Memo

Date:	Thursday, May 11, 2017
Project:	Lake Charlene Area Drainage Improvements
To:	Joy Blackmon
From:	Allen Vinson
Subject:	Lake Charlene Water Surface Iterations

At the request of the Lake Charlene HOA and Escambia County District 2, this memo seeks to analyze the results of increased water surface elevations for the Lake Charlene design. The goal of the project is to reduce the frequency of flooding in areas surrounding Lake Charlene, minimize impacts downstream of Lake Charlene, and successfully fund the project through a FEMA HMGP Grant. In order to accomplish these goals, the current design proposes to lower the water surface elevation in Lake Charlene to the bottom of the existing outfall pipe while providing additional outfall capacity. This results in an 18" lowering of the lake water surface elevation, when the lake is full. The existing outfall pipe currently contains a sluice gate, which keeps the Lake Charlene water surface elevation approximately 18" higher than the proposed condition when the lake is full. Average lake level conditions fall somewhere between the top and bottom of the sluice gate depending on the amount of rainfall.

In order to analyze the affects of incremental increases in the water surface elevation, the project drainage model utilized the proposed outfall design as a starting point. The starting water surface was increased by 3" increments until the 18" sluice gate elevation was reached. The primary goal of each 3" increase is to keep the Lake Charlene 100-year flood stage below the warning stage. The warning stage is the point at which surrounding areas begin to flood. In order to keep the modeled stages below the warning stage for each iteration, modifications to the design included the lengthening of the outfall weir located at the outfall structure. Lengthening of the outfall weir allows more flow to leave the lake as stages increase. With each iterative increase in water surface elevation, the weir was lengthened so that more flow could outfall from the lake in order to keep flood stages below the warning stage. Increases in outflow causes stages to increase downstream in Jones Swamp, which is the final project outfall.

The proposed design, which lowers the lake approximately 18" when full, minimizes the stage increases downstream since there is water staging capacity available in the lake. This is an important component with regards to the FEMA Grant because the goal is to design and construct a project that has minimal affect on the surrounding environment. The proposed design already results in minor downstream stage increases. By increasing the stage of the lake, more water has to be let out of the lake through the weir structure. Letting more water out of the lake will further increase stages downstream. Since the lake is part of the drainage system from upstream to downstream, and there is no feasible way to

increase the water-holding capacity upstream or within the lake, the best justification for minor stage increases downstream is for the lake to be part of the solution. The best solution to minimize downstream stages while keeping lake stages below the warning stage is to lower the lake level.

In analyzing the iterative results (see following page), increasing the stage of the lake by 3" increments and increasing the weir lengths for each iteration does increase the stages downstream as expected. The stage increases are not substantial though. In order to justify any stage increases downstream to FEMA, no matter how small, the best argument is that the lowering of Lake Charlene to some extent should be a part of the scenario. If the lake is held at the sluice gate elevation, then the project simply becomes building a bigger outfall with no consideration for downstream impacts as part of the solution.

Taking a further look at the iterative results, it appears that the most significant jump in modeled stage increases takes place between the 6" and 12" water surface increases from the design condition. By taking the 9" water surface increase as the new design condition, it is still arguable that reducing the water surface elevation in the lake is part of a justifiable solution.

It should be noted that drainage modeling is not an exact science since many factors can affect the results such as precedent rainfall conditions and distribution of rainfall during a storm event. The original recommendation of lowering the lake by 18" provides the most buffer with respect to stormwater stages reaching private property. Lowering the lake level by only 9" inches will provide less buffer, but still provides over 4.1 million gallons of extra stage capacity in the lake. This is equivalent to approximately 200 average size swimming pools. Increasing stage capacity in the lake by reducing the starting water surface elevation is an important component to reducing downstream stages and increasing chances of project funding approval.

100-year / 24-hour Stage Results

Existing Conditions				Starting Water Surface @ 21.82 - 43 ft weir				Starting Water Surface at 22.07 ft - 45 ft weir					Starting Water Surface at 22.32 ft - 43 ft weir					Starting Water Surface at 22.57 ft - 52 ft weir					Starting Water Surface at 22.82 ft - 52 ft weir					Starting Water Surface at 23.07 ft - 54 ft weir					Starting Water Surface at 23.32 ft - 52 ft weir				
Name	Max Stage (ft)	Warning Stage (ft)	Warning Stage Exceeded (Y/N)	Max Stage (ft)	Max Time Outflow (hrs)	Warning Stage Exceeded (Y/N)	Max Outflow (cfs)	Max Stage (ft)	from Original Design (ft)	Max Time Outflow (hrs)	Max Outflow (cfs)	Exceeds Warning Stage Y/N	Max Stage (ft)	Delta from Original Design (ft)	Max Time Outflow (hrs)	Max Outflow (cfs)	Exceeds Warning Stage Y/N	Max Stage (ft)	Delta from Original Design (ft)	Max Time Outflow (hrs)	Max Outflow (cfs)	Exceeds Warning Stage Y/N	Max Stage (ft)	from Original Design (ft)	Warning Stage (ft)	Max Outflow (cfs)	Exceeds Warning Stage Y/N	Max Stage (ft)	Delta from Original Design (ft)	Warning Stage (ft)	Max Outflow (cfs)	Exceeds Warning Stage Y/N	Max Stage (ft)	Delta from Original Design (ft)	Max Time Outflow (hrs)	Max Outflow (cfs)	Exceeds Warning Stage Y/N
NA010 (Old Corry Dn)	4.564	8	N	4.789	19.18	N	1373.35	4.792	0.00	19.18	1374.52	N	4.795	0.01	19.17	1375.53	N	4.797	0.01	19.17	1376.64	N	4.801	0.01	8	1377.97	N	4.801	0.01	8	1377.97	N	4.8	0.01	19.16	1377.69	N
NA020 (Old Corry Up)	5.978	7	N	6.415	19.18	N	1361.895	6.421	0.01	19.17	1363.07	N	6.426	0.01	19.17	1364.07	N	6.431	0.02	19.17	1365.17	N	6.437	0.02	7	1366.49	N	6.437	0.02	7	1366.49	N	6.436	0.02	19.16	1366.2	N
NA021	18.182	22.13	N	18.182	16.07	N	15.494	18.182	0.00	16.07	15.494	N	18.182	0.00	16.07	15.494	N	18.182	0.00	16.07	15.494	N	18.182	0.00	22.13	15.494	N	18.182	0.00	22.13	15.494	N	18.182	0.00	16.07	15.494	N
NA022	18.203	21.21	N	18.203	12	N	3.931	18.203	0.00	12	3.931	N	18.203	0.00	12	3.931	N	18.203	0.00	12	3.931	N	18.203	0.00	21.21	3.931	N	18.203	0.00	21.21	3.931	N	18.203	0.00	12	3.931	N
NA023	18.462	21.41	N	18.462	10.76	N	70.755	18.462	0.00	10.76	70.755	N	18.462	0.00	10.76	83.859	N	18.462	0.00	10.76	70.755	N	18.462	0.00	21.41	70.755	N	18.462	0.00	21.41	84.051	N	18.462	0.00	10.76	84.051	N
NA024	20.585	21	N	20.585	17.32	N	13.421	20.585	0.00	17.32	13.421	N	20.585	0.00	17.32	13.421	N	20.585	0.00	17.32	13.421	N	20.585	0.00	21	13.421	N	20.585	0.00	21	13.421	N	20.585	0.00	17.32	13.421	N
NA025	6.169	7	N	6.597	19.24	N	1331.255	6.602	0.00	19.24	1332.41	N	6.607	0.01	19.23	1333.39	N	6.612	0.01	19.23	1334.47	N	6.618	0.02	7	1335.76	N	6.618	0.02	7	1335.76	N	6.617	0.02	19.22	1335.46	N
NA026	6.383	7	N	6.809	19.21	N	1331.148	6.814	0.00	19.21	1332.31	N	6.819	0.01	19.2	1333.28	N	6.824	0.01	19.2	1334.37	N	6.83	0.02	7	1335.66	N	6.83	0.02	7	1335.66	N	6.829	0.02	19.19	1335.36	N
NA028	6.449	7	N	6.868	19.17	N	1331.126	6.874	0.01	19.17	1332.29	N	6.878	0.01	19.17	1333.27	N	6.883	0.01	19.17	1334.36	N	6.889	0.02	7	1335.65	N	6.889	0.02	7	1335.65	N	6.888	0.02	19.16	1335.34	N
NA030	6.482	8	N	6.896	19.15	N	1331.175	6.901	0.00	19.15	1332.33	N	6.905	0.01	19.13	1333.31	N	6.91	0.01	19.13	1334.4	N	6.916	0.02	8	1335.7	N	6.916	0.02	8	1335.7	N	6.915	0.02	19.11	1335.4	N
NA040 (Navy Down)	7.627	11.5	N	8.026	19.39	N	1303.43	8.031	0.01	19.38	1304.56	N	8.035	0.01	19.37	1305.45	N	8.04	0.01	19.37	1306.47	N	8.045	0.02	11.5	1307.68	N	8.045	0.02	11.5	1307.68	N	8.044	0.02	19.35	1307.32	N
NA050 (Navy Up)	10.579	11	N	11.063	19.43	Y	1297.613	11.069	0.01	19.43	1298.73	Y	11.074	0.01	19.42	1299.61	Y	11.08	0.02	19.42	1300.62	Y	11.086	0.02	11	1301.8	Y	11.086	0.02	11	1301.8	Y	11.084	0.02	19.4	1301.42	Y
NA060 (Forest Creek)	11.155	9	Y	11.472	19.4	Y	1240.08	11.477	0.01	19.4	1241.15	Y	11.48	0.01	19.4	1241.87	Y	11.484	0.01	19.39	1242.76	Y	11.488	0.02	9	1243.78	Y	11.488	0.02	9	1243.79	Y	11.487	0.02	19.38	1243.27	Y
NA070 (PSC East)	12.515	11	Y	12.542	19.46	Y	1142.933	12.541	0.00	19.46	1143.92	Y	12.541	0.00	19.45	1144.4	Y	12.541	0.00	19.46	1145.12	Y	12.54	0.00	11	1145.88	Y	12.54	0.00	11	1145.89	Y	12.54	0.00	19.45	1145.17	Y
NA080 (PSC West)	12.861	11	Y	12.928	19.79	Y	1132.114	12.928	0.00	19.78	1133.03	Y	12.929	0.00	19.78	1133.47	Y	12.929	0.00	19.77	1134.18	Y	12.93	0.00	11	1134.89	Y	12.93	0.00	11	1134.91	Y	12.929	0.00	19.77	1134.21	Y
NA090	13.241	15	N	13.336	19.8	N	1124.005	13.337	0.00	19.78	1124.9	N	13.337	0.00	19.78	1125.34	N	13.338	0.00	19.77	1126.04	N	13.339	0.00	15	1126.74	N	13.339	0.00	15	1126.76	N	13.338	0.00	19.77	1126.07	N
NA100	13.402	16	N	13.502	19.62	N	1104.037	13.503	0.00	19.61	1104.91	N	13.504	0.00	19.61	1105.33	N	13.504	0.00	19.6	1106.03	N	13.505	0.00	16	1106.72	N	13.505	0.00	16	1106.73	N	13.504	0.00	19.6	1106.06	N
NA110	14.448	20	N	14.48	19.55	N	1068.886	14.481	0.00	19.54	1069.71	N	14.482	0.00	19.54	1070.09	N	14.483	0.00	19.54	1070.78	N	14.485	0.00	20	1071.44	N	14.484	0.00	20	1071.44	N	14.484	0.00	19.53	1070.8	N
NA120	15.216	21	N	15.323	19.72	N	967.126	15.324	0.00	19.71	967.828	N	15.324	0.00	19.67	968.202	N	15.325	0.00	19.66	968.85	N	15.326	0.00	21	969.416	N	15.326	0.00	21	969.452	N	15.325	0.00	19.71	968.857	N
NA130 (98 Outfall)	15.351	16	N	15.465	19.5	N	876.098	15.465	0.00	19.48	876.803	N	15.466	0.00	19.55	877.129	N	15.467	0.00	19.5	877.705	N	15.467	0.00	16	878.217	N	15.467	0.00	16	878.278	N	15.467	0.00	19.57	877.717	N
NB010 (S. 61st Ave)	21.708	26.36	N	21.336	15.12	N	122.026	21.344	0.01	14.98	122.272	N	21.356	0.02	15.01	122.61	N	21.364	0.03	15.02	122.838	N	21.382	0.05	26.36	123.376	N	21.382	0.05	26.36	123.366	N	21.382	0.05	15.05	123.384	N
NB020 (61st Confluence)	23.391	28.81	N	22.684	11.97	N	146.469	22.691	0.01	11.86	146.344	N	22.709	0.02	11.73	146.02	N	22.731	0.05	11.6	145.89	N	22.757	0.07	28.81	145.306	N	22.757	0.07	28.81	145.333	N	22.757	0.07	11.42	145.309	N
NB030 (Mid. 61st)	24.511	26.75	N	24.315	12.26	N	13.466	24.315	0.00	12.27	13.466	N	24.315	0.00	12.26	13.466	N	24.315	0.00	12.26	13.466	N	24.315	0.00	26.75	13.466	N	24.315	0.00	26.75	13.465	N	24.315	0.00	12.26	13.466	N
NB040	25.387	27.59	N	25.386	15.17	N	12.187	25.386	0.00	15.17	12.187	N	25.386	0.00	15.17	12.187	N	25.386	0.00	15.17	12.187	N	25.386	0.00	27.59	12.187	N	25.386	0.00	27.59	12.187	N	25.386	0.00	15.17	12.187	N
NB050	27.817	29.72	N	27.817	16.5	N	6.02	27.817	0.00	16.5	6.02	N	27.817	0.00	16.51	6.02	N	27.817	0.00	16.54	6.02	N	27.817	0.00	29.72	6.021	N	27.817	0.00	29.72	6.02	N	27.817	0.00	16.51	6.02	N
NB055	24.159	26.27	N	23.272	16.65	N	92.144	23.276	0.00	16.77	92.377	N	23.279	0.01	17.43	92.486	N	23.263	-0.01	19.39	91.869	N	23.264	-0.01	26.27	91.903	N	23.267	0.00	26.27	91.828	N	23.264	-0.01	14.29	91.42	N
NB060	24.547	27.57	N	23.329	14.03	N	70.599	23.333	0.00	13.94	70.684	N	23.336	0.01	13.45	70.72	N	23.321	-0.01	12.95	70.834	N	23.322	-0.01	27.57	70.77	N	23.324	0.00	27.57	70.822	N	23.322	-0.01	12.38	70.842	N
NB063	24.707	28.22	N	23.375	17.91	N	57.425	23.38	0.00	17.03	57.483	N	23.383	0.01	17.44	57.483	N	23.369	-0.01	19.67	57.481	N	23.376	0.00	28.22	57.487	N	23.376	0.00	28.22	57.485	N	23.376	0.00	19.61	57.528	N
NB065	24.796	28.22	N	23.447	18.96	N	53.962	23.452	0.01	17.25	54.113	N	23.455	0.01	17.45	54.26	N	23.441	-0.01	19.41	53.879	N	23.463	0.02	28.22	53.945	N	23.463	0.02	28.22	53.996	N	23.463	0.02	19.48	53.916	N
NB070 (61st Duplexes)	25.419	30.49	N	23.799	16.18	N	51.801	23.805	0.01	16.17	52.154	N	23.811	0.01	16.18	52.558	N	23.82	0.02	16.16	53.073	N	23.844	0.05	30.49	53.653	N	23.844	0.05	30.49	53.654	N	23.844	0.05	16.14	53.657	N
NB080 (Open Ditch)	25.973	29.51	N	24.117	16.19	N	51.792	24.125	0.01	16.17	52.155	N	24.134	0.02	16.16	52.557	N	24.149	0.03	16.17	53.072	N	24.173	0.06	29.51	53.645	N	24.173	0.06	29.51	53.646	N	24.173	0.06	16.14	53.65	N
NB090 (SS Lk Joanne Dr)	26.79	28.85	N	24.592	19.12	N	45.082	24.6	0.01	17.91	45.315	N	24.61	0.02	17.72	45.56	N	24.625	0.03	17.48	45.934	N	24.646	0.05	28.85	46.308	N	24.646	0.05	28.85	46.319	N	24.646	0.05	17.22	46.311	N
NB095	27.02	27	Y	24.719	19.15	N	188.661	24.727	0.01	19.25	189.113	N	24.736	0.02	18.41	189.448	N	24.753	0.03	19.4	190.14	N	24.771	0.05	27	190.563	N	24.772	0.05	27	190.63	N	24.771	0.05	19.47	190.568	N
NB100 (S. Canal)	27.651	27	Y	24.847	19.15	N	188.656	24.86	0.01	19.25	189.105	N	24.891	0.04	18.41	189.443	N	24.892	0.04	19.4	190.129	N	24.928	0.08	27	190.55	N	24.922	0.07	27	190.618	N	24.928	0.08	19.47	190.555	N
NB110 (Lake Joanne)	27.653	27	Y	24.87	19.3	N	186.34	24.882	0.01	19.25	186.773	N	24.913	0.04	19.32	187.082	N	24.915	0.04	19.4	187.83	N	24.951	0.08	27	188.252	N	24.944	0.07	27	188.31	N	24.951	0.08	19.47	188.257	N
NB120 (N. Canal)	27.654	27	Y	24.883	12.17	N	181.783	24.895	0.01	12.01	180.38	N	24.926	0.04	11.78	179.009	N	24.928	0.05	11.61	180.332	N	24.963	0.08	27	180.999	N	24.957	0.07	27	181.448	N	24.963	0.08	11.26	181.028	N
NB130 (N. Canal @ Lake)	27.656	26	Y	24.896	12.17	N	176.911	24.909	0.01	12.01	175.736	N	24.939	0.04	11.77	175.855	N	24.941	0.04	11.61	178.449	N	24.976	0.08	26	182.08	N	24.97	0.07	26	182.286	N	24.977	0.08	11.26	182.138	N
NB140 (Lake Charlene)	27.664	25	Y	24.918	12.17	N	255.33	24.931	0.01	12	254.052	N	24.962	0.04	11.77	254.647	N	24.964	0.05	11.61	261.201	N	24.999	0.08	25	262.336	N	24.993	0.07	25	262.537	N	24.999	0.08	11.26	262.413	N
NB150 (S. Long Lake)	27.654	28	N	24.887	12.01	N	3.506	24.914	0.03	12.01	3.481	N	24.945	0.06	12.01	3.424	N	24.948	0.06	12.01	3.411	N	24.992	0.11	28	3.393	N	24.985	0.10	28	3.395	N	24.992	0.11	12.01	3.393	N
NB160 (S. Kitty Hawk)	27.661	26.5	Y	26.609	12.28	Y	16.284	26.609	0.00	12.89	16.574	Y	26.609	0.00	12.76	16.959	Y	26.605	0.00	12.67	17.139	Y	26.58	-0.03	26.5	17.447	Y	26.583	-0.03	26.5	17.423	Y	26.58	-0.03	12.47	17.448	Y
NB170 (Mid. Bunker Hill))	27.78	27	Y	25.395	12.17	N	24.192	25.422	0.03	12.17	24.012	N	25.471	0.08	12.21	24.123	N	25.487	0.09	12.21	24.138	N	25.541	0.15	27	24.104	N	25.533	0.14	27	24.108	N	25.541	0.15	12.21	24.104	N
NB180 (N. Kitty Hawk)	28.008	27.11	Y	26.023	12.17	N	19.267	26.05	0.03	12.3	19.236	N	26.096	0.07	12.27	19.315	N	26.111	0.09	12.27	19.318	N	26.161	0.14	27.11	19.269	N	26.154	0.13	27.11	19.278	N	26.161	0.14	12.27	19.268	N
NB181	30.027	31	N	30.027	13.86	N	7.579	30.027	0.00	13.86	7.579	N	30.027	0.00	13.86	7.579	N	30.027	0.00	13.86	7.579	N	30.027	0.00	31	7.579	N	30.027	0.00	31	7.579	N	30.027	0.00	13.86	7.579	N
NB182	30.276	30	Y	30.276	13.6	Y	7.592	30.276	0.00	13.6	7.592	Y	30.276	0.00	13.6	7.592	Y	30.276	0.00	13.6	7.592	Y	30.276	0.00	30	7.592	Y	30.276	0.00	30	7.592	Y	30.276	0.00	13.6	7.592	Y
NB183	30.283	30	Y	30.283	13.61	Y	17.934	30.283	0.00	13.61	17.934	Y	30.283	0.00	13.61	17.934	Y	30.283	0.00	13.61	17.934	Y	30.283	0.00	30	17.934	Y	30.283	0.00	30	17.934	Y	30.283	0.00	13.61	17.934	Y
NB190 (N. Long Lake)	27.661	28	N	24.947	12.2	N	6.334	24.96	0.01	12.21	6.234	N	24.994	0.05	12.22	6.13	N	25.001	0.05	12.23	6.091	N	25.043	0.10	28	6.036	N	25.036	0.09	28	6.041	N	25.043	0.10	12.23	6.036	N
NB200 (LC East End)	28.236	27.64	Y	26.257	15.09	N	17.665	26.251	-0.01	15.08	17.662	N	26.234	-0.02	15.06	17.651	N	26.224	-0.03	15.05	17.642	N	26.205	-0.05	27.64	17.618	N	26.206	-0.05	27.64	17.621	N	26.205	-0.05	15.01	17.618	N
NB210 (61st SE LC)	29.688	29	Y	28.938	15.41	N	16.998	28.932	-0.01	15.36	16.99	N	28.924	-0.01	15.34	16.973	N	28.92	-0.02	15.34	16.964	N	28.913	-0.02	29	16.934	N	28.913	-0.02	29	16.938	N	28.913	-0.02	15.32	16.934	N
NB220 (61st E. LC)	31.244	29	Y	31.031	22.25	Y	12.593	31.029	0.00	22.25	12.591	Y	31.025	-0.01	22.25	12.59	Y	31.023	-0.01	22.25	12.587	Y	31.019	-0.01	29	12.589	Y	31.019	-0.01	29	12.588	Y	31.019	-0.01	22.25	12.589	Y
NB230	31.893	30.5	Y	31.728	24.3	Y	8.632	31.727	0.00	24.3	8.632	Y	31.725	0.00	24.3	8.632	Y	31.724	0.00	24.29	8.632	Y	31.722	-0.01	30.5	8.631	Y	31.722	-0.01	30.5	8.631	Y	31.722	-0.01	24.29	8.631	Y
NB240	32.59	31.8	Y	32.536	24.32	Y	8.627	32.536	0.00	24.32	8.627	Y	32.536	0.00	24.32	8.627	Y	32.536	0.00	24.32	8.626	Y	32.535	0.00	31.8	8.626	Y	32.535	0.00	31.8	8.626	Y	32.535	0.00	24.32	8.626	Y
NB260	42.566	42.5	Y	42.566	12.01	Y	3.744	42.566	0.00	12.01	3.744	Y	42.566	0.00	12.01	3.744	Y	42.566	0.00	12.01	3.744	Y	42.566	0.00	42.5	3.744	Y	42.566	0.00	42.5	3.744	Y	42.566	0.00	12.01	3.744	Y
NB270	27.666	27.5	Y	24.99	12.02	N	5.692	25.002	0.01	12.02	5.73	N	25.032	0.04	12.02	5.699	N	25.039	0.05	12.01	5.694	N	25.083	0.09	27.5	5.696	N	25.076	0.09	27.5	5.696	N	25.083	0.09	12.02	5.696	N
NB280 (LC Northeast)	27.669	26.81	Y	25.12	12.01	N	5.735	25.141	0.02	12.01	5.735	N	25.177	0.06	12.01	5.735	N	25.186	0.07	11.98	5.721	N	25.234	0.11	26.81	5.713	N	25.228	0.11	26.81	5.713	N	25.235	0.11	12.02	5.713	N
NB290	27.753	25.69	Y	25.563	12.06	N	33.121	25.582	0.02	12.04	33.152	N	25.617	0.05	12.08	33.128	N	25.625	0.06	12.05	33.109	N	25.662	0.10	25.69	32.707	N	25.656	0.09	25.69	32.76	N	25.662	0.10	11.95	32.703	N
NB295 (LC North)	27.813	25.76	Y	25.892	12.06	Y	33.142	25.91	0.02	12.05	33.166	Y	25.942	0.05	12.08	33.144	Y	25.95	0.06	12.05	33.125	Y	25.985	0.09	25.76	32.722	Y	25.98	0.09	25.76	32.775	Y	25.985	0.09	11.95	32.718	Y
NB300	27.918	26.04	Y	26.193	12.05	Y	22.33	26.211	0.02	12.03	22.366	Y	26.242	0.05	12.03	22.334	Y	26.25	0.06	12.02	22.338	Y	26.283	0.09	26.04	22.221	Y	26.278	0.08	26.04	22.226	Y	26.284	0.09	12.03	22.22	Y
NB305	28.076	28.2	N	26.455	16.11	N	18.879	26.473	0.02	16.11	18.879	N	26.504	0.05	16.11	18.879	N	26.512	0.06	16.11	18.878	N	26.545	0.09	28.2	18.878	N	26.54	0.09	28.2	18.878	N	26.545	0.09	16.11	18.878	N
NB400	28.171	27	Y	26.626	10.35	N	17.162	26.645	0.02	10.33	16.875	N	26.675	0.05	10.3	16.495	N	26.686	0.06	10.28	16.208	N	26.719	0.09	27	15.756	N	26.715	0.09	27	15.782	N	26.72	0.09	10.25	15.752	N
NB410 (LC Northwest)	28.501	26.98	Y	27.633	10.34	Y	17.241	27.65	0.02	10.32	16.96	Y	27.675	0.04	10.29	16.58	Y	27.689	0.06	10.26	16.301	Y	27.717	0.08	26.98	15.858	Y	27.714	0.08	26.98	15.884	Y	27.717	0.08	10.24	15.853	Y
NB420	28.446	26.5	Y	26.345	12.9	N	82.671	26.356	0.01	12.76	82.279	N	26.378	0.03	23.67	81.582	N	26.377	0.03	23.66	81.704	N	26.401	0.06	26.5	81.5	N	26.396	0.05	26.5	81.526	N	26.401	0.06	23.74	81.5	N
NB430 (Bunker LC West)	29.104	26.51	Y	27.867	26	Y	11.964	27.874	0.01	26	11.947	Y	27.886	0.02	26	11.895	Y	27.887	0.02	26	11.906	Y	27.901	0.03	26.51	11.828	Y	27.898	0.03	26.51	11.845	Y	27.901	0.03	26	11.828	Y
NB440 (Bridle Pond)	29.106	26	Y	27.872	22.3	Y	11.577	27.878	0.01	22.3	11.597	Y	27.89	0.02	22.3	11.615	Y	27.891	0.02	22.3	11.648	Y	27.905	0.03	26	11.672	Y	27.903	0.03	26	11.675	Y	27.905	0.03	22.3	11.673	Y

Existing Condition | Original Design - 18" Lower | 3-inch increase | 6-inch increase | 9-inch increase | 12 inch increase | 15-inch increase | 18-inch increase