24.79			25.52	-2.97
4	0.159	23.25			23.65	-1.73
5	0.198	21.97			22.15	-0.830
6	0.248	20.95			20.95	-0.00112
7	0.312	20.17			20.12	0.257
8	0.393	19.60			19.58	0.102
9	0.497	19.20			19.26	-0.320
10	0.629	18.94			19.17	-1.19
11	0.797	18.83			19.17	-1.82
12	1.01	18.81			19.33	-2.75
13	1.28	18.96			19.50	-2.85
14	1.63	19.20			19.72	-2.74
15	2.07	19.57			19.96	-1.99
16	2.64	20.08			20.32	-1.20
17	3.37	20.65			20.79	-0.674
18	4.29	21.30			21.51	-0.994
19	5.47	22.15			22.56	-1.85
20	6.97	23.48			24.18	-2.96
21	0.352	20.55			20.06	2.40
22	0.427	20.09			19.64	2.24
23	0.525	19.72			19.39	1.67
24	0.647	19.49			19.30	0.969
25	0.802	19.36			19.27	0.444
26	1.00	19.27			19.38	-0.555
27	1.25	19.36			19.50	-0.688
28	1.58	19.56			19.65	-0.484
29	1.99	19.85			19.81	0.213
30	2.52	20.27			20.01	1.30
31	3.19	20.67			20.28	1.86
32	4.05	21.16			20.69	2.20

Prepared for 1156

C13 Page 2

No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
33	5.14	21.75			21.31	2.02
34	6.54	22.32			22.23	0.380
35	8.32	23.36			23.60	-1.04
36	10.59	24.59			25.64	-4.24
37	13.49	27.61			28.40	-2.86
38	17.19	33.75			32.19	4.61
39*	21.90	55.10			36.32	34.09
40*	27.92	417.5			39.35	90.57
41	0.881	19.77			19.36	2.09
42	1.06	19.72			19.45	1.36
43	1.31	19.73			19.55	0.907
44	1.61	19.83			19.70	0.686
45	2.00	20.19			19.83	1.77
46	2.50	20.41			20.01	1.94
47	3.14	20.74			20.25	2.33
48	3.95	21.21			20.62	2.77
49	4.99	21.63			21.17	2.12
50	6.31	22.37			21.98	1.74
51	7.99	23.45			23.15	1.27
52	10.13	24.65			24.82	-0.669
53	12.86	27.26			26.93	1.20
54	16.35	28.89			29.60	-2.48
55	20.80	31.22			31.80	-1.84
56	26.47	36.71			32.45	11.59
57	33.72	-29.88			30.39	201.6
58	42.96	-27.33			26.68	197.6
59	54.74	-19.59			22.79	216.3
60*	69.77	-7.31			19.60	368.0

"*" INDICATES MASKED DATA POINT

Prepared for 1156

C13

Central Loop TEM

Northing: 1002747.0 Easting: 292180.0 Elevation: 1621.0

Layered Model

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
				1621.0		
1	19.58	26.57	26.57	1594.4	1.35	520.5
2	76.87	4.66	31.23	1589.7	0.0606	358.2
3	4.73	4.56	35.80	1585.1	0.963	21.63
4	39.27	8.01	43.81	1577.1	0.204	314.8
5	13.76	27.73	71.55	1549.4	2.01	381.7
6	100.2	28.43	99.99	1521.0	0.283	2852.0
7	20.20	220.2	320.2	1300.7	10.89	4449.7
8	39.00	333.6	653.8	967.1	8.55	13011.6
9	0.607	659.2	1313.0	307.9	1084.4	400.7
10	13.33					

ALL PARAMETERS ARE FREE

Prepared for 1156

C13

Central Loop TEM

Northing: 1002747.0 Easting: 292180.0 Elevation: 1621.0

Smooth Model: Ridge Regression

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
					1621.0		
1	17.10	25.28	25.28	*	1595.7	1.47	432.6
2	57.83	1.63	26.92	*	1594.0	0.0282	94.56
3	29.12	1.74	28.66	*	1592.3	0.0597	50.70
4	34.87	1.85	30.51	*	1590.4	0.0531	64.63
5	9.17	1.97	32.49	*	1588.5	0.214	18.11
6	14.63	2.10	34.59	*	1586.4	0.143	30.74
7	26.53	2.23	36.82	*	1584.1	0.0842	59.34
8	27.89	2.38	39.20	*	1581.7	0.0853	66.42
9	23.14	2.53	41.74	*	1579.2	0.109	58.67
10	23.79	2.69	44.44	*	1576.5	0.113	64.21
11	14.93	2.87	47.31	*	1573.6	0.192	42.91
12	21.62	3.05	50.37	*	1570.6	0.141	66.14
13	6.85	3.25	53.63	*	1567.3	0.474	22.34
14	9.36	3.46	57.10	*	1563.8	0.370	32.45
15	14.11	3.69	60.79	*	1560.2	0.261	52.09
16	9.14	3.93	64.72	*	1556.2	0.429	35.95
17	44.67	4.18	68.90	*	1552.0	0.0936	186.9
18	36.52	4.45	73.36	*	1547.6	0.121	162.7
19	33.35	4.74	78.10	*	1542.8	0.142	158.2
20	29.71	5.04	83.15	*	1537.8	0.169	150.0
21	31.59	5.37	88.53	*	1532.4	0.170	169.8
22	41.84	5.72	94.25	*	1526.7	0.136	239.5
23	49.20	6.09	100.3	*	1520.6	0.123	299.8
24	36.55	6.48	106.8	*	1514.1	0.177	237.1
25	20.98	6.90	113.7	*	1507.2	0.329	144.9
26	19.93	7.35	121.1	*	1499.8	0.368	146.6
27	15.66	7.82	128.9	*	1492.0	0.499	122.6
28	17.77	8.33	137.2	*	1483.7	0.469	148.1
29	27.49	8.87	146.1	*	1474.8	0.322	243.9
30	25.01	9.44	155.5	*	1465.4	0.377	236.3
31	24.41	10.05	165.6	*	1455.3	0.411	245.6
32	26.66	10.71	176.3	*	1444.6	0.401	285.5

Prepared for 1156

C13 Page 2

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
33	22.74	11.40	187.7	*	1433.2	0.501	259.3
34	25.42	12.13	199.9	*	1421.0	0.477	308.6
35	22.58	12.92	212.8	*	1408.1	0.572	291.8
36	23.41	13.76	226.5	*	1394.4	0.587	322.1
37	17.48	14.65	241.2	*	1379.7	0.837	256.1
38	24.34	15.59	256.8	*	1364.1	0.640	379.6
39	26.51	16.60	273.4	*	1347.5	0.626	440.2
40	22.50	17.67	291.1	*	1329.8	0.785	397.9
41	33.36	18.82	309.9	*	1311.0	0.564	628.0
42	35.55	20.03	329.9	*	1291.0	0.563	712.4
43	35.83	21.33	351.3	*	1269.6	0.595	764.4
44	37.89	22.71	374.0	*	1246.9	0.599	860.6
45	44.01	24.18	398.2	*	1222.7	0.549	1064.3
46	46.19	25.74	423.9	*	1197.0	0.557	1189.3
47	45.14	27.41	451.3	*	1169.6	0.607	1237.4
48	50.59	29.18	480.5	*	1140.4	0.576	1476.5
49	48.18	31.07	511.6	*	1109.3	0.644	1497.1
50	47.85	33.07	544.7	*	1076.2	0.691	1582.9
51	44.21	35.21	579.9	*	1041.0	0.796	1557.1
52	39.67	37.49	617.4	*	1003.5	0.945	1487.4
53	32.44	39.91	657.3	*	963.6	1.23	1295.2
54	23.46	42.49	699.8	*	921.1	1.81	997.0
55	15.47	45.24	745.0	*	875.9	2.92	700.2
56	8.14	48.17	793.2	*	827.7	5.91	392.4
57	2.94	51.28	844.5	*	776.4	17.40	151.1
58	0.858	54.60	899.1	*	721.8	63.62	46.85
59	1.59	58.13	957.2	*	663.7	36.44	92.73
60	14.56						

"*" INDICATES FIXED PARAMETER

Prepared for 1156

C14

Central Loop TEM

Northing: 1003665.0 Easting: 293179.0 Elevation: 1626.0

			Layered Model:		Smooth Model:	
No.	Time (ms)	Data Resistivity (ohm-m)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)
1	0.0859	32.08			31.04	3.23
2	0.104	27.61			28.66	-3.79
3	0.129	26.16			26.59	-1.66
4	0.159	24.78			24.79	-0.0591
5	0.198	23.39			23.23	0.680
6	0.248	22.03			21.91	0.536
7	0.312	20.83			20.80	0.118
8	0.393	19.86			19.93	-0.394
9	0.497	19.11			19.30	-1.01
10	0.629	18.60			18.86	-1.41
11	0.797	18.30			18.65	-1.90
12	1.01	18.16			18.55	-2.15
13	1.28	18.19			18.57	-2.09
14	1.63	18.26			18.61	-1.91
15	2.07	18.41			18.70	-1.60
16	2.64	18.54			18.77	-1.20
17	3.37	18.74			18.93	-1.00
18	4.29	18.91			19.22	-1.65
19	5.47	19.15			19.84	-3.63
20	6.97	19.08			20.96	-9.80
21	0.352	21.23			20.55	3.18
22	0.427	20.44			19.89	2.69
23	0.525	19.76			19.34	2.13
24	0.647	19.30			18.94	1.84
25	0.802	19.00			18.72	1.42
26	1.00	18.81			18.59	1.13
27	1.25	18.76			18.56	1.07
28	1.58	18.79			18.54	1.32
29	1.99	18.86			18.53	1.77
30	2.52	18.89			18.46	2.26
31	3.19	18.93			18.41	2.70
32	4.05	18.90			18.39	2.72

Prepared for 1156

C14 Page 2

No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
33	5.14	18.90			18.51	2.07
34	6.54	19.04			18.81	1.22
35	8.32	19.45			19.32	0.664
36	10.59	19.66			19.86	-1.03
37	13.49	20.61			20.17	2.14
38	17.19	21.31			19.84	6.89
39	21.90	19.69			18.83	4.37
40	27.92	16.77			17.51	-4.37
41	0.881	19.33			18.70	3.26
42	1.06	19.17			18.61	2.91
43	1.31	19.04			18.58	2.41
44	1.61	19.04			18.55	2.57
45	2.00	19.07			18.53	2.81
46	2.50	19.04			18.46	3.04
47	3.14	19.07			18.38	3.60
48	3.95	19.02			18.32	3.71
49	4.99	18.87			18.36	2.68
50	6.31	18.97			18.53	2.30
51	7.99	19.04			18.83	1.09
52	10.13	18.96			19.08	-0.619
53	12.86	18.66			19.02	-1.91
54	16.35	18.92			18.29	3.37
55	20.80	18.21			16.95	6.91
56	26.47	14.34			15.26	-6.43
57	33.72	10.66			13.70	-28.52
58*	42.96	25.26			12.51	50.45
59*	54.74	27.41			11.75	57.13
60*	69.77	4.13			11.42	-176.4

"*" INDICATES MASKED DATA POINT

Prepared for 1156

C14

Central Loop TEM

Northing: 1003665.0 Easting: 293179.0 Elevation: 1626.0

Layered Model

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
				1626.0		
1	17.56	28.59	28.59	1597.4	1.62	502.4
2	27.34	12.07	40.67	1585.3	0.441	330.2
3	11.00	6.65	47.32	1578.6	0.604	73.26
4	26.78	10.62	57.95	1568.0	0.396	284.5
5	12.01	20.47	78.42	1547.5	1.70	245.8
6	20.46	135.9	214.3	1411.6	6.64	2781.5
7	9.89	157.1	371.4	1254.5	15.87	1555.1
8	29.32	68.31	439.7	1186.2	2.32	2003.1
9	0.916	652.2	1092.0	533.9	711.6	597.8
10	90.23					

ALL PARAMETERS ARE FREE

Prepared for 1156

C14

Central Loop TEM

Northing: 1003665.0 Easting: 293179.0 Elevation: 1626.0

Smooth Model: Ridge Regression

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
					1626.0		
1	17.66	23.57	23.57	*	1602.4	1.33	416.5
2	18.17	1.52	25.10	*	1600.8	0.0838	27.70
3	20.25	1.62	26.72	*	1599.2	0.0801	32.86
4	16.94	1.72	28.45	*	1597.5	0.102	29.27
5	20.03	1.83	30.29	*	1595.7	0.0918	36.85
6	22.16	1.95	32.25	*	1593.7	0.0883	43.40
7	29.94	2.08	34.33	*	1591.6	0.0696	62.44
8	40.82	2.22	36.55	*	1589.4	0.0543	90.63
9	11.54	2.36	38.92	*	1587.0	0.204	27.28
10	23.99	2.51	41.43	*	1584.5	0.104	60.37
11	30.29	2.67	44.11	*	1581.8	0.0884	81.15
12	18.95	2.85	46.96	*	1579.0	0.150	54.06
13	29.18	3.03	50.00	*	1575.9	0.104	88.63
14	17.58	3.23	53.23	*	1572.7	0.183	56.84
15	7.08	3.44	56.68	*	1569.3	0.485	24.39
16	17.06	3.66	60.34	*	1565.6	0.214	62.55
17	8.87	3.90	64.24	*	1561.7	0.439	34.64
18	13.56	4.15	68.40	*	1557.5	0.306	56.35
19	14.57	4.42	72.82	*	1553.1	0.303	64.47
20	30.04	4.70	77.53	*	1548.4	0.156	141.4
21	22.13	5.01	82.54	*	1543.4	0.226	110.9
22	22.41	5.33	87.88	*	1538.1	0.238	119.6
23	12.96	5.68	93.56	*	1532.4	0.438	73.68
24	27.25	6.04	99.61	*	1526.3	0.221	164.8
25	18.72	6.44	106.0	*	1519.9	0.344	120.5
26	16.09	6.85	112.9	*	1513.0	0.426	110.3
27	24.78	7.30	120.2	*	1505.7	0.294	180.9
28	17.20	7.77	127.9	*	1498.0	0.451	133.7
29	23.68	8.27	136.2	*	1489.7	0.349	195.9
30	26.76	8.80	145.0	*	1480.9	0.329	235.8
31	27.31	9.37	154.4	*	1471.5	0.343	256.1
32	20.89	9.98	164.4	*	1461.5	0.477	208.6

Prepared for 1156

C14 Page 2

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
33	20.47	10.63	175.0	*	1450.9	0.519	217.6
34	18.60	11.31	186.3	*	1439.6	0.608	210.5
35	20.46	12.05	198.4	*	1427.5	0.588	246.6
36	12.40	12.82	211.2	*	1414.7	1.03	159.1
37	15.25	13.65	224.9	*	1401.0	0.895	208.3
38	13.17	14.54	239.4	*	1386.5	1.10	191.5
39	15.09	15.48	254.9	*	1371.0	1.02	233.7
40	15.44	16.48	271.4	*	1354.5	1.06	254.5
41	15.90	17.54	288.9	*	1337.0	1.10	279.1
42	14.15	18.68	307.6	*	1318.3	1.31	264.5
43	15.10	19.89	327.5	*	1298.4	1.31	300.5
44	16.85	21.17	348.7	*	1277.2	1.25	357.0
45	18.57	22.54	371.2	*	1254.7	1.21	418.7
46	17.80	24.00	395.2	*	1230.7	1.34	427.2
47	20.10	25.55	420.8	*	1205.1	1.27	513.6
48	19.00	27.20	448.0	*	1177.9	1.43	517.0
49	17.00	28.96	477.0	*	1148.9	1.70	492.5
50	10.84	30.84	507.8	*	1118.1	2.84	334.5
51	5.41	32.83	540.6	*	1085.3	6.06	177.8
52	3.18	34.95	575.6	*	1050.3	10.99	111.1
53	1.99	37.21	612.8	*	1013.1	18.68	74.14
54	2.54	39.62	652.4	*	973.5	15.54	101.0
55	5.28	42.18	694.6	*	931.3	7.98	222.8
56	9.87	44.91	739.5	*	886.4	4.54	443.6
57	14.94	47.81	787.4	*	838.5	3.19	714.6
58	19.87	50.90	838.3	*	787.6	2.56	1011.9
59	23.97	54.20	892.5	*	733.4	2.26	1299.4
60	96.19						

"*" INDICATES FIXED PARAMETER

Prepared for 1156

C15

Central Loop TEM

Northing: 1004076.0 Easting: 294046.0 Elevation: 1639.0

			Layered Model:		Smooth Model:	
No.	Time (ms)	Data Resistivity (ohm-m)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)	Synthetic Resistivity (ohm-m)	DIFFERENCE (percent)
1	0.0859	32.11			31.19	2.85
2	0.104	27.44			28.23	-2.89
3	0.129	25.62			25.80	-0.698
4	0.159	23.89			23.77	0.493
5	0.198	22.19			22.11	0.391
6	0.248	20.61			20.69	-0.361
7	0.312	19.27			19.45	-0.933
8	0.393	18.18			18.48	-1.61
9	0.497	17.36			17.68	-1.82
10	0.629	16.80			17.16	-2.14
11	0.797	16.47			16.84	-2.24
12	1.01	16.33			16.74	-2.50
13	1.28	16.37			16.80	-2.63
14	1.63	16.51			16.97	-2.73
15	2.07	16.73			17.15	-2.53
16	2.64	16.94			17.35	-2.45
17	3.37	17.11			17.48	-2.13
18	4.29	17.17			17.58	-2.35
19	5.47	17.12			17.66	-3.18
20	6.97	16.95			17.89	-5.54
21	0.352	19.62			19.16	2.34
22	0.427	18.73			18.38	1.85
23	0.525	17.99			17.69	1.68
24	0.647	17.48			17.23	1.41
25	0.802	17.14			16.92	1.28
26	1.00	16.94			16.78	0.956
27	1.25	16.91			16.78	0.762
28	1.58	16.98			16.85	0.766
29	1.99	17.08			16.92	0.931
30	2.52	17.13			16.94	1.12
31	3.19	17.10			16.83	1.60
32	4.05	16.89			16.59	1.77

Prepared for 1156

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No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
33	5.14	16.39			16.21	1.10
34	6.54	15.92			15.75	1.04
35	8.32	15.10			15.29	-1.21
36	10.59	14.49			14.84	-2.40
37	13.49	13.64			14.35	-5.16
38	17.19	13.47			13.70	-1.71
39	21.90	13.75			12.93	5.99
40	27.92	15.22			12.21	19.75
41	0.881	17.26			16.87	2.24
42	1.06	17.08			16.81	1.55
43	1.31	17.02			16.80	1.24
44	1.61	17.03			16.87	0.941
45	2.00	17.13			16.92	1.22
46	2.50	17.17			16.92	1.43
47	3.14	17.10			16.79	1.81
48	3.95	16.86			16.53	1.99
49	4.99	16.53			16.11	2.52
50	6.31	16.01			15.58	2.65
51	7.99	15.40			15.01	2.53
52	10.13	14.99			14.38	4.05
53	12.86	14.18			13.68	3.55
54	16.35	13.04			12.79	1.88
55	20.80	10.93			11.77	-7.74
56	26.47	8.93			10.76	-20.52
57	33.72	8.85			9.86	-11.36
58*	42.96	84.32			9.20	89.07
59*	54.74	14.10			8.80	37.57
60*	69.77	3.42			8.68	-153.9

"*" INDICATES MASKED DATA POINT

Prepared for 1156

C15

Central Loop TEM

Northing: 1004076.0 Easting: 294046.0 Elevation: 1639.0

Layered Model

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
				1639.0		
1	25.03	22.68	22.68	1616.3	0.905	567.9
2	7.21	9.67	32.35	1606.6	1.34	69.74
3	25.19	22.14	54.49	1584.5	0.879	557.7
4	11.63	39.07	93.57	1545.4	3.35	454.6
5	20.39	123.6	217.1	1421.8	6.06	2520.9
6	6.42	136.1	353.3	1285.6	21.18	874.9
7	10.61	52.25	405.5	1233.4	4.92	554.8
8	2.77	282.7	688.2	950.7	101.8	784.9
9	44.51					

ALL PARAMETERS ARE FREE

Prepared for 1156

C15

Central Loop TEM

Northing: 1004076.0 Easting: 294046.0 Elevation: 1639.0

Smooth Model: Ridge Regression

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
					1639.0		
1	22.00	21.80	21.80	*	1617.1	0.990	479.7
2	13.17	1.40	23.21	*	1615.7	0.106	18.57
3	21.53	1.50	24.71	*	1614.2	0.0696	32.31
4	16.68	1.59	26.30	*	1612.6	0.0957	26.66
5	5.61	1.70	28.01	*	1610.9	0.302	9.55
6	6.69	1.81	29.82	*	1609.1	0.270	12.12
7	8.39	1.92	31.74	*	1607.2	0.229	16.18
8	16.68	2.05	33.80	*	1605.1	0.123	34.24
9	23.11	2.18	35.98	*	1603.0	0.0945	50.50
10	22.80	2.32	38.31	*	1600.6	0.102	53.05
11	24.45	2.47	40.79	*	1598.2	0.101	60.58
12	22.34	2.63	43.42	*	1595.5	0.118	58.93
13	18.59	2.80	46.23	*	1592.7	0.150	52.22
14	18.15	2.98	49.22	*	1589.7	0.164	54.26
15	15.51	3.18	52.40	*	1586.5	0.205	49.37
16	12.72	3.38	55.79	*	1583.2	0.266	43.10
17	14.80	3.60	59.40	*	1579.5	0.243	53.40
18	13.68	3.84	63.24	*	1575.7	0.280	52.55
19	13.68	4.08	67.33	*	1571.6	0.298	55.94
20	13.28	4.35	71.68	*	1567.3	0.327	57.85
21	10.68	4.63	76.32	*	1562.6	0.433	49.52
22	11.07	4.93	81.25	*	1557.7	0.445	54.63
23	10.65	5.25	86.51	*	1552.4	0.493	55.97
24	18.62	5.59	92.10	*	1546.8	0.300	104.1
25	17.49	5.95	98.06	*	1540.9	0.340	104.2
26	14.71	6.34	104.4	*	1534.5	0.430	93.30
27	19.82	6.75	111.1	*	1527.8	0.340	133.8
28	19.71	7.18	118.3	*	1520.6	0.364	141.6
29	19.14	7.65	125.9	*	1513.0	0.399	146.4
30	23.33	8.14	134.1	*	1504.8	0.349	190.0
31	22.29	8.67	142.8	*	1496.1	0.388	193.3
32	33.06	9.23	152.0	*	1486.9	0.279	305.2

Prepared for 1156

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L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
33	24.86	9.83	161.8	*	1477.1	0.395	244.4
34	17.55	10.46	172.3	*	1466.6	0.596	183.7
35	29.15	11.14	183.4	*	1455.5	0.382	324.9
36	11.21	11.86	195.3	*	1443.6	1.05	133.0
37	10.94	12.62	207.9	*	1431.0	1.15	138.2
38	9.13	13.44	221.4	*	1417.5	1.47	122.7
39	9.85	14.31	235.7	*	1403.2	1.45	141.1
40	8.43	15.24	250.9	*	1388.0	1.80	128.6
41	8.09	16.22	267.2	*	1371.7	2.00	131.4
42	7.08	17.27	284.4	*	1354.5	2.43	122.3
43	8.39	18.39	302.8	*	1336.1	2.19	154.3
44	7.83	19.58	322.4	*	1316.5	2.49	153.4
45	7.31	20.84	343.3	*	1295.6	2.85	152.4
46	5.67	22.19	365.4	*	1273.5	3.91	125.8
47	3.91	23.63	389.1	*	1249.8	6.02	92.63
48	9.26	25.15	414.2	*	1224.7	2.71	232.9
49	6.03	26.78	441.0	*	1197.9	4.43	161.6
50	10.78	28.51	469.5	*	1169.4	2.64	307.6
51	4.14	30.36	499.9	*	1139.0	7.31	125.9
52	1.52	32.32	532.2	*	1106.7	21.17	49.35
53	3.38	34.41	566.6	*	1072.3	10.17	116.3
54	5.06	36.63	603.3	*	1035.6	7.23	185.4
55	7.22	39.00	642.3	*	996.6	5.40	281.7
56	9.54	41.53	683.8	*	955.1	4.34	396.5
57	11.92	44.21	728.0	*	910.9	3.70	527.1
58	14.11	47.07	775.1	*	863.8	3.33	664.5
59	15.77	50.11	825.2	*	813.7	3.17	790.6
60	43.05						

"*" INDICATES FIXED PARAMETER

Prepared for 1156

C16

Central Loop TEM

Northing: 1004278.0 Easting: 295144.0 Elevation: 1663.0

No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
1	0.0859	31.83	28.78	9.57	28.55	10.29
2	0.104	24.23	25.56	-5.48	25.53	-5.36
3	0.129	21.92	23.00	-4.89	23.04	-5.10
4	0.159	20.64	21.11	-2.31	21.14	-2.42
5	0.198	19.65	19.75	-0.492	19.70	-0.287
6	0.248	18.85	18.78	0.372	18.66	1.02
7	0.312	18.19	18.12	0.385	17.93	1.46
8	0.393	17.56	17.61	-0.260	17.40	0.891
9	0.497	16.94	17.24	-1.77	17.03	-0.554
10	0.629	16.37	16.82	-2.73	16.68	-1.90
11	0.797	15.90	16.53	-3.93	16.42	-3.26
12	1.01	15.58	16.20	-4.00	16.13	-3.54
13	1.28	15.43	16.03	-3.87	15.96	-3.38
14	1.63	15.46	15.90	-2.84	15.82	-2.32
15	2.07	15.66	16.02	-2.26	15.91	-1.56
16	2.64	16.01	16.20	-1.23	16.11	-0.640
17	3.37	16.49	16.81	-1.93	16.70	-1.25
18	4.29	17.10	17.66	-3.24	17.55	-2.62
19	5.47	18.00	19.09	-6.03	18.95	-5.26
20	6.97	19.13	21.01	-9.82	20.90	-9.24
21	0.352	18.87	18.05	4.31	17.85	5.41
22	0.427	18.26	17.65	3.36	17.44	4.48
23	0.525	17.64	17.29	1.96	17.09	3.09
24	0.647	17.10	16.88	1.26	16.75	2.01
25	0.802	16.62	16.60	0.148	16.49	0.781
26	1.00	16.25	16.25	0.00861	16.18	0.460
27	1.25	16.07	16.05	0.126	15.98	0.573
28	1.58	16.05	15.89	0.987	15.80	1.53
29	1.99	16.17	15.88	1.80	15.78	2.42
30	2.52	16.41	15.95	2.84	15.85	3.45
31	3.19	16.77	16.30	2.77	16.19	3.42
32	4.05	17.14	16.79	2.07	16.67	2.74

Prepared for 1156

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No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
33	5.14	17.54	17.58	-0.240	17.46	0.493
34	6.54	18.11	18.47	-1.95	18.33	-1.18
35	8.32	18.61	19.33	-3.86	19.17	-3.01
36	10.59	19.64	19.56	0.448	19.39	1.30
37	13.49	20.87	19.00	8.95	18.76	10.12
38*	17.19	22.22	17.40	21.69	17.26	22.32
39*	21.90	23.53	15.49	34.17	15.60	33.71
40	27.92	14.44	13.82	4.32	14.21	1.64
41	0.881	16.68	16.47	1.28	16.37	1.85
42	1.06	16.37	16.19	1.08	16.13	1.46
43	1.31	16.19	16.04	0.948	15.95	1.46
44	1.61	16.15	15.87	1.75	15.79	2.26
45	2.00	16.26	15.88	2.35	15.78	2.97
46	2.50	16.52	15.93	3.55	15.83	4.15
47	3.14	16.75	16.23	3.12	16.13	3.72
48	3.95	17.30	16.64	3.79	16.53	4.41
49	4.99	17.67	17.31	2.04	17.20	2.62
50	6.31	18.20	18.04	0.920	17.93	1.52
51	7.99	18.89	18.63	1.39	18.56	1.77
52	10.13	19.35	18.61	3.86	18.56	4.07
53	12.86	19.35	17.77	8.12	17.73	8.34
54	16.35	15.92	15.97	-0.315	16.05	-0.811
55	20.80	12.30	13.94	-13.36	14.22	-15.56
56	26.47	10.83	12.08	-11.55	12.58	-16.20
57*	33.72	-54.48	10.68	119.6	11.34	120.8
58*	42.96	-8.83	9.74	210.2	10.57	219.7
59*	54.74	3.90	9.15	-134.5	10.16	-160.4
60*	69.77	-54.10	8.97	116.5	10.17	118.7

"*" INDICATES MASKED DATA POINT

Prepared for 1156

C16

Central Loop TEM

Northing: 1004278.0 Easting: 295144.0 Elevation: 1663.0

Layered Model

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
				1663.0		
1	20.31	23.48	23.48	1639.5	1.15	477.0
2	7.04	7.02	30.51	1632.4	0.996	49.51
3	32.52	4.11	34.62	1628.3	0.126	133.8
4	9.34	13.51	48.14	1614.8	1.44	126.3
5	34.91	38.58	86.72	1576.2	1.10	1347.0
6	9.49	34.56	121.2	1541.7	3.64	328.1
7	19.91	304.1	425.4	1237.5	15.27	6057.7
8	1.99	160.4	585.9	1077.0	80.30	320.6
9	109.2					

ALL PARAMETERS ARE FREE

Prepared for 1156

C16

Central Loop TEM

Northing: 1004278.0 Easting: 295144.0 Elevation: 1663.0

Smooth Model: Ridge Regression

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
					1663.0		
1	18.36	22.23	22.23	*	1640.7	1.21	408.3
2	13.65	1.43	23.67	*	1639.3	0.105	19.62
3	11.01	1.53	25.20	*	1637.7	0.138	16.85
4	8.78	1.62	26.83	*	1636.1	0.185	14.31
5	18.18	1.73	28.56	*	1634.4	0.0954	31.54
6	4.53	1.84	30.41	*	1632.5	0.407	8.37
7	35.90	1.96	32.38	*	1630.6	0.0547	70.60
8	10.30	2.09	34.47	*	1628.5	0.203	21.57
9	19.13	2.22	36.70	*	1626.2	0.116	42.64
10	18.60	2.37	39.07	*	1623.9	0.127	44.16
11	26.48	2.52	41.60	*	1621.3	0.0953	66.92
12	22.09	2.69	44.29	*	1618.7	0.121	59.43
13	4.03	2.86	47.16	*	1615.8	0.710	11.54
14	18.34	3.04	50.20	*	1612.7	0.166	55.94
15	17.79	3.24	53.45	*	1609.5	0.182	57.77
16	18.64	3.45	56.91	*	1606.0	0.185	64.43
17	49.49	3.67	60.59	*	1602.4	0.0743	182.1
18	16.11	3.91	64.50	*	1598.4	0.243	63.12
19	36.28	4.17	68.68	*	1594.3	0.114	151.3
20	31.04	4.44	73.12	*	1589.8	0.143	137.8
21	26.22	4.72	77.84	*	1585.1	0.180	123.9
22	20.94	5.03	82.88	*	1580.1	0.240	105.4
23	27.33	5.35	88.24	*	1574.7	0.196	146.4
24	12.35	5.70	93.94	*	1569.0	0.461	70.45
25	22.33	6.07	100.0	*	1562.9	0.271	135.6
26	10.80	6.46	106.4	*	1556.5	0.598	69.88
27	11.15	6.88	113.3	*	1549.6	0.617	76.78
28	9.20	7.32	120.7	*	1542.2	0.796	67.48
29	12.57	7.80	128.5	*	1534.4	0.620	98.12
30	16.61	8.30	136.8	*	1526.1	0.500	138.0
31	14.47	8.84	145.6	*	1517.3	0.611	128.0
32	14.10	9.41	155.0	*	1507.9	0.667	132.7

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C16 Page 2

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
33	21.75	10.02	165.1	*	1497.8	0.460	218.1
34	21.40	10.67	175.7	*	1487.2	0.498	228.4
35	27.40	11.36	187.1	*	1475.8	0.414	311.4
36	16.42	12.09	199.2	*	1463.7	0.736	198.7
37	19.91	12.88	212.1	*	1450.8	0.646	256.5
38	18.82	13.71	225.8	*	1437.1	0.728	258.1
39	20.62	14.60	240.4	*	1422.5	0.707	301.1
40	26.40	15.54	255.9	*	1407.0	0.588	410.5
41	35.96	16.55	272.5	*	1390.4	0.460	595.2
42	23.82	17.62	290.1	*	1372.8	0.739	419.8
43	25.82	18.76	308.9	*	1354.0	0.726	484.4
44	26.78	19.97	328.8	*	1334.1	0.745	535.0
45	20.43	21.26	350.1	*	1312.8	1.04	434.5
46	13.51	22.63	372.7	*	1290.2	1.67	305.9
47	15.14	24.10	396.8	*	1266.1	1.59	365.1
48	10.27	25.66	422.5	*	1240.4	2.49	263.7
49	8.31	27.32	449.8	*	1213.1	3.28	227.1
50	3.06	29.08	478.9	*	1184.0	9.49	89.11
51	1.48	30.96	509.9	*	1153.0	20.88	45.91
52	1.96	32.96	542.9	*	1120.0	16.73	64.93
53	4.73	35.10	578.0	*	1084.9	7.41	166.1
54	10.55	37.37	615.3	*	1047.6	3.53	394.5
55	18.48	39.78	655.1	*	1007.8	2.15	735.4
56	25.62	42.35	697.5	*	965.4	1.65	1085.2
57	33.78	45.09	742.6	*	920.3	1.33	1523.5
58	39.94	48.01	790.6	*	872.3	1.20	1917.9
59	44.17	51.11	841.7	*	821.2	1.15	2258.0
60	188.4						

"*" INDICATES FIXED PARAMETER

Prepared for 1156

C17

Central Loop TEM

Northing: 1005388.0 Easting: 296112.0 Elevation: 1679.0

No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
1	0.0859	33.63	33.64	-0.0265	33.43	0.594
2	0.104	31.13	31.47	-1.11	31.37	-0.765
3	0.129	29.79	29.91	-0.422	29.77	0.0514
4	0.159	28.75	28.77	-0.0578	28.60	0.530
5	0.198	27.84	27.82	0.0659	27.69	0.546
6	0.248	26.89	26.97	-0.310	26.82	0.275
7	0.312	25.75	25.88	-0.515	25.87	-0.490
8	0.393	24.31	24.57	-1.07	24.64	-1.36
9	0.497	22.64	22.99	-1.53	23.16	-2.27
10	0.629	20.86	21.30	-2.10	21.49	-3.01
11	0.797	19.21	19.76	-2.88	19.86	-3.42
12	1.01	17.80	18.37	-3.20	18.42	-3.50
13	1.28	16.74	17.33	-3.53	17.26	-3.11
14	1.63	15.99	16.53	-3.40	16.40	-2.58
15	2.07	15.55	16.03	-3.06	15.87	-2.05
16	2.64	15.38	15.77	-2.52	15.64	-1.65
17	3.37	15.46	15.77	-1.99	15.71	-1.62
18	4.29	15.76	16.01	-1.57	16.09	-2.10
19	5.47	16.22	16.57	-2.17	16.82	-3.71
20	6.97	16.92	17.62	-4.16	17.96	-6.17
21	0.352	26.38	25.53	3.23	25.61	2.94
22	0.427	24.92	24.31	2.43	24.39	2.10
23	0.525	23.25	22.77	2.07	22.96	1.22
24	0.647	21.54	21.23	1.44	21.41	0.613
25	0.802	19.94	19.79	0.755	19.89	0.239
26	1.00	18.53	18.44	0.462	18.50	0.149
27	1.25	17.41	17.40	0.0341	17.33	0.436
28	1.58	16.59	16.55	0.236	16.44	0.904
29	1.99	16.05	15.97	0.474	15.81	1.46
30	2.52	15.78	15.57	1.31	15.44	2.14
31	3.19	15.67	15.41	1.69	15.32	2.22
32	4.05	15.72	15.36	2.29	15.42	1.94

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No.	Time (ms)	Data Resistivity (ohm-m)	Layered Model: Synthetic Resistivity (ohm-m)	Layered Model: DIFFERENCE (percent)	Smooth Model: Synthetic Resistivity (ohm-m)	Smooth Model: DIFFERENCE (percent)
33	5.14	15.87	15.58	1.82	15.73	0.884
34	6.54	16.18	15.98	1.26	16.21	-0.188
35	8.32	16.44	16.62	-1.15	16.88	-2.70
36	10.59	16.75	17.50	-4.51	17.58	-4.93
37	13.49	17.19	18.39	-7.00	18.27	-6.32
38	17.19	18.08	19.02	-5.20	18.55	-2.64
39	21.90	19.78	18.95	4.20	18.47	6.62
40	27.92	16.77	18.18	-8.43	18.00	-7.36
41	0.881	19.65	19.20	2.30	19.31	1.75
42	1.06	18.44	18.15	1.55	18.16	1.54
43	1.31	17.44	17.23	1.23	17.16	1.61
44	1.61	16.70	16.50	1.22	16.37	1.96
45	2.00	16.20	15.97	1.44	15.81	2.42
46	2.50	15.90	15.58	2.00	15.45	2.83
47	3.14	15.73	15.39	2.12	15.30	2.69
48	3.95	15.81	15.31	3.14	15.36	2.85
49	4.99	15.92	15.47	2.81	15.60	2.00
50	6.31	16.02	15.75	1.65	16.00	0.136
51	7.99	16.49	16.26	1.34	16.51	-0.152
52	10.13	16.59	16.86	-1.63	16.99	-2.43
53	12.86	17.10	17.39	-1.68	17.38	-1.63
54	16.35	18.88	17.55	7.08	17.26	8.60
55	20.80	20.09	17.01	15.35	16.76	16.55
56	26.47	18.11	15.79	12.79	15.75	13.03
57	33.72	10.93	14.35	-31.34	14.59	-33.51
58	42.96	14.23	13.14	7.63	13.57	4.65
59	54.74	-12.34	12.21	198.9	12.83	203.9
60*	69.77	3.07	11.71	-280.7	12.47	-305.6

"*" INDICATES MASKED DATA POINT

Prepared for 1156

C17

Central Loop TEM

Northing: 1005388.0 Easting: 296112.0 Elevation: 1679.0

Layered Model

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
				1679.0		
1	22.88	22.68	22.68	1656.3	0.991	519.0
2	10.33	7.31	30.00	1648.9	0.708	75.59
3	32.36	47.15	77.15	1601.8	1.45	1526.1
4	8.53	62.49	139.6	1539.3	7.32	533.5
5	19.28	414.5	554.1	1124.8	21.49	7992.2
6	2.61	183.0	737.1	941.8	69.88	479.3
7	38.38					

ALL PARAMETERS ARE FREE

Prepared for 1156

C17

Central Loop TEM

Northing: 1005388.0 Easting: 296112.0 Elevation: 1679.0

Smooth Model: Ridge Regression

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
					1679.0		
1	20.51	22.92	22.92	*	1656.0	1.11	470.2
2	12.21	1.48	24.40	*	1654.5	0.121	18.10
3	11.94	1.57	25.98	*	1653.0	0.132	18.84
4	22.42	1.68	27.66	*	1651.3	0.0749	37.67
5	19.39	1.78	29.45	*	1649.5	0.0922	34.69
6	24.73	1.90	31.35	*	1647.6	0.0770	47.09
7	21.74	2.02	33.38	*	1645.6	0.0932	44.08
8	22.78	2.15	35.54	*	1643.4	0.0947	49.17
9	27.84	2.29	37.84	*	1641.1	0.0825	63.98
10	31.28	2.44	40.28	*	1638.7	0.0782	76.53
11	33.10	2.60	42.89	*	1636.1	0.0786	86.23
12	30.21	2.77	45.66	*	1633.3	0.0917	83.78
13	29.22	2.95	48.61	*	1630.3	0.101	86.28
14	26.43	3.14	51.76	*	1627.2	0.118	83.09
15	30.73	3.34	55.10	*	1623.8	0.108	102.8
16	28.04	3.56	58.67	*	1620.3	0.127	99.93
17	23.49	3.79	62.46	*	1616.5	0.161	89.12
18	22.37	4.03	66.50	*	1612.4	0.180	90.38
19	20.08	4.29	70.80	*	1608.1	0.214	86.36
20	17.23	4.57	75.38	*	1603.6	0.265	78.88
21	17.79	4.87	80.25	*	1598.7	0.273	86.73
22	12.60	5.18	85.44	*	1593.5	0.411	65.40
23	12.52	5.52	90.96	*	1588.0	0.440	69.20
24	12.07	5.88	96.84	*	1582.1	0.486	71.03
25	7.12	6.26	103.1	*	1575.8	0.878	44.61
26	7.54	6.66	109.7	*	1569.2	0.883	50.29
27	6.45	7.09	116.8	*	1562.1	1.09	45.82
28	7.62	7.55	124.4	*	1554.5	0.991	57.59
29	9.58	8.04	132.4	*	1546.5	0.838	77.14
30	11.15	8.56	141.0	*	1537.9	0.768	95.50
31	12.81	9.11	150.1	*	1528.8	0.711	116.8
32	15.22	9.70	159.8	*	1519.1	0.637	147.8

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C17 Page 2

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	DEPTH		ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
33	16.95	10.33	170.2	*	1508.7	0.609	175.2
34	19.62	11.00	181.2	*	1497.7	0.560	215.9
35	21.11	11.71	192.9	*	1486.0	0.554	247.3
36	22.71	12.47	205.4	*	1473.6	0.549	283.3
37	23.51	13.28	218.6	*	1460.3	0.564	312.3
38	23.81	14.13	232.8	*	1446.1	0.593	336.7
39	25.00	15.05	247.8	*	1431.1	0.601	376.4
40	25.60	16.02	263.8	*	1415.1	0.625	410.3
41	25.26	17.06	280.9	*	1398.0	0.675	431.0
42	25.14	18.16	299.1	*	1379.8	0.722	456.8
43	24.21	19.33	318.4	*	1360.5	0.798	468.3
44	22.61	20.59	339.0	*	1339.9	0.910	465.7
45	21.88	21.92	360.9	*	1318.0	1.00	479.7
46	19.27	23.33	384.3	*	1294.6	1.21	449.7
47	17.30	24.84	409.1	*	1269.8	1.43	430.0
48	15.93	26.45	435.6	*	1243.3	1.65	421.6
49	14.18	28.16	463.7	*	1215.2	1.98	399.4
50	11.45	29.98	493.7	*	1185.2	2.61	343.5
51	8.03	31.92	525.6	*	1153.3	3.97	256.4
52	5.41	33.98	559.6	*	1119.3	6.28	183.8
53	5.17	36.18	595.8	*	1083.1	6.99	187.1
54	3.99	38.52	634.3	*	1044.6	9.64	153.8
55	3.55	41.01	675.4	*	1003.5	11.53	145.8
56	4.04	43.66	719.0	*	959.9	10.78	176.7
57	5.36	46.49	765.5	*	913.4	8.66	249.3
58	7.34	49.49	815.0	*	863.9	6.73	363.6
59	9.59	52.69	867.7	*	811.2	5.48	505.8
60	33.56						

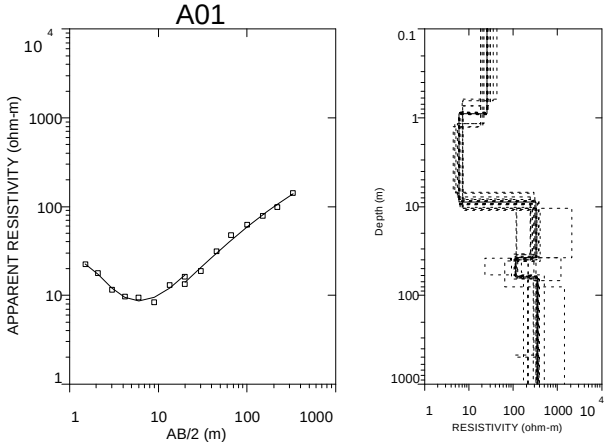
"*" INDICATES FIXED PARAMETER

Prepared for 1156

Data S.1.5 : VES Analytical Results Diagram (1/5)

Qaaxo-North Area

A01



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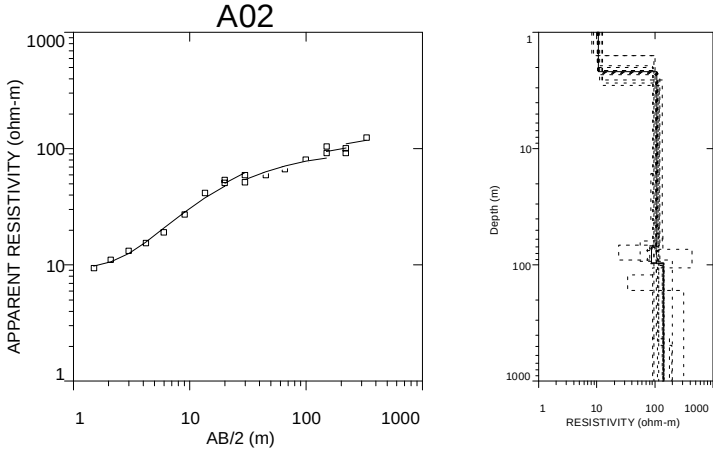

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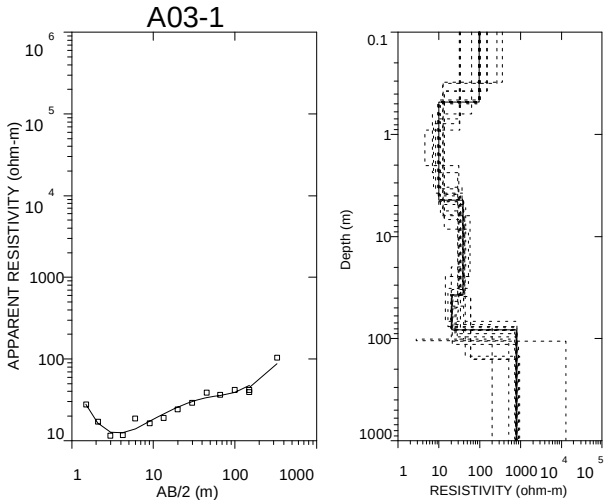

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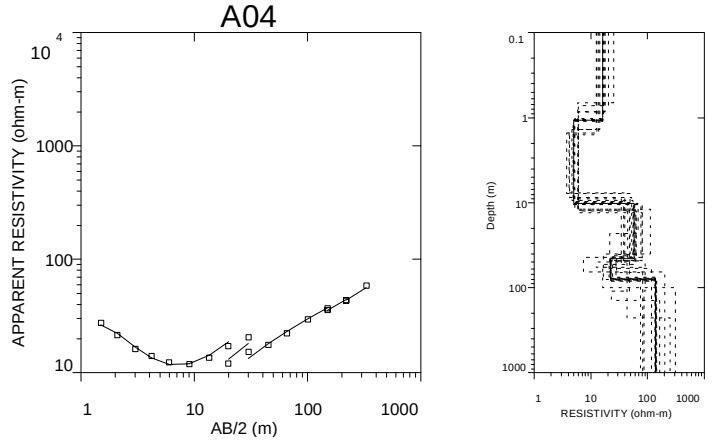

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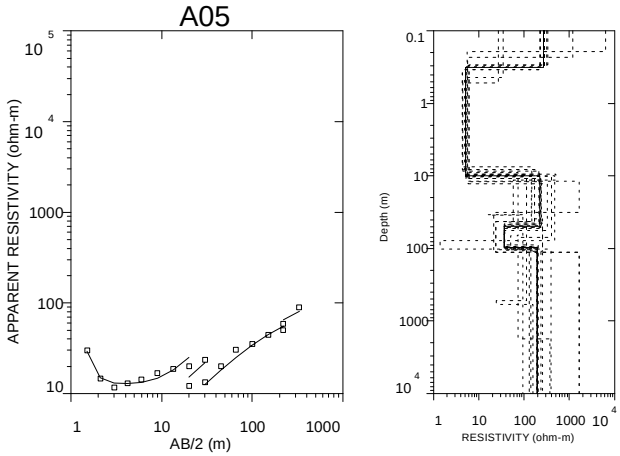

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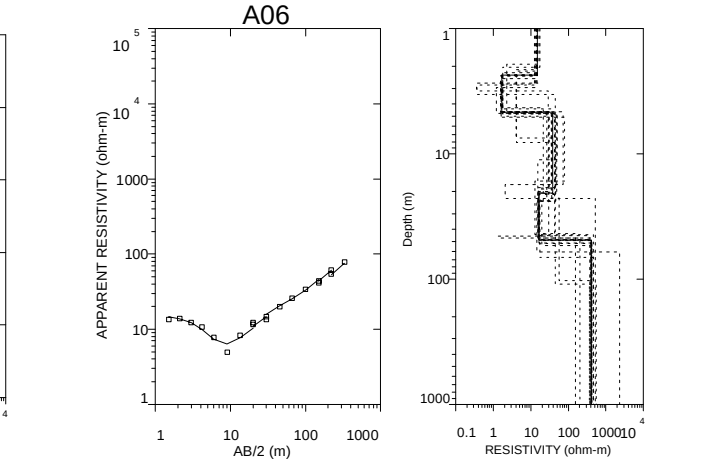
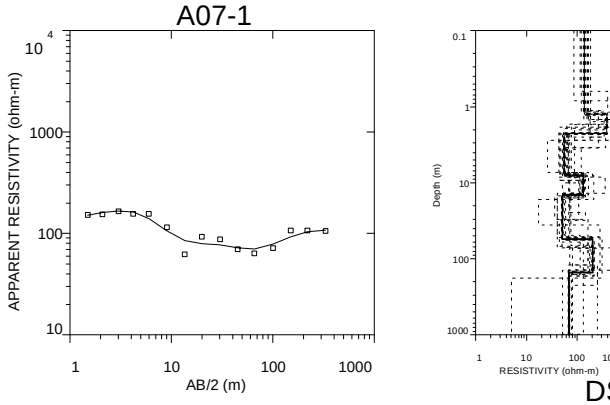


A07-1



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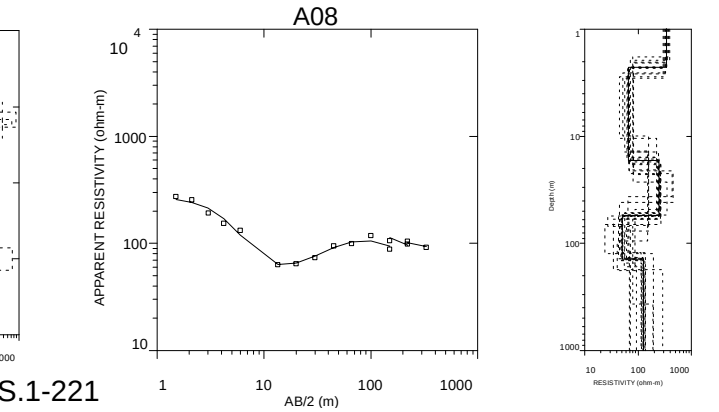
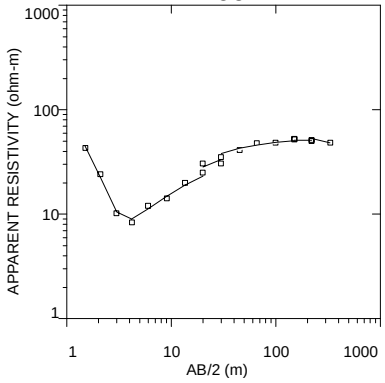
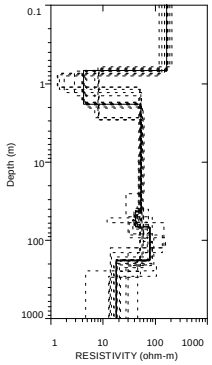


Data S.1.5 : VES Analytical Results Diagram (2/5)

A09





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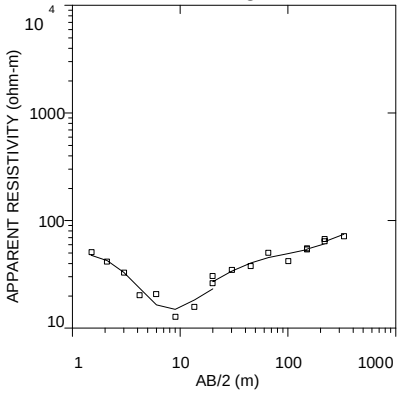

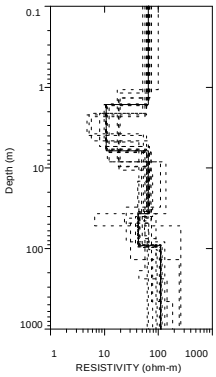

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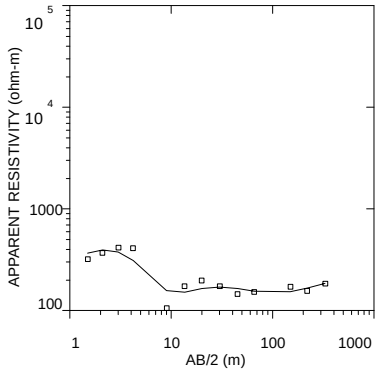

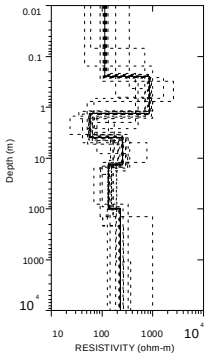

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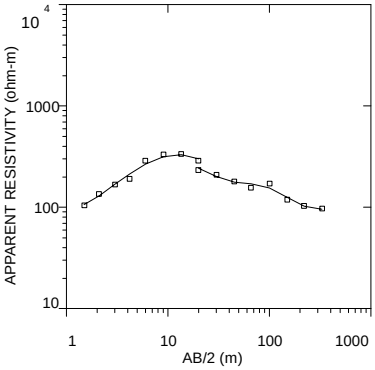
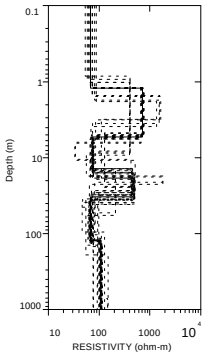
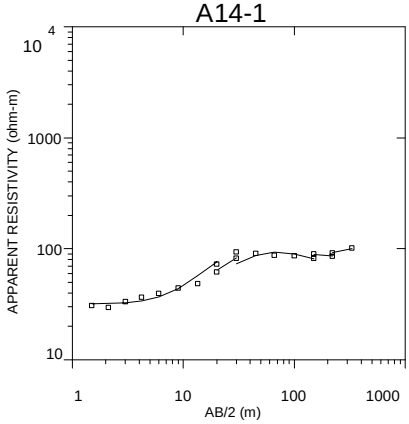
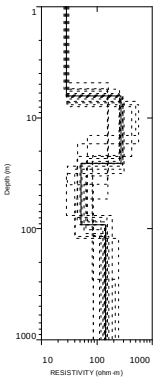


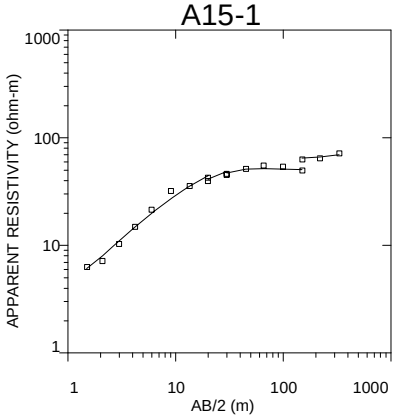


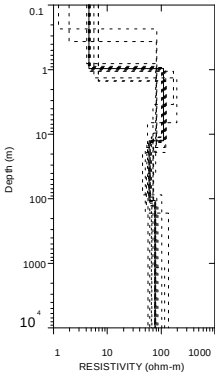
A14-1





A15-1





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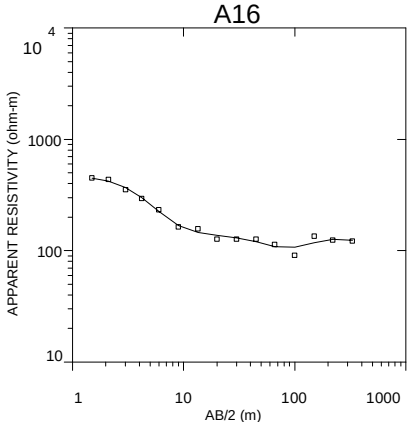
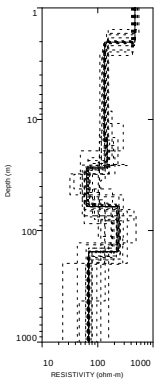
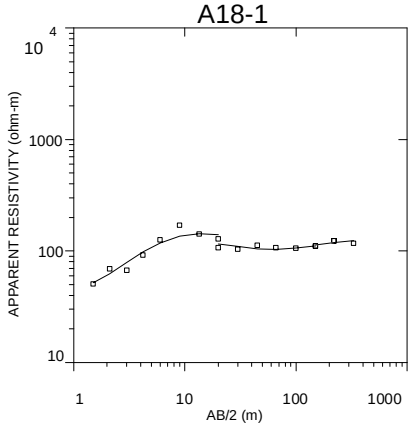
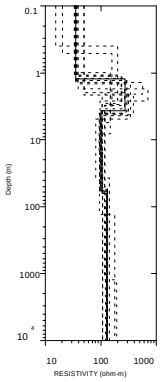




A18-1

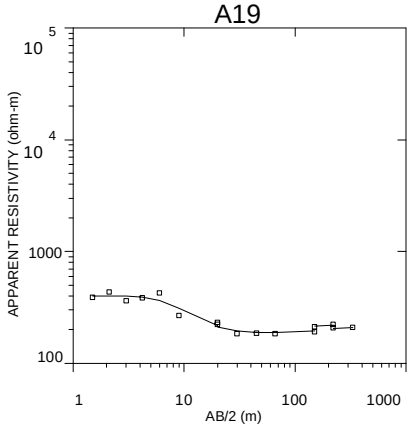


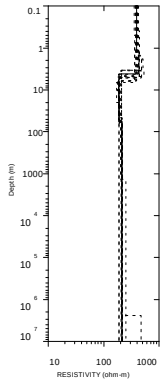


Data S.1.5 : VES Analytical Results Diagram (3/5)

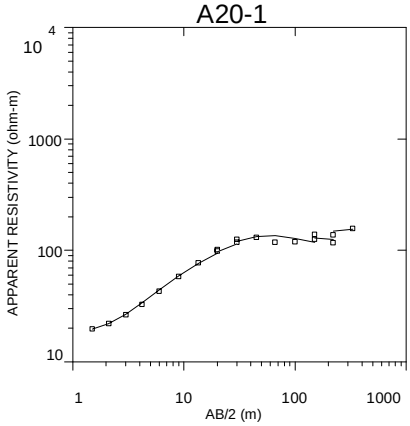
Data 4.5 : VES analytical results diagram (3/5)

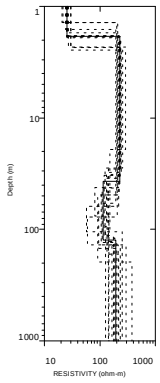
A19





A20-1





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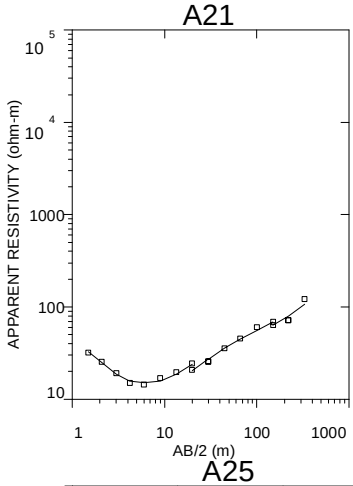

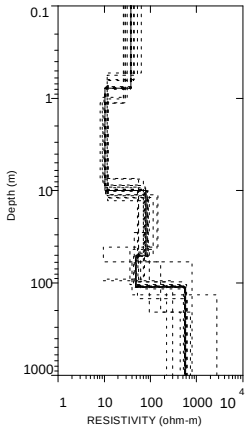

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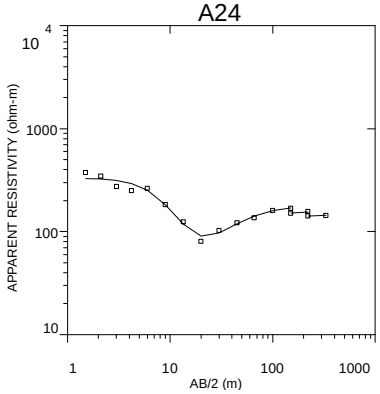

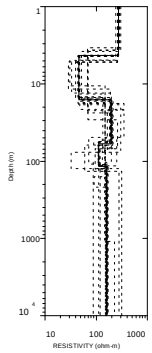

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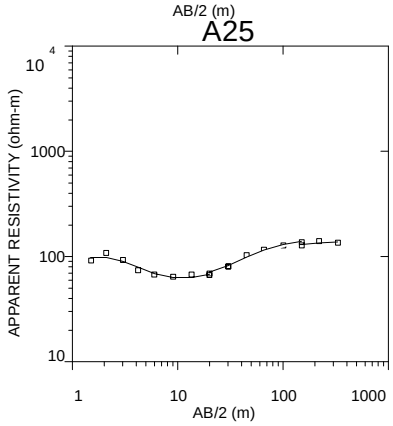

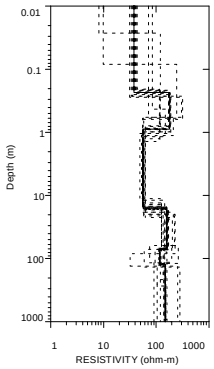

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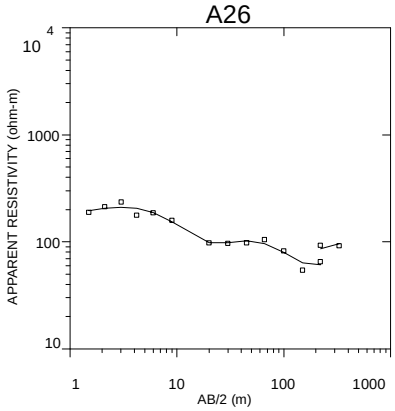

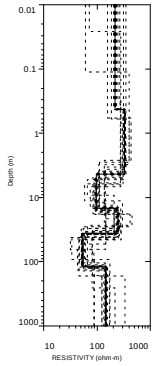

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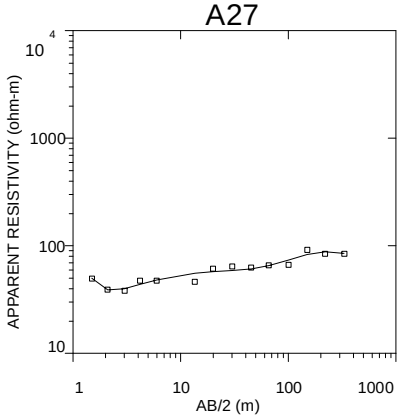

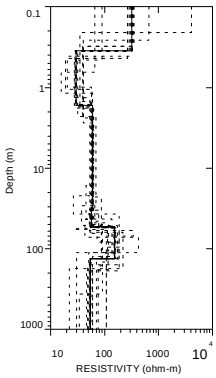

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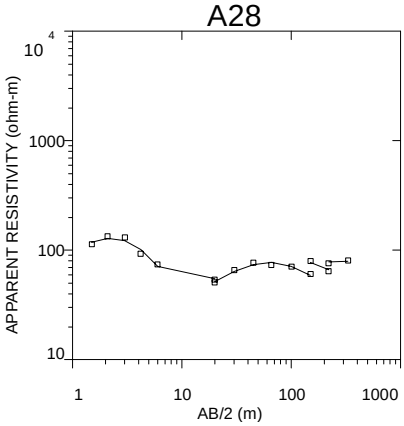
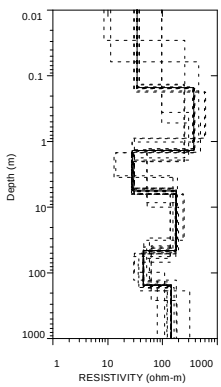
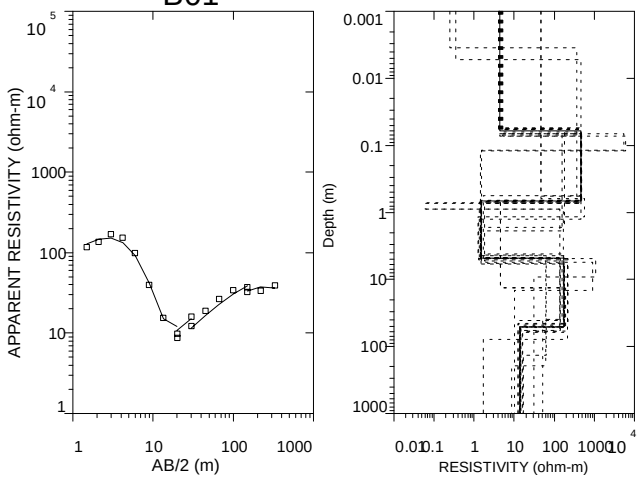


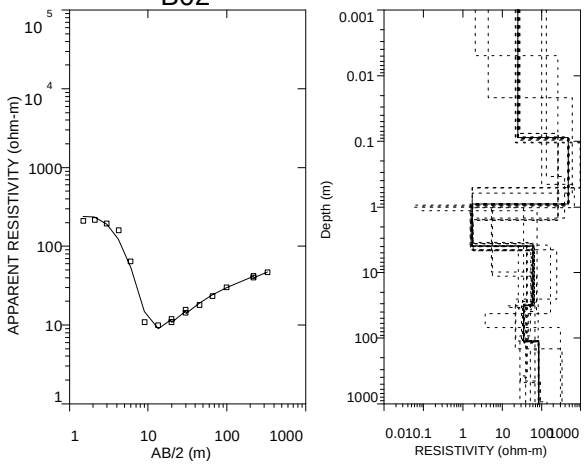


Data S.1.5 : VES Analytical Results Diagram (4/5)

B01

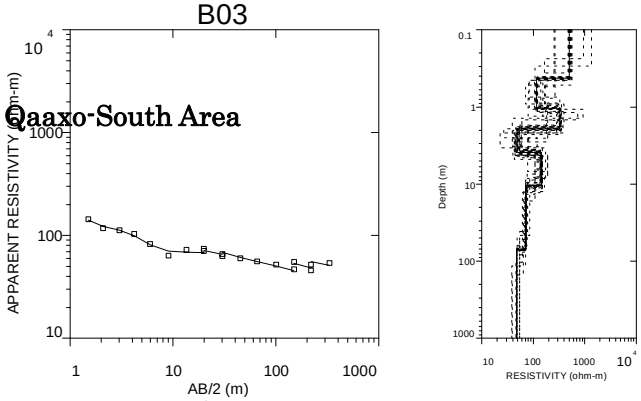


B02

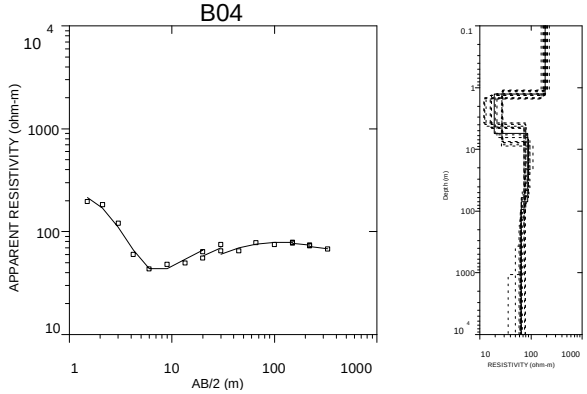


B03

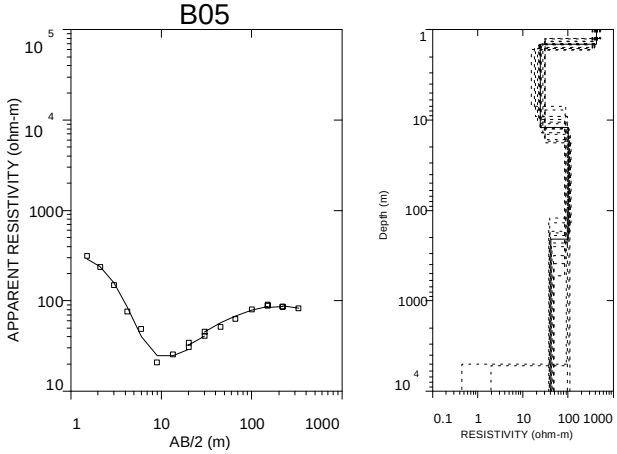
Qaaxo-South Area



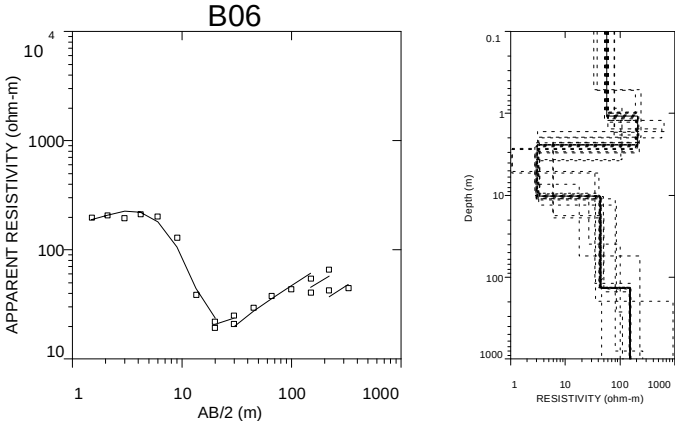
B04



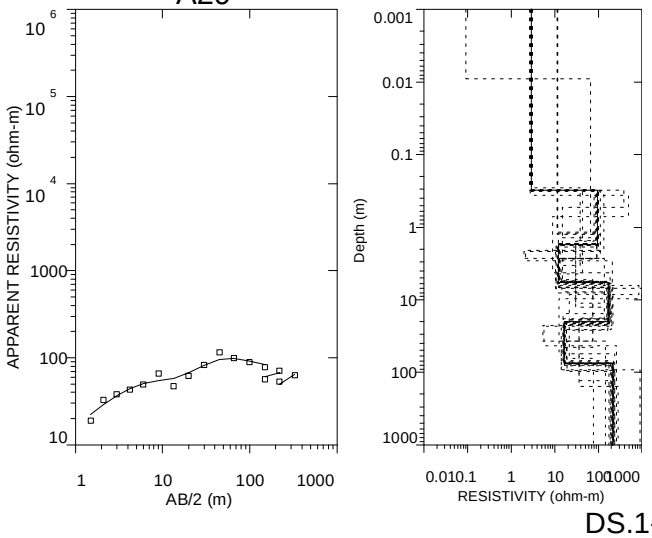
B05



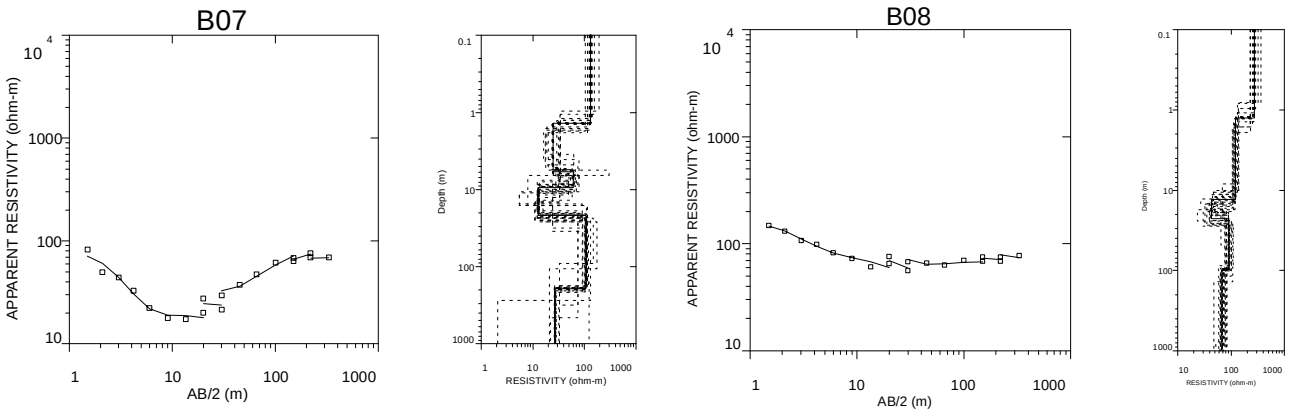
B06

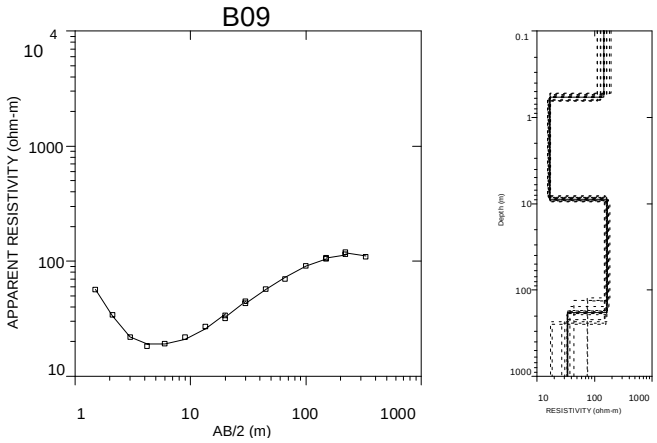


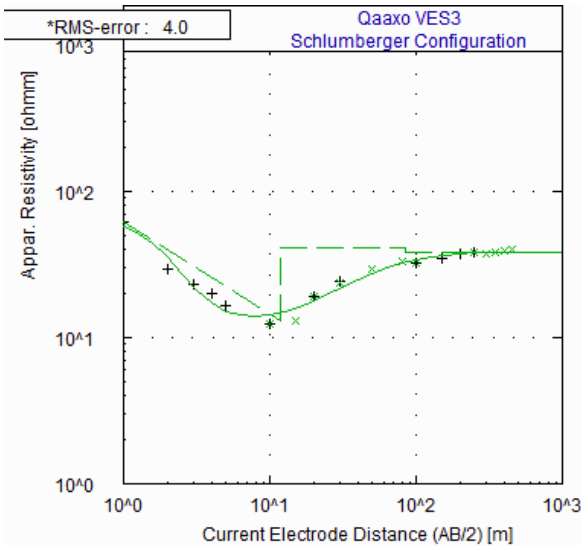
A29

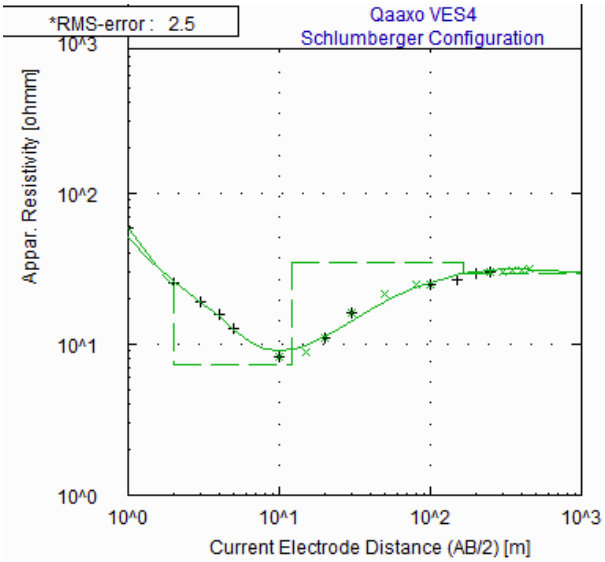


Data S.1.5 : VES Analytical Results Diagram (5/5)









Data S.1.6 : VES prospecting measurement data(VES data, Structure Inversion data) (1/10)

Qaaxo-North Area

A01 SCHL 1453.000 0.000 1 280565.000 998525.000
JICA May, 2012
Jarar Valley 1
Somali Region Ethiopia
Jarar Valley Water Supply WDJD-2

No.	SPACING	RHO-A
1	1.5000	22.5000
2	2.1000	17.6900
3	3.0000	11.5000
4	4.2000	9.6900
5	6.0000	9.4200
6	9.0000	8.3900
7	13.5000	13.0200
8	20.0000	16.2400
9	20.0000	13.3800
10	30.0000	18.8000
11	45.0000	31.2900
12	66.0000	47.5100
13	100.0000	62.6400
14	150.0000	78.4100
15	220.0000	98.8800
16	330.0000	143.0000

DATASET: A01 NORTH: 998525.00 EAST: 280565.00
ELEVATION: 1453.00

LAYER	RESISTIVITY	THICKNESS (meters)
1	2.61259E+01	8.99220E-01
2	6.07653E+00	8.06076E+00
3	3.24819E+02	2.90018E+01
4	1.13643E+02	2.40895E+01
5	3.52236E+02	

A02 SCHL 1454.000 0.000 1 281100.000 999405.000
JICA May, 2012
Jarar Valley 1
Somali Region Ethiopia
Jarar Valley Water Supply WDJD-2

No.	SPACING	RHO-A
1	1.5000	9.4000
2	2.1000	11.0900
3	3.0000	13.2200
4	4.2000	15.4700
5	6.0000	19.2000
6	9.0000	27.3000
7	13.5000	41.7700
8	20.0000	51.2400
9	20.0000	54.2300
10	30.0000	59.7400
11	30.0000	51.6400
12	45.0000	59.7300
13	66.0000	67.0700
14	100.0000	80.4800
15	150.0000	91.5700
16	150.0000	104.3700
17	220.0000	92.3400
18	220.0000	101.0400
19	330.0000	125.3200

DATASET: A02 NORTH: 999405.00 EAST: 281100.00
ELEVATION: 1454.00

LAYER	RESISTIVITY	THICKNESS (meters)
1	1.05085E+01	2.16350E+00
2	1.07425E+02	6.77685E+01
3	8.72411E+01	2.66130E+01
4	1.39926E+02	

A03-1 SCHL 1465.000 0.000 1 280975.000 1000044.000
JICA May, 2012
Jarar Valley 1
Somali Region Ethiopia
Jarar Valley Water Supply WDJD-2

No.	SPACING	RHO-A
1	1.5000	27.8100
2	2.1000	17.1900
3	3.0000	11.4600
4	4.2000	11.7000
5	6.0000	18.5900
6	9.0000	16.3200
7	13.5000	18.8900
8	20.0000	24.1700
9	30.0000	28.8400
10	45.0000	38.6000
11	66.0000	36.7300
12	100.0000	41.6000
13	150.0000	42.1100
14	150.0000	39.5700
15	330.0000	104.3000

DATASET: A03-1 NORTH: 1000044.00 EAST: 280975.00
ELEVATION: 1465.00

LAYER	RESISTIVITY	THICKNESS (meters)
1	9.87916E+01	4.81372E-01
2	9.95356E+00	3.92721E+00
3	3.95177E+01	3.29079E+01
4	2.08835E+01	4.49955E+01
5	8.03623E+02	

A04 SCHL 1464.000 0.000 1 281212.000 1000110.000
JICA May, 2012
Jarar Valley 1
Somali Region Ethiopia
Jarar Valley Water Supply WDJD-2

No.	SPACING	RHO-A
1	1.5000	27.5000
2	2.1000	21.5000
3	3.0000	16.2000
4	4.2000	14.1000
5	6.0000	12.3000
6	9.0000	11.9000
7	13.5000	13.6000
8	20.0000	17.1000
9	20.0000	12.0000
10	30.0000	20.6000
11	30.0000	15.3000
12	45.0000	17.7000
13	66.0000	22.4000
14	100.0000	29.6000
15	150.0000	37.2000
16	150.0000	35.8000
17	220.0000	43.5000
18	220.0000	43.2000
19	330.0000	58.8000

DATASET: A04 NORTH: 1000110.00 EAST: 281212.00
ELEVATION: 1464.00

LAYER	RESISTIVITY	THICKNESS (meters)
1	1.61866E+01	1.06530E+00
2	4.99630E+00	9.03934E+00
3	5.74630E+01	3.53183E+01
4	2.22929E+01	3.37672E+01
5	1.39425E+02	

Data S.1.6 : VES prospecting measurement data(VES data, Structure Inversion data) (2/10)

A05 SCHL 1465.000 0.000 1 281600.000 1000500.000
JICA May,2012
Jarar Valley 1
Somali Region Ethiopia
Jarar Valley Water Supply WDJD-2

No.	SPACING	RHO-A
1	1.5000	29.8000
2	2.1000	14.7000
3	3.0000	11.7000
4	4.2000	13.0000
5	6.0000	14.2000
6	9.0000	16.9000
7	13.5000	18.8000
8	20.0000	19.9000
9	20.0000	12.1000
10	30.0000	23.4000
11	30.0000	13.4000
12	45.0000	19.9000
13	66.0000	30.4000
14	100.0000	35.2000
15	150.0000	44.2000
16	220.0000	49.8000
17	220.0000	59.1000
18	330.0000	89.6000

DATASET: A05 NORTH: 1000500.00 EAST: 281600.00
ELEVATION: 1465.00

LAYER	RESISTIVITY	THICKNESS (meters)
1	2.73731E+02	3.17061E-01
2	5.14239E+00	9.56151E+00
3	2.26329E+02	3.96173E+01
4	3.67437E+01	4.72663E+01
5	1.97371E+02	

A06 SCHL 1464.000 0.000 1 281400.000 1000300.000
JICA May,2012
Jarar Valley 1
Somali Region Ethiopia
Jarar Valley Water Supply WDJD-2

No.	SPACING	RHO-A
1	1.5000	13.4100
2	2.1000	13.9200
3	3.0000	12.3100
4	4.2000	10.7600
5	6.0000	7.8100
6	9.0000	4.9300
7	13.5000	8.2100
8	20.0000	11.5600
9	20.0000	12.3400
10	30.0000	13.5100
11	30.0000	14.7300
12	45.0000	20.0700
13	66.0000	25.9100
14	100.0000	34.1000
15	150.0000	43.5600
16	150.0000	41.5200
17	220.0000	61.6200
18	220.0000	54.1000
19	330.0000	77.9000

DATASET: A06 NORTH: 1000300.00 EAST: 281400.00
ELEVATION: 1464.00

LAYER	RESISTIVITY	THICKNESS (meters)
1	1.47921E+01	2.35719E+00
2	1.69459E+00	2.28710E+00
3	3.89406E+01	1.58374E+01
4	1.62469E+01	2.83313E+01
5	4.15035E+02	

A07-1 SCHL 1466.000 0.000 1 280466.000 999656.000
JICA May,2012
Jarar Valley 1
Somali Region Ethiopia
Jarar Valley Water Supply WDJD-2

No.	SPACING	RHO-A
1	1.5000	153.0000
2	2.1000	154.6000
3	3.0000	166.8000
4	4.2000	155.8000
5	6.0000	156.0700
6	9.0000	115.6000
7	13.5000	62.0400
8	20.0000	93.4700
9	30.0000	87.3500
10	45.0000	69.9700
11	66.0000	64.1300
12	100.0000	71.4900
13	150.0000	106.8800
14	220.0000	106.7100
15	330.0000	105.5200

DATASET: A07-1 NORTH: 999656.00 EAST: 280466.00
ELEVATION: 1466.00

LAYER	RESISTIVITY	THICKNESS (meters)
1	1.39986E+02	1.25466E+00
2	3.83466E+02	9.95077E-01
3	5.57799E+01	5.69933E+00
4	1.32072E+02	6.49157E+00
5	5.10573E+01	4.04051E+01
6	2.02311E+02	9.65199E+01
7	6.84974E+01	

A08 SCHL 1475.000 0.000 1 280555.000 1000139.000
JICA May,2012
Jarar Valley 1
Somali Region Ethiopia
Jarar Valley Water Supply WDJD-2

No.	SPACING	RHO-A
1	1.5000	274.0000
2	2.1000	256.0000
3	3.0000	192.0000
4	4.2000	154.0000
5	6.0000	132.0000
6	13.5000	63.1700
7	20.0000	64.8900
8	30.0000	73.7800
9	45.0000	95.1300
10	66.0000	99.5200
11	100.0000	119.0000
12	150.0000	88.6500
13	150.0000	106.0000
14	220.0000	99.0300
15	220.0000	105.0000
16	330.0000	92.5300

DATASET: A08 NORTH: 1000139.00 EAST: 280555.00
ELEVATION: 1475.00

LAYER	RESISTIVITY	THICKNESS (meters)
1	3.37907E+02	2.27123E+00

Data S.1.6 : VES prospecting measurement data(VES data, Structure Inversion data) (3/10)

2	6.63827E+01	1.44398E+01
3	2.45142E+02	3.82511E+01
4	5.04628E+01	8.48665E+01
5	1.25931E+02	

A09 SCHL 1471.000 0.000 1 281000.000 1000502.000
JICA May,2012
Jarar Valley 1
Somali Region Ethiopia
Jarar Valley Water Supply WDJD-2

No.	SPACING	RHO-A
1	1.5000	43.2000
2	2.1000	24.1000
3	3.0000	10.2000
4	4.2000	8.4000
5	6.0000	12.1000
6	9.0000	14.3000
7	13.5000	20.0000
8	20.0000	25.2000
9	20.0000	30.6000
10	30.0000	30.8000
11	30.0000	35.2000
12	45.0000	41.2000
13	66.0000	48.3000
14	100.0000	48.7000
15	150.0000	51.9000
16	150.0000	52.5000
17	220.0000	50.3000
18	220.0000	51.6000
19	330.0000	48.6000

DATASET: A09 NORTH: 1000502.00 EAST: 281000.00
ELEVATION: 1471.00

LAYER	RESISTIVITY	THICKNESS (meters)
1	1.64297E+02	6.82798E-01
2	4.24771E+00	1.14784E+00
3	5.35064E+01	4.12558E+01
4	4.15146E+01	2.46348E+01
5	7.83050E+01	1.11696E+02
6	1.80222E+01	

A10 SCHL 1468.000 0.000 1 281300.000 1000900.000
JICA May,2012
Jarar Valley 1
Somali Region Ethiopia
Jarar Valley Water Supply WDJD-2

No.	SPACING	RHO-A
1	1.5000	50.9300
2	2.1000	41.7500
3	3.0000	32.7800
4	4.2000	20.2600
5	6.0000	20.6800
6	9.0000	12.7300
7	13.5000	15.8400
8	20.0000	26.2200
9	20.0000	30.5700
10	30.0000	34.7800
11	45.0000	37.9400
12	66.0000	50.6000
13	100.0000	41.9500
14	150.0000	54.0000
15	150.0000	55.1200
16	220.0000	64.6300
17	220.0000	67.2700
18	330.0000	71.4000

DATASET: A10 NORTH: 1000900.00 EAST: 281300.00
ELEVATION: 1468.00

LAYER	RESISTIVITY	THICKNESS (meters)
1	6.55005E+01	1.63635E+00
2	1.08162E+01	4.48194E+00
3	6.57900E+01	3.08381E+01
4	4.28608E+01	5.53177E+01
5	1.10661E+02	

A12 SCHL 1492.000 0.000 1 279900.000 1000300.000
JICA May,2012
Jarar Valley 1
Somali Region Ethiopia
Jarar Valley Water Supply WDJD-2

No.	SPACING	RHO-A
1	1.5000	322.0000
2	2.1000	369.0000
3	3.0000	417.0000
4	4.2000	412.0000
5	9.0000	106.0000
6	13.5000	175.0000
7	20.0000	199.0000
8	30.0000	173.0000
9	45.0000	146.0000
10	66.0000	153.0000
11	150.0000	172.0000
12	220.0000	156.0000
13	330.0000	184.0000

A13 SCHL 1492.000 0.000 1 280300.000 1000600.000
JICA May,2012
Jarar Valley 1
Somali Region Ethiopia
Jarar Valley Water Supply WDJD-2

No.	SPACING	RHO-A
1	1.5000	105.0000
2	2.1000	136.0000
3	3.0000	167.0000
4	4.2000	192.0000
5	6.0000	289.0000
6	9.0000	332.0000
7	13.5000	338.0000
8	20.0000	289.0000
9	20.0000	234.0000
10	30.0000	211.0000
11	45.0000	181.0000
12	66.0000	157.0000
13	100.0000	172.0000
14	150.0000	119.0000
15	220.0000	103.0000
16	330.0000	97.1000

DATASET: A13 NORTH: 1000600.00 EAST: 280300.00
ELEVATION: 1492.00

LAYER	RESISTIVITY	THICKNESS (meters)
1	6.70867E+01	1.20790E+00
2	7.11578E+02	4.09701E+00
3	7.41437E+01	1.05820E+01
4	4.67296E+02	1.67604E+01
5	6.76705E+01	8.97199E+01
6	1.08404E+02	

A14-1 SCHL 1487.000 0.000 1 280700.000 1001000.000
JICA May,2012
Jarar Valley 1
Somali Region Ethiopia
Jarar Valley Water Supply WDJD-2

Data S.1.6 : VES prospecting measurement data(VES data, Structure Inversion data) (4/10)

No.	SPACING	RHO-A
1	1.5000	30.8100
2	2.1000	29.6400
3	3.0000	33.6200
4	4.2000	36.5900
5	6.0000	39.9300
6	9.0000	44.4500
7	13.5000	48.6500
8	20.0000	73.3400
9	20.0000	61.9000
10	30.0000	93.7000
11	30.0000	82.7300
12	45.0000	91.2200
13	66.0000	87.6000
14	100.0000	86.9200
15	150.0000	82.1000
16	150.0000	89.8500
17	220.0000	85.6800
18	220.0000	92.3600
19	330.0000	101.6300

DATASET: A14-1 NORTH: 1001000.00 EAST: 280700.00
ELEVATION: 1487.00

LAYER	RESISTIVITY	THICKNESS (meters)
1	2.81791E+01	6.34971E+00
2	2.74699E+02	1.94110E+01
3	5.20017E+01	6.62213E+01
4	1.41250E+02	

A15-1 SCHL 1486.000 0.000 1 281100.000 1001300.000
JICA May,2012
Jarar Valley 1
Somali Region Ethiopia
Jarar Valley Water Supply WDJD-2

No.	SPACING	RHO-A
1	1.5000	6.3200
2	2.1000	7.1900
3	3.0000	10.3300
4	4.2000	14.9500
5	6.0000	21.5300
6	9.0000	32.1400
7	13.5000	35.7400
8	20.0000	42.5000
9	20.0000	39.9500
10	30.0000	46.4300
11	30.0000	45.1200
12	45.0000	51.4700
13	66.0000	55.2100
14	100.0000	53.8600
15	150.0000	49.6000
16	150.0000	63.2300
17	220.0000	64.2200
18	330.0000	71.6900

DATASET: A15-1 NORTH: 1001300.00 EAST: 281100.00
ELEVATION: 1486.00

LAYER	RESISTIVITY	THICKNESS (meters)
1	4.58147E+00	9.54343E-01
2	1.09113E+02	1.16038E+01
3	5.98732E+01	9.34489E+01
4	7.78775E+01	

A16 SCHL 1481.000 0.000 1 280300.000 1000100.000
JICA May,2012
Jarar Valley 1
Somali Region Ethiopia
Jarar Valley Water Supply WDJD-2

No.	SPACING	RHO-A
1	1.5000	451.0000
2	2.1000	440.0000
3	3.0000	354.0000
4	4.2000	295.0000
5	6.0000	234.0000
6	9.0000	164.0000
7	13.5000	157.0000
8	20.0000	127.0000
9	30.0000	128.0000
10	45.0000	127.0000
11	66.0000	114.0000
12	100.0000	91.4100
13	220.0000	125.0000
14	330.0000	122.0000

DATASET: A16 NORTH: 1000100.00 EAST: 280300.00
ELEVATION: 1481.00

LAYER	RESISTIVITY	THICKNESS (meters)
1	4.67829E+02	2.05035E+00
2	1.33250E+02	1.33160E+01
3	1.55003E+02	1.22349E+01
4	7.25139E+01	5.38579E+01
5	1.58440E+02	

A18-1 SCHL 1496.000 0.000 1 280250.000 1001000.000
JICA June,2012
Jarar Valley 1
Somali Region Ethiopia
Jarar Valley Water Supply WDJD-2

No.	SPACING	RHO-A
1	1.5000	50.8000
2	2.1000	69.5000
3	3.0000	67.1000
4	4.2000	91.9000
5	6.0000	126.0000
6	9.0000	171.0000
7	13.5000	142.0000
8	20.0000	129.0000
9	20.0000	107.0000
10	30.0000	104.0000
11	45.0000	113.0000
12	66.0000	107.0000
13	100.0000	106.0000
14	150.0000	110.0000
15	150.0000	112.0000
16	220.0000	123.0000
17	220.0000	123.0000
18	330.0000	118.0000

DATASET: A18-1 NORTH: 1001000.00 EAST: 280250.00
ELEVATION: 1496.00

LAYER	RESISTIVITY	THICKNESS (meters)
1	3.53251E+01	1.23032E+00
2	2.73207E+02	2.41168E+00
3	1.00225E+02	5.44947E+01
4	1.29704E+02	

A19 SCHL 1513.000 0.000 1 280500.000 1001300.000
JICA June,2012
Jarar Valley 1
Somali Region Ethiopia
Jarar Valley Water Supply WDJD-2

No.	SPACING	RHO-A
1	1.5000	389.0000

Data S.1.6 : VES prospecting measurement data(VES data, Structure Inversion data) (5/10)

2	2.1000	436.0000
3	3.0000	363.0000
4	4.2000	387.0000
5	6.0000	425.0000
6	9.0000	269.0000
7	20.0000	232.0000
8	20.0000	224.0000
9	30.0000	185.0000
10	45.0000	187.0000
11	66.0000	185.0000
12	150.0000	192.0000
13	150.0000	212.0000
14	220.0000	223.0000
15	220.0000	208.0000
16	330.0000	210.0000

DATASET: A19 NORTH: 1001300.00 EAST: 280500.00
ELEVATION: 1513.00

LAYER	RESISTIVITY	THICKNESS (meters)
1	3.93403E+02	1.19658E+00
2	4.30321E+02	2.96161E+00
3	1.88517E+02	5.13800E+01
4	2.12356E+02	

A20-1 SCHL 1506.000 0.000 1 280700.000 1001600.000
JICA May,2012
Jarar Valley 1
Somali Region Ethiopia
Jarar Valley Water Supply WDJD-2

No.	SPACING	RHO-A
1	1.5000	19.7300
2	2.1000	22.0100
3	3.0000	26.5200
4	4.2000	32.6800
5	6.0000	43.1700
6	9.0000	58.2600
7	13.5000	77.6900
8	20.0000	99.0600
9	20.0000	102.0000
10	30.0000	119.0000
11	30.0000	126.0000
12	45.0000	131.0000
13	66.0000	119.0000
14	100.0000	120.0000
15	150.0000	126.0000
16	150.0000	139.0000
17	220.0000	117.0000
18	220.0000	138.0000
19	330.0000	158.0000

DATASET: A20-1 NORTH: 1001600.00 EAST: 280700.00
ELEVATION: 1506.00

LAYER	RESISTIVITY	THICKNESS (meters)
1	2.53627E+01	1.84983E+00
2	2.26813E+02	3.49262E+01
3	1.14598E+02	8.75661E+01
4	1.91934E+02	

A21 SCHL 1473.000 0.000 1 281111.000 1000179.000
JICA May,2012
Jarar Valley 1
Somali Region Ethiopia
Jarar Valley Water Supply WDJD-2

No.	SPACING	RHO-A
1	1.5000	32.2200
2	2.1000	25.5400
3	3.0000	19.1100
4	4.2000	15.1100
5	6.0000	14.4000
6	9.0000	16.8800
7	13.5000	19.5900
8	20.0000	24.5000
9	20.0000	20.6800
10	30.0000	25.6500
11	30.0000	25.4700
12	45.0000	35.5700
13	66.0000	45.3700
14	100.0000	60.5900
15	150.0000	69.2300
16	150.0000	64.0400
17	220.0000	72.3200
18	220.0000	71.8400
19	330.0000	122.4200

DATASET: A21 NORTH: 1000179.00 EAST: 281111.00
ELEVATION: 1473.00

LAYER	RESISTIVITY	THICKNESS (meters)
1	3.76807E+01	7.77544E-01
2	1.04663E+01	9.13861E+00
3	8.13984E+01	3.99315E+01
4	4.82967E+01	5.95040E+01
5	5.69471E+02	

A24 SCHL 1515.000 0.000 1 280100.000 1001700.000
JICA May,2012
Jarar Valley 1
Somali Region Ethiopia
Jarar Valley Water Supply WDJD-2

No.	SPACING	RHO-A
1	1.5000	378.0000
2	2.1000	346.0000
3	3.0000	275.0000
4	4.2000	252.0000
5	6.0000	264.0000
6	9.0000	184.0000
7	13.5000	125.0000
8	20.0000	80.6000
9	30.0000	103.0000
10	45.0000	122.0000
11	66.0000	137.0000
12	100.0000	160.0000
13	150.0000	169.0000
14	150.0000	152.0000
15	220.0000	157.0000
16	220.0000	143.0000
17	330.0000	144.0000

DATASET: A24 NORTH: 1001700.00 EAST: 280100.00
ELEVATION: 1515.00

LAYER	RESISTIVITY	THICKNESS (meters)
1	2.69821E+02	4.29035E+00
2	4.57198E+01	1.17579E+01
3	1.96241E+02	4.35082E+01
4	1.11601E+02	5.68559E+01
5	1.59550E+02	

A25 SCHL 1514.000 0.000 1 280300.000 1001975.000
JICA May,2012
Jarar Valley 1
Somali Region Ethiopia
Jarar Valley Water Supply WDJD-2

No.	SPACING	RHO-A

Data S.1.6 : VES prospecting measurement data(VES data, Structure Inversion data) (6/10)

1	1.5000	91.5000
2	2.1000	109.0000
3	3.0000	93.0000
4	4.2000	74.0000
5	6.0000	67.9000
6	9.0000	64.6000
7	13.5000	67.7000
8	20.0000	66.7000
9	20.0000	69.5000
10	30.0000	80.8000
11	30.0000	80.9000
12	45.0000	104.0000
13	66.0000	117.0000
14	100.0000	128.0000
15	150.0000	137.0000
16	150.0000	128.0000
17	220.0000	140.0000
18	330.0000	136.0000

DATASET: A25 NORTH: 1001975.00 EAST: 280300.00
ELEVATION: 1514.00

LAYER	RESISTIVITY	THICKNESS (meters)
1	3.81678E+01	2.33067E-01
2	1.79018E+02	6.44467E-01
3	5.66309E+01	1.49768E+01
4	1.59961E+02	5.36016E+01
5	1.16933E+02	5.33085E+01
6	1.48796E+02	

A26 SCH 1471.000 0.000 1 280624.000 999882.000
JICA May,2012
Jarar Valley 1
Somali Region Ethiopia
Jarar Valley Water Supply WDJD-2

No.	SPACING	RHO-A
1	1.5000	188.2600
2	2.1000	214.3200
3	3.0000	235.8200
4	4.2000	178.5800
5	6.0000	186.8400
6	9.0000	159.1400
7	20.0000	98.2100
8	30.0000	96.5500
9	45.0000	98.1300
10	66.0000	105.5700
11	100.0000	82.7100
12	150.0000	54.3800
13	220.0000	65.4200
14	220.0000	93.1500
15	330.0000	91.7200

DATASET: A26 NORTH: 999882.00 EAST: 280624.00
ELEVATION: 1471.00

LAYER	RESISTIVITY	THICKNESS (meters)
1	2.17530E+02	4.24685E-01
2	3.27264E+02	3.91171E+00
3	9.71790E+01	1.04836E+01
4	2.45779E+02	2.14743E+01
5	5.30318E+01	8.15760E+01
6	1.45406E+02	

A27 SCHL 1470.000 0.000 1 280756.000 1000042.000
JICA May,2012
Jarar Valley 1
Somali Region Ethiopia
Jarar Valley Water Supply WDJD-2

No.	SPACING	RHO-A
1	1.5000	49.9000
2	2.1000	39.1900
3	3.0000	38.5600
4	4.2000	47.4800
5	6.0000	47.4600
6	13.5000	46.6000
7	20.0000	61.4900
8	30.0000	64.5000
9	45.0000	62.8200
10	66.0000	66.2200
11	100.0000	66.8100
12	150.0000	91.8200
13	220.0000	84.9600
14	330.0000	84.8800

DATASET: A27 NORTH: 1000042.00 EAST: 280756.00
ELEVATION: 1470.00

LAYER	RESISTIVITY	THICKNESS (meters)
1	3.18055E+02	3.50647E-01
2	2.96786E+01	1.32119E+00
3	5.95706E+01	2.96766E+01
4	5.69582E+01	2.20768E+01
5	1.54437E+02	7.89785E+01
6	5.40593E+01	

A28 SCHL 1471.000 0.000 1 280750.000 1000385.000
JICA May,2012
Jarar Valley 1
Somali Region Ethiopia
Jarar Valley Water Supply WDJD-2

No.	SPACING	RHO-A
1	1.5000	114.0200
2	2.1000	133.7400
3	3.0000	130.8700
4	4.2000	92.5000
5	6.0000	74.2600
6	20.0000	54.2800
7	20.0000	51.2500
8	30.0000	65.9400
9	45.0000	77.2000
10	66.0000	73.0900
11	100.0000	70.9300
12	150.0000	60.8000
13	150.0000	79.8800
14	220.0000	64.8400
15	220.0000	76.3900
16	330.0000	80.4400

DATASET: A28 NORTH: 1000385.00 EAST: 280750.00
ELEVATION: 1471.00

LAYER	RESISTIVITY	THICKNESS (meters)
1	3.42743E+01	1.50233E-01
2	3.73347E+02	1.21468E+00
3	2.87951E+01	4.24544E+00
4	1.79166E+02	3.97308E+01
5	4.48902E+01	1.07483E+02
6	1.44536E+02	

A29 SCHL 1470.000 0.000 1 281150.000 1000700.000
JICA May,2012
Jarar Valley 1
Somali Region Ethiopia
Jarar Valley Water Supply WDJD-2

No.	SPACING	RHO-A
1	1.5000	19.0200

Data S.1.6 : VES prospecting measurement data(VES data, Structure Inversion data) (7/10)

2	2.1000	32.6500
3	3.0000	38.0900
4	4.2000	43.1200
5	6.0000	49.6000
6	9.0000	66.2900
7	13.5000	46.9900
8	20.0000	61.7000
9	30.0000	83.2000
10	45.0000	114.7700
11	66.0000	98.7700
12	100.0000	89.6600
13	150.0000	77.7200
14	150.0000	56.7100
15	220.0000	71.6200
16	220.0000	53.0500
17	330.0000	62.6600

DATASET: A29 NORTH: 1000700.00 EAST: 281150.00
ELEVATION: 1470.00

LAYER	RESISTIVITY	THICKNESS (meters)
1	2.92023E+00	3.10639E-01
2	9.57864E+01	1.41670E+00
3	1.21681E+01	4.05985E+00
4	1.77313E+02	1.42427E+01
5	1.65080E+01	5.45143E+01
6	2.13824E+02	

Qaaxo-South Area

B01 SCHL 1424.000 0.000 1 282185.000 994671.000
JICA May,2012
Jarar Valley 1
Somali Region Ethiopia
Jarar Valley Water Supply PASI

No.	SPACING	RHO-A
1	1.5000	118.0000
2	2.1000	137.0000
3	3.0000	171.0000
4	4.2000	153.0000
5	6.0000	99.8000
6	9.0000	39.9000
7	13.5000	15.4000
8	20.0000	9.8000
9	20.0000	8.7000
10	30.0000	16.1000
11	30.0000	12.3000
12	45.0000	18.9000
13	66.0000	26.4000
14	100.0000	34.4000
15	150.0000	37.1000
16	150.0000	32.3000
17	220.0000	33.8000
18	330.0000	39.2000

DATASET: B01 NORTH: 994671.00 EAST: 282185.00
ELEVATION: 1424.00

LAYER	RESISTIVITY	THICKNESS (meters)
1	4.43503E+00	5.99510E-02
2	4.62834E+02	6.18319E-01
3	1.47709E+00	4.09571E+00
4	1.76105E+02	4.59705E+01
5	1.39738E+01	

B02 SCHL 1424.000 0.000 1 282475.000 994631.000
JICA May,2012
Jarar Valley 1
Somali Region Ethiopia
Jarar Valley Water Supply PASI

No.	SPACING	RHO-A
1	1.5000	209.0000
2	2.1000	216.0000
3	3.0000	195.0000
4	4.2000	159.0000
5	6.0000	64.1000
6	9.0000	10.9000
7	13.5000	10.0000
8	20.0000	11.9000
9	20.0000	10.9000
10	30.0000	15.6000
11	30.0000	14.4000
12	45.0000	18.0000
13	66.0000	23.1000
14	100.0000	30.0000
15	220.0000	41.8000
16	220.0000	40.3000
17	330.0000	47.0000

DATASET: B02 NORTH: 994631.00 EAST: 282475.00
ELEVATION: 1424.00

LAYER	RESISTIVITY	THICKNESS (meters)
1	2.50293E+01	8.82862E-02
2	4.84491E+02	8.21003E-01
3	1.72453E+00	3.01224E+00
4	6.12076E+01	2.73669E+01
5	3.53454E+01	8.09933E+01
6	8.40882E+01	

B03 SCHL 1427.000 0.000 1 282709.000 994579.000
JICA May,2012
Jarar Valley 1
Somali Region Ethiopia
Jarar Valley Water Supply PASI

No.	SPACING	RHO-A
1	1.5000	144.0000
2	2.1000	118.0000
3	3.0000	113.0000
4	4.2000	104.0000
5	6.0000	82.7000
6	9.0000	64.0000
7	13.5000	72.5000
8	20.0000	71.3000
9	20.0000	74.6000
10	30.0000	62.8000
11	30.0000	65.9000
12	45.0000	60.1000
13	66.0000	56.1000
14	100.0000	52.4000
15	150.0000	47.1000
16	150.0000	55.1000
17	220.0000	45.6000
18	220.0000	52.3000
19	330.0000	54.1000

DATASET: B03 NORTH: 994579.00 EAST: 282709.00
ELEVATION: 1427.00

LAYER	RESISTIVITY	THICKNESS (meters)
1	5.08140E+02	4.24605E-01
2	1.15638E+02	6.07463E-01
3	3.30912E+02	8.78740E-01
4	4.89617E+01	1.98724E+00
5	1.42718E+02	6.50814E+00
6	7.15810E+01	6.02758E+01
7	4.74523E+01	

Data S.1.6 : VES prospecting measurement data(VES data, Structure Inversion data) (8/10)

B04 SCHL 1435.000 0.000 1 282973.000 994542.000
JICA May,2012
Jarar Valley 1
Somali Region Ethiopia
Jarar Valley Water Supply PASI

No.	SPACING	RHO-A
1	1.5000	196.0000
2	2.1000	183.0000
3	3.0000	121.0000
4	4.2000	60.2000
5	6.0000	43.5000
6	9.0000	48.4000
7	13.5000	49.8000
8	20.0000	63.8000
9	20.0000	55.7000
10	30.0000	75.3000
11	30.0000	65.2000
12	45.0000	65.3000
13	66.0000	78.6000
14	100.0000	75.2000
15	150.0000	78.8000
16	150.0000	77.4000
17	220.0000	74.7000
18	220.0000	72.7000
19	330.0000	67.9000

DATASET: B04 NORTH: 994542.00 EAST: 282973.00
ELEVATION: 1435.00

LAYER	RESISTIVITY	THICKNESS (meters)
1	1.90384E+02	1.27438E+00
2	1.92859E+01	4.19655E+00
3	8.52534E+01	6.53315E+01
4	6.41092E+01	

B05 SCHL 1444.000 0.000 1 283303.000 994487.000
JICA May,2012
Jarar Valley 1
Somali Region Ethiopia
Jarar Valley Water Supply PASI

No.	SPACING	RHO-A
1	1.5000	316.0000
2	2.1000	238.0000
3	3.0000	149.0000
4	4.2000	76.6000
5	6.0000	48.8000
6	9.0000	20.9000
7	13.5000	25.6000
8	20.0000	31.0000
9	20.0000	34.4000
10	30.0000	40.7000
11	30.0000	45.5000
12	45.0000	51.2000
13	66.0000	63.0000
14	100.0000	80.6000
15	150.0000	90.6000
16	150.0000	88.6000
17	220.0000	86.2000
18	220.0000	86.5000
19	330.0000	82.5000

DATASET: B05 NORTH: 994487.00 EAST: 283303.00
ELEVATION: 1444.00

LAYER	RESISTIVITY	THICKNESS (meters)
1	4.19972E+02	1.44626E+00
2	2.41628E+01	1.07096E+01
3	1.01662E+02	1.97362E+02
4	4.16228E+01	

B06 SCHL 1426.000 0.000 1 282521.000 994859.000
JICA May,2012
Jarar Valley 1
Somali Region Ethiopia
Jarar Valley Water Supply PASI

No.	SPACING	RHO-A
1	1.5000	197.0000
2	2.1000	207.0000
3	3.0000	195.0000
4	4.2000	213.0000
5	6.0000	202.0000
6	9.0000	129.0000
7	13.5000	38.9000
8	20.0000	21.9000
9	20.0000	19.4000
10	30.0000	24.9000
11	30.0000	21.0000
12	45.0000	29.7000
13	66.0000	37.7000
14	100.0000	43.6000
15	150.0000	54.7000
16	150.0000	40.7000
17	220.0000	65.9000
18	220.0000	42.4000
19	330.0000	44.8000

DATASET: B06 NORTH: 994859.00 EAST: 282521.00
ELEVATION: 1426.00

LAYER	RESISTIVITY	THICKNESS (meters)
1	5.72244E+01	1.07846E+00
2	2.07456E+02	1.36748E+00
3	3.03335E+00	7.71093E+00
4	4.33495E+01	1.24559E+02
5	1.50623E+02	

B07 SCHL 1432.000 0.000 1 282873.000 994911.000
JICA May,2012
Jarar Valley 1
Somali Region Ethiopia
Jarar Valley Water Supply PASI

No.	SPACING	RHO-A
1	1.5000	82.9000
2	2.1000	49.8000
3	3.0000	44.0000
4	4.2000	33.0000
5	6.0000	22.2000
6	9.0000	17.9000
7	13.5000	17.5000
8	20.0000	20.0000
9	20.0000	27.6000
10	30.0000	21.5000
11	30.0000	29.7000
12	45.0000	37.3000
13	66.0000	47.7000
14	100.0000	61.8000
15	150.0000	68.1000
16	150.0000	63.8000
17	220.0000	76.0000
18	220.0000	69.0000
19	330.0000	69.0000

DATASET: B07 NORTH: 994911.00 EAST: 282873.00
ELEVATION: 1432.00

Data S.1.6 : VES prospecting measurement data(VES data, Structure Inversion data) (9/10)

LAYER	RESISTIVITY	THICKNESS (meters)
1	1.33322E+02	1.38163E+00
2	2.46380E+01	4.47743E+00
3	6.00438E+01	3.56965E+00
4	1.27396E+01	1.21035E+01
5	1.06872E+02	1.71356E+02
6	2.70263E+01	

B08 SCHL 1438.000 0.000 1 283265.000 994854.000
JICA May,2012
Jarar Valley 1
Somali Region Ethiopia
Jarar Valley Water Supply PASI

No.	SPACING	RHO-A
1	1.5000	148.0000
2	2.1000	131.0000
3	3.0000	107.0000
4	4.2000	98.5000
5	6.0000	82.2000
6	9.0000	73.0000
7	13.5000	61.0000
8	20.0000	65.2000
9	20.0000	75.8000
10	30.0000	56.3000
11	30.0000	67.7000
12	45.0000	65.9000
13	66.0000	63.1000
14	100.0000	70.2000
15	150.0000	68.9000
16	150.0000	75.2000
17	220.0000	68.4000
18	220.0000	75.1000
19	330.0000	77.3000

DATASET: B08 NORTH: 994854.00 EAST: 283265.00
ELEVATION: 1438.00

LAYER	RESISTIVITY	THICKNESS (meters)
1	2.71109E+02	1.24904E+00
2	1.20890E+02	1.17127E+01
3	4.31792E+01	9.49452E+00
4	9.11187E+01	7.39783E+01
5	6.76200E+01	

B09 SCHL 1442.000 0.000 1 283601.000 994817.000
JICA May,2012
Jarar Valley 1
Somali Region Ethiopia
Jarar Valley Water Supply PASI

No.	SPACING	RHO-A
1	1.5000	56.5000
2	2.1000	34.1000
3	3.0000	21.9000
4	4.2000	18.3000
5	6.0000	19.1000
6	9.0000	21.9000
7	13.5000	27.0000
8	20.0000	33.9000
9	20.0000	31.9000
10	30.0000	44.9000
11	30.0000	43.1000
12	45.0000	57.0000
13	66.0000	69.8000
14	100.0000	91.1000
15	150.0000	105.0000
16	150.0000	107.0000
17	220.0000	115.0000
18	220.0000	120.0000
19	330.0000	109.0000

DATASET: B09 NORTH: 994817.00 EAST: 283601.00
ELEVATION: 1442.00

LAYER	RESISTIVITY	THICKNESS (meters)
1	1.45111E+02	5.82669E-01
2	1.65343E+01	8.25640E+00
3	1.65259E+02	1.72908E+02
4	3.41424E+01	

VES3 SCHL 1408.000 0.000 1 282176.000 995006.000
UNHCR Aug,2011
Jarar Valley 1
Somali Region Ethiopia
Sit Hydrogeological Investigat

No.	SPACING	RHO-A
1	1.0000	62.4000
2	2.0000	29.6700
3	3.0000	23.0500
4	4.0000	19.8500
5	5.0000	16.7200
6	10.0000	12.3400
7	10.0000	12.2900
8	15.0000	12.9800
9	20.0000	18.9300
10	20.0000	19.0100
11	30.0000	24.1100
12	30.0000	23.9500
13	50.0000	29.6700
14	80.0000	32.8100
15	100.0000	32.7700
16	100.0000	32.7700
17	150.0000	34.5800
18	200.0000	37.1600
19	250.0000	38.2900
20	250.0000	38.2900
21	300.0000	37.7400
22	350.0000	38.5800
23	400.0000	38.9800
24	450.0000	39.9900

DATASET: VES3 NORTH: 995006.00 EAST: 282176.00
ELEVATION: 1408.00

LAYER	RESISTIVITY	THICKNESS (meters)
1	1.32000E+02	1.44000E+00
2	9.88991E+00	1.26814E+01
3	6.73530E+01	6.28563E+01
4	3.47166E+01	

VES4 SCHL 1408.000 0.000 1 282223.000 994265.000
UNHCR Aug,2011
Jarar Valley 1
Somali Region Ethiopia
Sit Hydrogeological Investigat

No.	SPACING	RHO-A
1	1.0000	58.3900
2	2.0000	25.6600
3	3.0000	19.0400
4	4.0000	15.8300
5	5.0000	12.7100
6	10.0000	8.3300
7	10.0000	8.2800
8	15.0000	8.9700
9	20.0000	11.0400

Data S.1.6 : VES prospecting measurement data(VES data, Structure Inversion data) (10/10)

10	20.0000	11.1200
11	30.0000	16.2200
12	30.0000	16.0600
13	50.0000	21.7800
14	80.0000	25.9200
15	100.0000	24.8800
16	100.0000	24.8800
17	150.0000	26.6900
18	200.0000	29.2700
19	250.0000	30.4000
20	250.0000	30.4000
21	300.0000	29.8500
22	350.0000	30.6900
23	400.0000	31.0900
24	450.0000	31.7900

DATASET: VES4 NORTH: 994265.00 EAST: 282223.00
ELEVATION: 1408.00

LAYER	RESISTIVITY	THICKNESS (meters)
1	1.48000E+02	3.70400E-01
2	2.44000E+01	1.61000E+00
3	7.32000E+00	1.04000E+01
4	3.52000E+01	1.54000E+02
5	2.94000E+01	

Supporting Report

2. Well Drilling Survey

2. Well Drilling Survey

Data S.2.1 : Well Drilling Data of JICA Well No.1

WELL DRILLING DATA Jarar Valley JICA Well No-1

Well No.	JICA Well No. 1	Drilling Diameter	305 mm	Static Water Level	85.02 m
Location	Farda	Casing Diameter	200 mm	Water Struck at	110 & 113 m
Easting	281111	Drilling Depth	202.0 m	Drilling method	Mud ,Air Rotary & DTH
Northing	1000180	Well Depth	202.0 m		
Altitude	ab. 1447 m				

Depth(m)	Geology	Colour	Drill Rate (min/m)	Well Structure	Remark	Depth(m)
0	**Top Soil** Sandy clay	Black			Surface casing 21 m length 13" in diameter installed	0
4						
5	**Sandy clay** fine to medium grained 90 % clay 10 % gravel limestone origin	Brownish	72			5
10			77			10
14						
15	**Limestone with clay soil** **(Top Soil Zone until 21m)** 95 % limestone composition whitish color , gravel size, moderately fractured,	Brownish	70			15
20	5 % clay soil, Brownish color, fine grained		99			20
21					0-21 m depth drilling using 17" in diameter tri-con bit using mud drilling system	21
25	**21-32m, Transition Zone,**		20			25
30	between Top soil & Limestone Brownish color, moderately fractured and weathered		26			30
32						
35	**Limestone** coarse grained Rounded to subrounded	Whitish	24		Drilling method changed from mud drilling system	35
40	higly fractured Maximum grain size 2-3 cm		18		to DTH drilling system starting from 21 m to 68 m in depth about 40m-50m zone some cave	40
45	**continued same limestone**		29			45
49	**continued same limestone**					
50			40			50

Depth(m)	Geology	Colour	Drill Rate (min/m)	Well Structure	Remark	Depth(m)
50						50
	continued same limestone					
55			32			55
	continued same limestone					
60			33			60
	continued same limestone					
65			28			65
	continued same limestone				Drilling Method changed from DTH drilling method to Mud rotary drilling method	
70			93			70
	Limestone Moderately weathered fine to medium grain size	Yellowish			from 68 - 74 m in depth	
72						72
74	**Limestone** Highly fractured	Yellowish			Drilling Method changed from Mud rotary to Air rotary starting from 74 m in depth	
75			175			75
	moderately weathered coarse grained angular to sub angular grain shape					
80	**No Sample until 86m**		48			80
	There is circulation loss, so no sample recovered from 74 m to 86 m depth					
85			42		**SWL 85.02 m** ∇	85
86						
	Limestone Fine grained moderately weathered	Yellowish				
90			57			90
	Continue Limestone					
95			61			95
	Continue Limestone					
100			60			100

Depth(m)	Geology	Colour	Drill Rate (min/m)	Well Structure	Remark	Depth(m)
100						100
	Continue Limestone					
105			66			105
	Limestone/Sandstone					
108						
	Sandstone	Dark				
110	fine grained	Greyish	62		Main water strike zone	110
	slightly weathered				starting from 110 m depth, Boundary of Limstone and Sandstone	
113						113
114	**Gravel and pebble**	Light				
115	Sandstone with Limestone origin	yellowish	80			115
	Highly weathred & fractured rounded to subrounded grain shape					
117	Maximum grain size 3-4 cm					
120	**Sandstone**	Light	81			120
	coarse grained	Greyish				
	No Sample Recovered b/c of circulation loss **117m-141m is No Sample**					
125			66			125
	May be Sandstone Continue					
130			79			130
135			48			135
140			65			140
141						
	Sandstone medium to coarse grained	Light grey				
145			81			145
149						
150	No sample from 149m		58			150

Depth(m)	Geology	Colour	Drill Rate (min/ m)	Well Structure	Remark	Depth(m)
150						150
	There is no sample recovered because of circulation loss from 149 - 188 m depth The drilling method is air rotary					151
155			59			155
160			141			160
	There is no sample recovered because of circulation loss from 149 - 188 m depth The drilling method is air rotary					
165			92			165
170			93			170
	There is no sample recovered because of circulation loss from 149 - 188 m depth The drilling method is air rotary					
175			137			175
180			134			180
	There is no sample recovered because of circulation loss from 149 - 188 m depth The drilling method is air rotary					
185			120			185
190			117			190
	There is no sample recovered because of circulation loss from 188 - 291 m depth The drilling method is air rotary					
195			79			195
	No Sample					
200	**Sandstone**		59			200
	201-202m: grain to gravel size, light grey					
202			56			202

S.2.2 : Well Drilling Data of JICA Well No.2

WELL DRILLING DATA Jarar Valley at Site No-2

Well No.	JICA Well No. 2	Drilling Diameter	305 mm	Static Water Leve	86.54 m
Location	Farda	Casing Diameter	200 mm	Water Struck at	36 ,151 & 173 m
Easting	280744	Drilling Depth	201.0 m	Drilling method	Mud & Air rotary
Northing	1000003	Well Depth	201.0 m		
Altitude	1448 m				

Depth(m)	Geology	Colour	Drill Rate (min/m)	Well Structure	Remark	Depth(m)
0	**Top Soil,sandy**	Brownish			Surface Casing 13 " in diameter and 5 m length	0
2	**Silty sand** fine grained	Yellowish				
	Limestone	Whitish				
5	Very fine grined		372		Drilling using 17" in diameter tri-con bit up to 5 m depth	5
	Massive					
	Sand with Limestone(5m-9m) Moderately weathered	Yellowish				
9	weathering limestone zone					9
10	**Sand with Limestone(9m-14m)**	Greyish	647			10
12	fine grained					
	Probably Limestone origin					
14						
15	**Weathering Limestone Zone continue 43m**	Yellowish	313			15
	medium to fine grained					
	Slightly weathered					
20			334			20
		Whitish				
	Fine grained					
23	massive					
		Yellowish				
25	Medium to coarse grained		394			25
	slightly weathered					
29						
30	weathering Limestone Zone	Whitish	322			30
	fine grained massive					
	weathering Limestone Zone	Light Yellowish				
	Medium to coarse grained					
35	Slightly weathered		297			35
37						
	weathering Limestone Zone	Whitish				
	fine grained					
40	massive		323			40
41	**(40-41 m) yellowish**					
	Limestone	Whitish				
45	fine grained		227			45
	massive					
48						
	Limestone	Yellowish				
50	fine grained		308			50

Depth(m)	Geology	Colour	Drill Rate (min/m)	Well Structure	Remark	Depth(m)
50	moderately weathered					50
53						
	Marl	Yellow				
55	muddy,sticky		408			55
	very fine grained					
60			396			60
65			422			65
66	**Marly limestone(66-79m)**	Yellowish				66
68	coarse grained					
	angular to subrounded					
	moderately fractured					
70	**Marl**	Yellowish	440			70
	muddy,sticky					
	fine grained					
	Limestone	Light Yellow				
	medium to coarse grained					
75	moderately fractured & weathered		300			75
	small amount of greenish					
	material probably shale					
78						
	Marly Sandstone(78-84m)	Yellowish				
80	sticky, muddy		264			80
	fine grained					
84						
85	**Weathering Limestone(84m-96m)**	Light Yellowish	343		Big amount of water strike	85
	Highly weathered and fractured				**SWL 86.54** ▽	86
	coarse grained					88
	30% marl					
90	70 % limestone coarse grained		155			90
	and fractured					
95			225			95
96						
	Marl	Yellowish				
98	Very fine to fine				Sample taken 100 m depth	
	Limestone	Yellowish			Temprature 28.5°c	
100	moderately fractured and		169		EC :191.5 mS/m	100

Depth(m)	Geology	Colour	Drill Rate (min/m)	Well Structure	Remark	Depth(m)
100						100
	weathered					
102	coarse grained					
	Shale(103m-108m)	Dark grey				
	compose 10 % limestone				Bit jamming occurred during	104
105	medium to fine grained		236		mud drilling at the depth	105
	moderately weathered				of 104 m and pulled out by the help of compressor air	
108						108
	Massive Limestone with	Light grey			The Drilling method changed	
110	**Sand(108m-130m)**		189		from mud rotary to air rotary	110
	fine grained				at depth of 108 m	
112	probably shale and limestone					
	origin	Dark grey				
115	**Massive Sandy Limestone**		50			115
	medium to fine grained					
	massive					
120			87			120
125			64			125
130	Alternation of very fine to fine		41			130
	and coarse sandstone, with	Greyish yellow				
	fractured sandstone(130-134m)					
	medium to coarse grained					
135	moderately weathered		85			135
	Sandstone:134-141m(Fine sandstone)	Greyish or Dark green gray				
	fine grained					
140	slightly weathered		59			140
141	**141-143m Coarse Sandstone,**					
	fine grained, moderately weathered	Light grey				
144						
145	**143-147m Fine sandstone**	Greyish yellow	83			145
	fine grained					
147	slightly weathered					
	147-158m Very Fine Sandstone	Light Greyish				
	fine to medium grained					
150	moderately weathered		52			150

Depth(m)	Geology	Colour	Drill Rate (min/m)	Well Structure	Remark	Depth(m)
150						150
	147-158m Very Fine Sandstone fine to medium grained moderately weathered				Big amount of water strike zone(151m)	151
155			26			155
158						
	158-162m Very Fine Sandstone fine grained slightly weathered	Greyish yellow				
160			147			160
162						
	162-174m Medium sandstone medium to coarse grained	Dark Grey				
165			83			165
170			78			170
172						
	Sandstone Moderately weathered and fractured, coarse grained 174-177m coarse sandstone(dark gray)	Dark Grey			Big amount of water strike zone	173
175			124			175
177						
	Sandstone fine grained 177-197m fine sandstone(Dark gray)	Dark Grey				
180			147			180
185			120			185
190			79			190
195			84			195
197						
	Sandstone 197-201m medium & grained	Dark Grey				
200			149			200
201			22			201

Data S.2.3 : Electrical logging data of JICA Well No.1

Well No: JICA Well No.1
Date: July 25, 2012

Depth (GL-m)	Resistivity (Ohm-m)		SP(mv)
	Short Normal	Long Normal	
75	855	2306	-81.3
76	170.2	947.3	-87.6
77	124.7	64.3	-95.5
78	115.2	63.2	-97.6
79	102.3	42.98	-95
80	119.3	48.8	-96.7
81	117.3	60.4	-90.5
82	100.9	43.1	-94.5
83	87.6	43.3	-92.6
84	78.7	40.8	-91
85	100.7	63	-95
86	115.5	41.9	-92.1
87	109.2	44.7	-90.9
88	89	41.4	-91
89	80.1	40.2	-90.6
90	78.8	40.9	-92
91	58.7	42.9	-91.2
92	73.8	42.8	-93.8
93	73.9	49.9	-92.9
94	54.3	21.5	-90.9
95	46.3	18.8	-88.4
96	39.6	21.7	-89.7
97	52.6	14.1	-87
98	46.5	14.7	-83.9
99	47.3	13.4	-85
100	50.3	16	-85.3
101	51.1	15.4	-84.2
102	40.4	14.7	-83.1
103	48	14	-83.4
104	34	12.3	-82.6
105	52.9	14.9	-84.4
106	45.9	14.9	-82.8
107	51.5	15.9	-82.3
108	48.4	14.9	-82.2
109	36.7	14.4	-81.5
110	50.9	14.6	-80.4
111	52.7	17.3	-81.6
112	62	19.1	-80.7
113	59.4	21.2	-81.5
114	63.6	22.2	-81.3
115	66.5	23.6	-83.2
116	71.4	26.7	-80.8
117	89.8	25.5	-82.1
118	74.9	28.4	-80
119	62.2	24	-81.4
120	39.2	17.4	-79.6
121	29.2	12.9	-80.4
122	43.4	12.7	-78.9
123	54.4	15.9	-80.1
124	70.9	20.9	-76.7

Data S.2.3 : Electrical logging data of JICA Well No.1

Well No: JICA Well No.1
Date: July 25, 2012

Depth (GL-m)	Resistivity (Ohm-m)		SP(mv)
	Short Normal	Long Normal	
125	78.2	25	-78.1
126	83.3	27.7	-75.3
127	65.3	26.2	-79.2
128	76	27.2	-77.6
129	71	25.4	-79.1
130	64.8	25.9	-77.2
131	72.7	23.6	-75.2
132	58.9	22.7	-74.6
133	54.9	20.6	-74
134	58.3	20.9	-73.6
135	49.6	19	-74.2
136	63.4	20.2	-72.1
137	51.7	19.5	-74.8
138	66.5	20.7	-72.9
139	67.4	24.9	-71.9
140	80.9	26.9	-71.6
141	83.1	28.2	-72.2
142	66.4	26.2	-71
143	52.3	21.6	-70.1
144	23.5	11.6	-66.6
145	32.2	12.9	-68.3
146	61.1	14.1	-69.4
147	65.6	23.7	-70.8
148	73.5	25.1	-67.8
149	64.8	25.3	-66.1
150	46.8	20.8	-63.1
151	40.8	18	-64.9
152	59.9	16.7	-68.9
153	53.1	20.2	-70.7
154	57.1	19.5	-68.2
155	61.2	22.3	-66.5
156	53.5	20.6	-64
157	53.1	20.2	-62.7
158	57.1	19.5	-63
159	61.2	22.3	-64.8
160	53.5	20.6	-65.7
161	46.7	19.7	-65.7
162	49.6	18.8	-62.5
163	47.6	17.8	-62
164	56	20.2	-53.9
165	57.2	20.5	-56.4
166	56.8	21	-54.8
167	51.4	20.5	-55.4
168	51.2	20.2	-54.5
169	48.6	19.4	-53.3
170	50.7	18.9	-52.4
171	42.8	15	-49.1
172	22.9	11.7	-50.9
173	24.2	9.8	-46.8
174	55.9	12.1	-48

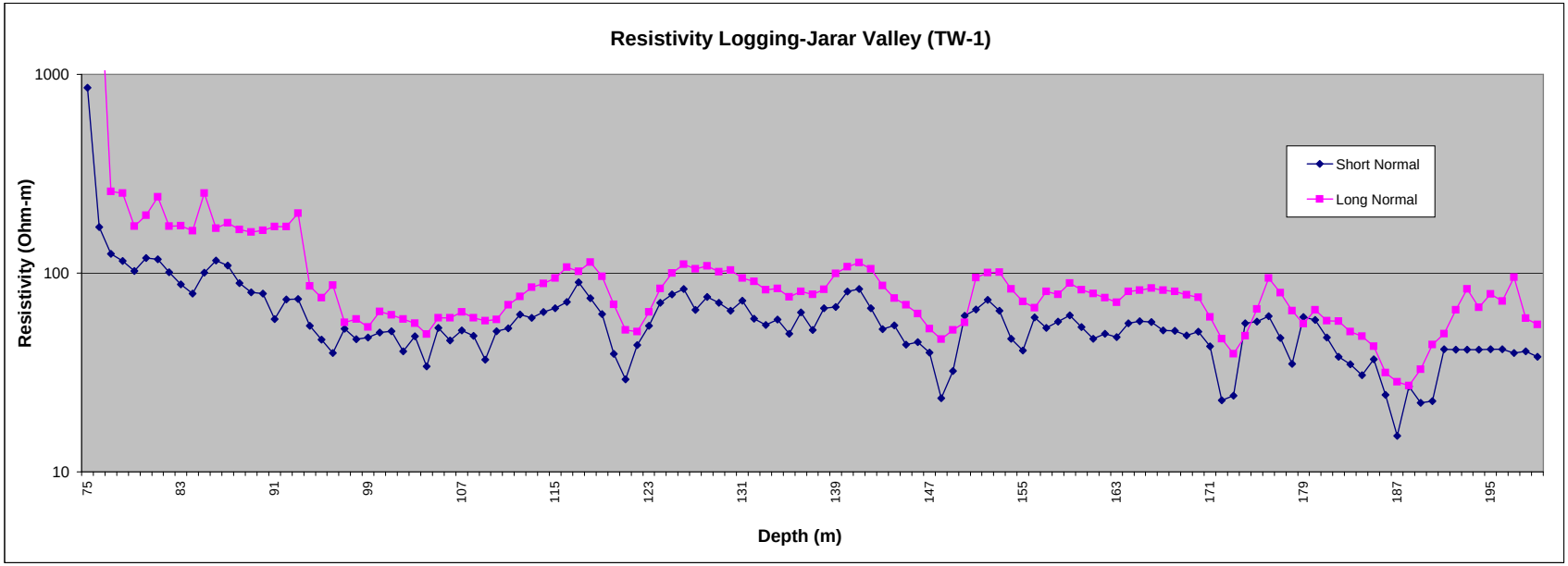
Data S.2.3 : Electrical logging data of JICA Well No.1

Well No: **JICA Well No.1**
Date: **July 25, 2012**

Depth (GL-m)	Resistivity (Ohm-m)		SP(mv)
	Short Normal	Long Normal	
175	57	16.5	-36.6
176	60.6	23.6	-36.2
177	47.2	19.9	-39.1
178	34.9	16.2	-41.9
179	60	13.9	-40.9
180	58	16.3	-33.5
181	47.3	14.4	-35.4
182	38	14.3	-35.5
183	34.7	12.7	-35.1
184	30.6	12	-38
185	36.9	10.7	-37.9
186	24.4	7.89	-44.5
187	15.2	7.1	-35.1
188	26.9	6.8	-48.6
189	22.3	8.2	-43.9
190	22.7	10.9	-48.3
191	41.3	12.4	-45.5
192	41.1	16.3	-47
193	41.1	20.8	-47.9
194	41.1	16.8	-49.1
195	41.3	19.6	-49.4
196	41.4	18.1	-49.8
197	39.7	23.8	-49.7
198	40.4	14.8	-50.3
199	38	13.8	-51.2

Data S.2.3(2) : Electrical logging data

Resistivity Logging-Jarar Valley TW-1 (JICA Well No.1)



Depth(m)	Resistivity (Ohm-m)	
	Short Normal	Long Normal
75	855	2306
76	170.2	947.3
77	124.7	64.3
78	115.2	63.2
79	102.3	42.98
80	119.3	48.8
81	117.3	60.4
82	100.9	43.1
83	87.6	43.3
84	78.7	40.8
85	100.7	63
86	115.5	41.9
87	109.2	44.7
88	89	41.4
89	80.1	40.2
90	78.8	40.9
91	58.7	42.9
92	73.8	42.8
93	73.9	49.9
94	54.3	21.5
95	46.3	18.8
96	39.6	21.7
97	52.6	14.1
98	46.5	14.7
99	47.3	13.4
100	50.3	16

	Resistivity (Ohm-m)	
Depth(m)	Short Normal	Long Normal
101	51.1	15.4
102	40.4	14.7
103	48	14
104	34	12.3
105	52.9	14.9
106	45.9	14.9
107	51.5	15.9
108	48.4	14.9
109	36.7	14.4
110	50.9	14.6
111	52.7	17.3
112	62	19.1
113	59.4	21.2
114	63.6	22.2
115	66.5	23.6
116	71.4	26.7
117	89.8	25.5
118	74.9	28.4
119	62.2	24
120	39.2	17.4
121	29.2	12.9
122	43.4	12.7
123	54.4	15.9
124	70.9	20.9
125	78.2	25
126	83.3	27.7

	Resistivity (Ohm-m)	
Depth(m)	Short Normal	Long Normal
127	65.3	26.2
128	76	27.2
129	71	25.4
130	64.8	25.9
131	72.7	23.6
132	58.9	22.7
133	54.9	20.6
134	58.3	20.9
135	49.6	19
136	63.4	20.2
137	51.7	19.5
138	66.5	20.7
139	67.4	24.9
140	80.9	26.9
141	83.1	28.2
142	66.4	26.2
143	52.3	21.6
148	23.5	11.6
149	32.2	12.9
150	61.1	14.1
151	65.6	23.7
152	73.5	25.1
153	64.8	25.3
154	46.8	20.8
155	40.8	18
156	59.9	16.7

	Resistivity (Ohm-m)	
Depth(m)	Short Normal	Long Normal
157	53.1	20.2
158	57.1	19.5
159	61.2	22.3
160	53.5	20.6
161	46.7	19.7
162	49.6	18.8
163	47.6	17.8
164	56	20.2
165	57.2	20.5
166	56.8	21
167	51.4	20.5
168	51.2	20.2
169	48.6	19.4
170	50.7	18.9
171	42.8	15
172	22.9	11.7
173	24.2	9.8
174	55.9	12.1
175	57	16.5
176	60.6	23.6
177	47.2	19.9
178	34.9	16.2
179	60	13.9
180	58	16.3
181	47.3	14.4
182	38	14.3

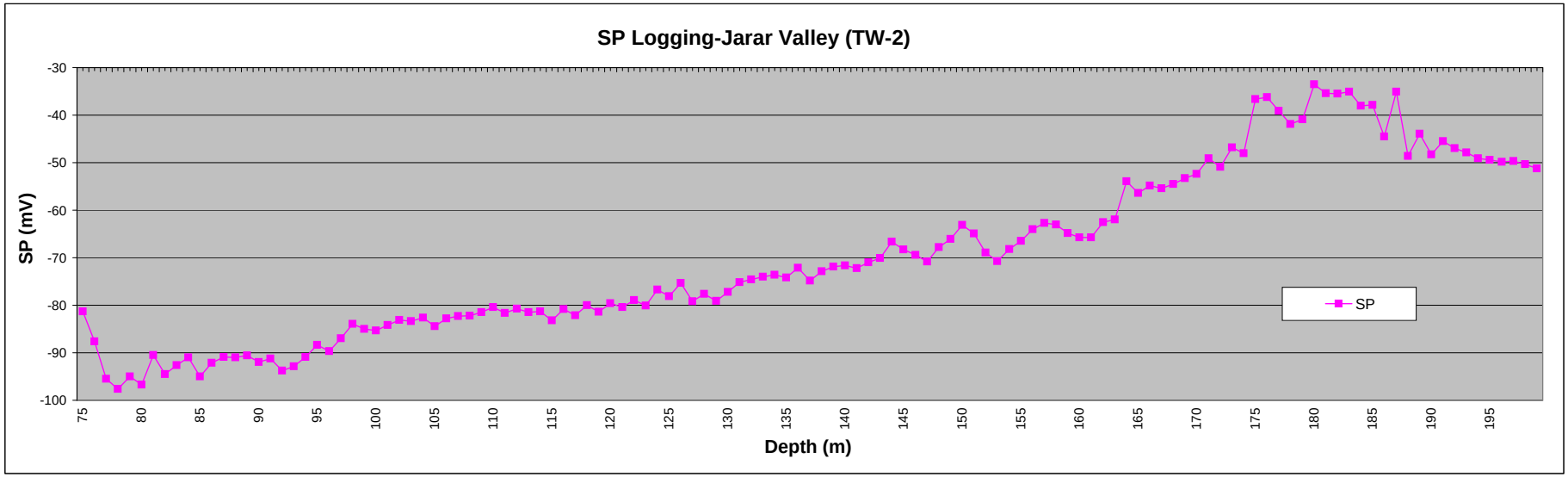
	Resistivity (Ohm-m)	
Depth(m)	Short Normal	Long Normal
183	34.7	12.7
184	30.6	12
185	36.9	10.7
186	24.4	7.89
187	15.2	7.1
188	26.9	6.8
189	22.3	8.2
190	22.7	10.9
191	41.3	12.4
192	41.1	16.3
193	41.1	20.8
194	41.1	16.8
195	41.3	19.6
196	41.4	18.1
197	39.7	23.8
198	40.4	14.8
199	38	13.8

Casing Arrangement

Depth range(m)		Blind	Screen		
202	190	2			
190	184		1		
184	178	1			
178	154		4		
154	148	1			
148	130		3		
130	124	1			
124	118		1		
118	-2	20			
	Total=	**25**	**9**	**34**	casing
				204	m

Data S.2.3(3) : Electrical logging data

SP Logging-Jarar Valley TW-2 (JICA Well-No.1)



Depth(m)	Self Potential (mV)	
		SP
75	81.3	-81.3
76	87.6	-87.6
77	95.5	-95.5
78	97.6	-97.6
79	95	-95
80	96.7	-96.7
81	90.5	-90.5
82	94.5	-94.5
83	92.6	-92.6
84	91	-91
85	95	-95
86	92.1	-92.1
87	90.9	-90.9
88	91	-91
89	90.6	-90.6
90	92	-92
91	91.2	-91.2
92	93.8	-93.8
93	92.9	-92.9
94	90.9	-90.9
95	88.4	-88.4
96	89.7	-89.7
97	87	-87
98	83.9	-83.9
99	85	-85
100	85.3	-85.3
101	84.2	-84.2
102	83.1	-83.1
103	83.4	-83.4
104	82.6	-82.6
105	84.4	-84.4
106	82.8	-82.8

Depth(m)	Self Potential (mV)	
		SP
107	82.3	-82.3
108	82.2	-82.2
109	81.5	-81.5
110	80.4	-80.4
111	81.6	-81.6
112	80.7	-80.7
113	81.5	-81.5
114	81.3	-81.3
115	83.2	-83.2
116	80.8	-80.8
117	82.1	-82.1
118	80	-80
119	81.4	-81.4
120	79.6	-79.6
121	80.4	-80.4
122	78.9	-78.9
123	80.1	-80.1
124	76.7	-76.7
125	78.1	-78.1
126	75.3	-75.3
127	79.2	-79.2
128	77.6	-77.6
129	79.1	-79.1
130	77.2	-77.2
131	75.2	-75.2
132	74.6	-74.6
133	74	-74
134	73.6	-73.6
135	74.2	-74.2
136	72.1	-72.1
137	74.8	-74.8

Depth(m)	Self Potential (mV)	
		SP
138	72.9	-72.9
139	71.9	-71.9
140	71.6	-71.6
141	72.2	-72.2
142	71	-71
143	70.1	-70.1
144	66.6	-66.6
145	68.3	-68.3
146	69.4	-69.4
147	70.8	-70.8
148	67.8	-67.8
149	66.1	-66.1
150	63.1	-63.1
151	64.9	-64.9
152	68.9	-68.9
153	70.7	-70.7
154	68.2	-68.2
155	66.5	-66.5
156	64	-64
157	62.7	-62.7
158	63	-63
159	64.8	-64.8
160	65.7	-65.7
161	65.7	-65.7
162	62.5	-62.5
163	62	-62
164	53.9	-53.9
165	56.4	-56.4
166	54.8	-54.8
167	55.4	-55.4
168	54.5	-54.5

Depth(m)	Self Potential (mV)	
		SP
169	53.3	-53.3
170	52.4	-52.4
171	49.1	-49.1
172	50.9	-50.9
173	46.8	-46.8
174	48	-48
175	36.6	-36.6
176	36.2	-36.2
177	39.1	-39.1
178	41.9	-41.9
179	40.9	-40.9
180	33.5	-33.5
181	35.4	-35.4
182	35.5	-35.5
183	35.1	-35.1
184	38	-38
185	37.9	-37.9
186	44.5	-44.5
187	35.1	-35.1
188	48.6	-48.6
189	43.9	-43.9
190	48.3	-48.3
191	45.5	-45.5
192	47	-47
193	47.9	-47.9
194	49.1	-49.1
195	49.4	-49.4
196	49.8	-49.8
197	49.7	-49.7
198	50.3	-50.3
199	51.2	-51.2

Data S.2.4 : Electrical logging data of JICA Well No.2

Well No: JICA Well No.2
Date: July 9, 2012

Depth (GL-m)	Resistivity (Ohm-m) Short Normal	Resistivity (Ohm-m) Long Normal	SP(mv)
83	60.7	76	-94.2
84	68.6	77.2	-90.5
85	103.2	79.2	-84.8
86	60.6	63.6	-80.8
87	47.4	57.6	-74.1
88	57.2	72	-81.3
89	53.9	74.4	-82.6
90	49.9	66.4	-81.5
91	42.5	53.6	-83.2
92	37.4	54.8	-82.7
93	41.8	50	-81.1
94	24.2	40	-81
95	42.8	38.4	-79.6
96	27.3	28.24	-79.8
97	32.8	50.4	-77.5
98	39.8	50.8	-79.9
99	45.5	49.6	-79.6
100	51.8	58.8	-78.1
101	50.2	57.6	-77.1
102	36.7	51.6	-77.6
103	45.7	48	-76.8
104	40.3	58.4	-77.7
105	49.9	57.2	-75.9
106	63.3	62	-75.1
107	43.2	62.8	-74.2
108	45.3	56.8	-73.5
109	47.5	54.8	-73.9
110	37.5	55.2	-72.2
111	56.7	64	-71.8
112	58	69.2	-71.4
113	60.4	78.4	-71.1
114	80.6	93.6	-72
115	69.4	88.4	-72.4
116	67.9	104	-70.9
117	76.9	91.6	-70.5
118	71.3	95.6	-69.7
119	67.3	99.2	-69
120	52.2	80.4	-68.7
121	36	64.8	-68.2
122	36.5	54.8	-67
123	41.1	55.6	-67.7
124	50.4	57.6	-67.2
125	58.2	74.4	-67.3
126	65.3	85.2	-68.2
127	64	88.4	-69.9
128	66.9	95.6	-68.6
129	76.5	104	-66.6
130	80.3	106.4	-59.7
131	79.8	109.2	-64.4

Data S.2.4 : Electrical logging data of JICA Well No.2

Well No: JICA Well No.2
Date: July 9, 2012

Depth (GL-m)	Resistivity (Ohm-m)		SP(mv)
	Short Normal	Long Normal	
132	61.4	93.2	-66.9
133	57.6	84	-67.6
134	54.4	75.2	-67.8
135	40.8	70.4	-72.1
136	38.2	65.2	-71.5
137	37.2	68	-73.6
138	53.5	67.2	-73.6
139	63.6	83.6	-75
140	70.3	87.6	-73.4
141	60.5	88.4	-71.9
142	43.2	67.6	-59.2
143	35.8	47.2	-52.3
144	36.1	44.8	-73.2
145	30.9	43.6	-73.5
146	29.4	45.2	-70.7
147	20.5	40.8	-64.3
148	34.9	40.8	-63.8
149	42.9	41.2	-59.3
150	42.3	54	-62.4
151	42.7	60.8	-60.8
152	41.8	60	-59.9
153	37.6	58	-58.8
154	36.1	53.6	-59.3
155	42.7	53.2	-54.4
156	60.3	61.6	-54.5
157	55.4	62	-55.3
158	51.3	63.2	-56.5
159	56.9	77.2	-62.2
160	45.6	67.2	-60.1
161	58.3	72.8	-57.3
162	50.3	74	-53.3
163	38.2	66.8	-52.9
164	47.2	60.8	-51.6
165	50.6	70.4	-51.1
166	55	74	-50.3
167	52.9	76.4	-50.2
168	48.3	73.2	-48.4
169	46.6	72.4	-47.2
170	43.5	66	-43.9
171	45.7	58.8	-45.5
172	21.5	39.32	-41.1
173	22.2	36.04	-43.3
174	49.8	39.2	-35.8
175	68.6	65.2	-37.5
176	65.6	88.4	-41
177	43.8	71.6	-46.2
178	57.4	61.2	-43.1
179	55.6	62	-44.5
180	49.7	58.8	-43.3
181	46.6	58	-41.9

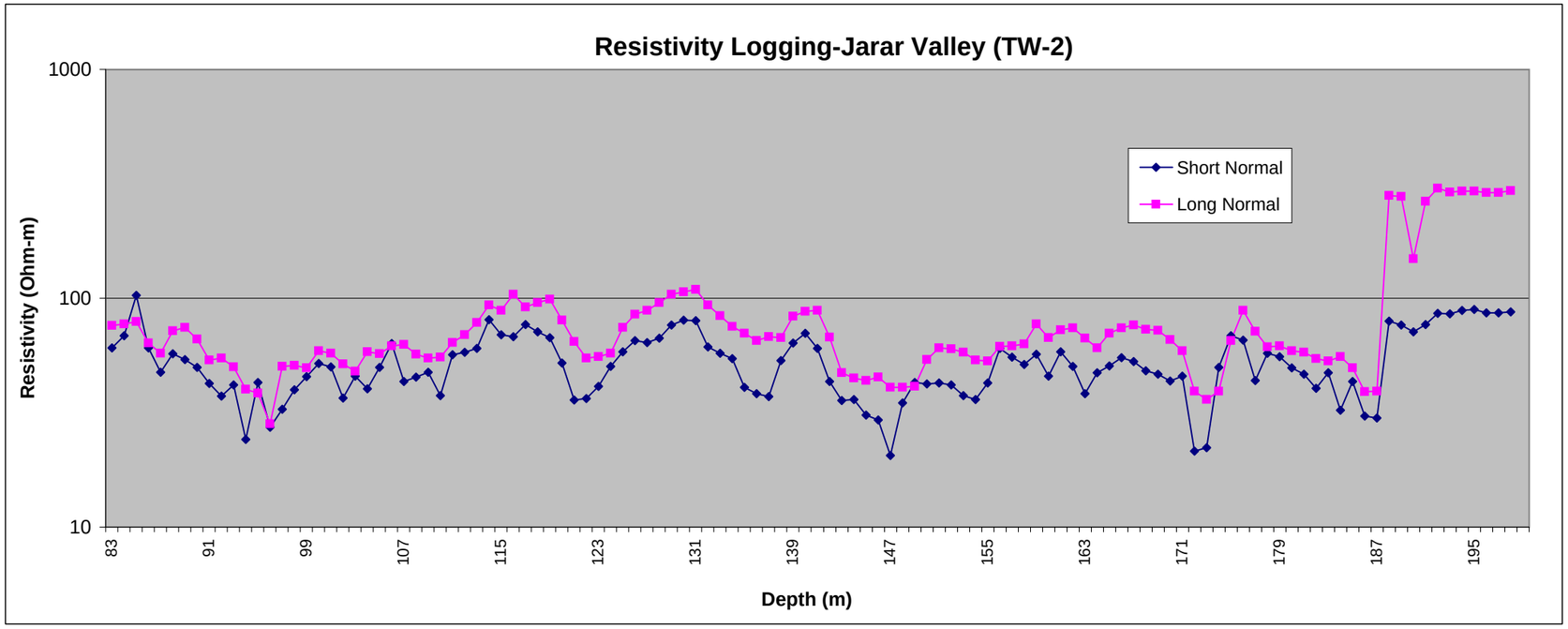
Data S.2.4 : Electrical logging data of JICA Well No.2

Well No: JICA Well No.2
Date: July 9, 2012

Depth (GL-m)	Resistivity (Ohm-m)		SP(mv)
	Short Normal	Long Normal	
182	40.4	54.4	-42.9
183	47.2	53.2	-40.8
184	32.4	55.6	-43.6
185	43.3	49.6	-42.7
186	30.6	38.96	-41.9
187	30	39.32	-42.4
188	79.3	281.6	-43.3
189	76.2	278	-45.5
190	71.3	148.8	-46.6
191	76.8	265.6	-47.5
192	86.1	303.2	-48.1
193	85.3	291.6	-47.1
194	88.5	294	-46.9
195	89.5	293.2	-45.5
196	86.4	289.2	-45.6
197	86.3	290	-45.4
198	87.2	295.2	-45.5

Data S.2.4(2) : Electrical logging data

Resistivity Logging of Jarar Valley TW-2 (JICA Well No.2)



Depth(m)	Resistivity (Ohm-m) Short Normal	Long Normal
83	60.7	76
84	68.6	77.2
85	103.2	79.2
86	60.6	63.6
87	47.4	57.6
88	57.2	72
89	53.9	74.4
90	49.9	66.4
91	42.5	53.6
92	37.4	54.8
93	41.8	50
94	24.2	40
95	42.8	38.4
96	27.3	28.24
97	32.8	50.4
98	39.8	50.8
99	45.5	49.6
100	51.8	58.8
101	50.2	57.6
102	36.7	51.6
103	45.7	48
104	40.3	58.4
105	49.9	57.2
106	63.3	62
107	43.2	62.8
108	45.3	56.8
109	47.5	54.8
110	37.5	55.2
111	56.7	64

Depth(m)	Resistivity (Ohm-m) Short Normal	Long Normal
112	58	69.2
113	60.4	78.4
114	80.6	93.6
115	69.4	88.4
116	67.9	104
117	76.9	91.6
118	71.3	95.6
119	67.3	99.2
120	52.2	80.4
121	36	64.8
122	36.5	54.8
123	41.1	55.6
124	50.4	57.6
125	58.2	74.4
126	65.3	85.2
127	64	88.4
128	66.9	95.6
129	76.5	104
130	80.3	106.4
131	79.8	109.2
132	61.4	93.2
133	57.6	84
134	54.4	75.2
135	40.8	70.4
136	38.2	65.2
137	37.2	68
138	53.5	67.2
139	63.6	83.6
140	70.3	87.6

Depth(m)	Resistivity (Ohm-m) Short Normal	Long Normal
141	60.5	88.4
142	43.2	67.6
143	35.8	47.2
144	36.1	44.8
145	30.9	43.6
146	29.4	45.2
147	20.5	40.8
148	34.9	40.8
149	42.9	41.2
150	42.3	54
151	42.7	60.8
152	41.8	60
153	37.6	58
154	36.1	53.6
155	42.7	53.2
156	60.3	61.6
157	55.4	62
158	51.3	63.2
159	56.9	77.2
160	45.6	67.2
161	58.3	72.8
162	50.3	74
163	38.2	66.8
164	47.2	60.8
165	50.6	70.4
166	55	74
167	52.9	76.4
168	48.3	73.2
169	46.6	72.4

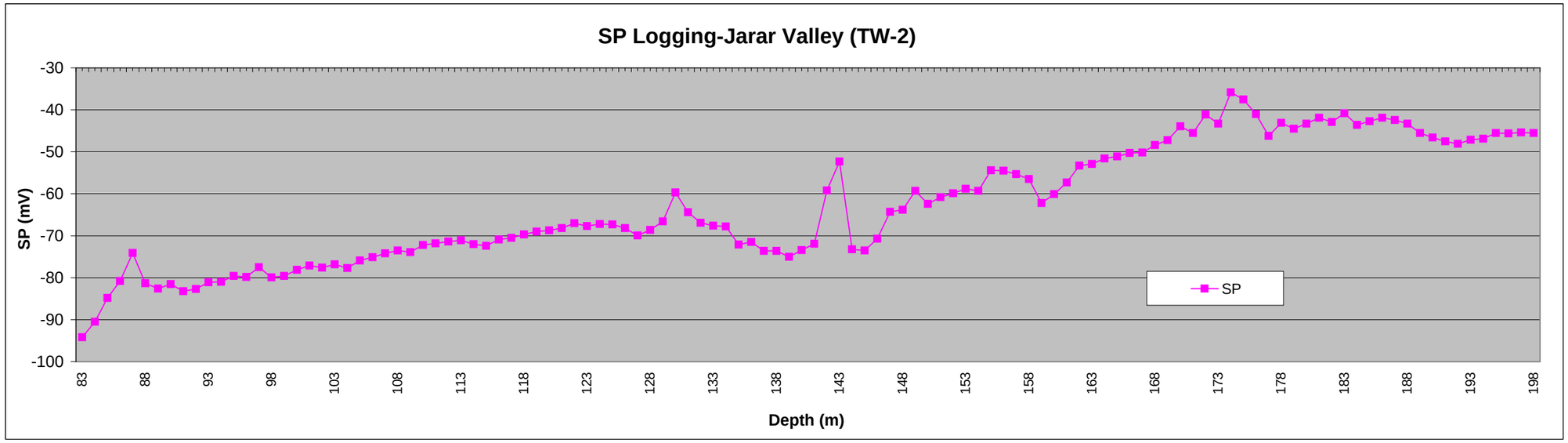
Depth(m)	Resistivity (Ohm-m) Short Normal	Long Normal
170	43.5	66
171	45.7	58.8
172	21.5	39.32
173	22.2	36.04
174	49.8	39.2
175	68.6	65.2
176	65.6	88.4
177	43.8	71.6
178	57.4	61.2
179	55.6	62
180	49.7	58.8
181	46.6	58
182	40.4	54.4
183	47.2	53.2
184	32.4	55.6
185	43.3	49.6
186	30.6	38.96
187	30	39.32
188	79.3	281.6
189	76.2	278
190	71.3	148.8
191	76.8	265.6
192	86.1	303.2
193	85.3	291.6
194	88.5	294
195	89.5	293.2
196	86.4	289.2
197	86.3	290
198	87.2	295.2

Casing Arrangement

Depth range(m)		Blind	Screen		
201	189	2			
189	183		1		
183	177	1			
177	171		1		
171	159	2			
159	153		1		
153	147	1			
147	135		2		
135	129	1			
129	117		2		
117	-3	20			
	Total=	**27**	**7**	**34**	casing
				204	m

Data S.2.4(3) : Electrical logging data

SP Logging-Jarar Valley TW-2 (JICA Well-No.2)



Depth(m)	Self Potential (mV)	SP
83	94.2	-94.2
84	90.5	-90.5
85	84.8	-84.8
86	80.8	-80.8
87	74.1	-74.1
88	81.3	-81.3
89	82.6	-82.6
90	81.5	-81.5
91	83.2	-83.2
92	82.7	-82.7
93	81.1	-81.1
94	81	-81
95	79.6	-79.6
96	79.8	-79.8
97	77.5	-77.5
98	79.9	-79.9
99	79.6	-79.6
100	78.1	-78.1
101	77.1	-77.1
102	77.6	-77.6
103	76.8	-76.8
102	77.6	-77.6
103	76.8	-76.8

Depth(m)	Self Potential (mV)	SP
104	77.7	-77.7
105	75.9	-75.9
106	75.1	-75.1
107	74.2	-74.2
108	73.5	-73.5
109	73.9	-73.9
110	72.2	-72.2
111	71.8	-71.8
112	71.4	-71.4
113	71.1	-71.1
114	72	-72
115	72.4	-72.4
116	70.9	-70.9
117	70.5	-70.5
118	69.7	-69.7
119	69	-69
120	68.7	-68.7
121	68.2	-68.2
122	67	-67
123	67.7	-67.7
124	67.2	-67.2
125	67.3	-67.3
126	68.2	-68.2
127	69.9	-69.9

Depth(m)	Self Potential (mV)	SP
128	68.6	-68.6
129	66.6	-66.6
130	59.7	-59.7
131	64.4	-64.4
132	66.9	-66.9
133	67.6	-67.6
134	67.8	-67.8
135	72.1	-72.1
136	71.5	-71.5
137	73.6	-73.6
138	73.6	-73.6
139	75	-75
140	73.4	-73.4
141	71.9	-71.9
142	59.2	-59.2
143	52.3	-52.3
144	73.2	-73.2
145	73.5	-73.5
146	70.7	-70.7
147	64.3	-64.3
148	63.8	-63.8
149	59.3	-59.3
150	62.4	-62.4
151	60.8	-60.8

Depth(m)	Self Potential (mV)	SP
152	59.9	-59.9
153	58.8	-58.8
154	59.3	-59.3
155	54.4	-54.4
156	54.5	-54.5
157	55.3	-55.3
158	56.5	-56.5
159	62.2	-62.2
160	60.1	-60.1
161	57.3	-57.3
162	53.3	-53.3
163	52.9	-52.9
164	51.6	-51.6
165	51.1	-51.1
166	50.3	-50.3
167	50.2	-50.2
168	48.4	-48.4
169	47.2	-47.2
170	43.9	-43.9
171	45.5	-45.5
172	41.1	-41.1
173	43.3	-43.3
174	35.8	-35.8
175	37.5	-37.5

Depth(m)	Self Potential (mV)	SP
176	41	-41
177	46.2	-46.2
178	43.1	-43.1
179	44.5	-44.5
180	43.3	-43.3
181	41.9	-41.9
182	42.9	-42.9
183	40.8	-40.8
184	43.6	-43.6
185	42.7	-42.7
186	41.9	-41.9
187	42.4	-42.4
188	43.3	-43.3
189	45.5	-45.5
190	46.6	-46.6
191	47.5	-47.5
192	48.1	-48.1
193	47.1	-47.1
194	46.9	-46.9
195	45.5	-45.5
196	45.6	-45.6
197	45.4	-45.4
198	45.5	-45.5

Data S.2.5 : Pumping Test of JICA Well No.1
(1): Step Drawdown Test

STEP-DRAWDOWN TEST DATA SHEET
SHEET No. : 1/3

Date: 4 August 2012

Location: Kebele Farda, Kabribeyah Woreda
Site No.: 1
GPS Reading: 281111 E, 1000180 N

Well No.: JICA No. 1
Well Depth: 202.00 m, Well Diameter: ϕ 8"
Screen Depth(s): 130 - 154 & 160 - 190 m
Static Groundwater Level (FToC*): 85.20 m
Screen Length: 54 m
Pump Type: Submersible
Casing stick up: 0.60 m
Pump Setting: 128.30 m,
Discharge (Q): 3.80 L/s

* FToC: From Top of Casing

Date	Time	Elapsed Time, [t]		Water Level (GL - m)	Drawdown, [s] (m)	EC	pH	Temp.
		(hour)	(min)			(S/m)		(℃)
4-Aug-12	21:30	0	0	85.20	0.00			
			1	93.03	7.83			
			2	94.27	9.07			
			4	95.67	10.47			
			6	96.38	11.18			
			8	96.62	11.42			
			10	96.77	11.57			
			12	96.93	11.73			
			14	97.00	11.80			
			16	97.18	11.98			
			18	97.23	12.03			
			20	97.27	12.07			
			25	97.35	12.15			
			30	97.40	12.20			
			35	97.46	12.26			
			40	97.53	12.33			
			45	97.78	12.58			
			50	97.89	12.69			
			55	98.15	12.95			
		1	60	98.27	13.07	0.216	7.35	27.1
			70	98.58	13.38			
			80	98.91	13.71			
			90	99.12	13.92			
			100	99.26	14.06			
			110	99.33	14.13			
		2	120	99.40	14.20	0.214	7.28	26.4

(1): Step Drawdown Test

STEP-DRAWDOWN TEST DATA SHEET

Date: 4 August 2012

SHEET No. : 2/3

Location: Kebele Farda, Kabribeyah Woreda Site No.: 1

GPS Reading: 281111 E, 1000180 N

Well No.: JICA No. 1 Well Depth: 202.00 m, Well Diameter: ϕ 8"

Screen Depth(s): 130 - 154 & 160 - 190 m

Static Groundwater Level (FToC*): 85.20 m Screen Length: 54 m

Pump Type: Submersible Casing stick up: 0.60 m

Pump Setting: 128.30 m, Discharge (Q): 5.20 L/s

* FToC: From Top of Casing

Date	Time	Elapsed Time, [t]		Water Level (GL - m)	Drawdown, [s] (m)	EC	pH	Temp.
		(hour)	(min)			(S/m)		(℃)
4-Aug-12	23:30	0	0	99.40	0.00			
			1	99.65	14.45			
			2	99.98	14.78			
			4	100.45	15.25			
			6	101.48	16.28			
			8	102.07	16.87			
			10	102.35	17.15			
			12	102.48	17.28			
			14	102.58	17.38			
			16	102.65	17.45			
			18	102.68	17.48			
			20	102.70	17.50			
			25	103.07	17.87			
5-Aug-12	0:00		30	103.08	17.88			
			35	103.35	18.15			
			40	103.65	18.45			
			45	103.74	18.54			
			50	103.80	18.60			
			55	104.08	18.88			
		1	60	104.17	18.97	0.216	7.24	27.5
			70	104.26	19.06			
			80	104.35	19.15			
			90	104.87	19.67			
			100	104.97	19.77			
			110	105.24	20.04			
		2	120	105.48	20.28	0.217	6.88	25.8

(1): Step Drawdown Test

STEP-DRAWDOWN TEST DATA SHEET

SHEET No. : 3/3

Date: 5 August 2012

Location: Kebele Farda, Kabribeyah Woreda Site No.: 1

GPS Reading: 281111 E, 1000180 N

Well No.: JICA No. 1 Well Depth: 202.00 m, Well Diameter: ϕ 8"

Screen Depth(s): 130 - 154 & 160 - 190 m

Static Groundwater Level (FToC*): 85.20 m Screen Length: 54 m

Pump Type: Submersible Casing stick up: 0.60 m

Pump Setting: 128.30 m, Discharge (Q): 6.50 L/s

* FToC: From Top of Casing

Date	Time	Elapsed Time, [t]		Water Level (GL - m)	Drawdown, [s] (m)	EC	pH	Temp.
		(hour)	(min)			(S/m)		(℃)
5-Aug-12	1:30	0	0	105.48	0.00			
			1	105.83	20.63			
			2	106.25	21.05			
			4	106.58	21.38			
			6	106.81	21.61			
			8	107.80	22.60			
			10	108.40	23.20			
			12	108.91	23.71			
			14	109.57	24.37			
			16	109.89	24.69			
			18	110.92	25.72			
			20	111.76	26.56			
			25	112.73	27.53			
			30	113.18	27.98			
			35	113.38	28.18			
			40	113.80	28.60			
			45	114.13	28.93			
			50	114.28	29.08			
			55	114.54	29.34			
		1	60	114.68	29.48	0.218	6.81	25.6
			70	115.14	29.94			
			80	115.50	30.30			
			90	115.63	30.43			
			100	115.76	30.56			
			110	115.90	30.70			
5-Aug-12	3:30	2	120	116.00	30.80	0.215	6.79	25.9

Data S.2.5 : Pumping Test of JICA Well No.1
(2): Continuous Pumping Test

CONTINUOUS PUMPING TEST DATA SHEET
SHEET No. : 1/2

Date: 5 August 2012

Location: Kebele Farda, Kabribeyah Woreda
Site No.: 1
GPS Reading: 281111 E, 1000180 N

Well No.: JICA No. 1
Well Depth: 202.00 m, Well Diameter: ϕ 8"
Screen Depth(s): 130 - 154 & 160 - 190 m
Static Groundwater Level (FToC*): 85.23 m
Screen Length: 54 m
Pump Type: Submersible
Casing stick up: 0.60 m
Pump Setting: 128.30 m,
Discharge (Q): 6.50 L/s

* FToC: From Top of Casing

Date	Time	Elapsed Time, [t]		Water Level (GL - m)	Drawdown, [s] (m)	EC	pH	Temp.
		(hour)	(min)			(mS/m)		(℃)
5-Aug-12	7:00		0	85.23	0			
			1	87.80	2.57			
			2	97.60	12.37			
			3	102.63	17.40			
			4	105.15	19.92			
			5	106.35	21.12			
			6	107.27	22.04			
			8	108.65	23.42			
			10	109.55	24.32			
			15	110.90	25.67			
			20	111.72	26.49			
			25	112.25	27.02			
			30	112.62	27.39			
			35	112.97	27.74			
			40	113.19	27.96			
			45	113.45	28.22			
			50	113.63	28.40			
			55	113.80	28.57			
		1	60	113.91	28.68	210.0	6.87	27.2
			70	114.11	28.88			
			80	114.31	29.08			
			90	114.51	29.28			
			100	114.68	29.45			
			110	114.81	29.58			
		2	120	114.90	29.67	212.0	6.81	27.1
			140	114.99	29.76			
			160	115.11	29.88			

(2): Continuous Pumping Test

CONTINUOUS PUMPING TEST DATA SHEET Date: 5 August 2012

SHEET No. : 2/2

Location: Kebele Farda, Kabribeyah Woreda Site No.: 1

GPS Reading: 281111 E, 1000180 N

Well No.: JICA No. 1 Well Depth: 202.00 m, Well Diameter: ϕ 8"

Screen Depth(s): 130 - 154 & 160 - 190 m

Static Groundwater Level (FToC*): 85.23 m Screen Length: 54 m

Pump Type: Submersible Casing stick up: 0.60 m

Pump Setting: 128.30 m, Discharge (Q): 6.50 L/s

* FToC: From Top of Casing

Date	Time	Elapsed Time, [t]		Water Level (GL - m)	Drawdown, [s] (m)	EC	pH	Temp.
		(hour)	(min)			(mS/m)		(℃)
5-Aug-12	10:00	3	180	115.22	29.99	210.0	6.79	27.7
			210	115.46	30.23			
		4	240	115.58	30.35	211.0	6.81	27.9
			270	115.74	30.51			
		5	300	115.90	30.67	210.0	6.8	28
			330	115.98	30.75			
		6	360	116.02	30.79	212.0	6.81	28.2
		7	420	116.08	30.85	211.0	6.82	28.1
		8	480	116.15	30.92	212.0	6.81	27.8
		9	540	116.22	30.99	210.0	6.82	27.9
		10	600	116.39	31.16	210.0	6.81	27.5
		11	660	116.59	31.36	211.0	6.8	26.8
		12	720	116.68	31.45	207.0	6.78	27.4
		13	780	116.87	31.64	207.0	6.83	27.2
		14	840	117.02	31.79	205.0	6.84	27
		15	900	117.11	31.88	212.0	6.83	25.5
		16	960	117.15	31.92	208.0	6.83	25.8
6-Aug-12	1:00	18	1080	117.48	32.25	207.0	6.85	25.7
		20	1200	117.60	32.37	212.0	6.84	25.6
		21	1260	117.69	32.46	210.0	6.83	25.9
		22	1320	117.71	32.48	211.0	6.82	25.5
		24	1440	117.73	32.50	211.0	6.81	25.6

Data S.2.5 : Pumping Test of JICA Well No.1
(3):Recovery Test / Water level checked for site no.2 during site no. 1 CDT

RECOVERY TEST DATA SHEET Date: 6 August 2012

SHEET No. : 1/1

Location: Kebele Farda, Kabribeyah Woreda Site No.: 1
GPS Reading: 281111 E, 1000180 N

Well No.: JICA No. 1 Well Depth: 202.00 m, Well Diameter: ϕ 8"
Screen Depth(s): 130 - 154 & 160 - 190 m
Static Groundwater Level (FToC*): 85.23 m Screen Length: 54 m
Pump Type: Submersible Casing stick up: 0.60 m
Pump Setting: m, Discharge (Q): L/s

* FToC: From Top of Casing

Date	Time	Time since Pumping Stopped, [t'] (hour)	(min)	Time since Pumping Started, [t] (min)	Time Ratio, [t/t']	Water Level (GL - m)	Residual Drawdown, [s'] (m)
6-Aug-12	7:00		0	1440		117.73	32.50
			1	1441	1441	104.12	18.89
			2	1442	721	97.99	12.76
			4	1444	361	94.00	8.77
			6	1446	241	91.50	6.27
			8	1448	181	90.20	4.97
			10	1450	145	89.25	4.02
			12	1452	121	88.58	3.35
			14	1454	104	88.26	3.03
			16	1456	91	87.97	2.74
			18	1458	81	87.70	2.47
			20	1460	73	87.54	2.31
			25	1465	59	87.23	2.00
			30	1470	49	86.99	1.76
			35	1475	42	86.80	1.57
			40	1480	37	86.68	1.45
			45	1485	33	86.58	1.35
			50	1490	30	86.49	1.26
		1	60	1500	25	86.36	1.13
			70	1510	22	86.27	1.04
			80	1520	19	86.22	0.99
			90	1530	17	86.17	0.94
			100	1540	100	86.07	0.84
			110	1550	110	86.02	0.79
		2	120	1560	120	85.98	0.75
			150	1590	150	85.86	0.63
		3	180	1620	9	85.82	0.59
			210	1650	8	85.73	0.50

＊Water level checked for site no.2 during site no. 1 CDT

Pumping well JICA Well No. 1	Water Level checked well JICA Well No.2	
Continous pumping test 24 hrs.	SWL before pumping test started at site no.1is 88.15 m	Drawdown (m)
SWL (m)	88.15	
8 hrs. pumping	88.18	−0.03
16 hrs. pumping	88.26	−0.11
23 hrs. pumping	88.28	−0.13
24 hrs. pumping	88.30	−0.15
Recovery 1hr. Passed	88.30	−0.15

Data S.2.6 : Pumping Test of JICA Well No.2
(1): Step Drawdown Test

STEP-DRAWDOWN TEST DATA SHEET

Date: 8 August 2012

SHEET No. : 1/3

Location: Kebele Farda, Kabribeyah Woreda
Site No.: 2
GPS Reading: 280743 E, 1000004 N

Well No.: JICA No. 2
Well Depth: 201.00 m, Well Diameter: ϕ 8"
Screen Depth(s): 135 - 159 & 165 - 189 m
Static Groundwater Level (FToC*): 88.35 m
Screen Length: 48 m
Pump Type: Submersible
Casing stick up: 1.51 m
Pump Setting: 127.30 m,
Discharge (Q): 3.00 L/s

* FToC: From Top of Casing

Date	Time	Elapsed Time, [t]		Water Level (GL - m)	[s] Drawdown, (m)	EC	pH	Temp.
		(hour)	(min)			(S/m)		(℃)
8-Aug-12	7:30	0	0	88.35	0.00			
			1	92.98	4.63			
			2	93.05	4.70			
			4	93.15	4.80			
			6	93.30	4.95			
			8	93.43	5.08			
			10	93.51	5.16			
			12	93.56	5.21			
			14	93.57	5.22			
			16	93.58	5.23			
			18	93.75	5.40			
			20	93.84	5.49			
			25	94.02	5.67			
			30	94.05	5.70			
			35	94.70	6.35			
			40	94.83	6.48			
			45	94.90	6.55			
			50	94.94	6.59			
			55	94.97	6.62			
	8:30	1	60	94.98	6.63	0.241	6.65	29.6
			70	95.26	6.91			
			80	95.30	6.95			
			90	95.37	7.02			
			100	95.41	7.06			
			110	95.43	7.08			
	9:30	2	120	95.45	7.10	0.244	6.66	29.4

(1): Step Drawdown Test

STEP-DRAWDOWN TEST DATA SHEET
SHEET No. : 2/3

Date: 8 August 2012

Location: Kebele Farda, Kabribeyah Woreda
Site No.: 2
GPS Reading: 280743 E, 1000004 N

Well No.: JICA No. 2
Well Depth: 201.00 m, Well Diameter: ϕ 8"
Screen Depth(s): 135 - 159 & 165 - 189 m
Static Groundwater Level (FToC*): 88.35 m
Screen Length: 48 m
Pump Type: Submersible
Casing stick up: 1.51 m
Pump Setting: 127.30 m,
Discharge (Q): 4.00 L/s

* FToC: From Top of Casing

Date	Time	Elapsed Time, [t]		Water Level (GL - m)	[s] Drawdown, (m)	EC	pH	Temp.
		(hour)	(min)			(S/m)		(℃)
8-Aug-12	9:30	0	0	95.45	0.00			
			1	95.98	7.63			
			2	96.70	8.35			
			4	96.74	8.39			
			6	96.82	8.47			
			8	96.91	8.56			
			10	97.05	8.70			
			12	97.07	8.72			
			14	97.09	8.74			
			16	97.16	8.81			
			18	97.21	8.86			
			20	97.27	8.92			
			25	97.36	9.01			
			30	97.37	9.02			
			35	97.38	9.03			
			40	97.51	9.16			
			45	97.59	9.24			
			50	97.63	9.28			
			55	97.66	9.31			
	10:30	1	60	97.68	9.33	0.239	6.63	29.4
			70	97.77	9.42			
			80	97.79	9.44			
			90	97.82	9.47			
			100	97.85	9.50			
			110	97.86	9.51			
	11:30	2	120	97.89	9.54	0.232	6.7	29.2

(1): Step Drawdown Test

STEP-DRAWDOWN TEST DATA SHEET

SHEET No. : 3/3

Date: 8 August 2012

Location: Kebele Farda, Kabribeyah Woreda

Site No.: 2

GPS Reading: 280743 E, 1000004 N

Well No.: JICA No. 2

Well Depth: 201.00 m, Well Diameter: ϕ 8"

Screen Depth(s): 135 - 159 & 165 - 189 m

Static Groundwater Level (FToC*): 88.35 m

Screen Length: 48 m

Pump Type: Submersible

Casing stick up: 1.51 m

Pump Setting: 127.30 m,

Discharge (Q): 5.00 L/s

* FToC: From Top of Casing

Date	Time	Elapsed Time, [t]		Water Level (GL - m)	[s] Drawdown, (m)	EC	pH	Temp.
		(hour)	(min)			(S/m)		(℃)
8-Aug-12	5:30	0	0	97.89	0.00			
			1	98.61	10.26			
			2	98.94	10.59			
			4	99.15	10.80			
			6	99.25	10.90			
			8	99.35	11.00			
			10	99.41	11.06			
			12	99.50	11.15			
			14	99.55	11.20			
			16	99.58	11.23			
			18	99.61	11.26			
			20	99.67	11.32			
			25	99.75	11.40			
			30	99.79	11.44			
			35	99.81	11.46			
			40	99.85	11.50			
			45	99.90	11.55			
			50	99.95	11.60			
			55	100.00	11.65			
	6:30	1	60	100.03	11.68	0.221	6.7	28.7
			70	100.07	11.72			
			80	100.12	11.77			
			90	100.20	11.85			
			100	100.26	11.91			
			110	100.32	11.97			
	7:30	2	120	100.35	12.00	0.214	6.67	28.2

Data S.2.6 : Pumping Test of JICA Well No.2
(2): Continuous Pumping Test

CONTINUOUS PUMPING TEST DATA SHEET Date: 26 July 2012

SHEET No. : 1/2

Location: Kebele Farda, Kabribeyah Woreda Site No.: 2
GPS Reading: 280743 E, 1000004 N

Well No.: JICA No. 2 Well Depth: 201.00 m, Well Diameter: ϕ 8"
Screen Depth(s): 135 - 159 & 165 - 189 m
Static Groundwater Level (FToC*): 88.40 m Screen Length: 48 m
Pump Type: Submersible Casing stick up: 1.51 m
Pump Setting: 127.30 m, Discharge (Q): 5.40 L/s

* FToC: From Top of Casing

Date	Time	Elapsed Time, [t]		Water Level (GL - m)	Drawdown, [s] (m)	EC	pH	Temp.
		(hour)	(min)			(S/m)		(℃)
26-Jul-12	19:15		0	88.40	0			
			1	97.85	9.45			
			2	98.74	10.34			
			3	99.13	10.73			
			4	99.55	11.15			
			5	99.74	11.34			
			6	100.20	11.80			
			8	100.23	11.83			
			10	100.44	12.04			
			15	100.85	12.45			
			20	101.23	12.83			
			25	101.40	13.00			
			30	101.60	13.20			
			35	101.72	13.32			
			40	101.86	13.46			
			45	101.96	13.56			
			50	102.08	13.68			
			55	102.18	13.78			
	20:15	1	60	102.25	13.85	0.205	6.75	28.4
			70	102.51	14.11			
			80	102.67	14.27			
			90	102.85	14.45			
			100	103.02	14.62			
			110	103.17	14.77			
	21:15	2	120	103.25	14.85	0.202	6.7	26.6
			140	103.45	15.05			
			160	103.62	15.22			

(2): Continuous Pumping Test

CONTINUOUS PUMPING TEST DATA SHEET Date: 27 July 2012

SHEET No. : 2/2

Location: Kebele Farda, Kabribeyah Woreda Site No.: 2

GPS Reading: 280743 E, 1000004 N

Well No.: JICA No. 2 Well Depth: 201.00 m, Well Diameter: ϕ 8"

Screen Depth(s): 135 - 159 & 165 - 189 m

Static Groundwater Level (FToC*): 88.40 m Screen Length: 48 m

Pump Type: Submersible Casing stick up: 1.51 m

Pump Setting: 127.30 m, Discharge (Q): 5.40 L/s

* FToC: From Top of Casing

Date	Time	Elapsed Time, [t]		Water Level (GL - m)	Drawdown, [s] (m)	EC	pH	Temp.
		(hour)	(min)			(mS/m)		(℃)
27-Jul-12	22:15	3	180	103.77	15.37	0.2	6.72	26.8
			210	103.92	15.52			
		4	240	104.04	15.64	198.8	6.74	26.7
			270	104.16	15.76			
		5	300	104.31	15.91	194.6	6.72	27.3
			330	104.39	15.99			
		6	360	104.45	16.05	197	6.73	26.4
		7	420	104.61	16.21	195.9	6.76	26.7
		8	480	104.72	16.32	195.4	6.76	26.5
		9	540	104.88	16.48	195.4	6.75	26.1
		10	600	104.99	16.59	190.6	6.77	27.1
		11	660	105.10	16.70	193.4	6.74	26.4
	7:15	12	720	105.20	16.80	193.7	6.76	26.2
	8:15	13	780	105.25	16.85	191	6.79	27.1
	9:15	14	840	105.30	16.90	188.1	6.83	28
	10:15	15	900	105.38	16.98	188.3	6.86	28.7
	11:15	16	960	105.44	17.04	188.9	6.87	29.3
	12:15	18	1080	105.55	17.15	188.1	6.88	29.7
	13:15	20	1200	105.87	17.47	187.3	6.83	28.8
	14:15	21	1260	106.02	17.62	187.8	6.82	28.7
	15:15	22	1320	106.05	17.65	186.7	6.81	28.8
	16:15	24	1440	106.05	17.65	186.4	6.82	28

Data S.2.6 : Pumping Test of JICA Well No.2
(3): Rercovery Test

RECOVERY TEST DATA SHEET

Date: 27 July 2012

SHEET No. : 1/2

Location: Kebele Farda, Kabribeyah Woreda Site No.: 2
GPS Reading: 280743 E, 1000004 N

Well No.: JICA No. 2 Well Depth: 201.00 m, Well Diameter: ϕ 8 "
Screen Depth(s): 135 - 159 & 165 - 189 m
Static Groundwater Level (FToC*): 88.40 m Screen Length: 48 m
Pump Type: Submersible Casing stick up: 1.51 m
Pump Setting: m, Discharge (Q): L/s

* FToC: From Top of Casing

Date	Time	Time since Pumping Stopped, [t'] (hour)	Time since Pumping Stopped, [t'] (min)	Time since Pumping Started, [t] (min)	Time Ratio, [t/t']	Water Level (GL - m)	Residual Drawdown, [s'] (m)
27-Jul-12	6:30		0	1440		106.05	17.65
			1	1441	1441	93.80	5.40
			2	1442	721	92.25	3.85
			4	1444	361	91.58	3.18
			6	1446	241	91.35	2.95
			8	1448	181	90.95	2.55
			10	1450	145	90.85	2.45
			12	1452	121	90.77	2.37
			14	1454	104	90.67	2.27
			16	1456	91	90.61	2.21
			18	1458	81	90.57	2.17
			20	1460	73	90.54	2.14
			25	1465	59	90.50	
			30	1470	49	90.46	2.06
			35	1475	42	90.42	2.02
			40	1480	37	90.37	1.97
			45	1485	33	90.32	1.92
			50	1490	30	90.24	1.84
	7:30	1	60	1500	25	90.15	1.75
			70	1510	22	90.06	1.66
			80	1520	19	90.01	1.61
			90	1530	17	89.94	1.54
			100	1540	100	89.89	1.49
			110	1550	110	89.82	1.42
	8:30	2	120	1560	120	89.78	1.38
			150	1590	150	89.65	1.25
		3	180	1620	9	89.57	1.17
			210	1650	8	89.48	1.08
		4	240	1680	7	89.43	1.03
			270	1710	6	89.36	0.96
		5	300	1740	6	89.31	0.91
			330	1770	5	89.26	0.86
		6	360	1800	5	89.20	0.80
			390	1830	5	89.17	0.77
	13:30	7	420	1860	4	89.13	0.73

(3): Rercovery Test / Result of Pack Test for Fluoride and Iron ions

RECOVERY TEST DATA SHEET

Date: 27 July 2012

SHEET No. : 2/2

Location: Kebele Farda, Kabribeyah Woreda Site No.: 2

GPS Reading: 280743 E, 1000004 N

Well No.: JICA No. 2 Well Depth: 201.00 m, Well Diameter: ϕ 8 "

Screen Depth(s): 135 - 159 & 165 - 189 m

Static Groundwater Level (FToC*): 88.40 m Screen Length: 48 m

Pump Type: Submersible Casing stick up: 1.51 m

Pump Setting: m, Discharge (Q): L/s

* FToC: From Top of Casing

Date	Time	Time since Pumping Stopped, [t']		Time since Pumping Started, [t] (min)	Time Ratio, [t/t']	Water Level (GL - m)	Residual Drawdown, [s'] (m)
		(hour)	(min)				
27-Jul-12	13:30		450	1890		89.06	0.66
		8	480	1920	4	89.00	0.60
		9	540	1980	4	88.96	0.56
		10	600	2040	3	88.91	0.51
		11	660	2100	3	88.87	0.47
		12	720	2160	3	88.84	0.44

*** Pack Test for Fluoride and Iron ions concetration for Site No. 1& 2**

Site Name	Date & Time Sample Taken	Sample Taken During	Fluoride (F) Ion Concetration in mg/l	Iron (Fe) Ion Concetration in mg/l
JICA Well No.1	5/8/2012 12:30 P.M.	Continous Pumping Test	0.8-1.5	0.5-1
JICA Well No.2	8/8/2012 5:00 P.M.	Step Draw DownTest	0.8-1.5	1-2

Supporting Report

3. Socio-economic Survey

Data.S.3.1 : Form-A (Woreda Water Supply)

Questionnaire Sheet on Woreda Water Supply

Woreda: _____ Date_____

Names/Titles of Informants: _____/_____

Sources of Information:

1. Woreda Administration Office
2. Woreda Water Development Office
3. Woreda Health Office or Health Center
4. Woreda Natural Resources Office (Agriculture & Livestock)

Part I: GENERAL INFORMATION ON WOREDA TOWN (Small Town)

1.1. Names of Kebele and Number of Households in the Town	Name of Kebele	No. of Households
1.2. Availability of electricity	1. Electrified by public grid; 2. Privately electrified (generator); 3. Not electrified; 4. Other (specify):	
1.3. Total Population	Male: Female: Total:	
1.5. Population change	1. Population has increased significantly in these years: (reason:) 2. Population has been stable in these years. 3. Population has been decreased in these years: (reason:)	
1.6 Type and No. of Houses	Type	Number
	Residential	
	Commercial	
	Offices	
	Other (shops, stores, etc.)	
1.7. Economic Activities in the town (No. of establishments)	1. Hotels ( ) 2. Bars and restaurants ( ) 3. Fuelling stations ( ) 4. Shops ( ) 5. Small scale processors ( ) 6. Medium scale processors ( ) 7. Stores ( )	

	8. Other (specify) ( )		
1.7 No. of offices and employees of Government institutions	Type	Number of Facilities	No. of Staff, Employee, Students, Teachers
	Government offices		
	Primary schools		
	Secondary schools		
	High schools		
	Other schools		
	Hospital		
	Health Center		
	Health Post		
	Clinic		
1.8 Private Offices and commercial facilities	Private offices		
	Commercial buildings		
	Stores, Shops		
	Private clinic		
	Other		
1.8 Main Agricultural Production per year in the town (maize, sorghum, teff, tomato, etc.)	Crops	Production	
	Maize		
	Sorghum		
	Teff		
	Tomato		
1.9 Number of Livestock in the town	Livestock	Number	
	Cattle		
	Camel		
	Goat		
	Sheep		
	Donkey		
1.10 Number of Water Vendors			

Part II: INFORMATION ON WOREDA WATER SUPPLY SITUATION

1. Information on the Water Development Office

1-1 Name and Position of the Staff

	Name	Position	Main Duty	Educational Background	Age	Employ period
1						
2						
3						
4						

5						
6						
7						
8						

1-2 Office Automation Equipment available at present

	Equipment	Qty		Equipment	Qty
1	Desk-top computer		5		
2	Lap top computer		6		
3	Printer		7		
4	Telephone		8		

Note: no need to put items that are out of order

1-3 Technical Equipment and materials available at present

	Equipment	Qty		Materials/Spare parts	Qty
1	Generator		1	Hand pump spare parts	
2	Tripod		2	Chlorination agent (for m^3 of water)	
3	Chain-block		3		
4	Motor cycle		4		
5	Spanner set		5		
6			6		

Note: no need to put items that are out of order

1-4 Specific improvement plan for these items above (items to be definitely supplied within one year).

	OA Equipment	Qty		Technical Equipment	Qty
1			1		
2			2		
3			3		
4			4		

2. Water Supply Situation in woreda

No need to include city water supply of Kebribeyah and Gode cities that is covered by another questionnaire form.

2-1 General water supply condition in woreda at present (check the consistency with Form-D)

	Type of public water supply facility*	Q'ty	5	Population	
1	Motorized system with BH		6	Supply ratio (%)	
2	Hand pump with BH or SW		7	Available water source for water supply development	1) Deep groundwater
3	Spring				2) Shallow groundwater
4	Haffir				3) River water
5	Birka				4) Spring
6	Other ( )				5) Rainwater (pond)
					6) Rainwater (container)

* Do not include those that are totally broken

* Deep groundwater is used by borehole wells while shallow groundwater is used by hand-dug wells

2-2 Water supply condition of Kebeles

1) Total number of Kebeles in the woreda _____

2) Water supply facilities by Kebele at present (check consistency with Form-D)

Kebele	Population	Source of Water Supply (type and number of water points) 1/	Activity of Water Committee (WASHCO)	Collection of Water Fee 2/	Water Coverage (%) 3/
		• Type • Number	Ex, Good, Poor	Ex, Good, Poor	

Note:

1/ Source of Water Supply (Type): alternative 1 to 6 in question 2-1

3/ Water Coverage: Population served by the water supply facilities divided by the total population

2-3 Collection of water fee in the woreda

Collection method	Applicable Ratio (%)	Range of water fee (birr)	
1. Pay at the site		—	per 20L
2. Monthly payment at water office		—	per month
3. Regular fee collection by staff		—	per month
4. Other		—	

2-4 Major problem of Collection of water fee (Describe why not collected efficiently)

3. Support Services to the Existing Facilities by the Woreda Water Office

Year	Location (Kebele)	Kind of Services	Cost spent for the Services* (birr)

* The cost includes transportation, spare parts, etc.

4. Names of the Kebele where some improvement works on water supply facilities are needed

Name of Kebele	Improvement Works Needed for better Water Supply	Reason

5. The list of the Kebeles that require the water supply system and the type of the system needed (Opinion of woreda water office)

Name of kebele	Population	Available Water Source [1/]		Type of water supply system needed	Number

Note 1/ choose from the alternatives in 2-1-7

Part III: INFORMATION ON WOREDA HEALTH SITUATION (RURAL AREA)

3.1 Medical Facilities and Human Resources	Facilities	Number	No. of Staff
	Health Center		Health Officer ( ) Nurse ( ) Extension Workers ( ) Other ( )
	Health Post		
3.2 Leading Causes of Water-related Diseases (Diarrhea, Typhoid, Malaria, Eye diseases, etc.)	No.	Diseases	No. of Cases
	1		
	2		
	3		
	4		
	5		
	6		
	7		
3.3 Estimated number of patients of water borne diseases per year	1. Diarrhea ( ) persons 2. Dysentery ( ) persons 3. Typhoid ( ) persons 4. Cholera ( ) persons 5. Malaria ( ) persons 6. Other (specify) _____ ( ) persons		
3.4 Kebele Population	Name of Kebele	Population	Household

Part IV: INFORMATION ON WOREDA AGRICULTURE AND LIVESTOCK

Kebele	Number of Livestock Health Post	No. of Cattle Trough	No. of Farmer Training Center (FTC)	Number of Extension House

Data.S.3.2 : Form－B (Town Water Supply)

Questionnaire Sheet for Urban Water Supply System (Q-C)
Jarar Valley and Shebele Sub-basin Water Supply Plan and Emergency Water Supply
in the Federal Democratic Republic of Ethiopia (JICA)

Date……, 2012
Woreda: _____)
Town/City: Kebribeyah / Gode, (Other _____)

1. General Information (from Town water supply utility office, town administration office)

1.1. Names of Kebele in the Town	1. 2. 3. 4. 5.	
1.2. Availability of electricity	1. Electrified by public grid; covering the whole city area 2. Electrified by public grid, covering a part of the city area 3. Not electrified; 4. Other (specify): 5. Coverage ratio (% of the city area), If no-2	
1.3. Population (latest data)	Male: Female: Total: Data Source:	
1.4. No. of households (latest data)		
1.5. Population change	1. Population has increased significantly in these years: (reason:) 2. Population has been stable in these years. 3. Population has been decreased in these years: (reason:)	
1.6. Information on town / city executive officials (name of head and position of other officials)	1. head of Woreda administration office	Name: Contact No:
	2. Town administration head	Name: Contact No:
	3. head of Water Supply Utility Office	Name: Contact No:
	4. head of Woreda Water Office	Name: Contact No:
	5. head of Woreda Health Office	Name: Contact No:

2. Existing Water Supply System for the Town (from Town Water supply utility office)

2.1 Existing water sources	A. Surface water	1. River / Stream 2. Impoundment (dams) / Pond / lakes 3. Other (specify):	No in Form D
	B. Groundwater.	1. No. of Deep boreholes (BH): Functional BHs ( ): Non-functional BHs ( ) 2. No. of Shallow BHs: Functional BHs ( ); Non-functional BHs ( )	No in Form D

		3. Other (specify):	
	C. Spring, etc.	1. Spring with intake facilities 2. Spring without any facilities 3. Other (specify):	No in Form D

2.2 Use of Water Meter	1. location of water meter: (terminal supply point or Water source) 2. Total no. of Water Meters in the system:
2.3 Distribution of Water by the system	1. Total number of connections: 2. Number of Water Points: a. Private house connections ( ) b. Institutions connection (government offices, schools, etc.): ( ) b. Public taps ( ) c. Yard taps ( ) d. Other (specify)

2.4 Population served during rainy season	
2.5 Population served during dry season	
2.6 Number of private customers	
2.7 Number of institutional customers	

2.8 Revenue and Expenses of the Utility Office	1. Revenue a. 2009: Water volume supplied; (m^3) Water fee collected (Birr) Unaccounted for water (m^3) b. 2010 Water volume supplied; (m^3) Water fee collected (Birr) Unaccounted for water (m^3) c. 2011 Water volume supplied; (m^3) Water fee collected (Birr) Unaccounted for water (m^3)
	2. Expenditures a. 2009: Salary: ( ) Operation and maintenance fee; ( ) Other: ( ) b. 2010 Salary: ( ) Operation and maintenance fee:( ) Other: ( ) c. 2011 Salary; ( ) Operation and maintenance fee: ( ) Other: ( )

	Item	Annual spending	
		2010	2011
2.8 Spending items for O/M	a. Fuel		
	b. Spare parts		
	c. Repair work		
	d. Transpiration		
	e. Other		

	Work item	Quantity
2.9 What kind of improvement works will be needed ? Please indicate the number of facilities required.	Construction of new Water source ( )	
	Construction of additional water points	
	Repair of ( )	
	Other (specify):	

2.10 How much water fee can the users pay for the per month or per volume, when the new water supply system will be constructed ?	a. Birr _____ per m^3 b. Birr _____ per month c. Don't like to pay any water fee.

3. Health Conditions (Information from Health Office)

3.1 Medical facilities in the town / city (number)	1. hospital ( ) 2. health center / clinic ( ); 3. other (specify:): ( )
3.3 Estimated number of patients of water borne diseases per year	1. Diarrhea ( ) persons 2. Dysentery ( ) persons 3. Typhoid ( ) persons 4. Cholera ( ) persons 5. Malaria ( ) persons 6. Other (specify) _____ ( ) persons
3.4 Average medical expenses paid by household per year	

Data.S.3.3 : Form-C

Questionnaire Sheet on Household Water Use

1. Date……, 2012
2. Jarar Valley area / Shebele River area
3. Rural are / Urban area ( )
4. Woreda: ……
5. Kebele : ……
6. GPS coordinate: E …… N……(UTM, Adindan)
7. Position of informant in household :……

Q1. Family members and water fetching ranking

	Relation	Age	Male/Female	Water Fetching Ranking
1	Head		Male/Female	1: most often, 2:often, :sometimes, 4: never
2	Spouse		Male/Female	1: most often, 2:often, :sometimes, 4: never
3			Male/Female	1: most often, 2:often, :sometimes, 4: never
4			Male/Female	1: most often, 2:often, :sometimes, 4: never
5			Male/Female	1: most often, 2:often, :sometimes, 4: never
6			Male/Female	1: most often, 2:often, :sometimes, 4: never
7			Male/Female	1: most often, 2:often, :sometimes, 4: never

Q2. What is your **main** water source for domestic water and distance to the sources?

	Drinking	Cooking	Washing	Bathing	Farming	For livestock
1. Rainy Season	1) Piped system 2) Hand pump 3) Hand-dug Well 4) River 5) Lake/Pond 6) Rain water 7) Hafir dam 8) Other ( ) Distance Approx. :_____m	1) Piped system 2) Hand pump 3) Hand-dug Well 4) River 5) Lake/Pond 6) Rain water 7) Hafir dam 8) Other ( ) Distance Approx. :_____m	1) Piped system 2) Hand pump 3) Hand-dug Well 4) River 5) Lake/Pond 6) Rain water 7) Hafir dam 8) Other ( ) Distance Approx. :_____m	1) Piped system 2) Hand pump 3) Hand-dug Well 4) River 5) Lake/Pond 6) Rain water 7) Hafir dam 8) Other ( ) Distance Approx. :_____m	1) Piped system 2) Hand pump 3) Hand-dug Well 4) River 5) Lake/Pond 6) Rain water 7) Hafir dam 8) Other ( ) Distance Approx. :_____m	1) Piped system 2) Hand pump 3) Hand-dug Well 4) River 5) Lake/Pond 6) Rain water 7) Hafir dam 8) Other ( ) Distance Approx. :_____m
2. Dry Season	1) Piped system 2) Hand pump 3) Hand-dug Well 4) River 5) Lake/Pond 6) Rain water 7) Hafir dam 8) Other ( ) Distance Approx. :_____m	1) Piped system 2) Hand pump 3) Hand-dug Well 4) River 5) Lake/Pond 6) Rain water 7) Hafir dam 8) Other ( ) Distance Approx. :_____m	1) Piped system 2) Hand pump 3) Hand-dug Well 4) River 5) Lake/Pond 6) Rain water 7) Hafir dam 8) Other ( ) Distance Approx. :_____m	1) Piped system 2) Hand pump 3) Hand-dug Well 4) River 5) Lake/Pond 6) Rain water 7) Hafir dam 8) Other ( ) Distance Approx. :_____m	1) Piped system 2) Hand pump 3) Hand-dug Well 4) River 5) Lake/Pond 6) Rain water 7) Hafir dam 8) Other ( ) Distance Approx. :_____m	1) Piped system 2) Hand pump 3) Hand-dug Well 4) River 5) Lake/Pond 6) Rain water 7) Hafir dam 8) Other ( ) Distance Approx. :_____m

Q3. How many times a day does your family go to fetch water?

Rainy season: 1) once a day; 2) twice a day; 3) 3 times a day; 4) more than 3 times

Dry season: 1) once a day; 2) twice a day; 3) 3 times a day; 4) more than 3 times

Q4. How many hours do you spend to fetch water at a time ? (time for round trip travel, queuing, and filling container)

Rainy season: about _____ hours per day
Dry season: about _____ hours per day

Q5. Which source of water does your family prefer for **drinking** purpose ?

No. 1 preference :
Rain water☐; Pond☐; River☐; HDW ☐; HP☐; Piped system ☐; Other ( ) ☐;

No. 2 preference :
Rain water☐; Pond☐; River☐; HDW ☐; HP☐; Piped system ☐; Other ( ) ☐;

No. 3 preference :
Rain water☐; Pond☐; River☐; HDW ☐; HP☐; Piped system ☐; Other ( ) ☐;

Q6. What is the reason for the above preference of the water source ?

1).Ease of use ☐; 2). Distance ☐; 3). Cost ☐; 4). Water quality ☐;
5) Other reason ( ) ☐

Q7. If No-4 in Q6, what is the reason for the preference in terms water quality ?

1).Good taste ☐; 2). No smell ☐; 3). No color ☐; 4). Other reason ( ) ☐

Q8. Do you boil water for drinking purpose?

1) Never ☐, 2) Sometimes yes ☐, 3) Always yes ☐

Q9. Do your family members suffer from diarrhea ?

1) Never ☐, 2) Sometimes yes ☐, 3) Quite often yes ☐

Q10. If yes to the above, who is suffering most often?
1) Baby under 1 year ☐, 2) Children under 5 ☐, 3) Children under 14 ☐,,
4) Elderly family members ☐, 5) Other ( ) ☐

Q11. Apart from diarrhea, what kind of **diseases** have your family members suffered in the last 12 months ? Put the name of diseases in the order of frequency of occurrence

	Name of Diseases
Adult members	
Children	

Q12. Are there any diseases prevalent in your kebele recently?
1) Yes ☐; 2) No ☐

<u>If yes</u>, describe the diseases: ( )

Q13. Are you required to pay water charge ? 1) Yes ☐; 2) No ☐

Q14. Are you paying any water charge ? 1) Yes ☐; 2) No ☐

If yes, how and how much do you pay ?

How	1) Per container (L)	2) Per month	3) By meter
How much	birr/container	birr/month	Birr/month

Q15 If yes to Q13 and No to Q14, what is the reason for not paying the water charge ?

1) Can not afford to pay the charge
2) I refuse to pay because of the service is not good (bad quality, frequent interruption etc.)
3) The water committee has not decided on the tariff
4) No one comes to me to collect the charge

Q16. Do you need any improved water supply system in your Kebele?
1) Yes ☐; 2) No ☐

Q17. What aspects of water supply do you want to be improved ?
Choose the most important one
1) Increased supply of water (water volume) ☐;
2) Improved water quality (water quality) ☐;
3) Shorter distance to water source (distance) ☐;
4) Lower cost of water (lower charge) ☐
5) Other reason ( ) ☐

Q18. If yes to Q16, what kind of water supply system do you require ?

1) Piped water system. ☐
2) Hand pump ☐
3) Other ( ) ☐

Q19. If the improved water supply system was constructed and the improvement of your chose under Q16 was made, how much can you pay for water fee for the improved system ?

_____birr/month

Q20. Did some of your family members get medical treatment in the last 12 months?

Medical instituion	No. of family members	No. of events	Distance to medical facilities	Cost of medical treatment	Cost of transport
		times	1. within the kebeke 2. _____ km	Birr / year	Birr / year
		times	1. within the kebeke 2. _____ km	Birr / year	Birr / year

Q. 21 Average household income per year
Only cash income is considered

Item	Amount (Birr/year)
1. Crop income (food crops, cash crops)	
2. Livestock income (sale of livestock, milk, meat, etc.)	
3. Fishing income	
4. Employment (government, company, etc.)	
5. Remittance from family members, relatives, etc.	
6. Commercial income (stores, etc.)	
7. Other (specify)	
Total	

Q. 22 Average household expenditure per year

Item	Amount (Birr/year)
1. Food and drinks	
2. Clothing	
3. Water	
4. School/education	
5. Medical expenses	
6. Transportation	
7. Other (specify)	
Total	

Data.S.3.4 : Form-D, Questionnaire Survey Sheet on water supply facilities

Zone: _____ **Date :** _____

Woreda: _____

No.	Project Name	Longtitude	Latitude	Kebele	Water	Construction		Borehole Features					Yield	Scheme composition					Population	Current	Supplied villages/Kebere
					Source	Date	By	Depth	Diameter	Static WL	Pump dep.	Daily Ope.		Reservoir	Generator	Distribution	Water point	Cattle trough	Served	Status	
					(BH/RI/SP/DN	(Year)	(Org)	(m)	(inch)	(m)	(m)	(hrs)	(l/sec)	(m3)	(Y/N)	(Y/N)	(nos)	(nos)	(persons)	(F/N)	
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Data.S.3.5: Form-E

Questionnaire Sheet for Household Water Use Survey

Q0. Basic information of sample household

1. Date……, 2012
2. Jarar Valley area / Shebele River area
3. Woreda: ……or Town ……
4. Kebele : ……
5. GPS coordinate: E …… N……(UTM, Adindan)
6. Position of informant in household :……

Q1. Number of family members in the household: ……

Q2. Major source of water (choose from below) : ……

1. Public tap, 2. domestic tap (house connection), 3. Hand pump, 4. Birka,
5. Herfir dam, 6. River 7. water vendor, 8. Neighbor

Q3. Distance to the source of water (in meter) : ……m

Q4. Number of tanks (20L) of water used in a day

(1) Rainy season: …… tanks
(2) Dry season: ……tanks

* Check the type and volume of water tank they use ( )

Q5. How much water (in liter) does your family use per day for the following purposes on average ?

	Drinking	Cooking	Washing clothes	Bathing	Farming	For livestock	Total
(1). Rainy Season							
(2). Dry Season							

* Estimate in liter

Q6. Frequency of going to fetch water to the water point (in times per day)

(1) Rainy season: …… times per day
(2) Dry season: …… times per day

Q7. Means of transportation of water (Choose from below) ……

1) Man power, 2) Donkey cart, 3) Others (specify) ……

Q8. Requirement of paying water charge (Choose from below) ……

1) Yes, 2) No

Q9. Are you paying any water charge ? (Choose from below) ……

1) Yes, 2) No,

Q10 If yes to above, how and how much do you pay ?

Choose one from (1) to (3) depending on the type of water source the household uses.

	(1) Per container (20 L)	(2) Per month	(3) By meter
How much	birr/container	birr/month	Birr/month

Q11 If yes to Q8 and No to Q9, what is the reason for not paying the water charge ? (Choose from below) ……

1) Can not afford to pay the charge
2) I refuse to pay because of the service is not good (bad quality, frequent interruption etc.)
3) The water committee has not decided on the tariff
4) No one comes to me to collect the charge
5) Other

Note

Data.S.3.6: Form-F

Sheet on Technical Confirmation of Water Use

1. In the case of towns

Observation site name : ……

Kebele : ……

GPS coordinate: E …… N……(UTM, Adindan)

1.	1) Number of people in total who came to get water for the day…… 2) Number of households in total that came to get water for the day…… 3) Amount of water the household get from the site (3 samples) HH a) ……L HH b) ……L HH b) ……L 4) Type of containers they use and number of containers they carry at once (as a whole) a) Type of container: ……L tank (%), ……L tank (%), b) Number container: …… (%), …… (%), …… (%),
2.	1) Specific tasks of WASHCO members by observation (concrete description) 2) Collection of money, if they do, how and how much
3.	1) Measured water use amount for the day by water meter ……L 2) Measured water use amount for three days by water meter ……L
4.	1) Ask if this water point is their only water source Yes:(%), No (%), 2) How many times they come to this water point per day Number of times: …… (%), …… (%), …… (%), 3) How many tanks of water they get in total per day Number of tanks:……(%), ……(%), ……(%), ……(%), ……(%),
5.	1) Number of users who get water from this water point, if possible based on the registration list. Rainy season……, Dry season……,

Note

2. In the case of woredas

Observation site name : ……

Kebele : ……

GPS coordinate: E …… N……(UTM, Adindan)

1.	3) Amount of water the household get from the site (3 samples) HH a) ……L HH b) ……L HH b) ……L 4) Type of containers they use and number of containers they carry at once (as a whole) a) Type of container: ……L tank (%), ……L tank (%), b) Number container: …… (%), …… (%), …… (%),
2.	1) Specific tasks of WASHCO members by observation (concrete description) 2) Collection of money, if they do, how and how much
3.	1) Ask if this water point is their only water source Yes:(%), No (%), 2) How many times they come to this water point per day Number of times: …… (%), …… (%), …… (%), 3) How many tanks of water they get in total per day Number of tanks:……(%), ……(%), ……(%), ……(%), ……(%),
4.	1) Number of users who get water from this water point, if possible based on the registration list. Rainy season……, Dry season……,

Note