The following design checklist is based on the WSAA Sewage Pumping Station Code of Australia WSA 04-2005-2.1 Sydney Water Edition - 2012 and related documents. 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 documentation.

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

**Related Documents**

| Parent document number | Parent document title |
| --- | --- |
| BMIS0209 | Sydney Water Technical Specification - Mechanical |
| CPDMS0023 | Sydney Water Technical Specification – Civil |
| CPDMS0022 | Sydney Water Technical Specification - Electrical |

| **ITEM** | **REQUIREMENTS** | **YES** | **NO** | **N/A** | **DESCRIPTION** |
| --- | --- | --- | --- | --- | --- |
| **DRAWINGS AND DESIGN** | |  |  |  |  |
| General | Content is relevant to the scope of work. |  |  |  |  |
| All changes to scope documented and agreed. |  |  |  |  |
| Sufficient details are shown to enable construction. |  |  |  |  |
| Include drawings with general notes. |  |  |  |  |
| Terminology complies with SW Edition of WSA 04, Part 0. |  |  |  |  |
| Compatibility with Concept Design | Detailed Design compatible with the Concept Design. Any fundamental changes to the Concept Design documented and endorsed by Sydney Water’ |  |  |  |  |
| Orientation | Accurately reflect locality and orientation. |  |  |  |  |
| Where practical ‘North’ arrows point to the top of drawing sheets (approx.). |  |  |  |  |
| Levels | All Reduced Levels (RL) are in meters and refer to AHD. |  |  |  |  |
| Dimensions | All dimensions are in millimeters except chainages which are in meters. |  |  |  |  |
| Drawing numbering | Comply with SW Asset Plan Numbering System. |  |  |  |  |
| Drawing standard | Comply with SW CAD Standard and Specification and Digital Engineering Standard. |  |  |  |  |
| Drawing format and title block | Use SW standard drawing templates. |  |  |  |  |
| Annotation | Clearly identify new and existing structures / equipment. |  |  |  |  |
| Services | Show existing and new water, sewage, gas, telecommunication and electricity services. |  |  |  |  |
| Safety in design | Safety in Design Report submitted. |  |  |  |  |
| **SITE LAYOUT** | |  |  |  |  |
| Vehicle access, parking and turning | Mobile crane able to reach the wet well, valve chamber, electrical kiosk / switch room, bypass pump connection and insertion points, CDU and OCU (where installed). |  |  |  |  |
| Show crane working envelope / radius. |  |  |  |  |
| Sufficient setback of gate(s) from main road to enable driver to open / close the gate safely. |  |  |  |  |
| Minimum 4m wide access road / driveway. |  |  |  |  |
| Minimum four parking spots provided. |  |  |  |  |
| Minimum 8m wide x 12m long hardstand area besides the wet well and valve chamber for mobile crane outriggers. |  |  |  |  |
| Set down areas for diesel bypass pump(s) and mobile generator provided and labelled. |  |  |  |  |
| Turning area suits nominated vehicle type. |  |  |  |  |
| Mobile crane (and tanker where CDU provided) able to enter, turn around or drive through and leave the site driving in forward direction. |  |  |  |  |
| Trafficable in all weather |  |  |  |  |
| Bollards | Concrete footed and filled at access road ends. |  |  |  |  |
| Concrete footed and filled if installed along the access road near wet well, valve chamber and structures not designed for vehicular load. |  |  |  |  |
| Removable where occasional vehicular access required. |  |  |  |  |
| Painted yellow with two strips of red and white reflective tape. |  |  |  |  |
| Site drainage | Shown on drawings. |  |  |  |  |
| Water service | Water service minimum DN100 to site and DN80 within site. |  |  |  |  |
| Hydrant(s) DN80 spring type and located close to the wet well and emergency storage. |  |  |  |  |
| DN25 hose cock installed on 500mm high galvanised or hardwood post. |  |  |  |  |
| Separate water service for emergency storage washdown system (if applicable). |  |  |  |  |
| RPZD on water service | Complies with AS 2845 and has ‘High Hazard’ PN16 rating. |  |  |  |  |
| Main RPZD DN50 and provided with an earthing clamp and conduit. |  |  |  |  |
| Additional DN25 RPZDs provided on water supply to CDU and toilet, where applicable. |  |  |  |  |
| External lighting | Shown on site layout drawings. |  |  |  |  |
| Fencing | As per SW DTC drawings DTC-5000 to DTC-5015. |  |  |  |  |
| Type of fence agreed with SW. |  |  |  |  |
| Aligned with SW site boundaries (cadastral). |  |  |  |  |
| Gate posts installed on the road gutter (not on top of kerb). |  |  |  |  |
| Security vulnerability assessment by Sydney Water security team if the height is reduced below standard height |  |  |  |  |
| Flood level | 1% AEP level shown on all sectional elevations or note stating that the site is not subject to flooding. |  |  |  |  |
| 1% AEP area/extent shown on the general site plan/layout. |  |  |  |  |
| Landscaping | Low maintenance, as per SW and Local Council’s requirements, if applicable. |  |  |  |  |
| Use 40mm gravel (stones). No grass. |  |  |  |  |
| Natural shrubs planted on embankments. |  |  |  |  |
| Shrubs are unlikely to block access or interfere with station when fully grown. |  |  |  |  |
| Land and easement acquisition details | Survey coordinates of new acquisition shown on drawings. |  |  |  |  |
| **FOUNDATION DESIGN (refer to Technical Specification – Civil, cl. C10.3)** | |  |  |  |  |
| Geotechnical Investigations | Available geotechnical investigation locations shown on drawings. (eg. boreholes indicated on site plans). |  |  |  |  |
| Geotechnical Factual Report Produced |  |  |  |  |
| Geotechnical Interpretive Report Produced |  |  |  |  |
| Ground conditions | Bearing capacity and ground (lateral and vertical) movement checks have been carried out and considered in foundation design. |  |  |  |  |
| Bearing capacity and ground movement checks documented in Design Report. |  |  |  |  |
| Values of ultimate bearing capacity and strength reduction factor considered for each structure have been provided. |  |  |  |  |
| Estimated ground movement values as appropriate at each structure (eg. differential settlement between wet well and valve chamber) have been provided. |  |  |  |  |
| Ground condition detail and on-site verification requirements indicated on drawings. |  |  |  |  |
| **EARTHWORKS (refer to Technical Specification – Civil, cl. C2 & C10)** | |  |  |  |  |
|  | Required backfill material details specified on drawings, in compliance to Technical Specification – Civil, cl. C2. |  |  |  |  |
| Compaction requirements and testing frequency specified on drawings in compliance to SW Technical Specification – Civil, cl. C2. |  |  |  |  |
| Selected fill specified for fill material around underground structures and shown on drawings in compliance to Technical Specification – Civil, cl. C2. |  |  |  |  |
| **ROADWORKS (refer to Technical Specification – Civil, cl. C8 & C10)** | |  |  |  |  |
| Geotechnical subgrade | Geotechnical subgrade testing carried out and documented in Geotechnical Factual Report. |  |  |  |  |
| Provide no. of tests undertaken / available and used for design, documented in Geotechnical Interpretive Report. |  |  |  |  |
| Provide minimum and maximum CBR values. Document in Design Report and Specify site verification requirements on drawings. |  |  |  |  |
| Pavements | Pavement designed considering geotechnical subgrade test results. |  |  |  |  |
| Provide CBR value adopted for design. |  |  |  |  |
| **INLET MH** | |  |  |  |  |
| Top of inlet MH | Slab/roof level min. 300mm higher than 1% AEP level and max. 25mm higher than the surrounding concrete slab or ground. |  |  |  |  |
| All perimeter concrete edges chamfered at 25mm x 45O. |  |  |  |  |
| Inlet MH structure | Inside diameter at invert not less than 1800mm excluding any benching. |  |  |  |  |
| Location of Inlet MH | Within SPS site and at sufficient distance from the wet well to allow for a rocker pipe, or otherwise integral part of the wet well. |  |  |  |  |
| Protective lining/coating | Unless agreed otherwise with Sydney Water, all internal concrete surfaces of walls and roof slab lined/coated in accordance with WSA 201. |  |  |  |  |
| SW sealing details used at all penetrations. |  |  |  |  |
| Provision for electric bypass pump | Provided min. ø900mm clear path to the invert. |  |  |  |  |
| Electrical turret provided next to the inlet MH. |  |  |  |  |
| Electrical conduit terminates 100mm behind the edge of access opening and max. 600mm below TOC. |  |  |  |  |
| Connecting line to additional emergency storage – Low-level fill/drain line | Size equal or larger than the size of the low-level inlet line to the wet well. |  |  |  |  |
| IL at inlet MH min. 150mm above the obvert of the low-level inlet line to the wet well. |  |  |  |  |
| Inlet MH end of the line flanged. |  |  |  |  |
| Min. 150mm clearance between back of the flange and the wall. |  |  |  |  |
| Puddle flange provided in all wall penetration. |  |  |  |  |
| Connecting line to additional emergency storage – High-level fill line (Configurations 2 & 3) | Size equal or larger than the size of the low-level inlet line to the wet well. |  |  |  |  |
| IL at inlet MH min. 150mm above the obvert of the low-level inlet line to the wet well. |  |  |  |  |
| Inlet MH end of the line flanged. |  |  |  |  |
| Min. 150mm clearance between back of the flange and the wall. |  |  |  |  |
| Puddle flange provided in all wall penetration. |  |  |  |  |
| The obvert of the high-level fill line at the emergency storage structure min. 100mm and at the inlet MH min. 150mm below the overflow weir crest level. |  |  |  |  |
| Connecting line to wet well - Low-level inlet line | Flow capacity at least equal to the pumping station capacity or the flow capacity of the upstream system, whichever is the largest. |  |  |  |  |
| Size equal or larger than the largest inlet line into the inlet MH. |  |  |  |  |
| Provision for double isolation of wet well. |  |  |  |  |
| Connecting line to wet well - High-level inlet line | Size equal or larger than the size of the low-level inlet line to the wet well. |  |  |  |  |
| Inlet MH end of line flanged. |  |  |  |  |
| Min. 150mm clearance between back of the flange and the wall. |  |  |  |  |
| Puddle flange provided in IMH wall penetration. |  |  |  |  |
| Obvert level of pipe at inlet MH min 150mm below weir crest level and graded towards the wet well. |  |  |  |  |
| Offset in relation to the low-level inlet line in the wet well by min. one inlet line diameter/ |  |  |  |  |
| Connecting line to emergency relief gas check MH (if emergency relief is off inlet MH) | Obvert of the pipe at the inlet MH min. 300mm below the weir crest level. |  |  |  |  |
| Pipe one size greater than the low-level wet well inlet line. |  |  |  |  |
| Low-level and high-level connecting lines | Metallic (DI or stainless steel) pipes in all wall penetrations. |  |  |  |  |
| Scum baffle on emergency relief pipe (if emergency relief is off inlet MH) | Baffle to extend 50 mm below and 150 mm above pipe outlet. Note: if obvert of the connecting pipe is min. 300mm below the weir crest level, then scum baffle in the inlet MH is not required. |  |  |  |  |
| Level sensor | Hydrostatic type. |  |  |  |  |
| Shown location and type (positioned slightly above obvert of the wet well low-level inlet line). |  |  |  |  |
| Level switch | Buoyancy type. |  |  |  |  |
| Shown location and type (positioned at weir crest level). |  |  |  |  |
| Grit collection | Provided where grit collection is required. |  |  |  |  |
| Personnel access | Stainless steel access ladder or individual stainless steel step irons to AS1657. |  |  |  |  |
| Top rung / step iron max. 400mm below TOC. |  |  |  |  |
| Ladder rungs / step irons extend min. 150mm into the access opening and positioned at the narrow side of the access opening. |  |  |  |  |
| Ladder / step irons landing in IMH maximized. |  |  |  |  |
| Covers | Hinged lightweight (aluminum) with hinged Gr. 316 stainless steel safety grilles in non-trafficable areas. |  |  |  |  |
| Designed and detailed to the load deflection requirements and configuration to drg. SPS-1357-S of WSA 04. |  |  |  |  |
| Heavy duty split solid-top type with removable Gr. 316 stainless steel safety grille in trafficable areas. Sufficiently sized concrete apron provided in the direction of covers opening on which the covers can be readily placed. |  |  |  |  |
| Min. clear opening 1000mm x 1150mm. |  |  |  |  |
| Hinged covers positioned and designed such that the cover and safety grille lie flat when fully open. |  |  |  |  |
| Permanent survey label plate | Label plates engraved Gr. 316 stainless steel. |  |  |  |  |
| Installed in the concrete surround of the Inlet MH cover within 100mm of the level sensing equipment showing the reduced level in AHD.. |  |  |  |  |
| **WET WELL** | |  |  |  |  |
| Hydraulic design | Well design complies with ANSI/HI guidelines. |  |  |  |  |
| Computational Fluid Dynamics (CFD) modelling undertaken. |  |  |  |  |
| Top of wet well | Slab/roof level min. 300mm higher than 1% AEP level and max. 25mm higher than the surrounding concrete slab or ground. |  |  |  |  |
| All perimeter concrete edges chamfered at 25mm x 45O. |  |  |  |  |
| Low-level and high-level inlet lines | Metallic (DI or stainless steel) pipes in all wall penetrations. |  |  |  |  |
| Have min. 1.5% fall. |  |  |  |  |
| Puddle flange provided in low-level line wet well wall penetration. |  |  |  |  |
| Low-level line from emergency storage (Configurations 2 & 3 only) | Metallic (DI or stainless steel) pipes in all wall penetrations. |  |  |  |  |
| Puddle flanges provided in all wall penetration. |  |  |  |  |
| Size not less than the size of the low-level inlet line. |  |  |  |  |
| Wet well end of line fitted with an isolating resilient seated gate valve. |  |  |  |  |
| Inlet isolation valve | Resilient seated gate valve up to DN600 or Gr. 316 stainless steel knife gate valve above DN600. |  |  |  |  |
| Provided with Gr. 316 stainless steel extension spindle with stainless steel support brackets. |  |  |  |  |
| Standard surface box provided in roof above the inlet valve. |  |  |  |  |
| Access opening in the roof provided for valves ≥DN375. |  |  |  |  |
| Valve supported inside the wet well on concrete plinth. |  |  |  |  |
| No valve gearbox installed in the wet well. |  |  |  |  |
| Valves ≥DN450 electrically actuated. |  |  |  |  |
| Electric actuator pedestal and enclosure or locking plate details shown. |  |  |  |  |
| Actuator pedestal installed on support bracket or adequately strengthened metal cover. |  |  |  |  |
| Low-level inlet | Flanged Gr. 316 stainless steel Sch. 10S drop tube provided for wet wells with two pumps. |  |  |  |  |
| Tip of drop tube extends to the pump cut-out level and is cut at 45O. |  |  |  |  |
| Baffle wall / plate provided for three or more pumps in wet well as per design guidelines. |  |  |  |  |
| Wet well floor | Provided with min. 1% grade to sump and self-cleansing benching all around. |  |  |  |  |
| Provided 1000mm sq. nearly flat (0.5% fall to sump) area directly below personnel access hatch for maintenance work box. |  |  |  |  |
| Ventilation arrangement | Natural ventilation via induct and educt vents. |  |  |  |  |
| Educt vent line connected to the educt vent shaft. |  |  |  |  |
| Induct vent 600mm high Gr. 316 stainless steel box installed close to electrical turrets (min. 300mm apart). |  |  |  |  |
| Induct vent positioned so that it does not obstruct laying of access cover flat on ground. |  |  |  |  |
| Induct vent line extends to 1m above pump cut-in level (show RL on drawings) and its centerline max. 1000mm away from the low-level inlet line. |  |  |  |  |
| Maximised distance between the induct and educt line connections to the wet well (ideally diagonally opposite) to prevent short-circuiting. |  |  |  |  |
| Educt vent line | Min. DN150 or half the size of the low-level inlet line to the wet well (whichever is the larger), but not larger than DN300 unless provided as part of odour control unit. |  |  |  |  |
| Length of the educt vent from the wet well and inlet MH to the top of the vent shaft max. 25m, or max. 35m if both increased by one nominal size. |  |  |  |  |
| Connected to the wet well as close as possible to top slab. |  |  |  |  |
| Connected to the inlet MH and emergency storage (where separate from wet well). |  |  |  |  |
| Discharge (riser) pipes | One spool (closing pipe) identified as 'cut on site to suit' if Gr. 316 stainless steel, or min. 25mm thick packer flange provided if DI. |  |  |  |  |
| Minimised number of bends. |  |  |  |  |
| Min. one size smaller than the pressure main, but not less than the pump throughlet. |  |  |  |  |
| Supports every 6m (show detail of wall attachment). |  |  |  |  |
| 3mm thick neoprene between supports and discharge pipes. |  |  |  |  |
| Discharge pipework in existing stations | Identify and provide a note to state 'Make good existing pipework'. |  |  |  |  |
| Notes detail painting requirements. |  |  |  |  |
| Sump | Located between pumps. |  |  |  |  |
| Size 400mm x 400mm x 300mm deep. |  |  |  |  |
| Access covers | Show all covers (typically five for a 2-pump SPS:   * one for personnel access, * one for electrical instruments, * one for each pump, and * one for radar level sensor). |  |  |  |  |
| Additional cover provided for inlet valve if ≥DN375. |  |  |  |  |
| All covers hinged lightweight (aluminum) fitted with hinged stainless steel safety grilles. |  |  |  |  |
| Designed and detailed to the load deflection requirements and configuration to drg. SPS-1550-S of WSA 04. |  |  |  |  |
| Min. clear opening sizes:   * personnel access: 1000mm x 1000mm * electrical instruments: 450mm x 450mm * pumps: min. 75mm clearance all around pump * radar level sensor: 250mm x 300mm * inlet valve: min. 75mm clearance all around valve |  |  |  |  |
| Show the mass of each cover and its unobstructed operation. |  |  |  |  |
|  |  |  |  |  |
| Hinged covers designed and positioned such that the covers and safety grilles lie flat when fully open. |  |  |  |  |
| Hooks for cables aligned with their conduits. |  |  |  |  |
| Hooks for pump lifting chains positioned on opposite side to the hooks for cables. |  |  |  |  |
| Personnel access | Show ladder tie points, safety harness anchor points etc. |  |  |  |  |
| Location of pumps in relation to access openings | Dimensions shown on drawings. |  |  |  |  |
| Openings aligned with the pumps and provide adequate clearance when flush valves are fixed to the pumps. |  |  |  |  |
| Guide rails | Gr. 316 stainless steel. |  |  |  |  |
| Show distance from the edge of access opening to the centre of guide rails. |  |  |  |  |
| Intermediate guide bar support bracket(s) provided every 6m. |  |  |  |  |
| 3mm thick neoprene between guide bar support bracket(s) and discharge pipes. |  |  |  |  |
| Level switch | Buoyancy type. |  |  |  |  |
| Show location (positioned at ATWL) and type on general arrangement drawings with details on electrical drawings. |  |  |  |  |
| Level sensors | Radar type. |  |  |  |  |
| Hydrostatic (located in a stilling tube) if radar cannot be used. |  |  |  |  |
| Show location and type on general arrangement drawings with details shown on electrical drawings. |  |  |  |  |
| Operating levels | Show all operating levels, weir crest level and 1% AEP. |  |  |  |  |
| Flushing volume for pressure main HDD section(s) provided below ATWL. |  |  |  |  |
| Protective coating | Unless agreed otherwise by Sydney Water, all internal concrete surfaces of walls and roof slab coated as per WSA 201. |  |  |  |  |
| SW sealing details used at all penetrations. |  |  |  |  |
| Not required at floor of the wet well. |  |  |  |  |
| Coating terminating end self-draining. |  |  |  |  |
| Permanent survey mark and survey label plate | Located on wet well roof slab near the el. instruments hatch. |  |  |  |  |
| Survey mark in brass. |  |  |  |  |
| Label plates engraved Gr. 316 stainless steel. |  |  |  |  |
| **EMERGENCY RELIEF SYSTEM** | |  |  |  |  |
| Top of gas check structure | Slab/roof level min. 300mm higher than 1% AEP level and max. 25mm higher than the surrounding concrete slab or ground. |  |  |  |  |
| All perimeter concrete edges chamfered at 25mm x 45O. |  |  |  |  |
| Gas check MH structure | Diameter at invert min. 1800mm. |  |  |  |  |
| Location of gas check MH | Preferably within SPS site and at sufficient distance from the inlet MH to allow for a rocker pipe, or otherwise integral part of the inlet MH. |  |  |  |  |
| Personnel access | Stainless steel access ladder or individual stainless steel step irons to AS1657. |  |  |  |  |
| Top rung / step iron max. 400mm below TOC. |  |  |  |  |
| Ladder rungs / step irons extend min. 150mm into the access opening. |  |  |  |  |
| Provide hand grips / stanchions, 32NB GMS, 1000mm high at 575mm centre, painted bright yellow or retractable hand grips in accordance with AS 1657. |  |  |  |  |
| Covers | Hinged lightweight (aluminum) with stainless steel Gr.. 316L safety grille in non-trafficable areas. |  |  |  |  |
| Heavy duty split solid-top type with removable Gr.. 316L stainless steel safety grille in trafficable areas. Sufficiently sized concrete apron provided in the direction of covers opening on which the covers can be readily placed. |  |  |  |  |
| Min. clear opening 1000mm x 1000mm. |  |  |  |  |
| Hinged covers designed and positioned such that the covers and safety grilles lie flat when fully open. |  |  |  |  |
| Overflow pipe and gas check valve | Min. one size larger than the wet well low-level inlet line or the flow capacity of the upstream system, whichever is the largest. |  |  |  |  |
| Have min. 0.5% incline from the inlet MH to the gas check MH. |  |  |  |  |
| Gas check valve able to fully open freely. |  |  |  |  |
| Emergency relief outlet structure | Concrete headwall with Gr. 316 stainless steel screen, brackets and fasteners. |  |  |  |  |
| Energy dissipation downstream and soil stabilization/erosion protection design around the structure. |  |  |  |  |
| Vehicular access to outlet structure for maintenance. |  |  |  |  |
| **EMERGENCY STORAGE** | |  |  |  |  |
| Top of emergency storage structure | Access openings min. 300mm higher than 1% AEP level and max. 25mm higher than the surrounding concrete slab or ground level. |  |  |  |  |
| All perimeter concrete edges chamfered at 25mm x 45O. |  |  |  |  |
| Capacity | Confirm emergency storage capacity meets the requirements of Needs Specification |  |  |  |  |
| Access covers | Provide sufficient number of access openings for washing down by hand held hose where no washdown system is provided. |  |  |  |  |
| Minimum two 1000mm x1000mm clear openings positioned diagonally opposite provided. |  |  |  |  |
| Hinged lightweight (aluminium) with hinged stainless steel safety grilles in non-trafficable areas. |  |  |  |  |
| Heavy duty split solid-top type with removable stainless steel safety grille in trafficable areas. Sufficiently sized concrete apron provided in the direction of covers opening on which the covers can be readily placed. |  |  |  |  |
| A separate cover with min. 450mm x 450mm clear opening for instrumentation provided in trafficable areas only. |  |  |  |  |
| One of the above access opening located over the deepest part of the storage facility and sized for the required emergency by-pass pump. |  |  |  |  |
| Personnel access | Ladder ties provided adjacent to all access points to secure a portable ladder (fixed ladders shall not be provided). |  |  |  |  |
| Head room inside tank | Minimum 2.2 m. Where space is limited, storage is under road and has small footprint, headroom can be reduced if additional access openings provided. |  |  |  |  |
| Wash-down capability | Storage can be hosed down without entering it. |  |  |  |  |
| Automatic washdown system emergency storage cannot be hosed down from the surface. |  |  |  |  |
| Floor | Min. 1% grade towards the outlet. |  |  |  |  |
| Ventilation arrangement | Induct and educt vents. |  |  |  |  |
| Educt vent connected to the educt vent shaft. |  |  |  |  |
| Induct vents 600mm high Gr. 316 stainless steel box. |  |  |  |  |
| Level sensors | Hydrostatic or radar type. |  |  |  |  |
| Show location and type on general arrangement drawings with details shown on electrical drawings |  |  |  |  |
| Permanent survey label plate | Located on roof slab near the instruments. |  |  |  |  |
| Label plates engraved Gr. 316 stainless steel showing TOC RL. |  |  |  |  |
| **PUMPING UNITS** | |  |  |  |  |
| Pump selection | Power rating margin min. 15% over pump operating range from zero flow to 110% of duty flow and non-overloading at minimum head condition. |  |  |  |  |
| Motor not to stall at any point on pump performance curve. |  |  |  |  |
| NPSHr appropriate under all operating conditions. |  |  |  |  |
| Min. 2m NPSH margin under all operating conditions. |  |  |  |  |
| Normal duty range between 50% and 120% of BEP flow rate. |  |  |  |  |
| Overall efficiency at the nominated duty point min. 40%. |  |  |  |  |
| For pumps with VSDs, the impeller diameter selected to meet the duty point at 95% of maximum speed. |  |  |  |  |
| For fixed speed pumps, the impeller diameter min. one size smaller than the maximum size that the pump can accommodate. |  |  |  |  |
| Pump selected for 50Hz max. speed. |  |  |  |  |
| Pumping units comply with WSA 101 and SW Supplement. |  |  |  |  |
| Hydraulic flush valve | Fitted to at least one pump (typically pump no. 1) facing the benching. |  |  |  |  |
| Where not feasible, use a return flush line off discharge pipes. |  |  |  |  |
| Pump numbering | From left to right viewed from upstream of the wet well in the direction of flow. |  |  |  |  |
| Pump and motor data | Details shown on drawings in a pump and motor data table. |  |  |  |  |
|  | Details include: make, model, impeller size, duty point(s), motor rating, speed (range), voltage, no. of phases, starter type, overall mass. |  |  |  |  |
| Pump pedestal / discharge connection | Comply with WSA 101 and SW Supplement. |  |  |  |  |
| Installed as per SW requirements. |  |  |  |  |
| Installation details shown on drawings and described in notes. |  |  |  |  |
| Taper on discharge line | Any tapers next to pump footstep bend are eccentric. |  |  |  |  |
| **VALVE CHAMBER** | |  |  |  |  |
| Top of valve chamber | Slab/roof level min. 300mm higher than 1% AEP level and max. 25mm higher than the surrounding concrete slab or ground. |  |  |  |  |
| All perimeter concrete edges chamfered at 25mm x 45O. |  |  |  |  |
| Location | At sufficient distance from the wet well to allow for a rocker pipe, or otherwise integral part of the wet well. |  |  |  |  |
| Structural design ensure minimal risk of differential settling. |  |  |  |  |
| Pipework clearances | As per SW Edition of WSA 04 and relevant DTC drawing(s). |  |  |  |  |
| Pipework set-out | Dimensions shown on drawings. |  |  |  |  |
| Pipework and valve materials | All metallic (DI or stainless steel). |  |  |  |  |
| Valve sequence on each pump discharge pipe | In direction of flow: non-return valve, load bearing dismantling joint, then isolating valve. |  |  |  |  |
| Air release valves upstream of the non-return valves provided where the depth from the discharge pipe obvert level to the bottom of the wet well is ≥10m. |  |  |  |  |
| Pressure main isolation valve position | Downstream of scour and upstream of bypass connection. |  |  |  |  |
| Isolation valves | All isolation valves flanged, resilient seated gate type with non-rising spindle and close in anti-clockwise direction. |  |  |  |  |
| All valves ≥DN450 electrically actuated. |  |  |  |  |
| If electrically actuated show pedestal and enclosure or locking plate details. |  |  |  |  |
| Pedestals installed on top of valve chamber cover. |  |  |  |  |
| Valve extension spindles | Provided with support brackets and finish 50 mm underside of the valve chamber cover. |  |  |  |  |
| Provide ø80mm holes above valve spindles. |  |  |  |  |
| All openings in gratings cut and banded before galvanizing. |  |  |  |  |
| Non-return valves | All non-return valves long bodied swing check type with extended hinge pin, lever and counterweight and guard, unless determined otherwise by transient analysis. |  |  |  |  |
| Counterweight positioned away from normal personnel access path, e.g. to face valve chamber walls. |  |  |  |  |
| Proximity no-flow (limit) switches installed. |  |  |  |  |
| Provide hooks on valve chamber walls to hang levers and counterweights if not used. |  |  |  |  |
| Valve supports | Concrete supports with separating 3mm thick neoprene sheet provided under all valves. |  |  |  |  |
| Air release valves | Fully metallic bodied, suitable for sewage application. |  |  |  |  |
| Exhaust piped back to the wet well. |  |  |  |  |
| Provide isolating valve upstream of air release valve. |  |  |  |  |
| Isolating ball valve provided in exhaust pipe. Valves ≥DN50 of 2-part design with PTFE seals and long handles. Handles to operate in vertical plane (up and down only). |  |  |  |  |
| Provide a 3-way union in exhaust pipe near the valve for valve removal. |  |  |  |  |
| Scour line | Scour isolating valve positioned next to branch off tee on the pressure main to reduce solids accumulation. |  |  |  |  |
| Capable of draining the pressure main within 30-45 minutes. |  |  |  |  |
| Drains to the wet well. |  |  |  |  |
| Drain line | Min. DN100 PVC-U or PE pipe. |  |  |  |  |
| Outlet fitted with a P-trap and flap valve inside the wet well. |  |  |  |  |
| Duck bill valve and a rodding pipe used instead of flap valve where overflow level is higher than the valve chamber floor level. |  |  |  |  |
| P-trap and check / duck bill valve installed parallel to wet well wall. |  |  |  |  |
| Duck bill valve positioned min. 1m below the valve chamber invert level. |  |  |  |  |
| An aluminium surface box with hinged cover provided above the rodding pipe with a label ‘Rodding pipe’ next to it. |  |  |  |  |
| Valve chamber graded towards the drain. Benching flush with drain line invert. |  |  |  |  |
| Wet well flushing line (where installed) | Connected upstream of pump discharge non-return valves. |  |  |  |  |
| Use electrically actuated eccentric plug valve for control. |  |  |  |  |
| Dismantling joints | All dismantling joints thrust bearing type. |  |  |  |  |
| Puddle flanges | Provided at all wall penetrations. |  |  |  |  |
| Access covers | Open grating galvanized steel. Marine grade aluminium or Gr. 316 stainless steel chequer plate (if close to coastline or in areas accessible to public, such as parks and reserves) in non-trafficable areas. |  |  |  |  |
| Hinged and locked over access ladders. |  |  |  |  |
| Open grating to have serrated finish on top. |  |  |  |  |
| Personnel access | Permanent inclined rung type access ladders with handgrips to AS1657. |  |  |  |  |
| Pressure tapping points | DN15 tapping point upstream of each non-return valve, one downstream of each pump isolating valve or common manifold (unless buried) and one downstream of the pressure main isolation valve (unless buried). |  |  |  |  |
| All pressure tapping points positioned on top of pipe and fitted with Gr. 316 stainless steel block and bleed 2-part stainless steel ball valves. |  |  |  |  |
| One DN15 tapping point with a Gr. 316 stainless steel 2-part ball valve provided between the bypass line isolating valves on bottom of the pipe. |  |  |  |  |
| Permanent survey label plate | Label plate engraved Gr.316 stainless steel. |  |  |  |  |
| Installed in the concrete wall to show the valve chamber TOC RL. |  |  |  |  |
| **BYPASS ARRANGEMENT** | |  |  |  |  |
| By-pass pump connection point | Quick disconnector type coupling with isolating valve and non-return valve installed horizontally within an above ground concrete bund and suitably positioned for connection of bypass pump. |  |  |  |  |
| Male Kamlock coupling up to DN100 or female Bauer coupling(s) for >DN100 sized in accordance with WSA 04. |  |  |  |  |
| DN15 tapping point with Gr. 316 stainless steel 2-part ball valve at the base of coupling (outlet facing floor of bund). |  |  |  |  |
| Secured dust caps on coupling to prevent unauthorised removal. |  |  |  |  |
| Isolating valve on bypass line positioned next to pressure main branch off tee to avoid solids accumulation. |  |  |  |  |
| Bypass connected to the pressure main downstream of the pressure main stop valve. |  |  |  |  |
| Provide scour to wet well if bypass line longer than 10m. |  |  |  |  |
| Valve supports | Concrete support blocks with 3mm thick separating neoprene sheet provided under all valves. |  |  |  |  |
| Bund | Drains to the inlet MH at min. 1% fall (provide a P-trap and a flap in inlet MH turned parallel to the wall). |  |  |  |  |
| Security enclosure | Security enclosure provided if determined necessary by site specific risk assessment (eg. unfenced sites). |  |  |  |  |
| **PRESSURE MAIN** | |  |  |  |  |
| Material and size | DICL or HDPE, as per Needs Specification. |  |  |  |  |
| Anchor / thrust blocks | Sized for max. test pressure. |  |  |  |  |
| Velocity | Minimum velocity to control slime and solids build-up. |  |  |  |  |
| Rating | Analysis done to verify surge and fatigue (if applicable). |  |  |  |  |
| Min. PN16 in trenched installations. Min. PN20 in trenchless (eg. horizontally directionally drilled) sections. |  |  |  |  |
| Design drawings nominate design and allowable site test pressures. |  |  |  |  |
| Water hammer | Transient analysis conducted. |  |  |  |  |
| Mitigation measures required. |  |  |  |  |
| Scour | Scours provided at all low points and at the valve chamber. |  |  |  |  |
| Pigging / rodding points | Provided for trenchless (eg. HDD) sections. |  |  |  |  |
| To comply with SW standard details. |  |  |  |  |
| Air release valves | Automatic air release valves provided at high point(s). |  |  |  |  |
| Fully metallic, suitable for sewage application. |  |  |  |  |
| Installed in a chamber(s) and off roads with provision for connecting line flushing. |  |  |  |  |
| Resilient seated gate valve installed upstream of air release valve. |  |  |  |  |
| Isolating ball valve provided in exhaust pipe. Valves ≥DN50 of a 2-part design with PTFE seals and long handles. Handles to operate in vertical plane (up and down only). |  |  |  |  |
| Provide a 3-way union in exhaust pipe near the valve for valve removal. |  |  |  |  |
| Ensure sufficient sealing pressure under min. head. |  |  |  |  |
| Air release valves connected to odour control unit and / or vent shaft. If close to pumping station, connected to wet well or educt vent shaft. |  |  |  |  |
| Flow meter | Generally required for large SPSs and where SPS is pumping directly to treatment plant. |  |  |  |  |
| Ultrasonic clamp-on type. |  |  |  |  |
| Installed in chamber. |  |  |  |  |
| Pressure main discharge maintenance hole | Internally coated in accordance with WSA 201 and vented. |  |  |  |  |
| Two MHs downstream of the discharge MH also coated. |  |  |  |  |
| Vent shaft at discharge MH have a diameter equal to the diameter of downstream sewer up to a max size of DN300. |  |  |  |  |
| **ELECTRICAL EQUIPMENT – GENERAL REQUIREMENTS** | |  |  |  |  |
| Power supply authority’s substation | Installed outside the SPS fenced perimeter. |  |  |  |  |
| If the perimeter fence is within the earthing zone of the HV substation the fence earthing shall comply to relevant AS. |  |  |  |  |
| Pits | All pits sized to provide at least 50% spare capacity. |  |  |  |  |
| Provided with drainage. Points of discharge shown on drawings. |  |  |  |  |
| Provide min. 1200mm x 1200mm x 900mm deep pit in front of the electrical kiosk or switch room. |  |  |  |  |
| All electrical pits shown on site plan. |  |  |  |  |
| Conduits | Layout of all conduits shown on site plan and detailed on electrical and civil drawings. |  |  |  |  |
| Conduits installed such that there is at least 50% spare capacity. |  |  |  |  |
| Conduits installed with fall away from electrical pits |  |  |  |  |
| Kiosk - position and orientation | Base of kiosk min. 300 mm above 1% AEP level. |  |  |  |  |
| Installed on concrete plinth max. 160mm high measured from surrounding concrete apron. |  |  |  |  |
| Oriented so that narrow sides face East and West. |  |  |  |  |
| Doors to face the wet well. |  |  |  |  |
| Location and orientation shown on site plan. |  |  |  |  |
| Provide a shade structure above the kiosk, unless approved otherwise by Sydney Water. |  |  |  |  |
| Doors able to open fully. |  |  |  |  |
| Provide a concrete apron with min.1500mm clear space in front and 900mm clearance on both sides of kiosk (for MDF and generator connections) and 600mm at the back. |  |  |  |  |
| Electrical switch room | Brick building to SW DTC drawings. |  |  |  |  |
| Include toilet facility with water supplied downstream of RPZD |  |  |  |  |
| Electrical turrets | Base of turrets min. 300mm above 1% AEP. |  |  |  |  |
| Roughly positioned at ‘9 and 3 o’clock’ central to the pumps when viewed in the direction of flow. |  |  |  |  |
| Positioned min. 1700mm from the opening to which conduits run. |  |  |  |  |
| Wider side to face wet well or inlet MH, as appropriate. |  |  |  |  |
| Electricity metering panel | Positioned so that no entry is required into confined spaces. |  |  |  |  |
| Located outside of electrical kiosk or building (where provided). |  |  |  |  |
| Telecommunications pit | Located within 5m of switchboard. |  |  |  |  |
| Soft starters | Located in switch room if >125kW. |  |  |  |  |
| VSD | Located in kiosk if ≤22 kW and in ventilated switch room if >22 kW. |  |  |  |  |
| **STRUCTURAL DESIGN** | |  |  |  |  |
| Basis of design | Consideration of available contingency in the event of failure due to seismic and wind events in determining Importance Level in the context of Sydney Water operational requirements and compliance to Table F1 of AS/NZS 1170.0. |  |  |  |  |
| Minimum Importance level (refer to Technical Specification – Civil, cl. C10.9.4). |  |  |  |  |
| Design life (refer to Technical Specification – Civil, cl. C10.1.6). |  |  |  |  |
| Temporary / permanent structure (any anticipated future modification). |  |  |  |  |
| 1 in 100 year ground water level determined for buoyancy check (refer to Technical Specification – Civil, cl. C10.9.1). Nominate source and RL. |  |  |  |  |
| If 1 in 100 year ground water level is not available, assumed at natural surface level for buoyancy check. |  |  |  |  |
| Geotechnical interpretive report with recommendations for allowable bearing pressure, modulus of subgrade reaction, earth pressure coefficients for design action and design resistance etc. |  |  |  |  |
| Design Report submitted with drawings includes structural demands and capacities for all critical elements. |  |  |  |  |
| Construction and site consideration | Impact to stability and strength of any adjacent structures. If Sydney Water asset is impacted, SEA report to be produced. |  |  |  |  |
| Layout of site, location of crane-pads / heavy construction traffic at proximity to pumping station, needing checks for additional loads or protection. |  |  |  |  |
| Sloped ground, unbalanced soil pressure on walls / foundation, stability of sloped ground in structure proximity. |  |  |  |  |
| Proximity to road / traffic, effect on structure from foundation of vehicle barriers. |  |  |  |  |
| Inground and above ground services - overhead wires / buried services identified and considered for the construction and maintenance of pumping station. |  |  |  |  |
| Pumping station at location of disturbed soil or brownfield. Additional consideration for stability or soil toxicity. |  |  |  |  |
| Impact to / from other buried structures (chambers, tanks or thrust blocks) adjacent to the pumping station. The pumping station must be independent in all structural aspects to any adjacent buried structures. |  |  |  |  |
| Impact on neighbouring property, e.g. retaining walls, swimming pools, trees, etc. |  |  |  |  |
| Potential of stray current flowing into pumping station from adjacent services. |  |  |  |  |
| Loading | Self-weight. |  |  |  |  |
| Superimposed dead load, additional soil fill, concrete finishes. |  |  |  |  |
| Live load (refer to Technical Specification – Civil, cl. C10.9.3). |  |  |  |  |
| Earth pressure due to retained soil, surcharge from traffic, crane pad, adjacent structure, etc. (refer to Technical Specification – Civil, cl. C10.9.7), |  |  |  |  |
| Lateral pressure in retained rock excavation to geotechnical interpretive report. |  |  |  |  |
| Earth pressure coefficient for design action to geotechnical interpretive report. |  |  |  |  |
| Earth pressure coefficient for design resistance to geotechnical interpretive report. |  |  |  |  |
| Contained liquid level for serviceability check (refer to Technical Specification – Civil, cl. C10.10.12). |  |  |  |  |
| Contained liquid level for strength check. |  |  |  |  |
| Ground water pressure in combination with earth pressure and surcharge loading for serviceability and strength check. |  |  |  |  |
| Ground water table for buoyancy check (refer to Technical Specification – Civil, cl. C10.9.1). |  |  |  |  |
| Temperature load on roof from variation in ambient temperature and internal content temperature (refer to cl. 2.2. 1 of AS 3735). |  |  |  |  |
| Shrinkage and swelling (refer to cl. 2.2.2 of AS 3735). |  |  |  |  |
| Seismic loading – excitation from content and additional earth pressure from surrounding soil (refer to Technical Specification – Civil, cl. C10.9.6).  The earth pressures due to seismic loading must be calculated following Appendix I of AS 4678-2002 (that refers an older version of AS 1170.4). Where the provisions of the updated AS 1170.4 differ from Appendix I of AS 4678, the provisions of updated AS 1170.4 apply. |  |  |  |  |
| Design load on bollards required to restrict vehicular traffic (refer to Technical Specification – Civil, cl. C10.9.8). |  |  |  |  |
| Thrust load from all anchored pipes. |  |  |  |  |
| The structure to be also checked for a case during hydrostatic testing, before backfilling. Both group A and B effect as per AS 3735 to be checked. The reinforcement stress to be treated as for group B effect. |  |  |  |  |
| Load combination to Technical Specification – Civil, cl. C10.10.12.  Additional combinations required to include seismic earth pressure. |  |  |  |  |
| Analysis model | Member size selection (refer to Technical Specification – Civil, cl. C10.10.6). |  |  |  |  |
| For large members, heat of hydration refer to Technical Specification – Civil, Table 3-2 note 5. |  |  |  |  |
| Member connection - fixed/pinned/springs to be based on practical aspects. |  |  |  |  |
| Soil support - soil stiffness modulus as recommended in the geotechnical factual report. |  |  |  |  |
| Cover to reinforcement in liquid retaining structures comply with Table 10-4 and Table 10-5 of Technical Specification – Civil, and in non-liquid reattaining structures to Tables 4.10.3.2 and 4.10.3.3 of AS 3600 or Tables 4.14.3.2 and 4.14.3.3 of AS 5100. |  |  |  |  |
| Structural demand for temperature effects to clause 2.2.1 of AS 3735 takes into consideration the reduced member stiffness for cracking and nonlinear analysis if applicable. |  |  |  |  |
| Design checks | Australian Standards:   * AS/NZS 1170 - Suite of loading standard * AS 1170.4 - Earthquake actions in Australia * AS 3735 – Concrete structures for retaining liquid * AS 3600 – Concrete structures * AS5100.5 – Bridge design, Concrete * AS 1657 – Fixed platforms, walkways, stairways, and ladders   Sydney Water specifications   * CPDMS0023 - Technical Specification - Civil * D0000833 – Engineering Competency Standard * CPDMS0021 – Computer Aided Drafting * D0000653 – Safety in Design Procedure   WSAA Codes:   * WSA 201 – Manual for Selection and Application of Protective Coating |  |  |  |  |
| Minimum reinforcement (refer to Technical Specification – Civil, cl. C10.10.9). |  |  |  |  |
| Early thermal and shrinkage crack width (refer to Technical Specification – Civil, cl. C3.14). |  |  |  |  |
| Deemed to comply crack width in service to cl. 3.2.3 of AS 3735. |  |  |  |  |
| Maximum earthquake base shears in two orthogonal directions for the entire structure to cl. C10.9.4 of Technical Specification – Civil (values to be provided in the description / reference column). |  |  |  |  |
| Buoyancy check (refer to Technical Specification – Civil, cl. C10.9.2 and cl. 4.2.3 of AS1170.0).  Ultimate buoyance demand and capacity values (to be provided in the description / reference column). |  |  |  |  |
| Durability design - concrete cover to cl. C10.10 of Technical Specification - Civil and additional protection where required to WSA 201. |  |  |  |  |
| Concrete strength and mix proportions (refer to Technical Specification – Civil, cl. C3.6.3). |  |  |  |  |
| Vibration checks if applicable (refer to Technical Specification – Civil, cl. C10.9.9). |  |  |  |  |
| Maximum serviceability demands and corresponding serviceability capacities in the shaft wall for load combination *G + Fep + Q* (values to be provided in the description / reference column):   1. Axial force in wall in horizontal direction 2. Positive bending moment in wall in horizontal direction 3. Negative bending moment in wall in horizontal direction 4. Positive bending moment in wall in vertical direction 5. Negative bending moment in wall in vertical direction |  |  |  |  |
| Maximum ultimate demands for seismic effects only (values to be provided in the description / reference column):   1. Axial tension (for precast shafts at location of fishplate connection) 2. Displacement of the shaft in horizontal direction 3. Bending moment in wall in vertical direction 4. Bending moment in wall in horizontal direction |  |  |  |  |
| Drawings | Concrete drawings including ground levels at cross sections. |  |  |  |  |
| Reinforcement details in plan / elevation and cross sections for all structural elements. |  |  |  |  |
| Joint detailing - construction joint, movement joint, filler and sealant and water stops (refer to Technical Specification – Civil, cl. C3.13). |  |  |  |  |
| Reinforcement details at penetrations and openings (refer to Technical Specification – Civil, cl. C10.10.14). |  |  |  |  |
| Reinforcement detailing at opening corners (refer to Technical Specification – Civil, cl. C10.10.13). |  |  |  |  |
| External water proofing / coating where required for durability. |  |  |  |  |
| Internal coating for durability where required to Tables 10-4 & 10-5 of Technical Specification – Civil and WSA 201. |  |  |  |  |
| Removable precast roof if required - hooks for craning - segmenting of the roof into liftable sizes. |  |  |  |  |
| Roof and hatch joint details, include waterproofing and sealants. |  |  |  |  |
| Reinforcement detail at opening L and T joints to cl C10.10.13 of Technical Specification – Civil. |  |  |  |  |
| Where precast components are used, details of joints assembly for water tightness. |  |  |  |  |
| Pre-cast wet wells and maintenance holes | Details to Sydney Water DTC drawing 6001 to 6050 for wet wells, depth up to 10m and, inlet maintenance holes, depth up to 9m. |  |  |  |  |
| Is structural connection required across the joints between segments to sustain earthquake loading. |  |  |  |  |
| For precast supplier and product refer to DTC-6021 |  |  |  |  |
| Precast maintenance holes and wet well design/drawing not as per DTC to be accompanied with design calculations. |  |  |  |  |
| **OTHER SITE SPECIFIC SPS REQUIREMENTS** | |  |  |  |  |
| SPSs receiving trade waste | Provide safety shower and eye wash. |  |  |  |  |
| Position shower and eye wash in shade where possible. |  |  |  |  |
| Incoming water pipes lagged. |  |  |  |  |
| SPSs with a permanent onsite gas/diesel generator or pump | Generator/pump installed in acoustic enclosure. |  |  |  |  |
| Fuel tank have a capacity to run the generator/pump for a min. 24 hours. Low fuel alarm raised at 50% level. |  |  |  |  |
| Reachable by a mobile crane and fueling tanker. |  |  |  |  |
| All details, including concrete plinth shown on the drawings. |  |  |  |  |
| Permanent generator sized to start and run all duty pumps and ancillaries. |  |  |  |  |
| Permanent bypass pump min. capacity to meet PDWF. |  |  |  |  |
| Pump self-primed in max. 180 seconds from cut-in level. |  |  |  |  |
| Provided additional discharge non-return valve outside the enclosure with proximity flow switch and conduit to it. |  |  |  |  |
| **MISCELLANEOUS** | |  |  |  |  |
| Pressure main(s) and external pipework | Thrust blocks/thrust forces shown on the drawings. |  |  |  |  |
| Materials schedule | Materials and parts listed on the drawings. |  |  |  |  |
| Numbers and description match with the drawings. |  |  |  |  |
| Mark numbers not duplicated or combined into one (eg. pipe spools). |  |  |  |  |
| For pipes that include puddle flanges, show total length, length from puddle flange to each end and whether pipe ends with a flange, socket or spigot. |  |  |  |  |
| Pipe connection details | All specified in notes. |  |  |  |  |
| Fasteners | Flange fasteners Gr. 316 stainless steel with insulating washers and sleeves where required. |  |  |  |  |
| Maintenance holes | Standard drawings in WSA 02 Sewerage Code of Australia referenced as appropriate to diameter and depth of sewer. |  |  |  |  |
| Grouting | Provided under all baseplates, feet and supports when mounted on concrete base or plinth or fastened to concrete walls, ceilings and floors. |  |  |  |  |
| Min. 20mm and max. 50mm thick. |  |  |  |  |
| Non-shrinking. |  |  |  |  |
| Signage | ’Do Not Drink’ at water tap post. |  |  |  |  |
| ‘No Parking - Sydney Water Vehicles Excepted’ outside gates. |  |  |  |  |
| Stop signs at access road ends inside gates. |  |  |  |  |
| ‘Confined Space’ on access covers. |  |  |  |  |
| ‘Two-Person Lift’ on covers and safety grilles where appropriate. |  |  |  |  |
| 10km/hr speed limit sign on access road. |  |  |  |  |
| Station facility number outside the fence and at public road. |  |  |  |  |
| ‘Do Not Trespass’ on outside the fence. |  |  |  |  |
| Affix Gr.. 316 stainless steel labels with asset (MAXIMO) numbers on concrete next to buried valves, if any (may need to provide small concrete slab next to valve). |  |  |  |  |
| Chemical dosing or Odour Control Unit | As per SW CDU or OCU Standard Specifications. |  |  |  |  |
| CDU tanker bund designed as a water retaining structure in accordance with AS3735 |  |  |  |  |
| Bund drainage with isolating valve to IMH provided. |  |  |  |  |
| Bund drain fitted with a P-trap and flap in the inlet MH turned parallel to the wall. |  |  |  |  |
| Chemical dosing line to IMH of a pipe-in-pipe arrangement for double containment purpose. |  |  |  |  |
| Provide break in pipe-in-pipe at the entry into the inlet MH. |  |  |  |  |
| Dosing pipe to exit outer pipe in IMH and terminate at an angle (approx. 15o from vertical) above benching. |  |  |  |  |
| Outer pipe support details shown on drawings. |  |  |  |  |
| HAZMAT box provided on a galvanized post inside the access gate. |  |  |  |  |
| Electrical and civil/mechanical drawings | Consistent with each other. |  |  |  |  |

**Document control**

**Ownership**

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| **Owner** | Manager, Engineering |
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| 3 | Structural Design | New section included. Minor amendments elsewhere. |
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| 1 | First issue | Not applicable. |