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

<table>
<thead>
<tr>
<th>SCENARIO</th>
<th>NODE ID</th>
<th>PH DEMAND (L/S)</th>
<th>PH PRESSURE (M)</th>
<th>FIRE FLOW DEMAND (L/S)</th>
<th>RESIDUAL PRESSURE (M)</th>
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<td>33</td>
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<td>ii. 2011 PH and Fire Flow with Kings Forest Development</td>
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<td>17</td>
<td>34</td>
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<td>32</td>
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</tbody>
</table>
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.

![2021 Duranbah Reservoir Complex Operation](image_url)

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.

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<th>NODE ID</th>
<th>PH DEMAND (L/S)</th>
<th>PH PRESSURE (M)</th>
<th>FIRE FLOW DEMAND (L/S)</th>
<th>RESIDUAL PRESSURE (M)</th>
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</table>
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

<table>
<thead>
<tr>
<th>SCENARIO</th>
<th>NODE ID</th>
<th>PH DEMAND (L/S)</th>
<th>PH PRESSURE (M)</th>
<th>FIRE FLOW DEMAND (L/S)</th>
<th>RESIDUAL PRESSURE (M)</th>
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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

<table>
<thead>
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<td></td>
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</tbody>
</table>

* 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).
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 Durabah 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 Durabah 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 Durabah 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.
JUNCTION AND PIPE REPORTS
**Table A1 – 2011 Junction Report**

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**Table A2 – 2011 Junction Report with Kings Forest Development**

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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