

Appendix 1

Lidar Patch Check Areas

Area 1

Horizontal Datum: NAD 1983(1992)

Horizontal Coordinate System: U.S. State Plane, 1983, Zone: Louisiana South 1702

Vertical Datum: NAVD88(2004.65)

Coordinate Units: US survey feet

Distance Units: U.S. survey feet

Height Units: U.S. survey feet

Name	Northing	Easting	Latitude	Longitude	Elevation	Feature Code
JP03	558518.69	3633625.16	30°01'51.96103"N	90°13'06.29152"W	-5.38	CHK
JP04	560557.95	3624734.09	30°02'12.99285"N	90°14'47.21895"W	-4.16	RTK BASE
P1A1	560541.09	3624777.84	30°02'12.82188"N	90°14'46.72293"W	-4.47	4111-HORZ
P1A2	560540.88	3624781.84	30°02'12.81938"N	90°14'46.67752"W	-4.25	4111-HORZ
P1A3	560537.99	3624826.74	30°02'12.78660"N	90°14'46.16702"W	-4.63	4111-HORZ
P1A4	560534.46	3624882.47	30°02'12.74640"N	90°14'45.53336"W	-4.55	4111-HORZ
P1A5	560529.67	3624961.36	30°02'12.69158"N	90°14'44.63629"W	-4.69	4111-HORZ
P1A6	560527.35	3624997.05	30°02'12.66523"N	90°14'44.23055"W	-5.19	4111-HORZ
P1A7	560526.86	3625004.99	30°02'12.65963"N	90°14'44.14022"W	-5.46	4111-HORZ
P1A8	560525.53	3625025.24	30°02'12.64459"N	90°14'43.91000"W	-4.89	4111-HORZ
P1A9	560525.09	3625032.06	30°02'12.63957"N	90°14'43.83245"W	-5.21	4111-HORZ
P1A10	560528.68	3625033.42	30°02'12.67503"N	90°14'43.81663"W	-5.14	4111-HORZ
P1A11	560529.42	3625025.24	30°02'12.68306"N	90°14'43.90960"W	-4.84	4111-HORZ
P1A12	560531.51	3624992.79	30°02'12.70677"N	90°14'44.27859"W	-5.13	4111-HORZ
P1A13	560534.47	3624945.46	30°02'12.74056"N	90°14'44.81668"W	-4.74	4111-HORZ
P1A14	560538.61	3624878.56	30°02'12.78779"N	90°14'45.57733"W	-4.56	4111-HORZ
P1A15	560541.88	3624826.64	30°02'12.82508"N	90°14'46.16765"W	-4.46	4111-HORZ
P1A16	560544.92	3624778.00	30°02'12.85978"N	90°14'46.72075"W	-4.26	4111-HORZ
P1A17	560439.35	3625204.39	30°02'11.77471"N	90°14'41.88117"W	-5.66	4111
P1A18	560438.30	3625221.75	30°02'11.76259"N	90°14'41.68376"W	-5.67	4111
P1A19	560437.14	3625237.97	30°02'11.74966"N	90°14'41.49937"W	-5.59	4111
P1A20	560436.11	3625253.78	30°02'11.73798"N	90°14'41.31960"W	-5.56	4111
P1A21	560435.09	3625271.82	30°02'11.72611"N	90°14'41.11445"W	-5.64	4111
P1A22	560433.99	3625290.01	30°02'11.71351"N	90°14'40.90768"W	-5.76	4111
P1A23	560432.87	3625308.76	30°02'11.70074"N	90°14'40.69447"W	-5.76	4111
P1A24	560431.45	3625327.40	30°02'11.68490"N	90°14'40.48247"W	-5.71	4111
P1A25	560430.41	3625345.24	30°02'11.67295"N	90°14'40.27968"W	-5.56	4111
P1A26	560429.07	3625362.81	30°02'11.65795"N	90°14'40.07989"W	-5.57	4111
P1A27	560428.11	3625379.92	30°02'11.64691"N	90°14'39.88541"W	-5.44	4111
P1A28	560426.65	3625400.50	30°02'11.63048"N	90°14'39.65136"W	-5.25	4111
P1A29	560425.27	3625421.05	30°02'11.61493"N	90°14'39.41771"W	-5.56	4111

Name	Northing	Easting	Latitude	Longitude	Elevation	Feature Code
P1A30	560424.14	3625439.07	30°02'11.60206"N	90°14'39.21285"W	-5.65	4111
P1A31	560423.00	3625455.40	30°02'11.58921"N	90°14'39.02717"W	-5.63	4111
P1A32	560533.70	3625829.71	30°02'12.64978"N	90°14'34.75676"W	-5.58	3111
P1A33	560533.29	3625841.68	30°02'12.64454"N	90°14'34.62058"W	-5.54	3111
P1A34	560532.71	3625852.24	30°02'12.63786"N	90°14'34.50051"W	-5.43	3111
P1A35	560531.59	3625864.87	30°02'12.62557"N	90°14'34.35691"W	-5.39	3111
P1A36	560530.43	3625876.45	30°02'12.61303"N	90°14'34.22532"W	-5.34	3111
P1A37	560529.18	3625888.48	30°02'12.59948"N	90°14'34.08856"W	-5.44	3111
P1A38	560527.39	3625900.61	30°02'12.58059"N	90°14'33.95080"W	-5.30	3111
P1A39	560525.35	3625830.07	30°02'12.56706"N	90°14'34.75351"W	-5.50	3111
P1A40	560522.38	3625841.45	30°02'12.53659"N	90°14'34.62436"W	-5.47	3111
P1A41	560520.17	3625852.58	30°02'12.51371"N	90°14'34.49798"W	-5.46	3111
P1A42	560517.82	3625864.15	30°02'12.48933"N	90°14'34.36665"W	-5.40	3111
P1A43	560516.04	3625876.36	30°02'12.47052"N	90°14'34.22787"W	-5.34	3111
P1A44	560517.08	3625888.20	30°02'12.47975"N	90°14'34.09306"W	-5.35	3111
P1A45	560516.73	3625899.51	30°02'12.47518"N	90°14'33.96445"W	-5.28	3111
P1A46	560515.70	3625910.92	30°02'12.46394"N	90°14'33.83472"W	-5.19	3111
P1A47	560782.24	3624817.76	30°02'15.20519"N	90°14'46.24275"W	-4.32	6111
P1A48	560795.65	3624832.84	30°02'15.33656"N	90°14'46.06977"W	-4.37	6111
P1A49	560806.16	3624845.26	30°02'15.43936"N	90°14'45.92730"W	-4.29	6111
P1A50	560825.00	3624865.46	30°02'15.62397"N	90°14'45.69548"W	-4.37	6111
P1A51	560837.95	3624879.66	30°02'15.75081"N	90°14'45.53257"W	-4.60	6111
P1A52	560849.64	3624892.41	30°02'15.86536"N	90°14'45.38624"W	-4.54	6111
P1A53	560871.74	3624914.93	30°02'16.08203"N	90°14'45.12765"W	-4.43	6111
P1A54	560881.46	3624924.64	30°02'16.17730"N	90°14'45.01605"W	-4.63	6111
P1A55	560890.87	3624934.30	30°02'16.26958"N	90°14'44.90521"W	-4.64	6111
P1A56	560906.35	3624950.13	30°02'16.42128"N	90°14'44.72344"W	-4.46	6111
P1A57	561205.92	3625256.64	30°02'19.35783"N	90°14'41.20385"W	21.58	4111-FLDWALL-HORZ
P1A58	561202.26	3625303.80	30°02'19.31717"N	90°14'40.66765"W	21.64	4111-FLDWALL-HORZ
P1A59	561318.72	3625439.20	30°02'20.45732"N	90°14'39.11463"W	18.60	4111-FLDWALL-HORZ
P1A60	561376.83	3625468.32	30°02'21.02980"N	90°14'38.77709"W	18.55	4111-FLDWALL-HORZ
P1A61	561093.33	3625179.46	30°02'18.25068"N	90°14'42.09413"W	-4.47	3121
P1A62	561099.16	3625185.72	30°02'18.30773"N	90°14'42.02228"W	-4.23	3121
P1A63	561104.72	3625191.76	30°02'18.36224"N	90°14'41.95294"W	-3.70	3121
P1A64	561110.34	3625198.10	30°02'18.41727"N	90°14'41.88018"W	-3.01	3121
P1A65	561116.43	3625204.33	30°02'18.47694"N	90°14'41.80867"W	-2.08	3121
P1A66	561122.85	3625210.13	30°02'18.53992"N	90°14'41.74203"W	-1.20	3121
P1A67	561130.71	3625203.46	30°02'18.61839"N	90°14'41.81703"W	-1.08	3121
P1A68	561126.10	3625198.26	30°02'18.57326"N	90°14'41.87670"W	-1.85	3121
P1A69	561121.35	3625192.78	30°02'18.52673"N	90°14'41.93956"W	-2.70	3121
P1A70	561116.41	3625186.94	30°02'18.47839"N	90°14'42.00655"W	-3.46	3121
P1A71	561111.29	3625181.37	30°02'18.42822"N	90°14'42.07041"W	-4.05	3121
P1A72	561105.01	3625175.37	30°02'18.36665"N	90°14'42.13937"W	-4.37	3121
P1A73	561114.60	3625167.63	30°02'18.46233"N	90°14'42.22639"W	-4.30	3121
P1A74	561120.41	3625173.12	30°02'18.51930"N	90°14'42.16327"W	-4.03	3121
P1A75	561126.41	3625178.47	30°02'18.57818"N	90°14'42.10174"W	-3.50	3121
P1A76	561132.83	3625183.62	30°02'18.64121"N	90°14'42.04245"W	-2.64	3121
P1A77	561138.64	3625188.69	30°02'18.69831"N	90°14'41.98418"W	-1.66	3121
P1A78	561144.48	3625191.66	30°02'18.75580"N	90°14'41.94974"W	-0.88	3121
P1A79	561189.94	3625517.17	30°02'19.17518"N	90°14'38.24145"W	-4.94	A111
P1A80	561201.35	3625524.28	30°02'19.28748"N	90°14'38.15935"W	-4.80	A111
P1A81	561211.75	3625532.56	30°02'19.38966"N	90°14'38.06408"W	-4.88	A111
P1A82	561220.35	3625538.79	30°02'19.47413"N	90°14'37.99227"W	-4.82	A111
P1A83	561228.50	3625545.07	30°02'19.55428"N	90°14'37.91983"W	-4.82	A111

Name	Northing	Easting	Latitude	Longitude	Elevation	Feature Code
P1A84	561219.34	3625559.93	30°02'19.46219"N	90°14'37.75184"W	-4.88	A111
P1A85	561209.24	3625553.77	30°02'19.36275"N	90°14'37.82293"W	-4.92	A111
P1A86	561201.46	3625547.13	30°02'19.28640"N	90°14'37.89933"W	-4.88	A111
P1A87	561193.57	3625540.61	30°02'19.20888"N	90°14'37.97444"W	-4.96	A111
P1A88	561182.95	3625531.73	30°02'19.10457"N	90°14'38.07657"W	-4.95	A111
P1A89	560871.85	3624982.19	30°02'16.07676"N	90°14'44.36235"W	-4.09	3111-ASPHALT
P1A90	560858.48	3624968.91	30°02'15.94572"N	90°14'44.51496"W	-3.99	3111-ASPHALT
P1A91	560845.33	3624955.77	30°02'15.81676"N	90°14'44.66584"W	-3.94	3111-ASPHALT
P1A92	560832.18	3624942.62	30°02'15.68783"N	90°14'44.81691"W	-3.92	3111-ASPHALT
P1A93	560838.44	3624935.43	30°02'15.75047"N	90°14'44.89795"W	-3.74	3111-ASPHALT
P1A94	560850.78	3624947.47	30°02'15.87151"N	90°14'44.75970"W	-3.76	3111-ASPHALT
P1A95	560862.68	3624959.45	30°02'15.98815"N	90°14'44.62207"W	-3.83	3111-ASPHALT
P1A96	560875.12	3624971.97	30°02'16.11015"N	90°14'44.47832"W	-3.86	3111-ASPHALT
P1A97	560879.43	3624976.08	30°02'16.15235"N	90°14'44.43102"W	-3.91	3111-ASPHALT
P1A98	560885.22	3624970.33	30°02'16.21025"N	90°14'44.49583"W	-4.11	3111-ASPHALT
P1A99	560874.99	3624959.75	30°02'16.11000"N	90°14'44.61732"W	-4.04	3111-ASPHALT
P1A100	560862.66	3624947.66	30°02'15.98908"N	90°14'44.75625"W	-3.96	3111-ASPHALT
P1A101	560849.98	3624935.04	30°02'15.86471"N	90°14'44.90112"W	-3.97	3111-ASPHALT
P1A102	560839.85	3624924.97	30°02'15.76542"N	90°14'45.01681"W	-3.96	3111-ASPHALT

Area 2

Horizontal Datum: NAD 1983(1992)

Horizontal Coordinate System: U.S. StatePlane, 1983, Zone: Louisiana South 1702

Vertical Datum: NAVD88(2004.65)

Coordinate Units: US survey feet

Distance Units: U.S. survey feet

Height Units: U.S. survey feet

Name	Northing	Easting	Latitude	Longitude	Elevation	Feature Code
ALCO	557299.70	3667048.43	30°01'36.52294"N	90°06'46.21053"W	6.14	RTK BASE
LOND	555491.49	3680327.10	30°01'17.19989"N	90°04'15.38392"W	8.78	CHK
P2A1	557263.53	3667052.00	30°01'36.16446"N	90°06'46.17437"W	5.45	4111
P2A2	557266.39	3667043.38	30°01'36.19371"N	90°06'46.27200"W	5.51	4111
P2A3	557268.87	3667035.64	30°01'36.21911"N	90°06'46.35983"W	5.55	4111
P2A4	557270.91	3667023.35	30°01'36.24056"N	90°06'46.49939"W	5.76	4111
P2A5	557271.11	3667014.66	30°01'36.24349"N	90°06'46.59816"W	5.78	4111
P2A6	557270.88	3667007.52	30°01'36.24196"N	90°06'46.67943"W	5.81	4111
P2A7	557269.76	3667000.12	30°01'36.23160"N	90°06'46.76377"W	5.78	4111
P2A8	557268.43	3666992.73	30°01'36.21927"N	90°06'46.84795"W	5.68	4111
P2A9	557266.50	3666985.65	30°01'36.20091"N	90°06'46.92875"W	5.59	4111
P2A10	557264.17	3666978.18	30°01'36.17864"N	90°06'47.01405"W	5.56	4111
P2A11	557264.53	3667174.55	30°01'36.16148"N	90°06'44.78013"W	6.85	A111
P2A12	557269.89	3667187.29	30°01'36.21324"N	90°06'44.63457"W	6.75	A111
P2A13	557276.33	3667201.16	30°01'36.27545"N	90°06'44.47602"W	6.80	A111
P2A14	557281.04	3667214.90	30°01'36.32066"N	90°06'44.31914"W	6.72	A111
P2A15	557287.14	3667228.44	30°01'36.37963"N	90°06'44.16441"W	6.74	A111
P2A16	557291.09	3667240.33	30°01'36.41742"N	90°06'44.02863"W	6.70	A111
P2A17	557294.56	3667253.38	30°01'36.45046"N	90°06'43.87979"W	6.83	A111
P2A18	557300.02	3667266.92	30°01'36.50306"N	90°06'43.72502"W	6.93	A111
P2A19	557304.82	3667279.66	30°01'36.54921"N	90°06'43.57952"W	6.96	A111
P2A20	557309.68	3667292.69	30°01'36.59595"N	90°06'43.43072"W	7.13	A111
P2A21	557314.12	3667306.56	30°01'36.63843"N	90°06'43.27245"W	7.22	A111
P2A22	557316.45	3667319.43	30°01'36.66011"N	90°06'43.12568"W	7.24	A111
P2A23	557320.11	3667333.41	30°01'36.69491"N	90°06'42.96631"W	7.27	A111
P2A24	557322.46	3667347.11	30°01'36.71667"N	90°06'42.81016"W	7.28	A111
P2A25	557326.09	3667360.47	30°01'36.75121"N	90°06'42.65776"W	7.26	A111
P2A26	557095.87	3667217.43	30°01'34.48745"N	90°06'44.31279"W	7.14	3121
P2A27	557087.08	3667208.00	30°01'34.40139"N	90°06'44.42108"W	6.95	3121
P2A28	557074.64	3667194.63	30°01'34.27970"N	90°06'44.57470"W	6.68	3121
P2A29	557062.70	3667181.90	30°01'34.16288"N	90°06'44.72096"W	6.58	3121
P2A30	557050.77	3667169.47	30°01'34.04609"N	90°06'44.86378"W	6.46	3121
P2A31	557038.25	3667157.16	30°01'33.92340"N	90°06'45.00542"W	6.35	3121
P2A32	557026.03	3667145.74	30°01'33.80370"N	90°06'45.13679"W	6.26	3121
P2A33	557013.91	3667134.50	30°01'33.68487"N	90°06'45.26608"W	6.19	3121
P2A34	557002.25	3667124.24	30°01'33.57053"N	90°06'45.38429"W	6.10	3121
P2A35	556989.64	3667113.40	30°01'33.44682"N	90°06'45.50902"W	6.03	3121
P2A36	556975.69	3667102.40	30°01'33.30989"N	90°06'45.63593"W	6.02	3121
P2A37	556962.08	3667091.56	30°01'33.17638"N	90°06'45.76084"W	5.75	3121
P2A38	556948.45	3667081.56	30°01'33.04247"N	90°06'45.87622"W	5.60	3121
P2A39	556931.72	3667076.31	30°01'32.87745"N	90°06'45.93801"W	5.46	3121

Name	Northing	Easting	Latitude	Longitude	Elevation	Feature Code
P2A40	556913.45	3667065.49	30°01'32.69777"N	90°06'46.06336"W	5.40	3121
P2A41	557035.17	3667298.85	30°01'33.87802"N	90°06'43.39398"W	19.06	BLDG ROOF CORNERS-HO
P2A42	557022.23	3667309.04	30°01'33.74883"N	90°06'43.27964"W	19.21	BLDG ROOF CORNERS-HO
P2A43	557034.47	3667324.65	30°01'33.86835"N	90°06'43.10058"W	19.12	BLDG ROOF CORNERS-HO
P2A44	557047.38	3667314.52	30°01'33.99720"N	90°06'43.21422"W	19.00	BLDG ROOF CORNERS-HO
P2A45	557004.48	3667298.01	30°01'33.57430"N	90°06'43.40725"W	7.87	A131
P2A46	556990.54	3667304.66	30°01'33.43564"N	90°06'43.33322"W	8.99	A131
P2A47	556979.90	3667309.74	30°01'33.32977"N	90°06'43.27679"W	12.70	A131
P2A48	556967.32	3667314.06	30°01'33.20472"N	90°06'43.22911"W	17.10	A131
P2A49	556958.95	3667316.94	30°01'33.12161"N	90°06'43.19736"W	19.45	A131
P2A50	556950.13	3667321.10	30°01'33.03385"N	90°06'43.15117"W	19.19	A131
P2A51	556939.80	3667325.46	30°01'32.93115"N	90°06'43.10279"W	15.66	A131
P2A52	556927.92	3667330.51	30°01'32.81298"N	90°06'43.04677"W	11.36	A131
P2A53	556914.48	3667336.02	30°01'32.67942"N	90°06'42.98574"W	6.62	A131
P2A54	556904.60	3667339.81	30°01'32.58116"N	90°06'42.94385"W	5.44	A131
P2A55	556898.38	3667342.48	30°01'32.51933"N	90°06'42.91423"W	3.53	A131
P2A56	556891.97	3667346.52	30°01'32.45546"N	90°06'42.86905"W	1.63	A131
P2A57	556879.33	3667352.74	30°01'32.32970"N	90°06'42.79987"W	1.23	A131
P2A58	556627.88	3667103.46	30°01'29.86691"N	90°06'45.66602"W	1.57	A131-SLOPE
P2A59	556629.84	3667093.93	30°01'29.88731"N	90°06'45.77414"W	1.70	A131-SLOPE
P2A60	556632.18	3667082.54	30°01'29.91174"N	90°06'45.90342"W	4.13	A131-SLOPE
P2A61	556633.14	3667076.85	30°01'29.92181"N	90°06'45.96807"W	5.29	A131-SLOPE
P2A62	556633.94	3667068.40	30°01'29.93068"N	90°06'46.06409"W	5.82	A131-SLOPE
P2A63	556634.18	3667064.48	30°01'29.93344"N	90°06'46.10863"W	6.42	A131-SLOPE
P2A64	556635.46	3667053.45	30°01'29.94723"N	90°06'46.23400"W	9.97	A131-SLOPE
P2A65	556636.90	3667042.99	30°01'29.96259"N	90°06'46.35280"W	13.58	A131-SLOPE
P2A66	556639.33	3667032.48	30°01'29.98782"N	90°06'46.47204"W	16.79	A131-SLOPE
P2A67	556640.27	3667023.71	30°01'29.99796"N	90°06'46.57163"W	18.66	A131-SLOPE
P2A68	556641.58	3667015.19	30°01'30.01183"N	90°06'46.66846"W	18.51	A131-SLOPE
P2A69	556642.50	3667007.38	30°01'30.02181"N	90°06'46.75719"W	16.46	A131-SLOPE
P2A70	556644.65	3666993.18	30°01'30.04457"N	90°06'46.91845"W	11.99	A131-SLOPE
P2A71	556646.98	3666981.56	30°01'30.06883"N	90°06'47.05030"W	8.32	A131-SLOPE
P2A72	556648.06	3666975.28	30°01'30.08023"N	90°06'47.12163"W	6.57	A131-SLOPE
P2A73	556650.18	3666962.10	30°01'30.10262"N	90°06'47.27130"W	5.74	A131-SLOPE
P2A74	556510.61	3666996.84	30°01'28.71740"N	90°06'46.89309"W	17.80	CONC FLOODWALL-HORZ
P2A75	556510.86	3666994.78	30°01'28.72006"N	90°06'46.91643"W	17.77	CONC FLOODWALL-HORZ
P2A76	556468.31	3666992.13	30°01'28.29913"N	90°06'46.95180"W	17.81	CONC FLOODWALL-HORZ
P2A77	556460.84	3666991.38	30°01'28.22533"N	90°06'46.96119"W	17.81	CONC FLOODWALL-HORZ
P2A78	556459.94	3666989.42	30°01'28.21659"N	90°06'46.98359"W	17.79	CONC FLOODWALL-HORZ
P2A79	556459.07	3666989.80	30°01'28.20796"N	90°06'46.97941"W	17.80	CONC FLOODWALL-HORZ
P2A80	556459.62	3666991.26	30°01'28.21323"N	90°06'46.96271"W	17.83	CONC FLOODWALL-HORZ
P2A81	556444.84	3666998.04	30°01'28.06618"N	90°06'46.88731"W	17.89	CONC FLOODWALL-HORZ
P2A82	556444.18	3666998.30	30°01'28.05968"N	90°06'46.88446"W	17.22	CONC FLOODWALL-HORZ
P2A83	556437.63	3667001.06	30°01'27.99448"N	90°06'46.85385"W	17.23	CONC FLOODWALL-HORZ
P2A84	556437.33	3667000.64	30°01'27.99159"N	90°06'46.85874"W	17.22	CONC FLOODWALL-HORZ
P2A85	556436.47	3667000.22	30°01'27.98309"N	90°06'46.86357"W	17.24	CONC FLOODWALL-HORZ
P2A86	556435.74	3667000.19	30°01'27.97591"N	90°06'46.86399"W	17.24	CONC FLOODWALL-HORZ
P2A87	556435.52	3667003.14	30°01'27.97344"N	90°06'46.83050"W	17.23	CONC FLOODWALL-HORZ
P2A88	556440.50	3667003.48	30°01'28.02265"N	90°06'46.82604"W	17.21	CONC FLOODWALL-HORZ

Name	Northing	Easting	Latitude	Longitude	Elevation	Feature Code
P2A89	556440.65	3667002.11	30°01'28.02433"N	90°06'46.84161"W	17.23	CONC FLOODWALL-HORZ
P2A90	556445.05	3667000.17	30°01'28.06802"N	90°06'46.86313"W	17.17	CONC FLOODWALL-HORZ
P2A91	556445.35	3667000.13	30°01'28.07107"N	90°06'46.86349"W	17.91	CONC FLOODWALL-HORZ
P2A92	556459.96	3666993.43	30°01'28.21635"N	90°06'46.93798"W	17.82	CONC FLOODWALL-HORZ
P2A93	556468.45	3666994.22	30°01'28.30036"N	90°06'46.92800"W	17.86	CONC FLOODWALL-HORZ
P2A94	557239.33	3667866.55	30°01'35.83898"N	90°06'36.91129"W	2.28	3111-ASPHALT
P2A95	557244.23	3667883.97	30°01'35.88564"N	90°06'36.71244"W	2.27	3111-ASPHALT
P2A96	557249.46	3667901.11	30°01'35.93558"N	90°06'36.51684"W	2.22	3111-ASPHALT
P2A97	557254.24	3667918.60	30°01'35.98107"N	90°06'36.31734"W	2.16	3111-ASPHALT
P2A98	557259.95	3667935.56	30°01'36.03582"N	90°06'36.12369"W	2.16	3111-ASPHALT
P2A99	557284.61	3667927.56	30°01'36.28073"N	90°06'36.21169"W	2.48	3111-ASPHALT
P2A100	557279.42	3667909.98	30°01'36.23118"N	90°06'36.41229"W	2.53	3111-ASPHALT
P2A101	557274.36	3667893.17	30°01'36.18294"N	90°06'36.60422"W	2.56	3111-ASPHALT
P2A102	557268.79	3667875.71	30°01'36.12960"N	90°06'36.80345"W	2.60	3111-ASPHALT
P2A103	557263.20	3667858.48	30°01'36.07611"N	90°06'37.00019"W	2.60	3111-ASPHALT
P2A104	557284.11	3667852.16	30°01'36.28372"N	90°06'37.06948"W	2.35	3111-ASPHALT
P2A105	557289.41	3667868.91	30°01'36.33444"N	90°06'36.87827"W	2.24	3111-ASPHALT
P2A106	557294.58	3667886.32	30°01'36.38378"N	90°06'36.67960"W	2.30	3111-ASPHALT
P2A107	557299.92	3667903.46	30°01'36.43488"N	90°06'36.48401"W	2.32	3111-ASPHALT
P2A108	557305.63	3667920.70	30°01'36.48955"N	90°06'36.28717"W	2.33	3111-ASPHALT

Area 3

Horizontal Datum: NAD 1983(1992)

Horizontal Coordinate System: U.S. StatePlane, 1983, Zone: Louisiana South 1702

Vertical Datum: NAVD88(2004.65)

Coordinate Units: US survey feet

Distance Units: U.S. survey feet

Height Units: U.S. survey feet

Name	Northing	Easting	Latitude	Longitude	Elevation	Feature Code
GRAHAM	559306.75	3678458.87	30°01'55.16917"N	90°04'36.15917"W	6.27	RTK BASE
LOND	555491.70	3680327.26	30°01'17.20195"N	90°04'15.38210"W	8.76	CHK
P3A1	559177.14	3680104.71	30°01'53.70724"N	90°04'17.45196"W	4.57	6111
P3A2	559181.55	3680118.93	30°01'53.74931"N	90°04'17.28971"W	4.38	6111
P3A3	559185.55	3680132.00	30°01'53.78747"N	90°04'17.14050"W	4.25	6111
P3A4	559190.71	3680144.86	30°01'53.83718"N	90°04'16.99353"W	4.16	6111
P3A5	559195.54	3680160.61	30°01'53.88323"N	90°04'16.81369"W	4.11	6111
P3A6	559201.25	3680176.34	30°01'53.93803"N	90°04'16.63413"W	4.04	6111
P3A7	559206.85	3680191.65	30°01'53.99179"N	90°04'16.45922"W	4.13	6111
P3A8	559212.13	3680207.06	30°01'54.04237"N	90°04'16.28324"W	4.18	6111
P3A9	559218.78	3680224.38	30°01'54.10630"N	90°04'16.08538"W	4.08	6111
P3A10	559223.79	3680239.32	30°01'54.15426"N	90°04'15.91480"W	4.10	6111
P3A11	559271.81	3680127.14	30°01'54.64192"N	90°04'17.18495"W	5.65	3111
P3A12	559266.82	3680112.37	30°01'54.59413"N	90°04'17.35358"W	5.72	3111
P3A13	559261.83	3680097.17	30°01'54.54639"N	90°04'17.52718"W	5.79	3111
P3A14	559256.23	3680079.85	30°01'54.49284"N	90°04'17.72491"W	5.92	3111
P3A15	559250.68	3680063.43	30°01'54.43963"N	90°04'17.91239"W	6.00	3111
P3A16	559245.42	3680046.50	30°01'54.38943"N	90°04'18.10559"W	6.05	3111
P3A17	559240.19	3680029.34	30°01'54.33958"N	90°04'18.30153"W	6.12	3111
P3A18	559234.58	3680012.95	30°01'54.28580"N	90°04'18.48862"W	6.17	3111
P3A19	559229.21	3679996.82	30°01'54.23437"N	90°04'18.67287"W	6.25	3111
P3A20	559223.58	3679980.54	30°01'54.18042"N	90°04'18.85873"W	6.35	3111
P3A21	559217.76	3679962.74	30°01'54.12473"N	90°04'19.06194"W	6.42	3111
P3A22	559211.84	3679944.18	30°01'54.06820"N	90°04'19.27380"W	6.44	3111
P3A23	559207.77	3679929.35	30°01'54.02951"N	90°04'19.44310"W	6.46	3111
P3A24	559203.24	3679913.89	30°01'53.98638"N	90°04'19.61947"W	6.45	3111
P3A25	559198.38	3679898.71	30°01'53.93990"N	90°04'19.79281"W	6.42	3111
P3A26	559242.26	3679574.89	30°01'54.40956"N	90°04'23.47112"W	5.06	4111
P3A27	559252.32	3679581.54	30°01'54.50838"N	90°04'23.39420"W	5.08	4111
P3A28	559262.69	3679588.37	30°01'54.61027"N	90°04'23.31520"W	5.05	4111
P3A29	559273.36	3679595.46	30°01'54.71512"N	90°04'23.23328"W	4.99	4111
P3A30	559281.52	3679600.90	30°01'54.79530"N	90°04'23.17034"W	5.02	4111
P3A31	559290.19	3679606.40	30°01'54.88057"N	90°04'23.10669"W	5.02	4111
P3A32	559299.04	3679612.34	30°01'54.96745"N	90°04'23.03797"W	5.06	4111
P3A33	559308.17	3679618.28	30°01'55.05720"N	90°04'22.96925"W	5.07	4111
P3A34	559318.32	3679624.95	30°01'55.15698"N	90°04'22.89209"W	5.04	4111
P3A35	559326.50	3679630.96	30°01'55.23730"N	90°04'22.82278"W	5.07	4111
P3A36	559336.46	3679639.04	30°01'55.33498"N	90°04'22.72958"W	5.07	4111
P3A37	559344.77	3679646.16	30°01'55.41652"N	90°04'22.64759"W	5.07	4111
P3A38	559352.33	3679653.36	30°01'55.49058"N	90°04'22.56469"W	5.02	4111
P3A39	559359.38	3679660.64	30°01'55.55950"N	90°04'22.48096"W	5.02	4111

Name	Northing	Easting	Latitude	Longitude	Elevation	Feature Code
P3A40	559366.49	3679668.18	30°01'55.62910"N	90°04'22.39431"W	5.00	4111
P3A41	559382.66	3679599.92	30°01'55.79657"N	90°04'23.16879"W	15.32	CANOPY ROOF CORNERS-HORZ
P3A42	559400.91	3679592.57	30°01'55.97799"N	90°04'23.25021"W	15.38	CANOPY ROOF CORNERS-HORZ
P3A43	559393.65	3679574.35	30°01'55.90809"N	90°04'23.45834"W	15.33	CANOPY ROOF CORNERS-HORZ
P3A44	559375.42	3679581.62	30°01'55.72691"N	90°04'23.37792"W	15.40	CANOPY ROOF CORNERS-HORZ
P3A45	559396.78	3680028.28	30°01'55.88967"N	90°04'18.29399"W	4.57	4111-CONC
P3A46	559405.96	3680028.62	30°01'55.98053"N	90°04'18.28895"W	4.89	4111-CONC
P3A47	559415.42	3680028.53	30°01'56.07413"N	90°04'18.28876"W	5.00	4111-CONC
P3A48	559415.86	3680011.04	30°01'56.08040"N	90°04'18.48768"W	5.04	4111-CONC
P3A49	559406.53	3680010.86	30°01'55.98807"N	90°04'18.49086"W	4.92	4111-CONC
P3A50	559397.40	3680010.52	30°01'55.89779"N	90°04'18.49589"W	4.55	4111-CONC
P3A51	559398.01	3679992.44	30°01'55.90577"N	90°04'18.70152"W	4.58	4111-CONC
P3A52	559407.22	3679992.70	30°01'55.99690"N	90°04'18.69739"W	4.94	4111-CONC
P3A53	559416.62	3679993.16	30°01'56.08987"N	90°04'18.69095"W	5.01	4111-CONC
P3A54	559417.32	3679974.97	30°01'56.09879"N	90°04'18.89779"W	5.01	4111-CONC
P3A55	559407.74	3679974.82	30°01'56.00402"N	90°04'18.90077"W	4.95	4111-CONC
P3A56	559398.63	3679974.33	30°01'55.91390"N	90°04'18.90752"W	4.59	4111-CONC
P3A57	559399.32	3679956.45	30°01'55.92268"N	90°04'19.11080"W	4.64	4111-CONC
P3A58	559408.40	3679956.47	30°01'56.01250"N	90°04'19.10940"W	4.97	4111-CONC
P3A59	559417.87	3679956.87	30°01'56.10624"N	90°04'19.10365"W	5.01	4111-CONC
P3A60	559097.44	3679672.81	30°01'52.96535"N	90°04'22.37535"W	3.79	A131-SLOPE
P3A61	559089.47	3679675.67	30°01'52.88618"N	90°04'22.34380"W	3.97	A131-SLOPE
P3A62	559083.60	3679677.72	30°01'52.82782"N	90°04'22.32122"W	5.09	A131-SLOPE
P3A63	559069.58	3679681.66	30°01'52.68855"N	90°04'22.27809"W	9.74	A131-SLOPE
P3A64	559057.58	3679682.75	30°01'52.56967"N	90°04'22.26718"W	14.07	A131-SLOPE
P3A65	559050.40	3679684.55	30°01'52.49838"N	90°04'22.24768"W	16.21	A131-SLOPE
P3A66	559038.77	3679687.07	30°01'52.38299"N	90°04'22.22039"W	16.04	A131-SLOPE
P3A67	559033.01	3679688.68	30°01'52.32580"N	90°04'22.20289"W	14.43	A131-SLOPE
P3A68	559023.90	3679691.25	30°01'52.23542"N	90°04'22.17475"W	10.92	A131-SLOPE
P3A69	559012.90	3679694.25	30°01'52.12614"N	90°04'22.14201"W	6.78	A131-SLOPE
P3A70	559004.26	3679696.99	30°01'52.04030"N	90°04'22.11189"W	4.19	A131-SLOPE
P3A71	558998.59	3679699.14	30°01'51.98399"N	90°04'22.08814"W	3.58	A131-SLOPE
P3A72	558984.48	3679702.50	30°01'51.84400"N	90°04'22.05173"W	3.21	A131-SLOPE
P3A73	558875.19	3679568.86	30°01'50.77671"N	90°04'23.58565"W	3.40	6131-SLOPE
P3A74	558870.47	3679552.49	30°01'50.73173"N	90°04'23.77249"W	3.82	6131-SLOPE
P3A75	558867.41	3679540.27	30°01'50.70274"N	90°04'23.91185"W	4.05	6131-SLOPE
P3A76	558866.49	3679537.09	30°01'50.69404"N	90°04'23.94818"W	4.86	6131-SLOPE
P3A77	558863.75	3679525.26	30°01'50.66814"N	90°04'24.08312"W	8.70	6131-SLOPE
P3A78	558861.78	3679517.41	30°01'50.64949"N	90°04'24.17262"W	11.23	6131-SLOPE
P3A79	558859.76	3679509.85	30°01'50.63041"N	90°04'24.25889"W	11.38	6131-SLOPE
P3A80	558859.10	3679507.74	30°01'50.62409"N	90°04'24.28295"W	10.85	6131-SLOPE
P3A81	558857.01	3679500.58	30°01'50.60415"N	90°04'24.36472"W	8.27	6131-SLOPE
P3A82	558855.99	3679496.95	30°01'50.59446"N	90°04'24.40612"W	7.39	6131-SLOPE
P3A83	558849.12	3679477.38	30°01'50.52861"N	90°04'24.62959"W	6.81	6131-SLOPE

Area 4

Horizontal Datum: NAD 1983(1992)

Horizontal Coordinate System: U.S. StatePlane, 1983, Zone: Louisiana South 1702

Vertical Datum: NAVD88(2004.65)

Coordinate Units: US survey feet

Distance Units: U.S. survey feet

Height Units: U.S. survey feet

Name	Northing	Easting	Latitude	Longitude	Elevation	Feature Code
AP01	560498.74	3694700.05	30°02'05.16913"N	90°01'31.24202"W	0.82	RTK BASE
OP16	561059.04	3699353.00	30°02'10.18669"N	90°00'38.23428"W	-3.68	CHK
P4A1	560918.05	3696965.19	30°02'09.06308"N	90°01'05.41793"W	5.10	6131-SLOPE
P4A2	560914.34	3696966.43	30°02'09.02629"N	90°01'05.40431"W	5.49	6131-SLOPE
P4A3	560905.23	3696969.71	30°02'08.93567"N	90°01'05.36811"W	9.15	6131-SLOPE
P4A4	560899.05	3696972.28	30°02'08.87427"N	90°01'05.33975"W	11.84	6131-SLOPE
P4A5	560894.75	3696973.20	30°02'08.83159"N	90°01'05.32985"W	12.75	6131-SLOPE
P4A6	560888.29	3696975.49	30°02'08.76733"N	90°01'05.30462"W	12.53	6131-SLOPE
P4A7	560884.13	3696976.69	30°02'08.72609"N	90°01'05.29154"W	11.51	6131-SLOPE
P4A8	560873.07	3696980.31	30°02'08.61616"N	90°01'05.25178"W	7.50	6131-SLOPE
P4A9	560860.10	3696984.95	30°02'08.48722"N	90°01'05.20068"W	2.62	6131-SLOPE
P4A10	560847.61	3696989.13	30°02'08.36315"N	90°01'05.15472"W	-0.97	6131-SLOPE
P4A11	560855.02	3696867.71	30°02'08.45032"N	90°01'06.53517"W	14.12	4121-FLOODWALL-HORZ
P4A12	560851.54	3696858.16	30°02'08.41688"N	90°01'06.64420"W	14.11	4121-FLOODWALL-HORZ
P4A13	560848.20	3696838.45	30°02'08.38611"N	90°01'06.86889"W	12.15	4121-FLOODWALL-HORZ
P4A14	560841.12	3696795.46	30°02'08.32084"N	90°01'07.35890"W	12.17	4121-FLOODWALL-HORZ
P4A15	560840.82	3696795.43	30°02'08.31792"N	90°01'07.35923"W	12.17	4121-FLOODWALL-HORZ
P4A16	560839.60	3696787.98	30°02'08.30665"N	90°01'07.44418"W	12.12	4121-FLOODWALL-HORZ
P4A17	560838.69	3696788.15	30°02'08.29769"N	90°01'07.44238"W	12.15	4121-FLOODWALL-HORZ
P4A18	560839.92	3696795.56	30°02'08.30904"N	90°01'07.35785"W	12.17	4121-FLOODWALL-HORZ
P4A19	560839.57	3696795.67	30°02'08.30550"N	90°01'07.35673"W	12.15	4121-FLOODWALL-HORZ
P4A20	560846.68	3696838.78	30°02'08.37100"N	90°01'06.86534"W	12.18	4121-FLOODWALL-HORZ
P4A21	560849.93	3696858.49	30°02'08.40094"N	90°01'06.64067"W	14.14	4121-FLOODWALL-HORZ
P4A22	560853.53	3696868.23	30°02'08.43546"N	90°01'06.52945"W	14.12	4121-FLOODWALL-HORZ
P4A23	561619.82	3697034.44	30°02'16.00178"N	90°01'04.53845"W	6.51	3111
P4A24	561633.15	3697022.67	30°02'16.13508"N	90°01'04.67058"W	6.49	3111
P4A25	561645.66	3697009.42	30°02'16.26046"N	90°01'04.81966"W	6.43	3111
P4A26	561657.77	3696996.56	30°02'16.38175"N	90°01'04.96437"W	6.40	3111
P4A27	561669.39	3696984.50	30°02'16.49816"N	90°01'05.10016"W	6.37	3111
P4A28	561681.51	3696971.92	30°02'16.61959"N	90°01'05.24167"W	6.43	3111
P4A29	561693.97	3696958.57	30°02'16.74443"N	90°01'05.39191"W	6.47	3111
P4A30	561706.22	3696945.22	30°02'16.86713"N	90°01'05.54216"W	6.57	3111
P4A31	561718.26	3696933.14	30°02'16.98773"N	90°01'05.67799"W	6.60	3111
P4A32	561730.06	3696920.13	30°02'17.10596"N	90°01'05.82455"W	6.65	3111
P4A33	561741.84	3696907.62	30°02'17.22398"N	90°01'05.96533"W	6.57	3111
P4A34	561753.76	3696894.84	30°02'17.34344"N	90°01'06.10912"W	6.41	3111
P4A35	561766.20	3696881.43	30°02'17.46812"N	90°01'06.26011"W	6.40	3111
P4A36	561777.99	3696868.99	30°02'17.58629"N	90°01'06.40007"W	6.45	3111
P4A37	561789.56	3696856.10	30°02'17.70228"N	90°01'06.54518"W	6.41	3111
P4A38	561282.37	3697038.93	30°02'12.66104"N	90°01'04.53139"W	4.35	6111
P4A39	561280.66	3697051.70	30°02'12.64264"N	90°01'04.38637"W	4.45	6111
P4A40	561279.29	3697065.95	30°02'12.62747"N	90°01'04.22437"W	4.42	6111
P4A41	561276.84	3697078.96	30°02'12.60169"N	90°01'04.07672"W	4.41	6111
P4A42	561274.29	3697090.66	30°02'12.57515"N	90°01'03.94391"W	4.28	6111

Name	Northing	Easting	Latitude	Longitude	Elevation	Feature Code
P4A43	561271.18	3697103.69	30°02'12.54289"N	90°01'03.79617"W	4.17	6111
P4A44	561268.95	3697120.11	30°02'12.51892"N	90°01'03.60965"W	4.43	6111
P4A45	561267.28	3697137.54	30°02'12.50038"N	90°01'03.41152"W	4.33	6111
P4A46	561264.37	3697151.76	30°02'12.47002"N	90°01'03.25014"W	4.42	6111
P4A47	561262.74	3697163.13	30°02'12.45257"N	90°01'03.12102"W	4.39	6111
P4A48	561041.27	3696984.74	30°02'10.28057"N	90°01'05.17945"W	5.20	4111
P4A49	561044.90	3696994.85	30°02'10.31537"N	90°01'05.06395"W	5.26	4111
P4A50	561048.50	3697004.77	30°02'10.34989"N	90°01'04.95054"W	5.33	4111
P4A51	561052.40	3697015.40	30°02'10.38730"N	90°01'04.82917"W	5.35	4111
P4A52	561055.77	3697024.78	30°02'10.41961"N	90°01'04.72202"W	5.29	4111
P4A53	561059.23	3697034.30	30°02'10.45275"N	90°01'04.61327"W	5.32	4111
P4A54	561062.51	3697043.29	30°02'10.48421"N	90°01'04.51056"W	5.31	4111
P4A55	561065.93	3697052.67	30°02'10.51700"N	90°01'04.40332"W	5.31	4111
P4A56	561069.19	3697061.69	30°02'10.54825"N	90°01'04.30034"W	5.31	4111
P4A57	561072.56	3697070.81	30°02'10.58054"N	90°01'04.19612"W	5.31	4111
P4A58	561075.72	3697079.77	30°02'10.61084"N	90°01'04.09382"W	5.30	4111
P4A59	561079.24	3697089.34	30°02'10.64454"N	90°01'03.98439"W	5.27	4111
P4A60	561082.44	3697098.14	30°02'10.67524"N	90°01'03.88388"W	5.24	4111
P4A61	561085.75	3697107.12	30°02'10.70703"N	90°01'03.78126"W	5.23	4111
P4A62	561088.18	3697113.92	30°02'10.73030"N	90°01'03.70358"W	5.23	4111
P4A63	561104.16	3697080.23	30°02'10.89230"N	90°01'04.08483"W	5.87	4111-CONC
P4A64	561099.34	3697067.31	30°02'10.84606"N	90°01'04.23248"W	5.94	4111-CONC
P4A65	561094.71	3697054.02	30°02'10.80173"N	90°01'04.38422"W	6.01	4111-CONC
P4A66	561090.15	3697041.81	30°02'10.75794"N	90°01'04.52370"W	6.01	4111-CONC
P4A67	561086.14	3697030.04	30°02'10.71964"N	90°01'04.65812"W	5.99	4111-CONC
P4A68	561097.54	3697026.08	30°02'10.83291"N	90°01'04.70178"W	5.83	4111-CONC
P4A69	561101.63	3697038.18	30°02'10.87199"N	90°01'04.56350"W	5.85	4111-CONC
P4A70	561105.99	3697049.94	30°02'10.91380"N	90°01'04.42914"W	5.90	4111-CONC
P4A71	561110.86	3697063.18	30°02'10.96057"N	90°01'04.27790"W	5.85	4111-CONC
P4A72	561115.56	3697076.56	30°02'11.00549"N	90°01'04.12505"W	5.84	4111-CONC
P4A73	561126.14	3697072.86	30°02'11.11065"N	90°01'04.16577"W	5.81	4111-CONC
P4A74	561121.30	3697059.31	30°02'11.06429"N	90°01'04.32061"W	5.81	4111-CONC
P4A75	561116.53	3697046.08	30°02'11.01856"N	90°01'04.47174"W	5.84	4111-CONC
P4A76	561112.57	3697034.53	30°02'10.98073"N	90°01'04.60368"W	5.85	4111-CONC
P4A77	561108.45	3697022.33	30°02'10.94136"N	90°01'04.74299"W	5.81	4111-CONC
P4A78	561122.18	3697017.70	30°02'11.07776"N	90°01'04.79381"W	5.61	4111-CONC
P4A79	561126.64	3697030.11	30°02'11.12046"N	90°01'04.65204"W	5.66	4111-CONC
P4A80	561130.23	3697041.15	30°02'11.15479"N	90°01'04.52602"W	5.70	4111-CONC
P4A81	561134.87	3697054.46	30°02'11.19916"N	90°01'04.37403"W	5.69	4111-CONC
P4A82	561139.83	3697068.84	30°02'11.24668"N	90°01'04.20978"W	5.63	4111-CONC
P4A83	561310.87	3697210.31	30°02'12.92366"N	90°01'02.57789"W	20.61	BLDG ROOF-HORZ
P4A84	561368.45	3697190.03	30°02'13.49588"N	90°01'02.80117"W	20.76	BLDG ROOF-HORZ
P4A85	561388.78	3697247.62	30°02'13.69063"N	90°01'02.14325"W	20.53	BLDG ROOF-HORZ
P4A86	561331.23	3697267.79	30°02'13.11864"N	90°01'01.92131"W	20.54	BLDG ROOF-HORZ

Area 5

Horizontal Datum: NAD 1983(1992)

Horizontal Coordinate System: U.S. StatePlane, 1983, Zone: Louisiana South 1702

Vertical Datum: NAVD88(2004.65)

Coordinate Units: US survey feet

Distance Units: U.S. survey feet

Height Units: U.S. survey feet

Name	Northing	Easting	Latitude	Longitude	Elevation	Feature Code
AG06	599773.10	3745246.63	30°08'27.86084"N	89°51'50.47976"W	3.39	CHK
PA5A1	596320.54	3744312.64	30°07'53.80483"N	89°52'01.61963"W	3.67	3111
PA5A2	596338.35	3744316.61	30°07'53.98066"N	89°52'01.57182"W	3.55	3111
PA5A3	596356.60	3744320.77	30°07'54.16079"N	89°52'01.52177"W	3.37	3111
PA5A4	596375.43	3744324.88	30°07'54.34662"N	89°52'01.47225"W	3.31	3111
PA5A5	596392.65	3744328.93	30°07'54.51657"N	89°52'01.42354"W	3.35	3111
PA5A6	596410.21	3744333.04	30°07'54.68984"N	89°52'01.37423"W	3.34	3111
PA5A7	596428.68	3744337.53	30°07'54.87207"N	89°52'01.32044"W	3.46	3111
PA5A8	596446.41	3744341.69	30°07'55.04703"N	89°52'01.27047"W	3.45	3111
PA5A9	596463.15	3744345.75	30°07'55.21230"N	89°52'01.22180"W	3.38	3111
PA5A10	596481.47	3744350.58	30°07'55.39297"N	89°52'01.16407"W	3.37	3111
PA5A11	596498.03	3744354.72	30°07'55.55637"N	89°52'01.11452"W	3.41	3111
PA5A12	596515.88	3744359.85	30°07'55.73244"N	89°52'01.05353"W	3.41	3111
PA5A13	596532.90	3744363.44	30°07'55.90046"N	89°52'01.01016"W	3.39	3111
PA5A14	596549.10	3744367.63	30°07'56.06029"N	89°52'00.96012"W	3.31	3111
PA5A15	596565.70	3744371.60	30°07'56.22410"N	89°52'00.91246"W	3.22	3111
PA5A16	596569.70	3744326.38	30°07'56.26937"N	89°52'01.42684"W	15.59	BLDG ROOF CORNERS-HORZ
PA5A17	596534.98	3744317.99	30°07'55.92675"N	89°52'01.52738"W	15.08	BLDG ROOF CORNERS-HORZ
PA5A18	596544.00	3744281.37	30°07'56.02069"N	89°52'01.94305"W	15.53	BLDG ROOF CORNERS-HORZ
PA5A19	597636.65	3744577.15	30°08'06.79862"N	89°51'58.41558"W	2.08	5111
PA5A20	597641.97	3744578.06	30°08'06.85116"N	89°51'58.40446"W	2.20	5111
PA5A21	597646.90	3744579.08	30°08'06.89978"N	89°51'58.39210"W	2.11	5111
PA5A22	597652.87	3744580.37	30°08'06.95874"N	89°51'58.37663"W	2.06	5111
PA5A23	597659.88	3744582.50	30°08'07.02781"N	89°51'58.35135"W	2.08	5111
PA5A24	597658.09	3744591.54	30°08'07.00893"N	89°51'58.24866"W	2.09	5111
PA5A25	597652.13	3744591.73	30°08'06.94997"N	89°51'58.24737"W	2.09	5111
PA5A26	597646.46	3744591.79	30°08'06.89377"N	89°51'58.24745"W	2.22	5111
PA5A27	597640.69	3744591.84	30°08'06.83669"N	89°51'58.24777"W	2.38	5111
PA5A28	597635.52	3744591.41	30°08'06.78559"N	89°51'58.25343"W	2.35	5111
PA5A29	595989.88	3744246.11	30°07'50.54036"N	89°52'02.42530"W	4.28	4111-CONC-BRIDGE
PA5A30	596009.70	3744248.89	30°07'50.73614"N	89°52'02.39082"W	4.49	4111-CONC-BRIDGE
PA5A31	596029.59	3744251.66	30°07'50.93263"N	89°52'02.35638"W	4.59	4111-CONC-BRIDGE
PA5A32	596049.32	3744254.44	30°07'51.12762"N	89°52'02.32183"W	4.65	4111-CONC-BRIDGE
PA5A33	596069.19	3744257.22	30°07'51.32397"N	89°52'02.28731"W	4.59	4111-CONC-BRIDGE
PA5A34	596088.89	3744260.07	30°07'51.51860"N	89°52'02.25197"W	4.51	4111-CONC-BRIDGE
PA5A35	596108.53	3744262.82	30°07'51.71260"N	89°52'02.21782"W	4.34	4111-CONC-BRIDGE
PA5A36	596106.97	3744272.76	30°07'51.69597"N	89°52'02.10480"W	4.41	4111-CONC-BRIDGE
PA5A37	596087.10	3744270.31	30°07'51.49959"N	89°52'02.13564"W	4.63	4111-CONC-BRIDGE
PA5A38	596067.32	3744267.51	30°07'51.30409"N	89°52'02.17040"W	4.72	4111-CONC-BRIDGE
PA5A39	596047.57	3744264.85	30°07'51.10894"N	89°52'02.20354"W	4.73	4111-CONC-BRIDGE
PA5A40	596027.80	3744262.18	30°07'50.91361"N	89°52'02.23687"W	4.69	4111-CONC-BRIDGE
PA5A41	596007.88	3744259.45	30°07'50.71681"N	89°52'02.27077"W	4.62	4111-CONC-BRIDGE
PA5A42	595988.42	3744256.75	30°07'50.52454"N	89°52'02.30445"W	4.46	4111-CONC-BRIDGE
PA5A43	595987.08	3744267.24	30°07'50.50994"N	89°52'02.18512"W	4.36	4111-CONC-BRIDGE

Name	Northing	Easting	Latitude	Longitude	Elevation	Feature Code
PA5A44	596006.53	3744269.88	30°07'50.70207"N	89°52'02.15225"W	4.47	4111-CONC-BRIDGE
PA5A45	596026.70	3744272.59	30°07'50.90141"N	89°52'02.11850"W	4.53	4111-CONC-BRIDGE
PA5A46	596046.48	3744275.51	30°07'51.09681"N	89°52'02.08229"W	4.59	4111-CONC-BRIDGE
PA5A47	596065.90	3744278.25	30°07'51.28868"N	89°52'02.04832"W	4.52	4111-CONC-BRIDGE
PA5A48	596085.71	3744281.11	30°07'51.48448"N	89°52'02.01281"W	4.49	4111-CONC-BRIDGE
PA5A49	596105.58	3744284.07	30°07'51.68075"N	89°52'01.97623"W	4.28	4111-CONC-BRIDGE
PA5A50	593472.88	3744165.57	30°07'25.63655"N	89°52'03.70913"W	0.58	6131-SLOPE
PA5A51	593484.75	3744163.73	30°07'25.75427"N	89°52'03.72833"W	3.29	6131-SLOPE
PA5A52	593497.39	3744164.22	30°07'25.87933"N	89°52'03.72085"W	7.47	6131-SLOPE
PA5A53	593511.72	3744164.75	30°07'26.02106"N	89°52'03.71274"W	12.42	6131-SLOPE
PA5A54	593516.20	3744164.72	30°07'26.06542"N	89°52'03.71250"W	13.40	6131-SLOPE
PA5A55	593527.13	3744166.04	30°07'26.17345"N	89°52'03.69583"W	13.34	6131-SLOPE
PA5A56	593530.94	3744166.30	30°07'26.21107"N	89°52'03.69237"W	12.28	6131-SLOPE
PA5A57	593543.89	3744166.11	30°07'26.33934"N	89°52'03.69258"W	7.88	6131-SLOPE
PA5A58	593558.77	3744166.47	30°07'26.48657"N	89°52'03.68639"W	3.44	6131-SLOPE
PA5A59	593566.32	3744165.29	30°07'26.56144"N	89°52'03.69869"W	1.79	6131-SLOPE
PA5A60	593529.92	3744319.30	30°07'26.18164"N	89°52'01.95036"W	13.12	4111-CONC-FLOODWALL-HORZ
PA5A61	593528.34	3744319.46	30°07'26.16596"N	89°52'01.94877"W	13.11	4111-CONC-FLOODWALL-HORZ
PA5A62	593532.63	3744379.67	30°07'26.20081"N	89°52'01.26257"W	13.10	4111-CONC-FLOODWALL-HORZ
PA5A63	593534.85	3744410.24	30°07'26.21889"N	89°52'00.91416"W	13.08	4111-CONC-FLOODWALL-HORZ
PA5A64	593534.78	3744410.59	30°07'26.21814"N	89°52'00.91022"W	12.57	4111-CONC-FLOODWALL-HORZ
PA5A65	593535.00	3744413.93	30°07'26.21998"N	89°52'00.87215"W	12.57	4111-CONC-FLOODWALL-HORZ
PA5A66	593534.31	3744414.02	30°07'26.21315"N	89°52'00.87115"W	12.56	4111-CONC-FLOODWALL-HORZ
PA5A67	593534.56	3744417.36	30°07'26.21513"N	89°52'00.83313"W	12.58	4111-CONC-FLOODWALL-HORZ
PA5A68	593537.18	3744417.17	30°07'26.24111"N	89°52'00.83488"W	12.56	4111-CONC-FLOODWALL-HORZ
PA5A69	593536.95	3744413.75	30°07'26.23927"N	89°52'00.87392"W	12.56	4111-CONC-FLOODWALL-HORZ
PA5A70	593536.38	3744410.41	30°07'26.23405"N	89°52'00.91198"W	12.56	4111-CONC-FLOODWALL-HORZ
PA5A71	593536.40	3744409.74	30°07'26.23436"N	89°52'00.91958"W	13.09	4111-CONC-FLOODWALL-HORZ
PA5A72	593534.18	3744379.70	30°07'26.21612"N	89°52'01.26204"W	13.10	4111-CONC-FLOODWALL-HORZ
PAT5	595878.07	3744218.43	30°07'49.43710"N	89°52'02.75684"W	2.27	RTK BASE

Area 6

Horizontal Datum: NAD 1983(1992)

Horizontal Coordinate System: U.S. StatePlane, 1983, Zone: Louisiana South 1702

Vertical Datum: NAVD88(2004.65)

Coordinate Units: US survey feet

Distance Units: U.S. survey feet

Height Units: U.S. survey feet

Name	Northing	Easting	Latitude	Longitude	Elevation	Feature Code
P6A1	609560.11	3785078.91	30°09'59.46102"N	89°44'15.30682"W	9.00	411-CONC SLAB-HORZ
P6A2	609571.64	3785072.21	30°09'59.57602"N	89°44'15.38134"W	9.05	411-CONC SLAB-HORZ
P6A3	609564.98	3785060.67	30°09'59.51169"N	89°44'15.51383"W	9.29	411-CONC SLAB-HORZ
P6A4	609553.33	3785067.42	30°09'59.39544"N	89°44'15.43874"W	9.16	411-CONC SLAB-HORZ
P6A5	609416.36	3785025.41	30°09'58.04553"N	89°44'15.93899"W	1.24	6131-SLOPE1
P6A6	609405.90	3785035.86	30°09'57.94054"N	89°44'15.82164"W	7.87	6131-SLOPE1
P6A7	609399.12	3785044.10	30°09'57.87227"N	89°44'15.72888"W	10.57	6131-SLOPE1
P6A8	609391.92	3785056.14	30°09'57.79933"N	89°44'15.59287"W	10.32	6131-SLOPE1
P6A9	609390.86	3785057.47	30°09'57.78872"N	89°44'15.57791"W	7.66	6131-SLOPE1
P6A10	609389.79	3785062.56	30°09'57.77744"N	89°44'15.52005"W	6.63	6131-SLOPE1
P6A11	609388.05	3785065.99	30°09'57.75970"N	89°44'15.48128"W	5.00	6131-SLOPE1
P6A12	609386.07	3785071.55	30°09'57.73937"N	89°44'15.41830"W	2.42	6131-SLOPE1
P6A13	609331.29	3785075.10	30°09'57.19664"N	89°44'15.38650"W	3.07	6131-SLOPE2
P6A14	609328.30	3785073.33	30°09'57.16725"N	89°44'15.40718"W	4.87	6131-SLOPE2
P6A15	609322.97	3785069.91	30°09'57.11504"N	89°44'15.44690"W	7.28	6131-SLOPE2
P6A16	609320.38	3785069.30	30°09'57.08944"N	89°44'15.45429"W	7.56	6131-SLOPE2
P6A17	609318.18	3785069.69	30°09'57.06761"N	89°44'15.45018"W	10.16	6131-SLOPE2
P6A18	609303.36	3785064.94	30°09'56.92157"N	89°44'15.50672"W	9.68	6131-SLOPE2
P6A19	609294.05	3785059.36	30°09'56.83021"N	89°44'15.57169"W	7.44	6131-SLOPE2
P6A20	609281.67	3785053.90	30°09'56.70837"N	89°44'15.63582"W	3.69	6131-SLOPE2
P6A21	609273.52	3785050.17	30°09'56.62825"N	89°44'15.67969"W	2.73	6131-SLOPE2
P6A22	609159.82	3784908.50	30°09'55.52239"N	89°44'17.31147"W	3.58	4111-SLAB CONC
P6A23	609166.95	3784887.83	30°09'55.59581"N	89°44'17.54577"W	3.86	4111-SLAB CONC
P6A24	609136.40	3784877.50	30°09'55.29483"N	89°44'17.66828"W	3.92	4111-SLAB CONC
P6A25	609118.05	3784856.03	30°09'55.11618"N	89°44'17.91573"W	3.91	4111-SLAB CONC
P6A26	609111.16	3784824.78	30°09'55.05231"N	89°44'18.27285"W	3.91	4111-SLAB CONC
P6A27	609093.16	3784828.35	30°09'54.87359"N	89°44'18.23497"W	3.73	4111-SLAB CONC
P6A28	609089.76	3784829.22	30°09'54.83979"N	89°44'18.22567"W	3.28	4111-SLAB CONC
P6A29	609090.99	3784834.46	30°09'54.85131"N	89°44'18.16578"W	3.86	4111-SLAB CONC
P6A30	609098.34	3784866.34	30°09'54.91965"N	89°44'17.80140"W	3.89	4111-SLAB CONC
P6A31	609124.24	3784896.42	30°09'55.17189"N	89°44'17.45468"W	3.79	4111-SLAB CONC
P6A32	609157.67	3784907.70	30°09'55.50119"N	89°44'17.32089"W	3.73	4111-SLAB CONC
P6A33	609160.00	3784908.50	30°09'55.52412"N	89°44'17.31140"W	3.50	4111-SLAB CONC
P6A34	609163.16	3784899.13	30°09'55.55670"N	89°44'17.41771"W	3.98	4111-SLAB CONC
P6A35	609149.18	3784893.55	30°09'55.41916"N	89°44'17.48344"W	4.05	4111-SLAB CONC
P6A36	609134.67	3784888.14	30°09'55.27620"N	89°44'17.54732"W	4.11	4111-SLAB CONC
P6A37	609126.29	3784882.22	30°09'55.19410"N	89°44'17.61608"W	4.18	4111-SLAB CONC
P6A38	609115.52	3784869.13	30°09'55.08932"N	89°44'17.76690"W	4.17	4111-SLAB CONC
P6A39	609108.14	3784860.49	30°09'55.01742"N	89°44'17.86650"W	4.21	4111-SLAB CONC
P6A40	609103.98	3784843.28	30°09'54.97863"N	89°44'18.06322"W	4.22	4111-SLAB CONC
P6A41	609100.82	3784826.90	30°09'54.94962"N	89°44'18.25036"W	4.06	4111-SLAB CONC

Name	Northing	Easting	Latitude	Longitude	Elevation	Feature Code
P6A42	608866.65	3784579.37	30°09'52.66593"N	89°44'21.10711"W	16.60	BLDG ROOF CORNERS-HO
P6A43	608842.73	3784568.00	30°09'52.43067"N	89°44'21.24032"W	17.03	BLDG ROOF CORNERS-HO
P6A44	608817.67	3784620.47	30°09'52.17542"N	89°44'20.64670"W	16.60	BLDG ROOF CORNERS-HO
P6A45	608841.94	3784631.95	30°09'52.41407"N	89°44'20.51205"W	16.75	BLDG ROOF CORNERS-HO
P6A46	609078.89	3785067.85	30°09'54.69939"N	89°44'15.50917"W	1.34	6111
P6A47	609075.05	3785056.35	30°09'54.66293"N	89°44'15.64070"W	1.27	6111
P6A48	609070.30	3785045.21	30°09'54.61745"N	89°44'15.76839"W	1.29	6111
P6A49	609065.64	3785035.18	30°09'54.57267"N	89°44'15.88335"W	1.34	6111
P6A50	609060.16	3785025.30	30°09'54.51984"N	89°44'15.99683"W	1.43	6111
P6A51	609054.01	3785016.49	30°09'54.46016"N	89°44'16.09813"W	1.38	6111
P6A52	609048.25	3785007.07	30°09'54.40443"N	89°44'16.20636"W	1.54	6111
P6A53	609042.21	3784997.26	30°09'54.34598"N	89°44'16.31906"W	1.52	6111
P6A54	609037.35	3784987.98	30°09'54.29924"N	89°44'16.42555"W	1.61	6111
P6A55	609034.46	3784979.69	30°09'54.27178"N	89°44'16.52037"W	1.56	6111
PIKE RESET	609582.87	3785134.53	30°09'59.67859"N	89°44'14.66962"W	8.14	RTK BASE
PIKE RM3	609562.56	3785070.21	30°09'59.48642"N	89°44'15.40546"W	9.15	CHK

Appendix 2

Topographic and Hydrographic Cross Section Data

Orleans and Jefferson Parishes

Horizontal Datum: NAD 1983(1992)

Horizontal Coordinate System: U.S. State Plane, 1983, Zone: Louisiana South 1702

Vertical Datum: NAVD88(2004.65)

Coordinate Units: US survey feet

Distance Units: U.S. survey feet

Height Units: U.S. survey feet

Reference Field Book Number 060857 for Raw Data.

Line Name	Location		
1-1	17th Street Canal		
Northing	Easting	Elevation (ft)	Description
555921.54	3664525.93	3.98	RR
555921.60	3664521.93	3.68	RR
555921.82	3664506.93	0.48	RR
555921.92	3664499.93	-1.02	WE
555924.40	3664329.95	0.88	TEF
555924.40	3664329.95	4.06	TPF
555924.37	3664331.95	4.06	TPF
555924.37	3664331.95	-1.02	WE
555924.36	3664332.95	-7.42	TOE
555921.50	3664528.93	6.28	TEF
555921.50	3664528.93	3.92	TPF
555921.53	3664526.93	3.92	TPF
555921.53	3664526.93	3.68	TEF
555922.99	3664426.94	-10.03	SND
555922.84	3664436.94	-9.63	SND
555922.69	3664446.94	-9.53	SND
555922.55	3664456.94	-9.43	SND
555922.40	3664466.94	-9.13	SND
555922.26	3664476.93	-8.63	SND
555922.11	3664486.93	-4.93	SND
555921.96	3664496.93	-1.23	SND
555924.30	3664336.95	-7.63	SND
555924.15	3664346.95	-8.33	SND

555924.01	3664356.95	-9.73	SND
555923.86	3664366.95	-10.33	SND
555923.72	3664376.95	-10.23	SND
555923.57	3664386.94	-10.33	SND
555923.42	3664396.94	-9.83	SND
555923.28	3664406.94	-9.83	SND
555923.13	3664416.94	-9.83	SND

Line Name		Location	
2-1		Orleans Ave. Canal	
Northing	Easting	Elevation (ft)	Description
557883.54	3672102.11	6.45	TPF
557883.47	3672101.12	6.45	TPF
557883.20	3672097.13	3.15	SLP
557882.64	3672089.15	-0.45	WES
557869.64	3671901.60	6.35	TPF
557869.71	3671902.59	6.35	TPF
557870.06	3671907.58	2.35	SLP
557870.54	3671914.56	-0.45	WES
557870.96	3671920.55	-2.84	SND
557871.65	3671930.53	-4.54	SND
557872.34	3671940.50	-4.94	SND
557873.03	3671950.48	-5.04	SND
557873.72	3671960.45	-5.34	SND
557874.42	3671970.43	-5.34	SND
557875.11	3671980.41	-5.44	SND
557875.80	3671990.38	-5.44	SND
557876.49	3672000.36	-5.54	SND
557877.18	3672010.33	-5.54	SND
557877.87	3672020.31	-5.74	SND
557878.56	3672030.29	-5.74	SND
557879.26	3672040.26	-5.94	SND
557879.95	3672050.24	-6.24	SND
557880.64	3672060.22	-6.94	SND
557881.33	3672070.19	-6.54	SND
557882.02	3672080.17	-6.94	SND
557882.71	3672090.14	-0.84	SND

Line Name		Location	
3-1		Orleans Ave. Canal	
Northing	Easting	Elevation (ft)	Description
555506.40	3671780.92	2.53	FST
555500.57	3671744.39	1.33	BSH
555497.89	3671727.60	0.63	BSH
555495.84	3671714.76	-0.27	WES
555461.17	3671497.51	13.03	PS
555461.64	3671500.47	13.03	CL
555462.75	3671507.39	12.53	FSC
555464.32	3671517.26	9.03	SLP

555465.90	3671527.14	5.63	SLP
555466.84	3671533.06	3.83	FST
555510.81	3671808.57	12.63	CL
555510.34	3671805.61	12.63	FSC
555508.45	3671793.76	9.23	SLP
555467.16	3671535.04	3.73	BSH
555467.79	3671538.99	2.83	ERK
555470.31	3671554.79	2.53	TRK
555471.10	3671559.72	0.63	BSH
555471.57	3671562.69	-0.27	WES
555472.20	3671566.64	-1.63	SND
555473.78	3671576.51	-3.03	SND
555475.35	3671586.39	-3.43	SND
555476.93	3671596.26	-3.73	SND
555478.51	3671606.14	-4.03	SND
555480.08	3671616.01	-5.03	SND
555481.66	3671625.89	-5.03	SND
555483.23	3671635.76	-6.53	SND
555484.81	3671645.64	-8.03	SND
555486.38	3671655.51	-10.13	SND
555487.96	3671665.39	-10.43	SND
555489.54	3671675.26	-10.13	SND
555491.11	3671685.14	-9.43	SND
555492.69	3671695.01	-7.63	SND
555494.26	3671704.89	-5.73	SND
555495.84	3671714.76	-3.93	SND
555497.42	3671724.64	-0.53	SND

Line Name	Location		
4-1	Orleans Ave. Canal		
Northing	Easting	Elevation (ft)	Description
554569.95	3671755.63	1.78	NG
554570.49	3671748.65	1.38	TBK
554570.88	3671743.66	0.28	TRK
554571.11	3671740.67	-0.42	WES
554584.30	3671571.18	13.40	TPF
554584.14	3671573.18	13.38	TPF
554584.14	3671573.18	7.48	TEF
554583.83	3671577.17	7.08	LSC
554566.61	3671798.50	10.08	TEF
554566.84	3671795.51	9.48	FSC
554568.39	3671775.57	3.88	SLP
554568.63	3671772.58	3.28	FST
554583.13	3671586.14	4.28	SLP
554582.43	3671595.11	2.78	FST
554581.58	3671606.08	1.58	NG
554581.04	3671613.06	1.58	TBK
554580.88	3671615.05	0.28	TOE
554566.53	3671799.49	13.28	TPF
554566.61	3671798.50	13.28	TPF

554580.57	3671619.04	-0.42	WES
554580.03	3671626.02	-3.43	SND
554579.25	3671635.99	-5.53	SND
554578.48	3671645.96	-9.73	SND
554577.70	3671655.93	-11.13	SND
554576.93	3671665.90	-12.03	SND
554576.15	3671675.87	-12.33	SND
554575.38	3671685.84	-12.23	SND
554574.60	3671695.81	-11.93	SND
554573.82	3671705.78	-10.73	SND
554573.05	3671715.75	-9.13	SND
554572.27	3671725.72	-2.63	SND
554571.50	3671735.69	-1.93	SND

Line Name	Location		
5-1	Orleans Ave. Canal		
Northing	Easting	Elevation (ft)	Description
545866.33	3670816.34	14.16	TPF
545866.32	3670817.34	14.15	TPF
545866.32	3670817.34	0.45	TEF
545866.26	3670821.34	-0.45	WES
545864.38	3670950.33	-0.45	WES
545864.28	3670957.33	2.75	SLP
545864.03	3670974.33	8.45	FSC
545863.97	3670978.33	8.65	TEF
545863.96	3670979.33	14.01	TPF
545863.94	3670980.33	14.02	TPF
545866.17	3670827.34	-1.43	SND
545866.02	3670837.34	-3.33	SND
545865.88	3670847.34	-3.13	SND
545865.73	3670857.34	-2.03	SND
545865.59	3670867.34	-1.23	SND
545865.44	3670877.34	-2.53	SND
545865.30	3670887.34	-4.23	SND
545865.15	3670897.34	-4.43	SND
545865.00	3670907.33	-5.03	SND
545864.86	3670917.33	-4.53	SND
545864.71	3670927.33	-5.23	SND
545864.57	3670937.33	-3.13	SND
545864.42	3670947.33	-1.13	SND

Line Name	Location		
6-1	London Ave. Canal		
Northing	Easting	Elevation (ft)	Description
543778.84	3681331.62	12.67	TPF
543778.84	3681332.62	12.67	TPF
543778.84	3681332.62	5.91	TEF
543778.86	3681341.62	5.61	HWL
543778.86	3681341.62	0.61	SLP
543778.86	3681342.62	0.11	WES
543778.98	3681435.62	0.11	WES
543778.98	3681436.62	4.98	HWL
543778.98	3681440.62	12.67	TPF
543778.98	3681440.62	5.91	TEF
543778.98	3681441.62	12.67	TPF
543778.86	3681347.62	-2.09	SND
543778.88	3681357.62	-4.49	SND
543778.89	3681367.62	-4.39	SND
543778.90	3681377.62	-4.59	SND
543778.91	3681387.62	-4.29	SND
543778.93	3681397.62	-3.69	SND
543778.94	3681407.62	-3.69	SND
543778.95	3681417.62	-4.19	SND
543778.96	3681427.62	-3.99	SND
543778.98	3681435.62	-1.39	SND

Line Name	Location		
8-1	London Ave. Canal		
Northing	Easting	Elevation (ft)	Description
556091.85	3680290.58	12.76	TPF
556091.86	3680291.58	12.76	TPF
556091.86	3680291.58	3.98	TEF
556091.88	3680293.58	3.78	SLP
556092.04	3680308.58	1.88	TBK
556092.06	3680310.58	0.78	TOE
556093.58	3680453.57	0.18	TOE
556093.59	3680454.57	1.38	TOP
556093.75	3680469.57	3.58	TEF
556093.75	3680469.57	12.76	TPF
556093.76	3680470.57	12.76	TPF
556092.08	3680312.58	0.20	WES
556092.09	3680313.58	0.00	SND
556092.20	3680323.58	-6.00	SND
556092.31	3680333.58	-10.00	SND
556092.41	3680343.58	-12.20	SND
556092.52	3680353.58	-11.90	SND
556092.62	3680363.57	-12.70	SND
556092.73	3680373.57	-11.80	SND
556092.84	3680383.57	-11.80	SND
556092.94	3680393.57	-11.80	SND
556093.05	3680403.57	-11.40	SND

556093.16	3680413.57	-11.20	SND
556093.26	3680423.57	-8.60	SND
556093.37	3680433.57	-3.80	SND
556093.47	3680443.57	-1.90	SND
556093.58	3680453.57	0.20	WES

Line Name	Location		
9-1	London Ave. Canal		
Northing	Easting	Elevation (ft)	Description
556558.27	3680040.23	11.78	CL
556559.94	3680044.94	11.78	FSC
556563.28	3680054.36	8.68	SLP
556569.96	3680073.22	3.18	FST
556571.63	3680077.93	2.88	NG
556573.97	3680084.53	2.68	TBK
556575.64	3680089.24	-0.02	TOE
55658.80	3680323.94	1.78	TBK
556661.80	3680332.43	2.88	NG
556668.48	3680351.28	3.98	NG
556675.16	3680370.13	4.88	FST
556680.17	3680384.27	7.98	SLP
556684.51	3680396.52	11.88	FSC
556685.85	3680400.29	11.98	CL
556578.31	3680096.78	-0.78	SND
556581.65	3680106.21	-1.58	SND
556584.99	3680115.63	-2.38	SND
556588.33	3680125.06	-2.58	SND
556591.67	3680134.48	-2.58	SND
556595.01	3680143.91	-2.98	SND
556598.35	3680153.34	-3.78	SND
556601.69	3680162.76	-4.38	SND
556605.03	3680172.19	-4.98	SND
556608.37	3680181.61	-5.58	SND
556611.71	3680191.04	-6.78	SND
556615.05	3680200.46	-7.68	SND
556618.38	3680209.89	-7.68	SND
556621.72	3680219.32	-8.38	SND
556625.06	3680228.74	-7.88	SND
556628.40	3680238.17	-8.68	SND
556631.74	3680247.59	-9.28	SND
556635.08	3680257.02	-9.18	SND
556638.42	3680266.45	-8.88	SND
556641.76	3680275.87	-9.38	SND
556645.10	3680285.30	-8.18	SND
556648.44	3680294.72	-7.28	SND
556651.78	3680304.15	-5.18	SND
556655.12	3680313.57	-1.58	SND
556657.79	3680321.12	0.22	WES
556575.97	3680090.18	0.22	WES

Line Name	Location		
10-1	London Ave. Canal		
Northing	Easting	Elevation (ft)	Description
558496.77	3679210.92	12.57	CL
558498.24	3679216.73	12.17	FSC
558501.91	3679231.28	7.37	SLP
558504.36	3679240.97	4.07	FST
558510.49	3679265.21	2.47	NG
558512.94	3679274.90	2.17	BSH
558513.43	3679276.84	2.37	TOP
558514.41	3679280.72	1.37	TOE
558516.61	3679289.45	0.87	TBK
558564.64	3679479.47	1.67	TBK
558568.07	3679493.05	2.57	TOE
558572.23	3679509.53	4.27	TOP
558577.87	3679531.83	5.37	NG
558584.00	3679556.06	6.77	NG
558588.90	3679575.46	7.67	FST
558592.57	3679590.00	11.47	FSC
558593.55	3679593.88	11.57	CL
558519.06	3679299.14	-2.16	SND
558521.51	3679308.84	-4.26	SND
558523.96	3679318.53	-5.96	SND
558526.41	3679328.23	-8.76	SND
558528.86	3679337.92	-12.56	SND
558531.32	3679347.62	-13.76	SND
558533.77	3679357.31	-14.36	SND
558536.22	3679367.01	-14.16	SND
558538.67	3679376.70	-14.16	SND
558541.12	3679386.40	-14.26	SND
558543.57	3679396.09	-13.16	SND
558546.02	3679405.79	-11.76	SND
558548.47	3679415.48	-9.26	SND
558550.92	3679425.18	-5.96	SND
558553.37	3679434.88	-3.26	SND
558555.82	3679444.57	-1.56	SND
558558.27	3679454.27	-1.36	SND
558560.72	3679463.96	-1.06	SND
558562.92	3679472.69	0.24	WES

Line Name	Location		
11-1	London Ave. Canal		
Northing	Easting	Elevation (ft)	Description
559101.55	3679136.03	6.23	TPF
559101.78	3679137.00	6.18	TPF
559102.93	3679141.87	2.98	SLP
559104.31	3679147.71	0.39	WES
559139.72	3679297.58	0.39	WES
559141.10	3679303.42	3.18	SLP
559142.48	3679309.26	6.48	TPF
559142.71	3679310.23	6.48	TPF
559139.72	3679297.58	0.39	WES
559106.15	3679155.50	-2.81	SND
559106.38	3679156.47	-11.01	SND
559108.68	3679166.20	-12.71	SND
559110.98	3679175.93	-12.61	SND
559113.28	3679185.66	-12.41	SND
559115.58	3679195.40	-12.31	SND
559117.88	3679205.13	-12.11	SND
559120.18	3679214.86	-12.11	SND
559122.48	3679224.59	-12.01	SND
559124.78	3679234.32	-12.01	SND
559127.08	3679244.06	-12.11	SND
559129.38	3679253.79	-11.71	SND
559131.68	3679263.52	-11.31	SND
559133.98	3679273.25	-10.61	SND
559136.28	3679282.98	-9.21	SND
559138.58	3679292.72	-2.21	SND

Line Name	Location		
12-1	Peoples & Florida Ave. Canal		
Northing	Easting	Elevation (ft)	Description
543096.45	3688735.07	-2.64	CLR
543094.33	3688748.40	-2.74	ER
543094.25	3688748.90	-2.19	CRB
543093.78	3688751.86	-2.24	TBK
543092.52	3688759.76	-6.84	SLP
543091.11	3688768.65	-11.04	TOE
543090.48	3688772.60	-11.94	TOP
543089.38	3688779.51	-14.34	WES
543088.59	3688784.45	-17.34	WB
543087.18	3688793.34	-20.34	CL
543085.92	3688801.24	-19.84	WB
543084.98	3688807.16	-14.34	WES
543083.88	3688814.08	-12.04	SLP
543082.94	3688820.00	-9.74	TC
543080.74	3688833.83	-7.94	SLP
543078.54	3688847.65	-3.94	SLP
543076.81	3688858.52	0.96	TBK

Line Name	Location		
13-1	Peoples Ave. Canal		
Northing	Easting	Elevation (ft)	Description
546116.13	3688561.36	-2.42	TER
546116.51	3688575.35	-3.62	TBK
546116.81	3688586.35	-8.62	TC
546117.03	3688594.34	-12.04	WES
546117.14	3688598.34	-13.32	SND
546117.46	3688610.34	-14.82	CL
546117.68	3688618.33	-16.04	SND
546117.79	3688622.33	-12.02	WES
546117.96	3688628.33	-9.82	TC
546118.12	3688634.33	-8.82	SLP
546118.50	3688648.32	-5.32	SLP
546118.64	3688653.32	-4.52	TBK
546118.94	3688664.32	-3.72	TER

Line Name	Location		
14-1	Peoples Ave. Canal		
Northing	Easting	Elevation (ft)	Description
546337.38	3688551.58	-2.79	NG
546338.07	3688554.50	-3.19	TBK
546339.45	3688560.34	-5.99	SLP
546340.83	3688566.18	-8.49	TOE
546341.06	3688567.15	-8.09	TPF
546341.17	3688567.64	-8.09	TPF
546341.17	3688567.64	-12.79	WES
546341.17	3688567.64	-13.99	TOE
546343.12	3688575.91	-14.99	WB
546345.88	3688587.59	-17.79	CL
546348.41	3688598.30	-17.09	WB
546349.56	3688603.16	-12.79	WES
546349.79	3688604.13	-11.99	SLP
546351.63	3688611.92	-9.19	TPF
546352.78	3688616.79	-7.69	SLP
546354.61	3688624.57	-4.79	TBK

Line Name	Location		
15-1	Peoples Ave. Canal		
Northing	Easting	Elevation (ft)	Description
546816.90	3688506.36	-3.32	CLR
546817.64	3688516.33	-3.92	ER
546817.86	3688519.32	-3.72	TBK
546818.38	3688526.30	-5.62	SLP
546819.12	3688536.27	-8.42	SLP
546819.71	3688544.25	-10.72	TOE
546819.74	3688544.75	-10.92	TPF
546819.78	3688545.25	-10.92	TPF
546819.78	3688545.25	-12.77	WES

546819.85	3688546.25	-16.82	TOE
546820.22	3688551.23	-16.92	CL
546820.63	3688556.72	-16.72	TOE
546820.63	3688556.72	-12.77	WES
546820.63	3688556.72	-11.02	TPF
546820.67	3688557.22	-11.02	TPF
546820.82	3688559.21	-10.82	TOE
546821.55	3688569.18	-8.42	SLP
546822.81	3688586.14	-4.22	SLP
546823.77	3688599.10	-1.32	TBK

Line Name	Location		
16-1	Peoples Ave. Canal		
Northing	Easting	Elevation (ft)	Description
546964.83	3688494.16	-3.19	DRV
546965.83	3688501.09	-3.46	ER
546966.11	3688503.07	-3.86	TBK
546968.39	3688518.90	-8.06	SLP
546970.10	3688530.78	-10.86	TOE
546970.39	3688532.76	-10.96	TOP
546970.53	3688533.75	-11.06	TOP
546970.53	3688533.75	-12.73	WES
546970.53	3688533.75	-16.76	TOE
546970.53	3688533.75	-16.96	CL
546972.03	3688544.14	-16.96	TOE
546972.03	3688544.14	-12.73	WES
546972.03	3688544.14	-11.06	TPF
546972.10	3688544.64	-11.06	TPF
546972.24	3688545.63	-11.16	TOE
546975.52	3688568.39	-6.06	SLP
546976.38	3688574.33	-4.19	SLP
546977.94	3688585.22	-0.49	SLP
546979.80	3688598.09	1.21	TBK

Line Name	Location		
17-1	Peoples Ave. Canal		
Northing	Easting	Elevation (ft)	Description
548619.26	3688368.40	0.66	NG
548618.84	3688374.39	0.46	TBK
548618.28	3688382.37	-3.04	SLP
548617.51	3688393.34	-5.74	SLP
548616.66	3688405.31	-9.94	TOE
548616.52	3688407.30	-10.34	TPF
548616.45	3688408.30	-10.34	TPF
548616.45	3688408.30	-11.79	WES
548616.45	3688408.30	-14.84	TOE
548616.10	3688413.29	-14.24	CL
548615.68	3688419.27	-14.34	TOE
548615.68	3688419.27	-11.79	WES

548615.68	3688419.27	-8.24	TPF
548615.61	3688420.27	-10.24	TPF
548615.33	3688424.26	-9.34	SLP
548614.35	3688438.23	-5.34	SLP
548613.64	3688448.20	-1.04	SLP
548612.80	3688460.17	4.16	SLP
548612.24	3688468.15	6.79	SLP
548611.75	3688475.14	9.89	TBK

Line Name	Location		
19-1	Florida Ave. Canal		
Northing	Easting	Elevation (ft)	Description
541565.64	3693462.77	-4.19	TER
541554.17	3693459.23	-5.39	NG
541538.89	3693454.50	-6.09	TBK
541530.29	3693451.84	-7.69	SLP
541518.83	3693448.29	-9.89	TOE
541512.14	3693446.23	-10.49	TOP
541508.32	3693445.04	-11.69	TPF
541507.84	3693444.90	-12.49	TPF
541507.84	3693444.90	-14.20	WES
541507.84	3693444.90	-19.09	TOE
541496.85	3693441.50	-19.19	CL
541483.48	3693437.36	-18.39	TOE
541483.48	3693437.36	-14.20	WES
541483.48	3693437.36	-12.39	TPF
541482.52	3693437.07	-12.39	TPF
541480.61	3693436.48	-11.09	SLP
541477.75	3693435.59	-9.79	TOP
541467.24	3693432.34	-8.69	SLP
541448.13	3693426.43	-4.19	TBK

Line Name	Location		
20-1	Florida Ave. Canal		
Northing	Easting	Elevation (ft)	Description
541196.81	3694913.33	-3.11	SLP
541187.41	3694909.91	-4.31	SLP
541170.49	3694903.76	-6.01	TBK
541163.91	3694901.37	-7.91	SLP
541150.76	3694896.59	-11.11	TOE
541149.82	3694896.24	-11.45	TPF
541148.88	3694895.90	-11.47	TPF
541148.88	3694895.90	-14.16	WES
541148.88	3694895.90	-20.41	TOE
541135.72	3694891.12	-20.41	CL
541122.56	3694886.34	-20.41	TOE
541122.56	3694886.34	-14.16	WES
541122.56	3694886.34	-11.67	TPF
541121.62	3694886.00	-11.67	TPF

541116.92	3694884.29	-10.21	SLP
541102.82	3694879.16	-7.81	SLP
541093.43	3694875.75	-6.41	SLP
541079.33	3694870.62	-4.41	TBK
541069.93	3694867.21	-3.31	NG

Appendix 3

Topographic and Hydrographic Cross Section Data

St. Bernard Parish (Areas 2 and 3)

AREA 2

Horizontal Datum: NAD 1983(1992)

Horizontal Coordinate System: U.S. State Plane, 1983, Zone: Louisiana South 1702

Vertical Datum: NAVD88(2004.65)

Coordinate Units: US survey feet

Distance Units: U.S. survey feet

Height Units: U.S. survey feet

AREA 2 : TYPICAL SECTION AT 1

Point Number	Northing	Easting	Elevation (ft)	Description
1	532454.88	3718795.74	-3.82	TBK
2	532449.36	3718793.40	-6.02	SLP
3	532445.68	3718791.83	-7.22	WE
4	532435.55	3718787.54	-9.42	CB
5	532417.14	3718779.72	-10.42	CB
6	532398.73	3718771.91	-11.42	CB
7	532380.32	3718764.09	-10.92	CB
8	532361.91	3718756.28	-10.52	CB
9	532351.78	3718751.98	-9.92	CB
10	532339.82	3718746.90	-7.22	WE
11	532332.45	3718743.77	-2.82	TBK

AREA 2 : TYPICAL SECTION AT 2

Point Number	Northing	Easting	Elevation (ft)	Description
12	532336.16	3719090.60	-3.93	TBK
13	532330.63	3719088.25	-5.63	SLP
14	532326.03	3719086.30	-7.23	WE
15	532314.98	3719081.61	-8.23	CB
16	532305.78	3719077.70	-11.33	CB
17	532287.37	3719069.89	-11.53	CB
18	532268.96	3719062.08	-10.33	CB
19	532250.55	3719054.26	-11.33	CB
20	532232.14	3719046.45	-11.53	CB
21	532213.73	3719038.63	-9.03	CB
22	532199.00	3719032.38	-7.23	WE

23	532192.56	3719029.64	-4.33	TBK
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AREA 2 : TYPICAL SECTION AT 3

Point Number	Northing	Easting	Elevation (ft)	Description
24	531320.75	3721621.25	-4.66	TBK
25	531309.62	3721616.75	-7.16	WE
26	531291.08	3721609.26	-8.46	CB
27	531272.54	3721601.77	-9.86	CB
28	531253.99	3721594.28	-10.96	CB
29	531235.45	3721586.79	-12.36	CB
30	531216.91	3721579.29	-12.16	CB
31	531205.78	3721574.80	-7.16	WE
32	531203.93	3721574.05	-5.56	SLP
33	531197.43	3721571.43	-3.86	TBK

AREA 2 : TYPICAL SECTION AT 4

Point Number	Northing	Easting	Elevation (ft)	Description
34	531253.70	3721834.56	-2.11	TBK
35	531244.37	3721828.73	-4.91	SLP
36	531235.89	3721823.43	-7.21	WE
37	531219.78	3721813.36	-10.81	CB
38	531202.82	3721802.76	-13.61	CB
39	531185.86	3721792.16	-13.51	CB
40	531168.90	3721781.56	-12.11	CB
41	531151.94	3721770.96	-9.41	CB
42	531134.97	3721760.37	-7.21	WE
43	531132.43	3721758.78	-5.51	SLP
44	531129.04	3721756.66	-3.91	TBK

AREA 2 : TYPICAL SECTION AT 5

Point Number	Northing	Easting	Elevation (ft)	Description
45	529982.01	3725017.92	-1.68	TBK
46	529975.72	3725014.85	-3.98	SLP
47	529970.33	3725012.22	-6.48	SLP
48	529964.93	3725009.59	-7.08	WE
49	529946.06	3725000.39	-8.58	CB
50	529928.08	3724991.62	-9.98	CB
51	529910.11	3724982.85	-16.08	CB
52	529892.13	3724974.09	-15.08	CB
53	529874.16	3724965.32	-8.48	CB
54	529870.56	3724963.56	-7.08	WE
55	529861.57	3724959.18	-4.18	SLP
56	529855.28	3724956.11	-1.88	TBK

AREA 2 : TYPICAL SECTION AT 6

Point Number	Northing	Easting	Elevation (ft)	Description
57	529840.01	3725354.44	-4.05	TBK
58	529833.67	3725351.48	-7.25	WE
59	529821.88	3725345.99	-9.15	CB
60	529803.76	3725337.54	-9.65	CB
61	529785.63	3725329.09	-13.15	CB
62	529767.51	3725320.63	-15.25	CB
63	529749.38	3725312.18	-13.25	CB
64	529726.72	3725301.62	-7.85	CB

65	529725.82	3725301.19	-7.25	WE
66	529717.66	3725297.39	-1.65	TBK

AREA 2 : TYPICAL SECTION AT 7

Point Number	Northing	Easting	Elevation (ft)	Description
67	531674.27	3716712.47	0.31	TBK
68	531667.78	3716709.84	-2.99	SLP
69	531663.14	3716707.97	-7.29	WE
70	531653.87	3716704.22	-7.99	CB
71	531642.74	3716699.73	-8.39	CB
72	531630.69	3716694.86	-8.49	CB
73	531626.98	3716693.36	-7.29	WE
74	531621.42	3716691.11	-6.39	SLP
75	531612.15	3716687.37	-5.49	SLP
76	531604.73	3716684.37	-0.59	TBK

AREA 2 : TYPICAL SECTION AT 8

Point Number	Northing	Easting	Elevation (ft)	Description
77	531048.54	3718193.76	-4.09	TBK
78	531046.60	3718197.26	-4.99	SLP
79	531044.66	3718200.76	-7.09	WE
80	531041.27	3718206.88	-11.79	CB
81	531036.91	3718214.75	-11.49	CB
82	531028.66	3718229.62	-11.49	CB
83	531028.18	3718230.50	-8.79	CB
84	531025.76	3718234.87	-7.09	WE
85	531023.82	3718238.37	-4.59	SLP
86	531021.39	3718242.74	-2.99	TBK

AREA 2 : TYPICAL SECTION AT 9

Point Number	Northing	Easting	Elevation (ft)	Description
87	527033.32	3716142.59	1.32	TBK
88	527029.82	3716150.81	-3.52	SLP
89	527027.94	3716154.13	-6.25	TOE
90	527027.17	3716157.67	-6.82	CL DITCH
91	527025.62	3716160.02	-6.67	TOE
92	527023.42	3716163.20	-3.65	SLP
93	527022.70	3716164.93	-3.18	SLP
94	527017.88	3716172.37	1.72	TBK

AREA 2 : TYPICAL SECTION AT 12

Point Number	Northing	Easting	Elevation (ft)	Description
95	531027.08	3718139.88	-3.37	TBK
96	531024.38	3718138.57	-4.47	SLP
97	531019.89	3718136.37	-7.27	WE
98	531018.09	3718135.50	-8.57	CB
99	531014.49	3718133.74	-9.37	CB
100	531011.80	3718132.43	-9.47	CB
101	531010.90	3718131.99	-8.07	CB
102	531009.10	3718131.11	-7.27	WE
103	531006.41	3718129.80	-4.97	SLP
104	531004.61	3718128.92	-3.67	TBK

AREA 2 : TYPICAL SECTION AT 13

Point Number	Northing	Easting	Elevation (ft)	Description
105	530946.42	3718146.76	-4.42	TBK
106	530945.10	3718149.45	-5.52	SLP
107	530943.79	3718152.15	-7.22	WE
108	530942.91	3718153.95	-10.62	CB
109	530938.09	3718163.83	-11.72	CB
110	530931.95	3718176.42	-10.92	CB
111	530928.88	3718182.71	-7.22	WE
112	530926.25	3718188.10	-4.32	SLP
113	530924.06	3718192.59	-2.12	TBK

AREA 2 : TYPICAL SECTION AT 14

Point Number	Northing	Easting	Elevation (ft)	Description
114	532223.15	3718841.36	-4.46	TBK
115	532224.56	3718838.71	-5.86	SLP
116	532225.97	3718836.06	-7.26	WE
117	532227.85	3718832.53	-11.06	CB
118	532233.95	3718821.05	-13.66	CB
119	532241.46	3718806.93	-12.46	CB
120	532243.81	3718802.51	-7.26	WE
121	532246.63	3718797.22	-4.06	TBK

AREA 2 : TYPICAL SECTION AT 15

Point Number	Northing	Easting	Elevation (ft)	Description
122	522670.74	3717726.32	6.93	TBK
123	522667.14	3717732.16	2.31	TOE
124	522666.09	3717734.94	1.95	CL DITCH
125	522665.18	3717736.98	2.31	TOE
126	522662.55	3717743.46	6.81	TBK

AREA 2 : TYPICAL SECTION AT 17

Point Number	Northing	Easting	Elevation (ft)	Description
127	523096.43	3717906.31	5.35	TBK
128	523093.24	3717913.64	2.45	TD
129	523090.85	3717919.15	1.95	CLD
130	523089.25	3717922.82	2.65	TD
131	523085.66	3717931.07	5.65	TBK

AREA 2 : TYPICAL SECTION AT 20

Point Number	Northing	Easting	Elevation (ft)	Description
132	527438.25	3719911.63	-1.12	TBK
133	527435.34	3719918.00	-3.52	SLP
134	527432.85	3719923.46	-7.42	WE
135	527432.44	3719924.37	-8.62	CB
136	527430.78	3719928.01	-9.22	CB
137	527429.12	3719931.65	-8.82	CB
138	527428.71	3719932.56	-7.42	WE
139	527425.81	3719938.93	-4.02	SLP
140	527423.73	3719943.48	-1.12	TBK

AREA 2 : TYPICAL SECTION AT 21

Point Number	Northing	Easting	Elevation (ft)	Description
141	527583.40	3719959.44	-0.95	TBK
142	527581.05	3719963.85	-2.75	SLP
143	527578.23	3719969.15	-6.05	TOE
144	527572.60	3719979.74	-6.65	TOP
145	527572.13	3719980.63	-7.25	WE
146	527571.19	3719982.39	-9.65	CB
147	527568.37	3719987.69	-11.05	CB
148	527562.74	3719998.29	-9.15	CB
149	527561.33	3720000.94	-7.25	WE
150	527558.98	3720005.35	-3.35	SLP
151	527557.57	3720008.00	-0.95	TBK

AREA 2 : TYPICAL SECTION AT 21A

Point Number	Northing	Easting	Elevation (ft)	Description
152	527549.95	3719830.77	-0.95	TBK
153	527543.98	3719831.34	-4.36	SLP
154	527536.02	3719832.11	-6.66	SLP
155	527529.05	3719832.78	-8.26	WE
156	527527.06	3719832.97	-9.46	CB
157	527521.09	3719833.55	-10.26	CB
158	527516.11	3719834.03	-10.46	CB
159	527514.12	3719834.22	-8.26	WE
160	527510.14	3719834.60	-4.55	SLP
161	527506.15	3719834.99	-1.75	TBK

AREA 2 : TYPICAL SECTION AT 31

Point Number	Northing	Easting	Elevation (ft)	Description
162	529717.84	3725084.31	-2.62	TBK
163	529719.87	3725079.74	-4.62	SLP
164	529720.69	3725077.92	-7.02	WE
165	529721.91	3725075.18	-9.02	CB
166	529728.01	3725061.47	-11.72	CB
167	529735.33	3725045.03	-9.12	CB
168	529737.36	3725040.46	-7.02	WE
169	529738.58	3725037.72	-3.22	TBK

AREA 2 : TYPICAL SECTION AT 35

Point Number	Northing	Easting	Elevation (ft)	Description
170	524394.24	3729001.22	-3.48	TBK
171	524387.71	3728998.72	-7.28	WE
172	524380.24	3728995.85	-10.28	CB
173	524370.91	3728992.26	-11.08	CB
174	524357.84	3728987.25	-8.98	CB
175	524353.17	3728985.46	-7.28	WE
176	524346.63	3728982.95	-4.08	SLP
177	524340.10	3728980.44	-1.88	TBK

AREA 2 : TYPICAL SECTION AT 36

Point Number	Northing	Easting	Elevation (ft)	Description
178	524284.92	3729082.61	-2.69	TBK
179	524288.72	3729085.86	-6.59	WE
180	524294.80	3729091.05	-11.09	CB

181	524303.93	3729098.84	-11.69	CB
182	524313.81	3729107.29	-11.49	CB
183	524320.66	3729113.13	-6.59	WE
184	524325.98	3729117.68	-3.49	SLP
185	524329.78	3729120.93	-1.99	TBK

AREA 2 : TYPICAL SECTION AT 37

Point Number	Northing	Easting	Elevation (ft)	Description
186	524280.24	3729017.19	-1.93	TBK
187	524282.89	3729014.19	-3.13	SLP
188	524286.21	3729010.44	-7.33	WE
189	524286.87	3729009.70	-8.93	CB
190	524289.52	3729006.70	-8.73	CB
191	524295.48	3728999.96	-8.43	CB
192	524296.15	3728999.21	-7.33	WE
193	524300.12	3728994.72	-2.33	TBK

AREA 2 : TYPICAL SECTION AT 38

Point Number	Northing	Easting	Elevation (ft)	Description
194	521647.72	3726838.13	3.11	TBK
195	521652.10	3726832.88	-1.00	TOE
196	521655.75	3726828.70	-0.52	CL DITCH
197	521659.60	3726824.19	-0.31	TOE
198	521663.25	3726820.15	3.20	TBK

AREA 2 : TYPICAL SECTION AT 39

Point Number	Northing	Easting	Elevation (ft)	Description
199	524412.87	3729056.39	-1.44	TBK
200	524408.61	3729061.95	-4.04	SLP
201	524402.52	3729069.88	-7.24	WE
202	524395.22	3729079.40	-9.94	CB
203	524389.13	3729087.34	-11.94	CB
204	524376.35	3729104.00	-10.44	CB
205	524371.48	3729110.34	-7.24	WE
206	524367.83	3729115.10	-4.24	SLP
207	524363.56	3729120.66	-2.54	TBK

AREA 2 : TYPICAL SECTION AT 40

Point Number	Northing	Easting	Elevation (ft)	Description
208	527332.95	3731688.77	-4.72	TBK
209	527327.49	3731686.29	-6.12	SLP
210	527316.57	3731681.31	-7.92	WE
211	527300.19	3731673.85	-10.22	CB
212	527281.99	3731665.55	-10.22	CB
213	527263.79	3731657.26	-10.92	CB
214	527245.59	3731648.96	-13.62	CB
215	527227.39	3731640.67	-14.92	CB
216	527218.29	3731636.52	-12.92	CB
217	527211.92	3731633.62	-8.52	CB
218	527211.01	3731633.21	-3.12	TPF

AREA 2 : TYPICAL SECTION AT 41

Point Number	Northing	Easting	Elevation (ft)	Description
219	527194.16	3731378.45	-1.39	TBK
220	527190.55	3731383.24	-4.79	SLP
221	527186.94	3731388.03	-7.49	WE
222	527183.93	3731392.03	-13.09	CB
223	527171.90	3731408.00	-13.89	CB
224	527159.86	3731423.97	-14.19	CB
225	527147.82	3731439.95	-9.49	CB
226	527144.82	3731443.94	-7.49	WE
227	527141.81	3731447.93	-5.09	TBK

AREA 2 : TYPICAL SECTION AT 43

Point Number	Northing	Easting	Elevation (ft)	Description
228	523681.25	3734815.97	-4.44	TBK
229	523674.36	3734804.95	-7.44	WE
230	523666.94	3734793.07	-9.44	CB
231	523656.34	3734776.11	-13.24	CB
232	523645.74	3734759.15	-16.74	CB
233	523635.15	3734742.19	-15.34	CB
234	523624.55	3734725.23	-15.04	CB
235	523613.95	3734708.27	-10.24	CB
236	523607.59	3734698.09	-7.44	WE
237	523604.94	3734693.85	-3.84	TBK

AREA 2 : TYPICAL SECTION AT 44

Point Number	Northing	Easting	Elevation (ft)	Description
238	519924.69	3737279.88	-0.55	TBK
239	519917.93	3737265.38	-11.65	SLP
240	519914.55	3737258.13	-7.45	WE
241	519911.59	3737251.78	-11.45	CB
242	519903.14	3737233.66	-15.25	CB
243	519894.68	3737215.53	-16.95	CB
244	519886.23	3737197.41	-10.25	CB
245	519883.27	3737191.06	-7.45	WE
246	519879.05	3737182.00	-4.25	SLP
247	519875.67	3737174.75	-0.65	TBK

AREA 2 : TYPICAL SECTION AT 45

Point Number	Northing	Easting	Elevation (ft)	Description
248	519622.87	3737572.07	0.77	TBK
249	519631.07	3737566.33	-2.03	SLP
250	519637.62	3737561.75	-7.43	WE
251	519640.90	3737559.45	-9.83	CB
252	519657.28	3737547.98	-13.83	CB
253	519673.66	3737536.51	-14.13	CB
254	519690.05	3737525.04	-13.73	CB
255	519706.43	3737513.56	-12.53	CB
256	519722.81	3737502.09	-7.43	WE
257	519726.09	3737499.80	-4.13	SLP
258	519733.46	3737494.64	-0.03	TBK

AREA 2 : TYPICAL SECTION AT 46

Point Number	Northing	Easting	Elevation (ft)	Description
259	519377.27	3737371.72	-1.55	TBK
260	519381.46	3737369.00	-4.25	SLP
261	519384.82	3737366.82	-7.45	WE
262	519390.69	3737363.00	-10.85	CB
263	519407.46	3737352.11	-13.85	CB
264	519424.23	3737341.22	-14.15	CB
265	519432.62	3737335.77	-9.45	CB
266	519437.65	3737332.50	-7.45	WE
267	519439.33	3737331.42	-4.75	SLP
268	519444.36	3737328.15	-1.55	TBK

AREA 2 : TYPICAL SECTION AT 47

Point Number	Northing	Easting	Elevation (ft)	Description
269	517669.01	3735318.12	-2.12	TBK
270	517671.58	3735321.19	-3.07	SLP
271	517674.15	3735324.25	-7.37	WE
272	517678.01	3735328.85	-9.47	CB
273	517686.36	3735338.80	-11.27	CB
274	517694.08	3735348.00	-9.57	CB
275	517700.50	3735355.66	-7.37	WE
276	517703.72	3735359.49	-4.27	SLP
277	517706.29	3735362.55	-2.47	TBK

AREA 2 : TYPICAL SECTION AT 49

Point Number	Northing	Easting	Elevation (ft)	Description
278	517657.80	3735495.37	-1.15	TBK
279	517662.26	3735491.36	-3.95	SLP
280	517665.98	3735488.01	-7.35	WE
281	517674.89	3735479.98	-10.35	CB
282	517686.78	3735469.28	-12.65	CB
283	517697.93	3735459.24	-11.65	CB
284	517705.36	3735452.55	-7.35	WE
285	517709.82	3735448.53	-4.05	SLP
286	517716.51	3735442.51	-0.45	TBK

AREA 2 : TYPICAL SECTION AT 50

Point Number	Northing	Easting	Elevation (ft)	Description
287	517565.75	3735497.34	-1.46	TBK
288	517561.16	3735492.06	-4.46	SLP
289	517557.88	3735488.28	-7.36	WE
290	517553.94	3735483.75	-9.36	CB
291	517547.38	3735476.21	-10.56	CB
292	517539.51	3735467.15	-10.06	CB
293	517532.95	3735459.60	-7.36	WE
294	517530.32	3735456.58	-4.36	SLP
295	517525.08	3735450.55	-1.96	TBK

AREA 2 : TYPICAL SECTION AT 51

Point Number	Northing	Easting	Elevation (ft)	Description
296	517589.68	3735308.70	0.10	TBK
297	517584.48	3735313.38	-3.40	SLP
298	517580.02	3735317.39	-8.10	WE

299	517579.27	3735318.06	-9.30	CB
300	517577.05	3735320.07	-9.70	CB
301	517573.33	3735323.42	-9.40	CB
302	517571.84	3735324.76	-8.10	WE
303	517568.87	3735327.43	-4.40	SLP
304	517564.41	3735331.45	-2.10	TBK

AREA 2 : TYPICAL SECTION AT 52

Point Number	Northing	Easting	Elevation (ft)	Description
305	515692.91	3733243.86	2.86	TBK
306	515689.05	3733247.04	1.46	SLP
307	515686.73	3733248.95	-0.64	TOE
308	515684.42	3733250.86	-0.74	CLD
309	515682.88	3733252.13	-0.74	TOE
310	515680.56	3733254.04	1.36	SLP
311	515679.02	3733255.31	2.36	TBK

AREA 2 : TYPICAL SECTION AT 54

Point Number	Northing	Easting	Elevation (ft)	Description
312	519393.13	3737568.36	0.01	TBK
313	519387.63	3737554.40	-3.29	SLP
314	519382.50	3737541.38	-7.49	WE
315	519380.66	3737536.72	-9.49	CB
316	519373.33	3737518.12	-11.29	CB
317	519366.00	3737499.51	-10.49	CB
318	519364.54	3737495.79	-9.29	CB
319	519363.07	3737492.06	-7.49	WE
320	519360.14	3737484.62	-6.09	SLP
321	519353.18	3737466.94	-2.29	SLP
322	519347.31	3737452.06	0.01	TBK

AREA 2 : TYPICAL SECTION AT 55

Point Number	Northing	Easting	Elevation (ft)	Description
323	515213.58	3740286.62	-3.20	TBK
324	515209.21	3740278.75	-6.60	SLP
325	515204.37	3740270.00	-7.30	WE
326	515197.58	3740257.75	-9.10	CB
327	515187.88	3740240.26	-8.90	CB
328	515178.19	3740222.77	-9.00	CB
329	515168.49	3740205.28	-9.60	CB
330	515158.79	3740187.78	-8.60	CB
331	515153.46	3740178.16	-7.30	WE
332	515151.52	3740174.67	-4.80	SLP
333	515150.55	3740172.92	-3.80	TBK

AREA 2 : TYPICAL SECTION AT 56

Point Number	Northing	Easting	Elevation (ft)	Description
334	514937.58	3740298.65	-3.45	TBK
335	514945.73	3740294.85	-7.25	WE
336	514946.64	3740294.42	-7.85	CB
337	514956.61	3740289.78	-9.85	CB
338	514959.33	3740288.51	-8.75	CB
339	514960.23	3740288.09	-7.25	WE
340	514967.49	3740284.70	-3.05	TBK

AREA 2 : TYPICAL SECTION AT 59

Point Number	Northing	Easting	Elevation (ft)	Description
341	514873.17	3740527.29	-4.13	TBK
342	514865.99	3740511.88	-7.23	WE
343	514857.53	3740493.76	-8.23	CB
344	514849.08	3740475.63	-8.63	CB
345	514840.63	3740457.51	-9.23	CB
346	514832.18	3740439.38	-9.53	CB
347	514823.72	3740421.25	-9.23	CB
348	514815.27	3740403.13	-8.93	CB
349	514812.31	3740396.78	-7.23	WE
350	514809.78	3740391.35	-4.43	TBK

AREA 2 : TYPICAL SECTION AT 60

Point Number	Northing	Easting	Elevation (ft)	Description
351	512796.23	3738069.03	-2.60	TBK
352	512794.51	3738065.42	-4.80	TOE
353	512788.91	3738053.68	-5.00	CLD
354	512783.31	3738041.95	-4.90	TOE
355	512780.73	3738036.53	-1.60	TBK

AREA 2 : TYPICAL SECTION AT 64

Point Number	Northing	Easting	Elevation (ft)	Description
356	525438.40	3721455.06	2.07	TBK
357	525438.83	3721460.87	-1.10	TOE
358	525435.70	3721465.99	-1.01	TOE
359	525432.74	3721470.91	2.07	TBK

St. Bernard Parish

AREA 3

Horizontal Datum: NAD 1983(1992)

Horizontal Coordinate System: U.S. State Plane, 1983, Zone: Louisiana South 1702

Vertical Datum: NAVD88(2004.65)

Coordinate Units: US survey feet

Distance Units: U.S. survey feet

Height Units: U.S. survey feet

AREA 3 : TYPICAL SECTION AT 1

Point Number	Northing	Easting	Elevation (ft)	Description
1	512944.36	3741327.15	-1.23	TBK
2	512941.85	3741320.62	-2.83	WE
3	512934.68	3741301.94	-7.33	CB
4	512927.51	3741283.27	-8.83	CB
5	512920.35	3741264.60	-7.43	CB
6	512913.18	3741245.93	-10.83	CB
7	512906.01	3741227.26	-4.23	CB
8	512904.22	3741222.59	-2.83	WE
9	512902.07	3741216.99	0.27	TBK

AREA 3 : TYPICAL SECTION AT 2

Point Number	Northing	Easting	Elevation (ft)	Description
10	510355.94	3742632.68	-1.44	TBK
11	510355.06	3742629.81	-2.84	WE
12	510353.02	3742623.12	-5.34	CB
13	510348.63	3742608.77	-7.34	CB
14	510345.71	3742599.21	-9.84	CB
15	510339.86	3742580.08	-10.94	CB
16	510334.01	3742560.96	-11.84	CB
17	510328.17	3742541.83	-9.44	CB
18	510323.20	3742525.57	-2.84	WE
19	510320.56	3742516.97	-1.54	SLP
20	510318.23	3742509.32	-0.14	TBK

AREA 3 : TYPICAL SECTION AT 3

Point Number	Northing	Easting	Elevation (ft)	Description
21	508070.15	3742928.53	0.00	TBK
22	508070.31	3742922.54	-1.20	SLP
23	508070.47	3742916.54	-2.90	WE
24	508070.62	3742910.54	-4.90	CB
25	508071.15	3742890.55	-8.90	CB
26	508071.67	3742870.55	-8.90	CB
27	508072.19	3742850.56	-9.20	CB
28	508072.72	3742830.57	-9.90	CB
29	508073.24	3742810.57	-3.90	CB
30	508073.35	3742806.58	-2.90	WE
31	508073.45	3742802.58	-1.60	SLP
32	508073.61	3742796.58	0.70	TBK

AREA 3 : TYPICAL SECTION AT 5

Point Number	Northing	Easting	Elevation (ft)	Description
33	504933.16	3743015.56	1.81	TBK
34	504927.90	3743012.69	-0.99	SLP
35	504921.75	3743009.33	-2.69	WE
36	504913.85	3743005.02	-5.69	CB
37	504900.68	3742997.84	-6.09	CB
38	504887.52	3742990.65	-9.29	CB
39	504879.62	3742986.34	-8.39	CB
40	504872.59	3742982.51	-6.69	CB
41	504866.45	3742979.16	-4.99	CB
42	504861.18	3742976.29	-2.69	WE
43	504860.30	3742975.81	-1.39	SLP
44	504852.40	3742971.50	2.01	TBK

AREA 3 : TYPICAL SECTION AT 6

Point Number	Northing	Easting	Elevation (ft)	Description
45	503875.42	3749894.12	-0.97	TBK
46	503867.46	3749893.35	-2.07	SLP
47	503862.48	3749892.87	-3.07	WE
48	503852.53	3749891.92	-6.07	CB
49	503842.58	3749890.96	-6.37	CB
50	503822.67	3749889.04	-6.27	CB
51	503812.71	3749888.08	-6.17	CB
52	503802.76	3749887.12	-3.07	WE
53	503792.81	3749886.17	-1.77	SLP
54	503782.85	3749885.21	0.43	TBK

AREA 3 : TYPICAL SECTION AT 7

Point Number	Northing	Easting	Elevation (ft)	Description
55	502968.37	3753158.97	-0.83	TBK
56	502962.19	3753155.69	-1.73	SLP
57	502958.65	3753153.81	-3.03	WE
58	502956.00	3753152.40	-4.03	CB
59	502947.18	3753147.70	-5.03	CB
60	502929.52	3753138.32	-7.53	CB
61	502911.86	3753128.93	-7.63	CB
69	502904.79	3753125.17	-3.03	WE
70	502899.50	3753122.35	-1.93	TBK

AREA 3 : TYPICAL SECTION AT 8

Point Number	Northing	Easting	Elevation (ft)	Description
62	505556.87	3760986.53	-2.97	WE
63	505542.88	3760986.16	-7.17	CB
64	505522.89	3760985.64	-7.67	CB
65	505502.89	3760985.12	-7.07	CB
66	505487.90	3760984.72	-2.97	WE
67	505482.90	3760984.59	-1.47	TBK
68	505562.87	3760986.69	-1.77	TBK

AREA 3 : TYPICAL SECTION AT 9

Point Number	Northing	Easting	Elevation (ft)	Description
71	505060.12	3769083.37	-1.11	TBK
72	505057.25	3769082.52	-3.01	WE
73	505038.07	3769076.84	-7.01	CB
74	505018.89	3769071.16	-9.41	CB
75	504999.72	3769065.48	-9.41	CB
76	504980.54	3769059.80	-10.51	CB
77	504961.36	3769054.12	-4.91	CB
78	504952.73	3769051.57	-3.01	WE
79	504941.23	3769048.16	-1.11	TBK

AREA 3 : TYPICAL SECTION AT 10

Point Number	Northing	Easting	Elevation (ft)	Description
80	503798.82	3772539.84	-2.22	TBK
81	503798.37	3772538.95	-3.02	WE
82	503797.46	3772537.17	-5.02	CB
83	503788.38	3772519.35	-9.52	CB
84	503779.30	3772501.53	-9.22	CB
85	503770.22	3772483.71	-10.22	CB
86	503761.14	3772465.88	-10.12	CB
87	503752.06	3772448.06	-7.52	CB
88	503744.80	3772433.81	-3.02	WE
89	503740.71	3772425.79	-1.32	TBK

AREA 3 : TYPICAL SECTION AT 11

Point Number	Northing	Easting	Elevation (ft)	Description
90	500687.77	3773335.93	0.59	TBK
91	500689.93	3773329.27	-2.01	SLP
92	500691.47	3773324.51	-3.01	WE
93	500694.26	3773315.96	-3.41	CB
94	500700.44	3773296.93	-4.01	CB
95	500706.62	3773277.91	-3.61	CB
96	500712.80	3773258.89	-3.51	CB
97	500714.65	3773253.19	-4.31	CB
98	500715.89	3773249.38	-6.01	CB
99	500718.98	3773239.87	-9.71	CB
100	500722.99	3773227.51	-3.01	WE
101	500724.23	3773223.70	1.29	TBK
285	504452.74	3761780.48	-1.50	TD
286	504448.75	3761780.31	-0.30	SLP
287	504443.75	3761780.09	0.80	TBK

AREA 3 : TYPICAL SECTION AT 12

Point Number	Northing	Easting	Elevation (ft)	Description
102	500290.75	3765319.78	4.92	ER
103	500287.75	3765319.67	4.52	TBK
104	500277.76	3765319.33	0.32	SLP
105	500272.76	3765319.15	-0.68	WE
106	500270.76	3765319.08	-1.28	BD
107	500268.76	3765319.01	-2.48	BD
108	500261.77	3765318.77	-2.68	BD
109	500250.77	3765318.38	-1.98	BD
110	500244.78	3765318.17	-0.68	WE

111	500238.78	3765317.96	0.82	TBK
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AREA 3 : TYPICAL SECTION AT 13

Point Number	Northing	Easting	Elevation (ft)	Description
112	499544.91	3771510.78	5.08	ER
113	499544.10	3771510.20	4.08	TBK
114	499534.39	3771503.14	-1.52	SLP
115	499530.35	3771500.20	-2.72	WE
116	499526.30	3771497.26	-3.72	DB
117	499519.02	3771491.97	-4.32	DB
118	499512.55	3771487.27	-3.72	DB
119	499509.31	3771484.92	-2.72	WE
120	499504.46	3771481.39	-1.42	SLP
121	499498.80	3771477.28	0.58	SLP
122	499490.70	3771471.40	2.28	TBK

AREA 3 : TYPICAL SECTION AT 14

Point Number	Northing	Easting	Elevation (ft)	Description
123	499472.26	3772962.60	1.66	TBK
124	499474.41	3772956.99	-0.94	SLP
125	499477.63	3772948.59	-2.94	WE
126	499479.78	3772942.99	-4.34	CB
127	499483.37	3772933.65	-4.94	CB
128	499486.95	3772924.32	-5.74	CB
129	499494.12	3772905.65	-4.24	CB
130	499494.83	3772903.78	-2.94	WE
131	499497.34	3772897.24	-1.24	SLP
132	499498.78	3772893.51	1.66	TBK

AREA 3 : TYPICAL SECTION AT 15

Point Number	Northing	Easting	Elevation (ft)	Description
102	500290.75	3765319.78	4.92	ER
103	500287.75	3765319.67	4.52	TBK
133	498364.26	3772544.24	1.89	TBK
134	498365.29	3772540.38	-0.71	SLP
135	498367.62	3772531.69	-2.91	WE
136	498370.73	3772520.10	-6.11	CB
137	498373.32	3772510.44	-6.71	CB
138	498375.91	3772500.78	-7.31	CB
139	498378.49	3772491.12	-7.01	CB
140	498381.08	3772481.46	-6.61	CB
141	498384.71	3772467.94	-2.91	WE
142	498387.04	3772459.24	-0.91	SLP
143	498388.59	3772453.45	1.19	TBK

AREA 3 : TYPICAL SECTION AT 16

Point Number	Northing	Easting	Elevation (ft)	Description
366	495995.62	3768430.89	0.83	TBK
367	496001.60	3768431.36	-1.87	SLP
368	496006.59	3768431.75	-2.97	WE
369	496008.58	3768431.90	-4.67	CB
370	496018.55	3768432.68	-5.47	CB
371	496038.49	3768434.24	-7.57	CB
372	496058.43	3768435.80	-6.97	CB

373	496074.38	3768437.04	-2.97	WE
374	496081.36	3768437.59	-1.07	SLP
375	496087.34	3768438.06	0.73	TBK
375	496087.34	3768438.06	0.73	TBK

AREA 3 : TYPICAL SECTION AT 17

Point Number	Northing	Easting	Elevation (ft)	Description
144	495767.85	3751050.87	-2.08	TBK
145	495771.84	3751050.72	-2.98	WE
146	495791.83	3751050.00	-6.48	CB
147	495811.82	3751049.27	-8.08	CB
148	495831.80	3751048.54	-8.98	CB
149	495851.79	3751047.82	-9.28	CB
150	495866.78	3751047.27	-7.58	CB
151	495876.77	3751046.91	-2.98	WE
152	495881.77	3751046.73	-1.28	TBK

AREA 3 : TYPICAL SECTION AT 18

Point Number	Northing	Easting	Elevation (ft)	Description
153	500879.97	3757034.41	5.58	ER
154	500877.07	3757033.63	5.18	TBK
155	500871.28	3757032.08	3.08	SLP
156	500865.48	3757030.53	0.08	WE
157	500862.58	3757029.75	-1.02	DB
158	500857.75	3757028.46	-1.52	DB
159	500852.92	3757027.16	-1.92	DB
160	500844.23	3757024.83	-1.42	DB
161	500836.50	3757022.76	0.08	WE
162	500828.78	3757020.69	3.38	TBK

AREA 3 : TYPICAL SECTION AT 19

Point Number	Northing	Easting	Elevation (ft)	Description
163	500040.31	3750236.45	7.94	ER
164	500033.47	3750234.94	4.84	SLP
165	500025.66	3750233.21	1.04	WE
166	500015.90	3750231.04	-0.16	TD
167	500008.09	3750229.31	0.34	TD
168	500006.14	3750228.88	1.04	WE
169	499999.30	3750227.36	3.34	TBK

AREA 3 : TYPICAL SECTION AT 20

Point Number	Northing	Easting	Elevation (ft)	Description
170	500347.36	3743685.66	8.12	ER
171	500344.37	3743685.51	7.82	TBK
172	500340.37	3743685.30	7.02	SLP
173	500331.38	3743684.82	2.72	WE
174	500324.39	3743684.46	1.72	TD
175	500312.41	3743683.83	1.72	TD
176	500306.42	3743683.52	2.72	WE
177	500299.43	3743683.15	5.52	TBK

AREA 3 : TYPICAL SECTION AT 21

Point Number	Northing	Easting	Elevation (ft)	Description
178	495553.89	3735396.14	0.67	TBK
179	495564.89	3735396.33	-1.53	SLP
180	495568.89	3735396.40	-2.93	WE
181	495587.88	3735396.74	-5.93	CB
182	495607.88	3735397.08	-7.03	CB
183	495627.88	3735397.43	-9.43	CB
184	495647.88	3735397.78	-7.03	CB
185	495665.87	3735398.10	-2.93	WE
186	495669.87	3735398.17	-1.43	SLP
187	495681.87	3735398.38	1.07	TBK

AREA 3 : TYPICAL SECTION AT 22

Point Number	Northing	Easting	Elevation (ft)	Description
188	500336.18	3738765.29	8.64	ER
189	500331.18	3738765.51	8.14	TBK
190	500328.19	3738765.64	7.14	SLP
191	500320.19	3738765.99	3.34	WE
192	500314.20	3738766.25	1.54	TD
193	500306.21	3738766.60	1.54	TD
194	500299.21	3738766.90	3.34	WE
195	500292.22	3738767.21	6.64	TBK

AREA 3 : TYPICAL SECTION AT 23

Point Number	Northing	Easting	Elevation (ft)	Description
196	502437.51	3737069.24	4.29	TBK
197	502428.64	3737067.67	-1.11	WE
198	502423.72	3737066.81	-2.01	CLD
199	502419.78	3737066.11	-1.11	WE
200	502409.93	3737064.38	5.39	TBK

AREA 3 : TYPICAL SECTION AT 24

Point Number	Northing	Easting	Elevation (ft)	Description
201	501895.01	3741813.45	2.45	TBK
202	501899.00	3741813.73	-0.25	SLP
203	501903.99	3741814.08	-1.85	SLP
204	501904.99	3741814.14	-2.85	WE
205	501907.98	3741814.35	-3.85	DB
206	501912.97	3741814.70	-4.85	DB
207	501918.95	3741815.12	-5.35	DB
208	501927.93	3741815.75	-5.45	DB
209	501931.92	3741816.03	-2.85	WE
210	501934.91	3741816.24	-1.55	SLP
211	501941.90	3741816.73	1.65	TBK

AREA 3 : TYPICAL SECTION AT 25

Point Number	Northing	Easting	Elevation (ft)	Description
212	501913.29	3742411.54	0.67	TBK
213	501913.55	3742408.55	-0.14	SLP
214	501914.25	3742400.58	-2.73	WE
215	501914.60	3742396.60	-4.24	DB
216	501915.73	3742383.65	-7.24	DB
217	501916.78	3742371.69	-5.13	DB

218	501917.21	3742366.71	-2.73	WE
219	501917.30	3742365.72	-1.74	SLP
220	501917.56	3742362.73	-0.94	SLP
221	501918.09	3742356.75	0.96	TBK

AREA 3 : TYPICAL SECTION AT 26

Point Number	Northing	Easting	Elevation (ft)	Description
222	503002.82	3744659.86	5.47	ER
223	503003.65	3744640.87	3.07	SLP
224	503004.17	3744628.89	1.37	NG
225	503004.39	3744623.89	0.47	WE
226	503004.65	3744617.90	-0.23	CLD
227	503004.83	3744613.90	0.47	WE
228	503005.00	3744609.90	1.87	SLP
229	503005.44	3744599.91	3.57	TBK

AREA 3 : TYPICAL SECTION AT 27

Point Number	Northing	Easting	Elevation (ft)	Description
230	502158.16	3746505.30	6.07	ER
231	502154.16	3746505.23	5.47	SLP
232	502136.16	3746504.92	3.27	SLP
233	502113.16	3746504.52	1.07	TBK
234	502104.16	3746504.36	-0.43	WE
235	502098.17	3746504.25	-1.73	CLD
236	502094.17	3746504.18	-0.43	WE
237	502089.17	3746504.10	1.17	TBK

AREA 3 : TYPICAL SECTION AT 28

Point Number	Northing	Easting	Elevation (ft)	Description
238	502196.13	3749425.63	6.06	ER
239	502190.13	3749425.73	5.56	SLP
240	502174.13	3749426.01	3.46	SLP
241	502160.14	3749426.26	1.16	SLP
242	502151.14	3749426.41	0.16	TBK
243	502148.14	3749426.46	-0.24	WE
244	502143.14	3749426.55	-1.54	CLD
245	502137.14	3749426.66	-0.24	WE
246	502133.14	3749426.73	1.26	TBK

AREA 3 : TYPICAL SECTION AT 29

Point Number	Northing	Easting	Elevation (ft)	Description
247	502255.47	3751666.31	5.70	ER
248	502251.47	3751666.31	5.20	SLP
249	502245.47	3751666.31	4.30	SLP
250	502235.47	3751666.31	3.50	SLP
251	502217.47	3751666.31	1.50	SLP
252	502197.47	3751666.31	0.20	TBK
253	502187.47	3751666.31	-1.40	WE
254	502184.47	3751666.31	-2.80	CLD
255	502176.47	3751666.31	-1.40	WE
256	502171.47	3751666.31	0.20	TBK

AREA 3 : TYPICAL SECTION AT 30

Point Number	Northing	Easting	Elevation (ft)	Description
257	502355.33	3754355.53	6.83	ER
258	502350.38	3754356.23	6.23	SLP
259	502339.49	3754357.76	3.83	SLP
260	502323.64	3754359.98	1.53	SLP
261	502301.86	3754363.05	-0.17	WE
262	502297.90	3754363.60	-2.17	TD
263	502290.96	3754364.58	-2.17	TD
264	502283.04	3754365.69	0.13	TBK

AREA 3 : TYPICAL SECTION AT 31

Point Number	Northing	Easting	Elevation (ft)	Description
265	503107.92	3756773.71	5.91	ER
266	503089.12	3756780.55	3.61	SLP
267	503055.29	3756792.86	0.31	TBK
268	503050.59	3756794.57	-3.39	TD
269	503044.02	3756796.97	-3.19	TD
270	503038.38	3756799.02	0.31	TBK

AREA 3 : TYPICAL SECTION AT 32

Point Number	Northing	Easting	Elevation (ft)	Description
271	504045.95	3759161.84	5.95	ER
272	504026.03	3759168.50	3.85	SLP
273	504007.07	3759174.85	0.85	SLP
274	503993.79	3759179.29	-0.15	TBK
275	503990.00	3759180.56	-2.15	TD
276	503983.36	3759182.78	-4.15	CLD
277	503979.56	3759184.05	-1.55	TD
278	503974.82	3759185.64	0.85	TBK

AREA 3 : TYPICAL SECTION AT 33

Point Number	Northing	Easting	Elevation (ft)	Description
279	504519.68	3761783.40	5.70	ER
280	504494.70	3761782.31	3.10	SLP
281	504477.72	3761781.57	0.70	SLP
282	504466.73	3761781.09	0.10	TBK
283	504461.74	3761780.87	-1.30	TD
284	504458.74	3761780.74	-1.50	CLD
285	504452.74	3761780.48	-1.50	TD
286	504448.75	3761780.31	-0.30	SLP
287	504443.75	3761780.09	0.80	TBK

AREA 3 : TYPICAL SECTION AT 34

Point Number	Northing	Easting	Elevation (ft)	Description
288	504330.64	3764320.72	4.94	ER
289	504303.97	3764316.49	4.34	SLP
290	504289.16	3764314.15	3.74	SLP
291	504275.33	3764311.96	0.04	TBK
292	504268.41	3764310.86	-2.56	TD
293	504264.46	3764310.24	-2.96	CLD
294	504257.55	3764309.14	-2.66	TD
295	504252.61	3764308.36	-1.56	SLP
296	504248.66	3764307.73	0.24	TBK

AREA 3 : TYPICAL SECTION AT 35

Point Number	Northing	Easting	Elevation (ft)	Description
297	504135.62	3766917.68	4.27	ER
298	504113.68	3766916.15	1.57	SLP
299	504092.73	3766914.68	-0.23	SLP
300	504074.77	3766913.43	-1.53	TBK
301	504069.78	3766913.08	-3.33	TD
302	504062.80	3766912.59	-4.13	CLD
303	504056.81	3766912.17	-3.23	TD
304	504052.82	3766911.89	-1.13	TBK

AREA 3 : TYPICAL SECTION AT 36

Point Number	Northing	Easting	Elevation (ft)	Description
305	503921.94	3769559.05	3.12	ER
306	503896.51	3769553.64	1.92	SLP
307	503869.12	3769547.82	-0.78	TBK
308	503859.34	3769545.74	-3.98	TD
309	503851.52	3769544.08	-7.98	CLD
310	503843.69	3769542.42	-7.88	TD
311	503837.82	3769541.17	-0.68	TBK

AREA 3 : TYPICAL SECTION AT 37

Point Number	Northing	Easting	Elevation (ft)	Description
312	502504.94	3771565.22	4.01	ER
313	502495.54	3771552.28	2.81	SLP
314	502483.19	3771535.29	1.01	SLP
315	502472.03	3771519.92	-0.19	TBK
316	502468.50	3771515.06	-1.39	SLP
317	502466.15	3771511.82	-2.89	WE
318	502463.80	3771508.59	-3.99	DB
319	502462.03	3771506.16	-6.59	DB
320	502457.33	3771499.69	-5.69	DB
321	502454.39	3771495.64	-2.89	WE
322	502452.63	3771493.22	-1.39	TBK

AREA 3 : TYPICAL SECTION AT 38

Point Number	Northing	Easting	Elevation (ft)	Description
323	500373.84	3773163.32	8.16	ER
324	500368.34	3773153.80	6.86	SLP
325	500352.34	3773126.08	0.96	SLP
326	500338.84	3773102.70	-1.74	TBK
327	500338.34	3773101.83	-2.64	WE
328	500336.84	3773099.24	-3.14	DB
329	500335.84	3773097.50	-7.54	DB
330	500333.84	3773094.04	-9.54	DB
331	500331.34	3773089.71	-5.44	DB
332	500329.84	3773087.11	-2.64	WE
333	500328.84	3773085.38	-1.44	TBK

AREA 3 : TYPICAL SECTION AT 39

Point Number	Northing	Easting	Elevation (ft)	Description
95	500706.62	3773277.91	-3.61	CB
127	499483.37	3772933.65	-4.94	CB
128	499486.95	3772924.32	-5.74	CB
323	500373.84	3773163.32	8.16	ER
334	500283.95	3773150.57	-3.01	WE
335	500290.67	3773152.53	-0.81	TBK
336	500304.12	3773156.43	0.39	SLP
337	500324.28	3773162.28	3.49	SLP
338	500348.29	3773169.25	7.19	SLP
339	500360.78	3773172.87	8.19	ER
340	500404.95	3773185.69	8.39	ER
341	500425.12	3773191.55	6.79	NG
342	500449.13	3773198.52	8.39	ER
343	500496.19	3773212.17	7.59	ER
344	500522.12	3773219.70	4.74	SLP
345	500541.33	3773225.27	1.44	TBK
346	500548.05	3773227.22	-2.76	WE

AREA 3 : TYPICAL SECTION AT 40

Point Number	Northing	Easting	Elevation (ft)	Description
90	500687.77	3773335.93	0.59	TBK
91	500689.93	3773329.27	-2.01	SLP
334	500283.95	3773150.57	-3.01	WE
335	500290.67	3773152.53	-0.81	TBK
336	500304.12	3773156.43	0.39	SLP
337	500324.28	3773162.28	3.49	SLP
338	500348.29	3773169.25	7.19	SLP
339	500360.78	3773172.87	8.19	ER
340	500404.95	3773185.69	8.39	ER
347	498970.07	3772502.25	3.86	ER
348	498969.17	3772501.81	3.26	TBK
349	498964.68	3772499.62	1.86	SLP
350	498961.09	3772497.87	-0.24	SLP
351	498958.39	3772496.55	-0.84	SLP
352	498953.89	3772494.36	-2.84	WE
353	498950.30	3772492.61	-4.24	DB
354	498939.51	3772487.35	-6.14	DB
355	498934.12	3772484.72	-3.84	DB
356	498928.73	3772482.09	-2.84	WE
357	498926.03	3772480.77	-1.84	SLP
358	498922.44	3772479.02	0.56	TBK

AREA 3 : TYPICAL SECTION AT 41

Point Number	Northing	Easting	Elevation (ft)	Description
1	512944.36	3741327.15	-1.23	TBK
2	512941.85	3741320.62	-2.83	WE
352	498953.89	3772494.36	-2.84	WE
353	498950.30	3772492.61	-4.24	DB
354	498939.51	3772487.35	-6.14	DB
355	498934.12	3772484.72	-3.84	DB
356	498928.73	3772482.09	-2.84	WE
359	498929.38	3772515.59	-2.87	WE
360	498927.33	3772520.15	-0.97	SLP
361	498923.64	3772528.36	0.83	TBK
362	498921.18	3772533.83	1.23	RMP
363	498911.33	3772555.72	1.53	RMP
364	498907.64	3772563.93	1.53	TBK
365	498905.59	3772568.49	-2.87	WE

Appendix 4

IHNC West Bank Breach Surveys

Florida Ave. to I-10, on and along France Road

Horizontal Datum: NAD 1983(1992)

Horizontal Coordinate System: U.S. State Plane, 1983, Zone: Louisiana South 1702

Vertical Datum: NAVD88(2004.65)

Coordinate Units: US survey feet

Distance Units: U.S. survey feet

Height Units: U.S. survey feet

Refer to digital file "IHNCFRANCERD.dc" for raw data.

Name	Northing	Easting	Elevation	Location
OP17	542897.98	3688637.67	-2.15	RTK BASE
TBM FRANCE	543277.00	3694356.18	4.62	CHK
IHNC2	549241.35	3694222.18	11.94	HUB AND TACK
IHNC1	548991.46	3693868.93	4.35	SPIKE NAIL
100	549420.94	3694236.63	12.41	TOP CONC FLDWALL
101	549418.78	3694236.47	4.24	TOE FLDGATE
102	549387.88	3694245.77	4.66	TOE FLDGATE
103	549385.80	3694246.87	12.46	TOP CONC FLDWALL
104	549376.64	3694249.92	12.42	TOP CONC FLDWALL
105	549376.41	3694249.95	13.20	TOP CONC FLDWALL
106	549375.55	3694250.66	13.19	TOP CONC FLDWALL
107	549344.99	3694259.83	12.92	TOP CONC FLDWALL
108	549325.45	3694265.08	12.73	END FLDWALL
109	549324.79	3694265.36	12.73	C/L LEVEE
110	549315.94	3694266.33	12.96	EDGE RAMP
111	549299.26	3694266.27	11.73	C/L RAMP
112	549283.85	3694260.65	11.74	EDGE RAMP
113	549262.73	3694245.80	12.02	C/L LEVEE
114	549193.32	3694168.87	12.43	C/L LEVEE
115	549152.95	3694118.09	12.25	C/L LEVEE
116	549127.74	3694081.39	12.16	C/L LEVEE
117	549095.07	3694026.87	12.12	C/L LEVEE
118	549064.34	3693973.45	11.91	C/L LEVEE
119	549064.01	3693972.61	11.87	EDGE CONC FLDWALL
120	549062.41	3693966.58	12.01	TOP CONC FLDWALL
121	548995.18	3693940.36	12.08	TOP CONC FLDWALL
122	548942.26	3693918.99	12.62	TOP CONC FLDWALL
123	548899.59	3693923.05	12.84	TOP CONC FLDWALL

Name	Northing	Easting	Elevation	Location
124	548856.89	3693926.79	13.01	TOP CONC FLDWALL
125	548856.41	3693926.69	12.50	TOP CONC FLDWALL
126	548843.65	3693927.51	12.51	TOP CONC FLDWALL
127	548843.15	3693925.12	12.54	TOP CONC FLDWALL
128	548841.09	3693907.95	12.50	TOP CONC FLDWALL
129	548841.19	3693905.65	3.16	TOE FLDGATE
130	548839.44	3693888.98	3.29	TOE FLDGATE
131	548838.68	3693886.79	12.50	TOP CONC FLDWALL
132	548837.34	3693876.98	12.51	TOP CONC FLDWALL
133	548835.44	3693876.86	12.51	TOP CONC FLDWALL
134	548834.17	3693865.73	12.46	TOP CONC FLDWALL
135	548773.68	3693870.59	12.42	TOP CONC FLDWALL
136	548771.92	3693856.48	12.38	END CONC FLDWALL
137	548771.93	3693855.78	12.00	TOE
138	548771.65	3693853.37	12.26	EDGE ASPHALT ROAD
139	548769.60	3693842.84	12.23	C/L ROAD
140	548768.77	3693829.19	12.04	EDGE ASPHALT ROAD
141	548767.29	3693819.40	11.91	NG
142	548767.87	3693803.73	12.65	EDGE ASPHALT ROAD
143	548767.49	3693792.66	12.59	C/L ROAD
144	548766.92	3693779.38	12.39	EDGE ASPHALT ROAD
145	548766.47	3693776.99	12.51	C/L LEVEE
146	548766.09	3693772.09	12.78	C/L LEVEE
147	548764.43	3693759.25	12.00	C/L LEVEE
148	548762.26	3693740.50	12.24	C/L LEVEE
149	548754.71	3693662.48	12.00	C/L LEVEE
150	548746.64	3693587.22	12.25	C/L LEVEE
151	548744.77	3693586.82	12.25	END CONC FLDWALL
152	548741.80	3693558.00	12.81	TOP CONC FLDWALL
153	548718.17	3693557.01	12.96	TOP CONC FLDWALL
154	548655.30	3693562.95	13.20	TOP CONC FLDWALL
155	548618.19	3693566.60	13.03	TOP CONC FLDWALL
156	548537.14	3693574.46	12.99	TOP CONC FLDWALL
157	548446.64	3693582.90	12.98	TOP CONC FLDWALL
158	548356.58	3693591.72	12.91	TOP CONC FLDWALL
159	548266.88	3693600.17	12.85	TOP CONC FLDWALL
160	548178.01	3693608.68	12.89	TOP CONC FLDWALL
161	548085.89	3693617.45	12.95	TOP CONC FLDWALL
162	547996.98	3693625.66	13.18	TOP CONC FLDWALL
163	547907.34	3693634.09	13.21	TOP CONC FLDWALL
164	547818.48	3693642.77	13.19	TOP CONC FLDWALL
165	547729.40	3693651.49	13.12	TOP CONC FLDWALL
166	547639.73	3693659.76	13.11	TOP CONC FLDWALL
167	547549.87	3693668.43	13.18	TOP CONC FLDWALL
168	547490.78	3693673.89	13.21	TOP CONC FLDWALL
169	547401.64	3693682.34	13.30	TOP CONC FLDWALL
170	547311.77	3693690.94	13.34	TOP CONC FLDWALL
171	547222.97	3693699.60	13.27	TOP CONC FLDWALL
172	547133.51	3693708.24	13.26	TOP CONC FLDWALL
173	547044.38	3693716.38	13.30	TOP CONC FLDWALL
174	546954.80	3693724.96	13.36	TOP CONC FLDWALL
175	546833.37	3693736.62	13.21	TOP CONC FLDWALL

Name	Northing	Easting	Elevation	Location
176	546743.74	3693745.16	13.18	TOP CONC FLDWALL
177	546713.97	3693747.80	13.22	TOP CONC FLDWALL
178	546683.70	3693749.77	13.23	TOP CONC FLDWALL
179	546608.19	3693755.43	13.33	TOP CONC FLDWALL
180	546535.25	3693771.23	13.36	TOP CONC FLDWALL
181	546447.37	3693790.41	13.26	TOP CONC FLDWALL
182	546330.00	3693816.67	13.22	TOP CONC FLDWALL
183	546242.06	3693836.14	13.19	TOP CONC FLDWALL
184	546153.50	3693855.83	13.25	TOP CONC FLDWALL
185	546064.06	3693875.42	13.19	TOP CONC FLDWALL
186	545974.27	3693895.22	13.23	TOP CONC FLDWALL
187	545885.62	3693914.78	13.23	TOP CONC FLDWALL
188	545795.58	3693935.09	13.10	TOP CONC FLDWALL
189	545706.97	3693954.65	13.16	TOP CONC FLDWALL
190	545677.54	3693961.10	13.14	TOP CONC FLDWALL
191	545648.30	3693967.82	13.25	TOP CONC FLDWALL
192	545560.00	3693987.19	13.03	TOP CONC FLDWALL
193	545471.87	3694006.25	12.98	TOP CONC FLDWALL
194	545384.37	3694025.94	13.07	TOP CONC FLDWALL
195	545295.95	3694045.87	12.88	TOP CONC FLDWALL
196	545209.89	3694064.79	12.82	TOP CONC FLDWALL
197	545119.41	3694084.75	12.69	TOP CONC FLDWALL
198	545030.89	3694104.21	12.74	TOP CONC FLDWALL
199	544971.73	3694117.35	12.90	TOP CONC FLDWALL
200	544884.27	3694136.82	12.92	TOP CONC FLDWALL
201	544796.24	3694156.45	12.81	TOP CONC FLDWALL
202	544708.79	3694175.70	12.86	TOP CONC FLDWALL
203	544620.41	3694195.26	13.03	TOP CONC FLDWALL
204	544532.58	3694214.70	12.99	TOP CONC FLDWALL
205	544444.85	3694233.95	13.19	TOP CONC FLDWALL
206	544357.14	3694253.37	13.08	TOP CONC FLDWALL
207	544269.64	3694272.88	13.11	TOP CONC FLDWALL
208	544181.20	3694292.16	12.97	TOP CONC FLDWALL
209	544123.61	3694304.53	12.79	END CONC FLDWALL
210	544122.32	3694304.55	4.52	TOE-END FLDWALL
211	544178.20	3694335.09	1.62	NG
212	544172.88	3694325.08	1.56	TOE
213	544166.25	3694309.68	2.96	SLOPE
214	544162.69	3694296.55	6.20	TOE
215	544162.39	3694296.51	12.89	TOP CONC FLDWALL
216	544156.66	3694295.47	4.01	TOE
217	544154.57	3694280.06	3.86	TOP
218	544152.67	3694271.80	2.10	TOE
219	544152.00	3694267.26	2.69	TOP OF RAIL
220	544150.60	3694262.75	2.55	TOP OF RAIL
221	544150.96	3694259.15	1.83	TOP
222	544149.29	3694253.17	0.71	TOE
223	544040.90	3694157.17	0.18	NG
224	544036.29	3694197.99	0.34	NG
225	543996.63	3694102.68	-0.27	NG
226	543944.83	3694115.82	-0.48	NG
227	543966.04	3694195.08	0.37	NG

Name	Northing	Easting	Elevation	Location
228	543972.84	3694229.28	0.26	NG
229	543865.48	3694266.47	-0.30	NG
230	543842.28	3694195.00	-0.30	NG
231	543714.06	3694229.75	-1.11	NG
232	543714.77	3694272.91	-1.02	NG
233	543718.92	3694302.91	-1.10	NG
234	543579.42	3694344.35	-1.06	NG
235	543567.48	3694299.93	-1.00	NG
236	543555.44	3694252.79	-1.05	NG
237	543666.19	3694276.54	-1.11	NG
238	543656.27	3694249.26	-0.98	NG
239	543642.45	3694217.94	-1.12	NG
240	543467.10	3694367.13	-0.30	NG
241	543451.95	3694332.13	-0.31	NG
242	543440.39	3694292.41	-0.17	NG
243	544137.48	3694302.31	8.29	C/L LEVEE
244	544136.27	3694313.20	8.05	C/L LEVEE
245	544129.87	3694320.69	8.00	C/L LEVEE
246	544031.41	3694342.20	7.94	C/L LEVEE
247	543935.15	3694363.94	7.98	C/L LEVEE
248	543837.45	3694386.52	7.95	C/L LEVEE
249	543803.94	3694398.08	7.85	C/L LEVEE
250	543730.69	3694414.59	7.71	C/L LEVEE
251	543632.90	3694433.45	7.60	C/L LEVEE
252	543534.10	3694449.87	7.94	C/L LEVEE
253	543435.57	3694465.09	7.87	C/L LEVEE
254	543390.76	3694471.25	7.79	C/L LEVEE
255	543378.55	3694470.39	7.76	C/L LEVEE
256	543308.05	3694452.53	7.82	C/L LEVEE
257	543309.42	3694446.68	7.64	C/L LEVEE-END
258	543312.25	3694446.31	3.68	TOE-END FLOODWALL
259	543311.32	3694446.79	13.35	END CONC FLDWALL
IHNC3	543247.21	3694283.72	0.88	1\2IN REBAR
IHNC4	543325.35	3694176.11	1.00	1\2IN REBAR
260	543112.38	3694397.80	7.78	C/L LEVEE-END
261	543108.44	3694401.69	8.13	C/L LEVEE
262	543014.07	3694377.52	7.70	C/L LEVEE
263	542917.45	3694354.47	8.11	C/L LEVEE
264	542820.97	3694330.93	7.81	C/L LEVEE
265	542728.07	3694307.45	7.93	C/L LEVEE
266	542723.87	3694306.35	8.58	C/L LEVEE
267	542670.14	3694294.77	8.19	C/L LEVEE
268	542627.90	3694283.21	7.53	C/L LEVEE
269	542625.49	3694280.61	7.39	C/L LEVEE
270	542626.38	3694275.73	7.28	C/L LEVEE-END
271	542671.93	3694287.79	4.94	TOE-END FLODWALL
272	542671.45	3694287.25	12.49	END CONC FLDWALL
273	542629.44	3694277.76	12.67	TOP CONC FLDWALL
274	542627.80	3694277.24	12.53	TOP CONC FLDWALL
275	542628.17	3694275.72	12.55	TOP CONC FLDWALL
276	542597.02	3694268.21	12.44	TOP CONC FLDWALL
277	542596.62	3694267.86	12.53	TOP CONC FLDWALL

Name	Northing	Easting	Elevation	Location
278	542591.60	3694266.72	12.57	TOP CONC FLDWALL
279	542587.92	3694281.36	12.53	TOP CONC FLDWALL
280	542588.09	3694281.73	13.28	TOP CONC FLDWALL
281	542586.86	3694283.21	13.31	END CONC FLDWALL
282	542587.78	3694284.09	3.09	TOE FLDGATE
283	542583.79	3694299.50	3.07	TOE FLDGATE
284	542583.63	3694300.05	13.28	END CONC FLDWALL
285	542582.82	3694301.67	13.31	TOP CONC FLDWALL
286	542582.72	3694301.90	12.58	TOP CONC FLDWALL
287	542581.44	3694307.56	12.51	TOP CONC FLDWALL
288	542581.48	3694308.09	13.38	TOP CONC FLDWALL
289	542578.04	3694325.16	13.23	TOP CONC FLDWALL
290	542576.09	3694334.32	13.10	END CONC FLDWALL
291	542576.01	3694334.54	10.51	TOE-FLDWALL
292	542827.67	3694414.77	2.35	C\I FRANCE ROAD
293	542801.48	3694408.00	2.41	C\I FRANCE ROAD
294	542775.19	3694401.46	2.70	C\I FRANCE ROAD
295	542749.30	3694395.00	3.19	C\I FRANCE ROAD
296	542723.03	3694388.44	3.84	C\I FRANCE ROAD
297	542697.36	3694381.99	4.90	C\I FRANCE ROAD
298	542671.54	3694375.55	6.32	C\I FRANCE ROAD
299	542645.25	3694369.13	7.79	C\I FRANCE ROAD
300	542619.64	3694362.73	9.17	C\I FRANCE ROAD
301	542594.62	3694356.56	10.22	C\I FRANCE ROAD
302	542568.11	3694349.66	10.62	C\I FRANCE ROAD
303	542555.35	3694346.33	2.60	C\I FRANCE ROAD
304	542541.09	3694343.20	2.26	C\I FRANCE ROAD
305	542538.76	3694342.28	10.56	C\I FRANCE ROAD
306	542528.23	3694340.00	9.70	C\I FRANCE ROAD
307	542498.23	3694332.35	7.80	C\I FRANCE ROAD
308	542458.20	3694321.88	5.43	C\I FRANCE ROAD
309	542454.06	3694321.09	2.10	C\I FRANCE ROAD
310	542439.30	3694318.15	0.94	C\I FRANCE ROAD
311	542581.62	3694334.54	10.43	C\I LEVEE
312	542557.02	3694433.20	10.94	C\I LEVEE
313	542533.78	3694528.97	11.01	C\I LEVEE
314	542507.21	3694625.98	10.80	C\I LEVEE
315	542482.02	3694723.23	10.96	C\I LEVEE
316	542458.93	3694818.22	10.74	C\I LEVEE
317	542434.64	3694916.01	10.47	C\I LEVEE
318	542426.71	3694952.37	9.95	C\I LEVEE
319	542415.52	3694983.29	10.03	C\I LEVEE
320	542412.83	3695000.09	10.23	C\I LEVEE
321	542412.54	3695003.75	9.89	TOE-FLDWALL
322	542412.54	3695004.06	13.08	END CONC FLDWALL
323	542410.94	3695010.63	13.87	END CONC FLDWALL
324	542411.32	3695009.06	13.89	TOP CONC FLDWALL
325	542411.39	3695008.72	13.13	TOP CONC FLDWALL
326	542410.71	3695011.15	6.28	TOE FLDGATE
327	542404.42	3695036.53	6.26	TOE FLDGATE
328	542404.23	3695037.10	13.84	END CONC FLDWALL
329	542402.73	3695043.46	13.07	END CONC FLDWALL

Name	Northing	Easting	Elevation	Location
330	542403.85	3695038.79	13.82	TOP CONC FLDWALL
331	542403.81	3695039.05	13.10	TOP CONC FLDWALL
332	542402.41	3695043.48	9.15	TOE FLDWALL
333	542400.95	3695044.87	9.83	C/L LEVEE
334	542397.93	3695059.19	10.30	C/L LEVEE
335	542375.37	3695155.03	10.81	C/L LEVEE
336	542351.64	3695248.94	10.91	C/L LEVEE
337	542339.06	3695301.12	11.37	C/L LEVEE
338	542330.30	3695342.10	10.48	C/L LEVEE
339	542316.91	3695415.26	10.04	C/L LEVEE
340	542309.55	3695439.22	9.69	C/L LEVEE
341	542301.53	3695470.39	10.48	C/L LEVEE
342	542298.02	3695484.97	10.79	C/L LEVEE-END PROFIL
343	542194.93	3695876.37	6.80	TOE FLDWALL
344	542194.26	3695876.77	13.02	TOP CONC FLDWALL
LA1054-WM	549412.38	3694521.34	11.92	TOP BLDG CINDER
346	544175.86	3694342.97	1.72	TOE
347	544176.49	3694348.47	2.90	TOP
348	544176.78	3694351.63	3.65	TOP OF RAIL
349	544177.53	3694356.31	3.69	TOP OF RAIL
350	544178.15	3694358.66	2.99	TOP
351	544179.76	3694365.80	0.63	TOE
352	544180.70	3694368.44	0.51	TOP DITCH
353	544181.37	3694370.11	0.04	WE
354	544183.04	3694386.43	-0.04	WE
355	544195.72	3694377.71	-2.44	C/L DITCH
356	544184.77	3694393.25	2.42	TOP DITCH
357	544185.85	3694402.70	3.59	PL
358	544188.14	3694411.22	3.42	EDGE ASPHALT ROAD
359	544189.93	3694423.17	3.29	C/L ROAD
360	544192.74	3694435.67	3.15	EDGE ASPHALT ROAD
361	544194.75	3694445.61	2.74	TOP DITCH
362	543258.67	3694433.59	12.98	END CONC FLDWALL
363	543256.32	3694431.96	3.51	TOE FLDGATE
364	543218.66	3694422.67	3.54	TOE FLDGATE
365	543202.85	3694418.75	3.54	TOE FLDGATE
366	543165.27	3694409.36	3.42	TOE FLDGATE
367	543216.40	3694422.35	12.89	END CONC FLDWALL
368	543204.96	3694419.52	12.94	END CONC FLDWALL
369	543162.66	3694409.01	12.89	END CONC FLDWALL
370	543109.54	3694396.85	12.92	END CONC FLDWALL
371	543109.19	3694396.16	4.78	TOE FLDWALL

Appendix 5

Railroad Detail

Topography

Horizontal Datum: NAD 1983(1992)

Horizontal Coordinate System: U.S. State Plane, 1983, Zone: Louisiana South 1702

Vertical Datum: NAVD88(2004.65)

Coordinate Units: US survey feet

Distance Units: U.S. survey feet

Height Units: U.S. survey feet

Name	Northing	Easting	Elevation	Code
102	544188.86	3680182.60	-0.20	EDGE CONC ABUTEMENT
103	544185.00	3680193.80	-5.39	TOP CONC RETAIN WALL
104	544184.76	3680194.05	-7.30	TOE
105	544181.76	3680203.29	-7.43	TOP CURB
106	544181.46	3680203.79	-8.03	EDGE ROAD
107	544173.46	3680224.79	-7.41	EDGE ROAD
108	544173.54	3680225.24	-6.77	TOP CURB
109	544171.57	3680230.33	-6.66	EDGE CONC PIER
110	544169.41	3680235.63	-6.86	EDGE CONC PIER
111	544168.98	3680237.29	-6.97	TOP CURB
112	544168.65	3680237.89	-7.61	EDGE ROAD
113	544155.79	3680270.77	-7.60	EDGE ROAD
114	544155.25	3680272.04	-6.95	TOP CURB
116	544154.03	3680274.46	-6.81	EDGE CONC PIER
117	544152.36	3680279.24	-6.94	EDGE CONC PIER
118	544151.46	3680281.24	-6.93	TOP CURB
119	544151.13	3680282.10	-7.55	EDGE ROAD
120	544137.53	3680315.64	-7.51	EDGE ROAD
121	544137.49	3680316.03	-6.88	TOP CURB
122	544136.69	3680318.62	-6.90	EDGE CONC PIER
123	544134.59	3680323.95	-7.13	EDGE CONC PIER
124	544132.15	3680330.42	-7.32	TOP CURB
125	544131.84	3680331.03	-7.95	EDGE ROAD
126	544122.79	3680354.57	-8.45	EDGE ROAD
127	544122.69	3680355.18	-7.82	TOP CURB
128	544116.09	3680370.53	-0.44	EDGE CONC ABUTEMENT
133	543730.78	3681338.42	8.21	TOP CONC ABUTEMENT
134	543730.32	3681338.97	3.92	EDGE CONC ABUTEMENT
135	543728.43	3681343.71	1.87	SLOPE
136	543726.00	3681349.69	0.59	TOP CONC WALL

Name	Northing	Easting	Elevation	Code
137	543725.61	3681350.85	-0.19	WES
138	543725.49	3681350.13	-4.53	TOE
139	543719.80	3681365.24	-6.53	CANAL BOTTOM
140	543713.31	3681381.32	-5.50	CANAL BOTTOM
142	543700.99	3681412.34	-3.23	CANAL BOTTOM
143	543694.71	3681428.94	-2.01	CANAL BOTTOM
144	543689.37	3681442.95	-1.10	CANAL BOTTOM
145	543684.96	3681454.03	-0.17	WES
146	543682.16	3681461.77	2.05	SLOPE
147	543680.28	3681465.58	2.62	EDGE CONC PIER
148	543680.15	3681465.89	5.82	TOP
149	543676.48	3681471.78	5.50	SLOPE
150	543673.54	3681483.25	8.14	TOP CONC ABUTEMENT
151	543610.09	3681653.76	0.97	EDGE CONC ABUTEMENT
152	543609.11	3681656.13	1.10	TOP
153	543601.45	3681675.13	-6.29	TOE
154	543601.29	3681676.32	-6.48	TOP CURB
155	543601.10	3681676.85	-7.00	TOE CURB
156	543599.57	3681680.97	-7.26	EDGE CONC PIER
157	543596.71	3681685.09	-7.57	EDGE CONC PIER
158	543595.34	3681688.26	-7.65	TOP CURB
159	543595.09	3681688.71	-8.25	EDGE ROAD
160	543583.77	3681717.46	-7.74	EDGE ROAD
161	543583.55	3681718.04	-7.21	TOP CURB
162	543581.03	3681724.08	-7.09	EDGE CONC PIER
163	543580.31	3681729.37	-6.82	EDGE CONC PIER
164	543577.88	3681736.41	-7.31	TOP CURB
165	543578.72	3681733.08	6.17	LOW CORD
166	543577.32	3681737.01	-7.83	EDGE ROAD
167	543566.40	3681764.99	-7.83	EDGE ROAD
168	543565.93	3681765.88	-7.39	TOP CURB
169	543564.74	3681768.19	-7.28	EDGE CONC PIER
170	543562.85	3681773.10	-6.66	EDGE CONC PIER
171	543562.99	3681773.24	-6.67	EDGE CONC PIER
172	543559.52	3681781.53	-6.67	TOE
173	543553.32	3681797.56	0.02	TOP
174	543552.20	3681800.52	0.60	EDGE CONC ABUTEMENT
200	542700.86	3688757.16	0.84	TOP
201	542696.84	3688763.15	-2.69	SLOPE
202	542690.95	3688771.72	-4.79	SLOPE
203	542683.22	3688783.11	-5.82	SLOPE
204	542674.61	3688793.13	-5.95	SLOPE
205	542665.50	3688804.69	-9.00	TOE
206	542662.17	3688808.69	-9.30	TOP CONC WALL
207	542660.41	3688810.50	-9.32	TOP CONC WALL
208	542659.52	3688810.98	-14.84	WES
209	542659.53	3688811.24	-16.15	TOE
210	542648.14	3688824.74	-16.74	CANAL BOTTOM
211	542633.65	3688840.39	-16.64	CANAL BOTTOM
212	542625.78	3688849.06	-16.23	TOE
213	542625.33	3688849.77	-16.24	TOE
214	542625.31	3688849.95	-14.88	WES

Name	Northing	Easting	Elevation	Code
215	542625.14	3688850.07	-9.33	TOP CONC WALL
216	542621.30	3688853.24	-8.76	SLOPE
217	542612.71	3688861.15	-6.15	E WOODEN ABUTEMENT
218	542612.97	3688861.27	1.11	TOP WOODEN ABUTEMENT
221	542567.84	3688885.92	2.51	C/L ROAD
239	544514.60	3687331.22	3.25	TOP CONC ABUTEMENT
240	544514.22	3687331.20	-13.18	EDGE CONC ABUTEMENT
241	544510.46	3687328.00	-14.66	EDGE SIDEWALK
242	544502.88	3687322.40	-14.83	EDGE SIDEWALK
243	544498.69	3687319.24	-16.78	TOE
244	544497.08	3687318.35	-16.67	TOP CURB
245	544495.75	3687317.44	-16.75	TOP CURB
246	544495.14	3687316.82	-17.44	EDGE ROAD
247	544459.53	3687289.73	-16.49	EDGE ROAD
248	544459.22	3687289.36	-15.83	TOP CURB
249	544458.08	3687288.65	-15.79	TOP CURB
250	544451.55	3687284.17	-15.73	TOP CURB
251	544449.40	3687282.34	-15.65	TOP CURB
252	544449.12	3687281.78	-16.19	EDGE ROAD
253	544413.93	3687255.39	-15.93	EDGE ROAD
254	544413.22	3687254.83	-15.34	TOP CURB
255	544412.48	3687254.31	-15.37	TOP CURB
256	544406.43	3687249.59	-14.50	EDGE SIDEWALK
257	544400.54	3687245.06	-14.48	EDGE SIDEWALK
258	544395.81	3687241.88	-13.46	EDGE CONC ABUTEMENT
259	544395.99	3687241.34	3.33	TOP CONC ABUTEMENT
261	542501.60	3689234.46	1.08	TOP
262	542508.06	3689246.18	-2.87	SLOPE
263	542513.69	3689261.32	-6.78	SLOPE
264	542518.93	3689272.90	-9.38	TOE
265	542519.86	3689274.24	-9.71	TOP CONC WALL
266	542521.11	3689276.22	-9.79	TOP CONC WALL
267	542521.32	3689277.33	-14.21	WES
268	542521.01	3689277.38	-16.84	TOE
269	542529.69	3689295.68	-17.22	CANAL BOTTOM
270	542536.66	3689311.24	-16.65	TOE
271	542536.62	3689311.13	-14.17	WES
272	542536.84	3689310.89	-9.82	TOP CONC WALL
273	542537.22	3689312.25	-9.82	TOP CONC WALL
274	542537.38	3689312.27	-10.69	TOE
275	542547.15	3689336.24	-9.95	TOE
276	542552.40	3689353.36	0.51	TOP
279	542513.63	3689207.94	1.31	TOP
280	542522.91	3689202.22	-3.20	SLOPE
281	542523.27	3689202.32	-4.63	SLOPE
282	542529.16	3689198.66	-6.36	SLOPE
283	542536.17	3689194.52	-9.51	TOE
284	542539.75	3689193.02	-9.63	TOP CONC WALL
285	542542.17	3689192.06	-9.60	TOP CONC WALL
286	542541.90	3689191.69	-14.12	WES
287	542541.87	3689191.99	-16.56	TOE
288	542556.46	3689183.21	-16.97	CANAL BOTTOM

Name	Northing	Easting	Elevation	Code
289	542570.63	3689174.80	-16.58	TOE
290	542570.49	3689174.95	-14.16	WES
291	542571.34	3689175.00	-9.56	TOP CONC WALL
292	542573.33	3689174.48	-9.66	TOP CONC WALL
293	542576.67	3689171.69	-9.61	TOE
294	542590.34	3689164.69	-8.91	SLOPE
295	542598.32	3689160.39	-7.98	SLOPE
296	542607.99	3689154.79	-2.75	SLOPE
297	542610.23	3689152.03	0.77	TOP
300	542576.96	3689028.25	0.32	TOP CONC ABUTEMENT
301	542578.11	3689028.49	-9.57	EDGE CONC ABUTEMENT
302	542580.34	3689028.37	-9.26	TOP CONC WALL
303	542582.68	3689028.18	-9.31	TOP CONC WALL
304	542582.50	3689027.83	-13.96	WES
305	542582.63	3689027.80	-15.91	TOE
306	542596.52	3689026.48	-16.77	CANAL BOTTOM
307	542608.55	3689025.74	-16.34	TOE
308	542607.53	3689026.06	-14.10	WES
309	542608.54	3689025.71	-9.50	TOP CONC WALL
310	542609.97	3689025.45	-9.53	TOP CONC WALL
311	542615.06	3689025.62	-9.44	EDGE CONC ABUTEMENT
312	542615.21	3689025.55	0.23	TOP CONC ABUTEMENT
314	546150.25	3688572.31	4.11	TOP CONC ABUTEMENT
315	546151.21	3688572.75	-3.79	EDGE CONC ABUTEMENT
316	546155.16	3688576.20	-4.19	TOP
317	546162.39	3688581.86	-8.03	SLOPE
318	546169.59	3688586.63	-8.96	SLOPE
319	546177.27	3688593.24	-12.16	TOE
320	546182.77	3688597.08	-12.95	WES
321	546187.77	3688601.03	-14.23	CANAL BOTTOM
322	546194.89	3688606.11	-15.26	CANAL BOTTOM
323	546199.56	3688609.75	-14.98	CANAL BOTTOM
324	546207.39	3688615.40	-13.07	WES
325	546211.30	3688618.41	-12.76	TOE
326	546217.33	3688623.08	-11.38	SLOPE
327	546222.50	3688626.73	-9.08	SLOPE
328	546222.13	3688626.92	-9.06	SLOPE
329	546235.00	3688636.44	-4.43	TOP
330	546241.59	3688641.66	-5.19	EDGE CONC ABUTEMENT
331	546242.08	3688642.17	4.21	TOP CONC ABUTEMENT
342	548700.81	3688525.15	13.77	TOP CONC ABUTEMENT
343	548699.92	3688525.18	5.99	TOP CONC ABUTEMENT
344	548709.40	3688524.15	1.75	SLOPE
345	548718.36	3688523.44	-3.87	TOE
346	548721.48	3688523.39	-3.97	TOP CURB
347	548722.19	3688523.28	-4.62	EDGE SIDEWALK
348	548727.39	3688522.80	-4.72	EDGE CONC PIER
349	548731.93	3688522.45	-4.93	EDGE CONC PIER
350	548732.66	3688522.52	-4.95	TOP CURB
351	548733.07	3688522.48	-5.53	EDGE ROAD
352	548762.49	3688520.19	-5.18	EDGE ROAD
353	548763.58	3688520.08	-4.54	TOP CURB

Name	Northing	Easting	Elevation	Code
354	548764.55	3688519.82	-4.54	EDGE CONC PIER
355	548769.33	3688519.07	-4.60	EDGE CONC PIER
356	548770.41	3688518.94	-4.51	TOP CURB
357	548770.84	3688518.93	-5.24	EDGE ROAD
358	548800.64	3688516.98	-5.68	EDGE ROAD
359	548801.00	3688517.02	-5.02	TOP CURB
360	548802.17	3688516.79	-5.06	EDGE CONC PIER
361	548806.97	3688516.61	-4.53	EDGE CONC PIER
362	548811.44	3688516.10	-4.37	EDGE SIDEWALK
363	548812.12	3688516.30	-3.98	TOP CURB
364	548812.59	3688516.02	-4.42	TOE
365	548814.37	3688515.98	-4.59	TOE
366	548823.23	3688515.12	0.28	SLOPE
367	548833.16	3688514.34	6.18	EDGE CONC ABUTEMENT
368	548833.53	3688513.80	13.49	TOP CONC ABUTEMENT
381	557982.67	3688500.89	5.20	TOP CONC ABUTEMENT
382	557982.76	3688501.52	-17.76	EDGE CONC ABUTEMENT
383	557990.91	3688510.40	-18.34	TOP CURB
384	557991.50	3688509.59	-22.76	EDGE ROAD
385	558008.15	3688529.62	-18.22	EDGE ROAD
386	558008.80	3688530.26	-17.61	TOP CURB
387	558016.97	3688540.12	-17.11	CL/ CL BENT
388	558025.67	3688549.23	-17.55	TOP CURB
389	558026.13	3688549.73	-18.22	EDGE ROAD
390	558045.29	3688567.55	-20.19	EDGE ROAD
391	558043.78	3688569.22	-18.36	EDGE ROAD
392	558047.57	3688573.95	-18.29	EDGE SIDEWALK
393	558051.65	3688578.33	-17.89	EDGE CONC ABUTEMENT
394	558051.88	3688578.69	5.84	TOP CONC ABUTEMENT
421	537264.03	3663070.99	1.33	TOP WOOD RETAINWALL
422	537264.33	3663070.52	-0.17	TOP WOOD BENT
423	537264.42	3663069.72	-0.13	TOP WOOD BENT
424	537264.19	3663069.73	-6.52	E WOODEN ABUTEMENT
425	537264.60	3663063.23	-9.87	SLOPE
426	537264.67	3663057.41	-10.80	SLOPE
427	537264.86	3663056.04	-11.38	WES
428	537265.04	3663051.42	-13.70	CANAL BOTTOM
429	537265.08	3663049.36	-15.61	CANAL BOTTOM
430	537266.06	3663039.65	-15.29	CANAL BOTTOM
431	537266.84	3663028.96	-13.65	CANAL BOTTOM
432	537266.96	3663024.35	-11.41	WES
433	537267.63	3663020.31	-9.61	SLOPE
434	537267.73	3663013.32	-5.73	SLOPE
435	537268.53	3663004.61	-3.62	E WOODEN ABUTEMENT
436	537268.31	3663004.45	0.11	TOP WOOD BENT
437	537268.60	3663003.19	0.17	TOP WOOD BENT
438	537269.08	3663002.71	1.68	TOP WOOD RETAINWALL
442	537271.95	3662705.12	4.18	TOP CONC RETAIN WALL
443	537271.65	3662704.84	0.21	TOP CONC ABUTEMENT
444	537271.80	3662699.48	0.25	TOP CONC ABUTEMENT
445	537272.44	3662699.36	-5.51	EDGE CONC ABUTEMENT
446	537273.23	3662681.26	-9.14	SLOPE

Name	Northing	Easting	Elevation	Code
447	537273.17	3662675.46	-10.56	SLOPE
448	537274.76	3662654.67	-13.15	SLOPE
449	537275.65	3662638.94	-14.71	TOE
450	537275.79	3662638.25	-14.17	TOP CURB
451	537275.74	3662637.76	-14.56	EDGE ROAD
452	537277.62	3662606.43	-14.17	EDGE ROAD
453	537277.88	3662603.45	-15.10	TOE
454	537278.80	3662590.28	-15.21	SLOPE
455	537279.01	3662590.03	-14.17	EDGE ROAD
456	537280.62	3662564.80	-14.56	EDGE ROAD
457	537280.68	3662564.33	-14.07	TOP CURB
458	537280.83	3662561.50	-14.30	TOE
459	537282.23	3662541.92	-10.98	SLOPE
460	537282.68	3662536.10	-8.68	SLOPE
461	537283.82	3662525.42	-7.61	SLOPE
462	537283.96	3662518.47	-5.67	EDGE CONC ABUTEMENT
463	537284.04	3662518.43	0.82	TOP CONC ABUTEMENT
464	537284.50	3662513.44	0.80	TOP CONC ABUTEMENT
465	537284.27	3662512.87	4.80	TOP CONC RETAIN WALL
466	537284.41	3662511.93	4.78	TOP CONC RETAIN WALL

Top Rail Elevations

Horizontal Datum: NAD 1983(1992)

Horizontal Coordinate System: U.S. State Plane, 1983, Zone: Louisiana South 1702

Vertical Datum: NAVD88(2004.65)

Coordinate Units: US survey feet

Distance Units: U.S. survey feet

Height Units: U.S. survey feet

Name	Northing	Easting	Elevation	Code
100	544187.43	3680113.98	10.81	TOP RAIL
101	544172.11	3680153.10	10.77	TOP RAIL/E RR BRIDGE
129	544094.97	3680349.12	10.78	TOP RAIL/E RR BRIDGE
130	543922.45	3680785.07	10.55	TOP RAIL
131	543708.21	3681329.43	9.52	TOP RAIL/E RR BRIDGE
175	543664.31	3681480.27	9.34	TOP RAIL/E RR BRIDGE
176	543599.82	3681644.02	9.20	TOP RAIL/E RR BRIDGE
177	543539.81	3681795.79	8.82	TOP RAIL/E RR BRIDGE
178	543314.77	3682327.41	6.76	TOP RAIL
179	543021.60	3683072.44	3.79	TOP RAIL
180	542834.49	3683546.45	2.50	TOP RAIL
181	542647.21	3684009.73	0.95	TOP RAIL
182	542543.41	3684282.47	0.36	TOP RAIL
183	542522.23	3684412.47	0.19	TOP RAIL
184	542519.19	3684634.81	0.47	TOP RAIL
185	542558.95	3685160.38	0.56	TOP RAIL
186	542592.48	3685568.11	-0.07	TOP RAIL
187	542630.62	3686029.34	-0.48	TOP RAIL
188	542651.02	3686281.58	-1.14	TOP RAIL
189	542693.06	3686802.35	-1.31	TOP RAIL
190	542729.14	3687257.81	-1.25	TOP RAIL
191	542753.08	3687559.77	-1.09	TOP RAIL
192	542793.49	3688079.97	-0.24	TOP RAIL
193	542783.52	3688492.01	-0.08	TOP RAIL
194	542756.74	3688618.74	0.64	TOP RAIL
195	542754.42	3688625.20	0.67	TOP RAIL/E ROAD
196	542739.58	3688662.93	1.11	TOP RAIL/E ROAD
197	542751.99	3688646.27	0.96	TOP RAIL/CL ROAD
198	542693.00	3688750.26	2.63	TOP RAIL/E RR BRIDGE
199	542601.57	3688858.20	2.85	TOP RAIL/E RR BRIDGE
220	542590.31	3688867.87	2.73	TOP RAIL/E ROAD
222	542546.92	3688900.81	2.31	TOP RAIL/E ROAD
223	542492.83	3688932.51	1.74	TOP RAIL
224	542440.36	3688955.59	1.39	TOP RAIL
225	542375.71	3688974.65	0.96	TOP RAIL
226	542114.42	3689005.37	0.01	TOP RAIL
227	536662.24	3688222.62	3.16	TOP RAIL
228	536590.57	3688198.57	3.29	TOP RAIL
229	536308.45	3688123.57	3.31	TOP RAIL/E ROAD
230	546009.99	3688458.17	4.24	TOP RAIL
231	545610.27	3688154.08	2.48	TOP RAIL
232	545287.24	3687909.11	1.88	TOP RAIL

Name	Northing	Easting	Elevation	Code
233	545228.99	3687864.60	1.88	TOP RAIL
236	544821.58	3687554.55	2.76	TOP RAIL
237	544522.94	3687327.42	4.08	TOP RAIL/E RR BRIDGE
238	544522.78	3687327.44	4.08	TOP RAIL/E RR BRIDGE
278	542511.61	3689205.54	2.60	TOP RAIL
298	542608.16	3689150.12	2.44	TOP RAIL/E RR BRIDGE
333	546154.73	3688567.68	0.10	TOP RAIL/E RR BRIDGE
334	546251.02	3688640.69	5.01	TOP RAIL/E RR BRIDGE
335	546308.66	3688685.12	4.86	TOP RAIL
336	546413.53	3688676.19	5.38	TOP RAIL
337	546926.17	3688643.98	6.16	TOP RAIL
338	547586.96	3688589.42	8.37	TOP RAIL
339	548062.97	3688550.57	10.46	TOP RAIL
340	548695.15	3688504.02	12.09	TOP RAIL/E RR BRIDGE
341	548835.18	3688492.88	11.97	TOP RAIL/E RR BRIDGE
370	549554.40	3688429.53	11.16	TOP RAIL
371	550585.39	3688345.72	9.43	TOP RAIL
372	551114.12	3688287.60	9.02	TOP RAIL
373	551988.13	3688216.08	8.61	TOP RAIL
374	552545.38	3688170.52	8.31	TOP RAIL
375	553079.66	3688126.76	7.61	TOP RAIL
376	553714.02	3688074.89	7.15	TOP RAIL
377	554338.21	3688023.82	6.85	TOP RAIL
378	554957.69	3687973.13	6.00	TOP RAIL
379	555588.04	3687921.40	5.99	TOP RAIL
380	556047.44	3687883.88	5.81	TOP RAIL
415	537249.93	3663186.15	1.49	TOP RAIL
416	537256.70	3663071.38	2.27	TOP RAIL/E RR BRIDGE
417	537260.97	3663002.41	2.50	TOP RAIL/E RR BRIDGE
439	537267.64	3662899.77	3.04	TOP RAIL
440	537280.37	3662706.97	4.06	TOP RAIL/E RR BRIDGE
441	537293.20	3662512.75	4.57	TOP RAIL/E RR BRIDGE
468	537305.43	3662313.84	4.53	TOP RAIL
469	537320.41	3662087.92	3.05	TOP RAIL
470	537336.97	3661829.00	1.79	TOP RAIL
471	537354.84	3661400.48	0.99	TOP RAIL
472	537393.29	3660601.29	0.19	TOP RAIL
473	537410.34	3660335.31	0.04	TOP RAIL
474	537558.66	3658728.86	1.64	TOP RAIL
475	537552.07	3657971.43	1.81	TOP RAIL
476	537552.08	3657971.43	1.82	TOP RAIL
477	537620.60	3657015.35	3.27	TOP RAIL
478	537659.53	3656416.86	3.59	TOP RAIL
5000	542500.17	3689216.45	2.35	TOP RAIL/EDGE ROAD
5001	542517.12	3689243.01	2.55	TOP RAIL/E RR BRIDGE
5002	542532.49	3689272.86	2.54	TOP RAIL
5003	542549.11	3689315.04	2.47	TOP RAIL
5004	542559.30	3689349.83	2.46	TOP RAIL/E RR BRIDGE
5005	542567.85	3689403.22	1.71	TOP RAIL
5006	542569.41	3689453.38	1.04	TOP RAIL
5007	542564.40	3689510.76	0.54	TOP RAIL
5008	542553.55	3689567.64	0.22	TOP RAIL

Name	Northing	Easting	Elevation	Code
5009	542536.69	3689641.51	0.02	TOP RAIL
5010	542410.17	3690157.74	2.13	TOP RAIL
5011	542284.39	3690658.96	-0.37	TOP RAIL
5012	542168.33	3691128.33	-1.54	TOP RAIL/EDGE ROAD
5013	542164.89	3691142.44	-1.57	TOP RAIL/CL ROAD
5014	542160.91	3691158.39	-1.58	TOP RAIL/EDGE ROAD
5015	542130.86	3691279.34	-1.54	TOP RAIL/EDGE ROAD
5016	542125.76	3691299.43	-1.36	TOP RAIL/CL ROAD
5017	542119.80	3691324.57	-1.35	TOP RAIL/EDGE ROAD
5018	542017.06	3691734.82	-0.11	TOP RAIL/EDGE ROAD
5019	542014.08	3691746.35	-0.15	TOP RAIL/CL ROAD
5020	542011.40	3691757.34	0.00	TOP RAIL/EDGE ROAD
5021	541882.86	3692273.63	0.02	TOP RAIL
5022	541746.73	3692820.89	0.63	TOP RAIL
5023	541627.03	3693303.39	0.16	TOP RAIL
5024	541440.57	3694054.81	2.20	TOP RAIL/EDGE ROAD
5025	541437.34	3694067.57	2.28	TOP RAIL/CL ROAD
5026	541434.18	3694080.34	2.28	TOP RAIL/EDGE ROAD
5027	541308.44	3694589.54	2.58	TOP RAIL
5028	541184.00	3695091.32	4.11	TOP RAIL
5029	541151.44	3695219.66	4.85	TOP RAIL
5030	541133.71	3695286.17	5.14	TOP RAIL
5031	541099.62	3695378.74	6.22	TOP RAIL
5032	541029.49	3695493.01	7.53	TOP RAIL/E FLOODGATE
5033	534151.89	3687582.04	9.72	TOP RAIL/EDGE ROAD
5034	534167.12	3687595.61	9.40	TOP RAIL/CL ROAD
5035	534182.60	3687607.73	9.17	TOP RAIL/CL ROAD
5036	534212.16	3687627.39	8.84	TOP RAIL
5037	534260.76	3687650.71	7.99	TOP RAIL
5038	534309.82	3687666.65	7.63	TOP RAIL
5039	534342.42	3687675.44	7.30	TOP RAIL/EDGE ROAD
5040	534364.94	3687681.14	7.12	TOP RAIL/CL ROAD
5041	534380.85	3687684.93	6.99	TOP RAIL/EDGE ROAD
5042	534701.09	3687766.71	5.99	TOP RAIL/EDGE ROAD
5043	534715.58	3687770.53	6.08	TOP RAIL/CL ROAD
5044	534731.84	3687774.62	5.94	TOP RAIL/EDGE ROAD
5045	534761.91	3687781.77	5.78	TOP RAIL
5046	534808.82	3687789.93	5.37	TOP RAIL
5047	534992.09	3687815.04	5.29	TOP RAIL
5048	535040.01	3687824.91	5.51	TOP RAIL
5049	535053.99	3687828.53	5.53	TOP RAIL/EDGE ROAD
5050	535075.19	3687834.06	5.47	TOP RAIL/CL ROAD
5051	535091.88	3687838.27	5.41	TOP RAIL/EDGE ROAD
5052	535226.56	3687872.67	4.81	TOP RAIL
5053	535309.52	3687887.98	4.79	TOP RAIL
5054	535416.40	3687903.67	4.74	TOP RAIL/EDGE ROAD
5055	535433.74	3687906.30	4.67	TOP RAIL/CL ROAD
5056	535447.20	3687908.58	4.67	TOP RAIL/EDGE ROAD
5057	535521.09	3687923.53	4.26	TOP RAIL
5058	535772.94	3687987.88	3.98	TOP RAIL/EDGE ROAD
5059	535787.88	3687991.72	3.89	TOP RAIL/CL ROAD
5060	535802.85	3687995.53	3.87	TOP RAIL/EDGE ROAD

Name	Northing	Easting	Elevation	Code
5061	535949.61	3688033.23	3.53	TOP RAIL
5062	536202.95	3688097.30	3.28	TOP RAIL/EDGE ROAD
5063	536227.81	3688103.71	3.20	TOP RAIL/CL ROAD
5064	536241.54	3688106.93	2.99	TOP RAIL/EDGE ROAD
5065	536269.47	3688114.15	3.25	TOP RAIL/EDGE ROAD
5066	542657.63	3685684.26	0.20	TOP RAIL
5067	542682.63	3685776.19	0.10	TOP RAIL
5068	542746.45	3685909.69	-0.30	TOP RAIL
5069	542820.48	3686010.00	-0.02	TOP RAIL
5070	542914.89	3686099.96	0.21	TOP RAIL
5071	542958.96	3686134.38	0.15	TOP RAIL
5072	543840.78	3686785.77	1.11	TOP RAIL
5073	544175.18	3687039.56	2.01	TOP RAIL
5074	544452.88	3687250.31	4.02	TOP RAIL/ RR BRIDGE
5075	544550.41	3687324.11	3.97	TOP RAIL/ RR BRIDGE
5076	542131.42	3689019.77	0.05	TOP RAIL
5077	542287.19	3689007.44	1.09	TOP RAIL
5078	542522.02	3688988.17	2.16	TOP RAIL/EDGE ROAD
5079	542540.76	3688986.50	2.41	TOP RAIL/CL ROAD
5080	542561.19	3688984.74	2.52	TOP RAIL/EDGE ROAD
5081	542504.43	3689209.21	2.40	TOP RAIL/EDGE ROAD
5082	542680.31	3689104.01	1.91	TOP RAIL
5083	542744.92	3689069.48	1.27	TOP RAIL
5084	542810.85	3689039.71	0.78	TOP RAIL
5085	542895.15	3689011.99	0.49	TOP RAIL
5086	542980.40	3688995.25	0.30	TOP RAIL
5087	542923.86	3688955.13	1.52	TOP RAIL
5088	542636.17	3688978.53	2.81	TOP RAIL
5089	542810.12	3688488.26	-0.17	TOP RAIL
5090	542828.04	3688577.04	0.45	TOP RAIL
5091	542858.39	3688655.69	1.35	TOP RAIL/EDGE ROAD
5092	542867.98	3688674.47	1.69	TOP RAIL/CL ROAD
5093	542881.28	3688697.13	2.10	TOP RAIL/EDGE ROAD
5094	542945.28	3688777.22	3.41	TOP RAIL
5095	543012.71	3688834.01	3.79	TOP RAIL
5096	543113.63	3688887.67	2.77	TOP RAIL
5097	543200.59	3688912.04	1.84	TOP RAIL
5098	543319.82	3688922.54	0.90	TOP RAIL
5099	543779.22	3688884.78	0.94	TOP RAIL
5100	544256.57	3688845.82	1.18	TOP RAIL
5101	544756.85	3688805.16	1.58	TOP RAIL
5102	545580.20	3688738.43	3.87	TOP RAIL
5103	545930.92	3688709.88	4.51	TOP RAIL
5104	546302.21	3688680.18	4.93	TOP RAIL
5105	558994.44	3691060.04	6.60	TOP RAIL/ FLOODGATE
5106	558844.21	3690539.31	6.88	TOP RAIL
5107	558699.00	3690029.48	6.54	TOP RAIL
5108	558642.63	3689824.35	6.41	TOP RAIL
5109	558619.53	3689741.34	6.45	TOP RAIL
5110	558555.73	3689508.21	6.51	TOP RAIL
5111	558526.30	3689401.69	6.55	TOP RAIL
5112	558474.41	3689231.25	6.48	TOP RAIL

Name	Northing	Easting	Elevation	Code
5113	558410.01	3689066.76	6.52	TOP RAIL
5114	558353.25	3688953.62	6.63	TOP RAIL
5115	558292.30	3688852.10	6.72	TOP RAIL
5116	558231.18	3688764.68	6.68	TOP RAIL
5117	558168.32	3688685.16	6.68	TOP RAIL
5118	558065.59	3688566.18	6.93	TOP RAIL RR BRIBGE
5119	557992.61	3688484.35	7.01	TOP RAIL RR BRIBGE
5120	557933.08	3688418.97	6.93	TOP RAIL
5121	557853.63	3688336.08	6.85	TOP RAIL
5122	557773.07	3688260.48	6.84	TOP RAIL
5123	557628.28	3688146.64	6.65	TOP RAIL
5124	557528.65	3688082.57	6.58	TOP RAIL
5125	557391.21	3688009.97	6.48	TOP RAIL
5126	557265.73	3687956.65	6.57	TOP RAIL
5127	557130.72	3687913.11	6.56	TOP RAIL
5128	556944.00	3687873.67	6.37	TOP RAIL
5129	556709.96	3687855.03	6.06	TOP RAIL
5130	556568.31	3687859.37	5.97	TOP RAIL
5131	556361.86	3687857.76	5.74	TOP RAIL
5152	537851.84	3653693.19	4.86	TOP RAIL
5153	537858.30	3653708.63	5.09	TOP RAIL
5154	537861.10	3653771.51	5.34	TOP RAIL
5155	537859.56	3653851.53	5.15	TOP RAIL
5156	537845.67	3654068.94	4.71	TOP RAIL
5157	537791.65	3654819.90	4.32	TOP RAIL EDGE ROAD
5158	537789.64	3654849.12	4.18	TOP RAIL EDGE ROAD
5159	537779.24	3655009.67	4.21	TOP RAIL
5160	537764.66	3655239.17	4.30	TOP RAIL EDGE ROAD
5161	537763.16	3655261.37	4.38	TOP RAIL EDGE ROAD
5162	537761.63	3655277.56	4.45	TOP RAIL
5163	537733.09	3655450.05	4.40	TOP RAIL
5164	537708.55	3655737.63	3.88	TOP RAIL
5165	537688.59	3655968.59	3.80	TOP RAIL

Low Chord Elevations

Horizontal Datum: NAD 1983(1992)

Horizontal Coordinate System: U.S. State Plane, 1983, Zone: Louisiana South 1702

Vertical Datum: NAVD88(2004.65)

Coordinate Units: US survey feet

Distance Units: U.S. survey feet

Height Units: U.S. survey feet

Name	Northing	Easting	Elevation	Code
115	544154.76	3680272.61	7.66	LOW CORD
132	543676.64	3681398.05	5.53	LOW CORD
141	543702.84	3681408.66	5.55	LOW CORD
219	542651.35	3688820.51	-5.72	LOW CORD
260	544454.80	3687286.32	-1.66	LOW CORD
277	542530.39	3689289.59	-1.72	LOW CORD
299	542557.68	3689181.06	-0.40	LOW CORD
313	542596.80	3689026.69	-3.68	LOW CORD
332	546231.43	3688598.06	-2.08	LOW CORD
369	548773.52	3688518.65	9.35	LOW CORD
395	558017.35	3688539.93	-2.52	LOW CORD
418	537267.18	3663012.10	0.02	LOW CORD
419	537264.73	3663042.36	-2.52	LOW CORD
420	537263.20	3663065.03	0.01	LOW CORD
467	537278.46	3662595.75	1.73	LOW CORD

Culverts

Horizontal Datum: NAD 1983(1992)

Horizontal Coordinate System: U.S. State Plane, 1983, Zone: Louisiana South 1702

Vertical Datum: NAVD88(2004.65)

Coordinate Units: US survey feet

Distance Units: U.S. survey feet

Height Units: U.S. survey feet

Name	Northing	Easting	Elevation	Code
234	545216.87	3687879.95	-11.55	INVERT-7.2FT.CORR. PIPE
235	545258.34	3687824.55	-12.04	INVERT-7.2FT.CORR. PIPE
396	548333.35	3688446.80	-9.42	INV-4FT ROUND CONC CULVERT
397	547755.07	3688481.04	-12.02	INV-3FT ROUND CONC CULVERT
398	547487.62	3688516.29	-11.04	INV-3FT ROUND CONC CULVERT
399	546747.65	3688571.73	-13.60	INV-4FT ROUND CONC CULVERT
400	546428.71	3688605.21	-13.25	INV-4.5FT ROUND CONC CULVERT
401	542709.50	3688469.77	-12.88	INV-8FTX8FT CONC BOX CULVERT
402	542647.10	3687790.31	-15.11	INV-3FTX3.7FT CONC BOX CULVERT
403	542623.41	3687494.72	-13.24	INV-2.3FT CONC ROUND CULVERT
404	542562.80	3686717.57	-14.02	INV-36" CONC ROUND CULVERT
405	542513.31	3686015.78	-15.80	INV-5FTX8FT 1½ MOON CONC CULVERT
406	542513.72	3686000.02	-13.11	INV-3.3FTX4FT OVEL CONC CULVERT
407	542480.29	3685645.12	-14.26	INV-3.4FT ROUND CONC CULVERT
408	542401.73	3684645.70	-11.18	INV-24" ROUND CONC CULVERT
409	542399.32	3684612.72	-12.79	INV-24" ROUND CONC CULVERT
410	542442.49	3684434.78	-13.02	INV-24" ROUND CONC CULVERT
411	542576.38	3684094.02	-11.64	INV-24" ROUND CONC CULVERT
412	542735.50	3683690.78	-11.81	INV-2.3FT ROUND CONC CULVERT
413	542881.50	3683321.45	-11.79	INV-24" ROUND CONC CULVERT
414	543022.32	3682987.77	-12.88	INV-6FT ROUND CONC CULVERT
5132	548606.50	3688432.30	-10.13	INV-4.1FT ROUND CONC CULVERT
5133	546474.07	3688731.63	-10.24	INV-4.5FT ROUND CONC CULVERT
5134	546205.73	3688627.90	-13.04	INV-3.5FT ROUND CONC CULVERT
5135	545594.85	3688674.91	-10.68	INV-3FT ROUND CONC CULVERT
5136	545123.16	3688715.20	-13.93	INV-3.5FT ROUND CONC CULVERT
5137	544987.73	3688724.15	-18.80	INV-9FTX10FT ROUND CONC CULVERT
5138	544017.87	3688806.34	-13.46	INV\3FT ROUND CONC CULVERT
5139	542434.20	3689721.54	-15.42	INV\3FT ROUND CONC CULVERT
5140	542291.87	3690296.08	-16.03	INV\3FT ROUND CONC CULVERT
5141	542217.08	3690590.14	-15.12	INV\3FT ROUND CONC CULVERT
5142	542159.28	3690826.30	-14.91	INV\3FT ROUND CONC CULVERT
5143	542147.93	3690870.69	-16.44	INV\1.5FT ROUND CONC CULVERT
5144	541920.20	3691786.22	-12.48	INV\6FTX8FT CONC BOX CULVERT
5145	541709.50	3692763.12	-10.65	INV\1FT ROUND CONC CULVERT
5146	541603.36	3693059.71	-14.76	INV\3.5FT ROUND CONC CULVERT
5147	541529.31	3693407.23	-10.37	INV\4.5FTX7FT OVAL CONC CULVERT
5148	541234.52	3694688.63	-8.71	INV\4.5FT ROUND CONC CULVERT
5149	543470.86	3681826.13	-11.68	INV\2FT ROUND CONC CULVERT
5150	543319.48	3682209.87	-11.74	INV\1.5FT ROUND CONC CULVERT
5151	543168.30	3682593.43	-11.86	INV\1.5FT ROUND CONC CULVERT

CULVERTS

All elevations are NAVD 88(2004.65) Feet.



396			
Northing	Easting	Elevation	
548333.35	3688446.80	-9.42	
INV-4FT ROUND CONC CULVERT			



397			
Northing	Easting	Elevation	
547755.06	3688481.04	-12.02	
INV-3FT ROUND CONC CULVERT			



398
Northing Easting Elevation
547487.62 3688516.28 -11.04
INV-3FT ROUND CONC CULVERT



399
Northing Easting Elevation
546747.64 3688571.73 -13.60
INV-4FT ROUND CONC CULVERT



400
 Northing Easting Elevation
 546428.71 3688605.21 -13.25
 INV-4.5FT ROUND CONC CULVERT



401
 Northing Easting Elevation

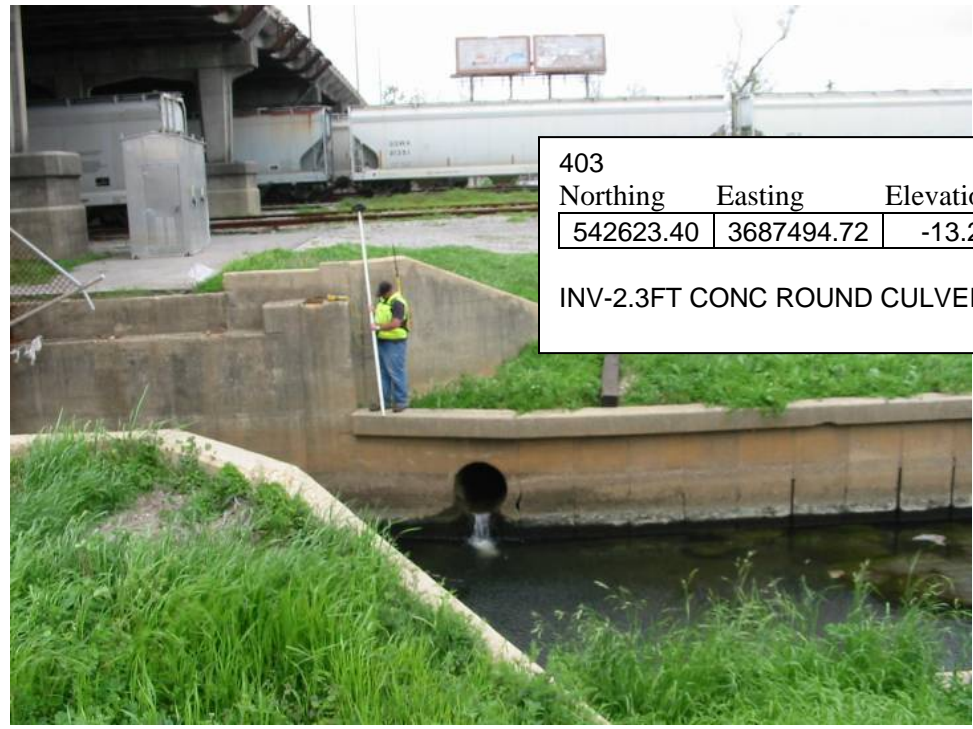
542709.50	3688469.77	-12.88
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 INV-8FTX8FT CONC BOX CULVERT

402
 Northing Easting Elevation

542647.10	3687790.31	-15.11
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 INV-3FTX3.7FT CONC BOX CULVERT



403
 Northing Easting Elevation

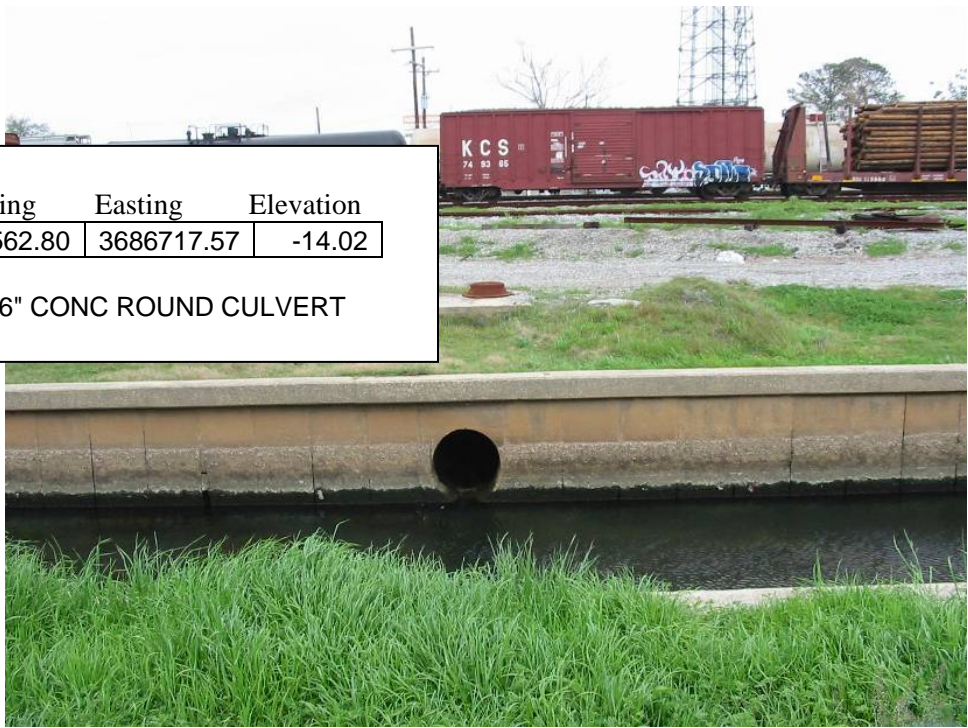
542623.40	3687494.72	-13.24
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 INV-2.3FT CONC ROUND CULVERT

404
 Northing Easting Elevation

542562.80	3686717.57	-14.02
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 INV-36" CONC ROUND CULVERT



405
 Northing Easting Elevation

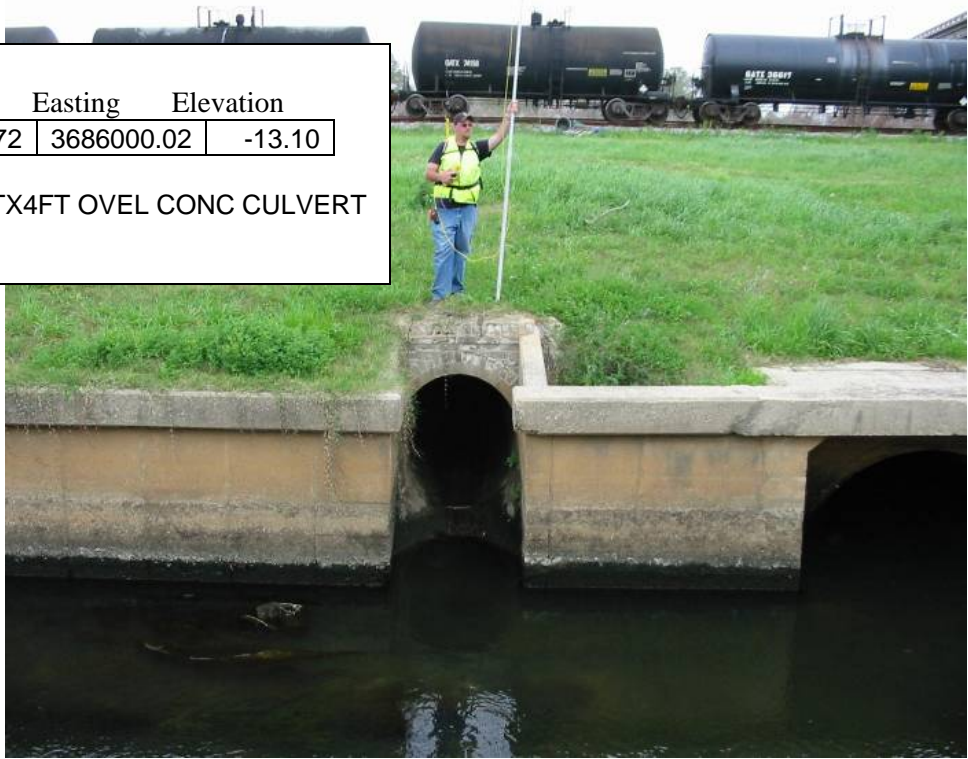
542513.31	3686015.78	-15.80
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 INV-5FTX8FT 1/2 MOON CONC

406
Northing Easting Elevation

542513.72	3686000.02	-13.10
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INV-3.3FTX4FT OVEL CONC CULVERT



407
Northing Easting Elevation

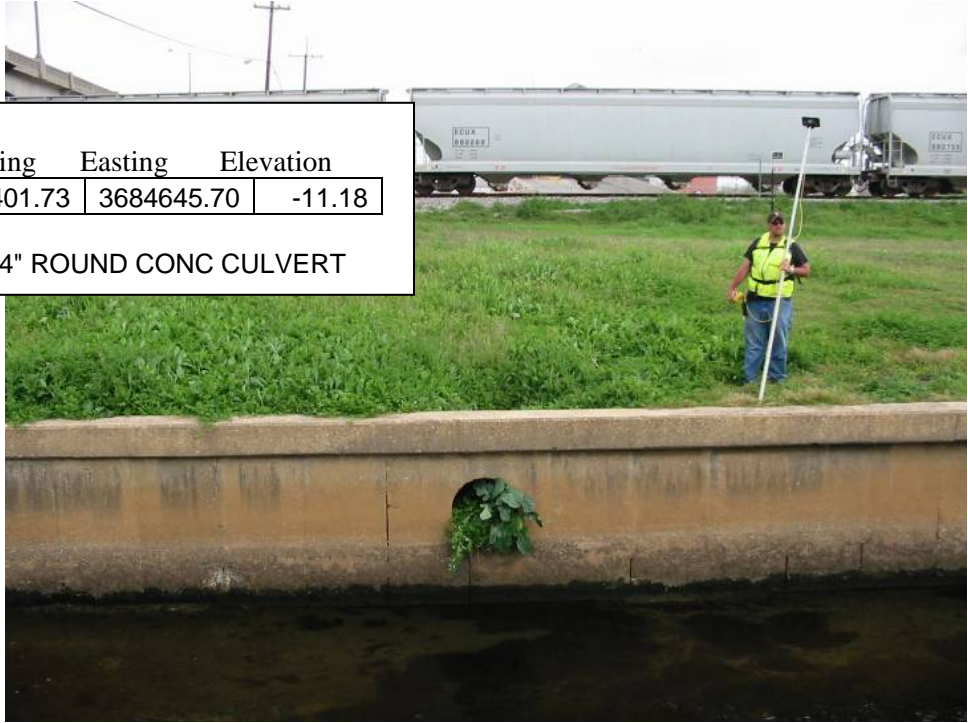
542480.29	3685645.12	-14.26
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INV-3.4FT ROUND CONC CULVERT

408
 Northing Easting Elevation

542401.73	3684645.70	-11.18
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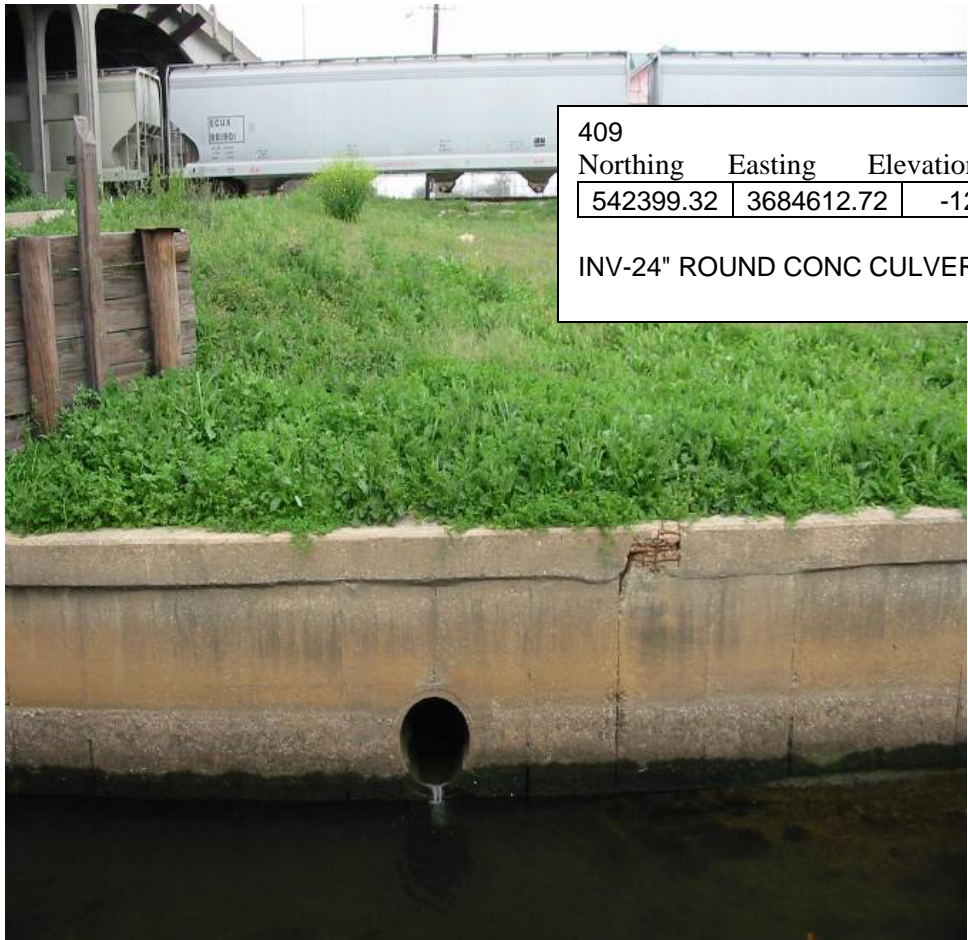
 INV-24" ROUND CONC CULVERT



409
 Northing Easting Elevation

542399.32	3684612.72	-12.79
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 INV-24" ROUND CONC CULVERT



410
Northing Easting Elevation
542442.48 3684434.78 -13.02
INV-24" ROUND CONC CULVERT



411
Northing Easting Elevation
542576.38 3684094.02 -11.64
INV-24" ROUND CONC CULVERT



412
Northing Easting Elevation

542735.50	3683690.78	-11.81
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INV-2.3FT ROUND CONC CULVERT



413
Northing Easting Elevation

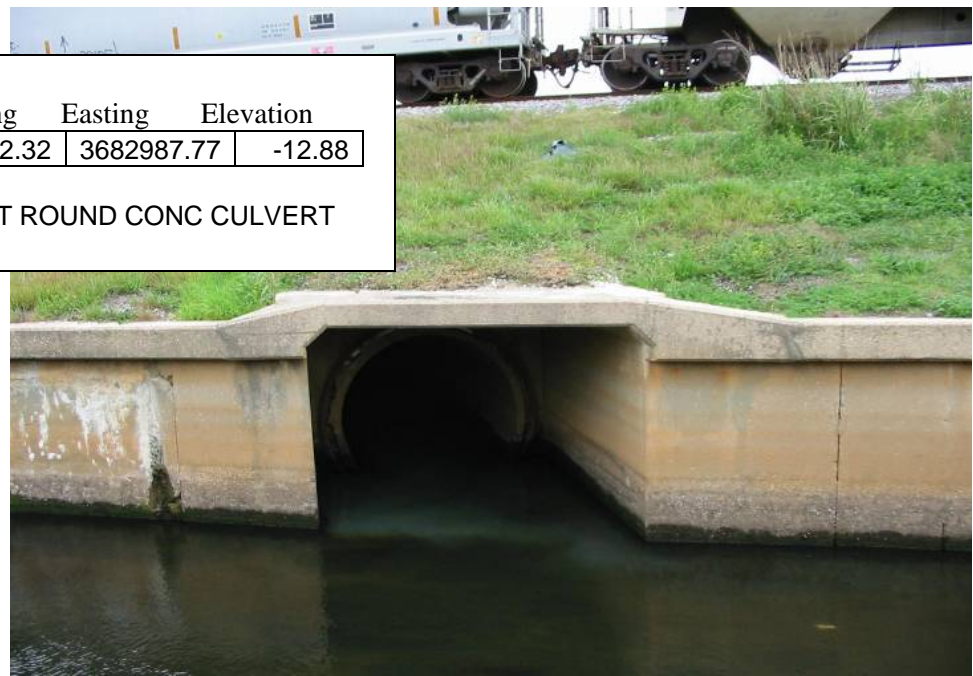
542881.50	3683321.45	-11.79
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INV-24" ROUND CONC CULVERT

414
Northing Easting Elevation

543022.32	3682987.77	-12.88
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INV-6FT ROUND CONC CULVERT



5132
Northing Easting Elevation

548606.50	3688432.30	-10.13
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INV-4.1FT ROUND CONC CULVERT



5133
Northing Easting Elevation
546474.07 3688731.62 -10.24
INV-4.5FT ROUND CONC CULVERT



5134
Northing Easting Elevation
546205.73 3688627.90 -13.04
INV-3.5FT ROUND CONC CULVERT





5135
Northing Easting Elevation
545594.85 3688674.91 -10.68
INV-3FT ROUND CONC CULVERT



5136
Northing Easting Elevation
545123.16 3688715.20 -13.93
INV-3.5FT ROUND CONC CULVERT



5137
Northing Easting Elevation
544987.73 3688724.15 -18.80

INV-9FTX10FT ROUND CONC
CULVERT



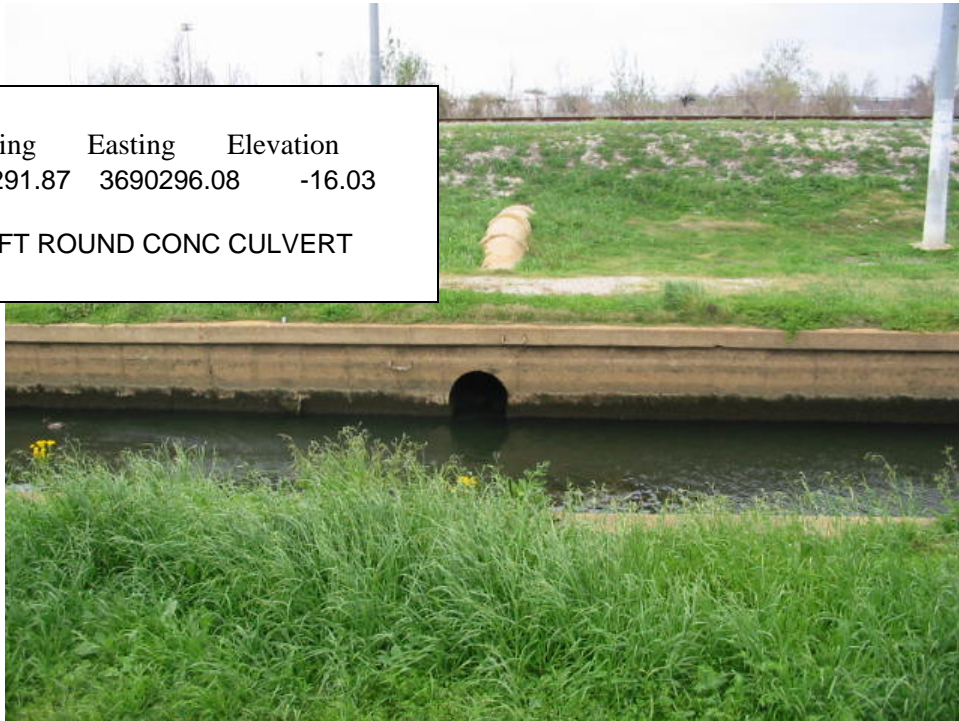
5138
Northing Easting Elevation
544017.87 3688806.34 -13.46

INV\3FT ROUND CONC CULVERT



5139
Northing Easting Elevation
542434.20 3689721.54 -15.42

INV3FT ROUND CONC CULVERT



5140
Northing Easting Elevation
542291.87 3690296.08 -16.03

INV3FT ROUND CONC CULVERT



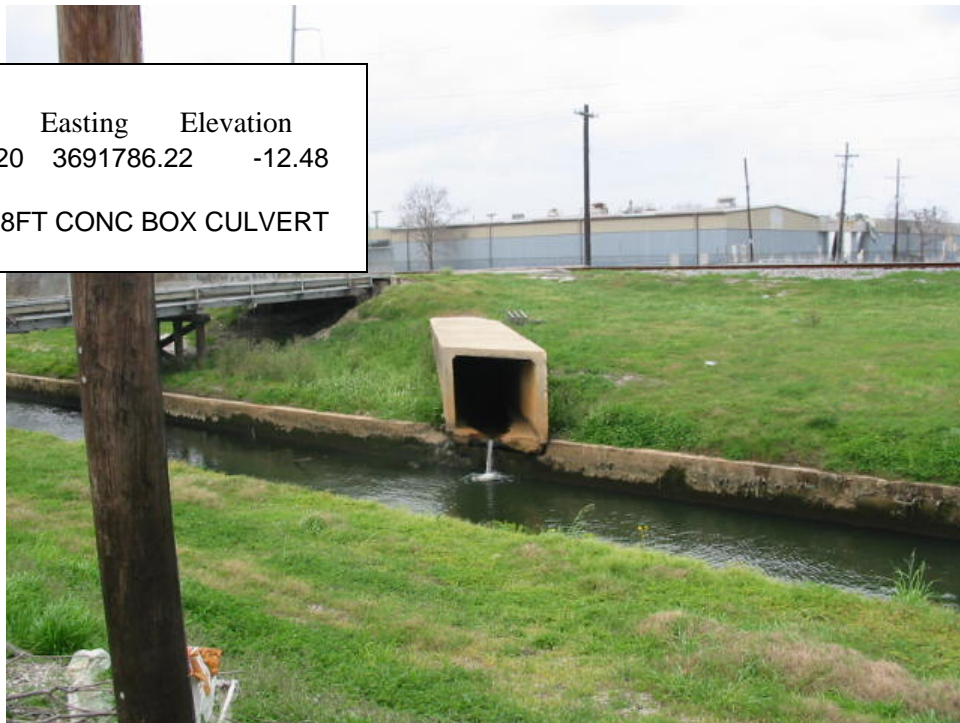
5141
Northing Easting Elevation
542217.08 3690590.14 -15.12
INV3FT ROUND CONC CULVERT



5142
Northing Easting Elevation
542159.28 3690826.30 -14.91
INV3FT ROUND CONC CULVERT



5143
Northing Easting Elevation
542147.93 3690870.69 -16.44
INV1.5FT ROUND CONC CULVERT



5144
Northing Easting Elevation
541920.20 3691786.22 -12.48
INV6FTX8FT CONC BOX CULVERT



5145			
Northing	Easting	Elevation	
541709.50	3692763.12	-10.65	
INV\1FT ROUND CONC CULVERT			



5146			
Northing	Easting	Elevation	
541603.36	3693059.71	-14.76	
INV\3.5FT ROUND CONC CULVERT			



5147
Northing Easting Elevation
541529.31 3693407.23 -10.37
INV4.5FTX7FT OVAL CONC CULVERT



5148
Northing Easting Elevation
541234.52 3694688.62 -8.71
INV4.5FT ROUND CONC CULVERT



5149
Northing Easting Elevation
543470.86 3681826.12 -11.68
INV2FT ROUND CONC CULVERT



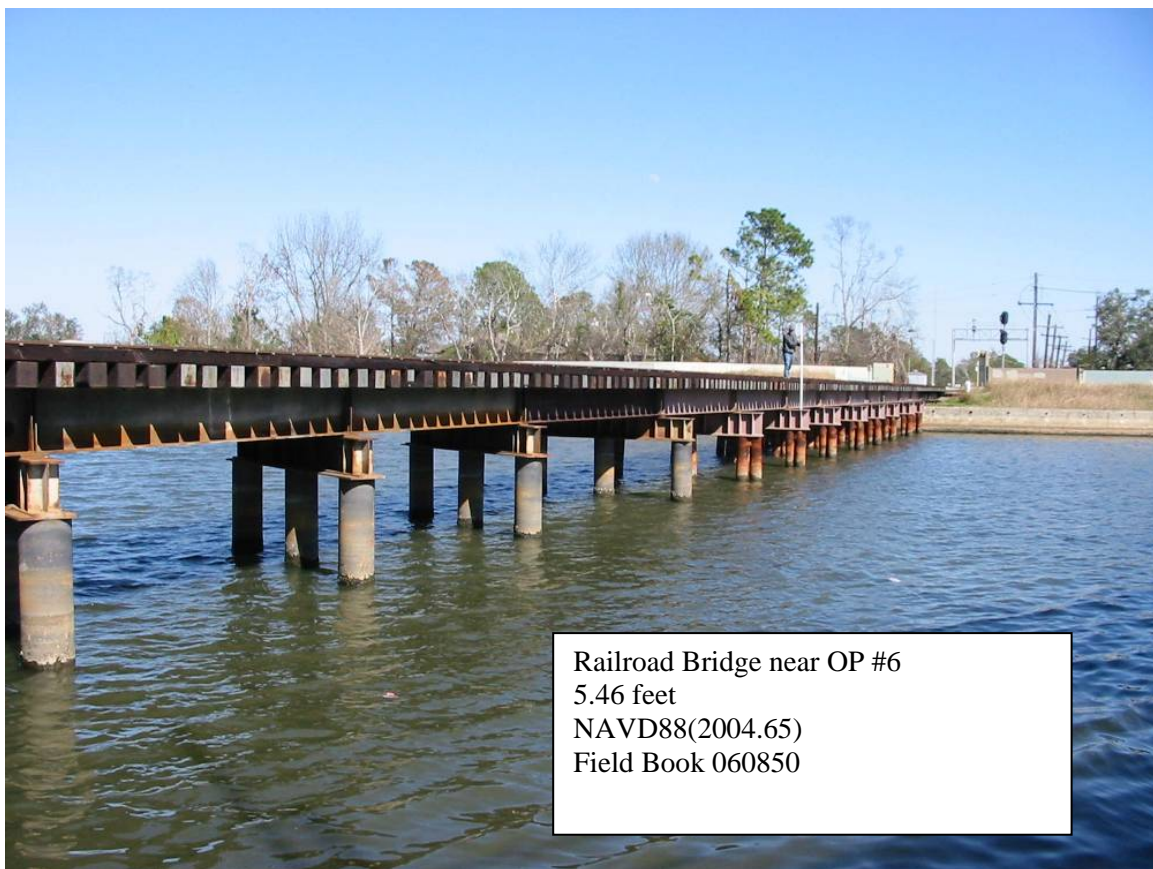
5150
Northing Easting Elevation
543319.48 3682209.86 -11.74
INV1.5FT ROUND CONC CULVERT

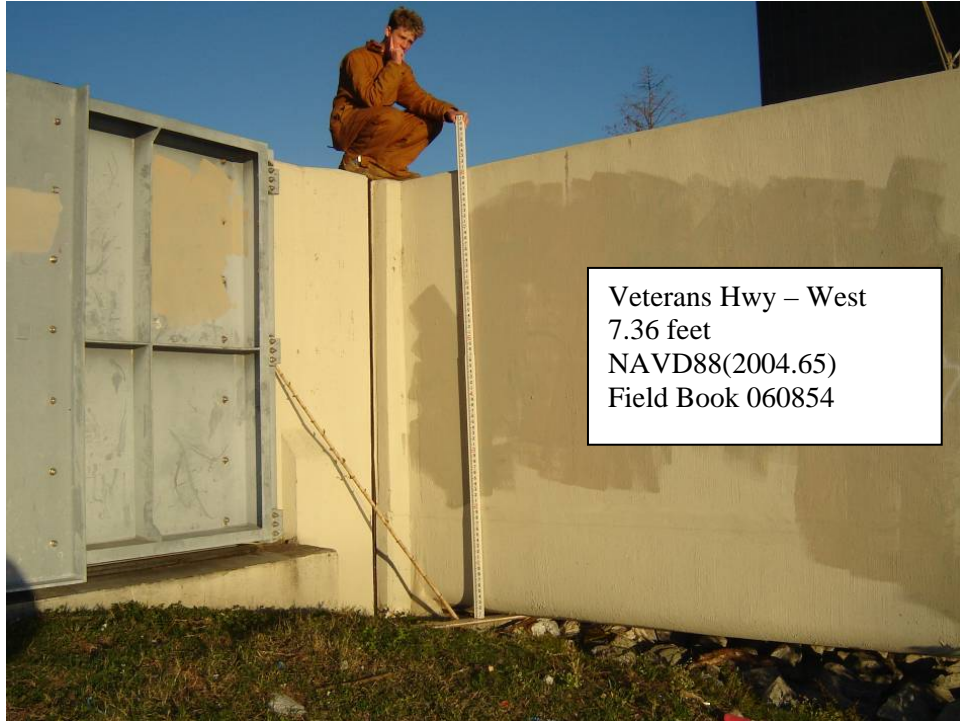


5151			
Northing	Easting	Elevation	
543168.30	3682593.43	-11.86	
INV1.5FT ROUND CONC CULVERT			

Appendix 6

17th Street Canal – Low Chord Elevations





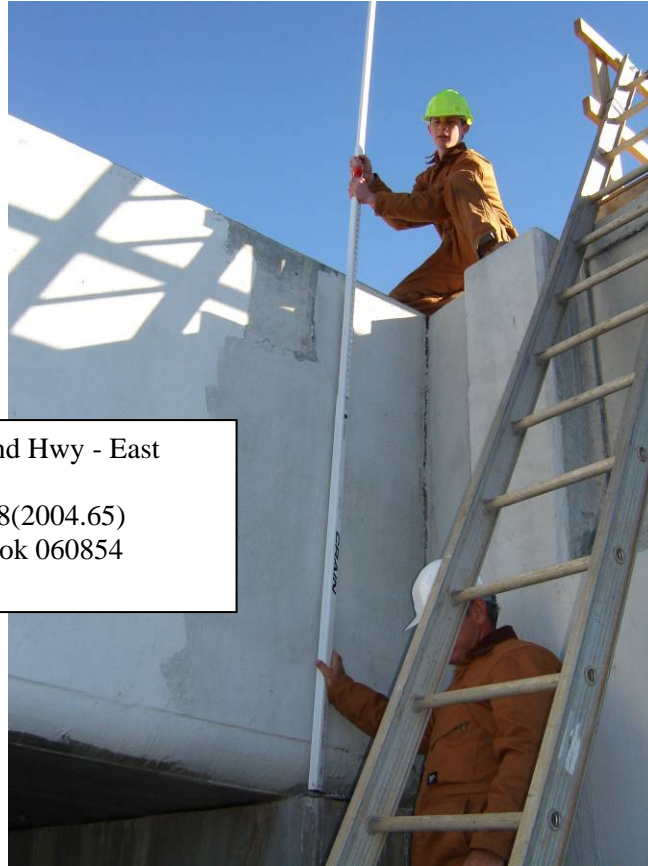
Veterans Hwy – West
7.36 feet
NAVD88(2004.65)
Field Book 060854



Veterans Hwy - East
7.40 feet
NAVD88(2004.65)
Field Book 060854



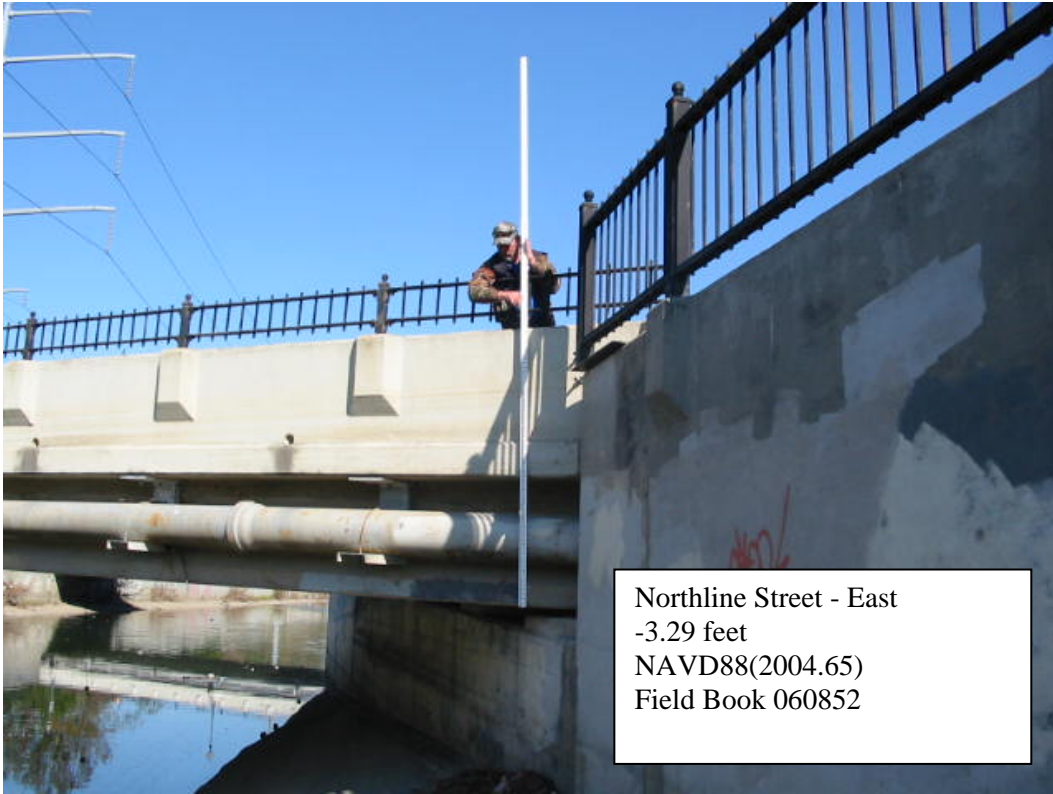
Hammond Hwy - West
3.93 feet
NAVD88(2004.65)
Field Book 060854



Hammond Hwy - East
4.94 feet
NAVD88(2004.65)
Field Book 060854



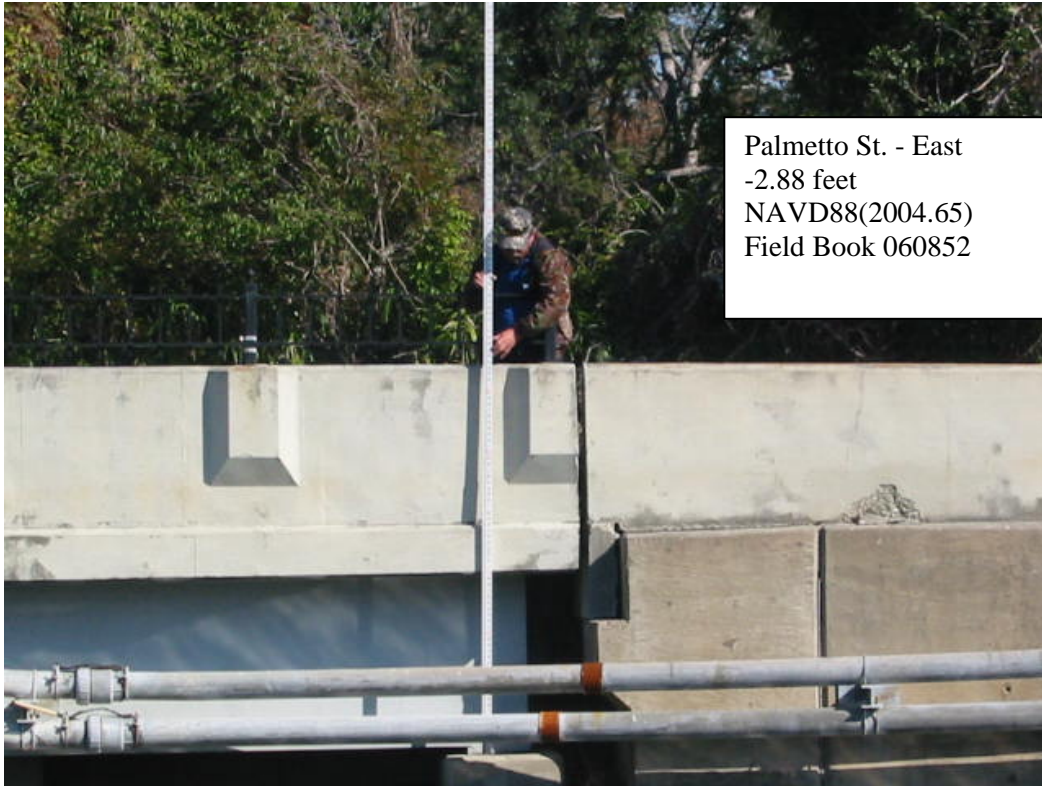
Northline Street - West
-3.72 feet
NAVD88(2004.65)
Field Book 060852



Northline Street - East
-3.29 feet
NAVD88(2004.65)
Field Book 060852



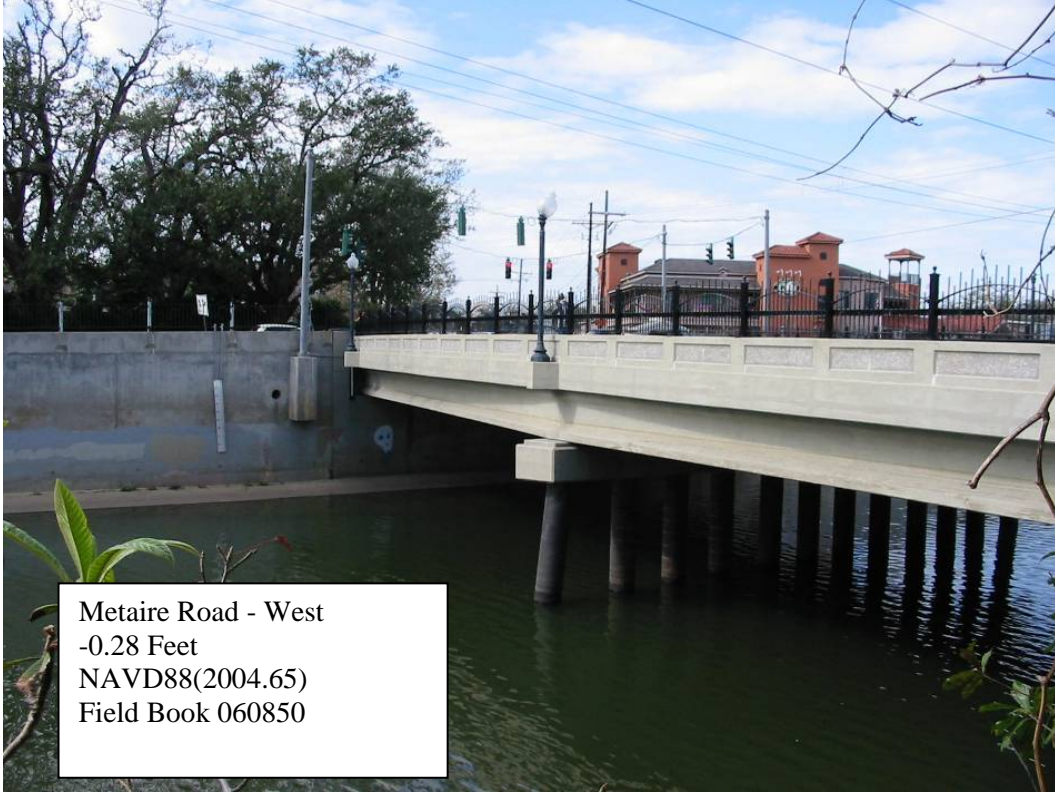
Palmetto St. - West
-1.84 feet
NAVD88(2004.65)
Field Book 060852



Palmetto St. - East
-2.88 feet
NAVD88(2004.65)
Field Book 060852

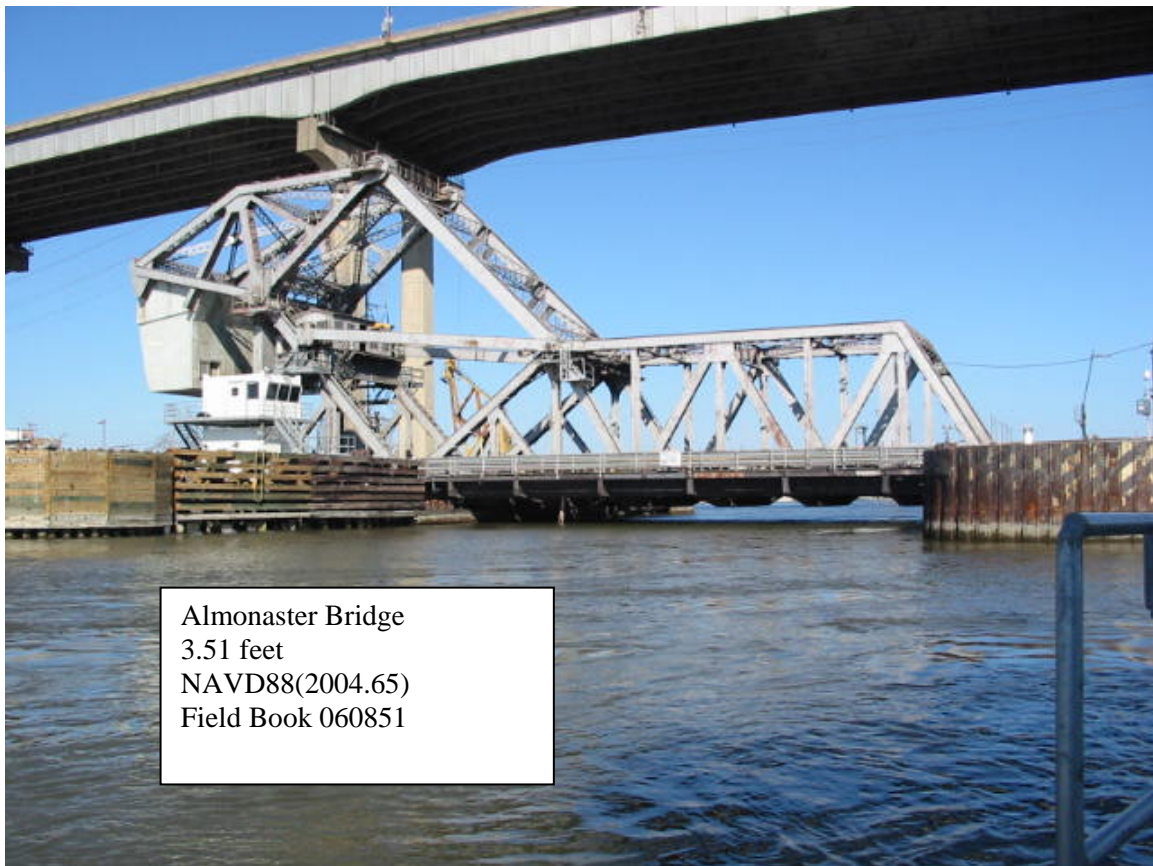


Metaire Road – East
-0.12 Feet
NAVD88(2004.65)
Field Book 060850



Appendix 7

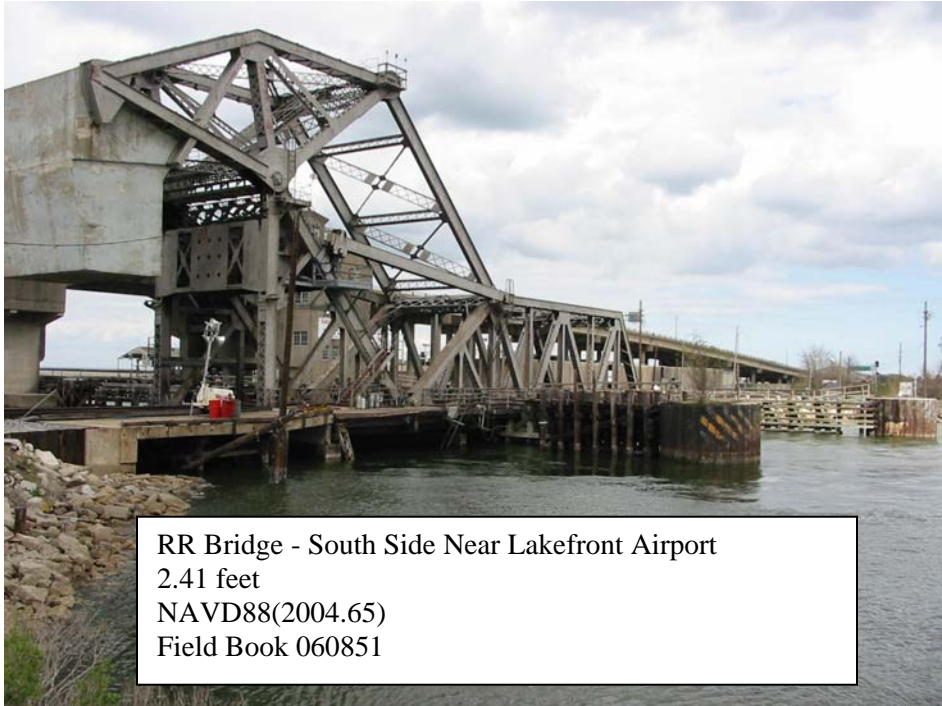
Inner Harbor Navigation Canal – Low Chord Elevations







Florida Ave.
4.14 feet
NAVD88(2004.65)
Field Book 060858

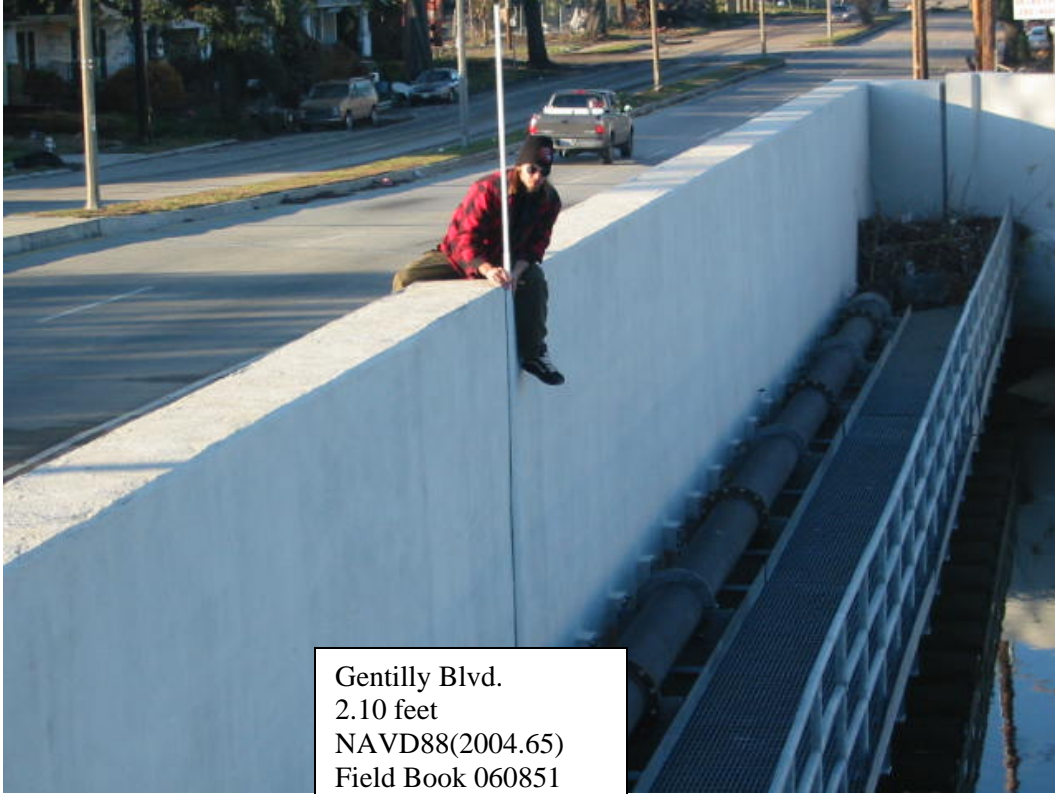


RR Bridge - South Side Near Lakefront Airport
2.41 feet
NAVD88(2004.65)
Field Book 060851

Appendix 8

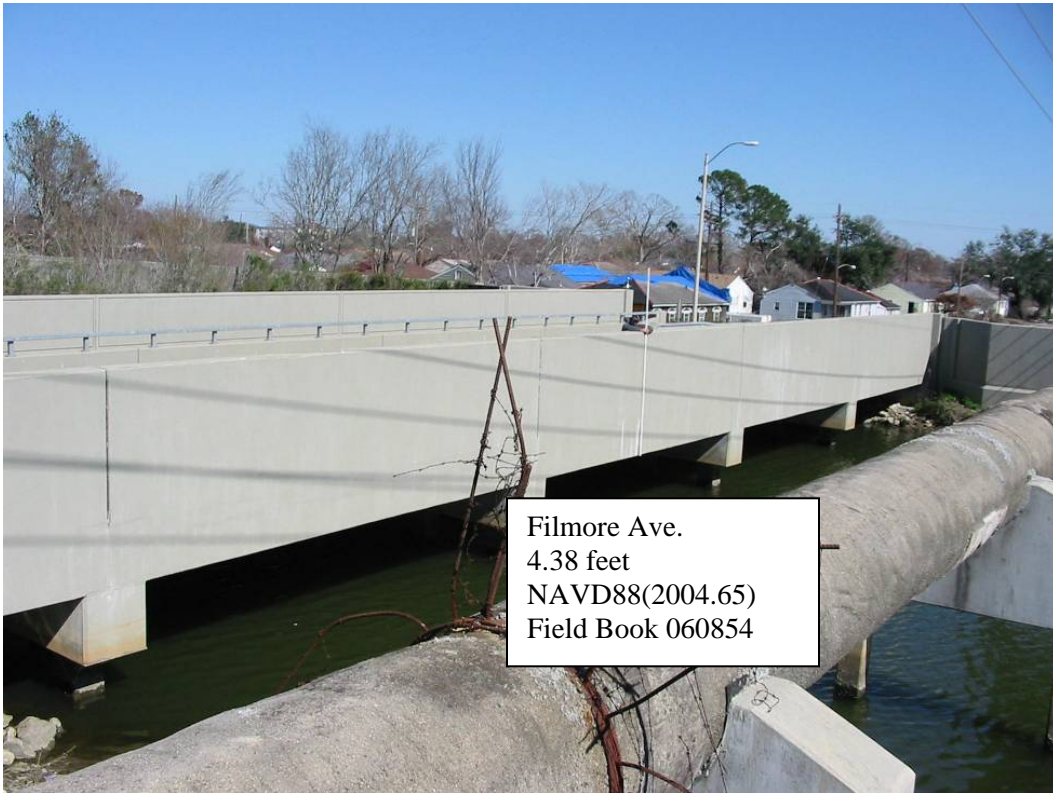
London Avenue Canal – Low Chord Elevations







Mirabeau Ave.
5.31 feet
NAVD88(2004.65)
Field Book 060851



Filmore Ave.
4.38 feet
NAVD88(2004.65)
Field Book 060854



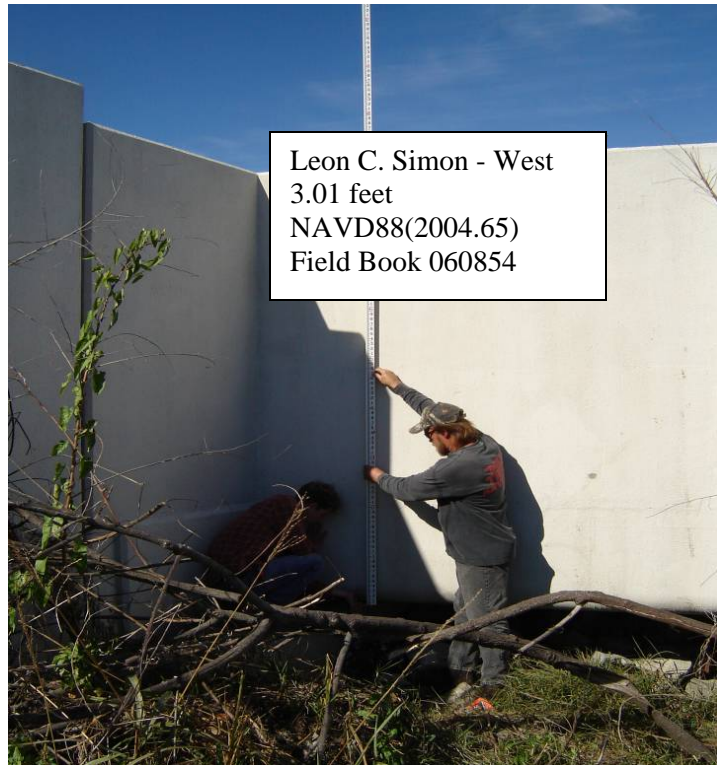
Robert E. Lee Blvd. - West
3.32 feet
NAVD88(2004.65)
Field Book 060854



Robert E. Lee Blvd. - East
2.74 feet
NAVD88(2004.65)
Field Book 060854



Leon C. Simon - East
3.46 feet
NAVD88(2004.65)
Field Book 060854

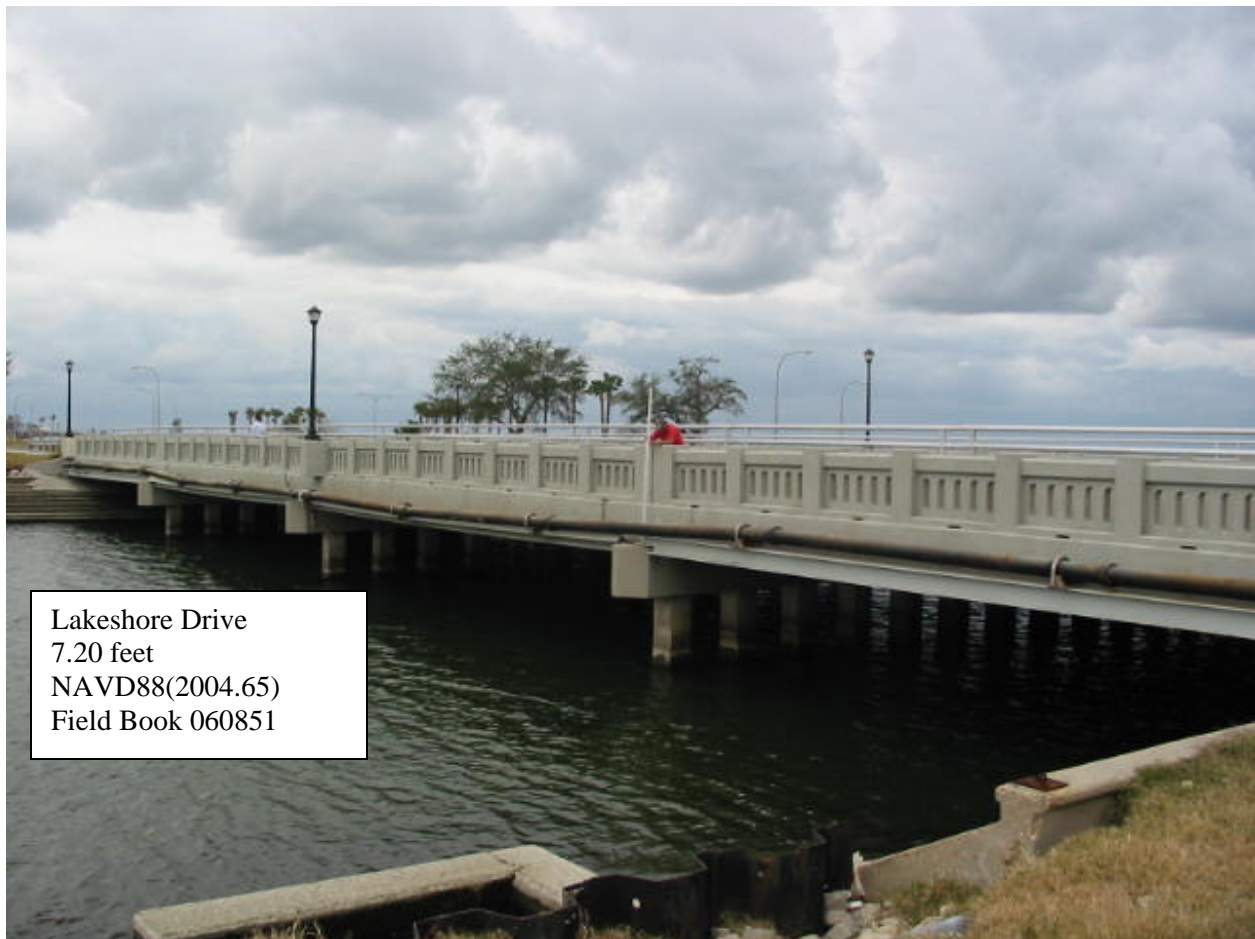


Leon C. Simon - West
3.01 feet
NAVD88(2004.65)
Field Book 060854



Appendix 9

Orleans Avenue Canal – Low Chord Elevations





Harrison Avenue - East
4.52 feet
NAVD88(2004.65)
Field Book 060854



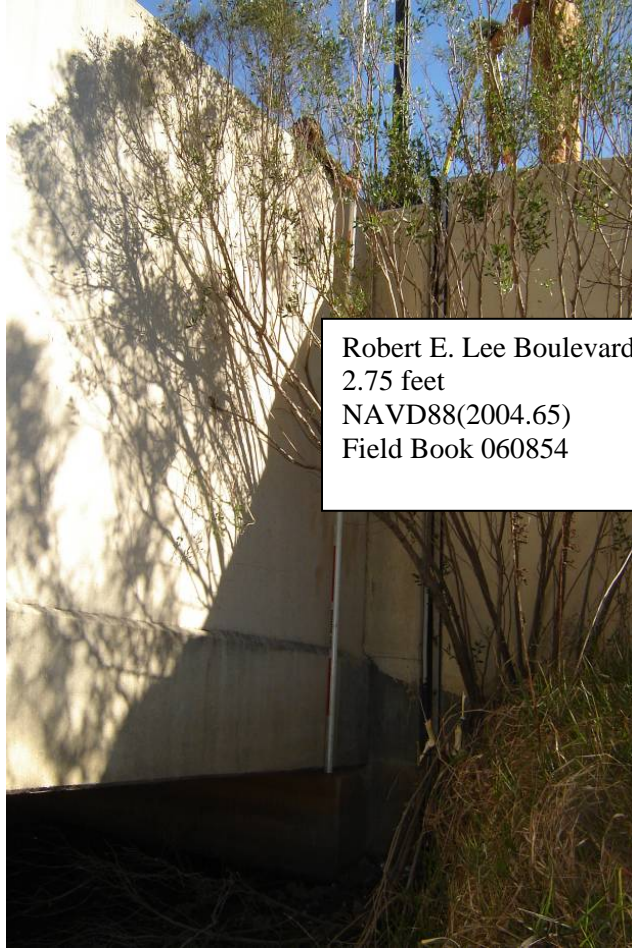
Harrison Avenue - West
4.26 feet
NAVD88(2004.65)
Field Book 060854



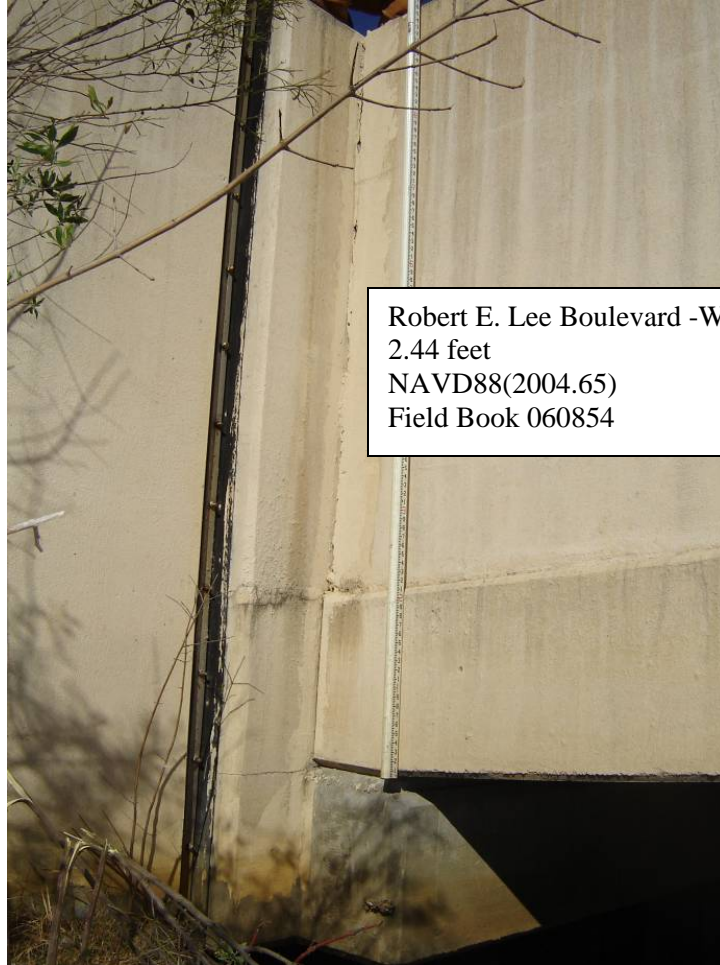
Filmore Avenue - East
2.20 feet
NAVD88(2004.65)
Field Book 060854



Filmore Avenue - West
3.40 feet
NAVD88(2004.65)
Field Book 060854



Robert E. Lee Boulevard - East
2.75 feet
NAVD88(2004.65)
Field Book 060854



Robert E. Lee Boulevard -West
2.44 feet
NAVD88(2004.65)
Field Book 060854

Appendix 10

High Water Marks – Orleans Parish, Interior



2930 Florida Ave. Elevation at slap = -3.59' NAVD88(2004.65)
Book# 060851, Pg. 8



5438 St Ferdinand Dr. slab = -5.90' NAVD88(2004.65)
Bk.060851, Pg 4



5544 St Ferdinand Dr.- Red Arrow on siding = 2.19' NAVD88(2004.65)
Bk. 060851, Pg. 3



6422 Peoples Dr. – Porch near door = -3.12' NAVD88(2004.65)
Bk. 060851, Pg. 2



Corner Of Peoples and Edge - Top Step at front door = -3.87' NAVD88(2004.65)
Bk. 060851, Pg. 6



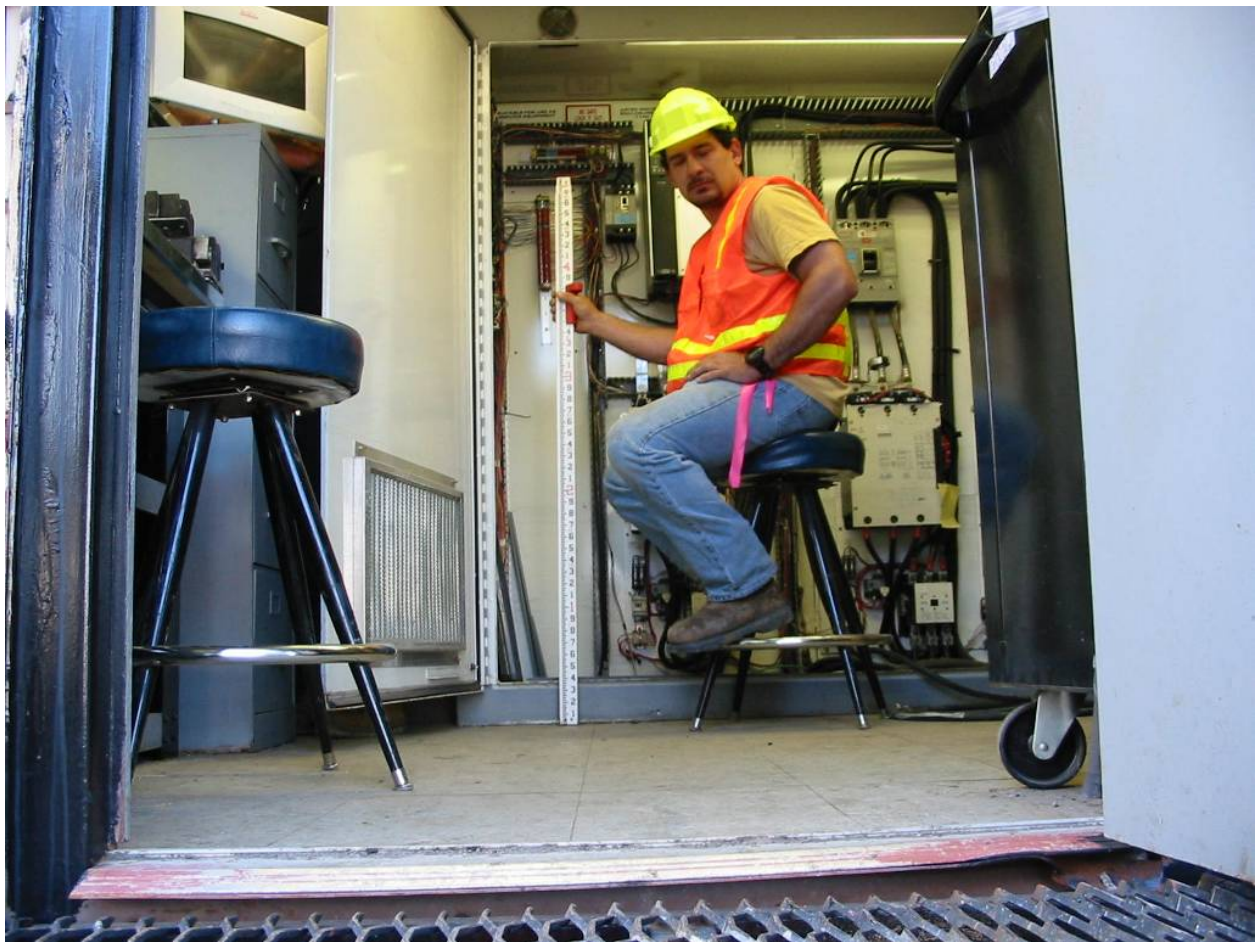
HWM OP-03 & London RR Gate – Survey arrow = 10.04' NAVD88(2004.65)
Bk. 060851, Pg. 19



OP-06 = 13.39' NAVD88(2004.65)
Bk. 060850, Pg. 32

Appendix 11

High Water Marks Inner Harbor Navigation Canal, West Bank



DASM 01 High Water Mark IHNCWEST 14.20 feet NAVD88(2004.65)
Field Book 060858



DASM 02 High Water Mark IHNCWEST 14.17 feet NAVD88(2004.65)
Field book 060858



DASM 03 High Water Mark IHNCWEST 14.28 feet NAVD88(2004.65)
Field Book 060858



DASM 04 High Water Mark IHNCWEST 14.25 feet NAVD88(2004.65)
Field Book 060858



DASM 05 High Water Mark IHNCWEST 14.19 feet NAVD88(2004.65)
Field Book 060858



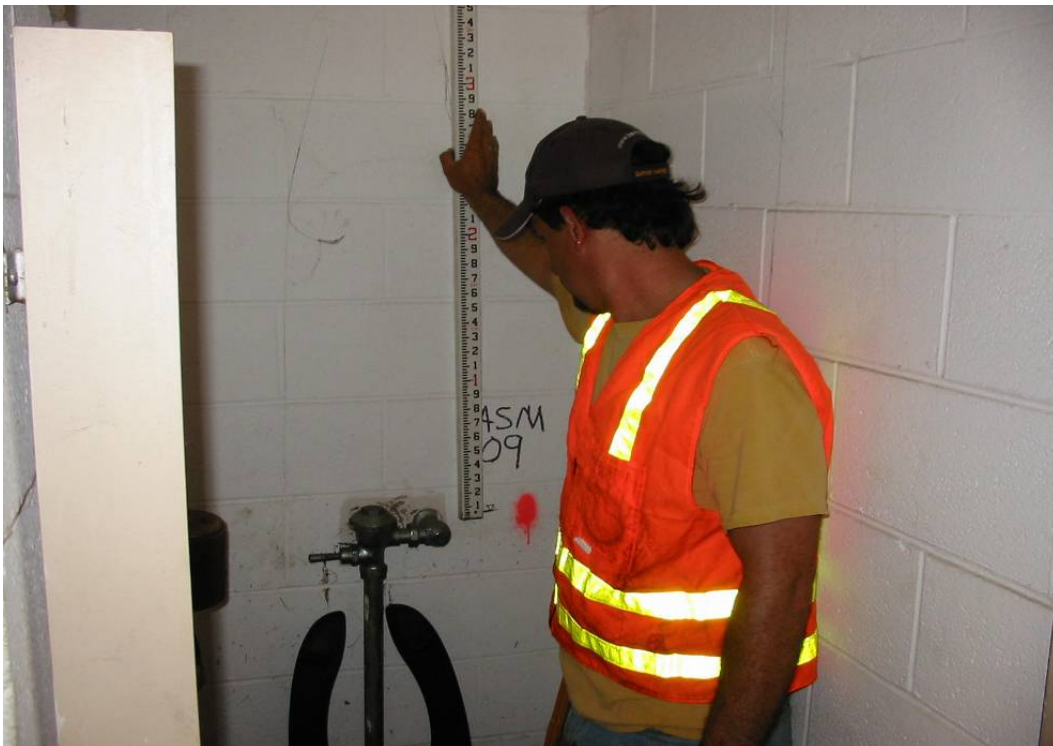
DASM 06 High Water Mark IHNCWEST 14.34 feet NAVD88(2004.65)
Field Book 060858



DASM 07 High Water Mark IHNCWEST 10.37 feet NAVD88(2004.65)
Field Book 060858



DASM 08 High Water Mark IHNCWEST 15.42 feet NAVD88(2004.65)
Field Book 060858



DASM 09 High Water Mark IHNCWEST 14.32 feet NAVD88(2004.65)
Field Book 060858



DASM 10 High Water Mark IHNCWEST 14.27 feet NAVD88(2004.65)
Field Book 060858



DASM 11 High Water Mark IHNCWEST 14.05 feet NAVD88(2004.65)
Field Book 060858



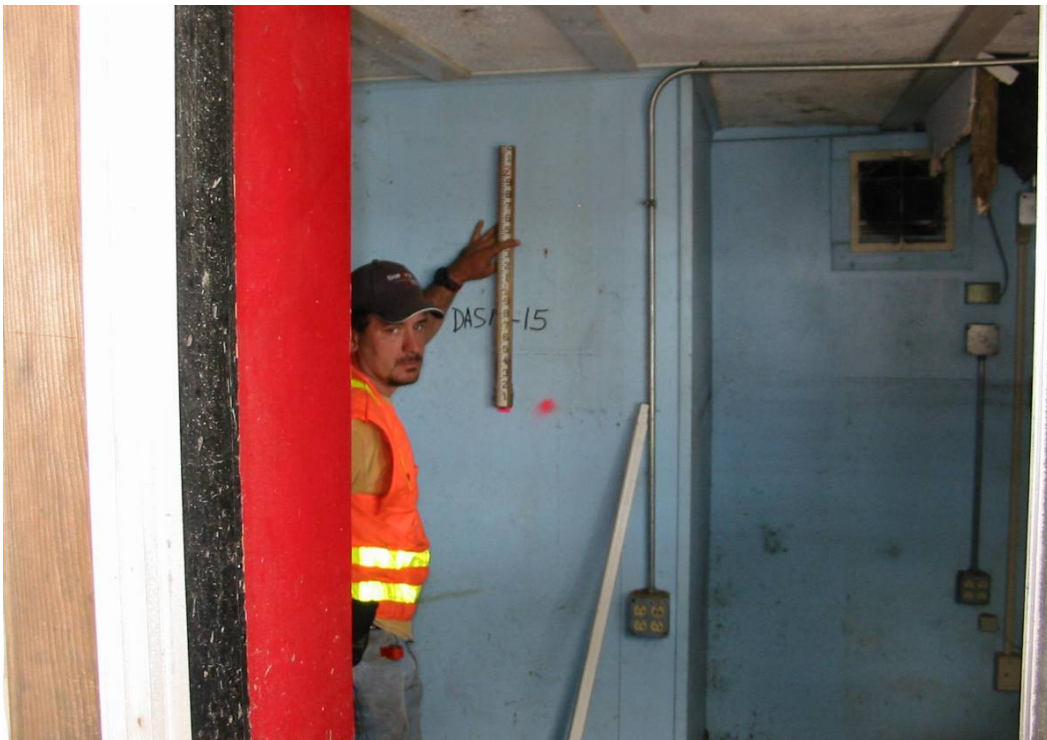
DASM 12 High Water Mark IHNCWEST 14.10 feet NAVD88(2004.65)
Field Book 060858



DASM 13 High Water Mark IHNCWEST 12.67 feet NAVD88(2004.65)
Field Book 060858



DASM 14 High Water Mark IHNCWEST 9.40 feet NAVD88(2004.65)
Field Book 060858



DASM 15 High Water Mark IHNCWEST 9.74 Feet NAVD88(2004.65)
Field Book 060858

Appendix 12

High Water Marks, Lower Plaquemines Parish

Location	NAVD 88(2004.65)	Reference	
	Elevation	Book	Page
LA 110 Lower Plaquimines HWM	12.68	60858	4
LA 111 Lower Plaquimines HWM	-0.03	60858	5
LA 112 Lower Plaquimines HWM	7.52	60858	6
LA 113 Lower Plaquimines HWM	7.31	60858	7
LA 114 Lower Plaquimines HWM	7.92	60858	8
LA 115 Lower Plaquimines HWM	12.35	60858	9
LA 116 Lower Plaquimines HWM	14.11	60858	10
LA 117 Lower Plaquimines HWM	14.17	60858	11
LA 118 Lower Plaquimines HWM	14.28	60858	12
LA 119 Lower Plaquimines HWM	15.65	60858	13
LA 120 Lower Plaquimines HWM	16.23	60858	14
LA 121 Lower Plaquimines HWM Bottom	14.84	60858	15
LA 121 Lower Plaquimines HWM Top	15.38	60858	15

LA 110= 12.68' NAVD88(2004.65)



LA 111 = -0.03' NAVD88(2004.65)

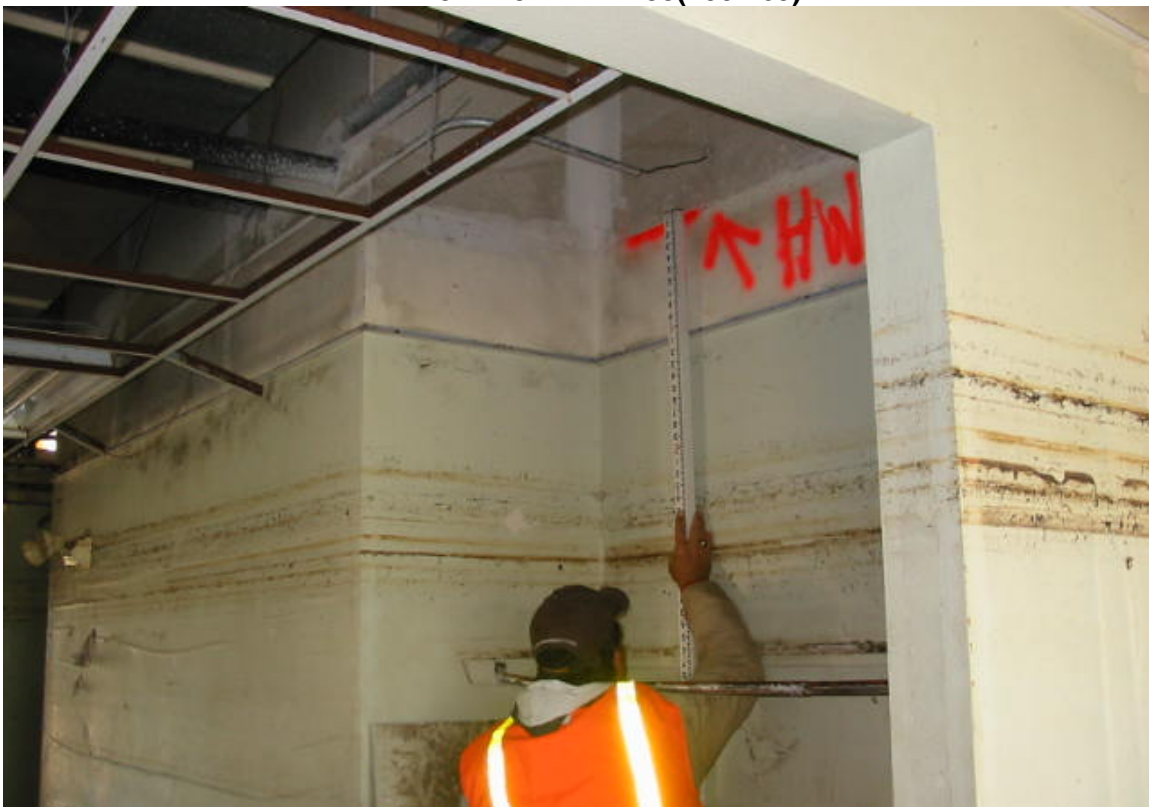
= THE FLOOR IN THE ROOM THAT HAD THE HWM MARKED ON THE WALL. DUE TO THE GUTTING OF THE INSIDE OF THE BUILDING THE HWM WAS GONE. SO WE JUST SHOT THE FLOOR NEAR THE LOCATION OF THE HWM.



LA 112 = 7.52' NAVD88(2004.65)



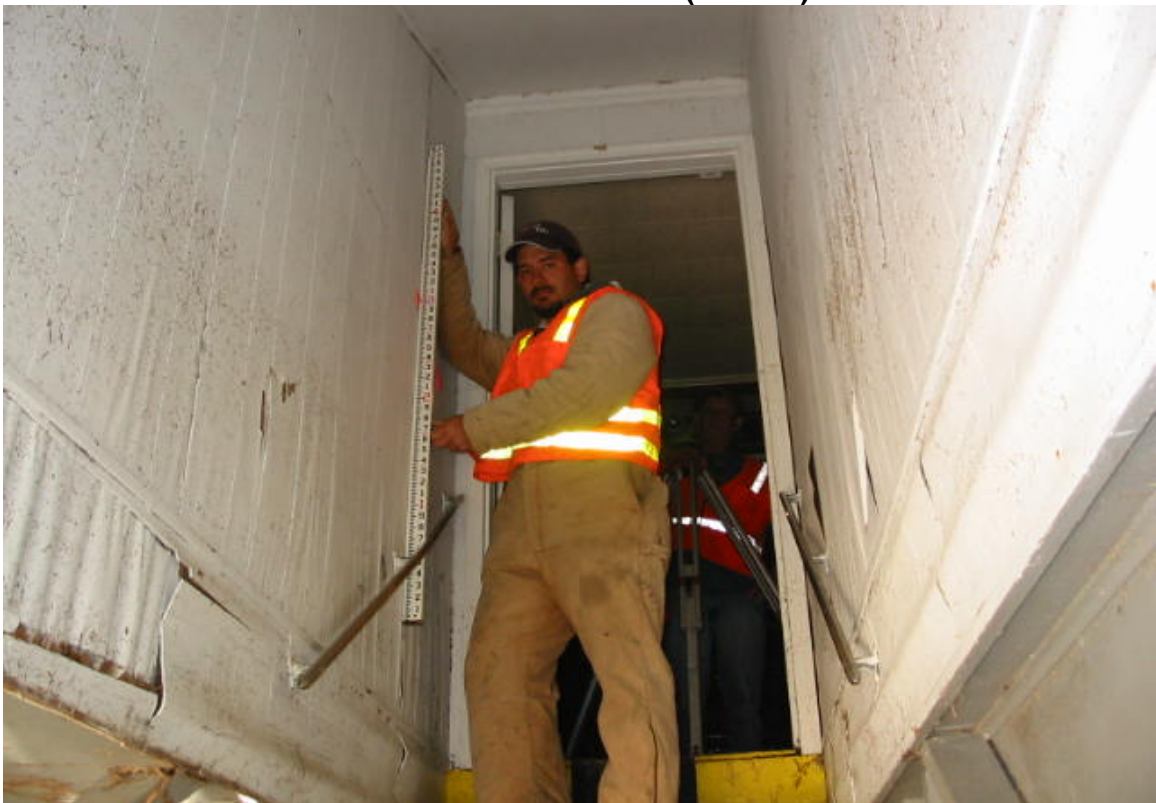
LA 113 = 7.31' NAVD88(2004.65)



LA 114 = 7.92' NAVD88(2004.65)



LA 115 = 12.35' NAVD88(2004.65)



LA 116 = 14.11' NAVD88(2004.65)



LA 117 = 14.17' NAVD 88(2004.65)



LA 118 = 14.28' NAVD88(2004.65)



LA 119 = 15.65' NAVD88(2004.65)



LA 120 = 16.23' NAVD88(2004.65)



LA 121 = 14.84' AND 15.38' NAVD88(2004.65) -- THERE WAS A LARGE PAINTED MARK ON THE STEEL BEAM. THESE 2 ELEV'S REPRESENT THE TOP AND THE BOTTOM OF THE PAINT MARK.



Appendix 13

High Water Mark, St. Bernard Parish



EBI Building HWM Elevation = 11.01' NAVD88(2004.65) Bk. 060855, Pg. 2

St. Bernard Parrish Levee

Horizontal Datum: NAD 1983(1992)

Horizontal Coordinate System: U.S. State Plane, 1983, Zone: Louisiana South 1702

Vertical Datum: NAVD88(2004.65)

Coordinate Units: US survey feet

Distance Units: U.S. survey feet

Height Units: U.S. survey feet

Name	Northing	Easting	Elevation	Location
EBI building			11.01	
5-01C\L	496736.70	3733434.95	15.32	C\L LEVEE
5-01N	496765.33	3733452.20	9.05	HWM-NORTHSIDE
5-02S	496709.26	3733420.41	10.67	HWM-SOUTHSIDE
5-03C\L	495284.94	3734011.64	13.75	C\L LEVEE
5-03N	495336.23	3734012.25	10.39	HWM-NORTHSIDE
5-04S	495253.53	3734008.39	10.43	HWM-SOUTHSIDE
5-05C\L	495278.29	3735995.25	14.10	C\L LEVEE
5-05N	495294.24	3736010.68	11.51	HWM-NORTHSIDE
5-06S	495254.66	3735967.82	10.48	HWM-SOUTHSIDE
5-07C\L	495310.92	3738493.52	17.66	C\L LEVEE
5-07N	495334.91	3738491.17	13.45	HWM-NORTHSIDE
5-08S	495283.08	3738496.72	11.87	SOUTHSIDE
5-09C\L	495324.63	3739645.54	16.61	C\L LEVEE
5-09N	495344.15	3739645.93	12.96	NORTHSIDE
5-10S	495299.74	3739644.76	11.80	SOUTHSIDE
5-11C\L	495390.87	3744324.49	18.41	C\L LEVEE
5-11N	495404.09	3744334.60	15.93	NORTHSIDE
5-12S	495360.09	3744303.93	12.04	SOUTHSIDE
5-13C\L	495451.10	3749110.19	17.17	C\L LEVEE
5-13N	495466.33	3749116.01	14.82	CHK
5-14S	495417.86	3749099.13	10.59	SOUTHSIDE
5-16C\L	495529.96	3754902.12	14.32	C\L LEVEE
5-16N	495546.13	3754899.90	10.94	NORTHSIDE
5-17S	495514.96	3754904.76	11.71	SOUTHSIDE
5-18C\L	495579.15	3758820.85	14.41	C\L LEVEE
5-18S	495569.64	3758820.98	12.91	SOUTHSIDE
5-19C\L	495608.13	3761064.70	14.62	C\L LEVEE
5-19S	495601.27	3761064.92	13.66	SOUTHSIDE
5-20C\L	495773.17	3771821.04	16.45	C\L LEVEE
5-20N	495796.00	3771815.92	11.96	NORTSIDE
5-21C\L	496221.10	3773239.07	17.45	C\L LEVEE
5-21N	496251.95	3773233.33	11.73	NORTHSIDE
5-22S	496196.31	3773245.72	12.26	SOUTHSIDE
GPLDA 1	498770.75	3732248.72	19.16	CHK
GPS TSPO	497791.90	3774665.51	16.38	CHK-COE GPS MARK
L 278	503313.63	3736367.04	6.93	RTK BASE
REGGIO2	492424.58	3779917.84	4.99	RTK BASE
STMY	495846.54	3768426.83	6.82	RTK BASE

Appendix 14

Inner Harbor Navigation Canal

West/SeaLand-Maresk Topographic Detail

Horizontal Datum: NAD 1983(1992)
 Horizontal Coordinate System: U.S. State Plane, 1983, Zone: Louisiana South 1702
 Vertical Datum: NAVD88(2004.65)
 Coordinate Units: US survey feet
 Distance Units: U.S. survey feet
 Height Units: U.S. survey feet

See electronic data collector file "IHNCWEST.dc" for raw data.

Name	Northing	Easting	Elevation	Feature Code
372	547912.92	3694882.23	14.62	DIRT RIP RAP PILE
373	547918.22	3694881.15	18.69	DIRT RIP RAP PILE
374	547922.98	3694880.50	18.18	DIRT RIP RAP PILE
375	547916.53	3694843.71	18.50	DIRT RIP RAP PILE
376	547916.11	3694819.96	17.59	DIRT RIP RAP PILE
377	547906.12	3694781.18	17.62	DIRT RIP RAP PILE
378	547881.41	3694730.86	17.68	DIRT RIP RAP PILE
379	547874.38	3694714.40	18.64	DIRT RIP RAP PILE
380	547869.17	3694706.86	15.60	DIRT RIP RAP PILE
381	547862.71	3694701.07	11.34	DIRT RIP RAP PILE
382	547857.15	3694698.83	8.00	DIRT RIP RAP PILE
383	547854.62	3694697.69	7.30	TOP CONC BAG
384	547811.33	3694674.30	7.54	TOP CONC BAG
385	547787.60	3694661.42	7.29	TOP CONC BAG
386	547727.40	3694627.69	7.50	TOP CONC BAG
387	547639.58	3694579.90	7.42	TOP CONC BAG
388	547547.64	3694529.01	7.30	TOP CONC BAG
389	547466.74	3694484.47	6.99	TOP CONC BAG
390	547382.75	3694439.24	6.69	TOP CONC BAG
391	547278.71	3694381.37	6.91	TOP CONC BAG
392	547210.08	3694343.50	6.97	TOP CONC BAG
393	547204.63	3694353.61	6.62	TOP CONC BAG
394	547203.86	3694355.43	6.29	TOP CONC BAG
395	547203.58	3694356.13	4.98	EDGE ASPHALT ROAD
396	547191.63	3694376.03	5.09	EDGE ASPHALT ROAD
397	547190.84	3694377.79	7.07	TOP CONC BAG

Name	Northing	Easting	Elevation	Feature Code
398	547145.25	3694464.48	7.79	TOP CONC BAG
399	547124.63	3694501.30	8.04	TOP CONC BAG
400	547082.21	3694575.68	7.38	TOP CONC BAG
401	547055.48	3694625.01	7.01	TOP CONC BAG
402	547052.03	3694632.83	6.69	TOP CONC BAG
403	547050.86	3694634.28	6.74	DIRT RIP RAP PILE
404	547050.94	3694642.03	6.88	DIRT RIP RAP PILE
405	547068.92	3694652.52	7.15	DIRT RIP RAP PILE
406	547070.59	3694653.25	7.23	TOP CONC BAG
407	547153.38	3694696.23	7.20	TOP CONC BAG
408	547167.70	3694702.58	6.57	TOP CONC BAG
409	547166.85	3694701.30	7.33	TOP SHEETPILING
410	547261.61	3694759.07	7.92	TOP SHEETPILING
411	547328.64	3694794.28	7.96	TOP SHEETPILING
412	547384.35	3694821.70	7.74	TOP SHEETPILING
413	547476.70	3694865.95	7.55	TOP SHEETPILING
414	547546.28	3694898.47	7.65	TOP SHEETPILING
415	547557.28	3694879.44	7.54	TOP SHEETPILING
416	547576.18	3694888.93	7.47	TOP SHEETPILING
417	547626.64	3694917.36	7.86	TOP SHEETPILING
418	547626.88	3694917.27	8.23	TOP CONC FLDWALL
419	547639.32	3694924.13	8.22	TOP CONC FLDWALL
420	547645.81	3694913.47	8.15	TOP CONC FLDWALL
421	547647.60	3694914.20	8.12	TOP CONC FLDWALL
422	547648.44	3694913.01	7.76	TOP SHEETPILING
423	547676.92	3694915.74	7.65	TOP SHEETPILING
424	547677.36	3694916.15	7.09	TOP CONC BAG
425	547737.68	3694917.60	6.85	TOP CONC BAG
426	547784.56	3694913.98	7.21	TOP CONC BAG
427	547840.37	3694904.41	7.09	TOP CONC BAG
428	547858.21	3694898.70	7.05	TOP CONC BAG
429	547876.46	3694890.97	6.53	TOP CONC BAG
430	547880.22	3694888.52	6.60	DIRT RIP RAP PILE
431	547900.17	3694885.17	6.92	DIRT RIP RAP PILE
432	547051.07	3694641.38	6.89	DIRT RIP RAP PILE
433	547039.87	3694650.53	11.93	TOE
434	547045.82	3694652.93	15.47	TOP SPILE DAUPHIN
435	547045.42	3694653.27	14.43	DAUPHIN DIRT FILLED
436	547022.38	3694672.60	14.61	DAUPHIN DIRT FILLED
437	546986.50	3694737.89	12.93	DAUPHIN DIRT FILLED
438	546956.83	3694792.46	14.54	DAUPHIN DIRT FILLED
439	546915.81	3694867.68	13.60	DAUPHIN DIRT FILLED
440	546902.78	3694894.84	14.61	DAUPHIN DIRT FILLED
441	546901.69	3694894.42	15.21	TOP SPILE DAUPHIN
442	546902.72	3694895.13	15.30	EDGE CONC FLDWALL
443	546901.88	3694896.18	15.34	TOP CONC FLDWALL
444	546901.78	3694896.40	14.36	TOP CONC FLDWALL
445	546889.19	3694920.82	14.38	TOP CONC FLDWALL
446	546877.69	3694941.42	14.36	TOP CONC FLDWALL
447	546877.59	3694941.70	14.70	TOP CONC FLDWALL
448	546829.38	3695030.01	14.43	TOP CONC FLDWALL
449	546794.18	3695094.22	14.33	TOP CONC FLDWALL

Name	Northing	Easting	Elevation	Feature Code
450	546779.88	3695120.10	14.23	TOP CONC FLDWALL
451	546780.16	3695119.98	14.20	FLDWALL BLOWOUT
452	546778.38	3695125.29	13.95	FLDWALL BLOWOUT
453	546777.71	3695126.20	10.30	FLDWALL BLOWOUT
454	546774.10	3695130.36	9.18	FLDWALL BLOWOUT
455	546773.09	3695132.72	13.95	FLDWALL BLOWOUT
456	546772.41	3695133.86	14.04	TOP CONC FLDWALL
457	546770.37	3695137.67	14.02	TOP CONC FLDWALL
458	546683.06	3695175.19	14.30	TOP CONC FLDWALL
459	546603.44	3695209.19	14.07	TOP CONC FLDWALL
460	546508.65	3695249.57	14.34	TOP CONC FLDWALL
461	546441.68	3695269.17	14.52	TOP CONC FLDWALL
462	546358.50	3695293.25	14.62	TOP CONC FLDWALL
463	546320.84	3695304.23	14.74	TOP CONC FLDWALL
464	546316.53	3695302.77	14.70	TOP CONC FLDWALL
465	546316.20	3695302.74	14.33	TOP CONC FLDWALL
466	546239.77	3695269.74	14.33	TOP CONC FLDWALL
467	546141.22	3695227.14	14.31	TOP CONC FLDWALL
468	546079.05	3695240.57	14.28	TOP CONC FLDWALL
469	546025.95	3695252.28	14.31	TOP CONC FLDWALL
470	545958.19	3695273.47	14.28	TOP CONC FLDWALL
471	545883.57	3695296.78	14.30	TOP CONC FLDWALL
472	545865.28	3695292.36	14.30	TOP CONC FLDWALL
473	545773.47	3695271.47	14.30	TOP CONC FLDWALL
474	545773.29	3695271.48	14.78	TOP CONC FLDWALL
475	545768.23	3695270.29	14.76	TOP CONC FLDWALL
476	545732.73	3695276.59	14.71	TOP CONC FLDWALL
477	545676.51	3695245.82	14.80	TOP CONC FLDWALL
478	545606.18	3695207.57	14.66	TOP CONC FLDWALL
479	545544.46	3695225.32	14.82	TOP CONC FLDWALL
480	545544.14	3695225.03	15.03	TOP CONC FLDWALL
481	545536.90	3695227.19	15.11	EDGE CONC FLDWALL
482	545536.73	3695227.25	9.53	TOE FLDGATE
483	545490.89	3695240.72	9.49	TOE FLDGATE
484	545490.79	3695240.75	15.05	EDGE CONC FLDWALL
485	545483.68	3695242.91	15.05	TOP CONC FLDWALL
486	545483.44	3695243.03	14.80	TOP CONC FLDWALL
487	545472.87	3695246.12	14.82	TOP CONC FLDWALL
488	545483.96	3695285.18	14.74	TOP CONC FLDWALL
489	545422.70	3695302.88	14.68	TOP CONC FLDWALL
490	545339.88	3695327.08	14.77	TOP CONC FLDWALL
491	545256.41	3695351.38	14.56	TOP CONC FLDWALL
492	545173.36	3695375.33	14.48	TOP CONC FLDWALL
493	545089.94	3695399.53	14.63	TOP CONC FLDWALL
494	545006.72	3695423.62	14.64	TOP CONC FLDWALL
495	544923.65	3695447.72	14.57	TOP CONC FLDWALL
496	544855.62	3695467.15	14.74	TOP CONC FLDWALL
497	544855.26	3695467.25	15.16	TOP CONC FLDWALL
498	544849.40	3695468.86	15.16	EDGE CONC FLDWALL
499	544849.19	3695469.01	9.89	TOE FLDWALL
500	544774.19	3695490.86	9.86	TOE FLDWALL
501	544773.99	3695490.79	15.11	EDGE CONC FLDWALL

Name	Northing	Easting	Elevation	Feature Code
502	544768.09	3695492.39	15.13	TOP CONC FLDWALL
503	544767.78	3695492.58	14.62	TOP CONC FLDWALL
504	544753.42	3695497.32	14.62	TOP CONC FLDWALL
505	544756.01	3695506.18	14.64	TOP CONC FLDWALL
506	544694.55	3695524.08	14.55	TOP CONC FLDWALL
507	544611.34	3695548.21	14.50	TOP CONC FLDWALL
508	544528.15	3695572.36	14.61	TOP CONC FLDWALL
509	544462.40	3695591.50	14.73	TOP CONC FLDWALL
510	544462.17	3695591.59	14.31	TOP CONC FLDWALL
511	544389.64	3695612.53	14.38	TOP CONC FLDWALL
512	544389.51	3695612.64	14.76	TOP CONC FLDWALL
513	544314.17	3695634.37	14.63	TOP CONC FLDWALL
514	544236.40	3695623.66	14.74	TOP CONC FLDWALL
515	544221.42	3695573.14	14.77	TOP CONC FLDWALL
516	544162.03	3695590.19	14.76	TOP CONC FLDWALL
517	544161.96	3695590.39	15.11	TOP CONC FLDWALL
518	544155.94	3695592.20	15.15	EDGE CONC FLDWALL
519	544155.66	3695592.20	8.67	TOE CONC FLDWALL
520	544114.99	3695604.00	8.60	TOE CONC FLDWALL
521	544114.85	3695604.05	14.98	EDGE CONC FLDWALL
522	544108.83	3695605.79	15.10	TOP CONC FLDWALL
523	544108.56	3695605.98	14.74	TOP CONC FLDWALL
524	544026.21	3695629.95	14.60	TOP CONC FLDWALL
525	544034.67	3695659.03	14.70	TOP CONC FLDWALL
526	544031.53	3695660.11	14.72	TOP CONC FLDWALL
527	544031.39	3695660.24	14.21	TOP CONC FLDWALL
528	543968.82	3695678.12	14.26	TOP CONC FLDWALL
529	543968.32	3695677.69	15.04	TOP CONC FLDWALL
530	543961.91	3695680.09	15.03	EDGE CONC FLDWALL
531	543961.89	3695679.94	9.68	TOE CONC FLDWALL
532	543906.26	3695696.22	9.71	TOE CONC FLDWALL
533	543906.02	3695696.11	15.03	EDGE CONC FLDWALL
534	543899.45	3695698.28	15.09	TOP CONC FLDWALL
535	543899.26	3695698.35	14.32	TOP CONC FLDWALL
536	543849.58	3695712.86	14.25	TOP CONC FLDWALL
537	543849.35	3695712.87	14.71	TOP CONC FLDWALL
538	543843.69	3695714.53	14.76	TOP CONC FLDWALL
539	543851.45	3695740.34	14.73	TOP CONC FLDWALL
540	543847.61	3695741.35	14.73	TOP CONC FLDWALL
541	543847.45	3695741.47	14.23	TOP CONC FLDWALL
542	543799.37	3695755.43	14.23	TOP CONC FLDWALL
543	543732.47	3695774.73	14.29	TOP CONC FLDWALL
544	543732.25	3695774.77	14.46	TOP CONC FLDWALL
545	543727.41	3695776.23	14.52	TOP CONC FLDWALL
546	543690.05	3695803.59	14.14	TOP CONC FLDWALL
547	543627.59	3695821.56	14.29	TOP CONC FLDWALL
548	543544.30	3695845.74	14.36	TOP CONC FLDWALL
549	543461.13	3695869.75	14.18	TOP CONC FLDWALL
550	543405.91	3695885.74	14.23	TOP CONC FLDWALL
551	543371.58	3695895.84	14.30	TOP CONC FLDWALL
552	543364.99	3695873.65	14.41	TOP CONC FLDWALL
553	543311.01	3695889.25	14.76	TOP CONC FLDWALL

Name	Northing	Easting	Elevation	Feature Code
554	543310.69	3695889.22	15.07	TOP CONC FLDWALL
555	543304.19	3695891.08	15.09	EDGE CONC FLDWALL
556	543304.11	3695890.98	9.91	TOE CONC FLDWALL
557	543262.98	3695903.16	9.89	TOE CONC FLDWALL
558	543262.84	3695903.22	15.03	EDGE CONC FLDWALL
559	543256.05	3695905.06	15.10	TOP CONC FLDWALL
560	543255.87	3695905.21	14.71	TOP CONC FLDWALL
561	543237.11	3695911.03	14.70	TOP CONC FLDWALL
562	543249.55	3695953.51	14.62	TOP CONC FLDWALL
563	543245.54	3695954.67	14.68	TOP CONC FLDWALL
564	543245.42	3695954.77	14.27	TOP CONC FLDWALL
565	543132.35	3695987.69	14.16	TOP CONC FLDWALL
566	543055.16	3696010.21	14.21	TOP CONC FLDWALL
567	543024.13	3696018.99	14.17	TOP CONC FLDWALL
568	543023.98	3696019.04	14.50	TOP CONC FLDWALL
569	543020.12	3696020.15	14.48	TOP CONC FLDWALL
570	543014.05	3695999.45	14.44	TOP CONC FLDWALL
571	542927.36	3696026.95	14.45	TOP CONC FLDWALL
572	542846.12	3696052.30	14.13	TOP CONC FLDWALL
573	542763.76	3696027.44	14.21	TOP CONC FLDWALL
574	542680.90	3696002.08	14.18	TOP CONC FLDWALL
575	542597.16	3695977.05	14.09	TOP CONC FLDWALL
576	542514.21	3695951.63	13.99	TOP CONC FLDWALL
577	542431.57	3695926.25	13.99	TOP CONC FLDWALL
578	542348.20	3695901.10	13.93	TOP CONC FLDWALL
579	542264.97	3695875.85	14.28	TOP CONC FLDWALL
580	542214.01	3695860.36	14.67	TOP CONC FLDWALL
581	542207.84	3695881.02	14.73	TOP CONC FLDWALL
582	542203.50	3695879.78	14.70	TOP CONC FLDWALL
583	542203.25	3695879.68	13.02	TOP CONC FLDWALL
584	542170.71	3695872.12	13.63	TOP CONC FLDWALL
585	542169.87	3695872.67	12.70	TOP CONC FLDWALL
586	542165.64	3695871.69	12.67	TOP CONC FLDWALL
587	542165.46	3695871.59	13.12	TOP CONC FLDWALL
588	542163.75	3695870.75	13.10	EDGE CONC FLDWALL
589	542163.79	3695870.43	9.65	TOE CONC FLDWALL
590	542119.99	3695860.17	9.70	TOE CONC FLDWALL
591	542119.85	3695860.15	13.27	EDGE CONC FLDWALL
592	542118.10	3695860.01	13.26	TOP CONC FLDWALL
593	542117.79	3695860.06	12.78	TOP CONC FLDWALL
594	542064.43	3695846.97	12.77	TOP CONC FLDWALL
595	542063.86	3695846.62	12.99	TOP CONC FLDWALL
596	542015.67	3695834.95	12.32	TOP CONC FLDWALL
597	541948.07	3695817.86	11.89	TOP CONC FLDWALL
598	541860.46	3695796.22	11.80	TOP CONC FLDWALL
599	541773.82	3695774.72	12.11	TOP CONC FLDWALL
600	541686.77	3695752.88	12.03	TOP CONC FLDWALL
601	541599.41	3695731.76	12.14	TOP CONC FLDWALL
602	541540.88	3695717.25	12.56	TOP CONC FLDWALL
603	541516.79	3695711.30	13.07	TOP CONC FLDWALL
604	541516.26	3695711.24	12.38	TOP CONC FLDWALL
605	541462.20	3695697.78	12.63	TOP CONC FLDWALL

Name	Northing	Easting	Elevation	Feature Code
606	541461.95	3695697.57	13.22	TOP CONC FLDWALL
607	541460.16	3695696.49	13.21	EDGE CONC FLDWALL
608	541460.13	3695696.66	10.07	TOE CONC FLDWALL
609	541416.33	3695685.67	10.06	TOE CONC FLDWALL
610	541416.27	3695685.50	13.22	EDGE CONC FLDWALL
611	541414.46	3695685.42	13.27	TOP CONC FLDWALL
612	541414.30	3695685.37	12.68	TOP CONC FLDWALL
613	541387.44	3695678.77	12.46	TOP CONC FLDWALL
614	541377.74	3695662.62	12.51	TOP CONC FLDWALL
615	541374.26	3695665.06	12.50	TOP CONC FLDWALL
616	541374.09	3695664.80	13.22	TOP CONC FLDWALL
617	541372.37	3695665.40	13.21	EDGE CONC FLDWALL
618	541372.54	3695666.25	7.54	TOE CONC FLDWALL
619	541358.18	3695674.87	7.57	TOE CONC FLDWALL
620	541357.69	3695674.29	13.22	EDGE CONC FLDWALL
621	541356.34	3695675.52	13.26	TOP CONC FLDWALL
622	541356.10	3695675.71	12.51	TOP CONC FLDWALL
623	541314.78	3695700.62	12.50	TOP CONC FLDWALL
624	541312.71	3695701.52	12.51	TOP CONC FLDWALL
625	541307.73	3695693.67	12.48	END CONC FLDWALL
626	541202.69	3695756.73	12.45	END CONC FLDWALL
627	541158.76	3695782.92	12.56	TOP CONC FLDWALL
628	541128.36	3695732.27	12.55	TOP CONC FLDWALL
629	541102.23	3695688.13	12.50	TOP CONC FLDWALL
630	541106.13	3695670.94	12.59	TOP CONC FLDWALL
631	541105.65	3695670.99	12.61	TOP CONC FLDWALL
632	541105.44	3695670.71	21.18	TOP CONC FLDWALL
633	541103.18	3695669.47	21.17	EDGE CONC FLDWALL
634	541102.49	3695669.82	5.25	TOE FLDGATE
635	541071.05	3695663.20	5.12	TOE FLDGATE
636	541071.05	3695663.08	13.34	EDGE CONC FLDWALL
637	541071.85	3695660.73	13.32	TOP CONC FLDWALL
638	541071.86	3695660.52	12.55	TOP CONC FLDWALL
639	541079.50	3695633.92	12.49	TOP CONC FLDWALL
640	541075.39	3695632.68	12.50	TOP CONC FLDWALL
641	541075.21	3695633.79	12.51	TOP CONC FLDWALL
642	541042.13	3695625.59	12.41	TOP CONC FLDWALL
643	541056.47	3695567.24	12.51	TOP CONC FLDWALL
644	541047.06	3695541.63	12.58	TOP CONC FLDWALL
645	541047.03	3695541.52	13.14	TOP CONC FLDWALL
646	541046.44	3695539.78	13.14	TOP CONC FLDWALL
647	541046.36	3695539.56	12.52	TOP CONC FLDWALL
648	541036.23	3695511.98	12.52	TOP CONC FLDWALL
649	541036.68	3695511.86	16.76	TOP CONC FLDWALL
650	541035.90	3695509.93	16.67	EDGE CONC FLDWALL
651	541034.88	3695509.52	7.84	TOE FLDGATE
652	541025.36	3695483.39	7.72	TOE FLDGATE
653	541025.98	3695482.74	13.77	EDGE CONC FLDWALL
654	541024.75	3695481.21	13.82	TOP CONC FLDWALL
655	541024.72	3695480.93	12.47	TOP CONC FLDWALL
656	541022.71	3695476.06	12.48	TOP CONC FLDWALL
657	541008.85	3695472.68	12.58	TOP CONC FLDWALL

Name	Northing	Easting	Elevation	Feature Code
658	541008.78	3695472.45	13.98	TOP CONC FLDWALL
659	540975.95	3695464.55	13.72	TOP CONC FLDWALL
660	540975.49	3695464.57	12.57	TOP CONC FLDWALL
661	540889.57	3695380.95	6.39	TOP CONC FLDWALL
662	540886.93	3695441.90	12.55	EDGE CONC FLDWALL
663	540884.39	3695440.22	0.11	TOE FLDGATE
664	540845.79	3695430.78	0.23	TOE FLDGATE
665	540842.93	3695430.67	12.61	EDGE CONC FLDWALL
667	540810.11	3695423.03	12.83	TOP CONC FLDWALL
668	540809.27	3695423.34	12.79	TOP CONC FLDWALL
669	540801.93	3695420.84	12.71	EDGE CONC FLDWALL
IHNC5	541419.07	3695686.94	9.96	CHISELED X
IHNC6	541436.98	3695528.23	4.95	PK NAIL
IHNC7	540899.42	3695300.31	0.57	PK NAIL
IHNC8	540944.19	3695118.09	-0.35	PK NAIL
OP17	542897.98	3688637.67	-2.15	RTK BASE
TBM FRANCE	543277.04	3694356.36	4.53	CHK

Appendix 15

Lake Pontchartrain/IHNC Gage Connections

Horizontal Datum: NAD 1983(1992)
 Horizontal Coordinate System: U.S. State Plane, 1983, Zone: Louisiana South 1702
 Vertical Datum: NAVD88(2004.65)
 Coordinate Units: US survey feet
 Distance Units: U.S. survey feet
 Height Units: U.S. survey feet

Gage Name/ Site

USGS at I-10 and Inner Harbor Navigation Canal (IHNC)

Control Point Name	Elevation	Field Book Reference	
		Book	Page
RP-1	10.09'	060855	36
B 3130 Reset (PID = BJ 5311)	9.68'	060855	37

Orleans Levee District Staff Gage at I-10 and IHNC

Control Point Name	Elevation	Field Book Reference	
		Book	Page
Staff Gage -10' Mark	9.62'	060855	36

USGS Gage at Paris Road(I-510) bridge over IWW

Control Point Name	Elevation	Field Book Reference	
		Book	Page
RP-1	6.50'	060850	27

Orleans Levee District Gage at Southshore Marina

Control Point Name	Elevation	Field Book Reference	
		Book	Page
Staff Gage - 0' Mark	-0.08'	060850	28-31
1A (PID-BJ1394 Original reference point)	8.33'	060850	28-31
RP-A (New reference point set)	4.42'	060850	28-31

Pass Manchac at Turtle Cove at Pontchatoula, LA

Control Point Name	Elevation	Field Book Reference	
		Book	Page
GPS-1	2.84'	060850	25-26
RP-1	2.41'	060850	25-26
RM-1	2.45	060850	25-26

Little Irish Bayou near HWY 11 near Slidell, LA

Control Point Name	Elevation	Field Book Reference	
		Book	Page
AGO6	3.62'	060855	27
GPS-1	4.96'	060855	27
RM-1	5.00'	060855	27
RP-1	9.67'	060855	27
RM-2	5.02'	060855	27

Weather Service Mid-Lake Gage

Control Point Name	Elevation	Field Book Reference	
		Book	Page
AGO7	9.04'	060858	29
SCREW	11.97'	060858	29
RM-1	9.06'	060858	29
Top Lip PVC Pipe	12.92'	060858	29

USGS and Orleans Levee District Gages at I-10 and Inner Harbor Navigation Canal (IHNC).



USGS Gage at I-10 and IHNC
Elevation taken on Iron directly over
transducer pipe = 10.09' NAVD88(2004.65)
Bk. 060855, Pg.36

Orleans Levee District Staff Gage
10' Mark = 9.62' NAVD88(2004.65)
Bk. 060855, Pg.36

Additional Photo of both gages.



USGS Gage at Paris Road (I 510) Bridge over the IWW



USGS Paris Road Gage, Elevation = 6.50' NAVD88(2004.65)
Bk. 060850, Pg 27



Red circles on photo are where elevation was taken.



Orleans Levee District gage at Southshore Marina

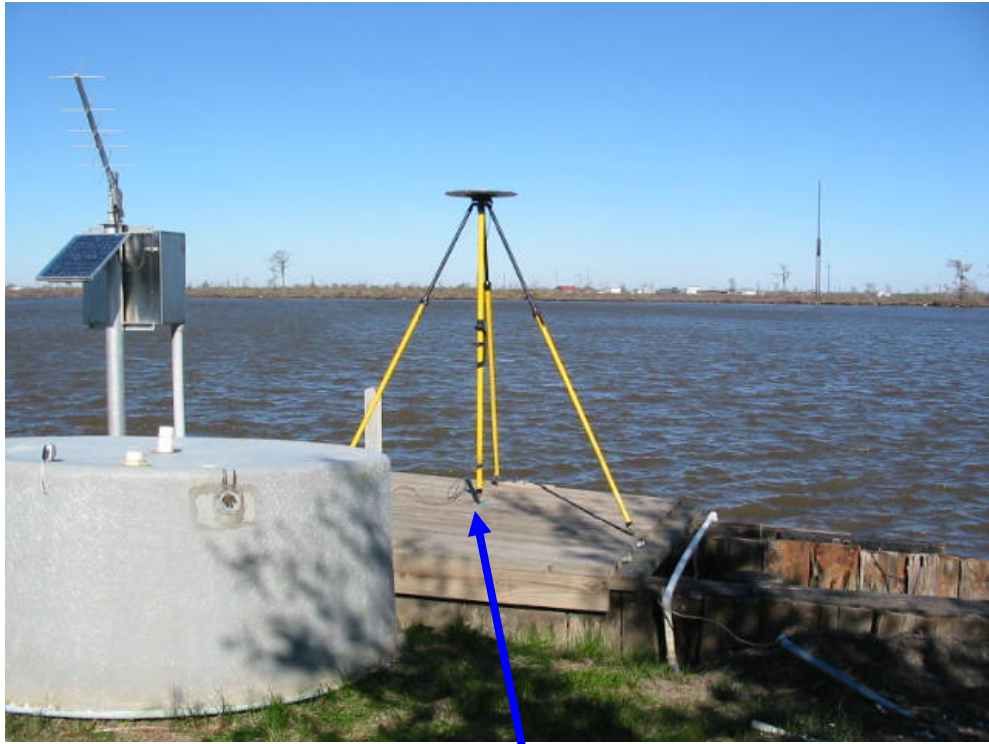


Southshore Marina Gage Staff Gage elevation at reading 0' = -0.79', New reference point RP-A Elevation = 4.42', Original reference point PID BJ1394 = 8.33' NAVD88(2004.65), Bk. 060850, Pgs. 28-31



The above photo shows location of RP-A and red circle shows staff gage.

Pass Manchac at Turtle Cove Pontchatoula, LA



Pass Manchac at Turtle Cove, Shot GPS-1 = 2.84' NAVD88(2004.65),
Bk. 060850, Pg. 25-26



Additional Photo of Pass Manchac at Turtle Cove below.



Little Irish Bayou near HWY 11 in Slidell, La



Little Irish Bayou, Shot GPS-1 = 4.96', AGO6 = 3.62', RM-1 = 5.00', RP-1 = 9.67', and RM-2 = 5.02', NAVD88(2004.65), Bk. 060855, Pg. 27

Weather Service Mid-Lake Gage



GPS Point -AGO7 = 9.04' NAVD88(2004.65)
Bk. 060858 Pg. 29



Shot at screw on gage = 11.97' NAVD88(2004.65), Bk. 060858 Pg. 29



Shot at top lip PVC Pipe = 12.92' NAVD88(2004.65), Bk. 060858 Pg. 29



Shot RM-1 = 9.06' NAVD88(2004.65), Bk. 060858 Pg. 29

Appendix 16

Time Stamped Surge Elevations - New Orleans Lakefront Airport

Horizontal Datum: NAD 1983(1992)

Horizontal Coordinate System: U.S. State Plane, 1983, Zone: Louisiana South 1702

Vertical Datum: NAVD88(2004.65)

Coordinate Units: US survey feet

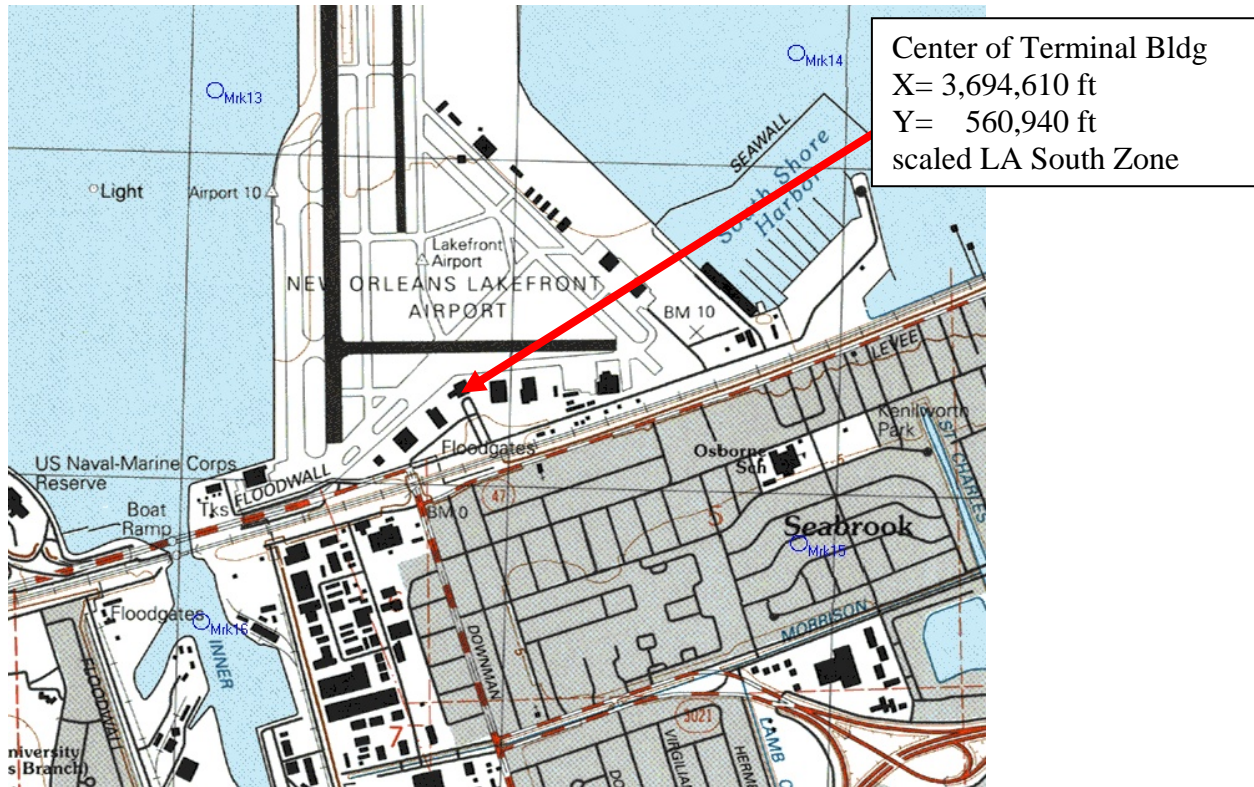
Distance Units: U.S. survey feet

Height Units: U.S. survey feet

High Water Marks at Lakefront Airport			
	NAVD88(2004.65)	Reference	
	FEET	Book	Page
HWM APH 01	6.72	060851	68-69
HWM APH 02	9.54	060851	68-69
HWM APH 03	10.63	060851	33
HWM APH 04	11.99	060851	33
HWM APH 05	11.30	060851	33
HWM APH 06	9.65	060851	33
HWM APH 07	11.56	060851	68-69
HWM APH 08	10.20	060851	68-69
HWM APH 09	8.89	060851	68-69
HWM APH 10	10.26	060851	68-69
HWM APH 11	7.35	060851	68-69
HWM APH 12	7.06	060851	68-69
HWM APH 13	8.25	060851	68-69

The following sheets contain Lake Pontchartrain surge elevations during the morning of 29 Aug 05. These points were marked by Maynard and Bergen on 15 Dec 05, based on photographs taken by Orleans Levee Board personnel (Fred Pruitt) who rode out Hurricane Katrina in the airport terminal building.

Water surface elevation marks were surveyed by differential leveling on 16 Dec 05, by 3001, Inc. Points are referenced to CHL photo numbers and time (LST). Data on additional HWM points not referenced by CHL photo and time are in other CHL (Maynard) files. All elevations are referenced to the updated time dependent vertical datum for the New Orleans region—NAVD88 (2004.65). Approximate horizontal locations of the marks are as described.



APH-01
TIME 7:38 AM (CHL Photo 1b)
On concrete barrier at terminal entrance

ELEVATION 6.72 FT NAVD88 (2004.65)

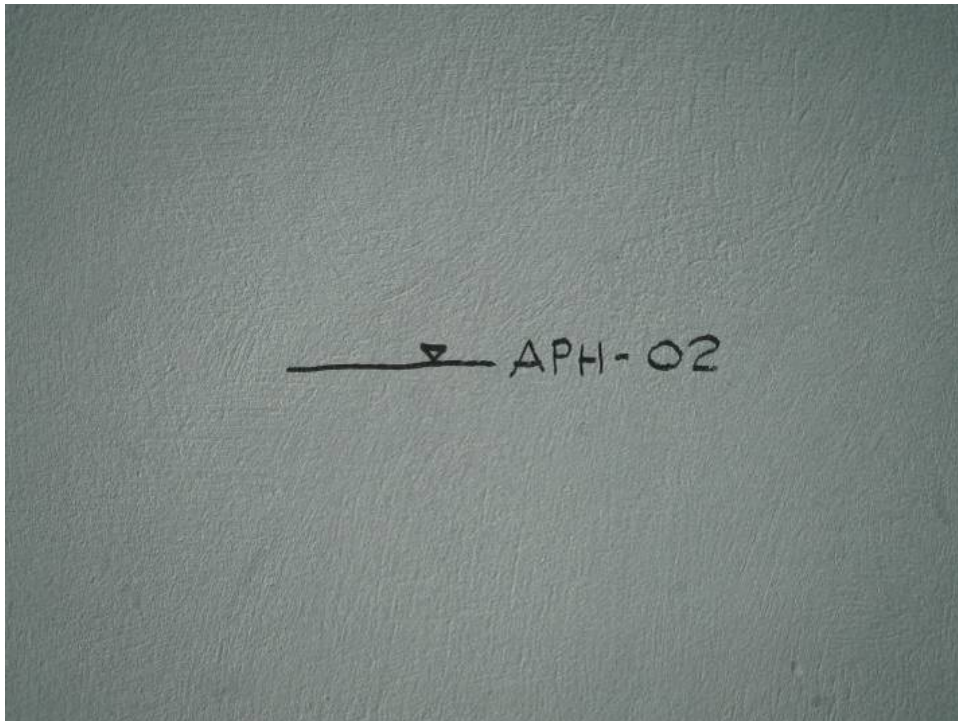


APH-01



APH-02
TIME 10:31 AM (CHL Photo 1f)
On wall NW side of terminal

ELEVATION	9.54 FT	NAVD88 (2004.65)
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APH-03

TIME 9:42 AM (CHL Photo 1d)

On column NE side of terminal building

ELEVATION 10.63 FT NAVD88 (2004.65)



APH-04
TIME 9:40 AM (CHL Photo 1d)
NE side of terminal bldg
Mark 9.6 ft below bottom of balcony

ELEVATION 11.99 FT NAVD88 (2004.65)



APH-05
TIME ? (no CHL Photo)
NE side of terminal bldg
marked by flagging on fence

ELEVATION 11.30 FT NAVD88 (2004.65)

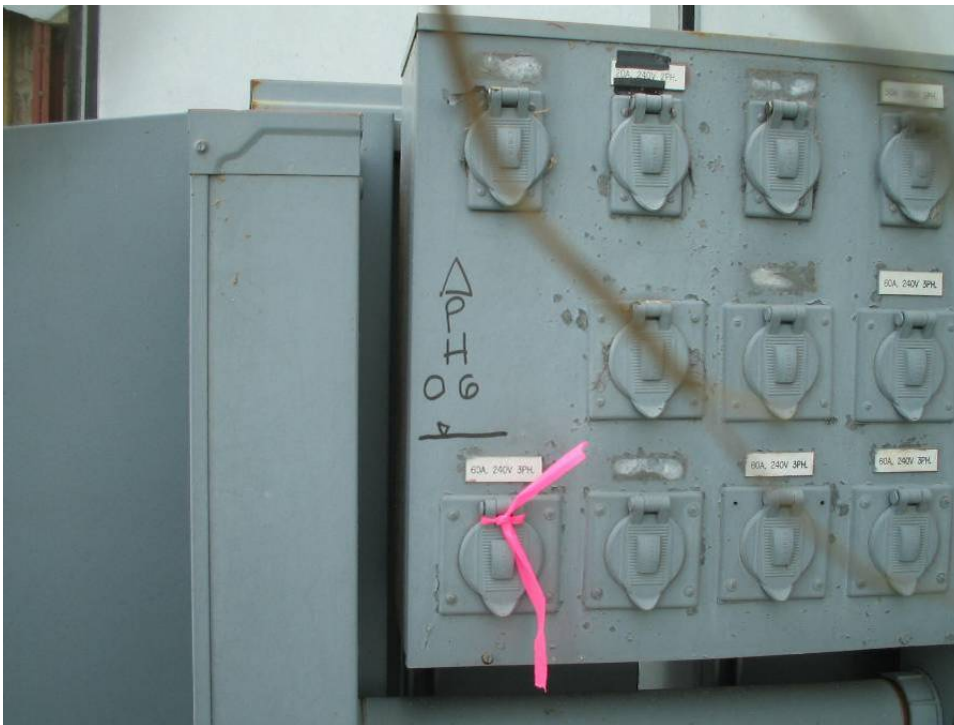


APH-06

TIME ? (no CHL Photo)

NE side of terminal bldg
mark on elec switch box inside fence

ELEVATION 9.65 FT NAVD88 (2004.65)



APH-07

TIME – Post-Katrina HWM (CHL Photo 1a)

NW office inside terminal bldg

Debris line on wall inside Landry's office

ELEVATION 11.56 FT NAVD88 (2004.65)



APH-08
TIME – 11:05 AM (CHL Photo 1g)
Column inside terminal bldg

ELEVATION 10.20 FT NAVD88 (2004.65)



APH-09
TIME – 12:08 PM (CHL Photo 1h)
Column inside terminal bldg



APH-10

TIME - ? (no CHL Photo)

Inside terminal bldg—East side
on elevator framework (Room 101)

ELEVATION 10.26 FT NAVD88 (2004.65)



APH-11
TIME – ? (no CHL Photo)
NW side of terminal bldg
on bottom chord of channel

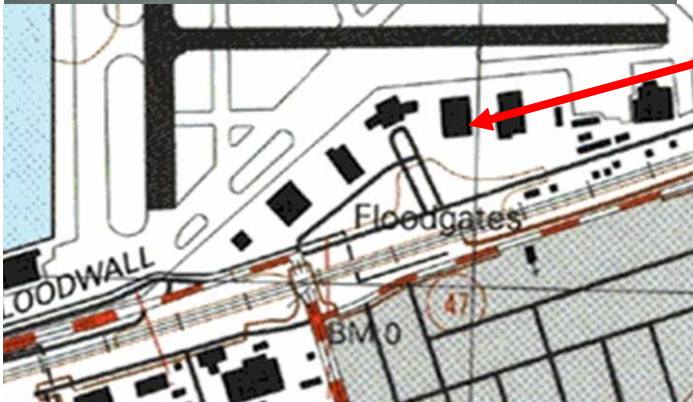
ELEVATION 7.35 FT NAVD88 (2004.65)



APH-12

TIME – ? (no CHL Photo)
NW corner of bldg 200 ft east
of main terminal bldg
below window frame

ELEVATION 7.06 FT NAVD88 (2004.65)



NW corner of building
east of main terminal

APH-13
TIME – 12:51 PM (CHL Photo 1i)
NW corner of bldg 200 ft east
of main terminal

ELEVATION 8.25 FT NAVD88 (2004.65)



APH-14

TIME – ? (no CHL Photo)

HWM on rail vicinity floodwall & floodgate
SSW of main terminal bldg
(ref CHL Lear Jet photo)

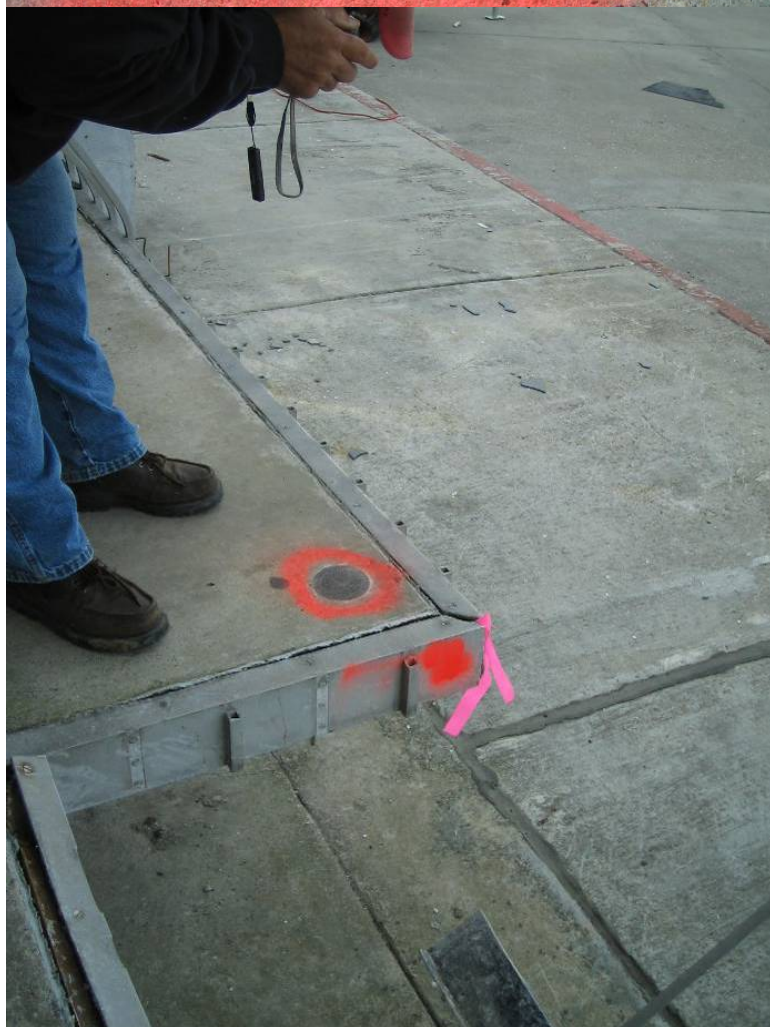
ELEVATION 7.04 FT NAVD88 (2004.65)



USC&GS BM Y 162 RESET (1963) [for reference elevation only—not a HWM point]
located on loading platform on north side of main terminal bldg



ELEVATION 8.42 FT NAVD88 (2004.65)



Appendix 17

Time Stamped Surge Elevations – Orleans Marina (Near New Canal at Lakefront)

Horizontal Datum: NAD 1983(1992)

Horizontal Coordinate System: U.S. State Plane, 1983, Zone: Louisiana South 1702

Vertical Datum: NAVD88(2004.65)

Coordinate Units: US survey feet

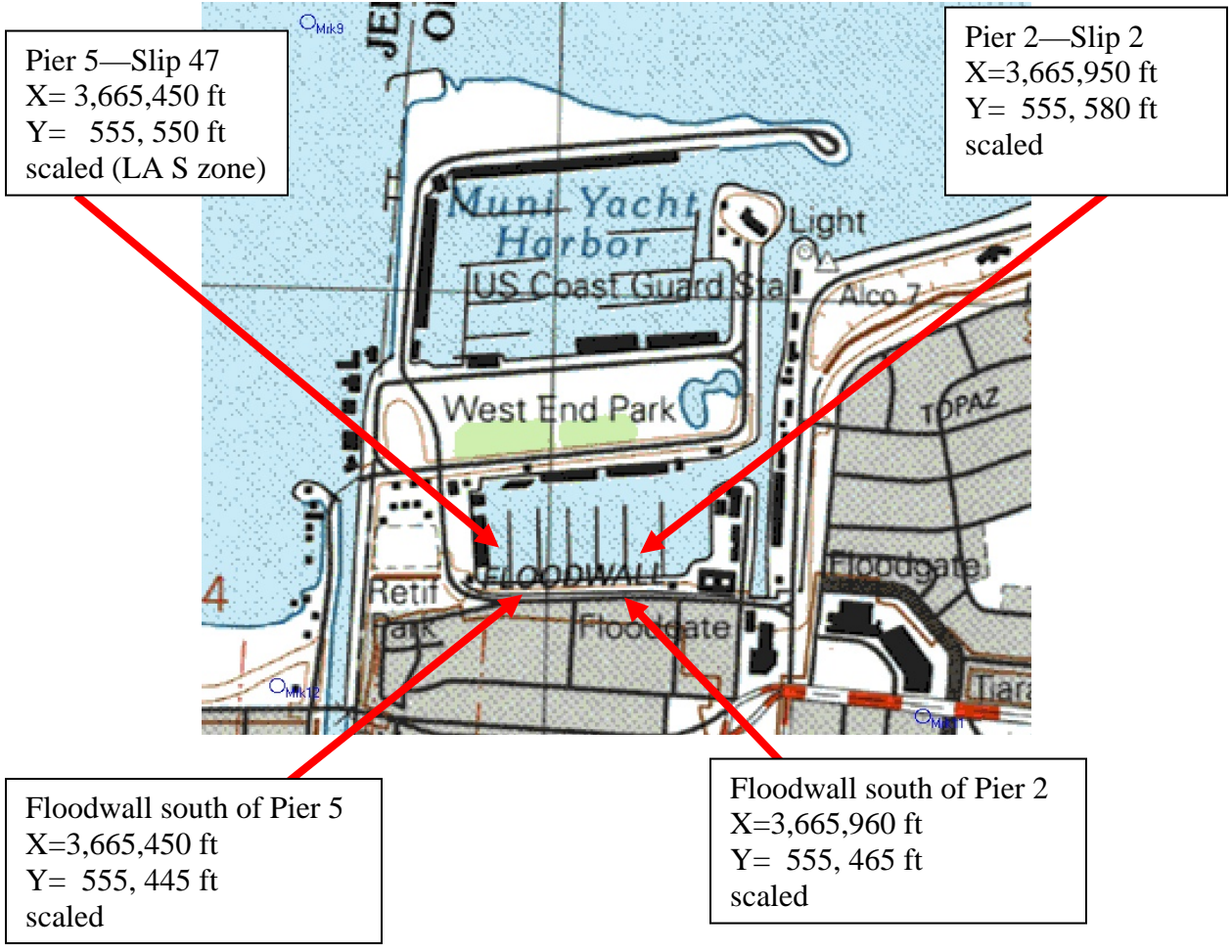
Distance Units: U.S. survey feet

Height Units: U.S. survey feet

High Water Marks at Orleans Marina			
	NAVD88(2004.65)	Reference	
	FEET	Book	Page
HWM OM 1	2.97	060851	70
HWM OM 2	3.73	060851	70
HWM OM 3	5.06	060851	70
HWM OM 4	5.61	060851	70
HWM OM 5	7.01	060851	70
HWM OM 6	10.06	060851	70
HWM OM 7	11.89	060851	70
HWM OM 8	9.81	060851	70
HWM OM 9	9.17	060851	70

The following sheets contain Lake Pontchartrain surge elevations during the morning of 29 Aug 05. These points were marked by Maynard and Bergen on 15 Dec 05, based on logged visual observations by the owner of the vessel “Kauai Girl” who rode out Hurricane Katrina in the southerly basin of Orleans Marina (Pier 2—Slip 2).

Water surface elevation marks were surveyed by differential leveling on 16 & 22 Dec 05, by 3001, Inc. All elevations are referenced to the updated time dependent vertical datum for the New Orleans region—NAVD88 (2004.65). Horizontal locations of the marks are scaled. OM4, OM5, OM6, and OM9 elevation summary revised March 2007.



OM-01
TIME 1:30 AM
Bottom of catwalk 2x6 (Pier 2 Slip 2)

ELEVATION 2.97 FT NAVD88 (2004.65)

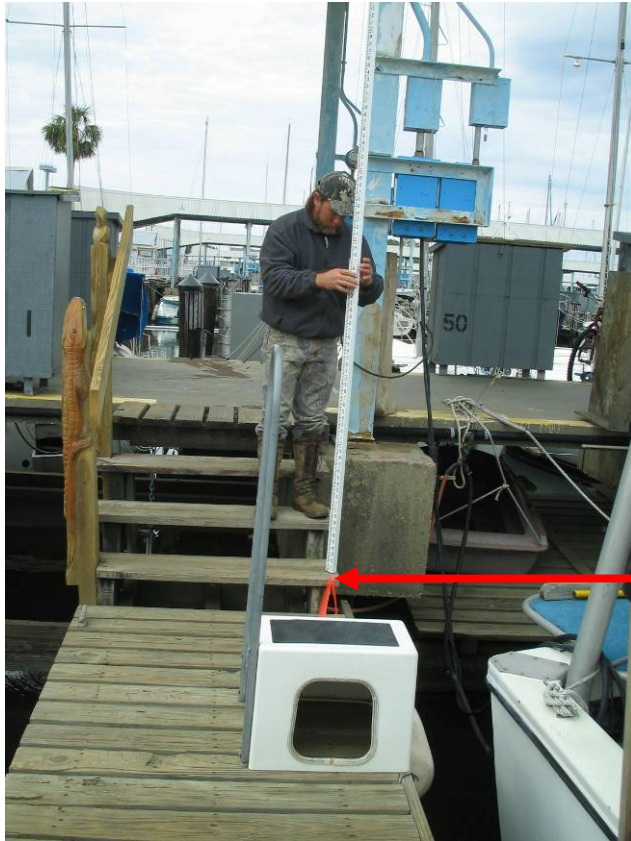


OM-02

TIME ? (between 1:30 AM and 4:00 AM?)

Top of 1st 2x12 step (Pier 2 Slip 2)

ELEVATION 3.73 FT NAVD88 (2004.65)



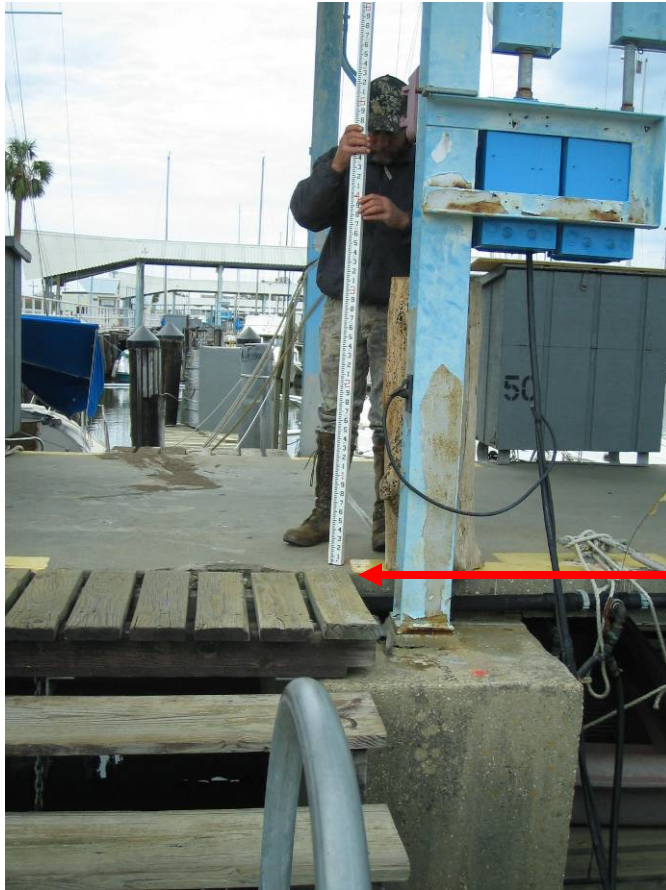
OM-03
TIME 4:00 AM
Top of Concrete Pile Cap (Pier 2 Slip 2)

ELEVATION 5.06 FT NAVD88 (2004.65)



OM-04
TIME 6:00 AM
Top of Concrete Pier (Pier 2 Slip 2)

ELEVATION 5.61 FT NAVD88 (2004.65)



OM-05
TIME 6:15 AM
Top of 1st Railing on Bulkhead (East of Pier 2)



ELEVATION 7.01 FT NAVD88 (2004.65)

1ST Rail (rod not on rail during photo)



OM-06
TIME 10:00 AM
Top Rail on Bulkhead (East of Pier 2)

ELEVATION 10.06 FT NAVD88 (2004.65)



Top Rail



OM-07
TIME 11:00 AM
Steel Column on Pier (Pier 2 Slip 2)

ELEVATION 11.89 FT NAVD88 (2004.65)



Mark



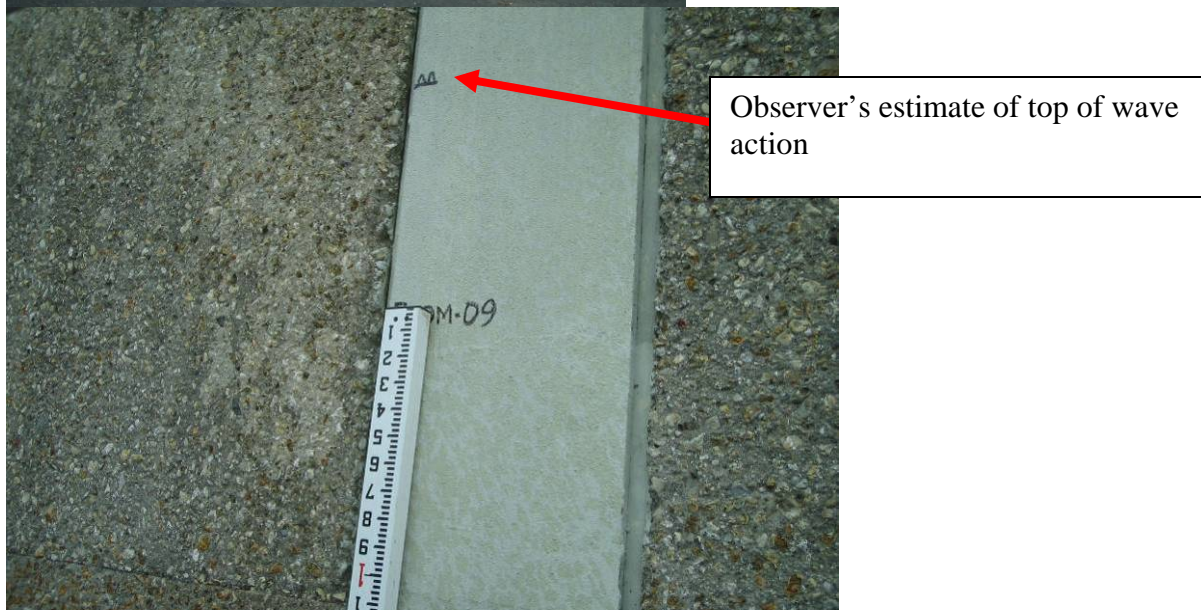
OM-08

TIME >11:00 AM (HWM Crest)

HWM determined by computing vessel lift to canopy during surge—comparing damage on vessel transom which was lifted 9.6 ft up to damaged metal roof. Accuracy estimated at +/- 0.5 ft given uncertainty of damage references. (Location Pier 5 Slip 47 – west of Pier 2)



OM-09
TIME >11:00 AM (HWM Crest)
E-W Floodwall directly south of Pier 2



Top of floodwall due south of Pier 5 12.52 feet.
(Used as check with prior MVN surveys of same floodwall ... checked to ± 0.05 ft)

Appendix 18

Topographic and Hydrographic Cross Section Data

17th Street Canal

Horizontal Datum: NAD 1983(1992)

Horizontal Coordinate System: U.S. State Plane, 1983, Zone: Louisiana South 1702

Vertical Datum: NAVD88(2004.65)

Coordinate Units: US survey feet

Distance Units: U.S. survey feet

Height Units: U.S. survey feet

Station/ Name	Northing	Easting	Elevation	Description	Raw Data Reference
4+50 Pt01	554308.30	3664395.55	-4.57	SND	Book# 060856
4+50 Pt02	554309.05	3664385.58	-8.67	SND	Book# 060856
4+50 Pt03	554309.80	3664375.61	-13.27	SND	Book# 060856
4+50 Pt04	554310.55	3664365.64	-14.67	SND	Book# 060856
4+50 Pt05	554311.30	3664355.67	-14.97	SND	Book# 060856
4+50 Pt06	554312.04	3664345.69	-16.17	SND	Book# 060856
4+50 Pt07	554313.54	3664325.75	-10.97	SND	Book# 060856
4+50 Pt08	554314.29	3664315.78	-18.07	SND	Book# 060856
4+50 Pt09	554314.29	3664315.78	-18.07	CL	Book# 060856
4+50 Pt10	554304.86	3664411.67	1.63	TOE CONC FLDWALL	17thLONDON.dc
4+50 Pt11	554304.68	3664434.30	4.19	LSC	17thLONDON.dc
4+50 Pt12	554304.30	3664439.71	0.57	SLP	17thLONDON.dc
4+50 Pt13	554302.55	3664444.77	-2.30	E LIMESTONE GRAVEL	17thLONDON.dc
4+50 Pt14	554303.31	3664451.02	-3.95	LST	17thLONDON.dc
4+50 Pt15	554301.10	3664488.35	-5.52	NG	17thLONDON.dc
4+50 Pt16	554300.64	3664501.78	-4.98	TOP	17thLONDON.dc
4+50 Pt17	554299.39	3664508.51	-6.26	TOE	17thLONDON.dc
4+50 Pt18	554299.10	3664510.12	-6.18	E BLDG	17thLONDON.dc
4+50 Pt19	554300.15	3664553.69	-5.75	E BLDG	17thLONDON.dc
4+50 Pt20	554292.71	3664586.90	-5.64	NG	17thLONDON.dc
4+50 Pt21	554306.19	3664411.28	1.57	TOP EDGE OF RIP RAP	17thLONDON.dc
4+50 Pt22	554290.72	3664616.05	-6.00	NG	17thLONDON.dc
4+50 Pt23	554288.81	3664637.51	-5.95	NG	17thLONDON.dc
4+50 Pt24	554288.00	3664654.64	-5.52	E ROAD	17thLONDON.dc
4+50 Pt25	554287.25	3664664.44	-5.27	CL ROAD	17thLONDON.dc
4+50 Pt26	554285.24	3664689.27	-5.68	ON ROAD	17thLONDON.dc

Station/ Name	Northing	Easting	Elevation	Description	Raw Data Reference
4+50 Pt27	554283.36	3664716.66	-5.62	ON ROAD	17thLONDON.dc
4+50 Pt28	554306.99	3664401.38	1.35	TOP RIP RAP	17thLONDON.dc
4+50 Pt29	554307.11	3664398.15	-0.78	WES	17thLONDON.dc
4+50 Pt30	554305.82	3664412.64	12.37	TOP CONC FLDWALL	17thLONDON.dc
4+50 Pt31	554305.78	3664413.38	12.38	TOP CONC FLDWALL	17thLONDON.dc
4+50 Pt32	554305.38	3664414.12	5.20	TOE CONC FLDWALL	17thLONDON.dc
4+50 Pt33	554305.30	3664416.43	5.10	ON LEVEE	17thLONDON.dc
4+50 Pt34	554305.14	3664423.63	4.97	C\L LEVEE	17thLONDON.dc
5+00 Pt01	554257.70	3664401.79	-0.97	SND	Book# 060856
5+00 Pt02	554258.44	3664391.81	-3.37	SND	Book# 060856
5+00 Pt03	554259.19	3664381.84	-9.67	SND	Book# 060856
5+00 Pt04	554259.94	3664371.87	-11.77	SND	Book# 060856
5+00 Pt05	554260.69	3664361.90	-15.17	SND	Book# 060856
5+00 Pt06	554261.44	3664351.93	-14.87	SND	Book# 060856
5+00 Pt07	554262.18	3664341.95	-16.17	SND	Book# 060856
5+00 Pt08	554262.93	3664331.98	-17.47	SND	Book# 060856
5+00 Pt09	554263.68	3664322.01	-18.27	SND	Book# 060856
5+00 Pt10	554263.68	3664322.01	-18.27	CL	Book# 060856
5+00 Pt11	554256.64	3664394.89	-0.81	WES	17thLONDON.dc
5+00 Pt12	554254.56	3664430.38	4.67	LSC	17thLONDON.dc
5+00 Pt13	554236.03	3664708.16	-4.87	NG	17thLONDON.dc
5+00 Pt14	554236.74	3664699.12	-5.63	EDGE SIDEWALK	17thLONDON.dc
5+00 Pt15	554237.68	3664695.33	-5.73	EDGE SIDEWALK	17thLONDON.dc
5+00 Pt16	554239.89	3664670.93	-5.85	E ROAD	17thLONDON.dc
5+00 Pt17	554239.80	3664660.29	-5.30	CL ROAD	17thLONDON.dc
5+00 Pt18	554240.00	3664651.46	-5.58	E ROAD	17thLONDON.dc
5+00 Pt19	554241.14	3664619.40	-4.93	NG	17thLONDON.dc
5+00 Pt20	554242.72	3664587.51	-4.59	NG	17thLONDON.dc
5+00 Pt21	554246.29	3664555.38	-5.76	NG	17thLONDON.dc
5+00 Pt22	554257.04	3664400.31	1.09	TOP RIP RAP	17thLONDON.dc
5+00 Pt23	554248.40	3664524.92	-6.15	NG	17thLONDON.dc
5+00 Pt24	554248.72	3664499.26	-6.45	NG	17thLONDON.dc
5+00 Pt25	554248.75	3664478.51	-5.87	NG	17thLONDON.dc
5+00 Pt26	554253.21	3664449.92	-4.10	LST	17thLONDON.dc
5+00 Pt27	554253.70	3664442.22	-2.47	E LIMESTONE GRAVEL	17thLONDON.dc
5+00 Pt28	554253.85	3664434.55	1.85	SLP	17thLONDON.dc
5+00 Pt29	554256.48	3664407.86	1.51	TOP EDGE OF RIP RAP	17thLONDON.dc
5+00 Pt30	554256.33	3664408.39	1.21	TOE CONC FLDWALL	17thLONDON.dc
5+00 Pt31	554256.33	3664409.22	12.42	TOP CONC FLDWALL	17thLONDON.dc
5+00 Pt32	554256.30	3664409.99	12.43	TOP CONC FLDWALL	17thLONDON.dc
5+00 Pt33	554256.25	3664410.59	5.23	TOE CONC FLDWALL	17thLONDON.dc
5+00 Pt34	554256.10	3664412.41	5.12	ON LEVEE	17thLONDON.dc
5+00 Pt35	554255.43	3664420.92	5.07	C\L LEVEE	17thLONDON.dc
5+50 Pt01	554208.58	3664388.07	-5.57	SND	Book# 060856
5+50 Pt02	554209.33	3664378.10	-9.57	SND	Book# 060856
5+50 Pt03	554210.08	3664368.13	-12.37	SND	Book# 060856
5+50 Pt04	554210.83	3664358.16	-10.67	SND	Book# 060856
5+50 Pt05	554211.58	3664348.19	-12.17	SND	Book# 060856
5+50 Pt06	554212.32	3664338.21	-12.57	SND	Book# 060856
5+50 Pt07	554213.07	3664328.24	-17.07	SND	Book# 060856

Station/ Name	Northing	Easting	Elevation	Description	Raw Data Reference
5+50 Pt08	554213.82	3664318.27	-17.57	SND	Book# 060856
5+50 Pt09	554213.82	3664318.27	-17.57	CL	Book# 060856
5+50 Pt10	554204.73	3664428.27	4.39	LSC	17thLONDON.dc
5+50 Pt11	554207.53	3664393.26	-0.85	WES	17thLONDON.dc
5+50 Pt12	554204.37	3664434.23	0.71	SLP	17thLONDON.dc
5+50 Pt13	554203.76	3664440.09	-2.63	E LIMESTONE GRAVEL	17thLONDON.dc
5+50 Pt14	554203.85	3664441.09	-2.80	LST	17thLONDON.dc
5+50 Pt15	554201.76	3664463.77	-3.63	NG	17thLONDON.dc
5+50 Pt16	554200.23	3664487.39	-4.13	NG	17thLONDON.dc
5+50 Pt17	554198.70	3664510.20	-4.54	NG	17thLONDON.dc
5+50 Pt18	554197.95	3664522.39	-4.33	TOP	17thLONDON.dc
5+50 Pt19	554197.24	3664527.49	-6.60	TOE	17thLONDON.dc
5+50 Pt20	554197.02	3664533.58	-6.96	TOE	17thLONDON.dc
5+50 Pt21	554205.41	3664417.29	4.97	CL LEVEE	17thLONDON.dc
5+50 Pt22	554197.51	3664539.09	-4.52	TOP	17thLONDON.dc
5+50 Pt23	554194.85	3664567.75	-4.00	NG	17thLONDON.dc
5+50 Pt24	554192.44	3664591.82	-5.05	NG	17thLONDON.dc
5+50 Pt25	554190.90	3664608.64	-5.13	NG	17thLONDON.dc
5+50 Pt26	554190.38	3664629.83	-5.65	NG	17thLONDON.dc
5+50 Pt27	554188.78	3664647.16	-5.80	E ROAD	17thLONDON.dc
5+50 Pt28	554187.95	3664656.76	-5.46	CL ROAD	17thLONDON.dc
5+50 Pt29	554187.55	3664667.56	-5.86	E ROAD	17thLONDON.dc
5+50 Pt30	554186.61	3664680.62	-5.76	NG	17thLONDON.dc
5+50 Pt31	554185.85	3664691.78	-5.86	EDGE SIDEWALK	17thLONDON.dc
5+50 Pt32	554205.63	3664409.65	4.94	ON LEVEE	17thLONDON.dc
5+50 Pt33	554184.45	3664695.45	-5.81	EDGE SIDEWALK	17thLONDON.dc
5+50 Pt34	554205.90	3664407.33	5.08	TOE CONC FLDWALL	17thLONDON.dc
5+50 Pt35	554205.41	3664406.50	12.33	TOP CONC FLDWALL	17thLONDON.dc
5+50 Pt36	554205.56	3664405.82	12.32	TOP CONC FLDWALL	17thLONDON.dc
5+50 Pt37	554205.65	3664404.99	2.07	TOE CONC FLDWALL	17thLONDON.dc
5+50 Pt38	554205.58	3664404.92	2.02	TOP EDGE OF RIP RAP	17thLONDON.dc
5+50 Pt39	554207.78	3664395.24	1.26	TOP RIP RAP	17thLONDON.dc
14+00 Pt01	553360.22	3664334.46	-1.37	SND	Book# 060856
14+00 Pt02	553360.96	3664324.48	-4.87	SND	Book# 060856
14+00 Pt03	553361.71	3664314.51	-12.57	SND	Book# 060856
14+00 Pt04	553362.46	3664304.54	-14.57	SND	Book# 060856
14+00 Pt05	553363.21	3664294.57	-12.77	SND	Book# 060856
14+00 Pt06	553363.96	3664284.60	-10.47	SND	Book# 060856
14+00 Pt07	553364.70	3664274.62	-16.17	SND	Book# 060856
14+00 Pt08	553365.45	3664264.65	-15.17	SND	Book# 060856
14+00 Pt09	553365.45	3664264.65	-15.17	CL	Book# 060856
14+00 Pt10	553355.82	3664365.99	2.43	FL	17thLONDON.dc
14+00 Pt11	553357.78	3664332.18	-0.72	WES	17thLONDON.dc
14+00 Pt12	553355.13	3664375.99	-0.46	SLP	17thLONDON.dc
14+00 Pt13	553355.00	3664384.04	-2.60	LST	17thLONDON.dc
14+00 Pt14	553353.09	3664410.26	-3.26	NG	17thLONDON.dc
14+00 Pt15	553351.11	3664431.85	-3.70	E CONC DRIVEWAY	17thLONDON.dc
14+00 Pt16	553349.22	3664459.28	-3.90	ON CONC DRIVEWAY	17thLONDON.dc
14+00 Pt17	553347.84	3664476.87	-4.10	E BLDG	17thLONDON.dc
14+00 Pt18	553346.16	3664500.90	-4.46	E BLDG	17thLONDON.dc
14+00 Pt19	553345.13	3664510.79	-4.92	ON CONC DRIVEWAY	17thLONDON.dc

Station/ Name	Northing	Easting	Elevation	Description	Raw Data Reference
14+00 Pt20	553343.54	3664540.19	-5.43	E CONC DRIVEWAY	17thLONDON.dc
14+00 Pt21	553355.64	3664362.60	3.14	LSC	17thLONDON.dc
14+00 Pt22	553340.86	3664565.89	-6.02	EDGE SIDEWALK	17thLONDON.dc
14+00 Pt23	553340.59	3664569.86	-6.09	EDGE SIDEWALK	17thLONDON.dc
14+00 Pt24	553339.32	3664587.10	-6.68	NG	17thLONDON.dc
14+00 Pt25	553338.48	3664598.12	-7.05	E ROAD	17thLONDON.dc
14+00 Pt26	553337.30	3664606.42	-6.77	CL ROAD	17thLONDON.dc
14+00 Pt27	553336.71	3664616.11	-7.34	E ROAD	17thLONDON.dc
14+00 Pt28	553335.20	3664634.89	-7.48	NG	17thLONDON.dc
14+00 Pt29	553356.50	3664355.24	3.72	CL LEVEE	17thLONDON.dc
14+00 Pt30	553356.85	3664349.18	4.15	TOE CONC FLDWALL	17thLONDON.dc
14+00 Pt31	553357.14	3664348.77	12.41	TOP CONC FLDWALL	17thLONDON.dc
14+00 Pt32	553357.13	3664348.05	12.36	TOP CONC FLDWALL	17thLONDON.dc
14+00 Pt33	553357.73	3664347.24	1.84	TOE CONC FLDWALL	17thLONDON.dc
14+00 Pt34	553357.78	3664347.34	1.82	TOP EDGE OF RIP RAP	17thLONDON.dc
14+00 Pt35	553358.19	3664336.86	1.39	TOP RIP RAP	17thLONDON.dc
14+50 Pt01	553310.22	3664337.66	-3.97	SND	Book# 060856
14+50 Pt02	553310.96	3664327.68	-6.17	SND	Book# 060856
14+50 Pt03	553311.71	3664317.71	-10.57	SND	Book# 060856
14+50 Pt04	553312.46	3664307.74	-15.37	SND	Book# 060856
14+50 Pt05	553313.21	3664297.77	-16.37	SND	Book# 060856
14+50 Pt06	553313.96	3664287.80	-16.27	SND	Book# 060856
14+50 Pt07	553314.70	3664277.82	-18.47	SND	Book# 060856
14+50 Pt08	553315.45	3664267.85	-17.67	SND	Book# 060856
14+50 Pt09	553315.45	3664267.85	-17.67	CL	Book# 060856
14+50 Pt10	553304.09	3664364.37	1.76	FL	17thLONDON.dc
14+50 Pt11	553307.30	3664345.18	12.36	TOP CONC FLDWALL	17thLONDON.dc
14+50 Pt12	553304.65	3664372.83	-0.95	SLP	17thLONDON.dc
14+50 Pt13	553303.25	3664382.75	-3.41	LST	17thLONDON.dc
14+50 Pt14	553301.34	3664405.05	-3.97	NG	17thLONDON.dc
14+50 Pt15	553300.41	3664428.16	-4.45	E BLDG	17thLONDON.dc
14+50 Pt16	553291.40	3664537.79	-4.26	E BLDG	17thLONDON.dc
14+50 Pt17	553290.39	3664563.10	-5.62	EDGE SIDEWALK	17thLONDON.dc
14+50 Pt18	553290.13	3664567.00	-5.68	EDGE SIDEWALK	17thLONDON.dc
14+50 Pt19	553286.89	3664585.37	-6.57	NG	17thLONDON.dc
14+50 Pt20	553287.28	3664596.03	-6.79	E ROAD	17thLONDON.dc
14+50 Pt21	553305.94	3664358.44	3.12	LSC	17thLONDON.dc
14+50 Pt22	553285.33	3664602.54	-6.62	CL ROAD	17thLONDON.dc
14+50 Pt23	553306.32	3664352.98	3.70	CL LEVEE	17thLONDON.dc
14+50 Pt24	553307.04	3664346.04	4.39	TOE CONC FLDWALL	17thLONDON.dc
14+50 Pt25	553307.32	3664345.33	12.39	TOP CONC FLDWALL	17thLONDON.dc
14+50 Pt26	553307.28	3664344.67	12.41	TOP CONC FLDWALL	17thLONDON.dc
14+50 Pt27	553308.32	3664337.41	-0.78	WES	17thLONDON.dc
14+50 Pt28	553307.20	3664343.86	-0.89	TOE CONC FLDWALL	17thLONDON.dc
14+50 Pt29	553307.38	3664344.60	12.39	TOP CONC FLDWALL	17thLONDON.dc
15+00 Pt01	553258.57	3664362.79	0.03	WES	Book# 060856
15+00 Pt02	553258.72	3664360.80	-0.87	SND	Book# 060856
15+00 Pt03	553259.47	3664350.83	-1.27	SND	Book# 060856
15+00 Pt04	553260.22	3664340.86	-5.07	SND	Book# 060856
15+00 Pt05	553260.96	3664330.88	-8.97	SND	Book# 060856

Station/ Name	Northing	Easting	Elevation	Description	Raw Data Reference
15+00 Pt06	553261.71	3664320.91	-10.57	SND	Book# 060856
15+00 Pt07	553262.46	3664310.94	-12.67	SND	Book# 060856
15+00 Pt08	553263.21	3664300.97	-18.27	SND	Book# 060856
15+00 Pt09	553263.96	3664291.00	-18.47	SND	Book# 060856
15+00 Pt10	553264.70	3664281.02	-18.17	SND	Book# 060856
15+00 Pt11	553265.45	3664271.05	-18.07	CL	Book# 060856
15+00 Pt12	553255.05	3664361.23	1.89	FL	17thLONDON.dc
15+00 Pt13	553255.95	3664388.93	-3.66	NG	17thLONDON.dc
15+00 Pt14	553253.89	3664394.66	-3.76	E CONC SLAB	17thLONDON.dc
15+00 Pt15	553252.84	3664403.94	-3.54	E CONC SLAB	17thLONDON.dc
15+00 Pt16	553251.10	3664409.93	-4.04	NG	17thLONDON.dc
15+00 Pt17	553250.52	3664423.38	-3.58	E BLDG	17thLONDON.dc
15+00 Pt18	553242.77	3664535.20	-4.57	E BLDG	17thLONDON.dc
15+00 Pt19	553242.69	3664547.45	-4.94	NG	17thLONDON.dc
15+00 Pt20	553240.83	3664560.53	-5.75	EDGE SIDEWALK	17thLONDON.dc
15+00 Pt21	553240.30	3664563.59	-5.75	EDGE SIDEWALK	17thLONDON.dc
15+00 Pt22	553238.23	3664592.28	-6.69	E ROAD	17thLONDON.dc
15+00 Pt23	553256.04	3664354.57	3.19	LSC	17thLONDON.dc
15+00 Pt24	553237.82	3664599.93	-6.57	CL ROAD	17thLONDON.dc
15+00 Pt25	553237.32	3664609.91	-7.13	E ROAD	17thLONDON.dc
15+00 Pt26	553256.53	3664348.69	3.87	CL LEVEE	17thLONDON.dc
15+00 Pt27	553256.95	3664342.65	4.73	TOE CONC FLDWALL	17thLONDON.dc
15+00 Pt28	553257.65	3664340.44	-0.65	TOE CONC FLDWALL	17thLONDON.dc
15+00 Pt29	553257.20	3664341.03	12.46	TOE CONC FLDWALL	17thLONDON.dc
15+00 Pt30	553257.23	3664341.86	12.48	TOE CONC FLDWALL	17thLONDON.dc
15+00 Pt31	553255.08	3664370.30	-1.26	SLP	17thLONDON.dc
15+00 Pt32	553254.79	3664379.49	-3.58	LST	17thLONDON.dc

Appendix 19

Topographic and Hydrographic Cross Section Data

London Avenue Canal

Horizontal Datum: NAD 1983(1992)

Horizontal Coordinate System: U.S. State Plane, 1983, Zone: Louisiana South 1702

Vertical Datum: NAVD88(2004.65)

Coordinate Units: US survey feet

Distance Units: U.S. survey feet

Height Units: U.S. survey feet

Station/ Name	Northing	Easting	Elevation	Description	Raw Data Reference
6+00 Pt01	555623.39	3680423.96	-13.57	SND	Book# 060856
6+00 Pt02	555622.75	3680413.98	-13.87	SND	Book# 060856
6+00 Pt03	555622.11	3680404.00	-13.77	SND	Book# 060856
6+00 Pt04	555621.46	3680394.02	-13.97	SND	Book# 060856
6+00 Pt05	555620.82	3680384.04	-12.77	SND	Book# 060856
6+00 Pt06	555620.18	3680374.06	-10.47	SND	Book# 060856
6+00 Pt07	555619.54	3680364.08	-5.47	SND	Book# 060856
6+00 Pt08	555618.90	3680354.10	-2.77	SND	Book# 060856
6+00 Pt09	555623.39	3680423.96	-13.57	CL	Book# 060856
6+00 Pt10	555618.57	3680350.16	-0.95	WES	17thLONDON.dc
6+00 Pt11	555609.64	3680210.07	11.54	LSC	17thLONDON.dc
6+00 Pt12	555609.40	3680204.67	7.78	SLP	17thLONDON.dc
6+00 Pt13	555609.24	3680199.34	6.11	SLP	17thLONDON.dc
6+00 Pt14	555607.91	3680180.70	0.70	LST	17thLONDON.dc
6+00 Pt15	555606.89	3680165.98	-0.01	NG	17thLONDON.dc
6+00 Pt16	555605.90	3680159.36	-0.76	TOP	17thLONDON.dc
6+00 Pt17	555605.83	3680148.91	-2.13	TOE	17thLONDON.dc
6+00 Pt18	555603.95	3680124.15	-2.97	NG	17thLONDON.dc
6+00 Pt19	555603.30	3680117.33	-3.12	TOP OF CURB	17thLONDON.dc
6+00 Pt20	555603.33	3680116.59	-3.45	TOE OF CURB	17thLONDON.dc
6+00 Pt21	555618.45	3680339.83	2.69	TBK	17thLONDON.dc
6+00 Pt22	555603.46	3680115.48	-3.43	E ROAD	17thLONDON.dc
6+00 Pt23	555602.59	3680098.58	-2.92	CL ROAD	17thLONDON.dc
6+00 Pt24	555601.32	3680082.95	-3.51	E ROAD	17thLONDON.dc
6+00 Pt25	555601.21	3680080.60	-3.57	TOE OF CURB	17thLONDON.dc
6+00 Pt26	555601.22	3680079.70	-3.21	TOP OF CURB	17thLONDON.dc

Station/ Name	Northing	Easting	Elevation	Description	Raw Data Reference
6+00 Pt27	555601.18	3680076.44	-3.41	EDGE SIDEWALK	17thLONDON.dc
6+00 Pt28	555601.10	3680071.67	-3.50	EDGE SIDEWALK	17thLONDON.dc
6+00 Pt29	555600.16	3680048.85	-2.87	NG	17thLONDON.dc
6+00 Pt30	555596.72	3680024.40	-2.36	NG	17thLONDON.dc
6+00 Pt31	555594.16	3679974.69	-2.65	NG	17thLONDON.dc
6+00 Pt32	555617.54	3680324.06	3.02	NG	17thLONDON.dc
6+00 Pt33	555615.25	3680298.84	4.23	NG	17thLONDON.dc
6+00 Pt34	555613.92	3680275.46	4.78	NG	17thLONDON.dc
6+00 Pt35	555612.80	3680253.85	5.22	FST	17thLONDON.dc
6+00 Pt36	555611.83	3680243.05	11.93	FSC	17thLONDON.dc
6+00 Pt37	555610.61	3680227.28	12.08	CL LEVEE	17thLONDON.dc
6+00 Pt38	555610.82	3680224.17	12.12	ON LEVEE	17thLONDON.dc
6+50 Pt01	555574.13	3680437.15	-13.17	SND	Book# 060856
6+50 Pt02	555573.49	3680427.17	-13.57	SND	Book# 060856
6+50 Pt03	555572.85	3680417.19	-13.67	SND	Book# 060856
6+50 Pt04	555572.21	3680407.21	-14.27	SND	Book# 060856
6+50 Pt05	555571.56	3680397.23	-13.47	SND	Book# 060856
6+50 Pt06	555570.92	3680387.25	-12.67	SND	Book# 060856
6+50 Pt07	555570.28	3680377.27	-9.47	SND	Book# 060856
6+50 Pt08	555569.64	3680367.29	-5.37	SND	Book# 060856
6+50 Pt09	555569.00	3680357.31	-1.37	SND	Book# 060856
6+50 Pt10	555574.13	3680437.15	-13.17	CL	Book# 060856
6+50 Pt11	555544.04	3679977.38	-2.78	NG	17thLONDON.dc
6+50 Pt12	555552.53	3680102.70	-2.59	CL ROAD	17thLONDON.dc
6+50 Pt13	555553.66	3680120.69	-2.35	TOE OF CURB	17thLONDON.dc
6+50 Pt14	555553.66	3680121.72	-1.93	TOP OF CURB	17thLONDON.dc
6+50 Pt15	555554.22	3680127.34	-2.06	NG	17thLONDON.dc
6+50 Pt16	555555.51	3680152.67	-1.85	NG	17thLONDON.dc
6+50 Pt17	555555.61	3680160.48	-1.53	TOE	17thLONDON.dc
6+50 Pt18	555557.28	3680174.17	-0.23	TOP	17thLONDON.dc
6+50 Pt19	555558.09	3680188.58	0.73	LST	17thLONDON.dc
6+50 Pt20	555558.32	3680194.83	1.80	SLP	17thLONDON.dc
6+50 Pt21	555559.88	3680203.10	2.86	SLP	17thLONDON.dc
6+50 Pt22	555546.53	3680002.34	-2.66	NG	17thLONDON.dc
6+50 Pt23	555560.83	3680227.28	4.78	SLP	17thLONDON.dc
6+50 Pt24	555562.12	3680247.64	7.23	SLP	17thLONDON.dc
6+50 Pt25	555563.30	3680256.06	10.64	LSC	17thLONDON.dc
6+50 Pt26	555563.83	3680275.16	10.82	CL LEVEE	17thLONDON.dc
6+50 Pt27	555564.03	3680278.46	10.61	ON LEVEE	17thLONDON.dc
6+50 Pt28	555564.60	3680292.73	10.40	FSC	17thLONDON.dc
6+50 Pt29	555566.58	3680302.61	7.77	SLP	17thLONDON.dc
6+50 Pt30	555568.35	3680310.66	5.01	SLP	17thLONDON.dc
6+50 Pt31	555566.25	3680316.62	4.26	FST	17thLONDON.dc
6+50 Pt32	555567.29	3680327.18	3.31	NG	17thLONDON.dc
6+50 Pt33	555548.29	3680027.68	-2.82	NG	17thLONDON.dc
6+50 Pt34	555568.55	3680346.78	2.79	NG	17thLONDON.dc
6+50 Pt35	555568.51	3680351.97	0.51	SLP	17thLONDON.dc
6+50 Pt36	555568.88	3680357.77	-0.87	WES	17thLONDON.dc
6+50 Pt37	555549.95	3680052.92	-2.76	NG	17thLONDON.dc
6+50 Pt38	555550.82	3680075.67	-3.22	EDGE SIDEWALK	17thLONDON.dc
6+50 Pt39	555551.52	3680080.55	-3.09	EDGE SIDEWALK	17thLONDON.dc

Station/ Name	Northing	Easting	Elevation	Description	Raw Data Reference
6+50 Pt40	555551.51	3680084.12	-2.91	TOP OF CURB	17thLONDON.dc
6+50 Pt41	555551.43	3680084.96	-3.26	TOE OF CURB	17thLONDON.dc
6+50 Pt42	555551.39	3680086.69	-3.29	E ROAD	17thLONDON.dc
7+00 Pt01	555524.24	3680440.37	-13.16	SND	Book# 060856
7+00 Pt02	555523.60	3680430.39	-13.36	SND	Book# 060856
7+00 Pt03	555522.96	3680420.41	-13.56	SND	Book# 060856
7+00 Pt04	555522.31	3680410.43	-13.86	SND	Book# 060856
7+00 Pt05	555521.67	3680400.45	-13.76	SND	Book# 060856
7+00 Pt06	555521.03	3680390.47	-14.16	SND	Book# 060856
7+00 Pt07	555520.39	3680380.49	-10.76	SND	Book# 060856
7+00 Pt08	555519.74	3680370.51	-4.86	SND	Book# 060856
7+00 Pt09	555524.24	3680440.37	-13.16	CL	Book# 060856
7+00 Pt10	555520.28	3680365.10	-0.83	WES	17thLONDON.dc
7+00 Pt11	555513.84	3680279.74	1.53	LST	17thLONDON.dc
7+00 Pt12	555512.06	3680255.54	0.64	NG	17thLONDON.dc
7+00 Pt13	555511.30	3680231.31	0.22	NG	17thLONDON.dc
7+00 Pt14	555510.49	3680220.82	-0.11	TOE	17thLONDON.dc
7+00 Pt15	555509.76	3680206.19	0.61	SLP	17thLONDON.dc
7+00 Pt16	555507.47	3680181.21	1.60	TOP	17thLONDON.dc
7+00 Pt17	555506.29	3680155.50	0.85	NG	17thLONDON.dc
7+00 Pt18	555505.79	3680150.37	0.73	TOP OF CURB	17thLONDON.dc
7+00 Pt19	555505.53	3680149.76	-0.02	TOE OF CURB	17thLONDON.dc
7+00 Pt20	555504.81	3680148.65	-0.07	E ROAD	17thLONDON.dc
7+00 Pt21	555519.77	3680356.40	2.90	TBK	17thLONDON.dc
7+00 Pt22	555505.04	3680140.10	-0.30	ON ROAD	17thLONDON.dc
7+00 Pt23	555504.21	3680130.72	-0.71	ON ROAD	17thLONDON.dc
7+00 Pt24	555502.72	3680106.99	-1.68	CL ROAD	17thLONDON.dc
7+00 Pt25	555501.45	3680080.77	-2.56	ON ROAD	17thLONDON.dc
7+00 Pt26	555499.75	3680069.06	-2.78	ON ROAD	17thLONDON.dc
7+00 Pt27	555499.76	3680055.91	-2.78	ON ROAD	17thLONDON.dc
7+00 Pt28	555497.68	3680032.11	-3.01	ON ROAD	17thLONDON.dc
7+00 Pt29	555496.73	3680006.01	-3.02	ON ROAD	17thLONDON.dc
7+00 Pt30	555494.47	3679980.48	-2.91	ON ROAD	17thLONDON.dc
7+00 Pt31	555518.03	3680341.41	3.22	FST	17thLONDON.dc
7+00 Pt32	555518.97	3680334.93	3.97	SLP	17thLONDON.dc
7+00 Pt33	555516.60	3680317.41	8.73	FSC	17thLONDON.dc
7+00 Pt34	555515.67	3680306.42	8.40	CVL LEVEE	17thLONDON.dc
7+00 Pt35	555514.99	3680294.66	8.15	LSC	17thLONDON.dc
7+00 Pt36	555517.18	3680324.80	7.18	SLP	17thLONDON.dc
7+00 Pt37	555513.52	3680285.86	2.86	SLP	17thLONDON.dc
15+50 Pt01	554669.76	3680398.17	4.29	TEF	Book# 060856
15+50 Pt02	554669.12	3680388.19	4.19	CL	Book# 060856
15+50 Pt03	554668.93	3680385.20	4.09	TOP	Book# 060856
15+50 Pt04	554668.03	3680371.22	3.29	TOP	Book# 060856
15+50 Pt05	554667.71	3680366.24	-0.11	FL	Book# 060856
15+50 Pt06	554667.64	3680365.24	-2.51	ERK	Book# 060856
15+50 Pt07	554667.32	3680360.25	-3.61	NG	Book# 060856
15+50 Pt08	554665.72	3680335.30	-4.21	NG	Book# 060856
15+50 Pt09	554664.62	3680318.33	-4.41	BLD	Book# 060856
15+50 Pt10	554664.24	3680312.35	-4.59	BLD	Book# 060856

Station/ Name	Northing	Easting	Elevation	Description	Raw Data Reference
15+50 Pt11	554659.29	3680235.51	-5.59	NG	Book# 060856
15+50 Pt12	554658.65	3680225.53	-5.49	ES	Book# 060856
15+50 Pt13	554658.39	3680221.53	-5.49	ES	Book# 060856
15+50 Pt14	554658.26	3680219.54	-4.79	TOP	Book# 060856
15+50 Pt15	554657.69	3680210.56	-4.89	TOP	Book# 060856
15+50 Pt16	554657.49	3680207.56	-5.59	TPC	Book# 060856
15+50 Pt17	554657.43	3680206.57	-5.99	TPC	Book# 060856
15+50 Pt18	554656.66	3680194.59	-5.79	CLR	Book# 060856
15+50 Pt19	554655.82	3680181.62	-6.29	TEC	Book# 060856
15+50 Pt20	554655.76	3680180.62	-5.89	TPC	Book# 060856
15+50 Pt21	554654.47	3680160.66	-5.39	NG	Book# 060856
15+50 Pt22	554657.43	3680206.57	-5.99	ER	Book# 060856
15+50 Pt23	554655.82	3680181.62	-6.29	ER	Book# 060856
15+50 Pt24	554674.71	3680475.01	-12.86	SND	Book# 060856
15+50 Pt25	554674.07	3680465.03	-12.76	SND	Book# 060856
15+50 Pt26	554673.42	3680455.05	-12.86	SND	Book# 060856
15+50 Pt27	554672.78	3680445.07	-6.86	SND	Book# 060856
15+50 Pt28	554672.14	3680435.09	-3.46	SND	Book# 060856
15+50 Pt29	554671.50	3680425.11	-1.46	SND	Book# 060856
15+50 Pt30	554674.71	3680475.01	-12.86	CL	Book# 060856
15+50 Pt31	554670.59	3680424.16	-0.96	WES	17thLONDON.dc
15+50 Pt32	554670.03	3680415.28	1.65	TBK	17thLONDON.dc
15+50 Pt33	554669.54	3680410.62	2.44	NG	17thLONDON.dc
15+50 Pt34	554668.50	3680400.32	3.12	TOE CONC FLDWALL	17thLONDON.dc
15+50 Pt35	554667.93	3680399.87	13.04	TOP EDGE CONC FLDWAL	17thLONDON.dc
15+50 Pt36	554667.96	3680399.17	13.11	TOP EDGE CONC FLDWAL	17thLONDON.dc
16+00 Pt01	554619.93	3680402.38	4.28	TEF	Book# 060856
16+00 Pt02	554619.42	3680394.39	3.88	CL	Book# 060856
16+00 Pt03	554619.03	3680388.41	3.78	RD	Book# 060856
16+00 Pt04	554618.33	3680377.43	3.18	TOP	Book# 060856
16+00 Pt05	554617.88	3680370.44	-1.12	FL	Book# 060856
16+00 Pt06	554617.81	3680369.45	-2.92	TOE	Book# 060856
16+00 Pt07	554617.43	3680363.46	-3.42	NG	Book# 060856
16+00 Pt08	554616.33	3680346.49	-3.72	EC	Book# 060856
16+00 Pt09	554616.01	3680341.50	-3.22	TOP	Book# 060856
16+00 Pt10	554616.01	3680341.50	-8.82	TOE	Book# 060856
16+00 Pt11	554614.34	3680315.56	-7.02	TOE	Book# 060856
16+00 Pt12	554614.09	3680311.57	-3.22	TOP	Book# 060856
16+00 Pt13	554614.02	3680310.57	-3.22	TOP	Book# 060856
16+00 Pt14	554614.02	3680310.57	-4.22	TOE	Book# 060856
16+00 Pt15	554613.76	3680306.58	-4.22	BLD	Book# 060856
16+00 Pt16	554610.49	3680255.68	-4.59	BLD	Book# 060856
16+00 Pt17	554610.17	3680250.69	-4.79	TOP	Book# 060856
16+00 Pt18	554609.97	3680247.70	-5.29	TOE	Book# 060856
16+00 Pt19	554609.39	3680238.72	-5.69	NG	Book# 060856
16+00 Pt20	554608.75	3680228.74	-5.69	ES	Book# 060856
16+00 Pt21	554608.50	3680224.75	-5.69	ES	Book# 060856
16+00 Pt22	554607.66	3680211.77	-5.79	TPC	Book# 060856
16+00 Pt23	554607.60	3680210.77	-6.19	TEC	Book# 060856
16+00 Pt24	554606.76	3680197.80	-6.09	CLR	Book# 060856
16+00 Pt25	554605.93	3680184.83	-6.19	TEC	Book# 060856

Station/ Name	Northing	Easting	Elevation	Description	Raw Data Reference
16+00 Pt26	554605.86	3680183.83	-5.89	TPC	Book# 060856
16+00 Pt27	554604.58	3680163.87	-5.29	NG	Book# 060856
16+00 Pt28	554625.46	3680488.20	-12.26	SND	Book# 060856
16+00 Pt29	554624.81	3680478.22	-12.26	SND	Book# 060856
16+00 Pt30	554624.17	3680468.24	-12.46	SND	Book# 060856
16+00 Pt31	554623.53	3680458.26	-12.66	SND	Book# 060856
16+00 Pt32	554622.89	3680448.28	-5.26	SND	Book# 060856
16+00 Pt33	554622.24	3680438.30	-3.46	SND	Book# 060856
16+00 Pt34	554621.60	3680428.32	-1.16	SND	Book# 060856
16+00 Pt35	554625.46	3680488.20	-12.26	CL	Book# 060856
16+00 Pt36	554619.52	3680428.70	-0.92	WES	17thLONDON.dc
16+00 Pt37	554618.84	3680420.75	1.10	TOP	17thLONDON.dc
16+00 Pt38	554620.89	3680412.46	1.79	TOE	17thLONDON.dc
16+00 Pt39	554620.75	3680409.01	2.95	TBK	17thLONDON.dc
16+00 Pt40	554619.14	3680404.50	2.94	TOE CONC FLDWALL	17thLONDON.dc
16+00 Pt41	554618.86	3680403.85	13.01	TOP EDGE CONC FLDWAL	17thLONDON.dc
16+00 Pt42	554618.87	3680403.40	13.01	TOP EDGE CONC FLDWAL	17thLONDON.dc
16+50 Pt01	554570.10	3680406.60	4.38	TEF	Book# 060856
16+50 Pt02	554569.52	3680397.61	3.88	CL	Book# 060856
16+50 Pt03	554569.14	3680391.63	3.78	TLV	Book# 060856
16+50 Pt04	554568.88	3680387.63	3.68	SLP	Book# 060856
16+50 Pt05	554568.37	3680379.65	-2.62	TOE	Book# 060856
16+50 Pt06	554568.11	3680375.66	-2.82	FL	Book# 060856
16+50 Pt07	554567.53	3680366.68	-3.52	NG	Book# 060856
16+50 Pt08	554566.12	3680344.72	-4.72	BLD	Book# 060856
16+50 Pt09	554561.94	3680279.86	-4.69	BLD	Book# 060856
16+50 Pt10	554561.11	3680266.88	-5.19	TC	Book# 060856
16+50 Pt11	554560.14	3680251.92	-5.69	TC	Book# 060856
16+50 Pt12	554559.50	3680241.94	-5.79	TC	Book# 060856
16+50 Pt13	554557.90	3680216.99	-5.69	TEC	Book# 060856
16+50 Pt14	554557.83	3680215.99	-6.09	TPC	Book# 060856
16+50 Pt15	554556.93	3680202.02	-5.79	CLR	Book# 060856
16+50 Pt16	554556.10	3680189.05	-6.09	TEC	Book# 060856
16+50 Pt17	554556.03	3680188.05	-5.79	TPC	Book# 060856
16+50 Pt18	554554.68	3680167.09	-5.19	NG	Book# 060856
16+50 Pt19	554575.56	3680491.42	-12.36	SND	Book# 060856
16+50 Pt20	554574.92	3680481.44	-12.06	SND	Book# 060856
16+50 Pt21	554574.28	3680471.46	-11.96	SND	Book# 060856
16+50 Pt22	554573.63	3680461.48	-12.06	SND	Book# 060856
16+50 Pt23	554572.99	3680451.50	-5.26	SND	Book# 060856
16+50 Pt24	554572.35	3680441.52	-3.26	SND	Book# 060856
16+50 Pt25	554571.71	3680431.54	-1.76	SND	Book# 060856
16+50 Pt26	554575.56	3680491.42	-12.36	CL	Book# 060856
16+50 Pt27	554569.65	3680407.23	13.00	TOP EDGE CONC FLDWAL	17thLONDON.dc
16+50 Pt28	554569.66	3680407.72	13.03	TOP EDGE CONC FLDWAL	17thLONDON.dc
16+50 Pt29	554569.58	3680408.32	3.21	TOE CONC FLDWALL	17thLONDON.dc
16+50 Pt30	554569.79	3680413.36	3.10	TBK	17thLONDON.dc
16+50 Pt31	554570.57	3680417.10	1.61	TOE	17thLONDON.dc
16+50 Pt32	554571.39	3680422.65	1.03	TOP	17thLONDON.dc
16+50 Pt33	554572.17	3680429.83	-0.92	WES	17thLONDON.dc

Station/ Name	Northing	Easting	Elevation	Description	Raw Data Reference
51+00 Pt01	551161.60	3681162.12	-5.82	NG	Book# 060856
51+00 Pt02	551158.39	3681112.22	-5.62	NG	Book# 060856
51+00 Pt03	551156.91	3681089.27	-6.02	ER	Book# 060856
51+00 Pt04	551156.27	3681079.29	-5.82	CLR	Book# 060856
51+00 Pt05	551155.50	3681067.32	-6.22	ER	Book# 060856
51+00 Pt06	551155.43	3681066.32	-5.92	PL	Book# 060856
51+00 Pt07	551155.17	3681062.33	-4.72	SLP	Book# 060856
51+00 Pt08	551153.76	3681040.37	-1.52	TOP	Book# 060856
51+00 Pt09	551152.60	3681022.41	-0.72	TOP	Book# 060856
51+00 Pt10	551151.83	3681010.43	-2.22	BLD	Book# 060856
51+00 Pt11	551151.38	3681003.45	-2.82	BLD	Book# 060856
51+00 Pt12	551156.91	3681089.27	-6.02	SD	Book# 060856
51+00 Pt13	551156.27	3681079.29	-5.82	SD	Book# 060856
51+00 Pt14	551155.50	3681067.32	-6.22	SD	Book# 060856
51+00 Pt15	551155.43	3681066.32	-5.92	TOE	Book# 060856
51+00 Pt16	551152.60	3681022.41	-0.72	SD	Book# 060856
51+00 Pt17	551151.83	3681010.43	-2.22	SD	Book# 060856
51+00 Pt18	551151.38	3681003.45	-2.82	SD	Book# 060856
51+00 Pt19	551149.59	3680975.51	-2.37	BLD	Book# 060856
51+00 Pt20	551149.14	3680968.52	-0.77	TOP	Book# 060856
51+00 Pt21	551148.75	3680962.53	-1.67	NG	Book# 060856
51+00 Pt22	551146.31	3680924.61	0.23	TOP	Book# 060856
51+00 Pt23	551145.54	3680912.64	-2.77	TOE	Book# 060856
51+00 Pt24	551144.19	3680891.68	-3.67	TOE	Book# 060856
51+00 Pt25	551143.55	3680881.70	-1.37	TOP	Book# 060856
51+00 Pt26	551142.32	3680862.74	-2.67	NG	Book# 060856
51+00 Pt27	551142.00	3680857.75	-3.07	FST	Book# 060856
51+00 Pt28	551141.36	3680847.77	0.23	SLP	Book# 060856
51+00 Pt29	551140.65	3680836.79	3.53	LSC	Book# 060856
51+00 Pt30	551140.46	3680833.80	3.53	TEF	Book# 060856
51+00 Pt31	551140.46	3680833.80	12.91	TPF	Book# 060856
51+00 Pt32	551140.40	3680832.80	12.89	TPF	Book# 060856
51+00 Pt33	551140.33	3680831.80	3.11	TEF	Book# 060856
51+00 Pt34	551140.14	3680828.81	3.11	TBK	Book# 060856
51+00 Pt35	551139.75	3680822.82	0.91	TOP	Book# 060856
51+00 Pt36	551139.50	3680818.83	-0.89	WES	Book# 060856
51+00 Pt37	551133.46	3680725.02	-0.89	WES	Book# 060856
51+00 Pt38	551133.07	3680719.04	2.61	TBK	Book# 060856
51+00 Pt39	551132.49	3680710.06	3.31	TEF	Book# 060856
51+00 Pt40	551132.49	3680710.06	12.86	TPF	Book# 060856
51+00 Pt41	551132.43	3680709.06	12.86	TPF	Book# 060856
51+00 Pt42	551132.37	3680708.06	8.01	TEF	Book# 060856
51+00 Pt43	551131.79	3680699.08	7.71	CLR	Book# 060856
51+00 Pt44	551130.95	3680686.11	7.41	TOP	Book# 060856
51+00 Pt45	551130.63	3680681.12	1.51	TER	Book# 060856
51+00 Pt46	551130.25	3680675.13	0.71	FL	Book# 060856
51+00 Pt47	551130.18	3680674.13	-0.09	TOE	Book# 060856
51+00 Pt48	551129.47	3680663.15	-0.99	NG	Book# 060856
51+00 Pt49	551126.26	3680613.26	-0.89	NG	Book# 060856
51+00 Pt50	551123.05	3680563.36	-0.89	NG	Book# 060856
51+00 Pt51	551119.84	3680513.46	-1.39	NG	Book# 060856
51+00 Pt52	551118.94	3680499.49	-0.69	FL	Book# 060856

Station/ Name	Northing	Easting	Elevation	Description	Raw Data Reference
51+00 Pt53	551118.30	3680489.51	-5.01	PL	Book# 060856
51+00 Pt54	551117.78	3680481.53	-5.51	ER	Book# 060856
51+00 Pt55	551116.88	3680467.56	-4.81	CLR	Book# 060856
51+00 Pt56	551116.62	3680463.57	-4.81	RD	Book# 060856
51+00 Pt57	551116.05	3680454.58	-5.31	ER	Book# 060856
51+00 Pt58	551115.98	3680453.59	-4.76	TPC	Book# 060856
51+00 Pt59	551115.08	3680439.62	-5.11	SWK	Book# 060856
51+00 Pt60	551113.41	3680413.67	-5.71	NG	Book# 060856
51+00 Pt61	551112.13	3680393.71	-5.21	NG	Book# 060856
51+00 Pt62	551115.98	3680453.59	-4.76	SWK	Book# 060856
51+00 Pt63	551149.14	3680968.52	-0.77	SD	Book# 060856
51+00 Pt64	551148.75	3680962.53	-1.67	SD	Book# 060856
51+00 Pt65	551146.31	3680924.61	0.23	SD	Book# 060856
51+00 Pt66	551145.54	3680912.64	-2.77	SD	Book# 060856
51+00 Pt67	551144.19	3680891.68	-3.67	SD	Book# 060856
51+00 Pt68	551143.55	3680881.70	-1.37	SD	Book# 060856
51+00 Pt69	551142.32	3680862.74	-2.67	SD	Book# 060856
51+00 Pt70	551142.00	3680857.75	-3.07	SD	Book# 060856
51+00 Pt71	551141.36	3680847.77	0.23	SD	Book# 060856
51+00 Pt72	551139.11	3680812.84	-6.30	SND	Book# 060856
51+00 Pt73	551138.47	3680802.86	-10.10	SND	Book# 060856
51+00 Pt74	551137.83	3680792.88	-12.00	SND	Book# 060856
51+00 Pt75	551137.18	3680782.91	-11.30	SND	Book# 060856
51+00 Pt76	551136.54	3680772.93	-11.10	CL	Book# 060856
51+50 Pt01	551111.70	3681165.33	-2.52	NG	Book# 060856
51+50 Pt02	551108.49	3681115.43	-5.02	NG	Book# 060856
51+50 Pt03	551107.01	3681092.48	-6.12	ER	Book# 060856
51+50 Pt04	551106.30	3681081.50	-6.12	CLR	Book# 060856
51+50 Pt05	551105.66	3681071.52	-6.02	ER	Book# 060856
51+50 Pt06	551105.28	3681065.54	-0.52	PL	Book# 060856
51+50 Pt07	551105.08	3681062.54	-2.72	TOE	Book# 060856
51+50 Pt08	551104.12	3681047.57	-1.72	TOP	Book# 060856
51+50 Pt09	551103.22	3681033.60	-3.02	TOE	Book# 060856
51+50 Pt10	551102.19	3681017.64	-2.42	BLD	Book# 060856
51+50 Pt11	551111.70	3681165.33	-2.52	SD	Book# 060856
51+50 Pt12	551108.49	3681115.43	-5.02	SD	Book# 060856
51+50 Pt13	551107.01	3681092.48	-6.12	SD	Book# 060856
51+50 Pt14	551106.30	3681081.50	-6.12	SD	Book# 060856
51+50 Pt15	551105.66	3681071.52	-6.02	SD	Book# 060856
51+50 Pt16	551105.28	3681065.54	-0.52	SD	Book# 060856
51+50 Pt17	551105.08	3681062.54	-2.72	SD	Book# 060856
51+50 Pt18	551104.12	3681047.57	-1.72	SD	Book# 060856
51+50 Pt19	551103.22	3681033.60	-3.02	SD	Book# 060856
51+50 Pt20	551099.56	3680976.72	-4.34	BLD	Book# 060856
51+50 Pt21	551098.85	3680965.74	-4.44	TOE	Book# 060856
51+50 Pt22	551098.47	3680959.76	-4.54	TOE	Book# 060856
51+50 Pt23	551097.89	3680950.77	-1.84	TOP	Book# 060856
51+50 Pt24	551097.57	3680945.78	-3.64	TOE	Book# 060856
51+50 Pt25	551097.05	3680937.80	-3.64	TOE	Book# 060856
51+50 Pt26	551096.54	3680929.82	-0.54	TOP	Book# 060856
51+50 Pt27	551095.83	3680918.84	-4.34	TOE	Book# 060856

Station/ Name	Northing	Easting	Elevation	Description	Raw Data Reference
51+50 Pt28	551095.25	3680909.86	-4.14	TOE	Book# 060856
51+50 Pt29	551094.42	3680896.89	-0.64	TOP	Book# 060856
51+50 Pt30	551093.65	3680884.91	-2.84	TOE	Book# 060856
51+50 Pt31	551093.20	3680877.92	-3.34	TOE	Book# 060856
51+50 Pt32	551093.01	3680874.93	-1.14	TOP	Book# 060856
51+50 Pt33	551092.43	3680865.95	-1.84	NG	Book# 060856
51+50 Pt34	551092.17	3680861.96	-1.44	FST	Book# 060856
51+50 Pt35	551091.46	3680850.98	0.06	SLP	Book# 060856
51+50 Pt36	551090.82	3680841.00	3.26	LSC	Book# 060856
51+50 Pt37	551090.63	3680838.01	3.36	TEF	Book# 060856
51+50 Pt38	551090.63	3680838.01	12.88	TPF	Book# 060856
51+50 Pt39	551098.85	3680965.74	-4.44	SD	Book# 060856
51+50 Pt40	551098.47	3680959.76	-4.54	SD	Book# 060856
51+50 Pt41	551097.89	3680950.77	-1.84	SD	Book# 060856
51+50 Pt42	551097.57	3680945.78	-3.64	SD	Book# 060856
51+50 Pt43	551097.05	3680937.80	-3.64	SD	Book# 060856
51+50 Pt44	551096.54	3680929.82	-0.54	SD	Book# 060856
51+50 Pt45	551095.83	3680918.84	-4.34	SD	Book# 060856
51+50 Pt46	551095.25	3680909.86	-4.14	SD	Book# 060856
51+50 Pt47	551094.42	3680896.89	-0.64	SD	Book# 060856
51+50 Pt48	551093.65	3680884.91	-2.84	SD	Book# 060856
51+50 Pt49	551093.20	3680877.92	-3.34	SD	Book# 060856
51+50 Pt50	551093.01	3680874.93	-1.14	SD	Book# 060856
51+50 Pt51	551092.43	3680865.95	-1.84	SD	Book# 060856
51+50 Pt52	551092.17	3680861.96	-1.44	SD	Book# 060856
51+50 Pt53	551090.56	3680837.01	12.87	TPF	Book# 060856
51+50 Pt54	551090.50	3680836.01	3.11	TEF	Book# 060856
51+50 Pt55	551090.31	3680833.02	3.11	TBK	Book# 060856
51+50 Pt56	551089.73	3680824.04	0.81	TOP	Book# 060856
51+50 Pt57	551089.54	3680821.04	-0.89	WES	Book# 060856
51+50 Pt58	551083.31	3680724.24	-0.89	WES	Book# 060856
51+50 Pt59	551083.24	3680723.25	2.41	TBK	Book# 060856
51+50 Pt60	551082.53	3680712.27	3.21	TEF	Book# 060856
51+50 Pt61	551082.53	3680712.27	12.86	TPF	Book# 060856
51+50 Pt62	551082.47	3680711.27	12.87	TPF	Book# 060856
51+50 Pt63	551082.41	3680710.27	3.94	TEF	Book# 060856
51+50 Pt64	551081.96	3680703.29	3.44	CLR	Book# 060856
51+50 Pt65	551081.57	3680697.30	3.04	TRK	Book# 060856
51+50 Pt66	551080.86	3680686.32	-2.16	TOE	Book# 060856
51+50 Pt67	551080.48	3680680.33	-3.06	FL	Book# 060856
51+50 Pt68	551080.22	3680676.34	-4.46	TOE	Book# 060856
51+50 Pt69	551079.58	3680666.36	-4.76	NG	Book# 060856
51+50 Pt70	551076.37	3680616.47	-4.96	NG	Book# 060856
51+50 Pt71	551073.16	3680566.57	-4.96	NG	Book# 060856
51+50 Pt72	551069.94	3680516.67	-5.56	NG	Book# 060856
51+50 Pt73	551069.11	3680503.70	-5.16	FL	Book# 060856
51+50 Pt74	551068.92	3680500.71	-5.46	ES	Book# 060856
51+50 Pt75	551068.66	3680496.71	-5.36	ES	Book# 060856
51+50 Pt76	551068.02	3680486.73	-5.26	TPC	Book# 060856
51+50 Pt77	551067.95	3680485.74	-5.66	ER	Book# 060856
51+50 Pt78	551067.12	3680472.76	-4.86	CLR	Book# 060856
51+50 Pt79	551066.73	3680466.78	-4.96	RD	Book# 060856

Station/ Name	Northing	Easting	Elevation	Description	Raw Data Reference
51+50 Pt80	551066.28	3680459.79	-5.26	ER	Book# 060856
51+50 Pt81	551066.28	3680459.79	-4.86	TPC	Book# 060856
51+50 Pt82	551066.22	3680458.79	-4.86	TPC	Book# 060856
51+50 Pt83	551065.51	3680447.82	-4.86	ES	Book# 060856
51+50 Pt84	551065.25	3680443.82	-4.76	ES	Book# 060856
51+50 Pt85	551064.74	3680435.84	-4.71	ES	Book# 060856
51+50 Pt86	551064.29	3680428.85	-4.76	ES	Book# 060856
51+50 Pt87	551063.52	3680416.88	-4.76	NG	Book# 060856
51+50 Pt88	551062.23	3680396.92	-4.86	NG	Book# 060856
51+50 Pt89	551089.22	3680816.05	-4.90	SND	Book# 060856
51+50 Pt90	551088.57	3680806.07	-9.70	SND	Book# 060856
51+50 Pt91	551087.93	3680796.09	-11.30	SND	Book# 060856
51+50 Pt92	551087.29	3680786.11	-11.60	SND	Book# 060856
51+50 Pt93	551086.65	3680776.14	-11.30	SND	Book# 060856
51+50 Pt94	551086.65	3680776.14	-11.30	CL	Book# 060856
52+00 Pt01	551059.10	3681126.64	-4.42	BLD	Book# 060856
52+00 Pt02	551058.59	3681118.65	-4.22	NG	Book# 060856
52+00 Pt03	551057.30	3681098.69	-6.42	ER	Book# 060856
52+00 Pt04	551056.53	3681086.72	-6.12	CLR	Book# 060856
52+00 Pt05	551055.83	3681075.74	-6.32	ER	Book# 060856
52+00 Pt06	551055.38	3681068.76	-0.92	PL	Book# 060856
52+00 Pt07	551054.67	3681057.78	-0.52	TOP	Book# 060856
52+00 Pt08	551054.54	3681055.78	-2.22	TOE	Book# 060856
52+00 Pt09	551053.96	3681046.80	-1.02	TOP	Book# 060856
52+00 Pt10	551052.16	3681018.86	-1.72	NG	Book# 060856
52+00 Pt11	551059.10	3681126.64	-4.42	SD	Book# 060856
52+00 Pt12	551058.59	3681118.65	-4.22	SD	Book# 060856
52+00 Pt13	551057.30	3681098.69	-6.42	SD	Book# 060856
52+00 Pt14	551056.53	3681086.72	-6.12	SD	Book# 060856
52+00 Pt15	551055.38	3681068.76	-0.92	SD	Book# 060856
52+00 Pt16	551054.67	3681057.78	-0.52	SD	Book# 060856
52+00 Pt17	551054.54	3681055.78	-2.22	SD	Book# 060856
52+00 Pt18	551053.96	3681046.80	-1.02	SD	Book# 060856
52+00 Pt19	551052.16	3681018.86	-1.72	SD	Book# 060856
52+00 Pt20	551050.30	3680989.92	-3.04	SD	Book# 060856
52+00 Pt21	551049.59	3680978.94	0.06	SD	Book# 060856
52+00 Pt22	551048.95	3680968.96	0.56	SD	Book# 060856
52+00 Pt23	551047.28	3680943.02	-4.54	SD	Book# 060856
52+00 Pt24	551045.74	3680919.07	-3.54	SD	Book# 060856
52+00 Pt25	551050.30	3680989.92	-3.04	TOE	Book# 060856
52+00 Pt26	551049.59	3680978.94	0.06	TOP	Book# 060856
52+00 Pt27	551048.95	3680968.96	0.56	TOP	Book# 060856
52+00 Pt28	551047.28	3680943.02	-4.54	TOE	Book# 060856
52+00 Pt29	551045.74	3680919.07	-3.54	SLP	Book# 060856
52+00 Pt30	551045.29	3680912.08	-0.24	TOP	Book# 060856
52+00 Pt31	551044.39	3680898.11	-2.54	TOE	Book# 060856
52+00 Pt32	551042.53	3680869.17	-1.44	NG	Book# 060856
52+00 Pt33	551042.34	3680866.18	-0.94	FST	Book# 060856
52+00 Pt34	551041.89	3680859.19	-0.34	SLP	Book# 060856
52+00 Pt35	551041.05	3680846.22	3.16	LSC	Book# 060856
52+00 Pt36	551040.79	3680842.23	3.46	TEF	Book# 060856

Station/ Name	Northing	Easting	Elevation	Description	Raw Data Reference
52+00 Pt37	551040.79	3680842.23	12.90	TPF	Book# 060856
52+00 Pt38	551045.29	3680912.08	-0.24	SD	Book# 060856
52+00 Pt39	551044.39	3680898.11	-2.54	SD	Book# 060856
52+00 Pt40	551040.73	3680841.23	12.87	TPF	Book# 060856
52+00 Pt41	551040.67	3680840.23	3.31	TEF	Book# 060856
52+00 Pt42	551040.41	3680836.24	3.31	TBK	Book# 060856
52+00 Pt43	551039.96	3680829.25	1.21	TOP	Book# 060856
52+00 Pt44	551039.70	3680825.26	-0.89	WES	Book# 060856
52+00 Pt45	551033.47	3680728.46	-0.89	WES	Book# 060856
52+00 Pt46	551033.28	3680725.47	2.81	TBK	Book# 060856
52+00 Pt47	551032.76	3680717.48	2.91	TEF	Book# 060856
52+00 Pt48	551032.76	3680717.48	12.88	TPF	Book# 060856
52+00 Pt49	551032.70	3680716.49	12.89	TPF	Book# 060856
52+00 Pt50	551032.64	3680715.49	3.61	TEF	Book# 060856
52+00 Pt51	551032.19	3680708.50	3.41	CLR	Book# 060856
52+00 Pt52	551031.67	3680700.52	3.01	TOP	Book# 060856
52+00 Pt53	551031.16	3680692.54	-1.89	TOE	Book# 060856
52+00 Pt54	551030.52	3680682.56	-3.09	FL	Book# 060856
52+00 Pt55	551030.45	3680681.56	-4.29	TOE	Book# 060856
52+00 Pt56	551029.68	3680669.58	-4.99	NG	Book# 060856
52+00 Pt57	551026.47	3680619.69	-4.89	NG	Book# 060856
52+00 Pt58	551023.26	3680569.79	-5.19	NG	Book# 060856
52+00 Pt59	551020.04	3680519.89	-5.19	NG	Book# 060856
52+00 Pt60	551019.08	3680504.92	-4.69	FL	Book# 060856
52+00 Pt61	551018.95	3680502.93	-4.89	ES	Book# 060856
52+00 Pt62	551018.76	3680499.93	-4.99	ES	Book# 060856
52+00 Pt63	551018.05	3680488.96	-4.99	TPC	Book# 060856
52+00 Pt64	551017.99	3680487.96	-5.44	ER	Book# 060856
52+00 Pt65	551017.15	3680474.99	-5.09	CLR	Book# 060856
52+00 Pt66	551016.83	3680470.00	-5.09	RD	Book# 060856
52+00 Pt67	551016.38	3680463.01	-5.49	ER	Book# 060856
52+00 Pt68	551016.25	3680461.01	-5.19	TPC	Book# 060856
52+00 Pt69	551015.55	3680450.04	-5.29	ES	Book# 060856
52+00 Pt70	551015.29	3680446.05	-4.99	ES	Book# 060856
52+00 Pt71	551014.13	3680428.08	-4.59	BLD	Book# 060856
52+00 Pt72	551039.32	3680819.27	-6.00	SND	Book# 060856
52+00 Pt73	551038.67	3680809.29	-9.00	SND	Book# 060856
52+00 Pt74	551038.03	3680799.31	-9.70	SND	Book# 060856
52+00 Pt75	551037.39	3680789.33	-10.40	SND	Book# 060856
52+00 Pt76	551036.75	3680779.36	-11.20	SND	Book# 060856
52+00 Pt77	551036.10	3680769.38	-11.60	SND	Book# 060856
52+00 Pt78	551036.10	3680769.38	-11.60	CL	Book# 060856
58+50 Pt01	550406.72	3681110.51	-3.93	NG	Book# 060856
58+50 Pt02	550405.12	3681085.56	-4.13	NG	Book# 060856
58+50 Pt03	550404.03	3681068.59	-3.23	BLD	Book# 060856
58+50 Pt04	550401.46	3681028.68	-3.73	BLD	Book# 060856
58+50 Pt05	550400.30	3681010.71	-3.93	NG	Book# 060856
58+50 Pt06	550398.69	3680985.76	-3.83	NG	Book# 060856
58+50 Pt07	550397.09	3680960.82	-3.63	NG	Book# 060856
58+50 Pt08	550395.48	3680935.87	-3.23	NG	Book# 060856
58+50 Pt09	550394.52	3680920.90	-2.33	FL	Book# 060856

Station/ Name	Northing	Easting	Elevation	Description	Raw Data Reference
58+50 Pt10	550394.20	3680915.91	-1.73	TOE	Book# 060856
58+50 Pt11	550393.87	3680910.92	-0.23	SLP	Book# 060856
58+50 Pt12	550393.10	3680898.94	2.97	LSC	Book# 060856
58+50 Pt13	550392.53	3680889.96	3.67	TEF	Book# 060856
58+50 Pt14	550392.53	3680889.96	12.72	TPF	Book# 060856
58+50 Pt15	550392.46	3680888.97	12.72	TPF	Book# 060856
58+50 Pt16	550392.40	3680887.97	4.17	TEF	Book# 060856
58+50 Pt17	550392.20	3680884.97	3.87	TBK	Book# 060856
58+50 Pt18	550392.08	3680882.98	3.20	TSP	Book# 060856
58+50 Pt19	550392.08	3680882.98	-1.23	WES	Book# 060856
58+50 Pt20	550392.08	3680882.98	-1.50	SND	Book# 060856
58+50 Pt21	550391.95	3680880.98	-1.90	SND	Book# 060856
58+50 Pt22	550391.30	3680871.00	-4.50	SND	Book# 060856
58+50 Pt23	550390.66	3680861.02	-6.10	SND	Book# 060856
58+50 Pt24	550390.02	3680851.04	-9.60	SND	Book# 060856
58+50 Pt25	550389.38	3680841.06	-10.10	SND	Book# 060856
58+50 Pt26	550388.73	3680831.09	-9.90	SND	Book# 060856
58+50 Pt27	550388.09	3680821.11	-8.10	SND	Book# 060856
58+50 Pt28	550388.09	3680821.11	-8.10	CL	Book# 060856
59+00 Pt01	550356.83	3681113.72	-4.23	DRV	Book# 060856
59+00 Pt02	550355.22	3681088.77	-4.03	DRV	Book# 060856
59+00 Pt03	550354.71	3681080.78	-3.93	BLD	Book# 060856
59+00 Pt04	550349.89	3681005.94	-3.63	BLD	Book# 060856
59+00 Pt05	550348.80	3680988.97	-3.63	NG	Book# 060856
59+00 Pt06	550347.19	3680964.03	-3.73	NG	Book# 060856
59+00 Pt07	550345.58	3680939.08	-3.83	NG	Book# 060856
59+00 Pt08	550344.56	3680923.11	-3.53	FL	Book# 060856
59+00 Pt09	550343.98	3680914.13	-0.73	NG	Book# 060856
59+00 Pt10	550343.21	3680902.15	3.17	LSC	Book# 060856
59+00 Pt11	550342.76	3680895.17	3.67	TEF	Book# 060856
59+00 Pt12	550344.56	3680923.11	-3.53	TOE	Book# 060856
59+00 Pt13	550342.76	3680895.17	12.77	TPF	Book# 060856
59+00 Pt14	550342.69	3680894.17	12.77	TPF	Book# 060856
59+00 Pt15	550342.63	3680893.17	3.27	TEF	Book# 060856
59+00 Pt16	550342.31	3680888.18	2.87	TBK	Book# 060856
59+00 Pt17	550342.31	3680888.18	3.77	TSP	Book# 060856
59+00 Pt18	550342.24	3680887.19	1.17	TOE	Book# 060856
59+00 Pt19	550341.86	3680881.20	-1.23	WE	Book# 060856
59+00 Pt20	550335.24	3680778.41	-1.23	WES	Book# 060856
59+00 Pt21	550335.18	3680777.41	1.17	TOP	Book# 060856
59+00 Pt22	550334.53	3680767.43	2.17	TOE	Book# 060856
59+00 Pt23	550334.53	3680767.43	3.87	TSP	Book# 060856
59+00 Pt24	550334.47	3680766.44	2.87	TBK	Book# 060856
59+00 Pt25	550334.28	3680763.44	3.57	TEF	Book# 060856
59+00 Pt26	550334.28	3680763.44	12.87	TPF	Book# 060856
59+00 Pt27	550334.21	3680762.44	12.87	TPF	Book# 060856
59+00 Pt28	550341.86	3680881.20	-3.22	SND	Book# 060856
59+00 Pt29	550341.41	3680874.21	-6.62	SND	Book# 060856
59+00 Pt30	550340.77	3680864.23	-9.52	SND	Book# 060856
59+00 Pt31	550340.12	3680854.25	-9.92	SND	Book# 060856
59+00 Pt32	550339.48	3680844.27	-9.82	SND	Book# 060856

Station/ Name	Northing	Easting	Elevation	Description	Raw Data Reference
59+00 Pt33	550338.84	3680834.29	-9.92	SND	Book# 060856
59+00 Pt34	550338.20	3680824.32	-9.62	SND	Book# 060856
59+00 Pt35	550337.55	3680814.34	-9.92	SND	Book# 060856
59+00 Pt36	550336.91	3680804.36	-10.62	SND	Book# 060856
59+00 Pt37	550336.27	3680794.38	-8.02	SND	Book# 060856
59+00 Pt38	550335.63	3680784.40	-2.22	SND	Book# 060856
59+00 Pt39	550338.20	3680824.32	-9.62	CL	Book# 060856
59+50 Pt01	550306.93	3681116.94	-4.13	NG	Book# 060856
59+50 Pt02	550305.32	3681091.99	-3.43	NG	Book# 060856
59+50 Pt03	550304.48	3681079.02	-3.73	BLD	Book# 060856
59+50 Pt04	550302.24	3681044.09	-3.38	BLD	Book# 060856
59+50 Pt05	550300.50	3681017.14	-2.98	NG	Book# 060856
59+50 Pt06	550298.90	3680992.19	-3.38	NG	Book# 060856
59+50 Pt07	550297.29	3680967.25	-3.58	NG	Book# 060856
59+50 Pt08	550295.68	3680942.30	-3.58	NG	Book# 060856
59+50 Pt09	550294.66	3680926.33	-2.98	FL	Book# 060856
59+50 Pt10	550294.08	3680917.35	-1.08	SLP	Book# 060856
59+50 Pt11	550293.31	3680905.37	3.42	LSC	Book# 060856
59+50 Pt12	550292.86	3680898.39	9.57	TEF	Book# 060856
59+50 Pt13	550294.66	3680926.33	2.77	TOE	Book# 060856
59+50 Pt14	550292.86	3680898.39	12.77	TPF	Book# 060856
59+50 Pt15	550292.79	3680897.39	12.77	TPF	Book# 060856
59+50 Pt16	550292.73	3680896.39	2.97	TEF	Book# 060856
59+50 Pt17	550292.41	3680891.40	2.67	TBK	Book# 060856
59+50 Pt18	550292.41	3680891.40	4.07	TSP	Book# 060856
59+50 Pt19	550292.34	3680890.41	-0.23	TOE	Book# 060856
59+50 Pt20	550292.09	3680886.41	-1.23	WES	Book# 060856
59+50 Pt21	550292.41	3680891.40	-0.42	SND	Book# 060856
59+50 Pt22	550292.15	3680887.41	-0.92	SND	Book# 060856
59+50 Pt23	550291.51	3680877.43	-5.22	SND	Book# 060856
59+50 Pt24	550290.87	3680867.45	-10.02	SND	Book# 060856
59+50 Pt25	550290.22	3680857.47	-10.32	SND	Book# 060856
59+50 Pt26	550289.58	3680847.49	-10.22	SND	Book# 060856
59+50 Pt27	550288.94	3680837.51	-10.02	SND	Book# 060856
59+50 Pt28	550288.30	3680827.54	-10.22	SND	Book# 060856
59+50 Pt29	550288.30	3680827.54	-10.22	CL	Book# 060856

Appendix 20

Topographic and Hydrographic Cross Section Data

Inner Harbor Navigation Canal -- East Bank

Horizontal Datum: NAD 1983(1992)

Horizontal Coordinate System: U.S. State Plane, 1983, Zone: Louisiana South 1702

Vertical Datum: NAVD88(2004.65)

Coordinate Units: US survey feet

Distance Units: U.S. survey feet

Height Units: U.S. survey feet

Station/ Name	Northing	Easting	Elevation	Description	Raw Data Reference
0+00 Pt01	540620.99	3696285.94	-1.91	SND	Book# 060858
0+00 Pt02	540625.90	3696266.56	-5.71	SND	Book# 060858
0+00 Pt03	540630.81	3696247.17	-15.31	SND	Book# 060858
0+00 Pt04	540635.71	3696227.78	-20.61	SND	Book# 060858
0+00 Pt05	540640.62	3696208.39	-23.31	SND	Book# 060858
0+00 Pt06	540645.53	3696189.00	-23.61	SND	Book# 060858
0+00 Pt07	540650.43	3696169.61	-25.81	SND	Book# 060858
0+00 Pt08	540655.34	3696150.22	-27.91	SND	Book# 060858
0+00 Pt09	540660.25	3696130.83	-28.31	SND	Book# 060858
0+00 Pt10	540665.15	3696111.45	-27.81	SND	Book# 060858
0+00 Pt11	540670.06	3696092.06	-29.31	SND	Book# 060858
0+00 Pt12	540674.97	3696072.67	-33.31	SND	Book# 060858
0+00 Pt13	540679.87	3696053.28	-34.71	SND	Book# 060858
0+00 Pt14	540684.78	3696033.89	-37.61	SND	Book# 060858
0+00 Pt15	540689.69	3696014.50	-38.51	SND	Book# 060858
0+00 Pt16	540694.59	3695995.11	-39.71	SND	Book# 060858
0+00 Pt17	540699.50	3695975.72	-38.51	SND	Book# 060858
0+00 Pt18	540699.50	3695975.72	-38.51	CL	Book# 060858
0+00 Pt19	540618.04	3696297.59	-0.69	WES	IHNCEAST.dc
0+00 Pt20	540602.86	3696365.81	5.07	TOP	IHNCEAST.dc
0+00 Pt21	540600.82	3696368.24	2.90	TOE	IHNCEAST.dc
0+00 Pt22	540600.63	3696371.06	2.58	TOE	IHNCEAST.dc
0+00 Pt23	540600.03	3696373.23	4.25	TOP	IHNCEAST.dc
0+00 Pt24	540596.72	3696384.48	1.84	TOE	IHNCEAST.dc
0+00 Pt25	540593.03	3696399.09	0.60	E ROAD	IHNCEAST.dc
0+00 Pt26	540585.06	3696424.74	0.19	ON ROAD	IHNCEAST.dc

Station/ Name	Northing	Easting	Elevation	Description	Raw Data Reference
0+00 Pt27	540574.15	3696471.53	-0.75	ON ROAD	IHNCEAST.dc
0+00 Pt28	540561.63	3696520.23	-1.34	ON ROAD	IHNCEAST.dc
0+00 Pt29	540549.86	3696566.48	-1.54	ON ROAD	IHNCEAST.dc
0+00 Pt30	540616.01	3696307.35	0.70	TOE	IHNCEAST.dc
0+00 Pt31	540537.04	3696618.07	-1.93	ON ROAD	IHNCEAST.dc
0+00 Pt32	540524.48	3696668.27	-2.48	ON ROAD	IHNCEAST.dc
0+00 Pt33	540508.83	3696729.95	-3.33	ON ROAD	IHNCEAST.dc
0+00 Pt34	540496.44	3696775.74	-4.74	ON ROAD	IHNCEAST.dc
0+00 Pt35	540484.56	3696820.81	-5.55	ON ROAD	IHNCEAST.dc
0+00 Pt36	540613.89	3696314.74	2.04	TBK	IHNCEAST.dc
0+00 Pt37	540608.41	3696337.61	2.36	TOE	IHNCEAST.dc
0+00 Pt38	540603.19	3696357.00	4.73	TOP	IHNCEAST.dc
0+00 Pt39	540601.74	3696362.30	5.20	TOE CONC FLDWALL	IHNCEAST.dc
0+00 Pt40	540601.98	3696362.82	12.62	TOP EDGE CONC FLDWAL	IHNCEAST.dc
0+00 Pt41	540602.19	3696363.60	12.64	TOP EDGE CONC FLDWAL	IHNCEAST.dc
0+00 Pt42	540602.43	3696364.03	5.34	TOE CONC FLDWALL	IHNCEAST.dc
0+50 Pt01	540572.61	3696273.77	-1.41	SND	Book# 060858
0+50 Pt02	540577.52	3696254.38	-2.71	SND	Book# 060858
0+50 Pt03	540582.42	3696234.99	-9.31	SND	Book# 060858
0+50 Pt04	540587.33	3696215.60	-19.51	SND	Book# 060858
0+50 Pt05	540592.24	3696196.21	-25.81	SND	Book# 060858
0+50 Pt06	540597.14	3696176.82	-27.71	SND	Book# 060858
0+50 Pt07	540602.05	3696157.43	-29.61	SND	Book# 060858
0+50 Pt08	540606.96	3696138.04	-31.31	SND	Book# 060858
0+50 Pt09	540611.86	3696118.66	-31.71	SND	Book# 060858
0+50 Pt10	540616.77	3696099.27	-32.41	SND	Book# 060858
0+50 Pt11	540621.68	3696079.88	-32.71	SND	Book# 060858
0+50 Pt12	540626.58	3696060.49	-34.01	SND	Book# 060858
0+50 Pt13	540631.49	3696041.10	-34.81	SND	Book# 060858
0+50 Pt14	540636.40	3696021.71	-36.41	SND	Book# 060858
0+50 Pt15	540641.30	3696002.32	-39.11	SND	Book# 060858
0+50 Pt16	540646.21	3695982.93	-40.21	SND	Book# 060858
0+50 Pt17	540651.12	3695963.55	-40.61	SND	Book# 060858
0+50 Pt18	540430.84	3696834.47	-4.97	NG-JUNK PILE	IHNCEAST.dc
0+50 Pt19	540466.11	3696694.41	-5.85	TOE	IHNCEAST.dc
0+50 Pt20	540470.01	3696678.90	-5.82	TOE	IHNCEAST.dc
0+50 Pt21	540477.87	3696653.85	-3.95	SLP	IHNCEAST.dc
0+50 Pt22	540483.44	3696626.44	-2.89	SLP	IHNCEAST.dc
0+50 Pt23	540486.15	3696614.10	-1.11	TOP	IHNCEAST.dc
0+50 Pt24	540494.87	3696582.29	-1.10	NG	IHNCEAST.dc
0+50 Pt25	540506.16	3696535.65	-0.76	NG	IHNCEAST.dc
0+50 Pt26	540516.50	3696492.38	0.00	NG	IHNCEAST.dc
0+50 Pt27	540527.14	3696453.62	0.90	E LEVEE RAMP	IHNCEAST.dc
0+50 Pt28	540533.00	3696429.73	1.66	C/L LEVEE RAMP	IHNCEAST.dc
0+50 Pt29	540440.31	3696796.19	-5.00	NG-JUNK PILE	IHNCEAST.dc
0+50 Pt30	540538.27	3696409.97	2.00	E LEVEE RAMP	IHNCEAST.dc
0+50 Pt31	540538.91	3696405.81	2.06	TOE	IHNCEAST.dc
0+50 Pt32	540539.20	3696402.32	3.31	TOP	IHNCEAST.dc
0+50 Pt33	540540.46	3696401.30	3.25	EDGE CONC SLAB	IHNCEAST.dc
0+50 Pt34	540541.79	3696394.91	3.17	EDGE CONC SLAB	IHNCEAST.dc
0+50 Pt35	540541.98	3696393.80	3.60	TOP	IHNCEAST.dc

Station/ Name	Northing	Easting	Elevation	Description	Raw Data Reference
0+50 Pt36	540543.79	3696388.33	3.91	TOE	IHNCEAST.dc
0+50 Pt37	540544.76	3696382.74	5.57	TOP	IHNCEAST.dc
0+50 Pt38	540545.18	3696380.63	3.44	TOE	IHNCEAST.dc
0+50 Pt39	540546.37	3696377.71	3.93	TOE FLDWALL	IHNCEAST.dc
0+50 Pt40	540451.07	3696758.62	-4.86	NG-JUNK PILE	IHNCEAST.dc
0+50 Pt41	540546.58	3696377.83	5.18	TOP	IHNCEAST.dc
0+50 Pt42	540546.79	3696376.33	5.33	TOE CONC FLDWALL	IHNCEAST.dc
0+50 Pt43	540546.84	3696375.81	12.56	TOP EDGE CONC FLDWAL	IHNCEAST.dc
0+50 Pt44	540547.01	3696374.68	12.59	TOP EDGE CONC FLDWAL	IHNCEAST.dc
0+50 Pt45	540547.28	3696374.47	6.55	TOE CONC FLDWALL	IHNCEAST.dc
0+50 Pt46	540548.50	3696370.52	6.31	TOP	IHNCEAST.dc
0+50 Pt47	540550.06	3696364.80	5.30	TOE	IHNCEAST.dc
0+50 Pt48	540555.74	3696341.16	4.55	NG	IHNCEAST.dc
0+50 Pt49	540566.29	3696298.04	3.37	TBK	IHNCEAST.dc
0+50 Pt50	540566.97	3696296.64	1.92	TOP EDGE OF RIP RAP	IHNCEAST.dc
0+50 Pt51	540453.92	3696734.98	-5.40	NG-JUNK PILE	IHNCEAST.dc
0+50 Pt52	540570.29	3696284.54	-0.58	EDGE RIP RAP	IHNCEAST.dc
0+50 Pt53	540570.59	3696282.74	-0.75	WES	IHNCEAST.dc
0+50 Pt54	540457.03	3696732.78	-5.35	E ROAD	IHNCEAST.dc
0+50 Pt55	540458.75	3696722.95	-5.32	CL ROAD	IHNCEAST.dc
0+50 Pt56	540460.77	3696717.19	-5.26	E ROAD	IHNCEAST.dc
0+50 Pt57	540461.75	3696713.81	-5.45	TOE	IHNCEAST.dc
0+50 Pt58	540463.53	3696707.30	-4.07	TOP	IHNCEAST.dc
41+65 Pt01	536592.68	3695205.28	-1.61	SND	Book# 060858
41+65 Pt02	536599.52	3695186.49	-3.41	SND	Book# 060858
41+65 Pt03	536606.36	3695167.69	-5.51	SND	Book# 060858
41+65 Pt04	536613.20	3695148.90	-6.81	SND	Book# 060858
41+65 Pt05	536620.04	3695130.10	-5.11	SND	Book# 060858
41+65 Pt06	536626.88	3695111.31	-8.11	SND	Book# 060858
41+65 Pt07	536633.72	3695092.52	-9.41	SND	Book# 060858
41+65 Pt08	536640.56	3695073.72	-9.31	SND	Book# 060858
41+65 Pt09	536647.40	3695054.93	-14.11	SND	Book# 060858
41+65 Pt10	536653.22	3695038.95	-10.21	SND	Book# 060858
41+65 Pt11	536661.08	3695017.34	-20.61	SND	Book# 060858
41+65 Pt12	536667.92	3694998.55	-22.31	SND	Book# 060858
41+65 Pt13	536674.76	3694979.75	-24.21	SND	Book# 060858
41+65 Pt14	536681.60	3694960.96	-25.91	SND	Book# 060858
41+65 Pt15	536688.45	3694942.17	-27.21	SND	Book# 060858
41+65 Pt16	536695.29	3694923.37	-30.31	SND	Book# 060858
41+65 Pt17	536702.13	3694904.58	-32.41	SND	Book# 060858
41+65 Pt18	536708.97	3694885.78	-32.91	SND	Book# 060858
41+65 Pt19	536715.81	3694866.99	-32.51	SND	Book# 060858
41+65 Pt20	536715.81	3694866.99	-32.51	CL	Book# 060858
41+65 Pt21	536529.11	3695379.06	0.08	EDGE OF BLDG	IHNCEAST.dc
41+65 Pt22	536447.32	3695605.21	-2.60	E ROAD	IHNCEAST.dc
41+65 Pt23	536445.62	3695611.19	-2.35	TOE	IHNCEAST.dc
41+65 Pt24	536445.33	3695613.70	-1.72	FL / TOP	IHNCEAST.dc
41+65 Pt25	536444.42	3695615.88	-1.66	E CONC SLAB	IHNCEAST.dc
41+65 Pt26	536434.58	3695637.87	-1.87	NG	IHNCEAST.dc
41+65 Pt27	536536.90	3695358.43	-0.18	ON ASPHALT	IHNCEAST.dc
41+65 Pt28	536545.27	3695338.01	-0.14	ON ASPHALT	IHNCEAST.dc

Station/ Name	Northing	Easting	Elevation	Description	Raw Data Reference
41+65 Pt29	536552.27	3695316.52	0.32	E ASPHALT	IHNCEAST.dc
41+65 Pt30	536552.42	3695315.70	0.68	FL	IHNCEAST.dc
41+65 Pt31	536557.52	3695303.01	0.61	LST	IHNCEAST.dc
41+65 Pt32	536495.48	3695471.57	-0.43	EDGE OF BLDG	IHNCEAST.dc
41+65 Pt33	536560.61	3695291.92	4.04	SLP	IHNCEAST.dc
41+65 Pt34	536563.67	3695283.89	7.07	LSC	IHNCEAST.dc
41+65 Pt35	536566.30	3695277.43	7.49	TOE CONC FLDWALL	IHNCEAST.dc
41+65 Pt36	536566.87	3695275.99	13.40	TOP EDGE CONC FLDWAL	IHNCEAST.dc
41+65 Pt37	536566.93	3695275.76	13.40	TOP EDGE CONC FLDWAL	IHNCEAST.dc
41+65 Pt38	536566.81	3695275.33	7.09	TOE CONC FLDWALL	IHNCEAST.dc
41+65 Pt39	536567.71	3695272.24	6.56	FSC	IHNCEAST.dc
41+65 Pt40	536570.58	3695264.23	4.42	SLP	IHNCEAST.dc
41+65 Pt41	536576.09	3695253.19	2.41	FST	IHNCEAST.dc
41+65 Pt42	536572.34	3695260.25	3.47	EDGE RIP RAP	IHNCEAST.dc
41+65 Pt43	536486.69	3695496.80	-0.66	NG	IHNCEAST.dc
41+65 Pt44	536578.11	3695243.26	1.83	ON RIP RAP	IHNCEAST.dc
41+65 Pt45	536584.67	3695225.90	2.02	TBK	IHNCEAST.dc
41+65 Pt46	536587.40	3695219.91	0.60	ON RIP RAP	IHNCEAST.dc
41+65 Pt47	536589.74	3695212.70	0.36	ON RIP RAP	IHNCEAST.dc
41+65 Pt48	536592.41	3695208.94	-0.44	WES	IHNCEAST.dc
41+65 Pt49	536479.14	3695518.73	-1.04	FL	IHNCEAST.dc
41+65 Pt50	536476.96	3695521.38	-1.12	TOP	IHNCEAST.dc
41+65 Pt51	536465.26	3695553.77	-3.49	TOE	IHNCEAST.dc
41+65 Pt52	536458.24	3695573.47	-3.35	NG	IHNCEAST.dc
41+65 Pt53	536453.15	3695588.28	-2.90	E ROAD	IHNCEAST.dc
41+65 Pt54	536450.37	3695597.45	-2.68	CL ROAD	IHNCEAST.dc
44+00 Pt01	536406.14	3695030.86	-2.01	SND	Book# 060858
44+00 Pt02	536412.98	3695012.06	-7.01	SND	Book# 060858
44+00 Pt03	536419.82	3694993.27	-11.71	SND	Book# 060858
44+00 Pt04	536426.66	3694974.47	-16.81	SND	Book# 060858
44+00 Pt05	536433.50	3694955.68	-19.01	SND	Book# 060858
44+00 Pt06	536440.34	3694936.89	-21.81	SND	Book# 060858
44+00 Pt07	536447.18	3694918.09	-24.71	SND	Book# 060858
44+00 Pt08	536454.02	3694899.30	-26.71	SND	Book# 060858
44+00 Pt09	536460.86	3694880.50	-27.61	SND	Book# 060858
44+00 Pt10	536467.70	3694861.71	-29.41	SND	Book# 060858
44+00 Pt11	536474.54	3694842.92	-33.21	SND	Book# 060858
44+00 Pt12	536481.38	3694824.12	-35.21	SND	Book# 060858
44+00 Pt13	536488.22	3694805.33	-33.71	SND	Book# 060858
44+00 Pt14	536495.06	3694786.53	-31.31	SND	Book# 060858
44+00 Pt15	536481.38	3694824.12	-35.21	CL	Book# 060858
44+00 Pt16	536276.14	3695387.94	-2.60	ON ASPHALT	IHNCEAST.dc
44+00 Pt17	536344.15	3695200.94	-1.92	NG	IHNCEAST.dc
44+00 Pt18	536361.78	3695153.02	-1.70	NG	IHNCEAST.dc
44+00 Pt19	536370.54	3695124.49	-1.05	FST	IHNCEAST.dc
44+00 Pt20	536374.84	3695118.57	0.09	SLP	IHNCEAST.dc
44+00 Pt21	536381.12	3695099.85	6.44	SLP	IHNCEAST.dc
44+00 Pt22	536382.54	3695096.06	7.42	FSC	IHNCEAST.dc
44+00 Pt23	536384.16	3695091.34	7.64	TOE CONC FLDWALL	IHNCEAST.dc
44+00 Pt24	536384.80	3695089.70	13.27	TOP CONC FLDWALL	IHNCEAST.dc
44+00 Pt25	536384.94	3695089.47	13.33	TOP CONC FLDWALL	IHNCEAST.dc

Station/ Name	Northing	Easting	Elevation	Description	Raw Data Reference
44+00 Pt26	536384.56	3695088.99	6.80	TOE CONC FLDWALL	IHNCEAST.dc
44+00 Pt27	536285.82	3695362.99	-2.80	ON ASPHALT	IHNCEAST.dc
44+00 Pt28	536385.92	3695086.56	6.34	FSC	IHNCEAST.dc
44+00 Pt29	536386.56	3695082.90	5.28	SLP	IHNCEAST.dc
44+00 Pt30	536389.94	3695075.35	3.01	FST	IHNCEAST.dc
44+00 Pt31	536393.08	3695065.91	2.81	NG	IHNCEAST.dc
44+00 Pt32	536396.09	3695058.76	2.60	TOE	IHNCEAST.dc
44+00 Pt33	536398.09	3695055.03	3.06	TOP	IHNCEAST.dc
44+00 Pt34	536400.58	3695045.72	3.38	TBK	IHNCEAST.dc
44+00 Pt35	536402.38	3695039.41	1.36	EDGE RIP RAP	IHNCEAST.dc
44+00 Pt36	536404.59	3695035.14	1.97	ON RIP RAP	IHNCEAST.dc
44+00 Pt37	536405.06	3695030.21	-0.57	WES	IHNCEAST.dc
44+00 Pt38	536297.66	3695328.47	-3.10	E ROAD	IHNCEAST.dc
44+00 Pt39	536297.91	3695328.17	-3.04	TOE OF CURB	IHNCEAST.dc
44+00 Pt40	536298.27	3695328.33	-2.72	TOE OF CURB	IHNCEAST.dc
44+00 Pt41	536300.01	3695322.96	-2.74	TOE OF CURB	IHNCEAST.dc
44+00 Pt42	536300.64	3695322.29	-2.49	NG	IHNCEAST.dc
44+00 Pt43	536311.01	3695294.05	-2.06	NG	IHNCEAST.dc
44+00 Pt44	536327.54	3695247.41	-1.95	NG	IHNCEAST.dc
44+50 Pt01	536359.05	3695013.64	-1.41	SND	Book# 060858
44+50 Pt02	536365.89	3694994.84	-7.61	SND	Book# 060858
44+50 Pt03	536372.73	3694976.05	-11.31	SND	Book# 060858
44+50 Pt04	536379.57	3694957.25	-17.11	SND	Book# 060858
44+50 Pt05	536386.41	3694938.46	-19.51	SND	Book# 060858
44+50 Pt06	536393.25	3694919.67	-21.61	SND	Book# 060858
44+50 Pt07	536400.09	3694900.87	-24.41	SND	Book# 060858
44+50 Pt08	536406.93	3694882.08	-26.41	SND	Book# 060858
44+50 Pt09	536413.77	3694863.28	-27.81	SND	Book# 060858
44+50 Pt10	536420.61	3694844.49	-30.21	SND	Book# 060858
44+50 Pt11	536427.45	3694825.70	-33.11	SND	Book# 060858
44+50 Pt12	536434.29	3694806.90	-35.61	SND	Book# 060858
44+50 Pt13	536434.29	3694806.90	-35.61	CL	Book# 060858
44+50 Pt14	536359.82	3695014.89	-0.67	WES	IHNCEAST.dc
44+50 Pt15	536339.39	3695066.75	6.67	FSC	IHNCEAST.dc
44+50 Pt16	536338.27	3695068.71	6.91	TOE CONC FLDWALL	IHNCEAST.dc
44+50 Pt17	536338.05	3695069.01	13.32	TOP CONC FLDWALL	IHNCEAST.dc
44+50 Pt18	536337.93	3695069.34	13.30	TOP CONC FLDWALL	IHNCEAST.dc
44+50 Pt19	536338.25	3695071.23	7.56	TOE CONC FLDWALL	IHNCEAST.dc
44+50 Pt20	536336.73	3695076.09	7.23	LSC	IHNCEAST.dc
44+50 Pt21	536333.22	3695082.70	5.45	SLP	IHNCEAST.dc
44+50 Pt22	536329.27	3695094.82	1.11	SLP	IHNCEAST.dc
44+50 Pt23	536328.62	3695102.11	-0.54	TOE	IHNCEAST.dc
44+50 Pt24	536320.06	3695119.20	-2.23	NG	IHNCEAST.dc
44+50 Pt25	536358.78	3695015.11	0.45	ON RIP RAP	IHNCEAST.dc
44+50 Pt26	536311.20	3695148.26	-2.36	NG	IHNCEAST.dc
44+50 Pt27	536297.15	3695183.94	-2.79	NG	IHNCEAST.dc
44+50 Pt28	536282.05	3695227.17	-2.34	E CONC DRIVEWAY	IHNCEAST.dc
44+50 Pt29	536278.56	3695235.61	-2.31	E CONC DRIVEWAY	IHNCEAST.dc
44+50 Pt30	536278.34	3695236.31	-2.54	E CONC DRIVEWAY	IHNCEAST.dc
44+50 Pt31	536273.27	3695249.27	-2.39	FL	IHNCEAST.dc
44+50 Pt32	536268.34	3695262.80	-2.76	FL	IHNCEAST.dc

Station/ Name	Northing	Easting	Elevation	Description	Raw Data Reference
44+50 Pt33	536262.27	3695276.60	-2.98	NG	IHNCEAST.dc
44+50 Pt34	536253.32	3695295.21	-6.83	FL	IHNCEAST.dc
44+50 Pt35	536357.26	3695020.60	0.64	EDGE RIP RAP	IHNCEAST.dc
44+50 Pt36	536355.52	3695023.08	0.89	TOE	IHNCEAST.dc
44+50 Pt37	536352.42	3695036.13	3.45	TOP	IHNCEAST.dc
44+50 Pt38	536351.38	3695038.94	3.55	TOP	IHNCEAST.dc
44+50 Pt39	536349.52	3695042.73	2.88	TOE	IHNCEAST.dc
44+50 Pt40	536343.70	3695054.27	3.07	FST	IHNCEAST.dc
44+50 Pt41	536341.28	3695062.35	5.48	SLP	IHNCEAST.dc

Appendix 21

Bridge/Floodwall Ties

Horizontal Datum: NAD 1983(1992)

Horizontal Coordinate System: U.S. State Plane, 1983, Zone: Louisiana South 1702

Vertical Datum: NAVD88(2004.65)

Coordinate Units: US survey feet

Distance Units: U.S. survey feet

Height Units: U.S. survey feet

17th Street Canal at Veterans Blvd.				
Name	Northing	Easting	Elevation	Code
17TH3A1	547581.05	3663968.33	4.96	TOE FLDGATE
17TH3A10	547607.94	3663747.27	12.36	TOP C/L CONC FLDWALL
17TH3A11	547607.73	3663747.32	12.53	TOP C/L CONC FLDWALL
17TH3A12	547604.71	3663746.77	12.49	END CONC FLDWALL
17TH3A13	547596.69	3663745.82	12.53	END CONC FLDWALL
17TH3A14	547593.69	3663745.62	12.52	TOP C/L CONC FLDWALL
17TH3A15	547586.33	3663744.00	13.08	TOP C/L CONC FLDWALL
17TH3A16	547585.04	3663743.89	13.05	TOP C/L CONC FLDWALL
17TH3A17	547582.53	3663789.43	13.44	TOP C/L CONC FLDWALL
17TH3A18	547580.04	3663834.30	13.59	TOP C/L CONC FLDWALL
17TH3A19	547578.79	3663856.82	13.67	TOP C/L CONC FLDWALL
17TH3A2	547585.82	3663967.05	4.92	TOE FLDGATE
17TH3A20	547576.31	3663901.81	13.56	TOP C/L CONC FLDWALL
17TH3A21	547575.12	3663924.22	13.53	TOP C/L CONC FLDWALL
17TH3A22	547573.89	3663946.76	13.40	TOP C/L CONC FLDWALL
17TH3A23	547572.63	3663970.08	13.11	TOP C/L CONC FLDWALL
17TH3A24	547574.06	3663970.22	13.11	TOP C/L CONC FLDWALL
17TH3A25	547574.35	3663970.14	13.04	TOP C/L CONC FLDWALL
17TH3A26	547580.93	3663968.30	13.03	END CONC FLDWALL
17TH3A27	547585.78	3663967.03	12.98	END CONC FLDWALL
17TH3A28	547591.83	3663965.29	12.99	TOP C/L CONC FLDWALL
17TH3A29	547598.00	3663965.68	12.52	TOP C/L CONC FLDWALL
17TH3A3	547432.61	3663959.00	6.02	TOE FLDGATE
17TH3A30	547598.28	3663965.78	12.19	TOP C/L CONC FLDWALL
17TH3A31	547628.76	3663967.91	12.32	TOP C/L CONC FLDWALL
17TH3A32	547388.13	3663954.39	12.80	TOP C/L CONC FLDWALL
17TH3A33	547418.65	3663956.31	12.82	TOP C/L CONC FLDWALL
17TH3A34	547418.89	3663956.26	13.01	TOP C/L CONC FLDWALL
17TH3A35	547427.91	3663957.04	12.99	TOP C/L CONC FLDWALL

17TH3A36	547432.42	3663959.02	13.06	END CONC FLDWALL
17TH3A37	547437.11	3663961.00	13.07	END CONC FLDWALL
17TH3A38	547441.78	3663962.64	13.10	TOP C/L CONC FLDWALL
17TH3A39	547442.09	3663962.85	13.12	TOP C/L CONC FLDWALL
17TH3A4	547436.83	3663960.84	6.05	TOE FLDGATE
17TH3A40	547443.38	3663963.12	13.14	TOP C/L CONC FLDWALL
17TH3A41	547446.00	3663917.00	13.46	TOP C/L CONC FLDWALL
17TH3A42	547448.46	3663872.57	13.63	TOP C/L CONC FLDWALL
17TH3A43	547450.95	3663827.49	13.65	TOP C/L CONC FLDWALL
17TH3A44	547452.22	3663804.75	13.64	TOP C/L CONC FLDWALL
17TH3A45	547454.64	3663759.89	13.27	TOP C/L CONC FLDWALL
17TH3A46	547455.95	3663736.82	13.04	TOP C/L CONC FLDWALL
17TH3A47	547454.61	3663736.75	13.01	TOP C/L CONC FLDWALL
17TH3A48	547454.36	3663736.67	12.96	TOP C/L CONC FLDWALL
17TH3A49	547451.16	3663736.75	12.97	END CONC FLDWALL
17TH3A5	547443.13	3663736.82	6.48	TOE FLDGATE
17TH3A50	547443.01	3663736.78	12.99	END CONC FLDWALL
17TH3A51	547441.73	3663736.85	12.99	TOP C/L CONC FLDWALL
17TH3A52	547441.60	3663736.96	12.83	TOP C/L CONC FLDWALL
17TH3A53	547413.15	3663737.10	12.83	TOP C/L CONC FLDWALL
17TH3A54	547382.25	3663737.32	12.86	TOP C/L CONC FLDWALL
17TH3A55	547350.90	3663736.47	12.85	TOP C/L CONC FLDWALL
17TH3A6	547450.80	3663736.58	6.45	TOE FLDGATE
17TH3A7	547604.58	3663746.68	6.01	TOE FLDGATE
17TH3A8	547596.73	3663746.00	6.09	TOE FLDGATE
17TH3A9	547638.86	3663751.79	12.35	TOP C/L CONC FLDWALL

17th Street Canal at Hammond Hwy.				
Name	Northing	Easting	Elevation	Code
17THA1	554649.72	3664445.06	12.10	TOP C/L CONC FLDWALL
17THA10	554723.08	3664404.22	14.18	TOP C/L CONC FLDWALL
17THA11	554725.67	3664384.31	14.33	TOP C/L CONC FLDWALL
17THA12	554731.13	3664345.37	14.43	TOP C/L CONC FLDWALL
17THA13	554736.20	3664306.46	13.97	TOP C/L CONC FLDWALL
17THA14	554741.63	3664267.53	13.10	TOP C/L CONC FLDWALL
17THA15	554744.37	3664248.55	12.36	TOP C/L CONC FLDWALL
17THA16	554744.41	3664247.55	12.37	TOP C/L CONC FLDWALL
17THA17	554742.71	3664247.50	12.33	TOP C/L CONC FLDWALL
17THA18	554742.40	3664247.49	12.31	TOP C/L CONC FLDWALL
17THA19	554737.36	3664247.25	12.33	TOP C/L CONC FLDWALL
17THA2	554679.59	3664446.77	11.92	TOP C/L CONC FLDWALL
17THA20	554729.46	3664236.36	12.31	TOP C/L CONC FLDWALL
17THA21	554699.23	3664235.16	12.34	TOP C/L CONC FLDWALL
17THA22	554668.80	3664234.00	12.39	TOP C/L CONC FLDWALL
17THA23	554922.34	3664221.65	12.30	TOP C/L CONC FLDWALL
17THA24	554890.32	3664216.02	12.24	TOP C/L CONC FLDWALL
17THA25	554890.70	3664212.19	12.26	TOP C/L CONC FLDWALL
17THA26	554866.60	3664207.70	12.21	TOP C/L CONC FLDWALL
17THA27	554866.31	3664207.90	12.17	TOP C/L CONC FLDWALL
17THA28	554860.87	3664207.04	12.16	TOP C/L CONC FLDWALL

17THA29	554860.04	3664211.54	12.19	TOP C/L CONC FLDWALL
17THA3	554684.98	3664447.07	11.89	TOP C/L CONC FLDWALL
17THA30	554859.87	3664211.96	12.93	TOP C/L CONC FLDWALL
17THA31	554859.58	3664213.70	12.96	END CONC FLDWALL
17THA32	554856.01	3664237.65	12.95	END CONC FLDWALL
17THA33	554855.57	3664239.44	12.93	TOP C/L CONC FLDWALL
17THA34	554855.67	3664239.92	12.19	TOP C/L CONC FLDWALL
17THA35	554854.72	3664246.14	12.12	TOP C/L CONC FLDWALL
17THA36	554854.09	3664249.47	12.16	TOP C/L CONC FLDWALL
17THA37	554828.27	3664258.70	12.17	TOP C/L CONC FLDWALL
17THA38	554825.24	3664258.35	12.12	TOP C/L CONC FLDWALL
17THA39	554825.01	3664258.21	12.21	TOP C/L CONC FLDWALL
17THA4	554713.11	3664442.71	13.68	TOP C/L CONC FLDWALL
17THA40	554823.81	3664258.12	12.22	TOP C/L CONC FLDWALL
17THA41	554823.43	3664259.31	12.19	TOP C/L CONC FLDWALL
17THA42	554818.41	3664297.44	13.33	TOP C/L CONC FLDWALL
17THA43	554813.05	3664336.92	14.27	TOP C/L CONC FLDWALL
17THA44	554810.35	3664356.52	14.28	TOP C/L CONC FLDWALL
17THA45	554805.19	3664395.21	14.36	TOP C/L CONC FLDWALL
17THA46	554799.64	3664434.48	13.84	TOP C/L CONC FLDWALL
17THA47	554797.19	3664452.70	13.35	TOP C/L CONC FLDWALL
17THA48	554797.05	3664453.82	13.37	TOP C/L CONC FLDWALL
17THA49	554798.32	3664454.10	13.36	TOP C/L CONC FLDWALL
17THA5	554715.73	3664442.85	13.20	TOP C/L CONC FLDWALL
17THA50	554798.56	3664454.16	13.07	TOP C/L CONC FLDWALL
17THA51	554798.73	3664453.23	13.08	TOP C/L CONC FLDWALL
17THA52	554804.23	3664454.48	13.05	TOP C/L CONC FLDWALL
17THA53	554822.02	3664459.99	12.62	TOP C/L CONC FLDWALL
17THA54	554850.77	3664469.37	12.23	TOP C/L CONC FLDWALL
17THA55	554850.99	3664469.76	12.26	TOP C/L CONC FLDWALL
17THA56	554851.03	3664471.11	12.29	TOP C/L CONC FLDWALL
17THA57	554854.47	3664471.97	12.29	TOP C/L CONC FLDWALL
17THA58	554884.55	3664474.19	12.34	TOP C/L CONC FLDWALL
17THA59	554856.01	3664237.55	7.66	TOE FLDGATE
17THA6	554715.65	3664443.41	13.21	TOP C/L CONC FLDWALL
17THA60	554859.54	3664213.89	7.69	TOE FLDGATE
17THA7	554715.91	3664443.50	13.44	TOP C/L CONC FLDWALL
17THA8	554717.52	3664443.57	13.45	TOP C/L CONC FLDWALL
17THA9	554717.65	3664442.55	13.44	TOP C/L CONC FLDWALL

London Ave. Canal at Gentilly Blvd.				
Name	Northing	Easting	Elevation	Code
LOND4A1	544960.38	3681240.02	12.80	TOP C/L CONC FLDWALL
LOND4A10	544974.91	3681347.43	12.47	TOP C/L CONC FLDWALL
LOND4A11	544975.17	3681347.49	12.68	TOP C/L CONC FLDWALL
LOND4A12	544976.05	3681347.29	12.88	TOP C/L CONC FLDWALL
LOND4A13	544986.66	3681338.52	12.85	TOP C/L CONC FLDWALL
LOND4A14	545018.06	3681335.96	12.77	TOP C/L CONC FLDWALL
LOND4A15	544790.95	3681355.19	14.20	TOP C/L CONC FLDWALL
LOND4A16	544791.03	3681355.09	13.57	TOP C/L CONC FLDWALL

LOND4A17	544823.05	3681352.44	12.77	TOP C/L CONC FLDWALL
LOND4A18	544862.72	3681356.84	12.88	TOP C/L CONC FLDWALL
LOND4A19	544862.95	3681356.66	12.44	TOP C/L CONC FLDWALL
LOND4A2	544930.77	3681242.29	12.87	TOP C/L CONC FLDWALL
LOND4A20	544868.25	3681356.27	12.42	TOP C/L CONC FLDWALL
LOND4A21	544847.60	3681327.06	12.41	TOP C/L CONC FLDWALL
LOND4A22	544821.86	3681291.00	12.46	TOP C/L CONC FLDWALL
LOND4A23	544800.96	3681261.52	12.44	TOP C/L CONC FLDWALL
LOND4A24	544790.44	3681246.65	12.51	TOP C/L CONC FLDWALL
LOND4A25	544786.14	3681246.77	12.49	TOP C/L CONC FLDWALL
LOND4A26	544785.90	3681246.88	13.02	TOP C/L CONC FLDWALL
LOND4A27	544774.29	3681252.02	13.04	TOP C/L CONC FLDWALL
LOND4A28	544774.10	3681252.06	12.80	TOP C/L CONC FLDWALL
LOND4A29	544764.50	3681256.22	12.82	TOP C/L CONC FLDWALL
LOND4A3	544927.86	3681242.25	12.81	TOP C/L CONC FLDWALL
LOND4A30	544762.11	3681256.33	12.80	TOP C/L CONC FLDWALL
LOND4A31	544761.87	3681256.36	12.94	TOP C/L CONC FLDWALL
LOND4A32	544735.08	3681258.50	12.92	TOP C/L CONC FLDWALL
LOND4A4	544899.48	3681237.68	12.74	TOP C/L CONC FLDWALL
LOND4A5	544899.13	3681237.78	12.42	TOP C/L CONC FLDWALL
LOND4A6	544893.31	3681238.27	12.40	TOP C/L CONC FLDWALL
LOND4A7	544914.01	3681267.26	12.38	TOP C/L CONC FLDWALL
LOND4A8	544944.69	3681310.53	12.38	TOP C/L CONC FLDWALL
LOND4A9	544971.36	3681347.83	12.32	TOP C/L CONC FLDWALL

London Ave. Canal at Mirabeau Ave.				
Name	Northing	Easting	Elevation	Code
LOND5A1	550552.11	3680754.05	12.62	TOP C/L CONC FLDWALL
LOND5A10	550496.16	3680784.98	13.24	TOP C/L CONC FLDWALL
LOND5A11	550500.94	3680844.71	13.26	TOP C/L CONC FLDWALL
LOND5A12	550504.03	3680884.53	13.32	TOP C/L CONC FLDWALL
LOND5A13	550504.08	3680885.93	13.36	TOP C/L CONC FLDWALL
LOND5A14	550505.16	3680885.82	13.38	TOP C/L CONC FLDWALL
LOND5A15	550505.50	3680885.83	13.02	TOP C/L CONC FLDWALL
LOND5A16	550520.02	3680884.31	13.00	END CONC FLDWALL
LOND5A17	550525.13	3680883.99	13.00	END CONC FLDWALL
LOND5A18	550544.85	3680882.37	13.04	TOP C/L CONC FLDWALL
LOND5A19	550524.99	3680883.91	4.35	TOE FLDGATE
LOND5A2	550518.98	3680756.95	12.63	END CONC FLDWALL
LOND5A20	550520.29	3680884.40	4.40	TOE FLDGATE
LOND5A21	550518.70	3680756.77	4.17	TOE FLDGATE
LOND5A22	550514.01	3680757.04	4.25	TOE FLDGATE
LOND5A23	550391.63	3680757.24	4.94	TOE FLDGATE
LOND5A24	550396.49	3680756.93	4.98	TOE FLDGATE
LOND5A25	550365.57	3680759.31	12.94	TOP C/L CONC FLDWALL
LOND5A26	550391.44	3680757.29	12.99	END CONC FLDWALL
LOND5A27	550396.59	3680756.94	12.95	END CONC FLDWALL
LOND5A28	550417.04	3680755.33	13.02	TOP C/L CONC FLDWALL
LOND5A29	550419.10	3680749.11	13.02	TOP C/L CONC FLDWALL
LOND5A3	550513.76	3680757.16	12.65	END CONC FLDWALL

LOND5A30	550422.06	3680748.81	13.07	TOP C/L CONC FLDWALL
LOND5A31	550422.45	3680748.84	13.45	TOP C/L CONC FLDWALL
LOND5A32	550423.41	3680748.75	13.39	TOP C/L CONC FLDWALL
LOND5A33	550423.80	3680750.65	13.34	TOP C/L CONC FLDWALL
LOND5A34	550423.59	3680751.35	13.39	TOP C/L CONC FLDWALL
LOND5A35	550426.75	3680790.93	13.36	TOP C/L CONC FLDWALL
LOND5A36	550431.48	3680850.39	13.33	TOP C/L CONC FLDWALL
LOND5A37	550434.74	3680890.16	13.35	TOP C/L CONC FLDWALL
LOND5A38	550434.76	3680891.29	13.33	TOP C/L CONC FLDWALL
LOND5A39	550433.40	3680891.50	13.32	TOP C/L CONC FLDWALL
LOND5A4	550510.19	3680757.03	12.66	TOP C/L CONC FLDWALL
LOND5A40	550433.03	3680891.51	12.76	TOP C/L CONC FLDWALL
LOND5A41	550430.62	3680891.76	12.77	TOP C/L CONC FLDWALL
LOND5A42	550425.66	3680887.28	12.80	TOP C/L CONC FLDWALL
LOND5A43	550409.17	3680888.32	12.79	END CONC FLDWALL
LOND5A44	550403.94	3680888.76	12.79	END CONC FLDWALL
LOND5A45	550370.32	3680891.47	12.94	TOP C/L CONC FLDWALL
LOND5A46	550404.19	3680888.73	4.96	TOE FLDGATE
LOND5A47	550408.93	3680888.43	4.98	TOE FLDGATE
LOND5A5	550503.91	3680743.20	12.77	TOP C/L CONC FLDWALL
LOND5A6	550494.69	3680743.00	12.67	TOP C/L CONC FLDWALL
LOND5A7	550494.20	3680743.17	13.34	TOP C/L CONC FLDWALL
LOND5A8	550492.59	3680743.29	13.35	TOP C/L CONC FLDWALL
LOND5A9	550492.87	3680745.54	13.35	TOP C/L CONC FLDWALL

London Ave. Canal at Filmore Ave.				
Name	Northing	Easting	Elevation	Code
LOND6A1	552090.97	3680621.06	13.00	TOP C/L CONC FLDWALL
LOND6A10	552035.64	3680687.20	13.24	TOP C/L CONC FLDWALL
LOND6A11	552041.69	3680763.08	13.25	TOP C/L CONC FLDWALL
LOND6A12	552041.74	3680764.18	13.22	TOP C/L CONC FLDWALL
LOND6A13	552043.23	3680764.13	13.27	TOP C/L CONC FLDWALL
LOND6A14	552043.44	3680764.17	12.83	TOP C/L CONC FLDWALL
LOND6A15	552045.67	3680764.14	12.86	TOP C/L CONC FLDWALL
LOND6A16	552050.90	3680757.15	12.87	TOP C/L CONC FLDWALL
LOND6A17	552058.99	3680756.42	12.87	END CONC FLDWALL
LOND6A18	552064.12	3680756.21	12.90	END CONC FLDWALL
LOND6A19	552090.64	3680754.39	12.98	TOP C/L CONC FLDWALL
LOND6A2	552056.05	3680624.27	12.91	END CONC FLDWALL
LOND6A20	552063.96	3680756.27	3.96	TOE FLDGATE
LOND6A21	552059.28	3680756.41	3.99	TOE FLDGATE
LOND6A22	552040.93	3680765.21	7.06	C C FWALL-WALKWAY
LOND6A23	552028.55	3680611.26	7.11	C C FWALL-WALKWAY
LOND6A24	552055.78	3680624.26	5.01	TOE FLDGATE
LOND6A25	552051.12	3680624.70	5.05	TOE FLDGATE
LOND6A26	551937.65	3680625.25	4.59	TOE FLDGATE
LOND6A27	551942.29	3680624.97	4.57	TOE FLDGATE
LOND6A28	551985.02	3680614.76	7.04	C C FWALL-WALKWAY
LOND6A29	551997.41	3680768.59	7.08	C C FWALL-WALKWAY
LOND6A3	552050.96	3680624.69	12.92	END CONC FLDWALL

LOND6A30	551953.57	3680766.01	4.46	TOE FLDGATE
LOND6A31	551948.90	3680766.42	4.44	TOE FLDGATE
LOND6A32	551931.00	3680767.91	12.84	TOP C/L CONC FLDWALL
LOND6A33	551948.61	3680766.34	12.86	END CONC FLDWALL
LOND6A34	551953.79	3680765.94	12.92	END CONC FLDWALL
LOND6A35	551962.71	3680765.22	12.92	TOP C/L CONC FLDWALL
LOND6A36	551963.23	3680765.06	13.72	TOP C/L CONC FLDWALL
LOND6A37	551964.94	3680765.08	13.83	P/L CROSSING
LOND6A38	551970.45	3680764.65	13.83	P/L CROSSING
LOND6A39	551972.14	3680764.30	13.84	TOP C/L CONC FLDWALL
LOND6A4	552047.45	3680624.88	12.85	TOP C/L CONC FLDWALL
LOND6A40	551972.67	3680764.37	13.00	TOP C/L CONC FLDWALL
LOND6A41	551986.93	3680763.17	12.96	TOP C/L CONC FLDWALL
LOND6A42	551993.11	3680768.25	12.98	TOP C/L CONC FLDWALL
LOND6A43	551994.76	3680768.13	12.89	TOP C/L CONC FLDWALL
LOND6A44	551994.99	3680767.86	13.32	TOP C/L CONC FLDWALL
LOND6A45	551996.33	3680767.69	13.32	TOP C/L CONC FLDWALL
LOND6A46	551990.07	3680690.26	13.27	TOP C/L CONC FLDWALL
LOND6A47	551984.34	3680616.99	13.24	TOP C/L CONC FLDWALL
LOND6A48	551984.01	3680615.75	13.23	TOP C/L CONC FLDWALL
LOND6A49	551982.72	3680615.85	13.24	TOP C/L CONC FLDWALL
LOND6A5	552032.13	3680611.65	12.90	TOP C/L CONC FLDWALL
LOND6A50	551982.57	3680615.80	12.95	TOP C/L CONC FLDWALL
LOND6A51	551980.85	3680615.93	13.04	TOP C/L CONC FLDWALL
LOND6A52	551974.72	3680622.92	13.02	TOP C/L CONC FLDWALL
LOND6A53	551962.21	3680623.53	13.03	TOP C/L CONC FLDWALL
LOND6A54	551961.71	3680623.65	13.77	TOP C/L CONC FLDWALL
LOND6A55	551959.86	3680623.70	13.73	P/L CROSSING
LOND6A56	551954.67	3680624.06	13.90	P/L CROSSING
LOND6A57	551952.89	3680624.14	13.76	TOP C/L CONC FLDWALL
LOND6A58	551952.43	3680624.19	12.97	TOP C/L CONC FLDWALL
LOND6A59	551942.62	3680625.01	12.86	END CONC FLDWALL
LOND6A6	552031.25	3680611.91	12.94	TOP C/L CONC FLDWALL
LOND6A60	551937.45	3680625.29	12.90	END CONC FLDWALL
LOND6A61	551934.27	3680625.40	12.93	TOP C/L CONC FLDWALL
LOND6A62	551929.76	3680635.07	13.01	TOP C/L CONC FLDWALL
LOND6A63	551898.64	3680638.00	12.98	TOP C/L CONC FLDWALL
LOND6A7	552031.02	3680612.00	13.28	TOP C/L CONC FLDWALL
LOND6A8	552029.63	3680612.15	13.36	TOP C/L CONC FLDWALL
LOND6A9	552029.65	3680613.42	13.31	TOP C/L CONC FLDWALL

London Ave. Canal at Robert E. Lee Blvd.				
Name	Northing	Easting	Elevation	Code
LOND7A1	555394.37	3680341.32	13.14	TOP C/L CONC FLDWALL
LOND7A10	555451.47	3680331.19	8.80	TOP GAURDRAIL-BRIDGE
LOND7A11	555446.05	3680330.76	8.84	FLOODGATE
LOND7A12	555451.65	3680330.40	8.81	FLOODGATE
LOND7A13	555452.00	3680330.42	6.31	FLOODGATE
LOND7A14	555455.64	3680330.13	6.36	FLOODGATE
LOND7A15	555455.95	3680330.22	5.58	FLOODGATE

LOND7A16	555483.79	3680328.02	5.57	FLOODGATE
LOND7A17	555484.19	3680327.89	6.32	FLOODGATE
LOND7A18	555485.97	3680327.75	6.32	FLOODGATE
LOND7A19	555486.02	3680327.77	8.82	FLOODGATE
LOND7A2	555425.63	3680339.34	13.13	TOP C/L CONC FLDWALL
LOND7A20	555491.93	3680327.17	8.78	FLOODGATE
LOND7A21	555434.51	3680495.49	9.98	END CONC FLDWALL
LOND7A22	555449.02	3680498.99	9.90	END CONC FLDWALL
LOND7A23	555449.84	3680498.10	9.95	END CONC FLDWALL
LOND7A24	555464.18	3680511.30	9.97	END CONC FLDWALL
LOND7A25	555460.56	3680512.82	7.98	FLOODGATE
LOND7A26	555466.35	3680512.44	7.93	FLOODGATE
LOND7A27	555466.71	3680512.42	5.50	FLOODGATE
LOND7A28	555470.33	3680512.17	5.48	FLOODGATE
LOND7A29	555470.47	3680511.99	4.79	FLOODGATE
LOND7A3	555425.98	3680341.27	13.10	TOP C/L CONC FLDWALL
LOND7A30	555498.39	3680510.00	4.79	FLOODGATE
LOND7A31	555498.67	3680510.01	5.49	FLOODGATE
LOND7A32	555500.38	3680509.63	5.48	FLOODGATE
LOND7A33	555500.45	3680509.59	7.96	FLOODGATE
LOND7A34	555506.18	3680509.13	7.96	FLOODGATE
LOND7A35	555503.93	3680508.58	7.96	END CONC FLDWALL
LOND7A36	555503.91	3680508.44	9.82	END CONC FLDWALL
LOND7A37	555503.52	3680504.89	9.85	TOP C/L CONC FLDWALL
LOND7A38	555511.51	3680504.22	9.83	TOP C/L CONC FLDWALL
LOND7A39	555512.80	3680516.88	9.88	TOP C/L CONC FLDWALL
LOND7A4	555428.83	3680341.36	13.08	TOP C/L CONC FLDWALL
LOND7A40	555528.72	3680515.71	9.78	TOP C/L CONC FLDWALL
LOND7A41	555529.18	3680516.22	13.01	TOP C/L CONC FLDWALL
LOND7A42	555535.80	3680515.72	13.00	TOP C/L CONC FLDWALL
LOND7A43	555571.28	3680512.73	12.97	TOP C/L CONC FLDWALL
LOND7A5	555429.12	3680341.28	9.94	TOP C/L CONC FLDWALL
LOND7A6	555436.78	3680340.85	9.97	TOP C/L CONC FLDWALL
LOND7A7	555436.94	3680341.97	9.95	TOP C/L CONC FLDWALL
LOND7A8	555440.53	3680341.41	9.95	TOP C/L CONC FLDWALL
LOND7A9	555450.65	3680331.54	9.81	END CONC FLDWALL

London Ave. Canal at Leon C. Simon Drive				
Name	Northing	Easting	Elevation	Code
LOND8A1	556362.19	3680531.22	12.90	END CONC FLDWALL
LOND8A10	556228.52	3680379.18	12.44	TOP C/L CONC FLDWALL
LOND8A11	556217.64	3680340.00	12.44	TOP C/L CONC FLDWALL
LOND8A12	556207.88	3680304.81	12.42	TOP C/L CONC FLDWALL
LOND8A13	556201.41	3680281.60	12.44	TOP C/L CONC FLDWALL
LOND8A14	556206.55	3680281.03	12.49	TOP C/L CONC FLDWALL
LOND8A15	556206.80	3680281.28	13.01	TOP C/L CONC FLDWALL
LOND8A16	556209.34	3680280.93	12.92	TOP C/L CONC FLDWALL
LOND8A17	556224.99	3680260.48	12.91	TOP C/L CONC FLDWALL
LOND8A18	556249.39	3680228.20	12.92	TOP C/L CONC FLDWALL
LOND8A19	556267.12	3680204.96	12.99	TOP C/L CONC FLDWALL

LOND8A2	556356.79	3680532.56	13.00	TOP C/L CONC FLDWALL
LOND8A20	556273.13	3680202.96	12.92	END CONC FLDWALL
LOND8A21	556071.04	3680272.91	12.98	TOP C/L CONC FLDWALL
LOND8A22	556090.82	3680290.48	12.94	TOP C/L CONC FLDWALL
LOND8A23	556114.98	3680288.87	12.91	TOP C/L CONC FLDWALL
LOND8A24	556115.23	3680288.67	12.40	TOP C/L CONC FLDWALL
LOND8A25	556120.31	3680288.08	12.38	TOP C/L CONC FLDWALL
LOND8A26	556129.36	3680320.72	12.38	TOP C/L CONC FLDWALL
LOND8A27	556149.49	3680392.87	12.40	TOP C/L CONC FLDWALL
LOND8A28	556162.91	3680441.00	12.38	TOP C/L CONC FLDWALL
LOND8A29	556169.97	3680466.62	12.41	TOP C/L CONC FLDWALL
LOND8A3	556319.58	3680504.13	12.90	TOP C/L CONC FLDWALL
LOND8A30	556165.87	3680466.96	12.46	TOP C/L CONC FLDWALL
LOND8A31	556165.55	3680466.89	12.92	TOP C/L CONC FLDWALL
LOND8A32	556162.39	3680466.89	12.91	TOP C/L CONC FLDWALL
LOND8A33	556159.84	3680466.77	12.90	END CONC FLDWALL
LOND8A34	556154.95	3680465.16	12.90	END CONC FLDWALL
LOND8A35	556152.41	3680464.19	12.91	TOP C/L CONC FLDWALL
LOND8A36	556111.21	3680467.75	12.92	TOP C/L CONC FLDWALL
LOND8A37	556155.23	3680465.31	5.01	TOP C/L CONC FLDWALL
LOND8A38	556159.60	3680466.69	4.98	TOP C/L CONC FLDWALL
LOND8A39	556171.17	3680467.45	6.42	C C FWALL-BRIDGEBED
LOND8A4	556287.63	3680479.60	12.91	TOP C/L CONC FLDWALL
LOND8A40	556121.00	3680287.20	6.81	C C FWALL-BRIDGEBED
LOND8A41	556200.30	3680280.86	6.93	C C FWALL-BRIDGEBED
LOND8A42	556250.44	3680460.82	6.49	C C FWALL-BRIDGEBED
LOND8A5	556261.04	3680459.19	12.87	TOP C/L CONC FLDWALL
LOND8A6	556256.00	3680459.45	12.91	TOP C/L CONC FLDWALL
LOND8A7	556255.64	3680459.46	12.39	TOP C/L CONC FLDWALL
LOND8A8	556251.11	3680460.02	12.47	TOP C/L CONC FLDWALL
LOND8A9	556240.90	3680423.59	12.45	TOP C/L CONC FLDWALL

Orleans Ave. Canal at Harrison Ave.				
Name	Northing	Easting	Elevation	Code
ORLEANS2A1	548957.47	3671091.30	13.59	TOP C/L CONC FLDWALL
ORLEANS2A10	549030.28	3671103.80	13.49	TOP C/L CONC FLDWALL
ORLEANS2A11	549026.87	3671140.82	13.46	TOP C/L CONC FLDWALL
ORLEANS2A12	549023.47	3671178.86	13.52	TOP C/L CONC FLDWALL
ORLEANS2A13	549020.07	3671215.97	13.49	TOP C/L CONC FLDWALL
ORLEANS2A14	549016.62	3671253.17	13.49	TOP C/L CONC FLDWALL
ORLEANS2A15	549016.59	3671255.41	13.41	TOP C/L CONC FLDWALL
ORLEANS2A16	549015.30	3671254.62	13.54	TOP C/L CONC FLDWALL
ORLEANS2A17	549015.04	3671254.59	13.95	TOP C/L CONC FLDWALL
ORLEANS2A18	549012.48	3671254.33	14.01	TOP C/L CONC FLDWALL
ORLEANS2A19	549005.20	3671259.99	14.03	END CONC FLDWALL
ORLEANS2A2	549002.89	3671095.47	13.63	TOP C/L CONC FLDWALL
ORLEANS2A20	549001.11	3671263.29	14.02	END CONC FLDWALL
ORLEANS2A21	548994.98	3671268.51	14.12	TOP C/L CONC FLDWALL
ORLEANS2A22	548991.51	3671268.21	14.07	TOP C/L CONC FLDWALL
ORLEANS2A23	548991.19	3671268.17	14.02	TOP C/L CONC FLDWALL

ORLEANS2A24	548962.22	3671265.37	13.96	TOP C/L CONC FLDWALL
ORLEANS2A25	549128.77	3671280.86	13.98	TOP C/L CONC FLDWALL
ORLEANS2A26	549087.63	3671276.94	14.01	TOP C/L CONC FLDWALL
ORLEANS2A27	549080.20	3671269.83	13.99	END CONC FLDWALL
ORLEANS2A28	549076.44	3671266.23	14.06	END CONC FLDWALL
ORLEANS2A29	549068.63	3671259.38	14.03	TOP C/L CONC FLDWALL
ORLEANS2A3	549004.27	3671095.28	13.64	TOP C/L CONC FLDWALL
ORLEANS2A30	549065.72	3671259.12	14.03	TOP C/L CONC FLDWALL
ORLEANS2A31	549065.42	3671259.13	13.51	TOP C/L CONC FLDWALL
ORLEANS2A32	549063.50	3671258.81	13.40	TOP C/L CONC FLDWALL
ORLEANS2A33	549064.00	3671257.85	13.50	TOP C/L CONC FLDWALL
ORLEANS2A34	549067.56	3671220.56	13.53	TOP C/L CONC FLDWALL
ORLEANS2A35	549070.85	3671183.16	13.57	TOP C/L CONC FLDWALL
ORLEANS2A36	549074.42	3671145.05	13.50	TOP C/L CONC FLDWALL
ORLEANS2A37	549077.82	3671108.27	13.48	TOP C/L CONC FLDWALL
ORLEANS2A38	549077.40	3671107.23	13.60	TOP C/L CONC FLDWALL
ORLEANS2A39	549079.31	3671107.10	13.54	TOP C/L CONC FLDWALL
ORLEANS2A4	549004.80	3671094.97	14.01	TOP C/L CONC FLDWALL
ORLEANS2A40	549079.61	3671107.12	14.08	TOP C/L CONC FLDWALL
ORLEANS2A41	549081.10	3671107.33	14.02	TOP C/L CONC FLDWALL
ORLEANS2A42	549099.76	3671103.68	14.01	TOP C/L CONC FLDWALL
ORLEANS2A43	549103.05	3671103.96	14.10	TOP C/L CONC FLDWALL
ORLEANS2A44	549103.71	3671104.71	13.22	TOP C/L CONC FLDWALL
ORLEANS2A45	549113.88	3671105.75	13.19	TOP C/L CONC FLDWALL
ORLEANS2A46	549139.80	3671108.04	13.24	TOP C/L CONC FLDWALL
ORLEANS2A47	549080.03	3671269.67	6.77	TOE FLDGATE
ORLEANS2A48	549076.54	3671266.35	6.70	TOE FLDGATE
ORLEANS2A49	549001.17	3671263.18	6.58	TOE FLDGATE
ORLEANS2A5	549007.66	3671095.18	14.07	TOP C/L CONC FLDWALL
ORLEANS2A50	549005.06	3671260.04	6.62	TOE FLDGATE
ORLEANS2A6	549026.56	3671102.15	13.99	TOP C/L CONC FLDWALL
ORLEANS2A7	549028.44	3671102.41	13.96	TOP C/L CONC FLDWALL
ORLEANS2A8	549028.74	3671102.56	13.39	TOP C/L CONC FLDWALL
ORLEANS2A9	549030.73	3671102.82	13.47	TOP C/L CONC FLDWALL
ORLEANS3A1	551861.15	3671526.17	13.60	TOP C/L CONC FLDWALL
ORLEANS3A10	551801.67	3671526.70	13.44	TOP C/L CONC FLDWALL
ORLEANS3A11	551805.61	3671483.50	13.05	TOP C/L CONC FLDWALL
ORLEANS3A12	551808.82	3671448.29	13.29	TOP C/L CONC FLDWALL
ORLEANS3A13	551811.58	3671417.45	13.27	TOP C/L CONC FLDWALL
ORLEANS3A14	551815.53	3671374.70	13.25	TOP C/L CONC FLDWALL
ORLEANS3A15	551817.55	3671352.97	13.35	TOP C/L CONC FLDWALL
ORLEANS3A16	551819.00	3671351.99	13.32	TOP C/L CONC FLDWALL
ORLEANS3A17	551819.42	3671352.00	13.88	TOP C/L CONC FLDWALL
ORLEANS3A18	551829.93	3671353.48	13.84	TOP C/L CONC FLDWALL
ORLEANS3A19	551830.60	3671353.01	13.36	TOP C/L CONC FLDWALL
ORLEANS3A2	551833.35	3671523.39	13.64	TOP C/L CONC FLDWALL
ORLEANS3A20	551831.66	3671354.28	12.61	TOP C/L CONC FLDWALL
ORLEANS3A21	551867.31	3671357.48	13.24	TOP C/L CONC FLDWALL
ORLEANS3A22	551893.43	3671359.95	12.99	TOP C/L CONC FLDWALL
ORLEANS3A23	551708.91	3671343.03	13.26	TOP C/L CONC FLDWALL
ORLEANS3A24	551743.27	3671346.29	13.28	TOP C/L CONC FLDWALL

ORLEANS3A25	551745.07	3671345.07	13.47	TOP C/L CONC FLDWALL
ORLEANS3A26	551745.53	3671345.68	13.78	TOP C/L CONC FLDWALL
ORLEANS3A27	551768.39	3671347.35	13.86	TOP C/L CONC FLDWALL
ORLEANS3A28	551768.65	3671347.50	13.41	TOP C/L CONC FLDWALL
ORLEANS3A29	551770.74	3671347.86	13.39	TOP C/L CONC FLDWALL
ORLEANS3A3	551821.14	3671522.02	13.66	TOP C/L CONC FLDWALL
ORLEANS3A30	551770.19	3671348.63	13.28	TOP C/L CONC FLDWALL
ORLEANS3A31	551768.21	3671369.89	13.30	TOP C/L CONC FLDWALL
ORLEANS3A32	551766.19	3671391.65	13.39	TOP C/L CONC FLDWALL
ORLEANS3A33	551762.10	3671435.59	13.36	TOP C/L CONC FLDWALL
ORLEANS3A34	551758.17	3671478.54	13.38	TOP C/L CONC FLDWALL
ORLEANS3A35	551754.28	3671521.91	13.45	TOP C/L CONC FLDWALL
ORLEANS3A36	551754.60	3671523.12	13.44	TOP C/L CONC FLDWALL
ORLEANS3A37	551752.57	3671523.17	13.45	TOP C/L CONC FLDWALL
ORLEANS3A38	551752.16	3671523.22	13.92	TOP C/L CONC FLDWALL
ORLEANS3A39	551747.74	3671523.05	13.99	TOP C/L CONC FLDWALL
ORLEANS3A4	551818.94	3671522.74	13.61	END CONC FLDWALL
ORLEANS3A40	551740.40	3671523.81	13.95	END CONC FLDWALL
ORLEANS3A41	551735.23	3671524.45	14.04	END CONC FLDWALL
ORLEANS3A42	551726.36	3671525.68	14.06	TOP C/L CONC FLDWALL
ORLEANS3A43	551722.82	3671525.28	14.03	TOP C/L CONC FLDWALL
ORLEANS3A44	551694.45	3671522.50	13.90	TOP C/L CONC FLDWALL
ORLEANS3A45	551665.82	3671519.92	13.95	TOP C/L CONC FLDWALL
ORLEANS3A46	551735.32	3671524.31	4.67	TOE FLDGATE
ORLEANS3A47	551740.22	3671523.82	4.65	TOE FLDGATE
ORLEANS3A48	551814.39	3671524.83	4.11	TOE FLDGATE
ORLEANS3A49	551818.91	3671522.87	4.20	TOE FLDGATE
ORLEANS3A5	551814.22	3671524.78	13.59	END CONC FLDWALL
ORLEANS3A50	551800.91	3671528.65	4.28	C C FWALL-BRIDGEBED
ORLEANS3A51	551817.25	3671350.91	5.43	C C FWALL-BRIDGEBED
ORLEANS3A52	551770.91	3671346.65	5.49	C C FWALL-BRIDGEBED
ORLEANS3A53	551754.73	3671524.36	4.31	C C FWALL-BRIDGEBED
ORLEANS3A54	551762.52	3671435.33	7.68	BASE FLDWALL-BRIDGEBED
ORLEANS3A55	551808.63	3671445.30	7.69	BASE FLDWALL-BRIDGEBED
ORLEANS3A6	551806.83	3671528.22	13.60	TOP C/L CONC FLDWALL
ORLEANS3A7	551806.49	3671528.10	13.56	TOP C/L CONC FLDWALL
ORLEANS3A8	551803.53	3671528.01	13.54	TOP C/L CONC FLDWALL
ORLEANS3A9	551803.25	3671527.87	13.42	TOP C/L CONC FLDWALL

Orleans Ave. Canal at Robert E. Lee Blvd.				
Name	Northing	Easting	Elevation	Code
ORLEANS4A1	554609.32	3671837.83	13.32	END CONC FLDWALL
ORLEANS4A10	554486.57	3671688.71	13.11	TOP C/L CONC FLDWALL
ORLEANS4A11	554489.82	3671633.22	13.17	TOP C/L CONC FLDWALL
ORLEANS4A12	554492.05	3671596.92	13.13	TOP C/L CONC FLDWALL
ORLEANS4A13	554492.76	3671597.03	13.13	TOP C/L CONC FLDWALL
ORLEANS4A14	554492.99	3671597.03	13.53	TOP C/L CONC FLDWALL
ORLEANS4A15	554495.48	3671597.15	13.54	TOP C/L CONC FLDWALL
ORLEANS4A16	554523.74	3671565.89	13.52	TOP C/L CONC FLDWALL
ORLEANS4A17	554584.12	3671572.39	13.43	TOP C/L CONC FLDWALL

ORLEANS4A18	554611.36	3671575.31	13.44	TOP C/L CONC FLDWALL
ORLEANS4A19	554658.06	3671548.08	13.44	TOP C/L CONC FLDWALL
ORLEANS4A2	554598.02	3671835.82	13.27	TOP C/L CONC FLDWALL
ORLEANS4A20	554669.50	3671548.11	13.45	END CONC FLDWALL
ORLEANS4A21	554312.50	3671750.39	13.61	TOP C/L CONC FLDWALL
ORLEANS4A22	554340.80	3671752.83	13.54	TOP C/L CONC FLDWALL
ORLEANS4A23	554369.03	3671755.41	13.55	TOP C/L CONC FLDWALL
ORLEANS4A24	554369.34	3671755.42	13.60	TOP C/L CONC FLDWALL
ORLEANS4A25	554374.79	3671756.00	13.61	TOP C/L CONC FLDWALL
ORLEANS4A26	554404.30	3671731.18	13.54	TOP C/L CONC FLDWALL
ORLEANS4A27	554407.41	3671730.71	13.46	TOP C/L CONC FLDWALL
ORLEANS4A28	554407.94	3671730.73	13.05	TOP C/L CONC FLDWALL
ORLEANS4A29	554408.45	3671730.25	13.15	TOP C/L CONC FLDWALL
ORLEANS4A3	554569.28	3671801.13	13.31	TOP C/L CONC FLDWALL
ORLEANS4A30	554409.74	3671707.03	13.08	TOP C/L CONC FLDWALL
ORLEANS4A31	554412.48	3671660.96	13.08	TOP C/L CONC FLDWALL
ORLEANS4A32	554415.19	3671615.69	13.07	TOP C/L CONC FLDWALL
ORLEANS4A33	554416.67	3671592.72	13.11	TOP C/L CONC FLDWALL
ORLEANS4A34	554416.13	3671592.05	13.14	TOP C/L CONC FLDWALL
ORLEANS4A35	554415.78	3671592.02	13.49	TOP C/L CONC FLDWALL
ORLEANS4A36	554394.40	3671587.30	13.40	TOP C/L CONC FLDWALL
ORLEANS4A37	554393.35	3671588.12	13.47	TOP C/L CONC FLDWALL
ORLEANS4A38	554360.69	3671585.36	13.28	TOP C/L CONC FLDWALL
ORLEANS4A39	554331.89	3671582.80	13.38	TOP C/L CONC FLDWALL
ORLEANS4A4	554546.65	3671773.77	13.45	TOP C/L CONC FLDWALL
ORLEANS4A40	554483.15	3671735.54	5.02	C C FWALL-WALKWAY
ORLEANS4A41	554491.49	3671595.95	4.92	C C FWALL-WALKWAY
ORLEANS4A42	554417.24	3671591.53	4.67	C C FWALL-WALKWAY
ORLEANS4A43	554409.02	3671731.34	5.07	C C FWALL-WALKWAY
ORLEANS4A5	554503.73	3671768.03	13.54	TOP C/L CONC FLDWALL
ORLEANS4A6	554487.45	3671734.85	13.52	TOP C/L CONC FLDWALL
ORLEANS4A7	554484.66	3671734.61	13.48	TOP C/L CONC FLDWALL
ORLEANS4A8	554484.45	3671734.57	13.06	TOP C/L CONC FLDWALL
ORLEANS4A9	554483.89	3671734.55	13.07	TOP C/L CONC FLDWALL

Appendix 22

Orleans Outfall Canal BM ALCO to CHRYSLER Level Run

Horizontal Datum: NAD 1983(1992)

Horizontal Coordinate System: U.S. State Plane, 1983, Zone: Louisiana South 1702

Vertical Datum: NAVD88(2004.65)

Coordinate Units: US survey feet

Distance Units: U.S. survey feet

Height Units: U.S. survey feet

See field book for observations.

Location	Elevation	Field Book Reference	
		Book	Page
Buick 1931	5.52	060854	36
Chrysler 1931	6.30	060854	36
Chrysler RM 1	6.38	060854	36

Appendix 23

Permanent and Temporary Control Used and Established for IPET Surveys

Horizontal Datum: NAD 1983(1992)
 Horizontal Coordinate System: U.S. State Plane, 1983, Zone: Louisiana South 1702
 Vertical Datum: NAVD88(2004.65)
 Coordinate Units: US survey feet
 Distance Units: U.S. survey feet
 Height Units: U.S. survey feet

Name	Northing	Easting	Elev	CODE	LOCATION
1703	547504.26	3664050.38	8.19	TBM	17TH STREET CANAL/VETERENS
5544	553678.12	3688613.59	-7.05	TBM	OP 5544 ST FERDINAN ST
6422	557007.07	3687727.80	-6.04	TBM	OP EAST SIDE PEOPLES ROAD
A 148	543696.12	3675283.43	5.81	NGS	OP NGS BENCH MARK
AG 06	599773.17	3745246.69	3.62	TBM	LITTLE IRISH BAYOU GAGE
AMES	494821.62	3666213.66	5.27	TBM	AMES PUMP STATION
AP 01	560498.73	3694700.04	0.82	TBM	LAKE FRONT AIRPORT
BARR	495348.68	3696427.26	-3.64	TBM	WHITNEY/BARATARIA PUMP STA.
BEL1	494282.41	3697937.75	-3.42	TBM	TBM-BELLE CHASSE 1 PUMP STA.
BEL2	506086.46	3703657.17	-2.47	TBM	TBM-BELLE CHASSE 2 PUMP STA.
BLOUNT	543352.65	3681458.36	-1.35	TBM	OP PUMP STATION 03
BRAI	493734.13	3732366.65	9.32	TBM	BRAITWAITE PUMP STATION
BYD 7	528943.38	3727697.07	-1.68	TBM	BAYOU DUCLOS PUMP STATION 7
DWYE	554365.02	3694988.80	-5.03	TBM	OP DWYER PUMP STATION
ELAI	548634.83	3705210.11	-0.54	TBM	ELAINE STREET
EMPI	329253.44	3831795.97	0.0	NGS	EMPIRE AZ MK 2
ESSE	557818.36	3674727.63	5.85	NGS	ESSEX- NGS
ESTE	487476.27	3681808.09	-2.31	TBM	ESTELLE PUMP STATION 2
G 275	651873.89	3574804.17	5.22	NGS	NGS BENCH MARK
GAIN	349610.07	3816909.58	-2.87	TBM	GAINARD WOODS PUMP STATION
GPS 1	653871.78	3595812.81	2.84	TBM	GPS POINT/MANCHAC PASS GAGE
GRAHAM RM	559308.98	3678375.72	6.28	NGS	See PID:BJ1359
GRAL	305324.97	3870979.71	2.46	TBM	GRAND LIARD
GRAN	550046.61	3718973.00	1.59	TBM	OP GRANT ST PUMP STATION
HARV	505250.23	3679105.33	-3.90	TBM	HARVEY PUMP STATION
HERO	488396.56	3685856.76	-3.56	TBM	HERO PUMP STATION
I010	544442.12	3665897.65	-5.21	TBM	TBM-1=I-10 PUMP STATION

Name	Northing	Easting	Elev	CODE	LOCATION
JEA 6	535492.45	3711065.99	0.27	TBM	JEAN LAFITTE PUMP STATION 6
JP 01	553956.53	3656765.31	-3.48	TBM	JP PUMP STATION 01
JP 02	554576.92	3645813.33	-2.85	TBM	JP PUMP STATION 02
JP 03	558518.67	3633625.18	-5.40	TBM	JP PUMP STATION 03
JP 04	560557.95	3624734.09	-4.16	TBM	JP PUMP STATION 04
KENN	537505.91	3614304.61	23.99	NGS	MONUMENT
L 278	503313.63	3736367.05	6.92	NGS	SBP NGS BENCH MARK
LC 05	550482.16	3681081.87	-1.22	TBM	OP LONDON CANAL
MER 4	519711.61	3737821.12	11.59	TBM	MERAUX PUMP STATION 4
MILA	355913.07	3806431.37	-0.5	NGS	MILAN 2
MONT	536942.30	3663012.89	-5.35	TBM	OP MONTICELLO PS
N 367	314850.55	3878540.66	1.12	NGS	N 367
OLLI	453118.01	3696982.75	0.52	TBM	TBM-OLLIE 2 PUMP STATION
OP 01	529999.79	3671912.07	-1.95	TBM	OP PUMP STATION 01
OP 02	535980.32	3676083.47	-2.40	TBM	OP PUMP STATION 02
OP 04	553616.66	3680819.59	-5.29	TBM	OP PUMP STATION 04
OP 06	542568.72	3663311.24	-0.29	TBM	OP PUMP STATION 06
OP 07	545522.72	3671153.35	0.29	TBM	OP PUMP STATION 07
OP 10	564890.96	3706240.72	-3.16	TBM	OP PUMP STATION 10
OP 11	515417.06	3710535.96	-1.93	TBM	OP PUMP STATION 11
OP 13	510301.98	3704016.56	-5.62	TBM	OP PUMP STATION 13
OP 14	569381.39	3713316.09	-2.89	TBM	OP PUMP STATION 14
OP 15	559459.74	3744289.03	-1.70	TBM	OP PUMP STATION 15
OP 16	561058.98	3699352.98	-3.60	TBM	OP PUMP STATION 16
OP 17	542897.98	3688637.67	-2.15	TBM	OP PUMP STATION 17
OP 18	563738.50	3732410.12	4.82	TBM	OP PUMP STATION 18
ORL 2	549012.44	3671275.40	5.89	TBM	ORLEANS CANAL
ORL 3	551747.14	3671584.19	1.10	TBM	ORLEANS CANAL
PLPS	551154.68	3614550.46	-6.16	TBM	PARISH LINE PUMP STATION
PAT 5	595878.07	3744218.43	2.27	TBM	LIDAR PATCH 5
PLAN	505869.20	3701618.78	-2.47	TBM	PLANTERS PUMP STATION
PUMP	540387.85	3696535.34	14.02	NGS	OP NGS STATION MARK
S 188	535086.13	3630421.60	7.71	NGS	JP NGS BENCH MARK
SEGN	510470.50	3653146.24	-1.72	TBM	BAYOU SEGNETTE STATE PARK
STMY	495846.54	3768426.83	6.82	TBM	ST MARY PUMP STATION 8
U 149	554506.18	3671789.17	6.20	NGS	ORLEANS CANAL
WES 2	507612.04	3653910.45	-4.38	TBM	WESTWEGO PUMP STATION 2
WEST	501577.73	3659769.64	-2.23	TBM	WESTMINSTER PUMP STATION
1327	536441.07	3691169.56	-0.13	TBM	near 1327 Independence St., New Orleans
2133	539506.93	3692472.56	-4.00	TBM	near int. of Alvar and N. Miro St., New Orleans
2320	540667.06	3685780.83	-3.64	TBM	near 2320 N. Tonti St., New Orleans
2474	539003.67	3686987.66	-2.54	TBM	near 2474 N. Roman St., New Orleans
3144	540187.55	3690705.56	-4.79	TBM	near 3144 Byrne Pl., New Orleans
3200	544407.07	3690541.04	-4.94	TBM	near int. of Benefit and Montegut St., New Orleans
3422	544827.19	3692077.46	-4.75	TBM	near 3422 Pleasure St., New Orleans
5701	553749.62	3682797.48	-4.96	TBM	near 5701 Pasteur Blvd., New Orleans
WE19	550746.22	3722193.44	-0.4	NGS	near Michoud Substation
110	281892.45	3909390.06	3.70	TBM	LA 110
112	288195.59	3910727.93	-2.48	TBM	LA 111/LA112
113	304703.00	3898424.59	-2.70	TBM	LA 113

Name	Northing	Easting	Elev	CODE	LOCATION
114	309237.01	3894462.66	-0.31	TBM	LA 114
115	310042.37	3866251.62	-1.75	TBM	LA 115
117	314910.14	3856557.71	0.54	TBM	LA 116/ LA117
118	316908.66	3854106.17	1.01	TBM	LA 118
119	320026.34	3842675.72	-1.24	TBM	LA 119
121	349013.64	3823503.41	2.32	TBM	LA 121
1494 C	393095.68	3767088.95	1.86	TBM	WEST POINT A-LA-HACHE GAGE SITE
1602 C	388177.25	3741375.04	0.61	TBM	LAKE JUDGE PEREZ
1799 B	364683.61	3696818.11	2.66	TBM	MV PETROLEUM SITE
DUVI	301331.82	3900803.99	1.55	TBM	DUVIC VENICE PUMP STATION
SUNR	318226.17	3843740.73	-0.61	TBM	SUNRISE 1 & 2 PUMP STATIONS

Appendix 24

Pump Stations Surveyed, Listed by Parish

Jefferson Parish (details found in Appendix 25)

Ames
Bayou Segnette
Bonnabel - JP#1
Cousins #1
Cousins #2
Duncan Canal - JP#4
Elmwood Canal - JP#3
Estelle #2
Harvey
Hero
Parish Line
Planters
Suburban - JP#2
Westminster
Westwego #2
Whitney/Barataria

Orleans Parish (details found in Appendix 26)

Dwyer Rd. *Note: No elevations collected; this site under construction.*
Elaine St.
Grant St.
I-10
Monticello (Upper Protection)
OP#01
OP#02
OP#03
OP#04
OP#05
OP#06
OP#07
OP#10 (Citrus)
OP#11
OP#12

OP#13
OP#14 (Jahncke)
OP#15
OP#16 (St. Charles)
OP#17 (Station D)
OP#18 (Maxent)
OP#19
OP#20 (Amid)
Pritchard

Plaquemines Parish (details found in Appendix 27)

Barreire
Belair
Belle Chasse #1
Belle Chasse #2
Bellevue
Braithwaite
Diamond
Duvic (Venice)
Gainard Woods
Grand Liard (Buras)
Hayes
Ollie #2
Ollie – Lower
Ollie -- Upper
Pointe A La Hache-East bank
Pointe A La Hache-West bank
Pointe Celeste #1
Pointe Celeste #2
Pointe Celeste (Private)
Scarsdale
Sunrise #1
Sunrise #2
Wilkinson (Private)

St. Bernard Parish (details found in Appendix 28)

Bayou Ducros #7
Bayou Villere #3
E.J. Gore #5
Fortification #1
Guichard #2
Jean Lafitte #6
Meraux #4
St. Mary #8

St. Charles Parish (details found in Appendix 29)

New Sarpy

Ormond I (Destrehan 1)

Ormond II (Destrehan 2)

Schexnaydre

Trepagnier

Appendix 25

Jefferson Parish Pump Stations

AMES Pump Station



TBM: AMES



TBM: AMES



Ames Pump Station



Finished Floor = -7.06 feet NGVD88(2004.65) Field Book 060852

BAYOU SEGNETTE Pump Station



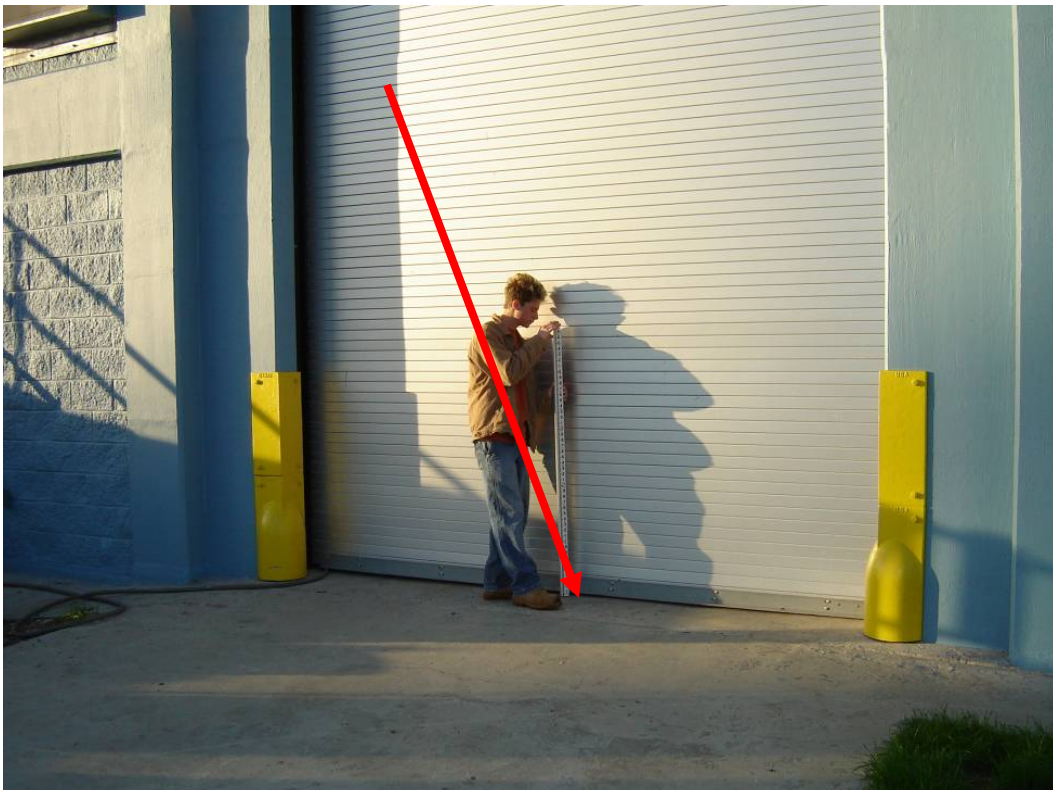
TBM: SEGN



TBM: SEGN



Finished Floor Bldg #1 = 2.99 Feet NAVD88(2004.65) Field Book 060852





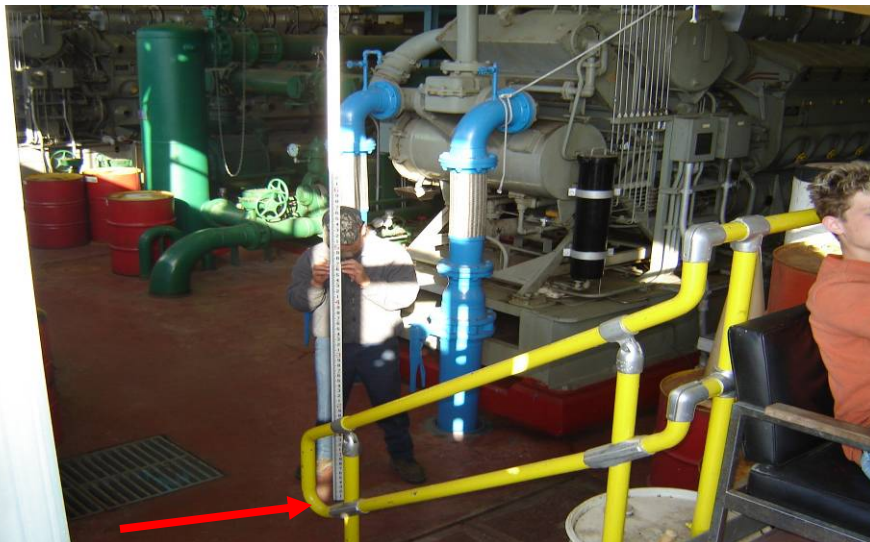
Finished Floor Bldg. #2 = 6.02 feet NAVD88(2004.65) Field Book 060852



Bonnabel Pump Station – JP 01



Pump Station JP-01



Finished Floor #1 = 2.87 feet NAVD88(2004.65) Field Book 060852 Page 41



Finished Floor #2 = 3.00 ft NAVD88(2004.65) Field Book 060852 Page 41

COUSINS #1 Pump Station



Cousins #1 Pump Station

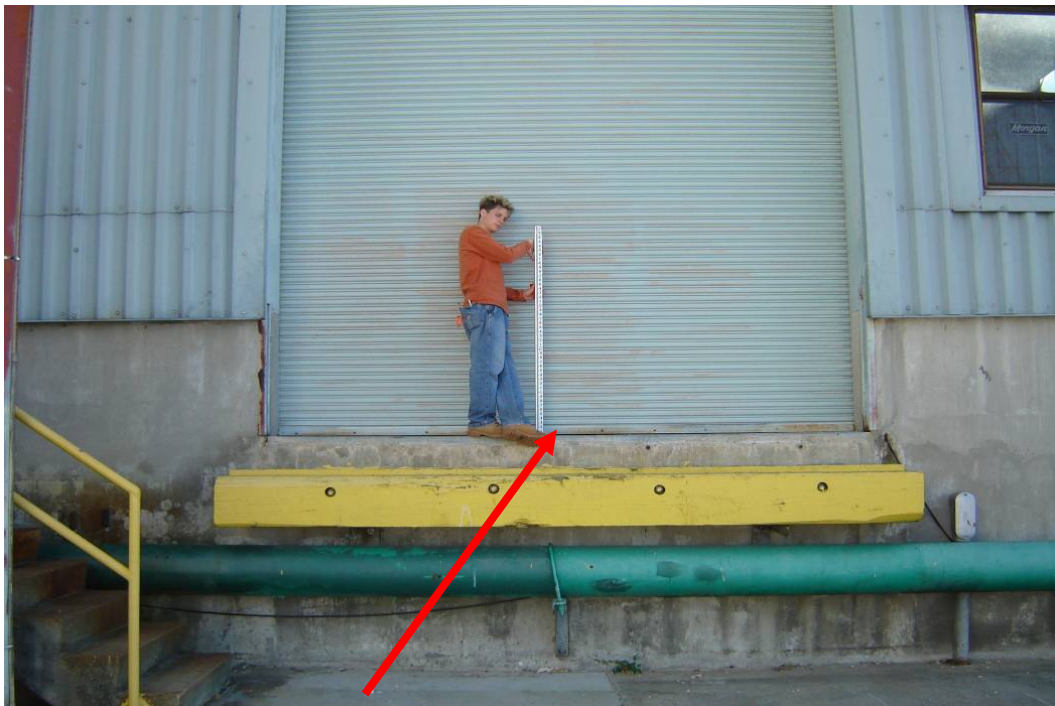


Finished Floor = 2.92 feet NGVD88(2004.65) Field Book 060852

COUSINS #2 Pump Station



Cousins #2 Pump Station



Finished Floor = 2.21 feet NAVD88(2004.65) Field Book 060852

Duncan Canal Pump Station --- JP-04



Pump Station JP-04



Finished Floor #1 = 6.20 ft, NAVD 88(2004.65) Bk.060852, Pg. 44



Finished Floor #2 = 2.72 ft, NAVD 88 (2004.65) Bk.060852, Pg. 44

Elmwood Canal Pump Station JP-03



Elmwood Canal Pump Station JP-03



Finished Floor #1 = 5.87 ft, NAVD88(2004.65) Bk.060852, Pg. 43



Finished Floor #2 = 4.75 ft, NAVD88(2004.65) Bk.060852, Pg. 43

ESTELLE #2 Pump Station



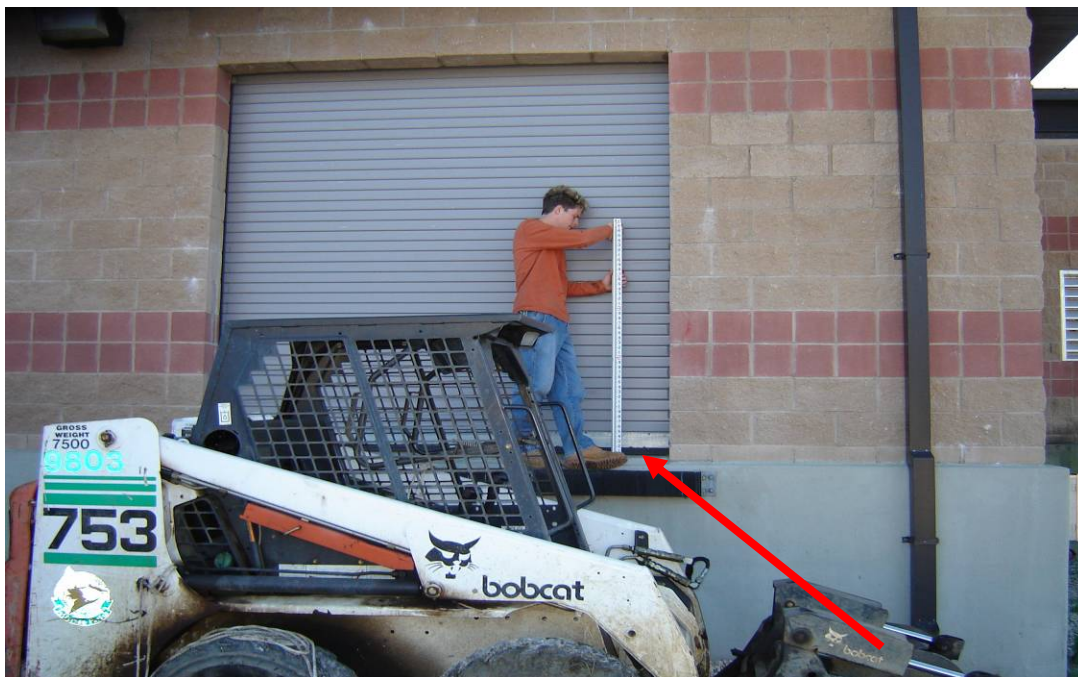
TBM: ESTE



TBM: ESTE



Estelle #2 Pump Station



Finished Floor = 2.87 feet NAVD88(2004.65) Field Book 060852

HARVEY Pump Station



Harvey Pump Station



Finished Floor = 3.15 feet NAVD88(2004.65) Field Book 060852

HERO Pump Station



TBM: HERO



TBM: HERO



Finished Floor #1 = 0.18 feet NAVD88(2004.65) Field Book 060852





Finished Floor #2 = 0.13 feet NAVD88(2004.65) Field Book 060852



Parish Line Pump Station



Parish Line Pump Station



Finished Floor #1 = 9.61 ft, NAVD88(2004.65) Bk.060852, Pg. 45



Finished Floor #2 = -5.38 ft, NAVD88(2004.65) Bk.060852, Pg. 45

PLANTERS Pump Station



TBM: PLAN



TBM: PLAN



Finished Floor = 2.78 feet NAVD88 (2004.65) Field Book 060852



Suburban Pump Station JP-02



Pump Station JP-02



Finished Floor #1 = 3.90 ft, NAVD88(2004.65) Bk.060852, Pg. 42



Finished Floor #2 = 5.96 ft, NAVD88(2004.65) Bk.060852, Pg. 42

Westminister Pump Station



Westminister Pump Station



Finish Floor = 5.69 feet NAVD88(2004.65) Book # 060852

WESTWEGO #2 Pump Station



TBM: WES2



TBM: WES2



Westwego #2 Pump Station



Finished Floor = -4.26 feet NAVD88(2004.65) Field Book 060852

Whitney\Barataria Pump Station



Whitney-Barataria Pump Station



Finished Floor = -2.20 feet NAVD88(2004.65) Book # 060852

Appendix 26

Orleans Parish Pump Stations

Elaine Street Pump Station



Elaine #1 = 1.82 feet NAVD88(2004.65) Field Book 060851

Grant Street Pump Station



TBM: GRAN



Finished Floor = 5.68 feet NAVD88(2004.65) Field Book 060851 Page 47

I -10 Pump Station



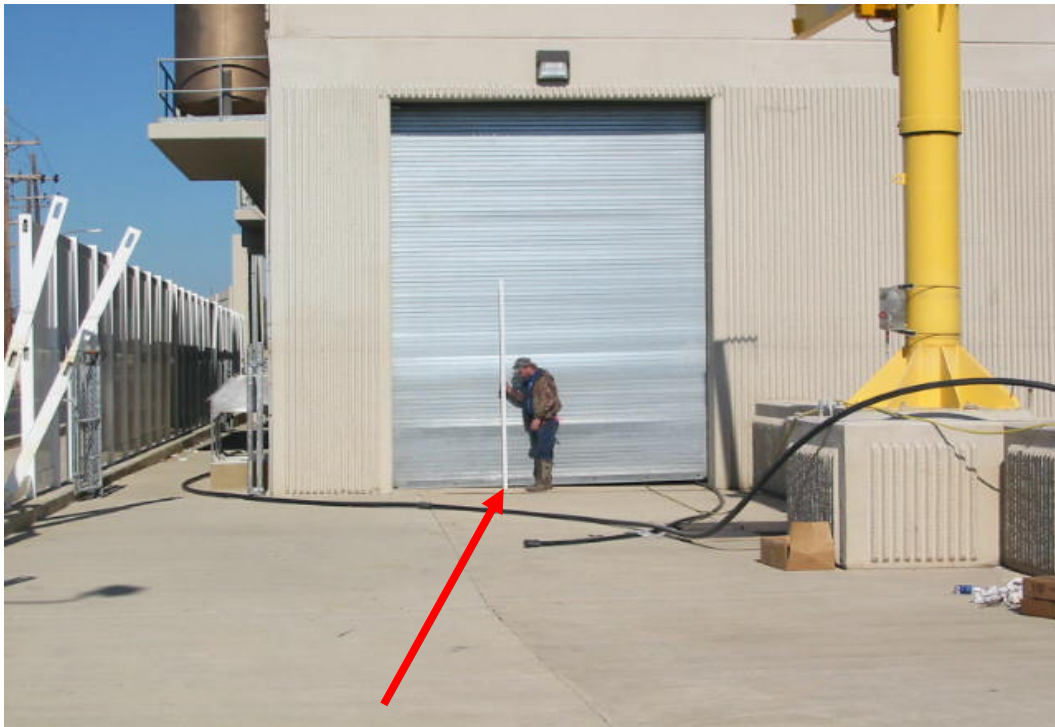
TBM: I010



I-10 Pump Station



Finished Floor #1 = -11.60 feet NAVD88(2004.65) Field Book 060852



Finished Floor #2 = -4.10 feet NAVD88(2004.65) Field Book 060852

MONTICELLO Pump Station



TBM: MONT



TBM: MONT



Finished Floor = 2.65 feet NAVD88(2004.65) Field Book 060851

OP #1 Pump Station



TBM: OP01



TBM: OP01



OP #1 Pump Station



OP #1 Melpomene Pump Station #1



Finished Floor = 1.65 feet NAVD88(2004.65) Field Book 060851

OP #2 Pump Station



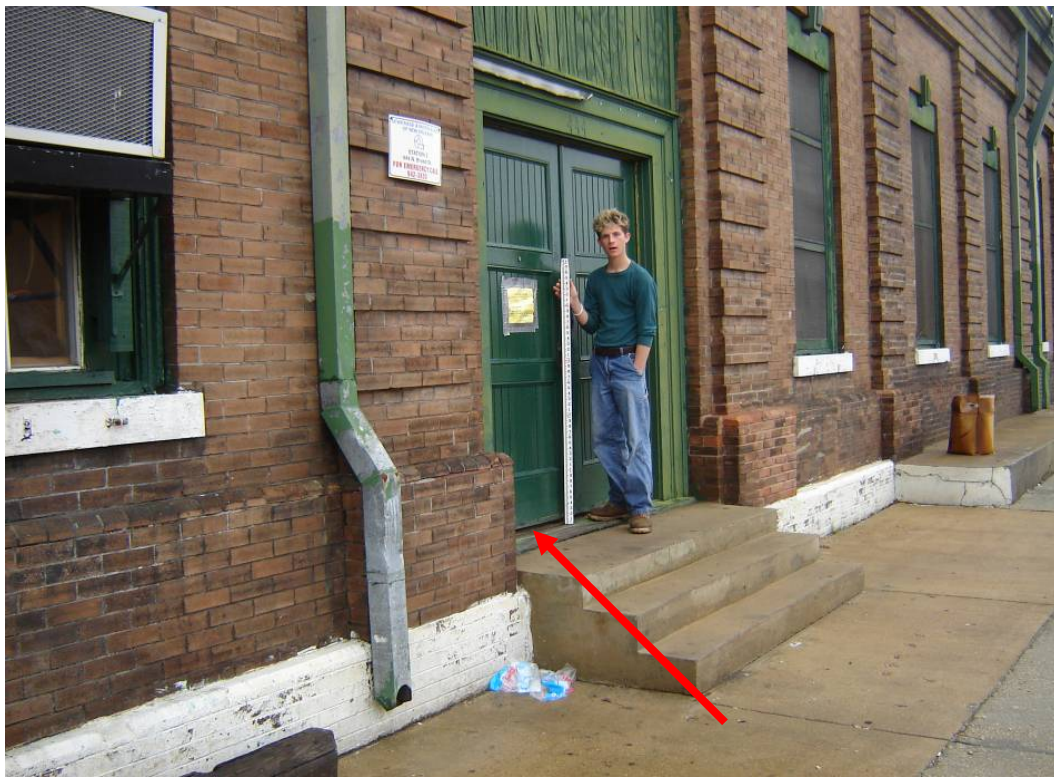
TBM: OP02



TBM: OP02



OP #2 Pump Station



Finished Floor = 2.04 feet NAVD88(2004.65) Field Book 060851

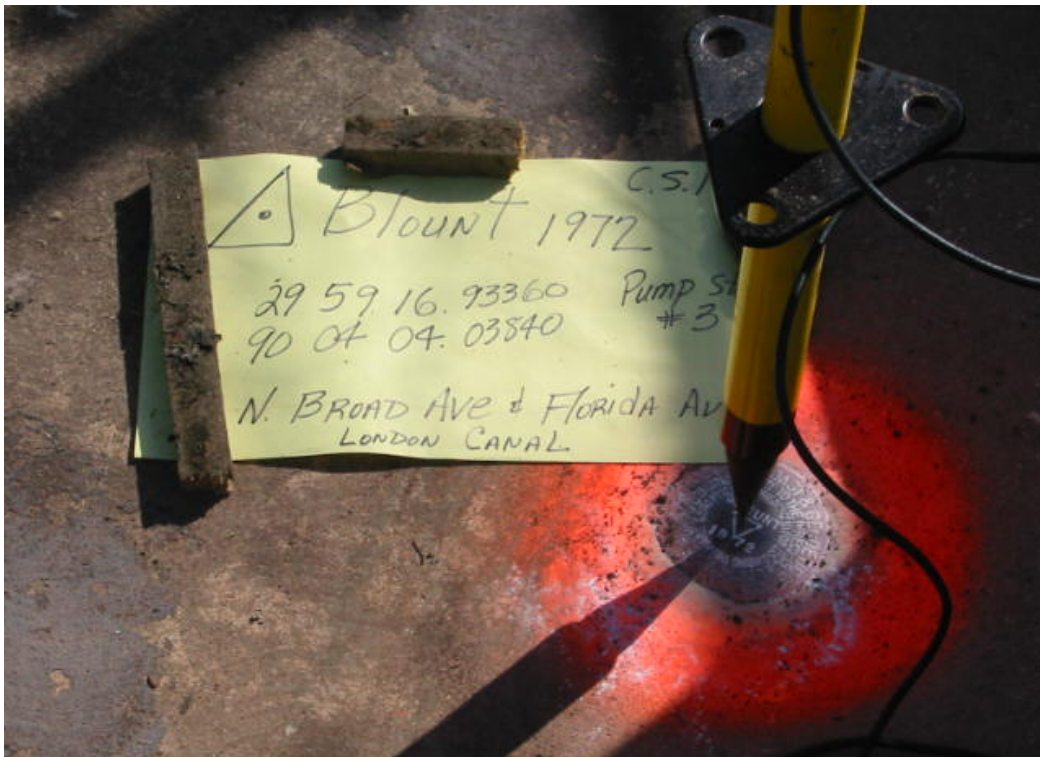


OP #2 PUMP STATION

OP #3 Pump Station



TBM: BLOU



TBM: BLOU



OP #3 Pump Station



Finished Floor = 1.23 feet NAVD88(2004.65) Field Book 060851

OP #4 Pump Station



TBM: OP04



TBM: OP04



OP #4 Pump Station



Finished Floor = 2.53 feet NAVD88(2004.65) Field Book 060851

OP #5 Pump Station

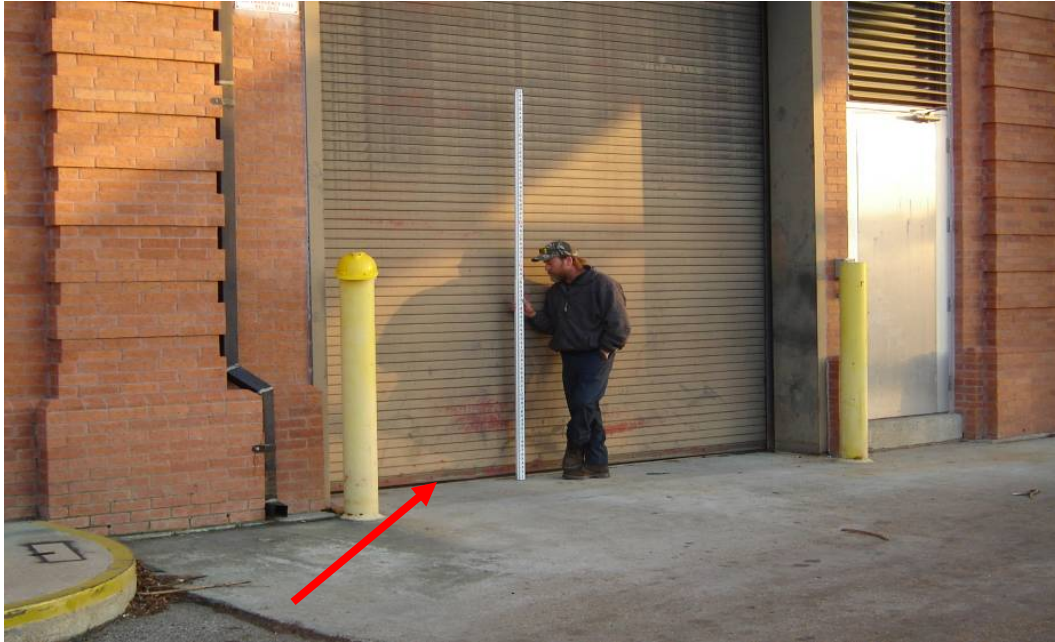


Finished Floor = 1.43 feet NAVD88(2004.65) Field Book 060851

OP # 6 Pump Station



Finished Floor #1 = 1.90 ft, NAVD88(2004.65) Bk.060852, Pg. 40



Finished Floor #2 = 0.85 ft, NAVD88(2004.65) Bk.060852, Pg. 40



Finished Floor #3 = 4.75 ft, NAVD88(2004.65) Bk.060852, Pg. 40

OP #7 Pump Station



TBM: OP07



TBM: OP07



Finished Floor = 2.03 feet NAVD88(2004.65) Field Book 060851

Citrus Pump Station -- OP 10



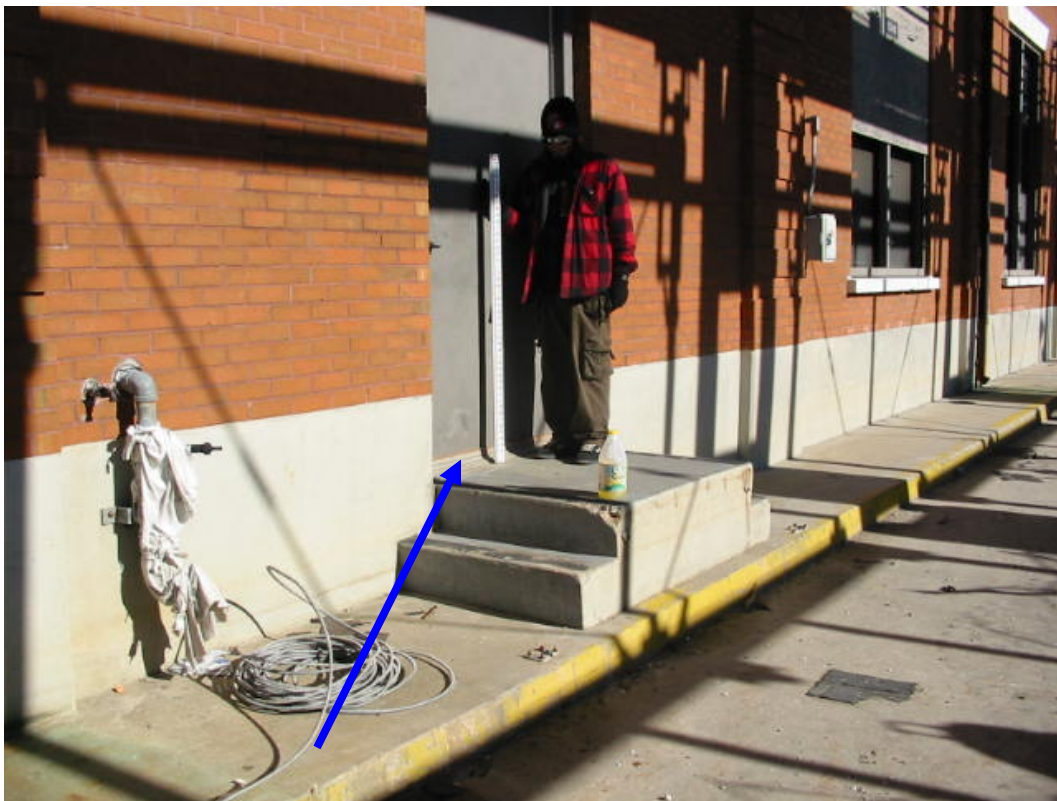
TBM: OP10



Citrus Pump Station OP 10



Finished floor = -1.50 feet NAVD 88 2004.65 Field book 060851



Finished floor = -1.50 feet NAVD 88 2004.65 Field book 060851

OP 11 Pump Station



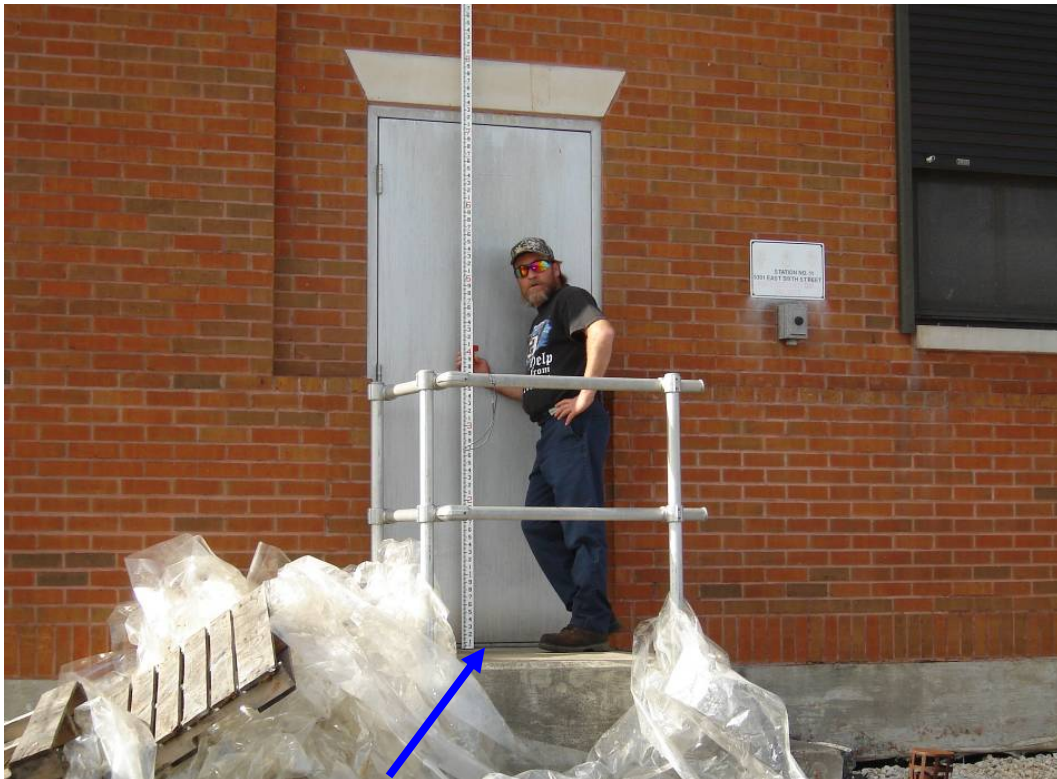
TBM: OP11



TBM: OP11



OP 11 PUMP STATION



Finished Floor = 2.62 feet NAVD88(2004.65) Field Book 060852

OP 12 Pump Station



OP 12 Finished Floor = 2.63 feet NAVD88(2004.65) Field Book 060851

OP 13 Pump Station



TBM: OP13



TBM: OP13



OP #13 PUMP STATION



Finished Floor = 1.50 feet NAVD88(2004.65) Field Book 060852

Jahncke Pump Station OP 14



TBM: OP14



Jahncke OP 14



Finished Floor = 14.93 feet NAVD88(2004.65) Field book 060851

OP 15 Pump Station



TBM: OP15



TBM: OP15



OP 15 Pump Station



Finished Floor #1 = -0.18 feet NAVD88(2004.65) Field Book 060851



Finished Floor #2 = 9.16 feet NAVD88(2004.65) Field Book 060851

St. Charles Pump Station OP 16



TBM: OP16



TBM: OP16



OP #16 -- ST. CHARLES PUMP STATION



Finished Floor = 14.85 feet NAVD88(2004.65) Field Book 060851

OP 17 Station D Pump Station



TBM: OP17



TBM: OP17



OP 17 Pump Station



Finished Floor = 0.75 feet NAVD88(2004.65) Field book 060851

OP 18 Maxent Pump Station



TBM: OP18



TBM: OP18



Finished Floor = 1.56 feet NAVD88(2004.65) Field book 060851

OP 19 Pump Station



OP 19 Finished Floor #1 = -3.79 feet NAVD88(2004.65) Field Book 060851



OP 19 Finished Floor #2 = -4.33 feet NAVD88(2004.65) Field Book 060851

OP 20 Amid Pump Station



TBM: OP20



TBM: OP20



OP 20 Amid Pump Station



Finished Floor (Upper) = 19.20 feet NAVD88(2004.65) Field Book 060851



Finished Floor = 3.69 feet NAVD88(2004.65) Field Book 060851

PRITCHARD Pump Station



Finished Floor = 3.23 feet NAVD88(2004.65) Field Book 060851

Appendix 27

Plaquemines Parish Pump Stations

BARREIRE Pump Station



Finished Floor = 6.73 feet NAVD88(2004.65)

BELAIR Pump Station



Belair Pump Station

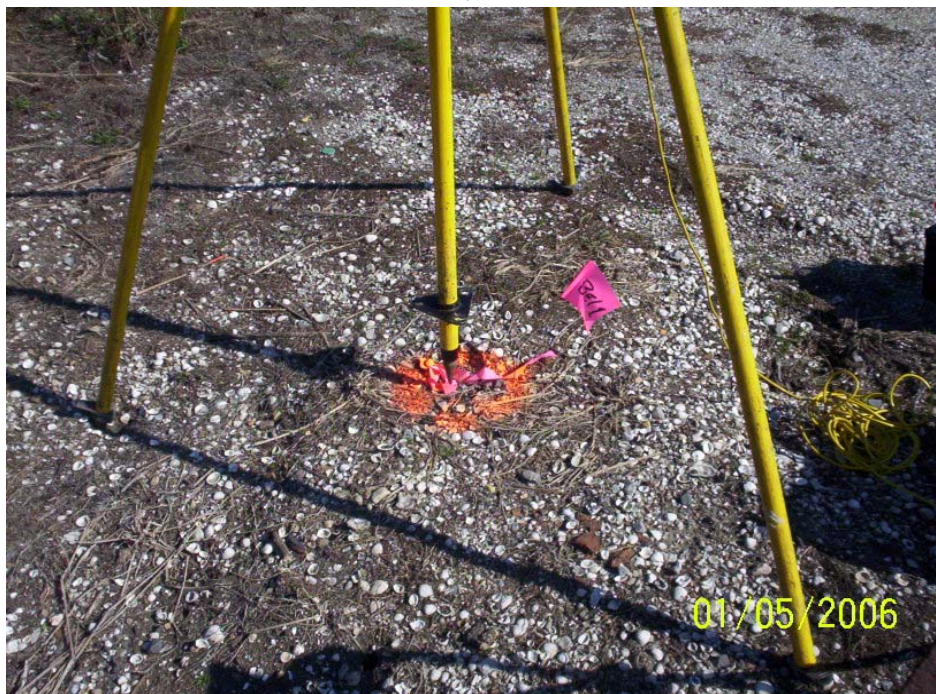


Finished Floor = 2.81 feet NAVD88(2004.65)

BELLE CHASE #1 Pump Station



TBM: BEL1



TBM: BEL1



Finished Floor = 4.80 feet NAVD88(2004.65)



BELLE CHASE #1 Pump Station

BELLE CHASE #2 Pump Station



TBM: BEL2



TBM: BEL2



Finished Floor = 9.67 feet NAVD88(2004.65)



Belle Chase #2 Pump Station

Bellevue Pump Station



Finished Floor = 12.72 feet NAVD88(2004.65)



Braithwaith Pump Station



TBM: BRAI



TBM: BRAI



Finished Floor #1 = 7.81 feet NAVD88(2004.65) Field Book 060852



Finished Floor #2 = 8.11 feet NAVD88(2004.65) Field Book 060852

DIAMOND Pump Station



DIAMOND PUMP STATION



Finished Floor = 10.37 feet NAVD88(2004.65) Field Book 060854

DUVIC (Venice) Pump Station



DUVIC(VENICE) PUMP STATION



Finished Floor = 17.05 feet NAVD88(2004.65) Field Book 060854

GAINARD WOODS Pump Station



TBM: GAIN



TBM: GAIN



Finished Floor #1 = 6.18 feet NAVD88(2004.65) Field Book 060854





Finished Floor #2 = 10.62 feet NAVD88(2004.65) Field Book 060854



GRAND LIARD(BURAS) Pump Station



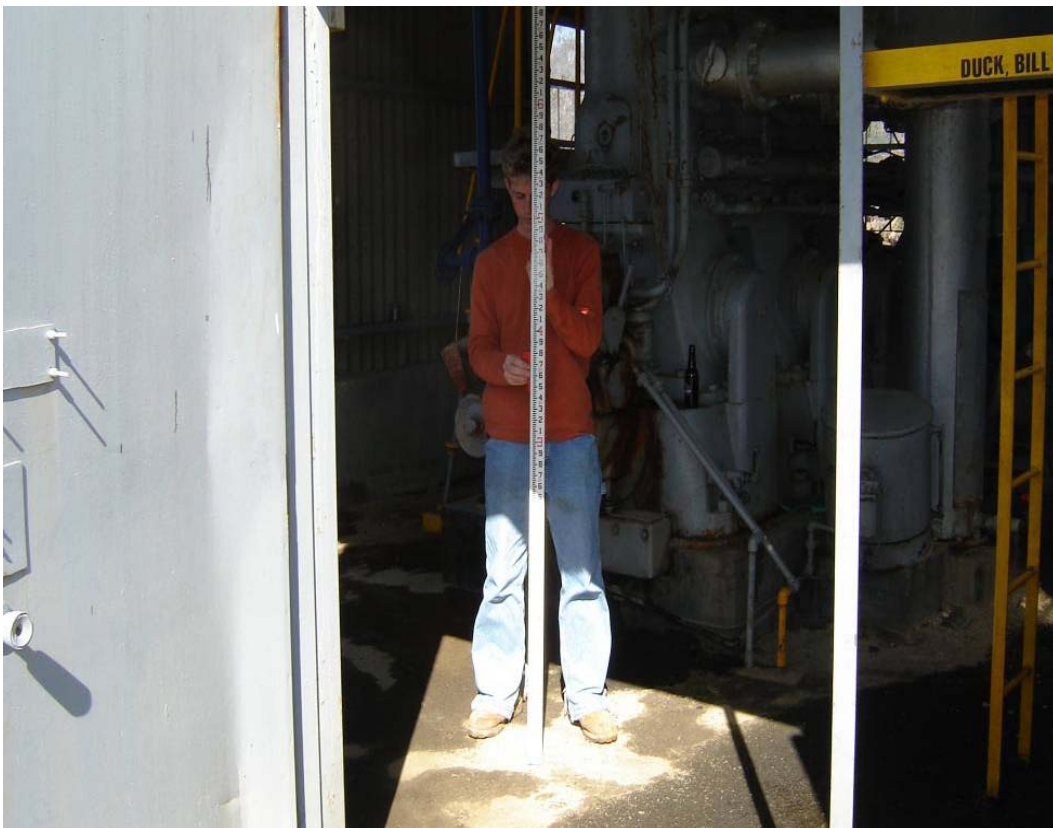
TBM: GRAL



TBM: GRAL



Finished Floor #1 = 4.72 feet NAVD88(2004.65) Field Book 060854





Finished Floor #2 = -0.38 feet NAVD88(2004.65) Field Book 060854



Finished Floor #3 = 17.11 feet NAVD88(2004.65) Field Book 060854



HAYES Pump Station



HAYES PUMP STATION



Finished Floor = 6.74 feet NAVD88(2004.65) Field Book 060854

OLLIE #2 Pump Station



TBM: OLLI



TBM: OLLI



OLLIE #2 PUMP STATION



Finished Floor = 9.52 feet NAVD88(2004.65) Field Book 060852

OLLIE LOWER PUMP STATION



Ollie Lower Pump Station
Finished Floor = 3.44 feet NAVD88(2004.65) Book 060858

OLLIE UPPER PUMP STATION



Ollie Upper Pump Station
Finished Floor = 3.50 feet NAVD88(2004.65) Book# 060858

POINTE A La HACHE EASTBANK Pump Station



POINTE A La HACHE EAST PUMP STATION

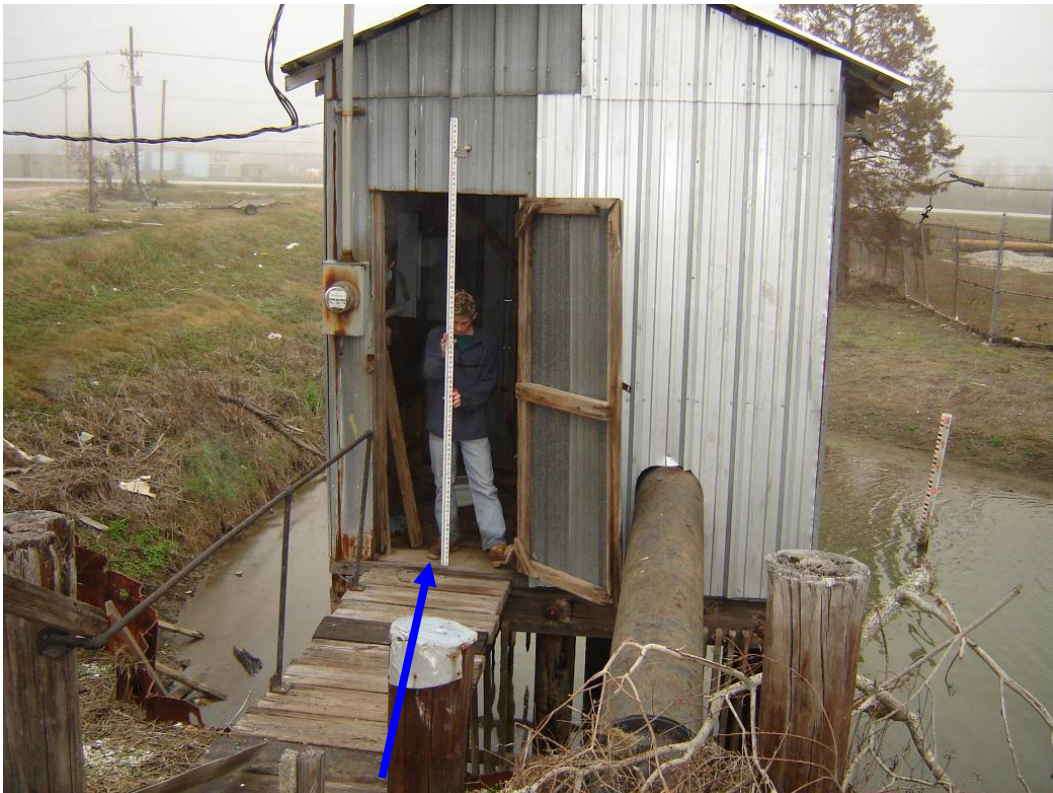


Finished Floor = 12.59 feet NAVD88(2004.65) Field Book 060852

POINTE A La HACHE WEST Pump Station



POINTE A LA HACHE PUMP STATION WEST 1 & 2



Finished Floor #1 = 2.66 feet NAVD88(2004.65) Field Book 060854



Finished Floor #2 = 6.82 feet NAVD88(2004.65) Field Book 060854

POINTE CELESTE #1 Pump Station



Finished Floor = 12.24 feet NAVD88(2004.65) Field Book 060858



POINT CELESTE 1 AND 2 Pump stations

POINTE CELESTE #2 Pump Station



Finished Floor =10.46 feet NAVD88(2004.65) Field Book 060858



POINT CELESTE 1 AND 2 Pump stations

POINTE CELESTE Pump Station



Finished Floor = 4.67 feet NAVD88(2004.65) Field Book 060854

SCARSDALE Pump Station



TBM: SCAR



TBM: SCAR



SCARSDALE PUMP STATION



Finished Floor = 11.08 feet NAVD88(2004.65) Field Book 060852

SUNRISE #1 Pump Station



SUNRISE #1 PUMP STATION



Finished Floor Sunrise #1 = 5.02 feet NAVD88(2004.65) Field Book 060854

SUNRISE #2 Pump Station



SUNRISE #2 PUMP STATION



Finished Floor = 11.90 feet NGVD88(2004.65) Field Book 060854

WILKINSON PUMP STATION



Finished Floor = 9.76 feet NAVD88(2004.65) Field Book 060858

Appendix 28

St. Bernard Parish Pump Stations

Bayou Ducros #7 Pump Station



TBM: BYD7



TBM: BYD7



Finished Floor = 1.25 feet NAVD88(2004.65) Field Book 060851

Bayou Villere Pump Station #3



Bayou Villere Pump Station #3
Finished Floor = 2.16 feet NAVD88(2004.65) Field Book 060851

E.J. Gore Pump Station #5



E.J. Gore Pump Station



Finished Floor = 4.75 feet NAVD88(2004.65) Field Book 060851

FORTIFICATION #1 Pump Station



Finished Floor = 1.31 feet NAVD88(2004.65) Field Book 060851

Guichard Pump Station #2



Guichard Pump Station #2



Finished Floor = 1.91 feet NAVD88(2004.65) Field Book 060851

Jean Lafitte Pump Station #6



TBM: JEA6



TBM: JEA6



Finished Floor #1 = 15.52 feet NAVD88(2004.65) Field Book 060851

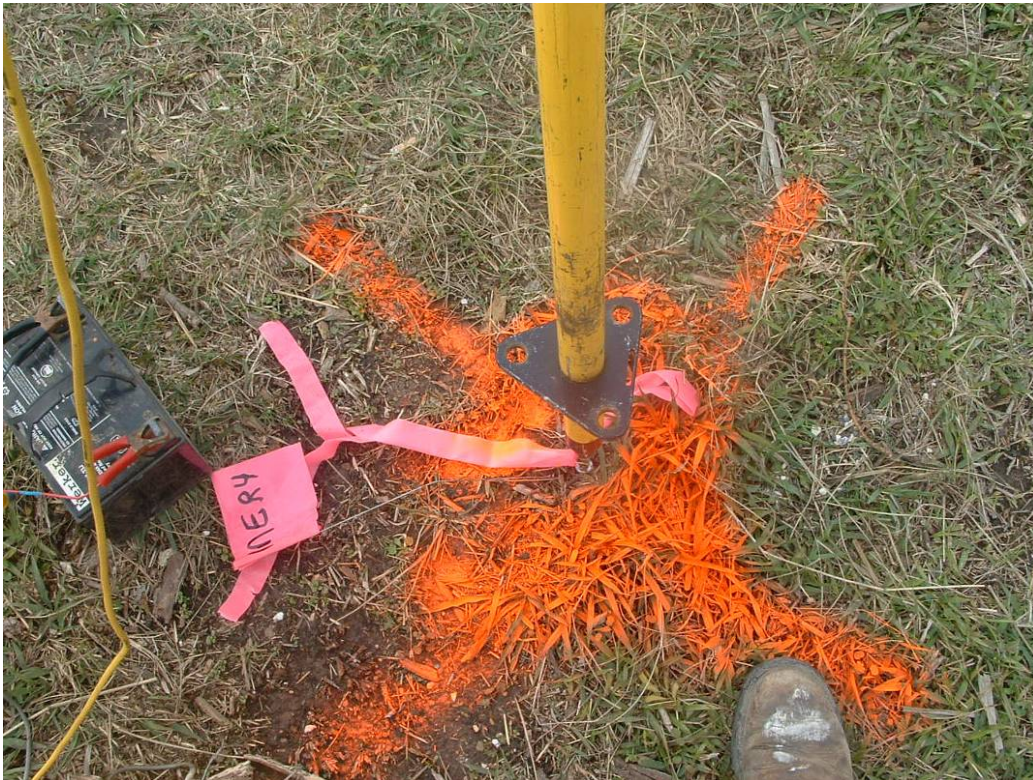


Finished Floor #2 = 2.50 feet NAVD88(2004.65) Field Book 060851

MERAUX #4 Pump Station



TBM: MER4



TBM: MER4



Finished Floor #1 = 13.92 feet NAVD88(2004.65) Field Book 060851



Finished Floor #2 = 2.43 feet NAVD88(2004.65) Field Book 060851

ST. MARY #8 Pump Station



TBM: STMY



TBM: STMY



Finished Floor = 1.24 feet NAVD88(2004.65) Field Book 060851

Appendix 29

St. Charles Parish Pump Stations

DESTREHAN #1 Pump Station



DESTREHAN #1 Pump Station



Finished Floor #1 = 14.21 feet NAVD88(2004.65) Field Book 060858



Finished Floor #2 = 8.39 feet NAVD88(2004.65) Field Book 060858

DESTREHAN #2 Pump Station



DESTREHAN #2 Pump Station



Finished Floor = 5.71 feet NAVD88(2004.65) Field Book 060858

NEW SARPY Pump Station



NEW SARPY Pump Station



Finished Floor = 8.92 feet NAVD88(2004.65) Field Book 060858

SCHEXNAYDRE Pump Station



Finished Floor = 8.36 feet NAVD88(2004.65) Field Book 060858

TREPAGNIER Pump Station



Finished Floor = 10.50 feet NAVD88(2004.65) Field Book 060858

Appendix 30

1985 New Orleans Policy on NGS

Benchmarks

31 January 2001

MEMORANDUM FOR Commander, New Orleans District, ATTN: CEMVN-ED

SUBJECT: CEMVN-ED Policy Letter of 1985 - NGS Benchmarks

1. We concur with your proposal to use the NAVD88 benchmark information for future work on all projects. Accordingly, the new policy is as follows:

a. All gages will be set to conform to the NAVD88 benchmark information.

b. Main stem features of the MR&T project under construction or to be constructed in the future will utilize the NAVD88 benchmark elevations.

c. Off-main stem projects of the MR&T under construction or to be constructed in the future will use the NAVD88 benchmark data.


d. All O&M dredging will use the NAVD88 benchmark data.

e. Hurricane protection projects under construction or to be constructed in the future will use the NAVD88 benchmark data.

2. We also agree that if CORS proves to be a reliable and accurate system for determining benchmark elevations, MVD and the New Orleans District should re-evaluate the above policy to consider use of the CORS benchmark information in lieu of the NAVD88 benchmark information. Further, the New Orleans District should at that time begin evaluation of completed projects to determine whether or not modifications are necessary to achieve authorized levels of protection.

3. We request that you provide MVD semi-annual status reports on the installation and operation of the CORS. We are interested in confirming its accuracy in determining benchmark information and subsidence rates as well as evaluating its application in other MVD districts.

Encls
nc


MICHAEL P. FALLON, P.E.
Chief, Engineering and
Construction Division

CF:
CECW-EE (M. K. Miles)
CEMVD-PM



DEPARTMENT OF THE ARMY

NEW ORLEANS DISTRICT CORPS OF ENGINEERS

P.O. BOX 60267

NEW ORLEANS, LOUISIANA 70160-0267

REPLY TO
ATTENTION OF:

CEMVN-ED

26 October 2000

MEMORANDUM FOR Chief, Engineering Division, Mississippi Valley Division, P. O.
Box 80, Vicksburg, MS 39181-0080

SUBJECT: CEMVN-ED Policy Letter of 1985 - NGS Benchmarks

1. Reference subject policy letter, and endorsements thereto, copy attached.
2. The New Orleans District has been abiding by the policy outlined in the referenced letter since its approval by the Division Office. In the 15 years since adopting this policy, the NGS has no longer performed the surveying of our reference benchmarks to publish new epochs and, most assuredly, we have witnessed continued subsidence. Until recently there has been very little alternative for maintaining accurate vertical control.
3. This district has recently hired an expert cartographer and geographer (Mr. Clifford Mugnier) to assist us on this issue. He has presented us with a proposal to implement and operate GPS Continuously Operating Reference Stations (CORS), which will measure gravity and accommodate subsidence, (See Attached, "GPS Leveling In The Gulf Coast Region"). This system will need to be validated with absolute gravity observations. We intend to implement this proposal and to cooperate with state and other federal agencies in South LA in establishing a network of CORS located at sites of mutual benefit. This vertical control network will provide the means for maintaining accurate vertical control.
4. It is becoming increasingly untenable to maintain the existing policy. We are proposing to use the NAVD88 for future work on all projects (Federal Register extract attached). All of our partners are using this datum for their work, and the existing policy is causing great confusion. We propose to abandon the 1985 policy and request your concurrence. We intend to evaluate the impacts of this on a project-by-project basis, and will take appropriate mitigation actions.

Encls

Robert J Fairless, P.E.
for Gerard S. Satterlee, P.E.
Chief, Engineering Division

CF:
CEMVN-CD
CEMVN-OD
CEMVN-DE

GPS LEVELING IN THE GULF COAST REGION

The Height Modernization Program of the National Geodetic Survey (NGS) is made possible by the development of "GEOID99," the mathematical model of the equipotential gravity field of the United States. GPS Leveling is a procedure that utilizes this concept, but requires independent validation and observation of benchmark velocities in regions of crustal motion. The ability to independently observe and measure subsidence with changes in Absolute Gravity is a new technology applicable to the Gulf Coast Region. GPS Continuously Operating Reference Stations (CORS) do record the variation in their own three-dimensional coordinates. However only the independent measurement of changes in Absolute Gravity allow the validation of the vertical component of CORS sites in a subsidence-prone region for short-term use. It is thought that 4 to 5 years of CORS site operation in a subsidence area will provide some validation of vertical movement of the CORS site itself, but short-term variations of subsidence rates can be masked by noise. The independent determination of changes in elevation by observing changes in the absolute gravity at the same point provide that physical certainty.

For an area of crustal motion, GPS Leveling must be accomplished by GPS observation of benchmarks for 30 minutes on one day, (say in the morning), and for 30 minutes the following day, in the afternoon. The two observation periods separated by a day insure that the GPS constellation above the observer's local horizon will be substantially different and free of geometric bias in a simultaneous post-processed solution. The maximum distance from a mobile observer using a dual-frequency geodetic survey-grade GPS receiver to a CORS site is 50 statute miles. The accuracy achieved with proper post-processing is **two centimeters vertical**. This represents the state of the art if each CORS site is validated with the observation of Absolute Gravity every year at each CORS site.

The data collected at each CORS site must be edited and adjusted on a daily basis and submitted electronically to the National Geodetic Survey. Acceptance and publication of the observed data from each CORS site by NGS constitutes the establishment of the national infrastructure of geodetic control with today's technology. LSU will provide the daily data processing support, the continuous observation of Absolute Gravity at LSU and on a rotating basis at all CORS sites, and the establishment of fiducial benchmarks. Fiducial benchmarks will be established and periodically re-observed at strategic locations throughout the NOD with GPS Leveling procedures and observation of Absolute Gravity with outdoor portable instruments.



DEPARTMENT OF THE ARMY
NEW ORLEANS DISTRICT CORPS OF ENGINEERS
P O BOX 60267
NEW ORLEANS LOUISIANA 70160

REPLY TO
ATTENTION OF

LMNED-S

7 August 1985

SUBJECT: NGS Benchmarks

Commander, Lower Mississippi Valley Division
ATTN: LMVED.

1. Reference is made to the following:
 - a. LMNED letter dated 2 November 1984 to LMVD, subject supra.
 - b. LMVED letter dated 5 March 1985 to RA John D. Bossler, subject: Adjustments to NGS Benchmarks.
 - c. John D. Bossler letter to LMVD dated 29 March 1985 in response to reference b above.
 - d. LMVED-TS letter dated 12 April 1985 to LMNED-S subject: Adjustments to NGS Benchmarks.
 - e. LMVED letter dated 1 May 1985 to LMNED-S subject: Adjustments to NGS Benchmarks, and 1st End thereto.
2. In essence, it is the position of NGS as set forth in reference c above that the current (1983) benchmark elevations are correct, but that they cannot be used in conjunction with earlier values to derive estimates of subsidence which are necessarily valid even in order of magnitude. Thus we are left with a problem of setting project grades to provide the level of protection authorized. The problem is particularly acute on projects which are partially complete, in that, if we adopt the new benchmark elevations for construction without altering design flowlines, we ensure that those projects will provide inconsistent levels of protection; with the previously constructed portions offering lower levels of protection than those to be constructed in the future. At the same time, it would hardly be prudent, based on what we now know about benchmark elevations, to embark on a program of wholesale raising of previous construction to conform to the latest elevations. This is particularly true in situations in which design flowlines are primarily a function of discharge with tide level having little effect, and in tidal cases where increases in grade can only be achieved through demolition and reconstruction.

LMNED-S
SUBJECT: NGS Benchmarks

3. The problem extends as well to our stream gaging network since the gages which comprise that network are ordinarily adjusted to conform to the latest information published by NGS. As an example, consider the Carrollton gage, which is typical of gages at and below New Orleans. It has been raised about 0.6 foot since 1952 (1983 data have not yet been applied) with the result that the reading of the staff now corresponds to a reading 0.6 foot lower on the 1952 staff. Application of the 1983 data would result in raising the staff another half foot or a total increase of over 1 foot.

4. The problem is exacerbated by the information, recently received, that the 1983 data have been superseded by the results of releveling done in the New Orleans area at the request of local officials. New elevations for benchmarks in Jefferson, St. Bernard, Plaquemines, and Orleans Parishes have been published which, in most instances, represent significant upward revisions of the 1983 data. Additional results of the releveling are being processed and it seems reasonable to expect that they will reflect the same upward trends. The overall significance of these changes in the light of the repeated and ringing affirmations of confidence in the 1983 data which appear in NOAA's letter of 29 March 1985 is not easy to assess, but it does further weaken the case for imputing, with any reasonable confidence, hard physical significance to the changes in benchmark elevations. Yet the data promulgated by NOAA, given their presumed primacy in deciding where the earth's crust is in the vertical plane, cannot be ignored.

5. While the NGS program (cadastre) for evaluating subsidence may well produce data relevant to our problem (and for this reason alone, we would be well advised to support it) that program offers little of utility in the foreseeable future. Thus we must select a course of action without material assistance from NGS.

6. Despite the absence of firm implications to be drawn from changing benchmark data, we believe that a clearly defined policy should be derived concerning the use of benchmark data in our various activities. Accordingly, we propose the following actions:

a. All gages will be set to conform to the latest available benchmark information published by NGS. Since both the gage information and the NGS data are widely disseminated, to do otherwise would be to court public confusion.

b. Modification of projects which have been completed will not be considered. The level of precision in the current data, and the practical difficulty and cost of changing such projects combine to mandate this course of action at least for the foreseeable future.

c. The main stem features of the MR&T project, such as MRL and Atchafalaya Basin, will be constructed utilizing the latest pre-1983 benchmark elevations. The grade requirements for these features are driven primarily by discharge and since subsidence presumably affects both bed and banks, required levee heights should be little affected by it. Thus, a shift to the new, lower benchmarks would result in the construction of levees higher than required to provide the authorized level of protection. There may be some problem with this approach at the lower (gulfward) ends of the system where tide becomes an increasingly important factor, and we plan to give that continuing consideration.

d. Off-main stem projects of the MR&T which are under construction or will be constructed in the future will use the latest benchmark data published by NGS at the time construction is/was started. The need for revision will be considered as construction proceeds.

e. All O&M dredging will use the latest available benchmark data published by NGS prior to the 1983 data. A change to the new data would mean that the depth of dredging in Southwest Pass, for example, would be lowered by about 1 foot. Given the perennial commotion by navigation interests, and considering the intensity of it this past year, such a course of action would be ill advised to say the least.

f. Hurricane protection projects which are partially complete will use the NGS benchmarks current at the time of construction of the first increment of the project. To shift to the later NGS data without altering the heights of previously constructed portions would make "fuseplugs" of those portions and thus impose a gratuitous servitude on the lands and facilities they protect. And altering previously constructed works would not be practicable.

g. New hurricane protection projects will be constructed using the latest available NGS benchmark data.

h. We plan to respond affirmatively to NOAA's invitation to participate in this "cadastre" program to better evaluate subsidence. Based on NOAA's estimate the total costs would be \$2.0 million in the first year, \$525 thousand in the second year, and \$345 thousand annually thereafter. Our participation would be in the form of membership on technical study groups and providing data. We do not, at this time, anticipate providing any direct funding.

7. Approval of the course of action set forth in paragraph 6 is recommended.

FOR THE COMMANDER:



FREDERIC M. CHATRY
Chief, Engineering Division

Encls

LMVED-TS (LMNED-S/7 Aug 85) 1st End
SUBJECT: NGS Benchmarks

Mr. Johnson/msm/5935

DA, Lower Mississippi Valley Division, CE, Vicksburg, MS 39180-0080

19 SEP 85

TO: Commander, New Orleans District, ATTN: LMNED-S

Your course of action outlined in para 6 of the basic letter is approved subject to the following comments:

a. Para 6b. We concur in general with this position; however, you should conscientiously review your flood control works and structures to ensure there are no exceptions that should be individually analyzed with an independent decision made on the specifics of that case.

b. Para 6c. While we agree in general with the rationale presented, the net result would be that there will be further disparity among levee grades, flowlines, and floodway operations. Therefore, the project design flowline of the Mississippi River and Tributaries Project should be adjusted within the affected areas to maintain comparability among the above elements.

c. Para 6f. Consideration should be given to reanalyzing and modifying (if needed) hurricane protection work in high density urban areas where the datum changes will drastically reduce the level of protection.

FOR THE COMMANDER:

5 Encls
nc


FRED H. BAYLEY III
Chief, Engineering Division

[Docket No. 930850-3150]

Affirmation of Vertical Datum for Surveying and Mapping Activities

SUBAGENCY: National Ocean Service, Coast & Geodetic Survey, National Oceanic and Atmospheric Administration, DOC.

ACTION: Notice.

SUMMARY: This Notice announces a decision by the Federal Geodetic Control Subcommittee (FGCS) to affirm the North American Vertical Datum of 1988 (NAVD 88) as the official civilian vertical datum for surveying and mapping activities in the United States performed or financed by the Federal Government, and to the extent practicable, legally allowable, and feasible, require that all Federal agencies using or producing vertical height information undertake an orderly transition to NAVD 88.

FOR FURTHER INFORMATION CONTACT: Mr. James & Stem, N/CG1x4, SSMC3, Station 9357, National Geodetic Survey, NOAA, Silver Spring, Maryland 20910; telephone: 301-713-3230.

SUPPLEMENTARY INFORMATION The Coast and Geodetic Survey (C&GS), National Geodetic Survey (NGS), has completed the general adjustment portion of the NAVD 88 project, which includes approximately 80 percent of the previously published bench marks in the NGS data base. The remaining "posted" bench marks which comprise approximately 20 percent of the total will be published by October 1993. Regions of significant crustal motion will be analyzed and published as resources allow.

NAVD 88 supersedes the National Geodetic Vertical Datum of 1929 (NGVD 29) which was the former official height reference (vertical datum) for the United States. NAVD 88 provides a modern, improved vertical datum for the United States, Canada, and Mexico. The NAVD 88 heights are the result of a mathematical least squares general adjustment of the vertical control portion of the National Geodetic Reference System and include 80,000 km of new U.S. Leveling observations undertaken specifically for this project.

NAVD 88 height information in paper or digital form is available from the National Geodetic Information Branch, N/CG174, SSMC3, Station 9202, National Geodetic Survey, NOAA, Silver Spring, Maryland, 20910; telephone: 301-713-3242.

Dated: June 21, 1993.

W. Stanley Wilson,

Assistant Administrator for Ocean Services and Coastal Zone Management, NOAA.

[FR Doc. 93-14922 Filed 6-23--93; 8:45 am]

BILLING CODE 351

Appendix 31

GPS Network Adjustment - IPET Project

Report

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Admin.

COMPUTATION
of
HORIZONTAL CONTROL

NAD83 (1991)
NAVD 88

State: Louisiana

LOCALITY: New Orleans and coastal areas
50 miles to the south
and 70 miles to the NE

.....

Year of Observations, 2006
Year of Computation, 2006

Chief of Party: 3001, Inc

Observer: various

Computer: Brian Shannon (USE) & Jeff Olsen

U.S. DEPARTMENT OF COMMERCE
National Oceanic & Atmospheric Administration
National Ocean Service
National Geodetic Survey

REPORT OF HORIZONTAL CONTROL COMPUTATIONS
Observation and Analysis Division

State Identification: LA-876

Classification: B-order (1:1,000,000)

Horizontal Datum: NAD 83 (1992) Vertical Datum: NAVD 88
(2004.65)

Geoid: GEOID03 Ellipsoid: GRS 80

Locality: New Orleans and coastal areas 50 miles S and 70 miles NE

Acc. No.: GPS 2212

Date of Field Work: 2006 Chief of Party: 3001, Inc.

***** OFFICE COMPUTATION *****

Accession No.: GPS^o 2212 Date of Computation: 2006

Number of Stations: 24 including 4 CORS

New horizontal pos.	=	4	Ellip ht readjusted	=	1
Old horizontal pos:					
Fixed:	=	15			
Readjusted:	=	<u>5</u>			
Total	=	24			

Free adjustment variance of unit weight (σ_0^2): = 88.60
Constrained adjustment variance of unit weight (σ_1^2): = 186.50
Ratio: (σ_1^2 / σ_0^2): = 2.105

Jeff Olsen
Geodesist

Maralyn L. Vorhauer
Branch Chief

Juliana Blackwell
Division Chief

PROJECT DATA

Locality: New Orleans and coastal areas 50 miles S and 70 miles NE

Source: GPS 2212

Year of Observation: 2006

Number of occupied stations: 20

Number of unoccupied stations: 4 (COVG, ENG2, GRIS and NDBC CORS)

Variance of Unit Weight, free adjustments (horizontal and vertical): 88.60

Degrees of Freedom: 213

Variance of Unit Weight, constrained horizontal adjustment: 186.50

Degrees of Freedom: 255

Variance of Unit Weight, constrained vertical adjustment: 91.86

Degrees of Freedom: 226

INTERAGENCY PERFORMANCE EVALUATION TASKFORCE (IPET) TASK 6 PHASE 1 STATIC GPS SURVEY

PURPOSE

Phase 1 was a geodetic survey designed to connect historical tide stations to the National Spatial Reference Network (NSRS). The focus of the project was the determination of the current separation of NAVD 88 from Local Mean Sea Level (LMSL) using tide stations that populated the region in the early 1980's. This approach was intended to enable answers more quickly than would be possible using the alternative approach--tide gauges installed and operated for a year to measure the separation.

Twenty-five years ago the State of Louisiana worked with NOAA on the Louisiana Marine Boundary Program. NOAA installed dozens of tide stations for durations averaging one year to find the Louisiana low water boundary. Following the devastation of Hurricane Katrina, it was hoped that the historical tidal benchmark data could be combined with current GPS observations to provide an accurate measure of the separation despite thirty years of settlement in the region.

Underlying assumptions for this survey were that LMSL was reasonably constant over the region and that benchmark settlement was not too uneven. If these assumptions were not borne out because of excessive variation in either LMSL or individual benchmarks), the survey could at least be used to monitor settlement compared to a GPS survey done two years prior for the purpose of geodetic vertical control.

TIME FRAME

Mr. Mark Huber of the U.S. Army Corps of Engineers, New Orleans District called Mr. Brian Shannon of the Engineer Research and Development Center in early October 2005 to locate tide gauge installations in the New Orleans vicinity. Mr. Shannon proposed using GPS to tie the historical tide stations at this time in lieu of setting gauges. This approach was implemented under Task 6 of the IPET study that had begun following Hurricane Katrina to develop vertical network improvements needed in New Orleans. A coordination meeting with NOAA was held in Alexandria, Virginia on 14 November 2005.

U.S. Army Corps of Engineer personnel performed preliminary reconnaissance on 9 November 2005, confirming three tide stations destroyed: 876 1426 Green Ditch, 876 1529 Martello Castle, and 876 1305 Shell Beach.

Contractors began reconnaissance for Phase 1 on 20 December 2006. GPS observations were performed Jan. 8-9 and 24-25, Feb. 20-21 and March 6-7, 2006. Leveling was performed at various tide stations during January and February, 2006.

GEOGRAPHIC EXTENT

The project extended west and south from a tide station five miles west of Gulfport, Mississippi to Barataria Bay south of New Orleans on the Gulf of Mexico. It included monuments west of New Orleans along Lake Pontchartrain, east to Lake Borgne and south to Port Sulphur on the Mississippi River. In all, nine tide stations were connected to the NSRS by this project. They are listed next along with the specific mark occupied at each and any marks that were leveled to.

876 1678 MICHOD SUBSTATION, ICWW
GPS CONTROL MARK

<u>PID</u>	<u>Designation</u>
BH3007	WES 19 1978
<u>Marks leveled to at tide station</u>	
BH3007	WES 19 1978
BH1083	D 276 1969
no PID	1678 A 1982
no PID	WES 17 1978

876 1402 U.S. HIGHWAY 90, THE RIGOLETS
GPS CONTROL MARK

BH1160	PIKE RM 3
<u>Marks leveled to at tide station</u>	
BH1164	PIKE RESET
BH1163	C 193

876 1602 LAKE JUDGE PEREZ, HERMITAGE
BAYOU

<u>GPS CONTROL MARK</u>	
AT1392	876 1602 C TIDAL
<u>Marks leveled to at tide station</u>	
AT1392	876 1602 C TIDAL
no PID	876 1602 A TIDAL
no PID	876 1602 B TIDAL
no PID	876 1602 E TIDAL
no PID	876 1602 F TIDAL

876 1487 CHEF MENTEUR, CHEF MENTEUR PASS
GPS CONTROL MARK

BH1133	E 3145
<u>Marks leveled to at tide station</u>	
BH1133	E 3145
None	1487 A 1982
None	1487 B 1982

876 1799 M.V. PETRO. DOCK, BAYOU ST.
DENIS

<u>GPS CONTROL MARK</u>	
None	1799 B 1985
<u>Marks leveled to at tide station</u>	
no PID	1799 B 1985
no PID	1799 A 1985
no PID	1799 C 1985
no PID	1799 D 1985

876 1494 USACE WEST PT A-LA-HACHE, MISS
RIVER

<u>GPS CONTROL MARK</u>	
no PID	1494 C 1996
<u>Marks leveled to at tide station</u>	
no PID	1494 C 1996
no PID	1494 A 1996
no PID	1494 B 1996

876 1955 USACE NEW CARROLLTON, MISS RIVER
GPS CONTROL MARK

AU2196	DISTRICT 1A
No leveling	

876 1927 USCG NEW CANAL, LAKE
PONTCHARTRAIN

<u>GPS CONTROL MARK</u>	
BJ1342	ALCO
No leveling	

876 1927 USCG NEW CANAL, LAKE
PONTCHARTRAIN

<u>GPS CONTROL MARK</u>	
BH0937	874 7437 TIDAL 1
No leveling	

TIDE STATIONS CONFIRMED DESTROYED, 9 NOVEMBER 2005
876 1426 GREENS DITCH
876 1529 MARTELLO CASTLE
876 1305 SHELL BEACH

PROCEDURES

GPS observations were performed in four-hour session pairs. Each session used four NAVD 88_2004.65 bench marks and one mark at a tide station. CORS data were included in the processing.

Leveling was performed to second-order class I FGCS standards at each historical tide station.

Processing and adjustment were performed using PAGES and ADJUST.

CORS

The following four CORS were included in the GPS processing and adjustment: COVG Covington, ENG2 English Turn, GRIS Grand Isle, and NDBC Stennis.

EQUIPMENT

Trimble SSI and SSE receivers were used during the survey. All antennas were type Compact L1/L2 with ground plane. All tripods were fixed height 2-meter tripods.

COORDINATION

NOAA and USACE coordinated all planning and specifications. Contract actions were performed through the U.S. Army Engineer District, St. Louis.

OBSERVATION FILE ANALYSIS

The program CHKOBS was run to verify the Blue Book observation file (Bfile). All errors identified by CHKOBS except those relating to 0.000 antenna heights were corrected. COMPGB and OBSCHK were run to check the Gfile against the Bfile. All errors identified by these programs were corrected.

DESCRIPTION FILE ANALYSIS

All stations in this project have either a new description or a recovery note except the CORS, which were omitted from the Dfile. CHKDESC, DISCREP and NEIGHBOR were run to verify the Dfile formats and to compare the recovery notes with the IDB descriptions. The messages generated by DISCREP reflect differences between the IDB and the submitted data. The new Dfile information will be used to update the IDB.

OBSDES was run to compare the Dfile with the Bfile. The output messages concern the omission of CORS descriptions from the Dfile.

FREE HORIZONTAL ADJUSTMENT

A minimally constrained horizontal adjustment was run, holding the published NAD83 coordinates and ellipsoid height for Covington CORS ARP. The highest residuals--approximately ten of them in the 2-3 cm range--were investigated. Reprocessing did not yield any meaningful improvement. Only two vectors with high residuals could be

rejected without causing a no-check situation. The remaining residuals exceeding 1 cm horizontally and 2 cm vertically had to be carried forward and are tabulated below.

Free adjustment horizontal residuals > 1 cm:

<u>v</u>	<u>From SSN</u>	<u>4-char ID</u>	<u>To SSN</u>	<u>4-char ID</u>
0.0159	7	ALCO	11	C189
0.0157	15	ENG2	23	V375
0.0147	15	ENG2	21	PIKE
0.0134	11	C189	20	NDBC
0.0132	5	A152	2	160C
0.0129	18	GRIS	16	G358
0.0128	5	A152	2	160C
0.0121	15	ENG2	23	V375
0.0106	15	ENG2	21	PIKE

Free adjustment vertical (EH) residuals > 2 cm:

<u>v</u>	<u>From SSN</u>	<u>4-char ID</u>	<u>To SSN</u>	<u>4-char ID</u>
-0.028	23	V375	24	WE19
0.027	19	MILN	15	ENG2
0.026	14	E314	21	PIKE
0.025	18	GRIS	16	G358
0.024	16	G358	10	BTID
-0.024	2	160C	19	MILN
0.023	15	ENG2	17	G365
0.022	9	BRO2	4	7437
0.021	11	C189	20	NDBC
-0.021	16	G358	10	BTID

CONSTRAINED HORIZONTAL ADJUSTMENT

All B-order marks and the CORS were initially constrained in position and ellipsoid heights. Residuals in the 4-5 cm range for the position of 876 1899 B Tidal resulted. Residuals in the 5-6 cm range for the ellipsoid height of that mark and for G 365 and 874 7437 Tidal 1 resulted.

The above three marks were freed up in a test adjustment as follows:

- 876 1899 B Tidal: position and EH
- 874 7437 Tidal 1: EH
- G 365: EH

The following shifts then occurred: for 876 1899 B TIDAL in position: 0.059 m. In ellipsoid height (EH):

- 874 7437 TIDAL 1: -0.043 (shifted to -25.963 m from -25.920)
- 876 1899 B TIDAL: -0.032 (shifted to -25.200 m from -25.168)
- G 365: -0.019 (shifted to -25.736 m from -25.717)

The 2- and 3-cm EH shifts for 1899 B and G 365 were considered small enough not to warrant re-adjusting the EH. The published values were restored for those marks.

Positions and/or EH for the following marks were then constrained for the horizontal adjustment:

<u>STATION NAME</u>	<u>SOURCE of position</u>
874 7437 TIDAL 1	GPS1606
A 152	GPS2100
A 193	GPS2100
ALCO	GPS2100
C 189	GPS2100
COVINGTON CORS ARP	CORS1460
DISTRICT 1 A	GPS2021
ENGLISH TURN 2 CORS ARP	CORS1674
G 358	GPS2100
G 365	GPS2100
GRAND ISLE CORS ARP	CORS1685
MILAN 2	GPS2100
REGGIO 2	GPS2100
STENNIS CORS ARP	CORS0680
V 375	GPS2100

<u>STATION NAME</u>	<u>SOURCE of ellipsoid height</u>
A 152	GPS2100
A 193	GPS2100
ALCO	GPS2100
876 1899 B TIDAL	GPS2100
C 189	GPS2100
COVINGTON CORS ARP	CORS1460
DISTRICT 1 A	GPS2021
ENGLISH TURN 2 CORS ARP	CORS1674
G 358	GPS2100
G 365	GPS2100
GRAND ISLE CORS ARP	GPS2100
MILAN 2	GPS2100
REGGIO 2	GPS2100
STENNIS CORS ARP	CORS0680
V 375	GPS2100

Highest horizontal residuals:

<u>v</u>	<u>From SSN</u>	<u>4-char ID</u>	<u>To SSN</u>	<u>4-char ID</u>
0.0239	15	ENGLISH TURN 2 CORS	23	V 375
0.0225	9	BROWN 2	4	874 7437 TIDAL 1
0.0173	19	MILAN 2	15	ENGLISH TURN 2 CORS A
0.0170	4	874 7437 TIDAL 1	8	B 31 USE
0.0166	7	ALCO	11	C 189
0.0155	4	874 7437 TIDAL 1	8	B 31 USE
0.0150	15	ENGLISH TURN 2 CORS	17	G 365
0.0148	5	A 152	2	876 1602 C TIDAL
0.0140	9	BROWN 2	4	874 7437 TIDAL 1
0.0124	15	ENGLISH TURN 2 CORS	23	V 375
0.0122	16	G 358	10	876 1899 B TIDAL
0.0119	22	REGGIO 2	11	C 189

Highest vertical (EH) residuals:

<u>v</u>	<u>From SSN</u>	<u>4-char ID</u>	<u>To SSN</u>	<u>4-char ID</u>
0.0632	16	G 358	10	876 1899 B TIDAL
0.0569	15	ENGLISH TURN 2 CORS	17	G 365
0.0537	11	C 189	20	STENNIS CORS ARP
0.0508	5	A 152	10	876 1899 B TIDAL
0.0485	11	C 189	20	STENNIS CORS ARP
-0.0484	10	876 1899 B TIDAL	22	REGGIO 2
-0.0416	10	876 1899 B TIDAL	3	876 1799 B TIDAL
-0.0415	10	876 1899 B TIDAL	22	REGGIO 2
0.0415	5	A 152	10	876 1899 B TIDAL
0.0397	6	A 193	9	BROWN 2
0.0373	5	A 152	2	876 1602 C TIDAL
0.0368	22	REGGIO 2	15	ENGLISH TURN 2 CORS A
0.0359	8	B 31 USE	20	STENNIS CORS ARP
-0.0357	18	GRAND ISLE CORS ARP	22	REGGIO 2
0.0355	6	A 193	9	BROWN 2
-0.0341	21	PIKE RM 3	6	A 193
0.0340	14	E 3145	21	PIKE RM 3
-0.0339	3	876 1799 B TIDAL	5	A 152
-0.0338	3	876 1799 B TIDAL	5	A 152
0.0303	15	ENGLISH TURN 2 CORS	17	G 365

FREE VERTICAL ADJUSTMENT

GEOID03 was used to compute geoid heights for the *86* records. A free vertical adjustment holding the coordinates of COVG and the 2004.65 epoch NAVD 88 orthometric height of Alco was executed. The differences between the free adjustment OH and the data base heights follow:

Free adjustment orthometric heights minus IDB values (m):

A 152	0.029
A 193	0.067
ALCO	0.000
876 1899 B TIDAL	-0.016
C 189	0.006
COVINGTON CORS ARP	0.021
DISTRICT 1 A	0.001
ENGLISH TURN 2 CORS ARP	0.006
G 358	0.020
G 365	-0.020
GRAND ISLE CORS ARP	0.000
MILAN 2	0.013
STENNIS CORS ARP	0.004
REGGIO 2	0.021
V 375	-0.005

Of these differences, only A 193 stands out at 7 cm. That mark was freed up and a constrained vertical adjustment was run.

CONSTRAINED VERTICAL ADJUSTMENT

Orthometric heights determined for the 2004.65 epoch of NAVD 88 were derived from two sources, either GPS 2021/C or GPS 2100, and constrained for the following marks in a preliminary adjustment:

A 152	G 365
ALCO	GRAND ISLE CORS ARP
876 1899 B TIDAL	MILAN 2
C 189	STENNIS CORS ARP
COVINGTON CORS ARP	REGGIO 2
DISTRICT 1 A	V 375
ENGLISH TURN 2 CORS ARP	

G 358

The following 15 highest vertical residuals resulted:

<u>v</u>	<u>From</u>	<u>SSN</u>	<u>4-char ID</u>	<u>To</u>	<u>SSN</u>	<u>4-char ID</u>
0.0602	16	G 358		10	876 1899 B TIDAL	
0.0492	15	ENGLISH TURN 2 CORS		17	G 365	
0.0449	5	A 152		10	876 1899 B TIDAL	
-0.0400	10	876 1899 B TIDAL		3	179B	
-0.0396	18	GRAND ISLE CORS ARP		22	REGGIO 2	
-0.0380	18	GRAND ISLE CORS ARP		16	G 358	
-0.0367	23	V 375		24	WES 19	
-0.0355	10	876 1899 B TIDAL		22	REGGIO 2	
0.0355	5	A 152		10	876 1899 B TIDAL	
0.0349	19	MILAN 2		15	ENGLISH TURN 2 CORS A	
0.0347	22	REGGIO 2		15	ENGLISH TURN 2 CORS A	
-0.0337	18	GRAND ISLE CORS ARP		19	MILAN 2	
0.0337	5	A 152		2	876 1602 C TIDAL	
0.0297	12	COVINGTON CORS ARP		20	STENNIS CORS ARP	
-0.0296	3	179B		5	A 152	

On the basis of the above residuals, 3 additional marks were freed up in a test: 876 1899 B, ENG2 CORS ARP and G 365. These did not shift enough to merit re-adjustment, however (3, 0 and 2 cm respectively) and were returned as constraints. 876 1899 B orthometric ht shifted to -0.022 m from 0.009; G 365 shifted to 0.219 m from 0.243.

FINAL FREE ADJUSTMENT WITH ACCURACIES

QQ records were generated and a final free adjustment with accuracies was run. Standard deviations were scaled by the a-posteriori standard deviation ('Y' was put in MM record column 4). The length-relative accuracies are listed below, followed by the ellipsoid height accuracies.

LENGTH RELATIVE ACCURACIES (USING A-POSTERIORI WEIGHTS)

SSN	FROM STATION	SSN	TO STATION	DISTANCE METERS	INTERNAL ACCURACY	EXTERNAL ACCURACY	SURVY ORDER
(0015)	ENGLISH TURN 2 CORS ARP	(0023)	V 375	5083	1:	3100000 1:	607233 B
(0004)	874 7437 TIDAL 1	(0008)	B 31 USE	15227	1:	4700000 1:	932068 B
(0004)	874 7437 TIDAL 1	(0009)	BROWN 2	16435	1:	4700000 1:	949190 B
(0011)	C 189	(0014)	E 3145	3597	1:	1400000 1:	1095758 B
(0007)	ALCO	(0013)	DISTRICT 1 A	10761	1:	3800000 1:	2347718 B
(0015)	ENGLISH TURN 2 CORS ARP	(0022)	REGGIO 2	18097	1:	12000000 1:	2380878 B
(0007)	ALCO	(0024)	WES 19	16927	1:	5200000 1:	2947633 B
(0011)	C 189	(0023)	V 375	21462	1:	13000000 1:	3053890 B
(0002)	876 1602 C TIDAL	(0005)	A 152	7440	1:	3100000 1:	3804084 B
(0023)	V 375	(0024)	WES 19	10464	1:	3600000 1:	3871739 B
(0015)	ENGLISH TURN 2 CORS ARP	(0017)	G 365	26390	1:	11000000 1:	3891018 B
(0013)	DISTRICT 1 A	(0023)	V 375	15753	1:	6100000 1:	4089165 B
(0007)	ALCO	(0017)	G 365	16064	1:	5900000 1:	4127162 B
(0011)	C 189	(0022)	REGGIO 2	26558	1:	13000000 1:	4310612 B
(0006)	A 193	(0021)	PIKE RM 3	13902	1:	4500000 1:	4504237 B
(0001)	876 1494 C TIDAL	(0019)	MILAN 2	16500	1:	5800000 1:	5368457 B
(0015)	ENGLISH TURN 2 CORS ARP	(0019)	MILAN 2	52062	1:	23000000 1:	5681789 B
(0015)	ENGLISH TURN 2 CORS ARP	(0021)	PIKE RM 3	37464	1:	18000000 1:	5775357 B
(0011)	C 189	(0020)	STENNIS CORS ARP	38396	1:	24000000 1:	6970995 B
(0002)	876 1602 C TIDAL	(0019)	MILAN 2	22134	1:	9300000 1:	7483942 B
(0014)	E 3145	(0021)	PIKE RM 3	12589	1:	4300000 1:	7591371 B
(0005)	A 152	(0010)	876 1899 B TIDAL	20531	1:	8900000 1:	7752871 B
(0003)	876 1799 B TIDAL	(0005)	A 152	18543	1:	5600000 1:	8036986 B
(0015)	ENGLISH TURN 2 CORS ARP	(0020)	STENNIS CORS ARP	61803	1:	46000000 1:	8333330 B
(0015)	ENGLISH TURN 2 CORS ARP	(0018)	GRAND ISLE CORS ARP	68036	1:	38000000 1:	9291433 B
(0016)	G 358	(0018)	GRAND ISLE CORS ARP	40402	1:	12000000 1:	9480518 B
(0018)	GRAND ISLE CORS ARP	(0019)	MILAN 2	34950	1:	16000000 1:	10264104 B
(0010)	876 1899 B TIDAL	(0016)	G 358	29945	1:	8400000 1:	11106667 B
(0010)	876 1899 B TIDAL	(0022)	REGGIO 2	39175	1:	18000000 1:	11115581 B
(0020)	STENNIS CORS ARP	(0021)	PIKE RM 3	24344	1:	12000000 1:	11139841 B
(0006)	A 193	(0009)	BROWN 2	13771	1:	4000000 1:	13152962 B
(0007)	ALCO	(0011)	C 189	26765	1:	14000000 1:	14983210 B
(0008)	B 31 USE	(0020)	STENNIS CORS ARP	42394	1:	14000000 1:	16495678 B
(0012)	COVINGTON CORS ARP	(0020)	STENNIS CORS ARP	48474	1:	44000000 1:	20643070 B
(0022)	REGGIO 2	(0023)	V 375	22058	1:	12000000 1:	23005800 B
(0003)	876 1799 B TIDAL	(0010)	876 1899 B TIDAL	20609	1:	6400000 1:	24698287 B
(0018)	GRAND ISLE CORS ARP	(0022)	REGGIO 2	67006	1:	33000000 1:	52527084 B
(0001)	876 1494 C TIDAL	(0002)	876 1602 C TIDAL	7980	1:	3000000 1:	66373755 B

Distribution of Ellipsoid Height Accuracies

OC	Number of Accuracies
---	-----
11	0
12	0
21	0
22	0
31	1
32	2
41	11
42	22
51	2
52	0
low	0

FINAL BLUE BOOK AND CHECKING PROGRAMS

ELEVUP was used to combine the horizontal and vertical blue books. Checking programs were run on the final Bfile, the Dfile and the Gfile.

EQUIPMENT

The GPS receivers and antennas used in the project are listed below.

GPS Receivers Used

<u>Manuf</u>	<u>Model</u>	<u>Serial Number</u>
TRIMBLE	DUAL CARRIER PHASE	PPS4000SSE 3343A04302
TRIMBLE	DUAL CARRIER PHASE	PPS4000SSI 3608A14652
TRIMBLE	DUAL CARRIER PHASE	PPS4000SSE 3343A04305
TRIMBLE	DUAL CARRIER PHASE	PPS4000SSE 3403A04927
TRIMBLE	DUAL CARRIER PHASE	PPS4000SSE 3343A4300
TRIMBLE	DUAL CARRIER PHASE	PPS4000SSI 3608A14570
TRIMBLE	DUAL CARRIER PHASE	PPS4000SSI 3324A03158
TRIMBLE	DUAL CARRIER PHASE	PPSNET RS 4508245731
ASHTECH	DUAL CARRIER PHASE	PPSZ-12 05436
TRIMBLE	DUAL CARRIER PHASE	PPSNET RS 4549261225
TRIMBLE	DUAL CARRIER PHASE	PPS4000SSI 3835A23672

GPS Antennas Used

<u>Model</u>	<u>Serial Number</u>
TRM22020.00+GP	0220010011
TRM22020.00+GP	0220050496
TRM22020.00+GP	0220010015
TRM22020.00+GP	0220024415
TRM22020.00+GP	0220024419
TRM22020.00+GP	0220132680
TRM22020.00+GP	0220050907
TRM22020.00+GP	0220010018
ASH701945E_M	SCIS 620024509
ASH701945E_M	SCIS 620024335
ASH700829.3	SNOW 11028
TRM22020.00+GP	0220024412

Appendix 32

IPET Digital Leveling Specifications

New Orleans Specific Leveling Procedures for Tidal Bench Marks – Exclusively, Second Order, Class II, for Bluebook entry into the National Geodetic Survey (NGS) Data Base.

Interagency Performance Evaluation Team, Task 6 (IPET 6)

NOTE: The following procedures have been established for connecting tidal bench marks to the NAVD 88 (2004.65) adjustment and are specific to the work related to the IPET. The following procedures are a mix of acceptable and non-acceptable procedures. These procedures cannot be used for any other leveling programs other than the one listed above.

Leveling

NOTE: All leveling will follow the guidelines as laid out below with one exception. Due to the possibility of moving around the turning points too much in the marsh areas, you will be allowed to take one setup [(mark to mark) uneven]. This is if the distance between mark to instrument (not greater than 70 meters) and instrument to mark (not greater than 70 meters) allows for a single setup. Please note that the processing program will not accept any readings that the distance exceeds the allowable, therefore it is advised that the shots be kept below 68 meters to eliminate the possibility of taking a longer shot than is required. **If the over all distance between the marks are greater than 140 meters total then even setups will be required. At all other tide stations you will be required to take even setups as described in item 4 for the “Running the sections (Mark to Mark)” section of this document. Adherence to these procedures, except for the allowance of single setup in the marsh area, will be followed or data will not be accepted by NGS.** All questions concerning these procedures shall be sent too or addressed to Ronnie Taylor or Brian Shannon.

Also, we want to restate something that may have not been understood. We are running second order class II procedures for the observations, but are not making the two mark tie to the NAVD 88 (2004.65) conventionally. The tie (connection) to the NAVD 88 (2004.65) is being made using GPS, therefore the tie is a GPS tie. The heights for these marks will be published as been connected by GPS and will not carry the second order class II accuracy statement, but a statement that lets everyone know the accuracy of the heights are based from a Height Modernization Mark and will be published to the nearest centimeter. The relative accuracy in difference in heights will be good to second order class II, but not the heights themselves.

Equipment Check List

Most of the tide stations for this project are accessible only by boat. The following equipment requirements are for all gages that require access by boat. Before leaving the boat ramp, make sure the following equipment is onboard.

Equipment checklist for tide stations in the marsh

1. Digital Level
2. Stiff Leg Tripod (FIGURE 7)
3. two fiberglass rods with bull's-eye bubble
4. Thermometer (to be secured to the tripod near the instrument)
5. Brush cutting equipment
6. Sledge Hammer in marsh areas
7. 2"x 2" stakes to support the tripod legs and rod in marsh areas
8. Shovel
9. Double headed nails for turning points on 2"x 2" stakes
10. Backup sheets for recording necessary information (figure 6)

Equipment checklist for tide stations that are on solid ground

1. Digital Level
2. Stiff Leg Tripod (FIGURE 7)
3. two fiberglass rods with bull's-eye bubble – use of Barcode INVAR rods are acceptable see figure 8.
4. Thermometer (to be secured to the tripod near the instrument)
5. Brush cutting equipment
6. Hammer
7. Turning pins or turning plates if working urban area on sidewalks
8. Shovel
9. Backup sheets for recording necessary information (figure 6)

Four Concerns with leveling

- 1) Turning Points in the Marsh
- 2) Curvature
- 3) Refraction
- 4) Instrument Collimation

NOTE: Most of this information is taken directly from the U.S. Department of Commerce, "User's Guide for the Installation of Bench Marks and Leveling Requirements for Water Level Stations", October 1987.

http://140.90.121.76/publications/users_guide_for_installation_of_Bench_Mark.pdf

1) Turning Points in Marsh Areas

Page 25 of the User's Guide, Figure 4 illustrates the construction of posts to support the rod and level. No method can be specified beforehand for these marsh situations because of different soil conditions. Both the rod and the level must be supported on stable platforms. It is suggested to drive a two-headed nail on the stake or hub supporting the rod so the rod can simply be rotated by the rod person instead of the rod person walking around the turning point and disturbing the setup.

2) Curvature

The level measurement is tangent to the curved level surface of the earth. The earth curvature is approximately 8 inches (one cinder block height w/ mortar joint) per mile. The correct formula is $C_f = 0.0785 K^2$ where C_f "is earth curvature in meters and "K" is kilometers.

Second order, class II leveling procedures will be followed for this project with the exception of using fiberglass rods for the entire project and single setups for the stations that are in the marsh. Following is an example of the site length distance allowable for Second order, class I and II, also showing the tolerance for setup imbalance which is the same for both class I and class II. **Second order, Class I maximum length of site from rod to instrument is 60 meters and Second order, Class II maximum length of site from rod to instrument is 70 meters. Both second order, class I and second order, class II maximum difference between foresight and backsight lengths are never to exceed 5 meters per setup (although 10 meter imbalance is allowed with 3-wire leveling not spirit or digital) and 10 meters overall**

3) Refraction

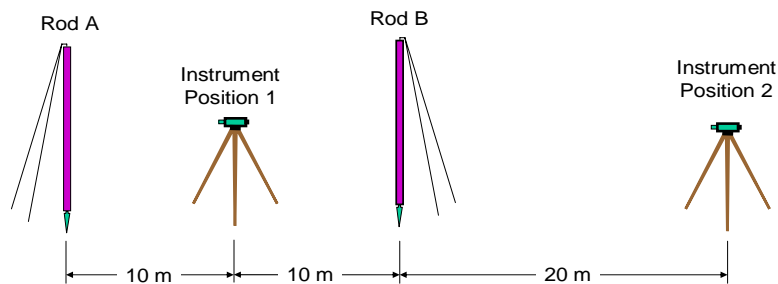
Refraction correction either helps or compounds the curvature error by a magnitude of one-seventh (or 14%) of the earth curvature. During the day, the denser air is above the earth because the air is cooler with altitude. This is mentioned in the literature as a negative temperature gradient – i.e. during the day the temperature drops approximately 3.5 degrees Fahrenheit per thousand feet of altitude. During the night, refraction compounds the curvature error because the earth cools faster than the air above it - i.e. a positive temperature gradient.

For these reasons above, temperature is recorded during geodetic surveys. Tripod heights are well above the ground and rod shots are never below half (0.5) meter from the bottom of the rod. The exception is when a monument may be located on say a gravity structure that can only be measured from a high setup reading a few centimeters of rod above the monument.

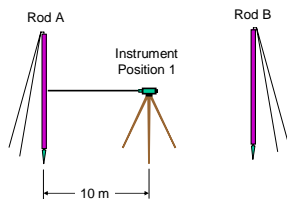
5) Collimation

The first task upon reaching the station and setting the Vertical Control Survey in motion to connect to the GPS survey in motion should be to remove the level instrument from the case and set it on the tripod while getting everything ready for the “C” shot (collimation check). This will allow the instrument to stabilize (acclimatize). The Kukkamaki Method is the recommended method to be used for this project. The 5 figures below show the complete setup for a “C” shot and then the sequence of observation.

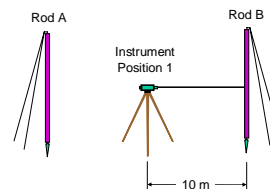
Collimation Check - Kukkamaki Method A x B x



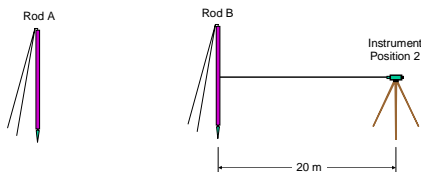
Collimation Check - Kukkamaki Method A x B x



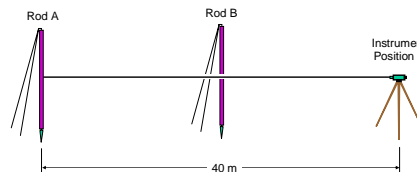
Collimation Check - Kukkamaki Method A x B x



Collimation Check - Kukkamaki Method A x B x



Collimation Check - Kukkamaki Method A x B x



NOTE: A new c-shot (collimation) shall be taken at the beginning of each day or when leveling is to begin at a different tide station. Example; you start the day at gage xxx yyyy and complete the survey. Then you move to gage xxx zzzz, a new c-shot (collimation) must be taken for gage xxx zzzz. This is required for several reasons, but primarily due to having a required c-shot for each project. Each gage site relative survey will be considered a separate subproject.

The collimation of the instrument should not exceed 10 arc seconds. After the collimation has been completed you must write the collimation on the backup sheets (figure 6) along with other required information. A sample of the backup sheet follows. **The header, code 1 and code 2 only have to be filled out at the beginning of the day,** if there is a change in observer, change in equipment, etc. otherwise after the first section only the code 11 and code 99 information has to be completed. The form also allows for the computation to ensure that the sections close.

Running the sections (Mark to Mark);

A section is beginning on one mark and ending on another mark (turning points are only holders of the height difference to be transferred). A separate handout is provided for setting the level instrument up and on how to code the instruments. Each manufacture has a slightly different way of coding the instrument. Each section must have the following:

1. Before running the section fill code 11 out on the backup sheets and the code (key) in the instrument. **NOTE: SEE SECTION 13 FOR SEQUENCE OF CODE TO BE ENTERED.**
2. Always make sure that the starting height in the instrument is 0.00000, this is because we are running differences in heights not heights (elevations)
3. Always run the instrument in the BF (backsight/foresight) format
4. Always begin with rod one on the mark and end with rod one on the mark (even set-ups).
5. Always level the instrument in the direction of the back rod.
6. Always read the back rod first then turn and read the front rod (never let the back rod person move until the front rod reading has been completed).
7. Before the reading on the ending mark make sure you key the DEFINE BARCODE SPSN (SSN) in the instrument. You will have to remember the number of setups the instrument was showing and add one since the SPSN will replace the setup number. SPSN stands for survey point serial number this

number is assigned to a mark and is used in the description program, leveling processing, and the abstract. The SPSN should be assigned when the recon is done and the descriptions are written. This way the observing crew will have the SPSN prior to running the levels.

8. The number 1 rod person (always on the mark) will call out the stamping on the mark before the observations are taken to ensure that the correct mark is being observed. If it is a different mark the recorder can write it down on the backup sheet correctly. **NOTE: the 99 record is never completed until the rod person calls out the stamping on the mark they are about to set the rod on.**
9. After the section has been closed out you will begin the next section by filling out another backup sheet. Remember after the first section only the code 11 and code 99 records have to be completed at the beginning and ending of the section.
10. If this is the second run for the section (both forward and backward are closed out) the form has a block at the bottom of the page which allows you to check to see if the section (forward and backward runs) checks. **NOTE: if one section is less than 0.10 kilometer distance or one setup, the section closure allowable is 1 mm. If the shortest distance of the section is more than 0.10 kilometer and multiple setups, then you multiply the square root of the km distance and multiply that times the allowable, which in the case of using the fiber glass rods would be second order class II, 8 mm times the square root of the shortest km distance. If you are using INVAR rods then we will be doing second order class I and the closure would be 6 mm times the square root of the shortest km distance.**
11. At the end of the day, after the last section a code 9999 shall be entered. This will let the processor know that the day has ended and to look for a new collimation check and code 1 and 2 record for the next day.
12. Processing the data:

Download the WinDesc and Translev program from the following site: http://www.ngs.noaa.gov/PC_PROD/PARTNERS/index.shtml. These are the programs that are used to produce the description file (WinDesc) and to process the bar code digital level data (Translev). These programs will put everything into a blue book format for submittal to NGS. Translev will process the level data and let you know what problems may exist. **Beware only the code records, code 1, 2, 11, 33, 99 can be changed or corrected based on the backup sheets. No data streams can be altered, if alter the project will be returned as being unacceptable. Before you start processing a days work create a folder that will hold the original data as it came from the instrument, then create a working directory which will hold the data that you will process. Both the processed files and the original data will be submitted. A list of what has to be submitted will follow.**

13. Leveling Procedural “Codes”

Code 1 Entered at the beginning of the day, change in observer, or change in instrument

Code 2 Entered at the beginning of the day or change in level instrument or level rods

Code 11 Entered at the beginning of each section

Code 22 Will reject a previous backsight and foresight

Code 33 Temperature code inserted after each set-up if recording gradient temperatures

Code 99 Entered at the end of a section

Code 9999 Entered at the end of the day or change of observer or equipment

14. SHORT LIST OF RULES;

NEVER SET UP ON ASPHALT

DOUBLE RUN EVERYTHING

NEVER READ BELOW 0.5 METER ON THE ROD (EXCEPTION IS WHEN MARK IS SET ON A STRUCTURE THAT IS WELL ABOVE THE GROUND, SUCH AS THE GUARD RAIL OF A BRIDGE)

ALL 3 CROSSHAIRS MUST BE ON THE ROD

SAME ROD ON BEGINNING AND ENDING BENCH MARKS

USE HAMMER AND PINS AS TURNING POINTS (SOME EXCEPTIONS WILL BE MADE AS STATED IN SOW)

ALWAYS KEEP A HAND ON THE LEVEL ROD WHEN SET UP

DO NOT TAKE ROD OFF TURNING POINT AFTER THE HEIGHTS HAVE BEEN TRANSFERRED TO YOUR TURNING (ONLY TAKE OFF AFTER THE OBSERVER HAS TRANSFERRED THE HEIGHT DIFFERENCE FROM THE BACK ROD TO THE FRONT ROD AND THE OBSERVER GIVES THE BACK ROD PERSON THE OK TO MOVE AHEAD)

Page 7 of 10

KEEP SETUP IMBALANCE AT A MINIMUM (BY KEEP THE IMBALANCE AT A MINIMUM SEVERAL POTENTIAL CORRECTIONS WILL BE CANCELED OUT, SUCH AS CURVATURE)

ALWAYS COMPLETE THE LEVELING IN ONE DIRECTION ALL THE WAY THROUGH ALL THE TIDAL MARKS BEFORE RUNNING THE SECTIONS BACK. (AS AN EXAMPLE: NEVER RUN TIDAL A TO TIDAL B AND TURN AROUND AND RUN IT BACK AND THEN MOVE TO TIDAL B AND RUN TO TIDAL C AND BACK. ALWAYS RUN TIDAL A TO TIDAL B, THEN TIDAL B TO TIDAL C, THEN TIDAL C TO TIDAL D, AND TIDAL D TO TIDAL E. THEN TURN AROUND AND RUN THE SECTIONS BACK TIDAL E TO TIDAL D, TIDAL D TO TIDAL C, TIDAL C TO TIDAL B, AND TIDAL B TO TIDAL A).

THE FOLLOWING IS A NON ACCEPTABLE PROCEDURE AND WILL NOT BE ACCEPTED, NEVER SET THE INSTRUMENT UP IN ONE SPOT AND TAKE ALL THE READINGS FROM THE SAME LOCATION. FOR THE STATIONS IN THE MARSH WHERE ONE SETUP IS BEING ALLOWED YOU STILL HAVE TO COMPLETE THE LEVELING AS MENTIONED ABOVE AND ON THE SECOND (BACKWARD) RUN YOU WILL HAVE TO RESET THE INSTRUMENT (BREAK DOWN AND RESET). IF YOU ARE RUN ON ANY OF THE DRIVE TOO MARKS TWO SETUPS ARE REQUIRED THEREFORE MOVEING THE INSTRUMENT IS ALSO A MUST.

PRECISE DIGITAL LEVELING – BACKUP RECORDING SHEET					
LINE	PROJECT		FILENAME	PAGE	
L-				OF	
SURVEY ORDER	SURVEY CLASS	TIME ZONE CODE	TEMP PROBE TOP HGT	TEMP PROBE BOTTOM HGT	
			M	M	
CODE 1 – BEGINNING OF DAY OR CHANGE IN OBSERVER / EQUIPMENT					
INFO 1 DATE (MMDDYY)	INFO 2 OBSERVER #	OBSERVER INITIALS	INFO 3 INST TYPE	INFO 4 TEMP CODE	
CODE 2 – EQUIPMENT USED					
INFO 1 INST S/N	INFO 2 COLLIMATION "	ROD CODE	INFO 3 ROD 1 S/N	INFO 4 ROD 2 S/N	
CODE 11 – BEGINNING SECTION INFORMATION					
SPSN #	BENCH MARK STAMPING	INFO 1 TIME	INFO 2 ROD/MK	INFO 3 TEMP	DIR F / B
CODE 99 – ENDING SECTION INFORMATION					
SPSN #	BENCH MARK STAMPING	INFO 1 TIME	INFO 2 ROD/MK	INFO 3 TEMP	INFO 4 W / S
SECTION OBSERVATION INFORMATION					
TOTAL SETUPS	TOTAL DISTANCE (KM)	ACCUMULATED IMBALANCE (M)	ELEV DIFFERENCE (M)		
	CLOSURE	REMARKS			
F					
B					
DIF					
ALW'D					

FIGURE 6 BACKUP RECORDING SHEET



FIGURE 7 STIFF LEG TRIPOD



FIGURE 8 INVAR ROD

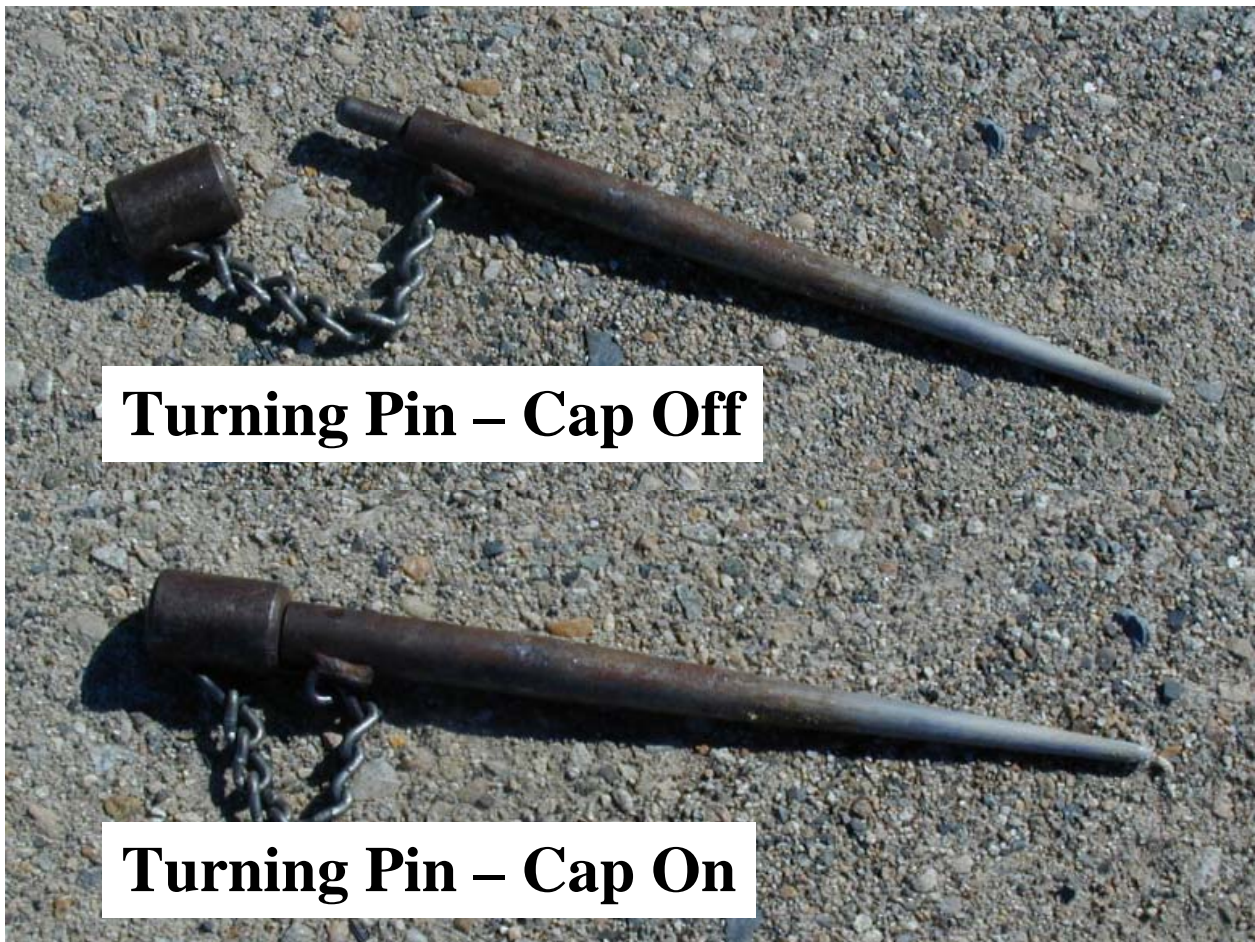


FIGURE 9 TURNING PINS

Appendix 33

IPET Survey Task Order–Contract Scope of Work-20 Nov 05

ORDER FOR SUPPLIES OR SERVICES

1. CONTRACT/PURCH. ORDER/ AGREEMENT NO. W912P9-06-D-0508	2. DELIVERY ORDER/ CALL NO. 0001	3. DATE OF ORDER/CALL (YYYYMMDD) 2005 Dec 05	4. REQ./ PURCH. REQUEST NO. W81C8X-5335-8160	5. PRIORITY
---	-------------------------------------	--	---	-------------

6. ISSUED BY CONTRACTING DIVISION USARMY ENGR DIST ST LOUIS 1222 SPRUCE ST RM 4.207 ST LOUIS MO 63103-2833	CODE W912P9	7. ADMINISTERED BY SEE ITEM 6 (if other than 6)	CODE	8. DELIVERY FOB <input checked="" type="checkbox"/> DESTINATION <input type="checkbox"/> OTHER (See Schedule if other)
--	----------------	--	------	---

9. CONTRACTOR 3001 INC 5525 MOUNES ST SUITE 102 NEW ORLEANS LA 70123	CODE 1B6Y4	FACILITY	10. DELIVER TO FOB POINT BY (Date) (YYYYMMDD) SEE SCHEDULE	11. MARK IF BUSINESS IS <input type="checkbox"/> SMALL <input type="checkbox"/> SMALL DISADVANTAGED <input type="checkbox"/> WOMEN-OWNED
NAME AND ADDRESS			12. DISCOUNT TERMS	
13. MAIL INVOICES TO THE ADDRESS IN BLOCK See Item 15				

14. SHIP TO GEOSPATIAL ENGINEERING BRANCH 1222 SPRUCE ST ST LOUIS MO 63103-2833	CODE W912P9	15. PAYMENT WILL BE MADE BY USACE FINANCE CENTER ST LOUIS DISTRICT (B3) 5722 INTEGRITY DRI MILLINGTON TN 38054-5005	CODE W912P9	MARK ALL PACKAGES AND PAPERS WITH IDENTIFICATION NUMBERS IN BLOCKS 1 AND 2.
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16. TYPE OF ORDER	DELIVERY/ CALL	<input checked="" type="checkbox"/>	This delivery order/call is issued on another Government agency or in accordance with and subject to terms and conditions of above numbered contract.
	PURCHASE	<input type="checkbox"/>	Reference your quote dated Furnish the following on terms specified herein. REF:

ACCEPTANCE. THE CONTRACTOR HEREBY ACCEPTS THE OFFER REPRESENTED BY THE NUMBERED PURCHASE ORDER AS IT MAY PREVIOUSLY HAVE BEEN OR IS NOW MODIFIED, SUBJECT TO ALL OF THE TERMS AND CONDITIONS SET FORTH, AND AGREES TO PERFORM THE SAME.

NAME OF CONTRACTOR	SIGNATURE	TYPED NAME AND TITLE	DATE SIGNED (YYYYMMDD)
<input type="checkbox"/> If this box is marked, supplier must sign Acceptance and return the following number of copies:			

17. ACCOUNTING AND APPROPRIATION DATA/ LOCAL USE
See Schedule

18. ITEM NO.	19. SCHEDULE OF SUPPLIES/ SERVICES	20. QUANTITY ORDERED/ ACCEPTED*	21. UNIT	22. UNIT PRICE	23. AMOUNT
SEE SCHEDULE					

* If quantity accepted by the Government is same as quantity ordered, indicate by X. If different, enter actual quantity accepted below quantity ordered and encircle.	24. UNITED STATES OF AMERICA TEL: 314-331-8505 EMAIL: A BY: ARCHIE C. RINGGENBERG	<i>Archie C. Ringgenberg</i> CONTRACTING / ORDERING OFFICER	25. TOTAL \$287,381.00
			26. DIFFERENCES

27a. QUANTITY IN COLUMN 20 HAS BEEN
 INSPECTED RECEIVED ACCEPTED, AND CONFORMS TO THE CONTRACT EXCEPT AS NOTED

b. SIGNATURE OF AUTHORIZED GOVERNMENT REPRESENTATIVE	c. DATE (YYYYMMDD)	d. PRINTED NAME AND TITLE OF AUTHORIZED GOVERNMENT REPRESENTATIVE
--	-----------------------	---

e. MAILING ADDRESS OF AUTHORIZED GOVERNMENT REPRESENTATIVE	28. SHIP NO.	29. DO VOUCHER NO.	30. INITIALS
f. TELEPHONE NUMBER	g. E-MAIL ADDRESS		31. PAYMENT <input type="checkbox"/> PARTIAL <input type="checkbox"/> FINAL
36. I certify this account is correct and proper for payment.			32. PAID BY
a. DATE (YYYYMMDD)	b. SIGNATURE AND TITLE OF CERTIFYING OFFICER		33. AMOUNT VERIFIED CORRECT FOR
			34. CHECK NUMBER
			35. BILL OF LADING NO.

37. RECEIVED AT	38. RECEIVED BY	39. DATE RECEIVED (YYYYMMDD)	40. TOTAL CONTAINERS	41. S/R ACCOUNT NO.	42. S/R VOUCHER NO.
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Section B - Supplies or Services and Prices

SCOPE OF WORK

29 November 2005

Interagency Performance Evaluation Team (IPET) for New Orleans and vicinity Hurricane Protection System

Task Group No. 6--Vertical Datum Elevation Modeling

GEODETTIC CONTROL AND TOPOGRAPHIC SURVEYS OF SE LOUISIANA HURRICANE PROTECTION
AND FLOOD CONTROL PROJECTS

3001, Inc
W912P9-06-D-0508

SCOPE OF WORK

1. LOCATION OF WORK. Geodetic control and topographic surveys will be performed in greater New Orleans and SE Louisiana (Orleans, Jefferson, St. Bernard, St. Charles, and Plaquemines Parishes), on hurricane protection and flood protection projects in and around (but not limited to) the following projects:

Lake Pontchartrain, LA and Vicinity Hurricane Protection Project (HPP)

The New Orleans to Venice, LA, HPP

The West Bank and Vicinity, New Orleans, LA, HPP

The Grande Isle and Vicinity (Larose to Vicinity of Golden Meadow) HPP

The Grand Isle and Vicinity LA, HPP

Mississippi River and Tributaries Flood Control Project (MRTFCP)

2. GENERAL PURPOSE OF SURVEYS. Geodetic and topographic surveys performed under this assignment are required to support other IPET Task Groups evaluating the performance of the existing (pre-Katrina) Federal hurricane protection system. These data will be used in hydrodynamic models and for other purposes—including support for Task Force Guardian. Since data obtained under this assignment will be used in forensic modeling, time is of the essence for completion of this work.

3. SURVEYING SERVICES TO BE PROVIDED. The services to be rendered by the Contractor shall include performance of precise vertical geodetic control surveys, topographic surveys, data analysis and adjustment, and related CADD functions. Three 4-man fully equipped conventional and GPS survey crews, each capable of performing four simultaneous static GPS occupations may be necessary. Under this task order, each field crew must possess the necessary materials and means to perform geodetic and topographic surveys as directed. An overall survey coordinator and/or survey computer shall be required for near real-time data reduction, adjustment, and submittal. Each field survey crew shall have the personnel, capability, and full survey equipment (such as fixed height tripods, dual frequency receivers, total stations, precision differential levels, calibrated invar rods, etc....) to perform the following types of surveys:

- Static DGPS Surveys (2 cm elevation accuracy determinations)
- Real-Time Kinematic Elevation Surveys
- Total Station Topography
- Differential Leveling (Second-Order, Class II)

One or more small (16-19 ft) skiff(s) with outboard motor may be required to reach some of the remote sites.

**See Appendix A for specific details on performing surveys related to Phase 1a.*

3.a. Government Furnished Information. The Government shall provide the following information to the contractor at the field site:

- List of Approved NGS Benchmarks for Primary Control;
- List of Benchmarks/Control Marks to be Surveyed;
- List of Tidal Benchmarks to be Surveyed and Tied to;
- Required Control Mark/Benchmark Description Form (Template)
- Detailed Maps of the Project Area
- Network Design Plan for DGPS Observations
- Submittal Criteria
- Template form for the submittal of data
- Pump station locations (1st Floor & invert elevations)
- Bridge surveys (floodwall & lower chord elevations and/or topo)
- Aerial/LIDAR mapping QC check points
- Floodwall and levee elevation and/or topo surveys

4. COMPLIANCE. All Surveying and Mapping products and related work shall be in strict compliance with the applicable Corps of Engineers Engineering Manuals and with related geodetic control technical standards and publications published by the National Geodetic Survey and the Federal Geodetic Control Subcommittee.

5. REFERENCED STANDARDS AND SPECIFICATIONS. The following standards and specifications shall be followed in performing various phases of the work. USACE IPET Task Group 6 personnel will only make exceptions and/or modifications to these criteria.

ER 1110-1-8156

Policies, Guidance, and Requirements for Geospatial Data and Systems

FM 3-34.331

Topographic Surveying

EM 1110-1-1000

Photogrammetric Mapping

EM 1110-1-1002

Survey Markers and Monumentation

EM 1110-1-1003

NAVSTAR Global Positioning System Surveying

EM 1110-1-1005

Control and Topographic Surveying (Draft) – Includes New Orleans District data submittal formats.

EM 1110-1-2909

Geospatial Data and Systems

FGDC 1998a

"Geospatial Positioning Accuracy Standards, PART 1: Reporting Methodology," Federal Geographic Data Committee, FGDC-STD-007.1-1998

FGDC 1998b

"Geospatial Positioning Accuracy Standards, PART 2: Standards for Geodetic Networks," Federal Geographic Data Committee, FGDC-STD-007.2-1998

FGDC 1998c

"Geospatial Positioning Accuracy Standards, PART 3: National Standard for Spatial Data Accuracy," Federal Geographic Data Committee, FGDC-STD-007.3-1998

FGDC 1998d

"Content Standard for Digital Geospatial Metadata (Version 2.0)," Federal Geographic Data Committee, FGDC-STD-001-1998

FGDC 2002

"Geospatial Positioning Accuracy Standards, PART 4: Standards for Architecture, Engineering, Construction (A/E/C) and Facility Management," Federal Geographic Data Committee, FGDC-STD-007.4-2002

FGCS 1984

Federal Geodetic Control Subcommittee 1984

"Standards and Specifications for Geodetic Control Networks," Rockville, MD.

FGCS 1988

Federal Geodetic Control Subcommittee 1988

"Geometric Geodetic Accuracy Standards and Specifications for Using GPS Relative Positioning Techniques (Preliminary)", Rockville, MD. (Reprinted with Corrections: 1 Aug 1989).

NGS 1988

National Geodetic Survey 1988

"Guidelines for Submitting GPS Relative Positioning Data to the National Geodetic Survey"

NOAA 1994

"Input Formats and Specifications of the National Geodetic Survey Data Base," NOAA, National Geodetic Survey, September 1994.

NOAA 1997

NOAA Technical Memorandum NOS NGS-58, Zilkoski, D.B., D'Onofrio, J. D., and Frankes, S. J. (Nov 1997)

"Guidelines for Establishing GPS-Derived Ellipsoid Heights (Standards: 2 cm and 5 cm)," Version 4.1.3. Silver Spring, Maryland.

NOAA 2005

Guidelines for establishing GPS derived orthometric heights (standards: 2cm and 5cm) version 1.4, National Geodetic Survey 2005 DRAFT

6. SURVEY SPECIFICATIONS.

Static DGPS Surveys. The primary control network consisting of approximately thirty points shall be performed to NGS Bluebook specifications, as directed in the network design plan as provided by the Government on site. Structure reference points, as stated in the network design plan, will not be bluebooked. The contractor shall follow detailed guidance contained in NOAA 2005 for all 2-cm accuracy GPS differential height surveys. This guidance is supplemented by the criteria in EM 1110-1-1003. All static GPS survey network designs shall be approved in advance by the NGS Representative on Task Group 6. All ties shall be relative to the NAVD88 (VTDP 2004) benchmark network.

RTK Surveys. Supplemental RTK elevation surveys to various structures shall follow the guidance in EM 1110-1-1003. Equivalent Third-Order accuracy elevations are required on flood control structures. Follow standards and specifications in EM 1110-1-1005 for fieldwork, metadata formats, and New Orleans District specific submittal formats.

Differential Leveling Surveys. Follow procedural guidance for Second-Order, Class II differential leveling in EM 1110-1-1005.

Topographic Surveys. (Total Station & Data Collector). Follow guidance outlined in EM 1110-1-1005.

7. TASK 6 POINTS OF CONTACT. The primary IPET (Task 6) points of contact for this work are:

Mr. Mark Huber (New Orleans District) 504-931-5949
Mr. Robert Mesko (St. Louis District) 314-630-5815
Mr. Jeff Navaille (Jacksonville District) 904-232-2499
Mr. Bill Bergen (HQ, USACE) 904-534-6980
Mr. James Garster (Topographic Engineering Center) 703-428-9026
Mr. Ronnie Taylor (National Geodetic Survey) 850-294-3072

Additional contact information (e.g., e-mail addresses) will be furnished upon award or commencement of work. Close coordination with these personnel is emphasized given the need to prioritize structure surveys.

8. WORK ASSIGNMENTS. Specific GPS and topographic surveys of flood/hurricane protection structures will be assigned by IPET Task Group 6 personnel in the New Orleans District office. These surveys will be phased based on prioritization requirements from the various hydrodynamic modeling Task Groups under the IPET. Daily field coordination with Task Group 6 points of contact shall be made in order to expedite survey tasks. Static DGPS surveys require coordination and approval by the NGS Representative in Task Group 6.

9. DATA PROCESSING AND SUBMITTAL. Given the critical urgency of this data collection effort, observed field data will be processed and adjusted (preliminary values) on site. The Contractor shall make the necessary computations to verify the correctness of all measurements and apply the proper theory of location in accordance with the law or precedent and publish the results of the survey. Compute and tabulate the horizontal and vertical positions on all work performed. The survey Contractor shall furnish data (raw data files in native format and RINEX, log sheets, obstruction charts and other field notes) directly to the Task 6 team in the New Orleans District Office within 24 hours after the survey data is collected in the field. The data shall be processed, adjusted and submitted within 48 hours of field collection. Static DGPS survey observations will be readjusted by the NGS. RTK, leveling, and topographic data collection formats shall conform to the criteria in EM 1110-1-1005, including those required by the New Orleans District. Digital data shall be submitted on Recordable (CD-R) Compact Disk, media. Compact Disk, Rewritable (CD-RW) will not be accepted.

a. The survey Contractor shall furnish any and all data requested by the POC's listed above, this includes the COPIES OF THE FIELD BOOKS, HARD COPY MAPS, DIGITAL FILES (X, Y, Z, DGN, OR DTM. All data (copies or plots) shall be stamped with a disclaimer such as PRELIMINARY OR ADVANCE COPY, FOR FIELD REVIEW ONLY, SUBJECT TO CORRECTIONS.

b. The following is a list of files that shall be submitted, as applicable to the particular type of geodetic/topographic survey work performed at a particular hurricane protection structure:

Raw data files (GPS or topographic data collector)
Adobe Acrobat pdf files of all field notes
XYZ ASCII files (unsorted, EM format w/ embedded metadata)
DGN design files
DTM surface files

ALG alignment files
TML template files
RWL roadway files
Readme files that explicitly detail the files
submitted
Daily Log of survey activities at the project site

c. The final data shall be submitted on CD-ROM at the conclusion of the project and under the direction of the New Orleans District Survey Section, a final project CD will be compiled and submitted. The CD will contain all of the partial project data sets in addition to a final overall set of files for the project (single overall DGN, etc.).

10. DIGITAL GEOSPATIAL METADATA. Metadata are “data about data”. Metadata describes the content, identification, data quality, spatial data organization, spatial reference, entity and attribute information, distribution, metadata reference, and other characteristics of data. Each survey project shall have metadata submitted with the final data submittal. All metadata submitted must be compliant with the Federal Geographic Data Committee Standard “Content Standard for Digital Geospatial Metadata”, FGDC-STD-001-1998. This standard is available for download from www.fgdc.gov. A graphical, annotated workbook explaining the standard is available in PDF format at www.fgdc.gov. Corpsmet95 is available for download from www.corpsgeol.usace.army.mil, and may be used to prepare metadata. All sections applicable to this collection effort must be completed.

11. CADD. Where required, topographic survey data shall be provided in 3D design files in Microstation V8.

a. GLOBAL ORIGIN. The design files shall have a global origin of 0, 0, 2147483.65. Design file working units shall be set to US Feet with the label set to FT. Drawing file names will be based on and named for the site surveyed or as directed by the District Office.

b. DIGITAL TERRAIN MODEL (DTM) DATA. The Contractor shall develop and deliver a surface model of the survey area using Intergraph compatible Digital Terrain Modeling software and the model file shall have the .dtm extension. The digital terrain model shall be developed from the collected data. Breaklines should include ridges, drainage, road edges, surface water boundaries, and other linear features implying a change in slope. The surface model shall be of adequate density and quality to produce a 1-foot contour interval derived from the original DTM (Digital Terrain Model) file. The contour data shall be incorporated as a reference file into the final data set. All data used to develop the DTMs shall be delivered in Bentley Microstation 3-D design files.

c. MODEL DGN FILES (SCALE 1:1).

(1) The topographic data shall be provided in one DGN file and shall be attached to the sheet files.

(2) The control/baseline data shall be provided in one DGN file and shall be attached to the sheet files.

d. COVER AND CONTROL SHEET. The first sheet shall be a cover sheet showing the control sketch, survey control tabulation, sheet layout or index, legend, project location map, survey notes, north arrow, graphic scale, grid ticks, and large signature block. Tabulate, plot, and list the horizontal control used for the survey on the final drawings.

e. PLAN SHEETS. The plan sheets shall be prepared same as Enclosure 1, in the Corps of Engineers format showing notes, title block, grid, north arrow, graphic scale, legend, sheet index. Sheets shall be oriented with north to the top. The extreme right 7 inches of the sheet shall be left blank for notes, legends, etc. The second sheet and all sheets following shall be a continuation sheet and shall have a minimum of two notes, note 1: See Drawing number 1 for notes, note 2: *Refer to Survey No. YY-YYY*.

f. SECTION VIEWS. The sections shall be extracted and displayed from the digital terrain model (DTM OR TTN) utilizing INROADS. The sections shall be generated or extracted along the same azimuth as the section was collected in the field. The sections shall be displayed at a 10 to 1 vertical exaggeration. The planimetric lines

(alignment of extraction), alignment, stations, and cross sections shall be displayed in one DGN file (NO PLOTS) with the district border file attached.

12. SURVEY/QUALITY CONTROL REPORT. The Contractor shall furnish a digital (*.doc) file on the final CD. The report shall include Right-of-Entry information, Control monuments Designation recovered, destroyed, fixed, included in control network, dates of field survey collection, types of equipment used, quality control checks, and digital files. Unique circumstances and/or issues related to this survey, general approach/methodology to this survey. Along with any other data required in accordance with the law or precedent and for the Corps of Engineers to publish the results of the survey.

13. MONUMENT DESCRIPTION REPORT. The contractor shall furnish a detailed monument description sheet for each control monument set, found or otherwise used in the completion of this survey. The document "*Monument-Description-Template.doc*" provides guidance as to what type of information must be included in these reports. Among the types of information that should be included are: Station name, survey name/number, written "To Reach" navigation instructions, vicinity map, type of monument (size and setting), date set or recovered, establishing agency, datum information, adjusted position, swing ties to aid in future recovery, scanned sketches and digital photos.

14. NOT TO EXCEED. It is emphasized that the Not To Exceed amount for this Task Order is \$288,000.00 and that the line item's will be identified during the negotiations for this Not to Exceed amount. The Contractor shall not provide services in excess of 85% of this total amount without first receiving written authorization from the Contracting Officer. It is the Contractor responsibility to notify this office prior to reaching 85% of the Not To Exceed amount. Payments will be made on the fixed unit prices of the task order for services performed, as reflected by DAILY TIME SHEETS submitted with the pay estimates. Upon completion of all services, if the total amount for services provided is less than the stated amount, the price of the delivery order will be modified to reflect services actually performed and accepted. To certify the hours worked and progress, a digital excel spread sheet shall be submitted on Monday of each week showing Survey crew members hours worked, work accomplished, Project Manager, Computer person, CADD person and the percentage used of the Not To Exceed amount.

15. Schedule and Submittal. All tasks (1-5) shall be completed as scheduled. All submittals including, original data sheets, maps, disk, and documentation, source code, etc. will be submitted to the Corps of Engineers, Geospatial Engineering Branch, CEMVS-ED-S, ATTN: Bob Mesko, 1222 Spruce, St. Louis, MO 63103-2833 by 30 March 2006 and shall become the sole property of the U.S. Government.

16. Time Extensions: In the event these schedules are exceeded due to causes beyond the control and without fault or negligence of the contractor, as determined by the Contracting Officer, this delivery order completion date will be extended one (1) calendar day for each day of delay. Requests for time extension for an individual task order should be forwarded to the Contracting Officer no later than fourteen (14) days preceding the completion date shown on the task order.

Appendix A.

Specific Phase 1a Information:

Background: A GPS static survey is needed to incorporate Tidal Benchmarks into the NAVD88 (VTDP 2004) vertical control for the New Orleans area. This information will be used to tie the water datums to the geodetic datum (NAVD88 (VTDP 2004)) in support of construction activity in New Orleans. Leveling will be required between three tidal benchmarks at each tide station to verify the station vertical datum integrity. NOAA leveling standards for tidal benchmarks will be provided to the contractor. GPS static survey measurements on one of these same three benchmarks will be submitted for "Blue Book" publication into the National Geodetic Survey (NGS) database of geodetic survey monuments. This particular GPS static survey will form a GPS static network composed of four tidal benchmarks from each of the four tide stations in the survey to four control monuments with NAVD 88 (VTDP 2004) elevations. This derivative NAVD 88 datum has been developed specifically for settlement issues in

New Orleans. "VTDP" is an acronym for Vertical Time Dependent Position. Four vertical control stations are required for this survey due to the settlement problems in New Orleans. Because some of the control monuments may span a great distance from the tidal benchmarks, each GPS static survey will require four hours of occupation. Two 4-hour GPS sessions will be required to best determine the ellipsoid height of a tidal benchmark.

This GPS static survey will follow the latest NGS procedures for the vertical two-centimeter local accuracy/five centimeter absolute accuracy standards and the NGS Blue-Book Standards for incorporation of survey information into the NGS Database for NGS Data Sheet publication. The survey measurements from the geodetic primary control to the tidal benchmarks will be established as secondary control accuracy standards. A federal representative will be available in the field to monitor the fieldwork during this survey. The contractor will submit a GPS survey plan to NGS prior to going into the field. The NGS point of contact for the contractor will be Mr. Ronnie Taylor at 904.488.2427.

Access to the control stations may be accomplished by motor vehicles as well as the first two tide stations listed below in the next section of this document. The last two tide stations are accessed by boat. Two boats may be required, as the stations will be occupied by GPS equipment at the same time

The National Ocean and Atmospheric Administration (NOAA) Tide Stations to be included in a network with the four NAVD 88 (VTDP 2004) monuments are:

- 1) 8761487, Chef Menteur, Chef Menteur Pass
- 2) 8761678, Michoud Substation, ICWW
- 3) 8761529, Martello Castle, Lake Borgne
- 4) 8761305, Shell Beach, Lake Borgne

Note: Second-Order, class II, levels between at least three benchmarks at each tide station above are required. Published NOAA Bench Mark Sheets for each tide station and a sketch depicting the tidal benchmarks are included with this Scope of Work.

The GPS network for this survey has four ties to the NAVD 88 (VTDP 2004). These stations are:

- 1) *PIKE RESET, PID BH1164 HOR ORDER - B, VERT ORDER – FIRST CLASS I, ELLIP ORDER - FOURTH, CLASS I
- 2) WASTE WELL 2 RESET, PID BH1089 VERT ORDER – FIRST CLASS I
- 3) ALCO, PID BJ1342 HOR ORDER - B, VERT ORDER – THIRD, ELLIP ORDER - FOURTH, CLASS I
- 4) V 375, PID AT0760 HOR ORDER - B, VERT ORDER – FIRST CLASS II, ELLIP ORDER - FOURTH, CLASS II

NOTE: C 189, PID BH1119 was searched 15 October and 9 November 2005 with no success finding the monument.

*PIKE RESET may not be suitable for GPS (tree) based on remarks from field reconnaissance personnel on the two dates above. A suggestion made 15 October was to run levels from PIKE RESET sixty-seven feet to PIKE RM 3 (BH1160) and use this as the control elevation.

Appendix 1(a)

Tidal Bench Mark Reconnaissance

Perform Reconnaissance for the nine historical benchmark sites below:

- | | | | |
|----|---|-------------------|----------------|
| 1. | 8761602, Lake Judge Perez, Hermitage Bayou– 7 BM's
Marks.2.Bench Marks | Vehicle Access.2. | Bench |
| 2. | 8761484, Lease VB #4, Bayou Dulac– 5 BM's | Boat Access .2. | Bench Marks.2. |

Bench Marks			
3.	8761742, Mendicant Island, Barataria Bay– 5 BM's Bench Marks	Boat Access .2.	Bench Marks.2.
4.	8761414, Billet Bay Community, Billet Bay – 5 BM's Bench Marks	Boat Access .2.	Bench Marks.2.
5.	8761679, St. Marys Point, Barataria Bay– 5 BM's Marks	Boat Access .2.	Bench Marks.2. Bench
6.	8761198, Chevron Station 289, Pelican Island– 5 BM's Bench Marks	Boat Access .2.	Bench Marks.2.
7.	8760889, Olga Compressor Station, Grand Bay– 5 BM's Bench Marks	Boat Access .2.	Bench Marks.2.
8.	8761108, Bay Gardene – 5 BM's Bench Marks	Boat Access .2.	Bench Marks.2.
9.	8761799, M.V. Petroleum Dock, Bayou St. Denis – 5 BM's Marks	Boat Access 3.2.	Bench Marks.2. Bench

The following equipment will be required to perform the procedures at each tide station:

- 1) Tidal Bench Mark Sheet Descriptions - look for monuments
- 2) Digital Camera – possible five photographs for each monument
- 3) surveyor's chains (or fiber glass tapes) - verify published distances of the data sheet
- 4) compass - verify directions of the published data sheet
- 5) hand-held GPS unit good to three thousands of a minute (6.076 feet ~ 6 feet) precision – locate each found tidal benchmark
- 6) field notebook – party chief's notes for each site (include weather info and site characteristics and possible site difficulties for GPS survey operations and leveling)
- 7) clip board with paper – prepare site sketch depicting the found benchmarks, GPS suitable monuments with horizon sketches.

1) Tidal Bench Mark Sheet Descriptions

The engineering firm will download the NOAA Tidal Bench Mark Sheets from the NOAA website <http://www.co-ops.nos.noaa.gov/> . The government will supply the engineering firm with sketches of the above nine tide station sites to help recover the tidal benchmarks.

2) Digital Camera

Place a tripod or four to five foot jade pole with flagging over the found monument and photograph the monument in a way that captures well-defined permanent features so the monument may possibly be relocated by looking at the photograph. If no well-defined permanent features are available, then photograph the monument from the four cardinal directions, not too close, not too far away. Name the photograph with the station name and direction to the object photographed. For example, 8761799BMctoSW.jpg or 8761799BMAtoE.jpg.

Digital photographs shall be taken showing the stamping and casting of bench mark disks (photo taken within 0.5 m to 1 m above the disk and must be legible), general location and any other major changes in a station. The digital file for a bench mark photo shall have the bench mark designation in its file name.

All digital photo files should be named such that the name of the file will indicate the station number and the type of photo taken. For example, the pressure sensor photo for DCP1 at San Francisco shall be named as 94142901 sensor N1.jpg. The bench mark photos at San Francisco showing the benchmark stamping should be named as 9414290 (designation) face.jpg.

3) surveyor's chains

Verify published distances to the monuments listed on the Tidal Bench Mark Sheet. Each found monument will typically have three references to the monument from well-defined permanent objects.

4) compass

Verify published directions to the monuments listed on the Tidal Bench Mark Sheet. Each found monument will typically have three references to the monument from well-defined permanent objects.

5) hand-held GPS unit

Use a hand-held GPS unit good to three thousands of a minute (6.076 feet ~ 6 feet) precision. Locate each found tidal benchmark.

6) field notebook

Party chief's notes for each site shall include: weather information, site characteristics, possible site difficulties for GPS survey operations, possible site difficulties for leveling, and survey personnel present.

7) clip board with paper

Prepare site sketch depicting the found benchmarks. Prepare a sketch for the most GPS suitable monument at each tide station with a horizon sketch depicting obstacles for GPS signals. NOAA has historically used 8"x11" paper for these sketches, so do not put the sketches in a field notebook. The government will forward tide station sketches that may be used to as a guide for the contractor's sketch.

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0001		1	Lump Sum		\$287,381.00

Project: Geodetic Control and Topographic Surveys of SE Louisiana - Hurricane Protection and Flood Control Projects

Section F - Deliveries or Performance

DELIVERY INFORMATION

COMPLETION DATE

30-MAR-2006

POC ADDRESS

US ARMY CORPS OF ENGINEERS
ST LOUIS DISTRICT
GEOSPATIAL ENGINEERING BRANCH
ATTN DANNY MCMURPHY (314) 331-8389
1222 SPRUCE ST
ST LOUIS MO 63103-2833

FOB: Destination

Section G - Contract Administration Data

ACCOUNTING AND APPROPRIATION DATA

AA: 96X31250000 082413 3230LG72J6099993 NA 96233
COST 000000000000
CODE:
AMOUNT: \$287,381.00

Appendix 34

NAVD88 ETL 1110-1-152 1994

CECW-EP

Technical Letter
No. 1110-1-152

1 January 1994

Engineering and Design CONVERSION TO THE NORTH AMERICAN VERTICAL DATUM OF 1988

1. Purpose

This technical letter provides technical guidance and implementation procedures for the conversion from the National Geodetic Vertical Datum of 1929 (NGVD29) to the North American Vertical Datum of 1988 (NAVD88).

2. Applicability

This letter is applicable to all HQUSACE elements, major subordinate commands, districts, laboratories, and field operating activities having responsibility for civil works, military construction, or environmental restoration projects.

3. References

a. Water Resources Development Act of 1992 (WRDA 92), Section 224, Channel Depths and Dimensions.

b. EM 1110-2-1003, Hydrographic Surveying.

c. Converting the National Flood Insurance Program to the North American Vertical Datum of 1988: Guidelines for Community Officials, Engineers, and Surveyors, FEMA Report No. FIA-20, June 1992.

d. Results of the General Adjustment of the North American Datum of 1988, American Congress on Surveying and Mapping Journal of Surveying and Land Information Systems, Vol. 52, No. 3, 1992, pp. 133-149.

e. American Congress on Surveying and Mapping Ad Hoc Committee Report on NAVD88, Special ACSM Report, 1990.

4. Discussion

a. NGVD29 has been replaced by NAVD88, an international datum adopted for use in Canada, the United States and Mexico. NAVD88 was established to resolve problems and discrepancies in NGVD29. The adjustment

of NAVD88 was completed in June 1991 by the National Geodetic Survey (NGS), an agency of the Department of Commerce, National Oceanic and Atmospheric Administration (NOAA). NAVD88 was constrained by holding fixed the height of a single primary tidal benchmark (BM) at Father's Point/Rimouski, Québec, Canada, and performing a minimally constrained general adjustment of U.S.-Canadian-Mexican leveling observations. The result of this adjustment is newly published NAVD88 elevation values for benchmarks (BMs) in the NGS inventory. Most Third-Order BMs, including those of other Federal, state and local government agencies, were not included in the NAVD88 adjustment. Appendix A contains further background information on the development and adjustment of NAVD88.

b. The Federal Geodetic Control Subcommittee (FGCS) of the Federal Geographic Data Committee (FGDC) has affirmed that NAVD88 shall be the official vertical reference datum for the U.S. The FGDC has prescribed that all surveying and mapping activities performed or financed by the Federal Government make every effort to begin an orderly transition to NAVD88, where practicable and feasible.

c. Both tidal and non-tidal low water reference planes and datums are affected by the change to NAVD88. The datum for the Great Lakes is now the International Great Lakes Datum of 1985 (IGLD85). Unlike the prior datum (IGLD55), IGLD85 has been directly referenced to NAVD88 and originates at the same point as NAVD88. Elevations of reference points/datums along the various inland waterway systems will also be impacted by the change in datums.

d. The transition to NAVD88 may have considerable impact on Corps projects, including maps, drawings, and other spatial data products representing those projects. However, once completed, the transition will result in a more accurate vertical reference datum that has removed leveling errors, accounts for subsidence, and other changes in elevation.

e. A computer program entitled "VERTCON 1.0" can be used to make approximate conversions between NGVD29 and NAVD88. This program was developed by NGS and during the later part of FY94 will be incorporated into the USACE program CORPSCON. VERTCON conversions are intended for general small-scale mapping uses -- VERTCON should not be used for converting benchmark elevations used for site plan design or construction applications. Further details on VERTCON are at Appendix A.

5. Action

a. USACE commands should begin the orderly transition to NAVD88. Procedural guidance for performing this conversion is given in Appendix A.

b. The conversion to NAVD88 should be accomplished on a project by project basis. The relationship of all project datums to both NGVD29 and NAVD88 will be clearly noted on all drawings, charts, maps, and elevation data files.

c. In accordance with Section 24 of WRDA 92, when elevations are referred to a tidal reference plane in coastal waters of the U.S., Mean Lower Low Water (MLLW) shall be used as the vertical datum. Tidal BMs should be tied to NAVD88 instead of NGVD29 where NAVD88 data is available. Tidal datums shall be established in accordance with the procedures outlined in EM 1110-2-1003.

FOR THE DIRECTOR OF CIVIL WORKS:

1 Appendix
APP A - Development and Implementation of
NAVD88

d. Other hydraulic-based reference planes established by USACE for the various inland waterways, reservoirs, and pools between control structures should continue to be used for consistency; however, they should also be connected with the NAVD88 where practicable and feasible.

e. In project areas where local municipal or sanitary jurisdictions have established their own vertical reference planes, every attempt should be made to obtain the relationship between that local datum and NGVD29 and/or NAVD88; and clearly note this relationship on all drawings, charts, maps, and elevation data files.

5. Technical Assistance

The U.S. Army Topographic Engineering Center (USATEC) may be consulted if technical assistance is required in the conversion effort. Contact Commander and Director, USATEC, ATTN: CETEC-TL-SP, Building 2592, Fort Belvoir, VA 22060-5546. The HQUSACE proponent for this action is the Engineering Division, Directorate of Civil Works, ATTN: CECW-EP-S.

PAUL D. BARBER
Chief, Engineering Division
Directorate of Civil Works

APPENDIX A DEVELOPMENT AND IMPLEMENTATION OF NAVD88

SECTION I Background

1. General

a. The NAVD88 is a new vertical datum for North America which effectively covers Canada, Mexico, and the U.S. The new adjustment of the U.S. National Vertical Control Network (NVCN) was authorized in 1978, and in 1982 the National Oceanic and Atmospheric Administration (NOAA) and Canada signed a Memorandum of Understanding (MOU) regarding the adoption of a common, international vertical control network called the NAVD88.

b. The Federal Geodetic Control Subcommittee (FGCS) of the Federal Geographic Data Committee (FGDC) has adopted the new NAVD88 datum. In addition, NAVD88 was established in conjunction with the International Coordinating Committee on Great Lakes Basic Hydraulic and Hydrologic Data. This committee defined the IGLD85 which was published for use in January 1992. IGLD85 replaced IGLD55.

2. The National Vertical Control Network (NVCN): NGVD29 and NAVD88

a. The NVCN consists of a hierarchy of interrelated nets which span the United States. Before the adoption of NAVD88, benchmark (BM) elevations of the NVCN were published as orthometric heights referenced to NGVD29. NGVD29 was established by the United States Coast and Geodetic Survey's (USC&GS's) 1929 General Adjustment. NGVD29 was established by constraining the combined U.S. and Canadian first order leveling nets to conform to Mean Sea Level (MSL) as determined at 26 long term tidal gage stations that were spaced along the east and west coast of North American and along the Gulf of Mexico, with 21 stations in the U.S. and 5 stations in Canada.

b. Local MSL is a vertical datum of reference that is based upon the observations from one or more tidal gaging stations. NGVD29 was based upon the assumption that local MSL at those 21 tidal stations in the U.S. and 5 tidal stations in Canada equalled 0.0000 foot on NGVD29. The value of MSL as measured over the Metonic cycle of 19 years shows that this assumption is

not entirely valid and that MSL varies from station to station.

c. The NGVD29 was originally named the Mean Sea Level Datum of 1929. It was known at the time that because of the variation of ocean currents, prevailing winds, barometric pressures and other physical causes, the MSL determinations at the tide gages would not define a single equipotential surface. The name of the datum was changed from the Mean Sea Level Datum to the NGVD29 in 1973 to eliminate the reference to sea level in the title. This was a change in name only; the definition of the datum established in 1929 was not changed. Since NGVD29 was established, it has become obvious that the geoid based upon local mean tidal observations would change with each measurement cycle. Estimating the geoid based upon the constantly changing tides does not provide the most stable estimate of the shape of the geoid, or the basic shape of the Earth.

d. The datum for NAVD88 is based upon the mass or density of the Earth instead of the varying heights of the seas. Measurements in the acceleration of gravity are made at observation points in the network and only one datum point, at Pointe-au-Pere/Rimouski, Québec, Canada, is used. The vertical reference surface is therefore defined by the surface on which the gravity values are equal to the control point value. Although the international cooperation between the United States and Canada greatly strengthened the 1929 network, Canada did not adopt the 1929 vertical datum. The NGVD29 was strictly a national datum. NAVD88 is an international vertical datum for the US, Canada, and Mexico.

3. Distinction Between Orthometric and Dynamic Heights

a. There are several different reference elevation systems used by the surveying and mapping community. Two of these height systems are relevant to IGLD85: orthometric heights and dynamic heights. Geopotential numbers relate these two systems to each other. The geopotential number (*C*) of a BM is the difference in potential measured from the reference geopotential surface to the equipotential surface passing through the

survey mark. In other words, it is the amount of work required to raise a unit mass of 1 kg against gravity through the orthometric height to the mark. Geopotential differences are differences in potential which indicate hydraulic head. The orthometric height of a mark is the distance from the reference surface to the mark, measured along the line perpendicular to every equipotential surface in between. A series of equipotential surfaces can be used to represent the gravity field. One of these surfaces is specified as the reference system from which orthometric heights are measured. These surfaces defined by the gravity field are not parallel surfaces because of the rotation of the earth and gravity anomalies in the gravity field. Two points, therefore, could have the same potential but may have two different orthometric heights. The value of orthometric height at a point depends on all the equipotential surfaces beneath that point.

b. The orthometric height (H) and the geopotential number (C) are related through the following equation:

$$C = G * H$$

where G is the gravity value estimated for a particular system. Height systems are called different names depending on the gravity value (G) selected. When G is computed using the Helmert height reduction formula that is used for NAVD88, the heights are called Helmert Orthometric Heights. When G is computed using the International Formula for Normal Gravity, the heights are called Normal Orthometric Heights. When G is equal to normal gravity at 45° latitude, the heights are called Normal Dynamic Heights. It should be noted that dynamic heights are just geopotential numbers scaled by a constant, using normal gravity at 45° latitude equal to 980.6199 gals. Therefore, dynamic heights are also an estimate of hydraulic head. In other words, two points that have the same geopotential number will have the same dynamic height.

c. IGLD55 is a normal dynamic height system which used a computed value of gravity based on the International Formula for Normal Gravity. Today, there is sufficient observed gravity data available to estimate "true" geopotential differences instead of "normal" geopotential differences. The "true" geopotential differences, which were used in developing IGLD85 and NAVD88, will more accurately estimate hydraulic head.

4. Problems with NGVD29 and Why a New Datum Needed to be Established

a. Approximately 625,000 km of leveling have been added to the National Geodetic Reference System (NGRS) since the 1929 adjustment. Each new line has been adjusted to the network. The new leveling data uncovered some problems in NGVD29. Through the years, the agreement between the new leveling and the network BM elevations slowly grew worse. An investigation of NGVD29 general adjustment results indicates that large residuals were distributed in some areas of the country during that adjustment. For example, the accumulated 1929 adjustment correction along a 3000 km east-west leveling route from Crookston, Minnesota, to Seattle, Washington is a delta of 89 centimeters (cm).

b. Inconsistencies in NGVD29 have increased over the years. This increase is a function of factors such as:

(1) Many BMs were affected by unknown vertical movement due to earthquake activity, postglacial rebound, and ground subsidence.

(2) Numerous BMs were disturbed or destroyed by highway maintenance, building, and other construction.

(3) New leveling became more accurate because of better instruments, procedures, and improved computations. It was decided in 1977 that the high accuracy achieved by the new leveling was being lost when forced to fit the 1929 network, and plans were made to begin developing a new national vertical network.

c. These inconsistencies have not always been apparent to the user since NGS has periodically readjusted large portions of the NVCN and spread these large residuals over large areas. Eventually, however, there would be a large number of areas in which surveyors would not be able to check their work using NGVD29. NAVD88 is specifically designed to remove the inconsistencies and distortions such as those found in the NGVD29. NGS has held off incorporating approximately 40,000 km of newer leveling data for these reasons. These data were incorporated into the NAVD88.

5. Selection of the Adjustment Method for NAVD88

a. The FGCS created a Vertical Subcommittee in 1989 to study the impact of the NAVD88 on the programs of member agencies and to recommend a datum definition. Several different datum definitions for

NAVD88 were studied by the subcommittee and the three options below were selected for final consideration:

(1) Fix the elevation or mean sea level at a single point.

(2) Fix mean sea level at four tide gages located at the network corners.

(3) Fix the NGVD29 elevations at 18 existing, well scattered BMs.

b. Two options were considered for the establishment of the vertical datum: (1) tidal epoch or (2) a minimally constrained adjustment. The tidal epoch option required that the adjustment hold MSL fixed at all appropriate primary tide stations and use the latest available tidal epoch. This definition is actually the same as NGVD29, but used the latest data available. The other option used a minimally constrained adjustment holding local MSL fixed at one primary tide station and adjusting all leveling data to it. This second option would maintain the integrity of the leveling data but would also create the greatest deviation from the presently published data.

c. Research was done by NGS to determine which option would be the best choice. To assist in the NAVD88 datum definition decision, several adjustments were performed using different constraints. The results obtained from several trial adjustments indicate that no matter which datum definition scenario is chosen for NAVD88, including a minimally constrained adjustment, that changes in absolute heights of as much as 75 to 100 cm would exist between NGVD29 and NAVD88.

d. In addition to the NGS research, agencies and appropriate bodies were queried to determine which option would be their preference and to ask for recommendations. The FGCS and the American Congress on Surveying and Mapping (ACSM) established committees to investigate the impact of NAVD88 on their members' activities and the activities of others in the community. Members of these committees were requested to provide documentation on the affects that the readjustment would have on their user populations and to include specific examples describing the real impact of a new vertical datum on their products. USACE was included in the questionnaire survey. The ACSM report is included as a reference to this document.

e. As a preliminary measure, both committees drafted recommendations for NAVD88 and specified that NGS should:

(1) Perform minimally-constrained least squares adjustment of the data for NAVD88.

(2) Shift the datum vertically to minimize recompilation of National Mapping Products.

(3) Develop computer transformation software to convert between NGVD29 and NAVD88. ("VERTCON").

(4) Develop national and/or regional geoid models to ensure GPS height differences meet at least 2nd Order, Class II FGCS precise geodetic leveling standards for accuracy.

f. Results indicated that the tidal epoch option would minimize the magnitude of the changes from NGVD29 to NAVD88 and thus possibly allow direct comparison of present hydrographic survey elevations with the proposed new NAVD88 elevations. The smaller change between elevations would cause less confusion and concern over flow heights, and the like. Regardless of the datum definition selected, large differences would exist between the NAVD88 and the NGVD29 heights. It should be noted that the NAVD88 heights are better estimates of orthometric heights than the NGVD29 heights. Better estimates of orthometric heights will become more critical in the future as surveying techniques continues to become more sophisticated and more accurate. The improved accuracy of geoid height determinations using GPS data requires the best estimate of true orthometric heights. Many cartographers want heights on their maps based on the best estimate of true orthometric heights.

6. The NAVD88 Adjustment

a. The NAVD88 adjustment is the culmination of over ten years of work. This effort has included: establishing about 100,000 km of trunk line leveling to reinforce weak areas in the network; modernizing the vast amount of leveling observation and description data that has been collected for over a century; performing adjustments of sections of the network to verify the quality of the observation data; informing the public users of the network of the pending change and determining the impact on the nation's engineering activities. After the datum definition was selected to be a minimally

constrained adjustment, the final task of this effort was to perform the least squares adjustment of the whole network.

b. The general adjustment of NAVD88 was completed in June 1991. The primary network consists of 200 loops containing 909 junction BMs. The network connects to 57 primary tidal stations which are part of the National Primary Tidal Network and 55 international water-level stations along the Great Lakes. In addition, 28 border connections were made to the Canadian vertical control network and 13 to the Mexican vertical control network. Third order BMs of other agencies (e.g., USACE) were not included in this adjustment. The 500,000 BMs established by the USGS were also not placed in computer readable form and therefore will not have NAVD88 heights. In addition, USACE commands have established thousands of BMs which will not have NAVD88 heights.

c. A particular concern for the developers of the NAVD88 was how to resolve the many issues associated with the National Mapping Program (NMP) of USGS and the National Map Accuracy Standard (NMAS). The NMP includes more than 83,000 different map products of which over 7 million copies are distributed annually. Almost all of these products contain elevation information as contours and spot elevations on maps or as elevation arrays in Digital Elevation Models. Changing these products, both graphical and digital, to the NAVD88 will be a massive and costly undertaking and will require a decade or more to complete.

d. The new leveling data have additional corrections applied for refraction and rod correction and are adjusted in geopotential units rather than the orthometric system used in the past. The datum definition is the most scientifically acceptable of all the definitions considered and is the most natural because it is based on an undisturbed representation of the Earth's gravity field. It is the most suitable for the geoid height computations needed for the reduction of GPS ellipsoidal heights. The main disadvantage is the differences with MSL on the west coast. At Seattle, a person standing on the zero elevation contour (NAVD88) will barely have their head above water at midtide.

e. Preliminary analysis indicates that the overall differences between orthometric heights referred to NAVD88 and to the NGVD29 range from approximately -40cm to +150cm. Most surveying applications should

not be significantly affected because the changes in relative height between adjacent BMs in most geotechnically stable areas should be less than 1 cm. In many geotechnically stable areas, a single bias factor describing the difference between NGVD29 and NAVD88 can be estimated and used for most mapping applications. This was a significant consideration for assessing the impact on the National Mapping Products. The absolute height values will change much more, but this should not be the surveyor's biggest concern, since he/she should be concerned with ensuring that all height values of BMs are referenced to the same vertical datum. The overall differences between dynamic heights referred to the IGLD85 and to IGLD55 will range from approximately 1 to 40 cm.

7. Maintenance of Parallel Datums by NGS: NAVD88 and NGVD29

For a period of time, NGS will support both the NAVD88 and the NGVD29. Beyond the next 5-7 years, continued maintenance of NGVD29 will depend on user demands and budget constraints.

SECTION II

Impact of NAVD88 Conversion on Other Hydraulic Reference Datums

8. International Great Lakes Datum of 1955 (IGLD55)

a. IGLD55 is a datum common to the United States and Canada and is defined by international agreement. Before the establishment and adoption of the IGLD55, the differences in elevation between the lakes had been determined but had not been connected to sea level and lake level data published from the United States and Canada did not match for the same lakes and rivers. The IGLD55 was an international cooperative effort between the those two countries, the result of which was that the Great Lakes-St. Lawrence River system was then covered by a single uniform vertical control network. The IGLD55 is different and separate from the NGVD29.

b. IGLD55 is by definition a hydraulic (i.e., dynamic) datum. The reference zero for IGLD55 is based on mean water level surface at Father's Point (Pointe-au-Pere), Québec, Canada. Holding this point fixed determined the IGLD55 datum. A procedure termed a "water level transfer" has been used to establish a local vertical datum on each of the Great Lakes. Research has concluded that the water level transfer technique was concluded to be at least as accurate as First-Order, Class I geodetic leveling. The remaining lakes were incorporated using a combination of level lines and water level transfers. Adjusted elevations on the IGLD55 are referenced using the dynamic number system. The dynamic value of a benchmark (BM) is not a true linear elevation, but a serial number given to the level surface on which the mark lies. Dynamic elevations were adopted for the IGLD55 primarily because they provide a means by which the geopotential hydraulic head can be measured more accurately between two points.

c. The earth's crust experiences movements around the entire Great Lakes and St. Lawrence River area. Therefore, the vertical reference datum for this area must be vertically readjusted every 25 to 30 years. This crustal movement is called "isostatic rebound," which is the gradual rising of the earth rebounding from the weight of the glaciers during the last glacial age. When IGLD55 was created, it was known that readjustment would be necessary due to the effects of isostatic rebound. Crustal movement is not uniform across the Great Lakes basin and causes bench marks to shift not only with respect to each other, but also with respect to the initial reference

point. Subsidence and other local effects can cause bench marks to shift as well.

9. International Great Lakes Datum of 1985 (IGLD85)

a. The Coordinating Committee on Great Lakes Basic Hydraulic and Hydrologic Data revised the IGLD55 datum and established IGLD85. This committee has input to the international management of the Great Lakes-St. Lawrence River system. Representatives from the U.S. and Canada are members on this committee. The efforts of the Coordinating Committee to revise IGLD55 and establish IGLD85 were coordinated with the efforts to establish the new common international vertical datum for the US, Canada and Mexico, NAVD88.

b. The IGLD85 is the current vertical control reference system in the Great Lakes Basin. The IGLD55 was the vertical control reference system for this area until the publication of the IGLD85 in January, 1992. Originally, an IGLD 80 had been planned, but the project was extended. The epoch that was actually used to determine the mean water level for the new datum was from 1983-1988 of which the mean year is 1985. The reference zero point for IGLD85 is located at benchmark #1250G, located at Rimouski, Québec. This benchmark has an IGLD85 elevation of 6.723 meters and IGLD55 elevation of 6.263 meters. IGLD85 increases the number and accuracy of benchmarks in the Great Lakes area. Corps districts were targeted to have converted over to IGLD85 by January of 1993. This cannot be practically done until NOAA publishes complete IGLD85 BM data for the area. IGLD85 data is available for the gages, but the spacing of the gages is not dense enough to support conversion of local project control.

c. Agencies in the U.S. and Canada will use IGLD85. The National Oceanic Service (NOS) and the Canadian Hydrographic Service (CHS) began reporting water levels referenced to IGLD85 upon its implementation in January, 1992. For a period of time, conversion factors for both IGLD55 and IGLD85 water level data will be provided by NOAA/NOS Great Lakes Section and CHS. The monthly water level bulletins published by USACE and CHS will reflect this information.

d. IGLD85 will not change water levels established for federal flood insurance programs in the US. These levels will be referred to NAVD88. Elevations common to both NAVD88 and IGLD85 are available from NOAA. Lake-level outflows also will not be affected by the datum change to IGLD85. As benchmark information becomes available, navigation, construction, and other improvement work on the Great Lakes should be referred to IGLD85. Either datum is acceptable until the benchmark data is available for the respective USACE District or project area. Drawings shall include a note for the vertical IGLD datum in use to avoid blunders. USACE permit applications will still be referenced to the Ordinary High Water Mark (OHWM) as defined under Section 10 of the Rivers and Harbors Act. As benchmark information becomes available, new applications should reference IGLD85.

10. NAVD88 and IGLD85

a. The specific needs of the Great Lakes system were taken into account while the decision were being made about how NAVD88 was to be established. Analyses of data in the Great Lakes Basin was used to determine the effects of the datum constraint, magnitudes of height changes from the IGLD55, deficiencies in the network design, selection of water-level station pairs to be used to generate zero geopotential difference observations, and additional leveling requirements. This coordination provided a check on the accuracy of the work and established a conversion between the IGLD85 and NAVD88.

b. Elevations referenced to NGVD29 are unacceptable for use in resolving the involved problems of the Great Lakes System. The reference zero for NGVD29 is not located within the Great Lakes system and orthometric elevations are not sufficient for use with large bodies of water such as the Great Lakes. The dynamics of large bodies of water are not modelled well by considering them as single equipotential surfaces. Other forces such as gravity must be considered. For example, water level measurements obtained at both ends of the Lake and connected to the NGVD29 would show some magnitude of a permanently northerly slope.

c. The general adjustment of the NAVD88 and IGLD85 is one and the same. A minimum constraint adjustment of Canadian-Mexican-U.S. leveling observations was performed holding fixed the height of the primary tidal BM, referred to the new IGLD85 local

mean sea level height value, at Father's Point/Rimouski, Québec, Canada. This constraint satisfies the requirements of shifting the datum vertically to minimize the impact of NAVD88 on USGS mapping products, as well as provides the datum point desired by the IGLD Coordinating Committee for IGLD85. The only difference between IGLD85 and NAVD88 is that IGLD85 BM values are given in dynamic height units and NAVD88 values are given in Helmert orthometric height units. The geopotential numbers of BMs are the same in both systems.

d. Geopotential numbers from the general adjustment of NAVD88 were used to compute IGLD85 dynamic heights. They will provide the best estimate of hydraulic head. If secondary gage data are placed in computer readable form, they will also be incorporated into NAVD88 and IGLD85. NGS will publish NAVD88 heights and provide, upon special request, geopotential numbers for all BMs included in NAVD88.

e. The use of GPS data and a high-resolution geoid model to estimate accurate GPS-derived orthometric heights will be a continuing part of the implementation of NAVD88 and IGLD85. It is important that users initiate a project to convert their products to NAVD88 and IGLD85. The conversion process is not a difficult task, but will require time and resources. Other local reference planes have been established by local jurisdictions and these can be referenced to either IGLD85 or NAVD88.

11. 1974 Low Water Reference Plane (LWRP)

a. On the Mississippi River between the mouths of the Missouri and the Ohio Rivers (the Middle Mississippi River), depths and improvements are referenced to a LWRP. No specific LWRP year is used for the Middle Mississippi north of Cairo, IL. Below Cairo, IL, depths and improvements along the Lower Mississippi River are referenced to the 1974 LWRP. This is also a hydraulic reference plane, established from long term observations of the river's stage, discharge rates, and flow duration periods. The low water profile was developed about the 97-percent flow duration line. The elevation of the 1974 LWRP drops gradually throughout the course of the Mississippi, however, some anomalies in the profile are present in places (particularly in areas containing rock bottoms or groins/weirs). The gradient is approximately 0.5 feet per river mile. The ever-changing river bottom will influence the 1974 LWRP. Changes in the stage-

discharge relationship will influence the theoretical flow line for the 1974 LWRP.

b. Construction and improvements along the lower river are performed relative to the 1974 LWRP at a particular point. Differences in 1974 LWRP elevations between successive points along the river are determined from simultaneous staff readings and are referenced to benchmarks along the bank. The 1974 LWRP slope gradients between any two points must be corrected by linear interpolation of the profile. Thus, over a typical 1-mile section of river with a 0.5-foot gradient, each 1000-foot C/C river cross section will have a different 1974 LWRP correction, each dropping successively at approximately 0.1-foot increments.

c. Where practicable and feasible, NAVD88 should be used as the common reference plane from which 1974 LWRP elevations are measured. The relationship of all project datums to both NGVD29 and NAVD88 should be clearly noted on all drawings, charts, maps, and elevation data files. All initial surveys should be referenced to both NAVD88 and NGVD29. If this is not feasible, then NGVD29 should be used as the common reference plane from which 1974 LWRP elevations are measured until the move to NAVD88 can be accomplished. Differences between the 1974 LWRP and NGVD29 are published for the reference benchmarks used to control surveys and construction activities. In some districts, surveys are performed directly on NGVD29 without regard to the 1974 LWRP profile (i.e., elevations above NGVD29 are plotted rather than depths below 1974 LWRP). The 1974 LWRP depths are then contoured from the plotted NGVD29 elevations, with the 1974 LWRP profile gradients applied during the contouring process. If a survey is conducted over a given reach of the river, the 1974 LWRP-NAVD88 and/or the 1974 LWRP-NGVD29 conversion must be interpolated based on the slope profile over that reach.

d. Controlled portions of the Upper Mississippi are referred to pool levels between the controlling structures. Although a variety of reference datums are used on other controlled river systems or impoundment reservoirs, most are hydraulically based and relate to some statistical pool level (e.g., "normal pool level," "flat pool level," "minimum regulated pool level", etc.).

e. On the Mississippi River above Melvin Price Locks and Dam at Alton, IL, to Lock and Dam No. 22 at Saverton, MO, the reference used is related to the

minimum regulated pool elevation. These pools are regulated referenced to a "hinge point". The pools are drawn down when the river's flow will provide adequate navigation depths naturally. When the flows are reduced to low volumes, the pools are reestablished and are essentially level. The depths and improvements along this reach of the Mississippi River are referenced to the "minimum regulated pool" elevations.

f. On the Mississippi River above Lock and Dam No. 22 at Saverton, MO, to St. Paul, MN, a "flat pool level" reference is used, and soundings are shown as "depth below flat pool". The flat pool is the authorized elevation of the navigation project and can be referenced to any number of local datums. Most commonly, this level is referenced to the mean sea level (MSL) datum of 1912, the general adjustment which preceded 1929. Conversions between MSL 1912 and NGVD29 are available. The Illinois Waterway pool elevations are referred to NGVD29, however, relationships to numerous other datums are also made.

g. Vertical clearances (bridges, transmission lines, etc.) are usually measured relative to high and low waters of record, or relative to full pool elevations. Shore lines shown on river drawings and navigation maps may be referenced to a low water datum (i.e., 1974 LWRP). On the Mississippi River above Lock and Dam No. 22 at Saverton, MO, the plotted shore line is referenced to full pool stage at dams with discharges equaled or exceeded 90 percent of the time. Given the variety of reference levels, special care must be taken to properly identify the nature and source of all vertical reference datums used on a project. The datum notes should include and clearly depict the relationship to NAVD88.

SECTION III

Impact of NAVD88 Conversion on U.S. Geological Survey and Federal Emergency Management Agency Programs

12. NAVD88 and the National Mapping Program (NMP)

a. The NMP of the U.S. Geological Survey (USGS) includes more than 83,000 different map products. Some 55,000 of these are in the 7.5-minute, 1:24,000-scale, primary quadrangle map series (7.5-minute quads). These maps are widely used by Corps planners. Since the 7.5-minute quad series is the largest scale in the NMP and contains the greatest detail and elevation accuracy, it will be significantly affected by the vertical datum change.

b. The contour intervals of the 7.5-minute map series are selected to best express the topography of the area. With a few exceptions, the contour intervals range from 5 feet for very flat country to 80 feet for rugged mountainous terrain. In between these limits are 10-, 20-, and 40-foot contour intervals. A few maps in recent years have been compiled with metric value contours. The USGS production processes were designed to produce maps that meet the requirements of the National Map Accuracy Standards (NMAS). This standard requires that the error in 90% of the test points be less than one-half contour interval. Field survey methods are generally used to test the maps, and the elevation on the map is determined by interpolation between contours.

c. Other forms of vertical information shown on the USGS 7.5-minute maps are BMs and useful elevations, which are indicated by a cross symbol with the elevation given to the nearest foot. These elevations are established by geodetic leveling of third-order accuracy or better. Spot elevations are measured by field or photogrammetric methods are readily identifiable features, eg: natural lakes, definite tops and saddles, fence corners, or road intersections. These elevations are usually placed at a density of about one-per-square mile and are considered to be accurate to within three-tenths of the contour interval.

d. Digital files of topographic information will also be affected by a change in the vertical datum. A Digital Elevation Model (DEM) consists of a sampled array of elevations for ground positions that are usually at regularly spaced intervals. For the 7.5-minute DEM, the horizontal framework is the Universal Transverse Mercator (UTM) system and the spacing is 30 meters.

The 1-degree DEM horizontal coordinate system is based on the latitude and longitude positions of the World Geodetic System of 1972 (WGS 72) datum and the spacing is 3 arc-seconds. Another form of the digital topographic data that will be affected by the datum conversion is the hypsography category Digital Line Graphs (DLG).

e. In support of the production of the USGS topographic maps, a 3rd order level network was established that resulted in few places being more than 5 miles from basic vertical control. These lines were usually established along farm roads, railroads, desert track roads, and mountain trails (less dense in mountain areas). USGS field surveyors have established nearly 500,000 BMs. Most of this work is on NGVD29.

f. Changing the above NMP products, both graphic and digital, to the NAVD88 will be a massive and costly undertaking and will require a decade or more to complete.

(1) In areas where the datum change is very small compared with the contour interval, advantage can be taken of the tolerance in the NMAS (i.e., 90% of the test point errors are less than ½ of the contour interval). If the datum change is only 1/10th of the contour interval, then the existing contours will still meet NMAS and will not require recompilation. The labeled elevations for BMs and spot elevations will need to be changed. This type of conversion is a low-cost approach but might be useful to extend the life of an otherwise sound map series. This is not a technically correct solution because a small bias is being introduced. Special care must be taken to insure that the contouring is in agreement with changed labeled elevations.

(2) Recompiling the contours and spot elevations on a 7.5-minute quad map is the most geometrically correct method of fitting the new vertical datum; however, this is an expensive approach. Therefore, total recompilation and recontouring due to an out-of-date datum is not considered to be cost-effective. However, some other factors may justify recompilation:

- Change to metric contours
- Terrain changes because of subsidence or other

causes

- Inaccurate existing contours or inappropriate contour interval

g. Adjusting the USGS 3rd-order leveling network to the NAVD88 is a different challenge, because high accuracy is needed to maintain its usefulness as geodetic data. This level of accuracy can only be provided by a least squares adjustment of the old observations to the new NAVD88 primary network elevations.

h. The selected NAVD88 datum definition best fits the needs of the NMP. The important characteristics are:

- Small elevation changes for the eastern half of the USA where the 7.5 map contour intervals are the smallest and large changes for the western half where contour intervals are the largest.
- The isograms representing these changes are smoother and show less irregularities.

Both of these are important if the map patching conversion techniques is to be used. The requirements are that the shift values be small compared with the contour interval and the gradient in the datum change be minimal so that a single change value can be applied over an entire 7.5-minute map with little noticeable error. A vertical shift (bias) in the defining elevation is desirable to expand the favorable interval/elevation change area over the entire U.S.

13. National Flood Insurance Program (NFIP) Transition to NAVD88

a. The NFIP is a federal program that provides identification of flood hazard areas on a community basis and includes availability of insurance against flood damages. When a community joins the NFIP, it agrees to adopt minimum Federal floodplain management criteria enforced by local regulations. The major product of the NFIP is the Flood Insurance Study (FIS) and accompanying Flood Insurance Rate Map (FIRM), which describes a community's floodplains and regulatory floodways, as well as computed flood profiles. FEMA prepares an FIS for severely flood prone communities, that identifies 100-year base flood elevations (BFEs) and flood hazard areas. Nearly all flood maps for these areas are referenced to the NGVD29. Conversion to NAVD88 will require the education of map users as well as map producers. New FISs will be based on NAVD88.

Existing studies and maps will be converted when substantive revisions occur to redefine flood hazards.

b. The dual mission of the NFIP through the Federal Insurance Administration (FIA) is to reduce future flood losses as well as provide insurance coverage to offset deficit producing disaster assistance payments. To provide the floodplain management information to the communities, FEMA provides flood hazard mapping of major flooding sources within a community, usually based on the 100 year BFEs.

c. FEMA will be converting its products the NAVD88 in a gradual process primarily as FEMA's FISs and FIRMs are republished. Currently, the vast majority of FEMA products for the NFIP are referred to NGVD29. All FEMA studies contracted for FY93 and beyond will require the use of NAVD88 as vertical control. Since October 1992, all requests for map change actions received required the inclusion of NAVD88 data. The NFIP will transition to NAVD88 on a project basis or as other reasons for revision indicate.

14. Effects of NAVD88 on FIRMs and Communities

a. The base 100-year BFEs and Elevation Reference Marks (ERMs) will be converted to NAVD88. Use of the current datum will be acceptable until the change is made of the FIRM. After that time, all flood insurance policy sales and renewals will be based on elevations referenced to NAVD88. Determination of locations of structures and proposed projects with respect to special flood hazard areas (SFHAs) will be based upon elevations referenced to NAVD88. The datum listed as the reference datum on the applicable FIRM panel should be used for Elevation Certificate completion. This is FEMA policy for all NFIP communities since the NAVD88 is defined over all these regions. For Hawaii, the Pacific Trust Territories, the Commonwealth of Puerto Rico and the US Virgin Islands, their datums will be adjusted based upon releveling work done in those areas and their 1960-78 tidal epoch. Their local datums will be designated as NAVD88 and will be defined by their current local MSL determinations.

b. The conversion of the vertical reference datum from NGVD29 to NAVD88 will take place over time and documentation should be carefully maintained to reflect which vertical reference datum was used. If a FIS is completed with ERMs referenced to NAVD88, the conversion method and results shall be part of the

deliverable items with that FIS. The FEMA Project Officer should be consulted to decide if NAVD88 must be used or not, prior to commencement of any work for that FIS.

c. No requirement is made by FEMA on local communities to relevel their local vertical control networks for NFIP purposes. If, however, the community's current vertical control system is referenced to an NGS bench mark(s) that is included in the new data available from NGS, then appropriate conversion can be made. Questions regarding the mechanics of shifting to NAVD88 may be addressed to the appropriate FEMA Regional Offices.

d. A very important potential problem is caused by mixing datums. If a consistent datum is used for determining Base 100-year BFEs and lowest floor elevation, actuarial rating and building requirements would be correctly determined. If mixed datums are used, significant problems arise. For example, if the 1-foot NAVD88 BFE is used mixed with the 2-foot NGVD29 lowest floor elevation, an error of 2 feet (not in the NFIP's favor) would occur. There are roughly 22 million people living in the nation's floodplains. Proposed elevations above the BFE are sometimes minimal for economic considerations, so up-to-date and properly referenced elevation data are a must. Correct referencing of those floodplains to the nation's vertical datum must be accomplished as soon as it is administratively and financially possible to do so.

15. Map Revision Requests to FEMA

a. As the NFIP moves further into the maintenance stage of the mapping program, the major action with respect to mapping of flood hazards will be the review and processing of requests for revisions to the currently effective FISs and FIRMs. The decision of whether to convert to NAVD88 as the reference datum for a revision action must be made on a case by case basis. All map revision requests should contain documentation of vertical control used and those requests to FEMA after 1 October 1992 must include vertical control data referenced to NAVD88. The decision regarding the published reference for the map revision will be made by the FEMA Project Officer for the applicable region.

b. Map revision requests shall include either NGS BM data or the method and computations used to tie to NGS BMs. If NGS BM data is unavailable, documenta-

tion to that effect must be submitted with the map revision request. If a computer program was used, the name of the program should be included along with where an exact copy of that program can be obtained. The leveling field notes should also be included. All surveying data must be certified by a licensed Land Surveyor or registered Professional Engineer. For all map revisions, the datum referenced on the current FIRM shall be used unless otherwise directed by the Project Officer. When the current map datum is used, a conversion factor to allow comparison to NAVD88 elevation should be included.

16. Impact of NAVD88 Change on Flooding Sources

a. *Riverine and Lacustrine Flooding.* For most areas affected by this type of flooding, the changes from NGVD29 to NAVD88 will be adequately addressed by a shift factor for areas of USGS 7.5-minute quadrangle series topographic maps. In larger areas than that, such as county wide studies involving significant stream or river reaches, additional considerations are necessary.

b. *Coastal Flooding.* In areas affected by coastal flooding, additional care must be taken to avoid confusion with local MSL data that are used in addition to NGVD29 data. In many areas, these are assumed to be the same, while in other areas differences may exist based upon the latest tidal observations. NGS has included in its published data the new reference elevations for tidal stations previously taken as 0.0000 foot on NGVD29. All vertical data must clearly reflect what basis of vertical control was used. For example, if mean low water datum was used, conversion to NAVD88, or at a minimum NGVD29, must be provided and sealed by a certified land surveyor.

c. *Other Influences.* Areas that have experienced crustal motion or land subsidence since the publication of the vertical control data for that area, must be referenced to at least one BM known to be stable. Documentation from a certified land surveyor or by the agency that recently relevelled the BM must be included with any data submitted to FEMA. NGS will be publishing special reports for these areas as part of its ongoing long term task.

(1) For areas that experience uniform change over a given range, and where datum difference can be expressed as a bias factor for specific geographic areas, little

if any distortion will occur in the hydrologic and hydraulic parameters that influence the definition of a given floodplain. In these instances, FEMA will be concerned with assuring that the proper conversion of ground and hydraulic elevations takes place.

(2) In instances where non-uniform elevation differences are indicated, an investigation of the potential effect on hydraulic behavior will be required. Usually, unless the change in flood elevation or depth is greater than 0.5 foot or in some cases 1.0 foot, no republication of the flood elevations is dictated. Indications of potential changes of 1.0 foot or more will probably place the stream or community on the priority list for a contracted restudy to establish the exact effect of the changes.

17. FEMA Policy for Map Conversion: Affect on NFIP Products

FEMA datum conversion activities called for all FY93 FIS's to be referenced to NAVD88 and that this action be confirmed by the contractor with the Project Officer prior to the beginning of survey work. The study contractor is responsible for assuring that proper reference to NAVD88 is made.

18. NAVD88 Requirements for Flood Insurance Studies

a. Type 15 Studies. For initial studies, NAVD88 shall be required. Exceptions must be approved by the Project Officer prior to the start of survey work.

b. Type 19 Studies and Limited Map Maintenance Program Studies. Use of NAVD88 shall be the decision of the Project Officer. If NGVD29 is used, then a conversion factor to NAVD88 should be included with the study material.

c. The use of NAVD88 for these studies will be determined by the extent of the changes that will occur to the community's FIRM when revised. For communities whose FIRM is larger than 1 panel and revision of other panels is unlikely with the restudy, the use of NGVD29 may be continued, but a note explaining the conversion to NAVD88 should be included in the "NOTES" in the map border of the panel being revised.

SECTION IV

Corps of Engineers Transition Plan to NAVD88

19. General

A change in vertical datum will affect most USACE engineering, construction, planning, and surveying activities. The cost of conversion could be substantial at the onset. There is a potential for errors in conversions inadvertently occurring. The effects of the vertical datum change can be minimized if the change is gradually applied over time, being applied to future projects and efforts, rather than concentrated on changing already published products. In order to insure an orderly and timely transition to NAVD88 is achieved for the appropriate products, the following general guidelines in this section should be followed.

a. Conversion Criteria. Maps, engineering site drawings, documents and associated spatial data products containing elevation data may require conversion to NAVD88. Specific requirements for conversion will, in large part, be based on local usage -- that of the local sponsor, installation, etc. Where applicable and appropriate, this conversion should be recommended to local interests.

b. Newly Authorized Construction Projects. Generally, initial surveys of newly authorized projects should be referenced to NAVD88. In addition to design/construction, this would include wide-area master plan mapping work. The project control should be referenced to NAVD88 using conventional or GPS surveying techniques. All planning and design activities should be based upon NAVD88. All maps and site drawings shall contain datum notes as described below. If the sponsor/installation requires the use of NGVD29 or some other local vertical reference datum for continuity, the relationship between NGVD29 and NAVD88 shall be clearly noted on all maps, engineering site drawings, documents and associated products.

c. Active Projects. On active projects where maps, site drawings, or elevation data are provided to non-USACE users, the conversion to NAVD88 should be performed. This conversion to NAVD88 may be performed the next time the project is surveyed or when the maps/site drawings are updated for other reasons. Civil works projects may be converted to NAVD88 during the next maintenance or repair cycle in the same manner as for newly initiated civil works projects.

However, if resources are not available for this level of effort, either re-draw the maps or drawings and add the necessary datum note. Plans should be made for the full conversion during a later maintenance or repair cycle when resources can be made available. MCA, OMA, AFH, OMAR, MCAF, OMAF and master planning projects should remain on NGVD29 or the local vertical datum until a thoroughly coordinated effort can be arranged with the MACOM DCSSENGR and installation DEH, or AFRCE and BCE. An entire installation's control network should be transformed simultaneously to avoid different datums on the same installation. MACOMs should be encouraged to convert to NAVD88. However, the respective MACOMs are responsible for this decision.

d. Inactive Projects. For inactive projects or active projects where maps, site drawings or elevation data are not normally provided to non-USACE users, conversion to NAVD88 is optional.

e. Work for Others. Projects for other agencies will remain on NGVD29 or the current local vertical datum until a thoroughly coordinated effort can be arranged with the sponsoring agency. Other agencies should be encouraged to convert their projects to NAVD88, although the decision to convert rests with the sponsoring agency. However, surveys, maps and drawings should have the datum note described below added before distribution to non-USACE users. If sponsoring agencies do not indicate a preference for new projects, NAVD88 should be used.

f. Miscellaneous Projects. Other projects referenced to strictly local datum, such as structural deformation, beach nourishment, submerged offshore disposal areas, historical preservation projects, etc., need not necessarily be converted to NAVD88. However, it is recommended that surveys, maps and drawings have a clear datum reference note added before distribution to non-USACE users.

20. Datum Reference Note

Whenever maps, site drawings or spatial elevation data are provided to non-USACE users, they should contain a datum note that provides, at minimum, the following information:

The elevations shown are referenced to the [NGVD29] [NAVD88] and are in [feet] [meters].

Differences between NGVD29 and NAVD88 at the center of the project sheet/data set are shown on the diagram below. Datum conversion was performed using the [program VERTCON] [direct leveling connections with published NGS benchmarks] [other]. Metric conversions are based on [US Survey Foot = 1200/3937 meters] [International Survey Foot = 30.48/100 meters].

21. Technical Advantages in Converting to NAVD88

There are several compelling reasons that make it advantageous for USACE commands to convert to NAVD88. These include:

- Differential leveling surveys between bench marks will often close better.
- NAVD88 will provide a better reference to estimate GPS-derived orthometric heights.
- IGLD85 will provide a better reference to estimate heights of water-level surfaces on the Great Lakes.
- Data and adjusted height values will be readily available and accessible in convenient form from NGS's Integrated Data Base.
- Federal surveying and mapping agencies will stop publishing on NGVD29 and IGLD55, and will publish only on NAVD88 and IGLD85.
- Surveys performed for the Federal government will require use of NAVD88.
- NAVD88 is recommended by ACSM and FGCS.

22. Levels of Effort

For map and site plan drawings, including digital variations thereof, the conversion process entails one of two levels of effort: (1) conversion of all elevations to NAVD88 and re-drawing the map, or (2) simply adding a datum note based on an approximate VERTCON conversion.

23. Real Estate Implications

a. Surveys, maps and plats prepared in support of civil works and military real estate activities should conform as much as possible with state requirements. Many states are expected to adopt NAVD88 (by statute) as an official vertical reference datum. This likewise will entail a transition to NAVD88 in those states. State and local authorities should therefore be contacted to ascertain their current policies.

b. Note that several states have adopted the International Foot for their standard conversion from meters to feet. However, recent action by the FGCS to affirm continued use of the U.S. Survey Foot for Federal surveying activities could lead to a reversal of some state policies.

c. In order to avoid dual elevations on USACE survey control points which have multiple uses, it is recommended that published elevations be based on the U.S. Survey Foot. In states where the International Foot is the only accepted standard for boundary and property surveys, conversion of these elevations to NAVD88 should be based on the International Foot while the control remains based on the U.S. Survey Foot.

SECTION V VERTCON 1.0

24. General Description of VERTCON

VERTCON is a program developed by the NGS that converts elevation data from NGVD29 to NAVD88. VERTCON uses a simplified transformation of benchmark (BM) heights using a modeled shift for a given area and is, in general, only sufficiently accurate to meet small-scale mapping requirements. VERTCON should not be used for converting benchmark elevations used for site plan design or construction applications. Users can simply input the latitude and longitude for a point and the vertical datum shift between NGVD29 and NAVD88 is output. Data may be input either point-to-point by hand or by batch file. Three batch file formats are supported:

- Free File Format Type 1
- Free File Format Type 2
- NGS Internal BM Format Type 3

A "help" menu in the program gives information and examples of the file formats. Example inputs and outputs for the first two batch file types and a hand input type are included in the following pages. In the existing release, survey points must be input in North American Datum of 1983 (NAD 83) horizontal coordinates. Future releases will convert inputs to NAD 83. This release works on IBM compatible PCs running DOS. VERTCON is command line driven and should be fairly easy to use for anyone with basic computer skills. Batch files are explained in the help menu within the program and can be created through the use of a standard text editor. The command line interface is very basic, but functional.

25. USACE Program CORPSCON

VERTCON was released by NGS in early 1993. During the later part of FY94, VERTCON will be incorporated into USACE program CORPSCON, which is currently used for horizontal datum conversions between the North American Datum of 1927 (NAD 27) and NAD 83. CORPSCON can use either geographic, State Plane or UTM coordinates as input/output. Until the revised version of CORPSCON is available, the current version can be used in combination with VERTCON to perform vertical datum conversions with State Plane or UTM inputs.

26. VERTCON Installation and Operation Details

Program VERTCON consists of the following files:

VERTCON.EXE - Executable program file
 VERTCON.DIR -Directory of VERTCON data base
 (non-readable, i.e., binary, file)
 VERTCON.COF -Coefficients of VERTCON data base
 (non-readable, i.e., binary, file)
 README.TXT -User's instruction file

a. VERTCON Installation.

(1) Make sure the original floppy disk is write-protected.

(2) Make a subdirectory on hard disk; for example: "mkdir NGVDCONV" (VERTCON will also run from the floppy disk)

(3) Go into a subdirectory; for example: "cd NGVDCONV"

(4) Copy the floppy disk into the subdirectory; for example: "copy A:*.***.*/v"

(5) Put the original floppy in a safe place.

b. VERTCON Execution. Type "VERTCON" and follow the prompts.

c. VERTCON Termination. VERTCON computations can be stopped at any time by the Control-C (i.e., <ctrl-c>) key combination, but interactive processing can be terminated by entering 0. (i.e., zero WITH DECIMAL POINT)

27. VERTCON Modeling Procedure

The modeled conversion of NGVD29 normal orthometric heights to NAVD88 Helmert orthometric heights can be accomplished by using the VERTCON software. This conversion is sufficiently accurate for many small-scale mapping purposes. The software and two files of modeling coefficients (data base) for the conterminous United States (CONUS) are provided on the disk.

VERTCON returns the orthometric height difference between NAVD88 and NGVD29 at the geodetic position specified by the user. The root-mean-square (RMS) error of the actual NGVD29/NAVD88 height differences versus the computed height differences from the model for the data points used to create the model is ± 1 cm; the estimated maximum error is ± 2.5 cm. Depending on network design and terrain relief, larger differences (e.g., 5 to 50 cm) may occur the further a bench mark is located from the control points used to establish the model coefficients. For this reason, VERTCON should only be used for approximate conversions where these potential errors are not critical. If feasible, future versions of VERTCON will contain estimates of uncertainty on a region-by-region basis.

28. VERTCON Data Input Procedures

The user can key in latitude and longitude on a point-by-point basis or can create an input file using a text editor. Several file formats are provided, including the internal bench mark file record format of the Vertical Network Branch, NGS. These formats are detailed in a "Help" menu option which appears when the input filename is specified. Most horizontal positions of the bench marks used to generate VERTCON were scaled from USGS topographic maps. The estimated uncertainty of the scaled positions is far greater than the differences between NAD 27 and NAD 83. Therefore, the horizontal geodetic datum to which the latitude and longitude are referenced (either NAD 27 or NAD 83) should not adversely affect the computed height difference since the height differences change very little with slight changes in horizontal position, i.e., less than 100 meters.

29. VERTCON Data Output

VERTCON Results are collected into an output file. The default name of this file is "VERTCON.OUT", but the user can choose any other legal filename. (Do not use misleading extensions such as *.EXE, *.DIR, *.COF, or *.BAT). The format of the output file is linked to the format of the input file to maintain consistency.

30. Derived NAVD88 Heights from NGVD29 Heights

The modeled NAVD88 - NGVD29 height differences convert from NGVD29 normal orthometric heights to NAVD88 Helmert orthometric heights. This value is ADDED ALGEBRAICALLY to NGVD29 normal orthometric heights to obtain NAVD88 Helmert

orthometric heights. If a NGVD29 height is desired when a NAVD88 height is given, SUBTRACT the value ALGEBRAICALLY from the NAVD88 height.

31. VERTCON Models for CONUS

a. Interconnected local VERTCON models were computed in October 1992 using more than 300,500 NAVD88 - NGVD29 orthometric height differences. The aggregate of these local models, defined for 144 Helmert blocks, comprise the total VERTCON model for CONUS. The benefit of developing this mosaic of local models is that any error found locally, such as gross errors and/or an inconsistent leveling network, can be corrected promptly and the data base "repaired" swiftly without affecting any other area.

b. The method of computation is based on Professor Rolland L. Hardy's multiquadric method for data modeling and prediction. Accordingly, a set of coefficients of radial basis functions are determined at "optimally" selected data points in a two-dimensional space. These coefficients define an irregular surface which matches the selected data exactly, in this case the NAVD88 - NGVD29 height differences, and approximate the data at varying error levels at other points.

c. It is desirable for datum conversion efficiency purposes to model the data field with a minimal set of surface coefficients, while keeping the deviation of the surface at non-selected data points within predefined bounds. This was achieved by an iterative process in which, after a small initial set of data points was modeled, additional data points were gradually added to the model at the locations of largest deviations between model surface and data. This approach provided a minimal set of model coefficients, while maintaining predefined error bounds.

d. The data base and VERTCON software are operational on standard disc operating system (DOS) controlled (IBM-compatible) personal computers (PC). However, the executable code and (binary) data base may not be transferable to other systems. In the near future two additional modules will be provided:

(1) CONVASCI -- will extract and store the local models in an ASCII file for transfer to other systems

(2) CONVBIN -- will restore the ASCII file into a two-file binary data base on the new system. The

recompiled VERTCON software can then operate on this data base.

32. Future VERTCON Modifications

A continuing development effort is underway to improve VERTCON results. NGVD29 normal orthometric heights are being analyzed for localized monument and/or crustal motion effects, for inconsistent adjustments, and other effects. Computed height differences which are significantly influenced by such effects will be flagged and rated for reliability on the output.

Appendix 35

NGS Data Sheet for IPET GPS Control

SURVEY CONTROL DATA

PROJECT=[GPS2212] IPET HURRICANE KATRINA

Version = APRIL 13, 2006

```

1      National Geodetic Survey,   Retrieval Date = APRIL 13, 2006
BH0937 *****
BH0937 HT_MOD      -   This is a Louisiana Height Modernization Survey Station.
BH0937 CBN         -   This is a Cooperative Base Network Control Station.
BH0937 TIDAL BM    -   This is a Tidal Bench Mark.
BH0937 DESIGNATION -   874 7437 TIDAL 1
BH0937 PID         -   BH0937
BH0937 STATE/COUNTY- MS/HANCOCK
BH0937 USGS QUAD   -   BAY ST LOUIS (1993)
BH0937
BH0937                      *CURRENT SURVEY CONTROL
BH0937
BH0937* NAD 83(1993)- 30 19 26.02790(N)    089 19 38.73164(W)    ADJUSTED
BH0937* NAVD 88      -           1.60 *(meters)    5.2 *(feet)  GPS OBS(2004.65)
BH0937 **This station is located in a subsidence area (see below).
BH0937
BH0937 X            -           64,680.695 (meters)                COMP
BH0937 Y            -          -5,509,813.989 (meters)            COMP
BH0937 Z            -          3,201,404.897 (meters)            COMP
BH0937 LAPLACE CORR-           -1.90 (seconds)                DEFLEC99
BH0937 ELLIP HEIGHT-           -25.96 (meters)                (04/11/06) GPS OBS
BH0937 GEOID HEIGHT-           -27.57 (meters)                GEOID03
BH0937 DYNAMIC HT   -           1.59 (meters)                5.2 (feet) COMP
BH0937 MODELED GRAV-          979,323.8 (mgal)                NAVD 88
BH0937
BH0937 HORZ ORDER   -   B
BH0937 VERT ORDER   -   FIRST      CLASS I (See Below)
BH0937 ELLP ORDER   -   FOURTH     CLASS II
BH0937
BH0937.The horizontal coordinates were established by GPS observations
BH0937.and adjusted by the National Geodetic Survey in February 2002..
BH0937
BH0937 ** Due to the variability of land subsidence, the orthometric, ellipsoid,
BH0937 ** and geoid heights are valid at the date of observation. These heights
BH0937 ** must always be validated when used as control.
BH0937 ** The orthometric height was determined by GPS observations using
BH0937 ** precise GPS observation and processing techniques and a new
BH0937 ** realization of GEOID03. It supersedes the leveled height previously
BH0937 ** determined for this station.

```

BH0937 ** The geoid height was determined by a new realization of GEOID03 for the
BH0937 ** epoch indicated which incorporates improved geoid heights for the
BH0937 ** Southern Louisiana Subsidence area.
BH0937 ** (see www.ngs.noaa.gov/PC_PROD/GEOID03/).
BH0937.The orthometric height was determined by GPS observations and a
BH0937.high-resolution geoid model using precise GPS observation and
BH0937.processing techniques. It supersedes the leveled height previously
BH0937.determined for this station.
BH0937.The vertical order pertains to the first NAVD 88 superseded value.
BH0937
BH0937.This Tidal Bench Mark is designated as VM 798
BH0937.by the Center for Operational Oceanographic Products and Services.
BH0937
BH0937.The X, Y, and Z were computed from the position and the ellipsoidal ht.
BH0937
BH0937.The Laplace correction was computed from DEFLEC99 derived deflections.
BH0937
BH0937.The ellipsoidal height was determined by GPS observations
BH0937.and is referenced to NAD 83.
BH0937
BH0937.The geoid height was determined by GEOID03.
BH0937
BH0937.The dynamic height is computed by dividing the NAVD 88
BH0937.geopotential number by the normal gravity value computed on the
BH0937.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
BH0937.degrees latitude (g = 980.6199 gals.).
BH0937
BH0937.The modeled gravity was interpolated from observed gravity values.
BH0937
BH0937;
BH0937;SPC MS E - North East Units Scale Factor Converg.
BH0937;SPC MS E - 91,428.616 252,484.548 MT 0.99997784 -0 14 58.1
BH0937;UTM 16 - 3,356,972.099 276,227.351 MT 1.00021780 -1 10 32.1
BH0937!
BH0937!SPC MS E - Elev Factor x Scale Factor = Combined Factor
BH0937!UTM 16 - 1.00000408 x 0.99997784 = 0.99998192
BH0937!UTM 16 - 1.00000408 x 1.00021780 = 1.00022188

BH0937
BH0937 SUPERSEDED SURVEY CONTROL
BH0937
BH0937 ELLIP H (04/15/02) -25.92 (m) GP () 4 2
BH0937 ELLIP H (02/15/02) -25.92 (m) GP () 4 1
BH0937 NAVD 88 (06/15/91) 1.652 (m) 5.42 (f) ADJUSTED 1 1
BH0937 NGVD 29 (??/??/??) 1.608 (m) 5.28 (f) ADJUSTED 1 1
BH0937
BH0937.Superseded values are not recommended for survey control.
BH0937.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
BH0937.See file dsdata.txt to determine how the superseded data were derived.
BH0937
BH0937_U.S. NATIONAL GRID SPATIAL ADDRESS: 16RBU7622756972 (NAD 83)
BH0937_MARKER: DJ = TIDAL STATION DISK
BH0937_SETTING: 32 = SET IN A RETAINING WALL OR CONCRETE LEDGE
BH0937_SP_SET: SET IN THE TOP OF A LOW CONCRETE
BH0937_STAMPING: NO.1 MS-04 1968
BH0937_MARK LOGO: CGS
BH0937_MAGNETIC: N = NO MAGNETIC MATERIAL
BH0937_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
BH0937+STABILITY: SURFACE MOTION
BH0937_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
BH0937+SATELLITE: SATELLITE OBSERVATIONS - March 06, 2006
BH0937
BH0937 HISTORY - Date Condition Report By

BH0937 HISTORY - 1968 MONUMENTED CGS
 BH0937 HISTORY - 1969 GOOD CGS
 BH0937 HISTORY - 1976 GOOD USPSQD
 BH0937 HISTORY - 1976 GOOD NGS
 BH0937 HISTORY - 20000901 GOOD NGS
 BH0937 HISTORY - 20060306 GOOD 3001
 BH0937
 BH0937 STATION DESCRIPTION
 BH0937
 BH0937'DESCRIBED BY COAST AND GEODETIC SURVEY 1969
 BH0937'0.4 MI NW FROM BAY ST LOUIS.
 BH0937'ABOUT 0.05 MILE WEST ALONG U. S. HIGHWAY 90 FROM THE WEST END OF THE
 BH0937'BRIDGE OVER ST LOUIS BAY, THENCE 0.35 MILE NORTHWEST ALONG NORTH BEACH
 BH0937'BLVD, NEAR THE ENTRANCE TO THE BAY WAVELAND YACHT CLUB, SET IN THE TOP
 BH0937'OF A CONCRETE SEA WALL, 39 FEET NORTHWEST OF THE CENTER OF THE
 BH0937'ENTRANCE TO THE CLUB, 28 FEET NORTHWEST OF THE NORTHWEST STEEL GATE
 BH0937'POST AT ENTRANCE TO YATCH CLUB, 18 FEET NORTHEAST OF THE CENTER LINE
 BH0937'OF THE BLVD, 336 FEET NORTHWEST OF TIDAL BM 2 (1968) DESCRIBED AND
 BH0937'ABOUT LEVEL WITH THE BLVD.
 BH0937
 BH0937 STATION RECOVERY (1976)
 BH0937
 BH0937'RECOVERY NOTE BY US POWER SQUADRON 1976 (WE)
 BH0937'RECOVERED IN GOOD CONDITION.
 BH0937
 BH0937 STATION RECOVERY (1976)
 BH0937
 BH0937'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1976
 BH0937'RECOVERED IN GOOD CONDITION.
 BH0937
 BH0937 STATION RECOVERY (2000)
 BH0937
 BH0937'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 2000
 BH0937'STATION IS LOCATED ON THE NORTHEAST SIDE OF BAY ST. LOUIS, MS, NEAR
 BH0937'THE SHORE OF ST. LOUIS BAY. THE STATION MARK IS SET IN THE TOP OF THE
 BH0937'LOW CONCRETE SEA WALL AT THE ENTRANCE OF THE BAY WAVELAND YACHT CLUB,
 BH0937'39 FT (11.9 M) NW OF THE CENTER OF THE ENTRANCE DRIVE, 28 FT (8.5 M)
 BH0937'NW OF THE NW STEEL GATE POST, AND 18 FT (5.5 M) NE OF THE CENTERLINE
 BH0937'OF NORTH BEACH BLVD. TO REACH FROM THE INTERSECTION OF US HWY 90 AND
 BH0937'NORTH BEACH BLVD. AT THE EAST EDGE OF BAY ST. LOUIS (AND THE WEST END
 BH0937'OF THE US 90 BRIDGE OVER ST. LOUIS BAY), DRIVE NORTH ON NORTH BEACH
 BH0937'BLVD. 0.4 MI (0.6 KM) TO THE YACHT CLUB AND THE MARK ON THE RIGHT.
 BH0937
 BH0937 STATION RECOVERY (2006)
 BH0937
 BH0937'RECOVERY NOTE BY 3001, INC 2006 (JCP)
 BH0937'THE STATION IS LOCATED ON THE NORTHEAST SIDE OF BAY ST. LOUIS,
 BH0937'MISSISSIPPI, ON THE WEST SIDE OF THE U.S. 90 BRIDGE OVER ST. LOUIS
 BH0937'BAY. OWNERSHIP - UNKNOWN TO REACH THE STATION FROM THE INTERSECTION
 BH0937'OF HIGHWAY 90 AND NORTH BEACH BLVD., DRIVE NORTH ON NORTH BEACH BLVD.
 BH0937'0.4 MI (0.64 KM) TO THE YACHT CLUB AND THE MARK ON THE RIGHT. THE
 BH0937'STATION IS A BRASS DISK SET IN THE TOP OF A LOW CONCRETE SEAWALL AT
 BH0937'THE ENTRANCE OF THE BAY WAVELAND YACHT CLUB, 39 FT (11.9 M) NORTHWEST
 BH0937'OF THE YACHT CLUB ENTRANCE DRIVE CENTERLINE, 28 FT (8.5 M) NORTHWEST
 BH0937'OF THE NORTHWEST STEEL GATE POST, AND 18 FT (5.5 M) NORTHEAST OF THE
 BH0937'NORTH BEACH BLVD. CENTERLINE.

1 National Geodetic Survey, Retrieval Date = APRIL 13, 2006
 DH9067 *****
 DH9067 HT_MOD - This is a Louisiana Height Modernization Survey Station.
 DH9067 DESIGNATION - 876 1494 C TIDAL
 DH9067 PID - DH9067
 DH9067 STATE/COUNTY- LA/PLAQUEMINES
 DH9067 USGS QUAD - POINTE A LA HACHE (1992)

DH9067
DH9067 *CURRENT SURVEY CONTROL
DH9067

DH9067* NAD 83 (1992) - 29 34 19.21106(N) 089 48 13.15403(W) ADJUSTED
DH9067* NAVD 88 - 0.58 **(meters) 1.9 **(feet) GPS OBS(2004.65)
DH9067 **This station is located in a subsidence area (see below).
DH9067

DH9067 EPOCH DATE - 2004.65
DH9067 X - 19,025.360 (meters) COMP
DH9067 Y - -5,551,770.851 (meters) COMP
DH9067 Z - 3,129,186.792 (meters) COMP
DH9067 LAPLACE CORR- 0.49 (seconds) DEFLEC99
DH9067 ELLIP HEIGHT- -24.14 (meters) (04/11/06) GPS OBS
DH9067 GEOID HEIGHT- -24.73 (meters) GEOID03
DH9067

DH9067 HORZ ORDER - B
DH9067 ELLP ORDER - FOURTH CLASS II
DH9067

DH9067.The horizontal coordinates were established by GPS observations
DH9067.and adjusted by the National Geodetic Survey in April 2006..
DH9067.The horizontal coordinates are valid at the epoch date displayed above.
DH9067.The epoch date for horizontal control is a decimal equivalence
DH9067.of Year/Month/Day.
DH9067

DH9067 ** Due to the variability of land subsidence, the orthometric, ellipsoid,
DH9067 ** and geoid heights are valid at the date of observation. These heights
DH9067 ** must always be validated when used as control.
DH9067 ** The orthometric height was determined by GPS observations using
DH9067 ** precise GPS observation and processing techniques and a new
DH9067 ** realization of GEOID03. It supersedes the leveled height previously
DH9067 ** determined for this station.
DH9067 ** The geoid height was determined by a new realization of GEOID03 for the
DH9067 ** epoch indicated which incorporates improved geoid heights for the
DH9067 ** Southern Louisiana Subsidence area.
DH9067 ** (see www.ngs.noaa.gov/PC_PROD/GEOID03/).
DH9067.The orthometric height was determined by GPS observations and a
DH9067.high-resolution geoid model using precise GPS observation and
DH9067.processing techniques.
DH9067

DH9067.The X, Y, and Z were computed from the position and the ellipsoidal ht.
DH9067
DH9067.The Laplace correction was computed from DEFLEC99 derived deflections.
DH9067
DH9067.The ellipsoidal height was determined by GPS observations
DH9067.and is referenced to NAD 83.
DH9067
DH9067.The geoid height was determined by GEOID03.
DH9067

DH9067;		North	East	Units	Scale	Factor	Converg.
DH9067;SPC LA S	-	119,815.801	1,148,211.007	MT	0.99995357	+0 45 53.5	
DH9067;SPC LA S	-	393,095.67	3,767,088.95	sFT	0.99995357	+0 45 53.5	
DH9067;UTM 16	-	3,274,642.674	228,385.294	MT	1.00051039	-1 23 04.2	

DH9067
DH9067!
DH9067!SPC LA S - Elev Factor x Scale Factor = Combined Factor
DH9067!SPC LA S - 1.00000379 x 0.99995357 = 0.99995736
DH9067!UTM 16 - 1.00000379 x 1.00051039 = 1.00051418
DH9067

DH9067 SUPERSEDED SURVEY CONTROL
DH9067
DH9067.No superseded survey control is available for this station.
DH9067
DH9067_U.S. NATIONAL GRID SPATIAL ADDRESS: 16RBT2838574643(NAD 83)
DH9067_MARKER: DJ = TIDAL STATION DISK

DH9067_SETTING: 35 = SET IN A MAT FOUNDATION OR CONCRETE SLAB OTHER THAN
 DH9067+WITH SETTING: PAVEMENT
 DH9067_SP_SET: SET
 DH9067_MARK LOGO: NOS
 DH9067_MAGNETIC: N = NO MAGNETIC MATERIAL
 DH9067_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
 DH9067_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
 DH9067+SATELLITE: SATELLITE OBSERVATIONS - January 23, 2006

DH9067	HISTORY	- Date	Condition	Report By
DH9067	HISTORY	- UNK	MONUMENTED	NOS
DH9067	HISTORY	- 20060123	GOOD	3001

DH9067 STATION DESCRIPTION

DH9067'DESCRIBED BY 3001, INC 2006 (JCP)
 DH9067'THE STATION IS LOCATED IN WEST POINT-A-LA-HACHE, 19.5 MI (31.38 KM)
 DH9067'SOUTHEAST OF LAFITTE, 9.1 MI (14.65 KM) NORTHWEST OF PORT SULPHUR.
 DH9067'OWNERSHIP - PORT SULPHUR WATER WORKS DEPARTMENT.
 DH9067'
 DH9067'TO REACH THE STATION FROM THE INTERSECTION OF HIGHWAYS 23 AND 406 IN
 DH9067'BELLE CHASSE, GO SOUTHEAST ON HIGHWAY 23 FOR 28.3 MI (45.54 KM) TO THE
 DH9067'PORT SULPHUR WATER WORKS PLANT ON THE LEFT. TURN LEFT ON A GRAVEL
 DH9067'ROAD LOCATED ON THE NORTHWEST SIDE OF THE FACILITY. FOLLOW THE GRAVEL
 DH9067'ROAD APPROXIMATELY 450 FT (137.2 M) TO ANOTHER GRAVEL ROAD LEADING
 DH9067'NORTHEAST. FOLLOW THE GRAVEL ROAD NORTHEAST APPROXIMATELY 200 FT
 DH9067'(61.0 M) TO THE MARK ON THE LEFT. THE STATION IS A BRASS DISK SET IN
 DH9067'CONCRETE SLAB LOCATED NEAR THE NORTHEAST CORNER OF THE 8X17X0.75 FT
 DH9067'(2.4 M) SLAB, 7.3 FT (2.2 M) NORTHEAST OF THE SOUTHEAST CORNER OF THE
 DH9067'SLAB, 23.3 FT (7.1 M) NORTHEAST OF THE NORTHEAST CORNER OF A PIPE
 DH9067'RACK, 0.8 FT (0.2 M) SOUTHWEST OF THE NORTHEAST CORNER OF THE CONCRETE
 DH9067'SLAB.

1 National Geodetic Survey, Retrieval Date = APRIL 13, 2006
 AT1392 *****
 AT1392 HT_MOD - This is a Louisiana Height Modernization Survey Station.
 AT1392 TIDAL BM - This is a Tidal Bench Mark.
 AT1392 DESIGNATION - 876 1602 C TIDAL
 AT1392 PID - AT1392
 AT1392 STATE/COUNTY- LA/PLAQUEMINES
 AT1392 USGS QUAD - LAKE LAURIER (1992)
 AT1392
 AT1392 *CURRENT SURVEY CONTROL
 AT1392
 AT1392* NAD 83(1992)- 29 33 33.83227(N) 089 53 05.03636(W) ADJUSTED
 AT1392* NAVD 88 - 0.16 *(meters) 0.5 *(feet) GPS OBS(2004.65)
 AT1392 **This station is located in a subsidence area (see below).
 AT1392
 AT1392 EPOCH DATE - 2004.65
 AT1392 X - 11,170.500 (meters) COMP
 AT1392 Y - -5,552,481.276 (meters) COMP
 AT1392 Z - 3,127,971.300 (meters) COMP
 AT1392 LAPLACE CORR- 0.61 (seconds) DEFLEC99
 AT1392 ELLIP HEIGHT- -24.55 (meters) (04/11/06) GPS OBS
 AT1392 GEOID HEIGHT- -24.72 (meters) GEOID03
 AT1392
 AT1392 HORZ ORDER - B
 AT1392 ELLP ORDER - FOURTH CLASS II
 AT1392
 AT1392.The horizontal coordinates were established by GPS observations
 AT1392.and adjusted by the National Geodetic Survey in April 2006..
 AT1392.The horizontal coordinates are valid at the epoch date displayed above.
 AT1392.The epoch date for horizontal control is a decimal equivalence
 AT1392.of Year/Month/Day.

AT1392
 AT1392 ** Due to the variability of land subsidence, the orthometric, ellipsoid,
 AT1392 ** and geoid heights are valid at the date of observation. These heights
 AT1392 ** must always be validated when used as control.
 AT1392 ** The orthometric height was determined by GPS observations using
 AT1392 ** precise GPS observation and processing techniques and a new
 AT1392 ** realization of GEOID03. It supersedes the leveled height previously
 AT1392 ** determined for this station.
 AT1392 ** The geoid height was determined by a new realization of GEOID03 for the
 AT1392 ** epoch indicated which incorporates improved geoid heights for the
 AT1392 ** Southern Louisiana Subsidence area.

AT1392 ** (see www.ngs.noaa.gov/PC_PROD/GEOID03/).
 AT1392.The orthometric height was determined by GPS observations and a
 AT1392.high-resolution geoid model using precise GPS observation and
 AT1392.processing techniques.

AT1392
 AT1392.This Tidal Bench Mark is designated as VM 15137
 AT1392.by the Center for Operational Oceanographic Products and Services.
 AT1392
 AT1392.The X, Y, and Z were computed from the position and the ellipsoidal ht.
 AT1392
 AT1392.The Laplace correction was computed from DEFLEC99 derived deflections.
 AT1392
 AT1392.The ellipsoidal height was determined by GPS observations
 AT1392.and is referenced to NAD 83.
 AT1392
 AT1392.The geoid height was determined by GEOID03.

AT1392;		North	East	Units	Scale Factor	Converg.
AT1392;SPC LA S	-	118,316.659	1,140,373.391	MT	0.99995523	+0 43 27.5
AT1392;SPC LA S	-	388,177.24	3,741,375.03	sFT	0.99995523	+0 43 27.5
AT1392;UTM 16	-	3,273,437.764	220,492.381	MT	1.00056408	-1 25 26.5
AT1392!	-	Elev Factor	x Scale Factor	=	Combined Factor	
AT1392!SPC LA S	-	1.00000386	x 0.99995523	=	0.99995909	
AT1392!UTM 16	-	1.00000386	x 1.00056408	=	1.00056794	

AT1392
 AT1392 SUPERSEDED SURVEY CONTROL
 AT1392
 AT1392 ELLIP H (09/30/02) -24.50 (m) GP() 4 2
 AT1392 NAD 83 (1992)- 29 33 33.83137(N) 089 53 05.03563(W) AD() 1
 AT1392 ELLIP H (01/21/93) -24.50 (m) GP() 4 2
 AT1392 NAD 83 (1986)- 29 33 33.84850(N) 089 53 05.03545(W) AD() 1
 AT1392 NAD 27 - 29 33 33.07216(N) 089 53 04.79385(W) AD() 1
 AT1392 NGVD 29 (05/20/88) 0.6 (m) 2. (f) GPS OBS
 AT1392

AT1392.Superseded values are not recommended for survey control.
 AT1392.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 AT1392.See file dsdata.txt to determine how the superseded data were derived.

AT1392
 AT1392_U.S. NATIONAL GRID SPATIAL ADDRESS: 16RBT2049273438(NAD 83)
 AT1392_MARKER: DJ = TIDAL STATION DISK
 AT1392_SETTING: 49 = STAINLESS STEEL ROD W/O SLEEVE (10 FT.+)
 AT1392_SP_SET: STAINLESS STEEL ROD
 AT1392_STAMPING: 1602 C 1985
 AT1392_MARK LOGO: NOS
 AT1392_PROJECTION: FLUSH
 AT1392_MAGNETIC: N = NO MAGNETIC MATERIAL
 AT1392_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
 AT1392_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
 AT1392+SATELLITE: SATELLITE OBSERVATIONS - February 24, 2006
 AT1392_ROD/PIPE-DEPTH: 22.0 meters

AT1392	HISTORY	- Date	Condition	Report By
AT1392	HISTORY	- UNK	MONUMENTED	
AT1392	HISTORY	- 1987	GOOD	LADTD
AT1392	HISTORY	- 19880920	GOOD	LADTD
AT1392	HISTORY	- 19890118	GOOD	
AT1392	HISTORY	- 20050301	GOOD	INDIV
AT1392	HISTORY	- 20060224	GOOD	3001

AT1392

STATION DESCRIPTION

AT1392

AT1392'DESCRIBED BY LA TRANSP AND DEV 1987 (TLH)

AT1392'THE DESIGNATED MARK WAS RECOVERED AS PREVIOUSLY DESCRIBED.

AT1392'A COMPLETE NEW DESCRIPTION FOLLOWS.

AT1392'

AT1392'THE STATION IS LOCATED ABOUT 8 KM (5 MI) SOUTH OF THE JUNCTION OF

AT1392'STATE HIGHWAY 23 AND LAKE JUDGE PEREZ ROAD, IN PLAQUEMINES PARISH,

AT1392'IN PORT SULPHUR, LA.

AT1392'OWNERSHIP--ALFRED J LEBLANC, RFD NO 1 BOX 113, LAKE JUDGE PEREZ

AT1392'ROAD, PORT SULPHUR, LA.

AT1392'

AT1392'TO REACH THE STATION FROM MYRTLE GROVE GO SOUTHEAST ON STATE

AT1392'HIGHWAY 23 TO MILE MARKER 45.7.

AT1392'TURN RIGHT AND GO EAST FOR 8 KM (5 MI) ON LAKE JUDGE PEREZ ROAD TO

AT1392'A FIRE STATION ON THE RIGHT AND THE BENCH MARK ON THE LEFT.

AT1392'

AT1392'THE STATION IS A STANDARD NOS DISK

AT1392'STAMPED---1602 C 1985--- CRIMPED TO A STEEL ROD DRIVEN 22 METERS

AT1392'(72 FT) INTO THE GROUND AND ENCASED IN A 5-INCH PVC PIPE SURROUNDED

AT1392'BY CONCRETE.

AT1392'29 METERS (95.2 FT) NORTH FROM THE NORTH CORNER OF THE FIRE STATION,

AT1392'21.8 METERS (71.4 FT) EAST FROM A POWER POLE AND

AT1392'0.5 METERS (1.8 FT) SOUTHWEST FROM A WITNESS POST.

AT1392

STATION RECOVERY (1988)

AT1392

AT1392'RECOVERY NOTE BY LA TRANSP AND DEV 1988

AT1392'THE STATION IS LOCATED ABOUT 8 KM (4.95 MI) SOUTH OF THE JUNCTION OF

AT1392'STATE HIGHWAY 23 AND LAKE JUDGE PEREZ ROAD IN PORT SULPHUR, LA.

AT1392'OWNERSHIP--ALFORD J. LABLANC, RFD NO 1 BOX 113, LAKE JUDGE PEREZ ROAD,

AT1392'PORT SULPHUR, LA.

AT1392'TO REACH THE STATION FROM MYRTLE GROVE GO SOUTHEAST ON STATE HIGHWAY

AT1392'23 TO MILE MARKER 45.7. TURN RIGHT AND GO EAST FOR 8 KM (4.95 MI) ON

AT1392'LAKE JUDGE PEREZ ROAD TO A FIRE STATION ON THE RIGHT AND THE BENCH

AT1392'MARK ON THE LEFT.

AT1392'THE STATION IS 29 M (95.1 FT) NORTH FROM THE NORTH CORNER OF THE FIRE

AT1392'STATION, 21.8 M (71.5 FT) EAST FROM A POWER POLE AND 0.5 M (1.6 FT)

AT1392'SOUTHWEST FROM A WITNESS POST.

AT1392

STATION RECOVERY (1989)

AT1392

AT1392'RECOVERED 1989

AT1392'RECOVERED IN GOOD CONDITION.

AT1392

STATION RECOVERY (2005)

AT1392

AT1392'RECOVERY NOTE BY INDIVIDUAL CONTRIBUTORS 2005 (TG)

AT1392'RECOVERED AS DESCRIBED

AT1392

STATION RECOVERY (2006)

AT1392

AT1392'RECOVERY NOTE BY 3001, INC 2006 (JCP)

AT1392'THE STATION IS LOCATED IN ORLEANS PARISH AT FORT PIKE ON THE WEST END
 AT1392'OF THE RIGOLETT'S BRIDGE 8.0 MI (12.87 KM) SOUTHEAST OF SLIDELL.
 AT1392'OWNERSHIP - LADOT TO REACH THE STATION FROM THE INTERSECTION OF
 AT1392'I-10, EXIT 263, AND HIGHWAY 433 IN SLIDELL, GO 6.5 MI (10.46 KM)
 AT1392'SOUTHEAST ALONG HIGHWAY 433 TO THE JUNCTION OF HIGHWAY 90, TURN RIGHT
 AT1392'ON HIGHWAY 90 AND GO 0.95 MI (1.53 KM), CROSSING THE RIGOLETT'S BRIDGE
 AT1392'TO THE MARK ON THE SOUTH SIDE OF HIGHWAY 90. THE STATION IS A BRASS
 AT1392'DISK SET IN THE CENTER OF A RED CONCRETE PAD, 114.2 FT (34.8 M)
 AT1392'SOUTHEAST OF THE HIGHWAY 90 CENTERLINE, 83.7 FT (27.4 M) SOUTH OF THE
 AT1392'BENCHMARK C 193, 67.3 FT (79.3 M) WEST OF TRIANGULATION STATION PIKE
 AT1392'RESET, 9.5 FT (2.9 M) NORTHEAST OF THE SOUTHWEST CORNER OF THE RED
 AT1392'CONCRETE PAD. THE FENCE MENTIONED IN THE PREVIOUS DESCRIPTIONS WAS
 AT1392'DESTROYED DURING THE KATRINA STORM.

1 National Geodetic Survey, Retrieval Date = APRIL 13, 2006
 DH9066 *****
 DH9066 HT_MOD - This is a Louisiana Height Modernization Survey Station.
 DH9066 DESIGNATION - 876 1799 B TIDAL
 DH9066 PID - DH9066
 DH9066 STATE/COUNTY- LA/JEFFERSON
 DH9066 USGS QUAD - BAY DOSGRIS (1994)
 DH9066
 DH9066 *CURRENT SURVEY CONTROL
 DH9066
 DH9066* NAD 83(1992)- 29 29 46.57411(N) 090 01 32.56821(W) ADJUSTED
 DH9066* NAVD 88 - 0.77 *(meters) 2.5 *(feet) GPS OBS(2004.65)
 DH9066 **This station is located in a subsidence area (see below).
 DH9066
 DH9066 EPOCH DATE - 2004.65
 DH9066 X - -2,493.414 (meters) COMP
 DH9066 Y - -5,555,941.148 (meters) COMP
 DH9066 Z - 3,121,883.193 (meters) COMP
 DH9066 LAPLACE CORR- 0.81 (seconds) DEFLEC99
 DH9066 ELLIP HEIGHT- -23.85 (meters) (04/11/06) GPS OBS
 DH9066 GEOID HEIGHT- -24.63 (meters) GEOID03
 DH9066
 DH9066 HORZ ORDER - B
 DH9066 ELLP ORDER - FOURTH CLASS II
 DH9066
 DH9066.The horizontal coordinates were established by GPS observations
 DH9066.and adjusted by the National Geodetic Survey in April 2006..
 DH9066.The horizontal coordinates are valid at the epoch date displayed above.
 DH9066.The epoch date for horizontal control is a decimal equivalence
 DH9066.of Year/Month/Day.
 DH9066
 DH9066 ** Due to the variability of land subsidence, the orthometric, ellipsoid,
 DH9066 ** and geoid heights are valid at the date of observation. These heights
 DH9066 ** must always be validated when used as control.
 DH9066 ** The orthometric height was determined by GPS observations using
 DH9066 ** precise GPS observation and processing techniques and a new
 DH9066 ** realization of GEOID03. It supersedes the leveled height previously
 DH9066 ** determined for this station.
 DH9066 ** The geoid height was determined by a new realization of GEOID03 for the
 DH9066 ** epoch indicated which incorporates improved geoid heights for the
 DH9066 ** Southern Louisiana Subsidence area.
 DH9066 ** (see www.ngs.noaa.gov/PC_PROD/GEOID03/) .
 DH9066.The orthometric height was determined by GPS observations and a
 DH9066.high-resolution geoid model using precise GPS observation and
 DH9066.processing techniques.
 DH9066
 DH9066.The X, Y, and Z were computed from the position and the ellipsoidal ht.
 DH9066
 DH9066.The Laplace correction was computed from DEFLEC99 derived deflections.
 DH9066

DH9066.The ellipsoidal height was determined by GPS observations
 DH9066.and is referenced to NAD 83.
 DH9066

DH9066.The geoid height was determined by GEOID03.
 DH9066

DH9066;		North	East	Units	Scale	Factor	Converg.
DH9066;SPC LA S	-	111,155.784	1,126,792.410	MT	0.99996426	+0 39	13.8
DH9066;SPC LA S	-	364,683.60	3,696,818.10	sFT	0.99996426	+0 39	13.8
DH9066;UTM 15	-	3,266,657.530	788,367.922	MT	1.00062619	+1 27	55.6
DH9066;UTM 16	-	3,266,786.251	206,643.680	MT	1.00066201	-1 29	27.0

DH9066
 DH9066!
 DH9066!SPC LA S
 DH9066!UTM 15
 DH9066!UTM 16

	-	Elev Factor	x	Scale Factor	=	Combined Factor
DH9066!SPC LA S	-	1.00000375	x	0.99996426	=	0.99996801
DH9066!UTM 15	-	1.00000375	x	1.00062619	=	1.00062994
DH9066!UTM 16	-	1.00000375	x	1.00066201	=	1.00066576

SUPERSEDED SURVEY CONTROL

DH9066.No superseded survey control is available for this station.
 DH9066

DH9066_U.S. NATIONAL GRID SPATIAL ADDRESS: 15RYN8836866658(NAD 83)
 DH9066_MARKER: DJ = TIDAL STATION DISK
 DH9066_SETTING: 49 = STAINLESS STEEL ROD W/O SLEEVE (10 FT.+)
 DH9066_STAMPING: 1799 B 1985
 DH9066_MARK LOGO: NOS
 DH9066_PROJECTION: PROJECTING 15 CENTIMETERS
 DH9066_MAGNETIC: O = OTHER; SEE DESCRIPTION
 DH9066_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
 DH9066_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
 DH9066+SATELLITE: SATELLITE OBSERVATIONS - January 24, 2006

DH9066	HISTORY	-	Date	Condition	Report By
DH9066	HISTORY	-	UNK	MONUMENTED	NOS
DH9066	HISTORY	-	20060124	GOOD	3001

STATION DESCRIPTION

DH9066'DESCRIBED BY 3001, INC 2006 (JCP)
 DH9066'THE STATION IS LOCATED IN JEFFERSON PARISH ALONG THE BARATARIA
 DH9066'WATERWAY 12.8 MI (20.6 KM) SOUTHEAST OF LAFITTE, 16.8 MI (27.04 KM)
 DH9066'NORTHEAST OF GALLIANO, 20.0 MI (32.19 KM) NORTHWEST OF PORT SULPHUR.
 DH9066'OWNERSHIP - M. V. PETROLEUM TO REACH THE STATION BY BOAT, DEPART
 DH9066'FROM THE C-WAY MARINA IN LAFITTE. PROCEED SOUTHEAST 12.45 MI (20.04
 DH9066'KM) ALONG THE BARATARIA WATERWAY TO RED BEACON NO. 50. TURN RIGHT
 DH9066'INTO THE OPEN BAY AND PROCEED APPROX. 1000 FT (304.8 M) TO THE FIRST
 DH9066'PLATFORM AND THE ENTRANCE OF AN OIL PLATFORM SLIP (CANAL). TURN RIGHT
 DH9066'INTO THE SLIP AND GO APPROX. 1200 FT (365.8 M) TO TWO STORAGE TANKS
 DH9066'LOCATED IN THE NORTHWEST CORNER OF THE SLIP. SECURE THE BOAT AND WALK
 DH9066'NORTHWEST APPROX. 250 FT (76.2 M) TO THE STATION. THE STATION IS A
 DH9066'STAINLESS STEEL ROD WITH BRASS CAP PROJECTING 0.5 FT (0.2 M) ABOVE THE
 DH9066'GROUND, 200 FT (61.0 M) NORTHWEST OF THE FACE OF THE NORTHERN MOST OF
 DH9066'THE TWO STORAGE TANKS, 249 FT (75.9 M) NORTHWEST OF BENCHMARK 1799 A
 DH9066'1985, 247 FT (680.3 M) SOUTH OF BENCHMARK 1799 C 1985, AND APPROX. 15
 DH9066'FT (4.6 M) NORTHWEST OF THE SLIP BANKLINE.

1 National Geodetic Survey, Retrieval Date = APRIL 13, 2006
 AU2310 *****
 AU2310 HT_MOD - This is a Louisiana Height Modernization Survey Station.
 AU2310 TIDAL BM - This is a Tidal Bench Mark.
 AU2310 DESIGNATION - 876 1899 B TIDAL
 AU2310 PID - AU2310
 AU2310 STATE/COUNTY- LA/JEFFERSON
 AU2310 USGS QUAD - LAFITTE (1973)

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AU2310
AU2310
AU2310
AU2310
AU2310* NAD 83(1992)- 29 40 02.04338(N) 090 06 33.55624(W) ADJUSTED
AU2310* NAVD 88 - 0.01 **(meters) 0.0 **(feet) LEVELING(2004.65)
AU2310 **This station is located in a subsidence area (see below).
AU2310 **This station is included in the VTDP model (see below).
AU2310
AU2310
AU2310 EPOCH DATE - 2004.65
AU2310 X - -10,582.959 (meters) COMP
AU2310 Y - -5,546,575.285 (meters) COMP
AU2310 Z - 3,138,362.852 (meters) COMP
AU2310 LAPLACE CORR- 0.59 (seconds) DEFLEC99
AU2310 ELLIP HEIGHT- -25.17 (meters) (06/22/05) GPS OBS
AU2310 GEOID HEIGHT- -25.19 (meters) GEOID03
AU2310
AU2310 HORZ ORDER - B
AU2310 VERT ORDER - THIRD
AU2310 ELLP ORDER - FOURTH CLASS I
AU2310
AU2310.The horizontal coordinates were established by GPS observations
AU2310.and adjusted by the National Geodetic Survey in April 2006..
AU2310.The horizontal coordinates are valid at the epoch date displayed above.
AU2310.The epoch date for horizontal control is a decimal equivalence
AU2310.of Year/Month/Day.
AU2310
AU2310 ** Due to the variability of land subsidence, the orthometric, ellipsoid,
AU2310 ** and geoid heights are valid at the date of observation. These heights
AU2310 ** must always be validated when used as control.
AU2310 ** The orthometric height was determined with a Vertical Time-dependent
AU2310 ** Positioning (VTDP) model and has been validated through GPS observations
AU2310 ** for the epoch indicated (see www.ngs.noaa.gov/heightmod/VTDP).
AU2310 ** The geoid height was determined by a new realization of GEOID03 for the
AU2310 ** epoch indicated which incorporates improved geoid heights for the
AU2310 ** Southern Louisiana Subsidence area
AU2310 ** (see www.ngs.noaa.gov/PC_PROD/GEOID03/).
AU2310.The orthometric height was determined by differential leveling.
AU2310.The vertical network tie was performed by a horz. field party for horz.
AU2310.obs reductions. Reset procedures were used to establish the elevation.
AU2310
AU2310.This Tidal Bench Mark is designated as VM 11049
AU2310.by the Center for Operational Oceanographic Products and Services.
AU2310
AU2310.The X, Y, and Z were computed from the position and the ellipsoidal ht.
AU2310
AU2310.The Laplace correction was computed from DEFLEC99 derived deflections.
AU2310
AU2310.The ellipsoidal height was determined by GPS observations
AU2310.and is referenced to NAD 83.
AU2310
AU2310.The geoid height was determined by GEOID03.
AU2310
AU2310; North East Units Scale Factor Converg.
AU2310;SPC LA S - 130,014.795 1,118,483.349 MT 0.99994259 +0 36 43.3
AU2310;SPC LA S - 426,556.87 3,669,557.45 sFT 0.99994259 +0 36 43.3
AU2310;UTM 15 - 3,285,408.395 779,785.708 MT 1.00056598 +1 25 54.1
AU2310
AU2310! - Elev Factor x Scale Factor = Combined Factor
AU2310!SPC LA S - 1.00000395 x 0.99994259 = 0.99994654
AU2310!UTM 15 - 1.00000395 x 1.00056598 = 1.00056994
AU2310
AU2310
AU2310 SUPERSEDED SURVEY CONTROL
AU2310

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AU2310 NAD 83(1992)- 29 40 02.04511(N) 090 06 33.55694(W) AD(2004.65) B
 AU2310 NAVD 88 (12/05/96) 0.141 (m) 0.46 (f) ADJUSTED 1 2
 AU2310 NAVD 88 (02/14/94) 0.094 (m) 0.31 (f) UNKNOWN 1 2
 AU2310

AU2310.Superseded values are not recommended for survey control.
 AU2310.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 AU2310.See file dsdata.txt to determine how the superseded data were derived.
 AU2310

AU2310_U.S. NATIONAL GRID SPATIAL ADDRESS: 15RYN7978685408(NAD 83)
 AU2310_MARKER: I = METAL ROD
 AU2310_SETTING: 49 = STAINLESS STEEL ROD W/O SLEEVE (10 FT.+)
 AU2310_SP_SET: STAINLESS STEEL ROD
 AU2310_STAMPING: 1899 B 1985
 AU2310_MARK LOGO: NOS
 AU2310_PROJECTION: RECESSED 15 CENTIMETERS
 AU2310_MAGNETIC: O = OTHER; SEE DESCRIPTION
 AU2310_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
 AU2310_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
 AU2310+SATELLITE: SATELLITE OBSERVATIONS - January 24, 2006
 AU2310_ROD/PIPE-DEPTH: 24.4 meters
 AU2310

AU2310	HISTORY	- Date	Condition	Report By
AU2310	HISTORY	- 1985	MONUMENTED	NOS
AU2310	HISTORY	- 1985	GOOD	LA-051
AU2310	HISTORY	- 19940826	GOOD	NGS
AU2310	HISTORY	- 20040416	GOOD	NGS
AU2310	HISTORY	- 20060124	GOOD	3001

AU2310
 AU2310 STATION DESCRIPTION
 AU2310

AU2310'DESCRIBED BY JEFFERSON PARISH LOUISIANA 1985
 AU2310'IN LAFITTE.

AU2310'AT LAFITTE, FROM THE JUNCTION OF LOUISIANA HGHWAY 45 AND MARRERO
 AU2310'STREET TURN LEFT AND PROCEED .05 MILE TO THE JUNCTION OF 3RD STREET,
 AU2310'LOCATED ON MARRERO STREET NEAR THE NORTHEAST CORNER OF A BASKETBALL
 AU2310'COURT, 237.0 FEET SOUTHEAST OF TIDAL MARK 876 1899 A, 63.0 FEET
 AU2310'NORTH-NORTHEAST OF THE SOUTHEAST CORNER OF A CHAIN LINK FENCE AROUND
 AU2310'THE BASKETBALL COURT, 57.0 FEET WEST-SOUTHWEST OF A POWER POLE ON THE
 AU2310'EAST SIDE OF MARRERO STREET (POLE BEARING STREET SIGN OF MARRERO AND
 AU2310'3RD STREET), 42.4 FEET NORTHEAST OF THE EASTERN MOST BASKETBALL POST,
 AU2310'32 FEET WEST OF THE CENTERLINE OF MARRERO STREET.
 AU2310'THE MARK IS 1 FT W FROM A WITNESS POST.

AU2310
 AU2310 STATION RECOVERY (1994)
 AU2310

AU2310'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1994 (GAS)
 AU2310'14.4 KM (8.95 MI) SOUTHERLY ALONG STATE HIGHWAY 45 FROM THE JUNCTION
 AU2310'OF STATE HIGHWAYS 303 AND 3134 IN CROWN POINT, THENCE 0.1 KM (0.05 MI)
 AU2310'SOUTHERLY ALONG MARRERO STREET, 9.8 M (32.2 FT) WEST OF THE CENTERLINE
 AU2310'OF MARRERO STREET, 6.3 M (20.7 FT) SOUTHEAST OF THE NORTHEAST CORNER
 AU2310'OF A CHAIN-LINK FENCE ENCLOSING A BASKETBALL COURT, 5.3 M (17.4 FT)
 AU2310'SOUTH OF THE CENTER OF THIRD STREET, AND 0.3 M (1.0 FT) BELOW THE
 AU2310'LEVEL OF MARRERO STREET. NOTE--THE DISK IS ENCASED IN A 5-INCH PCV
 AU2310'PIPE AND IS FLUSH WITH THE GROUND SURFACE.

AU2310
 AU2310 STATION RECOVERY (2004)
 AU2310

AU2310'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 2004 (KLF)
 AU2310'9 MI SOUTH ON STATE HWY 45 FROM THE JUNCTION WITH 303 AND 3134 IN
 AU2310'CROWN POINT. LOCATED AT THE LOWER LAFITTE PLAYGROUND. IT IS 32.2 FT
 AU2310'W OF THE CENTERLINE OF US 45, 20.8 FT SE OF THE NE CORNER OF THE
 AU2310'FENCE AROUND THE BASKETBALL COURT, 18.1 FT EAST OF THE FIRST POST
 AU2310'SOUTH OF THE NE CORNER POST, 34.6 FT NNE OF THE NORTHERN MOST SIGN

AU2310'POST FOR THE LOWER LAFFITE PLAYGROUND.
AU2310
AU2310 STATION RECOVERY (2006)
AU2310
AU2310'RECOVERY NOTE BY 3001, INC 2006 (JCP)
AU2310'RECOVERED AS DESCRIBED.
1 National Geodetic Survey, Retrieval Date = APRIL 13, 2006

AT0407 *****
AT0407 HT_MOD - This is a Louisiana Height Modernization Survey Station.
AT0407 DESIGNATION - A 152
AT0407 PID - AT0407
AT0407 STATE/COUNTY- LA/PLAQUEMINES
AT0407 USGS QUAD - LAKE LAURIER (1992)
AT0407
AT0407 *CURRENT SURVEY CONTROL
AT0407

AT0407*	NAD 83(1992)-	29 37 28.58854(N)	089 54 10.66914(W)	ADJUSTED
AT0407*	NAVD 88	- 0.67 ** (meters)	2.2 ** (feet)	GPS OBS(2004.65)

AT0407 **This station is located in a subsidence area (see below).
AT0407

AT0407	EPOCH DATE	-	2004.65	
AT0407	X	-	9,397.673 (meters)	COMP
AT0407	Y	-	-5,548,915.372 (meters)	COMP
AT0407	Z	-	3,134,256.848 (meters)	COMP
AT0407	LAPLACE CORR-		0.46 (seconds)	DEFLEC99
AT0407	ELLIP HEIGHT-		-24.25 (meters)	(06/22/05) GPS OBS
AT0407	GEOID HEIGHT-		-24.93 (meters)	GEOID03
AT0407	DYNAMIC HT	-	0.67 (meters)	2.2 (feet) COMP
AT0407	MODELED GRAV-		979,304.9 (mgal)	NAVD 88

AT0407
AT0407 HORZ ORDER - B
AT0407 VERT ORDER - THIRD (See Below)
AT0407 ELLP ORDER - FOURTH CLASS I
AT0407

AT0407.The horizontal coordinates were established by GPS observations
AT0407.and adjusted by the National Geodetic Survey in June 2005..
AT0407.The horizontal coordinates are valid at the epoch date displayed above.
AT0407.The epoch date for horizontal control is a decimal equivalence
AT0407.of Year/Month/Day.
AT0407

AT0407 ** Due to the variability of land subsidence, the orthometric, ellipsoid,
AT0407 ** and geoid heights are valid at the date of observation. These heights
AT0407 ** must always be validated when used as control.
AT0407 ** The orthometric height was determined by GPS observations using
AT0407 ** precise GPS observation and processing techniques and a new
AT0407 ** realization of GEOID03. It supersedes the leveled height previously
AT0407 ** determined for this station.
AT0407 ** The geoid height was determined by a new realization of GEOID03 for the
AT0407 ** epoch indicated which incorporates improved geoid heights for the
AT0407 ** Southern Louisiana Subsidence area.
AT0407 ** (see www.ngs.noaa.gov/PC_PROD/GEOID03/).
AT0407.The orthometric height was determined by GPS observations and a
AT0407.high-resolution geoid model using precise GPS observation and
AT0407.processing techniques. It supersedes the leveled height previously
AT0407.determined for this station.
AT0407.WARNING-GPS observations at this control monument resulted in a GPS
AT0407.derived orthometric height which differed from the leveled height by
AT0407.more than one decimeter (0.1 meter).
AT0407.The vertical order pertains to the first NAVD 88 superseded value.
AT0407
AT0407.The X, Y, and Z were computed from the position and the ellipsoidal ht.
AT0407

AT0407.The Laplace correction was computed from DEFLEC99 derived deflections.
AT0407
AT0407.The ellipsoidal height was determined by GPS observations
AT0407.and is referenced to NAD 83.
AT0407
AT0407.The geoid height was determined by GEOID03.
AT0407
AT0407.The dynamic height is computed by dividing the NAVD 88
AT0407.geopotential number by the normal gravity value computed on the
AT0407.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
AT0407.degrees latitude (g = 980.6199 gals.).
AT0407
AT0407.The modeled gravity was interpolated from observed gravity values.
AT0407
AT0407;

	North	East	Units	Scale	Factor	Converg.
AT0407;SPC LA S	- 125,521.799	1,138,516.597	MT	0.99994717	+0 42	54.7
AT0407;SPC LA S	- 411,816.10	3,735,283.20	sFT	0.99994717	+0 42	54.7
AT0407;UTM 16	- 3,280,711.979	218,906.187	MT	1.00057504	-1 26	09.3

AT0407
AT0407!

	Elev Factor	x	Scale Factor	=	Combined Factor
AT0407!SPC LA S	- 1.00000381	x	0.99994717	=	0.99995098
AT0407!UTM 16	- 1.00000381	x	1.00057504	=	1.00057885

AT0407
AT0407

SUPERSEDED SURVEY CONTROL

AT0407

	NAVD 88	(02/14/94)	0.870	(m)	2.85	(f)	READJUSTED	3
AT0407	NAVD 88	(06/15/91)	0.924	(m)	3.03	(f)	UNKNOWN	1 1
AT0407	NGVD 29	(??/??/??)	0.962	(m)	3.16	(f)	ADJUSTED	1 1

AT0407
AT0407.Superseded values are not recommended for survey control.
AT0407.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
AT0407.See file dsdata.txt to determine how the superseded data were derived.
AT0407
AT0407_U.S. NATIONAL GRID SPATIAL ADDRESS: 16RBT1890680712(NAD 83)
AT0407_MARKER: DB = BENCH MARK DISK
AT0407_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT
AT0407_SP_SET: SET IN TOP OF CONCRETE MONUMENT
AT0407_STAMPING: A 152 1951
AT0407_MARK LOGO: CGS
AT0407_MAGNETIC: N = NO MAGNETIC MATERIAL
AT0407_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
AT0407+STABILITY: SURFACE MOTION
AT0407_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
AT0407+SATELLITE: SATELLITE OBSERVATIONS - January 24, 2006
AT0407

AT0407	HISTORY	- Date	Condition	Report By
AT0407	HISTORY	- 1951	MONUMENTED	CGS
AT0407	HISTORY	- 1971	GOOD	NGS
AT0407	HISTORY	- 1984	GOOD	NGS
AT0407	HISTORY	- 20030608	GOOD	NGS
AT0407	HISTORY	- 20040419	GOOD	NGS
AT0407	HISTORY	- 20051006	GOOD	NGS
AT0407	HISTORY	- 20060124	GOOD	3001

AT0407
AT0407

STATION DESCRIPTION

AT0407
AT0407'DESCRIBED BY NATIONAL GEODETIC SURVEY 1971
AT0407'7.2 MI NW FROM POINTE A LA HACHE.
AT0407'ABOUT 7.2 MILES NORTHWEST ALONG STATE HIGHWAY 39 FROM THE COURTHOUSE
AT0407'AT POINTE A LA HACHE, 2.15 MILES SOUTHEAST OF THE PHOENIX HIGH SCHOOL,
AT0407'33 FEET NORTHEAST OF THE CENTER LINE OF THE HIGHWAY, 54.0 FEET WEST OF
AT0407'THE WEST CORNER OF A TWO-STORY FRAME HOUSE, 36 FEET NORTHWEST OF THE
AT0407'CENTER LINE OF A DRIVEWAY, 24 FEET SOUTHEAST OF THE CENTER LINE OF A

AT0407'DRIVEWAY, 6 FEET EAST OF A POWER POLE, 5.5 FEET EAST OF A METAL
 AT0407'WITNESS POST, ABOUT LEVEL WITH THE HIGHWAY, AND SET IN THE TOP OF A
 AT0407'CONCRETE POST WHICH PROJECTS 2 INCHES. SEC 44, T 16S, R 13E.
 AT0407
 AT0407 STATION RECOVERY (1984)
 AT0407
 AT0407'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1984
 AT0407'RECOVERED IN GOOD CONDITION.
 AT0407
 AT0407 STATION RECOVERY (2003)
 AT0407
 AT0407'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 2003
 AT0407'NOW 1 FT SE OF STEEL POST (NO SIGN), AND ABOUT 3 FT SE OF NEW POLE
 AT0407'WITH LIGHT AND TRANSFORMER. OLD POLE WAS CUT OFF ABOUT 15 FEET UP.
 AT0407
 AT0407 STATION RECOVERY (2004)
 AT0407
 AT0407'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 2004 (KLF)
 AT0407'THE STATION IS LOCATED ABOUT 2.0 MI SOUTH OF PHOENIX ON PRIVATE
 AT0407'PROPERTY.
 AT0407'
 AT0407'TO REACH THE STATION FROM THE PHOENIX HIGH SCHOOL, IN PHOENIX, GO
 AT0407'SOUTHERLY FOR 2.1 MI ON PARISH ROAD 15 TO THE STATION ON THE RIGHT
 AT0407'JUST BEFORE REACHING A LARGE RAISED WOOD FRAME HOUSE ON THE LEFT.
 AT0407'
 AT0407'THE STATION IS LOCATED 16.5 M WEST OF THE WEST CORNER OF THE FRONT
 AT0407'PORCH OF THE HOUSE, 10.6 M SOUTHEAST OF THE CENTER OF THE ROAD, 1.2 M
 AT0407'SOUTH-SOUTHWEST OF A WOODEN UTILITY POLE WITH METER, 0.4 M SOUTHWEST
 AT0407'OF A METAL POST, AND 0.3 M BELOW THE LEVEL OF THE ROAD.
 AT0407
 AT0407 STATION RECOVERY (2005)
 AT0407
 AT0407'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 2005 (KLF)
 AT0407'RECOVERED AS DESCRIBED
 AT0407
 AT0407 STATION RECOVERY (2006)
 AT0407
 AT0407'RECOVERY NOTE BY 3001, INC 2006 (JCP)
 AT0407'RECOVERED AS DESCRIBED.

1 National Geodetic Survey, Retrieval Date = APRIL 13, 2006
 BH1212 *****
 BH1212 HT_MOD - This is a Louisiana Height Modernization Survey Station.
 BH1212 DESIGNATION - A 193
 BH1212 PID - BH1212
 BH1212 STATE/COUNTY- LA/ST TAMMANY
 BH1212 USGS QUAD - ENGLISH LOOKOUT (1996)
 BH1212
 BH1212 *CURRENT SURVEY CONTROL
 BH1212
 BH1212* NAD 83(1992)- 30 14 19.40273(N) 089 37 10.40720(W) ADJUSTED
 BH1212* NAVD 88 - 0.81 *(meters) 2.7 *(feet) GPS OBS(2004.65)
 BH1212 **This station is located in a subsidence area (see below).
 BH1212 **This station is included in the VTDP model (see below).
 BH1212
 BH1212 EPOCH DATE - 2004.65
 BH1212 X - 36,618.883 (meters) COMP
 BH1212 Y - -5,514,833.117 (meters) COMP
 BH1212 Z - 3,193,251.064 (meters) COMP
 BH1212 LAPLACE CORR- -1.30 (seconds) DEFLEC99
 BH1212 ELLIP HEIGHT- -26.03 (meters) (06/22/05) GPS OBS
 BH1212 GEOID HEIGHT- -26.83 (meters) GEOID03
 BH1212 DYNAMIC HT - 0.81 (meters) 2.7 (feet) COMP
 BH1212 MODELED GRAV- 979,336.4 (mgal) NAVD 88

BH1212
 BH1212 HORZ ORDER - B
 BH1212 VERT ORDER - THIRD (See Below)
 BH1212 ELLP ORDER - FOURTH CLASS I
 BH1212
 BH1212.The horizontal coordinates were established by GPS observations
 BH1212.and adjusted by the National Geodetic Survey in June 2005..
 BH1212.The horizontal coordinates are valid at the epoch date displayed above.
 BH1212.The epoch date for horizontal control is a decimal equivalence
 BH1212.of Year/Month/Day.
 BH1212
 BH1212 ** Due to the variability of land subsidence, the orthometric, ellipsoid,
 BH1212 ** and geoid heights are valid at the date of observation. These heights
 BH1212 ** must always be validated when used as control.
 BH1212 ** The orthometric height was determined with a Vertical Time-dependent
 BH1212 ** Positioning (VTDP) model and has been validated through GPS observations
 BH1212 ** for the epoch indicated (see www.ngs.noaa.gov/heightmod/VTDP).
 BH1212 ** The geoid height was determined by a new realization of GEOID03 for the
 BH1212 ** epoch indicated which incorporates improved geoid heights for the
 BH1212 ** Southern Louisiana Subsidence area
 BH1212 ** (see www.ngs.noaa.gov/PC_PROD/GEOID03/).
 BH1212.The orthometric height was determined by GPS observations and a
 BH1212.high-resolution geoid model using precise GPS observation and
 BH1212.processing techniques. It supersedes the leveled height previously
 BH1212.determined for this station.
 BH1212.The vertical order pertains to the first NAVD 88 superseded value.
 BH1212
 BH1212.The X, Y, and Z were computed from the position and the ellipsoidal ht.
 BH1212
 BH1212.The Laplace correction was computed from DEFLEC99 derived deflections.
 BH1212
 BH1212.The ellipsoidal height was determined by GPS observations
 BH1212.and is referenced to NAD 83.
 BH1212
 BH1212.The geoid height was determined by GEOID03.
 BH1212
 BH1212.The dynamic height is computed by dividing the NAVD 88
 BH1212.geopotential number by the normal gravity value computed on the
 BH1212.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
 BH1212.degrees latitude (g = 980.6199 gals.).
 BH1212
 BH1212.The modeled gravity was interpolated from observed gravity values.
 BH1212
 BH1212;

	North	East	Units	Scale	Factor	Converg.
BH1212;SPC LA S	- 193,961.478	1,164,941.665	MT	0.99993433	+0 51	24.9
BH1212;SPC LA S	- 636,355.28	3,821,979.45	sFT	0.99993433	+0 51	24.9
BH1212;UTM 16	- 3,348,141.664	247,913.036	MT	1.00038407	-1 19	11.7

 BH1212
 BH1212!

- Elev Factor	x	Scale Factor	=	Combined Factor
BH1212!SPC LA S	-	1.00000409	x	0.99993433 = 0.99993842
BH1212!UTM 16	-	1.00000409	x	1.00038407 = 1.00038816

 BH1212
 BH1212

SUPERSEDED SURVEY CONTROL

 BH1212

BH1212	NAVD 88 (02/14/94)	0.879	(m)	2.88	(f)	ADJUSTED	1	1
BH1212	NAVD 88 (06/15/91)	0.879	(m)	2.88	(f)	UNKNOWN	1	1
BH1212	NGVD 29 (??/??/??)	0.837	(m)	2.75	(f)	ADJUSTED	1	1

 BH1212
 BH1212.Superseded values are not recommended for survey control.
 BH1212.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 BH1212.See file dsdata.txt to determine how the superseded data were derived.
 BH1212
 BH1212_U.S. NATIONAL GRID SPATIAL ADDRESS: 16RBU4791348142(NAD 83)

BH1212_MARKER: DB = BENCH MARK DISK
 BH1212_SETTING: 49 = STAINLESS STEEL ROD W/O SLEEVE (10 FT.+)

BH1212_SP_SET: COPPER-CLAD STEEL ROD

BH1212_STAMPING: A 193 1963

BH1212_MARK LOGO: CGS

BH1212_PROJECTION: RECESSED 5 CENTIMETERS

BH1212_MAGNETIC: N = NO MAGNETIC MATERIAL

BH1212_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL

BH1212_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR

BH1212+SATELLITE: SATELLITE OBSERVATIONS - March 06, 2006

BH1212_ROD/PIPE-DEPTH: 29.3 meters

BH1212	HISTORY	- Date	Condition	Report By
BH1212	HISTORY	- 1963	MONUMENTED	CGS
BH1212	HISTORY	- 1970	GOOD	NGS
BH1212	HISTORY	- 1977	GOOD	NGS
BH1212	HISTORY	- 19930317	GOOD	NGS
BH1212	HISTORY	- 20040413	GOOD	NGS
BH1212	HISTORY	- 20060306	GOOD	3001

BH1212
 BH1212 STATION DESCRIPTION

BH1212'DESCIBED BY NATIONAL GEODETIC SURVEY 1970
 BH1212'0.35 MI W FROM PEARLINGTON.
 BH1212'ABOUT 0.35 MILE WEST ALONG U.S. HIGHWAY 90 FROM THE EAST END OF THE
 BH1212'HIGHWAY BRIDGE OVER THE PEARL RIVER AT PEARLINGTON, 130 FEET NORTH OF
 BH1212'THE CENTER LINE OF THE HIGHWAY, 29 FEET WEST OF A POWER POLE WITH A
 BH1212'TRANSFORMER, 11 1/2 FEET EAST OF THE CENTER LINE OF A DRIVEWAY, 1.5
 BH1212'FEET WEST OF A METAL WITNESS POST, ABOUT 5 FEET BELOW THE LEVEL OF THE
 BH1212'HIGHWAY, AND ON THE TOP OF A COPPER COATED ROD THAT IS DRIVEN TO A
 BH1212'DEPTH OF 96 FEET AND IS ENCASED IN A 4-INCH IRON PIPE WHICH IS 1 FOOT
 BH1212'BELOW THE SURFACE OF THE GROUND. SEC 30 ,T 9S,R 16W.

BH1212
 BH1212 STATION RECOVERY (1977)

BH1212'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1977
 BH1212'RECOVERED IN GOOD CONDITION.

BH1212
 BH1212 STATION RECOVERY (1993)

BH1212'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1993
 BH1212'0.9 KM (0.55 MI) WESTERLY ALONG U.S. HIGHWAY 90 FROM THE JUNCTION OF
 BH1212'STATE HIGHWAY 604 IN PEARLINGTON, MISSISSIPPI, 39.7 M (130.2 FT)
 BH1212'NORTH OF THE HIGHWAY CENTERLINE, 8.8 M (28.9 FT) WEST OF A UTILITY
 BH1212'LIGHT POLE WITH 2 GUY CABLES AND A TRANSFORMER ATTACHED, 4.2 M (13.8
 BH1212'FT) EAST OF THE CENTER OF A DRIVEWAY, 1.0 M (3.3 FT) BELOW THE LEVEL
 BH1212'OF THE HIGHWAY, 0.6 M (2.0 FT) WEST OF A WITNESS POST, AND 0.3 M (1.0
 BH1212'FT) SOUTHEAST OF A UTILITY POLE STUB. NOTE--THE DISK IS ENCASED IN A
 BH1212'4-INCH METAL PIPE AND IS FLUSH WITH THE GROUND SURFACE. THE ORIGINAL
 BH1212'DESCRIPTION STATES THAT THE MARK IS IN MISSISSIPPI, BUT IT IS IN
 BH1212'LOUISIANA.

BH1212
 BH1212 STATION RECOVERY (2004)

BH1212'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 2004 (KLF)
 BH1212'FROM EXIT 246, I 10 AND I 510 GO S ON I 510 FOR 2 MI. TO EXIT 2C, US
 BH1212'HWY 90 AND GO GO TO THE TRAFFIC LIGHT. TURN LEFT, EASTERLY ON US 90,
 BH1212'CHEF MENTEUR HWY, FOR 6.25 MI TO THE JUNCTION WITH US 11. CONTINUE ON
 BH1212'US 90 FOR 18.8 MI. TO THE JUNCTION OF US 190, CONTINUE EASTERLY FOR
 BH1212'3.7 MI. TO THE MARK ON THE LEFT. IT IS 0.35 MI WESTERLY FROM THE EAST
 BH1212'END OF THE BRIDGE OVER THE PEARL RIVER, 1 FT ENE OF A 4 FT POWER POLE
 BH1212'STUB, 11.5 FT E OF A SHELL DRIVE, 29 FT W OF A POWER POLE WITH A
 BH1212'TRANSFORMER, AND 1 FOOT BELOW THE HIGHWAY.

BH1212
 BH1212 STATION RECOVERY (2006)
 BH1212
 BH1212'RECOVERY NOTE BY 3001, INC 2006 (JCP)
 BH1212'RECOVERED AS DESCRIBED.

1 National Geodetic Survey, Retrieval Date = APRIL 13, 2006

BJ1342 *****
 BJ1342 HT_MOD - This is a Louisiana Height Modernization Survey Station.
 BJ1342 FBN - This is a Federal Base Network Control Station.
 BJ1342 TIDAL BM - This is a Tidal Bench Mark.
 BJ1342 DESIGNATION - ALCO
 BJ1342 PID - BJ1342
 BJ1342 STATE/COUNTY- LA/ORLEANS
 BJ1342 USGS QUAD - SPANISH FORT (1992)
 BJ1342
 BJ1342 *CURRENT SURVEY CONTROL
 BJ1342

BJ1342*	NAD 83(1992)-	30 01 36.52293(N)	090 06 46.21053(W)	ADJUSTED
BJ1342*	NAVD 88	- 1.87 *(meters)	6.1 *(feet)	LEVELING(2004.65)

BJ1342 **This station is located in a subsidence area (see below).
 BJ1342 **This station is included in the VTDP model (see below).
 BJ1342

BJ1342	EPOCH DATE	-	2004.65	
BJ1342	X	-	-10,884.174 (meters)	COMP
BJ1342	Y	-	-5,526,738.134 (meters)	COMP
BJ1342	Z	-	3,172,935.170 (meters)	COMP
BJ1342	LAPLACE CORR-		-0.05 (seconds)	DEFLEC99
BJ1342	ELLIP HEIGHT-		-24.37 (meters)	(06/22/05) GPS OBS
BJ1342	GEOID HEIGHT-		-26.24 (meters)	GEOID03
BJ1342	DYNAMIC HT	-	1.87 (meters)	6.1 (feet) COMP
BJ1342	MODELED GRAV-		979,318.9 (mgal)	NAVD 88

BJ1342
 BJ1342 HORZ ORDER - B
 BJ1342 VERT ORDER - THIRD
 BJ1342 ELLP ORDER - FOURTH CLASS I
 BJ1342

BJ1342.The horizontal coordinates were established by GPS observations
 BJ1342.and adjusted by the National Geodetic Survey in June 2005..
 BJ1342.The horizontal coordinates are valid at the epoch date displayed above.
 BJ1342.The epoch date for horizontal control is a decimal equivalence
 BJ1342.of Year/Month/Day.
 BJ1342

BJ1342 ** Due to the variability of land subsidence, the orthometric, ellipsoid,
 BJ1342 ** and geoid heights are valid at the date of observation. These heights
 BJ1342 ** must always be validated when used as control.
 BJ1342 ** The orthometric height was determined with a Vertical Time-dependent
 BJ1342 ** Positioning (VTDP) model and has been validated through GPS observations
 BJ1342 ** for the epoch indicated (see www.ngs.noaa.gov/heightmod/VTDP).
 BJ1342 ** The geoid height was determined by a new realization of GEOID03 for the
 BJ1342 ** epoch indicated which incorporates improved geoid heights for the
 BJ1342 ** Southern Louisiana Subsidence area
 BJ1342 ** (see www.ngs.noaa.gov/PC_PROD/GEOID03/).
 BJ1342.The orthometric height was determined by differential leveling.
 BJ1342.The vertical network tie was performed by a horz. field party for horz.
 BJ1342.obs reductions. Reset procedures were used to establish the elevation.
 BJ1342

BJ1342.This Tidal Bench Mark is designated as VM 832
 BJ1342.by the Center for Operational Oceanographic Products and Services.
 BJ1342

BJ1342.The X, Y, and Z were computed from the position and the ellipsoidal ht.
 BJ1342

BJ1342.The Laplace correction was computed from DEFLEC99 derived deflections.
 BJ1342

BJ1342+SATELLITE: SATELLITE OBSERVATIONS - February 20, 2006

BJ1342	HISTORY	- Date	Condition	Report By
BJ1342	HISTORY	- 1931	MONUMENTED	CGS
BJ1342	HISTORY	- 1935	GOOD	LAGS
BJ1342	HISTORY	- 1942	GOOD	CGS
BJ1342	HISTORY	- 1953	GOOD	CGS
BJ1342	HISTORY	- 1954	GOOD	CGS
BJ1342	HISTORY	- 1963	GOOD	CGS
BJ1342	HISTORY	- 1964	GOOD	CGS
BJ1342	HISTORY	- 1981	MARK NOT FOUND	USGS
BJ1342	HISTORY	- 1985	GOOD	USPSQD
BJ1342	HISTORY	- 1985	GOOD	NGS
BJ1342	HISTORY	- 1987	GOOD	LADTD
BJ1342	HISTORY	- 1988	GOOD	USPSQD
BJ1342	HISTORY	- 19880920	GOOD	LADTD
BJ1342	HISTORY	- 19890117	GOOD	
BJ1342	HISTORY	- 19901108	GOOD	NGS
BJ1342	HISTORY	- 19911016	GOOD	LADTD
BJ1342	HISTORY	- 19921124	GOOD	NOS
BJ1342	HISTORY	- 19930303	GOOD	NOS
BJ1342	HISTORY	- 19941117	GOOD	NGS
BJ1342	HISTORY	- 19960130	GOOD	NGS
BJ1342	HISTORY	- 19960218	GOOD	NGS
BJ1342	HISTORY	- 19980213	GOOD	NGS
BJ1342	HISTORY	- 19980309	GOOD	NGS
BJ1342	HISTORY	- 20010505	GOOD	NGS
BJ1342	HISTORY	- 20030402	GOOD	3001
BJ1342	HISTORY	- 20040601	GOOD	NGS
BJ1342	HISTORY	- 20040922	GOOD	LADTD
BJ1342	HISTORY	- 20051008	GOOD	NGS
BJ1342	HISTORY	- 20060220	GOOD	3001

BJ1342

BJ1342 STATION DESCRIPTION

BJ1342

BJ1342'DESCRIBED BY COAST AND GEODETIC SURVEY 1931 (RLS)
 BJ1342'NEAR THE WEST END LIGHTHOUSE, ON THE LAKE PONTCHARTRAIN
 BJ1342'SEA-WALL IN ZONE 1, WHICH LIES BETWEEN THE ORLEANS CANAL AND THE
 BJ1342'NEW BASIN CANAL, AND IN THE 132ND BAY COUNTING FROM THE ORLEANS
 BJ1342'CANAL.

BJ1342'

BJ1342'THE STATION IS MARKED BY A STANDARD BRONZE DISK WHICH IS SET
 BJ1342'FLUSH WITH THE TOP SURFACE OF THE TOP COPING.

BJ1342'

BJ1342'THE REFERENCE MARK, A STANDARD BRONZE DISK, IS
 BJ1342'S 77 DEG 38 MIN E.

BJ1342'

BJ1342'THE CROSS ON THE MOUNT CARMEL CONVENT IS S 19 DEG 56 MIN E.

BJ1342

BJ1342 STATION RECOVERY (1935)

BJ1342

BJ1342'RECOVERY NOTE BY LOUISIANA GEODETIC SURVEY 1935
 BJ1342'STATION RECOVERED AS DESCRIBED.

BJ1342

BJ1342 STATION RECOVERY (1942)

BJ1342

BJ1342'RECOVERY NOTE BY COAST AND GEODETIC SURVEY 1942 (HCW)
 BJ1342'STATION WAS RECOVERED AS DESCRIBED IN EVERY DETAIL. THE
 BJ1342'DISTANCES AND DIRECTIONS TO AZIMUTH MARKS WERE NOT CHECKED.
 BJ1342'

BJ1342'NEAR THE WEST END LIGHTHOUSE, ON THE LAKE PONTCHARTRAIN
 BJ1342'SEA-WALL IN ZONE 1, WHICH LIES BETWEEN THE ORLEANS CANAL AND
 BJ1342'THE NEW BASIN CANAL, AND IN THE 132ND BAY COUNTING FROM THE

BJ1342'ORLEANS CANAL.
 BJ1342'
 BJ1342'THE STATION IS MARKED BY A STANDARD BRONZE DISK WHICH IS SET
 BJ1342'FLUSH WITH THE TOP SURFACE OF THE TOP COPING.
 BJ1342'
 BJ1342'THE REFERENCE MARK, A STANDARD BRONZE DISK, IS
 BJ1342'S 77 DEG 38 MIN E.
 BJ1342'
 BJ1342'THE CROSS ON THE MOUNT CARMEL CONVENT IS S 19 DEG 56 MIN E.
 BJ1342
 BJ1342 STATION RECOVERY (1953)
 BJ1342
 BJ1342'RECOVERY NOTE BY COAST AND GEODETIC SURVEY 1953 (RLE)
 BJ1342'STATION AND REFERENCE MARK WERE RECOVERED IN GOOD CONDITION.
 BJ1342'A NEW DESCRIPTION FOLLOWS--
 BJ1342'
 BJ1342'STATION IS LOCATED ON THE LAKE PONTCHARTRAIN SEAWALL, JUST E
 BJ1342'OF A U.S. COAST GUARD STATION. IT IS A STANDARD BRONZE DISK,
 BJ1342'STAMPED ALCO 1931 AND CEMENTED IN A DRILL HOLE IN THE TOP OF A
 BJ1342'CONCRETE SEAWALL.
 BJ1342'
 BJ1342'THE REFERENCE MARK IS A STANDARD BRONZE DISK, STAMPED ALCO 1931
 BJ1342'AND CEMENTED IN A DRILL HOLE IN THE TOP OF A CONCRETE SEAWALL.
 BJ1342'
 BJ1342'TO REACH THE STATION FROM THE INTERSECTION OF LAKESHORE DRIVE
 BJ1342'AND CANAL BOULEVARD, GO W ON LAKESHORE DRIVE ALONG THE SEAWALL
 BJ1342'FOR 0.4 MI. TO THE STATION ON THE RIGHT AS DESCRIBED JUST E OF
 BJ1342'THE COAST GUARD STATION.
 BJ1342
 BJ1342 STATION RECOVERY (1954)
 BJ1342
 BJ1342'RECOVERY NOTE BY COAST AND GEODETIC SURVEY 1954 (RAE)
 BJ1342'THE STATION IS LOCATED IN THE NW SECTION OF NEW ORLEANS, NEAR THE
 BJ1342'MOUTH OF NEW CANAL, 150 FT. SE OF NEW CANAL LIGHTHOUSE, AND ON
 BJ1342'THE S SHORE OF LAKE PONCHARTRAIN. IT IS 46 PACES E OF THE W END
 BJ1342'OF THE SEAWALL, AND 132 BAYS W OF ORLEANS CANAL. IT IS A
 BJ1342'STANDARD DISK, SET IN A DRILL HOLE IN THE TOP OF THE SEAWALL. IT
 BJ1342'IS STAMPED ALCO 1931.
 BJ1342'
 BJ1342'THE REFERENCE MARK IS W OF THE STATION S 77 DEG 38 MIN W.
 BJ1342'IT IS 13 PACES E OF THE W END OF THE SEAWALL. IT IS A STANDARD
 BJ1342'DISK, SET IN A DRILL HOLE IN THE TOP OF THE SEAWALL, AND STAMPED
 BJ1342'ALCO 1931.
 BJ1342
 BJ1342 STATION RECOVERY (1963)
 BJ1342
 BJ1342'RECOVERY NOTE BY COAST AND GEODETIC SURVEY 1963
 BJ1342'IN NEW ORLEANS.
 BJ1342'AT NEW ORLEANS, AT WEST END, NEAR THE NORTH END OF WEST END BOULEVARD,
 BJ1342'NEAR THE COAST GUARD STATION, SET IN THE TOP OF THE SEA WALL ALONG
 BJ1342'SHORE OF LAKE PONTCHARTRAIN, 112 FEET NORTHWEST OF THE CENTER LINE OF
 BJ1342'LAKESHORE DRIVE, 115 FEET EAST OF THE WEST END OF THE SEA WALL, 70
 BJ1342'FEET EAST OF A STEEL FENCE CORNER POST ON TOP OF THE SEA WALL AND IS
 BJ1342'ABOUT 2 FEET ABOVE THE DRIVE.
 BJ1342
 BJ1342 STATION RECOVERY (1964)
 BJ1342
 BJ1342'RECOVERY NOTE BY COAST AND GEODETIC SURVEY 1964 (RRG)
 BJ1342'THE STATION AND ONE REFERENCE MARK WAS FOUND AND IN GOOD
 BJ1342'CONDITION.
 BJ1342'
 BJ1342'THE STATION IS LOCATED ALONG THE SEA WALL ALONG THE SHORE OF LAKE
 BJ1342'PONTCHARTRAIN, NEAR THE COAST GUARD STATION, 112 FEET NORTHWEST

BJ1342'OF THE CENTER LINE OF LAKESHORE DRIVE, 115 FEET EAST OF THE WEST
 BJ1342'END OF THE SEA WALL, 70 FEET EAST OF A STEEL FENCE POST IN
 BJ1342'SEA WALL AND ABOUT 2 FEET ABOVE THE LEVEL OF THE DRIVE.
 BJ1342'
 BJ1342'THE REFERENCE MARK IS 87 FEET WEST OF THE STATION AND SET ON
 BJ1342'TOP OF THE SEA WALL. 23 FEET EAST OF THE WEST END OF THE WALL
 BJ1342'AND 2 FEET ABOVE THE LEVEL OF THE DRIVE,
 BJ1342
 BJ1342 STATION RECOVERY (1981)
 BJ1342
 BJ1342'RECOVERY NOTE BY US GEOLOGICAL SURVEY 1981
 BJ1342'MARK NOT FOUND.
 BJ1342
 BJ1342 STATION RECOVERY (1985)
 BJ1342
 BJ1342'RECOVERY NOTE BY US POWER SQUADRON 1985 (JCM)
 BJ1342'ALCO--1931 FOUND GOOD.
 BJ1342'
 BJ1342'DESCRIPTION ADEQUATE.
 BJ1342'
 BJ1342'REFERENCE MARK FOUND GOOD.
 BJ1342'LOCATED ON TOP SURFACE OF SEA WALL 87 FEET WEST OF STATION, APPROX.
 BJ1342'TWO FEET WEST OF US COAST GUARD DRIVEWAY GATE, UNDER CYCLONE FENCE.
 BJ1342
 BJ1342 STATION RECOVERY (1985)
 BJ1342
 BJ1342'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1985
 BJ1342'RECOVERED IN GOOD CONDITION, THE 1963 RECOVERY IS ADEQUATE WITH THE
 BJ1342'FOLLOWING ADDITION, ADD--7.07 METERS (23.2 FT) NORTH-NORTHEAST OF
 BJ1342'STEEL LAMP POST 500.
 BJ1342
 BJ1342 STATION RECOVERY (1987)
 BJ1342
 BJ1342'RECOVERY NOTE BY LA TRANSP AND DEV 1987 (TLH)
 BJ1342'THE DESIGNATED MARK WAS RECOVERED WITH CHANGES NOTED BELOW--
 BJ1342'A COMPLETE NEW DESCRIPTION WAS MADE THIS DATE.
 BJ1342'
 BJ1342'THE STATION IS LOCATED ABOUT 7 KM (4.4 MI) NORTH OF INTERSTATE
 BJ1342'HIGHWAY 10, NEAR THE U.S. COAST GUARD STATION AT LAKE PONCHATRAIN.
 BJ1342'OWNERSHIP--ORLEANS PARISH LEVEE BOARD, SUITE 202, ADMINISTRATION
 BJ1342'BUILDING, LAKEFRONT AIRPORT, NEW ORLEANS, LA. PHONE 504-246-4000.
 BJ1342'
 BJ1342'TO REACH THE STATION FROM THE JUNCTION OF INTERSTATE HIGHWAY 10 AND
 BJ1342'CAUSEWAY BOULEVARD, GO NORTH FOR 0.55 KM (0.35 MI) ON CAUSEWAY
 BJ1342'BOULEVARD TO VETERANS MEMORIAL HIGHWAY.
 BJ1342'TURN RIGHT AND GO EAST FOR 3.89 KM (2.4 MI) ON VETERANS MEMORIAL
 BJ1342'BOULEVARD TO PONCHATRAIN BOULEVARD.
 BJ1342'TURN LEFT AND GO NORTH FOR 1.85 KM (1.15 MI) ON PONCHATRAIN
 BJ1342'BOULEVARD TO ROBERT E LEE BOULEVARD.
 BJ1342'CONTINUE STRAIGHT AHEAD AND GO NORTH FOR 0.72 KM (0.45 MI) ON
 BJ1342'ROBERT E LEE BOULEVARD TO THE COAST GUARD STATION ENTRANCE ON THE
 BJ1342'LEFT AT THE EAST END OF A CURVE IN THE ROAD. TURN LEFT ONTO A
 BJ1342'NARROW LANE FOR 30 METERS (100 FT) TO THE STATION ON THE RIGHT.
 BJ1342'
 BJ1342'THE STATION IS A STANDARD CGS DISK
 BJ1342'STAMPED---ALCO 1931---,
 BJ1342'SET INTO A DRILL HOLE IN THE TOP STEP OF THE SEAWALL.
 BJ1342'21.2 METERS (69.5 FT) EAST FROM THE EAST GATE POST AT THE ENTRANCE
 BJ1342'TO THE COAST GUARD STATION,
 BJ1342'7.2 METERS (23.6 FT) NORTHEAST FROM A METAL LIGHT POLE, AND
 BJ1342'4.6 METERS (15.1 FT) WEST FROM A SEAM IN THE SEAWALL.
 BJ1342
 BJ1342 STATION RECOVERY (1988)

BJ1342
 BJ1342'RECOVERY NOTE BY US POWER SQUADRON 1988 (WFT)
 BJ1342'RECOVERED IN GOOD CONDITION.
 BJ1342
 BJ1342 STATION RECOVERY (1988)
 BJ1342
 BJ1342'RECOVERY NOTE BY LA TRANSP AND DEV 1988
 BJ1342'THE STATION IS LOCATED ABOUT 7 KM (4.35 MI) NORTH OF INTERSTATE
 BJ1342'HIGHWAY 10, NEAR THE U.S. COAST GUARD STATION AT LAKE PONTCHATRAIN.
 BJ1342'OWNERSHIP--ORLEANS PARISH LEVEE BOARD, SUITE 202, ADMINISTRATION
 BJ1342'BUILDING, LAKEFRONT AIRPORT, NEW ORLEANS, LA. PHONE 504-246-4000.
 BJ1342'TO REACH THE STATION FROM THE JUNCTION OF INTERSTATE HIGHWAY 10 AND
 BJ1342'CAUSEWAY BOULEVARD, GO NORTH FOR 0.55 KM (0.35 MI) ON CAUSEWAY
 BJ1342'BOULEVARD TO VETERANS MEMORIAL HIGHWAY, TURN RIGHT AND GO EAST FOR
 BJ1342'3.89 KM (2.40 MI) ON VETERANS MEMORIAL BOULEVARD TO WEST END BLVD,
 BJ1342'TURN LEFT AND GO NORTH ON WEST END BLVD FOR 2.57 KM (1.60 MI) TO THE
 BJ1342'COAST GUARD STATION ENTRANCE ON THE LEFT AT THE EAST END OF A CURVE IN
 BJ1342'THE ROAD. TURN LEFT ONTO A NARROW LANE FOR 30 METERS (98.4 FT) TO THE
 BJ1342'STATION ON THE RIGHT, 21.2 M (69.6 FT) EAST FROM THE EAST GATE POST AT
 BJ1342'THE ENTRANCE TO THE COAST GUARD STATION, 7.2 M (23.6 FT) NORTHEAST
 BJ1342'FROM A METAL LIGHT POLE, AND 4.6 M (15.1 FT) WEST FROM A SEAM IN THE
 BJ1342'SEAWALL.
 BJ1342
 BJ1342 STATION RECOVERY (1989)
 BJ1342
 BJ1342'RECOVERED 1989
 BJ1342'RECOVERED IN GOOD CONDITION.
 BJ1342
 BJ1342 STATION RECOVERY (1990)
 BJ1342
 BJ1342'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1990
 BJ1342'IN NEW ORLEANS, AT 800 LAKESHORE DRIVE, IN A CONCRETE RETAINING WALL
 BJ1342'ALONG THE SOUTH SHORE OF LAKE PONTCHARTRAIN, 38.8 M (127.3 FT)
 BJ1342'EAST-SOUTHEAST OF THE SOUTHEAST CORNER OF A LIGHTHOUSE AT 800
 BJ1342'LAKESHORE DRIVE, 35.0 M (114.8 FT) EAST OF THE WEST END OF THE
 BJ1342'RETAINING WALL, 34.1 M (111.9 FT) NORTHWEST OF THE CENTERLINE OF THE
 BJ1342'DRIVE, 23.9 M (78.4 FT) EAST OF THE CENTER OF A DRIVEWAY, 21.3 M
 BJ1342'(69.9 FT) EAST OF A STEEL FENCE CORNER POST ON TOP OF THE SEA WALL,
 BJ1342'7.1 M (23.3 FT) NORTH-NORTHEAST OF UTILITY LIGHT POLE NUMBER 500, AND
 BJ1342'0.6 M (2.0 FT) ABOVE THE LEVEL OF THE DRIVE.
 BJ1342
 BJ1342 STATION RECOVERY (1991)
 BJ1342
 BJ1342'RECOVERY NOTE BY LA TRANSP AND DEV 1991
 BJ1342'THE STATION IS LOCATED IN NORTHWEST NEW ORLEANS, NEAR THE U.S. COAST
 BJ1342'GUARD STATION ON THE SOUTH SHORE OF LAKE PONCHATRAIN.
 BJ1342'OWNERSHIP--ORLEANS PARISH LEVEE BOARD, SUITE 202, ADMINISTRATION
 BJ1342'BUILDING, LAKEFRONT AIRPORT, NEW ORLEANS, LA. PHONE 504-246-4000.
 BJ1342'TO REACH THE STATION FROM THE JUNCTION OF INTERSTATE HIGHWAY 10 AND
 BJ1342'CAUSEWAY BOULEVARD, GO NORTH FOR 0.35 MI (0.56 KM) ON CAUSEWAY
 BJ1342'BOULEVARD TO THE JUNCTION WITH VETERANS MEMORIAL BOULVARD, TURN RIGHT
 BJ1342'AND GO EAST FOR 2.4 MI (3.9 KM) ON VETERANS BOULEVARD TO THE JUNCTION
 BJ1342'WITH WEST END BOULEVARD, TURN LEFT AND GO NORTH FOR 1.6 MI (2.6 KM)
 BJ1342'ON WEST END BOULEVARD WHICH TURNS INTO LAKESHORE DRIVE TO THE COAST
 BJ1342'GUARD STATION ON THE LEFT AND STATION MARK ON THE LEFT SET IN THE
 BJ1342'SEAWALL.
 BJ1342'THE STATION IS 123.0 FT (37.5 M) NORTH-NORTHWEST FROM THE CENTER OF
 BJ1342'LAKESHORE DRIVE, 69.5 FT (21.2 M) EAST-NORTHEAST FROM THE EAST GATE
 BJ1342'POST AT THE ENTRANCE OF THE COAST GUARD STATION, 23.5 FT (7.2 M)
 BJ1342'NORTHEAST FROM A METAL LIGHT POLE, 32.5 FT (9.9 M) NORTH FROM THE
 BJ1342'CENTER OF THE DRIVE INTO THE COAST GUARD STATION, 15.0 FT (4.6 M)
 BJ1342'WEST-SOUTHWEST FROM A SEAM IN THE SEA WALL, FLUSH WITH THE TOP OF THE
 BJ1342'SEAWALL AND ABOUT LEVEL WITH THE ROAD.

BJ1342
 BJ1342 STATION RECOVERY (1992)
 BJ1342
 BJ1342'RECOVERY NOTE BY NATIONAL OCEAN SERVICE 1992
 BJ1342'RECOVERED IN GOOD CONDITION.
 BJ1342
 BJ1342 STATION RECOVERY (1993)
 BJ1342
 BJ1342'RECOVERY NOTE BY NATIONAL OCEAN SERVICE 1993
 BJ1342'RECOVERED IN GOOD CONDITION.
 BJ1342
 BJ1342 STATION RECOVERY (1994)
 BJ1342
 BJ1342'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1994 (GAS)
 BJ1342'IN NEW ORLEANS, AT 8001 LAKESHORE DRIVE, IN A CONCRETE RETAINING WALL
 BJ1342'ALONG THE SOUTH SHORE OF LAKE PONTCHARTRAIN, 36.7 M (120.4 FT)
 BJ1342'SOUTHEAST OF THE SOUTHEAST CORNER OF THE U.S. COAST GUARD LIGHT HOUSE
 BJ1342'AT 8001 LAKESHORE DRIVE, 27.3 M (89.6 FT) EAST OF ALCO REFERENCE MARK,
 BJ1342'9.9 M (32.5 FT) NORTH-NORTHEAST OF AND LEVEL WITH THE CENTER OF THE
 BJ1342'LIGHTHOUSE ENTRANCE DRIVE, AND 7.2 M (23.6 FT) NORTHEAST OF A UTILITY
 BJ1342'LIGHT POLE.
 BJ1342
 BJ1342 STATION RECOVERY (1996)
 BJ1342
 BJ1342'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1996 (RPB)
 BJ1342'RECOVERED AS DESCRIBED.
 BJ1342
 BJ1342 STATION RECOVERY (1996)
 BJ1342
 BJ1342'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1996 (RPB)
 BJ1342'RECOVERED AS DESCRIBED.
 BJ1342
 BJ1342 STATION RECOVERY (1998)
 BJ1342
 BJ1342'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1998 (CSM)
 BJ1342'RECOVERED AS DESCRIBED.
 BJ1342
 BJ1342 STATION RECOVERY (1998)
 BJ1342
 BJ1342'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1998 (CSM)
 BJ1342'RECOVERED AS DESCRIBED.
 BJ1342
 BJ1342 STATION RECOVERY (2001)
 BJ1342
 BJ1342'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 2001 (RTN)
 BJ1342'THIS STATION IS LOCATED IN NORTH NEW ORLEANS, LOUISIANA. IN A
 BJ1342'CONCRETE
 BJ1342'RETAINING WALL ALONG THE SOUTH SHORE OF LAKE PONTCHARTRAIN.
 BJ1342'OWNERSHIP IS THE ORLEANS PARISH LEVEE BOARD, SUITE 202, ADMINISTRATION
 BJ1342'BUILDING, LAKEFRONT AIRPORT, STARS AND STRIPES BOULEVARD, NEW ORLEANS,
 BJ1342'LA. PHONE 504 246-4000.
 BJ1342'
 BJ1342'TO REACH THIS STATION FROM THE JUNCTION OF INTERSTATE 10 AND CAUSEWAY
 BJ1342'BOULEVARD, GO NORTH FOR 0.35 MILES ON CAUSEWAY BOULEVARD TO THE
 BJ1342'JUNCTION WITH VETERANS BOULEVARD. RIGHT AND GO EAST FOR 2.4 MILES ON
 BJ1342'VETERANS BOULEVARD TO THE JUNCTION WITH WEST END BOULEVARD, TURN
 BJ1342'LEFT AND GO NORTH FOR 1.6 MILES ON WEST END BOULEVARD WHICH TURNS INTO
 BJ1342'LAKESHORE DRIVE TO THE COAST GUARD
 BJ1342'
 BJ1342'STATION ON LEFT AND STATION ON THE LEFT. . STATION IS SET IN THE
 BJ1342'SEAWALL. IT
 BJ1342'IS 217.0 FEET NORTH-NORTHWEST FROM THE CENTER OF LAKESHORE DRIVE, 69.5
 BJ1342'FEET EAST-NORTHEAST FROM TH EAST GATE POST AT THE ENTRANCE OF THE

BJ1342' COAST GUARD STATION, 23.5 FEET NORTH FROM THE CENTER OF THE DRIVE INTO
BJ1342' COAST GUARD STATION, 15.0 FEET WEST-SOUTHWEST FROM THE SEAM IN THE SEA
BJ1342' WALL, 89.6 FEET EAST OF ALCO REFERENCE MARK, 23.6 FEET NORTHEAST OF A
BJ1342' UTILITY LIGHT POLE, AND FLUSH WITH TOP OF THE SEAWALL AND ABOUT LEVEL
BJ1342' WITH ROAD.

BJ1342'
BJ1342'
BJ1342

STATION RECOVERY (2003)

BJ1342

BJ1342' RECOVERY NOTE BY 3001, INC 2003 (KD)

BJ1342' THE STATION IS LOCATED IN NEW ORLEANS ON A SEA WALL BESIDE JOES
BJ1342' RESTURANT AT THE LAKE SHORE. ITI IS NEXT TO A GREEN AND WHITE LIGHT
BJ1342' HOUSE. THE STATION IS 3.8 MILES FROM METAIRIE, 8.0 MILES FROM KENNER,
BJ1342' AND 10.7 MILES FROM CHALMETTE.

BJ1342'

BJ1342' OWNERSHIP- UNKNOWN

BJ1342'

BJ1342' TO REACH THE STATION FROM THE INTERSECTION OF I-10 AND I-610 DRIVE
BJ1342' NORTH ON WEST END BLVD. FOR 1.7 MILES. THE ROAD BECOMES LAKE FRONT
BJ1342' DRIVE. KEEP GOING FOR 0.4 MILES TO A CURVE IN THE ROAD. TURN INTO
BJ1342' JOE'S RESTURANT PARKING LOT ON THE LEFT SIDE OF THE ROAD. THE STATION
BJ1342' IS LOCATED NORTH OF THE PARKING AREA IN THE SEAWALL.

BJ1342'

BJ1342' THE STATION IS A TRIANGULATION STATION DISK SET FLUSH IN A SEAWALL. IT
BJ1342' IS LOCATED 68.7 FT. EAST FROM THE CORNER OF THE SEAWALL, 23.5 FT.
BJ1342' NORTHEAST FROM A LIGHT POLE, AND 54 FEET NORTHWEST OF A STORM DRAIN.

BJ1342

BJ1342

STATION RECOVERY (2004)

BJ1342

BJ1342' RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 2004 (KLF)

BJ1342' RECOVERED AS DESCRIBED.

BJ1342

BJ1342

STATION RECOVERY (2004)

BJ1342

BJ1342' RECOVERY NOTE BY LA TRANSP AND DEV 2004 (SLC)

BJ1342' RECOVERED IN GOOD CONDITION.

BJ1342

BJ1342

STATION RECOVERY (2005)

BJ1342

BJ1342' RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 2005 (KLF)

BJ1342' RECOVERED AS DESCRIBED.

BJ1342

BJ1342

STATION RECOVERY (2006)

BJ1342

BJ1342' RECOVERY NOTE BY 3001, INC 2006 (JCP)

BJ1342' RECOVERED AS DESCRIBED.

1 National Geodetic Survey, Retrieval Date = APRIL 13, 2006

BH0901 *****

BH0901 HT_MOD - This is a Louisiana Height Modernization Survey Station.

BH0901 DESIGNATION - B 31 USE

BH0901 PID - BH0901

BH0901 STATE/COUNTY- MS/HARRISON

BH0901 USGS QUAD - PASS CHRISTIAN (1994)

BH0901

BH0901

*CURRENT SURVEY CONTROL

BH0901

BH0901* NAD 83(1993)- 30 20 15.35294(N) 089 10 11.52293(W) ADJUSTED

BH0901* NAVD 88 - 3.16 *(meters) 10.4 *(feet) GPS OBS(2004.65)

BH0901 **This station is located in a subsidence area (see below).

BH0901

BH0901 EPOCH DATE - 2004.65

BH0901 X - 79,820.802 (meters) COMP

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BH0901  Y          -  -5,508,849.443 (meters)          COMP
BH0901  Z          -   3,202,716.547 (meters)          COMP
BH0901  LAPLACE CORR-    -1.35 (seconds)          DEFLEC99
BH0901  ELLIP HEIGHT-  -24.68 (meters)          (04/11/06) GPS OBS
BH0901  GEOID HEIGHT-  -27.86 (meters)          GEOID03
BH0901  DYNAMIC HT  -    3.16 (meters)          10.4 (feet) COMP
BH0901  MODELED GRAV-   979,317.1 (mgal)          NAVD 88
BH0901
BH0901  HORZ ORDER  -  B
BH0901  VERT ORDER  -  FIRST    CLASS I (See Below)
BH0901  ELLP ORDER  -  FOURTH   CLASS II
BH0901
BH0901.The horizontal coordinates were established by GPS observations
BH0901.and adjusted by the National Geodetic Survey in April 2006..
BH0901.The horizontal coordinates are valid at the epoch date displayed above.
BH0901.The epoch date for horizontal control is a decimal equivalence
BH0901.of Year/Month/Day.
BH0901
BH0901 ** Due to the variability of land subsidence, the orthometric, ellipsoid,
BH0901 ** and geoid heights are valid at the date of observation. These heights
BH0901 ** must always be validated when used as control.
BH0901 ** The orthometric height was determined by GPS observations using
BH0901 ** precise GPS observation and processing techniques and a new
BH0901 ** realization of GEOID03. It supersedes the leveled height previously
BH0901 ** determined for this station.
BH0901 ** The geoid height was determined by a new realization of GEOID03 for the
BH0901 ** epoch indicated which incorporates improved geoid heights for the
BH0901 ** Southern Louisiana Subsidence area.
BH0901 ** (see www.ngs.noaa.gov/PC_PROD/GEOID03/).
BH0901.The orthometric height was determined by GPS observations and a
BH0901.high-resolution geoid model using precise GPS observation and
BH0901.processing techniques. It supersedes the leveled height previously
BH0901.determined for this station.
BH0901.The vertical order pertains to the first NAVD 88 superseded value.
BH0901
BH0901.The X, Y, and Z were computed from the position and the ellipsoidal ht.
BH0901
BH0901.The Laplace correction was computed from DEFLEC99 derived deflections.
BH0901
BH0901.The ellipsoidal height was determined by GPS observations
BH0901.and is referenced to NAD 83.
BH0901
BH0901.The geoid height was determined by GEOID03.
BH0901
BH0901.The dynamic height is computed by dividing the NAVD 88
BH0901.geopotential number by the normal gravity value computed on the
BH0901.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
BH0901.degrees latitude (g = 980.6199 gals.).
BH0901
BH0901.The modeled gravity was interpolated from observed gravity values.
BH0901
BH0901;
          North          East          Units Scale Factor Converg.
BH0901;SPC MS E  -   92,892.010   267,641.067   MT  0.99996291  -0 10 11.9
BH0901;SPC MS E  -   304,763.20    878,085.73   sFT 0.99996291  -0 10 11.9
BH0901;UTM  16   -  3,358,190.541   291,408.687   MT  1.00013681  -1 05 47.0
BH0901
BH0901!
          - Elev Factor x Scale Factor = Combined Factor
BH0901!SPC MS E  -   1.00000388 x  0.99996291 =  0.99996679
BH0901!UTM  16   -   1.00000388 x  1.00013681 =  1.00014069
BH0901
BH0901
          SUPERSEDED SURVEY CONTROL
BH0901
BH0901
BH0901  NAVD 88 (06/15/91)   3.178 (m)          10.43 (f) ADJUSTED   1 1

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BH0901 NGVD 29 (??/??/??) 3.139 (m) 10.30 (f) ADJUSTED 1 1
BH0901
BH0901.Superseded values are not recommended for survey control.
BH0901.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
BH0901.See file dsdata.txt to determine how the superseded data were derived.
BH0901
BH0901_U.S. NATIONAL GRID SPATIAL ADDRESS: 16RBU9140958191(NAD 83)
BH0901_MARKER: DD = SURVEY DISK
BH0901_SETTING: 36 = SET IN A MASSIVE STRUCTURE
BH0901_SP_SET: SET IN A MASSIVE STRUCTURE
BH0901_STAMPING: B 31 1958
BH0901_MAGNETIC: N = NO MAGNETIC MATERIAL
BH0901_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
BH0901
BH0901 HISTORY - Date Condition Report By
BH0901 HISTORY - 1958 MONUMENTED USE
BH0901 HISTORY - 1968 GOOD CGS
BH0901 HISTORY - 1976 GOOD NGS
BH0901 HISTORY - 19880823 GOOD USPSQD
BH0901 HISTORY - 20060306 GOOD 3001
BH0901
BH0901 STATION DESCRIPTION
BH0901
BH0901'DESCRIBED BY COAST AND GEODETIC SURVEY 1968
BH0901'1.7 MI SW FROM LONG BEACH.
BH0901'ABOUT 1.2 MILES SOUTHWEST ALONG THE LOUISVILLE AND NASHVILLE RAILROAD
BH0901'FROM THE CROSSING OF JEFF DAVIS AVENUE AT LONG BEACH, THENCE 0.5 MILE
BH0901'SOUTH ALONG LANG AVENUE, 217 FEET NORTHEAST OF THE EXTENDED CENTER
BH0901'LINE OF LANG AVENUE, SET ON THE TOP OF THE CONCRETE SEA WALL NEAR THE
BH0901'EAST CORNER OF A CONCRETE CULVERT UNDER U. S. HIGHWAY 90, 16.2 FEET
BH0901'SOUTHEAST OF THE SOUTHEAST CURB OF THE EASTBOUND LANE OF THE HIGHWAY,
BH0901'2.9 FEET NORTHEAST OF THE SOUTHWEST END OF THE SEA WALL AND 2 1/2 FEET
BH0901'ABOVE THE LEVEL OF THE HIGHWAY.
BH0901
BH0901 STATION RECOVERY (1976)
BH0901
BH0901'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1976
BH0901'RECOVERED IN GOOD CONDITION.
BH0901
BH0901 STATION RECOVERY (1988)
BH0901
BH0901'RECOVERY NOTE BY US POWER SQUADRON 1988 (WCE)
BH0901'RECOVERED IN GOOD CONDITION.
BH0901
BH0901 STATION RECOVERY (2006)
BH0901
BH0901'RECOVERY NOTE BY 3001, INC 2006 (JCP)
BH0901'RECOVERED AS DESCRIBED.
1 National Geodetic Survey, Retrieval Date = APRIL 13, 2006
BH0984 *****
BH0984 HT_MOD - This is a Louisiana Height Modernization Survey Station.
BH0984 DESIGNATION - BROWN 2
BH0984 PID - BH0984
BH0984 STATE/COUNTY- MS/HANCOCK
BH0984 USGS QUAD - WAVELAND (1976)
BH0984
BH0984 *CURRENT SURVEY CONTROL
BH0984
BH0984* NAD 83(1993) - 30 18 07.45682(N) 089 29 47.18326(W) ADJUSTED
BH0984* NAVD 88 - 5.42 *(meters) 17.8 *(feet) GPS OBS(2004.65)
BH0984 **This station is located in a subsidence area (see below).
BH0984
BH0984 EPOCH DATE - 2004.65

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BH0984 X - 48,438.040 (meters) COMP
BH0984 Y - -5,511,205.569 (meters) COMP
BH0984 Z - 3,199,318.313 (meters) COMP
BH0984 LAPLACE CORR- -2.07 (seconds) DEFLEC99
BH0984 ELLIP HEIGHT- -21.76 (meters) (04/11/06) GPS OBS
BH0984 GEOID HEIGHT- -27.19 (meters) GEOID03
BH0984 DYNAMIC HT - 5.42 (meters) 17.8 (feet) COMP
BH0984 MODELED GRAV- 979,335.6 (mgal) NAVD 88
BH0984
BH0984 HORZ ORDER - B
BH0984 VERT ORDER - FIRST CLASS I (See Below)
BH0984 ELLP ORDER - FOURTH CLASS II
BH0984
BH0984.The horizontal coordinates were established by GPS observations
BH0984.and adjusted by the National Geodetic Survey in April 2006..
BH0984.The horizontal coordinates are valid at the epoch date displayed above.
BH0984.The epoch date for horizontal control is a decimal equivalence
BH0984.of Year/Month/Day.
BH0984
BH0984 ** Due to the variability of land subsidence, the orthometric, ellipsoid,
BH0984 ** and geoid heights are valid at the date of observation. These heights
BH0984 ** must always be validated when used as control.
BH0984 ** The orthometric height was determined by GPS observations using
BH0984 ** precise GPS observation and processing techniques and a new
BH0984 ** realization of GEOID03. It supersedes the leveled height previously
BH0984 ** determined for this station.
BH0984 ** The geoid height was determined by a new realization of GEOID03 for the
BH0984 ** epoch indicated which incorporates improved geoid heights for the
BH0984 ** Southern Louisiana Subsidence area.
BH0984 ** (see www.ngs.noaa.gov/PC_PROD/GEOID03/).
BH0984.The orthometric height was determined by GPS observations and a
BH0984.high-resolution geoid model using precise GPS observation and
BH0984.processing techniques. It supersedes the leveled height previously
BH0984.determined for this station.
BH0984.The vertical order pertains to the first NAVD 88 superseded value.
BH0984
BH0984.The X, Y, and Z were computed from the position and the ellipsoidal ht.
BH0984
BH0984.The Laplace correction was computed from DEFLEC99 derived deflections.
BH0984
BH0984.The ellipsoidal height was determined by GPS observations
BH0984.and is referenced to NAD 83.
BH0984
BH0984.The geoid height was determined by GEOID03.
BH0984
BH0984.The dynamic height is computed by dividing the NAVD 88
BH0984.geopotential number by the normal gravity value computed on the
BH0984.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
BH0984.degrees latitude (g = 980.6199 gals.).
BH0984
BH0984.The modeled gravity was interpolated from observed gravity values.
BH0984
BH0984;
BH0984;SPC MS E - North East Units Scale Factor Converg.
BH0984;SPC MS E - 89,092.028 236,216.467 MT 1.00000017 -0 20 04.5
BH0984;SPC MS E - 292,296.10 774,986.86 sFT 1.00000017 -0 20 04.5
BH0984;SPC LA S - 201,166.325 1,176,677.541 MT 0.99993951 +0 55 06.5
BH0984;SPC LA S - 659,993.18 3,860,482.90 sFT 0.99993951 +0 55 06.5
BH0984;UTM 16 - 3,354,898.116 259,919.147 MT 1.00031114 -1 15 36.7
BH0984
BH0984!
BH0984!SPC MS E - Elev Factor x Scale Factor = Combined Factor
BH0984!SPC MS E - 1.00000342 x 1.00000017 = 1.00000359
BH0984!SPC LA S - 1.00000342 x 0.99993951 = 0.99994293
BH0984!UTM 16 - 1.00000342 x 1.00031114 = 1.00031456

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BH0984
BH0984:          Primary Azimuth Mark          Grid Az
BH0984:SPC MS E    - BROWN RM 2                269 18 00.0
BH0984:SPC LA S    - BROWN RM 2                268 02 49.0
BH0984:UTM 16     - BROWN RM 2                270 13 32.2
BH0984
BH0984|-----|
BH0984| PID      Reference Object          Distance      Geod. Az      |
BH0984|          |                          |              | dddmmss.s    |
BH0984| BH0983 BROWN 2 RM 4          12.202 METERS 09239    |
BH0984| BH2725 BROWN                    52.181 METERS 18543    |
BH0984| BH0986 BROWN RM 2              2685755.5    |
BH0984| BH0985 BROWN RM 5              26.043 METERS 27240    |
BH0984|-----|
BH0984
BH0984          SUPERSEDED SURVEY CONTROL
BH0984
BH0984 NAD 83 (1993) - 30 18 07.45905(N) 089 29 47.18106(W) AD(      ) 2
BH0984 NAD 83 (1986) - 30 18 07.47239(N) 089 29 47.17571(W) AD(      ) 2
BH0984 NAD 27      - 30 18 06.77100(N) 089 29 46.98600(W) AD(      ) 2
BH0984 NAVD 88 (02/14/94) 5.466 (m) 17.93 (f) ADJUSTED 1 1
BH0984 NAVD 88 (06/15/91) 5.465 (m) 17.93 (f) UNKNOWN 1 1
BH0984 NGVD 29 (??/??/??) 5.421 (m) 17.79 (f) ADJUSTED 1 1
BH0984
BH0984.Superseded values are not recommended for survey control.
BH0984.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
BH0984.See file dsdata.txt to determine how the superseded data were derived.
BH0984
BH0984_U.S. NATIONAL GRID SPATIAL ADDRESS: 16RBU5991954898(NAD 83)
BH0984_MARKER: DS = TRIANGULATION STATION DISK
BH0984_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT
BH0984_SP_SET: CONCRETE POST
BH0984_STAMPING: BROWN 2 1965
BH0984_MARK LOGO: CGS
BH0984_MAGNETIC: N = NO MAGNETIC MATERIAL
BH0984_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
BH0984+STABILITY: SURFACE MOTION
BH0984_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
BH0984+SATELLITE: SATELLITE OBSERVATIONS - March 06, 2006
BH0984
BH0984 HISTORY      - Date      Condition      Report By
BH0984 HISTORY      - 1965      MONUMENTED    CGS
BH0984 HISTORY      - 1969      GOOD          CGS
BH0984 HISTORY      - 1969      GOOD          CGS
BH0984 HISTORY      - 1972      GOOD          MSHD
BH0984 HISTORY      - 1972      GOOD          MSHD
BH0984 HISTORY      - 1974      GOOD          NGS
BH0984 HISTORY      - 1976      GOOD          NGS
BH0984 HISTORY      - 19930318 GOOD          NGS
BH0984 HISTORY      - 20060306 GOOD          3001
BH0984
BH0984          STATION DESCRIPTION
BH0984
BH0984'DESCRIBED BY COAST AND GEODETIC SURVEY 1965 (AKH)
BH0984'THE STATION IS LOCATED ABOUT 9 MILES WEST OF BAY ST. LOUIS AT THE
BH0984'FORKS FORMED BY THE JUNCTION OF U.S. HIGHWAY 90 AND THE STATE
BH0984'HIGHWAY 43, 0.15 MILES EAST OF THE FORKS, 76 FEET NORTH OF THE
BH0984'CENTERLINE OF U.S. HIGHWAY 90, 25 FEET NORTH OF A POWER LINE, 117
BH0984'FEET EAST OF POWER POLE NO. 91, 2 FEET EAST NORTHEAST OF A METAL
BH0984'WITNESS POST. IT IS A STANDARD DISK STAMPED BROWN 2 1965.
BH0984'PROJECTS 4-INCHES.
BH0984'
BH0984'REFERENCE MARK NO. 4 IS 40.03 FEET EAST OF THE STATION, 76 FEET NORTH

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BH0984'OF THE CENTER OF THE ROAD, 157 FEET EAST OF A POWER POLE NO. 91,
BH0984'25 FEET NORTH OF A POWER POLE. IT IS A STANDARD DISK STAMPED BROWN 2
BH0984'NO. 4 1965 SET IN THE TOP OF RIGHT-OF-WAY MARKER, PROJECTING
BH0984'8-INCHES.

BH0984'

BH0984'REFERENCE MARK NO. 5 IS 85.44 FEET WEST OF THE STATION, 76 FEET NORTH
BH0984'OF THE CENTERLINE OF U.S. HIGHWAY 90, 25 FEET NORTH OF A POWER
BH0984'POLE, 41 FEET NORTHEAST OF POWER POLE NO. 91, 2 FEET NORTHEAST OF A
BH0984'METAL WITNESS POST. IT IS A STANDARD DISK STAMPED BROWN 2 NO.
BH0984'5 1965. PROJECTS 4-INCHES.

BH0984'

BH0984'REFERENCE MARK NO. 2 (AZIMUTH MARK) IS ABOUT 750 FEET WEST OF THE
BH0984'STATION, 0.1 MILE WEST OF THE JUNCTION OF U.S. HIGHWAY 90 AND STATE
BH0984'HIGHWAY 43. SET IN TOP OF CENTER OF NORTH HEADWALL OF A 15-INCH
BH0984'CONCRETE CULVERT UNDER HIGHWAY.

BH0984'

BH0984'TO REACH THE STATION FROM THE POST OFFICE IN BAY ST. LOUIS, GO NORTH
BH0984'ON MAIN STREET TO U.S. HIGHWAY 90, TURN LEFT (WEST) AND GO 9.5 MILES
BH0984'TO MARK ON THE RIGHT, CONTINUE WEST FOR 0.15 MILE TO REFERENCE MARK
BH0984'NO. 2 ON THE RIGHT.

BH0984

BH0984

STATION RECOVERY (1969)

BH0984

BH0984'RECOVERY NOTE BY COAST AND GEODETIC SURVEY 1969 (RRG)
BH0984'THE STATION, RM 2, 4 AND 5 WERE ALL RECOVERED AND IN GOOD
BH0984'CONDITION. THE STATION MAY BE REACHED BY GOING 8.3 MILES
BH0984'NORTHEAST ALONG U.S. HIGHWAY 90 FROM THE EAST END OF THE BRIDGE
BH0984'OVER THE PEARL RIVER AT PEARLINGTON, IN SECTION 33, R 15 W, T 8 S,
BH0984'75.5 FEET NORTH OF THE CENTER LINE OF THE PRESENT HIGHWAY, 119
BH0984'FEET NORTHEAST OF POWER LINE POLE NO. 91, 2 FEET NORTHEAST OF A
BH0984'METAL WITNESS POST, 1 FOOT BELOW THE LEVEL OF THE HIGHWAY AND
BH0984'SET IN THE TOP OF A CONCRETE POST PROJECTING 1 INCH ABOVE THE
BH0984'LEVEL OF THE GROUND.

BH0984'

BH0984'RM 2 IS ABOUT 0.2 MILE SOUTHWEST OF THE STATION, ALONG STATE
BH0984'HIGHWAY 607, SET ON THE TOP AND NEAR THE CENTER OF THE NORTH
BH0984'CONCRETE HEAD WALL FOR A 15-INCH PIPE CULVERT UNDER THE STATE
BH0984'HIGHWAY, 15.5 FEET NORTH OF THE CENTER LINE OF THE STATE HIGHWAY
BH0984'AND ABOUT LEVEL WITH THE HIGHWAY.

BH0984'

BH0984'RM 4 IS 40.0 FEET EAST OF THE STATION MARK, 75 FEET NORTH OF THE
BH0984'CENTER LINE OF THE HIGHWAY, 2 FEET NORTHEAST OF A METAL WITNESS
BH0984'POST, SET IN THE TOP OF A CONCRETE POST PROJECTING 12 INCHES ABOVE
BH0984'THE LEVEL OF THE GROUND AND ABOUT LEVEL WITH THE HIGHWAY.

BH0984'

BH0984'RM 5 IS 85.0 FEET WEST OF THE STATION MARK, 77 FEET NORTH OF THE
BH0984'CENTER LINE OF THE HIGHWAY, 2 FEET EAST OF A METAL WITNESS POST,
BH0984'42 FEET NORTHEAST OF POWER LINE POLE 91, 1 FOOT BELOW THE LEVEL
BH0984'OF THE HIGHWAY AND SET IN THE TOP OF A CONCRETE POST PROJECTING
BH0984'2 INCHES ABOVE THE LEVEL OF THE GROUND.

BH0984'

BH0984'NOTE--

BH0984'

BH0984'THE STATION MARK IS STAMPED BROWN 2 1965

BH0984'

BH0984'RM 2 IS STAMPED BROWN NO 2 1931

BH0984'

BH0984'RM 4 IS STAMPED BROWN 2 NO 4 1965

BH0984'

BH0984'RM 5 IS STAMPED BROWN NO 5 1965.

BH0984'

BH0984'AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN

BH0984'8.3 MILES NORTHEAST OF PEARLINGTON.

BH0984
BH0984 STATION RECOVERY (1969)
BH0984
BH0984'RECOVERY NOTE BY COAST AND GEODETIC SURVEY 1969 (WHS)
BH0984'STATION MARK AND REFERENCE MARKS NO. 4 AND NO. 5 RECOVERED IN
BH0984'GOOD CONDITION. THE AZIMUTH MARK WAS NOT FOUND AND IS BELIEVED
BH0984'TO HAVE BEEN DESTROYED BY ROAD CONSTRUCTION.
BH0984'
BH0984'THE ORIGINAL DESCRIPTION IS ADEQUATE WITH THE FOLLOWING
BH0984'CORRECTIONS--
BH0984'
BH0984'1. STATE HIGHWAY 43 HAS BEEN RENUMBERED AND IS NOW STATE
BH0984'HIGHWAY 607.
BH0984'
BH0984'2. REFERENCES TO POWER LINES AND POWER POLE ARE NOT USEFUL AS THE
BH0984'POWER LINE NO LONGER EXISTS.
BH0984'

BH0984 STATION RECOVERY (1972)
BH0984
BH0984'RECOVERY NOTE BY MISSISSIPPI STATE HIGHWAY DEPARTMENT 1972 (RLW)
BH0984'THE STATION WAS VISITED 3-24-72 AND THE STATION MARK RM NO 2
BH0984'(AZIMUTH MARK) WAS REPORTED DESTROYED BY A PREVIOUS DESCRIPTION.
BH0984'
BH0984'THE STATION IS LOCATED 7.8 MILES NORTHEAST OF PEARLINGTON ON
BH0984'THE NORTH ROW OF U.S. HIGHWAY 90, 9.6 MILES WEST OF BAY ST. LOUIS,
BH0984'0.4 MILES EAST OF THE JUNCTION OF U.S. HIGHWAY 90 AND STATE HIGHWAY
BH0984'607 IN THE SOUTHEAST 1/4 OF SECTION 33, T 8S, R 15W.
BH0984'
BH0984'IT IS 75.5 FEET NORTH OF THE NORTH LANE OF HIGHWAY 90, 108 FEET
BH0984'WEST OF THE SOUTH POST OF A LARGE SIGN, 105 FEET EAST OF A POWER
BH0984'POLE WITH A GUY WIRE WHERE THE LINE ENDS, 1.5 FEET NORTHWEST OF
BH0984'A METAL WITNESS POST AND 49.5 FEET NORTHWEST OF THE NORTH POST OF
BH0984'THE PEARLINGTON NEXT LEFT SIGN.
BH0984'
BH0984'IT IS A TRIANGULATION DISK, STAMPED BROWN 2 1965 PROJECTING 4
BH0984'INCHES.
BH0984'
BH0984'REFERENCE MARK NO 4 IS 40.03 FEET EAST OF THE STATION. IT IS
BH0984'75 FEET NORTH OF THE CENTER OF THE NORTH LANE OF U.S. HIGHWAY 90,
BH0984'68 FEET WEST OF THE SOUTH POST OF A LARGE SIGN, 44 FEET NORTHEAST
BH0984'OF THE NORTH POST OF THE PEARLINGTON NEXT LEFT SIGN, 1.5 FEET
BH0984'EAST OF A METAL WITNESS POST SET IN THE TOP OF A ROW MARKER
BH0984'PROJECTING 12 INCHES. IT IS A REFERENCE MARK DISK, STAMPED
BH0984'BROWN 2 NO 4 1965.
BH0984'
BH0984'REFERENCE MARK NO 5 IS 88.44 FEET WEST OF THE STATION. IT IS 76
BH0984'FEET EAST OF THE CENTER OF THE NORTH LANE OF U.S. HIGHWAY 90,
BH0984'19.5 FEET EAST OF A POWER POLE WITH A GUY WIRE, 22 FEET SOUTHEAST
BH0984'OF THE SOUTH POST OF THE EAST ONE OF TWO SIGNS AND 1.5 FEET
BH0984'NORTHEAST OF A METAL WITNESS POST. IT IS A REFERENCE MARK DISK,
BH0984'STAMPED BROWN NO 5 1965 PROJECTING 4 INCHES.
BH0984'
BH0984'TO REACH THE STATION FROM THE WEST END OF THE BRIDGE OVER
BH0984'ST. LOUIS BAY AT BAY ST. LOUIS GO WEST ON U.S. HIGHWAY 90 FOR
BH0984'3.5 MILES TO THE JUNCTION OF STATE HIGHWAY 603 AND 43. CONTINUE
BH0984'WEST ON U.S. HIGHWAY 90 FOR 4.8 MILES TO A CROSSROAD. CONTINUE
BH0984'WEST ON U.S. HIGHWAY 90 FOR 2.4 MILES TO THE STATION ON THE
BH0984'RIGHT.
BH0984'
BH0984'AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN
BH0984'7.8 MILES NORTHEAST OF PEARLINGTON.
BH0984
BH0984 STATION RECOVERY (1972)

BH0984
 BH0984'RECOVERY NOTE BY MISSISSIPPI STATE HIGHWAY DEPARTMENT 1972
 BH0984'7.8 MI NE FROM PEARLINGTON.
 BH0984'THE MARK IS LOCATED 7.8 MILES NORTHEAST OF PEARLINGTON ON THE NORTH
 BH0984'ROW OF U.S. HIGHWAY 90, 9.6 MILES WEST OF BAY ST. LOUIS, 0.4 MILES
 BH0984'EAST OF THE JUNCTION OF U.S. HIGHWAY 90 AND STATE HIGHWAY 607 IN THE
 BH0984'SOUTHEAST 1/4 OF SECTION 33, T 8S, R 15W. IT IS 75.5 FEET NORTH OF
 BH0984'THE CENTER OF THE NORTH LANE OF U.S. HIGHWAY 90, 108 FEET WEST OF THE
 BH0984'SOUTH POST OF A LARGE SIGN, 105 FEET EAST OF A POWER POLE WITH A GUY
 BH0984'WIRE WHERE THE LINE ENDS, 49.5 FEET NORTHWEST OF THE NORTH POST OF THE
 BH0984'PEARLINGTON NEXT LEFT SIGN, 1.5 FEET NORTHWEST OF A METAL WITNESS POST
 BH0984'SET IN THE TOP OF A 12 INCH ROUND CONCRETE POST ABOUT 1 FOOT BELOW THE
 BH0984'LEVEL OF THE HIGHWAY AND PROJECTS 4 INCHES. TO REACH FROM THE WEST
 BH0984'END OF THE BRIDGE OVER ST. LOUIS BAY AT BAY ST. LOUIS GO WEST ON U.S.
 BH0984'HIGHWAY 90 FOR 3.5 MILES TO THE JUNCTION OF STATE HIGHWAY 603 AND 43.
 BH0984'CONTINUE WEST ON U.S. HIGHWAY 90 FOR 4.8 MILES TO A CROSSROAD.
 BH0984'CONTINUE WEST ON U.S. HIGHWAY 90 FOR 2.4 MILES TO THE MARK ON THE
 BH0984'RIGHT.

BH0984
 BH0984 STATION RECOVERY (1974)
 BH0984

BH0984'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1974 (CDS)
 BH0984'STATION AND REFERENCE MARKS ARE IN GOOD CONDITION WITNESS POST
 BH0984'2 FEET SW OF STATION MARK.

BH0984
 BH0984 STATION RECOVERY (1976)
 BH0984

BH0984'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1976
 BH0984'RECOVERED IN GOOD CONDITION.

BH0984
 BH0984 STATION RECOVERY (1993)
 BH0984

BH0984'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1993
 BH0984'11.5 KM (7.15 MI) WESTERLY ALONG U.S. HIGHWAY 90 FROM THE JUNCTION
 BH0984'OF STATE HIGHWAY 43 IN WAVELAND, 150.0 M (492.1 FT) WEST OF THE
 BH0984'EXTENDED CENTER OF A DIRT ROAD LEADING SOUTH, 25.9 M (85.0 FT) EAST
 BH0984'OF REFERENCE MARK 5, 23.1 M (75.8 FT) NORTH OF THE CENTERLINE OF THE
 BH0984'WESTBOUND LANES OF THE HIGHWAY, 12.3 M (40.4 FT) WEST OF REFERENCE
 BH0984'MARK 4, 0.5 M (1.6 FT) NORTHEAST OF A WITNESS POST, AND THE MONUMENT
 BH0984'PROJECTS 0.05 M (0.16 FT) ABOVE THE GROUND SURFACE.

BH0984
 BH0984 STATION RECOVERY (2006)
 BH0984

BH0984'RECOVERY NOTE BY 3001, INC 2006 (JCP)
 BH0984'RECOVERED AS DESCRIBED.

1 National Geodetic Survey, Retrieval Date = APRIL 13, 2006

BH1119 *****
 BH1119 HT_MOD - This is a Louisiana Height Modernization Survey Station.
 BH1119 DESIGNATION - C 189
 BH1119 PID - BH1119
 BH1119 STATE/COUNTY- LA/ORLEANS
 BH1119 USGS QUAD - CHEF MENTEUR (1994)
 BH1119
 BH1119 *CURRENT SURVEY CONTROL
 BH1119
 BH1119* NAD 83(1992)- 30 04 24.49899(N) 089 50 25.90012(W) ADJUSTED
 BH1119* NAVD 88 - 0.63 *(meters) 2.1 *(feet) LEVELING(2004.65)
 BH1119 **This station is located in a subsidence area (see below).
 BH1119 **This station is included in the VTDP model (see below).
 BH1119
 BH1119 EPOCH DATE - 2004.65
 BH1119 X - 15,375.449 (meters) COMP
 BH1119 Y - -5,524,136.168 (meters) COMP


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BH1119 Z - 3,177,411.655 (meters) COMP
BH1119 LAPLACE CORR- -0.12 (seconds) DEFLEC99
BH1119 ELLIP HEIGHT- -25.72 (meters) (06/22/05) GPS OBS
BH1119 GEOID HEIGHT- -26.34 (meters) GEOID03
BH1119 DYNAMIC HT - 0.63 (meters) 2.1 (feet) COMP
BH1119 MODELED GRAV- 979,321.3 (mgal) NAVD 88
BH1119
BH1119 HORZ ORDER - B
BH1119 VERT ORDER - THIRD
BH1119 ELLP ORDER - FOURTH CLASS I
BH1119
BH1119.The horizontal coordinates were established by GPS observations
BH1119.and adjusted by the National Geodetic Survey in June 2005..
BH1119.The horizontal coordinates are valid at the epoch date displayed above.

BH1119.The epoch date for horizontal control is a decimal equivalence
BH1119.of Year/Month/Day.
BH1119
BH1119 ** Due to the variability of land subsidence, the orthometric, ellipsoid,
BH1119 ** and geoid heights are valid at the date of observation. These heights
BH1119 ** must always be validated when used as control.
BH1119 ** The orthometric height was determined with a Vertical Time-dependent
BH1119 ** Positioning (VTDP) model and has been validated through GPS observations
BH1119 ** for the epoch indicated (see www.ngs.noaa.gov/heightmod/VTDP).
BH1119 ** The geoid height was determined by a new realization of GEOID03 for the
BH1119 ** epoch indicated which incorporates improved geoid heights for the
BH1119 ** Southern Louisiana Subsidence area
BH1119 ** (see www.ngs.noaa.gov/PC_PROD/GEOID03/).
BH1119.The orthometric height was determined by differential leveling.
BH1119.The vertical network tie was performed by a horz. field party for horz.
BH1119.obs reductions. Reset procedures were used to establish the elevation.
BH1119
BH1119.The X, Y, and Z were computed from the position and the ellipsoidal ht.
BH1119
BH1119.The Laplace correction was computed from DEFLEC99 derived deflections.
BH1119
BH1119.The ellipsoidal height was determined by GPS observations
BH1119.and is referenced to NAD 83.
BH1119
BH1119.The geoid height was determined by GEOID03.
BH1119
BH1119.The dynamic height is computed by dividing the NAVD 88
BH1119.geopotential number by the normal gravity value computed on the
BH1119.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
BH1119.degrees latitude (g = 980.6199 gals.).
BH1119
BH1119.The modeled gravity was interpolated from observed gravity values.
BH1119
BH1119; North East Units Scale Factor Converg.
BH1119;SPC LA S - 175,347.837 1,143,914.390 MT 0.99992654 +0 44 47.1
BH1119;SPC LA S - 575,287.03 3,752,992.46 sFT 0.99992654 +0 44 47.1
BH1119;UTM 16 - 3,330,329.700 226,183.461 MT 1.00052512 -1 25 27.5
BH1119
BH1119! - Elev Factor x Scale Factor = Combined Factor
BH1119!SPC LA S - 1.00000404 x 0.99992654 = 0.99993058
BH1119!UTM 16 - 1.00000404 x 1.00052512 = 1.00052916
BH1119
BH1119 SUPERSEDED SURVEY CONTROL
BH1119
BH1119 ELLIP H (01/21/03) -25.68 (m) GP( ) 4 2
BH1119 NAD 83(1992)- 30 04 24.49852(N) 089 50 25.89947(W) AD( ) 1
BH1119 NAD 83(1992)- 30 04 24.49854(N) 089 50 25.89947(W) AD( ) 1
BH1119 ELLIP H (01/21/93) -25.66 (m) GP( ) 4 2

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BH1119 NAD 83(1986)- 30 04 24.51432(N) 089 50 25.89678(W) AD() 1
 BH1119 NAVD 88 (12/05/96) 0.794 (m) 2.60 (f) ADJUSTED 1 1
 BH1119 NAVD 88 (02/14/94) 0.789 (m) 2.59 (f) UNKNOWN 1 1
 BH1119 NAVD 88 (06/15/91) 0.810 (m) 2.66 (f) UNKNOWN 1 1
 BH1119 NGVD 29 (05/21/91) 0.851 (m) 2.79 (f) ADJUSTED 1 1
 BH1119

BH1119.Superseded values are not recommended for survey control.
 BH1119.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 BH1119.See file dsdata.txt to determine how the superseded data were derived.

BH1119
 BH1119_U.S. NATIONAL GRID SPATIAL ADDRESS: 16RBU2618330330(NAD 83)
 BH1119_MARKER: DB = BENCH MARK DISK
 BH1119_SETTING: 46 = COPPER-CLAD STEEL ROD W/O SLEEVE (10 FT.+)
 BH1119_SP_SET: COPPER-CLAD STEEL ROD
 BH1119_STAMPING: C 189 1963
 BH1119_MARK LOGO: CGS
 BH1119_PROJECTION: FLUSH
 BH1119_MAGNETIC: N = NO MAGNETIC MATERIAL
 BH1119_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
 BH1119_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
 BH1119+SATELLITE: SATELLITE OBSERVATIONS - January 08, 2006
 BH1119_ROD/PIPE-DEPTH: 20.7 meters
 BH1119_SLEEVE-DEPTH : 1.00 meters

BH1119
 BH1119 HISTORY - Date Condition Report By
 BH1119 HISTORY - 1963 MONUMENTED CGS
 BH1119 HISTORY - 1969 GOOD CGS
 BH1119 HISTORY - 1970 GOOD NGS
 BH1119 HISTORY - 1977 GOOD NGS
 BH1119 HISTORY - 1978 GOOD USE
 BH1119 HISTORY - 1985 GOOD NGS
 BH1119 HISTORY - 1986 GOOD NGS
 BH1119 HISTORY - 19880920 GOOD LADTD
 BH1119 HISTORY - 19890123 GOOD
 BH1119 HISTORY - 19901101 GOOD NGS
 BH1119 HISTORY - 19941024 GOOD NGS
 BH1119 HISTORY - 20020703 GOOD USACE
 BH1119 HISTORY - 20040413 GOOD NGS
 BH1119 HISTORY - 20060108 GOOD 3001

BH1119 STATION DESCRIPTION

BH1119
 BH1119'DESCRIBED BY COAST AND GEODETIC SURVEY 1969
 BH1119'12.0 MI E FROM NEW ORLEANS.
 BH1119'ABOUT 12.0 MILES EAST ALONG U. S. HIGHWAY 90 FROM THE I 10 OVERPASS
 BH1119'OVER U. S. HIGHWAY 90 AT NEW ORLEANS, ABOUT 0.1 MILE NORTHWEST OF A
 BH1119'LARGE METAL BUILDING FOR THE MARINE CENTER EAST, 58.7 FEET NORTHWEST
 BH1119'OF THE SOUTH CORNER OF THE CHAIN LINK FENCE AROUND THE STORAGE YARD OF
 BH1119'THE P. HUTCHISON DRAGLINE WORKS, 44 FEET NORTHEAST OF THE CENTER LINE
 BH1119'OF THE WESTBOUND LANE OF THE HIGHWAY, 6 FEET EAST OF A 12-INCH OAK
 BH1119'TREE, 0.9 FOOT SOUTHWEST OF FENCE LINE, 1.5 FEET NORTHWEST OF A METAL
 BH1119'WITNESS POST, ABOUT LEVEL WITH THE HIGHWAY AND IS A DISK ON THE TOP OF
 BH1119'A COPPER COATED STEEL ROD FLUSH WITH THE GROUND AND PROTECTED BY A 6
 BH1119'INCH TILE WHICH IS FLUSH WITH THE GROUND. THE ROD WAS DRIVEN TO A
 BH1119'DEPTH OF 88 FEET.

BH1119
 BH1119 STATION RECOVERY (1970)
 BH1119

BH1119'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1970
 BH1119'RECOVERED IN GOOD CONDITION.

BH1119
 BH1119 STATION RECOVERY (1977)
 BH1119

BH1119'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1977
 BH1119'12.0 MILES EAST ALONG U.S. HIGHWAY 90 FROM THE INTERSTATE HIGHWAY
 BH1119'10 OVERPASS, 0.1 MILE NORTHWEST OF A LARGE METAL BUILDING FOR
 BH1119'HALTER MARINE SERVICES INCORPORATED, 44 FT. NORTHEAST OF THE CENTER
 BH1119'LINE OF THE WEST BOUND LANES OF THE HIGHWAY, 59 FT. NORTHWEST
 BH1119'OF THE SOUTH CORNER OF A STEEL MESH FENCE, 58.5 FT. SOUTHEAST OF
 BH1119'THE APPROXIMATE CENTER LINE OF A SHELL DRIVEWAY LEADING NORTHEAST,
 BH1119'6 FT. EAST OF A 12-INCH OAK TREE, 0.9 FT. SOUTHWEST OF A
 BH1119'NORTHWEST-SOUTHEAST FENCE LINE, THE DISK IS PROTECTED BY A
 BH1119'6-INCH SQUARE TILE.
 BH1119
 BH1119 STATION RECOVERY (1978)
 BH1119
 BH1119'RECOVERY NOTE BY US ENGINEERS 1978
 BH1119'RECOVERED IN GOOD CONDITION.
 BH1119
 BH1119 STATION RECOVERY (1985)
 BH1119
 BH1119'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1985
 BH1119'RECOVERED IN GOOD CONDITION.
 BH1119
 BH1119 STATION RECOVERY (1986)
 BH1119
 BH1119'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1986
 BH1119'RECOVERED IN GOOD CONDITION.
 BH1119
 BH1119 STATION RECOVERY (1988)
 BH1119
 BH1119'RECOVERY NOTE BY LA TRANSP AND DEV 1988
 BH1119'ABOUT 19.3 KM (12.00 MI) EAST ALONG U.S. HIGHWAY 90 FROM THE
 BH1119'INTERSTATE HIGHWAY 10 OVERPASS OVER U.S. HIGHWAY 90 AT NEW ORLEANS,
 BH1119'ABOUT 0.2 KM (0.10 MI) NORTHWEST OF A LARGE METAL BUILDING FOR THE
 BH1119'MARINE CENTER EAST, 17.9 M (58.7 FT) NORTHWEST OF THE SOUTH CORNER OF
 BH1119'THE CHAIN LINK FENCE AROUND THE STORAGE YARD OF THE P. HUTCHINSON
 BH1119'DRAGLINE WORKS, 13.4 M (44.0 FT) NORTHEAST OF THE CENTER LINE OF THE
 BH1119'WESTBOUND LANE OF THE HIGHWAY, 6.7 M (22.0 FT) SOUTHEAST FROM THE
 BH1119'CENTER OF A CHAIN LINK GATE, 0.3 M (1.0 FT) SOUTHWEST OF THE FENCE AND
 BH1119'0.5 M (1.6 FT) NORTHWEST OF A METAL WITNESS POST. THE MARK IS ABOUT
 BH1119'LEVEL WITH THE HIGHWAY AND PROTECTED BY A 6-INCH TILE WHICH IS FLUSH
 BH1119'WITH THE GROUND.
 BH1119
 BH1119 STATION RECOVERY (1989)
 BH1119
 BH1119'RECOVERED 1989
 BH1119'RECOVERED IN GOOD CONDITION.
 BH1119
 BH1119 STATION RECOVERY (1990)
 BH1119
 BH1119'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1990
 BH1119'19.3 KM (12.0 MI) EASTERLY ALONG U.S. HIGHWAY 90 (CHEF MENTEUR
 BH1119'HIGHWAY) FROM THE JUNCTION OF INTERSTATE HIGHWAY 10 IN NEW ORLEANS,
 BH1119'0.2 KM (0.1 MI) NORTHWEST OF A LARGE METAL BUILDING (VACANT 1990),
 BH1119'18.0 M (59.1 FT) NORTHWEST OF THE SOUTH CORNER OF STEEL MESH FENCE,
 BH1119'17.8 M (58.4 FT) SOUTHEAST OF THE CENTER OF A SHELLED DRIVEWAY, 13.4
 BH1119'M (44.0 FT) NORTHEAST OF THE CENTERLINE OF THE WESTBOUND LANES OF THE
 BH1119'HIGHWAY, 0.4 M (1.3 FT) NORTHWEST OF A WITNESS POST, AND 0.3 M (1.0
 BH1119'FT) SOUTHWEST OF A FENCE. NOTE--THE DISK IS ENCASED IN A 6-INCH
 BH1119'SQUARE PIPE THAT IS FLUSH WITH THE GROUND SURFACE.
 BH1119
 BH1119 STATION RECOVERY (1994)
 BH1119
 BH1119'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1994 (GAS)
 BH1119'19.1 KM (11.85 MI) EASTERLY ALONG U.S. HIGHWAY 90 (CHEF MENTEUR

BH1119' HIGHWAY) FROM THE JUNCTION OF INTERSTATE HIGHWAY 10 IN NEW ORLEANS,
 BH1119' 18.0 M (59.1 FT) NORTHWEST OF THE SOUTH CORNER OF A CHAIN-LINK FENCE,
 BH1119' 17.8 M (58.4 FT) SOUTHEAST OF THE CENTER OF A SHELLED DRIVEWAY, 13.4 M
 BH1119' (44.0 FT) NORTHEAST OF AND LEVEL WITH THE CENTERLINE OF THE WESTBOUND
 BH1119' LANES OF THE HIGHWAY, 1.5 M (4.9 FT) NORTHEAST OF THE CENTER OF A
 BH1119' WATER METER COVER, 0.4 M (1.3 FT) NORTHWEST OF A WITNESS POST, AND 0.3
 BH1119' M (1.0 FT) SOUTHWEST OF A FENCE. NOTE--THE DISK IS ENCASED IN A
 BH1119' 6-INCH METAL PIPE AND IS RECESSED 0.1 M (0.3 FT) BELOW THE GROUND
 BH1119' SURFACE.

BH1119

STATION RECOVERY (2002)

BH1119

BH1119' RECOVERY NOTE BY US ARMY CORPS OF ENGINEERS 2002 (MWH)

BH1119' SOME OBSTRUCTIONS BUT IS MARGINALLY SUITABLE FOR GPS OBSERVATIONS.

BH1119

STATION RECOVERY (2004)

BH1119

BH1119' RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 2004 (KLF)

BH1119' THE STATION IS LOCATED EAST OF NEW ORLEANS ALONG US HIGHWAY 90 ABOUT 7

BH1119' MILES EAST OF MICHOU.

BH1119'

BH1119' TO REACH THE STATION FROM EXIT 246, INTERSTATE HIGHWAY 10 AND

BH1119' INTERSTATE HIGHWAY 510 NORTHEAST OF NEW ORLEANS, GO SOUTH FOR 2.0 MI

BH1119' ON INTERSTATE HIGHWAY 510 THE US HIGHWAY 90 EXIT (EXIT 2C), TAKE

BH1119' THE EXIT TO A TRAFFIC LIGHT. TURN LEFT, AND GO EASTERLY ON US 90,

BH1119' CHEF MENTEUR HWY, FOR 6.25 MI TO THE JUNCTION WITH US 11, CONTINUE

BH1119' EASTERLY ON US HIGHWAY 90 FOR 1.45 MI. TO THE MARK ON THE LEFT ALONG

BH1119' A FENCELINE.

BH1119'

BH1119' THE MARK IS LOCATED 1 FT ENE OF THE WITNESS POST, 0.9 FT NE OF A 5 FOOT

BH1119' FENCE, 5.3 FT NNE OF A 12 INCH DIAMETER WATER METER COVER, 11 S OF AN

BH1119' ELECTRIC SERVICE POLE, 55 FT NE OF THE CENTERLINE OF US 90, AND 115

BH1119' ESE OF MILE MARKER 287. NOTE--THE MARK IS ENCASED IN A 6 INCH PIPE

BH1119' RECESSED 0.3 FEET BELOW THE LEVEL OF THE GROUND IN AN AREA INUNDATED

BH1119' WITH WATER AFTER HEAVEY RAINS.

BH1119

STATION RECOVERY (2006)

BH1119

BH1119' RECOVERY NOTE BY 3001, INC 2006 (JCP)

BH1119' RECOVERED AS DESCRIBED.

1 National Geodetic Survey, Retrieval Date = APRIL 13, 2006

DG6568 *****

DG6568 HT MOD - This is a Louisiana Height Modernization Survey Station.

DG6568 CORS - This is a GPS Continuously Operating Reference Station.

DG6568 DESIGNATION - COVINGTON CORS ARP

DG6568 CORS_ID - COVG

DG6568 PID - DG6568

DG6568 STATE/COUNTY- LA/ST TAMMANY

DG6568 USGS QUAD - COVINGTON (1994)

DG6568

*CURRENT SURVEY CONTROL

DG6568

DG6568* NAD 83 (CORS) - 30 28 33.26965 (N) 090 05 43.92326 (W) ADJUSTED

DG6568* NAVD 88 - 22.39 ** (meters) 73.5 ** (feet) GPS OBS (2004.65)

DG6568 **This station is located in a subsidence area (see below).

DG6568

DG6568 EPOCH DATE - 2002.00

DG6568 X - -9,173.433 (meters) COMP

DG6568 Y - -5,501,676.859 (meters) COMP

DG6568 Z - 3,215,950.683 (meters) COMP

DG6568 ELLIP HEIGHT- -4.56 (meters) (08/??/04) GPS OBS

DG6568 GEOID HEIGHT- -26.98 (meters) GEOID03

DG6568

DG6568 HORZ ORDER - SPECIAL (CORS)
 DG6568 ELLP ORDER - SPECIAL (CORS)
 DG6568
 DG6568. ITRF positions are available for this station.
 DG6568. The coordinates were established by GPS observations
 DG6568. and adjusted by the National Geodetic Survey in August 2004..
 DG6568. The coordinates are valid at the epoch date displayed above.
 DG6568. The epoch date for horizontal control is a decimal equivalence
 DG6568. of Year/Month/Day.
 DG6568
 DG6568 ** Due to the variability of land subsidence, the orthometric, ellipsoid,
 DG6568 ** and geoid heights are valid at the date of observation. These heights
 DG6568 ** must always be validated when used as control.
 DG6568 ** The orthometric height was determined by GPS observations using
 DG6568 ** precise GPS observation and processing techniques and a new
 DG6568 ** realization of GEOID03. It supersedes the leveled height previously
 DG6568 ** determined for this station.
 DG6568 ** The geoid height was determined by a new realization of GEOID03 for the
 DG6568 ** epoch indicated which incorporates improved geoid heights for the
 DG6568 ** Southern Louisiana Subsidence area.
 DG6568 ** (see www.ngs.noaa.gov/PC_PROD/GEOID03/) .
 DG6568. The orthometric height was determined by GPS observations and a
 DG6568. high-resolution geoid model using precise GPS observation and
 DG6568. processing techniques.
 DG6568
 DG6568. The PID for the CORS L1 Phase Center is DG6569.
 DG6568
 DG6568. The XYZ, and position/ellipsoidal ht. are equivalent.
 DG6568
 DG6568. The ellipsoidal height was determined by GPS observations
 DG6568. and is referenced to NAD 83.
 DG6568
 DG6568. The geoid height was determined by GEOID03.
 DG6568
 DG6568;

	North	East	Units	Scale	Factor	Converg.
DG6568; SPC LA S	- 219,662.521	1,118,849.594	MT	0.99996000	+0 37	08.1
DG6568; SPC LA S	- 720,676.12	3,670,759.04	sFT	0.99996000	+0 37	08.1

 DG6568
 DG6568!

- Elev Factor	x	Scale Factor	=	Combined Factor
DG6568! SPC LA S	- 1.00000072	x	0.99996000	= 0.99996072

 DG6568
 DG6568

SUPERSEDED SURVEY CONTROL

 DG6568
 DG6568. No superseded survey control is available for this station.
 DG6568
 DG6568. U.S. NATIONAL GRID SPATIAL ADDRESS: 15RYP7884175108 (NAD 83)
 DG6568. MARKER: STATION IS THE ANTENNA REFERENCE POINT OF THE GPS ANTENNA
 DG6568

STATION DESCRIPTION

 DG6568
 DG6568
 DG6568 'DESCRIBED BY NATIONAL GEODETIC SURVEY 2004
 DG6568 'STATION IS A GPS CORS. LATEST INFORMATION INCLUDING POSITIONS AND
 DG6568 'VELOCITIES ARE AVAILABLE IN THE COORDINATE AND LOG FILES ACCESSIBLE
 DG6568 'BY ANONYMOUS FTP OR THE WORLDWIDE WEB.
 DG6568 ' FTP CORS.NGS.NOAA.GOV: CORS/COORD AND CORS/STATION_LOG
 DG6568 ' HTTP://WWW.NGS.NOAA.GOV UNDER PRODUCTS AND SERVICES.
 1 National Geodetic Survey, Retrieval Date = APRIL 13, 2006
 AU2196 *****
 AU2196 HT_MOD - This is a Louisiana Height Modernization Survey Station.
 AU2196 DESIGNATION - DISTRICT 1 A
 AU2196 PID - AU2196
 AU2196 STATE/COUNTY- LA/ORLEANS
 AU2196 USGS QUAD - NEW ORLEANS WEST (1992)

AU2196
AU2196 *CURRENT SURVEY CONTROL
AU2196

AU2196* NAD 83(1992)- 29 55 53.38291(N) 090 08 02.35063(W) ADJUSTED
AU2196* NAVD 88 - 3.30 *(meters) 10.8 *(feet) GPS OBS(2004.65)
AU2196 **This station is located in a subsidence area (see below).
AU2196

AU2196 X - -12,936.651 (meters) COMP
AU2196 Y - -5,532,014.848 (meters) COMP
AU2196 Z - 3,163,783.648 (meters) COMP
AU2196 LAPLACE CORR- 0.03 (seconds) DEFLEC99
AU2196 ELLIP HEIGHT- -22.70 (meters) (12/29/04) GPS OBS
AU2196 GEOID HEIGHT- -26.01 (meters) GEOID03
AU2196 DYNAMIC HT - 3.29 (meters) 10.8 (feet) COMP
AU2196 MODELED GRAV- 979,312.2 (mgal) NAVD 88
AU2196

AU2196 HORZ ORDER - B
AU2196 VERT ORDER - FIRST CLASS II (See Below)
AU2196 ELLP ORDER - FOURTH CLASS I
AU2196

AU2196.The horizontal coordinates were established by GPS observations
AU2196.and adjusted by the National Geodetic Survey in December 2004..
AU2196

AU2196 ** Due to the variability of land subsidence, the orthometric, ellipsoid,
AU2196 ** and geoid heights are valid at the date of observation. These heights
AU2196 ** must always be validated when used as control.
AU2196 ** The orthometric height was determined by GPS observations using
AU2196 ** precise GPS observation and processing techniques and a new
AU2196 ** realization of GEOID03. It supersedes the leveled height previously
AU2196 ** determined for this station.
AU2196 ** The geoid height was determined by a new realization of GEOID03 for the
AU2196 ** epoch indicated which incorporates improved geoid heights for the
AU2196 ** Southern Louisiana Subsidence area.
AU2196 ** (see www.ngs.noaa.gov/PC_PROD/GEOID03/).
AU2196.The orthometric height was determined by GPS observations and a
AU2196.high-resolution geoid model using precise GPS observation and
AU2196.processing techniques. It supersedes the leveled height previously
AU2196.determined for this station.
AU2196.WARNING-GPS observations at this control monument resulted in a GPS
AU2196.derived orthometric height which differed from the leveled height by
AU2196.more than one decimeter (0.1 meter).
AU2196.The vertical order pertains to the first NAVD 88 superseded value.
AU2196

AU2196.The X, Y, and Z were computed from the position and the ellipsoidal ht.
AU2196

AU2196.The Laplace correction was computed from DEFLEC99 derived deflections.
AU2196

AU2196.The ellipsoidal height was determined by GPS observations
AU2196.and is referenced to NAD 83.
AU2196

AU2196.The geoid height was determined by GEOID03.
AU2196

AU2196.The dynamic height is computed by dividing the NAVD 88
AU2196.geopotential number by the normal gravity value computed on the
AU2196.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
AU2196.degrees latitude (g = 980.6199 gals.).
AU2196

AU2196.The modeled gravity was interpolated from observed gravity values.
AU2196

AU2196;		North	East	Units	Scale	Factor	Converg.
AU2196;SPC LA S	-	159,279.058	1,115,789.304	MT	0.99992647	+0 35	58.9
AU2196;SPC LA S	-	522,568.04	3,660,718.74	sFT	0.99992647	+0 35	58.9
AU2196;UTM 15	-	3,314,648.999	776,668.392	MT	1.00054452	+1 25	51.4

AU2196
 AU2196! - Elev Factor x Scale Factor = Combined Factor
 AU2196!SPC LA S - 1.00000357 x 0.99992647 = 0.99993003
 AU2196!UTM 15 - 1.00000357 x 1.00054452 = 1.00054809
 AU2196
 AU2196 SUPERSEDED SURVEY CONTROL
 AU2196
 AU2196 NAVD 88 (12/05/96) 3.450 (m) 11.32 (f) ADJUSTED 1 2
 AU2196 NAVD 88 (02/14/94) 3.435 (m) 11.27 (f) UNKNOWN 1 2
 AU2196 NGVD 29 (05/21/91) 3.495 (m) 11.47 (f) ADJUSTED 1 2
 AU2196

AU2196.Superseded values are not recommended for survey control.
 AU2196.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 AU2196.See file dsdata.txt to determine how the superseded data were derived.

AU2196
 AU2196_U.S. NATIONAL GRID SPATIAL ADDRESS: 15RYP7666814649(NAD 83)
 AU2196_MARKER: I = METAL ROD
 AU2196_SETTING: 49 = STAINLESS STEEL ROD W/O SLEEVE (10 FT.+)
 AU2196_SP_SET: STAINLESS STEEL ROD
 AU2196_STAMPING: DISTRICT 1 A
 AU2196_MARK LOGO: USE
 AU2196_PROJECTION: RECESSED 10 CENTIMETERS
 AU2196_MAGNETIC: I = MARKER IS A STEEL ROD
 AU2196_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
 AU2196_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
 AU2196+SATELLITE: SATELLITE OBSERVATIONS - January 08, 2006
 AU2196_ROD/PIPE-DEPTH: 18.2 meters

AU2196
 AU2196 HISTORY - Date Condition Report By
 AU2196 HISTORY - 1985 MONUMENTED USE
 AU2196 HISTORY - 1985 GOOD NGS
 AU2196 HISTORY - 19901110 GOOD NGS
 AU2196 HISTORY - 19941108 GOOD NGS
 AU2196 HISTORY - 20011119 GOOD 3001
 AU2196 HISTORY - 20060108 GOOD 3001

AU2196
 AU2196 STATION DESCRIPTION
 AU2196

AU2196'DESCRIBED BY NATIONAL GEODETIC SURVEY 1985
 AU2196'IN NEW ORLEANS.
 AU2196'THE MARK IS 0.91 M ABOVE TRACKS.
 AU2196'IN NEW ORLEANS, 1.2 KM (0.75 MI) SOUTH ALONG RIVER ROAD FROM THE
 AU2196'JUNCTION OF CARROLLTON AVENUE TO THE MARK ON THE RIGHT, AT THE SOUTH
 AU2196'END OF THE U.S. ENGINEERS PROPERTY, AT THE TOE OF THE LEVEE,
 AU2196'SURROUNDED BY 3 METAL POSTS PAINTED YELLOW, 16.33 METERS (53.6 FT)
 AU2196'WEST OF THE WEST RAIL OF THE NEW ORLEANS PUBLIC BELT RAILROAD,
 AU2196'12.10 METERS (39.7 FT) SOUTHWEST OF THE SOUTHEAST CORNER POST OF A
 AU2196'CHAIN LINK FENCE, 18.59 METERS (61.0 FT) NORTH OF THE NORTH EDGE OF A
 AU2196'WALKWAY CROSSING THE LEVEE, 2.22 METERS (7.3 FT) SOUTH OF A CHAIN LINK
 AU2196'FENCE.

AU2196
 AU2196 STATION RECOVERY (1990)
 AU2196

AU2196'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1990
 AU2196'0.4 KM (0.2 MI) NORTHERLY ALONG LAKE AVENUE FROM THE INTERSECTION OF
 AU2196'MAGAZINE STREET IN NEW ORLEANS, AT THE SOUTH END OF THE U.S. CORP OF
 AU2196'ENGINEERS PROPERTY, 43.4 M (142.4 FT) NORTH OF A HIGH LINE TOWER,
 AU2196'31.3 M (102.7 FT) WEST OF THE WEST CURB OF THE AVENUE, 16.3 M (53.5
 AU2196'FT) WEST OF THE NEAR RAIL OF THE NEW ORLEANS PUBLIC BELT RAILROAD,
 AU2196'12.0 M (39.4 FT) WEST-SOUTHWEST OF A CHAIN-LINK FENCE CORNER, 2.0 M
 AU2196'(6.6 FT) SOUTHEAST OF THE FENCE, 1.0 M (3.3 FT) ABOVE THE LEVEL OF
 AU2196'THE AVENUE, AND NEAR THE CENTER OF 3 METAL POSTS PAINTED YELLOW.
 AU2196'NOTE--ACCESS TO THE DATUM POINT IS THROUGH A 5-INCH LOGO CAP.

AU2196
 AU2196 STATION RECOVERY (1994)
 AU2196
 AU2196'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1994 (GAS)
 AU2196'IN NEW ORLEANS, AT 7400 LEAKE AVENUE, 20.8 M (68.2 FT) SOUTHEAST OF
 AU2196'THE SOUTHEAST CORNER OF THE U.S. CORPS OF ENGINEERS DISTRICT WAREHOUSE
 AU2196'816 AT 7400 LEAKE AVENUE, 18.5 M (60.7 FT) NORTH OF THE NORTH EDGE OF
 AU2196'A SIDEWALK LEADING TO THE TOP OF A LEVEE, 11.8 M (38.7 FT) SOUTHWEST
 AU2196'OF THE SOUTHWEST CORNER OF A CHAIN-LINK FENCE ENCLOSING THE DISTRICT
 AU2196'HEADQUARTERS, 2.1 M (6.9 FT) SOUTH OF A FENCE, 0.15 M (0.49 FT) BELOW
 AU2196'THE GROUND SURFACE, AND THE MARK IS NEAR THE CENTER OF 3 CONCRETE
 AU2196'FILLED PIPES PROJECTING 3-FEET ABOVE THE GROUND SURFACE. NOTE--ACCESS
 AU2196'TO THE DATUM POINT IS THROUGH A 5-INCH LOGO CAP.

AU2196
 AU2196 STATION RECOVERY (2001)
 AU2196
 AU2196'RECOVERY NOTE BY 3001, INC 2001 (KC)
 AU2196'THE STATION IS LOCATED IN NEW ORLEANS, 2.4 MILES SOUTHEAST OF THE HUEY
 AU2196'P. LONG BRIDGE , 2.85 MILES SOUTH OF HWY 61, 4.4 MILES WEST OF THE
 AU2196'GREATER NEW ORLEANS BRIDGE.

AU2196'
 AU2196'OWNERSHIP- COE
 AU2196'
 AU2196'TO REACH THE STATION FROM THE INTERSECTION OF CARROLLTON AVE. AND
 AU2196'RIVER ROAD GO SOUTH FOR .75 MILES TO A MARK ON THE RIGHT, WEST AND
 AU2196'ACROSS CHAIN LINK FENCE. ALSO STATION IS ACCESSABLE FROM THE SOUTHERN
 AU2196'MOST GUARD GATE AT COE ENTRANCE THEN SOUTH ON A SMALL ASPHALT ROAD
 AU2196'JUST WEST OF THE RAILROAD TRACKS TO A CHAIN LINK FENCE CORNER ON RIGHT
 AU2196'AND THREE YELLOW PIPES SURROUNDING MARK.

AU2196'
 AU2196'THE STATION IS 68.2' SOUTHEAST OF THE SOUTHEAST CORNER OF US CORPS
 AU2196'DISTRICT WAREHOUSE BUILDING, 60' NORTH OF THE NORTH EDGE OF A
 AU2196'SIDEWALK LEADING OVER LEVEE, 38.7' SOUTHWEST OF THE SOUTHWEST CORNER
 AU2196'OF A CHAIN LINK FENCE ENCLOSING THE DISTRICT HEADQUATERS, 69' SOUTH
 AU2196'OF THE FENCE, .5' BELOW THE SURFACE AND SURROUNDED BY THREE CONCRETE
 AU2196'FILLED STEEL PIPES. STATION IS A ROD DRIVEN 18.2 METERS AND STAMPED
 AU2196'DISTRICT 1A.

AU2196
 AU2196 STATION RECOVERY (2006)
 AU2196
 AU2196'RECOVERY NOTE BY 3001, INC 2006 (JCP)
 AU2196'RECOVERED AS DESCRIBED.

1 National Geodetic Survey, Retrieval Date = APRIL 13, 2006
 BH1133 *****
 BH1133 HT_MOD - This is a Louisiana Height Modernization Survey Station.
 BH1133 TIDAL BM - This is a Tidal Bench Mark.
 BH1133 DESIGNATION - E 3145
 BH1133 PID - BH1133
 BH1133 STATE/COUNTY- LA/ORLEANS
 BH1133 USGS QUAD - CHEF MENTEUR (1994)
 BH1133
 BH1133 *CURRENT SURVEY CONTROL
 BH1133
 BH1133* NAD 83(1992)- 30 04 06.73061(N) 089 48 13.12979(W) ADJUSTED
 BH1133* NAVD 88 - 4.82 *(meters) 15.8 *(feet) GPS OBS(2004.65)
 BH1133 **This station is located in a subsidence area (see below).
 BH1133
 BH1133 EPOCH DATE - 2004.65
 BH1133 X - 18,932.222 (meters) COMP
 BH1133 Y - -5,524,402.922 (meters) COMP
 BH1133 Z - 3,176,940.272 (meters) COMP
 BH1133 LAPLACE CORR- -0.16 (seconds) DEFLEC99
 BH1133 ELLIP HEIGHT- -21.51 (meters) (04/11/06) GPS OBS

BH1133
 BH1133 NAVD 88 (12/05/96) 4.987 (m) 16.36 (f) ADJUSTED 1 1
 BH1133 NAVD 88 (02/14/94) 4.976 (m) 16.33 (f) UNKNOWN 1 1
 BH1133 NAVD 88 (06/15/91) 4.996 (m) 16.39 (f) UNKNOWN 1 1
 BH1133 NGVD 29 (05/21/91) 5.038 (m) 16.53 (f) ADJUSTED 1 1

BH1133

BH1133.Superseded values are not recommended for survey control.

BH1133.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.

BH1133.See file dsdata.txt to determine how the superseded data were derived.

BH1133

BH1133_U.S. NATIONAL GRID SPATIAL ADDRESS: 16RBU2972729695(NAD 83)

BH1133_MARKER: DD = SURVEY DISK

BH1133_SETTING: 35 = SET IN A MAT FOUNDATION OR CONCRETE SLAB OTHER THAN

BH1133+WITH SETTING: PAVEMENT

BH1133_SP_SET: DISK SET IN A CONCRETE BRIDGE DE

BH1133_STAMPING: E 3145

BH1133_MARK LOGO: LAGS

BH1133_MAGNETIC: N = NO MAGNETIC MATERIAL

BH1133_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO

BH1133+STABILITY: SURFACE MOTION

BH1133_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR

BH1133+SATELLITE: SATELLITE OBSERVATIONS - January 09, 2006

BH1133

BH1133	HISTORY	- Date	Condition	Report By
BH1133	HISTORY	- UNK	MONUMENTED	LAGS
BH1133	HISTORY	- 1969	GOOD	CGS
BH1133	HISTORY	- 1970	GOOD	NGS
BH1133	HISTORY	- 1977	GOOD	NGS
BH1133	HISTORY	- 1981	GOOD	USGS
BH1133	HISTORY	- 1985	GOOD	NGS
BH1133	HISTORY	- 1986	MARK NOT FOUND	NGS
BH1133	HISTORY	- 19901019	GOOD	NGS
BH1133	HISTORY	- 19941024	GOOD	NGS
BH1133	HISTORY	- 20060109	GOOD	LAGS

BH1133

BH1133 STATION DESCRIPTION

BH1133

BH1133'DESCRIBED BY COAST AND GEODETIC SURVEY 1969

BH1133'14.65 MI E FROM NEW ORLEANS.

BH1133'ABOUT 14.65 MILES EAST ALONG U. S. HIGHWAY 90 FROM THE I 10 OVERPASS

BH1133'OVER U. S. HIGHWAY 90 AT NEW ORLEANS, AT THE NORTHEAST END OF THE

BH1133'HIGHWAY BRIDGE OVER CHEF MENTEUR PASS, SET IN THE CONCRETE BRIDGE

BH1133'FLOOR, 247 FEET SOUTHWEST OF THE NORTHEAST END OF THE BRIDGE, 2.5 FEET

BH1133'NORTHEAST OF THE NORTHEAST END OF THE STEEL SPAN OF THE BRIDGE, 9 FEET

BH1133'NORTHWEST OF THE CENTER LINE OF THE BRIDGE AND 0.5 FOOT SOUTHEAST OF

BH1133'THE SOUTHEAST FACE OF THE NORTHWEST GUARD RAIL BASE.

BH1133

BH1133 STATION RECOVERY (1970)

BH1133

BH1133'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1970

BH1133'RECOVERED IN GOOD CONDITION.

BH1133

BH1133 STATION RECOVERY (1977)

BH1133

BH1133'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1977

BH1133'RECOVERED IN GOOD CONDITION.

BH1133

BH1133 STATION RECOVERY (1981)

BH1133

BH1133'RECOVERY NOTE BY US GEOLOGICAL SURVEY 1981

BH1133'RECOVERED IN GOOD CONDITION.

BH1133

BH1133 STATION RECOVERY (1985)

BH1133
 BH1133'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1985
 BH1133'RECOVERED IN GOOD CONDITION.
 BH1133
 BH1133 STATION RECOVERY (1986)
 BH1133
 BH1133'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1986
 BH1133'NOT RECOVERED, AFTER A THOROUGH SEARCH WAS MADE NO EVIDENCE OF THE
 BH1133'MARK WAS FOUND.
 BH1133
 BH1133 STATION RECOVERY (1990)
 BH1133
 BH1133'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1990
 BH1133'23.6 KM (14.7 MI) EASTERLY ALONG U.S. HIGHWAY 90 (CHEF MENTEUR
 BH1133'HIGHWAY) FROM THE JUNCTION OF INTERSTATE HIGHWAY IN NEW ORLEANS, IN
 BH1133'THE CONCRETE BRIDGE DECK AT THE NORTHEAST END OF THE HIGHWAY BRIDGE
 BH1133'SPANNING CHEF MENTEUR PASS, 75.3 M (247.0 FT) SOUTHWEST OF THE
 BH1133'NORTHEAST END OF THE BRIDGE, 2.7 M (8.9 FT) NORTHWEST OF THE
 BH1133'CENTERLINE OF THE HIGHWAY, 0.8 M (2.6 FT) NORTHEAST OF THE NORTHEAST
 BH1133'END OF THE STEEL SPAN OF THE BRIDGE, AND 0.15 M (0.49 FT) SOUTHEAST
 BH1133'OF THE SOUTHEAST FACE OF THE NORTHWEST BRIDGE RAIL.
 BH1133
 BH1133 STATION RECOVERY (1994)
 BH1133
 BH1133'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1994 (GAS)
 BH1133'23.0 KM (14.30 MI) EASTERLY ALONG U.S. HIGHWAY 90 (CHEF MENTEUR
 BH1133'HIGHWAY) FROM THE JUNCTION OF INTERSTATE HIGHWAY 10 IN NEW ORLEANS, IN
 BH1133'THE CONCRETE DECK OF THE HIGHWAY BRIDGE SPANNING CHEF MENTEUR PASS,
 BH1133'75.3 M (247.0 FT) SOUTHWEST OF THE NORTHEAST END OF THE BRIDGE, 2.7 M
 BH1133'(8.9 FT) NORTHWEST OF AND LEVEL WITH THE HIGHWAY CENTERLINE, 0.8 M
 BH1133'(2.6 FT) NORTHEAST OF THE NORTHEAST END OF THE STEEL SPAN OF THE
 BH1133'BRIDGE, AND 0.1 M (0.3 FT) SOUTHEAST OF THE SOUTHEAST EDGE OF THE
 BH1133'NORTHWEST BRIDGE RAIL.
 BH1133
 BH1133 STATION RECOVERY (2006)
 BH1133
 BH1133'RECOVERY NOTE BY LOUISIANA GEODETIC SURVEY 2006 (JCP)
 BH1133'THE STATION IS LOCATED IN ORLEANS PARISH AT CHEF MENTEUR, CHEF MENTEUR
 BH1133'PASS, 13 MILES NE OF CHALMETTE, AND 14.3 MILES SSW OF SLIDELL.
 BH1133'OWNERSHIP - LADOT - CHEF MENTEUR PASS, HIGHWAY 90 BRIDGE.
 BH1133'
 BH1133'TO REACH THE STATION FROM THE INTERSECTION OF I-10 AND HIGHWAY 433 IN
 BH1133'SLIDELL, GO 6.4 MILES SE ALONG HIGHWAY 433 TO THE JUNCTION OF HIGHWAYS
 BH1133'433 AND 406, THENCE 9.67 MILES SW ALONG HIGHWAY 90 TO THE MARK ON THE
 BH1133'RIGHT. ALTERNATELY, PROCEED 9.9 MILES NE ALONG HIGHWAY 90 FROM THE
 BH1133'INTERSECTION OF I-510 AND HIGHWAY 90 IN MICHLOUD. THE STATION IS A
 BH1133'BRASS BENCHMARK DISK SET IN CONCRETE BRIDGE DECK AT THE NE END OF THE
 BH1133'U.S. HIGHWAY 90 BRIDGE OVER CHEF MENTEUR PASS, 247 FEET SW OF THE NE
 BH1133'END OF THE BRIDGE, 9 FEET NW OF THE BRIDGE ROADWAY CENTERLINE, 2.5
 BH1133'FEET NE OF THE NE END OF THE STEEL SPAN OF THE BRIDGE, 0.5 FEET SE OF
 BH1133'THE SE FACE OF THE NW CONCRETE GUARD RAIL BASE.

1 National Geodetic Survey, Retrieval Date = APRIL 13, 2006

AF9593 *****
 AF9593 HT_MOD - This is a Louisiana Height Modernization Survey Station.
 AF9593 CORS - This is a GPS Continuously Operating Reference Station.
 AF9593 DESIGNATION - ENGLISH TURN 2 CORS ARP
 AF9593 CORS_ID - ENG2
 AF9593 PID - AF9593
 AF9593 STATE/COUNTY- LA/PLAQUEMINES
 AF9593 USGS QUAD - CHALMETTE (1994)
 AF9593
 AF9593 *CURRENT SURVEY CONTROL
 AF9593

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AF9593* NAD 83 (CORS) - 29 52 45.04451(N) 089 56 31.48474(W) ADJUSTED
AF9593* NAVD 88 - 8.63 *(meters) 28.3 *(feet) GPS OBS(2004.65)
AF9593 **This station is located in a subsidence area (see below).
AF9593
AF9593 EPOCH DATE - 2002.00
AF9593 X - 5,595.314 (meters) COMP
AF9593 Y - -5,534,923.260 (meters) COMP
AF9593 Z - 3,158,759.288 (meters) COMP
AF9593 ELLIP HEIGHT- -17.19 (meters) (10/??/05) GPS OBS
AF9593 GEOID HEIGHT- -25.82 (meters) GEOID03
AF9593
AF9593 HORZ ORDER - SPECIAL (CORS)
AF9593 ELLP ORDER - SPECIAL (CORS)
AF9593
AF9593.ITRF positions are available for this station.
AF9593.The coordinates were established by GPS observations
AF9593.and adjusted by the National Geodetic Survey in October 2005..
AF9593.The coordinates are valid at the epoch date displayed above.
AF9593.The epoch date for horizontal control is a decimal equivalence
AF9593.of Year/Month/Day.
AF9593
AF9593 ** Due to the variability of land subsidence, the orthometric, ellipsoid,
AF9593 ** and geoid heights are valid at the date of observation. These heights
AF9593 ** must always be validated when used as control.
AF9593 ** The orthometric height was determined by GPS observations using
AF9593 ** precise GPS observation and processing techniques and a new
AF9593 ** realization of GEOID03. It supersedes the leveled height previously
AF9593 ** determined for this station.
AF9593 ** The geoid height was determined by a new realization of GEOID03 for the
AF9593 ** epoch indicated which incorporates improved geoid heights for the
AF9593 ** Southern Louisiana Subsidence area.
AF9593 ** (see www.ngs.noaa.gov/PC_PROD/GEOID03/).
AF9593.The orthometric height was determined by GPS observations and a
AF9593.high-resolution geoid model using precise GPS observation and
AF9593.processing techniques.
AF9593
AF9593.The PID for the CORS L1 Phase Center is CQ5984.
AF9593
AF9593.The XYZ, and position/ellipsoidal ht. are equivalent.
AF9593
AF9593.The ellipsoidal height was determined by GPS observations
AF9593.and is referenced to NAD 83.
AF9593
AF9593.The geoid height was determined by GEOID03.
AF9593
AF9593; North East Units Scale Factor Converg.
AF9593;SPC LA S - 153,690.042 1,134,386.275 MT 0.99992799 +0 41 44.3
AF9593;SPC LA S - 504,231.41 3,721,732.30 sFT 0.99992799 +0 41 44.3
AF9593
AF9593! - Elev Factor x Scale Factor = Combined Factor
AF9593!SPC LA S - 1.00000270 x 0.99992799 = 0.99993069
AF9593
AF9593 SUPERSEDED SURVEY CONTROL
AF9593
AF9593 NAD 83 (CORS) - 29 52 45.04458(N) 089 56 31.48453(W) AD(2002.00) c
AF9593 NAD 83 (CORS) - 29 52 45.04424(N) 089 56 31.48517(W) AD(2002.00) c
AF9593 ELLIP H (03/??/02) -17.17 (m) GP(2002.00) c c
AF9593 NAD 83 (CORS) - 29 52 45.04427(N) 089 56 31.48457(W) AD(1997.00) c
AF9593 NAD 83 (CORS) - 29 52 45.04427(N) 089 56 31.48457(W) AD(1996.00) c
AF9593 ELLIP H (08/??/96) -17.17 (m) GP(1997.00) c c
AF9593 ELLIP H (08/??/96) -17.17 (m) GP(1996.00) c c
AF9593
AF9593.Superseded values are not recommended for survey control.

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AF9593.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
AF9593.See file dsdata.txt to determine how the superseded data were derived.
AF9593
AF9593_U.S. NATIONAL GRID SPATIAL ADDRESS: 16RBU1583709034(NAD 83)
AF9593_MARKER: STATION IS THE ANTENNA REFERENCE POINT OF THE GPS ANTENNA
AF9593
AF9593 STATION DESCRIPTION
AF9593
AF9593'DESCRIBED BY NATIONAL GEODETIC SURVEY 2005
AF9593'STATION IS A GPS CORS. LATEST INFORMATION INCLUDING POSITIONS AND
AF9593'VELOCITIES ARE AVAILABLE IN THE COORDINATE AND LOG FILES ACCESSIBLE
AF9593'BY ANONYMOUS FTP OR THE WORLDWIDE WEB.
AF9593' FTP CORS.NGS.NOAA.GOV: CORS/COORD AND CORS/STATION_LOG
AF9593' HTTP://WWW.NGS.NOAA.GOV UNDER PRODUCTS AND SERVICES.
1 National Geodetic Survey, Retrieval Date = APRIL 13, 2006
AU2028 *****
AU2028 HT_MOD - This is a Louisiana Height Modernization Survey Station.
AU2028 DESIGNATION - G 358
AU2028 PID - AU2028
AU2028 STATE/COUNTY- LA/LAFOURCHE
AU2028 USGS QUAD - GOLDEN MEADOW (1994)
AU2028
AU2028 *CURRENT SURVEY CONTROL
AU2028
AU2028* NAD 83(1992)- 29 27 38.86103(N) 090 18 31.16586(W) ADJUSTED
AU2028* NAVD 88 - 0.82 *(meters) 2.7 *(feet) LEVELING(2004.65)
AU2028 **This station is located in a subsidence area (see below).
AU2028 **This station is included in the VTDP model (see below).
AU2028
AU2028 EPOCH DATE - 2004.65
AU2028 X - -29,940.604 (meters) COMP
AU2028 Y - -5,557,796.012 (meters) COMP
AU2028 Z - 3,118,459.943 (meters) COMP
AU2028 LAPLACE CORR- 0.95 (seconds) DEFLEC99
AU2028 ELLIP HEIGHT- -23.97 (meters) (06/22/05) GPS OBS
AU2028 GEOID HEIGHT- -24.79 (meters) GEOID03
AU2028 DYNAMIC HT - 0.82 (meters) 2.7 (feet) COMP
AU2028 MODELED GRAV- 979,289.0 (mgal) NAVD 88
AU2028
AU2028 HORZ ORDER - B
AU2028 VERT ORDER - THIRD
AU2028 ELLP ORDER - FOURTH CLASS I
AU2028
AU2028.The horizontal coordinates were established by GPS observations
AU2028.and adjusted by the National Geodetic Survey in June 2005..
AU2028.The horizontal coordinates are valid at the epoch date displayed above.
AU2028.The epoch date for horizontal control is a decimal equivalence
AU2028.of Year/Month/Day.
AU2028
AU2028 ** Due to the variability of land subsidence, the orthometric, ellipsoid,
AU2028 ** and geoid heights are valid at the date of observation. These heights
AU2028 ** must always be validated when used as control.
AU2028 ** The orthometric height was determined with a Vertical Time-dependent
AU2028 ** Positioning (VTDP) model and has been validated through GPS observations
AU2028 ** for the epoch indicated (see www.ngs.noaa.gov/heightmod/VTDP).
AU2028 ** The geoid height was determined by a new realization of GEOID03 for the
AU2028 ** epoch indicated which incorporates improved geoid heights for the
AU2028 ** Southern Louisiana Subsidence area
AU2028 ** (see www.ngs.noaa.gov/PC_PROD/GEOID03/).
AU2028.The orthometric height was determined by differential leveling.
AU2028.The vertical network tie was performed by a horz. field party for horz.
AU2028.obs reductions. Reset procedures were used to establish the elevation.
AU2028

AU2028' COACH LOUNGE, 8.53 METERS (28.0 FEET) NORTHEAST OF THE CENTER LINE OF
 AU2028' THE HIGHWAY, 11.07 METERS (36.3 FEET) SOUTH OF THE CORNER OF THE
 AU2028' BUILDING, 0.51 METER (1.7 FEET) WEST OF THE SOUTHWEST END OF A 3-FOOT
 AU2028' HIGH METAL PIPE PROPERTY LINE FENCE, 0.91 METER (3.0 FEET) NORTHWEST
 AU2028' OF A POWER POLE WITH TWO TRANSFORMERS.

AU2028

AU2028 STATION RECOVERY (1993)

AU2028

AU2028' RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1993

AU2028' 9.3 KM (5.75 MI) NORTHWESTERLY ALONG STATE HIGHWAY 308 FROM THE

AU2028' JUNCTION OF STATE HIGHWAY 1 IN GOLDEN MEADOW, 11.1 M (36.4 FT)

AU2028' SOUTHWEST OF THE SOUTH CORNER OF AN ABANDONED BUILDING, 8.5 M (27.9

AU2028' FT) NORTHEAST OF THE CENTERLINE OF THE HIGHWAY, 0.7 M (2.3 FT)

AU2028' NORTHWEST OF A UTILITY LIGHT POLE WITH 2 TRANSFORMERS ATTACHED, 0.4 M

AU2028' (1.3 FT) NORTH-NORTHWEST OF THE SOUTHWEST END OF A FENCE, AND 0.3 M

AU2028' (1.0 FT) BELOW THE LEVEL OF THE HIGHWAY. NOTE--ACCESS TO THE DATUM

AU2028' POINT IS THROUGH A 5-INCH LOGO CAP.

AU2028

AU2028 STATION RECOVERY (2004)

AU2028

AU2028' RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 2004 (KLF)

AU2028' RECOVERED AS DESCRIBED

AU2028

AU2028 STATION RECOVERY (2005)

AU2028

AU2028' RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 2005 (KLF)

AU2028' RECOVERED AS DESCRIBED.

AU2028

AU2028 STATION RECOVERY (2006)

AU2028

AU2028' RECOVERY NOTE BY 3001, INC 2006 (JCP)

AU2028' RECOVERED AS DESCRIBED.

1 National Geodetic Survey, Retrieval Date = APRIL 13, 2006

AU2110 *****

AU2110 HT_MOD - This is a Louisiana Height Modernization Survey Station.

AU2110 DESIGNATION - G 365

AU2110 PID - AU2110

AU2110 STATE/COUNTY- LA/JEFFERSON

AU2110 USGS QUAD - NEW ORLEANS WEST (1992)

AU2110

AU2110 *CURRENT SURVEY CONTROL

AU2110

AU2110* NAD 83 (1992) - 29 54 39.52074 (N) 090 12 46.30724 (W) ADJUSTED

AU2110* NAVD 88 - 0.24 ** (meters) 0.8 ** (feet) GPS OBS (2004.65)

AU2110 **This station is located in a subsidence area (see below).

AU2110

AU2110 EPOCH DATE - 2004.65

AU2110 X - -20,556.547 (meters) COMP

AU2110 Y - -5,533,123.639 (meters) COMP

AU2110 Z - 3,161,810.933 (meters) COMP

AU2110 LAPLACE CORR - -0.08 (seconds) DEFLEC99

AU2110 ELLIP HEIGHT - -25.72 (meters) (06/22/05) GPS OBS

AU2110 GEOID HEIGHT - -25.97 (meters) GEOID03

AU2110 DYNAMIC HT - 0.24 (meters) 0.8 (feet) COMP

AU2110 MODELED GRAV - 979,313.4 (mgal) NAVD 88

AU2110 OBS GRAVITY - 979,310.0 (mgal) GRAV_OBS

AU2110

AU2110 HORZ ORDER - B

AU2110 VERT ORDER - FIRST CLASS II (See Below)

AU2110 ELLP ORDER - FOURTH CLASS I

AU2110

AU2110. The horizontal coordinates were established by GPS observations

AU2110. and adjusted by the National Geodetic Survey in June 2005..

AU2110.The horizontal coordinates are valid at the epoch date displayed above.

AU2110.The epoch date for horizontal control is a decimal equivalence
AU2110.of Year/Month/Day.

AU2110

AU2110 ** Due to the variability of land subsidence, the orthometric, ellipsoid,
AU2110 ** and geoid heights are valid at the date of observation. These heights
AU2110 ** must always be validated when used as control.

AU2110 ** The orthometric height was determined by GPS observations using

AU2110 ** precise GPS observation and processing techniques and a new

AU2110 ** realization of GEOID03. It supersedes the leveled height previously

AU2110 ** determined for this station.

AU2110 ** The geoid height was determined by a new realization of GEOID03 for the

AU2110 ** epoch indicated which incorporates improved geoid heights for the

AU2110 ** Southern Louisiana Subsidence area.

AU2110 ** (see www.ngs.noaa.gov/PC_PROD/GEOID03/).

AU2110.The orthometric height was determined by GPS observations and a

AU2110.high-resolution geoid model using precise GPS observation and

AU2110.processing techniques. It supersedes the leveled height previously

AU2110.determined for this station.

AU2110.The vertical order pertains to the first NAVD 88 superseded value.

AU2110

AU2110.The X, Y, and Z were computed from the position and the ellipsoidal ht.

AU2110

AU2110.The Laplace correction was computed from DEFLEC99 derived deflections.

AU2110

AU2110.The ellipsoidal height was determined by GPS observations

AU2110.and is referenced to NAD 83.

AU2110

AU2110.The geoid height was determined by GEOID03.

AU2110

AU2110.The dynamic height is computed by dividing the NAVD 88

AU2110.geopotential number by the normal gravity value computed on the

AU2110.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45

AU2110.degrees latitude (g = 980.6199 gals.).

AU2110

AU2110.The modeled gravity was interpolated from observed gravity values.

AU2110.The observed gravity was obtained from relative gravimeter ties

AU2110.to the IGSN71 gravity network.

AU2110

AU2110;

		North	East	Units	Scale	Factor	Converg.
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AU2110;SPC LA S	-	156,927.889	1,108,196.737	MT	0.99992697	+0 33	36.9
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AU2110;SPC LA S	-	514,854.25	3,635,808.79	sFT	0.99992697	+0 33	36.9
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AU2110;UTM 15	-	3,312,186.525	769,106.240	MT	1.00049359	+1 23	26.4
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AU2110

AU2110! - Elev Factor x Scale Factor = Combined Factor

AU2110!SPC LA S - 1.00000404 x 0.99992697 = 0.99993101

AU2110!UTM 15 - 1.00000404 x 1.00049359 = 1.00049763

AU2110

AU2110 SUPERSEDED SURVEY CONTROL

AU2110

AU2110	NAVD 88	(12/05/96)	0.342	(m)	1.12	(f) ADJUSTED	1 2
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AU2110	NAVD 88	(02/14/94)	0.313	(m)	1.03	(f) UNKNOWN	1 2
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AU2110	NAVD 88	(06/15/91)	0.371	(m)	1.22	(f) UNKNOWN	1 2
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AU2110	NGVD 29	(??/??/??)	0.407	(m)	1.34	(f) ADJUSTED	1 2
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AU2110

AU2110.Superseded values are not recommended for survey control.

AU2110.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.

AU2110.See file dsdata.txt to determine how the superseded data were derived.

AU2110

AU2110_U.S. NATIONAL GRID SPATIAL ADDRESS: 15RYP6910612187(NAD 83)

AU2110_MARKER: I = METAL ROD

AU2110_SETTING: 59 = STAINLESS STEEL ROD IN SLEEVE (10 FT.+)

AU2110_SP_SET: STAINLESS STEEL ROD IN SLEEVE
 AU2110_STAMPING: G 365 1984
 AU2110_MARK LOGO: NGS
 AU2110_PROJECTION: FLUSH
 AU2110_MAGNETIC: I = MARKER IS A STEEL ROD
 AU2110_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
 AU2110_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
 AU2110+SATELLITE: SATELLITE OBSERVATIONS - January 08, 2006
 AU2110_ROD/PIPE-DEPTH: 32.9 meters
 AU2110_SLEEVE-DEPTH : 9.10 meters

AU2110	HISTORY	- Date	Condition	Report By
AU2110	HISTORY	- 1984	MONUMENTED	NGS
AU2110	HISTORY	- 1984	GOOD	LA-051
AU2110	HISTORY	- 19941122	GOOD	NGS
AU2110	HISTORY	- 20040413	GOOD	NGS
AU2110	HISTORY	- 20060108	GOOD	3001

AU2110
 AU2110 STATION DESCRIPTION
 AU2110

AU2110'DESCRIBED BY NATIONAL GEODETIC SURVEY 1984
 AU2110'0.24 KM (0.15 MI) WEST FROM AVONDALE.
 AU2110'0.24 KM (0.15 MI) WEST ALONG U.S. HIGHWAY 90 FROM THE JUNCTION OF
 AU2110'AVONDALE GARDEN ROAD IN AVONDALE. INSIDE THE ENTRANCE OF THE REST
 AU2110'LAWN CEMETARY GROUNDS AND IN THE MIDDLE OF A GRASSY MEDIAN, 3.0 METERS
 AU2110'(9.9 FT)NORTH OF THE NORTH FACE OF THE CENTER BRICK PIER OF THE
 AU2110'ENTRANCE FENCE, 9.1 METERS (30.0 FT) WEST OF THE CENTER OF A PAVED
 AU2110'ENTRANCE ROAD TO THE CEMETARY AND AN IRONGATE, 9.4 METERS (30.7 FT)
 AU2110'EAST OF THE CENTER OF A ENTRANCE ROAD AND AN IRONGATE, 4.7 METERS
 AU2110'(15.5 FT) SOUTH OF A 4 INCH CEDAR TREE, 24.9 METERS (81.6 FT) SOUTH OF
 AU2110'A METAL FLAG POLE, 4.6 METERS (15.2 FT) WEST OF THE WEST FACE OF A 1
 AU2110'FOOT HIGH BRICK ENTRANCE FENCE, 5.1 METERS (16.7 FT) EAST OF THE EAST
 AU2110'FACE OF A 1 FOOT HIGH ENTRANCE FENCE AND 39.0 METERS (128.0 FT) NORTH
 AU2110'OF CENTERLINE OF U.S. HIGHWAY 90 WESTBOUND. NOTE, DRIVEN TO REQUIRED
 AU2110'DRIVING RATE.
 AU2110'THE MARK IS 0.15 M ABOVE CEMETARY ENTRANCE ROAD..

AU2110
 AU2110 STATION RECOVERY (1984)

AU2110
 AU2110'RECOVERY NOTE BY JEFFERSON PARISH LOUISIANA 1984
 AU2110'RECOVERED IN GOOD CONDITION.

AU2110
 AU2110 STATION RECOVERY (1994)

AU2110
 AU2110'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1994 (GAS)
 AU2110'5.7 KM (3.55 MI) WESTERLY ALONG U.S. HIGHWAY 90 FROM THE TRAFFIC
 AU2110'CIRCLE AT THE SOUTH END OF THE HUEY P LONG BRIDGE IN BRIDGE CITY, 40.5
 AU2110'M (132.9 FT) NORTH OF THE CENTERLINE OF THE WESTBOUND LANES OF THE
 AU2110'HIGHWAY, 12.0 M (39.4 FT) SOUTH OF A FLAG POLE, 9.3 M (30.5 FT) EAST
 AU2110'OF THE CENTER OF A ROAD, 9.2 M (30.2 FT) WEST OF THE CENTER OF THE
 AU2110'ENTRANCE TO THE REST LAWN CEMETERY, 3.0 M (9.8 FT) NORTH OF THE NORTH
 AU2110'FACE OF A BRICK PILLAR IN THE MEDIAN OF THE ENTRANCE, AND 0.5 M (1.6
 AU2110'FT) BELOW THE LEVEL OF THE HIGHWAY. NOTE--ACCESS TO THE DATUM POINT
 AU2110'IS THROUGH A 5-INCH LOGO CAP.

AU2110
 AU2110 STATION RECOVERY (2004)

AU2110
 AU2110'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 2004 (KLF)
 AU2110'5.7 KM (3.55 MI) WEST ALONG US HWY 90 FROM THE HUEY LONG BRIDGE IN
 AU2110'BRIDGE CITY, 0.24KM (0.15 MI) WEST ALONG US 90 FROM THE JUNCTION OF
 AU2110'AVONDALE GARDEN ROAD IN AVONDALE. THE MARK IS LOCATED INSIDE THE
 AU2110'ENTRANCE OF THE REST LAWN CEMENTARY GARDENS IN THE APPROX CENTER OF
 AU2110'THE GRASSY MEDIAN. THE MARK IS APPROX. 40 MTR N OF THE WEST BOUND

AU2110'LANES OF US 90, IT 10 FT NORTH OF THE FACE OF THE CENTER BRICK
AU2110'PILLAR, 16 FT ESE OF THE NE CORNER OF THE NW BRICK PILLAR, 17 FT ENE
AU2110'OF THE NE CORNER OF THE SW BRICK PILLAR, 16.6 FT WSW OF THE NW CORNER
AU2110'OF THE NE BRICK PILLAR, 16.7 FT WNW OF OF THE SW BRICK PILLAR, AND
AU2110'39.4 FT S OF THE FLAGPOLE.
AU2110
AU2110 STATION RECOVERY (2006)
AU2110
AU2110'RECOVERY NOTE BY 3001, INC 2006 (JCP)
AU2110'RECOVERED AS DESCRIBED.

1 National Geodetic Survey, Retrieval Date = APRIL 13, 2006

DH7121 *****
DH7121 HT_MOD - This is a Louisiana Height Modernization Survey Station.
DH7121 CORS - This is a GPS Continuously Operating Reference Station.
DH7121 DESIGNATION - GRAND ISLE CORS ARP
DH7121 CORS_ID - GRIS
DH7121 PID - DH7121
DH7121 STATE/COUNTY- LA/JEFFERSON
DH7121 USGS QUAD - BARATARIA PASS (1993)
DH7121
DH7121 *CURRENT SURVEY CONTROL
DH7121

DH7121*	NAD 83 (CORS) -	29 15 55.88303 (N)	089 57 26.26266 (W)	ADJUSTED
DH7121*	NAVD 88	- 8.40 ** (meters)	27.6 ** (feet)	GPS OBS (2004.65)

DH7121 **This station is located in a subsidence area (see below).
DH7121

DH7121	EPOCH DATE	-	2002.00	
DH7121	X	-	4,150.421 (meters)	COMP
DH7121	Y	-	-5,568,495.489 (meters)	COMP
DH7121	Z	-	3,099,600.510 (meters)	COMP
DH7121	ELLIP HEIGHT-		-15.60 (meters)	(11/??/05) GPS OBS
DH7121	GEOID HEIGHT-		-23.99 (meters)	GEOID03

DH7121
DH7121 HORZ ORDER - SPECIAL (CORS)
DH7121 ELLP ORDER - SPECIAL (CORS)
DH7121
DH7121. ITRF positions are available for this station.
DH7121. The coordinates were established by GPS observations
DH7121. and adjusted by the National Geodetic Survey in November 2005..
DH7121. The coordinates are valid at the epoch date displayed above.
DH7121. The epoch date for horizontal control is a decimal equivalence
DH7121. of Year/Month/Day.
DH7121
DH7121 ** Due to the variability of land subsidence, the orthometric, ellipsoid,
DH7121 ** and geoid heights are valid at the date of observation. These heights
DH7121 ** must always be validated when used as control.
DH7121 ** The orthometric height was determined by GPS observations using
DH7121 ** precise GPS observation and processing techniques and a new
DH7121 ** realization of GEOID03. It supersedes the leveled height previously
DH7121 ** determined for this station.
DH7121 ** The geoid height was determined by a new realization of GEOID03 for the
DH7121 ** epoch indicated which incorporates improved geoid heights for the
DH7121 ** Southern Louisiana Subsidence area.
DH7121 ** (see www.ngs.noaa.gov/PC_PROD/GEOID03/).
DH7121. The orthometric height was determined by GPS observations and a
DH7121. high-resolution geoid model using precise GPS observation and
DH7121. processing techniques.
DH7121
DH7121. The PID for the CORS L1 Phase Center is DH7122.
DH7121
DH7121. The XYZ, and position/ellipsoidal ht. are equivalent.
DH7121
DH7121. The ellipsoidal height was determined by GPS observations

DH7121.and is referenced to NAD 83.
DH7121
DH7121.The geoid height was determined by GEOID03.
DH7121
DH7121;
North East Units Scale Factor Converg.
DH7121;SPC LA S - 85,659.175 1,133,733.344 MT 1.00000748 +0 41 16.9
DH7121;SPC LA S - 281,033.48 3,719,590.15 sFT 1.00000748 +0 41 16.9
DH7121
DH7121! - Elev Factor x Scale Factor = Combined Factor
DH7121!SPC LA S - 1.00000245 x 1.00000748 = 1.00000993
DH7121
SUPERSEDED SURVEY CONTROL
DH7121
DH7121.No superseded survey control is available for this station.
DH7121
DH7121_U.S. NATIONAL GRID SPATIAL ADDRESS: 16RBT1263241031(NAD 83)
DH7121_MARKER: STATION IS THE ANTENNA REFERENCE POINT OF THE GPS ANTENNA
DH7121
STATION DESCRIPTION
DH7121
DH7121'DESCRIBED BY NATIONAL GEODETIC SURVEY 2005
DH7121'STATION IS A GPS CORS. LATEST INFORMATION INCLUDING POSITIONS AND
DH7121'VELOCITIES ARE AVAILABLE IN THE COORDINATE AND LOG FILES ACCESSIBLE
DH7121'BY ANONYMOUS FTP OR THE WORLDWIDE WEB.
DH7121' FTP CORS.NGS.NOAA.GOV: CORS/COORD AND CORS/STATION_LOG
DH7121' HTTP://WWW.NGS.NOAA.GOV UNDER PRODUCTS AND SERVICES.
1 National Geodetic Survey, Retrieval Date = APRIL 13, 2006
AT0200 *****
AT0200 HT_MOD - This is a Louisiana Height Modernization Survey Station.
AT0200 DESIGNATION - MILAN 2
AT0200 PID - AT0200
AT0200 STATE/COUNTY- LA/PLAQUEMINES
AT0200 USGS QUAD - PORT SULPHUR (1993)
AT0200
AT0200 *CURRENT SURVEY CONTROL
AT0200
AT0200* NAD 83(1992)- 29 28 05.74368(N) 089 40 53.72992(W) ADJUSTED
AT0200* NAVD 88 - -0.15 *(meters) -0.5 *(feet) GPS OBS(2004.65)
AT0200 **This station is located in a subsidence area (see below).
AT0200
AT0200 EPOCH DATE - 2004.65
AT0200 X - 30,884.220 (meters) COMP
AT0200 Y - -5,557,383.217 (meters) COMP
AT0200 Z - 3,119,180.322 (meters) COMP
AT0200 LAPLACE CORR- 0.43 (seconds) DEFLEC99
AT0200 ELLIP HEIGHT- -24.53 (meters) (06/22/05) GPS OBS
AT0200 GEOID HEIGHT- -24.39 (meters) GEOID03
AT0200 DYNAMIC HT - -0.15 (meters) -0.5 (feet) COMP
AT0200 MODELED GRAV- 979,306.4 (mgal) NAVD 88
AT0200
AT0200 HORZ ORDER - B
AT0200 VERT ORDER - THIRD (See Below)
AT0200 ELLP ORDER - FOURTH CLASS I
AT0200
AT0200.The horizontal coordinates were established by GPS observations
AT0200.and adjusted by the National Geodetic Survey in June 2005..
AT0200.The horizontal coordinates are valid at the epoch date displayed above.
AT0200.The epoch date for horizontal control is a decimal equivalence
AT0200.of Year/Month/Day.
AT0200
AT0200 ** Due to the variability of land subsidence, the orthometric, ellipsoid,
AT0200 ** and geoid heights are valid at the date of observation. These heights
AT0200 ** must always be validated when used as control.

AT0200 ** The orthometric height was determined by GPS observations using
 AT0200 ** precise GPS observation and processing techniques and a new
 AT0200 ** realization of GEOID03. It supersedes the leveled height previously
 AT0200 ** determined for this station.
 AT0200 ** The geoid height was determined by a new realization of GEOID03 for the
 AT0200 ** epoch indicated which incorporates improved geoid heights for the
 AT0200 ** Southern Louisiana Subsidence area.
 AT0200 ** (see www.ngs.noaa.gov/PC_PROD/GEOID03/).
 AT0200.The orthometric height was determined by GPS observations and a
 AT0200.high-resolution geoid model using precise GPS observation and
 AT0200.processing techniques. It supersedes the leveled height previously
 AT0200.determined for this station.
 AT0200.WARNING-GPS observations at this control monument resulted in a GPS
 AT0200.derived orthometric height which differed from the leveled height by
 AT0200.more than one decimeter (0.1 meter).
 AT0200.The vertical order pertains to the first NAVD 88 superseded value.
 AT0200
 AT0200.The X, Y, and Z were computed from the position and the ellipsoidal ht.
 AT0200
 AT0200.The Laplace correction was computed from DEFLEC99 derived deflections.
 AT0200
 AT0200.The ellipsoidal height was determined by GPS observations
 AT0200.and is referenced to NAD 83.
 AT0200
 AT0200.The geoid height was determined by GEOID03.
 AT0200
 AT0200.The dynamic height is computed by dividing the NAVD 88
 AT0200.geopotential number by the normal gravity value computed on the
 AT0200.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
 AT0200.degrees latitude (g = 980.6199 gals.).
 AT0200
 AT0200.The modeled gravity was interpolated from observed gravity values.
 AT0200
 AT0200;

	North	East	Units	Scale	Factor	Converg.
AT0200;SPC LA S	- 108,482.520	1,160,202.601	MT	0.99996865	+0 49	33.2
AT0200;SPC LA S	- 355,913.07	3,806,431.37	sFT	0.99996865	+0 49	33.2
AT0200;UTM 16	- 3,262,861.970	239,949.682	MT	1.00043452	-1 19	11.7

 AT0200

AT0200!	- Elev Factor	x	Scale Factor	=	Combined Factor
AT0200!SPC LA S	- 1.00000385	x	0.99996865	=	0.99997250
AT0200!UTM 16	- 1.00000385	x	1.00043452	=	1.00043837

 AT0200

	Primary Azimuth Mark	Grid Az
AT0200:SPC LA S	- MILAN 2 AZ MK	322 05 29.7
AT0200:UTM 16	- MILAN 2 AZ MK	324 14 14.6

 AT0200

PID	Reference Object	Distance	Geod. Az
			ddmmss.s
AT0200	AT0202 MILAN 2 RM 1	39.715 METERS	13301
AT0200	AT0201 MILAN 2 RM 2	27.150 METERS	17659
AT0200	AT1151 PORT SULPHUR FREEPORT CO STACK	APPROX. 0.7 KM	2490755.2
AT0200	AT1157 FREEPORT SULPHUR CO WATER TANK	APPROX. 0.9 KM	2941510.4
AT0200	DD7445 MILAN 2 AZ MK		3225502.9

 AT0200
 AT0200

SUPERSEDED SURVEY CONTROL

 AT0200

AT0200	NAD 83 (1992)	- 29 28 05.73772 (N)	089 40 53.72090 (W)	AD () 2
AT0200	NAD 83 (1986)	- 29 28 05.74729 (N)	089 40 53.72727 (W)	AD () 2
AT0200	NAD 27	- 29 28 04.96471 (N)	089 40 53.50130 (W)	AD () 2
AT0200	NAVD 88 (02/14/94)	0.005 (m)	0.02 (f)	READJUSTED 3

AT0200 NAVD 88 (06/15/91) 0.061 (m) 0.20 (f) UNKNOWN 1 1
 AT0200 NGVD 29 (??/??/??) 0.092 (m) 0.30 (f) ADJUSTED 1 1

AT0200

AT0200.Superseded values are not recommended for survey control.

AT0200.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.

AT0200.See file dsdata.txt to determine how the superseded data were derived.

AT0200

AT0200_U.S. NATIONAL GRID SPATIAL ADDRESS: 16RBT3995062862(NAD 83)

AT0200_MARKER: DS = TRIANGULATION STATION DISK

AT0200_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT

AT0200_SP_SET: SET IN TOP OF CONCRETE MONUMENT

AT0200_STAMPING: MILAN 2 1966

AT0200_MARK LOGO: CGS

AT0200_MAGNETIC: N = NO MAGNETIC MATERIAL

AT0200_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO

AT0200+STABILITY: SURFACE MOTION

AT0200_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR

AT0200+SATELLITE: SATELLITE OBSERVATIONS - January 24, 2006

AT0200

AT0200	HISTORY	- Date	Condition	Report By
AT0200	HISTORY	- 1966	MONUMENTED	CGS
AT0200	HISTORY	- 1971	GOOD	USGS
AT0200	HISTORY	- 1971	GOOD	NGS
AT0200	HISTORY	- 1984	GOOD	NGS

AT0200	HISTORY	- 20040419	GOOD	NGS
AT0200	HISTORY	- 20051007	GOOD	NGS
AT0200	HISTORY	- 20060124	GOOD	3001

AT0200

AT0200 STATION DESCRIPTION

AT0200

AT0200'DESCRIBED BY COAST AND GEODETIC SURVEY 1966 (LMC)

AT0200'STATION IS LOCATED IN PORT SULPHUR, IS IN THE SOUTHEASTERLY CORNER

AT0200'OF GOLF COURSE

AT0200'BELONGING TO FREEPORT SULPHUR COMPANY AND JUST NORTHWEST

AT0200'OF DELTA BANK AND TRUST COMPANY

AT0200'BUILDING.

AT0200'

AT0200'TO REACH FROM THE FREEPORT SULPHUR COMPANY MAIN OFFICE IN PORT

AT0200'SULPHUR, GO

AT0200'SOUTHEAST ON STATE HIGHWAY 23 FOR 0.9 MILE TO SIDE ROAD

AT0200'RIGHT AND STATION AS

AT0200'DESCRIBED.

AT0200'

AT0200'STATION MARK, A STANDARD DISK STAMPED MILAN 2 1966, IS SET IN

AT0200'THE TOP OF A

AT0200'CONCRETE CYLINDER WHICH IS SET FLUSH WITH GROUND. THE MARK

AT0200'IS 88 FEET SOUTHWEST OF CENTER

AT0200'OF STATE HIGHWAY 23, 52.5 FEET SOUTH

AT0200'OF THE SOUTHEAST CORNER OF ELEVATED GOLF GREEN,

AT0200'47.5 FEET WEST OF TREE,

AT0200'51 FEET NORTHWEST OF CENTER OF ROAD AND 28 FEET NORTHWEST OF

AT0200'FENCE.

AT0200'

AT0200'REFERENCE MARK 1, A STANDARD DISK STAMPED MILAN 2 NO 1 1966, IS

AT0200'SET IN THE TOP OF

AT0200'A CONCRETE CYLINDER WHICH IS SET FLUSH. THE MARK IS

AT0200'34 FEET SOUTHEAST OF CENTER OF ROAD,

AT0200'5 FEET WEST OF THE NORTHWEST

AT0200'CORNER OF DELTA BANK AND LOAN BUILDING AND 3.5 FEET

AT0200'NORTHWEST OF THE

AT0200'NORTHWEST SIDE OF BANK BUILDING.

AT0200'

AT0200'REFERENCE MARK 2, A STANDARD DISK STAMPED MILAN 2 NO 2 1966, IS
 AT0200'SET IN THE TOP OF
 AT0200'A CONCRETE CYLINDER WHICH IS SET FLUSH WITH THE
 AT0200'GROUND. THE MARK IS 36 FEET
 AT0200'SOUTHEAST OF CENTER OF ROAD, 20 FEET NORTHEAST
 AT0200'OF CENTER OF REAR DRIVEWAY AND 6 FEET NORTH OF
 AT0200'THE NORTHWEST
 AT0200'CORNER OF DELTA BANK AND TRUST BUILDING.
 AT0200'
 AT0200'AZIMUTH MARK, A STANDARD DISK STAMPED MILAN 2 1966, IS SET IN
 AT0200'THE TOP OF A
 AT0200'CONCRETE CYLINDER WHICH IS PROJECTING ABOUT 2 INCHES. THE
 AT0200'MARK IS 88.5 FEET NORTHEAST OF
 AT0200'CENTER OF STATE HIGHWAY 23, 44.5 FEET
 AT0200'SOUTH OF THE SOUTH PIPE OF A GROUP OF PIPES, 36
 AT0200'FEET EAST OF POWER
 AT0200'POLE, 15 FEET SOUTHWEST OF CENTER OF LEVEE AND 2.3 FEET SOUTHEAST
 AT0200'OF WITNESS POST.
 AT0200'
 AT0200'TO REACH AZIMUTH MARK FROM STATION, GO NORTHWEST ON STATE HIGHWAY
 AT0200'23 FOR 0.3 MILE TO
 AT0200'WHERE PIPES CROSS OVER ROAD AND AZIMUTH MARK ON RIGHT.
 AT0200'
 AT0200'DISTANCE BETWEEN REFERENCE MARK 1 AND 2 IS 90.57 FEET OR 27.603
 AT0200'METERS.
 AT0200'
 AT0200'HEIGHT OF LIGHT ABOVE STATION MARK 30 METERS.
 AT0200
 AT0200 STATION RECOVERY (1971)
 AT0200
 AT0200'RECOVERY NOTE BY US GEOLOGICAL SURVEY 1971 (JDS)
 AT0200'MILAN 2 AND RM 1 AND 2 FOUND IN GOOD CONDITION. AZ. MK. NOT FOUND.
 AT0200'DISTANCES AND DIRECTIONS CHECKED OK. ORIGINAL DESCRIPTION IS
 AT0200'ADEQUATE.
 AT0200
 AT0200 STATION RECOVERY (1971)
 AT0200
 AT0200'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1971
 AT0200'1.1 MI SE FROM PORT SULPHUR.
 AT0200'ABOUT 1.1 MILES SOUTHEAST ALONG STATE HIGHWAY 23 FROM THE FIRE STATION
 AT0200'AND CEMETERY AT PORT SULPHUR, NEAR THE EAST CORNER OF A GOLF COURSE,
 AT0200'88 FEET SOUTHWEST OF THE CENTER LINE OF THE HIGHWAY, 53 FEET NORTHWEST
 AT0200'OF THE CENTER LINE OF A DRIVEWAY WHICH LEADS SOUTHWEST ALONG THE
 AT0200'NORTHWEST SIDE OF THE DELTA STATE BANK AND TRUST COMPANY BUILDING, 59
 AT0200'FEET SOUTHWEST OF A FIRE HYDRANT, 47 1/2 FEET WEST OF A 12-INCH OAK
 AT0200'TREE, 54 1/2 FEET NORTH OF A 14-INCH OAK TREE, 28 FEET NORTHWEST OF A
 AT0200'ROW OF CONCRETE FILLED 3-INCH METAL PIPES THAT PROJECT 2 FEET, ABOUT
 AT0200'LEVEL WITH THE DRIVEWAY, ABOUT 1 FOOT BELOW THE LEVEL OF THE HIGHWAY,
 AT0200'AND SET IN THE TOP OF A CONCRETE POST WHICH IS 0.1 FOOT BELOW THE
 AT0200'SURFACE OF THE GROUND.
 AT0200
 AT0200 STATION RECOVERY (1984)
 AT0200
 AT0200'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1984
 AT0200'RECOVERED IN GOOD CONDITION.
 AT0200
 AT0200 STATION RECOVERY (2004)
 AT0200
 AT0200'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 2004 (KLF)
 AT0200'THE STATION IS LOCATED IN PORT SULPER NEAR THE SOUTHEAST CORNER OF THE
 AT0200'PORT SULPHUR GOLF COURSE. OWNERSHIP--PLAQUEMINES PARISH RECREATIONAL
 AT0200'DEPARTMENT.
 AT0200'

AT0200'TO REACH THE STATION FROM THE POST OFFICE IN PORT SULPHUR GO SOUTHERLY
 AT0200'FOR 3.2 MI ON STATE HIGHWAY 23 TO THE STATION ON THE RIGHT NEAR THE
 AT0200'SOUTEAST CORNER OF THE PORT SULPHUR GOLF COURSE, JUST BEFORE REACHING
 AT0200'A GRAVEL ENTRANCE WAY TO THE REGIONS BANK PARKING LOT ON THE RIGHT.
 AT0200'

AT0200'THE STATION IS LOCATED 22.8 M SOUTHWESTR OF THE SOUTHWEST EDGE OF THE
 AT0200'HIGHWAY, 19.1 M SOUTH OF THE SOUTHERN MOST 1 OF 2 SUPPORT POSTS FOR A
 AT0200'GOLF COURSE SIGN, 10.0 M NORTH OF THE NORTHEAST END OF A CHAIN LINK
 AT0200'FENCE, 9.6 M NORTHWEST OF THE NORTHWEST EDGE OF THE REGIONS BANK
 AT0200'PARKING LOT, AND ABOUT 0.3 M BELOW THE LEVEL OF THE HIGHWAY.

AT0200
 AT0200
 AT0200

STATION RECOVERY (2005)

AT0200'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 2005 (KLF)
 AT0200'RECOVERED AS DESCRIBED WITH THE FOLLOWING CHANGES. 0.65 M SE OF A
 AT0200'METAL POST WITH WITNESS SIGN ATTACHED. NOTE--THE GOLF COURSE SIGN
 AT0200'PREVIOUSLY REFERENCED TO IS MISSING BUT THE SIGN POST IS INTACT.
 AT0200'NOTE--THE BANK BUILDING PREVIOUSLY REFERENCED TO WAS SEVERELY DAMAGED
 AT0200'BY HURRICANE KATRINA.

AT0200
 AT0200
 AT0200

STATION RECOVERY (2006)

AT0200'RECOVERY NOTE BY 3001, INC 2006 (JCP)
 AT0200'THE STATION IS LOCATED IN PORT SULPHUR IN THE NORTHEAST CORNER OF A
 AT0200'GOLF COURSE, 5 MILES NW OF NAIRN AND 5 MILES SE OF HAPPY JACK ON STATE
 AT0200'HIGHWAY 23. OWNERSHIP - PLAQUEMINES PARISH RECREATIONAL DEPARTMENT.
 AT0200'TO REACH THE STATION FROM THE POST OFFICE IN PORT SULPHUR, GO SE 3.2
 AT0200'MILES ON STATE HIGHWAY 23 TO THE STATION ON THE RIGHT. FOR REFERENCE,
 AT0200'THE FREEPORT SULPHUR COMPANY, MAIN OFFICE, IS 0.9 MILES NW OF THE
 AT0200'MARK. THE STATION IS A BRASS DISK SET IN CONCRETE, STAMPED MILAN 2
 AT0200'1966, 88 FEET SW OF THE CENTERLINE OF HIGHWAY 23, 52.5 FEET SOUTH OF
 AT0200'THE SE CORNER OF AN ELEVATED GOLF GREEN, 47.5 FEET WEST OF AN OAK
 AT0200'TREE, 51 FEET NW OF A ROAD ON THE WEST SIDE OF THE DELTA STATE BANK.

1 National Geodetic Survey, Retrieval Date = APRIL 13, 2006

BH1160 *****
 BH1160 HT_MOD - This is a Louisiana Height Modernization Survey Station.
 BH1160 TIDAL BM - This is a Tidal Bench Mark.
 BH1160 DESIGNATION - PIKE RM 3
 BH1160 PID - BH1160
 BH1160 STATE/COUNTY- LA/ORLEANS
 BH1160 USGS QUAD - RIGOLETS (1993)

BH1160
 BH1160

*CURRENT SURVEY CONTROL

BH1160* NAD 83 (1992) - 30 09 59.48640(N) 089 44 15.40588(W) ADJUSTED
 BH1160* NAVD 88 - 2.80 *(meters) 9.2 *(feet) GPS OBS(2004.65)
 BH1160 **This station is located in a subsidence area (see below).

BH1160

BH1160	EPOCH DATE	-	2004.65		
BH1160	X	-	25,274.213 (meters)		COMP
BH1160	Y	-	-5,518,925.102 (meters)		COMP
BH1160	Z	-	3,186,335.043 (meters)		COMP
BH1160	LAPLACE CORR-		-0.37 (seconds)		DEFLEC99
BH1160	ELLIP HEIGHT-		-23.75 (meters)	(04/11/06)	GPS OBS
BH1160	GEOID HEIGHT-		-26.57 (meters)		GEOID03
BH1160	DYNAMIC HT	-	2.80 (meters)	9.2 (feet)	COMP
BH1160	MODELED GRAV-		979,331.2 (mgal)		NAVD 88
BH1160	OBS GRAVITY	-	979,332.1 (mgal)		GRAV_OBS

BH1160

BH1160 HORZ ORDER - B
 BH1160 VERT ORDER - FIRST CLASS I (See Below)
 BH1160 ELLP ORDER - FOURTH CLASS II

BH1160

BH1160 NAD 83 (1992) - 30 09 59.48860 (N) 089 44 15.40340 (W) AD () 2
 BH1160 NAD 83 (1986) - 30 09 59.49961 (N) 089 44 15.40082 (W) AD () 2
 BH1160 NAD 27 - 30 09 58.79300 (N) 089 44 15.18100 (W) AD () 2
 BH1160 NAVD 88 (12/05/96) 2.929 (m) 9.61 (f) ADJUSTED 1 1
 BH1160 NAVD 88 (02/14/94) 2.930 (m) 9.61 (f) UNKNOWN 1 1
 BH1160 NAVD 88 (06/15/91) 2.938 (m) 9.64 (f) UNKNOWN 1 1
 BH1160 NGVD 29 (05/21/91) 2.993 (m) 9.82 (f) ADJUSTED 1 1

BH1160

BH1160.Superseded values are not recommended for survey control.

BH1160.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.

BH1160.See file dsdata.txt to determine how the superseded data were derived.

BH1160

BH1160_U.S. NATIONAL GRID SPATIAL ADDRESS: 16RBU3635640404 (NAD 83)

BH1160_MARKER: DR = REFERENCE MARK DISK

BH1160_SETTING: 35 = SET IN A MAT FOUNDATION OR CONCRETE SLAB OTHER THAN

BH1160+WITH SETTING: PAVEMENT

BH1160_SP_SET: DISK CENTERED ON A RED CONCRETE

BH1160_STAMPING: PIKE NO 3 1952

BH1160_MARK LOGO: CGS

BH1160_MAGNETIC: N = NO MAGNETIC MATERIAL

BH1160_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO

BH1160+STABILITY: SURFACE MOTION

BH1160_SATELLITE: THE SITE LOCATION WAS REPORTED AS NOT SUITABLE FOR

BH1160+SATELLITE: SATELLITE OBSERVATIONS - January 06, 2006

BH1160

BH1160	HISTORY	- Date	Condition	Report By
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BH1160	HISTORY	- 1952	MONUMENTED	CGS
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BH1160	HISTORY	- 1954	GOOD	CGS
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BH1160	HISTORY	- 1963	GOOD	CGS
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BH1160	HISTORY	- 1969	GOOD	CGS
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BH1160	HISTORY	- 1970	GOOD	NGS
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BH1160	HISTORY	- 1977	GOOD	NGS
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BH1160	HISTORY	- 1980	GOOD	LADTD
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BH1160	HISTORY	- 1984	GOOD	LA-051
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BH1160	HISTORY	- 1985	GOOD	NGS
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BH1160	HISTORY	- 1986	GOOD	NGS
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BH1160	HISTORY	- 19901022	GOOD	NGS
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BH1160	HISTORY	- 19930317	GOOD	NGS
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BH1160	HISTORY	- 19941018	GOOD	NGS
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BH1160	HISTORY	- 20060106	GOOD	3001
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BH1160

BH1160 STATION DESCRIPTION

BH1160

BH1160'DESCRIBED BY COAST AND GEODETIC SURVEY 1952 (PLB)

BH1160'THE STATION IS LOCATED ABOUT 8 MILES SE. OF SLIDELL NEAR THE S. END

BH1160'OF THE NEW RIGOLETS BRIDGE ON U.S. HIGHWAY 90 ON THE LAWN OF THE OLD

BH1160'FORT PIKE AND BETWEEN THE MOAT OF THE FORT AND THE HIGHWAY. A

BH1160'STANDARD CAA 36 INCH ROTATING AIRWAY BEACON FLASHING RED AND

BH1160'WHITE, MOUNTED ON A STEEL FRAME TOWER AND ABOUT 70 FEET HIGH.

BH1160'

BH1160'PIKE RM NO. 3 1952 WAS ESTABLISHED IN THE CONCRETE FOUNDATION OF THE

BH1160'BEACON, DIRECTLY UNDER THE BEACON LIGHT.

BH1160'

BH1160'THE BEACON IS CALLED NEW ORLEANS-ATLANTA AIRWAY BEACON NO. 2.

BH1160

BH1160 STATION RECOVERY (1954)

BH1160

BH1160'RECOVERY NOTE BY COAST AND GEODETIC SURVEY 1954 (RAE)

BH1160'THE ORIGINAL DESCRIPTION IS ADEQUATE.

BH1160

BH1160 STATION RECOVERY (1963)

BH1160

BH1160'RECOVERY NOTE BY COAST AND GEODETIC SURVEY 1963 (RRG)

BH1160'THE STEEL TOWER SUPPORTING THE BEACON LIGHT OVER R.M. 3 FOR PIKE HAS
BH1160'BEEN TORN DOWN BUT THE CONCRETE BASE REMAINS AND THE MARK HAS NOT
BH1160'BEEN DISTURBED.

BH1160

STATION RECOVERY (1969)

BH1160

BH1160'RECOVERY NOTE BY COAST AND GEODETIC SURVEY 1969

BH1160'23.2 MI E FROM NEW ORLEANS.

BH1160'ABOUT 23.2 MILES EAST ALONG U. S. HIGHWAY 90 FROM THE I 10 OVERPASS
BH1160'OVER U. S. HIGHWAY 90 AT NEW ORLEANS, AT OLD FORT PIKE, 67.5 FEET WEST
BH1160'OF THE STATION MARK, SET ON THE TOP AND ABOUT IN THE CENTER OF A 13
BH1160'1/2 FOOT SQUARE CONCRETE BLOCK WHICH FORMERLY SUPPORTED A BEACON
BH1160'LIGHT, 113 FEET SOUTHEAST OF THE CENTER LINE OF THE HIGHWAY, 83 FEET
BH1160'SOUTH OF BENCH MARK C 193 DESCRIBED AND ABOUT LEVEL WITH THE HIGHWAY.

BH1160

STATION RECOVERY (1970)

BH1160

BH1160'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1970

BH1160'RECOVERED IN GOOD CONDITION.

BH1160

STATION RECOVERY (1977)

BH1160

BH1160'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1977

BH1160'RECOVERED IN GOOD CONDITION.

BH1160

STATION RECOVERY (1980)

BH1160

BH1160'RECOVERY NOTE BY LA TRANSP AND DEV 1980

BH1160'RECOVERED IN GOOD CONDITION.

BH1160

STATION RECOVERY (1984)

BH1160

BH1160'RECOVERY NOTE BY JEFFERSON PARISH LOUISIANA 1984

BH1160'RECOVERED IN GOOD CONDITION.

BH1160

STATION RECOVERY (1985)

BH1160

BH1160'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1985

BH1160'RECOVERED IN GOOD CONDITION.

BH1160

STATION RECOVERY (1986)

BH1160

BH1160'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1986

BH1160'RECOVERED IN GOOD CONDITION.

BH1160

STATION RECOVERY (1990)

BH1160

BH1160'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1990

BH1160'37.4 KM (23.2 MI) EASTERLY ALONG U.S. HIGHWAY 90 (CHEF MENTEUR
BH1160'HIGHWAY) FROM THE JUNCTION OF INTERSTATE HIGHWAY 10 IN NEW ORLEANS,
BH1160'AT FORT PIKE HISTORICAL SITE, IN THE CENTER OF A 4.1 M (13.5 FT)
BH1160'SQUARE CONCRETE BLOCK WHICH FORMERLY SUPPORTED A BEACON, 34.4 M
BH1160'(112.9 FT) SOUTHEAST OF THE HIGHWAY CENTERLINE, 20.5 M (67.3 FT) WEST
BH1160'OF TRIANGULATION STATION PIKE, 0.6 M (2.0 FT) ABOVE THE GROUND
BH1160'SURFACE, AND LEVEL WITH THE HIGHWAY.

BH1160

STATION RECOVERY (1993)

BH1160

BH1160'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1993

BH1160'37.4 KM (23.25 MI) EASTERLY ALONG U.S. HIGHWAY 90 (CHEF MENTEUR
BH1160'HIGHWAY) FROM THE JUNCTION OF INTERSTATE HIGHWAY 10 IN NEW ORLEANS,
BH1160'NEAR THE CENTER OF A 12 BY 12-FOOT CONCRETE PAD THAT FORMERLY
BH1160'SUPPORTED A BEACON, 34.8 M (114.2 FT) SOUTHEAST OF AND LEVEL WITH THE

BH1160'CENTERLINE OF THE HIGHWAY, 25.5 M (83.7 FT) SOUTH OF BENCH MARK C
 BH1160'193, 24.7 M (81.0 FT) SOUTH-SOUTHEAST OF A WITNESS POST, 20.5 M (67.3
 BH1160'FT) WEST OF TRIANGULATION STATION PIKE RESET, 19.4 M (63.6 FT)
 BH1160'SOUTHEAST OF A CHAIN-LINK FENCE, AND 2.9 M (9.5 FT) NORTHEAST OF THE
 BH1160'SOUTHWEST CORNER OF THE PAD.

BH1160

BH1160

STATION RECOVERY (1994)

BH1160

BH1160'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1994 (GAS)

BH1160'37.0 KM (23.00 MI) EASTERLY ALONG U.S. HIGHWAY 90 (CHEF MENTEUR
 BH1160'HIGHWAY) FROM THE JUNCTION OF INTERSTATE HIGHWAY 10 IN NEW ORLEANS,
 BH1160'NEAR THE CENTER OF A 12 BY 12-FOOT CONCRETE PAD THAT FORMERLY
 BH1160'SUPPORTED A BEACON, 34.8 M (114.2 FT) SOUTHEAST OF AND LEVEL WITH THE
 BH1160'HIGHWAY CENTERLINE, 25.5 M (83.7 FT) SOUTH OF BENCH MARK C 193, 24.7 M
 BH1160'(81.0 FT) SOUTH-SOUTHEAST OF A WITNESS POST, 20.5 M (67.3 FT) WEST OF
 BH1160'TRIANGULATION STATION PIKE RESET, 19.4 M (63.6 FT) SOUTHEAST OF A
 BH1160'CHAIN-LINK FENCE, AND 2.9 M (9.5 FT) NORTHEAST OF THE SOUTHWEST CORNER
 BH1160'OF THE PAD.

BH1160

BH1160

STATION RECOVERY (2006)

BH1160

BH1160'RECOVERY NOTE BY 3001, INC 2006 (JCP)

BH1160'THE STATION IS LOCATED IN ORLEANS PARISH AT FORT PIKE ON THE WEST END
 BH1160'OF THE RIGOLETT'S BRIDGE 8.0 MILES SE OF SLIDELL. OWNERSHIP - LADOT
 BH1160'

BH1160'TO REACH THE STATION FROM THE INTERSECTION OF I-10, EXIT 263, AND
 BH1160'HIGHWAY 433 IN SLIDELL, GO 6.5 MILES SE ALONG HIGHWAY 433 TO THE
 BH1160'JUNCTION OF HIGHWAY 90, TURN RIGHT ON HIGHWAY 90 AND GO 0.95 MILES,
 BH1160'CROSSING THE RIGOLETT'S BRIDGE TO THE MARK ON THE SOUTH SIDE OF HIGHWAY
 BH1160'90. THE STATION IS A BRASS DISK SET IN THE CENTER OF A RED CONCRETE
 BH1160'PAD, 114.2 FEET SE OF THE HIGHWAY 90 CENTERLINE, 83.7 FEET SOUTH OF THE
 BH1160'BENCHMARK C 193, 67.3 FEET WEST OF TRIANGULATION STATION PIKE RESET,
 BH1160'9.5 FEET NE OF THE SW CORNER OF THE RED CONCRETE PAD. NOTE THE FENCE
 BH1160'MENTIONED IN THE PREVIOUS DESCRIPTIONS WAS DESTROYED DURING THE
 BH1160'KATRINA STORM.

1 National Geodetic Survey, Retrieval Date = APRIL 13, 2006

AT0804 *****

AT0804 HT_MOD - This is a Louisiana Height Modernization Survey Station.

AT0804 FBN - This is a Federal Base Network Control Station.

AT0804 DESIGNATION - REGGIO 2

AT0804 PID - AT0804

AT0804 STATE/COUNTY- LA/ST BERNARD

AT0804 USGS QUAD - DELACROIX (1994)

AT0804

*CURRENT SURVEY CONTROL

AT0804

AT0804* NAD 83(1992)- 29 50 40.71916(N) 089 45 32.43079(W) ADJUSTED

AT0804* NAVD 88 - 1.52 *(meters) 5.0 *(feet) GPS OBS(2004.65)

AT0804 **This station is located in a subsidence area (see below).

AT0804

AT0804 EPOCH DATE - 2004.65

AT0804 X - 23,288.344 (meters) COMP

AT0804 Y - -5,536,777.168 (meters) COMP

AT0804 Z - 3,155,435.922 (meters) COMP

AT0804 LAPLACE CORR- -0.03 (seconds) DEFLEC99

AT0804 ELLIP HEIGHT- -24.15 (meters) (06/22/05) GPS OBS

AT0804 GEOID HEIGHT- -25.68 (meters) GEOID03

AT0804 OBS GRAVITY - 979,309.8 (mgal) GRAV_OBS

AT0804

AT0804 HORZ ORDER - B

AT0804 ELLP ORDER - FOURTH CLASS I

AT0804

AT0804.The horizontal coordinates were established by GPS observations

AT0804.and adjusted by the National Geodetic Survey in June 2005..
AT0804.The horizontal coordinates are valid at the epoch date displayed above.
AT0804.The epoch date for horizontal control is a decimal equivalence
AT0804.of Year/Month/Day.
AT0804
AT0804 ** Due to the variability of land subsidence, the orthometric, ellipsoid,
AT0804 ** and geoid heights are valid at the date of observation. These heights
AT0804 ** must always be validated when used as control.
AT0804 ** The orthometric height was determined by GPS observations using
AT0804 ** precise GPS observation and processing techniques and a new
AT0804 ** realization of GEOID03. It supersedes the leveled height previously
AT0804 ** determined for this station.
AT0804 ** The geoid height was determined by a new realization of GEOID03 for the
AT0804 ** epoch indicated which incorporates improved geoid heights for the
AT0804 ** Southern Louisiana Subsidence area.
AT0804 ** (see www.ngs.noaa.gov/PC_PROD/GEOID03/).
AT0804.The orthometric height was determined by GPS observations and a
AT0804.high-resolution geoid model using precise GPS observation and
AT0804.processing techniques. It supersedes the leveled height previously
AT0804.determined for this station.
AT0804
AT0804.The X, Y, and Z were computed from the position and the ellipsoidal ht.
AT0804
AT0804.The Laplace correction was computed from DEFLEC99 derived deflections.
AT0804
AT0804.The ellipsoidal height was determined by GPS observations
AT0804.and is referenced to NAD 83.
AT0804
AT0804.The geoid height was determined by GEOID03.
AT0804.The observed gravity was obtained from relative gravimeter ties
AT0804.to the IGSN71 gravity network.
AT0804
AT0804;

	North	East	Units	Scale	Factor	Converg.
AT0804;SPC LA S	- 150,091.312	1,152,121.263	MT	0.99992944	+0 47	13.9
AT0804;SPC LA S	- 492,424.58	3,779,917.84	sFT	0.99992944	+0 47	13.9
AT0804;UTM 16	- 3,304,766.395	233,434.144	MT	1.00047681	-1 22	25.8

AT0804
AT0804!

AT0804!SPC LA S	-	1.00000379	x	0.99992944	=	0.99993323
AT0804!UTM 16	-	1.00000379	x	1.00047681	=	1.00048060

AT0804
AT0804

SUPERSEDED SURVEY CONTROL

AT0804
AT0804

AT0804	NAD 83 (1992)-	29 50 40.71916(N)	089 45 32.43101(W)	AD(	)	B
AT0804	ELLIP H (12/29/04)	-24.13 (m)		GP(	)	4 1
AT0804	ELLIP H (06/20/00)	-24.12 (m)		GP(	)	3 1
AT0804	ELLIP H (01/21/93)	-24.10 (m)		GP(	)	4 2
AT0804	NAD 83 (1992)-	29 50 40.71874(N)	089 45 32.43093(W)	AD(	)	A
AT0804	ELLIP H (09/04/92)	-24.10 (m)		GP(	)	3 1
AT0804	NAD 83 (1986)-	29 50 40.73696(N)	089 45 32.43028(W)	AD(	)	1
AT0804	NAD 27	- 29 50 39.98989(N)	089 45 32.20535(W)	AD(	)	1
AT0804	NAVD 88 (02/14/94)	1.714 (m)		5.62	(f)	READJUSTED 3
AT0804	NGVD 29 (02/23/90)	1.82 (m)		6.0	(f)	LEVELING 3

AT0804
AT0804.Superseded values are not recommended for survey control.
AT0804.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
AT0804.See file dsdata.txt to determine how the superseded data were derived.
AT0804
AT0804_U.S. NATIONAL GRID SPATIAL ADDRESS: 16RBU3343404766(NAD 83)
AT0804_MARKER: F = FLANGE-ENCASED ROD
AT0804_SETTING: 59 = STAINLESS STEEL ROD IN SLEEVE (10 FT.+)
AT0804_SP_SET: STAINLESS STEEL ROD
AT0804_STAMPING: REGGIO 2 1987

AT0804_MARK LOGO: NGS
 AT0804_PROJECTION: FLUSH
 AT0804_MAGNETIC: I = MARKER IS A STEEL ROD
 AT0804_STABILITY: A = MOST RELIABLE AND EXPECTED TO HOLD
 AT0804+STABILITY: POSITION/ELEVATION WELL
 AT0804_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
 AT0804+SATELLITE: SATELLITE OBSERVATIONS - January 24, 2006
 AT0804_ROD/PIPE-DEPTH: 20.7 meters
 AT0804_SLEEVE-DEPTH : 1 meters

AT0804	HISTORY	- Date	Condition	Report By
AT0804	HISTORY	- 1987	MONUMENTED	LADTD
AT0804	HISTORY	- 1988	GOOD	BUN-Y
AT0804	HISTORY	- 19880920	GOOD	LADTD
AT0804	HISTORY	- 19890119	GOOD	
AT0804	HISTORY	- 19910903	GOOD	LADTD
AT0804	HISTORY	- 19920316	GOOD	
AT0804	HISTORY	- 19920330	GOOD	
AT0804	HISTORY	- 19940620	GOOD	LADTD
AT0804	HISTORY	- 19960215	GOOD	NGS
AT0804	HISTORY	- 19980217	GOOD	NGS
AT0804	HISTORY	- 19980311	GOOD	NGS
AT0804	HISTORY	- 20030402	GOOD	3001
AT0804	HISTORY	- 20030820	GOOD	INDIV
AT0804	HISTORY	- 20040419	GOOD	NGS
AT0804	HISTORY	- 20060124	GOOD	3001

AT0804
 AT0804 STATION DESCRIPTION
 AT0804
 AT0804'DESCRIBED BY LA TRANSP AND DEV 1987 (TLH)
 AT0804'THE STATION IS LOCATED IN THE NORTHEAST END OF REGGIO ON STATE
 AT0804'HIGHWAY 46.
 AT0804'OWNERSHIP--LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT.
 AT0804'
 AT0804'TO REACH THE STATION FROM THE JUNCTION OF STATE HIGHWAYS 300 AND 46
 AT0804'IN REGGIO GO NORTHWEST FOR 0.46 KM (0.3 MI) ON HIGHWAY 46 TO THE
 AT0804'FAR END OF THE BRIDGE AND THE STATION ON THE RIGHT.
 AT0804'
 AT0804'THE STATION IS A STANDARD VERTICAL DATUM POINT ATTACHED TO A
 AT0804'STAINLESS STEEL ROD ACCESSED THROUGH A LOGO CAP
 AT0804'STAMPED---REGGIO 2 1987---,
 AT0804'7.6 METERS (24.9 FT) NORTHEAST FROM THE CENTER OF THE NORTH BOUND
 AT0804'LANES OF THE HIGHWAY,
 AT0804'1.1 METERS (5.6 FT) NORTH FROM THE NORTH END OF THE BANNISTER,
 AT0804'0.7 METERS (2.3 FT) NORTHEAST FROM A BRIDGE CURB,
 AT0804'0.5 METERS (1.6 FT) WEST FROM THE NORTH CORNER OF THE ABUTMENT WING
 AT0804'AND
 AT0804'1.2 METERS (4 FT) NORTH FROM A FIBERGLASS WITNESS POST.

AT0804
 AT0804 STATION RECOVERY (1988)
 AT0804
 AT0804'RECOVERY NOTE BY BURK AND N-Y 1988
 AT0804'0.5 KM (0.30 MI) NW FROM REGGIO.
 AT0804'LOCATED 0.48 KM (0.30 MI) NORTHWEST ALONG STATE HIGHWAY 46 FROM THE
 AT0804'CROSSROADS AT REGGIO, TO THE WEST END OF THE BRIDGE AND THE MARK ON
 AT0804'THE RIGHT. IT IS 7.62 M (25.0 FT) NORTH OF THE CENTERLINE OF THE
 AT0804'EAST-BOUND LANE, 1.07 M (3.5 FT) NORTHWEST OF THE NORTHWEST END OF
 AT0804'THE BANNISTER, 0.67 M (2.2 FT) NORTHEAST OF THE BRIDGE CURB AND 0.46
 AT0804'M (1.5 FT) FROM THE NORTH CORNER OF THE ABUTMENT WING. NOTE--ACCESS
 AT0804'TO DATUM POINT IS HAD THROUGH A 5-INCH NGS LOGO CAP,
 AT0804'(THIS IS A 3-D GPS STATION MARK).

AT0804
 AT0804 STATION RECOVERY (1988)

AT0804
 AT0804'RECOVERY NOTE BY LA TRANSP AND DEV 1988
 AT0804'THE STATION IS LOCATED IN THE NORTHWEST EDGE OF REGGIO ON STATE
 AT0804'HIGHWAY 46. OWNERSHIP--LOUISIANA DEPARTMENT OF TRANSPORTATION AND
 AT0804'DEVELOPMENT.
 AT0804'TO REACH THE STATION FROM THE JUNCTION OF STATE HIGHWAYS 300 AND 46 IN
 AT0804'REGGIO GO NORTHWEST FOR 0.46 KM (0.30 MI) ON HIGHWAY 46 TO THE FAR END
 AT0804'OF THE BRIDGE AND THE STATION ON THE RIGHT.
 AT0804'THE STATION IS A STAINLESS STEEL ROD ACCESSED THROUGH A LOGO CAP, 7.6
 AT0804'M (24.9 FT) NORTHEAST FROM THE CENTER OF THE NORTH BOUND LANES OF THE
 AT0804'HIGHWAY, 1.1 M (3.6 FT) NORTH FROM THE NORTH END OF THE BANISTER, 0.7
 AT0804'M (2.3 FT) NORTHEAST FROM A BRIDGE CURB, 0.5 M (1.6 FT) WEST FROM THE
 AT0804'NORTH CORNER OF THE ABUTMENT WING AND 1.2 M (3.9 FT) NORTH FROM A
 AT0804'FIBERGLASS WITNESS POST.
 AT0804
 AT0804 STATION RECOVERY (1989)
 AT0804
 AT0804'RECOVERED 1989
 AT0804'RECOVERED IN GOOD CONDITION.
 AT0804
 AT0804 STATION RECOVERY (1991)
 AT0804
 AT0804'RECOVERY NOTE BY LA TRANSP AND DEV 1991
 AT0804'THE STATION IS LOCATED IN THE NORTHEAST END OF REGGIO ON STATE HIGHWAY
 AT0804'46. OWNERSHIP--LOUISIANA DEPARTMENT OF TRANSPORTATION AND
 AT0804'DEVELOPMENT.
 AT0804'TO REACH THE STATION FROM THE JUNCTION OF STATE HIGHWAYS 46 AND 300 IN
 AT0804'REGGIO, GO NORTHWEST FOR 0.3 MI (0.5 KM) ON HIGHWAY 46 TO THE NORTH
 AT0804'END OF A BRIDGE AND THE STATION SET ON THE RIGHT.
 AT0804'THE STATION IS 25.0 FT (7.6 M) NORTHEAST FROM THE CENTER OF THE NORTH
 AT0804'BOUND LANES OF THE HIGHWAY, 5.5 FT (1.7 M) NORTH FROM THE NORTH END
 AT0804'OF THE BANNISTER, 2.0 FT (0.6 M) NORTHEAST FROM A BRIDGE CURB, 1.5 FT
 AT0804'(0.5 M) WEST FROM THE NORTH CORNER OF THE NORTH BOUND BRIDGE
 AT0804'ABUTMENT, 1.5 FT (0.5 M) NORTHWEST FROM A FIBERGLASS WITNESS POST,
 AT0804'FLUSH WITH THE GROUND AND ABOUT LEVEL WITH THE HIGHWAY.
 AT0804
 AT0804 STATION RECOVERY (1992)
 AT0804
 AT0804'RECOVERED 1992
 AT0804'RECOVERED IN GOOD CONDITION.
 AT0804
 AT0804 STATION RECOVERY (1992)
 AT0804
 AT0804'RECOVERED 1992
 AT0804'RECOVERED IN GOOD CONDITION.
 AT0804
 AT0804 STATION RECOVERY (1994)
 AT0804
 AT0804'RECOVERY NOTE BY LA TRANSP AND DEV 1994 (SLC)
 AT0804'RECOVERED AS DESCRIBED.
 AT0804
 AT0804 STATION RECOVERY (1996)
 AT0804
 AT0804'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1996 (ALG)
 AT0804'RECOVERED AS DESCRIBED.
 AT0804
 AT0804 STATION RECOVERY (1998)
 AT0804
 AT0804'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1998 (CSM)
 AT0804'RECOVERED AS DESCRIBED. NOTE--THE PREVIOUS DESCRIPTION INCORRECTLY
 AT0804'STATES THE ROD HAS NO SLEEVE.
 AT0804
 AT0804 STATION RECOVERY (1998)

AT0804
 AT0804'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1998 (CSM)
 AT0804'RECOVERED AS DESCRIBED. NOTE--THE PREVIOUS DESCRIPTION INCORRECTLY
 AT0804'STATES THE ROD HAS NO SLEEVE.
 AT0804
 AT0804
 AT0804 STATION RECOVERY (2003)
 AT0804
 AT0804'RECOVERY NOTE BY 3001, INC 2003 (MH)
 AT0804'THE STATION IS LOCATED NORTHWEST OF REGGIO ON LA HWY 46, 14.09 MILES
 AT0804'SOUTHEAST OF INTERSECTION OF LA HWY 47 AND HWY 39 IN CHALMETTE, LA.
 AT0804'6.95 MILES EAST SOUTHEAST OF INTERSECTION OF HWY 39 AND HWY 46 IN ST.
 AT0804'BERNARD, 4.83 MILES WEST OF THE END OF HWY 46 IN SHELL BEACH.
 AT0804'
 AT0804'OWNERSHIP- LA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
 AT0804'
 AT0804'TO REACH THE STATION FROM THE INTERSECTION OF LA HWY 300 AND HWY 46 IN
 AT0804'REGGIO HEAD NORTHWEST FOR 0.3 MILES ON HWY 46, TO THE NORTHEAST
 AT0804'CORNER OF A BRIDGE AND THE MARK IS ON THE RIGHT.
 AT0804'
 AT0804'THE STATION IS 25.0 FT. NORTHEAST OF CENTERLINE OF NORTH BOUND LANES
 AT0804'OF HWY, 3.6 FT. NORTH FROM NORTH END OF BRIDGE CONCRETE RAIL, 2.1 FT.
 AT0804'NORTHEAST OF A CONCRETE CURB, 1.5 FT. NORTHWEST OF A CONCRETE
 AT0804'ABUTMENT WING. STATION IS A STAINLESS STEEL ROD ACCESSED THROUGH A
 AT0804'LOGO CAP STAMPED- REGGIO2 1987, FLUSH WITH TOP OF LOGO SLEEVE COVER
 AT0804'MISSING OTHERWISE IN GOOD CONDITION.
 AT0804
 AT0804 STATION RECOVERY (2003)
 AT0804
 AT0804'RECOVERY NOTE BY INDIVIDUAL CONTRIBUTORS 2003 (JCJ)
 AT0804'RECOVERED IN GOOD CONDITION.
 AT0804
 AT0804 STATION RECOVERY (2004)
 AT0804
 AT0804'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 2004 (KLF)
 AT0804'RECOVERED AS DESCRIBED
 AT0804
 AT0804 STATION RECOVERY (2006)
 AT0804
 AT0804'RECOVERY NOTE BY 3001, INC 2006 (JCP)
 AT0804'THE STATION IS LOCATED ST. BERNARD PARISH NEAR THE COMMUNITY OF
 AT0804'REGGIO, 13.95 MILES SE OF CHALMETTE. OWNERSHIP - LOUISIANA DEPARTMENT
 AT0804'OF HWYS.
 AT0804'
 AT0804'TO REACH THE STATION FROM THE INTERSECTION OF HIGHWAYS 47 AND 39 IN
 AT0804'CHALMETTE, GO SE ON HIGHWAY 39 FOR 8.25 MILES TO HIGHWAY 46 ON THE
 AT0804'LEFT. TURN LEFT ON HIGHWAY 46 AND GO 7.6 MILES TO THE MARK ON THE
 AT0804'LEFT. THE STATION IS 25.0 FEET NE OF OF THE HIGHWAY 46 NORTHBOUND
 AT0804'LANES, 3.6 FEET NORTH OF THE NORTH END OF THE NW CORNER OF A BRIDGE
 AT0804'CONCRETE RAIL, 2.1 FEET NE OF A CONCRETE CURB, 1.5 FEET NW OF A
 AT0804'CONCRETE ABUTMENT WINGWALL. THE MARK IS A STAINLESS STEEL ROD WITH
 AT0804'ACCESS THROUGH A LOGO CAP STAMPED REGGIO 2 1987. NOTE THE COVER IS
 AT0804'MISSING.

1 National Geodetic Survey, Retrieval Date = APRIL 13, 2006
 AF9574 *****
 AF9574 HT_MOD - This is a Louisiana Height Modernization Survey Station.
 AF9574 CORS - This is a GPS Continuously Operating Reference Station.
 AF9574 DESIGNATION - STENNIS CORS ARP
 AF9574 CORS_ID - NDBC
 AF9574 PID - AF9574
 AF9574 STATE/COUNTY- MS/HANCOCK
 AF9574 USGS QUAD - LOGTOWN (1993)
 AF9574
 AF9574 *CURRENT SURVEY CONTROL

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AF9574
AF9574* NAD 83 (CORS)- 30 21 22.59138(N) 089 36 36.97621(W) ADJUSTED
AF9574* NAVD 88 - 16.88 *(meters) 55.4 *(feet) GPS OBS(2004.65)
AF9574 **This station is located in a subsidence area (see below).
AF9574
AF9574 EPOCH DATE - 2002.00
AF9574 X - 37,468.090 (meters) COMP
AF9574 Y - -5,508,266.605 (meters) COMP
AF9574 Z - 3,204,510.665 (meters) COMP
AF9574 ELLIP HEIGHT- -10.26 (meters) (03/??/02) GPS OBS
AF9574 GEOID HEIGHT- -27.17 (meters) GEOID03
AF9574
AF9574 HORZ ORDER - SPECIAL (CORS)
AF9574 ELLP ORDER - SPECIAL (CORS)
AF9574
AF9574.ITRF positions are available for this station.
AF9574.The coordinates were established by GPS observations
AF9574.and adjusted by the National Geodetic Survey in March 2002..
AF9574.The coordinates are valid at the epoch date displayed above.
AF9574.The epoch date for horizontal control is a decimal equivalence
AF9574.of Year/Month/Day.
AF9574
AF9574 ** Due to the variability of land subsidence, the orthometric, ellipsoid,
AF9574 ** and geoid heights are valid at the date of observation. These heights
AF9574 ** must always be validated when used as control.
AF9574 ** The orthometric height was determined by GPS observations using
AF9574 ** precise GPS observation and processing techniques and a new
AF9574 ** realization of GEOID03. It supersedes the leveled height previously
AF9574 ** determined for this station.
AF9574 ** The geoid height was determined by a new realization of GEOID03 for the
AF9574 ** epoch indicated which incorporates improved geoid heights for the
AF9574 ** Southern Louisiana Subsidence area.
AF9574 ** (see www.ngs.noaa.gov/PC_PROD/GEOID03/).
AF9574.The orthometric height was determined by GPS observations and a
AF9574.high-resolution geoid model using precise GPS observation and
AF9574.processing techniques.
AF9574
AF9574.The PID for the CORS L1 Phase Center is AB8531.
AF9574
AF9574.The XYZ, and position/ellipsoidal ht. are equivalent.
AF9574
AF9574.The ellipsoidal height was determined by GPS observations
AF9574.and is referenced to NAD 83.
AF9574
AF9574.The geoid height was determined by GEOID03.
AF9574
AF9574;
AF9574;SPC MS E - North East Units Scale Factor Converg.
AF9574;SPC MS E - 95,170.385 225,307.984 MT 1.00001880 -0 23 33.6
AF9574;SPC MS E - 312,238.17 739,197.94 sFT 1.00001880 -0 23 33.6
AF9574
AF9574! - Elev Factor x Scale Factor = Combined Factor
AF9574!SPC MS E - 1.00000161 x 1.00001880 = 1.00002041
AF9574
AF9574 SUPERSEDED SURVEY CONTROL
AF9574
AF9574 NAD 83 (CORS)- 30 21 22.59167(N) 089 36 36.97624(W) AD(1997.00) c
AF9574 ELLIP H (07/??/98) -10.27 (m) GP(1997.00) c c
AF9574 NAD 83 (CORS)- 30 21 22.59171(N) 089 36 36.97633(W) AD(1996.00) c
AF9574 ELLIP H (12/??/96) -10.21 (m) GP(1996.00) c c
AF9574
AF9574.Superseded values are not recommended for survey control.
AF9574.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.

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AF9574. See file dsdata.txt to determine how the superseded data were derived.

AF9574
 AF9574 U.S. NATIONAL GRID SPATIAL ADDRESS: 16RBU4910761154(NAD 83)
 AF9574 MARKER: STATION IS THE ANTENNA REFERENCE POINT OF THE GPS ANTENNA
 AF9574
 AF9574 STATION DESCRIPTION
 AF9574
 AF9574 DESCRIBED BY NATIONAL GEODETIC SURVEY 2002
 AF9574 STATION IS A GPS CORS. LATEST INFORMATION INCLUDING POSITIONS AND
 AF9574 VELOCITIES ARE AVAILABLE IN THE COORDINATE AND LOG FILES ACCESSIBLE
 AF9574 BY ANONYMOUS FTP OR THE WORLDWIDE WEB.
 AF9574 FTP CORS.NGS.NOAA.GOV: CORS/COORD AND CORS/STATION_LOG
 AF9574 HTTP://WWW.NGS.NOAA.GOV UNDER PRODUCTS AND SERVICES.

1 National Geodetic Survey, Retrieval Date = APRIL 13, 2006

AT0760 *****
 AT0760 HT MOD - This is a Louisiana Height Modernization Survey Station.
 AT0760 DESIGNATION - V 375
 AT0760 PID - AT0760
 AT0760 STATE/COUNTY- LA/ORLEANS
 AT0760 USGS QUAD - CHALMETTE (1994)
 AT0760
 AT0760 *CURRENT SURVEY CONTROL
 AT0760

AT0760*	NAD 83(1992)-	29 55 01.55070(N)	089 58 18.04218(W)	ADJUSTED
AT0760*	NAVD 88	- 0.71 ** (meters)	2.3 ** (feet)	GPS OBS(2004.65)

AT0760 **This station is located in a subsidence area (see below).
 AT0760

AT0760	EPOCH DATE	-	2004.65	
AT0760	X	-	2,734.905 (meters)	COMP
AT0760	Y	-	-5,532,823.275 (meters)	COMP
AT0760	Z	-	3,162,399.142 (meters)	COMP
AT0760	LAPLACE CORR-		0.15 (seconds)	DEFLEC99
AT0760	ELLIP HEIGHT-		-25.24 (meters)	(06/22/05) GPS OBS
AT0760	GEOID HEIGHT-		-25.95 (meters)	GEOID03
AT0760	DYNAMIC HT	-	0.71 (meters)	2.3 (feet) COMP
AT0760	MODELED GRAV-		979,311.5 (mgal)	NAVD 88

AT0760
 AT0760 HORZ ORDER - B
 AT0760 VERT ORDER - FIRST CLASS II (See Below)
 AT0760 ELLP ORDER - FOURTH CLASS I

AT0760
 AT0760 The horizontal coordinates were established by GPS observations
 AT0760 and adjusted by the National Geodetic Survey in June 2005..
 AT0760 The horizontal coordinates are valid at the epoch date displayed above.
 AT0760 The epoch date for horizontal control is a decimal equivalence
 AT0760 of Year/Month/Day.
 AT0760

AT0760 ** Due to the variability of land subsidence, the orthometric, ellipsoid,
 AT0760 ** and geoid heights are valid at the date of observation. These heights
 AT0760 ** must always be validated when used as control.
 AT0760 ** The orthometric height was determined by GPS observations using
 AT0760 ** precise GPS observation and processing techniques and a new
 AT0760 ** realization of GEOID03. It supersedes the leveled height previously
 AT0760 ** determined for this station.
 AT0760 ** The geoid height was determined by a new realization of GEOID03 for the
 AT0760 ** epoch indicated which incorporates improved geoid heights for the
 AT0760 ** Southern Louisiana Subsidence area.
 AT0760 ** (see www.ngs.noaa.gov/PC_PROD/GEOID03/).
 AT0760 The orthometric height was determined by GPS observations and a
 AT0760 high-resolution geoid model using precise GPS observation and
 AT0760 processing techniques. It supersedes the leveled height previously
 AT0760 determined for this station.

AT0760.WARNING-GPS observations at this control monument resulted in a GPS
AT0760.derived orthometric height which differed from the leveled height by
AT0760.more than one decimeter (0.1 meter).
AT0760.The vertical order pertains to the first NAVD 88 superseded value.
AT0760
AT0760.The X, Y, and Z were computed from the position and the ellipsoidal ht.
AT0760
AT0760.The Laplace correction was computed from DEFLEC99 derived deflections.
AT0760
AT0760.The ellipsoidal height was determined by GPS observations
AT0760.and is referenced to NAD 83.
AT0760
AT0760.The geoid height was determined by GEOID03.
AT0760
AT0760.The dynamic height is computed by dividing the NAVD 88
AT0760.geopotential number by the normal gravity value computed on the
AT0760.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
AT0760.degrees latitude (g = 980.6199 gals.).
AT0760
AT0760.The modeled gravity was interpolated from observed gravity values.
AT0760
AT0760;

	North	East	Units	Scale	Factor	Converg.
AT0760;SPC LA S	- 157,858.377	1,131,477.366	MT	0.99992681	+0 40	51.0
AT0760;SPC LA S	- 517,907.03	3,712,188.66	sFT	0.99992681	+0 40	51.0
AT0760;UTM 16	- 3,313,312.157	213,085.466	MT	1.00061579	-1 28	59.3
AT0760;UTM 15	- 3,313,455.172	792,385.972	MT	1.00065491	+1 30	41.2

AT0760
AT0760!

	Elev Factor	x	Scale Factor	=	Combined Factor
AT0760!SPC LA S	- 1.00000396	x	0.99992681	=	0.99993077
AT0760!UTM 16	- 1.00000396	x	1.00061579	=	1.00061976
AT0760!UTM 15	- 1.00000396	x	1.00065491	=	1.00065888

AT0760

SUPERSEDED SURVEY CONTROL

AT0760

AT0760	NAD 83 (1992)-	29 55 01.55098 (N)	089 58 18.04288 (W)	AD ()	B
AT0760	ELLIP H (05/09/05)	-25.20 (m)		GP ()	4 2
AT0760	NAD 83 (1992)-	29 55 01.55047 (N)	089 58 18.04138 (W)	AD ()	1
AT0760	ELLIP H (01/21/93)	-25.18 (m)		GP ()	4 2
AT0760	NAD 83 (1986)-	29 55 01.56676 (N)	089 58 18.04032 (W)	AD ()	1
AT0760	NAVD 88 (12/05/96)	0.890 (m)	2.92 (f)	ADJUSTED	1 2
AT0760	NAVD 88 (02/14/94)	0.873 (m)	2.86 (f)	UNKNOWN	1 2
AT0760	NGVD 29 (05/21/91)	0.933 (m)	3.06 (f)	ADJUSTED	1 2

AT0760
AT0760.Superseded values are not recommended for survey control.
AT0760.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
AT0760.See file dsdata.txt to determine how the superseded data were derived.
AT0760
AT0760_U.S. NATIONAL GRID SPATIAL ADDRESS: 16RBU1308513312(NAD 83)
AT0760_MARKER: I = METAL ROD
AT0760_SETTING: 59 = STAINLESS STEEL ROD IN SLEEVE (10 FT.+)
AT0760_SP_SET: STAINLESS STEEL ROD IN SLEEVE
AT0760_STAMPING: V 375 1985
AT0760_MARK LOGO: NGS
AT0760_PROJECTION: PROJECTING 6 CENTIMETERS
AT0760_MAGNETIC: N = NO MAGNETIC MATERIAL
AT0760_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
AT0760_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
AT0760+SATELLITE: SATELLITE OBSERVATIONS - January 08, 2006
AT0760_ROD/PIPE-DEPTH: 25.6 meters
AT0760_SLEEVE-DEPTH : 18.2 meters
AT0760

AT0760	HISTORY	- Date	Condition	Report By
AT0760	HISTORY	- 1985	MONUMENTED	NGS

AT0760	HISTORY	- 19880920	GOOD	LADTD
AT0760	HISTORY	- 19890124	GOOD	
AT0760	HISTORY	- 19901025	GOOD	NGS
AT0760	HISTORY	- 19941202	GOOD	NGS
AT0760	HISTORY	- 19960205	GOOD	NGS
AT0760	HISTORY	- 20021119	GOOD	3001
AT0760	HISTORY	- 20040414	GOOD	JCLS
AT0760	HISTORY	- 20040414	GOOD	JCLS
AT0760	HISTORY	- 20040418	GOOD	NGS
AT0760	HISTORY	- 20050910	GOOD	JCLS
AT0760	HISTORY	- 20051008	GOOD	NGS
AT0760	HISTORY	- 20060108	GOOD	3001

AT0760
AT0760
AT0760

STATION DESCRIPTION

AT0760'DESCRIBED BY NATIONAL GEODETIC SURVEY 1985
AT0760'IN NEW ORLEANS.
AT0760'THE MARK IS ABOVE LEVEL WITH ROAD.
AT0760'IN NEW ORLEANS, ON THE WEST BANK, AT THE SOUTHEAST SIDE OF THE
AT0760'ENTRANCE GATE OF THE ALGIERS LOCKS, LOCATED AT THE SOUTH END OF BLYTHE
AT0760'STREET, 6.85 METERS (22.5 FT) SOUTHEAST OF THE CENTER OF THE ENTRANCE
AT0760'ROAD LEADING TO THE LOCKS, 5.85 METERS (19.2 FT) SOUTH OF THE
AT0760'SOUTHEAST ENTRANCE GATE POST, 3.53 METERS (11.6 FT) WEST OF A CONCRETE
AT0760'LAMP POST. NOTE--ACCESS TO DATUM POINT IS HAD THROUGH A 5-INCH LOGO
AT0760'CAP.

AT0760'THE MARK IS 3.23 METERS W FROM A WITNESS POST
AT0760

STATION RECOVERY (1988)

AT0760
AT0760
AT0760'RECOVERY NOTE BY LA TRANSP AND DEV 1988
AT0760'IN NEW ORLEANS, ON THE WEST BANK , AT THE SOUTHEAST SIDE OF THE
AT0760'ENTRANCE GATE OF THE ALGIERS LOCKS, LOCATED AT THE SOUTH END OF BLYTHE
AT0760'STREET, 6.85 M (22.5 FT) SOUTHEAST OF THE CENTER OF THE ENTRANCE ROAD
AT0760'LEADING TO THE LOCKS, 5.85 M (19.2 FT) SOUTH OF THE SOUTHEAST ENTRANCE
AT0760'GATE POST, 3.53 M (11.6 FT) WEST OF A CONCRETE LAMP POST ABOUT LEVEL
AT0760'WITH THE ROAD AND 3.23 M (10.6 FT) WEST FROM A WITNESS POST.
AT0760'NOTE--ACCESS TO DATUM POINT IS HAD THROUGH A 5-INCH LOGO CAP.

AT0760
AT0760
AT0760

STATION RECOVERY (1989)

AT0760'RECOVERED 1989
AT0760'RECOVERED IN GOOD CONDITION.

AT0760
AT0760
AT0760

STATION RECOVERY (1990)

AT0760
AT0760'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1990
AT0760'0.5 KM (0.3 MI) SOUTHWESTERLY ALONG BLYTHE STREET FROM ITS JUNCTION
AT0760'WITH PATTERSON ROAD IN ALGIERS, ON THE U.S. ARMY CORPS OF ENGINEERS
AT0760'ALGIERS LOCK PROPERTY, 6.6 M (21.7 FT) NORTHEAST OF AND LEVEL WITH
AT0760'THE CENTER OF THE ALGIERS LOCK ENTRANCE ROAD AND GATE, AND 3.6 M
AT0760'(11.8 FT) SOUTHEAST OF A UTILITY LIGHT POST. NOTE--ACCESS TO DATUM
AT0760'POINT IS HAD THROUGH A 5-INCH LOGO CAP.

AT0760
AT0760
AT0760

STATION RECOVERY (1994)

AT0760'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1994 (GAS)
AT0760'IN ALGIERS, AT 3500 BLYTHE STREET, 109.5 M (359.3 FT) NORTHWEST OF THE
AT0760'NORTHWEST CORNER OF THE U.S. ARMY CORP OF ENGINEERS GENERATOR BUILDING
AT0760'AT 3500 BLYTHE STREET, 6.9 M (22.6 FT) EAST OF AND LEVEL WITH THE
AT0760'STREET CENTER, 5.6 M (18.4 FT) SOUTHEAST OF THE EAST POST OF A GATE,
AT0760'3.3 M (10.8 FT) SOUTH OF A UTILITY POLE, AND 3.1 M (10.2 FT) SOUTH OF
AT0760'A WITNESS POST. NOTE--ACCESS TO THE DATUM POINT IS THROUGH A 5-INCH
AT0760'LOGO CAP. THE MARK IS ON THE PROPERTY OF THE U.S. ARMY CORP OF

AT0760'ENGINEERS ALGIERS LOCK, 3500 BLYTHE STREET, ALGIERS, LA 70131.
AT0760
AT0760 STATION RECOVERY (1996)
AT0760
AT0760'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1996 (ALG)
AT0760'RECOVERED AS DESCRIBED.
AT0760
AT0760 STATION RECOVERY (2002)
AT0760
AT0760'RECOVERY NOTE BY 3001, INC 2002 (KC)
AT0760'THE STATION IS LOCATED IN NEW ORLEANS, ON WEST BANK, 4.5 MILES NORTH
AT0760'OF BELLE CHASE FERRY, 5.5 MILES SOUTHEAST OF GREATER NEW ORLEANS
AT0760'BRIDGE, OVER MISSISSIPPI RIVER, 0.5 MILES SOUTH OF CHALMETTE FERRY.
AT0760'
AT0760'OWNERSHIP- CORPS OF ENGINEERS
AT0760'
AT0760'TO REACH THE STATION FROM THE INTERSECTION OF GENERAL DE GAULLE AVENUE
AT0760'AND SULLEN ROAD, NEAR THE BRIDGE OVER INTERCOASTAL WATERWAY, GO NORTH
AT0760'ON SULLEN ROAD TO PATTERSON DRIVE (LEVEE ROAD), TURN RIGHT ON
AT0760'PATTERSON DRIVE AND PROCEED EAST ON PATTERSON FOR 0.9 MILES TO BLYTHE
AT0760'ROAD , TURN RIGHT ON BLYTHE AND GO TO GATE ENTRANCE TO LOCKS, PASSING
AT0760'THROUGH GATE AND MARK ON LEFT NEAR GATE.
AT0760'
AT0760'THE STATION IS 22.6 FEET EAST OF CENTERLINE OF ENTRANCE ROAD TO LOCKS,
AT0760'18.3 FEET SOUTHEAST OF THE EAST GATE POST FOR GATE, 107 FEET SOUTH OF
AT0760'A LIGHT POLE, 10 FEET SOUTH OF A WITNESS SIGN. STATION IS A
AT0760'STAINLESS ROD DRIVEN 25.6 METERS AND STAMPED V 375.
AT0760
AT0760 STATION RECOVERY (2004)
AT0760
AT0760'RECOVERY NOTE BY JOHN CHANCE LAND SURVEYS INC 2004 (FJO)
AT0760'RECOVERED IN GOOD CONDITION.
AT0760
AT0760 STATION RECOVERY (2004)
AT0760
AT0760'RECOVERY NOTE BY JOHN CHANCE LAND SURVEYS INC 2004
AT0760'RECOVERED IN GOOD CONDITION.
AT0760
AT0760 STATION RECOVERY (2004)
AT0760
AT0760'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 2004 (KLF)
AT0760'RECOVERED AS DESCRIBED
AT0760
AT0760 STATION RECOVERY (2005)
AT0760
AT0760'RECOVERY NOTE BY JOHN CHANCE LAND SURVEYS INC 2005 (MRY)
AT0760'RECOVERED IN GOOD CONDITION.
AT0760
AT0760 STATION RECOVERY (2005)
AT0760
AT0760'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 2005 (KLF)
AT0760'RECOVERED AS DESCRIBED.
AT0760
AT0760 STATION RECOVERY (2006)
AT0760
AT0760'RECOVERY NOTE BY 3001, INC 2006
AT0760'RECOVERED AS DESCRIBED.

1 National Geodetic Survey, Retrieval Date = APRIL 13, 2006
BH3007 *****
BH3007 HT_MOD - This is a Louisiana Height Modernization Survey Station.
BH3007 TIDAL BM - This is a Tidal Bench Mark.
BH3007 DESIGNATION - WES 19
BH3007 PID - BH3007

BH3007 STATE/COUNTY- LA/ORLEANS
 BH3007 USGS QUAD - LITTLE WOODS (1994)
 BH3007
 BH3007 *CURRENT SURVEY CONTROL
 BH3007

BH3007*	NAD 83(1992) -	30 00 25.42356(N)	089 56 19.81680(W)	ADJUSTED
BH3007*	NAVD 88	-	-0.11 **(meters)	-0.4 **(feet) GPS OBS(2004.65)

BH3007 **This station is located in a subsidence area (see below).
 BH3007

BH3007	EPOCH DATE	-	2004.65	
BH3007	X	-	5,900.851 (meters)	COMP
BH3007	Y	-	-5,527,839.247 (meters)	COMP
BH3007	Z	-	3,171,038.528 (meters)	COMP
BH3007	LAPLACE CORR-		0.00 (seconds)	DEFLEC99
BH3007	ELLIP HEIGHT-		-26.30 (meters)	(04/11/06) GPS OBS
BH3007	GEOID HEIGHT-		-26.19 (meters)	GEOID03
BH3007	DYNAMIC HT	-	-0.11 (meters)	-0.4 (feet) COMP
BH3007	MODELED GRAV-		979,315.8 (mgal)	NAVD 88

BH3007
 BH3007 HORZ ORDER - FIRST
 BH3007 VERT ORDER - FIRST CLASS II (See Below)
 BH3007 ELLP ORDER - FOURTH CLASS II
 BH3007

BH3007.The horizontal coordinates were established by GPS observations
 BH3007.and adjusted by the National Geodetic Survey in April 2006..
 BH3007.The horizontal coordinates are valid at the epoch date displayed above.
 BH3007.The epoch date for horizontal control is a decimal equivalence
 BH3007.of Year/Month/Day.
 BH3007

BH3007 ** Due to the variability of land subsidence, the orthometric, ellipsoid,
 BH3007 ** and geoid heights are valid at the date of observation. These heights
 BH3007 ** must always be validated when used as control.
 BH3007 ** The orthometric height was determined by GPS observations using
 BH3007 ** precise GPS observation and processing techniques and a new
 BH3007 ** realization of GEOID03. It supersedes the leveled height previously
 BH3007 ** determined for this station.
 BH3007 ** The geoid height was determined by a new realization of GEOID03 for the
 BH3007 ** epoch indicated which incorporates improved geoid heights for the
 BH3007 ** Southern Louisiana Subsidence area.
 BH3007 ** (see www.ngs.noaa.gov/PC_PROD/GEOID03/).
 BH3007.The orthometric height was determined by GPS observations and a
 BH3007.high-resolution geoid model using precise GPS observation and
 BH3007.processing techniques. It supersedes the leveled height previously
 BH3007.determined for this station.
 BH3007.WARNING-GPS observations at this control monument resulted in a GPS
 BH3007.derived orthometric height which differed from the leveled height by
 BH3007.more than one decimeter (0.1 meter).
 BH3007.The vertical order pertains to the first NAVD 88 superseded value.
 BH3007

BH3007.This Tidal Bench Mark is designated as VM 6520
 BH3007.by the Center for Operational Oceanographic Products and Services.
 BH3007

BH3007.The X, Y, and Z were computed from the position and the ellipsoidal ht.
 BH3007

BH3007.The Laplace correction was computed from DEFLEC99 derived deflections.
 BH3007

BH3007.The ellipsoidal height was determined by GPS observations
 BH3007.and is referenced to NAD 83.
 BH3007

BH3007.The geoid height was determined by GEOID03.
 BH3007

BH3007.The dynamic height is computed by dividing the NAVD 88
 BH3007.geopotential number by the normal gravity value computed on the

BH3007.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
 BH3007.degrees latitude (g = 980.6199 gals.).
 BH3007
 BH3007.The modeled gravity was interpolated from observed gravity values.
 BH3007
 BH3007;

	North	East	Units	Scale	Factor	Converg.
BH3007;SPC LA S	- 167,867.783	1,134,526.830	MT	0.99992575	+0 41	50.2
BH3007;SPC LA S	- 550,746.22	3,722,193.44	sFT	0.99992575	+0 41	50.2
BH3007;UTM 16	- 3,323,205.859	216,513.373	MT	1.00059164	-1 28	14.6
BH3007;UTM 15	- 3,323,515.270	795,291.801	MT	1.00067596	+1 31	55.3

 BH3007
 BH3007!

	Elev Factor	x	Scale Factor	=	Combined Factor
BH3007!SPC LA S	- 1.00000413	x	0.99992575	=	0.99992988
BH3007!UTM 16	- 1.00000413	x	1.00059164	=	1.00059577
BH3007!UTM 15	- 1.00000413	x	1.00067596	=	1.00068009

SUPERSEDED SURVEY CONTROL

BH3007
 BH3007 ELLIP H (01/21/03) -26.19 (m) GP () 4 2
 BH3007 NAD 83(1992)- 30 00 25.42395(N) 089 56 19.81619(W) AD() 1
 BH3007 NAD 83(1992)- 30 00 25.42395(N) 089 56 19.81618(W) AD() 1
 BH3007 ELLIP H (01/21/93) -26.17 (m) GP () 4 2
 BH3007 NAD 83(1986)- 30 00 25.44004(N) 089 56 19.81358(W) AD() 1
 BH3007 NAVD 88 (12/05/96) 0.104 (m) 0.34 (f) ADJUSTED 1 2
 BH3007 NAVD 88 (02/14/94) 0.129 (m) 0.42 (f) UNKNOWN 1 2
 BH3007 NGVD 29 (05/21/91) 0.189 (m) 0.62 (f) ADJUSTED 1 2
 BH3007

BH3007.Superseded values are not recommended for survey control.
 BH3007.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 BH3007.See file dsdata.txt to determine how the superseded data were derived.
 BH3007

BH3007_U.S. NATIONAL GRID SPATIAL ADDRESS: 16RBU1651323206(NAD 83)
 BH3007_MARKER: DD = SURVEY DISK
 BH3007_SETTING: 15 = METAL ROD DRIVEN INTO GROUND. SEE TEXT FOR ADDITIONAL
 BH3007+WITH SETTING: INFORMATION.
 BH3007_SP_SET: METAL ROD DRIVEN INTO GROUND
 BH3007_STAMPING: WES 19 1978
 BH3007_MARK LOGO: USE
 BH3007_PROJECTION: RECESSED 2 CENTIMETERS
 BH3007_MAGNETIC: N = NO MAGNETIC MATERIAL
 BH3007_STABILITY: D = MARK OF QUESTIONABLE OR UNKNOWN STABILITY
 BH3007_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
 BH3007+SATELLITE: SATELLITE OBSERVATIONS - March 06, 2006
 BH3007

BH3007	HISTORY	- Date	Condition	Report By
BH3007	HISTORY	- 1978	MONUMENTED	USE
BH3007	HISTORY	- 19890120	GOOD	
BH3007	HISTORY	- 19901102	GOOD	NGS
BH3007	HISTORY	- 19950119	GOOD	NGS
BH3007	HISTORY	- 20040801	GOOD	EMCINC
BH3007	HISTORY	- 20060306	GOOD	3001

STATION DESCRIPTION

BH3007'DESCRIBED BY US ENGINEERS 1978
 BH3007'THE STATION IS LOCATED IN NEW ORLEANS NEAR THE SOUTHWEST CORNER OF THE
 BH3007'NOPSI POWER SUB-STATION PROPERTY AT THE STATE HIGHWAY 47 BRIDGE OVER
 BH3007'THE INTRACOASTAL WATERWAY, ABOUT 8 KM (4.95 MI) NORTH OF CHALMETTE AND
 BH3007'ABOUT 3.2 KM (2.00 MI) SOUTHWEST OF MICHOUND.
 BH3007'TO REACH THE STATION FROM THE JUNCTION OF U S HIGHWAY 90 AND STATE
 BH3007'HIGHWAY 47 GO SOUTH FOR 1 KM (0.60 MI) ON HIGHWAY 47 TO THE NORTH END
 BH3007'OF THE HIGHWAY 47 BRIDGE OVER THE INTRACOASTAL WATERWAY. CONTINUE
 BH3007'STRAIGHT AHEAD AND GO SOUTH FOR 0.5 KM (0.30 MI) ON THE PAVED ROAD

BH3007'ALONG THE SIDE OF THE BRIDGE TO THE JUNCTION WITH OLD GENTILLY ROAD.
BH3007'CONTINUE STRAIGHT AHEAD ACROSS OLD GENTILLY ROAD FOR 0.6 KM (0.35 MI)
BH3007'ON THE PAVED ROAD TO AN ELECTRIC SUB-STATION ENTRANCE ON THE LEFT AND
BH3007'THE STATION SET NEAR THE ENTRANCE TO THE SUB-STATION.
BH3007'THE STATION IS A USE DISK CRIMPED ONTO A METAL ROD DRIVEN INTO THE
BH3007'GROUND AND ENCASED IN A 5-INCH PVC PIPE FLUSH WITH THE GROUND 31.1 M
BH3007'(102.0 FT) SOUTH FROM THE CENTER OF THE ENTRANCE GATE INTO THE
BH3007'SUB-STATION, 1.2 WEST FROM A CHAIN LINK FENCE AND 0.6 M (2.0 FT) WEST
BH3007'FROM A METAL WITNESS POST WITH A SIGN ATTACHED.

BH3007

STATION RECOVERY (1989)

BH3007

BH3007'RECOVERED 1989

BH3007'RECOVERED IN GOOD CONDITION.

BH3007

BH3007 STATION RECOVERY (1990)

BH3007

BH3007'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1990

BH3007'0.5 KM (0.3 MI) SOUTHERLY ALONG PARIS ROAD FROM THE JUNCTION OF
BH3007'GENTILLY ROAD IN NEW ORLEANS, 80.0 M (262.5 FT) EAST OF THE CENTER OF
BH3007'THE ROAD, 31.1 M (102.0 FT) SOUTH OF THE CENTER OF THE ENTRANCE GATE
BH3007'LEADING TO A SUB-STATION, 1.2 M (3.9 FT) WEST OF A CHAIN-LINK FENCE,
BH3007'AND 0.7 M (2.3 FT) WEST OF A WITNESS POST. NOTE--THE DISK IS ENCASED
BH3007'IN A 5-INCH PVC PIPE THAT IS FLUSH WITH THE GROUND SURFACE.

BH3007

STATION RECOVERY (1995)

BH3007

BH3007'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1995 (GAS)

BH3007'4.3 KM (2.65 MI) WESTERLY ALONG U.S. HIGHWAY 90 (CHEF MENTEUR HIGHWAY)
BH3007'FROM THE JUNCTION OF INTERSTATE HIGHWAY 610 IN NEW ORLEANS, THENCE 4.5
BH3007'KM (2.80 MI) EASTERLY ALONG GENTILLY ROAD, THENCE 0.6 KM (0.35 MI)
BH3007'SOUTHERLY ALONG PARIS ROAD, 31.2 M (102.4 FT) SOUTH OF THE ROAD CENTER
BH3007'AND A POWER PLANT ENTRANCE GATE, 15.8 M (51.8 FT) EAST OF THE CENTER
BH3007'OF A GRAVEL ROAD, 1.1 M (3.6 FT) WEST OF A CHAIN-LINK FENCE, 0.9 M
BH3007'(3.0 FT) WEST OF A WITNESS POST, 0.4 M (1.3 FT) BELOW THE LEVEL OF THE
BH3007'ROAD, AND 0.3 M (1.0 FT) BELOW THE GROUND SURFACE. NOTE--THE DISK IS
BH3007'ENCASED IN A 5-INCH PVC PIPE AND IS 0.3 M (1.0 FT) BELOW THE GROUND
BH3007'SURFACE.

BH3007

STATION RECOVERY (2004)

BH3007

BH3007'RECOVERY NOTE BY EMC INCORPORATED 2004 (MDG)

BH3007'RECOVERED IN GOOD CONDITION.

BH3007

STATION RECOVERY (2006)

BH3007

BH3007'RECOVERY NOTE BY 3001, INC 2006 (JCP)

BH3007'RECOVERED AS DESCRIBED.

*** retrieval complete.

Appendix 36

Outfall Canal Post-Katrina Topographic Surveys

17th Street Canal							
West side of Canal				East side of Canal			
Point No.	Elev.	Code	Note	Point No.	Elev.	Code	Note
							North End
358	15.28	TCW	Lakefront Levee	104	13.47	TCW	Hammond Hwy.
357	15.42	TCW		105	13.47	TCW	
354	14.99	TCW		106	13.22	TCW	
353	14.99	TCW		107	12.02	TCW	
352	13.30	TCW		108	12.34	TCW	
351	12.57	TCW		109	12.24	TCW	
350	12.32	TCW		110	11.87	TCW	
349	12.55	TCW		114	11.90	TCW	
348	12.46	TCW		115	12.23	TCW	
347	12.47	TCW		116	12.18	TCW	
346	12.41	TCW		117	12.08	TCW	
345	12.41	TCW		118	12.11	TCW	
344	13.16	TCW		119	12.18	TCW	
343	13.14	TCW		120	12.07	TCW	
340	13.20	TCW		121	12.16	TCW	
339	12.43	TCW		122	12.18	TCW	
338	12.40	TCW		123	12.11	TCW	
337	12.40	TCW		124	12.19	TCW	
336	12.45	TCW		125	12.21	TCW	
325	12.55	TCW		126	12.16	TCW	
324	12.56	TCW		127	12.14	TCW	
323	12.54	TCW		128	12.15	TCW	
322	12.54	TCW		129	12.12	TCW	
321	12.48	TCW		130	12.46	TCW	
320	12.46	TCW		131	12.88	TCW	
319	12.51	TCW		132	12.91	TFG	To Veterans Hwy
318	12.57	TCW		Mean:	12.35		
317	12.56	TCW		High:	13.47		
316	12.53	TCW		Low:	11.87		
315	12.58	TCW		# of Obs.	26		
314	12.52	TCW					
313	12.45	TCW		146	12.98	TCW	Veterans Hwy. To

17th Street Canal

West side of Canal				East side of Canal			
Point No.	Elev.	Code	Note	Point No.	Elev.	Code	Note
312	12.48	TCW		147	12.96	TCW	
311	12.53	TCW		148	12.89	TFG	
310	12.59	TCW		149	12.89	TFG	
309	12.58	TCW		150	12.85	TCW	
308	12.57	TCW		151	12.85	TCW	
307	12.65	TCW		152	12.59	TCW	
306	12.63	TCW		153	12.72	TCW	
305	12.58	TCW		154	12.79	TCW	
304	12.28	TCW		155	12.83	TCW	
303	12.38	TCW		156	12.79	TCW	
302	12.30	TCW		157	12.80	TCW	
301	12.30	TCW		158	12.75	TCW	
300	12.32	TCW		159	12.75	TCW	
299	12.22	TCW		160	12.75	TCW	
298	12.20	TCW		161	13.75	TCW	
297	12.21	TCW		162	13.82	TFG	
296	12.25	TCW		163	13.82	TFG	
295	12.27	TCW		164	13.78	TCW	
294	12.30	TCW		165	13.85	TCW	
293	12.26	TCW		166	14.56	TCW	
292	12.47	TCW		167	14.55	TCW	
291	12.45	TFG		168	13.73	TCW	
290	12.43	TFG		169	13.73	TCW	
289	12.44	TCW		170	13.71	TCW	
288	12.94	TCW		171	13.71	TCW	
287	12.94	TCW	To Veterans Hwy	172	17.49	TCW	
Mean:	12.70			173	17.49	TCW	
High:	15.42			174	17.26	TCW	
Low:	12.20			175	14.37	TCW	
# of Obs.	58			176	14.05	TFG	
				177	14.00	TFG	
274	12.88	TCW	Veterans Hwy	178	14.04	TFG	
273	12.87	TFG		179	14.54	TFG	
272	12.87	TFG		180	14.53	TCW	
271	12.88	TCW		181	14.71	TCW	
270	12.70	TCW		182	14.22	TCW	I-10 Bridge
269	12.74	TCW		Mean:	13.84		
268	12.77	TCW		High:	17.49		
267	12.83	TCW		Low:	12.59		
266	12.74	TCW		# of Obs.	37		
265	12.77	TCW					
264	12.65	TCW		183	14.25	TCW	I-10 Bridge to
263	12.66	TCW		184	14.20	TCW	
262	13.89	TCW		185	14.70	TCW	
261	13.88	TCW		186	14.62	TCW	
260	13.88	TCW		187	14.66	TCW	
259	13.88	TCW		188	13.11	TCW	
258	14.16	TCW		189	13.21	TCW	

17th Street Canal

West side of Canal				East side of Canal			
Point No.	Elev.	Code	Note	Point No.	Elev.	Code	Note
257	14.16	TCW		190	13.24	TCW	
254	14.33	TCW		191	13.25	TCW	
253	14.28	TCW		192	13.21	TCW	
252	14.32	TCW		193	13.28	TCW	
251	14.36	TCW		194	13.30	TCW	
250	13.29	TCW	I-10 Bridge	195	13.27	TCW	
Mean:	13.38			196	13.30	TCW	
High:	14.36			197	13.32	TCW	
Low:	12.65			198	13.24	TCW	
# of Obs.	23			199	13.22	TCW	
				200	13.16	TCW	Southern RR
249	13.32	TCW	I-10 Bridge to	Mean:	13.59		
248	13.28	TCW		High:	14.70		
247	13.30	TCW		Low:	13.11		
246	13.37	TCW		# of Obs.	18		
245	13.33	TCW					
244	13.29	TFG					
243	13.30	TFG					
242	13.32	TCW					
241	13.34	TCW					
240	13.33	TCW					
239	13.33	TCW					
238	13.28	TCW					
237	13.84	TCW					
236	13.35	TCW					
235	13.35	TCW					
234	13.28	TCW	Southern RR				
Mean:	13.35						
High:	13.84						
Low:	13.28						
# of Obs.	16						

Orleans Ave. Canal

West side of Canal				East side of Canal			
Point No.	Elev.	Code	Note	Point No.	Elev.	Code	Note
							North End
45	13.02	TCW	South Robert E. Lee Blvd. Bridge.	230	12.98	TCW	South Robert E. Lee Blvd. Bridge.
46	13.40	TCW		229	13.45	TCW	
47	13.44	TCW		228	13.47	TCW	
48	13.21	TCW		227	13.50	TCW	
49	13.23	TCW		226	13.45	TCW	
50	13.19	TCW		225	13.48	TCW	
51	13.17	TCW		224	13.48	TCW	
52	13.03	TCW		223	13.47	TCW	
53	13.04	TCW		222	13.48	TCW	
54	13.21	TCW		221	13.51	TCW	
55	13.17	TCW		220	13.46	TCW	
56	13.66	TCW		219	13.42	TCW	
57	13.74	TCW		218	13.46	TCW	
58	13.23	TCW		217	13.46	TCW	
61	12.74	TCW	To Filmore Ave. Bridge.	216	13.45	TCW	
Mean:	13.23			215	13.44	TCW	
High:	13.74			214	13.42	TCW	
Low:	12.74			213	13.43	TCW	
				212	13.27	TCW	
				211	13.26	TCW	To Filmore Ave. Bridge.
65	12.72	TCW	South of Filmore Ave. Bridge.	Mean:	13.42		
68	13.27	TCW		High:	13.51		
69	13.72	TCW		Low:	12.98		
70	13.68	TCW					
71	13.16	TCW					
72	13.21	TCW		196	13.84	TFG	South of Filmore Ave. Bridge.
73	13.27	TCW		195	13.85	TFG	
74	13.07	TCW		194	13.85	TCW	
75	13.08	TCW		193	13.92	TCW	
76	13.08	TCW		192	13.90	TCW	
77	13.14	TCW		191	13.91	TCW	
78	13.18	TCW		190	13.91	TCW	
79	13.23	TCW		189	13.93	TCW	
80	13.16	TCW		188	13.93	TCW	
81	12.98	TCW		187	13.88	TCW	
82	12.98	TCW		186	13.85	TCW	
83	13.98	TCW		185	13.87	TCW	
84	14.06	TCW		184	13.87	TCW	
85	14.49	TCW		183	13.90	TCW	
86	14.49	TCW	To North of Harrison Ave. Bridge	182	13.87	TCW	
Mean:	13.40			181	13.84	TCW	
High:	14.49			180	13.88	TCW	
Low:	12.72			179	13.89	TCW	
				178	13.79	TFG	
				177	13.79	TFG	
96	13.48	TCW	South of Harrison Ave. Bridge	176	13.89	TCW	
97	14.02	TCW		175	13.92	TCW	

Orleans Ave. Canal

West side of Canal				East side of Canal			
Point No.	Elev.	Code	Note	Point No.	Elev.	Code	Note
98	14.02	TCW		174	13.87	TCW	
99	14.04	TCW		173	13.39	TCW	
100	14.03	TCW		172	13.32	TCW	To North of Harrison Ave. Bridge
101	13.59	TCW		Mean:	13.83		
102	13.75	TCW		High:	13.93		
103	13.63	TCW		Low:	13.32		
104	13.64	TCW					
105	14.16	TCW					
106	14.15	TCW		162	13.32	TCW	South of Harrison Ave. Bridge
107	14.17	TCW		161	13.31	TCW	
108	14.17	TCW		160	13.86	TCW	
109	14.17	TCW		159	13.89	TCW	
110	14.20	TCW		158	13.87	TCW	
111	13.71	TCW		157	13.84	TFG	
112	13.65	TCW		156	13.85	TFG	
113	13.67	TCW		155	13.90	TCW	
114	14.07	TCW		154	14.00	TCW	
115	14.36	TCW		153	13.36	TCW	
116	14.17	TCW		152	14.00	TCW	
117	14.23	TCW		151	13.93	TCW	
118	14.16	TCW		150	13.91	TCW	
119	14.23	TCW		149	14.00	TCW	
120	14.23	TCW		148	14.05	TCW	
121	14.24	TCW		147	14.04	TCW	
122	13.98	TCW		146	14.00	TCW	
123	13.99	TCW	To near Pumpstation #7	145	13.98	TCW	
Mean:	14.00			144	14.02	???	To near Pumpstation #7
High:	14.36			Mean:	13.85		
Low:	13.48			High:	14.05		
				Low:	13.31		

London Ave. Canal

West side of Canal				East side of Canal			
Point No.	Elev.	Code	Note	Point No.	Elev.	Code	Note
							North End
62	13.12	TCW	South Robert E. Lee Blvd. Bridge.	328	12.4	TCW	South of Leon C. Simon
67	13.40	TCW		327	12.9	TCW	
68	13.40	TCW		326	12.8	TFG	
69	13.00	TCW		325	12.8	TFG	
70	13.00	TCW		324	12.9	TCW	
71	12.90	TCW		323	12.9	TCW	
72	12.90	TCW		322	12.9	TCW	
77	12.90	TCW		321	12.9	TCW	To Robert E. Lee Bridge
78	12.90	TCW		Mean:	12.82		
79	12.90	TCW		High:	12.94		
80	12.90	TCW		Low:	12.39		
81	12.90	TCW					
82	12.87	TFG					
83	12.91	TFG					
84	12.91	TCW		306	12.7	TCW	South Robert E. Lee Blvd. Bridge.
85	12.89	TCW		305	12.7	TCW	
86	13.22	TCW		304	12.7	TCW	
87	13.22	TCW	To Filmore Ave. Bridge.	303	13.0	TCW	
Mean:	13.01			302	13.0	TCW	
High:	13.40			301	13.0	TCW	
Low:	12.87			300	13.0	TCW	
				299	13.0	TCW	
				298	13.0	TCW	
93	13.00	TCW	South of Filmore Ave. Bridge.	297	12.5	TCW	
97	13.23	TCW		296	12.5	TCW	
98	13.23	TCW		294	12.4	TCW	
99	12.96	TCW		293	12.5	TCW	
100	12.96	TCW		292	12.5	TCW	
101	12.94	TCW		291	12.5	TCW	
102	12.53	???		290	13.0	TCW	
103	13.69	TCW		289	13.0	TCW	
104	12.86	TFG		288	13.0	TCW	
105	12.87	TFG		287	13.0	TCW	
106	12.91	TCW		286	13.1	TCW	
107	12.93	TCW		285	13.1	TCW	
108	12.94	TCW		284	12.9	TFG	
109	12.91	TCW		283	12.9	TFG	
110	12.92	TCW		282	13.0	TCW	
111	12.64	???		281	13.0	TCW	
112	12.64	TFG		280	13.3	TCW	To Filmore Ave. Bridge.
113	12.69	TFG		Mean:	12.85		
114	12.66	TCW		High:	13.30		
115	12.69	TCW		Low:	12.44		
116	12.69	???					
117	13.29	TCW					
118	13.29	TCW	To North of Mirabeau Ave. Bridge	273	12.4	TCW	South of Filmore Ave. Bridge.
Mean:	12.93			272	12.9	TCW	

London Ave. Canal

West side of Canal				East side of Canal			
Point No.	Elev.	Code	Note	Point No.	Elev.	Code	Note
High:	13.69			271	12.9	TCW	
Low:	12.53			270	12.4	???	
				269	12.9	TFG	
				268	12.9	TFG	
128	12.98	TCW	South of Mirabeau Ave. Bridge	267	13.0	TCW	
129	12.98	TCW		266	13.1	TCW	
130	13.00	TFG		265	12.9	TCW	
131	13.01	TFG		260	12.5	TCW	
132	13.01	TCW		259	12.9	TCW	
133	13.02	TCW		258	12.9	TCW	
134	13.01	TCW		257	12.8	TFG	
135	13.04	TCW		256	12.8	TFG	
136	13.04	TCW		254	13.1	TCW	
137	13.07	TCW		253	13.3	TCW	
138	13.01	TCW		252	13.3	TCW	To North of Mirabeau Ave. Bridge
139	12.97	TCW		Mean:	12.88		
140	12.90	TCW		High:	13.31		
141	12.85	TCW		Low:	12.35		
142	12.92	TCW					
143	12.80	TCW					
144	12.88	TCW		241	13.4	TCW	South of Mirabeau Ave. Bridge
145	12.97	TCW		240	12.8	TCW	
146	12.94	TCW		239	12.9	TCW	
147	12.95	TCW		238	12.9	TCW	
148	12.85	TCW		237	12.9	TFG	
149	12.89	TCW		236	12.9	TCW	
150	12.89	TCW		235	12.9	TCW	
151	12.87	TCW		234	13.0	TCW	
152	12.93	TCW		233	13.0	TCW	
153	12.85	TCW		232	13.0	TCW	
154	12.49	TCW	To Gentilly Blvd.	231	13.0	TCW	
Mean:	12.93			230	13.0	TCW	
High:	13.07			229	13.0	TCW	
Low:	12.49			228	13.0	TCW	
				227	13.0	TCW	
				226	12.9	TCW	
165	12.5	TCW	South of Gentilly Blvd.	225	12.9	TCW	
166	12.5	TCW		224	12.9	TCW	
167	13.0	TCW		223	13.0	TCW	
168	12.8	TCW		222	12.9	TCW	
169	13.0	TCW		221	13.0	TCW	
170	12.9	TCW		220	13.0	TCW	
171	12.9	TCW		219	12.5	TCW	
172	13.0	???		218	12.9	TCW	To Gentilly Blvd.
173	12.9	???		Mean:	12.94		
174	12.9	???		High:	13.40		
175	13.0	???		Low:	12.48		
176	12.9	TCW					

London Ave. Canal

West side of Canal				East side of Canal			
Point No.	Elev.	Code	Note	Point No.	Elev.	Code	Note
177	12.9	TCW					
178	13.0	TCW		217	12.9	TCW	South of Gentilly Blvd.
179	16.8	TCW		216	12.9	TCW	
180	16.8	TCW		215	12.9	TCW	
183	13.2	TCW		214	12.9	TCW	
184	13.2	TCW		213	12.9	TCW	
185	13.2	TCW	To Pumpstation #3	212	13.0	TCW	
Mean:	13.34			211	13.0	TCW	
High:	16.79			210	12.9	TCW	
Low:	12.49			209	13.0	TCW	
				208	12.9	TCW	
				207	12.9	TCW	
				206	13.0	TCW	
				205	12.9	TCW	
				204	12.5	TCW	
				203	12.5	TCW	
				202	16.8	TCW	
				199	13.2	TCW	
				198	13.2	TCW	To Pumpstation #3
				Mean:	13.12		
				High:	16.76		
				Low:	12.50		

Appendix 37

IPET Supplemental Survey Scope of Work-10 Dec 05

SUBJECT: IPET TASK GROUP 6-- SCOPE OF WORK for PHASE 2 AND PHASE 3 SURVEYS

Revision/Version Date: 10 December 2005 [BERGEN]

Following is a scope of work for Phase 2 and Phase 3 elevation connections to flood control and hurricane protection (FC & HP) structures and other facilities in and around greater New Orleans. These surveys are required in support of other IPET Katrina performance assessment teams evaluating the performance of the existing (pre-Katrina) federal hurricane protection system, and indirectly to Task Force Guardian reconstruction efforts. Data from these surveys will be incorporated into models used by IPET Team 2/3 (Interior Drainage Models), Team 4/5 (Physical/Numerical Storm Surge Models), Team 8 (Pump Station Performance), and Team 10 (Engineering and Operational Risk and Reliability Analysis).

These connections include topographic/elevation surveys of high water marks, floodwalls, levees, pump stations, and bridges. Also included are connections to non-NOAA water level gages and calibration (ground truthing) of recently flown high & low altitude LIDAR mapping over FC & HP structures.

Field surveys are tentatively scheduled to commence on 5 Dec 05 and be completed on/before 31 Jan 06. These Phase 2 & 3 tasks will be performed before or concurrent with Phase 1 surveys (NOAA Tidal Benchmark DGPS connections), depending on contracted survey crew availability on site.

This scope is subject to modification during field survey operations in New Orleans; based on unforeseen site conditions, uncertain contract survey crew capabilities, funding restraints, and/or reprioritized IPET/TF Guardian requirements. Potential field modifications to this scope are shown in *[brackets]*.

Items shown as *[IPET Action]* are will be performed by Task Group 6 personnel, not the survey contractor.

1. SUPPORT TO TASK FORCE GUARDIAN [PRIORITY]

[IPET Action] Assessment of Constructed (Pre-Katrina) Flood/Hurricane Structure Elevations

Purpose: Develop relationship of older design & construction datums (eg, NGVD 29, Normal Water Surface) and current NAVD88 (LA VTDP 2004.65) and LMSL/LWRP protection elevations, to support on-going TF Guardian reconstruction, and subsequent settlement and loss of flood protection analysis. Provide survey and technical support to TF Guardian as required to evaluate on-going construction protection levels. *[Some of this support has already begun in the 17th Street Canal area with the CO-OPS installation of a new gage at the USCG Station.]*

2. GENERAL SURVEY PROCEDURES AND STANDARDS

Survey methods shall conform to the established engineering survey techniques used by the New Orleans District (MVN) in design & construction, and specifically to those methods currently being performed in support of Task Force Guardian. This includes profile density atop levees and floodwalls, breakline shots, static GPS TBM positioning, RTK surveys, recording procedures, and submittal requirements. Additional guidance on these procedures will be provided on site if needed. Most work will be performed using RTK survey methods; however, where more practical or necessary, total station trig elevations or conventional differential leveling methods may also be used. Recommended engineering & construction procedural criteria for GPS, RTK, differential leveling, and total station surveys are in EM 1110-1-1005 (Topographic Surveying--1 Jan 06 draft). A copy of this draft manual is available on site from Task Group 6 (Bergen).

a. Performance/Accuracy Standards

Survey accuracy performance standards will generally conform to standard Engineering-Construction methods outlined in Section 4-3 (Accuracy Standards for Engineering and Construction Surveying) of EM 1110-1-1005.

b. Reference Vertical Datum--NAVD88 (LA VTDP 2004.65)

Topographic and/or elevation surveys of levee/floodwall heights, gage sites, high water marks, bridges, pump stations, etc. will generally be observed from the nearest existing National Geodetic Survey (NGS) NAVD88 (LA VTDP 2004.65) BMs, or from TBMs established by static GPS connections (using current MVN methods) relative to this datum. The horizontal reference system is the Louisiana South Zone SPCS.

c. Data Recording and Submittal

Survey data may be recorded in either a standard field book or data collector. Elevations will be recorded to the nearest 0.1 ft. Data submittal formats will conform to New Orleans District standards. Station descriptions on permanently set points shall follow New Orleans District formats, which include written and digital data. A master copy of this description standard is available from MVN (Huber).

d. Supplemental TBM Control Points

Where no VTDP points are near the structure (eg, beyond RTK radio link range--3 miles \pm), then temporary benchmark (TBM) points will be set using MVN static GPS survey methods being employed in support of Task Force Guardian. These TBMs may then be used to control supplemental topographic

surveys using either RTK or conventional survey methods. MVN static surveys for new TBM points will be connected to, at minimum, the two (2) nearest recoverable NAVD88 (LA VTDP 2004.65) VTDP network benchmarks. Two 60-minute sessions from two VTDP points are required. The two sessions shall be performed on different days, and at different times on these days. GPS observing sessions shall be of sufficient length to obtain fixed baseline solutions.

TBMs should be set at optimum locations that will serve multiple structure sites.

TBM points will be set at sufficient density to set/check elevations on structures using conventional topographic survey methods [eg, RTK or total station].

A TBM is not needed if structure site is within RTK radio link range of an existing VTDP BM. (First floor elevations inside pump stations and some HWM points may require a nearby TMB to be set).

TBM points should be set near critical breach areas, floodwalls, high water marks, bridges, and pump stations that require detailed topographic surveys.

Occupy existing MVN levee control points (eg, PIs), NGS marks, or levee board control monuments for TBMs where practical. If none exist, then use concrete or like structures to mark a TBM. Capped rebar may also be used.

Obtain MVN database of existing levee control monuments (horizontal & vertical)—attempt to use these points if a new TBM needs to be set in an area.

A new description is required for permanently marked TBM points that are established. Follow MVN description and digital photo guidelines. A standard MVN monument description format will be provided.

Recovered VTDP points and TBM points require only brief field book descriptions.

Baselines will be reduced and adjusted by the contractor at the New Orleans field office, relative to the fixed NAVD88 (LA VTDP 2004.65) points. An OPUS solution on the new TBM point should be made as a QC check.

The *[2005 (?) revised/re-realized (?)]* Geoid03 model for the area will be used for RTK surveys extending from NAVD88 (LA VTDP 2004.65) points. *[The adequacy of this latest geoid model is uncertain for RTK site calibration/localization and will need to be verified by independent calibration checks ... or PPRTK if beyond radio link range]*

e. General Procedures for Floodwall, Levee Profile, Pump Station, and MHW Surveys

Elevation connections to various structures will originate from the nearest NAVD88 (LA VTDP 2004.65) or TBM points. Structure or HWM ties can be made by RTK, total station, or differential leveling methods, whichever is most efficient—using standard engineering/construction survey techniques, as outlined in EM 1110-1-1005.

Surveys should attempt to close between and/or back to VTDP marks or TBMs, where practical and feasible. RTK calibration checks should be performed at another VTDP or TBM point if possible. If no checks between adjacent VTDP BMs or TBMs are possible, then other RTK procedural QC methods may need to be performed—e.g., occupy points twice with at least 2 hours difference in time between

observations, make RTK ties from two separate VTDP/TBM points, etc. Independent or separate RTK ties onto a topographic point should agree within ± 0.1 ft.

[Procedures for RTK surveys of some HWMs are TBD ... pending MVN criteria]

f. Checks against Existing VTDP Benchmarks

When occupying one of the VTDP marks, a check survey on the marks stability should be made if practical. This can be accomplished by a rapid/fast static observation to another VTDP mark. Base station data should be logged for all RTK topographic sessions set up at a VTDP or TBM over one hour, and an OPUS solution computed for QC purposes. (The absolute accuracy of VTDP network points is estimated by NGS to be about ± 0.15 ft.—this should be considered in evaluating checks within the VTDP network. The relative accuracy of adjacent VTDP points is unknown--this could be obtained from the NGS if checks between VTDP points are questionable, or movement is suspected).

g. Use of English Turn CORS for QC Checks

*[Optional: If English Turn CORS orthometric elevation can be backed in from Phase 1a long-term static DGPS observations, then this point could be used as a QC check for TBM static surveys in this area (where fixed solutions on this baseline are obtained)].

3. HIGH WATER MARK SURVEYS

High water mark (HWM) surveys are required at the following 34 locations. The points in the St Bernard parish levee are higher priority in that cows may disturb the wooden stakes marking the HWMs. All these surveys should be completed ASAP in that the HWMs are considered perishable.

The point of contact for these surveys is Steve Maynard, CHL, 601-634-3284.

[NOTE: Additional HWM points will be marked the week of 12 Dec by Maynard & Bergen at the Orleans Marina, based on visual observations by an individual who rode out the storm at the marina. These points will be provided later.]

1. Lakefront Airport:
 - a. Admin Building, room on Northwest corner of main lobby. High water mark is 3.1 ft above slab. Survey slab elevation. No mark placed on wall.



- b. Estimate position of water level on sloping wall, mark point, and survey.
Time = 0738.



- c. Admin bldg, east side of upstairs deck on north side of bldg. Survey top of rail.
Time = 0940.



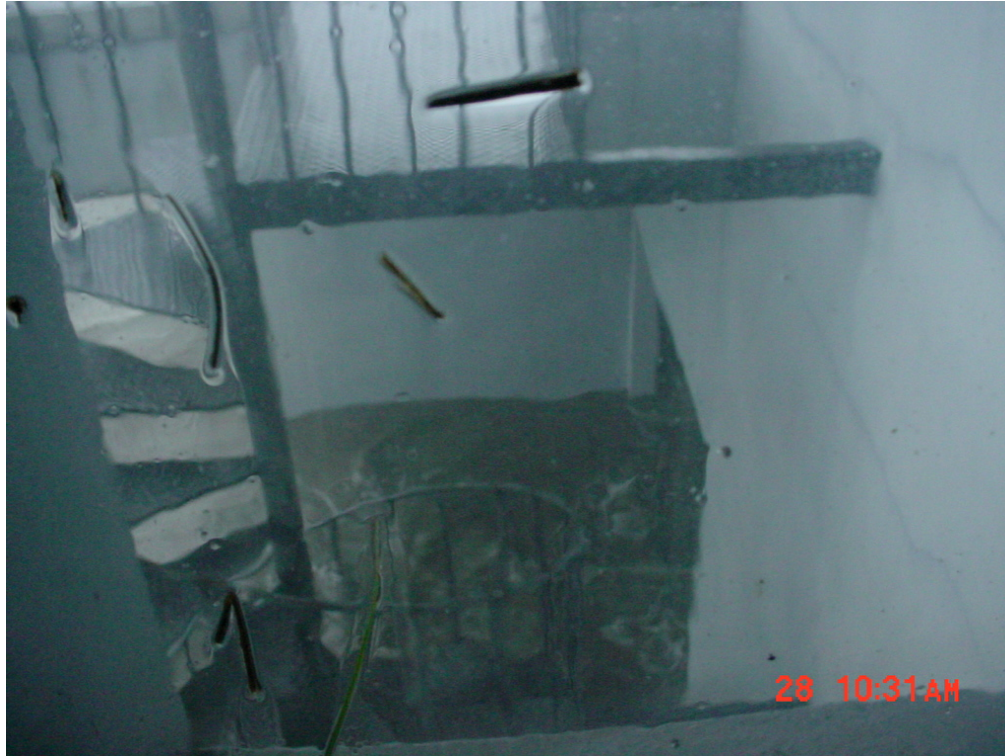
- d. Admin Bldg, northeast area, south side of damaged wall that is north of spiral staircase. Put mark on framework that plaster was attached to. Time = 0942.



- e. Admin Bldg, northeast area, south side of damaged wall that is north of spiral staircase. Survey where water is on framework in picture. Time = 0955.



- f. Admin bldg, northwest area, south side of damaged wall that is north of spiral staircase. Survey painted orange paint on white plaster wall. This photo was taken from the upstairs window on the northwest portion of the building. Ask surveyors to go upstairs and look at picture and orange mark to see if mark is correct. Time = 1031.



- g. Admin Bldg, main lobby, column on east side but not near any wall that has electrical plug on it. Close to stairs with sign “Director Aviation”. Survey slab below electrical plug. Time = 1105.



- h. Admin Bldg, main lobby, column on east side but not near any wall that has electrical plug on it. Close to stairs with sign “Director Aviation”. Survey slab below electrical plug. Time = 1208.



- i. Building just east of Admin bldg. Survey top of lowest window. Time = 1251.



- j. Building just west of Admin bldg with “Moffet” on side of bldg. Survey top of lowest window having red frames. Time = 1254.



- k. Survey top of second step from top in picture. Time = 1621.



2. Pump station 3 at south end of London Canal- West side of pump station at floodgate opening for railroad. Arrow above gate sill on north side of gate. Survey arrow.



3. Pump station 6 at south end of 17th street canal- survey top of fronting protection at three points across north side of pump station that is about equal to floodwall elevations.



4. Interior points:
a. 6422 peoples- 30 1.59', 90 2.866' - It is 35" from outside concrete slab to porch, 72" from porch to HWM. Survey porch near door.



- b. 5438 St Ferdinand Drive- 30 0.925', 90 2.617' - HWM is 99" above slab on front left corner of house. Survey slab.
- c. 5544 St Ferdinand Dr- 30 0.975', 90 2.692', 95" above ground on right front side of house, marked with red arrow on plastic siding. Survey red arrow.
- d. Corner of Peoples and Edge- 29 59.560', 90 2.708' - HWM is 89" above step to front door on front porch. HWM is a black arrow on inside of front door frame on left side of door. Survey top of step to front door.



- e. 2930 Florida Street- 29 59.104', 90 2.528' - HWM is 92" above painted slab at door. Survey slab.



5. South St Bernard Parish Levee:
- a. EBI building on side away from floodwall. 29 51.783', 89 54.496' - HWM door is next to door marked office. HWM door has sign on it "no smoking". Moved mark to outside of building on right side of HWM door. Marked with small black arrow about 4" below top of door. Survey HWM.
 - b. HWM EL111105-1(north) and 2(south). Top of levee at 29 51.49', 89 54.33' - Survey both debris points at stakes and top of levee. Record GPS of all three points. (This is to make sure we can keep north and south point locations correct).
 - c. HWM EL111105-3(north) and 4(south). Top of levee at 29 51.25', 89 54.22' - Survey both debris points at stakes and top of levee. Record GPS of all three points.
 - d. HWM EL111105-5(north) and 6(south). Top of levee at 29 51.24', 89 53.85' - Survey both debris points at stakes and top of levee. Record GPS of all three points.
 - e. HWM EL111105-7(north) and 8(south). Top of levee at 29 51.24', 89 53.37' - Survey both debris points at stakes and top of levee. Record GPS of all three points.
 - f. HWM EL111105-9(north) and 10(south). Top of levee at 29 51.24', 89 53.15' - Survey both debris points at stakes and top of levee. Record GPS of all three points.
 - g. HWM EL111105-11(north) and 12(south). Top of levee at 29 51.25', 89 52.27' - Survey both debris points at stakes and top of levee. Record GPS of all three points.

- h. HWM EL111105-13(north) and 14(south). Top of levee at 29 51.25', 89 51.36' - Survey both debris points at stakes and top of levee. Record GPS of all three points.
 - i. HWM EL111105- 15(south). (no mark found on north side). Top of levee at 29 51.24', 89 50.77' - Survey debris point at south stake and top of levee. Record GPS of both points.
 - j. HWM EL111105-16(north) and 17(south). Top of levee at 29 51.25', 89 50.27' - Survey both debris points at stakes and top of levee. Record GPS of all three points.
 - k. HWM EL111105- 18(south). (no mark found on north side). Top of levee at 29 51.25', 89 49.52' - Survey debris point at south stake and top of levee. Record GPS of both points.
 - l. Survey top of levee with conventional level techniques to see if levee is low in this area. Survey every 200 ft for 1000 ft east and west of 29 51.25', 89 49.38'.
 - m. HWM EL111105- 19(south). (no mark found on north side). Top of levee at 29 51.24', 89 49.10' - Survey debris point at south stake and top of levee. Record GPS of both points.
 - n. HWM EL111105- 20(north). (no mark set on south side). Top of levee at 29 51.24', 89 47.07' - Survey debris point at north stake and top of levee. Record GPS of both points.
 - o. HWM EL111105-21(north) and 22(south). Top of levee at 29 51.32', 89 46.74' - Survey both debris points at stakes and top of levee. Record GPS of all three points.
-

4. PUMP STATION TOPOGRAPHIC SURVEYS (SUPPORT TO TASK GROUP 8)

Purpose: Elevation surveys are required to be able to calculate when and how much reverse flow did or could have occurred when the water level on the discharge side rises above the invert of the high point pump discharge waterway. Task Group 8 does not plan to provide any performance (flow) data for any Orleans Parish pump station rated below 1,000 cfs or any Jefferson Parish station rated below 900 cfs since these discharges represents less than 5% of the total for each parish; thus, surveys at these stations are not required.

First floor elevations are required on 63 pump stations, as indicated below.

The 6 priority stations in Orleans & Jefferson Parish (East Bank) shall be tied in first—highlighted in blue.

If available use as-built plans of the pump stations to indicate first floor elevation location(s). If as-builts are not available, show elevation location on a detailed field book sketch of the pump station facility. Note also any variable slab settlement.

Task Group 8 point of contact is Brian Moentenich, Hydroelectric Design Center--Portland, OR --503-808-4266.

Pump Stations (63 68 total)

I) Orleans Parish

A) East Bank (E-3)

1) OP 1 – PS 1	4640 cfs
2) OP 2 – PS 2	3190 cfs
3) OP 3 – PS 3	4140 cfs Note: inverts required **
4) OP 4 – PS 4	3680 cfs
5) OP 5 – PS 5	2260 cfs
6) OP 6 – PS 6	9480 cfs
7) OP 7 – PS 7	2690 cfs Note: Inverts required **
8) OP 12 – PS 12	1000 cfs
9) OP 19 – PS 19	3770 cfs
10) Mont – Monticello	9 cfs

B) East Bank (E-4a)

1) OP 10 – PS 10 Citrus	1000 cfs
2) OP 14 – PS 14 Jahncke	1200 cfs
3) OP 16 – PS 16 St Charles	1000 cfs
4) OP 18 – PS 18 Maxent	150 cfs
5) OP 20 – PS 20 Amid	500 cfs
6) DR – Dwyer Rd	120 cfs
7) GS – Grant	112 cfs
8) Elai – Elaine St	90 cfs

C) East Bank (E-4b)

1) OP 15 – PS 15	750 cfs
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D) West Bank (W-3b)

1) OP 13 – PS 13	4650 cfs
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E) West Bank (W-4b)

1) OP 11 – PS 1	1530 cfs
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II) Jefferson Parish

A) East Bank (E-2)

1) PS 1 – Bonnabel	3750 cfs
2) PS 2 – Suburban	3040 cfs
3) PS 3 – Elmwood	3400 cfs
4) PS 4 – Duncan	4800 cfs
5) PS 5 – Parish Line	900 cfs

B) West Bank (W-1)

3) BS-PS – Bayou Segnette	936 cfs
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C) West Bank (W-2)

1) A-PS – Ames	1930 cfs
2) W-PS – Westminister	1200 cfs
3) C2-PS – Cousins 2	2300 cfs
4) E2-PS – Estelle 2	1140 cfs
5) C1-PS – Cousins 1	960 cfs
6) Harv-PS – Harvey	960 cfs
7) W2-PS – Westwego 2	936 cfs

D) West Bank (W-3)

1) Hero-PS – Hero	3902 cfs
2) P-PS – Planters	2360 cfs

III) St Bernard Parish

A) East Bank (E-5a)

1) F-1 – PS 1 Fortification	1214 cfs
2) M-4 – PS 4 Meraux	1214 cfs
3) JL-6 – PS 6 Jean Lafitte	1003 cfs
4) BD-7 – PS 7 Bayou Ducros	1003 cfs
5) SM-8 – PS 8 St Mary	836 cfs
6) BV-3 – PS 3 Bayou Villere	501 cfs
7) G-2 – PS 2 Guichard	724 cfs
8) EJG-5 – PS 5 E.J. Gore	668 cfs

IV) Plaquemines Parish

A) East Bank

1) Scarsdale	1780 cfs
2) Belair	130 cfs
3) Bellevue	516 cfs
4) Point A La Hache (East)	516 cfs

B) West Bank (W-4a)

1) BC-1 – Belle Chase 1	3556 cfs
2) BC-2 – Belle Chase 2	990 cfs

C) West Bank

1) Ollie	300 cfs
2) Upper Ollie	250 cfs
3) Lower Ollie	120 cfs
4) Point A La Hache (West)	??? cfs
5) Diamond	256 cfs
6) Hayes	500 cfs
7) Gainard Woods	408 cfs
8) Sunrise 1	200 cfs
9) Sunrise 2	290 cfs
10) Grand Liard (Buras)	840 cfs
11) Duvic (Venice)	560 cfs
12) Wilkinson (Private)	??? cfs
13) Pointe Celeste (Private)	??? cfs

The following pump stations ~~may be added later~~ have been added (9 Dec 05—Bergen). ~~They should not be tied in unless advised.~~

Plaquemines Parish:	
Braithwaite	??cfs
Barreire	??cfs
Orleans Parish:	
I-10	860cfs
PS OP #17 (Sta. D)	625cfs
Pritchard	??cfs

**** PUMP STATION INVERT ELEVATIONS (LONDON AVE & ORLEANS CANALS)**

Elevations of inverts on discharge side of pumps (cut in highest point on bottom of the discharge tube ... may need to hit top point and apply diameter for invert? Do not rely entirely on as-builts at these sites, even if available). [No backflow prevention at these sites. 17th St not included ... had backflow valves at this station.]. NOTE: This duplicates work required under the surveys of 63 pump stations previously described ... the difference being invert elevations are required at these facilities.

5. ELEVATION TIES TO FC & HP STRUCTURES

Purpose and Location of Work. To obtain updated NAVD88 (LA VTDP 2004.65) and related water surface elevations on FP & HP structures and facilities in the greater New Orleans metropolitan area (Orleans, Jefferson, St. Bernard, St. Charles, and Plaquemines Parishes), in and around the following projects, as outlined in the IPET Scope of Work:

Lake Pontchartrain, LA and Vicinity Hurricane Protection Project (HPP). The project lies between the Mississippi River and Lake Pontchartrain, and is located in St. Bernard, Orleans, Jefferson, and St. Charles Parishes in southeast Louisiana, (generally the greater New Orleans metropolitan area), and also includes a mitigation dike on the west shore of the lake. The project includes:

- New levee from the Bonnet Carré Spillway East Guide Levee to the Jefferson-St. Charles Parish boundary
- Floodwall along the Jefferson-St. Charles Parish line
- Enlarged levees along the Jefferson and Orleans Parish lakefronts
- Parallel protection (levees, floodwalls, and flood proofed bridges) along the 17th Street, Orleans Avenue, and London Avenue outfall canals
- Levees from the New Orleans lakefront to the Gulf Intracoastal Waterway (GIWW)
- Enlarged levees along the GIWW and Mississippi River-Gulf Outlet (MR-GO)
- New levee around the Chalmette Area.

The West Bank and Vicinity, New Orleans, LA, HPP. The project is located in Orleans, Jefferson and Plaquemines Parishes, and in metropolitan New Orleans on the west bank of the Mississippi River. The project includes:

- 22 miles of earthen levee and 2 miles of floodwall extending from the Harvey Canal south to the V-levee near the Jean Lafitte National Historical Park and back up to the town of Westwego.
- The Lake Cataouatche area eliminated the west-side closure in Westwego, and added about 10 miles of levee and 2 miles of floodwall
- The East of Harvey Canal area has a sector floodgate in the Harvey Canal and about 25 miles of levee and 5 miles of floodwall.

The New Orleans to Venice, LA, HPP. This project is located along the east bank of the Mississippi River from Phoenix, Louisiana, (28 miles southeast of New Orleans) down to Bohemia, Louisiana, and along the west bank of the river from St. Jude, Louisiana, (39 miles southeast of New Orleans) down to the vicinity of Venice, Louisiana.

The Grande Isle and Vicinity (Larose to Vicinity of Golden Meadow) HPP. *[TBD]*

[Private levees in various Parishes--Requirements TBD]

a. General Procedures for FC & HP Elevation Profile Surveys

Low altitude LIDAR mapping of levees and floodwalls throughout the area was flown by Furgo- Chance in 2005. The estimated vertical accuracy of this mapping is $[\pm \text{?? ft}]$. High altitude LIDAR mapping was also performed by the JALBTCX after Katrina, with an estimated relative accuracy of ± 0.5 ft. All

mapping/DEMs being used by the IPET models needs need to be checked to ensure consistency with the NAVD88 (LA VTDP 2004.65) datum.

Levee and floodwall elevation profile surveys are required throughout the projects listed above. Although some 300 miles of FC & HP structures are represented, it is anticipated that many of these structures will not require detailed profile surveys; or they may have already been profiled by Task Force Guardian crews. Specific projects will be prioritized on site, in coordination with MVN and TF Guardian work currently underway. Elevations will be referenced to the NAVD88 (LA VTDP 2004.65) and LMSL/LWRP reference datums.

The primary survey effort will be to validate and/or calibrate the elevation models obtained from recent low-altitude LIDAR mapping. Selected shot points atop levees, floodwalls, or nearby flat surfaces throughout the region will be surveyed for comparison with the low-altitude LIDAR DEMs. The number of verification (or ground truthing) test points that must be surveyed will depend on the field survey comparison results. If the checks are within acceptable tolerances, then field survey efforts can be greatly minimized and the LIDAR mapping can be deemed sufficiently accurate for other IPET model studies. If the checks are outside tolerance, then a sufficient number of additional ground calibration points will have to be observed to recalibrate/adjust the DEM; or a full levee profile survey will have to be performed.

Profiling will not be required in areas where low-altitude LIDAR mapping adequately and accurately defined the levee profile elevation. This adequacy and accuracy will be verified in near real-time by ground truthing verification surveys. This is especially important in the long levee reaches in St Bernard and Plaquemines Parishes—verifying that the LIDAR mapping is adequate/accurate will eliminate detailed conventional profiling surveys.

[IPET Action: All of the above assumes that the low-altitude LIDAR mapping was processed at a high post-spacing resolution sufficient to detail the floodwall caps and levees. This needs to be verified. If the LIDAR data was not processed at a high resolution, then reprocessing may be needed]

b. Accuracy and Tolerance Criteria

Elevations will be observed and recorded to the nearest 0.1 ft. Accuracies should generally be within ± 0.2 ft, relative to the nearest VTDP network points. Floodwall elevations should be more accurately surveyed than earthen levees.

Tolerance checks for low-altitude LIDAR mapping should generally fall within $[\pm 0.25 \text{ ft}]^*$ on floodwall caps and $[\pm 0.5 \text{ ft}]^*$ on earthen levees.

c. Prior MVN Control and Levee/Floodwall Surveys

Coordinate with MVN (Huber) to ensure recent District surveys supporting TF Guardian are not duplicated; and to utilize control points already established by these prior surveys. Most, if not all, of the floodwalls in the 17th Street, London Ave, and Orleans Canals have been surveyed. Check for work already accomplished on the Lake Pontchartrain floodwall, the IHNC, and other breach areas to the southeast towards Venice.

[IPET Action: Obtain (from Task Group 1(?) as-built drawings for all FC & HP structures ... hard copy drawings are needed for field survey crews, along with hard-copy MVN general location project maps]

6. Ground Truth Checks on Low-Altitude (Furgo-Chance) LIDAR Mapping

This low-altitude LIDAR mapping was obtained before the revised VTDP elevations were released by NGS; thus, field calibration checks are needed.

Verification point shot density should be every lineal *[0.5 mile or mile]* along levee profile flight line *[or a minimum of 3]* points along a flight line. If field checks are within acceptable tolerances of the LIDAR DEM, then check point spacing may be increased; the assumption being that the PP/DGPS vertical control along that particular flight line was good throughout. If field checks are outside the acceptable tolerance (Furgo-Chance LIDAR flight lines only), then continue at the original spacing ... or even smaller if the checks are not consistent. Presumably this check data can be applied to the original LIDAR or DEM to correct elevation errors ... if they are consistent. Otherwise, the levee/floodwall will need to be fully profiled. *[LIDAR map testing to FGDC/ASPRS standards may need to be performed if results are inconsistent.]*

Procedures:

- Utilize existing VTDP and TBM points set for other subtasks to maximum extent practical
 - Obtain check points when occupying VTDP or TBMs for other subtasks.
 - Verify LIDAR imagery/DEM post-spacing density adequately picked up tops/caps of narrow floodwalls.
 - Obtain LIDAR mapping flight lines from the original sources. Check points only within this imagery. Have imagery on a laptop in the field when selecting check points.
 - Select flat, open points easily discerned on aerial/LIDAR imagery models—eg, tops of levees, parking lots, road intersections. Obtain a sufficient number of points over the flat area to define a planer surface ... ie, 3+ points, but should be recorded.
 - Primarily interested in ground truthing (checking) vertical alignment—horizontal not as critical.
 - Check Furgo-Chance DEMs in near real-time ... in field or office.
-

7. Ground Truth Checks on High-Altitude (JALBTCX) LIDAR Mapping

In an effort to facilitate consistent model results in the New Orleans area, checkpoint surveys, described in FEMA's *Guidelines and Specifications for Flood Hazard Mapping Partners [April 2003] – Appendix A: Guidance for Aerial Mapping and Surveying*, are needed to provide ground truth control.

Six potential locations for collecting checkpoint survey data near the south shore of Lake Pontchartrain are shown on the figure below. These check surveys can be jointly performed while set up for other subtasks in the vicinity.

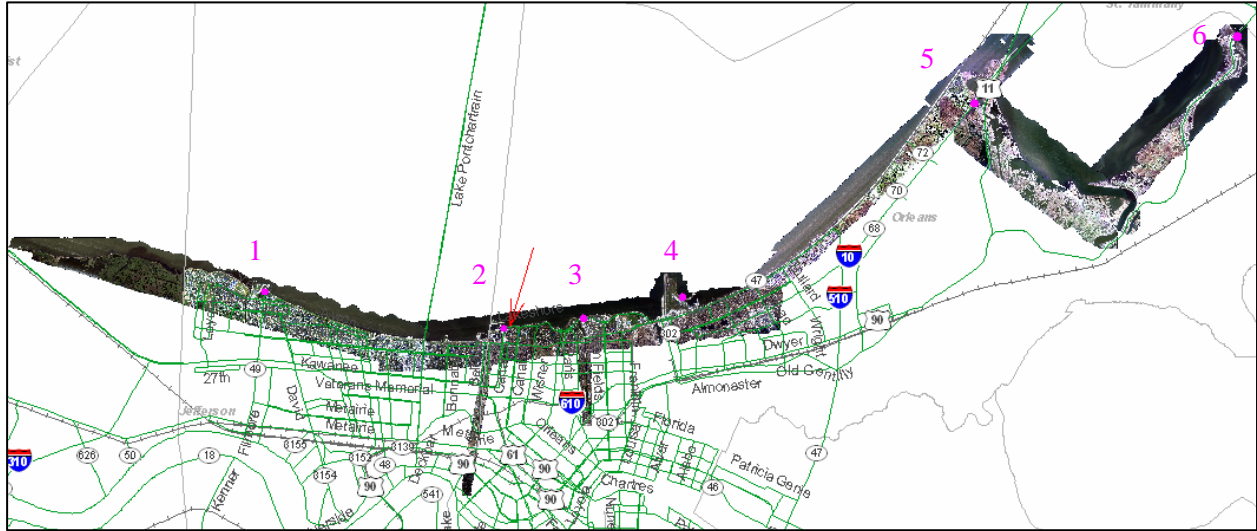


Figure 1: CHARTS Data Coverage Along Lake Pontchartrain South Shore and Along Levees in New Orleans.

Figure 1. Figure 1 shows the extents of data collection by CHARTS in this area. While CHARTS collected additional data outside the area shown in Figure 1, potential patch areas for those locations will be provided at a later date.

For reference in Figure 1, the red arrow is pointing to the vicinity of monument ALCO (PID BJ1342). The six magenta dots indicate the approximate locations where patch areas are desired. These patch locations will provide valuable ground truth information for the CHARTS data and have high potential of being included within others' data collection efforts. Additional images are available at larger scales for the six potential locations—these will be furnished to the contractor separately.

A sufficient number of X-Y-Z points in each patch area shall be obtained to define both a vertical plane and sharp breaklines for checking the horizontal orientation. Where possible, take some check points in different terrains—paved concrete/asphalt, grass, etc. For additional information regarding these locations and checkpoint procedures, please contact Eddie Wiggins (JALBTCX) at 228-252-1103.

Surveys of these calibration “checkpoints” should follow the guidance in FEMA's *Guidelines and Specifications for Flood Hazard Mapping Partners [April 2003] – Appendix A: Guidance for Aerial Mapping and Surveying*. Part of this guidance is excerpted below. A complete copy is available from Bergen.

Checkpoints are normally surveyed with transections or small clusters of points, at least two of which have been surveyed using GPS relative to NSRS monuments that have both Ellipsoid Order and Vertical Order specified on their NGS data sheets. If selected monuments are farther than 20 kilometers (36 miles) from the test areas to be surveyed, the assigned Mapping Partner shall establish Secondary Base Stations so that final surveys of checkpoints satisfy NGS-58 requirements for Local Network accuracy of 5-centimeters at the 95-percent confidence level.

Alternatively, the assigned Mapping Partner may use GPS real-time-kinematic (RTK) procedures provided the following conditions are met:

- 1. The base station is an existing NGS three-dimensional mark or a new NGS-58 mark,*
- 2. RTK procedures are used only in open areas and each RTK point is occupied twice with at least 2 hours' difference in time between observations, and Section A-28 A.6.*
- 3. The difference between observations does not exceed 5 centimeters.*

The assigned Mapping Partner may use third-order conventional surveys to extend control from GPS "anchor points" to other transection or cluster points, especially when checkpoints are in forested areas where GPS signals are blocked.

When checkpoints are to be used for QA/QC reviews of digital elevation data (e.g., TINs, DEMs), the checkpoints must be at least 5 meters away from any breakline where there is a change in slope. Such checkpoints must be on flat or uniformly sloping terrain. The assigned Mapping Partner shall take photographs to record the location of the checkpoint relative to its surroundings, and to verify the vegetation category within which the checkpoint is located. The Mapping Partner shall mark each checkpoint with a 60d nail or larger. The Mapping Partner shall write the station ID number on an adjacent above-ground stake within 1 foot of the referenced stake, to aid in subsequent recovery if required during the course of the Flood Map Project. The Mapping Partner shall use "to reach" location descriptions and photographs to document the location, the land cover surrounding each stake, and the uniform slope of the terrain surrounding each stake.

8. SUPPORT TO ERDC/COASTAL HYDRAULICS LAB— TASK GROUP 4 (NUMERICAL STORM SURGE & WAVE MODELS)

The following surveys are required to support ERDC-Coastal Hydraulics Lab model studies.

[Contact Mr. Maynard at CHL Vicksburg 601-634-3284 if questions on specific line items herein]

8-1. BRIDGE SURVEYS (ORLEANS, LONDON AVE & 17TH ST CANALS):

- Obtain low chord elevations on all street bridges crossing these canals
- Topo flood protection connectors between bridge and floodwalls

8-2. BRIDGE SURVEYS (Three (3) RAILROAD BRIDGES OVER IHNC)

- a. Obtain low chord elevations —down position ... (bridges were down at Katrina event)
- b. Survey bottom of opening at railroad crossing/opening in floodwall (floodgate W-30) at west side of IHNC just south of I-10.

8-3. IHNC PRIVATE LEVEE/FLOODWALL

Survey elevations along private floodwall/levee and connections with mainline levee at Sealand/Maersk on west side of IHNC, south of I-10. Survey and document dimensions of any failures or changes in elevation. Conduct survey between each end where this private floodwall/levee ties into the main line of protection. (Portions of this levee failed during Katrina).

~~8-4. IHNC LOCK (STAFF GAGE) (Requirement Deleted)~~

~~Lock at confluence of MRGO/IWW & IHNC. Gage BM recently tied in by MVN to NAVD88 (LA VTDP 2004.65). Need to tie in to LMSL (2005). May be of use in short term water elevation transfer check to New Canal and/or LaBranche gages.—~~

~~8-5. I-10 LAKE PONTCHARTRAIN BRIDGE RECORDING GAGES~~

~~Tie in two gages to NAVD88 (LA VTDP 2004.65) and LMSL (2005) ... one USGS and the other Orleans Levee District. (Gages were running before/during Katrina ... still operational? Local gage datums uncertain. Specific gage locations on I-10 bridge unknown).~~

~~8-6. PUMP STATIONS (LONDON AVE & ORLEANS CANALS)-[See Subtask 4 above]~~

~~Elevations of inverts on discharge side of pumps (cut in highest point on bottom of the discharge tube ... may need to hit top point and apply diameter for invert? Do not rely entirely on as built at these sites, even if available). [No backflow prevention at these sites. 17th St not included ... had backflow valves at this station.]. NOTE: This duplicates work required under the surveys of 63 pump stations previously described ... the difference being invert elevations are required at these facilities.~~

8-7. GAGE CONNECTION SURVEYS

The following gages need to be connected to NAVD88 (2004.65) and LMSL.

- 1) USGS at I-10 and Inner Harbor Navigation Canal**
- 2) Orleans Levee District Gage at same general location as above**
- 3) USGS gage at Paris Road (I510) bridge over IWW**
- 4) Orleans Levee District gage at Southshore Marina**
- 5) Pass Manchac at Turtle Cove at Pontchatoula, LA**
- 6) Little Irish Bayou near HWY 11 near Slidell, LA**
- 7) National Weather Service gage at North Shore and Causeway. This gage was moved after the hurricane ... may not be possible to establish a datum for the old gage.**

Details and contacts regarding these gages have not been researched at this time. Will possibly need to make contact with USGS and Orleans Levee Board. MVN POC is Ms. Nancy Powell.

***[IPET Actions]* The following miscellaneous tasks have not been defined by Task Group 6 to date**

VTDP ties to Original Construction Benchmarks

Obtain MVN construction drawings from IPET web site and locate control used for original construction. Connect these marks to the VTDP reference.

MVN Collected HWM Database

Verify collected data is referenced to NAVD88 (LA VTDP 2004.65). Reference Klaus 21 Oct 05 e-mail. (Ken Klaus, MVD 601-634-7122).

“The MVN database for HWM and the IPET data base in the new orleans vicinity I am working are the same. Nancy Powell of MVN hydraulics and I are working together in developing the database. I have attached the latest file showing data. According to Nancy Powell the point numbers in red such as LA1171 have been surveyed in epoch 2004.65. The points with black letters such as LA1004 were surveyed prior to the determination that we would use epoch 200465. According to Nancy Powell, the District is going to have these earlier points adjusted/resurveyed to reflect 200465. Will you ask Mark Huber if I am correct that the District will adjust these earlier points to 200465? If not we have many more points to add to our effort.” Steve Maynard

MISSISSIPPI RIVER GAGES ... TIES TO NAVD88 (LA VTDP 2004.65) & LWRP (19XX)

Purpose: To establish the relationship between NAVD88 (LA VTDP 2004.65) and the local protection levee design elevations (LWRP).

- Connect *[six]* recording gages along Mississippi River reach from New Orleans to Venice.
- Coordinate with MVN for specific LWRP (19XX) reference and BM locations.
- Perform MVN static DGPS ties to two nearest NAVD88 (LA VTDP 2004.65) marks, *[unless already done by MVN (Huber) at some sites]*.
- Relate LWRP (19XX) & NAVD88 (LA VTDP 2004.65) to designed/constructed levee elevations.
- In lower reaches, determine relationship between LWRP (19XX), NAVD88 (LA VTDP 2004.65), MLG (19??), and MLLW/MSL (2005), as applicable.
- Define specific LWRP-MLG-MLLW transition points throughout reach.
- Need POC in MVN or MVD for LWRP design relationship.
- Mean Low Gulf datum vs. Mean Gulf Level datum ... two distinct datums used by MVN (Nancy Powell)
- LMVD not defined/updated below New Orleans

Appendix 38

ETL 1110-2-349 Coastal MLLW Datum

1 Apr 93

CECW-EP

Engineer Technical Letter
No. 1110-2-349

1 April 1993

Engineering and Design
REQUIREMENTS AND PROCEDURES FOR REFERENCING
COASTAL NAVIGATION PROJECTS TO MEAN LOWER LOW WATER DATUM

1. Purpose.

This engineer technical letter (ETL) provides guidance, technical considerations, and general implementation procedures for referencing coastal navigation projects to a consistent Mean Lower Low Water (MLLW) datum based on tidal characteristics defined and published by the U.S. Department of Commerce. This guidance is necessary to implement applicable portions of Section 224 of the Water Resources Development Act of 1992.

2. Applicability.

This ETL applies to HQUSACE elements, major subordinate commands, districts, laboratories, and field operating activities (FOA) having responsibilities for design of river and harbor navigation projects on the Atlantic, Gulf, and Pacific coasts, and where such projects are subject to tidal influence.

3. References.

- a.* Rivers and Harbors Appropriation Act of 1915 (38 Stat. 1053; 33 U.S.C. 562).
- b.* Water Resources Development Act of 1992 (WRDA 92), Section 224, Channel Depths and Dimensions.
- c.* ER 1130-2-306, Navigation Lights, Aids to Navigation, Navigation Charts, and Related Data Policy, Practices and Procedures.
- d.* ER 1130-2-307, Dredging Policies and Practices.
- e.* EM 1110-2-1003, Hydrographic Surveying.
- f.* EM 1110-2-1414, Water Levels and Wave Heights for Coastal Engineering and Design.
- g.* Tidal Datum Planes, Special Publication 135, U.S. Department of Commerce.

h. Manual of Tide Observations, Publication 30-1, U.S. Department of Commerce.

i. Tide and Current Glossary, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Rockville, MD.

j. Statement of Work for the Installation, Operation and Maintenance of Tide Stations, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Rockville, MD.

k. User's Guide for the Installation of Bench Marks and Leveling Requirements for Water Level Stations, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Rockville, MD.

l. The National Tidal Datum Convention of 1980, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Rockville, MD.

4. Background.

a. Depths of USACE navigation projects in coastal areas subject to tidal influences are currently referred to a variety of vertical reference planes, or datums. Most project depths are referenced to a local or regional datum based on tidal phase criteria, such as Mean Low Water, Mean Lower Low Water, Mean Low Gulf, Gulf Coast Low Water Datum, etc. Some of these tidal reference planes were originally derived from U.S. Department of Commerce, National Ocean Service (NOS) observations and definitions used for the various coasts (see references 3g and 3i). Others were specifically developed for a local project and may be without reference to an established vertical network (e.g. National Geodetic Vertical Datum of 1929) or a tidal reference. Depending on the year of project authorization, tidal epoch, procedures, and the agency that established or connected to the reference datum, the current adequacy of the vertical reference may be uncertain, or in some cases, unknown. In some instances, project tidal reference grades may not have

been updated since original construction. In addition, long-term physical effects may have significantly impacted presumed relationships to the NOS MLLW datum.

b. The National Tidal Datum Convention of 1980 (reference 3l) established one uniform, continuous tidal datum for all marine waters of the United States, its territories, and Puerto Rico. This convention thereby lowered the reference plane (and tidal definition) of both the Atlantic and Gulf coasts from a mean low water datum to a MLLW datum. In addition, the National Tidal Datum Epoch was updated to the 1960-1978 period and mean higher/high water datums used for legal shoreline delineation were redefined.

c. Since 1989, nautical charts published by the Coast and Geodetic Survey (C&GS), U.S. Department of Commerce, reference depths (or soundings) to the local MLLW reference datum, also termed a "chart datum." U.S. Coast Guard (USCG) Notices to Mariners also refer depths or clearances over obstructions to MLLW. Depths and clearances reported on USACE project/channel condition surveys provided to C&GS, for incorporation into their published charts in plan or tabular format, must be on the same NOS MLLW reference as the local chart of the project site.

d. WRDA 92, Section 224, requires consistency between USACE project datums and C&GS marine charting datums. This act amended Section 5 of the Rivers and Harbors Appropriation Act of 1915 (reference 3a) to define project depths of operational projects as being measured relative to a MLLW reference datum for all coastal regions. (Only the Pacific coast was previously referenced to MLLW). The amendment states that this reference datum shall be as defined by the Department of Commerce for nautical charts (C&GS) and tidal prediction tables (NOS) for a given area. This provision requires USACE project reference grades be consistent with NOS MLLW.

5. Impact of MLLW Definition on USACE Projects.

a. Corps navigation projects that are referenced to older datums (e.g., Mean Low Water along the Atlantic coast or various Gulf coast low water reference planes) must be converted to and correlated with the local MLLW tidal reference established by the NOS. Changes in project grades due to redefining the datum from mean low water to NOS MLLW will normally be small, and in many cases will be compensated for by offsetting secular

sea level or epochal increases occurring over the years. Thus, impacts on dredging due to the redefinition of the datum reference are expected to be small and offsetting in most cases.

b. All Corps project reference datums, including those currently believed to be on MLLW, must be checked to insure that they are properly referred to the latest tidal epoch, and that variations in secular sea level, local reference gage or benchmark subsidence/uplift, and other long-term physical phenomena are properly accounted for. In addition, projects should be reviewed to insure that tidal phase and range characteristics are properly modeled and corrected during dredging, surveying, and other marine construction activity, and that specified project clearances above grade properly compensate for any tidal range variances. Depending on the age and technical adequacy of the existing MLLW reference (relative to NOS MLLW), significant differences could be encountered. Such differences may dictate changes in channels currently maintained. Future NOS tidal epoch revisions will also change the project reference planes.

c. Conversion of project datum reference to NOS MLLW may or may not involve field tidal observations. In many projects, existing NOS tidal records can be used to perform the conversion, and short-term simultaneous tidal comparisons will not be required. Tidal observations and/or comparisons will be necessary for projects in areas not monitored by NOS or in cases where no recent or reliable observations are available (see references 3e and 3h).

6. Implementation Actions.

A number of options are available to USACE commands in assessing individual projects for consistency and accuracy of reference datums, and performing the necessary tidal observations and/or computations required to adequately define NOS MLLW project reference grade. Datum establishment or verification may be done using USACE technical personnel, through an outside Architect-Engineer contract, by another Corps district or laboratory having special expertise in tidal work, or through reimbursable agreement with NOS. Regardless of who performs the tidal study, all work should be closely coordinated with both the C&GS and NOS in the Department of Commerce.

a. *Technical Specifications.* The general techniques for evaluating, establishing, and/or transferring a tidal

reference plane are fully described in the USACE and Department of Commerce publications referenced in paragraph 3. These references should be cited in technical specifications used for a tidal study contract or reimbursable agreement with another agency/command.

b. Department of Commerce Contacts. Before and during the course of any tidal study, close coordination is required with NOS. The NOS point of contact is the Chief, Ocean and Lake Levels Division, National Ocean Service (ATTN: N/OES2), 6001 Executive Blvd., Rockville, MD 20852, telephone (301) 443-8807, FAX (301) 443-1920.

c. Sources. If in-house forces are not used, the following outside sources may be utilized to perform a tidal study of a project, including any field tidal observations.

(1) Architect-Engineer (A-E) Contract. A number of private firms possess capabilities to perform this work. Either a fixed-scope contract or indefinite delivery type (IDT) contract form may be utilized. In some instances, this type of work may be within the scope of existing IDT contracts. Contact NOS to obtain a typical technical specification which may be used in developing a scope of work. The references in paragraph 3 of this letter must be cited in the technical scope of work for the A-E contract.

(2) Reimbursable Support Agreement. Tidal studies and datum determinations may be obtained directly from the NOS, Department of Commerce, via a reimbursable support agreement. A cooperative agreement can be configured to include any number of projects within a district. Funds are provided to NOS by standard inter-agency transfer methods and may be broken down to individual projects. Contact the Chief of the Ocean and Lake Levels Division at the address given in paragraph 6b to coordinate and schedule a study agreement.

FOR THE DIRECTOR OF CIVIL WORKS:

d. Scheduling of Conversions. Section 224 of WRDA 92 did not specify an implementation schedule for converting existing projects to NOS MLLW (or verifying the adequacy of an existing MLLW datum). It is recommended that a tidal datum study be initiated during a project's next major maintenance cycle.

e. Funding. No centralized account has been established to cover the cost of converting projects to NOS MLLW datum. Project O&M funds will be used to cover the cost of tidal studies and/or conversions on existing projects. For new construction, adequate funding should be programmed during the initial planning and study phases. Budget estimates for performing the work can be obtained from NOS.

f. MLLW Relationship to National Vertical Network. Reference 3k prescribes requirements for connecting USACE tidal bench marks to the national vertical network maintained by C&GS; either the National Geodetic Vertical Datum, 1929 Adjustment (NGVD 29) or the updated North American Vertical Datum, 1988 Adjustment (NAVD 88). Project condition surveys, maps, reports, studies, etc. shall clearly depict the local relationship between MLLW datum and the national vertical network.

g. Changes in Dredging. It is not expected that the datum conversion will significantly impact dredging requirements. USACE commands should request HQUSACE guidance should a datum conversion cause a significant change in a channel's maintained depth.

7. Proponency.

The proponent for this technical letter is the Engineering Division, HQUSACE. Any comments regarding improvements and/or clarifications should be submitted to HQUSACE, ATTN: CECW-EP-S, 20 Massachusetts Ave., NW, Washington, D.C. 20314-1000.

PAUL D. BARBER, P.E.
Chief, Engineering Division
Directorate of Civil Works

Appendix 39

Monument Memo

8 Feb 95

17TH ST. OUTFALL CANAL
HISTORY OF SURVEYS USED FOR CONSTRUCTING FLOODWALLS
AND CANAL DREDGING

*Discussed w/
Vic Landry 2/23/95
and
Steve Spencer 2/24/95
SL*

MAR-APR 1987 Walker & Avery performed surveys for the NOS&WB using PBM "Disk T-193" with Elev. 9.741 NGVD to establish TBM "USCE Monument 14", El. 8.77 NGVD

(NOTE: The elevation of the PBM used by Walker & Avery cannot be verified by NOD's Survey Section. No such elevation exists in the historical data for this PBM)

TBM "USCE Monument 14", El. 8.77, was used to design and construct the floodwalls on both sides of the canal as well as for the canal dredging.

JAN 1995

Surveys for the Hammond Hwy Gates were performed by NOD using TBM "Pump Station 1", El. -0.02 NGVD and establishing TBM "USCE Monument 14", at El. 8.32. (The elevation of TBM "USCE Monument 14" established by NOD is 0.45 ft. lower than the elevation established by Walker & Avery).

The elevation of TBM "Pump Station 1" was established during previous NOD surveys using PBM "ALCO 1931", El. 7.375 NGVD (1964 epoch).

The elevation of TBM "USCE Monument 14" was double checked by running a level from PBM "North Gate 2", located on the New Basin Canal Pump Station, El. 11.48 NGVD (1964 Epoch). TBM "USCE Monument 14" was found to be at El. 8.29 NGVD (-0.03 ft. lower than the original NOD surveys of Jan 95).

From these data, it appears that the floodwalls on both sides of the canal were constructed approx. 5.5 inches lower than the elevations indicated on the P&S for these walls.

The I-walls were supposed to have been constructed with 6 inches of allowable settlement. Instead, the walls were constructed with only approx. 0.5 inch overbuild.

Also, the Veterans Hwy Bridges were designed using surveys performed by Walker & Avery, using PBM "Disk T-193" with Elev. 9.741 NGVD. The design elevations for the bridges should be checked for adequacy.

VERTICAL CONTROL DATA
by the
NATIONAL GEODETIC SURVEY
SEA LEVEL DATUM OF 1929

QUAD 300902 PAGE NO. 18
LOUISIANA 30°00' to 30°30'
LATITUDE 90°00' to 90°30'
LONGITUDE DIAGRAM BATON ROUGE NE 15-8

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

RECOVERY NOTE, BENCH MARK

Designation CANAL State Louisiana County Orleans
Nearest town New Orleans
Distance and direction from nearest town At New Orleans Stamping CANAL 1936 -3.071
Character of mark A disk
Established by E.O.S. & W.B. Recovered as Described 14.3
Present condition Good
Detailed report At New Orleans, near the center of the neutral ground of Canal Boulevard between Harrison Avenue and French Street, 47 feet east of the east curb of the west lane of Canal Boulevard, 112 feet north of the north curb of French Street, in the top of a 24-foot concrete 10 by 10-inch pile with top about 2 feet below the surface of the ground surrounded by a brick retaining wall and covered with a 2-foot east iron manhole lid east spalls.

-3.708
LINE 108

DESCRIPTION OF BENCH MARK

Designation R 193 State Louisiana County Jefferson
Nearest town Metairie Chief of party R. Gerrish
Distance and direction from nearest town 0.6 mile east Leveling date 1/64
Character of mark A C&GS Bench Mark Disk Stamping R 193 1964
Established by C&GS
Detailed description About 0.6 mile east along Veterans Memorial Highway from its intersection with North Causeway Blvd. at Metairie, about 55 yards west of the junction of Veterans Memorial Highway and Hesper Avenue, set on the top of the south end of the west concrete abutment of an 80-foot bridge over Hannabel Canal, 22 feet south of the center line of the east-bound lane of the highway, 9 feet east of the west end of the south guard rail of the bridge and 8 feet above the level of the highway.

7.487

DESCRIPTION OF BENCH MARK

Designation Q 193 State Louisiana County Jefferson
Nearest town Metairie Chief of party R. Gerrish
Distance and direction from nearest town 0.4 mile east Leveling date 1/64
Character of mark A C&GS Bench Mark Disk Stamping Q 193 1964
Established by C&GS
Detailed description About 0.4 mile east along the Veterans Memorial Highway from its intersection with North Causeway Blvd. at Metairie, at the intersection of Veterans Memorial Highway and Metairie Heights Avenue, set on the top of the west end of the south concrete abutment of a 75 foot long Metairie Heights Avenue Bridge over Elmwood Canal, 54 feet north of the center line of the east-bound lane of the Veterans Memorial Highway, 17 feet west of the center line of Metairie Heights Drive, 9 feet north of the south end of the east bridge guard rail and about 1 foot above the level of the highway.

-1.771

DESCRIPTION OF BENCH MARK

Designation T 193 State Louisiana County Jefferson
Nearest town Metairie Chief of party R. Gerrish
Distance and direction from nearest town 2.0 miles east Leveling date 1/64
Character of mark A C&GS Bench Mark Disk Stamping T 193 1964
Established by C&GS
Detailed description About 2.0 miles east along the Veterans Memorial Highway from its intersection with North Causeway Blvd. at Metairie, near the Orleans-Jefferson Parish line, 0.4 mile west along Veterans Memorial Highway from the junction of Pontchartrain Blvd in Orleans Parish, set on the top of the north end of the west concrete abutment of the Veterans Memorial Highway bridge over the 17th Street Canal, 16 feet north of the center line of the east-bound lane of the highway, 15 feet southwest of the east end of the north guard rail of bridge and 8 feet above the level of the highway.

9.741 (1965)

DESCRIPTION OF BENCH MARK

Designation S 193 State Louisiana County Jefferson
Nearest town Metairie Chief of party R. Gerrish
Distance and direction from nearest town 1.3 miles east Leveling date 1/64
Character of mark A C&GS Bench Mark Disk Stamping S 193 1964
Established by C&GS
Detailed description About 1.3 miles east along the Veterans Memorial Highway from its intersection with North Causeway Blvd. at Metairie, between William David Parkway and Sena Drive, set on the top of the east end of the south concrete head wall of a double 8-foot box type culvert under the highway, 28.5 feet south of the center line of the east-bound lane of the Veterans Memorial Highway, 115 feet west of the center line of William David Parkway, 0.8 foot west of the east end of the head wall and about level with the highway

-1.949

DESCRIPTION OF BENCH MARK

Designation Y 189 State Louisiana County Jefferson
Nearest town Metairie Chief of party R. Gerrish
Distance and direction from nearest town At Metairie Leveling date 1/64
Character of mark A C&GS Bench Mark Disk Stamping Y 189 1964
Established by C&GS
Detailed description At Metairie, at the intersection of Veterans Memorial Highway and North Causeway Blvd, set on the top of the west end of the south concrete abutment of the 75 foot long North Causeway Blvd bridge over Elmwood Canal, 42 feet north of the center line of the east-bound lane of the Veterans Memorial Highway, 17 feet west of the center line of the south-bound lane of the North Causeway Blvd, 9 feet north of the south end of the bridge guard rail and about 8 feet above the level of the Blvd.

-495

Appendix 40

Historical Timeline

COPY

U. S. DEPARTMENT OF COMMERCE
COAST & GEODETIC SURVEY
WASHINGTON 25, D. C.

In Reply address the Director:
Coast & Geodetic Survey
and not the signer of this
letter
And Refer to No. 651-mc

Your file: LMNGS

10 April 1958

TO: District Engineer
New Orleans District
Corps of Engineers, U. S. Army
P. O. Box 267
New Orleans, Louisiana

Subject: Leveling in the Vicinity of New Orleans

Receipt is acknowledged of your letter of 27 February 1958, pertaining to the adjustment of leveling in the vicinity of New Orleans, Louisiana. The adjusted results for the 1955 releveing were published under date of 10 October 1957, copy of which is enclosed for your file.

The releveing of 1951 was undertaken as a reimbursable assignment and due to limited funds and also due to other commitments, we were not in a position to extend the leveling into more stable areas as we would have liked to have done. The releveing of 1955 which was extended both east and west of New Orleans brought out the fact that marks in New Orleans were settling by varying amounts.

In your letter of 5 January 1956 to Comdr. Robert A. Earle, Coast and Geodetic Survey, New Orleans, you stated that bench marks 1326/02.68 (USE), U 8, and A 10 appeared to be less reliable than most of the other marks. Yet our leveling shows these marks to have settled less than those referred to in your recent letter as being on stable structures.

In the adjustment of leveling, we try as far as possible to avoid changing previously adjusted values. However, where the changes in elevation are appreciable, the releveing would be unduly punished to fit it to previously adjusted values. We realize that changed elevations cause inconvenience to local engineers but the matter of settlement has been noted in a good many areas. Releveing in the vicinity of Galveston and Houston has shown that there is considerable change in this region, with a maximum of about 2.8 feet in the vicinity of Texas City. Other regions of settlement have been noted east of Little Rock, Arkansas, and in many regions of California. In fact, the more releveing that is accomplished, the more we lean toward the belief that there is no mark which can be trusted to remain absolutely stable and that any mark may undergo some change due to adjustments in the earth's crust. The setting of marks in substantial structures does not always guarantee their stability because often the changes are deep seated.

It is believed that until we have additional releveing to give us a better understanding of what changes have taken place in your region of interest, we should retain the adjusted elevations as published in the list enclosed. It is realized that often less confusion results by retaining the old elevations by local engineers and if this is the case

Incl. 2

C O P Y

in your instance, there are certainly no objections to your retaining previous values for your local use. In fact, field work by the U.S.E. accomplished around 1938 should be tied to our 1938 elevations and not the most recent elevations.

/s/ Charles Pierce
Charles Pierce
Rear Admiral, C&GS
Assistant Director

Enclosure (1)

12840 NOTICES

NATIONAL VERTICAL CONTROL NET

Proposed Action

MAY 7, 1973.

Elevations of marked points (benchmarks) in the National Vertical Control Net are based on the "Sea Level Datum of 1929." Since this datum was derived from the overall average sea, level of 26 tide stations, the official elevation at any particular one of these tide stations does not necessarily reflect the actual local "mean sea level." In order to avoid such apparent confusion and the costly errors that may result through failure to consider local sea level when engineering projects are undertaken, it is proposed to change the present name of the vertical control datum from the "Sea Level Datum of 1929" to the "National Geodetic Vertical Datum of 1929." This change is proposed to be effective on or before July 2, 1973. Comments on this proposed action may be directed to the Director, National Ocean Survey, NOAA, Rockville, Md. 20852.

ROBERT M. WHITE, Administrator.

[FR Doc.73-9694 Filed 5-15-73; 8:45 am]

FEDERAL REGISTER, VOL. 38, NO. 94-WEDNESDAY, MAY 16, 1973

DAEN-CWE-DC
DAEN-MPE-S

DEPARTMENT OF THE ARMY
Office of the Chief of Engineers
Washington, D. C. 20314

ETL 1110-1-97

Engineer Technical
Letter No. 1110-1-97

31 October 1978

Engineering and Design
CHANGE IN NAME OF NATIONAL VERTICAL CONTROL NET

1. Purpose. The purpose of this letter is to inform Corps of Engineers personnel of the change in nomenclature of vertical datum used on topographic maps.
2. Applicability. This ETL is applicable to all field operating agencies having Civil Works and/or Military Construction responsibilities located within the United States.
3. References.
 - a. Federal Register, V. 38, No. 94, May 16, 1973, page 12840
 - b. Federal Register, V. 41, No. 96, May 17, 1976, page 20202
4. Discussion. Elevations of marked points (benchmarks) in the National Vertical Control Net are based on the "Sea Level Datum of 1929." Since this datum was derived from the overall average sea level of 26 tide stations, the official elevation of any particular one of these tide stations does not necessarily reflect the actual local "mean sea level." To avoid the implication that vertical control datum elevations are referenced to a condition which may vary from one location to another, the National Ocean Survey has redesignated the "Sea Level Datum of 1929" as the "National Geodetic Vertical Datum of 1929," reference paragraph 3 above.
5. Action. All new maps, revisions or documents whose elevations are those of the National Vertical Control Net will make reference to "National Geodetic Vertical Datum of 1929" rather than "Sea Level Datum of 1929."

FOR THE CHIEF OF ENGINEERS:

Homer B. Willis
HOMER B. WILLIS
Chief, Engineering Division
Directorate of Civil Works

Do: LMWED
cf: ~~the~~ District File

14 NOV 78

50-1-05



DEPARTMENT OF THE ARMY
LOWER MISSISSIPPI VALLEY DIVISION, CORPS OF ENGINEERS
VICKSBURG, MISSISSIPPI 39180

REPLY TO
ATTENTION OF: LMVED-TS

9 FEB 79

SUBJECT: Change in Name of National Vertical Control Net

District Engineer, St. Louis
District Engineer, Memphis
District Engineer, Vicksburg
District Engineer, New Orleans

1. References:

- a. ETL 1110-1-97, 31 Oct 78, subject as above.
- b. LMVED-CM M/L, 15 Sep 78, subject as above (Incl 1).

2. The purpose of this letter is to clarify the intent of the referenced ETL. The change in nomenclature of the vertical control datum should be reflected on all new correspondence, design memorandums, survey reports, plans and specifications, maps, and other reports and engineering documents.

3. You should take appropriate action to insure that the "National Geodetic Vertical Datum of 1929" (NGVD) is used in lieu of "Sea Level Datum of 1929" (msl) to identify the vertical control datum on all new documents as discussed above.

FOR THE DIVISION ENGINEER:

Robert I. Kaufman
ROBERT I. KAUFMAN
Acting Chief, Engineering Division

1 Incl
as

DISPOSITION FORM

For use of this form, see AR 340-15; the proponent agency is TAGO.

*K Copy to Mr. Soileau, Mr. Piccola
& Mr. Hamilton & Mr. Sullivan
I'd like to meet w/ them
as a group.
Calvin M. Brown*

REFERENCE OR OFFICE SYMBOL

SUBJECT

LMVED-A

Subsidence of Coastal Louisiana

TO C/Plng Div

FROM C/Eng Div

DATE 30 Nov 81
Kaufman/eb/5902

CMT 1

1. During the 16-18 Nov 81 Coastal Engineering Research Board meeting at LMVD, the Board indicated that the following factors may influence subsidence either real or suggested, and therefore need additional investigation:

- a. Settlement of permanent benchmarks.
- b. Earthquakes and/or faulting.
- c. Withdrawal of subsurface minerals, such as oil, gas, and water.

2. It is suggested that these factors be included in any ongoing studies of coastal Louisiana which address the present or projected future amount or condition of coastal resources which are affected by subsidence.

R
RESTA

CF:
Mr. Whatry
Mr. Weaver
Mr. WR Hill

12/9/81
Met w/ atone today. Established the
ad hoc group chaired by Mr. Piccola
First step to be literature research
in the various areas of responsibility. Mr
Piccola to report to me in 60 days



DA FORM 2496
AUG 80

PREVIOUS EDITIONS WILL BE USED

Eames
for comments by early Friday
please on thought &
Scenario.

S: - 6 Apr 84

LMVED-TS

SUBJECT: Datum Changes in Southern Louisiana

JOHNSON/ajw/
E

W. R.

Commander, New Orleans District

R

1. On 10 Apr 84, Mr. David S. Zilkoski, Chief of the Vertical Analysis Section, National Geodetic Survey in Rockville, MD, will be in Vicksburg to brief General Road and his staff on the recently completed leveling and adjustment work on the Vertical Datum in the Gulf Coast area. As these level adjustments will affect projects in your area of concern, you and members of your staff are requested to attend the briefing.

HAI

COL :

2. The briefing will begin at 10:00 a.m. in the Vicksburg District Main Conference Room on the fourth floor of the Crawford Street Post Office Building.

GEN :

3. In addition to the briefing on 10 Apr, there will be an informal "round-table" discussion among members of the LMVD staff and Mr. Zilkoski during the afternoon of 9 Apr 84. This discussion will begin at 1:00 p.m. in Room 206 of the Walnut Towers Building. You are encouraged to attend this discussion also. A tentative list of attendees for both meetings should be furnished by 6 Apr 84.

4. My point of contact for these activities is Mr. Frank N. Johnson. Mr. Johnson can be reached at EXT. 5935 for additional information.

FOR THE COMMANDER:

R. H. RESTA, P.E.
Chief, Engineering Division

AGENDA

BRIEFING FOR MG READ ON DATUM
CHANGES IN SOUTHERN LOUISIANA
Lower Mississippi Valley Division Office
Vicksburg, MS
10 April 84

Tuesday - 10 April 1984 (Post Office Building, Room 402)

- 10:00 a.m.....Welcome and Opening Remarks by General Read,
Introduction of Mr. Zilkoski to group by Mr. Frank Johnson
- 10:10 a.m.....Presentation of Briefing by Mr. Zilkoski (NGS)
- 10:40 a.m.....Question and Answer Period
- * 10:50 a.m.....Presentation by Mr. Harrington (NOD) - Specific Problems
In the NOD related to Datum Adjustments
- 11:15 a.m.....Floor Open For General Discussion
- 12:00 a.m.....LUNCH
- 1:00 to 3:00 p.m.....Conference Room Available if needed

* Introduce Mr. Harrington

Note: Tom! This is tentative only, and may be adjusted later, however, I believe this is basically the way it will go.

FACSIMILE HEADER SHEET
(FR 105-1-5)

FROM (Name) Frank N. Johnson	OFFICE SYMBOL LMVED-TS	TELEPHONE NO. EX. 5935	TELETYPE UNIT Frank N. Johnson		
TO (Name) Tom Harrington	OFFICE SYMBOL LMNED-M	TELEPHONE NO. EX. 2592	PAGES 1	PRECEDENCE Priority	DTG 3 APR 84

FORM 1050
1 FEB 73

SSpace from top



9-10 Apr 84

NGVD Change

Meeting of COE with NGS
9-10 Apr 84, Vicksburg, Miss.

Thoughts

Time Considerations

1. Past
2. Present
3. Future 50 year-100 year

Sources of Change

1. Consolidation of overburden 50,000'±
2. Mineral removal
3. Sea Level change
4. Bedrock subsidence
5. Loss of overbank building by sediments
6. Survey corrections and adjustments

Where

1. Coastal lands
2. Continental shelf
3. River valleys
4. Uplands
5. Metropolitan-cities-urban-countryside

1. Straightline
2. Progressive
 - a. accelerating
 - b. deceleration
3. Site specific
4. Sudden

Projects impacted

1. Projects in place.
2. Projects under construction
3. Projects under design
4. Future projects
5. Concerns not specifically related to projects but of concern.
 - a. FIA
 - b. Gages

Types of Projects

1. Flood Control
 - a. Levees
 - b. Drainage canals
 - c. Pumping stations
 - d. Drainage structures
 - e. Combinations

Organizations Concerned

1. Federal - COE, SCS, FIA, USCG, etc.
2. State
3. Local governments
4. Public
5. Private
6. General public

2. Navigation
 - a. Deepdraft
 - b. Shallow draft
 - c. Structures
 - d. Combinations

3. Freshwater Diversion
 - a. Dilution
 - b. Wildlife

Datum Planes

MSL	]	How defined
MSG	]	How established
NGVD	]	How monitored
		Reference point(s)

NGVD Network

1. How run
2. Computer techniques
3. Future methodology & outlook

Engineering Disciplines Concerned

- | | | |
|-------------|---|--|
| Hydraulics | - | Flowlines
Gages
Storage areas
Tidal surges
Sea level |
| Foundations | - | Stability (F of S)
Geology |
| Design | - | Levee Floodwall grades
Pile penetrations
Structural adequacies |
| Surveying | - | Benchmarks
Gages |
| Drafting | - | Mapmaking |

Scenario: NGVD Change Impacts on Levee Status

Problem: Generally along the Mississippi River Levees and Atchafalaya Basin Levees the change in the datum is about .5 foot.

Discussion:

1. An analysis of the impacts is complex because of the following factors:

a. Is the flowline falling at the same rate as the ground is subsiding?

b. Is the change in channel capacity a function of the datum change or other factors, primarily degradation of the channel cross section the reason for the increase?

c. What are the tidal influences and what is the extent of sea level change?

2. a. These major main stem levees are _____ miles long (_____ MRL; Atch W, E, & R). Using the current flowline and datum, _____ miles of MRL and _____ miles of Atchafalaya levees were below grade. A .5 foot adjustment would have _____ miles of MRL and _____ miles of Atchafalaya Levees below grade.

b. While we do not undertake raising of earthen levees of less than 1 foot to restore freeboard, we do have areas now on the order of .5 to .9 foot too low and the .5 foot adjustment will equal or exceed 1 foot.

c. Because of poor foundation conditions and restricted areas, we have and are continuing to construct floodwalls as part of the protective system. Corrections to sheet pile walls, while undesirable is possible, but usually correction to T-walls will result in overstress or non-correction to higher flood frequency overtopping.

d. Both of these levee systems contain flood control structures. On the Mississippi we have the overbank, low, sill, auxiliary and lock structures at Old River; Morganza structure and floodway, Bonnet Carre structure; Harvey, Algiers and IHNC Locks, and soon Caernarvon Structure. The state also has Empire Lock. In the Atchafalaya system we have by Sorrel, Berwick, Beouf Locks, Charenton floodgate, E & W Colume floodgates, and Upper Pointe Coupee Control Structure, Wax Lake West Control Structure and _____ pumping stations. Because of a recent adjustment in flowline, several of these facilities may require modification or replacement. Any datum change will accentuate the need for replacement or modification.

3. Our concerns for the protective system are accentuated if the prediction are for continued settlement. If a steady but relatively slow settlement continues, then in all probability, development within the protected area will continue and we will continue to raise the protective system to protect the improvements.

LMNED-S

2 November 1984

SUBJECT: NGS Bench Marks

Commander, Lower Mississippi Valley Division

1. Reference is made to the meeting in LMVD on 10 Apr 84; and on 24 Oct 84 in the New Orleans District, relative to the above subject. Reference is also made to discussion between Admiral Bosler, NOAA, Mr. Resta, and the undersigned on this years low water trip.
2. The 1983 adjustments have been formally promulgated by the NGS. Before we begin to use the adjustments, we believe a discussion with NGS, preferably to include Admiral Bosler, would be useful. In particular, we would like to better understand the NGS methodology and its implications.
3. As set forth in the meeting on 24 Oct 84, the new adjustments do have significant implications for a number of our projects.
4. To provide some insight as to the implications of the new adjustments insofar as our projects are concerned, I have enclosed plots comparing prior elevations of NGS bench marks with those that result from application of the new adjustments. (Encls 1 and 2.)
5. We recommend that a meeting as described in paragraph 2 be arranged at the earliest practicable date.

2 Encl

FREDERIC M. CHATRY
Chief, Engineering Division

CHATRY
LMNED

CF: LMNED-SS

JOHNSON/dw/5935
ED-TS

MARCH 05, 1985

DUBUISSON
ED-TS

Engineering Division

GHISHAM
ED-TL

SUBJECT: Adjustments to NGS Bench Marks

HISKELLEY
ED-TO

RA John D. Bossler
Director, Charting and
Geodetic Services, NOAA
U.S. Department of Commerce
Rockville, MD 20852

W. R. HILL
ED-T

Dear Admiral Bossler:

WEAVER
ED-G

The results of the NGS 1983 adjustments to the Vertical Datum in the Gulf Coast area have been formally published and the new adjustments have significant implications for a number of our projects. Of particular concern to this office are those adjustments which result in changes in elevation to bench marks in South Louisiana and the potential effects on flood control and hurricane protection works in that area.

KAUFMAN
ED-R

A preliminary study performed by the New Orleans District which compares prior elevations of NGS bench marks with elevations resulting from the 1983 adjustments indicate a general lowering of elevations along the Mississippi River in the southern half of the state. Based on the data analyzed, a maximum rate of settlement of -0.06 feet per year in certain areas has been determined. This rate of settlement could result in a deficiency in top elevation of over one foot for some of our facilities in only 20 years.

LOUQUE
ED-W

KAUFMAN
ED-A

In view of the implications to existing facilities and possible changes to projects in the planning and design stage, we would appreciate at your earliest convenience any information you could give us concerning the level of confidence that can be expected from the 1983 adjustments before we begin using this new elevation data in current projects and before initiating any modifications to existing facilities.

BAYLEY
PD

GRAHAM
RE

FOR THE COMMANDER:

J. HILL
CO

R. H. RESTA, P.E.
Chief, Engineering Division

RESTA
ED

CF:
LHMED
DAEN-ECE-8 (Mr. Miles)

HASCOTT
ED-T (FOR CF)

Comback
Mr. Johnson
27 Apr 84



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
OFFICE OF CHARTING AND GEODETIC SERVICES
ROCKVILLE, MARYLAND 20852

MAR 29 1985

Mr. R. H. Resta, P.E.
Chief, Engineering Division
U. S. Army Corps of Engineers
Lower Mississippi Valley Division
P.O. Box 80
Vicksburg, Mississippi 39180-0080

Dear Mr. Resta:

In response to your letter dated March 5, 1985, I can assure you that we place a very high level of confidence in the 1983 Gulf Coast area adjustment results. We believe they are the best available heights for the region. However, as an engineer you realize the importance of the assumptions imposed when the adjustment was performed and their impact on the adjusted results.

Specifically, the Louisiana Gulf Coast is an unstable region of the country. As you know, the entire area is subsiding. I have enclosed two publications which estimate the crustal movements in this area (see enclosures 1 and 2). The subsidence varies substantially throughout the region, but as the reports indicate, the subsidence tends to increase from north to south. This increases the complexity of data analysis and adjustment constraints.

The following scenario was developed for the 1983 Gulf Coast adjustment. First, a primary network, consisting of leveling data observed from 1968 to 1982, was adjusted. This assumed that no significant movements occurred between surveys. In this area, there most likely was a small amount of bench mark movement between surveys. However, it is difficult to estimate the true magnitude of these movements without additional releveling. These primary heights were then used to constrain the secondary network. The assumption was made that the secondary network was displaced in the same manner as the primary. In most subsidence areas, crustal movement rates vary considerably. Once again, a more accurate estimate of these movement rates cannot be determined without additional surveys.

As stated earlier, we have high confidence in the adjustment results under the assumptions stated above. The adjusted heights from the area adjustment are the best available estimates for the Gulf Coast region. It should be noted that the assumptions made for this adjustment were necessary because the Gulf Coast vertical network was not designed specifically to monitor subsidence.

In the past, when National Geodetic Survey (NGS) performed leveling and adjustments in this area, the new leveling was forced to fit previously published values of the existing network. The constraints imposed in these past adjustments arbitrarily biased the results such that "true" movement

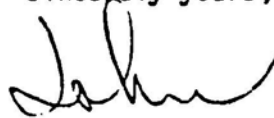


could not be detected when adjusted height differences were compared. This is the reason adjusted heights should not be used when estimating subsidence. Repeat leveling and/or special adjustments provide the best estimates of crustal motion.

In some subsiding areas, special networks have been established to estimate crustal motion. The Houston-Galveston, Texas, area is a good example (see enclosures 3,4, and 5). The NGS has designed a subsidence plan, called the Geocadastre, for the Louisiana Gulf Coast. Messrs. Gilbert J. Mitchell and David B. Zilkoski, of my staff, briefed the New Orleans District and the Greater New Orleans Planning Council in November 1984. Enclosure 6 describes the Geocadastre in detail.

In conclusion, the major problem in the area is that the Gulf Coast vertical network is not intended to provide detailed crustal motion information. However, we still believe the heights from the 1983 Gulf Coast area adjustment are the best obtainable at this time. We also believe that the Geocadastre is a means of more confidently estimating subsidence in the area. Mr. Mitchell, (301) 443-8143, and Mr. Zilkoski, (301) 443-8567, are available to meet with you to discuss the Geocadastre, the Gulf Coast adjustment, or other special analyses to meet specific project needs. I am pleased that we can participate in this joint effort to better assess your agency's requirements of the geodetic network.

Sincerely yours, .



John D. Bossler
Rear Admiral, NOAA
Director
Charting and Geodetic Services

Enclosures



DEPARTMENT OF THE ARMY
LOWER MISSISSIPPI VALLEY DIVISION, CORPS OF ENGINEERS
P. O. BOX 80
VICKSBURG, MISSISSIPPI 39180-0080

REPLY TO
ATTENTION OF:

LMVED-TS

12 APR '85

SUBJECT: Adjustments to NGS Bench Marks

Commander, New Orleans District
ATTN: LMNED-S

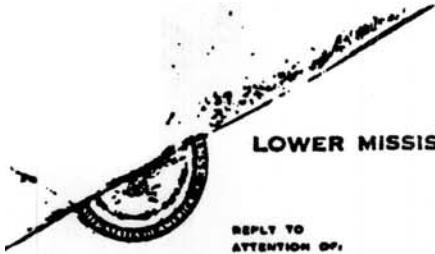
The inclosed letter from Rear Admiral Bossler to Mr. Resta concerning the 1983 Gulf Coast area adjustments to Bench Marks is furnished for your information.

FOR THE COMMANDER:

1 Incl
as

CF w incl:
DAEN-ECE-B


ROBERT I. KAUFMAN
Acting Chief, Engineering Division



Mr. Harrington - your copy original to Ticker

DEPARTMENT OF THE ARMY
LOWER MISSISSIPPI VALLEY DIVISION, CORPS OF ENGINEERS
P. O. BOX 80
VICKSBURG, MISSISSIPPI 39180

REPLY TO
ATTENTION OF:

S: 31 May 85

LMVED

01 MAY '85

SUBJECT: Adjustments to NGS Bench Marks

Commander, New Orleans District
ATTN: LMNED-S

1. Our letter to you of 12 Apr 85, subject as above, inclosed a letter from John D. Bossler, Rear Admiral NOAA, concerning the 1983 Gulf Coast area adjustments to bench marks with several reports on elevation changes along the Gulf Coast.
2. From the material furnished we conclude that although regional subsidence is occurring in the Gulf Coast area, the amount of such subsidence cannot be determined accurately from available data, and it appears that a NOAA system called Grcodastre may be needed to obtain an accurate assessment of subsidence in the area.
3. In view of the potential significant consequences of elevation changes on projects in your District, we request that you reexamine the information in Rear Admiral Bossler's letter and then after any consultation with the NOAA staff which you consider necessary, propose a course of action for incorporating the changes in elevation into your projects and studies and for defining in a more reliable manner the subsidence of the area. Your action plan should include a schedule and cost estimate and is requested by 31 May 85.

FOR THE COMMANDER:

Robert I. Kaufman
RT I. KAUFMAN, P.E.
ng Chief, Engineering Division

*Mr. Harrington - Ple
note due date*

*CS
28 May 85
507*

LMNED-S (LMVED/1 May 85) 1st End
SUBJECT: Adjustments to NGS Bench Marks

Mr. Harrington/jes/2592


DA, New Orleans District, Corps of Engineers, P.O. Box 60267, New Orleans,
LA 70160-0267 24 May 1985

TO: Commander, Lower Mississippi Valley Division, ATTN: LMVED

1. Representatives of the NOAA met with the Regional Planning Commission representing Jefferson, Orleans, St. Bernard, and St. Tammany Parishes on 29 April 1985. These Parish governments have contributed funds to NOAA to rerun portions of the control net in their respective jurisdictions and further participation can be expected. Mr. Zilkoski of NOAA suggested that he present NOAA's estimate of overall needs to predict subsidence and to obtain a more reliable network to the New Orleans District. That meeting is now scheduled for 0900 on 12 June 1985 in the New Orleans District.

2. After the meeting with NOAA we will develop a recommended plan of action with a schedule and cost estimate.

FOR THE COMMANDER:



FREDERIC M. CHATRY
Chief, Engineering Division

wd all encls



DEPARTMENT OF THE ARMY
NEW ORLEANS DISTRICT CORPS OF ENGINEERS
P O BOX 60267
NEW ORLEANS LOUISIANA 70160

REPLY TO
ATTENTION OF

LMNED-S

7 August 1985

SUBJECT: NGS Benchmarks

Commander, Lower Mississippi Valley Division
ATTN: LMVED.

1. Reference is made to the following:

- a. LMNED letter dated 2 November 1984 to LMVD, subject supra.
- b. LMVED letter dated 5 March 1985 to RA John D. Bossler, subject: Adjustments to NGS Benchmarks.
- c. John D. Bossler letter to LMVD dated 29 March 1985 in response to reference b above.
- d. LMVED-TS letter dated 12 April 1985 to LMNED-S subject: Adjustments to NGS Benchmarks.
- e. LMVED letter dated 1 May 1985 to LMNED-S subject: Adjustments to NGS Benchmarks, and 1st End thereto.

2. In essence, it is the position of NGS as set forth in reference c above that the current (1983) benchmark elevations are correct, but that they cannot be used in conjunction with earlier values to derive estimates of subsidence which are necessarily valid even in order of magnitude. Thus we are left with a problem of setting project grades to provide the level of protection authorized. The problem is particularly acute on projects which are partially complete, in that, if we adopt the new benchmark elevations for construction without altering design flowlines, we ensure that those projects will provide inconsistent levels of protection; with the previously constructed portions offering lower levels of protection than those to be constructed in the future. At the same time, it would hardly be prudent, based on what we now know about benchmark elevations, to embark on a program of wholesale raising of previous construction to conform to the latest elevations. This is particularly true in situations in which design flowlines are primarily a function of discharge with tide level having little effect, and in tidal cases where increases in grade can only be achieved through demolition and reconstruction.

LMNED-S
SUBJECT: NGS Benchmarks

3. The problem extends as well to our stream gaging network since the gages which comprise that network are ordinarily adjusted to conform to the latest information published by NGS. As an example, consider the Carrollton gage, which is typical of gages at and below New Orleans. It has been raised about 0.6 foot since 1952 (1983 data have not yet been applied) with the result that the reading of the staff now corresponds to a reading 0.6 foot lower on the 1952 staff. Application of the 1983 data would result in raising the staff another half foot or a total increase of over 1 foot.

4. The problem is exacerbated by the information, recently received, that the 1983 data have been superseded by the results of releveling done in the New Orleans area at the request of local officials. New elevations for benchmarks in Jefferson, St. Bernard, Plaquemines, and Orleans Parishes have been published which, in most instances, represent significant upward revisions of the 1983 data. Additional results of the releveling are being processed and it seems reasonable to expect that they will reflect the same upward trends. The overall significance of these changes in the light of the repeated and ringing affirmations of confidence in the 1983 data which appear in NOAA's letter of 29 March 1985 is not easy to assess, but it does further weaken the case for imputing, with any reasonable confidence, hard physical significance to the changes in benchmark elevations. Yet the data promulgated by NOAA, given their presumed primacy in deciding where the earth's crust is in the vertical plane, cannot be ignored.

5. While the NGS program (cadastre) for evaluating subsidence may well produce data relevant to our problem (and for this reason alone, we would be well advised to support it) that program offers little of utility in the foreseeable future. Thus we must select a course of action without material assistance from NGS.

6. Despite the absence of firm implications to be drawn from changing benchmark data, we believe that a clearly defined policy should be derived concerning the use of benchmark data in our various activities. Accordingly, we propose the following actions:

a. All gages will be set to conform to the latest available benchmark information published by NGS. Since both the gage information and the NGS data are widely disseminated, to do otherwise would be to court public confusion.

b. Modification of projects which have been completed will not be considered. The level of precision in the current data, and the practical difficulty and cost of changing such projects combine to mandate this course of action at least for the foreseeable future.

c. The main stem features of the MR&T project, such as MRL and Atchafalaya Basin, will be constructed utilizing the latest pre-1983 benchmark elevations. The grade requirements for these features are driven primarily by discharge and since subsidence presumably affects both bed and banks, required levee heights should be little affected by it. Thus, a shift to the new, lower benchmarks would result in the construction of levees higher than required to provide the authorized level of protection. There may be some problem with this approach at the lower (gulfward) ends of the system where tide becomes an increasingly important factor, and we plan to give that continuing consideration.

LMNED-S
SUBJECT: NGS Benchmarks

d. Off-main stem projects of the MR&T which are under construction or will be constructed in the future will use the latest benchmark data published by NGS at the time construction is/was started. The need for revision will be considered as construction proceeds.

e. All O&M dredging will use the latest available benchmark data published by NGS prior to the 1983 data. A change to the new data would mean that the depth of dredging in Southwest Pass, for example, would be lowered by about 1 foot. Given the perennial commotion by navigation interests, and considering the intensity of it this past year, such a course of action would be ill advised to say the least.

f. Hurricane protection projects which are partially complete will use the NGS benchmarks current at the time of construction of the first increment of the project. To shift to the later NGS data without altering the heights of previously constructed portions would make "fuseplugs" of those portions and thus impose a gratuitous servitude on the lands and facilities they protect. And altering previously constructed works would not be practicable.

g. New hurricane protection projects will be constructed using the latest available NGS benchmark data.

h. We plan to respond affirmatively to NOAA's invitation to participate in this "cadastre" program to better evaluate subsidence. Based on NOAA's estimates, the total costs would be \$2.0 million in the first year, \$525 thousand in the second year, and \$345 thousand annually thereafter. Our participation would be in the form of membership on technical study groups and providing data. We do not, at this time, anticipate providing any direct funding.

7. Approval of the course of action set forth in paragraph 6 is recommended.

FOR THE COMMANDER:



FREDERIC M. CHATRY
Chief, Engineering Division

Encls

LMVED-TS (LMNED-S/7 Aug 85) 1st End
SUBJECT: NGS Benchmarks

Mr. Johnson/msm/5935

DA, Lower Mississippi Valley Division, CE, Vicksburg, MS 39180-0080

19 SEP 85

TO: Commander, New Orleans District, ATTN: LMNED-S

Your course of action outlined in para 6 of the basic letter is approved subject to the following comments:

a. Para 6b. We concur in general with this position; however, you should conscientiously review your flood control works and structures to ensure there are no exceptions that should be individually analyzed with an independent decision made on the specifics of that case.

b. Para 6c. While we agree in general with the rationale presented, the net result would be that there will be further disparity among levee grades, flowlines, and floodway operations. Therefore, the project design flowline of the Mississippi River and Tributaries Project should be adjusted within the affected areas to maintain comparability among the above elements.

c. Para 6f. Consideration should be given to reanalyzing and modifying (if needed) hurricane protection work in high density urban areas where the datum changes will drastically reduce the level of protection.

FOR THE COMMANDER:

5 Encls
nc


FRED H. BAYLEY III
Chief, Engineering Division



DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
WASHINGTON, D.C. 20314-1000

REPLY TO
ATTENTION OF:

DAEN-CWH-D

21 March 1986

SUBJECT: Relative Sea Level Change

SEE DISTRIBUTION

1. The purpose of this letter is to provide the philosophy and distribute policy on the technical considerations required for relative sea level change in the design of coastal flood control and erosion protection projects.
2. Throughout geologic history, global sea level variations (both rise and fall) have occurred. Some authorities have found evidence to indicate we may be entering a new ice age with a resultant sea level drop. Others argue that increasing atmospheric concentrations of carbon dioxide and other gases are causing the earth to warm, thus contributing to a sea level rise. Global cooling or warming trends have at least two consequences: more extensive and rapid accumulation or melting of snow and ice in alpine and polar areas, and actual contraction or expansion of upper ocean waters. Both consequences contribute to "absolute" global sea level change. The absolute changes can not be distributed equally due to the dynamic and interactive nature of the earth's atmosphere, oceans, and crust and the changes required thereof by global cooling or warming.
3. Historic trends are commonly used in hydraulic and hydrologic studies to estimate expected future design conditions. Studies to determine expected precipitation intensities, water level frequencies, and shore erosion rates are typical examples. High confidence in the predicted values is generally limited to an average return period of not more than three times the length of data record. Local trends in local sea level change can perhaps best indicate what will occur in the future. The National Ocean Survey (NOS) has published sea level trends for regions along US Coasts based on yearly mean sea level records from its tide gages. These trends appear in the NOS publication entitled Sea Level Variations for the United States 1855-1980. Enclosure 1 is a table from this publication showing trends by region, from 1940 through 1980. Most existing tide gages are located on structures in harbors, and are responsive to land motions as well as water level changes.

DAEN-CWH-D
SUBJECT: Relative Sea Level Change

21 Mar 86

4. Predicting future sea level rise is risky because there are so many variables and, as yet undefined, interrelationships involved (see enclosure 2, Can Mean Sea Level Changes be Predicted?). It is for this reason that the hydraulic designers should not make projections of the degree of either global or relative sea level rise on other than a historic basis. Corps of Engineers policy is that, until substantial evidence indicates otherwise, we will maintain the procedure of considering only local regional history of sea level changes to project a rise or fall for a specific project.

5. While emergence or rebound of a land mass normally is not a problem along the coast, submergence or subsidence may often be a contributing factor in coastal flooding and erosion problems. Where long periods of tidal records exist and are used in determining the exceedance frequency relationship for coastal flood levels, it may be necessary to adjust the water level records for relative sea level changes when such changes are significant. Similarly, Coastal Engineering Technical Aid 79-2, A Method for Estimating Long-Term Erosion Rates from a Long-Term Rise in Water Level, May 1979, explains how to account for relative sea level rise in beach erosion estimates. Prudence may require an allowance in a project design for the continuation over the project design life of an established significant long-term trend in relative sea level rise. Consideration must be given to the relative magnitude of the suggested allowance and the confidence band of the data the designer is using and the tolerance allowed in constructing the project. For instance there would be no need for a sea level rise allowance of about one foot when the construction tolerance of the project structure is plus or minus one half foot. Another consideration is whether it is more cost effective to include the allowance for significant sea level rise in the initial construction or to plan for modification later after the need for such is demonstrated.

FOR THE COMMANDER:

2 Encls
as

for *SB Parker*
EARL E. EIKER

Acting Chief, Hydraulics and Hydrology Division
Directorate of Civil Works

Distribution:
(See page 3)

TABLE 6
TRENDS AND VARIABILITY*
AREA^a AND U.S.^b MEANS
1940 THROUGH 1980

Northern East Coast		
Trend	2.6 mm/yr	.009 ft/yr
Standard Error of Trend	± .3 mm/yr	±.0011 ft/yr
Variability ^c	±24.5 mm	±.080 ft
Southern East Coast		
Trend	1.9 mm/yr	.006 ft/yr
Standard Error of Trend	± .4 mm/yr	±.0013 ft/yr
Variability ^c	±31.1 mm	±.102 ft
Gulf Coast		
Trend	1.5 mm/yr	.005 ft/yr
Standard Error of Trend	± .4 mm/yr	±.0013 ft/yr
Variability ^c	±29.5 mm	±.097 ft
Southern West Coast		
Trend	1.0 mm/yr	.003 ft/yr
Standard Error of Trend	± .4 mm/yr	±.0012 ft/yr
Variability ^c	±27.2 mm	±.089 ft
Northern West Coast		
Trend	- .4 mm/yr	-.001 ft/yr
Standard Error of Trend	± .3 mm/yr	±.0011 ft/yr
Variability ^c	±25.9 mm	±.085 ft

^a From area yearly mean sea level values rather than means of station trends, et cetera, in area.

^b From means of area yearly mean sea level values rather than means of area trends, et cetera.

^c Standard Error of Estimate.

* Variability is represented by the standard error of estimate, which is the standard deviation from the line of regression.

Attachment 1

Table 6, continued

United States

Trend	1.3 mm/yr	.004 ft/yr
Standard Error of Trend	± .2 mm/yr	±.0007 ft/yr
Variability ^c	±16.2 mm	±.053 ft

^c Standard Error of Estimate.



DEPARTMENT OF THE ARMY
MISSISSIPPI RIVER COMMISSION, CORPS OF ENGINEERS
VICKSBURG, MISSISSIPPI 39180

ADDRESS REPLY TO:

PRESIDENT, MISSISSIPPI RIVER COMMISSION
CORPS OF ENGINEERS
P. O. BOX 80
VICKSBURG, MISSISSIPPI 39180 -0080

MRCED-WH

01 APR '86

SUBJECT: Relative Sea Level Change

✓ Commander, Vicksburg District, ATTN: LMKED-H
Commander, New Orleans District, ATTN: LMNED-H

The enclosed material is provided for your information.

FOR THE PRESIDENT OF THE COMMISSION:

Encl


FRED H. BAYLEY III
Chief, Engineering Division

Mr. Phatry

28 Aug 86

Our letter on the benchmarks was directed primarily toward construction. Dredging maintenance was also addressed.

But... no mention of operational changes.

My concern is how to adjust gage readings over time to compensate for changes.

Tom Harrington

Mr. Harrington:

I'd like a

recommendation



LMNED-9

TO: C/Design Br.
C/H&H Br.

Subject: NGS
FROM: C/Des S

GRAND ISLE

SURVEYS &
PLOTS FOR
H&H

2 Sep 86

19ton/2592

1. Recently Mr. Nettles^{C.J.} informed Mr. Chatry about a decision by Operations Division to adjust the operation of East and West Calumet Floodgates by 0.3 feet because the gage had been adjusted by 0.3 feet for the "new" NGS datum. Mr. Chatry ask me for a copy of our correspondence to LMVD~~etc~~ concerning NGS Benchmarks (copy enclosed) and Mr. Chatry has asked for a recommendation

The thrust is at least two fold:

a. What operational changes in structures is warranted? A question for Design Branch as Operational Manuals are prepared by that Branch.

b. How to adjust the multitudes gage readings collected over many years to compensate for benchmark changes that are documented at infrequent intervals and not always with physical point checks? A question for H&H Branch and Design Services initially and for a much larger body subsequently.

3. I will be meeting with you in the near future, to discuss the above and to develop recommendations.

CF: MR. JUDLIN
MR. SOILEAU

MR. ROMAN

Thomas E. Hanning
C/DES SVS Br

→ Mr. Barton

MEMO TO MR. WAGAHOFF

1. As per your recent request, attached is a suggested rationale for inclusion of an extra foot of freeboard in the WBHP levees as an allowance for future change in apparent sea level.
2. I have found only one prior expression by us which speaks directly to this issue. It was in the Reevaluation Study for Lake Pontchartrain, La. & Vic. The attached rationale represents a reasonable extension of that expression.

FREDERIC M. CHATRY
3/4/87

CF: w/encl

Mr. Seale
Mr. Soileau
Mr. Picciola
~~Mr. Shelton~~
✓ Mr. Harrington
Mr. Judlin

↓
CF: Mr. Barton

As is well documented over time, absolute sea level is not constant. The record includes periods of consistent rise or fall with contrary excursions sandwiched in. For the past 5,000 years, the trend has been consistently up. The current rate of rise in absolute sea level is thought to be less than 1.0 foot per century. A number of scenarios developed in the last few years project wildly accelerating rates of sea level rise due to the increased accumulations of carbon dioxide in the atmosphere. These scenarios are far too conjectural to influence project planning.

The impact of sea level rise on land areas is very much influenced by local conditions. Where the coastal land mass rises sharply as one moves landward from the shoreline, the impact is minimized, and where it does not, that impact is intensified. Furthermore, the vertical stability of the land mass involved is most important. Where subsidence is material, the impact of such subsidence frequently is far more important than the rise in absolute sea level. Insofar as those who live on the land mass are concerned, it makes no difference whether the sea goes up or the land goes down, for the impact is the same. Thus, planners in coastal areas must be more concerned with what is called the apparent rise in sea level than with the absolute rise.

The "stuff" of which Coastal Louisiana is largely comprised is the accumulated sediments brought down by the Mississippi. Depending upon location, it is more or less susceptible to various influences, all of which result in subsidence of the land mass over time. These include consolidation, compaction, downwarping of the coastal region under the load of sedimentation accumulation, faulting, and to some extent, extraction of groundwater and/or minerals. A localized phenomenon associated with forced drainage of developed areas can result in dramatic reductions in land elevations as the water is removed from highly organic surface soils, but this phenomenon is usually not particularly important insofar as levee grades are concerned.

Subsidence rates (excluding the aforementioned phenomenon) in some parts of the project area of as much as 2.0 - 2.5 feet per century have been observed while in others rates have been much lower. Unfortunately, the measurement of subsidence rates is not an exercise in precision, and the economic and environmental costs to build into levee projects allowances which would accommodate the larger values are so great as to preclude such allowances. There is, however, no doubt that subsidence is going on in the project area, and it represents another element of uncertainty with respect to the establishment of a levee freeboard to deal with the admittedly less than totally precise nature of our calculations. Currently, it is our practice to allow a freeboard of 2 feet above stillwater levels for levees not subject to waves, and 3 feet of freeboard above the stillwater level, or the limit of wave runup, whichever is the higher, where waves are a factor. An additional allowance of 1 foot for possible future changes in apparent sea level is believed to be prudent.

CECW-EP

Engineer Technical Letter
No. 1110-2-349

1 April 1993

**Engineering and Design
REQUIREMENTS AND PROCEDURES FOR REFERENCING
COASTAL NAVIGATION PROJECTS TO MEAN LOWER LOW WATER DATUM**

1. Purpose.

This engineer technical letter (ETL) provides guidance, technical considerations, and general implementation procedures for referencing coastal navigation projects to a consistent Mean Lower Low Water (MLLW) datum based on tidal characteristics defined and published by the U.S. Department of Commerce. This guidance is necessary to implement applicable portions of Section 224 of the Water Resources Development Act of 1992.

2. Applicability.

This ETL applies to HQUSACE elements, major subordinate commands, districts, laboratories, and field operating activities (FOA) having responsibilities for design of river and harbor navigation projects on the Atlantic, Gulf, and Pacific coasts, and where such projects are subject to tidal influence.

3. References.

- a.* Rivers and Harbors Appropriation Act of 1915 (38 Stat. 1053; 33 U.S.C. 562).
- b.* Water Resources Development Act of 1992 (WRDA 92), Section 224, Channel Depths and Dimensions.
- c.* ER 1130-2-306, Navigation Lights, Aids to Navigation, Navigation Charts, and Related Data Policy, Practices and Procedures.
- d.* ER 1130-2-307, Dredging Policies and Practices.
- e.* EM 1110-2-1003, Hydrographic Surveying.
- f.* EM 1110-2-1414, Water Levels and Wave Heights for Coastal Engineering and Design.
- g.* Tidal Datum Planes, Special Publication 135, U.S. Department of Commerce.

h. Manual of Tide Observations, Publication 30-1, U.S. Department of Commerce.

i. Tide and Current Glossary, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Rockville, MD.

j. Statement of Work for the Installation, Operation and Maintenance of Tide Stations, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Rockville, MD.

k. User's Guide for the Installation of Bench Marks and Leveling Requirements for Water Level Stations, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Rockville, MD.

l. The National Tidal Datum Convention of 1980, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Rockville, MD.

4. Background.

a. Depths of USACE navigation projects in coastal areas subject to tidal influences are currently referred to a variety of vertical reference planes, or datums. Most project depths are referenced to a local or regional datum based on tidal phase criteria, such as Mean Low Water, Mean Lower Low Water, Mean Low Gulf, Gulf Coast Low Water Datum, etc. Some of these tidal reference planes were originally derived from U.S. Department of Commerce, National Ocean Service (NOS) observations and definitions used for the various coasts (see references 3g and 3i). Others were specifically developed for a local project and may be without reference to an established vertical network (e.g. National Geodetic Vertical Datum of 1929) or a tidal reference. Depending on the year of project authorization, tidal epoch, procedures, and the agency that established or connected to the reference datum, the current adequacy of the vertical reference may be uncertain, or in some cases, unknown. In some

instances, project tidal reference grades may not have been updated since original construction. In addition, long-term physical effects may have significantly impacted presumed relationships to the NOS MLLW datum.

b. The National Tidal Datum Convention of 1980 (reference 3l) established one uniform, continuous tidal datum for all marine waters of the United States, its territories, and Puerto Rico. This convention thereby lowered the reference plane (and tidal definition) of both the Atlantic and Gulf coasts from a mean low water datum to a MLLW datum. In addition, the National Tidal Datum Epoch was updated to the 1960-1978 period and mean higher/high water datums used for legal shoreline delineation were redefined.

c. Since 1989, nautical charts published by the Coast and Geodetic Survey (C&GS), U.S. Department of Commerce, reference depths (or soundings) to the local MLLW reference datum, also termed a "chart datum." U.S. Coast Guard (USCG) Notices to Mariners also refer depths or clearances over obstructions to MLLW. Depths and clearances reported on USACE project/channel condition surveys provided to C&GS, for incorporation into their published charts in plan or tabular format, must be on the same NOS MLLW reference as the local chart of the project site.

d. WRDA 92, Section 224, requires consistency between USACE project datums and C&GS marine charting datums. This act amended Section 5 of the Rivers and Harbors Appropriation Act of 1915 (reference 3a) to define project depths of operational projects as being measured relative to a MLLW reference datum for all coastal regions. (Only the Pacific coast was previously referenced to MLLW). The amendment states that this reference datum shall be as defined by the Department of Commerce for nautical charts (C&GS) and tidal prediction tables (NOS) for a given area. This provision requires USACE project reference grades be consistent with NOS MLLW.

5. Impact of MLLW Definition on USACE Projects.

a. Corps navigation projects that are referenced to older datums (e.g., Mean Low Water along the Atlantic coast or various Gulf coast low water reference planes) must be converted to and correlated with the local MLLW tidal reference established by the NOS. Changes in project grades due to redefining the datum from mean low water to NOS MLLW will normally be small, and in

many cases will be compensated for by offsetting secular sea level or epochal increases occurring over the years. Thus, impacts on dredging due to the redefinition of the datum reference are expected to be small and offsetting in most cases.

b. All Corps project reference datums, including those currently believed to be on MLLW, must be checked to insure that they are properly referred to the latest tidal epoch, and that variations in secular sea level, local reference gage or benchmark subsidence/uplift, and other long-term physical phenomena are properly accounted for. In addition, projects should be reviewed to insure that tidal phase and range characteristics are properly modeled and corrected during dredging, surveying, and other marine construction activity, and that specified project clearances above grade properly compensate for any tidal range variances. Depending on the age and technical adequacy of the existing MLLW reference (relative to NOS MLLW), significant differences could be encountered. Such differences may dictate changes in channels currently maintained. Future NOS tidal epoch revisions will also change the project reference planes.

c. Conversion of project datum reference to NOS MLLW may or may not involve field tidal observations. In many projects, existing NOS tidal records can be used to perform the conversion, and short-term simultaneous tidal comparisons will not be required. Tidal observations and/or comparisons will be necessary for projects in areas not monitored by NOS or in cases where no recent or reliable observations are available (see references 3e and 3h).

6. Implementation Actions.

A number of options are available to USACE commands in assessing individual projects for consistency and accuracy of reference datums, and performing the necessary tidal observations and/or computations required to adequately define NOS MLLW project reference grade. Datum establishment or verification may be done using USACE technical personnel, through an outside Architect-Engineer contract, by another Corps district or laboratory having special expertise in tidal work, or through reimbursable agreement with NOS. Regardless of who performs the tidal study, all work should be closely coordinated with both the C&GS and NOS in the Department of Commerce.

a. Technical Specifications. The general techniques

for evaluating, establishing, and/or transferring a tidal reference plane are fully described in the USACE and Department of Commerce publications referenced in paragraph 3. These references should be cited in technical specifications used for a tidal study contract or reimbursable agreement with another agency/command.

b. Department of Commerce Contacts. Before and during the course of any tidal study, close coordination is required with NOS. The NOS point of contact is the Chief, Ocean and Lake Levels Division, National Ocean Service (ATTN: N/OES2), 6001 Executive Blvd., Rockville, MD 20852, telephone (301) 443-8807, FAX (301) 443-1920.

c. Sources. If in-house forces are not used, the following outside sources may be utilized to perform a tidal study of a project, including any field tidal observations.

(1) Architect-Engineer (A-E) Contract. A number of private firms possess capabilities to perform this work. Either a fixed-scope contract or indefinite delivery type (IDT) contract form may be utilized. In some instances, this type of work may be within the scope of existing IDT contracts. Contact NOS to obtain a typical technical specification which may be used in developing a scope of work. The references in paragraph 3 of this letter must be cited in the technical scope of work for the A-E contract.

(2) Reimbursable Support Agreement. Tidal studies and datum determinations may be obtained directly from the NOS, Department of Commerce, via a reimbursable support agreement. A cooperative agreement can be configured to include any number of projects within a district. Funds are provided to NOS by standard inter-agency transfer methods and may be broken down to individual projects. Contact the Chief of the Ocean and Lake Levels Division at the address given in paragraph 6b to coordinate and schedule a study agreement.

FOR THE DIRECTOR OF CIVIL WORKS:

d. Scheduling of Conversions. Section 224 of WRDA 92 did not specify an implementation schedule for converting existing projects to NOS MLLW (or verifying the adequacy of an existing MLLW datum). It is recommended that a tidal datum study be initiated during a project's next major maintenance cycle.

e. Funding. No centralized account has been established to cover the cost of converting projects to NOS MLLW datum. Project O&M funds will be used to cover the cost of tidal studies and/or conversions on existing projects. For new construction, adequate funding should be programmed during the initial planning and study phases. Budget estimates for performing the work can be obtained from NOS.

f. MLLW Relationship to National Vertical Network. Reference 3k prescribes requirements for connecting USACE tidal bench marks to the national vertical network maintained by C&GS; either the National Geodetic Vertical Datum, 1929 Adjustment (NGVD 29) or the updated North American Vertical Datum, 1988 Adjustment (NAVD 88). Project condition surveys, maps, reports, studies, etc. shall clearly depict the local relationship between MLLW datum and the national vertical network.

g. Changes in Dredging. It is not expected that the datum conversion will significantly impact dredging requirements. USACE commands should request HQUSACE guidance should a datum conversion cause a significant change in a channel's maintained depth.

7. Proponency.

The proponent for this technical letter is the Engineering Division, HQUSACE. Any comments regarding improvements and/or clarifications should be submitted to HQUSACE, ATTN: CECW-EP-S, 20 Massachusetts Ave., NW, Washington, D.C. 20314-1000.

PAUL D. BARBER, P.E.
Chief, Engineering Division
Directorate of Civil Works

[Docket No. 930850-3150]

Affirmation of Vertical Datum for Surveying and Mapping Activities

SUBAGENCY: National Ocean Service, Coast & Geodetic Survey, National Oceanic and Atmospheric Administration, DOC.

ACTION: Notice.

SUMMARY: This Notice announces a decision by the Federal Geodetic Control Subcommittee (FGCS) to affirm the North American Vertical Datum of 1988 (NAVD 88) as the official civilian vertical datum for surveying and mapping activities in the United States performed or financed by the Federal Government, and to the extent practicable, legally allowable, and feasible, require that all Federal agencies using or producing vertical height information undertake an orderly transition to NAVD 88.

FOR FURTHER INFORMATION CONTACT: Mr. James & Stem, N/CG1x4, SSMC3, Station 9357, National Geodetic Survey, NOAA, Silver Spring, Maryland 20910; telephone: 301-713-3230.

SUPPLEMENTARY INFORMATION The Coast and Geodetic Survey (C&GS), National Geodetic Survey (NGS), has completed the general adjustment portion of the NAVD 88 project, which includes approximately 80 percent of the previously published bench marks in the NGS data base. The remaining "posted" bench marks which comprise approximately 20 percent of the total will be published by October 1993. Regions of significant crustal motion will be analyzed and published as resources allow.

NAVD 88 supersedes the National Geodetic Vertical Datum of 1929 (NGVD 29) which was the former official height reference (vertical datum) for the United States. NAVD 88 provides a modern, improved vertical datum for the United States, Canada, and Mexico. The NAVD 88 heights are the result of a mathematical least squares general adjustment of the vertical control portion of the National Geodetic Reference System and include 80,000 km of new U.S. Leveling observations undertaken specifically for this project.

NAVD 88 height information in paper or digital form is available from the National Geodetic Information Branch, N/CG174, SSMC3, Station 9202, National Geodetic Survey, NOAA, Silver Spring, Maryland, 20910; telephone: 301-713-3242.

Dated: June 21, 1993.

W. Stanley Wilson,
Assistant Administrator for Ocean Services and Coastal Zone Management, NOAA.

[FR Doc. 93-14922 Filed 6-23--93; 8:45 am]

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Federal Register / Vol. 58, No. 120 / Thursday, June 24, 1993 / Notices 34245
[Docket No. 930650-3150]

Affirmation of Vertical Datum for Surveying and Mapping Activities

SUBAGENCY: National Ocean Service, Coast & Geodetic Survey, National Oceanic and Atmospheric Administration, DOC.

ACTION: Notice.

SUMMARY: This Notice announces a decision by the Federal Geodetic Control Subcommittee (FGCS) to affirm the North American Vertical Datum of 1988 (NAVD 88) as the official civilian vertical datum for surveying and mapping activities in the United States performed or financed by the Federal Government. and to the extent practicable, legally allowable, and feasible, require that all Federal agencies using or producing vertical height information undertake an orderly transition to NAVD 88.

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Dated: June 21, 1993.

W. Stanley Wilson, Assistant Administrator for Ocean Services and Coastal Zone Management, NOAA.

[FR Doc. 93-14922 Filed 6-23--93; 8:45 am)

BILLING CODE 351

The Board of Commissioners

OF THE

Orleans Levee District

SUITE 202 — ADMINISTRATION BUILDING
NEW ORLEANS LAKEFRONT AIRPORT

New Orleans, La.

70126

August 13, 1993

PROTECTING YOU
AND YOUR FAMILY

Mr. Eugene Tickner
Chief Engineering Division
U. S. Army Corps of Engineers
New Orleans District
P. O. Box 60267
New Orleans, La. 70160-0267

RE: London and Orleans Avenue Outfall Canals
Lake Pontchartrain & Vicinity Hurricane Protection

Mr. Tickner:

Enclosed are the description of benchmarks for Phase IID Orleans Avenue Canal, and Pumping Station No. 3 to Mirabeau London Avenue Canal projects. The Orleans Avenue Canal benchmark is based upon a 1983 datum and the London Avenue Canal benchmark is based upon a 1964 datum. Other contracts for work on these canals are based upon the same datums for each canal.

According to our records there is an adjustment required between these two datums. The adjustment required makes elevation of flood protection for the Orleans Canal higher than that for the London Canal. This appears to be an intolerable situation.

Please adjust as may be required so as to provide maximum protection for both canals.

Sincerely,

Stevan G. Spencer
Stevan G. Spencer, P.E.
Chief Engineer

SGS:FPM:pns
Enclosure

H. B. Lansden
Geneva Grille, DOTD

CECW-EP

Technical Letter
No. 1110-1-152

1 January 1994

Engineering and Design
CONVERSION TO THE NORTH AMERICAN VERTICAL DATUM OF 1988

1. Purpose

This technical letter provides technical guidance and implementation procedures for the conversion from the National Geodetic Vertical Datum of 1929 (NGVD29) to the North American Vertical Datum of 1988 (NAVD88).

2. Applicability

This letter is applicable to all HQUSACE elements, major subordinate commands, districts, laboratories, and field operating activities having responsibility for civil works, military construction, or environmental restoration projects.

3. References

a. Water Resources Development Act of 1992 (WRDA 92), Section 224, Channel Depths and Dimensions.

b. EM 1110-2-1003, Hydrographic Surveying.

c. Converting the National Flood Insurance Program to the North American Vertical Datum of 1988: Guidelines for Community Officials, Engineers, and Surveyors, FEMA Report No. FIA-20, June 1992.

d. Results of the General Adjustment of the North American Datum of 1988, American Congress on Surveying and Mapping Journal of Surveying and Land Information Systems, Vol. 52, No. 3, 1992, pp. 133-149.

e. American Congress on Surveying and Mapping Ad Hoc Committee Report on NAVD88, Special ACSM Report, 1990.

4. Discussion

a. NGVD29 has been replaced by NAVD88, an international datum adopted for use in Canada, the United States and Mexico. NAVD88 was established to resolve problems and discrepancies in NGVD29. The adjustment

of NAVD88 was completed in June 1991 by the National Geodetic Survey (NGS), an agency of the Department of Commerce, National Oceanic and Atmospheric Administration (NOAA). NAVD88 was constrained by holding fixed the height of a single primary tidal benchmark (BM) at Father's Point/Rimouski, Québec, Canada, and performing a minimally constrained general adjustment of U.S.-Canadian-Mexican leveling observations. The result of this adjustment is newly published NAVD88 elevation values for benchmarks (BMs) in the NGS inventory. Most Third-Order BMs, including those of other Federal, state and local government agencies, were not included in the NAVD88 adjustment. Appendix A contains further background information on the development and adjustment of NAVD88.

b. The Federal Geodetic Control Subcommittee (FGCS) of the Federal Geographic Data Committee (FGDC) has affirmed that NAVD88 shall be the official vertical reference datum for the U.S. The FGDC has prescribed that all surveying and mapping activities performed or financed by the Federal Government make every effort to begin an orderly transition to NAVD88, where practicable and feasible.

c. Both tidal and non-tidal low water reference planes and datums are affected by the change to NAVD88. The datum for the Great Lakes is now the International Great Lakes Datum of 1985 (IGLD85). Unlike the prior datum (IGLD55), IGLD85 has been directly referenced to NAVD88 and originates at the same point as NAVD88. Elevations of reference points/datums along the various inland waterway systems will also be impacted by the change in datums.

d. The transition to NAVD88 may have considerable impact on Corps projects, including maps, drawings, and other spatial data products representing those projects. However, once completed, the transition will result in a more accurate vertical reference datum that has removed leveling errors, accounts for subsidence, and other changes in elevation.

e. A computer program entitled "VERTCON 1.0" can be used to make approximate conversions between NGVD29 and NAVD88. This program was developed by NGS and during the later part of FY94 will be incorporated into the USACE program CORPSCON. VERTCON conversions are intended for general small-scale mapping uses -- VERTCON should not be used for converting benchmark elevations used for site plan design or construction applications. Further details on VERTCON are at Appendix A.

5. Action

a. USACE commands should begin the orderly transition to NAVD88. Procedural guidance for performing this conversion is given in Appendix A.

b. The conversion to NAVD88 should be accomplished on a project by project basis. The relationship of all project datums to both NGVD29 and NAVD88 will be clearly noted on all drawings, charts, maps, and elevation data files.

c. In accordance with Section 24 of WRDA 92, when elevations are referred to a tidal reference plane in coastal waters of the U.S., Mean Lower Low Water (MLLW) shall be used as the vertical datum. Tidal BMs should be tied to NAVD88 instead of NGVD29 where NAVD88 data is available. Tidal datums shall be established in accordance with the procedures outlined in EM 1110-2-1003.

FOR THE DIRECTOR OF CIVIL WORKS:

1 Appendix
APP A - Development and Implementation of
NAVD88

d. Other hydraulic-based reference planes established by USACE for the various inland waterways, reservoirs, and pools between control structures should continue to be used for consistency; however, they should also be connected with the NAVD88 where practicable and feasible.

e. In project areas where local municipal or sanitary jurisdictions have established their own vertical reference planes, every attempt should be made to obtain the relationship between that local datum and NGVD29 and/or NAVD88; and clearly note this relationship on all drawings, charts, maps, and elevation data files.

5. Technical Assistance

The U.S. Army Topographic Engineering Center (USATEC) may be consulted if technical assistance is required in the conversion effort. Contact Commander and Director, USATEC, ATTN: CETEC-TL-SP, Building 2592, Fort Belvoir, VA 22060-5546. The HQUSACE proponent for this action is the Engineering Division, Directorate of Civil Works, ATTN: CECW-EP-S.

PAUL D. BARBER
Chief, Engineering Division
Directorate of Civil Works

APPENDIX A DEVELOPMENT AND IMPLEMENTATION OF NAVD88

SECTION I Background

1. General

a. The NAVD88 is a new vertical datum for North America which effectively covers Canada, Mexico, and the U.S. The new adjustment of the U.S. National Vertical Control Network (NVCN) was authorized in 1978, and in 1982 the National Oceanic and Atmospheric Administration (NOAA) and Canada signed a Memorandum of Understanding (MOU) regarding the adoption of a common, international vertical control network called the NAVD88.

b. The Federal Geodetic Control Subcommittee (FGCS) of the Federal Geographic Data Committee (FGDC) has adopted the new NAVD88 datum. In addition, NAVD88 was established in conjunction with the International Coordinating Committee on Great Lakes Basic Hydraulic and Hydrologic Data. This committee defined the IGLD85 which was published for use in January 1992. IGLD85 replaced IGLD55.

2. The National Vertical Control Network (NVCN): NGVD29 and NAVD88

a. The NVCN consists of a hierarchy of interrelated nets which span the United States. Before the adoption of NAVD88, benchmark (BM) elevations of the NVCN were published as orthometric heights referenced to NGVD29. NGVD29 was established by the United States Coast and Geodetic Survey's (USC&GS's) 1929 General Adjustment. NGVD29 was established by constraining the combined U.S. and Canadian first order leveling nets to conform to Mean Sea Level (MSL) as determined at 26 long term tidal gage stations that were spaced along the east and west coast of North American and along the Gulf of Mexico, with 21 stations in the U.S. and 5 stations in Canada.

b. Local MSL is a vertical datum of reference that is based upon the observations from one or more tidal gaging stations. NGVD29 was based upon the assumption that local MSL at those 21 tidal stations in the U.S. and 5 tidal stations in Canada equalled 0.0000 foot on NGVD29. The value of MSL as measured over the Metonic cycle of 19 years shows that this assumption is

not entirely valid and that MSL varies from station to station.

c. The NGVD29 was originally named the Mean Sea Level Datum of 1929. It was known at the time that because of the variation of ocean currents, prevailing winds, barometric pressures and other physical causes, the MSL determinations at the tide gages would not define a single equipotential surface. The name of the datum was changed from the Mean Sea Level Datum to the NGVD29 in 1973 to eliminate the reference to sea level in the title. This was a change in name only; the definition of the datum established in 1929 was not changed. Since NGVD29 was established, it has become obvious that the geoid based upon local mean tidal observations would change with each measurement cycle. Estimating the geoid based upon the constantly changing tides does not provide the most stable estimate of the shape of the geoid, or the basic shape of the Earth.

d. The datum for NAVD88 is based upon the mass or density of the Earth instead of the varying heights of the seas. Measurements in the acceleration of gravity are made at observation points in the network and only one datum point, at Pointe-au-Pere/Rimouski, Québec, Canada, is used. The vertical reference surface is therefore defined by the surface on which the gravity values are equal to the control point value. Although the international cooperation between the United States and Canada greatly strengthened the 1929 network, Canada did not adopt the 1929 vertical datum. The NGVD29 was strictly a national datum. NAVD88 is an international vertical datum for the US, Canada, and Mexico.

3. Distinction Between Orthometric and Dynamic Heights

a. There are several different reference elevation systems used by the surveying and mapping community. Two of these height systems are relevant to IGLD85: orthometric heights and dynamic heights. Geopotential numbers relate these two systems to each other. The geopotential number (C) of a BM is the difference in potential measured from the reference geopotential surface to the equipotential surface passing through the

A

survey mark. In other words, it is the amount of work required to raise a unit mass of 1 kg against gravity through the orthometric height to the mark. Geopotential differences are differences in potential which indicate hydraulic head. The orthometric height of a mark is the distance from the reference surface to the mark, measured along the line perpendicular to every equipotential surface in between. A series of equipotential surfaces can be used to represent the gravity field. One of these surfaces is specified as the reference system from which orthometric heights are measured. These surfaces defined by the gravity field are not parallel surfaces because of the rotation of the earth and gravity anomalies in the gravity field. Two points, therefore, could have the same potential but may have two different orthometric heights. The value of orthometric height at a point depends on all the equipotential surfaces beneath that point.

b. The orthometric height (H) and the geopotential number (C) are related through the following equation:

$$C = G * H$$

where G is the gravity value estimated for a particular system. Height systems are called different names depending on the gravity value (G) selected. When G is computed using the Helmert height reduction formula that is used for NAVD88, the heights are called Helmert Orthometric Heights. When G is computed using the International Formula for Normal Gravity, the heights are called Normal Orthometric Heights. When G is equal to normal gravity at 45° latitude, the heights are called Normal Dynamic Heights. It should be noted that dynamic heights are just geopotential numbers scaled by a constant, using normal gravity at 45° latitude equal to 980.6199 gals. Therefore, dynamic heights are also an estimate of hydraulic head. In other words, two points that have the same geopotential number will have the same dynamic height.

c. IGLD55 is a normal dynamic height system which used a computed value of gravity based on the International Formula for Normal Gravity. Today, there is sufficient observed gravity data available to estimate "true" geopotential differences instead of "normal" geopotential differences. The "true" geopotential differences, which were used in developing IGLD85 and NAVD88, will more accurately estimate hydraulic head.

4. Problems with NGVD29 and Why a New Datum Needed to be Established

a. Approximately 625,000 km of leveling have been added to the National Geodetic Reference System (NGRS) since the 1929 adjustment. Each new line has been adjusted to the network. The new leveling data uncovered some problems in NGVD29. Through the years, the agreement between the new leveling and the network BM elevations slowly grew worse. An investigation of NGVD29 general adjustment results indicates that large residuals were distributed in some areas of the country during that adjustment. For example, the accumulated 1929 adjustment correction along a 3000 km east-west leveling route from Crookston, Minnesota, to Seattle, Washington is a delta of 89 centimeters (cm).

b. Inconsistencies in NGVD29 have increased over the years. This increase is a function of factors such as:

(1) Many BMs were affected by unknown vertical movement due to earthquake activity, postglacial rebound, and ground subsidence.

(2) Numerous BMs were disturbed or destroyed by highway maintenance, building, and other construction.

(3) New leveling became more accurate because of better instruments, procedures, and improved computations. It was decided in 1977 that the high accuracy achieved by the new leveling was being lost when forced to fit the 1929 network, and plans were made to begin developing a new national vertical network.

c. These inconsistencies have not always been apparent to the user since NGS has periodically readjusted large portions of the NVCN and spread these large residuals over large areas. Eventually, however, there would be a large number of areas in which surveyors would not be able to check their work using NGVD29. NAVD88 is specifically designed to remove the inconsistencies and distortions such as those found in the NGVD29. NGS has held off incorporating approximately 40,000 km of newer leveling data for these reasons. These data were incorporated into the NAVD88.

5. Selection of the Adjustment Method for NAVD88

a. The FGCS created a Vertical Subcommittee in 1989 to study the impact of the NAVD88 on the programs of member agencies and to recommend a datum definition. Several different datum definitions for

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1 Jan 94

NAVD88 were studied by the subcommittee and the three options below were selected for final consideration:

(1) Fix the elevation or mean sea level at a single point.

(2) Fix mean sea level at four tide gages located at the network corners.

(3) Fix the NGVD29 elevations at 18 existing, well scattered BMs.

b. Two options were considered for the establishment of the vertical datum: (1) tidal epoch or (2) a minimally constrained adjustment. The tidal epoch option required that the adjustment hold MSL fixed at all appropriate primary tide stations and use the latest available tidal epoch. This definition is actually the same as NGVD29, but used the latest data available. The other option used a minimally constrained adjustment holding local MSL fixed at one primary tide station and adjusting all leveling data to it. This second option would maintain the integrity of the leveling data but would also create the greatest deviation from the presently published data.

c. Research was done by NGS to determine which option would be the best choice. To assist in the NAVD88 datum definition decision, several adjustments were performed using different constraints. The results obtained from several trial adjustments indicate that no matter which datum definition scenario is chosen for NAVD88, including a minimally constrained adjustment, that changes in absolute heights of as much as 75 to 100 cm would exist between NGVD29 and NAVD88.

d. In addition to the NGS research, agencies and appropriate bodies were queried to determine which option would be their preference and to ask for recommendations. The FGCS and the American Congress on Surveying and Mapping (ACSM) established committees to investigate the impact of NAVD88 on their members' activities and the activities of others in the community. Members of these committees were requested to provide documentation on the affects that the readjustment would have on their user populations and to include specific examples describing the real impact of a new vertical datum on their products. USACE was included in the questionnaire survey. The ACSM report is included as a reference to this document.

e. As a preliminary measure, both committees drafted recommendations for NAVD88 and specified that NGS should:

(1) Perform minimally-constrained least squares adjustment of the data for NAVD88.

(2) Shift the datum vertically to minimize recompilation of National Mapping Products.

(3) Develop computer transformation software to convert between NGVD29 and NAVD88. ("VERTCON").

(4) Develop national and/or regional geoid models to ensure GPS height differences meet at least 2nd Order, Class II FGCS precise geodetic leveling standards for accuracy.

f. Results indicated that the tidal epoch option would minimize the magnitude of the changes from NGVD29 to NAVD88 and thus possibly allow direct comparison of present hydrographic survey elevations with the proposed new NAVD88 elevations. The smaller change between elevations would cause less confusion and concern over flow heights, and the like. Regardless of the datum definition selected, large differences would exist between the NAVD88 and the NGVD29 heights. It should be noted that the NAVD88 heights are better estimates of orthometric heights than the NGVD29 heights. Better estimates of orthometric heights will become more critical in the future as surveying techniques continues to become more sophisticated and more accurate. The improved accuracy of geoid height determinations using GPS data requires the best estimate of true orthometric heights. Many cartographers want heights on their maps based on the best estimate of true orthometric heights.

6. The NAVD88 Adjustment

a. The NAVD88 adjustment is the culmination of over ten years of work. This effort has included: establishing about 100,000 km of trunk line leveling to reinforce weak areas in the network; modernizing the vast amount of leveling observation and description data that has been collected for over a century; performing adjustments of sections of the network to verify the quality of the observation data; informing the public users of the network of the pending change and determining the impact on the nation's engineering activities. After the datum definition was selected to be a minimally

constrained adjustment, the final task of this effort was to perform the least squares adjustment of the whole network.

b. The general adjustment of NAVD88 was completed in June 1991. The primary network consists of 200 loops containing 909 junction BMs. The network connects to 57 primary tidal stations which are part of the National Primary Tidal Network and 55 international water-level stations along the Great Lakes. In addition, 28 border connections were made to the Canadian vertical control network and 13 to the Mexican vertical control network. Third order BMs of other agencies (e.g., USACE) were not included in this adjustment. The 500,000 BMs established by the USGS were also not placed in computer readable form and therefore will not have NAVD88 heights. In addition, USACE commands have established thousands of BMs which will not have NAVD88 heights.

c. A particular concern for the developers of the NAVD88 was how to resolve the many issues associated with the National Mapping Program (NMP) of USGS and the National Map Accuracy Standard (NMAS). The NMP includes more than 83,000 different map products of which over 7 million copies are distributed annually. Almost all of these products contain elevation information as contours and spot elevations on maps or as elevation arrays in Digital Elevation Models. Changing these products, both graphical and digital, to the NAVD88 will be a massive and costly undertaking and will require a decade or more to complete.

d. The new leveling data have additional corrections applied for refraction and rod correction and are adjusted in geopotential units rather than the orthometric system used in the past. The datum definition is the most scientifically acceptable of all the definitions considered and is the most natural because it is based on an undisturbed representation of the Earth's gravity field. It is the most suitable for the geoid height computations needed for the reduction of GPS ellipsoidal heights. The main disadvantage is the differences with MSL on the west coast. At Seattle, a person standing on the zero elevation contour (NAVD88) will barely have their head above water at midtide.

e. Preliminary analysis indicates that the overall differences between orthometric heights referred to NAVD88 and to the NGVD29 range from approximately -40cm to +150cm. Most surveying applications should

not be significantly affected because the changes in relative height between adjacent BMs in most geotechnically stable areas should be less than 1 cm. In many geotechnically stable areas, a single bias factor describing the difference between NGVD29 and NAVD88 can be estimated and used for most mapping applications. This was a significant consideration for assessing the impact on the National Mapping Products. The absolute height values will change much more, but this should not be the surveyor's biggest concern, since he/she should be concerned with ensuring that all height values of BMs are referenced to the same vertical datum. The overall differences between dynamic heights referred to the IGLD85 and to IGLD55 will range from approximately 1 to 40 cm.

7. Maintenance of Parallel Datums by NGS: NAVD88 and NGVD29

For a period of time, NGS will support both the NAVD88 and the NGVD29. Beyond the next 5-7 years, continued maintenance of NGVD29 will depend on user demands and budget constraints.

SECTION II

Impact of NAVD88 Conversion on Other Hydraulic Reference Datums

8. International Great Lakes Datum of 1955 (IGLD55)

a. IGLD55 is a datum common to the United States and Canada and is defined by international agreement. Before the establishment and adoption of the IGLD55, the differences in elevation between the lakes had been determined but had not been connected to sea level and lake level data published from the United States and Canada did not match for the same lakes and rivers. The IGLD55 was an international cooperative effort between the those two countries, the result of which was that the Great Lakes-St. Lawrence River system was then covered by a single uniform vertical control network. The IGLD55 is different and separate from the NGVD29.

b. IGLD55 is by definition a hydraulic (i.e., dynamic) datum. The reference zero for IGLD55 is based on mean water level surface at Father's Point (Pointe-au-Pere), Québec, Canada. Holding this point fixed determined the IGLD55 datum. A procedure termed a "water level transfer" has been used to establish a local vertical datum on each of the Great Lakes. Research has concluded that the water level transfer technique was concluded to be at least as accurate as First-Order, Class I geodetic leveling. The remaining lakes were incorporated using a combination of level lines and water level transfers. Adjusted elevations on the IGLD55 are referenced using the dynamic number system. The dynamic value of a benchmark (BM) is not a true linear elevation, but a serial number given to the level surface on which the mark lies. Dynamic elevations were adopted for the IGLD55 primarily because they provide a means by which the geopotential hydraulic head can be measured more accurately between two points.

c. The earth's crust experiences movements around the entire Great Lakes and St. Lawrence River area. Therefore, the vertical reference datum for this area must be vertically readjusted every 25 to 30 years. This crustal movement is called "isostatic rebound," which is the gradual rising of the earth rebounding from the weight of the glaciers during the last glacial age. When IGLD55 was created, it was known that readjustment would be necessary due to the effects of isostatic rebound. Crustal movement is not uniform across the Great Lakes basin and causes bench marks to shift not only with respect to each other, but also with respect to the initial reference

point. Subsidence and other local effects can cause bench marks to shift as well.

9. International Great Lakes Datum of 1985 (IGLD85)

a. The Coordinating Committee on Great Lakes Basic Hydraulic and Hydrologic Data revised the IGLD55 datum and established IGLD85. This committee has input to the international management of the Great Lakes-St. Lawrence River system. Representatives from the U.S. and Canada are members on this committee. The efforts of the Coordinating Committee to revise IGLD55 and establish IGLD85 were coordinated with the efforts to establish the new common international vertical datum for the US, Canada and Mexico, NAVD88.

b. The IGLD85 is the current vertical control reference system in the Great Lakes Basin. The IGLD55 was the vertical control reference system for this area until the publication of the IGLD85 in January, 1992. Originally, an IGLD 80 had been planned, but the project was extended. The epoch that was actually used to determine the mean water level for the new datum was from 1983-1988 of which the mean year is 1985. The reference zero point for IGLD85 is located at benchmark #1250G, located at Rimouski, Québec. This benchmark has an IGLD85 elevation of 6.723 meters and IGLD55 elevation of 6.263 meters. IGLD85 increases the number and accuracy of benchmarks in the Great Lakes area. Corps districts were targeted to have converted over to IGLD85 by January of 1993. This cannot be practically done until NOAA publishes complete IGLD85 BM data for the area. IGLD85 data is available for the gages, but the spacing of the gages is not dense enough to support conversion of local project control.

c. Agencies in the U.S. and Canada will use IGLD85. The National Oceanic Service (NOS) and the Canadian Hydrographic Service (CHS) began reporting water levels referenced to IGLD85 upon its implementation in January, 1992. For a period of time, conversion factors for both IGLD55 and IGLD85 water level data will be provided by NOAA/NOS Great Lakes Section and CHS. The monthly water level bulletins published by USACE and CHS will reflect this information.

d. IGLD85 will not change water levels established for federal flood insurance programs in the US. These levels will be referred to NAVD88. Elevations common to both NAVD88 and IGLD85 are available from NOAA. Lake-level outflows also will not be affected by the datum change to IGLD85. As benchmark information becomes available, navigation, construction, and other improvement work on the Great Lakes should be referred to IGLD85. Either datum is acceptable until the benchmark data is available for the respective USACE District or project area. Drawings shall include a note for the vertical IGLD datum in use to avoid blunders. USACE permit applications will still be referenced to the Ordinary High Water Mark (OHWM) as defined under Section 10 of the Rivers and Harbors Act. As benchmark information becomes available, new applications should reference IGLD85.

10. NAVD88 and IGLD85

a. The specific needs of the Great Lakes system were taken into account while the decision were being made about how NAVD88 was to be established. Analyses of data in the Great Lakes Basin was used to determine the effects of the datum constraint, magnitudes of height changes from the IGLD55, deficiencies in the network design, selection of water-level station pairs to be used to generate zero geopotential difference observations, and additional releveling requirements. This coordination provided a check on the accuracy of the work and established a conversion between the IGLD85 and NAVD88.

b. Elevations referenced to NGVD29 are unacceptable for use in resolving the involved problems of the Great Lakes System. The reference zero for NGVD29 is not located within the Great Lakes system and orthometric elevations are not sufficient for use with large bodies of water such as the Great Lakes. The dynamics of large bodies of water are not modelled well by considering them as single equipotential surfaces. Other forces such as gravity must be considered. For example, water level measurements obtained at both ends of the Lake and connected to the NGVD29 would show some magnitude of a permanently northerly slope.

c. The general adjustment of the NAVD88 and IGLD85 is one and the same. A minimum constraint adjustment of Canadian-Mexican-U.S. leveling observations was performed holding fixed the height of the primary tidal BM, referred to the new IGLD85 local

mean sea level height value, at Father's Point/Rimouski, Québec, Canada. This constraint satisfies the requirements of shifting the datum vertically to minimize the impact of NAVD88 on USGS mapping products, as well as provides the datum point desired by the IGLD Coordinating Committee for IGLD85. The only difference between IGLD85 and NAVD88 is that IGLD85 BM values are given in dynamic height units and NAVD88 values are given in Helmert orthometric height units. The geopotential numbers of BMs are the same in both systems.

d. Geopotential numbers from the general adjustment of NAVD88 were used to compute IGLD85 dynamic heights. They will provide the best estimate of hydraulic head. If secondary gage data are placed in computer readable form, they will also be incorporated into NAVD88 and IGLD85. NGS will publish NAVD88 heights and provide, upon special request, geopotential numbers for all BMs included in NAVD88.

e. The use of GPS data and a high-resolution geoid model to estimate accurate GPS-derived orthometric heights will be a continuing part of the implementation of NAVD88 and IGLD85. It is important that users initiate a project to convert their products to NAVD88 and IGLD85. The conversion process is not a difficult task, but will require time and resources. Other local reference planes have been established by local jurisdictions and these can be referenced to either IGLD85 or NAVD88.

11. 1974 Low Water Reference Plane (LWRP)

a. On the Mississippi River between the mouths of the Missouri and the Ohio Rivers (the Middle Mississippi River), depths and improvements are referenced to a LWRP. No specific LWRP year is used for the Middle Mississippi north of Cairo, IL. Below Cairo, IL, depths and improvements along the Lower Mississippi River are referenced to the 1974 LWRP. This is also a hydraulic reference plane, established from long term observations of the river's stage, discharge rates, and flow duration periods. The low water profile was developed about the 97-percent flow duration line. The elevation of the 1974 LWRP drops gradually throughout the course of the Mississippi, however, some anomalies in the profile are present in places (particularly in areas containing rock bottoms or groins/weirs). The gradient is approximately 0.5 feet per river mile. The ever-changing river bottom will influence the 1974 LWRP. Changes in the stage-

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discharge relationship will influence the theoretical flow line for the 1974 LWRP.

b. Construction and improvements along the lower river are performed relative to the 1974 LWRP at a particular point. Differences in 1974 LWRP elevations between successive points along the river are determined from simultaneous staff readings and are referenced to benchmarks along the bank. The 1974 LWRP slope gradients between any two points must be corrected by linear interpolation of the profile. Thus, over a typical 1-mile section of river with a 0.5-foot gradient, each 1000-foot C/C river cross section will have a different 1974 LWRP correction, each dropping successively at approximately 0.1-foot increments.

c. Where practicable and feasible, NAVD88 should be used as the common reference plane from which 1974 LWRP elevations are measured. The relationship of all project datums to both NGVD29 and NAVD88 should be clearly noted on all drawings, charts, maps, and elevation data files. All initial surveys should be referenced to both NAVD88 and NGVD29. If this is not feasible, then NGVD29 should be used as the common reference plane from which 1974 LWRP elevations are measured until the move to NAVD88 can be accomplished. Differences between the 1974 LWRP and NGVD29 are published for the reference benchmarks used to control surveys and construction activities. In some districts, surveys are performed directly on NGVD29 without regard to the 1974 LWRP profile (i.e., elevations above NGVD29 are plotted rather than depths below 1974 LWRP). The 1974 LWRP depths are then contoured from the plotted NGVD29 elevations, with the 1974 LWRP profile gradients applied during the contouring process. If a survey is conducted over a given reach of the river, the 1974 LWRP-NAVD88 and/or the 1974 LWRP-NGVD29 conversion must be interpolated based on the slope profile over that reach.

d. Controlled portions of the Upper Mississippi are referred to pool levels between the controlling structures. Although a variety of reference datums are used on other controlled river systems or impoundment reservoirs, most are hydraulically based and relate to some statistical pool level (e.g., "normal pool level," "flat pool level," "minimum regulated pool level", etc.).

e. On the Mississippi River above Melvin Price Locks and Dam at Alton, IL, to Lock and Dam No. 22 at Saverton, MO, the reference used is related to the

minimum regulated pool elevation. These pools are regulated referenced to a "hinge point". The pools are drawn down when the river's flow will provide adequate navigation depths naturally. When the flows are reduced to low volumes, the pools are reestablished and are essentially level. The depths and improvements along this reach of the Mississippi River are referenced to the "minimum regulated pool" elevations.

f. On the Mississippi River above Lock and Dam No. 22 at Saverton, MO, to St. Paul, MN, a "flat pool level" reference is used, and soundings are shown as "depth below flat pool". The flat pool is the authorized elevation of the navigation project and can be referenced to any number of local datums. Most commonly, this level is referenced to the mean sea level (MSL) datum of 1912, the general adjustment which preceded 1929. Conversions between MSL 1912 and NGVD29 are available. The Illinois Waterway pool elevations are referred to NGVD29, however, relationships to numerous other datums are also made.

g. Vertical clearances (bridges, transmission lines, etc.) are usually measured relative to high and low waters of record, or relative to full pool elevations. Shore lines shown on river drawings and navigation maps may be referenced to a low water datum (i.e., 1974 LWRP). On the Mississippi River above Lock and Dam No. 22 at Saverton, MO, the plotted shore line is referenced to full pool stage at dams with discharges equaled or exceeded 90 percent of the time. Given the variety of reference levels, special care must be taken to properly identify the nature and source of all vertical reference datums used on a project. The datum notes should include and clearly depict the relationship to NAVD88.

SECTION III

Impact of NAVD88 Conversion on U.S. Geological Survey and Federal Emergency Management Agency Programs

12. NAVD88 and the National Mapping Program (NMP)

a. The NMP of the U.S. Geological Survey (USGS) includes more than 83,000 different map products. Some 55,000 of these are in the 7.5-minute, 1:24,000-scale, primary quadrangle map series (7.5-minute quads). These maps are widely used by Corps planners. Since the 7.5-minute quad series is the largest scale in the NMP and contains the greatest detail and elevation accuracy, it will be significantly affected by the vertical datum change.

b. The contour intervals of the 7.5-minute map series are selected to best express the topography of the area. With a few exceptions, the contour intervals range from 5 feet for very flat country to 80 feet for rugged mountainous terrain. In between these limits are 10-, 20-, and 40-foot contour intervals. A few maps in recent years have been compiled with metric value contours. The USGS production processes were designed to produce maps that meet the requirements of the National Map Accuracy Standards (NMAS). This standard requires that the error in 90% of the test points be less than one-half contour interval. Field survey methods are generally used to test the maps, and the elevation on the map is determined by interpolation between contours.

c. Other forms of vertical information shown on the USGS 7.5-minute maps are BMs and useful elevations, which are indicated by a cross symbol with the elevation given to the nearest foot. These elevations are established by geodetic leveling of third-order accuracy or better. Spot elevations are measured by field or photogrammetric methods and are readily identifiable features, eg: natural lakes, definite tops and saddles, fence corners, or road intersections. These elevations are usually placed at a density of about one-per-square mile and are considered to be accurate to within three-tenths of the contour interval.

d. Digital files of topographic information will also be affected by a change in the vertical datum. A Digital Elevation Model (DEM) consists of a sampled array of elevations for ground positions that are usually at regularly spaced intervals. For the 7.5-minute DEM, the horizontal framework is the Universal Transverse Mercator (UTM) system and the spacing is 30 meters.

The 1-degree DEM horizontal coordinate system is based on the latitude and longitude positions of the World Geodetic System of 1972 (WGS 72) datum and the spacing is 3 arc-seconds. Another form of the digital topographic data that will be affected by the datum conversion is the hypsography category Digital Line Graphs (DLG).

e. In support of the production of the USGS topographic maps, a 3rd order level network was established that resulted in few places being more than 5 miles from basic vertical control. These lines were usually established along farm roads, railroads, desert track roads, and mountain trails (less dense in mountain areas). USGS field surveyors have established nearly 500,000 BMs. Most of this work is on NGVD29.

f. Changing the above NMP products, both graphic and digital, to the NAVD88 will be a massive and costly undertaking and will require a decade or more to complete.

(1) In areas where the datum change is very small compared with the contour interval, advantage can be taken of the tolerance in the NMAS (i.e., 90% of the test point errors are less than 1/2 of the contour interval). If the datum change is only 1/10th of the contour interval, then the existing contours will still meet NMAS and will not require recompilation. The labeled elevations for BMs and spot elevations will need to be changed. This type of conversion is a low-cost approach but might be useful to extend the life of an otherwise sound map series. This is not a technically correct solution because a small bias is being introduced. Special care must be taken to insure that the contouring is in agreement with changed labeled elevations.

(2) Recompiling the contours and spot elevations on a 7.5-minute quad map is the most geometrically correct method of fitting the new vertical datum; however, this is an expensive approach. Therefore, total recompilation and recontouring due to an out-of-date datum is not considered to be cost-effective. However, some other factors may justify recompilation:

- Change to metric contours
- Terrain changes because of subsidence or other

causes

- Inaccurate existing contours or inappropriate contour interval

g. Adjusting the USGS 3rd-order leveling network to the NAVD88 is a different challenge, because high accuracy is needed to maintain its usefulness as geodetic data. This level of accuracy can only be provided by a least squares adjustment of the old observations to the new NAVD88 primary network elevations.

h. The selected NAVD88 datum definition best fits the needs of the NMP. The important characteristics are:

- Small elevation changes for the eastern half of the USA where the 7.5 map contour intervals are the smallest and large changes for the western half where contour intervals are the largest.
- The isograms representing these changes are smoother and show less irregularities.

Both of these are important if the map patching conversion techniques is to be used. The requirements are that the shift values be small compared with the contour interval and the gradient in the datum change be minimal so that a single change value can be applied over an entire 7.5-minute map with little noticeable error. A vertical shift (bias) in the defining elevation is desirable to expand the favorable interval/elevation change area over the entire U.S.

13. National Flood Insurance Program (NFIP) Transition to NAVD88

a. The NFIP is a federal program that provides identification of flood hazard areas on a community basis and includes availability of insurance against flood damages. When a community joins the NFIP, it agrees to adopt minimum Federal floodplain management criteria enforced by local regulations. The major product of the NFIP is the Flood Insurance Study (FIS) and accompanying Flood Insurance Rate Map (FIRM), which describes a community's floodplains and regulatory floodways, as well as computed flood profiles. FEMA prepares an FIS for severely flood prone communities, that identifies 100-year base flood elevations (BFEs) and flood hazard areas. Nearly all flood maps for these areas are referenced to the NGVD29. Conversion to NAVD88 will require the education of map users as well as map producers. New FISs will be based on NAVD88.

Existing studies and maps will be converted when substantive revisions occur to redefine flood hazards.

b. The dual mission of the NFIP through the Federal Insurance Administration (FIA) is to reduce future flood losses as well as provide insurance coverage to offset deficit producing disaster assistance payments. To provide the floodplain management information to the communities, FEMA provides flood hazard mapping of major flooding sources within a community, usually based on the 100 year BFEs.

c. FEMA will be converting its products the NAVD88 in a gradual process primarily as FEMA's FISs and FIRMs are republished. Currently, the vast majority of FEMA products for the NFIP are referred to NGVD29. All FEMA studies contracted for FY93 and beyond will require the use of NAVD88 as vertical control. Since October 1992, all requests for map change actions received required the inclusion of NAVD88 data. The NFIP will transition to NAVD88 on a project basis or as other reasons for revision indicate.

14. Effects of NAVD88 on FIRMs and Communities

a. The base 100-year BFEs and Elevation Reference Marks (ERMs) will be converted to NAVD88. Use of the current datum will be acceptable until the change is made of the FIRM. After that time, all flood insurance policy sales and renewals will be based on elevations referenced to NAVD88. Determination of locations of structures and proposed projects with respect to special flood hazard areas (SFHAs) will be based upon elevations referenced to NAVD88. The datum listed as the reference datum on the applicable FIRM panel should be used for Elevation Certificate completion. This is FEMA policy for all NFIP communities since the NAVD88 is defined over all these regions. For Hawaii, the Pacific Trust Territories, the Commonwealth of Puerto Rico and the US Virgin Islands, their datums will be adjusted based upon releveling work done in those areas and their 1960-78 tidal epoch. Their local datums will be designated as NAVD88 and will be defined by their current local MSL determinations.

b. The conversion of the vertical reference datum from NGVD29 to NAVD88 will take place over time and documentation should be carefully maintained to reflect which vertical reference datum was used. If a FIS is completed with ERMs referenced to NAVD88, the conversion method and results shall be part of the

deliverable items with that FIS. The FEMA Project Officer should be consulted to decide if NAVD88 must be used or not, prior to commencement of any work for that FIS.

c. No requirement is made by FEMA on local communities to relevel their local vertical control networks for NFIP purposes. If, however, the community's current vertical control system is referenced to an NGS bench mark(s) that is included in the new data available from NGS, then appropriate conversion can be made. Questions regarding the mechanics of shifting to NAVD88 may be addressed to the appropriate FEMA Regional Offices.

d. A very important potential problem is caused by mixing datums. If a consistent datum is used for determining Base 100-year BFEs and lowest floor elevation, actuarial rating and building requirements would be correctly determined. If mixed datums are used, significant problems arise. For example, if the 1-foot NAVD88 BFE is used mixed with the 2-foot NGVD29 lowest floor elevation, an error of 2 feet (not in the NFIP's favor) would occur. There are roughly 22 million people living in the nation's floodplains. Proposed elevations above the BFE are sometimes minimal for economic considerations, so up-to-date and properly referenced elevation data are a must. Correct referencing of those floodplains to the nation's vertical datum must be accomplished as soon as it is administratively and financially possible to do so.

15. Map Revision Requests to FEMA

a. As the NFIP moves further into the maintenance stage of the mapping program, the major action with respect to mapping of flood hazards will be the review and processing of requests for revisions to the currently effective FISs and FIRMs. The decision of whether to convert to NAVD88 as the reference datum for a revision action must be made on a case by case basis. All map revision requests should contain documentation of vertical control used and those requests to FEMA after 1 October 1992 must include vertical control data referenced to NAVD88. The decision regarding the published reference for the map revision will be made by the FEMA Project Officer for the applicable region.

b. Map revision requests shall include either NGS BM data or the method and computations used to tie to NGS BMs. If NGS BM data is unavailable, documenta-

tion to that effect must be submitted with the map revision request. If a computer program was used, the name of the program should be included along with where an exact copy of that program can be obtained. The leveling field notes should also be included. All surveying data must be certified by a licensed Land Surveyor or registered Professional Engineer. For all map revisions, the datum referenced on the current FIRM shall be used unless otherwise directed by the Project Officer. When the current map datum is used, a conversion factor to allow comparison to NAVD88 elevation should be included.

16. Impact of NAVD88 Change on Flooding Sources

a. *Riverine and Lacustrine Flooding.* For most areas affected by this type of flooding, the changes from NGVD29 to NAVD88 will be adequately addressed by a shift factor for areas of USGS 7.5-minute quadrangle series topographic maps. In larger areas than that, such as county wide studies involving significant stream or river reaches, additional considerations are necessary.

b. *Coastal Flooding.* In areas affected by coastal flooding, additional care must be taken to avoid confusion with local MSL data that are used in addition to NGVD29 data. In many areas, these are assumed to be the same, while in other areas differences may exist based upon the latest tidal observations. NGS has included in its published data the new reference elevations for tidal stations previously taken as 0.0000 foot on NGVD29. All vertical data must clearly reflect what basis of vertical control was used. For example, if mean low water datum was used, conversion to NAVD88, or at a minimum NGVD29, must be provided and sealed by a certified land surveyor.

c. *Other Influences.* Areas that have experienced crustal motion or land subsidence since the publication of the vertical control data for that area, must be referenced to at least one BM known to be stable. Documentation from a certified land surveyor or by the agency that recently relevelled the BM must be included with any data submitted to FEMA. NGS will be publishing special reports for these areas as part of its ongoing long term task.

(1) For areas that experience uniform change over a given range, and where datum difference can be expressed as a bias factor for specific geographic areas, little

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if any distortion will occur in the hydrologic and hydraulic parameters that influence the definition of a given floodplain. In these instances, FEMA will be concerned with assuring that the proper conversion of ground and hydraulic elevations takes place.

(2) In instances where non-uniform elevation differences are indicated, an investigation of the potential effect on hydraulic behavior will be required. Usually, unless the change in flood elevation or depth is greater than 0.5 foot or in some cases 1.0 foot, no republication of the flood elevations is dictated. Indications of potential changes of 1.0 foot or more will probably place the stream or community on the priority list for a contracted restudy to establish the exact effect of the changes.

17. FEMA Policy for Map Conversion: Affect on NFIP Products

FEMA datum conversion activities called for all FY93 FIS's to be referenced to NAVD88 and that this action be confirmed by the contractor with the Project Officer prior to the beginning of survey work. The study contractor is responsible for assuring that proper reference to NAVD88 is made.

18. NAVD88 Requirements for Flood Insurance Studies

a. Type 15 Studies. For initial studies, NAVD88 shall be required. Exceptions must be approved by the Project Officer prior to the start of survey work.

b. Type 19 Studies and Limited Map Maintenance Program Studies. Use of NAVD88 shall be the decision of the Project Officer. If NGVD29 is used, then a conversion factor to NAVD88 should be included with the study material.

c. The use of NAVD88 for these studies will be determined by the extent of the changes that will occur to the community's FIRM when revised. For communities whose FIRM is larger than 1 panel and revision of other panels is unlikely with the restudy, the use of NGVD29 may be continued, but a note explaining the conversion to NAVD88 should be included in the "NOTES" in the map border of the panel being revised.

SECTION IV Corps of Engineers Transition Plan to NAVD88

19. General

A change in vertical datum will affect most USACE engineering, construction, planning, and surveying activities. The cost of conversion could be substantial at the onset. There is a potential for errors in conversions inadvertently occurring. The effects of the vertical datum change can be minimized if the change is gradually applied over time; being applied to future projects and efforts, rather than concentrated on changing already published products. In order to insure an orderly and timely transition to NAVD88 is achieved for the appropriate products, the following general guidelines in this section should be followed.

a. Conversion Criteria. Maps, engineering site drawings, documents and associated spatial data products containing elevation data may require conversion to NAVD88. Specific requirements for conversion will, in large part, be based on local usage -- that of the local sponsor, installation, etc. Where applicable and appropriate, this conversion should be recommended to local interests.

b. Newly Authorized Construction Projects. Generally, initial surveys of newly authorized projects should be referenced to NAVD88. In addition to design/construction, this would include wide-area master plan mapping work. The project control should be referenced to NAVD88 using conventional or GPS surveying techniques. All planning and design activities should be based upon NAVD88. All maps and site drawings shall contain datum notes as described below. If the sponsor/installation requires the use of NGVD29 or some other local vertical reference datum for continuity, the relationship between NGVD29 and NAVD88 shall be clearly noted on all maps, engineering site drawings, documents and associated products.

c. Active Projects. On active projects where maps, site drawings, or elevation data are provided to non-USACE users, the conversion to NAVD88 should be performed. This conversion to NAVD88 may be performed the next time the project is surveyed or when the maps/site drawings are updated for other reasons. Civil works projects may be converted to NAVD88 during the next maintenance or repair cycle in the same manner as for newly initiated civil works projects.

However, if resources are not available for this level of effort, either re-draw the maps or drawings and add the necessary datum note. Plans should be made for the full conversion during a later maintenance or repair cycle when resources can be made available. MCA, OMA, AFH, OMAR, MCAF, OMAF and master planning projects should remain on NGVD29 or the local vertical datum until a thoroughly coordinated effort can be arranged with the MACOM DCSSENGR and installation DEH, or AFRCE and BCE. An entire installation's control network should be transformed simultaneously to avoid different datums on the same installation. MACOMs should be encouraged to convert to NAVD88. However, the respective MACOMs are responsible for this decision.

d. Inactive Projects. For inactive projects or active projects where maps, site drawings or elevation data are not normally provided to non-USACE users, conversion to NAVD88 is optional.

e. Work for Others. Projects for other agencies will remain on NGVD29 or the current local vertical datum until a thoroughly coordinated effort can be arranged with the sponsoring agency. Other agencies should be encouraged to convert their projects to NAVD88, although the decision to convert rests with the sponsoring agency. However, surveys, maps and drawings should have the datum note described below added before distribution to non-USACE users. If sponsoring agencies do not indicate a preference for new projects, NAVD88 should be used.

f. Miscellaneous Projects. Other projects referenced to strictly local datum, such as structural deformation, beach nourishment, submerged offshore disposal areas, historical preservation projects, etc., need not necessarily be converted to NAVD88. However, it is recommended that surveys, maps and drawings have a clear datum reference note added before distribution to non-USACE users.

20. Datum Reference Note

Whenever maps, site drawings or spatial elevation data are provided to non-USACE users, they should contain a datum note that provides, at minimum, the following information:

The elevations shown are referenced to the [NGVD29] [NAVD88] and are in [feet] [meters]. Differences between NGVD29 and NAVD88 at the center of the project sheet/data set are shown on the diagram below. Datum conversion was performed using the [program VERTCON] [direct leveling connections with published NGS benchmarks] [other]. Metric conversions are based on [US Survey Foot = 1200/3937 meters] [International Survey Foot = 30.48/100 meters].

21. Technical Advantages in Converting to NAVD88

There are several compelling reasons that make it advantageous for USACE commands to convert to NAVD88. These include:

- Differential leveling surveys between bench marks will often close better.
- NAVD88 will provide a better reference to estimate GPS-derived orthometric heights.
- IGLD85 will provide a better reference to estimate heights of water-level surfaces on the Great Lakes.
- Data and adjusted height values will be readily available and accessible in convenient form from NGS's Integrated Data Base.
- Federal surveying and mapping agencies will stop publishing on NGVD29 and IGLD55, and will publish only on NAVD88 and IGLD85.
- Surveys performed for the Federal government will require use of NAVD88.
- NAVD88 is recommended by ACSM and FGCS.

22. Levels of Effort

For map and site plan drawings, including digital variations thereof, the conversion process entails one of two levels of effort: (1) conversion of all elevations to NAVD88 and re-drawing the map, or (2) simply adding a datum note based on an approximate VERTCON conversion.

23. Real Estate Implications

a. Surveys, maps and plats prepared in support of civil works and military real estate activities should conform as much as possible with state requirements. Many states are expected to adopt NAVD88 (by statute) as an official vertical reference datum. This likewise will entail a transition to NAVD88 in those states. State and local authorities should therefore be contacted to ascertain their current policies.

b. Note that several states have adopted the International Foot for their standard conversion from meters to feet. However, recent action by the FGCS to affirm continued use of the U.S. Survey Foot for Federal surveying activities could lead to a reversal of some state policies.

c. In order to avoid dual elevations on USACE survey control points which have multiple uses, it is recommended that published elevations be based on the U.S. Survey Foot. In states where the International Foot is the only accepted standard for boundary and property surveys, conversion of these elevations to NAVD88 should be based on the International Foot while the control remains based on the U.S. Survey Foot.

SECTION V VERTCON 1.0

24. General Description of VERTCON

VERTCON is a program developed by the NGS that converts elevation data from NGVD29 to NAVD88. VERTCON uses a simplified transformation of benchmark (BM) heights using a modeled shift for a given area and is, in general, only sufficiently accurate to meet small-scale mapping requirements. VERTCON should not be used for converting benchmark elevations used for site plan design or construction applications. Users can simply input the latitude and longitude for a point and the vertical datum shift between NGVD29 and NAVD88 is output. Data may be input either point-to-point by hand or by batch file. Three batch file formats are supported:

- Free File Format Type 1
- Free File Format Type 2
- NGS Internal BM Format Type 3

A "help" menu in the program gives information and examples of the file formats. Example inputs and outputs for the first two batch file types and a hand input type are included in the following pages. In the existing release, survey points must be input in North American Datum of 1983 (NAD 83) horizontal coordinates. Future releases will convert inputs to NAD 83. This release works on IBM compatible PCs running DOS. VERTCON is command line driven and should be fairly easy to use for anyone with basic computer skills. Batch files are explained in the help menu within the program and can be created through the use of a standard text editor. The command line interface is very basic, but functional.

25. USACE Program CORPSCON

VERTCON was released by NGS in early 1993. During the later part of FY94, VERTCON will be incorporated into USACE program CORPSCON, which is currently used for horizontal datum conversions between the North American Datum of 1927 (NAD 27) and NAD 83. CORPSCON can use either geographic, State Plane or UTM coordinates as input/output. Until the revised version of CORPSCON is available, the current version can be used in combination with VERTCON to perform vertical datum conversions with State Plane or UTM inputs.

26. VERTCON Installation and Operation Details

Program VERTCON consists of the following files:

VERTCON.EXE - Executable program file
VERTCON.DIR -Directory of VERTCON data base
(non-readable, i.e., binary, file)
VERTCON.COF -Coefficients of VERTCON data base
(non-readable, i.e., binary, file)
README.TXT -User's instruction file

a. VERTCON Installation.

(1) Make sure the original floppy disk is write-protected.

(2) Make a subdirectory on hard disk; for example: "mkdir NGVDCONV" (VERTCON will also run from the floppy disk)

(3) Go into a subdirectory; for example: "cd NGVDCONV"

(4) Copy the floppy disk into the subdirectory; for example: "copy A:.*.*.* /v"

(5) Put the original floppy in a safe place.

b. VERTCON Execution. Type "VERTCON" and follow the prompts.

c. VERTCON Termination. VERTCON computations can be stopped at any time by the Control-C (i.e., <ctrl-c>) key combination, but interactive processing can be terminated by entering 0. (i.e., zero WITH DECIMAL POINT)

27. VERTCON Modeling Procedure

The modeled conversion of NGVD29 normal orthometric heights to NAVD88 Helmert orthometric heights can be accomplished by using the VERTCON software. This conversion is sufficiently accurate for many small-scale mapping purposes. The software and two files of modeling coefficients (data base) for the conterminous United States (CONUS) are provided on the disk.

VERTCON returns the orthometric height difference between NAVD88 and NGVD29 at the geodetic position specified by the user. The root-mean-square (RMS) error of the actual NGVD29/NAVD88 height differences versus the computed height differences from the model for the data points used to create the model is ± 1 cm; the estimated maximum error is ± 2.5 cm. Depending on network design and terrain relief, larger differences (e.g., 5 to 50 cm) may occur the further a bench mark is located from the control points used to establish the model coefficients. For this reason, VERTCON should only be used for approximate conversions where these potential errors are not critical. If feasible, future versions of VERTCON will contain estimates of uncertainty on a region-by-region basis.

28. VERTCON Data Input Procedures

The user can key in latitude and longitude on a point-by-point basis or can create an input file using a text editor. Several file formats are provided, including the internal bench mark file record format of the Vertical Network Branch, NGS. These formats are detailed in a "Help" menu option which appears when the input filename is specified. Most horizontal positions of the bench marks used to generate VERTCON were scaled from USGS topographic maps. The estimated uncertainty of the scaled positions is far greater than the differences between NAD 27 and NAD 83. Therefore, the horizontal geodetic datum to which the latitude and longitude are referenced (either NAD 27 or NAD 83) should not adversely affect the computed height difference since the height differences change very little with slight changes in horizontal position, i.e., less than 100 meters.

29. VERTCON Data Output

VERTCON Results are collected into an output file. The default name of this file is "VERTCON.OUT", but the user can choose any other legal filename. (Do not use misleading extensions such as *.EXE, *.DIR, *.COF, or *.BAT). The format of the output file is linked to the format of the input file to maintain consistency.

30. Derived NAVD88 Heights from NGVD29 Heights

The modeled NAVD88 - NGVD29 height differences convert from NGVD29 normal orthometric heights to NAVD88 Helmert orthometric heights. This value is ADDED ALGEBRAICALLY to NGVD29 normal orthometric heights to obtain NAVD88 Helmert

orthometric heights. If a NGVD29 height is desired when a NAVD88 height is given, SUBTRACT the value ALGEBRAICALLY from the NAVD88 height.

31. VERTCON Models for CONUS

a. Interconnected local VERTCON models were computed in October 1992 using more than 300,500 NAVD88 - NGVD29 orthometric height differences. The aggregate of these local models, defined for 144 Helmert blocks, comprise the total VERTCON model for CONUS. The benefit of developing this mosaic of local models is that any error found locally, such as gross errors and/or an inconsistent leveling network, can be corrected promptly and the data base "repaired" swiftly without affecting any other area.

b. The method of computation is based on Professor Rolland L. Hardy's multiquadric method for data modeling and prediction. Accordingly, a set of coefficients of radial basis functions are determined at "optimally" selected data points in a two-dimensional space. These coefficients define an irregular surface which matches the selected data exactly, in this case the NAVD88 - NGVD29 height differences, and approximate the data at varying error levels at other points.

c. It is desirable for datum conversion efficiency purposes to model the data field with a minimal set of surface coefficients, while keeping the deviation of the surface at non-selected data points within predefined bounds. This was achieved by an iterative process in which, after a small initial set of data points was modeled, additional data points were gradually added to the model at the locations of largest deviations between model surface and data. This approach provided a minimal set of model coefficients, while maintaining predefined error bounds.

d. The data base and VERTCON software are operational on standard disc operating system (DOS) controlled (IBM-compatible) personal computers (PC). However, the executable code and (binary) data base may not be transferable to other systems. In the near future two additional modules will be provided:

(1) CONVASCI -- will extract and store the local models in an ASCII file for transfer to other systems

(2) CONVBIN -- will restore the ASCII file into a two-file binary data base on the new system. The

recompiled VERTCON software can then operate on this data base.

32. Future VERTCON Modifications

A continuing development effort is underway to improve VERTCON results. NGVD29 normal orthometric heights are being analyzed for localized monument and/or crustal motion effects, for inconsistent adjustments, and other effects. Computed height differences which are significantly influenced by such effects will be flagged and rated for reliability on the output.

A



DEPARTMENT OF THE ARMY

NEW ORLEANS DISTRICT CORPS OF ENGINEERS

P.O. BOX 80287

NEW ORLEANS, LOUISIANA 70180-0287

REPLY TO
ATTENTION OF:

CEMVN-ED

26 October 2000

MEMORANDUM FOR Chief, Engineering Division, Mississippi Valley Division, P. O.
Box 80, Vicksburg, MS 39181-0080

SUBJECT: CEMVN-ED Policy Letter of 1985 - NGS Benchmarks

1. Reference subject policy letter, and endorsements thereto, copy attached.
2. The New Orleans District has been abiding by the policy outlined in the referenced letter since its approval by the Division Office. In the 15 years since adopting this policy, the NGS has no longer performed the surveying of our reference benchmarks to publish new epochs and, most assuredly, we have witnessed continued subsidence. Until recently there has been very little alternative for maintaining accurate vertical control.
3. This district has recently hired an expert cartographer and geographer (Mr. Clifford Mugnier) to assist us on this issue. He has presented us with a proposal to implement and operate GPS Continuously Operating Reference Stations (CORS), which will measure gravity and accommodate subsidence, (See Attached, "GPS Leveling In The Gulf Coast Region"). This system will need to be validated with absolute gravity observations. We intend to implement this proposal and to cooperate with state and other federal agencies in South LA in establishing a network of CORS located at sites of mutual benefit. This vertical control network will provide the means for maintaining accurate vertical control.
4. It is becoming increasingly untenable to maintain the existing policy. We are proposing to use the NAVD88 for future work on all projects (Federal Register extract attached). All of our partners are using this datum for their work, and the existing policy is causing great confusion. We propose to abandon the 1985 policy and request your concurrence. We intend to evaluate the impacts of this on a project-by-project basis, and will take appropriate mitigation actions.

Encls

Robert J. Fairless, P.E.
for Gerard S. Satterlee, P.E.
Chief, Engineering Division

CF:
CEMVN-CD
CEMVN-OD
CEMVN-DE

GPS LEVELING IN THE GULF COAST REGION

The Height Modernization Program of the National Geodetic Survey (NGS) is made possible by the development of "GEOID99," the mathematical model of the equipotential gravity field of the United States. GPS Leveling is a procedure that utilizes this concept, but requires independent validation and observation of benchmark velocities in regions of crustal motion. The ability to independently observe and measure subsidence with changes in Absolute Gravity is a new technology applicable to the Gulf Coast Region. GPS Continuously Operating Reference Stations (CORS) do record the variation in their own three-dimensional coordinates. However only the independent measurement of changes in Absolute Gravity allow the validation of the vertical component of CORS sites in a subsidence-prone region for short-term use. It is thought that 4 to 5 years of CORS site operation in a subsidence area will provide some validation of vertical movement of the CORS site itself, but short-term variations of subsidence rates can be masked by noise. The independent determination of changes in elevation by observing changes in the absolute gravity at the same point provide that physical certainty.

For an area of crustal motion, GPS Leveling must be accomplished by GPS observation of benchmarks for 30 minutes on one day, (say in the morning), and for 30 minutes the following day, in the afternoon. The two observation periods separated by a day insure that the GPS constellation above the observer's local horizon will be substantially different and free of geometric bias in a simultaneous post-processed solution. The maximum distance from a mobile observer using a dual-frequency geodetic survey-grade GPS receiver to a CORS site is 50 statute miles. The accuracy achieved with proper post-processing is **two centimeters vertical**. This represents the state of the art if each CORS site is validated with the observation of Absolute Gravity every year at each CORS site.

The data collected at each CORS site must be edited and adjusted on a daily basis and submitted electronically to the National Geodetic Survey. Acceptance and publication of the observed data from each CORS site by NGS constitutes the establishment of the national infrastructure of geodetic control with today's technology. LSU will provide the daily data processing support, the continuous observation of Absolute Gravity at LSU and on a rotating basis at all CORS sites, and the establishment of fiducial benchmarks. Fiducial benchmarks will be established and periodically re-observed at strategic locations throughout the NOD with GPS Leveling procedures and observation of Absolute Gravity with outdoor portable instruments.

31 January 2001

MEMORANDUM FOR Commander, New Orleans District, ATTN: CEMVN-ED

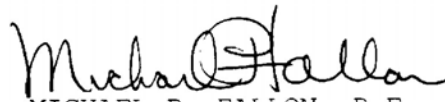
SUBJECT: CEMVN-ED Policy Letter of 1985 - NGS Benchmarks

1. We concur with your proposal to use the NAVD88 benchmark information for future work on all projects. Accordingly, the new policy is as follows:

- a. All gages will be set to conform to the NAVD88 benchmark information.
- b. Main stem features of the MR&T project under construction or to be constructed in the future will utilize the NAVD88 benchmark elevations.
- c. Off-main stem projects of the MR&T under construction or to be constructed in the future will use the NAVD88 benchmark data.
- d. All C&M dredging will use the NAVD88 benchmark data.
- e. Hurricane protection projects under construction or to be constructed in the future will use the NAVD88 benchmark data.

2. We also agree that if CORS proves to be a reliable and accurate system for determining benchmark elevations, MVD and the New Orleans District should re-evaluate the above policy to consider use of the CORS benchmark information in lieu of the NAVD88 benchmark information. Further, the New Orleans District should at that time begin evaluation of completed projects to determine whether or not modifications are necessary to achieve authorized levels of protection.

3. We request that you provide MVD semi-annual status reports on the installation and operation of the CORS. We are interested in confirming its accuracy in determining benchmark information and subsidence rates as well as evaluating its application in other MVD districts.


MICHAEL P. FALLON, P.E.
Chief, Engineering and
Construction Division

Encls
nc

CF:
CRCW-EE (M. K. Miles)
CEMVD-PM

MEMORANDUM FOR Branch Chiefs

SUBJECT: Vertical Control and Permanent Benchmarks

1. It is the policy of Engineering Division to use those benchmarks that best define vertical control with respect to the NAVD88 datum. Consequently, all scopes of work for our design contracts that include surveying work must be reviewed by our Survey Section to ensure that the preferred reference benchmarks are clearly and accurately specified.
2. Survey Section personnel or its contractors will visit District benchmarks as they are needed to update their vertical elevations through the use of the Continuously Operating Reference Stations (CORS) associated with LSU's GULFNET system. This system allows us to more accurately define vertical elevations and will provide information to predict future subsidence.
3. For all Engineering Division products, please coordinate with Survey Section for their involvement and to budget against the benefiting projects for these efforts.

GERARD S. SATTERLEE, JR.
Chief, Engineering Division

20 December 2002

CEMVN-ED-S

MEMORANDUM FOR : Engineering Division, Branch Chiefs,
Section Chiefs, Functional Team Leaders
(FTLs) and Technical Managers

SUBJECT: Vertical Datum Policy

1. It is the policy of Engineering Division to use the NAVD88 datum for all vertical control and for gages, for engineering studies, design and construction documents and for the reporting of all levels of protection, etc. All new work shall be requested in NAVD88.
2. The Survey Section shall not sanction mathematical conversions to the NAVD88 datum from permanent benchmark elevations published in the NGVD29 datum. Prior to any field data collection effort either in-house, through contracts, by sponsors or their AEs, the project shall fund to validate benchmarks and to establish vertical controls in the project area.
3. Historic data to include topographic and hydrographic surveys, flowlines, hydrologic data, benchmarks, map elevation contours, and all such field information collected using non-NAVD88 datums is suspect and cannot easily be used in conjunction with current NAVD88 data. No meaningful conversion between old datums and NAVD88 is possible without proper field investigations and even then could result in an approximation at best. Therefore, Survey Section will be consulted for each instance of attempted use of historic data. The degree of their involvement will depend on the purpose for which the data is to be used and the acceptable magnitude of error. As a minimum, a quick validation of the vicinity benchmark elevation without cost to the project is required to determine the magnitude of the problem.
4. It is recognized that some interim exceptions to this policy may be necessary. These should be expressly approved by the Chief, Engineering Division.
5. To ensure adherence to proper surveying practices, the use of acceptable benchmarks and their assigned values, and the conformance of the data to Corps standards and datums, all planned field surveying effort shall be reviewed by the Chief, Surveying Section. This includes the field data gathering effort performed by District design and planning AE contractors, sponsors, and the sponsor's AE contractors.

6. Plans and specifications shall identify the permanent benchmarks and their assigned elevations to be used for each construction contract. It will be incumbent upon the design engineer to assure that all designs and data are compatible with the elevations assigned to the permanent benchmarks used in the contract documents.

7. It is the intent of this policy that the assigned benchmark elevations represent a "snapshot", and may change on future contracts depending on benchmark movement. Engineers must use sound engineering judgment in employing the NAVD88 datum, recognizing that projects have already been designed and/or constructed using the NGVD29 datum against various epochs and that projects may require a significant number of years from conception to completion, and therefore allowances must be made for vertical movement.

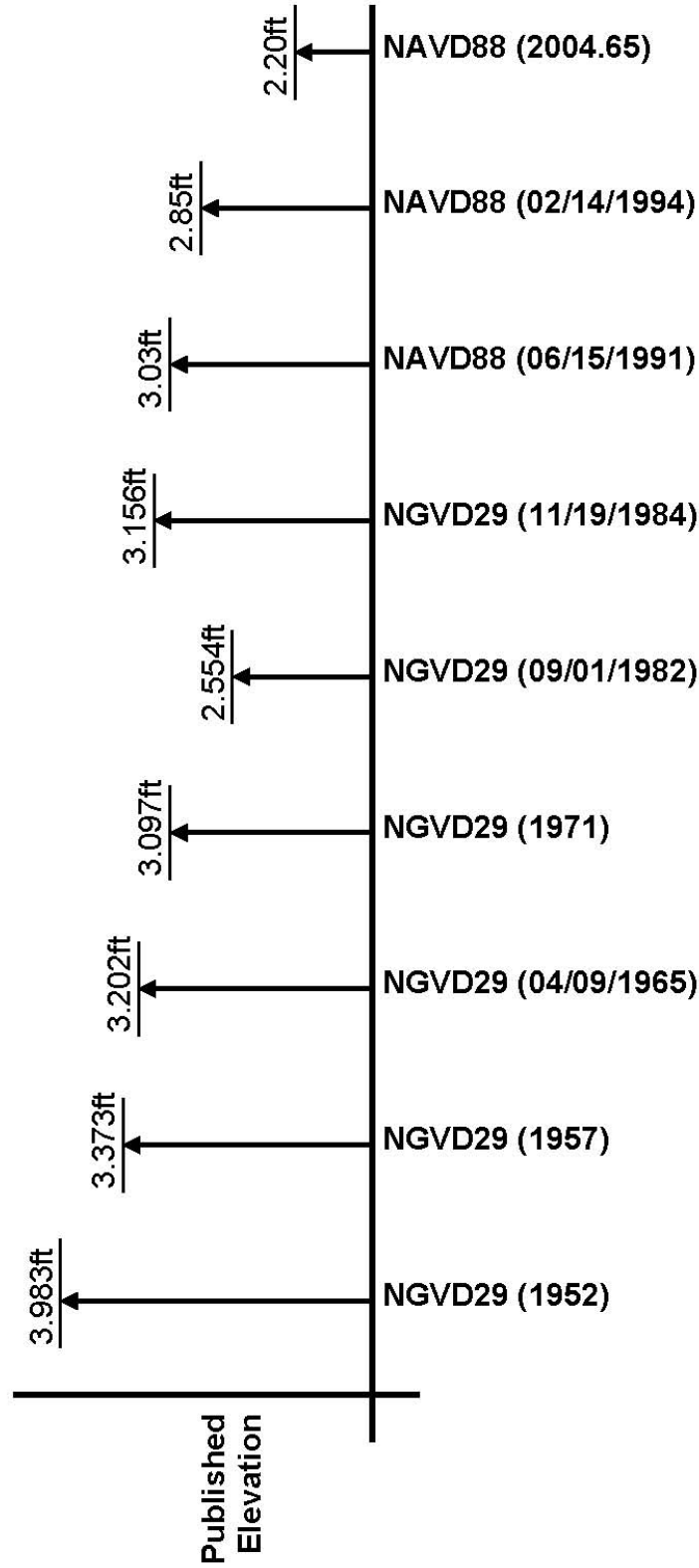
/s/
GERARD S. SATTERLEE, Jr.
Chief, Engineering Division

CF: CEMVN-OD
CEMVN-PA
CEMVN-PM
CEMVN-CD

Appendix 41

Benchmark History

Changes in the Published Heights (Elevations) for Benchmark “A 152” (PID: AT0407)

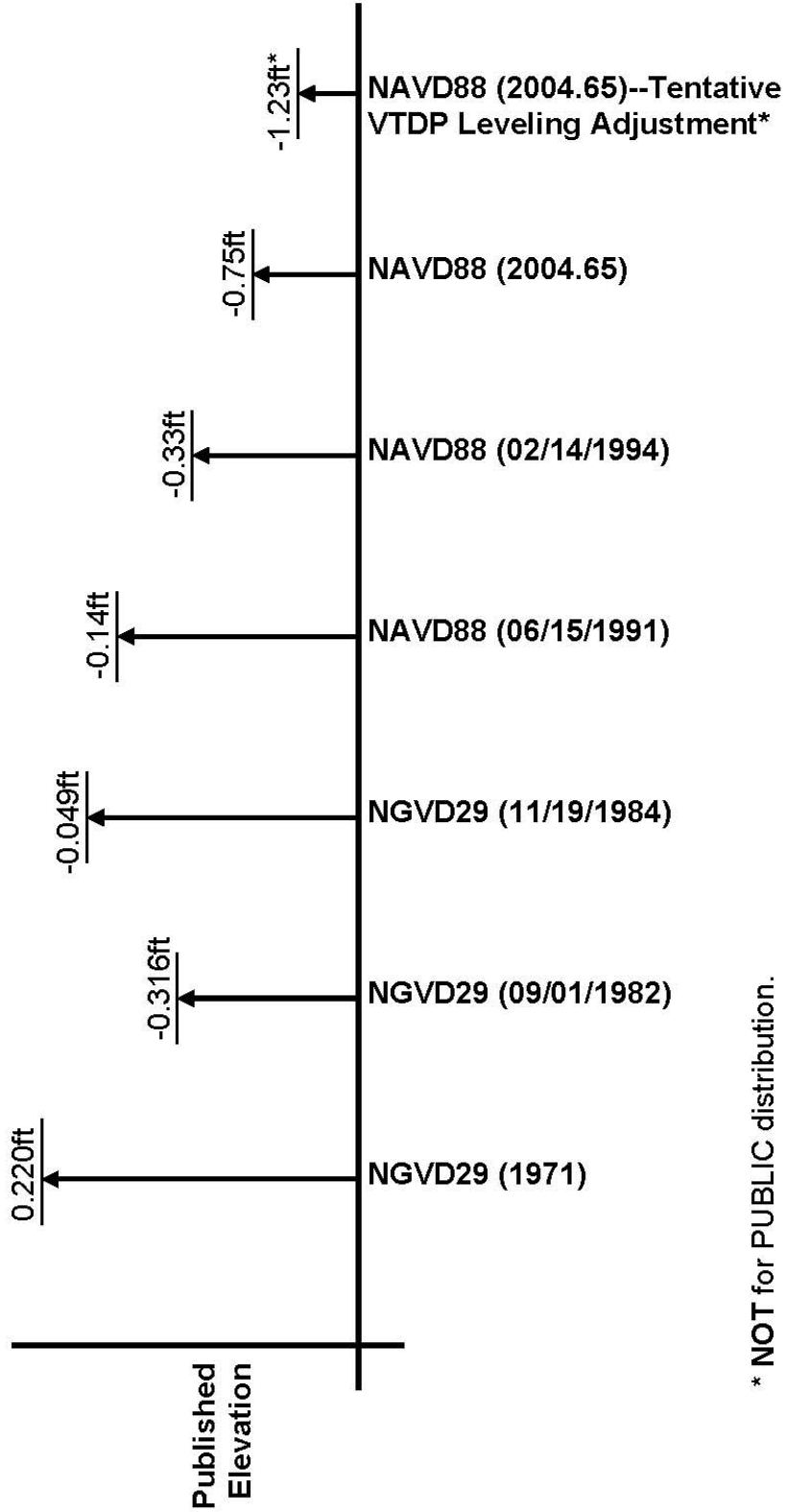


The changes in the above values point out the problem of errors in various adjustments on the datum(s) and not a direct solution to it.

Source: NOAA (NGS)

[not to scale]

Changes in the Published Heights (Elevations) for Benchmark “C 279” (PID: AT0247)



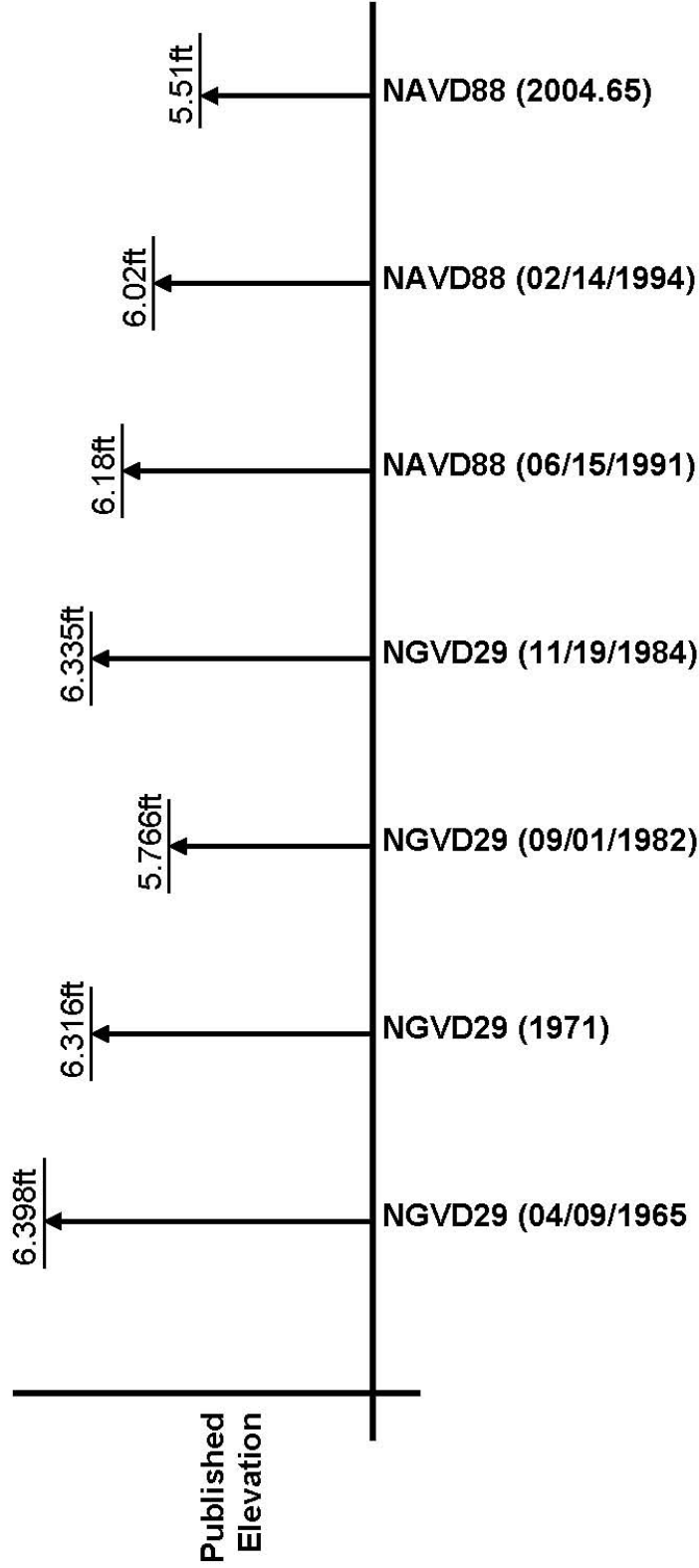
* NOT for PUBLIC distribution.

The changes in the above values point out the problem of errors in various adjustments on the datum(s) and not a direct solution to it.

Source: NOAA (NGS)

[not to scale]

Changes in the Published Heights (Elevations) for Benchmark “D 194” (PID: AT0357)

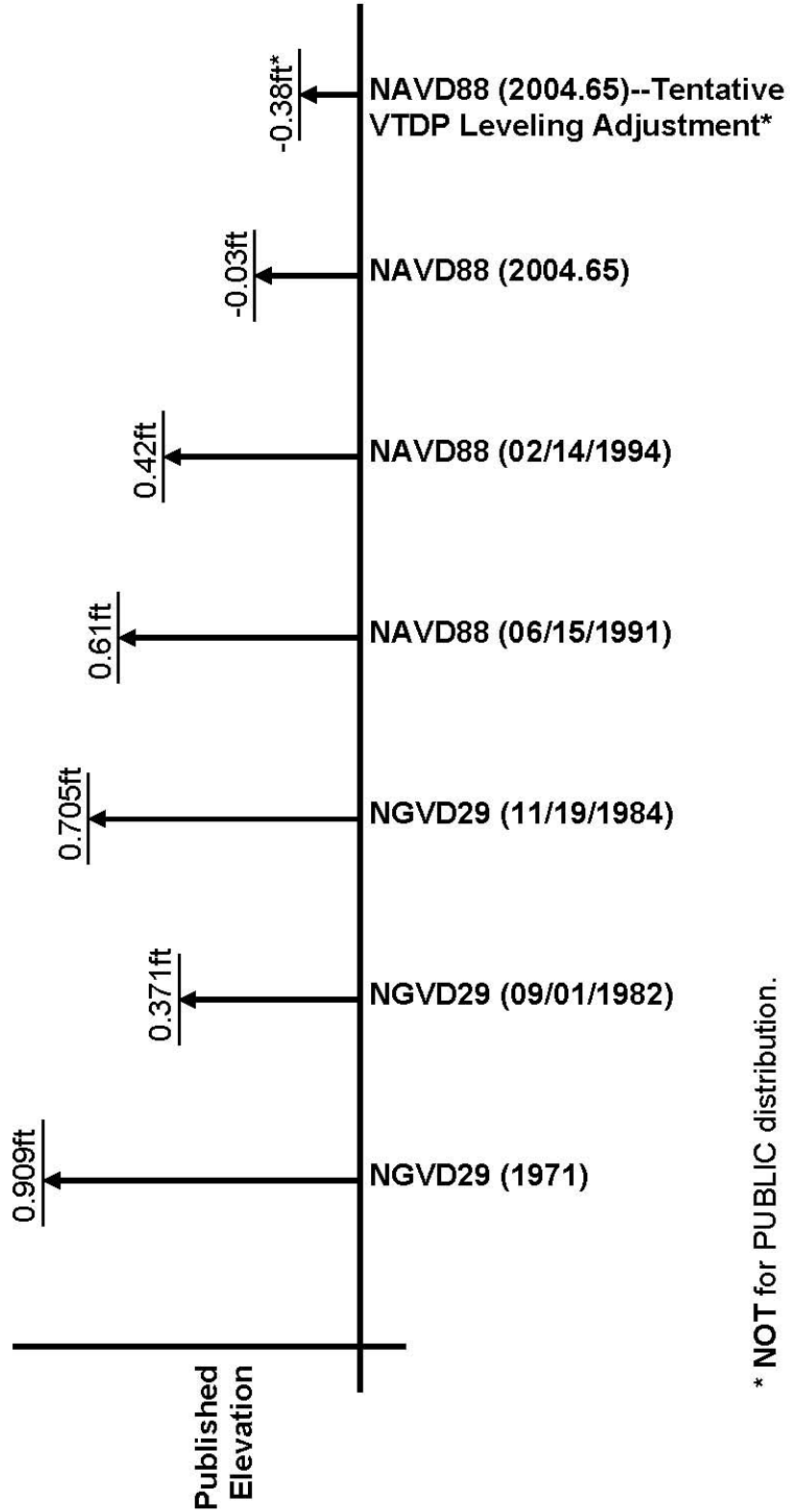


The changes in the above values point out the problem of errors in various adjustments on the datum(s) and not a direct solution to it.

Source: NOAA (NGS)

[not to scale]

Changes in the Published Heights (Elevations) for Benchmark “EMPIRE AZ MK 2 1934 1966” (PID: AT0231)



* NOT for PUBLIC distribution.

The changes in the above values point out the problem of errors in various adjustments on the datum(s) and not a direct solution to it.

Source: NOAA (NGS)

[not to scale]

Appendix 42

Leveling Abstracts

*** FIELD ABSTRACT ***

060110-060110 HGZ L26879 1 6.0 MM ORDER 2 CLASS 1 PAGE 1
 LEVELING AT TIDE STATION 876 1678 MICHOUD SUBSTATION ICWW

FROM TO	START	F/B	DIST TOTAL (KM)	ELEV DIFF (MT)		-(F+B) TOTAL (MM)	MEAN DIFF FLD ELEV (MT)	I C
0001 WES 19							-0.11300	
0001 WES 19	1100750	B	0.26	-3.19270	*	0.19	3.19261	1
0002 876 1678 A TIDAL SL 1	1100936	F	0.26	3.19252	*			1
			0.26			0.19	3.07961	
0001 WES 19	1100819	F	0.37	-0.28700	*	0.09	-0.28696	1
0004 876 1678 WES 17	1100917	B	0.37	0.28691	*			1
			0.37			0.09	-0.39996	
0004 876 1678 WES 17	1100842	F	0.21	1.14050	*	0.00	1.14050	1
0003 D 276	1100903	B	0.21	-1.14051	*			1
			0.57			0.09	0.74054	

ELEVATION REJECTION AND ERROR CODES

- C - section elevation difference was rejected for cause ie. *43* record rejection code set to "F"
- R - section elevation difference was rejected by Halperin rejection algorithm
- @ - section elevation difference does not include refraction correction
- * - section elevation difference does not include rod correction

INSTRUMENT CODE	INSTRUMENT	RODS
1	243 - 333294	396 - 24167 396 - 24168

LEVEL LINE SECTION RUNNING TREE

0001 (0002)
 0004
 0003

FROM TO	N. LATITUDE	W. LONGITUDE	FIELD DISTANCE	VS. COMPUTED
0001	300025	0895619	0.00	0.00
0001 0002	300024	0895615	0.26	0.11
0001 0004	300037	0895622	0.37	0.38
0004 0003	300043	0895623	0.21	0.19

SECTION FROM TO ERROR MESSAGES

-*- FIELD ABSTRACT -*-

060107-060107 HGZ L26879 2 6.0 MM ORDER 2 CLASS 1 PAGE 1
 LEVELING AT TIDE STATION 876 1402 THE RIGOLETS

FROM TO	START	F/B	DIST TOTAL (KM)	ELEV DIFF (MT)		-(F+B) TOTAL (MM)	MEAN DIFF FLD ELEV (MT)	I C
0001 PIKE RM 3							2.80200	
0001 PIKE RM 3	1070933	B	0.04	0.30480	*	0.00	-0.30480	1
0003 PIKE RESET	1071025	F	0.04	-0.30480	*			1
	SL 1		0.04			0.00	2.49720	
0001 PIKE RM 3	1070948	F	0.03	-0.21800	*	-0.10	-0.21805	1
0002 C 193	1071015	B	0.03	0.21810	*			1
			0.03			-0.10	2.58395	
0002 C 193	1071000	F	0.05	0.07320	*	0.10	0.07325	1
0004 PIKE RM 4	1071009	B	0.05	-0.07330	*			1
			0.08			-0.00	2.65720	

ELEVATION REJECTION AND ERROR CODES

- C - section elevation difference was rejected for cause ie. *43* record rejection code set to "F"
- R - section elevation difference was rejected by Halperin rejection algorithm
- @ - section elevation difference does not include refraction correction
- * - section elevation difference does not include rod correction

INSTRUMENT CODE	INSTRUMENT	RODS
1	243 - 333294	396 - 24167 396 - 24168

LEVEL LINE SECTION RUNNING TREE

FROM	TO	N. LATITUDE	W. LONGITUDE	FIELD DISTANCE	VS. COMPUTED
0001	0003	300959	0894415	0.00	0.00
0001	0002	300959	0894414	0.04	0.03
0001	0002	301000	0894415	0.03	0.03
0002	0004	300959	0894414	0.05	0.04

Windows Abstra Version 2.3 -- Jan 1, 2004 -- Wed Apr 19 12:31:34 2006

SECTION FROM TO ERROR MESSAGES

-*- FIELD ABSTRACT -*-

060116-060116 HGZ L26879 3 6.0 MM ORDER 2 CLASS 1 PAGE 1
 LEVELING AT TIDE STATION 876 1602 LAKE JUDGE PEREZ

FROM TO	START	F/B	DIST TOTAL (KM)	ELEV DIFF (MT)	-(F+B) TOTAL (MM)	MEAN DIFF FLD ELEV (MT)	I C
0002 876 1602 C TIDAL						0.16300	
0002 876 1602 C TIDAL	1160900	B	0.10	-0.25420 *	0.10	0.25415	1
0006 876 1602 F TIDAL	1160910	F	0.10	0.25410 *			1
			0.10		0.10	0.41715	
0006 876 1602 F TIDAL	1160830	B	0.24	0.13230 *	-0.40	-0.13209	1
0005 876 1602 E TIDAL	1160923	F	0.24	-0.13189 *			1
			0.34		-0.30	0.28506	
0005 876 1602 E TIDAL	1160811	B	0.20	0.06680 *	0.40	-0.06700	1
0004 876 1602 B TIDAL	1160958	F	0.20	-0.06720 *			1
			0.54		0.09	0.21806	
0004 876 1602 B TIDAL	1160747	B	0.07	0.03630 *	0.00	-0.03630	1
0003 876 1602 A TIDAL	1161015	F	0.07	-0.03630 *			1
			0.61		0.09	0.18176	

ELEVATION REJECTION AND ERROR CODES

- C - section elevation difference was rejected for cause ie. *43* record rejection code set to "F"
- R - section elevation difference was rejected by Halperin rejection algorithm
- @ - section elevation difference does not include refraction correction
- * - section elevation difference does not include rod correction

INSTRUMENT CODE	INSTRUMENT	RODS
1	243 - 333294	396 - 24167 396 - 24168

LEVEL LINE SECTION RUNNING TREE

0002					
0006					
0005					
0004					
0003					
FROM	TO	N. LATITUDE	W. LONGITUDE	FIELD DISTANCE	VS. COMPUTED
	0002	293333	0895305	0.00	0.00
0002	0006	293333	0895300	0.10	0.13
0006	0005	293330	0895300	0.24	0.09
0005	0004	293330	0895300	0.20	0.00
0004	0003	293330	0895300	0.07	0.00

SECTION
 FROM TO ERROR MESSAGES

-*- FIELD ABSTRACT -*-

060107-060107 HGZ L26879 4 6.0 MM ORDER 2 CLASS 1 PAGE 1
 LEVELING AT TIDE STATION 876 1487 CHEF MENTEUR

FROM TO	START	F/B	DIST TOTAL (KM)	ELEV DIFF (MT)	-(F+B) TOTAL (MM)	MEAN DIFF FLD ELEV (MT)	I C
0001 E 3145						4.81800	
0001 E 3145	1071145	F	0.48	-4.61118	* 1.35	-4.61050	1
0003 876 1487 B TIDAL	1071340	B	0.48	4.60983	* 1.35	0.20750	1
0003 876 1487 B TIDAL	1071250	F	0.20	0.32662	* -0.81	0.32622	1
0002 876 1487 A TIDAL	1071320	B	0.20	-0.32582	* 0.55	0.53372	1

ELEVATION REJECTION AND ERROR CODES

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ie. *43* record rejection code set to "F"
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INSTRUMENT CODE	INSTRUMENT	RODS
1	243 - 333294	396 - 24167 396 - 24168

LEVEL LINE SECTION RUNNING TREE

FROM	TO	N. LATITUDE	W. LONGITUDE	FIELD DISTANCE	VS. COMPUTED
0001		300407	0894813	0.00	0.00
0001	0003	300354	0894800	0.48	0.53
0003	0002	300354	0894800	0.20	0.00

Windows Abstra Version 2.3 -- Jan 1, 2004 -- Tue May 02 14:48:37 2006

SECTION
FROM TO ERROR MESSAGES

-*- FIELD ABSTRACT -*-

060118-060118 HGZ L26879 5 6.0 MM ORDER 2 CLASS 1 PAGE 1
 LEVELING AT TIDE STATION 876 1799 M V PETROLEUM

FROM	TO	START	F/B	DIST TOTAL (KM)	ELEV DIFF (MT)	-(F+B) TOTAL (MM)	MEAN DIFF FLD ELEV (MT)	I C
0001	876 1799 B	TIDAL					0.77300	
0001	876 1799 B	TIDAL	1180829 B	0.08	0.22130 *	0.30	-0.22145	1
0002	876 1799 A	TIDAL	1180943 F	0.08	-0.22160 *			1
			SL 1	0.08		0.30	0.55155	
0001	876 1799 B	TIDAL	1180853 F	0.08	-0.34970 *	0.10	-0.34965	1
0003	876 1799 C	TIDAL	1180929 B	0.08	0.34960 *			1
				0.08		0.10	0.42335	
0003	876 1799 C	TIDAL	1180910 F	0.08	-0.00180 R*	0.00	-0.00605	1
0004	876 1799 D	TIDAL	1180919 B	0.08	0.01030 R*			1
				0.16		0.10	0.41730	

ELEVATION REJECTION AND ERROR CODES

- C - section elevation difference was rejected for cause
ie. *43* record rejection code set to "F"
- R - section elevation difference was rejected by Halperin rejection algorithm
- @ - section elevation difference does not include refraction correction
- * - section elevation difference does not include rod correction

INSTRUMENT CODE	INSTRUMENT	RODS
1	243 - 333294	396 - 24167 396 - 24168

LEVEL LINE SECTION RUNNING TREE

0001 (0002)				
0003				
0004				
FROM	TO	N. LATITUDE	W. LONGITUDE	FIELD DISTANCE VS. COMPUTED
0001		292947	0900133	0.00 0.00
0001	0002	292948	0900130	0.08 0.09
0001	0003	292948	0900130	0.08 0.09
0003	0004	292948	0900130	0.08 0.00

SECTION
FROM TO ERROR MESSAGES

0003 0004 *** All runnings for this section were rejected, all elevations beyond this point are erroneous !

*** FIELD ABSTRACT ***

060118-060118 HGZ L26879 6 6.0 MM ORDER 2 CLASS 1 PAGE 1
 LEVELING AT TIDE STATION 876 1494 WEST POINT A LA HACHE

FROM TO	START	F/B	DIST TOTAL (KM)	ELEV DIFF (MT)	-(F+B) TOTAL (MM)	MEAN DIFF FLD ELEV (MT)	I C
0001 876 1494 C TIDAL						0.57900	
0001 876 1494 C TIDAL	1181356	B	0.38	-1.02605	* -0.37	1.02623	1
0003 876 1494 B TIDAL	1181451	F	0.38	1.02642	* -0.37	1.60523	1
0003 876 1494 B TIDAL	1181316	B	0.33	-1.93309	* -0.43	1.93330	1
0002 876 1494 A TIDAL	1181542	F	0.33	1.93352	* -0.80	3.53853	1
			0.71				

ELEVATION REJECTION AND ERROR CODES

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INSTRUMENT CODE	INSTRUMENT	RODS
1	243 - 333294	396 - 24167 396 - 24168

LEVEL LINE SECTION RUNNING TREE

0001				
0003				
0002				
FROM	TO	N. LATITUDE	W. LONGITUDE	FIELD DISTANCE VS. COMPUTED
	0001	293419	0894813	0.00 0.00
0001	0003	293419	0894813	0.38 0.00
0003	0002	293419	0894813	0.33 0.00

Windows Abstra Version 2.3 -- Jan 1, 2004 -- Fri May 05 14:44:22 2006

SECTION FROM TO ERROR MESSAGES

The data below compares Second-Order, Class I, leveling for water level gauge reference performed in the 1980's with Second-Order, Class I, leveling for National Geodetic Survey, BlueBook, performed in 2006. The Local Mean Sea Level (LMSL) is roughly 0.2 feet above the North American Vertical Datum of 1988, readjusted for New Orleans in 2004 on the 65 Julian day of that year. 876 1678 Michoud Substation apparently shows 0.5 feet of settlement.

These elevations are preliminary and subject to minor changes when they receive a final adjustment. They are based on Second-Order Class I leveling from a GPS-derived starting height that has an expected nominal absolute accuracy of 0.1-0.13 FEET

USE THIS COLUMN TO IDENTIFY SETTLED BM'S (OUTLIERS)

ID	Location	BM stamping	elevation NAVD 88.2004.65 H (feet)	LMSL - NAVD 88.2004.65 height difference (feet)	height BM-LMSL H (feet)
874 7437	Bay Waveland Yacht Club, Bay St. Louis, Mississippi	NO 1 1968	5.24	0.37	4.87
876 1402	U.S. Highway 90, The Rigolets	PIKE RM 3	9.19	0.26	8.93
		PIKE RESET	8.19	0.20	7.99
		C 193	not a Tidal BM		
		PIKE RM 4	not a Tidal BM		
876 1487	Chef Menteur, Chef Menteur Pass	E 3145	15.81	0.14	15.67
		1487 B 1982	0.68	0.13	0.55
		1488 A 1982	1.75	0.15	1.60
876 1602	Lake Judge Perez, Hermitage Bayou	1602 C 1985	0.53	0.09	0.45
		1603 F 1987	1.37	0.09	1.28
		1604 E 1985	0.94	0.09	0.85
		1605 B 1985	0.72	0.08	0.64
		1606 A 1985	0.60	0.09	0.51
876 1678	Michoud Substation, ICWW	WES 19 1978	-0.37	-0.35	-0.02
		1678 A 1982	10.10	-0.44	10.54
		WES 17 1978	-1.31	-0.24	-1.07
		D 276 1969	2.43	-0.30	2.73
876 1724	Grand Isle, East Point, Louisiana	876 1724 TIDAL 11	3.12	0.20	2.91
876 1799	M.V. Petroleum Dock, Bayou St. Denis	1799 B 1985	2.54	0.31	2.23
		1799 A 1985	1.81	0.19	1.62
		1799 C 1985	1.39	0.18	1.21
		1799 D 1985	REJECTED		
876 1927	U.S.C.G. New Canal	ALCO 1931	6.15	0.27	5.88