APPENDIX A - SYSTEM MAP & MODELING RESULTS

[DATE: 3/15/2012 11:04 AM] [AUTHOR: nboggs] [PLOTTER: CutePDF Writer] [STYLE: WHP-Standard.ctb]
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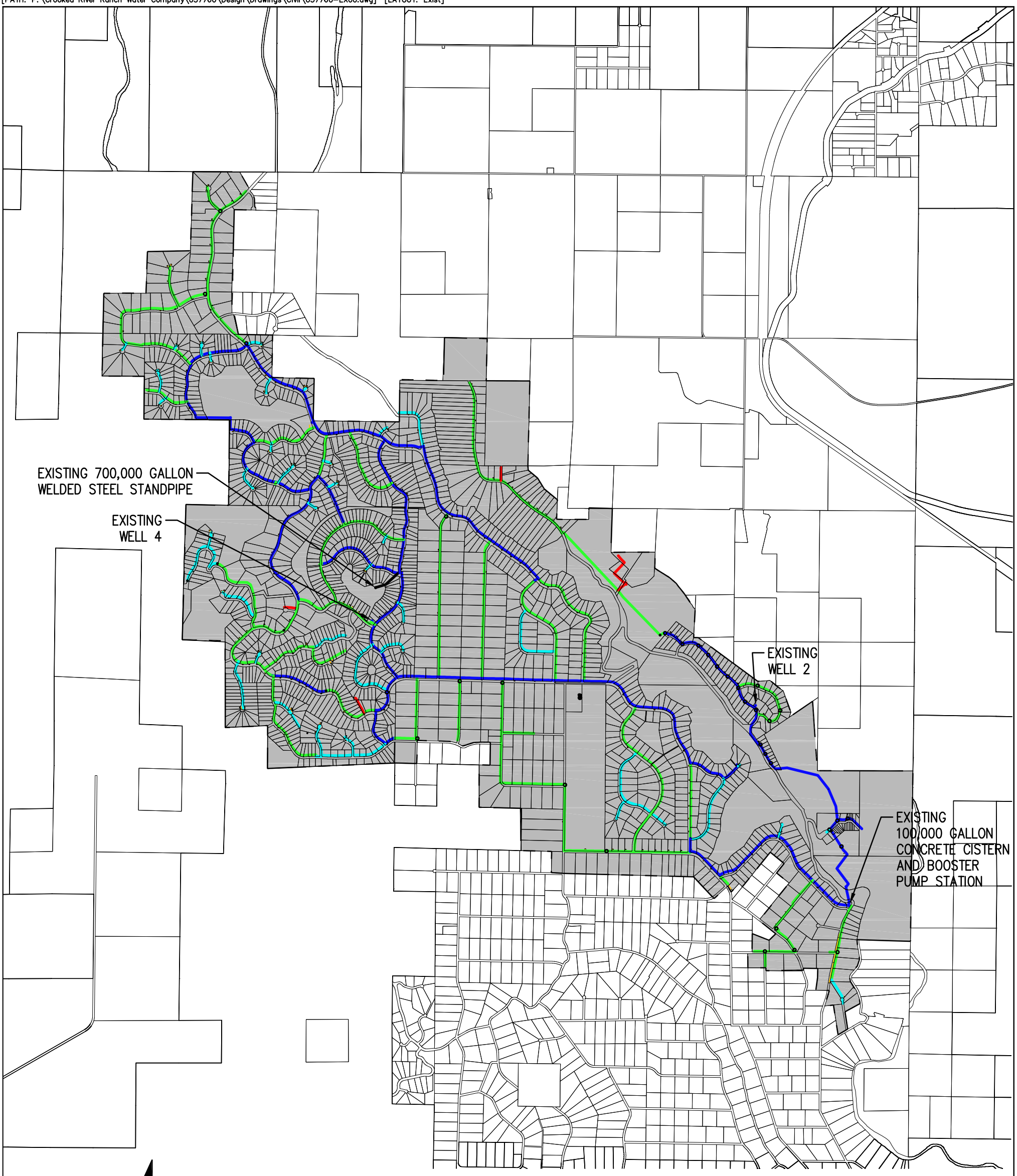


N

SCALE
3000 0 1500 3000
(FEET)
1 INCH = 3000 FT.

EXISTING SERVICE AREA

TAX LOT

2" WATER MAIN
4" WATER MAIN
6" WATER MAIN
8" WATER MAIN
12" WATER MAIN

SHEET NUMBER

CROOKED RIVER RANCH WATER SERVICE AREA EXHIBIT WITH WATER MAIN INVENTORY

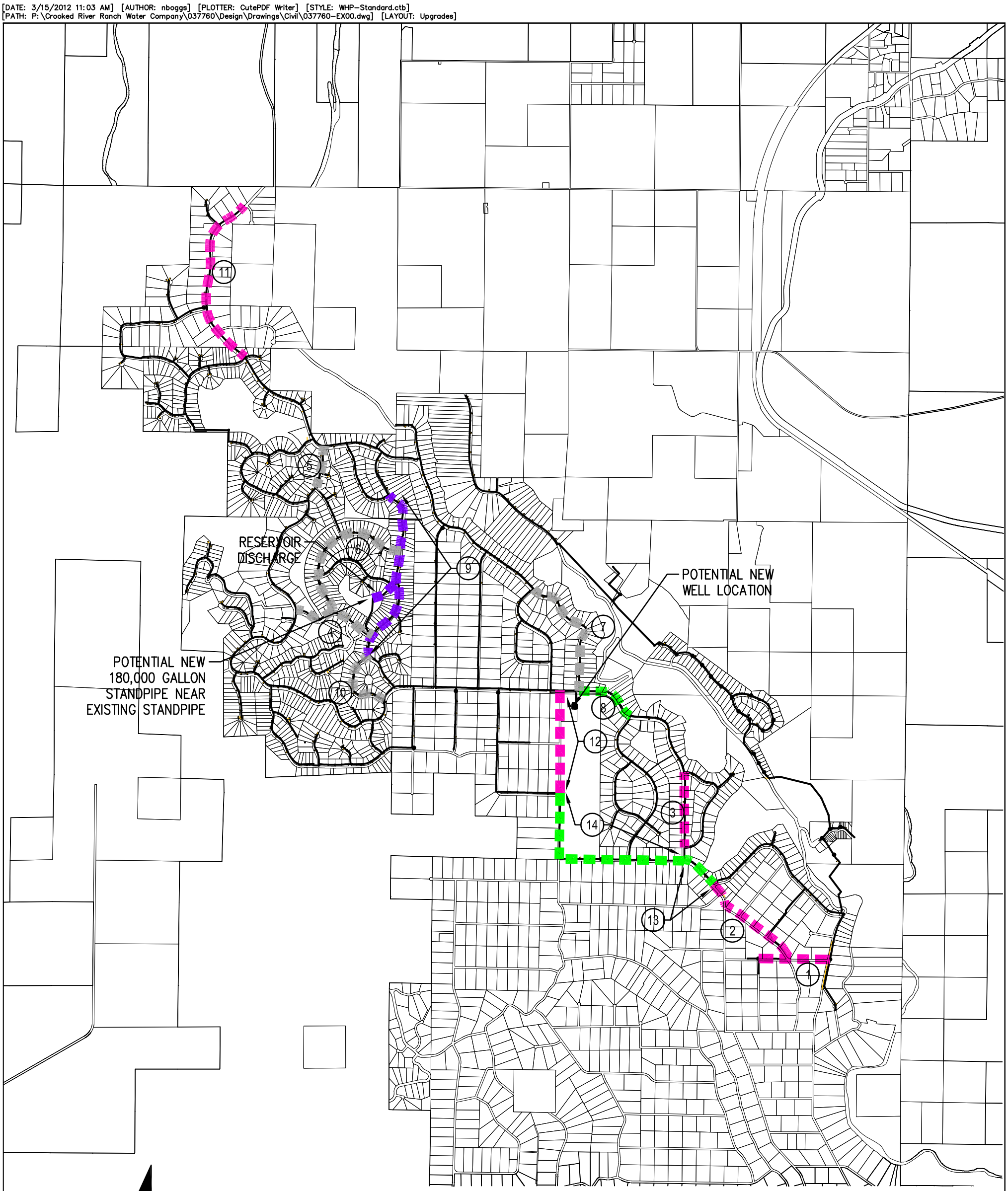
PROJECT NUMBER	DRAWING FILE NAME	SCALE
	037760-EX00	

SHEET INFO	
DESIGNED	NWB
DRAWN	KLL/NWB
CHECKED	NWB
APPROVED	NWB
LAST EDIT	3/15/2012
PLOT DATE	3/15/2012
SUBMITTAL	

REVISIONS			
NO.	BY	DATE	REMARKS

WHPacific
123 SW Columbia Street
Bend, OR 97702
541-388-4255 Fax 541-388-4229
www.whpacific.com

[DATE: 3/15/2012 11:03 AM] [AUTHOR: nboggs] [PLOTTER: CutePDF Writer] [STYLE: WHP-Standard.ctb]
[PATH: P:\Crooked River Ranch Water Company\037760\Design\Drawings\Civil\037760-EX00.dwg] [LAYOUT: Upgrades]



N

SCALE
3000 0 1500 3000
(FEET)
1 INCH = 3000 FT.

IMPROVEMENT RECOMMENDATION 2a (RECOMMENDED FOR ALL STORAGE ALTERNATIVES)

IMPROVEMENT RECOMMENDATION 3 (RECOMMENDED FOR 2955' HGL, NOT FOR 2970' HGL)

IMPROVEMENT RECOMMENDATION 2b (RECOMMENDED FOR ALL STORAGE ALTERNATIVES)

POTENTIAL FUTURE WATER MAIN UPGRADES (LOWER PRIORITY)

SHEET NUMBER

CROOKED RIVER RANCH WATER COMPANY
POTENTIAL WATER MAIN UPGRADES

PROJECT NUMBER	DRAWING FILE NAME	SCALE
	037760-EX00	

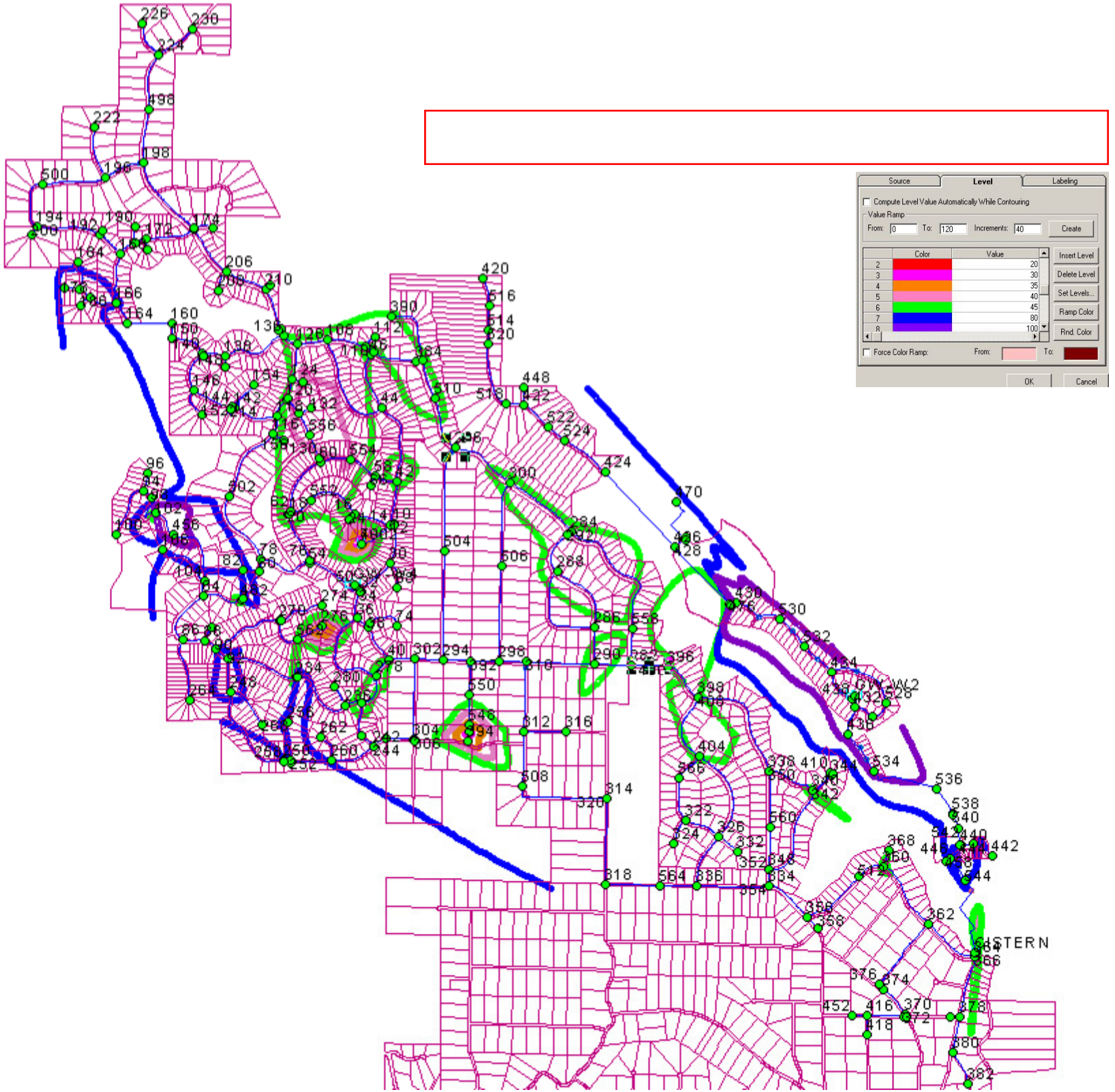
SHEET INFO	
DESIGNED	NWB
DRAWN	KLL/NWB
CHECKED	NWB
APPROVED	NWB
LAST EDIT	3/15/2012
PLOT DATE	3/15/2012
SUBMITTAL	

REVISIONS			
NO.	BY	DATE	REMARKS

WHPacific
123 SW Columbia Street
Bend, OR 97702
541-388-4255 Fax 541-388-4229
www.whpacific.com

CRRWC Hydrant Number	Run (Existing) - No Piping Upgrades, no new reservoir		Run A - Pipe Upgrades 1,2,3		Run B - Pipe Upgrade 6		Run C - Pipe Upgrade 5		Run D - Pipe Upgrade 4		Run E - Pipe Upgrades 5 and 6		Run F - Pipe Upgrade 8 (12" from 8")		Run G - Pipe Upgrade 7		Run H - Pipe Upgrade 9 (12" from 8")		Run I - New Reservoir ON		Run J - Pipe Upgrade 10 (8" from 4")		Run K - New Reservoir ON, Pipe Upgrades 1,2,3		Run L - New Reservoir ON, Pipe Upgrades 1,2,3,5,6,10,7,4		Run M - New Reservoir ON, Pipe Upgrades 11 & 12		Run N - New Reservoir ON, Pipe Upgrades 1,2,3,11,12		Run O - New Reservoir ON, Pipe Upgrades 1,2,3,11,12,5,6,10, 7,4		Run P - Elevated HGL at exist. standpipe, NO Pipe Upgrades		Run Q - Elevated HGL at exist. standpipe, Pipe Upgrades 9,Reservoir Discharge		Run R - Elevated HGL at exist. standpipe, Pipe Upgrades 1,2,3,9,11,Reservoir Discharge		Run S - Elevated HGL at exist. standpipe, Pipe Upgrades 1,2,3,9,11,12,Reservoir Discharge	
	ID	Available Flow @Hydrant (gpm)	ID	Available Flow @Hydrant (gpm)	ID	Available Flow @Hydrant (gpm)	ID	Available Flow @Hydrant (gpm)	ID	Available Flow @Hydrant (gpm)	ID	Available Flow @Hydrant (gpm)	ID	Available Flow @Hydrant (gpm)	ID	Available Flow @Hydrant (gpm)	ID	Available Flow @Hydrant (gpm)	ID	Available Flow @Hydrant (gpm)	ID	Available Flow @Hydrant (gpm)	ID	Available Flow @Hydrant (gpm)	ID	Available Flow @Hydrant (gpm)	ID	Available Flow @Hydrant (gpm)	ID	Available Flow @Hydrant (gpm)	ID	Available Flow @Hydrant (gpm)	ID	Available Flow @Hydrant (gpm)	ID	Available Flow @Hydrant (gpm)	ID	Available Flow @Hydrant (gpm)
2	198	779.2	198	779.2	198	791.64	198	781.97	198	790.44	198	795.91	198	779.17	198	779.12	198	845.54	198	871.89	198	781.47	198	863.18	198	900.58	198	1,107.21	198	1,107.58	198	1,174.18	198	957.05	198	1,051.54	198	1364	198	1364.40
1	224	391.07	224	391.07	224	395.71	224	391.92	224	395.51	224	397.04	224	391.06	224	391.03	224	417.92	224	432.9	224	392.03	224	429.19	224	441.94	224	709.91	224	710.17	224	744.39	224	506.78	224	542.07	224	909	224	908.77
3	228	1,231.41	228	1,231.40	228	1,262.66	228	1,240.49	228	1,259.17	228	1,276.42	228	1,231.35	228	1,231.31	228	1,395.65	228	1,438.48	228	1,236.07	228	1,417.15	228	1,527.48	228	1,418.01	228	1,418.51	228	1,530.46	228	1,501.77	228	1,751.30	228	1752	228	1752.11
8	278	828.53	278	828.53	278	851.63	278	830.1	278	833.4	278	854.19	278	828.58	278	832.1	278	1,069.21	278	1,488.24	278	943.44	278	1,487.76	278	1,747.96	278	1,580.52	278	1,582.51	278	1,752.83	278	1,255.14	278	1,650.74	278	1648	278	1648.30
11	282	674.3	282	674.24	282	686.87	282	676.31	282	675.01	282	689.71	282	673.91	282	710.61	282	794.65	282	2,971.00	282	696.85	282	2,004.82	282	3,044.45	282	2,107.21	282	2,112.28	282	3,163.74	282	971.28	282	1,154.29	282	1153	282	1153.40
4	296	938.2	296	938.16	296	958.62	296	943.68	296	940.66	296	965.8	296	937.94	296	938.75	296	1,164.61	296	1,781.11	296	970.49	296	1,654.54	296	1,865.69	296	1,664.76	296	1,666.84	296	1,897.55	296	1,327.58	296	1,686.85	296	1685	296	1685.47
7	308	866.59	308	866.59	308	880.47	308	867.57	308	869.64	308	882.05	308	866.61	308	868.86	308	1,000.70	308	1,205.61	308	914.7	308	1,187.22	308	1,256.45	308	1,203.78	308	1,204.60	308	1,257.94	308	1,125.60	308	1,320.82	308	1320	308	1319.73
5	310	1,051.20	310	1,051.27	310	1,068.60	310	1,054.10	310	1,052.96	310	1,072.61	310	1,051.59	310	1,069.21	310	1,229.19	310	2,676.80	310	1,089.06	310	2,348.68	310	2,748.28	310	2,362.46	310	2,367.43	310	2,754.94	310	1,344.66	310	1,614.36	310	1613	310	1615.74
9	314	455.32	314	460.09	314	461.01	314	456.13	314	455.57	314	462.15	314	469.91	314	461.22	314	504.84	314	738.32	314	464.19	314	689.91	314	750.08	314	1,934.93	314	1,942.68	314	2,317.42	314	627.23	314	694.25	314	700	314	1234.36
15	370	260.69	370	404.52	370	263.19	370	261.02	370	260.85	370	263.67	370	271.37	370	263.43	370	281.27	370	366.68	370	263.96	370	576.58	370	684.44	370	349.53	370	612.12	370	704.25	370	359.08	370	385.14	370	654	370	669.15
13	376	311.38	376	463.94	376	314.2	376	311.77	376	311.54	376	314.74	376	324.94	376	314.84	376	334.7	376	438.38	376	315.22	376	655.07	376	788.02	376	416.32	376	698.69	376	813.11	376	415.05	376	445.21	376	692	376	707.06
16	378	291.66	378	403.77	378	294.52	378	292.04	378	291.83	378	295.06	378	304.83	378	295.02	378	315.27	378	418.46	378	295.49	378	570.48	378	673.06	378	396.77	378	604.41	378	691.74	378	398.96	378	429.21	378	643	378	656.97
6	392	1,071.84	392	1,071.87	392	1,093.20	392	1,074.78	392	1,074.60	392	1,097.42	392	1,072.01	392	1,080.47	392	1,294.43	392	2,330.32	392	1,123.40	392	2,137.15	392	2,435.47	392	2,163.64	392	2,167.13	392	2,444.12	392	1,415.59	392	1,762.51	392	1761	392	1762.08
14	416	239.47	416	348.09	416	241.74	416	239.77	416	239.62	416	242.17	416	248.61	416	241.83	416	258.04	416	332.27	416	242.38	416	477.44	416	543.96	416	317.86	416	499.71	416	555.37	416	331.33	416	354.55	416	618	416	631.02
17	430	998.49	430	998.49	430	998.49	430	998.49	430	998.49	430	998.49	430	998.49	430	998.49	430	998.49	430	998.49	430	998.49	430	998.49	430	998.49	430	998.49	430	998.49	430	998.49	430	998.49	430	998.49	430	998	430	998.49
24	432	1,021.79	432	1,021.79	432	1,021.79	432	1,021.79	432	1,021.79	432	1,021.79	432	1,021.79	432	1,021.79	432	1,021.79	432	1,021.79	432	1,021.79	432	1,021.79	432	1,021.79	432	1,021.79	432	1,021.79	432	1,021.79	432	1,021.79	432	1,021.79	432	1022	432	1021.79
34	444	1,389.74	444	1,389.74	444	1,389.74	444	1,389.74	444	1,389.74	444	1,389.74	444	1,389.74	444	1,389.74	444	1,389.74	444	1,389.74	444	1,389.74	444	1,389.74	444	1,389.74	444	1,389.74	444	1,389.74	444	1,389.74	444	1,389.74	444	1,389.74	444	1390	444	1389.74
33	488	1,316.89	488	1,316.89	488	1,316.89	488	1,316.89	488	1,316.89	488	1,316.89	488	1,316.89	488	1,316.89	488	1,316.89	488	1,316.89	488	1,316.89	488	1,316.89	488	1,316.89	488	1,316.89	488	1,316.89	488	1,316.89	488	1,316.89	488	1,316.89	488	1317	488	1316.89
25	526	954.89	526	954.89	526	954.89	526	954.89	526	954.89	526	954.89	526	954.89	526	954.89	526	954.89	526	954.89	526	954.89	526	954.89	526	954.89	526	954.89	526	954.89	526	954.89	526	954.89	526	954.89	526	955	526	954.89
19	530	1,036.74	530	1,036.74	530	1,036.74	530	1,036.74	530	1,036.74	530	1,036.74	530	1,036.74	530	1,036.74	530	1,036.74	530	1,036.74	530	1,036.74	530	1,036.74	530	1,036.74	530	1,036.74	530	1,036.74	530	1,036.74	530	1,036.74	530	1,036.74	530	1037	530	1036.74
21	532	1,038.82	532	1,038.82	532	1,038.82	532	1,038.82	532	1,038.82	532	1,038.82	532	1,038.82	532	1,038.82	532	1,038.82	532	1,038.82	532	1,038.82	532	1,038.82	532	1,038.82	532	1,038.82	532	1,038.82	532	1,038.82	532	1,038.82	532	1,038.82	532	1039	532	1038.82
31	534	1,177.65	534	1,177.65	534	1,177.65	534	1,177.65	534	1,177.65	534	1,177.65	534	1,177.65	534	1,177.65	534	1,177.65	534	1,177.65	534	1,177.65	534	1,177.65	534	1,177.65	534	1,177.65	534	1,177.65	534	1,177.65	534	1,177.65	534	1,177.65	534	1178	534	1177.65
35	544	1,738.97	544	1,738.97	544	1,738.97	544	1,738.97	544	1,738.97	544	1,738.97	544	1,738.97	544	1,738.97	544	1,738.97	544	1,738.97	544	1,738.97	544	1,738.97	544	1,738.97	544	1,738.97	544	1,738.97	544	1,738.97	544	1,738.97	544	1,738.97	544	1739	544	1738.97
10	564	571.71	564	583.14	564	577.99	564	572.66	564	572	564	579.3	564	606.71	564	581.71	564	627.99	564	982.57	564	582.32	564	860.34	564	1,018.40	564	1,047.77	564	1,068.44	564	1,233.13	564	740.95	564	819	564	835	564	928.24

CRRWC Hydrant Number	Run (Existing) - No Piping Upgrades, no new reservoir Available Flow @Hydrant (gpm)	Run K - New Reservoir ON, Pipe Ugrades 1,2,3 Available Flow @Hydrant (gpm)	Run L - New Reservoir ON, Pipe Ugrades 1,2,3,5,6,10,7,4 Available Flow @Hydrant (gpm)	Run M - New Reservoir ON, Pipe Upgrades 11 & 12 Available Flow @Hydrant (gpm)	Run N - New Reservoir ON, Pipe Upgrades 1,2,3,11,12 Available Flow @Hydrant (gpm)	Run O - New Reservoir ON, Pipe Upgrades 1,2,3,11,12,5,6,10,7,4 Available Flow @Hydrant (gpm)	Run P - Elevated HGL at exist. standpipe, NO Pipe Upgrades Available Flow @Hydrant (gpm)	Run Q - Elevated HGL at exist. standpipe, Pipe Upgrades 9,Reservoir Discharge Available Flow @Hydrant (gpm)	Run R - Elevated HGL at exist. standpipe, Pipe Upgrades 1,2,3,9,11,Reservoir Discharge Available Flow @Hydrant (gpm)	Run S - Elevated HGL at exist. standpipe, Pipe Upgrades 1,2,3,9,11,12,Reservoir Discharge Available Flow @Hydrant (gpm)	Run T - Elevated HGL at exist. Standpipe, Pipe Upgrades 1,2,3,9,11,12,13,Reservoir Discharge Available Flow @Hydrant (gpm)	Run U - Elevated HGL at exist. Standpipe, Pipe Upgrades 1,2,3,9,11,12,8,Reservoir Discharge Available Flow @Hydrant (gpm)	Run V - Elevated HGL at exist. Standpipe, Pipe Upgrades 1,2,3,9,11,12,8,13,Reservoir Discharge Available Flow @Hydrant (gpm)	Run W - Elevated HGL at exist. Standpipe, Pipe Upgrades 1,2,3,9,11,12,8,13,14a,Reservoir Discharge Available Flow @Hydrant (gpm)	Run X - Elevated HGL at exist. Standpipe, Pipe Upgrades 1,2,3,9,11,12,8,13,14a,14b,Reservoir Discharge Available Flow @Hydrant (gpm)	Run Y - Elevated HGL 2970 at exist. Standpipe, no pipe upgrades NOTE: very similar results to Run Q. Therefore elevating additional 15' eliminates need for pipe 9 or Reservoir discharge upgrades Available Flow @Hydrant (gpm)
2	779	863	901	1107	1108	1,174	957	1052	1364	1364	1364	1,364	1,364	1,364	1,364	1,026
1	391	429	442	710	710	744	507	542	909	909	909	909	909	909	909	551
3	1231	1417	1527	1418	1419	1,530	1502	1751	1752	1752	1752	1,752	1,752	1,752	1752	1,608
8	829	1488	1748	1581	1583	1,753	1255	1651	1648	1648	1648	1,648	1,648	1,648	1648	1,412
11	674	2005	3044	2107	2112	3,164	971	1154	1153	1153	1153	1,153	1,153	1,161	1193	1,083
4	938	1655	1866	1665	1667	1,898	1328	1687	1685	1685	1685	1,685	1,685	1,686	1686	1,473
7	867	1187	1256	1204	1205	1,258	1126	1321	1320	1320	1320	1,320	1,320	1,320	1320	1,224
5	1051	2349	2748	2362	2367	2,755	1345	1614	1613	1616	1616	1,616	1,616	1,616	1616	1,458
9	455	690	750	1935	1943	2,317	627	694	700	1234	1234	1,237	1,237	1,239	1244	692
15	261	577	684	350	612	704	359	385	654	669	721	713	774	787	954	396
13	311	655	788	416	699	813	415	445	692	707	762	753	818	832	1008	455
16	292	570	673	397	604	692	399	429	643	657	705	698	754	767	918	439
6	1072	2137	2435	2164	2167	2,444	1416	1763	1761	1762	1762	1,762	1,762	1,762	1762	1,547
14	239	477	544	318	500	555	331	355	618	631	675	669	721	732	867	366
17	998	998	998	998	998	998	998	998	998	998	998	998	998	998	998	998
24	1022	1022	1022	1022	1022	1,022	1022	1022	1022	1022	1022	1,022	1,022	1,022	1022	1,022
34	1390	1390	1390	1390	1390	1,390	1390	1390	1390	1390	1390	1,390	1,390	1,390	1390	1,390
33	1317	1317	1317	1317	1317	1,317	1317	1317	1317	1317	1317	1,317	1,317	1,317	1317	1,317
25	955	955	955	955	955	955	955	955	955	955	955	955	955	955	955	955
19	1037	1037	1037	1037	1037	1,037	1037	1037	1037	1037	1037	1,037	1,037	1,037	1037	1,037
21	1039	1039	1039	1039	1039	1,039	1039	1039	1039	1039	1039	1,039	1,039	1,039	1039	1,039
31	1178	1178	1178	1178	1178	1,178	1178	1178	1178	1178	1178	1,178	1,178	1,178	1178	1,178
35	1739	1739	1739	1739	1739	1,739	1739	1739	1739	1739	1739	1,739	1,739	1,739	1739	1,739
10	572	860	1018	1048	1068	1,233	741	819	835	928	928	970	970	1,082	1339	806


Source
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Labeling
Compute Level Value Automatically While Contouring
Value Ramp
From: 0
To: 120
Increments: 40
Create
Color
Value
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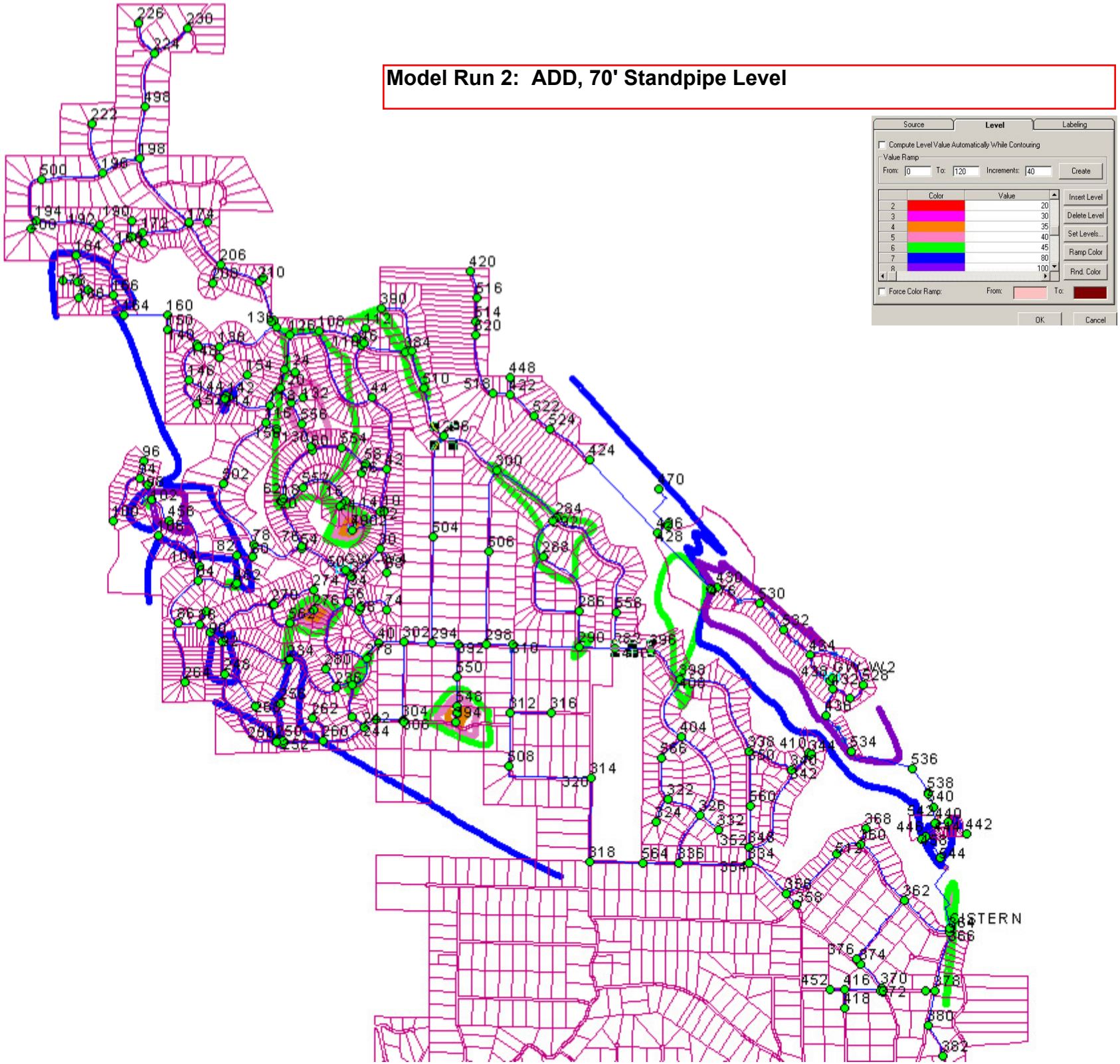
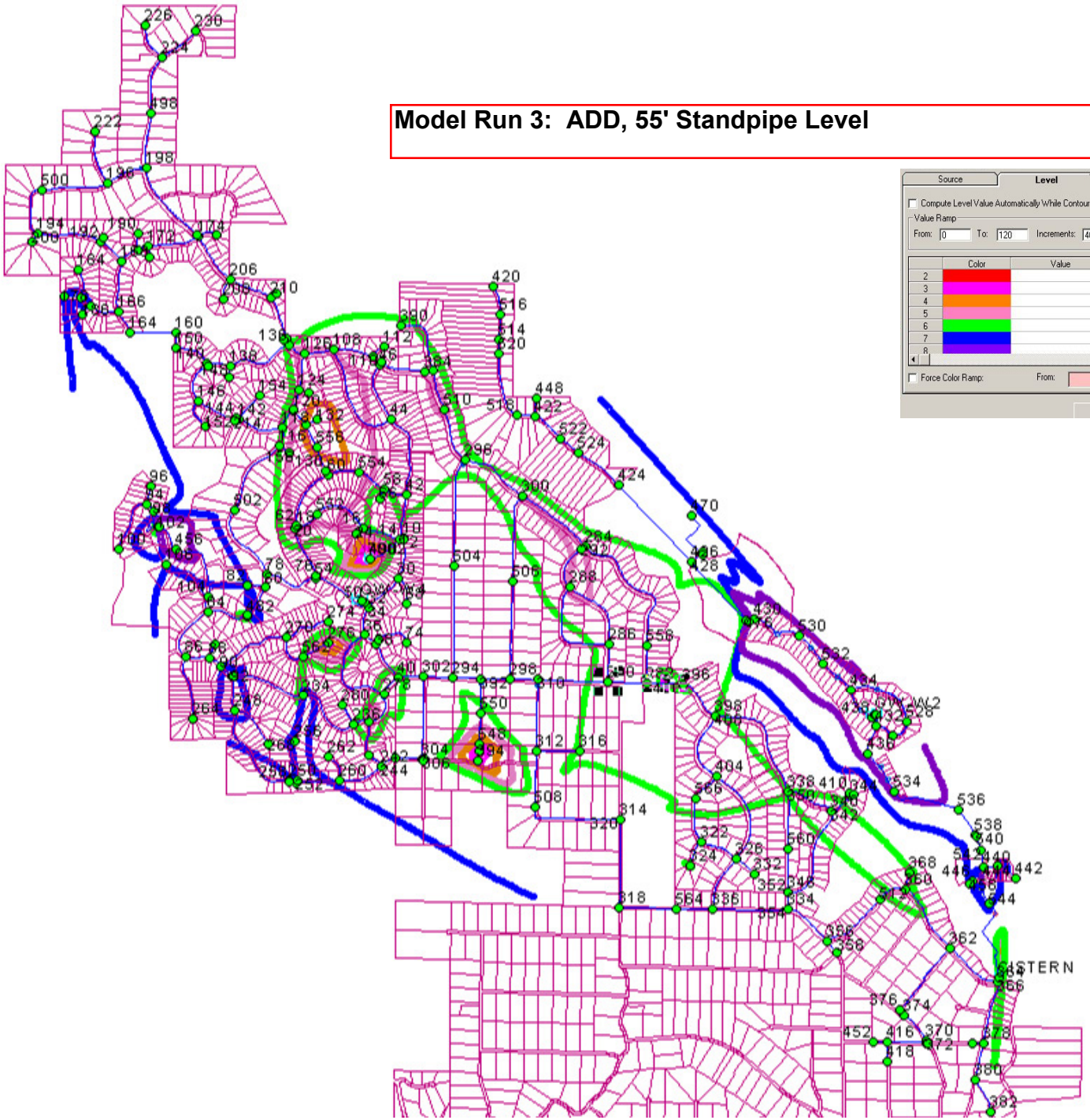
3 30
4 35
5 40
6 45
7 80
8 100
Insert Level
Delete Level
Set Levels...
Ramp Color
Rnd. Color
Force Color Ramp:
From:
To:
OK
Cancel
EASTERN

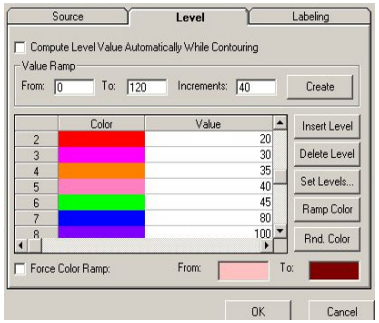
Model Run 2: ADD, 70' Standpipe Level

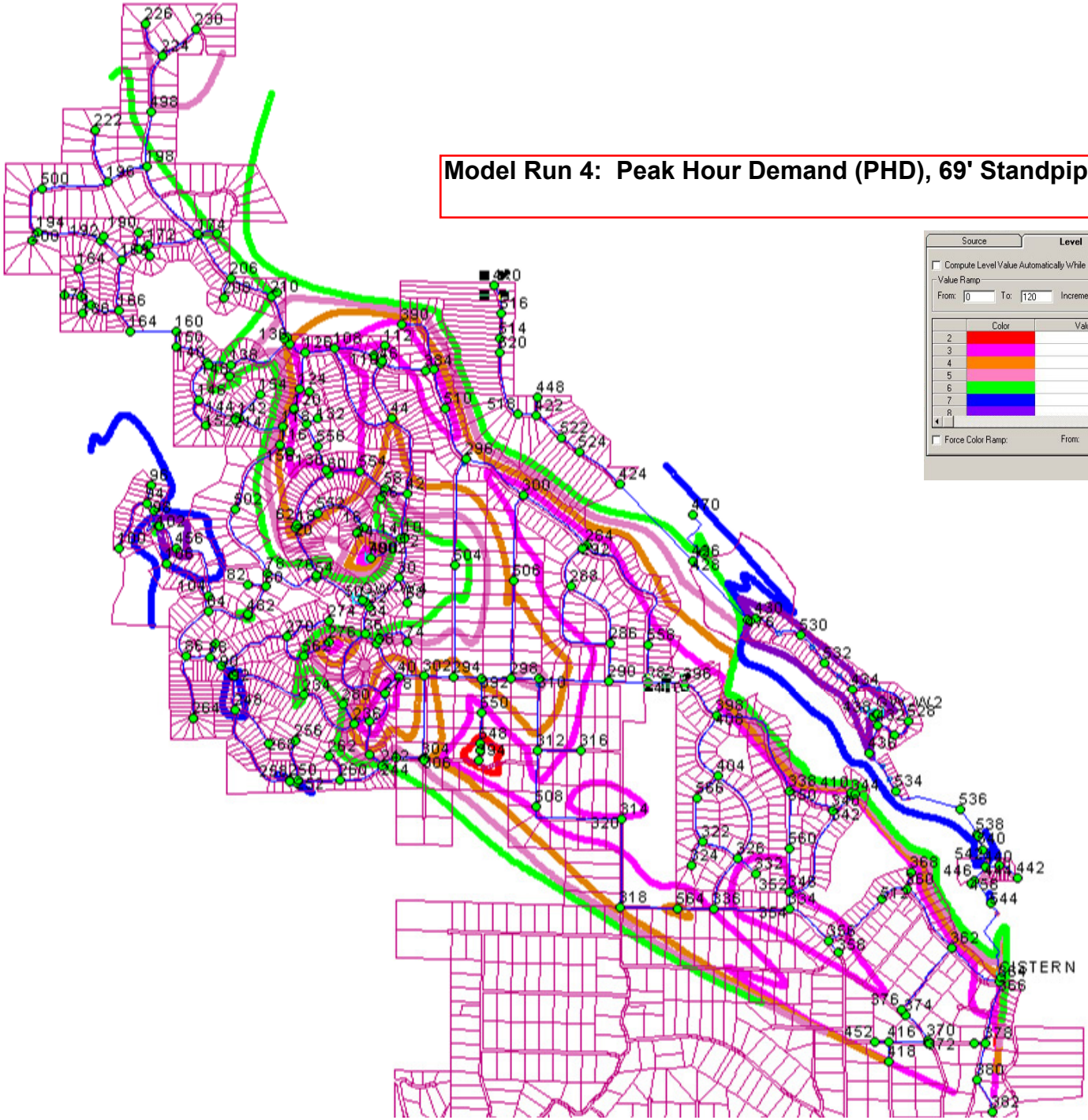


Model Run 3: ADD, 55' Standpipe Level

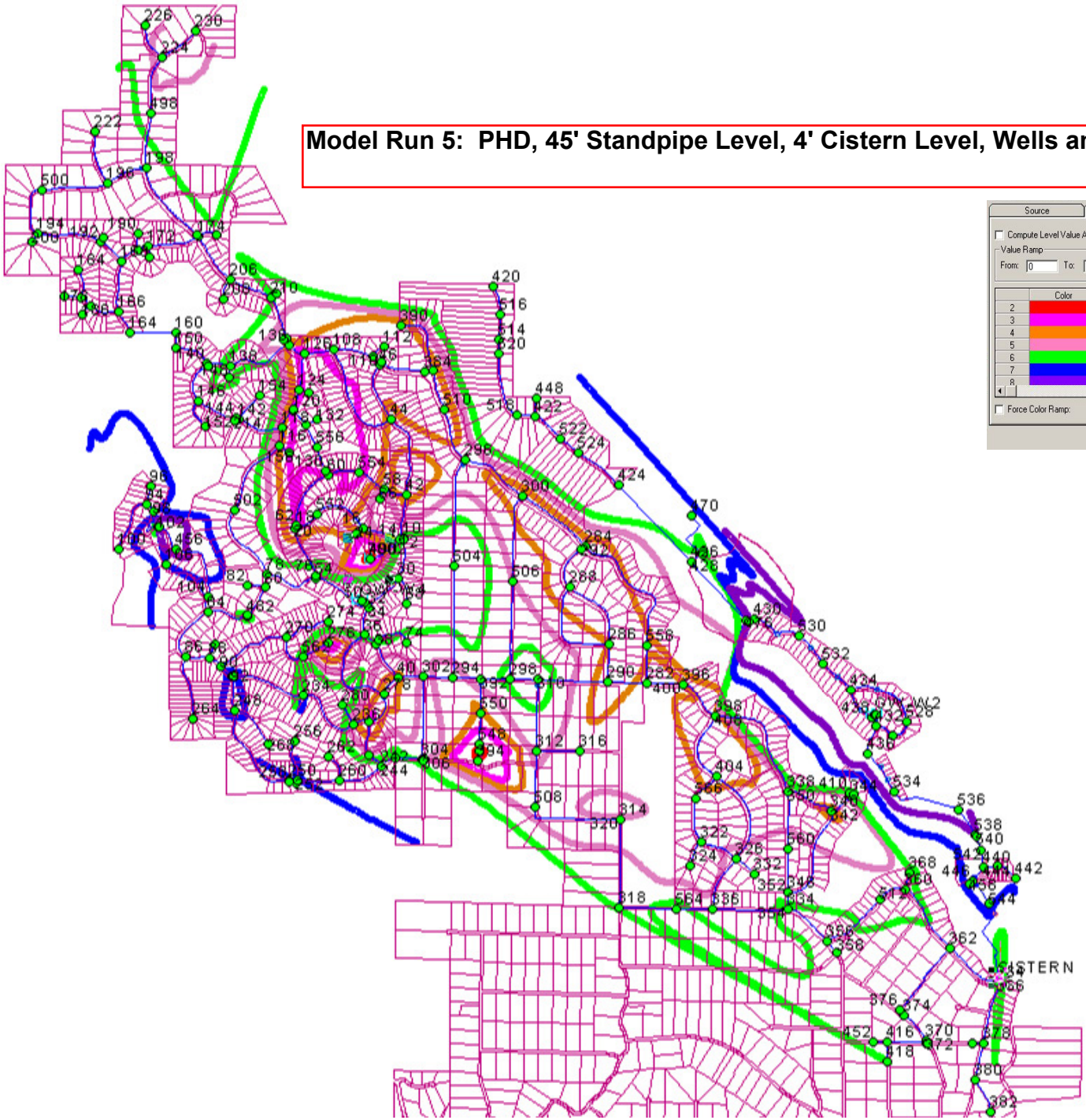


Model Run 4: Peak Hour Demand (PHD), 69' Standpipe Level

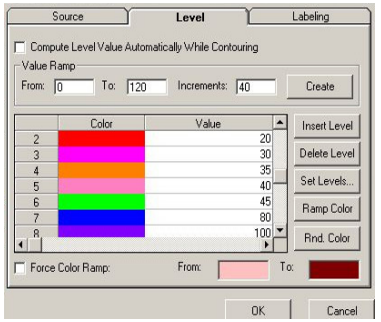


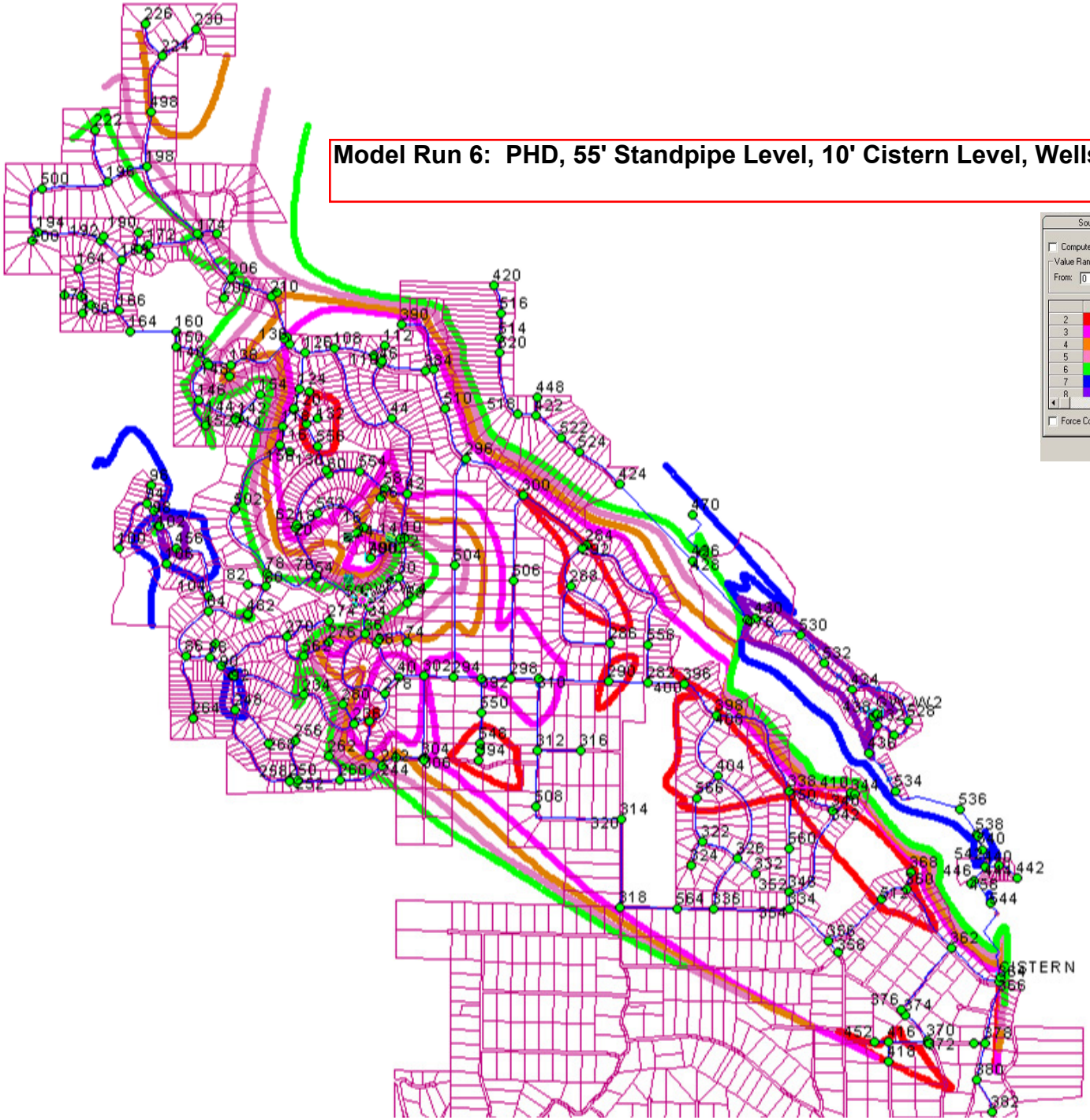


Model Run 5: PHD, 45' Standpipe Level, 4' Cistern Level, Wells and Booster ON

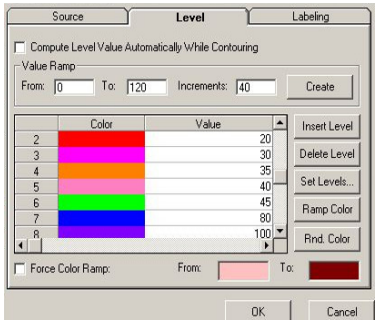


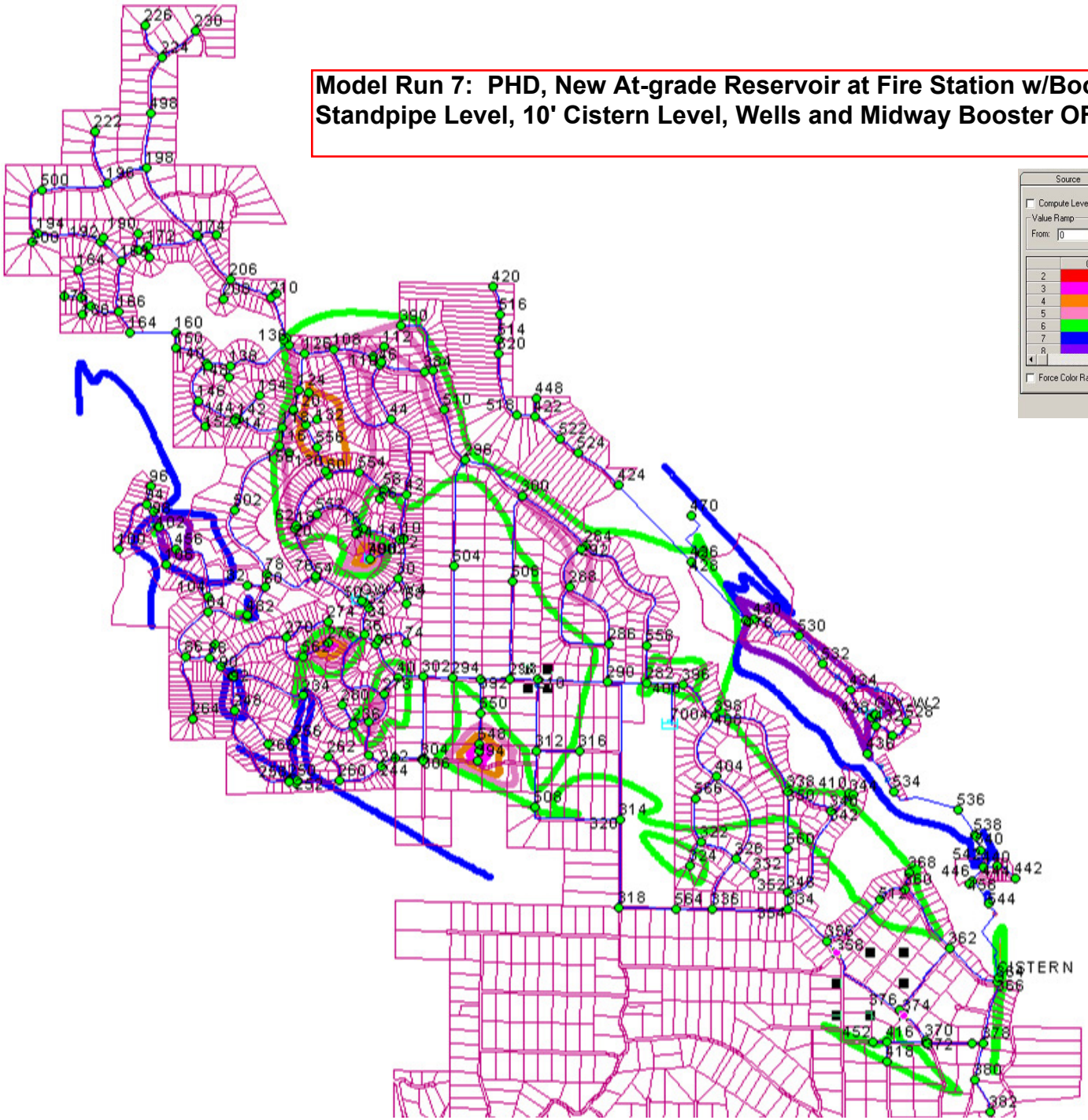
Model Run 6: PHD, 55' Standpipe Level, 10' Cistern Level, Wells and Booster OFF



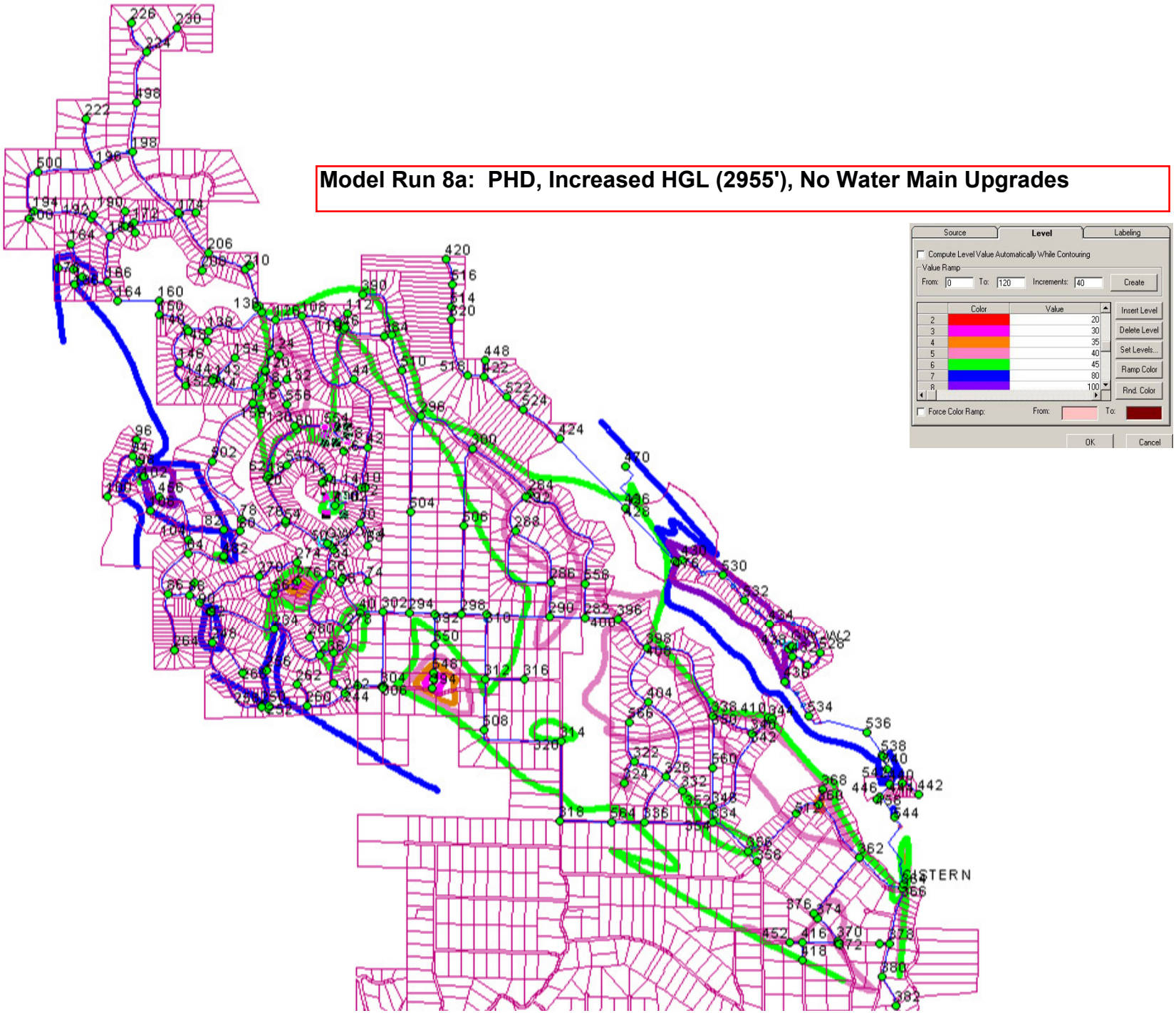


Model Run 7: PHD, New At-grade Reservoir at Fire Station w/Booster, 69' Standpipe Level, 10' Cistern Level, Wells and Midway Booster OFF

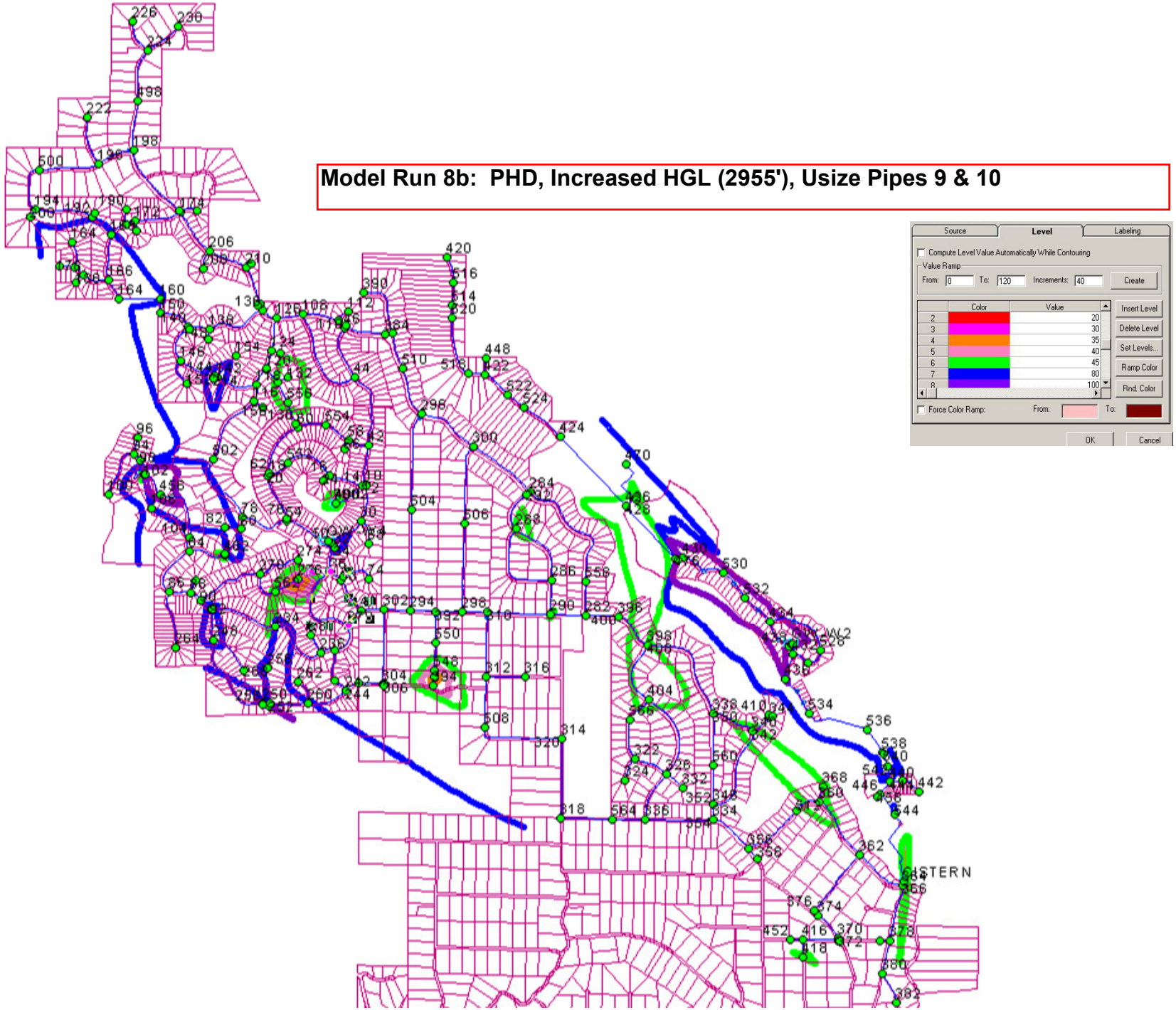




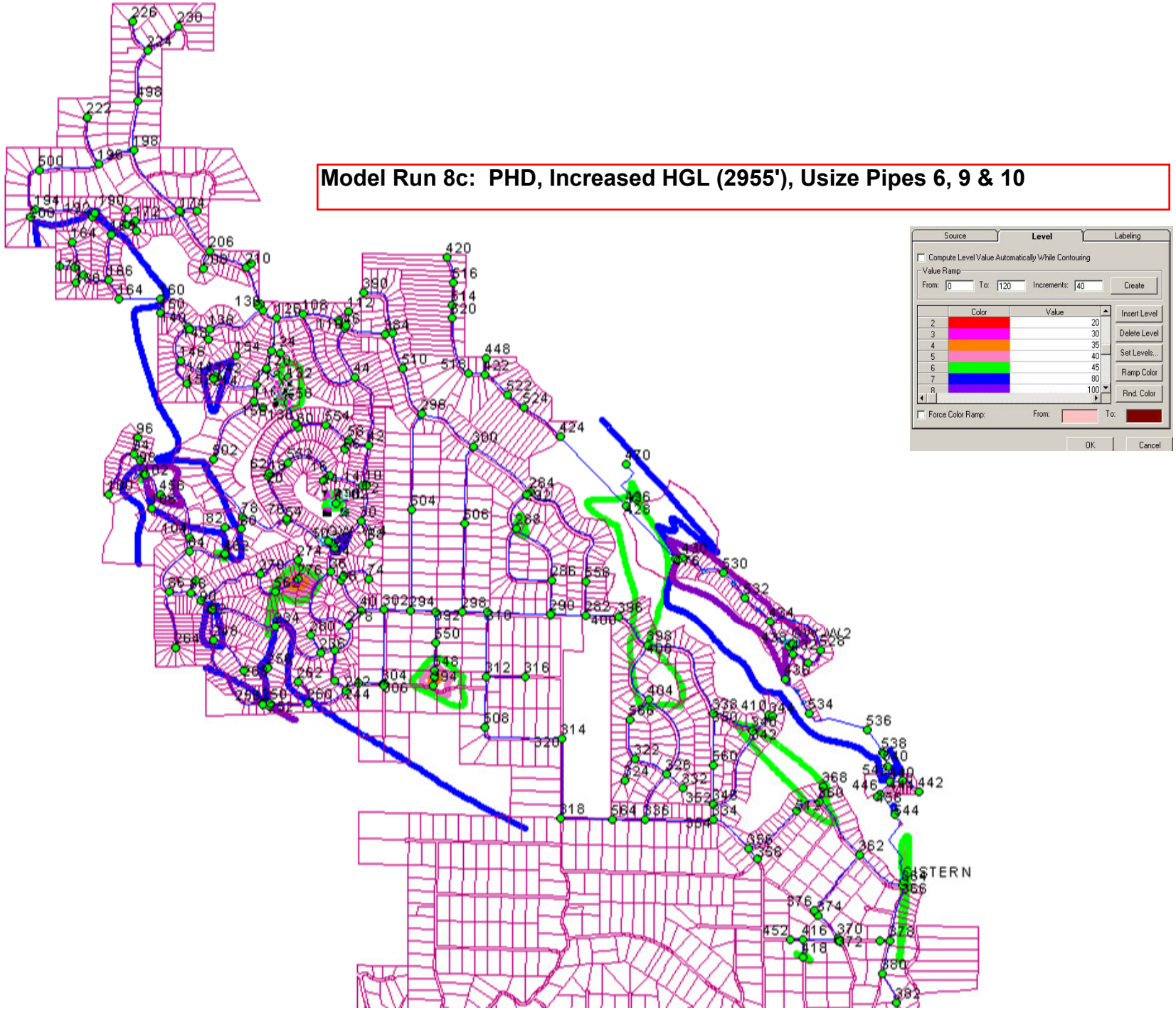
Model Run 8a: PHD, Increased HGL (2955'), No Water Main Upgrades



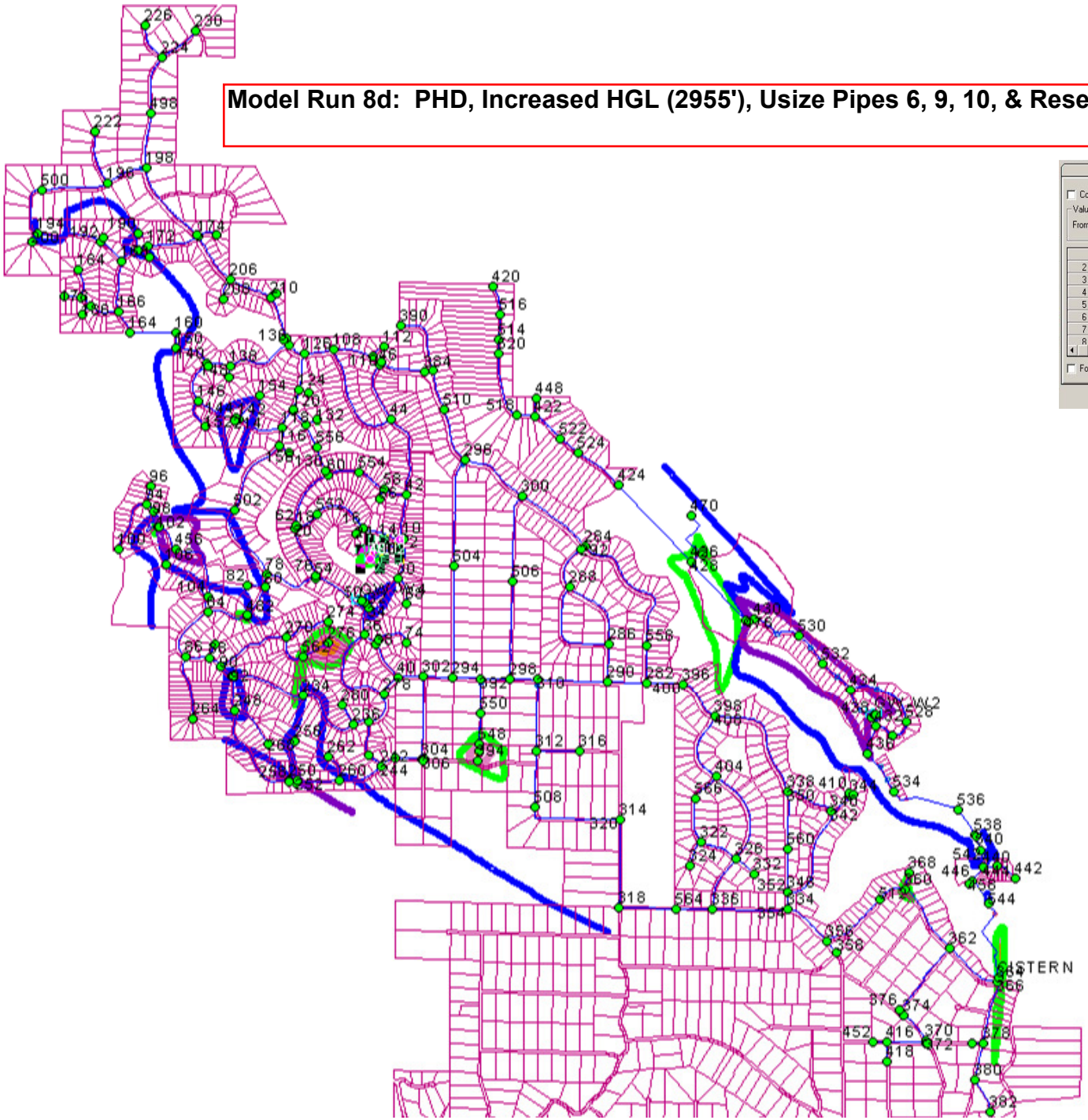
Model Run 8b: PHD, Increased HGL (2955'), Usize Pipes 9 & 10



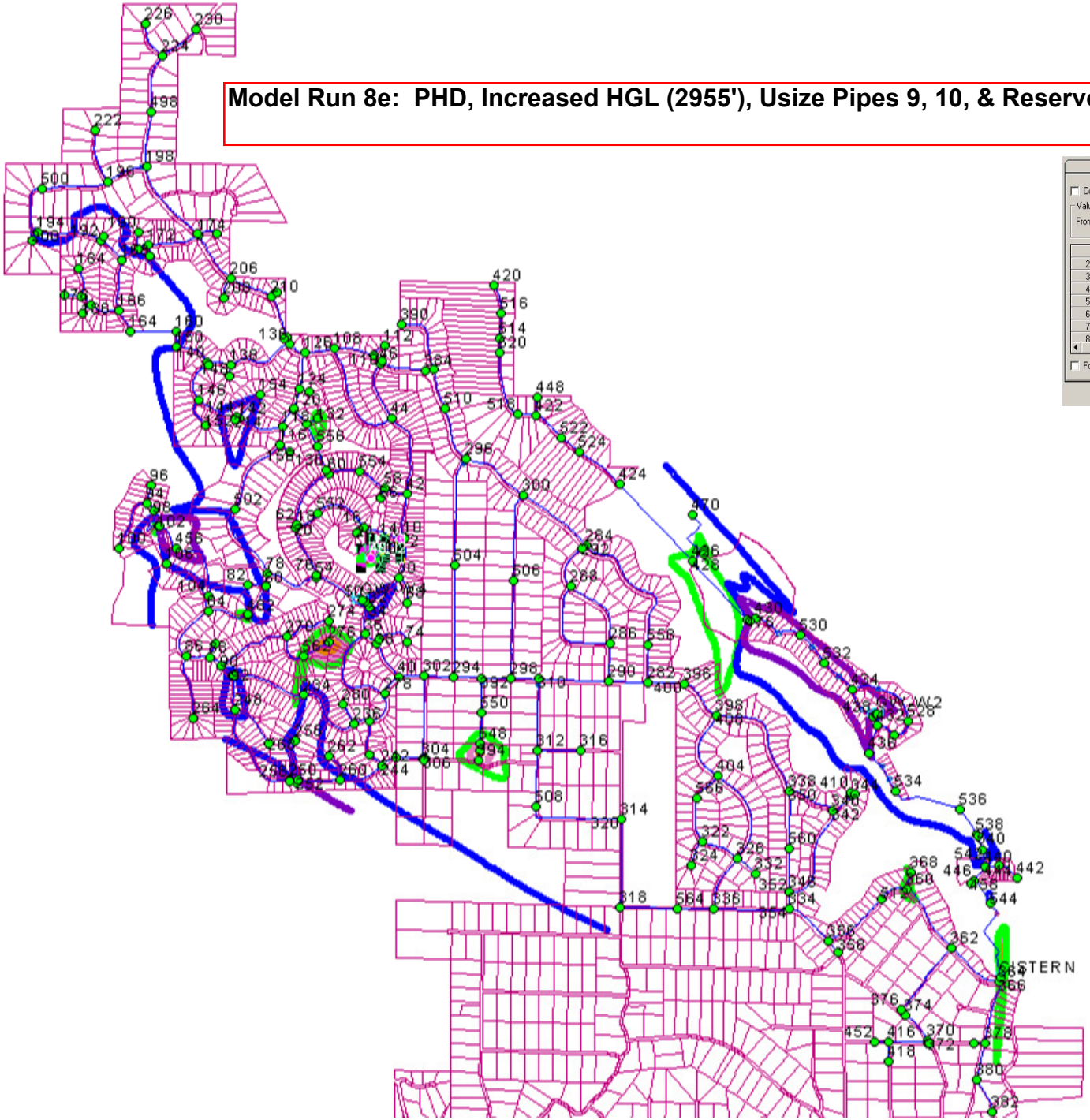
Model Run 8c: PHD, Increased HGL (2955'), Usize Pipes 6, 9 & 10



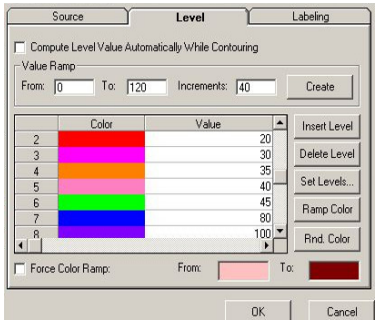
Model Run 8d: PHD, Increased HGL (2955'), Usize Pipes 6, 9, 10, & Reservoir Discharge Pipe

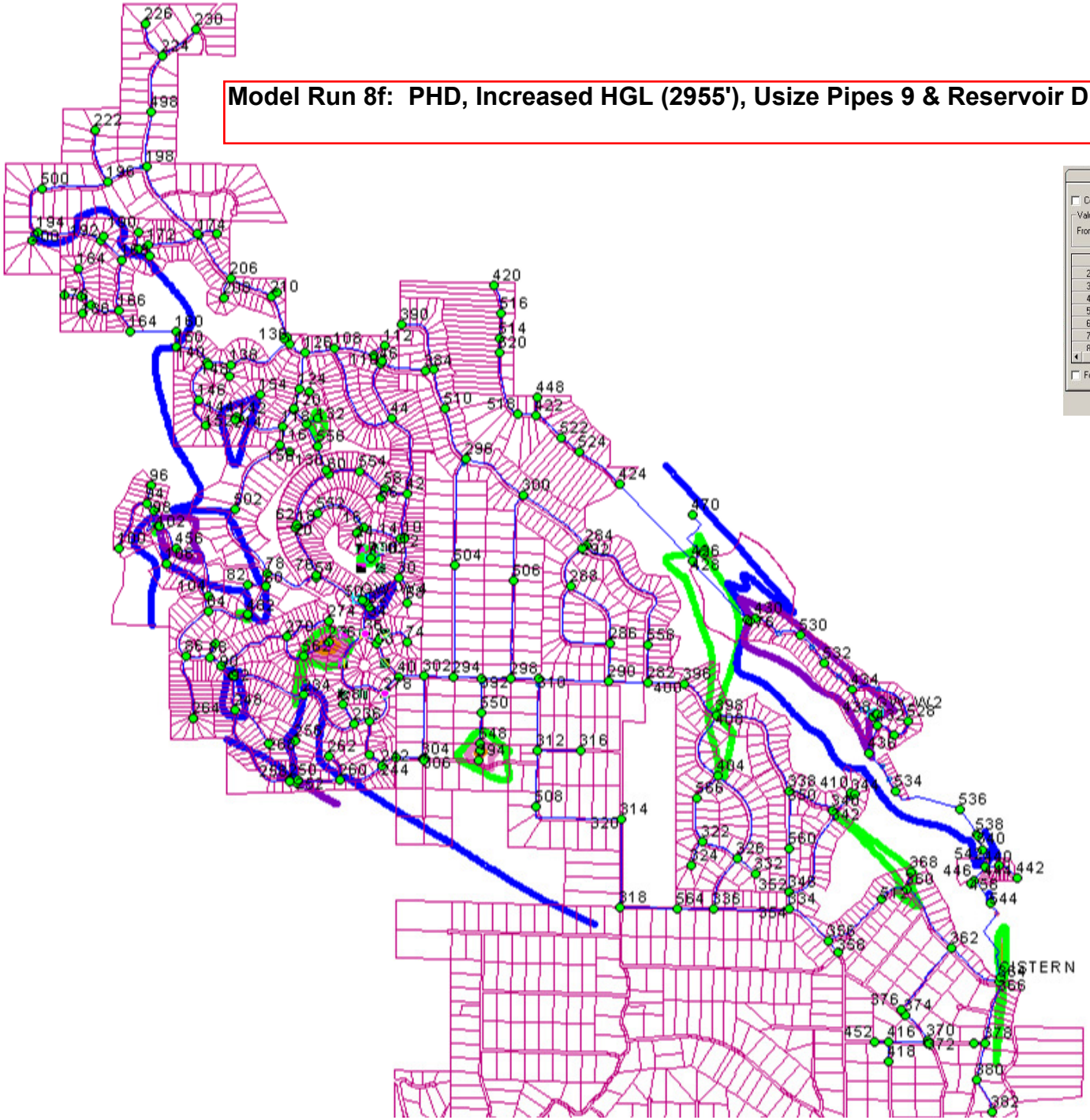


Model Run 8e: PHD, Increased HGL (2955'), Usize Pipes 9, 10, & Reservoir Discharge Pipe



Model Run 8f: PHD, Increased HGL (2955'), Usize Pipes 9 & Reservoir Discharge Pipe





Model Run 9: PHD, 2970' HGL, No Pipe Upgrades