

## Sewerage Pumping Station Code of Australia

Requirement	Clause
<p>Delete '200 L/s' and insert '150 L/s.'</p> <p>At the end of the second paragraph, insert: "PWC requires dry-well construction with three pumps for ultimate loads greater 150 L/s. A building shall be constructed over the dry-well, such that the building shall remain serviceable after strong winds (including cyclone) or earthquake."</p> <p>After the second paragraph, insert "In the Northern Region, pumping stations with an ultimate load exceeding 50 L/s shall be fitted with three pumps, such that operation of two pumps will adequately transfer peak wet weather flows."</p>	1.1
<p>Before the first paragraph, insert: "Unless specifically approved by PWC, design shall not permit sewerage to pass through more than three sewerage pump stations between the customer's property and final treatment."</p>	1.3.1
<p>The Power and Water Corporation has adopted the 'Planning Guidelines for Water Supply and Sewerage' as issued by the Queensland Department of Environment and Resource Management.</p> <p>The Power and Water Corporation has also adopted the WSAA codes and this supplement provides details of those modifications and additions that suit the particular requirements of the Power and Water Corporation.</p> <p>The requirements of this supplement in respect of the WSAA codes take precedence over the requirements of the Queensland Planning Guidelines.</p> <p>Where subdividers propose to construct sewage pumping stations to serve their own subdivisions, the subdivider will be responsible for certain planning elements such as ensuring that environmental and statutory approvals are obtained, as well as for presenting the planning case for the size, type and location of the pumping station.</p> <p>Before undertaking any planning work, and in order to avoid duplicated and repeated work, developers, proponents and/or designers are required to discuss and agree the exact disposition of planning responsibilities with Power and Water.</p> <p>Where developers or proponents are required to construct sewage pumping stations that serve more than their own subdivisions, then Power and Water and the developers or proponents must discuss and agree on the exact dispositions of planning responsibility before proceeding to design. Where an area is being developed by more than one developer or proponent, then developers or proponents are expected to liaise and coordinate without PWC facilitation.</p>	1.5.2
<p>PWC will not provide a Concept Plan and the designer is required to develop the Concept plan for PWC approval.</p> <p>Delete reference to SPS-1103.</p>	1.5.3

Requirement	Clause
<p>Replace the existing clause with the following:</p> <p>Planners and Designers shall consult with stakeholders as necessary.</p> <p><i>Stakeholders may include, but are not limited to:</i></p> <ul style="list-style-type: none"> <li>a) <i>Property Owners served (or affected) by the works, including absentee owners;</i></li> <li>b) <i>Tenants</i></li> <li>c) <i>Heritage groups;</i></li> <li>d) <i>Indigenous people groups;</i></li> <li>e) <i>AAPA</i></li> <li>f) <i>Native Title holders;</i></li> <li>g) <i>Municipal councils;</i></li> <li>h) <i>Gas pipeline owners and/or operators;</i></li> <li>i) <i>Road, rail and tram owners</i></li> <li>j) <i>Planning authorities;</i></li> <li>k) <i>Developers of adjacent works;</i></li> <li>l) <i>Environmental and community groups</i></li> <li>m) <i>Other utility agencies, including PWC Power Networks</i></li> </ul>	1.5.4
<p>From an operational perspective, sewerage pumping stations are undesirable.</p> <p>Designers shall minimise the number of sewerage pumping stations needed for a development and shall preferably design to avoid the requirement for any pump stations.</p>	1.6.3
<p>Add:</p> <ul style="list-style-type: none"> <li>(f) operational philosophy</li> <li>(g) life cycle cost calculations</li> <li>(h) staging philosophy (if applicable)</li> <li>(i) details of land tenure for sewerage pumping station site</li> <li>(j) AAPA clearances for sewerage pumping station site</li> <li>(k) environmental and heritage clearances for sewerage pumping station site</li> <li>(l) system curves for pressure mains</li> <li>(m) surge analysis for pressure mains</li> <li>(n) fatigue calculations for pressure mains</li> <li>(o) pump curves</li> </ul>	1.6.4
<p>Delete Figure 1.1 and replace with Figure 1.1(NT) at the end of this supplement.</p> <p>Delete "(b) Pump peak dry weather flow plus an allowance for wet weather flow" and insert "(b) Pump peak wet weather flow as determined in accordance with NT Supplement to Sewerage Code of Australia".</p> <p>Add (i) Access to site and all equipment at site shall be provided for all events including 1:100 year flood.</p> <p>Add (j) For coastal areas, vehicle access to site shall be possible after cyclone and any associated storm surge.</p>	2.2
<p>Insert "As a pre-requisite to design" at the beginning of the third paragraph ("A contingency plan shall be developed for station failure...").</p>	2.5

Requirement	Clause
<p>After the final paragraph, add the following:</p> <p>"Designers are required to complete surge analysis for all pressure mains (refer Section 10).</p> <p>For plastic pipes, correction for temperature and fatigue shall be undertaken in accordance with Section 10.</p> <p>PE is the preferred material for use <b>within pumping station wet wells</b> in all centres.</p> <p>General use of PE products is allowed in Alice Springs, Yulara and Kings Canyon, however specific written approval is required from PWC for its use in other centres.</p> <p>Designers must ensure that avoidance or minimisation of corrosion of metallic components within the pumping station is specifically addressed."</p>	2.6
<p>After the final paragraph, add the following:</p> <p>"If all possible design parameters have been addressed to minimise septicity of the sewage in the pump station and pressure main, and a problem of septicity still remains, it may be necessary to chemically dose the pressure main, pump well, and/or the reticulation mains leading to the pumping station.</p> <p>Where the design has indicated that septicity control is considered necessary then the Designer is to detail options in the Concept Plan that address available impacts, advantages and disadvantages, capital / operating costs associated with the septicity control."</p>	2.8.1
<p>After the final paragraph, add the following:</p> <p>"For permanent pumping stations, the designer must undertake an analysis to predict hydrogen sulphide generation at the pumping station and its corresponding discharge location.</p> <p>Attention must be paid to inlet and wet well design to minimise odour production. Avoidance of turbulence is to be addressed in the design of the pump inlet structure.</p> <p>The designer will need to liaise closely with PWC on proposed ventilation and odour control.</p> <p>As part of the process for controlling the impact of odour on neighbouring properties, developers and consultants are directed to Power and Water's 'Guidelines for Buffer Zones'.</p> <p><i>This is especially critical in Darwin where sewers are unventilated."</i></p>	2.9

Requirement	Clause
<p>Before the first paragraph, insert:</p> <ul style="list-style-type: none"> <li>• <b>PWC WILL NOT ACCEPT RESPONSIBILITY FOR THE OPERATION OF A SEWERAGE PUMPING STATION WHERE A TEMPORARY ELECTRICITY SUPPLY EXISTS</b></li> <li>• <b>PWC WILL NOT ACCEPT RESPONSIBILITY FOR THE OPERATION OF A SEWERAGE PUMPING STATION PRIOR TO THE SUCCESSFUL COMPLETION OF COMMISSIONING</b></li> </ul>	2.17.1
<p>Add the following after final paragraph:</p> <p>"PWC shall be given written notification of the proposed commissioning date at least days in advance and all pre-commissioning documentation must be forwarded to PWC at least 14 working days before the planned commissioning date.</p> <p>Failure to provide written notice or all pre-commissioning documentation may lead to delays in commissioning.</p> <p>Digital drawings shall be provided in accordance with PWC drawing procedures, refer: <a href="http://www.powerwater.com.au/business/for_business_and_developers/standard_drawings/drawingproceduresvolume">http://www.powerwater.com.au/business/for_business_and_developers/standard_drawings/drawingproceduresvolume</a> "</p>	2.17.2
<p>Coordinates to be specified to MGA. Pine Creek and west of Pine Creek falls within Zone 52. East of Pine Creek falls within Zone 53.</p>	3.2
<p>Delete the first paragraph and insert:</p> <p>"Geotechnical recommendations are required for all proposed sewerage pumping station sites and copies of the geotechnical report shall be provided to PWC prior to submission of designs for approval. Refer also Section 11. Geotechnical investigations shall be undertaken prior to completion of design.</p> <p>Vertical bearing capacity for waterlogged conditions shall be determined at full depth and at the centre of the proposed wet-well, at full depth and at the centre of the proposed inlet MH and where applicable, at full depth at four locations at the proposed overflow storage chamber/s."</p>	3.4
<p>After the first paragraph, add:</p> <p>"Before construction commences, Aboriginal Areas Protection Authority (AAPA) clearances shall be obtained, including a set of clearances in the name of the Power and Water Corporation."</p> <p>Add:</p> <ul style="list-style-type: none"> <li>(m) areas under control of an aboriginal land council</li> <li>(n) areas where Native Title has been granted</li> </ul>	3.6.1
<p>Add the following after final paragraph:</p> <p>"Note that trees and some landforms, particularly in desert areas, can form part of an aboriginal sacred site. If there is any doubt, then the advice of the Aboriginal Areas Protection Authority should be sought, and if necessary, an AAPA certificate obtained and paid for by the developer.</p>	3.6.3

Requirement	Clause								
Developers should be aware that significant delays may occur should AAPA certificates not be obtained in time to commence construction. Power and Water will not accept any site that has been the subject of destruction of sacred sites until all outstanding issues resulting from that destruction have been finalised and final AAPA certification issued.	3.6.3 (cont)								
<b>Severe penalties apply under NT law for destruction of sacred sites.”</b> Add:  (e) In coastal areas subject to storm surge, the weir crest of any ERS shall be set at least 0.5m above the storm surge level.  (f) In coastal areas subject to storm surge, electrical switchboards and electrical connection points shall be set at least 0.9m above the storm surge level.	3.6.5								
Delete the third paragraph (“For some Water Agencies, an easement over private property...”) and insert:  “An easement over private property is not the preferred location for a pressure pipeline and may only be used as temporary solution pending future permanent pipeline within a road reserve”.  Delete the paragraph “ <i>Typical situations where the Water Agency may approve ...</i> ”.  Delete the paragraph “Specific requirements for the use of an easement ...” and insert the following:  “Where a pressure main must be located within private property, an easement shall be provided in favour of PWC. All easements in favour of PWC shall be in accordance with the PWC Policy ‘Minimum Easement Dimensions, Conditions and Restrictions for Water and Sewerage Infrastructure’.	3.7								
<table border="1"> <thead> <tr> <th>Pressure Mains (DN)</th> <th>Minimum Easement Width (m)</th> </tr> </thead> <tbody> <tr> <td>≤ 150</td> <td>3</td> </tr> <tr> <td>&gt;150 to ≤450</td> <td>6</td> </tr> <tr> <td>≥450</td> <td>8</td> </tr> </tbody> </table>	Pressure Mains (DN)	Minimum Easement Width (m)	≤ 150	3	>150 to ≤450	6	≥450	8	
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The easement is generally to be centrally located over the pressure main.  Pressure mains located within private land may be subject to increased easement requirements to the satisfaction of PWC, where:  <ul style="list-style-type: none"> <li>the pressure or vacuum main is not parallel to the property boundary</li> <li>there is a shared alignment for services approved by the relevant authorities</li> <li>there more than one PWC asset within the easement”</li> </ul>									
Insert before first paragraph, “Pipe joints for all crossing of roads, railway lines, creeks and drainage reserves shall be fully restrained”.	3.8.1								
Delete reference to Standard Drawings WAT-1211, WAT-1212 and WAT-1213. Additionally, the minimum clearances in Table 3.1 shall be 300mm for vertical clearance and 600mm for horizontal clearances.	3.11.4.2								

Requirement	Clause
In the first paragraph, delete the words "Unless approved by the Water Agency, ... pressure main material".	3.11.6
Figure 3.1 – Deflection at Joints, only applies only for small vertical deflections.  Deflections must be fully restrained for Figure 3.2 – Deflection using SOC-SOC Bends.  For Figure 3.3 – Deflection using SOC-SOC Connectors, only applies only for small horizontal deflections and deflections must be fully restrained where allowable horizontal bearing pressure of the soil, when saturated, is less than 100 kPa.	
<b>Sewerage pressure mains shall be laid below water mains wherever possible.</b>	
Applicable to inlet MH's, wet-wells and macerator pits.	4.2.2
Delete reference to Standard Drawings SPS-1200, SPS-1201, SPS-1202, SPS-1203, SPS-1306 and SPS-1307.	5.1
In (b), delete "100mm" and insert "500mm".	5.2.3
Add the following after final paragraph:  "Note that where aboveground buildings are contemplated, and especially in built up areas, local council and/or DCI planning officers must be given an opportunity to comment on the acceptability of the building appearance.  Buffer zones shall be provided in accordance with PWC Guidelines for Buffer Zones. For sewerage pumping stations with ultimate capacity >150 L/s, the radius of the buffer zone shall exceed 100 metres."	
Add the following after final paragraph:	5.2.5
"The access road shall be constructed at least 300mm above the 1:100 flood level.  Specific consideration shall also be given to the access to the site so that vehicles leaving the site can safely merge with the traffic on the public road."	
Delete reference to Standard Drawings SPS-1200, SPS-1201, SPS-1202 and SPS-1203. Add the following after final paragraph:	5.2.6
"Information on waterwise gardening principles acceptable to Power and Water is contained in <a href="http://www.powerwater.com.au/powerwater/docs/green_guide/PW_WaterWise_Garden.pdf">http://www.powerwater.com.au/powerwater/docs/green_guide/PW_WaterWise_Garden.pdf</a> .  Landscaping will be restricted to the perimeter of the site to enable maximum utilisation of the site for future hardstand."	
After the sentence ending "...any existing step irons shall be removed.", insert "a stainless steel ladder shall be provided in the inlet MH."	5.3.2
Delete the first sentence of the second paragraph ("A knife gate valve...") and replace with "A knife gate valve complying with WSA PS-266 shall be fitted at the outlet of the inlet MH to enable the flow of sewage to the wet-well to be stopped. All valves must close clockwise."	5.3.3

Requirement	Clause												
<p>Delete the first paragraph ("For "small" pumping stations...") and insert "For pumping stations with ultimate capacity of &lt;50 L/s, provide a single wet-well to retain the sewage inflow and house the pumping equipment."</p> <p>Delete third paragraph.</p> <p>Note that small pump stations have an ultimate capacity &lt;50 L/s, whilst medium pump stations have an ultimate capacity ≥50 L/s to 150 L/s.</p>	5.4.1												
<p>Delete (c) and insert:</p> <p>(c) For pumping stations with an ultimate capacity exceeding 20 L/s, the wet-well diameter shall be a minimum of 2m; and</p> <p>(d) For pumping stations with an ultimate capacity ≤ 20 L/s, the wet-well diameter shall be a minimum of 1.7m</p>	5.4.2												
<p>Delete Table 5.1 and insert the following:</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2" style="text-align: center;">TABLE 5.1 (NT) DEFAULT CONTROL LEVELS</th> </tr> <tr> <th style="text-align: center;">Level</th> <th style="text-align: center;">Description</th> </tr> </thead> <tbody> <tr> <td>duty pump cut-out</td> <td>set in accordance with the heights corresponding to the cut-in/cut-out volumes and not being lower than the minimum submergence level of the pumps</td> </tr> <tr> <td>duty pump cut-in</td> <td>set at least 300mm below the incoming sewer invert level</td> </tr> <tr> <td>second duty pump** cut-in</td> <td>set at least 150mm above the duty pump cut-in level</td> </tr> <tr> <td>standby pump cut-in</td> <td>set at least 150mm above the duty pump cut-in level, or if applicable, at least 150mm above the second duty pump cut-in</td> </tr> </tbody> </table> <p>** applicable only to pump stations with three equally sized pumps</p>	TABLE 5.1 (NT) DEFAULT CONTROL LEVELS		Level	Description	duty pump cut-out	set in accordance with the heights corresponding to the cut-in/cut-out volumes and not being lower than the minimum submergence level of the pumps	duty pump cut-in	set at least 300mm below the incoming sewer invert level	second duty pump** cut-in	set at least 150mm above the duty pump cut-in level	standby pump cut-in	set at least 150mm above the duty pump cut-in level, or if applicable, at least 150mm above the second duty pump cut-in	5.4.4
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<p>Delete the third paragraph ("Wet-well washers should be connected...") and insert the following:</p> <p>"Designers shall consult with Power and Water to determine the necessity for wet-well washers. It is preferred that wet-well washers have no moving parts and are connected to the pressure side of the pump/s."</p>	5.4.7												
<p>Before the first paragraph, insert the following:</p> <p>"Note that natural sewer ventilation is employed in Alice Springs, Tennant Creek and Katherine, but is not generally employed in Darwin. Ventilation designs, where applicable, must be submitted to PWC for approval."</p>	5.5.1												
<p>After the first paragraph, insert the following:</p> <p>"Any proposals for forced ventilation of pumping stations shall have plume modelling carried out (and remedial odour reduction fitted as required) as described in 5.5.1 above."</p>	5.5.2												

Requirement	Clause
<p>After the final paragraph, add the following:</p> <p>"Dependant on the level of H<sub>2</sub>S generation, it may be necessary to model odour dispersion to ascertain the impact of the odourous discharge on neighbouring properties. Plume calculations shall comply with an industry accepted standard such as the Victorian State Environment Protection Policy (Air Quality Management) – Gazette No S240. Plume modelling shall utilise an industry accepted model such as AUSPLUME. If the plume modelling indicates that there will be a problem with odour transmission to adjacent properties, the designer shall incorporate odour reduction processes into the design to eliminate that odour problem. Where odour reduction is required, the proposed design shall be submitted to PWC for approval."</p>	5.5.2 (cont)
<p>Delete the first paragraph and insert the following:</p> <p>"To provide adequate time for operations / maintenance personnel to respond to an emergency, overflows need to be contained at the pump station site by the provision of emergency storage."</p> <p>Delete reference to Standard Drawings SPS-1402 and SPS-1403.</p>	5.6.1
<p>In the first paragraph, delete the words "and associated gravity sub-catchment".</p> <p>After the first paragraph, insert the following:</p> <p>"Overflow to emergency storage shall occur at 90% of wet-well depth (ie. 10% 'free-board' remains in wet-well when overflow to emergency storage commences).</p> <p>The emergency storage shall be capable of retaining at least three hours of flow at peak dry weather flow (the maximum dry weather sewage inflow) for the ultimate development to be serviced.</p> <p>When calculating storage volumes, any available storage in pipes shall not be considered.</p> <p>Where travel time (at a reasonable average speed) from the PWC depot to the pump station exceeds forty-five minutes, the minimum storage capacity shall be increased accordingly (ie. 135 minutes is allowed for fault-finding plus repairs / response at site plus mobilisation of additional equipment and/or implementation of contingency plans).</p> <p>Some PWC systems are remote from regional depots or have accessibility issues. Therefore, there will need to be discussion with PWC at the planning stage of the pump station design in relation to the necessary emergency storage.</p> <p>For environmentally sensitive areas or high population areas or CBD areas, additional emergency storage may be required by PWC.</p> <p>The provision of permanent standby generation may reduce the likelihood of pump station failure, but will not reduce likelihood to zero, hence overflow storage requirements are considered independent of standby generation arrangements."</p> <p>Figure 5.1 is the configuration preferred by PWC.</p>	5.6.2.2

Requirement	Clause
At (c), delete existing wording and insert "concrete: use same concrete specification as for Pre-Cast Maintenance Holes – Shaft Segments as included in the PWC Water Supply and Sewerage Products Manual – Gravity Sewerage Products – Maintenance Structures;"	5.6.2.3
In the second paragraph, delete the words "a minimum clear opening of 600mm" and insert "a minimum opening of 900mm by 600mm".  At the end of the second paragraph, insert "At least one access point on each storage structure shall have a minimum opening of 1200mm by 900mm."  After the final paragraph, add "In non-trafficable areas, access points shall be finished at least 150mm above natural surface level."	5.6.2.4
Butt joints between pre-cast culverts or pre-cast pipes are not permitted.	5.6.2.5
After the final paragraph, add:  "The Designer shall provide a detailed report to PWC regarding the proposed ERS design which includes the following:  <ul style="list-style-type: none"> <li>• longitudinal section plans and hydraulic grade lines for the ERS;</li> <li>• plans showing alternative locations for the ERS;</li> <li>• facilities to retain gross solids/trash, scum and gas;</li> <li>• methods for removal of gross solids/trash and scum retained in the ERS;</li> <li>• for drains, creeks, rivers or other watercourses – minimum, median and maximum flow rates by month;</li> <li>• for harbours or tidal waters – modelling of dispersion and dilution of discharge from ERS;</li> <li>• occupational health and safety aspects;</li> <li>• public health and safety aspects;</li> <li>• overflow alarm;</li> <li>• all relevant data used in design computations;</li> <li>• assumptions made in the design computations;</li> <li>• any other information the designer/consultant deem relevant</li> </ul> The Designer shall provide the above documentation to PWC at least six months prior to proposed commencement of construction of the sewerage pumping station. PWC will seek NRETAS approval for ERS and related discharges.  The flap gate is to be a Hume-King floodgate or a Tideflex Technologies check valve or PWC approved equivalent. Floodgate or check valve shall be installed to ensure that positive and effective gas seal is achieved.  Where an ERS discharges to an unformed drain, creek, river or water course, then the designer will be required to indicate impact of 1:10, 1:20, 1:100 year storm events on ERS operation."	5.6.4
A stainless steel or other corrosion resistant material ladder shall be fitted to the inlet MH.  Ladders are not to be fitted to the wet-well or emergency storage structure.  Delete reference to Standard Drawings SPS-1604 and SPS-1606	5.7

Requirement	Clause
<p>Add:</p> <p>(I) Bollards to be placed to prevent vehicle loading on the wet well and valve chamber covers.</p> <p>After the final paragraph, add:</p> <p>"If staging requires a change of pumps, or if the catchment is anticipated to grow beyond the current design parameters, then the access covers shall be sized to accommodate the maximum size pump that the well can accommodate."</p>	5.8
<p>Refer PWC Standard Drawings W2-3-04A and W2-3-04B for details for guardrails and handrails.</p> <p>After the final paragraph, insert the following:</p> <p>"Mounting plates, associated foundations compete with structural certification shall be provided at the wet-well and at the inlet MH to allow future use by PWC of a davit arm confined space rescue system at the pump station.</p> <p>Similar davit arm mounting plates (including associated foundations compete with structural certification) shall be provided at valve pits and meter pits where the pits are more than 1.5m deep.</p> <p>Where overflow storage chambers are required at the pump station, PWC may elect for the Developer to provide similar davit arm mounting plates (including associated foundations compete with structural certification) at PWC's cost, at the larger opening of each overflow storage chamber."</p>	5.9
<p>Delete the existing wording and insert:</p> <p>"Electrically powered submersible mixers shall be installed at dry-well installations.</p> <p>For wet-well installations, an electric mixer may be installed in the pump well. Where the pump is unable to be fitted with an approved flushing valve, or if the well is too large for a flushing valve to operate efficiently (&gt;4m diameter wet-well). Approval of make and model of mixer must be obtained from PWC.</p> <p>Mixers shall be placed and oriented to ensure efficient mixing of the well contents. Mixers shall be sized to ensure that they draw only 80% of full load current under the most adverse well conditions. Mixers shall be mounted with a lifting-chain and guide-rails, in a similar manner to the pumps, to facilitate removal for maintenance.</p> <p>The mixer is to be controlled by the PLC to run at appropriate intervals to achieve sufficient mixing to enable all suspended and floating solids to be pumped out of the wet well."</p>	5.12
<p>In the third paragraph ("Design flows shall be based on the total..."), delete "in WSA 02 shall be used" and insert "in the NT Supplement to WSA 02 shall be used".</p>	6.2
<p>In the sixth paragraph ("In deriving the system curve..."), delete "150mm" and insert "300mm".</p> <p>Add after the final paragraph: "Pump equipment shall be consistent with existing pumping equipment owned by PWC, such as Flygt and Grundfos pumps."</p>	6.3

Requirement	Clause
At (i), delete existing wording and insert:	6.4
“(i) • 100% stand-by capacity (ie. one duty pump and one stand-by pump) for ultimate flows < 50 L/s • 50% stand-by capacity for triple-pump pumping stations (refer Clause 6.5) • 100% stand-by capacity for ultimate flows > 50 L/s, where PWC has approved a pump station with only two pumps”	
Delete the existing wording and insert:	6.5
“For ultimate flows > 50 L/s and ≤ 150 L/s, triple-pump pumping stations shall be installed unless otherwise approved by PWC.	
Pumps in a triple-pump pumping stations, the pumps shall be the same size. Two pumps shall share the duty with the third as stand-by. Each pump will have a capacity so that, when two pumps are operating together, they will pump the required flow (peak wet weather flow).”	
After the final paragraph, add:	6.6.1
“Any proposal to install pumps in series shall require the written approval of PWC.”	
Discharge connections shall be manufactured by Flygt.	6.6.4
For pumps with motors ≤30kW, a de-contactor shall be installed.	6.6.5
Delete “5.5kW” and insert “7.5kW”.	6.8.1
Electronic soft starters are preferred by PWC.	6.8.2
In remote locations where higher reliability is required, PWC may specify autotransformers or star-delta starters, however autotransformer starters are preferred over star-delta starters.	
In the last paragraph, delete “240 V AC” and insert “24 V DC”.	
At (b), by-pass contactors shall be integral to the soft starter.	6.8.3
In the third paragraph, delete “200 L/s” and insert “150 L/s”.	7.2.3
Before the first paragraph, insert:	7.2.5
“On-site generation capacity is to be provided on all pumping stations with ultimate flow ≥ 100 L/s unless the station contingency plan and due diligence studies can demonstrate that it is not required.”	
At (c), delete “8%” and insert “5%”.	
Refer Appendix F regarding generating set requirements.	7.2.6
In the first paragraph, delete “200 L/s” and insert “150 L/s”.	7.2.8
PWC Standard Drawings take precedence over the requirements of Section 7.3.	7.3
For pumps >45kW, liaise with PWC regarding switchboard requirements and layout.	7.3.1
Delete reference to Standard Drawing SPS-1103.	
Delete the sixth paragraph, “Where cubicles are remote from the pumping station, ...”	
PWC Standard Drawings take precedence over the requirements of all of Section 8.	8
Delete reference to SPS-1103 and SPS-1505.	8.1

Requirement	Clause
Delete the third paragraph ("The electrical controls...") and insert:  "The electrical controls shall equalise pump running times within $\pm 10\%$ . The stand-by pump shall automatically cut-in should any of the duty pumps fail and the stand-by cut-in level is reached".	8.3.1
Delete the fourth paragraph (In a two-pump station...")	
Delete "Flush with Manual <sup>(optional)</sup> in this position pumping can be controlled locally."	8.3.2
Add after the final paragraph:  "The emergency control system shall be relay based with separate floats. All pumps shall start if the upper float is triggered and will only be shut-down when the lower float is triggered. An alarm shall be sent via telemetry when the upper float is triggered."	8.3.4
Delete this clause.	8.3.5
In Table 8.2, delete row titled "Enunciator FAILURE".	8.5.3
In Table 8.2, delete words "Inflow emergency level REACHED" and insert "Spill level REACHED".	
Delete Table 8.3.	8.5.4
Refer PWC Standard Drawings.	
Delete this clause.	8.5.5
In the first paragraph, delete the wording "shall be compatible with" and replace with "shall be identical to".	8.6.1
Delete this clause.	8.6.4
PWC shall provide the communications service, however, the Developer shall provide all hardware (eg. aerials, masts and cabling) necessary to connect the telemetry to the communications service.	
Radio communication is the preferred option. The Developer shall conduct a received signal strength indication (RSSI) test at the proposed site for the following heights: <ul style="list-style-type: none"> <li>• 5 metres;</li> <li>• 7.5 metres;</li> <li>• 10 metres;</li> <li>• 12.5 metres;</li> <li>• 15 metres;</li> <li>• 17.5 metres; and</li> <li>• 20 metres.</li> </ul>	8.6.5
Liaise with PWC to identify the appropriate master or repeater station/s and the relevant test frequencies to use for the RSSI test. Results of the test shall be provided to PWC with or before submission of the Concept Plan.	
Where the proposed pumping station site is an area where topography or tall buildings may inhibit reliable radio communications, or in central business districts or in areas adjacent to central business districts, liaise with PWC before conducting a RSSI test to confirm that radio communication is still preferred.	

Requirement	Clause
For medium and large pump stations (ie. ultimate flow > 50 L/s), a magflow meter shall be installed on the (outflow) pressure main.	8.8.2
Piping shall be arranged to avoid the meter draining or air entering the meter during normal operation.	
For large pump stations (ie. ultimate flow > 150 L/s), the meter shall be installed with a thrust dismantling joint provided.	
Where aboveground piping is utilised (refer Clause 9.3.1), the magflow meter can be installed aboveground provided it is adequately shaded.	
Where the meter is installed belowground, the meter shall be installed in a pit for large pump stations. Direct burial of meters is permitted for medium pump stations.	
Delete this clause.	8.8.4
Level sensors shall be VegaWell 52 hydrostatic 4-20mA probes (order code WL52.XXA4AMD1CD1X) with a one bar range (ie. 0-10m) used in conjunction with Vega model DIS11.X 4-20mA transmitter. The lower end of the VegaWell 52 probe shall be installed 150mm from the bottom of the wet-well (it may necessary to shape the benching to match this requirement).	8.8.5
The length of the VegaWell 52 probe shall be sufficient to reach the terminals on the PLC in the adjacent switchboard with a minimum of 10% slack. The minimum length of the VegaWell 52 probe, irrespective of the proximity of the adjacent switchboard, shall be 12m. At April 2010, available standard probe lengths were 12m and 27m.	
Delete reference to Standard Drawing SPS-1505	
Delete second sentence of first paragraph ("Since this alarm is the first indication...").	8.8.6
Delete the second paragraph ("Three-element bi-metallic type...").	8.8.8.5
Delete this clause.	8.8.8.6
Delete this clause.	8.8.8.7
Delete this clause.	8.9
Refer to PWC Standard Drawings.	
PWC Standard Drawings take precedence over the requirements of this clause.	8.11.1
After the final paragraph, add:	9.1.2
"Penetrations of pipe work through concrete walls of pumping station including wet-wells and valve chambers must have an approved puddle flange and provide adequate thrust restraint against pressure surges and vibration created by the pump. Penetrations through block outs shall be grouted using high quality non-shrink grouts with at least the same strength as the parent concrete.	
The pressure main shall be fitted with a scour line to enable the main to be drained back to the pump well or into an adjoining part of the sewer reticulation system. The valve to operate this scour shall be accessible from the surface via a gas tight winding box adjacent to the access cover within the valve chamber."	
Fusion welded PE pipework is preferred within the wet well.	9.1.3
PE pipe within the wet-well shall not exceed a maximum diameter of 355mm.	

Requirement	Clause
Delete the first paragraph. Delete reference to Standard Drawings SPS-1306 and SPS-1307. Power and Water requires: (a) Clockwise closing. (b) Resilient seated in accordance with PWC Products Manual	9.2.1
In the first paragraph, delete the words "to WSA PS-264".	9.2.2
After the last paragraph, insert "Refer to PWC Water Supply and Sewerage Infrastructure Products Manual regarding approved non-return valves."	
Delete reference to Standard Drawing SPS-1307.	9.2.3
Delete all references to "automatic sewage air-release valves" and insert "automatic sewage gas-release valves". Refer also Clause 10.9.3.	9.2.4
Designers shall submit surge/fatigue analysis calculations and analysis (refer Section 10) to PWC before proceeding to procurement of pressure main piping or sewage gas-release valves.	
Designers shall nominate make and model of sewage gas-release valves to be used on the pressure main. The capacity of sewage gas-release valves for a particular nominal size (DN) can vary significantly from one design/manufacture to another, such that specification of a nominal diameter is inadequate.	
Manually operated ball valves are not permitted for air/sewage gas release.	
Automatic sewage gas-release valves shall be provided on all sewage pressure mains where air/sewage gas release is necessary.	
Delete "WSA 112" and insert "AS4883".	
Sewage gas-release valves shall be specifically designed for application in sewerage systems and shall be an approved type as per PWC Water Supply and Sewerage Infrastructure Products Manual.	
Delete reference to Standard Drawing SPS-1605.	
For pump stations in the Northern Region or where the pump station is located within 200 kilometres of the coast or where the pump station is located within the 1:500 year flood zone, valve assemblies shall be installed below ground.	9.3.1
For pump stations in other areas, aboveground piping is permitted subject to PWC approval. Refer to PWC Standard Drawings W2-3-05 and W2-3-06.	
Delete reference to Standard Drawings SPS-1306 and SPS-1307.	
Delete reference to Standard Drawings SPS-1306, SPS-1307 and SPS-1508.	9.3.2
After the final paragraph, add:  "The valve chamber covers shall be large enough to enable crane access to remove valves for maintenance purposes. For valves greater than DN150, removal must be able to be carried out as a "direct lift" operation."	

Requirement	Clause								
Delete the existing wording and insert:  One long sleeve uniflange is to be provided per valve to enable ease of removal of valves. Long sleeve gibbault type joints are permitted in lieu of uniflances, provided that the gibbaults are approved type from PWC Water Supply and Sewage Infrastructure Products Manual. In vertical pipe work the uniflances joint shall be installed at the top of the valve.	9.3.3								
Delete this clause.	9.3.5								
Delete reference to Standard Drawing SPS-1306 and SPS-1508.	9.3.6								
Delete reference to Standard Drawings SPS-1307 and SPS-1508.	9.4								
Delete this clause.	9.4.1								
Delete this clause and insert:  The pressure mains shall be located as follows, listed in order of decreasing preference:  1. Parks, drainage reserves, walkways etc, subject to approval by relevant agencies; 2. Nature strip (i.e. footpath) area within the road reserve, at the distance from the property boundary specified in the service allocation plan or a service corridor; 3. Land owned by PWC, subject to PWC approval; 4. Road pavement (shoulder or emergency lane preferred), subject to approval by relevant agencies; 5. Areas that would be inundated by a storm surge; 6. Private property requiring an easement; 7. Areas of acid sulphate soil; and 8. Areas that would be inundated by a 1 in 100 flood  Pressure mains are not permitted in private property except where specifically approved in writing by PWC. In such circumstances, easements shall be provided in accordance with Clause 3.7."	10.2.1								
Where pressure mains are constructed in road reserves, the alignment shall conform to that nominated on the service allocation plan and by gaining approval from PWC and the relevant road authority or Council. Refer also 'Service Allocations in Road Reserves' in Section 4 of Volume 2 of the Power Supply Volumes of PWC's Standard Drawings (drawing numbers SO2-4-1-XX).  Where pressure mains are less than the following distances from the property boundary, easements in favour of PWC shall be provided over the adjacent portion of the property.	10.2.2								
<table border="1"> <thead> <tr> <th>Pressure Mains (DN)</th> <th>Minimum Distance to Property Boundary (m)</th> </tr> </thead> <tbody> <tr> <td>≤ 150</td> <td>1.5</td> </tr> <tr> <td>&gt;150 to ≤450</td> <td>3.0</td> </tr> <tr> <td>≥ 450</td> <td>4.0</td> </tr> </tbody> </table>	Pressure Mains (DN)	Minimum Distance to Property Boundary (m)	≤ 150	1.5	>150 to ≤450	3.0	≥ 450	4.0	
Pressure Mains (DN)	Minimum Distance to Property Boundary (m)								
≤ 150	1.5								
>150 to ≤450	3.0								
≥ 450	4.0								
Where a pressure main is required across a railway reserve, thrust boring or directional drilling shall be used. The rising main shall be encased in a sleeve.	10.2.3								
Delete reference to Standard Drawing WAT-1213									
In the second last paragraph, delete "3.5 m/s" and insert "2.5 m/s".	10.3.5								
Refer also PWC supplement to Part 2 of WSA 04 and Table 16.1(NT).	10.3.6								

Requirement	Clause
In the last paragraph, delete "A safety factor of 1.5 shall be used."	10.4.1
Delete the third paragraph ("A computer simulation shall be undertaken unless it can be demonstrated...the amplitude and frequency estimated"), and insert:  "A computer simulation shall be undertaken to estimate the amplitude and frequency of surge events. Computer simulation pump stop / start is uncontrolled (ie. benefits of motor soft start or VSD control shall be ignored). A summary of the results of the computer analysis shall be provided to PWC."	10.4.3
In the first paragraph, delete "Class 12" and insert "PN 16".  Delete the second paragraph ("Many Water Agencies...").  Delete the third paragraph ("Designers shall verify the Water Agency's specific...").	10.5.4
For PWC pressure mains, use 30°C as the time weighted average temperature.	10.6.1
PVC fittings shall not be used.	10.6.3
Delete reference to Standard Drawings SPS-1604 and SPS-1605.	10.9.1
Delete the third paragraph ("Gas release valves shall be fitted at all high points...") and insert:  "The pressure main shall be designed to avoid high points where gas may be trapped. Where it will be necessary to install the pressure main at a depth > 3m to avoid a high point, the Designer shall demonstrate that the flow velocity is insufficient to move accumulated gas at the high point to the next high point in the pressure main or point of discharge before specifying installation of a gas release valve. Isolating valves shall be fitted to gas release valves to permit on-line cleaning and maintenance of gas release valves".  Delete the second last paragraph ("It shall also be verified that the depth...").  Delete the last paragraph ("gas release valves shall be installed...").  After the final paragraph, insert "The minimum class of gas release valves shall be PN16".	10.9.3
The point of discharge of gravity scours shall be agreed with PWC.	10.9.5
In the first paragraph, delete "ultimate dry weather flows from the station were allowed for in the original design of the receiving sewer, or that" and after "WSA 02", add "as amended by PWC supplement to WSA 02."	10.11.1
Delete the second paragraph ("As a rule of thumb...").	

Requirement	Clause
In the fourth paragraph, delete the words "or for at least a distance until the soffit ... at its point of discharge, whichever is greater."	10.11.2
Delete the fifth paragraph.	
Delete the sixth paragraph.	
In the eighth paragraph, delete the words "or ductile iron lined with acid resisting cement mortar lining (Refer to WSA PS-2009)."	
Delete the ninth paragraph.	
Delete the tenth paragraph.	
In the first paragraph, delete ">DN 300."	11.1.2
Delete "40 MPa" and insert "50 MPa".	11.2.2.2
Details of trench requirements are set out in the PWC Water Supply and Sewerage Construction Master Specification.	11.3.4.3
Delete reference to Standard Drawings WAT-1203 and WAT-1204.	11.3.4.4
Add:  "Embedment types are set out in the PWC Water Supply and Sewerage Construction Master Specification.  Unless geotechnical investigations have been completed and the resultant report supports the use of lower quality bedding, a minimum of Type 2 embedment shall be used for pipe bedding.	

Application	Minimum Permissible Embedment Type	Comments
Under roadways (open cut)	4	Use cement stabilised sand for trench fill (backfill)
Under drain	4	Use 5% cement stabilised gravel for trench fill (backfill)
Areas with high water table	2A / 2B	Consider use in conjunction with geotextile
Areas subject to tidal inundation	2A / 2B	Consider use in conjunction with geotextile
Areas where water table is influenced by tides	2A / 2B	Consider use in conjunction with geotextile
Poor native soils	2A / 2B	
High subsoil drainage flows	2B	Use in conjunction with geotextile
Grades > 5%	1 / 2	Use trenchstops or bulkheads in accordance with Clause 8.10
Normal	1	

Requirement	Clause
<p>Minimum test pressure shall be 1000 kPa for pressure mains <math>\leq</math>DN 300 and minimum test pressure shall be 1200 kPa for pressure mains <math>&gt;</math>DN 300.</p> <p>Permanent thrust blocks are to be provided on buried mains incorporating unrestrained, flexible joints. When designing thrust blocks it shall be assumed that the total unbalance thrust is transferred from the thrust block to the adjacent soil or rock.</p> <p>When sizing a thrust block the block shall not protrude beyond the trench with allocation for that main, unless approval is obtained from the affected service utility whose allocation is encroached upon. Thrust blocks must be constructed within the allocated service corridor.</p> <p>Concrete shall be used to construct permanent thrust blocks.</p>	11.3.9.2
<p>In the first paragraph, delete "<math>\geq</math>DN 40" and insert "DN50", plus delete "<math>\geq</math>25m head" and insert "<math>\geq</math>15m head".</p> <p>Delete the second paragraph.</p> <p>Delete the third paragraph.</p> <p>Delete the fourth paragraph.</p> <p>Delete reference to Standard Drawings SPS-1200, SPS-1201, SPS-1202 and SPS-1203.</p> <p>After the final paragraph, insert:</p> <p>"Provide one or more fire hose reels (FHR) adjacent to the access points to the emergency storage structures. The FHR's shall reach all sections of the emergency storage structures and the wet-well using less than 90% of available hose. Dry-wells shall have a service at the bottom of the dry-well".</p>	12.1.2
<p>After the final paragraph, insert:</p> <p>"Dry-wells shall have at least two GPO's at the bottom of dry-well".</p>	12.1.4
<p>WC to be provided at all large pump stations.</p>	12.1.6
<p>Before the first paragraph, insert:</p> <p>"PWC will normally request security fencing, and will advise if it is not required at a particular site.</p> <p>Fencing shall be 2400 chainmesh in accordance with PWC Standard Drawing W1-6-02.</p> <p>In urban areas, PWC may require anti-climb fencing in lieu of chainmesh fencing. Furthermore, in critical areas or areas of high public importance, further architectural treatment of fencing may be required. Refer PWC Standard Drawing W1-6-06"</p>	12.3
<p>Add:</p> <p>(f) AAPA certificate number/s applicable to any sacred sites clearance, plus locations and details of known and suspected sacred sites, including trees, that may be affected by any works related to the construction and maintenance of the site</p>	15.2.2

Requirement	Clause
Refer to PWC's Drawing Procedures Volume available on the PWC website ( <a href="http://www.powerwater.com.au">www.powerwater.com.au</a> )	15.3.1
In Item 1, Delete "crane SWL," and replace "hearing" with "personal".  At Item 4, add "(where applicable)" at end of item.  Delete Item 11  Delete Item 14  At Item 24, insert "Where applicable," before "check operation of the alternating set...".  Delete Item 26	Appendix A Mechanical Items
Delete Item 1  Delete Item 9  Delete Item 10  Delete Item 16  At Item 19, delete words "(0.58 times for star/delta), set overloads...instantaneous settings"  Delete Item 20  At Item 27, delete words "With star delta...from the overload."  At Item 34, delete the existing words and insert "Check that telemetry communications have been established back to the central monitoring point. Locally verify all telemetry inputs."	Appendix A Electrical Items
Add Item 46, "Confirm that PWC or PWC contractor has loaded ladder logic into PLC and completed all related function checks."  Add Item 47, "Check that all lights and GPO's are functional"  Add Item 48, "Verify that the top slab is flush with the finished surface level"  Add Item 49, "Verify that there is no damage to any exposed concrete surface"  Add Item 50, "Verify that the top slab does not affect the drainage of the site"  Add Item 51, "Verify that the dimensions of the top slab are in accordance with the design drawings"  Add Item 52, "Verify that the below ground concrete structures are dimensionally correct and correct in accordance with the design drawings"  Add Item 53, "Verify no leakage through the concrete structure"	Appendix A Additional Items

Requirement	Clause
Add Item 54, "Verify that the verticality of the structure is within tolerance in accordance with PWC specifications"	Appendix A Additional Items (cont)
Add Item 55, "Verify that the pump well benching has been provided in accordance with the design drawings"	
Add Item 56, "Verify that the specified coating to the walls has been applied in accordance with the design drawings (extent/coverage)"	
Add Item 58, "Verify that all NCR items have been resolved"	
Add Item 59, "Verify that the station identification signage has been fitted to the electrical switchboard and the boundary fencing"	
Add Item 60, "Verify that the pump guide rails comply with specifications and drawings?"	
Add Item 61, "Record the dimensions of the pump footstool connections"	
Add Item 62, "Verify that the pump footstool has been secured to the wet-well floor with appropriate chemical anchors"	
Add Item 63, "Verify that the wet-well infiltration test was satisfactory"	
Add Item 64, "Verify that the pump drawdown tests were satisfactory"	
Add Item 65, "Verify that all conduits through the top slab have been sealed to prevent odour escaping"	
Add Item 66, "Verify that adequate site drainage has been provided"	
Add Item 67, "Verify that all valves can be removed through the available access opening"	
Add Item 68, "Where fitted, verify that the flow meter can be removed"	
Add Item 69, "Verify that a flap valve has been installed on the valve chamber drain"	
Add Item 70, "Verify that all gate and knife valves are clockwise closing, that they operate through their full range and are left in the open position"	
Add Item 71, "Verify that adequate supports have been provided for each valve"	
Add Item 72, "Verify that adequate supports have been provided for vertical pipework"	
Add Item 73, "Verify that valve extension spindles have been provided where required"	
Add Item 74, "Verify that all products incorporated into the pump station and rising main are approved by PWC"	

Requirement	Clause
Add Item 75, "Verify that covers and frames are greased in accordance with the manufacturer's requirements"	Appendix A
Add Item 76, "Verify that ladder access (where fitted) meets OH&S requirements"	Additional Items (cont)
Add Item 77, "Verify that handrails have been installed in accordance with the design drawings"	
Add Item 78, "Verify that no overhead cables restrict access via crane trucks"	
Add Item 79, "Verify that emergency pump-out connections have been provided in accordance with design drawings"	
Delete Appendix B and use Appendix G (refer below)	Appendix B
Appendix E is informative only and Designers should prepare a new checklist for each project	Appendix E
Add Appendix F (refer below) Designers should prepare new data sheets for each pump station and submit to PWC,	Appendix F

APPENDIX F

Pump Station - Data Sheets  
General Information  
Darwin PS1

PHOTOS

<u>GENERAL</u>	
Pump Station Name	PS1
Region	NT
Town	Darwin
Pump Station Address	
Year Constructed/ Commissioned	
Phone Number	
Drawing number/s	
<u>COMMUNICATION</u>	
Radio Channel	
Citect	
<u>WET WELL</u>	
Collection Manhole	mm dia
Wet Well Diameter	mm dia
Receiving Manhole	
<u>OVERFLOW</u>	
Overflow Storage	cubic metres
Overflow Point	



Plate 1 - Location Photo



Plate 2 - Wet well



Plate 3 - Valve Pit



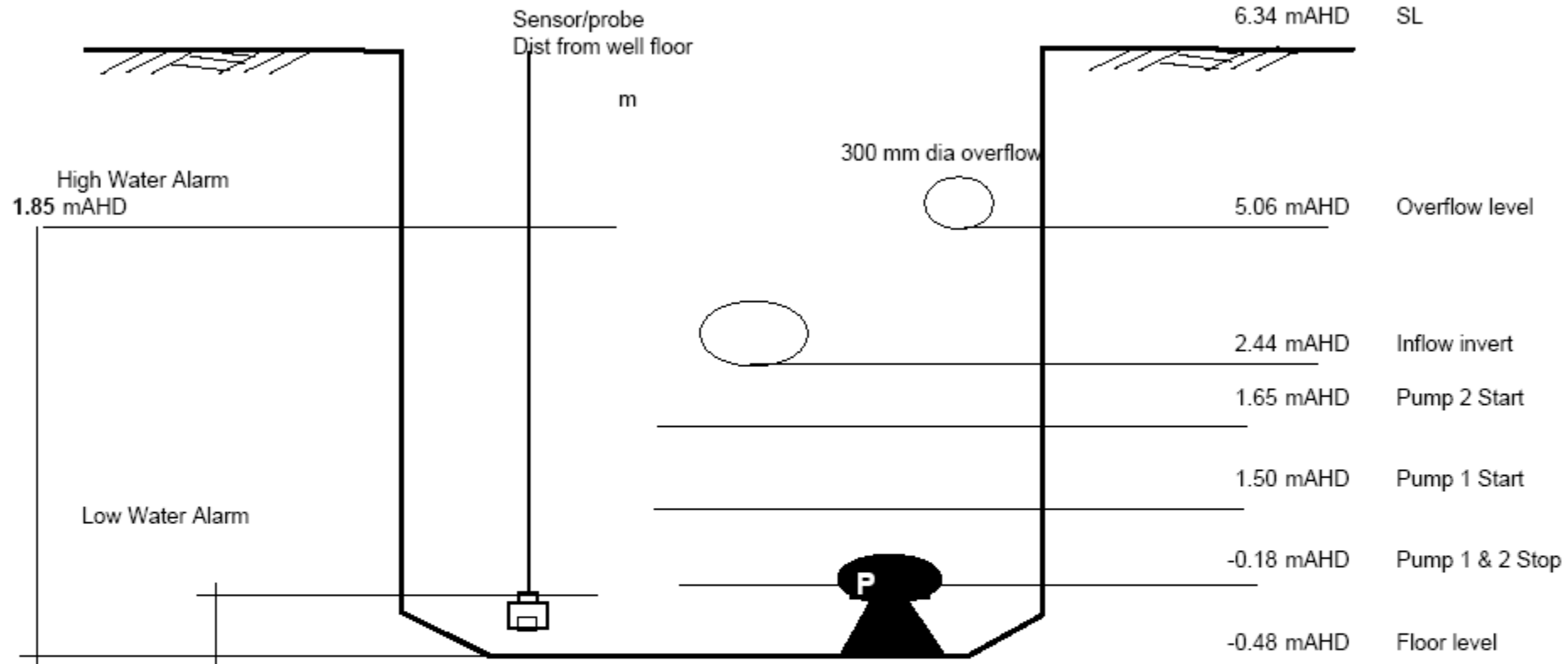
Plate 4 - Meter Pit

<u>RISING MAIN</u>					
<u>Diameter</u>	<u>Length</u>	<u>Material</u>	<u>Class</u>	<u>Static Head</u>	
mm	m			m	

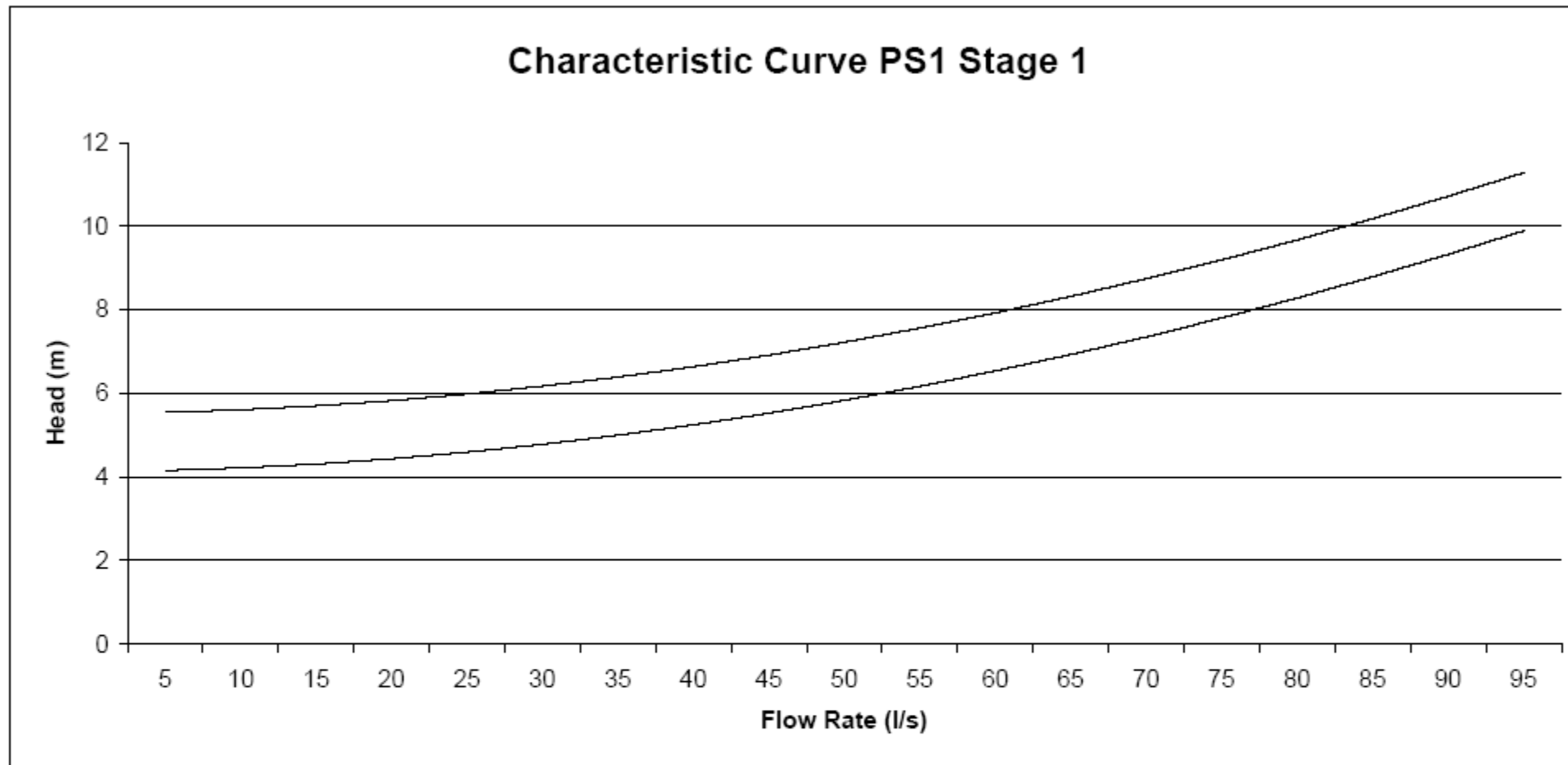
Pump Station - Data Sheets		
Mechanical and Electrical Information		
PS1		
ELECTRICAL	PUMP MOTOR 1	PUMP MOTOR 2
Asset Number		
Motor Number		
Manufacturer	Flygt	Flygt
Year of Manufactured	2006	2005
Model	3153.181	3171.181
Serial No.	640302	580170
RPM	1460	1460
Current	18 amps	29 amps
Rated Voltage	415 v	415v
Rated kW	9 kW	15 kW
Rated HP		
Rated Frequency	50 HZ	50 HZ
Insulation	NP	NP
Mass (kg)	320 kg	319 kg
MECHANICAL	PUMP 1	PUMP 2
Asset Number		
Pump Number		
Manufacturer	Flygt	Flygt
Year of Manufactured	2006	2005
Model	3153.181	3171.181
Serial Number	640302	580170
Number of Stages	1	1
Diameter of Suction	200mm	150mm
Diameter of Discharge	200mm	150mm
RPM	1460	1460
Seals	TC / TC	TC / TC
Impeller ID	LT 413	MT 433
Impeller Size (mm)	217mm	266mm
Capacity	82l/s @ 7.3m	72l/sec @ 15.1m
Mass (kg)	320 kg	319 kg

Pump Station - Data Sheets		
Mechanical and Electrical Information		
PS1		
VALVES	PUMP 1	PUMP 2
Discharge		
Manufacturer	AVK	AVK
Size	DN200	DN200
Flange to Flange	292mm	292mm
Flange	200mm	200mm
Reflux		
Manufacturer	AVK	AVK
Type	RS	RS
Size	DN200	DN200
Flange to Flange	540mm	540mm
Flange	200mm	200mm

**Pump Station - Data Sheets**  
**Pump Station Control Parameters**  
**PS1**







**APPENDIX G – COMMISSIONING CHECKLIST****Documentation**

1. Verify that consultant has provided all documentation. (as constructed details, operating manuals, test results etc)

If not, then discontinue commissioning / handover checks

**Electricity Supply**

2. Verify that the electricity supply to the pump station is a permanent arrangement (ie. not a generator, not a temporary connection to the power network)

If not, then discontinue commissioning / handover checks

**Pre-Commissioning**

3. Verify that pre-commissioning has been satisfactorily completed

If not, then discontinue commissioning / handover checks

4. Verify that pump well hydrostatic test and infiltration test was satisfactorily completed

If not, then discontinue commissioning / handover checks

5. Verify that pump draw down tests were satisfactorily completed

If not, then discontinue commissioning / handover checks

6. Verify that PLC ladder logic has been installed and checked

If not, then discontinue commissioning / handover checks

**Safety**

7. Verify that ladder access to Inlet MH meets OH&S requirements

8. Verify that other ladders, where fitted, meet OH&S requirements

9. Verify that guardrails and handrails have been installed in accordance with the design drawings

10. Verify that adequate distance between wet well opening and switchboard is in accordance with OH&S requirements

11. Verify that adequate set down areas for access covers has been provided in accordance with OH&S requirements

12. Verify that hinged covers can be adequately secured in the open position during maintenance

13. Verify that no overhead cables restrict access via crane trucks

14. Verify that davit arm mounting points have been provided in accordance with the design drawings

**Concrete**

15. Verify that there is no damage to any exposed concrete surface
16. Verify that the below ground concrete structures are dimensionally correct and in accordance with the design drawings
17. Verify the verticality of the structure is within tolerance
18. Verify that the pump well benching has been provided in accordance with design drawings
19. Verify that joints between wet-well segments (including joint between top slab and wet-well) have been sealed in accordance with the design drawings
20. Verify that the specified coating to the walls has been applied in accordance with the design drawings (extent / coating thickness / colour / )
21. Verify no leakage in or out of the concrete structure
22. Verify that the top slab does not affect the drainage of the site
23. Verify that the surface dimensions of the top slab are in accordance with the design drawings

**Mechanical Equipment**

24. Verify that the pump guide-rails are in accordance with the design drawings
25. Verify that the lifting chain complies with PWC requirements
26. Verify that the pump footstool/s have been secured to wet well floor with appropriate chemical anchors

**Electrical Equipment**

27. Verify that the telemetry aerial has been correctly installed in accordance with PWC requirements
28. Verify that external lighting over the switchboard has been provided
29. Verify that the PWC locks have been fitted to switchboard and are operational
30. Verify that a generator connection point has been provided in accordance with the design drawings

**Security**

31. Verify that the security fencing has been installed in accordance with the design drawings
32. Verify that PWC keyed locks have been installed on all required points
33. Verify that the Station Identification, safety and other signage has been provided

**Products and Materials**

34. Verify that all products incorporated on the project are approved by PWC
35. Verify penstock has been installed in accordance with the design drawings

36. Verify that the covers and frames are greased in accordance with the manufacturer's requirements

37. Verify that the valves are clockwise closing

38. Verify that adequate supports have been provided for the valves

39. Verify that valve extension spindles have been supplied (includes penstock)

40. Verify that adequate supports for vertical pipe work has been provided.(i.e. vibration not noticeable when pumps are operating)

41. Verify that all valves can be removed through the available cover opening

42. Verify that a flap valve has been installed on the drain from the valve pit

**Other Services**

43. Verify that the water service has been fitted with an approved back flow prevention device and hose reel in accordance with the design drawings

44. Verify that all conduits through the top slab have been sealed to prevent odour escaping

45. Verify that the electrical cabling to the switchboard is below ground

46. Verify that the access track is in accordance with the design drawings

47. Verify that adequate site drainage has been provided

48. Verify that the site restoration has been completed

FIGURE 1.1(NT) – CONCEPT DESIGN FLOWCHART (Informative)

