RENEWAL OF DRY WELL SEWAGE PUMPING STATIONS design checklist

The following design checklist is a guide only, based on the Technical Specification - Renewal of Dry Well Sewage Pumping Stations (D0000691). The list is not exhaustive and full responsibility for complying with relevant specifications, codes and standards lies with the designer. The checklist must be completed by the design verifiers and submitted with design drawings.

*The wet well sewage pumping stations design checklist (D0001217) based on SWC Edition of WSA-04 is not required to be used for dry well SPS renewal projects.*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| SPS No: | Location: | | Project No: | | | Delivery Contractor: | |
| Project Name: | | SWC Project Manager: | | | SW Project Engineer: | | |
| Design Stage: | Design Team: | | | **Verifiers:** | | | **Date:** |

| **ITEM** | **REQUIREMENTS** | **YES** | **NO** | **N/A** | **Clause Reference** | **COMMENT** |
| --- | --- | --- | --- | --- | --- | --- |
| **GENERAL** | | | | | | |
| Design life | Design Life of new equipment and structures complies with WSAA Sewage Pumping Station Code of Australia WSA 04, Sydney Water Edition. |  |  |  | 3.1.1 |  |
| Design Life of existing structures complies with cl. 11. |  |  |  | 3.1.1 & 11. |  |
| Flood levels | 1% AEP taken from the Council mapping or based on flood study, using Australian Rainfall and Runoff flood estimation method based on RCP 4.5. (NOTE: flood study only required if 0.5% AEP > finished station ground level). |  |  |  | 3.1.2 |  |
| The 1% AEP flood level is shown on the drawings or a note stating that the site is not subject to flooding |  |  |  |  |
| Where the pumping station is deemed critical, high value or high risk, a climate risk assessment has been carried out for RCP 8.5 and adaptation actions identified. |  |  |  | 3.1.2 |  |
| Heritage | If the scope of work affects elements of the site that have heritage value/significance, the impacts have been assessed and works approved as per SWC Heritage Compliance Procedure SWEMS0031 prior to carrying out the works |  |  |  | 3.1.3 |  |
| Valves | All new valves comply with the latest version of the SWC Technical Specification - Mechanical. |  |  |  | 3.2.1 |  |
| Gate valves | Gate valves are resilient seated complying with AS2638.2, unless otherwise accepted by SWC. |  |  |  | 3.2.1.1 |  |
| DN375 and larger resilient seated gate valves are not installed in pipelines inclined >10O from the horizontal plane or with their spindles positioned >45O off vertical. |  |  |  |  |
| Counterclockwise closing and fitted with non-rising spindles. |  |  |  |  |
| Buried gate valves are complete with extension spindle, extension spindle shroud and surface box. |  |  |  |  |
| Unless installed under pavement, surface boxes are designed with a concrete surround (min size 100mm wide and 150mm deep circular) and comply with SWC Edition of WSA 03. |  |  |  |  |
| Knife gate valves | Only used where space constraints don't allow the installation of standard gate valves. |  |  |  | 3.2.1.2 |  |
| Knife gate valves in dry wells and valve chambers fitted with bonnets rated to the same pressure class as the valve body. |  |  |  |  |
| Knife gate valves in wet wells, IMHs, emergency storage structures or where they may be submerged are grade 316 stainless steel fitted with grade 316 stainless steel extension spindles, extension spindle brackets, spindle caps and stainless steel shroud. |  |  |  |  |
| Counterclockwise closing and fitted with non-rising spindles |  |  |  |  |
| Non-return valves | Long bodied swing check type complying with AS4794. |  |  |  | 3.2.1.3 |  |
| Installed horizontally where possible. |  |  |  |  |
| Levers and counterweights positioned away from the main walking area. |  |  |  |  |
| Sufficient side clearance provided to ensure the valve top cover and spindle can be removed whilst the valve is in situ. |  |  |  |  |
| Guards are provided for non-return valve levers and counterweights which are retained on the non-return valves post commissioning. |  |  |  |  |
| Metal hooks 1500mm off the floor provided on the wall near the non-return valves for levers and counterweights if removed. |  |  |  |  |
| Pump discharge non-return valves supplied with proximity ‘no-flow’ switches which are easily accessible for adjustment. |  |  |  |  |
| BSPP (parallel thread) tapping point with plug provided on the highest point of the valve body or inspection cover, where fitted. Non-return valves installed in valve chambers and dry wells are fitted with a grade 316 stainless steel two-part ball valve instead of the plug. |  |  |  |  |
| Grade 316 stainless steel tube with a downturn bend is provided from the ball valve to direct air/sewage to the floor. |  |  |  |  |
| Supports | All new pipework and valves are adequately supported in accordance with SWC Technical Specification - Mechanical |  |  |  | 3.2.2 |  |
| All valves are supported on concrete supports with 3mm thick neoprene sheet separating the valve body from concrete. |  |  |  |  |
| Dismantling joints | The design allows for easy installation and removal of all pumps, stop and non-return valves. |  |  |  | 3.2.3 |  |
| Dismantling joints are thrust type. Non-thrust dismantling joints, unrestrained couplings or grip flanges and couplings etc. are not used. |  |  |  |  |
| Dismantling joints are full length. Short body dismantling joints used only in existing installations where space restrictions do not allow use of full length dismantling joints, provided that their tie rods can be backed off to free up the adjoining fitting. |  |  |  |  |
| Where the DJ and stop valve are installed vertically, the required vertical position of the valve (for operation) must determine whether the dismantling joint should be installed upstream or downstream of the stop valve. The loose ring of the DJ is shown on the drawing nearest to the stop valve and a note added to the drawing accordingly. |  |  |  |  |
| In pump discharge pipework, the DJ is installed between the non-return valve and stop valve, the loose ring of the DJ is shown on the drawing nearest to the non-return valve and a note added to the drawing accordingly. |  |  |  |  |
| All non-return valves, stop valves and electromagnetic flowmeters ≥PN25 and ≥DN450, are provided with a dismantling joint adjacent to them. All other valves and electromagnetic flowmeters may have a dismantling joint located no more than one fitting/pipe spool away. |  |  |  |  |
| Testing & commissioning | Complies with SWC Specification – Commissioning, transitioning assets into operation (D0001440) and SWC Specification Maintenance (D0001441). |  |  |  | 3.2.4 |  |
| **DRY WELL VENTILATION** | | | | | | |
| Dry well ventilation | Complies with SWC Design Specification for Sewage Pumping Stations Dry Well Ventilation (D0001896). |  |  |  | 3.2.5 |  |
| **WET WELL VENTILATION** | | | | | | |
| Wet well ventilation | Complies with SWD Edition of WSA 04. |  |  |  | 3.2.5 |  |
| **DRY WELL** | | | | | | |
| Main pumps | Dry mounted submersible type. |  |  |  | 4.1.1 |  |
| Pumps selected in accordance with: • SWC Shared Purchasing Contracts  • WSA 101 • SWC Supplement to WSA 101 • SWC Technical Specification - Mechanical • SWC Edition of WSA-04 |  |  |  |  |
| Each pump provided with: • Suction bend (vertical pumps only) • Galvanised steel support stand (vertical pumps) or baseplate (horizontal pumps) • Pump electrical and control cabling • Protection relay (Xylem MiniCAS II or MAS801as appropriate) |  |  |  | 4.1.2 |  |
| Pumps with external wear plate adjustment:  • If vertically installed - suction bends provided with slots or oversized bolt holes.  • If horizontally installed - load-bearing dismantling joint with adjustable length installed on their suction pipeline. |  |  |  | 4.1.3 |  |
| Existing system hydraulics confirmed by comparing actual test data for the pumping station with a calculated system curve |  |  |  | 4.1.4 |  |
| The most suitable pump with respect to performance, efficiency, and site limitations (e.g. space, weight, power, excessive vibration) has been selected by the designer and accepted by SWC. |  |  |  |  |
| Selected pump always remains primed while available for operation. |  |  |  |  |
| Life cycle costing | 25-year life cycle costing analysis has been undertaken. |  |  |  | 4.1.5 |  |
| Information on drawings | All control levels and related information are provided on the drawings. |  |  |  | 4.1.6 |  |
| The pump and motor details are provided in the drawings in a Pump and Motor Table as per the table provided in Clause 4.1.7. |  |  |  | 4.1.7 |  |
| For variable speed pumps the flow, head and speed ranges are stated on the drawings. |  |  |  |  |
| Pump position for lifting and maintenance | Pumps align with overhead lifting equipment (existing or new as applicable). |  |  |  | 4.1.8 |  |
| Design provides safe access to the top of the motor for attaching a crane hook to the motor lifting lug or bridle or, subject to SWC acceptance, provided with a short length of a permanently attached suitably rated grade 316 stainless steel lifting chain where access to the motor lifting lug is difficult. |  |  |  |  |
| A rectangular designated pump set down area is shown on the drawings (150mm larger than the pumping unit footprint all around) and marked with a 75mm wide yellow border with diagonal hatching. |  |  |  |  |
| The pump set down area is sufficiently load rated. |  |  |  |  |
| In stations without a superstructure over the dry well, the pump set down area aligns with the existing machinery openings at ground level. |  |  |  |  |
| In pumping stations where there is insufficient room to provide adequate pump set down area, alternative arrangements have been discussed with and accepted by SWC. |  |  |  |  |
| Removal and entry of pumps into the superstructure is allowed for in the design. |  |  |  |  |
| Available lifting height has been checked to ensure sufficient vertical lift is available with min. 500mm clearance. Clearance has been confirmed for both motor and impeller (in case a maintenance stand is used) and for the entire pump including its volute. |  |  |  |  |
| Where handrailing comes in the way of pump removal, the handrail is a retractable type or provided with a hinged gate, as appropriate. |  |  |  |  |
| Pump cables | Consideration given to the pump cable supports if confirmed by the pump vendor. |  |  |  | 4.1.9 |  |
| Cable supports and cable harnesses are shown on the drawings. |  |  |  |  |
| Orientation, number, and size of the cabling entering the pump has been confirmed with the pump vendor |  |  |  |  |
| Pump removal | Where junction boxes or turrets cannot be provided, access is provided to the pump head to facilitate the disconnection of the power and instrumentation cables and their entry assemblies. |  |  |  | 4.1.10 |  |
| Where junction boxes or turrets cannot be provided, adequate pump head cover plate(s) and cable entry assembly parking base(s) have been provided for each pump installed in the pumping station. |  |  |  |  |
| Metallic pump support stands (vertically installed pumps only) | Design drawings clearly state the height of the stand from the base or show RLs of the top of the stand and the base. |  |  |  | 4.1.11 |  |
| Pump support stands are as low as possible to minimise height of the pump and motor and reduce the potential for excessive vibrations. |  |  |  |  |
| Vendor’s drawings for the pump support stands have been obtained to confirm stand dimensions and footprint is in accordance with the pumping station’s general arrangement drawings. |  |  |  |  |
| Support stands are robust, fabricated from hot dipped galvanised mild steel or grade 316 stainless steel. Drawing notes state that galvanising must be carried out off site. |  |  |  |  |
| The pump support stand design eliminates areas of water accumulation. |  |  |  |  |
| Support stands provide easy access to pump suction bend connections, wear adjustment screws (where applicable), pump mounting bolts, pump volute bolts, suction bend drain and inspection cover, where fitted. |  |  |  |  |
| Dry well floor area under the stand grouted in a dome shape such that water disperses outside the confines of the stand, or a drain through the grout is provided. Grout compatible with epoxy grout ‘Conbextra EP65 Plus’ used between the dry well floor and underside of the pump stand. |  |  |  |  |
| Pump support stand - natural frequency | Complies with WSA 101, SWC Supplement to WSA 101 and SWC Technical Specification – Mechanical. |  |  |  | 4.1.12 |  |
| Pump support stand levelling and anchoring | Complies with SWC Technical Specification – Mechanical. |  |  |  | 4.1.13 |  |
| Maintenance stands | Provided for 50kW and larger pumps. |  |  |  | 4.1.14 |  |
| Confirmed with SWC if the stand is to be mobile or permanent. |  |  |  |  |
| Procured through the pump vendor, or if it needs to be fabricated, the details have been provided in the detailed design drawings. |  |  |  |  |
| Designed to take the full load of the pump. |  |  |  |  |
| Has bolt holes in the top plate so that the pump can be secured in place. |  |  |  |  |
| Design allows for it to be secured to a sound base with bolts. |  |  |  |  |
| Design drawings show the designated location for the maintenance stand bolted to the dry well floor, provided there is sufficient space. |  |  |  |  |
| If stored in a lesser used floor area within the operating envelope of lifting equipment, the drawings note that tapped grade 316 stainless steel inserts must be provided in the concrete floor to secure the maintenance stand. |  |  |  |  |
| Sump pump | Submersible type with a stainless steel body, impeller, and motor casing. |  |  |  | 4.2 |  |
| A single phase, 230V power supply (wherever possible). |  |  |  |  |
| Includes an integrated float level switch control and starter. |  |  |  |  |
| A hook provided on the dry well wall approx. 1500mm off the floor and adjacent to the pump to hang spare electrical cable |  |  |  |  |
| Supplied with a PN16 flexible discharge hose with a camlock connection onto a rigid grade 316 stainless steel Sch. 40S pipe approximately 1000mm above the sump grate level. |  |  |  |  |
| A non-return valve, stop valve and a DN15 drain/tapping point included in the stainless steel pipe spool downstream of the camlock connection. The tapping point provided with a two-part grade 316 stainless steel ball valve with 90 deg elbow and a drain pipe finishing approx. 500mm above the sump. |  |  |  |  |
| Non-return valve fitted with a lever and counterweight and a counterweight guard. |  |  |  |  |
| The sump pump discharges back to the wet well above the overflow level. |  |  |  |  |
| Sump pump data table provided on drawings. |  |  |  |  |
| Stainless steel or marine grade aluminium open grating has been specified over the sump opening with a cut out and with kick plates all around to enable the pump to be withdrawn. |  |  |  |  |
| Existing pipework tie in point | Pumping station suction and discharge pipework penetrating through the wet well, dry well and valve chamber walls, if retained, has been confirmed as acceptable for re-use. |  |  |  | 4.3.1 |  |
| Where existing pipework is to be retained, the new pipework and valves connect to the flanges on the existing pipework. |  |  |  |  |
| Physical dimensional checks of the position of the existing pipework flange faces including RLs have been completed to confirm the exact tie in points for all new pipework and valves. |  |  |  |  |
| Suction and discharge pipework and fittings | All new stainless steel pipework is grade 316 Schedule 40S. |  |  |  | 4.3.2 |  |
| Drawing includes notes stating: • Stainless steel pipes may be cut to correct dimensions and tack welded on the site to get correct alignment and then fully welded and tested off site,  • No site welding is allowed. |  |  |  |  |
| Risk of dimensional tolerances has been assessed for ductile iron pipework and fittings (where used), since site cutting and welding will not be possible. |  |  |  |  |
| Suction velocities are no more than 1.5m/s and no less than the self-cleansing and slime control velocities |  |  |  |  |
| The velocity in the discharge pipework is sufficient to achieve efficient sediment transport through vertical bends and risers, usually 1.5m/s-2.5m/s, but do not exceed 3m/s. |  |  |  |  |
| Sufficient pipe supports are provided so that all pipes remain supported if any of the valves are removed. To support high level pipes such as discharge manifold, as far as practical the supports are provided from structures other than the dry well floor. |  |  |  |  |
| The layout of the pump discharge pipes, manifold, risers and valves is such to prevent filling the pipes with silt and debris when a pump is offline for maintenance. |  |  |  |  |
| Where possible, a grade 316 stainless steel straight spool piece min. 900mm long is provided in the discharge pipework, preferably in the horizontal pipework, to allow installation of a clamp-on ultrasonic flowmeter sensors (temporary or permanent).The location of the flowmeter sensors has been confirmed with SWC and nominated on the drawings. |  |  |  |  |
| Suction and discharge instrument connections | Tapping points for pressure measurement are provided in the following locations: • Each pump suction branch, • Each pump discharge branch, • On top of the discharge manifold in the dry well; and • On discharge pipework / pressure main in the valve chamber downstream of the pressure main stop valve. |  |  |  | 4.3.3 |  |
| The tapping points are positioned on top of pipe spools, min. 150mm from the nearest pipe flange. |  |  |  |  |
| Tapping points in stainless steel spools include a DN15 x DN15 BSPP grade 316 stainless steel hexagonal nipple into a threadolet of minimum 20mm height welded vertically to the pipe. |  |  |  |  |
| Tapping points in ductile iron spools may be tapped into the pipes if they are provided with tapping bosses. Otherwise, tapping bands complying with AS 4793 are used. |  |  |  |  |
| All tapping points are fitted with two DN15 BSPP grade 316 stainless steel ball valves in block and bleed arrangement. The ball valves are of two-part type. |  |  |  |  |
| Each pressure measuring tapping point is fitted with an S-bend made from grade 316 stainless steel tube. |  |  |  |  |
| All open ends of block and bleed arrangements are provided with hexagonal end plugs/caps. |  |  |  |  |
| Pump suction bend (vertically installed pumps only) | Suction bends have been included as part of the pump scope of supply. |  |  |  | 4.3.4 |  |
| Suction bends are fabricated from either Grade 316 stainless steel Schedule 40S or ductile iron fusion bonded epoxy. |  |  |  |  |
| Adequate inspection port is provided in the suction bends. For bends DN300 or greater the inspection port is a minimum 150mm dia. |  |  |  |  |
| Each suction bend is provided with a DN50 two-part Grade 316 stainless steel ball type drain valve (Note: DN25 drain valves may be used if there is insufficient clearance, with approval from SWC). A male camlock hose connection has been specified on the end of the DN50 drain valve. |  |  |  |  |
| Design drawings contain a note for the contractor to provide a single lay-flat hose of sufficient length to connect from the suction bend drain valve to the sump, complete with a female camlock fitting and wall bracket for storing the hose. |  |  |  |  |
| Pump suction reducer | If required due to space limitations, changes in diameter between the suction pipework and the pump suction flange have been achieved using a reducing bend (vertically installed pumps), or a reducer (horizontally installed pumps). Where a reducer / reducing bend is used to taper the pump suction pipework, the soffit of the reducer is horizontal (eccentric reducer with level soffit). |  |  |  | 4.3.5 |  |
| Discharge pipework drain point | A DN50 two-part Grade 316 stainless steel ball valve is provided in each pump discharge branch. Where there are space constraints, a DN25 valve may be used. |  |  |  | 4.3.6 |  |
| Where the pump discharge isolating valve is installed in the vertical riser pipe downstream of the duck foot bend, the drain valve is in the lowest point upstream of the duck foot bend. |  |  |  |  |
| Where the isolating valve is installed in the horizontal pipe upstream of the duck foot bend, the drain valve is in the lowest point between the valve and the bend and, in addition, a DN15 drain ball valve is provided between the non-return and isolating valves. |  |  |  |  |
| All pipe lengths between stop valves and between stop and non-return valves are provided with a DN15 stainless steel two-part ball valve located at pipe inverts. Where necessary, a grade 316 stainless steel tube must be fitted to direct the discharge towards the floor. |  |  |  |  |
| Discharge pipework air bleed | An air bleed / test point is provided immediately downstream of each pump / upstream of the pump discharge non-return valve and upstream of the non-return valve in the valve chamber. |  |  |  | 4.3.7 |  |
| Where it is likely that air may be entrained in sewage entering the wet well, an automatic air release valve is provided in each pump suction pipe, with the exhaust piped back to the wet well above the overflow level. |  |  |  |  |
| Stop valves are provided upstream (resilient seated gate valve) and downstream (Grade 316 stainless steel two-part ball valve) of the air valve, no more than 1800mm above the operating platform or floor level. |  |  |  |  |
| An air bleed point in the form of DN15 block and bleed two-part stainless steel ball valves is provided in the discharge manifold in the dry well. |  |  |  |  |
| Riser discharge bends | The ‘duck-foot’ riser discharge bends are fabricated stainless steel or ductile iron and are supported from the base of the dry well on a concrete support and held in place by chemical anchors and grade 316 stainless steel hold down bolts/nuts. |  |  |  | 4.3.8 |  |
| Pump air bleed | Where required (based on advice from the pump vendor), an adequate air bleed point to vent air from the pump motor jacket is provided. |  |  |  | 4.3.9 |  |
| The pump air vent port is provided with a grade 316 stainless steel pipe with a two-part stainless steel ball valve. The pipe is terminated at the dry well floor with a bend directed towards the floor sump/drain. |  |  |  |  |
| Suction and discharge valves | A non-return valve is provided downstream of each pump. |  |  |  | 4.4.1 |  |
| As a minimum, stop valves are provided upstream of each pump, downstream of each pump non-return valve, on each suction pipe from the wet well upstream of the suction manifold, where installed, and on the suction manifold between the pump suction pipes. |  |  |  |  |
| For pumping stations with multiple pumps and pressure mains, the discharge pipework is fitted with electrically operated stop valves to allow any pump to operate with any pressure main. These interconnecting stop valves may be installed in the dry well (e.g. on the discharge manifold), in the existing valve chamber, or in a new valve chamber provided for that purpose. Additional stop valve(s) are also provided to allow maintenance of the actuated valve(s). |  |  |  |  |
| Bonneted knife edged gate valves are used only where there are space restrictions and acceptance has been given by SWC. |  |  |  |  |
| Electric actuators are provided for all dry well and valve chamber stop valves DN450 and greater. |  |  |  |  |
| Handwheels are provided on all stop valves in the dry well including bypass stop valves (where applicable) |  |  |  |  |
| Chain wheels are specified for valve operation only where necessary and comply with the requirements of SWC Technical Specification - Mechanical. Hooks are provided on the valve support to tie the chain up safely when not in use. |  |  |  |  |
| Proof of isolation valves | DN15 stainless steel ball valves are provided as test valves between branches on suction manifolds and between stop valves in the pipe invert. |  |  |  | 4.4.2 |  |
| Wash down valves | One DN25 wash down valve is provided in the dry well approx. 1200mm above the floor complete with a minimum 15m length of hose (sufficient length to reach the sump) in the machinery well. Hose must be stored on a wall bracket approx. 1200mm above the floor level. |  |  |  | 4.4.3 |  |
| Dry well access | Safe access to all regularly maintainable items in the dry well is provided. |  |  |  | 4.5 |  |
| Detailed design drawings show the location of a warning sign at the entry door to the superstructure stating: “No Entry Without Torch”. |  |  |  |  |
| All existing access facilities on site (incl. ladders, platforms, stairs, handrails, and gates) have been reviewed for condition, safety, structural integrity, and compliance with AS1657 |  |  |  |  |
| All existing access facilities deemed as non-compliant to AS1657, structurally unsound, or in poor or unsafe condition are shown on detailed design drawings to be modified or replaced to comply with AS1657. |  |  |  |  |
| Consideration has been given for access to both sides of the pumps for maintenance and removal activities. The design of access facilities eliminates the need to crawl under or step over pipework. |  |  |  |  |
| Location of phosphorescent emergency exit signs are indicated on the design drawings in compliance with relevant standards |  |  |  |  |
| All ladders are provided with self-closing swing gates at the top landings. Existing chains on top landings of access ladders are to be removed. The detailed design drawings indicate a 5mm thick neoprene pad heat shrunk onto the strike plate of the swing gates. |  |  |  |  |
| [Detailed design drawings indicate the location of signs which state the following: • A minimum three points of contact must be maintained all the time (signs located at top and bottom of ladder) • The ladder must be accessed facing the ladder (sign located at top of ladder) All signs comply with SWC’s SDIMS0026 Customer Delivery Facility Safety Signage Specification.](https://swdelivery.com.au/reference/393) |  |  |  |  |
| Redundant pump plinths and valve supports | Detailed design drawings show all redundant concrete plinths and supports to be demolished to the dry well floor level and the remaining surface made good in a workmanlike manner such that it finishes flush with the existing floor. |  |  |  | 4.6 |  |
| Dry well cleaning | Detailed design drawings including notes stating the following: • Prior to commencing the dry well renewal works, the Delivery Contractor must pressure clean the walls and floor in the dry well to remove loose paint, dirt, and redundant material. The floor may need to be degreased prior to pressure washing where oil spills are evident. • The Delivery Contractor must not use the dry well sump pump during pressure washing, as it can get damaged by large solids or paint. A vacuum tanker or suitable temporary pump is to be used. |  |  |  | 4.7 |  |
| SWC has been consulted regarding whether painting or coating of the dry well walls is required, and the detailed design drawings indicate this if required. |  |  |  |  |
| Where required, the dry well floor must be repaired and, if possible, graded towards the perimeter drainage trench or sump to prevent water pooling |  |  |  |  |
| Lifting facilities | All new / modified designs for lifting facilities comply with SWC Technical Specification - Mechanical and applicable standards |  |  |  | 4.8 |  |
| Condition assessment and compliance assessment against relevant standards of the existing lifting facilities have been completed and a decision made to replace or upgrade lifting facilities based on this assessment. |  |  |  | 4.8 |  |
| Weights of all new equipment have been confirmed and checked against the certified rating of the existing lifting equipment. If the rated capacity of the existing lifting equipment is not at least 20% greater than the heaviest item that needs to be lifted, the designer has: • Established whether the crane load rating can be increased to the required capacity and, if it can, the crane has been or will be tested and re-certified as part of the project. All calculations have been performed by a qualified structural engineer, or • Designed new crane / lifting facilities to replace the existing ones |  |  |  | 4.8.1 |  |
| Electrically operated hoists are provided where required based on criteria stated in SWC Technical Specification - Mechanical |  |  |  | 4.8.2 |  |
| Pendants are not battery operated. Where battery operated pendant is standard part of crane supply, an additional cabled/wired pendant is provided. |  |  |  | 4.8.3 |  |
| Flood gates and bund walls | Protection from flooding has been provided for dry wells of pumping stations located below 1% AEP flood level or in areas subject to overland stormwater flows (e.g. flood gates, floor/bund walls, raising entry points, raising concrete surrounds of access hatches on roof) |  |  |  | 4.9 |  |
| Flood gates are on-seating and leak proof. |  |  |  |  |
| The top of the flood gate or any raised entry point or concrete surround is min. 300mm above the 1% AEP flood level. |  |  |  |  |
| Flood gates are of lightweight, aluminium design. |  |  |  |  |
| Flood gates are hinged and preferably be able to open 180O. |  |  |  |  |
| Flood gates are monitored and able to be latched in the open position. |  |  |  |  |
| Where embankments or bund walls are provided, the enclosed area is drained to a sump that drains into the IMH via a P-trap and non-return flap in the maintenance hole. The design drawings show the wet well and IMH lids are bolted down and all penetrations sealed to prevent surcharging within the embankment and flooding the site through the incoming sewers. Access stairs or ramps are provided to cross over the embankment or bund wall. |  |  |  |  |
| All dry well wall penetrations are sealed. |  |  |  |  |
| **WET WELL** | | | | | | |
| Computational Fluid Dynamics Modelling | CFD modelling has been undertaken to confirm the hydraulic suitability of the wet well where the pumping station is being upgraded beyond its current design capacity, or where major modifications to the wet well are proposed, or where siltation is considered a problem. |  |  |  | 5.1 |  |
| Existing access steelwork | Design drawings indicate that existing ladders, step irons, platforms and any other non-concrete access structures are to be removed from the wet well |  |  |  | 5.2 |  |
| Designs drawings indicate concrete surfaces which must made be good after the removal of existing access structures from the wet well. |  |  |  |  |
| Wet well isolation | All inlet penstocks or stop valves to the wet well and in the wet well dividing walls, where existing, have been inspected and tested and a decision made and approved by SWC on whether they are to be replaced or retained. |  |  |  | 5.3 |  |
| The maximum differential head has been calculated to the station overflow level or to the 1% AEP flood level, whichever is higher. |  |  |  |  |
| Wherever possible, the penstocks are replaced with knife gate valves. |  |  |  |  |
| Electric actuators are provided for wet well inlet pipe and dividing wall valves/penstocks DN450 and greater. Actuators are operable locally only. All signals from actuators provided with a marshalling panel located next to the IICATS cubicle to permit future IICATS connectivity. |  |  |  |  |
| Spindle caps of the new valves or penstocks comply with AS2638.1 |  |  |  |  |
| Where feasible, stop board grooves and stop boards are provided in the IMH. Facilities are provided inside the superstructure for storage of the stop boards while they are not in use (e.g. stand for stop boards). |  |  |  |  |
| Hatches | Wet well hatches and safety grilles have been inspected for overall condition and compliance |  |  |  | 5.4 |  |
| Hatches are provided for new valve spindle openings where the position of valve or penstock spindles has changed. |  |  |  |  |
| Existing openings are closed. |  |  |  |  |
| Where wet well access hatch size has increased, the access opening remains central to the dividing wall if provided in the wet well. |  |  |  |  |
| All new safety grilles have 125mm clear spacings starting from their perimeter. The level instruments are accessible with the grille in place. |  |  |  |  |
| All new hatches and grilles lay flat when fully opened. Where this is not possible, facility is provided to enable the hatch and grille to be secured in open position to the adjacent structure to prevent inadvertent closure. |  |  |  |  |
| Wet Well Flushing | Where specified or required by CFD, wet wells are fitted with an automatic flushing system. |  |  |  | 5.5 |  |
| The flushing system consists of a grade 316 stainless steel return line using a portion of the pumped flow to stir up the wet well content for a short period of time at each pump start. |  |  |  |  |
| The return flushing line is tapped off the discharge manifold or pressure main upstream of the pressure main non-return valve and fitted with a timer controlled electrically actuated eccentric plug valve installed in the valve chamber or the dry well, and then piped back into the wet well. |  |  |  |  |
| The flushing line branch off in the wet well as required and terminates with a duck-foot bend(s) directed away from the pump suction bell mouths. |  |  |  |  |
| The flushing lines are sized so that the flow velocity does not exceed 7.5m/s. |  |  |  |  |
| **IMH** | | | | | | |
| Existing access steelwork | Existing ladders and step irons have been inspected and assessed for condition, safety, structural soundness, and compliance with AS1657 and either retained if they are in satisfactory condition or replaced with a new stainless steel ladder which complies with AS1657. |  |  |  | 6.1 |  |
| Designs drawings indicate the concrete surfaces which must be made good after the removal of existing ladders and step irons from the IMH. |  |  |  |  |
| Access Hatch | Existing access hatches and safety grilles have been inspected for overall condition and compliance. |  |  |  | 6.2 |  |
| All new hatches and safety grilles comply with SWC Edition of WSA 04 and SWC DTC drawings. |  |  |  | 6.2 |  |
| A ‘grille in grille’ design is provided for the safety grille for emergency pump discharge hose and dredging activities. |  |  |  | 6.2 |  |
| The new grille has 125mm clear spacings starting from its perimeter. |  |  |  |  |
| The instrument hooks are positioned so that they allow unimpeded removal of the instruments through the 125mm x 125mm openings. |  |  |  |  |
| All new hatches and grilles lay flat when fully opened. Where this is not possible, facility is provided to enable the hatch and grille to be secured in open position to the adjacent structure to prevent inadvertent closure. |  |  |  |  |
| High level inlet pipe | A high level inlet pipe is provided between the inlet maintenance hole and the wet well |  |  |  | 6.3 |  |
| **VALVE CHAMBER** | | | | | | |
| Pipework and fittings | All new pipework and fittings are Schedule 40S Grade 316 stainless steel or ductile iron. |  |  |  | 7.1 |  |
| Condition assessment undertaken on existing stop valves. Existing stop valves which are inoperable, leaking or in poor condition have been identified for replacement. |  |  |  |  |
| New tapping points have been provided downstream of the stop valve where not already provided on existing pipework. |  |  |  |  |
| DN15 drain valves are provided at spool inverts between stop valves and between stop and non-return valves. |  |  |  |  |
| The drawings note that O-rings and flange gaskets are to be replaced for existing pressure main load bearing dismantling joint within the valve chamber which are being re-used |  |  |  |  |
| Review of thrust forces has been undertaken to establish whether additional restraint is necessary when making modifications to the existing scour pipework. |  |  |  |  |
| Below ground pipework | All exposed pipework and penetrations through structures are metallic, i.e. either ductile iron or stainless steel. |  |  |  | 7.2 |  |
| All buried pressure pipework upstream of the valve chamber is DICL or Grade 316 Schedule 40S stainless steel. |  |  |  |  |
| All new buried scour pipework and high level pipe between the inlet maintenance hole and the wet well is DICACL or DIFB. |  |  |  |  |
| All gravity drain pipework, e.g. from the bypass bund and valve chamber is uPVC to AS1273. |  |  |  |  |
| Thrust restraints are provided. |  |  |  |  |
| Break-ins to the pressure main outside of the valve chamber are minimised if possible. Instead, connections (such as new scours) have been made off the new pipework, preferably within the valve chamber. |  |  |  |  |
| Valve chamber valves | Non-return and stop gate valves are installed within the valve chamber for each pressure main. |  |  |  | 7.3 |  |
| A bevel gearbox is provided for all horizontally installed gate valves, complete with extension spindle, spindle support and opening in the cover. |  |  |  |  |
| Gate valves, scour and bypass pump stop valves installed in the valve chamber are operable from the surface level, with extension spindles and spindle brackets provided where required. |  |  |  |  |
| Double isolation (via two stop valves) is provided for the scour downstream of the pressure main stop valve. |  |  |  |  |
| Gate stop valve(s) off the scour tee are preferred to be installed within the existing valve chamber, however if there is insufficient room the scour stop valve(s) may be buried |  |  |  |  |
| Where applicable, use of lugged PN16 bonneted knife gates for scour isolation as an alternative to gate valves has been approved by SWC. |  |  |  |  |
| Handwheels to gate valves have not been provided |  |  |  |  |
| Valve chamber covers | Covers are appropriately rated for vehicles when located in an access or public road. |  |  |  | 7.4 |  |
| If the valve chamber cover is in a non-trafficable location, the cover is galvanised mild steel open grid for fenced sites or chequer plate for unfenced sites or within 1km of shoreline. |  |  |  |  |
| Galvanized mild steel or aluminium chequer plate used in unfenced public spaces. Marine grade aluminium or grade 316 stainless steel used within 1km of shoreline. |  |  |  |  |
| In open grid cover, the valve spindle access holes are fitted with a galvanised reinforcement ring. ‘Tear drop’ covers must be provided over valve spindle access holes in all solid (chequer plate) covers. |  |  |  |  |
| Where existing covers are being re-used, the alignment of existing access holes are checked against changed valve spindle locations. New access holes must be provided where required. Redundant holes must be covered with plates from matching material. |  |  |  |  |
| All valve chamber hatches locked in place using padlocks either directly (preferred) or indirectly. Use of holding down plates welded to hatch(es) to lock another hatch(es) indirectly is acceptable. |  |  |  |  |
| Penetrations | Pipework penetrations through walls fitted with puddle flanges |  |  |  | 7.5 |  |
| Access into valve chamber | Condition and safety assessment and assessment for compliance with AS1657 undertaken for existing access into valve chamber. |  |  |  | 7.6 |  |
| Access and egress provided and compliant with AS1657 |  |  |  |  |
| Where space allows, an inclined ladder is provided in place of vertical ladder. Individual rung ladder (step irons) may be provided as a last resort, subject to acceptance by SWC. |  |  |  |  |
| Rungs for all ladders must be from deformed bar. Individual rung ladders, where provided, made of single rungs minimum 400mm long. |  |  |  |  |
| Materials for ladders within 1km of shoreline is grade 316 stainless steel. |  |  |  |  |
| All fasteners to secure the ladder into concrete surfaces are grade 316 stainless steel and chemically set using Hilti HIT RE 500 V3, Ramset Chemset Reo 502, or equivalent. |  |  |  |  |
| Fixed or retractable hand stanchions provided at the top of all ladders. |  |  |  |  |
| **EMERGENCY BYPASS ARRANGEMENT** | | | | | | |
| Emergency bypass arrangement | Design of emergency bypass pump connection arrangement, associated bund and enclosure complies with SWC Edition of WSA 04. |  |  |  | 8 |  |
| DN15 grade 316 stainless steel two-part ball valves are provided for the bypass pump connection pipework as follows: • At the invert of the pipe spool between the Camlock hose connection and the non-return valve.  • In the vertical spool downstream of the bend prior to the bypass pipework going underground about 120mm above the concrete bund, facing the concrete support of the gate valve and terminate with a 90 deg elbow directed to the bund floor. |  |  |  | 8.1 |  |
| Tapping bands complying to AS4793 are provided where required if installing DN15 ball valves on existing ductile or cast iron pipework. |  |  |  |  |
| A scour line is provided to drain the bypass line if: • the bypass size ≥ DN200, or • the bypass pipework is more than 15m long, or • there are multiple bypasses. The scour line includes a stop valve provided off the bypass line and discharging to the IMH. |  |  |  |  |
| Where there are multiple bypass arrangements in a single bund: • A minimum 600mm clear access is provided between the bypass pipework in the bund. • The bypass pipework is combined into a single manifold before connecting to the pressure main.  Where there is more than one pressure main, the manifold joins each pressure main with an isolating valve to allow individual pressure main operation with the emergency bypasses. |  |  |  |  |
| Bypass line stop valve in valve chamber | The stop valve on the bypass line is installed as close as possible to the pressure main. |  |  |  | 8.2 |  |
| If the stop valve is buried, it is provided complete with extension spindle, spindle shroud and surface box. |  |  |  |  |
| Permanent emergency pump | Emergency Pump complies with the SWC Technical Specification – Permanent Gas Engine Driven Pump (D0002174), or Technical Specification - Permanent Diesel Engine Driven Pump (D0002169). |  |  |  | 8.3 |  |
| Pump is able to pump from the IMH bypassing the pumping station or, where impractical, from the wet well directly into the pressure main. |  |  |  |  |
| Pump is sized to meet the ultimate peak dry weather flow to the pumping station unless specified otherwise. |  |  |  |  |
| The pump is self-primed by means of a vacuum pump or ejector or similar without any need for manual priming. The priming mechanism can fully prime the pump in no more than 180 seconds. |  |  |  |  |
| A gas engine driven emergency pump has been provided (instead of a diesel engine pump) where adequate gas supply is available |  |  |  |  |
| **SUPERSTRUCTURE** | | | | | | |
| Superstructure | A condition assessment including waterproofing and roofing has been undertaken to ensure structural integrity of the superstructure prior to any works. The assessment included safety, serviceability, durability, protection of equipment within the superstructure, security of all entry doors, peeling paint, water damage, absence of overhead protection to the door, and any other significant defects of the superstructure. The designer has considered the prevalence of lead paint on these doors and heritage requirements (if any) and proposed a cost-effective solution to repair or replace the doors to SWC’s acceptance. |  |  |  | 10 |  |
| Design drawings specify the following:  • All graffiti on the walls is to be removed and the walls applied with anti-graffiti clear coating as per WSA 201.  • Holes to be sealed to prevent ingress of vermin.  • All vegetation that has grown and infiltrated the roof tiles, downpipes, and walls to be removed to prevent dislodgement due to root jacking |  |  |  |  |
| **STRUCTURAL ASSESSMENT OF EXISTING STRUCTURES** | | | | | | |
| Residual service life | Structural assessment of the wet well, dry well, inlet maintenance hole and other structures has been undertaken. |  |  |  | 11 |  |
| Where the assessed residual service life of the station is less than 25 years, refurbishment works have been specified in the design to ensure that the residual service life is extended to a minimum of 50 years. |  |  |  |  |
| Loading and concrete deterioration | A structural assessment has been undertaken and has taken into consideration the items mentioned in Clauses 11.1 and 11.2. |  |  |  | 11.1 & 11.2 |  |
| Earth pressure coefficients and load combinations | Earth pressure coefficients and load combinations are in accordance with SWC Technical Specification - Civil, depending on whether they are for design action or design resistance |  |  |  | 11.2.1 |  |
| Structural analysis | A three-dimensional finite element analysis has been carried out for all unreinforced concrete walls. |  |  |  | 11.3 |  |
| Design parameters for material properties | Characteristic compressive strength of the existing concrete has been nominated for the design of the SPS upgrade works. |  |  |  | 11.4.1 |  |
| Design strengths (ultimate) for unreinforced concrete in tension and shear corresponding to min. characteristic compressive strength of concrete of 25MPa have been adopted as per the table. |  |  |  |  |
| Reinforced concrete members | For assets constructed in or after 1975, the strength of existing reinforced concrete members has been assessed in accordance with AS3600. |  |  |  | 11.4.2 |  |
| For assets constructed before 1975, ultimate strength design to AS3600 may be used but a reduced value for capacity reduction factors has been adopted to reflect the age of construction. |  |  |  |  |
| Serviceability check has been carried out to AS3735. |  |  |  |  |
| Durability of wet well | A durability assessment of the wet well has been undertaken which has considered the following: • The extent of concrete deterioration • The remaining sound concrete cover to reinforcement, if reinforced • The pH of concrete adjacent to reinforcement, if reinforced • The weighted average of hydrogen sulphide over a one-month period (excluding during wet weather flow days). • Potential for increased septicity of sewage within the next 20 years |  |  |  | 11.4.3.1 |  |
| No protective coating for plain concrete has been specified in the design if the assessment satisfies all the criteria listed below: • Depth of concrete deterioration over the past years is <0.5mm per year. • The weighted average of hydrogen sulphide gas over one month period of dry weather flow <5ppm • SWC has confirmed that the septicity of the sewage is unlikely to increase considerably over the next 20 years. If any of the above criteria is not met, protective coating of the plain concrete to WSA 201 has been specified in the design. |  |  |  | 11.4.3.2 |  |
| The following criteria has been satisfied for the existing reinforced concrete: • Existing sound concrete cover to reinforcement is >35mm. • pH of concrete adjacent to reinforcement >11 If any of the above criteria is not met, the design specifies that the existing sound concrete cover to reinforcement is to be increased by the application of structural polymer modified repair mortar of minimum thickness of 20 mm so that the total sound concrete cover to reinforcement is > 40 mm. |  |  |  | 11.4.3.3 |  |
| **ELECTRICAL AND CONTROL REQUIREMENTS** | | | | | | |
| General | All critical electrical switchgear, including motor starters, power distribution boards, RTU panels, ventilation panels, junction boxes/turrets, etc. are located within the pump station building above ground level and min. 300mm above 1% AEP flood level. |  |  |  | 12.1 |  |
| A new electrical switch room has been provided in the design if there is not enough room to fit new electrical equipment in the existing building/superstructure, or if the current pump station doesn't meet the requirements for the location of electrical equipment. |  |  |  |  |
| Mains supply upgrade - assessment | Where station refurbishment increases the site maximum power demand the designer has assessed if a mains supply upgrade is required. |  |  |  | 12.2 |  |
| Mains supply upgrade requirements (if included in project scope) | Assessment of maximum demand has been undertaken. Maximum demand calculations exclude connected loads that cannot operate simultaneously (for example duty/ standby pumps). |  |  |  |  |
| An “Application for Connection” has been prepared and submitted to the electricity distributor including payment of all necessary fees. |  |  |  |  |
| A service protection device has been provided where it is not currently fitted, or the existing device is underrated. |  |  |  |  |
| Where an upgrade is required to an existing Form 1 Main Switchboard then it is nominated for replacement with a Form 3b / Form 4 switchboard. Pump stations with an outdoor kiosk may be exempt from this requirement but must be confirmed with SWC. |  |  |  |  |
| If a new Main Switchboard is required, the designer has included the provision of a portable generator connection with manual change-over switches. Switches are accommodated in separate cubicles if the switches have protection functions. This facility has been provided even if the site has a permanent standby generator. Controllers for automatic transfer switches (ATS) to be in a separate compartment from the ATS changeover switches. |  |  |  |  |
| Upgraded from direct metering to current transformer (CT) metering including a CT metering panel as required |  |  |  |  |
| A new panel is provided where the service protection device (SPD) and/or CT metering cannot be accommodated within existing switchboard |  |  |  |  |
| Adequate protection grading provided between the electricity distributor supply and all downstream protective elements in accordance with SWC Technical Specification -– Protection (DOC0014). |  |  |  | 12.2 |  |
| Portable generator connection | All new main switchboards are provided with a portable generator connection. |  |  |  | 12.3 |  |
| On sites where an existing portable generator connection does not exist, a portable generator connection panel is provided adjacent to the generator set down area. |  |  |  |  |
| Power cabling between the generator breaker and connection panel is provided. |  |  |  |  |
| A mechanical key interlock is provided between the generator incomer and the normal supply incomer circuit breakers, to prevent the supplies from being inadvertently paralleled. |  |  |  |  |
| The generator panel, switching arrangement, and cabling is as per the standard SPS electrical drawing templates. |  |  |  |  |
| Permanent generator | The generator complies with the SWC Technical Specification - Permanent Diesel Generator (D0002061). |  |  |  | 12.4 |  |
| The generator has been sized to supply the calculated load based on its continuous prime rating. It can start and run all duty pumps plus the station auxiliaries. i.e. sized for the full SPS load. |  |  |  |  |
| The scope includes an automatic transfer switch (ATS) on the main switchboard, power cabling and protection as required by the Service and Installation Rules of NSW and local power authority requirements |  |  |  |  |
| Electrical switchboard modifications | The main switchboard is upgraded or replaced if any of the following applies: • motor starter sizes or types are modified, • pump motor current ratings are increased beyond the capacity of the existing starters and the switchboard, • the equipment is deemed unserviceable, • main power or auxiliary distribution boards are modified, • additional loads are to be added, • the main switchboard does not comply to the current service and installation rules, or • there are no protective devices for the revenue metering units. |  |  |  | 12.5 |  |
| New or upgraded main switchboard complies with the requirements of SWC Technical Specification – Electrical. |  |  |  |  |
| Pump feeder breakers are sized to be larger than the associated motor rated current and of sufficient capacity to carry the starting current dependent on the starting method. |  |  |  |  |
| SWC standard SPS drawings power schematic E0105, Power Distribution Section GA E0300 and Power Distribution Section Equipment Schedule E0305 have been referenced for the main switchboard circuit arrangement and equipment details. |  |  |  |  |
| Additional supply breakers that are provided, if nominated in the project scope, are cranes, motor actuated valves, sump pump and ventilation fans. Additional breakers are provided for power factor or active harmonic filters as determined necessary in the assessment of the site power quality to meet AS61000 and local power authority requirements. |  |  |  |  |
| The crane supply is a 3 phase breaker providing supply to the vendor supplied equipment box unless agreed otherwise with SWC. |  |  |  |  |
| Motor actuated valves are 3 phase valve units complete with a local starter supplied by the pump station power distribution panel and controlled by the RTU unless agreed otherwise with SWC.Schematics are based upon the latest templates issued by SWC. |  |  |  |  |
| The sump pump supply is from a single phase 10A RCD located in the pump station distribution board, unless agreed otherwise with SWC. |  |  |  |  |
| The ventilation fan starter and control panel are as per the standard drawings included in the Design Specification for Sewage Pumping Stations Dry Well Ventilation (D0001896). |  |  |  | 12. |  |
| Electrical switchboard modifications - Starters | Starters are upgraded based on the typical pump starter schematics, which are provided in the following SWC standard SPS electrical drawing sets: • S1 / S2 / S5 / S6 / S12 Starters comply with the requirements of SWC Technical Specification – Electrical. |  |  |  | 12.5 |  |
| Typical pump starter panel modifications, specific to dry well upgrades where conventional pump motor units are replaced with submersible units are undertaken as follows: • Provision of new Flygt Mini CAS or MAS801 relays and associated bases, replacing the existing relays (generally these are ATS Tritronics type relays). • The upgrade of 2A, 24V DC power supplies to 5A units and associated changes to the control circuitry within the existing starter panels. • Removal of the Unit Flooded switch and associated wiring for each pump. Bridging of the Pump Station Flooded switch terminals within the starter panels and removal of the indication lamps and associated labelling. |  |  |  |  |
| Actuated valve modifications | The following items are covered: • Clearly identified new actuated valves & decommissioning of unused actuated valves in accordance with the project scope. • Provided power supply, monitoring and control to the actuator. • RTU I/O assignment has been confirmed with SWC Instrumentation and Control Services team; • Drawings have been provided in accordance with the latest SWC SPS electrical templates. |  |  |  | 12.6 |  |
| Electrical cables | All necessary cabling has been provided to complete the installation as required in the design/scope. |  |  |  | 12.7 |  |
| All new cables and existing cables are sized based on AS3008 taking into consideration the new loads and appropriate derating factor based on the number of cables on the shared route, cable support or enclosure, cable arrangement, insulation type etc |  |  |  |  |
| Pump screened cables are of sufficient free length to allow removal and laydown of pumps in the centre of the dry well for maintenance without disconnection. |  |  |  |  |
| The new pump cabling has been supported above the pump motor location and terminated in junction boxes or turrets. In some instances where they cannot be installed above the 1% AEP flood level, SWC may elect to dispense with junction boxes or turrets and terminate directly into the starter panels. Disconnection, if required, is at the motor termination box. |  |  |  |  |
| Cable supports in the form of stainless steel half circles, cable hooks and stockings are provided where required to ensure the full weight of the pump cabling is not transferred to the terminals at the pump head, turret, junction box or starters. The cable supports are located to allow the cables to hang in a fashion that facilitates safe removal and does not obstruct dry well access. |  |  |  |  |
| Protection cabling has been modified to match the new submersible pump monitoring and protection equipment usually necessitating an increase in the number of cores in cabling from junction boxes or turrets back to the pump motor starters. Additional terminals are provided in turrets, junction boxes or starters where the existing units can accommodate these, if not, the equipment that is space constrained has been replaced with new units. |  |  |  |  |
| New IP68 instruments and latch stops have been provided complete with cabling where terminations are potted. Cable run lengths are determined to ensure the correct cable length is supplied. To facilitate equipment replacement, removal and installation of the cabling, new individual and continuous conduits with long sweep bends have been provided. |  |  |  |  |
| The new and modified cabling details are updated in the site electrical cable schedule and block diagrams. |  |  |  |  |
| New cable penetrations are to be provided into the wet well, inlet maintenance hole, through kiosk bases or dry well entries as necessary to achieve the project objectives. The penetration details must be clearly and comprehensively covered in the site layout drawings. All existing or new penetrations must be fire stopped and properly sealed to be weatherproof, vermin proof and prevent the passing of sewer gases. |  |  |  |  |
| Pump power and instrument cable junction boxes and turrets | New junction boxes or turrets are provided for the termination of pump and instrument cabling. These are: • Located above ground level and min. 300mm above the 1% AEP level • Located to facilitate the segregation of other services and power and instrument cabling • Located to minimise the installation of new or the relocation of existing pits and buried cable conduits |  |  |  | 12.8 |  |
| All existing junction boxes are relocated to min. 300mm above the 1% AEP flood level. |  |  |  |  |
| New SWC standard stainless steel turrets have been utilised if there is sufficient space available on site.  Care has been taken to maintain hatch and turret door opening clearances. Where space is limited, prohibiting the use of the standard stainless steel turrets, other options have been considered, such as Fulton FPB2TV green plastic turrets, or equivalent. Failing this, junction boxes have been located either off the exterior of the pump station walls or located on the entry or mezzanine level, provided these locations are above the flood and overflow levels. The turrets or junction boxes are specified with cable glands or conduit penetrations as required to accommodate the new cabling. |  |  |  |  |
| Lighting, power distribution and GPOs | Light and power distribution boards, lighting, and general power outlets (GPO’s) have been provided in the design as specified in the project scope and the requirements of the Technical Specification – Electrical. |  |  |  | 12.9.1 |  |
| New internal and external lighting, switches and GPOs are provided in the design to replace any existing unserviceable or incorrectly IP rated fittings, or to cater for any building plant layout or access changes. |  |  |  |  |
| All new/upgraded light fittings are designed so they are easily accessible |  |  |  | 12.9.2 |  |
| Lighting installation and lux levels are in accordance with the SWC Technical Specification - Electrical. |  |  |  |  |
| Lighting design has been undertaken where rearrangement of the dry well equipment leads to obscuring of the lighting or casting of shadow on plant or access routes. |  |  |  |  |
| Where applicable, new or upgraded lighting has been provided for safe and effective operation of new bypass arrangements. |  |  |  |  |
| Lights are operated via a manual switch located inside the building, close to the personnel access door. The design indicates a sign at light switches which clearly identifies its purpose |  |  |  |  |
| Replaced or new luminaires located within the switchroom are industrial LED type and have an IP55 rating. |  |  |  |  |
| Luminaires located outdoors or within the dry well are non-corrosive rated IP56. |  |  |  |  |
| An assessment has been undertaken if spare capacity of the existing distribution board is planned to be used, to check if the remaining spare capacity complies with the minimum requirements of the SWC Technical Specification – Electrical. |  |  |  | 12.9.3 |  |
| If the existing Distribution Board has insufficient spare capacity, or if the proposed modification to create additional spare capacity doesn't comply with SWC Technical Specification - Electrical, Australian Standards or NSW Service and Installation Rules, then a new Distribution Board has been provided in the design. |  |  |  |  |
| The GPO’s and lighting power equipment are segregated so that equipment above the flood and overflow level are powered from separate circuits to those below these levels. The design indicates these separate circuits are clearly labelled. |  |  |  |  |
| RCD circuit breakers are provided on all GPO circuits and on the power distribution board where required. |  |  |  |  |
| All GPOs in the dry well are installed on separate power circuits, are changed to IP56 rated equivalents and are installed min. 1.5m above the dry well floor level. |  |  |  | 12.9.4 |  |
| The sump pump power supply is via a wall mounted single phase industrial type weatherproof (IP56), 230V AC 10A GPO located in the dry well near the sump. |  |  |  | 12.9.5 |  |
| Where a 230V sump pump is not available, a three-phase sump pump with a 415 V 3-phase feeder is provided in the low voltage distribution board supplying a new direct online starter. |  |  |  |  |
| The sump pump motor is connected to the starter directly or to a termination panel. The starter or the termination panel is located above the flood and overflow levels in a similar location to the main pump starters. |  |  |  |  |
| Where 3 phase sump pumps are specified, additional IICATS I/O has been obtained from SWC OT. |  |  |  |  |
| Level switches to control the pump on / off operation and to provide monitoring are connected back to the starter via a local IP67 junction box. |  |  |  |  |
| Modifications to instrumentation | All existing dry well instruments are replaced with potted IP68 type instruments. The cables run in a separate continuous conduit for each instrument to facilitate instrument replacement.  All bends are long radius type. |  |  |  | 12.10.1 |  |
| The monitoring of wet well levels is via a hydrostatic level transmitter located in the dry well unless otherwise agreed with SWC. The transmitter is connected to a 50mm manifold that is installed through the wall separating the dry well and the wet well. |  |  |  | 12.10.2 |  |
| The manifold arrangement is designed in accordance with standard  SWC drawing [STD001CMD01](#_SW_Standard_Pressure_1). |  |  |  |  |
| The manifold and instrument are located below the centre line of the suction pipework and max. 300mm above the floor of the dry well. |  |  |  |  |
| Where the potted cable has been terminated below the high water level, all dry well float switches (machinery well flooded, sump level high unit flooded) are specified to be replaced in the design drawings. |  |  |  | 12.10.3 |  |
| Float switch cables are terminated in an instrument junction box located above ground level and min. 300mm above the 1% AEP level. |  |  |  |  |
| If conventional non-submersible pumps have been installed in the dry well the existing "unit flooded" level switches and redundant circuit components are disconnected and removed. |  |  |  |  |
| A float/buoyancy level switch is provided in the valve chamber for a valve chamber flooded alarm |  |  |  | 12.10.4 |  |
| Each pressure main is provided with a pressure transmitter downstream of the stop valve within the valve chamber. |  |  |  | 12.10.4 |  |
| Where specified, a flowmeter(s) is to be installed on the SPS pressure main(s), either in the dry well where space allows, or in a separate valve chamber. Ultrasonic flowmeters are preferred. Electromagnetic flowmeters may be used, subject to SWC acceptance. |  |  |  | 12.10.5 |  |
| Latch stop stations | A risk assessment has been performed to determine whether local latch stops or local start/stop control for each pump, or no local control is required. |  |  |  | 12.11 |  |
| If local controls or latch stops are provided these are IP68. Cabling is potted with lengths specified for site conditions and installed to facilitate replacement in separate conduits.  All conduit bends are long radius type. Each latch stops is located within 2m from the pump that it controls and at the same floor level. |  |  |  |  |
| Modifications to IICATS I/O and control functions | The designer has identified any changes to the pumping station functional description, RTU and emergency PLC I/O. |  |  |  | 12.12 |  |
| For dry well submersible pumps, the existing “pump stopped due to flooding” function has been removed for each pump. All, “Pump Stopped Due To Flooding”, relay contacts have been replaced with the pump “Water in Oil” alarm contacts in the RTU DI drawings. |  |  |  |  |
| One ball float is maintained within the dry well to provide a “Machinery Well Flooded” alarm, which does not disable the pumping units. |  |  |  |  |
| The existing Omniflex RTU power supply has been replaced with Dyne Industries 5A custom analogue power supply based on the previously adopted Radameter unit. The voltage monitoring contacts have been wired into the RTU DI monitoring circuit. |  |  |  |  |
| Dual power supply arrangement for the ATWL alarm circuit is provided as shown on SWC standard SPS electrical drawing E0220. ATWL circuit is supplied by both supplies via diode auctioneering, located on the field rail. The Power Supply Units are Phoenix units, with the size being load dependent with a minimum 20AH battery system (refer to SPS standard electrical drawing E0170). |  |  |  |  |
| All IICATS signals are in accordance with the I/O list provided by the SWC Instrumentation and Control Services team. Drawings have been updated in accordance with their requirements. |  |  |  |  |
| Removal of redundant equipment | Design drawings identify all electrical equipment which is to be made redundant during the project. |  |  |  | 12.14 |  |
| SWC has been consulted regarding identifying which redundant electrical equipment is to be retained (if any), and a suitable off-site storage location nominated. |  |  |  |  |
| Electrical design drawings include the following notes: • All equipment made redundant during the project must be isolated, disconnected and removed from the site, either to the agreed off-site storage location for equipment to be retained by SWC, or to a suitable waste disposal facility.  • All decommissioned cables must be isolated, disconnected and removed from the existing pits, conduits, and cable trays.  • Remaining existing cables must be rearranged in association with the new cables |  |  |  |  |
| **SITE INFRASTRUCTURE** | | | | | | |
| Survey labels | Survey labels showing RL of the roof in AHD are indicated on the design drawings on all structures above instruments, including the IMH, wet well and valve chamber. |  |  |  | 13.1 |  |
| A survey datum line showing the RL to AHD must be marked on a clearly visible grade 316 stainless steel label (100mm long x 80mm high x 2mm thick) attached to the dry well / wet well dividing wall close to the wet well level sensor approx. 1600mm above floor to facilitate instrument installation and adjustment. |  |  |  |  |
| Anchor points | All anchor points comply with the requirements of SWC Edition of WSA 04 and SWC Technical Specification - Mechanical, and are located 1.5m from the access openings and in line with the hatch hinges. |  |  |  | 13.2 |  |
| The number and location of the anchor points have been confirmed with SWC. |  |  |  |  |
| Bollards | Permanent bollards are provided to protect assets and/or structures on site from vehicles. |  |  |  | 13.3.1 |  |
| All permanent bollards are concrete filled with concrete footings and comply with SWC Technical Specifications - Civil & Mechanical. |  |  |  |  |
| Two permanent bollards are provided at each side of the vehicle entry doors to the station superstructure. |  |  |  |  |
| Vent shafts close to trafficable paths and in parks are protected from vehicles using permanent bollards. |  |  |  |  |
| Where valve chamber, wet well, maintenance holes, emergency storage structures and other covers are not trafficable but there is a risk that traffic may drive over them, permanent bollards or alternative safety barriers are provided. |  |  |  |  |
| Removable bollards are only specified in the design if specifically requested by SWC. The design drawings note that SWC locks are provided for the removable bollards. |  |  |  | 13.3.2 |  |

**Document control**

**Ownership**

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| **Group** | Engineering and Technical Support |
| **Owner** | Manager, Engineering |
| **Author** | Milan Rubcic, Lead Engineer |

**Change history**

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**Revision details**

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| 1 | First issue | Not applicable. |