

**FOL15/876: Hyde Park Borehole Pipe Distribution Works Project**

**Schedule 4 – Contract-specific Works Information**

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1. Introduction

A new borehole was constructed in May 2012 near to the Diana Princess of Wales Memorial Fountain in Hyde Park. It is proposed to distribute water from this borehole throughout Kensington Gardens and Hyde Park. This borehole is termed Diana Borehole No.2.

There are two other boreholes in Hyde Park and Kensington Gardens as shown on *Dwg. No. A1\_245.T.01 General Water Distribution.* These are the Italian Gardens Borehole and the Diana Borehole No. 1.

Diana Borehole No. 1 is to be used as a stand-by only. Currently it supplies water only to the existing adjacent buried tank which in turn supplies the Diana Princess of Wales Memorial Fountain (and some other uses).

The signal for switching the borehole pump on and off is a simple float switch system within the existing buried tank, which is governed from the main panel within the Diana Plant Room.

The Italian Gardens Borehole currently supplies water to the Round Pond, The Long Water and the Hyde Park Reservoir (*Dwg. No. A1\_245.T.01 General Water Distribution).* The selection of sending water to these three points of discharge is governed by an Allen Bradley Micro Controller PLC within the Engine House at the head of the Long Water and within the Italian Gardens. Signals are received as follows:

1. Round Pond – via timed input
2. Long Water – via timed input and signal from the fountain pumping system
3. Hyde Park Reservoir – via float switches and GSM signalling

The Hyde Park Reservoir has a priority on calling for water from the Italian Gardens Borehole, with signalling via GSM.

The proposal now is as follows.

1. To decrease the amount of water abstracted in total from the Italian Gardens Borehole by using it only (or mainly) at times of maintenance works on the Diana Borehole No. 2.
2. To not use the Diana Borehole No. 1 at all, except at times of maintenance works on the Diana Borehole No. 2.
3. To use the Diana Borehole No. 2 as the main supply of water to the following:
	1. Hyde Park Reservoir and the Round Pond
	2. Diana Princess of Wales Memorial Fountain (via existing buried tank adjacent to Diana Borehole No. 1
	3. Numerous irrigation tanks and toilet supply tanks
	4. New Rotten Row sports pitches irrigation.

This work shall include integrating the existing controls at the Engine House with the controls for the new pump house at the Tennis Centre such that:

At the Engine House (for the Italian Gardens Borehole):

1. No signal is received from the Hyde Park reservoir via the existing GSM signalling system
2. New signal to be received from the Hyde Park Reservoir via the new fibre-optic secure network (see below) but only as a maintenance and emergency issue.
3. Pumping to the Round Pond can take place by manual operation via the existing panel
4. Pumping to the Long Water can take place by both manual operation via the existing panel and by signalling from the Fountains panel that the Tazza (a fountain within the Italian Gardens) is operational

In this way, the default setting for the Italian Gardens borehole will be that it only pumps to the Long Water.

In addition, the remote GSM functionality of the existing Italian Gardens control panel, in particular its receipt of start/stop signals from the Hyde Park Reservoir float switch signalling system is to be removed and superseded by the new control system which is to be directly interfaced with the existing panel via a new fibre-optic network. The new method of communication shall be via fibre-optic. The Royal Parks will have created (by the time of this contract’s start) the new network within the two parks, isolated from external communication.

In addition:

1. The existing three recording pulse water meters within the Engine House on the Round Pond, Hyde Park Reservoir and Long Water lines are to be remain as monitored within the existing control structure within the Engine House but with the system being networked into the new Royal Parks fibre-optic network system.
2. New pulse water meters are to be installed on the new pumping systems associated with the Diana Borehole No.2 distribution system. These meters are to be included within a new monitoring system and also connected via a new HTTPS Browser Network formed with the new fibre-optic network. These new meters shall be located on:
3. The Hyde Park Reservoir supply line
4. The Round Pond supply line
5. The Diana Princess of Wales Memorial Fountain existing buried tank supply line
6. The irrigation tanks and toilet supply tanks supply line
7. The new Rotten Row sports pitches irrigation supply line

Currently water is pumped from the Diana Borehole No. 2 only to the Serpentine as part of the 2012 works. The proposal now is that this borehole also pumps water to a new buried tank upslope and to the south-west (see *Dwg. No. A1\_245.T.01 General Water Distribution)* and from this new buried tank, water is pumped onwards to the points of discharge described immediately above.

1. Preliminaries and Mobilisation
2. Access is only available throughout the parks by prior agreement. Many roads, especially Serpentine Road are busy with motorised traffic, pedestrians, cyclist and horse riders. Any movements into and out of the sites must be supervised by a banksman. The contractor shall construct a compound at a location to be agreed and as deemed necessary for the works, temporary storage, site welfare facilities, site office and accommodation. The boundary of the compound shall be demarked by 2.4m Heras fencing with lockable gates and fitted with appropriate signage and flashing warning lights at appropriate places.
3. Working hours shall be limited to 7.00am – 6.00pm Monday to Friday with negotiated extensions and weekend working by arrangement with the Royal Parks
4. Allow for containment of waste to be removed from site
5. This mobilisation component shall comprise all necessary H&S, CDM, permitting and administrative work.
6. No potable water is available on site.
7. The contractor shall allow to locate buried & overhead services and to allow for their protection.
8. All damage must be made good at handover. This includes, but is not limited to tarmac and hard standing, kerbs, rails, kiosks, posts & poles.
9. Submission of O&M Manuals. The contractor shall also adhere to statutory reporting requirements, plus statutory requirements of the water undertaker, power distribution company and any other utilities.
10. General Standards of Installation

The Contractor shall diligently follow the manufacturers’ recommendations for the installation of all pipes, ducts, tanks, chambers, valves and any other item of equipment or component of this works package.

1. General Specifications for Materials and Installation
	1. Trenching

Pipe and duct installation shall be by open trenching only using a combination of hand-digging and by mini-digger only. The contractor shall satisfy himself of ground conditions and buried services/roots in order to do this and is reminded of The Royal Park’s policy on working under and close to trees.

The trench width and depth shall be as small as required to provide the correct degree of separation between the equipment to be installed. The NJUG Guidelines on the Positioning and Colour Coding of Underground Utilities’ Apparatus shall be followed, but provisionally equipment shall be laid as follows:

|  |  |  |
| --- | --- | --- |
| **Equipment** | **Min depth to crown** | **Max depth to crown** |
| Potable water | 900mm | 1350mm |
| Borehole water | 750mm | 1350mm |
| General ducts | 600mm | 1350mm |
| LV signal cable duct | 600mm | 750 |
| Fibre-optic duct | 600 | 750 |

Table 1: Services depths

In addition, any further condition imposed by Thames Water upon the installation of the potable pipe work shall be followed. This contract does not extend to the commissioning of the potable systems.

Where trenching takes place, the Contractor shall first remove the turf – if present - with a turf cutter and store the turf on polythene sheets. The base of the trench shall be backfilled with an approved material free of stones, frozen material, vegetation or sharp objects (either imported material or screened arisings), to ensure a smooth floor.

It is anticipated that as-dug material shall be used for pipe embedment and backfill with excess material removed from site at the contractor’s expense. As dug materials shall have the following properties:

* It should be easy to scrape or shovel to form a bed on which to lay a pipe, and also be easy to distribute uniformly beneath the haunches of a pipe by tamping.
* The largest particle size should not be excessive in relation to the pipeline diameter otherwise impact damage and concentrated point loading can occur.
* It should not contain particles with sharp edges when used with those pipes or pipe coatings that are susceptible to damage.
* The grading should be such that water passing through will not encourage fine materials to be carried away and thus reduce the support for the pipeline.

If required by the engineer, Compaction Fraction tests shall be carried out in order to further determine the suitability of the arisings for reinstatement, and the quantity of import fill to be used. This may be done on a location by location basis.

Pipes and ducts shall be laid and embedded with the approved as-dug material and compacted by using manual punners. Backfilling shall be done in loose increments of no more than 150mm depth and properly compacted prior to the next increment. Mechanical compactors should not be used until the total depth of backfill over the pipe exceeds 450mm. The final increment shall be a topsoil material and the Contractor shall re-lay the turf. Where turf is of poor quality it shall be replaced with new turf of an equivalent type at the Contractor’s expense. If and where as-dug material is not appropriate for backfill, instructions shall be sought from the engineer and appropriately costed into the contract.

Trees, shrubs, herbaceous borders and seasonal borders shall be treated as per the General Standards of Installation. The tendering contractor is again reminded of The Royal Parks policy on carrying out works near trees.

Where paths are open cut the Contractor shall re-instate the paths to the same surface standard as the original construction. Rammal or hoggin bases not complying with Tables 5/3 (coarse aggregate) or Table 5/4 (fine and all-in aggregated) material for pipe bedding, haunching and surrounding (EN13242), shall be removed and the path base re-made with Type 1and then finished to the Royal Parks standard to insure full re-instatement. This will involve hot-tarmac and top-dressing to The Royal Parks specification.

Two major road crossings are proposed of Serpentine Road. One shall be to the west of the new underground tank, and one just north of the Serpentine Bar & Kitchen at the east end of the Serpentine. Both crossings shall be open cut in two halves with an appropriate traffic management system and reinstated for each one. Importantly, the crossing of the road adjacent to the Serpentine Bar & Kitchen shall be diagonally. The Serpentine Road is not a public road, but the excavation of the trench, placement of the equipment and re-instatement shall follow the Code of Practice under the New Roads and Streetworks Act 1991 ‘Specification for the reinstatement of openings in Highways’, and whilst the site north of the Serpentine Bar & Kitchen is trafficked with private vehicles and numerous pedestrians, cyclists, roller-bladers and horses, the other western crossing carries public vehicles as well.

* 1. Polyethylene Pipe Work

PE pipe work for non-potable use shall be as follows:

* Black
* SDR17
* PE100
* Complying with BS EN12201 (all parts)
* Jointed by electrofusion sockets only or butt-welded only
* All fittings WRAS approved
* Installed with a ‘Caution – Raw Water Main’ Detectable mesh such as the 200mm x 100mm Terram wire Detectamesh (or approved equal) laid at 350mm below finished ground level and above the centre line of the pipe

PE pipe work for potable use shall be as follows:

* Blue
* SDR11
* PE80
* Complying with BS EN12201 (all parts)
* Jointed by electrofusion sockets only or butt-welded only
* All fittings WRAS approved
* Installed with a ‘Caution – Water Main’ Detectable mesh such as the 200mm x 100mm Terram wire Detectamesh (or approved equal) laid at 350mm below finished ground level and above the centre line of the pipe

All pipe work shall be laid with a depth from finished ground level to the crown of the pipe of between 750mm and 1350mm.

The Contractor must state their proposed machinery and plant list for pipe installation in their method statement, indicating the type, make and model of machine.

All open ends of pipe which may fill with dirt or mud in the event of rain, shall always be plugged or capped before leaving each day or when work is not in progress.

Pipes should be installed such that horizontal and vertical curvature do not exceed manufacturer’s specifications. Under no circumstances should pipes be bent or re-shaped by means of heat or any other method.

After the completion of each section of pipe-work, pipes shall be flushed to remove any dirt or debris and then tested by the Contractor in accordance with the instructions of the Engineer. As a minimum this shall be as follows:

The entire pipe network shall be tested for a period of not less than 6 hours at 1.5 times the rated pressure. During this time losses due to leakage shall not exceed 5% of the calculated stored volume in the pipe network, to be calculated by the Engineer prior to enactment of the test. Where components of existing systems are re-used (e.g. cast-iron pipe work) temporary blanking shall be used to restrict the testing to the polyethylene network. Any leaks or bursts resulting from the tests shall be repaired at the Contractor’s expense.

* + 1. General Ducting

All general ducts, i.e. not including purpose-made fibre-optic ducting, shall be installed in accordance with the Manual of Contract Documents for Highway Works Volume 1 Specification for Highway Works, Series 500 – Drainage and Service Ducts, Table 5/2, and be of thermoplastics structured wall (Twin Wall) to BS EN 50086-2-4 and to BS EN 50086-2-4. All path crossings and road crossings where control cabling and pipes sized at Ø110mm or smaller pass beneath shall be fitted with such ducts. In addition to the specific requirement of this project as shown within the drawings, all path and road crossings shall be fitted with one additional 150mm Twin Wall duct and full-length draw-rope and plugged with removable plugs prior to backfilling.

* + 1. Low Voltage Signal Cable Ducting

Internally smooth ducting for copper-based signal cabling (<40VAC) shall meet the minimum requirements of EN50086 and installed generally as per the Manual for Contract Documents for Highway Works Volume 3. It shall be sized at nominally 100mm.

* + 1. Low Voltage Signal Cable

Signalling for Motorised Valve Actuation

Signal cabling (for electrically actuated motorised butterfly valves) shall comprise 2c x 2.5mm2 XLPE insulated, PVC bedded, steel wire armoured and PVC sheathed cable with annealed copper conductors complying with BS EN 60228 class 2 and designed in accordance with BS 546.

There should be no cable joints between valve actuators and control panels.

NB: All motorised valves shall be capable of being manually over-ridden with a hand-wheel.

Signalling for other Non-motorised Valve Actuation Requirements

Control cables shall comprise 2c or 3c (as specified) x 2.5 mm2 solid copper conductors, double insulated and sheathed with pure, non-hydroscopic PE, conforming to BS6346/69 or CEI 60502-1.

No cable joints are to be made below ground level.

* + 1. Fibre-optic Ducting

Fibre-optic ducting shall be suitable for direct-burial and be a bundled micro-duct comprising a seven-way bundle of Ø12/10mm ducts within a single bundle overall OD of 43.8mm as manufactured by Emtelle – Product Code 60144 - or approved equal.

* + 1. Fibre-optics

Fibre-optic supply and installation within ducts is outside of this contract except a continuous length of 10mm fibre cable laid between the Tennis Centre Pump House and the Diana Plant Room.

* + 1. Inspection Chambers

All pre-cast manholes are to be made to BS EN 5911-3 and BS EN 1917and sized at DN900 or DN1200 as appropriate for valve and pipe work, except as where otherwise specified. Chambers for signal cabling and fibre-optic ducting shall be manufactured in accordance with BS EN 13598-2:2009. Manufacturers to be approved prior to installation and the manufacturer’s installation recommendations are to be followed.

Where instructions and specifications are not given which are contrary to the Manual of Contract Documents for Highway Works Volume 1 – Specification for Highway Works, Series 500, Clause 507, the Manual of Contract Documents for Highway Works shall be followed. This includes method of laying and penetrations.

Concrete chambers shall be installed upon ST1 C25 concrete with a minimum depth of 200mm.

* + 1. Concrete, Bricks & Blockwork & Mortar

Where instructions are not given which are contrary to the Sewers for Adoption 7th Edition (SFA7), Part 5 – Civil Engineering Specification, the Sewers for Adoption 6th Edition, Part 5 – Civil Engineering Specification shall be followed.

All concrete shall follow the specifications within the following standards:

BS EN 206-1 Concrete – Part 1: Specification, performance, production and conformity

BS 8500-1 Concrete – Complementary British Standards to BS EN 206-1. Part 1: Method for specifying and guidance for the specifier

BS 8500-2 Concrete - Complementary British Standards to BS EN 206-1. Part 2. Specifications for constituent materials

The supply of ready-mix concrete shall be via a plant is approved by a Third Party Certification Body accredited under Category 2 (Product Conformity) by the National Accreditation Council for Certification Bodies.

All cement shall be sulphate resisting Portland Cement complying with the provisions of BS EN 197-1. Mortar shall be mixed on site as required and shall comply with the requirements of BS EN 998-1 and BS EN 998.2

All bricks used below ground or as part of a below ground structure shall be Class B Engineering bricks complying with the relevant provisions of BS 3921 and shall be F-Category frost resistant.

* + 1. Testing and Commissioning

Allow for all testing and commissioning for all systems and the interaction of newly installed components with existing systems (e.g., but not exhaustively, toilet supply connections). This is to be allowed for at all stages of the contract, within individual phases or identifiable phases, and at completion.

1. Detailed specification
	1. Buried tank

A new buried GRP tank shall be installed as shown on *Dwgs. No A2\_245.T.07 Buried tank and Booster Pump Sets and A2\_245.T.08 Buried tank and Booster Pump Sets – plan*.

The tank specified is a Spel Tankstor ®Type 400 and shall be installed as per the manufacturer’s instructions, (see attached document ‘Spel Products Data Manual -Section 4 SPEL underground tanks – speciﬁcations and installation’) - but alternative manufacturers may be offered.

The tank’s location is as shown in *Dwg. No. A1\_245.T.02 Tennis centre pump house & tank location.* Some geotechnical drilling was carried out in June 2015 to ascertain ground conditions and this information is appended.

The useable volume of the tank, i.e. between high water filling and low water pump cut out shall be not less than 40m3 and this shall be verified upon completion.

The tank shall be used for the temporary storage of Chalk groundwater only pumped directly from the Diana Borehole No. 2. From the tank, water shall be transferred by the four pumping systems described in 5.6 New Pumping Systems’ below.

The tank shall be fitted with 4 No. access shafts sized and fitted in turn with guide rails and appropriate autocouplers for the submersible pumps specified below. The access shafts shall each be fitted with a lockable D400 heavy duty ductile iron lid with an adjacent flush fitting and capped davit socket.

The tank shall be fitted with all the pipe work specified below as part of the ‘New Pumping Systems’. This includes penetrations through the tank walls for the 4 No. separate riser pipes, ducts for power cabling for each pump, a duct for signal cabling and a Ø100mm vent which can be taken on a constant rising grade to within 20m of the tank via Ø110mm PE100 pipe work and fitted with a flanged, and stabilised in C25 concrete, hot-dipped galvanised DN100 vertical vent pipe c/w 180° u-turned top section opening faced downwards and fitted with a 10mm mesh vermin guard at an elevation of 300mm above ground level. The location of the vent-stack shall be agreed but provisionally shall be within the adjacent soft-landscaping of the Tennis Centre adjacent to the proposed pump house.

* 1. Pipe work and ducting

The location of the tank, subject to final archaeological investigation shall be sited as per the drawings. Ducting, with power and signal cabling, together all rising pipe work shall be determined precisely on site but the schematic configuration is as shown on *Dwg. No. A2\_245.T.08 Buried tank and Booster Pump Sets – plan.*

Note that all pipe works and ducting shall be routed into the new Pump House location via the new access way directly from the fence line in the north of the enclosure and beneath the curved path. The Bill of Quantities allows for a variation to be made in distance only from the pump house.

* 1. Pump house site civils

*Dwgs. No. A2\_245.T.03 Tennis Centre with aerial imagery, A2\_245.T.04 Pump station Access plan, A2\_245.T.05 Pump House elevation montage and A2\_245.T.06 Pump House elevation,* show the layout and construction of the pump house enclosure.

Within the Tennis Centre compound, the ground shall be cleared as required for the construction footprint and the location of the pump house platform and access ramp excavated to a depth of at least 300mm below formation level. Type 1 material is to be brought in and compacted into the natural sand/gravel substrate up to formation level and the pump house platform shall be constructed as follows:

Following compaction of the Type 1 as required, 200mm of C35 300kg/m3 concrete with two sheets of A252 anti-crack mesh (top and bottom) shall be laid to a finished level of approximately 600mm below existing ground level (see *Dwg. No. 245.T.06*) but to be agreed on site (+/- 150m). This foundation shall be extended to cover the area of the pump house and be penetrated in appropriate positions (see schematic *Dwg. No 245.T.08 Booster pump Sets*), by the power cabling duct, the communication duct and the fibre-optic ducting. In addition, cut-outs shall be provided within the area at the fore of the platform for incoming riser (supply) pipes and outgoing (discharge) pipe work also as indicated. Drainage shall be effected within the area by the installation of the following:

1. Internal pump house drainage - 160mm PVC gully and trap in internal corner with DN100 TwinWall carrier drain to MH389 as per Dwg. No. *245.T.21’Carrier drain from pump house to MH389’* and see below.
2. Toe of ramp – 100mm channel drain such as Birco 100 with D400 cast iron slotted grid c/w with trap and infiltration network (up to 10m) formed of 100mm perforated Twin Wall laid level into the existing substrate.

A concrete ramp at not more than 7° slope shall be constructed also as per *Dwgs. No. A2\_245.T.03 Tennis Centre with aerial imagery, A2\_245.T.04 Pump station access plan, A2\_245.T.05 Pump House elevation montage and A2\_245.T.06 Pump House elevation.* The ramp shall be constructed as per the specification for the concrete pump house platform excepting that in addition it shall be finished as rough concrete with an epoxy/aggregate coating in order to reduce the risk of slippage.

The pump house platform shall be tied in with the concrete footings of the same standard flanking the ramp in plan and shall form the base for the construction of a retaining wall of maximum depth 600mm as per *Dwg. No.* *A2\_245.T.06 Pump House elevation.* The wall shall be one-brick and English bonded. Capping shall be made with bull-nose bricks to the same standard (Class B and F class frost resistant). No drain shall be required behind the wall. All bricks shall be blue or as otherwise approved.

Between the top of the ramp and the entrance gateway the 2.3m wide access path shall be formed with Type 3 to a depth of at least 300mm and terminating in 75mm of 6-10mm porous asphalt above a 400mm layer of 12mm clean washed compacted approved stone. Retention shall be provided using 50mm prefabricated pin kerbs and sufficient C20 haunching.

All excess materials excavated from the site are to be removed off site.

The carrier drain between the pump house and ManHole 389 as per Dwg. No. *245.T.21’Carrier drain from pump house to MH389’* shall be laidat a natural even grade between the outgoing invert of the gulley laid within the pump house and c. 19.56m within MH389. An intermediate chamber shall be installed (labelled MH389-A) on Dwg. No. *245.T.21’Carrier drain from pump house to MH389’*. Nominally this is approximately 1:100 but shall be determined precisely on site. This chamber shall be constructed in accordance with SFA7 and fitted with a D400 lid.

* 1. Fence and gate

As per *Dwg. No. A2\_245.T.04 Pump station access plan and A2\_245.T.05 Pump House elevation montage*, the existing fence shall be taken down. New gate pillars shall be installed and gates with an opening of not less than 2.2m with a height of 1.2m shall be installed to a design, standard and colour to be agreed with The Royal Parks. Provisionally this shall be as per adjacent post and gate construction. Please see additional specification.

* 1. Pump house

The pump house shall be pre-fabricated Royal Parks Green (BS12C39) GRP and shall be erected upon the platform described above within the confines of the retaining walls. The pump house should include the following:

* Lockable doors
* 2 no. closable ventilation louvres
* Internal insulation to provide U value of 0.6 W/m2 oC
* 1 no. 1.5m 58W anti-corrosion IP65 fluorescent light
* 3kW Electric heater with frost stat
* Pump house to be sized as 2.5m x 4.0m and not more than 1.48m at its highest elevation above previous (excavated by 600mm) ground level
* Primed riser and discharge pipe work to be laid and protrude as described in the drawings and above
	1. New pumping systems

Four new pumping systems are to be installed as follows:

1. Diana Fountain Tank Pumping System
2. Hyde Park Reservoir and Round Pond Pumping System
3. Toilet Tanks and Irrigation Tanks Pumping System
4. Rotten Row Irrigation Pumping System

Note that Grundfos pumps are specified throughout but alternative manufacturers’ models may be offered for approval. The panel shall be bespoke manufactured using existing tried and tested technology. The basic control function for the Diana Fountain Tank Pumping System shall be a Grundfos CU362, with the three other systems based on the CU352 system. Each pumping system shall be fitted with the GRM card such that monitoring via the new Royal Parks internal (or external) networked system is possible. Note the requirements for remote monitoring of water meter readings on the new systems as per 5.10.

* + 1. Diana Fountain Tank Pumping System

Installation of 1 No. new Grundfos SLV.65.65.30.2.50D.C fixed speed submersible pump as per the attached data sheet within the new underground tank on stainless steel guide rails with chains, stand and autocoupler as per *Dwg. No. A2\_245.T.07 Buried tank and Booster Pump Sets*. It shall be fitted with a DN100 stainless steel riser and Socla 925 non-return valve or approved equal.

The pump is to be signalled for start/stop from the existing control panel within the Diana Plant Room via the new control panel in the Tennis Centre Pump House. Currently, Diana Borehole No. 1 is signalled from this existing control panel by operation of a float switch within the Diana Fountain Tank. This proposal is to switch operation from the Diana Borehole No. 1 pump to the Diana Tank Pumping System in the new underground tank, from the float switch in the existing Diana Fountain Tank. Diana Borehole No. 1 pump is to be placed into OFF mode and switching via the existing panel of either the borehole pump or the new submersible pump shall be made as a simple control modification from within the existing panel.This shall be for both manual run-up of the existing Diana Borehole No. 1 pump for testing/maintenance and for rapid switch over to the Diana Borehole Pump No. 1 in event of failure of the new Diana Fountain Tank Pump.

The signal for the operation of the new Diana Fountain Tank Pumping System (submersible pump within the new underground tank) shall be taken via a new 2c x 2.5mm signal cable to the site of the new pump house at the Tennis Centre. The pump starter unit shall be situated within the Tennis Centre Pump House.

The new Diana Fountain Tank Pumping System shall supply water to the existing Diana Fountain Tank via pipe work as described below in 5.11 below.

* + 1. Hyde Park Reservoir and Round Pond Pumping System

Two new pumps as a submersible and booster system shall be installed.

Installation of 1 No. new Grundfos SLV.100.100.55.4.51D.C fixed speed submersible pump as per the attached data sheet within the new underground tank on stainless steel guide rails with chains, stand and autocoupler as per *Dwg. No. A2\_245.T.07 Buried tank and Booster Pump Sets*. It shall be fitted with a DN150 stainless steel riser and Socla 925 non-return valve or approved equal.

The submersible pump shall be started from its start signal - supplied from within the new Tennis Centre Pump House – and have its pump starter unit situated within the Tennis Centre Pump House.

Cable and pipe work between the underground tank and the Tennis Centre shall be as per 5.11 below.

A new fixed speed booster pump shall be installed within the Tennis Centre pump house which shall be supplied by the new submersible pump described immediately above. This pump shall be a Grundfos NB 80-315/305 AS-F-A-BAQE horizontal end-suction pump as per the attached data sheet and installed as per *Dwgs No.A2\_245.T.08 Buried tank and Booster Pump Sets – plan A2\_245.T.09 Booster Pump Sets.* This includes:

* Control structure with integration of sub pump and booster pump
* Electronic soft-starter with modifiable delay to allow for between 2s and 10s submersible pump run-up time prior to the end-suction pump starting
* Stainless steel suction to DN150 to EN DIN 1.4301
* Stainless steel discharge pipe work to DN150 to EN DIN 1.4301
* Expansion joints
* Stainless steel chassis to EN DIN 1.4301
* No suction isolator
* Socla 405 reflux valve (or approved equal) on the discharge side
* Manometer (glycerine filled, 16 bar rated, 0 – 10bar display)
* Split discharge manifold to DN100 for each point of discharge
* 2 No. DN100 Motorised butterfly valves all as per specification below in 5.9.2 and with the valve to the Hyde Park Reservoir normally open, and the valve to the Round Pond normally closed
	+ 1. Toilet Tanks and Irrigation Tanks Pumping System

Three new pumps as a submersible and (duty-assist) booster system shall be installed.

Installation of 1 No. new Grundfos SLV.80.80.22.3.50D.C fixed speed submersible pump as per the attached data sheet within the new underground tank on stainless steel guide rails with chains, stand and autocoupler as per *Dwg. No. A2\_245.T.07 Buried tank and Booster Pump Sets*. It shall be fitted with a DN100 stainless steel riser and Socla 925 non-return valve or approved equal.

The submersible pump shall be started from its start signal - supplied from within the new Tennis Centre Pump House – and have its pump starter unit situated within the Tennis Centre Pump House.

Cable and pipe work between the underground tank and the Tennis Centre shall be as per 5.11 below.

A new variable speed duty-assist booster pump system shall be installed within the Tennis Centre pump house which shall be supplied by the new submersible pump described immediately above. This pump set shall be Grundfos Hydro MPC-E 2 CRIE15-3 vertical multi-stage pump set as per the attached data sheet and installed as per *Dwgs No.A2\_245.T.08 Buried tank and Booster Pump Sets – plan A2\_245.T.09 Booster Pump Sets.* This includes:

* Control structure with integration of sub pump and booster pump
* Variable frequency drive units for each pump allowing for delay of booster pump start until pump suction pressure is reached
* 2 vertical multistage, centrifugal pumps on the basis of Duty-Assist
* Variable Frequency Drive for each pump
* Stainless steel suction and delivery manifolds DN80 to EN DIN 1.4301
* Expansion joints
* Stainless steel chassis to EN DIN 1.4301
* Individual suction and delivery valves for each pump, stainless steel (EN/DIN 1.4581)
* Non-slam check valve for each pump POM Polyacetyl
* 80 litre diaphragm tank with isolation valve
* Mechanical water meter with pulse output as per other water meter outputs
* Manometer (glycerine filled, 16 bar rated, 0 – 10bar display)
* Pressure transducer on discharge side and suction side
* Discharge valve isolator with preceding and valved commissioning line of DN25 304 stainless steel pipe work to exterior or pump house
	+ 1. Rotten Row Irrigation Pumping System

Two new pumps as a submersible and booster system shall be installed.

Installation of 1 No. new Grundfos SLV.80.80.22.3.50D.C fixed speed submersible pump as per the attached data sheet within the new underground tank on stainless steel guide rails with chains, stand and autocoupler as per *Dwg. No. A2\_245.T.07 Buried tank and Booster Pump Sets*. It shall be fitted with a DN100 stainless steel riser and Socla 925 non-return valve or approved equal.

The submersible pump shall be started from its start signal - supplied from within the new Tennis Centre Pump House – and have its pump starter unit situated within the Tennis Centre Pump House.

Cable and pipe work between the underground tank and the Tennis Centre shall be as per 5.11 below.

A new variable speed single booster pump system shall be installed within the Tennis Centre pump house which shall be supplied by the new submersible pump described immediately above. This pump shall be a Grundfos CRIE 20-4 AN-FGJ-I-E-HQQE vertical multi-stage pump as per the attached data sheet and installed as per *Dwgs No.A2\_245.T.08 Buried tank and Booster Pump Sets – plan A2\_245.T.09 Booster Pump Sets.* This includes:

* Control structure with integration of sub pump and booster pump
* Variable frequency drive unit allowing for delay of booster pump start until pump suction pressure is reached
* Vertical multistage, centrifugal pumps
* Variable Frequency Drive
* Stainless steel suction and delivery pipe work DN80 to EN DIN 1.4301
* Expansion joints
* Stainless steel chassis to EN DIN 1.4301
* Non-slam check valve for each pump POM Polyacetyl
* 33 litre diaphragm tank with isolation valve
* Mechanical water meter with pulse output as per other water meter outputs
* Manometer (glycerine filled, 16 bar rated, 0 – 10bar display)
* Pressure transducer on discharge side and suction side
* Discharge valve isolator with preceding and valved commissioning line of DN25 304 stainless steel pipe work to exterior or pump house
	1. Pipe work and ducting between the Tennis Centre Pump House and the existing Diana Plant Room and Tank

IEE Regulations 17th Edition must be followed in all instances in this contract.

Please see *Dwgs. No.*

* *A2\_245.T.08 Buried tank and Booster Pump Sets – plan,*
* *A2\_245.T.09 Booster Pump Sets,*
* *A2\_245.T.10 Pipe work to pump house schematic,*
* *A2\_245.T.11 Chamber in car park,*
* *A2 \_514.1.T.07 Diana BH No. 2 pipe work as-built,*
* *A2\_245.T.12 Supply of water between borehole* and *tank*
* *A2\_245.T.15 Supply of water from the new Tennis Centre PH to the Lido toilets.*
	+ 1. Installation between existing Diana Plant Room and Diana Borehole No. 2

A new power supply is to be taken from the location adjacent to the Diana Plant Room as shown on Dwg. No. *A2\_245.T.12 Supply of water between borehole and tank* and via the existing Ø110mm communication duct installed in 2012 and as shown on Dwg. No. *A2 \_514.1.T.07 Diana BH No. 2 pipe work as-built*. This may require periodic exposure of the ducting depending on rigidity of the cabling.

Within the same duct a new 10mm fibre-optic cable shall be installed plus signal cabling to signal the Diana Fountain Tank supply pump from the fountain tank, plus signal cabling to signal the Diana Borehole No. 2 starter panel in the Diana Plant room from the new Tennis Centre pump house. In summary:

* Existing Ø110mm duct - New power cabling from new power connection into existing duct and extension within duct to Diana Borehole No. 2 (and onward continuation)
* Existing (same) Ø110mm duct – New 1 No. 2c x 2.5mm signal cable to signal Diana Fountain Tank supply pump (fitted within new tank) from existing plant room
* Existing (same) Ø110mm duct - 1 No. 2c x 2.5mm2 signal cable to signal the starter for the Diana Borehole No. 2 pump panel situated in the existing Diana Plant Room
* Existing (same) Ø110mm duct - 1 No Ø10mm direct-install fibre cable (free-issue)
	+ 1. Trench between Diana BH No. 2 and Tennis Centre
* Ø110mm duct for:
	+ 1 No. power cable (described above) and fitted with ‘Electric Cable Below’ tape at appropriate location and
	+ 2 No. 3c x 2.5mm2 SWA XLPE signal cable to open and close the pair of motorised valves in the new chamber
* Ø180mm PE pipe for borehole water transfer to tank
* Ø90mm potable standard PE as tee’d off Ø160mm potable standard PE north of new pump house
* Ø90mm PE to connect the new Diana Fountain Tank supply pump to the existing Ø90mm PE ‘spare’
* Ø110mm duct for:
	+ 1 No. 2c x 2.5mm signal cable to signal Diana Fountain Tank supply pump (fitted within new tank)
	+ 1 No. 2c x 2.5mm2 signal cable to signal the starter for the Diana Borehole No. 2 pump panel situated in the existing Diana Plant Room
	+ 1 No. 2c x 2.5mm2 signal cable to take water meter at borehole signals back to Tennis Centre Pump House
	+ 1 No Ø10mm direct-install fibre cable (free-issue) (unbroken run from Diana Plant Room)
		1. Additional duct between South side of Rotten Row and Tennis Centre within Trench 5.7.2 above

See from Dwg. No. 245.T.12 that the main trench southwards from the borehole and just south of Rotten Row includes an additional duct.

* Ø110mm duct (spare) – approximately 120m

Note to tenderers: This last Ø110mm duct is shown on Dwg. No. 245.T.12 but not on the Dwg. No. 245.T.08.

One 450mm x 600mm c/w D400 lid shall be fitted at the northern end of this duct or as directed on site between the start of the duct and the Tennis Centre. The duct shall rise immediately adjacent to the other Ø110mm duct within the Pump House.

* 1. Works at the Diana Plant Room
		1. Electrical power connection

IEE Regulations 17th Edition must be followed in all instances in this contract.

Carry out all works within the incoming mains supply room adjacent to the Diana Plant Room in order to provide a new supply of power to the Tennis Centre Pump House.

* + 1. Pump start switching control in the existing Diana Fountain Control Panel

Incorporate new switching mechanism within the existing fountain and install all works, panel, transformer etc. in order to send a signal to the Tennis Centre pump house where the starter for the new Diana Fountain Tank supply (submersible) pump will be sited.

* + 1. Extension of Ø90mm PE pipe into existing Diana Fountain Tank

Excavate and locate existing blanked off Ø90mm PE pipe on north side of Diana Plant Room, connect new Ø90mm SDR17 Black PE100 to this. Locate existing ‘spare’ Ø125mm PE pipe work in hard-surfacing in front of doors to the Diana Plant Room as per location shown in Dwg, No. 245.T.12. Cut into this existing Ø125mm PE, fit reducing elbow on tank-side spur and fit Ø90mm PE pipe.

* + 1. Automation of existing Diana Borehole Control Panel

The existing Diana Fountain Pumps Panel is fitted already with the capability for automatic operation of a remote pump based upon an external signal. Fit new signalling system with 1 No. 2c x 2.5mm2 signal cable and all other electrical components as required including ducting to Ø110mm duct outside of the plant room, to allow start/stop signal to be received from the Tennis Centre PH/Tank.

* 1. Works at the existing Diana Borehole No. 2

The existing borehole location is as shown in Dwg. No. *A2 \_514.1.T.07 Diana BH No. 2 pipe work as-built*. Currently this is fitted with a DN150 elbow and Ø160mm PE pipe work to the Serpentine. Immediately downstream of the chamber is a smaller chamber which features a sampling tap from which periodic water monitoring samples are taken. Further downstream of this chamber is a third chamber which holds the water meter. All three chambers are to be remade as follows:

* + 1. Replacement water meter and sampling point

A new water meter is to be fitted in replacement of the existing water meter. It is to be compatible with the pulse output required of the water flow monitoring system. This new water meter and equipment is to be compatible with chamber installation (IP67). A new duct shall be fed back to the main new chamber within which signal cabling appropriate for the carrying of the pulse data back to the Tennis Centre pump house control centre shall be installed.

* + 1. New borehole chamber and headworks

The borehole headworks at present are minimal. The existing head is to be reduced in size and as per Dwg. No. *A2\_245.T.11 Chamber in car park* fitted with a new DN100 x DN150 ductile iron epoxy coated tee. Each branch of the tee shall be fitted with a DN150 electrically actuated butterfly valves. The new valves shall be centric semi-lug or full-lug butterfly valves with fixed EPDM liner. The body is to be of ductile iron and epoxy coated. Suitable manufacturers to be AVK (75/31 or 75/41), Tomoe, Socla or approved equal.

The butterfly valves shall be actuated by Valpes quarter turn VS100 90B Low Voltage (15-30v 50Hz) electric actuators or approved equal, with a closing time of c. 15s and a torque of 100Nm. The valve actuators shall be epoxy coated and rated IP68. The actuators shall include a failsafe mechanism whereby in the event of a failure of the supply from the Tennis Centre Pump House, the valve on the line to the new tank shall close, and the valve on the line to the Serpentine shall open. The cabling for the operation of these two valve actuators shall be 2No. 3c x 2.5mm3 SWA XLPE cable.

* 1. Water meter monitoring at new Tennis Centre Pump House

The following water meters are to be monitored and logged within this component of the technical specification. Installation of signal cabling and the meters themselves are included elsewhere:

1. Diana Borehole No. 2 Serpentine DN150 water meter. Installed in 2.4.8 A above. Signal cabling to be taken into the Tennis Centre Pump House and data logged via CU352 or similar integrated system.
2. Diana Fountain Tank supply DN100 water meter (see 2.4.10 D below). Signal cabling to be taken into the Tennis Centre Pump House and data logged via CU352 or similar integrated system.
3. Round Pond supply DN150 water meter (see 5.11(vi) below). Signal cabling to be taken into the Tennis Centre Pump House and data logged via CU352 or similar integrated system.
4. Hyde Park Reservoir supply DN150 water meter (see 2.4.10 G below). Signal cabling to be taken into the Tennis Centre Pump House and data logged via CU352 or similar integrated system.
5. Rotten Row Irrigation DN80 water meter (5.6.4(iv) above). Signal cabling to be taken into the Tennis Centre Pump House and data logged via CU352 or similar integrated system.
6. Toilet tank and Irrigation Tank DN80 water meter (see 5.6.4(iv) above). Signal cabling to be taken into the Tennis Centre Pump House and data logged via CU352 or similar integrated system.
	1. Trenching, ducting, pipe work and cabling between new tank and Tennis Centre Pump House and in the immediate vicinity

Please see Dwgs. No. *A2\_245.T.08 Buried tank and Booster Pump Sets – plan, A2\_245.T.09 Booster Pump Sets* and *A2\_245.T.10 Pipe work to pump house schematic.*

All of the above listed drawings are schematic only and serve to indicate approximate routings of the equipment required between a) the Diana Borehole No. 2 and the tank and b) the tank and the Diana Plant Room. All power for the pumps and controls is to be derived from within the new Tennis Centre Pump House as shown in Dwgs. No. *A2\_245.T.11 Chamber in car park, A2 \_514.1.T.07 Diana BH No. 2 pipe work as-built and A2\_245.T.12 Supply of water between borehole and tank.*

The contractor shall allow for all ducts, pipe work, cabling etc. to enable the following:

1. Supply of water into the new underground tank (no water meter required)
2. Power supply to 4 No. submersible pumps taken in duct back to new Tennis Centre Pump House
3. Signal cabling for 2 No. tank water depth monitoring systems taken in duct back to new Tennis Centre Pump House
4. Ø90mm black SDR17 PE100 supply for Diana Fountain Tank c/w new DN100 water meter within 600mm x 450mm concrete chamber and D400 lid c/w signal cabling taken in duct back to new Tennis Centre Pump House
5. Ø160mm black SDR17 PE100 primed line to the Tennis Centre Pump House for the Round Pond and Hyde Park Reservoir booster set
6. Ø160mm black SDR17 PE100 supply for Round Pond c/w new DN150 water meter within 600mm x 450mm concrete chamber and D400 lid c/w signal cabling to Tennis Centre Pump House – also to be fitted with AVK S21 Wedge-type gate valve in sleeve duct and D400 service lid as per Dwg. No. *A2\_245.T.08 Buried tank and Booster Pump Sets – plan*
7. Ø160mm black SDR17 PE100 supply for Hyde Park Reservoir c/w new DN150 water meter within 600mm x 450mm concrete chamber and D400 lid c/w signal cabling to Tennis Centre Pump House – also to be fitted with AVK S21 Wedge-type gate valve in sleeve duct and D400 service lid as per Dwg. No. *A2\_245.T.08 Buried tank and Booster Pump Sets – plan*
8. Ø110mm black SDR17 PE100 primed line to the Tennis Centre Pump House for the Rotten Row Irrigation booster set
9. Ø110mm black SDR17 PE100 supply for Rotten Row Irrigation
10. Ø110mm black SDR17 PE100 primed line to the Tennis Centre Pump House for the Toilet Tank and Irrigation Tank booster set
11. Ø90mm black SDR17 PE100 supply the Toilet Tank and Irrigation Tank supply
12. Ducts for other cabling if required (2 No. Ø110mm)
13. Fibre-optic multi bundle duct (28mm)
	1. Level sensing of the new underground tank

Two level control systems, completely independent of each other are to be installed within the tank.

* + 1. Float switch high and low emergency levels

Two separate floats shall be installed within the tank and incorporated into the control system as follows:

* A low level float switch will over-ride all other signals to the pumping systems and switch off all pumps except the borehole pump.
* A high level float switch will switch off the borehole pump.
	+ 1. Ultrasonic level controller

An ultrasonic level controller such as the Pulsar Ultra 5 with appropriate dB transducer within the tank shall monitor the water level continuously. The Ultra 5 unit must be panel mounted. The five relay outputs on the controller will act as follows:

|  |  |
| --- | --- |
| **Level** | **Function** |
| **1. High Level** | Cease call for water from borehole pump (but set below float switch) |
| **2. Mid 1** | Call for water from borehole pump |
| **3. Mid 2** | Switch off Toilets Tank and Irrigation Tank system |
| **4. Mid 3** | Switch off Diana Fountain Tank supply pump |
| **5. Low Level** | Cut out all pumps except borehole pump (but set above float switch) |

*Table 2: New underground tank level settings for the ultrasonic level*

The level control unit shall be supplied with Ultra Scan Software and all additional hardware to enable remote monitoring via Modbus protocol and incorporated into the Ethernet enabled fibre-optic system.

* 1. Motorised valve installation on existing 8” cast iron west of Hyde Park Reservoir

See Dwg. No*. A2\_245.T.19 Routes in proximity of Hyde Park Reservoir*.

Locate and excavate existing 8” cast iron pipe approximately as shown on the above indicated drawing. A new 8” ductile iron epoxy coated tee shall be installed, thrust blocked as appropriate for this 100-year-old main line. Distance must be allowed either side of the tee on the existing line for the installation of restraining Viking Johnson (type) flange adapters together with a valve on its western side.

Two new DN200 electrically actuated butterfly valves are to be fitted on the tee; one on the west side (for the Italian Gardens Borehole supply) and one on the south branch (for the Tennis Centre pump house supply). The new valves shall be centric semi-lug or full-lug butterfly valves with fixed EPDM liner. The body is to be of ductile iron and epoxy coated. Suitable manufacturers to be AVK (75/31 or 75/41), Tomoe, Socla or approved equal.

The butterfly valves shall be actuated by Valpes quarter turn VS100 90B Low Voltage (15-30v 50Hz) electric actuators or approved equal, with a closing time of c. 15s and a torque of 100Nm. The valve actuators shall be epoxy coated and rated IP68. The actuators shall include a failsafe mechanism whereby in the event of a failure of the signalling supply from the Hyde Park Reservoir (see 2.4.13 below), the West valve shall open and the South Valve shall close. This is to protect the old cast-iron pipe between the Italian gardens borehole and this point.

The cabling for the operation of these two valve actuators shall be 2No. 3c x 2.5mm3 SWA XLPE cable. And this shall be installed in c. 20m of Ø110mm duct laid south towards the termination of the new fibre-optic multi-duct and along the line of the new Ø160mm PE100 supply, and from there laid in an existing duct (shown purple-dashed on Dwg. No*. A2\_245.T.19 Routes in proximity of Hyde Park Reservoir* back to the Hyde Park Reservoir Pump House.

The operation of these valves shall be governed by the new ‘Distribution Control’ system as per section 2.4.15 below.

* 1. Control of supply of water to Hyde Park Reservoir

An existing Ultrasonic level indicator (Pulsar Ultra 5) is located within the existing Hyde Park Reservoir Pump House. Currently this unit, signalled via an ultrasonic transducer in the reservoir, indicates level only. It has five relay outputs. The following shall be done within this existing pump house.

Set the following levels within the Ultra 5 unit:

|  |  |  |  |
| --- | --- | --- | --- |
| **Level** | **Function 1** | **Function 2** | **Function 3** |
| **High** | ALARM (function to be determined in accordance with the software used but provisionally GSM text) |  |  |
| **Mid 1** | Signal reservoir is FULL | Cease call for water from Tennis Centre | Normal valve location on no-pump condition is: SOUTH DN200 motorised valve (Tennis Centre) NORMALLY CLOSED and WEST DN200 motorised valve (Italian Gardens) is NORMALLY OPEN |
| **Mid 2** | Call for water from Tennis Centre | Cease call for water from Italian Gardens | Open SOUTH DN200 motorised valve (Tennis Centre) and close WEST DN200 motorised valve (Italian Gardens) |
| **Mid 3** | Call for water from Italian Gardens |  | Open WEST DN200 motorised valve (Italian Gardens) and close SOUTH DN200 motorised valve (Tennis Centre) NORMALLY CLOSED |
| **Low** | ALARM (function to be determined in accordance with the software used but provisionally GSM text) |  |  |

*Table 3: Hyde Park Reservoir level switching function*

In addition, the level control unit shall be upgraded with Ultra Scan Software and all additional hardware to enable remote monitoring via Modbus protocol and incorporated into the Ethernet enabled fibre-optic system.

All hardware and any software required within the Hyde Park Pump Reservoir Pump House for these functions to be enabled are to be included within this section.

* 1. Removal of existing signalling components from within the Hyde Park Reservoir Pump House

An existing float level switch and GSM-based signalling system currently signals the call-for-water and cease-calling-for-water operation of water supply from the Italian Gardens borehole. This panel is to be decommissioned and removed from the Hyde Park Reservoir, together with the GSM link within the existing panel in the Engine House at the Italian Gardens being removed. Note however that the GSM module may be incorporated into the new system solely to GSM text Function 1 High Alarm and Low Alarm only. All other signals to be via the new fibre-optic Ethernet System.

* 1. New Distribution Control System

As per Section 1 above the control of the systems described within this specification, including the existing Italian Gardens pumping system is included within this project.

* + 1. Modification to existing Engine House controls not included in above sections

The existing ‘Tazza suction and auto start control panel’ within the Engine House shall remain as it in terms of its ability to receive signals generated within the Engine House and to be programmed by direct HMI at the control panel. The ability for this control panel to receive signals from the GSM-based panel (which is to be removed as part of 5.15 above) and for it to have its programmes altered by GSM text-message shall be removed.

The operation of the panel shall not be altered in terms of its ability to:

1. Send Italian Gardens Borehole water to the Long Water as programmed as one of six internal programmes (including Tazza flushing function); and
2. Send Italian Gardens Borehole water to the Round Pond as programmed as one of six internal programmes.

In preparation for this, prior to the start of the contract, any reference within the six programmes to sending water to the Hyde Park Reservoir and as signalled from the Hyde Park Reservoir GSM signalling system shall be removed.

The New Distribution Control system shall, upon receipt of a signal from the Hyde Park Reservoir Pulsar Ultrasonic level control system, via its incorporation within the fibre-optic network, over-ride all programmes within the existing ‘Tazza suction and auto start control panel’ within the Engine House and signal Italian Gardens borehole water to be sent up the 8” cast-iron line to the Hyde Park Reservoir. As detailed in 5.14 above this shall be upon receipt of the Mid 3 level at Hyde Park Reservoir.

The Mid 2 level signal at Hyde Park Reservoir shall stop water being sent to the Hyde Park Reservoir from the Italian Gardens and the operation of the system governed at the ‘Tazza suction and auto start control panel’ shall be reverted to.

All additional hardware and any software required within the Italian Gardens Engine House for these functions to be enabled is included within this section.

* + 1. Modification to existing Engine House water meter logging system

The three points of discharge of the borehole water from the Italian Gardens Borehole are each fitted with a pulse output water meter. The data derived from these meters is stored locally within the control panel in the Engine House. At present, this data is accessed via a lap-top and plug in Ethernet cable. The software is browser based.

No change is required of this system except that the Ethernet output hardware (and any additional software that may be required) shall be adapted such that the same existing monitoring/logging system can be read from any access point on the new fibre-optic system.

* + 1. Distribution operation control panel and structure

Where not expressly described above, the connection of the new (The Royal Parks installed) fibre-optic system shall be made to the following:

1. All relevant pump control components in the Engine House
2. Water meter logging system in the Engine House
3. All relevant components in the Tennis Centre Pump House and new buried tank
4. Al relevant components in the Diana Plant Room
5. Diana Borehole No. 2, panel and water meter
6. Hyde Park Reservoir level signal
7. DN150 MOTORISED VALVES AT Diana borehole No. 2
8. DN200 MOTORISED VALVES adjacent to Hyde Park Reservoir
9. DN100 MOTORISED VALVES on Round Pond/Hyde Park Reservoir discharge manifold in Tennis Centre Pump House

The control panel for the Distribution shall be located within the Tennis Centre Pump House. It shall be integrated to provide remote access (via the internal network being created) and all functions must be compatible with and supplied alongside (as part of this contract) an IP based HTTPS Browser package.

It is not anticipated that the water-meters within the Engine House will be re-adapted to the monitoring structure of the new water meters, but the extraction of all data to csv files in the same format (for both systems) is required. These systems (i.e. the existing Engine House system and the new Tennis Centre Pump House system) need not be identical but the output for analysis and storage must be.

The control of the ‘Tazza suction and auto start control panel’ within the Engine House shall not be integrated into the new Distribution Control System except as described above.

The following logic shall be incorporated into the Distribution Control System. Key terms are ‘Demand-based’ and ‘Timer-based’ pumping.

1. The priority call for water shall at all times be the Hyde Park Reservoir. This is a demand-based call and shall operate as follows:
	1. Water is preferentially supplied to the Hyde Park Reservoir from the new Tennis Centre pumping system
	2. The secondary source of water to the Hyde Park Reservoir shall be the Italian Gardens borehole

Thus, when there is a need for water in the Hyde Park Reservoir, the Mid 2 level in the reservoir shall signal the DN200 valve on the cast-iron line from the Italian gardens to close, and at the same time for the DN200 valve on the Tennis Centre Pumping Systems line to open (adjacent to the Hyde Park Reservoir). Also at the same time, the DN100 valve on the Round Pond side of the discharge manifold of the end-suction booster pump in the Tennis Centre shall close and the DN100 valve on the Hyde Park Reservoir side of the discharge manifold shall open, and this shall be controlled as part of the pump start/stop operation.

This valve operation for both pairs shall take 15s. Once 15s has elapsed, the submersible pump within the new buried tank shall start, followed by the end-suction booster pump 2s later.

If there is a fault with either pump, or there is no current draw after 10s, the Round Pond and Hyde Park Reservoir pumping system shall shut down and an alarm be signalled at the control panel and for receipt via the IP browser system.

If the Mid 3 level signal is activated within the Hyde Park Reservoir, for whatever reason (e.g. failure of Diana Borehole No. 2, failure of the Round Pond and Hyde Park Reservoir pumping system, loss of motorised valve operation, or switch off of the Tennis Centre systems for testing), the Italian Gardens borehole shall be signalled and shall over-ride all programmes within the ‘Tazza suction and auto start control panel’ such that water is pumped to the Hyde Park Reservoir as it is at present. Once the Mid 2 level is reached the Tennis Centre pumping system is signalled to start, the Italian Gardens Borehole will stop and a delay of up to 30 minutes shall be incorporated so that the system can recognise if the Tennis Centre pumping system supply has started and the water level has risen above the level which would otherwise re-start the Italian Gardens.

1. Excepting the above, the Italian Gardens borehole supply to the Long Water and the Round Pond is NOT influenced by the new control panel system.
2. Supply of water to the new underground tank from Diana Borehole No. 2 (demand-based)

The underground tank at the Tennis Centre has first call for water from the Diana Borehole No. 2 as signalled from the ultrasonic controller (see 5.12.2 above). If for any reason, the water level falls below the call-for-water level for borehole water (Mid 1 level) in the underground tank the following shall happen.

The DN150 valve on the Tank-side shall open and the DN150 valve on the Serpentine-side of the Diana Borehole No. 2 shall close. After 15 seconds the pump shall start.

1. Supply of water to the Serpentine from Diana Borehole No. 2.

This is a timer-based function. The control panel shall have the option to select six, twelve or eighteen hours of pumping a day from the Diana Borehole No. 2 directly to the Serpentine. The daily amount of time available is dependent upon the call for water from the four demand-based systems within the Tennis Centre system (Diana Fountain Tank Supply, Toilet Tanks and Irrigation Tanks Supply, Hyde Park Reservoir supply and Rotten Row Irrigation supply), and the timer-based requirement of the Round Pond supply. In other words, the demand-based needs of the underground tank over-ride the timer-based need of the Serpentine Supply.

Note that all days start at midnight and finish at midnight. Where, for instance, the underground tank has demanded water for a total of six hours and twelve minutes in one day, were the Serpentine supply programmed to be supplied with eighteen hours of water, it would in fact only receive seventeen hours and forty-eight minutes.

The actual amount of water pumped shall be indicated within the water meter logs together with the length of time each pumping system (except the borehole pump) has been operational.

There is no stop signal except the timer programme for the supply of water to the Serpentine.

1. Supply of water to the Toilet Tank and Irrigation Tank System

This shall be a demand-based system. A pressure transducer mounted on the discharge side of the pumping unit will signal a pressure drop. This will start the submersible pump followed 5s later by the booster set. The booster set is a duty-assist set with the lead pump alternating on a daily basis. Loss of either pump shall signal a fault with the other pump taking over sole pumping duty. All usual functions provided by the CU352 unit and GRM card shall be included.

1. Supply of water to the Rotten Row Irrigation System

This shall be a demand based system and shall operate as per the Toilet Tank and Irrigation Tank system, except that there is only one pump. A pressure transducer mounted on the discharge side of the pumping unit will signal a pressure drop. This will start the submersible pump followed 5s later by the single booster pump. All usual functions provided by the CU352 unit and GRM card shall be included.

1. Supply of water to the existing Diana Fountain Tank

This shall be a demand based system and is the highest priority (see level control above in 5.12.2). When the tank float mechanism via the existing Diana Fountain Panel signals a call for water, the submersible pump shall start. It shall cease pumping when the signal is switched off. All usual functions provided by the CU362 unit and GRM card shall be included.

1. Supply of water to the Round Pond

This shall be a timer-based system. The control panel shall have the option to select six, twelve or eighteen hours of pumping a day from the new underground tank directly to the Round Pond. The daily amount of time available is dependent upon the following:

1. Water available in the tank in competition with the other higher set-level demand-based systems (see Low Level Cut out (5) in 5.12.2 above)
2. Priority demand from the Hyde Park Reservoir

If the Hyde Park Reservoir is calling for water (see Table 3 above) and there is sufficient water to supply it from the underground tank (see 5.12.2 above), no water can be sent to the Round Pond. If the Hyde Park Reservoir is not calling for water and there is sufficient water in the underground tank, then the following takes place:

The normally closed DN100 valve on the Round Pond side of the discharge manifold of the end-suction booster pump in the Tennis Centre shall close and the normally open DN100 valve on the Hyde Park Reservoir side of the discharge manifold shall close. This shall be controlled as part of the pump start/stop operation.

The valve operation for both of these DN100 valves shall take 15s. Once 15s has elapsed, the submersible pump within the new buried tank shall start, followed by the end-suction booster pump 2s later.

If there is a fault with either pump, or there is no current draw after 10s, the Round Pond and Hyde Park Reservoir pumping system shall shut down and an alarm be signalled at the control panel and for receipt via the IP browser system.

There is no stop signal except the timer programme for the supply of water to the Round Pond.

* 1. Road & major thoroughfare crossings
		1. Crossing of Serpentine Road west of Tennis Centre

Crossing of Serpentine Road, c. 28m from soft to soft directly across the road. Includes installation of all pipework, ducts, fibre-optic ducts and cable as described. It also includes the installation of a PN16 AVK Underground fire hydrant (29/288) c/w 2 ½” London round thread outlet mounted directly on the western end of the potable (160mm) pipe line fitted within a chamber with flush fitting D400 lid.

* + 1. Crossing of Serpentine Road north of Serpentine Bar & Kitchen

Crossing of Serpentine Road, c. 68m from soft to soft directly across the road. Includes installation of all pipework, ducts, fibre-optic ducts and cable as described.

* + 1. Crossing of Rotten Row North of the Tennis Centre

Crossing of Rotten Row, c. 45m from soft to soft diagonally across the row. Includes installation of all pipework, ducts, fibre-optic ducts and cable as described. The Rotten Row has a substrate formed from crushed and compacted brick with a sand layer at the surface. This must be re-instated exactly as it is.

* + 1. Crossing of Rotten Row South East of the Dell

Crossing of Rotten Row, c. 42m from soft to soft diagonally across the row. Includes installation of all pipework, ducts, fibre-optic ducts and cable as described. The Rotten Row has a substrate formed from crushed and compacted brick with a sand layer at the surface. This must be re-instated exactly as it is.

* 1. Round Pond Phase
		1. Trenchwork running SW from Tennis Centre PH towards Serpentine Road crossing

Trench and lay as shown in Dwg. No. 245.T.13 **110m** of Ø160mm PE80 potable standard main together with Ø90mm black PE100

* + 1. Ø90mm PE pipe to Albert Memorial irrigation connection

Locate existing Ø90mm SDR17 Black PE100 to east of Albert Memorial as shown in *Dwg. No. 245.T.13 ‘Supply of water from the new Tennis Centre PH to Kensington Gardens’* and entrench new **150m** of Ø90mm SDR17 Black PE100 to this point from the west of the road crossing and connect.

* + 1. Ø90mm PE pipe towards Serpentine Gallery with Ø160mm PE pipe

Lay within combined trench **240m** of Ø90mm SDR17 Black PE100 and Ø160mm SDR17 Black PE100 as shown in *Dwg. No. 245.T.13 ‘Supply of water from the new Tennis Centre PH to Kensington Gardens’*

* + 1. Ø50mm PE pipe to connect to Mount Gate Toilet

Trench and install c. **20m** of Ø50mm SDR17 Black PE100 to known blanked connection for Mount Gate Toilet Tank as shown in *Dwg. No. 245.T.13 ‘Supply of water from the new Tennis Centre PH to Kensington Gardens’*

* + 1. Ø90mm PE pipe to Serpentine Gallery alone

Trench and install **50m** of Ø90mm SDR17 Black PE100 as shown in *Dwg. No. 245.T.13 ‘Supply of water from the new Tennis Centre PH to Kensington Gardens’* towards the Serpentine Gallery and cap off below ground.

* + 1. Ø160mm PE pipe to Connect with existing 6” cast-iron main

To south-west of Round Pond locate and expose existing 6” cast-iron potable main as per in *Dwg. No. 245.T.14 ‘Round Pond and St. Gover’s Well connections’*. Remove c. 0.5m section and cap both ends with restrained and blanked Viking-John type flange adapters. Re-fill west-side.

South of Round Pond, locate and remove existing 6” gate valve and replace with new section of pipe.

To West of Serpentine Gallery locate and expose existing 6” cast-iron potable main. Isolate and drain. Cut into it and remove sufficient length for the works. To eastern spur fit new restrained and blanked Viking-John type flange adapter. To western spur fit long-radius Ø160mm restrained bend and connect to new Ø160mm SDR17 Black PE100 as shown in *Dwg. No. 245.T.13 ‘Supply of water from the new Tennis Centre PH to Kensington Gardens’.*

Trench and install c. **100m** Ø160mm SDR17 Black PE100 as shown in *Dwg. No. 245.T.13 ‘Supply of water from the new Tennis Centre PH to Kensington Gardens’* to lead to this above connection.

* + 1. Ø63mm Potable connection to St. Gover’s Well

Locate existing potable water supply at Palace Gate as shown in *Dwg. No. 245.T.14 ‘Round Pond and St. Gover’s Well connections’.* Trench approximately **200m** of Ø63mm SDR11 Blue PE80 to site of St. Gover’s Well. Locate potable pipe work into St. Gover’s Well, expose and connect all as per Water Regs, into existing line to the drinking fountain. Cap off other end.

* 1. Rotten Row installation
		1. Trench work north side of Tennis Centre

From Tennis Centre, as shown in *Dwg. No. 245.T.16 ‘Supply of water from new Tennis Centre PH to Rotten Row’* trench and lay **170m** of:

* Ø160mm SDR11 Blue PE80 potable main
* Ø90mm SDR17 Black PE100
* Ø160mm SDR17 Black PE100
* Ø110mm SDR17 Black PE100
* Fibre-optic bundle duct (supplied by The Royal Parks)

Connect Ø160mm SDR11 Blue PE80 potable main to line running to west side of Serpentine Road at Coalbrookdale Gate and continue pipe in east as below in 2.4.18.B. Fit tee for Ø90mm SDR11 Blue PE80 potable main spur up to Diana Borehole No. 2 site. Fit new DN100 potable standard AVK S21 valve or approved equal in service sleeve and D400 access cover.

Continue Ø90mm SDR17 Black PE100 in east as below in 5.19.2

Continue Ø160mm SDR17 Black PE100 in east as below in 5.19.2

Continue Ø110mm SDR17 Black PE100 in east as below in 5.19.2

* + 1. Trench work north side of Rotten Row Recreational Pitches

From 2.4.18.A, as shown in *Dwg. No. 245.T.16 ‘Supply of water from new Tennis Centre PH to Rotten Row’* , trench and lay **475m** of:

* Ø160mm SDR11 Blue PE80 potable main
* Ø90mm SDR17 Black PE100
* Ø160mm SDR17 Black PE100
* Ø110mm SDR17 Black PE100

Connect Ø160mm SDR11 Blue PE80 potable main to line running to west side of Serpentine Road at Coalbrookdale Gate and continue pipe in east as below in 2.4.18.D. Fit tee for Ø90mm SDR11 Blue PE80 potable main spur up to Diana Borehole No. 2 site. Fit new DN100 potable standard AVK S21 valve or approved equal in service sleeve and D400 access cover.

Continue Ø90mm SDR17 Black PE100 in east as below in 5.19.4

Continue Ø160mm SDR17 Black PE100 in east as below in 5.19.4

* + 1. Rotten Row Hydrants

As per *Dwg. No. 245.T.16 ‘Supply of water from new Tennis Centre PH to Rotten Row’* supply and install 8 No. in-line hydrants and 1 No. end-of-line hydrant as per *Dwg. No. 245.T.17 ‘Hydrants in Rotten Row’*

* + 1. Trench work north side of Rotten Row to Westbourne

From 2.4.18.B, as shown in *Dwg. No. 245.T.16 ‘Supply of water from new Tennis Centre PH to Rotten Row’* and *Dwg. No. 245.T.18 ‘Pipe routes across the Westbourne’,*trench and lay **380m** of:

* Ø160mm SDR11 Blue PE80 potable main
* Ø90mm SDR17 Black PE100
* Ø160mm SDR17 Black PE100

Connect Ø160mm SDR11 Blue PE80 potable main to line laid in 2.4.18 B above and terminate in capped end at location shown in *Dwg. No. 245.T.18 ‘Pipe routes across the Westbourne’*  for connection in a future phase. It is not necessary to flush and chlorinate this line.

Continue Ø90mm SDR17 Black PE100 in east as below in 5.19.7

Continue Ø160mm SDR17 Black PE100 in east as below in 5.19.7

* + 1. Lido connections

From the Ø90mm SDR17 Black PE100 (toilet and irrigation tank line) laid in 2.4.18.B above, tee off with **120m** Ø50mm SDR17 Black PE100 as shown in *Dwg. No. 245.T.15 ‘Supply of water from the new Tennis Centre PH to the Lido Toilets’*, and connect to existing non-potable line within the Diana Fountain enclosure. Install 2 No. DN50 AVK S21 wedge type gate valves, access sleeve and lids.

In the same trench lay 1 No. free-issue Fibre-optic multi-duct.

* + 1. Connection to existing Dell Irrigation tank

From the Ø90mm SDR17 Black PE100 (toilet and irrigation tank line) laid in 2.4.18.D above, tee off with **50m** Ø50mm SDR17 Black PE100 as shown in *Dwg. No. 245.T.18 ‘Pipe routes across the Westbourne’.* Disconnect existing potable connection in irrigation tank from float-valve and connect in new line. Install 1 No. DN50 AVK S21 wedge type gate valve, access sleeve and lid in suitable agreed location between the Ø90mm pipe and the tank.

* + 1. Pipe work across Westbourne and to north of Serpentine Bar & Kitchen

From the point of termination of the east end of the Ø160mm SDR11 Blue PE80 potable main and as shown on Dwg. No. 245.T.18 ‘Pipe routes across the Westbourne’, and as detailed in 5.19.4 above, trench and lay **280m** of

* Ø90mm SDR17 Black PE100
* Ø160mm SDR17 Black PE100

The Ø90mm SDR17 Black PE100 Toilet and Irrigation Tank line is to be capped off in the soft as shown just north of the Serpentine Road north of the Serpentine Bar and Kitchen.

Within the same trench shall be laid a free-issue fibre-optic micro-duct. Note that this starts approximately 30m before the end of the line of the Ø160mm SDR11 Blue PE80 potable main, the eastern termination of which marks the end of part 5.19.4.

* + 1. Pipe work to Hyde Park Reservoir

See Dwg. No*. A2\_245.T.19 ‘Routes in proximity of Hyde Park Reservoir*.’

From the point of termination of the northernmost point of the Ø90mm SDR17 Black PE100

and as detailed in 5.19.7 above, trench and lay **380m** of

* Ø160mm SDR17 Black PE100

And connect into existing 8” cast-iron all as described in Dwg. No*. A2\_245.T.19 ‘Routes in proximity of Hyde Park Reservoir* ’ and in Section 2.4.12 above.