



Figure 5-1 shows that Kings Forest does not significantly impact on the 2011 reservoir operation. The blue line represents the reservoir level with the additional Kings Forest demand. WPS-10 was controlled to operate between 8.00PM to 6.30AM during the night and 2.30PM to 5.00PM in the afternoon.

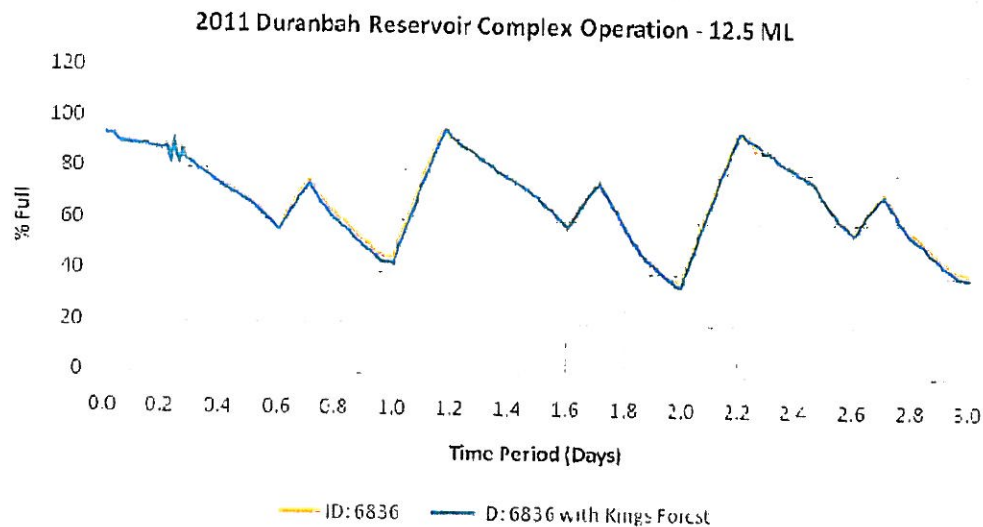


Figure 5-1: 2011 Duranbah Reservoir Operation

5.3.2 HYDRAULIC PERFORMANCE

The 2011 network was assessed for PH. Network pressures were obtained using the demand nodes from the TSC H₂Omap Conveyancing Model.

Table A1 and A2 in Appendix A provides a full junction report under 2011 PH and fire flow conditions. The location of the external demand nodes can be seen on Figure 2-3 and the location of the Kings Forest demand nodes are shown on Figure 6-1.

Node 6345 is the critical node and is well above the minimum pressure requirement before Kings Forest is developed. Kings Forest reduces the PH localised by a maximum 2m pressure and the fire flow residual pressure by a maximum of 3m. This is not a significant impact.

Table 5-3 details the critical node under PH and fire flow before and after the addition of the Kings Forest development.

Table 5-3: Critical Nodes – 2011 PH and Fire Flow

SCENARIO	NODE ID	PH DEMAND (L/S)	PH PRESSURE (M)	FIRE FLOW DEMAND (L/S)	RESIDUAL PRESSURE (M)
i. 2011 PH and Fire Flow	6345	17	34	11	33
ii. 2011 PH and Fire Flow with Kings Forest Development	6345	17	34	11	32



A pipe report of the 2011 Kings Forest water mains is available in Table A3, Appendix A.

5.4 INTERMEDIATE SYSTEM ANALYSIS (2021)

The 2021 Planning Horizon is an intermediate horizon to assess the timing of the trunk augmentation/ connection main from Duranbah Reservoir Complex to the Kings Forest Development. Three scenarios have been considered in the 2021 analysis:

- 2021 System without trunk augmentation/ connection mains;
- 2021 System with Kings Forest, **without** trunk augmentation/ connection mains; and
- 2021 System with Kings Forest, **with** trunk augmentation/ connection main and additional Duranbah 7.5 ML reservoir.

5.4.1 RESERVOIR OPERATION

The Duranbah reservoir operation under three consecutive MD demand conditions was assessed with and without the proposed Kings Forest Development and the required 7.5 ML storage. Figure 5-2 shows that Kings Forest does not significantly impact on the 2021 reservoir operation, however with the existing 12.5 ML storage capacity for both cases falls below the minimum 20% level requirement at the third MD.

WPS-10 was controlled to operate between 8.00PM to 6.30AM during the night and 9.00AM to 5.00PM in the daytime. With the additional 7.5 ML reservoir the minimum level increases to 40% which satisfies the minimum level requirement over 3 maximum days. The light blue line represents the reservoir level with the additional Kings Forest demand and the new 7.5 ML reservoir.

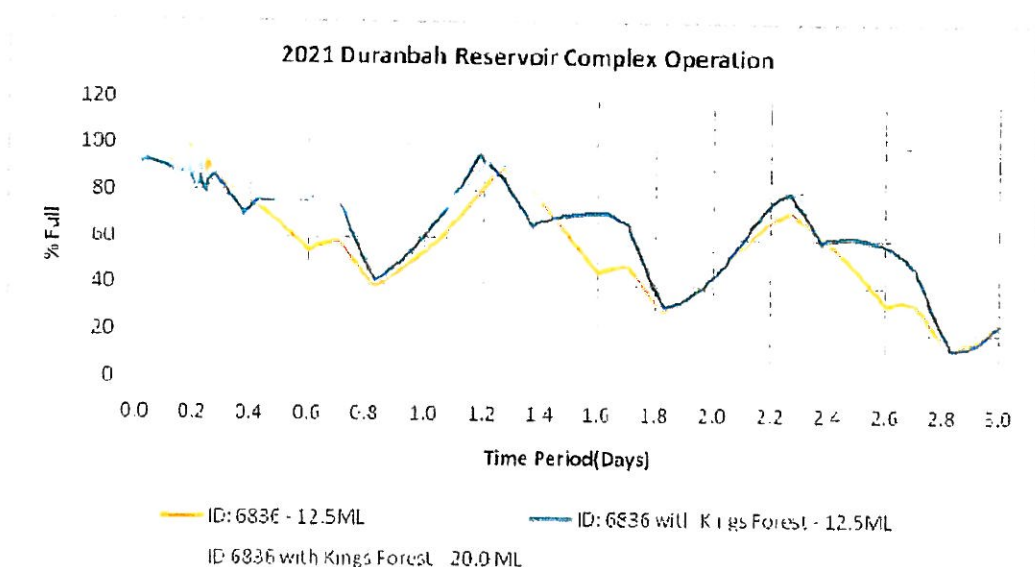


Figure 5-2: 2021 Duranbah Reservoir Operation



5.4.2 HYDRAULIC PERFORMANCE

The 2021 network was assessed for PH. Network pressures were obtained using the demand nodes from the TSC H₂OMap Conveyancing Model. Tables A4, A5 and A6 in Appendix A provide a full junction report under 2021 PH and fire flow conditions for each scenario. The location of the external demand nodes can be seen on Figure 2-3 and the location of the Kings Forest demand nodes are shown on Figure 6-1.

Table 5-4 details the nodes that do not meet the minimum pressure requirements under PH and fire flow.

Table 5-4: Critical Nodes – 2021 PH and Fire Flow

SCENARIO	NODE ID	PH DEMAND (L/S)	PH PRESSURE (M)	FIRE FLOW DEMAND (L/S)	RESIDUAL PRESSURE (M)
i. 2021 PH and Fire Flow, without trunk augmentation/connection mains	-	-	-	-	-
ii. 2021 PH and Fire Flow with Kings Forest Development, without trunk augmentation/connection mains	4801	14	12.9	11	10.3
	5183	101	6.1	22	0.0
	5508	55	10.3	11	7.8
	5472	42	10.9	15	7.1
	KF_001	1	11.6	22	7.2
	KF_002	2	11.0	22	6.5
	KF_003	4	9.8	15	6.6
	KF_004	44	8.5	11	5.9
	KF_005	36	8.3	11	5.7
	KF_006	7	12.2	11	9.4
	KF_007	10	7.5	11	4.7
	KF_008	34	7.2	15	3.2
	KF_009	12	10.7	11	6.9
	KF_010	9	5.5	11	1.2
	KF_011	4	5.4	11	1.1
	KF_012	12	-30.4	11	-34.4
	KF_014	0	7.2	11	4.3
iii. 2021 PH and Fire Flow with Kings Forest Development, with trunk augmentation/connection mains	-	-	-	-	-



Table 5-4 clearly shows that the Kings Forest significantly impacts on the hydraulic network without the trunk augmentation/ connection main from Duranbah Reservoir to the Kings Forest development. The local network fails under PH and fire flow conditions. The trunk augmentation/ connection main is required when precinct 6 commences construction. This equates to a population of approximately 2,300 persons or 920 dwellings. With the trunk augmentation/ connection main it significantly improves the system under PH and fire flow conditions.

The trunk augmentation/ connection main has been sized for ultimate PH and the sizing can be seen on Figure 6-1. The pipe reports of the 2021 Kings Forest water mains with and without the trunk augmentation/ connection main are available in Table A7 and A8 of Appendix A.

5.5 ULTIMATE SYSTEM ANALYSIS (2041)

The 2041 Planning Horizon is the ultimate horizon. Two scenarios have been considered in the 2041 analysis:

- 2041 System with second additional 5.0 ML Duranbah reservoir and upgraded pump station (WPS-10); and
- 2041 System with second additional 5.0 ML reservoir, upgraded pump station (WPS-10) and Kings Forest.

5.5.1 RESERVOIR OPERATION

The Duranbah reservoir operation under three consecutive MD demand conditions was assessed with and without the proposed Kings Forest Development. The ultimate 25.0 ML storage capacity along with the pump station upgrade to WPS-10 was included for both ultimate scenarios. WPS-10 was controlled to operate between 8.00PM to 6.30AM during the night and 9.00AM to 5.00PM in the daytime.

Figure 5-3 shows that Kings Forest impacts on the 2041 reservoir operation, however is still above the 20% minimum level criteria. The blue line represents the reservoir level with the additional Kings Forest demand.

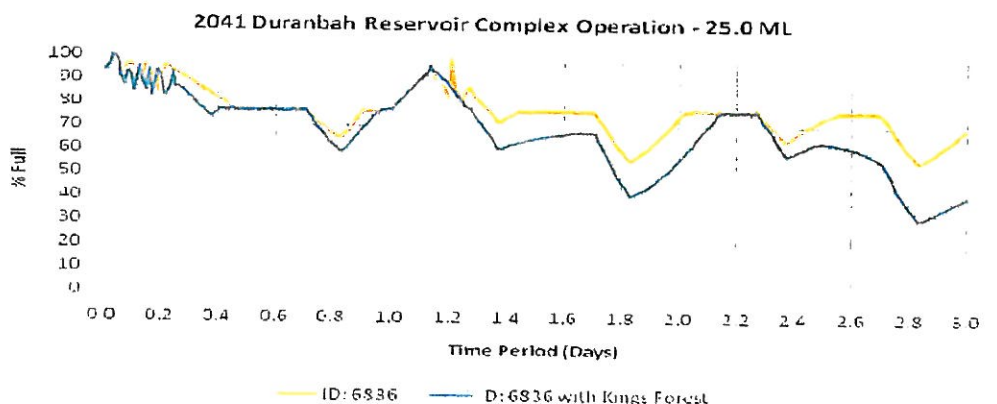


Figure 5-3: 2041 Duranbah Reservoir Operation



5.5.2 HYDRAULIC PERFORMANCE

The 2041 network was assessed for PH. Network pressures were obtained using the demand nodes from the TSC H₂OMap Water Conveyancing Model. Tables A9 and A10 in Appendix A provide a full junction report for 2041 PH and fire flow conditions for each scenario. The location of the external demand nodes can be seen on Figure 2-3 and the location of the Kings Forest demand nodes are shown on Figure 6-1.

Table 5-5 details the critical nodes under PH and fire flow before and after the addition of the Kings Forest development.

Table 5-5: Critical Nodes – 2041 PH and Fire Flow

SCENARIO	NODE ID	PH DEMAND (L/S)	PH PRESSURE (M)	FIRE FLOW DEMAND (L/S)	RESIDUAL PRESSURE (M)
i. 2041 PH and Fire Flow	6345	28	33.4	11	32.0
	6387	21	34.1	11	30.6
ii. 2041 PH and Fire Flow with Kings Forest Development	KF_012	22	23.2	11	22.0

The Kings Forest development reduces PH and fire flow residual pressure in the localised zone by a maximum of 8m, however all pressures well exceed the minimum pressure requirement of 20m. This includes junction KF_012 in the Kings Forest Development which is at a maximum elevation of 45m.



6. WATER RETICULATION LAYOUT

The Kings Forest water reticulation has been sized based on ultimate PH and fire flow conditions. The proposed layout can be seen on Figure 6-1. The proposed sizing and timing of the water infrastructure is detailed in Table 6-1.

Table 6-1: Kings Forest Water Reticulation

PIPE ID	LENGTH (M)	DIAMETER (MM)	PLANNING HORIZON	PIPE ID	LENGTH (M)	DIAMETER (MM)	PLANNING HORIZON
KFM_001	1023	450	2011	KFM_015	95	250	2021
KFM_002	198	450	2011	KFM_016	177	250	2021
KFM_003	424	450	2011	KFM_017	390	250	2031
KFM_004	502	450	2011	KFM_018	199	250	2031
KFM_005	139	450	2011	KFM_019	568	250	2031
KFM_006	334	450	2021	KFM_020	75	250	2031
KFM_007	641	450	2021	KFM_021	570	250	2031
KFM_008	170	450	2021	KFM_022	285	250	2031
KFM_009	480	525	2021	KFM_023	295	250	2031
KFM_010	320	525	2021	KFM_024	421	200	2031
KFM_011	568	600	2021	KFM_025	806	150	2031
KFM_012*	955	600	2021	KFM_026	273	150	2031
P-793*	1644	600	2021	KFM_027	275	200	2031
KFM_013	447	250	2021	KFM_028	1437	200	2031
KFM_014	449	250	2021				

* Augmentation/ Connection Main from Duranbah Reservoirs to Kings Forest Development

The proposed planning horizon timing of the Kings Forest water reticulation is only indicative and the actual timings will be determined by the growth realised in the development.

Figure 6-2 is an additional figure that shows the proposed sizing of Kings Forest using Peak Instantaneous Demand (PID) criteria of 0.1 L/s/ET. The reduction in design demand criteria to 0.075 L/s/ET has allowed pipe KFM_012 to be downsized to a 600mm diameter main and pipes KFM_025 and KFM_026 to become 150 mm in diameter (refer Figure 6-1).

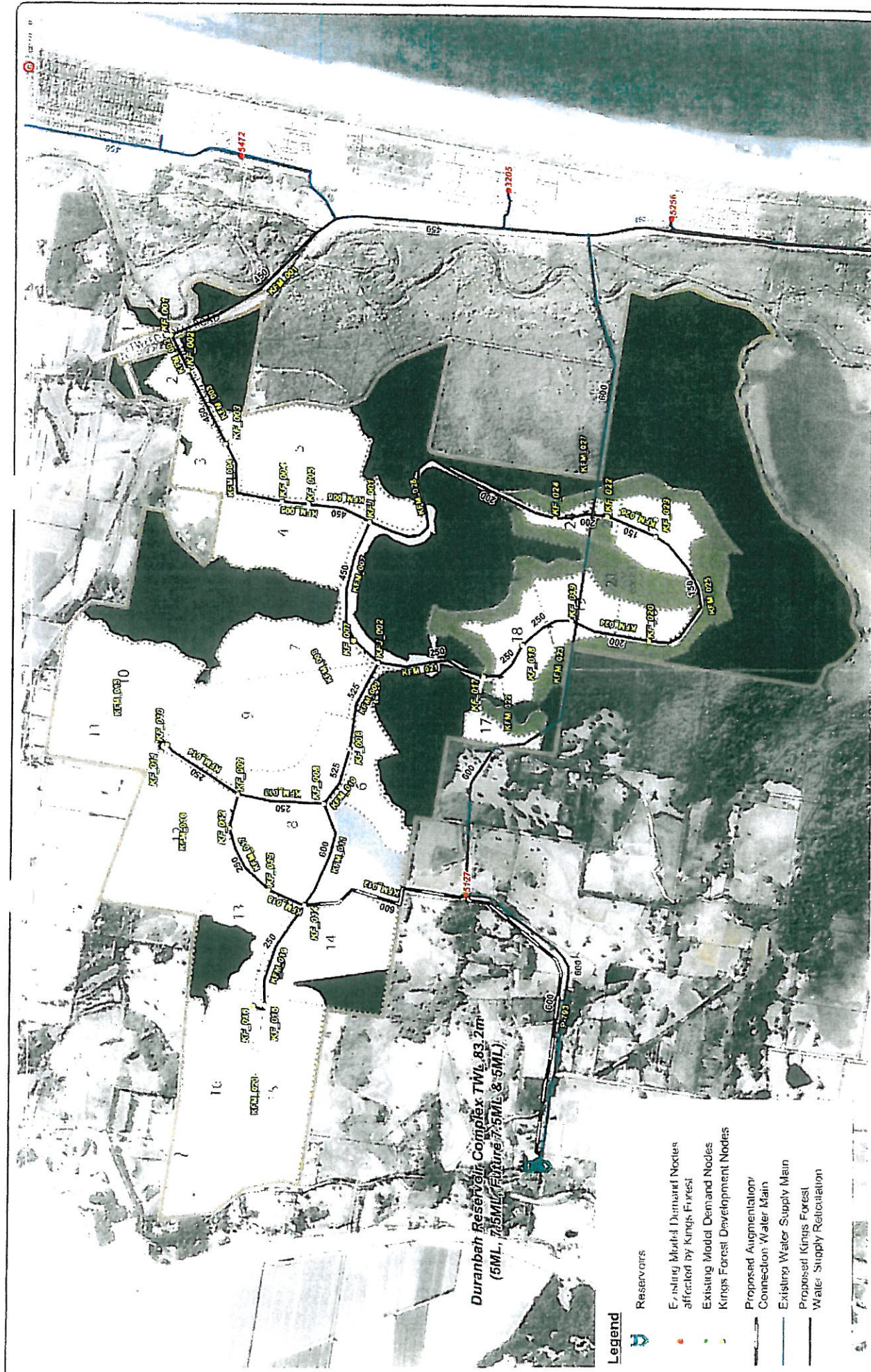


Figure 6-1
Kings Forest Water Supply
Reticulation Layout
PH Demands



DATE	DESCRIPTION
12/12/2010	AS SHOWN

APR 2011

1:10,000

1:10,000

1:10,000

1:10,000

1:10,000

1:10,000

1:10,000

Legend

- Reservoirs
- Existing Model Demand Nodes affected by Kings Forest
- Existing Model Demand Nodes
- Kings Forest Development Nodes
- Proposed Augmentation/Connection Water Main
- Existing Water Supply Main
- Proposed Kings Forest Water Supply Reticulation





Duranbah Reservoir Complex TWL 83.2m
(5ML, 7.5ML, 5ML, 5ML, 5ML)

- Legend**
- Reservoirs
 - Existing Model Demand Nodes affected by Kings Forest
 - Existing Model Demand Nodes
 - Kings Forest Development Noxies
 - Proposed Augmentation Connection Water Main
 - Existing Water Supply Main
 - Proposed Kings Forest Water Supply Reticulation



NHD A193/003
1:17,500



Figure 6-2
Kings Forest Water Supply
Reticulation Layout
PID Demands



7. SUMMARY

A water supply network analysis has been undertaken on the proposed Kings Forest development. The outcomes of the analysis are summarised below:

- A 7.5 ML Reservoir is required at Duranbah Reservoir Complex at 2018 to supplement the Kings Forest and growth within the localised South Tweed Coast;
- An additional 5.0 ML Reservoir is required at Duranbah Reservoir Complex between 2031 and 2041 to supplement the Kings Forest and growth within the localised South Tweed Coast;
- Pump Station WPS-10 will require upgrading to 555 L/s at 74 m head between 2031 and 2041 when the additional 5.0 ML Reservoir is built;
- Kings Forest does not significantly impact on the current (2011) water supply system;
- The proposed augmentation/ connection main from Duranbah Reservoirs to Kings Forest Development is required when Kings Forest development reaches a population of 2,300 persons or 920 dwellings. The proposed sizing is available in Table 6-1 and proposed route is shown on Figure 6-1;
- Kings Forest significantly impacts on the 2021 water supply system. With the addition of the augmentation/ connection main the hydraulic performance improves significantly;
- Kings Forest does not impact significantly on the 2041 water supply system;
- The proposed water reticulation layout for Kings Forest is shown on Figure 6-1 and detailed in Table 6-1; And
- Appendix A provides all junction and pipe reports for the analysis undertaken.



APPENDIX A

JUNCTION AND PIPE REPORTS

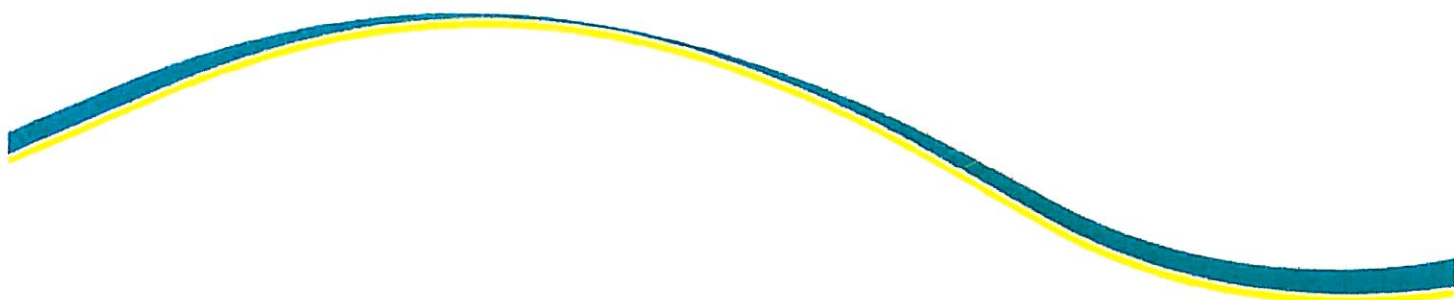




Table A1 – 2011 Junction Report

ID	PH DEMAND (L/S)	ELEVATION (M)	PH HEAD (M)	PH PRESSURE (M)	FIRE FLOW DEMAND (L/S)	RESIDUAL PRESSURE (M)	COMMENTS
4801	7	5	56	51	11	49	Satisfactory
5183	90	10	54	44	22	40	Satisfactory
5508	14	8	56	48	11	47	Satisfactory
5472	38	10	57	47	11	45	Satisfactory
3205	43	6	59	54	15	52	Satisfactory
5127	1	4	74	70	11	70	Satisfactory
5256	14	9	60	51	11	50	Satisfactory
13774	4	3	47	45	11	43	Satisfactory
13776	40	3	47	45	11	43	Satisfactory
7395	25	6	43	37	11	36	Satisfactory
6387	13	5	41	36	11	33	Satisfactory
6345	17	7	41	34	11	33	Satisfactory

Table A2 – 2011 Junction Report with Kings Forest Development

ID	PH DEMAND (L/S)	ELEVATION (M)	PH HEAD (M)	PH PRESSURE (M)	FIRE FLOW DEMAND (L/S)	RESIDUAL PRESSURE (M)	COMMENTS
4801	7	5	53	49	11	47	Satisfactory
5183	90	10	52	42	22	38	Satisfactory
5508	14	8	54	46	11	44	Satisfactory
5472	38	10	54	45	15	42	Satisfactory
3205	43	6	58	52	15	50	Satisfactory
5127	1	4	74	70	11	70	Satisfactory
5256	14	9	58	49	11	48	Satisfactory
13774	4	3	47	44	11	42	Satisfactory
13776	40	3	47	44	11	43	Satisfactory
7395	25	6	43	37	11	35	Satisfactory
6387	13	5	40	36	11	33	Satisfactory
6345	17	7	41	34	11	32	Satisfactory
KF_004	9	9	56	47	11	46	Satisfactory
KF_005	8	9	56	47	11	46	Satisfactory



Table A3 – 2011 Kings Forest Pipe Report

ID	LENGTH (M)	DIAMETER (MM)	ROUGHNESS (C)	FLOW (L/S)	PH VELOCITY (M/S)	MAX PH HL/KM	MAX MD HL/KM
KFM_001	1023	450	120	21.4	0.14	0.1	0.01
KFM_002	198	450	120	21.4	0.14	0.1	0.01
KFM_003	424	450	120	21.4	0.14	0.1	0.01
KFM_004	502	450	120	17.4	0.11	0.0	0.01
KFM_005	139	450	120	8.4	0.05	0.0	0.00

Table A4 – 2021 Junction Report

ID	PH DEMAND (L/S)	ELEVATION (M)	PH HEAD (M)	PH PRESSURE (M)	FIRE FLOW DEMAND (L/S)	RESIDUAL PRESSURE (M)	COMMENTS
4801	14	5	42.6	37.8	11	35.7	Satisfactory
5183	101	10	40.7	31.0	22	25.9	Satisfactory
5508	55	8	43.0	35.3	11	33.2	Satisfactory
5472	42	10	45.8	35.9	11	33.6	Satisfactory
3205	54	6	50.8	45.1	15	42.9	Satisfactory
5127	1	4	72.3	68.5	11	68.2	Satisfactory
5256	18	9	52.4	43.5	11	42.5	Satisfactory
13774	33	3	34.3	31.6	11	28.2	Satisfactory
13776	48	3	36.5	34.0	11	32.2	Satisfactory
7395	30	6	34.4	28.4	11	26.5	Satisfactory
6387	16	5	32.2	27.5	11	23.2	Satisfactory
6345	21	7	33.2	26.2	11	23.5	Satisfactory



Table A5 – 2021 Junction Report with Kings Forest Development, no Augmentation/
Connection Main

ID	PH DEMAND (L/S)	ELEVATION (M)	PH HEAD (M)	PH PRESSURE (M)	FIRE FLOW DEMAND (L/S)	RESIDUAL PRESSURE (M)	COMMENTS
4801	14	5	17.6	12.9	11	10.3	Unsatisfactory
5183	101	10	15.8	6.1	22	0.0	Unsatisfactory
5508	55	8	18.1	10.3	11	7.8	Unsatisfactory
5472	42	10	20.9	10.9	15	7.1	Unsatisfactory
3205	54	6	33.3	27.5	15	25.0	Satisfactory
5127	1	4	68.1	64.4	11	64.0	Satisfactory
5256	18	9	39.9	31.0	11	29.9	Satisfactory
13774	33	3	26.4	23.6	11	20.2	Satisfactory
13776	48	3	28.6	26.1	11	24.2	Satisfactory
7395	30	6	28.1	22.1	11	20.0	Satisfactory
6387	16	5	26.4	21.7	11	17.3	Satisfactory
6345	21	7	27.4	20.4	11	17.6	Satisfactory
KF_001	1	9	20.6	11.6	22	7.2	Unsatisfactory
KF_002	2	9	20.0	11.0	22	6.5	Unsatisfactory
KF_003	4	9	18.8	9.8	15	6.6	Unsatisfactory
KF_004	44	9	17.5	8.5	11	5.9	Unsatisfactory
KF_005	36	9	17.3	8.3	11	5.7	Unsatisfactory
KF_006	7	4	16.2	12.2	11	9.4	Unsatisfactory
KF_007	10	9	16.5	7.5	11	4.7	Unsatisfactory
KF_008	34	9	16.2	7.2	15	3.2	Unsatisfactory
KF_009	12	4	14.7	10.7	11	6.9	Unsatisfactory
KF_010	9	9	14.5	5.5	11	1.2	Unsatisfactory
KF_011	4	9	14.4	5.4	11	1.1	Unsatisfactory
KF_012	12	45	14.6	-30.4	11	-34.4	Unsatisfactory
KF_014	0	9	16.2	7.2	11	4.3	Unsatisfactory



Table A6 – 2021 Junction Report with Kings Forest Development, with Augmentation/
Connection Main

ID	PH DEMAND (L/S)	ELEVATION (M)	PH HEAD (M)	PH PRESSURE (M)	FIRE FLOW DEMAND (L/S)	RESIDUAL PRESSURE (M)	COMMENTS
4801	14	5	56.4	51.6	11	50.2	Satisfactory
5183	101	10	54.6	44.8	22	41.2	Satisfactory
5508	55	8	56.8	49.1	11	47.8	Satisfactory
5472	42	10	59.6	49.7	15	47.5	Satisfactory
3205	54	6	61.7	55.9	15	54.3	Satisfactory
5127	1	4	75.7	71.9	11	71.8	Satisfactory
5256	18	9	60.8	51.8	11	51.1	Satisfactory
13774	33	3	39.4	36.6	11	33.3	Satisfactory
13776	48	3	41.6	39.1	11	37.3	Satisfactory
7395	30	6	37.8	31.8	11	29.9	Satisfactory
6387	16	5	35.1	30.5	11	26.3	Satisfactory
6345	21	7	36.1	29.1	11	26.6	Satisfactory
KF_001	1	9	64.0	55.0	22	53.6	Satisfactory
KF_002	2	9	64.3	55.3	22	53.9	Satisfactory
KF_003	4	9	65.0	56.0	15	55.1	Satisfactory
KF_004	44	9	65.8	56.8	11	56.2	Satisfactory
KF_005	36	9	66.2	57.2	11	56.6	Satisfactory
KF_006	7	4	72.0	68.0	11	67.7	Satisfactory
KF_007	10	9	70.2	61.2	11	60.8	Satisfactory
KF_008	34	9	72.7	63.7	15	63.3	Satisfactory
KF_009	12	4	71.2	67.2	11	66.0	Satisfactory
KF_010	9	9	71.0	62.0	11	60.3	Satisfactory
KF_011	4	9	71.0	62.0	11	60.3	Satisfactory
KF_012	12	45	71.2	26.2	11	24.8	Satisfactory
KF_014	0	9	73.8	64.8	11	64.6	Satisfactory



Table A7 – 2021 Kings Forest Pipe Report, no Augmentation/ Connection Main

ID	LENGTH (M)	DIAMETER (MM)	ROUGHNESS (C)	FLOW (L/S)	PH VELOCITY (M/S)	MAX PH HL/KM	MAX MD HL/KM
KFM_001	1023	450	120	174.4	1.1	2.9	0.5
KFM_002	198	450	120	173.1	1.1	2.9	0.5
KFM_003	424	450	120	171.2	1.1	2.8	0.5
KFM_004	502	450	120	167.2	1.1	2.7	0.5
KFM_005	139	450	120	123.2	0.8	1.5	0.3
KFM_006	334	450	120	87.3	0.5	0.8	0.2
KFM_007	641	450	120	87.3	0.5	0.8	0.2
KFM_008	170	450	120	77.1	0.5	0.6	0.1
KFM_009	480	525	120	77.1	0.4	0.3	0.1
KFM_010	320	525	120	70.6	0.3	0.3	0.0
KFM_011	568	600	120	0.0	0.0	0.0	0.0
KFM_013	447	250	110	36.6	0.7	3.3	0.7
KFM_014	449	250	110	13.3	0.3	0.5	0.1
KFM_015	95	250	110	4.3	0.1	0.1	0.0
KFM_016	177	250	110	11.7	0.2	0.4	0.1

Table A8 – 2021 Kings Forest Pipe Report, with Augmentation/ Connection Main

ID	LENGTH (M)	DIAMETER (MM)	ROUGHNESS (C)	FLOW (L/S)	PH VELOCITY (M/S)	MAX PH HL/KM	MAX MD HL/KM
KFM_001	1023	450	120	-123.6	0.8	1.5	0.9
KFM_002	198	450	120	-124.9	0.8	1.6	0.9
KFM_003	424	450	120	-126.8	0.8	1.6	1.0
KFM_004	502	450	120	-130.8	0.8	1.7	1.0
KFM_005	139	450	120	-174.8	1.1	2.9	1.2
KFM_006	334	450	120	-210.7	1.3	4.1	1.6
KFM_007	641	450	120	-210.7	1.3	4.1	1.6
KFM_008	170	450	120	-220.9	1.4	4.5	1.7
KFM_009	480	525	120	-220.9	1.0	2.1	0.8
KFM_010	320	525	120	-227.4	1.1	2.2	0.8
KFM_011	568	600	120	-298.0	1.1	1.9	0.6
KFM_013	447	250	110	36.6	0.7	3.3	0.7
KFM_014	449	250	110	13.3	0.3	0.5	0.1
KFM_015	95	250	110	4.3	0.1	0.1	0.0
KFM_016	177	250	110	11.7	0.2	0.4	0.1
KFM_001	1023	450	120	-123.6	0.8	1.5	0.9



Table A9 – 2041 Junction Report

ID	PH DEMAND (L/S)	ELEVATION (M)	PH HEAD (M)	PH PRESSURE (M)	FIRE FLOW DEMAND (L/S)	RESIDUAL PRESSURE (M)	COMMENTS
4801	14	5	59.3	54.5	11	53.2	Satisfactory
5183	102	10	57.4	47.7	22	44.3	Satisfactory
5508	55	8	59.8	52.0	11	50.8	Satisfactory
5472	43	10	62.6	52.7	11	51.2	Satisfactory
3205	55	6	64.1	58.3	15	56.8	Satisfactory
5127	1	4	77.8	74.0	11	73.9	Satisfactory
5256	19	9	61.5	52.5	11	51.8	Satisfactory
13774	33	3	39.1	36.3	11	33.4	Satisfactory
13776	65	3	41.3	38.8	11	37.4	Satisfactory
7395	41	6	40.9	34.9	11	33.5	Satisfactory
6387	21	5	38.7	34.1	11	30.6	Satisfactory
6345	28	7	40.4	33.4	11	31.9	Satisfactory



Table A10 – 2041 Junction Report with Kings Forest Development

ID	PH DEMAND (L/S)	ELEVATION (M)	PH HEAD (M)	PH PRESSURE (M)	FIRE FLOW DEMAND (L/S)	RESIDUAL PRESSURE (M)	COMMENTS
4801	14	5	51.0	46.2	11	45	Satisfactory
5183	102	10	49.1	39.4	22	36	Satisfactory
5508	55	8	51.4	43.7	11	42	Satisfactory
5472	43	10	54.3	44.3	15	42	Satisfactory
3205	55	6	56.7	50.9	15	49	Satisfactory
5127	1	4	73.5	69.7	11	70	Satisfactory
5256	19	9	55.5	46.5	11	46	Satisfactory
13774	33	3	35.7	32.9	11	30	Satisfactory
13776	65	3	37.9	35.4	11	34	Satisfactory
7395	41	6	37.8	31.8	11	30	Satisfactory
6387	21	5	36.2	31.5	11	28	Satisfactory
6345	28	7	37.9	30.9	11	29	Satisfactory
KF_001	1	9	58.2	49.2	22	48	Satisfactory
KF_002	2	9	58.5	49.5	22	48	Satisfactory
KF_003	4	9	59.0	50.0	15	49	Satisfactory
KF_004	44	9	59.6	50.6	11	50	Satisfactory
KF_005	36	9	60.0	51.0	11	50	Satisfactory
KF_006	12	4	66.1	62.1	11	62	Satisfactory
KF_007	19	9	63.7	54.7	11	54	Satisfactory
KF_008	61	9	67.2	58.2	15	58	Satisfactory
KF_009	22	4	66.2	62.2	11	61	Satisfactory
KF_010	17	9	65.4	56.4	11	55	Satisfactory
KF_011	8	9	65.4	56.4	11	55	Satisfactory
KF_012	22	45	66.3	21.3	11	20	Satisfactory
KF_013	8	4	67.9	63.9	11	63	Satisfactory
KF_014	22	9	68.9	59.9	11	60	Satisfactory
KF_015	18	45	67.1	22.1	11	21	Satisfactory
KF_016	18	35	67.1	32.1	11	30	Satisfactory
KF_017	4	10	61.4	51.4	11	50	Satisfactory
KF_018	15	9	60.1	51.1	11	49	Satisfactory
KF_019	13	9	59.5	50.5	11	48	Satisfactory
KF_020	7	9	58.7	49.7	11	46	Satisfactory
KF_022	4	9	57.4	48.4	15	42	Satisfactory
KF_023	16	9	56.5	47.5	11	42	Satisfactory
KF_024	4	9	57.7	48.7	11	45	Satisfactory



Table A11 – 2041 Kings Forest Pipe Report

ID	LENGTH (M)	DIAMETER (MM)	ROUGHNESS (C)	FLOW (L/S)	PH VELOCITY (M/S)	MAX PH HL/KM	MAX MD HL/KM
KFM_001	1023	450	120	-105.4	0.7	1.1	0.5
KFM_002	198	450	120	-106.7	0.7	1.2	1.6
KFM_003	424	450	120	-108.6	0.7	1.2	1.6
KFM_004	502	450	120	-112.6	0.7	1.3	1.7
KFM_005	139	450	120	-156.6	1.0	2.4	2.0
KFM_006	334	450	120	-192.5	1.2	3.5	2.4
KFM_007	641	450	120	-209.5	1.3	4.1	2.5
KFM_008	170	450	120	-228.9	1.4	4.8	2.7
KFM_009	480	525	120	-276.9	1.3	3.2	1.6
KFM_010	320	525	120	-289.3	1.3	3.5	1.7
KFM_011	568	600	120	-380.6	1.3	3.0	1.2
KFM_012	955	600	120	-485.9	1.7	4.8	0.9
KFM_013	447	250	110	30.0	0.6	2.3	0.4
KFM_014	449	250	110	25.4	0.5	1.7	0.3
KFM_015	95	250	110	8.2	0.2	0.2	0.0
KFM_016	177	250	110	-17.6	0.4	0.8	0.3

Appendix B

Bulk Earthworks Cut Fill Areas
Dwg No. 12301-05-040(E)
Prepared by Mortons – Urban Solutions

Bulk Earthworks Sequencing Diagram
Dwg No. 12301-All-041 to 50(A)
Prepared by Mortons-Urban Solutions