

**MIDLAND PLANT**  
UNITS 1 AND 2

REVISION NO. 14  
to  
RESPONSE TO NRC  
REQUESTS REGARDING  
PLANT FILL

UNIT 1: DOCKET 50-329  
UNIT 2: DOCKET 50-330



**CONSUMERS POWER COMPANY**

VOLUME 1

8301180103 830112  
PDR ADOCK 05000329  
A PDR

INSTRUCTIONS FOR REVISION 14

TO

RESPONSES TO NRC REQUESTS REGARDING PLANT FILL

Please follow the instructions when inserting this revision into your set(s). If you have any questions, please call Dia Wesolowski at (313) 994,7861.

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**James W Cook**  
*Vice President - Projects, Engineering  
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December 17, 1982

Harold R Denton, Director  
Office of Nuclear Reactor Regulation  
Attn: Division of Licensing  
US Nuclear Regulatory Commission  
Washington, DC 20555

MIDLAND NUCLEAR COGENERATION PLANT  
MIDLAND DOCKET NOS 50-329, 50-330  
AMENDMENT 111  
FILE: 0485.11, 0485.16 SERIAL: 20390

Enclosed herewith is Amendment 111 to the Company's Application for Construction Permits and Operating Licenses containing three (3) signed originals and sixty (60) copies of Revision 14 to the Responses to NRC Requests Regarding Plant Fill.

Revision 14 of the Responses to NRC Requests Regarding Plant Fill contains updated information as detailed in the application page.

/s/ J W Cook  
JWC/GEC/bjb

CC RJCook, Midland Resident Inspector, (w/o)

CONSUMERS POWER COMPANY  
APPLICATION FOR  
REACTOR CONSTRUCTION PERMIT AND OPERATING LICENSE

DOCKET NO 50-329  
DOCKET NO 50-330  
AMENDMENT NO 111

Enclosed herewith, revising and supplementing the above-entitled application, are revised and new pages for incorporation in the Responses to NRC Requests Regarding Plant Fill. The Responses to NRC Requests Regarding Plant Fill were referenced by Amendment 72 to the above dockets on December 19, 1979. The enclosed material consists of the following:

1. Addition of new Appendix D information consisting of:
  - a. Well logs and well construction summaries
  - b. Boring logs and sample extrusion logs
  - c. Piezometer plots
2. Corrections of minor errors and omissions
3. Changes relating to the above (Table of Contents, Figures, Tables, etc)

These new and revised pages bear the notation "Revision 14, 12/82" and are marked in the margin to indicate where changes or new material is submitted. Additional pages and figures have been added as reflected on the revised "List of Effective Pages."

Consumers Power Company

Dated December 20, 1982

By /s/ James W Cook  
James W Cook, Vice President

Sworn and subscribed to before me on this 20 day of December, 1982.

/s/ Barbara P Townsend  
Notary Public, Jackson County, Michigan  
My Commission Expires September 8, 1984

(S E A L)

RESPONSES TO THE  
NRC 10 CFR 50.54(f) REQUEST  
REGARDING PLANT FILL  
FOR  
MIDLAND PLANT UNITS 1 AND 2  
CONSUMERS POWER COMPANY  
DOCKET NUMBERS 50-329 AND 50-330

Consisting of:

1. Responses to Questions 1-36, 38-53
2. Appendix A, Summaries of Bechtel Consultants
3. Appendix B, Consultants' Continued Involvement
4. Appendix C, Consultant Communications
5. Appendix D, Exploration Data

Report Date: April 24, 1979  
Revision 1: May 31, 1979  
Revision 2: July 9, 1979  
Revision 3: September 13, 1979  
Revision 4: November 13, 1979  
Revision 5: February 29, 1980  
Revision 6: April 1, 1980  
Revision 7: May 5, 1980  
Revision 8: August 15, 1980  
Revision 9: September 14, 1980  
Revision 10: November 21, 1980  
Revision 11: February 27, 1981  
Revision 12: October 5, 1981  
Revision 13: June 23, 1982  
Revision 14: December 20, 1982

RESPONSES TO 10 CFR 50.54  
 NRC REQUESTS REGARDING PLANT FILL

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D.1-546	13	D.1-594	13
D.1-547	13	D.1-595	13
D.1-548	13	D.1-596	13
D.1-549	13	D.1-597	13
		D.1-598	13

<u>Sheet ID</u>	<u>Latest Revision</u>	<u>Sheet ID</u>	<u>Latest Revision</u>
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D.1-601	13	D.1-650	13
D.1-602	13	D.1-651	13
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D.1-604	13	D.1-653	13
D.1-605	13	D.1-654	13
D.1-606	13	D.1-655	13
D.1-607	13	D.1-656	13
D.1-608	13	D.1-657	13
D.1-609	13	D.1-658	13
D.1-610	13	D.1-659	13
D.1-611	13	D.1-660	13
D.1-612	13	D.1-661	13
D.1-613	13	D.1-662	13
D.1-614	13	D.1-663	13
D.1-615	13	D.1-664	13
D.1-616	13	D.1-665	13
D.1-617	13	D.1-666	13
D.1-618	13	D.1-667	13
D.1-619	13	D.1-668	13
D.1-620	13	D.1-669	13
D.1-621	13	D.1-670	13
D.1-622	13	D.1-671	13
D.1-623	13	D.1-672	13
D.1-624	13	D.1-673	13
D.1-625	13	D.1-674	13
D.1-626	13	D.1-675	13
D.1-627	13	D.1-676	13
D.1-628	13	D.1-677	13
D.1-629	13	D.1-678	13
D.1-630	13	D.1-679	13
D.1-631	13	D.1-680	13
D.1-632	13	D.1-681	13
D.1-633	13	D.1-682	13
D.1-634	13	D.1-683	13
D.1-635	13	D.1-684	13
D.1-636	13	D.1-685	13
D.1-637	13	D.1-686	13
D.1-638	13	D.1-687	13
D.1-639	13	D.1-688	13
D.1-640	13	D.1-689	13
D.1-641	13	D.1-690	13
D.1-642	13	D.1-691	13
D.1-643	13	D.1-692	13
D.1-644	13	D.1-693	13
D.1-645	13	D.1-694	13
D.1-646	13	D.1-695	13
D.1-647	13	D.1-696	13

<u>Sheet ID</u>	<u>Latest Revision</u>	<u>Sheet ID</u>	<u>Latest Revision</u>
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D.1-698	13	D.1-747	13
D.1-699	13	D.1-748	13
D.1-700	13	D.1-749	13
D.1-701	13	D.1-750	13
D.1-702	13	D.1-751	13
D.1-703	13	D.1-752	13
D.1-704	13	D.1-753	13
D.1-705	13	D.1-754	13
D.1-706	13	D.1-755	13
D.1-707	13	D.1-756	13
D.1-708	13	D.1-758	13
D.1-709	13	D.1-759	13
D.1-710	13	D.1-760	13
D.1-711	13	D.1-761	13
D.1-712	13	D.1-762	13
D.1-713	13	D.1-763	13
D.1-714	13	D.1-764	13
D.1-715	13	D.1-765	13
D.1-716	13	D.1-766	13
D.1-717	13	D.1-767	13
D.1-718	13	D.1-768	13
D.1-719	13	D.1-769	13
D.1-720	13	D.1-770	13
D.1-721	13	D.1-771	13
D.1-722	13	D.1-772	13
D.1-723	13	D.1-773	13
D.1-724	13	D.1-774	13
D.1-725	13	D.1-775	13
D.1-726	13	D.1-776	13
D.1-727	13	D.1-777	13
D.1-728	13	D.1-778	13
D.1-729	13	D.1-779	13
D.1-730	13	D.1-780	13
D.1-731	13	D.1-781	13
D.1-732	13	D.1-782	13
D.1-733	13	D.1-783	13
D.1-734	13	D.1-784	13
D.1-735	13	D.1-785	13
D.1-736	13	D.1-786	13
D.1-737	13	D.1-787	13
D.1-738	13	D.1-788	13
D.1-739	13	D.1-789	13
D.1-740	13	D.1-790	13
D.1-741	13	D.1-791	13
D.1-742	13	D.1-792	13
D.1-743	13	D.1-793	13
D.1-744	13	D.1-794	13
D.1-745	13	D.1-795	13

<u>Sheet ID</u>	<u>Latest Revision</u>	<u>Sheet ID</u>	<u>Latest Revision</u>
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D.1-797	13	D.1-846	13
D.1-798	13	D.1-847	13
D.1-799	13	D.1-848	13
D.1-800	13	D.1-849	13
D.1-801	13	D.1-850	13
D.1-802	13	D.1-851	13
D.1-803	13	D.1-852	13
D.1-804	13	D.1-853	13
D.1-805	13	D.1-854	13
D.1-806	13	D.1-855	13
D.1-807	13	D.1-856	13
D.1-808	13	D.1-857	13
D.1-809	13	D.1-858	13
D.1-810	13	D.1-859	13
D.1-811	13	D.1-860	13
D.1-812	13	D.1-861	13
D.1-813	13	D.1-862	13
D.1-814	13	D.1-863	13
D.1-815	13	D.1-864	13
D.1-816	13	D.1-865	13
D.1-817	13	D.1-866	13
D.1-818	13	D.1-867	13
D.1-819	13	D.1-868	13
D.1-820	13	D.1-869	13
D.1-821	13	D.1-870	13
D.1-822	13	D.1-871	13
D.1-823	13	D.1-872	13
D.1-824	13	D.1-873	13
D.1-825	13	D.1-874	13
D.1-826	13	D.1-875	13
D.1-827	13	D.1-876	13
D.1-828	13	D.1-877	13
D.1-829	13	D.1-878	13
D.1-830	13	D.1-879	13
D.1-831	13	D.1-880	13
D.1-832	13	D.1-881	13
D.1-833	13	D.1-882	13
D.1-834	13	D.1-883	13
D.1-835	13	D.1-884	13
D.1-836	13	D.1-885	13
D.1-837	13	D.1-886	13
D.1-838	13	D.1-887	13
D.1-839	13	D.1-888	13
D.1-840	13	D.1-889	13
D.1-841	13	D.1-890	13
D.1-842	13	D.1-891	13
D.1-843	13	D.1-892	13
D.1-844	13	D.1-893	13

<u>Sheet ID</u>	<u>Latest Revision</u>	<u>Sheet ID</u>	<u>Latest Revision</u>
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D.1-895	13	D.1-943	13
D.1-896	13	D.1-944	13
D.1-897	13	D.1-945	13
D.1-898	13	D.1-946	13
D.1-899	13	D.1-947	13
D.1-900	13	D.1-948	13
D.1-901	13	D.1-949	13
D.1-902	13	D.1-950	13
D.1-903	13	D.1-951	13
D.1-904	13	D.1-952	13
D.1-905	13	D.1-953	13
D.1-906	13	D.1-954	13
D.1-907	13	D.1-955	13
D.1-908	13	D.1-956	13
D.1-909	13	D.1-957	13
D.1-910	13	D.1-958	13
D.1-911	13	D.1-959	13
D.1-912	13	D.1-960	13
D.1-913	13	D.1-961	13
D.1-914	13	D.1-962	13
D.1-915	13	D.1-963	13
D.1-916	13	D.1-964	13
D.1-917	13	D.1-965	13
D.1-918	13	D.1-966	13
D.1-919	13	D.1-967	13
D.1-920	13	D.1-968	13
D.1-921	13	D.1-969	13
D.1-922	13	D.1-970	13
D.1-923	13	D.1-971	13
D.1-924	13	D.1-972	13
D.1-925	13	D.1-973	13
D.1-926	13	D.1-974	13
D.1-927	13	D.1-975	13
D.1-928	13	D.1-976	13
D.1.5 ab		D.1-977	13
D.1-929	13	D.1-978	13
D.1-930	13	D.1-979	13
D.1-931	13	D.1-980	13
D.1-932	13	D.1-981	13
D.1-933	13	D.1-982	13
D.1-934	13	D.1-983	13
D.1-935	13	D.1-984	13
D.1-936	13	D.1-985	13
D.1-937	13	D.1-986	13
D.1-938	13	D.1-987	13
D.1-939	13	D.1-988	13
D.1-940	13	D.1-989	13
D.1-941	13	D.1-990	13

<u>Sheet ID</u>	<u>Latest Revision</u>	<u>Sheet ID</u>	<u>Latest Revision</u>
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D.1-992	13	D.1-1041	13
D.1-993	13	D.1-1042	13
D.1-994	13	D.1-1043	13
D.1-995	13	D.1-1044	13
D.1-996	13	D.1-1045	13
D.1-997	13	D.1-1046	13
D.1-998	13	D.1-1047	13
D.1-999	13	D.1-1048	13
D.1-1000	13	D.1-1049	13
D.1-1001	13	D.1-1050	13
D.1-1002	13	D.1-1051	13
D.1-1003	13	D.1-1052	13
D.1-1004	13	D.1-1053	13
D.1-1005	13	D.1-1054	13
D.1-1006	13	D.1-1055	13
D.1-1007	13	D.1-1056	13
D.1-1008	13	D.1-1057	13
D.1-1009	13	D.1-1058	13
D.1-1010	13	D.1-1059	13
D.1-1011	13	D.1-1060	13
D.1-1012	13	D.1-1061	13
D.1-1013	13	D.1-1062	13
D.1-1014	13	D.1-1063	13
D.1-1015	13	D.1-1064	13
D.1-1016	13	D.1-1065	13
D.1-1017	13	D.1-1066	13
D.1-1018	13	D.1-1067	14
D.1-1019	13	D.1-1068	13
D.1-1020	13	D.1-1069	13
D.1-1021	13	D.1-1070	13
D.1-1022	13	D.1-1071	13
D.1-1023	13	D.1-1072	13
D.1-1024	13	D.1-1073	13
D.1-1025	13	D.1-1074	13
D.1-1026	13	D.1-1075	13
D.1-1027	13	D.1-1076	13
D.1-1028	13	D.1-1077	13
D.1-1029	13	D.1-1078	13
D.1-1030	13	D.1-1079	13
D.1-1031	13	D.1-1080	13
D.1-1032	13	D.1-1081	13
D.1-1033	13	D.1-1082	13
D.1-1034	13	D.1-1083	13
D.1-1035	13	D.1-1084	13
D.1-1036	13	D.1-1085	14
D.1-1037	13	D.1-1086	13
D.1-1038	13	D.1-1087	13
D.1-1039	13	D.1-1088	13

<u>Sheet ID</u>	<u>Latest Revision</u>	<u>Sheet ID</u>	<u>Latest Revision</u>
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D.1-1090	13	D.1-1139	13
D.1-1091	13	D.1-1140	13
D.1-1092	13	D.1-1141	13
D.1-1093	13	D.1-1142	13
D.1-1094	13	D.1-1143	13
D.1-1095	13	D.1-1144	13
D.1-1096	13	D.1-1145	13
D.1-1097	13	D.1-1146	13
D.1-1098	13	D.1-1147	13
D.1-1099	13	D.1-1148	13
D.1-1100	13	D.1-1149	13
D.1-1101	13	D.1-1150	13
D.1-1102	13	D.1-1151	13
D.1-1103	13	D.1-1152	13
D.1-1104	13	D.1-1153	13
D.1-1105	13	D.1-1154	13
D.1-1106	13	D.1-1155	13
D.1-1107	13	D.1-1156	13
D.1-1108	13	D.1-1157	13
D.1-1109	13	D.1-1158	13
D.1-1110	13	D.1-1159	13
D.1-1111	13	D.1-1160	13
D.1-1112	13	D.1-1161	13
D.1-1113	13	D.1-1162	13
D.1-1114	13	D.1-1163	14
D.1-1115	13	D.1-1164	14
D.1-1116	13	D.1-1165	14
D.1-1117	13	D.1-1166	14
D.1-1118	13	D.1-1167	14
D.1-1119	13	D.1-1168	14
D.1-1120	13	D.1-1169	14
D.1-1121	13	D.1-1170	14
D.1-1122	13	D.1-1171	14
D.1-1123	13	D.1-1172	14
D.1-1124	13	D.1-1173	14
D.1-1125	13	D.1-1174	14
D.1-1126	13	D.1-1175	14
D.1-1127	13	D.1-1176	14
D.1-1128	13	D.1-1177	14
D.1-1129	13	D.1-1178	14
D.1-1130	13	D.1-1179	14
D.1-1131	13	D.1-1180	14
D.1-1132	13	D.1-1181	14
D.1-1133	13	D.1-1182	14
D.1-1134	14	D.1-1183	14
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D.1-1136	13	D.1-1185	14
D.1-1137	13	D.1-1186	14

<u>Sheet ID</u>	<u>Latest Revision</u>	<u>Sheet ID</u>	<u>Latest Revision</u>
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D.1-1188	14	D.1-1237	14
D.1-1189	14	D.1-1238	14
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D.1-1191	14	D.1-1240	14
D.1-1192	14	D.1-1241	14
D.1-1193	14	D.1-1242	14
D.1-1194	14	D.1-1243	14
D.1-1195	14	D.1-1244	14
D.1-1196	14	D.1-1245	14
D.1-1197	14	D.1-1246	14
D.1-1198	14	D.1-1247	14
D.1-1199	14	D.1-1248	14
D.1-1200	14	D.1-1249	14
D.1-1201	14	D.1-1250	14
D.1-1202	14	D.1-1251	14
D.1-1203	14	D.1-1252	14
D.1-1204	14	D.1-1253	14
D.1-1205	14	D.1-1254	14
D.1-1206	14	D.1-1255	14
D.1-1207	14	D.1-1256	14
D.1-1208	14	D.1-1257	14
D.1-1209	14	D.1-1258	14
E.1-1210	14	D.1-1259	14
D.1-1211	14	D.1-1260	14
D.1-1212	14	D.1-1261	14
D.1-1213	14	D.1-1262	14
D.1-1214	14	D.1-1263	14
D.1-1215	14	D.1-1264	14
D.1-1216	14	D.1-1265	14
D.1-1217	14	D.1-1266	14
D.1-1218	14	D.1-1267	14
D.1-1219	14	D.1-1268	14
D.1-1220	14	D.1-1269	14
D.1-1221	14	D.1-1270	14
D.1-1222	14	D.1-1271	14
D.1-1223	14	D.1-1272	14
D.1-1224	14	D.1-1273	14
D.1-1225	14	D.1-1274	14
D.1-1226	14	D.1-1275	14
D.1-1227	14	D.1-1276	14
D.1-1228	14	D.1-1277	14
D.1-1229	14	D.1-1278	14
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D.1-1231	14	D.1-1280	14
D.1-1232	14	D.1-1281	14
D.1-1233	14	D.1-1282	14
D.1-1234	14	D.1-1283	14
D.1-1235	14	D.1-1284	14



<u>Sheet ID</u>	<u>Latest Revision</u>	<u>Sheet ID</u>	<u>Latest Revision</u>
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D.1-1286	14	D.1-1334	14
D.1-1287	14	D.1-1335	14
D.1-1288	14	D.1-1336	14
D.1-1289	14	D.1-1337	14
D.1-1290	14	D.1-1338	14
D.1-1291	14	D.1-1339	14
D.1-1292	14	D.1-1340	14
D.1-1293	14	D.1-1341	14
D.1-1294	14	D.1-1342	14
D.1-1295	14	D.1-1343	14
D.1-1296	14	D.1-1344	14
D.1-1297	14	D.1-1345	14
D.1-1298	14	D.1-1346	14
D.1-1299	14	D.1-1347	14
D.1-1300	14	D.1-1348	14
D.1-1301	14	D.1-1349	14
D.1-1302	14	D.1-1350	14
D.1-1303	14	D.1-1351	14
D.1-1304	14	D.1-1352	14
D.1-1305	14	D.1-1353	14
D.1-1306	14	D.1-1354	14
D.1-1307	14	D.1-1355	14
D.1-1308	14	D.1-1356	14
D.1-1309	14	D.1-1357	14
D.1-1310	14	D.1-1358	14
D.1-1311	14	D.1-1359	14
D.1-1312	14	D.1-1360	14
D.1-1313	14	D.1-1361	14
D.1-1314	14	D.2 Tab	
D.1-1315	14	D.2-1	13
D.1-1316	14	D.2.1 Tab	
D.1-1317	14	D.2-2	13
D.1-1318	14	D.2-3	13
D.1-1319	14	D.2.1.1 Tab	
D.1-1320	14	D.2-4	13
D.1-1321	14	D.2-5	13
D.1-1322	14	D.2-6	13
D.1-1323	14	D.2-7	13
D.1-1324	14	D.2-8	13
D.1-1325	14	D.2-9	13
D.1-1326	14	D.2-10	13
D.1-1327	14	D.2-11	13
D.1-1328	14	D.2-12	13
D.1-1329	14	D.2-13	13
D.1-1330	14	D.2-14	13
D.1.6 Tab		D.2-15	13
D.1-1331	14	D.2-16	13
D.1-1332	14	D.2-17	13

<u>Sheet ID</u>	<u>Latest Revision</u>	<u>Sheet ID</u>	<u>Latest Revision</u>
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D.2-19	13	D.2-61	13
D.2-20	13	D.2-62	13
D.2-21	13	D.2-63	13
D.2-22	13	D.2-64	13
D.2-23	13	D.2-65	13
D.2-24	13	D.2-66	13
D.2-25	13	D.2-67	13
D.2-26	13	D.2-68	13
D.2.1.2 Tab		D.2-69	13
D.2-27	13	D.2-70	13
D.2-28	13	D.2.1.6 Tab	
D.2-29	13	D.2-71	13
D.2-30	13	D.2-72	13
D.2-31	13	D.2-73	13
D.2-32	13	D.2-74	13
D.2-33	13	D.2-75	13
D.2-34	13	D.2-76	13
D.2-35	13	D.2-77	13
D.2-36	13	D.2-78	13
D.2-37	13	D.2-79	13
D.2-38	13	D.2-80	13
D.2-39	13	D.2-81	13
D.2-40	13	D.2-82	13
D.2.1.3 Tab		D.2-83	13
D.2-41	13	D.2-84	13
D.2-42	13	D.2-85	13
D.2-43	13	D.2-86	13
D.2-44	13	D.2-87	13
		D.2-88	13
<u>Volume 9</u>		D.2-89	13
		D.2-90	13
D.2.1.4 Tab		D.2-91	13
D.2-45	13	D.2-92	13
D.2-46	13	D.2-93	13
D.2-47	13	D.2-94	13
D.2-48	13	D.2-95	13
D.2-49	13	D.2-96	13
D.2-50	13	D.2-97	13
D.2-51	13	D.2-98	13
D.2-52	13	D.2-99	13
D.2-53	13	D.2-100	13
D.2-54	13	D.2-101	13
D.2-55	13	D.2-102	13
D.2-56	13	D.2-103	13
D.2-57	13	D.2-104	13
D.2-58	13	D.2-105	13
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D.2-109	13	D.2-155	13
D.2-110	13	D.2-156	13
D.2-111	13	D.2-157	13
D.2-112	13	D.2-158	13
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D.2-113	13	D.2-160	13
D.2-114	13	D.2-161	13
D.2.2.1 Tab		D.2-162	13
D.2-115	13	D.2-163	13
D.2-116	13	D.2-164	13
D.2-117	13	D.2-165	13
D.2-118	13	D.2-166	13
D.2-119	13	D.2-167	13
D.2-120	13	D.2-168	13
D.2-121	13	D.2-169	13
D.2-122	13	D.2-170	13
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D.2-124	13	D.2-173	13
D.2-125	13	D.2-174	13
D.2-126	13	D.2-175	13
D.2-127	13	D.2-176	13
D.2-128	13	D.2-177	13
D.2-129	13	D.2-178	13
D.2-130	13	D.2-179	13
D.2-131	13	D.2-180	13
D.2-132	13	D.2-181	13
D.2-133	13	D.2-182	13
D.2-134	13	D.2-183	13
D.2-135	13	D.2-184	13
D.2-136	13	D.2-185	13
D.2-137	13	D.2-186	13
D.2-138	13	D.2-187	13
D.2-139	13	D.2-188	13
D.2-140	13	D.2-189	13
D.2-141	13	D.2-190	13
D.2-142	13	D.2-191	13
D.2-143	13	D.2-192	13
D.2-144	13	D.2-193	13
D.2-145	13	D.2-194	13
D.2-146	13	D.2-195	13
D.2-147	13	D.2-196	13
D.2-148	13	D.2-197	13
D.2-149	13	D.2-198	13
D.2-150	13	D.2-199	13
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D.2-203	13	D.2-252	13
D.2-204	13	D.2-253	13
D.2-205	13	D.2-254	13
D.2-206	13	D.2-255	13
D.2-207	13	D.2-256	13
D.2-208	13	D.2-257	13
D.2-209	13	D.2-258	13
D.2-210	13	D.2-259	13
D.2-211	13	D.2-260	13
D.2-212	13	D.2-261	13
D.2-213	13	D.2-262	13
D.2-214	13	D.2-263	13
D.2-215	13	D.2-264	13
D.2-216	13	D.2-265	13
D.2-217	13	D.2-266	13
D.2-218	13	D.2-267	13
D.2-219	13	D.2-268	13
D.2-220	13	D.2-269	13
D.2-221	13	D.2-270	13
D.2-222	13	D.2-271	13
D.2-223	13	D.2-272	13
D.2-224	13	D.2-273	13
D.2-225	13	D.2-274	13
D.2-226	13	D.2-275	13
D.2-227	13	D.2-276	13
D.2-228	13	D.2-277	13
D.2-229	13	D.2-278	13
D.2-230	13	D.2-279	13
D.2-231	13	D.2-280	13
D.2-232	13	D.2-281	13
D.2-233	13	D.2-282	13
D.2-234	13	D.2-283	13
D.2-235	13	D.2-284	13
D.2-236	13	D.2-285	13
D.2-237	13	D.2-286	13
D.2-238	13	D.2-287	13
D.2-239	13	D.2-288	13
D.2-240	13	D.2-289	13
D.2-241	13	D.2-290	13
D.2-242	13	D.2-291	13
D.2-243	13	D.2-292	13
D.2-244	13	D.2-293	13
D.2-245	13	D.2-294	13
D.2-246	13	D.2-295	13
D.2-247	13	D.2-296	13
D.2-248	13	D.2-297	13
D.2-249	13	D.2-298	13
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D.2-300	13	D.2-348	13
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D.2-302	13	D.2-350	13
D.2-303	13	D.2-351	13
D.2-304	13	D.2-352	13
D.2-305	13	D.2-353	13
D.2-306	13	D.2-354	13
D.2-307	13	D.2-355	13
D.2-308	13	D.2-356	13
D.2-309	13	D.2-357	13
D.2-310	13	D.2-358	13
D.2-311	13	D.2-359	13
D.2-312	13	D.2-360	13
D.2-313	13	D.2-361	13
D.2-314	13	D.2-362	13
D.2-315	13	D.2-363	13
D.2-316	13	D.2-364	13
D.2-317	13	D.2-365	13
D.2-318	13	D.2-366	13
D.2-319	13	D.2-367	13
D.2-320	13	D.2-368	13
D.2-321	13	D.2-369	13
D.2-322	13	D.2-370	13
D.2-323	13	D.2-371	13
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D.2-324	13	D.2-373	13
D.2-325	13	D.2-374	13
D.2-326	13	D.2-375	13
D.2-327	13	D.2-376	13
D.2-328	13	D.2-377	13
D.2-329	13	D.2-378	13
D.2-330	13	D.2-379	13
D.2-331	13	D.2-380	13
D.2-332	13	D.2-381	13
D.2-333	13	D.2-382	13
D.2-334	13	D.2-383	13
D.2-335	13	D.2-384	13
D.2-336	13	D.2-385	13
D.2-337	13	D.2-386	13
D.2-338	13	D.2-387	13
D.2-339	13	D.2-388	13
D.2-340	13	D.2-389	13
D.2-341	13	D.2-390	13
D.2-342	13	D.2-391	13
D.2-343	13	D.2-392	13
D.2-344	13	D.2-393	13
D.2-345	13	D.2-394	13
D.2-346	13	D.2-395	13
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D.2-398	13	D.2-447	13
D.2-399	13	D.2-448	13
D.2-400	13	D.2-449	13
D.2-401	13	D.2-450	13
D.2-402	13	D.2-451	13
D.2-403	13	D.2-452	13
D.2-404	13	D.2-453	13
D.2-405	13	D.2-454	13
D.2-406	13	D.2-455	13
D.2-407	13	D.2-456	13
D.2-408	13	D.2-457	13
D.2-409	13	D.2-458	13
D.2-410	13	D.2-459	13
D.2-411	13	D.2-460	13
D.2-412	13	D.2-461	13
D.2-413	13	D.2-462	13
D.2-414	13	D.2-463	13
D.2-415	13	D.2-464	13
D.2-416	13	D.2-465	13
D.2-417	13	D.2-466	13
D.2-418	13	D.2-467	13
D.2-419	13	D.2-468	13
D.2-420	13	D.2-469	13
D.2-421	13	D.2-470	13
D.2-422	13	D.2-471	13
D.2-423	13	D.2-472	13
D.2-424	13	D.2-473	13
D.2-425	13	D.2-474	13
D.2-426	13	D.2-475	13
D.2-427	13	D.2-476	13
D.2-428	13	D.2-477	13
D.2-429	13	D.2-478	13
D.2-430	13	D.2-479	13
D.2-431	13	D.2-480	13
D.2-432	13	D.2-481	13
D.2-433	13	D.2-482	13
D.2-434	13	D.2-483	13
D.2-435	13	D.2-484	13
D.2-436	13	D.2-485	13
D.2-437	13	D.2-486	13
D.2-438	13	D.2-487	13
D.2-439	13	D.2-488	13
D.2-440	13	D.2-489	13
D.2-441	13	D.2-490	13
D.2-442	13	D.2-491	13
D.2-443	13	D.2-492	13
D.2-444	13	D.2-493	13
D.2-445	13	D.2-494	13

<u>Sheet ID</u>	<u>Latest Revision</u>	<u>Sheet ID</u>	<u>Latest Revision</u>
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D.2-496	13	D.2-545	13
D.2-497	13	D.2-546	13
D.2-498	13	D.2-547	13
D.2-499	13	D.2-548	13
D.2-500	13	D.2-549	13
D.2-501	13	D.2-550	13
D.2-502	13	D.2-551	13
D.2-503	13	D.2-552	13
D.2-504	13	D.2-553	13
D.2-505	13	D.2-554	13
D.2-506	13	D.2-555	13
D.2-507	13	D.2-556	13
D.2-508	13	D.2-557	13
D.2-509	13	D.2-558	13
D.2-510	13	D.2-559	13
D.2-511	13	D.2-560	13
D.2-512	13	D.2-561	13
D.2-513	13	D.2-562	13
D.2-514	13	D.2-563	13
D.2-515	13	D.2-564	13
D.2-516	13	D.2-565	13
D.2-517	13	D.2-566	13
D.2-518	13	D.2.2.4 Tab	
D.2-519	13	D.2-567	13
D.2-520	13	D.2-568	13
D.2-521	13	D.2-570	13
D.2-522	13	D.2-571	13
D.2-523	13	D.2-572	13
D.2-524	13	D.2-573	13
D.2-525	13	D.2.2.5 Tab	
D.2-526	13	D.2-574	13
D.2-527	13	D.2-575	13
D.2-528	13	D.2-576	13
D.2-529	13	D.2-577	13
D.2-530	13	D.2-578	13
D.2-531	13	D.2-579	13
D.2-532	13	D.2-580	13
D.2-533	13	D.2-581	13
D.2-534	13	D.2-582	13
D.2-535	13	D.2-583	13
D.2-536	13	D.2-584	13
D.2-537	13	D.2-585	13
D.2-538	13	D.2-586	13
D.2-539	13	D.2-587	13
D.2-540	13	D.2-588	13
D.2-541	13	D.2-589	13
D.2-542	13	D.2-590	13
D.2-543	13	D.2-591	13

<u>Sheet ID</u>	<u>Latest Revision</u>	<u>Sheet ID</u>	<u>Latest Revision</u>
D.2-592	13	D.2-641	13
D.2-593	13	D.2-642	13
D.2-594	13	D.2-643	13
D.2-595	13	D.2-644	13
D.2-596	13	D.2-645	13
D.2-597	13	D.2-646	13
D.2-598	13	D.2-647	13
D.2-599	13	D.2-648	13
D.2-600	13	D.2-649	13
D.2-601	13	D.2-650	13
D.2-602	13	D.2-651	13
D.2-603	13	D.2-652	13
D.2-604	13	D.2-653	13
D.2-605	13	D.2-654	13
D.2-606	13	D.2-655	13
D.2-607	13	D.2.2.6 Tab	
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D.2-609	13	D.2-657	13
D.2-610	13	D.2-658	13
D.2-611	13	D.2-659	13
D.2-612	13	D.2-660	13
D.2-613	13	D.2-661	13
D.2-614	13	D.2-662	13
D.2-615	13	D.2-663	13
D.2-616	13	D.2-664	13
D.2-617	13	D.2-665	13
D.2-618	13	D.2-666	13
D.2-619	13	D.2-667	13
D.2-620	13	D.2-668	13
D.2-621	13	D.2-669	13
D.2-622	13	D.2-670	13
D.2-623	13	D.2-671	13
D.2-624	13	D.2-672	13
D.2-625	13	D.2-673	13
D.2-626	13	D.2-674	13
D.2-627	13	D.2-675	13
D.2-628	13	D.2-676	13
D.2-629	13	D.2-677	13
D.2-630	13	D.2-678	13
D.2-631	13	D.2-679	13
D.2-632	13	D.2-680	13
D.2-633	13	D.2-681	13
D.2-634	13	D.2-682	13
D.2-635	13	D.2-683	13
D.2-636	13	D.2-684	13
D.2-637	13	D.2-685	13
D.2-638	13	D.2-686	13
D.2-639	13	D.2-687	13
D.2-640	13	D.2-688	13



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D.2-690	13	D.2-739	13
D.2-691	13	D.2-740	13
D.2-692	13	D.2-741	13
D.2-693	13	D.2-742	13
D.2-694	13	D.2-743	13
D.2-695	13	D.2-744	13
D.2-696	13	D.2-745	13
D.2-697	13	D.2-746	13
D.2-698	13	D.2-747	13
D.2-699	13	D.2.2.7 Tab	
D.2-700	13	D.2-748	13
D.2-701	13	D.2-749	13
D.2-702	13	D.2-750	13
D.2-703	13	D.2-751	13
D.2-704	13	D.2-752	13
D.2-705	13	D.2-753	13
D.2-706	13	D.2-754	13
D.2-707	13	D.2-755	13
D.2-708	13	D.2-756	13
D.2-709	13	D.2-757	13
D.2-710	13	D.2-758	13
D.2-711	13	D.2-759	13
D.2-712	13	D.2-760	13
D.2-713	13	D.2-751	13
D.2-714	13	D.2-762	13
D.2-715	13	D.2-763	13
D.2-716	13	D.2-764	13
D.2-717	13	D.2-765	13
D.2-718	13	D.2-766	13
D.2-719	13		
D.2-720	13	<u>Volume 10</u>	
D.2-721	13		
D.2-722	13	D.2.3 Tab	
D.2-723	13	D.2-767	13
D.2-724	13	D.2-768	13
D.2-725	13	D.2.3.1 Tab	
D.2-726	13	D.2-769	13
D.2-727	13	D.2-770	13
D.2-728	13	D.2-771	13
D.2-729	13	D.2-772	13
D.2-730	13	D.2-773	13
D.2-731	13	D.2-774	13
D.2-732	13	D.2-775	13
D.2-733	13	D.2-776	13
D.2-734	13	D.2-777	13
D.2-735	13	D.2-778	13
D.2-736	13	D.2-779	13
D.2-737	13	D.2-780	13

<u>Sheet ID</u>	<u>Latest Revision</u>	<u>Sheet ID</u>	<u>Latest Revision</u>
D.2-781	13	D.2.3.2 Tab	
D.2-782	13	D.2-830	13
D.2-783	13	D.2-831	13
D.2-784	13	D.2-832	13
D.2-785	13	D.2-833	13
D.2-786	13	D.2-834	13
D.2-787	13	D.2-835	13
D.2-788	13	D.2-836	13
D.2-789	13	D.2-837	13
D.2-790	13	D.2-838	13
D.2-791	13	D.2-839	13
D.2-792	13	D.2-840	13
D.2-793	13	D.2-841	13
D.2-794	13	D.2-842	13
D.2-795	13	D.2-843	13
D.2-796	13	D.2-844	13
D.2-797	13	D.2-845	13
D.2-798	13	D.2-846	13
D.2-799	13	D.2-847	13
D.2-800	13	D.2-848	13
D.2-801	13	D.2-849	13
D.2-802	13	D.2-850	13
D.2-803	13	D.2-851	13
D.2-804	13	D.2-852	13
D.2-805	13	D.2-853	13
D.2-806	13	D.2-854	13
D.2-807	13	D.2-855	13
D.2-808	13	D.2-856	13
D.2-809	13	D.2-857	14
D.2-810	13	D.2-858	14
D.2-811	13	D.2-859	13
D.2-812	13	D.2-860	13
D.2-813	13	D.2-861	13
D.2-814	13	D.2-862	13
D.2-815	13	D.2-863	13
D.2-816	13	D.2-864	13
D.2-817	13	D.2-865	13
D.2-818	13	D.2-866	13
D.2-819	13	D.2-867	13
D.2-820	13	D.2-868	13
D.2-821	13	D.2-869	13
D.2-822	13	D.2-870	13
D.2-823	13	D.2-871	13
D.2-824	13	D.2-872	13
D.2-825	13	D.2-873	13
D.2-826	13	D.2-874	13
D.2-827	13	D.2-875	13
D.2-828	13	D.2-876	14
D.2-829	13	D.2-877	13

<u>Sheet ID</u>	<u>Latest Revision</u>	<u>Sheet ID</u>	<u>Latest Revision</u>
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D.2-879	13	D.2-926	13
D.2-880	13	D.2-927	13
D.2-881	13	D.2-928	13
D.2-882	13	D.2-929	13
D.2-883	13	D.2-930	13
D.2-884	13	D.2-931	13
D.2-885	13	D.2-932	13
D.2-886	13	D.2-933	13
D.2-887	13	D.2-934	13
D.2-888	13	D.2-935	13
D.2-889	13	D.2-936	13
D.2-890	13	D.2-937	14
D.2-891	13	D.2-938	13
D.2-892	13	D.2-939	13
D.2-893	13	D.2-940	13
D.2-894	13	D.2-941	13
D.2-895	13	D.2-942	13
D.2-896	13	D.2-943	13
D.2-897	13	D.2-944	13
D.2-898	13	D.2-945	14
D.2-899	13	D.2-946	14
D.2-900	13	D.2-947	13
D.2-901	13	D.2-948	13
D.2-902	13	D.2-949	13
D.2-903	13	D.2-950	13
D.2-904	13	D.2-951	13
D.2-905	13	D.2-952	13
D.2-906	13	D.2-953	13
D.2-907	13	D.2-954	13
D.2-908	13	D.2-955	13
D.2-909	13	D.2-956	13
D.2-910	13	D.2-957	13
D.2-911	13	D.2-958	13
D.2-912	13	D.2-959	13
D.2-913	13	D.2-960	13
D.2-914	13	D.2-961	13
D.2-915	14	D.2-962	13
D.2-916	13	D.2-963	13
D.2-917	13	D.2-964	13
D.2-917a	13	D.2-965	13
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D.6-38	13	D.6-87	13
D.6-39	13	D.6-88	13
D.6-40	13	D.6-89	13
D.6-41	13	D.6-90	13
D.6-42	13	D.6-91	13
D.6-43	13	D.6-92	13
D.6-44	13	D.6-93	13
D.6-45	13	D.6-94	13
D.6-46	13	D.6-95	13
D.6-47	13	D.6-96	13
D.6-48	13	D.6-97	13
D.6-49	13	D.6-98	13
D.6-50	13	D.6-99	13
D.6-51	13	D.6-100	13
D.6-52	13	D.6-101	13
D.6-53	13	D.6-102	13
D.6-54	13	D.6-103	13
D.6-55	13	D.6-104	13
D.6-56	13	D.6-105	13
D.6-57	13	D.7 Tab	
D.6-58	13	D.7-1	13
D.6-59	13	D.7-2	13
D.6-60	13	D.7-3	13
D.6-61	13	D.7-4	13
D.6-62	13	D.7-5	13
D.6-63	13	D.7-6	13
D.6-64	13	D.7-7	13
D.6-65	13	D.7-8	13
D.6-66	13	D.7-9	13
D.6-67	13	D.7-10	13
D.6-68	13	D.7-11	13
D.6-69	13	D.7-12	13
D.6-70	13	D.7-13	13
D.6-71	13	D.7-14	13
D.6-72	13	D.7-15	13
D.6-73	13	D.7-16	13
D.6-74	13	D.7-17	13
D.6-75	13	D.7-18	13
D.6-76	13	D.7-19	14
D.6-77	13	D.7-20	14
D.6-78	13	D.7-21	13

<u>Sheet ID</u>	<u>Latest Revision</u>	<u>Sheet ID</u>	<u>Latest Revision</u>
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D.7-23	13	D.7-71	13
D.7-24	13	D.7-72	13
D.7-25	13	D.7-73	13
D.7-26	13	D.7-74	13
D.7-27	13	D.7-75	13
D.7-28	13	D.7-76	13
D.7-29	13	D.7-77	13
D.7-30	13	D.7-78	13
D.7-31	13	D.7-79	13
D.7-32	13	D.7-80	13
D.7-33	13	D.7-81	13
D.7-34	13	D.7-82	13
D.7.2 Tab		D.7.3 Tab	
D.7-35	13	D.7-83	13
D.7-36	13	D.7-84	13
D.7-37	13	D.7-85	13
D.7-38	13	D.7-86	13
D.7-39	13	D.7-87	13
D.7-40	13	D.7-88	13
D.7-41	13	D.7-89	13
D.7-42	13	D.7-90	13
D.7-43	13	D.7-91	13
D.7-44	13	D.7-92	13
D.7-45	13	D.7-93	13
D.7-46	13	D.7-94	13
D.7-47	13	D.7-95	13
D.7-48	13	D.7-96	13
D.7-49	13	D.7-97	13
D.7-50	13	D.7-98	13
D.7-51	13	D.7-99	13
D.7-52	13	D.7-100	13
D.7-53	14	D.7-101	13
D.7-54	13	D.7-102	13
D.7-55	13	D.7-103	13
D.7-56	13	D.7.4 Tab	
D.7-57	13	D.7-104	13
D.7-58	13	D.7-105	13
D.7-59	13	D.7-106	13
D.7-60	13	D.7-107	13
D.7-61	13	D.7-108	13
D.7-62	13	D.8 Tab	
D.7-63	13	D.8-1	13
D.7-64	13	D.8-2	13
D.7-65	13	D.8-3	13
D.7-66	13	D.8-4	13
D.7-67	13	D.8-5	13
D.7-68	13	D.8-6	13
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D.8-9	13	D.8-58	13
D.8-10	13	D.8-59	13
D.8-11	13	D.8-60	13
D.8-12	13	D.8-61	13
D.8-13	13	D.8-62	13
D.8-14	13	D.8-63	13
D.8-15	13	D.8-64	13
D.8-16	13	D.8-65	13
D.8-17	13	D.8-66	13
D.8-18	13	D.8-67	13
D.8-19	13	D.8-68	13
D.8-20	13	D.8-69	13
D.8-21	13	D.8-70	13
D.8-22	13	D.8-71	13
D.8-23	13	D.8-72	13
D.8-24	13	D.8-73	13
D.8-25	13	D.8-74	13
D.8-26	13	D.8-75	13
D.8-27	13	D.8-76	13
D.8-28	13	D.8-77	13
D.8-29	13	D.8-77a	14
D.8-30	13	D.8-77b	14
D.8-31	13	D.8-77c	14
D.8-32	13	D.8-77d	14
D.8-33	13	D.8-77e	14
D.8-34	13	D.8-77f	14
D.8-35	13	D.8-77g	14
D.8-36	13	D.8-77h	14
D.8-37	13	D.8-77i	14
D.8-38	13	D.8-77j	14
D.8-39	13	D.8-77k	14
D.8-40	13	D.8-77l	14
D.8-41	13	D.8-77m	14
D.8-42	13	D.8-77n	14
D.8-43	13	D.8-77o	14
D.8-44	13	D.8-77p	14
D.8-45	13	D.8-77q	14
D.8-46	13	D.8-77r	14
D.8-47	13	D.8-77s	14
D.8-48	13	D.8-77t	14
D.8-49	13	D.8-77u	14
D.8-50	13	D.8-77v	14
D.8-51	13	D.8-77w	14
D.8-52	13	D.8-78	13
D.8-53	13	D.8-79	13
D.8-54	13	D.8-80	13
D.8-55	13	D.8-81	13
D.8-56	13	D.8-82	13

<u>Sheet ID</u>	<u>Latest Revision</u>	<u>Sheet ID</u>	<u>Latest Revision</u>
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D.8-84	13	D.9-21	14
D.8-85	13	D.9-22	14
D.8-86	13	D.9-23	14
D.8-87	13	D.9-24	14
D.8-88	13	D.9-25	14
D.8-89	13	D.9-26	14
D.8-90	13	D.9-27	14
D.8-91	13	D.9-28	14
D.8-92	13	D.9-29	14
D.8-93	13	D.9-30	14
D.8-94	13	D.9-31	14
D.8-95	13	D.9-32	14
D.8-96	13	D.9-33	14
D.8-97	13	D.9-34	14
D.8-98	13	D.9-35	14
D.8-100	13	D.9-36	14
D.8-101	13	D.9-37	14
D.8-102	13	D.9-38	14
D.8-103	13	D.9-39	14
D.8-104	13	D.9-40	14
D.8-105	13	D.9-41	14
D.8-106	13	D.9-42	14
D.8-107	13	D.9-43	14
D.8-108	13	D.9-44	14
D.8-109	13	D.9-45	14
D.8-110	13	D.9-46	14
D.8-111	13	D.9-47	14
D.8-112	13	D.9-48	14
D.9 Tab		D.9-49	14
D.9-1	13	D.9-50	14
D.9-2	14	D.9-51	14
D.9-3	14	D.9-52	14
D.9-4	14	D.9-53	14
D.9-5	14	D.9-54	14
D.9-6	14	D.9-55	14
D.9-7	14	D.9-56	14
D.9-8	14	D.9-57	14
D.9-9	14	D.9-58	14
D.9-10	14	D.9-59	14
D.9-11	14	D.9-60	14
D.9-12	14	D.9-61	14
D.9-13	14	D.9-62	14
D.9-14	14	D.9-63	14
D.9-15	14	D.9-64	14
D.9-16	14	D.9-65	14
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D.9-18	14	D.9-67	14
D.9-19	14	D.9-68	14



<u>Sheet ID</u>	<u>Latest Revision</u>	<u>Sheet ID</u>	<u>Latest Revision</u>
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D.9-70	14	D.9-80m	14
D.9-71	14	D.9-80n	14
D.9-72	14	D.9-80o	14
D.9-73	14	D.9-80p	14
D.9-74	14	D.9-80q	14
D.9-75	14	D.9-80r	14
D.9-76	14	D.9-80s	14
D.9-77	14	D.9-80t	14
D.9-78	14	D.9-80u	14
D.9-79	14	D.9-80v	14
D.9-79a	14	D.9-80w	14
D.9-79b	14	D.9-80x	14
D.9-79c	14	D.9-80y	14
D.9-79d	14	D.9-80z	14
D.9-79e	14	D.9-81	14
D.9-79f	14	D.9-81a	14
D.9-79g	14	D.9-81b	14
D.9-79h	14	D.9-81c	14
D.9-79i	14	D.9-81d	14
D.9-79j	14	D.9-81e	14
D.9-79k	14	D.9-81f	14
D.9-79l	14	D.9-81g	14
D.9-79m	14	D.9-81h	14
D.9-79n	14	D.9-81i	14
D.9-79o	14	D.9-81j	14
D.9-79p	14	D.9-81k	14
D.9-79q	14	D.9-81l	14
D.9-79r	14	D.9-81m	14
D.9-79s	14	D.9-81n	14
D.9-79t	14	D.9-81o	14
D.9-79u	14	D.9-81p	14
D.9-79v	14	D.9-81q	14
D.9-79w	14	D.9-81r	14
D.9-79x	14	D.9-81s	14
D.9-79y	14	D.9-81t	14
D.9-79z	14	D.9-81u	14
D.9-80	14	D.9-81v	14
D.9-80a	14	D.9-81w	14
D.9-80b	14	D.9-81x	14
D.9-80c	14	D.9-81y	14
D.9-80d	14	D.9-81z	14
D.9-80e	14	D.9-82	14
D.9-80f	14	D.9-82a	14
D.9-80g	14	D.9-82b	14
D.9-80h	14	D.9-82c	14
D.9-80i	14	D.9-82d	14
D.9-80j	14	D.9-82e	14
D.9-80k	14	D.9-82f	14

<u>Sheet ID</u>	<u>Latest Revision</u>	<u>Sheet ID</u>	<u>Latest Revision</u>
D.9-82g	14	D.9-86	13
D.9-82h	14	D.9-87	13
D.9-82i	14	D.9-88	13
D.9-82j	14	D.9-89	13
D.9-82k	14	D.9-90	13
D.9-82l	14	D.9-91	13
D.9-82m	14	D.9-92	13
D.9-82n	14	D.9-93	13
D.9-82o	14	D.9-94	13
D.9-82p	14	D.9-95	13
D.9-82q	14	D.9-96	13
D.9-82r	14	D.9-97	13
D.9-82s	14	D.9-98	13
D.9-82t	14	D.9-99	13
D.9-82u	14	D.9-100	13
D.9-82v	14	D.9-101	13
D.9-82w	14	D.9-102	13
D.9-82x	14	D.9-103	13
D.9-82y	14	D.9-104	13
D.9-82z	14	D.9-105	13
D.9-83	14	D.9-106	13
D.9-83a	14	D.9-107	14
D.9-83b	14	D.9-108	14
D.9-83c	14	D.9-109	14
D.9-83d	14	D.9-110	14
D.9-83e	14	D.9-111	14
D.9-83f	14	D.9-112	14
D.9-83g	14	D.9-113	14
D.9-83h	14	D.9-114	14
D.9-83i	14	D.9-115	14
D.9-83j	14	D.9-116	14
D.9-83k	14	D.9-117	14
D.9-83l	14	D.9-118	14
D.9-83m	14	D.9-119	14
D.9-83n	14	D.9-120	14
D.9-83o	14	D.9-121	14
D.9-83p	14	D.9-122	14
D.9-83q	14	D.9-123	14
D.9-83r	14	D.9-124	14
D.9-83s	14	D.9-125	14
D.9-83t	14	D.9-126	14
D.9-83u	14	D.9-127	14
D.9-83v	14	D.9-128	14
D.9-83w	14	D.9-129	14
D.9-83x	14	D.9-130	14
D.9-83y	14	D.9-131	14
D.9-83z	14	D.9-132	14
D.9-84	14	D.9-133	14
D.9-85	13	D.9-134	14

<u>Sheet ID</u>	<u>Latest Revision</u>	<u>Sheet ID</u>	<u>Latest Revision</u>
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D.10-1	14	D.10-50	13
D.10-2	13	D.10-51	13
D.10-3	13	D.10-52	13
D.10-4	13	D.10-53	13
D.10-5	13	D.10-54	14
D.10-6	13	D.10-55	13
D.10-7	13	D.10-56	13
D.10-8	13	D.10-57	13
D.10-9	14	D.10-58	13
D.10-10	13	D.10-59	13
D.10-11	13	D.10-60	13
D.10-12	13	D.10-61	13
D.10-13	13	D.10-62	13
D.10-14	13	D.10-63	13
D.10-15	13	D.10-64	14
D.10-16	13	D.10-65	14
D.10-17	13	D.10-66	13
D.10-18	13	D.10-67	13
D.10-19	13	D.10-68	13
D.10-20	13	D.10-69	13
D.10-21	13	D.10-70	13
D.10-22	13	D.10-71	13
D.10-23	13	D.10-72	13
D.10-24	13	D.10-73	13
D.10-25	13	D.10-74	13
D.10-26	13	D.10-75	13
D.10-27	13	D.10-76	13
D.10-28	13	D.10-77	13
D.10-29	13	D.10-78	13
D.10-30	13	D.10-79	13
D.10-31	13	D.10-80	13
D.10-32	14	D.10-81	13
D.10-33	13	D.10-82	13
D.10-34	13	D.10-83	13
D.10-35	13	D.10-84	13
D.10-36	13	D.10-85	13
D.10-37	13	D.10-86	13
D.10-38	13	D.10-87	13
D.10-39	13	D.10-88	13
D.10-40	13	D.10-89	13
D.10-41	13	D.10-90	13
D.10-42	13	D.10-91	13
D.10-43	13	D.10-92	13
D.10-44	13	D.10-93	13
D.10-45	13	D.10-94	13
D.10-46	13	D.10-95	13
D.10-47	13	D.10-96	13
D.10-48	13	D.10-97	13

<u>Sheet ID</u>	<u>Latest Revision</u>	<u>Sheet ID</u>	<u>Latest Revision</u>
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D.10-99	13	D.10-148	13
D.10-100	13	D.10-149	13
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D.10-102	13	D.10-151	13
D.10-103	13	D.10-152	13
D.10-104	13	D.10-153	13
D.10-105	13	D.10-154	13
D.10-106	14	D.10-155	13
D.10-107	13	D.10-156	13
D.10-108	13	D.10-157	13
D.10-109	13	D.10-158	13
D.10-110	13	D.10-159	13
D.10-111	13	D.10-160	13
D.10-112	13	D.10-161	13
D.10-113	13	D.10-162	13
D.10-114	13	D.10-163	13
D.10-115	13	D.10-164	13
D.10-116	13	D.10-165	13
D.10-117	13	D.10-166	13
D.10-118	13	D.10-167	13
D.10-119	13	D.10-168	13
D.10-120	13	D.10-169	13
D.10-121	13	D.10-170	13
D.10-122	13	D.10-171	13
D.10-123	13	D.10-172	13
D.10-124	13	D.10-173	13
D.10-125	13	D.10-174	14
D.10-126	13	D.10-175	14
D.10-127	13	D.10-176	13
D.10-128	13	D.10-177	13
D.10-129	13	D.10-178	13
D.10-130	13	D.10-179	13
D.10-131	13	D.10-180	13
D.10-132	13	D.10-181	13
D.10-133	13	D.10-182	13
D.10-134	13	D.10-183	13
D.10-135	13	D.10-184	13
D.10-136	13	D.10-185	13
D.10-137	13	D.10-186	13
D.10-138	13	D.10-187	13
D.10-139	13	D.10-188	14
D.10-140	13	D.10-189	13
D.10-141	13	D.10-190	13
D.10-142	13	D.10-191	13
D.10-143	13	D.10-192	13
D.10-144	13	D.10-193	13
D.10-145	13	D.10-194	13
D.10-146	13	D.10-195	13

<u>Sheet ID</u>	<u>Latest Revision</u>	<u>Sheet ID</u>	<u>Latest Revision</u>
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D.10-197	13	D.10-246	13
D.10-198	13	D.10-247	13
D.10-199	13	D.10-248	13
D.10-200	13	D.10-249	13
D.10-201	13	D.10-250	13
D.10-202	13	D.10-251	13
D.10-203	13	D.10-252	13
D.10-204	13	D.10-253	13
D.10-205	13	D.10-254	13
D.10-206	13	D.10-255	13
D.10-207	13	D.10-256	13
D.10-208	13	D.10-257	13
D.10-209	13	D.10-258	13
D.10-210	13	D.10-259	13
D.10-211	13	D.10-260	13
D.10-212	13	D.10-261	13
D.10-213	13	D.10-262	13
D.10-214	13	D.10-263	13
D.10-215	13	D.10-264	13
D.10-216	13	D.10-265	13
D.10-217	13	D.10-266	13
D.10-218	13	D.10-267	13
D.10-219	13	D.10-268	13
D.10-220	13	D.10-269	13
D.10-221	13	D.10-270	13
D.10-222	13	D.10-271	13
D.10-223	13	D.10-272	13
D.10-224	13	D.10-273	13
D.10-225	14	D.10-274	13
D.10-226	14	D.10-275	13
D.10-227	13	D.10-276	13
D.10-228	13	D.10-277	13
D.10-229	13	D.10-278	13
D.10-230	13	D.10-279	13
D.10-231	13	D.10-280	13
D.10-232	13	D.10-281	13
D.10-233	13	D.10-282	13
D.10-234	13	D.10-283	13
D.10-235	13	D.10-284	13
D.10-236	13	D.10-285	13
D.10-237	13	D.10-286	13
D.10-238	13	D.10-287	13
D.10-239	13	D.10-288	13
D.10-240	13	D.10-289	13
D.10-241	13	D.10-290	14
D.10-242	13	D.10-291	13
D.10-243	13	D.10-292	13
D.10-244	13	D.10-293	13

<u>Sheet ID</u>	<u>Latest Revision</u>	<u>Sheet ID</u>	<u>Latest Revision</u>
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D.10-295	13	D.10-344	13
D.10-296	13	D.10-345	13
D.10-297	13	D.10-346	13
D.10-298	13	D.10-347	13
D.10-299	13	D.10-348	13
D.10-300	13	D.10-349	13
D.10-301	13	D.10-350	13
D.10-302	13	D.10-351	13
D.10-303	13	D.10-352	13
D.10-304	13	D.10-353	13
D.10-305	13	D.10-354	13
D.10-306	13	D.10-355	13
D.10-307	13	D.10-356	13
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## SOIL EXPLORATION DATA

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Boring No.	Location <sup>(1)</sup>	Depth (ft)	Surface Elevation	Purpose	Type Drilling	Number and Type of Samples Taken
601	S 5,750.5 E 2,694.0	28.0	603.4	Dike perimeter	Auger, standard pen. ASTM	Split spoon 8
602	S 6,098.1 W 3,298.6	25.0	601.6	Dike perimeter	Auger, standard pen. ASTM	Split spoon 8
603	S 6,431.0 W 3,415.8	15.5	609.6	Dike perimeter	Auger, standard pen. ASTM	Split spoon 6
604	S 6,731 W 3,529	20.0	604.0	Dike perimeter	Auger, rotary wash, standard pen. ASTM	Split spoon 7
604A <sup>(3)</sup>	S 6,731 W 3,529	5.0	604.0	Dike perimeter	Auger, Dames & Moore pen.	Type U 1
605	S 7,650 W 3,680	21.0	618.7	Dike perimeter	Auger, standard pen. ASTM	Split spoon 7
606	S 8,998 W 3,740	20.0	623.0	Dike perimeter	Auger, standard pen. ASTM	Split spoon 7
606A <sup>(3)</sup>	S 8,998 W 3,740	6.5	623.0	Dike perimeter	Auger, Dames & Moore pen.	Type U 2
607	S 9,638 W 3,710	40.0	624.6	Dike perimeter	Auger, standard pen. ASTM	Split spoon 11
607A <sup>(3)</sup>	S 9,638 W 3,710	16.5	624.6	Dike perimeter	Auger, Dames & Moore pen.	Type U 3
608	S10,977 W 1,306	20.0	627.1	Dike perimeter	Auger, standard pen. ASTM	Split spoon 7
608A <sup>(3)</sup>	S10,977 W 1,306	8.5	627.1	Dike perimeter	Auger, Dames & Moore pen.	Type U 2 Bulk 2
609	S 5,455 E 2,779	13.5	603.6	Dike perimeter	Auger, standard pen. ASTM, Dames & Moore pen.	Split spoon 3 Type U 2
610	S 5,610 E 2,975	15.0	603.1	Dike perimeter	Auger, standard pen. ASTM	Split spoon 5
611	S 5,570 E 2,374	26.0	603.6	Dike perimeter	Auger, standard pen. ASTM	Split spoon 8

612 through 729 not drilled

TABLE OF BORING LOGS (Continued)

Boring No.	Location <sup>(1)</sup>	Depth (ft)	Surface Elevation	Purpose	Type Drilling	Number and Type of Samples Taken
730	S 4,715 <sup>(2)</sup> E 130	60.0	601.6	Plant area, radwaste building	Auger, rotary wash, Dames & Moore pen.	Type U 15
731	S 4,450 <sup>(2)</sup> E 75	150.0	603.8	Plant area, auxi- liary boiler building	Auger, rotary wash, Dames & Moore pen.	Type U 36
732 through 800 not drilled						
801	S 5,878.9 E 4,014.5	50.0	603.6	Dike perimeter and railroad bridge	Auger, rotary wash, standard pen. ASTM, Dames & Moore pen.	Split spoon 7 Type U 9
802	S 5,821.7 E 4,053.1	70.0	604.8	Dike perimeter and railroad bridge	Auger, rotary wash, standard pen. ASTM, Dames & Moore pen.	Split spoon 8 Type U 9
803	S 5,766.1 E 4,089.4	57.5	602.8	Dike perimeter and railroad bridge	Auger, rotary wash, standard pen. ASTM, Dames & Moore pen.	Split spoon 7 Type U 6
804	S 5,711.7 E 4,123.3	27.0	587.1	Dike perimeter and railroad bridge	Rotary wash, standard pen. ASTM	Split spoon 9
805	S 5,662.6 E 4,162.4	30.5	586.0	Dike perimeter and railroad bridge	Rotary wash, standard pen. ASTM	Split spoon 12
806	S 5,588.6 E 4,203.0	25.0	586.0	Dike perimeter and railroad bridge	Rotary wash, standard pen. ASTM	Split spoon 9
807	S 5,503.4 E 4,253.1	40.5	600.5	Dike perimeter and railroad bridge	Auger, rotary wash, standard pen. ASTM, Dames & Moore pen.	Split spoon 5 Type U 6
808	S 5,443.1 E 4,290.8	30.0	600.8	Dike perimeter and railroad bridge	Auger, standard pen. ASTM, Dames & Moore pen.	Split spoon 5 Type U 4
809	S 5,011.6 E 4,549.5	36.0	602.8	Dike perimeter and railroad bridge	Auger, rotary wash, standard pen. ASTM, Dames & Moore pen.	Split spoon 3 Type U 6
A	S 5,950 <sup>(2)</sup> W 1,280	12.0	609±	Dike perimeter	Auger, Dames & Moore pen.	Bulk 2 Type U 1
B	S 7,600 <sup>(2)</sup> W 1,230	20.0	617±	General borrow	Auger, Dames & Moore pen.	Bulk 2 Type U 2
C	S 8,350 <sup>(2)</sup> W 2,215	27.0	625±	General borrow	Auger, Dames & Moore pen.	Bulk 2 Type U 3

TABLE OF BORING LOGS (Continued)

<u>Boring No.</u>	<u>Location<sup>(1)</sup></u>	<u>Depth (ft)</u>	<u>Surface Elevation</u>	<u>Purpose</u>	<u>Type Drilling</u>	<u>Number and Type of Samples Taken</u>
CH-4	S 5,044.0 E 712.15	50.0	634.6±	Investigate backfill	Auger and/or rotary wash	Split spoon 8
CH-5	S 5,050.78 E 713.05	25.0	633.8±	Investigate backfill	Auger and/or rotary wash	Split spoon 3
CH-5A	S 5,051.30 E 707.35	50.0	633.8	Investigate backfill	Auger and/or rotary wash	Split spoon 6
CH-6	S 5,058.80 E 701.75	24.5	634.0±	Investigate backfill	Auger and/or rotary wash	Split spoon 3
CH-6A	S 5,057.73 E 697.65	50.0	634.0±	Investigate backfill	Auger and/or rotary wash	Split spoon 5
CH-7	S 4,625 E 345	41.0	632.0±	Investigate backfill	Auger and/or rotary wash	Split spoon 8
CH-8	S 4,619 E 346.4	40.5	632.0±	Investigate backfill	Auger and/or rotary wash	Split spoon 8
CH-9	S 4,610 E 345.9	41.5	632.0±	Investigate backfill	Auger and/or rotary wash	Split spoon 8
CH-9A	S 4,610 E 345.9	86.5	632.0	Investigate backfill	Rotary wash	Split spoon 9
CH-10	S 4,619 E 200	41.5	632.0	Investigate backfill	Auger and/or rotary wash	Split spoon 8
CH-11	S 4,612.9 E 200	41.5	632.0±	Investigate backfill	Auger and/or rotary wash	Split spoon 8
CH-12	S 4,605.9 E 198	41.5	632.0±	Investigate backfill	Auger and/or rotary wash	Split spoon 8
CH-13	S 5,067 E 185	41.5	633.7	Investigate backfill	Rotary wash	Split spoon 7
CH-14	S 5,067.5 E 191	41.5	632.40	Investigate backfill	Rotary wash	Split spoon 7
CH-15	S 5,067 E 200	41.5	633.8	Investigate backfill	Rotary wash	Split spoon 7
CH-16	S 5,113 E 246	40.0	633.4	Investigate backfill	Rotary wash	Split spoon 8
CH-17	S 5,113 E 317	46.0	633.0±	Investigate backfill	Rotary wash	Split spoon 7

TABLE OF BORING LOGS (Continued)

Boring No.	Location <sup>(1)</sup>	Depth (ft)	Surface Elevation	Purpose	Type Drilling	Number and Type of Samples Taken
CH-18	S 5,113 E 323	46.5	633.0	Investigate backfill	Rotary wash	Split spoon 7
CH-19	S 5,225 E 400	5.5	634.0 ±	Investigate backfill	Auger	Split spoon 1
CH-19A	S 5,225 E 402	41.5	634.0 ±	Investigate backfill	Auger and/or rotary wash	Split spoon 9
CH-20	S 5,231 E 402	41.5	634.0 ±	Investigate backfill	Auger and/or rotary wash	Split spoon 8
CH-21	S 5,240 E 402	41.5	634.0	Investigate backfill	Auger and/or rotary wash	Split spoon 8
TEW-1	S 4,896.75 E 444.08	49.0	634.5	Permanent dewatering system investigation	Rotary wash	Split spoon 11
TEW-2	S 4,907.75 E 377.08	53.5	634.5	Permanent dewatering system investigation	Rotary wash	Split spoon 13
TEW-3	S 4,896.75 E 377.08	51.5	634.5	Permanent dewatering system investigation	Rotary wash	Split spoon 9
TEW-4	S 4,896.75 E 105.92	49.5	634.5	Permanent dewatering system investigation	Rotary wash	Split spoon 10
TEW-5	S 4,905.25 E 179.92	54.5	634.5	Permanent dewatering system investigation	Rotary wash	Split spoon 13
TEW-7	S 4,896.75 E 155.92	54.5	634.5	Permanent dewatering system investigation	Rotary wash	Split spoon 14
TEW-8	S 4,896.75 E 141.92	51.5	634.5	Permanent dewatering system investigation	Rotary wash	Split spoon 12
LOW-7	S 4,913.75 E 393.08	54.0	634.5	Permanent dewatering system investigation	Rotary wash	Split spoon 13
LOW-8	S 4,896.75 E 395.08	51.5	634.5	Permanent dewatering system investigation	Rotary wash	Split spoon 12
LOW-9	S 4,948.75 E 422.5	37.5	634.5	Permanent dewatering system investigation	Rotary wash	Split spoon 5
LOW-11	S 4,948.75 E 117.92	40.0	634.5	Permanent dewatering system investigation	Rotary wash	Split spoon 6
LOW-13	S 4,907.75 E 174.92	53.5	634.5	Permanent dewatering system investigation	Rotary wash	Split spoon 13

TABLE OF BORING LOGS (Continued)

<u>Boring No.</u>	<u>Location<sup>(1)</sup></u>	<u>Depth (ft)</u>	<u>Surface Elevation</u>	<u>Purpose</u>	<u>Type Drilling</u>	<u>Number and Type of Samples Taken</u>
WJ-1B <sup>(5)</sup>	S 5,102 E 545	67.0	633.8	Permanent dewatering well pilot holes	Auger and/or rotary wash	Pitcher 24
WJ-2 <sup>(5)</sup>	S 5,034.5 E 592.5	67.0	632.6	Permanent dewatering well pilot holes	Auger and/or rotary wash	Pitcher 20
WN-1 <sup>(5)</sup>	S 4,932 E 707	90.0	634.7	Permanent dewatering well pilot holes	Auger and/or rotary wash	Pitcher 28
WN-4 <sup>(5)</sup>	S 4,740 E 647	96.0	633.8	Permanent dewatering well pilot holes	Auger and/or rotary wash	Pitcher 26
WN-5 <sup>(5)</sup>	S 4,815 E 698	84.0	634.0	Permanent dewatering well pilot holes	Auger and/or rotary wash	Pitcher 25
WN-3 <sup>(5)</sup>	S 4,684 E 350	67.0	634.7	Permanent dewatering well pilot holes	Auger and/or rotary wash	Pitcher 17
WN-4 <sup>(5)</sup>	S 4,615 E 387	83.5	634.3	Permanent dewatering well pilot holes	Auger and/or rotary wash	Pitcher 28
WN-4R <sup>(5)</sup>	S 4,677 E 437	69.6		Permanent dewatering well pilot holes	Auger and/or rotary wash	Pitcher 24
WN-5 <sup>(5)</sup>	S 4,647 E 492	91.5	633.4	Permanent dewatering	Auger and/or rotary	Pitcher 24
ME-27B	S 5,062.35 E 524.39	59.5	634.0	Dewatering well for auxiliary building underpinning support	Auger and/or rotary wash	Split spoon 11
ME-33	S 5,178.82 E 346.99	40.0	634.0	Dewatering well for auxiliary building underpinning support	Auger and/or rotary wash	Split spoon 5
ME-34	S 5,202 E 346.19	40.0	634.0	Dewatering well for auxiliary building underpinning support	Auger and/or rotary wash	Split spoon 8
ME-50	S 5,177.87 E 155.95	52.0	634.0	Dewatering well for auxiliary building underpinning support	Auger and/or rotary wash	Split spoon 8
ME-51	S 5,201.98 E 161.21	44.5	634.0	Dewatering well for auxiliary building underpinning support	Auger and/or rotary wash	Split spoon 10
MP-4	S 4,935.07 E 494.69	60.0	634.0	Observation well for auxiliary building underpinning support	Auger and/or rotary wash	Split spoon 11

TABLE OF BORING LOGS (Continued)

Boring No.	Location <sup>(1)</sup>	Depth (ft)	Surface Elevation	Purpose	Type Drilling	Number and Type of Samples Taken
MP-4A	S 5,016.40 E 509.99	57.0	634.0	Observation well for auxiliary building underpinning support	Auger and/or rotary wash	Split spoon 10
MP-5	S 5,155.01 E 487.47	36.5	634.0	Observation well for auxiliary building underpinning support	Auger and/or rotary wash	Split spoon 6
MP-7	S 5,173.86 E 299	63.0	634.0	Observation well for auxiliary building underpinning support	Auger and/or rotary wash	Split spoon 12
MP-8	S 5,146.06 E 200.05	62.0	634.0	Observation well for auxiliary building underpinning support	Auger and/or rotary wash	Split spoon 11
MP-9	S 5,173.56 E 28.98	40.0	634.0	Observation well for auxiliary building underpinning support	Auger and/or rotary wash	Split spoon 7
MP-10	S 4,942.6 W 7.74	61.5	634.0	Observation well for auxiliary building underpinning support	Auger and/or rotary wash	Split spoon 11
MP-11	S 4,874 W 4.84	56.5	634.0	Observation well for auxiliary building underpinning support	Auger and/or rotary wash	Split spoon 8
MP-14	S 5,163.19 E 459	46.5	634.0	Observation well for auxiliary building underpinning support	Auger and/or rotary wash	Split spoon 8
MP-16	S 4,946.19 E 534.12	45.5	634.0	Observation well for auxiliary building underpinning support	Auger and/or rotary wash	Split spoon 9
TH-22	S 5,169 E 493	53.5	634.0	Temperature monitor hole auxiliary building for underpinning support	Auger and/or rotary wash	Split spoon 5
DSB-1E	(6)	200.0	619.4	Deep-seated bench mark	Rotary wash	Split spoon 1
DSB-1W	(6)	194.9	619.3	Deep-seated bench mark	Rotary wash	Split spoon 1
DSB-2E	(6)	209.4	614.0	Deep-seated bench mark	Rotary wash	Split spoon 2



TABLE OF BORING LOGS (Continued)

Boring No.	Location <sup>(1)</sup>	Depth (ft)	Surface Elevation	Purpose	Type Drilling	Number and Type of Samples Taken
DSB-2W	(6)	193.1	614.0	Deep-seated bench mark	Rotary wash	Split spoon 2
DSB-3E	(6)	193.8	614.0	Deep-seated bench mark	Rotary wash	Split spoon 1
DBM-6	(6)	6.7	614.0	Deep-seated bench mark	Rotary wash	None
DSB-3W	(6)	189.4	614.0	Deep-seated bench mark	Rotary wash	Split spoon 1
DBM-5	(6)	26.4	614.0	Deep-seated bench mark	Rotary wash	None
DSB-AN1	(6)	214.9	634.5	Deep-seated bench mark	Rotary wash	Split spoon 1
DSB-AN2	(6)	210.0	634.5	Deep-seated bench mark	Rotary wash	Split spoon 1
DSB-AS	(6)	162.8	584.0	Deep-seated bench mark	Rotary wash	Split spoon 1
DSB-AS1	(6)	154.5	584.0	Deep-seated bench mark	Rotary wash	Split spoon 1
DSB-AS2	(6)	159.3	584.0	Deep-seated bench mark	Rotary wash	Split spoon 1
DSB-AS3	(6)	159.2	584.0	Deep-seated bench mark	Rotary wash	Split spoon 1
DSB-AS4	(6)	159.2	584.0	Deep-seated bench mark	Rotary wash	Split spoon 2

<sup>(1)</sup> Locations are based on Bechtel Construction Coordinate System

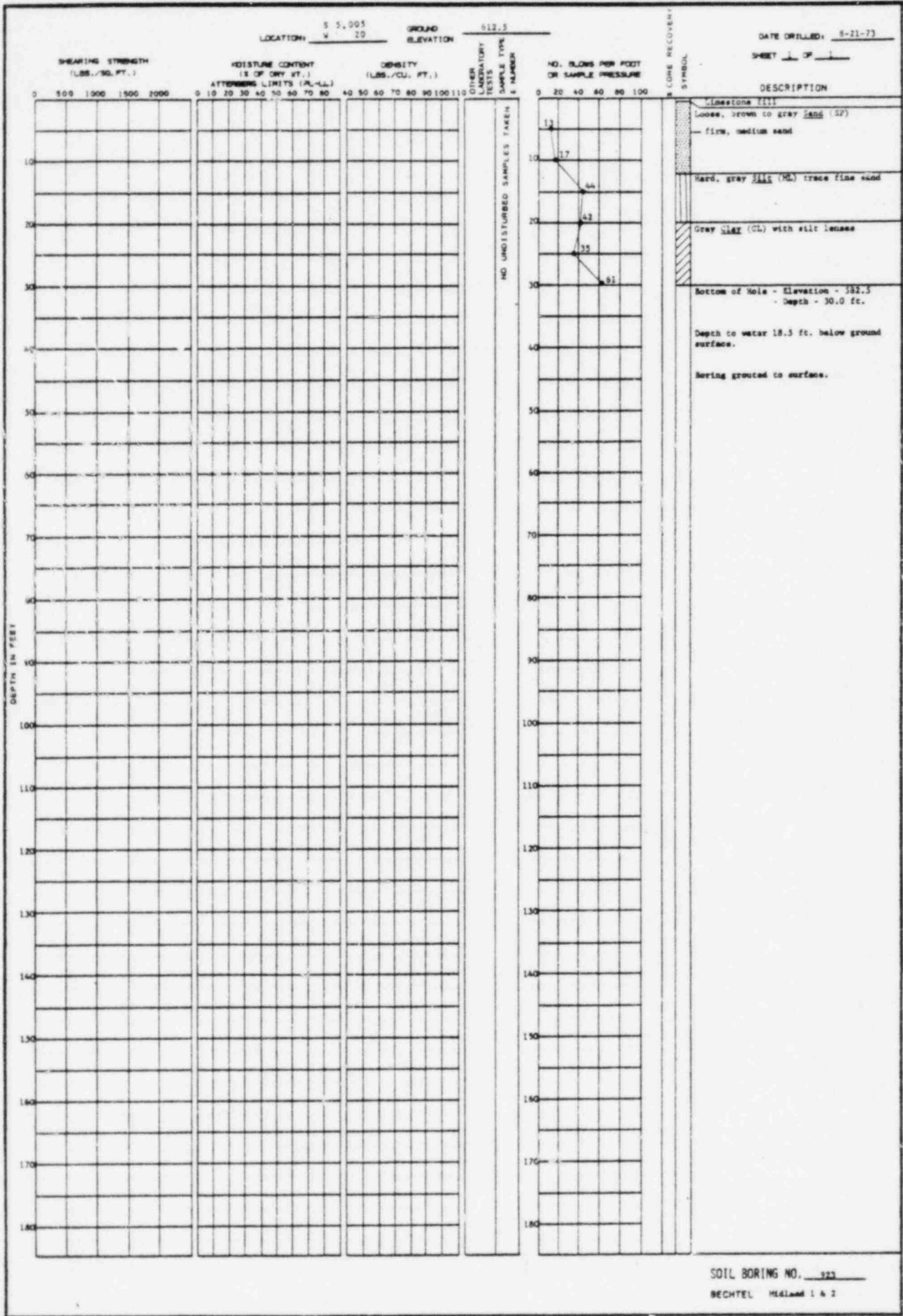
<sup>(2)</sup> Approximate location

<sup>(3)</sup> Boring located 5 feet from preceding boring

<sup>(4)</sup> The boring logs show elevations according to Dow Chemical Company datum.  
The elevations shown in this table are according to USGS datum.

<sup>(5)</sup> Boring log is in Section D.10.

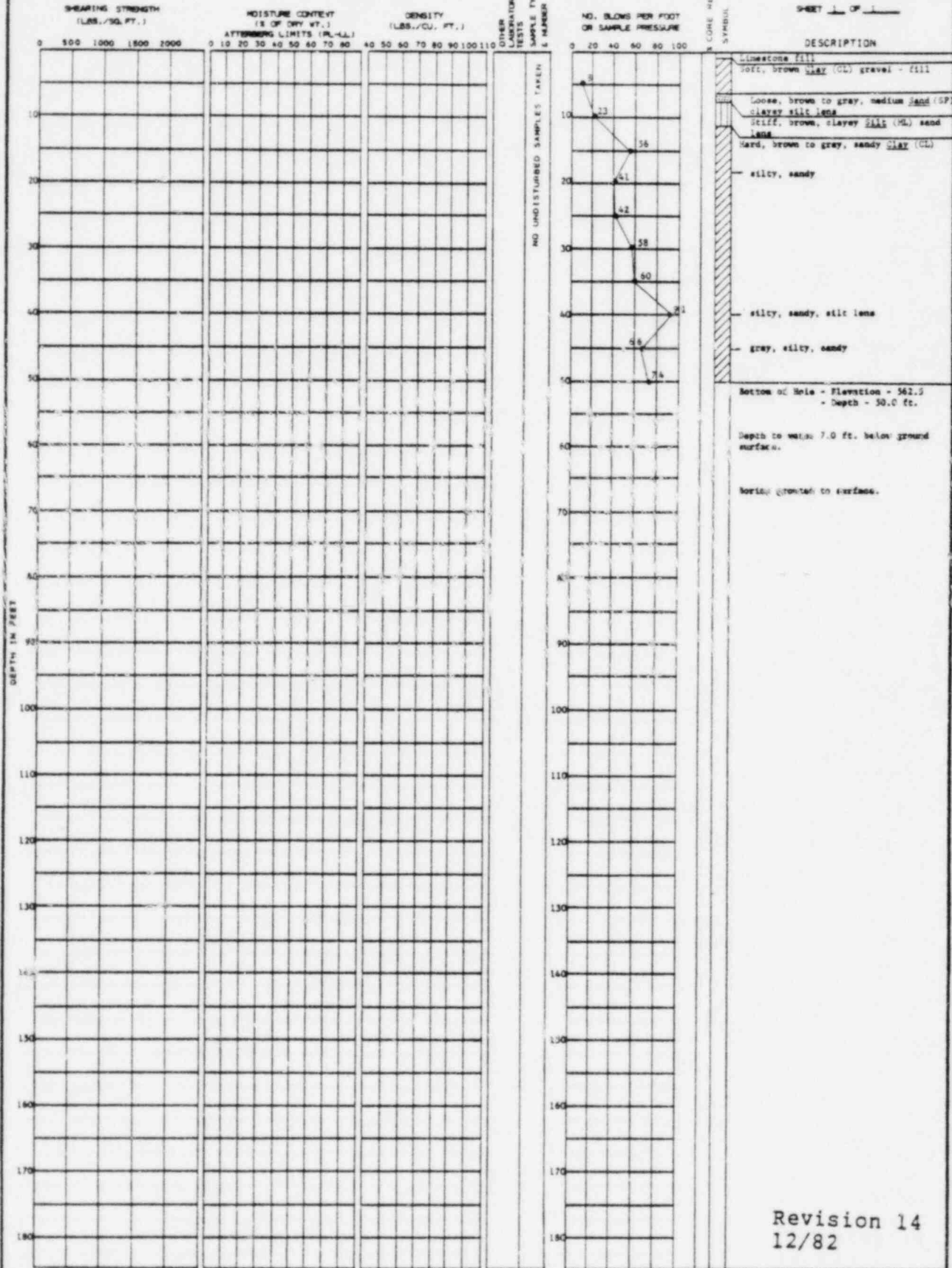
<sup>(6)</sup> See Bechtel Drawing 7220-C-1490(Q), C-1491(Q), C-1491(Q), SK-C-785, and SK-C-786 for detailed locations.



LOCATION: S 5, 210 GROUND ELEVATION: 517.5  
V 22

DATE DRILLED: 8-21-73

SHEET 1 OF 1



Bottom of Hole - Elevation - 562.5  
 - Depth - 50.0 ft.

Depth to water: 7.0 ft. below ground surface.

Notes: (none) to surface.

Revision 14  
 12/82

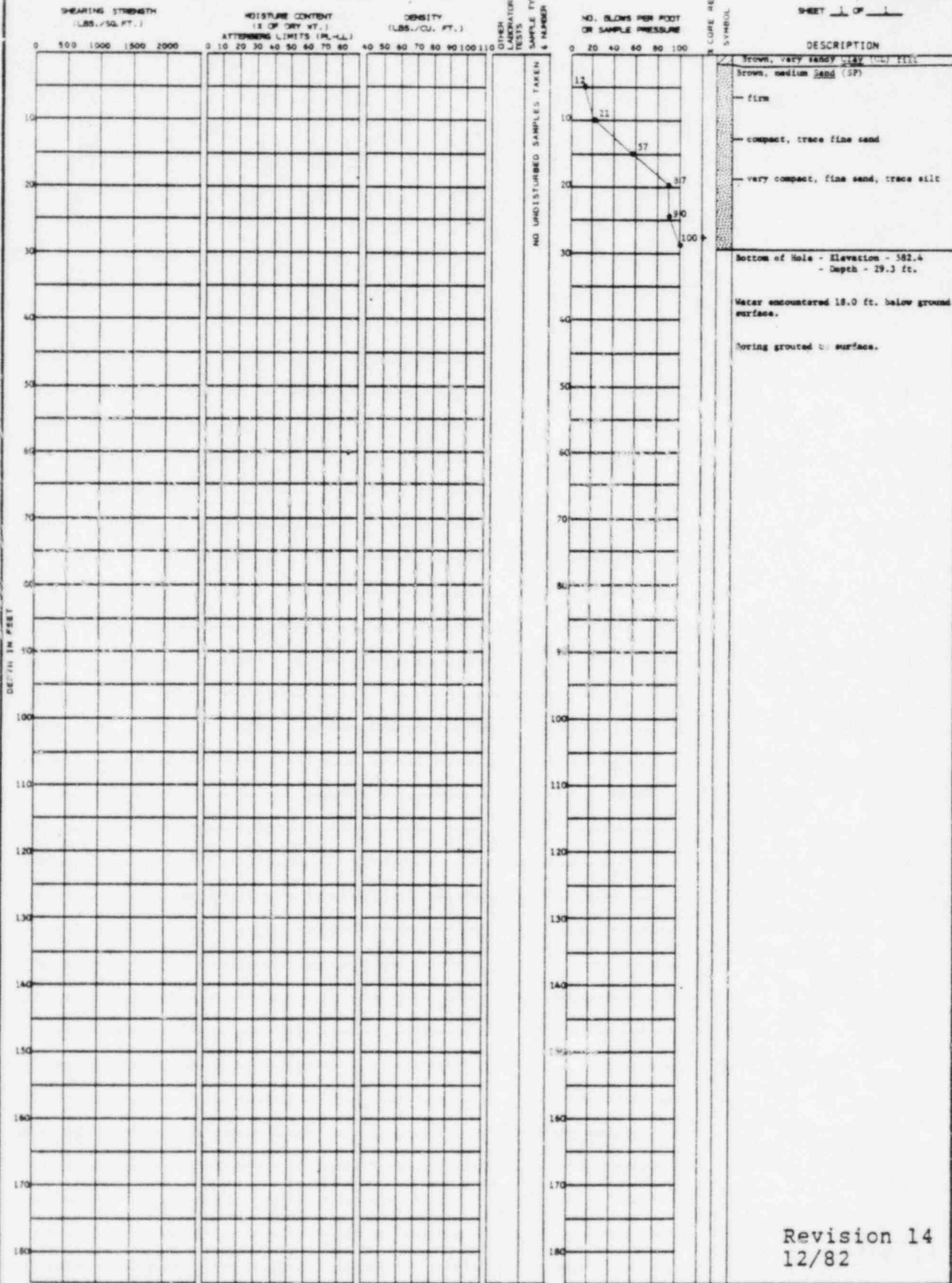
SOIL BORING NO. 926  
 BECHTEL Midland 1 & 2

LOCATION: S 3, 004  
 W 113

GROUND ELEVATION: 511.7

DATE DRILLED: 8-22-73

SHEET 1 OF 1

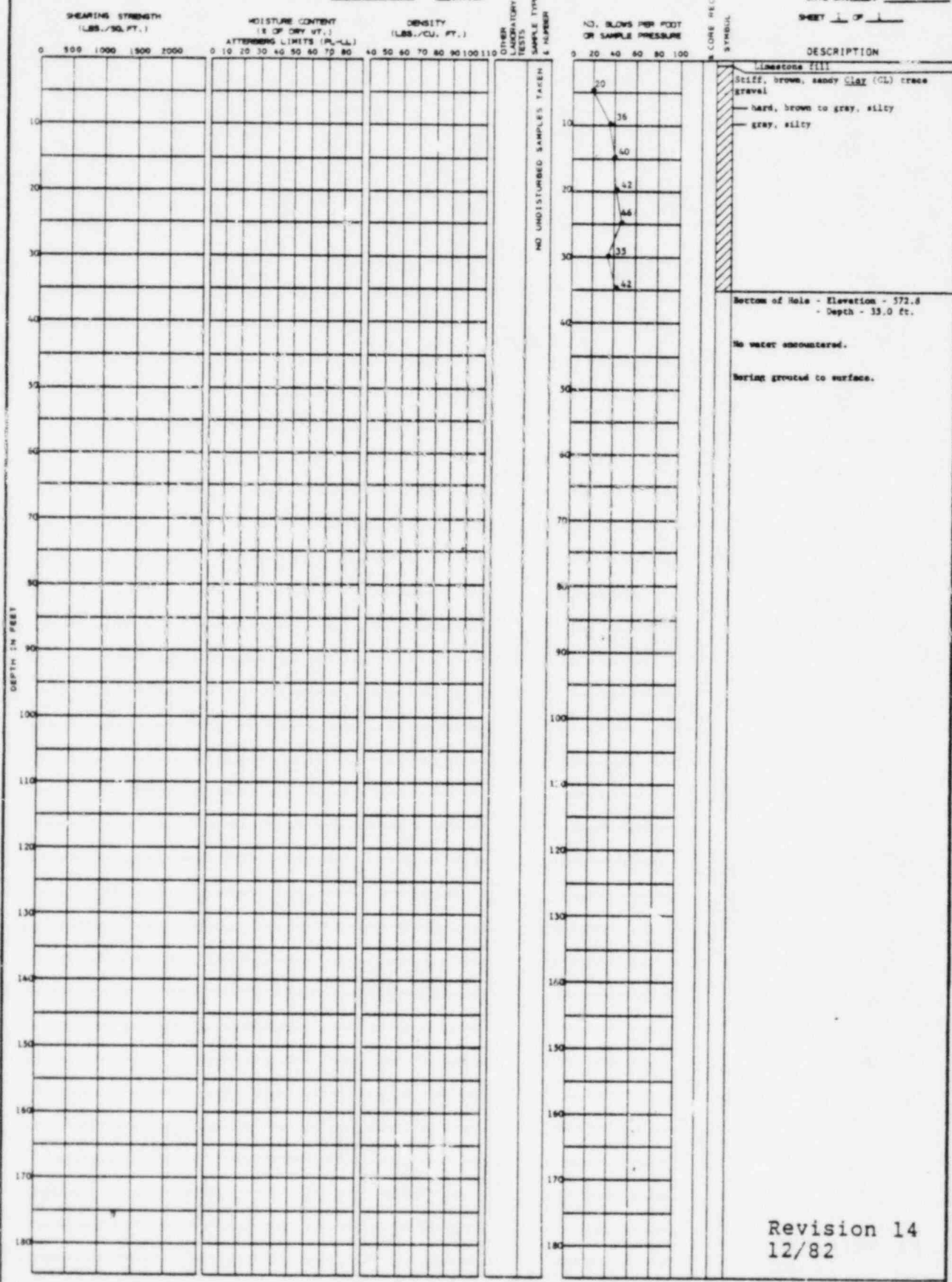


Revision 14  
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SOIL BORING NO. 123  
 BECHTEL HEADLAND 1 & 2

LOCATION: S 5,415 E 13 GROUND ELEVATION: 527.8

DATE DRILLED: 5-22-73



Bottom of Hole - Elevation - 572.6  
 - Depth - 35.0 ft.

No water encountered.

String grouted to surface.

Revision 14  
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SOIL BORING NO. 926  
 BECHTEL HASLAND 1 & 2

LOCATION: S 5,710      GROUND ELEVATION: 5077  
 DATE DRILLED: 8-22-73  
 SHEET 1 OF 1

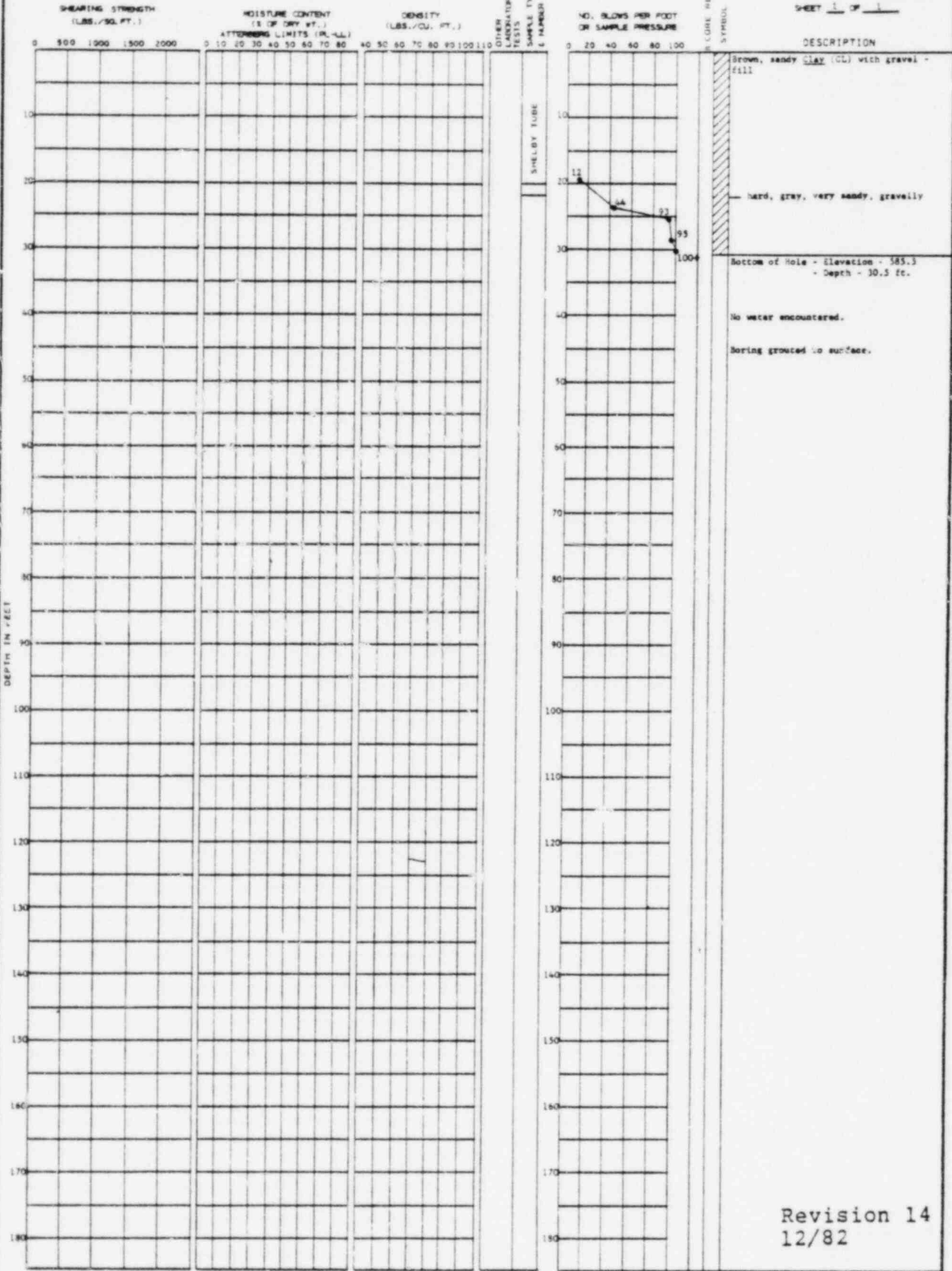
DEPTH IN FEET	SHEARING STRENGTH (LBS./SQ. FT.)	MOISTURE CONTENT (% OF DRY WT.) ATTENDING LIMITS (PL-LL)	DENSITY (LBS./CU. FT.)	NO. UNDISTURBED SAMPLES TAKEN	NO. BLOWS PER FOOT OR SAMPLE PRESSURE	DESCRIPTION
0						Hard, brown, sandy CLAY (CL) with gravel
10					39	gray, silty, sandy
20					40	
25					37	
28					61	
30					69	
30.0						Bottom of Hole - Elevation - 577.2 - Depth - 30.0 ft.
40						No wear encountered.
50						Boring grouted on surface.
60						
70						
80						
90						
100						
110						
120						
130						
140						
150						
160						
170						
180						

Revision 14  
 12/82  
 SOIL BORING NO. 227  
 BECHTEL Midland 1 & 2

LOCATION <u>S 5, 325</u> <u>W 112</u>		GROUND ELEVATION <u>511.8</u>	DATE DRILLED: <u>8-22-73</u>
MOISTURE CONTENT (% OF DRY WT.) ATTENDING LIMITS (PL-LL)	DENSITY (LBS./CU. FT.)	NO. BLOWS PER FOOT ON SAMPLE PRESSURE	SHEET <u>1</u> OF <u>1</u>
0 500 1000 1500 2000	0 10 20 30 40 50 60 70 80	0 20 40 60 80 100	DESCRIPTION
<p style="text-align: center;">SHEARING STRENGTH (LBS./SQ. FT.)</p> <p style="text-align: center;">DEPTH IN FEET</p>	<p style="text-align: center;">OTHER LABORATORY TESTS SAMPLE TYPE &amp; NUMBER</p>	<p style="text-align: center;">NO. UNDISTURBED SAMPLES TAKEN</p>	<p style="text-align: center;">% CORE RECOVERY</p> <p style="text-align: center;">SYMBOL</p>
<p>0</p> <p>10</p> <p>20</p> <p>30</p> <p>40</p> <p>50</p> <p>60</p> <p>70</p> <p>80</p> <p>90</p> <p>100</p> <p>110</p> <p>120</p> <p>130</p> <p>140</p> <p>150</p> <p>160</p> <p>170</p> <p>180</p>	<p>0</p> <p>10</p> <p>20</p> <p>30</p> <p>40</p> <p>50</p> <p>60</p> <p>70</p> <p>80</p> <p>90</p> <p>100</p> <p>110</p> <p>120</p> <p>130</p> <p>140</p> <p>150</p> <p>160</p> <p>170</p> <p>180</p>	<p>0</p> <p>10</p> <p>20</p> <p>30</p> <p>40</p> <p>50</p> <p>60</p> <p>70</p> <p>80</p> <p>90</p> <p>100</p> <p>110</p> <p>120</p> <p>130</p> <p>140</p> <p>150</p> <p>160</p> <p>170</p> <p>180</p>	<p>Loose, brown sand (SP) some organic material - fill.</p> <p>Hard, brown, sandy clay (CL) trace gravel</p> <p>grey, silty</p> <p>Bottom of Hole - Elevation - 581.8 - Depth - 30.0 ft.</p> <p>No water encountered.</p> <p>String grouted to surface.</p>
			Revision 14 12/82
			SOIL BORING NO. <u>325</u> BECHTEL Midland 1 & 2

LOCATION: S 3,825 GROUND ELEVATION: 416.7  
E 2,855

DATE DRILLED: 8-23-73  
SHEET 1 OF 1



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SOIL BORING NO. 329  
BECHTEL Midland 1 & 2



LOCATION: S 5,820 W 3,400 GROUND ELEVATION: 510 M

DATE DRILLED: 8-23-73

SHEET 1 OF 1

DEPTH IN FEET	SHEARING STRENGTH (LBS./SQ. FT.)	MOISTURE CONTENT (% OF DRY WT.) ATTERING LIMITS (PL-LL)	DENSITY (LBS./CU. FT.)	OTHER LABORATORY TESTS	NO. BLOWS PER FOOT OR SAMPLE PRESSURE	CORRECTION SYMBOL	DESCRIPTION
0	500 1000 1500 2000	0 10 20 30 40 50 60 70 80	40 50 60 70 80 90 100 110		0 20 40 60 80 100		Firm, brown, fine sand (SP) loose, fine to medium, wet
10					28 21 17		Brown, fine sandy clay (CL) hard, gray, some gravel
10.0							Bottom of Hole - Elevation - 500 - Depth - 10.0 ft.
20							Water encountered 3.0 ft. below ground surface.
30							Spring grouted to surface.
40							
50							
60							
70							
80							
90							
100							
110							
120							
130							
140							
150							
160							
170							
180							

NO UNDISTURBED SAMPLES TAKEN

SOIL BORING NO. 130

BECHTEL Midland I & I

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SYNTHESIZED  
LOG OF BORING GQE-5...

SHEET 2 OF 4...

ELEVATION	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penet resist bl/6in		
666	HARD, GRAY BROWN, LOW PLASTIC SILTY CLAY W/ TRACE FINE SAND, OCCASIONAL GRAVEL, DRY-MOIST. (CL-ML)	15	5-6	PS	11/25 FT	PP > 4.5 TSP	5-6 AFTER EXTRACTION NOTED BOTTOM OF TUBE IS WORN 44% RECOVERY.	
656		16						
646	BECOMING BROWN IN COLOR W/ TRACE - SOME FINE SAND, TRACE ORGANICS (CL)	17	5-7	PS	2.4/25 FT	PP > 4.5 TSP	5-7 BOTTOM OF TUBE BENT NO BOTTOM PACKER. 96% RECOVERY.	
626		18						
626	HARD, BROWN, LOW PLASTIC, SILTY CLAY WITH SOME FINE-MED SAND, TRACE FINE GRAVEL, MOIST. (CL-MC)	19					5-8 OVER SAMPLE TO 21.6 FT VOIDS WERE NOTED ALONG SIDES OF TUBE ON BOTTOM. SOME FLUID WAS FLOWING OUT OF TUBE BOTTOM UPON INSPECTION. BOTTOM OF TUBE IS BENT. 100% RECOVERY.	
616		20	5-8	PS	2.6/26 FT	PP > 4.5 TSP		
606	NO RECOVERY GRAVEL OR COBBLE	21					5-9 GRAVEL OR COBBLE AT 21.6-22.0 FT. DEPTH INDICATED BY ERRATIC DRILLING RATE & CUTTINGS SHOW PIECES OF ROCK & METAL (TUBE BEING SQUARE) STOP DRILLING. TUBE EXTRACTED & INSPECTED 20/24 FT RECOVERY. BOTTOM OF TUBE DAMAGED	N/A
607.6		22	5-9	SEE REMARKS				
608.6	HARD, RED BROWN AND BROWN, MED. PLASTIC SILTY CLAY W/ SOME LT. GRAY AND YELLOWISH BROWN DRY SILTY CLAY, DRY-MOIST. (CL)	23					DRILL WITH 4 7/8" TRICONE ROLLER BIT FROM 22.0-23.0 FT TO REMOVE ROCK.	
607.6		24	5-10	PS	1.5/25 FT	PP > 4.5 TSP		
606	HARD, BROWN, MED PLASTIC, SILTY CLAY MIXED WITH MINOR AMOUNTS OF RED BROWN SILTY CLAY. (CL)	25					5-10 GRAVEL INDICATED AT 25.2-25.5 FT. 60% RECOVERY	
605.6		26						
604.6	HARD, BROWN, MED PLASTIC, SILTY CLAY MIXED WITH MINOR AMOUNTS OF RED BROWN SILTY CLAY. (CL)	27	5-11	PS	1.3/25 FT	PP > 4.5 TSP	5-11 48% RECOVERY	
603.6		28						
602.6	SAME AS ABOVE W/ OUT RED BROWN SILTY CLAY AND W/ TRACE FINE-MED SAND, FINE GRAVEL. (CL)	29					5-12 40% RECOVERY	
601.6		30	5-12	PS	1.0/25 FT	PP > 4.5 TSP		
600.6	V. STIFF MOTTLED GRAY AND ORANGE-BROWN, MED PLASTIC, SILTY CLAY W/ TRACE FINE SAND, FINE GRAVEL	31					5-13 BOTTOM 0.4 FT OF TUBE OUT OF ROUND. 76% RECOVERY.	
599.6		32	5-13	PS	1.9/25 FT	PP = 2.50-2.55 TSP		

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SYNTHESIZED LOG OF BORING .COR-5...

SHEET 3 OF 4

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOW
			no. loc	type	recov.	penet. resist. bl/ft		
578.6	INDURATED SAND NODULES w/ GREENISH OXIDATION STAINING, GRAVEL SURROUNDED BY THIN CLAY SKINS, MOIST (CL)	33						
577.6	SAME AS ABOVE	34	S-14	PG 3	1.7 / 2.5 FT	PP ON CLAY 74.5 TSP	S-14 BOTTOM OF SAMPLE TUBE GENT TOP 0.1 FT OF SAMPLE REMOVED FOR INSPECTION. 68% RECOVERY	
576.6	HARD, LT. BROWN, LOW PLASTIC, SILTY CLAY w/ TRACE SAND, DRY MOIST (CL)	35						
575.6	LT BROWN NON PLASTIC SILTY SAND FINE-MED SUBROUNDED POORLY SORTED SAND, MOIST (SM)	36					S-15 SWITCHED TO PG3 CORE BARREL TWO MECHANICAL BREAKS IN SAMPLE BUT EACH HAD BROWN STAINING ON FRACTURE SURFACES 100% RECOVERY	
574.6	HARD GARY LOW PLASTIC SILTY CLAY w/ TRACE - SOME FINE SAND, TRACE GRAVEL, COBBLES, DRY MOIST. (CL-ML)	37					NOTE: MANY PIECES OF FINE TO COARSE GRAVEL CUT WITHOUT APPARENT DISTURBANCE OF SAMPLE.	
573.6		38	S-15	PG 3	5.0 / 5.0 FT	PP > 4.5 TSP		
572.6		39						
571.6		40	A					
570.6		41						
569.6		42					S-16 OIL USED TO LUBRICATE INNER SLEEVE. THIS WAS WIPED OFF SAMPLE IMMEDIATELY w/ RAG 100% RECOVERY	
568.6	SAME AS ABOVE WITH SAND SIZE INCREASING TO FINE-MED (CL)	43	S-16	PG 3	5.0 / 5.0	PP > 4.5 TSP		
567.6		44						
566.6		45						
565.6		46					S-17 HARDER DRILLING NOTED FROM 50.0 TO 50.5 FT 86% RECOVERY	
564.6		47						
563.6	SAME AS ABOVE (CL)	48	S-17	PG 3	4.1 / 5.0 FT	PP > 4.5 TSP		
562.6		49						
561.6	LOWER SAND CONTENT	50						

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SYNTHESIZED LOG OF BORING COE-8...

SHEET 2 OF 3...

DEPTH SCALE ft	DESCRIPTION	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
		no. loc	type	recov.	penetrist resist bit		
15	BROWN NON PLASTIC, SAND, W/ TRACE FINE GRAVEL, WET. (FINE-COARSE SUBROUNDED SAND) (SP) -	5-9	PS	SEE REMARKS	NO PP ON SAND	S-9 REFUSAL AFTER 0.5 FT PUSH OF HVORSLEV SAMPLER. RECOVERY 0.5/0.5 FT (100%). NO PP ON SAND SWITCHED TO PITCHER SAMPLER DUE TO SHORT ADVANCE OF HVORSLEV SAMPLER	N/A
16		5-10	PS	1.0/2.5 FT	NO PP ON SAND	S-10 72% RECOVERY	
18		5-11	PS	2.5/2.5 FT	NO PP ON SAND	S-11 SAMPLER WAS DIFFICULT TO EXTRACT FROM BORING. 100% RECOVERY	
21		5-12	PS	1.5/2.5 FT	NO PP ON SAND	S-12 0.5 FT OF SAMPLE SLIDES FROM TUBE UPON TUBE EXTRACTION. 60% RECOVERY.	
24		5-13	PS	0.7/2.5 FT	NO PP ON SAND	S-13 28% RECOVERY - NOTED LOSS OF DRILLING FLUID AT THIS DEPTH. EXCESSIVE AMOUNTS OF CUTTINGS WERE REMOVED FROM MUD TUB. CASING NOTED IN BORING. (C. DRILL RODS WILL NOT SET AT BOTTOM OF BORING WHEN LIFTED. SAND SETTLING) REMOVED REVERT DRILLING FLUID AND REPLACED WITH BENTONITE SEALING FLUID.	
26		5-14	PS	2.0/2.5 FT	NO PP ON SAND	DRILL W/ 47/8" & TRICONE ROLLER BIT TO REMOVE SLOWED SAND S-14 80% RECOVERY	
28		5-15	PS	1.0/2.5 FT	NO PP ON SAND	S-15 40% RECOVERY	
31		5-16	PS	1.7/2.5 FT	NO PP ON SAND	S-16 68% RECOVERY	
32						NOTE: LOST ~ 25 GALLONS OF DRILLING FLUID IN THE BORE HOLE SINCE CHANGING DRILLING FLUID TO BENTONITE.	

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SYNTHESIZED  
 LOG OF BORING CQE-8...

SHEET 3 OF 3

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	percent resist di/6in		
402.2	BROWN, Non-PLASTIC, SAND, with trace F. Gravel (SP)	33	5-17	PS	1.6/2.5 FT	NO PP ON SAND	5-17 BOTTOM OF TUBE BENT. A PIECE OF STEEL WEDGE WAS FOUND IN TOP OF SAMPLE. 64% RECOVERY NOTE: DRILLING MUD VERY THICK, LABORED W/ SAND.	N/A
	LT BROWN, NON PLASTIC, SAND, (FINE-MED. SUBROUNDED, POORLY GRADED), W/ OCCASIONAL FINE GRAVEL, TRACE ORGANICS, WET. (SP)	35					5-18 DRILLING INDICATES OCCASIONAL COBBLE OR GRAVEL BOTTOM OF TUBE BENT. 60% RECOVERY	
	BECOMING MORE GRADED W/ MORE FINE GRAVEL. (CP)	36	5-18	PS	1.5/2.5 FT	NO PP ON SAND		
577.2		37					SWITCH TO SPLIT SPOON SAMPLING	
	V. DENSE, LT GRAY - GRAY BROWN, NON PLASTIC, SILTY SAND, (V. FINE-FINE, POORLY GRADED SAND) W/ LT BROWN LAYERING (Iron stains) (SM-ML)	38	5-19	33	1.2/2.5 FT	26 66 78	5-19 80% RECOVERY N = 144	
	LIGNITE FRAGMENTS AT 38 FT	39				43	5-20 87% RECOVERY	
		40	5-20	33	1.3/2.5 FT	72 135	100 blows/0.3 ft at 40.2 ft Refusal (overdrive sampler to 40.4 ft)	
573.8	LT GRAY NON PLASTIC SANDY SILT SAND	41						
	BOTTOM OF BORING 40.4 FT	42						
572.2		43						
		44						
		45						
		46						
		47						
		48						
		49						
572.2		50						

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SYNTHESIZED LOG OF BORING COE-16A.

SHEET 4. OF 5...

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS	
			no. loc	type	recov. percent	depth interval ft			
	HARD, GRAY, LOW PLASTIC SILTY CLAY W/ SOME V. FINE TO FINE SAND AND OCCASIONAL GRAVEL, MOIST (CL)	51	5-18	PS	0.7/2.5	NO PP ON LOGBLE	5-18 28% RECOVERY GRAVEL INDICATED BY ERRATIC DRILLING AT 51.0 AND 52.6 FT. COBBLE STUCK IN BOTTOM OF TUBE.		
		52							
		53							
		54	5-19	PS	1.1/2.5		5-19 44% RECOVERY		
579.1		55							
		56	5-20	PS	1.4/2.5		5-20 56% RECOVERY		
		57							
		58							
		59	5-21	PS	2.5/2.5		5-21 100% RECOVERY		
574.1		60						REAM W/ 4 7/8 IN TRICONE TO 60.1 FT. MIX FRESH DRILLING FLUID. ~15 LBS BENTONITE TO 50 GALS. WATER. ASSEMBLE TRIPLE TUBE CORE BARREL (PQ3). PQ3 HANGS UP AT 30.6 FT. REAM SLOWLY, FLUSHING HOLE WITH PQ3 TO 60.1 FT.	N/A
	61								
	62					5-22 46% RECOVERY			
	63	5-22	PQ3	2.3/5.0	PP > 4.5 TSE	GRAVEL INDICATED BY HARD & SOFT DRILLING AT 62.6-63.2 AND 64.3-64.7 FT.			
	64								
569.1	65								
	66					5-23 100% RECOVERY*			
	67	5-23	PQ3	5.2/5.2	PP > 4.5 TSE	* NO RECOVERY WHEN PQ3 IS PULLED AFTER RUN. IN SECOND ATTEMPT TO RECOVER CORE, PQ3 WAS SENT BACK INTO BORING AND ADVANCED FROM 70.1 TO 70.3 FT W/ CIRCULATION. 5.2 FT OF SAMPLE WAS RECOVERED.			
	68								

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SYNTHESIZED LOG OF BORING COE-16A.

SHEET 5 OF 5

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOW, ETC.)	CASING BLOWS
			no. loc	type	recov.	penet. resist. bl/6in		
66.1	HARD, BROWN GRAY, LOW PLASTIC, SILTY CLAY W/ SOME FINE SAND AND TRACE FINE GRAVEL, MOIST (CL)	69	5-23 (cont)	PQ3	5.2/5.4			
		70						
	70.3 - 70.8 GRAY BROWN, NONPLASTIC SILTY SAND, V. FINE TO FINE, SUB-ROUNDED POORLY GRADED SAND, MOIST (SM)	71					5-24 20% RECOVERY	
		72					ADVANCE PQ3 FROM 74.9 TO 75.3 W/O CIRCULATION TO IMPROVE RECOVERY.	
		73	5-24	PQ3	1.4/5.0		THICKEN DRILL FLUID BY ADDING ~20LB BENTONITE TO HELP STABILIZE BORING OVER THE WEEKEND.	
659.1		74					PP > 4.5 TSF	
		75					END SHIFT 22 MAY 81 BEGIN SHIFT 23 MAY 81	
	HARD, BROWN GRAY, LOW PLASTIC SILTY CLAY W/ SOME FINE TO COARSE SAND AND TRACE FINE GRAVEL W/ OCCASIONAL COARSE GRAVEL, MOIST (CL)	76					REAM BORING TO 75.3 FT W/ 4 7/8 IN TRICONE. BIT GOES TO 75.0 FT W/O DRILLING INDICATING LITTLE OR NO SAMPLE LEFT IN HOLE AFTER 5-24. (ALSO BORING STABLE OVER WEEKEND).	
		77						
		78	5-25	PQ3	5.0/5.0		5-25 100% RECOVERY	
		79					ADVANCE PQ3 FROM 80.1 TO 80.3 W/O CIRCULATION TO IMPROVE RECOVERY	
653.8		80						
	BOTTOM OF BORING 80.3 FT							
							BORING BACKFILLED W/ CEMENT BENTONITE GROUT.	

N/A

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SYNTHESIZED  
 LOG OF BORING . J.: 28 ...

SHEET . 3 . OF . 3 . . . .

ELEVATION	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS	
			NO. LOG	TYPE	REC. V.	PENET. RESIST. BL/6IN			
600.0	V L-CLASSE, LT BROWN-TAN, FINE-MED GRAINED, POORLY GRADED SAND, MOIST-DRY (SP) W/TRACE COARSE SAND 12.6 TO 23.0 FT  W/TRACE SILT (SP)  STRATIFIED (SP) BECOMES WHITE-LT GRAY IN COLOR	33	S-13	CONR.	1-4/16	77 100/0.44	S-13 100% RECOVERY N=179 FOR 0.2 FT BORING CONTINUED W/ 4 1/4 IN TRI-CORNER ROLLER BIT	N/A	
34		S-14	SS	1.5/15.5	36 57 70	S-14 100% RECOVERY N=127			
35		S-15	SS	1.5/15.5	30 42 63	S-15 100% RECOVERY N=105			
36		BOTTOM OF BORING 35.8 FT							BORING BACKFILLED W/ BENTONITE-CEMENT GROUT UP TO GROUND SURFACE.
37									
38									
39									
40									
41									
42									
43									
44									
45									
46									
47									
48									
49									
50									



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LOG OF BORING. **DSB-LE**

SHEET 1 OF 12

project	MIDLAND NUCLEAR PLANTS 1 & 2	project no.	BIC-217-2Y
location	MIDLAND, MICH	elevation & datum	+619.4 FE. USGS
drilling agency	D & G DRILLING	date started	5 FEB. 82
drilling equipment	MOBILE B-61	date finished	9 Feb 82
size & type of bit	4 3/4" $\phi$ , 3 3/4" $\phi$ , 2 5/8" $\phi$ TRICONE ROLLER	completion depth	200.0 FT FROM EL. 619.4 FT
casing	5" ID (TEMPORARY), 3" ID PERMANENT	rbck depth	N/A
casing hammer	N/A weight N/A drop N/A	no. samples	dist. 1 undist. N/A core N/A
sampler	SPLIT SPOON	water level first	N/A ccmpl. N/A 24 hr. N/A
sampler hammer	#1 weight 140 lbs d-op 30 IN.	driller	BARRY THOMASSON
		supervisor	LUKE HEFFERMAN

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES					REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	percent	regist		
619.4		1							
		2							
		3							
		4							
614.4	REINFORCED CONCRETE	5							
		6							
		7							
		8							
		9							
		10							
607.4		11							
		12							
		13							
605.4	LT BROWN NON PLASTIC MED-FINE SAND TR SILT OCCASIONAL COARSE SAND (SP)	14							

APPROVAL TO ADVANCE BORING *[Signature]*

BECHTEL PERSONNEL CORED A 6"  $\phi$  HOLE 11.4 FT DEEP THROUGH THE REINFORCED CONCRETE FLOOR SLAB @ BECHTEL SUPPLY LOCATION. RIG SET UP ON PLATFORM ABOVE VALVE PIT. DRILLER SET UP RIG OVER CORE HOLE. RIG WAS LEVELED TO INSURE VERTICAL CORE HOLE SET 4 1/2 FT 5" ID CASING TO 4.8 FT BELOW FLOOR SLAB (36.2 FT STICK UP) [FLOOR SLAB ELEV. 619.4 FT]

BOTTOM OF PANS = 36.2 FT FROM FLOOR EL. 655.6

DRILLER FILLED BOREHOLE & CASING W/ WATER. DRILLER MIXED 50 GALS OF WATER & 15 LBS CEMENTITE IN MUD PUG.

DRILL BIT 1.4 FT + 50 FT EOB = 51.4 FT STICK UP 36.2 - 4.8 = 11.4 FT STAY ABOVE PANS OF DRILLING

11:08 AM BEGIN DRILLING W/ 4 3/4"  $\phi$  ROLLER BIT

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LEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	percent resist bl/6in		
6054								
	LT BROWN NON PLASTIC MED-FINE SAND TR SILT OCCASIONAL C. SAND (SP)	15						
		16				ADD 5 FT OF ROD = 56.4 FT ADD 30 gals water @ 5 lbs BENTONITE TO MUD TUB.		
		17						
		18						
6004		19						
		20						
	LT BROWN NON PLASTIC MED-FINE SAND OCCASIONAL C. SAND, SILT (SP)	21				ADD 5 FT OF ROD = 61.4 FT (BEGAN TO LOSE DRILL FLUID AT SLOW RATE)		
		22						
		23						
584		24				LOSE DRILL FLUID @ HIGH RATE. NOTE: SEAL @ FLOOR SLAB LEAKING.		
		25						
	LT BROWN NON PLASTIC COARSE-FINE SAND TR SILT, OCCASIONAL F. GRAVEL (SP)	26						
		27				ADD 50 GALS WATER TO DRILL TUB DRILLER W/ WCL INSPECTOR CONCURRENTLY BEGAN TO SET 4" ID CASING TO SEAL OFF BORE HOLE SET CUFF - 4" ID CASING + 0.4 FT SHOE + 0.5 FT PAW IN BORE HOLE. " 60.9 FT TOTAL 36.3 FT NEW STRAP FROM 61.4 FT SLAB TO BOTTOM OF PAW		
		28				SET 4" TO 24.6 FT DEPTH		
		29				ADD 4 LBS BENTONITE TO THE 50 GALS OF WATER IN MUD TUB FILL W/ CASING AND LOGS WATER TUB CONTINUE ADVANCING BORE HOLE W/ 3 3/4" ROLLER BIT 0.9 FT BIT 6.0 FT DRILL ROD 66.9 FT TOTAL 41.3 FT STICKUP 24.6		
584		30						
		31				BEGIN TO LOSE DRILL MUD @ ~ 30.0 FT NOTE: SEAL @ FLOOR SLAB LEAKING ADD 5 FT DRILL ROD TO 70.9 FT TOTAL ADD 5 LBS BENTONITE TO MUD TUB		
584	LT BROWN NON PLASTIC M-F SAND OCCASIONAL F GRAVEL, C. SAND	32						

NO SAMPLES RETAINED - SATISFACTORY  
 IDENTIFIED FROM DRILLED CUTTINGS & DRILLING CONDITIONS

N/A

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LOG OF BORING . D4B-1A

SHEET . 3 . OF . 12 . . .

LEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	LOG TIME C.B.
			no. loc	type	recov.	penetr. resist. bl/6in		
57.4								
586.5	LT BROWN FINE SAND (SP)	33				LOST MOST OF DRILLING MUD ADD 40 GALLONS WATER TO MUD TUB		
	CONCRETE	34				HIT OBSTRUCTION @ 32.9 ft STOPPED DRILLING. CRED W/ D.S. BOALD C. WILSON (BECHTEL) FOR IDENTIFICATION OF OBSTRUCTION. IDENTIFIED AS MUD MAT. D.S. BOALD DIRECTED DRILLING TO CONTINUE. DRILLER ADDED 8.0 ft 9" P CASING. 26.9 ft total		
		35				36.3 STICK UP TO BOTTOM OF PAN		
		36				NOW SET TO 32.6 ft from valve pit FLOOR SLAB		
587.4		37				FILL CASING W/ WATER CASING HOLDING WATER @ THIS POINT ADD 3 LBS BENTONITE TO MUD TUB. CONTINUE ADVANCING BORE HOLE W/ 3 3/4" P ROLLER BIT		
		38				ADD 5.0 ft DRILL ROD TOTAL = 75.9		
		39						
		40				ADD 5.0 ft DRILL ROD TOTAL = 80.9		
		41						
		42						
587.4		43						
	CONCRETE	44						
		45				ADD 5.0 ft DRILL ROD TOTAL 85.9 ft FULL DRILL RODS END OF SHIRT SPEC 82 WATER LEVEL 12.7 ft down		
587.0	BOTTOM CONTACT 85.9	45				START OF SHIRT 6 FEET WATER LEVEL 13.7 ft down FROM PAN		
		46						
587.4	GRAY MED PLASTIC SILTY CLAY W/ TR. FINE SAND (C)	47						
		48						
		49						
587.1		50				Revision 14 12/82  EMPTY MUD TUB ADD 50 GALLONS WATER TO THIS MUD. ADD 5.0 ft DRILL ROD TOTAL 90.9 ft		

NO SAMPLES RETAINED STRATEGICALLY  
IDENTIFIED FROM DRILLED CUTTINGS & DRILLING CONDITIONS

N/A

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LOG OF BORING D.S.B.:1.E.

SHEET 4..OF. 12...

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES					REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	percent resist	bl/6in		
549.4		51							
	GRAY MED PLASTIC <u>SILTY CLAY</u> w/ TR. M-F SAND (CL)	52							
		53							
		54							
544.4		55					ADD 5.0 FT DRILL ROD TOTAL = 95.9 FT		
	MED. GRAY MED PLASTIC <u>SILTY CLAY</u> w/TR. M-F SAND (CL)	56							
		57							
		58							
		59							
539.4		60					ADD 5.0 FT OF DRILL ROD TOTAL = 100.9 FT		
	MED GRAY PLASTIC <u>SILTY CLAY</u> w/ TR. M-F SAND (CL)	61							
		62							
		63							
		64							
534.4		65					ADD 5.0 FT OF DRILL ROD TOTAL = 105.9 FT		
	GRAY MED PLASTIC <u>SILTY CLAY</u> w/ TR. M-F SAND (CL)	66							
		67							
529.4		68							

NO SAMPLES RETAINED STRATIGRAPHY IDENTIFIED FROM MILLER CUTTINGS & DRILLING CONDITIONS

N/A

D.1-1,166

Revision 14  
12/82

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LOG OF BORING . D.S.B.-1.E.

SHEET . 5 . OF . 12 . . .

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	C.A. BLOWS
			no. loc	type	recov.	penet. resist. Bl/6in		
557.4								
	GRAY MED PLASTIC SILTY CLAY (CL)	69				ADVANCE BORING w/ 3 3/4" φ ROLLER BIT		
		70				ADD 5.0 FT DRILL ROD TOTAL = 110.9 FT		
		71						
		72						
546.4	GRAY LOW-MED PLASTIC SILTY CLAY w/ TR-SOME M-F SAND (CL)	73						
		74						
		75				ADD 5.0 FT DRILL ROD TOTAL = 115.9 FT		
		76						
		77						
541.4	GRAY LOW PLASTIC SILTY CLAY w/ TR-SOME M-F SAND (CL)	78						
		79						
		80				EMPTY MUD TUB, FILL w/ ~ 50 gals. OF WATER		
		81				ADD 5.0 FT DRILL ROD TOTAL = 120.9 FT		
		82						
		83						
536.4	GRAY LOW-MED PLASTIC SILTY CLAY w/ TR. M-F SAND. (CL)	84						
		85						
		86				ADD 5.0 FT OF DRILL ROD, TOTAL = 125.9		
533.4						Revision 14 12/82		

NO SAMPLES RETAINED STRATIGRAPHY IDENTIFIED FROM DRILLED CUTTINGS & DRILLING CONDITIONS

D.1-1,167

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LOG OF BORING .. Q58-1E

SHEET 6. OF 12...

EV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penet resist bl/6in		
533.4		87						
	GRAY MED PLASTIC <u>SILTY CLAY</u> w/ TR SAND.	88						
	(CL)	89						
		90						
538.4		91						
	GRAY MED PLASTIC <u>SILTY CLAY</u> w/ TR SAND	92						
	(CL)	93						
		94						
		95						
522.4		96						
	GRAY MED PLASTIC <u>SILTY CLAY</u> w/ TR - SOME SAND	97						
	(CL)	98						
		99						
		100						
518.4		101						
	GRAY MED PLASTIC <u>SILTY CLAY</u> w/ TR. M-F SAND	102						
	(CL)	103						
515.4		104						

NO SAMPLES RETAINED STRATIGRAPHIC IDENTIFIED FROM DRILLER CUTTINGS & MILLING CONDITIONS

ADVANCE BORING w/ 3/4" ROLLER BIT

ADD 5.0 FT OF DRILL ROD, TOTAL = 135.9

ADD 5.0 FT OF DRILL ROD TOTAL = 135.9

ADD 5.0 FT OF DRILL ROD TOTAL = 140.9

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12/82

D.1-1,168

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LOG OF BORING ..DSB-1E

SHEET 7 OF 12

LEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CLOG BLOWS
			NO. LOC	TYPE	REC. PENET. RESIST. BL/6IN			
515.4								
	MED GRAY LOW-MED PLASTIC SILTY CLAY w/ TR-SOME F-C SAND (CL)	105-107				ADD 5.0 FT OF DRILL RODS TOTAL = 145.9 FT  DRILLER REPORTS MORE SAND CASED ON DRILLING RATE.		
510.4								
	GRAY LOW-MED PLASTIC SILTY CLAY w/ TR. F-M SAND (CL)	112-113				ADD 5.0 FT OF DRILL RODS, TOTAL = 150.9 FT		
505.4								
	MED GRAY LOW PLASTIC SILTY CLAY w/ TR. F-M SAND (CL)	117-118				ADD 5.0 FT OF DRILL ROD TOTAL = 155.9 FT		
500.4								
		119-120				ADD 5.0 FT OF DRILL ROD TOTAL = 160.9 FT		
497.4		121-122						

ALL SAMPLES RETAINED STRATEGICALLY IDENTIFIED FROM DRILLER CUTTINGS & MILLING SCRAPINGS

N/A

D.1-1,169

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12/82

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penetration resist bl/6in		
497.4								
	MED GRAY LOW PLASTIC SILTY CLAY w/ TR. F.M. SAND (CL)	123-124				ADVANCE BORING w/ 3 3/4" $\phi$ ROLLER BIT		
		125				ADD 5.0 FT OF DRILL ROD TOTAL = 165.9 FT		
492.4	GRAY LOW-MED PLASTIC SILTY CLAY w/ OCCASIONAL F.M. SAND (CL)	127-128				EMPTY MUD TUB (FILLED w/ CUTTINGS) ADD ~50 GAL WATER, FLUSH BORING FOR 15 min. ADD 5.0 FT OF DRILL ROD TOTAL = 170.9 FT		
		129						
		130						
		131						
482.4	GRAY MED PLASTIC SILTY CLAY w/ OCCASIONAL FM SAND. (CL)	132-133						
		134				FLUSH BORING FOR 5 MIN PULL RODS & BRAIN LINES. WATER LEVEL 11.7 FT DOWN FROM GROUND END OF SHIFT 6 FEB 82		
		135				START OF SHIFT 8 FEB 82. WATER LEVEL 19.4 FT DOWN FROM GROUND ADD 5.0 FT DRILL ROD TOTAL 175.9 FT		
		136						
482.4	GRAY MED PLASTIC SILTY CLAY w/ OCCASIONAL F.M. SAND (CL)	137-138						
		139						
		140						
479.4						Revision 14 12/82		
	D.1-1,170					ADD 5.0 FT DRILL ROD TOTAL = 180.9 FT		

NO SAMPLES TAKEN. STRATIGRAPHY INDICATED FROM BITTED CUTTINGS & DRILLING CONDITIONS.

N/A



ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING FEET
			no. loc	type	recov. percent	resist bl/6in		
479.4								
	GRAY LOW PLASTIC SILTY CLAY w/ OCCASIONAL FINE SAND. (CL)	141						
		142						
		143						
		144						
474.4		145				ADVANCE BORING w/ 3/4" ROLLER BIT		
		146						
	GRAY - LIGHT BROWN GRAY LOW PLASTIC SILTY CLAY (BECOMING MORE SILTY) (CL)	147						
		148						
		149						
469.4		150				ADD 5.0 FT DRILL ROD TOTAL = 185.9		
		151						
	GRAY LOW PLASTIC SILTY CLAY (CL)	152						
		153						
		154						
464.4		155						
		156						
		157						
461.4	Gray low plastic SILTY CLAY (CL)	158						
		159						

NO SAMPLES RETAINED STRATIGRAPHY  
 IDENTIFIED FROM DRILLER CUTTINGS & MUDLOG CONDITIONS

ADD 5.0 FT DRILL ROD TOTAL = 185.9

ADD 5.0 FT OF DRILL ROD TOTAL = 190.9 FT

ADD 5.0 FT of drill rod Total = 195.9 FT

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12/82

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penetr resist bl/ft		
461.4	Gray silty CLAY (CL)	159						
		160						
		161						
		162						
456.4	Gray silty CLAY (CL)	163						
		164						
		165						
		166						
451.4	GRAY SILTY CLAY (CL)	167						
		168						
		169						
		170						
		171						
		172						
446.4	GRAY LOW PLASTIC SILTY CLAY (CL)	173						
		174						
		175						
443.4	GRAY SILTY CLAY	176						

NO SAMPLES RETAINED STRATIGRAPHY TAKENTHIEL FROM BRINE CUTTINGS & DRILLING CONDITIONS.

N/A

ADVANCE BORING w/ 3 3/4" φ ROLLER BIT  
 Add 5 ft of drill rod. Total 200.9 ft.

Add 5 ft drill rod Total 205.9

Add 5 ft of drill rod Total 210.9

210.9 ft ROD  
 - 0.2 TOP OF PANTO TOP OF ROD.  
 210.7  
 36.3 STKCRP  
 174.4 Drilled Depth  
 Total from 655.7  
 - 210.4

DRILLED TO 174.1 ft. 01 #4 C3  
 FLUSHED BOREHOLE AND W/ 10 MIN. PULSED AGES. CHANGED BITS. INSTALLED 1.121 LONG 2 1/2" φ BIT. ADD 5.0 FT DRILL ROD TOTAL 210.9 FT BEGIN TO SET 5" ID FLUSH. JOINT CASING. SET #111 #112 (11-10.0 ft) SECTIONS & ONE 5" SECTION UNPAINTED CASING SET #113 (6-10.0 ft) PAINTED SECTIONS SET 111 (3-10.0 ft) SECTIONS & ONE 5" SECTION

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LOG OF BORING .DSB-1E.

SHEET 11 OF 12

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penet. resist. bl/6in		
443.4	GRAY <u>SILTY CLAY</u>  (CL)	177					UNPAINTED. TOTAL CASING SET 210.0 FT BOTTOM OF 3" ID PERMANENT CASING SET TO 173.9 FT. BOTTOM CASING EL 175.5 SET DRILL RODS TOTAL = 216.1 FT EMPTY MUD TUB ADD ~ 50 gals WATER. CONTINUE ADVANCING BOREHOLE.	
		178						
		177						
		180						ADD 5.0 FT DRILL ROD TOTAL 221.1 FT
438.4		181						
	GRAY <u>SILTY CLAY</u> w/ LAST TWO FEET BECOMING VERY SILTY.  (CL) SILTY	182					NO SAMPLES RETAINED IDENTIFIED FROM ABLETTA CUTTINGS & ABLETTA CONDITIONS	
		183						
		184						PULLED DRILL RODS NOTED BIT & LAST 10" SECTION PLUGGED w/ SILT.
		185						WATER LEVEL 13.1 FT DOWN FROM PAW END OF SHIRT REEFER
433.4		186						START OF SHIRT 9 FEB 82 WATER LEVEL 14.0 FT DOWN FROM PAW CHANGED ROLLER HEAD ON BIT. BIT IS STILL 11.4 LONG, & 2 1/8" Ø. ADD ~ 20 gals WATER TO MUD TUB ADD 5.0 FT DRILL ROD TOTAL = 226.1 FT CONTINUE ADVANCEMENT OF BOREHOLE
	GRAY LOW PLASTIC <u>SILTY CLAY</u>  (CL)	187					ADD 5.0 FT OF DRILL ROD TOTAL = 231.1 FT	
		190						
		187						
		190						
428.4		191						
	GRAY MED PLASTIC <u>SILTY CLAY</u>  (CL)	192						
		193						
425.4		194						

D.1-1,173

Revision 14  
12/82

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	percent resist b1/6in		
425.4		195						
	GRAY PLASTIC SILTY CLAY TO CLAY. (CL)	196						
		197						
420.4	GRAY PLASTIC SILTY CLAY - CLAY (CL)	197	5-	SS	19" / 18"	27 6		
419.4	✓ BOTTOM OF BORING 200.0 FT.	200						
		201						
		202						
		203						
415.4		204						
		205						
		206						
		207						
		208						
410.4		209						
		210						
		211						
407.4		212						

ADD 5.0 FT OF DRILL ROD TOTAL = 236.1  
 236.1 ft rods  
 - 38.2 ft casing + 1.9 ft above pan  
 197.9 ft  
 36.3 ft pickup  
 + 1.9 ft above pan  
 38.2

FLD. 617.4 ft  
 197.9  
 421.5

DRILL TO 197.9 ft @ 421.5 ft FLUSH BORING FOR ~ 10 MINUTES. PULL ROSS. REMOVE BIT ATTACH SPLIT SPOON SAMPLER. 235.0 FT RODS. 3.2 IN SPLIT SPOON & ADAPTER  
 238.2  
 40.2 STICK UP TO PAN + ABOVE PAN  
 198.0 ft. SET SPLIT SPOON & BEGIN SAMPLING. DRIVE SPOON 18" FULL SAMPLER. PLACE SAMPLE IN JARS & LABEL. REMOVE SAMPLER & ADD 1/4" LONG BIT TO 235.0 FT OF DRILL ROD TOTAL 236.1 FT.

DRILL TO 200.0 ft 216.2 rod  
 0.2 ft above pan  
 FLUSH BORING FOR ~ 10 MIN. 216.5  
 EMPTY MUD TUB ADD ~ 50 GALS 216.3 casing  
 WATER. FLUSH BORING FOR 200.0 ft  
 ~ 25 MIN. PULLED DRILL ROD FROM BORING  
 EXTRACTED 4" ID FLUSH JOINT CASING (TEMPORARY) FROM BORING. CRED WATER LEVEL IN BORING MEASURED @ 34.0 ft FROM TOP OF 3" & PERMANENT CASING.  
 10 FEB 82 WATER LEVEL CRED, STAYED THE SAME. @ 34.0 ft DOWN FROM TOP OF 3" CASING. EXTRACTED 5" ID TEMPORARY CASING. BEGAN INSTALLATION OF BENCHMARK ROD. SEE BENCHMARK INSTALLATION DATA SHEETS FOR DETAILS.

Boring Log Revised:  
 John H. Vicks  
 5/24/82

Revision 14  
 12/82

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LOG OF BORING. *ASB-1.4*

SHEET 1... OF 14...

project	MIDLAND NUCLEAR PLANT	project no.	BIC 217-24
location	MIDLAND, MICHIGAN	elevation & datum	elev. of floor of valve pit +619.3 USGS
drilling agency	D & G DRILLING	date started	22 Jan 82
drilling equipment	MOBILE B-61	date finished	29 Jan 82
size & type of bit	4 3/4 IN TRICONE (3 3/4 IN LONG / 2 9/16 IN)	completion depth	194.9 (from elev. 619.3) Mt encountered
casing	Temporary 5 1/2" Steel; 4" ID steel; 3" ID Perm Steel	rock depth	
casing hammer	#1 weight N/A drop N/A	no. samples	dist. / undist. <input type="checkbox"/> core <input type="checkbox"/>
sampler	Split Spoon	water level first	N/A compl. N/A 24 hr. N/A
sampler hammer	#1 weight 140 lb drop 30 IN	driller	Carry Thomason
		supervisor	<i>[Signature]</i>

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc.	type	recov.	percent resist. bit/min		
619.3		1				Approval to advance boring * <i>[Signature]</i>		
	Reinforced concrete (Cored by Bechtel)	2				Set 5 1/2" ID steel casing from valve pit floor (el. 619.3) to elev. 614.5 (4.0 ft of casing) through 6 in hole cored to a depth of 7.2 ft by Bechtel personnel. Casing extended 33.1 ft above floor to working platform.		
		3						
		4						
		5				Place 1 bag of bentonite into cored hole before setting casing to act as seal. There was water in core hole prior to placement of bentonite		
		6				End shift 23 Jan 82		
		7				Begin shift 24 Jan 82		
		8				7:00-9:30 AM difficulties starting rig because of extreme cold		
	Concrete mud mat trace of wood in cuttings	9				Leakage of water between 5 1/2" casing and cored hole requires preparing an additional seal of rope, deer and leather. Leak is sealed. Bechtel laborers put small pump at floor of valve pit to remove water leaking thru joints in casing.	12	
617.3		10				Set 4 3/4" IN TRICONE Bit and N-tool in boring.		
		11				Mix drill fluid. ~25 lbs bentonite to ~50 gals water.		
		12				Begin drilling at ~12:15 PM.		
		13				Drill stem: 7-10 ft + 1-5 ft + bit (1.4 ft) = 14.4 ft		
615.3	bottom of concrete 13.9 ft	14				Casing stuck up from floor to bottom of casing part = 36.05 Add 10 ft rod to 21 (51.4 ft)		

No samples returned. stratigraphy identified by drilled cuttings and drilling conditions

N/A

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LOG OF BORING .058-1.W.

SHEET 2 OF 14

LEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penetr resist bl/6in		
625.3	med. to coarse SAND and Fine GRAVEL (SP-SW)	15						
		16					Add 5 ft. rod (total 56.4 ft)	
		17						
		18						
		19					Drill rate ~ 1 ft/min in SAND	
		20					Add 10 ft rod (total 61.4 ft)	
		21					Drill to 20.9 by end of shift end shift 24 JAN 82	
		22					Begin SA. ft. 25 JAN 82 Need to ream boring from 15.0 - 21.9 ft.	
		23					Add ~ 20 gals of water to ~ 30 gals of drill fluid mixed yesterday	
		24						N/A
		25					Add 5 ft rod (total 66.4 ft)	
		26						
		27						
		28						
		29						
	Med to Coarse SAND and Fine GRAVEL (SP-SW)	30					Add 10 ft rod (total: 71.4 ft)	
		31						
597.3		32						

No samples returned. Stratigraphy identified by  
dotted strings and drilling conditions

Revision 14  
12/82

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LOG OF BORING . D.S.B-1W.

SHEET 3. OF 14.

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES					REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING B
			no. loc	type	recov.	penetr resist	bl/6in		
537.3									
	Med. to coarse SAND and FINE GRAVEL (SP-SW)	33					Drill w/ 4 3/4" TRICONE bit and bentonite fluid.		
		34							
		35					Add 5 ft rod (total 76.4 ft)		
		36							
532.9	CONCRETE	37					Hit obstruction at 36.9 ft. Concrete in cuttings. Stop drilling. Check w/ C. Wilson of Bucktel Surveying on nature of obstruction. Identified as mud mat. A. Sibbald instructs K O'Dea to continue drilling.	9" dia drill 370.2 ft	
		38							
		39							
		40					Add 10 ft rod (total 81.4 ft)		
		41							
		42							
		43							
		44							
		45					Drill through bottom of mud mat at 45.4 ft.		
533.9	Coarse gray, low plastic silty or sandy CLAY. (CL)	46					resistance drilling below 45.4 ft indicates stiff clayey material. Sandy clay in cuttings. Add 5 ft rod (total 86.4 ft)	13" dia	
		47							
		48							
		49							
		50							

No samples returned. Stratigraphy easily identified by detailed cuttings and drilling conditions.

N/A

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LOG OF BORING .DSB-1.W.

SHEET 4..OF. 14...

LEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			NO. LOC	TYPE	RECOVER.	PENETR. RESIST. bl/6in		
569.3	Brown gray, low plastic <u>SILTY CLAY</u>	51						
		52						
		53						
		54						
	Brown gray, low plastic <u>SILTY CLAY</u>	55						
		56						
		57						
		58						
		59						
	Brown gray, low plastic <u>SILTY CLAY</u>	60						
		61						
		62						
		63						
		64						
		65						
		66						
	Brown gray, low plastic <u>SILTY CLAY</u>	67						
557.3		68						

No samples returned. Stratigraphy identified by drilled cuttings and drilling conditions

Empty mud tub. Fill w/ ~60 gals of clear water.  
 Drill w/ 4 3/4 IN TRICONE  
 Add 10 ft rod (total 91.4 ft)

Add 5 ft rod (total 96.4)

Add 10 ft rod (total 101.4 ft)

Empty mud pit. Fill w/ ~60 gals of water  
 Add 5 ft rods (total 106.4 ft)

N/A

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LOG OF BORING . D.S.B.-1W.

SHEET 5 OF 14

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLWS
			no. loc	type	recov.	penet. resist. bl/6in		
531.3	<u>BROWN GRAY LOW PLASTIC SILTY CLAY</u>	67						
		70					DRILLER REPORTS CLAY BECOMING HARDER	
		71					ADD 5 FT ROD (TOTAL 111.4 FT)	
		72						
		73						
		74						
	<u>BROWN GRAY LOW PLASTIC SILTY CLAY</u>	75						
		76						
		77					ADD 5 FT ROD (TOTAL 116.4 FT)	
		78						
		79						
	<u>BROWN GRAY LOW-MED PLASTIC SILTY CLAY</u>	80						
		81						
		82						
	<u>Brown Gray, Low-med plastic silty clay</u>	83						
		84						
		85						
533.3		86						

No samples returned. Stratigraphy identified by drilled cuttings and drilling conditions

EMPTY MUD TUB FILL w/ ~60 GALS. OF WATER. THIN DRILLING MUD IN CASING. EMPTY MUD TUB FOR NIGHT  
 2 1/2" OF SLAG IN BORING OVERNIGHT WATER LEVEL IN BORING DROPPED overnight MIXED FRESH MUD (~60 gals water 2000s BENTONITE) ATTEMPT TO fill Core hole unable to do so. ADD 40 gals under more 4 10 lbs BENTONITE LUMP INTO Core Hole HAVE RETURN BUT STILL losing mud (~30-35 gals) MIX another batch of mud. ~45 gals water w/ ~25 lb bentonite. Lose fluid more slowly SEE NOTES

N/A

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E.V. 533 J	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penet resist bl/6in		
						SEE NOTES END SHIFT 26 JAN 82 Begin SHIFT 27 Jan 82		
	Brown gray, low to med <u>Silty</u> <u>CLAY</u>	87				Set 123 ft of 4 in ID steel Casing to bottom of Boring It was necessary to push the casing w/ hydraulics.		
		88						
		89				Remove top 5 ft section of previously Placed 5 in casing.		
		90				Distance from valve pit floor to plate of circulation "T" at top of casing 35.9 ft ("T" is 2.7 ft above bottom board of Platform)		
		91						
		92				Fill mud tub w/ clear water (also gals)		
		93				Begin drilling w/ 3 3/4 in. TRICONE (0.9 ft long) and fresh water.		
		94				Bit and rods lowered w/o drilling to 85.3 ft.		
		95				No fluid loss is noticed (ie. casing seated well)		
	Brown gray, low to med plastic <u>Silty CLAY</u>	95				12-10ft + 5 ft rods + bit = 125.9 ft total		
		96				at 90.0 Add 10ft rod (total 130.9)		
		97						
		98						
		99						
		100				at 95.0 Add 5 ft rod (135.9 total)		
		101						
		102						
		103						
		104						
	Gray, low to med plastic <u>Silty</u> <u>CLAY</u>	100				Add 10ft rod (140.9 total)		
		101						
		102						
		103						
		104						

No samples retained. Stratigraphy identified by  
 drilled cuttings and drilling conditions

N/A

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LOG OF BORING .DSB.-1.W.

SHEET 7 OF 14...

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	Casing B
			no. loc	type	recov.	penet. resist. bl/6in		
575.3								
		105					Add 5 ft rod (145.9 ft total)	
		106						
		107						
	Brown gray, <u>silty CLAY</u> , w/ fine sand.	108						
		109						
		110					Add 10 ft rod (150.9 total)	
		111					<u>Drilling Rate</u> 110-115 ft: 1459-1505 5 ft / 6 min = 0.8 ft/min	
		112						
		113						
	Brown gray, sandy, <u>silty CLAY</u>	114						
		115					Add 5 ft rod (155.9 total)	
		116						
		117					<u>Drilling Rate</u> 115-120 ft: 1511-1521 = 30 5 ft / 10.5 min = 0.5 ft/min	
	(fine sand) Brown gray, sandy, <u>silty CLAY</u>	118						
		119						
		120					Add 10 ft. rod (160.9 total)	
		121						
		122						

No samples retained. Stratigraphy identified by drilled cuttings

N/A

497.3

D.1-1,181

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ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES					REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	percent pass 20 #	percent pass 40 #		
473	(fine sand) Brown gray, sandy, silty CLAY	123							
		124							
		125					Drilling Rate 125-125 ft: 1530-1538 5 ft/8.0 min = 0.6 ft/min		
		126					Add 5 ft Rod (165.9 total)		
		127					Drilling Rate 125-130 ft: 1544-1550 5 ft/6.0 min = 0.8 ft/min		
	(fine sand) Brown gray, sandy, silty CLAY with trace organic material (like rot matter)	128							
		129							
		130					Add 10 ft Rod (170.9 total)		
		131					Drilling Rate 130-135 ft: 1559-1604 5 ft/5.0 min = 1.0 ft/min		
		132							
	(fine sand) Brown gray, sandy, silty CLAY with trace organic material.	133							
		134							
481.3		135					Add 5 ft rod (175.9 total)		
	Possible sandy or silty seam -- less cohesive material.	136					Drilling Rate 135-140: 1613-1617 5 ft/4.0 min = 1.25 ft/min		
		137					Driller reports increase in drill rate 135-138.5 ft, indicating less cohesive material.		
		138							
	(fine sand) Brown gray, sandy, silty CLAY	139							
479.5		140					Revision 14 12/82		
	D.1-1,182						Add 10 ft Rod (180.9 total)		

All samples returned. Stratigraphy identified by drilled cuttings and drilling conditions

N/A

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LOG OF BORING . DSB-1W.

SHEET 9.. OF 14..

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING B
			no. loc	type	recov.	percent resist bl/6in		
479.3								
		141				<u>Drilling Rate</u> 140-145 ft: 1630 - 1636 5.0 ft/6.0 min = 0.8 ft/min		
		142						
	(fine sand) Brown gray, sandy, silty CLAY, with trace organic materials.	143						
		144						
		145				Added 5' Rod (185.9 total)		
		146						
		147				<u>Drilling Rate</u> 145-150 ft: 1643:30 - 1649:30 5.0 ft/6.0 min = 0.8 ft/min		
	Brown gray, silty CLAY. Less sand than above	148				Stopped for day at 150 ft Diluted fluid in settling tub with fresh water & circulated this mixture into the boring.		
		149				Begin shift, 1-28-82		
		150				Add 10' Rod (190.9 Total)		
		151						
		152				<u>Drilling Rate</u> 150-155 ft: 0819-0926 5.0 ft/7.0 min = 0.7 ft/min		
	Brown gray, sandy (fine sand) silty CLAY, with trace organics.	153				Fairly steady drilling except for 2-3 thin (~1-2 ft) layers of increased resistance.		
		154						
		155				Add 5' Rod (195.9 Total)		
		156				<u>Drilling Rate</u> 155-160 ft: 0835:30 - 0840 5.0 ft/4.5 min = 1.1 ft/min		
		157				Fairly steady drilling entire run		
461.3		158						

No samples retained. Stratigraphy identified by  
 drilled cuttings and drilling conditions

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LOG OF BORING . DSB-1W

SHEET 10 OF 14

V.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	Type	recov.	penet. resist. BI/6IN		
161.3	Brown gray, sandy (fine sand), silty CLAY, with trace coarse sand to fine gravel & trace organic.	159						
		160						
		161						
157.3		162						
		163						
	Becoming less cohesive - possibly siltier. Smaller amount of cohesive clumps of fines in cuttings.	164						
		165						
		166						
		167						
		168						
	Brown gray; sandy (fine sand), silty CLAY to clayey SILT. Trace organic.	169						
		170						
		171						
		172						
		173						
	Increased drilling resistance	174						
		175						
		176						
	Decreased drilling resistance again.	177						
		178						
		179						
	Becoming less sandy (very little sand) on base of bit after pulling rods is gray brown, plastic, silty CLAY.	180						
163.3		181						

No sample returned. Stratigraphy identified by drilled cuttings and drilling conditions

Add 10 ft. Rod (200.9 Total)

Drilling Rate

160-165 ft: 0851:30 - 0855:30  
 5.0 ft / 4.0 min. = 1.25 ft/min.

At ~162 drilling rate increased continued rapid until 165. Sand content in cuttings similar to above - possibly a silty layer.

Add 5 ft. Rod (205.9 Total)

Drilling Rate

165-170 ft: 0903 - 0906:30  
 5.0 ft / 3.5 min. = 1.4 ft/min

Most of run rapid drilling, w/ thin layers, increased resistance.

Add 10 ft Rod (210.9 Total)

Drilling Rate

170-175 ft: 0915 - 0920  
 5.0 ft / 5.0 min. = 1.0 ft/min

Approx. top 1/2 of run (170-172.5) increased drilling resistance, then faster drilling to 175 ft

Wash boring

Stop at 175 ft & pull rods. Empty setting tub. Drillers go to trailer to get cages.

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Remainder Casing Pulled up 10 ft

Section of pipe casing

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LOG OF BORING *DSB-1W*

SHEET *11* OF *14*

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOW												
			no. loc	type	recov.	penetr resist bl/6in														
<i>443.3</i>																				
	<i>Brown gray silty CLAY, with trace organics (CL)</i>	177-178					<p>Put 110 ft. unpainted casing into boring. At base of casing is 0.4 ft long carbide bit. (on top of 110')</p> <p>Put in 70 ft. of red/orange painted casing, followed by 30 ft of unpainted casing.</p> <p>Total = 0.4 + 110 + 70 + 30 = 210.4 ft.</p> <p>End of shift, 1-28-82</p>													
		179-180					<p>Start of shift, 1-29-82</p> <p>Fluid level in casing at top of 3" casing.</p> <p>Advance boring from 174 ft w/ 2 1/16" tri-wing bit. Bit + extension = 1.15 ft.</p> <p>215' Rods + 1.15 = 216.15 ft.</p> <p>Bottom - 210.9 from 47 ft</p> <p>Structure 5.25 FT</p> <table border="0"> <tr> <td>Drilling Rate</td> <td>16.15</td> </tr> <tr> <td></td> <td>210.90</td> </tr> <tr> <td></td> <td>5.25</td> </tr> </table> <p>175-180.25 FT: No Rate Taken</p> <table border="0"> <tr> <td>Add 10' Rod (221.15 Total)</td> <td>216.15</td> </tr> <tr> <td></td> <td>35.90</td> </tr> <tr> <td></td> <td>180.25</td> </tr> </table> <p>Drilling Rate</p>	Drilling Rate	16.15		210.90		5.25	Add 10' Rod (221.15 Total)	216.15		35.90		180.25	
Drilling Rate	16.15																			
	210.90																			
	5.25																			
Add 10' Rod (221.15 Total)	216.15																			
	35.90																			
	180.25																			
	<i>Brown gray, silty CLAY, with trace fine sand, &amp; trace organics (CL)</i>	181-184					<p>180.25 - 185.25 FT: 0855-0900:20</p> <p>5.0 FT / 5.5 min.</p> <p>Top = 1.5 ft of ma relatively slow drilling, as in cohesive clay.</p> <p>Bottom = 3.5 ft. is decreased resistance.</p> <p>Add 5 ft Rod (226.15 Total)</p> <p>Drilling Rate</p> <p>185.25 - 190.25: 0911-0920</p> <p>5.0 FT / 9.0 min = .55 ft/sec</p>													
		185-186																		
	<i>Brown gray, silty CLAY, with trace fine sand, &amp; trace organics (CL)</i>	187-190					<p>Add 10 ft Rod (231.15 Total)</p>													
		191-192					<p>190.25 - 192.8: 0940:30 - 0945</p> <p>Joint represents 190.25 FT. = .57 ft/sec.</p> <p>192.80 - 190.25 = 2.55, is stuck up at 192.80 = 2.55 FT.</p>													
	<i>S-1</i> <i>0-0.02'</i> : Flat, subrounded cobbles <i>0.02'-0.55'</i> : Hard, gray brown, plastic, silty CLAY, moist, with occasional trace sand & fine gravel (<2%). At base of sample is within (-1/4") sandy layer. Below this last consisted of rest of sample is comp. of med. plastic sandy (fine sand) silty clay to low plastic clayey sand.	193-194					<p>length of split spoon = 2.95 ft</p> <p>extension = .77 ft</p> <p>3.72 ft</p> <p>Counted rods as they pulled them to put in split spoon. Verified 230 FT.</p> <p>Rods + 1/16" bit</p> <p>Revision 14</p> <p>12/82</p>													
<i>425.3</i>																				

No samples retained. Stratigraphy identified by skilled cuttings and drilling conditions

No photos drilled

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LOG OF BORING . DSB-1W

SHEET 12 OF 14

Elev.	DESCRIPTION	DEPTH SCALE ft	SAMPLES					REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penetr resist	bl/6in		
425.3	Brown gray Nonplastic to low plastic, clayey SAND - sandy CLAY, wet (SC-CL)								
424.4	SEE Note #								
	Bottom of Boring 194.9 ft.	195 196					<p>S-1</p> <p>23. Rods + 3.3 sampler = 233.3 FT                  233.3 - 192.8 = 40.5 FT                  40.5 FT - 35.9 FT = 4.6 FT pickup</p> <p>St. ckupans only 4.4 FT, so bottom of sampler at 193.0 FT. weight of rods falling to bottom of hole drove sampler 0.2 FT into the formation before start of sampling (193.0 FT - 193.85 FT.)</p> <p>Refusal at 193.85 FT.</p> <p>193.0 FT - 193.5 FT = 50 blows                  193.5 FT - 193.85 FT = 100 blows                  P. on S-1 = 4.0 J/ft<sup>2</sup></p> <p>230 ft Rods + 1.1 ft bit = 231.1 ft                  231.1 - 194.8 = 36.8                  36.8 - 35.9 = 0.9 ft pickup at elev. 425.</p> <p>Pulled rods, put on 2 3/4" tri-lobed bit, &amp; drilled to elev. 425 (194.3 ft).</p> <p>Washed boring through the bit with clear water until return water cleared.</p> <p>* Note: During flushing w/ clear water, the boring was advanced (i.e. washed out) to a depth of 194.9 ft.</p>		

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LOG OF BORING DSB-1WSHEET 13 OF 14NOTES

Before drilling began on 24 Jan 82, the fluid level in boring had dropped overnight (level not measured). ~ 55 gals of fresh water was pumped into boring to fill casing but the water quickly drained through boring. A batch (1) of bentonite drill fluid was mixed (~60 gals water; ~20 lb bentonite) and pumped into boring. The fluid was again quickly lost. Another batch (2) of fluid was mixed (~60 gals water; ~10 lbs bentonite) and lost quickly after being pumped into boring. The boring was advanced to 33.2 ft and cuttings indicated clay from 31.0 - 33.2 ft. K. O'Dea informed D. Sibbald of CPC of fluid loss problems. Sibbald instructed K. O'Dea to continue pumping bentonite fluid into boring to try to stop flow out of borehole. K. O'Dea had found out that the dewatering system in the area of this boring had been shut down over the weekend and yesterday until ~ 6<sup>30</sup> pm. This would explain the fact that no appreciable fluid loss was experienced on 24 or 25 Jan.

The drillers then mixed three (3) more batches of drill fluid (all with ~ 45 gals water; ~ 20-25 lbs bentonite). Each was pumped into boring and quickly lost. There was some indication that the fluid was being lost at a slower rate.

K. O'Dea contacted D. Sibbald at ~ 11<sup>00</sup> am and suggested that the boring be cased <sup>(w/ 4" flush joint casing)</sup> to prevent further loss of drill fluid. Sibbald agreed with this suggestion and added that Bill Paris at Bechtel Geotech. had been informed of the fluid loss problem in order to alert him to the possible anomalies that this might cause in monitoring the dewatering system. Paris asked that precautions be taken to minimize fluid loss. D & G Drilling doesn't have enough 4" casing on site but can have it delivered by this evening.

When K. O'Dea returned to the drill rig it was

lost within 2 min after beginning recirculation

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LOG OF BORING DSB-1WSHEET 14 OF 14NOTES

noticed that the fluid level was dropping but very slowly. He instructed the drillers to mix another batch of fluid (~45 gals water; 20 lbs Bentonite) to see how well the boring had been sealed. K. O'Dea informed D. Sibbald that this attempt was going to be made and was given authorization. The mud was recirculated through the boring and the boring was advanced to 86.8 ft w/ the Tricone bit. Fluid was lost (probably ~10 gals) but very slowly. Drilling was stopped and the following measurements of the falling fluid level were made:

date	Time	Fluid level (below top of casing)
26 JAN	2 <sup>05</sup> pm	0.0 ft
	2 <sup>30</sup> pm	0.8 ft
	3 <sup>00</sup> pm	2.6 ft
	4 <sup>30</sup> pm	5.8 ft.

K. O'Dea suggested to D. Sibbald that although the fluid loss has been minimized, the boring still should be cased. Casing will begin tomorrow morning.

BORING LOG REVIEWED BY John S. Hoffmann 4 MAY 82

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LOG OF BORING. ASB-2E.

SHEET 1..OF. 14...

project <b>MIDLAND NUCLEAR PLANT</b>	project no. <b>81C217-24</b>
location <b>MIDLAND, MICHIGAN</b>	elevation & datum <b>+614.0 USGS</b>
drilling agency <b>DY G DRILLING</b>	date started <b>1-29-82</b> date finished <b>2-5-82</b>
drilling equipment <b>AKER SKID RIG</b>	completion depth <b>209.35 FT</b> rock depth <b>N/A</b>
size & type of bit <b>4 3/4 in, 2 1/4 in Tricone; 3 7/8 in. Drag bit</b>	no. samples 2 dist.      undist. <b>N/A</b> core <b>N/A</b>
casing <b>5 in temporary; 3 in ID Permanent</b>	water level first <b>N/A</b> compl. <b>N/A</b> 24 hr <b>N/A</b>
casing hammer: <b>N/A</b> weight <b>N/A</b> drop <b>N/A</b>	driller <b>Larry Koditek</b>
sampler <b>Split spoon</b>	supervisor <b>John R. Hsieh / K O'Dea</b>
sampler hammer: #1 weight <b>140 lbs</b> drop <b>30 in</b>	

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penetr. resist. (psi/6in)		
614.0		1						
	Concrete (cured by Bechtel) w/ reinforcing steel and rubber membranes	2					<p>CRG approval to advance boring; + Donald's signature</p> <p>Rig was set up on the floor at the 634.6 elev. level; 46 ft south of Kraus wall. Bechtel corral 1.3 of concrete floor at the elev. 634.6 level and 61 ft of concrete at the elev 614. The concrete must exist below the elev 614 floor slab was not core'd.</p> <p>Drill rig is leveled to maintain verticality of boring</p> <p>Set 27 ft of 5 in steel surface casing. Have difficulty sealing casing at 614 level seal w/ rope and denturite</p> <p>Begin drilling w/ 4 3/4 in Tricone bit using water as drilling fluid</p> <p>Add ~5 lbs bentonite to 30-35 gals of drill water.</p> <p>Measurement of depth to be recorded from 614.0 elev floor. In measuring stick up on rods from elev. 634.6 floor 20.6 ft is added to calculate depth.</p> <p>bit + sub (60ft) + 4-5ft + 2-2ft rods + 0.4 ft coupling = 30.4 ft</p> <p>break through mud mat at 8.5ft.</p> <p>Drilling rate increase. Add 5' rod end of 54.1ft 10.7ft (31.4ft)</p> <p>Start of Shift, 1-20-82</p> <p>33.0' to joint - 1.75 stickup = 31.2'</p> <p>31.3 - 20.6' = 10.7' = hole depth</p> <p>J.H. replaces K.C.</p>	
		3						
		4						
		5						
608.9		6						
	CONCRETE	7						
		8						
		9						
		10						
		11						
		12						
		13						
600.0		14						

No samples returned. Stratigraphy identified by drilled cuttings and drilling conditions

N/A

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penet resist bl/6in		
582.0		15				Driller reports increase in drilling resistance at ~13ft. Cuttings still consist of sand.		
	Brown, coarse to fine (med. to fine predominant) SAND, w/tr. silty to clayey fines.	16				At 13.5ft: Add 5' Rod (36.4' total) $\hookrightarrow 36.4' - (20.6' + 2.2' \text{ stick}) = 13.5\text{ft}$		
		17						
		18						
		19				At 19.5ft: Add 5' Rod (41.4ft total)		
		20						
		21						
		22						
		23				At 23.5ft: Add 5' Rod (46.4 total)		
		24				Increased drilling resistance at 25-26ft. At 26.7ft driller reports he may be in a mudmat. Stop drilling & notify O. Sibbold, who gives the O.K. to continue drilling.		
		25						
	26							
581.5		27						
	CONCRETE							
	Mud Mat.	28						
		29						
		30						
		31						
583.0		32				At 28.5ft: Add 5' Rod (51.4 total) At ~31ft driller reports he is in clay. No clay in cuttings - possibly is being ground up. Gravel & sand, which is still appearing in cuttings, is possibly partly from the formation, & partly recirculated from settling tub. Drill fluid (thin water/bentonite mixture) is becoming quite thick. Pump out settling tub & add clean H <sub>2</sub> O.		

No samples obtained immediately IDENTIFIED FROM DRILLED CUTTINGS

N/A

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ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CUTTINGS
			no. loc	type	recov.	penetr resist bl/6in		
532.0	Brown CLAY w/tr. subangular, coarse to fine (course predominant) SAND, & fine gravel.	33						
		34						
		35						
		36						
		37						
	possible Brown CLAY, w/tr. coarse to fine (med.-course predominant) sand. (see remarks)	38						
		39						
		40						
		41						
		42						
	possible Brown CLAY, w/tr. coarse to fine sand (course predominant) (see remarks)	43						
		44						
		45						
		46						
		47						
		48						
		49						
564.0	Becoming slightly silty Revision 14 12/82	50						

NO SAMPLES RETAINED STRATIGRAPHY IDENTIFIED BY DEPTH CUTTINGS & DRILLING CONDITIONS

At 33.5ft: Add 5' Rod (56.7ft Total)  
 Course sand & fine gravel still predominate in cuttings, yet slow drilling conditions indicate v. clayey material. Is difficult to drill this material w/ tricone bit - cones become clogged w/ clay.  
 At ~35ft stop to recase casing at 614 level - were losing fluid.

At 38.5ft: Add 5' Rod (61.7 Total)  
Drilling Rates  
 38.5-40.2': 1217-1226 = 30 = .18ft/min.  
 40.2-42.1': 1229-1250 = 21 = .09ft/min.  
 42.1-43.5': 1254-1301 = 47 = .21ft/min.

38.5-43.5': Cuttings still consist of sand, yet drilling conditions continue to indicate v. clayey material which is not appearing in cuttings. Most or all sand is probably being recirculated or washing off sides of upper portion of borehole.

At 43.5ft: Add 5' Rod (66.7 Total)  
 Pump out settling tub & refill w/ clean H<sub>2</sub>O.

Stop at ~46.5 - exhaust line melted. Replace w/ metal pipe.  
Drilling Rates  
 47.0-48.5ft: 1420-1433 = 13 = .12ft/min.  
 At 48.5ft: Add 5' Rod (71.7 Total)  
 Difficulty replacing rods in hole after adding 5' section.  
Drilling Rates  
 48.5-49.7ft: 1446-1457 = 11 = .11ft/min.  
 49.7-51.7ft: 1457-1511 = 54 = .17ft/min.

ELEV. ft	DESCRIPTION	DEPTH SCALE ft	SAMPLES					REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penet.	resist.		
44.0									
	Less silty & more clayey <u>1 Feb. 82</u> From bottom of bit at ~54ft Brown gray, plastic <u>CLAY</u> , w/ some silt, moist.	51					At ~48ft. bit begins to cut more easily & smoothly. At ~50.5-51.5ft resistance increases again. End of shift, 1-30-82 @ ~52ft		
		52					Start of shift, 2-1-82 Pull rods, put on 3 7/8-in. Hawthorne drag bit to facilitate drilling the clay. Bit = 1.3ft; Coupling = 0.4ft; sub = 4.9ft.		
		53					Replace rods in hole & complete run started 1-30.		
		54					Hole depth = 53.5 ft + extra length of new bit (0.2ft) = 53.7ft.		
		55					At 53.7ft: Add 5' Rod (76.6 total)		
		56							
		57							
		58					At 58.7ft: Add 5' Rod (81.6' total)		
		59					<u>Drilling Rates</u> 58.7-60.4': 0937-0938 = 0.34 ft/min. 60.4'-62.4': 0940-0946 = 0.33 ft/min.		
		60					At 63.7ft. stop to replace seal in pump, drain settling tub, & add fresh H <sub>2</sub> O.		
		61					New bit makes it slightly easier to collect cuttings - it does not seem to grind up the clay as thoroughly as did the tricone bit.		
		62					At 63.7ft: Add 5' Rod (86.6' total)		
		63					<u>Drilling Rates</u> 63.7-65.0': 1037-1040 = 0.26 ft/min. 65.0-67.0': 1044:30-1054 = 0.21 ft/min		
		64					67.0-68.7': 1056:30-1104 = 0.23 ft/min.		
		65					Fairly uniform drilling 63.7 - 68.7ft except for bottom ~0.6 ft. relatively fast. It probably a silty layer.		
		66							
		67							
		68							

No samples retained. Stratigraphic  
Identified from drilled cuttings

N/A

Gray brown CLAY, w/ some  
silt, & tr. med. to fine sand

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING INCHES
			no. loc	type	recov.	penet. resist. bl/6in		
546.0	Brown gray, silty CLAY, w/ tr. coarse to fine sand.	69					At 68.7ft: Add 5' Rod (91.6 total) Drilling Rates 68.7-70.0': 1116-1118:30 = .15 ft/min. 70.0-72.0': 1126:30-1130:30 = 0.5 ft/min. ? (Possibly misread times this interval) 72.0-73.7ft: 1138:30-1149:30 = .15 ft/min	
	Brown gray CLAY, w/ tr. to some silt, & tr. coarse to fine, graded sand.	72					Drilling at slow rate to avoid drilling a crooked hole	
		73						
		74					At 73.7ft: Add 5' Rod (96.6 Total) Drilling Rates 73.7-74.8': 1157-1202:30 = .2 ft/min. 74.8-76.8': No Rate taken 76.8-79.7': 1219-1229 = .19 ft/min	
		75						
		76						
		77						
	Brown gray CLAY, w/ tr. to some silt, & tr. coarse to fine, graded sand.	78					At 78.7ft: Add 5' Rod (101.6 Total) Drilling Rates 78.7-79.9': 1241:30-1245:30 = .34 ft/min. 79.9-81.8': 1248-1252 = .47 ft/min No cohesive clayey clumps or sand in cuttings.	
	Becoming silty, w/ no sand.	79					81.8-83.7': No rate taken. Still relatively fast drilling	
	At 80ft get pale reddish, pulpy fragments in cuttings - looks like paper - is most likely organic.	80						
		81						
		82						
		83					Occasionally replacing rods in hole after adding rod.	
		84					At 83.7ft: Add 5' Rod (106.6 Total) Drilling Rates 83.7-84.9': 1310-1315 = .24 ft/min. 84.9-86.9': 1318:30-1324 = .36 ft/min. 86.9-88.7': 1326:30-1333 = .28 ft/min	
		85					83.7'-86.9' cuttings consist of reddish, pulpy, fibrous shreds (organic)	
		86					Revision 14 12/82	

All Samples retained Strategically  
 Identical to core drilled cuttings & drilling conditions

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penet. resist. bl/6in		
	Less silty, w/ tr. coarse to fine sand & tr. organics (reddish colored)	87						
		88						
		89						
		90						
		91						
		92						
		93						
		94						
		95						
		96						
	Brown gray CLAY, w/ tr. silt, tr. coarse to fine sand & fine gravel, & tr. organics (reddish colored). Occasional thin silty layers.	97						
		98						
		99						
		100						
		101						
		102						
		103						
		104						
		105						
		106						
512.3	Brown gray silty layer, w/ tr. coarse sand (amt. of sand v. small - 2-5%). Most likely a silty CLAY.	107						
510.0		108						

No samples retained stratigraphically  
 Identified from drilled cuttings

86.7-88.7': 6+ trace clayey fines in cuttings, possibly indicating return to less silty (more clayey material). It's also a trace coarse to fine sand in cuttings.

At 88.7ft: Add 5' Rod (111.6 Total)

Drilling Rates

88.7ft-90.0': 1342-1356 = .09 ft/min  
 90.0-92.0': 1359-1405 = .23 ft/min  
 92.0-93.7': 1410-1415 = .34 ft/min

At 93.7ft: Add 5' Rod (116.6 Total)

Drilling Rates

93.7-94.7': 1426:30-1470:30 = .25 ft/min  
 94.7-96.7': 1432:30-1441 = .24 ft/min  
 96.7-98.7': 1443:30-1449 = .36 ft/min

At 98.7ft: Add 5' Rod (121.6 Total)

Drilling Rates

98.7-99.7': 1456-1501:30 = .18 ft/min  
 99.7-101.7': 1503-1510 = .29 ft/min  
 102.3-103.7': 1513-1515 = .7 ft/min

At 103.7ft: Add 5' Rod (126.6 Total)

Drilling Rates

103.7-104.8': 1521:30-1523:30 = .55 ft/min

N/A



ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	BORING S.M.S.
			no. loc	type	recov.	penetr resist bl/6in		
510.0								
		105				Drilling Rate: 104.7-106.8': 1526-1529.30 = 61 ft/min		
		106				(Approx) 106.8-108.7': 1533-1536.30 = .54 ft/min		
		107				V. little cuttings return		
		108						
		109				At 108.7 ft: Add 5' Rod (131.6 Total) Drilling Rate: 108.7-109.8': 1543.30-1548.30 = .22 ft/min		
494.0		110				109.8-111.8': 1551-1558 = .29 ft/min		
		111				111.8'-113.7': 16.01-16.72 = .32 ft/min		
		112				At 110' drill motor begins to labor a bit more than in the 7-8 ft above. Material a bit more clayey.		
		113						
		114				At 113.7 ft: Add 5' Rod (136.6 Total) Drilling Rate: 113.7-114.7': 1615.30-1617 = .67 ft/min		
499.5		115				114.7-116.7': 1619-1624 = .4 ft/min		
		116				Motor not straining as it did above - is running uniformly.		
		117				116.7-118.7': 1627-1630.30 = .57 ft/min (Approx)		
		118						
		119				At 118.7 ft: Add 5' Rod (141.6 Total) Drilling Rate: 118.7-119.7': 1639-1641 = .5 ft/min		
		120				119.7-121.7': 1643.30-1648 = .44 ft/min		
		121				121.7-123.7': 1656.30-1701 = .44 ft/min		
492.0		122						

Brown gray, silty CLAY, w/ tr. (0-5%) med.-course sand.

Less silty, & more clayey.

Brown gray, silty CLAY, w/ tr. (0-5%) coarse sand to fine gravel. Slightly more silty than above, as indicated by drilling conditions.

Brown gray, silty CLAY, w/ tr. coarse sand to fine gravel. Alternating more silty & more clayey layers, as indicated by drilling conditions.

No Samples Retained - Stratigraphy Identified from drilled cuttings & drilling conditions

EV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penetration resist bl/6in		
492.0						End of shift, 2-1-82 122.8 ft Start of shift, 2-2-82		
		123				At 123.7 ft: Add 5' Rod (146.6 Total) <u>Drilling Rates</u>		
		124				123.7-124.9: 0721:30-0724:30 = 0.4 ft/min.		
		125				124.9-126.9: 0727-0731 = 0.5 ft/min.		
		126				126.9-128.7: 0735-0738 = 0.6 ft/min.		
	Brown gray, <u>silty CLAY</u> , w/ fr. (0-5%) subangular, coarse to fine sand. Includes layers of more silty to more clayey material, as indicated by drilling conditions.	127						
		128				At 128.7 ft: Add 5' Rod (151.6 Total) <u>Drilling Rates</u>		
		129				128.7-129.8: 0752:30-0754:30 = 0.55 ft/min.		
		130				129.8-131.8: 0758-0802:30 = 0.44 ft/min.		
		131				131.8-133.7: No rate taken - relatively rapid, even drilling	N/A	
		132						
	Brown gray, <u>silty CLAY</u> , w/ fr. (0-5%) subangular, coarse to fine (course predominant) sand & fine gravel.	133				At 133.7 ft: Add 5' Rod (156.6 Total) <u>Drilling Rates</u>		
		134				133.7-135.1: No Rate Taken		
		135				135.1-137.1: 0832-0836:30 = 0.74 ft/min.		
		136				137.1-138.7 ft: 0839-0841:30 = 0.64 ft/min.		
		137				Drain settling tub & refill w/ clean H <sub>2</sub> O		
		138				At 138.7 ft: Add 5' Rod (161.6 Total) <u>Drilling Rates</u>		
		139				142.2-143.7: 0912-0914 = 0.75 ft/min.		
		140				Material appears fairly uniform - drilling speed fairly constant, motor turning evenly.		

No Samples retained, stratigraphy identified from drilled cuttings

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES					REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING B.P.
			no. log	type	recov.	penetr resist bl/6in			
474.0	Gray brown, silty CLAY, w/ tr. (Co-sg.) subangular, coarse to fine sand & fine gravel.	141							
		142							
		143					At 143.7ft: Add 5' Rod (166.6 Total)		
		144					Drilling Rates 143.7ft - 145.1ft: 0923:30 - 0925 = .93 ft/min.		
	Gray brown, silty CLAY, w/ tr. subangular, coarse to fine (less coarse, more fine than above) sand.	145					145.1 - 147.1: 0928:30 - 0932 = .57 ft/min.		
		146					147.1 - 148.7: 0936 - 0939:30 = .64 ft/min.		
		147							
		148					At 148.7ft: Add 5' Rod (171.6 Total)		
		149					Drilling Rates 148.7 - 150.2: 0948 - 0951 = 0.5 ft/min.		
		150					150.2 - 152.2: 0954 - 0957 = 0.67 ft/min.		
		151					152.2 - 153.7: 1000 - 1007 = 0.5 ft/min.		
	Gray brown, silty CLAY, w/ tr. subangular, coarse to fine (med. to fine predominant) sand.	152							
		153					At 153.7ft: Add 5' Rod (176.6 Total)		
		154							
		155							
	Gray brown, silty CLAY, w/ tr. subangular, coarse to fine sand & fine gravel.	156							
		157							
476.0		158							

No samples retained stratigraphically identified from drilled cuttings & drilling conditions

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov. percent	resist dl/6in		
432.0		157				At 158.7ft: Add 5' Rod (181.6ft total) <u>Drilling Rates</u> 157-158.7': 1101-1103 = .85 ft/min.		
		160						
		161						
		162						
		163				At 163.7 ft: Add 5' Rod (186.6 ft total) <u>Drilling Rates</u> 163.7-165.2': 1113-1115:30 = 0.52 ft/min 165.2-167.2': 1117:30-1121:30 = 0.5 ft/min.		
		164						
		165						
	Gray brown CLAY, w/ tr. to some silt, & tr. sub-angular, coarse to fine sand.	166				At ~ 165ft driller reports he thinks he is back into v. clayey material: 167.2-168.7': 1124-1127 = 0.5 ft/min.	N/A	
		167						
		168						
		169				At 168.7ft: Add 5' Rod (191.6ft total) <u>Drilling Rates</u> 168.7-170': 1147:30-1150 = 0.52 ft/min.		
		170						
	Gray brown CLAY, w/ tr. subangular, coarse to fine sand.	171						
		172				At 173.7ft: Add 5' Rod (196.6 total) Drain settling tub & refill w/ clean H <sub>2</sub> O <u>Drilling Rates</u> 176.7-178.7': 1232-1240 = 0.66 ft/min.		
		173						
		174				At 178.7 ft pull rods & install permanent casing (see "NOTES" page for details). Put on 2 5/16-in. tricone bit & Ch (1 ft) + 200 ft Rods = 201.1 ft. 201.1 - (201.6 + 178.7) = 1.8' sticking Measured sticking = 1.95 ft. 0.15' difference due to 2-3 rods not being fully tightened		
		175						
		176						

No samples retained stratigraphically  
 Identical from drilled cuttings & drilling conditions

430.0

D.1-1, 198

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LOG OF BORING ..DSB-24

SHEET. 11. OF. 14...

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING
			no. loc	type	recov.	percent resist DI/6in		
436.0								
		177					Drain settling tub & fill w/ clean H <sub>2</sub> O.	
	From sample off bit at 178.7 ft: Gray brown, plastic CLAY, with trace (5%) fine sand, & trace silt.	178					3 Feb 82 Begin drilling @ 178.7 ft w/ 20.1' Total on string.	
	Bottom of PERMANENT CASING	179					Set Note ① for installation of casing	
		180						
		181						
		182						
		183						
	Gray brown CLAY, w/ trace to some silt	184					At 183.7 ft: Add 5' Rod (20.6' Total) Not getting any cuttings return. Stratigraphy identified by drilling conditions & color of return fluid.	
		185						
		186						
		187						
		188						
		189						
		190						
		191						
	Gray brown CLAY, with trace to some silt.	192						
		193						
		194						
420.0								

No samples retained. Stratigraphy identified from drilled cuttings & drilling conditions.

N/A

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At 193.2 ft. Add 5' Rod (216.1' Total)  
(Stickup = 2.2 ft)

D.1-1, 199

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LOG OF BORING . P. 50-24.

SHEET 12 OF 14...

LEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penet. resist. bl/6in		
420.0								
	Gray brown <u>CLAY</u> , w/ tr. to some silt.	195						
		196						
		197						
		198						
		199						
		200						
		201						
		202						
	<u>S-1</u> (pp=3.0-3.25 tsf) v. stiff, brown, med. to v. plastic <u>CLAY</u> , w/ tr. silt, & tr. (CL7.) fine to v. fine sand, moist. (CL-CH)	203	S-1	Split Spoon	1.9/1.5'	30		
		204				45		
		205						
		206						
		207						
	<u>S-2</u> (pp=3.0-3.25 tsf) v. stiff, brown, med. to v. plastic <u>CLAY</u> , w/ tr. silt, & tr. (CL7.) fine to v. fine sand, moist. (CL-CH)	208	S-2	Split Spoon	1.7/1.5'	17		
		209						
	Bottom of boring 209.35 ft							
		211						
		212						

No samples retained. Stratigraphically identified - Gamma drilled cuttings.

Measured 2.3 ft. stickup.  
221.1 - (2.3 + 20.6) = 198.2

At 198.2 ft: Pull off 5' Rod & add 10' Rod (221.1 Total)

Drill 4.0 ft into 5-ft run, to 202.2 ft. No cuttings return. Drilling conditions indicate silty clay material. After completion, wash boring w/ clean H<sub>2</sub>O. Rod count after rods pulled confirm 220' Rods + 1.1' bit.

Split spoon length = 3.25 ft.  
222' Rods + 3.25' = 225.25'  
Measured stickup = 2.05 ft.  
225.25 - (2.05 + 20.6) = 202.6'  
= Bottom of hole. Sample must have sank from 202.2 - 202.6' under weight of rods.

Drive sampler to 204.1 ft w/ 14 lb. hammer

Remove sampler. Rod count confirms 222 ft. Rods.

Attach 1.1' tri-cone bit (2 3/4") & 220 ft Rods. Was instructed by O. Sibbe. 1 to take another sample 5 ft deeper than S-1 due to less-than-50 blow material in S-1.

Notes: Excessive length of S-1 might have increased blow count for last 0.5 ft due to sample butting against end of sample tube. Tube was full when opened.

End of shift, 2-4-82, 204.1 ft  
See Note 2

Start of shift, 2-5-82  
Add 5' Rod - total = 225' Rods + 1.1' bit = 226.1 ft.  
Drill from 204.1 ft. to 207.1 ft.  
Drive S-2 from 207.3' (sample sink 0.2 ft under weight of rods) to 208.7 ft.  
See NOTE 3 & Page 14 for details.

N/A

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LOG OF BORING DSB-2ESHEET 13 OF 14NOTES

① Installation of permanent casing: Bottom of hole is elev. 435.3. Installed 120 ft. (22 5-ft & 1 10-ft. lengths) of unpainted casing, plus 0.3 ft drive shoe (on bottom of casing) from elev. 435.3 ft to elev. 555.6 ft. Then installed 60.0 ft (12 5-ft lengths) of orange-painted casing, from elev. 555.6 ft to elev. 615.6 ft. Then installed 20 ft. (4 5-ft lengths) of unpainted casing, from elev. 615.6 to 635.6. To check if casing was to bottom of boring, an additional 5-ft was added to check the stickup: Elev. 435.3 + 205.3 ft casing = elev. 640.6, which equals stickup of 6.0 ft. above 634.6 floor. Actual measured stickup = 5.9 ft, so casing settled 0.1 ft. into boring, with bottom of casing at 435.2 ft. in elev. The top 5-ft length of casing was then removed.

② 3 Feb 82

D. Sibbald of CPCO was informed that the SPT test taken from el. 411.4 to 409.9, the blow counts did not meet the <sup>specified</sup> Bechtel acceptance criteria of 50 blows/6 in. D. Sibbald instructed K O'Dea to advance the boring 5 ft deeper or to a change in material which ever came first. \* Donald K. Sibbald

③ 4 Feb 82

Again D. Sibbald was informed that the 2nd SPT Test from el. 406.7 to 405.2 didn't meet the specified 50 blows/6 in criteria. Sibbald contacted the Bechtel Geotechnical staff about this problem. It is expected that a DCN will be issued this afternoon or early tomorrow to change the acceptance criteria from 50 blows/6 in to 50 blows/ft. The boring was drilled to el 404.7 and flushed thoroughly in preparation to set monitoring rods. The rods were set in anticipation of the issuance of the DCN w/ CPCO approval. \* Donald K. Sibbald

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LOG OF BORING DSB-2E

SHEET 14 OF 14

NOTES

Measure of hole depth at 207.2 ft before S-2 sampling:

227' Rods (2' piece added)  
 + 3.25' Sampler  
230.25'  
 - 2.35' measured stickup  
227.90  
 - 20.60  
207.30 Hole Depth

Although sampler was gently laid on bottom, it sank 0.2 ft. into the formation. Drove sampler 1.5 ft to 208.8 ft. Removed rods & attached 2 3/4-in. tri-cone bit, & lowered to bottom of hole. Hole depth measured at 207.25 ft:

227' Rods  
 + 1.1' bit  
228.1'  
 1.5' Distance from top of rods to mark made on A-Rods  
229.60  
 - 1.75 measured stickup  
227.85  
 - 20.60  
207.25 Hole Depth

Drilled 2.05' to 209.35'. Drained mud tub & refilled w/ clean H<sub>2</sub>O. Washed boring for ~ 5-7 min. until return fluid clear.

227' Rods  
 + 1.1' bit  
228.1'  
 + 3.0' Distance from top of rods to mark made on A-Rods  
231.1'  
 - 1.15' measured stickup  
229.95  
 - 20.60  
209.35 Hole Depth (Final)

BORING LOG REVIEWED BY Jule A. Heffernan 4 MAY 82

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LOG OF BORING...058-2W

SHEET 1...OF 14...

project <i>Midland Nuclear Plant</i>	project no. <i>81C217-2y</i>
location <i>Midland, Michigan</i>	elevation & datum <i>+614.0 USGS</i>
drilling agency <i>O &amp; G Drilling Co.</i>	date started <i>6 Feb. 82</i> date finished <i>11 Feb. 81</i>
drilling equipment <i>Aker Skid Rig</i>	completion depth <i>193.1 Ft. from of 614.0</i> rock depth <i>N/A</i>
size & type of bit <i>3 7/8-in. Tricone; 4 1/2-in. Org; 2 3/4-in. Tricone</i>	no. samples <i>2</i> dist. <i>undist.</i> core <i>core</i>
casing <i>5-in. temporary; 3-in. ID permanent</i>	water level first <i>N/A</i> compl. <i>N/A</i> 24 hr <i>N/A</i>
casing hammer: <i>N/A</i> weight <i>N/A</i> drop <i>N/A</i>	driller <i>Larry Kuditek</i>
sampler <i>Split Spoon</i>	supervisor <i>John Hulse</i>
sampler hammer: <i>#3</i> weight <i>140 lb</i> drop <i>30 in</i>	

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES			REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	recov.	penetr resist by 6 in		
614.0	<p>REINFORCED Concrete -</p> <p>Cored by Bechtel</p>	1				<p>3 7/8-in. Tricone bit + sub = 6.0 ft</p> <p>Begin lowering rods in hole at 0750.</p> <p>4 5/8-in. Rods + bit &amp; sub = 26.6 FT. resting.</p> <p>Top of rim around wash pan is 1.85' above floor.</p> <p>Distance from "ground zero" (elev 614 level) to 624.5 ft floor when rig is placed is 20.5 ft. -</p> <p>Permission to advance boring:</p> <p><i>D. Donald</i></p> <p>Using plain H<sub>2</sub>O for drilling fluid.</p> <p>(2.4 ft stickup)</p> <p>At 8.0 ft: Add 5' Rod (31.0 Total)</p> <p>Rapid drilling</p> <p>(revised 2.4' stickup)</p> <p>At 13.0 ft. Add 5' Rod (36.0 Total)</p>	N/A
		2					
		3					
		4					
		5					
		6					
		7					
	<p>Gray brown, subangular, coarse to fine SAND w/ tr. to some silt, &amp; tr. med. to dk. brown organics.</p>	8				<p>No Samples obtained</p> <p>Stratigraphy identified by drill cuttings &amp; drilling conditions</p>	
		9					
		10					
		11					
		12					

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LOG OF BORING .. DSB-24

SHEET 2 OF 14...

EV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penetr resist bl/6in		
000A								
	Cuttings consist dominantly of brown organic material, w/ tr. sand.	15						
		16						
		17						
		18						
	Coarse, subangular, coarse SAND to fine GRAVELS w/ tr. fine to med. sand, & some brown organic material.	19						
		20						
		21						
		22						
		23						
		24						
	Brown, subangular, coarse SAND, w/ some brown organics.	25						
		26						
		27						
		28						
	Brown, subangular, coarse to fine SAND.	29						
		30						
		31						
		32						

Continue rapid drilling - ~1.0-1.5 ft/min.

At 18.0 FT: Add 5' Rod (41.0 Total)

At 22 FT, driller reports that he is in gravel - cuttings are dominantly coarse sand.

At 23.0 FT: Add 5' Rod (46.0 Total)  
Difficulty getting rods back down hole after adding rod.

At 28.0 FT: Add 5' R. (51.0 Total)  
Difficulty getting rods back down hole after adding section.

Drill rate approx. 0.9 ft/min.

No Samples Obtained  
Stratigraphy identified by drill cuttings & drilling conditions

N/A

5820

D.1-1,204

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ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES					REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING B
			NO. LOG	TYPE	RECOV.	REMARKS	BL/6IN		
587.0									
	Approx. sand/clay contact ↗	33					At ~32.2 FT drill rate slows abruptly.		
		34					At 33.0 FT: Add 5' Rod (56.0 Total) <u>Drilling Rates</u> 33.0-33.9 FT: 1102:30 - 1107:30 = 0.18 FT/min		
		35							
		36					35.9-37.4 FT: 1116-1120:30 = 0.33 FT/min.		
		37							
	At bottom of bit at 38 FT: Gray brown, med. to v. plastic CLAY, w/ tr. to some silt, & tr. fine sand.	38					At 38 FT pull rods, remove tricone bit, & attach 0.9 ft long, 4.5-in dia drag bit to facilitate drilling the clay. Rod count verifies 50' Rods + 5.8' bit + sub.		
		39					Shovel sediment off bottom of settling tub & off wash pan At 38.1 FT: Add 5' Rod (60.8 Total) ↳ (2.1 ft pickup measured) 60.8 - (2.1 + 20.6) = 38.1 FT		
		40					Note: Using small settling tub due to cramped quarters - easier for sediment to accumulate & re-suspend.		
		41					At 43.1 FT: Add 5' Rod (65.8 Total)		
		42					<u>Drilling Rates</u>		
		43					43.1-44.1 FT: 1110-1112:45 = 0.76 FT/min		
	Gray brown CLAY, w/ tr. to some silt; possible to sand *	44					44.1-45.6 FT: 1.5 FT / 3.0 min = 0.5 FT/min		
		45					At 45.6 FT drain settling tub & refill w/ clean H <sub>2</sub> O.		
		46					* Cuttings contain large amt. of subangular, coarse to fine sand intermixed w/ the clayey material. However, relatively slow drilling indicates clayey material containing v. little or no sand. Some sand from above 30 FT is still in drill fluid & is re-suspending. Sand is also possibly washing off boring walls into drill fluid.		
		47					At 48.1 FT: Add 5' Rod (70.8 Total)		
		48							
		49							
564.9		50							

No samples obtained. Stratigraphy identified by drill cuttings & drilling conditions.

N/A

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LOG OF BORING . D.S.B.-2W.

SHEET 7 OF 14

EV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES					REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penetr resist	bl/6in		
564	Gray brown <u>CLAY</u> , w/ tr. to some silty, possible fr. sand.	51							
		52							
		53					At 53 ft: Add 5' Rod (75.8 Total)		
		54					Drilling Fluid thickening perceptively due to clay content.		
		55							
		56					Drilling Rate = approx. 0.3 ft/min		
		57					2.3 ft stickup measured		
	Gray brown <u>CLAY</u> , w/ tr. to some silty, possible fr. sand	58					At 57.9 ft: Add 5' Rod (80.8 Total)		
		59						N/A	
		60					Drilling Rate approx. 0.35-0.4 ft/min.		
		61					Is still coarse-fine sand mixed w/ silty/clayey fines in the cuttings. Drilling conditions (slow rate, thickening fluid) continue to indicate clay material w/ little or no sand. Most of sand being recirculated from tub, & possibly also washing off boring walls.		
		62					End of shift, 1530, 2-1-82, 62.9 FT.		
		63					Begin shift, 0700, 12-8-82 Shovel sediment out of settling tub.		
		64					At 62.9 ft: Add 5' Rod (85.8 Total)		
		65					Very little sand in cuttings - mostly silty clay.		
		66					Drilling Rate ~ 0.23 ft/min. (-64-65.5 ft) 2		
		67							
		68					At 67.9 ft: Add 5' Rod (90.8 Total)		

No Samples Obtained.  
Stratigraphy identified by drill  
Cuttings & drilling conditions

Gray brown CLAY, w/ tr. to some silty, & fr. fine sand

D.1-1,206

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LOG OF BORING *058-2w*

SHEET *5* OF *14*

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES					REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING NO.
			no. loc	type	recov.	percent resist	bl/6in		
<i>546</i>									
	<i>Gray brown CLAY, w/ tr. to some silt, tr. fine sand, &amp; tr. brown organics.</i>	<i>69</i>					<u>Drilling Rates</u> <i>69-72 FT = 2.3 FT / 8.5 min = .29 ft/min</i>		
		<i>70</i>					<i>At 70 ft. Thin drilling fluid by pumping out part of fluid in tub &amp; adding clean H<sub>2</sub>O. Fluid was becoming v. thick due to clay content.</i>		
		<i>71</i>							
		<i>72</i>					<i>At 72.9 FT. Add 5' Rod (95.8 Total)</i>		
		<i>73</i>					<u>Drilling Rate</u> <i>72.9-77.9 FT = 5 FT / 9 min = 0.55 ft/min</i>		
		<i>74</i>							
		<i>75</i>							
		<i>76</i>							
		<i>Gray brown CLAY, w/ tr. to some silt, tr. fine sand, &amp; tr. brown organics.</i>	<i>77</i>					<i>At 77.9 FT. add 5 FT. rod (100.8 Total)</i>	
			<i>78</i>					<i>Sediment accumulating at bottom of settling tub is mostly fine sand &amp; silty clay, w/ tr. coarse sand. Much of clay fines remain suspended in drilling fluid, as indicated by gradual thickening of the fluid.</i>	
	<i>79</i>						<u>Drilling Rates</u> <i>79-80.5 FT = 1.5 FT / 4.5 min = 0.33 ft/min</i>		
	<i>80</i>								
	<i>81</i>								
	<i>82</i>						<i>At 82.9 FT add 5' Rod (105.8 Total)</i>		
	<i>83</i>						<u>Drilling Rates</u> <i>82.9-85.2 FT = 2.3 FT / 5 min = 0.46 ft/min</i>		
	<i>84</i>								
	<i>85</i>								
			<i>86</i>						

*No samples obtained. Stratigraphy identified by drill cuttings & drilling conditions.*

*528*

D.1-1,207

Revision 14  
12/82

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penetration resist bl/6in		
28		87						
		88						
	Gray brown CLAY, w/ tr. to some silt, & tr. fine sand.	89						
		90						
		91						
		92						
		93						
		94						
		95						
	Gravelly Layer	96						
	Becoming very clayey	97						
		98						
	Less clayey	99						
		100						
		101						
		102						
		103						
		104						

Gray brown CLAY, w/ tr. to some silt, & tr. fine sand.

Gravelly Layer

Becoming very clayey

Less clayey

Brown silty CLAY to clayey SILT, w/ tr. to some sand (fine predominant).

At 87.9 FT: Add 5' Rod (110.8 Total)

Drilling Rate  
87.9 - 91.0 FT: 3.1 FT / 9.5 min = .33 ft/min.  
Entire run (87.9 - 92.1) fairly slow, even drilling.

At 92.9 FT: Add 5' Rod (115.8 Total)

Drilling Rates  
93.6 - 97.9 FT: 4.3 FT / 25.75 min = .17 ft/min.  
V. hard drilling approx. last 1 ft this interval.  
- 95.2 - 96.2 FT: Much "Rod chatter," w/ slow drilling

At 97.9 FT: Add 5' Rod (120.8 Total)

97.9 - 100 FT: 2.1 FT / 5.75 min = .37 ft/min.

At 99 ft. drill rate increases slightly  
It's fairly steady to 102.9 FT.

At 102.9 FT: Add 5' Rod (125.8 Total)

Pump fluid & accumulated sediment out of settling tub & refill w/ clean H<sub>2</sub>O. Not much sediment accumulation. Fine sand mixed w/ silty/clayey fines.

No samples obtained  
Stratigraphy identified by drill cuttings & drilling conditions.

N/A

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CORRECTIONS
			no. loc	type	recov.	penet resist bl/6in		
510								
		65						
		66						
		67						
		68						
		69						
		110						
		111						
		112						
		113						
		114						
		115						
		116						
		117						
		118						
		119						
		120						
		121						
		122						

Brown, silty CLAY to clayey SILT, w/tr. to some sand (fine to ultrafine predominant, w/tr. med. - coarse).

Gray brown, silty CLAY to clayey SILT, w/tr. to some sand (fine to med. predominant, w/tr. coarse).

Drilling Rates:  
102.9-105.9 FT: 3ft/5min = 0.6ft/min  
105.9-107.9 FT: no rate taken - still relatively rapid drilling  
At 107.9' check setting tool - Fine sand mixed w/ silty to clayey fines is accumulating.  
At 107.9ft: Add 5' Rod (130.8 Total)  
107.9-111.8 FT: 3.9 FT/4.5 min = 0.87 ft/min.  
Relatively Rapid drilling entire run, w/ occasional thin layers of slower drilling. Not much cuttings return - trace fine to coarse sand (mostly coarse) w/ to subangular silty to clayey clumps. Most of fines (fine sand to silt & clay) not being caught in strainer.

At 112.9 FT: Add 5' Rod (135.8 Total)  
Drilling Rates  
112.9-115.4 FT: 2.5 FT/2.25 min = 1.1 ft/min  
Relatively rapid drilling 112.9-117.9 ft.

At 117.9 FT: Add 5' Rod (140.8 Total)  
Continue rapid drilling to 122.9 FT.  
Drilling Rate  
120-121.6 FT: 1.6 FT/1.5 min = 1.1 ft/min  
Cuttings consist of silty/clayey clumps and sand (med. to fine, w/ tr. coarse). Roughly 60%:40% silt & clay: sand.

No Samples Obtained  
Stratigraphy identified by Drill  
Cuttings & drilling conditions

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LOG OF BORING ... DSB-2W

SHEET 8 OF 14

E.V.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penetr resist bl/6in		
492		123						
		124						
		125						
	Gray brown, <u>silty CLAY to clayey SILT</u> , w/tr. to some sand (v. fine to med. predominant, w/tr. subangular, coarse sand).	126				At 122.9 FT: Clean accumulated sediment out of settling tub & add 5' Rod (145.8 Total). Most of sediment was fine sand, w/ silty clay. If a bore strata were mostly sand here would have been more in the tub. Sand most likely a minor constituent of the material.		
		127				<u>Drilling Rate</u> Fairly rapid drilling 122.9 - 127.9 FT		
		128				125.3-126.9 FT: 1.6 FT/11.75 min = 0.91 ft/min.		
		129				At 127.9 FT: Add 5' Rod (150.8 Total)		
		130				<u>Drilling Rates</u> 127.9 - 130.3 FT: 2.4 FT/~2.05 min = 1.2 FT/min.		
		131				Drill fluid remaining relatively thin compared to when we were drilling in v. clayey material. Continue rapid drilling to 132.9 FT.		
		132				At 132.9 FT: Add 5' Rod (155.8 Total)		
		133				Some fine sand & silt to clay accumulating in settling tub.		
		134						
		135						
	Gray brown, <u>silty CLAY to clayey SILT</u> , w/tr. to some sand (fine predominant, w/tr. med. coarse).	136				(measured 2.2 FT stickup)		
		137				At 138.0 FT: Add 5' Rod (160.8 Total)		
		138				#20 - Rig down due to broken linkage 1650 - Resumed drilling		
		139				<u>Drilling Rate</u> Rapid drilling 138 - 138.5 FT		
		140				139 - 142 FT: 3.0 FT/2.25 min = 1.33 ft/min.		

No Samples obtained  
5 stratigraphically identified by drill cuttings & drilling conditions.

N/A

D.1-1,210

Revision 14  
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474



ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	ING MS
			no. loc	type	recov.	penetr resist bl/6in		
474		141						
	Gray brown, silty CLAY to clayey SILT, w/ tr. sand (v. fine to fine predominant, w/ tr. med-course)	142						
		143				At 143 FT: Add 5' Rod (165.8 Total)		
		144				Drilling Rate: 143-147 FT: 4 FT / 3.05 min = 1.3 ft/min.		
		145						
		146				Sediment accumulated in settling tub consists predominantly of fine to v. fine sand & silty/clayey fines, w/ tr. med. to coarse sands.		
		147						
		148				End of Shift, 1730, 2-8-82, 148 FT.		
		149				Begin shift, 0700, 2-9-82 Pick up casing at trailer. Begin drilling 0755		
	Gray brown, silty CLAY to clayey SILT, w/ tr. to some sand (fine predominant, w/ tr. med-course)	150				At 148 FT: Add 5' Rod (170.8 Total)		
		151				Drilling Rate 148-152.2 FT: 4.2 ft / 3.17 min = 1.3 ft/min.		
		152				Cuttings discontinue clumps of silty/clayey fines, w/ tr. fine sand.		
		153						
		154				At 153 FT: Add 5' Rod (175.8 Total)		
		155				Drilling Rates 153.2-157.3 FT: 4.1 FT / 2.08 min = 2.0 FT/min. Rods dropped, v. quickly at ~156 ft ~0.75 ft		
	Sandy Layer	156				Note: Cuttings from 153-158' interval are of med. plastic, silty CLAY to clayey SILT, w/ tr. fine sand. Dirt cutting moving rods up w/ tr. adding rod. Rods sank slowly under own weight to 158 FT when released.		
	Gray brown, med. plastic, silty CLAY to clayey silt, w/ tr. fine sand.	157						
456	D.1-1,211	158				At 158 FT: Add 5' Rod (180.8 Total)		

No Samples Obtained.  
 Stratigraphy identified by  
 drill cuttings & drilling conditions.

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penet. resist. bl/6in		
56								
		159						
		160						
		161						
	Sandy layer	162						
		163						
		164						
		165						
		166						
	From bit at 167.5 FTs Brown, med. plastic, silty CLAY, w/ tr. fine sand.	167						
		168						
		169						
		170						
		171						
		172						
		173						
	Brown gray silty CLAY w/ tr. brown to black organic	174						
		175						
		176						

Drilling Rate  
 161-163 FT: 2 FT/25 sec = 4.8 FT/sec.  
 Driller thinks extremely rapid drilling indicates  
 Note: Took sample off bottom of settling tub at 158 FT. IS brown, low-med. plastic, silty CLAY w/ some sand (fine predominant, w/ tr. med. coarse).

measured 2.2 FT stickup  
 At 163 FT: Add 5' Rod (185-8 Total)

Continue Rapid drilling to 167.5 FT  
 164.5-167.5 FT: 3 FT/1.5 min = 2.0 FT/min.

Note: Could not pull rods up w/ rope & pulley after adding rods. Rods sank slowly - as though thru debris - w/ driller turning them w/ pipe wrench.

Drilled 4.5 FT of 5' ft. run to 167.5 FT. (Stopped 0.5 FT from top of A-rod). Washed boring for ~10 min, & pulled rods.

At very tip of bit is brown, med. plastic, silty CLAY, w/ tr. fine sand. Coating sides of bit is brown, low-med. plastic, silty CLAY, w/ some sand (fine predominant, w/ tr. med-coarse). This probably scraped off the sides of the borehole somewhere along its length.

Put in 190-35 ft 3/4 in. o.d casing w/ bottom at 168.15 FT. (elev 445.85). See "NOTES" page for details of casing installation. Begin replacing rods in hole (see "NOTES" page)

End shift, 1730, 2-9-82, 167.5 FT.  
 Begin shift, 0700 12-10-82  
 w/ 185 FT Rods + 1.1' bit on string, measure stickup of 2.4 FT. Hole depth is 163.1 FT.  
 At 168.1 FT add 5' Rod (191.1 Total).

Drilling Rate  
 169-171.2 FT: 2.2 FT/6.75 min = .33 FT/min.  
 172.5-173.1 FT: 0.6 FT/4.75 min = .13 FT/min.

At 172 FT. Drill rate slowed. Slower drill rates due to 1/2 cast iron part to change in drill bits at 167.5 FT. v. little cuttings return - mostly organic w/ slight trace silty/clayey fines.

No Samples Obtained. Stratigraphy identified by drilling conditions & drill cuttings

Rodcount verifies 185.8 FT on string

Bottom of Permanent Casing

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CUTTINGS
			no. loc	type	recov.	penet. resist bl/6in		
438								
		177						
	Brown, silty CLAY, w/ tr. brown organics (less than above).	178						
		179						
		180						
		181						
	Sandy layer	182						
	Course, subangular SAND	183						
		184						
	Less course - sandy to silty.	185						
		186						
		187						
		188						
		189						
		190						
	S-1 Bottom 0.4 ft. of sample: Brown, non-plastic, fine to v. fine SAND, w/ tr. to some silt. Moist.	191	S-1	split spoon	45.2-25.10-4.4FT	200 blows/0.4FT		
	Rest of sample: Brown, non-plastic, fine to v. fine SAND, moist to wet.	192						
	S-2 Interlayered brown & to v. fine SAND, moist to wet, and brown, med. to very plastic CLAY w/ tr. to some silt & tr. to some v. fine to fine sand, moist.	193	S-2	split spoon	0.15/0.10	0.15FT		
420		194						

No samples obtained  
 Stratigraphy identified by drill  
 Cuttings & drilling conditions

At 173.1 FT: Add 5' Rod (196.1 Total)  
Drilling Rate  
 173.1-175.6: 2.5 FT/7.75 min.  
 = 0.72 FT/min.  
 Still v. little cuttings return. Slow drilling rate allows fines to be broken up - pass thru strainer in the fluid.

At 178.1 FT: Add 5' Rod (201.1 Total)  
Drilling Rate  
 178.1-182.2 FT: 4.1 FT/11.5 min.  
 = 0.36 FT/min.

At 181.5 FT Drill rate increases abruptly - hit sandy zone. Some fluid loss at approx. this depth.

At 183.1 FT: Add 5' Rod (206.1 Total)  
Drilling Rate  
 Rate in sandy layers 2.5 FT/1.25 min.  
 = 2.0 FT/min.

At 184.5 FT drill rate decreases somewhat, but is still more rapid than above the sandy layer. Drilling conditions indicate material not as coarse as 181.5-184.5 FT.

2.4 FT stickup measured (above 187.6 ft)

At 187.1 FT: Add 10' Rod (211.1 Total)  
 Drilled 3.0 FT (within 2 FT. of top of rod) to 191.1 FT (elev. 422.9). Wash hole w/ clean H<sub>2</sub>O. Pulled rods - rod count confirms 21.0 FT rods + 1.1 FT bit. Attach 3.3 FT long split spoon sampler, & put rods back in hole. Some sluff in boring (bottom 2 FT).  
 21.0 FT Rods + 3.3 FT Sampler = 24.3 FT.

S-1  
 191.1-191.5 FT.  
 Refusal at 191.5 FT.  
 20 blows of 14 lb hammer  
 Recovery = 2.2 FT. (completely full)  
 Removed sampler, attached 2 1/4" tri-cone bit, lowered to 0.2 FT. at bottom of sample hole, finished w/ thin water/bentonite mud (to 15 lb bentonite of Hygit. No. 2) (No. 200 Volcan). See Notes p. 13 & 14 for more details related to sampling.

BOTTOM OF BORING

N/A

NOTES

Installation of permanent casing. Drilled to 167.5 FT (Elev. 446.5)

with the 4 1/2-in bit. Attached 0.35 FT long drive shoe to bottom of

casing. Installed drive shoe plus 110 ft (Two 5-ft lengths at bottom followed

by Ten 10-ft lengths) of unpainted 3 1/2 ID NUD steel casing to elev

556.85, followed by 60 ft (Two 10-ft lengths at bottom followed by

eight 5-ft lengths) to elev 616.85. On top of the painted casing,

20 ft (one 10-ft length on bottom followed by two 5-ft lengths) of unpainted

casing was installed, to elev. 636.85. Total ant. of casing = 190.35 ft.

After 100 ft of casing went into the hole, it became difficult to

get the casing down. After putting in 130 ft, the difficulty increased.

The last 20 ft of casing had to be driven into the hole with a

3000 lb hammer. The casing was driven to 168.15 (Elev. 445.85),

0.65 ft past the bottom of the drilled hole, in order to get a workable

stuckup above the 634.5 floor. Final sticking = 1.6 ft.

Experienced difficulty replacing rods in hole due to sediment in the

casing. Tried to wash them down with some success, but this became

difficult to do. After putting in 160 ft, the rig used the raise & lower the

rods broke. Began to slowly drill the rods down to depth. Cuttings consist of

brown organic material, silty clayey fines, & fine sand. Stop at 168.15 FT and clean setting tool.

Show out sediment, replace worker in boring & hole w/ clean. Hoop Continued drilling see page

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LOG OF BORING D58-2W(Rods sank through this sediment under own weight) SHEET 13 OF 14SPT:NOTES

While lowering sampler to depth, encountered some resistance approx. 2 ft. off bottom. This stuff apparently entered the sample tube, since the tube was completely full when opened. The SPT cannot be considered valid for this reason.

Replaced rods in hole <sup>(w/ 2 1/4" + new bit) (191.3 FT)</sup> to within 0.2 FT. of bottom, & flushed w/ thin water/bentonite fluids. It was felt that water alone would not keep the boring open. Pull rods up inside permanent casing. End Shift, 2-10-82, 1700

Sample preserved in 5 sample jars: S-1(A) 0-0.5 FT

Bottom 0.4 FT. is cohesive core which S-1(B) 0.5-0.95 FT

is distinguishable from rest of sample. S-1(C) 0.95-1.4 FT.

It is the material through which the S-1(D) 1.4-1.8 FT

sampler was driven w/ the hammer. S-1(E) 1.8-2.2 FT

Start of shift, 2-11-82, 0700. Cleaned out boring to 191.5 FT (bottom of S-1), then drilled an additional 0.6 FT. to 192.1 FT (211.1 FT on string. Drilled to within 1.0 FT of top of A-Rod, whereas we had drilled to within 2.0 FT. of top of A-Rod w/ same amt. of rods on the string when drilling to 191.1 FT before sampling). Washed boring w/ clean, thin water/bentonite mud. Raise & lower bit to bottom to confirm absence of loose sediment - is a hard surface. (Note: No difficulty lowering rods from inside casing to bottom of boring - Hole appears open).

Sample S-2's No apparent result on lowering sampler to bottom of boring. Sticking measures 2.6 FT.  $(215.3 \text{ FT Rods} + \text{spoon} - (20.6 + 1 \text{ FT}) = 2.6 \text{ FT} = \text{calculated sticking}$ . Blow count = 100 blows of 140 lb hammer dropping 30 in / 0.3 FT. (192.1 - 192.4 FT).

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LOG OF BORING D58-2W

SHEET 14 OF 14

NOTES

After S-2, replaced sampler w/ 3<sup>3</sup>/<sub>4</sub>-in. tricone bit, & reamed boring to 192.4 FT (bottom of S-2). Advanced boring from 192.4 FT to 193.1 FT, & washed w/ the thin water/bentonite fluid. Replaced fluid w/ thick water/bentonite fluid (~40 lb. bentonite & ~40 gal. H<sub>2</sub>O) & washed boring. After washing raise & lower bit to confirm absence of loose sediment on bottom - is a hard surface. After rods pulled measured hole depth w/ weighted tape. Was difficult to feel bottom through the thick drilling mud, but hole depth appeared to be correct.

BORING LOG REVIEWED BY John L. Hoffmann 4 MAY 82

project <i>MILANO NUCLEAR PLANT</i>	project no. <i>BIC 217-2V</i>			
location <i>MILANO MICHIGAN</i>	elevation & datum <i>+614.0 USGS</i>			
drilling agency <i>D&amp;G DRILLING</i>	date started <i>19 MARCH 82</i>	date finished <i>24 MARCH 82</i>		
drilling equipment <i>ACKER 5210 RIG</i>	completion depth <i>193.8 FT FROM 614.0 FLOOR</i>	rock depth <i>N/A</i>		
size & type of bit <i>4 3/4 IN, 2 5/8 IN TRIPLE FLUTE, 4 1/2 IN Ø DRILL BIT</i>	no. samples <i>1</i>	dist. <i>1</i>	undist. <i>0</i>	core <i>N/A</i>
casing <i>8 1/2 IN COUPLED (ELL-TEL STAND PIPE) TUBE, 2 IN Ø ANNEALED STEEL</i>	water level first <i>N/A</i>	compl. <i>N/A</i>	24 hr <i>N/A</i>	
casing hammer: #2 weight <i>310 LB</i>	drop <i>24 IN</i>	driller <i>LARRY KOOTER</i>		
sampler <i>SPLIT SPOON</i>	supervisor <i>LUKE L. HEFFERNAN</i>			
sampler hammer: #3 weight <i>140 LB</i>	drop <i>30 IN</i>			

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	percent pass 15/6 in		
614.0								
		1					APPROVAL TO ADVANCE BORING: <i>Donald E. [Signature]</i>	
		2					BECNTEL PERSONNEL CUT A SECTION OF THE MAN-WAY BOTTOM PIPEWALLOUT. A CONCRETE MAT BELOW THE MAN-WAY WAS EXPOSED. A 8 1/2 IN Ø STAND PIPE 29.1 FT LONG WAS BOLTED TO THE CONCRETE. THIS WILL SERVE AS TOP CASING & GUIDE FOR DRILLING. ~ 1 FT. OF GROUT WAS POURED INTO STAND PIPE TO SEAL OF BOTTOM OF STAND PIPE TOP OF STAND PIPE 1.45 FT ABOVE 614.0 FLOOR SLAB.	
		3						
		4						
		5						
	8 1/2 IN Ø STAND PIPE	6						
		7						
		8						
		9						
		10						
		11						
		12						
		12						
		14						

NOT APPLICABLE

N/A

EV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penetr resist bl/6in		
600.0		15						
		16						
		17						
		18						
	8 1/2 in φ STAND PIPE	19						
		20						
		21						
		22				TOP OF STAND PIPE (CASING) IS 1.45 FT ABOVE 614.0 FLOOR SLAB.		
		23						
		24				18 MARCH 82 A BECHTEL WATER WELL WAS USED TO CK AREA GROUND WATER ELEVATION. FOUND TO EI. 594.5		
		25				19 MARCH 82 MIX ~ 80 GALLONS WATER w/ ~ 30 BS CENTRAUTS ALL TO MUD THRU STAND PIPE BIT 4 3/4" IN φ LIFT LONG TRIMMER ROLLER SET 25 FT DRILL ROD + 1.1 FT BIT + ADAPTER 0.8 FT + 3.8 FT DRILL ROD = 30.2 FT TOTAL 3.55 FT STICKUP FROM 26.65 HIT CONCRETE	N/A	
597.3	TOP OF GRUNT	26						
		27						
	BOTTOM OF STAND PIPE TOP OF CONCRETE	28				DRILL STEEL 30.2 FT 2.45 FT STICKUP FROM FLOOR 27.75 HIT CONCRETE * SEE NOTE #1 HIT STEEL @ 27.05 FT ADD 2.2 FT DRILL ROD 32.4 FT TOTAL		
	CONCRETE	29						
584		30				PULL 6.0 FT OF DRILL ROD 26.8 FT DRILL ROD 31.4 FT TOTAL		
		31				ADD 4.0 FT DRILL ROD 35.4 FT TOTAL HIT OBSTRUCTION @ 30.8 FT * SEE NOTE 2		
582.2	FINE SAND, RED PLASTIC, BLACK PLASTIC TICS (MOISTURE PROTECTION LAYER)	32						
	MUD MAT W/RED CONCRETE PLASTIC IN CUTTINGS	33						
582.0								

NOT AVAILABLE

NO SAMPLES RETAINED  
 STRATIGRAPHY FROM CUTTINGS

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LOG OF BORING .DOB.-3E

SHEET 3 OF 14

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES					REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	C.A. BL.
			no. loc	type	recov.	percent pass 20/60	bl/6in		
582.0									
580.95	CONCRETE MUD MAT						DRILL ROD 35.4 2.35 pickup 73.05 HIT STEEL EL. 580.95 DRILL FOR ~ 20 MIN. NO PROBLEMS *SEE NOTE #1		
	HIT STEEL 2 1/2" THICK	33					END OF SHIFT 19 MARCH 82 WATER LEVEL TOP OF CASING. START OF SHIFT 20 MARCH 82 WATER LEVEL *SEE NOTE #4 DOWN 2.6 FT		
	CONCRETE MUD MAT	34					ADD 2.0 FT DRILL ROD 37.4 FT TOTAL		
		35							
	LT GRAY LOW-MED PLASTIC SILTY CLAY w/ OCCASIONAL FINE SAND CL	36					PULL 6.0 FT OF DRILL ROD ADD 9.0 FT OF DRILL ROD 40.4 FT TOTAL		
		37							
		38							
		39							
		40					PULL ALL RODS *SEE NOTE #5 NEW BIT & SUB 5.9 FT, ADAPTED 0.35 FT SET 36.0 FT OF DRILL RODS + BIT + ADAPTER = 42.2 FT TOTAL		
		41							
	LT GRAY LOW-MED PLASTIC SILTY CLAY w/ OCCASIONAL F-M SAND (CL)	42					PULL 6.0 FT OF RODS ADD 9.0 FT OF DRILL ROD 45.2 FT TOTAL		
		43							
		44					ADD 2.0 FT DRILL ROD 47.2 FT TOTAL		
		45							
		46					PULL 6.0 FT OF RODS ADD 9.0 FT OF DRILL ROD 50.2 FT TOTAL		
		47							
	LT GRAY LOW-MED PLASTIC SILTY CLAY w/ OCCASIONAL F-M SAND (CL)	48							
		49					PULL 4.0 FT OF DRILL ROD AND SUB OF DRILL ROD 54.2 FT TOTAL		
584.0		50					ADD 4.0 FT OF DRILL ROD 55.2 FT TOTAL		

NO SAMPLES RETAINED STRATIGRAPHY IDENTIFIED FROM ACQUIRED CUTTINGS & DRILLING CONDITIONS

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LOG OF BORING . DSC-3E.

SHEET 4. OF 14...

E.V.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penet. resist. bl/6in		
5640	LT GRAY LOW PLASTIC SILTY CLAY w/ TR. F-M SAND (CL)	51						
		52						
		53						
		54				PULL 4.0 FT OF DRILL ROD ADD 5.0 FT DRILL ROD 59.2 FT TOTAL		
		55				ADD 4.0 FT OF DRILL ROD 60.2 FT TOTAL		
	GRAY LOW PLASTIC SILTY CLAY w/ OCCASIONAL F-M SAND (CL)	56						
		57				WATER LEVEL 0.1 FT ABOVE CASING TOP END OF SHIFT 20 MARCH 82		
		58				START OF SHIFT 21 MARCH 82 WATER LEVEL 0.1 FT ABOVE CASING TOP		
		59				PULL 4.0 FT OF DRILL ROD ADD 5.0 FT DRILL ROD 61.2 FT TOTAL		
		60				ADD 4.0 FT OF DRILL ROD 65.2 FT TOTAL EMPTY MUD TUB OF CUTTINGS & THICK MUD. ADD ~ 20 GALLONS WATER TO MUD TUB.		
	LT BROWNISH GRAY LOW PLASTIC SILTY CLAY w/ TR M-C SAND OCCASIONAL F. GRAVEL (CL)	61						
		62						
	BECOMING GRAVELLY SILTY CLAY	63						
		64				PULL 4.0 FT OF DRILL ROD ADD 5.0 FT DRILL ROD 66.2 FT TOTAL		
	COBBLE - E	64						
		65				ADD 4.0 FT OF DRILL ROD 70.2 FT TOTAL		
		66						
	LT BROWNISH GRAY LOW PLASTIC SILTY CLAY w/ TR M-P SAND, OCCASIONAL C. SAND, F. GRAVEL	67						
5460		68						

NO SAMPLES RETAINED STRATIGRAPHY IDENTIFIED FROM MILLER CUTTINGS & DRILLING CONDITIONS

N/A

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LOG OF BORING DSB-3E

SHEET 5 OF 14

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CORRECTION
			no. loc	type	recov.	penet resist bl/6in		
546.0								
	LT BROWNISH GRAY LOW-MED PLASTIC SILTY CLAY w/ TR. M-F SAND, OCCASIONAL C. SAND (CL)	69						
		70				PULL 4.0 FT OF DRILL ROD ALL 5.0 FT DRILL ROD 71.2 FT TOTAL		
		71				ADD 4.0 FT OF DRILL ROD 75.2 FT TOTAL		
		72				FLUSH BORING w/ CLEAN WATER TO REMOVE THICK SLURRY CUTTINGS CLEAN MUD PIG ADD 4.0 GAL WATER TO MUD PIG		
	BECOMING MORE SILTY	73						
	BROWN-GRAY LOW PLASTIC SILTY CLAY w/ TR. M-F SAND, OCCASIONAL C. SAND (CL)	74				PULL 4.0 FT OF DRILL ROD ALL 5.0 FT DRILL ROD 76.2 FT TOTAL		
		75				ADD 4.0 FT OF DRILL ROD 80.2 FT TOTAL		
		76						
		77						
		78						
	BROWN-GRAY LOW-MED PLASTIC SILTY CLAY w/ TR. M-F SAND (CL)	79				PULL 4.0 FT OF DRILL ROD ADD 5.0 FT DRILL ROD 81.2 FT TOTAL		
		80				ADD 4.0 FT OF DRILL ROD 85.2 FT TOTAL		
		81						
		82						
		83						
		84				PULL 4.0 FT OF DRILL ROD ADD 5.0 FT DRILL ROD 86.2 FT TOTAL		
		85						
		86				ADD 4.0 FT OF DRILL ROD 90.2 FT TOTAL		
	GRAY LOW-MED PLASTIC SILTY CLAY w/ TR. SOME MED-FINE SAND (CL)	87						
528.0		88						

NO SAMPLES RETAINED STRATIGRAPHY IDENTIFIED FROM DRILLED CUTTINGS & MILLING CONDITIONS

N/A

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES					REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penetr resist	bl/6in		
	GRAY LOW PLASTIC SILTY CLAY w/ TR MED-FINE SAND (CL)	87-93							
		94-95					PULL 4.0 FT OF DRILL RODS ALL SOFT DRILL ROD 91.2 FT TOTAL		
		96-97					ADD 4.0 FT OF DRILL ROD 95.2 FT TOTAL		
	GRAY LOW-MED PLASTIC SILTY CLAY w/ TR. MED SAND (CL)	98-100					PULL 4.0 FT OF DRILL ROD ALL SOFT DRILL ROD 96.2 FT TOTAL EMPTY MUD TUB OF CUTTINGS & THICK MUD FLUSH OFF WITH CLEAN WATER & PUMP OUT THICK MUD. ALL MUD PUMPED TO TAD ADD 4.0 FT OF DRILL ROD 100.2 FT TOTAL		
		101-102							
	GRAY LOW-NON PLASTIC SILTY CLAY - CLAYE/SAND M-F SAND OCCASIONAL CSAND (CL-SL)	103-104					PULL 4.0 FT OF DRILL ROD ADD SOFT DRILL ROD 101.2 FT TOTAL BEGIN TO LOSE DRILLING MUD. CR 8 1/2" CASING. NO LEAKS. ADD 4.0 FT OF DRILL ROD 105.2 FT TOTAL THICKEN DRILL MUD UP. NO MORE LOSS OF DRILLING MUD.		
		105-106							
	GRAY LOW PLASTIC SILTY CLAY w/ TR-SOME M-F SAND, OCCASIONAL COARSE SAND (CL)	107-108					PULL 4.0 FT OF DRILL ROD. ADD SOFT DRILL ROD 106.2 FT TOTAL		

ALL SAMPLES RETAINED STRATIGRAPHY IDENTIFIED FROM DRILL CUTTINGS & DRILLING CONDITIONS

N/A

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ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING FEET
			no. loc	type	recov.	penetr resist bl/6in		
510	BECOMES GRAVELLY	105						
	BROWNISH GRAY LOW PLASTIC SILTY CLAY TR M-F SAND OCCASIONAL C. SAND. (CL)	106						
		107						
		108						
		109						
		110						
		111						
	GRAY MED PLASTIC SILTY CLAY W/ OCCASIONAL M-F SAND (CL)	112						
		113						
		114						
	GRAY MED PLASTIC SILTY CLAY W/ OCCASIONAL M-F SAND (CL)	115						
		116						
		117						
	BECOMING SILTY	118						
		119						
		120						
	BROWN GRAY LOW PLASTIC SILTY CLAY - CLAY/ SILT W/ OCCASIONAL M-F SAND (CL-MIL)	121						
		122						

NO SAMPLES RETAINED STRATIGRAPHY IDENTIFIED FROM DRILL CUTTINGS & DRILLING CONDITIONS

N/A

ADD 4.0 FT OF DRILL ROD 110.2 FT TOTAL  
 WATER LEVEL 0.1 FT BELOW TOP OF CASING  
 END OF SHIFT 21 MARCH 82  
 START OF SHIFT 22 MARCH 82  
 WATER LEVEL 0.7 FT BELOW TOP OF CASING

PULL 4.0 FT OF DRILL ROD ALL 5.0 FT DRILL ROD 111.2 FT TOTAL

ADD 4.0 FT OF DRILL ROD 115.2 FT TOTAL

PULL 4.0 FT OF DRILL ROD ALL 5.0 FT DRILL ROD 116.2 FT TOTAL  
 EMPTY AND TUBS OF CUTTINGS. THIN DRILLING FLUID. ADD ~ 20 BALLS. WATER TO TUB.  
 ADD 4.0 FT OF DRILL ROD 120.2 FT TOTAL

PULL 4.0 FT OF DRILL ROD ALL 5.0 FT DRILL ROD 121.2 FT TOTAL

ADD 4.0 FT OF DRILL ROD 125.2 FT TOTAL

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LOG OF BORING DSB-3C

SHEET 8 OF 14

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penet. resist. bl/6in		
92.0								
	BROWN GRAY LOW PLASTIC SILTY CLAY CLAY/SILT W/OCCASIONAL M-F SAND (CL-ML)	123-124					PULL 4.0 FT OF DRILL ROD ADD 5.0 FT DRILL ROD 126.2 FT TOTAL	
		125					ADD 4.0 FT OF DRILL ROD 130.2 FT TOTAL	
		126						
		127						
	BECOMES CLAYEY AGAIN	128						
		129					PULL 4.0 FT OF DRILL ROD ADD 5.0 FT DRILL ROD 131.2 FT TOTAL	
	GRAY LOW-MED PLASTIC SILTY CLAY W/OCCASIONAL M-F SAND (CL)	130					ADD 4.0 FT OF DRILL ROD 135.2 FT TOTAL	
		131						
		132						
		133						
	SANDY GRAVELLY CLAY ZONE	134					PULL 4.0 FT OF DRILL ROD ADD 5.0 FT DRILL ROD 136.2 FT TOTAL	
	GRAY LOW-MED PLASTIC SILTY CLAY W/TR M-F SAND (CL) Cobble	135					ADD 4.0 FT OF DRILL ROD 140.2 FT TOTAL	
		136						
		137						
		138						
		139					Revision 14 12/82	
	GRAY LOW-MED PLASTIC SILTY CLAY W/TR M-F SAND (CL)	140					PULL 4.0 FT OF DRILL ROD ADD 5.0 FT DRILL ROD 141.2 FT	
		141					ADD 4.0 FT OF DRILL ROD 145.2 FT TOTAL	

NO SAMPLES RETAINED UNUSUALLY IDENTICAL FROM DRILLED CUTTINGS & MILLING CONDITIONS

N/A

D.1-1,224 (CL)

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. log	type	recov.	penetr resist bl/6in		
474.0								
	GRAY MED PLASTIC SILTY CLAY w/ OCCASIONAL M-F SAND (CL)	141-142						
		143						
		144						
		145						
	GRAY MED PLASTIC SILTY CLAY w/ TR M-F SAND (CL)	146-147						
		148						
	GRAVELLY SILTY CLAY	149						
		150						
	GRAY LOW-MED PLASTIC SILTY CLAY w/ TR M-F SAND (CL)	151-152						
		153						
		154						
		155						
		156						
	GRAY MED PLASTIC SILTY CLAY w/ TR M-F SAND (CL)	157-158						
456.0								

NO SAMPLES RETAINED STRATIGRAPHY IDENTIFIED FROM DRILLED CUTTINGS & DRILLING CONDITIONS

PULL 4.0 FT OF DRILL ROD ADD 5.0 FT DRILL ROD 146.2 FT TOTAL  
 EMPTY MUD TUB OF CUTTINGS. FRESH BORING W/ FRESH WATER. PERFECT THICK MUD. ADD 20 GALS WATER TO MUD TUB  
 ADD 4.0 FT OF DRILL ROD 150.2 FT TOTAL

PULL 4.0 FT OF DRILL ROD ADD 5.0 FT DRILL ROD 157.2 FT TOTAL  
 ADD 4.0 FT OF DRILL ROD 156.2 FT TOTAL

PULL 4.0 FT OF DRILL ROD ADD 5.0 FT DRILL ROD 156.2 FT TOTAL  
 ADD 4.0 FT OF DRILL ROD 160.2 FT TOTAL

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penet. resist. bl/6in		
160	GRAY MED PLASTIC SILTY CLAY w/ OCCASIONAL M-F SAND (CL)	159						
		160						
		161						
		162						
		163						
	GRAY MED PLASTIC SILTY CLAY w/ OCCASIONAL M-F SAND (CL)	164						
		165						
		166						
		167						
		168						
	GRAY MED PLASTIC SILTY CLAY w/ OCCASIONAL M-F SAND (CL)	169						
		170						
		171						
		172						
	DRILLER REPORTS MATL. BECOMING MORE SILTY.	173						
		174						
		175						
	BROWNISH GRAY LOW PLASTIC SILTY CLAY - CLAY/SILT, w/ OCCASIONAL F-M SAND. (CL-ML)	176						

NO SAMPLES RETAINED SIMILARITY LOCATIONS FROM PASTED CUTTINGS TAKING CONDITIONS

N/A

PULL 4.0 FT OF DRILL ROD ADD 5.0 FT  
 DRILL ROD 161.2 FT TOTAL

ADD 4.0 FT OF DRILL ROD 165.2 FT  
 TOTAL

PULL 4.0 FT OF DRILL ROD ADD 5.0 FT  
 DRILL ROD 166.2 FT TOTAL

DRILL TO 164.0 FT 161.2 FT  
 EL 450.0 2.2 FT STICK UP 4.0 FT  
 FLUSH BORING FOR ~ 8 MIN. 1.0 FT 2.0 FT

PULL RODS BEGINS TO SET CASING SEE NOTE # 6

END OF SHIFT 22 MARCH 82 3" DIA CASING SET TO 150.9 WATER LEVEL TOP OF CASING

START OF SHIFT 23 MARCH 82 3" DIA CASING SET TO 164.05 FT CHANGE BITS. NEW BIT 2 1/4 IN, 1.1 FT LONG TRI-CORNER ROLLER

SET BIT + 165.0 FT DRILL RODS + 0.3 FT ADAPTER = 166.4 FT TOTAL CONTINUE ADVANCING ROPEWALK FROM 164.05 FT

ADD 4.0 FT OF DRILL ROD 170.4 FT TOTAL

PULL 4.0 FT OF DRILL ROD ADD 5.0 FT  
 DRILL ROD 171.4 FT  
 TOTAL

ADD 4.0 FT OF DRILL ROD 175.4 FT  
 TOTAL

FASTER DRILLING RATE  
 FEW CUTTINGS TRAPPED IN FINE SCREEN  
 THIS INDICATING MORE SILT (POWERING AS RILLED & BECOMING SLURRY)

PULL 4.0 FT OF DRILL ROD ADD 5.0 FT  
 DRILL ROD 176.4 FT TOTAL

EMPTY MUD TUB OF CUTTINGS THIN DRILLING MUD w/ FRESH WATER:

ADD 4.0 FT OF DRILL ROD 180.4 FT TOTAL

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LOG OF BORING ASB-SE

SHEET 11 OF 14

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CLOG BLOW
			no. loc	type	recov.	penet. resist. bl/6in		
438.0								
	BROWNISH GRAY LOW PLASTIC SILTY CLAY - CLAYEY SILT w/ OCCASIONAL M-F SAND (CL-ML)	177					FAST DRILLING RATE (FEW CUTTINGS IN RETURN)	
		178						
		179					PULL 4.0 FT OF DRILL ROD ADD SOFT DRILL ROD 181.4 FT TOTAL	
		180					ADD 4.0 FT OF DRILL ROD 185.4 FT TOTAL	
		181						
		182					FAST DRILLING RATE	
	BROWNISH GRAY LOW-NON PLASTIC CLAYEY SILT - SILTY CLAY w/ OCCASIONAL M-F SAND (ML-CL)	183						
		184					PULL 4.0 FT OF DRILL ROD ADD SOFT DRILL ROD 189.4 FT TOTAL	
		185					ADD 4.0 FT OF DRILL ROD 193.4 FT TOTAL	
		186					DRILLING RATE BEGINS TO SLOW DOWN	
	BROWNISH GRAY MED PLASTIC SILTY CLAY w/ OCCASIONAL M-F SAND (CL)	187						
		188					DRILL TO 188.8 FT @ 425.2 FLASH BORING FOR 15 MIN. PULL RODS REPLACE BIT w/ 3.35 FT LONG SPLIT SPOON SAMPLE SET SPANN + 190.9 FT DRILL ROD 194.25 START SPLIT SPOON SAMPLE @ 5.45 1/23.00 PULL RODS.	
	SPOON SAMPLE GRAY MED-HIGH PLASTIC SILTY CLAY - CLAY (CL-CH)	189	5-1	Spoon	1.5H/15TH	19	0.25 FT OF SLOUGH ON TOP OF SAMPLE FULL RECOVERY SAMPLE PLACED IN LABELED JARS	
		190				21	L. HEFFERNAN DIRECTS DRILLER TO ADVANCE BORING 5.0 FT FROM TOP OF SPOON RUN. SEE NOTE # 7 SET 190.0 FT DRILL RODS + 1.1 FT BIT + 0.3 FT ADAPTER 191.4 FT TOTAL ADD 4.0 FT DRILL ROD 195.4 FT TOTAL	
		191					Revision 14 12/82	
		192					WATER LEVEL 0.1 FT DOWN FROM TOP OF CASING	
	GRAY MED-HIGH PLASTIC SILTY CLAY - CLAY (CL-CH)	193					END OF SHIFT 23 MARCH 82	
420.0	CL 420.2 BOTTOM OF BORING	194					START OF SHIFT 24 MARCH 82 WATER LEVEL ADVANCE BORING TO 193.8 FT SEE NOTE # 8 (DRILL ROD 195.4 - 1.6 FT SPILL UP) FLASH BORING FOR 10 MIN. BEGIN BENCH MARK INSTALLATION SEE ARCHIVE MARK INSTALLATION SHEET	

NO SAMPLES RETAINED STRATIGRAPHY IDENTIFIED FROM DRILLED CUTTINGS & DRILLING CONDITIONS

N/A

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LOG OF BORING DSB-3ESHEET 12 OF 14NOTES

\* NOTE #1 DRILLING INTO THE CONCRETE PRODUCED EXCESS VIBRATION. THIS VIBRATION CAUSED THE GROUT IN THE STAND PIPE TO BREAK UP & FALL IN ON THE DRILL ROSS. THE DRILL ROSS BIT BEGAN TO BIND UP. THE MUD TUB BOTTOM SEAL ALSO BEGAN TO LEAK DUE TO THE EXCESS VIBRATION. THE DRILLER MADE SEVERAL ATTEMPTS TO SEAL THE MUD TUB W/OUT MUCH SUCCESS. @ 9:07<sup>AM</sup> DRILL CREW NOTED THE 8 1/2 IN. STAND PIPE CASING HAD LOOSENED UP @ ITS BOTTOM & WAS BEGINNING TO LEAK. JIM WENZEL OF BECHTEL W/ WCC CONCURRENCE REQUESTED DRILLING TO STOP & HAVE BECHTEL PERSONNEL PUMP OUT WATER IN BOTTOM OF MAN-WAY. THIS WAS DONE. BECHTEL PERSONNEL ALSO TIGHTENED UP NUTS HOLDING THE STANDPIPE IN PLACE. BECHTEL PERSONNEL WELDED SIX METAL BRACKETS FROM THE STANDPIPE TO THE MANWAY WALL FOR STABILITY. THE DRILLER RESEALED THE MUD TUB BOTTOM. DRILLING CONTINUED @ 11:15 AM. THE BOTTOM OF THE STAND PIPE WAS CKED PERIODICALLY FOR LEAKING. NONE WAS NOTED.

\* NOTE #2 2:10 CROSS THROUGH CONCRETE @ 30.0 FT DRILLED 0.8 FT VERY FAST. FINE SAND, RED PLASTIC & BLACK PLASTIC TIES IN CUTTINGS HIT OBSTRUCTION @ 30.8 FT STOP DRILLING IMMEDIATELY CK W/ C. WILSON BECHTEL & D. SICARD C/O FOR IDENTIFICATION OF PLASTIC MATL & OBSTRUCTION. C. WILSON REPORTS RED PLASTIC TO BE BEARING FOR A MOISTURE PROTECTIVE LAYER PLACED BETWEEN THE SB4.0 FLOOR SLAB & A MUD MAT. HE REPORTS OBSTRUCTION @ 30.8 FT CI. SB3.2 FT TO BE MUD MAT. C. WILSON & D. SICARD GIVE OK TO CONTINUE DRILLING. DRILLING CONTINUES @ 2:29 AM

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\* NOTE #3 STOP DRILLING CK W/ C. WILSON BECHTEL & D. SICARD C/O FOR IDENTIFICATION OF OBSTRUCTION (STEEL). THEY ARE @ THIS TIME UNABLE TO IDENTIFY STEEL. WCC INSPECTOR DIRECTS DRILLER TO PULL ROSS TO CK DEPTH & CONDITION OF BIT. DRILLER PULLS ROSS. DEPTH OF SAME. BIT CONDITION APPEARS TO BE FINE. DRILLER CHANGES BITS TO NEW 4 3/4" Ø

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LOG OF BORING DSB-3ESHEET 13 OF 14NOTES

- \* NOTE #3 CONT. TRICONE ROLLER BIT, SET 35.4 FT DRILL RODS & BIT. DRILLING THEN CONTINUES FOR 15 MIN. W/ NO PROGRESS DRILLING STOPPED FOR DAY
- \* NOTE #4 DRILLING RE. AN @ 7:53 AM. DRILLING ON STEEL STILL. PENETRATE STEEL @ 9:44 AM 0.1 FT THICK. CONTINUE DRILLING IN CONCRETE
- \* NOTE #5 WCC W/ CPO CONCURRENCE DIRECTED THE DRILLER TO PULL ALL THE DRILL RODS & THEN ATTEMPT TO SET 4 IN  $\phi$  FLUSH JOINT CASING TO SEE IF BORE HOLE WAS CLEAN TO 200' DEPTH DUE TO ALL OF THE OBSTRUCTIONS ENCOUNTERED. DRILLER PULLED RODS & BEGAN SETTING 4"  $\phi$  FLUSH JOINT CASING. SET 10.0 FT PIECE 4 IN  $\phi$  FLUSH JOINT CASING TO 29.5 FT WHERE IT BEGAN TO HANG UP. PULLED 4 IN  $\phi$  CASING OUT. SET 10.0 FT 3 IN  $\phi$  FLUSH JOINT CASING TO 39.6 FT PRESENT BOTTOM OF BORING. EXTRACTED 3 IN  $\phi$  CASING. SILTY CLAY NOTED ON BOTTOM OF CASING. DRILLER W/ WCC CONCURRENCE CHANGED BIT TO 4 1/8 IN  $\phi$  DRAG BIT TO CUT CLAY BETTER.
- \* NOTE #6 SETTING 3 IN  $\phi$  NEW PERMANENT CASING. SET 0.4 FT SAWTOOTHED DRIVE SHOE ON BOTTOM OF CASING. THEN SET 10 - 10.0 FT SECTIONS & 2 - 5.0 FT SECTIONS ALL UNPAINTED (110.4 TOTAL UNPAINTED). THEN SET 9 - 5.0 FT SECTIONS PAINTED BRIGHT ORANGE. CASING SET TO 150.9 FT (TEMPORARILY) STOP WORK FOR DAY. NEXT DAY ADD 2 - 5.0 FT SECTIONS PAINTED (55.0 FT TOTAL PAINTED) TOTAL 3"  $\phi$  NEW CASING 165.4 FT SET TO 164.05 FT FROM 614.0 FLOOR SLAB. BOTTOM OF CASING EL. 449.95 FT.
- \* NOTE #7 AFTER TAKING SPLIT SPOON SAMPLE L. HEFFERNAN REVIEWED BLOW COUNT OF SAMPLE W/ D. SIBALD (CPO). D. SIBALD DIRECTED WCC TO ADVANCE BORING ~ 5.0 FT & THEN TAKE ANOTHER SPLIT SPOON SAMPLE TO SEE IF HIGHER BLOW COUNT MATL. WOULD BE ENCOUNTERED. L. HEFFERNAN DIRECTED DRILLER TO ADVANCE BORING 5.0 FT. DRILLER BEGAN ADVANCING BOREHOLE. L. HEFFERNAN REVIEWED BORING LOGS DSB-1E, DSB-2E & REUTEL BORING LOG SS-9 WITH GLEN MURRAY (CPO) & J. WANZER (REUTEL). ALL BORING LOGS INDICATED THAT ADVANCING THE BOREHOLE

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LOG OF BORING DSB-3E

SHEET 14 OF 14

NOTES

NOTE #7 CONT. DSB-3E 5.0 FT WOULD NOT YIELD HIGHER BLOW COUNT MATL.  
THE HIGHER BLOW COUNT MATL. WAS ESTIMATED TO BE BETWEEN 3.0-4.5 FT  
LOWER THAN PRESENT BOTTOM DEPTH. J. JIBBOLD WAS NOTIFIED OF THESE CONDITIONS  
& THUS DIRECTED DRILLING TO STOP @ PRESENT DEPTH & BOTTOM OF BENCHMARK  
SET @ PRESENT DRILLED DEPTH. THE DRILLER HAD ADVANCED THE BORE HOLE 4.0 FT BY THIS  
TIME. (TOP 1.5 FT WAS SPLIT SPOON RUN). THE CUTTINGS & DRILLING CONDITIONS INDICATED  
NO CHANGE IN SOIL MATL. L. HEFFERNAN STOPPED DRILLING FOR DAY

\* NOTE #8 L. HEFFERNAN DIRECTED THE DRILLER TO ADVANCE THE BORE HOLE  
0.8 FT TO ASSURE A FRESH UNEXPOSED & UNDISTURBED (POSSIBLE SLIGHT SWELLING OF  
CLAY ON BOTTOM OF BORE HOLE AFTER BEING LEFT OPEN OVERNIGHT). BOTTOM FOR  
BENCHMARK INSTALLATION. DRILLING CUTTINGS & DRILLING CONDITIONS INDICATE  
SAME MATL. AS IN SPLIT SPOON SAMPLE. THE BORING WAS FLUSHED & THEN DRILL  
RODS PULLED. THE DRILL BIT WAS INSPECTED FOR SAMPLE OF BOTTOM MATL. FOUND  
SOIL MATL. ON BOTTOM OF BIT TO BE SAME MATL. AS IN SPLIT SPOON SAMPLE.

Boring log reviewed: John R. Hines  
5/24/82

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LOG OF BORING..DBM-6.

SHEET.1..OF.1....

project	MIDLAND NUCLEAR PLANT	project no.	BIC-217-2Y
location	MIDLAND MICHIGAN	elevation & datum	+ 614.00 USGS
drilling agency	D & G DRILLING	date started	26 JAN 82
drilling equipment	ACKER SKID RIG	date finished	26 JAN 82
size & type of bit	4 3/8" φ TRICONE ROLLER BIT	completion depth	6.65 FT
casing	TEMPORARY 5" ID - 5 FT LONG	rock depth	N/A
casing hammer:	N/A weight N/A drop N/A	no. samples	dist. N/A undist. N/A core N/A
sampler	NONE	water level first	N/A compl. N/A 24 hr N/A
sampler hammer:	N/A weight N/A drop N/A	driller	LARRY KODITEK
		supervisor	LUKE L. HEFFERNAN

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penetr. resist. 01/6in		
614								
	REINFORCED CONCRETE	1-6		CONCRETE CORE 6" φ			<p>APPROVAL TO ADVANCE BORING <i>Donald S. Clark</i> C.E.O.</p> <p>BECHTEL PERSONNEL CORED A 6" φ HOLE THROUGH THE REINFORCED CONCRETE FLOOR SLAB TO 6.0 FT DEPTH AT THE BECHTEL SURVEY LOCATION AT THE BECHTEL OPERATOR WAS UNABLE TO EXTRACT THE LAST ~ 1.0 FT FILL OF CORE D&amp;G SET UP ACKER SKID DRILL RIG OVER THIS CORE HOLE. THE DRILL RIG WAS LEVELLED UP TO PROVIDE A VERTICAL BORE HOLE.</p> <p>INSTALL 0.5" ID 5" CASING + 0.5" PAN (ON TOP) TO 4.6 FT</p> <p>PLACED ~ 30 GALLONS OF WATER &amp; 15 LB BENTONITE INTUG FOR DRILLING MUD.</p> <p>DRILLER BEGAN DRILLING W/ 4 3/8" φ TRICONE ROLLER BIT.</p>	N/A
609	CONCRETE	6						
	STEEL	7					HIT STEEL @ 6.65 FT (HILSAM) STOPPED DRILLING. CRED W/D. SIBBALD CRO & ABE LOWREY BECHTEL FOR IDENTIFICATION OF STEEL THEY INSPECTED LOCATION AREA AND FOUND ELECTRICAL CONDUIT IN LINE W/ BORE HOLE AND AT A DEPTH STEEL WAS ENCOUNTERED DRILLING REMAINED STOPPED UNTIL DECISION IS MADE.	
	BOTTOM OF BORE HOLE (ABANDONED)	7						
		8						
		9						
604		10					NOTE: LOST ~ 12 gal of WATER DOWN BORE HOLE AFTER DRILLING STOPPED.	
		11					12:10 PM D.S. BRALD DIRECTS WELL TO ABANDON BORE HOLE AFTER CLEANING & FLUSHING W/ WATER	
		12					DRILLER FLUSHED & CLEANED BORE HOLE PULLED OFF BORE HOLE 1:00 PM	
		13					APPROVAL TO ABANDON BORE HOLE	
600		14					* <i>Donald S. Clark</i>	

BORING LOG REVIEWED BY:  
*John R. Hink*, 5/24/82

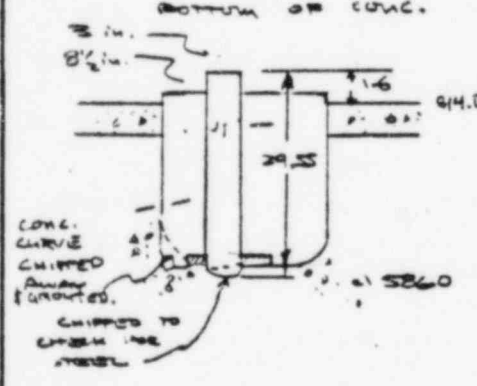
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LOG OF BORING DS-3-2

SHEET 1 OF 14

project <b>MIDLAND NUCLEAR PLANT</b>	project no. <b>SAC217-2Y</b>
location <b>MIDLAND, MICHIGAN</b>	elevation & datum <b>+614.0 USGS</b>
drilling agency <b>D&amp;C DRILLING</b>	date started <b>24 MARCH 82</b> date finished <b>29 MARCH 82</b>
drilling equipment <b>BUCKED CYCLO RIC</b>	completion depth <b>189.4 FT FROM 614.0 FLOOR</b> rock depth <b>N/A</b>
size & type of bit <b>3 1/2 IN. Ø CONCRETE (BEUTEL) TEMP. STAMPING</b>	no. samples dist. / undist. <b>0</b> core <b>N/A</b>
casing <b>3 1/2 in. Ø COUPLED (BEUTEL) TEMP. STAMPING</b>	water level first N/A compl. N/A      24 hr <b>N/A</b>
casing hammer: #2      weight <b>210 lb.</b> drop <b>24 in.</b>	driller <b>LARRY KORMAN &amp; BARRY THOMASON</b>
sampler <b>SPLIT SPOON : #3</b>	supervisor <b>LUKE HEFFERNAN &amp; JOHN SEMOUR</b>
sampler hammer: #3      weight <b>140 lbs.</b> drop <b>30 in.</b>	

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES					REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc.	type	recov.	depth	bl./in.		
614		1							
	5 1/2 in. Ø TEMP. STAMPING STICKUP ABOVE EL 614.04 = 1.6 ft	2							
		3							
610	8 1/2 in. Ø TEMP. STAMPING 29.55 ft DOWN TO BOTTOM OF CONC.	4							
		5							
		6							
		7							
		8							
605		9							
		10							
		11							
		12							
		13							
600									

APPROVAL TO ADVANCE DRILLING:  
*[Signature]*

BEUTEL MODIFIED MANUAL  
SHEET AS SHOWN IN SKETCH  
TO ALLOW FOR CORRECT  
SEALING OF 5 1/2 in. Ø STAMPING  
THAT WILL ACT AS TEMP.  
CASING. BEUTEL ALSO  
CHIPPED CONC. AT BOTTOM  
SLAB TO CHECK THE  
STEEL.

D&C SET UP OVER  
STAMPING ELEVATED.  
RIC WAS ALSO BUTTER  
(MILT.) TO 614 SLAB. ALSO  
THE HAS BEEN SEALED  
USING RUBBER WELT-  
BRANE & CLAMP AROUND  
5 1/2 in. Ø STAMPING

AT START OF DRILLING:  
31.1 ft ROD STICKING UP  
1.5 ft ABOVE 5 1/2 in. Ø  
CASING

D.1-1,232

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LOG OF BORING VSB-3W.

SHEET 7 OF 12...

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penet. resist. bl/6in		
		5						
		16						
	8 1/2 in. $\phi$ STANDARD	17						
		18						
595		19						
		20						
		21						
		22						
		23						
590		24						
		25						
		26						
		27						
586		28						
	CONCRETE SLAB	29						
588		29						
		30						
		31						
	204 ft STEEL @ 31.3							
	D.1-1,233							

NOT APPLICABLE

NO SAMPLES RETAINED  
DESCRIPTION BY CUTTINGS

BENTONITE WATER WELL WAS USED TO CHECK AHEAD GROUNDWATER WHICH WAS FOUND AT el 594.5 ft (SEE LOG OF VSB-3E)

Well top  
1.1 ft bit  
+ 10 ft  
+ 10 ft  
+ 0.3 ft ADAPTER TO 2 1/4" A ROD

4 3/4 in.  $\phi$  THRU ROD ROLLER  
1.1 ft LONG

SEAL AROUND MUD PILE & 8 1/2 in. LEAKING.  
SEAL AT BOTTOM OF 8 1/2 in. OK.

JOB DRILLED ~ 1.35 ft 4am  
END OF NIGHT SHIFT 25 MAR 82  
START OF DAY SHIFT 6:00 AM 25 MAR 82  
ROD DROP 0.2 ft

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STOP DRILLING  
CLW/ C. WILSON BELATED FOR IDENTIFICATION OF STEEL. HE REPORTS NO UTILITIES & STEEL TO BE AID TEMPORARY SUPPORT FOR MAINWAY PIPE. HE GIVES OK TO CONTINUE DRILLING

N/A

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LOG OF BORING ~~15B-3W~~

SHEET 3 OF 12...

LEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penet. resist bl/6in		
	20.14 STEEL @ 32.4 CONCRETE 0.134 STEEL @ 33.9 CONCRETE 20.14 STEEL @ 33.2 CONCRETE	32 33 34 35						
5785	GRAY CLAY SOME SILT, LOW PLASTICITY (CL)	36 37 38 39 40 41 42 43 44 45 46 47 48 49						
575								
570								
565	GRAY SILTY CLAY (CL)							

4.104 CHANTRY @ 33 ft  
 14.17 3rd VIBRATOR  
 32.9 ft @ 10:00 AM. DRILLED TO  
 4.15 PM W/ STUBS TO SWITCH TO  
 FOLLOWING BITS:  
 USE 2, 4 1/4 in. φ TRILUXE TROWER  
 USE 1, 4 1/8 in. φ TUNGSTEN CARBIDE  
 DRAG BIT  
 BIT 0.8 ft  
 ENG 6.0  
 ROB 25.0  
 ADAPTER 0.3  
 CHECK 4.0  
 32.1 ft total (0.5 ft @ 32)  
 SWITCH TO 3 7/8 in. φ TRILUXE  
 AT 5:15 PM, TUNGSTEN  
 DRAG BIT CHECKED UP.  
 TOTAL DRILL  
 STEEL = 36.1 ft  
 1.7 STICK UP  
 34.4 ft  
 SWITCH TO 4 1/8 in. DRAG BIT  
 @ 35.5 ft TO PULL OUT  
 CONCRETE. 33.9 ft DRILL ST.  
 40.2 ft " "

NO SAMPLES RETAINED  
 SOIL DESCRIPTION FROM CLIPPINGS

← 45.2 ft DRILL STEEL

← 50.2 ft DRILL STEEL

N/A

D.1-1,234


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LOG OF BORING DSB-24

SHEET 4 OF 12

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penet. resist. Bl/6in		
560	Green low plasticity, <u>SILTY CLAY</u> w/ SOME MEDIUM SAND, subangular (CL)	51-56					55.9 ft DRILL STEEL 1 ft STACKED OVER 2 1/2 in. φ STANDPIPE	
	APPROXIMATE CONTACT							
555	GRAY, low plasticity, <u>VERY SILTY CLAY TO CLAYEY SILT</u> (CL-ML)	57-59					60.9 ft DRILL STEEL	
		60						
		61						
	GRAY low PLASTIC <u>VERY SILTY CLAY</u> TRACE MEDIUM SAND SUBANGULAR, (CL) COBBLE 	62					65.9 ft DRILL STEEL 11:35 AM	
		63						
		64						
		65						
		66						
	GRAY low PLASTIC <u>VERY SILTY CLAY</u> w/ SOME MEDIUM SAND, ANGULAR TO SUBANGULAR (CL)	67						

NO SAMPLES RETAINED  
SOIL DESCRIPTION FROM CUTTINGS

D.1-1,235

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ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penetr resist bl/6in		
545		69				70.9 ft DRILL STEEL 65 ft ROD 5 ft SLS 0.9 ft BIT 70.9 RAISE RODS 10 ft TO LOOSEN CUTTINGS FROM ABOVE BIT		
	GRAY LOW PLASTIC SILTY CLAY SOME FINE TO MEDIUM SAND (CL)	70-72						
540		74				75.9 ft DRILL STEEL		
	GRAY LOW PLASTIC SILTY CLAY FINE TO MEDIUM SAND (CL)	76				RAISE RODS 10 ft TO LOOSEN CUTTINGS ABOVE BIT.		
		78						
535		79				80.9 ft DRILL STEEL 125am		
	GRAVEL OR CORAL	80						
		84						
	GRAY LOW PLASTIC SILTY CLAY RED AND BLACK DISCOLOURED FLECKS, SOME FINE TO MEDIUM SAND (CL)	83				END SHIFT AM 26 MARCH START OF SHIFT 6:00 AM 26 MARCH WATER LEVEL 0.15 FT BELOW FROM TOP OF 8 1/2" CASING 85.9 ft DRILL STEEL		
530		85						

NO SAMPLES RETAINED  
 SOIL DESCRIPTION FROM CUTTINGS & DRILLING CONDITIONS

N/A

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penet. resist. bl/6in		
525	GRAY MED PLASTIC <u>SILTY CLAY</u> w/ TR-SOME M-F SAND (CL)	87-88						
		89-90				← 90.9 FT DRILL STEEL EMPTY MUD TUB OF CUTTINGS FLUSH CASING W/ FRESH WATER. PUMP OUT MUD TUB, ADD ~ 25 GALLONS WATER TO MUD TUB. 7:06 DRILL RIG OUT OF GAS. DRILLER REPAIRS PUMP WHILE OILER SORTS FOR GAS.		
520	GRAY MED-LOW PLASTIC <u>SILTY CLAY</u> w/ TR M-F SAND (CL)	93-94				← 95.9 FT DRILL STEEL		
		95-96						
515	GRAY LOW PLASTIC <u>SILTY CLAY</u> w/ TR. M-F SAND (CL)	97-98				← 100.9 FT DRILL ROD		
		99-100						
		101-102						
510	GRAY LOW PLASTIC <u>SILTY CLAY</u> w/ OCCASIONAL M-F SAND (CL)	103				← 105.9 FT DRILL ROD D.1-1,237		

NO SAMPLES RETAINED  
 SOIL DESCRIPTION FROM CUTTINGS & DRILLING CONDITIONS

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ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	percent resist bl/6in		
	BROWNISH GRAY LOW PLASTIC SILTY CLAY w/ OCCASIONAL M-F SAND  (CL)	105 106 107						
-505		108 109 110 111						
	BROWNISH GRAY LOW PLASTIC SILTY CLAY w/ OCCASIONAL SILTY LAYERS  (CL)	112 113						
-500		114 115 116 117						
	BROWNISH GRAY LOW PLASTIC SILTY CLAY  (CL)	118 119						
-495		120 121						





NO SAMPLES RETAINED  
SOIL DESCRIPTION FROM CUTTINGS & DRILLING CONDITIONS

← DRILLING RATE SLOWS DOWN  
← 110.9 FT DRILL ROD

← 115.9 FT DRILL ROD  
EMPTY MUDTUB OF CUTTINGS  
FLUSH BORING W/ FRESH  
WATER PUMP OUT MUDTUB. ADD  
~ 25 GALS WATER TO MUDTUB,

← 120.9 FT DRILL ROD

N/A

LEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	C A S I N G B L O W S
			no. loc	type	recov.	percent resist DI/6IN		
-440	<u>GRAY LOW-MED PLASTIC SILTY CLAY w/ OCCASIONAL M-F SAND</u> (CL)	123					← 125.9 FT DRILL ROD	
		124						
		125						
		126						
	COBBLE - 	127						
	<u>DARK GRAY LOW PLASTIC SILTY CLAY w/ OCCASIONAL COBBLE - </u> M-F SAND, FINE GRAVEL (CL)	128					← 130.9 FT DRILL ROD  DRILLER REPORTS SMALL GAIN OF WATER IN MUD TUB.	
-485		129						
		130						NO MORE GAIN OF WATER IN MUD TUB IS NOTED.
		131						
		132						
	<u>DARK GRAY-GRAY LOW PLASTIC SILTY CLAY w/ TR M-F SAND</u> (CL)	133					← 135.9 FT DRILL ROD	
-480		134						
		135						
		136						
		137						
		138						
	<u>DARK GRAY LOW PLASTIC SILTY CLAY w/ OCCASIONAL M-F SAND</u> COBBLE  GRAVELLY  (CL)	139					← 140.9 FT DRILL ROD	
-475								

NO SAMPLES RETAINED  
 SOIL DESCRIPTION FROM CUTTINGS & DRILLING CONDITIONS

N/A

Revision 14'  
12/82

DEPTH SCALE ft	DESCRIPTION	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
		no. loc	type	recov.	penet. resist. bl/6in		
141	GRAY-BROWNISH GRAY LOW PLASTIC SILTY CLAY w/ OCCASIONAL M-F SAND (CL)						
142							
143	COBBLE (III)						
144							
145							
146							
147							
148							
149	GRAY-BROWNISH GRAY LOW PLASTICITY SILTY CLAY w/ TRACE FINE SAND (CL)						
150							
151							
152							
153							
154	GRAY-BROWNISH GRAY LOW TO MEDIUM PLASTICITY SILTY CLAY TRACE FINE TO MEDIUM SAND (CL)						
155							
156							
157							

470

465

460

457

NO SAMPLES RETAINED  
SOIL DESCRIPTION FROM CUTTINGS & DRILLING CONDITIONS

← 145.9 FT DRILL ROD

END OF DAY SHIFT WATER LEVEL 205A BELOW  
TOP OF CASING  
START OF NIGHT SHIFT

← 150.9 FT DRILL STEEL  
4:45 PM

← 155.9 FT DRILL STEEL  
5:45 PM

N/A

LEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES					REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)
			no. loc	type	recov.	penet. resist	bl/6in	
-455	GRAY LOW PLASTIC SILTY CLAY (CL)	159						160.7 ft DRILL STEEL 6:40 PM 161.1 ft DRILL STEEL 3 in. Ø TX DRAIN MUD TANK & PUSH BOREHOLE CASING SWITCH TO 2 15/16 in Ø TAPERED POINT BIT, 1.1 ft LONG SOE NOTE #1
-450	No CUTTINGS BEING RETURNED IN DRILL FLUID DRILLING INDICATES CLAY	163						166.1 ft DRILL STEEL 12:05 AM
-445	No CUTTINGS BEING RETURNED DRILLING INDICATES CLAY.	169						171.1 ft DRILL STEEL 12:45 AM
-440	No CUTTINGS BEING RETURNED DRILLING INDICATES CLAY	174						176.1 ft DRILL STEEL 1:20 AM

NO SAMPLES RETAINED  
 SOIL DESCRIPTION FROM DRILLED CUTTINGS  
 NO DRILLING CONDITIONS

Revision 14.  
12/82

DESCRIPTION	DEPTH SCALE ft	SAMPLES			REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS	
		NO. LOG	TYPE	RECOVER. PERCENT RESIST B1/6IN			
NO CUTTINGS BEING RETURNED. DRILLING INDICATES CLAY.  GRAY SILTY CLAY, LOW TO MEDIUM PLASTICITY (CL)  GRAY SILTY CLAY LOW TO MEDIUM PLASTIC (CL)  HARD GRAY SILTY CLAY LOW PLASTIC (CL)	172				181.1 FT DRILL STEEL 1:55 AM  FLUID 0.02 FT BELOW 8 1/2 IN. Ø. END OF NIGHT SHIFT 2300 29 MARCH START OF DAY SHIFT 29 MARCH 82 FLUID LEVEL 0.05 FT BELOW 8 1/2 IN. Ø 186.1 FT DRILL STEEL  DRILL TO 187.4 FT. FLUSH BORING FOR 10 MIN. PULL ROBS. SET SPLIT SPOON SAMPLER TO 187.4 FT BEGINS SPLIT SPOON SAMPLING FROM HERE. DRIVE SPOON 18 IN. SET 4 MIN. PULL ROBS. CR SPOON 0.45 FT SLOUGH IN TOP OF SPOON. PP ON SAMPLE = 4.25 TSF SET DRILL RODS & BIT 192.4 FT TOTAL DRILL TO 189.4 FT 3.0 FT. STICK 189.4 FLUSH BORING FOR 15 MIN. PULL ROBS. BEGIN INSTALLATION OF BENCHMARK ROBS SEE BENCHMARK INSTALLATION SHEETS.	NO SAMPLES RETAINED SOIL ASSOCIATION FROM ABISHED CUTTINGS & DRILLING CONDITIONS.	N/A
	174						
	178						
	180						
	181						
	182						
	183						
	184						
	185						
	186						
187							
188							
189							
ELEV. 474.6 FT BOTTOM OF BORING	190						

-435

30

-475



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LOG OF BORING DSB-3W

SHEET 12 OF 12

NOTES

1. NWCasing as follows:

el 454.6 to el 4550 3 in.  $\phi$ , 0.4 ft long saw-toothed drive shoe

el 455 to el 555 ft, 10, 10 ft long unpainted

pieces of flush-coupled casing.

el 555 to 605 ft, 5, 10 ft long orange painted

pieces of flush-coupled casing.

el 605 to el 615, 1, 10 ft long unpainted pieces

of flush-coupled casing.

Above arrangement of painted & unpainted

accepted by D SIBBALD. THE TOP

unpainted 10 ft section will be replaced

by a painted section at a later date

Boring Log reviewed: John R. Fike  
5/27/82

Revision 14  
12/82

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LOG OF BORING.  $\Delta$ B.M. - 5

SHEET 1..OF. 3....

project	MIDLAND NUCLEAR PLANT	project no.	BIC-217-24
location	MIDLAND MICHIGAN	elevation & datum	el 614.0 USGS
drilling agency	D&G DRILLING	date started	23 JANUARY
		date finished	25 JAN 82
drilling equipment	ACKER SKID RIG	completion depth	26.4 ft
		rock depth	N/A
size & type of bit	4 5/8" $\phi$ TRICONE ROLLER BIT	no. samples	dist. N/A undist. N/A core N/A
casing	TEMPORARY 5" ID - 5 FT LONG	water level first	N/A compl. N/A 24 hr. N/A
casing hammer:	N/A weight N/A drop N/A	driller	LARRY KODITEK
sampler	NONE	supervisor	LUKE HEFFERNAN
sampler hammer:	N/A weight N/A drop N/A		

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penetr resist		
614.0		1						
		2						
	REINFORCED CONCRETE	3						
		4						
		5						
		6						
607.6		7						
	LT BROWN NON PLASTIC F.-VF SAND TR. SILT, M SAND.	8						
605		9						
	Cuttings indicate wood & cement mud mat.	10						
		11						
		12						
601.3		13						
	LT BROWN NON PLASTIC M-F SAND TR. SILT, C. SAND, ORGANICS	14						

CONCRETE CORE (6"  $\phi$ )

NO SAMPLES RECEIVED - STRAIGHTENED IDENTIFIED FROM DRILLED CUTTINGS & DRILLING CONDITIONS.

NONE

APPROVAL TO ADVANCE BORING *[Signature]*

BEHTEL PERSONNEL CORED A 6"  $\phi$  HOLE THROUGH REINFORCED CONCRETE TO 6.4 FT DEPTH AT BEHTEL SURVEY LOCATION

D&G SET UP DRILL RIG OVER THIS CORE HOLE. THE DRILL RIG WAS LEVELED UP TO PROVIDE A VERTICAL BORE HOLE.

INSTALLED 5 FT - 5" ID CASING + 0.5 FT PAN (ON TOP) TO 4.9 FT PLACED ~30 GALLONS OF WATER IN TUB FOR DRILLING FLUID

DRILLER BEGAN DRILLING W/ 4 5/8"  $\phi$  TRICONE ROLLER BIT

HIT OBSTRUCTION AT 9.0 FT (EL 605.0), STOPPED DRILLING IMMEDIATELY CRED W/ D. SIBBALD (GPO) & CHUCK WILSON (BEHTEL) FOR IDENTIFICATION OF OBSTRUCTION. CHUCK WILSON REPORTED OBSTRUCTION TO BE MUD MAT. D. SIBBALD DIRECTED DRILLING TO PROCEED SLOWLY, INSPECTING CUTTINGS. DRILLER ADDED ~12 LB OF BENTONITE TO DRILLING MUD (CUTTINGS & WATER)

Revision 14

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LOG OF BORING .DBM-5

SHEET 7 OF 3

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penet resist bl/6in		
680		15						
	Brown w/ gray & white non plastic SAND w/ TR. S:IT, C.SAND, ORGANICS	16						
		17						
		18						
		19						
		20						
583.3		21						
	CONCRETE THRUST BLOCK w/ STEEL REINFORCING.	22						
		23						
		24						
		25						
587.6		26						
	BORE HOLE ABANDONED @ 26.4 ft	27						
		28						
		29						
		30						
		31						
582.0		32						

NO SAMPLES RETAINED STRATEGICALLY IDENTIFIED FROM ACQUIRED CUTTINGS & DRILLING CONDITIONS

N/A

ADVANCED COREHOLE  
w/ 4 5/8" Ø TRICONE ROLLER  
BIT

HIT OBSTRUCTION AT 20.7 FT  
STOPPED DRILLING IMMEDIATELY  
CKED W/ D. SIBBALD (CPCO) FOR  
IDENTIFICATION OF OBSTRUCTION  
OBSTRUCTION WAS IDENTIFIED  
AS MUD MAT. D. SIBBALD DIRECTED  
DRILLING TO CONTINUE SLOWLY  
w/ INSPECTION OF CUTTINGS

END OF SHIFT 23 JAN 82  
START OF SHIFT 24 JAN 82  
ADD ~ 10 GALLONS OF WATER TO  
DRILLING MUD

HIT STEEL IN THRUST BLOCK  
@ ~ 23.4 FT WEL INSPECTOR  
CREG w/ CHUCK WILSON (BECHTEL)  
FOR IDENTIFICATION OF STEEL  
CHUCK WILSON WAS UNABLE TO  
IDENTIFY STEEL. L. HEFFERMAN  
(WCL) DIRECTED DRILLER TO CONTINUE  
DRILLING SLOWLY & THE CUTTINGS  
WERE INSPECTED FREQUENTLY.

D. SIBBALD CPCO CKED W/ CHUCK  
WILSON BECHTEL & THEY LATER  
IDENTIFIED STEEL AS PART OF  
CONCRETE REINFORCED THRUST  
BLOCK

ADD ~ 10 GALLONS WATER TO DRILLING  
MUD  
END OF SHIFT 24 JAN 82  
START OF SHIFT 25 JAN 82

D. SIBBALD CPCO DIRECTED WCL  
TO STOP ADVANCEMENT OF BOREHOLE  
& BACKFILL BORE HOLE ACCORDING TO  
WCL PROCEDURE (PH) DRILLER  
BACK FILLED BORE HOLE w/ A CEMENT  
BESTONITE GROUT ACCORDING TO  
PROCEDURES. BORE HOLE WAS  
GROUTED FROM BOTTOM. SEE  
BACKFILL SHEET.

D.1-1,245

Revision 14  
12/82

BOREHOLE BACKFILLING REPORT  
CONSUMERS POWER COMPANY

Sheet 3 of 3

Date 25 JAN. 82

Borehole Data

Borehole No. DBM-5  
BASICENT FLOOR SLAB  
Ground Surface Elev 614.0  
Depth of Borehole 26.4

Personnel Data

Contractor DEG DRILLING  
Foreman LARRY KODITEK  
Inspector L. HEFFERNAN

Grout-Mix Data

Type Cement PORTLAND TYPE 1  
Mix Proportions  
187 lbs : 20 lbs : 280 lbs  
water      bentonite      cement  
Bags of Cement Used 3  
Bags of Bentonite Used ~ 0.4  
No. of Batches of Mix 1  
Total Volume of Grout Mix Injected  
Into Borehole ~ 18 gals.

Time Summary

Chargeable

Mob at Borehole —  
Clearing Borehole —  
Mixing Grout 1 hr  
Backfilling at Borehole 1 hr  
Demob at Borehole 3 1/2 hr  
Other —

(1) Subtotal 5 1/2 hrs

Non-Chargeable

Breakdown Time —  
Weather Delay —  
Other —

(2) Subtotal —

TOTAL HOURS WORKED

(1)+(2) 5 1/2

Post-Backfilling Measurement

Depth of Grout Surface 5.8  
Elev of Grout Surface 608.2

Remarks CPLD APPROVAL TO BACKFILL  
BORING OF SMALL SIBBLE

USED: 3 BAGS CEMENT  
20 LBS OF BENTONITE

Larry Koditek  
Foreman's Signature

L. Heffernan  
Inspector's Signature

BORING LOG REVIEWED BY: John R. Hicks, 5/24/82

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LOG OF BORING... ~~DSB-AN~~ DSB-AN 1 <sup>4PS</sup> 16 Sept 82

SHEET... OF... 15

project	MIDLAND NUCLEAR PLANT	project no.	81C217-2Y
location	MIDLAND MICHIGAN	elevation & datum	+634.5 USGS
drilling agency	D&G DRILLING	date started	9 MARCH 82
drilling equipment	ACKER SKID RIG	date finished	8 APRIL 82
size & type of bit	4 5/8" IN $\phi$ TRI-CONE	completion depth	214.9 FT FROM 634.5 FLOOR
casing	5" ID TEMPORARY, 4" ID TEMPORARY	rock depth	N/A
casing hammer: #2	weight 310 lbs drop 24 IN	no. samples	1 undist. N/A core N/A
sampler SPLIT SPON		water level first	N/A compl. N/A 24 hr N/A
sampler hammer: #3	weight 140 lbs drop 30 IN	driller	LARRY KODITEK / LARRY THOMAS
		supervisor	LUKE L. HEFFERNAN / TERRY KEANE

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			NO. LOG	type	recov.	penetr resist 1/16 in		
634.5		1						
	REINFORCED CONCRETE	2						
		3						
		4						
		5						
		6						
	REINFORCED CONCRETE	7						
		8						
		9						
	LT BROWN-TAN NON PLASTIC FINE-Y. FINE SAND w/ OCCASIONAL HRD SAND, FINE ORGANIC MATR.	10						
		11						
		12						
		13						
620.5	BELOWING M-E SAND	14						

6" AND  $\phi$  CONCRETE CORE

NO SAMPLES RETRIEVED STRATIGRAPHY FROM CUTTINGS

APPROVAL TO ADVANCE BORING  
*[Signature]* CRD

BECHTEL PERSONNEL CORED THROUGH THE REINFORCED CONCRETE @ THE BECHTEL SURVEY LOCATION W/ A SIX INCH  $\phi$  CORE DRILL, TO A DEPTH OF 8.7 FT.

D&G SET SKID RIG UP DIRECTLY OVER CORED HOLE. THE RIG WAS LEVELED TO INSURE A VERTICAL BORE HOLE WOULD BE DRILLED.

SET MUD TUB OVER CORE HOLE & SEALED BOTTOM SET 5.2 FT OF 5" ID CASING W/ PAN TO A DEPTH OF 4.2 FT.

STICK UP = 1.0 FT (FROM TOP OF PAN TO FLOOR, FLOOR SLAB ELEV. + 634.5)

ADD ~40 GALS WATER TO MUD TUB & CORE HOLE.

SET 4 5/8"  $\phi$  TRI-CONE ROCKER BIT 1.1 FT LONG + 10.0 FT DRILL ROD

TOTAL 11.1 FT STICK UP 2.4 FT START DRILLING @ 8.7 FT

ADD ~ 18 LBS BENTONITE TO MUD TUB (THICKEN DRILLING MUD)

ADD 2.3 FT DRILL ROD 13.4 FT TOTAL

ADD 20 FT DRILL ROD 15.4 FT TOTAL

VERY FAST DRILLING RATE  
1 FT/15 SEC Revision 14

N/A

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LOG OF BORING ~~DSB-AN~~ DSB-AN 1

SHEET 2 OF 15

ELEV. 620.9	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penet resist bl/6in		
	LT BROWN NON PLASTIC <u>M-F SAND</u> W/ TRACE SILT, OCCASIONAL FINE ORGANICS.	15					REMOVE 4.3 FT DRILL ROD 16.1 FT TOTAL ADD 2.3 FT DRILL ROD 18.4 FT TOTAL	
		16					BEGIN TO LOSE SMALL AMOUNT OF DRILLING MUD.	
		17					ADD 2.0 FT DRILL ROD 20.4 FT TOTAL	
		18						
		19					LOST ~ 5 GAL DRILLING MUD ADD ~ 15 GALS WATER TO MUD PULL 4.3 FT OF DRILL ROD ADD 5 FT DRILL ROD 21.1 FT TOTAL	
	LT BROWN NON PLASTIC <u>C-F SAND</u> W/ TRACE SILT OCCASIONAL F. ORGANICS.	20					ADD 2.3 FT DRILL ROD 23.4 FT TOTAL	
		21						
		22					ADD 2.0 FT DRILL ROD 25.4 FT TOTAL	
		23						
		24					CONTINUE TO HAVE FAST DRILLING RATE & SMALL DRILLING FLUID LOSS.	
		25					PULL 4.3 FT OF DRILL ROD ADD 5 FT DRILL ROD 26.1 FT TOTAL	
	LT BROWN NON PLASTIC <u>M-F SAND</u> W/ TRACE SILT, C. SAND	26					BORING HAS COLLAPSED @ BOTTOM OPEN TO 22.6 FT ONLY, LOST ~ 20 GALLONS OF DRILLING MUD DRILLER W/ WCL CONCURRENCE DECIDES TO PULL RODS & SET 4" ID FLUSH JOINT CASING, SET 2-10.0 FT SECTIONS + 8" DRIVE SHC OF 4" ID CASING TO 19.4 FT, CHANGE DRILL BIT 3 7/8" Ø TRI-FLASH DRAG BIT	24
		27					BIT + SUB = 5.8 FT LONG	32
		28					ADD 15.0 FT RODS 22.8 FT TOTAL FLUSH BORING, ADD ~ 20 GALS H <sub>2</sub> O TO MUD TUB. ADD 4.3 FT OF DRILL RODS 25.1 FT TOTAL ADD	74
		29					PULL 4.3 FT OF DRILL RODS ADD 5.0 FT 25.8 FT TOTAL	
		30					ADD 4.3 FT OF DRILL RODS 30.1 FT TOTAL PULL DRILL RODS ADD 10.0 FT W/ 8" ID FLUSH JOINT CASING 30.4 FT TOTAL SET TO 26 FT DRIVE TO 29.4 FT, SET BIT + 25 FT OF RODS 30.8 FT TOTAL	
	LT BROWN NON PLASTIC <u>C SAND -</u> <u>FINE GRAVEL</u> W/ TRACE F-M SAND, SILT	31					ADD 2.3 FT DRILL ROD 33.1 FT TOTAL	

NO SAMPLES RETAINED STARTING APPROX 15 FT DEPTH FROM DRILL CUTTINGS & DRILLING CONDITIONS

N/A

D.1-1,248

Revision 14  
12/82

WOODWARD-CLYDE CONSULTANTS  
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LOG OF BORING ~~58-AN~~ DSB-ANI

SHEET 3 OF 15

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc.	type	recov.	penet. resist bl/6in		
602.5								
	LT BROWN NON PLASTIC COARSE SAND - FINE GRAVEL w/ TR. M-F SAND, SILT	33					ADD 2.0 FT DRILL ROD 33.1 FT TOTAL	
		34					PULL 4.3 FT OF DRILL ROD ADD 5.0 FT DRILL ROD 35.8 FT TOTAL	
		35					ADD 2.3 FT DRILL ROD 38.1 FT TOTAL	
		36						
		37					ADD 2.0 FT DRILL ROD 40.1 FT TOTAL LOST ~ 15 GAL DRILL FLUID IN LAST 10.0 FT OF DRILLING	
	LT BROWN & BLACK NON PLASTIC C-M SAND w/ TR. F. GRAVEL F SAND, SILT.	38						
		39					PULL 4.3 FT OF DRILL ROD ADD 5.0 FT DRILL ROD 48.8 FT TOTAL	
		40					ADD 2.3 FT DRILL ROD 43.1 FT TOTAL	
		41						
		42					ADD 2.0 FT DRILL ROD 45.1 FT TOTAL	
		43						
	LT BROWN NON PLASTIC M-F SAND w/ SOME COARSE SAND TR. F. GRAVEL	44					END OF SHIFT 10 MARCH 82 FLUSH BORING FOR ~ 5 MIN. PULL RODS. ADD 10.0 FT 4 IN. ID FLUSH POINT CASING (40.4 FT TOTAL) DROVE TO 39.4 FT START OF SHIFT 11 MARCH 82 ADD ~ 10005 CEMENTITE & 15 GALS WATER TO HND TUB SET 40 FT DRILL ROD 45.8 FT TOTAL ADD 2.3 FT DRILL ROD 48.1 FT TOTAL	
		45						
		46						
		47					ADD 2.0 FT DRILL ROD 50.1 FT TOTAL	
		48						
	LT BROWN NON PLASTIC M-F SAND w/ SOME C. SAND, TR. F. GRAVEL	49					PULL 4.3 FT OF DRILL ROD ACCEPT DRILL ROD 54.8 FT TOTAL	
604.5		50					ADD 2.3 FT DRILL ROD 57.1 FT TOTAL	

NO SAMPLES RETAINED STRATIGRAPHY IDENTIFIED FROM DRILLED CUTTINGS & DRILLING CONVENTIONS

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES					REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	resist	bl/6in		
584.5	LT BROWN NON PLASTIC COARSE - FINE SAND & TR. F. GRAVEL	51							
		52					ADD 2.0 FT DRILL ROD 55.1 FT TOTAL		
		53					HIT OBSTRUCTION @ 53.2 FT EL. 581.3 (8:19 AM) CUTTINGS INDICATE CONCRETE STOP DRILLING CK W/ C. WILSON BECHTEL SURVEY FOR EXISTENCE OF OBSTRUCTION. HE REPORTS NO UTILITIES @ THIS DEPTH. POSSIBLE MUD MAT OR CRANE FOUNDATION. HE REPORTED IT WOULD BE OK TO DRILL (NOTE: LAST ~15 GALS DRILLING MUD)		
580	CONCRETE NOTED COPPER & FIBROUS MATERIAL IN CUTTINGS	54					ADVANCE BORING TO 54.0 FT. PULL RODS ADD 15 FT OF 4 IN. ID FLUX JOINT CASING 55.4 FT TOTAL DRIVEN TO 53.1 FT REMOVED 5 1/2" TO ENABLE DRILLING EMPTY MUD TUBS OF CUTTINGS ADD 20 GALS WATER & 5 LB BENTONITE TO TUB SET 50 FT DRILL RODS + CIT = 55.8 FT TOTAL		
		55							
		56					HIT COPPER & FIBROUS MATERIAL @ 54.2 FT. STOP DRILLING CK W/ D. SIBBALD CAP FOR IDENTIFICATION OF COPPER MAT. REPORTED IT TO BE EITHER GROUNDING 58.8 FT OLD DISCONNECTED POWER CABLE. HE CONCURRED W/ C. WILSON BECHTEL & THEN DIRECTED DRILLING TO CONTINUE		
		57					@ 54.9 FT ADD 2.3 FT DRILL ROD 58.1 FT HIT & PUNCTURED WATER LINE @ 56.1 FT EL. 578.4 FT. SEE NOTE 1. 6 APRIL DRILL RIG SET UP OVER AREA AND LEVELLED. 3 3/4" dia. with long 1/2" rod		
		58							
575		59					Note #2 MIX A TUB OF 90 GAL WATER W/ 50 LB BENTONITE & MUD SPALLS WITH LOSS OF ~50 GAL. 60.9 FT TOTAL DRILL STEEL (10:45 PM)		
		60							
		61					APPROXIMATE TO ADVANCE THE BORING BELOW EL 578.2 FT Donald C. [Signature] CPC.		
		62							
		63							
		64					65.9 FT TOTAL DRILL STEEL (12:30 AM)		
		65							
		66							
		67							
566.5	CONCRETE	68							

NO SAMPLES RETAINED SEPARATELY  
 IDENTIFIED FROM DRILLED CUTTINGS & DRILLING CONDITIONS



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LOG OF BORING

D.1-1, 251  
~~D.1-1, 251~~

SHEET 5 OF 15

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BI
			no. loc	type	recov.	penetr resist bl/6in		
85	CONCRETE	69						
		70						
		71						
		72						
	CONCRETE	73						
80	GRAY LOW PLASTIC SILTY CLAY W/ TR MED-FINE ANGULAR SAND (CL)	74						
		75						
		76						
		77						
		78						
55	GRAY-BROWNISH GRAY LOW PLASTIC SILTY CLAY w/ occasional MED-FINE SAND, SILTY LAYERS (CL)	79						
		80						
		81						
		82						
		83						
550	GRAY-BROWNISH GRAY LOW-MED PLASTIC SILTY CLAY w/ occasional MED-FINE SAND (CL)	84						
		85						
		86						

NO SAMPLES RETAINED STRATEGICALLY FROM DRILLED CUTTINGS & DRILLING CONDITIONS

← ADD 5 ft  
 70.9 ft TOTAL DRILL STEEL  
 MUD @ TOP OF PAN  
 ← END OF NIGHT SHIFT  
 START OF DAY SHIFT 7 APRIL 82  
 MUD @ 0.20' BELOW TOP OF PAN

← ADD 5.0 ft  
 75.9 ft TOTAL DRILL STEEL

DRILL TO 79.0 FT PULL RODS  
 SET 80 FT 3 in.  $\phi$  NEW CASING TO  
 CR CLEARANCE THROUGH CONCRETE  
 OR. PULL CASING SET 89 FT DRILL ROD  
 + NEW BIT 3 3/4 in  $\phi$  DRAG BIT

← ADD 5.0 ft  
 85.9 ft TOTAL DRILL STEEL  
 (9:50 AM)

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N/A

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LOG OF BORING ~~453-AA~~ DSB-AN1

SHEET 6 OF 15

LEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	percent resist bl/6in		
	GRAY LOW-MED PLASTIC SILTY CLAY w/ TR. MED-FINE SAND  (CL)	87						
		88						
545		89				← ADD 5.0 FT		
		90				90.9 FT TOTAL DRILL STEEL (10:25 AM)		
	GRAY MED PLASTIC SILTY CLAY w/ TR. MED-FINE SAND (CL)	91				EMPTY MUD TUB OF CUTTINGS FLUSH BORING w/ FRESH WATER THROUGH DRILL RODS. EMPTY MUD TUB OF CUTTINGS & THICK MUD. ADD 25 GALS WATER TO MUD TUB		
	GRAVELLY COBBLE	92						
		93						
		94				← ADD 5.0 FT		
540		95				95.9 FT TOTAL DRILL STEEL		
	GRAY MED PLASTIC SILTY CLAY w/ TR. MED-FINE SAND (CL)	96						
	COBBLE	97						
		98						
		99				← ADD 7.0 FT		
535		100				100.9 FT TOTAL DRILL STEEL (12:10 AM)		
	GRAY-BROWNISH GRAY MED PLASTIC SILTY CLAY w/ TR. MED-FINE SAND (CL)	101						
		102						
	OCCASIONAL SILTY LAYER	103						
		104						

NO SAMPLES RETAINED STRATEGICALLY FROM DRILLED CUTTINGS & DRILLING COUNTIONS.

N/A

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LOG OF BORING ~~DSB-AN~~ DSB-AN1

SHEET .7. OF 15.....

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOW
			no. loc	type	recov.	penetr resist bl/6in		
30	<p>GRAY - BROWNISH GRAY LOW PLASTIC SILTY CLAY w/ TR. MED-FINE SAND (CL)</p> <p>BECOMING MORE SILTY</p> <p>GRAY - BROWNISH GRAY LOW PLASTIC SILTY CLAY w/ TR. MED-FINE SAND (CL)</p> <p>GRAY - BROWNISH GRAY LOW PLASTIC SILTY CLAY w/ OCCASIONAL MED-FINE SAND (CL)</p> <p>GRAY - BROWNISH GRAY LOW PLASTIC SILTY CLAY w/ OCCASIONAL MED-FINE SAND (CL)</p>	105					ADD 5.0 FT 105.9 FT TOTAL DRILL STEEL (1:17 PM)	
		106					EMPTY MUD TUB OF CUTTINGS & DRILL MUD. FLUSH BORING w/ FRESH WATER THROUGH DRILL RODS. EMPTY THICK DRILL MUD INTO TUB. ADD ~ 25 GALS FRESH WATER TO MUD TUB.	
		107					FAST DRILLING RATE	
		108						
526		109					← ADD 5.0 FT 110.9 FT TOTAL DRILL STEEL	
		110						
		111					FAST DRILLING RATE (FEWER CUTTINGS)	
		112						
		113						
520		114					← ADD 5.0 FT 115.9 FT TOTAL DRILL STEEL (2:40 PM)	
	115							
	116							
	117							
	118							
515	119					← ADD 5.0 FT 120.9 FT TOTAL DRILL STEEL (3:12 PM)		
	120							
	121							
	122							

NO SAMPLES RETAINED STRATIGRAPHY IDENTIFIED FROM MILLER CUTTINGS & DRILLING CONDITIONS

N/A

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LOG OF BORING ~~D.1-1~~ SB-AN1

SHEET 8 OF 15...

LEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES					REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penet. resist. bl/6in			
510	GRAY - BROWNISH GRAY LOW PLASTIC SILTY CLAY w/ OCCASIONAL FINE-MED SAND (CL)	123-124					← ADD 5.0 FT 125.9 FT TOTAL DRILL STEEL (4:01 PM)		
506	GRAY LOW PLASTICITY SILTY CLAY - w/ TR FINE TO MED ANGRULAR SAND (CL)	127-131					← ADD 5.0 FT 130.9 FT TOTAL DRILL STEEL (4:45 PM)	N/A	
500	GRAY LOW PLASTICITY SILTY CLAY w/ TR FINE-MED SAND (CL)	134-137					← ADD 5 FT 135.9 FT TOTAL DRILL STEEL (5:40 PM)		
495	GRAY LOW PLASTICITY SILTY CLAY w/ TR FINE-MED SAND (CL)	139-140					← ADD 5 FT 140.9 FT TOTAL DRILL STEEL (6:35 PM)		

NO SAMPLES RETAINED STRATIGRAPHICALLY IDENTIFIED FROM DRILLED CUTTINGS & DRILLING CONDITIONS

END OF DAY SHIFT MUD LEVEL 0.2M BELOW AW  
 START OF NIGHT SHIFT MUD LEVEL SAME

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LOG OF BORING ~~DSB-AN1~~ DSB-AN1

SHEET 9 OF 15

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOW
			no. loc	type	recov.	penet. resist. bl/6in		
	GRAY LOW PLASTICITY <u>SILTY CLAY</u> w/ SOME FINE SAND (CL)	141						
		142						
		143						
490	GRAY LOW PLASTICITY <u>SILTY CLAY</u> w/ SOME FINE SAND (CL)	144						
		145						
		146						
		147						
		148						
		149						
485		150						
		151						
		152						
	GRAY LOW PLASTICITY <u>SILTY CLAY</u> w/ SOME FINE SAND (CL)	153						
		154						
480		155						
		156						
		157						
		158						

No SAMPLES RETAINED  
SOME DESCRIPTIONS FROM DRILLED CASING  
AND DRILLING CONDITIONS

← Add 5 ft  
145.9 ft TOTAL DRILL  
STEEL 7:25 PM  
EMPTY H2O TANK &  
ADD ~ 30 gal FRESH  
WATER  
FASTER DRILLING RATE

← Add 5 ft  
150.9 ft TOTAL DRILL  
STEEL (8:15 PM)

← Add 5 ft  
155.9 ft TOTAL DRILL  
STEEL (8:50 PM)

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LOG OF BORING ~~DSB-A1~~ DSB-A1

SHEET 19 OF 15

LEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			NO. LOG	type	recov. percent	resist. DI/6in		
475	GRAY LOW PLASTICITY VERY SILTY CLAY w/ SOME FINE SAND (CL)	159				← Add 5 ft 160.9 ft TOTAL DRILL STEEL (9:20 pm)		
		160				FASTER DRILLING RATE		
		161						
		162						
		163						
470	GRAY LOW TO MED. PLASTIC SILTY CLAY w/ SOME TO TRACE FINE SAND (CL)	164				← Add 5 ft 165.9' TOTAL DRILL STEEL (10:40 pm)		
		165						
		166						
		167						
		168						
		169						
		170				← Add 5 ft 170.9' TOTAL DRILL STEEL (11:25 pm)		
		171				SLOWER DRILLING RATE		
		172						
		173						
465		174				← Add 5 ft 175.9 ft TOTAL DRILL STEEL (12:15 pm)		
		175				FLUSH MUD TANK & ADD ~ 40 gal WATER		
		176						
460								

NO SAMPLES RETAINED  
SOIL DESCRIPTORIAL FROM DRILLED CUTTINGS  
AND DRILLING CONDITIONS

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LOG OF BORING ~~DSB-11~~ DSB-11

SHEET 1.1 OF 15

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penetr resist bl/6in		
455	GRAY LOW PLASTICITY <u>SILTY CLAY</u> w/ TRACE TO SOME FINE SAND (CL)	177-180						
450	GRAY LOW PLASTICITY <u>SILTY CLAY</u> w/ TR TO OCCASIO- NAL FINE SAND (CL)	183-186						
445	GRAY LOW PLASTIC <u>SILTY CLAY</u> w/ TR FINE SAND (CL)	189-190						
	GRAY LOW-MED PLASTIC <u>SILTY CLAY</u> w/ TR FINE SAND (CL)	193-194						

No samples retained  
Soil description from drilled cuttings  
and drilling conditions.

ADD 5 ft  
180.9 ft TOTAL DRILL  
STEEL (1:00 AM)

NOTE # 3  
FLUSH FOR 15 MIN & SET CASING  
END JOINT 11.00 AM 0.15 ft ABOVE  
START BIT " " " "  
8 AM 02 (SEE NOTE 3)  
DRIVE CASING 0.3 ft BOTTOM @  
184.5 ft EL 450.2. SET 186.1 ft DRILL  
STEEL + BIT. (BIT 1.1 ft LONG 2 7/8"  
TRLOWE

ADD 5.0 FT  
191.1 FT TOTAL DRILL STEEL

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LOG OF BORING ~~DSB-AN1~~ DSB-AN1

SHEET 12 OF 15

LEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penetr resist bl/6in		
440	GRAY MED PLASTIC <u>SILTY CLAY</u> W/ OCCASIONAL FINE SAND (CL)	195					ADD 5.0 FT 196.1 FT TOTAL DRILL STEEL	
		196					EMPTY MUD TUB OF CUTTINGS & DRILLING MUD. FLUSH BORING THROUGH DRILL RODS w/ FRESH WATER. EMPTY MUD TUB OF THICK DRILLING MUD ADD ~25 GALLONS FRESH WATER TO MUD TUB.	
		197						
		198						
		199						
	200							
435	GRAY MED PLASTIC <u>SILTY CLAY</u> W/ TH. FINE SAND (CL)	201					ADD 5.0 FT 201.1 FT TOTAL DRILL STEEL	
		202					DRILLER REPORTS SOIL TO BE MORE PLASTIC.	
		203						
		204						
		205						
	206							
430	GRAY MED PLASTIC <u>SILTY CLAY</u> W/ OCCASIONAL FINE SAND. (CL)	207					ADD 5.0 FT 206.1 FT TOTAL DRILL STEEL	
		208					N/A	
		209						
		210						
		211						
	212							
425	GRAY LOW-MED PLASTIC <u>SILTY CLAY</u> (CL)	211					ADD 5.0 FT 211.1 FT TOTAL DRILL STEEL	
		212						

NO SAMPLES RETAINED STRATIGRAPHY IDENTIFIED FROM CUTTINGS & DRILLING CONDITIONS.

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LOG OF BORING . ~~DSB-A1~~ DSB-A1

SHEET 13 OF 15

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			NO. LOG	type	recov.	penetr resist bl/6in		
420	GRAY LOW-MED PLASTIC SILTY CLAY (CL) SPOON SAMPLE: VERY STIFF GRAY LOW-MED PLASTIC SILTY CLAY, MOIST (CL) PL 49.6 COH 24.9	213 214	5-1	SP. 7.5000	10/1.58	19 27 36	DRILL TO 212.9 FT FLUSH BORING W/ FRESH WATER & PUMP OUT MUD TWO CUTTINGS & THICK MUD. ADD 25 GALS FRESH WATER PULL ROBS REMOVE BIT ADD SPRT SPOON SAMPLER SET 210.0 FT DRILL ROD + 4.2 FT SPOON & ADAPTERS 214.2 FT TOTAL SET TO 212.9. ROBB SINK OUT. 1.3 FT SPOON 212.9 2 DEPTH DRIVE SPOON 18 IN. FROM 212.0 DEPTH PULL ROBS SET 213.1 FT DRILL STEEL + OIT BIT TO 214.9	
415		215 216 217 218 219 220 221 222 223 224 225 226 227 228 229					FLUSH BORING FOR ~ 15 MIN THROUGH DRILL ROBS. PULL ROBS & SIGN BENCH MARK INSTALLATION. SEE DATA SHEETS. → PP = 3.5TSF, 3.5TSF	N/A
410								
405		230						

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LOG OF BORING DSB-AN1  
ASB-AN1SHEET 14 OF 15NOTES

#1 IMMEDIATELY FOLLOWING PUNCTURE OF WATER LINE, A FLOW OF DRILLING MUD OUT OF THE CORE HOLE OCCURRED. FOLLOWING THE DRILL MUD WAS CLEAN SEDIMENT FREE WATER. WCL INSPECTOR DIRECTED MILLER TO RESTART PUMPING WATER OUT OF BUILDING, PULL RODS & CAP CASING. WCL INSPECTOR THEN WENT TO NOTIFY D. SIBBALD C/O & C. WILSON RECHTEL OF PRESENT CONDITIONS. THE DRILLER RESTART PUMPING WATER OUT OF THE BUILDING & PULLED THE DRILL RODS. 10.0 FT OF 4" ID FLUSH JOINT CASING WAS ADDED (60.4 FT TOTAL). THE CASING DRIVE SHOULDER WAS ATTACHED WHICH REDUCED THE CASING TO A 3" Ø THREADED PIPE ON TOP. A 3" Ø GATE VALVE WAS PLACED ON TOP CAPPING OFF THE CASING & REDUCING THE WATER FLOW TO A TRICKLE. (LEAKING @ TOP TWO CASING JOINTS)

D. SIBBALD DIRECTS MILLER TO BE ON STANDBY. HE REPORTS THAT ATTEMPTS TO IDENTIFY WATER LINE ARE BEING MADE & THAT ATTEMPTS TO FIND A SHUT OFF VALVE ARE ALSO BEING MADE. WORK FOR AN1 WAS STOPPED. BORING IS ON HOLD UNTIL FURTHER NOTICE FROM BECHTEL ENGINEERING.

12 MARCH 82 BORING IS STILL ON HOLD, MILLER PUT ON STANDBY, SHUT OFF VALVE STILL NOT FOUND.

15 MARCH 82 CONDITIONS HAVE NOT CHANGED

16 MARCH 82 CONDITIONS HAVE NOT CHANGED

17 MARCH 82 BECHTEL PERSONNEL WERE ABLE TO SHUT OFF WATER FROM TEMPORARY POTABLE WATER LINE THAT HAD BEEN PUNCTURED D. SIBBALD.

DIRECTS WCL TO TEMPORARILY ABANDON THIS BOREHOLE.

APPROVAL TO TEMPORARILY ABANDON ASB-AN1 <sup>16 SEP 1982 WPS</sup> DSB-AN1 *Donald C. [Signature]*

30 MARCH 82 BECHTEL PERSONNEL GREAT PERMANENTLY TEMPORARY WATER LINE FROM BOTH ENDS.

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LOG OF BORING ~~DSB-AN1~~  
~~DSB-AT~~

SHEET 15 OF 15

NOTES

#2 6 APRIL 82: SET UP ON BORING & WOULD NOT HOLD WATER  
 PUT RODS IN BORING TO A DEPTH OF 55.3 FT. (BZLN 634.5)  
 WATER LINE IS (REPORTED TO BE GRouted) LOCATED 56.1 TO  
 56.3 FT. GRout, THEREFORE, ASSUMED TO BE A 55.3 FT DRILLING  
 COMMENCED AFTER MIXING OF 1/4" SOIL. PRODUCTION W/ 90% WATER  
 & A COORDINATE INITIAL LOSS OF ~40 GSI.

#3 DRILLED BORING TO 184 FT DEPTH (EQ 450.5 FT) &  
 SET 110 FT OF UNPAINTED 3 IN. ID NX ELUGH COUPLE  
 CASING & 75 FT OF ORANGE-PAINTED CASING ON  
 TOP OF UNPAINTED CASING. 0.4 FT LOW, SAW-TOOTH  
 SHAPE IS AT THE BOTTOM (EVE 12). TOTAL OF  
 185.4 FT OF CASING. TOP OF CASING EL 635.6  
 BOTTOM OF CASING EL 450.2

Boring Log Reviewed: J. M. R. H. H. H.  
 5/24/82

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LOG OF BORING. ~~AS-AN-1~~ DSB-AN2 15 Sept 82

SHEET 1 OF 13

Project	MIDLAND NUCLEAR PLANT	Project no.	81C-217-24
Location	MIDLAND, MICHIGAN	Elevation & datum	+634.5 FT USGS
Drilling agency	D&G DRILLING CO.	Date started	22 APRIL '82
Drilling equipment	ACKER SKID RIG	Date finished	29 APRIL '82
Size & type of bit	4 3/4" IN Ø TRICONE	Completion depth	210.0 FT
Casing	5" IN Ø TEMP. 4" IN Ø PERM. 3" IN Ø ALUM. JOINT	Rock depth	N/A
Casing hammer	# 2 weight 310 lbs drop 24 IN	No. samples	dist. 1 undist. 0 core N/A
Sampler	SPLIT SPOON (2" IN Ø)	Water level	first N/A compl. N/A 24 hr N/A
Sampler hammer	# 3 weight 140 lbs drop 30 IN	Driller	LARRY KODITEK / BARRY THOMASSON
		Supervisor	LUKE HEFFERNAN / JOHN SEY, II DLP

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penet resist 0.1/6 in		
634.5		1					APPROVAL TO ADVANCE BORING <i>[Signature]</i>	
		2					BECHTEL PERSONNEL CAME @ 6" IN Ø HOLE THROUGH THE RE-INFORCED CONCRETE FLOOR SLAB @ THE BECHTEL SURVEY LOCATION TO A DEPTH OF 9.2 FT.	
	REINFORCED CONCRETE	3						
		4						
		5						
629.5		6					D&G SET DRILL RIG UP DIRECTLY OVER THE 6" IN. CORE HOLE. THE RIG WAS CENTERED & LEVELED UP TO ASSURE A VERTICAL BORE HOLE WOULD BE DRILLED. DRILLER SET MUD TUB DIRECTLY OVER CORE HOLE. SET 7.3" SMID CASING + PAN TO 6.2 FT DEPTH TOP OF PAN 1.1 FT ABOVE 634.5 FLOOR.	N/A
		7						
		8						
		9					MIX 40 GALS. WATER W/ 35 LBS BENTONITE IN MUD TUB. SET 1.1 FT LONG 4 3/4" Ø TRICONE ROLLER BIT + 5.0" SUB + 5.0" DRILL ROD 11.1 FT TOTAL BEGIN DRILLING	
624.5		10						
	YELLOW-BROWN NON PLASTIC COARSE-FINE SAND W/ TR SILT, OCCASIONAL FINE GRAVEL	11						
		12					LOSS ~ 5 GALS WATER @ INITIAL DRILLING. AFTER 4 FT OF RUN STOP LOSING WATER.	
	(SP)	13						
		14						

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LOG OF BORING ~~ASL-A-1~~ ~~2SB-AN2~~

SHEET 2 OF 13

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. log	type	recov.	penet. resist bl/6in		
619.5	YELLOW BROWN NON PLASTIC COARSE-FINE SAND w/ OCCASIONAL SILT, F. GRAVEL  (SP)	15-17						ADD 5.0 FT DRILL ROD 16.1 FT TOTAL DRILL STEEL
614.5	YELLOW BROWN & BLACK NON PLASTIC COARSE-FINE SUBANGULAR SAND w/ OCCASIONAL FINE GRAVEL, SILT.  (SP)	18-22						ADD 5.0 FT DRILL ROD 21.1 FT TOTAL DRILL STEEL  BEGIN TO LOSE DRILLING MUD @ SLOW RATE.
609.5	YELLOW BROWN & BLACK NON PLASTIC COARSE-FINE SUBANGULAR SAND w/ TRACE - SOME FINE-MED GRAVEL OCCASIONAL SILT  (SP)	23-27						ADD 5.0 FT DRILL ROD 26.1 FT TOTAL DRILL STEEL  ~ 15 GALS DRILL MUD LOST
604.5	YELLOW BROWN NON PLASTIC COARSE - FINE SUBANGULAR SAND w/ TR. FINE GRAVEL OCCASIONAL SILT  (SP)	28-31						DRILL ROD PLUGS UP w/ SAND, CLEAN ROD OUT. ADD 5.0 FT DRILL ROD 31.1 FT TOTAL DRILL STEEL EMPTY MUD TUB OF CUTTINGS & THICK MUD. ADD 30 GALS WATER TO TUB MIX 15/16% CEADWITE TO MUD.
	D.1-1,263	32						Revision 14 12/82

NO SAMPLES RETAINED, SOIL DESCRIPTION FROM DRILLED CUTTINGS & DRILLING CONDITIONS

NA

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LOG OF BORING ~~AST-AN-1~~ DSB-ANZ

SHEET 3 OF 13

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov. percent	penet. resist bl/6in		
599.5	YELLOW BROWN NON PLASTIC COARSE-FINE SUB ANGULAR SAND W/ TR F. GRAVEL, SILT (SP)	33-35						
			NO SAMPLES RETAINED SOIL DESCRIPTION FROM SOILS CUTTINGS & DRILLING CONDITIONS					
594.5	YELLOW BROWN NON PLASTIC COARSE-FINE SUB ANGULAR SAND W/ TR FINE GRAVEL, SILT (SP)	39-41						
589.5	YELLOW BROWN NON PLASTIC COARSE-FINE SUB ANGULAR SAND W/ TR FINE GRAVEL, SILT (SP)	44-45						
584.5	YELLOW BROWN NON PLASTIC MED-FINE SUB ANGULAR SAND W/ TR COARSE SAND OCCASIONAL FINE GRAVEL, SILT (SP)	49-50						

(SAND SLOUGHS IN 1-0 FT AFTER RUN - CASING MAY BE REQUIRED)  
 ADD 5.0 FT DRILL ROD  
 36.1 FT TOTAL DRILL STEEL

LOSING MUD @ SLOW RATE

DRILL TO 39.3 FT DRILLER W/ WCL CONCURRENCE PULS DRILL RODS & BEGINS SETTING 4 IN. ID FLUSH JOINT CASING. SET 40.4 FT 4 IN. CASING (W/ SMOO) TO 39.3 FT. CHANGE BITS. NEW BIT 0.9 FT LONG 3 7/8" Ø TRICONE ROLLER SET 40.9 FT DRILL STEEL PERIT CONTINUE ADVANCING BOREHOLE. ADD 4 10 GALS WATER TO MUD TWO.

ADD 5.0 FT DRILL ROD  
 45.9 FT TOTAL DRILL STEEL

DRILL ROD PLUGS UP W/ SAND. CLEAN OUT ROD - EMPTY MUSTER OF CUTTINGS. ADD 30 GALS WATER & RETURN TO ADD 5.0 FT DRILL ROD TO MUD TWO  
 50.9 FT TOTAL DRILL STEEL

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LOG OF BORING ~~DSB-AN1~~ DSB-AN2

SHEET 4. OF 13.

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOW
			no. loc	type	recov.	penetr resist bl/6in		
	YELLOW BROWN & BLACK NON PLASTIC COARSE-FINE SAND W/ TR FINE GRAVEL SILT (SP)	51						
		52						
521.6		53				HIT CONCRETE @ 52.9 FT DEPTH STOP DRILLING IMMEDIATELY FILLER W/ WCL CONCURRENCE PULL RODS & ADVANCE 4 INCH FLUSH JOINT CASING TO 49.2 FT SEE NOTE 1. END OF SHIFTS 18 APRIL WATER LEVEL 0.2 FT BELOW P.M.A. START OF SHIFTS 23 APRIL 82 WATER LEVEL SAME. WASH OUT 4 INCH CASING. ADVANCE CASING TO 52.9 FT TOTAL 4 INCH CASING IN HOLE: 50.4 FT SET 50.9 FT DRILL ROD + BIT. FRESH BORING W/ FRESH WATER. CONTINUE DRILLING ADD 5.0 FT DRILL ROD 55.9 FT TOTAL DRILL STEEL EMPTY MUD TUB OF CUTTINGS AND ~ 25 GALS WATER TO MUD TUB.		
519.5	CONCRETE	54						
		55						
		56						
		57						
		58						
		59						
517.5		60				ADD 5.0 FT DRILL ROD 60.9 FT TOTAL DRILL STEEL	N/A	
		61						
		62						
		63						
	CONCRETE	64				ADD 5.0 FT DRILL ROD 65.9 FT TOTAL DRILL STEEL		
		65						
569.5		66				EMPTY MUD TUB OF CUTTINGS & THICK DRILLING MUD. FRESH BORING W/ FRESH WATER. ADD ~ 25 GALS OF WATER TO MUD TUB.		
		67						
		68						

NO SAMPLES RETAINED. SOIL DESCRIPTIONS FROM DRILLED CUTTINGS & DRILLING CONDITIONS

D.1-1,265

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LOG OF BORING ~~DSB-AN1~~ DSB-AN2

SHEET 5 OF 13...

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penet. resist bl/6in		
84.5	CONCRETE	69						
		70						
		71						
		72						
		73						
el 561.1		74						
559.5	GRAY MED. TO LOW PLASTIC SILTY CLAY, TRACE FINE TO V. FINE SAND, MOIST (CL) (BRON BIT)	75						
		76						
		77						
		78						
		79						
554.5	DRILLING INDICATES CLAY	80						
		81						
		82						
		83						
		84						
549.5	DRILLING INDICATES CLAY	85						
		86						

NO SAMPLES RETAINED SOIL DESCRIPTION FROM DRILLED CUTTINGS & DRILLING CONDITIONS

DRILL TO 68.9 ft PULL RODS DUE TO END OF SHIFT WATER @ TOP OF PAN. (23 APRIL 82)  
 26 April 7am. Water ~ 20ft down in casing. Put 70 ft rod in hole w/ 3 3/8 in. Ø TRICONE, 0.9 ft LONG. 70.9 ft TOTAL DRILL STEEL.

OUT OF CONCRETE  
 → DRAIN & CLEAN MUD TUB. CHANGE TO 3 1/2 in. Ø DRILL BIT. SUB. BIT IS 5.9 ft LONG. ADD 5 ft DRILL ROD. 75.9 ft TOTAL DRILL STEEL. 10:45am. ADD FRESH WATER

→ Add 5 ft DRILL ROD 80.9 ft TOTAL DRILL STEEL 11:20 am

→ Add 5 ft DRILL ROD 85.9 ft TOTAL DRILL STEEL 11:30 am

N/A



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LOG OF BORING ~~DSB-AN1~~ DSB-AN2

SHEET 6 OF 13...

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penet. resist bl/6in		
545.5	GRAY MED TO LOW PLASTIC SILTY CLAY, TR TO OCCASIONAL TRNG TO V. FINE SAND, MOIST (CL)	87-88						
545	GRAY MED. TO LOW PLASTIC SILTY CLAY TRACE TO SOME FINE SAND, MOIST (CL)	89-93				← Add 5 ft DRILL ROD 90.9 ft TOTAL DRILL STEEL 1:10pm		
540.5	GRAY TO BROWNISH-GRAY MED. TO LOW PLASTIC SILTY CLAY, SOME FINE SAND, MOIST (CL)	94-98				← Add 5 ft DRILL ROD 95.9 ft TOTAL 1:45pm PUMP OUT AND TAKE & ADD FRESH WATER.  (DRIFT OF ~25mm. TO FIX VACUUM)	N/A	
535	GRAY LOW PLASTIC SILTY CLAY, SOME FINE SAND, MOIST (CL)	99-103				← Add 5 ft DRILL ROD 100.9 ft TOTAL DRILL STEEL 2:50pm		
530.5	GRAY LOW PLASTIC SILTY CLAY, SOME FINE SAND, MOIST (CL)	104				← Add 3 ft 3:45pm 103.9 ft TOTAL DRILL STEEL		

NO SAMPLES RETAINED. SOIL DESCRIPTION FROM DRILLER CUTTINGS AND DRILLING CONDITIONS.

Revision 14  
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LOG OF BORING ~~DSB-AN-1~~ DSB-AN-2

SHEET .7. OF .13...

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES			REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov. penetr resist bl/6in		
		105					
		106					
		107					
5755	GRAY MED. PLASTIC SILTY CLAY, TR FINE SAND MOIST (CL)	108					
		109					
		110					
		111					
		112					
5725	GRAY LOW PLASTIC SILTY CLAY, TR FINE SAND MOIST (CL)	113					
		114					
		115					
		116					
		117					
		118					
5755	GRAY LOW PLASTIC SILTY CLAY, TR FINE SUBANGULAR SAND MOIST (CL)	119					
		120					
		121					
		122					

NO SAMPLES RETAINED, SOIL DESCRIPTION FROM BRUILED CUTTINGS AND DRILLING CONDITIONS.

PUMP OUT MUD TUB & ADD FRESH WATER.

← Add 5 ft DRILL ROD  
 110.9 ft TOTAL DRILL STEEL  
 END DAY SHIFT MUD 8 AM.  
 2747 lbs mud 75 ft below  
 PAH. Flush Boring 15 min.  
 \* CONTINUE DRILLING.

← Add 5 ft DRILL ROD  
 115.9 ft TOTAL DRILL STEEL  
 7:30 AM.

DRILL RATE SLOWED TO  
 GET CUTTINGS FROM  
 BORING.

← Add 5 ft DRILL ROD  
 120.9 ft TOTAL DRILL STEEL  
 9:00 AM.

N/A

D.1-1,268

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LOG OF BORING ~~DSB-AN1~~ DSB-AN2

SHEET 8 OF 13

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOW
			no. loc	type	recov.	penetr resist bl/6in		
510.5	GRAY LOW PLASTIC SILTY CLAY TR. FINE SAND, MOIST (CL)	123						
		124				← Add 5 ft rod 125.9 ft TOTAL DRILL STEEL 10:00 am DRAIN & CLEAN AND TUG & ADD FRESH WATER.		
		125						
		126						
		127						
		128						
505.5			129				← Add 5 ft rod 130.9 ft TOTAL DRILL STEEL 11:00 am	
			130					
			131					
			132					
500.5	GRAY TO BROWNISH-GRAY LOW TO MED. PLASTIC SILTY CLAY, TR. FINE SAND, MOIST (CL)	133						
		134				← Add 5 ft rod 135.9 ft TOTAL DRILL STEEL 11:45 am		
		135						
		136						
		137						
		138						
495.5			139				← Add 5 ft rod 140.9 ft TOTAL DRILL STEEL 1:30 pm	
			140					

No. SAMPLES RETAINED. SOIL DESCRIPTION FROM DRILLED CUTTINGS AND DRILLING CONDITIONS

N/A

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D.1-1,269

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LOG OF BORING ~~DSB-AN1~~ DSB-AN2

SHEET 9 OF 13...

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penet. resist bl/6in		
	GRAY TO BROWNISH-GRAY LOW TO MED. PLASTIC <u>SILTY CLAY</u> , TR FINE SAND MOIST (CL)	141 142 143						
490.5		144				← Add 5 ft rod 145.9 ft total drill steel 2:10 pm		
	GRAY TO BROWNISH-GRAY LOW TO MED. PLASTIC <u>SILTY CLAY</u> , TR FINE SAND MOIST (CL)	146 147 148						
488.5		149				← Add 5 ft drill rod 150.9 ft total drill steel 2:55 pm DRAINAGE CLEAN AND TR. ADD TRAIL WATER TO TR.		
	GRAY TO BROWNISH-GRAY LOW <u>PLASTIC SILTY CLAY</u> , TR TO OCCASIONAL FINE SAND MOIST (CL)	151 152 153						
480.5		154				← Add 5 ft rod 155.9 ft total drill steel 3:35 pm		
	GRAY TO BROWNISH-GRAY LOW <u>PLASTIC SILTY CLAY</u> , TR FINE SAND MOIST (CL)	157 158 159						

NO SAMPLES RETAINED. SOIL DESCRIPTION FROM REMAINING CUTTINGS AND DRILLING CONDITIONS

N/A

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LOG OF BORING ~~DSB-AN1~~ DSB-AN2

SHEET 19 OF 13

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	Type	recov.	penetr resist bl/6in		
475.5	GRAY TO BROWNISH-GRAY LOW PLASTICITY SILTY CLAY, SOME FINE SAND MOIST (CL)	159						
		160						
		161						
		162						
		163						
470.5	GRAY TO BROWNISH-GRAY LOW PLASTICITY SILTY CLAY, TO OCCASIONAL FINE TO MED. SUBANGULAR SAND, MOIST (CL)	164						
		165						
		166						
		167						
		168						
465.5	GRAY TO BROWNISH-GRAY LOW PLASTICITY SILTY CLAY, SOME V. FINE SAND, MOIST (CL)	169						
		170						
		171						
		172						
		173						
460.5	GRAY TO BROWNISH-GRAY LOW PLASTICITY SILTY CLAY, SOME V. FINE SAND, MOIST (CL)	174						
		175						
		176						

NO SAMPLES RETAINED. SOIL DESCRIPTION FROM DRILLED CUTTINGS & DRILLING CONDITIONS

← Add 5ft rod  
160.9ft TOTAL DRILL STEEL  
4:15pm

← Add 5ft rod  
165.9ft TOTAL DRILL STEEL  
1:55pm  
DRAIN & CLEAN MUD TUB.  
ADD FRESH WATER.  
200 GAL. 1000 OIL FREE  
200 GAL. FAN AND OIL  
200 GAL. FAN.

← Add 5ft rod  
170.9ft TOTAL DRILL STEEL  
7:30am

← Add 5ft rod  
DRAIN & CLEAN MUD TUB.  
ADD FRESH WATER.  
175.9ft TOTAL DRILL ROD  
8:15am

N/A

D.1-1,271

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LOG OF BORING ~~DSB-AM1~~ DSB-AM2

SHEET 11 OF 13...

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. log	type	recov.	penet. resist. bl/6in		
495.5		177						
		178						
		179				← Add 5 ft rod. 180 ft TOTAL DRILL STEEL, 8:50 AM.		
	GRAY TO BROWNISH-GRAY LOW PLASTIC SILTY CLAY, SOME FINE SAND MOIST (CL)	180						
		181						
		182						
495	FROM BIT: STIFF GRAY-BROWNISH GRAY LOW PLASTIC SILTY CLAY, W/ TRACE FINE GRAVEL, COARSE TO MED SAND, w/ SOME FINE SAND, ROUNDED TO SUBANGULAR SAND & GRAVEL, MOIST (CL)	183				9:40 Drill to end of run. Thin mud & clean out mud tub. Pull rods. Set 3 in. Ø flush joint NX casing as follows: 110 ft unlined + 0.4 ft low drive shoe (not sawtooth), + 75 ft drilled = 185.4 ft casing. Drive to el 4902. Add 75 ft rod + 2 5/16 in Ø TRicone roller = 176.1 ft TOTAL DRILL STEEL. Drill out bottom 10 ft of casing. Add 5 ft 12:55 PM Add 5 ft 1:10 PM 186.1 ft TOTAL DRILL STEEL Bottom of permanent casing		
		184						
		185						
		186						
		187						
		188						
495.5		189				← Add 5 ft rod 191.1 ft TOTAL DRILL STEEL 1:30		
	GRAY TO BROWNISH-GRAY LOW PLASTIC SILTY CLAY w/ TR. C.M. SAND, SOME F. SAND, MOIST (CL)	190				DRILLING RATE INCREASED WITH SMALLER BIT & MORE SILTY SOIL.		
	APPROXIMATE CONTACT	191				DRILLING INDICATES V. SILTY SOIL w/ CLAYEY LAYERS.		
	GRAY LOW PLASTIC SILTY CLAY TO M-M PLASTIC CLAYEY SILT w/ LAYERS OF CLAY (CL-ML)	192						
		193						
495		194						

NO SAMPLES RETAINED. SOIL DESCRIPTION FROM DRILLED CUTTINGS & DRILLING CONDITIONS.

N/A

Revision 14  
12/82

D.1-1,272

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LOG OF BORING ~~72A-M-1~~ DSB-A12

SHEET 12 OF 13

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penetration resist bl/6in		
4355		195						
		196						
		197						
		198						
		199						
	GRAY TO BROWNISH-GRAY LOW PLASTIC SILTY CLAY w/ some FINE SAND TO CLAYEY SILT w/ some FINE SAND (CL-ML)	200						
		201						
		202						
		203						
	APPROXIMATE CONTACT	203						
4305		204						
		205						
		206						
	S-1 (4305)	206						
	V. STIFF, GRAY, LOW PLASTIC SILTY CLAY TO V. FINE SAND, MOIST w <sub>p</sub> > w <sub>L</sub> , LOW TO MED. TOUCH T-100 @ w <sub>p</sub>	207						
		208						
		209						
		210						
		211						
		212						
		213						
		214						
		215						
		216						
		217						
		218						
		219						
424.5		220						
	BOTTOM OF CORING	220						

NO SAMPLES REMAINED FROM DRILL CUTTINGS & AS LONG CONDITIONS

ADD 5 ft rod  
196.1 ft TOTAL DRILL STEEL

FAST DRILLING RATE & VERY SMALL CUTTING SIZE, LITTLE SAND. DRILLER INDICATED SOIL IS PROBABLY SILT OR V. SILTY CLAY.

INTERMITTANT LAYERS OF INCREASED DRILLING RESISTANCE INDICATING CLAY LAYERS.

ADD 5 ft rod  
201.1 ft TOTAL DRILL STEEL

DRILLING RATE DECREASED INDICATING CLAY.  
END SHIFT 28 APR. HLG 0.09 ft ABOVE PAM

29 APR. ROD 1.5 ft BELOW TOP OF PAM  
ADD 5 ft rod.  
206.1 ft TOTAL DRILL STEEL  
7:30 AM

840 AM  
PAM 3.07 ft N=63

rod 32 ft ADD 5 ft rod & DOWN TO BELOW SAMPLE DEPTH.

rod 30 ft & DOWN WITH THE 840 AM @ COMPLETION. DRILL STEEL WENT.

BAT @ 210.0 ft

BENCHMARK INSTALLED 29 APR 82.  
SEE BENCHMARK INSTALLATION SHEET.

SEE NOTE #2. Revision 14  
12/82

N/A

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LOG OF BORING ~~DSB-AH1~~ DSB-AW2

SHEET 13 OF 13

BORING  
NOTES

NOTE #1 L. HEFFERNAN WENT TO BEHTEL SURVEY OFFICE TO CR ON IDENTIFICATION OF OBSTRUCTION. C WILSON (BEHTEL) IS NOT ON SITE @ THIS TIME. L. HEFFERNAN NOTIFIES D. SIRCALD (CPCO) OF PRESENT CONDITIONS & BOTH CONCUR THAT THE 4 IN. CASING SHOULD BE ADVANCED TO THE OBSTRUCTION & THEN STOP ADVANCEMENT OF BORING UNTIL OBSTRUCTION CAN BE IDENTIFIED. 4 IN. CASING ADVANCED TO 49.0 FT. END OF SHIFT 22 APRIL 82. 7:00 AM 23 APRIL L. HEFFERNAN CR. W/ C. WILSON BEHTEL FOR IDENTIFICATION OF CONCRETE OBSTRUCTION. C. WILSON REPORTS CONCRETE TO BE ABANDONED WATERLINE IN JACKPILL CONCRETE SAME AS THE ONE ENCOUNTERED IN ~~DSB-AH1~~ <sup>DSB-AH1 7/16 Sept 82</sup> THAT WAS GROUTED UP BY BEHTEL & THUS GIVES OK TO CONTINUE DRILLING. D. SIRCALD CPCO IS NOTIFIED OF CONDITIONS & GIVES OK TO CONTINUE DRILLING.

NOTE #2 PRIOR TO GROUTING BENCHMARK 20 LB BENTONITE + 240 GALL (400 LB) WATER SLURRY INJECTED INTO BUREAU TRENCH 1 IN. ID BENCHMARK PIPE.

Boring Log Reviewed: John L. Heide  
5/25/82

Revision 14  
12/82

D.1-1,274



WORTHWARD-CLYDE CONSULTANTS

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LOG OF BORING. D&G-75.

SHEET 1 OF 12...

project	MIDLAND NUCLEAR PLANT	project no.	BIC217-2Y
location	MIDLAND MICHIGAN	elevation & datum	+584.0 U.S.G.S.
drilling agency	D & G DRILLING	date started	15 FEB. 82
drilling equipment	ACKER SKID RIG	date finished	22 FEB 82
size & type of bit	4 7/8 IN. TRICONE ROLLER, 4 1/2" DRAG, 2 1/16" ROLLER	completion depth	162.8 FT.
casing	14.7 FT. 5 IN. ID TEMPORARY, 135.0 FT. 3 IN. ID PERMANENT	rock depth	N/A
casing hammer: #2	weight 310 lbs drop 24 IN.	no. samples	1
sampler	SPLIT SPOON	dist.	1
sampler hammer: #3	weight 140 lbs drop 30 IN.	undist.	N/A
		core	N/A
		water level first	0.0 FT. compl. N/A
		driller	LARRY KONITEK
		supervisor	LURE L. HEFFERNAN

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc.	type	recov.	penetr. resist. 5/16 in		
584.0								
		1					APPROVAL TO ADVANCE CORING: <i>Donald K. Hall</i>	CRO
		2					BECHTEL PERSONNEL CORED THROUGH THE REINFORCED CONCRETE @ THE BECHTEL SURVEY LOCATION W/ A SIX INCH Ø CORE DRILL TO A DEPTH OF 16.4 FT.	
	REINFORCED CONCRETE	3						
		4						
577.0		5					D&G SET SKID RIG DIRECTLY OVER CORED HOLE. THE RIG WAS LEVELED TO INSURE A VERTICAL BORE HOLE WOULD BE DRILLED	
		6					SET MUD TUB OVER CORE HOLE & SEALED BOTTOM. SET 14.7 FT OF 5 IN ID CASING & PAN TO 13.9 FT	
		7					STICK UP ± 0.8 FT (FROM TOP OF PAN TO FLOOR. FLOOR EL. 584.0)	N/A
		8					ADD ~ 30 GALS WATER TO MUD TUB FOR DRILLING FLUID.	
		9					DRILL BIT: 4 7/8 IN Ø / 15 FT LONG TRICONE ROLLER BIT	
		10					NOTE: SLIGHT STREAM OF GROUND WATER MOVING UP & INTO THE BUILDING THROUGH THE CORE HOLE.	
		11						
	REINFORCED CONCRETE	12						
		13						
570.0		14						

D.1-1,275

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LOG OF BORING ... BSS:AD

SHEET 7 OF 12

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penet resist bl/6in		
570.0		15		CONCRETE				
	REINFORCED CONCRETE	16		CORE				
		17						
	LT GRAY, NON PLASTIC FINE-VERY FINE SAND TR SILT (NATURAL) (SP)	18						
56.0	BECOMING SLIGHTLY CLAYEY	19						
	LT GRAY NON PLASTIC FINE-V. FINE SAND w/ TR SILT & CLAY (SP)	20						
		21						
		22						
	COBBLE	23						
56.0	LT GRAY NON PLASTIC FINE SANDY SILT w/ TR CLAY	24						
		25						
	LT GRAY SLIGHTLY PLASTIC F-M SANDY SILTY CLAY (CL)	26						
		27						
		28						
55.0		29						
	GRAY LOW-MED PLASTIC SILTY CLAY w/ TR. F-M SAND (CL)	30						
		31						
55.0		32						

NO SAMPLES RETAINED STRATIGRAPHY IDENTIFIERS FROM DRILLER CUTTINGS & DRILLING CONDITIONS

SET BIT (1.15 FT) + 3-5.0 FT RODS + 0.3 FT ADAPTER + 2.0 FT ROD  
TOTAL = 18.45 FT  
STICK UP = 2.05  
BEGAN DRILLING @ 16.4 FT

WATER LEVEL: 1.0 FT DOWN FROM TOP OF TANK  
END OF SHIFT 16 FEB 82  
START OF SHIFT 17 FEB 82  
WATER LEVEL OVER FLOWING TANK  
ADD 5.0 FT OF DRILL ROD  
4-5.0 FT ROD + BIT & ADAPTER (1.15 FT)  
TOTAL = 21.45  
ADD 2.0 FT OF DRILL ROD  
TOTAL = 23.45

TOTAL = 23.45  
STICK UP = 1.25  
22.20 HIT OBSTRUCTION  
STOP DRILLING CR W/ C. WILSON SCOTT & D. SIBBOLD CAPS. THEY REPORTED NO UTILITIES OF ANY KIND AT THIS ELEV. 56.8  
D. SIBBOLD DIRECTED WCL TO CONTINUE DRILLING  
ADD 2.0 FT DRILL ROD 25.45 FT TOTAL  
TALL OF 4.0 FT BRILLIANT  
ADD 5.0 FT DRILL ROD 26.45 FT TOTAL

ADD 2.0 FT DRILL ROD 28.45 FT TOTAL

ADD 2.0 FT DRILL ROD 30.45 FT TOTAL

30.45  
1.2 STICK UP  
29.25  
DRILL TO 29.15 FT PULL ALL RODS & ROLLER BIT CHANGE BIT  
NEW BIT & ADAPTER = 5.8 FT LONG (TYPE: 3 FIN DRAG BIT)  
ADD 5-5.0 FT DRILL RODS + BIT + ADAPTER TO DRILL CHUCK @ 34 31.15 FT TOTAL  
ADD 2.0 FT DRILL ROD 33.1 FT TOTAL

N/A

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D.1-1,276

WOODWARD-CLYDE CONSULTANTS  
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LOG OF BORING . A.S.B.:A2.

SHEET 3. OF 12..

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BL
			no. loc	type	recov.	percent water bl/6in		
552.0	GRAY MED PLASTIC <u>SILTY CLAY</u> w/ TR F-M SAND (CL)	33					ADD 2.0 FT DRILL ROD 35.1 FT TOTAL	
		34					PULL 4.0 FT DRILL ROD ADD 5.0 FT DRILL ROD TOTAL = 36.1 FT	
		35					ADD 2.0 FT DRILL ROD 38.1 FT TOTAL	
547.0		36						
		37					ADD 2.0 FT DRILL ROD 40.1 FT TOTAL	
	GRAY MED PLASTIC <u>SILTY CLAY</u> w/ TR F-M SAND. (CL)	38						
		39					PULL 4.0 FT ROD ADD 5.0 FT ROD 41.1 FT TOTAL	
		40					ADD 2.0 FT DRILL ROD 43.1 FT TOTAL	
542.0		41						
		42					ADD 2.0 FT DRILL ROD 45.1 FT TOTAL	
	GRAY MED PLASTIC <u>SILTY CLAY</u> w/ TR F-M SAND (CL)	43						
		44					PULL 4.0 FT ROD ADD 5.0 FT ROD 46.1 FT TOTAL	
		45					ADD 2.0 FT DRILL ROD 48.1 FT TOTAL	
537.0		46						
		47					EMPTY MUD TUB OF CUTTINGS & DRILLING MUD ADD ~ 20 GALS WATER TO MUD TUB FOR DRILLING FLUID. ADD 2.0 FT DRILL ROD 50.1 FT TOTAL	
	GRAY LOW PLASTIC <u>SILTY CLAY</u> w/ OCCASIONAL F-M SAND (CL)	48						
		49					PULL 4.0 FT ROD ADD 5.0 FT 51.1 FT TOTAL	
532.0		50						

NO SAMPLES RETAINED STRATIGRAPHY LOCATIONS FROM DRILL CUTTINGS & DRILLING CONDITIONS

N/A

Revision 14  
12/82

D.1-1,277

WOODWARD-CLYDE CONSULTANTS  
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G OF BORING . ~~DB-45~~

SHEET . 7 . OF . 12 . . .

EV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penet resist bl/6in		
524.0	GRAY LOW-MED PLASTIC <u>SILTY CLAY</u> w/ OCCASIONAL F-M SAND. (CL)	51					ADD 2.0 FT DRILL ROD 53.1 FT TOTAL	
		52					ADD 2.0 FT DRILL ROD 55.1 FT TOTAL	
		53						
		54					PULL 4.0 FT ROD ADD 5.0 FT ROD 56.1 FT TOTAL	
527.0	GRAY LOW PLASTIC <u>SILTY CLAY</u> w/ TR. F-M SAND (CL)	55					ADD 2.0 FT DRILL ROD 58.1 FT TOTAL	
		56						
		57					ADD 2.0 FT DRILL ROD 60.1 FT TOTAL	
		58						
		58.4						
		59					PULL 4.0 FT ROD ADD 5.0 FT ROD 61.1 FT TOTAL	
524.0	GRAY LOW PLASTIC <u>SILTY CLAY</u> w/ TR. F-M SAND (CL)	60					EMPTY MUD TUB. FIN DRILLING AND ADD 20 GALS WATER TO TUB. ADD 2.0 FT DRILL ROD 63.1 FT TOTAL	
		61						
		62					ADD 2.0 FT DRILL ROD 65.1 FT TOTAL	
		63					PULL 4.0 FT OF ROD, ADD 5.0 FT ROD 66.1 FT TOTAL	
521.0	GRAY LOW PLASTIC <u>SILTY CLAY</u> w/ OCCASIONAL F-M SAND (CL)	64						
		65					ADD 2.0 FT DRILL ROD 68.1 FT TOTAL	
		66						
		67					ADD 2.0 FT DRILL ROD 70.1 FT TOTAL	
516.0	GRAY LOW PLASTIC <u>SILTY CLAY</u> w/ OCCASIONAL F-M SAND (CL)	68					ADD 2.0 FT DRILL ROD 72.1 FT TOTAL	

NO SAMPLES BEING STRATIGRAPHY IDENTICAL FROM DRILLER CUTTINGS & DRILLING CONDITIONS

N/A

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LOG OF BORING .. P.S.B. 42.

SHEET 5 OF 12

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CAS. BLO.
			no. loc	type	recov.	percent resist bl/6in		
516.0								
	GRAY MED PLASTIC SILTY CLAY W/OCCASIONAL F-M SAND (CL)	69				PULL 4.0 FT OF ROD ADD 5.0 FT ECL 71.1 FT TOTAL		
		70				ADD 2.0 FT DRILL ROD 73.1 FT TOTAL		
		71						
		72				ADD 2.0 FT DRILL ROD 75.1 FT TOTAL		
511.0		73						
	GRAY MED-LOW PLASTIC SILTY CLAY W/ TR M-F SAND (CL)	74				PULL 4.0 FT OF ROD ADD 5.0 FT ROD 76.1 FT TOTAL		
		75				ADD 2.0 FT DRILL ROD 78.1 FT TOTAL		
		76						
		77				ADD 2.0 FT DRILL ROD 80.1 FT TOTAL		
506.0		78						
	GRAY LOW PLASTIC SILTY CLAY W/ TR M-F SAND (CL)	79				PULL 4.0 FT OF ROD ADD 5.0 FT ROD 81.1 FT TOTAL		
		80				ADD 2.0 FT DRILL ROD 83.1 FT TOTAL		
		81						
		82						
		83				ADD 2.0 FT DRILL ROD 85.1 FT TOTAL		
501.0		84				EMPTY AND TUB WATER LEVEL 12A DOWN FROM TOP OF TUB END OF SHIFT 17 FEB 82		
		85				START OF SHIFT 18 FEB 82 WATER LEVEL OVER PLANNING TUB PULL 4.0 FT OF ROD ADD 5.0 FT ROD 86.1 FT TOTAL		
498.0	GRAY LOW PLASTIC SILTY CLAY W/OCCASIONAL M-F SAND (CL) D.1-1,279	86				ADD 2.0 FT DRILL ROD 88.1 FT TOTAL Revision 14 12/82		

NO SAMPLES RETAINED STRATIGRAPHY IDENTIFIED FROM DRILLED CUTTINGS & DRILLING CONDITIONS

N/A

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LOG OF BORING .. DSB-A2.

SHEET 6.. OF 12...

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penetr resist bl/6in		
478	GRAY LOW PLASTIC <u>SILTY CLAY</u> (CL)	87					ADD 2.0 FT DRILL ROD 90.1 FT TOTAL	
		88						
		89					PULL 4.0 FT OF DRILL ROD ADD 5.0 FT DRILL ROD 91.1 FT TOTAL	
		90					ADD 2.0 FT DRILL ROD 93.1 FT TOTAL	
473.0		91					EMPTY MUD TUB OF CUTTINGS & DRILLING MUD. ADD 40 GALS WATER FLUSH BORING EMPTY MUD TUB ADD ~ 25 GALS WATER FOR DRILLING MUD	
	BROWN GRAY MED PLASTIC <u>SILTY CLAY</u> (CL)	92					ADD 2.0 FT DRILL ROD 95.1 FT TOTAL	
		93						
		94					PULL 4.0 FT OF DRILL ROD ADD 5.0 FT DRILL ROD 96.1 FT TOTAL	
		95					ADD 2.0 FT DRILL ROD 98.1 FT TOTAL	
483.0		96						
	GRAY-BROWN GRAY MED PLASTIC <u>SILTY CLAY</u> (CL)	97					ADD 2.0 FT DRILL ROD 100.1 FT TOTAL	
		98						
		99					PULL 4.0 FT OF DRILL ROD ADD 5.0 FT DRILL ROD 101.1 FT TOTAL	
		100					ADD 2.0 FT DRILL ROD 103.1 FT TOTAL	
483.0		101						
		102						
		103					ADD 2.0 FT DRILL ROD 105.1 FT TOTAL	
	D.1-1,280	103					Revision 14 12/82	
480.0	GRAY MED PLASTIC <u>SILTY CLAY</u> (CL)	104					PULL 4.0 FT OF DRILL ROD ADD 5.0 FT DRILL ROD 106.1 FT TOTAL	

NO SAMPLES RETAINED STRATIGRAPHY IDENTIFIERS FROM DRILLED CUTTINGS & DRILLING CONDITIONS

N/A

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LOG OF BORING . 553-15.

SHEET 7.. OF 12...

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	C B L
			no. loc	type	recov.	penet. resist. bl/6in		
480.0	GRAY MED-LOW PLASTIC <u>SILTY CLAY</u> (CL)	105					ADD 2.0 FT DRILL ROD 108.1 FT TOTAL	
		106						
		107					ADD 2.0 FT DRILL ROD 110.1 FT TOTAL	
	COBBLES <	108						
475		109					PULL 4.0 FT OF DRILL ROD ADD 5.0 FT DRILL ROD 111.1 FT TOTAL EMPTY MUD TUB OF DRILLING FLUID & CUTTINGS ADD ~ 25 GALS WATER FOR DRILLING	
		110					ADD 2.0 FT OF DRILL ROD 113.1 FT TOTAL	
	GRAY LOW PLASTIC <u>SILTY CLAY</u> (CL)	111						
		112					ADD 2.0 FT DRILL ROD 115.1 FT TOTAL	
		113						
470		114					PULL 4.0 FT OF DRILL ROD ADD 5.0 FT DRILL ROD 116.1 FT TOTAL	
		115					ADD 2.0 FT DRILL ROD 118.1 FT TOTAL	
	GRAY MED PLASTIC <u>SILTY CLAY</u> (CL)	116						
		117					ADD 2.0 FT DRILL ROD 120.1 FT TOTAL	
		118						
465		119					PULL 4.0 FT DRILL ROD ADD 5.0 FT DRILL ROD 121.1 FT TOTAL	
		120					ADD 2.0 FT DRILL ROD 123.1 FT TOTAL	
		121						
462.0	GRAY MED. PLASTIC <u>SILTY CLAY</u> D.1-1,281 (CL)	122						

NO. SAMPLES RETAINED STRATIGRAPHY IDENTIFIED FROM DRILLED CUTTINGS & DRILLING CONDITIONS

N/A

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12/82

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LOG OF BORING ..DSB:45.

SHEET 2 OF 12...

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc.	type	recov.	percent loss 1/2" dia 17/64"		
462.0								
	GRAY MED PLASTIC SILTY CLAY (CL)	123					ADD 2.0 FT DRILL ROD 125.1 FT TOTAL	
		124					PULL 4.0 FT DRILL ROD ADD 5.0 FT DRILL ROD 126.1 FT TOTAL	
		125					ADD 2.0 FT DRILL ROD 128.1 FT TOTAL	
		126						
457.0		127					ADD 2.0 FT DRILL ROD 130.1 FT TOTAL	
		128						
		129					PULL 4.0 FT DRILL ROD ADD 5.0 FT DRILL ROD 131.1 FT TOTAL	
	GRAY PLASTIC SILTY CLAY w/ OCCASIONAL M-F SAND (CL)	130					ADD 2.0 FT DRILL ROD 133.1 FT TOTAL	
		131						
452.0		132					ADD 2.0 FT DRILL ROD 135.1 FT TOTAL	
		133						
		134					EMPTY AUG THIS WATER LEVEL 125 FT DOWN FROM TOP OF TUB END OF SHIFT 12 FEET	
		135					START OF SHIFT 11 FEB 82. WATER LEVEL OVER FLOWING MUSTHS. PUMPED OUT EXCESS, FLUSHED BORING FOR 10 MIN. PULLED DRILL RODS (NOTE: DRILL RODS BECAME HUNG UP FROM ~90.0 FT TO ~50.0 FT. DRILLER THIS RECORDED BORING & FLOWED FROM 50.0 FT TO THE PRESENT BOTTOM.) BEGAN INSTALLATION OF PERMANENT CASING. SEE NOTE 1 (SHEET 11) PERMANENT CASING SET TO EL. 449.04 NEW BIT 2 5/8" IN Ø, 1.117" LONG TRICO CONE LBLR SET BIT + 135 FT CASE 136.1 FT TOTAL.	
	GRAY PLASTIC SILTY CLAY (CL)	135					© 135 FT ADD 2.0 FT DRILL ROD 138.1 FT TOTAL DRILL RATE INCREASED SUBSTANTIALLY © 136.2 FT. NOTES SAND IN CUTTINGS.	
		136					© 137 FT ADD 2.0 FT DRILL ROD 140.1 FT TOTAL	
447.0	LT GRAY NON PLASTIC FINE-V. FINE SAND w/ TR MED SAND, SILT, CLAY	137					Revision 14 12/82	
		138					PULL 4.3 FT DRILL ROD ADD 5.0 FT DRILL ROD 141.1 FT TOTAL	
		139						
		140					© 139.9 DRILL RATE SLOWS DOWN	

NO SAMPLES RETAINED STRATIGRAPHY IDENTIFIERS FROM DRILLED CUTTINGS & DRILLING CONDITIONS

N/A

D.1-1,282

SAND  
CLAY



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LOG OF BORING . b55-A3.

SHEET 9 OF 12

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOW
			no. loc	type	recov.	penet. resist. BI/61R		
444.0								
	GRAY MED PLASTIC - PLASTIC SILTY CLAY w/ OCCASIONAL F-F SAND (CL)	141					ADD 2.3 FT DRILL ROD 143.4 FT TOTAL	
		142						
		143					ADD 2.0 FT DRILL ROD 145.4 FT TOTAL	
		144						
439.0		145					PULL 4.3 FT OF DRILL ROD ADD 5.0 FT DRILL ROD 146.1 FT TOTAL	
	GRAY MED PLASTIC SILTY CLAY (CL)	146					ADD 2.3 FT OF DRILL ROD 148.4 FT TOTAL	
		147						
		148					ADD 2.0 FT DRILL ROD 150.4 FT TOTAL	
		149					PULL 4.3 FT OF DRILL ROD ADD 5.0 FT 151.1 FT TOTAL END OF SHIRT 19 FEET 22 WATER 26 FT START OF SHIRT 20 FEET 92 WATER OVERFLOW 0.4 FT OF STOUGH IN BORING MUD THIS	
434.0	GRAY MED PLASTIC SILTY CLAY (CL)	150					ADD 2.3 FT DRILL ROD 153.4 FT TOTAL	
		151						
		152					ADD 2.0 FT DRILL ROD 155.4 FT TOTAL	
		153						
		154					PULL 4.3 FT OF DRILL ROD ADD 5.0 FT DRILL ROD TOTAL 156.1 FT	
429.0		155					ADD 2.3 FT DRILL ROD 158.4 FT TOTAL	
		156						
	D.1-1,283	157					ADD 2.0 FT DRILL ROD 160.4 FT TOTAL	
	GRAY MED PLASTIC - PLASTIC SILTY CLAY (CL)	157					Revision 14	
426.0	BOTTOM OF CLAY	158					12/82	

NO SAMPLES RETAINED STRATIGRAPHY IDENTIFIED FROM DRILL CUTTINGS & DRILLING CONDITIONS

N.Y.

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LOG OF BORING . DSA-49.

SHEET 10 OF 12

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penetration vesicles bl/6 in		
426.0	TOP OF GRAVEL GRAVEL →							
	LT GRAY NON PLASTIC FINE-V. FINE SAND W/ TR GRAVEL, MED SAND, SILT (SP)	157-160						
		161						
		162						
421.0	GRAY NON PLASTIC FINE SAND W/ TR MED. SAND, SILT (SP) LAST 1/2" OF SAND IS GRAY LOW PLASTIC SILTY CLAY (CL)	163	5-1	55	100			
		164						
		165						
		166						
		167						
416.0		168						
		169						
		170						
		171						
		172						
411.0		173						
		174						
		175						
408.0		176						

NO. SAMPLES TAKEN  
SPENT/CASING - FROM CUTTING  
100  
5-1  
55  
25/0.5 FT

HIT GRAVEL & SAND @ 158 FT  
PULL 4.3 FT OF DRILL ROD ADD 5.0 FT DRILL ROD  
161.1 FT TOTAL  
ADD 2.3 FT DRILL ROD 163.4 FT TOTAL  
163.4  
STOP RUN W/ 0.9 FT STICK UP  
PRESENT DEPTH 162.5 FT RUSH BORING FOR 15 MIN  
CL DEPTH W/ RODS. SAME. PULL RODS & REMOVE  
1.1 FT BIT ADD 3.5 FT. SAND & SET SPOON &  
160 FT. RODS 163.5 FT TOTAL  
1.0 STICK UP  
162.5 START OF 173000  
SAMPLING  
REFURAL MET: 100 BLOWS / 0.304  
PULL ROD. SAND HAS 0.44 SILT IN  
TOP. SET 2 1/2" BIT 11" LONG + 160 FT RODS  
TO 158 FT DEPTH. GRAVEL LAYER COLLAPSING  
SEE NOTE # 2

BORING ABANDONED DUE TO  
ARTESIAN CONDITIONS.

N/A

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LOG OF BORING D50-AS

SHEET 11 OF 12

NOTES

NOTE # 1

PERMANENT CASING INSTALLATION: BOTTOM OF DRILLING 133.8 FT = EL. 450.2

<u>AREA:</u>	<u>FLOOR EL.</u>	<u>SBY</u>	<u>SET:</u>	<u>TOP OF CASING</u>	<u>EL. SBY. BY</u>
				(PAINTED)	
		562	- 22 FT MIN PAINTED		- 25 FT PAINTED
				BOTTOM OF PAINTED 559.84	
				TOP OF UNPAINTED	
		450	- 112 FT UNPAINTED		- 110 FT UNPAINTED
				BOTTOM OF CASING 449.84	

SET 110 FT UNPAINTED CASING (11 - 10.0 FT SECTIONS) THEN SET 25.0 FT OF PAINTED CASING (2 - 10.0 FT SECTIONS & 1 - 5.0 FT SECTION) TOTAL CASING SET 135.0 FT. SET TO EL. 450.4 AT DRIVE CASING W/ 3/16 15 HAMMER 9.3 FT (9 FEET TO SEAT CASING FINAL BOTTOM OF CASING EL. 449.84 FT.

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NOTE # 2 DRILL RODS ARE HANGING UP ON THE GRAVEL ZONE. THE DRILLER

EMPTIES THE MUD TRO IN ORDER TO THICKEN UP DRILL MUD & FLUSH SPRING AS PER PROGRAM. ~ 40 GALS WATER WAS MIXED W/ A SOLID BAG OF ACETAMIDE IN A 55 GAL DRUM. PRIOR TO PLACEMENT OF THIS NEW DRILLING FLUID INTO THE MUD TRO, DRILLER & WELL INSPECTOR

NOTED A SMALL INFLOW OF WATER UP THROUGH THE 2 IN ID PERMANENT CASING WATER FLOW @ THIS TIME 2-3 GPM. (ARTESIAN CONDITION) DRILLER ADDED NEW DRILL FLUID TO MUD TRO & TURNED RODS W/ DRILL

RIG DOWN TO TOP OF SPIT SPOON RUN (162.5 FT DEPTH) THE WATER FLOW UP THROUGH THE CASING CONTINUED TO INCREASE PUSHING THE HEAVY DRILL MUD OUT OF THE 2 IN CASING. THE WATER WAS ALSO BRINGING UP FINE - VE NONPLASTIC SAND WELL DIRECTED DRILLER TO PULL THE DRILL RODS WHILE GOING TO NOTIFY D. SICARD CEO OF PRESENT CONDITIONS. DRILLER

REPORTED HE PULLED THE DRILL RODS IN ~ 15 MIN. HE ESTIMATED WATER INFLOW @ THIS TIME TO BE ~ 15-20 GPM. DRILLER ADDED 17 FT OF 2 IN ID CASING TO MEET HYDROSTATIC HEAD & STOP FLOW OF WATER & SAND. WATER FLOW CALD @ THIS TIME BY WELL INSPECTOR

FOUND TO BE 74 GALLON/MINUTE W/ LITTLE SAND. A 3 IN RUBBER COMPRESSED AIR PUMP WAS PLACED IN THE TOP OF CASING TO STOP WATER FLOW COMPLETELY. NEW T.O.C. 601.84 FT

THE SAND THAT HAD BEEN BROUGHT UP COLLECTED IN THE MUD TRO & WAS CALCULATED TO BE ~ 29 GALS. (3.87 FT<sup>3</sup>) D. SICARD DIRECTED WELL TO LEAVE BORING AS IS UNTIL CONDITIONS CAN BE

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LOG OF BORING D50-AS

SHEET 12 OF 12

NOTES

NOTE # 2 CONT.

EVALUATED BY CFCO & BECHTEL ENGINEERING.

NOTE # 3

22 FEB 82 J. SIBBALD CFCO CONCURRED, W/ BECHTEL ENGINEERING AS TO PRESENT CONDITIONS. J. SIBBALD THEN DIRECTED WGL TO ABANDON THIS BENCHMARK BOREHOLE. HE REPORTED THAT BECHTEL WILL PERFORM REMEDIAL TREATMENT TO FILL BOREHOLE (PRESSURE GROUT). A NEW LOCATION WILL BE LOCATED BY BECHTEL SURVEY SO THAT A BENCHMARK CAN BE INSTALLED IN THIS AREA. THE 3"  $\phi$  CASING, 5" ID CASING (TEMPORARY) & THE MUD PYS WILL REMAIN IN PLACE UNTIL AFTER BECHTEL COMPLETES REMEDIAL TREATMENT (GROUTING) TO STOP THE ARTESIAN FLOW.

Boring log revised: John R. Hise  
5/27/82

APPROVAL TO ABANDON BORING AS DESCRIBED *Ronald E. [Signature]* CFCO

BECHTEL PERSONNEL DIRECTED & PERFORMED GROUTING OF D50-AS ON 3/5/82 & ON 5 APRIL 82. GROUTING WAS COMPLETED @ THE TOP OF 3IN  $\phi$  NEW CASING SEE BECHTEL FIELD ENGINEERING REPORTS.

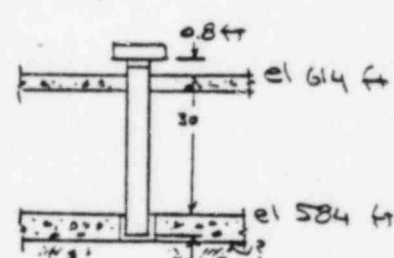
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LOG OF BORING ~~DR-441~~

SHEET 1 OF 11

project <b>MIDLAND NUCLEAR PROJECT - BENCHMARKS</b>	project no. <b>81C217-24</b>
location <b>MIDLAND, MICHIGAN</b>	elevation & datum <b>el 584.0 ft USGS</b>
drilling agency <b>D &amp; G DRILLING</b>	date started <b>1 APRIL 1982</b> date finished <b>5 APRIL 1982</b>
drilling equipment <b>ACKETE SKID TRIG</b>	completion depth <b>154.5 ft FROM 584.0 FLOOR ELEV.</b> rock depth <b>N/A</b>
size & type of bit <b>4 3/4" TRUSS END   4 1/2" CORE   3 3/4" DRAG   2 3/4" 1 1/2" CORE</b>	no. samples dist.   undist.   core <b>N/A   N/A   N/A</b>
casing <b>5 IN ID COPPER 4 IN ID PLUSH JOINT (TRAP) 3 IN ID PLUSH JOINT (TRAP)</b>	water level first compl.   24 hr <b>N/A   N/A   N/A</b>
casing hammer: <b>N/A</b> weight <b>N/A</b> drop <b>N/A</b>	driller <b>BARRY THOMASSEN &amp; LARRY KUBITZ</b>
sampler <b>2 IN Ø SPLIT SPOON</b>	supervisor <b>JOHN SEYMOUR &amp; LUCE HERRERTMAN</b>
sampler hammer: <b>#3</b> weight <b>140 lbs</b> drop <b>30 in</b>	

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penetr resist bl/6in		
584	(BORING DRILLED FROM SLAB @ el 614.0)	1					APPROVAL TO ADVANCE BORING: <i>Donald White</i> / CFC	
	CONCRETE SLAB	2					NOTE #1 BENTONITE CORED 8 IN Ø HOLE FROM SLAB @ el 584 & 614. 5 IN Ø TEMP CASING INSTALLED AS SHOWN:	
580	(BOTTOM NOT DETERMINED BY WCC, CORED BY BENTONITE)	3						
		4						
		5						
		6						
		7						
		8						
		9						
575		10					BORING WILL BE DRILLED FROM 614 SLAB TO AVOID ARTESIAN WATER PRESSURE AT el 425 ft.	
		11					4 3/4" Ø TRUSS CORE, 1.1 ft LONG, 45 ft ROD, 46.1 TOTAL CO START	
		R						
		13					Revision 14 12/82	
	D.1-1,287 BOX OF BENTONITE CORE	14					← 46.1 ft TOTAL, TOP ROD @ el 616.6	
570	DRILLER INDICATES CLAY, SOME FINE SAND IN CUTTING							

6 IN Ø CONCRETE CORE

N/A

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LOG OF BORING ~~DB-ASL~~

SHEET 2 OF 11...

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. log	type	recov.	penet. resist. bl/6in		
	GRAY LOW PLASTICITY SILTY CLAY (CL) (CLASSIFIED FROM BIT CUTTING WHEN CHANGING BITS)	15-16						
		17-18						
535		19				→ Add 5.0 ft 30.8 ft TOTAL DRILL STEEL (TOP OF ROD at 616.0 @ change)		
	GRAY LOW PLASTICITY SILTY CLAY TO FINE SAND (CL)	20-21				NOTE THE PLUG COMING OUT OF CORED HOLE IN el 584 SLAB, ~ 6 ft AWAY FROM DB-ASL.		
		22				INSTALL 5.0 ft of 4 in. φ CASING & CHANGE TO 3/4 in. DRILL BIT, 0.9 ft LONG, 30.2 ft TOTAL DRILL STEEL		
		23				→ BOTTOM OF 4 in. φ CASING REPLACE LOOSEND THE PLUG DRILLING @ 10:30 pm		
560		24				→ Add 5.0 ft 35.2 ft TOTAL DRILL ROD (10:40 pm)		
	GRAY LOW PLASTICITY SILTY CLAY TO FINE SAND (CL)	25-26						
		27				@ 10:50 NOTICED WATER COMING OVER TOP OF 3 in. φ CASING @ DB-AS @ el 589.8 @ 1 gpm CA. - LITTLE LOSS OF DRILLING MUD BETWEEN 4 & 5 in. φ CASING. SEE NOTE #1		
		28						
555		29				→ Add 5.0 ft 40.2 ft TOTAL DRILL STEEL (11:15 pm)		
	GRAY LOW PLASTICITY SILTY CLAY SOME FINE SAND (CL)	30-31						
	FINE TO MEDIUM COARSE SAND W/ SOME COARSE GRAVEL (SP)	32				11:20 pm NO LOSS OF DRILLING FLUID & LESS FLOW @ DB-AS.		

No SAMPLES RETAINED  
 SOIL CLASSIFICATION FROM DRILLED CUTTINGS & DRILLING CONDITIONS

N/A

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LOG OF BORING DSB-AS1.

SHEET 3 OF 11.

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penet. resist bl/6in		
550	TR. MED QUARTZ SAND, ANGULAR	33						
		34						
	GRAY LOW PLASTICITY SILTY CLAY w/ SOME FINE SAND (CL)	35						
		36						
		37						
		38						
545		39						
	GRAY LOW PLASTICITY SILTY CLAY w/ SOME FINE TO V. FINE SAND (CL)	40						
		41						
		42						
		43						
540		44						
		45						
		46						
		47						
	- ? - BROWN FIBROUS ORGANIC, OORLESS - ? -	48						
		49						
535	GRAY LOW PLASTICITY V. SILTY CLAY, TR. FINE SAND (CL)	50						

NO SAMPLES RETAINED  
SOIL DESCRIPTION FROM DRILLED CUTTINGS  
DRILLING CONDITIONS

N/A

DRILLER INDICATES COARSE SAND w/ SOME GRAVEL at 552.8 to 551.3. CUTTINGS SHOW FINE TO MEDIUM COARSE SAND.

↑ Add 5.0 ft  
65.9 ft TOTAL DRILL STEEL  
(11:45 am)

11:55 AM LAYED 0.25 ft DOWN FROM TOP OF 3.125" CASING (TOP @ CL 549.8) IN DSB-AS

↑ Add 5.0 ft  
70.9 ft TOTAL DRILL STEEL  
(12:15 pm)

↑ Add 5.0 ft  
75.9 ft TOTAL DRILL STEEL  
(12:50 pm)  
THIN MUD & CLOTH MUD TRAP. DOG FRESH WATER


↑ Add 5.0 ft  
80.9 ft TOTAL DRILL STEEL  
(1:25 pm)

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LOG OF BORING DSB-ASL

SHEET 4 OF 11

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penet resist bl/6in		
51	GRAY LOW PLASTICITY V. SILTY CLAY, w/ LITTLE F. SAND (CL)	51						5 in. φ casing between 50 1/4 & 51 SBH WORKING SLIGHTLY.
52		52						Add ~ 5 gal WATER TO MUD TANK
53		53						Add 5.0 ft
54		54						85.9 ft TOTAL DRILL STEEL (2:00 am)
55	GRAY LOW PLASTICITY V. SILTY CLAY, w/ LITTLE F. SAND (CL)	55						
56		56						
57		57						Add ~ 3 gal WATER
58		58						Add 5.0 ft
59		59						90.9 ft TOTAL DRILL STEEL (2:35 am)
60	GRAY LOW PLASTIC SILTY CLAY w/ OCCASIONAL F. SAND. (CL)	60						END NIGHT SHIFT MUD 0.06 ft ABOVE TOP OF PAV. 
61		61						6:00 AM START OF DRY SHIFT 2 AM MUD LEVEL TOP OF 4 IN. φ CASING NONE IN 5 IN. φ CASING
62		62						
63		63						
64		64						EMPTY MUD TUB OF CUTTINGS & DRILLING FLUID. ADD 25 GALS WATER TO MUD TUB. ← ADD 5.0 FT
65		65						95.9 FT TOTAL DRILL STEEL
66	GRAY LOW PLASTIC SILTY CLAY w/ TR. SOME FINE-MED ANGULAR SAND (CL)	66						
67		67						
68		68						

NO SAMPLES RETAINED  
 SOIL DESCRIPTION FROM DRILLED CUTTINGS & DRILLING  
 CONDITIONS.

N/A



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LOG OF BORING DSO-AS.1.

SHEET 5. OF 11.

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penet. resist. BI/61R		
515	GRAY LOW PLASTIC <u>SILTY CLAY</u> w/ TR. MED-FINE SAND (CL)	69						
		70						
		71						
		72						
		73						
510	GRAY-BROWNISH GRAY LOW PLASTIC <u>V. SILTY CLAY</u> w/ OCCASIONAL MED-FINE SAND (CL)	74						
		75						
		76						
		77						
		78						
505	GRAY-BROWNISH GRAY LOW PLASTIC <u>V. SILTY CLAY</u> w/ OCCASIONAL MED-FINE SAND (CL)	79						
		80						
		81						
		82						
		83						
500	GRAY-BROWNISH GRAY LOW PLASTIC <u>SILTY CLAY</u> w/ TR. MED-FINE SAND (CL)	84						
		85						
		86						

NO SAMPLES RETAINED  
SOIL DESCRIPTION FROM DRILLS & CUTTINGS & DRILLING CONDITIONS.

N/A

← ADD 5.0 FT  
100.9 FT TOTAL DRILL STEEL

FAST DRILLING RATE

← ADD 5.0 FT  
105.9 FT TOTAL DRILL STEEL

FAST DRILLING RATE

EMPTY MUD TUB OF CUTTINGS & DRILLING MUD ADD 25 GAL. WATER TO MUD TUBS.

← ADD 5.0 FT  
110.9 FT TOTAL DRILL STEEL (8:30 AM)

FAST DRILLING RATE

← ADD 5.0 FT  
115.9 FT TOTAL DRILL STEEL (9:20 AM)

D.1-1,291

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LOG OF BORING .DSB-A51

SHEET 6. OF 11...

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penet resist bl/6in		
495	GRAY - BROWNISH GRAY LOW PLASTIC V. SILTY CLAY w/TR MED-FINE ANGULAR SAND (CL)	87-88					FAST DRILLING RATE	
490	GRAY - BROWNISH GRAY LOW-MED PLASTIC SILTY CLAY w/TR MED-FINE SAND (CL)	89-92					← ADD 5.0 FT 120.9 FT TOTAL DRILL STEEL  FAST DRILLING RATE	
485	GRAY - BROWNISH GRAY MED. PLASTIC SILTY CLAY w/TR FINE -MED SAND (CL)	93-97					← A N 1.5 FT LONG CIRCULAR CLUMP OF SILTY CLAY WAS PUSHED UP AROUND RODS & OUT OF THE BORING BY DRILLING MUD ← ADD 5.0 FT 125.9 FT TOTAL DRILL STEEL  ← A SECOND CLUMP OF SILTY CLAY ~ 0.6 FT LONG WAS PUSHED UP OUT OF THE BORING BY DRILLING MUD. WLL INSPECTOR CONCURRED W/ DRILLER, BOTH AGREE THAT THE FAST DRILLING RATE & MED PLASTIC SOIL ARE CAUSING THIS CONDITION, THUS DRILLER WILL SLOW DRILLING RATE DOWN ← A 2.3 FT LONG CLUMP OF SILTY CLAY WAS PUSHED OUT ADD 5.0 FT 130.9 FT TOTAL DRILL STEEL  EMPTY MUD TUB OF CUTTINGS & DRILLING MUD. ADD FRESH WATER & FLUSH BORING. FILL MUD TUBS W/ ~ 25 GALS WATER.	N/A
480	GRAY MED PLASTIC SILTY CLAY w/TR. MED-FINE SAND (CL)	98-102						

NO SAMPLES RETAINED  
 SOIL DESCRIPTION FROM DRILLED CUTTINGS & DRILLING CONDITIONS.

D.1-1,292

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LOG OF BORING . D.S.B - A51

SHEET 7.. OF . 11.

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penet resist bl/6in		
	GRAY MED PLASTIC <u>SILTY CLAY</u> w/ TR. MED - FINE SAND  (CL)	105 106 107 108					ADD 5.0 FT 135.9 FT TOTAL DRILL STEEL	
475	GRAY MED PLASTIC <u>SILTY</u> <u>CLAY</u> w/ TR MED-FINE SAND  (CL)	109 110 111 112					ADD 5.0 FT 140.9 FT TOTAL DRILL STEEL	
470	GRAY MED PLASTIC <u>SILTY</u> <u>CLAY</u> w/ TR MED-FINE SAND  (CL)	113 114 115 116					ADD 5.0 FT 145.9 FT TOTAL DRILL STEEL	N/A
465	GRAY MED-LOW PLASTIC <u>SILTY CLAY</u> w/ OCCASIONAL FINE-MED SAND  (CL)	117 118 119 120 121 122					ADD 5.0 FT 150.9 FT TOTAL DRILL STEEL  EMPTY MUDTUB OF CUTTINGS & DRILLING MUD. FLUSH BORING w/ FRESH WATER. EMPTY MUD TUB. ADD ~ 25 gals FRESH WATER TO MUDTUB. Revision 14 12/82	

ALL SAMPLES RETAINED  
 SOIL DESCRIPTIONAL FROM ARILLED CUTTINGS & DRILLING  
 CONDITIONS

D.1-1,293

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LOG OF BORING DSB:AS1.

SHEET 3 OF 11...

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penet. resist bl/bin		
460	GRAY MED-LOW PLASTIC <u>SILTY CLAY</u> w/ OCCASIONAL MED-FINE SAND (CL)	123-124						
455	GRAY MED-LOW PLASTIC <u>SILTY CLAY</u> w/ TR. MED FINE SAND (CL)	125-129						
450		130-135						
445	GRAY LOW PLASTICITY <u>SILTY CLAY</u> (CL)	136-140						

NO SAMPLES RETAINED  
Soil Description from Cuttings & Drilling Conditions

← ADD 5.0 ft  
155.9 ft TOTAL DRILL STEEL

← DRILL TO 128.6 FT FULL RODS  
& BEGIN TO SET CASING -  
END OF DAYSHIRT WATER  
LEVEL 0.1 FT BELOW CASING.  
← SENOTE #2 & NOTE #4  
3 in. φ IX CASING DRIVEN  
TO el 454.5. STICKING  
UP 0.2 FT ABOVE el 614.0 ft

END NIGHT SHIFT @ 8:50 PM  
(SEE NOTE #2)  
BECAUSE PCR-C-3722  
STATES THAT DSB-AS1 CANNOT  
BE ADVANCED BELOW el 500  
WITH DSB-AS 16 GROUDED. HND  
LEVEL 0.15 FT BELOW CASING.  
MORNING, START @ 4:30 PM, HND  
LEVEL 0.15 FT BELOW CASING  
NOTE #3  
SWITCH TO 2 1/2 in. φ  
TRicone, 1.1 ft LONG  
161.1 ft TOTAL DRILL STEEL  
(5:15 PM)  
166.1 ft TOTAL DRILL  
STEEL (6:05 PM)

N/A

Revision 14  
12/82

← 171.1 ft TOTAL DRILL STEEL  
(7:05 PM)

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LOG OF BORING USB-AS1

SHEET 9 OF 11

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOW
			no. loc	type	recov.	penetr resist bl/6in		
440	GRAY TO BROWNISH-GRAY LOW TO MEDIUM PLASTICITY <u>SILTY CLAY</u> , TR F. TO C. SAND  (CL)	141						
		142						
		143						
		144					POD 5.0 ft 176.1 ft TOTAL DRILL STRENGTH (7:50 PM)	
		145						
		146						
		147						
		148						
435		149					POD 5.0 ft 181.1 ft TOTAL DRILL STRENGTH (8:40 PM)	
		150						
	151							
	152							
431.5	S-1 4 SAMPLES RETAINED 152.5-152.85 } GRAY TO BROWNISH 152.85-153.20 } GRAY LOW TO MED 153.20-153.55 } PLASTICITY SILTY 153.55-153.85 } CLAY (CL) TR F. SAND	153	S-1	SPT	1-3/16"	24	PP=3.875#	
		154				34	PP=7.575#	
430		154				41		
		155						
429		155						
		156						
		157						
		158						

NO SAMPLES RETAINED  
SOIL DESCRIPTION FROM DRILLED CUTTINGS & DRILLING  
CONDITIONS.

N/A

B.O.H. 154.5A EL 429.5  
FLUSH BORING W/ DRILL RAGS FOR ~ 10 MIN.  
THIN MUD THROUGH LINE  
BEHIND RIGS. PUMPED  
MUD THROUGH & FLUSHED  
BORING W/ 2% BENTONITE  
& SUGAR WATER SLURRY  
SEE BENCHMARK INSTALLATION  
DATA SHEET FOR COMPLETION  
AT BENCHMARK. Revision 14

D.1-1,295

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LOG OF BORING DSB-AS1

BORING

SHEET 10 OF 11

NOTES

\*1 DAY SHIFT ADDED WATER TO 5in.  $\phi$  CASING & IT DRAINED INTO SOIL BETWEEN FOUNDATION SLAB, TOP of SB4. DRILLER REPORTED WATER LEVEL IN 3in.  $\phi$  CASING OF DSB-AS (~74 NORTHWEST) ROSE & WATER FLOWED OVER THE TOP OF THE CASING @ el 599.8. (WELL LOGS INDICATE GROUNDWATER TO BE BETWEEN el 572 & 605)

NIGHT SHIFT MIXED 25lb. BENTONITE w/ 40gal WATER & ADDED IT TO 5in.  $\phi$  CASING. SOME INITIAL LOSS OF FLUID NOTED & THEN FLUID LEVEL STABILIZED. AS THE SHIFT PROCEEDED, DROPS IN DRILLING FLUID LEVEL WERE NOTED WITH A RISE IN WATER LEVEL IN THE 3in.  $\phi$  CASING OF ABANDONED DSB-AS.

#2 FCR-C-3722, ISSUED 26 MARCH '82 PROHIBITED DSB-AS1 FROM BEING DRILLED BELOW el 500 UNTIL DSB-AS IS COMPLETELY GROUTED. DSB-AS IS PRESENTLY (24882) ONLY PLUGGED TO ~ el 449.5. DRILLING WAS STOPPED WHEN WCC WAS NOTIFIED OF THE EXISTENCE OF FCR-C-3722. BORE HOLE WAS CASED w/ 3in  $\phi$  NEW CASING (STABILIZE HOLE) TO PRESENT DRILLED DEPTH el 454.5 (CASING WENT DOWN BORE HOLE EASILY)

#3 DSB-AS WAS GROUTED COMPLETELY BY RECHTEL ON MONDAY MORNING 5 APRIL 1982. DRILLING CAN NOW CONTINUE ACCORDING TO FCR-C-3722 & PER DONALD SIBBALD, CACO.

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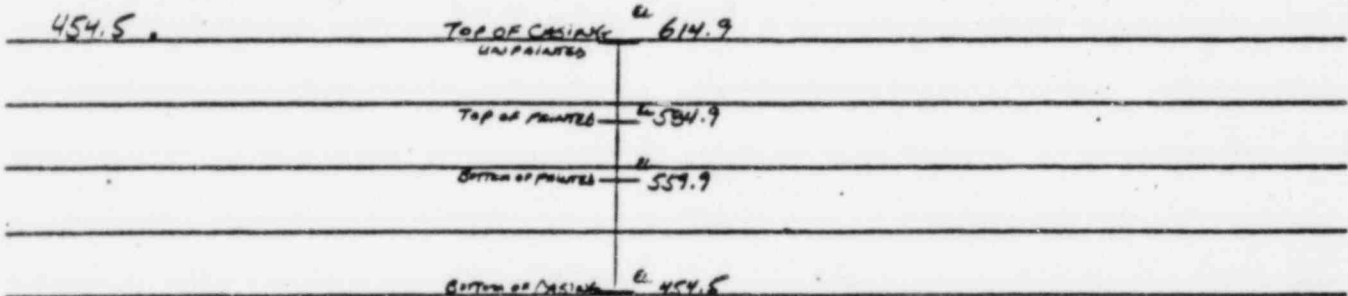
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LOG OF BORING DSB-AS1

SHEET 11 OF 11

NOTES

#4 PERMANENT CASING: PLACED 0.4 FT SAW TOOTHED DRIVE SHOE ON BOTTOM OF 3 IN  $\phi$  NEW CASING. SET 105.4 FT UNPAINTED CASING (10-10.0 FT SECTIONS + 1-5.0 FT SECTION + 0.4 FT SHOE.) THEN SET 25.0 FT PAINTED CASING (5-5.0 FT SECTIONS). THEN SET 30.0 FT UNPAINTED CASING (3-10.0 FT SECTIONS) TOTAL CASING 160.4 FT. BOTTOM OF CASING SET TO ELEV 454.5.



#5 AS NOTED IN NOTE #2 THE BORING WAS CASED W/ 3 IN  $\phi$  NEW CASING, AFTER RECEIVING WORD OF EXISTING FCR-C-3722<sup>+</sup>, TO STABILIZE CORE HOLE. THE WATER LEVEL IN THE CASING WAS MONITORED AS WELL AS DEPTH OF BORE HOLE. WORK WAS STOPPED AT THIS TIME UNTIL MON 5 APRIL 82 4:00 PM.

(BECHTEL PERSONNEL HAD COMPLETED GROUTING OF DSBAS ON MON 5 APRIL 82 11:00 AM) THE DRILLING FLUID LEVEL WAS CHECKED & FOUND TO BE 0.05 FT BELOW FRIDAYS READING. THE DEPTH OF THE CORE HOLE WAS UNCHANGED. DURING GROUTING OF DSB-AS NO RISE OR LOSS OF DRILLING FLUID WAS NOTED IN BORING DSB-AS1. ALL OF THESE FACTS INDICATE THAT THE NON COMPLIANCE CONDITION FROM FCR-C-3722 (DRILLING BELOW EL 500.0 PRIOR TO COMPLETION OF GROUTING IN DSB-AS) HAS CAUSED NO NEGATIVE OR DETRIMENTAL CONDITIONS FOR THE DSB-AS1 BENCHMARK.

Boring Log Reviewed: *John R. Heick*

5/24/82

D:1-1,297

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12/82

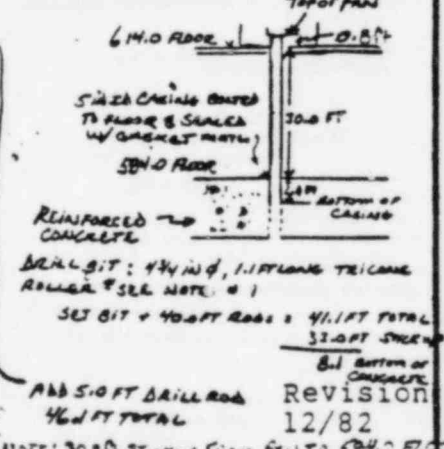
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LOG OF BORING. DSB-7492

SHEET 1 OF 11

project	MIDLAND NUCLEAR PLANT	project no.	BIC 217-24
location	MIDLAND MICHIGAN	elevation & datum	+584.0 USGS
drilling agency	D & G DRILLING CO.	date started	30 MARCH 82
drilling equipment	ACKER SKID RIG	date finished	31 MARCH 82
size & type of bit	4 3/4" IN. 2 1/2" DIA. 4 1/2" DIA. 2 5/8" DIA. TRICONE	completion depth	159.3 ft FROM EL. 584 FLOOR N/A
casing	5" ID (TEMPORARY) 3" ID NEW FLASH TIGHT (PERMANENT)	rock depth	N/A
casing hammer: # 2	weight 310 lb drop 24 in.	no. samples	dist. 1 undist. 0 core N/A
sampler	SPLIT SPOON	water level first	N/A compl. N/A 24 hr N/A
sampler hammer: # 3	weight 140 lbs drop 30 in.	driller	LARRY KODITEK / BARRY THOMPSON
		supervisor	LUKE L. HEFFERNAN / JOHN SPANNAUER

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc.	type	recov.	penet. resist. BI/6in		
584.0								
	REINFORCED CONCRETE (CORED BY BECHTEL)	1-2					APPROVAL TO ADVANCE BORING <i>Donald K. Gibbels</i> CPE	
		3-4					BECHTEL PERSONNEL CORED AN 8 IN Ø HOLE THROUGH THE 614.0 FLOOR SLAB ~ 1.6 FT THICK @ BECHTEL SURVEY LOCATION. ANOTHER HOLE WAS CORED, 6 IN Ø, THROUGH THE 584.0 FLOOR SLAB BY BECHTEL PERSONNEL. THIS CORE HOLE WAS LOCATED @ A BECHTEL SURVEY LOCATION DIRECTLY BELOW THE 8 IN Ø CORE HOLE IN 614.0 FLOOR SLAB.	
579		5-8					D & G SET DRILL RIG UP OVER 8 IN Ø CORE HOLE @ 614.0 FL. ELEV. RIG WAS CENTERED OVER THE HOLE & LEVELED UP TO ASSURE A VERTICAL HOLE WOULD BE DRILLED. DRILLER SET 32.9 FT 5 IN ID CASING W/ ANN ON TOP. SET MUD TUB OVER CASING & SEALED OFF BOTTOM. SEALED OFF BOTTOM OF 5 IN CASING. TOP OF ANN	
		9-10						
574	LT GRAY NON PLASTIC V FINE-FINE SAND W/ TR SILT, OCCASIONAL M-C SAND. (SP)	10-14						
570.0	LT GRAY NON PLASTIC V FINE SAND W/ TR. SILT, OCCASIONAL M-C SAND (SP)	14					NO SAMPLES RETAINED SILT DESCRIPTION FROM CASINGS & DRILLING CONDITIONS	
							Revision 14 12/82	



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3 OF BORING .DSB.AS2

SHEET 2 OF 11

LEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES					REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BL
			no. loc	type	recov.	percent resist	bl/6in		
570									
	LT GRAY - GRAY NON PLASTIC SILTY F.V.F. SAND w/ SOME CLAY, TR. M.C. SAND	15						← STOP DRILLING PULL ROGS. CHANGE BITS. NEW BIT 4 1/2" DRAG BIT 0.9 FT LONG SET 45.0 FT ROGS + BIT = 45.9 FT TOTAL	
	(SM)	16						SLOW DRILLING RATE INDICATES VERY DENSE SAND SOIL.	
		17							
		18						* SEE NOTE 2	
565		19						← 2 ADD 5.0 FT DRILL ROD 50.9 FT TOTAL	
	LT GRAY NON PLASTIC FINE-V. FINE SAND w/ SOME TR. SILT, OCCASIONAL MED-COARSE SAND, CLAY	20							
	(SM)	21						SLOW DRILLING RATE	
		22							
	COBBLE	23							
560		24						ADD ~ 10 LBS BENTONITE TO MUD TO THICKEN MUD	
	LT GRAY - BROWN NON PLASTIC FINE-V. FINE SAND w/ SOME SILT TR. MED-COARSE SAND, CLAY	25						← 2 ADD 5.0 FT DRILL ROD 55.9 FT TOTAL	
	(SM)	26						ADD ~ 20 LBS BENTONITE TO MUD w/ 30 GALL. WATER TO THICKEN DRILLING MUD	
		27						SLOW DRILLING RATE.	
	COBBLE	28							
	SAND GRAIN SIZE BECOMING MED-FINE.	29							
555		29						← 2 ADD 5.0 FT DRILL ROD 60.9 FT TOTAL	
	COBBLES	30							
	D.1-1,299	31							
	GRAY NON PLASTIC - LOW PLASTIC CLAYEY SAND w/ TR. SILT, COARSE SAND, SAND IS MED-FINE	31						SLOW DRILLING RATE	
	(SC)	32							

NO SAMPLES RETAINED  
SOIL DESCRIPTION FROM DRILLED CUTTINGS & DRILLING CONDITIONS

N/A

Revision 14  
12/82


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LOG OF BORING ..DSB-ASZ

SHEET 3. OF 11...

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov. penet. resist. DI/6in			
530	GRAY LOW PLASTIC CLAYEY FINE SAND - SANDY CLAY w/ TR SILT MED SAND OCCASIONAL COARSE SAND (SC-LC) SANDY CLAYEY GRAVEL	33-34				ADD 5.0 FT OF DRILL ROD 65.9 FT TOTAL		
	BECOMING MORE CLAYEY	35						
545	GRAY LOW PLASTIC SILTY CLAY w/ SOME MED-FINE SAND, OCCASIONAL COARSE SAND (CL)	37-38				ADD 5.0 FT OF DRILL ROD 70.9 FT TOTAL		
	GRAY LOW-NON PLASTIC CLAYEY FINE SAND w/ SOME MED SAND, TR SILT OCCASIONAL COARSE SAND. (SC)	41-42				SLOW DRILLING RATE WATER LEVEL 0.1 FT DOWN FROM END OF DAY SHIFT 30 MAR 82 START OF NIGHT SHIFT	N/A	
540		44				235.9 FT DRILL STEEL TOTAL (405 PM) DIFFICULT GETTING RODS BACK DOWN. SIDES OF BORING OR CUTTINGS SETTLING OUT OF SUSPENSION MAY BE PREVENTING RODS FROM BEING LOWERED. WASHED THROUGH BLOCKAGE & ADD RODS & CONTINUE DRILLING. FLUID LOSS DUE TO WORKING 5 in φ CASING. ADD 410 GAL WATER.		
535	GRAY NON-PLASTIC CLAYEY FINE SAND w/ TR MED. SAND, SOME SILT, CLAY IS LOW PLASTIC (SC)	48-49				ADD 5 FT 80.9 FT DRILL STEEL (620 PM)		
	D.1-1,300	50				Revision 14 12/82		

NO SAMPLES RETAINED  
 SOIL DESCRIPTION FROM DRILLED CUTTINGS & DRILLING CONDITIONS

LEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING 1 5
			no. loc	type	recov.	penet resist bl/6in		
		51					TOTAL = 3	
	GRAY CLAYEY V.F TO F. SAND						RESEAL MUD THIN	
	4 ft TO SOME M. SAND (SC)	52					ADD ~ 25 gal water	
		53						
		54					ADD ~ 5 gal water	
-530	ESTIMATED GRADIENT  BOULDER OR COBBLE						ADD 5 ft 85.9 ft DRILL STEEL (11:10)	
	GRAY LOW TO NONPLASTIC V. SILTY CLAY OR CLAYEY SILT w/ SOME V.F. TO F. SAND (CL-ML)	55					DRILLING INDICATES CLAY, BUT VERY SILTY	
		56						
		57						
		58						
		59					ADD ~ 5 gal WATER	
-525		60					ADD 5 ft 80.9 ft DRILL STEEL (11:45pm)	
		61						
	INTERMITTANT SILTY ZONES < 1ft THICK	62					ADD ~ 10 gal WATER	
		63						
		64						
-520	GRAY LOW TO NONPLASTIC VERY SILTY CLAY OR CLAYEY SILT w/ SOME V.F. TO F. SAND (CL-ML)	65					ADD 5 ft 85.9 ft DRILL STEEL (12:25am)	
		66						
		67						
		68						

NO SAMPLES RETAINED  
 SOIL DESCRIPTION FROM DRILLED CUTTINGS & DRILLING CONDITIONS

D.1-1,301

Revision 14  
12/82

DEPTH SCALE ft	DESCRIPTION	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
		no. loc	type	recov.	penet resist bl/6in		
69	GRAY LOW TO NON PLASTIC V. SILTY CLAY - CLAYEY SILT w/ SOME V.F.F.O.F. SAND (CL-ML)					200 5ft 100.9 ft DRILL STEEL (1:00am)	
70						SEE NOTE #4	
71						REWORK MUD TANK # 700 20 gal WATER	
72	No CLAY CUTTINGS BEING RETURNED.					LEAK DID NOT RECOVER	
73	DRILLING INDICATES LOW TO NON PLASTIC VERY SILTY CLAY OR CLAYEY SILT - w/ LITTLE V.F. SAND BEING RETURNED IN DRILLING FLUID. (CL-ML)						
74						200 5ft 105.9 ft DRILL STEEL (2:10am)	
75							
76	INTERMITTENT SILTYER BONES 1 ft thick						
77						DRILL STEEL NOT WHIPPING CASING. GOOD SEAL @ MUD TANK.	
78							
79						200 5ft 110.9 ft DRILL STEEL TOTAL (2:45am)	
80							
81							
82	GRAY LOW TO NON PLASTIC VERY SILTY CLAY OR CLAYEY SILT w/ TRACE V.F. SAND (CL-ML)						
83							
84						200 5ft 115.9 ft DRILL STEEL TOTAL (3:25am)	
85							
86							

NO SAMPLES RETAINED  
 SOIL DESCRIPTION FROM CUTTINGS & DRILLING CONDITIONS

N/A

LEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	C B
			no. loc	type	recov.	particle resist bl/6in		
	Drilling indicates low to nonplastic VERY SILTY CLAY OR CLAYEY SILT; w/ some med. coarse angular sand returned as cuttings (CL-ML)	87-90						
485		89				ADD 5 gal water		
		90				ADD 5 ft 120.9 ft DRILL STEEL TO (4:10am)		
		91						
	GRAY LOW PLASTICITY SILTY CLAY w/ some med. coarse angular sand, occasional gravel (CL)	92-93						
490		93						
		94				ADD 5 ft 125.9 ft DRILL STEEL TO (4:45am)		
	<u>ESTIMATED CONTACT</u>	95						
		96						
	GRAY TO BROWNISH-GRAY LOW TO MEDIUM PLASTICITY SILTY CLAY w/ TR MED. COARSE ANGULAR SAND. (CL)	97-98						
		97						
		98						
495		99				ADD 5 ft 130.9 ft DRILL STEEL TO (5:20 am)		
		100						
		101						
		102				ADD ~5 gal WATER (LOSING AT MUD TUB SEAL)		
		103						
480	GRAY TO BROWNISH-GRAY LOW TO MEDIUM PLASTICITY SILTY CLAY w/ TR MED-COARSE ANGULAR SAND D.1-1,303 (CL)	104						

NO SAMPLES RETAINED  
SOIL DESCRIPTIONS FROM DRILLED CUTTINGS & DRILLING CONDITIONS

N/A

NO.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penet. resist. Bl/6in		
		104						
	GRAY - BROWNISH GRAY LOW-MED PLASTIC <u>SILTY CLAY</u> w/ TR MED-COARSE ANGULAR SAND (CL)	105					ADD 3 ft 138.9 ft DRILL STEEL (5:50am) SHIFT CHANGE @ 6:00am	
		106						
		107						
		108						
-475		109						
	GRAY - BROWNISH GRAY LOW-MED PLASTIC <u>SILTY CLAY</u> w/ OCCASIONAL MED-COARSE ANGULAR SAND (CL)	110					ADD 5.0 FT DRILL ROD 140.9 ft TOTAL	
		111						
		112						
		113						
-470		114						
	GRAY - BROWNISH GRAY MED PLASTIC <u>SILTY CLAY</u> w/ TR - SOME MED - FINE ANGULAR SAND (CL) COBBLE -	115					ADD 5.0 FT DRILL ROD 145.9 ft TOTAL	
		116						
		117						
		118						
-465	GRAY LOW-MED PLASTIC <u>SILTY CLAY</u> w/ TR MED-FINE SAND (CL)	119					ADD 5.0 FT DRILL ROD 150.9 FT TOTAL	
		120						
		121						
		122						

NO SAMPLES RETAINED  
SOIL DESCRIPTION FROM: DRILLER CUTTINGS & DRILLING CONDITIONS.

N/A

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D.1-1,304

LEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES					REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)
			no. loc	type	recov.	penchli resist	bl/6hr	
-460	GRAY MED PLASTIC <u>SILTY CLAY</u> w/ TR MED-FINE SAND (CL)	123						
		124						ADD 5.0 FT DRILL ROD 155.9 FT TOTAL
		125						
		126						
		127						
-455	GRAY MED PLASTIC <u>SILTY CLAY</u> w/ TR MED-FINE SAND (CL)	128						EMPTY MUD TUB OF DRILLING MUD & CUTTINGS FLUSH BORING w/ FRESH WATER ADD ~ 25 GALS WATER TO MUD TUB AFTER PUMPING IT OUT A SECOND TIME
		129						ADD 5.0 FT DRILL ROD 160.9 FT TOTAL
		130						
		131						
		132						
		133						
-450	GRAY MED PLASTIC <u>SILTY CLAY</u> w/ OCCASIONAL FINE-MED SAND (CL)	134						CASING BOTTOM 134.3 FT DRILL TO 134.0 FT. PULL RODS BEGIN 3 IN Ø NW PERMANENT CASING PLACEMENT. SEE NOTE # 5 CHANGED BITS AFTER SETTING CASING NEW BIT: 1 1/2" LONG 2 5/16 IN Ø TRICONE ROLLER. SET IN 2" OR MORE OF BIT CASING PLUGGED UP 15" FROM BOTTOM DURING INSTALLATION. LIFTED OUT CUTTINGS & CONTINUED ADVANCEMENT OF BORING. ADD 5.0 FT DRILL ROD 166.1 FT
		135						
		136						
		137						
		138						
-445	GRAY MED PLASTIC <u>SILTY CLAY</u> w/ OCCASIONAL FINE SAND (CL) D. 1-1,305	139						ADD 5.0 FT DRILL ROD 171.1 FT TOTAL Revision 14 12/82
		140						

NO SAMPLES RETAINED  
SOIL DESCRIPTION FROM DRILLER CUTTINGS & DRILLING CONDITIONS

N/A

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LOG OF BORING *DES-A52*

SHEET 9 OF 11...

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penetr resist bl/6in		
	<i>GRAY MED PLASTIC SILTY CLAY W/ OCCASIONAL FINE SAND (CL)</i>	141-142						
440		143-144						
	<i>GRAY MED PLASTIC SILTY CLAY W/ OCCASIONAL FINE SAND (CL)</i>	145-146						
		147-148						
435		149-150				← ALL 5.0 FT DRILL ROD 176.1 FT TOTAL  WATER LEVEL @ BOTTOM OF PNA END OF DAY SHIFT ← ADD 5.0 FT DRILL ROD 181.1 FT START OF NIGHTSHIFT TOTAL  ADD ~25 gal WATER	N/A	
	<i>GRAY MED. PLASTIC SILTY CLAY W/ OCCASIONAL FINE SAND (CL)</i>	151-152						
		153-154						
430		155-156				← ADD 5.0 ft 186.1 ft DRILL STEEL TOTAL		
	<i>S-1 STIFF GRAY LOW TO MED. PLASTIC SILTY CLAY MOIST (CL)</i>	157-158						
		159						

NO SAMPLES RETAINED  
 COIL DESCRIPTION FROM DRILL CUTTINGS & DRILLING CONDITIONS

D.1-1,306

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LOG OF BORING DSB-AS2.

SHEET 12 OF 11

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOW
			no. loc	type	recov.	penet resist bl/6in		
425	GRAY LOW-MED PLASTIC SILTY CLAY (CL) ELEV. 424.7      604 157.8 ft	157	ST1	SPT	13/5	3 1	DP = 3.25 FT SET ROBS & ADVANCE BORING THROUGH SPLITSPIN SAME ZONE TO UNDISTURBED SOIL. FLUSH BORING FOR ~15 MIN. PULL STILL ROBS BEGIN SETTING BENCHMARK ROBS. SEE BENCHMARK INSTALLATION SHEETS.	
	BOTTOM OF BORING	160						
		161						
		162						
		163						
420		164						
		165						
		166						
		167						
		168						
415		169						
		170						
		171						
		172						
		173						
410		174						
		175						
		176						

D.1-1,307

Revision 14  
12/82

N/A

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LOG OF BORING DSB-ASZ

SHEET 11 OF 11

NOTES

NOTE #1 DRILLER FILLED MUD TUB W/ ~ 50 GALLONS WATER MIXED W/ ~ 20 LB BENTONITE. AFTER SETTING ROBS & START OF DRILLING FLUID LOSS WAS NOTED. FOUND THE 5 IN Ø ID CASING LEAKING @ 584.0 FLOOR SURFACE. DRILLING SHUT DOWN FROM 6:55 AM UNTIL 8:00 AM WHILE REPAIRS WERE MADE ON THE SEAL. A NEW CASSETT WAS PUT IN PLACE & THE CASING RECOURED TO THE 584.0 FLOOR. THE DRILLER ADDED ~ 50 GALL. WATER TO THE MUD TUB. DRILLING THEN CONTINUED @ 8:00 AM.

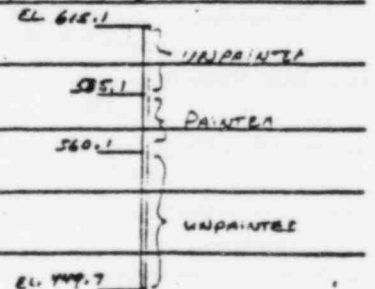
NOTE #2 THE SEAL @ BOTTOM OF MUD TUB FAILED & LEAKING WAS NOTED. DRILLER STOPPED DRILLING @ 9:20 AM & BEGAN REPAIRS. THE SEAL WAS REPAIRED & DRILLING THEN CONTINUED @ 10:20 AM.

NOTE #3 6:30 AM STOPPED TO REPAIR LEAK AT BASE OF MUD TANK. STARTED DRILL @ 7:30 & STOP AT 8:00 TO TRY TO RESTRAIN CASING & STOP LEAK @ MUD TANK. BRACED CASING & RESEAL MUD TANK. DRILLING AGAIN @ 10:45 AM W/ LITTLE MUD LOSS.

NOTE #4 INCREASED MUD LOSS @ 1:20 AM. RESEAL MUD TANK TO TEMPORARY CASING. DRILLING @ 1:40 AM.

NOTE #5 SET 10.4 FT UNPAINTED CASING & SHOE (11-10.0 FT SECTIONS & 1 OVERT SAW TOOTHED DRIVE SHOE. THEN SET 25.0 FT ORANGE PAINTED CASING (2-10.0 FT SECTIONS & 1-5.0 FT SECTION). THEN SET 30.0 FT OF UNPAINTED CASING (2-10.0 FT SECTIONS) TOTAL CASING SET 165.4 FT. BOTTOM OF CASING SET @ 584.0 FT FROM EL. 584.0 = EL. 449.7. TOP OF CASING EL. 615.1.

ALL OF THIS CASING IS 3 IN Ø NEW FLUID TIGHT



Boring Log Reviewed: *[Signature]*  
5/24/82

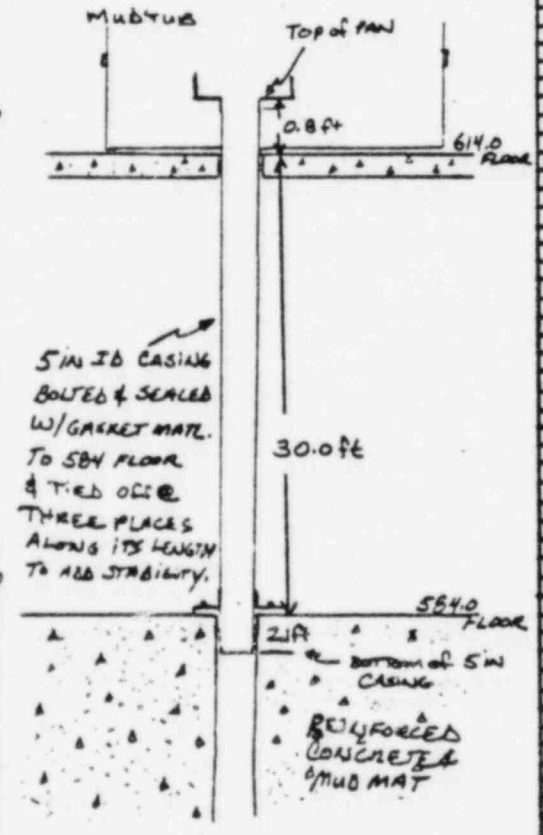
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LOG OF BORING..DSB-AS3

SHEET..1..OF..11..

project	MIDLAND NUCLEAR PLANT	project no.	81C217-2Y
location	MIDLAND, MICHIGAN	elevation & datum	+584.0 FT USGS
drilling agency	D&G DRILLING	date started	10 JUNE 82
		date finished	17 JUNE 82
drilling equipment	ACKER SKIA RIG	completion depth	159.2 FT FROM EL 584.0
		rock depth	N/A
size & type of bit	4 1/2 IN $\phi$ TRICONE   3 1/2 IN DRAG   2 7/8 IN TRICONE	no. samples	1
		undist.	NA
		core	N/A
casing	5 IN ID TEMPORARY   4 IN ID FUSION JOINT   3 IN ID RUBBER JOINT PAN	water level first	N/A
casing hammer: # 2	weight 310 lbs drop 24 IN	compl.	N/A
sampler 2 IN $\phi$ SPLIT SPOON		24 hr	27
sampler hammer: # 3	weight 140 lbs drop 30 IN	driller	DAVE CRUISE / BARRY THOMASSON
		supervisor	LUKE L. HEFFERNAN

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penetr resist 0/6 in		
584.0	Log Reviewed Sept 82 by John F. Seymour John P. Seymour	1					APPROVAL TO ADVANCE BORING Donald S. Hall CTO	
	REINFORCED CONCRETE	2					BECHTEL PERSONNEL CORED A 6 IN $\phi$ HOLE THROUGH THE 614.0 FLOOR SLAB (~1.5 FT THICK) @ THE BECHTEL SURVEY LOCATION	
		3					A SECOND 6 IN $\phi$ HOLE WAS CORED THROUGH THE 584.0 FLOOR SLAB BY BECHTEL PERSONNEL. THIS CORE HOLE WAS LOCATED @ A BECHTEL SURVEY LOCATION DIRECTLY BELOW THE 6 IN $\phi$ CORE HOLE IN 614.0 FLOOR SLAB. (584.0 FLOOR SLAB MUD MAT WAS 22 FT THICK)	
		4						
	5 IN ID CASING BOLTED & SEALED W/ GASKET MAT. TO 584 FLOOR & TIED OFF @ THREE PLACES ALONG ITS LENGTH TO ADD STABILITY.	5						
		6						
		7						
		8						
		9						
		10						
		11						
		12						
		13						
		14						

6 IN  $\phi$  CORE BY BECHTEL

N/A

D.1-1,309

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LOG OF BORING .45A.453

SHEET . 2 . OF . 16 . . .

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES					REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			NO. LOG	TYPE	RECOV.	PENET. RESIST. bl/6in			
570	CONCRETE	15							
	CONCRETE	16							
		17							
		18							
565		19							
	CONCRETE	20							
		21							
		22							
	GRAY SILTY CLAY (CL)	22.7							
	CONCRETE	23							
560	FEW CUTTINGS IN RETURN DRILLING RATE INDICATES CLAY (CL)	24							
		25							
		26							
		27							
555	GRAY LOW PLASTIC SILTY CLAY W/ TRACE-SOME COARSE- MED SAND, TRACE FINE SAND (SAMPLE FROM END OF BIT) (CL)	28							
		29							
		30							
		31							
		32							

6 IN. CASE BY DECKERS

NO SAMPLES RETAINED  
 STRATIGRAPHY IDENTIFIED FROM DRILLED  
 CUTTINGS & DRILLING CONDITIONS

N/A

WATER LEVEL STABILIZES @ 30.5 FT FROM TOP OF PAIN (TOP OF PAIN EL. 614.8)  
 MIX A THICK BATCH OF MUD IN 55 GAL DRUM (~ 15 LB. MONTMORILLONITE & ~ 30 GAL WATER) PUMP INTO 5" IN CASING. NOTE SLOW RATE OF FLUID LOSS & COMMUNICATION W/ DSB-AS1 AROUND FLUSH JOINT CASING. DRILLING MUD LEVEL DROPS TO ~ 9.5 FT WHERE IT STABILIZES. BIT = 3/4" IN DRAG 0.8 FT LONG. SUB = 50 FT LONG  
 SET BIT + SUB + 45 FT RODS TO 21 FT DEPTH FROM 584 FLOOR  
 DRILL STEEL TOTAL 50.8  
 (NOTE: STICK UP TO TOP OF PAIN 0.8 FT FROM EL. 614 & 30.8 FT FROM EL. 584.0)

12:05 AM BEGIN DRILLING  
 12:20 HIT OBSTRUCTION

HIT OBSTRUCTION @ 22.7 FT (EL. 561.5)  
 STOP DRILLING IMMEDIATELY CK W/ C. WILSON (GEO) FOR IDENTIFICATION OF OBSTRUCTION SEE NOTE 1 END OF SHEET 10 JUNE 82 DRILLING MUD LEVEL ~ 9.0 FT  
 START OF SHEET 11 JUNE 82 MUD LEVEL ~ 11.0 FT  
 PULL RODS CHANGE BITS (NEW BIT 1.1 FT LONG 1/2" φ TRICONE ROLLER BIT)  
 SET BIT + 50 FT DRILL ROD  
 DRILL STEEL TOTAL 51.1 FT  
 PULL RODS CHANGE BITS. BIT 0.8 FT LONG 3/4" φ DRAG BIT. SET BIT + 55 FT DRILL ROD  
 55.8 FT TOTAL DRILL STEEL  
 LOSING DRILLING MUD @ STEADY RATE COMMUNICATION W/ DSB-AS1 AROUND 3 IN. AROUND JOINT CASING. NOTED DRILLING MUD IS BRUSHING UP. FEW CUTTINGS L. HEFFERNAN DIRECTS BANNER TO PULL RODS & SET 4" 30 FLUSH JOINT CASING  
 SET 55.4 FT 4 IN 30 CASING TO 24.6 FT DEPTH FROM EL. 584.0  
 SET DRAG BIT + 60.0 FT DRILL RODS  
 60.8 FT TOTAL DRILL STEEL

D.1-1,310

Revision 14  
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LOG OF BORING D.S.B.-A53

SHEET 3 OF 11

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOW
			no. log	type	recov.	penet. resist. bl/6in		
550	GRAY MED-FINE SAND LAYER TRACE FINE GRAVEL	33						
	DRILLING RATE INDICATES SILTY CLAY	34						
	GRAY LOW PLASTIC SILTY CLAY w/ TRACE FINE SAND FROM SAMPLE ON END OF BIT	35						
		36						
		37						
		38						
545	GRAY LOW PLASTIC SILTY CLAY w/ TRACE MED-FINE SAND	39						
		40						
		41						
		42						
		43						
540	GRAY LOW PLASTIC SILTY CLAY w/ TRACE FINE SAND OCCASIONAL FINE GRAVEL	44						
		45						
		46						
		47						
		48						
535	GRAY LOW PLASTIC SILTY CLAY w/ TRACE FINE SAND	49						
		50						

NO SAMPLES RETAINED, SOIL DESCRIPTION FROM DRILLED CUTTINGS & DRILLING CONDITIONS

N/A

FAST DRILLING RATE  
 LOSING DRILLING MUD @  
 STEADY RATE ADD ~ 10 GALS WATER TO MUD TUB.  
 L HEFFERNAN DIRECTS DRILLER TO PULL ROSS & ADD 10.00 4 IN ID FLUSH JOINT CASING. DRILLER PULLS ROSS & ADDS 10 FT OF 4 IN CASING. TOTAL 65.4 FT  
 ADD ~ 10 LB BENTONITE w/ 1/5 GALS WATER TO MUD TUB TO THICKEN DRILL MUD. 4 IN CASING IS SET TO 34.6 FT FROM CL 5B4. DRILLER SETS DRILL ROSS & BEGINS TO WASH OUT BOTTOM 10.0 FT OF 4 IN ID CASING. DRILL ROSS PLUG UP ~ 1 FT FROM BOTTOM OF CASING. PULL DRILL ROSS. CLEAN OUT DRILL BIT & BOTTOM ROD. CLEAN OUT PUMP. NOTE STILL LOSING WATER IN BORING. COMMUNICATION w/ DSB-A51. MIX ~ 35 LB BENTONITE w/ ~ 40 GALS WATER  
 ADD TO BOREHOLE END OF SHIRT II JUNE DRILLING MUD LEVEL 0.2 FT DOWN IN 4 IN ID START OF SHIRT II JUNE 82 BEING MUD LEVEL 0.2 FT DOWN IN 4 IN CASING SET 0.8 FT LONG 3/4 IN ID BRAG BIT & 65 FT DRILL ROD. 65.8 FT TOTAL DRILL STEEL  
 ADD 5.0 FT DRILL ROD  
 70.8 FT TOTAL DRILL STEEL  
 ADD ~ 15 GALS WATER TO MUD TUB  
 NOTE: LOSING MUD @ SLOW RATE BETWEEN 4 IN & 5 IN CASING & THEN COMMUNICATION w/ DSB-A51  
 ADD 5.0 FT DRILL ROD  
 75.8 FT TOTAL DRILL STEEL  
 ADD ~ 25 GALS FRESH THICK DRILLING MUD TO TUB, STILL LOSING DRILLING MUD @ COUPLING IN 5 IN CASING & COMMUNICATION TO DSB-A51  
 ADD 5.0 FT DRILL ROD  
 80.8 FT TOTAL DRILL STEEL

D.1-1,311

Revision 14  
 12/82

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LOG OF BORING . ΔSB-A53

SHEET 4 OF 11

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. log	type	recov.	penet resist bl/6in		
51	NO CUTTINGS IN DRILL MUD RETURN. DRILLING RATE INDICATES <u>SILTY CLAY</u> (CL)	51						LOSING DRILLING MUD @ STEADY RATE FROM BOTTOM COUPLING 5 IN. CASING & COMMUNICATION TO ΔSB-A51 ADD ~ 30 GALS WATER DURING RUN
52								
53								
54	NO CUTTINGS IN DRILL MUD RETURN. DRILLING RATE INDICATES <u>SILTY CLAY</u> (CL)	54						← ADD 50 FT DRILL ROD 85.8 FT TOTAL DRILL STEEL
55								
56								
57	NO CUTTINGS IN DRILL MUD RETURN. DRILLING RATE INDICATES <u>SILTY CLAY</u> (CL)	57						LOSING DRILLING MUD AS ABOVE. ADD ~ 25 GALS WATER DURING RUN.
58								
59								
60	NO CUTTINGS IN DRILL MUD RETURN. DRILLING RATE INDICATES <u>SILTY CLAY</u> (CL)	60						WATER LEVEL 1.8 FT DOWN FROM PAN END OF SHIFT IN JUNE 92 START OF SHIFT 15 JUNE 92 WATER LEVEL 5.2 FT DOWN ADD 50 FT DRILL ROD 90.8 FT TOTAL DRILL STEEL
61								
62								
63	NO CUTTINGS IN DRILL MUD RETURN. DRILLING RATE INDICATES <u>SILTY CLAY</u> (CL)	63						ADD ~ 20 GALS WATER TO MUD TUB BEGIN DRILLING. LOSING DRILLING MUD @ 5 IN. & CASING COUPLING & COMMUNICATION w/ ΔSB-A51 ADD ~ 40 GALS MORE WATER TO MUD TUB DURING RUN
64								
65								
66	NO CUTTINGS IN DRILL MUD RETURN. DRILLING RATE INDICATES <u>SILTY CLAY</u> (CL)	66						← ADD 50 FT DRILL ROD 95.8 FT TOTAL DRILL STEEL  ADD ~ 20 GALS WATER TO MUD TUB DURING RUN
67								
68								

NO SAMPLES RETAINED SOIL.  
 DESCRIPTION FROM SEALED CUTTINGS & DRILLING CONDITIONS

N/A

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LOG OF BORING DSB-AS3

SHEET 5 OF 11

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penetration resist bl/6in		
515	NO CUTTINGS IN DRILL MUD RETURN. DRILLING RATE INDICATES <u>SILTY CLAY</u> (CL)	69					← ADD 5.0 FT DRILL ROD 100.8 FT TOTAL DRILL STEEL	
		70						
		71					ADD ~ 25 GALS WATER TO MUD TUB DURING RUN	
		72						
510	NO LARGE CUTTINGS IN DRILL MUD RETURN. DRILLING RATE INDICATES <u>SILTY CLAY W/ TRACE SAND</u> (CL)	73					← ADD 5.0 FT DRILL ROD 105.8 FT TOTAL DRILL STEEL	
		74						
		75					LOSSING DRILL MUD @ 5 IN CASING COUPLING & @ DSB-AS1 CORE HOLE. ADD ~ 30 GALS FRESH WATER TO MUD TUB DURING RUN. NOTE: DUE TO VERY THIN DRILLING MUD THE CUTTINGS ARE NOT BEING BROUGHT UP TO SURFACE. THEY ARE BEING GROUND UP TO POWDER SIZE & CARRIED OUT IN THIN MUD.	
		76						
505	NO LARGE CUTTINGS IN DRILL MUD RETURN. DRILLING RATE INDICATES <u>SILTY CLAY W/ TRACE SAND</u> (CL)  (SLIGHT INCREASE IN DRILLING RATE INDICATES MORE SILT IN MUD.)	77					← ADD 5.0 FT DRILL ROD 110.8 FT TOTAL DRILL STEEL	
		78						
		79					ADD ~ 25 GALS WATER TO MUD TUB DURING RUN	
		80						
500	NO LARGE CUTTINGS IN DRILL MUD RETURN. DRILLING RATE INDICATES <u>SILTY CLAY W/ TRACE FINE SAND</u> D.1-1,313 (CL)	81						
		82						
		83					Revision 14 12/82	
		84					← ADD 5.0 FT DRILL ROD 115.8 FT TOTAL DRILL STEEL	
		85					ADD ~ 15 GALS WATER TO MUD TUB DURING RUN.	
		86						

NO SAMPLES RETAINED SOIL  
DESCRIPTION FROM DRILLED CUTTINGS & DRILLING CONDITIONS

N/A

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LOG OF BORING . DSA-A33

SHEET 6 OF 11

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penet resist bl/6in		
495	FEW CUTTINGS IN DRILL MUD RETURN. DRILLING RATE INDICATES <u>SILTY CLAY</u> w/ TRACE FINE SAND (CL)	87-88						
		89				← ADD 5.0 FT DRILL ROD 120.8 FT TOTAL DRILL STEEL		
		90						
		91				ADD ~ 20 GALS WATER TO MUD TUB DURING RUN.		
	NO CUTTINGS IN DRILL MUD RETURN. DRILLING RATE INDICATES <u>SILTY CLAY</u> (CL)	92						
		93						
490		94				← ADD 5.0 FT DRILL ROD 125.8 FT TOTAL DRILL STEEL		
		95						
	NO LARGE CUTTINGS IN DRILL MUD RETURN. DRILLING RATE INDICATES <u>SILTY CLAY</u> w/ TRACE FINE SAND (CL)	96				ADD ~ 20 GALS WATER TO MUD TUB DURING RUN.		
		97						
		98						
		99				← ADD 5.0 FT DRILL ROD 130.8 FT TOTAL DRILL STEEL		
		100						
		101				Revision 14 12/82		
		102				ADD ~ 25 GALS WATER TO MUD TUB DURING RUN		
		103				END OF SHIFT 15 JUNE 82 DRILLING MUD LEVEL @ TOP OF PAN		
485		104				← START OF SHIFT 16 JUNE MUD LEVEL @ TOP OF PAN ADD 5.0 FT DRILL ROD		
480								

NO SAMPLES RETAINED SOIL DESCRIPTION FROM DRILLED CUTTINGS & DRILLING CONDITIONS

N/A

D.1-1,314



WOODWARD-CLYDE CONSULTANTS  
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING . DSB-AS3

SHEET 7. OF 11.

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOW
			no. loc	type	recov.	penetr resist bl/6in		
	GRAY LOW-MED PLASTIC SILTY CLAY w/ TRACE MED-FINE SAND OCCASIONAL COARSE SAND. (CL)	105					135.84 TOTAL DRILL STEEL	
		106					ADD ~ 15 GALS. WATER TO MUD TUB DURING RUN.	
		107						
		108						
475		109					← ADD 5.0 FT DRILL ROD	
	FEW CUTTINGS IN DRILL MUD RETURN. DRILLING RATE INDICATES SILTY CLAY (CL)	110					140.84 TOTAL DRILL STEEL	
		111					ADD ~ 15 GALS WATER TO MUD TUB DURING RUN	
		112						
		113						
470		114					← ADD 5.0 FT DRILL ROD	
	NO CUTTINGS IN DRILL MUD RETURN. DRILLING RATE INDICATES SILTY CLAY (CL)	115					145.84 TOTAL DRILL STEEL	
		116					ADD ~ 10 GALS WATER TO MUD TUB DURING RUN. STILL LOSING MUD BETWEEN 4 IN & 5 IN CASINGS (BOTTOM SIN COUPLER IS LEAKING) & COMMUNICATING TO DSB-AS3 CORE HOLE.	
		117						
		118						
465		119					← ADD 5.0 FT DRILL ROD	
	FEW CUTTINGS IN DRILL MUD RETURN. DRILLING RATE INDICATES SILTY CLAY. (CL)	120					150.84 TOTAL DRILL STEEL	
		121					ADD ~ 10 GALS WATER TO MUD TUB DURING RUN.	
		122						

NO SAMPLES RETAINED SOIL DESCRIPTION FROM DRILLED CUTTINGS & DRILLING CONDITIONS

N/A

D.1-1,315

Revision 14

12/82

WOODWARD-CLYDE CONSULTANTS  
 CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING D95-833.

SHEET 3 OF 11...

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. log	type	recov.	penet. resist. bl/6in		
460	NO CUTTINGS IN DRILL MUD RETURN. DRILLING RATE INDICATES SILTY CLAY (CL)	123-124						
		124				← ADD 5.0 FT DRILL ROD 155.8 FT TOTAL DRILL STEEL		
		125						
		126				ADD ~ 12 GALS WATER TO MUSTUB DURING RUN.		
		127						
		128						
455	NO CUTTINGS IN DRILL MUD RETURN. DRILLING RATE INDICATES SILTY CLAY (CL)	129				← ADD 5.0 FT DRILL ROD 160.8 FT TOTAL DRILL STEEL		N/A
		130						
		131				ADD ~ 10 GALS WATER TO MUD TUB DURING RUN.		
		132				DRILL TO 133.9 FT DEPTH (ELEV 400.1) FLUSH BORING FOR ~ 8 MIN. PULL DRILL RODS & BEGIN PLACEMENT OF 3 IN Ø NW PERMANENT CASING. SEE NOTE #2		
		133				CASING DRIVEN TO 134.4 FT ELEV 449.6 CHANGE BITS NEW BIT 1.141 LONG 2 5/16" Ø TRI-CONE ROLLER		
450	GRAY LOW-MED PLASTIC SILTY CLAY (from soil sample on drill bit) (CL)	134				← SET BIT + 165 FT DRILL ROD 166.1 FT TOTAL DRILL STEEL		28
		135				DRILLER SEALS OFF AROUND TOP OF 3 IN Ø NW CASING. NO LONGER LOSING DRILLING MUD. CUTTINGS IN RETURN DRILL MUD.		
		136						
		137						
		138						
445	DARK GRAY LOW-MED PLASTIC SILTY CLAY W/OCCASIONAL MED-FINE SAND (CL)	139						
		140				← ADD 5.0 FT DRILL ROD 171.1 FT TOTAL DRILL STEEL		

NO SAMPLES RETAINED SOIL DESCRIPTION FROM DRILLED CUTTINGS & DRILLING CONDITIONS

Revision 14  
12/82

D.1-1,316

WOODWARD-CLYDE CONSULTANTS  
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIROMENTAL SCIENTISTS

LOG OF BORING DSB-A53.

SHEET 9. OF 11.

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOW
			no. loc	type	recov.	penetr resist bl/6in		
	Gray med plastic silty clay w/ occasional med-fine sand. (CL)	141-142						<p>SLOW DRILLING RATE NO LOSS OF DRILLING MUD.</p>
440	Gray med plastic silty clay (CL)	145-146						<p>← ADD 5.0 FT DRILL ROD 176.1 FT TOTAL DRILL STEEL</p> <p>SLOW DRILLING RATE</p>
435	Gray med plastic silty clay w/ occasional fine sand (CL)	149-150						<p>DRILLING MUD LEVEL @ TOP OF 3 IN Ø NEW CASING</p> <p>← END OF SHIFT 16 JUNE 82 START OF SHIFT 17 JUNE 82 DRILLING MUD LEVEL @ TOP OF 3 IN Ø NEW CASING.</p> <p>← ADD 5.0 FT DRILL ROD 181.1 FT TOTAL DRILL STEEL</p>
	Dark gray-gray med plastic silty clay (CL)	153-154						<p>Revision 14 12/82</p>
300	Gray med plastic silty clay D.1-1,317 (CL)	157-158						<p>← ADD 5.0 FT DRILL ROD 186.1 FT TOTAL DRILL STEEL</p> <p>DRILL TO 157.6 FT. FLUSH BOREHOLE FOR ~10 MIN. SPLIT SPOON SAMPLE WILL BE TAKEN HERE. DRILLER PULLS RODS, REMOVES BIT, &amp; ADDS SPLIT SPOON SAMPLER + 185.9 FT DRILL ROD. SET SPOON @ 157.6 FT FROM SURFACE. (SPOON LENGTH 33A) DRILL SPOON 18 IN.</p> <p>← GLOW COUNT 22-33-34</p>

NO SAMPLES RETAINED SOIL DESCRIPTION FROM DRILLED CUTTINGS & DRILLING CONDITIONS

WOODWARD-CLYDE CONSULTANTS  
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING DSB-AS3

SHEET 10 OF 11...

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penetr resist bl/6in		
425	GRAY MED PLASTIC SILTY CLAY (CL)	159	5-1	55	65/100	33 34	PULL ROBS & REMOVE SPLIT-SPON SAMPLER. REATTACH 2 1/16 IN Ø TR. CORE BIT WASH OUT TO 159.2 FT DEPTH. FUSH BORING FOR ~ 10 MIN.	N/A
	EL 424.8 BOTTOM OF CORING	159.2 ft					PP = 3.5 TSF ON ALL 3 SIX IN SECTIONS.	
		160					PULL ROBS & BEGIN INSTALLATION OF BENCHMARK ROBS. SEE BENCHMARK INSTALLATION SHEETS.	
		161						
		162						
		163						
420		164						
		165						
		166						
		167						
		168						
415		169						
		170						
		171						
		172						
		173						
410		174						
		175						
		176						

D.1-1,318

Revision 14  
12/82

WOODWARD-CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING DSB-AS3

SHEET 11 OF 11

NOTES

12:30 PM 11 JUNE 82

NOTE #1 C. WILSON REPORTS THAT NO UTILITIES HAVE BEEN INSTALLED @ THIS

ELEV. SINCE 1979 & MOST LIKELY NONE BEFORE THIS. L. HEFFERNAN THEN CALLS

D. SIBBALD (CPLA). HE REPORTS THAT A NEW PROCEDURE WHEN HITTING AN OBSTRUCTION

HAS BEEN ASSIGNED. S. SIBBALD NOTIFIES J. KELLEHER (BECHTEL) OF CONDITIONS.

J. KELLEHER REPORTS THAT SOMEONE FROM THE BECHTEL REMEDIAL SOILS

GROUP WILL COME DOWN TO DRILL RIG & OBTAIN PRESENT STATUS OF BORING.

1:10 PM

LEE MITCHELL (BECHTEL) REQUESTS STATUS OF BORING. L. HEFFERNAN WCLL REPORTS ALL

PERTINENT INFORMATION. L. MITCHELL (BECHTEL) DIRECTS L. HEFFERNAN TO STANDBY

UNTIL FURTHER NOTICE FROM HIMSELF OR ANOTHER BECHTEL REMEDIAL SOILS GROUP

REP. 7:20 AM 11 JUNE 82 RECEIVE COPY OF BECHTEL DAILY REPORT FORM APPROVING

CONTINUATION OF DRILLING FROM GARY JOHNSON (CPLA) HE REPORTS ALL BECHTEL

SIGNATURES NEEDED ARE ON THE FORM. 7:55 AM CONTINUE DRILLING.

NOTE #2 SET 110.4 FT UNPAINTED 3 IN ID NW (FLUSH JOINT) CASING

(11-10.0 FT SECTIONS & 1 0.4 FT DRIVE SHOE). THEN SET 25.0 FT PAINTED (ORANGE)

3 IN ID NW CASING. (2-10.0 FT SECTIONS & 1 5.0 FT SECTION) THEN SET 30 FT

3 IN ID NW CASING (3-10.0 FT SECTIONS TEMPORARY CASING) DRIVE CASING

(165.4 FT TOTAL) FROM 133.8 FT TO 139.4 FT (2.584 IS-O-).

TOP OF CASING	615.0
BOTTOM TEMP. CASING	525.0
TOP PAINTED CASING	
BOTTOM PAINTED CASING	560.0
TOP UNPAINTED CASING	
BOTTOM OF CASING	449.6



WOODWARD-CLYDE CONSULTANTS  
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LOG OF BORING .DSB-A54

SHEET 2 OF 11

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	TR COV.	percent resist		
570.0	CONCRETE	15						
		16						
		17						
		18						
		19						
		20						
		21						
	CONCRETE	22						
		23						
	BEHNTEL LABORATORY REPORTS CLAY ON BOTTOM OF CONCRETE CORE	24						
560.0		25						
	BROWNISH GRAY FINE-V.FINE NON-PLASTIC SAND W/ TRACE SOME MED SAND, SILT	26						
	(SP)	27						
	LOGGERS	28						
		29						
555.0	GRAY LOW PLASTIC V.SILTY CLAY W/SOME FINE-V.FINE SAND TR MED SAND, FINE GRAVEL	30						
	(CL)	31						
	BECOMES MORE SANDY (FINE-FINE SAND)	32						

6 IN Ø CORE BY BEHNTEL

NO SAMPLES RETAINED  
 SOIL DESCRIPTION FROM CUTTINGS  
 & DRILLING CONDITIONS

MUD @ SLOW RATE. CK  
 SEAL OF 5 IN Ø CASING @ 584.0 FLOOR. FIND SEAL INTACT  
 COUPLINGS OF 5 IN ALSO SEALED.  
 DRILLING MUD IS MOST LIKELY MOVING ALONG BOTTOM OF FLOOR SLAB.

BIT: 3 1/2 IN Ø 0.8 FT LONG, DRAL  
 SET BIT + 50.0 FT DRILL ROGS  
 TO 22.8 FT DEPTH FROM RL 584.0.  
 ADD ~ 20 GALS WATER TO MUD TUB. BEGIN DRILLING

MED DRILLING RATE

← ADD 5.0 FT DRILL ROD  
 55.8 FT TOTAL DRILL STEEL

INSPECT CUTTINGS LEFT ON PAN & IN BOTTOM OF TUB. FIND SAND. DRILLING MUD IS NOT BRINGING UP LARGE CUTTINGS. MATE IS PROBABLY SILTY

ADD ~ 6 GALS DRILLING MUD TO TUB.

BEHNTEL GEOTECH MIKE LEWIS REQUESTS SPLIT SPOON SAMPLE BELOW CONCRETE IF SAND IS ENCOUNTERED L. HEFFERNAN WILL UNDER 0.5 SEALS (CR) DIRECTION HAS DRILLER TAKE SPLIT SPOON SAMPLE @ 28.9 FT FROM ELEV. 584 SET SPOON 2.0 IN L & 58.0 FT DRILL ROB TO 28.9 FT DRIVE SPOON 18 IN. PULL SPOON & ROGS.

SET 3 1/2 IN Ø DRAGBIT 0.8 FT LONG + 60.0 FT ROGS TO 20.9 FT  
 CONTINUE DRILLING ADD ~ 8 GALLONS DRILLING MUD TO TUB

N/A

D.1-1,321

Revision 14

12/82

WOODWARD-CLYDE CONSULTANTS  
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIROMENTAL SCIENTISTS

LOG OF BORING . DSB: A54

SHEET 3. OF 11...

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES					REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penet. resist bl/6in			
550	GRAY LOW PLASTIC <u>SANDY SILTY CLAY</u> W/ TR MED-COARSE SAND (VERY FINE - FINE SAND) (CL-SC)	33-34							
		35					← ADD 5.0 FT DRILL ROD 65.8 FT TOTAL DRILL STEEL		
		36					DRILLING RATE DECREASES		
		37							
545	GRAY LOW PLASTIC <u>SILTY CLAY</u> W/ SOME V. FINE - FINE SAND TR. MED-COARSE SAND (CL)	38-39							
		40					← ADD 5.0 FT DRILL ROD 70.8 FT TOTAL DRILL STEEL		
		41							
		42							
		43							
540	GRAY LOW PLASTIC <u>V. SILTY CLAY</u> W/ SOME V. FINE - FINE SAND TR. MED-COARSE SAND (CL)	44					DRILLING MUD LEVEL 0.2 FT DOWN FROM PAN. ← END OF SHIFT 23 JUNE 02 START OF SHIFT 24 JUNE 02 DRILLING MUD LEVEL 8.2 FT DOWN FROM PAN		
		45					← ADD 5.0 FT DRILL ROD 75.8 FT TOTAL DRILL STEEL ADD ~ 5 GALS WATER TO MUD TUB		
		46							
		47							
		48							
535	FEW CUTTINGS IN DRILL MUD RETURN, DRILLING RATE INDICATES <u>V. SILTY CLAY</u> W/ SOME V. FINE - FINE SAND TR. MED-COARSE SAND (CL)	49					← ADD 5.0 FT DRILL ROD 80.8 FT TOTAL DRILL STEEL		
		50					Revision 14 12/82		

NO SAMPLES RETAINED SOIL DESCRIPTION FROM MILLER CUTTINGS & DRILLING CONDITIONS

N/A



WOODWARD-CLYDE CONSULTANTS  
 CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING . DSB:454

SHEET 4 OF 11

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES					REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penet resist bl/6in			
	FEW CUTTINGS IN DRILL MUD. DRILLING RATE INDICATES <u>SILTY CLAY</u> w/ SOME V. FINE-FINE SAND  (CL)	51-52							
530	GRAY LOW PLASTIC <u>SILTY CLAY</u> - <u>CLAYEY SILT</u> w/TR. V. FINE- FINE SAND.  (CL-MI)	54-56					← ADD 5.0 FT DRILL ROD 85.8 FT TOTAL DRILL STEEL		
525	GRAY LOW PLASTIC <u>SILTY CLAY</u> - <u>CLAYEY SILT</u> w/TR. V. FINE- FINE SAND  (CL-MI)	57-61					← ADD 5.0 FT DRILL ROD 90.8 FT TOTAL DRILL STEEL	N/A	
520	FEW CUTTINGS IN DRILL MUD. DRILLING RATE INDICATES <u>SILTY</u> <u>CLAY</u>  (CL)	64-67					← ADD 5.0 FT DRILL ROD 95.8 FT TOTAL DRILL STEEL		
	D.1-1,323	68							

NO SAMPLES RETAINED. SOIL DESCRIPTION  
FROM DRILLED CUTTINGS & DRILLING CONDITIONS

Revision 14  
12/82

WOODWARD-CLYDE CONSULTANTS  
 CONSULTING ENGINEERS, GEOLOGISTS AND ENVIROMENTAL SCIENTISTS

LOG OF BORING DSB-A34

SHEET 5 OF 11...

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penetr resist bl/6in		
515	GRAY LOW PLASTIC SILTY CLAY W/TR FINE SAND  (CL)	69					← ADD 5.0 FT DRILL ROD 100.8 FT TOTAL DRILL STEEL	
		70						
		71						
		72						
		73						
510	FEW CUTTINGS IN DRILL MUD RETURN. DRILLING RATE INDICATES SILTY CLAY W/ TR. MED SAND  (CL)	74					← ADD 5.0 FT DRILL ROD 105.8 FT TOTAL DRILL STEEL	
		75						
		76						
		77						
		78						
505	FEW CUTTINGS IN DRILL MUD RETURN. DRILLING RATE INDICATES SILTY CLAY W/TR MED-FINE SAND  (CL)	79					← ADD 5.0 FT DRILL ROD 110.8 FT TOTAL DRILL STEEL	
		80						
		81					ADD ~ 4 GALS WATER TO MUD TUB.	
		82						
		83						
500	GRAY LOW PLASTIC SILTY CLAY W/TR MED-FINE SAND  (CL)	84					← ADD 5.0 FT DRILL ROD 115.8 FT TOTAL DRILL STEEL	
		85						
		86						

NO SAMPLES RETAINED SOIL DESCRIPTION  
FROM DRILLED CUTTINGS & DRILLING CONDITIONS

N/A

D.1-1,324

Revision 14  
12/82

WOODWARD-CLYDE CONSULTANTS  
 CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING DSB-ASH.

SHEET 6. OF 11.

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOW
			no. loc	type	recov.	penet. resist bl/6in		
495	GRAY LOW PLASTIC SILTY CLAY w/ TR. MED-COARSE SAND (CL)	87-89						
		90-92						
490	GRAY LOW-MED PLASTIC SILTY CLAY w/ TR. FINE-COARSE SAND. (CL)	93-95						
		96-98						
485	GRAY LOW PLASTIC SILTY CLAY w/ TR-SOME FINE-COARSE SAND. (CL)	99-101						
		102-103						
480	BROWNISH GRAY LOW-MED PLASTIC SILTY CLAY w/ TR FINE-COARSE SAND D.1-1,325 (CL)	104						

NO SAMPLES RETAINED SOIL DESCRIPTION FROM DRILLED CUTTINGS & DRILLING CONDITIONS

← ADD 5.0 FT DRILL ROD  
120.8 FT TOTAL DRILL STEEL

← ADD 5.0 FT DRILL ROD  
125.8 FT TOTAL DRILL STEEL

← ADD 5.0 FT DRILL ROD  
130.8 FT TOTAL DRILL STEEL

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12/82

DRILLING MUD LEVEL @ TOP OF PAN AND OP SHIF 24 JUNE 82  
← START OF SHIF 25 JUNE 82

N/A

WOODWARD-CLYDE CONSULTANTS  
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LOG OF BORING .D.S.G. 954

SHEET 7 OF 11

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			NO. LOG	TYPE	RECOV.	PENETR. RESIST. bl/6in		
		105						
	BROWNISH GRAY MED PLASTIC SILTY CLAY w/ TR FINE-MED SAND (CL)	106						
		107						
		108						
475		109				ADD 5.0 FT DRILL ROD 135.8 FT TOTAL DRILL STEEL		
	BROWNISH GRAY MED PLASTIC SILTY CLAY w/ TR FINE-MED SAND (CL)	110						
		111						
		112						
		113						
470		114				ADD 5.0 FT DRILL ROD 140.8 FT TOTAL DRILL STEEL		
		115						
	BROWNISH GRAY MED PLASTIC SILTY CLAY w/ TR. MED-FINE SAND (CL)	116						
		117						
		118						
465		119				ADD 5.0 FT DRILL ROD 145.8 FT TOTAL DRILL STEEL		
		120						
		121						
	BROWNISH GRAY MED PLASTIC SILTY CLAY w/ OCCASIONAL MED-FINE SAND (CL)	122						

NO SAMPLES RETAINED SOIL DESCRIPTION FROM DRILLED CUTTINGS & DRILLING CONDITIONS

N/A

Revision 14  
12/82

WOODWARD-CLYDE CONSULTANTS  
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING D.S.B.-A54

SHEET 8 OF 11

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOW
			no. loc	type	recov.	penetration resist b1/6in		
460	GRAY-BROWNISH GRAY MED PLASTIC SILTY CLAY w/ TR MED-FINE SAND (CL)	123-124						
		125						
		126						
		127						
455	GRAY-BROWNISH GRAY MED PLASTIC SILTY CLAY w/ TR MED-FINE SAND (CL)	128-129						
		130						
		131						
		132						
		133						
450	GRAY-BROWNISH GRAY LOW-MED PLASTIC SILTY CLAY w/ TR. FINE GRAVEL, F. SAND (CL) <small>BOTTOM OF PERMANENT CASING</small>	134						
		135						
		136						
		137						
		138						
445	BROWNISH GRAY LOW-MED PLASTIC SILTY CLAY (CL)	139						
		140						

NO SAMPLES RETAINED. SOIL DESCRIPTIONS FROM DRILLED CUTTINGS & DRILLING CONDITIONS

← ADD 5.0 FT DRILL ROD  
155.8 FT TOTAL DRILL STEEL

EMPTY MUD TUB OFF CUTTINGS & THICK L. MUD. ADD ~ 10 GALS FRESH WATER TO MUD TUB.

← ADD 5.0 FT DRILL ROD  
160.8 FT TOTAL DRILL STEEL

DRILL TO 132.9 FT, FLUSH BORING FOR 8 MIN. ALL RODS. SET 3 IN ID NW CASING. SEE NOTE 3. DRIVE CASING TO 134.4 FT DEPTH. END OF SHIFT 25 JUNE 82 DRILLING MUD DOWN 2.0 FT FROM TOP OF 3 IN Ø NW CASING. START OF SHIFT 29 JUNE 82 DRILLING MUD LEVEL DOWN 29.0 FT FROM TOP OF 3 IN Ø NW CASING. NEW BIT 3 IN Ø 1 1/4 IN LWD DRAG SET BIT + 160 FT DRILL ROD TO 131.8 FT. WASH OUT BOTTOM OF CASING.

← ADD 5.0 FT DRILL ROD  
166.1 FT TOTAL DRILL STEEL

Revision 14  
12/82

← ADD 5.0 FT DRILL ROD  
171.1 FT TOTAL DRILL STEEL

N/A

WOODWARD-CLYDE CONSULTANTS  
 CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING .DSB:ASH

SHEET 9..OF..11...

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penet. resist bl/6in		
	<u>Brownish Gray med plastic silty clay</u> (CL)	141						
		142						
		143						
440		144						
		145						
	<u>Brown Gray med plastic silty clay</u> (CL)	146						
		147						
		148						
435		149						
		150						
		151						
	<u>Brownish Gray med plastic silty clay</u> (CL)	152						
		153						
430		154						
		155						
	<u>Brownish Gray med plastic silty clay</u> (CL)	156						
		157						
		158	52	53	↓	21		

NO SAMPLES RETAINED SOIL DESCRIPTIONS FROM DRILLED CUTTINGS & DRILLING CONDITIONS

Slow DRILLING RATE

← ADD 5.0 FT DRILL ROD  
 176.1 TOTAL DRILL STEEL

← ADD 5.0 FT DRILL ROD  
 181.1 FT TOTAL DRILL STEEL

EMPTY MUD TUB OF THICK DRILLING MUD & CUTTINGS ADD ~ 10 GALS WATER TO MUD TUB & DRILLING MUD LEVEL DOWN 8.1 FT FROM TOP OF 3 IN Ø CASING  
 END OF SHIFT 29 JUNE 82  
 START OF SHIFT 30 JUNE 82  
 DRILLING MUD @ TOP OF 3 IN Ø CASING  
 ADD 5.0 FT DRILL ROD

186.1 FT TOTAL DRILL STEEL

DRILL TO 157.5 FT FRESH BORING FOR 10 MIN. PULL RODS & REMOVE BIT. REPLACE BIT W/ SPILT SPOON SAMPLED (3.3 FT LONG) SET POINT TO 157.5 FT DEPTH DRIVE SAMPLER DOWN. PULL RODS & SAMPLER REPLACE SAMPLER W/ 3 IN Ø DRAG BIT SET BIT + DRILL RODS TO 157.5 FT

D.1-1,328

N/A

WOOD'ARD-CLYDE CONSULTANTS  
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIROMENTAL SCIENTISTS

LOG OF BORING *D.S.B.-A54*

SHEET 10 OF 11

ELEV.	DESCRIPTION	DEPTH SCALE ft	SAMPLES				REMARKS (DRILLING FLUID, FLUID LOSS, DEPTH OF CASING, CASING BLOWS, ETC.)	CASING BLOWS
			no. loc	type	recov.	penetr resist bl/6in		
425	BROWNISH GRAY MED PLASTIC SILTY CLAY (CL)	159	5-2	SS	100% SA	32	WASH OUT TO UNDISTURBED SOIL 159.2 FT DEPTH FLUSH BORING FOR N=75 10 MIN. PULL RODS & BEGIN BENCHMARK ROD INSTALLATION	
	BOTTOM OF BORING EL. 424.8	159.2					SEE DSB-A54 BENCHMARK INSTALLATION DATA SHEETS.	
420		160						
		161						
		162						
		163						
415		164						
		165						
		166						
		167						
		168						
		169						
		170						
		171						
		172						
		173						
410		174						
		175						
		176						

D.1-1,329

Revision 14  
12/82

N/A

WOODWARD-CLYDE CONSULTANTS

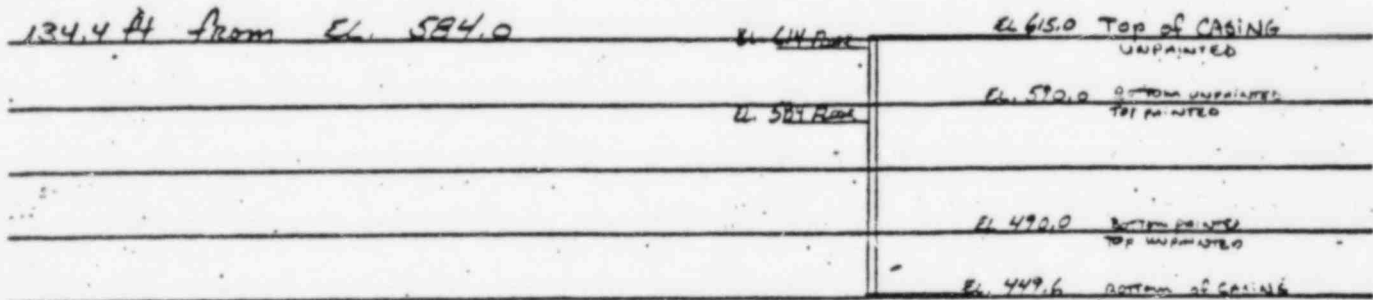
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING DSB-AS4

SHEET 11 OF 11

NOTES

NOTE #1 SET 40.4 FT OF 3" IN Ø NW FLUSH JOINT PERMANENT CASING (3-10.0 FT SECTIONS, 2-5.0 FT SECTIONS, & A 0.4 FT DRIVE SHOE) WHICH WAS UNPAINTED. THEN SET 100 FT OF PAINTED 3" IN Ø NW FLUSH JOINT PERMANENT CASING (9-10.0 FT SECTIONS, & 2-5 FT SECTIONS). THEN SET 25 FT OF UNPAINTED 3" IN Ø NW FLUSH JOINT PERMANENT CASING (5-5.0 FT SECTIONS) THUS TOTAL = 165.4 FT 3" IN Ø PERMANENT CASING INSTALLED CASING WAS SET TO 132.9 FT & DRIVEN TO 134.4 FT FROM EL. 584.0





SECTION D.1.6

BORINGS BY MERGENTIME AND SPENCER WHITE  
AND PRENTISS FOR GROUNDWATER CONTROL (1982)

Revision 14  
12/82

D.1-1,331

# BORING LOG

PROJECT: Midland Units 1 and 2  
 JOB NO.: 7220  
 SHEET NO.: 1 OF 2  
 HOLE NO.: ME-27B

SITE: East of Unit 2 Transformer  
 COORDINATES: S5062.35 E524.39  
 ANGLE FROM HORIZ.: 90°  
 BEARING: NA

RESUM: 4/15/82  
 COMPLETED: 4/15/82  
 DRILLER: Mergentime/Moretrench  
 DRILL MAKE AND MODEL: Mobile B-61  
 HOLE SIZE: 3-7/8"  
 OVERBURDEN(FT.): NA  
 ROCK(FT.): NA  
 TOTAL DEPTH: 59.5'

CORE RECOVERY(FY/N): NA  
 CORE BOXES: NA  
 SAMPLES: 11  
 EL. TOP OF CASING: 635.5  
 GROUND EL.: 634.0  
 DEPTH/EL. GROUND WATER: Not Determined  
 DEPTH/EL. TOP OF ROCK: NA

SAMPLE HAMMER WEIGHT/FALL: 140 lbs/30 in  
 CASING LEFT IN HOLE: DIA./LENGTH: 3"/49.5'  
 LOGGED BY: R.J. Kelleher

SAMPLE TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLER BLOWS F.A. PERCENT CORE RECOVERY	PENETRATION BLOWS			ELEVATION	DEPTH	GRAPHIC LOG SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
				1ST 2"	2ND 2"	3RD 2"					
							634.0	0		0-8.0' No samples	0-8.0' Drilled with a 4" nom. O.D. continuous flight auger. 4" I.D. surface casing set to 7.5 ft.
SS 2"	18"	13"	18	4	10	8	626.0	8	1	8.0-13.0' Sandy Clay, light brown to brownish gray, mottled, very stiff, trace fine gravel.(CL) (Fill)	8.0-59.5' Rotary drilled with a 3-7/8" tricone roller bit and recirculating Johnson Revert drilling fluid.
SS 2"	18"	8"	4	2	2	2	621.0	13	2	13.0-22.5' Sand, brown to gray, very loose, very fine- to coarse-grained, poorly sorted, subrounded to sub-angular, some gravel.(SP) (Fill)	
SS 2"	18"	11"	3	2	2	1		15	3		
SS 2"	18"	8"	12	4	5	7	611.5	22.9	4	22.5-32.5' Sandy Clay, gray, mottled, stiff, fine- to coarse-grained sand, some fine gravel.(CL) (Fill)	
SS 2"	18"	5"	26	14	15	11		25	5		
SS 2"	18"	8"	68	16	28	40	601.5	32.5	6	32.5-57.0' Sand, light brown to gray, very dense, very fine- to fine-grained, well sorted, (SP) (Lacustrine)	Fill Lacustrine

SS - SPLIT SPONS BY - SHELBY TUBE;  
 S - DENISON; P - PITCHER; O - OTHER

SITE: East of Unit 2 Transformer  
 Revision 14  
 12/82  
 HOLE NO.: ME-27B



# BORING LOG

PROJECT

Midland Units 1 and 2

JOB NO.

7220

SHEET NO.

2 OF 2

HOLE NO.

ME-27B

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLER BLOWS " "	PENETRATION BLOWS			ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: 1. WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
				1ST 6"	2ND 6"	3RD 6"						
							599.0	35				
SS 2"	8"	8"	100+	50	100/ 2"	-		37				
								40				
SS 2"	6"	6"	100+	100/ 6"	-	-		43				
								45				
SS 2"	5"	5"	100+	100/ 5"	-	-		48				
								50				
SS 2"	18"	13"	150	58	60	90		53				
								55				
							577.0	57				
SS 2"	18"	18"	50	16	22	28	574.5	59.5			57.0-59.5' Silty Clay, gray, hard. (CL) (Lacustrine)	
								60			Bottom of boring at 59.5'	
											Construction dewatering well installed. See pumping well construction summary.	

Revision 14  
12/82

SS = SPLIT SPOON; ST = SHELLEY TUBE  
O = OBSERVATION; P = PITCHER; G = OTHER

SITE

East of Unit 2 Transformer

HOLE NO.

ME-27B

# BORING LOG

PROJECT

Midland Units 1 and 2

JOB NO.

7220

SHEET NO.

1 OF 2

HOLE NO.

ME-33

SITE

Southeast of Diesel Building

COORDINATES

S5178.82 E346.99

ANGLE FROM HORIZ.

90°

BEARING

NA

REQ'D

COMPLETED

DRILLER

DRILL MAKE AND MODEL

HOLE SIZE

OVERBURDEN (FT.)

ROCK (FT.)

TOTAL DEPTH

3-5-82

3-5-82

Mergentime/Moretrench

Mobile B-61

3-7/8"

NA

NA

40.0'

CORE RECOVERY (FT./%)

NA

CORE BOXES

NA

SAMPLES

5

EL. TOP OF CASING

NA

GROUND EL.

634.0

DEPTH/EL. GROUND WATER

Not Determined

DEPTH/EL. TOP OF ROCK

NA

SAMPLE HAMMER WEIGHT/FALL

140 lbs/30 in

CASING LEFT IN HOLE: DIA./LENGTH

3"/40.0'

LOGGED BY:

T.R. Cullen

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLER BLOWS	PENETRATION BLOWS			ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
				1ST 6"	END 6"	END 6"						
							634.0	0			0-18.5' No samples taken	0-9.0' Dug with backhoe. 10" surface starter casing installed and backfilled around casing. 4" I.D. drill casing installed through starter casing and driven to 13.0'.
							621.0	13			13.0-13.7' Concrete, mudmat. (Fill)	13.0-40.0' Rotary drilled with a 3-7/8" tricone roller bit and recirculating Johnson revert drilling fluid
							620.3	13.7			13.7-18.5' Clay, brown, with fine- to medium-grained sand to fine gravel. (CL) (Fill)	
SS	2"	18"	15"	15	4	5	615.5	18.5		1	18.5-22.0' Silty Clay, brown, stiff, with fine- to medium-grained sand seams 1/4" to 1/2" thick. (CL) (Fill)	
							612.0	22		2	22.0-34.0' Sand, brown, fine- to coarse-grained dry, dense, with fine gravel. (SP) (Fill)	
SS	2"	18"	12"	45	9	17		25				
SS	2"	12"	12"	95+	45	95		30		3		
												33.5-38.5' Down pressure 300 lbs
SS	2"	18"	15"	38	17	14	600.0	34		4	Fill	
							599.0	35			Lacustrine	

SS = SPLIT SPIDER; ST = STREY TUBE;  
 S = DENISON; P = PITCHER; O = OTHER

SITE

Southeast of Diesel Building

Revision 14

12/82

HOLE NO.

ME-33

D.1-1,334



# BORING LOG

PROJECT

Midland Units 1 and 2

JOB NO.

7220

SHEET NO.

2 OF 2

HOLE NO.

ME-33

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLER BLOWS "N"	PENETRATION BLOWS			ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: A. WATER LEVELS. B. WATER RETURN. C. CHARACTER OF DRILLING, ETC.
				1ST 5"	2ND 5"	3RD 5"						
							599.0	35				
									5		34.0-40.0' Silty Clay; brown, hard, with thin gray silt laminations. (CL) (Lacustrine)	
SS 2"	18"	18"	56	11	21	35	594.0	40				
											Bottom of boring at 40.0' Construction dewatering well installed. See pumping well construction summary.	

Revision 14  
12/82SS = SPLIT SPOON; SY = SHELBY TUBE  
D = DENNISON; P = PITCHER; O = OTHER

NOTE

Southeast of Diesel Building  
D.1-1,335

HOLE NO.

ME-33

# BORING LOG

PROJECT: Midland Units 1 and 2  
 JOB NO.: 7220  
 SHEET NO.: 1 OF 2  
 HOLE NO.: ME-34

SITE: Southeast of Diesel Generator  
 COORDINATES: S5202 E346.19  
 ANGLE FROM HORIZ.: 90°  
 BEARING: NA

BEGIN: 4-21-82  
 COMPLETED: 4-22-82  
 DRILLER: Mergentime/Moretrench  
 DRILL MAKE AND MODEL: Mobile B-61  
 HOLE SIZE: 3-7/8"  
 OVERBURDEN (FT.): NA  
 ROCK (FT.): NA  
 TOTAL DEPTH: 40.0'

CORE RECOVERY (FT./%): NA  
 CORE BOXES: NA  
 SAMPLES: 8  
 EL. TOP OF CASING: NA  
 GROUND EL.: 634.0  
 DEPTH/EL. GROUND WATER: Not Determined  
 DEPTH/EL. TOP OF ROCK: NA

SAMPLE HAMMER WE. (SH): 140 lbs/30 in.  
 CASING LEFT IN HOLE: DIA./LENGTH: 3"/40.0'  
 LOGGED BY: R.J. Kelleher

SAMPLE TYPE AND DIAMETER	SAMPLE ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "F"	PENETRATION BLOWS			ELEVATION	DEPTH	GRAPHIC LOG SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
				1ST "	2ND "	3RD "					
							634.0	0		0-3.5' No samples	
SS 2"	18"	18"	8	4	4	4	630.5	3.5	1	3.5-8.0' Sand; light brown to brown, loose, very fine- to medium-grained, trace fine gravel. (SP) (Fill)	0-40.0' Rotary drilled with a 3-7/8" tricone roller bit and recirculating Johnson revert drilling fluid. 4" I.D. surface casing set to 8.0'
SS 2"	18"	18"	31	19	15	16	626.0	8	2	8.0-18.0' Sandy Clay; brown to gray, mottled, hard, very fine- to medium-grained sand, some fine gravel. (CL) (Fill)	
SS 2"	18"	12"	9	6	4	5		15	3		
SS 2"	18"	12"	25	10	11	14	616.0	18	4	18.0-33.5' Sand; light brown to gray, medium to very dense, very fine- to coarse-grained, trace to some fine gravel. (SP) (Fill)	
SS 2"	18"	12"	71	19	34	37		25	5		
SS 2"	18"	12"	99	32	37	62		30	6		
SS 2"	13"	7"	50	17	21	29	600.5	33.5	7	33.5-37.5' Sand; gray, dense, fine- to coarse-grained, trace fine gravel. (SP) (Lacustrine)	30.0' Slight to moderate circulation loss. Fill Lacustrine
							599.0	35			

SS = SPLIT SPINER ST - SHELBY TUBE; S = DENISON; P = PITCHER; O = OTHER  
 SITE: Southeast of Diesel Generator  
 Revision 14  
 12/82  
 HOLE NO.: ME-34



# BORING LOG

PROJECT

Midland Units 1 and 2

JOB NO.



7220

SHEET NO.

2 OF 2

HOLE NO.

ME-34

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLE BLOWS "N"	PENETRATION BLOWS			ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: A. WATER LEVELS. B. WATER RETURN. C. CHARACTER OF DRILLING, ETC.
				1ST 6"	2ND 6"	3RD 6"						
							596.0	35				
							596.5	37.5				
SS 2"	18"	18"	60	15	23	37	594.0	40		8	37.5-40.0' Silty Clay; gray to dark gray, hard. (CL) (Lacustrine)	
											Bottom of boring at 40.0'	
											Construction dewatering well installed. See pumping well construction summary.	

Revision 14  
12/82SS = SPLIT SPOON; ST = SHELBY TUBE  
D = DENRISON; P = PITCHER; O = OTHER

SITE

Southeast of Diesel Generator

HOLE NO.

ME-34

D.1-1,337

# BORING LOG

PROJECT

Midland Units 1 and 2

JOB NO.

7220

SHEET NO.

1 OF 2

HOLE NO.

ME-50

SITE  
Southwest of Diesel Building

COORDINATES  
S5177.87 E155.95

ANGLE FROM MERID.  
90°

BEARING  
NA





REQ'D	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH
3-4-82	3-4-82	Mergentime/Moretrench	Mobile B-61	3-7/8"	NA	NA	52.0'

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP OF CASING	GROUND EL.	DEPTH/EL. GROUND WATER	DEPTH/EL. TOP OF ROCK
NA	NA	8	NA	634.0	Not Determined	NA

SAMPLE HAMMER WEIGHT/FALL: 140 lbs/30 in.

CASING LEFT IN HOLE: DIA./LENGTH: 3"/52.0'

LOGGED BY: T.R. Cullen

SAMPLE TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "H"	PENETRATION BLOWS			ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
				1ST 5"	2ND 5"	3RD 5"						
				PERCENT CORE RECOVERY								
						634.0	0				0-16.0' No samples	0-11.1' backhoe excavation
SS 2"	18"	6"	10	4	4	618.0	16		1	16.0-21.5' Silty Clay; gray to brown, medium stiff; trace to some fine- to medium-grained sand, occasional pebbles. (CL) (Fill)	11.1-15.0' 4" I.D. surface casing set at 15.0'	
SS 2"	18"	13"	37	6	12	612.5	21.5		2	21.5-36.0' Sand; brown, dense to very dense, medium- to coarse-grained, some fine gravel. (SP) (Fill)	15.0-52.0' Rotary drilled with a 3-7/8" tricone roller bit and circulating Johnson revert drilling fluid	
SS 2"	18"	11"	85	12	30		30		3			
SS 2"	18"	10"	26	16	15		35		4			
						599.0	35					

SS = SPLIT SPDR BY - SHSLY TUBE;  
V = DENNISON; P = PITCHER; S = OTHER

NOTE  
Southwest of Diesel Building

Revision 14  
12/82

HOLE NO.  
ME-50



# BORING LOG

PROJECT

Midland Units 1 and 2

JOB NO.




7220

SHEET NO.

2 of 2

HOLE NO.

ME-50

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLE BLOWS "M"	PENETRATION BLOWS			ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: A. WATER LEVELS. B. WATER RETURN. C. CHARACTER OF DRILLING, ETC.
				1ST 6"	2ND 6"	3RD 6"						
							599.0	35				
SS 2"	12"	-	145	33	45	100	598.0	36		5		Fill
											36.0-50.0' Sand; tan, very fine- to fine-grained, well sorted, very dense, trace to some silty clay, occasional fine gravel. (SP) (Lacustrine)	Lacustrine
SS 2"	6"	5"	100+	100/ 6"	-	-		40		6		
SS 2"	6"	-	100+	100/ 4.5"	-	-		45		7		
							584.0	50			50.0-52.0' Silty Clay; gray, hard, with light gray silt seams. (CL) (Lacustrine)	
SS 2"	12"	-	30+	18	30	-	582.0	52		8		
											Bottom of boring at 52.0'	
											Construction dewatering well installed. See pumping well construction summary.	

SS = SPLIT SPOON; ST = SHELBY TUBE  
D = DENNISON; P = PITCHER; O = OTHER

SITE

Southwest of Diesel Building

Revision 14

12/82

HOLE NO.

ME-50

# BORING LOG

PROJECT  
Midland Units 1 and 2

HOLE NO.  
7220

SHEET NO.  
1 OF 2

HOLE NO.  
ME-51

SITE  
Southwest of Diesel Generator

COORDINATES  
S5201.98 E161.21

ANGLE FROM VORIE.  
90°

BEARING  
NA

BEGIN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH
4-22-82	4-22-82	Mergentime/Moretrench	Mobile B-61	6"	NA	NA	44.5'

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP OF CASING	GROUND EL.	DEPTH/EL. GROUND WATER	DEPTH/EL. TOP OF ROCK
NA	NA	10	NA	634.0	Not Determined	NA

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA. /LENGTH	LOGGED BY:
140 lb/30 in.	3"/44.5'	R.J. Kelleher

SAMPLE TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLER BLOWS "M"	PENETRATION BLOWS			ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
				1ST 6"	2ND 6"	3RD 6"						
							634.0	0			0-3.5' No samples	0-44.5' Rotary drilled With a 6" tricone roller bit and recirculating Johnson revert drilling fluid.
SS 2"	18"	18"	26	5	10	16	630.5	3.5	1	3.5-7.5' Sand, light brown to brown, medium dense, very fine- to fine-grained, trace medium-grained sand. (SP) (Fill)		
							626.5	7.5	2	7.5-22.5' Sandy Clay, gray, stiff, trace of fine gravel. (CL) (Fill)		
SS 2"	18"	11"	12	2	4	8		10				
SS 2"	18"	11"	11	5	6	5		15				
SS 2"	18"	0"	15	9	7	8		20			18.0-19.5' No sample recovery.	
SS 2"	18"	11"	10	4	4	6		22.5				
SS 2"	18"	11"	93	17	33	60	611.5	22.5	6	22.5-40.0' Sand, light brown to gray, very dense, very fine- to fine-grained. (SP) (Lacustrine)	Fill Lacustrine	
SS 2"	18"	12"	104	33	44	60		25				
SS 2"	18"	11"	126	33	50	76	599.0	35	8	28.0-29.5' Fine- to coarse-grained, some fine gravel.		

SE = SPLIT SPOON ST = SHELBY TUBE;  
D = DENISON; P = PITCHER; O = OTHER

SITE  
Southwest of Diesel Generator

Revision 14  
12/82

HOLE NO.  
ME-51



# BORING LOG

PROJECT

JOB NO.

SHEET NO.

HOLE NO.

Midland Units 1 and 2

7220

2 OF 2

ME-51

SAMPLER TYPE AND DIAM./FEET	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N"	PENETRATION BLOWS			ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: A. WATER LEVELS. B. WATER RETURN. C. CHARACTER OF DRILLING, ETC.
				1ST 6"	2ND 6"	3RD 6"						
							599.0	35				
SS 2"	18" 16"	132	45	73	59				9			
						594.0	40				39.2-40.0' Increasing clay content	
											40.0-44.5' Silty Clay, gray to dark gray, hard. (CL) (Lacustrine)	
SS 2"	18" 18"	52	14	21	31	589.5	44.5		10			
											Bottom of boring at 44.5'	
											Construction dewatering well installed. See pumping well construction summary.	

SS - SPLIT SPOON; ST - SHELBY TUBE  
 D - DENNISON; F - FITCHER; O - OTHER

SITE

Southwest of Diesel Generator

Revision 14  
12/82

HOLE NO.

ME-51

D.1-1,341

# BORING LOG

<b>PROJECT</b> Midland Units 1 and 2			<b>JOB NO.</b> 7220		<b>SHEET NO.</b> 1 OF 2		<b>HOLE NO.</b> MP-4			
<b>SITE</b> East of Turbine Building			<b>COORDINATES</b> S4935.07 E494.69			<b>ANGLE FROM HORIZ.</b> 90°		<b>BEARING</b> NA		
<b>REQD.</b> 3-31-82		<b>COMPLETED</b> 3-31-82		<b>DRILLER</b> Mergentime/Moretrench		<b>DRILL MAKE AND MODEL</b> Mobile B-61		<b>HOLE SIZE</b> 3-7/8"		
<b>OVERBURDEN (FT.)</b> NA		<b>ROCK (FT.)</b> NA		<b>TOTAL DEPTH</b> 60.0'						
<b>CORE RECOVERY (FT./%)</b> NA			<b>CORE BOXES</b> NA		<b>SAMPLES</b> 11		<b>EL. TOP OF CASING</b> NA		<b>GROUND EL.</b> 634.0	
<b>DEPTH/EL. GROUND WATER</b> Not Determined			<b>DEPTH/EL. TOP OF ROCK</b> NA							
<b>SAMPLE HAMMER WEIGHT/FALL</b> 140 lb/30 in			<b>CASING LEFT IN HOLE: DIA./LENGTH</b> 1"/60.0'			<b>LOGGED BY:</b> A.J. Fiksdal				

SAMPLE TYPE AND DIAMETER	SAMPLER ADVANCE	LENGTH CORE RUN	SAMPLER RECOVERY	SAMPLE BLOWS	PENETRATION BLOWS			ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVEL, WATER RETURN, CHARACTER OF DRILLING, ETC.
					1ST 2"	2ND 2"	3RD 2"						
								634.0	0			0-8.5' Silty Sand; brown, fine- to coarse-grained, crushed gravel on surface. (SP-SM) (Fill)	0-4.0' Drilling with 4" nom. O.D. continuous flight auger.  4" I.D. surface casing set to 8.0'.  8.0-60.0' Rotary drilled with a 3-7/8" tri-cone roller bit and recirculating Johnson revert drilling fluid.
SS 2"	18"	12"	19	8	9	10		625.5	8.5		1	8.5-26.5' Silty Sand; brown, medium dense to very dense, fine- to coarse-grained, trace fine gravel. (SP-SM) (Fill)	0-8.5' Material descriptions obtained from visual examination of cuttings.
SS 2"	18"	12"	130	17	43	87			15		2		
SS 2"	18"	10"	38	14	19	19			20		3		8.0-10.0' Circulation loss. Surface casing advanced to 9.0'.
SS 2"	18"	11"	142	20	42	100			25		4		
								607.5	26.5			26.5-27.5' Concrete (Fill)	
								606.5	27.5			27.5-34.7' Silty Clay; gray and brown mottled, very stiff to hard, moist, some sand, trace organics and fine gravel. (CL) (Fill)	
SS 2"	18"	14"	38	15	16	22			30		5		
SS 2"	18"	18"	28	7	13	15		599.3	34.7		6		Fill Lacustrine

<b>REVISION</b> Revision 14 12/82			<b>SITE</b> East of Turbine Building			<b>HOLE NO.</b> MP-4		
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# BORING LOG

PROJECT: Midland Units 1 and 2  
 JOB NO.: 7220  
 SHEET NO.: 2 OF 2  
 HOLE NO.: MP-4

SAMPLER TYPE AND DIAMETER	SAMPLE ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N"	PENETRATION BLOWS			ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: A. WATER LEVELS. B. WATER RETURN. C. CHARACTER OF DRILLING, ETC.
				1ST 6"	END 6"	END 6"						
							599.0	35				
											34.7-39.0' Silty Clay; gray, hard, moist, low to medium plasticity, trace fine gravel, silt partings. (CL) (Lacustrine)	
SS 2"	18"	18"	115	16	40	75	595.0	39.0		7	39.0-53.5' Sand; brown, very dense, fine-grained, well sorted moist, trace medium sand and organics. (SP) (Lacustrine)	
								40				
SS 3"	12"	7"	100+	60	100	-		45		8		
SS 3"	6"	6"	100+	100	-	-		50		9		
SS 3"	6"	6"	100+	100	-	-	580.5	53.5		10	53.5-56.0' Silty Sand, gray, very dense, fine- to very fine-grained, moist, trace organics. (SM) (Lacustrine)	
								55				
							578.0	56			56.0-60.0' Silty Clay, gray, hard, medium plasticity, silt partings. (CL) (Lacustrine)	
SS 2"	18"	18"	63	17	30	33	574.0	60		11		
											Bottom of boring at 60.0'	
											Groundwater observation well installed. See observation well construction summary.	

SS = SPLIT SPONGE; ST = SHELBY TUBE  
 O = OBRISON; P = PITCHER; Q = OTHER

SITE: East of Turbine Building Area

Revision 14  
 12/82

HOLE NO.: MP-4

# BORING LOG

PROJECT

Midland Units 1 and 2

JOB NO.

7220

SHEET NO.

1 OF 2

HOLE NO.

MP-4A

SITE

East of Turbine Building

COORDINATES

S5016.40 E509.99

ANGLE FROM HORIZ.

90°

BEARING

NA

BEGUN

4-13-82

COMPLETED

4-14-82

DRILLER

Mergentime/Moretrench

DRILL MAKE AND MODEL

Mobile B-61

HOLE SIZE

3-7/8"

OVERBURDEN(FT.)

NA

ROCK(FT.)

NA

TOTAL DEPTH

57.0'

CORE RECOVERY(FT./%)

NA

CORE BOARS

NA

SAMPLES

10

EL. TOP OF CASING

635.1

GROUND EL.

634.0

DEPTH/EL. GROUND WATER

13.4'/621.7

DEPTH/EL. TOP OF ROCK

NA

SAMPLE HAMMER WEIGHT/FALL

140 lbs/30 in

CASING LEFT IN HOLE: DIA./LENGTH

1"/57.0'

LOGGED BY:

R.J. Kelleher

SAMPLE TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLE BLOWS 1" IN. PERCENT CORE RECOVERY	PENETRATION BLOWS			ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
				1ST 2"	2ND 2"	3RD 2"						
				1ST 2"	2ND 2"	3RD 2"						
						634.0	0					
											0-8.5' No samples	0-3.0' Drilled with a 4" nom. O.D. continuous flight auger.
												4" I.D. surface casing set to 8.0'.
												8.0-57.8' Rotary drilled with a 3-7/8" tri-cone roller bit and recirculating Johnson revert drilling fluid.
SS 2"	18"	7"	4	2	2	625.5	8.5		1	8.5-33.5' Sandy Clay, brown to gray, mottled, soft to stiff, very fine- to coarse-grained sand, trace of fine gravel. (CL) (Fill)		
SS 2"	18"	10"	14	6	7		10		2			
SS 2"	18"	10"	13	2	7		15		3			
SS 2"	18"	8"	14	7	8		20		4			
SS 2"	18"	8"	6	4	3		25		5			
SS 2"	18"	8"	6	4	3		30		6			
						600.5	33.5				Fill	
						599.0	35				33.5-57.0' Sand, light brown to gray, very dense, very fine- to	Lacustrine

5-5-82



SS = SPLIT SPOON BY SHELLEY TUBE;  
S = SERRISON; P = PITCHER; O = OTHER

SITE  
East of Turbine Building

Revision 14  
12/82

HOLE NO.  
MP-4A



# BORING LOG

PROJECT

Midland Units 1 and 2

JOB NO.

7220

SHEET NO.

2 OF 2

HOLE NO.

MP-4A

SAMPLER TYPE AND DIAMETER	SAMPLE ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS	PENETRATION BLOWS			ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: A. WATER LEVELS. B. WATER RETURN. C. CHARACTER OF DRILLING, ETC.
				1ST #	2ND #	3RD #						
SS 2"	18"	8"	70	10	23	47	599.0	35				
									6		fine-grained, well sorted, sub-rounded to subangular. (SP) (Lacustrine)	
SS 2"	6"	6"	100+	100	-	-		40	7			
SS 2"	5"	5"	100+	100/ 5"	-	-		45	8			
SS 2"	8"	8"	100+	50	100/ 2"	-		50	9			
							580.0	54				
SS 2"	18"	18"	58	15	22	36		55	10		54.0-57.0' Silty Clay, gray to dark gray, hard. (CL) (Lacustrine)	
							577.0	57				
											Bottom of boring at 57.0'	
											Groundwater observation well installed. See observation well construction summary.	

SS = SPLIT SPOON; ST = SHELBY TUBE  
 O = ORISON; P = PITCHER; G = OTHER

SITE  
 East of Turbine Building

Revision 14  
 12/82

HOLE NO.  
 MP-4A

# BORING LOG

PROJECT

Midland Units 1 and 2

JOB NO.

7220

SHEET NO.

1 OF 2

HOLE NO.

MP-5

SITE

South of Unit 2 Transformer

COORDINATES

S5155.01

E487.47

ANGLE FROM HORIZ.

90°

BEARING

NA

REQUR

COMPLETED

DRILLER

DRILL MAKE AND MODEL

HOLE SIZE

OVERBURDEN (FT.)

ROCK (FT.)

TOTAL DEPTH

3-30-82

3-30-82

Mergentime/Moretrench

Mobile B-61

3-7/8"

NA

NA

36.5'

CORE RECOVERY (FT./%)

CORE BOXES

SAMPLES

EL. TOP OF CASING

GROUND EL.

DEPTH/EL. GROUND WATER

DEPTH/EL. TOP OF ROCK

NA

NA

6

639.0

634.0

15.85'/629.3

NA

SAMPLE HAMMER WEIGHT/FALL

140 lbs/30 in.

CASING LEFT IN HOLE: DIA./LENGTH

1"/35.0'

LOGGED BY:

A.J. Fiksdal

SAMPLE TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLER BLOWS * N"	PENETRATION BLOWS			ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
				1ST 6"	2ND 6"	3RD 6"						
							634.0	0				
											0-10.0' No samples	0-3.0' Drilling with 4" nom. O.D. continuous flight auger. 4" I.D. surface casing set to 9.0'. 9.0-36.5' Rotary drilled with a 3-7/8" tricone roller bit and recirculating Johnson revert drilling fluid.
SS 2"	18"	13"	44	19	21	23	624.0	10		1	10.0-13.5' Silty Sand; brown, fine- to medium-grained, dense, some fine gravel. (SM) (Fill)	
							620.5	13.5			13.5-31.0' Sandy Clay; brown mottled with gray, hard, moist, some silt, trace fine gravel. (CL) (Fill)	5/5/82
SS 2"	18"	13"	31	5	12	19		15		2		
SS 2"	18"	13"	36	9	16	20		20		3		
SS 2"	18"	13"	38	9	18	20		25		4		
SS 2"	18"	17"	94	14	55	39	603.0 602.7	31 31.3		5	31.0-31.3' Sand; brown, fine- to medium-grained. (SP) (Lacustrine) 31.3-36.5' Silty Clay; gray, hard, silt partings. (CL) (Lacustrine)	Fill Lacustrine
							599.0	35				

SS = SPLIT SPON. ST = SHELBY TUBE;  
D = DENISON; F = FRYER; O = OTHER

SITE

South of Unit 2 Transformer

Revision 14  
12/82

HOLE NO.

MP-5





# BORING LOG

PROJECT

Midland Units 1 and 2

JOB NO.


7220

SHEET NO.

2 OF 2

HOLE NO.

MP-5

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLER BLOWS "N"	PENETRATION BLOWS			ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: A. WATER LEVELS. B. WATER RETURN. C. CHARACTER OF DRILLING, ETC.
				1ST 6"	2ND 6"	3RD 6"						
SS N°	18"	17"	48	10	19	29	599.0	35				
							597.5	36.5		6	Bottom of boring at 36.5'  Ground water observation well installed. See observation well construction summary.	

SS - SPLIT SPOON; ST - SHELBY TUBE  
 O - OERRISON; F - FITCHER; G - OTHER

SITE

South of Unit 2 Transformer

Revision 14  
12/82

HOLE NO.

MP-5

D.1-1,347

# BORING LOG

PROJECT

Midland Units 1 and 2

JOB NO.

7220

SHEET NO.

1 OF 2

HOLE NO.

MP-7

NOTE

South of Diesel Building

COORDINATES

S5173.86 E299

ANGLE FROM HORIZ.

90°

BEARING

NA

BEGUN

4-7-82

COMPLETED

4-7-82

DRILLER

Mergentime/Moretrench

DRILL MAKE AND MODEL

Mobile B-61

HOLE SIZE

3-7/8"

OVERBURDEN (FT.)

NA

ROCK (FT.)

NA

TOTAL DEPTH

63.0'

CORE RECOVERY (FT./%)

NA

CORE BOXES

NA

SAMPLES

12

EL. TOP OF CASING

636.9

GROUND EL.

634.0

DEPTH/EL. GROUND WATER

17.5'/619.4

DEPTH/EL. TOP OF ROCK

NA

SAMPLE HAMMER WEIGHT/FALL

140 lbs/30 in.

CASING LEFT IN HOLE: DIA. /LENGTH

1"/62.5'

LOGGED BY:

R.J. Kelleher

SAMPLE TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOW "M"	PENETRATION BLOWS			ELEVATION	DEPTH	GRAPHIC LOG SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
				1ST "	2ND "	3RD "					
							634.0	0		0-8.5' No samples	0-8.0' Drilled with a 4" nom. O.D. continuous flight auger. 4" I.D. surface casing set to 8.0'. 8.5-10.0' No sample recovery
SS 2"	18"	0	14	5	7	7	625.5	8.5	1		
SS 2"	18"	8	9	2	4	5	624.0	10	2	10.0-15.5' Sandy Clay, brown to gray-brown, mottled, medium to stiff, fine- to coarse-grained sand, trace of fine gravel. (CL) (Fill)	8.0-63.0' Rotary drilled with a 3-7/8" tricone roller bit and recirculating Johnson revert drilling fluid.
SS 2"	18"	4	38	5	16	22	618.5	15.5	3	15.5-18.0' Sand, brown to gray-brown, dense, very fine- to coarse-grained, poorly sorted, trace clay. (SP) (Fill)	5-5-82
SS 2"	18"	12	23	5	9	14	616.0	18	4	18.0-25.0' Sandy Clay, brown to gray-brown, very stiff, fine- to coarse-grained sand, trace fine gravel. (CL) (Fill)	
SS 2"	18"	12	14	4	6	8	609.0	25	5	25.0-28.0' Silty Clay, light brown to gray-brown, mottled, stiff, trace of sand and gravel. (CL) (Fill)	
SS 2"	16"	11	100+	32	80	100/4	606.0	28	6	28.0-60.0' Sand; brown to gray, very dense, very fine- to medium-grained, moderately sorted, subrounded to subangular. (SP) (Lacustrine)	Fill Lacustrine
							599.0	35			

SS = SPLIT SPONS BY SHELBY TUBE;  
B = BENTONITE; P = PITCHER; O = OTHER

NOTE

South of Diesel Building

Revision 14  
12/82

HOLE NO.

MP-7



# BORING LOG

PROJECT

Midland Units 1 and 2

JOB NO.

7220

SHEET NO.

2 OF 2

HOLE NO.

MP-7

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERED	SAMPLE BLOWS "N"	PENETRATION BLOWS			ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: A. WATER LEVELS. B. WATER RETURN. C. CHARACTER OF DRILLING, ETC.
				1ST 6"	2ND 6"	3RD 6"						
							599.0	35				
SS 2"	12"	10"	100+	34	100	-			7			
SS 2"	8"	6"	100+	55	100/2"	-		40	8			
SS 2"	6"	5"	100+	100	-	-		45	9		45.0-50.4' Slightly finer materials.	
SS 2"	5"	5"	100+	100/5"	-	-		50	10			
SS 2"	5"	5"	100+	100/5"	-	-		55	11			
SS 2"	18"	18"	63	16	29	34	574.0	60	12		60.0-63.0' Silty Clay; gray to dark gray, hard. (CL) (Lacustrine)	
							571.0	63				
											Bottom of boring at 63.0'	
											Groundwater observation well installed. See observation well construction summary.	

SS = SPLIT SPOON; ST = SHELBY TUBE  
 D = DENISON P = PITCHER; O = OTHER

SITE

South of Diesel Generator Building

Revision 14  
12/82

HOLE NO.

MP-7

D.1-1,349

# BORING LOG

PROJECT

Midland Units 1 and 2

JOB NO.

7220

SHEET NO.

1 OF 2

HOLE NO.

MP-8

SITE

South of Diesel Building

COORDINATES

S5146.06 E200.05

ANGLE FROM HORIZ.

90°

BEARING

NA

BEGIN

4-8-82

COMPLETED

4-8-82

DRILLER

Mergentime/Moretrench

DRILL MAKE AND MODEL

Mobile B-61

HOLE SIZE

3-7/8"

OVERBURDEN (FT.)

NA

ROCK (FT.)

NA

TOTAL DEPTH

62.0'

CORE RECOVERY (FT./%)

NA

CORE BOXES

NA

SAMPLES

11

EL. TOP OF CASING

636.1

GROUND EL.

634.0

DEPTH/EL. GROUND WATER

18.9'/615.1

DEPTH/EL. TOP OF ROCK

NA

SAMPLE HAMMER WEIGHT/FALL

140 lbs/30 in.


CASING LEFT IN HOLE: DIA. /LENGTH

1"/62.0'

LOGGED BY:

R.J. Kelleher/A.J. Fiksdal

SAMPLE TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLER BLOWS "M"	PENETRATION BLOWS			ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
				1ST "	2ND "	3RD "						
							634.0	0				
								5			0-8.5' No samples	Moved 4.0' north and 2.5' west of survey pin.
SS 2"	18"	8"	8	3	3	5	625.5	8.5	1		8.5-23.0' Sandy Clay, brown to gray-brown, medium to hard, fine- to coarse-grained sand, trace fine gravel. (CL) (Fill)	0-8.0' Drilled with a 4" nom. O.D. continuous flight auger.
								10				4" I.D. surface casing set to 8.0'.
								15				8.0-62.0' Rotary drilled with a 3-7/8" tricone roller bit and recirculating Johnson revert drilling fluid.
SS 2"	18"	12"	27	6	13	14		20				
								23				
SS 2"	18"	13"	33	8	16	17		25				
							611.0	23			23.0-33.0' Silty Clay, brown to gray-brown, mottled, hard, trace fine gravel. (CL) (Fill)	
								25				
SS 2"	18"	16"	38	8	16	22		30				
								33				
								35				
							601.0	33			33.0-55.0' Sand, brown to gray, very dense, very fine- to fine-grained, moist, trace to little	Fill Lacustrine
							599.0	35				

5-5-82 

SS - SPLIT SPONGE ST - SHELBY TUBE;  
D - DENISON; F - FITCHER; G - OTHER

SITE  
South of Diesel Building

Revision 14  
12/82

HOLE NO.  
MP-8



# BORING LOG

PROJECT

Midland Units 1 and 2

JOB NO.

7220

SHEET NO.

2 OF 2

HOLE NO.

MP-8

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLE BLOWS "N"	PENETRATION BLOWS			ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: A. WATER LEVELS. B. WATER RETURN. C. CHARACTER OF DRILLING, ETC.
				1ST "	2ND "	3RD "						
SS 2"	12"	11"	100+	34	100	-	599.0	35		6	silt. (SP-SM) (Lacustrine)	
SS 2"	7"	6"	100+	60	100/2"	-		40		7		
SS 2"	4"	4"	100+	100/4"	-	-		45		8		
SS 2"	4"	3"	100+	100/4"	-	-		50		9	50.0-55.0' Increased silt	
SS 2"	6"	6"	100+	100	-	-	579.0	55		10	55.0-58.0' Silty Sand; gray, very dense, very fine-grained, sandy silt layers. (SM) (Lacustrine)	
							576.0	58			58.0-62.0' Silty Clay; gray, hard, occasional fine silt layers. (CL) (Lacustrine)	
SS 2"	18"	12"	61	17	30	31		60		11		
							572.0	62				
Bottom of boring at 62.0'												
Groundwater observation well installed. See observation well construction summary.												

SS = SPLIT SPOON; ST = SHELBY TUBE  
 O = OERRISON; F = FITCHER; G = OTHER

SITE  
 South of Diesel Building

Revision 14  
 12/82

HOLE NO.  
 MP-8

# BORING LOG

PROJECT

Midland Units 1 and 2

JOB NO.

7220

SHEET NO.

1 OF 2

HOLE NO.

MP-9

SITE

Southwest of Diesel Generator

COORDINATES

55173.56 E28.98

ANGLE FROM HORIZ.

90°

BEARING

NA

BEGUN

4-1-82

COMPLETED

4-2-82

DRILLER

Mergentime/Moretrench

DRILL MAKE AND MODEL

Mobile B-61

HOLE SIZE

3-7/8"

OVERBURDEN (FT.)

NA

ROCK (FT.)

NA

TOTAL DEPTH

40.0'

CORE RECOVERY (FT./%)

NA

CORE BOXES

NA

SAMPLES

7

EL. TOP OF CASING

636.1

GROUND EL.

634.0

DEPTH/EL. GROUND WATER

13.4'/624.3

DEPTH/EL. TOP OF ROCK

NA

SAMPLE HAMMER WEIGHT/FALL

140 lbs/30 in

CASING LEFT IN HOLE: DIA./LENGTH

1"/40.0'

LOGGED BY:

R.J. Kelleher

SAMPLE TYPE AND DIAMETER	SAMPLER ADVANCED LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLER BLOW "N"	PENETRATION BLOWS			ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
				1ST "	2ND "	3RD "						
							634.0	0			0-4.0' No samples	0-4.0' Drilled with a 4" nom. continuous flight auger.
							630.0	4			4.0-8.5' <u>Concrete</u>	4.0-40.0' Rotary drilled with a 3-7/8" tricone roller bit and recirculating Johnson revert drilling fluid.
SS 2"	18"	11"	4	1	1	3	625.5	8.5	1		8.5-20.0' Sandy Clay, brown to gray, mottled, soft to hard, very fine- to medium-grained sand. (CL) (Fill)	
SS 2"	18"	8"	7	4	3	4		10	2			
SS 2"	18"	2"	34	13	15	19	614.0	20	3		18.5-20.0' Some fine gravel.	
SS 2"	18"	13"	25	7	11	14		25	4		20.0-33.5' Silty Clay, brown to gray, mottled, very stiff, some fine gravel. (CL) (Fill)	
SS 2"	18"	17"	50	9	18	32		30	5			
SS 2"	18"	18"	26	8	12	14	600.5	33.5			33.5-40.0' Silty Clay; brown to gray, mottled, very stiff to hard.	Fill Lacustrine
							599.0	35				

5/5/82

SS = SPLIT SPIN ST = SHELLEY TUBE;  
B = BERRIGNON, F = FITCHER; O = OTHER

SITE  
Southwest of Diesel Generator

Revision 14  
12/82

HOLE NO.  
MP-9



# BORING LOG

PROJECT

Midland Units 1 and 2

JOB NO.

7220

SHEET NO.

2 OF 2

HOLE NO.

MP-9

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N"	PENETRATION BLOWS			ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: A. WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
				1ST 6"	2ND 6"	3RD 6"						
							599.0	35				
									/		(CL) (Lacustrine)	
SS 2"	18"	18"	35	7	14	21	594.0	40	/	7		
											Bottom of boring at 40.0'	
											Ground water observation well installed. See observation well construction summary.	

SS - SPLIT SPOON; ST - SHELBY TUBE  
 O - OERRISON; P - PITCHER; Q - OTHER

SITE

Southwest of Diesel Generator

Revision 14  
12/82

HOLE NO.

MP-9

D.1-1,353

# BORING LOG

PROJECT

Midland Units 1 and 2

JOB NO.

7220

SHEET NO.

1 OF 2

HOLE NO.

MP-10

SITE West of Administration Building			COORDINATES S4942.6 W7.74			ANGLE FROM HORIZ. 90°		BEARING NA	
BEGUN 4-27-82	COMPLETED 4-27-82	DRILLER Mergentime/Moretrench	DRILL MAKE AND MODEL Mobile B-62		HOLE SIZE 3-7/8"	OVERBURDEN (FT.) NA	ROCK (FT.) NA	TOTAL DEPTH 61.5'	
CORE RECOVERY (FT./%) NA		CORE SORES NA	SAMPLES 11	EL. TOP OF CASING 635.6	GROUND EL. 634.0	DEPTH/EL. GROUND WATER 33.9'/600.1		DEPTH/EL. TOP OF ROCK NA	
SAMPLE HAMMER WEIGHT/FALL 140 lbs/30 in			CASING LEFT IN HOLE: DIA./LENGTH 1"/61.5'			LOGGED BY: R.J. Kelleher			

SAMPLE TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLER BLOWS * N	PENETRATION BLOWS			ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
				1ST 4"	2ND 4"	3RD 4"						
							634.0	0			0-9.0' No samples	0-8.0' Drilled with a 4" nom. O.D. continuous flight auger 4" I.D. surface casing set. 8.0-61.5' Rotary drilled with a 3-7/8" tricone roller bit and recirculating Johnson revert drilling fluid.
SS 2"	18"	11"	4	2	2	2	625.0	9		1	9.0-12.5' Sand, light brown to brown, very loose, very fine- to fine-grained, trace fine gravel. (SP) (Fill)	
							621.5	12.5			12.5-22.0' Concrete. (Fill)	
							612.0	22			22.0-45.0' Sandy Clay, gray, mottled, hard, very fine- to fine-grained sand, some fine gravel. (CL) (Fill)	
SS 2"	18"	18"	35	10	17	18		25		2		
								30		3		30.0-31.5' No sample recovery.
SS 2"	18"	18"	35	8	18	17		35		4		
							599.0	35				

* = SPL/7 SPOON BT = SHELLEY TUBE; S = SERRISON; F = FLYCHER; O = OTHER	SITE West of Administration Building	Revision 14 12/82	HOLE NO. MP-10
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# BORING LOG

PROJECT: Midland Units 1 and 2  
 JOB NO.: 7220  
 SHEET NO.: 2 OF 2  
 HOLE NO.: MP-10

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLE BLOWS "N"	PENETRATION BLOWS			ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: A WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
				1ST "	2ND "	3RD "						
SS 2"	18"	2"	29	8	11	18	599.0	35				
SS 2"	18"	6"	19	6	8	11				35.0' Boulder		
SS 2"	18"	10"	11	5	5	6		40				
SS 2"	18"	7"	23	6	11	12	589.0	45				
SS 2"	8"	8"	100+	92	100/2"	-		50			45.0-57.0' Sand, brown to gray, medium to very dense, very fine to fine-grained, trace clay and silt. (SP) (Lacustrine)	Fill Lacustrine
SS 2"	12"	12"	100+	26	100	-		55			55.0-57.0' Increased amounts of clay and silt.	
SS 2"	18"	18"	97	24	37	60	577.0	57			57.0-61.5' Silty clay, gray, hard. (CL) (Lacustrine)	
SS 2"	18"	18"	97	24	37	60	572.5	61.5			Bottom of boring at 61.5'	
											Ground water observation well installed. See observation well construction summary.	

SS - SPLIT SPOON; ST - SHELBY TUBE  
 O - OERRISON; P - PITCHER; Q - OTHER

SITE: West of Administration Building

Revision 14  
 12/82

HOLE NO.: MP-10

# BORING LOG

PROJECT

Midland Plant Units 1 and 2

JOB NO.

7220

SHEET NO.

1 OF 2

HOLE NO.

MP-11

SITE  
Administration Building

COORDINATES  
S4874 W4.84

ANGLE FROM NORTH  
90°

BEARING  
NA

BEGIN COMPLETED DRILLER  
3-29-82 3-29-82 Mergentime/Moretrench

DRILL MAKE AND MODEL  
Mobile B-61

HOLE SIZE  
3-7/8"

OVERBURDEN (FT.)  
NA

ROCK (FT.)  
NA

TOTAL DEPTH  
56.5'

CORE RECOVERY (FT./%)  
NA

CORE BOXES  
NA

SAMPLES  
6

EL. TOP OF CASING  
636.3

GROUND EL.  
634.0

DEPTH/EL. GROUND WATER  
Not Determined

DEPTH/EL. TOP OF ROCK  
NA

SAMPLE HAMMER WEIGHT/FALL  
140 lb/30 in.

CASING LEFT IN HOLE: DIA./LENGTH  
1"/56.5'

LOGGED BY:  
A.J. Fiksdal

SAMPLE TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLER BLOWS PER CENT CORE RECOVERY	PENETRATION BLOWS			ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
				1ST 6"	END 6"	END 6"						
							634.0	0			0-10.0' No samples	0-10.0' Drilling with 4" nom. O.D. continuous flight augers.  Set surface casing at 9.0'.  10.0-56.5' Rotary drilled with a 3-7/8" tricone roller bit and recirculating bentonite drilling fluid.
SS 2"	18"	16"	47	10	20	27	624.0	10		1	10.0-13.0' Sand, brown, dense fine- to medium-grained. (SP) (Fill)	
							621.0	13			13.0-23.0' Concrete	Changed drilling fluid to revert.  Sampler refusal at 15.0'.
							611.0	23			23.0-30.0' Silty Clay, gray, very stiff, low plasticity, damp, trace fine gravel and sand. (CL) (Fill)	
SS 2"	18"	12"	28	7	12	16		25		2		
							604.0	30		3	30.0-35.0' Sandy Clay, gray with brown mottling, hard, some silt, trace fine gravel. (CL) (Fill)	
							599.0	35				

SS = SPLIT SPIN BY SHELBY TUBE;  
D = DENISON; P = PITCHER; O = OTHER

SITE  
Administration Building

Revision 14  
12/82

HOLE NO.  
MP-11



# BORING LOG

PROJECT

Midland Units 1 and 2

JOB NO.

7220

SHEET NO.

1 OF 2

HOLE NO.

MP-14

SITE

Southeast of Diesel Generator

COORDINATES

S5163.19

E459

ANGLE FROM HORIZ.

90°

BEARING

NA

REGUR  
4-5-82

COMPLETED  
4-5-82

DRILLER

Mergentime/Moretrench

DRILL MAKE AND MODEL

Mobile B-61

HOLE SIZE

3-7/8"

OVERBURDEN (FT.)

NA

ROCK (FT.)

NA

TOTAL DEPTH

46.5'

CORE RECOVERY (FT./%)

NA

CORE BOXES

NA

SAMPLES

8

EL. TOP OF CASING

636.2

GROUND EL.

634.0

DEPTH/EL. GROUND WATER

17.1'/619.7

DEPTH/EL. TOP OF ROCK

NA

SAMPLE HAMMER WEIGHT/FALL

140 lbs/30 in


CASING LEFT IN HOLE: DIA./LENGTH

1"/44.7'

LOGGED BY:

R.J. Kelleher

SAMPLE TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLER BLOWS PER FEET	PENETRATION BLOWS			ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
				1ST 6"	END 6"	END 6"						
							634.0	0			0-8.5' No samples	0-8.0' Drilled with a 4" nominal O.D. continuous flight auger. 4" I.D. surface casing set to 8.0'. 8.0-46.5' Rotary drilled with a 3-7/8" tricone roller bit and recirculating Johnson revert drilling fluid.
SS 2"	18"	8"	3	3	1	2	625.5	8.5	1		8.5-23.0' Sandy Clay, brown to gray-brown, mottled, very soft to stiff, fine- to coarse-grained sand, some fine gravel. (CL) (Fill)	
SS 2"	18"	10"	15	4	6	9		15	2			
SS 2"	18"	11"	14	2	4	10		20	3			
							611.0	23			23.0-26.0' Sand; light to dark brown, very loose, very fine- to coarse-grained, poorly sorted, subrounded to subangular, some fine gravel. (SP) (Fill)	
SS 2"	18"	7"	6	5	2	4	608.0	25	4		26.0-30.9' Sandy Clay, brown to gray-brown, mottled, stiff, fine- to coarse-grained sand. (CL) (Fill)	
SS 2"	18"	13"	52	8	18	34	603.1	30.9	5		30.9-38.0' Sand, brownish gray, very dense, very fine- to coarse-grained, poorly sorted, subrounded to subangular, some fine gravel. (SP) (Lacustrine)	Fill Lacustrine
							599.0	35				

5-5-82 

SS - SPLIT SPONGE ST - SHELBY TUBE;  
D - DENISON; P - PITCHER; G - OTHER

SITE  
Southeast of Diesel Generator

Revision 14  
12/82

HOLE NO.  
MP-14



# BORING LOG

PROJECT

Midland Units 1 and 2

JOB NO.

7220

SHEET NO.

2 OF 2

HOLE NO.

MP-14

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLER BLOWS "N"	PENETRATION BLOWS			ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: A. WATER LEVELS. B. WATER RETURN. C. CHARACTER OF DRILLING, ETC.
				1ST "	2ND "	3RD "						
							599.0	35				
SS 2"	9"	9"	100+	70	100	3"			6			
							596.0	38			38.0-43.0' Sandy <u>Clay</u> , brown to dark brown, hard, some silt, trace organics. (CL) (Lacustrine)	
								40				
SS 2"	18" 14"	86		33	34	52			7			
							591.0	43			43.0-46.5' Silty <u>Clay</u> , gray to dark gray, hard, trace very fine-grained sand. (CL) (Lacustrine)	
								45				
SS 2"	18" 18"	62		16	28	34	587.5	46.5	8			
											Bottom of boring at 46.5'	
											Groundwater observation well installed. See observation well construction summary.	

SS = SPLIT SPOON; ST = SHELBY TUBE  
 O = DENNISON; P = PITCHER; Q = OTHER

SITE

Southeast of Diesel Generator

Revision 14  
12/82

HOLE NO.

MP-14

# BORING LOG

PROJECT

Midland Units 1 and 2

JOB NO.

7220

SHEET NO.

1 OF 2

HOLE NO.

MP-16

SITE

East of Turbine Building

COORDINATES

S4946.19

E534.12

ANGLE FROM HORIZ.

90°

BEARING

NA

BEGIN

COMPLETED

DRILLER

DRILL MAKE AND MODEL

HOLE SIZE

OVERBURDEN (FT.)

ROCK (FT.)

TOTAL DEPTH

4-28-82

4-28-82

Mergentime/Moretrench

Mobile B-61

3-7/8"

NA

NA

45.5'

CORE RECOVERY (FT./%)

CORE BOXES

SAMPLES

EL. TOP OF CASING

GROUND EL.

DEPTH/EL. GROUND WATER

DEPTH/EL. TOP OF ROCK

NA

NA

9

636.9

634.0

18.9'/617.9

NA

SAMPLE HAMMER WEIGHT/FALL


140 lbs/30 in.

CASING LEFT IN HOLE: DIA. /LENGTH

1"/40.7'

LOGGED BY:

R.J. Kelleher

SAMPLE TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLER BLOWS * N"	PENETRATION BLOWS			ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN CHARACTER OF DRILLING, ETC.
				1ST "	END "	END "						
							634.0	0				
											0-3.5' No samples	
SS 2"	18"	6"	16	6	7	9	630.5	3.5		1	3.5-31.0' Sandy Clay, brown to gray, mottled, medium to very stiff, very fine- to fine-grained sand, trace of fine gravel, well sorted. (CL) (Fill)	0-45.5' Rotary drilled with a 3-7/8" tricone roller bit and recirculating Johnson revert drilling fluid.
								5				
SS 2"	18"	10"	24	8	11	13		10		2		
SS 2"	18"	10"	6	2	2	4		15		3		
SS 2"	18"	11"	13	4	5	8		20		4		
SS 2"	18"	8"	20	11	9	11		25		5	25.0-31.0' Increasing amount of fine gravel.	
SS 2"	18"	10"	21	4	8	13	603.0	30		6	31.0 -34.3' Sand; light brown to brown, medium dense, very fine- to fine-grained, well sorted. (SP) (Fill)	
							599.7	34.3			34.3-35.0' Concrete. (Fill)	Fill
							599.0	35				

5/5/82 

SS - SPLIT SPON; ST - SHELBY TUBE; B - BENTONITE; P - PITCHER; O - OTHER

SITE  
East of Turbine Building

Revision 14  
12/82

HOLE NO.  
MP-16



# BORING LOG

PROJECT

Midland Units 1 and 2

JOB NO.

7220

SHEET NO.

2 OF 2

HOLE NO.

MP-16

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS 7" - PERCENT CORE RECOVERY	PENETRATION BLOWS			ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: A. WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
				1ST 6"	2ND 6"	3RD 6"						
							599.0	35				
SS 2"	18"	11"	148	25	50	98			7		35.0-45.5' Sand, brown to gray, very dense, very fine- to medium-grained, moderately to well sorted, subrounded to subangular. (SP) (Lacustrine)	Lacustrine
SS 2"	6"	6"	100+	100	-	-		40	8			
SS 2"	6"	6"	100+	100	-	-	588.5	45.5	9			
											Bottom of boring at 45.5'	
											Groundwater observation well installed. See observation well construction summary.	

SS = SPLIT SPOON; ST = SHELBY TUBE  
O = DENNISON; P = PITCHER; Q = OTHER

SITE

East of Turbine Building

Revision 14  
12/82

HOLE NO.

MP-16

# BORING LOG

PROJECT  
Midland Units 1 & 2

JOB NO.  
7220

SHEET NO.  
1 of 1

HOLE NO.  
TH-22

SITE  
SE of Turbine Building

COORDINATES  
S 5169 E 493

ANGLE FROM HORIZ.  
90°

BEARING  
NA

BEGUN 3-9-82	COMPLETED 3-9-82	DRILLER Moretrench American Co.	DRILL MAKE AND MODEL Mobile B-61	HOLE SIZE 4"	OVERBURDEN (FT.) NA	ROCK (FT.) NA	TOTAL DEPTH 53.5'
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CORE RECOVERY (FT./%) NA	CORE BOXES NA	SAMPLES 5	EL. TOP OF CASING NA	GROUND EL. 634.0	DEPTH/EL. GROUND WATER Not Determined	DEPTH/EL. TOP OF ROCK NA
-----------------------------	------------------	--------------	-------------------------	---------------------	--	-----------------------------

SAMPLE HAMMER WEIGHT/FALL: 140 lb/30"  
CASING LEFT IN HOLE: DIA./LENGTH: 1"/53.5'  
LOGGED BY: T. R. Cullen

SAMPLE TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS PER CENT CORE RECOVERY	PENETRATION SLOWS			ELEVATION	DEPTH	GRAPHIC LOG SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
				1ST "	2ND "	3RD "					
							634.0	0		0-32.0' No samples	Drilling was in progress when Geologist arrived. Drilled to 32' with drag bit.
SS 2"	18" 17"	57	15 24 33			602.0	32	1	32.0 -36.5' Sand, brown-gray, very dense, fine-to coarse-grained, with trace to some fine-to coarse gravel. (SP) Fill	Fill	
SS 2"	18" 18"	59	15 27 32			597.5	36.5	2	36.5 -53.5' Clay, brown gray, hard with light gray silt lenses. (CL) Lacustrine	Lacustrine	
SS 2"	18" 17"	62	10 25 37				40	3			
SS 2"	18" 18"	52	16 22 30				45	4			
SS 2"	18" 18"	61	20 27 34			580.5	51.5	5			
Bottom of boring at 53.5'. Freeze-wall temperature monitor installed.											

SS = SPLIT TUBE BY SHELBY TUBE;  
O = OERRISON; P = PITCHER; G = OTHER

SITE  
S. E. of Turbine Building

Revision 14  
12/82

HOLE NO.  
TH-22



BIC4055T3 (BIC2.7) Prepared by JWS Reviewed by Jue Checked by IF 2.4.82

BORING NO. COE-5 GROUND SURFACE ELEV (ft) 631.6 Sheet 4 of 5

Sample No.	Section No.	Depth ft.	Tube			Section			Ave. PP t/ft <sup>2</sup>	W %	W <sub>L</sub> %	PI %	% Passing Sieve				G <sub>s</sub>	Type Eng. Prop. Test
			Type	Rec. ft	d <sub>e</sub> lb/ft <sup>3</sup>	USCS Symbol	W %	d <sub>e</sub> lb/ft <sup>3</sup>					d <sub>y</sub> lb/ft <sup>3</sup>	# 4	# 10	# 40		
S-13		30.5-33.0	PS	1.83	135.3 136.7													
	A	30.8					20.5											F
	B	31.2				CL	20.3			39	20	97	96	90	64			F
	C	31.8					17.6											F
	D	32.2				CL	17.5			32	16							F
S-14		33.0-35.5	PS	1.47	142.3 140.3													D-FT
	A	33.2					11.6		>4.5									N
	B	33.8				CL	10.1		>4.5	23	10	99	97	89	57			N
	C	34.2				ML	11.5			15	3							N
S-15A		35.5-39.5*	PQ3	4.0*	-													DIKE, D-FT
	B	36.2				CL-ML	6.6	150.7	141.4		18	6	97	95	89	57	2.73	CTU
	C	37.0				CL-ML	6.5	149.6	140.5		18	6	99	95	92	58	2.74	CTU
	F	39.0*				CL-ML	6.8	150.3	140.7		17	6	98	96	90	57	2.74	CTU
S-15B		39.5-40.5	PQ3	1.0	-													N
S-16		40.5-45.5	PQ3	5.0	-													
	A	40.8				CL-ML	7.1	150.3	140.3		18 17	6	94	92	87	54	2.73	CTU
	B	41.4				CL-ML	7.5	149.6	139.1		17	5	97	96	91	57		UU
	C	42.0				CL-ML	7.4	151.0	140.6		18	6	98	97	92	58		UU
	D	42.9				CL-ML	7.1	149.8	139.9		17	5	99	98	93	59		UU
	E	43.6				CL-ML	7.2	150.1	140.0		16	5	98	96	91	58		UU

\* Data not previously reported.

MIDLAND PLANT UNITS 1 and 2 - CONSUMERS POWER CO.  
LAB TESTING SUMMARY: PERIMETER DIKE

D.2-857

Table B-5 (4/5)

Revision 14  
12/82

BIC-4055T3 (BIC-117) Prepared by JWS Reviewed by JWC Checked by JF 1.4.82

BORING NO. COE-5 GROUND SURFACE ELEV. (ft.) 631.6 Sheet 5 of 5

Sample No.	Section No.	Depth ft.	Tube		USCS Symbol	Section				Ave. PP t/ft <sup>2</sup>	W %	WL %	PI %	% Passing Sieve			Type Eng. Prop. Test						
			Type	Rec. ft.		$\gamma_c$ lb/ft <sup>3</sup>	$\gamma_r$ lb/ft <sup>3</sup>	W %	$\gamma_c$ lb/ft <sup>3</sup>					$\gamma_r$ lb/ft <sup>3</sup>	$\gamma_c$ lb/ft <sup>3</sup>	#		#	#				
S-17A	A	45.5	PQ3	1.8	-																		
		47.3																					
		45.7				6.9				>4.5												N	
		46.2				7.4				>4.5												N	
S-17B	B	46.7				7.6				>4.5											N		
		47.2				7.0				>4.5											N		
S-17B	B	47.3	PQ3	2.5	-																		
		50.5																					
		48.1				CL-ML	7.4	148.4	138.1			16	5	98	96	91	59					D-FT	
		48.6					7.9	152.7	141.5		>4.5											N	
		49.0				CL-ML					>4.5		15	4								N	
S-17B	E	49.5				7.7				>4.5											N		

\* Data not previously reported.

MIDLAND PLANT UNITS 1 and 2 - CONSUMERS POWER CO.  
LAB TESTING SUMMARY: PERIMETER DIKE

Revision 14  
12/82

Table B-5 (5/5)

310405573 (DICK) Prepared by JEB Reviewed by JWC Checked by Lm 6/29/81  
 EORING NO. COE-B GROUND SURFACE ELEV. (21) 634.2 Sheet 1 of 3 PF 2.1.82

Sample No.	Section No.	Depth ft.	Tube		USCS Symbol	Section			Ave. PP t/ft <sup>2</sup>	W %	W <sub>L</sub> %	PI %	% Passing Sieve			Type Eng Prop. Test	
			Type	Size ft.		d <sub>c</sub> lb/ft <sup>3</sup>	d <sub>e</sub> lb/ft <sup>3</sup>	w %					d <sub>e</sub> lb/ft <sup>3</sup>	d <sub>e</sub> lb/ft <sup>3</sup>	#		#
S-1		5.0-5.7	DS	0.54	138.0				2.5*				4	10	40	200	DGB
		5.10				11.9											F
		5.25				13.3											F
		5.27				13.5			3.0*								F
S-2		6.4-8.3	HS	1.70	122.7												DGB
	A	6.6				3.5							97	68	25	1	F
		7.8				9.0											F
S-4		8.3-8.9	HS	0.49	122.2												DGB
	A	8.55				10.0							89	54	29	6	F
S-5		8.9-10.6	HS	1.62	122.7												DGB
	A	9.2				4.5							93	61	31	2	F
	B	10.4				9.5											F
S-6		10.6-12.2	HS	1.39	124.5												DGB
	A	10.85				4.4											F
	B	11.65				7.2											F
S-7		12.2-13.3	HS	1.03	132.0												DGB
	A	12.4				7.4							94	66	34	3	F
		12.7				10.3											F
	B	13.0				9.5							96	76	48	15	F
S-8		13.3-14.4	HS	0.95	129.3												DGB
	A	13.5				8.9							91	61	32	3	F
	B	14.2				6.1							94	64	32	3	F

\* Data not previously reported.

MIDLAND PLANT UNITS 1 and 2 - CONSUMERS POWER CO.  
 LAB TESTING SUMMARY - DIESEL GENERATOR BUILDING

Table B-8 (1/3)

BORING NO. COE-8 PREPARED BY RFF CHECKED BY HIF  
 81C4055T3 (8/2/87) REVIEWED BY Inne IF 2.4.82  
 GROUND SURFACE ELEV (FE) 634.2 SHEET 2 OF 3

Sample No.	Section No.	Depth ft.	Tube		USCS Symbol	Section				Ave. PP t/ft <sup>2</sup>	W %	W <sub>L</sub> %	PI %	% Passing Sieve			Type Eng Prop. Test		
			Type	Rec. ft.		d <sub>c</sub> lb/ft <sup>3</sup>	w %	d <sub>c</sub> lb/ft <sup>3</sup>	d <sub>c</sub> lb/ft <sup>3</sup>					#	#	#			
S-9	A	14.4-14.9	HS	2.41	131.1	SP	9.6							87	56	29	3	DGB	F
S-10	A	14.9-17.4	PS	1.65	125.9		3.9											DGB	F
	B	15.6				SP	5.8							76	66	33	2		F
	C	16.2					8.9												F
S-11	A	17.4-17.9	PS	2.42	124.1	SP	4.5							95	44	6	1	DGB	F
	B	18.1					3.8												F
	C	18.6					4.3												F
	D	19.4				SP	11.9							96	68	34	2		F
S-12	A	19.9-20.4	PS	1.34	129.6	SP	6.0							84	55	25	1	DGB	F
	B	20.6					9.7												F
	C	21.0				SP	10.9							96	66	34	3		F
S-13		22.4-24.9	PS	0.60	126.1	SP	10.2							89	45	21	2		F
S-14		24.9-27.4	PS	1.93	128.4													DGB	F
	A	25.1				SP	8.2							89	46	24	3		F
	B	25.6					8.2												F
	C	26.1					12.6												F
	D	26.6				SP	14.9							17	70	50	4		F

MIDLAND PLANT UNITS 1 and 2 - CONSUMERS POWER CO.  
 LAB TESTING SUMMARY - DIESEL GENERATOR BUILDING

Revision 14  
 12/82

Table B-8 (2/3)

BIC4055T3 (BIC2:7)

Prepared by VB

Reviewed by JWS

Checked by JWS

11F 2.4.72

BORING NO. COE-14

GROUND SURFACE ELEV. (FL.) 633.5

Sheet 5 of 5

Sample No.	Section No.	Depth ft.	Tube		Section			Ave. PP t/ft <sup>2</sup>	W %	W <sub>L</sub> %	PI %	% Passing Sieve				G <sub>s</sub>	Type Eng. Prop. Test	
			Type	Rec. ft	d <sub>c</sub> lb/ft <sup>3</sup>	USCS Symbol	W %					d <sub>c</sub> lb/ft <sup>3</sup>	d <sub>g</sub> lb/ft <sup>3</sup>	# 4	# 10			# 40
S-23		49.2-51.7	PS	1.16	127.9 131.8												RW	
	A	49.3					14.9										N	
		49.4						15.3									N	
	B	49.8				SM	20.3	127.9	105.9		Non-Plastic	100	100	100	42	2.68	CIU	
		50.0								9.7							N	
	C	50.2					13.7										N	
S-24		51.7-54.2	F	1.13	126.2 128.9													
	A	52.0					18.2										N	
	B	52.5				SPSM	18.3					100	100	99	6		N	
S-25		54.2-56.7	PS	1.50	132.2 136.4												RW	
	A	54.5					17.7			>4.5							N	
	B	55.0					17.7			>4.5					100		N	
	C	55.5				CL	18.2			>4.5	41	22					N	
S-26		56.7-57.5	PS in var	0.1	—	CL	19.5				38	20					RW	
S-27		57.5-58.3	OS	0.8		CL	19.7				42	24	—	—	—	99	RW	
S-28		58.3-60.8	PS	1.95	131.6 134.9												RW	
	A	58.6															N	
	B	59.1				CL	19.7	132.5	110.7		40	21	—	—	—	100	2.77	CIU
	C	59.6				CL	20.0	132.0	109.9		40	23	—	—	—	99	—	CIU
	D	60.1				CL	20.1	131.7	109.7		40	23	—	—	—	99	2.76	CIU

MIDLAND PLANT UNITS 1 and 2 - CONSUMERS POWER CO.  
 LAB TESTING SUMMARY RETAINING WALLS

D.2-915

Table B-22 (5/5)

Revision 14  
 12/82

BIC4055T3 (BIC217)

Prepared by JWS

Reviewed by Line Checked by IF 2.4.82

BORING NO. COE-15

GROUND SURFACE ELEV. (ft.) 634.2

Sheet 1 of 2

Sample No	Section No	Depth ft.	Tube			Section			Ave. PP $\frac{L}{ft^2}$	$\omega$ %	$\omega_L$ %	PI %	% Passing Sieve				$G_s$	Type Eng. Prop. Test	
			Type	Rec. ft	$\gamma_d$ lb/ft <sup>3</sup>	USCS Symbol	$\omega$ %	$\gamma_d$ lb/ft <sup>3</sup>					$\gamma_d$ lb/ft <sup>3</sup>	# 4	# 10	# 40			# 200
S-3		30-5.5	TW	1.06	$\frac{133.4}{136.2}$														F
	A	3.3						11.3											F
	B	3.8						10.8	142.5	128.6									F
S-4		5.5-8.0	OS	1.42	$\frac{139.0}{140.7}$														
	A	6.8						11.6	139.1	124.7									F
	B	6.2						10.8	142.0	128.1									F
	C	6.7						11.6											F
S-5		8.0-10.5	OS	1.37	$\frac{137.8}{142.1}$														
	A	8.3						12.6											F
	B	8.8						10.8											F
	C	9.2				CL		12.6				23	10						F
S-6		10.6-13.0	OS	1.93	$\frac{140.9}{144.0}$														
	A	10.7						12.6											F
	B	11.2						11.7	139.7	125.0									F
	C	11.7						12.6											F
	D	12.2						12.2											F
		12.4																	F

MIDLAND PLANT UNITS 1 and 2 - CONSUMERS POWER CO.  
LAB TESTING SUMMARY: RETAINING WALLS

D.2-916

Table B-23 (1/2)

REVISION  
6/82



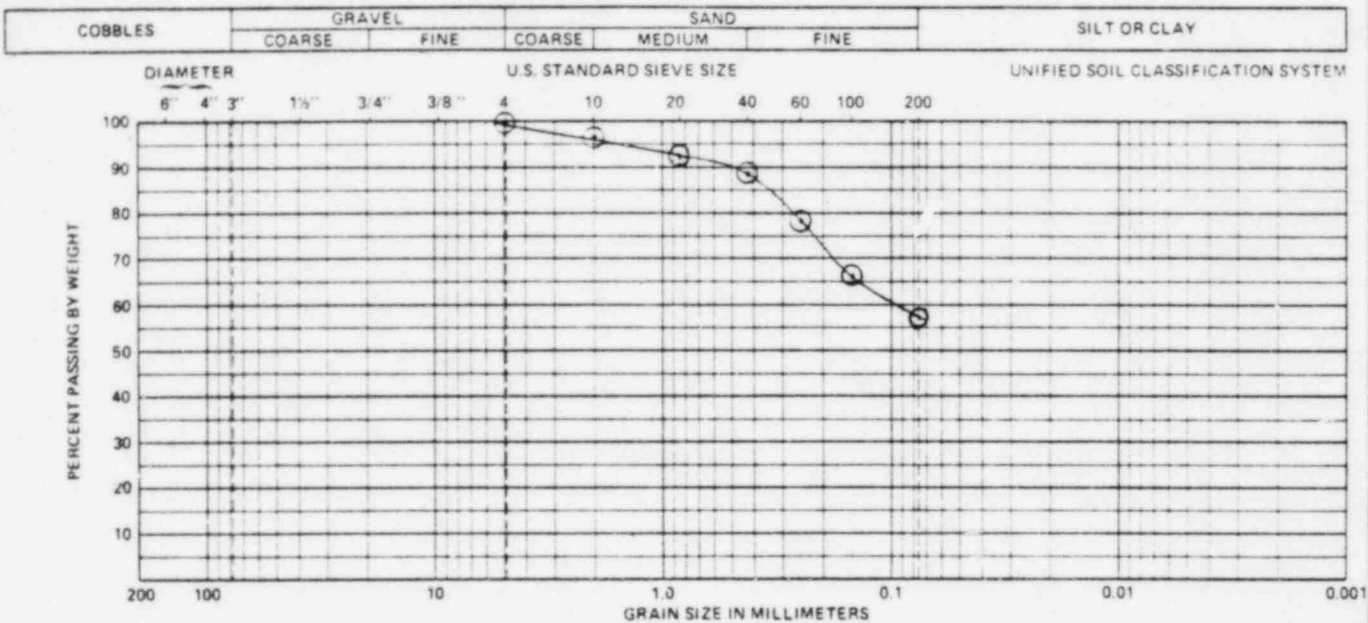




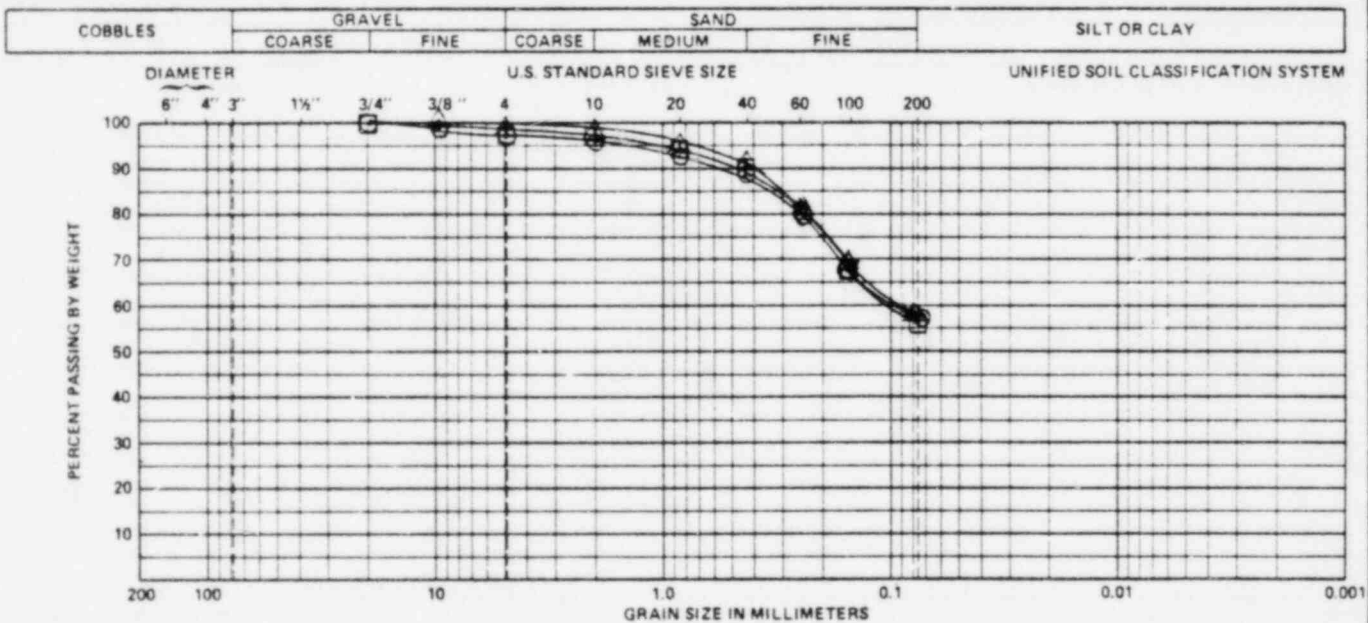




# PARTICLE-SIZE DISTRIBUTION



BORING	SAMPLE	DEPTH (ft)	SYMBOL	CLASSIFICATION	w (%)	w <sub>L</sub> (%)	w <sub>p</sub> (%)
COE-5	S-14-B	33.8	○	CL, brown, f. sandy, sp. to m. p. silty CLAY, trace f. gravel to m. sand.	10.1	23	13

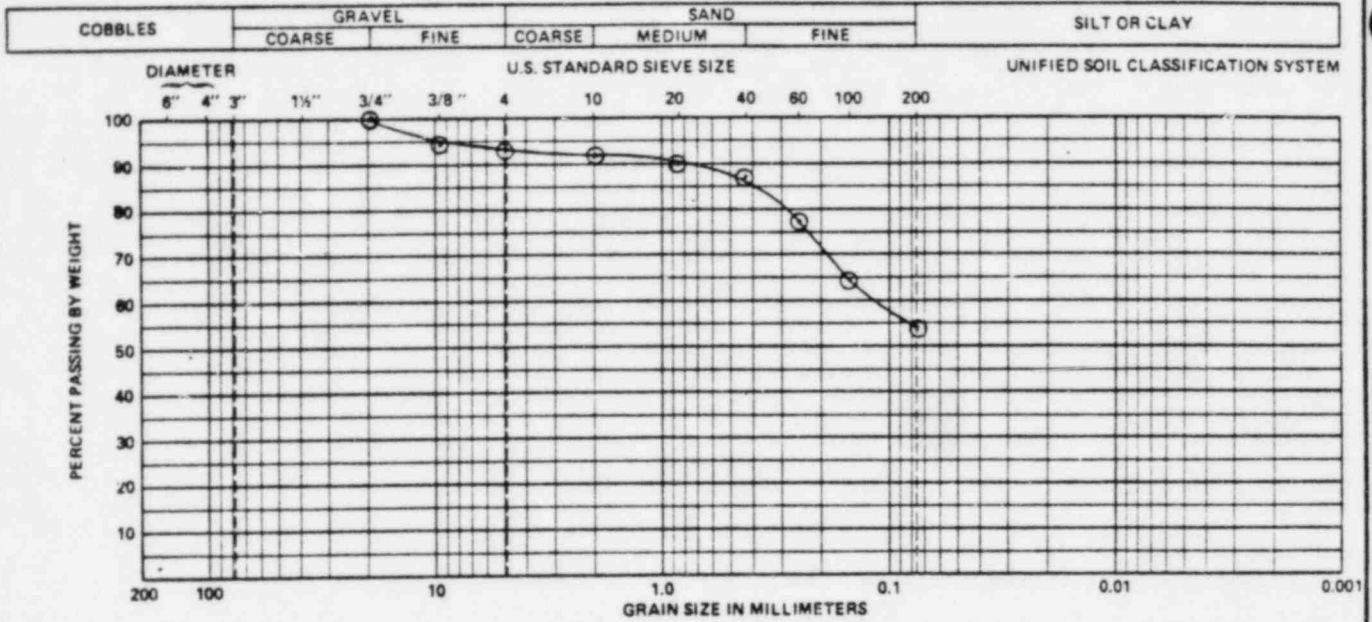


BORING	SAMPLE	DEPTH (ft)	SYMBOL	CLASSIFICATION	w (%)	w <sub>L</sub> (%)	w <sub>p</sub> (%)
COE-5	S15A-B	36.2	○	CL-MI, mottled brown and gray, f. sandy, sp. silty CLAY, tr. c. m. sand - CU spec.	6.6	18	12
COE-5	S15A-C	37.0	△	CL-MI, brown, f. sandy, s. p. silty CLAY, tr. f. gravel to m. sand - CU spec.	6.5	18	12
COE-5	S15A-F	39.0	□	CL-MI, mottled brown and gray, f. sandy, s. p. silty CLAY, tr. f. gravel to m. sand - CU spec.	6.8	17	11

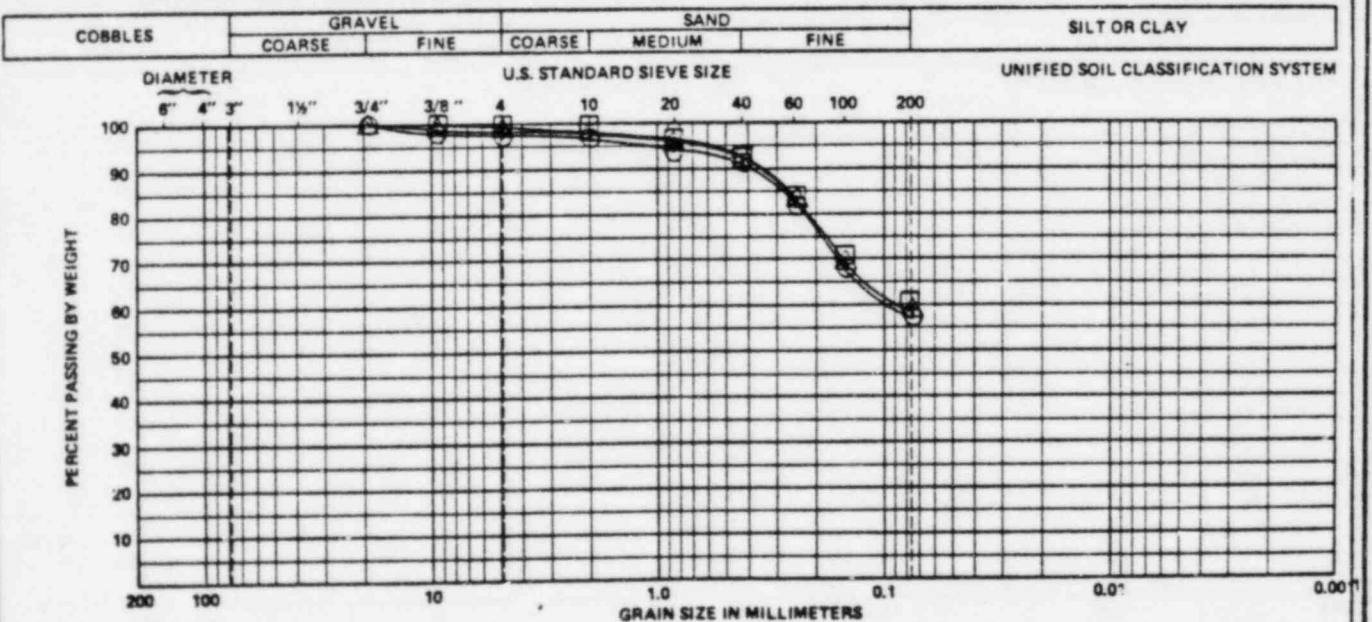
REVIEWED BY WCCU LR-101 (10/82)

PROJECT NO. 8104055 T3 DRAWN BY: WLD

# PARTICLE-SIZE DISTRIBUTION



BORING	SAMPLE	DEPTH (ft)	SYMBOL	CLASSIFICATION	w (%)	w <sub>L</sub> (%)	w <sub>p</sub> (%)
COE 5	S-16-A	40.8	⊙	CL-ML, gray, f. sandy, s.p. silty CLAY, some f. gravel to m. sand - UH spec.	7.1	17	11
						18	12



BORING	SAMPLE	DEPTH (ft)	SYMBOL	CLASSIFICATION	w (%)	w <sub>L</sub> (%)	w <sub>p</sub> (%)
COE 5	S-16-B	41.4	⊙	CL-ML, gray, f. sandy, s.p. silty CLAY, tr. f. gravel to m. sand - UH spec.	7.5	17	12
COE 5	S-16-C	42.0	△	CL-ML, gray, f. sandy, s.p. silty CLAY, tr. f. gravel to m. sand, occ. f. gravel - UH spec.	7.4	18	12
COE 5	S-16-D	42.9	⊠	CL-ML, gray, f. sandy, s.p. silty CLAY, tr. f. gravel to m. sand - UH spec.	7.1	17	12

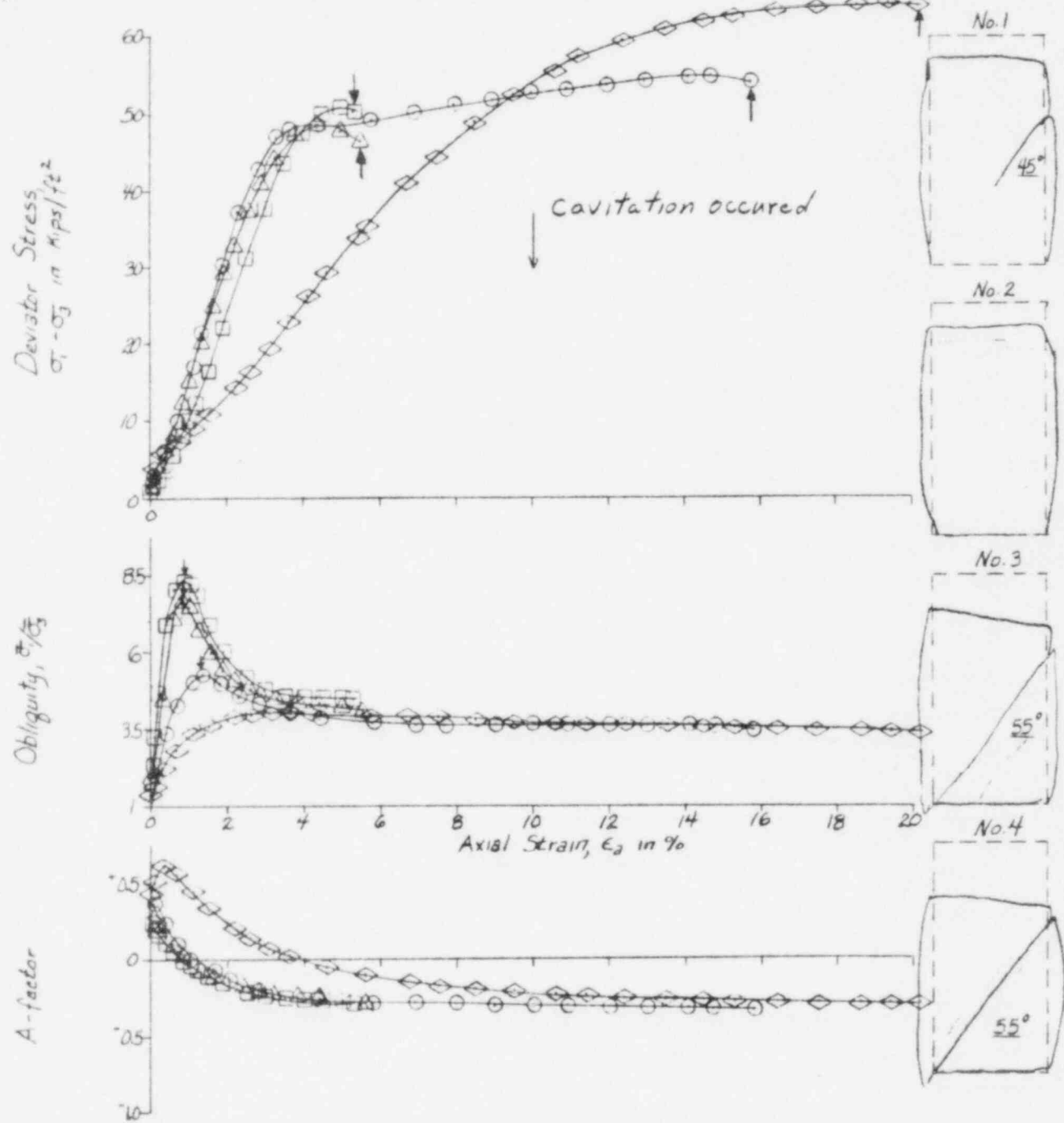
REVIEWED BY: WLL LK-101 (WBL) *June*

PROJECT NO: DIL-7000 IS DRAWN BY: FNU

B10405573 Drawn by CBE Reviewed by RSL Checked by J.W. 06/28/82

Specimens 2.9 in. dia by 6.0 in. ht. with top, bottom, and radial (filter strips) drainage boundaries

Test No.	Symbol	Boring No. CDE	Sample No.	Elev. ft	USCS Symbol	w <sub>o</sub> %	w <sub>c</sub> %	γ <sub>dc</sub> lb/ft <sup>3</sup>	γ <sub>dc</sub> lb/ft <sup>3</sup>	σ <sub>vc</sub> Kip/ft <sup>2</sup>	K <sub>c</sub>	B-factor	ε̇ %/hr	t <sub>c</sub> days
1	□	5	15A-B	595.4	CL-ML	66	72	141.4	142.1	1.019	1.006	98.3	0.75	3
2	△	5	15A-C	594.6	CL-ML	65	74	140.5	141.6	2.016	0.997	97.2	0.74	2
3	○	5	15A-F	592.6	CL-ML	68	72	140.7	142.4	4.003	0.998	96.5	0.79	1
4	◇	5	16-A	590.8	CL-ML	71	71	140.3	142.4	7.991	0.997	96.8	0.78	1



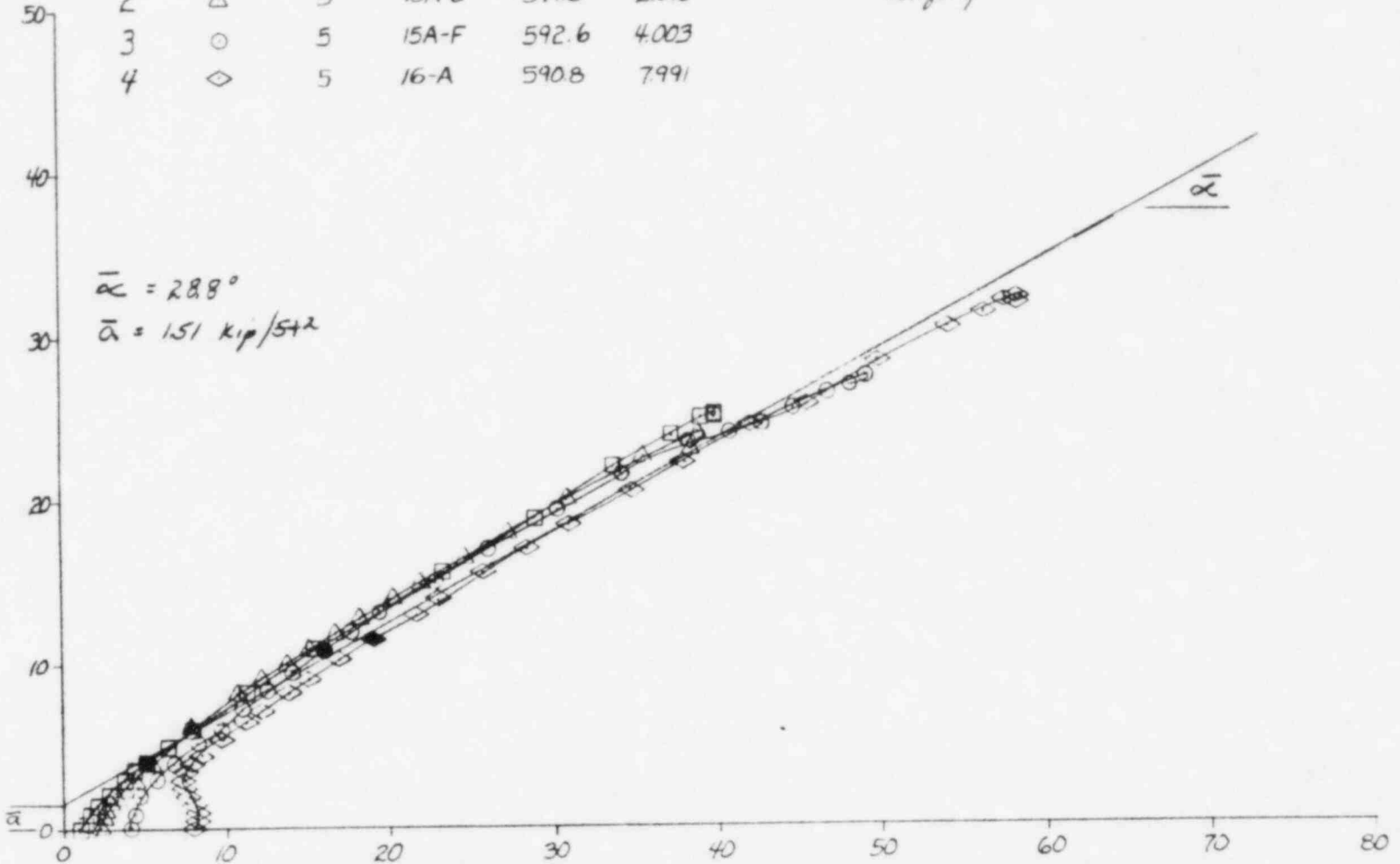
MIDLAND PLANT UNITS 1 and 2 - CONSUMERS POWER CO  
 CIU-TRIAXIAL TEST SERIES - STRESS/STRAIN CHARACTERISTICS  
 AREA: PERIMETER DIKE - FOUNDATION TILL

Revision 14  
 12/82

Test No.	Symbol	Boring No. COE-	Sample No.	Elev. ft.	$\bar{\sigma}_{vc}$ kip/ft <sup>2</sup>
1	□	5	15A-B	595.4	1.019
2	△	5	15A-C	594.6	2.016
3	○	5	15A-F	592.6	4.003
4	◇	5	16-A	590.8	7.991

Note 1) Solid symbols for conditions of peak obliquity  
 2) Strength envelope for conditions of peak obliquity

Shear Stress,  $q = (\sigma_1 - \sigma_2) / 2$  in kip/ft<sup>2</sup>



$\alpha = 28.8^\circ$   
 $c = 1.51 \text{ kip/ft}^2$

Average Effective Stress,  $\bar{p} = (\sigma_1 + \sigma_2) / 2$  in kip/ft<sup>2</sup>

MIDLAND PLANT UNITS 1 and 2 - CONSUMERS POWER CO.  
 CIU - TRIAXIAL TEST SERIES - STRESS PATHS  
 AREA: PERIMETER DIKE-FOUNDATION TILL

D.2-1, 230

Revision 14  
 12/82

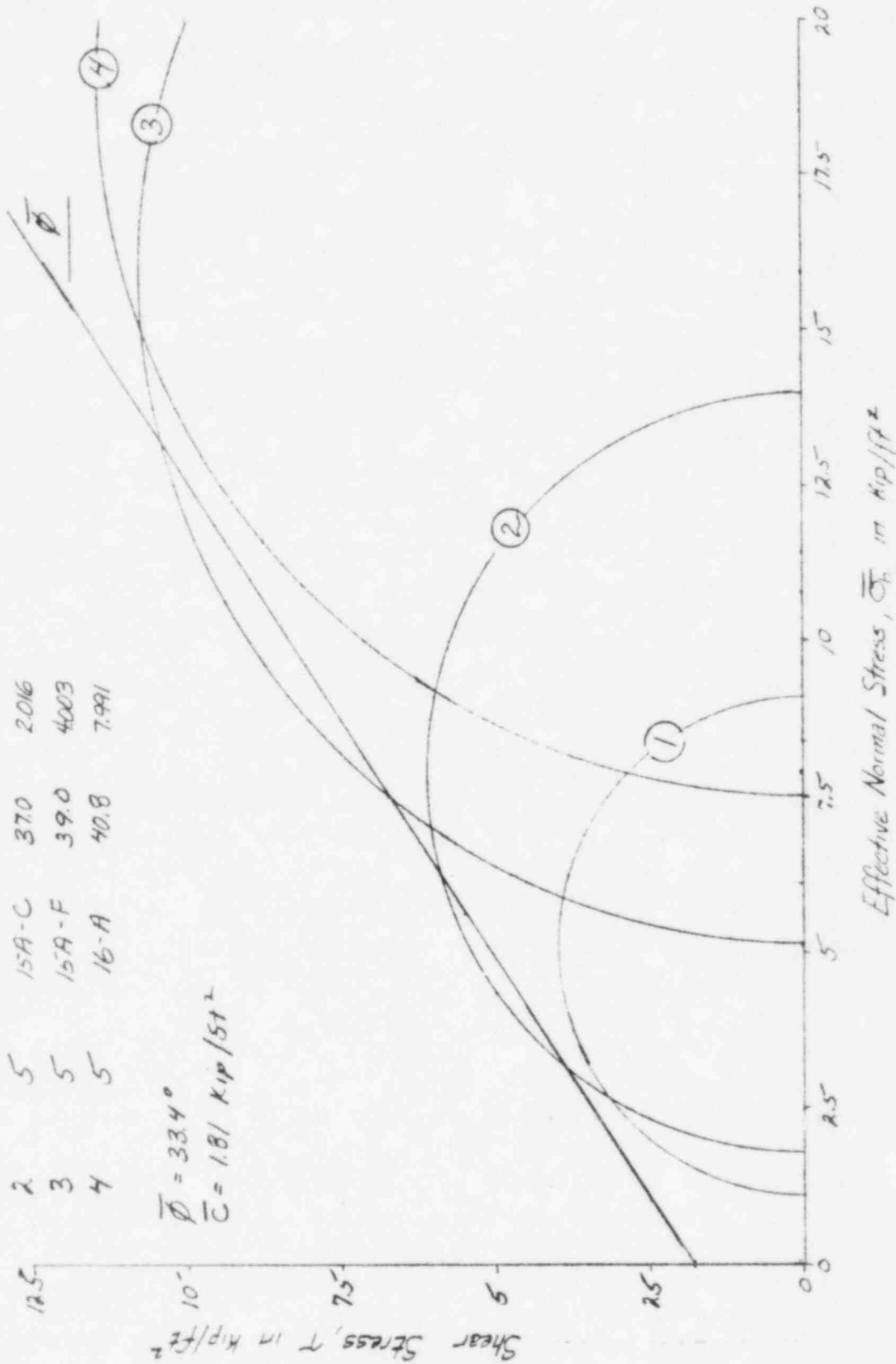
81C 4055 T3

11/14/81 KSLRA REVIEWED R. RA

Checked by  
JWS  
30 June 81

TEST NO.	BORING NO. COE	SAMPLE NO.	DEPTH FT.	$\bar{\sigma}_{vc}$ KIP/FT <sup>2</sup>	Mohr circles for conditions of peak obliquity
1	5	15A-B	36.2	1019	
2	5	15A-C	37.0	2016	
3	5	15A-F	39.0	4003	
4	5	16-A	40.8	7991	

$\bar{\phi} = 33.4^\circ$   
 $\bar{c} = 1.81 \text{ KIP/FT}^2$

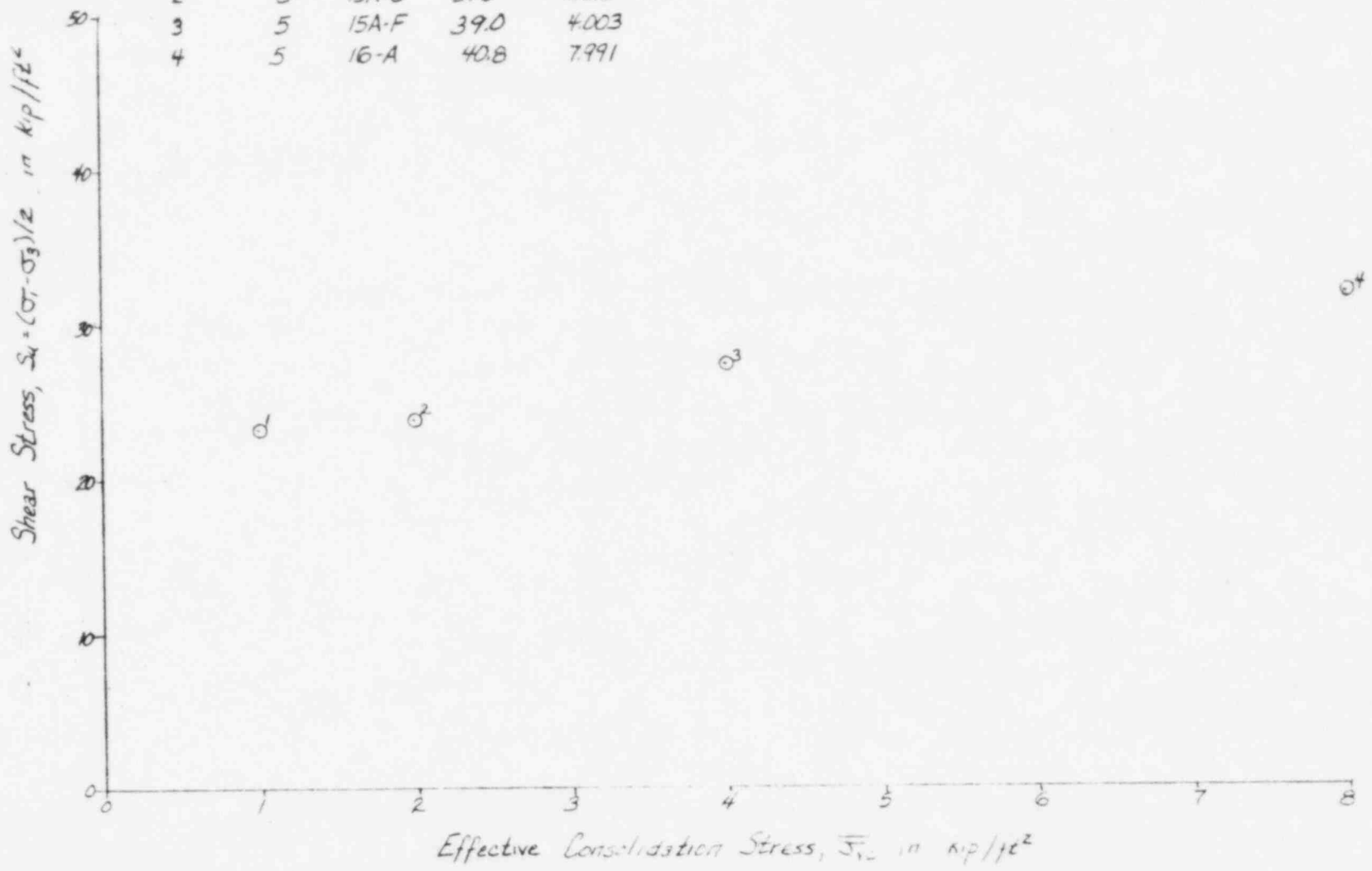


MIDLAND PLANT UNITS 1 and 2 - CONSUMERS POWER CO.  
TIU - TRIAXIAL TEST SERIES - STRENGTH ENVELOPE  
AREA: PERIMETER DIKE FOUNDATION TILL

Revision 14  
12/82

Test No.	Boring No. COE -	Sample No.	Depth Ft.	$\bar{\sigma}_{vc}$ kip/ft <sup>2</sup>
1	5	15A-B	36.2	1.019
2	5	15A-C	37.0	2.016
3	5	15A-F	39.0	4.003
4	5	16-A	40.8	7.991

Note: Data for conditions of deviator stress when cavitation occurred



MIDLAND PLANT UNITS 1 and 2 - CONSUMERS POWER CO.  
 CIU - TRIAXIAL TEST SERIES - UNDRAINED STRENGTH  
 AREA: PERIMETER DIKE - FOUNDATION TILL

D.2-1232

REVISION 13  
 6/82

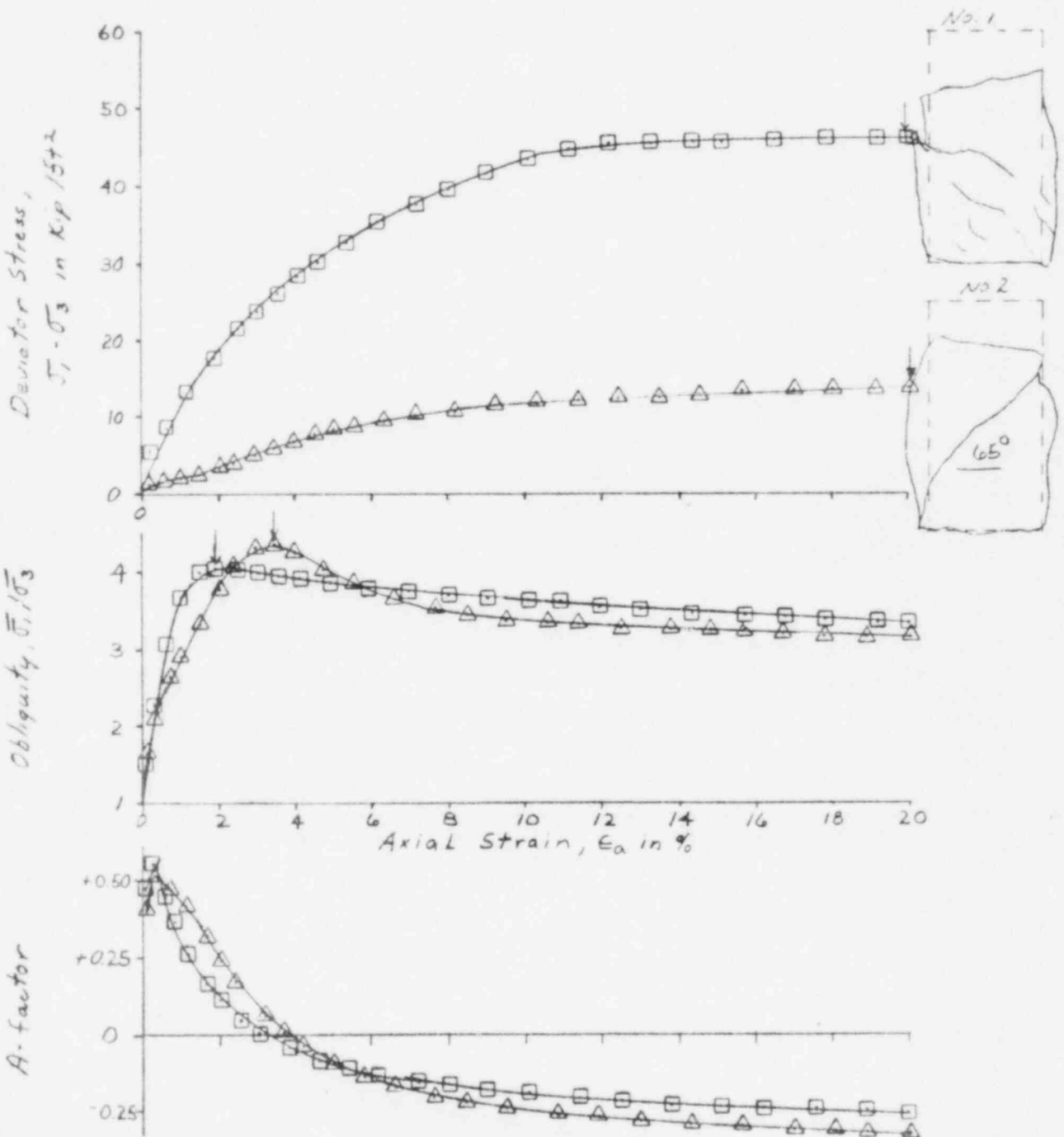


Reviewed by R.R. Checked by i.F.

Drawn by JWS

Specimens: 2.9 in. dia. by 6.0 in. ht. with top, bottom and radial (filter strips) drainage boundaries

Test No.	Symbol	Boring No COE-	Sample No.	Elev. ft.	USCS Symbol	W <sub>o</sub> %	W <sub>c</sub> %	γ <sub>dc</sub> lb/st <sup>2</sup>	γ <sub>dc</sub> lb/st <sup>3</sup>	σ <sub>vc</sub> kip/st <sup>2</sup>	k <sub>c</sub>	B-Sactor %	ε̇ %/hr	t <sub>c</sub> days
1	△	15A	19-B	593.6	CL	8.7	9.1	135.4	136.6	1.998	1.001	98.9	0.80	1
2	□	15A	20-B	590.8	CL-ML	8.8	7.8	136.6	140.4	8.000	0.996	95.7	0.79	1



MIDLAND PLANT UNITS 1 and 2 - CONSUMERS POWER CO. 12/82  
 CTU TRIAXIAL TEST SERIES - STRESS/STRAIN CHARACTERISTICS  
 AREA: RETAINING WALLS - FOUNDATION TILL Fig E-4a  
 D.2-1,261

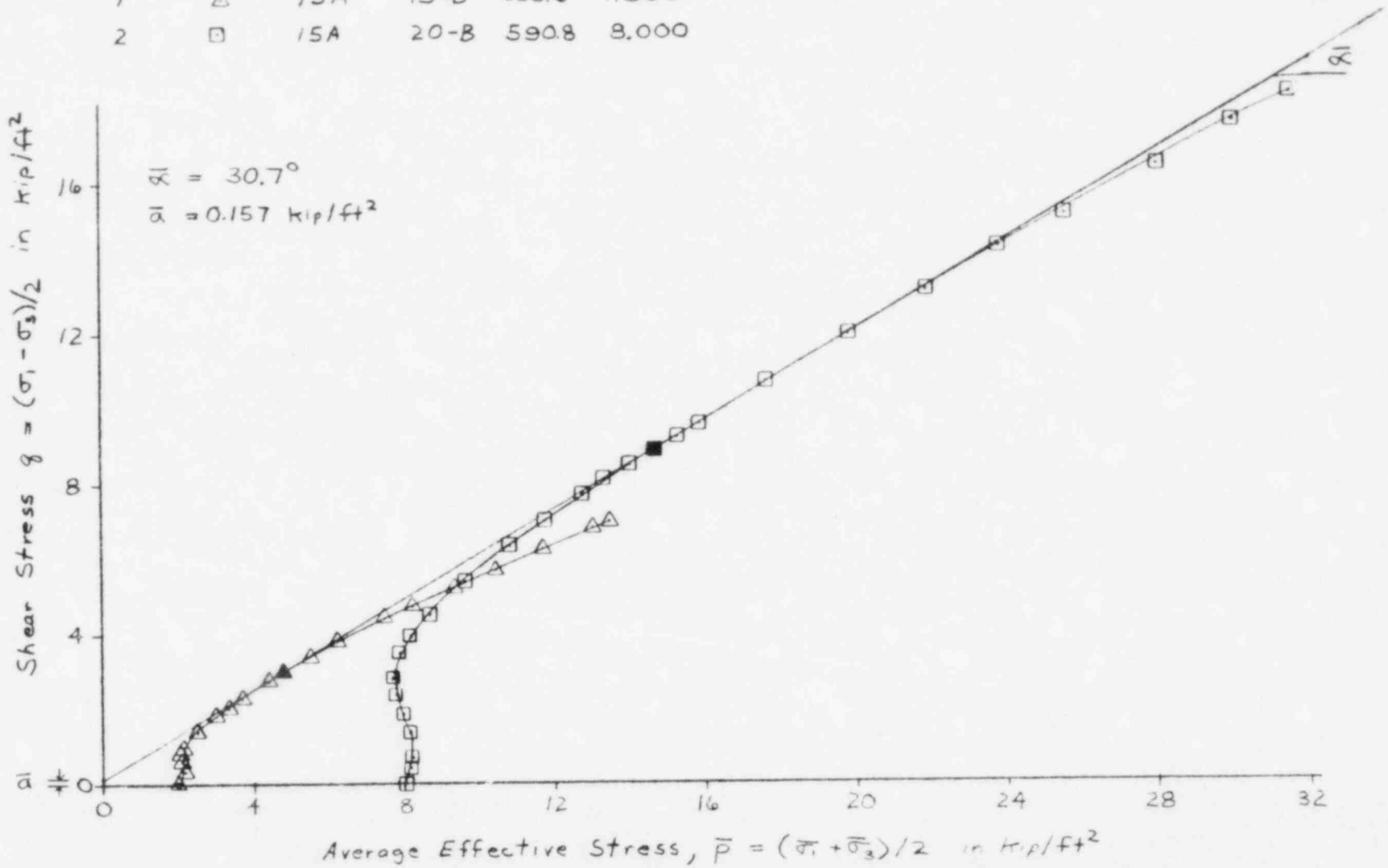
Revision 14

Drawn by JWS Reviewed by RSL

Checked by JF

Test No.	Symbol	Boring No. COE.-	Sample No	Elev Ft.	$\bar{\sigma}_{vc}$ Kip/ft <sup>2</sup>
1	△	15A	19-B	593.6	1.998
2	□	15A	20-B	590.8	8.000

Note: Solid symbols for conditions of peak obliquity  
Strength envelope for conditions of peak obliquity



MIDLAND PLANT UNITS 1 and 2 - CONSUMERS POWER Co.  
CTD TRIAXIAL TEST SERIES - STRESS PATHS  
AREA: RETAINING WALLS - FOUNDATION TILL

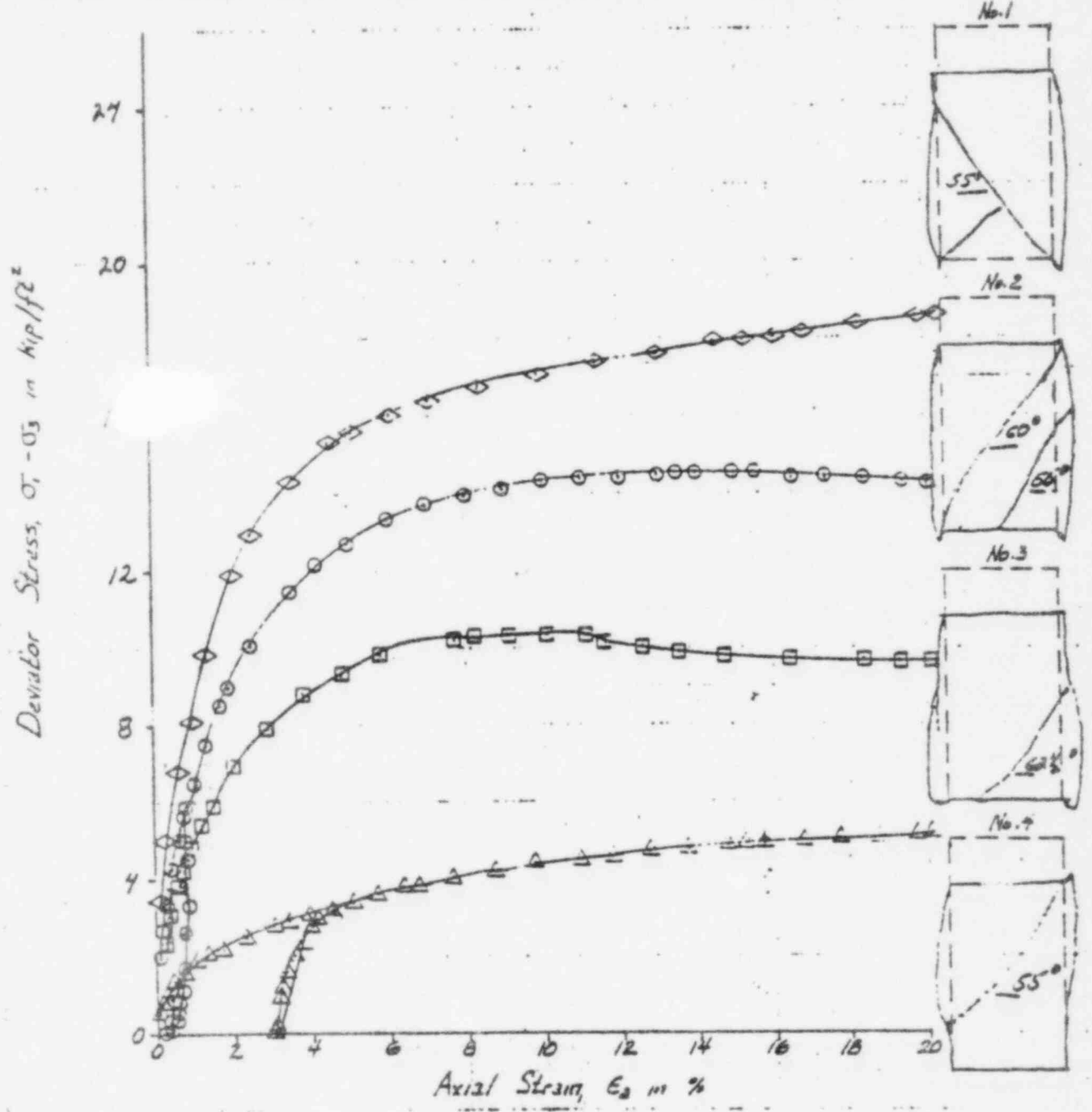
FIG E-4b

D.2-1262

Revision 13  
6/82

BLD 9005 73 Drawn by EBC Reviewed by RLV checked by JLF 8/18/81

Test No.	Symbol	Boring No.	Sample No.	Elev. ft.	USCS Symbol	$w_p$ %	$\gamma_d$ lb/ft <sup>3</sup>	$\sigma_c$ kip/ft <sup>2</sup>	$e_{sw}$ %	Spec. Dia. inch	$\dot{\epsilon}$ %/hr
1	□	17	S-26D	570.8	CL	23.2	104.2	6.005	0.19	2.0	56.2
2	△	17	S-29D	560.3	CL	23.6	104.0	6.000	0.07	2.9	28.8
3	○	17	S-33C	551.1	CL	21.0	108.3	6.000	0.11	2.9	27.8
4	◇	17	S-36B	543.7	CL	15.6	121.2	6.000	0.15	2.0	73.6

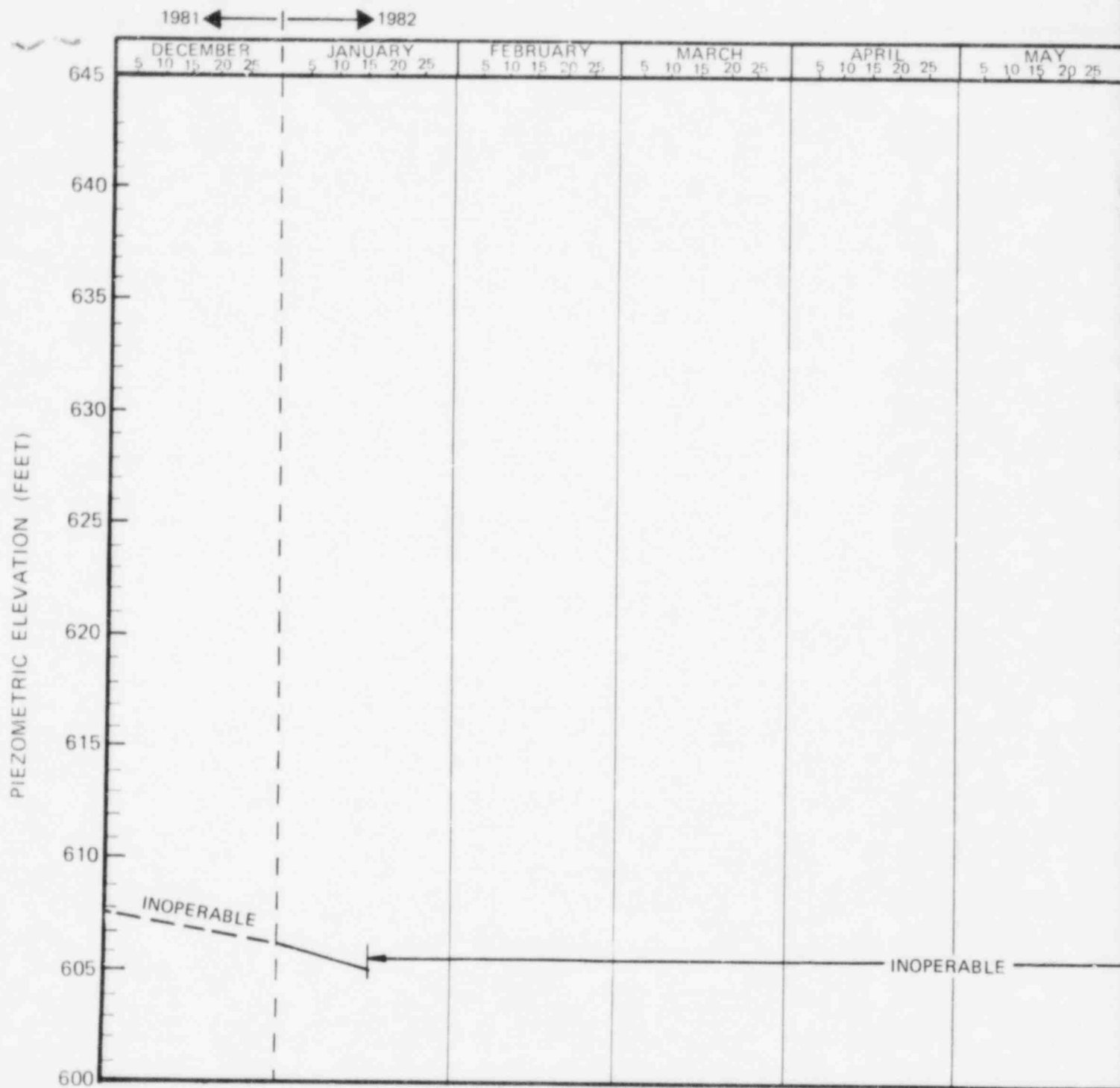


MIDLAND PLANT UNITS 1 and 2 - CONSUMERS POWER CO.  
 UU-TRIAXIAL TESTS - STRESS/STRAIN CHARACTERISTICS  
 AREA: AUXILIARY BUILDING - FOUNDATION CLAY

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D-2-1,286b

Revision 14  
12/82

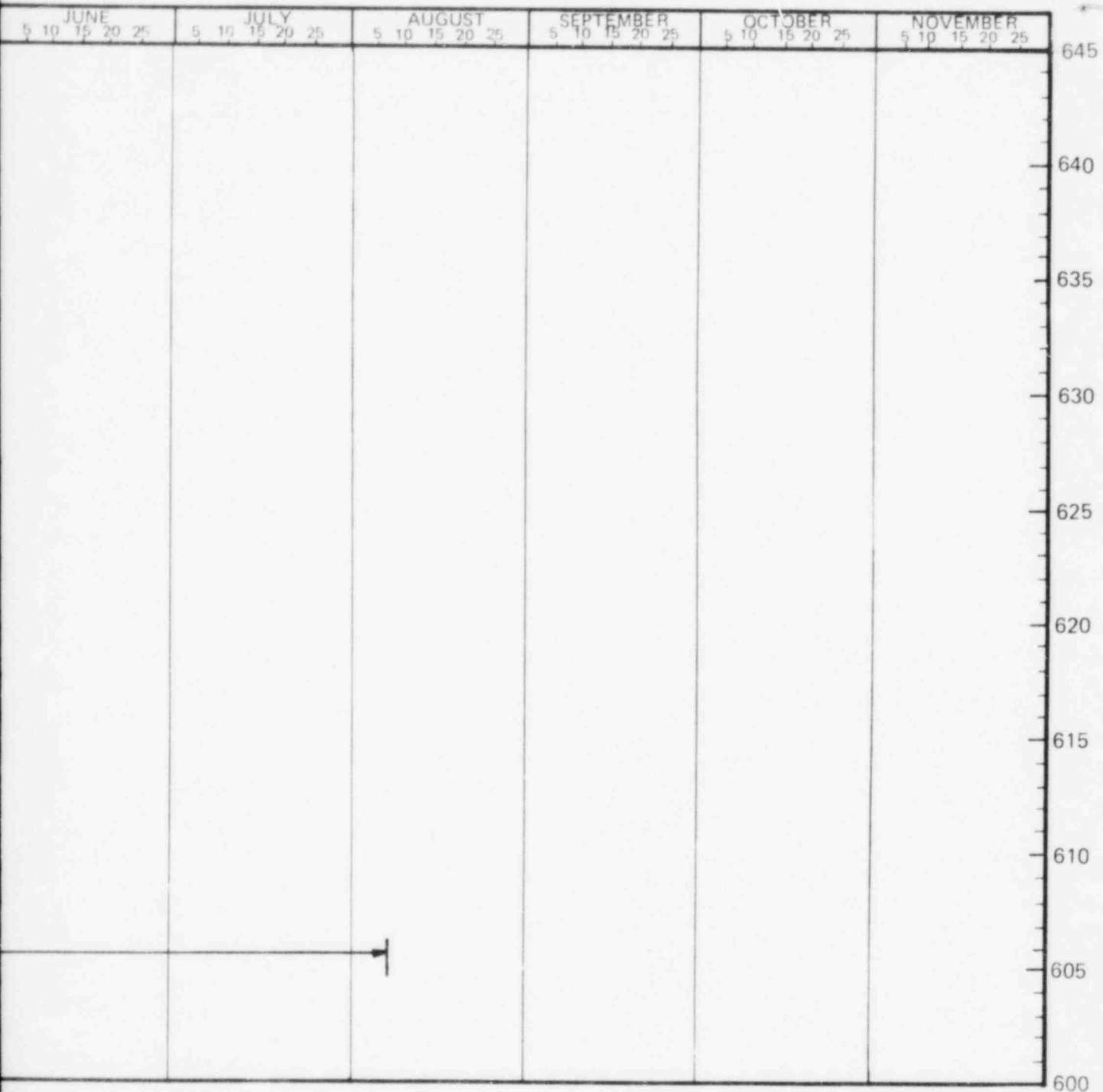


NOTE:

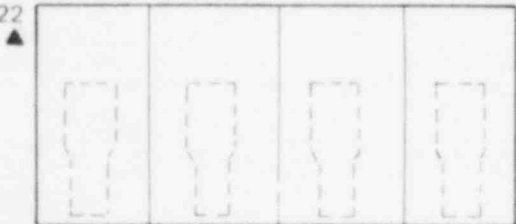
PIEZOMETER ELEVATIONS ARE INITIAL  
ELEVATION OF CENTER OF OTTAWA  
SAND ZONE.

TIP ELEVATION (FT) 590.1

TIME (DAYS)



PZ-22



LOCATION PLAN

LEGEND

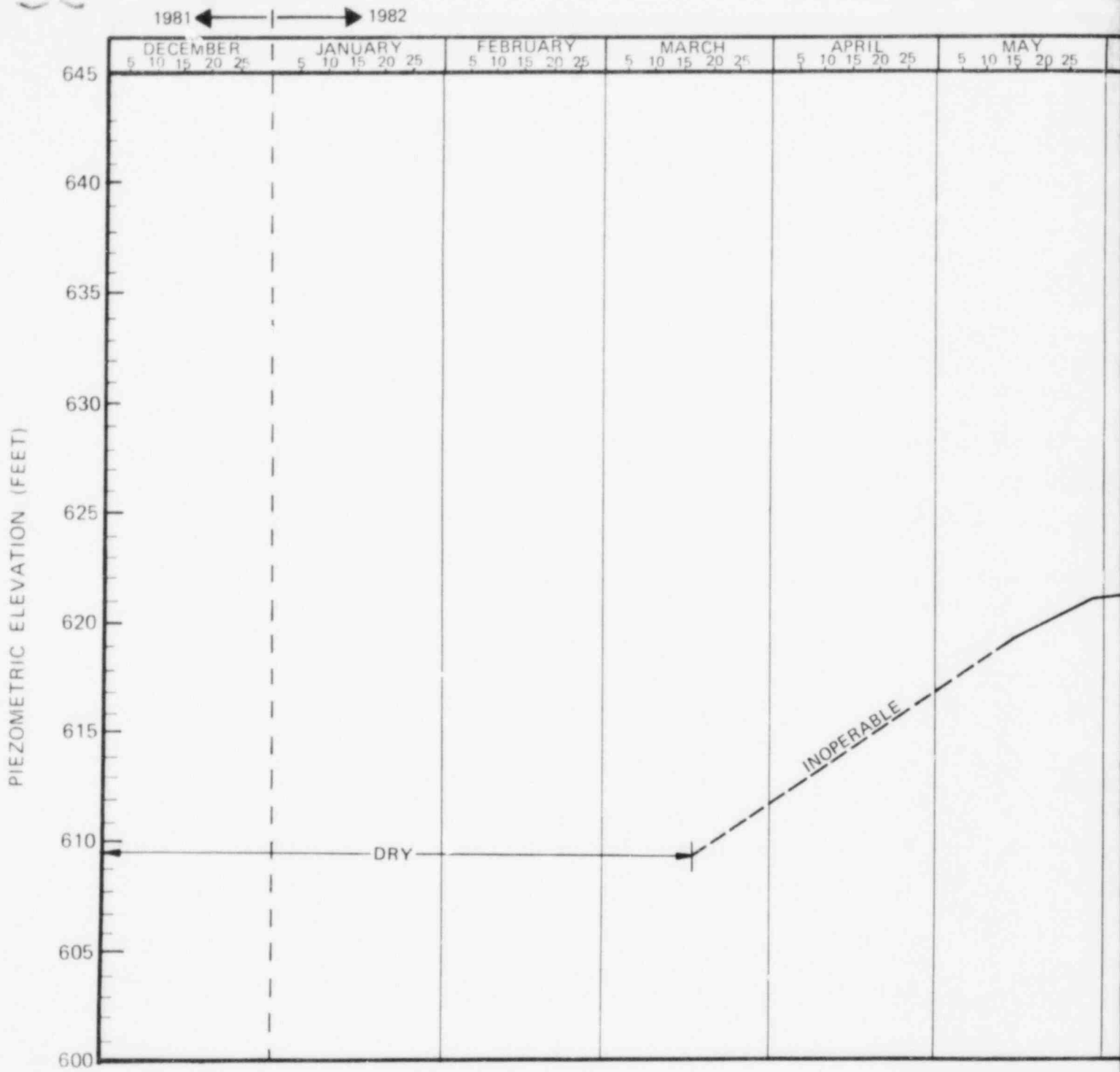
▲ PIEZOMETER



**CONSUMERS POWER COMPANY  
MIDLAND PLANT UNITS 1 & 2**

Piezometer Elevation vs Time  
Piezometer No. 22

Figure D.5-22, sh 4

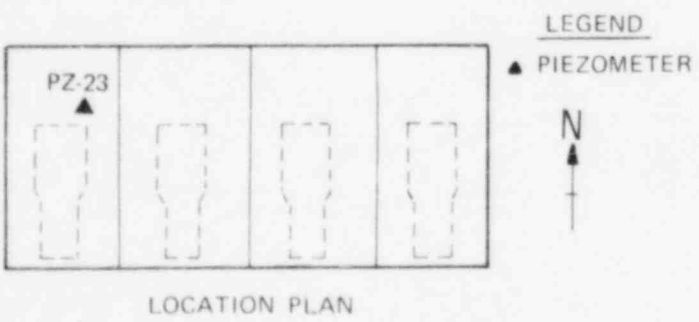
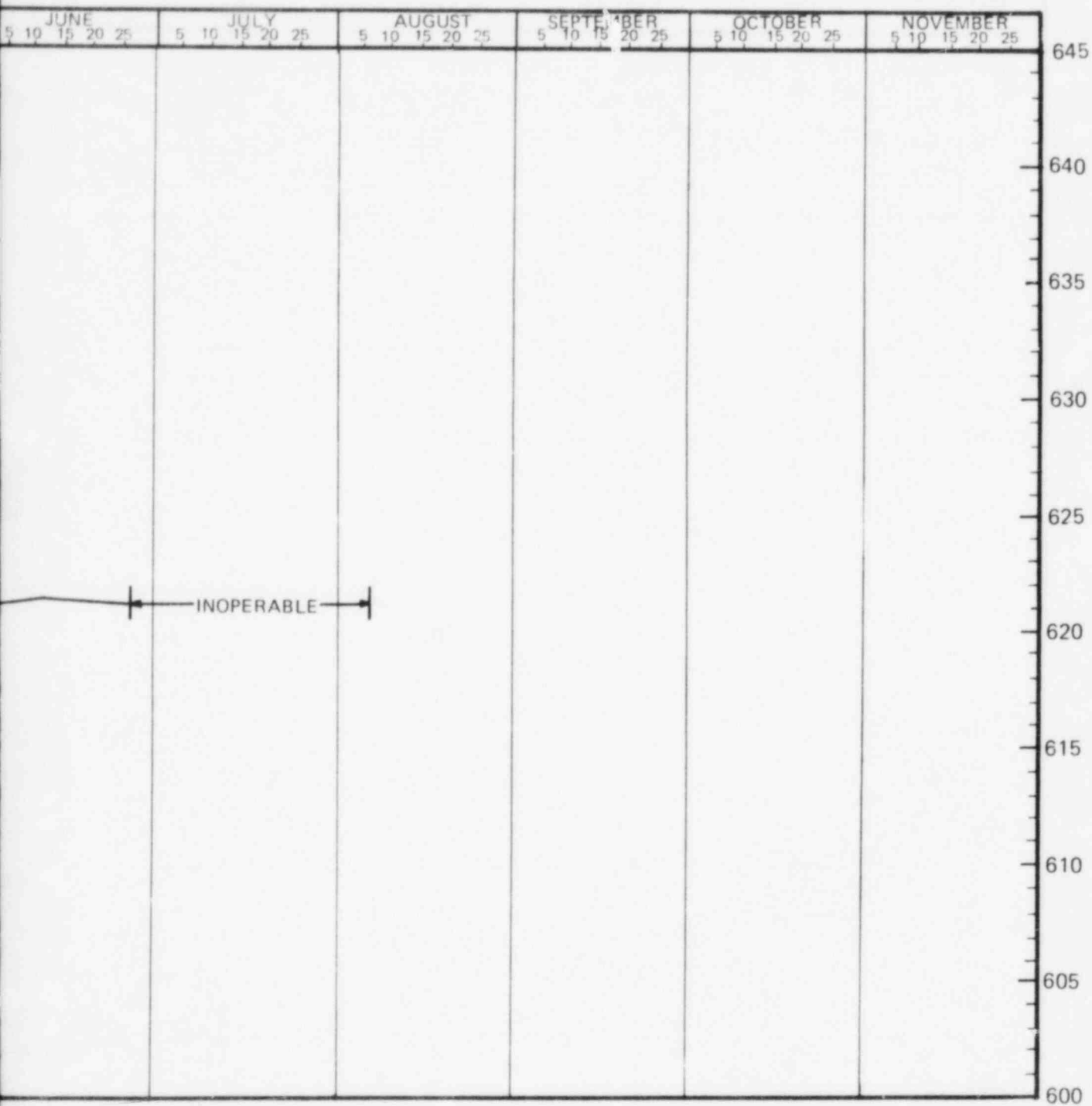


NOTE:

PIEZOMETER ELEVATIONS ARE INITIAL ELEVATION OF CENTER OF OTTAWA SAND ZONE.

TIP ELEVATION (FT) 609.5

TIME (DAYS)



**CONSUMERS POWER COMPANY  
MIDLAND PLANT UNITS 1 & 2**

Piezometer Elevation vs Time  
Piezometer No. 23

Figure D.5-23, sh 4



APPENDIX A

Consolidation Test Results, Tested by WCC in 1981

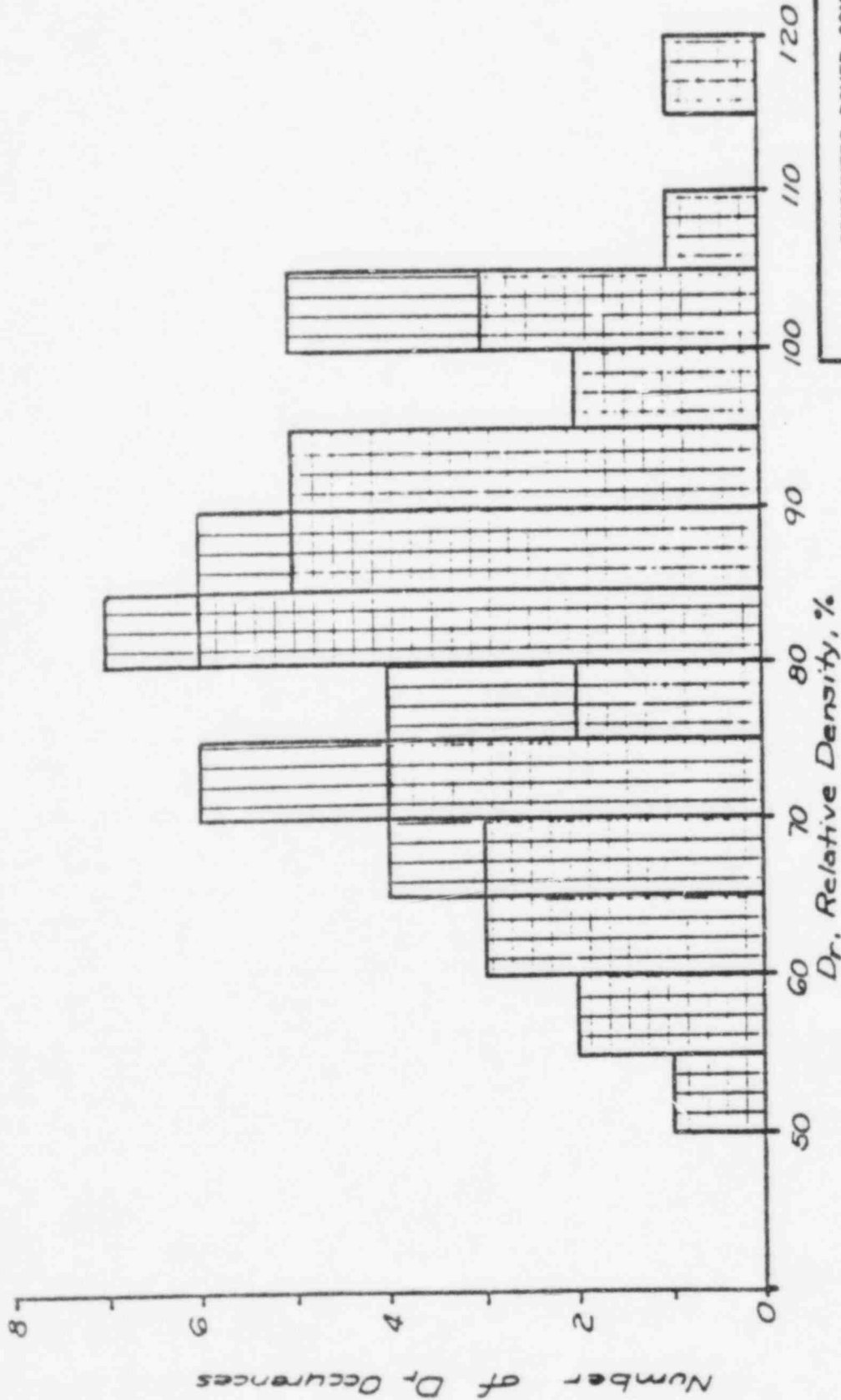
See Appendix D.2.3 for  
Woodward-Clyde Consultants and  
original consolidation test data and  
results of 1981

APPENDIX B

Consolidation Test Results, Tested by GZD in 1978

- Strain-log p plots (by WCC from GZD data)
- Void ratio-log p plots (original GZD data)

See Appendix D.2.2 for the original  
Goldberg, Zoino, Dunicliff & Associates, Inc.  
Consolidation Test Data and Results



Sample size  $n = 47$   
Tube and section densities

Sample size  $n = 38$   
Tube densities only

CONSUMERS POWER COMPANY Midland Plant-Units 1&2	
Histogram of Relative Densities	
81C217-4	24 July 1981
Fig. 4	
Woodward-Clyde Consultants	

APPENDIX A

Particle-Size Distribution Curves

See Appendix D.2  
for Particle Size Distribution  
Curves Prepared from the Tests Performed  
on the Selected Soil samples in the area of Diesel  
Generator Building

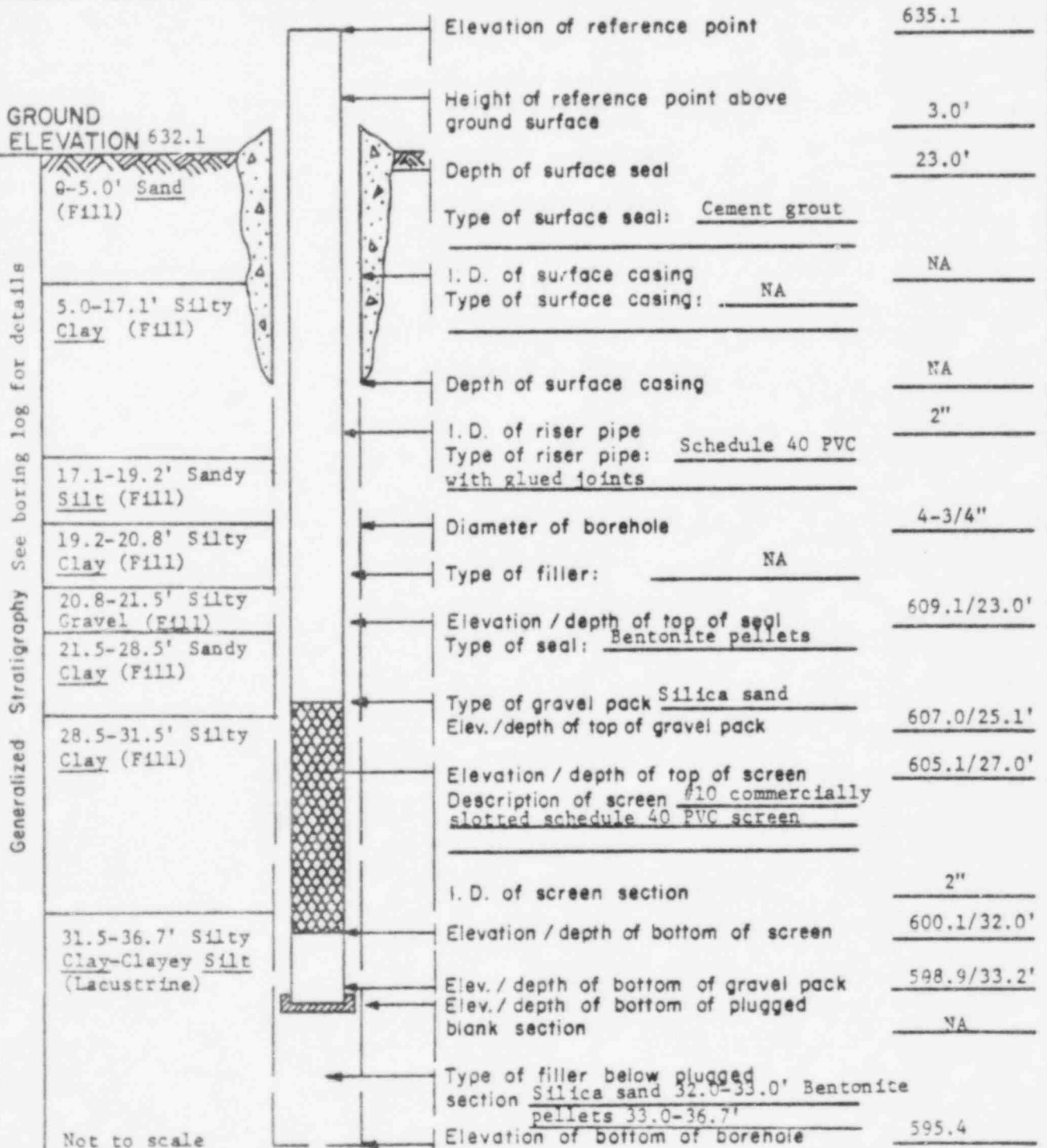
Revision 14  
12/82



# OBSERVATION WELL CONSTRUCTION SUMMARY

PROJECT Midland Power Plant  
 SITE Tank Farm  
 COORDINATES S 4595 E181  
 DATE COMPLETED 5-12-81  
 SUPERVISED BY G.K. Hess - Woodward-Clyde Consultants

WELL NO. T-27  
 AQUIFER Backfill and Lacustrine Clay



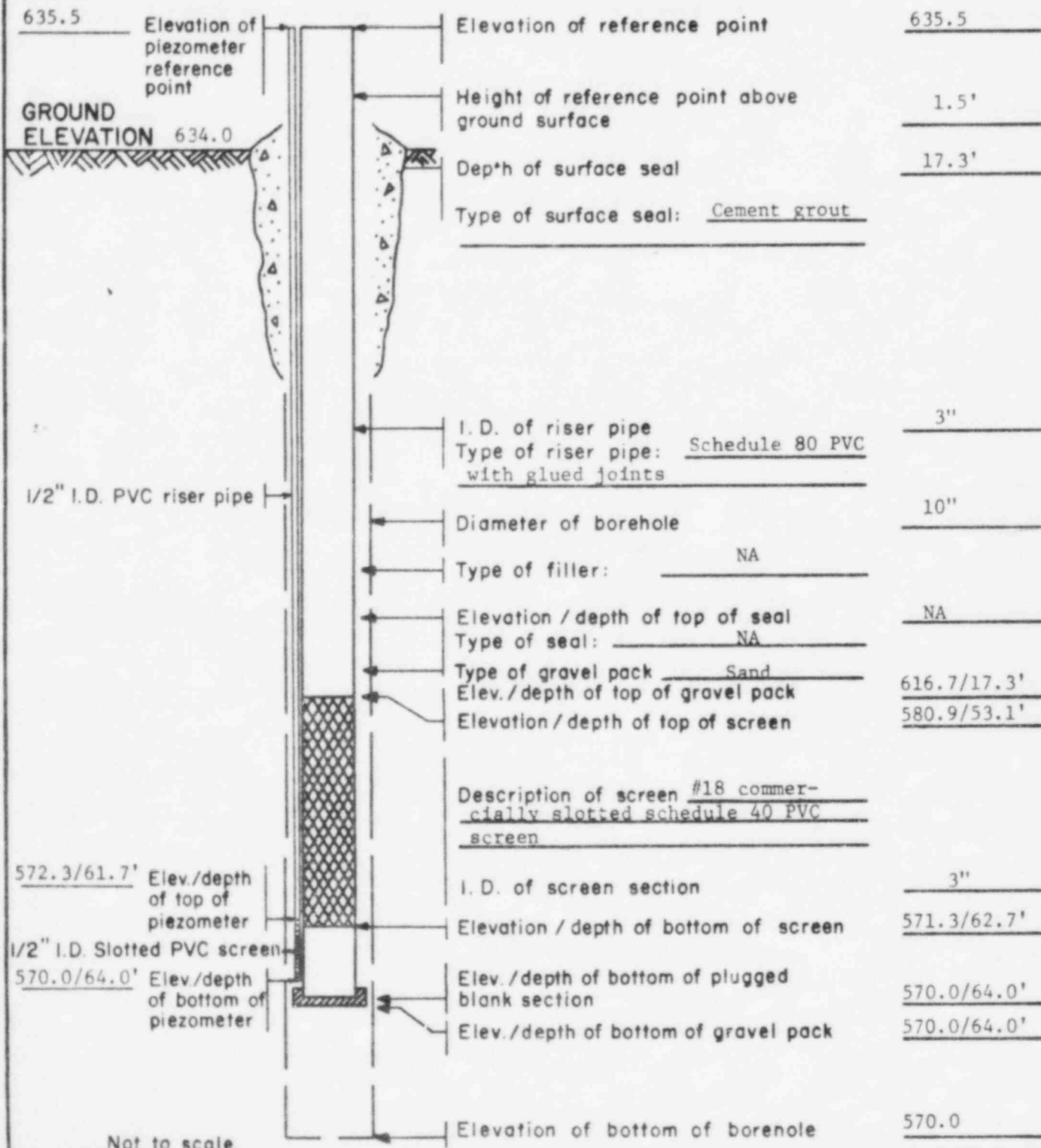
Not to scale



# PUMPING WELL CONSTRUCTION SUMMARY

PROJECT Midland Power Plant  
 SITE West of Administration Building  
 COORDINATES S 4970.0 W 7.0  
 DATE COMPLETED 8/20/82  
 SUPERVISED BY M. D. Johnson

WELL NO. ME-68  
 AQUIFER Lacustrine  
Sandy Silt, Silt and  
Silty Clay

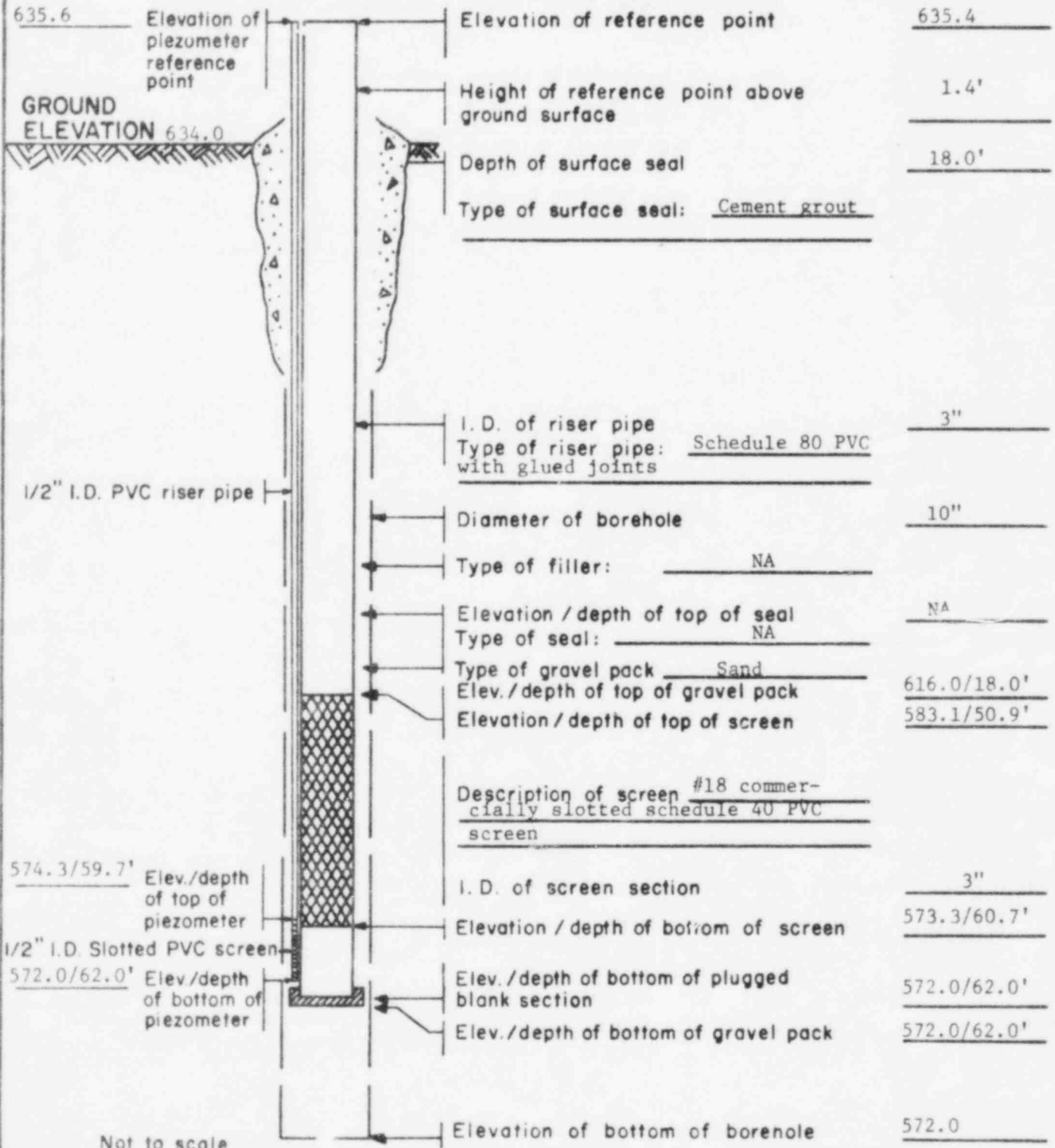




# PUMPING WELL CONSTRUCTION SUMMARY

PROJECT Midland Power Plant  
 SITE West of Administration Building  
 COORDINATES S 4923.0 W 7.0  
 DATE COMPLETED 8/26/82  
 SUPERVISED BY M. D. Johnson

WELL NO. ME-69  
 AQUIFER Sandy Silty  
Clay Till

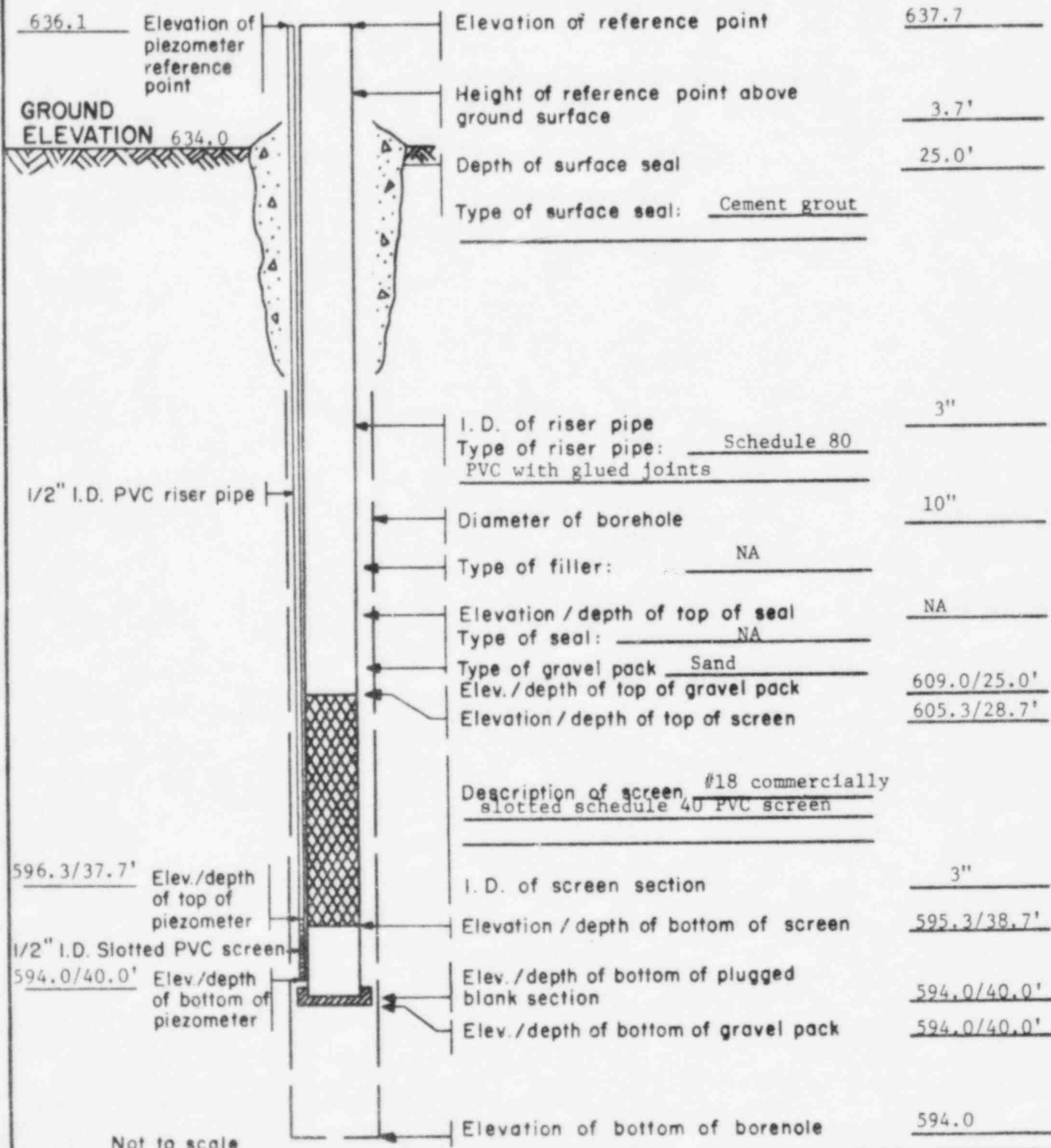




# PUMPING WELL CONSTRUCTION SUMMARY

PROJECT Midland Power Plant  
 SITE West of Administration Building  
 COORDINATES S 5008.0 E 44.0  
 DATE COMPLETED 8/11/82  
 SUPERVISED BY M. D. Johnson

WELL NO. ME-79  
 AQUIFER Backfill  
and Lacustrine Silty  
Clay



Not to scale



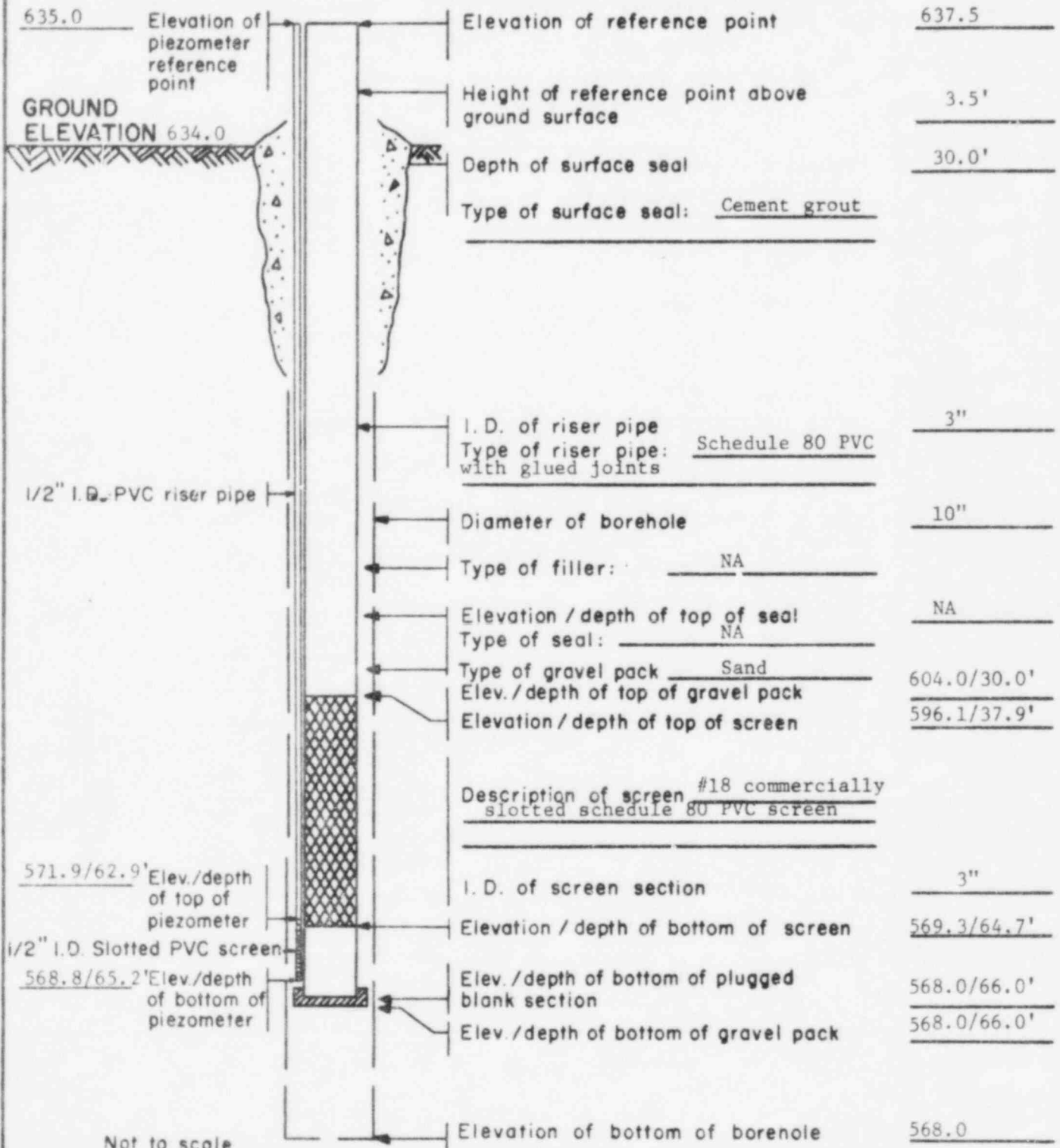


# PUMPING WELL CONSTRUCTION SUMMARY

PROJECT Midland Power Plant  
 SITE West of Administration Building  
 COORDINATES S 5138.0 E 44.0  
 DATE COMPLETED 8/5/82  
 SUPERVISED BY M. D. Johnson

WELL NO. ME-81

AQUIFER Lacustrine  
Silty Clay



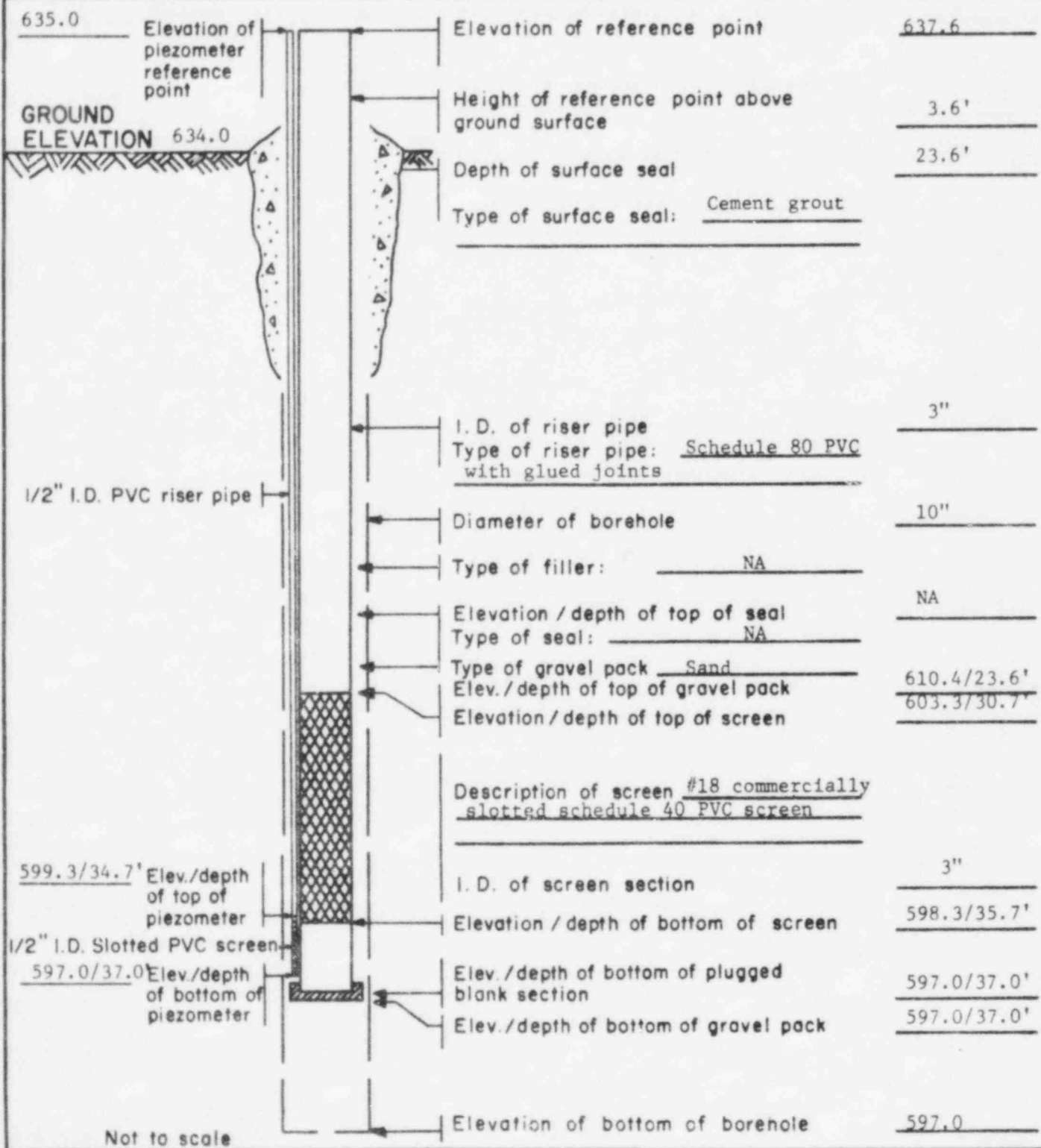
Not to scale



# PUMPING WELL CONSTRUCTION SUMMARY

PROJECT Midland Power Plant  
 SITE West of Administration Building  
 COORDINATES S 5132.0 E 37.0  
 DATE COMPLETED 8/6/82  
 SUPERVISED BY M. D. Johnson

WELL NO. ME-82  
 AQUIFER Backfill  
and Lacustrine Silty  
Clay



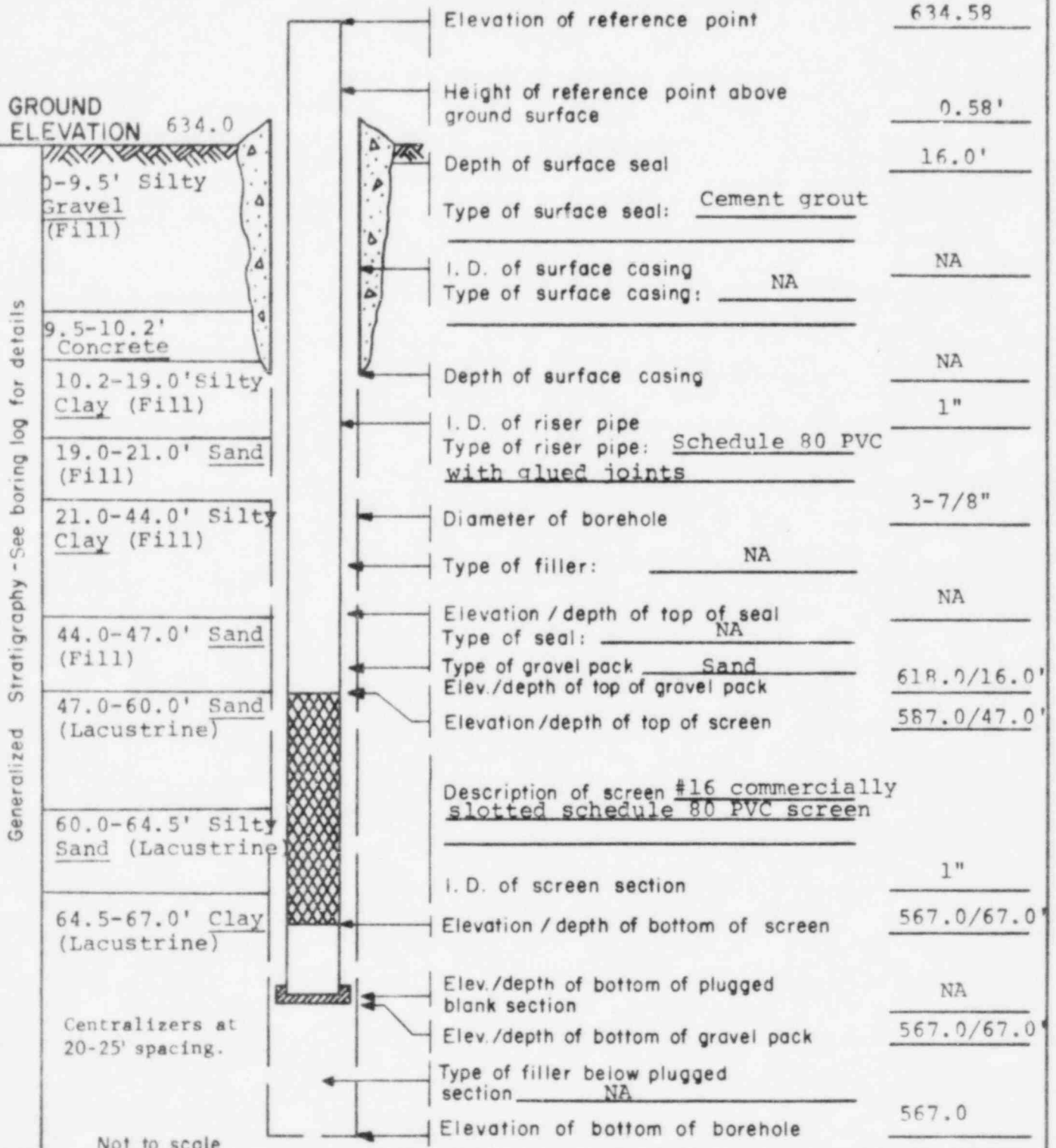
Not to scale



# OBSERVATION WELL CONSTRUCTION SUMMARY

PROJECT Midland Power Plant  
 SITE East of Unit 2 Containment  
 COORDINATES S 4855.39 E 471.86  
 DATE COMPLETED 3-12-82  
 SUPERVISED BY Rafael Gallardo

WELL NO. MP-2  
 AQUIFER Lacustrine  
Sand and Clay

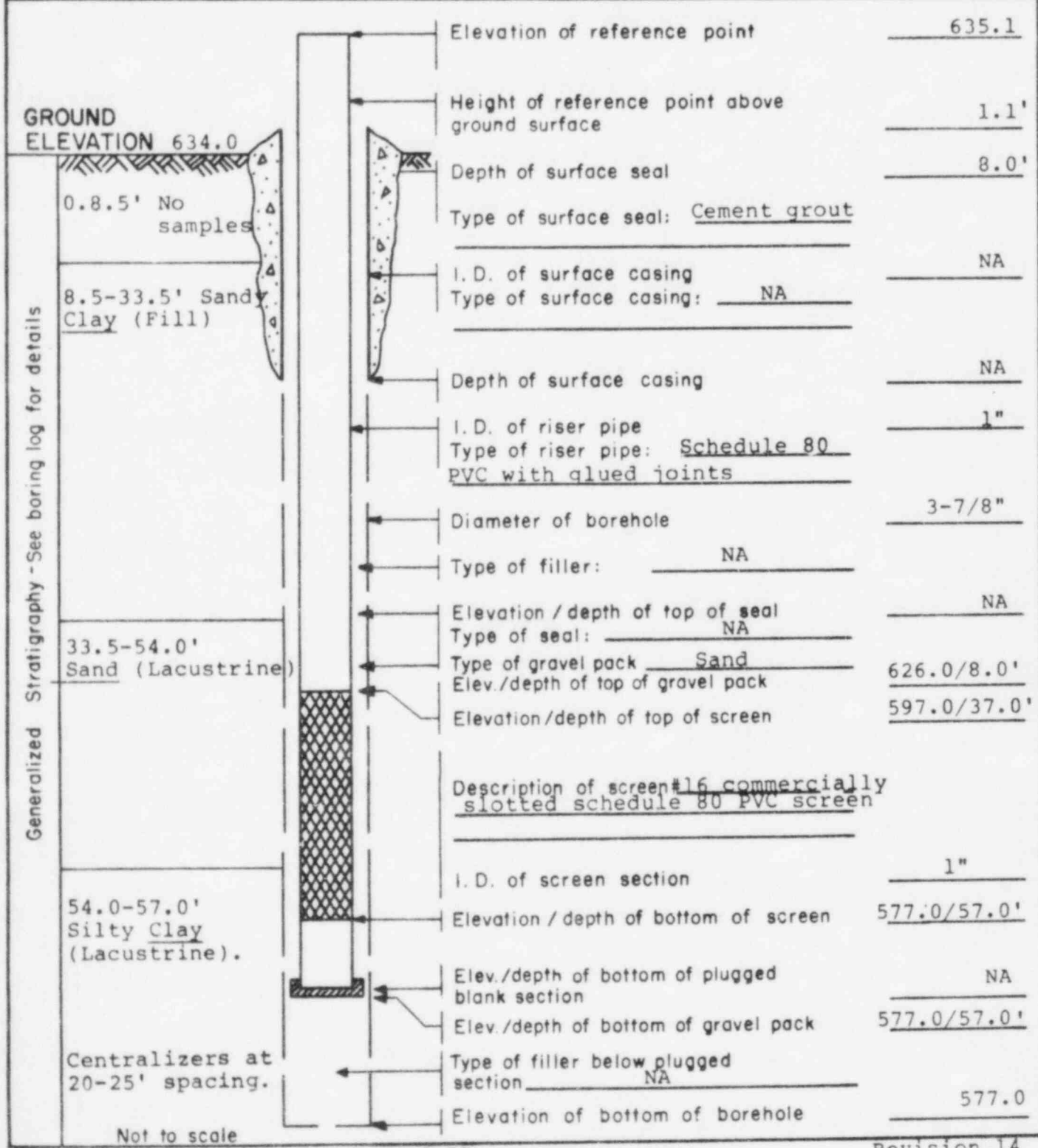




# OBSERVATION WELL CONSTRUCTION SUMMARY

PROJECT Midland Power Plant  
 SITE East of Turbine Building  
 COORDINATES S 5016.40 E 509.99  
 DATE COMPLETED 4-14-82  
 SUPERVISED BY R.J. Kelleher

WELL NO. MP-4A  
 AQUIFER Lacustrine  
Sand and Silty Clay

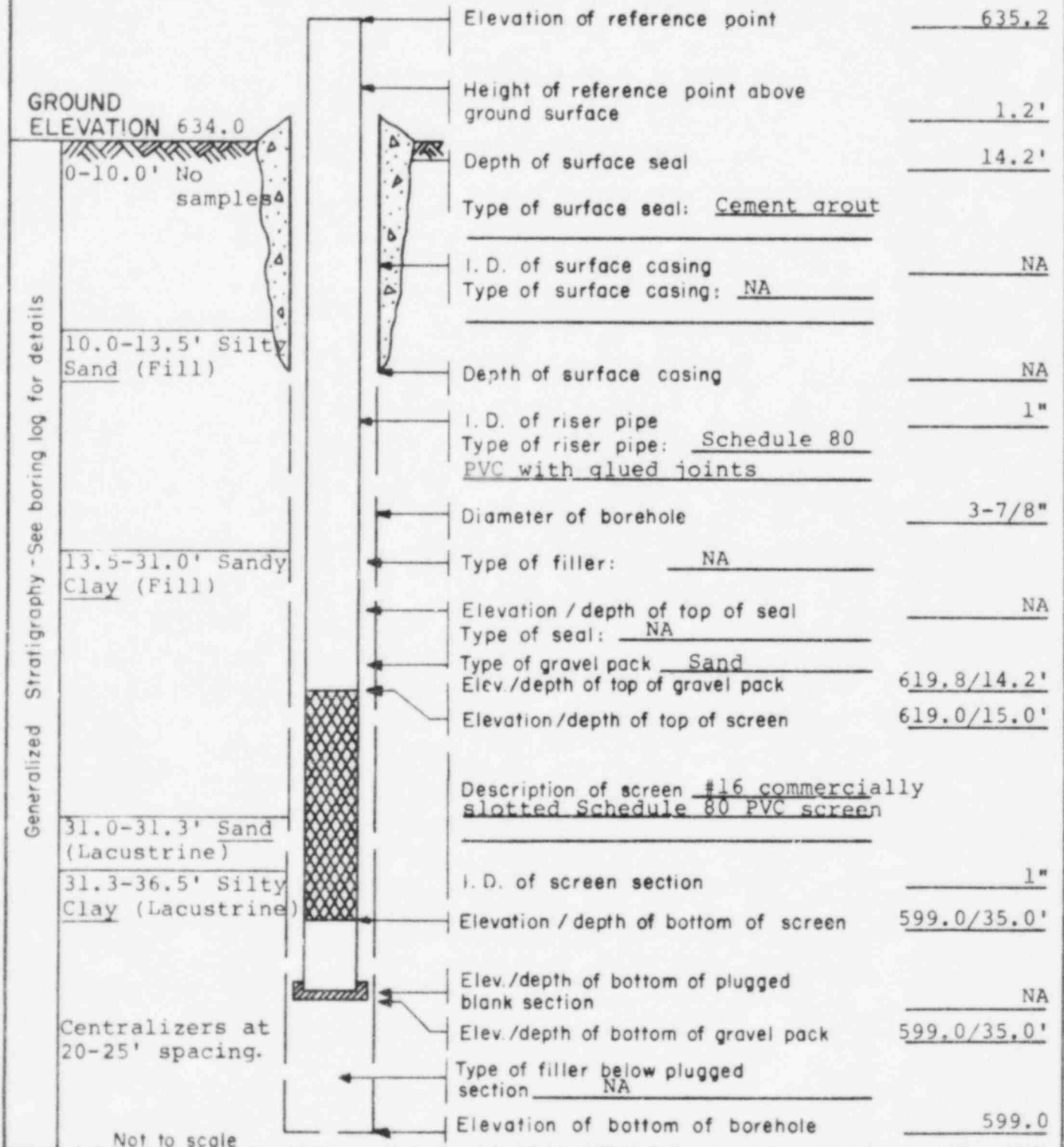




# OBSERVATION WELL CONSTRUCTION SUMMARY

PROJECT Midland Power Plant  
 SITE South of Unit 2 Transformer  
 COORDINATES S5155.01 E487.47  
 DATE COMPLETED 3-30-82  
 SUPERVISED BY A.J. Fiksdal

WELL NO. MP-5  
 AQUIFER Sandy Clay  
Backfill and Lacustrine Sand and Silty Clay

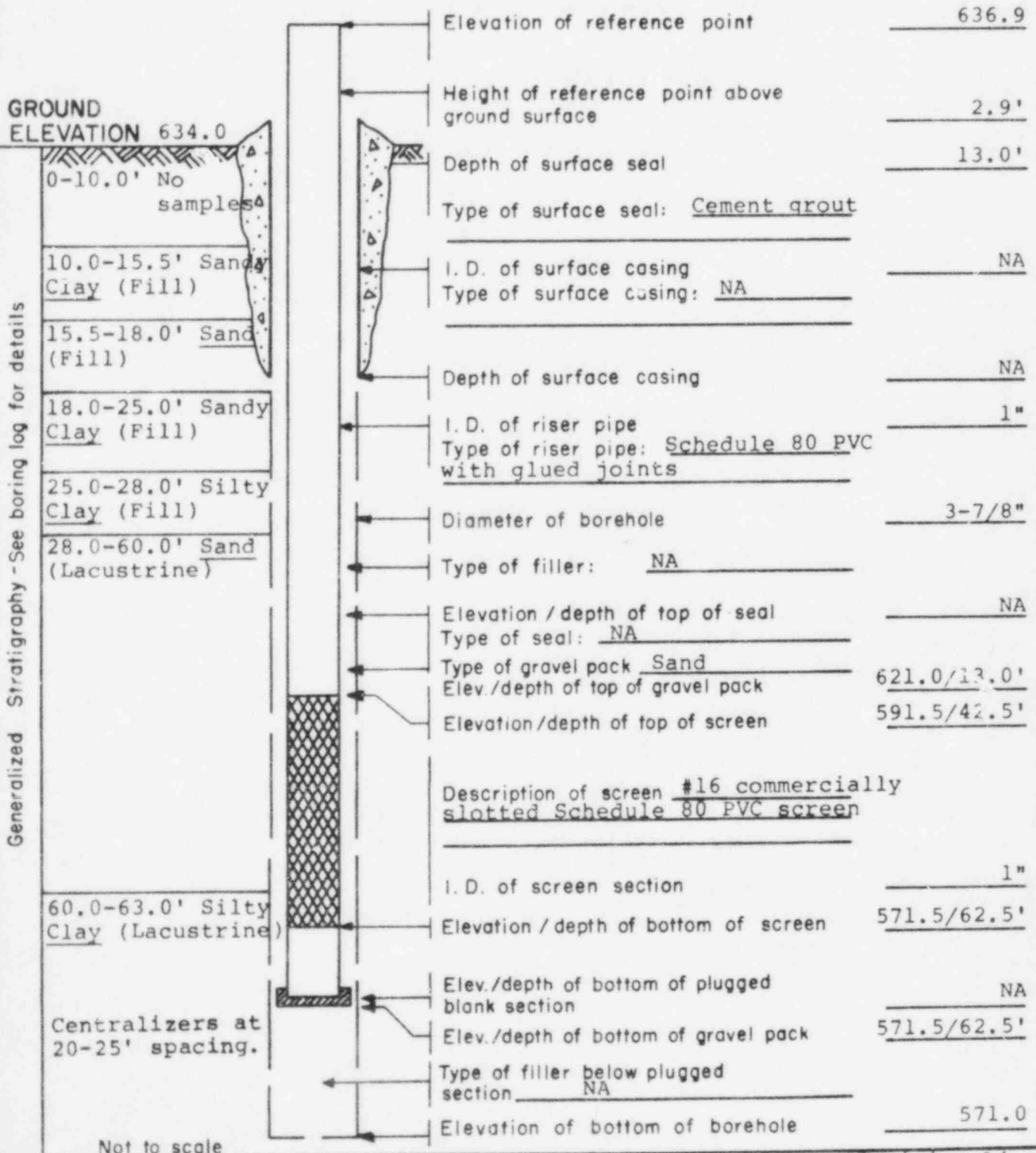




# OBSERVATION WELL CONSTRUCTION SUMMARY

PROJECT Midland Power Plant  
 SITE South of Diesel Generator Building  
 COORDINATES S5173.86 E299  
 DATE COMPLETED 4-9-82  
 SUPERVISED BY R.J. Kelleher

WELL NO. MP-7  
 AQUIFER Lacustrine  
Sand and Silty  
Clay

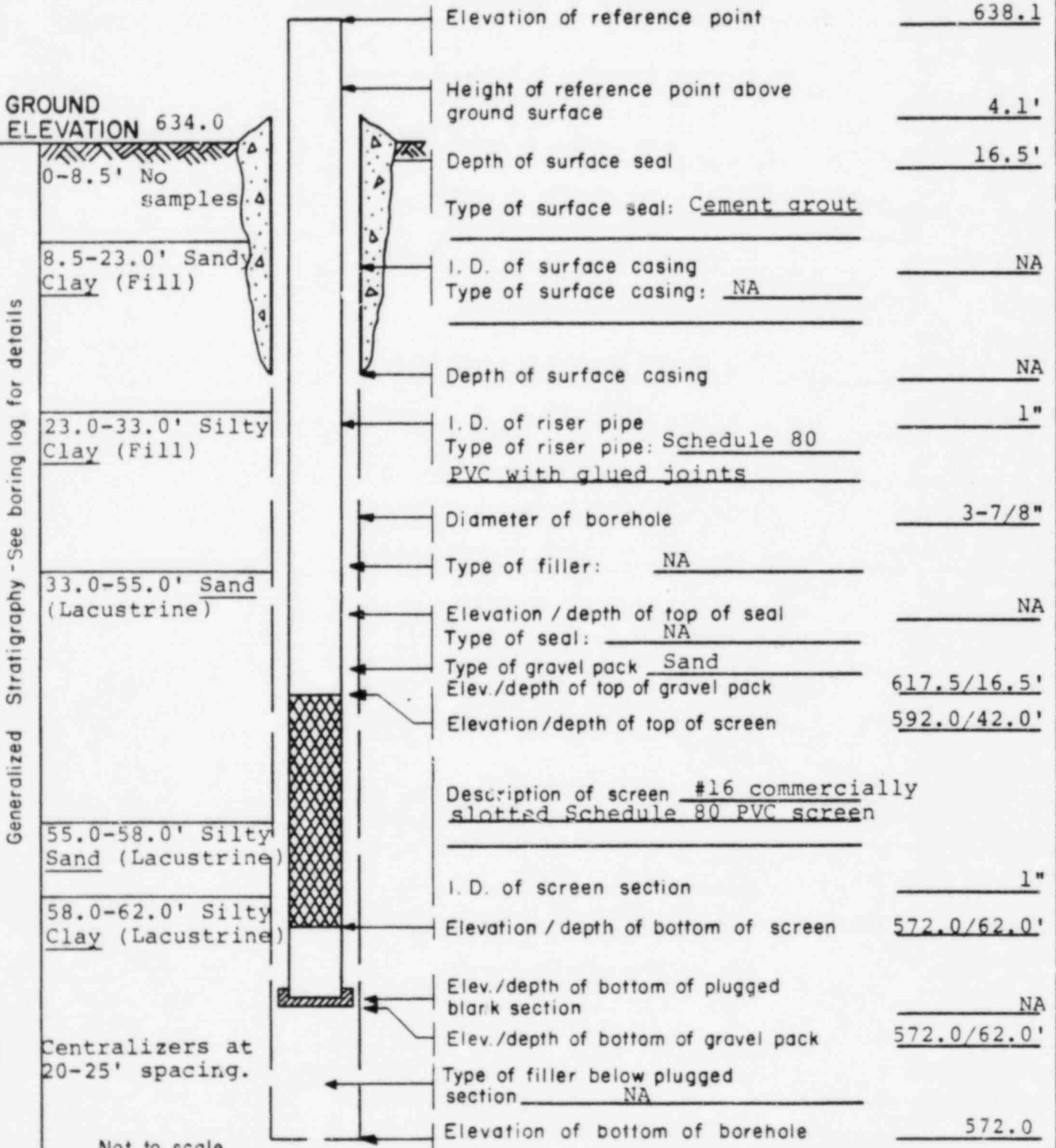




# OBSERVATION WELL CONSTRUCTION SUMMARY

PROJECT Midland Power Plant  
 SITE South of Diesel Generator Building  
 COORDINATES S5146.06 E200.5  
 DATE COMPLETED 4-9-82  
 SUPERVISED BY R.J. Kelleher

WELL NO. MP-8  
 AQUIFER Lacustrine Sand and Silty Clay



GROUND ELEVATION 634.0

0-8.5' No samples

8.5-23.0' Sandy Clay (Fill)

23.0-33.0' Silty Clay (Fill)

33.0-55.0' Sand (Lacustrine)

55.0-58.0' Silty Sand (Lacustrine)

58.0-62.0' Silty Clay (Lacustrine)

Centralizers at 20-25' spacing.

Generalized Stratigraphy - See boring log for details

Not to scale

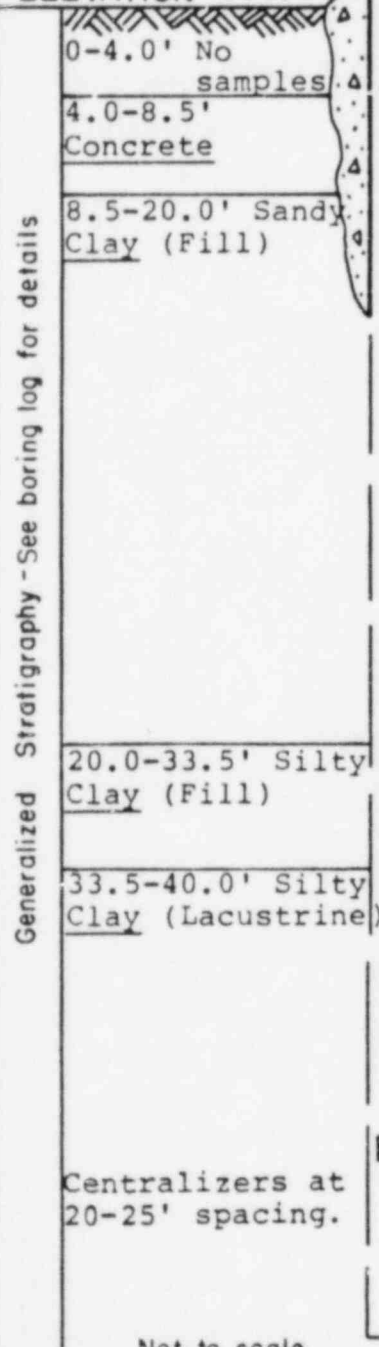


# OBSERVATION WELL CONSTRUCTION SUMMARY

PROJECT Midland Power Plant  
 SITE Southwest of Diesel Generator Building  
 COORDINATES S5173,56 E28.98  
 DATE COMPLETED 4-2-82  
 SUPERVISED BY R.J. Kelleher

WELL NO MP-9  
 AQUIFER Backfill  
and Lacustrine  
Silty Clay

GROUND ELEVATION 634.0



Elevation of reference point	<u>637.7</u>
Height of reference point above ground surface	<u>3.7'</u>
Depth of surface seal	<u>14.5'</u>
Type of surface seal:	<u>Cement grout</u>
I. D. of surface casing	<u>NA</u>
Type of surface casing:	<u>NA</u>
Depth of surface casing	<u>NA</u>
I. D. of riser pipe	<u>1"</u>
Type of riser pipe:	<u>Schedule 80 PVC with glued joints</u>
Diameter of borehole	<u>3-7/8"</u>
Type of filler:	<u>NA</u>
Elevation / depth of top of seal	<u>NA</u>
Type of seal:	<u>NA</u>
Type of gravel pack	<u>Sand</u>
Elev./depth of top of gravel pack	<u>619.5/14.5'</u>
Elevation/depth of top of screen	<u>614.0/20.0'</u>
Description of screen	<u>#16 commercially slotted Schedule 80 PVC screen</u>
I. D. of screen section	<u>1"</u>
Elevation / depth of bottom of screen	<u>594.0/40.0'</u>
Elev./depth of bottom of plugged blank section	<u>NA</u>
Elev./depth of bottom of gravel pack	<u>594.0/40.0'</u>
Type of filler below plugged section	<u>NA</u>
Elevation of bottom of borehole	<u>594.0</u>

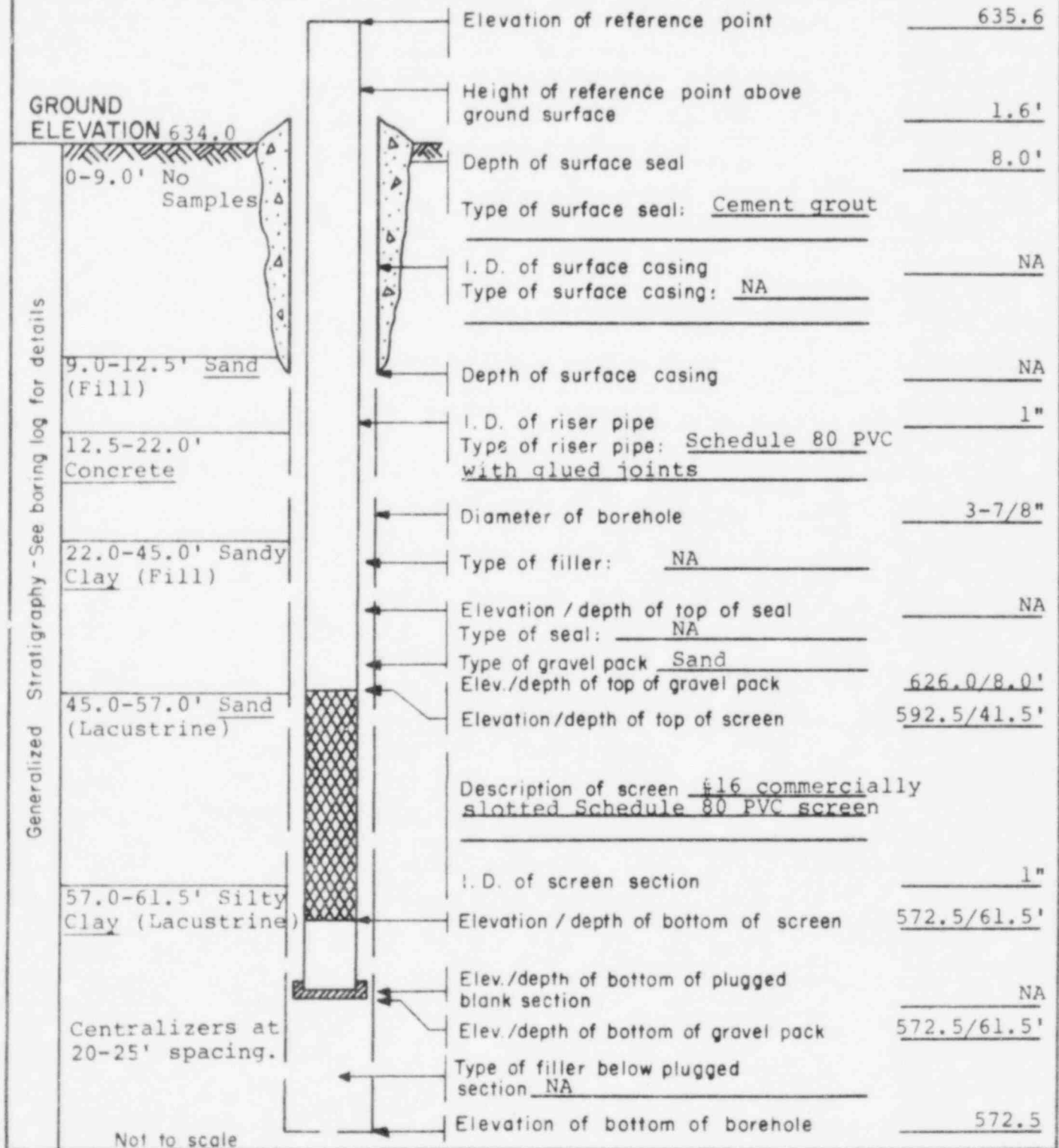




# OBSERVATION WELL CONSTRUCTION SUMMARY

PROJECT Midland Power Plant  
 SITE West of Administration Building  
 COORDINATES S4942.6 W7.74  
 DATE COMPLETED 4-27-82  
 SUPERVISED BY R.J. Kelleher

WELL NO. MP-10  
 AQUIFER Backfill  
Sandy Clay and Lacustrine Sand and Silty Clay

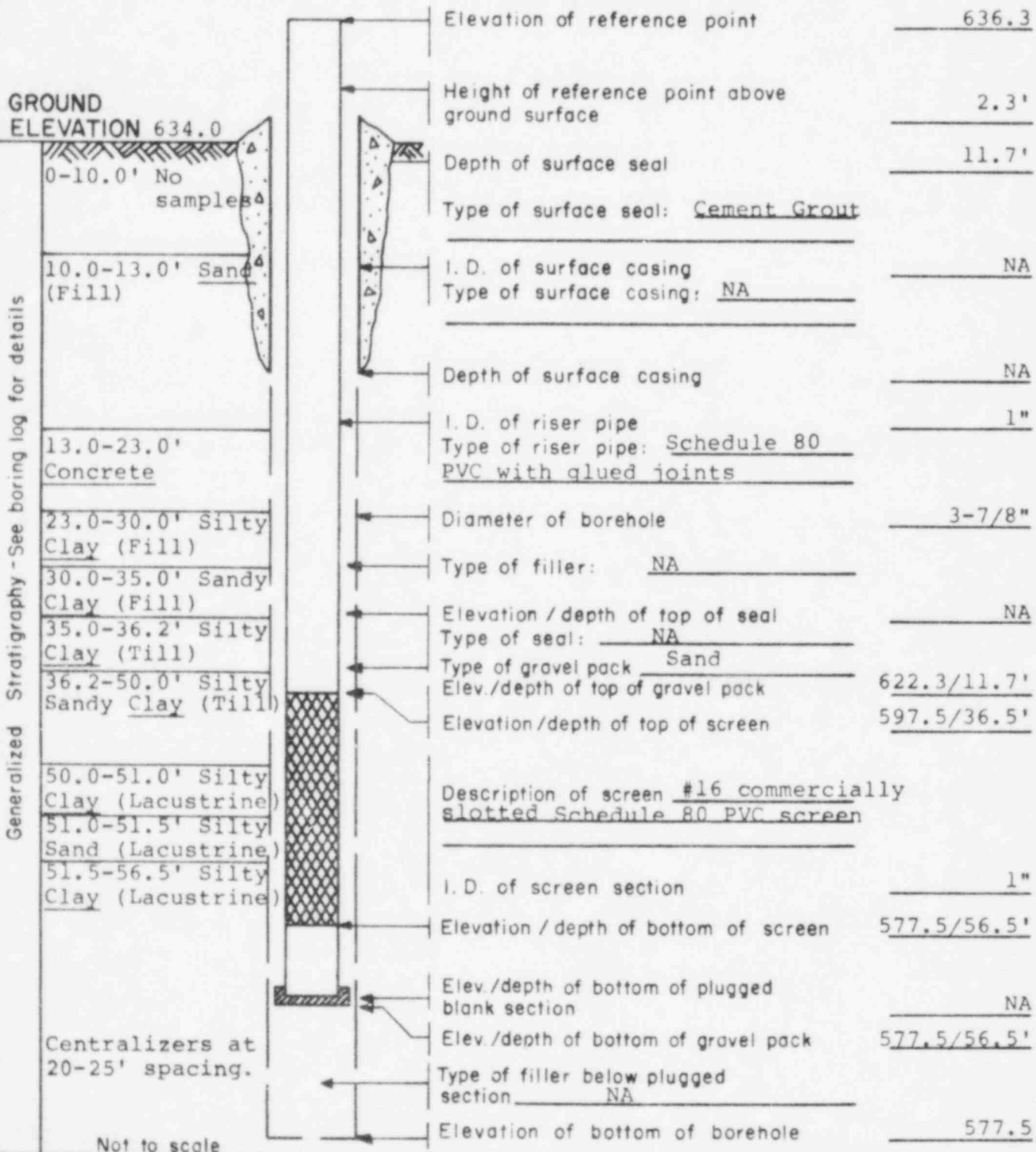




# OBSERVATION WELL CONSTRUCTION SUMMARY

PROJECT Midland Power Plant  
 SITE Administration Building  
 COORDINATES S4874 W4.84  
 DATE COMPLETED 3-29-82  
 SUPERVISED BY A.J. Fiksdal

WELL NO. MP-11  
 AQUIFER Clay Till  
and Lacustrine Silty  
Sand and Silty Clay





# OBSERVATION WELL CONSTRUCTION SUMMARY

PROJECT Midland Power Plant  
 SITE West of Unit 1 Containment  
 COORDINATES S 4806.1 E 85.62  
 DATE COMPLETED 3-13-82  
 SUPERVISED BY T. R. Cullen

WELL NO. MP-13  
 AQUIFER Backfill  
Sandy Gravel and  
Silty Clay

GROUND  
ELEVATION 634.0

0-4.0' Sandy Clay  
 4.0-5.0' Concrete  
 5.0-33.0' Clay (Fill)

Generalized Stratigraphy - See boring log for details

33.0-34.0' Gravel (Fill)  
 34.0-42.0' Silty Clay (Fill)  
 42.0-49.5' Sandy Gravel (Fill)  
 49.5-50.0' Silty Clay (Fill)  
 50.0-56.0' Silty Clay (lacustrine)

Centralizers at  
20-25' spacing.

Not to scale

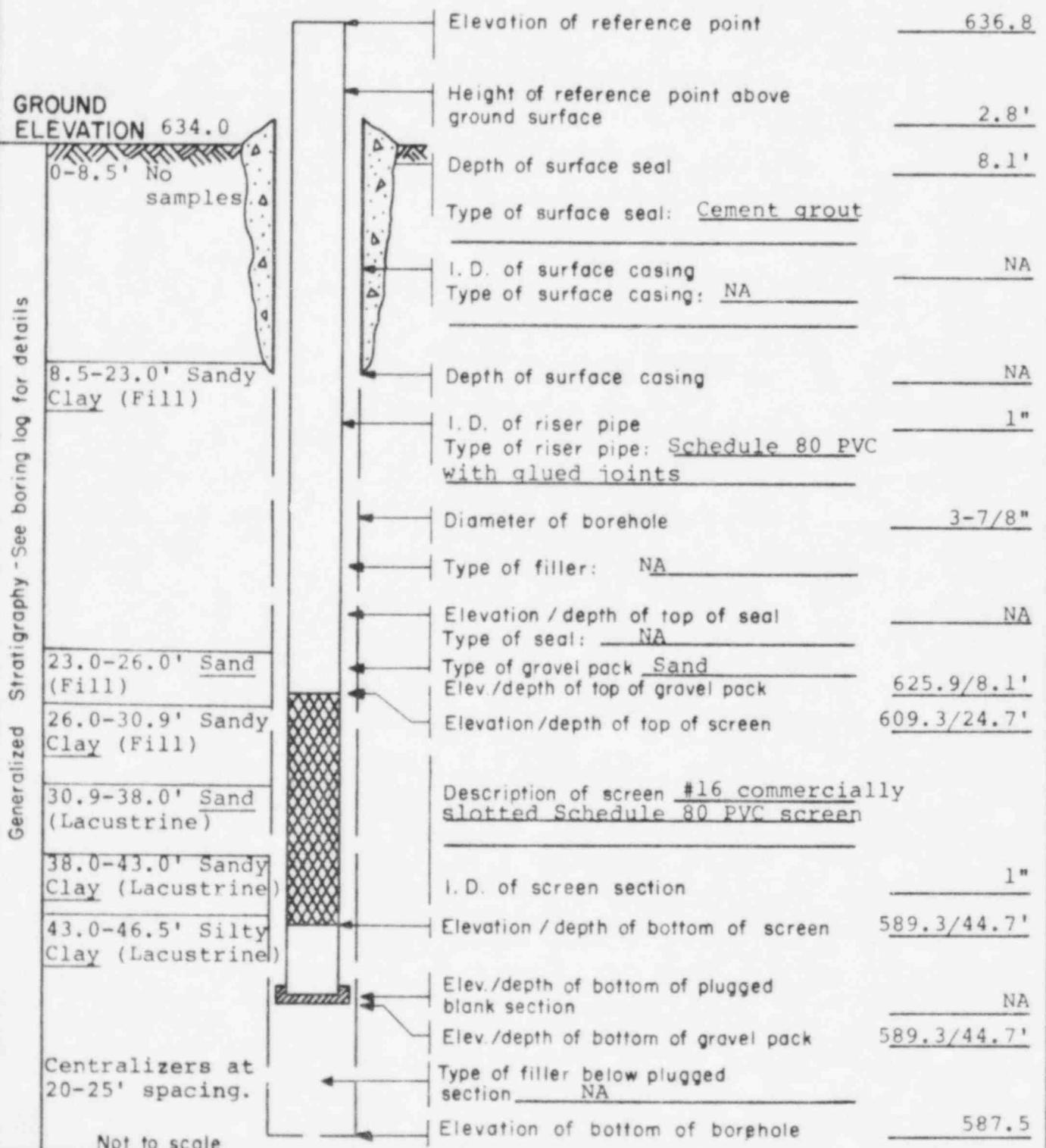
Elevation of reference point	<u>636.27</u>
Height of reference point above ground surface	<u>2.27'</u>
Depth of surface seal	<u>NA</u>
Type of surface seal: <u>Cement grout</u>	
I. D. of surface casing	<u>NA</u>
Type of surface casing:	<u>NA</u>
Depth of surface casing	<u>NA</u>
I. D. of riser pipe	<u>1"</u>
Type of riser pipe: <u>Schedule 80 PVC with glued joints</u>	
Diameter of borehole	<u>3-7/8 "</u>
Type of filler:	<u>NA</u>
Elevation / depth of top of seal	<u>NA</u>
Type of seal:	<u>NA</u>
Type of gravel pack <u>Sand</u>	
Elev / depth of top of gravel pack	<u>627.0/7.0'</u>
Elevation / depth of top of screen	<u>598.0/36.0'</u>
Description of screen <u>#16 commercially slotted schedule 80 PVC screen</u>	
I. D. of screen section	<u>1"</u>
Elevation / depth of bottom of screen	<u>578.0/56.0'</u>
Elev / depth of bottom of plugged blank section	<u>NA</u>
Elev / depth of bottom of gravel pack	<u>578.0/56.0'</u>
Type of filler below plugged section <u>NA</u>	
Elevation of bottom of borehole	<u>578.0</u>



# OBSERVATION WELL CONSTRUCTION SUMMARY

PROJECT Midland Power Plant  
 SITE Southeast of Diesel Generator Building  
 COORDINATES S5163.19 E459  
 DATE COMPLETED 4-9-82  
 SUPERVISED BY R.J. Kelleher

WELL NO. MP-14  
 AQUIFER Sand and Clay Backfill and Lacustrine Sand and Clay





# OBSERVATION WELL CONSTRUCTION SUMMARY

PROJECT Midland Power Plant  
 SITE East of Turbine Building  
 COORDINATES S4946.19 E534.12  
 DATE COMPLETED 4-29-82  
 SUPERVISED BY R.J. Kelleher

WELL NO. MP-16  
 AQUIFER Backfill  
Sand and Clay and  
Lacustrine Sand

GROUND ELEVATION 634.0

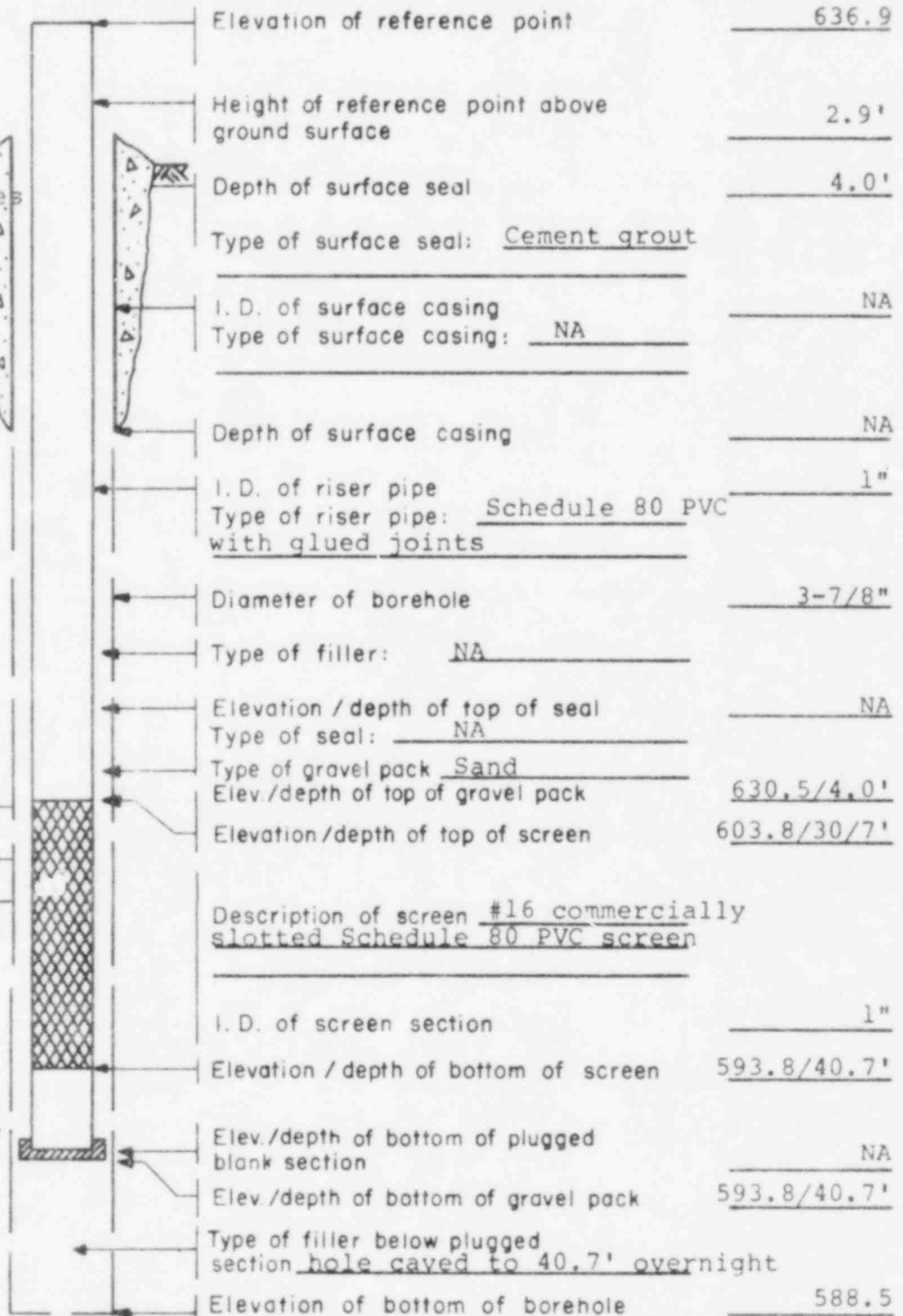
0-3.5' No samples  
 3.5-31.0' Sandy Clay (Fill)

31.0-34.3' Sand (Fill)  
 34.3-35.0' Concrete  
 35.0-45.5' Sand (Lacustrine)

Centralizers at 20-25' spacing.

Not to scale

Generalized Stratigraphy - See boring log for details



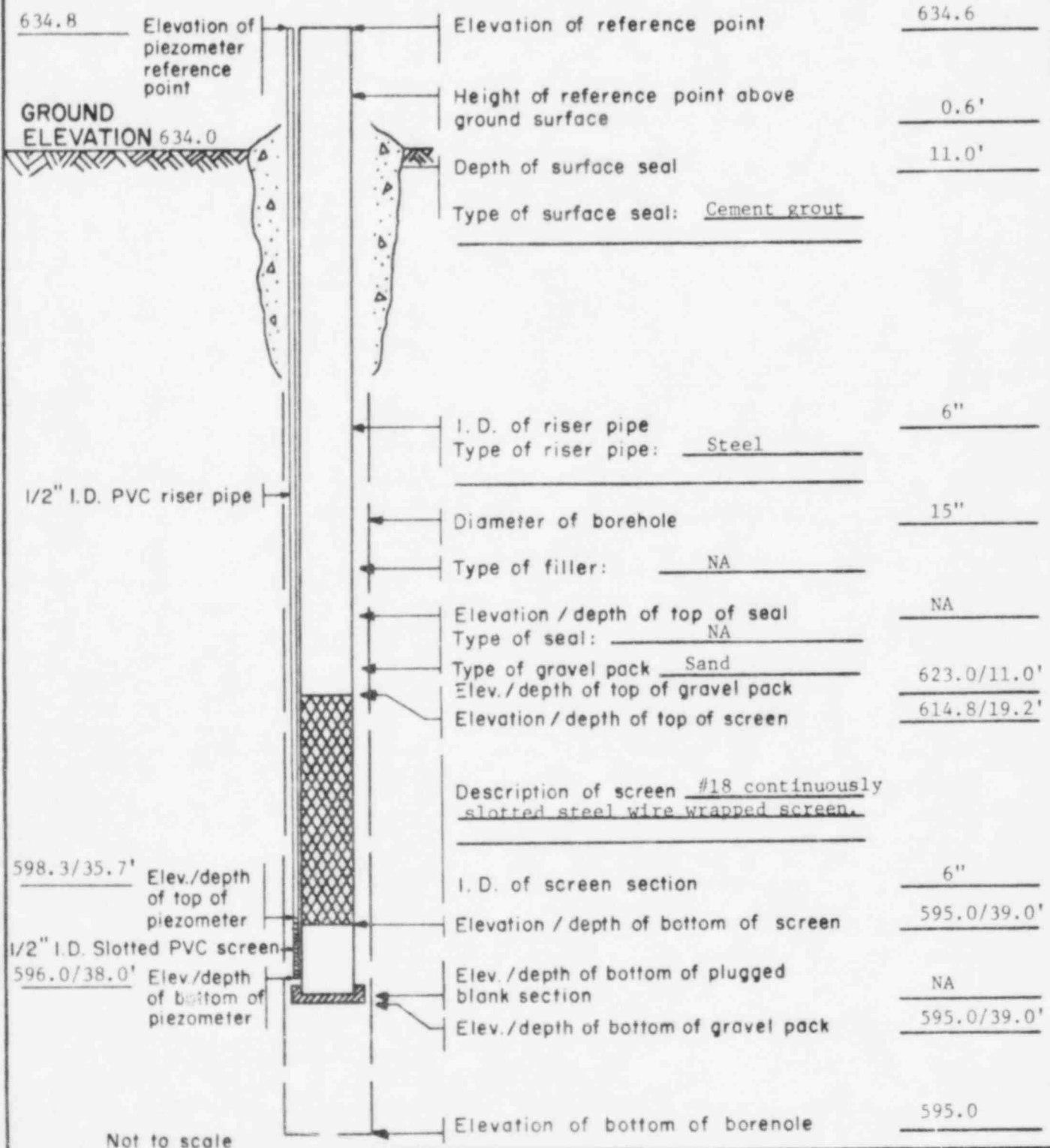
Elevation of reference point 636.9  
 Height of reference point above ground surface 2.9'  
 Depth of surface seal 4.0'  
 Type of surface seal: Cement grout  
 I. D. of surface casing NA  
 Type of surface casing: NA  
 Depth of surface casing NA  
 I. D. of riser pipe 1"  
 Type of riser pipe: Schedule 80 PVC with glued joints  
 Diameter of borehole 3-7/8"  
 Type of filler: NA  
 Elevation / depth of top of seal NA  
 Type of seal: NA  
 Type of gravel pack Sand  
 Elev./depth of top of gravel pack 630.5/4.0'  
 Elevation/depth of top of screen 603.8/30.7'  
 Description of screen #16 commercially slotted Schedule 80 PVC screen  
 I. D. of screen section 1"  
 Elevation / depth of bottom of screen 593.8/40.7'  
 Elev./depth of bottom of plugged blank section NA  
 Elev./depth of bottom of gravel pack 593.8/40.7'  
 Type of filler below plugged section hole caved to 40.7' overnight  
 Elevation of bottom of borehole 588.5



# PUMPING WELL CONSTRUCTION SUMMARY

PROJECT Midland Power Plant  
 SITE East of Service Water Pump Structure  
 COORDINATES S 5022.87 E 879.82  
 DATE COMPLETED 7/16/82  
 SUPERVISED BY M. D. Johnson

WELL NO. OF-1  
 AQUIFER Backfill  
Gravel and Silty Clay,  
and Silty Clay Fill

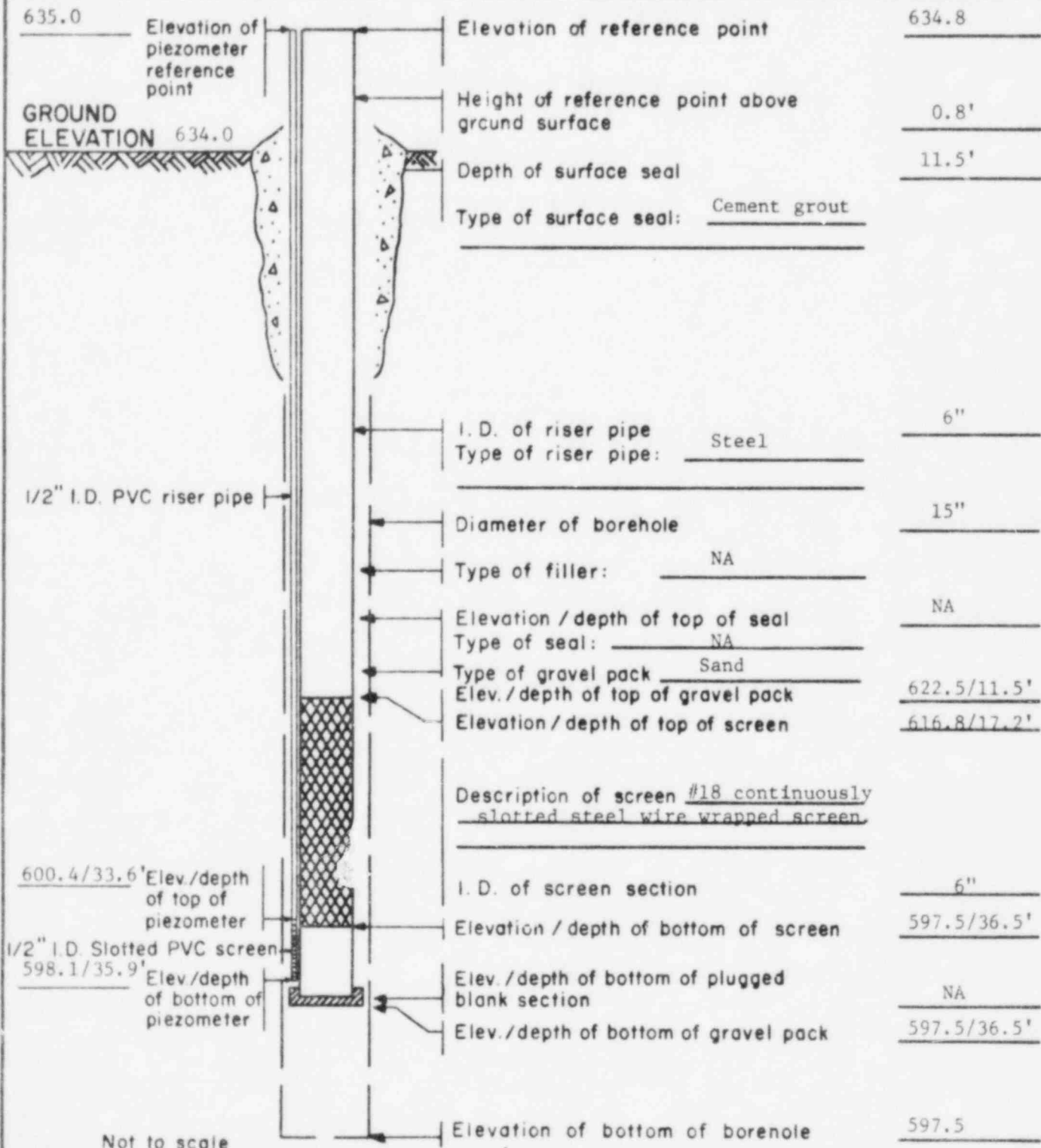


# PUMPING WELL CONSTRUCTION SUMMARY

PROJECT Midland Power Plant  
 SITE East of Service Water Pump Structure  
 COORDINATES S 5028.83 E 869.58  
 DATE COMPLETED 7/15/82  
 SUPERVISED BY M. D. Johnson

WELL NO. OF-2

AQUIFER Backfill  
Clay and Silty Clay



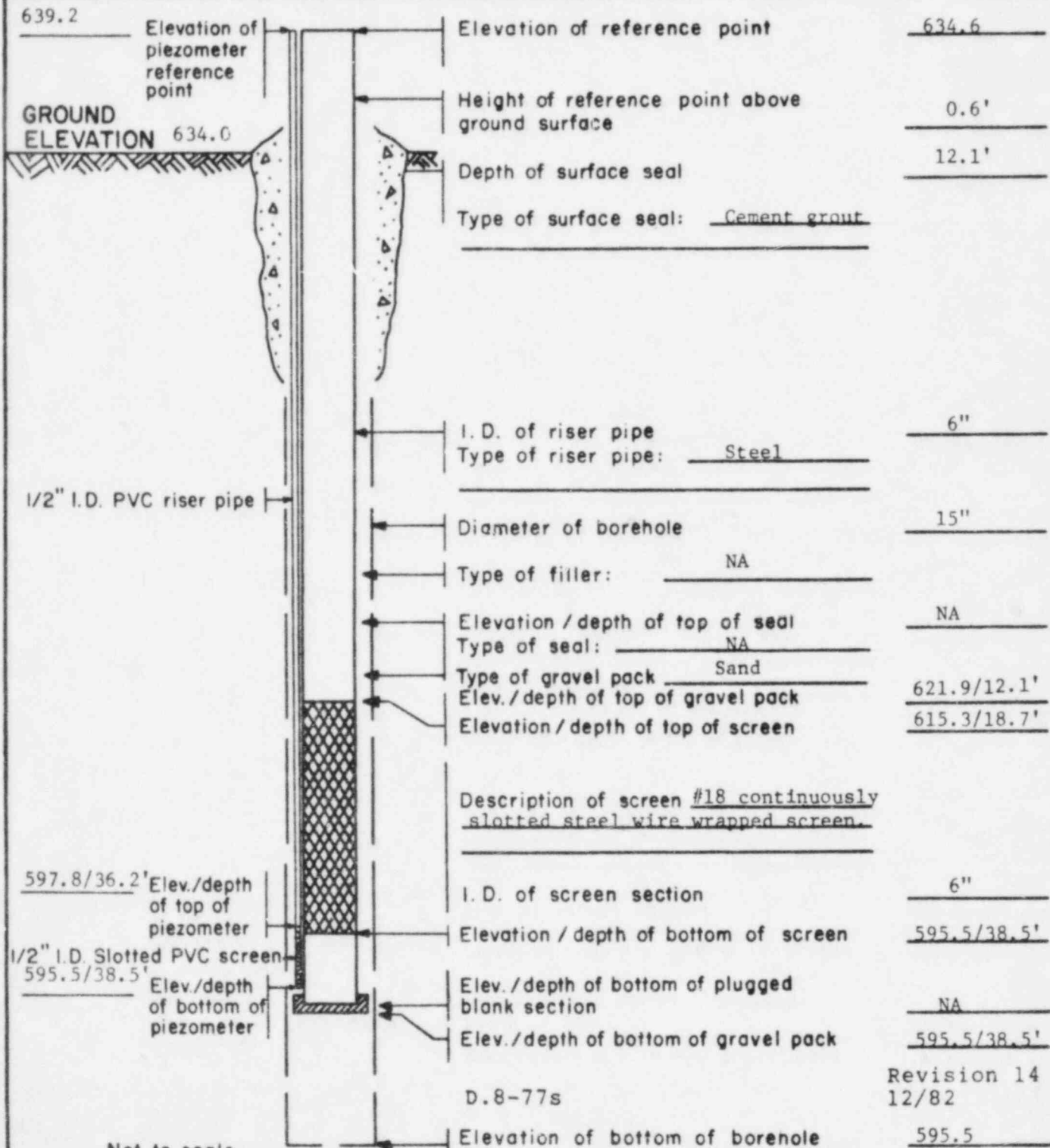
Not to scale



# PUMPING WELL CONSTRUCTION SUMMARY

PROJECT Midland Power Plant  
 SITE East of Service Water Pump Structure  
 COORDINATES S 5014.66 E 875.11  
 DATE COMPLETED 7/22/82  
 SUPERVISED BY M. D. Johnson

WELL NO. OF-3  
 AQUIFER Backfill  
Gravel and Silty Clay,  
Silty Clay Till



Not to scale

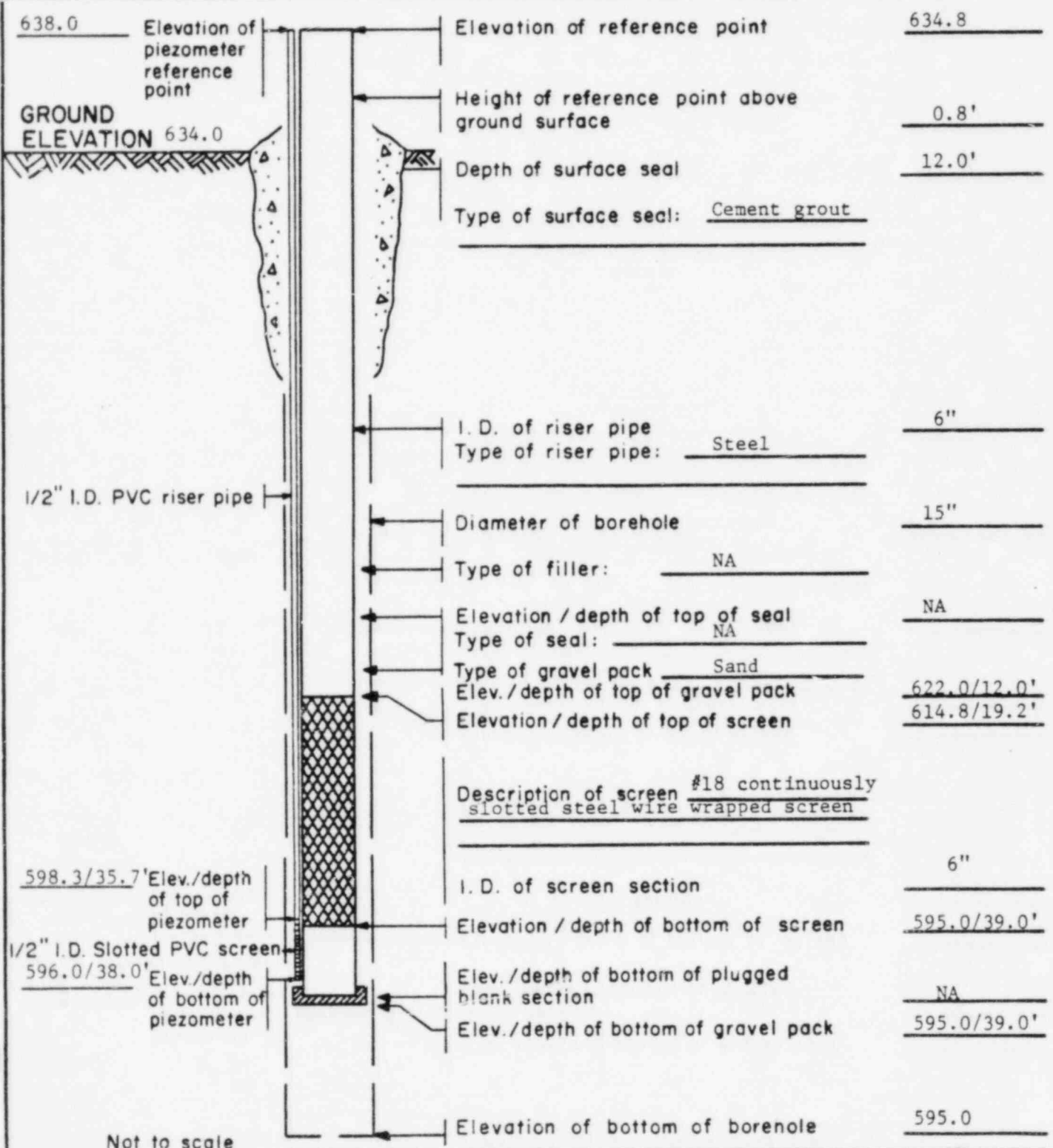




# PUMPING WELL CONSTRUCTION SUMMARY

PROJECT Midland Power Plant  
 SITE East of Service Water Pump Structure  
 COORDINATES S 5020.68 E 864.73  
 DATE COMPLETED 7/23/82  
 SUPERVISED BY M. D. Johnson

WELL NO. OF-4  
 AQUIFER Backfill  
Clay and Silty Clay  
Till



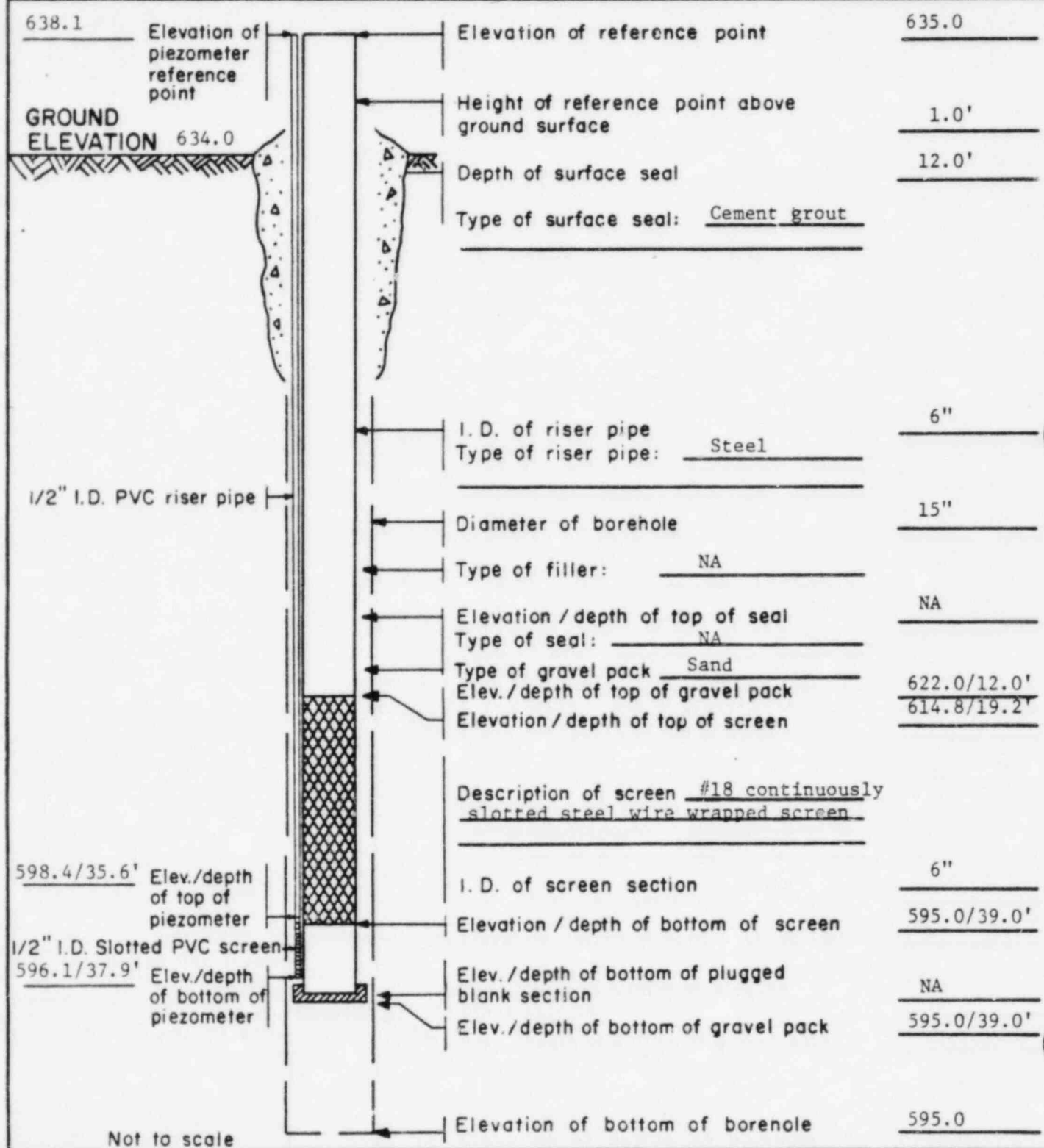
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# PUMPING WELL CONSTRUCTION SUMMARY

PROJECT Midland Power Plant  
 SITE East of Service Water Pump Structure  
 COORDINATES S 5010.86 E 872.90  
 DATE COMPLETED 7/21/82  
 SUPERVISED BY M. D. Johnson

WELL NO. OF-5  
 AQUIFER Backfill  
Gravel and Silty  
Clay and Till



Not to scale

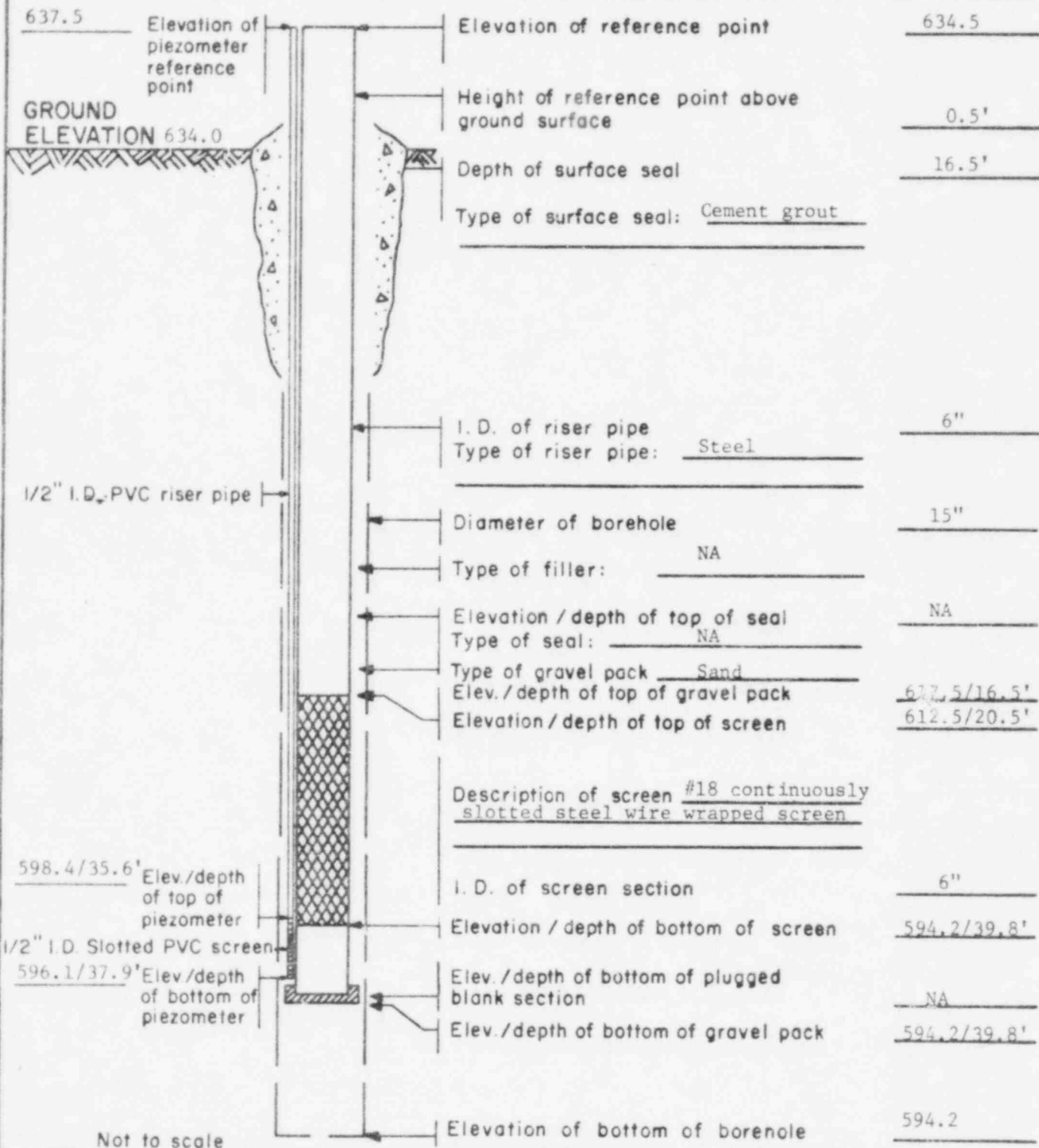


# PUMPING WELL CONSTRUCTION SUMMARY

PROJECT Midland Power Plant  
 SITE East of Service Water Pump Structure  
 COORDINATES S 4992.15 E 862.12  
 DATE COMPLETED 7/20/82  
 SUPERVISED BY M. D. Johnson

WELL NO. OF-7

AQUIFER Backfill  
Silty Clay

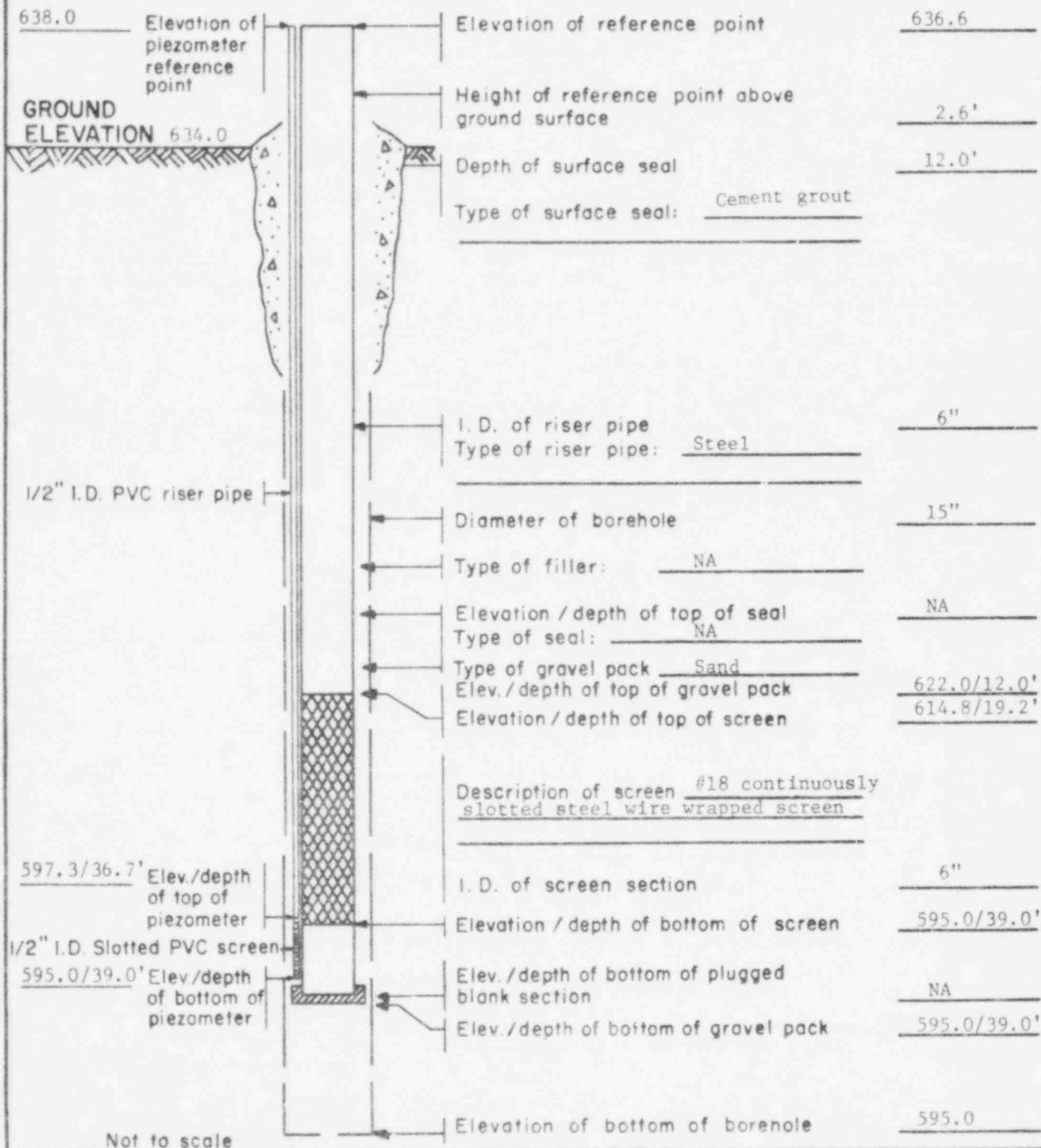




# PUMPING WELL CONSTRUCTION SUMMARY

PROJECT Midland Power Plant  
 SITE East of Service Water Pump Structure  
 COORDINATES S 4983.03 E 856.82  
 DATE COMPLETED 7/26/82  
 SUPERVISED BY M. D. Johnson

WELL NO. OF-9  
 AQUIFER Backfill  
Silty Clay and Silty  
Clay Till



Not to scale

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# PUMPING WELL CONSTRUCTION SUMMARY

PROJECT Midland Power Plant  
 SITE Turbine Building  
 COORDINATES S 4896.75 E 444.08  
 DATE COMPLETED 9/28/79  
 SUPERVISED BY K. R. Bailey

WELL NO. TEW-1  
 AQUIFER Silty Clay,  
 Sand & Sandy Gravel  
 (Fill)

Not to scale.

GROUND ELEVATION 634.5'

0-21.5' Space Between floors

21.5-28.0' Concrete

28.0-43.6' Silty Clay (Fill)

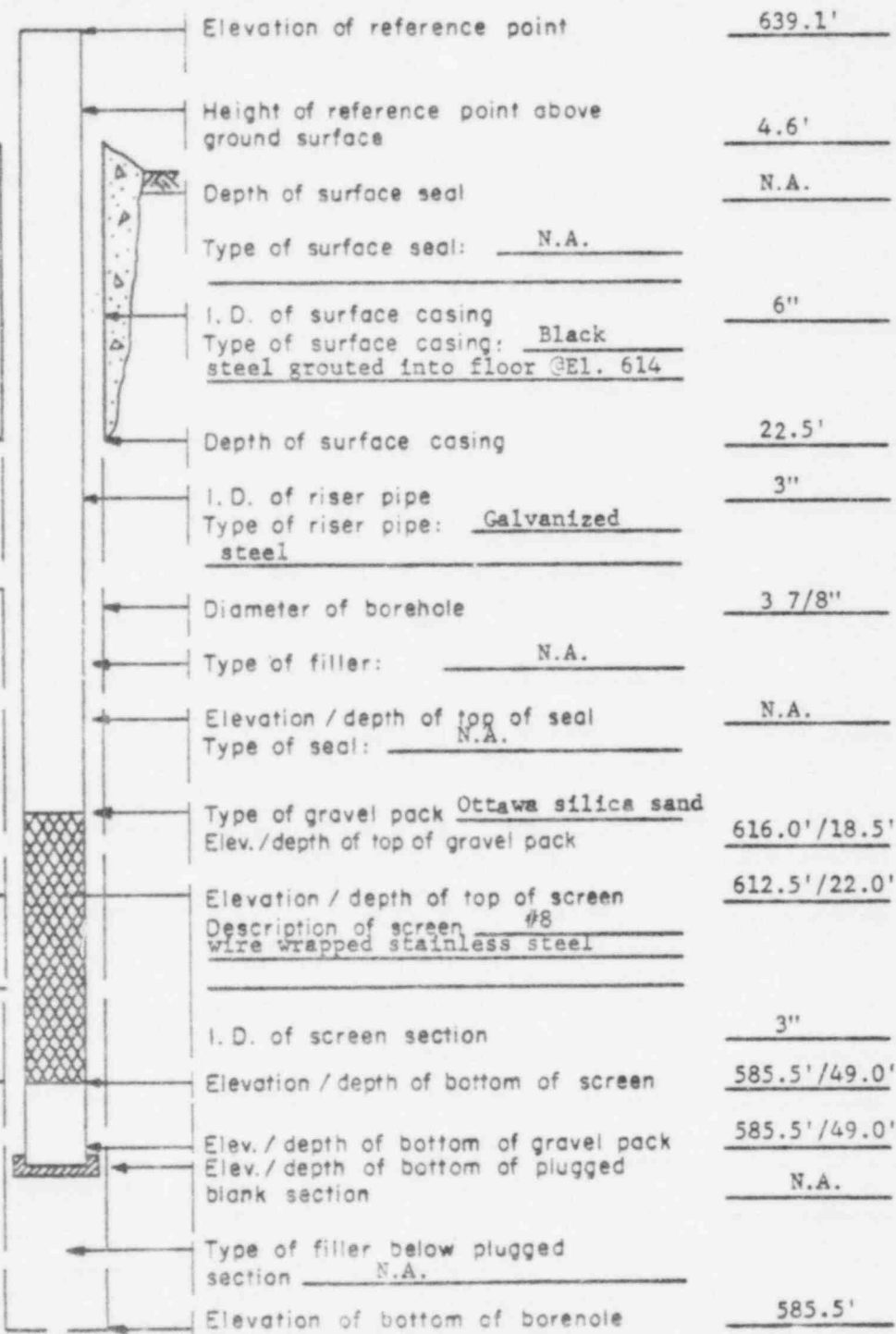
43.6-46.0' Sand (Fill)

46.0-46.5' Sandy Gravel (Fill)

46.5-49.0' Silty Clay (Lacustrine)

\*See boring log for details

Generalized Stratigraphy \*



Elevation of reference point 639.1'  
 Height of reference point above ground surface 4.6'  
 Depth of surface seal N.A.  
 Type of surface seal: N.A.  
 I. D. of surface casing 6"  
 Type of surface casing: Black steel grouted into floor @EL. 614  
 Depth of surface casing 22.5'  
 I. D. of riser pipe 3"  
 Type of riser pipe: Galvanized steel  
 Diameter of borehole 3 7/8"  
 Type of filler: N.A.  
 Elevation / depth of top of seal N.A.  
 Type of seal: N.A.  
 Type of gravel pack Ottawa silica sand  
 Elev./depth of top of gravel pack 616.0' / 18.5'  
 Elevation / depth of top of screen 612.5' / 22.0'  
 Description of screen #8 wire wrapped stainless steel  
 I. D. of screen section 3"  
 Elevation / depth of bottom of screen 585.5' / 49.0'  
 Elev. / depth of bottom of gravel pack 585.5' / 49.0'  
 Elev. / depth of bottom of plugged blank section N.A.  
 Type of filler below plugged section N.A.  
 Elevation of bottom of borehole 585.5'

<b>WELL LOG</b>			PROJECT	JOB NO.	SHEET NO.	WELL NO.
			MIDLAND UNITS 1 AND 2	7220	1 OF 2	A-1
SITE				COORDINATES		
South of Diesel Generator Building				S5210.2 E216.5		
BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE	TOTAL DEPTH	SAMPLES
3-30-82	4-2-82	Kelley Dewatering Co.	Bucyrus-Erie 60 L	17"	61.4'	13
SCREEN DIA/LENGTH/SLOT		EL TOP OF CASING	GROUND SURFACE EL	DEPTH/EL GROUND WATER		LOGGED BY GEOLOGIST/HYDROGEOLOGIST
6"/8.5"/#18		634.4	633.9	28.0'/605.9		M.D. Johnson/T.R. Cullen
CHECKED BY:			DATE	APPROVED BY:		DATE
L.E. Young			6-10-82	W.C. Paris, Jr.		6-16-82

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
633.9	0			0-10.0' Gravelly Sandy Clay, gray, fine- to coarse-grained sand, fine to coarse gravel, some silt. (Fill)	Well A-1 was relocated 5.0' northeast of pilot hole WA-1. 0-2.0' Hand dug starter hole.
623.9	10			10.0'-28.0' Silty Clay, gray and brown mottled, some fine- to coarse grained sand, some fine to medium gravel. (Fill)	
	20				End of shift 3-30-82 at 20.0' Start of shift 3-31-82
605.9	28			28.0'-44.0' Sand, brown, fine-grained, trace medium-grained sand, trace to little silt. (Lacustrine)	Fill Lacustrine  4-1-82
598.9	35			33.0' Sand becomes gray.	End of shift 3-31-82 at 35.0'

SAMPLE TYPE	SITE	WELL NO.
Grab and Bailer	South of Diesel Generator Building	A-1

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# WELL LOG

PROJECT MIDLAND UNITS 1 AND 2

JOB NO. 7220

SHEET NO. 2 OF 2

WELL NO. A-1

ELEVATION	DEPTH	SAMPLE GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES:
598.9	35			
	35-44			Start of shift 4-1-82
589.9	44-45		44.0'-61.4' Silty Clay and Clayey Silt, gray. Clay and silt partings. (lacustrine)	
	45-60			End of shift 4-1-82 at 60.0'
	60-61.4			Start of shift 4-2-82 Completed hole 4-2-82
572.5	61.4		T.D.: 61.4', See well construction summary.	See sample extrusion and field log for pilot hole WA-1.

SAMPLE TYPE  
Bailer

SITE  
South of Diesel Generator Building

WELL NO.  
A-1

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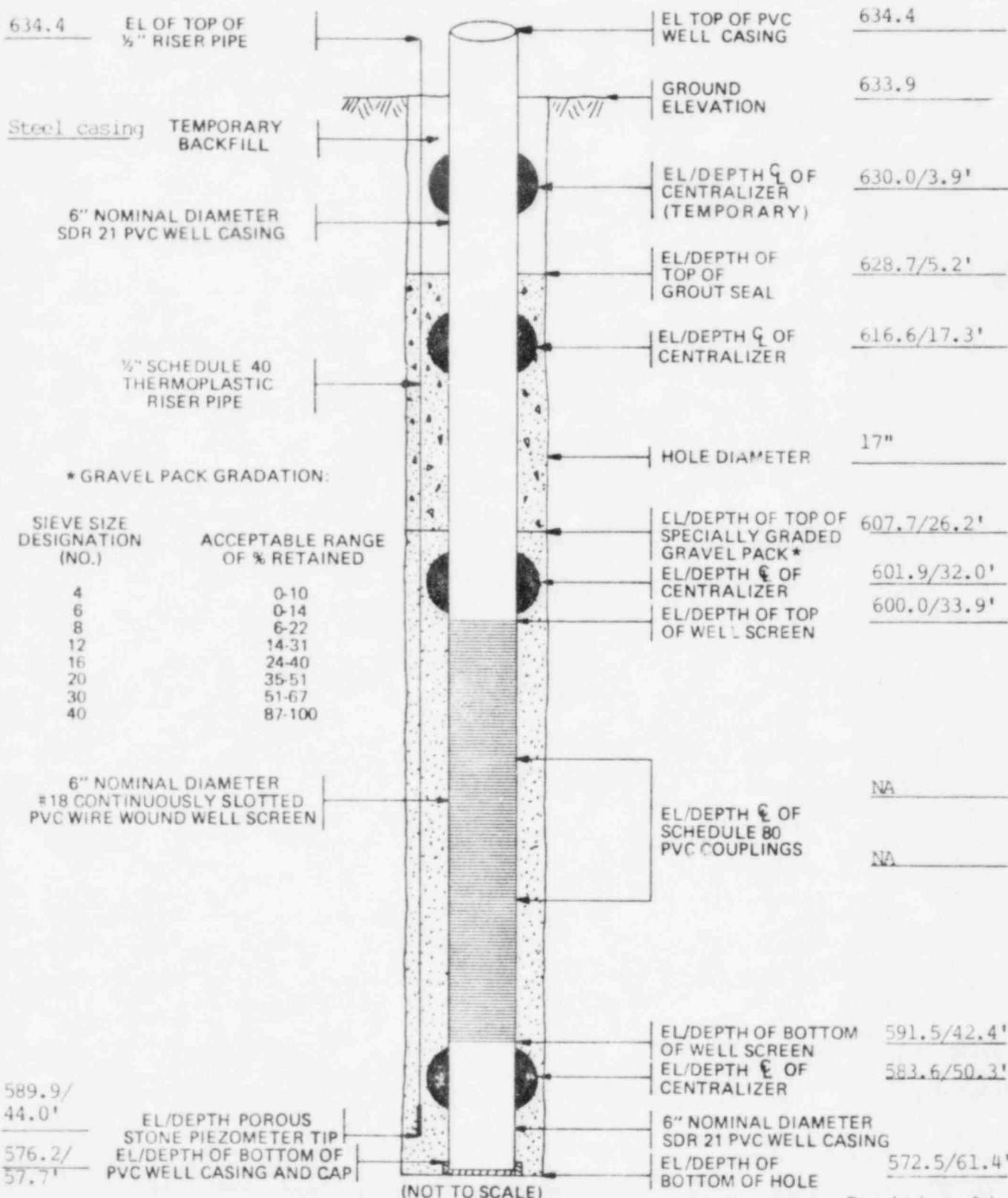
# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

JOB NO. 7220

WELL NO. A-1

SITE South of Diesel Generator Building      COORDINATES S 5210.2    E 216.5  
 DATE STARTED 4/19/82      DATE COMPLETED 4/20/82  
 GEOLOGIST/HYDROGEOLOGIST T.R. Cullen/  
A.J. Fiksdal      INSTALLED BY Kelly Contract Dewatering Co.



\* GRAVEL PACK GRADATION:

SIEVE SIZE DESIGNATION (NO.)	ACCEPTABLE RANGE OF % RETAINED
4	0-10
6	0-14
8	6-22
12	14-31
16	24-40
20	35-51
30	51-67
40	87-100



WELL INSTALLATION DATA SHEET

WELL NUMBER A-1

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S 5210.2 E 216.5 SURFACE ELEVATION 633.9

DATE STARTED 3/30/82 DATE COMPLETED 4/23/82 NO. OF SAMPLES 13

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool  
O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 61.4'  
I.D. 15 1/4" nom SPECIAL CONDITIONS 3.7' of material in bottom of hole.

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS   
SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 8.5'  
CENTRALIZERS: 3.9', 17.3', 32.0', 50.3

LENGTH OF BLANK BELOW SCREEN 15.3' LENGTH OF RISER ABOVE SCREEN 34.4'  
LENGTH OF GRAVEL PACKED ZONE 31.5' CALCULATED AMOUNT OF GRAVEL PACK 42.1 cu. ft.  
ACTUAL AMOUNT OF GRAVEL PACK 44.6 cu. ft. CIRCULATION DURING GRAVEL PACKING   
CASAGRANDE TIP DEPTH 44.0' THICKNESS OF SEAL 21.0'  
TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 28.1 cu. ft.  
ACTUAL AMOUNT OF SEAL 28.1 cu. ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping  
DEVELOPING TIME 8 hours AMOUNT OF MATERIAL REMOVED <0.01 cu. ft. (est)

SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT SPECIAL CONDITIONS none  
FIRST TEST 1.4  
SECOND RETEST \_\_\_\_\_  
THIRD RETEST \_\_\_\_\_

STATIC WATER LEVEL 28.0'/605.9 DATE 4/1/82 EDUCTOR SETTING NA

SUBCONTRACTOR SUBMITTALS:

MICHIGAN DEWATERING WELL RECORD

Revision 14  
12/82

SUPERVISED BY  
GEOLOGIST/HYDROGEOLOGIST A. J. Fiksdal/  
M. D. Johnson

<b>WELL LOG</b>		PROJECT MIDLAND UNITS 1 AND 2		JOB NO. 7220	SHEET NO. 1 OF 2	WELL NO. A-2
SITE South of Diesel Generator Building				COORDINATES S 5274.7 E 231		
BEGUN 1-18-82	COMPLETED 1-21-82	DRILLER Kelly Dewatering Co.	DRILL MAKE AND MODEL Bucyrus-Erie 22w	HOLE SIZE 17"	TOTAL DEPTH 54.9'	SAMPLES 11
SCREEN DIA/LENGTH/SLOT 6"/15.0'/#18		EL TOP OF CASING 636.9	GROUND SURFACE EL 633.5	DEPTH/EL GROUND WATER 32.9'/600.6		LOGGED BY GEOLOGIST/HYDROGEOLOGIST: T.R. Cullen/M.D. Johnson
CHECKED BY: L.E. Young		DATE 3-11-82	APPROVED BY: W.C. Paris, Jr.			DATE 6-16-82
ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES	
633.5	0					
	5			0-29.0' Silty Clay, brown-orange mottled, some fine- to coarse-grained sand, occasional cobble. (Fill)	Samples collected from this hole contain pea gravel used to backfill pilot hole WA-2 at this location. 0-3.0' Used 30" O.D. tapered auger to drill through frost zone. 3.0'-8.0' Drove 19.8" O.D. casing and cleaned out with 15" O.D. auger.	
	10				End of shift 1-18-82 at 8.0'	
	15				Start of shift 1-20-82	
	20			20.0'-29.0' Sand content increasing.		
	25					
604.5	29			29.0'-45.0' Sand, brown, fine- to medium-grained, some silt. (Lacustrine)	Fill Lacustrine	
	30					
	35				▽ 3-11-82	
598.5	35				Revision 14 12/82	
SAMPLE TYPE Grab and Bailer			SITE South of Diesel Generator Building			WELL NO. A-2



# WELL LOG

PROJECT MIDLAND UNITS 1 AND 2

JOB NO. 7220

SHEET NO. 2 OF 2

WELL NO. A-2

ELEVATION	DEPTH	SAMPLE GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
598.5	35			
	40		39.0'-45.0' Sand becomes gray.	End of shift 1-20-82 at 42.0' Start of shift 1-21-82
588.5	45		45.0'-53.0' Silty Clay, dark gray, trace fine-grained sand. (Lacustrine)	
	50			Completed hole 1-21-82
578.6	54.9		T.D.: 54.9', See well construction summary.	See sample extrusion and field log for pilot hole WA-2.

SAMPLE TYPE  
Bailer

SITE  
South of Diesel Generator Building

WELL NO. A-2



# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

JOB NO. 7220

WELL NO. A-2

SITE South of Diesel Generator Building

COORDINATES S 5274.7

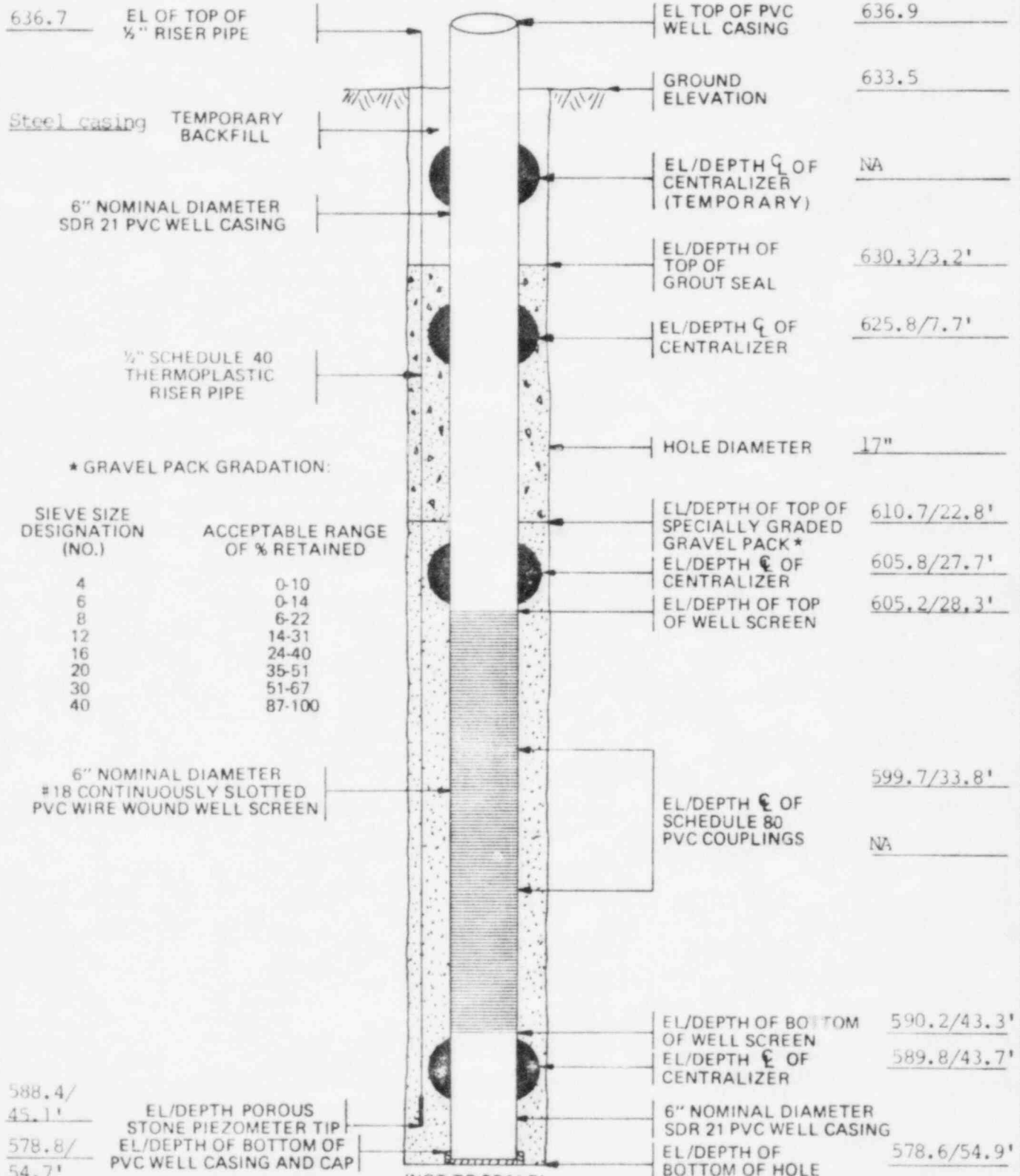
E 231

DATE STARTED 3/2/82

DATE COMPLETED 3/5/82

GEOLOGIST/HYDROGEOLOGIST T.R. Cullen

INSTALLED BY Kelly Contract Dewatering Co.



### \* GRAVEL PACK GRADATION:

SIEVE SIZE DESIGNATION (NO.)	ACCEPTABLE RANGE OF % RETAINED
4	0-10
6	0-14
8	6-22
12	14-31
16	24-40
20	35-51
30	51-67
40	87-100

Revision 14  
12/82



WELL INSTALLATION DATA SHEET

WELL NUMBER A-2

PROJECT Midland Units 1 & 2 JOB NO. 7220-10J SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S 5247.7 E 231 SURFACE ELEVATION 633.5

DATE STARTED 1/18/82 DATE COMPLETED 4/7/82 NO. OF SAMPLES 11

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool  
O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 54.9'  
I.D. 15 1/4" nom SPECIAL CONDITIONS 0-8.0' used 19.8" O.D. casing.  
0.2' of material in bottom of hole.

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS   
SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 15.0'  
CENTRALIZERS: 7.7', 27.7', 33.8', 43.7'

LENGTH OF BLANK BELOW SCREEN 11.4' LENGTH OF RISER ABOVE SCREEN 31.9'  
LENGTH OF GRAVEL PACKED ZONE 31.9' CALCULATED AMOUNT OF GRAVEL PACK 42.6 cu. ft.  
ACTUAL AMOUNT OF GRAVEL PACK 44.6 cu. ft. CIRCULATION DURING GRAVEL PACKING   
CASAGRANDE TIP DEPTH 45.1' THICKNESS OF SEAL 19.6'  
TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 29.0 cu. ft.  
ACTUAL AMOUNT OF SEAL 28.1 cu. ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping  
DEVELOPING TIME 7 hours AMOUNT OF MATERIAL REMOVED <0.01 cu. ft. (est)

SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT SPECIAL CONDITIONS none  
FIRST TEST 0.0  
SECOND RETEST \_\_\_\_\_  
THIRD RETEST \_\_\_\_\_


STATIC WATER LEVEL 32.9'/600.6 DATE 3/11/82 EDUCTOR SETTING NA

SUBCONTRACTOR SUBMITTALS:

MICHIGAN DEWATERING WELL RECORD

Revision 14  
12/82

SUPERVISED BY  
GEOLOGIST/HYDROGEOLOGIST M. D. Johnson/  
T. R. Cullen

WELL LOG		PROJECT	JOB NO.	SHEET NO.	WELL NO.
		MIDLAND UNITS 1 AND 2	7220	1 OF 2	A-3
SITE			COORDINATES		
South of Diesel Generator Building			S 5274.7 E270.1		
BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE	TOTAL DEPTH
1-18-82	1-25-82	Kelly Dewatering Co.	Bucyrus-Erie 22W	17"	55.5'
SAMPLES		LOGGED BY GEOLOGIST/HYDROGEOLOGIST:			
12		T.R. Cullen/M.D. Johnson			
SCREEN DIA/LENGTH/SLOT		EL TOP OF CASING	GROUND SURFACE EL	DEPTH/EL GROUND WATER	
6"/15.0' #18		634.2	633.3	33.74'/599.56	
CHECKED BY:		DATE	APPROVED BY:	DATE	
L.E. Young		3-11-82	W.C. Paris, Jr.	6-16-82	
ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
633.3	0				
	1			0-32.0' Silty Clay, brown, orange mottled, some fine- to coarse-grained sand, some pea gravel, occasional cobble. (Fill)	0-3.0' Used 30" O.D. tapered auger to drill through frost zone. 3.0-8.0' Drove 19.8" O.D. casing and cleaned out with 15" O.D. auger.
	5				
	10				End of shift 1-18-82 at 8.0' Start of shift 1-22-82
	15			15.0 - 20.0' Sandy clay.	
	20				
	25				
	30				End of shift 1-22-82 at 28.0' Start of shift 1-25-82
601.3	32			32.0'-47.0' Sand, brown, fine- to medium-grained. (Lacustrine)	Fill Lacustrine  3-11-82
598.3	35				
SAMPLE TYPE		SITE			WELL NO.
Grab and Bailer		South of Diesel Generator Building			A-3

# WELL LOG

PROJECT  
MIDLAND UNITS 1 AND 2

JOB NO.  
7220

SHEET NO.  
2 OF 2

WELL NO.  
A-3

ELEVATION	DEPTH	SAMPLE GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
598.3	35			
577.8	55.5		47.0'-54.8' Silty Clay, gray, trace fine-grained sand. (Lacustrine)	Completed hole 1-25-82
			T.D.:55.5, See well construction summary.	

SAMPLE TYPE  
Bailer

SITE  
South of Diesel Generator Building

WELL NO.  
A-3





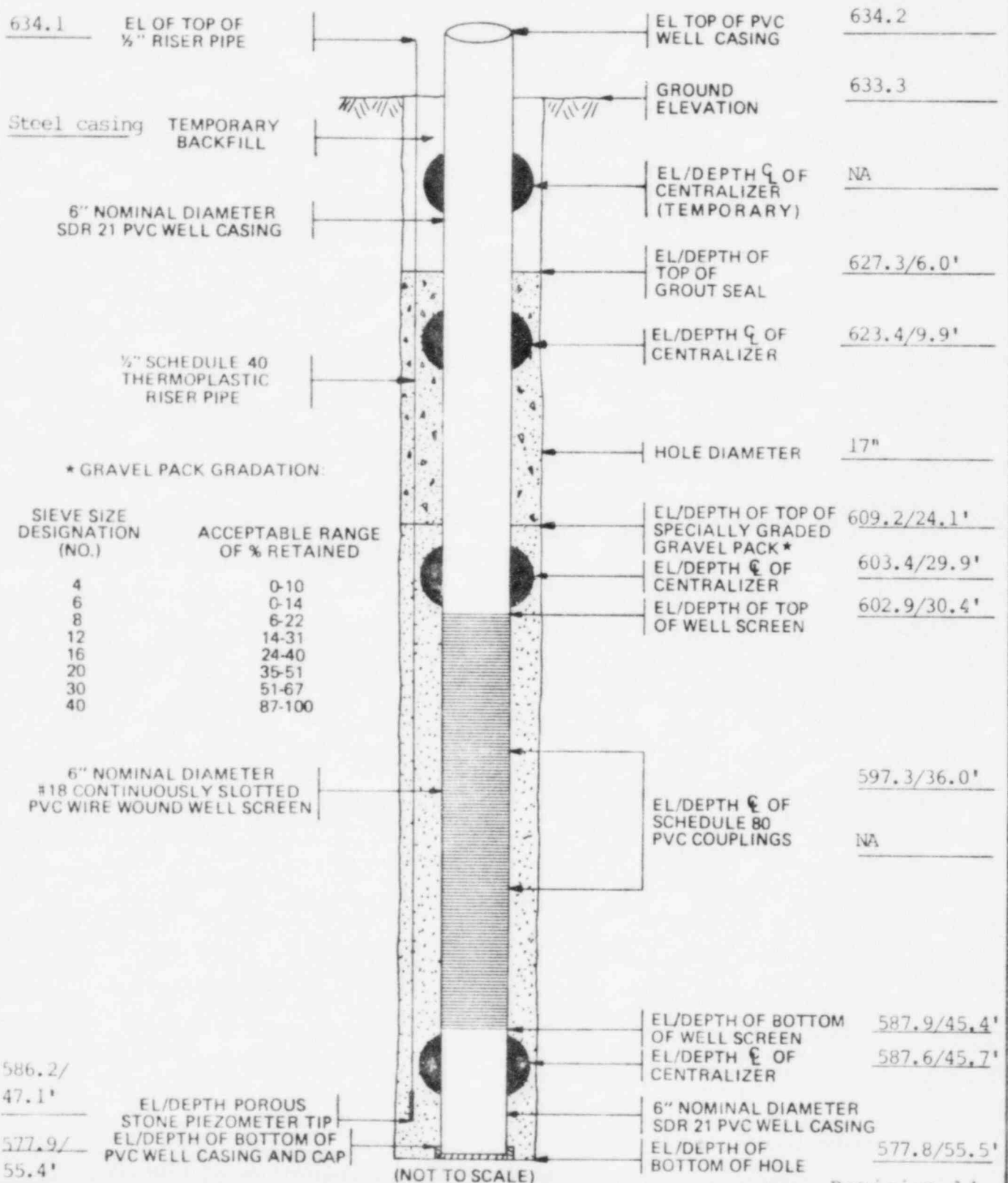
# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

JOB NO. 7220

WELL NO. A-3

SITE South of Diesel Generator Building COORDINATES S 5274.7 E 270.1  
 DATE STARTED 3/3/82 DATE COMPLETED 3/4/82  
 GEOLOGIST/HYDROGEOLOGIST T.R. Cullen INSTALLED BY Kelly Contract Dewatering Co.



<p>634.1 EL OF TOP OF 1/2" RISER PIPE</p> <p>Steel casing TEMPORARY BACKFILL</p> <p>6" NOMINAL DIAMETER SDR 21 PVC WELL CASING</p> <p>1/2" SCHEDULE 40 THERMOPLASTIC RISER PIPE</p>	<p>EL TOP OF PVC WELL CASING 634.2</p> <p>GROUND ELEVATION 633.3</p> <p>EL/DEPTH C OF CENTRALIZER (TEMPORARY) NA</p> <p>EL/DEPTH OF TOP OF GROUT SEAL 627.3/6.0'</p> <p>EL/DEPTH C OF CENTRALIZER 623.4/9.9'</p> <p>HOLE DIAMETER 17"</p> <p>EL/DEPTH OF TOP OF SPECIALLY GRADED GRAVEL PACK* 609.2/24.1'</p> <p>EL/DEPTH C OF CENTRALIZER 603.4/29.9'</p> <p>EL/DEPTH OF TOP OF WELL SCREEN 602.9/30.4'</p> <p>EL/DEPTH C OF SCHEDULE 80 PVC COUPLINGS 597.3/36.0'</p> <p>EL/DEPTH OF BOTTOM OF WELL SCREEN 587.9/45.4'</p> <p>EL/DEPTH C OF CENTRALIZER 587.6/45.7'</p> <p>6" NOMINAL DIAMETER SDR 21 PVC WELL CASING</p> <p>EL/DEPTH OF BOTTOM OF HOLE 577.8/55.5'</p>	<p>EL/DEPTH POROUS STONE PIEZOMETER TIP 586.2/47.1'</p> <p>EL/DEPTH OF BOTTOM OF PVC WELL CASING AND CAP 577.9/55.4'</p>
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**\* GRAVEL PACK GRADATION:**

SIEVE SIZE DESIGNATION (NO.)	ACCEPTABLE RANGE OF % RETAINED
4	0-10
6	0-14
8	6-22
12	14-31
16	24-40
20	35-51
30	51-67
40	87-100



WELL INSTALLATION DATA SHEET

WELL NUMBER A-3

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S 5274.7 E 270.1 SURFACE ELEVATION 633.3

DATE STARTED 1/18/82 DATE COMPLETED 4/8/82 NO. OF SAMPLES 12

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool  
O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 55.5'  
I.D. 15 1/4" nom SPECIAL CONDITIONS 0-8.0' used 19.8" O.D. casing.  
0.7' flushed from hole during cleaning.

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS   
SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 15.0'  
CENTRALIZERS: 9.9', 29.9', 36.0', 45.7'

LENGTH OF BLANK BELOW SCREEN 10.0' LENGTH OF RISER ABOVE SCREEN 31.3'  
LENGTH OF GRAVEL PACKED ZONE 31.4' CALCULATED AMOUNT OF GRAVEL PACK 42.0 cu.ft.  
ACTUAL AMOUNT OF GRAVEL PACK 39.6 cu.ft. CIRCULATION DURING GRAVEL PACKING   
CASAGRANDE TIP DEPTH 47.1' THICKNESS OF SEAL 18.1'  
TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 25.3 cu.ft.  
ACTUAL AMOUNT OF SEAL 30.6 cu.ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping  
DEVELOPING TIME 7 hours AMOUNT OF MATERIAL REMOVED < 0.01 cu.ft. (est)  
SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT SPECIAL CONDITIONS none  
FIRST TEST 0.2  
SECOND RETEST \_\_\_\_\_  
THIRD RETEST \_\_\_\_\_

STATIC WATER LEVEL 33.74' / 599.56 DATE 3/11/82 EDUCTOR SETTING NA

SUBCONTRACTOR SUBMITTALS:

MICHIGAN DEWATERING WELL RECORD

Revision 14  
12/82

SUPERVISED BY  
GEOLOGIST/HYDROGEOLOGIST M.D. Johnson/T.R. Cullen

# WELL LOG


PROJECT: MIDLAND UNITS 1 AND 2  
 JOB NO.: 7220  
 SHEET NO.: 1 OF 2  
 WELL NO.: A-4

SITE: South of Diesel Generator Building  
 COORDINATES: S 5275.1 E308.9

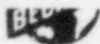
BEGUN: 1-19-82 COMPLETED: 1-28-82 DRILLER: Kelly Dewatering Co.  
 DRILL MAKE AND MODEL: Bucyrus-Erie 22W HOLE SIZE: 17" TOTAL DEPTH: 54.0' SAMPLES: 12

SCREEN DIA/LENGTH/SLOT: 6"/9.0'/#18 EL TOP OF CASING: 635.3 GROUND SURFACE EL: 633.1 DEPTH/EL GROUND WATER: 32.67'/600.43 LOGGED BY GEOLOGIST/HYDROGEOLOGIST: T.R. Cullen

CHECKED BY: L.E. Young DATE: 3-11-82 APPROVED BY: W.C. Paris, Jr. DATE: 6-16-82

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
633.1	0				
	1			0-32.0' Silty Clay, brown, orange mottled, some fine-to coarse-grained sand, occasional pebbles, gravel, and cobbles. (Fill)	Samples collected from this hole contain pea gravel used to backfill pilot hole WA-4 at this location. 0-3.0' Used 30" O.D. tapered auger to drill through frost zone. 3.0'-8.0' Drove 19.8" O.D. casing and cleaned out with 15" O.D. auger.
	5				End of shift 1-19-82 at 8.0'
	10				Start of shift 1-26-82 at 6.5'
	15				
	20				
	25				
	30				End of shift 1-26-82 at 30.0'
	32				Start of shift 1-27-82
601.1	32			32.0'-47.0' Sand, brown medium-grained. (Lacustrine)	Fill Lacustrine  3-11-82
598.1	35				

SAMPLE TYPE: Grab and Bailor SITE: South of Diesel Generator Building WELL NO.: A-4



# WELL LOG

PROJECT MIDLAND UNITS 1 AND 2

JOB NO. 7220

SHEET NO. 2 OF 2

WELL NO. A-4

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
598.1	35				
	40				
	45				
586.147	47.0			47.0'-54.0' Silty <u>Clay</u> , gray. (Lacustrine)	
	50				End of shift 1-27-82 at 51.0' Start of shift 1-28-82
	51.0				
	52.0				Completed hole 1-28-82
579.154	54.0			T.D.: 54.0', See well construction summary.	See sample extrusion and field log of pilot hole WA-4.

SAMPLE TYPE  
Bailer

SITE  
South of Diesel Generator Building

WELL NO.  
A-4



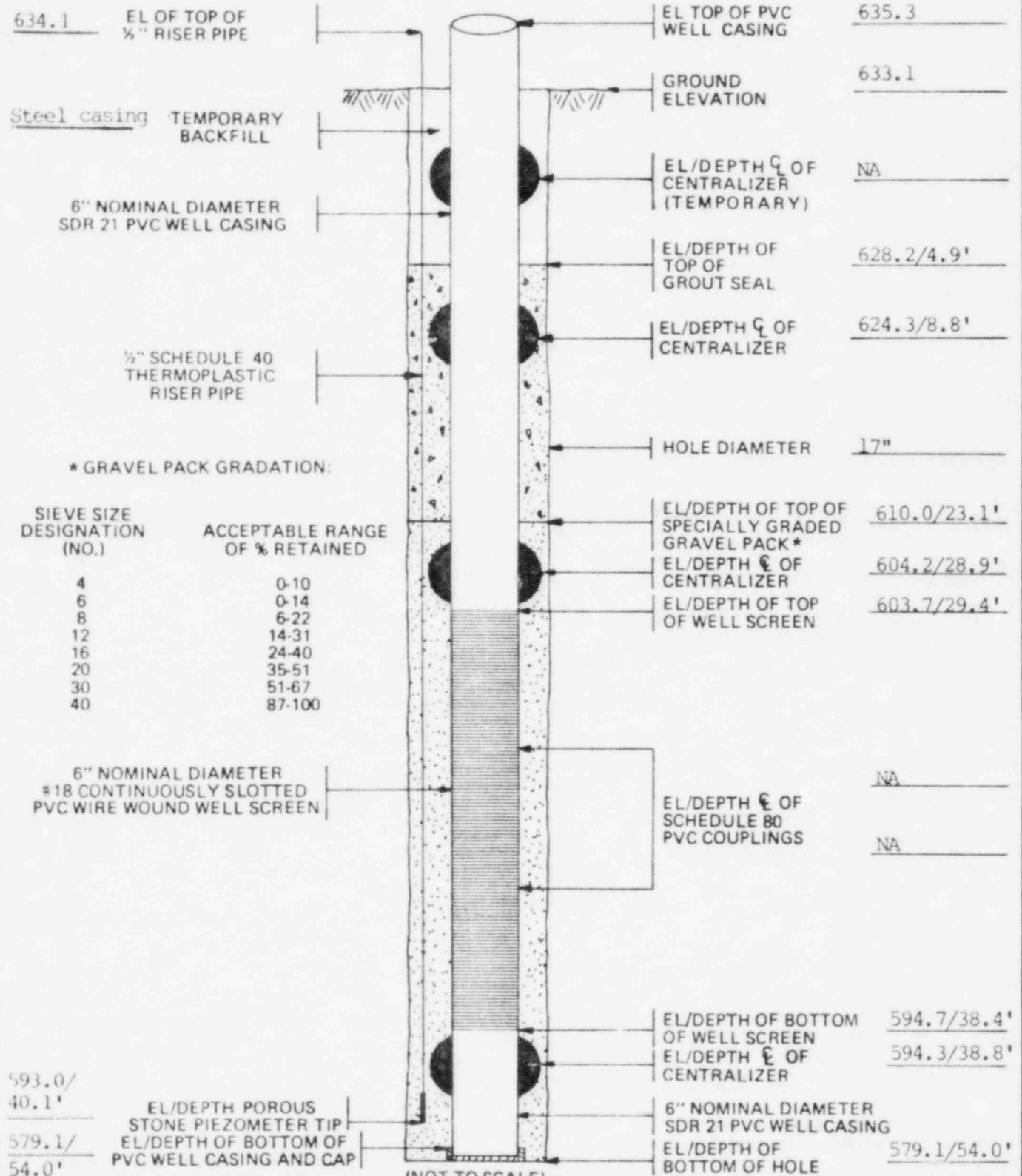
# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

JOB NO. 7220

WELL NO. A-4

SITE South of Diesel Generator Building COORDINATES S 5275 E 309  
 DATE STARTED 3/2/82 DATE COMPLETED 3/4/82  
 GEOLOGIST/HYDROGEOLOGIST T.R. Cullen INSTALLED BY Kelly Contract Dewatering Co.





WELL INSTALLATION DATA SHEET

WELL NUMBER A-4

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S 5275 E 309 SURFACE ELEVATION 633.1

DATE STARTED 1/19/82 DATE COMPLETED 4/9/82 NO. OF SAMPLES 12

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool  
O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 54.0'  
I.D. 15 1/4" nom SPECIAL CONDITIONS 0-8.0' used 19.8" O.D. casing.

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS   
SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 9.0'  
CENTRALIZERS: 8.8', 28.9', 38.8'

LENGTH OF BLANK BELOW SCREEN 15.6' LENGTH OF RISER ABOVE SCREEN 31.6'  
LENGTH OF GRAVEL PACKED ZONE 30.9' CALCULATED AMOUNT OF GRAVEL PACK 41.3 cu. ft.  
ACTUAL AMOUNT OF GRAVEL PACK 39.6 cu. ft. CIRCULATION DURING GRAVEL PACKING   
CASAGRANDE TIP DEPTH 40.1' THICKNESS OF SEAL 18.2'  
TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 32.0 cu. ft.  
ACTUAL AMOUNT OF SEAL 35.7 cu. ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping  
DEVELOPING TIME 8 hours AMOUNT OF MATERIAL REMOVED <0.01 cu. ft. (est)  
SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT SPECIAL CONDITIONS none  
FIRST TEST 0.2  
SECOND RETEST \_\_\_\_\_  
THIRD RETEST \_\_\_\_\_


STATIC WATER LEVEL 32.67'/600.43 DATE 3/11/82 EDUCTOR SETTING NA

SUBCONTRACTOR SUBMITTALS:

MICHIGAN DEWATERING WELL RECORD

Revision 14  
12/82

SUPERVISED BY  
GEOLOGIST/HYDROGEOLOGIST M. D. Johnson/  
T. R. Cullen

<b>WELL LOG</b>		PROJECT MIDLAND UNITS 1 AND 2			JOB NO. 7220	SHEET NO. 1 OF 2	WELL NO. A-5
SITE South of Diesel Generator Building				COORDINATES S 5194.9 E 258.9			
BEGUN 2-11-82	COMPLETED 3-29-82	DRILLER Kelley Dewatering Co.	DRILL MAKE AND MODEL Bucyrus-Erie 60L	HOLE SIZE 17"	TOTAL DEPTH 63.6'	SAMPLES 16	
SCREEN DIA/LENGTH/SLOT 6"/23.1'/#18		EL TOP OF CASING 637.0	GROUND SURFACE EL 633.0	DEPTH/EL GROUND WATER 32.0'/601.0		LOGGED BY GEOLOGIST/HYDROGEOLOGIST: A.J. Fiksdal/M.D. Johnson	
CHECKED BY: L.E. Young			DATE 6-10-82	APPROVED BY: W.C. Paris, Jr.			DATE 6/18/82
ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES		
633.0	0						
	1			0-8.0' Silty Clay, gray, some sand, some fine to medium gravel with occasional larger pebbles. (Fill)	Well A-5 was relocated 4.0' south of pilot hole WA-5. 0-2.0' Used 30" tapered auger to drill through frost zone. 2.0-8.0'Drove 19.8" O.D. casing and cleaned out with 15" O.D. auger.		
	5				End of shift 2-11-82 at 8.0'		
625.0	8			8.0'-10.0' Clayey Sand, gray, fine-grained, hard. (Fill)	Start of shift 3-24-82		
623.0	10			10.0'-30.0' Silty Clay, gray and brown, fine-to coarse-grained sand, fine gravel. (Fill)			
	15				End of shift 3-24-82 at 18.0'		
	20			20.0' Silty sand lens.	Start of shift 3-25-82		
	25						
	30				Fill		
603.0	30			30.0-58.0' Sand, brown, fine-grained, silt. (Lacustrine)	Lacustrine		
	35				 3-25-82		
598.0	35				Revision 14 12/82		
SAMPLE TYPE Grab and Bailor			SITE South of Diesel Generator Building			WELL NO. A-5	



# WELL LOG

PROJECT MIDLAND UNITS 1 AND 2

JOB NO. 7220

SHEET NO. 2 OF 2

WELL NO. A-5

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
598.0	35				
	9				End of shift 3-25-82 at 39.0'
	40				Start of shift 3-26-82
	10			43.0' Sand becomes grayer.	
	45				
	11				
	50				End of shift 3-26-82 at 52.0'
	12				Start of shift 3-29-82
	55				
	13				
575.0	58			58.0'-63.6' Silty Clay, gray, silt laminations. (Lacustrine)	
	60				
	14				
569.4	63.6			T.D.: 63.6', See well construction summary.	Completed hole 3-29-82 See sample extrusion and field log for pilot hole WA-5.
	15				

SAMPLE TYPE  
Bailer

SITE  
South of Diesel Generator Building

WELL NO.  
A-5

D.9-19

Revision 14  
12/82





# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

JOB NO. 7220

WELL NO. A-5

SITE South of Diesel Generator Building

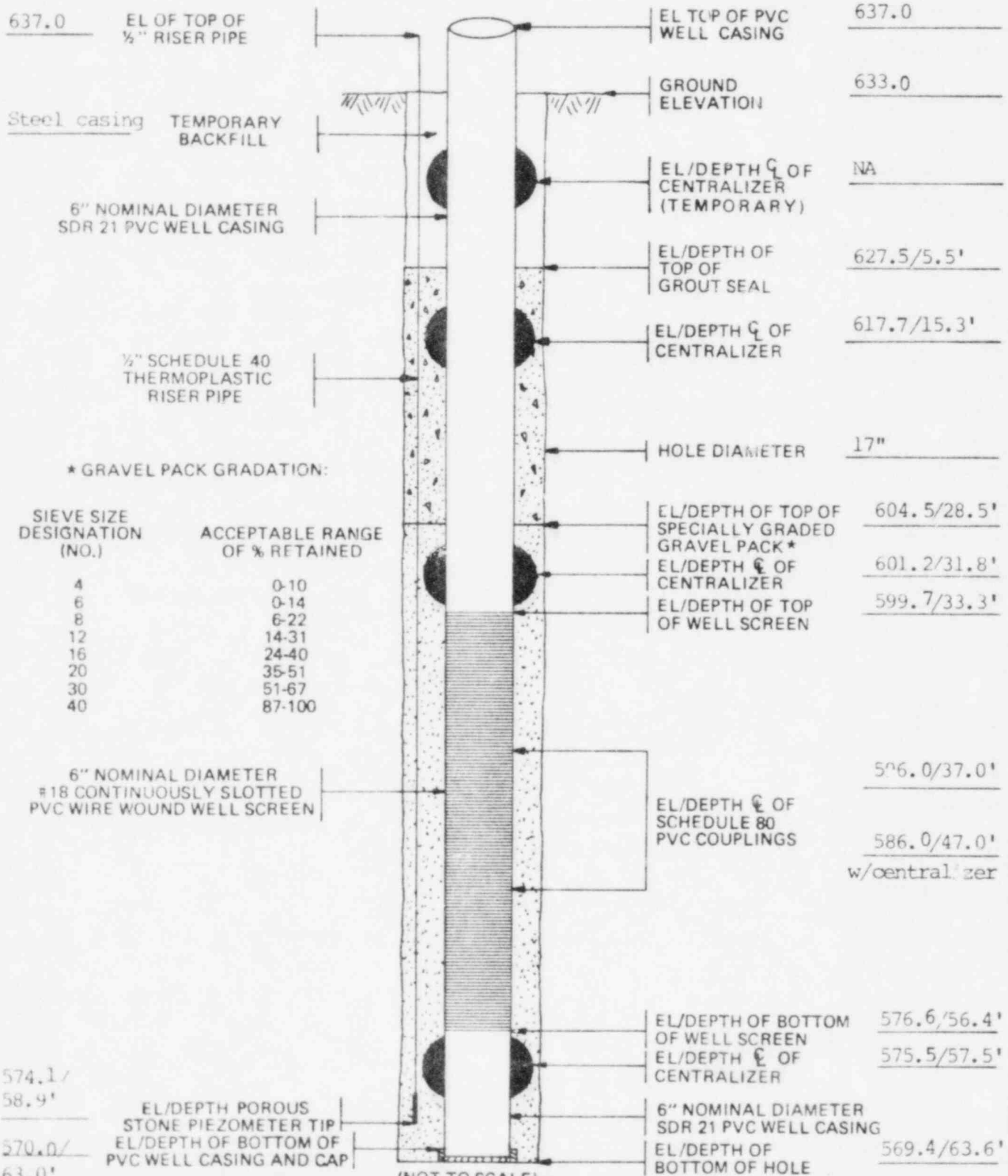
COORDINATES S 5194.9 E 258.9

DATE STARTED 4/19/82

DATE COMPLETED 4/20/82

GEOLOGIST/HYDROGEOLOGIST T.R. Cullen

INSTALLED BY Kelly Contract Dewatering Co.



637.0	EL OF TOP OF 1/2" RISER PIPE	EL TOP OF PVC WELL CASING	637.0
	Steel casing	GROUND ELEVATION	633.0
	TEMPORARY BACKFILL	EL/DEPTH C OF CENTRALIZER (TEMPORARY)	NA
	6" NOMINAL DIAMETER SDR 21 PVC WELL CASING	EL/DEPTH OF TOP OF GROUT SEAL	627.5/5.5'
	1/2" SCHEDULE 40 THERMOPLASTIC RISER PIPE	EL/DEPTH C OF CENTRALIZER	617.7/15.3'
		HOLE DIAMETER	17"
	* GRAVEL PACK GRADATION:	EL/DEPTH OF TOP OF SPECIALLY GRADED GRAVEL PACK*	604.5/28.5'
		EL/DEPTH C OF CENTRALIZER	601.2/31.8'
		EL/DEPTH OF TOP OF WELL SCREEN	599.7/33.3'
		EL/DEPTH C OF SCHEDULE 80 PVC COUPLINGS	586.0/47.0' w/centralizer
		EL/DEPTH OF BOTTOM OF WELL SCREEN	576.6/56.4'
		EL/DEPTH C OF CENTRALIZER	575.5/57.5'
574.1/58.9'	EL/DEPTH POROUS STONE PIEZOMETER TIP	6" NOMINAL DIAMETER SDR 21 PVC WELL CASING	
570.0/63.0'	EL/DEPTH OF BOTTOM OF PVC WELL CASING AND CAP	EL/DEPTH OF BOTTOM OF HOLE	569.4/63.6'



WELL INSTALLATION DATA SHEET

WELL NUMBER A-5

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S 5194.9 E 258.9 SURFACE ELEVATION 633.0

DATE STARTED 2/11/82 DATE COMPLETE 4/26/82 NO. OF SAMPLES 15

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool  
O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 63.6'  
I.D. 15 1/4" nom SPECIAL CONDITIONS 0-8.0' used 19.8" O.D. casing.  
0.6' of material in bottom of hole.

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS   
SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 23.1'  
CENTRALIZERS: 15.3', 31.8', 47.0', 57.5'

LENGTH OF BLANK BELOW SCREEN 6.6' LENGTH OF RISER ABOVE SCREEN 32.3'  
LENGTH OF GRAVEL PACKED ZONE 34.5' CALCULATED AMOUNT OF GRAVEL PACK 46.1 cu. ft.  
ACTUAL AMOUNT OF GRAVEL PACK 49.5 cu. ft. CIRCULATION DURING GRAVEL PACKING   
CASAGRANDE TIP DEPTH 58.9' THICKNESS OF SEAL 23.0'  
TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 32.2 cu. ft.  
ACTUAL AMOUNT OF SEAL 33.2 cu. ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping  
DEVELOPING TIME 8 hours AMOUNT OF MATERIAL REMOVED <0.01 cu. ft. (est)

SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT SPECIAL CONDITIONS none  
FIRST TEST 0.1  
SECOND RETEST \_\_\_\_\_  
THIRD RETEST \_\_\_\_\_


STATIC WATER LEVEL 32.0'/601.0 DATE 3/25/82 EDUCTOR SETTING NA

SUBCONTRACTOR SUBMITTALS:

MICHIGAN DEWATERING WELL RECORD

Revision 14  
12/82

SUPERVISED BY  
GEOLOGIST/HYDROGEOLOGIST M. D. Johnson/  
A. J. Fiksdal

WELL LOG		PROJECT		JOB NO.	SHEET NO.	WELL NO.
		MIDLAND UNITS 1 AND 2		7220	1 OF 2	B-1
SITE			COORDINATES			
Diesel Generator Building			S 5050 E 254			
BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE	TOTAL DEPTH	SAMPLES
4-16-82	4-21-82	Kelly Dewatering Co.	Bucyrus-Erie 22 W	17"	55.9'	14
SCREEN DIA/LENGTH/SLOT		EL TOP OF CASING	GROUND SURFACE EL	DEPTH/EL GROUND WATER	LOGGED BY GEOLOGIST/HYDROGEOLOGIST	
6"/13.5'/#18		637.3	634.3	23.7'/610.6	M.D. Johnson	
CHECKED BY:		DATE	APPROVED BY:		DATE	
A.J. Fiksdal		6-15-82	W.C. Paris, Jr.		6-18-82	
ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES:	
634.3	0					
633.8	0.5			0-0.5' Gravel, gray, fine to medium, some fine- to coarse-grained sand. (Fill)	Well B-1 was relocated 11.0' south and 6.0' east of pilot hole WB-1.	
	2			1.5'-5.5' Sand, brown, coarse-grained, occasional fine gravel. (Fill)	0-2.0' Hand dug starter hole	
628.8	5.5			5.5'-6.5' Sand, brown, medium- to coarse-grained, pieces of grout, occasional fine gravel. (Fill)	Grout from hole COE-9A.	
627.8	6.5			6.5'-8.0' Concrete mudmat (Fill)		
626.3	8.0			8.0'-23.0' Silty Clay, brown, some fine- to medium-grained sand, occasional fine gravel. (Fill)	End of shift 4-16-82 at 15.0'	
	15				Start of shift 4-19-82	
	23			23.0'-38.0' Sand, brown, fine- to medium-grained, little silt. (Fill)	 4-16-82 End of shift 4-19-82 at 25.0' Start of shift 4-20-82	
	35					
599.3					Revision 14 12/82	
SAMPLE TYPE:		SITE			WELL NO.	
Grab and Bailor		Diesel Generator Building			B-1	






# WELL LOG

PROJECT MIDLAND UNITS 1 AND 2

JOB NO. 7220

SHEET NO. 2 OF 2

WELL NO. B-1

ELEVATION	DEPTH	SAMPLE GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
599.3	35			
596.3	38		38.0'-48.0' Sand, brown, fine-grained, little silt. (Lacustrine)	Fill Lacustrine
	40			End of shift 4-20-82 at 43.0' Start of shift 4-21-82
586.3	48		48.0'-55.9' Clay, gray, trace fine-grained sand, trace angular gravel, clay is thinly laminated. (Lacustrine)	
	50		53.0' No gravel.	
578.4	55.9		T.D.: 55.9', See well construction summary.	Completed hole 4-21-82 See sample extrusion and field log of pilot hole WB-1.

SAMPLE TYPE  
Bailer

SITE  
Diesel Generator Building

WELL NO.  
B-1



# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

JOB NO. 7220

WELL NO. B-1

SITE North of Diesel Generator Building

COORDINATES S 5050

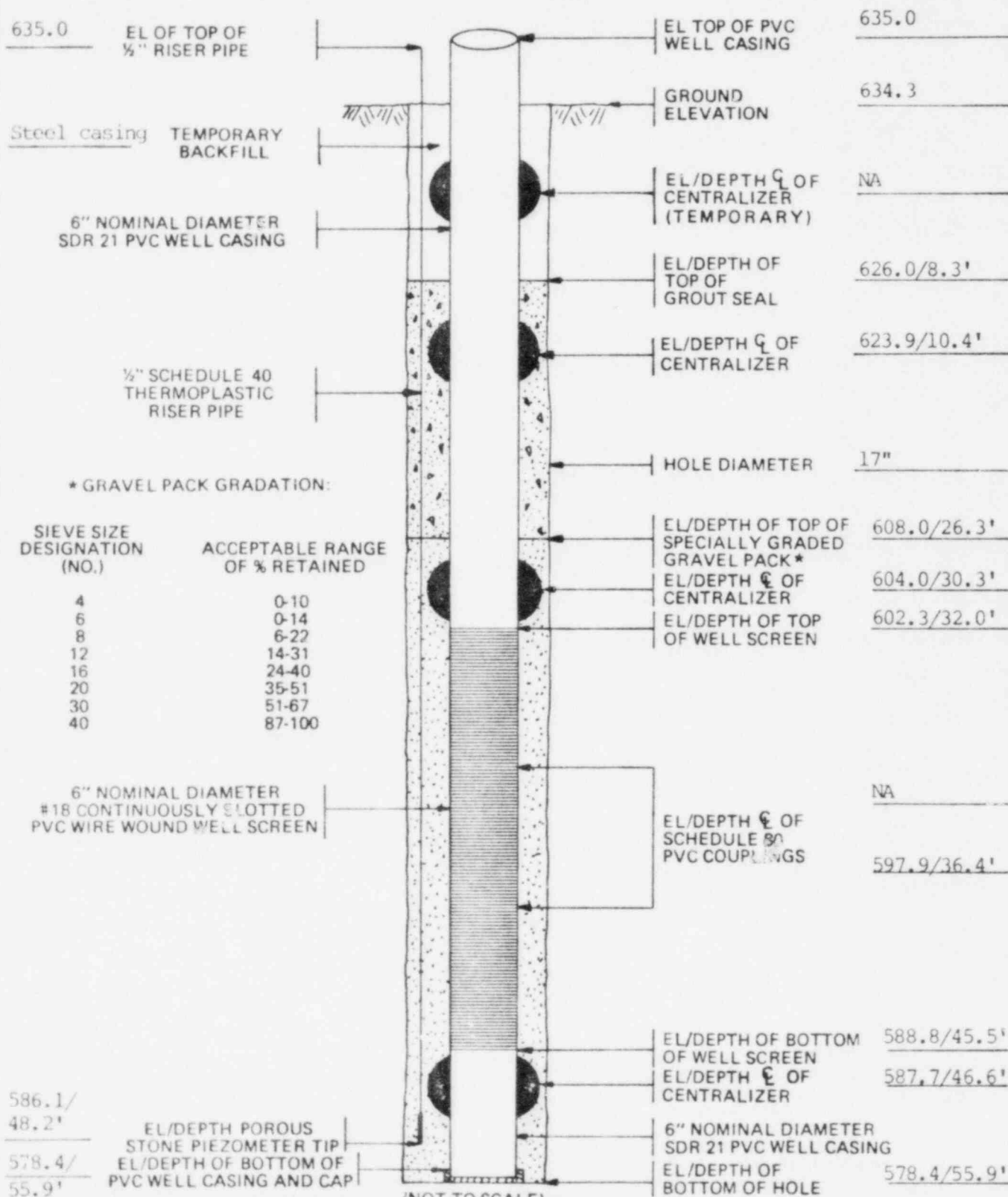
E 254

DATE STARTED 4/15/82

DATE COMPLETED 4/26/82

GEOLOGIST/HYDROGEOLOGIST A.J. Fiksdal

INSTALLED BY Kelly Contract Dewatering Co.





WELL INSTALLATION DATA SHEET

WELL NUMBER B-1

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S 5050 E 254 SURFACE ELEVATION 634.3

DATE STARTED 4/16/82 DATE COMPLETED 5/4/82 NO. OF SAMPLES 14

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool  
O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 55.9'  
I.D. 15 1/4" nom SPECIAL CONDITIONS Excessive amount of soil adhering to casing when pulled.

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS   
SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 13.5'  
CENTRALIZERS: 10.4', 30.3', 46.6'

LENGTH OF BLANK BELOW SCREEN 10.4' LENGTH OF RISER ABOVE SCREEN 32.7'  
LENGTH OF GRAVEL PACKED ZONE 29.6' CALCULATED AMOUNT OF GRAVEL PACK 39.6 cu. ft.  
ACTUAL AMOUNT OF GRAVEL PACK 40.6 cu. ft. CIRCULATION DURING GRAVEL PACKING   
CASAGRANDE TIP DEPTH 48.2' THICKNESS OF SEAL 18.0'  
TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 24.1 cu. ft.  
ACTUAL AMOUNT OF SEAL 30.6 cu. ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping  
DEVELOPING TIME 7 hours AMOUNT OF MATERIAL REMOVED <0.01 cu. ft. (est)  
SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT SPECIAL CONDITIONS none  
FIRST TEST 2.3  
SECOND RETEST \_\_\_\_\_  
THIRD RETEST \_\_\_\_\_

STATIC WATER LEVEL 23.7'/610.6 DATE 4/16/82 EDUCTOR SETTING NA

SUBCONTRACTOR SUBMITTALS:

MICHIGAN DEWATERING WELL RECORD

Revision 14  
12/82

SUPERVISED BY  
GEOLOGIST/HYDROGEOLOGIST M. D. Johnson/  
A. J. Fiksdal

# WELL LOG

PROJECT: MIDLAND UNITS 1 AND 2  
 JOB NO.: 7220  
 SHEET NO.: 1 OF 2  
 WELL NO.: B-2

SITE: Diesel Generator Building  
 COORDINATES: S 5047 E200

BEGUN: 4-9-82  
 COMPLETED: 4-15-82  
 DRILLER: Kelley Dewatering Co.  
 DRILL MAKE AND MODEL: Bucyrus-Erie 22 W  
 HOLE SIZE: 17"  
 TOTAL DEPTH: 55.6'  
 SAMPLES: 13

SCREEN DIA/LENGTH/SLOT: 6"/11.2"/#18  
 EL TOP OF CASING: 635.98  
 GROUND SURFACE EL: 634.3  
 DEPTH/EL GROUND WATER: 25.0'/609.3  
 LOGGED BY GEOLOGIST/HYDROGEOLOGIST: A.J. Fiksdal/M.D. Johnson

CHECKED BY: L.E. Young  
 DATE: 6-15-82  
 APPROVED BY: W.C. Paris, Jr.  
 DATE: 6-18-82

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
634.3	0				
	1			0-7.6' Sand, brown, fine- to coarse-grained, trace silt and fine gravel. (Fill)	Well B-2 was relocated 7' north of pilot hole WB-2. 0-1.5' Hand dug starter hole.
626.7	7.6				End of shift 4-9-82 at 7.6'
626.3	8.0			7.6'-8.0' Concrete mudmat. (Fill)	Start of shift 4-12-82
	4			8.0'-15.0' Sand, brown, coarse-grained, some fine gravel. (Fill)	
619.3	15			15.0'-25.0' Silty Clay, brown, some fine- to coarse-grained sand. (Fill)	
	6				
609.3	25			25.0'-40.0' Sand, brown, fine-grained. (Fill)	4-12-82 End of shift 4-12-82 at 25.0' Start of shift 4-13-82
	7				
	20				
	30				
599.3	35				

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12/82

SAMPLE TYPE: Grab and Bailor  
 SITE: Diesel Generator Building  
 WELL NO.: B-2

# WELL LOG

PROJECT MIDLAND UNITS 1 AND 2

JOB NO. 7220

SHEET NO. 2 OF 2

WELL NO. B-2

ELEVATION	DEPTH	SAMPLE GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
599.3	35			
	40		40.0'-45.0' Sand, brown, very fine-grained. (Lacustrine)	Fill Lacustrine End of shift 4-13-82 at 43.0' Start of shift 4-14-82
589.3	45		45.0'-55.6' Clay, gray, stiff, thinly laminated. (Lacustrine)	End of shift 4-14-82 at 48.0' Start of shift 4-15-82
578.7	55.6		T.D.: 55.6', See well construction summary.	Completed hole 4-15-82 See sample extrusion and field log of pilot hole WB-2.

SAMPLE TYPE Bailer

SITE Diesel Generator Building

WELL NO. B-2





# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

JOB NO. 7220

WELL NO. B-2

SITE North of Diesel Generator Building

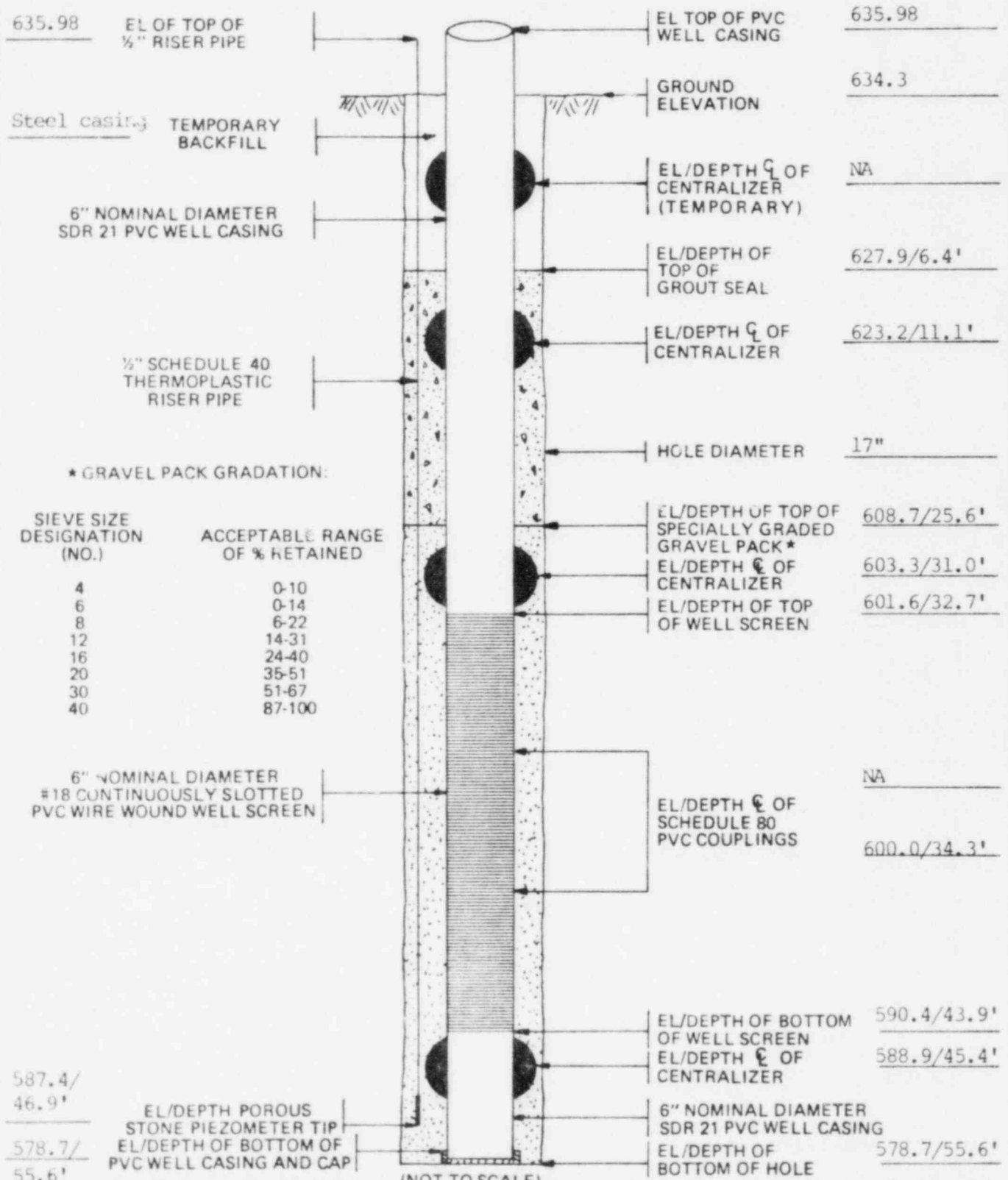
COORDINATES S 5047 E 200

DATE STARTED 4/9/82

DATE COMPLETED 4/26/82

GEOLOGIST/HYDROGEOLOGIST A.J. Fiksdal

INSTALLED BY Kelly Contract Dewatering Co.



\* GRAVEL PACK GRADATION:

SIEVE SIZE DESIGNATION (NO.)	ACCEPTABLE RANGE OF % RETAINED
4	0-10
6	0-14
8	6-22
12	14-31
16	24-40
20	35-51
30	51-67
40	87-100



WELL INSTALLATION DATA SHEET

WELL NUMBER B-2

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S 5047 E 200 SURFACE ELEVATION 634.3

DATE STARTED 4/9/82 DATE COMPLETED 5/5/82 NO. OF SAMPLES 13

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool  
O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 55.6'  
I.D. 15 1/4" nom SPECIAL CONDITIONS none

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS   
SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 11.2'  
CENTRALIZERS: 11.1', 31.0', 45.4'

LENGTH OF BLANK BELOW SCREEN 11.7' LENGTH OF RISER ABOVE SCREEN 27.3'  
LENGTH OF GRAVEL PACKED ZONE 30.0' CALCULATED AMOUNT OF GRAVEL PACK 40.1 cu. ft.  
ACTUAL AMOUNT OF GRAVEL PACK 39.6 cu. ft. CIRCULATION DURING GRAVEL PACKING   
CASAGRANDE TIP DEPTH 46.9' THICKNESS OF SEAL 19.2'  
TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 26.7 cu. ft.  
ACTUAL AMOUNT OF SEAL 29.1 cu. ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping  
DEVELOPING TIME 8 hours AMOUNT OF MATERIAL REMOVED <0.01 cu. ft. (est)  
SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT SPECIAL CONDITIONS none  
FIRST TEST 1.3  
SECOND RETEST \_\_\_\_\_  
THIRD RETEST \_\_\_\_\_

STATIC WATER LEVEL 25.0' / 609.3 DATE 4/12/82 EDUCTOR SETTING NA

SUBCONTRACTOR SUBMITTALS:

MICHIGAN DEWATERING WELL RECORD

Revision 14  
12/82

SUPERVISED BY  
GEOLOGIST/HYDROGEOLOGIST M. D. Johnson/  
A. J. Fiksdal

<b>WELL LOG</b>			PROJECT	JOB NO.	SHEET NO.	WELL NO.
			MIDLAND UNITS 1 AND 2	7220	1 OF 2	B-3
SITE			COORDINATES			
Diesel Generator Building			S 5133.3 E 200			
BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE	TOTAL DEPTH	SAMPLES
1-19-82	1-27-82	Kelly Dewatering Co.	Bucyrus-Erie 60 L	17"	65.3'	16
SCREEN DIA/LENGTH/SLOT		EL TOP OF CASING	GROUND SURFACE EL	DEPTH/EL GROUND WATER		LOGGED BY GEOLOGIST/HYDROGEOLOGIST
6"/8.9"/#18		635.4	633.8	35.12'/598.68		T.R. Cullen/M.D. Johnson
CHECKED BY:			DATE	APPROVED BY:		DATE
L.E. Young			6-10-82	W.C. Paris, Jr.		6-18-82
ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES:	
633.8	0					
	1			0-2.0' <u>Gravel</u> , gray, roadbed. (Fill)	Samples collected from this hole contain pea gravel used to backfill pilot hole WB-3 at this location.	
631.8	2			2.0'-6.5' <u>Sand</u> , orange, fine- to coarse-grained. (Fill)		
	5				0-2.0' Used 30" O.D auger to drill through frost zone.	
	6.5				2.0'-6.5' Drove 19.8" O.D. casing and cleaned out with 15" O.D. auger.	
627.3	6.5			6.5'-8.0' <u>Concrete</u> , gray, mudmat. (Fill)	End of shift 1-19-82 at 6.5'	
625.8	8.0			8.0'-10.0' <u>Sand</u> , orange, fine- to coarse-grained. (Fill)	Start of shift 1-25-82	
623.8	10			10.0'-32.0' <u>Silty Clay</u> , brown, with fine- to coarse-grained sand. (Fill)	Drilled through mudmat with 20" O.D. bit, set 17" casing.	
	15					
	20					
	25				End of shift 1-25-82 at 25.0'	
	26				Start of shift 1-26-82	
	32				Fill	
601.8	32			32.0'-54.0' <u>Sand</u> , gray, fine- to medium-grained. (Lacustrine)	Lacustrine	
598.8	35					
SAMPLE TYPE			SITE			WELL NO.
Grab and Bailor			Diesel Generator Building			B-3

Revision 14  
12/82



# WELL LOG

PROJECT MIDLAND UNITS 1 AND 2

JOB NO. 7220

SHEET NO. 2 OF 2

WELL NO. B-3

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
598.8	35				3-10-82
	40				End of shift 1-26-82 at 42.0'
	45				Start of shift 1-27-82
579.8	54			54.0'-65.3' Silty Clay, gray. (Lacustrine)	
	55				
	60				
568.5	65.3			T.D.: 65.3', See well construction summary.	Completed hole 1-27-82 See sample extrusion and field log of pilot hole WB-3.

SAMPLE TYPE  
Bailer

SITE  
Diesel Generator Building

WELL NO.  
B-3



# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

JOB NO. 7220

WELL NO. B-3

SITE South of Diesel Generator Building

COORDINATES S 5133.3

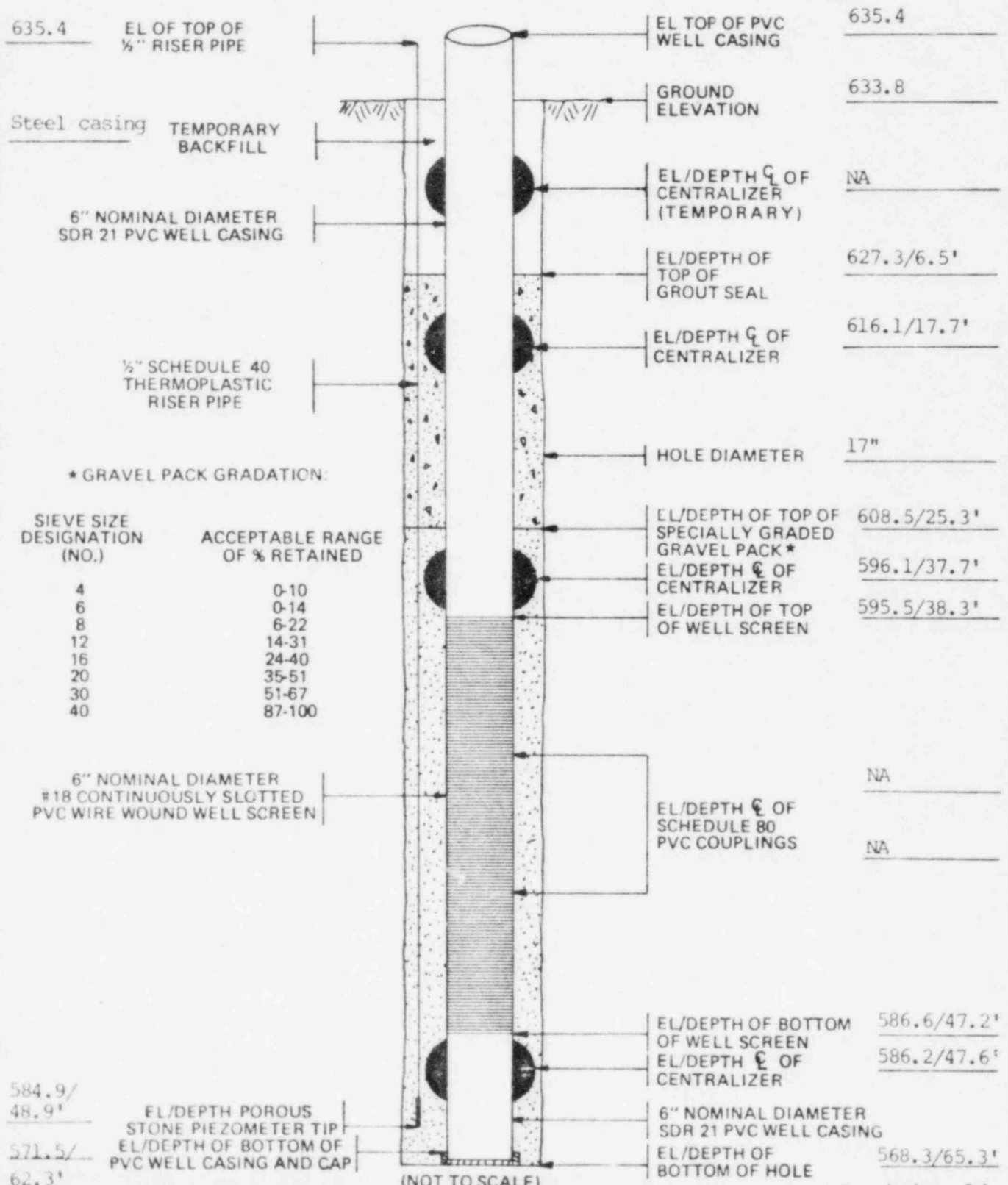
E 200

DATE STARTED 2/24/82

DATE COMPLETED 3/1/82

GEOLOGIST/HYDROGEOLOGIST T.R. Cullen

INSTALLED BY Kelly Contract Dewatering Co.



SIEVE SIZE DESIGNATION (NO.)	ACCEPTABLE RANGE OF % RETAINED
4	0-10
6	0-14
8	6-22
12	14-31
16	24-40
20	35-51
30	51-67
40	87-100

(NOT TO SCALE)

Revision 14



WELL INSTALLATION DATA SHEET

WELL NUMBER B-3

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S 5133.3 E 200 SURFACE ELEVATION 633.8

DATE STARTED 1/19/82 DATE COMPLETED 4/13/82 NO. OF SAMPLES 16

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool  
O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 65.3'  
I.D. 15 1/4" nom SPECIAL CONDITIONS 0-6.5' used 19.8" O.D. casing, 3.0' of material in bottom of hole.

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS   
SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 8.9'  
CENTRALIZERS: 17.7', 37.7', 47.6'

LENGTH OF BLANK BELOW SCREEN 15.1' LENGTH OF RISER ABOVE SCREEN 39.9'  
LENGTH OF GRAVEL PACKED ZONE 37.0' CALCULATED AMOUNT OF GRAVEL PACK 49.5 cu. ft.  
ACTUAL AMOUNT OF GRAVEL PACK 52.5 cu. ft. CIRCULATION DURING GRAVEL PACKING   
CASAGRADE TIP DEPTH 48.9' THICKNESS OF SEAL 18.8'  
TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 26.0 cu. ft.  
ACTUAL AMOUNT OF SEAL 28.1 cu. ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping  
DEVELOPING TIME 8 hours AMOUNT OF MATERIAL REMOVED <0.01 cu. ft. (est)

SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT SPECIAL CONDITIONS none  
FIRST TEST 0.2  
SECOND RETEST \_\_\_\_\_  
THIRD RETEST \_\_\_\_\_

STATIC WATER LEVEL 35.12'/598.68 DATE 3/10/82 EDUCTOR SETTING NA

SUBCONTRACTOR SUBMITTALS:

MICHIGAN DEWATERING WELL RECORD

Revision 14  
12/82

SUPERVISED BY  
GEOLOGIST/HYDROGEOLOGIST T. R. Cullen

<b>WELL LOG</b>		PROJECT	JOB NO.	SHEET NO.	WELL NO.	
		MIDLAND UNITS 1 AND 2	7220	1 OF 2	B-4	
SITE Diesel Generator Building			COORDINATES S 5133.4 E 273.2			
BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE	TOTAL DEPTH	SAMPLES
1-20-82	2-1-82	Kelly Dewatering Co.	Bucyrus-Erie 60 L	17"	65.7'	15
SCREEN DIA./LEN./TH./SLOT		EL TOP OF CASING	GROUND SURFACE EL	DEPTH/EL GROUND WATER		LOGGED BY GEOLOGIST/HYDROGEOLOGIST
6"/19.0"/#18		636.5	633.8	34.45'/599.35		T.R. Cullen/M.D. Johnson
CHECKED BY: L.E. Young			DATE 6-10-82	APPROVED BY: W.C. Paris, Jr.		DATE 6-18-82
ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES	
633.8	0					
632.8	1			0-1.0' Gravel, gray, road-bed. (Fill)	Well B-4 was relocated 10.0' east of Pilot hole WB-4. 0-1.0' Used 30" O.D. tapered auger to drill through frost zone. 1.0'-8.0' Drove 19.8" O.D. casing and cleaned out with 15" O.D. auger.	
				1.0'-6.0' Sand, orange, fine- to coarse-grained, occasional pebbles, occasional building material. (Fill)		
627.8 627.3	6			6.0'-6.5' Concrete, mudmat. (Fill)		
				6.5'-10.0' Silty Clay, brown. (Fill)	End of shift 1-20-82 at 8.0' ----- Start of shift 1-28-82	
623.8	10			10.0'-13.5' Sandy Clay, brown. (Fill)		
620.3	13			13.5'-17.0' Sand, brown, fine- to medium-grained, some silt. (Fill)		
616.8	17			17.0'-25.0' Silty Clay, brown, some fine- to coarse-grained sand. (Fill)		
608.8	25			25.0'-35.0' Sand, brown, fine- to medium-grained, some clay. (Fill)	End of shift 1-28-82 at 25.0' ----- Start of shift 1-29-82	
598.8	35					
				Fill	Revision 14 12/82  J-10-82	
SAMPLE TYPE Grab and Barrel		SITE Diesel Generator Building			WELL NO. B-4	

# WELL LOG

PROJECT

MIDLAND UNITS 1 AND 2

JOB NO.  
7220

SHEET NO.  
OF  
2 2

WELL NO.  
B-4

ELEVATION	DEPTH	SAMPLE GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
598.8	35			
	35		35.0'-50.0' Sand, brown, fine- to coarse-grained. (Lacustrine)	Lacustrine
	40			End of shift 1-29-82 at 40.0' Start of shift 2-1-82
	45			
583.8	50		50.0'-60.0' Sand, gray, fine- to medium-grained. (Lacustrine)	
	55			
573.8	60		60.0'-65.7' Silty Clay, gray, laminated. (Lacustrine)	
	65			Completed hole 2-1-82
568.1	65.7		T.D.: 65.7', see well construction summary.	See sample extrusion and field log of pilot hole WB-4.

SAMPLE TYPE  
Bailer

SITE

Diesel Generator Building

WELL NO.

B-4





# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

JOB NO. 7220

WELL NO. B-4

SITE South of Diesel Generator Building

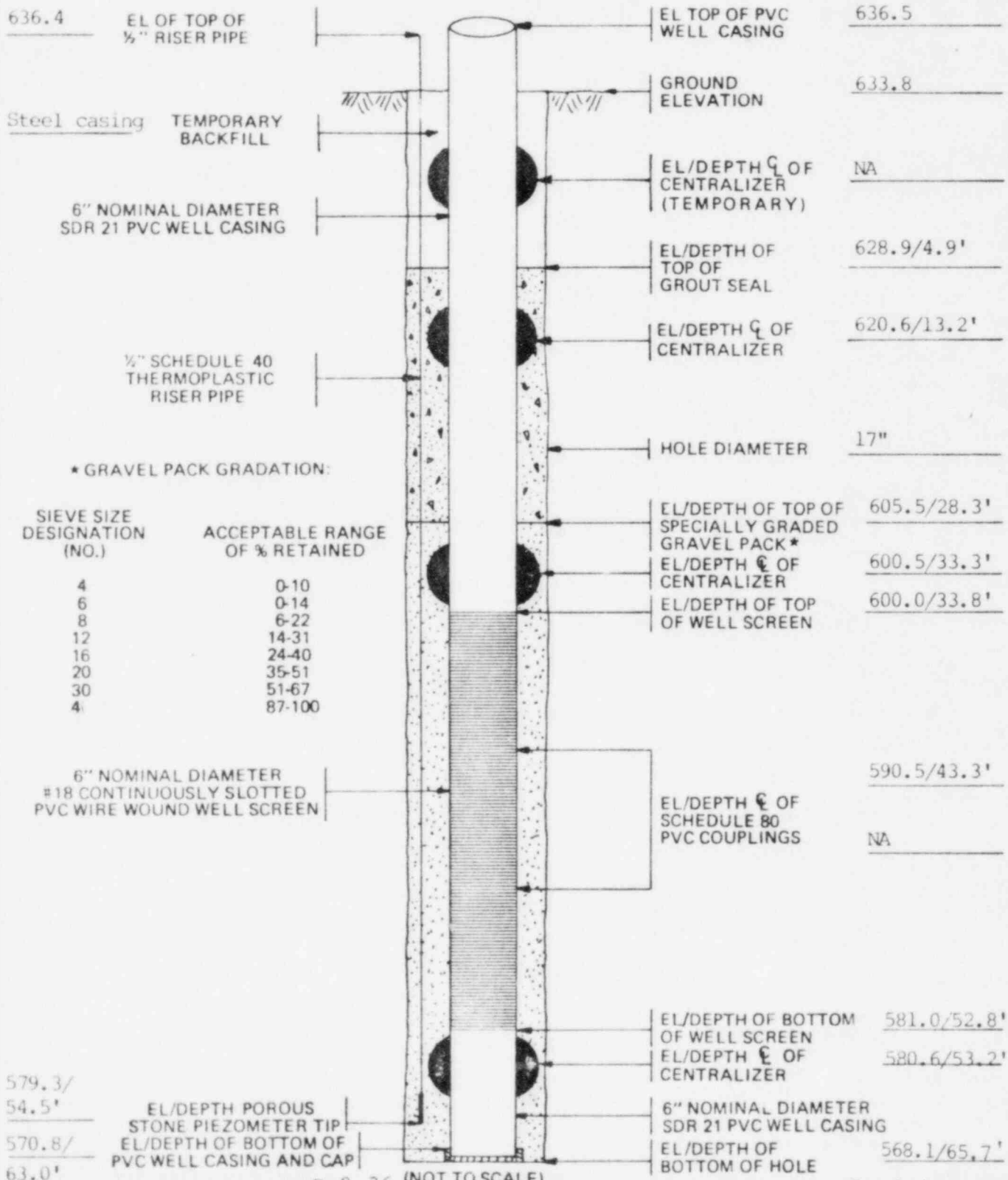
COORDINATES S 5133.4 E 273.2

DATE STARTED 2/24/82

DATE COMPLETED 3/1/82

GEOLOGIST/HYDROGEOLOGIST T.R. Cullen

INSTALLED BY Kelly Contract Dewatering Co.



Revision 14  
12/82



WELL INSTALLATION DATA SHEET

WELL NUMBER B-4

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S 5133.4 E 273.2 SURFACE ELEVATION 633.8

DATE STARTED 1/19/82 DATE COMPLETED 4/12/82 NO. OF SAMPLES 15

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool  
O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 65.7'  
I.D. 15 1/4" nom SPECIAL CONDITIONS 0-8.0' used 19.8" O.D. casing.

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS   
SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 19.0'  
CENTRALIZERS: 13.2', 33.3', 53.2'

LENGTH OF BLANK BELOW SCREEN 10.2' LENGTH OF RISER ABOVE SCREEN 36.5'  
LENGTH OF GRAVEL PACKED ZONE 34.7' CALCULATED AMOUNT OF GRAVEL PACK 46.5 cu. ft.  
ACTUAL AMOUNT OF GRAVEL PACK 51.5 cu. ft. CIRCULATION DURING GRAVEL PACKING   
CASAGRANDE TIP DEPTH 54.5' THICKNESS OF SEAL 23.4'  
TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 33.0 cu. ft.  
ACTUAL AMOUNT OF SEAL 28.1 cu. ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping  
DEVELOPING TIME 8 hours AMOUNT OF MATERIAL REMOVED <0.01 cu. ft. (est)  
SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT SPECIAL CONDITIONS none  
FIRST TEST 0.1  
SECOND RETEST \_\_\_\_\_  
THIRD RETEST \_\_\_\_\_

STATIC WATER LEVEL 34.45' / 599.35 DATE 3/10/82 EDUCTOR SETTING NA

SUBCONTRACTOR SUBMITTALS:

MICHIGAN DEWATERING WELL RECORD

Revision 14  
12/82

SUPERVISED BY  
GEOLOGIST/HYDROGEOLOGIST T. R. Cullen

<b>WELL LOG</b>			PROJECT	JOB NO.	SHEET NO.	WELL NO.
			MIDLAND UNITS 1 AND 2	7220	1 OF 2	B-5
SITE			COORDINATES			
Diesel Generator Building			S 5133.5		E310.3	
BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE	TOTAL DEPTH	SAMPLES
1-19-82	2-4-82	Kelly Dewatering Co.	Bucyrus-Erie 60 L	17"	60.0'	16
SCREEN DIA/LENGTH/SLOT		EL TOP OF CASING	GROUND SURFACE EL	DEPTH/EL GROUND WATER		LOGGED BY GEOLOGIST/HYDROGEOLOGIST
6"/16.0'/#18		638.6	633.7	34.21'/599.49		T.R. Cullen/M.D. Johnson
CHECKED BY:			DATE	APPROVED BY:		DATE
L.E. Young			6-15-82	W.C. Paris, Jr.		6-18-82

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
633.7	0			0-2.5' Gravel, gray, roadbed. (Fill)	Well B-5 was drilled 5.6' east of pilot hole WB-5.  0-1.0' Used 30" O.D. tapered auger to drill through frost zone. 1.0'-8.0' Drove 19.8" O.D. casing and cleaned out with 15" O.D. auger.
631.2	2			2.0'-5.5' Sand, orange, fine- to coarse-grained. (Fill)	
628.2	5			5.5'-6.0' Silty Clay, brown. (Fill)	
627.7	6			6.0'-6.5' Concrete, mudmat. (Fill)	
627.2	6.5			6.5'-8.0' Silty Clay, brown-orange mottled, with some fine- to coarse-grained sand, fine gravel and pebbles, occasional cobbles. (Fill)	
625.7	8			8.0'-10.0' Sand, brown, fine- to coarse-grained, sand, some pea gravel, little concrete. (Fill)	
623.7	10			10.0'-22.0' Silty Clay, brown, some fine- to coarse-grained sand, some pea gravel, little concrete. (Fill)	
	15				
	20				
	24				
611.7	24			22.0'-24.0' sand, brown, fine- to medium-grained. (Fill)	End of shift 1-19-82 at 8.0' Start of shift 2-2-82
609.7	24			24.0'-29.0' Silty Clay, brown, some fine- to coarse-grained sand, little pea gravel. (Fill)	End of shift 2-2-82 at 22.0' Start of shift 2-3-82
604.7	29			29.0'-58.0' Sand, brown, fine-grained, little to some medium-grained sand, trace coarse-grained sand. (Lacustrine)	Fill Lacustrine
598.7	35				Revision 14 12/82

SAMPLE TYPE	SITE	WELL NO.
Grab and Bailor	Diesel Generator Building	B-5

D.9-38

# WELL LOG

PROJECT  
MIDLAND UNITS 1 AND 2

JOB NO.  
7220

SHEET NO.  
2 OF 2

WELL NO.  
B-5

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
598.7	35				
	10				End of shift 2-3-82 at 37.0'
	40				Start of shift 2-4-82
	11				
	45				
	12				
	50				
	13				
	55				
	14				
	15			57.0'-58.0' Color change to gray.	
575.7	50			59.0'-60.0' Silty Clay, gray, laminated. (Lacustrine)	Completed hole 2-4-82
573.7	60			T.D.: 60.0', See well construction summary.	See sample extrusion and field log of pilot hole WB-5.

SAMPLE TYPE  
Bailer

SITE  
Diesel Generator Building

WELL NO.  
B-5



# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

JOB NO. 7220

WELL NO. B-5

SITE South of Diesel Generator Building

COORDINATES S 5133.5

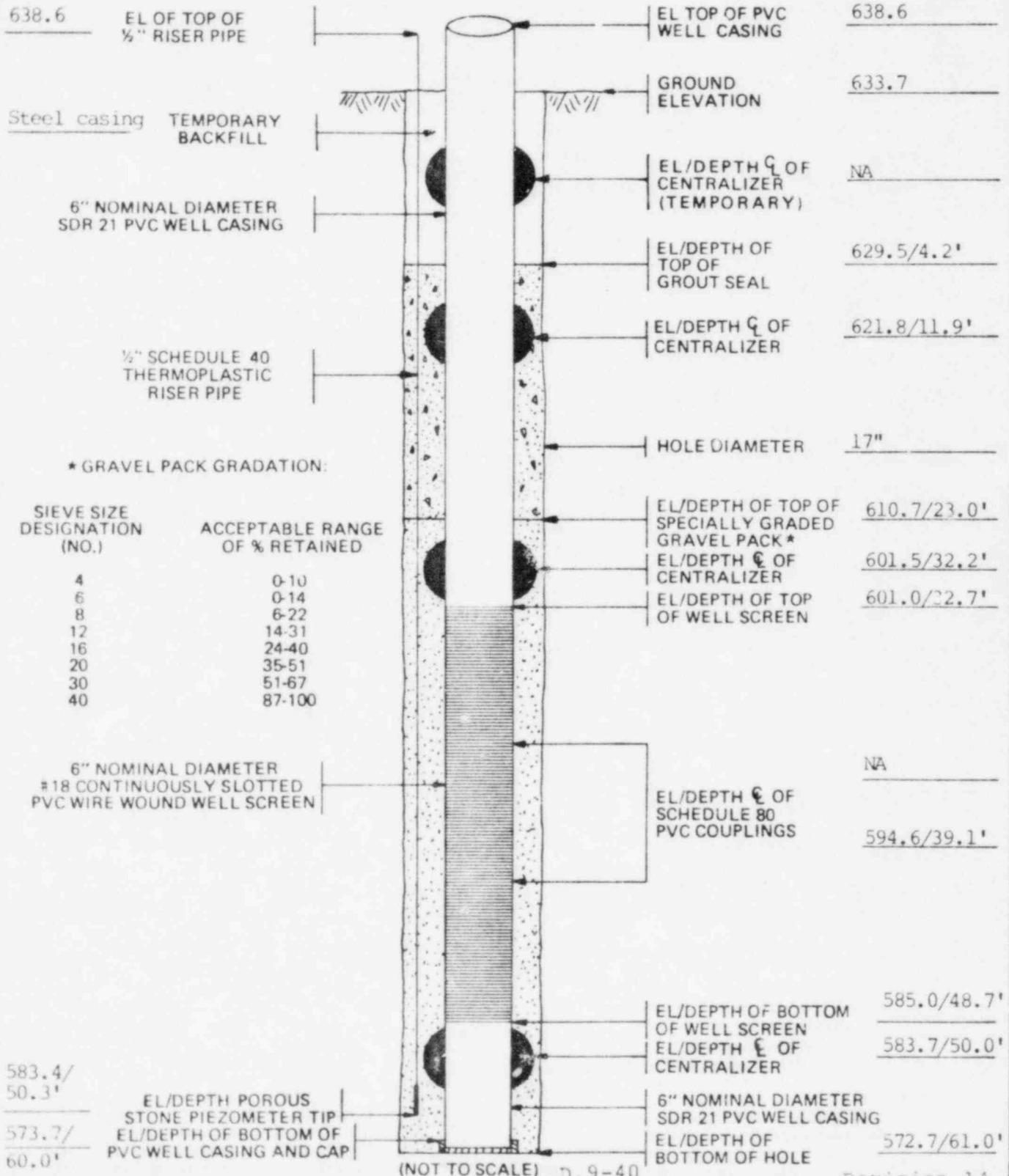
E 310.3

DATE STARTED 2/24/82

DATE COMPLETED 3/1/82

GEOLOGIST/HYDROGEOLOGIST T.R. Cullen

INSTALLED BY Kelly Contract Dewatering Co.



\* GRAVEL PACK GRADATION:

SIEVE SIZE DESIGNATION (NO.)	ACCEPTABLE RANGE OF % RETAINED
4	0-10
6	0-14
8	6-22
12	14-31
16	24-40
20	35-51
30	51-67
40	87-100

583.4/  
50.3'

EL/DEPTH POROUS STONE PIEZOMETER TIP  
EL/DEPTH OF BOTTOM OF PVC WELL CASING AND CAP

(NOT TO SCALE) 0.9-40

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WELL INSTALLATION DATA SHEET

WELL NUMBER B-5

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S 5133.3 E 310.3 SURFACE ELEVATION 633.7

DATE STARTED 1/19/82 DATE COMPLETED 4/12/82 NO. OF SAMPLES 16

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool  
O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 61.0'  
I.D. 15 1/4" nom SPECIAL CONDITIONS 0-8.0' used 19.8" O.D. casing.  
1.0' removed during flushing, 1.0' of material in bottom  
of hole.

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS   
SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 16.0'  
CENTRALIZERS: 11.9', 32.2', 50.0'

LENGTH OF BLANK BELOW SCREEN 11.3' LENGTH OF RISER ABOVE SCREEN 37.6'  
LENGTH OF GRAVEL PACKED ZONE 37.0' CALCULATED AMOUNT OF GRAVEL PACK 49.5 cu. ft.  
ACTUAL AMOUNT OF GRAVEL PACK 45.5 cu. ft. CIRCULATION DURING GRAVEL PACKING   
CASAGRANDE TIP DEPTH 50.3' THICKNESS OF SEAL 18.8'  
TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 28.0 cu. ft.  
ACTUAL AMOUNT OF SEAL 31.6 cu. ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping  
DEVELOPING TIME 6 hours AMOUNT OF MATERIAL REMOVED < 0.01 cu. ft. (est)

SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT SPECIAL CONDITIONS none  
FIRST TEST 0.2  
SECOND RETEST \_\_\_\_\_  
THIRD RETEST \_\_\_\_\_

STATIC WATER LEVEL 34.21' / 599.49 DATE 3/10/82 EDUCTOR SETTING NA

SUBCONTRACTOR SUBMITTALS:

MICHIGAN DEWATERING WELL RECORD

Revision 14  
12/82

SUPERVISED BY  
GEOLOGIST/HYDROGEOLOGIST M. D. Johnson/  
T. R. Cullen

<b>WELL LOG</b>			PROJECT	JOB NO.	SHEET NO.	WELL NO.
			MIDLAND UNITS 1 AND 2	7220	1 OF 2	C-1
SITE				COORDINATES		
Chlorination Building				S 5196.7 E554.4		
BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE	TOTAL DEPTH	SAMPLES
2-10-82	3-1-82	Kelley Dewatering Co.	Bucyrus-Erie 22W	17"	56.5'	13
SCREEN DIA/LENGTH/SLOT		FL TOP OF CASING	GROUND SURFACE EL	DEPTH/EL GROUND WATER		LOGGED BY GEOLOGIST/HYDROGEOLOGIST:
6"/19.1'/#18		637.2	633.9	13.0'/620.9		A.J. Fiksdal
CHECKED BY:			DATE	APPROVED BY:		DATE
L.E. Young			6-21-82	W.C. Paris, Jr.		6-21-82
ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES:	
633.9	0					
	1			0 - 3.0' Sand, yellow-brown, fine- to coarse-grained, fine rounded gravel. 0.2' veneer of fine crushed gravel on the surface. (Fill)	0 - 2.2' Used 30" O.D. tapered auger to drill through frost zone.	
630.9	3			3.0' - 8.0' Sandy Gravel, gray, fine- to medium-grained sand and fine crushed gravel. (Fill)	2.2' - 8.0' Drove 19.8" O.D. casing and cleaned out with 15" O.D. auger to 7.0'.	
	5				End of shift 2-10-82 at 7.0'	
	2				Start of shift 2-25-82	
625.9	8			8.0' - 33.0' Clay, gray, sand, silt, little fine gravel. (Fill)		
	10					
	3					
	15					
	4					
	20			18.0' - 33.0' Color mottled gray, brown, red.		
	25					
	30			30.0' - 33.0' Some crushed gravel.	Revision 14	
	7				12/82	
	32.6			32.6' Wood.	Fill End of shift 2-25-82 at 33.0'	
600.9	33			33.0' - 49.0' Sand, brown, fine-grained. (Lacustrine)	Lacustrine Start of shift 2-26-82	
	8					
598.9	35					
SAMPLE TYPE			SITE	WELL NO.		
Grat and Bailor			Chlorination Building	C-1		



# WELL LOG

PROJECT

MIDLAND UNITS 1 AND 2

JOB NO.

7220

SHEET NO.

2 OF 2

WELL NO.

C-1

ELEVATION	DEPTH	SAMPLE GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
598.9	35			
	40		40.0' - 43.0' Pieces of copper wire from fill and trace of fine to medium gravel.	
	45		43.0' - 49.0' Color becomes more gray, with trace of lignite and medium-grained sand.	
	47		47.0' - 49.0' Gray clay in sand.	End of shift 2-26-82 at 49.0'
584.9	49		49.0' - 56.5' Clay, gray, trace of sand and silt.	Start of shift 3-1-82
	50			
	55			Completed hole 3-1-82
577.4	56.5		T.D.: 56.5', See well construction summary.	

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SAMPLE TYPE

Bailer

SITE

Chlorination Building

WELL NO.

C-1





# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

JGB NO. 7220

WELL NO. C-1

SITE Chlorination Building

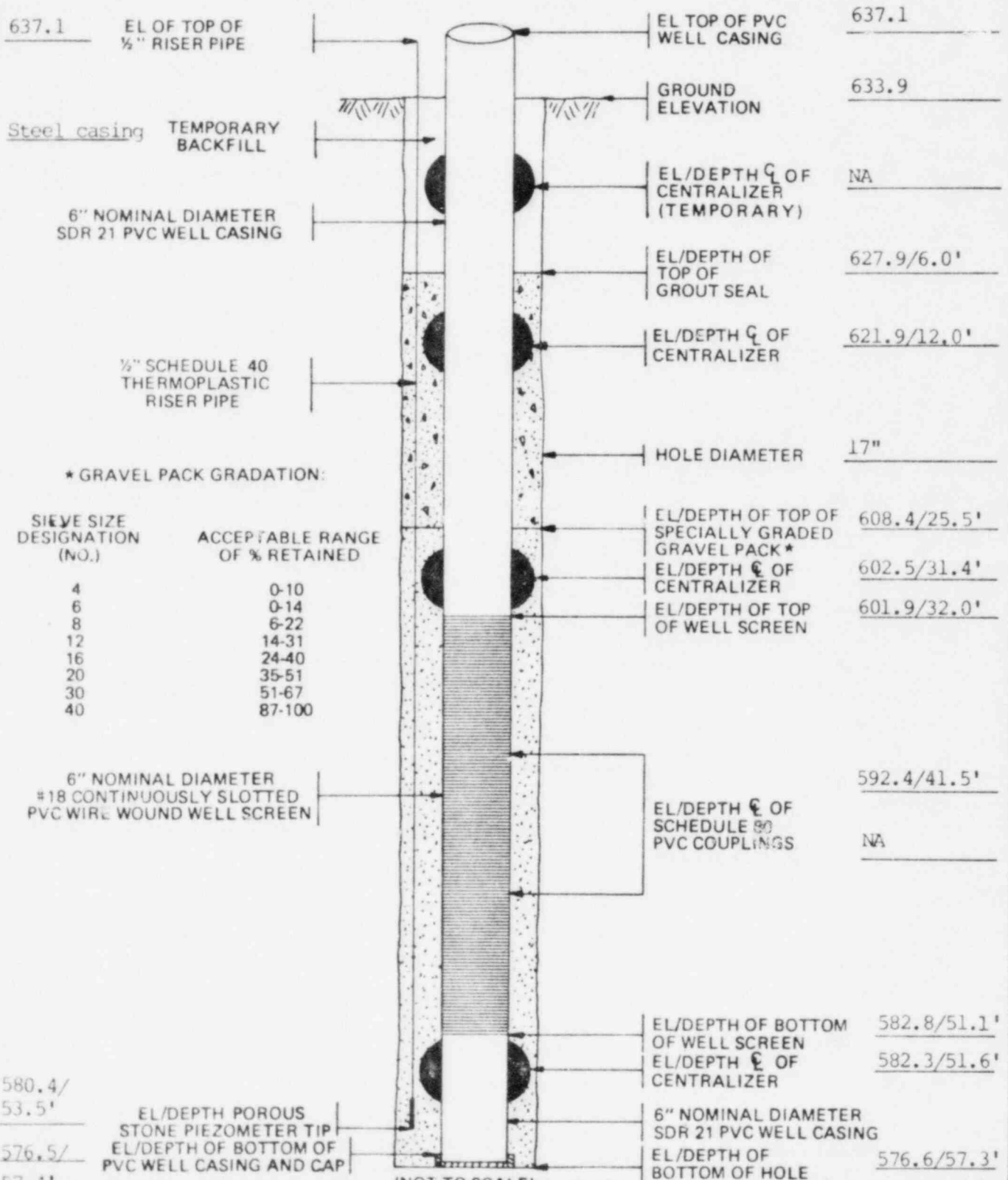
COORDINATES S 5196.7 E 554.4

DATE STARTED 3/16/82

DATE COMPLETED 3/18/82

GEOLOGIST/HYDROGEOLOGIST T.R. Cullen

INSTALLED BY Kelly Contract Dewatering Co.



Revision 14

12/82



WELL INSTALLATION DATA SHEET

WELL NUMBER C-1

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S 5196.7 E 554.4 SURFACE ELEVATION 633.9

DATE STARTED 2/10/82 DATE COMPLETED 4/14/82 NO. OF SAMPLES 13

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool

O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 57.3'

I.D. 15 1/4" nom SPECIAL CONDITIONS 0-2.0' used 19.8" O.D. casing, 0.8' flushed from hole during cleaning, 0.1' PVC settled into bottom.

WELL INSTALLATION of hole.

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS

SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 19.1'

CENTRALIZERS: 12.0', 31.4', 51.6'

LENGTH OF BLANK BELOW SCREEN 6.3' LENGTH OF RISER ABOVE SCREEN 35.2'

LENGTH OF GRAVEL PACKED ZONE 31.8' CALCULATED AMOUNT OF GRAVEL PACK 42.6 cu. ft.

ACTUAL AMOUNT OF GRAVEL PACK 39.6 cu. ft. CIRCULATION DURING GRAVEL PACKING

CASAGRANDE TIP DEPTH 53.5' THICKNESS OF SEAL 19.5'

TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 27.2 cu. ft.

ACTUAL AMOUNT OF SEAL 33.7 cu. ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping

DEVELOPING TIME 8 hours AMOUNT OF MATERIAL REMOVED < 0.01 cu. ft. (est)

SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT SPECIAL CONDITIONS none

FIRST TEST 0.1

SECOND RETEST

THIRD RETEST

STATIC WATER LEVEL 13.0' / 620.9 DATE 2/25/82 EDUCTOR SETTING NA











SUBCONTRACTOR SUBMITTALS:

MICHIGAN DEWATERING WELL RECORD

Revision 14  
12/82

SUPERVISED BY  
GEOLOGIST/HYDROGEOLOGIST T. R. Cullen/  
A. J. Fiksdal

D.9-45

WELL LOG		PROJECT MIDLAND UNITS 1 AND 2		JOB NO. 7220	SHEET NO. 1 OF 2	WELL NO. C-2
SITE Chlorination Building			COORDINATES S5202.6 E 545			
BEGUN 2-10-82	COMPLETED 3-3-82	DRILLER Kelley Dewatering Co.	DRILL MAKE AND MODEL Bucyrus-Erie 22W	HOLE SIZE 17"	TOTAL DEPTH 59.7'	SAMPLES 14
SCREEN DIA/LENGTH/SLOT 6"/13.17#18		EL TOP OF CASING 637.0	GROUND SURFACE EL 634.0	DEPTH/EL GROUND WATER 12.06'/621.94		LOGGED BY GEOLOGIST/HYDROGEOLOGIST. A.J. Fiksdal
CHECKED BY: L.E. Young		DATE 6-21-82	APPROVED BY: W.C. Paris, Jr.		DATE 6-21-82	
ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES	
634.0	0					
633.0	1	1		0 - 1.0' Gravelly Sand, gray, fine- to medium-grained, fine crushed gravel. (Fill)	0 - 2.0' Used 30" O.D. tapered auger to drill through frost zone.	
631.0	3	2		1.0' - 3.0' Sand, yellow-brown, fine- to coarse-grained, fine rounded gravel. (Fill)	2.0' - 8.0' Drove 19.8" O.D. casing and cleaned out with 15" O.D. auger.	
627.0	7	3		3.0' - 7.0' Sandy Gravel, gray, crushed fine gravel, fine- to medium-grained sand. (Fill)	End of shift 2-10-82 at 8.0'	
	7			7.0' - 32.0' Clay, gray, sand, silt, fine gravel. (Fill)	Start of shift 3-1-82	
	10	4			 3-1-82	
	15	5				
	20	6				
	25	7			End of shift 3-1-82 at 25.0'	
	25				Start of shift 3-2-82	
	30	8				
602.0	32			32.0' - 42.0' Sand, brown, fine-grained, trace medium-grained sand, pieces of clay cuttings from above clay fill. (Lacustrine)	Fill Lacustrine	
599.0	35	9				
SAMPLE TYPE Grab and Bailor		SITE Chlorination Building			WELL NO. C-2	

Revision 14  
12/82

# WELL LOG

PROJECT MIDLAND UNITS 1 AND 2

JOB NO. 7220

SHEET NO. 2 OF 2

WELL NO. C-2

ELEVATION	DEPTH	SAMPLE GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
599.0	35			
	40		39.0' - 42.0' Fine angular gravel.	
592.0	42		42.0' - 44.0' Sand and Clay with fine angular gravel. (Lacustrine)	
590.0	44		44.0' - 49.0' Clay, gray, sand, angular fine gravel from above. (Lacustrine)	End of shift 3-2-82 at 47.0'
	45			Start of shift 3-3-82
585.0	49		49.0' - 59.7' Clay, gray, trace fine-grained sand. (Lacustrine)	
	50			
	55			
	59			Completed hole 3-3-82
574.3	59.7		T.D.: 59.7', See well construction summary.	

SAMPLE TYPE  
Bailer

SITE  
Chlorination Building

WELL NO.  
C-2



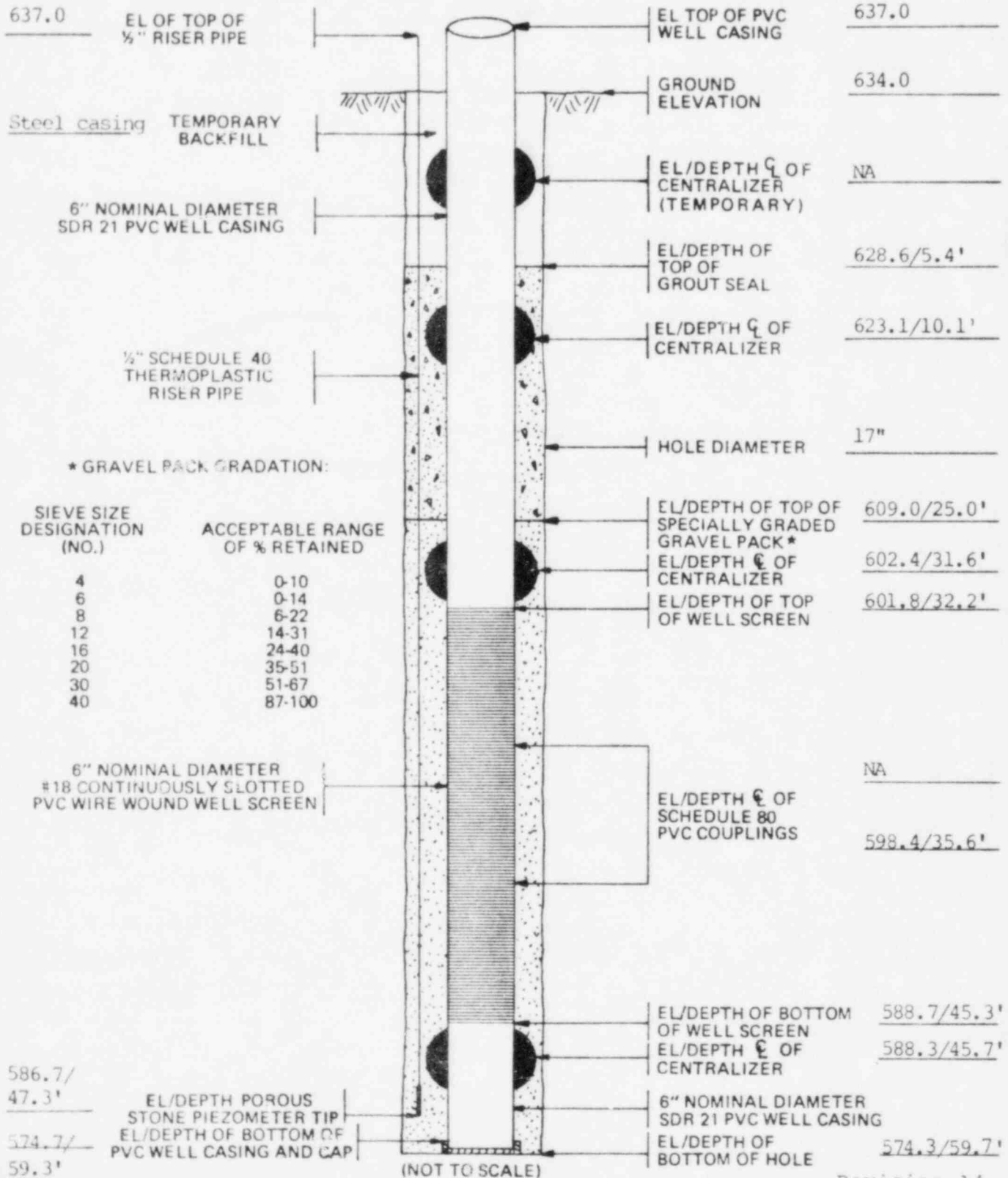
# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

JOB NO. 7220

WELL NO. C-2

SITE Chlorination Building COORDINATES S 5202.6 E 545.0  
 DATE STARTED 3/16/82 DATE COMPLETED 3/18/82  
 GEOLOGIST/HYDROGEOLOGIST T.R. Cullen INSTALLED BY Kelly Contract Dewatering Co.



**\* GRAVEL PACK GRADATION:**

SIEVE SIZE DESIGNATION (NO.)	ACCEPTABLE RANGE OF % RETAINED
4	0-10
6	0-14
8	6-22
12	14-31
16	24-40
20	35-51
30	51-67
40	87-100

586.7/  
47.3'  
574.7/  
59.3'

EL/DEPTH POROUS STONE PIEZOMETER TIP  
 EL/DEPTH OF BOTTOM OF PVC WELL CASING AND CAP

(NOT TO SCALE)

Revision 14  
12/82



WELL INSTALLATION DATA SHEET

WELL NUMBER C-2

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S 5202.6 E 545.0 SURFACE ELEVATION 634.0

DATE STARTED 2/10/82 DATE COMPLETED 4/16/82 NO. OF SAMPLES 14

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool  
O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 59.7'  
I.D. 15 1/4" nom SPECIAL CONDITIONS 0-8.0' used 19.8" O.D. casing.  
0.4' of material in bottom of hole.

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS   
SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 13.1'  
CENTRALIZERS: 10.1', 31.6', 45.7'

LENGTH OF BLANK BELOW SCREEN 14.0' LENGTH OF RISER ABOVE SCREEN 35.2'  
LENGTH OF GRAVEL PACKED ZONE 34.3' CALCULATED AMOUNT OF GRAVEL PACK 45.9 cu. ft.  
ACTUAL AMOUNT OF GRAVEL PACK 43.6 cu. ft. CIRCULATION DURING GRAVEL PACKING   
CASAGRANDE TIP DEPTH 47.3' THICKNESS OF SEAL 19.6'  
TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 27.7 cu. ft.  
ACTUAL AMOUNT OF SEAL 28.1 cu. ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping  
DEVELOPING TIME 8 hours AMOUNT OF MATERIAL REMOVED <0.01 cu. ft. (est)

SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT SPECIAL CONDITIONS none  
FIRST TEST 0.6  
SECOND RETEST \_\_\_\_\_  
THIRD RETEST \_\_\_\_\_

STATIC WATER LEVEL 12.06' / 621.94 DATE 3/1/82 EDUCTOR SETTING NA

SUBCONTRACTOR SUBMITTALS: Revision 14  
MICHIGAN DEWATERING WELL RECORD  12/82

SUPERVISED BY T. R. Cullen/  
GEOLOGIST/HYDROGEOLOGIST A. J. Fiksdal

# WELL LOG

PROJECT: MIDLAND UNITS 1 AND 2  
 JOB NO.: 7220  
 SHEET NO.: 1 OF 2  
 WELL NO.: C-3

SITE: Chlorination Building  
 COORDINATES: S5209.4 E 533.8

LOGUN: 2-11-82  
 COMPLETED: 3-11-82  
 DRILLER: Kelley Dewatering Co.  
 DRILL MAKE AND MODEL: Bucyrus-Erie 22W  
 HOLE SIZE: 17"  
 TOTAL DEPTH: 58.4'  
 SAMPLES: 13

SCREEN DIA/LENGTH/SLOT: 6"/15.6'/#18  
 EL TOP OF CASING: 637.4  
 GROUND SURFACE EL: 633.8  
 DEPTH/EL GROUND WATER: 10.3'/623.5  
 LOGGED BY GEOLOGIST/HYDROGEOLOGIST: A.J. Fiksdal/R.L. Gallardo

CHECKED BY: L.E. Young  
 DATE: 6-21-82  
 APPROVED BY: W.C. Paris, Jr.  
 DATE: 6-21-82

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
633.8	0				
	1			0 - 3.0' Silty Sand, gray, fine- to medium-grained, fine crushed gravel. (Fill)	0 - 2.5' Used 30" O.D. tapered auger to drill through frost zone.
630.8	3			3.0' - 8.0' Silty Sandy Clay, gray and brown mottled, fine- to medium-grained sand, trace fine gravel. (Fill)	2.0' - 8.0' Drove 19.8" O.D. casing and cleaned out with 15" O.D. auger.
	5				
625.8	8			8.0' - 12.5' Sand, brown, fine-grained, little clay. (Fill)	End of shift 2-11-82 at 8.0' Start of shift 3-9-82
	10				▽ 3-10-82
621.3	12			12.5' - 32.0' Clay, brownish gray, some fine- to coarse-grained sand and fine gravel. (Fill)	
	15			17.5' 4" Cobble.	
	20				
	25				
	27.5			27.5' - 32.0' Increasing sand content.	End of shift 3-9-82 at 27.5' Start of shift 3-10-82
	30				
601.8	32			32.0' - 47.0' sand, brown, fine-grained, trace silt. (Lacustrine)	Fill Lacustrine
	35				
598.8					

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12/82

SAMPLE TYPE: Grab and Bailor  
 SITE: Chlorination Building  
 WELL NO.: C-3

# WELL LOG

PROJECT MIDLAND UNITS 1 AND 2

JOB NO. 7220

SHEET NO. 2 OF 2

WELL NO. C-3

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
598.8	35				
	40			42.0' - 47.0' Increasing silt, some clay.	
586.8	47			47.0' - 58.4' Clay, gray, plastic, trace fine gravel. (Lacustrine)	
	50				End of shift 3-10-82 at 53.0' Start of shift 3-11-82
575.4	58.4			T.D.:58.4', See well construction summary.	Completed hole 3-11-82

SAMPLE TYPE  
Bailer

SITE  
Chlorination Building

WELL NO.  
C-3

D.9-51

Revision 14  
12/82





# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

JOB NO. 7220

WELL NO. C-3

SITE Chlorination Building

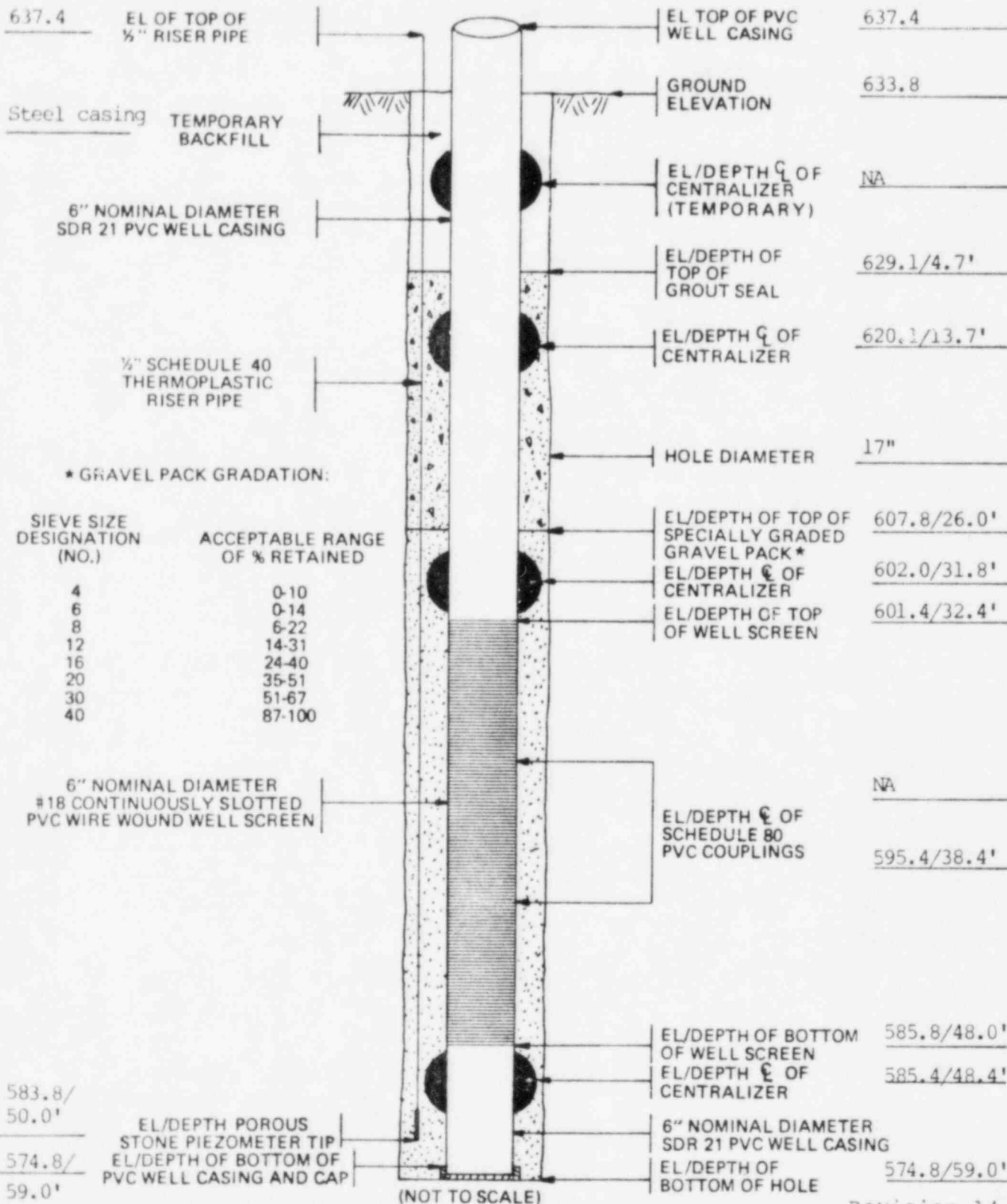
COORDINATES S 5209.4 E 533.8

DATE STARTED 3/17/82

DATE COMPLETED 3/18/82

GEOLOGIST/HYDROGEOLOGIST T.R. Cullen

INSTALLED BY Kelly Contract Dewatering Co.





WELL INSTALLATION DATA SHEET

WELL NUMBER C-3

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S 5209.4 E 533.8 SURFACE ELEVATION 633.8

DATE STARTED 2/11/82 DATE COMPLETED 4/19/82 NO. OF SAMPLES 13

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool  
O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 59.0'  
I.D. 15 1/4" nom SPECIAL CONDITIONS 0-8.0' used 19.8" O.D. casing. 0.6' flushed from hole during cleaning.

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS   
SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 15.6'  
CENTRALIZERS: 13.7', 31.8', 48.4'

LENGTH OF BLANK BELOW SCREEN 11.0' LENGTH OF RISER ABOVE SCREEN 36.0'  
LENGTH OF GRAVEL PACKED ZONE 33.0' CALCULATED AMOUNT OF GRAVEL PACK 44.2 cu. ft.  
ACTUAL AMOUNT OF GRAVEL PACK 45.5 cu. ft. CIRCULATION DURING GRAVEL PACKING   
CASAGRANDE TIP DEPTH 50.0' THICKNESS OF SEAL 21.3'  
TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 30.4 cu. ft.  
ACTUAL AMOUNT OF SEAL 32.1 cu. ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping  
DEVELOPING TIME 8 hours AMOUNT OF MATERIAL REMOVED <0.01 cu. ft (est)

SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT SPECIAL CONDITIONS none  
FIRST TEST 0.4  
SECOND RETEST \_\_\_\_\_  
THIRD RETEST \_\_\_\_\_

STATIC WATER LEVEL 10.3'/623.5 DATE 3/10/82 EDUCTOR SETTING NA

SUBCONTRACTOR SUBMITTALS: MICHIGAN DEWATERING WELL RECORD  Revision 14 12/82

SUPERVISED BY  
GEOLOGIST/HYDROGEOLOGIST T. R. Cullen/ A. J. Fiksdal

WELL LOG			PROJECT MIDLAND UNITS 1 AND 2		JOB NO. 7220	SHEET NO. 1 OF 2	WELL NO. C-4	
SITE Chlorination Building				COORDINATES S5225.2 E532.8				
BEGUN 2-11-82	COMPLETED 3-9-82	DRILLER Kelley Dewatering Co.	DRILL MAKE AND MODEL Bucyrus-Erie 22W	HOLE SIZE 17"	TOTAL DEPTH 53.2'	SAMPLES 12		
SCREEN DIA./LENGTH/SLOT 6"/15.1'/#18		EL TOP OF CASING 633.8	GROUND SURFACE EL 633.8	DEPTH/EL GROUND WATER 12.0'/621.8		LOGGED BY GEOLOGIST/HYDROGEOLOGIST. A.J. Fiksdal		
CHECKED BY L.P. Young			DATE 6-21-82	APPROVED BY: W.C. Paris, Jr.			DATE 6-21-82	
ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION			NOTES	
633.8	0			0-3.0' Silty Sand, gray, fine- to medium-grained, fine crushed gravel. (Fill)			0-1.8' Used 30" O.D. tapered auger to drill through frost zone. 1.8'-8.0' Drove 19.8" O.D. casing and cleaned out with 15" O.D. auger.	
631.8	3			3.0'-6.0' Clayey Sand, gray, fine- to coarse-grained, fine gravel. (Fill)				
627.8	6			6.0'-31.0' Clay, gray, little fine- to medium-grained sand, trace fine gravel. (Fill)			End of shift 2-11-82 at 8.0' Start of shift 3-3-82	
	10						End of shift 3-3-82 at 10.0' Start of shift 3-4-82	
	15						▽ 3-4-82	
	20							
	25			25.0'-31.0' Increasing sand content.				
	30						End of shift 3-4-82 at 30.0' Start of shift 3-8-82	
602.8	31			31.0'-46.0' Sand, brown, fine-grained, with gray clay. (Lacustrine).			Fill Lacustrine	
598.8	35							
SAMPLE TYPE Grab and Bailor			SITE Chlorination Building				WELL NO. C-4	

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# WELL LOG

PROJECT

MIDLAND UNITS 1 AND 2

JOB NO.

7220

SHEET NO.

2 OF 2

WELL NO.

C-4

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
598.5	35				
	36.0			36.0'-41.0' Trace fine angular gravel, silt.	
	40				
	41.0			41.0'-46.0' Sand is gray with trace of lignite and silt.	
	45				
587.8	46			46.0'-1.0' Clay, gray, with fine-grained sand. (Lacustrine)	
	50				
	51.0			51.0' Sand content decreases, clay is plastic.	End of shift 3-9-82 at 52.7'
	52.7				Start of shift 3-10-82
580.6	53.2			T.D.: 53.2'; See well construction summary.	Completed hole 3-10-82

SAMPLE TYPE

Bailer

SITE

Chlorination Building

WELL NO.

C-4

D.9-55

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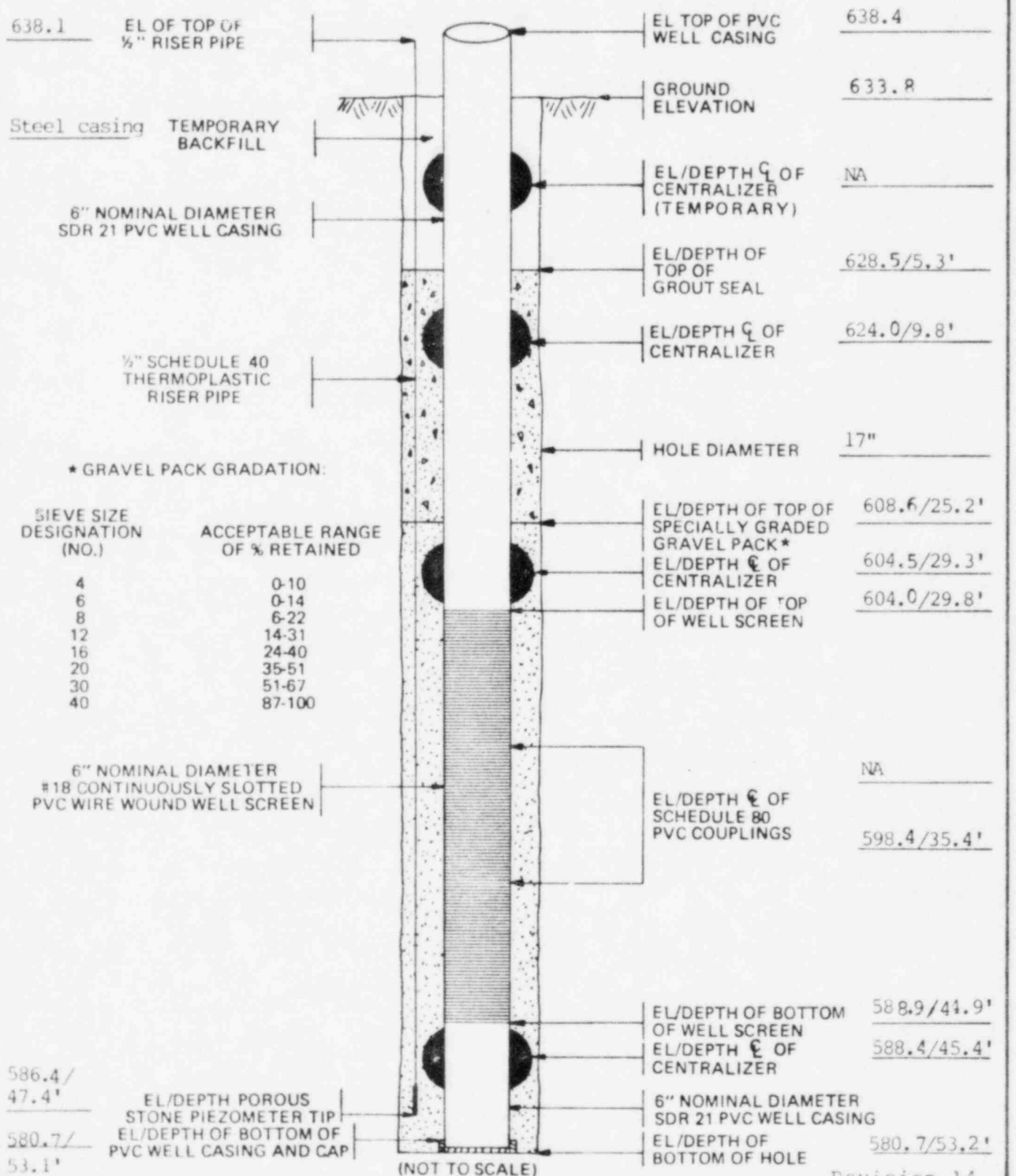
# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

JOB NO. 7220

WELL NO. C-4

SITE Chlorination Building      COORDINATES S 5225.2      E 532.8  
 DATE STARTED 3/17/82      DATE COMPLETED 3/18/82  
 GEOLOGIST/HYDROGEOLOGIST T.R. Cullen      INSTALLED BY Kelly Contract Dewatering Co.



SIEVE SIZE DESIGNATION (NO.)	ACCEPTABLE RANGE OF % RETAINED
4	0-10
6	0-14
8	6-22
12	14-31
16	24-40
20	35-51
30	51-67
40	87-100



WELL INSTALLATION DATA SHEET

WELL NUMBER C-4

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S 5225.2 E 532.8 SURFACE ELEVATION 633.8

DATE STARTED 2/11/82 DATE COMPLETED 4/20/82 NO. OF SAMPLES 12

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool  
O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 53.2'  
I.D. 15 1/4" nom SPECIAL CONDITIONS 0-8.0' used 19.8" O.D. casing, 0.1' of material in bottom of hole.

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS   
SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 15.1'  
CENTRALIZERS: 9.8', 29.8', 45.4'

LENGTH OF BLANK BELOW SCREEN 8.2' LENGTH OF RISER ABOVE SCREEN 34.2'  
LENGTH OF GRAVEL PACKED ZONE 27.5' CALCULATED AMOUNT OF GRAVEL PACK 36.8 cu. ft.  
ACTUAL AMOUNT OF GRAVEL PACK 39.6 cu. ft. CIRCULATION DURING GRAVEL PACKING   
CASAGRANDE TIP DEPTH 47.4' THICKNESS OF SEAL 19.9'  
TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 28.1 cu. ft.  
ACTUAL AMOUNT OF SEAL 28.1 cu. ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping  
DEVELOPING TIME 8 hours AMOUNT OF MATERIAL REMOVED <0.01 cu. ft. (est)

SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT SPECIAL CONDITIONS none  
FIRST TEST 0.6  
SECOND RETEST \_\_\_\_\_  
THIRD RETEST \_\_\_\_\_

STATIC WATER LEVEL 12.0'/621.8 DATE 3/4/82 EDUCTOR SETTING NA

SUBCONTRACTOR SUBMITTALS:

MICHIGAN DEWATERING WELL RECORD

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12/82

SUPERVISED BY  
GEOLOGIST/HYDROGEOLOGIST T. R. Cullen/  
A. J. Fiksdal

<b>WELL LOG</b>		PROJECT MIDLAND UNITS 1 AND 2		JOB NO. 7220	SHEET NO. 1 OF 2	WELL NO. D-1
SITE Service Water Pump Structure			COORDINATES S4952.8 E 752.1			
BEGUN 1-27-82	COMPLETED 2-10-82	DRILLER Kelley Dewatering Co.	DRILL MAKE AND MODEL Bucyrus-Erie 60L	HOLE SIZE 17"	TOTAL DEPTH 75.2'	SAMPLES 18
SCREEN DIA/LENGTH/SLOT 6"/21.7'/#18		EL TOP OF CASING 637.5	GROUND SURFACE EL 634.5	DEPTH/EL GROUND WATER 51.7'/582.8		LOGGED BY GEOLOGIST/HYDROGEOLOGIST: T.R. Cullen/M.D. Johnson
CHECKED BY: A.J. Fiksdal			DATE 6-18-82	APPROVED BY: W.C. Paris, Jr.		DATE 6-21-82
ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES	
634.5	0			0 - 3.0' Gravel, Clay, unsorted Sand. (Fill)	0 - 2.0' Used 30" O.D. tapered auger to drill through frost zone.	
631.5	3			3.0' - 6.0' Sand, orange-brown, poorly sorted, some coarse gravel. (Fill)	2.0' - 8.0' Drove 19.8" O.D. casing and cleaned out with 15" O.D. auger.	
628.5	6			6.0' - 8.0' Silty Clay, Brown-Orange to tan mottled, with fine- to coarse-grained sand, gravel. (Fill)	End of shift 1-27-82 at 8.0'	
626.5	8			8.0' - 13.0' Silt, brown, some clay, some fine- to coarse-grained sand, little pea gravel. (Fill)	Start of shift 2-8-82	
621.5	13			13.0' - 20.0' Sand, brown, medium- to coarse-grained, some fine-grained sand, little silt. (Fill)		
614.5	20			20.0' - 22.0' Gravel, dark gray, little fine- to coarse-grained sand. (Fill)		
612.5	22			22.0' - 37.0' Silty Clay, brown, little pea gravel and medium- to coarse-grained sand. (Fill)		
599.5	35					
				Revision 14 12/82		
SAMPLE TYPE Grab and Bailor			SITE Service Water Pump Structure			WELL NO. D-1



# WELL LOG

PROJECT MIDLAND UNITS 1 AND 2

JOB NO. 7220

SHEET NO. 2 OF 2

WELL NO. D-1

ELEVATION	DEPTH	SAMPLE GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
599.5	35			
597.5	37		37.0' - 47.0' Silty Clay, gray, some fine- to coarse-grained sand. (Till)	Fill Till
	40			End of shift 2-8-82 at 43.0' Start of shift 2-9-82
587.5	47		47.0' - 52.0' Sand, gray, fine- to coarse-grained. (Lacustrine)	Till Lacustrine
582.5	52		52.0' - 75.2' Sand, gray, fine- to medium-grained. (Lacustrine)	2-8-82
	60			End of shift 2-9-82 at 63.0' Start of shift 2-10-82
559.3	75.2		See well construction summary.	Completed hole 2-10-82

SAMPLE TYPE Bailer	SITE Service Water Pump Structure	WELL NO. D-1
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# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

JOB NO. 7220

WELL NO. D-1

SITE Service Water Pump Structure

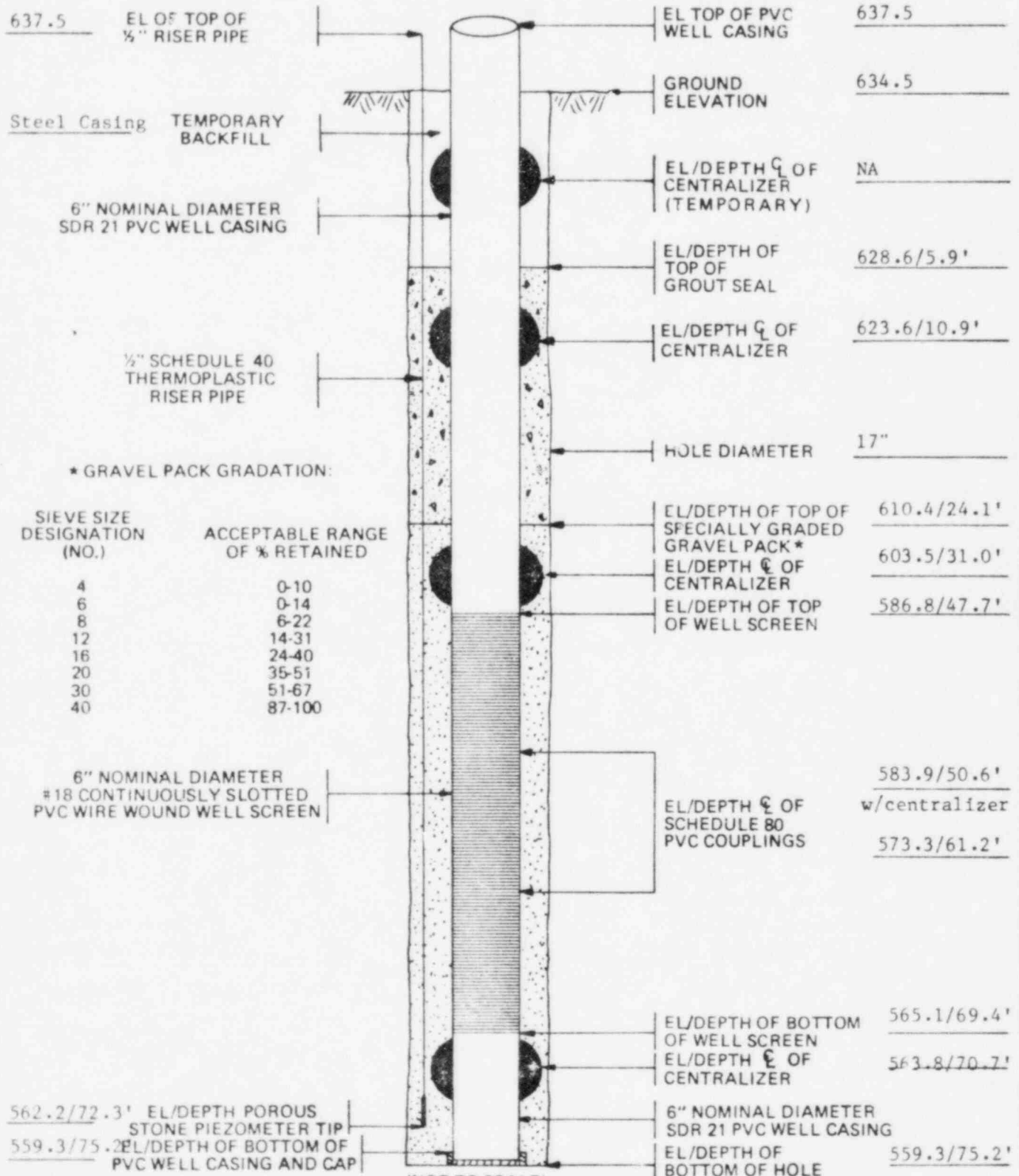
COORDINATES S4952.8

E752.1

DATE STARTED 3/12/82

DATE COMPLETED 3/15/82

GEOLOGIST/HYDROGEOLOGIST T.R. Cullen/A.J. Fiksdal INSTALLED BY Kelly Contract Dewatering Co.



\* GRAVEL PACK GRADATION:

SIEVE SIZE DESIGNATION (NO.)	ACCEPTABLE RANGE OF % RETAINED
4	0-10
6	0-14
8	6-22
12	14-31
16	24-40
20	35-51
30	51-67
40	87-100

(NOT TO SCALE)

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WELL INSTALLATION DATA SHEET

WELL NUMBER D-1

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S 4952.8 E 752.1 SURFACE ELEVATION 634.5

DATE STARTED 1/27/82 DATE COMPLETED 5/5/82 NO. OF SAMPLES 18

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool  
O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 75.2'  
I.D. 15 1/4" nom SPECIAL CONDITIONS none

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS   
SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 21.7'  
CENTRALIZERS: 10.9', 31.0', 50.6', 70.7'

LENGTH OF BLANK BELOW SCREEN 5.8' LENGTH OF RISER ABOVE SCREEN 50.7'  
LENGTH OF GRAVEL PACKED ZONE 51.1' CALCULATED AMOUNT OF GRAVEL PACK 68.3 cu. ft.  
ACTUAL AMOUNT OF GRAVEL PACK 69.3 cu. ft. CIRCULATION DURING GRAVEL PACKING   
CASAGRANDE TIP DEPTH 72.3' THICKNESS OF SEAL 18.2'  
TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 25.5 cu. ft.  
ACTUAL AMOUNT OF SEAL 28.1 cu. ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping  
DEVELOPING TIME 8 hours AMOUNT OF MATERIAL REMOVED < 0.01 cu. ft. (est)

SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT SPECIAL CONDITIONS none  
FIRST TEST 0.8  
SECOND RETEST \_\_\_\_\_  
THIRD RETEST \_\_\_\_\_

STATIC WATER LEVEL 51.7'/582.8 DATE 2/8/82 EDUCTOR SETTING NA

SUBCONTRACTOR SUBMITTALS:

MICHIGAN DEWATERING WELL RECORD

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12/82

SUPERVISED BY  
GEOLOGIST/HYDROGEOLOGIST T.R. Cullen/A.J. Fiksdal

D.9-61

<b>WELL LOG</b>			PROJECT	JOB NO.	SHEET NO.	WELL NO.
			MIDLAND UNITS 1 AND 2	7220	1 OF 2	D-2
SITE			COORDINATES			
Service Water Pump Structure			S4956 E735.9			
BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE	TOTAL DEPTH	SAMPLES
1-22-82	3-2-82	Kelley Dewatering Co.	Bucyrus-Erie 60 L	17"	75.2'	18
SCREEN DIA./LENGTH/SLOT		EL TOP OF CASING	GROUND SURFACE EL	DEPTH/EL GROUND WATER		LOGGED BY GEOLOGIST/HYDROGEOLOGIST
6"/23.3'/#18		638.8	634.4	34.4'/600.0		M.D. Johnson
CHECKED BY:			DATE	APPROVED BY:		DATE
A.J. Fiksdal			6-15-82	W.C. Paris, Jr.		6-16-82
ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES	
634.4	0					
	1			0-5.0' <u>Clay</u> , with gravel, cobbles and unsorted sand. (Fill)	0-2.0' Used 30" O.D. tapered auger to drill through frost zone. 2.0'-8.0' Drove 19.8" O.D. casing and cleaned out with 15" O.D. auger.	
629.4	5			5.0'-10.0' <u>Sand</u> , brown, unsorted, some gravel, occasional cobble. (Fill)	End of shift 1-22-82 at 8.0' Start of shift 2-23-82	
624.4	10			10.0'-20.0' <u>Clay</u> , brown and orange mottled, fine to coarse gravel. (Fill)		
	15					
614.4	20			20.0'-22.0' <u>Sand</u> , brown, fine- to coarse-grained, little fine gravel and clay. (Fill)	End of shift 2-23-82 at 20.0' Start of shift 2-24-82	
612.4	22			22.0'-24.0' <u>Concrete</u> , gray, mud mat. (Fill)	End of shift 2-24-82 at 24.0'	
610.4	24			24.0'-34.0' <u>Clay</u> , brown, some fine gravel and fine- to coarse-grained sand. (Fill)	Start of shift 2-25-82 End of shift 2-25-82 at 26.0' Start of shift 2-26-82	
	25					
	30					
	34				Fill	
600.4	34				Lacustrine	
599.4	35			34.0'-41.0' <u>Silty Sand</u> , brown,	2-23-82	
SAMPLE TYPE			SITE			WELL NO.
Grab and Bailor			Service Water Pump Structure			D-2

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# WELL LOG

PROJECT

MIDLAND UNITS 1 AND 2

JOB NO.

7220

SHEET NO.

2 of 2

WELL NO.

D-2

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
595.4	35			medium- to coarse-grained, little clay. (Lacustrine)	
	10			38.0' Clay seams.	End of shift 2-26-82 at 39.0'
	40				Start of shift 3-1-82
593.4	41			41.0'-46.0' Clay, gray, fine- to medium-grained sand, trace fine gravel. (Till)	Lacustrine Till
	45				Till
588.4	46			46.0'-75.2' Sand, gray, medium-grained, little coarse-grained sand. (Lacustrine)	Lacustrine
	50				
	55			57.0' Fine to coarse gravel layer.	End of shift 3-1-82 at 56.0'
	60				Start of shift 3-2-82
	65			63.0' Fine gravel layer.	
	70				
559.2	75.2			T.D. 75.2' See well construction summary.	Completed hole 3-2-82

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SAMPLE TYPE

Bailer

SITE

Service Water Pump Structure

WELL NO.

D-2

D.9-63



# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

JOB NO. 7220

WELL NO. D-2

SITE Service Water Pump Structure

COORDINATES S4956

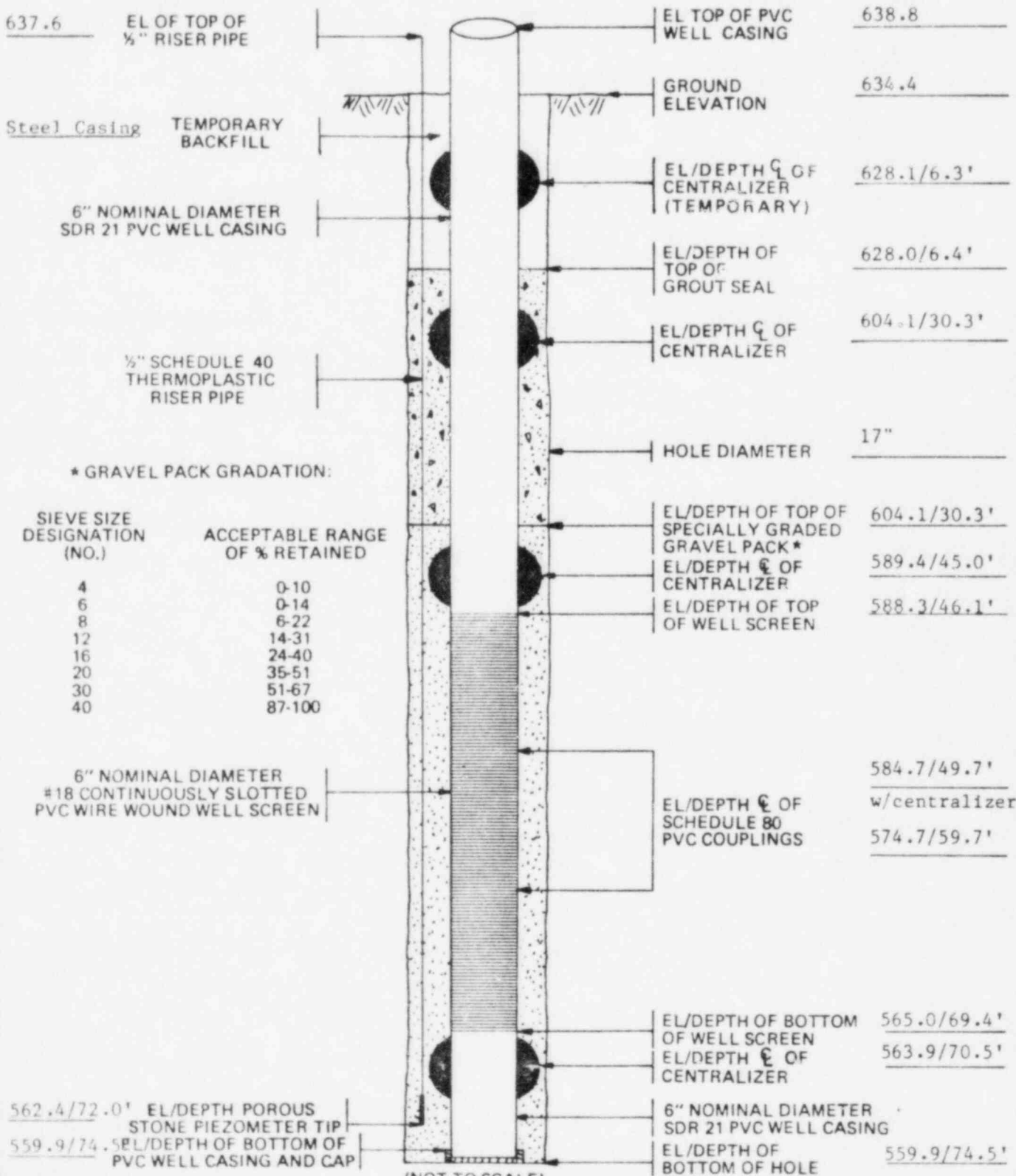
E735.9

DATE STARTED 5/26/82

DATE COMPLETED 6/3/82

GEOLOGIST/HYDROGEOLOGIST M.D. Johnson

INSTALLED BY Kelly Contract Dewatering Co.



\* GRAVEL PACK GRADATION:

SIEVE SIZE DESIGNATION (NO.)	ACCEPTABLE RANGE OF % RETAINED
4	0-10
6	0-14
8	6-22
12	14-31
16	24-40
20	35-51
30	51-67
40	87-100



WELL INSTALLATION DATA SHEET

WELL NUMBER D-2

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S 4956 E 735.9 SURFACE ELEVATION 634.4

DATE STARTED 1/27/82 DATE COMPLETED 6/8/82 NO. OF SAMPLES 18

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool  
O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 74.5'  
I.D. 15 1/4" nom SPECIAL CONDITIONS 0-8.0' used 19.8" O.D. casing.

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS   
SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 23.3'  
CENTRALIZERS: 6.3', 30.3', 45.0', 49.7', 70.5'

LENGTH OF BLANK BELOW SCREEN 5.1' LENGTH OF RISER ABOVE SCREEN 50.3'  
LENGTH OF GRAVEL PACKED ZONE 44.2' CALCULATED AMOUNT OF GRAVEL PACK 59.1 cu.ft.  
ACTUAL AMOUNT OF GRAVEL PACK 57.4 cu.ft. CIRCULATION DURING GRAVEL PACKING   
CASAGHIANDE TIP DEPTH 72.0' THICKNESS OF SEAL 23.9'  
TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 33.2 cu.ft.  
ACTUAL AMOUNT OF SEAL 33.2 cu.ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping  
DEVELOPING TIME 8 hours AMOUNT OF MATERIAL REMOVED <0.01 cu.ft. (est)  
SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT SPECIAL CONDITIONS none  
FIRST TEST 0.9  
SECOND RETEST \_\_\_\_\_  
THIRD RETEST \_\_\_\_\_

STATIC WATER LEVEL 34.4'/600.0 DATE 2/23/82 EDUCTOR SETTING NA

SUBCONTRACTOR SUBMITTALS:

MICHIGAN DEWATERING WELL RECORD

Revision 14  
12/82

SUPERVISED BY  
GEOLOGIST/HYDROGEOLOGIST M. D. Johnson

<b>WELL LOG</b>			PROJECT	JOB NO.	SHEET NO.	WELL NO.
			MIDLAND UNITS 1 AND 2	7220	1 OF 2	D-3
SITE			COORDINATES			
Service Water Pump Structure			S 4963.2	E 716.2		
BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE	TOTAL DEPTH	SAMPLES
1-27-82	2-22-82	Kelly Dewatering Co	Bucyrus-Erie 60 L	17"	75.6'	18
SCREEN DIA/LENGTH/SLOT		EL TOP OF CASING	GROUND SURFACE EL	DEPTH/EL GROUND WATER		LOGGED BY GEOLOGIST/HYDROGEOLOGIST
6"/28.6'/#18		637.5	634.0	42.80'/591.20		T.R. Cullen/M.D. Johnson
CHECKED BY			DATE	APPROVED BY		DATE
L.E. Young			3-31-82	W.C. Paris, Jr.		6-18-82

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
634.0	0				
	1			0-5.0' Sand, brown, fine- to coarse-grained, pebbles, gravel. (Fill)	0-2.0' Used 30" O.D. tapered auger to drill through frost zone. 2.0'-8.0' Drove 19.8" O.D. casing and cleaned out with 15" O.D. auger.
629.0	5			5.0'-21.0' Silty Clay, brown, with pebbles, gravel, and unsorted sand lenses. (Fill)	End of shift 1-27-82 at 8.0' ----- Start of shift 2-17-82
	10				
	15				17.0'-35.0' Encountered fragments of PVC, casing and well screen from construction dewatering wells located 1.5' from center of D-3.
613.0	21			21.0'-24.0' Gravelly Sand, brown, fine- to coarse-grained. (Fill)	End of shift 2-17-82 at 21.0' ----- Start of shift 2-18-82
610.0	24			24.0'-27.0' Sand, brown, coarse-grained, little clay. (Fill)	
607.0	27			27.0'-32.0' Sandy Gravel, brown, rounded. (Fill)	
	30				
602.0	32			32.0'-36.0' Silty Clay, brown, medium- to coarse-grained sand and gravel. (Fill)	
599.0	35				

SAMPLE TYPE	SITE	WELL NO.
Grab and Bailer	Service Water Pump Structure	D-3

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# WELL LOG

PROJECT MIDLAND UNITS 1 AND 2

JOB NO. 7220

SHEET NO. OF 2 2

WELL NO. D-3

ELEVATION	DEPTH	SAMPLE GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
599.0	35			
598.0	36		36.0'-44.0' Silty Clay, gray, with fine gravel, fine- to medium-grained sand, and occasional coarse pebble. (Till)	Fill Till
	10			
	40			
	11			▽ 2-18-82
590.0	44		44.0'-75.6' Sand, gray, fine- to medium-grained, trace to some fine gravel. (Lacustrine)	Till Lacustrine
	45			End of shift 2-18-82 at 45.0' Start of shift 2-19-82
	12			
	50			
	13			
	55			
	14			
	60			
	15			End of shift 2-19-82 at 62.0' Start of shift 2-22-82
	65			
	16			
	70			
	17			
558.4	75.6		T.D.: 75.6', See well construction summary.	Completed hole 2-22-82

SAMPLE TYPE  
Bailer

SITE  
Service Water Pump Structure

WELL NO.  
D-3

D.9-67

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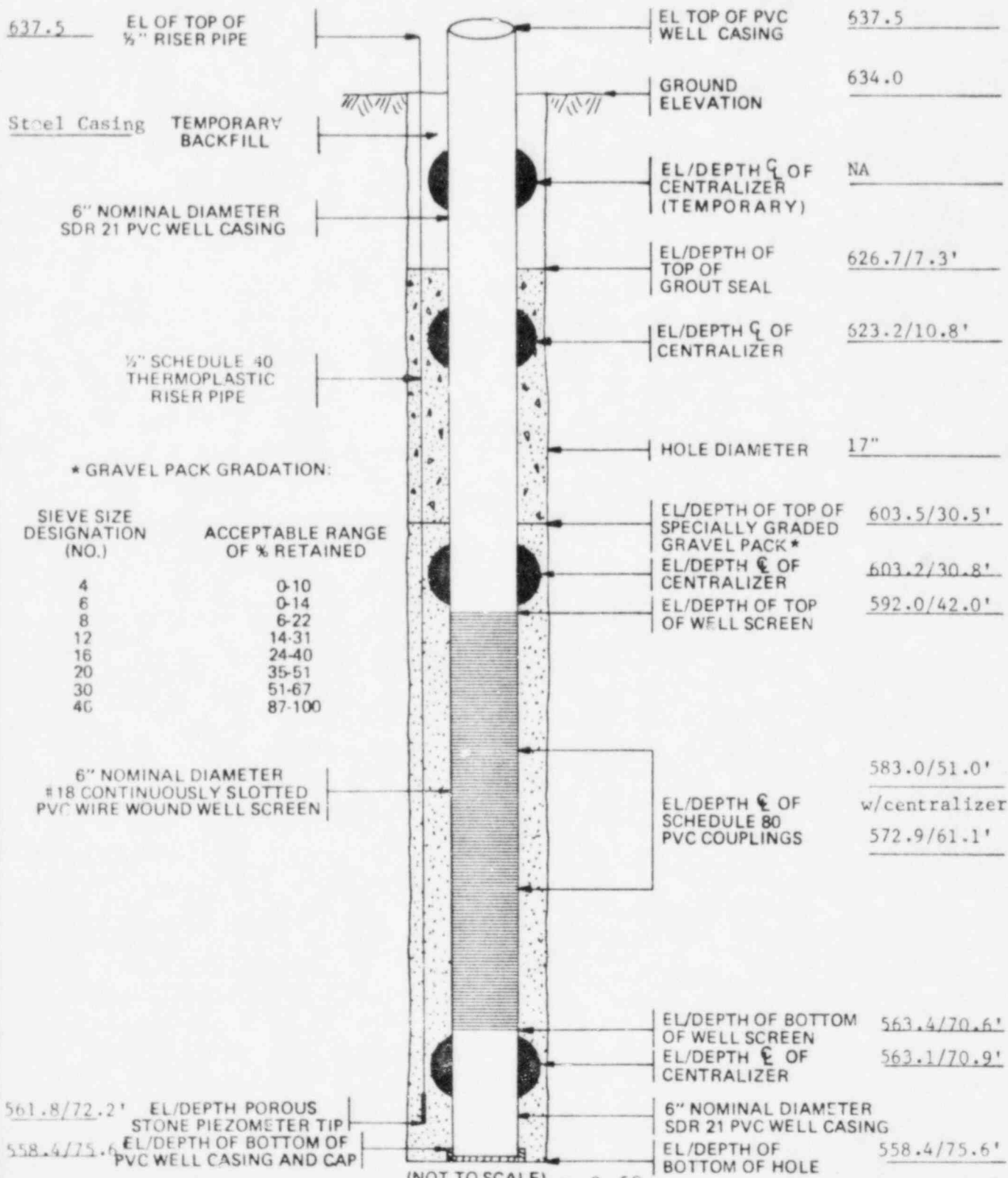
# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

JOB NO. 7220

WELL NO. D-3

SITE Service Water Pump Structure COORDINATES S4963.2 E716.2  
 DATE STARTED 3/11/82 DATE COMPLETED 3/15/82  
 GEOLOGIST/HYDROGEOLOGIST T.R. Cullen/A.J. Fiksdal INSTALLED BY Kelly Contract Dewatering Co.



\* GRAVEL PACK GRADATION:

SIEVE SIZE DESIGNATION (NO.)	ACCEPTABLE RANGE OF % RETAINED
4	0-10
6	0-14
8	6-22
12	14-31
16	24-40
20	35-51
30	51-67
40	87-100



WELL INSTALLATION DATA SHEET

WELL NUMBER D-3

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S 4963.2 E 716.2 SURFACE ELEVATION 634.0

DATE STARTED 1/27/82 DATE COMPLETED 5/4/82 NO. OF SAMPLES 18

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool  
O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 75.6'  
I.D. 15 1/4" nom SPECIAL CONDITIONS 0-8.0' used 19.8" O.D. casing.

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS   
SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 28.6'  
CENTRALIZERS: 10.8', 30.8', 51.0', 70.9'

LENGTH OF BLANK BELOW SCREEN 5.0' LENGTH OF RISER ABOVE SCREEN 45.5'  
LENGTH OF GRAVEL PACKED ZONE 45.1' CALCULATED AMOUNT OF GRAVEL PACK 60.3 cu. ft.  
ACTUAL AMOUNT OF GRAVEL PACK 69.3 cu. ft. CIRCULATION DURING GRAVEL PACKING   
CASAGRANDE TIP DEPTH 72.2' THICKNESS OF SEAL 23.2'  
TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 31.4 cu. ft.  
ACTUAL AMOUNT OF SEAL 30.6 cu. ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping  
DEVELOPING TIME 7 hours AMOUNT OF MATERIAL REMOVED <0.01 cu. ft. (est)

SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT SPECIAL CONDITIONS none  
FIRST TEST 1, 6  
SECOND RETEST \_\_\_\_\_  
THIRD RETEST \_\_\_\_\_










STATIC WATER LEVEL 42.8'/591.2 DATE 1/27/82 EDUCTOR SETTING NA

SUBCONTRACTOR SUBMITTALS:

MICHIGAN DEWATERING WELL RECORD

Revision 14  
12/82

SUPERVISED BY  
GEOLOGIST/HYDROGEOLOGIST T.R. Cullen/A.J. Fiksdal

WELL LOG		PROJECT		JOB NO.	SHEET NO.	WELL NO.
		MIDLAND UNITS 1 AND 2		7220	1 OF 2	D-4
SITE			COORDINATES			
Service Water Pump Structure			S 4970 E 703			
BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE	TOTAL DEPTH	SAMPLES
1-28-82	2-16-82	Kelly Dewatering Co.	Bucyrus-Erie 60L	17"	75.1'	17
SCREEN DIA/LENGTH/SLOT		EL TOP OF CASING	GROUND SURFACE EL	DEPTH/EL GROUND WATER		LOGGED BY GEOLOGIST/HYDROGEOLOGIST
6"/23.3'/#18		638.4	634.6	39.15'/595.45		T.R. Cullen/M.D. Johnson
CHECKED BY:			DATE	APPROVED BY:		DATE
A.J. Fiksdal			6-21-82	W.C. Paris, Jr.		6-21-82
ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION		NOTES
634.6	0					
632.6	2	1		0 - 2.0' Gravel and Clay, brown, roadbed. (Fill)		0 - 2.0' Used 30" O.D. tapered auger to drill through frost zone.
	5	2		2.0' - 7.0' Sand, brown, fine- to coarse-grained, poorly sorted. (Fill)		2.0' - 8.0' Drove 19.8" O.D. casing and cleaned out with 15" O.D. auger.
627.6	7	3		7.0' - 37.0' silty Clay, brown, mottled orange, with medium gravel, trace to some fine- to coarse-grained sand. (Fill)		End of shift 1-28-82 at 8.0' Start of shift 2-11-82
	10					
	15					
	20					
	25					
	30					
	35					End of shift 2-11-82 at 27.0' Start of shift 2-12-82
599.6	35					
SAMPLE TYPE			SITE		WELL NO.	
Grab and Bailor			Service Water Pump Structure		D-4	

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

# WELL LOG

PROJECT MIDLAND UNITS 1 AND 2

JOB NO. 7220

SHEET NO. 2 OF 2

WELL NO. D-4

ELEVATION	DEPTH	SAMPLE GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
599.6	35			
597.6	37			Fill
			37.0' - 38.5' Silty Clay, gray, laminated. (Lacustrine)	Lacustrine
596.1	38.5		38.5' - 75.1' Sand, gray, fine-to coarse-grained, some silt. (Lacustrine)	<p>▽ 2-11-82</p> <p>End of shift 2-12-82 at 42.0'</p> <p>Start of shift 2-15-82</p> <p>Water had to be added frequently to maintain water level in casing.</p> <p>End of shift 2-15-82 at 57.0'</p> <p>Start of shift 2-16-82</p> <p>Completed hole 2-16-82</p>
559.5	75.1			

At D. 75.1, see well construction summary.

SAMPLE TYPE  
Bailer

SITE  
Service Water Pump Structure

WELL NO.  
D-4

D.9-71

Revision 14  
12/82



# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

JOB NO. 7220

WELL NO. D-4

SITE Service Water Pump Structure

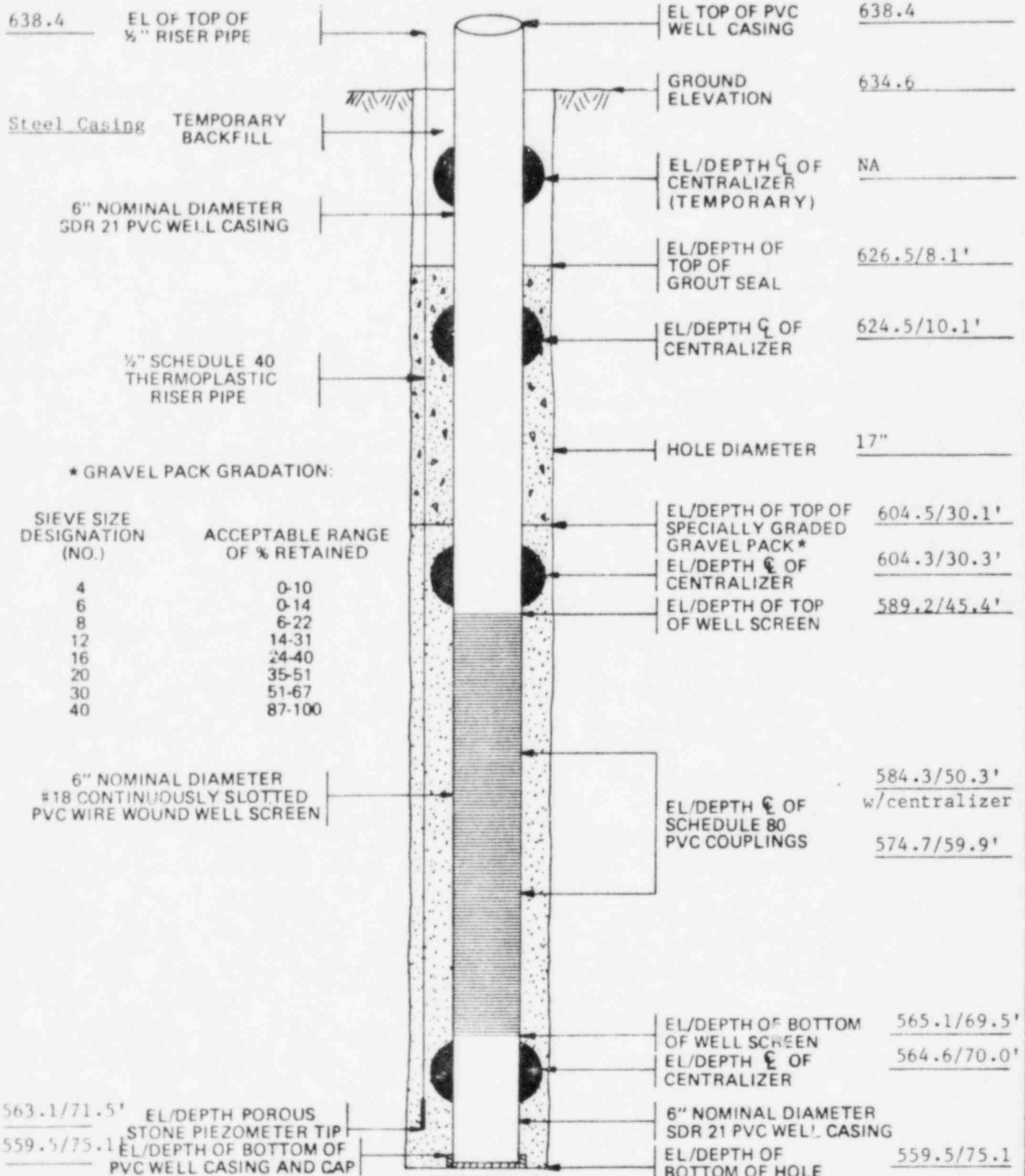
COORDINATES S4970

E703

DATE STARTED 3/11/82

DATE COMPLETED 3/15/82

GEOLOGIST/HYDROGEOLOGIST T.R. Cullen/A.J. Fiksdal INSTALLED BY Kelly Contract Dewatering Co.



(NOT TO SCALE) D.9-72

Revision 14  
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WELL INSTALLATION DATA SHEET

WELL NUMBER D-4

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S 4970 E 703 SURFACE ELEVATION 634.6

DATE STARTED 1/28/82 DATE COMPLETED 5/3/82 NO. OF SAMPLES 17

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool  
O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 75.1'  
I.D. 15 1/4" nom SPECIAL CONDITIONS 0-8.0' used 19.8" O.D. casing.

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS   
SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 24.1'  
CENTRALIZERS: 10.1', 30.3', 50.3', 70.0'

LENGTH OF BLANK BELOW SCREEN 5.6' LENGTH OF RISER ABOVE SCREEN 49.2'  
LENGTH OF GRAVEL PACKED ZONE 45.0' CALCULATED AMOUNT OF GRAVEL PACK 60.2 cu.ft.  
ACTUAL AMOUNT OF GRAVEL PACK 59.4 cu.ft. CIRCULATION DURING GRAVEL PACKING   
CASAGRANDE TIP DEPTH 71.5' THICKNESS OF SEAL 22.0'  
TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 29.4 cu.ft.  
ACTUAL AMOUNT OF SEAL 30.6 cu.ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping  
DEVELOPING TIME 6.5 hours AMOUNT OF MATERIAL REMOVED <0.01 cu.ft. (est)

SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT SPECIAL CONDITIONS none  
FIRST TEST 0.7  
SECOND RETEST \_\_\_\_\_  
THIRD RETEST \_\_\_\_\_

STATIC WATER LEVEL 39.15'/595.45 DATE 2/11/82 EDUCTOR SETTING NA

SUBCONTRACTOR SUBMITTALS:

MICHIGAN DEWATERING WELL RECORD

Revision 14  
12/82

SUPERVISED BY  
GEOLOGIST/HYDROGEOLOGIST T.R.Cullen/A.J.Fiksdal

D.9-73

<b>WELL LOG</b>				PROJECT MIDLAND UNITS 1 AND 2		JOB NO. 7220	SHEET NO. 1 OF 2	WELL NO. D-5	
SITE Service Water Pump Structure				COORDINATES S 5008.4 E668.7					
BEGUN 1-29-82	COMPLETED 4-13-82	DRILLER Kelly Dewatering Co.	DRILL MAKE AND MODEL Bucyrus-Erie 22 W	HOLE SIZE 17"	TOTAL DEPTH 69.0'	SAMPLES 16			
SCREEN DIA/LENGTH/SLOT 6"/15.1"/#18		EL TOP OF CASING 637.5	GROUND SURFACE EL 634.3	DEPTH/EL GROUND WATER 14.0'/620.3		LOGGED BY GEOLOGIST/HYDROGEOLOGIST: M.D. Johnson/R.J. Kelleher			
CHECKED BY A.J. Fiksdal			DATE 6-15-82	APPROVED BY: W.C. Paris, Jr.			DATE 6-16-82		
ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES				
634.3	0			0-5.0' Sand, light brown to brown, fine- to coarse-grained, gravel. (Fill)	0-2.0' Used 30" O.D. tapered auger to drill through frost zone.  2.0'-8.0' Drove 19.8" O.D. casing and cleaned out with 15" O.D. auger.				
	1				End of shift 1-29-82 at 8.0'				
	5				Start of shift 4-7-82				
624.3	10			10.0'-19.0' Sandy Clay, brown mottled, fine- to coarse-grained sand, fine gravel. (Fill)					
	3								
	4			13.5'-15.0' Increasing gravel.	▽ 4-12-82				
	15				End of shift 4-7-82 at 19.0'				
615.3	19			19.0'-29.0' Clayey Sand, brown fine- to coarse-grained, fine gravel. (Fill)	Start of shift 4-8-82				
	20								
	25				End of shift 4-8-82 at 26.0'				
	29			29.0'-34.0' Sandy Clay, brown, fine-grained sand, silt. (Fill)	Start of shift 4-9-82				
	30								
600.3	34				Fill				
599.3	35			34.0'-42.0' Sandy Clay, gray,	Till				
	4				Revision 14 12/82				
SAMPLE TYPE Grab and Bailor			SITE Service Water Pump Structure				WELL NO. D-5		



# WELL LOG

PROJECT MIDLAND UNITS 1 AND 2	JOB NO. 7220	SHEET NO. 2 OF 2	WELL NO. D-5
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ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
599.3	35				
	36			fine-grained sand, little fine gravel. (Till)	End of shift 4-9-82 at 36.0' Start of shift 4-12-82
	40				
592.3	42			42.0'-47.0' Silty Sandy Clay, gray-black, organic, with layers of fine- to medium-grained sand. (Lacustrine)	Till Lacustrine mixed with till
	45				
587.3	47			47.0'-56.0' Sand, gray, very fine- to fine-grained, with gray silty clay layers. (Lacustrine)	Lacustrine
	50				End of shift 4-12-82 at 51.0' Start of shift 4-13-82
	55				
578.3	56			56.0'-61.0' Silty Clay, gray, with silt laminations. (Lacustrine)	
	60				
573.3	61			61.0'-69.0' Clay, gray, with silt laminations. (Lacustrine)	
	65				
565.3	69			T.D.: 69.0'. See well construction summary.	Completed hole 4-13-82

SAMPLE TYPE Bailer	SITE Service Water Pump Structure	WELL NO. D-5
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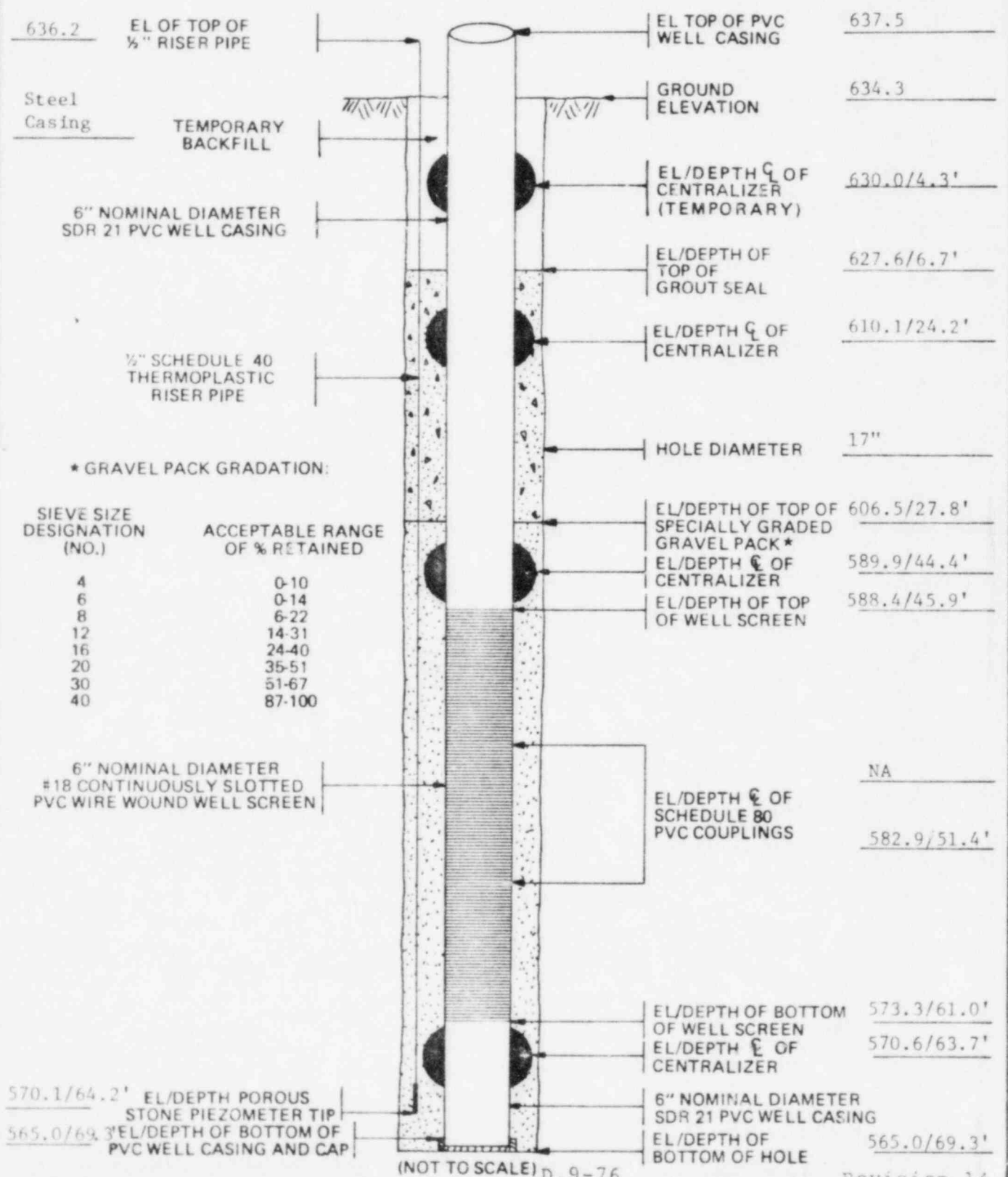
# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

JOB NO. 7220

WELL NO. D-5

SITE Service Water Pump Structure      COORDINATES S 5008.4      E 668.7  
 DATE STARTED 4/15/82      DATE COMPLETED 5/4/82  
 GEOLOGIST/HYDROGEOLOGIST M. D. Johnson      INSTALLED BY Kelly Contract Dewatering Co.



(NOT TO SCALE) D.9-76

Revision 14  
12/82



WELL INSTALLATION DATA SHEET

WELL NUMBER D-5

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S 5008.4 E 668.7 SURFACE ELEVATION 634.3

DATE STARTED 1/29/82 DATE COMPLETED 5/10/82 NO. OF SAMPLES 16

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool  
O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 69.3'  
I.D. 15 1/4" nom SPECIAL CONDITIONS 0-8.0' used 19.8" O.D. casing.  
0.3' flushed from hole during cleaning.

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS   
SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 15.1'  
CENTRALIZERS: 4.3', 24.2', 44.4', 63.7'

LENGTH OF BLANK BELOW SCREEN 8.3' LENGTH OF RISER ABOVE SCREEN 49.1'  
LENGTH OF GRAVEL PACKED ZONE 41.5' CALCULATED AMOUNT OF GRAVEL PACK 55.5 cu.ft.  
ACTUAL AMOUNT OF GRAVEL PACK 59.4 cu.ft. CIRCULATION DURING GRAVEL PACKING   
CASAGRANDE TIP DEPTH 64.2' THICKNESS OF SEAL 21.1'  
TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 29.0 cu.ft.  
ACTUAL AMOUNT OF SEAL 28.1 cu.ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping  
DEVELOPING TIME 7 hours AMOUNT OF MATERIAL REMOVED <0.01 cu.ft. (est)

SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT SPECIAL CONDITIONS none  
FIRST TEST 4.4  
SECOND RETEST \_\_\_\_\_  
THIRD RETEST \_\_\_\_\_

STATIC WATER LEVEL 14.0'/620.3 DATE 4/12/82 EDUCTOR SETTING NA

SUBCONTRACTOR SUBMITTALS:

MICHIGAN DEWATERING WELL RECORD

Revision 14  
12/82

SUPERVISED BY  
GEOLOGIST/HYDROGEOLOGIST M.D. Johnson

D.9-77

# WELL LOG

PROJECT: MIDLAND UNITS 1 AND 2  
 JOB NO.: 7220  
 SHEET NO. OF: 1 OF 2  
 WELL NO.: D-6

SITE: Service Water Pump Structure  
 COORDINATES: S 5022.8 E 657.6

BEGUN: 2-9-82  
 COMPLETED: 4-7-82  
 DRILLER: Kelley Dewatering Co.  
 DRILL MAKE AND MODEL: Bucyrus-Erie 22W  
 HOLE SIZE: 17"  
 TOTAL DEPTH: 63.8'  
 SAMPLES: 15

SCREEN DIA/LENGTH/SLOT: 6"/8.0'/#18  
 EL TOP OF CASING: 637.8  
 GROUND SURFACE EL: 633.8  
 DEPTH/EL GROUND WATER: 16.5'/617.3  
 LOGGED BY GEOLOGIST/HYDROGEOLOGIST: T.R. Cullen

CHECKED BY: L.E. Young  
 DATE: 8-9-82  
 APPROVED BY: A.J. Fiksdal  
 DATE: 8-9-82








ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
633.8	0				
632.8	1	1		0-1.0' Silty Sand, gray, fine- to medium-grained, some fine crushed gravel. (Fill)	0-2.0' Used 30" O.D. tapered auger to drill through frost zone. End of shift 2-9-82 at 2.0'
	2	2		1.0'-25.0' Sand, yellow-brown, fine- to coarse-grained, fine rounded gravel. (Fill)	Start of shift 2-10-82 2.0'-8.0' Drove 19.8" O.D. casing and cleaned out with 15" O.D. auger.
	5				
	8				
	10				
	15				
	17				End of shift 2-10-82 at 8.0' Start of shift 4-5-82
	20			22.0'-25.0' Coarse gravel	
608.8	25	6		25.0'-35.0' Clay, brown and orange mottled, fine- to medium-grained sand, trace fine gravel. (Fill)	▽ 4-5-82 End of shift 4-5-82 at 17.0' Start of shift 4-6-82
	30				
	35				
598.8	35				Fill Till

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12/82

SAMPLE TYPE: Grab and Bailor  
 SITE: Service Water Pump Structure  
 WELL NO.: D-6

# WELL LOG

PROJECT MIDLAND UNITS 1 AND 2  
 JOB NO. 7220  
 SHEET NO. OF 2 2  
 WELL NO. D-6

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
598.8	35				
	35-40			35.0'-47.0' Clay, gray, sandy with silt and occasional pebbles. (Till)	
	40-45			40.0' Sand content increasing.	
	45-47			45.0' Trace of black organic silty sandy clay.	
568.8	47			47.0'-55.0' Sand, gray, fine- to medium-grained, trace to occasional fine gravel. (Lacustrine)	Till Lacustrine
	50-55			54.9' More gravel.	
578.8	55			55.0'-63.8' Clay, gray, trace fine- to medium-grained sand. (Lacustrine)	End of shift 4-6-82 at 56.0' Start of shift 4-7-82
	60-63.8			T.D.: 63.8', See well construction summary.	Completed hole 4-7-82

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SAMPLE TYPE: Bailer      SITE: Service Water Pump Structure      WELL NO.: D-6



# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

JOB NO. 7220

WELL NO. D-6

SITE Service Water Pump Structure

COORDINATES S5022.8

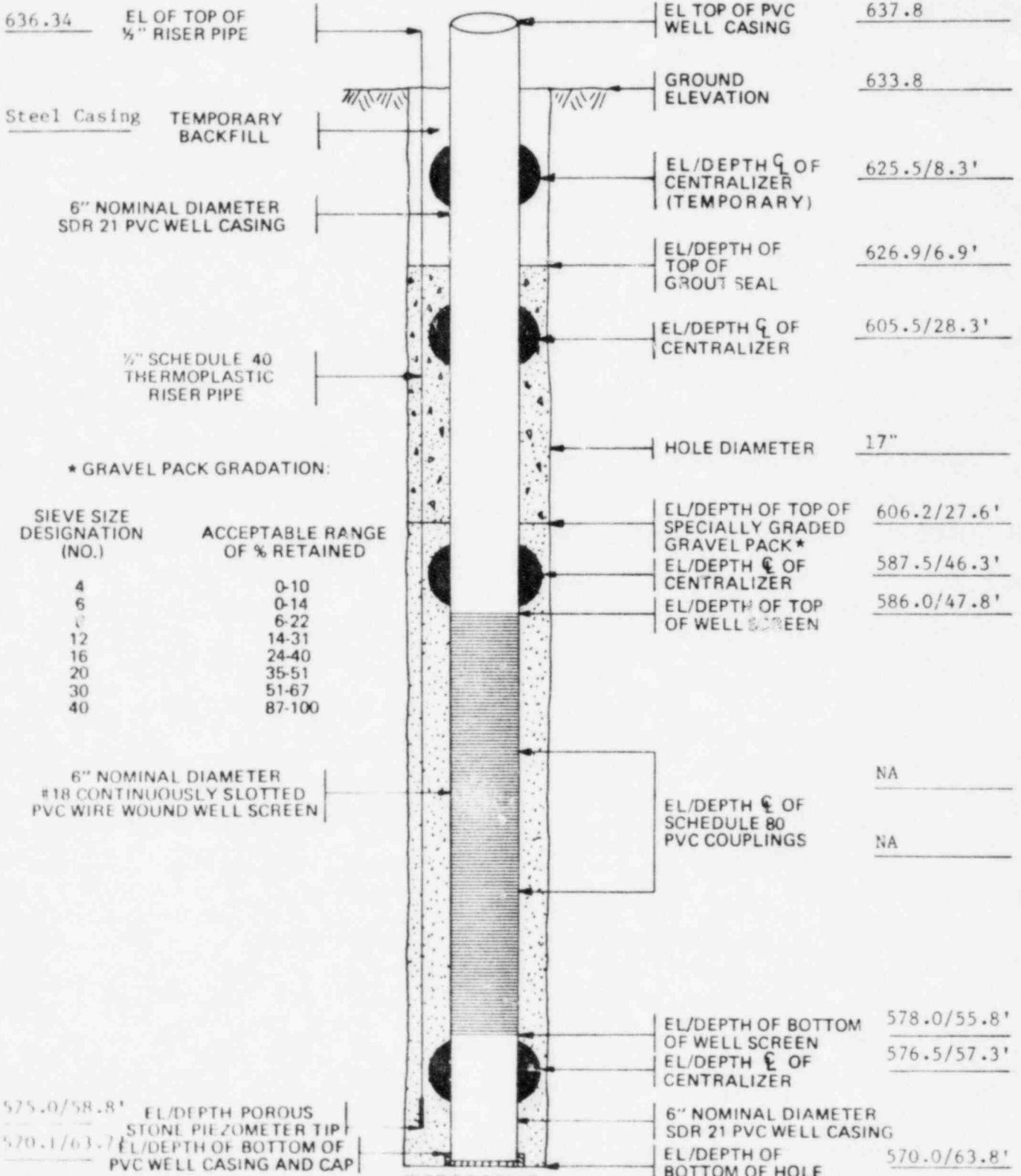
E657.6

DATE STARTED 4/14/82

DATE COMPLETED 5/4/82

GEOLOGIST/HYDROGEOLOGIST M.D. Johnson

INSTALLED BY Kelly Contract Dewatering Co.



**\* GRAVEL PACK GRADATION:**

SIEVE SIZE DESIGNATION (NO.)	ACCEPTABLE RANGE OF % RETAINED
4	0-10
6	0-14
12	6-22
16	14-31
20	24-40
30	35-51
40	51-67
	87-100

(NOT TO SCALE) D.9-79a

Revision 14  
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WELL INSTALLATION DATA SHEET

WELL NUMBER D-6

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S5022.8 E657.6 SURFACE ELEVATION 633.8

DATE STARTED 2/9/82 DATE COMPLETED 5/7/82 NO. OF SAMPLES 15

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool  
O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 63.8'  
I.D. 15 1/4" nom SPECIAL CONDITIONS 0-8.0' used 19.8' O.D. casing.  
0.1' of material in bottom of hole.

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS   
SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 8.0'  
CENTRALIZERS: 8.3', 28.3', 46.3', 57.3'

LENGTH OF BLANK BELOW SCREEN 7.9' LENGTH OF RISER ABOVE SCREEN 51.8'  
LENGTH OF GRAVEL PACKED ZONE 36.1' CALCULATED AMOUNT OF GRAVEL PACK 48.3 cu. ft.  
ACTUAL AMOUNT OF GRAVEL PACK 48.5 cu. ft. CIRCULATION DURING GRAVEL PACKING   
AGRADE TIP DEPTH 58.8' THICKNESS OF SEAL 20.7'  
TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 28.3 cu. ft.  
ACTUAL AMOUNT OF SEAL 30.6 cu. ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping  
DEVELOPING TIME 7.5 hours AMOUNT OF MATERIAL REMOVED < 0.01 cu. ft. (est)  
SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT SPECIAL CONDITIONS none  
FIRST TEST 0.9  
SECOND RETEST \_\_\_\_\_  
THIRD RETEST \_\_\_\_\_

STATIC WATER LEVEL 16.5'/617.3 DATE 4/5/82 EDUCTOR SETTING NA

SUBCONTRACTOR SUBMITTALS:  
MICHIGAN DEWATERING WELL RECORD

Revision 14  
12/82

SUPERVISED BY  
GEOLOGIST/HYDROGEOLOGIST M.D. Johnson

D.9-79b

<b>WELL LOG</b>		PROJECT	JOB NO.	SHEET NO.	WELL NO.
		MIDLAND UNITS 1 AND 2	7220	1 OF 2	D-7
SITE			COORDINATES		
Circulating Water Intake Structure			S 5028 E 642.1		
BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE	TOTAL DEPTH
2-4-82	4-4-82	Kelley Dewatering Co.	Bucyrus-Erie 22W	17"	62.5'
SCREEN DIA./LENGTH/LOT		EL TOP OF CASING	GROUND SURFACE EL	DEPTH/EL GROUND W.A. 24	LOGGED BY GEOLOGIST/HYDROGEOLOGIST
6"/15.0'/#18		637.5	633.8	18.8'/615.0	T.R. Cullen
CHECKED BY:		DATE	APPROVED BY:		DATE
L.E. Young		8-9-82	A.J. Fiksdal		8-9-82
ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
633.8	0				
	1		1	0-3.0' Silty Sand, gray, fine- to medium-grained, trace fine gravel. (Fill)	0-2.0' Used 30" O.D. tapered auger to drill through frost zone.
630.8	3			3.0'-14.0' Silty Clay, gray, little- to some fine- to medium-grained sand, trace fine gravel. (Fill)	2.0'-8.0' Drove 19.8" O.D. casing and cleaned out with 15" O.D. auger.
	5		2		
	10				End of shift 2-1-82 at 8.0' Start of shift 3-31-82
	14		3	14.0'-24.0' Sand, brown, fine- to coarse-grained, with fine gravel, some silt. (Fill)	
619.8	15				End of shift 3-31-82 at 18.0'
	20		4	20.0' Coarse, angular gravel.	$\nabla$ 4-1-82 Start of shift 4-1-82
	24				
609.8	25		5	24.0'-35.0' Clay, brown and orange mottled, fine- to coarse-grained sand, occasional pebbles. (Fill)	
	30				
	35		6		
599.8					
SAMPLE TYPE		SITE			WELL NO.
Grab and Bailer		Circulating Water Intake Structure			D-7

Fill  
Till - Lacustrine

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# WELL LOG

PROJECT MIDLAND UNITS 1 AND 2

JOB NO. 7220

SHEET NO. 2 OF 2

WELL NO. D-7

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
598.8	35				
	10			35.0'-46.0' Silty Clay, gray-black, with silty fine-grained sand layers, fine gravel, organics. (Till and Lacustrine)	
	40			40.0' More sand and fine gravel.	
	45				
587.8	46			46.0'-52.0' Sand, gray, fine- to medium-grained, with occasional fine gravel, trace organics. (Lacustrine)	Till-Lacustrine End of shift 4-1-82 at 46.0' Lacustrine Start of shift 4-2-82
	50				
581.8	52			52.0'-62.5' Clay, gray, trace to some fine- to medium-grained sand. (Lacustrine)	
	55				End of shift 4-2-82 at 57.0' Start of shift 4-5-82
	60				
571.3	62.5			T.D.: 62.5'. See well construction summary.	Completed hole 4-5-82

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17/82

SAMPLE TYPE  
Bailer

SITE  
Circulating Water Intake Structure

WELL NO.  
D-7





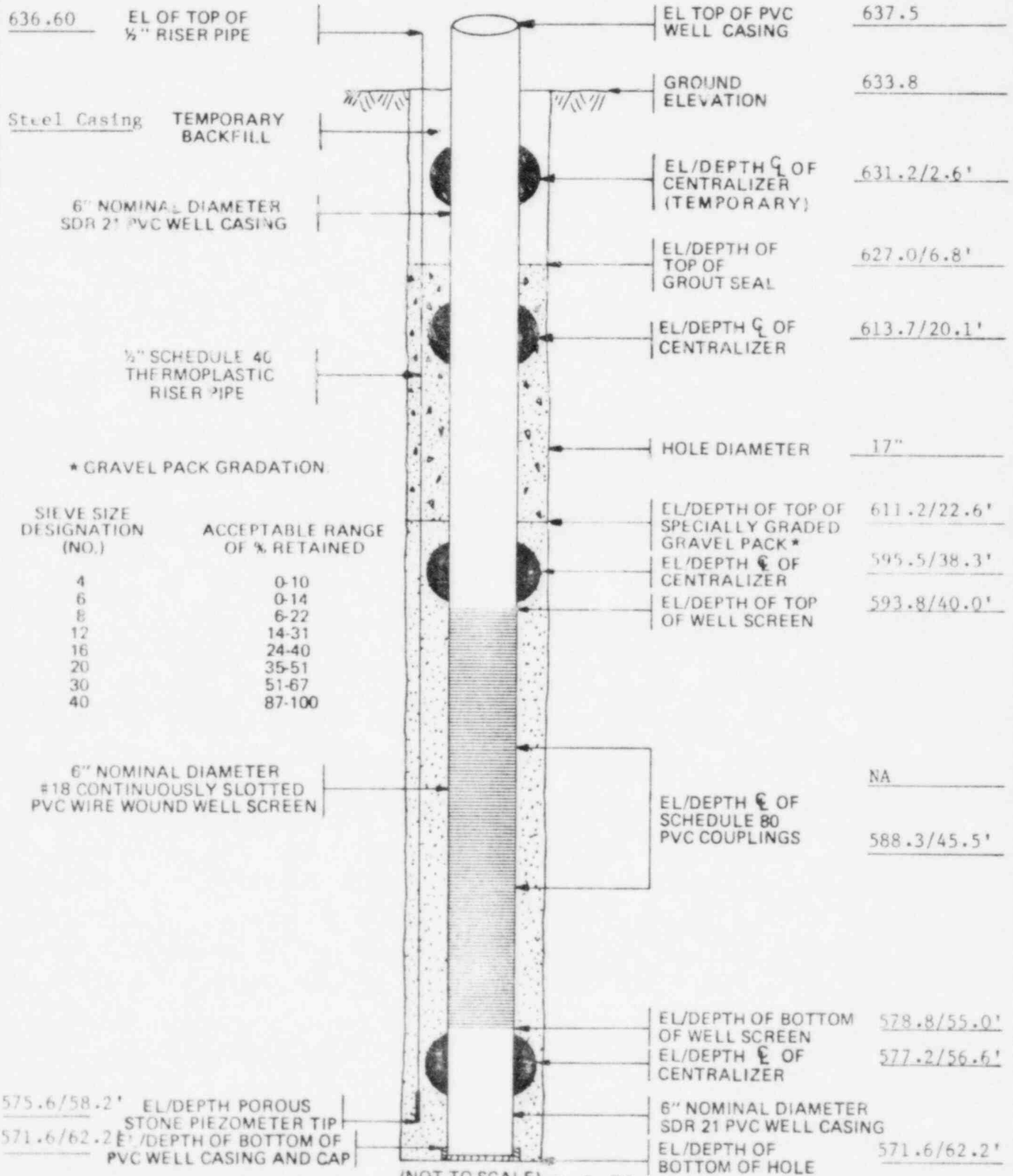
# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

JOB NO. 7220

WELL NO. D-7

SITE Service Water Pump Structure      COORDINATES S5028      E642.1  
 DATE STARTED 4/28/82      DATE COMPLETED 5/3/82  
 GEOLOGIST/HYDROGEOLOGIST A.J. Fiksdal/M.D. Johnson      INSTALLED BY Kelly Contract Dewatering Co.



636.60	EL OF TOP OF 1/2" RISER PIPE		EL TOP OF PVC WELL CASING	637.5
			GROUND ELEVATION	633.8
	Steel Casing	TEMPORARY BACKFILL		
	6" NOMINAL DIAMETER SDR 21 PVC WELL CASING		EL/DEPTH $\phi$ OF CENTRALIZER (TEMPORARY)	631.2/2.6'
			EL/DEPTH OF TOP OF GROUT SEAL	627.0/6.8'
	1/2" SCHEDULE 40 THERMOPLASTIC RISER PIPE		EL/DEPTH $\phi$ OF CENTRALIZER	613.7/20.1'
			HOLE DIAMETER	17"
	* GRAVEL PACK GRADATION:			
			EL/DEPTH OF TOP OF SPECIALLY GRADED GRAVEL PACK*	611.2/22.6'
			EL/DEPTH $\phi$ OF CENTRALIZER	595.5/38.3'
			EL/DEPTH OF TOP OF WELL SCREEN	593.8/40.0'
			EL/DEPTH $\phi$ OF SCHEDULE 80 PVC COUPLINGS	588.3/45.5'
			EL/DEPTH OF BOTTOM OF WELL SCREEN	578.8/55.0'
			EL/DEPTH $\phi$ OF CENTRALIZER	577.2/56.6'
575.6/58.2'	EL/DEPTH POROUS STONE PIEZOMETER TIP		6" NOMINAL DIAMETER SDR 21 PVC WELL CASING	
571.6/62.2'	EL/DEPTH OF BOTTOM OF PVC WELL CASING AND CAP		EL/DEPTH OF BOTTOM OF HOLE	571.6/62.2'



WELL INSTALLATION DATA SHEET

WELL NUMBER D-7

PROJECT Midland Units 1 & 2

JOB NO. 7220-101

SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S5028

E642.1

SURFACE ELEVATION 633.8

DATE STARTED 2/4/82

DATE COMPLETED 5/6/82

NO. OF SAMPLES 16

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN)

DRILLING METHOD Cable Tool

O.D. 17" nom

HOLE DIAMETER 17" nom

HOLE DEPTH 62.2'

I.D. 15 1/4" nom

SPECIAL CONDITIONS 0-3.0' used 19.8" O.D. casing.

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT

GRAVEL PACK TEST RESULTS

SCREEN SLOT SIZE 0.018"

SCREEN DIAMETER 6" nom

SCREEN LENGTH 15.0'

CENTRALIZERS: 2.6', 20.1', 38.3', 56.6'

LENGTH OF BLANK BELOW SCREEN 7.2'

LENGTH OF RISER ABOVE SCREEN 43.7'

LENGTH OF GRAVEL PACKED ZONE 39.6'

CALCULATED AMOUNT OF GRAVEL PACK 52.9 cu. ft.

ACTUAL AMOUNT OF GRAVEL PACK 49.5 cu. ft.

CIRCULATION DURING GRAVEL PACKING

CASAGRANDE TIP DEPTH 58.2'

THICKNESS OF SEAL 15.8'

TYPE OF SEAL Master Flow - 713 Grout

CALCULATED AMOUNT OF SEAL 27.5 cu. ft.

ACTUAL AMOUNT OF SEAL 30.6 cu. ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping

DEVELOPING TIME 8 hours

AMOUNT OF MATERIAL REMOVED <0.01 cu. ft. (est)

SAND CONCENTRATION: (ppm by weight)  
DURING DEVELOPMENT

SPECIAL CONDITIONS none

FIRST TEST 0.1

SECOND RETEST

THIRD RETEST

STATIC WATER LEVEL 18.8'/615.0

DATE 4/1/82

EDUCTOR SETTING NA


SUBCONTRACTOR SUBMITTALS:

MICHIGAN DEWATERING WELL RECORD

Revision 14  
12/82

D.9-79E

SUPERVISED BY  
GEOLOGIST/HYDROGEOLOGIST A.J. Fiksdal/  
M.D. Johnson

<b>WELL LOG</b>			PROJECT	JOB NO.	SHEET NO.	WELL NO.
			MIDLAND UNITS 1 AND 2	7220	1 OF 2	E-1
SITE				COORDINATES		
Circulating Water Intake Structure				S 5160.2 E 594.9		
BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE	TOTAL DEPTH	SAMPLES
2-9-82	2-15-82	Kelley Dewatering Co.	Bucyrus-Erie 22W	17"	68.3'	16
SCREEN DIA/LENGTH/SLOT		EL TOP OF CASING	GROUND SURFACE EL	DEPTH/EL GROUND WATER		LOGGED BY GEOLOGIST/HYDROGEOLOGIST
6"/19.3'/#18		636.1	634.2	16.5'/617.7		A.J. Fiksdal /T.R. Cullen
CHECKED BY:			DATE	APPROVED BY:		DATE
L.F. Young			6-21-82	W.C. Paris Jr.		6-21-82
ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES	
614.2	0					
612.2	1			0-2.0' Silty Sand, gray, fine- to medium-grained, with crushed gravel. (Fill)	Changed location of hole 4.0' from pin, change is reflected in as-built coordinates.  0-2.0' Used 39" O.D. tapered auger to drill through frost zone. 2.0-7.0' Drove 19.6" O.D. casing to refusal and cleaned out with 15" O.D. auger.	
	2			2.0'-5.0' Sand, yellow-brown, fine- to coarse-grained, with fine gravel. (Fill)		
609.2	5			5.0'-42.0' Sandy Clay, brown to gray mottled with brown, trace to some fine- to coarse-grained sand, fine gravel. (Fill)	End of shift 2-9-82 at 7.0' Start of shift 2-11-82	
	10				<div style="text-align: center;">  2-11-82         </div>	
	15					
	20				End of shift 2-11-82 at 32.0' Start of shift 2-12-82	
	25					
	30				Revision 14 12/82	
	32					
599.2	35					
SAMPLE TYPE			SITE			WELL NO.
Grab and Bailor			Circulating Water Intake Structure			E-1

# WELL LOG

PROJECT  
MIDLAND UNITS 1 AND 2

JOB NO.  
7220

SHEET NO.  
2 OF 2

WELL NO.  
E-1

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
	35				
	40				
592.2	42			42.0'-61.0' Sand, brown-gray, fine- to medium-grained, some fine pebbles. (Lacustrine)	Fill Lacustrine
	45				
	50				End of shift 2-12-82 at 51.0' Start of shift 2-15-82
	55				
	60			57.0'-61.0' Increasing silt content.	
573.2	61			61.0'-68.3' Silty Clay, gray. (Lacustrine)	
	65				
565.9	68			T.D.: 68.3', See well construction summary.	Completed hole 2-15-82

SAMPLE TYPE  
Bailer

SITE  
Circulating Water Intake Structure

WELL NO.  
E-1

D.9-79h

Revision 14  
12/82



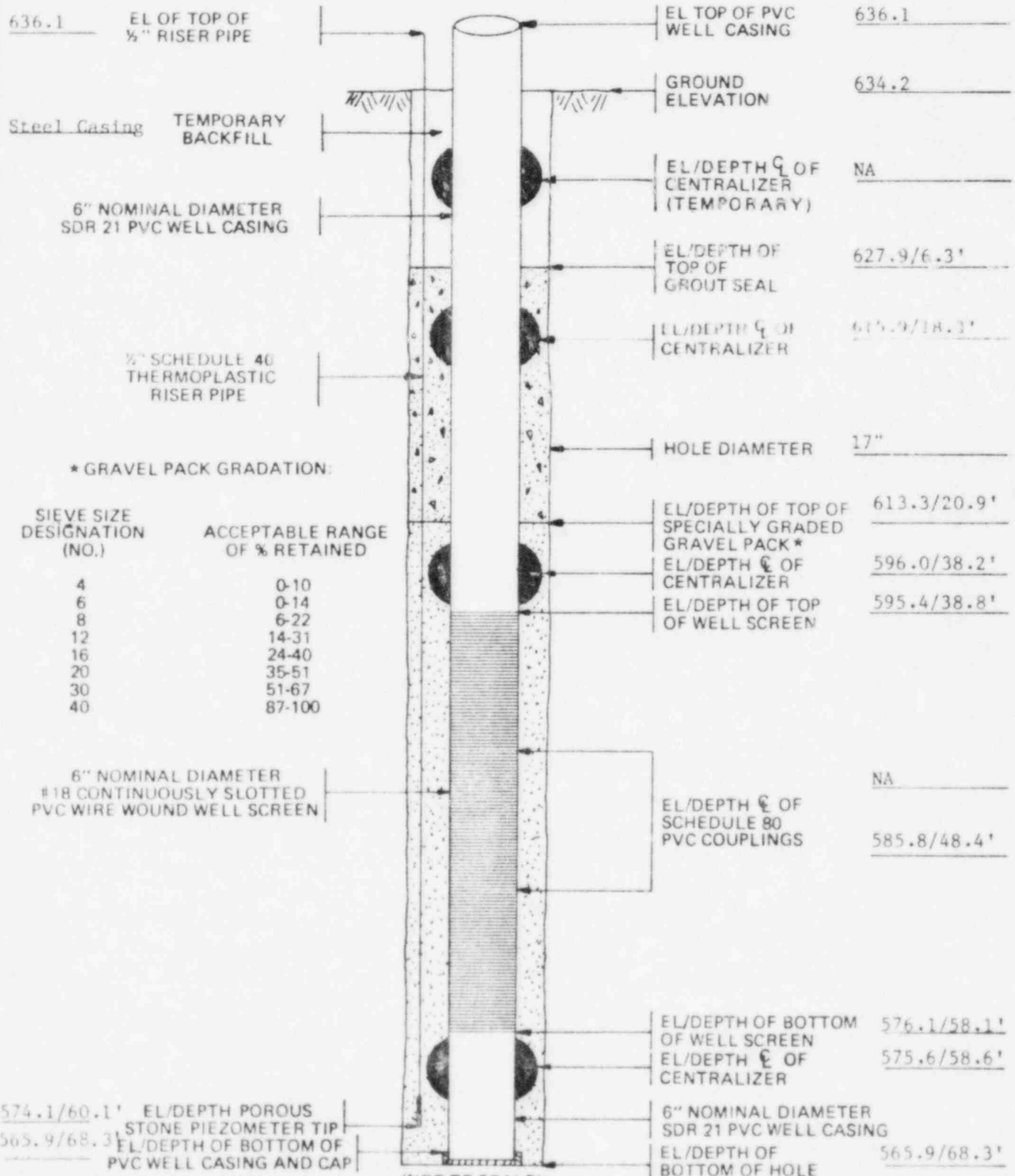
# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

JOB NO. 7220

WELL NO. E-1

SITE Circulating Water Intake Structure      COORDINATES S5160.2      E594.9  
 DATE STARTED 3/8/82      DATE COMPLETED 3/10/82  
 GEOLOGIST/HYDROGEOLOGIST T.R. Cullen      INSTALLED BY Kelly Contract Dewatering Co.



SIEVE SIZE DESIGNATION (NO.)	ACCEPTABLE RANGE OF % RETAINED
4	0-10
6	0-14
8	6-22
12	14-31
16	24-40
20	35-51
30	51-67
40	87-100



WELL INSTALLATION DATA SHEET

WELL NUMBER E-1

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S 5160.2 E 594.9 SURFACE ELEVATION 634.2

DATE STARTED 2/9/82 DATE COMPLETED 5/24/82 NO. OF SAMPLES 16

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool  
O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 68.3'  
I.D. 15 1/4" nom SPECIAL CONDITIONS 0-7.0' used 19.8" O.D. casing.

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS   
SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 19.3'  
CENTRALIZERS: 18.3', 38.2' 58.6'

LENGTH OF BLANK BELOW SCREEN 10.2' LENGTH OF RISER ABOVE SCREEN 40.7'  
LENGTH OF GRAVEL PACKED ZONE 47.4' CALCULATED AMOUNT OF GRAVEL PACK 62.1 cu.ft.  
ACTUAL AMOUNT OF GRAVEL PACK 66.3 cu.ft. CIRCULATION DURING GRAVEL PACKING   
CASAGRANDE TIP DEPTH 60.1' THICKNESS OF SEAL 14.6'  
TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 20.5 cu.ft.  
ACTUAL AMOUNT OF SEAL 23.0 cu.ft.

WELL DEVELOPMENT


TYPE OF DEVELOPMENT Intermittent Pumping  
DEVELOPING TIME 8 hours AMOUNT OF MATERIAL REMOVED < 0.01 cu.ft. (est)  
SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT SPECIAL CONDITIONS none  
FIRST TEST 0.2  
SECOND RETEST \_\_\_\_\_  
THIRD RETEST \_\_\_\_\_

STATIC WATER LEVEL 16.5'/617.7 DATE 2/11/82 EDUCTOR SETTING NA

SUBCONTRACTOR SUBMITTALS: Revision 14 12/82  
MICHIGAN DEWATERING WELL RECORD

SUPERVISED BY T. R. Cullen  
GEOLOGIST/HYDROGEOLOGIST

D.9-79j

<b>WELL LOG</b>		PROJECT	JOB NO.	SHEET NO.	WELL NO.
		MIDLAND UNITS 1 AND 2	7220	1 OF 2	E-2
SITE			COORDINATES		
Circulating Water Intake Structure			S5149.89 E609.27		
BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE	TOTAL DEPTH
2-9-82	2-18-82	Kelley Dewatering Co.	Bucyrus-Erie 60L	17"	65.2'
SCREEN DIA/LENGTH/SLOT		EL TOP OF CASING	GROUND SURFACE EL	DEPTH/EL GROUND WATER	LOGGED BY GEOLOGIST/HYDROGEOLOGIST
6"/15.0'/#18		638.9	634.3	15.0'/619.3	A.J. Fiksdal
CHECKED BY:		DATE	APPROVED BY:	DATE	
D.E. Young		6-21-82	W.C. Paris, Jr.	6-21-82	
ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
634.3	0				
633.3	1			0-1.0' Silty Sand, gray, fine- to medium-grained, with crushed gravel (Fill)	Changed location of hole 4.0' from pin, change is reflected in as-built coordinates. 0-2.0' Used 30" O.D. tapered auger to drill through frost zone. 2.0'-8.0' Drove 19.8" O.D. casing and cleaned out with 15" O.D. auger.
	2			1.0'-31.0' Sand, yellow-brown to gray-brown, fine- to coarse-grained. little fine gravel. (Fill)	
	3				End of shift 2-9-82 at 8.0'
	4				Start of shift 2-15-82
	10				
	15				 2-18-82
	20			21.0'-31.0' Trace fine gravel.	End of shift 2-15-82 at 21.0'
	25				Start of shift 2-16-82
	30				
603.3	31			31.0'-41.0' Silty Sand, brown, fine-grained, trace clay. (Fill)	31.0'-32.5' Very slow drilling rate.
	38				
599.3	45				
SAMPLE TYPE				SITE	
Grab and Bailer				Circulating water Intake Structure	
				WELL NO.	
				E-2	

Revision 14  
12/82

# WELL LOG






PROJECT

MIDLAND UNITS 1 AND 2

JOB NO.  
7220

SHEET NO.  
2 OF 2

WELL NO.  
E-2

ELEVATION	DEPTH	SAMPLE GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
599.3	35			
	36.0		36.0'-41.0' Trace medium- to coarse-grained sand.	
593.3	41		41.0'-43.0' Sand, brown, fine- to coarse-grained, with cobbles and wire. (Fill)	End of shift 2-16-82 at 42.0' Start of shift 2-17-82 Fill
591.3	43		43.0'-57.0' Sand, gray-brown, fine-grained, trace medium-grained sand, lignite. (Lacustrine)	Lacustrine
	51.0			End of shift 2-17-82 at 51.0' Start of shift 2-18-82
577.3	57		57.0'-65.2' Silty Clay, gray, some fine-grained sand. (Lacustrine)	
569.1	65.2		T.D.: 65.2', See well construction summary.	Completed hole 2-18-82

SAMPLE TYPE  
Bailer

SITE  
Circulating Water Intake Structure

WELL NO.  
E-2

D.9-791

Revision 14  
12/82





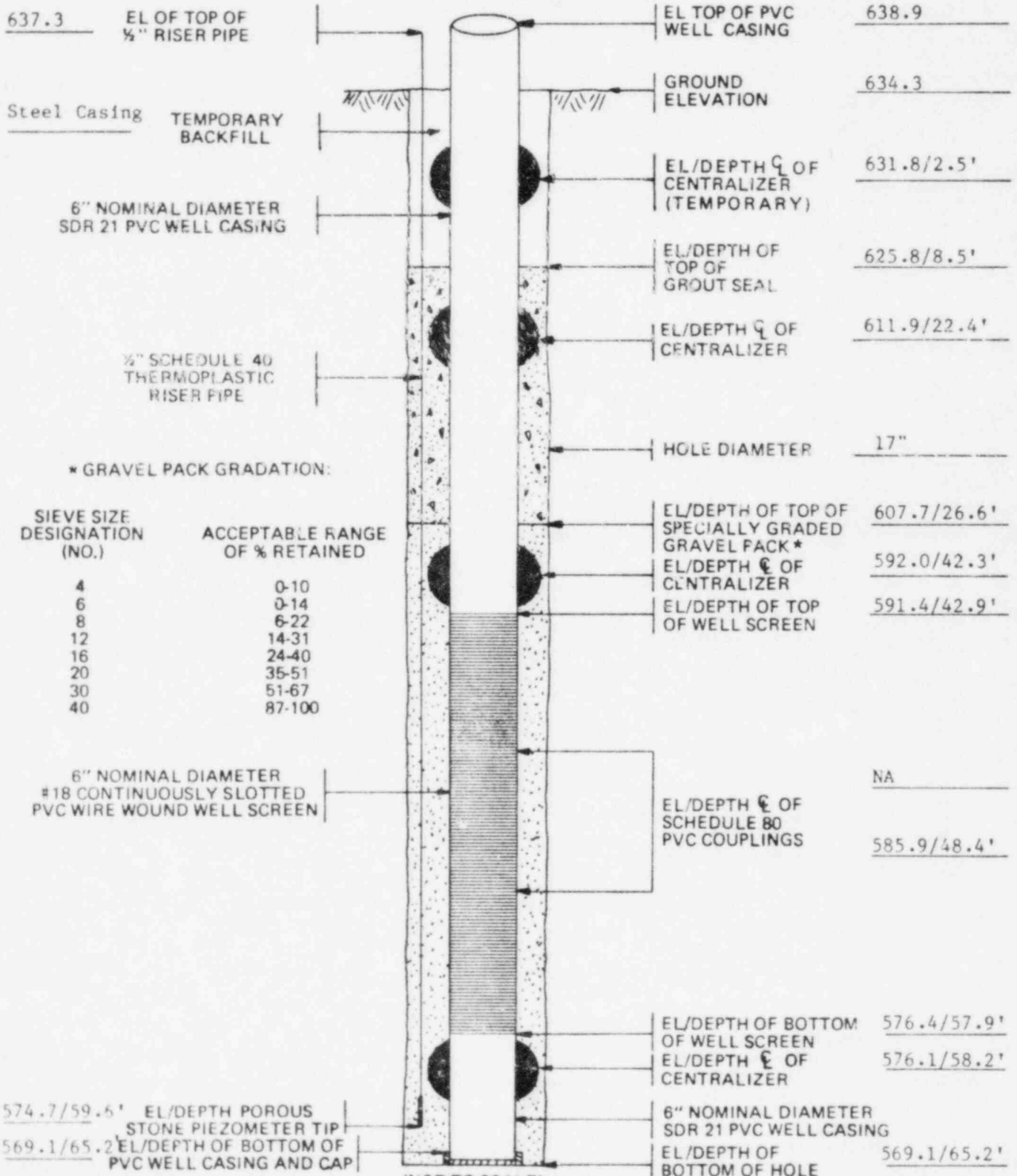
# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

JOB NO. 7220

WELL NO. E-2

SITE Circulating Water Intake Structure      COORDINATES S5150      E609.2  
 DATE STARTED 3/8/82      DATE COMPLETED 3/10/82  
 GEOLOGIST/HYDROGEOLOGIST T.R. Cullen      INSTALLED BY Kelly Contract Dewatering Co.



**\* GRAVEL PACK GRADATION:**

SIEVE SIZE DESIGNATION (NO.)	ACCEPTABLE RANGE OF % RETAINED
4	0-10
6	0-14
8	6-22
12	14-31
16	24-40
20	35-51
30	51-67
40	87-100

(NOT TO SCALE) D.9-79m

Revision 14  
12/82



WELL INSTALLATION DATA SHEET

WELL NUMBER E-2

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S 5150 E 609.2 SURFACE ELEVATION 634.3

DATE STARTED 2/9/82 DATE COMPLETED 4/22/82 NO. OF SAMPLES 15

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool  
O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 65.2'  
I.D. 15 1/4" nom SPECIAL CONDITIONS 0-8.0' used 19.8" O.D. casing.

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS   
SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 15.0'  
CENTRALIZERS: 2.5', 2.4', 42.3', 58.2'

LENGTH OF BLANK BELOW SCREEN 7.2' LENGTH OF RISER ABOVE SCREEN 47.5'  
LENGTH OF GRAVEL PACKED ZONE 38.6' CALCULATED AMOUNT OF GRAVEL PACK 42.0 cu.ft.  
ACTUAL AMOUNT OF GRAVEL PACK 42.6 cu.ft. CIRCULATION DURING GRAVEL PACKING   
CASAGRANDE TIP DEPTH 59.6' THICKNESS OF SEAL 18.1'  
TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 24.2 cu.ft.  
ACTUAL AMOUNT OF SEAL 28.1 cu.ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping  
DEVELOPING TIME 8 hours AMOUNT OF MATERIAL REMOVED <0.01 cu.ft (est)

SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT SPECIAL CONDITIONS none  
FIRST TEST 0.6  
SECOND RETEST \_\_\_\_\_  
THIRD RETEST \_\_\_\_\_

STATIC WATER LEVEL 15.0'/619.3 DATE 2/18/82 EDUCTOR SETTING NA

SUBCONTRACTOR SUBMITTALS:  
MICHIGAN DEWATERING WELL RECORD  Revision 14  
12/82

SUPERVISED BY  
GEOLOGIST/HYDROGEOLOGIST T.R. Cullen  
D.9-79n

<b>WELL LOG</b>			PROJECT	JOB NO.	SHEET NO.	WELL NO.
			MIDLAND UNITS 1 AND 2	7220	1 OF 2	E-3
SITE				COORDINATES		
Circulating Water Intake Structure				S5139.1 E 601.6		
BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE	TOTAL DEPTH	SAMPLES
2-8-82	2-23-82	Kelly Dewatering Co.	Bucyrus-Erie 22 W	17"	63.3'	16
SCREEN DIA/LENGTH/SLOT		EL TOP OF CASING	GROUND SURFACE EL	DEPTH/EL GROUND WATER		LOGGED BY GEOLOGIST/HYDROGEOLOGIST
6"/17.0'/#18		637.2	634.4	15.0'/619.4		A.J. Fiksdal
CHECKED BY:			DATE	APPROVED BY:		DATE
L.E. Young			6-21-82	W.C. Paris, Jr.		6-21-82
ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES:	
634.4	0					
632.4	2			0-2.0' Silty Clay, brown, with sand and fine crushed gravel. (Fill)	0-2.2' Used 30" O.D. tapered auger to drill through frost zone.	
	2			2.0'-15.0' Sand, brown, fine- to coarse-grained, with fine gravel. (Fill)	2.2-8.0' Drove 19.8" O.D. casing and cleaned out to 7.0' with 15" O.D. auger.	
	5				End of shift 2-8-82 at 7.0'	
	10				Start of shift 2-18-82	
619.4	15				2-18-82	
618.4	16			15.0'-16.0' Silty Clay, brown (Fill)	End of shift 2-18-82 at 15.0'	
	16			16.0'-27.0' Sand, brown-yellow, fine- to coarse-grained, trace fine gravel. (Fill)	Start of shift 2-19-82	
	20					
607.4	27			27.0'-32.0' Sandy Clay, brown with fine- to medium-grained sand, fine gravel. (Fill)	27.0' Driller reports that bailer will not advance.	
	30					
602.4	32			32.0'-47.0' Sand, brown, fine-grained, some gray clay, trace fine gravel. (Fill)	32.0' Drill penetration rate increases.	
	35					
599.4						
SAMPLE TYPE			SITE			WELL NO.
Grab and Bailer			Circulating Water Intake Structure			E-3

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# WELL LOG

PROJECT MIDLAND UNITS 1 AND 2

JOB NO. 7220

SHEET NO. 2 OF 2

WELL NO. E-3

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
	35				
	40			37.0'-47.0' No clay.	End of shift 2-19-82 at 38.0' Start of shift 2-22-82
587.4	47			47.0'-60.0' Sand, gray fine-grained, trace lignite. (Lacustrine)	Fill Lacustrine
	50				
	55				
574.4	60			60.0'-63.3' Sand, gray, very fine-grained, little silt, trace clay and lignite. (Lacustrine)	60.0' Drill penetration rate decreases. End of shift 2-22-82 at 61.5' Start of shift 2-23-82
571.1	63.3			T.D.: 63.3', See well construction summary.	Completed hole 2-23-82

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SAMPLE TYPE  
Bailer

SITE  
Circulating Water Intake Structure

WELL NO.  
E-3



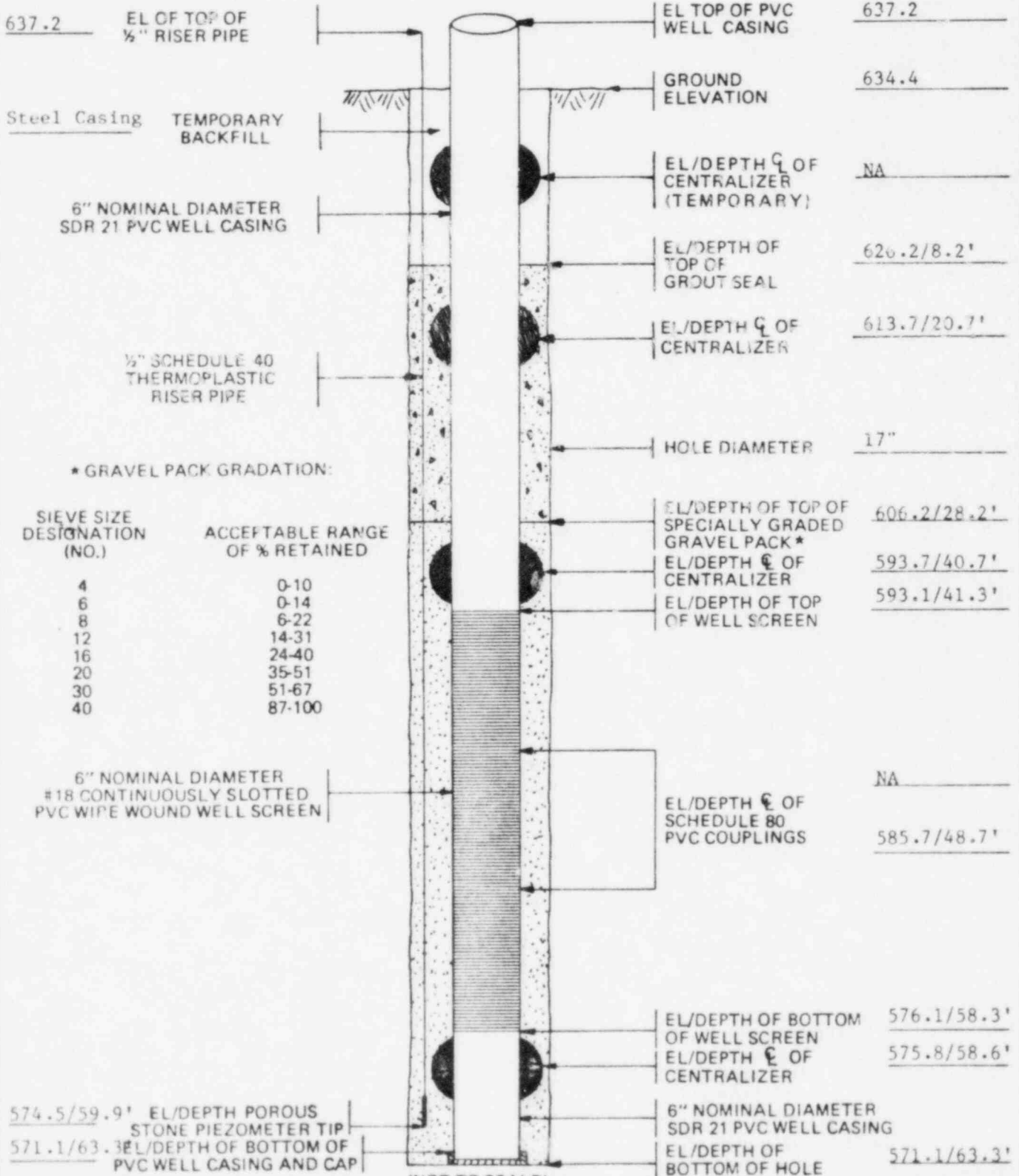
# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

JOB NO. 7220

WELL NO. E-3

SITE Circulating Water Intake Structure COORDINATES S5139.1 E 601.6  
 DATE STARTED 3/9/82 DATE COMPLETED 3/10/82  
 GEOLOGIST/HYDROGEOLOGIST T.R. Cullen INSTALLED BY Kelly Contract Dewatering Co.



Revision 14  
12/82



WELL INSTALLATION DATA SHEET

WELL NUMBER E-3

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S 5139.1 E 601.6 SURFACE ELEVATION 634.4

DATE STARTED 2/8/82 DATE COMPLETED 4/21/82 NO. OF SAMPLES 16

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool  
O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 63.3'  
I.D. 15 1/4" nom SPECIAL CONDITIONS 0-8.0' used 19.8" O.D. casing.

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS   
SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 17.0'  
CENTRALIZERS: 20.7, 40.7, 58.6'

LENGTH OF BLANK BELOW SCREEN 5.0' LENGTH OF RISER ABOVE SCREEN 44.1'  
LENGTH OF GRAVEL PACKED ZONE 35.1' CALCULATED AMOUNT OF GRAVEL PACK 47.0 cu. ft.  
ACTUAL AMOUNT OF GRAVEL PACK 47.5 cu. ft. CIRCULATION DURING GRAVEL PACKING   
CASAGRANDE TIP DEPTH 59.9' THICKNESS OF SEAL 20.0'  
TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 26.8 cu. ft.  
ACTUAL AMOUNT OF SEAL 30.6 cu. ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping  
DEVELOPING TIME 8 hours AMOUNT OF MATERIAL REMOVED < 0.01 cu. ft. (est)

SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT SPECIAL CONDITIONS \_\_\_\_\_  
FIRST TEST 0.0  
SECOND RETEST \_\_\_\_\_  
THIRD RETEST \_\_\_\_\_

STATIC WATER LEVEL 15.0'/619.4 DATE 2/18/82 EDUCTOR SETTING NA

SUBCONTRACTOR SUBMITTALS: Revision 14  
MICHIGAN DEWATERING WELL RECORD  12/82

SUPERVISED BY  
GEOLOGIST/HYDROGEOLOGIST T. R. Cullen

D.9-79r

<b>WELL LOG</b>			PROJECT	JOB NO.	SHEET NO.	WELL NO.
			MIDLAND UNITS 1 AND 2	7220	1 OF 1	E-4
SITE				COORDINATES		
Circulating Water Intake Structure				S5124	E607.7	
BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE	TOTAL DEPTH	SAMPLES
2-8-82	2-24-82	Kelley Dewatering Co.	Bucyrus-Erie 22 W	17"	25.5'	7
SCREEN DIA/LENGTH/SLOT		EL TOP OF CASING	GROUND SURFACE EL	DEPTH/EL GROUND WATER		LOGGED BY GEOLOGIST/HYDROGEOLOGIST:
NA		NA	634.2	15.3'/618.9		A.J. Fiksdal
CHECKED BY:			DATE	APPROVED BY:		DATE
L.E. Young			6-22-82	W.C. Paris, Jr.		6-28-82

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES:
634.2	0				
	1			0-2.0' Silty Clay, gray, with fine to coarse-grained sand and fine crushed gravel. (Fill)	0-2.0' Used 30" tapered auger to drill through frost zone.
632.2	2			2.0'4.0' Sandy, yellow-brown, fine to medium-grained. (Fill)	2.0'-8.0' Drove 19.8" O.D. casing and cleaned out with 15" O.D. auger to 7.0'.
630.2	4			4.0'-24.0' Sand, brown, fine- to coarse-grained, fine rounded gravel. (Fill)	
	5				End of shift 2-8-82 at 7.0'
	3				Start of shift 2-23-82
	10				
	15				▽ 2-23-82
	5				
	20				
	6				
	24				End of shift 2-23-82 at 24.0'
610.2	24			24.0'-25.5' Concrete, dark gray, pieces of metal and fine- to coarse-grained gray-brown sand. (Fill)	Start of shift 2-24-82
608.7	25				24.0'-26.2' Casing out-of-plumb
	25.5				End of shift 2-24-82 at 25.5'
				T.D.: 25.5', well abandoned 2-24-82. See well plugging report.	Well E-4A replaces well E-4.
	30				
	35				

SAMPLE TYPE	SITE	WELL NO.
Grab and Bailer	Circulating Water Intake Structure	E-4

Revision 14  
12/82

# WELL LOG

PROJECT

MIDLAND UNITS 1 AND 2

JOB NO.  
7220

SHEET NO.  
OF  
1 2

WELL NO.  
E-4A

SITE

COORDINATES

Circulating Water Intake Structure







S 5122.1

E 605.8

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE	TOTAL DEPTH	SAMPLES
5-6-82	5-11-82	Kelley Dewatering Co.	Bucyrus-Erie 22W	17"	74.0'	17

SCREEN DIA./LENGTH/SLOT	EL TOP OF CAGING	GROUND SURFACE EL	DEPTH/EL GROUND WATER	LOGGED BY GEOLOGIST/HYDROGEOLOGIST
6"/24.9'/#18	636.6	634.2	10.2'/624.0	M.D. Johnson

CHECKED BY:	DATE	APPROVED BY:	DATE
A.J. Fiksdal	6-15-82	L.E. Young	8-5-82

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
634.2	0				
	1			0-3.0' Gravel, gray, fine to coarse, crushed, some sand and silt. (Fill)	Well E-4A replaces well E-4. 0-1.5' Hand dug starter hole.
631.2	3			3.0'-27.0' Sand, brown, fine- to coarse-grained, some gravel. (Fill)	
	5				
	10				
	15				
	20				
	25				
607.2	27			27.0'-27.8' Concrete. (Fill)	 5-5-82
606.4	27.8			27.8'-33.0' Clay, gray-brown, mottled, some sand and silt, trace fine gravel. (Fill)	
	30				
601.2	33			33.0'-62.0' Sand, brown, fine- to medium-grained. (Lacustrine)	Fill Lacustrine
599.2	35				Revision 14 12/82

SAMPLE TYPE  
Grab and Bailer

SITE  
Circulating Water Intake Structure

WELL NO.  
E-4A



# WELL LOG

PROJECT  
MIDLAND UNITS 1 AND 2

JOB NO.  
7220

SHEET NO.  
OF  
2 2

WELL NO.  
E-4A

ELEVATION	DEPTH	SAMPLE GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
599.2	35			
597.2	9			
	10			
	40			
				End of shift 5-6-82 at 47.0'
				Start of shift 5-7-82
	11			
	45			
			52.0' Sand becomes gray.	
	12			
	50			
	13			
	55			
	14			
	60			
572.2				End of shift 5-7-82 at 63.0'
	15		62.0'-66.0' Sandy Silt, gray, fine-grained sand. (Lacustrine)	Start of shift 5-11-82
	65			
568.2	66		66.0'-74.0' Clay, gray, thinly laminated. (Lacustrine)	
	16			
	70			
	17			
	74		T.D.: 74.0', See well construction summary.	Completed hole 5-11-82.

SAMPLE TYPE  
Bailer

SITE

Circulating Water Intake Structure

WELL NO.

E-4A

D.9-79u

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D.9-79v



# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

JOB NO. 7220

WELL NO. E-4A

SITE Service Water Pump Structure

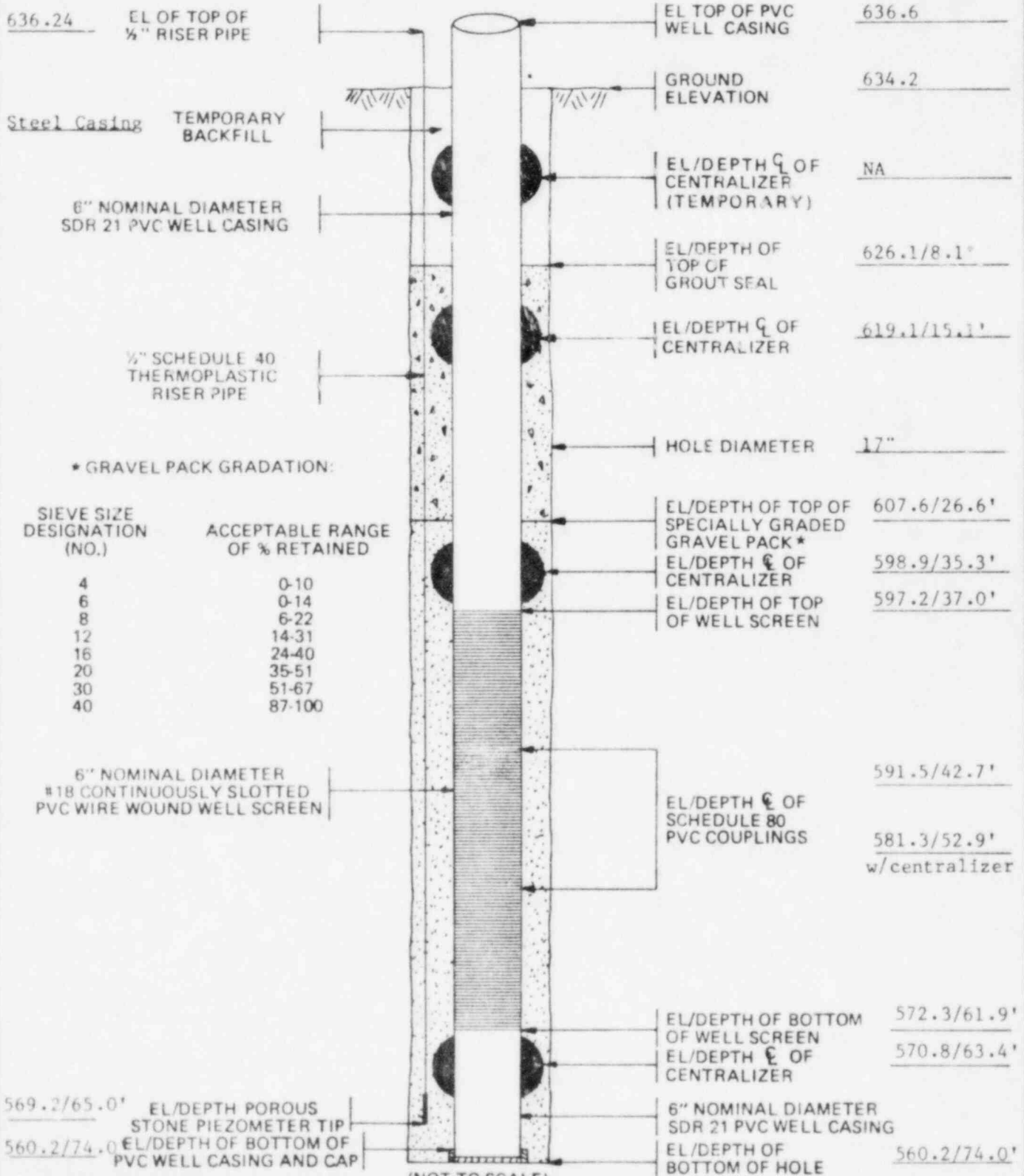
COORDINATES S5122.1 E605.8

DATE STARTED 5/19/82

DATE COMPLETED 5/21/82

GEOLOGIST/HYDROGEOLOGIST M.D. Johnson

INSTALLED BY Kelly Contract Dewatering Co.



(NOT TO SCALE) D.9-80

Revision 14



WELL INSTALLATION DATA SHEET

WELL NUMBER E-4A

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S 5122.1 E 605.8 SURFACE ELEVATION 634.2

DATE STARTED 5/6/82 DATE COMPLETED 5/26/82 NO. OF SAMPLES 17

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool  
O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 74.0'  
I.D. 15 1/4" nom SPECIAL CONDITIONS Relocated 1.5' from E-4 to avoid obstruction.

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS   
SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 24.9'  
CENTRALIZERS: 15.1', 35.3', 52.9', 63.4'

LENGTH OF BLANK BELOW SCREEN 12.1' LENGTH OF RISER ABOVE SCREEN 39.4'  
LENGTH OF GRAVEL PACKED ZONE 47.4' CALCULATED AMOUNT OF GRAVEL PACK 63.2 cu.ft.  
ACTUAL AMOUNT OF GRAVEL PACK 67.3 cu.ft. CIRCULATION DURING GRAVEL PACKING   
CASAGRANDE TIP DEPTH 65.0' THICKNESS OF SEAL 18.5'  
TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 19.2 cu.ft.  
ACTUAL AMOUNT OF SEAL 20.9 cu.ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping  
DEVELOPING TIME 8 hours AMOUNT OF MATERIAL REMOVED <0.01 cu.ft. (est)

SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT SPECIAL CONDITIONS none  
FIRST TEST 4.3  
SECOND RETEST \_\_\_\_\_  
THIRD RETEST \_\_\_\_\_

STATIC WATER LEVEL 10.2' / 624.0 DATE 5/5/82 EDUCTOR SETTING NA

SUBCONTRACTOR SUBMITTALS:

MICHIGAN DEWATERING WELL RECORD

Revision 14  
12/82

SUPERVISED BY M. D. Johnson  
D.9-80a GEOLOGIST/HYDROGEOLOGIST

WELL LOG			PROJECT MIDLAND UNITS 1 AND 2		JOB NO. 7220	SHEET NO. OF 1 2	WELL NO. E-5
SITE Circulating Water Intake Structure				COORDINATES S 5111.5 E 620.2			
BEGUN 4-30-82	COMPLETED 5-5-82	DRILLER Kelley Dewatering Co.	DRILL MAKE AND MODEL Bucyrus-Erie 22W	HOLE SIZE 17"	TOTAL DEPTH 73.7'	SAMPLES 17	
SCREEN DIA/LENGTH/SLOT 6"/29.3'/#18		EL TOP OF CASING 635.4	GROUND SURFACE EL 634.5	DEPTH/EL GROUND WATER 10.5'/624.0		LOGGED BY GEOLOGIST/HYDROGEOLOGIST: A.J. Fiksdal	
CHECKED BY L.E. Young			DATE 8-5-82	APPROVED BY: W.C. Paris, Jr.			DATE 8-5-82
ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES		
634.5	0						
633.5	1	1		0-1.0' Gravel, gray, crushed, fine- to coarse-grained sand. (Fill)	Well E-5 relocated to avoid concrete footing. 0-2.0' Hand dug starter hole. End of shift 4-30-82 at 2.0'		
632.5	2	2		1.0'-2.0' Clay, red-brown mottled, fine- to coarse-grained sand, coarse gravel. (Fill)	Start of shift 5-1-82		
	3			2.0'-27.0' Sand, brown, fine- to coarse-grained, some fine gravel, trace clay. (Fill)			
	5						
	10	4			▽ 5-1-82		
	15	5					
	20	6					
	25	7					
607.5	27	8		27.0'-32.0' Clay, brown, some silt, fine- to coarse-grained sand, fine gravel. (Fill)			
	30						
602.5	32	9		32.0'-47.0' Sand, brown, fine-grained, some silt and clay, trace fine gravel. (Lacustrine)	Fill End of shift 5-1-82 at 32.0'		
	35				Lacustrine Start of shift 5-4-82		
599.5	35				Revision 14 12/82		
SAMPLE TYPE Grab and Bailer		SITE Circulating Water Intake Structure			WELL NO. E-5		



# WELL LOG

PROJECT MIDLAND UNITS 1 AND 2

JOB NO. 7220

SHEET NO. 2 OF 2

WELL NO. E-5

ELEVATION	DEPTH	SAMPLE GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
599.5	35			
	35-40	[Dotted pattern]		
	40-45	[Dotted pattern]	45.0' Less gravel, sand becomes more gray.	
587.5	47		47.0'-64.0' Sand, gray, fine-grained, trace silt, lignite. (Lacustrine)	
	47-50	[Dotted pattern]		
	50-55	[Dotted pattern]		End of shift 5-4-82 at 55.0' Start of shift 5-5-82
	55-60	[Dotted pattern]		
570.5	64		64.0'-73.7' Clay, gray, some silt, laminated. (Lacustrine)	
	64-70	[Hatched pattern]		
	70-73.7	[Hatched pattern]		
560.8	73.7		T.D.: 73.7', See well construction summary.	Completed hole 5-5-82

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SAMPLE TYPE  
Bailer

SITE  
Circulating Water Intake Structure

WELL NO.  
E-5



# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

JOB NO. 7220

WELL NO. E-5

SITE Service Water Pump Structure

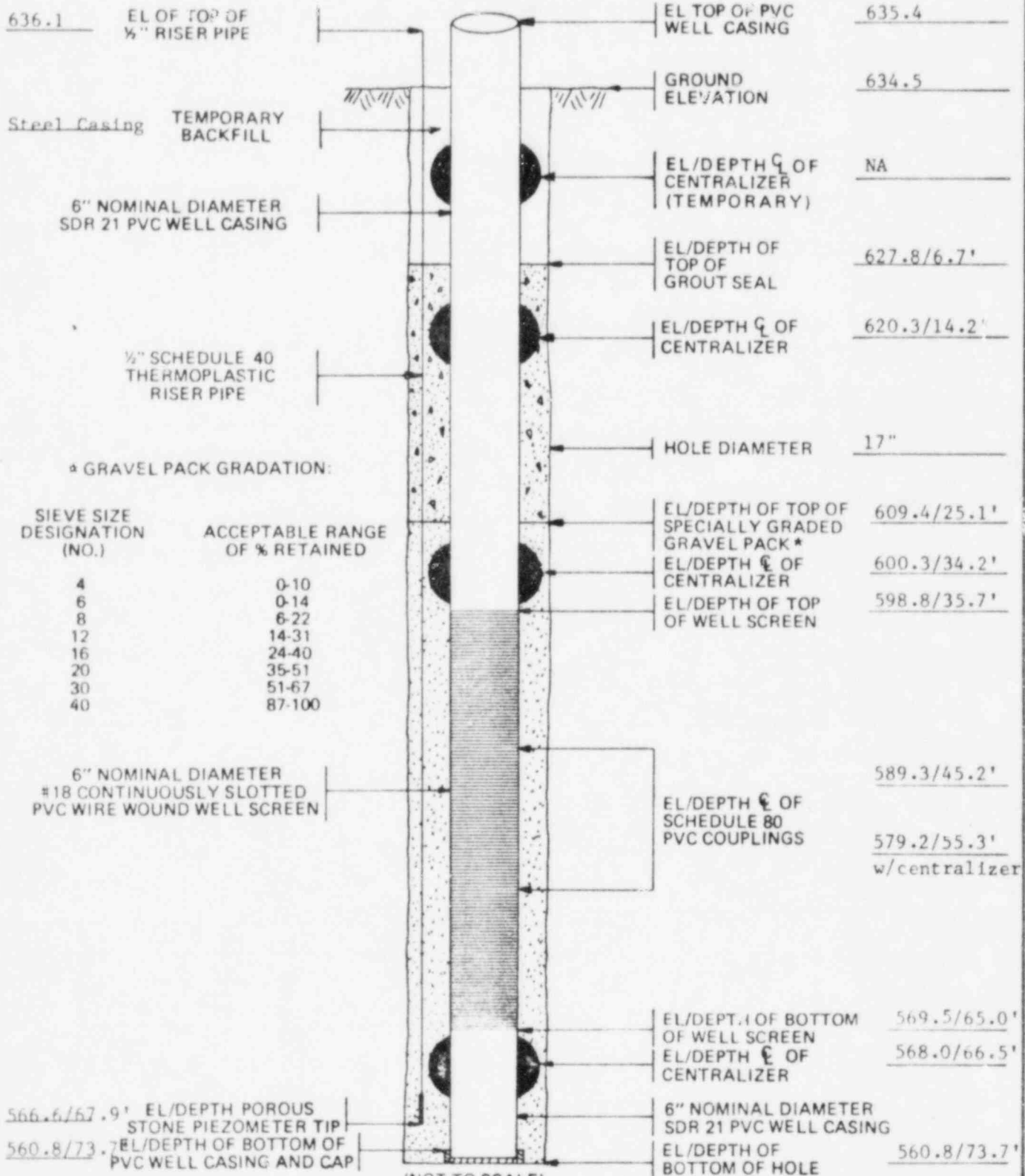
COORDINATES S5111.5 E620.2

DATE STARTED 5/13/82

DATE COMPLETED 5/19/82

GEOLOGIST/HYDROGEOLOGIST M.D. Johnson

INSTALLED BY Kelly Contract Dewatering Co.



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WELL INSTALLATION DATA SHEET

WELL NUMBER E-5

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S 5111.5 E 620.2 SURFACE ELEVATION 634.5

DATE STARTED 4/30/82 DATE COMPLETED 5/26/82 NO. OF SAMPLES 17

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool  
O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 73.7'  
I.D. 15 1/4" nom SPECIAL CONDITIONS none

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS   
SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 29.3'  
CENTRALIZERS: 14.2', 34.2', 55.3', 66.5'

LENGTH OF BLANK BELOW SCREEN 8.7' LENGTH OF RISER ABOVE SCREEN 36.6'  
LENGTH OF GRAVEL PACKED ZONE 48.6' CALCULATED AMOUNT OF GRAVEL PACK 65.0 cu.ft.  
ACTUAL AMOUNT OF GRAVEL PACK 72.3 cu.ft. CIRCULATION DURING GRAVEL PACKING   
CASAGRANDE TIP DEPTH 67.9' THICKNESS OF SEAL 18.4'  
TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 19.2 cu.ft.  
ACTUAL AMOUNT OF SEAL 19.4 cu.ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping  
DEVELOPING TIME 16 hours AMOUNT OF MATERIAL REMOVED <0.1 cu.ft. (est)  
SAND CONCENTRATION: (ppm by weight) SPECIAL CONDITIONS Added water for second development,  
DURING DEVELOPMENT  
FIRST TEST 102.9  
SECOND RETEST 0.6  
THIRD RETEST \_\_\_\_\_

STATIC WATER LEVEL 10.5' / 624.0 DATE 5/4/82 EDUCTOR SETTING NA

CONTRACTOR SUBMITTALS:

MICHIGAN DEWATERING WELL RECORD

Revision 14  
12/82

SUPERVISED BY  
GEOLOGIST/HYDROGEOLOGIST M. D. Johnson



# WELL LOG


PROJECT: MIDLAND UNITS 1 AND 2  
 JOB NO.: 7220  
 SHEET NO. OF: 1 OF 2  
 WELL NO.: E-6

SITE: Circulating Water Intake Structure  
 COORDINATES: S 5100.9 E 635.6

BEGUN: 4-27-82 COMPLETED: 4-30-82 DRILLER: Kelley Dewatering Co.  
 DRILL MAKE AND MODEL: Bucyrus-Erie 22W HOLE SIZE: 17" TOTAL DEPTH: 69.8' SAMPLES: 18

SCREEN DIA/LENGTH/SLOT: 6"/24.0'/#18 EL TOP OF CASING: 637.9 GROUND SURFACE EL: 634.8 DEPTH/EL GROUND WATER: 10.5'/624.3 LOGGED BY GEOLOGIST/HYDROGEOLOGIST: T.R. Cullen

CHECKED BY: L.E. Young DATE: 8-5-82 APPROVED BY: W.C. Paris, Jr. DATE: 8-5-82

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
634.8	0				
	1			0-7.0' Silty Clay, brown, some sand and fine gravel. (Fill)	Well E-6 relocated to avoid concrete footing. 0-2.0' Hand dug starter hole.
	2				
627.8	7			7.0'-28.5' Sand, brown, fine- to coarse-grained, some silt, trace fine gravel. (Fill)	 4-28-82
	3				
	4				
	5				
	15			21.0' Wood pieces	End of shift 4-27-82 at 22.0' Start of shift 4-28-82
	20				
607.8	27			27.0'-27.5' Concrete mud mat.	Fill Till
607.3	27.5				
606.3	28			28.5'-35.0' Silty Clay, red-brown, fine- to medium-grained sand, gravel. (Fill)	
	30				
	35				
592.8					

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SAMPLE TYPE: Grab and Bailor SITE: Circulating Water Intake Structure WELL NO.: E-6



# WELL LOG

PROJECT MIDLAND UNITS 1 AND 2

JOB NO. 7220

SHEET NO. OF 2 2

WELL NO. E-6

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
599.8	35				
597.8	37			35.0'-37.0' Silty Clay, gray, coarse- to fine-grained sand, fine gravel, silt partings. (Till)	Till End of shift 4-29-82 at 37.0'
	40			37.0'-64.0' Sand, gray-brown, fine- to medium-grained, trace to some coarse angular gravel. (Lacustrine)	Lacustrine Start of shift 4-29-82
	45				
	50				
	55				
	60				
	63.0				End of shift 4-29-82 at 63.0'
570.8	64			64.0'-66.5' Silty Sand or Sandy Silt, gray, fine- to very fine-grained sand, silt. (Lacustrine)	Start of shift 4-30-82
568.3	66.5			66.5'-69.8' Silty Clay, gray, fine-grained sand, layered silty clay. (Lacustrine)	
565.0	69.8			T.D.: 69.8', See well construction summary.	Completed hole 4-30-82

SAMPLE TYPE  
Bailer

SITE

Circulating Water Intake Structure  
D.9-80g

WELL NO.

E-6

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# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

JOB NO. 7220

WELL NO. E-6

SITE Service Water Pump Structure

COORDINATES S5100.9

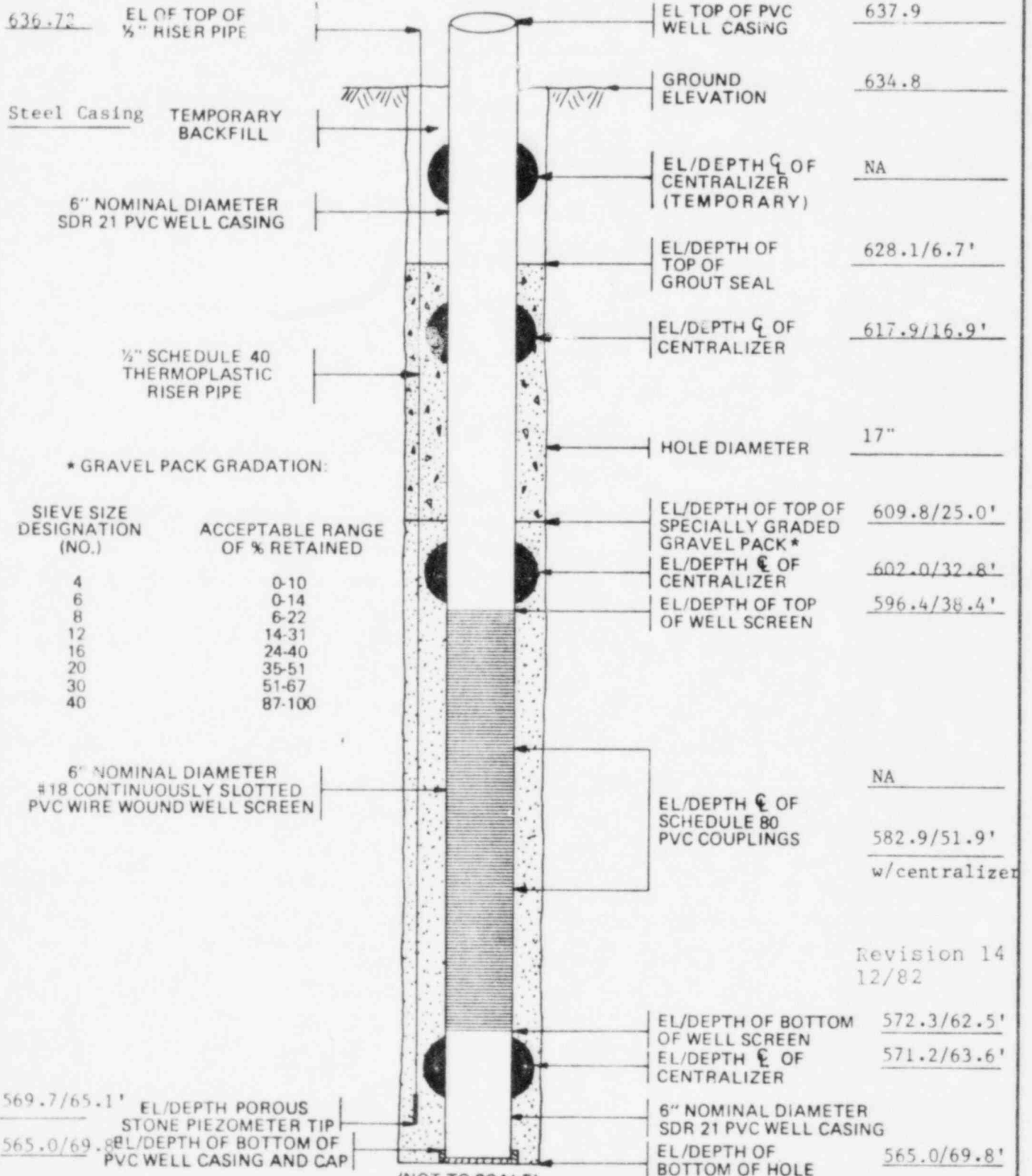
E635.6

DATE STARTED 5/13/82

DATE COMPLETED 5/19/82

GEOLOGIST/HYDROGEOLOGIST M.D. Johnson

INSTALLED BY Kelly Contract Dewatering Co.



(NOT TO SCALE) D. 9-80h

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WELL INSTALLATION DATA SHEET

WELL NUMBER E-6

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Felly Contract Dewatering Co.

COORDINATES S5100.9 E635.6 SURFACE ELEVATION 634.8

DATE STARTED 4/27/82 DATE COMPLETED 5/25/82 NO. OF SAMPLES 18

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool  
O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 69.8'  
I.D. 15 1/4" nom SPECIAL CONDITIONS Hit concrete mudmat from 27.0-27.5'

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS   
SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 24.1'  
CENTRALIZERS: 16.9', 32.8', 51.9', 63.6'

LENGTH OF BLANK BELOW SCREEN 7.3' LENGTH OF RISER ABOVE SCREEN 41.5'  
LENGTH OF GRAVEL PACKED ZONE 44.8' CALCULATED AMOUNT OF GRAVEL PACK 59.9 cu. ft.  
ACTUAL AMOUNT OF GRAVEL PACK 59.4 cu. ft. CIRCULATION DURING GRAVEL PACKING   
CASAGRANDE TIP DEPTH 65.1' THICKNESS OF SEAL 18.3'  
TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 19.0 cu. ft.  
ACTUAL AMOUNT OF SEAL 19.4 cu. ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping  
DEVELOPING TIME 8 hours AMOUNT OF MATERIAL REMOVED <0.01 cu. ft. (est)

SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT SPECIAL CONDITIONS none  
FIRST TEST 4.6  
SECOND RETEST \_\_\_\_\_  
THIRD RETEST \_\_\_\_\_

STATIC WATER LEVEL 10.5'/624.3 DATE 4/28/82 EDUCTOR SETTING NA

SUBCONTRACTOR SUBMITTALS:

MICHIGAN DEWATERING WELL RECORD

Revision 14  
12/82

SUPERVISED BY  
GEOLOGIST/HYDROGEOLOGIST M.D. Johnson

D.9-80i

WELL LOG			PROJECT	JOB NO.	SHEET NO.	WELL NO.
			MIDLAND UNITS 1 AND 2	7220	1 OF 2	E-7
SITE			COORDINATES			
Circulating Water Intake Structure			S 5085.2	E 658.0		
BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE	TOTAL DEPTH	SAMPLES
4-15-82	4-19-82	Kelley Dewatering Co.	Bucyrus-Erie 22W	17"	57.8'	18
SCREEN DIA/LENGTH/SLOT		EL TOP OF CASING	GROUND SURFACE EL	DEPTH/EL GROUND WATER		LOGGED BY GEOLOGIST/HYDROGEOLOGIST
6"/9.0'/#18		639.0	634.8	11.0'/623.8		T.R. Cullen
CHECKED BY			DATE	APPROVED BY:		DATE
L.E. Young			8-5-82	W.C. Paris, Jr.		8-5-82

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
634.8	0				
633.8	1			0-1.5' <u>Sandy Gravel</u> , gray, fine- to coarse-grained sand, coarse gravel. (Fill)	Well E-7 relocated to avoid concrete footing.  0-2.0' Hand dug starter hole.
	2			1.5'-5.0' <u>Clay</u> , red-brown, fine- to coarse-grained sand, gravel. (Fill)	
629.8	5			5.0'-27.0' <u>Sand</u> , brown, fine- to coarse-grained, rounded gravel. (Fill)	
	3				
	10				▽ 4-15-82
	4				
	15				End of shift 4-15-82 at 15.0'
	5				Start of shift 4-16-82
	20				
	6				
	25				
	7				
607.8	27			27.0'-27.5' <u>Concrete</u> , gray, mud mat. (Fill)	
607.3	27.5			27.5'-28.0' <u>Sand</u> , brown, fine- to coarse-grained. (Fill)	
606.8	28			28.0'-35.0' <u>Sandy Clay</u> , brown-orange mottled. (Fill)	
	10				
	30				
	11				
599.8	35				Fill Till

SAMPLE TYPE	SITE	WELL NO.
Grab and Bailor	Circulating Water Intake Structure	E-7



# WELL LOG

PROJECT MIDLAND UNITS 1 AND 2

JOB NO. 7220

SHEET NO. OF 2 2

WELL NO. E-7

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
599.8	35				
	35			35.0'-40.0' Silty Clay, gray-black, trace fine-grained sand, occasional pebbles. (Till)	
	40			40.0'-47.0' Sand, gray, fine- to medium-grained, trace fine gravel. (Lacustrine)	Till Lacustrine End of shift 4-16-82 at 41.0' Start of shift 4-19-82
	47			47.0'-57.6' Sandy Clay, gray, very fine- to fine-grained sand. (Lacustrine)	
	55			57.6'-57.8' Sand, light gray, fine- to medium-grained. (Lacustrine)	Completed 4-19-82
577.2 577.0	57.6 57.8			T.D.: 57.8', See well construction summary.	

SAMPLE TYPE  
BailerSITE  
Circulating Water Intake StructureWELL NO.  
E-7

D.9-80k

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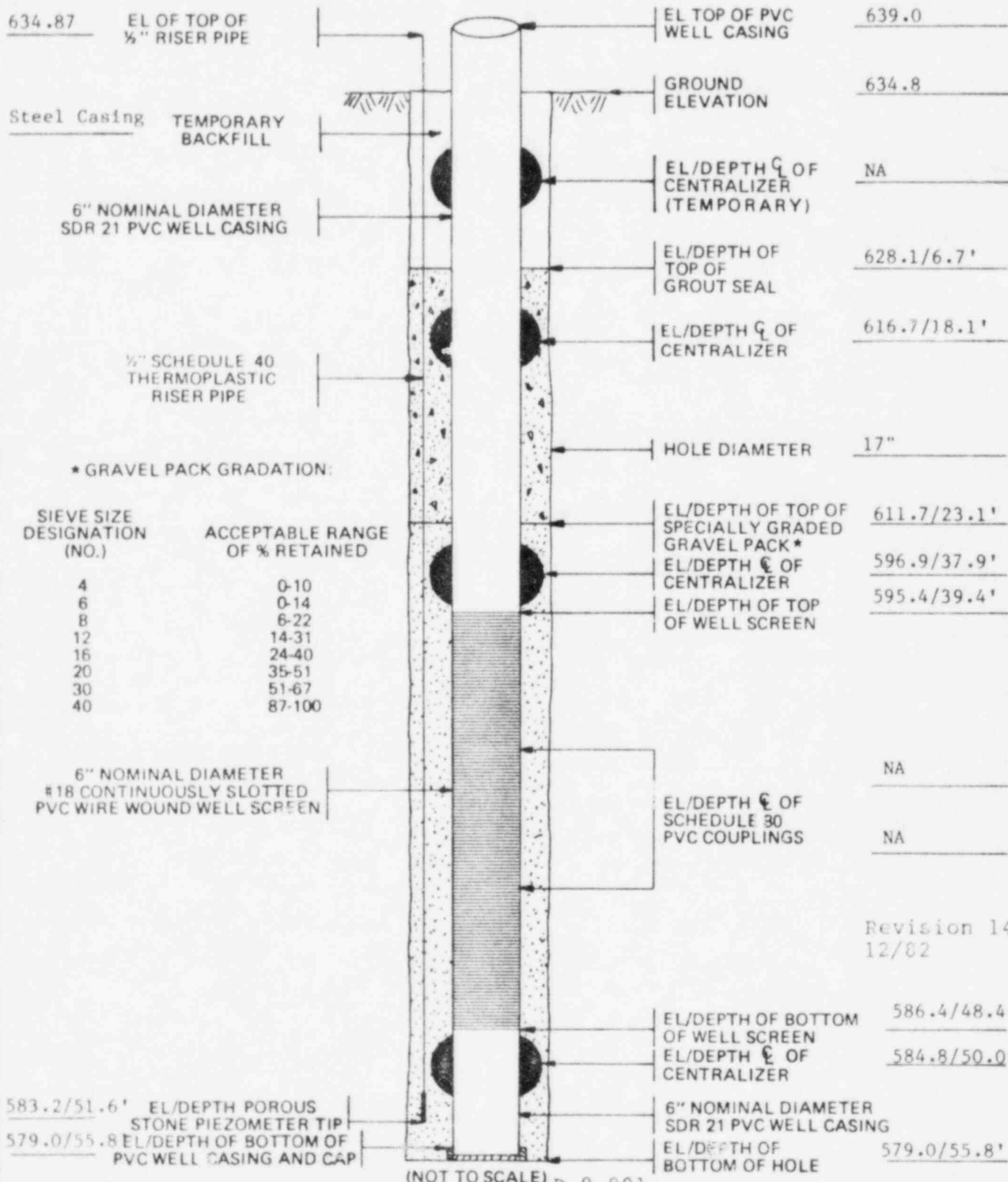
# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

JOB NO. 7220

WELL NO. E-7

SITE Service Water Pump Structure COORDINATES S5085.2 E658.0  
 DATE STARTED 5/13/82 DATE COMPLETED 5/19/82  
 GEOLOGIST/HYDROGEOLOGIST M.D. Johnson INSTALLED BY Kelly Contract Dewatering Co.



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WELL INSTALLATION DATA SHEET

WELL NUMBER E-7

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S5085.2 E658.0 SURFACE ELEVATION 634.8

DATE STARTED 4/15/82 DATE COMPLETED 5/27/82 NO. OF SAMPLES 18

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool  
O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 55.8'  
I.D. 15 1/4" nom SPECIAL CONDITIONS none

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS   
SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 9.0'  
CENTRALIZERS: 18.1', 17.9', 50.0'

LENGTH OF BLANK BELOW SCREEN 7.4' LENGTH OF RISER ABOVE SCREEN 43.6'  
LENGTH OF GRAVEL PACKED ZONE 32.7' CALCULATED AMOUNT OF GRAVEL PACK 43.7 cu. ft.  
ACTUAL AMOUNT OF GRAVEL PACK 44.6 cu. ft. CIRCULATION DURING GRAVEL PACKING   
CASAGRANDE TIP DEPTH 51.6' THICKNESS OF SEAL 16.4'  
TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 17.1 cu. ft.  
ACTUAL AMOUNT OF SEAL 17.3 cu. ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping  
DEVELOPING TIME 23 hours AMOUNT OF MATERIAL REMOVED <.1 cu. ft. (est)

SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT SPECIAL CONDITIONS 17" steel surface casing left in place from ground surface to top of gravel pack. Added water for second and third development.  
FIRST TEST 17.6  
SECOND RETEST 14.0  
THIRD RETEST 1.0

STATIC WATER LEVEL 11.0'/623.8 DATE 4/15/82 EDUCTOR SETTING NA

SUBCONTRACTOR SUBMITTALS:

MICHIGAN DEWATERING WELL RECORD

Revision 14  
12/82

SUPERVISED BY  
GEOLOGIST/HYDROGEOLOGIST M.D. Johnson

D.9-80m



<b>WELL LOG</b>		PROJECT	JOB NO.	SHEET NO.	WELL NO.	
MIDLAND UNITS 1 AND 2		7220	1 OF 1	E-8		
SITE Circulating Water Intake Structure		COORDINATES S 5073.6 E 675.3				
BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE	TOTAL DEPTH	SAMPLES
4-14-82	4-15-82	Kelley Dewatering Co.	Bucyrus-Erie 22W	17"	22.0'	6
SCREEN DIA/LENGTH/SLOT		EL TOP OF CASING	GROUND SURFACE EL	DEPTH/EL GROUND WATER	LOGGED BY GEOLOGIST/HYDROGEOLOGIST:	
NA		NA	634.6	Not Determined	T. R. Cullen	
CHECKED BY:		DATE	APPROVED BY:		DATE	
L. E. Young		9-22-82	W. C. Paris, Jr.		9-22-82	
ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES	
634.6	0					
633.6	1	1		0-1.0' Sand, brown, fine-to coarse-grained with coarse gravel. (Fill)	0-2.0' Hand dug starter hole.	
	2	2		1.0-3.0' Sandy Clay, brown-orange mottled, with fine-to coarse-grained sand and coarse gravel, occasional pebbles. (Fill)		
631.6	3	3		3.0-22.0' Sand, brown, fine-to coarse-grained, with fine gravel. (Fill)		
	10	4			End of shift 4-14-82 at 18.0'	
	20	6			Start of shift 4-15-82	
	22				22.0' Casing out-of-plumb. End of Shift 4-15-82 at 22.0'	
612.6	22			T. D.: 22.0', Well abandoned 4-15-82. See well plugging report.	Well E-8A replaces well E-8.	
SAMPLE TYPE		SITE			WELL NO.	
Grab and Bailor		Circulating Water Intake Structure			E-8	

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# WELL LOG

PROJECT: MIDLAND UNITS 1 AND 2  
 JOB NO.: 7220  
 SHEET NO.: 1 OF 2  
 WELL NO.: E-8A

SITE: Circulating Water Intake Structure  
 COORDINATES: S 5071.9 E 676.9

BEGUN: 4-20-82 COMPLETED: 4-22-82 DRILLER: Kelley Dewatering Co.  
 DRILL MAKE AND MODEL: Bucyrus-Erie 22W HOLE SIZE: 17" TOTAL DEPTH: 65.6' SAMPLES: 17

SCREEN DIA/LENGTH/SLOT: 6"/12.5'/#18 EL TOP OF CASING: 635.1 GROUND SURFACE EL: 634.7 DEPTH/EL GROUND WATER: 11.0'/623.7  
 LOGGED BY GEOLOGIST/HYDROGEOLOGIST: R.J. Kelleher/M.D. Johnson

CHECKED BY: A.J. Fiksdal DATE: 6-21-82 APPROVED BY: L.E. Young DATE: 8-5-82

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES:
634.7					
	1			0-1.8' <u>Gravel</u> . (Fill)	Well E-8A replaces well E-8.
632.9	1.8			1.8'-27.0' <u>Sand</u> , brown, fine- to coarse-grained, subround- to subangular, trace fine gravel. (Fill)	0-2.0' Hand dug starter hole.
	5				
	10				
	15				
	20				
	25				
607.7	27				
606.7	28			27.0'-28.0' <u>Concrete</u> , mud mat.(Fill)	
	30			28.0'-38.0' <u>Sandy Clay</u> , light brown, fine- to coarse-grained sand, trace fine gravel. (Fill)	
	35				

▽ 4-21-82

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SAMPLE TYPE: Grab and Bailor SITE: Circulating Water Intake Structure WELL NO.: E-8A



# WELL LOG

PROJECT  
MIDLAND UNITS 1 AND 2

JOB NO.  
7220

SHEET NO.  
OF  
2 2

WELL NO.  
E-8A

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
599.7					
	10				
596.7	38			38.0'-40.0' Sandy Clay, gray, fine- to coarse-grained sand, trace fine gravel. (Till)	Fill End of shift 4-20-82 at 39.0' Till Start of shift 4-21-82
594.7	40			40.0'-61.0' Sandy Clay or Clayey Sand, gray, fine- to medium-grained sand, trace coarse-grained sand. (Lacustrine)	Till Lacustrine
	45			47.0'-61.0' Gray to dark gray, organics.	
	50				
	55				End of shift 4-21-82 at 55.0' Start of shift 4-22-82
573.7	61			61.0'-65.6' Clay, gray, thinly laminated, silt. (Lacustrine)	
569.1	65				Completed hole 4-22-82
	65.6			T.D.: 65.6', See well construction summary.	

Revision 14  
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SAMPLE TYPE Bailer	SITE Circulating Water Intake Structure	WELL NO. E-8A
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# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

JOB NO. 7220

WELL NO. E-8A

SITE Circulating Water Intake Structure

COORDINATES S5071.9

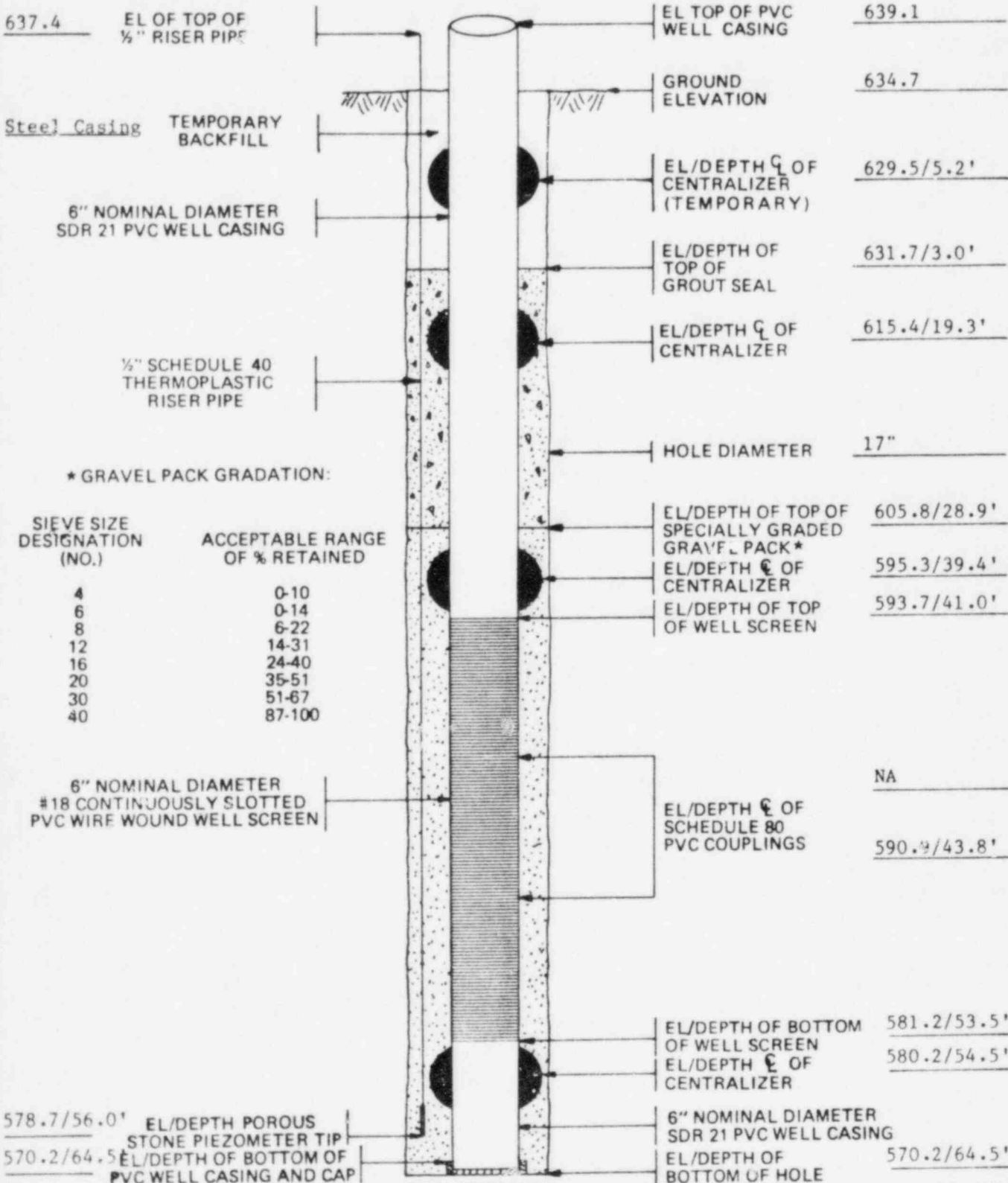
E676.9

DATE STARTED 4/29/82

DATE COMPLETED 5/3/82

GEOLOGIST/HYDROGEOLOGIST M.D. Johnson

INSTALLED BY Kelly Contract Dewatering Co.



(NOT TO SCALE) D. 9-80g

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WELL INSTALLATION DATA SHEET

WELL NUMBER E-8A

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S5071.9 E676.9 SURFACE ELEVATION 634.7

DATE STARTED 4/20/82 DATE COMPLETED 5/12/82 NO. OF SAMPLES 17

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool  
O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 64.5'  
I.D. 15 1/4" nom SPECIAL CONDITIONS Hit concrete mudmat from 27.0-28.0'.

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS   
SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 12.5'  
CENTRALIZERS: 5.2', 19.3', 39.4', 54.5'

LENGTH OF BLANK BELOW SCREEN 11.0' LENGTH OF RISER ABOVE SCREEN 45.4'  
LENGTH OF GRAVEL PACKED ZONE 35.6' CALCULATED AMOUNT OF GRAVEL PACK 47.6 cu. ft.  
ACTUAL AMOUNT OF GRAVEL PACK 49.5 cu. ft. CIRCULATION DURING GRAVEL PACKING   
CASAGRANDE TIP DEPTH 56.0' THICKNESS OF SEAL 25.9'  
TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 26.9 cu. ft.  
ACTUAL AMOUNT OF SEAL 28.1 cu. ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping  
DEVELOPING TIME 8 hours AMOUNT OF MATERIAL REMOVED <0.01 cu. ft. (est)

SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT SPECIAL CONDITIONS none  
FIRST TEST 0.7  
SECOND RETEST \_\_\_\_\_  
THIRD RETEST \_\_\_\_\_

STATIC WATER LEVEL 11.0'/623.7 DATE 4/21/82 EDUCTOR SETTING NA

SUBCONTRACTOR SUBMITTALS: MICHIGAN DEWATERING WELL RECORD  Revision 14 12/82

SUPERVISED BY GEOLOGIST/HYDROGEOLOGIST M.D. Johnson

D.9-80r

# WELL LOG

PROJECT

MIDLAND UNITS 1 AND 2

JOB NO.  
7220

SHEET NO.  
1 OF 2

WELL NO.  
E-9

SITE

Circulating Water Intake Structure

COORDINATES

S 5064.9 E 661.0

BEGUN: 2-4-82	COMPLETED 4-27-82	DRILLER Kelley Dewatering Co.	DRILL MAKE AND MODEL Bucyrus-Erie 22W	HOLE SIZE 17"	TOTAL DEPTH 67.3'	SAMPLES 17
SCREEN DIA/LENGTH/SLOT 6"/19.0'/#18	EL TOP OF CASING 638.7	GROUND SURFACE EL 634.8	DEPTH/EL GROUND WATER 11.0'/623.8	LOGGED BY GEOLOGIST/HYDROGEOLOGIST: R.J. Kelleher		
CHECKED BY: A.J. Fiksdal		DATE 6-21-82	APPROVED BY: W.C. Paris, Jr.			DATE 6-21-82

ELEVATION	DEPTH	DEPTH SAMPLE GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
634.8	0			
633.6	1.2	1	0 - 1.2' <u>Sandy Silty Gravel</u> , gray, broken angular gravel. (Fill)	0 - 2.0' Used 30" O.D. tapered auger to drill through frost zone.
		2	1.2' - 5.0' <u>Sand</u> , brown, fine- to coarse-grained, trace fine gravel. (Fill)	2.0'-8.0' drove 19.8" O.D. casing and cleaned out with 15" O.D. auger.
629.8	5	3	5.0' - 15.0' <u>Clayey Sand</u> , gray, fine- to coarse-grained, trace fine gravel. (Fill)	End of shift 2-4-82 at 8.0'
				Start of shift 4-22-82
				▽ 4-22-82
619.8	15	4	15.0' - 22.0' <u>Sand</u> , brown, fine- to medium-grained, little silt, fine gravel. (Fill)	End of shift 4-22-82 at 15.0'
				Start of shift 4-23-82
612.8	22	5	22.0' - 32.0' <u>Sandy Clay</u> , brown, fine- to coarse-grained sand, fine gravel. (Fill)	
				Fill
602.8	32	6	32.0' - 45.0' <u>Sandy Clay</u> , gray, fine- to coarse-grained, trace fine gravel. (Till)	Till
599.8	35	7		

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SAMPLE TYPE  
Grab and Bailer

SITE  
Circulating Water Intake Structure

WELL NO.  
E-9



# WELL LOG

PROJECT  
MIDLAND UNITS 1 AND 2

JOB NO.  
7220

SHEET NO.  
2 OF 2

WELL NO.  
E-9

ELEVATION	DEPTH	SAMPLE GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
599.8	35			
	39			End of shift 4-23-82 at 41.0'
	40			Start of shift 4-26-82
	41			Till
589.8	45		45.0' - 49.0' Sandy Clay, dark gray, very fine- to medium-grained sand, organics. (Lacustrine)	Lacustrine
585.8	49		49.0' - 51.0' Sand, dark gray, very fine- to medium-grained. (Lacustrine)	
583.8	51		51.0' - 61.0' Sandy Clay, dark gray. Very fine- to fine-grained sand layers. (Lacustrine)	
	55			
	60			
573.8	61		61.0' - 66.0' Silty Clay, gray, laminated. (Lacustrine)	
	65			End of shift 4-26-82 at 66.0'
561.8	66		66.0' - 67.3' Clay, gray, plastic. (Lacustrine)	Start of shift 4-27-82 Completed hole 4-27-82
567.5	67.3		T.D.: 67.3'; See well construction summary.	

SAMPLE TYPE Grab and Bailer	SITE Circulating Water Intake Structure	WELL NO. E-9
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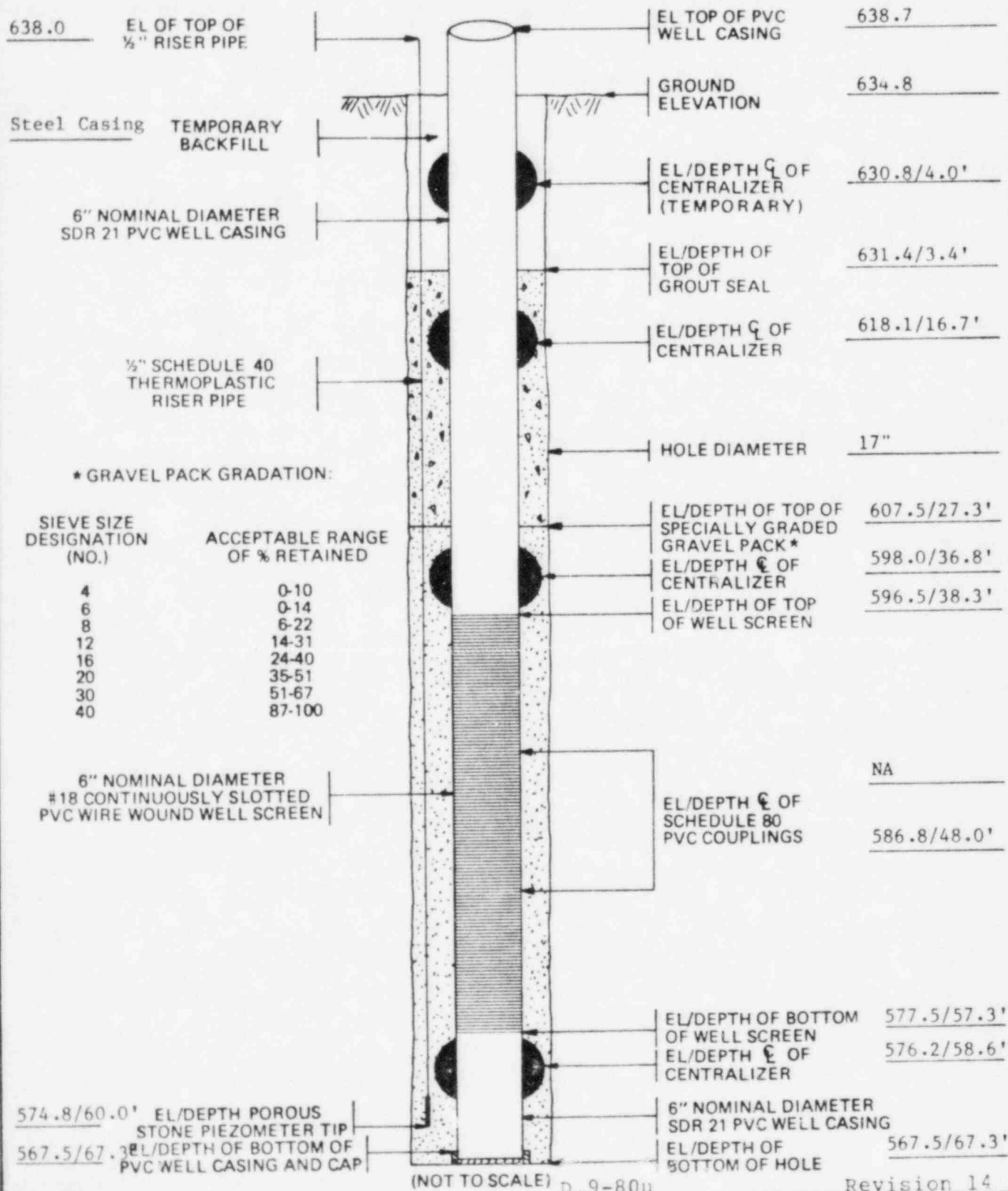
# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

JOB NO. 7220

WELL NO. E-9

SITE Circulating Water Intake Structure COORDINATES S5064.9 E661.0  
 DATE STARTED 4/29/82 DATE COMPLETED 5/3/82  
 GEOLOGIST/HYDROGEOLOGIST M.D. Johnson INSTALLED BY Kelly Contract Dewatering Co.



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WELL INSTALLATION DATA SHEET

WELL NUMBER E-9

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S 5064.9 E 661.0 SURFACE ELEVATION 634.8

DATE STARTED 2/4/82 DATE COMPLETED 5/11/82 NO. OF SAMPLES 17

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool  
O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 67.3'  
I.D. 15 1/4" nom SPECIAL CONDITIONS 0-8.0' used 19.8" O.D. casing.

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS   
SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 19.0'  
CENTRALIZERS: 4.0', 16.7', 36.8', 58.6'

LENGTH OF BLANK BELOW SCREEN 10.0' LENGTH OF RISER ABOVE SCREEN 42.2'  
LENGTH OF GRAVEL PACKED ZONE 40.0' CALCULATED AMOUNT OF GRAVEL PACK 53.4 cu.ft.  
ACTUAL AMOUNT OF GRAVEL PACK 54.5 cu.ft. CIRCULATION DURING GRAVEL PACKING   
CASAGRANDE TIP DEPTH 60.0' THICKNESS OF SEAL 23.9'  
TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 24.9 cu.ft.  
ACTUAL AMOUNT OF SEAL 25.5 cu.ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping  
DEVELOPING TIME 7.5 hours AMOUNT OF MATERIAL REMOVED <0.01 cu.ft. (est)

SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT SPECIAL CONDITIONS none  
FIRST TEST 0.4  
SECOND RETEST \_\_\_\_\_  
THIRD RETEST \_\_\_\_\_

STATIC WATER LEVEL 11.0'/623.8 DATE 4/22/82 EDUCTOR SETTING NA

SUBCONTRACTOR SUBMITTALS:

MICHIGAN DEWATERING WELL RECORD

Revision 14  
12/82

D.9-80V

SUPERVISED BY  
GEOLOGIST/HYDROGEOLOGIST M. D. Johnson

# WELL LOG

PROJECT: MIDLAND UNITS 1 AND 2  
 JOB NO.: 7220  
 SHEET NO.: 1 OF 2  
 WELL NO.: J-1

SITE: Southeast of Turbine Building  
 COORDINATES: S5103.1 E544.9

BEGUN: 2-12-82  
 COMPLETED: 3-18-82  
 DRILLER: Kelley Dewatering Co.  
 DRILL MAKE AND MODEL: Bucyrus-Erie 22W  
 HOLE SIZE: 17"  
 TOTAL DEPTH: 60.3'  
 SAMPLES: 14

SCREEN DIA/LENGTH/SLOT: 6"/13.0'/#18  
 EL TOP OF CASING: 636.1  
 GROUND SURFACE EL: 633.8  
 DEPTH/EL GROUND WATER: 15.0'/618.8  
 LOGGED BY GEOLOGIST/HYDROGEOLOGIST: A.J. Fiksdal

CHECKED BY: L.E. Young  
 DATE: 6-10-82  
 APPROVED BY: W.C. Paris Jr.  
 DATE: 6-16-82

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
633.8	0				
631.8	1			0-2.0' Silty Sand, gray, fine- to coarse-grained, trace fine gravel. (Fill)	Well J-1 was relocated 1.0' south of pilot hole wJ-1B
629.8	2			2.0'-4.0' Gravel, crushed coarse road gravel, trace sand. (Fill)	0-2.0' Used 30" O.D. tapered auger to drill through frost zone.
	4			4.0'-34.0' Sandy Clay, gray and brown mottled, fine- to coarse-grained sand, trace fine gravel, silt. (Fill)	2.0'-8.0' Drove 19.8" O.D. casing and cleaned out with 15" O.D. auger.
	10				End of shift 2-12-82 at 8.0'
	15				Start of shift 3-16-82
	20				
	25				
	30			30.0' Gravel, clay becomes more sandy.	
599.8	34				Fill Lacustrine
598.8	35			34.0'-46.0' Sand, gray-brown,	End of shift 3-16-82 at 35.0'

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SAMPLE TYPE: Grab and Bailor  
 SITE: Southeast of Turbine Building  
 WELL NO.: J-1



WELL LOG		PROJECT	JOB NO.	SHEET NO.	WELL NO.	
		MIDLAND UNITS 1 AND 2	7220	2 OF 2	J-1	
ELEVATION	DEPTH	SAMPLE GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION			NOTES
598.8	35		fine- to medium-grained, little silt and clay, trace to little angular gravel. (Lacustrine)			Start shift 3-17-82
	40		40.0' Less gravel.			
587.8	46		46.0'-55.0' Sand, gray, fine-grained, trace silt, organics. (Lacustrine)			
	50		53.5' Sand becomes more silty.			End shift 3-17-82 51.0' Start shift 3-18-82
578.8	55		55.0'-60.3' Clay, gray, plastic, silt. (Lacustrine)			
573.8	60		T.D.: 60.3', See well construction summary.			Completed 3-18-82 See sample extrusion and field log of pilot hole wj-18.
SAMPLE TYPE		SITE			WELL NO.	
Bailer		Southeast of Turbine Building			J-1	



# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

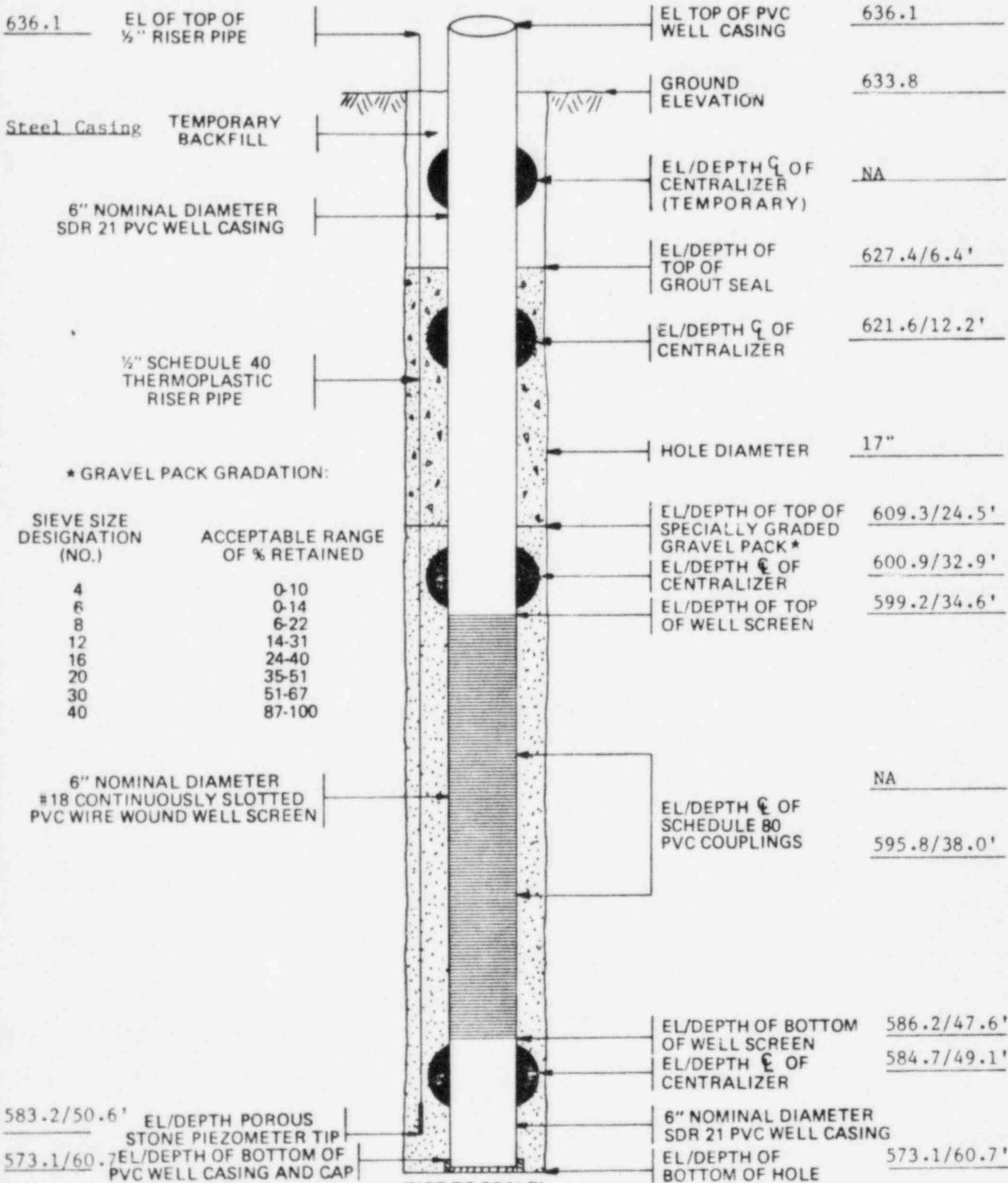
JOB NO. 7220

WELL NO. J-1

SITE Southeast of Turbine Building COORDINATES S5103.1 E544.9

DATE STARTED 3/26/82 DATE COMPLETED 4/12/82

GEOLOGIST/HYDROGEOLOGIST A.J. Fiksdal/T.R. Cullie INSTALLED BY Kelly Contract Dewatering Co.



**\* GRAVEL PACK GRADATION:**

SIEVE SIZE DESIGNATION (NO.)	ACCEPTABLE RANGE OF % RETAINED
4	0-10
6	0-14
8	6-22
12	14-31
16	24-40
20	35-51
30	51-67
40	87-100

(NOT TO SCALE) D. 9-80y

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WELL INSTALLATION DATA SHEET

WELL NUMBER J-1

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S 5103.1 E 544.9 SURFACE ELEVATION 633.8

DATE STARTED 2/12/82 DATE COMPLETED 6/4/82 NO. OF SAMPLES 14

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool  
O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 60.7'  
I.D. 15 1/4" nom SPECIAL CONDITIONS 0-8.0' used 19.8" O.D. casing.  
0.4' flushed from hole during cleaning.

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS   
SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 13.0'  
CENTRALIZERS: 12.2', 32.9', 49.1'

LENGTH OF BLANK BELOW SCREEN 13.1' LENGTH OF RISER ABOVE SCREEN 36.9'  
LENGTH OF GRAVEL PACKED ZONE 36.2' CALCULATED AMOUNT OF GRAVEL PACK 48.4 cu.ft.  
ACTUAL AMOUNT OF GRAVEL PACK 44.6 cu.ft. CIRCULATION DURING GRAVEL PACKING   
CASAGRANDE TIP DEPTH 50.6' THICKNESS OF SEAL 18.1'  
TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 34.7 cu.ft.  
ACTUAL AMOUNT OF SEAL 33.2 cu.ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping  
DEVELOPING TIME 8 hours AMOUNT OF MATERIAL REMOVED <0.1 cu.ft. (est)

SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT SPECIAL CONDITIONS Added water for development.  
FIRST TEST 0.4  
SECOND RETEST \_\_\_\_\_  
THIRD RETEST \_\_\_\_\_

STATIC WATER LEVEL 15.0'/618.8 DATE 3/16/82 EDUCTOR SETTING NA

SUBCONTRACTOR SUBMITTALS:

MICHIGAN DEWATERING WELL RECORD

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# WELL LOG

PROJECT: MIDLAND UNITS 1 AND 2  
 JOB NO.: 7220  
 SHEET NO.: 1 OF 2  
 WELL NO.: J-2

SITE: Yard East of Turbine Building  
 COORDINATES: S5034.8 E593.1

BEGUN: 2-12-82  
 COMPLETED: 3-22-82  
 DRILLER: Kelley Dewatering Co.  
 DRILL MAKE AND MODEL: Bucyrus-Erie 22W  
 HOLE SIZE: 17"  
 TOTAL DEPTH: 65.6'  
 SAMPLES: 15

SCREEN DIA/LENGTH/SLOT: 6"/16.0'/#18  
 EL TOP OF CASING: 636.6  
 GROUND SURFACE EL: 632.6  
 DEPTH/EL GROUND WATER: 28.2'/604.4  
 LOGGED BY GEOLOGIST/HYDROGEOLOGIST: A.J. Fiksdal /M.D. Johnson

CHECKED BY: L.E. Young  
 DATE: 6-10-82  
 APPROVED BY: W.C. Paris, Jr.  
 DATE: 6-16-82

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
632.6	0				
631.6	1	1		0-1.0' Silty Sand, gray, fine- to medium-grained, trace fine gravel, with occasional pebble. (Fill)	Well J-2 drilled 18.5' south of pilot hole WJ-2. 0-2.0' Used 30" O.D. tapered auger to drill through frost zone.
628.6	4	2		1.0'-4.0' Sand, yellow-brown, fine-grained, trace medium- to coarse-grained sand. (Fill)	2.0'-8.0' Drove 19.8" O.D. casing and cleaned out with a 15" O.D. auger.
	9	3			End of shift 2-12-82 at 8.0'
623.6	10	4		4.0'-9.0' Sandy Gravel, grav, fine crushed gravel, fine-grained sand. (Fill)	Start of shift 3-18-82
	14	5			
	15	6			
	19	7			End of shift 3-18-82 at 20.0'
	20	8		9.0'-33.0' Clay, brown, with fine- to coarse-grained sand and fine gravel, some silt. (Fill)	Start of shift 3-19-82
	24	9			
	25	10			
	29	11			
	30	12			
	33	13			
599.6	33	14		33.0'-60.0' Sand, brown, fine-grained. (Lacustrine)	3-18-82
597.6	35	15			Fill Lacustrine

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SAMPLE TYPE: Grab and Bailer  
 SITE: Yard East of Turbine Building  
 WELL NO.: J-2



# WELL LOG

PROJECT

MIDLAND UNITS 1 AND 2

JOB NO.

7220

SHEET NO.

2 OF 2

WELL NO.

J-2

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
597.6	35				
	9				
	40				End of shift 3-19-82 at 39.0'
	10				Start of shift 3-22-82
	45			45.0' Color becomes greenish-gray.	
	11				
	50				
	12				
	55				
	13				
	14				
572.6	60			60.0'-65.6' Clay, gray, some silt. (Lacustrine)	
	15				
567.0	65				Completed hole 3-22-82
				T.D.: 65.6', See well construction summary.	

SAMPLE TYPE

Sailer

SITE

Yard East of Turbine Building

WELL NO.

J-2

D.9-81a

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# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

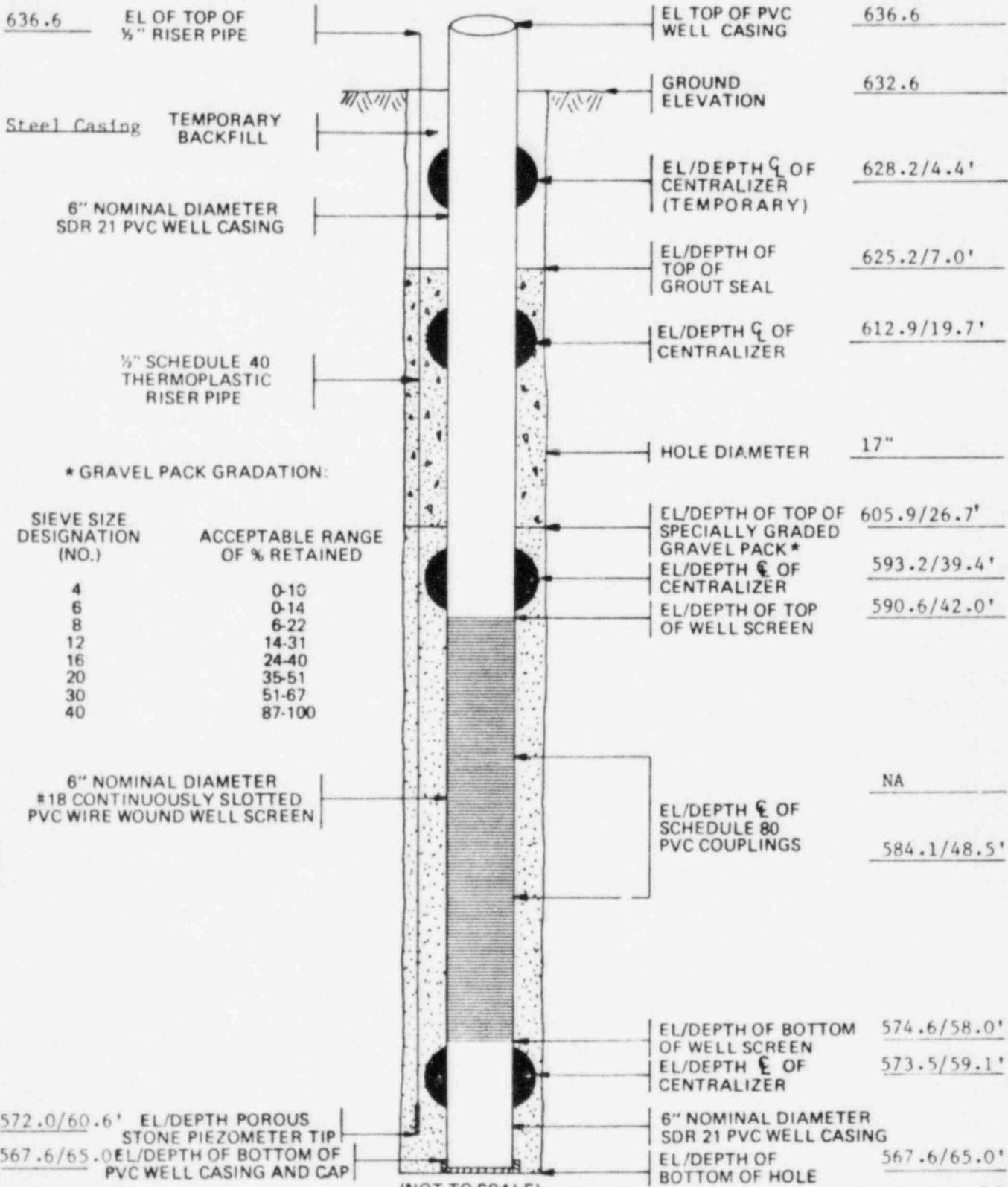
JOB NO. 7220

WELL NO. J-2

SITE East of Turbine Building COORDINATES S5034.8 E593.1

DATE STARTED 3/26/82 DATE COMPLETED 4/12/82

GEOLOGIST/HYDROGEOLOGIST A.J. Fiksdal/T.R. Cullen INSTALLED BY Kelly Contract Dewatering Co.



**\* GRAVEL PACK GRADATION:**

SIEVE SIZE DESIGNATION (NO.)	ACCEPTABLE RANGE OF % RETAINED
4	0-10
6	0-14
8	6-22
12	14-31
16	24-40
20	35-51
30	51-67
40	87-100

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12/82





WELL INSTALLATION DATA SHEET

WELL NUMBER J-2

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S 5034.8 E 593.1 SURFACE ELEVATION 632.6

DATE STARTED 2/12/82 DATE COMPLETED 4/28/82 NO. OF SAMPLES 14

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool  
O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 65.6'  
I.D. 15 1/4" nom SPECIAL CONDITIONS 0-8.0' used 19.8" O.D. casing,  
0.6' of material in bottom of hole.

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS   
SCREEN SLOT SIZE 0.016" SCREEN DIAMETER 6" nom SCREEN LENGTH 16.0'  
CENTRALIZERS: 4.4', 19.7', 39.4', 59.1'

LENGTH OF BLANK BELOW SCREEN 7.0' LENGTH OF RISER ABOVE SCREEN 46.0'  
LENGTH OF GRAVEL PACKED ZONE 38.3' CALCULATED AMOUNT OF GRAVEL PACK 51.3 cu.ft.  
ACTUAL AMOUNT OF GRAVEL PACK 54.5 cu.ft. CIRCULATION DURING GRAVEL PACKING   
CASAGRANDE TIP DEPTH 60.6' THICKNESS OF SEAL 19.7'  
TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 26.9 cu.ft.  
ACTUAL AMOUNT OF SEAL 30.6 cu.ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping  
DEVELOPING TIME 8 hours AMOUNT OF MATERIAL REMOVED <0.01 cu.ft. (est)

SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT SPECIAL CONDITIONS none  
FIRST TEST 0.3  
SECOND RETEST \_\_\_\_\_  
THIRD RETEST \_\_\_\_\_

STATIC WATER LEVEL 28.2'/604.4 DATE 3/18/82 EDUCTOR SETTING NA

SUBCONTRACTOR SUBMITTALS:

MICHIGAN DEWATERING WELL RECORD

Revision 14  
12/82

D.9-81c

SUPERVISED BY  
GEOLOGIST/HYDROGEOLOGIST A.J. Fiksdal/T. R. Cullen

# WELL LOG


PROJECT: MIDLAND UNITS 1 AND 2  
 JOB NO.: 7220  
 SHEET NO.: 1 OF 2  
 WELL NO.: J-3

SITE: Yard East of Turbine Building  
 COORDINATES: S 4981.1 E 643.4

BEGUN: 1-29-82  
 COMPLETED: 3-17-82  
 DRILLER: Kelley Dewatering Co.  
 DRILL MAKE AND MODEL: Bucyrus-Erie 60L  
 HOLE SIZE: 17"  
 TOTAL DEPTH: 65.0'  
 SAMPLES: 14

SCREEN DIA/LENGTH/SLOT: 6"/26.0'/#18  
 EL TOP OF CASING: 636.7  
 GROUND SURFACE EL: 634.0  
 DEPTH/EL GROUND WATER: 32.0'/602.0  
 LOGGED BY GEOLOGIST/HYDROGEOLOGIST: A.J. Fiksdal /R. Gallardo

CHECKED BY: L.E. Young  
 DATE: 6-10-82  
 APPROVED BY: W.C. Paris, Jr.  
 DATE: 6/16/82

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
634.0	0				
	1			0-8.0' Silty Clay, gray, sand, trace fine gravel. (Fill)	0-2.0' Used 30" O.D. tapered auger to drill through frost zone.
	5				2.0'-8.0' Drove 19.8" O.D. casing and cleaned out with 15" O.D. auger.
	8				End of shift 1-29-82 at 8.0'
626.0	8			8.0'-37.0' Silty Sandy Clay, brown to tan, fine- to coarse-grained sand, trace fine gravel. (Fill)	Start of shift 3-15-82
	10				
	15				
	20				
	25				End of shift 3-15-82 at 25.0'
	25				Start of shift 3-16-82
	30				
	35				
599.0	35				 3-16-82 Revision 14 12/82

SAMPLE TYPE: Grab and Bailer  
 SITE: Yard East of Turbine Building  
 WELL NO.: J-3





# WELL LOG

PROJECT MIDLAND UNITS 1 AND 2

JOB NO. 7220

SHEET NO. 2 OF 2

WELL NO. J-3

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
599.0	35				
597.0	37				Fill
	37			37.0'- 65.0' Sand, brown, fine-grained. (lacustrine)	Lacustrine
	40				
	45				End of shift 3-16-82 at 45.0'
	45				Start of shift 3-17-82
	50				
	55				
	60				
	62			62.0' Color becomes grayish with trace of fine angular gravel.	
569.0	65			T.D.: 65.0', See well construction summary.	Completed hole 3-17-82

SAMPLE TYPE  
Boiler

SITE  
Yard East of Turbine Building

WELL NO.  
J-3



# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

JOB NO. 7220

WELL NO. J-3

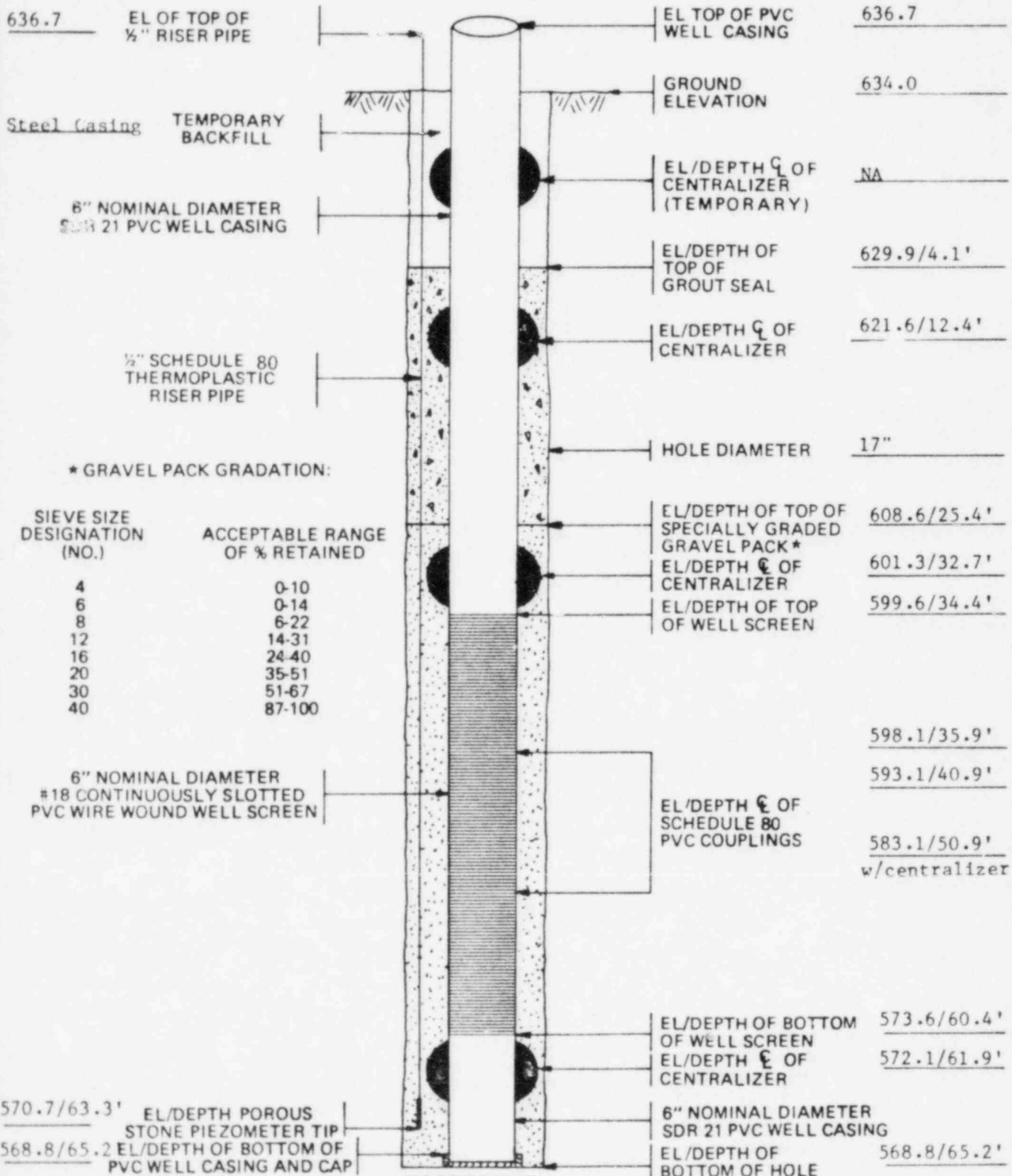
SITE East of Turbine Building

COORDINATES S4981.1 E643.4

DATE STARTED 4/1/82

DATE COMPLETED 4/13/82

GEOLOGIST/HYDROGEOLOGIST T.R. Cullen/A.J. Fiksdal INSTALLED BY Kelly Contract Dewatering Co.



\* GRAVEL PACK GRADATION:

SIEVE SIZE DESIGNATION (NO.)	ACCEPTABLE RANGE OF % RETAINED
4	0-10
6	0-14
8	6-22
12	14-31
16	24-40
20	35-51
30	51-67
40	87-100

(NOT TO SCALE) D.9-81f

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WELL INSTALLATION DATA SHEET

WELL NUMBER J-3

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S 4981.1 E 643.4 SURFACE ELEVATION 634.0

DATE STARTED 1/29/82 DATE COMPLETED 4/29/82 NO. OF SAMPLES 14

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool  
O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 65.2'  
I.D. 15 1/4" nom SPECIAL CONDITIONS 0-8.0' used 19.8" O.D. casing.

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS   
SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 26.0'  
CENTRALIZERS: 12.4', 32.7', 50.9', 60.4'

LENGTH OF BLANK BELOW SCREEN 4.8' LENGTH OF RISER ABOVE SCREEN 28.1'  
LENGTH OF GRAVEL PACKED ZONE 39.8' CALCULATED AMOUNT OF GRAVEL PACK 53.2 cu.ft.  
ACTUAL AMOUNT OF GRAVEL PACK 50.5 cu.ft. CIRCULATION DURING GRAVEL PACKING   
CASAGRANDE TIP DEPTH 63.3' THICKNESS OF SEAL 21.3'  
TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 30.2 cu.ft.  
ACTUAL AMOUNT OF SEAL 30.6 cu.ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping  
DEVELOPING TIME 8 hours AMOUNT OF MATERIAL REMOVED < 0.01 cu.ft. (est)

SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT SPECIAL CONDITIONS none  
FIRST TEST 0.6  
SECOND RETEST \_\_\_\_\_  
THIRD RETEST \_\_\_\_\_

STATIC WATER LEVEL 32.0'/602.0 DATE 3/16/82 EDUCTOR SETTING NA

SUBCONTRACTOR SUBMITTALS:

MICHIGAN DEWATERING WELL RECORD

Revision 14  
12/82

D.9-81g

SUPERVISED BY  
GEOLOGIST/HYDROGEOLOGIST T.R.Cullen/A.J.Fiksdal

# WELL LOG

PROJECT: MIDLAND UNITS 1 AND 2  
 JOB NO.: 7220  
 SHEET NO.: 1 OF 2  
 WELL NO.: M-1

SITE: Yard East of Turbine Building  
 COORDINATES: S 4931.9 E 707

BEGUN: 1-28-82  
 COMPLETED: 3-8-82  
 DRILLER: Kelley Dewatering Co.  
 DRILL MAKE AND MODEL: Bucyrus-Erie 60L  
 HOLE SIZE: 17"  
 TOTAL DEPTH: 70.1'  
 SAMPLES: 16

SCREEN DIA/LENGTH/SLOT: 6"/25.77#18  
 EL TOP OF CASING: 638.2  
 GROUND SURFACE EL: 634.7  
 DEPTH/EL GROUND WATER: 28.0'/606.7  
 LOGGED BY GEOLOGIST/HYDROGEOLOGIST: M.D. Johnson/A.J. Fiksdal

CHECKED BY: L.E. Young  
 DATE: 5/18/82  
 APPROVED BY: W.C. Paris Jr.  
 DATE: 5/26/82

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
634.7	0				
	1			0-8.0' Silty Clay, gray, with some fine gravel and fine-to coarse-grained sand. (Fill)	Samples collected from this hole contain pea gravel used to backfill pilot hole WM-1 at this location.  0-3.0' Used 30" O.D. tapered auger to drill through frost zone.  3.0'-8.0' drove 19.8" O.D. casing and cleaned out with 15" O.D. auger.
626.7	8			8.0'-12.0' Sand, brown, fine-to coarse-grained, some clay. (Fill)	End of shift 1-28-82 at 8.0' Start of shift 3-3-82
622.7	12			12.0'-16.0' Silty Clay, brown, orange mottled. (Fill)	End of shift 3-2-82 at 12.0' Start of shift 3-3-82
618.7	16			16.0'-18.0' Sandy Silty Clay, brown, some fine gravel. (Fill)	
611.7	18			18.0'-26.0' Clayey Sand, brown, fine-to medium-grained sand, trace fine gravel. (Fill)	
608.7	26			26.0'-32.5' Sandy Clay, mottled gray and brown, fine-to coarse-grained sand. (Fill)	▽ 3-8-82
602.2	32.5			31.0'-70.1' Sand, brown to gray, fine-to medium-grained. (Lacustrine)	Fill Lacustrine
599.7	35				

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SAMPLE TYPE: Grab and Bailer  
 SITE: Yard East of Turbine Building  
 WELL NO.: M-1



# WELL LOG

PROJECT

MIDLAND UNITS 1 AND 2

JOB NO.  
7220

SHEET NO.  
2 OF 2

WELL NO.  
M-1

ELEVATION

DEPTH

SAMPLE

GRAPHIC LOG

DESCRIPTION AND CLASSIFICATION

NOTES

599.7

35

40

45

50

55

60

65

70.1

End of shift 3-3-82 at 39.0'  
Start of shift 3-4-82

End of shift 3-4-82 at 53.0'  
Start of shift 3-5-82

55.0'-70.1' Color change to gray.

End of shift 3-5-82 at 68.0'  
Start of shift 3-8-82

Completed hole 3-8-82

T.P.: 70.1', See well construction summary

See sample extrusion and field log of pilot hole WM-1.

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SAMPLE TYPE

Bailer

SITE

Yard East of Turbine Building

WELL NO.

M-1

D.9-81i



# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

JOB NO. 7220

WELL NO. M-1

SITE Service Water Pump Structure

COORDINATES S 4931.9

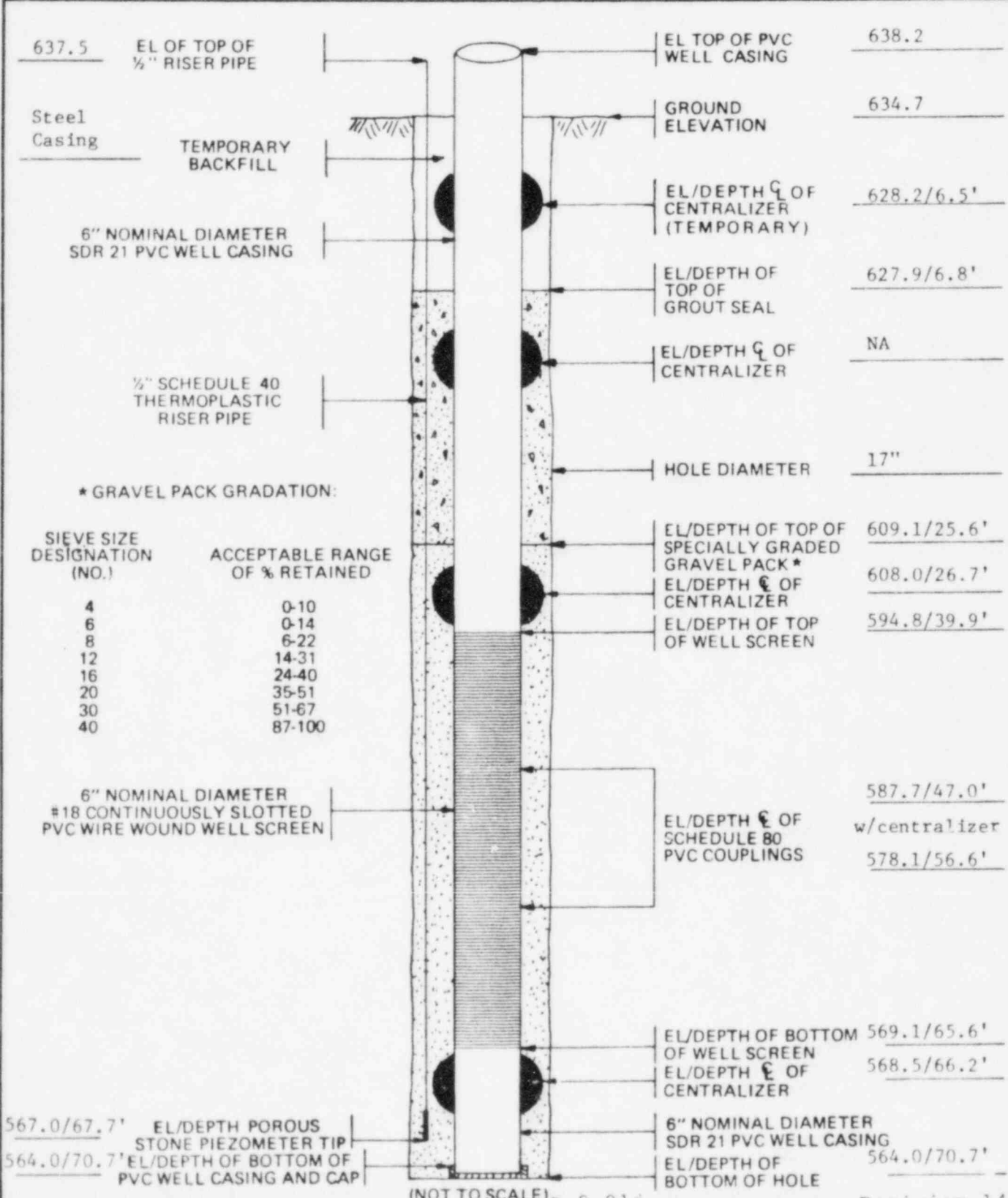
E 707

DATE STARTED 3/19/82

DATE COMPLETED 3/23/82

GEOLOGIST/HYDROGEOLOGIST T. R. Cullen

INSTALLED BY Kelly Contract Dewatering Co.



\* GRAVEL PACK GRADATION:

SIEVE SIZE DESIGNATION (NO.)	ACCEPTABLE RANGE OF % RETAINED
4	0-10
6	0-14
8	6-22
12	14-31
16	24-40
20	35-51
30	51-67
40	87-100

(NOT TO SCALE) D.9-81j

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WELL INSTALLATION DATA SHEET

WELL NUMBER M-1

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S 4931.9 E 707 SURFACE ELEVATION 634.7

DATE STARTED 1/28/82 DATE COMPLETED 4/30/82 NO. OF SAMPLES 16

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool  
O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 70.7'  
I.D. 15 1/4" nom SPECIAL CONDITIONS 0-8.0' used 19.8" O.D. casing.  
0.6' flushed from hole during cleaning.

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS   
SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 25.7'  
CENTRALIZERS: 6.5', 26.7', 47.0', 66.2'

LENGTH OF BLANK BELOW SCREEN 5.1' LENGTH OF RISER ABOVE SCREEN 43.4'  
LENGTH OF GRAVEL PACKED ZONE 45.1' CALCULATED AMOUNT OF GRAVEL PACK 60.3 cu.ft.  
ACTUAL AMOUNT OF GRAVEL PACK 64.4 cu.ft. CIRCULATION DURING GRAVEL PACKING   
CASAGRANDE TIP DEPTH 67.7' THICKNESS OF SEAL 18.8'  
TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 25.9 cu.ft.  
ACTUAL AMOUNT OF SEAL 30.6 cu.ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping  
DEVELOPING TIME 8 hours AMOUNT OF MATERIAL REMOVED <0.01 cu.ft. (est)

SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT SPECIAL CONDITIONS none  
FIRST TEST 0.2  
SECOND RETEST \_\_\_\_\_  
THIRD RETEST \_\_\_\_\_

STATIC WATER LEVEL 28.0'/606.7 DATE 3/8/82 EDUCTOR SETTING NA

SUBCONTRACTOR SUBMITTALS:

MICHIGAN DEWATERING WELL RECORD

Revision 14  
12/82

SUPERVISED BY  
GEOLOGIST/HYDROGEOLOGIST T. R. Cullen

# WELL LOG







PROJECT: MIDLAND UNITS 1 AND 2  
 JOB NO.: 7220  
 SHEET NO.: 1 OF 3  
 WELL NO.: M-2

SITE: Northeast of Service Water Pump Structure  
 COORDINATES: S4931 E 766.1

BEGUN: 3-1-82  
 COMPLETED: 3-12-82  
 DRILLER: Kelley Dewatering Co.  
 DRILL MAKE AND MODEL: Bucyrus-Erie 60L  
 HOLE SIZE: 17"  
 TOTAL DEPTH: 84.7'  
 SAMPLES: 20

SCREEN DIA/LENGTH/SLOT: 6"/19.2'/#18  
 EL TOP OF CASING: 637.4  
 GROUND SURFACE EL: 633.8  
 DEPTH/EL GROUND WATER: 28.0'/605.8  
 LOGGED BY GEOLOGIST/HYDROGEOLOGIST: A.J. Fiksdal/M.D. Johnson

CHECKED BY: L.E. Young  
 DATE: 6-21-82  
 APPROVED BY: W.C. Paris, Jr.  
 DATE: 6-21-82

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
633.8	0				
631.8	2	1		0 - 2.0' Silty Sand, gray, fine- to coarse-grained, little to some fine crushed gravel. (Fill)	0 - 2.3' Used 30" O.D. tapered auger to drill through frost zone.
630.8	3	2		2.0' - 3.0' Gravel, fine, crushed. (Fill)	2.3' - 8.0' Drove 19.8" O.D. casing and cleaned out with 15" O.D. auger to 7.5'.
	5	3		3.0' - 8.0' Clay, gray and brown, sand and gravel. (Fill)	
	8				End of shift 3-1-82 at 7.5'
625.8	10	4		8.0' - 13.0' Clayey Sand, brown, fine- to medium-grained. (Fill)	Start of shift 3-8-82
	13				End of shift 3-8-82 at 11.0'
620.8	15	5		13.0' - 19.0' Silty Sand, brown, fine- to medium-grained, little clay. (Fill)	Start of shift 3-9-82
	19				End of shift 3-9-82 at 20.0'
614.8	20	6		19.0' - 38.0' Silty Clay, brown-orange mottled, some coarse-grained sand and fine gravel. (Fill)	Start of shift 3-10-82
	25				
	30				
	35				
598.8					

▽ 3-9-82

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12/82

SAMPLE TYPE: Grab and Bailer  
 SITE: Northeast of Service Water Pump Structure  
 WELL NO.: M-2





# WELL LOG

PROJECT MIDLAND UNITS 1 AND 2

JOB NO. 7220

SHEET NO. 2 OF 3

WELL NO. M-2

ELEVATION	DEPTH	SAMPLE GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
598.8	35			
	37.0'		37.0' Increasing sand.	Fill
595.8	38		38.0' - 43.0' Clayey Silt, gray, dense, some fine- to medium-grained sand, trace coarse-grained sand, organics. (Till)	Till
	40			End of shift 3-10-82 at 40.0' Start of shift 3-11-82
590.8	41		43.0' - 61.0' Sandy Clay, dark gray, very dense, trace coarse-grained sand and fine gravel, peat.	Till Lacustrine
	45		47.0' - 61.0' Increasing sand.	
	50			
	55			
	57.0'		57.0' - 61.0' Layered sandy and silty clay with silt partings.	
572.8	61		61.0' - 75.0' Sand, gray, fine- to medium-grained, trace coarse-grained sand and fine gravel. (Lacustrine)	End of shift 3-11-82 at 61.0' Start of shift 3-12-82
	63.0'		63.0' - 75.0' Sand, gray, fine- to medium-grained, with sub-rounded gravel. (Alluvial)	Lacustrine Alluvial
	70			
558.8	75			

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SAMPLE TYPE  
Bailer

SITE  
Northeast of Service Water Pump Structure

WELL NO.  
M-2



# WELL LOG

PROJECT MIDLAND UNITS 1 AND 2

JOB NO. 7220

SHEET NO. 3 OF 3

WELL NO. M-2

ELEVATION	DEPTH	SAMPLE GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
558.8	75		75.0' - 85.0' Sand, gray, fine-grained, trace medium-grained sand, trace silt. (Lacustrine)	Alluvial Lacustrine
549.1	84.7		T.D.: 84.7', See well construction summary.	Completed hole 3-12-82

SAMPLE TYPE  
Bailer

SITE  
Northeast Service Water Pump Structure

WELL NO.  
M-2

D.9-81n

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# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

JOB NO. 7220

WELL NO. M-2

SITE North of Service Water Pump Structure

COORDINATES S 4931

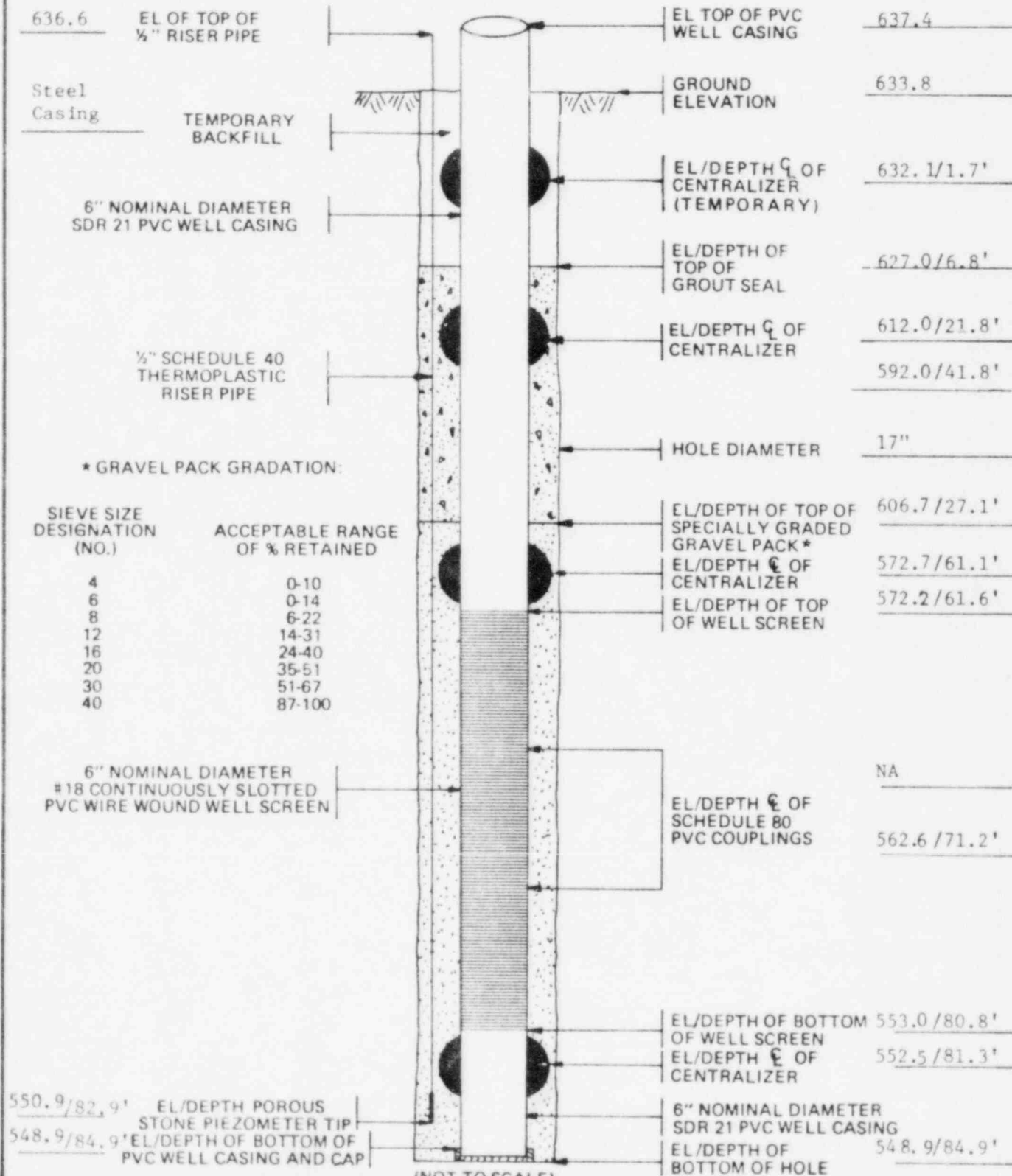
E 766

DATE STARTED 3/19/82

DATE COMPLETED 3/23/82

GEOLOGIST/HYDROGEOLOGIST T. R. Cullen

INSTALLED BY Kelly Contract Dewatering Co.





WELL INSTALLATION DATA SHEET

WELL NUMBER M-2

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S 4931 E 766.1 SURFACE ELEVATION 633.8

DATE STARTED 3/1/82 DATE COMPLETED 5/6/82 NO. OF SAMPLES 20

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool  
O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 84.9'  
I.D. 15 1/4" nom SPECIAL CONDITIONS 0-8.0' used 19.8" O.D. casing,  
0.4' flushed from hole during cleaning.

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS   
SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 19.2'  
CENTRALIZERS: 1.7', 21.8', 41.8', 61.1', 80.8'

LENGTH OF BLANK BELOW SCREEN 4.1' LENGTH OF RISER ABOVE SCREEN 65.0'  
LENGTH OF GRAVEL PACKED ZONE 57.8' CALCULATED AMOUNT OF GRAVEL PACK 77.3 cu.ft.  
ACTUAL AMOUNT OF GRAVEL PACK 86.1 cu.ft. CIRCULATION DURING GRAVEL PACKING   
CASAGRANDE TIP DEPTH 82.9' THICKNESS OF SEAL 20.3'  
TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 27.8 cu.ft.  
ACTUAL AMOUNT OF SEAL 30.6 cu.ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping  
DEVELOPING TIME 5 hours AMOUNT OF MATERIAL REMOVED <0.01 cu.ft. (est)  
SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT SPECIAL CONDITIONS none  
FIRST TEST 0.3  
SECOND RETEST \_\_\_\_\_  
THIRD RETEST \_\_\_\_\_

STATIC WATER LEVEL 28.0'/605.8' DATE 3/9/82 EDUCTOR SETTING NA

SUBCONTRACTOR SUBMITTALS:

MICHIGAN DEWATERING WELL RECORD

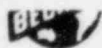
Revision 14  
12/82

SUPERVISED BY  
GEOLOGIST/HYDROGEOLOGIST T.R.Cullen

D.9-81p

WELL LOG		PROJECT		JOB NO.	SHEET NO.	WELL NO.
		MIDLAND UNITS 1 AND 2		7220	1 OF 2	M-3
SITE			COORDINATES			
East Yard			S4858.1 E728			
BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE	TOTAL DEPTH	SAMPLES
1-26-82	2-5-82	Kelley Dewatering Co.	Bucyrus-Erie 22W	17"	71.0'	15
SCREEN DIA/LENGTH/SLOT		EL TOP OF CASING	GROUND SURFACE EL	DEPTH/EL GROUND WATER		LOGGED BY GEOLOGIST/HYDROGEOLOGIST:
6"/8.9'/#18		636.6	634.7	58.7'/576.0		T.R. Cullen/M.D. Johnson
CHECKED BY:			DATE	APPROVED BY:		DATE
A.J. Fiksdal			6-15-82	W.C. Paris, Jr.		6-21-82
ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES	
634.7	0					
	1			0 - 3.0' Clayey Gravel and Sand, gray-brown, traces of concrete filler between grains. (Fill)	0 - 2.0' used 30" O.D. tapered auger to drill through frost zone.	
631.7	3			3.0' - 23.0' Silty Clay, brown-orange mottled, with fine- to medium-grained sand, gravel, and pebbles. (Fill)	2.0' - 8.0' Drove 19.8" O.D. casing and cleaned out with 15" O.D. auger.	
	5				End of shift 1-26-82 at 8.0'	
	10				Start of shift 2-3-82	
	15					
	20					
611.7	23			23.0' - 20.0' Sand, brown, fine- to coarse-grained, poorly sorted, some clay, occasional pebbles. (Fill)		
	25					
608.7	26			26.0' - 31.0' Clay, brown, gray, orange, mottled, fine- to coarse-grained sand, fine gravel, silt. (Fill)		
	30				End of shift 2-3-82 at 30.0'	
	31				Start of shift 2-4-82	
605.6	35			31.0' - 46.0' Clay, brown and gray, some fine- to coarse-grained sand, little fine gravel, silt. (Till)	Fill	
599.7						
SAMPLE TYPE			SITE		WELL NO.	
Grab and Bailer			East Yard		M-3	

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# WELL LOG

PROJECT

MIDLAND UNITS 1 AND 2

JOB NO.


7220

SHEET NO.

2 OF 2

WELL NO.

M-3

ELEVATION	DEPTH	SAMPLE GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
599.7	35			
	40			
	45			
588.7	46		46.0' - 51.0' Silty Clay, gray, some fine-grained sand, little fine gravel. (Till)	
	50			Till
583.7	51		51.0' - 57.0' Silty Clay, gray and black, little fine-grained sand, laminated. (Lacustrine)	Lacustrine
	55			
577.7	57		57.0' - 71.0' Sand, gray, fine-grained, trace to some fine gravel. (Lacustrine)	End of shift 2-4-82 at 57.0' Start of shift 2-5-82  2-5-82
	60			
	65			
	70			Completed hole 2-5-82
563.7	71		T.D.: 71.0', See well construction summary.	
SAMPLE TYPE		SITE		WELL NO.
Bailer		East Yard		M-3

D.9-81r

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# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

JOB NO. 7220

WELL NO. M-3

SITE East of Start-up Transformers

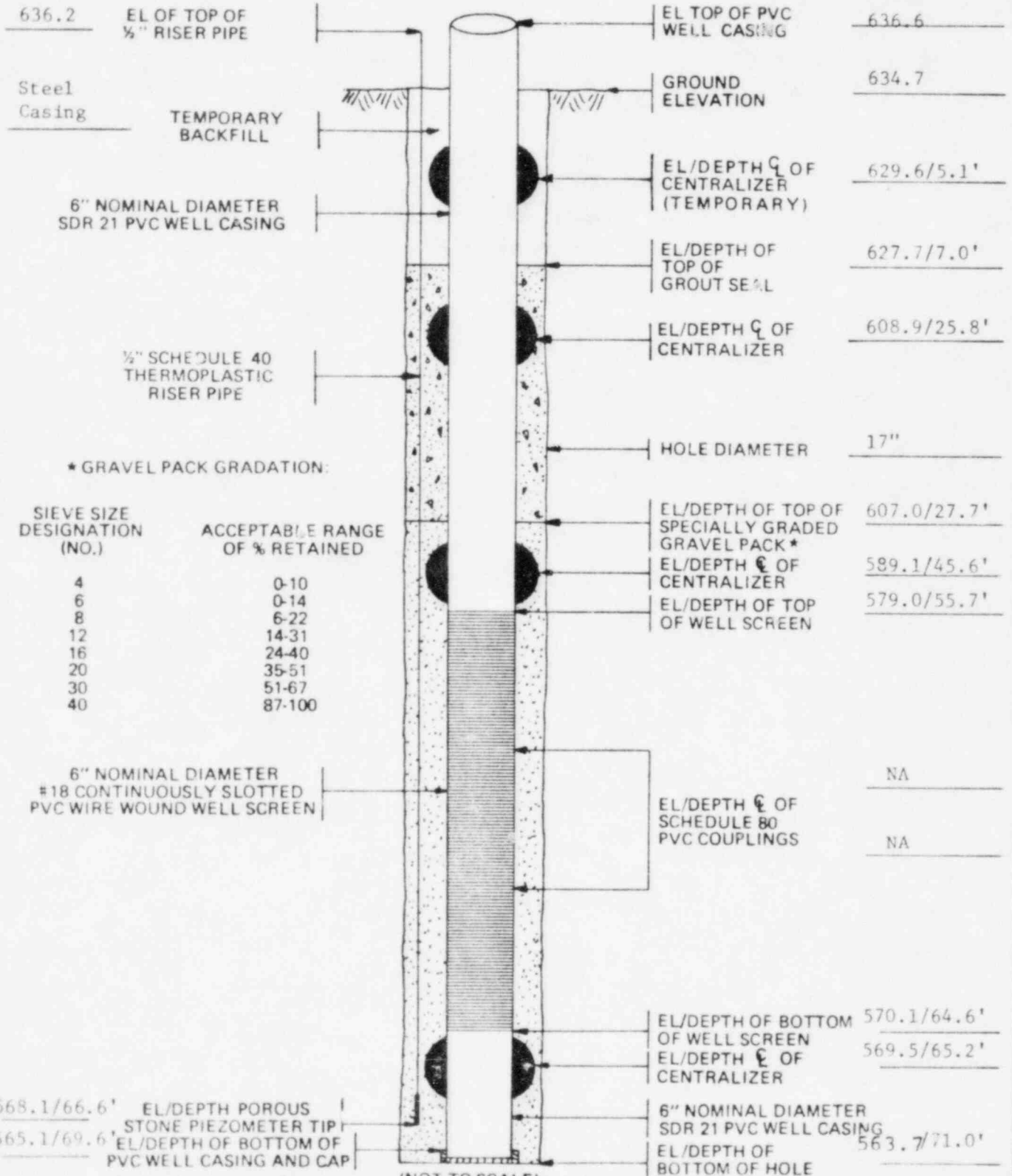
COORDINATES S 4858.1 E 728

DATE STARTED 2/19/82

DATE COMPLETED 2/23/82

GEOLOGIST/HYDROGEOLOGIST T. R. Cullen

INSTALLED BY Kelly Contract Dewatering Co.



**\* GRAVEL PACK GRADATION:**

SIEVE SIZE DESIGNATION (NO.)	ACCEPTABLE RANGE OF % RETAINED
4	0-10
6	0-14
8	6-22
12	14-31
16	24-40
20	35-51
30	51-67
40	87-100

(NOT TO SCALE)

D.9-81s

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WELL INSTALLATION DATA SHEET

WELL NUMBER M-3

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S 4858.1 E 728 SURFACE ELEVATION 634.7

DATE STARTED 1/26/82 DATE COMPLETED 5/10/82 NO. OF SAMPLES 15

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool  
O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 71.0'  
I.D. 15 1/4" nom SPECIAL CONDITIONS 0-8.0' used 19.8" O.D. casing.  
1.4' of material in bottom of hole.

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS   
SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 8.9'  
CENTRALIZERS: 5.1', 25.8', 45.6', 65.2'

LENGTH OF BLANK BELOW SCREEN 5.0' LENGTH OF RISER ABOVE SCREEN 57.6'  
LENGTH OF GRAVEL PACKED ZONE 41.9' CALCULATED AMOUNT OF GRAVEL PACK 56.1 cu.ft.  
ACTUAL AMOUNT OF GRAVEL PACK 56.4 cu.ft. CIRCULATION DURING GRAVEL PACKING   
CASAGRANDE TIP DEPTH 66.6' THICKNESS OF SEAL 20.7'  
TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 28.3 cu.ft.  
ACTUAL AMOUNT OF SEAL 27.0 cu.ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping  
DEVELOPING TIME 7 hours AMOUNT OF MATERIAL REMOVED <0.01 cu.ft. (est)

SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT SPECIAL CONDITIONS none  
FIRST TEST 0.5  
SECOND RETEST \_\_\_\_\_  
THIRD RETEST \_\_\_\_\_

STATIC WATER LEVEL 58.7' / 576.0 DATE 2/5/82 EDUCTOR SETTING NA

SUBCONTRACTOR SUBMITTALS: MICHIGAN DEWATERING WELL RECORD  Revision 14 12/82

SUPERVISED BY T.R. Cullen  
GEOLOGIST/HYDROGEOLOGIST

<b>WELL LOG</b>			PROJECT MIDLAND UNITS 1 AND 2	JOB NO. 7220	SHEET NO. 1 OF 2	WELL NO. M-4
SITE East of Startup Transformer				COORDINATES S4704.1 E 647		
BEGUN 3-1-82	COMPLETED 3-31-82	DRILLER Kelley Dewatering Co.	DRILL MAKE AND MODEL Bucyrus-Erie 22W	HOLE SIZE 17"	TOTAL DEPTH 65.0'	SAMPLES 17
SCREEN DIA/LENGTH/SLOT NA		EL TOP OF CASING NA	GROUND SURFACE EL 633.7	DEPTH/EL GROUND WATER 32.0'/601.7	LOGGED BY GEOLOGIST/HYDROGEOLOGIST A.J. Fiksdal/R.L. Gallardo	
CHECKED BY: L.E. Young			DATE 6-21-82	APPROVED BY: W.C. Paris, Jr.	DATE 6-21-82	

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
633.7	0				
632.2	1.5	1		0 - 1.5' Sand, brown, fine- to coarse-grained, fine to coarse gravel. (Fill)	Well M-4 drilled 36.0' north of Pilot Hole WM-4.
630.7	3	2		1.5' - 3.0' Gravel, fine to coarse, wet, road bed. (Fill)	0 - 2.0' Used 30" O.D. tapered auger to drill through frost zone.
628.7	5	3		3.0' - 5.0' Clay, brown and gray mottled, sand, silt, and fine gravel. (Fill)	2.0' - 8.0' Drove 19.8" O.D. casing and cleaned out with 15" O.D. auger to 7.0'.
				5.0' - 10.0' Sandy Clay, brown. (Fill)	End of shift 3-1-82 at 7.0' ----- Start of shift 3-26-82
623.7	10			10.0' - 36.0' Sandy Gravelly, Clay, brown and gray mottled, fine gravel. (Fill)	
	15				
	20				End of shift 3-26-82 at 20.0' ----- Start of shift 3-29-82
	25				21.5' Large boulder obstructing casing.
	30				
	35				
598.7	35				End of shift 3-29-82 at 34.5' ----- Start of shift 3-10-82

SAMPLE TYPE Grab and Bailor	SITE East of Startup Transformer	WELL NO. M-4
--------------------------------	-------------------------------------	-----------------



# WELL LOG

PROJECT  
MIDLAND UNITS 1 AND 2

JOB NO.  
7220

SHEET NO.  
2 OF 2

WELL NO.  
M-4

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
598.7	35				
597.7	36			36.0' - 42.0' Sand, brownish gray, fine-grained, trace of silt and clay. (Lacustrine)	Fill Lacustrine
591.7	42			42.0' - 44.0' Clay, gray, fine- to medium-grained sand, thinly laminated. (Lacustrine)	
589.7	44			44.0' - 65.0' Sand, gray, fine- to medium-grained. (Lacustrine)	
	55				End of shift 3-30-82 at 55.0' Start of shift 3-31-82
	57			57.0' - 62.0' Coarse-grained sand and fine gravel.	
568.7	65			T.D.: 65.0', well abandoned 4-27-82. See well plugging report.	Completed hole 3-31-82 See sample extrusion and field log for pilot hole WM-4. Well M-4 replaced by well M-4A.

SAMPLE TYPE  
Bailer

SITE  
East of Startup Transformer

WELL NO.  
M-4

D.9-Slv

Revision 14  
12/82

<b>WELL LOG</b>			PROJECT	JOB NO.	SHEET NO.	WELL NO.
			MIDLAND UNITS 1 AND 2	7220	1 OF 2	M-4A
SITE			COORDINATES			
East of Startup Transformer			S4700.6 E647.6			
BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE	TOTAL DEPTH	SAMPLES
5-12-82	5-17-82	Kelley Dewatering Co.	Bucyrus-Erie 60L	17"	65.4'	15
SCREEN DIA/LENGTH/SLOT		EL TOP OF CASING	GROUND SURFACE EL	DEPTH/EL GROUND WATER		LOGGED BY GEOLOGIST/HYDROGEOLOGIST:
6"/21.5'/#18		638.6	633.7	31.5'/602.2		R.J. Kelleher/M.D. Johnson
CHECKED BY:			DATE	APPROVED BY:		DATE
A.J. Fiksdal			6-8-82	W.C. Paris, Jr.		6-21-82
ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES	
633.7						
	1			0 - 3.0' Gravel, gray, fine to coarse. (Fill)	Well M-4A replaces well M-4. Hand dug 2.0' starter hole.	
630.7	3			3.0' - 7.0' Clay, brown and gray mottled, sand, silt, and fine gravel. (Fill)	End of shift 5-12-82 at 3.0' Start of shift 5-13-82	
	5					
626.7	7			7.0' - 11.0' Sandy Clay, brown to brownish gray mottled, fine gravel. (Fill)		
	10					
622.7	11			11.0' - 36.0' Sandy Gravelly Clay, brown and gray mottled, fine gravel. (Fill)		
	15				18.5' Large boulder obstructing casing.	
	20				End of shift 5-13-82 at 18.5' Start of shift 5-14-82	
	25					
	30					
	35					
598.7					▽ 5-13-82	
				Revision 14 12/82		
SAMPLE TYPE			SITE		WELL NO.	
Grab and Bailor			East of Startup Transformer		M-4A	



# WELL LOG

PROJECT

MIDLAND UNITS 1 AND 2

JOB NO.





7220

SHEET NO.

2 OF 2

WELL NO.

M-4A

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
598.7	35				
597.7	36			36.0' - 44.0' Sand, brownish gray, fine-grained. (Lacustrine)	Fill End of shift 5-14-82 at 36.0' Lacustrine Start of shift 5-17-82
589.7	44			44.0' - 48.0' Clay, gray, with fine to medium-grained sand, thinly laminated. (Lacustrine)	
585.7	48			48.0' - 65.4' Sand, gray, fine- to medium-grained. (Lacustrine)	
	57.0			57.0' - 60.0' Coarse-grained sand and fine gravel.	
568.3	65.4			T.D.: 65.4', See well construction summary.	Completed hole 5-17-82 See sample extrusion and field log of pilot hole WN-4.

SAMPLE TYPE

Bailer

SITE

East of Startup Transformer

WELL NO.

M-4A

D.9-81x

Revision 14  
12/82



# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

JOB NO. 7220

WELL NO. M-4A

SITE East of Startup Transformer

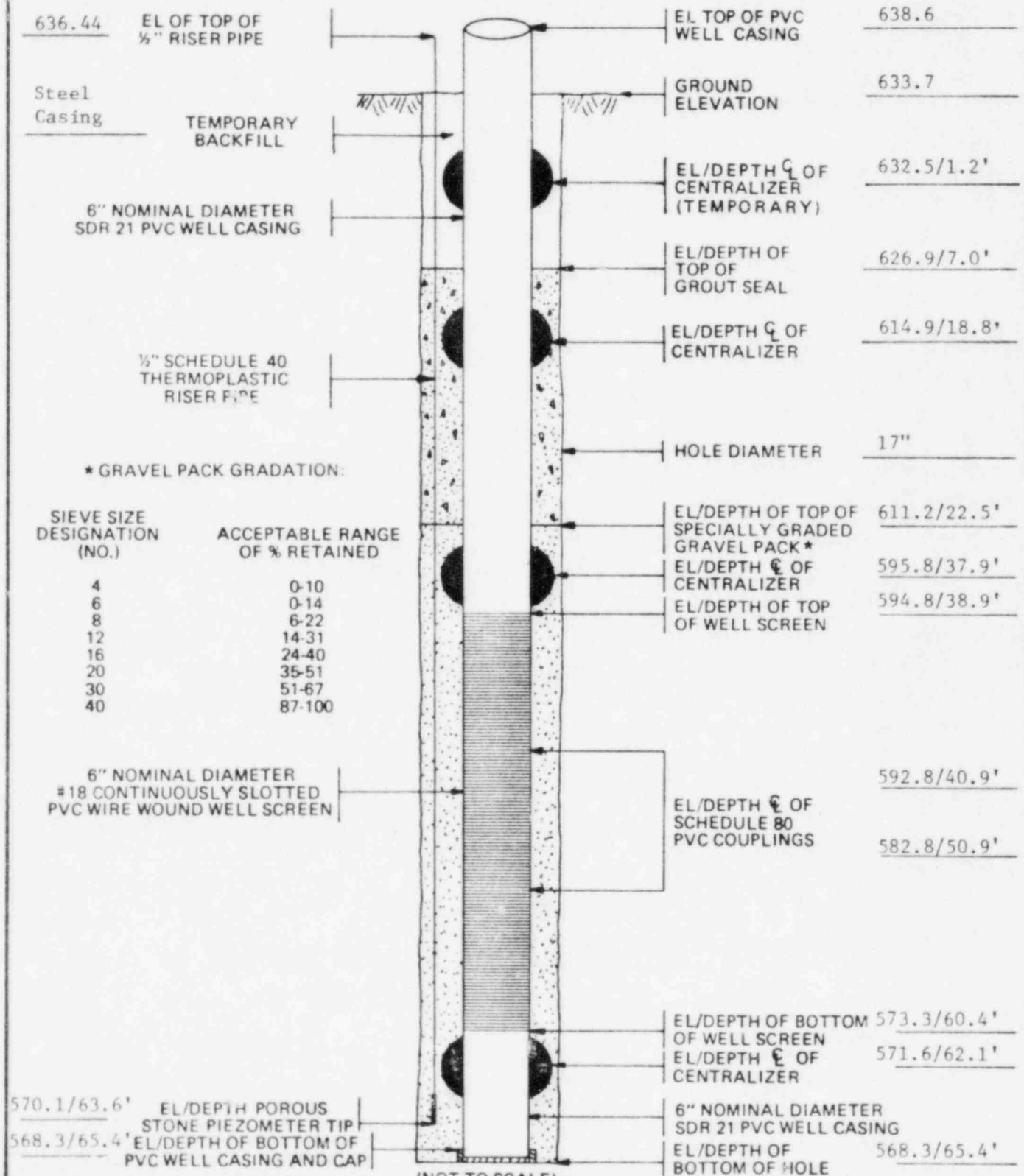
COORDINATES S 4700.6

E 647.6

DATE STARTED 5/20/82

DATE COMPLETED 5/28/82

GEOLOGIST/HYDROGEOLOGIST A. J. Fiksdal/M. D. Johnson INSTALLED BY Kelly Contract Dewatering Co.



(NOT TO SCALE)

d.9-81y

Revision 14



WELL INSTALLATION DATA SHEET

WELL NUMBER M-4A

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S 4700.6 E 647.6 SURFACE ELEVATION 633.7

DATE STARTED 5/12/82 DATE COMPLETED 6/9/82 NO. OF SAMPLES 15

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool  
O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 65.4'  
I.D. 15 1/4" nom SPECIAL CONDITIONS Relocated 3.0' north of well M-4.  
0.4' flushed from hole during cleaning.

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS   
SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 21.5'  
CENTRALIZERS: 1.2', 18.8', 37.9', 62.1'

LENGTH OF BLANK BELOW SCREEN 5.0' LENGTH OF RISER ABOVE SCREEN 43.8'  
LENGTH OF GRAVEL PACKED ZONE 42.9' CALCULATED AMOUNT OF GRAVEL PACK 57.3 cu.ft.  
ACTUAL AMOUNT OF GRAVEL PACK 54.5 cu.ft. CIRCULATION DURING GRAVEL PACKING   
CASAGRANDE TIP DEPTH 63.6' THICKNESS OF SEAL 15.5'  
TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 20.7 cu.ft.  
ACTUAL AMOUNT OF SEAL 24.0 cu.ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping  
DEVELOPING TIME 8 hours AMOUNT OF MATERIAL REMOVED <0.01 cu.ft. (est)

SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT SPECIAL CONDITIONS Added water for development.

FIRST TEST 5.7  
SECOND RETEST \_\_\_\_\_  
THIRD RETEST \_\_\_\_\_

STATIC WATER LEVEL 31.5'/602.2 DATE 5/13/82 EDUCTOR SETTING NA

SUBCONTRACTOR SUBMITTALS:

MICHIGAN DEWATERING WELL RECORD

Revision 14  
12/82

D.9-81z

SUPERVISED BY  
GEOLOGIST/HYDROGEOLOGIST A.J.Fiksdal/M.D.Johnson



# WELL LOG








PROJECT: MIDLAND UNITS 1 AND 2  
 JOB NO.: 7220  
 SHEET NO.: 1 OF 2  
 WELL NO.: M-5

SITE: East of Start-up Transformers  
 COORDINATES: S 4820.1 E 697.7

REGUN: 2-4-82  
 COMPLETED: 2-10-82  
 DRILLER: Kelly Dewatering Co.  
 DRILL MAKE AND MODEL: Bucyrus-Erie 22W  
 HOLE SIZE: 17"  
 TOTAL DEPTH: 67.2'  
 SAMPLES: 15

SCREEN DIA/LENGTH/SLOT: 6"/24.6"/#18  
 EL TOP OF CASING: 638.0  
 GROUND SURFACE EL: 634.0  
 DEPTH/EL GROUND WATER: 52.07/581.93  
 LOGGED BY GEOLOGIST/HYDROGEOLOGIST: T.R. Cullen/M.D. Johnson

CHECKED BY: L.E. Young  
 DATE: 5-18-82  
 APPROVED BY: W. C. Paris Jr.  
 DATE: 5/26/82

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
634.0	0				
632.0	2	1		0-2.0' Silty Sand, gray-brown, fine to medium-grained. (Fill)	Samples collected from this hole contain pea gravel used to backfill pilot hole WM-5 at this location.  0-2.2' Used 30" O.D. tapered auger to drill through frost zone.  2.2'-8.0' Drove 19.8" O.D. casing and cleaned out with 15" O.D. auger.  End of shift 2-4-82 at 8.0' Start of shift 2-8-82
	5	2		2.0'-12.0' Silty Clay, red-brown, with fine to medium-grained sand. (Fill)	
622.0	12	4		12.0'-15.0' Sand, brown, fine to coarse-grained, some silt. (Fill)	
619.0	15	5		15.0'-37.5' Silty to Sandy Clay, brown, some fine to coarse-grained sand. (Fill)	
	20	6			
	25	7			
	30	8			
599.0	32				End of shift 2-8-82 at 33.0' Start of shift 2-9-82

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12/82

SAMPLE TYPE: Grab and Bailer  
 SITE: East of Start-up Transformers  
 WELL NO.: M-5

# WELL LOG

PROJECT

MIDLAND UNITS 1 AND 2

JOB NO.



7220

SHEET NO.

2 OF 2

WELL NO.

M-5

ELEVATION	DEPTH	SAMPLE GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
599.0	35			
596.5	37.5			Fill
	40		37.5'-67.2' Sand, brown to gray, fine-to coarse-grained. (Lacustrine)	Lacustrine
	45			
	50			
	55			▽ 2-7-82
	60			
	65			End of shift 2-9-82 at 64.0' Start of shift 2-10-82
566.8	67.2		T.D.: 67.2', See well construction summary.	Completed hole 2-10-82 See sample extrusion and field log of pilot hole WM-5.

SAMPLE TYPE

Bailer

SITE

East of Start-up Transformer

WELL NO.

M-5

D.9-82a

Revision 14  
12/82



# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

JOB NO. 7220

WELL NO. M-5

SITE East of Startup Transformers

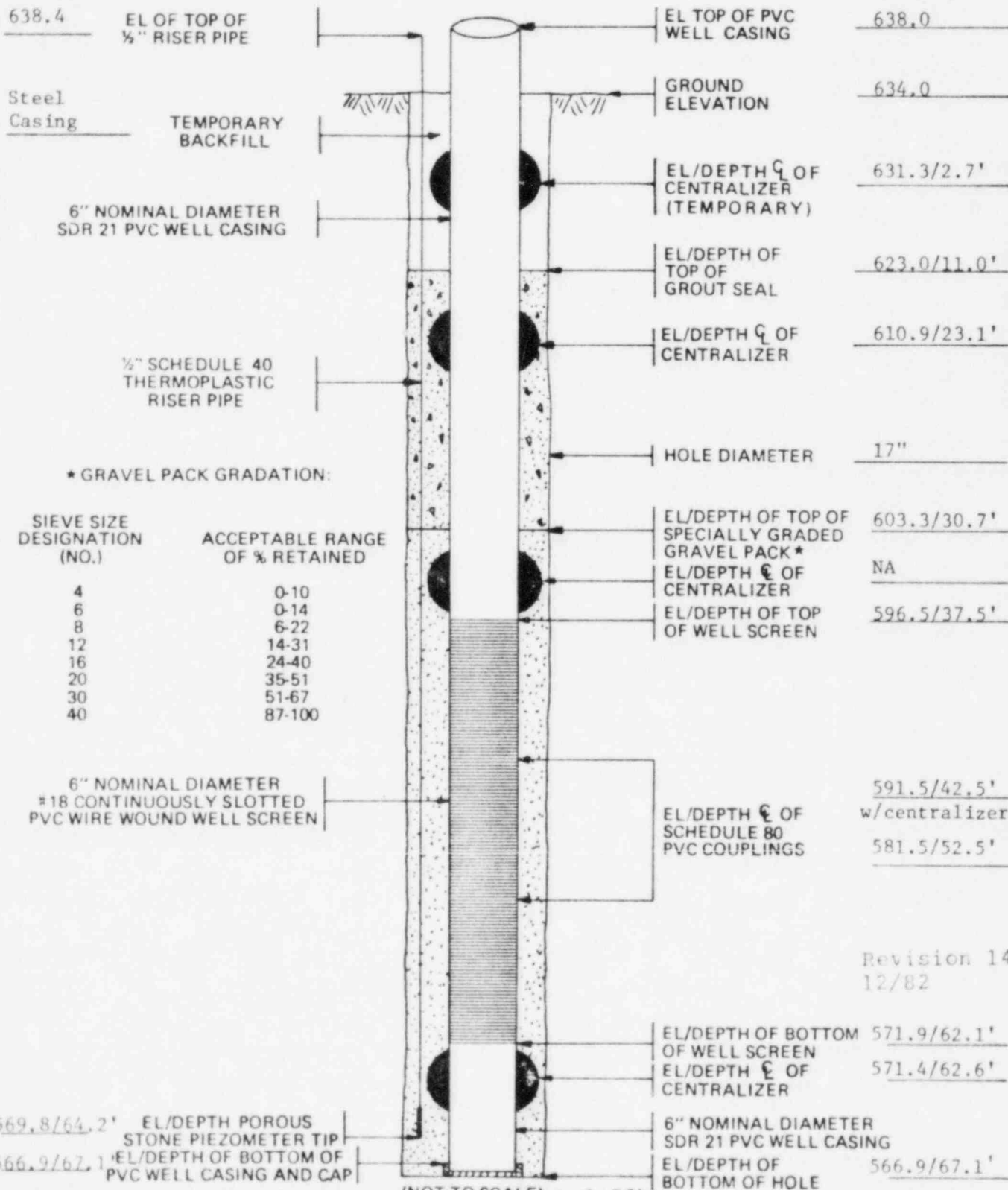
COORDINATES S 4820.1 E 697.7

DATE STARTED 2/19/82

DATE COMPLETED 2/23/82

GEOLOGIST/HYDROGEOLOGIST T. R. Cullen

INSTALLED BY Kelly Contract Dewatering Co.





WELL INSTALLATION DATA SHEET

WELL NUMBER M-5

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S 4820.1 E 697.7 SURFACE ELEVATION 634.0

DATE STARTED 2/4/82 DATE COMPLETED 5/7/82 NO. OF SAMPLES 15

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) O.D. 17" nom I.D. 15 1/4" nom DRILLING METHOD Cable Tool HOLE DIAMETER 17" nom HOLE DEPTH 67.2' SPECIAL CONDITIONS 0-8.0' used 19.8" O.D. casing. 0.1' of material in bottom of hole.

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS  SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 24.6' CENTRALIZERS: 2.7', 23.1', 42.5', 62.6'

LENGTH OF BLANK BELOW SCREEN 5.0' LENGTH OF RISER ABOVE SCREEN 41.5' LENGTH OF GRAVEL PACKED ZONE 36.4' CALCULATED AMOUNT OF GRAVEL PACK 48.6 cu.ft. ACTUAL AMOUNT OF GRAVEL PACK 46.5 cu.ft. CIRCULATION DURING GRAVEL PACKING  CASAGRANDE TIP DEPTH 64.2' THICKNESS OF SEAL 19.7' TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 26.3 cu.ft. ACTUAL AMOUNT OF SEAL 32.1 cu.ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping DEVELOPING TIME 8 hours AMOUNT OF MATERIAL REMOVED <0.01 cu.ft. (1/2st)

SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT 0.5 SPECIAL CONDITIONS none FIRST TEST 0.5 SECOND RETEST  THIRD RETEST

STATIC WATER LEVEL 52.07'/581.93 DATE 2/7/82 EDUCTOR SETTING NA

SUBCONTRACTOR SUBMITTALS: MICHIGAN DEWATERING WELL RECORD  Revision 14 12/82

D.9-82c SUPERVISED BY GEOLOGIST/HYDROGEOLOGIST T.R.Cullen

# WELL LOG

PROJECT: MIDLAND UNITS 1 AND 2  
 JOB NO.: 7220  
 SHEET NO.: 1 OF 2  
 WELL NO.: N-1

SITE: East of Auxiliary Building  
 COORDINATES: S4693.9 E350.1

BEGUN: 1-20-82 COMPLETED: 4-26-82 DRILLER: Kelly Dewatering Co.  
 DRILL MAKE AND MODEL: Bucyrus-Erie 60L HOLE SIZE: 17" TOTAL DEPTH: 53.6' SAMPLES: 13

SCREEN DIA/LENGTH/SLOT: 6"/7.62"/#18 EL TOP OF CASING: 638.3 GROUND SURFACE EL: 634.8 DEPTH/EL GROUND WATER: 21.0'/613.8 LOGGED BY GEOLOGIST/HYDROGEOLOGIST: T.R. Cullen/M.D. Johnson

CHECKED BY: L.E. Young DATE: 6-10-82 APPROVED BY: W.C. Paris, Jr. DATE: 6-16-82

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
634.8	0				
632.8	1			0-2.0' Gravel, gray, with unsorted sand. (Fill)	Samples collected from this hole contain pea gravel used to backfill pilot hole wn-3 at this location.
	2			2.0'-20.0' Silty Clay, brown, orange mottled, with fine- to coarse-grained sand, pebbles, occasional cobble. (Fill)	0-2.0' Used 30" O.D. tapered auger to drill through frost zone. 2.0'-8.0' Drove 19.8" O.D. casing and cleaned out with 15" O.D. auger.
	5				End of shift 1-21-82 at 8.0'
	10				Start of shift 4-22-82
	15				End of shift 4-22-82 at 15.0'
	20			20.0'-28.0' Sand, brown, fine- to coarse-grained, little gravel and silt. (Fill)	4-22-82
	25				
	28			28.0'-35.0' Silty Clay, brown, some fine- to coarse-grained sand, little fine gravel. (Fill)	
	30				
606.8	35				

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12/82

SAMPLE TYPE: Grab and Bailor SITE: East of Auxiliary Building WELL NO.: N-1

# WELL LOG

PROJECT

MIDLAND UNITS 1 AND 2

JOB NO.  
7220

SHEET NO.  
2 OF 2

WELL NO.  
N-1

ELEVATION	DEPTH	SAMPLE GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
599.8	35			
	9		35.0'-45.0' Sandy Clay, brown, fine-grained sand, trace coarse-grained sand. (Fill)	
	40			
	11		44.0'-45.0' Decrease in sand content.	
589.8	45		45.0'-53.6' Sand, brown, fine-to coarse-grained, some fine gravel. (Fill)	End of shift 4-23-82 at 47.0' Start of shift 4-26-82
	50			
	13			
581.2	53.6		53.6' Concrete.	Completed hole 4-26-82
			T.D.: 53.6', See well construction summary	See sample extrusion and field log of pilot hole WN-3.

SAMPLE TYPE  
Bailer

SITE  
East of Auxiliary Building

WELL NO.  
N-1

D.9-82e

Revision 14  
12/82



# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

JOB NO. 7220

WELL NO. N-1

SITE Auxiliary Building

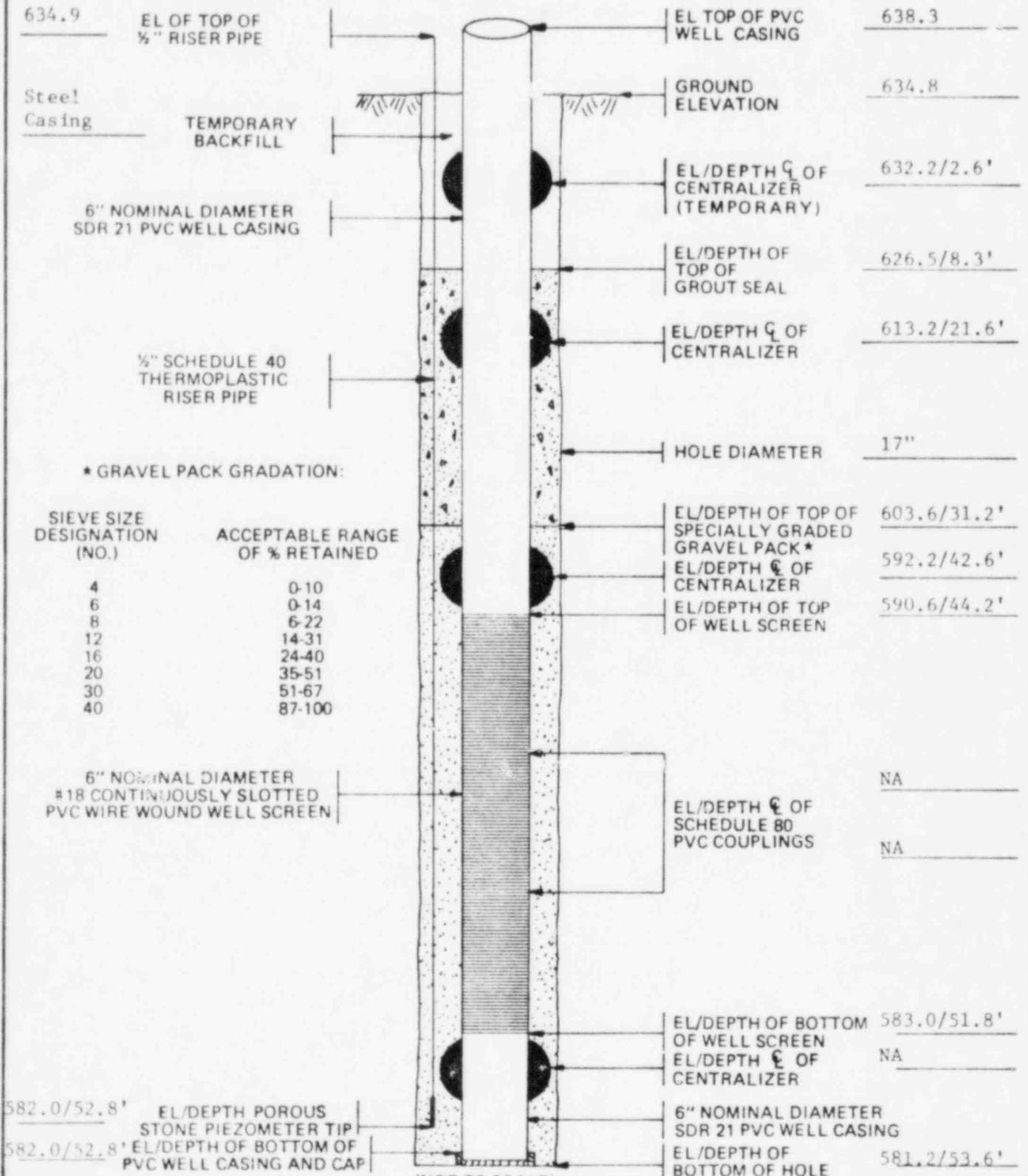
COORDINATES S 4683.9 E 350.1

DATE STARTED 5/14/82

DATE COMPLETED 5/28/82

GEOLOGIST/HYDROGEOLOGIST M. D. Johnson

INSTALLED BY Kelly Contract Dewatering Co.



**\* GRAVEL PACK GRADATION:**

SIEVE SIZE DESIGNATION (NO.)	ACCEPTABLE RANGE OF % RETAINED
4	0-10
6	0-14
8	6-22
12	14-31
16	24-40
20	35-51
30	51-67
40	87-100

6" NOMINAL DIAMETER  
#18 CONTINUOUSLY SLOTTED  
PVC WIRE WOUND WELL SCREEN

NA

NA

583.0/51.8'

NA

581.2/53.6'

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WELL INSTALLATION DATA SHEET

WELL NUMBER N-1

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S 4683.9 E 350.1 SURFACE ELEVATION 634.8

DATE STARTED 1/20/82 DATE COMPLETED 6/8/82 NO. OF SAMPLES 13

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool  
O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 53.6'  
I.D. 15 1/4" nom SPECIAL CONDITIONS 0-8.0' used 19.8" O.D. casing.  
0.8' of material in bottom of hole.

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS   
SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 7.62'  
CENTRALIZERS: 2.6', 21.6', 42.6'

LENGTH OF BLANK BELOW SCREEN 1.0' LENGTH OF RISER ABOVE SCREEN 47.7'  
LENGTH OF GRAVEL PACKED ZONE 21.6' CALCULATED AMOUNT OF GRAVEL PACK 28.9 cu.ft.  
ACTUAL AMOUNT OF GRAVEL PACK 26.7 cu.ft. CIRCULATION DURING GRAVEL PACKING   
CASAGRANDE TIP DEPTH 52.8' THICKNESS OF SEAL 22.9'  
TYPE OF SEAL Myster Flow - 713 Grout CALCULATED AMOUNT OF SEAL 30.7 cu.ft.  
ACTUAL AMOUNT OF SEAL 35.7 cu.ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping  
DEVELOPING TIME 7 hours AMOUNT OF MATERIAL REMOVED <0.01 cu.ft. (est)

SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT SPECIAL CONDITIONS none  
FIRST TEST 1.6  
SECOND RETEST \_\_\_\_\_  
THIRD RETEST \_\_\_\_\_

STATIC WATER LEVEL 21.0'/613.8 DATE 4/22/82 EDUCTOR SETTING NA

SUBCONTRACTOR SUBMITTALS:

MICHIGAN DEWATERING WELL RECORD

Revision 14  
12/82

D.9-82g

SUPERVISED BY  
GEOLOGIST/HYDROGEOLOGIST M.D. Johnson



# WELL LOG

PROJECT: MIDLAND UNITS 1 AND 2  
 JOB NO.: 7220  
 SHEET NO.: 1 OF 2  
 WELL NO.: N-2

SITE: Oily Waste Building  
 COORDINATES: S4661.1 E381

BEGUN: 1-21-82  
 COMPLETED: 4-29-82  
 DRILLER: Kelley Dewatering Co.  
 DRILL MAKE AND MODEL: Bucyrus-Erie 60L  
 HOLE SIZE: 17"  
 TOTAL DEPTH: 70.2'  
 SAMPLES: 16

SCREEN DIA/LENGTH/SLOT: 6"/23.0'/#18  
 EL TOP OF CASING: 638.0  
 GROUND SURFACE EL: 634.8  
 DEPTH/EL GROUND WATER: 15.42'/619.38  
 LOGGED BY GEOLOGIST/HYDROGEOLOGIST: M.D. Johnson/R.J. Kelleher

CHECKED BY: L.E. Young  
 DATE: 6-10-82  
 APPROVED BY: W.C. Paris, Jr.  
 DATE: 6-18-82

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
634.8	0				
	1			0-3.0' Gravel, gray. (Fill)	0-2.0' Used 30" O.D. tapered auger to drill through frost zone.
631.8	3			3.0'-6.5' Sand, orange-brown, some gravel. (Fill)	2.0'-8.0' Drove 19.8" O.D. casing and cleaned out with 15" O.D. auger.
628.3	6.5			6.0'-38.0' Silty Clay, brown, with pebbles, gravel, and cobbles. (Fill)	End of shift 1-21-82 at 8.0' Start of shift 4-27-82
	10				
	15				
	20				
	25				
	30				
	35				
599.8	35				

▽  
5-5-82

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SAMPLE TYPE: Grab and Bailer  
 SITE: Oily Waste Building  
 WELL NO.: N-2

# WELL LOG

PROJECT

MIDLAND UNITS 1 AND 2

JOB NO.




7220

SHEET NO.

2 OF 2

WELL NO.

N-2

ELEVATION	DEPTH	SAMPLE GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
599.8	35			
596.8	38			Fill
	40		38.0'-61.0' Sand, brown, fine-grained. (Lacustrine)	End of shift 4-27-82 at 38.0' Lacustrine Start of shift 4-28-82
573.8	61		61.0'-70.2' Silty Clay, gray, trace very fine- to fine-grained sand. (Lacustrine)	End of shift 4-28-82 at 61.0' Start of shift 4-29-82
564.6	70.2		T.D.: 70.2', Well abandoned 5-26-82. See well plugging report.	Completed hole 4-29-82 Well N-2A replaces well N-2.

SAMPLE TYPE

Bailer

SITE

Oily Waste Building

WELL NO.

N-2

D.9-82i

Revision 14  
12/82



# WELL LOG

PROJECT

MIDLAND UNITS 1 AND 2

JOB NO.






7220

SHEET NO.

2 OF 2

WELL NO.

N-2A

ELEVATION	DEPTH	SAMPLE GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
599.2	35			
597.2	37		37.0'-38.0' Sand and Gravel, brown, fine- to coarse-grained sand and fine gravel, trace to some silty clay. (Fill)	Start of shift 7-26-82
596.2	38			Fill
	40		38.0'-65.0' Sand, brown, very fine- to fine-grained, trace fine gravel, trace organics. (Lacustrine)	Lacustrine
	42			End of shift 7-26-82 at 42.0'
	44			Start of shift 7-27-82
	45			
	50			 8-6-82
	55			
	60			
569.2	65		65.0'-70.2' Silty Clay, gray, laminated. (Lacustrine)	
	70			Completed hole 7-27-82
564.0	70.2		T.D. : 70.2', See well construction summary.	

SAMPLE TYPE  
Bailer

SITE

Oily Waste Tank

WELL NO.  
N-2A

D.9-82k

Revision 14  
12/82



# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

JOB NO. 7220

WELL NO. N-2A

SITE Oily Waste Tank

COORDINATES S 4661.2

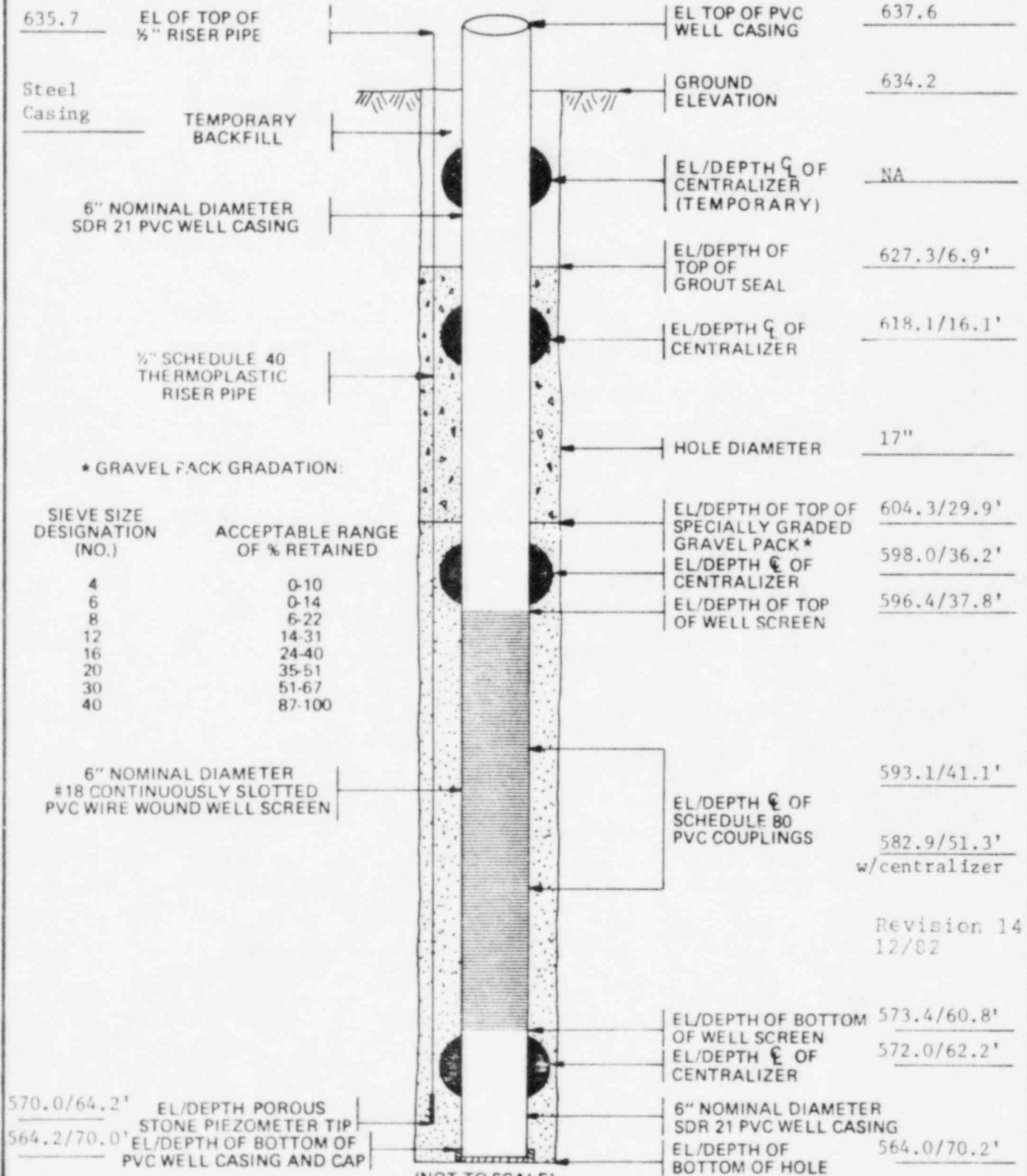
E 385.8

DATE STARTED 7/28/82

DATE COMPLETED 7/30/82

GEOLOGIST/HYDROGEOLOGIST A. J. Fiksdal

INSTALLED BY Kelly Contract Dewatering Co.



Revision 14  
12/82

(NOT TO SCALE) D.9-821



WELL INSTALLATION DATA SHEET

WELL NUMBER N-2A

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S 4661.2 E 385.8 SURFACE ELEVATION 634.2

DATE STARTED 7/22/82 DATE COMPLETED 8/2/82 NO. OF SAMPLES 17

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool  
O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 70.2'  
I.D. 15 1/4" nom SPECIAL CONDITIONS N-2A relocated 5.0' east of well N-2, 0.2' of material in bottom of hole.

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS   
SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 23.0'  
CENTRALIZERS: 16.1', 36.2', 51.3', 62.2'

LENGTH OF BLANK BELOW SCREEN 9.2' LENGTH OF RISER ABOVE SCREEN 41.2'  
LENGTH OF GRAVEL PACKED ZONE 40.1' CALCULATED AMOUNT OF GRAVEL PACK 53.6 cu.ft.  
ACTUAL AMOUNT OF GRAVEL PACK 54.5 cu.ft. CIRCULATION DURING GRAVEL PACKING   
CASAGRANDE TIP DEPTH 64.2' THICKNESS OF SEAL 23.0'  
TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 30.7 cu.ft.  
ACTUAL AMOUNT OF SEAL 33.2 cu.ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping  
DEVELOPING TIME 7 hours AMOUNT OF MATERIAL REMOVED <0.01 cu.ft. (est)

SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT SPECIAL CONDITIONS Added water for development.  
FIRST TEST 0.4  
SECOND RETEST \_\_\_\_\_  
THIRD RETEST \_\_\_\_\_

STATIC WATER LEVEL 49.05'/585.15 DATE 8/6/82 EDUCTOR SETTING NA

SUBCONTRACTOR SUBMITTALS: Revision 14  
MICHIGAN DEWATERING WELL RECORD  12/82














SUPERVISED BY  
GEOLOGIST/HYDROGEOLOGIST A.J. Fiksdal

D.9-82m

# WELL LOG

PROJECT: MIDLAND UNITS 1 AND 2  
 JOB NO.: 7220  
 SHEET NO.: 1 OF 2  
 WELL NO.: N-3

SITE: Oily Waste Storage Tank  
 COORDINATES: S 4614.7 E 387.1  
 BEGUN: 1-26-82 COMPLETED: 3-25-82 DRILLER: Kelley Dewatering Co.  
 DRILL MAKE AND MODEL: Bucyrus-Erie 22W HOLE SIZE: 17" TOTAL DEPTH: 66.9' SAMPLES: 16  
 SCREEN DIA/LENGTH/SLOT: 6"/19.1'/#18 EL TOP OF CASING: 637.6 GROUND SURFACE EL: 634.3 DEPTH/EL GROUND WATER: 15.42'/618.88  
 LOGGED BY GEOLOGIST/HYDROGEOLOGIST: M.D. Johnson/B.L. Gallardo  
 CHECKED BY: L.E. Young DATE: 5-14-82 APPROVED BY: W.C. Paris, Jr. DATE: 5-26-82

ELEVATION	DEPTH	SAMPLE GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
634.3	0			
	3		0-3.0' <u>Clay and Gravel</u> , gray. (Fill)	Samples collected from this hole contain grout used to backfill pilot hole WN-4 at this location.
631.3	3		3.0'-6.5' <u>Sand</u> , brown, some silt. (Fill)	0-2.0' Used 30" O.D. tapered auger to drill through frost zone. 2.0'-8.0' Drove 19.8" O.D. casing and cleaned out with 15" O.D. auger.
627.8	6.5		6.5'-29.0' <u>Silty Clay</u> , brown, with fine-to coarse-grained sand and some fine gravel. (Fill)	End of shift 1-26-82 at 8.0' Start of shift 3-23-82
	10			
	15			
	20			
	25			
	27			End of shift 3-23-82 at 27.0' Start of shift 3-24-82
605.3	29		29.0'-33.0' <u>Sandy Clay</u> , brown, fine-to coarse-grained sand. (Fill)	
	30			
	33		Fill	
601.3	33		33.0'-67.0' <u>Sand</u> , brown to gray, fine- to medium-grained. (Lacustrine)	
	35			

 5-5-82

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12/82

SAMPLE TYPE: Crab and Butler SITE: Oily Waste Storage Tank WELL NO.: N-3

# WELL LOG

PROJECT MIDLAND UNITS 1 AND 2

JOB NO. 7220

SHEET NO. 2 OF 2

WELL NO. N-3

ELEVATION	DEPTH	SAMPLE GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
599.3	35			
	9			
	10			
	40			End of shift 3-24-82 at 40.0' Start of shift 3-25-82
	11			
	45			
	2			
	50			
	3			
	55			
	4			
	60			
	5			
	65			
	6			
567.4	66.9			Completed hole 3-25-82
			T.D.: 66.9', See well construction summary.	See sample extrusion and field log of pilot hole WN-4.
	70			

SAMPLE TYPE Bailler	SITE Oily Waste Storage Tank	WELL NO. N-3
------------------------	---------------------------------	-----------------

D.9-82o

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# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

JOB NO. 7220

WELL NO. N-3

SITE Oily Waste Building

COORDINATES S 4614.7

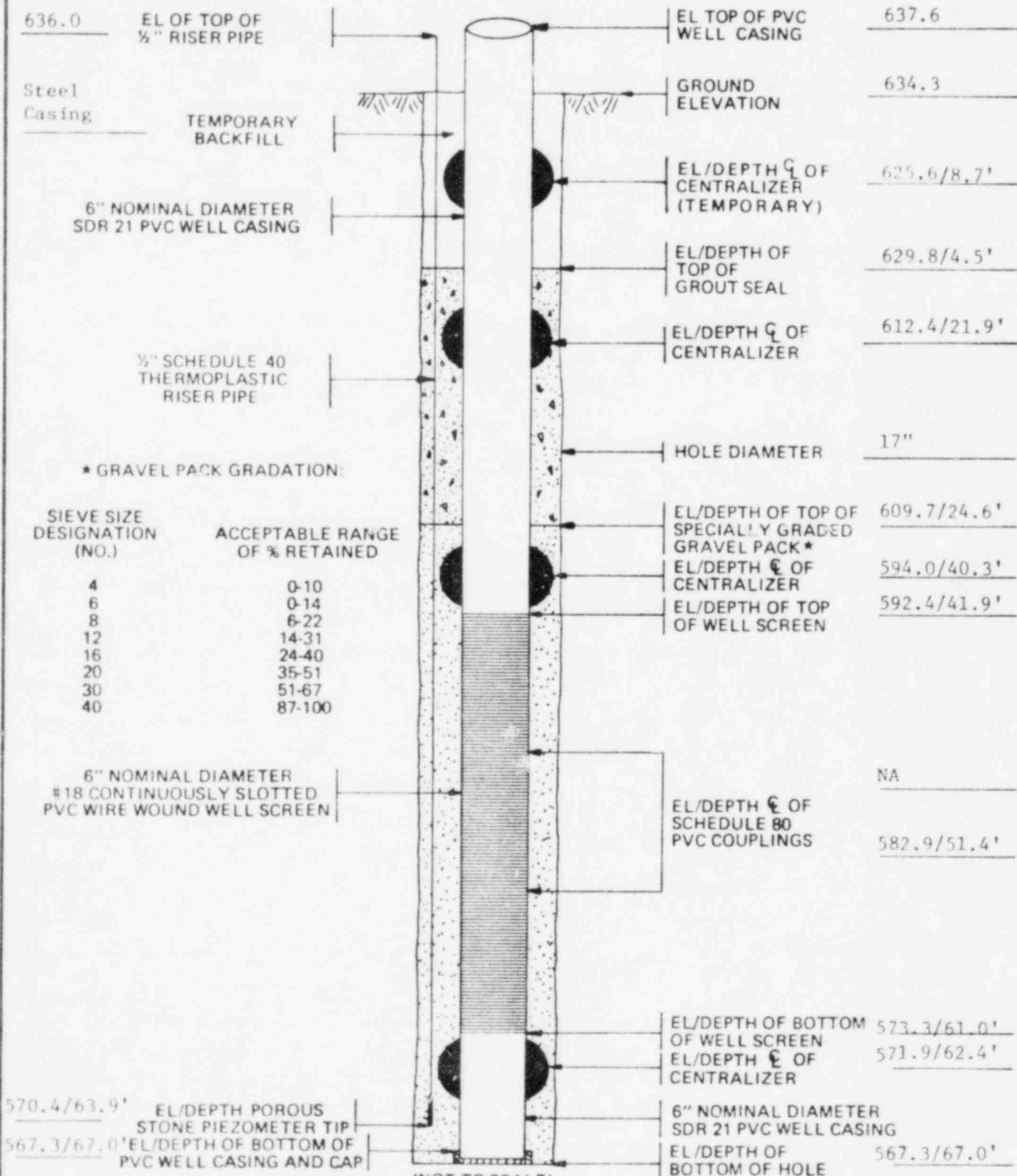
E 387.1

DATE STARTED 4/1/82

DATE COMPLETED 5/5/82

GEOLOGIST/HYDROGEOLOGIST A. J. Fiksdal

INSTALLED BY Kelly Contract Dewatering Co.



(NOT TO SCALE) D.9-82p

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WELL INSTALLATION DATA SHEET

WELL NUMBER N-3

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S 4614.7 E 387.1 SURFACE ELEVATION 634.3

DATE STARTED 1/26/82 DATE COMPLETED 5/13/82 NO. OF SAMPLES 16

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool  
O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 67.0'  
I.D. 15 1/4" nom SPECIAL CONDITIONS 0-8.0' used 19.8" O.D. casing.  
0.1' flushed from hole during cleaning.

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS   
SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 19.1'  
CENTRALIZERS: 8.7', 21.9', 40.3', 62.4'

LENGTH OF BLANK BELOW SCREEN 6.0' LENGTH OF RISER ABOVE SCREEN 45.2'  
LENGTH OF GRAVEL PACKED ZONE 42.4' CALCULATED AMOUNT OF GRAVEL PACK 56.7 cu.ft.  
ACTUAL AMOUNT OF GRAVEL PACK 53.5 cu.ft. CIRCULATION DURING GRAVEL PACKING   
CASAGRANDE TIP DEPTH 63.9' THICKNESS OF SEAL 20.1'  
TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 28.9 cu.ft.  
ACTUAL AMOUNT OF SEAL 28.1 cu.ft.

WELL DEVELOPMENT











TYPE OF DEVELOPMENT Intermittent Pumping  
DEVELOPING TIME 8 hours AMOUNT OF MATERIAL REMOVED < 0.01 cu.ft. (est)

SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT SPECIAL CONDITIONS none  
FIRST TEST 0.3  
SECOND RETEST \_\_\_\_\_  
THIRD RETEST \_\_\_\_\_

STATIC WATER LEVEL 15.42'/618.88 DATE 5/5/82 EDUCTOR SETTING NA

SUBCONTRACTOR SUBMITTALS:  
MICHIGAN DEWATERING WELL RECORD  Revision 14  
12/82

SUPERVISED BY  
D. 9-82g GEOLOGIST/HYDROGEOLOGIST A.J. Fiksdal

WELL LOG		PROJECT		JOB NO.	SHEET NO.	WELL NO.
		MIDLAND UNITS 1 AND 2		7220	1 OF 2	N-4
SITE			COORDINATES			
Oily Waste Building			S 4677.1 E 437.1			
BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE	TOTAL DEPTH	SAMPLES
1-26-82	4-8-82	Kelley Dewatering Co.	Eucyrus-Erie 60L	17"	65.5'	17
SCREEN DIA/ LENGTH/SLOT		EL TOP OF CASING	GROUND SURFACE EL	DEPTH/EL GROUND WATER	LOGGED BY GEOLOGIST/HYDROGEOLOGIST:	
6"/25.0'/#18		637.1	633.9	33.0'/600.9	T. R. Cullen/M. D. Johnson	
CHECKED BY:			DATE	APPROVED BY:		DATE
L. E. Young			5-14-82	W. C. Paris Jr.		5-26-82
ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES	
633.9	0					
631.4	2.5			0-2.5' Gravel, gray. (Fill)	Samples collected from this hole contain pea gravel used to backfill pilot hole WN-4R at this location.	
	5			2.5'-6.5' Sand, reddish brown, fine-to coarse-grained, some fine gravel. (Fill)	0-2.0' Used 30" O.D. tapered auger to drill through frost zone. 2.0'-8.0' Drove 19.8" O.D. casing and cleaned out with a 15" O.D. auger.	
627.4	6.5			6.5'-33.0' Silty Clay, brown, with layers of fine-to coarse-grained sand. (Fill)	End of shift 1-26-82 at 8.0' Start of shift 4-5-82	
	10					
	15					
	20					
	25				End of shift 4-5-82 at 23.0' Start of shift 4-6-82	
	30					
600.9	33.0			33.0'-37.5' Sand, brown, fine-grained, little silt. (Fill)	▽ 4-8-82	
598.9	35				Revision 14 12/82	
SAMPLE TYPE			SITE			WELL NO.
Grab and Bailer			Oily Waste Building			N-4

# WELL LOG

PROJECT

MIDLAND UNITS 1 AND 2

JOB NO.





7220

SHEET NO.

2 OF 2

WELL NO.

N-4

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
598.9	35				
595.4	37.5				Fill
	40			37.5'-63.0' Sand, brown, fine-grained, trace silt. (Lacustrine)	Lacustrine  End of shift 4-6-82 at 41.0' Start of shift 4-8-82
570.9	63			63.0'-64.0' Silty Sand, gray, fine-grained trace lignite. (Lacustrine)	
569.9	64			64.0'-65.5' Sandy Silt, gray, fine-grained sand. (Lacustrine)	
569.4	65.5			T.D.: 65.5', See well construction summary.	Completed hole 4-8-82 See sample extrusion and field log of pilot hole WN-4R.

SAMPLE TYPE

Bailer

SITE

Oily Waste Building

WELL NO.

N-4

D.9-82s

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12/82



# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

JOB NO. 7220

WELL NO. N-4

SITE Oily Waste Building

COORDINATES S 4677.1

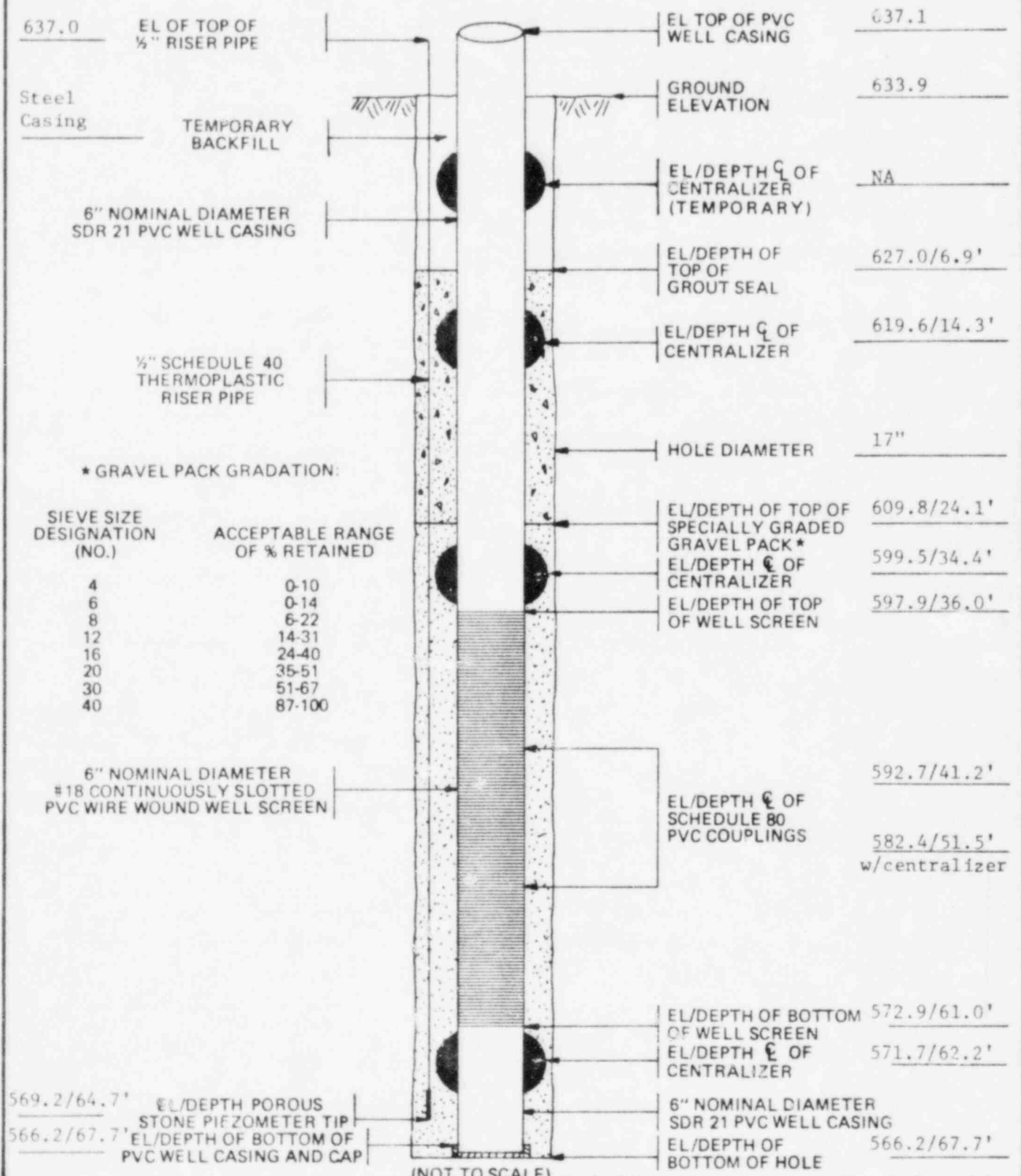
E 437.1

DATE STARTED 4/20/82

DATE COMPLETED 5/5/82

GEOLOGIST/HYDROGEOLOGIST T.R. Cullen/M.D. Johnson

INSTALLED BY Kelly Contract Dewatering Co.



637.0 EL OF TOP OF 1/2" RISER PIPE

Steel Casing

6" NOMINAL DIAMETER SDR 21 PVC WELL CASING

1/2" SCHEDULE 40 THERMOPLASTIC RISER PIPE

\* GRAVEL PACK GRADATION:

6" NOMINAL DIAMETER #18 CONTINUOUSLY SLOTTED PVC WIRE WOUND WELL SCREEN

569.2/64.7' EL/DEPTH POROUS STONE PIEZOMETER TIP

566.2/67.7' EL/DEPTH OF BOTTOM OF PVC WELL CASING AND CAP

EL TOP OF PVC WELL CASING 637.1

GROUND ELEVATION 633.9

EL/DEPTH C OF CENTRALIZER (TEMPORARY) NA

EL/DEPTH OF TOP OF GROUT SEAL 627.0/6.9'

EL/DEPTH C OF CENTRALIZER 619.6/14.3'

HOLE DIAMETER 17"

EL/DEPTH OF TOP OF SPECIALLY GRADED GRAVEL PACK\* 609.8/24.1'

EL/DEPTH C OF CENTRALIZER 599.5/34.4'

EL/DEPTH OF TOP OF WELL SCREEN 597.9/36.0'

EL/DEPTH C OF SCHEDULE 80 PVC COUPLINGS 592.7/41.2'

582.4/51.5' w/centralizer

EL/DEPTH OF BOTTOM OF WELL SCREEN 572.9/61.0'

EL/DEPTH C OF CENTRALIZER 571.7/62.2'

6" NOMINAL DIAMETER SDR 21 PVC WELL CASING

EL/DEPTH OF BOTTOM OF HOLE 566.2/67.7'

(NOT TO SCALE)

D.9-82t

Revision 14  
12/02



WELL INSTALLATION DATA SHEET

WELL NUMBER N-4

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S 4677.1 E 437.1 SURFACE ELEVATION 633.9

DATE STARTED 1/26/82 DATE COMPLETED 5/12/82 NO. OF SAMPLES 17

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool  
O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 67.7'  
I.D. 15 1/4" nom SPECIAL CONDITIONS 0-8.0' used 19.8" O.D. casing.  
2.2' flushed from hole during cleaning.

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS   
SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 25.0'  
CENTRALIZERS: 14.3', 34.4', 51.5', 62.2'

LENGTH OF BLANK BELOW SCREEN 6.7' LENGTH OF RISER ABOVE SCREEN 39.2'  
LENGTH OF GRAVEL PACKED ZONE 43.6' CALCULATED AMOUNT OF GRAVEL PACK 58.3 cu. ft.  
ACTUAL AMOUNT OF GRAVEL PACK 58.4 cu. ft. CIRCULATION DURING GRAVEL PACKING   
CASAGRANDE TIP DEPTH 64.7' THICKNESS OF SEAL 17.2'  
TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 23.9 cu. ft.  
ACTUAL AMOUNT OF SEAL 28.1 cu. ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping  
DEVELOPING TIME 8 hours AMOUNT OF MATERIAL REMOVED < 0.01 cu. ft. (est)  
SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT SPECIAL CONDITIONS none  
FIRST TEST 0.1  
SECOND RETEST \_\_\_\_\_  
THIRD RETEST \_\_\_\_\_

STATIC WATER LEVEL 33.0' / 600.9 DATE 4/8/82 EDUCTOR SETTING NA

SUBCONTRACTOR SUBMITTALS:

MICHIGAN DEWATERING WELL RECORD

Revision 14  
12/82

SUPERVISED BY  
GEOLOGIST/HYDROGEOLOGIST T.R.Cullen/M.D.Johnson

D.9-82u

<b>WELL LOG</b>		PROJECT MIDLAND UNITS 1 AND 2		JOB NO. 7220	SHEET NO. 1 OF 1	WELL NO. N-5
SITE Oily Waste Building			COORDINATES S 4647 E 492			
BEGUN 1-21-82	COMPLETED 1-28-82	DRILLER Kelley Dewatering Co.	DRILL MAKE AND MODEL Bucyrus-Erie 22W	HOLE SIZE 17"	TOTAL DEPTH 18.0'	SAMPLES 5
SCREEN DIA/LENGTH/SLOT NA		EL TOP OF CASING NA	GROUND SURFACE EL 633.9	DEPTH/EL GROUND WATER NA		LOGGED BY GEOLOGIST/HYDROGEOLOGIST T.R. Cullen/A.J. Fiksdal
CHECKED BY L.E. Young			DATE 8-5-82	APPROVED BY: W.C. Paris, Jr.		DATE 8-5-82
ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES:	
633.9						
631.9	1 2 5			0-2.0' Sand and Gravel, gray, poorly sorted. (Fill)  2.0'-9.5' Sand, red-brown, poorly sorted. (Fill)  6.0' Some gravel	0-2.0' Used 30" O.D. tapered auger to drill through frost zone.  2.0'-8.0' Drove 19.8" O.D. casing and cleaned out with 15" O.D. auger.  End of shift 1-21-82 at 8.0' ----- Start of shift 1-28-82	
624.4	9.5 10			9.5'-13.2' Concrete. (Fill)		
620.7	13.2 15			13.2'-18.0' Sandy Clay, red-brown, low plasticity. (Fill)		
615.9	18			T.D.: 18.0', Well abandoned 1-28-82. See well plugging report.	End of shift 1-28-82 at 18.0'  Well N-5A replaces well N-5. See sample extrusion and field log of pilot hole WN-5.	
SAMPLE TYPE Grab and Bailer		SITE Oily Waste Building			WELL NO. N-5	

Revision 14  
12/82

# WELL LOG

PROJECT

MIDLAND UNITS 1 AND 2

JOB NO.

7220

SHEET NO.

1 OF 2

WELL NO.

N-5A

SITE

Oil Waste Building

COORDINATES

S 4642.4

E 491.9

BEGUN

5-7-82

COMPLETED

5-12-82

DRILLER

Kelley Dewatering Co.

DRILL MAKE AND MODEL

Lucyus-Erie 60L

HOLE SIZE

17"

TOTAL DEPTH

70.0'

SAMPLES

16

SCREEN DIA/LENGTH/OT

6"/23.0'/#18

EL TOP OF CASING

637.3

GROUND SURFACE EL

633.9

DEPTH/EL GROUND WATER

18.0'/615.9

LOGGED BY GEOLOGIST/HYDROGEOLOGIST

R.J. Kelleher

CHECKED BY:

L.E. Young

DATE


6-10-82

APPROVED BY:

W.C. Paris, Jr.

DATE

6-16-82

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
633.9	0				
632.5	1.4			0-1.4' Gravel, gray. (Fill)	Well N-5A replaces well N-5. 0-2.0' Hand dug starter hole.
				1.4'-8.0' Sand, brown, very fine- to fine-grained, trace of medium- to coarse-grained sand. (Fill)	
625.9	8			8.0'-38.0' Sandy Clay, brown to gray, mottled, very fine- to fine-grained sand, trace fine gravel. (Fill)	
	14.0				End of shift 5-7-82 at 14.0'
					Start of shift 5-11-82
					 5-12-82
598.9	35				

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12/82

SAMPLE TYPE

Grab and Bailor

SITE

Oil Waste Building

WELL NO.

N-5A









# WELL LOG

PROJECT  
MIDLAND UNITS 1 AND 2

JOB NO.  
7220

SHEET NO.  
2 OF 2

WELL NO.  
N-5A

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
598.9	35				
595.9	38			38.0'-70.0' Sand, brown, very fine- to fine-grained. (Lacustrine)	Fill Lacustrine
	40				
	45				End of shift 5-11-82 at 45.0' ----- start of shift 5-12-82
	50				
	55				
	60				
563.9	70			T.D.: 70.0', See well construction summary.	Completed hole 5-12-82 See sample extrusion and field log of pilot hole WN-5.

SAMPLE TYPE  
Cutter

SITE  
Oil waste building

WELL NO.  
N-5A

D.9-82x

Revision 14  
12/82



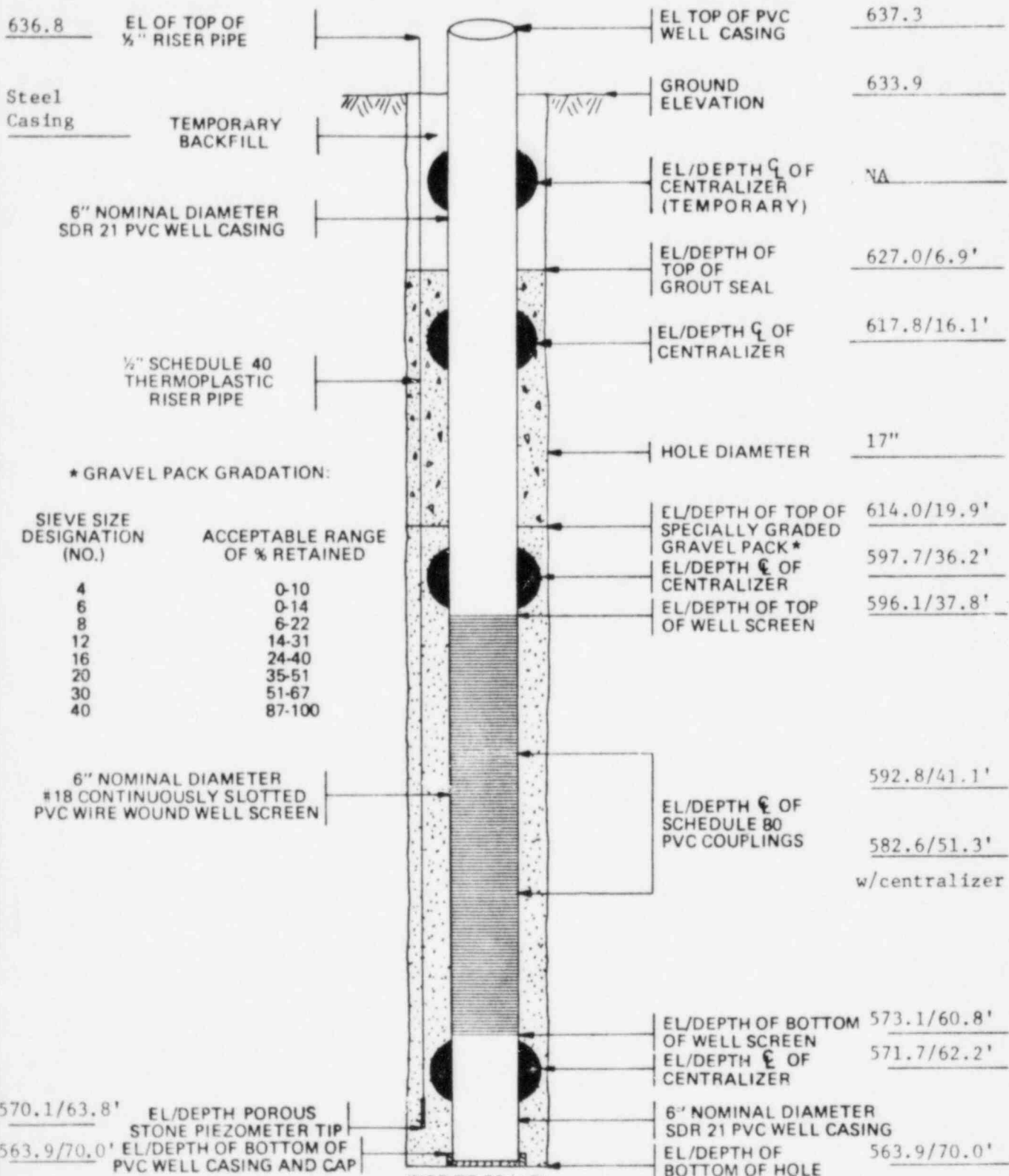
# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

JOB NO. 7220

WELL NO. N-5A

SITE Oily Waste Building      COORDINATES S 4642.4      E 491.9  
 DATE STARTED 5/21/82      DATE COMPLETED 5/28/82  
 GEOLOGIST/HYDROGEOLOGIST M. D. Johnson      INSTALLED BY Kelly Contract Dewatering Co.



\* GRAVEL PACK GRADATION:

SIEVE SIZE DESIGNATION (NO.)	ACCEPTABLE RANGE OF % RETAINED
4	0-10
6	0-14
8	6-22
12	14-31
16	24-40
20	35-51
30	51-67
40	87-100

(NOT TO SCALE)

Revision 14  
12/82



WELL INSTALLATION DATA SHEET

WELL NUMBER N-5A

PROJECT Midland Units 1 & 2 JOB NO. 722-101 SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S 4642.4 E 491.9 SURFACE ELEVATION 633.9

DATE STARTED 5/7/82 DATE COMPLETED 6/10/82 NO. OF SAMPLES 16

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool  
O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 70.0'  
I.D. 15 1/4" nom SPECIAL CONDITIONS none

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS   
SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 23.0'  
CENTRALIZERS: 16.1', 36.2', 51.3', 62.2'

LENGTH OF BLANK BELOW SCREEN 9.2' LENGTH OF RISER ABOVE SCREEN 41.2'  
LENGTH OF GRAVEL PACKED ZONE 50.1' CALCULATED AMOUNT OF GRAVEL PACK 67.0 cu.ft.  
ACTUAL AMOUNT OF GRAVEL PACK 63.4 cu.ft. CIRCULATION DURING GRAVEL PACKING   
CASAGRANDE TIP DEPTH 63.8' THICKNESS OF SEAL 13.0'  
TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 17.4 cu.ft.  
ACTUAL AMOUNT OF SEAL 18.4 cu.ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping  
DEVELOPING TIME 7.5 hours AMOUNT OF MATERIAL REMOVED <0.01 cu.ft. (est)

SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT SPECIAL CONDITIONS none  
FIRST TEST 0.1  
SECOND RETEST \_\_\_\_\_  
THIRD RETEST \_\_\_\_\_

STATIC WATER LEVEL 18.0'/615.9 DATE 5/12/82 EDUCTOR SETTING NA

SUBCONTRACTOR SUBMITTALS:

MICHIGAN DEWATERING WELL RECORD

Revision 14  
12/82

SUPERVISED BY  
GEOLOGIST/HYDROGEOLOGIST M.D. Johnson

# WELL LOG

PROJECT

MIDLAND UNITS 1 AND 2

JOB NO.

722

SHEET NO.

1 OF 2

WELL NO.

N-6

SITE

East of Oily Waste Building

COORDINATES

S 4660.3 E 553.2

BEGUN

1-26-82

COMPLETED

2-2-82

DRILLER

Kelley Dewatering Co.

DRILL MAKE AND MODEL

Bucyrus-Erie 22 W

HOLE SIZE

17"

TOTAL DEPTH

72.5'

SAMPLES

16

SCREEN DIA/LENGTH/SLOT

6"/22.6'/#18

EL TOP OF CASING

637.0

GROUND SURFACE EL

634.0

DEPTH/EL GROUND WATER

46.77'/587.23

LOGGED BY GEOLOGIST/HYDROGEOLOGIST

T.R. Cullen/A.J. Fiksdal

CHECKED BY:

L.E. Young

DATE

5-7-82

APPROVED BY:

W.C. Paris Jr.

DATE

5/28/82

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
634.0	0				
631.5	2.5			0-2.5' Gravel, gray-brown, poorly sorted, with brown clay. (Fill)	0-3.0' Used 30" O.D. tapered auger to drill through frost zone.
	5			2.5'-23.0' Clay, red-brown, with fine-to medium-grained sand, some gravel. (Fill)	3.0'-8.0' prove 19.0" O.D. casing and cleaned out with 15" O.D. auger.
	10				End of shift 1-26-82 at 8.6'
	15				Start of shift 1-29-82
611.0	23			23.0'-35.5' Sandy Clay, gray, with fine-to medium-grained sand, little to some fine-grained sand. (Fill)	
	30				End of shift 1-29-82 at 30.0'
	35				Start of shift 2-1-82

Revision 14  
12/82

SAMPLE TYPE

Grab and Bailor

SITE

East of Oily Waste Building

WELL NO.

N-6







# WELL LOG


PROJECT  
MIDLAND UNITS 1 AND 2

JOB NO.  
7220

SHEET NO.  
2 OF 2

WELL NO.  
N-6

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
599.0	35				
598.5	35.5			35.5'-40.0' Silty Clay, gray, little to some sand. (Lacustrine)	Fill Lacustrine
	40			40.0'-72.5' Sand, brown-gray, fine-to medium-grained. (Lacustrine)	
	45				
	50			50.0'-60.0' Fine-grained, trace coarse-grained sand, fine gravel, occasional pebbles.	
	55				
	60			60.0'-72.5' Fine-grained, little to some medium-grained sand, occasional cobble.	
	65				
	70				
561.5	72.5			T.D.: 72.5', See well construction summary.	Completed hole 2-2-82

 3-11-82

End of shift 2-1-82 at 57.2'

Start of shift 2-2-82

SAMPLE TYPE  
Bailer

SITE  
East of Oily Waste Building

WELL NO.  
N-6



# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

JOB NO. 7220

WELL NO. N-6

SITE East of Oily Waste Building

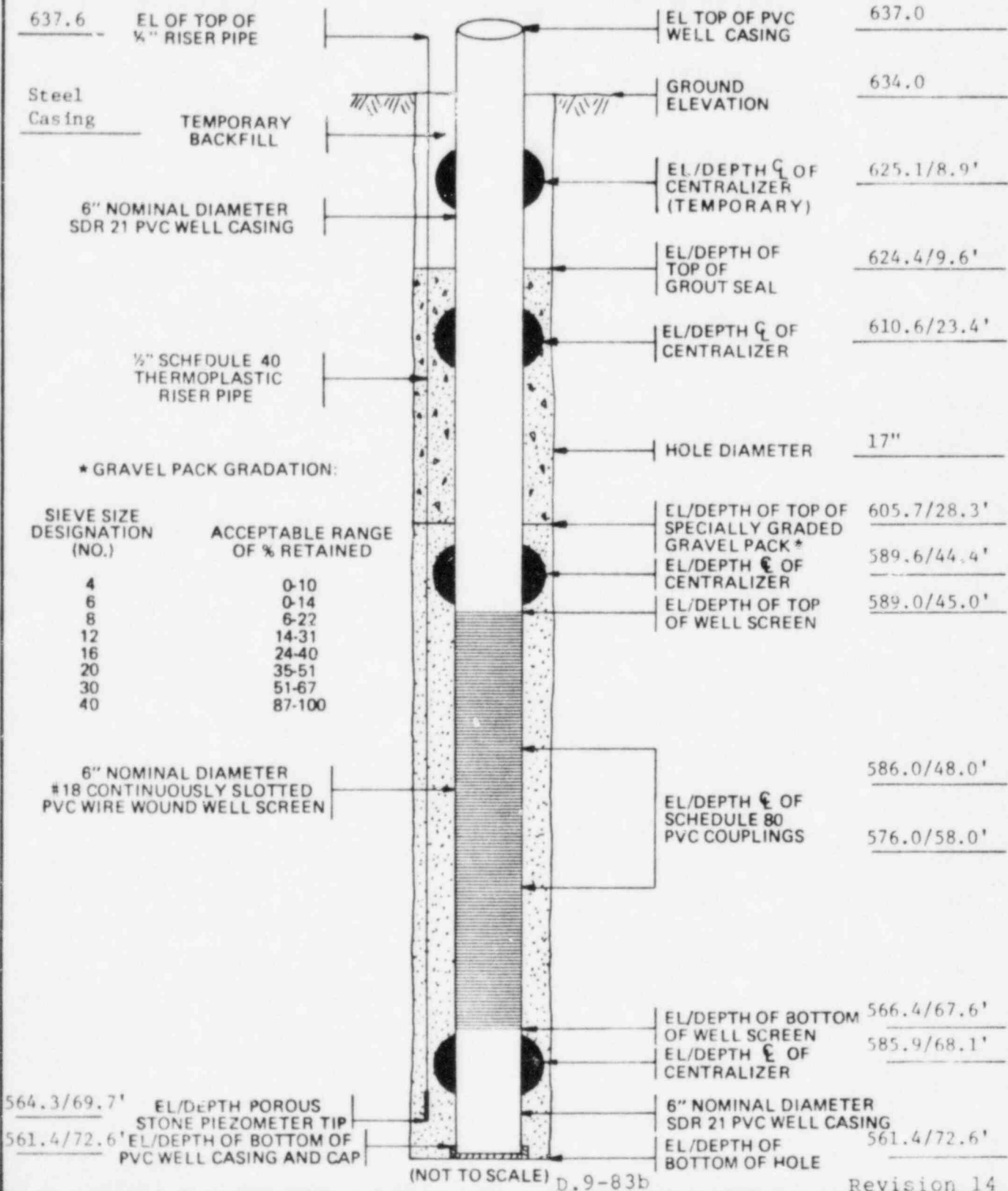
COORDINATES S 4660.3 E 553.2

DATE STARTED 2/15/82

DATE COMPLETED 2/23/82

GEOLOGIST/HYDROGEOLOGIST T. R. Cullen

INSTALLED BY Kelly Contract Dewatering Co.



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12/82



WELL INSTALLATION DATA SHEET

WELL NUMBER N-6

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S 4660.3 E 553.2 SURFACE ELEVATION 634.0

DATE STARTED 1/26/82 DATE COMPLETED 6/11/82 NO. OF SAMPLES 16

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool  
O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 72.6'  
I.D. 15 1/4" nom SPECIAL CONDITIONS 0-8.0' used 19.8" O.D. casing,  
0.1' flushed from hole during cleaning.

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS   
SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 22.6'  
CENTRALIZERS: 8.9', 23.4', 44.4', 68.1'

LENGTH OF BLANK BELOW SCREEN 5.0' LENGTH OF RISER ABOVE SCREEN 48.0'  
LENGTH OF GRAVEL PACKED ZONE 44.3' CALCULATED AMOUNT OF GRAVEL PACK 59.3 cu.ft.  
ACTUAL AMOUNT OF GRAVEL PACK 57.4 cu.ft. CIRCULATION DURING GRAVEL PACKING   
CASAGRANDE TIP DEPTH 69.7' THICKNESS OF SEAL 18.7'  
TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 29.9 cu.ft.  
ACTUAL AMOUNT OF SEAL 32.6 cu.ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping  
DEVELOPING TIME 6.5 hours AMOUNT OF MATERIAL REMOVED <0.01 cu.ft. (est)

SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT SPECIAL CONDITIONS none  
FIRST TEST 0.4  
SECOND RETEST \_\_\_\_\_  
THIRD RETEST \_\_\_\_\_

STATIC WATER LEVEL 46.77'/587.23 DATE 3/11/82 EDUCTOR SETTING NA

SUBCONTRACTOR SUBMITTALS:

MICHIGAN DEWATERING WELL RECORD










Revision 14  
12/82

SUPERVISED BY  
GEOLOGIST/HYDROGEOLOGIST T.R.Cullen

# WELL LOG

PROJECT: MIDLAND UNITS 1 AND 2  
 JOB NO.: 7220  
 SHEET NO. OF: 1 2  
 WELL NO.: OBS-1

SITE: Diesel Generator Building  
 COORDINATES: S 5128.2 E 348.4  
 BEGUN: 5-11-82 COMPLETED: 5-13-82 DRILLER: Kelley Dewatering Co.  
 DRILL MAKE AND MODEL: Bucyrus-Erie 22W HOLE SIZE: 17" TOTAL DEPTH: 55.1' SAMPLES: 14  
 SCREEN DIA/LENGTH/SLOT: 6"/5.0'/#18 EL TOP OF CASING: 637.7 GROUND SURFACE EL: 634.1 DEPTH/EL GROUND WATER: 15.0'/619.1  
 LOGGED BY GEOLOGIST/HYDROGEOLOGIST: M.D. Johnson/A.J. Fiksdal  
 CHECKED BY: L.E. Young DATE: 8-9-82 APPROVED BY: W.C. Paris, Jr. DATE: 8-9-82

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
634.1	0				
633.1	1	1		0-1.0' Gravel, gray, fine to coarse, some clay and sand. (Fill)	0-1.5' Hand dug starter hole.
	2	2		1.0'-6.0' Sand, brown, fine- to medium-grained. (Fill)	
628.1	6	3		6.0'-11.0' Silty Clay, brown, some fine- to coarse-grained sand and fine gravel. (Fill)	
623.1	11	4		11.0'-13.0' Sand, brown, fine- to coarse-grained, little fine gravel. (Fill)	End of shift 5-11-82 at 11.0' Start of shift 5-12-82
621.1	13	5		13.0'-32.0' Sandy Clay, brown, fine- to coarse-grained sand. (Fill)	$\nabla$ 5-13-82
	20	6			
	25	7			
	30	8			
602.1	32	9		32.0'-34.0' Sand, brown, coarse-grained, some fine gravel, little fine- to medium-grained sand. (Fill)	End of shift 5-12-82 at 33.0' Start of shift 5-13-82
600.1	34				
599.1	35				

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SAMPLE TYPE: Grab and Bailor SITE: Diesel Generator Building WELL NO.: OBS-1



# WELL LOG

PROJECT  
MIDLAND UNITS 1 AND 2

JOB NO.  
7220

SHEET NO.  
OF  
2 2

WELL NO.  
OBS-1

ELEVATION	DEPTH	SAMPLE GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
599.1				
598.1	36	10	34.0'-36.0' Clay, brown. (Fill)	Fill
			36.0'-46.0' Silty Clay, gray, low plasticity, trace fine- to coarse-grained sand, thin laminations. (Lacustrine)	Lacustrine
	40			
	45			
588.1	46	13	46.0'-55.1' Clay, gray, plastic, silt laminations, occasional coarse-grained sand. (Lacustrine)	
	50			
	55			Completed hole 5-13-82
579.0	55.1		T.D.: 55.1', See well construction summary.	

SAMPLE TYPE  
Bailer

SITE  
Diesel Generator Building

WELL NO.  
OBS-1

D.9-83e

Revision 14  
12/82



# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

JOB NO. 7220

WELL NO. OBS-1

SITE Diesel Generator Building

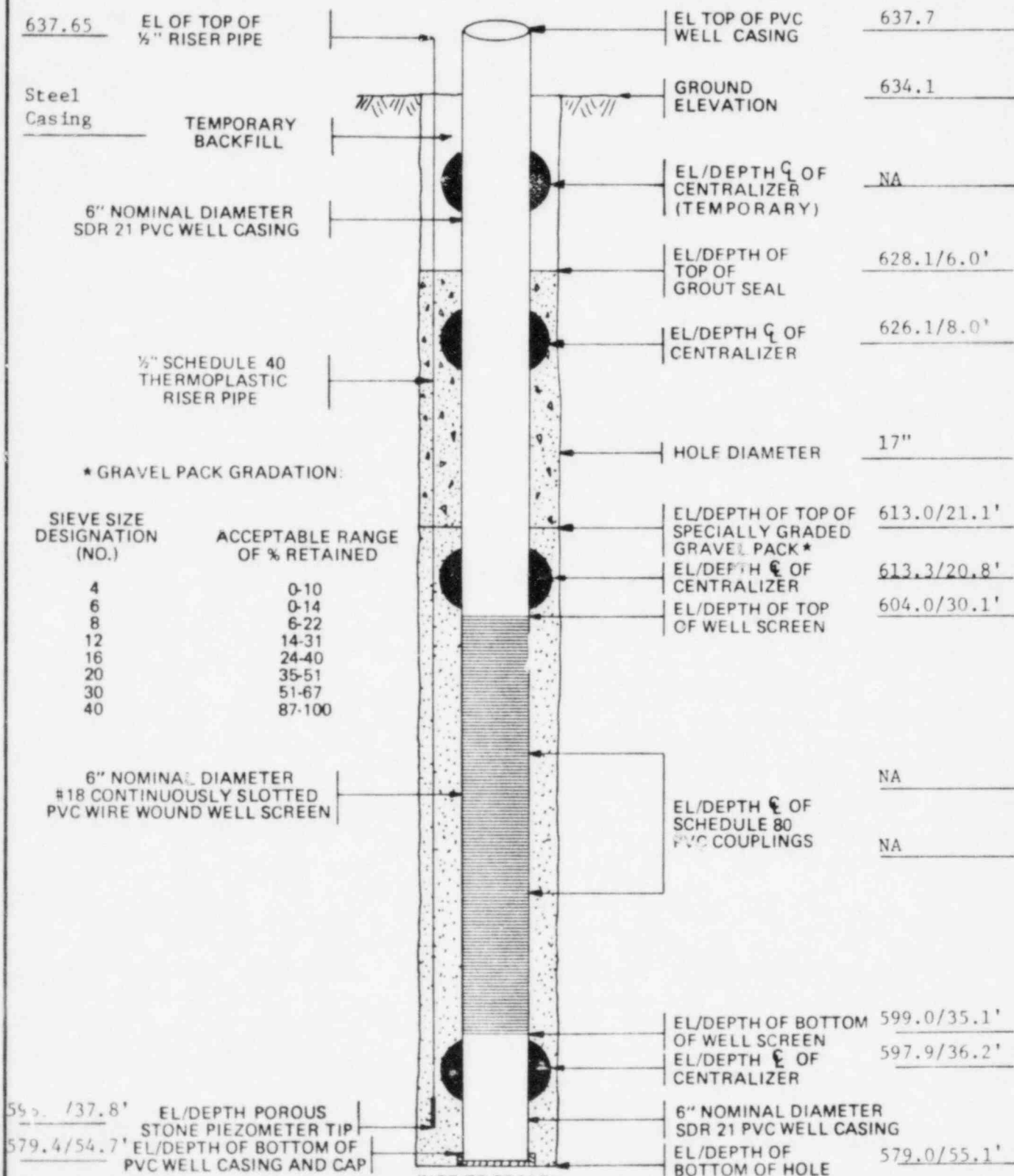
COORDINATES S 5128.2 E 348.4

DATE STARTED 6/1/82

DATE COMPLETED 6/3/82

GEOLOGIST/HYDROGEOLOGIST M. D. Johnson

INSTALLED BY Kelly Contract Dewatering Co.



**\* GRAVEL PACK GRADATION:**

SIEVE SIZE DESIGNATION (NO.)	ACCEPTABLE RANGE OF % RETAINED
4	0-10
6	0-14
8	6-22
12	14-31
16	24-40
20	35-51
30	51-67
40	87-100

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WELL INSTALLATION DATA SHEET

WELL NUMBER OBS-1

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S 5128.2 E 348.4 SURFACE ELEVATION 634.1

DATE STARTED 5/11/82 DATE COMPLETED 6/10/82 NO. OF SAMPLES 14

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool  
O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 55.1'  
I.D. 15 1/4" nom SPECIAL CONDITIONS 0.4' of material in bottom of hole.

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS   
SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 5.0'  
CENTRALIZERS: 8.0', 20.8', 36.2'

LENGTH OF BLANK BELOW SCREEN 19.6' LENGTH OF RISER ABOVE SCREEN 33.7'  
LENGTH OF GRAVEL PACKED ZONE 33.6' CALCULATED AMOUNT OF GRAVEL PACK 44.9 cu.ft.  
ACTUAL AMOUNT OF GRAVEL PACK 39.6 cu.ft. CIRCULATION DURING GRAVEL PACKING   
CASAGRANDE TIP DEPTH 37.8' THICKNESS OF SEAL 15.1'  
TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 20.2 cu.ft.  
ACTUAL AMOUNT OF SEAL 23.0 cu.ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping  
DEVELOPING TIME 6 hours AMOUNT OF MATERIAL REMOVED <0.01 cu.ft. (est)

SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT SPECIAL CONDITIONS none  
FIRST TEST 1.0  
SECOND RETEST \_\_\_\_\_  
THIRD RETEST \_\_\_\_\_

STATIC WATER LEVEL 15.0'/619.1 DATE 6/5/82 EDUCTOR SETTING NA

SUBCONTRACTOR SUBMITTALS:

MICHIGAN DEWATERING WELL RECORD

Revision 14  
12/82

SUPERVISED BY  
GEOLOGIST/HYDROGEOLOGIST M.D. Johnson

D. 9-83g

<b>WELL LOG</b>			PROJECT	JOB NO.	SHEET NO.	WELL NO.
			MIDLAND UNITS 1 AND 2	7220	1 OF 2	OBS-1A
SITE			COORDINATES			
South of Diesel Generator Building			S 5177.8 E 325.4			
BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE	TOTAL DEPTH	SAMPLES
5-18-82	7-22-82	Kelley Dewatering Co.	Bucyrus-Erie 22W	17"	55.7'	14
SCREEN DIA/LENGTH/SLOT		EL TOP OF CASING	GROUND SURFACE EL	DEPTH/EL GROUND WATER	LOGGED BY GEOLOGIST/HYDROGEOLOGIST	
6"/8.2'/#18		633.5	633.8	44.01'/589.79	M. D. Johnson/L. F. Young	
CHECKED BY:			DATE	APPROVED BY:		DATE
A. J. Fiksdal			8-18-82	W. C. Paris, Jr.		8-18-82
ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES	
633.8	0					
629.8	4			0-4.0' Sand, brown, medium- to coarse-grained, some fine gravel. (Fill)	Well OBS-1A supplements well OBS-1. 0-2.8' Hand-dug starter hole.	
629.3	4.5			4.0'-4.5' Concrete, gray. (Fill)		
				4.5'-18.0' Sandy Clay, brown, with fine- to coarse-grained sand, some fine gravel. (Fill)	End of shift 5-18-82 at 12.0' ----- Start of shift 5-19-82	
615.8	18			18.0'-30.0' Sand and Silty Clay, brown, alternating layers of fine- to coarse-grained sand and silty clay, with some fine gravel. (Fill)	End of shift 5-19-82 at 20.0' ----- Start of shift 7-20-82	
603.8	30			30.0'-41.5' Sand, brown, fine- to medium-grained, trace fine gravel. (Lacustrine)	End of shift 7-20-82 at 23.0' ----- Start of shift 7-21-82	
				Fill		
598.8	35				Revision 14 12/82	
SAMPLE TYPE			SITE			WELL NO.
Grab and Bailer			South of Diesel Generator Building			OBS-1A

# WELL LOG

PROJECT  
MIDLAND UNITS 1 AND 2

JOB NO.  
7220

SHEET NO.  
2 OF 2

WELL NO.  
OBS-1A

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
598.8	35				
	40				
592.3	41.5			41.5'-55.7' Silty Clay, gray, laminated. (Lacustrine)	<p>▽ 8-6-82</p> <p>End of shift 7-21-82 at 47.0'</p> <p>Start of shift 7-22-82</p>
	45				
	50				
	55				
578.1	55.7			T.D.: 55.7', See well construction summary.	Completed hole 7-22-82

SAMPLE TYPE Bailer	SITE South of Diesel Generator Building	WELL NO. OBS-1A
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# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

JOB NO. 7220

WELL NO. OBS-1A

SITE South of Diesel Generator Building

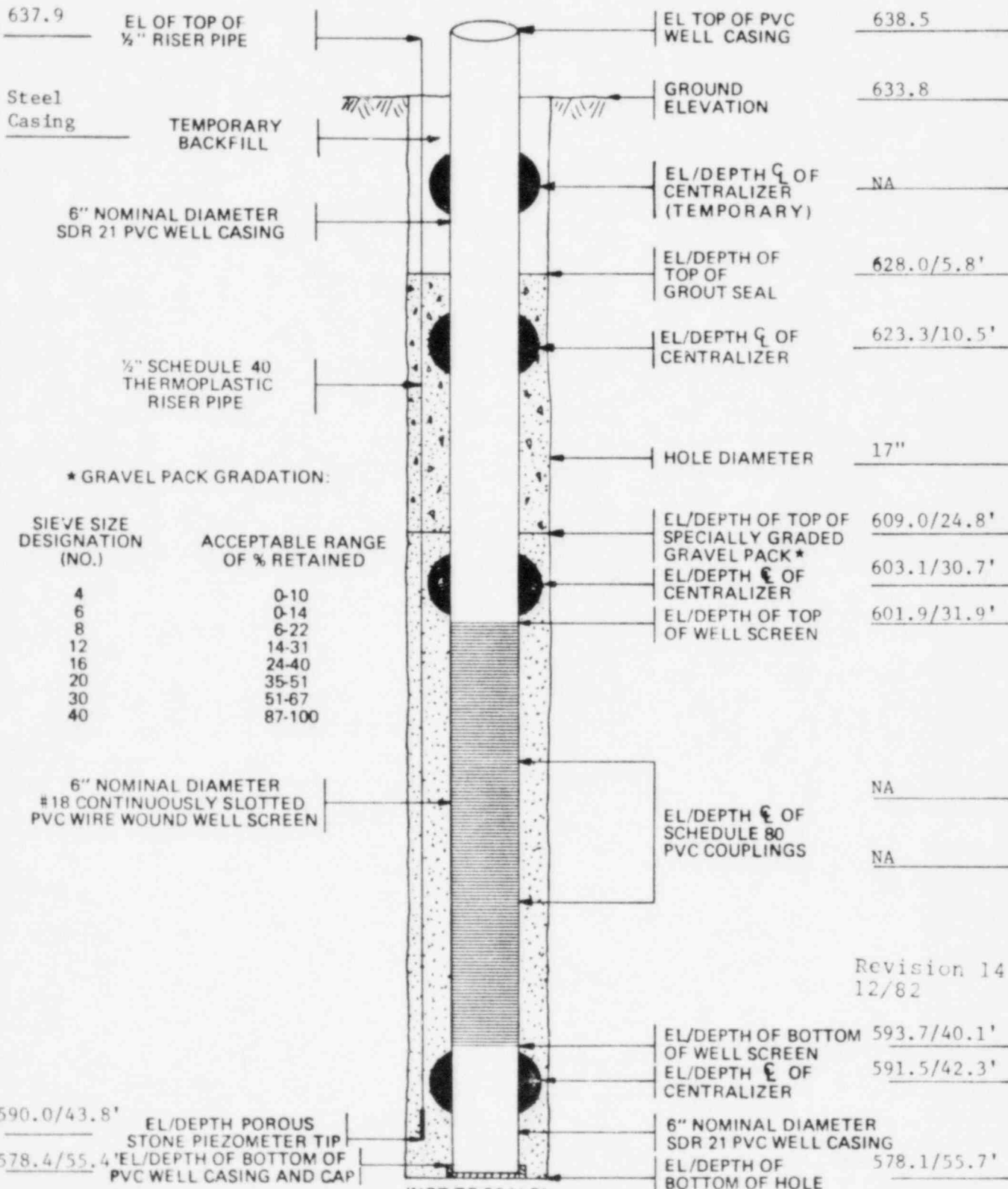
COORDINATES S 5177.8 E 325.4

DATE STARTED 7/29/82

DATE COMPLETED 7/30/82

GEOLOGIST/HYDROGEOLOGIST A. J. Fiksdal

INSTALLED BY Kelly Contract Dewatering Co.



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12/82



WELL INSTALLATION DATA SHEET

WELL NUMBER OBS-1A

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S 5177.8 E 325.4 SURFACE ELEVATION 633.8

DATE STARTED 5/18/82 DATE COMPLETED 8/2/82 NO. OF SAMPLES 14

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool  
O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 55.7'  
I.D. 15 1/4" nom SPECIAL CONDITIONS OBS-1A relocated 49.6' south and 23.0' west of OBS-1. 0.3' of material in bottom of hole.

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS   
SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 8.2'  
CENTRALIZERS: 10.5', 30.7', 42.3'

LENGTH OF BLANK BELOW SCREEN 15.3' LENGTH OF RISER ABOVE SCREEN 36.6'  
LENGTH OF GRAVEL PACKED ZONE 30.6' CALCULATED AMOUNT OF GRAVEL PACK 41.0 cu. ft.  
ACTUAL AMOUNT OF GRAVEL PACK 41.6 cu. ft. CIRCULATION DURING GRAVEL PACKING   
CASAGRANDE TIP DEPTH 43.8' THICKNESS OF SEAL 19.0'  
TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 25.4 cu. ft.  
ACTUAL AMOUNT OF SEAL 28.1 cu. ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping  
DEVELOPING TIME 7 hours AMOUNT OF MATERIAL REMOVED < 0.01 cu. ft. (est)

SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT SPECIAL CONDITIONS Added water for development.  
FIRST TEST 0.5  
SECOND RETEST \_\_\_\_\_  
THIRD RETEST \_\_\_\_\_

STATIC WATER LEVEL 44.01'/589.79 DATE 8/6/82 EDUCTOR SETTING NA

SUBCONTRACTOR SUBMITTALS:

MICHIGAN DEWATERING WELL RECORD

Revision 14  
12/82

SUPERVISED BY  
GEOLOGIST/HYDROGEOLOGIST A.J. Fiksdal

D.9-83k

# WELL LOG

PROJECT: MIDLAND UNITS 1 AND 2  
 JOB NO.: 7220  
 SHEET NO.: 1 OF 2  
 WELL NO.: OBS-2

SITE: Yard East of Turbine Building  
 COORDINATES: S 5133 E 520.1

BEGUN: 3-3-82  
 COMPLETED: 3-15-82  
 DRILLER: Kelley Dewatering Co.  
 DRILL MAKE AND MODEL: Bucyrus-Erie 22W  
 HOLE SIZE: 17"  
 TOTAL DEPTH: 56.4'  
 SAMPLES: 13

SCREEN DIA/LENGTH/SLOT: 6"/12.0'/#18  
 EL TOP OF CASING: 634.7  
 GROUND SURFACE EL: 633.8  
 DEPTH/EL GROUND WATER: 12.12'/621.68  
 LOGGED BY GEOLOGIST/HYDROGEOLOGIST: A.J. Fiksdal/M.D. Johnson

CHECKED BY: L.E. Young  
 DATE: 5-7-82  
 APPROVED BY: W. C. Paris, Jr.  
 DATE: 5/26/82

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
633.8	0				
631.8	2			0-2.0' Sand, gray-brown, with silt and fine gravel. (Fill)	0-2.0' Used 30" O.D. tapered auger to drill through frost zone.
629.8	4			2.0' 4.0' Gravel and Sand. (Fill)	2.0' 4.0' Drove 19.8" O.D. casing and cleaned out with 15" O.D. auger to 6.0'.
	5			4.0' 33.0' Silty Clay, gray to brown, mottled, some fine-to coarse-grained sand. (Fill)	End of shift 3-3-82 at 6.0'
	10				Start of shift 3-11-82
	15			13.0' Fine gravel.	▽ 3-25-82 End of shift 3-11-82 at 14.0'
	20				Start of shift 3-12-82
	25				
	30				
600.8	33			33.0' 47.0' Sand, brown, fine-to coarse-grained, some silt.	End of shift 3-12-82 at 32.0'
598.8	35			(Lacustrine)	Fill Start of shift 3-15-82 Lacustrine

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SAMPLE TYPE: Grab and Bailer  
 SITE: Yard East of Turbine Building  
 WELL NO.: 083-2





# WELL LOG

PROJECT

MIDLAND UNITS 1 AND 2

JOB NO.  
7220

SHEET NO.  
2 OF 2

WELL NO.  
OBS-2

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
598.8	35				
	9				
	40				
	45				
586.8	47			47.0'-51.0' Sand, gray, fine-grained, trace medium-grained sand, organics, and silt. (Lacustrine)	
	50				
582.8	51			51.0'-56.4' Silty Clay, gray, some fine-grained sand, silt partings. (Lacustrine)	
	55				
577.4	56.4			T.D.: 56.4', See well construction summary.	Completed hole 3-15-82

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12/82

SAMPLE TYPE

Bailer

SITE

Yard East of Turbine Building

WELL NO.

OBS-2



# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

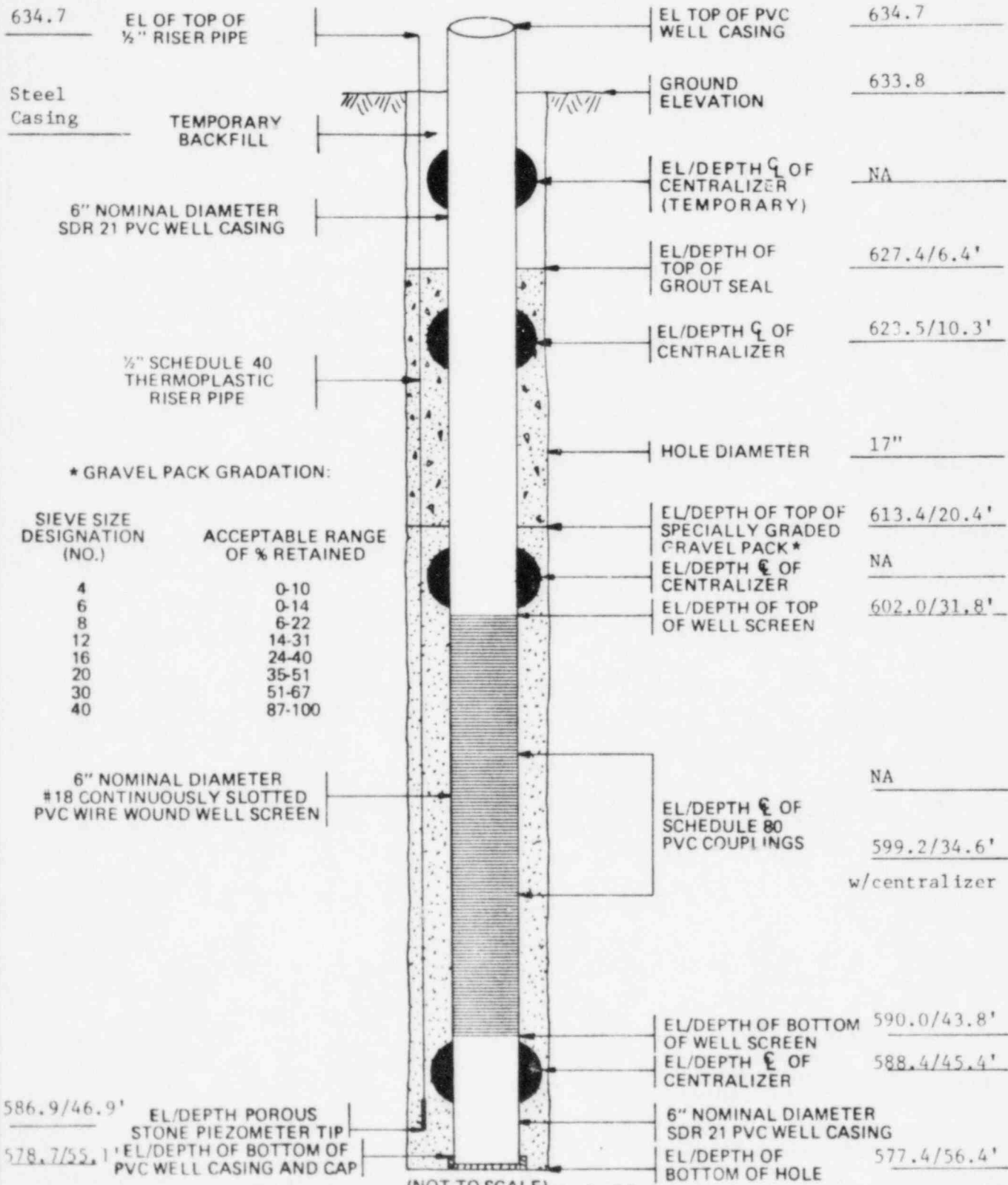
JOB NO. 7220

WELL NO. OBS-2

SITE Southeast of Turbine Building COORDINATES S 5133 E 520.1

DATE STARTED 3/26/82 DATE COMPLETED 4/12/82

GEOLOGIST/HYDROGEOLOGIST A.J. Fiksdal/T.R. Cullen INSTALLED BY Kelly Contract Dewatering Co.



(NOT TO SCALE) D.9-83n

Revision 14  
12/82



WELL INSTALLATION DATA SHEET

WELL NUMBER OBS-2

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S 5133 E 520.1 SURFACE ELEVATION 633.8

DATE STARTED 3/3/82 DATE COMPLETED 5/25/82 NO. OF SAMPLES 13

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool  
O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 56.4'  
I.D. 15 1/4" nom SPECIAL CONDITIONS 0-8.0' used 19.8" O.D. casing.  
1.3' of material in bottom of hole.

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS   
SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 12.0'  
CENTRALIZERS: 10.3', 34.6', 45.4'

LENGTH OF BLANK BELOW SCREEN 11.3' LENGTH OF RISER ABOVE SCREEN 32.7'  
LENGTH OF GRAVEL PACKED ZONE 34.7' CALCULATED AMOUNT OF GRAVEL PACK 46.5 cu.ft.  
ACTUAL AMOUNT OF GRAVEL PACK 44.6 cu.ft. CIRCULATION DURING GRAVEL PACKING   
CASAGRANDE TIP DEPTH 46.9' THICKNESS OF SEAL 14.0'  
TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 25.5 cu.ft.  
ACTUAL AMOUNT OF SEAL 25.5 cu.ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping  
DEVELOPING TIME 8 hours AMOUNT OF MATERIAL REMOVED < 0.01 cu.ft. (est)  
SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT SPECIAL CONDITIONS none  
FIRST TEST 1.6  
SECOND RETEST \_\_\_\_\_  
THIRD RETEST \_\_\_\_\_

STATIC WATER LEVEL 12.12'/621.68 DATE 3/25/82 EDUCTOR SETTING NA

SUBCONTRACTOR SUBMITTALS:  
MICHIGAN DEWATERING WELL RECORD

Revision 14  
12/82

SUPERVISED BY T.R.Cullen/A.J.Fiksdal  
D.9-830 GEOLOGIST/HYDROGEOLOGIST

# WELL LOG

PROJECT: MIDLAND UNITS 1 AND 2  
 JOB NO.: 7220  
 SHEET NO.: 1 OF 2  
 WELL NO.: OBS-3

SITE: South Start-up Transformer  
 COORDINATES: S 4927.7 E 606.2

BEGUN: 3-3-82  
 COMPLETED: 3-22-82  
 DRILLER: Kelly Dewatering Co.  
 DRILL MAKE AND MODEL: Bucyrus-Erie 60L  
 HOLE SIZE: 17"  
 TOTAL DEPTH: 70.7'  
 SAMPLES: 15

SCREEN DIA/LENGTH/SLOT: 6"/26.3"/#18  
 EL TOP OF CASING: 635.9  
 GROUND SURFACE EL: 634.5  
 DEPTH/EL GROUND WATER: 28.95'/605.55  
 LOGGED BY GEOLOGIST/HYDROGEOLOGIST: A.J. Fiksdal/M.D. Johnson

CHECKED BY: L.E. Young  
 DATE: 5-7-82  
 APPROVED BY: W.C. Paris, Jr.  
 DATE: 5/26/82

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
634.5	0				
	1			0-5.0' Silty Clay, gray, with fine-to coarse-grained sand and fine gravel. (Fill)	0-2.0' Used 30" O.D. tapered auger to drill through frost zone. 2.0'-8.0' Drove 19.8" O.D. casing and cleaned out with a 15" O.D. auger.
629.5	5			5.0'-32.0' Sandy Clay, brown, orange, gray, mottled, fine-to coarse-grained sand, some fine gravel and silt. (Fill)	End of shift 3-3-82 at 8.0' Start of shift 3-18-82
	10				
	15				
	20				
	25				End of shift 3-18-82 at 25.0' Start of shift 3-18-82
	30				
602.5	32			32.0'-66.0' Sand, brown to gray, fine-grained. (Lacustrine)	Fill Lacustrine
599.5	35				

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SAMPLE TYPE: Grab and Bailor  
 SITE: South Start-up Transformer  
 WELL NO.: OBS-3

# WELL LOG

PROJECT  
MIDLAND UNITS 1 AND 2

JOB NO.  
7220

SHEET NO.  
2 OF 2

WELL NO.  
OBS-3

ELEVATION	DEPTH	SAMPLE GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
599.5	35			
	40			End of shift 3-19-82 at 40.0'
	45			Start of shift 3-22-82
	50			
	55			
	60			
	65			
568.5	66		66.0'-70.7' Silty Clay, gray. (Lacustrine)	
	70			Completed hole 3-22-82
563.8	70.7		T.D.: 70.7', See well construction summary.	

SAMPLE TYPE

Bailer

SITE

South Start-up Transformer

WELL NO.

OBS-3

D.9-83q

Revision 14  
12/82



# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

JOB NO. 7220

WELL NO. OBS-3

SITE East of Turbine Building

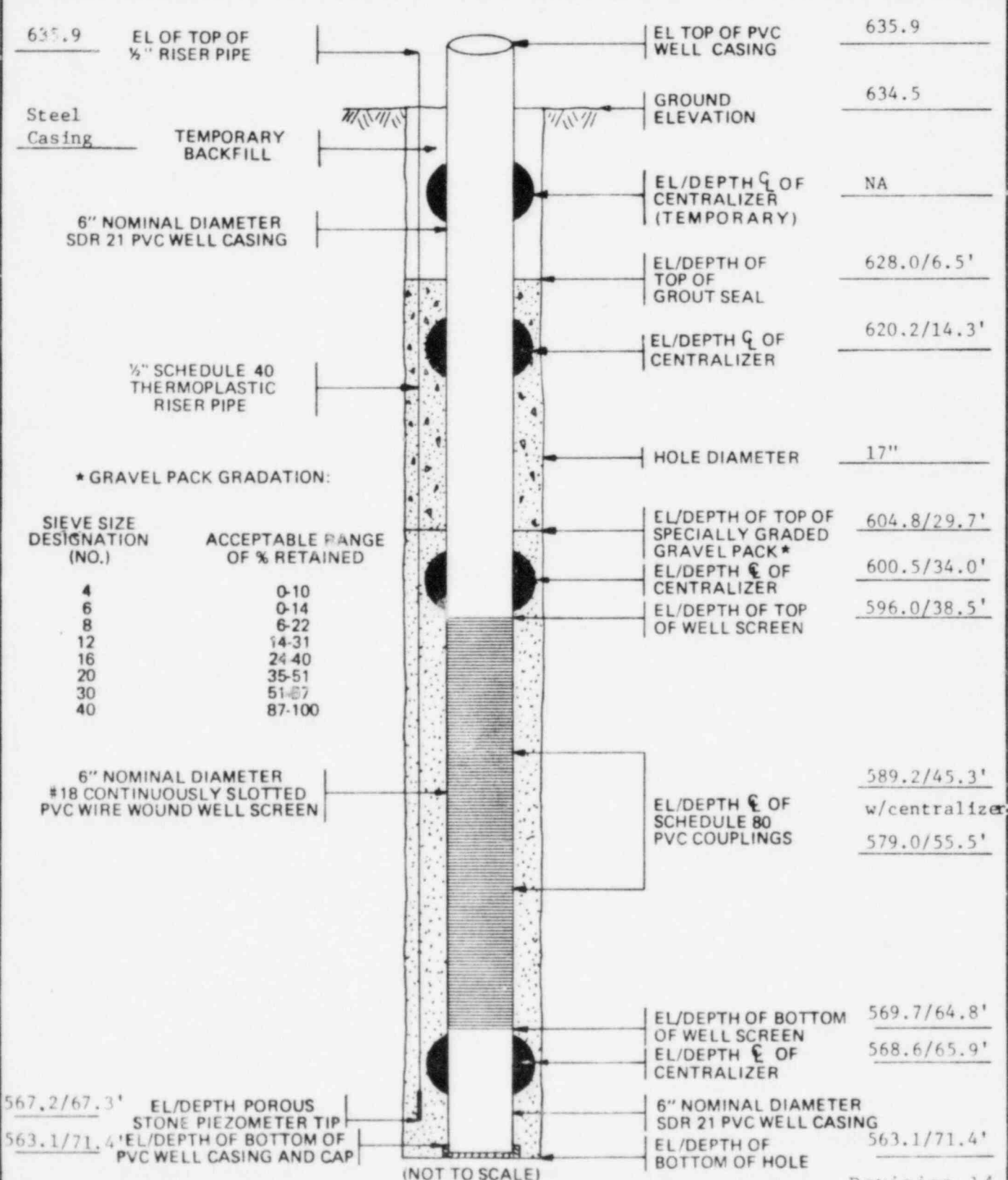
COORDINATES S 4927.7 E 606.2

DATE STARTED 4/1/82

DATE COMPLETED 4/13/82

GEOLOGIST/HYDROGEOLOGIST T.R. Cullen/A. J. Fiksdal

INSTALLED BY Kelly Contract Dewatering Co.



**\* GRAVEL PACK GRADATION:**

SIEVE SIZE DESIGNATION (NO.)	ACCEPTABLE RANGE OF % RETAINED
4	0-10
6	0-14
8	6-22
12	14-31
16	24-40
20	35-51
30	51-67
40	87-100

Revision 14  
12/82



WELL INSTALLATION DATA SHEET

WELL NUMBER OBS-3

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S 4927.7 E 606.2 SURFACE ELEVATION 634.5

DATE STARTED 3/3/82 DATE COMPLETED 5/11/82 NO. OF SAMPLES 15

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool  
O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 71.4'  
I.D. 15 1/4" nom SPECIAL CONDITIONS 0-8.0' used 19.8" O.D. casing.  
0.7' flushed from hole during cleaning.

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS   
SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 26.3'  
CENTRALIZERS: 14.3', 34.0', 45.3', 65.9'

LENGTH OF BLANK BELOW SCREEN 6.6' LENGTH OF RISER ABOVE SCREEN 39.9'  
LENGTH OF GRAVEL PACKED ZONE 41.7' CALCULATED AMOUNT OF GRAVEL PACK 55.7 cu.ft.  
ACTUAL AMOUNT OF GRAVEL PACK 59.4 cu.ft. CIRCULATION DURING GRAVEL PACKING   
CASAGRANDE TIP DEPTH 67.3' THICKNESS OF SEAL 23.2'  
TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 31.9 cu.ft.  
ACTUAL AMOUNT OF SEAL 35.7 cu.ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping  
DEVELOPING TIME 7 hours AMOUNT OF MATERIAL REMOVED <0.01 cu.ft. (est)

SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT SPECIAL CONDITIONS none  
FIRST TEST 0.7  
SECOND RETEST \_\_\_\_\_  
THIRD RETEST \_\_\_\_\_

STATIC WATER LEVEL 28.95'/605.55 DATE 3/22/82 EDUCTOR SETTING NA

SUBCONTRACTOR SUBMITTALS: Revision 14  
MICHIGAN DEWATERING WELL RECORD  12/82

SUPERVISED BY T.R.Cullen/A.J.Fiksdal  
GEOLOGIST/HYDROGEOLOGIST

# WELL LOG














PROJECT: MIDLAND UNITS 1 AND 2  
 JOB NO.: 7220  
 SHEET NO.: 1 OF 2  
 WELL NO.: OBS-5

SITE: Auxiliary Building Train Bay  
 COORDINATES: S 4670.8 E 324.7

BEGUN: 1-20-82  
 COMPLETED: 4-6-82  
 DRILLER: Kelley Dewatering Co.  
 DRILL MAKE AND MODEL: Bucyrus-Erie 60L  
 HOLE SIZE: 17"  
 TOTAL DEPTH: 53.4'  
 SAMPLES: 15

SCREEN DIA/LENGTH/SLOT: 6"/8.7"/#18  
 EL TOP OF CASING: 638.2  
 GROUND SURFACE EL: 634.4  
 DEPTH/EL GROUND WATER: 18.0'/616.4  
 LOGGED BY GEOLOGIST/HYDROGEOLOGIST: T.R. Cullen/R.J. Kelleher

CHECKED BY: A.J. Fiksdal  
 DATE: 6-11-82  
 APPROVED BY: L.E. Young  
 DATE: 8-5-82

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
634.4					
632.4	1			0-2.0' Gravel, gray, coarse, with unsorted sand. Roadbed. (Fill)	Samples collected from this hole may contain pea gravel used to backfill pilot hole OW-5 located 1.0' east of OBS-5.  0-2.0' Used 30" O.D. tapered auger to drill through frost zone.  2.0'-8.0' Drove 19.8" O.D. casing and cleaned out with 15" O.D. auger.
	2			2.0'-8.0' Clay, brown, orange, mottled, with fine- to coarse-grained sand, some gravel, pebbles, occasional cobbles. (Fill)	
	5				End of shift 1-20-82 at 8.0'
626.4	10			8.0'-26.0' Sand, light brown to brown, very fine- to medium-grained, subangular, poorly sorted. (Fill)	Start of shift 4-5-82
	15				
	20				▽ 4-5-82 End of shift 4-5-82 at 18.0'
	25				Start of shift 4-6-82
	26				
608.4	26.5			22.0'-26.0' Some coarse-grained sand and fine gravel.	
607.9	26.5			26.0'-26.5' Concrete. (Fill)	
	30				
	35			26.5'-44.0' Silty Clay, light brown to brown, mottled, fine-grained sand, fine gravel. Low plasticity. (Fill)	
599.4	35				

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SAMPLE TYPE: Grab and Bailer  
 SITE: Auxiliary Building Train Bay  
 WELL NO.: OBS-5





# WELL LOG

PROJECT

MIDLAND UNITS 1 AND 2

JOB NO.  
7220

SHEET NO.  
OF  
2 2

WELL NO.

OBS-5

ELEVATION	DEPTH	SAMPLE GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
599.4	35			
	40			
590.4	44 45		44.0'-53.5' Sand, brown and yellowish brown, fine- to coarse-grained, trace clay. (Fill)	
	50			Completed hole 4-6-82
580.9	52.5		T.D.: 53.5', See well construction summary.	See sample extrusion and field log of pilot hole OW-5.

SAMPLE TYPE Bailer	SITE Auxiliary Building Train Bay	WELL NO. OBS-5
-----------------------	--------------------------------------	-------------------

D.9-83y

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# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

JOB NO. 7220

WELL NO. OBS-5

SITE Auxiliary Building

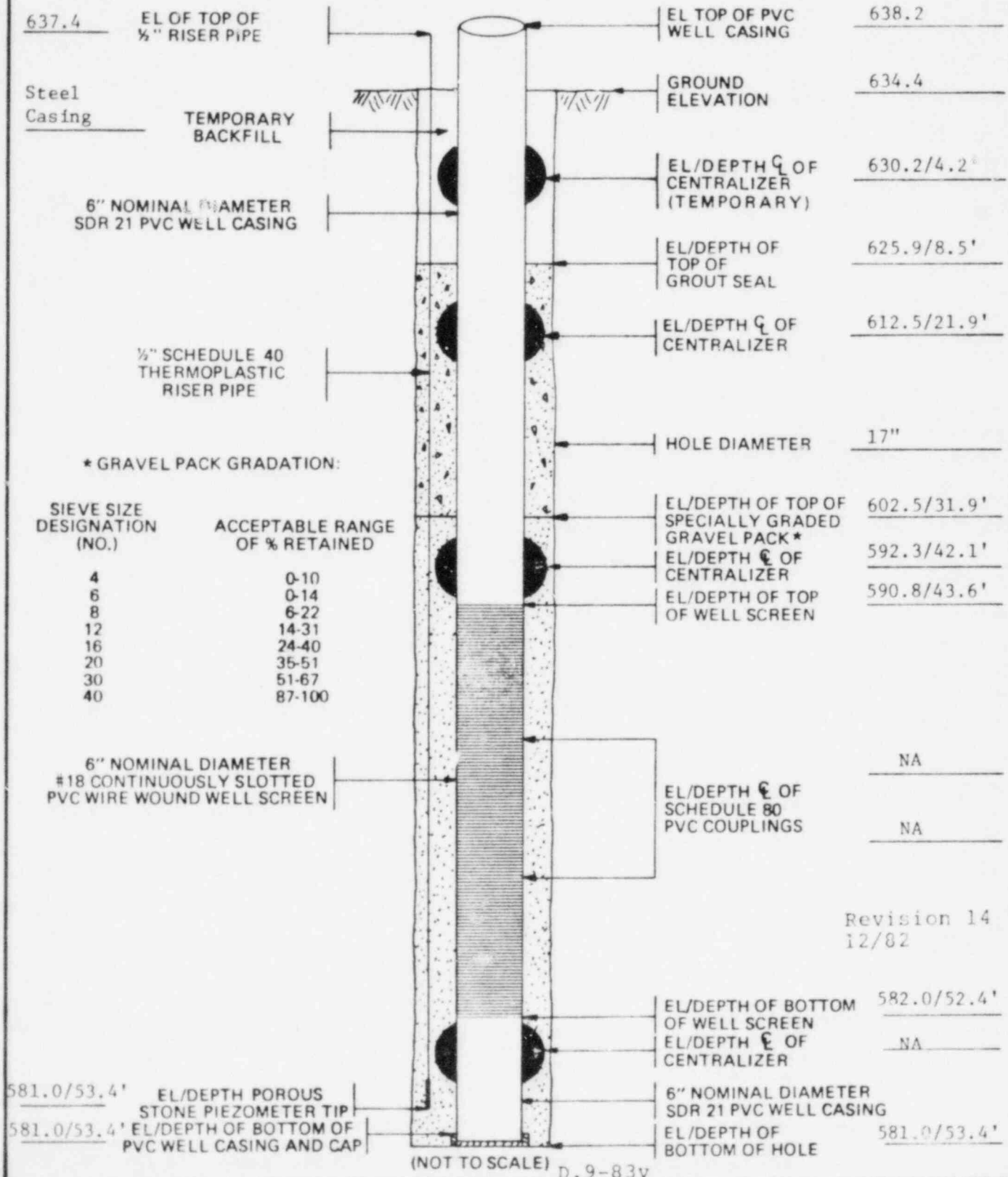
COORDINATES S 4670.8 E 324.7

DATE STARTED 5/14/82

DATE COMPLETED 5/27/82

GEOLOGIST/HYDROGEOLOGIST M. D. Johnson

INSTALLED BY Kelly Contract Dewatering Co.



<p>637.4 EL OF TOP OF 1/2" RISER PIPE</p> <p>Steel Casing</p> <p>6" NOMINAL DIAMETER SDR 21 PVC WELL CASING</p> <p>1/2" SCHEDULE 40 THERMOPLASTIC RISER PIPE</p> <p>* GRAVEL PACK GRADATION:</p> <table border="1" style="font-size: small; border-collapse: collapse; width: 100%;"> <thead> <tr> <th>SIEVE SIZE DESIGNATION (NO.)</th> <th>ACCEPTABLE RANGE OF % RETAINED</th> </tr> </thead> <tbody> <tr><td>4</td><td>0-10</td></tr> <tr><td>6</td><td>0-14</td></tr> <tr><td>8</td><td>6-22</td></tr> <tr><td>12</td><td>14-31</td></tr> <tr><td>16</td><td>24-40</td></tr> <tr><td>20</td><td>35-51</td></tr> <tr><td>30</td><td>51-67</td></tr> <tr><td>40</td><td>87-100</td></tr> </tbody> </table> <p>6" NOMINAL DIAMETER #18 CONTINUOUSLY SLOTTED PVC WIRE WOUND WELL SCREEN</p>	SIEVE SIZE DESIGNATION (NO.)	ACCEPTABLE RANGE OF % RETAINED	4	0-10	6	0-14	8	6-22	12	14-31	16	24-40	20	35-51	30	51-67	40	87-100	<p>EL TOP OF PVC WELL CASING</p> <p>GROUND ELEVATION</p> <p>EL/DEPTH C OF CENTRALIZER (TEMPORARY)</p> <p>EL/DEPTH OF TOP OF GROUT SEAL</p> <p>EL/DEPTH C OF CENTRALIZER</p> <p>HOLE DIAMETER</p> <p>EL/DEPTH OF TOP OF SPECIALLY GRADED GRAVEL PACK *</p> <p>EL/DEPTH C OF CENTRALIZER</p> <p>EL/DEPTH OF TOP OF WELL SCREEN</p> <p>EL/DEPTH C OF SCHEDULE 80 PVC COUPLINGS</p> <p>EL/DEPTH OF BOTTOM OF WELL SCREEN</p> <p>EL/DEPTH C OF CENTRALIZER</p> <p>6" NOMINAL DIAMETER SDR 21 PVC WELL CASING</p> <p>EL/DEPTH OF BOTTOM OF HOLE</p>	<p>638.2</p> <p>634.4</p> <p>630.2/4.2'</p> <p>625.9/8.5'</p> <p>612.5/21.9'</p> <p>17"</p> <p>602.5/31.9'</p> <p>592.3/42.1'</p> <p>590.8/43.6'</p> <p>NA</p> <p>NA</p> <p>Revision 14 12/82</p> <p>582.0/52.4'</p> <p>NA</p> <p>581.0/53.4'</p> <p>581.0/53.4'</p> <p>581.0/53.4'</p>
SIEVE SIZE DESIGNATION (NO.)	ACCEPTABLE RANGE OF % RETAINED																			
4	0-10																			
6	0-14																			
8	6-22																			
12	14-31																			
16	24-40																			
20	35-51																			
30	51-67																			
40	87-100																			



WELL INSTALLATION DATA SHEET

WELL NUMBER OBS-5

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S 4670.8 E 324.7 SURFACE ELEVATION 634.4

DATE STARTED 1/20/82 DATE COMPLETED 6/7/82 NO. OF SAMPLES 15

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool  
O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 53.4'  
I.D. 15 1/4" nom SPECIAL CONDITIONS 0-8.0' used 19.8" O.D. casing,

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS   
SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 8.8'  
CENTRALIZERS: 4.2', 21.9', 42.1'

LENGTH OF BLANK BELOW SCREEN 1.0' LENGTH OF RISER ABOVE SCREEN 47.4'  
LENGTH OF GRAVEL PACKED ZONE 21.5' CALCULATED AMOUNT OF GRAVEL PACK 28.7 cu. ft.  
ACTUAL AMOUNT OF GRAVEL PACK 26.7 cu. ft. CIRCULATION DURING GRAVEL PACKING   
CASAGRANDE TIP DEPTH 53.4' THICKNESS OF SEAL 23.4'  
TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 31.3 cu. ft.  
ACTUAL AMOUNT OF SEAL 35.7 cu. ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping  
DEVELOPING TIME 8 hours AMOUNT OF MATERIAL REMOVED <0.01 cu. ft. (est)

SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT SPECIAL CONDITIONS none  
FIRST TEST 0.7  
SECOND RETEST \_\_\_\_\_  
THIRD RETEST \_\_\_\_\_

STATIC WATER LEVEL 18.0'/616.4 DATE 4/5/82 EDUCTOR SETTING NA

SUBCONTRACTOR SUBMITTALS:  
MICHIGAN DEWATERING WELL RECORD  Revision 14  
12/82

SUPERVISED BY M.D. Johnson  
GEOLOGIST/HYDROGEOLOGIST

<b>WELL LOG</b>			PROJECT	JOB NO.	SHEET NO.	WELL NO.
			MIDLAND UNITS 1 AND 2	7220	1 OF 2	OBS-6
SITE			COORDINATES			
East of Auxiliary Building			S4706.7 E398.1			
BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE	TOTAL DEPTH	SAMPLES
3-1-82	5-4-82	Kelley Dewatering Co.	Bucyrus-Erie 60L	17"	65.3'	16
SCREEN DIA/LENGTH/SLOT		EL TOP OF CASING	GROUND SURFACE EL	DEPTH/EL GROUND WATER	LOGGED BY GEOLOGIST/HYDROGEOLOGIST:	
6"/19.1'/#18		636.1	635.0	19.01'/615.99	A.J. Fiksdal/R.J. Kelleher	
CHECKED BY:			DATE	APPROVED BY:		DATE
L.E. Young			5-7-82	W.C. Paris, Jr.		6-21-82
ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES	
635.0	0					
633.0	1			0 - 2.0' Gravel, gray, with fine- to coarse-grained sand. (Fill)	0 - 1.5' Used 30" O.D. tapered auger to drill through frost zone.	
	2			2.0' - 12.0' Sand, yellow-brown, fine- to coarse-grained, trace fine gravel. (Fill)	1.5 - 8.0' Drove 9.8" O.D. casing and cleaned out with 15" O.D. auger to 6.0'.	
	5				End of shift 3-1-82 at 6.0'	
	3				Start of shift 4-30-82	
623.0	12			12.0' - 37.0' Sandy Clay, brown, mottled, fine- to coarse-grained sand, some fine gravel. (Fill)	End of shift 4-30-82 at 16.0'	
	15				Start of shift 5-3-82	
	20				▽ 5-5-82	
	25					
	30					
	35					
600.0						
SAMPLE TYPE			SITE			WELL NO.
Grab and Bailer			East of Auxiliary Building			OBS-6

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# WELL LOG

PROJECT: MIDLAND UNITS 1 AND 2

JOB NO. 7220

SHEET NO. 2 OF 2

WELL NO. OBS-6

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
600.0	35				
598.0	37			37.0' - 40.0' Silty Clay, brown mottled, with sand, trace fine gravel. (Fill)	End of shift 5-3-82 at 38.0' Start of shift 5-4-82
595.5	40			40.0' - 56.0' Sand, brown, very fine- to fine-grained. (Lacustrine)	Fill Lacustrine
579.0	56			56.0' - 65.3' Silty Clay, gray, some very fine-grained sand, trace coarse-grained sand. (Lacustrine)	
569.7	65.3			T.D.: 65.3', See well construction summary.	Completed hole 5-4-82

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SAMPLE TYPE  
Bailer

SITE  
East of Auxiliary Building

WELL NO.  
OBS-6



# WELL CONSTRUCTION SUMMARY

MIDLAND UNITS 1 AND 2

JOB NO. 7220

WELL NO. OBS-6

SITE Auxiliary Building

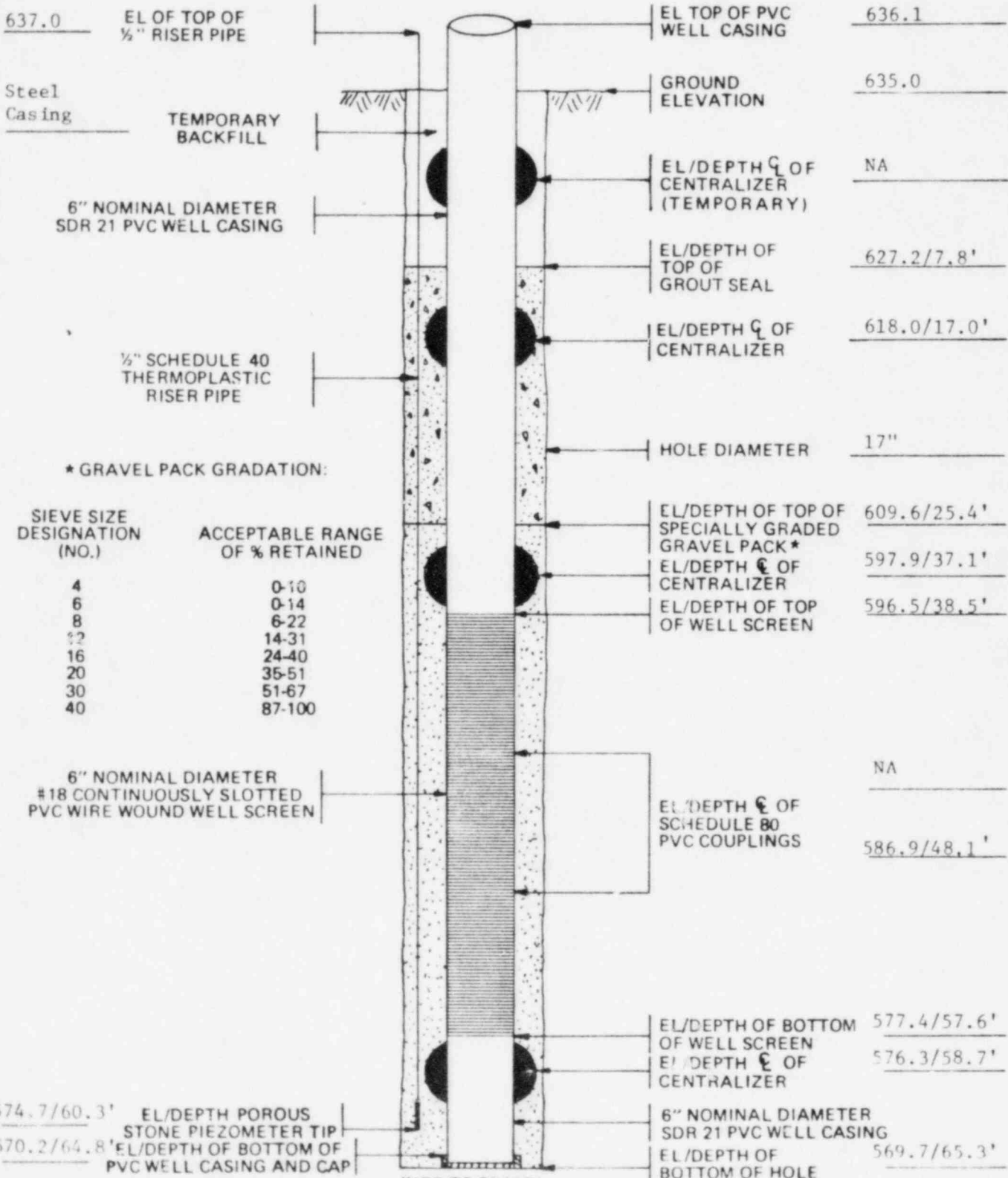
COORDINATES S 4706.5 E 398

DATE STARTED 5/14/82

DATE COMPLETED 5/28/82

GEOLOGIST/HYDROGEOLOGIST M. D. Johnson

INSTALLED BY Kelly Contract Dewatering Co.



\* GRAVEL PACK GRADATION:

SIEVE SIZE DESIGNATION (NO.)	ACCEPTABLE RANGE OF % RETAINED
4	0-10
6	0-14
8	6-22
12	14-31
16	24-40
20	35-51
30	51-67
40	87-100

(NOT TO SCALE)

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WELL INSTALLATION DATA SHEET

WELL NUMBER OBS-6

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Kelly Contract Dewatering Co.

COORDINATES S 4706.7 E 398.1 SURFACE ELEVATION 635.0

DATE STARTED 3/1/82 DATE COMPLETED 6/9/82 NO. OF SAMPLES 16

TYPE OF SAMPLES Grab and Bailer

DRILLING PROCEDURE

CASING DIAMETERS (IN) DRILLING METHOD Cable Tool  
O.D. 17" nom HOLE DIAMETER 17" nom HOLE DEPTH 65.3'  
I.D. 15 1/4" nom SPECIAL CONDITIONS 0-8.0' used 19.8" O.D. casing.  
0.5' of material in bottom of hole.

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK TEST RESULTS   
SCREEN SLOT SIZE 0.018" SCREEN DIAMETER 6" nom SCREEN LENGTH 19.1'  
CENTRALIZERS: 17.0', 37.1', 58.7'

LENGTH OF BLANK BELOW SCREEN 7.2' LENGTH OF RISER ABOVE SCREEN 39.6'  
LENGTH OF GRAVEL PACKED ZONE 39.4' CALCULATED AMOUNT OF GRAVEL PACK 52.7 cu.ft.  
ACTUAL AMOUNT OF GRAVEL PACK 53.5 cu.ft. CIRCULATION DURING GRAVEL PACKING   
CASAGRANDE TIP DEPTH 60.3' THICKNESS OF SEAL 17.6'  
TYPE OF SEAL Master Flow - 713 Grout CALCULATED AMOUNT OF SEAL 23.7 cu.ft.  
ACTUAL AMOUNT OF SEAL 28.1 cu.ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent Pumping  
DEVELOPING TIME 7.5 hours AMOUNT OF MATERIAL REMOVED <0.01 cu.ft. (est)

SAND CONCENTRATION: (ppm by weight) DURING DEVELOPMENT SPECIAL CONDITIONS none  
FIRST TEST 5.6  
SECOND RETEST \_\_\_\_\_  
THIRD RETEST \_\_\_\_\_

STATIC WATER LEVEL 19.01'/615.99 DATE 5/5/82 EDUCTOR SETTING NA

SUBCONTRACTOR SUBMITTALS:  
MICHIGAN DEWATERING WELL RECORD

Revision 14  
12/82

SUPERVISED BY M.D. Johnson  
GEOLOGIST/HYDROGEOLOGIST



JETTING LOG				PROJECT	JOB NO.	SHEET NO.	HOLE NO.	
				Midland Units 1 & 2	7220	1 OF 2	DD-1	
SITE				COORDINATES				
South of Diesel Generator Building				S 51924	E 209.2			
REQ'D	COMPLETED	DRILLER		HOLE SIZE	EL. TOP OF CASING	BROUND EL.	TOTAL DEPTH	
12-22-81	12-22-81	Loughney Dewatering Co.		12-3/4"	633.17	633.6	55.3'	
SCREEN DIA./LENGTH/SLOT		CASING LEFT IN HOLE DIA./LENGTH		LOGGED BY GEOLOGIST/HYDROGEOLOGIST				
6"/24.5'/#18		6"/29.9'		L. E. Young				
FLOW METER READING (GALLONS)	G.P.M.	PREMURE P.S.I.	TIME IN MINUTES	ELEVATION	DEPTH	BRACING LOG	DESCRIPTION	NOTES
				633.6	0			
21192720		75	1.5				0-30.0' Silty to Sandy <u>Clay</u> , brown. (Fill)	0-.5' hand dug Started jetting at 14:11.
		75	2.2					
		75	2.1					
		75	1.3					
		75	1.2					
		75	0.8		5			
		75	0.7					
		75	1.1					
		75	1.0					
		75	0.9		10			
		75	2.5					
		75	1.1					
		75	2.1					
		77	1.6					
		77	2.1		15			
		75	1.5					
		75	1.5					
		75	1.0					
		75	1.0					
		75	1.1		20			
		70	0.4					
		70	1.3					
		70	1.2					
		70	2.2					
		70	1.2		25			
		70	1.4					
		70	2.4					
		70	1.0					
		70	2.2					
		70	2.0	603.6	30			Fill
		70	1.0					Lacustrine
		70	1.1					
		70	1.4					Stopped jetting at 15:07 to repair choker, re-started jetting at 15:21.
21217710		70	5.5					
		65	3.2	598.6	35			
SITE							HOLE NO.	
South of Diesel Generator Building							DD-1	

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WELL INSTALLATION REPORT SHEET

WELL NUMBER DD-5

PROJECT Midland Units 1 & 2 JOB NO. 7220-101 SUBCONTRACTOR Loughney Dewatering Co.

NATES S 5259.3 E 226.5 SURFACE ELEVATION 633.6

DATE STARTED 12-23-81 DATE COMPLETED 12-24-81

JETTING PROCEDURE

JETTING PRESSURES: (PSI) HOLE DIAMETER 12 3/4" HOLE DEPTH 47.4'  
MAX 72 SPECIAL CONDITIONS None  
AVG 58

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT  GRAVEL PACK CONFORMANCE REPORT   
SCREEN SLOT SIZE .018" SCREEN DIAMETER 6" SCREEN LENGTH 12.9'  
CENTRALIZERS: 9.2', 22.2', 39.1'

LENGTH OF RISER ABOVE SCREEN 33.3'  
CALCULATED AMOUNT OF GRAVEL PACK 20.8 cu. ft.  
1 OF GRAVEL PACKED ZONE 32.6'  
ACTUAL AMOUNT OF GRAVEL PACK 21.3 cu. ft.

WELL DEVELOPMENT

TYPE OF DEVELOPMENT Intermittent pumping  
DEVELOPING TIME 16 hrs.  
SAND CONCENTRATION: (ppm by weight) FOR INFORMATION ONLY SPECIAL CONDITIONS None  
FIRST TEST 0.1  
SECOND RETEST \_\_\_\_\_  
THIRD RETEST \_\_\_\_\_

STATIC WATER LEVEL e1 601.92 DATE 12-28-81 PUMP SETTING e1 588.5

Revision 13  
6/82

SUPERVISED BY  
GEOLOGIST/HYDROGEOLOGIST A. J. Fiksdal  
D.9-106

# WELL LOG

PROJECT: MIDLAND UNITS 1 AND 2  
 JOB NO.: 7220  
 SHEET NO.: 1 OF 2  
 WELL NO.: ME-68

SITE: West of Administration Building  
 COORDINATES: S 4970.0 W 7.0

BEGUN: 8/9/82  
 COMPLETED: 8/19/82  
 DRILLER: Moretrench/Mergentime  
 DRILL MAKE AND MODEL: Mobile B-61  
 HOLE SIZE: 10"  
 TOTAL DEPTH: 64.0'  
 SAMPLES: NA

SCREEN DIA/LENGTH/SLOT: 3"/9.6'/#18  
 EL TOP OF CASING: 635.5  
 GROUND SURFACE EL: 634.0  
 DEPTH/EL GROUND WATER: 44.47'/589.53  
 LOGGED BY GEOLOGIST/HYDROGEOLOGIST: M. D. Johnson

CHECKED BY: L. E. Young  
 DATE: 9/9/82  
 APPROVED BY: W. C. Paris, Jr.  
 DATE: 9/21/82

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
634.0	0				
631.5	2.5			0-2.5' <u>Gravel</u> and <u>Sand</u> , gray, little clay and silt. (Fill)	0-3.0' Drilled with a 12" nom O.D. continuous flight auger. 11" I.D. surface casing set to 3.0'.
	5			2.5-8.0' Silty <u>Clay</u> , brown, little fine-to coarse-grained sand and fine gravel. (Fill)	3.0-64.0' Rotary drilled with a 10" tricone roller bit and recirculating Johnson Revert drilling fluid.
626.0	8			8.0-12.0' <u>Sand</u> , brown, coarse-grained, little clay and fine gravel. (Fill)	
622.0	12			12.0-21.0' <u>Concrete</u> , gray. (Fill)	
	15				End of shift 8/9/82 at 14.5' Start of shift 8/17/82
	20				End of shift 8/17/82 at 19.8' Start of shift 8/18/82
613.0	21			21.0-42.0' Silty <u>Clay</u> , gray-brown, little fine-to coarse-grained sand. (Fill)	
	25				
	30			29.5-30.0' Quartzite boulder.	End of shift 8/18/82 at 29.8' Start of shift 8/19/82
599.0	35			D.9-107	

Revision 14  
12/82

SAMPLE TYPE: NA  
 SITE: West of Administration Building  
 WELL NO.: ME-68

# WELL LOG





PROJECT

MIDLAND UNITS 1 AND 2

JOB NO.  
7220

SHEET NO.  
2 OF 2

WELL NO.  
ME-68

ELEVATION	DEPTH	SAMPLE GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
599.0	35			
	40			
592.0	42		42.0-44.0' Silty <u>Clay</u> , brown to gray, some sand and silt, trace lignite. (Lacustrine)	Fill Lacustrine
590.0	44		44.0-52.0' Silty <u>Sand</u> , gray, fine-grained, some clay, little lignite. (Lacustrine)	▽ 8/19/82 ≡
	45			
	50			
582.0	52		52.0-60.0' Sandy <u>Silt</u> , gray, fine-grained sand. (Lacustrine)	
	55			
574.0	60		60.0-61.0' <u>Silt</u> , gray, trace fine-grained sand. (Lacustrine)	
573.0	61		61.0-64.0' Silty <u>Clay</u> , gray. (Lacustrine)	
570.0	64		T.D.: 64.0'. Construction dewatering well installed. See pumping well construction summary.	Completed hole 8/19/82

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12/82

SAMPLE TYPE  
NA

SITE  
West of Administration Building

WELL NO.  
ME-68

# WELL LOG

PROJECT

MIDLAND UNITS 1 AND 2

JOB NO.

7220

SHEET NO.

1 OF 2

WELL NO.

ME-69

SITE

West of Administration Building

COORDINATES

S 4923.0 W 7.0

BEGUN

8/20/82

COMPLETED

8/25/82

DRILLER

Moretrench/Mergentime

DRILL MAKE AND MODEL

Mobile B-61

HOLE SIZE

10"

TOTAL DEPTH

62.0'

SAMPLES

NA

SCREEN DIA/LENGTH/SLOT

3"/9.8"/#18

EL TOP OF CASING

635.4

GROUND SURFACE EL

634.0

DEPTH/EL GROUND WATER

45.14'/588.86

LOGGED BY GEOLOGIST/HYDROGEOLOGIST

M.D. Johnson

CHECKED BY

L.E. Young

DATE








9/9/82

APPROVED BY

W.C. Paris Jr.

DATE

9/21/82

ELEVATION	DEPTH	SAMPLE GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
634.0	0			
631.5	2.5		0-2.5' <u>Gravel and Sand</u> , gray, some clay and silt. (Fill)	0-3.6' Drilled with a 12" nom. O.D. continuous flight auger. 11" I.D. surface casing installed to 3.6'.
	5		2.5-10.0' <u>Silty Clay</u> , brown, little fine-to coarse-grained sand. (Fill)	3.6-62.0' Rotary drilled with a 10" tricone roller bit and recirculating Johnson Revert drilling fluid.
624.0	10		10.0-12.0' <u>Sand</u> , brown, fine-to coarse-grained, little fine gravel. (Fill)	Installed 9" O.D. casing to support hole over the weekend.
622.0	12		12.0-21.0' <u>Concrete</u> , gray. (Fill)	End of shift 8/20/82 at 14.0' Start of shift 8/23/82
	15			Removed 9" O.D. casing, no caving of hole was apparent.
	20			End of shift 8/23/82 at 18.5' Start of shift 8/24/82
613.0	21		21.0-42.0' <u>Silty Clay</u> , brown to gray, little fine-to coarse-grained sand.(Fill)	
	25			
	30			
599.0	35			

D.9-109

Revision 14  
12/82

SAMPLE TYPE

NA

SITE

West of Administration Building

WELL NO.

ME-69





# WELL LOG

PROJECT MIDLAND UNITS 1 AND 2

JOB NO. 7220

SHEET NO. 2 OF 2

WELL NO. ME-69

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
599.0	32				
	40				
592.0	42			42.0-50.0' Silty Clay, some medium-to coarse-grained sand. (Till)	<p>Fill Till</p> <p><math>\nabla</math> 8/25/82</p>
	45				
584.0	50			50.0-58.0' Sandy Silty Clay, some medium-to coarse-grained sand and fine gravel. (Till)	53.0-62.0' Drilling indicates clay becomes stiffer.
	55				
576.0	58			58.0-62.0' Silty Clay, gray, trace fine-grained sand. (Lacustrine)	<p>Till Lacustrine</p> <p>End of shift 8/24/82 at 61.0' Start of shift 8/25/82</p>
	60				
572.0	62			T.D. 62.0', Construction dewatering well installed. See pumping well construction well summary.	Completed hole 8/25/82

Revision 14  
12/82

SAMPLE TYPE

NA

SITE

West of Administration Building

WELL NO.

ME-69

# WELL LOG

PROJECT

MIDLAND UNITS 1 AND 2

JOB NO.

7220

SHEET NO.

1 OF 2

WELL NO.

ME-79

SITE  
West of Administration Building

COORDINATES

S 5008.0 W 44.0

BEGUN  
8/9/82

COMPLETED  
8/9/82

DRILLER  
Moretrench/Mergentime

DRILL MAKE AND MODEL  
Drill Tech D 40K

HOLE SIZE  
10"

TOTAL DEPTH  
40.0'

SAMPLES  
NA

SCREEN DIA/LENGTH/SLOT  
3"/10.0'/#18

EL TOP OF CASING  
637.7

GROUND SURFACE EL  
634.0

DEPTH/EL GROUND WATER  
34.95'/599.05

LOGGED BY GEOLOGIST/HYDROGEOLOGIST  
M.D. Johnson

CHECKED BY  
A.J. Fiksdal

DATE  
9/9/82

APPROVED BY  
W.C. Paris Jr.

DATE  
9/21/82

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
634.0	0				
				0-7.0' Gravel and Sand, gray, little clay and silt. (Fill)	0-7.0' Rotary drilled with a 10" tricone roller bit using air. Drove 11" O.D. surface casing to 6.0'.
627.0	7			7.0-10.0' Gravely Clay, brown, some fine-to coarse-grained sand. (Fill)	7.0-40.0' Rotary drilled with a 10" tricone roller bit and recirculating Johnson Revert drilling fluid.
624.0	10			10.0-36.0' Silty Clay, brown and gray mottled, some fine gravel, some fine-to coarse-grained sand. (Fill)	
	17			17.0' Boulder or cobble.	17.0-19.0' Slow drilling on boulder, possibly driving it deeper.
599.0	35				

D.9-111



8/9/82

Revision 14  
12/82

SAMPLE TYPE

NA

SITE

West of Administration Building

WELL NO.

ME-79



# WELL LOG

PROJECT

MIDLAND UNITS 1 AND 2

JOB NO.



7220

SHEET NO.

2 OF 2

WELL NO.

ME-79

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
599.0	35				
	36				Fill
				36.0-40.0' Silty Clay, gray, stiff. (Lacustrine)	Lacustrine
594.0	40			T.D.:40.0', Construction dewatering well installed. See pumping well construction summary.	Completed hole 8/9/82

U.9-112

Revision 14  
12/82

SAMPLE TYPE

NA

SITE

West of Administration Building

WELL NO.

ME-79

# WELL LOG

PROJECT

MIDLAND UNITS 1 AND 2

JOB NO.  
7220

SHEET NO.  
1 OF 2

WELL NO.  
ME-81

SITE  
West of Administration Building

COORDINATES  
S 5038.0 W 44.0

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE	TOTAL DEPTH	SAMPLES
8/4/82	8/5/82	Moretrench/Mergentime	Drill Tech D 40K	10"	66.0'	NA

SCREEN DIA/LENGTH/SLOT	EL TOP OF CASING	GROUND SURFACE EL	DEPTH/EL GROUND WATER	LOGGED BY GEOLOGIST/HYDROGEOLOGIST
3"/26.8'/#18	637.5	634.0	34.87'/599.13	M.D. Johnson

CHECKED BY	DATE	APPROVED BY	DATE
L.E. Young	9/8/82	W.C. Paris Jr.	9/24/82

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
634.0	0				
	5			0-7.5' <u>Gravel</u> and <u>Sand</u> , gray, little silt and clay. (Fill)	0-6.0' Rotary drilled with a 10" tricone roller bit using air. Drove 11" O.D. surface casing to 6.0'.
626.5	7.5			7.5-37.0' Silty <u>Clay</u> , brn, some fine gravel and fine-to coarse-grained sand. (Fill)	6.0-66.0' Rotary drilled with a 10" tricone roller bit and recirculating Johnson Revert drilling fluid.
	10				10.0-14.0' Rapid drilling rate.
	15				
	20				
	25				
	30				
	35			33.0' Coal fragments.	

D.9-113

8/5/82

Revision 14  
12/82

SAMPLE TYPE

NA

SITE

West of Administration Building

WELL NO.

ME-81












# WELL LOG

PROJECT  
MIDLAND UNITS 1 AND 2

JOB NO.  
7220

SHEET NO.  
2 OF 2

WELL NO.  
ME-81

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
599.0	35				
597.0	37			37.0-66.0' Silty Clay, gray. (Lacustrine)	Fill Lacustrine
	40				44.0-66.0' Drilling indicates clay becomes stiffer.
	45				End of shift 8/4/82 at 49.0'
	50				Start of shift 8/5/82
	55				
	60				
	65				
568.0	66			T.D.: 66.0', Construction dewatering well installed. See pumping well construction summary.	Completed hole 8/5/82

D.9-114

Revision 14  
12/82

SAMPLE TYPE NA	SITE West of Administration Building	WELL NO. ME-81
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# WELL LOG

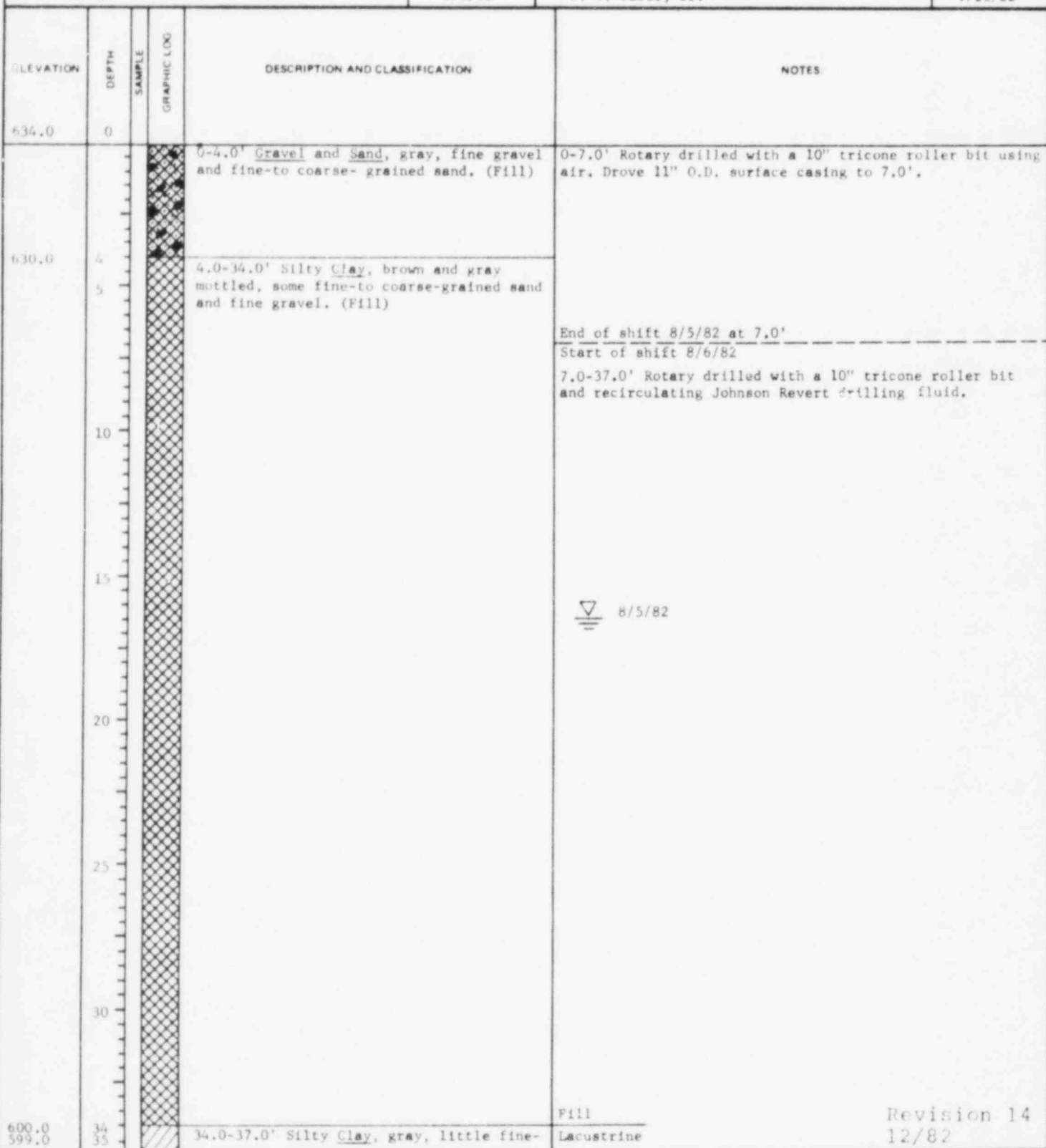
PROJECT: MIDLAND UNITS 1 AND 2  
 JOB NO.: 7220  
 SHEET NO.: 1 OF 2  
 WELL NO.: ME-82

SITE: West of Administration Building  
 COORDINATES: S 5132.0 E 32.0

BEGUN: 8/5/82  
 COMPLETED: 8/6/82  
 DRILLER: Moretrench/Mergentime  
 DRILL MAKE AND MODEL: Drill Tech D40K  
 HOLE SIZE: 10"  
 TOTAL DEPTH: 37.0'  
 SAMPLES: NA

SCREEN DIA/LENGTH/SLOT: 3"/5.0'/#18  
 EL TOP OF CASING: 637.5  
 GROUND SURFACE EL: 634.0  
 DEPTH/EL GROUND WATER: 16.62'/617.38  
 LOGGED BY GEOLOGIST/HYDROGEOLOGIST: M. D. Johnson

CHECKED BY: L. E. Young  
 DATE: 9/8/82  
 APPROVED BY: W. C. Paris, Jr.  
 DATE: 9/22/82



Revision 14  
12/82

SAMPLE TYPE: NA  
 D.9-115  
 SITE: West of Administration Building  
 WELL NO.: ME-82




# WELL LOG

PROJECT MIDLAND UNITS 1 AND 2

JOB NO. 7220

SHEET NO. 2 OF 2

WELL NO. ME-82

ELEVATION	DEPTH	SAMPLE GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
599.0	35		grained sand. (Lacustrine)	
597.0	37		T.D.: 37.0', Constuction dewatering well installed. See pumping well construction summary.	Completed hole 8/6/82

D.9-116

Revision 14  
12/82

SAMPLE TYPE

NA

SITE

West of Administration Building

WELL NO.

ME-82

# WELL LOG

PROJECT

MIDLAND UNITS 1 AND 2

JOB NO.

7220

SHEET NO.

OF

1 2

WELL NO.

MP-2

SITE

East of Unit 2 Containment

COORDINATES

S4855.39 E471.86

BEGUN

3/12/82

COMPLETED

3/12/82

DRILLER

Mergentime/Moretrench

DRILL MAKE AND MODEL

Mobile B40L

HOLE SIZE

3-7/8"

TOTAL DEPTH

67.0'

SAMPLES

NA

SCREEN DIA/LENGTH/SLOT

1"/20.0'/#16

EL TOP OF CASING

634.58

GROUND SURFACE EL

634.0

DEPTH/EL GROUND WATER

Not Determined

LOGGED BY GEOLOGIST/HYDROGEOLOGIST

Rafael Gallardo

CHECKED BY

A.J. Fiksdal

DATE

8/24/82

APPROVED BY

W.C. Paris Jr.

DATE

8/25/82

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
634.0	0				
				0-9.5' Silty Gravel, brownish-gray to gray, fine, subangular to sub-rounded. (Fill)	0-67.0' Rotary drilled with 3-7/8" tricone roller bit with recirculating Johnson Revert drilling fluid.  Log made from drill cuttings, no samples retained.
624.5	9.5			9.5-10.2' Concrete (Fill)	
623.8	10.2			10.2-19.0' Silty Clay, brown to brownish-gray, trace fine- to medium-grained sand. (Fill)	
615.0	19			19.0-21.0' Sand, brownish gray, coarse-grained, some fine gravel. (Fill)	
613.0	21			21.0-44.0' Silty Clay, brown, with sand and fine gravel. (Fill)	
599.0	35				

Revision 14  
12/82

SAMPLE TYPE

NA

SITE

East of Unit 2 Containment

WELL NO.

MP-2



# WELL LOG

PROJECT  
MIDLAND UNITS 1 AND 2

JOB NO.  
7220

SHEET NO.  
OF  
2 OF 2

WELL NO.  
MP-2

ELEVATION	DEPTH	SAMPLE GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
599.0	35			
	40			
590.0	44.0		44.0-47.0' Sand, brown, coarse-grained, angular. (Fill)	44.0-60.0' Gradual loss of drilling fluid.
	45			Fill
581.0	47		47.0-60.0' Sand, brown, fine-grained, trace lignite. (Lacustrine)	Lacustrine
	50			
	55			
574.0	60		60.0-64.5' Silty Sand, gray, fine-grained. (Lacustrine)	
	64.5		64.5-67.0' Clay, gray, stiff. (Lacustrine)	
569.5	65			Completed hole 3/12/82
567.0	67		T.D.: 67.0', See observation well construction summary.	

Revision 14  
12/82

SAMPLE TYPE NA	D.9-118	SITE East of Unit 2 Containment	WELL NO. MP-2
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<b>WELL LOG</b>			PROJECT	JOB NO.	SHEET NO.	WELL NO.
			MIDLAND UNITS 1 AND 2	7220	1 OF 2	MP-13
SITE			COORDINATES			
West of Unit 1 Containment			S4806.1 E85.62			
BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE	TOTAL DEPTH	SAMPLES
3/18/82	3/18/82	Mergentime/Moretrench	Mobil B-40L	3-7/8"	56.0'	NA
SCREEN DIA/LENGTH/SLOT		EL TOP OF CASING	GROUND SURFACE EL	DEPTH/EL GROUND WATER	LOGGED BY GEOLOGIST/HYDROGEOLOGIST	
1"/20.0"/#16		636.27	634.0	Not Determined	T.R. Cullen	
CHECKED BY:			DATE	APPROVED BY:	DATE	
A.J. Fiksdal			8/24/82	W.C. Paris Jr.	8/25/82	
ELEVATION	DEPTH	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES		
634.0	0					
			0-4.0' Sandy Clay, gray, fine- to medium-grained sand. (Fill)	0-3.0' 4" I.D. casing advanced with water. 3.0-56.0' Rotary drilled with 3-7/8" tricone roller bit using recirculating Johnson Revert drilling fluid.		
630.0	4		4.0-5.0' Concrete, occasional steel cuttings. (Fill)			
629.0	5		5.0-33.0' Clay, brown, fine- to medium-grained sand. (Fill)	Logmade from drill cuttings, no samples retained.		
			12.0' Gray clay and some silt.			
			18.0' No silt			
			19.0' Some gravel			
			25.0' Silt and gravel	12.0'-33.0' - Alternating drilling rates indicating layering of materials.		
601.0	33		33.0-34.0' Gravel, gray, coarse. (Fill)			
600.0	34		34.0-42.0' Silty Clay, brown,			
599.0	35					
SAMPLE TYPE			SITE	WELL NO.		
NA			West of Unit 1 Containment	MP-13		

Revision 14  
12/82



# WELL LOG

PROJECT MIDLAND UNITS 1 AND 2

JOB NO. 7220

SHEET NO. 2 OF 2

WELL NO. MP-13

ELEVATION	DEPTH	SAMPLE GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
599.0	35			
			fine-to medium-grained sand. (Fill)	
	40			
592.0	42		42.0-49.5' Sandy Gravel, brown to tan, fine- to medium-grained sand, poorly sorted gravel. (Fill)	
	45			
584.5	49.5		49.0 -50.0' Silty Clay, brown, fine to medium-grained sand. (Fill)	Fill
584.0	50		50.0-56.0' Silty Clay, gray, trace to some sand. (Lacustrine)	Lacustrine
	55			
578.0	56		T.D.: 56.0', See observation well construction summary.	Completed Hole 3/13/82

D.9-120

Revision 14  
12/82

SAMPLE TYPE  
NA

SITE  
West of Unit 1 Containment

WELL NO.  
MP-13

# WELL LOG

PROJECT: MIDLAND UNITS 1 AND 2  
 JOB NO.: 7220  
 SHEET NO.: 1 OF 2  
 WELL NO.: OF-1

SITE: East of Service Water Pump Structure  
 COORDINATES: S 5022.87 E 879.82

BEGUN: 7/15/82 COMPLETED: 7/16/82 DRILLER: Moretrench/Mergentime  
 DRILL MAKE AND MODEL: Drill Tech D40K HOLE SIZE: 15" TOTAL DEPTH: 39.0'  
 SAMPLES: NA

SCREEN DIA/LENGTH/SLOT: 6"/19.8'/#18 EL TOP OF CASING: 634.6  
 GROUND SURFACE EL: 634.0 DEPTH/EL GROUND WATER: Not Determined  
 LOGGED BY GEOLOGIST/HYDROGEOLOGIST: M.D. Johnson

CHECKED BY: A.J. Fiksdal DATE: 9/1/82 APPROVED BY: W.C. Paris Jr. DATE: 9/21/82

ELEVATION	DEPTH	SAMPLE GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
634.0	0			
			0-5.0' <u>Gravel</u> and <u>Sand</u> , gray-brown, some silt and clay. (Fill)	0-5.0' Rotary drilled with a 15" tricone roller bit using air. Drove 15" O.D. surface casing to 5.0'.
629.0	5		5.0-10.0' <u>Silty Clay</u> , brown, some fine-to coarse-grained sand. (Fill)	5.0-39.0' Rotary drilled with a 15" tricone roller bit and recirculating Johnson Revert drilling fluid.
624.0	10		10.0-27.0' <u>Gravel</u> , gray, some fine-to coarse-grained sand and light gray clay. (Fill)	
	15			17.0' Difficult drilling.
	25			End of shift 7/15/82 at 25.0' Start of shift 7/16/82
607.0	27		27.0-38.0' <u>Silty Clay</u> , brown, some fine-to medium-grained sand and fine gravel. (Fill)	27.0' Easier drilling.
	30			
599.0	35			

D.9-121

Revision 14  
12/82

SAMPLE TYPE: NA SITE: East of Service Water Pump Structure WELL NO.: OF-1







# WELL LOG

PROJECT  
MIDLAND UNITS 1 AND 2

JOB NO.  
7220

SHEET NO.  
OF  
2 2

WELL NO.  
OF-1

ELEVATION	DEPTH	SAMPLE GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
599.0	35			
596.0	38		38.0-39.0' Silty Clay, gray. (Till)	Fill Till
595.0	39		1 to 39.0', Construction dewatering well installed. See pumping well construction summary.	Completed hole 7/16/82

D. 9-122

Revision 14  
12/82

SAMPLE TYPE  
NA

SITE  
East of Service Water Pump Structure

WELL NO.  
OF-1

# WELL LOG

PROJECT

MIDLAND UNITS 1 AND 2

JOB NO.

7220

SHEET NO.

1 OF 2

WELL NO.

0F-2

SITE

East of Service Water Pump Structure

COORDINATES

S 5028.83 E 869.58

BEGUN

7/13/82

COMPLETED

7/15/82

DRILLER

Moretrench/Mergentime

DRILL MAKE AND MODEL

Drill Tech D 40K

HOLE SIZE

15"

TOTAL DEPTH

36.5'

SAMPLES

NA

SCREEN DIA/LENGTH/SLOT

6"/19.8"/#18

EL TOP OF CASING

634.8

GROUND SURFACE EL

634.0

DEPTH/EL GROUND WATER

Not Determined

LOGGED BY GEOLOGIST/HYDROGEOLOGIST

M.D. Johnson

CHECKED BY

A.J. Fiksdal

DATE

9/1/82

APPROVED BY

W.C. Paris Jr.

DATE

9/21/82

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
634.0	0				
				0-5.0' <u>Gravel</u> and <u>Sand</u> , gray-brown, some silt and clay. (Fill)	0-5.0' Rotary drilled with a 15" tricone roller bit using air. Drove 15" O.D. surface casing to 5.0'.  End of shift 7/13/82 at 5.0'
629.0	5			5.0-10.0' <u>Clay</u> , brown-orange mottled, little to some fine-to coarse-grained sand. (Fill)	Start of shift 7/14/82  5.0-37.0' Rotary drilled with a 15" tricone roller bit and recirculating Johnson Revert drilling fluid.
624.0	10			10.0-11.5' <u>Cement</u> , gray, angular chips. (Fill)	
	11.5			11.5-14.0' <u>Clay</u> , brown-orange mottled, little fine-to coarse-grained sand. (Fill)	
620.0	14			14.0-17.0' <u>Gravel</u> and <u>Sand</u> , gray, fine-to coarse-grained. (Fill)	
	15				
617.0	17			17.0-23.0' <u>Clay</u> , brown-light brown, some fine-grained sand and chips of gravel. (Fill)	
	20				
611.5	23			23.0-32.5' <u>Clay</u> , brown, some silt. (Fill)	
	25				
	30				
601.5	32.5			32.5-34.0' <u>Cement</u> , gray. (Fill)	End of shift 7/14/82 at 32.5' Start of shift 7/15/82
600.0	34				
599.0	35			34.0-36.5' Silty <u>Clay</u> , brown, little fine	D.9-123

Revision 14  
12/82

SAMPLE TYPE

NA

SITE

East of Service Water Pump Structure

WELL NO.

0F-2



# WELL LOG

PROJECT

MIDLAND UNITS 1 AND 2

JOB NO.

7220

SHEET NO.

2 OF 2

WELL NO.

OF-2

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
599.0	35			gravel. (Fill)	
597.5	36.5			T.D.:36.5', Construction dewatering well installed. See pumping well construction summary.	Completed hole 7/15/82

B.9-124

Revision 14  
12/82

SAMPLE TYPE	NA	SITE	East of Service Water Pump Structure	WELL NO.	OF-2
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# WELL LOG






PROJECT: MIDLAND UNITS 1 AND 2  
 JOB NO.: 7220  
 SHEET NO.: 1 OF 2  
 WELL NO.: OF-3

SITE: East of Service Water Pump Structure  
 COORDINATES: S 5014.66 E 875.11

BEGUN: 7/21/82  
 COMPLETED: 7/21/82  
 DRILLER: Moretrench/Mergentime  
 DRILL MAKE AND MODEL: Drill Tech D40K  
 HOLE SIZE: 15"  
 TOTAL DEPTH: 38.5'  
 SAMPLES: NA

SCREEN DIA/LENGTH/SLOT: 6"/19.8'/#18  
 EL TOP OF CASING: 634.6  
 GROUND SURFACE EL: 634.0  
 DEPTH/EL GROUND WATER: Not Determined  
 LOGGED BY GEOLOGIST/HYDROGEOLOGIST: M.D. Johnson/L.E. Young

CHECKED BY: A.J. Fiksdal  
 DATE: 9/1/82  
 APPROVED BY: W.C. Paris Jr.  
 DATE: 9/21/82

ELEVATION	DEPTH	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
634.0	0			
632.0	2		0-2.0' <u>Gravel</u> and <u>Sand</u> , gray, fine-to medium grained sand, some silt and clay. (Fill)	0-5.0' Rotary drilled with a 15" tricone roller bit using air. Drove 15" O.D. surface casing to 5.0'. 1.0-1.3' Concrete broken up with jack hammer.
	5		2.0-12.5' <u>Silty Clay</u> , brown, little fine-to medium-grained sand. (Fill)	5.0-38.5' Rotary drilled with a 15" tricone roller bit and recirculating Johnson Revert drilling fluid.
621.5	12.5		12.5-25.0' <u>Gravel</u> , brown to gray, trace clay. (Fill)	
609.0	25		25.0-34.0' <u>Silty Clay</u> , brown, trace to some gravel. (Fill)	
600.0 599.0	34 35		34.0-38.5' <u>Silty Clay</u> , gray, trace fine-	

D.9-125  
 Fill  
 Till

Revision 14  
 12/82

SAMPLE TYPE: NA  
 SITE: East of Service Water Pump Structure  
 WELL NO.: OF-3




# WELL LOG

PROJECT MIDLAND UNITS 1 AND 2

JOB NO. 7220

SHEET NO. 2 OF 2

WELL NO. OF-3

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
599.0	35			grained sand. (Till)	
595.5	38.5			T.D.: 38.5', Construction dewatering well installed. See pumping well construction summary.	Completed hole 7/21/82

D.9-126

Revision 14  
12/82

SAMPLE TYPE  
NA

SITE  
East of Service Water Pump Structure

WELL NO.  
OF-3

# WELL LOG

PROJECT: MIDLAND UNITS 1 AND 2  
 JOB NO.: 7220  
 SHEET NO.: 1 OF 2  
 WELL NO.: OF-4

SITE: East of Service Water Pump Structure  
 COORDINATES: S 5020.68 E 864.73

BEGUN: 7/22/82  
 COMPLETED: 7/22/82  
 DRILLER: Moretrench/Mergentime  
 DRILL MAKE AND MODEL: Drill Tech D40K  
 HOLE SIZE: 15"  
 TOTAL DEPTH: 39.0'  
 SAMPLES: NA

SCREEN DIA/LENGTH/SLOT: 6"/19.8"/#18  
 EL TOP OF CASING: 634.8  
 GROUND SURFACE EL: 634.0  
 DEPTH/EL GROUND WATER: Not Determined  
 LOGGED BY GEOLOGIST/HYDROGEOLOGIST: M.D. Johnson

CHECKED BY: A.J. Fiksdal  
 DATE: 9/1/82  
 APPROVED BY: W.C. Paris Jr.  
 DATE: 9/21/82

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
634.0	0				
				0-4.0' <u>Gravel</u> and <u>Sand</u> , fine-to coarse-grained, some silt and clay. (Fill)	0-5.0' Rotary drilled with a 15" tricone roller bit using air. Drove 15" O.D. surface casing.
630.0	4			4.0-8.5' <u>Silty Clay</u> , brown, some fine-to coarse-grained sand. (Fill)	5.0-39.0' Used 15" tricone roller bit and recirculating Johnson Revert drilling fluid.
	5				
625.5	8.5			8.5-15.0' <u>Clay</u> , brown, some fine-to coarse-grained sand and gravel. (Fill)	8.5' Drilling rate decreased.
	10				
619.0	15			15.0-17.0' <u>Sand</u> and <u>Gravel</u> , fine-to coarse-grained. (Fill)	15.0' Drilling rate increased.
	17			17.0-29.0' <u>Clay</u> , brown, some fine-to coarse-grained sand and gravel. (Fill)	17.0' Drilling rate decreased.
	20				
	25				
605.0	29			29.0-38.0' <u>Silty Clay</u> , brown, some fine-to coarse-grained sand and gravel. (Fill)	29.0' Drilling rate increased.
	30				
	35				
599.0					

D.9-127

Revision 14  
 12/82

SAMPLE TYPE: NA  
 SITE: East of Service Water Pump Structure  
 WELL NO.: OF-4





# WELL LOG

PROJECT MIDLAND UNITS 1 AND 2

JOB NO. 7220

SHEET NO. 2 OF 2

WELL NO. OF-4

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
599.0	35				
596.0	38			38.0-39.0' Silty <u>Clay</u> , gray. (Till)	Fill Till
595.0	39			T.D.: 39.0', Construction dewatering well installed. See pumping well construction summary.	Completed hole 7/22/82

D.9-128

Revision 14  
12/82

SAMPLE TYPE NA	SITE East of Service Water Pump Structure	WELL NO. OF-4
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# WELL LOG

PROJECT

MIDLAND UNITS 1 AND 2

JOB NO.

7220

SHEET NO.

1 OF 2

WELL NO.

OF-5

SITE

East of Service Water Pump Structure

COORDINATES

S 5010.86 E 872.90

BEGUN

7/20/82

COMPLETED

7/20/82

DRILLER

Moretrench/Mergentime

DRILL MAKE AND MODEL

Drill Tech D 40K

HOLE SIZE

15"

TOTAL DEPTH

39.0'

SAMPLES

NA

SCREEN DIA/LENGTH/SLOT

6"/19.8'/#18

EL TOP OF CASING

635.0

GROUND SURFACE EL

634.0

DEPTH/EL GROUND WATER

Not Determined

LOGGED BY GEOLOGIST/HYDROGEOLOGIST

M.D. Johnson

CHECKED BY

A.J. Fiksdal

DATE

9/9/82

APPROVED BY

W.C. Paris Jr.

DATE

9/21/82

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
634.0	0				
631.0	3			0-3.0' <u>Gravel and Sand</u> , gray and brown, fine-to coarse-grained, some silt. (Fill)	0-5.0' Rotary drilled with a 15" O.D. tricone roller bit using air. Drove 15" O.D. starter casing to 5.0'.
	5			3.0-12.5' <u>Silty Clay</u> , brown, little fine-to medium-grained sand. (Fill)	
621.5	12.5			12.5-25.0' <u>Gravel</u> , brownish gray, some clay and fine-to medium-grained sand. (Fill)	5.0-39.0' Rotary drilled with a 15" tricone roller bit and recirculating Johnson Revert drilling fluid.
	15				12.5' Drilling rate decreased.
609.0	25			25.0-35.0' <u>Silty Clay</u> , brown, little gravel and fine-to coarse-grained sand. (Fill)	25.0' Drilling rate increased.
599.0	35				35.0' Drilling rate decreased.

D.9-129

Revision 14  
12/82

SAMPLE TYPE

NA

SITE

East of Service Water Pump Structure

WELL NO.

OF-5





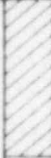
# WELL LOG

PROJECT  
MIDLAND UNITS 1 AND 2

JOB NO.  
7220

SHEET NO.  
2 OF 2

WELL NO.  
OF-5

ELEVATION	DEPTH	SAMPLE GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
599.0	35			
595.0	39		35.0-39.0' Silty Clay, gray, little fine-grained sand. (Till)	<p>Fill Till</p> <p>Completed hole 7/20/82</p> <p>T.D.: 39.0', Construction dewatering well installed. See pumping well construction summary.</p>

D.9-130

Revision 14  
12/82

SAMPLE TYPE  
NA

SITE  
East of Service Water Pump Structure

WELL NO.  
OF-5

# WELL LOG

PROJECT: MIDLAND UNITS 1 AND 2  
 JOB NO.: 7220  
 SHEET NO.: 1 OF 2  
 WELL NO.: OF-7

SITE: East of Service Water Pump Structure  
 COORDINATES: S 4992.15 E 862.12

BEGUN: 7/16/82  
 COMPLETED: 7/19/82  
 DRILLER: Moretrench/Mergentime  
 DRILL MAKE AND MODEL: Drill Tech D40K  
 HOLE SIZE: 15"  
 TOTAL DEPTH: 39.8'  
 SAMPLES: NA

SCREEN DIA/LENGTH/SLOT: 6"/19.3"/#18  
 EL TOP OF CASING: 634.5  
 GROUND SURFACE EL: 634.0  
 DEPTH/EL GROUND WATER: Not Determined  
 LOGGED BY GEOLOGIST/HYDROGEOLOGIST: M.D. Johnson

CHECKED BY: A.J. Fiksdal  
 DATE: 9/1/82  
 APPROVED BY: L.E. Young  
 DATE: 9/3/82

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
634.0	0				
633.0	1			0-1.0' Gravel and Sand, gray, fine-to coarse-grained, some silt and clay. (Fill)	0-5.0' Rotary drilled with a 15" tricone roller bit using air. Drove 15" O.D. surface casing to 5.0'.
				1.0-3.0' Sand, brown, fine-to medium-grained. (Fill)	
631.0	3			3.0-13.0' Silty Clay, brown, little fine gravel. (Fill)	
	5				End of shift 7/16/82 at 5.5' Start of shift 7/19/82
					5.0-39.8' Rotary drilled with a 15" tricone roller bit and recirculating Johnson Revert drilling fluid.
621.0	13			13.0-27.0' Silty Clay, brown-light brown, some fine gravel chips. (Fill)	13.0' Drilling rate decreased.
	15				
	20				
	25				
607.0	27			27.0-30.0' Silty Clay, brownish gray, little fine gravel. (Fill)	27.0' Drilling rate increased.
	30				Fill
604.0	30			30.0-39.8' Silty Clay, gray, little fine-grained sand, gravel. (Till)	Till 30.0' Drilling rate decreased.
599.0	35				

D.9-131

Revision 14  
12/82

SAMPLE TYPE: NA  
 SITE: East of Service Water Pump Structure  
 WELL NO.: OF-7



# WELL LOG

PROJECT MIDLAND UNITS 1 AND 2

JOB NO. 7220

SHEET NO. 2 OF 2

WELL NO. OF-7

ELEVATION

DEPTH

SAMPLE

GRAPHIC LOG

DESCRIPTION AND CLASSIFICATION

NOTES

549.0

35

544.2

39.8



Completed hole 7/19/82

T.D.: 39.8', Construction dewatering well installed. See pumping well construction summary.

D.9-132

Revision 14  
12/82

SAMPLE TYPE

NA

SITE

East of Service Water Pump Structure

WELL NO.

OF-7

# WELL LOG

PROJECT MIDLAND UNITS 1 AND 2		JOB NO. 7220	SHEET NO. OF 1 OF 2	WELL NO. OF-9
SITE East of Service Water Pump Structure		COORDINATES S 4983.03 E 856.82		
BEGUN 7/19/82	COMPLETED 7/23/82	DRILLER Moretrench/Mergentine	DRILL MAKE AND MODEL Drill Tech D40K	HOLE SIZE 15"
SCREEN DIA/LENGTH/SLOT 6"/19.8"/#18		EL TOP OF CASING 636.6	GROUND SURFACE EL 634.0	DEPTH/EL GROUND WATER Not Determined
CHECKED BY: A.J. Fiksdal		DATE 9/7/82	APPROVED BY: W.C. Paris Jr.	LOGGED BY GEOLOGIST/HYDROGEOLOGIST: M.D. Johnson
				SAMPLES NA

ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
634.0	0				
633.0	1			0-1.0' <u>Gravel and Sand</u> , gray, some silt and clay. (Fill)	0-4.0' Rotary drilled with a 15" tricone roller bit using air. Drove 15" O.D. surface casing to 5.5'.  End of shift 7/19/82 at 4.0'
				1.0-4.0' <u>Sand</u> , brown, fine-to medium-grained. (Fill)	
630.0	4			4.0-4.3' <u>Concrete</u> . (Fill)	Start of shift 7/22/82 4.0-4.3' Drilled through concrete with jack hammer.
	5			4.3-10.0' <u>Silty Clay</u> , brown and orange mottled, little fine-to coarse-grained sand. (Fill)	End of shift 7/22/82 at 4.3' Start of shift 7/23/82
					4.3-39.0' Rotary drilled with a 15" tricone roller bit and recirculating Johnson Revert drilling fluid.
624.0	10			10.0-22.0' <u>Gravel and Clay</u> , brown-gray and brown, little fine-to coarse-grained sand, gravel chips. (Fill)	
	15				
	20				
612.0	22			22.0-29.0' <u>Silty Clay</u> , brown, little to some fine-to coarse-grained sand, gravel. (Fill)	22.0' Drilling rate increased.
	25				
	29			29.0-39.0' <u>Silty Clay</u> , gray, little fine-grained sand, gravel. (Till)	Fill Till 29.0' Drilling rate decreased.
605.0	30				
	35				
599.0					

D.9-133

Revision 14  
12/82

SAMPLE TYPE NA	SITE East of Service Water Pump Structure	WELL NO. OF-9
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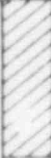
# WELL LOG

PROJECT  
MIDLAND UNITS 1 AND 2

JOB NO.  
7220

SHEET NO.  
OF  
2 2

WELL NO.  
OF-9

ELEVATION	DEPTH	SAMPLE GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES
599.0	35			
595.0	39		T.D.: 39.0', Construction & casing well installed. See pumping well construction summary.	Completed hole 7/23/82

D.9-134

Revision 14  
12/82

SAMPLE TYPE  
NA

SITE  
East of Service Water Pump Structure

WELL NO.  
OF-9

SECTION D.10

BORING LOGS, SAMPLE EXTRUSION LOGS,  
AND GRADATIONAL TESTS FROM PERMANENT  
DEWATERING WELL PILOT HOLES

S-9

set pitcher at 44 off

PS + 4-10 ft + 5 ft rods = 50.5 ft

stick up: 6.5 ft

Down Pressure: 300 psi

Fluid Pressure: 50 psi

Drill Rate: 1 ft/1.0 min

Set Time: 5 min

A. Fiksdal of Bechtel arrives at ~11<sup>00</sup> AM to supervise drilling and sampling operations.



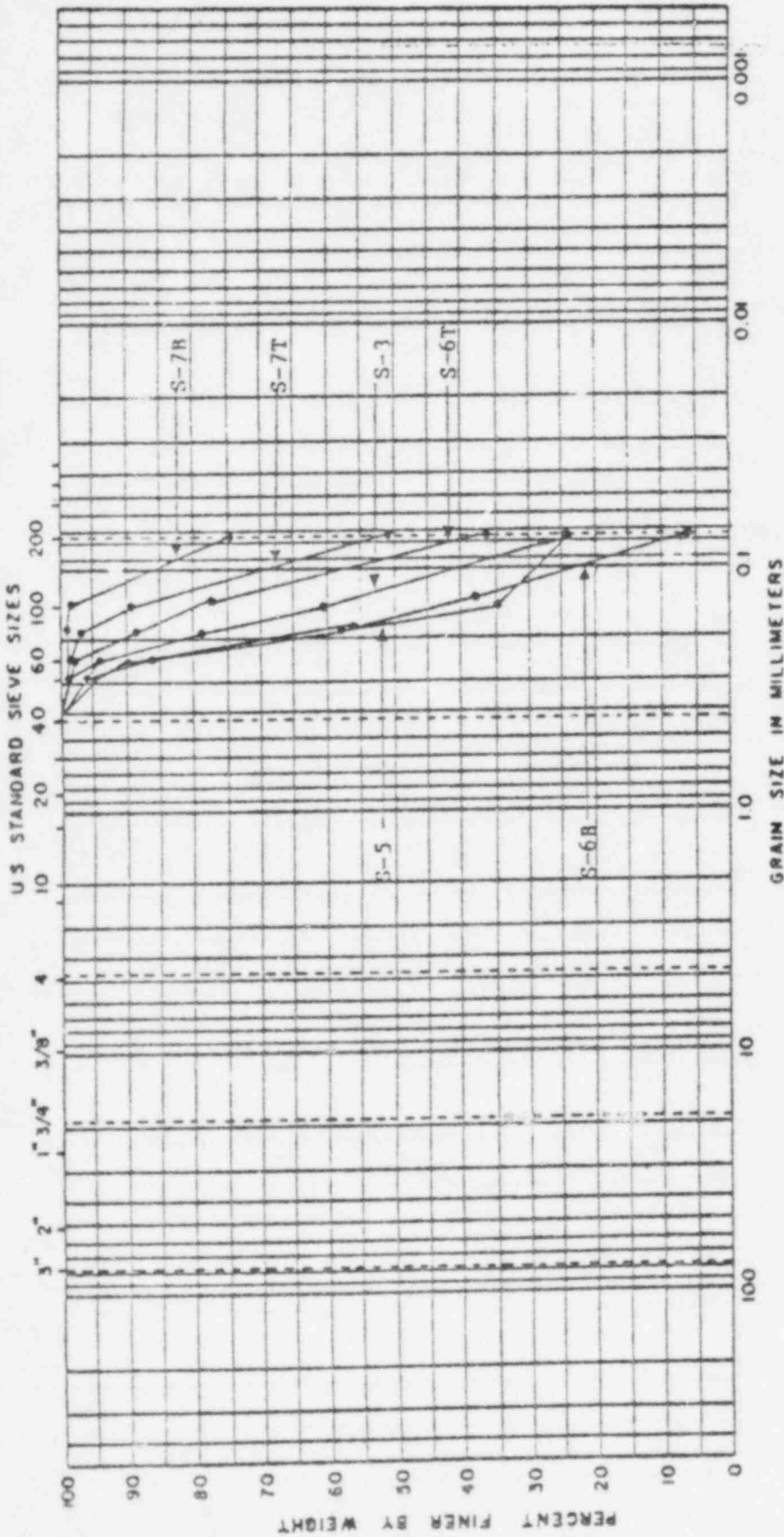
SAMPLE EXTRUSION LOG				PROJECT	JOB NO.	SHEET NO.	HOLE NO.
SITE Diesel Generator Area				SAMPLES 11	DATE EXTRUDED 2-3-82	COORDINATES # 5214	1 OF 2 WA-1
GROUND EL. 633.9		TOTAL DEPTH 49.0'		LOGGED BY: A. J. Fiksdal			
SAMPLE RECOVERY (%)	ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON SAMPLES SENT FOR LABORATORY ANALYSIS, SPECIAL FEATURES	
	633.9	0			0-29' No samples taken. See Woodward-Clyde field boring log for material description.	Pilot hole WA-1 drilled for well A-1  Results of sieve analysis tests are included in descriptive log.  Representative portions of all samples were retained unless noted by an *.	
		1					
		2					
		28					
	604.9	29			29.0-29.5' Sand, yellow-brown, fine-grained, moist, trace to little silt. One thin laminae of silty clay with organics. (SM) Fill	See Woodward-Clyde field boring log for description of samples not extruded.	
55	603.9	30		1	29.5-30.0' Sandy Clay, yellow, red and brown, stiff, low plasticity, moist trace coarse-grained sand. Red subrounded piece of coarse gravel. (CL) Fill		
	602.9	31			30.0-31.0' Sand, dark gray to yellow-brown, fine-grained, moist. Upper 1/4 dark gray organics with some clay grading to yellow-brown fine-grained sand with a trace of silt. (SM) Fill	Sample not Tested	
55		32		2	31.0-33.0' Sand, yellow-brown, fine-grained, moist, trace medium-grained sand and fine subrounded gravel. Trace to little silt in top 0.1' of sample. No internal structure. (SP-SM) Fill	Tested	
	600.9	33			33.0-35.0' Sand, yellowish-gray, fine-grained, moist trace silt, organics. Top 0.1' light tan, dense, silty sand with lignite. Color of sample becomes more gray and particle size finer towards bottom. (SP-SM) Lacustrine	Tested  See grain size distribution curves of tested samples.	
38		35		3			
	598.9	35			35.0-37.0' Sample not extruded		
		4					
	596.9	37			37.0-39.0' Sand, gray to dark gray, fine-grained, moist, trace silt, organics. Very dark gray organic staining in middle to lower portion of sample with alternating fine- to very fine-grained sand layers in lower 1/2 of sample. (SP-SM) Lacustrine	Tested	
50		39		5			
	594.9	39					
SAMPLER TYPE 3" Pitcher		SITE Diesel Generator Area		HOLE NO. WA-1			

Revision 14  
12/82





SAMPLE EXTRUSION LOG				PROJECT	JOB NO.	SHEET NO.	HOLE NO.
				Midland Units 1 & 2	7220	2 OF 2	WA-4
SAMPLE RECOVERY (%)	ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON SAMPLES SENT FOR LABORATORY ANALYSIS, SPECIAL FEATURES	
	595.1	38					
80				6	38.0- 38.5' Silty Sand, gray, fine-grained, moist. Thin silt layers alternating with the fine sand. (SM) Lacustrine	Top* and bottom tested separately	
	593.1	40		7	38.5-40.0' Sand, gray, fine-grained, moist, trace silt. Alternating thin layers of light and dark-gray sand throughout. (SP-SM) Lacustrine		
75				7	40.0-40.4' Sandy-Silty Clay, gray-brown, very fine-grained sand, very dense, moist to wet, well sorted, trace organics (ML) Lacustrine	Top and bottom tested separately*	
	591.1	42		7	40.4-42.0' Silty Clay, gray, hard, low plasticity, damp, clean, varved with small layers of silt, lower portion is banded with light and dark layers of silt and organic materials. (CL) Lacustrine		
				8	42.0-44.0' Sample not extruded		
	589.1	44		9	44.0-46.0' Silty Clay; see description of sample 7, 40.4-42.0'. (CL) Lacustrine	Sample not tested	
70				9			
	587.1	46			46.0-52.0' Samples 10-12 not extruded		
					52.0-56.0' No samples taken		
				13	56.0-58.0' Sample not extruded		
	575.1	58			Bottom of boring at 58.0'		
SAMPLER TYPE				SITE		HOLE NO.	
3" Pitcher				Diesel Generator Building Area		WA-4	



BULK DEPS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

BORING NO	DESCRIPTION OR CLASSIFICATION	
	DEPTH	See Sample Extrusion Log
WA-4	S-3	32.0 - 34.0
	S-5	36.0 - 38.0
	S-6T	38.0 - 40.0
	S-6B	38.0 - 40.0
	S-7T	40.0 - 42.0
	S-7B	40.0 - 42.0

**GRAIN SIZE DISTRIBUTION**

Permanent Dewatering Well Pilot Hole  
WA-4



SAMPLE EXTRUSION LOG				PROJECT	JOB NO.	SHEET NO.	HOLE NO.
SITE Diesel Generator Bldg.				Midland Units 1&2	7220	1 of 2	WB-1
SAMPLES 5		DATE EXTRUDED 2-2-82		COORDINATES E 5039		E 248	
GROUND EL. 633.9		TOTAL DEPTH 52.5'		LOGGED BY: A.J. Fiksdal			
SAMPLE RECOVERY (%)	ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON SAMPLES SENT FOR LABORATORY ANALYSIS, SPECIAL FEATURES	
	633.9	0			0-42' No samples taken. See Woodward-Clyde field boring log for material description.	Pilot hole WB-1 drilled for well B-1.	
		1				Results of sieve analysis tests are included in descriptive log.	
		2				Representative portions of all samples were retained unless noted by an *.	
		26				See Woodward-Clyde field boring log for description of materials not extruded.	
		27			27 - 41.7' Concrete	See grain size distribution curves for samples tested.	
		41.7					
	591.5	42			42.0-43.0' Sand, brown, fine-grained, saturated, trace angular gravel. (SP) Lacustrine	Tested as one sample	
33				1	43.0-44.0' Sand, gray, fine-grained, saturated, trace silt, trace organics. (SP) Lacustrine		
	589.9	44			44.0-46.0' Sand, gray, fine-grained, moist to wet, discontinuous lignite laminae. One third of sample (lengthwise) was fill, with 2" x 3/4" piece of steel on bottom of pitcher tube. Fill consisted of saturated fine crushed gravel in a fine sand and silt matrix. (SP-SM) Lacustrine	Only natural material tested.	
30				2			
	587.9	46			46.0-46.5' No sample taken		
	587.4	46.5			46.5-47.5' Sand, gray, fine-grained, moist, trace medium-grained sand, trace fine gravel, organics. Faint horizontal structuring of alternating sand sizes. Very sharp contact with clay below. (SP) Lacustrine	Top only tested	
50				3	47.5-48.5' Clay, gray, stiff medium plastic, few thin silt laminae. Clay is very finely laminated. (CL) Lacustrine		
	585.4	48.5			48.5-52.5' Samples 4 and 5 not extruded.		
	584.9	49					
SAMPLER TYPE 3" Pitcher			SITE Diesel Generator Building			HOLE NO. WB-1	





SAMPLE EXTRUSION LOG				PROJECT	JOB NO.	SHEET NO.	HOLE NO.	
SITE Diesel Generator Bldg.				SAMPLES 10	DATE EXTRUDED 7-2-82	COORDINATES E 5040	WB-2	
GROUND EL. 634.3		TOTAL DEPTH 51.0'		LOGGED BY: A. J. Fiksdal				
SAMPLE RECOVERY (%)	ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON SAMPLES SENT FOR LABORATORY ANALYSIS, SPECIAL FEATURES		
	634.3	0			0-29.0' No samples taken. See Woodward-Clyde field boring logs for material description.	Pilot hole WB-2 drilled for well B-2.		
		1				Results of sieve analysis tests included in descriptive log.		
		2				Representative portions of all samples were retained unless noted by an *.		
		28						
	605.3	29			29.0-30.5' Sand, yellowish-brown, fine-grained sand to fine gravel, well graded, moist. Gravel is round to subround. (SW) Fill	Tested*		
20		30		1				
	603.8	30.5			30.5-36.0' No samples taken	See Woodward-Clyde field boring log for description of samples not extruded.		
		31				See grain size distribution curves for samples tested.		
		35			Concrete			
	598.3	36			36.0-36.5' Gravel, gray, fine crushed backfill with sand and silt. Small pieces of rubber at contact with sand below. (GM) Fill	Bottom only tested		
15		37		2	36.5-38.0' Sand, yellowish-brown, fine-grained, wet, trace silt. Zones of oxidized sand. Distinct contact with above gravel. (SP-SM) Lacustrine			
	596.3	38			38.0-39.0' Sand, gray, fine-grained, moist, some silt. Discontinuous lignite laminae in middle 1/3 of sample. Top is oxidized yellow color with thin silt laminae. (SM) Lacustrine.	Tested		
50		39		3	39.0-40.0' Sand, grayish-brown, fine-grained, moderately dense, moist, little to some silt. Sandy silt with organics at approximately 39.5'. (SM) Lacustrine.	Tested		
55		40		4				
	594.3	40			40.0-41.0' Sand, grayish-brown, fine-grained, moist, little to some silt organics. Silt increases toward bottom. Bottom 0.05' laminated silt with organic partings. Distinct contact between silt and sand above. (SM) Lacustrine	Bottom silt layer not included with sample tested.		
85		41		5				
	593.3	41						
60		42		6				
	592.3	42						
SAMPLER TYPE 1" Pitcher				SITE Diesel Generator Building			HOLE NO. WB-2	

Revision 14  
12/82

D.10-64



SAMPLE EXTRUSION LOG				PROJECT	JOB NO.	SHEET NO.	HOLE NO.
				Midland Units 1 & 2	7220	2 OF 2	WB-2
SAMPLE RECOVERY (%)	ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON SAMPLES SENT FOR LABORATORY ANALYSIS, SPECIAL FEATURES	
	592.3	42					
				6	41.0-43.0' Silty Sand, gray, fine-grained, dense, moist. Approximately 0.2' of clean, medium-grained sand at 41.5'. Cross beds of silt and organics near bottom of sample bounded on top and bottom by horizontal silt and sandy silt laminae. (SM) Lacustrine.	Tested	
40	591.3	43		7	43.0-44.0' Sand, gray, fine-grained, moist, little silt. Alternating thin layers of lighter and darker sand. (SM) Lacustrine.	Top only tested	
					44.0-45.0' Silty Sand and Sandy Silt, gray, dense, moist. Thin to thickly laminated with organics. (SM-ML) Lacustrine		
	589.3	45		8	45.0-45.3' Sand, gray, fine-grained, moist, some silt. Occasional wet, thin silt laminae. (SM) Lacustrine	Sample not tested	
55					45.3-47.0' Silt, gray, dense, non-plastic. Thin laminae of lighter and darker silt and silt with clay. (ML) Lacustrine		
	587.3	47		9	47.0-51.0' Samples 9 and 10 not extruded.		
				10			
	583.3	51			Bottom of boring 51.0'		
SAMPLER TYPE				SITE		HOLE NO.	
3" Pitcher				Diesel Generator Building		WB-2	

Revision 14  
12/82

D.10-65

BOREHOLE BACKFILLING REPORT  
CONSUMERS POWER COMPANY

Date 2 Oct 81

Borehole Data

Borehole No. WB-5  
Ground Surface Elev 622.7  
Depth of Borehole 67.0 ft

Personnel Data

Contractor NYG Drilling  
Foreman B THOMASSON  
Inspector K. O'Dea

Grout-Mix Data

Type Cement Portland I  
Mix Proportions  
1 : 1 : .08  
water      bentonite      cement  
Bags of Cement Used 6 - 94 lb.  
Bags of Bentonite Used 1 - 50 lb.  
No. of Batches of Mix 2  
Total Volume of Grout Mix Injected  
Into Borehole ~ 90 gals

Time Summary

Chargeable

Mob at Borehole 1<sup>00</sup>  
Clearing Borehole 1<sup>00</sup>-1<sup>15</sup>  
Mixing Grout 1<sup>15</sup>-1<sup>45</sup>  
Backfilling at Borehole 1<sup>45</sup>-2<sup>15</sup> PM  
Demob at Borehole 2<sup>15</sup>-2<sup>10</sup> PM  
Other —

Post-Backfilling Measurement

Depth of Grout Surface \_\_\_\_\_  
Elev of Grout Surface \_\_\_\_\_

(1) Subtotal 1 1/2 hrs

Non-Chargeable

Breakdown Time 0  
Weather Delay 0  
Other 0

Remarks \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
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\_\_\_\_\_

(2) Subtotal 0

TOTAL HOURS WORKED

(1)+(2) 1 1/2 hrs

Brian Thomasson  
Foreman's Signature

Kevin O'Dea  
Inspector's Signature



SAMPLE EXTRUSION LOG				PROJECT	JOB NO.	SHEET NO.	HOLE NO.	
SITE Diesel Generator Building				Midland Units 1 & 2	7220	1 of 3	WB-5	
SAMPLES		DATE EXTRUDED		COORDINATES				
20		10-5-81		* 5133.8		* 304.7		
GROUND EL.			TOTAL DEPTH		LOGGED BY:			
633.7			67.0'		A. J. Fiksdal			
SAMPLE RECOVERY (%)	ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON SAMPLES SENT FOR LABORATORY ANALYSIS, SPECIAL FEATURES		
	633.7	0			0-29.0' No samples taken. See Woodward-Clyde field boring log for material description.	Pilot hole WB-5 drilled for well B-5 Results of sieve analysis tests included in descriptive log. See grain size distribution curves of tested samples. See Woodward-Clyde field boring log for description of samples not extruded.		
	604.7	29			29.0-31.0' Sample not extruded	Representative portions of all samples were retained unless noted by an*.		
	602.7	31		1				
	60			2	31.0-32.3' Silty Sand, brown, moist, little coarse-grained sand and fine gravel, trace clay, lignite. (SM) Fill	Bottom only tested		
	600.7	33			32.3-33.0' Sand, light brown, fine-grained, moist, some medium-grained sand, trace silt and coarse-grained sand, organics. (SP) Lacustrine			
	80			3	33.0-34.5' Sand, light tan to light brown, fine-to medium-grained, subrounded, trace silt, trace coarse-grained sand, angular large sand grains. Middle of sample medium-to fine-grained (SM) that grades to fine-grained sand toward the bottom. (SP-SM) Lacustrine	Top and bottom tested together Middle tested separately		
	599.2	34.5			34.5-36.0' Sand, grayish tan, very fine-to medium-grained, moist, little silt, sample grades from very fine-to fine-sand near top to fine-to medium-sand at bottom. Organics in thin discontinuous laminae for upper half of sample. Medium-grained sand angular, fine-grained sand subrounded. (SM) Lacustrine	Tested		
	73			4				
	597.7	36			36.0-37.5' Sample not extruded			
	596.2	37.5		5				
	80			6	37.5-39.2' Sand, tanish gray, fine-to very fine-grained, subrounded to subangular, moist, well sorted, trace, silt, organics. Fine-grained sand grades to medium-grained sand toward the bottom. (SP) Lacustrine	Tested		
	594.7	39						
SAMPLER TYPE				SITE			HOLE NO.	
3" Pitcher				Diesel Generator Building			WB-5	

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D.10-105





SAMPLE EXTRUSION LOG				PROJECT	JOB NO.	SHEET NO.	HOLE NO.
				Midland Units 1 & 2	7220	2 of 4	WF-7
SAMPLE RECOVERY (ft)	ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON SAMPLES SENT FOR LABORATORY ANALYSIS, SPECIAL FEATURES	
	589.9	39					
72				5	28.9-40.8 Silty Sand, gray, hard, fine-grained, wet, with thin clay laminations. (SM) Lacustrine 40.8-40.9' Silty Clay, black, organic. (OL) Lacustrine 40.9-41.4' Sand, gray, fine-to medium-grained, trace silt becoming more medium-grained near bottom. (SP) Lacustrine	Bottom only tested	
	592.5	41.0			41.4-43.9' Sample not extruded		
40	590.0	43.0		7	43.5-45.5' Silty Clay, gray, low plasticity, moist, with some fine-grained sand. (CL) Lacustrine 45.5-46.4' Silty Sand, gray, fine-to medium-grained, subrounded, non plastic, wet. (SP) Lacustrine	Sample not tested	
50	587.5	46.0		8	46.4-47.4' Sand, brownish gray, fine-to medium-grained, non-plastic, moist to wet, trace silt, becoming finer-grained toward the bottom. (SP) Lacustrine	Tested	
60	585.5	48.0		9	47.4-50.1' Sand, brownish gray, fine-to medium-grained, non plastic, moist to wet, trace silt, becoming finer grained toward the bottom. (SP) Lacustrine 50.1-50.4' Sand, gray, fine-grained, non-plastic, wet, trace silt. (SP) Lacustrine	Bottom only tested	
	583.5	50.0		10	50.4-52.4' Sample not extruded		
45	581.5	52.0		11	52.4-54.4' Sand, gray, very fine-grained, non-plastic, wet, trace to little silt, subrounded. (SP-SM) Lacustrine	Tested	
	599.5	54.4					
	578.4	55					
SAMPLER TYPE				SITE		HOLE NO.	
3" Pitcher				Service Water Pump Structure		WF-7	

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SAMPLE EXTRUSION LOG				PROJECT Midland Units 1 & 2	JOB NO. 7220	SHEET NO. 3 OF 4	HOLE NO. WF-7	
SAMPLE RECOVERY (%)	ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON SAMPLES SENT FOR LABORATORY ANALYSIS, SPECIAL FEATURES		
	578.4	55						
50				12	54.4-55.9' Silty Sand, or Sandy Silt, gray, very fine grained, trace organics, wet. (SM-ML) Lacustrine 55.9-56.4' Clay, gray, very stiff, with thin light gray, silt laminations. (CL) Lacustrine	Tested		
	577.5	56.4			56.4-67.9' Samples 13-17 not extruded			
				13				
		58.4						
				14				
		60.4						
				15				
		62.9						
				16				
		65.4						
				17				
		67.9			67.9-70.0' No samples taken			
		70						
				18	70.0-72.5' Sample not extruded			
	562.9	71						
SAMPLER TYPE 3" Pitcher				SITE Service Water Pump Structure			HOLE NO. WF-7	

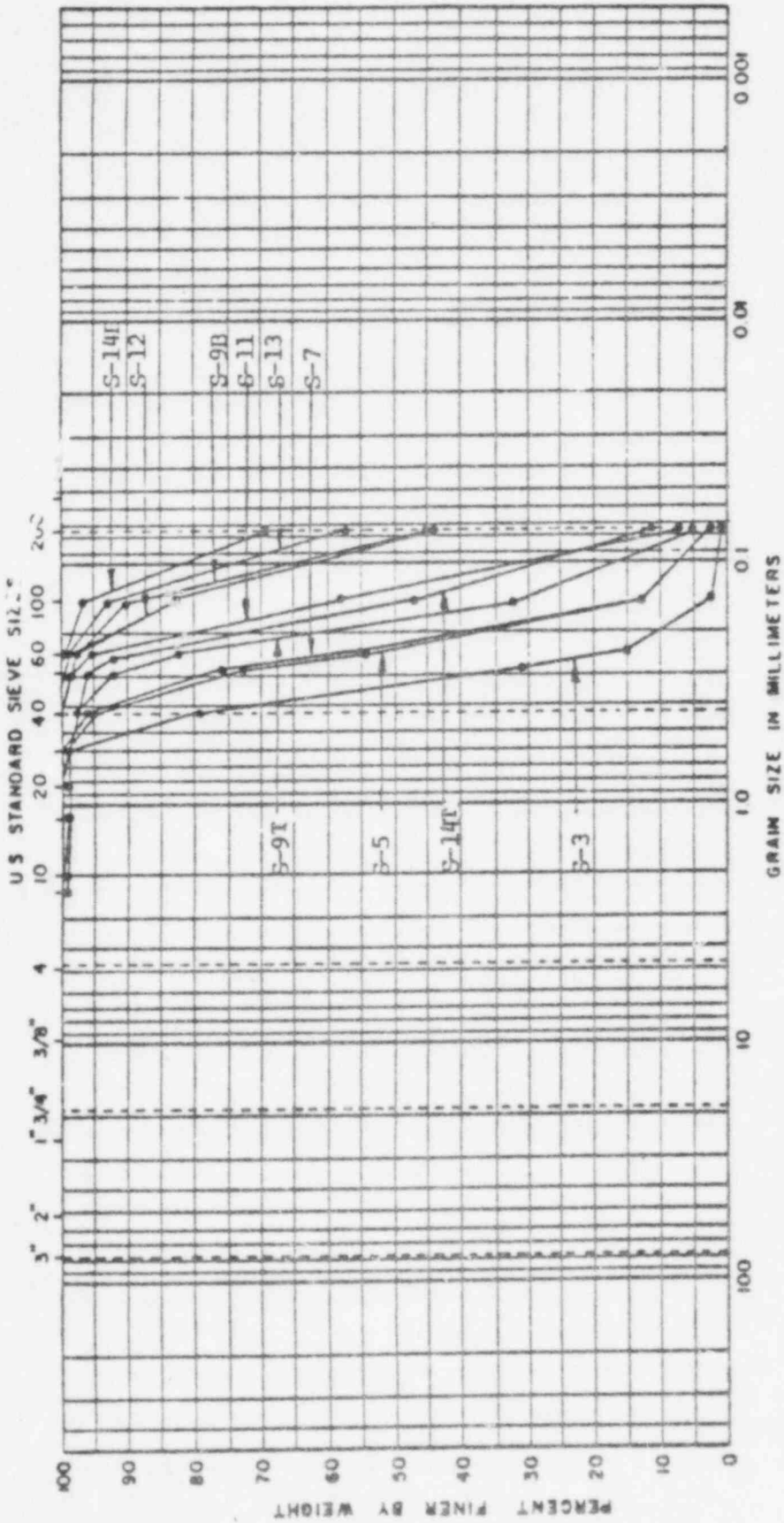
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SAMPLE EXTRUSION LOG				PROJECT	JOB NO.	SHEET NO.	HOLE NO.
				Midland Units 1 & 2	7220	3 of 3	WG-1
SAMPLE RECOVERY (%)	ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON SAMPLES SENT FOR LABORATORY ANALYSIS, SPECIAL FEATURES	
44	579.7	58		11	53.7-56.2' Sand, gray to gray-brown, fine-grained, dense, moist to wet, poorly sorted, trace medium-grained sand, trace silt. (SP-SM) Lacustrine	Tested	
55	577.5	56.2		12	56.2-58.2' Sand and Silt, gray-brown, very fine-to fine-grained, very dense, moist, poorly sorted, trace medium-grained sand and organics. Locally silty sand with bottom 0.1' sandy silt, gray, moist. Grading to silt. (SM-ML) Lacustrine	Tested	
55	575.5	58.2		13	58.2-60.2' Sand and Silt, gray-brown to gray, very fine-to fine-grained, very dense, wet, poorly sorted, trace organics. Some silt layering towards bottom of sample. (SM) Lacustrine	Tested	
60	573.5	60.2		14	60.2-60.65' Sand, gray to gray-brown, dense to very dense, wet, poorly sorted, little silt, trace medium-grained sand, trace organics. (SP-SM) Lacustrine	Top and bottom tested separately	
					60.65-62.2' Sandy Silt, gray, very fine-grained, very dense, moist, trace organics. Small laminations of silty sand throughout with occasional 1/4" silty clay laminations. (ML) Lacustrine		
	571.5	62.2		15	62.2-64.2' Sample not extruded		
	569.5	64.2		16	Bottom of boring at 64.2'		
SAMPLER TYPE				SITE		HOLE NO.	
3" Pitcher				Circulating Water Intake Structure		WG-1	

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BOULDER SIZES	COBBLES		GRAVEL		SAND			FINE S		CLAY SIZES	
	COARSE	FINE	COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES		

BORING NO	DEPTH	DESCRIPTION OR CLASSIFICATION	
		DESCRIPTION OR CLASSIFICATION	DESCRIPTION OR CLASSIFICATION
WG-1	33.7-36.2	See Sample Extrusion Log	Permanent Dewatering Well Pilot Hole WG-1
	38.7-41.2		
	43.7-46.2		
	48.7-51.2		
	53.7-56.2		
	58.2-58.2		
	58.2-60.2		
	60.2-62.2		
	60.2-62.2		
	60.2-62.2		



SAMPLE EXTRUSION LOG				PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Midland Units 1 & 2				7220	1 of 3	WG-8	
SITE		SAMPLES	DATE EXTRUDED	COORDINATES			
Circulating Water Intake Struct.		16	7-9-81	E 5069.19		N 674.67	
GROUND EL.		TOTAL DEPTH	LOGGED BY:				
634.3		69.3'	W. C. Paris, Jr.				
SAMPLE RECOVERY (%)	ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: SAMPLES SENT FOR LABORATORY ANALYSIS, SPECIAL FEATURES	
	634.3	0			0-29.3' No samples taken. See Woodward-Clyde field boring log for material description.	Pilot hole WG-8 drilled for well G-8  Results of sieve analysis tests included in descriptive log.  See grain size distribution curve of tested samples.	
	605.0	29.3			29.3-41.8' Samples 1-6 not extruded	See Woodward-Clyde field boring log for description of samples not extruded.  Representative portions of all samples were retained unless noted by an *.	
		31.8		1			
		34.3		2			
		36.8		3			
		38.8		4			
SAMPLER TYPE		SITE		HOLE NO.			
3" Pitcher		Circulating Water Intake Structure		WG-8			

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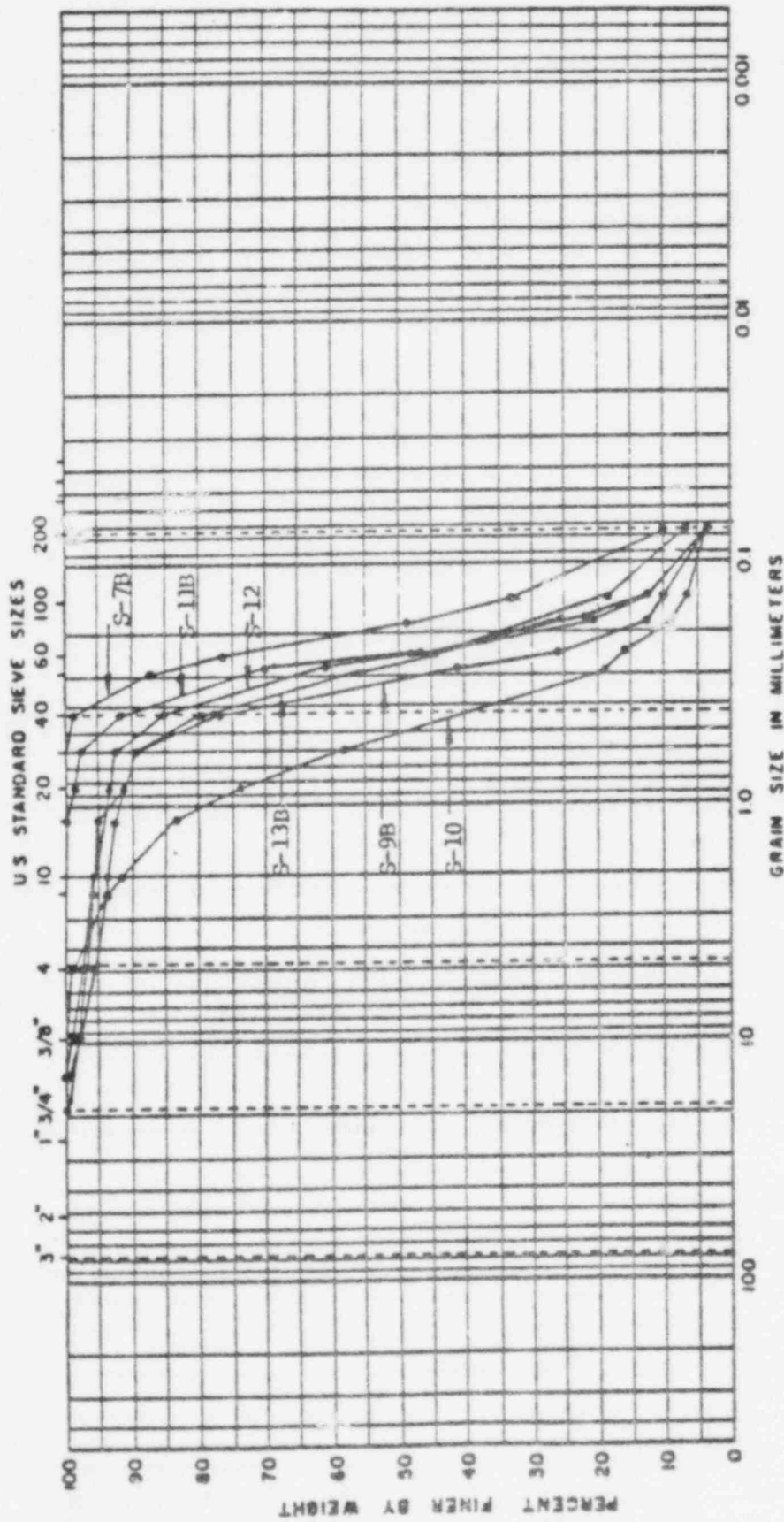


SAMPLE EXTRUSION LOG				PROJECT	JOB NO.	SHEET NO.	HOLE NO.	
				Midland Units 1 & 2	7220	2 of 3	WG-8	
SAMPLE RECOVERY (%)	ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON SAMPLES SENT FOR LABORATORY ANALYSIS, SPECIAL FEATURES		
	595.3	39						
				5				
	40.3			6				
	592.5	41.8			41.8-46.8' No samples taken			
	587.5	46.8		7	46.8-47.6' Clayey Sand, dark gray, mottled, hard, dry trace organics. (SC) Till	Bottom only tested		
87					47.6-48.3' Sand, gray, fine-to medium-grained, trace organics, little silt. (SP-SM) Lacustrine			
	586.0	48.3			48.3-50.3' Sample not extruded			
				8				
	584.0	50.3		9	50.3-51.9' Sand, gray, fine-to coarse-grained, trace silt, trace fine gravel. (SP) Lacustrine	Bottom only tested		
50					51.9-52.3' Sand, light gray, fine-to medium-grained, trace silt, (SP-SM) Lacustrine			
	582.0	52.3		10	52.3-54.3' Sand, gray, fine-to coarse-grained, trace silt, trace fine gravel, subrounded, wet. (SP) Lacustrine	Tested		
65								
	580.0	54.3						
	579.3	55						
SAMPLER TYPE 3" Pitcher				SITE Circulating Water Intake Structure			HOLE NO. WG-8	

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SAMPLE EXTRUSION LOG				PROJECT Midway Units 1 & 2	JOB NO. 7220	SHEET NO. 3 of 3	HOLE NO. WG-8	
SAMPLE RECOVERY (%)	ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON SAMPLES SENT FOR LABORATORY ANALYSIS, SPECIAL FEATURES		
	579.3	55						
50				11	54.3-55.3' Sand, see description of sample 10 above. (SP) Lacustrine	Bottom only tested		
	578.0	56.3			55.3-56.3' Sand, gray, fine-to medium-grained, trace silt, trace gravel, organic clay layer 55.8-55.9', has 45° contact top and bottom. (SP) Lacustrine			
55				12	56.3-58.3' Sand, gray, fine-to medium-grained, trace silt, trace fine gravel, 0.5" dark gray, silty clay layer at 58.2'. (SP) Lacustrine	Tested		
	576.0	58.3			58.3-59.0' Silty Clay, dark gray. (CL) Lacustrine.	Bottom only tested		
50				13	59.0-60.3' Sand, gray, fine-to coarse-grained with occasional thin (< 1/4"), fine sandy organic silt layers. (SP-SM) Lacustrine			
	574.0	60.3			60.3-62.3' Sandy Silt, gray, very fine-grained grading to silty clay with light gray silt laminations. (ML-CL) Lacustrine	Sample not tested		
	572.0	62.3			62.3-64.3' Sample not extruded			
				15				
					64.3-67.3' No sample taken			
					67.3-69.3' Sample not extruded			
				16				
	565.0	69.3			Bottom of boring at 69.3'			
SAMPLER TYPE 3" Pitcher				SITE Circulating Water Intake Structure			HOLE NO. WG-8	



BOULDER SIZES	COBBLES		GRAVEL		SAND			FINES	
	COARSE	FINE	COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

BORING NO	DEPTH	GRAIN SIZE DISTRIBUTION	
		DESCRIPTION OR CLASSIFICATION	Permanent Dewatering Well Pilot Hole WG-8
WG-8	S-7B 46.8-48.3	See Sample Extrusion Log	
	S-9B 50.3-52.3		
	S-10 52.3-54.3		
	S-11B 54.3-56.3		
	S-12 56.3-58.3		
	S-13B 58.3-60.3		





SAMPLE EXTRUSION LOG				PROJECT	JOB NO.	SHEET NO.	HOLE NO.
				Midland Units 1 & 2	7220	2 OF 3	WJ-2
SAMPLE RECOVERY (%)	ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON SAMPLES SENT FOR LABORATORY ANALYSIS, SPECIAL FEATURES	
	594.6	38					
		39		6			
				7			
100	591.6	41			41.0-41.7' Silty Clay, black, very hard, low plasticity. (CL) Lacustrine		
				8	41.7-42.3' Clayey Sand, greenish black, fine-to very fine-grained, low plasticity. (SC) Lacustrine		Bottom only tested
					42.3-43.0' Sand, green, fine-grained, wet to moist, well sorted, subangular to subrounded, angular contact with above clayey sand, 75-80%. (SP-SM) Lacustrine		
55	589.6	43			43.0-43.5' Sandy Silt or Silty Sand, green to dark green, fine-grained sand, moist. (SM)		Bottom only tested
				9	43.5-45.0' Sand, green, fine-grained, subangular to subrounded, moist to wet, well sorted, trace silt. Distinct contact with sandy silt above. (SQ) Lacustrine		
60	587.6	45			45.0-47.0' Sand, greenish gray, fine-to medium-grained, angular to subrounded, moist to wet, little silt, trace coarse-grained sand, organics. Larger fraction more angular, particularly chert fragments. Coarse-grained sand in two thick laminae near top. (SM) Lacustrine		Tested
				10			
	585.6	47			47.0-49.0' Sample not extruded		
				11			
55	583.6	49			49.0-51.0' Sand, tan to gray with slight green tint, fine-grained, angular to subrounded, moist to wet, trace medium to coarse-grained sand, trace silt, two thin to thick coarse-grained sand laminae near top. Thin fine-grained sand bed near middle. (SP) Lacustrine		Tested
				12			
65	581.6	51			51.0-53.0' Sand, gray, fine-to very fine-grained, subangular to subrounded, moist, little silt, organics. Discontinuous lignite laminae at approximately 52.0'. (SM) Lacustrine		Tested
				13			
65	579.6	53			53.0-55.0' Sand, gray, fine-grained, subangular to subrounded, moist, well sorted, little silt, organics. One thin silt laminae at 54.0'. Hard thin silt laminae at top, sample finer grained toward the bottom. (SM) Lacustrine		Tested
				14			
	578.6	54					
SAMPLER TYPE				SITE		HOLE NO.	
3" Pitcher				East Yard Area		WJ-2	

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SAMPLE EXTRUSION LOG				PROJECT	JOB NO.	SHEET NO.	HOLE NO.	
				Midland Units 1 & 2	7220	3 OF 3	WJ-2	
SAMPLE RECOVERY (IN)	ELEVATION	USPTN	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON SAMPLES SENT FOR LABORATORY ANALYSIS, SPECIAL FEATURES		
	578.6	54		14				
	577.6	55		15	55.0-57.0' Sample not extruded			
60	575.6	57		16	57.0-59.0' Sand, gray, very fine-to fine-grained, moist, some silt, organics. Thin silt or sandy silt laminae and thin discontinuous lignite laminae. (SM) Lacustrine	Tested		
60	573.6	59		17	59.0-60.0' Sandy Silt, gray, very fine-grained sand, dry to moist, organics. Thin silt laminae at contact with silty clay below. (ML) Lacustrine 60.0-61.0' Silty Clay, gray, low to medium plasticity. Increasing thin clay laminae toward the bottom. At bottom medium plastic gray clay with silt laminae. (Cl) Lacustrine	Top only tested		
	571.6	61		18	61.0-67.0' Samples 18-20 not extruded			
				19				
				20				
	565.6	67			Bottom of boring at 67.0'			
SAMPLER TYPE 3" Pitcher				SITE East Yard Area			HOLE NO. WJ-2	

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SAMPLE EXTRUSION LOG				PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Oily Waste Building				Midland Units 1 & 2	7220	1 OF 3	WN-4R
SITE		SAMPLES	DATE EXTRUDED	COORDINATES			
Oily Waste Building		24	11-27-82	E 4677		E 437	
GROUND EL.		TOTAL DEPTH		LOGGED BY:			
633.9		69.6		A. J. Fiksdal			
SAMPLE RECOVERY (%)	ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON SAMPLES SENT FOR LABORATORY ANALYSIS, SPECIAL FEATURES	
	633.9	0			0-29' No samples taken. See Woodward-Clyde field boring log for material description.	Pilot hole WN-4R drilled for well N-4. Results of sieve analysis tests are included in descriptive log. Representative portions of all samples were retained unless noted by an *.	
		1					
		2					
		28					
	604.9	29		1	29.0-33.0' Samples 1 and 2 not extruded.	See Woodward-Clyde field boring log for description of samples not extruded.	
		31		2		See grain size distribution curves of tested samples.	
		33					
68	600.9	33		3	33.0-34.5' Silty Clay, gray, mottled brown and tan, low to medium plasticity, moist, trace to some sand, trace fine gravel. (CL) Fill	Sample not tested	
					34.5-34.9' Sand, brown, fine-grained, moist to wet, poorly sorted, trace to little silt, nodules of clay. (SM/wCL) Fill		
	599.0	34.9			34.9-37.5' No sample taken		
		37.5					
86	596.4	37.5		4	37.5-38.9' Sand, grayish-brown, fine-grained, moist, trace silt. No internal structure. (SP) Lacustrine	Tested	
	595.0	38.9					
SAMPLER TYPE		SITE		HOLE NO.			
3" Pitcher		Oily Waste Building		WN-4R			

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D.10-392



SAMPLE EXTRUSION LOG				PROJECT	JOB NO.	SHEET NO.	HOLE NO.
				Midland Units 1&2	7220	2 of 3	WN-4R
SAMPLE RECOVERY (%)	ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: SAMPLES SENT FOR LABORATORY ANALYSIS, SPECIAL FEATURES	
	595.0	18					
					38.9-39.5' No samples taken		
80	594.4	19		5	39.5-41.0' Sand, grayish-brown, fine-grained, moist to wet, trace medium-grained sand. Top 0.05' coarse-to fine-grained sand grading to fine-grained sand. (SP) Lacustrine	Tested	
	592.9	41		6	41.0-42.0' Sample not extruded		
90	591.9	42		7	42.0-43.0' Sand, brown, fine to very fine-grained, dense, moist, little silt. Top 0.6' fine-grained sand, lower 0.3' increase in silt and decrease in grain size to very fine-grained with some silt. (SP-SM) Lacustrine	Tested	
55	590.9	43		8	43.0-45.0' Sand, brown, fine-grained, moist, little silt. Upper 1/3 of sample very fine-grained sand with silt laminae, lower 2/3 fine-grained clear quartz. (SM) Lacustrine	Tested	
60	588.9	45		9	45.0-46.5' Sand, brown, fine-grained, moist to wet, organics. No internal structure. (SP) Lacustrine	Tested	
67	587.4	46.5		10	46.5-48.0' Sand, brown, fine-grained, moist, trace silt. Thin beds of very fine-grained sand with lignite partings at approximately 20° from horizontal. (SP-SM) Lacustrine	Tested	
	585.9	48		11	48.0-48.9' Sample not extruded.		
91	585.0	48.5		12	48.9-50.0' Sand, grayish-brown, fine-grained, moist to wet, trace silt, organics. Brown silt, sand laminae at top and near bottom. Sand grades coarser grained towards bottom. (SP-SM) Lacustrine	Tested	
	583.9	50		13	50.0-51.0' Sample not extruded.		
100	582.9	51		14	51.0-52.0' Sand, grayish-brown, fine-grained, moist, trace silt. Silty sand laminae at top and bottom. Discontinuous lignite laminae. (SP-SM) Lacustrine	Tested	
	581.9	52		15	52.0-54.0' Sample not extruded.		
50	579.9	54		16	54.0-56.0' Sand, brown, fine-grained, moist to wet, organics. No internal structure. (SP) Lacustrine	Tested	
	578.9	55					
SAMPLER TYPE 3" Pitcher				SITE Oily Waste Building		HOLE NO. WN-4R	

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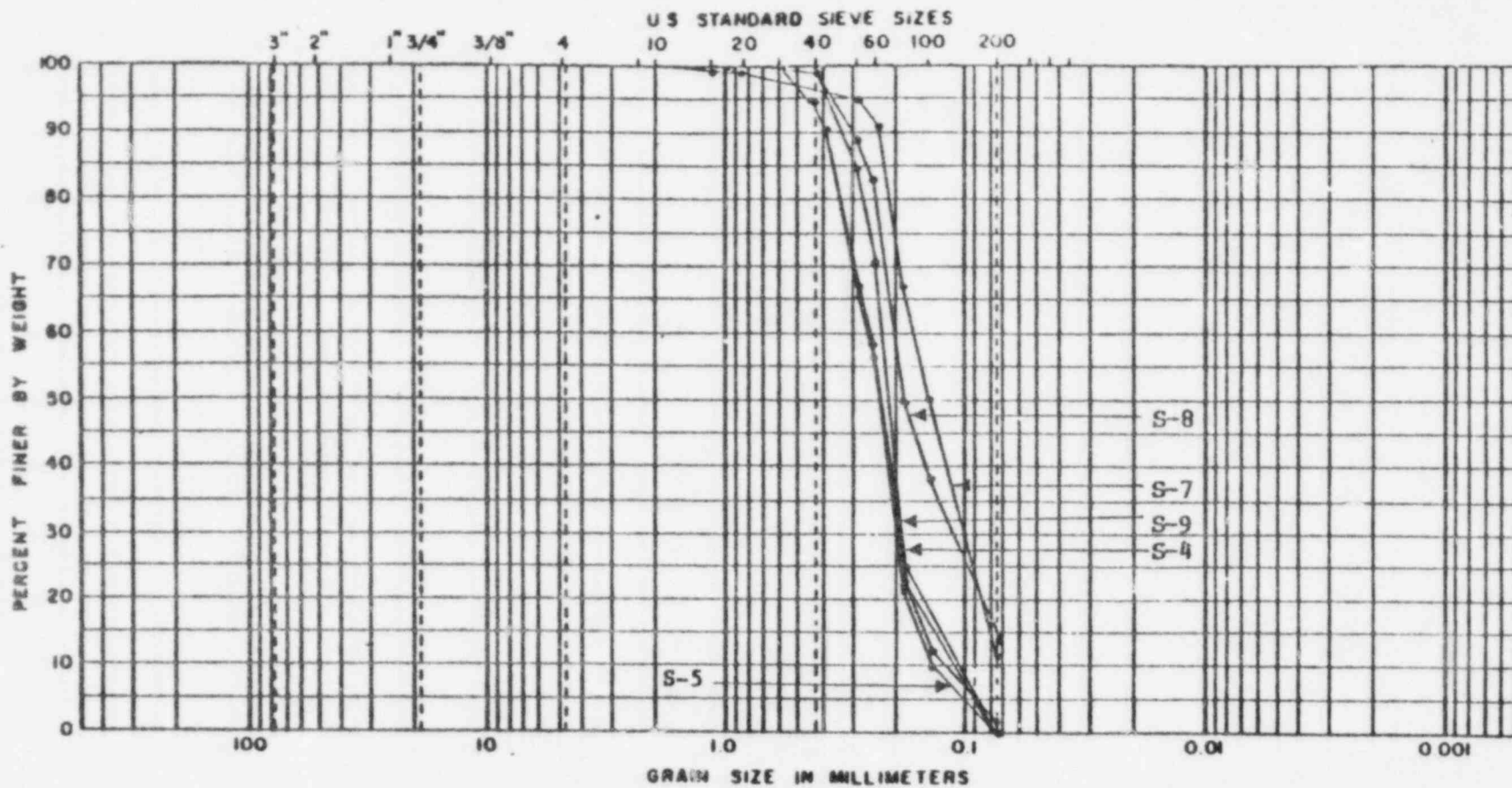


SAMPLE EXTRUSION LOG				PROJECT	JOB NO.	SHEET NO.	HOLE NO.
				Midland Units 1&2	7220	3 OF 3	WN-4R
SAMPLE RECOVERY (%)	ELEVATION	DEPTH	GRAPHIC LOG / SAMPLE	DESCRIPTION AND CLASSIFICATION			NOTES ON SAMPLES SENT FOR LABORATORY ANALYSIS, SPECIAL FEATURES
	578.9	55					
48	577.9	56		56.0-58.0' Sand, brown, fine-grained, moist to wet, trace silt, organics. Sample grades slightly finer grained towards bottom. (SP-SM) Lacustrine			Tested
	575.9	58		58.0-59.5' Sample not extruded.			
50	574.4	59.5		59.5-61.5' Sand, grayish-brown, fine-grained, moist to wet, trace silt, organics. Silty sand laminae on top of sample and a medium-grained zone near the middle. (SP-SM) Lacustrine			Tested
100	572.4	61.5		61.5-62.6' Sand, gray, fine-grained, moist to wet, trace silt. Silty sand laminae on top. Color change from gray-brown to gray at middle of sample. (SP-SM) Lacustrine			Tested
90	571.3	62.6		62.6-63.6' Sand, gray, fine-grained, moist to wet, little silt. Thick laminae of silty fine-grained sand near top and sandy silt near bottom. Lignite partings on bottom. (SM) Lacustrine			Tested
50	570.3	63.6		63.6-65.6' Sandy silt, fine-grained sand, moist to wet, Thin silt laminae in fine-grained sand increasing toward bottom. Bottom 1/4 of sample wet moderately dense, silty sand. (ML) Lacustrine			Tested
	568.3	65.6		65.6-69.6' Samples 23 and 24 not extruded.			
		67.6					
	564.3	69.6		Bottom of boring 69.6'			
SAMPLER TYPE 3" Pitcher				SITE Oily Waste Building		HOLE NO. WN-4R	

D.10-394

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D.10-395



BORING NO	DEPTH	DESCRIPTION OR CLASSIFICATION	<b>GRAIN SIZE DISTRIBUTION</b> Permanent Dewatering Well Pilot Hole WN-4R (sheet 1 of 3)
WN-4R	S-4 37.5-38.9 S-5 39.5-41.0 S-7 42.0-43.0 S-8 43.0-45.0 S-9 45.0-46.5	See Sample Extrusion Log	

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SAMPLE EXTRUSION LOG				PROJECT	JOB NO.	SHEET NO.	HOLE NO.	
SITE Auxiliary Building Train Bay				SAMPLES 19	DATE EXTRUDED 2-2-82	COORDINATES # 4671 E 324		
GROUND EL. 638.7		TOTAL DEPTH 68.0'		LOGGED BY: A. J. Fiksdal				
SAMPLE RECOVERY (N)	ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON SAMPLES SENT FOR LABORATORY ANALYSIS, SPECIAL FEATURES		
	643.7	0			0.-29' No samples taken. See Woodward-Clyde field boring log for material description.	Pilot hole OW-5 drilled for observation well OBS-5.  Results of sieve analysis tests are included in descriptive log.  Representative portions of all samples were retained unless noted by an *.		
		1						
		2						
		26			26.0- 26.5' Obstruction			
	605.7	29			29.0-41.0 Samples 1-6 not extruded	See Woodward-Clyde field boring log for description of materials not extruded.		
		30		1				
		31						
				6				
	593.7	41			41.0-42.6' Silty Clay, mottled gray-brown, stiff medium plastic, little sand, trace fine gravel. (CL) Fill	Sample not tested		
43				7				
	591.7	43			42.6-43.0' Clayey Sand, brown, fine to medium-grained, moist, trace coarse sand. (SC) Fill	Sample not tested		
25				8				
	590.7	44			43.0-44.0' Silty Clay, reddish-brown, medium density, low plasticity, moist, some sand, trace fine gravel. (CL) Fill	Sample not tested		
SAMPLER TYPE 3" Pitcher/Split Spoon				SITE Auxiliary Building Train Bay			HOLE NO. OW-5	

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D.10-424



SAMPLE EXTRUSION LOG				PROJECT Midland Units 1 & 2	JOB NO. 7220	SHEET NO. 2 OF 3	HOLE NO. OW-5
SAMPLE RECOVERY (%)	ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTE ON: SAMPLES SENT FOR LABORATORY ANALYSIS, SPECIAL FEATURES	
	590.7	42					
				8	44.0-45.0' Sand, brown, fine-grained, moist, trace to little silt, trace coarse sand. (SM) Fill		
NA	589.7	45		9	45.0-45.5' Sand, brown, fine-grained, moist to wet, trace clay. (SM) Fill		Sample combined for testing
					45.5-47.0' Sand, yellowish-brown, fine-to medium-grained moist to wet, trace coarse-grained sand. (SP) Fill		
25	587.7	47		10	47.0-49.0' Sand, yellowish-brown, fine-to coarse-grained, moist to wet. Nodules of clayey coarse-grained sand in middle of sample. (SP-SM) Fill		Tested*
73	585.7	49		11	49.0-50.5' Sand, brown, fine-to coarse-grained, moist. No internal structure. (SP-SM) Fill		Split spoon sample tested
87	584.2	50.5		12	50.5-52.0' Sand, brown, fine-to coarse-grained, moist. No internal structure. (SP-SM) Fill		Split spoon sample tested
87	582.7	52		13	52.0-53.5' Sand, brown, fine-to coarse-grained, moist, trace fine gravel. No internal structure. (SM-SM) Fill		Split spoon sample tested
	581.2	53.5		14	53.5-53.7' No sample recovered.		
	581.0	53.7		14	53.7-60.5' No sample taken.		
87	578.2	60.5		15	60.5-62.0' Silty Sand, grav, fine-grained, moist, organics. Thin silt laminae near bottom and middle, black fine-grained sand bed at approximately #1'. Top of sample brownish gray. (SM) Lacustrine		
	572.7	62					
SAMPLER TYPE 3" Pitcher/ Split Spoon				SITE Auxiliary Building Train Bay		HOLE NO. OW-5	

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Soil investigative data not normally subject to change (e.g., boring logs, lab test data, etc) have been consolidated in Appendix D to these volumes. The enclosed material includes a few minor corrections to previously submitted pages and additional new data acquired by investigations for remedial soils actions. A list of effective pages to aid you in collating this material is also included.

To verify receipt of the enclosed information, please sign the acknowledgement below and return the entire form within 30 days to me at the above location. If any of this material is missing, please indicate in the space provided below.

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