

C3.5.5

PARTICULAR SPECIFICATION FOR CONTROL AND INSTRUMENTATION

PARTICULAR SPECIFICATION FOR CONTROL AND INSTRUMENTATION

TABLE OF CONTENTS

PART IA	PARTICULAR SPECIFICATIONS.....	4
IB1	SCOPE OF WORK	4
IB1.1	FIBRE OPTIC ETHERNET BACKBONE COMMUNICATION SYSTEM.....	4
IB1.2	NEW HEAD OF WORKS PLANT CONTROL AND INSTRUMENTATION	4
IB1.3	NEW DE-WATERING PLANT CONTROL AND INSTRUMENTATION	4
IB1.4	PUMP STATION NO'S.1-4, AERATOR NO'S 1-6 PLC SYSTEMS	5
IB1.5	SYSTEM INTEGRATION.....	5
IB1.6	SCADA SYSTEM – CITECT.....	5
IB2	SITE AND SYSTEM CONDITIONS	6
IB3	DETAILED SCOPE OF WORK	6
IB3.1	FIBRE OPTIC ETHERNET BACKBONE	6
IB3.2	PLC SYSTEMS.....	8
IB3.3	NEW HEAD OF WORKS C&I SYSTEM.....	11
IB3.4	NEW DE-WATERING PLANT C&I SYSTEM.....	12
IB3.5	PUMP STATIONS C&I SYSTEMS	12
IB3.6	FIELD INSTRUMENTS	12
IB3.7	INSTRUMENT JUNCTION BOXES.....	12
IB3.8	FIELD JUNCTION BOXES	13
IB3.9	INSTRUMENT AND CONTROL CABLES	13
IB3.10	CABLE SUPPORT SYSTEMS AND SUPPORT STEELWORK.....	14
IB3.11	TRAINING	14
IB3.12	MAINTENANCE SPARES.....	14

IB4	DRAWING SCHEDULE	15
IB5	TRAINING REQUIREMENTS	15
IB5.1	GENERAL	15
IB5.2	TRAINING MANUAL	15
IB5.3	TRAINING SCHEDULE	16
IB5.4	MAINTENANCE AND OPERATION TRAINING	16
IB5.5	CONTROL, INSTRUMENTATION AND SCADA EQUIPMENT	17

PART IA PARTICULAR SPECIFICATIONS

Purpose of Contract

The purpose of this contract is to facilitate the phased upgrade of Hammarsdale WWTW to achieve an ADWF of 27 MI/d and improve overall process efficiency through equipment modernization. Under this contract, the following upgrades to the mechanical and electrical equipment will be achieved:

- A completely new inlet works (screening and degritting) together with a new pump station to supply the existing bioreactors.
- A completely new dewatering facility using high efficiency centrifuges together with new sludge handling and storage equipment.
- Replacement of the existing reactor surface aerators with modern, efficient units
- Replacement of existing reactor mixers with modern, efficient units
- Various upgrades to the electrical and control and instrumentation infrastructure, as detailed within this specification and the electrical specification.

References To Product Brands

It is not the intention at any point in this document to recommend any particular product brand. Any accidental references to product brands shall automatically be assumed that an equivalent product is acceptable as long as the products are fundamentally the same and fit for purpose.

IB1 SCOPE OF WORK

The Work to be performed under this Contract is in connection with the construction and erection of the electrical and electronic installation at the Hammarsdale WWTW, eThekweni, Kwazulu-Natal.

The scope of supply of the C&I part of this contract shall be the manufacturing, supply, delivery, safe storage on site before installation, installation and commissioning of the process monitoring instrumentation systems listed in this tender document and on the relevant drawings. The C&I equipment shall include the following:

IB1.1 Fibre Optic Ethernet Backbone Communication System

- a. Supply, installation, splicing and testing of multimode fibre optic cabling system, including the required patch panels and fly leads.
- b. Supply, installation and commissioning of network switches.
- c. Supply of network monitoring software.
- d. Testing, commissioning, and full certification of the installed system

IB1.2 New Head Of Works Plant Control And Instrumentation

- a. Supply and installation of PLC system
- b. Supply and installation of field instrumentation.
- c. Supply and installation of junction boxes and instrument junction boxes.
- d. Supply, installation and termination of instrumentation cabling.
- e. Supply and installation of cable support systems, including racking, trenching, conduit as required.
- f. PLC and HMI software development, testing, commissioning and full certification of the installed system.

IB1.3 New De-Watering Plant Control and Instrumentation

- a. Supply and installation of PLC system
- b. Supply and installation of field instrumentation.
- c. Supply and installation of junction boxes and instrument junction boxes.

- d. Supply, installation and termination of instrumentation cabling.
- e. Supply and installation of cable support systems, including racking, trenching, conduit as required.
- f. PLC and HMI software development, testing, commissioning and full certification of the installed system.
- g. Interfacing of proprietary equipment control systems to the site SCADA system. It is noted that EWS prefers not to have "black box" solutions, and the control systems offered for the specialist equipment should as far as possible be of the same type as specified for the rest of the plant.

IB1.4 PUMP STATION No's.1-4, AERATOR NO's 1-6 PLC SYSTEMS

- a. Supply and installation of four PLC systems panels for the existing pump stations numbers 1 -4 and aerators no. 1-6.
- b. Supply and installation of field instrumentation.
- c. Supply and installation of junction boxes and instrument junction boxes.
- d. Supply, installation and termination of instrumentation cabling.
- e. Supply and installation of cable support systems, including racking, trenching, conduit as required.
- f. PLC and HMI software development, testing, commissioning and full certification of the installed system.

IB1.5 SYSTEM INTEGRATION

The System Integration function will be provided under a sub contract agreement of the main contract. A provisional sum has been included in Bill 5 BOQ 6 to cater for the requirements, which will include the following:

- Development of the functional specification and control philosophies.
- System Design
- PLC, HMI and SCADA Software Development
- Factory acceptance testing
- Site acceptance testing
- Commissioning

The control system development will be required for the following plant areas being automated:

- Head of Works, including second class water system.
- De-watering plant, including sludge transfer pump station
- Pump station's No. 1, No. 2, No. 3 and No. 4.
- Monitoring of the new "smart ready" mini-substation units
- Main substation monitoring

IB1.6 SCADA SYSTEM – CITECT

The SCADA system including all hardware, UPS, power supplies and software licenses will be provided under a sub contract agreement of the main contract. A provisional sum has been included in Bill 5 BOQ 6 to cater for the requirements, which will include the following:

- a. Redundant Servers, for:
 - i. Historian
 - ii. Reporting
 - iii. Citect system
- b. Two operator (client) stations – Citect AnyWhere
- c. One engineering station
- d. Hardware firewall
- e. Licensing:
 - i. 25k Tag SCADA
 - ii. 10k Tag Historian
 - iii. Dream Reporting
- f. Software development, factory acceptance testing (FAT), site acceptance testing (SAT) and commissioning of the SCADA system.

IB2 SITE AND SYSTEM CONDITIONS

Site Conditions

Altitude:	The altitude in the area varies between 500m and 700m above mean sea level.
Temperature:	Ambient temperature between 15°C and 50°C. Average daily maximum ambient: 32°C.
Equipment Rating:	50°C.
Humidity:	Maximum – 100 % Average – 82 %
Rainfall:	Approximately 1500 mm per annum. An average of 2 – 3 working days per month is lost due to inclement weather. No claims for delays as a result of adverse weather conditions will be considered.
Lightning:	The area is subject to severe lightning storms, approximately 4.8 flashes/km ² /year.
Pollution:	MEDIUM. Inland
Wind:	Design wind speed of 108 km/h (700 pa).
Mean annual value of solar radiation:	1,0 kW/m ²

Electricity Supply System

The nominal system voltage in the Hammarsdale area is 11 kV, 400 V three phase and 230 V single phase fed by Eskom.

The maximum MV system voltage is 12,5 kV.

The system frequency is 50 Hertz and the phase rotation is R-W-B anti-clockwise.

IB3 DETAILED SCOPE OF WORK

The works is further described below and provides information of the various items described as part of the Scope of Works.

IB3.1 Fibre Optic Ethernet Backbone

All fibre-optic cables will be 62.5/125 µm multi-mode (MM) cable with wire armouring, for use with 1000BASE-SX gigabit Ethernet.

The fibre-optic cables will be buried within 110mm sleeves.

A length of free cable shall be provided at each end of a cable pull. Loops of cable (commonly called service loops) shall be provided at all intermediate pulling points, such as in manholes and pull boxes where manholes and pull boxes are required to be installed by the Engineer. Service loops of 3 m length that are easily accessible and clearly marked with the prescribed cable number shall be provided at all fibre cable patch panels. The cables' minimum bending radii shall not be exceeded.

Intermediate patch and splice panels shall not be allowed unless approved by the Engineer. Cables that are found to be damaged either due to defective manufacturing, delivery or installation practice shall be replaced in their entirety at the cost of the contractor.

All fibre-optic cables will contain at least 8-cores.

Approximate distances have been measured to each remote location for tender purposes and have been included in the bill of quantities. The contractor shall verify and confirm these cable lengths on site, after the tender has been awarded, before cutting cable lengths to the exact installation size. Cable lengths in the Bill Of Quantities are merely there to ensure the availability of sufficient capital for the project. These quantities must not be used for placing orders. All cable installations shall be re-measured for payment after installation.

All data communications cables (each fibre-optic cable, each patch lead, each copper cable and all equipment) will be named according to the cable block diagram and naming list as provided by the Engineer during construction. All equipment labels, cable markers and cable route markers must comply with the relevant specifications.

The fibre optic cabling required to be installed, terminated and tested is provided in the cable schedule Section B12. It is noted that the allowance has been made for the fibre cable network connection to the propriety equipment control systems. All other equipment required for interfacing with the Site SCADA system is to be included by the contractor.

Fibre Optic Ethernet Switches

An area switch shall be provided in the main control room, each PLC cubicle, each new MSU, main substation and the generator plant.

The required configuration of each switch is provided in table below.

Network Switch Configuration				
Area	1000BASE-SX SFP Modules	Gigabit Ports – RJ45 Copper	10/100 Mbit RJ45 Copper	Switch Quantity
Control Room	4	2	24	1
Head of Works PLC	2	2	48	1
Head of Works Field Switches	2	2	12	3
Second Class Water RIO Panel	2	2	12	1
De-watering PLC	2	2	24	1
De-watering Field Switches	2	2	12	3
Sludge Transfer Pump Station RIO Panel	2	2	12	1
Pump Station PLC Panels	2	2	24	4
Mini-substation Units	2	2	6	6
Main Substation	2	2	6	1
Generator Plant	2	2	6	1

Each switch shall consist of a switch, 2 x 1000BASE-SX SFP modules, 4 x 3m multi mode fibre patch leads, 2 x Gigabit Ports, at least 2 x 10BASE-T/100BASE-TX RJ45 copper ports, 4 x 3m certified Cat-6 patch lead and a power supply.

The contractor is primarily responsible for all fibre-optic and data communication testing and commissioning work. All testing and commissioning work shall be documented in detail in the prescribed formats and the results shall be verified and approved by the Engineer.

The fibre-optic cables must be tested and commissioned after installation. The commissioning of the data network can commence after the fibre-optic cables are commissioned.

Fibre Optic Splicing

All fibre-optic cable shall be terminated on patch panels at each end. All cores shall be terminated at each patch panel.

IB3.2 PLC Systems

Supply and install PLC Systems for the following Plant Areas:

- Head of works plant PLC
- Second class water system remote I/O station
- Pump Station No. 1 PLC
- Pump Station No. 2 PLC
- Pump Station No. 3 PLC
- Pump Station No. 4 PLC
- Dewatering plant PLC and sludge transfer pump station remote I/O station.
- Centrifuge control system
- Poly-dosing system.

The PLC's shall be complete with a floor-standing, top/bottom-entry enclosure forming part of the MCC panel. Each PLC panel should be equipped with:

- 220VAC Distribution Board, for both raw and UPS power
- 220VAC/24 VDC 5 Amp power supply
- 24VDC fused distribution terminals – 10 way feed including 10 by 0 VDC terminals
- 15 amp plug socket
- Ethernet Switch configuration as per the table in Section B3.1.
- 16 way -Fibre patch panel and associated equipment
- 24VDC fused distribution terminals
- Terminals as per IO card requirements
- Panel wire 0.75mm² fine strand
- Digital input circuits shall be supplied via 24VDC fused terminal.
- Digital output circuits shall be separated from the PLC by rail mounted interposing relays.
- All cores (except shield and earth cores) of power and signal field cables terminating in the marshalling panels shall be equipped with surge arrestors.
- Tag labels
- Surge protection devices

All wires must be enclosed in trunking and where possible equipment mounted on din-rail.

All PLC input and output circuits, including spares shall be wired to the marshalling terminals.

All analogue inputs must be capable of connecting loop powered and 4 wire instruments. Analogue signals shall be 4 to 20 mA. Loop powered sensors shall have a supply voltage of 24V. 4 wire instruments shall be powered by 231 VAC fed from the PLC 231VAC UPS distribution board.

All power supply terminals shall be fused with blown fuse indication.

All digital inputs shall be 24VDC.

All digital outputs shall be relay outputs.

The terminals, wiring and cabling for the digital and the analogue I/O must as far as possible be installed in separate wire ways.

Typical loop diagrams are provided, drawing number 60325-I-10-002 sheet 1 through 6. The Contractor shall develop a full set of loop diagrams for all instruments.

All the PLC I/O, including spares must be wired to terminals. The contractor shall ensure that there is sufficient space for all terminals, fused terminals, circuit breakers, surge protection, etc. There shall also be sufficient space to ensure that all spare slots in the PLC racks can be equipped and wired in future if required.

The PLC panels must be equipped with a true online UPS.

The UPS must be a transformer-based unit and must have a 3kVA rating. The applicable PLC circuits must also be equipped with proper surge protection.

Each PLC panel will be equipped with a 15 inch HMI screen.

The PLC hardware to be supplied under this contract is listed in the tables below:

Head of Works

Head of Works PLC Hardware		
Description	Part Number	Quantity
PLC 12 slots Ethernet backplane	BMEXBP1200	2
X80 AC Power Supply Module, 100...240 V AC, 40W, optional redundancy	BMXCPS4002	1
X80 AC Power Supply Module, 100...240 V AC, 20W	BMXCPS2000	1
M580 CPU Level 1 with distributed IO	BMEP581020	1
M580 I/O Scanner Module, IP Forwarding, Ethernet/IP & Modbus TCP, 3 ports - Coated	BMENOC0321	1
X80 Fibre Module, Multi-mode repeater, 2 RJ45 ports and 2 Fibre Optics ports	BMXNRP0200	1
X80 Backplane Expander Kit for 2-rack configuration	BMXXBE2005	1
X80 Analog Input Module, High Speed, 8 channels, isolated	BMXAMI0810	7
X80 Digital Input Module, 16 channels, 24 V DC, Positive (sink)	BMXDDI1602	2
X80 Digital Output Relay Module, 16 channels, 24 V DC / 24...240 V AC, NO	BMXDRA1605	1
20-way removable terminal block with cage clamp	BMXFTB2000	3
28-way removable terminal block with cage clamp type	BMXFTB2800	7
<u>Touch panel screen, Harmony ST6, 15"W display, 2COM, 2Ethernet, USB host & device, 24 VDC</u>	HMIST6700	1

Second Class Water System

Second Class Water Remote I/O PLC Hardware		
Description	Part Number	Quantity
STB Network Interface module, Ethernet/IP & Modbus TCP, 2 ports	STBNIP2311	1

STB Standard Power Supply Module, 24 VDC	STBPDT3100K	1
STB Standard Analog Input Module, 4 channels, isolated, Current	STBACI0320K	1
STB Basic Digital Input Module, 16 channels, 24 V DC, Positive, Screw	STBDDI3725KS	1

De-watering Plant

De-watering Plant PLC Hardware		
Description	Part Number	Quantity
PLC 12 slots Ethernet backplane	BMEXBP1200	1
X80 AC Power Supply Module, 100...240 V AC, 36W	BMXCPS3500	1
M580 CPU Level 1 with distributed IO	BMEP581020	1
M580 I/O Scanner Module, IP Forwarding, Ethernet/IP & Modbus TCP, 3 ports - Coated	BMENOC0321	1
X80 Fibre Module, Multi-mode repeater, 2 RJ45 ports and 2 Fibre Optics ports	BMXNRP0200	1
X80 Analog Input Module, High Speed, 8 channels, isolated	BMXAMI0810	4
X80 Digital Input Module, 16 channels, 24 V DC, Positive (sink)	BMXDDI1602	2
20-way removable terminal block with cage clamp	BMXFTB2000	2
28-way removable terminal block with cage clamp type	BMXFTB2800	4
<u>Touch panel screen, Harmony ST6, 15"W display, 2COM, 2Ethernet, USB host & device, 24 VDC</u>	HMIST6700	1

Sludge Transfer Pump Station

Sludge Transfer Pump Station Remote I/O PLC Hardware		
Description	Part Number	Quantity
STB Network Interface module, Ethernet/IP & Modbus TCP, 2 ports	STBNIP2311	1
STB Standard Power Supply Module, 24 VDC	STBPDT3100K	1
STB Standard Analog Input Module, 4 channels, isolated, Current	STBACI0320K	1
STB Basic Digital Input Module, 16 channels, 24 V DC, Positive, Screw	STBDDI3725KS	1

Pump Station's No. 1, 2 3 & 4

Note: The table below lists the PLC hardware for one pump station, each pump station will require identical equipment.

Typical Pump Station PLC Hardware		
Description	Part Number	Quantity
PLC 12 slots Ethernet backplane	BMEXBP1200	1
X80 AC Power Supply Module, 100...240 V AC, 36W	BMXCPS3500	1
M580 CPU Level 1 with distributed IO	BMEP581020	1
M580 I/O Scanner Module, IP Forwarding, Ethernet/IP & Modbus TCP, 3 ports - Coated	BMENOC0321	1
X80 Fibre Module, Multi-mode repeater, 2 RJ45 ports and 2 Fibre Optics ports	BMXNRP0200	1
X80 Analog Input Module, High Speed, 8 channels, isolated	BMXAMI0810	1
X80 Digital Input Module, 16 channels, 24 V DC, Positive (sink)	BMXDDI1602	1
20-way removable terminal block with cage clamp	BMXFTB2000	1
28-way removable terminal block with cage clamp type	BMXFTB2800	1
<u>Touch panel screen, Harmony ST6, 15"W display, 2COM, 2Ethernet, USB host & device, 24 VDC</u>	HMIST6700	1

Hardware Supply

User manuals - for all equipment supplied by the contractor must be included in the documentation.

Three copies of all documentation must be provided.

Shop Drawings

Before PLC or junction box manufacturing can start, the successful tenderer must submit detailed panel layout drawings for approval by the engineer.

IB3.3 New Head of Works C&I System

A new head of works is being constructed including screening, de-gritting and a new raw sewage pump station. In addition a new second class water system will be installed. The C&I scope of work for the new plant includes the manufacture, supply, installation, testing and commissioning of the C&I equipment required to support the processing operations. The following main scope of works are identified, with full technical detailed provided in the data sheets, technical drawings and bill of quantities:

PLC PANEL

Manufacture, fabrication, assembly, testing, delivery to site, installation and commissioning of the PLC panel for head of works and remote I/O panel for the second-class water system. The HOW PLC is integral to the HOW MCC which will be installed in the substation room of the new head of works building and the second class water system will be installed in the existing screened sewage pump station building.

The work will include:

- Design and preparation of detailed design drawings in accordance with the manufacturer's standards.
- Labelling of the PLC and all equipment inside the panel.
- Proof of SANS compliance to be provided.

IB3.4 New De-Watering Plant C&I System

A new de-watering plant is being constructed. The C&I scope of work for the new plant includes the manufacture, supply, installation, testing and commissioning of the control and instrumentation equipment required to support the processing operations. The following main scope of works are identified, with full technical detailed provided in the data sheets, technical drawings and bill of quantities:

PLC PANEL

Manufacture, fabrication, assembly, testing, delivery to site, installation and commissioning of the PLC panel for de-watering plant and remote I/O panel for the sludge transfer pump station. The de-watering PLC is integral to the de-watering MCC which will be installed in the substation room of the new de-watering building.

The work will include:

- Design and preparation of detailed design drawings in accordance with the manufacturer's standards.
- Labelling of the PLC and all equipment inside the panel.
- Proof of SANS compliance to be provided.

IB3.5 Pump Stations C&I Systems

Pump Stations No. 1 to 4 are to be upgraded, including the addition of PLC systems. The C&I scope of work for the pump stations includes the manufacture, supply, installation, testing and commissioning of the control and instrumentation equipment required to support the processing operations. The following main scope of works are identified, with full technical detailed provided in the data sheets, technical drawings and bill of quantities:

PLC PANELS

Manufacture, fabrication, assembly, testing, delivery to site, installation and commissioning of the PLC panel for the four pump stations.

The work will include:

- Design and preparation of detailed design drawings in accordance with the manufacturer's standards.
- Labelling of the PLC and all equipment inside the panel.
- Proof of SANS compliance to be provided.

IB3.6 Field Instruments

Manufacture, assembly, testing, delivery to site, installation and commissioning of the field instrumentation as detailed in the data sheets, technical drawings and bill of quantities. The scope of work includes complete installation including all fittings, isolation valves, mounting brackets and support as required.

The contractor shall fabricate 304 stainless steel mounting brackets for the secure mounting of the measuring heads at the designated points in the process. All mounting bolts, nuts and anchors shall be stainless steel unless otherwise approved.

All field transmitters shall be mounted in Field Equipment Boxes (FEB) which in turn will be mounted in the field close to the measuring heads.

Installation of inline equipment, flow meters, actuated valves etc. shall be performed by the Sub-Contractor.

Every effort will be made by the Engineer to show instrument locations and cable routes with accuracy on the relevant project drawings. In the interests of prevention of rework, confirmation of exact locations and routings shall be obtained by the Sub-Contractor from the Engineer before the work is carried out

IB3.7 Instrument Junction Boxes

Instrument junction boxes (IJB) shall be constructed of polycarbonate, with no painting required.

The IJB's shall be mounted facing south as far as practicable.

IJB's will be equipped with a removable chassis plate upon which the field instrumentation equipment including surge arrestors etc. shall be mounted.

The front door of the IJB shall be a hinged door with an armour plate glass window mounted in a rubber seal in the door. The equipment mounted in the IJB shall be located such that any display can be read without opening the door. The door is to be fitted with a lockable latch.

The junction boxes shall be equipped with removable, bottom entry, gland plates. All cabling to and from the equipment mounted in the junction boxes shall be glanded off on gland plates.

Power and signal cable cores are to be terminated on rail mounted surge arrestors mounted in the IJB.

A prototype of each type of junction box proposed shall be submitted to the Engineer for approval before purchasing in quantity.

IB3.8 Field Junction Boxes

Field junction boxes will be provided at areas with high concentrations of instrumentation and valves. Two types of FJB's will be provide for site, designated as Type A and Type B.

Type A will include the following elements:

- Network switch, for interfacing field valves on the Ethernet/Modbus TCP network to the PLC.
- Two 8-way patch panels and required patch leads.
- Valve distribution board, 400Vac 3 phase. One incoming 3 pole circuit breaker, multiple feeder breakers (3 pole) to supply the valves. Surge protection required in the incoming supply.
- Instrument distribution board, 231Vac 1 phase UPS supply. Supplying the network switch and field instruments.
- Terminals for the connection of multicore cables to the field equipment.
- Earthing
- Accessories to complete the FJB; such as SPD's, trunking, dinrail and labelling.

Type B junction boxes will include the following elements:

- Terminals for the connection of multicore cables to the field equipment.
- Earthing
- Accessories to complete the FJB; such as SPD's, trunking, dinrail and labelling.

No power distribution will be included in the Type B FJB's.

FJB's will be equipped with a removable chassis plate upon which the equipment including surge arrestors etc. shall be mounted.

The front door of the FJB shall be a hinged, fitted with a lockable latch.

The junction boxes shall be equipped with removable, bottom entry, gland plates. All cabling to and from the equipment mounted in the junction boxes shall be glanded off on gland plates.

Power and signal cable cores are to be terminated on rail mounted surge arrestors mounted in the IJB.

A prototype of each type of junction box proposed shall be submitted to the Engineer for approval before purchasing in quantity.

IB3.9 Instrument and Control Cables

All cables and labelling are to be supplied by the contractor. Lengths as shown on the cable schedules are estimates only. Quantities for order are to be determined by contractor based on, on site measurement. All cables are to be measured on site before being cut. If the cable is found to be too short it will be for the contractor's account to rectify. Cable joints on newly installed or supplied cables will not be accepted without written prior approval by the engineer.

The following work is included:

- The installation, termination, jointing and connection of all the control and instrument and instrument power cables as per attached cable schedule. The cable termination rate is to include cost of all required material including glands, lugs and ferrules.

- The manufacture, supply and installation of field junction boxes and instrument junction boxes.

Notes:

- Future equipment cabling has been excluded from this scope of work. Cable racking has been sized to allow for future installation.
- All glands to be of Pratley or equivalent.
- All crimping dies are to be in perfect condition, correctly sized and suited to the lug to be crimped. The lugs are to be of the correct type and size for the cross section of the cable to be crimped.
- All control cables are to be double ferruled with bootlace ferrules and with the numbers at the supply and destination ends.
- All cable ties are to be fully weather and ultraviolet resistant.

IB3.10 Cable Support Systems and Support Steelwork

All cables shall be run horizontally or vertically with single layers on ladder cable racking. All cables shall be strapped individually with normal PVC straps at a maximum unsupported length of 300 mm.

The Bill of Quantities will indicate required lengths and sizes of cable racking. Sizes and quantities indicated in the Bill Of Quantities are there to ensure sufficient funds are available for racking. These quantities must not be used for placing of orders. The contractor must submit cable racking layouts for approval by the Engineer before any racking is ordered.

The Contractor is to make due allowance for all angle iron droppers, and support steelwork including any brackets required for cable racks, field junction boxes, instrument junction boxes etc.

Cable racking shall be manufactured from 3CR12. Cable racking shall be earthed at a point closest to the source of supply and continuity shall be maintained across joints by means of jumpers. The minimum size of the earth continuity conductor shall be 16 mm², the bonding conductor shall be 10 mm² and it shall be green PVC insulated.

IB3.11 Training

The tenderer must allow an amount to cover the cost of training of EWS personnel by the supplier (not only the contractor) on new instrumentation supplied on this contract. Training will be by the supplier at the supplier's premises or on site. If no training is required, then this amount will not be claimed.

IB3.12 Maintenance Spares

The tenderer will be required to provide a recommended list of instrumentation spares, including PLC equipment and data communications equipment including, but not limited to, at least one type of each PLC I/O module processor and power supply, spare Ethernet Switch etc., for at least the following three years' maintenance. The tenderer must allow a corresponding cost for these spares in the BOQ.

IB4 DRAWING SCHEDULE

The following drawings are part of the tender and should be priced accordingly.

Drawing Number	DRAWING DESCRIPTION	REVISION
60325-I-LI-100	HOW Cable block diagram	Rev B
60325-I-LS-300	Pump station No. 1 to No. 4 Cable Block Diagram	Rev B
60325-I-SD-700	Sludge De-watering Cable block diagram	Rev B
60325-I-GW-900	HWWTW Control System Architecture Drawing	Rev B
60325-I-GW-901	Typical Instrument Loop Schematic drawings	Rev B
60325-I-GW-902	Typical Field Junction Box – Type A	Rev B
60325-I-GW-903	Typical Field Junction Box – Type B	Rev B
60325-I-GW-904	Typical PLC Panel	Rev B
60325-I-GW-905	Typical Instrument Junction Box	Rev B
60325-I-GW-906	Type A Junction Box – Power Distribution	Rev B
60325-I-GW-907	PLC Panel – Power Distribution	Rev B
60325-I-GW-908	Site Fibre Cable Routing	Rev B

IB5 TRAINING REQUIREMENTS**IB5.1 General**

The Contractor shall conduct comprehensive training for EWS maintenance and operational staff of the plant during the commissioning period.

Electrical (Medium Voltage and Low Voltage) ,Control ,Instrumentation and SCADA ,Mechanical and Process equipment operation and maintenance training shall form part of the overall training programme.

All equipment shall be in operational order before training shall commence.

The training shall be designed specifically for the works paying close attention to specialized equipment

Specified training shall allow for at least 5 each operational/maintenance staff members and 5 engineering staff members.

The contractor must allow for sufficient time when specialists are engaged for specialized training to allow expert training to be given to operational/maintenance and engineering staff.

During the installation phase, the Employer may nominate a team of operational/maintenance/engineering employees who will be closely involved with the installation and commissioning process. These employees will only observer to get the maximum information regarding the installation, to enable efficient maintenance to be undertaken by the Employer.

IB5.2 Training Manual

Training and training manuals shall be based on the O&M Manuals.

Each trainee shall have his/her own manual with three additional copies which shall form part of the Operation and Maintenance Manuals.

IB5.3 Training Schedule

The Engineer shall approve the training schedule. A CV of the training facilitator shall be submitted to the Engineer for approval.

The training shall include operator training, technical and maintenance training.

The program for the training shall include instruction for a minimum 2 days on-site.

The schedule shall cover the following:

- General process/system overview
- Functional operation of the system. A complete operational narrative in conjunction with PID, electro mechanical schematic detailing the start-up, shut down process, interlock checking , specific operations of process equipment across all driplines , what alarms are critical, where to reset, fault finding, standby supply operations etc.
- Maintenance Schedules and how to complete them.
- Standard Maintenance Procedures.
- Spare Part Lists

EWS maintenance staff and other supporting staff should be fully proficient in the system operation and maintenance thereof.

IB5.4 Maintenance and Operation Training

The training shall be designed to teach operators how to operate the Process, Electrical, Mechanical, Instrumentation and Control systems and shall include the following but not limited to the following:

- a) Start-up, shut-down and operating instruction for all operational modes for the works shall be provided. This shall be comprehensive and shall include actions to be taken in the case of all alarm conditions and basic to in-depth fault finding.
- b) A layout drawing of the installation, a process flow diagram, and a P&ID shall be provided for each Operator. The instructions described in IB7.1 above shall also be provided in printed form for each operator.
- c) If a SCADA and Telemetry system is part of the control system, the SCADA operations training as described in the SCADA and Telemetry standard specification shall be incorporated in the training.
- d) This training shall be designed to teach operations and maintenance personnel how to operate, repair and maintain the electrical, mechanical ,instrumentation and control systems.

IB5.5 Control, Instrumentation and Scada Equipment

Description of training	Equipment	Training By	Duration	Certificate
Detail training on the specific PLC, Instrumentation, control and SCADA equipment	HOW, Centrifuge, pumps, Poly systems, chlorination Aerators etc	OEM Accredited Facilitator	TBA	Yes
Detail training on operations with regards to control philosophy understanding. Common PLC, Instrumentation, control and SCADA faults and what action is needed	HOW, Centrifuge, pumps, Poly systems, chlorination Aerators etc	OEM	TBA	Yes
Detailed overview of PLC, Instrumentation, control and SCADA settings, programming - target audience is engineers (2) and technicians(2 off)	HOW, Centrifuge, pumps, Poly systems, chlorination Aerators etc	OEM Accredited training course. All costs to be by tenderer if training is offered out of Durban	TBA - Depends on training provider	Yes , accredited for CPD points
Where and how to install common spare parts.	HOW, Centrifuge, pumps, Poly systems, chlorination Aerators etc	OEM	TBA	Yes ,
Detail list of where to obtain spare parts locally/nationally	HOW, Centrifuge, pumps, Poly systems, chlorination Aerators etc	OEM	TBA	Yes ,
Safety in operations and maintenance	HOW, Centrifuge, pumps, Poly systems, chlorination Aerators etc	OEM	TBA	Yes ,

IB5.1 WITNESSING OF FACTORY ACCEPTANCE TESTING

The Employer's team and engineering team reserve the right to witness and sign off Factory Acceptance Testing (FAT) of all equipment. Witnessing of testing and the relevant representatives from the Employer and engineering team shall be confirmed during the contract. In the absence of witnessing, inspection certificates detailing all works testing conducted shall be forwarded to the Engineer for approval.

The Tenderer should make provision for all allowances, disbursements, accommodation and associated costs for travelling to areas outside the Ethekwini Metropolitan Area, to inspect and conduct factory acceptance testing or any other Inspections, tests, etc. of equipment in the BoQ.

The following provisions shall be made for travel inside South Africa per relevant equipment item FAT:

- Total number of representatives: 2 – Employer, 1- Engineering team
- Hotel/Guest house accommodation in a 3 or 4 star hotel for 2 nights
- Return flights economy class
- Car hire with a class B car
- Subsistence allowance as per the SARS guideline "Guide for Employers in Respect of Allowances" for travel within the Republic of South Africa.

The following provisions shall be made for travel outside South Africa per relevant equipment item FAT:

- Total number of representatives: 2 – Employer, 1- Engineering team
- Hotel/Guest house accommodation in a 3 or 4 star hotel for 5 nights
- Return flights economy class
- Car hire with a class B car
- Subsistence allowance as per the SARS guideline "Guide for Employers in Respect of Allowances" for travel outside the Republic of South Africa.
- VISA costs and travel insurance.

The Tenderer shall make provision for the Employer's representatives and engineering team representatives to witness FAT testing on the following equipment:

- PLC Systems
- SCADA Systems
- Instrument Junction Boxe

IB6 CABLE SCHEDULE-HEAD OF WORKS

From		To		Type	Voltage (V)	Number of Cores	Nominal Section mm ²	Total Length (m)	Terminations (no.)	Type	Cable Number
Equipment No.	Equipment Description	Equipment No.	Equipment Description								
PLC01	Head of Works PLC Panel	01-JB01	HOW Screening Area Junction Box	Power	400	3	2.5	100	2	Cu/PVC/PVC/SWA /PVC 600/1000V	EP/001/PLC01 /01-JB01
PLC01	Head of Works PLC Panel	01-JB01	HOW Screening Area Junction Box	Instr	24VDC	12Pr	1.0	100	2	Dekabon M877	I/001/PLC01/0 1-JB01
PLC01	Head of Works PLC Panel	01-JB01	HOW Screening Area Junction Box	Instr	24VDC	8Pr	1.0	100	2	Dekabon M877	I/002/PLC01/0 1-JB01
PLC01	Head of Works PLC Panel	01-JB01	HOW Screening Area Junction Box	Instr	231VAC	12Pr	1.0	100	2	Dekabon M877	I/003/PLC01/0 1-JB01
PLC01	Head of Works PLC Panel	01-JB01	HOW Screening Area Junction Box	Instr	-	8	MM	100	2	8 Core FO SWA	FO/001/PLC0 1/01-JB01
MCC01	HOW MCC Panel	01-JB01	HOW Screening Area Junction Box	Power	400	3	4.0	100	2	Cu/PVC/PVC/SWA /PVC 600/1000V	EP/002/01MC C-DB/01-JB01
01-JB01	HOW Screening Area Junction Box	FIT001	Inlet flow to works flow transmitter	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/001/01-JB01/FIT001
01-JB01	HOW Screening Area Junction Box	LIT001	Channel 1 coarse screen differential level transmitter	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/002/01-JB01/LIT001
01-JB01	HOW Screening Area Junction Box	LIT002	Channel 1 fine screen differential level transmitter	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/003/01-JB01/LIT002
01-JB01	HOW Screening Area Junction Box	LIT003	Channel 2 coarse screen differential level transmitter	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/004/01-JB01/LIT003
01-JB01	HOW Screening Area Junction Box	LIT004	Channel 2 fine screen differential level transmitter	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/005/01-JB01/LIT004
01-JB01	HOW Screening Area Junction Box	LIT007	Washer compactor 1 level transmitter	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/006/01-JB01/LIT007
01-JB01	HOW Screening Area Junction Box	LIT008	Washer compactor 2 level transmitter	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/007/01-JB01/LIT008
01-JB01	HOW Screening Area Junction Box	FIT003	Emergency bypass flow transmitter	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/008/01-JB01/FIT003
01-JB01	HOW Screening Area Junction Box	FIT001	Inlet flow to works flow transmitter	Power	231VAC	3	1.5	15	2	Cu/PVC/PVC/SWA /PVC 600/1000V	EP/001/01-JB01/FIT001
01-JB01	HOW Screening Area Junction Box	LIT001	Channel 1 coarse screen differential level transmitter	Power	231VAC	3	1.5	15	2	Cu/PVC/PVC/SWA /PVC 600/1000V	EP/002/01-JB01/LIT001
01-JB01	HOW Screening Area Junction Box	LIT002	Channel 1 fine screen differential level transmitter	Power	231VAC	3	1.5	15	2	Cu/PVC/PVC/SWA /PVC 600/1000V	EP/003/01-JB01/LIT002
01-JB01	HOW Screening Area Junction Box	LIT003	Channel 2 coarse screen differential level transmitter	Power	231VAC	3	1.5	15	2	Cu/PVC/PVC/SWA /PVC 600/1000V	EP/004/01-JB01/LIT003

From		To		Type	Voltage (V)	Number of Cores	Nominal Section mm ²	Total Length (m)	Terminations (no.)	Type	Cable Number
01-JB01	HOW Screening Area Junction Box	LIT004	Channel 2 fine screen differential level transmitter	Power	231VAC	3	1.5	15	2	Cu/PVC/PVC/SWA /PVC 600/1000V	EP/005/01-JB01/LIT004
01-JB01	HOW Screening Area Junction Box	LIT007	Washer compactor 1 level transmitter	Power	231VAC	3	1.5	15	2	Cu/PVC/PVC/SWA /PVC 600/1000V	EP/006/01-JB01/LIT007
01-JB01	HOW Screening Area Junction Box	LIT008	Washer compactor 2 level transmitter	Power	231VAC	3	1.5	15	2	Cu/PVC/PVC/SWA /PVC 600/1000V	EP/007/01-JB01/LIT008
01-JB01	HOW Screening Area Junction Box	FIT003	Emergency bypass flow transmitter	Power	231VAC	3	1.5	15	2	Cu/PVC/PVC/SWA /PVC 600/1000V	EP/008/01-JB01/FIT003
01-JB01	HOW Screening Area Junction Box	XS001	Channel 1 coarse screen torque switch	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/009/01-JB01/XS001
01-JB01	HOW Screening Area Junction Box	XS002	Channel 1 fine screen torque switch	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/010/01-JB01/XS002
01-JB01	HOW Screening Area Junction Box	XS003	Channel 2 coarse screen torque switch	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/011/01-JB01/XS003
01-JB01	HOW Screening Area Junction Box	XS004	Channel 2 fine screen torque switch	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/012/01-JB01/XS004
01-JB01	HOW Screening Area Junction Box	ZS001	Dolley skip position indicator	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/013/01-JB01/ZS001
01-JB01	HOW Screening Area Junction Box	ZS002	Dolley skip position indicator	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/014/01-JB01/ZS002
01-JB01	HOW Screening Area Junction Box	XV004	WHC01 water supply valve - open command	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/015/01-JB01/XV004
01-JB01	HOW Screening Area Junction Box	XV005	WHC02 water supply valve - open command	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/016/01-JB01/XV005
01-JB01	HOW Screening Area Junction Box	XV0035	Washer/compactor pan flush valve 1	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/017/01-JB01/XV0035
01-JB01	HOW Screening Area Junction Box	XV0036	Washer/compactor pan flush valve 2	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/018/01-JB01/XV0036
01-JB01	HOW Screening Area Junction Box	XV001	Hydraulic launder washwater supply valve	Network	Modbus	STP	Cat6	15	2	CAT6 STP	NM/001/01-JB01/XV001
01-JB01	HOW Screening Area Junction Box	XV002	WHC01 screenings feed valve	Network	Modbus	STP	Cat6	15	2	CAT6 STP	NM/001/01-JB01/XV002
01-JB01	HOW Screening Area Junction Box	XV003	WHC02 screenings feed valve	Network	Modbus	STP	Cat6	15	2	CAT6 STP	NM/001/01-JB01/XV003
01-JB01	HOW Screening Area Junction Box	XV006	WHC01 drain valve	Network	Modbus	STP	Cat6	15	2	CAT6 STP	NM/001/01-JB01/XV006
01-JB01	HOW Screening Area Junction Box	XV007	WHC02 drain valve	Network	Modbus	STP	Cat6	15	2	CAT6 STP	NM/001/01-JB01/XV007
01-JB01	HOW Screening Area Junction Box	XV037	Hydraulic launder water supply valve 1	Network	Modbus	STP	Cat6	15	2	CAT6 STP	NM/001/01-JB01/XV037
01-JB01	HOW Screening Area Junction Box	XV038	Hydraulic launder water supply valve 2	Network	Modbus	STP	Cat6	15	2	CAT6 STP	NM/001/01-JB01/XV038
01-JB01	HOW Screening Area Junction Box	XV001	Hydraulic launder washwater supply valve	Power	231VAC	4	1.5	15	2	Cu/PVC/PVC/SWA /PVC 600/1000V	EP/009/01-JB01/XV001

From		To		Type	Voltage (V)	Number of Cores	Nominal Section mm ²	Total Length (m)	Terminations (no.)	Type	Cable Number
01-JB01	HOW Screening Area Junction Box	XV002	WHC01 screenings feed valve	Power	231VAC	4	1.5	15	2	Cu/PVC/PVC/SWA /PVC 600/1000V	EP/010/01-JB01/XV002
01-JB01	HOW Screening Area Junction Box	XV003	WHC02 screenings feed valve	Power	231VAC	4	1.5	15	2	Cu/PVC/PVC/SWA /PVC 600/1000V	EP/011/01-JB01/XV003
01-JB01	HOW Screening Area Junction Box	XV006	WHC01 drain valve	Power	231VAC	4	1.5	15	2	Cu/PVC/PVC/SWA /PVC 600/1000V	EP/012/01-JB01/XV006
01-JB01	HOW Screening Area Junction Box	XV007	WHC02 drain valve	Power	231VAC	4	1.5	15	2	Cu/PVC/PVC/SWA /PVC 600/1000V	EP/013/01-JB01/XV007
01-JB01	HOW Screening Area Junction Box	XV037	Hydraulic launder water supply valve 1	Power	231VAC	4	1.5	15	2	Cu/PVC/PVC/SWA /PVC 600/1000V	EP/014/01-JB01/XV037
01-JB01	HOW Screening Area Junction Box	XV038	Hydraulic launder water supply valve 2	Power	231VAC	4	1.5	15	2	Cu/PVC/PVC/SWA /PVC 600/1000V	EP/015/01-JB01/XV038
PLC01	Head of Works PLC Panel	01-JB02	HOW De-gritting Area Junction Box	Instr	24VDC	4Pr	1.0	60	2	Dekabon M877	I/001/PLC01/01-JB02
PLC01	Head of Works PLC Panel	01-JB02	HOW De-gritting Area Junction Box	Instr	-	8	MM	60	2	8 Core FO SWA	FO/001/PLC01/01-JB02
MCC01	HOW MCC Panel	01-JB02	HOW De-gritting Area Junction Box	Power	400	3	4.0	60	2	Cu/PVC/PVC/SWA /PVC 600/1000V	EP/1/01MCC-DB/01-JB02
01-JB02	HOW De-gritting Area Junction Box	FSL005	Grit Slurry Pump No. 1 low flow switch	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/001/01-JB02/FSL005
01-JB02	HOW De-gritting Area Junction Box	FSL006	Grit Slurry Pump No. 2 low flow switch	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/002/01-JB02/FSL006
01-JB02	HOW De-gritting Area Junction Box	XV019	Grit trap 1 2nd class water valve	Network	Modbus	STP	Cat6	15	2	CAT6 STP	NM/001/01-JB02/XV019
01-JB02	HOW De-gritting Area Junction Box	XV020	Grit trap 2 2nd class water valve	Network	Modbus	STP	Cat6	15	2	CAT6 STP	NM/002/01-JB02/XV020
01-JB02	HOW De-gritting Area Junction Box	XV023	Grit trap 1 grit slurry valve	Network	Modbus	STP	Cat6	15	2	CAT6 STP	NM/003/01-JB02/XV023
01-JB02	HOW De-gritting Area Junction Box	XV024	Grit trap 2 grit slurry valve	Network	Modbus	STP	Cat6	15	2	CAT6 STP	NM/004/01-JB02/XV024
01-JB02	HOW De-gritting Area Junction Box	XV019	Grit trap 1 2nd class water valve	Power	231VAC	4	1.5	15	2	Cu/PVC/PVC/SWA /PVC 600/1000V	EP/001/01-JB02/XV019
01-JB02	HOW De-gritting Area Junction Box	XV020	Grit trap 2 2nd class water valve	Power	231VAC	4	1.5	15	2	Cu/PVC/PVC/SWA /PVC 600/1000V	EP/002/01-JB02/XV020
01-JB02	HOW De-gritting Area Junction Box	XV023	Grit trap 1 grit slurry valve	Power	231VAC	4	1.5	15	2	Cu/PVC/PVC/SWA /PVC 600/1000V	EP/003/01-JB02/XV023
01-JB02	HOW De-gritting Area Junction Box	XV024	Grit trap 2 grit slurry valve	Power	231VAC	4	1.5	15	2	Cu/PVC/PVC/SWA /PVC 600/1000V	EP/004/01-JB02/XV024

From		To		Type	Voltage (V)	Number of Cores	Nominal Section mm ²	Total Length (m)	Terminations (no.)	Type	Cable Number
PLC01	Head of Works PLC Panel	01-JB03	HOW Grit Classifier Area Junction Box	Instr	24VDC	8Pr	1.0	40	2	Dekabon M877	I/001/PLC01/01-JB01
PLC01	Head of Works PLC Panel	01-JB03	HOW Grit Classifier Area Junction Box	Instr	24VDC	16Pr	1.0	40	2	Dekabon M877	I/002/PLC01/01-JB01
PLC01	Head of Works PLC Panel	01-JB03	HOW Grit Classifier Area Junction Box	Instr	231VAC	12Pr	1.0	40	2	Dekabon M877	I/003/PLC01/01-JB01
PLC01	Head of Works PLC Panel	01-JB03	HOW Grit Classifier Area Junction Box	Instr	-	8	MM	40	2	8 Core FO SWA	FO/001/PLC01/01-JB01
MCC01	HOW MCC Panel	01-JB03	HOW Grit Classifier Area Junction Box	Power	400	3	4.0	40	2	Cu/PVC/PVC/SWA /PVC 600/1000V	EP/001/01MC C-DB/01-JB01
01-JB03	HOW Grit Classifier Area Junction Box	PIT001	Grit classifier 1 pressure transmitter	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/001/01-JB03/PIT001
01-JB03	HOW Grit Classifier Area Junction Box	PIT002	Grit classifier 2 pressure transmitter	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/002/01-JB03/PIT002
01-JB03	HOW Grit Classifier Area Junction Box	LIT009	Channel 1 ultra fine screen differential level transmitter	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/003/01-JB03/LIT009
01-JB03	HOW Grit Classifier Area Junction Box	LIT0010	Channel 2 ultra fine screen differential level transmitter	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/004/01-JB03/LIT0010
01-JB03	HOW Grit Classifier Area Junction Box	ZS003	Dolley skip position indicator	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/005/01-JB03/ZS003
01-JB03	HOW Grit Classifier Area Junction Box	ZS004	Dolley skip position indicator	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/006/01-JB03/ZS004
01-JB03	HOW Grit Classifier Area Junction Box	ZS005	Dolley skip position indicator	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/007/01-JB03/ZS005
01-JB03	HOW Grit Classifier Area Junction Box	ZS006	Dolley skip position indicator	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/008/01-JB03/ZS006
01-JB03	HOW Grit Classifier Area Junction Box	PSH001	HP washwater booster pump pressure switch	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/009/01-JB03/PSH001
01-JB03	HOW Grit Classifier Area Junction Box	PSH002	HP washwater booster pump pressure switch	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/010/01-JB03/PSH002
01-JB03	HOW Grit Classifier Area Junction Box	ZS007	Ultrafine screenings conveyor selector position limit	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/022/01-JB03/ZS007
01-JB03	HOW Grit Classifier Area Junction Box	ZS008	Ultrafine screenings conveyor selector position limit	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/023/01-JB03/ZS008
01-JB03	HOW Grit Classifier Area Junction Box	ZS009	Ultrafine screenings conveyor selector position limit	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/024/01-JB03/ZS009
01-JB03	HOW Grit Classifier Area Junction Box	ZS0010	Ultrafine screenings conveyor selector position limit	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/025/01-JB03/ZS0010
01-JB03	HOW Grit Classifier Area Junction Box	ZS0011	Ultrafine screenings conveyor cover proxy	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/026/01-JB03/ZS0011

From		To		Type	Voltage (V)	Number of Cores	Nominal Section mm ²	Total Length (m)	Terminations (no.)	Type	Cable Number
01-JB03	HOW Grit Classifier Area Junction Box	ZS0012	Ultrafine screenings conveyor cover proxy	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/027/01-JB03/ZS0012
01-JB03	HOW Grit Classifier Area Junction Box	XV008	MSR02 washwater supply	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/011/01-JB03/XV008
01-JB03	HOW Grit Classifier Area Junction Box	XV009	MSR03B washwater supply	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/012/01-JB03/XV009
01-JB03	HOW Grit Classifier Area Junction Box	XV0010	MSR02 HP washwater supply	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/013/01-JB03/XV0010
01-JB03	HOW Grit Classifier Area Junction Box	XV0011	MSR03B HP washwater supply	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/014/01-JB03/XV0011
01-JB03	HOW Grit Classifier Area Junction Box	XV0012	Hydraulic launder water supply	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/015/01-JB03/XV0012
01-JB03	HOW Grit Classifier Area Junction Box	XV0014	WHC03 washwater supply valve 1	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/016/01-JB03/XV0014
01-JB03	HOW Grit Classifier Area Junction Box	XV0015	WHC03 washwater supply valve 2	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/017/01-JB03/XV0015
01-JB03	HOW Grit Classifier Area Junction Box	XV0017	WHC03 washwater supply valve 1	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/018/01-JB03/XV0017
01-JB03	HOW Grit Classifier Area Junction Box	XV0018	WHC03 washwater supply valve 2	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/019/01-JB03/XV0018
01-JB03	HOW Grit Classifier Area Junction Box	XV0021	Grit classifier 1 2nd class water valve	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/020/01-JB03/XV0021
01-JB03	HOW Grit Classifier Area Junction Box	XV0022	Grit classifier 2 2nd class water valve	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/021/01-JB03/XV0022
01-JB03	HOW Grit Classifier Area Junction Box	XV013	WHC03 screenings feed inlet valve	Network	Modbus	STP	Cat6	15	2	CAT6 STP	NM/001/01-JB03/XV013
01-JB03	HOW Grit Classifier Area Junction Box	XV016	WHC03 screenings feed inlet valve	Network	Modbus	STP	Cat6	15	2	CAT6 STP	NM/001/01-JB03/XV016
01-JB03	HOW Grit Classifier Area Junction Box	XV025	Grit classifier 1 inlet valve	Network	Modbus	STP	Cat6	15	2	CAT6 STP	NM/001/01-JB03/XV025
01-JB03	HOW Grit Classifier Area Junction Box	XV026	Grit classifier 2 inlet valve	Network	Modbus	STP	Cat6	15	2	CAT6 STP	NM/001/01-JB03/XV026
01-JB03	HOW Grit Classifier Area Junction Box	XV029	Grit classifier organic residue valve	Network	Modbus	STP	Cat6	15	2	CAT6 STP	NM/001/01-JB03/XV029
01-JB03	HOW Grit Classifier Area Junction Box	XV030	Grit classifier organic residue valve	Network	Modbus	STP	Cat6	15	2	CAT6 STP	NM/001/01-JB03/XV030
01-JB03	HOW Grit Classifier Area Junction Box	XV013	WHC03 screenings feed inlet valve	Power	231VAC	4	1.5	15	2	Cu/PVC/PVC/SWA /PVC 600/1000V	EP/005/01-JB03/XV013
01-JB03	HOW Grit Classifier Area Junction Box	XV016	WHC03 screenings feed inlet valve	Power	231VAC	4	1.5	15	2	Cu/PVC/PVC/SWA /PVC 600/1000V	EP/006/01-JB03/XV016
01-JB03	HOW Grit Classifier Area Junction Box	XV025	Grit classifier 1 inlet valve	Power	231VAC	4	1.5	15	2	Cu/PVC/PVC/SWA /PVC 600/1000V	EP/007/01-JB03/XV025
01-JB03	HOW Grit Classifier Area Junction Box	XV026	Grit classifier 2 inlet valve	Power	231VAC	4	1.5	15	2	Cu/PVC/PVC/SWA /PVC 600/1000V	EP/008/01-JB03/XV026

From		To		Type	Voltage (V)	Number of Cores	Nominal Section mm ²	Total Length (m)	Terminations (no.)	Type	Cable Number
01-JB03	HOW Grit Classifier Area Junction Box	XV029	Grit classifier organic residue valve	Power	231VAC	4	1.5	15	2	Cu/PVC/PVC/SWA /PVC 600/1000V	EP/009/01-JB03/XV029
01-JB03	HOW Grit Classifier Area Junction Box	XV030	Grit classifier organic residue valve	Power	231VAC	4	1.5	15	2	Cu/PVC/PVC/SWA /PVC 600/1000V	EP/010/01-JB03/XV030
PLC01	Head of Works PLC Panel	01-JB04	HOW Sewage Pump 1 Junction Box	Instr	24VDC	16Pr	1.0	20	2	Dekabon M877	I/001/PLC01/01-JB04
01-JB04	HOW Sewage Pump 1 Junction Box	VT001	Bioreactor feed pump No.1 Pump DE Vibration -X	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/001/01-JB04/VT001
01-JB04	HOW Sewage Pump 1 Junction Box	VT002	Bioreactor feed pump No.1 Pump DE Vibration -Y	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/002/01-JB04/VT002
01-JB04	HOW Sewage Pump 1 Junction Box	VT003	Bioreactor feed pump No.1 Pump NDE Vibration -X	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/003/01-JB04/VT003
01-JB04	HOW Sewage Pump 1 Junction Box	VT004	Bioreactor feed pump No.1 Pump NDE Vibration -Y	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/004/01-JB04/VT004
01-JB04	HOW Sewage Pump 1 Junction Box	TT001	Bioreactor feed pump No.1 Pump DE Bearing Temperature	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/005/01-JB04/TT001
01-JB04	HOW Sewage Pump 1 Junction Box	TT002	Bioreactor feed pump No.1 Pump NDE Bearing Temperature	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/006/01-JB04/TT002
01-JB04	HOW Sewage Pump 1 Junction Box	TT003	Bioreactor feed pump No.1 Motor Temperature 'U'	Instr	24VDC	4TR	1.0	15	2	Dekabon M887	I/007/01-JB04/TT003_4_5
01-JB04	HOW Sewage Pump 1 Junction Box	TT004	Bioreactor feed pump No.1 Motor Temperature 'V'	Instr	24VDC						
01-JB04	HOW Sewage Pump 1 Junction Box	TT005	Bioreactor feed pump No.1 Motor Temperature 'W'	Instr	24VDC						
01-JB04	HOW Sewage Pump 1 Junction Box	LIT0013	Screened washwater sump level transmitter	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/010/01-JB04/LIT0013
01-JB04	HOW Sewage Pump 1 Junction Box	FIT0013	Screened washwater sump level overflow flow transmitter	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/011/01-JB04/FIT0013
01-JB04	HOW Sewage Pump 1 Junction Box	PIT003	Bio-reactor feed line pressure	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/012/01-JB04/PIT003
PLC01	Head of Works PLC Panel	01-JB05	HOW Sewage Pump 2 Junction Box	Instr	24VDC	12Pr	1.0	20	2	Dekabon M877	I/001/PLC01/01-JB05
01-JB05	HOW Sewage Pump 2 Junction Box	VT005	Bioreactor feed pump No.2 Pump DE Vibration -X	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/001/01-JB05/VT005
01-JB05	HOW Sewage Pump 2 Junction Box	VT006	Bioreactor feed pump No.2 Pump DE Vibration -Y	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/002/01-JB05/VT006
01-JB05	HOW Sewage Pump 2 Junction Box	VT007	Bioreactor feed pump No.2 Pump NDE Vibration -X	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/003/01-JB05/VT007

From		To		Type	Voltage (V)	Number of Cores	Nominal Section mm ²	Total Length (m)	Terminations (no.)	Type	Cable Number
01-JB05	HOW Sewage Pump 2 Junction Box	VT008	Bioreactor feed pump No.2 Pump NDE Vibration -Y	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/004/01-JB05/VT008
01-JB05	HOW Sewage Pump 2 Junction Box	TT006	Bioreactor feed pump No.2 Pump DE Bearing Temperature	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/005/01-JB05/TT006
01-JB05	HOW Sewage Pump 2 Junction Box	TT007	Bioreactor feed pump No.2 Pump NDE Bearing Temperature	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/006/01-JB05/TT007
01-JB05	HOW Sewage Pump 2 Junction Box	TT008	Bioreactor feed pump No.2 Motor Temperature 'U'	Instr	24VDC	4TR	1.0	15	2	Dekabon M887	I/007/01-JB05/TT008_9_10
01-JB05	HOW Sewage Pump 2 Junction Box	TT009	Bioreactor feed pump No.2 Motor Temperature 'V'	Instr	24VDC						
01-JB05	HOW Sewage Pump 2 Junction Box	TT0010	Bioreactor feed pump No.2 Motor Temperature 'W'	Instr	24VDC						
PLC01	Head of Works PLC Panel	01-JB06	HOW Sewage Pump 3 Junction Box	Instr	24VDC	12Pr	1.0	20	2	Dekabon M877	I/001/PLC01/01-JB06
01-JB06	HOW Sewage Pump 2 Junction Box	VT009	Bioreactor feed pump No.3 Pump DE Vibration -X	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/001/01-JB06/VT009
01-JB06	HOW Sewage Pump 2 Junction Box	VT0010	Bioreactor feed pump No.3 Pump DE Vibration -Y	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/002/01-JB06/VT0010
01-JB06	HOW Sewage Pump 2 Junction Box	VT0011	Bioreactor feed pump No.3 Pump NDE Vibration -X	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/003/01-JB06/VT0011
01-JB06	HOW Sewage Pump 2 Junction Box	VT0012	Bioreactor feed pump No.3 Pump NDE Vibration -Y	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/004/01-JB06/VT0012
01-JB06	HOW Sewage Pump 2 Junction Box	TT0011	Bioreactor feed pump No.3 Pump DE Bearing Temperature	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/005/01-JB06/TT0011
01-JB06	HOW Sewage Pump 2 Junction Box	TT0012	Bioreactor feed pump No.3 Pump NDE Bearing Temperature	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/006/01-JB06/TT0012
01-JB06	HOW Sewage Pump 2 Junction Box	TT0013	Bioreactor feed pump No.3 Motor Temperature 'U'	Instr	24VDC	4TR	1.0	15	2	Dekabon M887	I/007/01-JB06/TT0013_14_15
01-JB06	HOW Sewage Pump 2 Junction Box	TT0014	Bioreactor feed pump No.3 Motor Temperature 'V'	Instr	24VDC						
01-JB06	HOW Sewage Pump 2 Junction Box	TT0015	Bioreactor feed pump No.3 Motor Temperature 'W'	Instr	24VDC						
PLC01	Head of Works PLC Panel	01-JB07	HOW Sewage Pump 4 Junction Box	Instr	24VDC	12Pr	1.0	20	2	Dekabon M877	I/001/PLC01/01-JB07
01-JB07	HOW Sewage Pump 2 Junction Box	VT0013	Bioreactor feed pump No.4 Pump DE Vibration -X	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/001/01-JB07/VT0013
01-JB07	HOW Sewage Pump 2 Junction Box	VT0014	Bioreactor feed pump No.4 Pump DE Vibration -Y	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/002/01-JB07/VT0014

From		To		Type	Voltage (V)	Number of Cores	Nominal Section mm ²	Total Length (m)	Terminations (no.)	Type	Cable Number
01-JB07	HOW Sewage Pump 2 Junction Box	VT0015	Bioreactor feed pump No.4 Pump NDE Vibration -X	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/003/01-JB07/VT0015
01-JB07	HOW Sewage Pump 2 Junction Box	VT0016	Bioreactor feed pump No.4 Pump NDE Vibration -Y	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/004/01-JB07/VT0016
01-JB07	HOW Sewage Pump 2 Junction Box	TT0016	Bioreactor feed pump No.4 Pump DE Bearing Temperature	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/005/01-JB07/TT0016
01-JB07	HOW Sewage Pump 2 Junction Box	TT0017	Bioreactor feed pump No.4 Pump NDE Bearing Temperature	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/006/01-JB07/TT0017
01-JB07	HOW Sewage Pump 2 Junction Box	TT0018	Bioreactor feed pump No.4 Motor Temperature 'U'	Instr	24VDC	4TR	1.0	15	2	Dekabon M887	I/007/01-JB07/TT008_9_10
01-JB07	HOW Sewage Pump 2 Junction Box	TT0019	Bioreactor feed pump No.4 Motor Temperature 'V'	Instr	24VDC						
01-JB07	HOW Sewage Pump 2 Junction Box	TT0020	Bioreactor feed pump No.4 Motor Temperature 'W'	Instr	24VDC						
PLC01	Head of Works PLC Panel	01-JB08	HOW Sewage Pump Station Junction Box	Instr	24VDC	8Pr	1.0	20	2	Dekabon M877	I/001/PLC01/01-JB08
PLC01	Head of Works PLC Panel	01-JB08	HOW Sewage Pump Station Junction Box	Instr	231VAC	8Pr	1.0	20	2	Dekabon M877	I/002/PLC01/01-JB08
01-JB08	HOW Sewage Pump Station Junction Box	FSL001	Bioreactor feed pump No.1 low flow switch	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/001/01-JB08/FSL001
01-JB08	HOW Sewage Pump Station Junction Box	FSL002	Bioreactor feed pump No.2 low flow switch	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/002/01-JB08/FSL002
01-JB08	HOW Sewage Pump Station Junction Box	FSL003	Bioreactor feed pump No.3 low flow switch	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/003/01-JB08/FSL003
01-JB08	HOW Sewage Pump Station Junction Box	FSL004	Bioreactor feed pump No.4 low flow switch	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/004/01-JB08/FSL004
01-JB08	HOW Sewage Pump Station Junction Box	LSL001	Dry well sump level switch low level switch	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/005/01-JB08/LSL001
01-JB08	HOW Sewage Pump Station Junction Box	LSH001	Dry well sump level switch low level switch	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/006/01-JB08/LSH001
01-JB08	HOW Sewage Pump Station Junction Box	LSH002	Screened wastewater sump high level switch	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/007/01-JB08/LSH002
01-JB08	HOW Sewage Pump Station Junction Box	XV0031	Wastewater sump fluidization valve 1	Instr	231VAC	2Pr	1.0	15	2	Dekabon M877	I/008/01-JB08/XV0031
01-JB09	HOW Sewage Pump Station Junction Box	XV0032	Wastewater sump fluidization valve 2	Instr	231VAC	2Pr	1.0	15	2	Dekabon M877	I/009/01-JB08/XV0032
01-JB10	HOW Sewage Pump Station Junction Box	XV0033	Wastewater sump fluidization valve 3	Instr	231VAC	2Pr	1.0	15	2	Dekabon M877	I/010/01-JB08/XV0033
01-JB11	HOW Sewage Pump Station Junction Box	XV0034	Wastewater sump fluidization valve 4	Instr	231VAC	2Pr	1.0	15	2	Dekabon M877	I/011/01-JB08/XV0034

Cable Schedule Second Class Water System

From		To		Type	Voltage (V)	Number of Cores	Nominal Section mm ²	Total Length (m)	Terminations (no.)	Type	Cable Number
Equipment No.	Equipment Description	Equipment No.	Equipment Description								
PLC05	Second Class Water PLC Panel	05-JB09	HOW Screening Area Junction Box	Instr	24VDC	8Pr	1.0	40	2	Dekabon M877	I/001/PLC05/05-JB09
PLC05	Second Class Water PLC Panel	PIT001	Second class water system pressure transmitter	Instr	24VDC	2Pr	1.0	40	2	Dekabon M877	I/001/PLC05/PIT001
05-JB09	HOW Screening Area Junction Box	FSL001	Second class water pump No. 1 low flow switch	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/001/PLC05/FSL001
05-JB09	HOW Screening Area Junction Box	FSL002	Second class water pump No. 2 low flow switch	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/002/PLC05/FSL002
05-JB09	HOW Screening Area Junction Box	FSL003	Second class water pump No. 3 low flow switch	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/003/PLC05/FSL003
05-JB09	HOW Screening Area Junction Box	FSL004	Second class water pump No. 4 low flow switch	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/004/PLC05/FSL004

IB7 CABLE SCHEDULE-DE-WATERING

From		To		Type	Voltage (V)	Number of Cores	Nominal Section mm ²	Total Length (m)	Terminations (no.)	Type	Cable Number
Equipment No.	Equipment Description	Equipment No.	Equipment Description								
PLC08	De-watering PLC Panel	08-JB10	Dewatering Centrifuge Feed Area Junction Box	Power	400	3	2.5	43	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/001/PLC 08/08-JB10
PLC08	De-watering PLC Panel	08-JB10	Dewatering Centrifuge Feed Area Junction Box	Instr	24VDC	12Pr	1.0	43	2	Dekabon M877	I/001/PLC08/08-JB10
PLC08	De-watering PLC Panel	08-JB10	Dewatering Centrifuge Feed Area Junction Box	Instr	24VDC	8Pr	1.0	43	2	Dekabon M877	I/002/PLC08/08-JB10
PLC08	De-watering PLC Panel	08-JB10	Dewatering Centrifuge Feed Area Junction Box	Instr	-	8	MM	43	2	8 Core FO SWA	FO/001/PLC 08/08-JB10
MCC08	De-watering MCC Panel	08-JB10	Dewatering Centrifuge Feed Area Junction Box	Power	400	3	4.0	43	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/002/08MCC-DB/08-JB10
08-JB10	Dewatering Centrifuge Feed Area Junction Box	AIT001	Centrifuge feed solids meter	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/001/08-JB10/AIT001
08-JB10	Dewatering Centrifuge Feed Area Junction Box	AIT002	Centrifuge feed solids meter	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/002/08-JB10/AIT002
08-JB10	Dewatering Centrifuge Feed Area Junction Box	FIT001	Centrifuge feed flow	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/004/08-JB10/FIT001
08-JB10	Dewatering Centrifuge Feed Area Junction Box	FIT002	Centrifuge dilution water flow	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/005/08-JB10/FIT002
08-JB10	Dewatering Centrifuge Feed Area Junction Box	FIT003	Centrifuge feed flow	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/006/08-JB10/FIT003
08-JB10	Dewatering Centrifuge Feed Area Junction Box	AIT001	Centrifuge feed solids meter	Power	231VAC	3	1.5	15	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/001/08-JB10/AIT001
08-JB10	Dewatering Centrifuge Feed Area Junction Box	AIT002	Centrifuge feed solids meter	Power	231VAC	3	1.5	15	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/002/08-JB10/AIT002
08-JB10	Dewatering Centrifuge Feed Area Junction Box	FIT001	Centrifuge feed flow	Power	231VAC	3	1.5	15	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/004/08-JB10/FIT001
08-JB10	Dewatering Centrifuge Feed Area Junction Box	FIT002	Centrifuge dilution water flow	Power	231VAC	3	1.5	15	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/005/08-JB10/FIT002
08-JB10	Dewatering Centrifuge Feed Area Junction Box	FIT003	Centrifuge feed flow	Power	231VAC	3	1.5	15	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/006/08-JB10/FIT003
08-JB10	Dewatering Centrifuge Feed Area Junction Box	PIT001	Centrifuge feed pump pressure transmitter	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/007/08-JB10/PIT001
08-JB10	Dewatering Centrifuge Feed Area Junction Box	PIT002	Centrifuge feed pump pressure transmitter	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/008/08-JB10/PIT002
08-JB10	Dewatering Centrifuge Feed Area Junction Box	LIT001	Centrifuge feed tank level transmitter	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/010/08-JB10/LIT001

From		To		Type	Voltage (V)	Number of Cores	Nominal Section mm ²	Total Length (m)	Terminations (no.)	Type	Cable Number
08-JB10	Dewatering Centrifuge Feed Area Junction Box	LSH001	Centrifuge feed tank level switch high	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/011/08-JB10/LSH001
08-JB10	Dewatering Centrifuge Feed Area Junction Box	LSL001	Centrifuge feed tank level switch low	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/012/08-JB10/LSL001
08-JB10	Dewatering Centrifuge Feed Area Junction Box	TSH001	Centrifuge feed pump temperature switch	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/013/08-JB10/TSH001
08-JB10	Dewatering Centrifuge Feed Area Junction Box	TSH002	Centrifuge feed pump temperature switch	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/014/08-JB10/TSH002
08-JB10	Dewatering Centrifuge Feed Area Junction Box	XV0028	Centrifuge feed pump isolation valve	Network	Modbus	STP	Cat6	15	2	CAT6 STP	NM/001/08-JB10/XV0028
08-JB10	Dewatering Centrifuge Feed Area Junction Box	XV0029	Centrifuge feed pump isolation valve	Network	Modbus	STP	Cat6	15	2	CAT6 STP	NM/001/08-JB10/XV0029
08-JB10	Dewatering Centrifuge Feed Area Junction Box	XV0028	Centrifuge feed pump isolation valve	Power	231VAC	4	1.5	15	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/007/08-JB10/XV0028
08-JB10	Dewatering Centrifuge Feed Area Junction Box	XV0029	Centrifuge feed pump isolation valve	Power	231VAC	4	1.5	15	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/008/08-JB10/XV0029
PLC08	De-watering PLC Panel	08-JB11	Dewatering Poly Area Junction Box	Power	400	3	2.5	19	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/001/PLC08/08/08-JB11
PLC08	De-watering PLC Panel	08-JB11	Dewatering Poly Area Junction Box	Instr	24VDC	12Pr	1.0	19	2	Dekabon M877	I/001/PLC08/08-JB11
PLC08	De-watering PLC Panel	08-JB11	Dewatering Poly Area Junction Box	Instr	24VDC	8Pr	1.0	19	2	Dekabon M877	I/002/PLC08/08-JB11
PLC08	De-watering PLC Panel	08-JB11	Dewatering Poly Area Junction Box	Instr	-	8	MM	19	2	8 Core FO SWA	FO/001/PLC08/08/08-JB11
MCC08	De-watering MCC Panel	08-JB11	Dewatering Poly Area Junction Box	Power	400	3	4.0	19	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/002/08MCC-DB/08-JB11
08-JB11	Dewatering Poly Area Junction Box	FIT004	Centrifuge dilution water flow	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/001/08-JB11/FIT004
08-JB11	Dewatering Poly Area Junction Box	FIT007	Polyelectrolyte flow	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/004/08-JB11/FIT007
08-JB11	Dewatering Poly Area Junction Box	FIT008	Polyelectrolyte flow	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/005/08-JB11/FIT008

From		To		Type	Voltage (V)	Number of Cores	Nominal Section mm ²	Total Length (m)	Terminations (no.)	Type	Cable Number
08-JB11	Dewatering Poly Area Junction Box	FIT0010	Polyelectrolyte lubrication flow	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/007/08-JB11/FIT0010
08-JB11	Dewatering Poly Area Junction Box	FIT0011	Poly make-up water	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/008/08-JB11/FIT0011
08-JB11	Dewatering Poly Area Junction Box	FIT004	Centrifuge dilution water flow	Power	231VAC	3	1.5	15	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/001/08-JB11/FIT004
08-JB11	Dewatering Poly Area Junction Box	FIT007	Polyelectrolyte flow	Power	231VAC	3	1.5	15	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/004/08-JB11/FIT007
08-JB11	Dewatering Poly Area Junction Box	FIT008	Polyelectrolyte flow	Power	231VAC	3	1.5	15	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/005/08-JB11/FIT008
08-JB11	Dewatering Poly Area Junction Box	FIT0010	Polyelectrolyte lubrication flow	Power	231VAC	3	1.5	15	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/007/08-JB11/FIT0010
08-JB11	Dewatering Poly Area Junction Box	FIT0011	Poly make-up water	Power	231VAC	3	1.5	15	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/008/08-JB11/FIT0011
08-JB11	Dewatering Poly Area Junction Box	PIT004	Poly dosing pump pressure transmitter	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/009/08-JB11/PIT004
08-JB11	Dewatering Poly Area Junction Box	PIT005	Poly dosing pump pressure transmitter	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/010/08-JB11/PIT005
08-JB11	Dewatering Poly Area Junction Box	PIT009	Poly lubrication pump pressure transmitter	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/011/08-JB11/PIT009
08-JB11	Dewatering Poly Area Junction Box	PIT0010	Poly lubrication pump pressure transmitter	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/012/08-JB11/PIT0010
08-JB11	Dewatering Poly Area Junction Box	TSH004	Poly dosing pump temperature switch	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/013/08-JB11/TSH004
08-JB11	Dewatering Poly Area Junction Box	TSH005	Poly dosing pump temperature switch	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/014/08-JB11/TSH005
08-JB11	Dewatering Poly Area Junction Box	TSH009	Poly lubrication pump temperature switch	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/016/08-JB11/TSH009
08-JB11	Dewatering Poly Area Junction Box	TSH0010	Poly lubrication pump temperature switch	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/017/08-JB11/TSH0010
08-JB11	Dewatering Poly Area Junction Box	XV0026	Poly lubrication valve	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/018/08-JB11/XV0026
08-JB11	Dewatering Poly Area Junction Box	XV0027	Poly lubrication valve	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/019/08-JB11/XV0027

From		To		Type	Voltage (V)	Number of Cores	Nominal Section mm ²	Total Length (m)	Terminations (no.)	Type	Cable Number
08-JB11	Dewatering Poly Area Junction Box	FCV001	Centrifuge poly dilution control valve	Network	Modbus	STP	Cat6	15	2	CAT6 STP	NM/001/08-JB11/FCV001
08-JB11	Dewatering Poly Area Junction Box	FCV002	Centrifuge poly dilution control valve	Network	Modbus	STP	Cat6	15	2	CAT6 STP	NM/002/08-JB11/FCV002
08-JB11	Dewatering Poly Area Junction Box	XV001	Centrifuge washwater valve - open command	Network	Modbus	STP	Cat6	15	2	CAT6 STP	NM/003/08-JB11/XV001
08-JB11	Dewatering Poly Area Junction Box	XV002	Centrifuge washwater valve	Network	Modbus	STP	Cat6	15	2	CAT6 STP	NM/004/08-JB11/XV002
08-JB11	Dewatering Poly Area Junction Box	XV004	Centrifuge washwater valve	Network	Modbus	STP	Cat6	15	2	CAT6 STP	NM/005/08-JB11/XV004
08-JB11	Dewatering Poly Area Junction Box	XV005	Centrifuge washwater valve	Network	Modbus	STP	Cat6	15	2	CAT6 STP	NM/006/08-JB11/XV005
08-JB11	Dewatering Poly Area Junction Box	XV0016	Cake pump wash water valve	Network	Modbus	STP	Cat6	15	2	CAT6 STP	NM/007/08-JB11/XV0016
08-JB11	Dewatering Poly Area Junction Box	XV0017	Cake pump wash water valve	Network	Modbus	STP	Cat6	15	2	CAT6 STP	NM/008/08-JB11/XV0017
08-JB11	Dewatering Poly Area Junction Box	FCV001	Centrifuge poly dilution control valve	Power	231VAC	4	1.5	15	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/009/08-JB10/FCV001
08-JB11	Dewatering Poly Area Junction Box	FCV002	Centrifuge poly dilution control valve	Power	231VAC	4	1.5	15	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/010/08-JB10/FCV002
08-JB11	Dewatering Poly Area Junction Box	XV001	Centrifuge washwater valve - open command	Power	231VAC	4	1.5	15	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/011/08-JB10/XV001
08-JB11	Dewatering Poly Area Junction Box	XV002	Centrifuge washwater valve	Power	231VAC	4	1.5	15	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/012/08-JB10/XV002
08-JB11	Dewatering Poly Area Junction Box	XV004	Centrifuge washwater valve	Power	231VAC	4	1.5	15	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/013/08-JB10/XV004
08-JB11	Dewatering Poly Area Junction Box	XV005	Centrifuge washwater valve	Power	231VAC	4	1.5	15	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/014/08-JB10/XV005
08-JB11	Dewatering Poly Area Junction Box	XV0016	Cake pump wash water valve	Power	231VAC	4	1.5	15	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/015/08-JB10/XV0016
08-JB11	Dewatering Poly Area Junction Box	XV0017	Cake pump wash water valve	Power	231VAC	4	1.5	15	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/016/08-JB10/XV0017
PLC08	De-watering PLC Panel	08-JB12	Dewatering Cake Handling Area Junction Box	Power	400	3	2.5	38	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/001/PLC 08/08-JB12

From		To		Type	Voltage (V)	Number of Cores	Nominal Section mm ²	Total Length (m)	Terminations (no.)	Type	Cable Number
PLC08	De-watering PLC Panel	08-JB12	Dewatering Cake Handling Area Junction Box	Instr	24VDC	12Pr	1.0	38	2	Dekabon M877	I/001/PLC08/08-JB12
PLC08	De-watering PLC Panel	08-JB12	Dewatering Cake Handling Area Junction Box	Instr	24VDC	8Pr	1.0	38	2	Dekabon M877	I/002/PLC08/08-JB12
PLC08	De-watering PLC Panel	08-JB12	Dewatering Cake Handling Area Junction Box	Instr	-	8	MM	38	2	8 Core FO SWA	FO/001/PLC08/08-JB12
MCC08	De-watering MCC Panel	08-JB12	Dewatering Cake Handling Area Junction Box	Power	400	3	4.0	38	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/002/08MCC-DB/08-JB12
08-JB12	Dewatering Cake Handling Area Junction Box	LIT002	Cake pump hopper level	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/001/08-JB12/LIT002
08-JB12	Dewatering Cake Handling Area Junction Box	LIT003	Cake pump hopper level	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/002/08-JB12/LIT003
08-JB12	Dewatering Cake Handling Area Junction Box	PIT007	Cake pump pressure transmitter	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/003/08-JB12/PIT007
08-JB12	Dewatering Cake Handling Area Junction Box	PIT008	Cake pump pressure transmitter	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/004/08-JB12/PIT008
08-JB12	Dewatering Cake Handling Area Junction Box	LIT004	Sludge cake silo 1 level	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/005/08-JB12/LIT004
08-JB12	Dewatering Cake Handling Area Junction Box	LIT005	Sludge cake silo 2 level	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/006/08-JB12/LIT005
08-JB12	Dewatering Cake Handling Area Junction Box	LIT002	Cake pump hopper level	Power	231VAC	3	1.5	15	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/001/08-JB11/LIT002
08-JB12	Dewatering Cake Handling Area Junction Box	LIT003	Cake pump hopper level	Power	231VAC	3	1.5	15	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/001/08-JB11/LIT003
08-JB12	Dewatering Cake Handling Area Junction Box	LIT004	Sludge cake silo 1 level	Power	231VAC	3	1.5	15	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/001/08-JB11/LIT004
08-JB12	Dewatering Cake Handling Area Junction Box	LIT005	Sludge cake silo 2 level	Power	231VAC	3	1.5	15	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/001/08-JB11/LIT005

From		To		Type	Voltage (V)	Number of Cores	Nominal Section mm ²	Total Length (m)	Terminations (no.)	Type	Cable Number
08-JB12	Dewatering Cake Handling Area Junction Box	TSH007	Cake pump temperature switch	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/007/08-JB12/TSH007
08-JB12	Dewatering Cake Handling Area Junction Box	TSH008	Cake pump temperature switch	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/008/08-JB12/TSH008
08-JB12	Dewatering Cake Handling Area Junction Box	ZS001	Cake pump hopper proximity switch	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/009/08-JB12/ZS001
08-JB12	Dewatering Cake Handling Area Junction Box	ZS002	Cake pump hopper proximity switch	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/010/08-JB12/ZS002
08-JB12	Dewatering Cake Handling Area Junction Box	ZS005	Sludge conveyor cover proximity sensor	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/011/08-JB12/ZS005
08-JB12	Dewatering Cake Handling Area Junction Box	ZS006	Sludge conveyor cover proximity sensor	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/012/08-JB12/ZS006
08-JB12	Dewatering Cake Handling Area Junction Box	XV003	Cake chute diversion valve	Network	Modbus	STP	Cat6	15	2	CAT6 STP	NM/001/08-JB11/XV003
08-JB12	Dewatering Cake Handling Area Junction Box	XV006	Cake chute diversion valve	Network	Modbus	STP	Cat6	15	2	CAT6 STP	NM/002/08-JB11/XV006
08-JB12	Dewatering Cake Handling Area Junction Box	XV0014	Sludge line dump valve	Network	Modbus	STP	Cat6	15	2	CAT6 STP	NM/003/08-JB11/XV0014
08-JB12	Dewatering Cake Handling Area Junction Box	XV0015	Sludge line dump valve	Network	Modbus	STP	Cat6	15	2	CAT6 STP	NM/004/08-JB11/XV0015
08-JB12	Dewatering Cake Handling Area Junction Box	FCV004	Sludge silo 1 discharge valve - position output	Network	Modbus	STP	Cat6	15	2	CAT6 STP	NM/005/08-JB11/FCV004
08-JB12	Dewatering Cake Handling Area Junction Box	FCV005	Sludge silo 2 discharge valve - position output	Network	Modbus	STP	Cat6	15	2	CAT6 STP	NM/006/08-JB11/FCV005
08-JB12	Dewatering Cake Handling Area Junction Box	XV0010	Sludge silo 1 inlet valve	Network	Modbus	STP	Cat6	15	2	CAT6 STP	NM/007/08-JB11/XV0010
08-JB12	Dewatering Cake Handling Area Junction Box	XV0011	Sludge silo 1 inlet valve	Network	Modbus	STP	Cat6	15	2	CAT6 STP	NM/008/08-JB11/XV0011
08-JB12	Dewatering Cake Handling Area Junction Box	XV0012	Sludge silo 2 inlet valve	Network	Modbus	STP	Cat6	15	2	CAT6 STP	NM/009/08-JB11/XV0012

From		To		Type	Voltage (V)	Number of Cores	Nominal Section mm ²	Total Length (m)	Terminations (no.)	Type	Cable Number
08-JB12	Dewatering Cake Handling Area Junction Box	XV0013	Sludge silo 2 inlet valve	Network	Modbus	STP	Cat6	15	2	CAT6 STP	NM/010/08-JB11/XV0013
08-JB12	Dewatering Cake Handling Area Junction Box	XV003	Cake chute diversion valve	Power	231VAC	4	1.5	15	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/005/08-JB10/XV003
08-JB12	Dewatering Cake Handling Area Junction Box	XV006	Cake chute diversion valve	Power	231VAC	4	1.5	15	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/006/08-JB10/XV006
08-JB12	Dewatering Cake Handling Area Junction Box	XV0014	Sludge line dump valve	Power	231VAC	4	1.5	15	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/007/08-JB10/XV0014
08-JB12	Dewatering Cake Handling Area Junction Box	XV0015	Sludge line dump valve	Power	231VAC	4	1.5	15	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/008/08-JB10/XV0015
08-JB12	Dewatering Cake Handling Area Junction Box	FCV004	Sludge silo 1 discharge valve - position output	Power	231VAC	4	1.5	15	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/009/08-JB10/FCV004
08-JB12	Dewatering Cake Handling Area Junction Box	FCV005	Sludge silo 2 discharge valve - position output	Power	231VAC	4	1.5	15	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/010/08-JB10/FCV005
08-JB12	Dewatering Cake Handling Area Junction Box	XV0010	Sludge silo 1 inlet valve	Power	231VAC	4	1.5	15	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/011/08-JB10/XV0010
08-JB12	Dewatering Cake Handling Area Junction Box	XV0011	Sludge silo 1 inlet valve	Power	231VAC	4	1.5	15	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/012/08-JB10/XV0011
08-JB12	Dewatering Cake Handling Area Junction Box	XV0012	Sludge silo 2 inlet valve	Power	231VAC	4	1.5	15	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/013/08-JB10/XV0012
08-JB12	Dewatering Cake Handling Area Junction Box	XV0013	Sludge silo 2 inlet valve	Power	231VAC	4	1.5	15	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/014/08-JB10/XV0013
08-RIO	Dewatering Sludge Transfer RIO Panel	LIT006	Existing WAS sump level transmitter	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/001/08-RIO/LIT006
08-RIO	Dewatering Sludge Transfer RIO Panel	LIT006	Existing WAS sump level transmitter	Power	231VAC	3	1.5	15	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/001/08-RIO/LIT006
08-RIO	Dewatering Sludge Transfer RIO Panel	FSL001	WAS Transfer pump flow switch	Instr	24VDC	2Pr	1.0	15	2	Dekabon M877	I/002/08-RIO/FSL001
08-RIO	Dewatering Sludge Transfer RIO Panel	FSL002	WAS Transfer pump flow switch	Instr	24VDC	2Pr	1.0	15	2	Dekabon M878	I/003/08-RIO/FSL002
08-RIO	Dewatering Sludge Transfer RIO Panel	XV0033	WAS sump feed valve	Network	Modbus	STP	Cat6	15	2	CAT6 STP	NM/001/08-RIO/XV0033

From		To		Type	Voltage (V)	Number of Cores	Nominal Section mm ²	Total Length (m)	Terminations (no.)	Type	Cable Number
08-RIO	Dewatering Sludge Transfer RIO Panel	XV0033	WAS sump feed valve	Power	231VAC	4	1.5	15	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/002/08-RIO/XV0033

IB8 CABLE SCHEDULE-PUMP STATION

From		To		Type	Voltage (V)	Number of Cores	Nominal Section mm ²	Total Length (m)	Terminations (no.)	Type	Cable Number
Equipment No.	Equipment Description	Equipment No.	Equipment Description								
03-01-PLC	Pump Station No. 1 PLC	AIT001A	Biological Reactor No. 1 Dissolved Oxygen	Instr	24VDC	2Pr	1.0	110	2	Dekabon M877	I/001/03-01-PLC/AIT001A
03-01-PLC	Pump Station No. 1 PLC	AIT001A	Biological Reactor No. 1 Dissolved Oxygen	Power	231VAC	3	1.5	110	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/001/03-01-PLC/AIT001A
03-01-PLC	Pump Station No. 1 PLC	AIT001B	Biological Reactor No. 1 Dissolved Oxygen	Instr	24VDC	2Pr	1.0	130	2	Dekabon M877	I/002/03-01-PLC/AIT001B
03-01-PLC	Pump Station No. 1 PLC	AIT001B	Biological Reactor No. 1 Dissolved Oxygen	Power	231VAC	3	1.5	130	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/002/03-01-PLC/AIT001B
03-01-PLC	Pump Station No. 1 PLC	AIT002A	Biological Reactor No. 2 Dissolved Oxygen	Instr	24VDC	2Pr	1.0	110	2	Dekabon M877	I/003/03-01-PLC/AIT002A
03-01-PLC	Pump Station No. 1 PLC	AIT002A	Biological Reactor No. 2 Dissolved Oxygen	Power	231VAC	3	1.5	110	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/003/03-01-PLC/AIT002A
03-01-PLC	Pump Station No. 1 PLC	AIT002B	Biological Reactor No. 2 Dissolved Oxygen	Instr	24VDC	2Pr	1.0	130	2	Dekabon M877	I/004/03-01-PLC/AIT002B
03-01-PLC	Pump Station No. 1 PLC	AIT002B	Biological Reactor No. 2 Dissolved Oxygen	Power	231VAC	3	1.5	130	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/004/03-01-PLC/AIT002B
03-02-PLC	Pump Station No. 2 PLC	AIT002	Biological Reactor No.3 Dissolved Oxygen	Instr	24VDC	2Pr	1.0	110	2	Dekabon M877	I/001/03-02-PLC/AIT002
03-02-PLC	Pump Station No. 2 PLC	AIT002	Biological Reactor No.3 Dissolved Oxygen	Power	231VAC	3	1.5	110	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/001/03-02-PLC/AIT002
03-02-PLC	Pump Station No. 2 PLC	AIT003B	Biological Reactor No.3 Dissolved Oxygen	Instr	24VDC	2Pr	1.0	110	2	Dekabon M877	I/002/03-02-PLC/AIT003B
03-02-PLC	Pump Station No. 2 PLC	AIT003B	Biological Reactor No.3 Dissolved Oxygen	Power	231VAC	3	1.5	110	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/002/03-02-PLC/AIT003B
03-03-PLC	Pump Station No. 3 PLC	AIT004A	Biological Reactor No.4 Dissolved Oxygen	Instr	24VDC	2Pr	1.0	110	2	Dekabon M877	I/001/03-03-PLC/AIT004A
03-03-PLC	Pump Station No. 3 PLC	AIT004A	Biological Reactor No.4 Dissolved Oxygen	Power	231VAC	3	1.5	110	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/001/03-03-PLC/AIT004A

03-03-PLC	Pump Station No. 3 PLC	AIT004B	Biological Reactor No.4 Dissolved Oxygen	Instr	24VDC	2Pr	1.0	110	2	Dekabon M877	I/002/03-03- PLC/AIT004B
03-03-PLC	Pump Station No. 3 PLC	AIT004B	Biological Reactor No.4 Dissolved Oxygen	Power	231VAC	3	1.5	110	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/002/03-03- PLC/AIT004B
03-04-PLC	Pump Station No. 4 PLC	AIT005A	Biological Reactor No. 5 Dissolved Oxygen	Instr	24VDC	2Pr	1.0	110	2	Dekabon M877	I/001/03-04- PLC/AIT005A
03-04-PLC	Pump Station No. 4 PLC	AIT005A	Biological Reactor No. 5 Dissolved Oxygen	Power	231VAC	3	1.5	110	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/001/03-04- PLC/AIT005A
03-04-PLC	Pump Station No. 4 PLC	AIT005B	Biological Reactor No. 5 Dissolved Oxygen	Instr	24VDC	2Pr	1.0	130	2	Dekabon M877	I/002/03-04- PLC/AIT005B
03-04-PLC	Pump Station No. 4 PLC	AIT005B	Biological Reactor No. 5 Dissolved Oxygen	Power	231VAC	3	1.5	130	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/002/03-04- PLC/AIT005B
03-04-PLC	Pump Station No. 4 PLC	AIT006A	Biological Reactor No. 6 Dissolved Oxygen	Instr	24VDC	2Pr	1.0	110	2	Dekabon M877	I/003/03-04- PLC/AIT006A
03-04-PLC	Pump Station No. 4 PLC	AIT006A	Biological Reactor No. 6 Dissolved Oxygen	Power	231VAC	3	1.5	110	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/003/03-04- PLC/AIT006A
03-04-PLC	Pump Station No. 4 PLC	AIT006B	Biological Reactor No. 6 Dissolved Oxygen	Instr	24VDC	2Pr	1.0	130	2	Dekabon M877	I/004/03-04- PLC/AIT006B
03-04-PLC	Pump Station No. 4 PLC	AIT006B	Biological Reactor No. 6 Dissolved Oxygen	Power	231VAC	3	1.5	130	2	Cu/PVC/PVC/SWA/PVC 600/1000V	EP/004/03-04- PLC/AIT006B

IB9 CABLE SCHEDULE-FIBRE NETWORK

From		To		Type	Voltage (V)	Number of Cores	Nominal Section mm ²	Total Length (m)	Terminations (no.)	Type	Cable Number
Equipment No.	Equipment Description	Equipment No.	Equipment Description								
MC	Main Control Room	MSU-05	Mini Substation No. 5	Network	-	8	MM	95	2	8 Core FO SWA	FO/001/MC/MSU-05
MSU-05	Mini Substation No. 5	MSU-04	Mini Substation No. 4	Network	-	8	MM	90	2	8 Core FO SWA	FO/002/MSU-05/MSU-04
MSU-04	Mini Substation No. 4	03-04-PLC	Pump Station No. 4 PLC	Network	-	8	MM	40	2	8 Core FO SWA	FO/003/MSU-04/03-04-PLC
03-04-PLC	Pump Station No. 4 PLC	03-03-PLC	Pump Station No. 3 PLC	Network	-	8	MM	75	2	8 Core FO SWA	FO/004/03-04-PLC/03-03-PLC
03-03-PLC	Pump Station No. 3 PLC	MSU-02	Mini Substation No. 2	Network	-	8	MM	45	2	8 Core FO SWA	FO/005/03-03-PLC/MSU-02
MSU-02	Mini Substation No. 2	MSU-03	Mini Substation No. 3	Network	-	8	MM	290	2	8 Core FO SWA	FO/006/MSU-02/MSU-03
MSU-03	Mini Substation No. 3	M-Sub	Main Substation	Network	-	8	MM	150	2	8 Core FO SWA	FO/007/MSU-03/M-Sub
M-Sub	Main Substation	PLC01	Head of Works PLC Panel	Network	-	8	MM	60	2	8 Core FO SWA	FO/008/M-Sub/PLC01
PLC01	Head of Works PLC Panel	03-01-PLC	Pump Station No. 1 PLC	Network	-	8	MM	320	2	8 Core FO SWA	FO/009/PLC01/03-01-PLC
03-01-PLC	Pump Station No. 1 PLC	GEN	Generator	Network	-	8	MM	60	2	8 Core FO SWA	FO/010/03-01-PLC/GEN
GEN	Generator	MSU-06	Mini Substation No. 6	Network	-	8	MM	100	2	8 Core FO SWA	FO/011/GEN/MSU-06
MSU-06	Mini Substation No. 6	PLC08	De-watering PLC Panel	Network	-	8	MM	40	2	8 Core FO SWA	FO/012/MSU-06/PLC08
PLC08	De-watering PLC Panel	Cent1	Centrifuge No. 1 PLC	Network	-	8	MM	30	2	8 Core FO SWA	FO/013/PLC08/Cent1
Cent1	Centrifuge No. 1 PLC	Cent2	Centrifuge No.2 PLC	Network	-	8	MM	20	2	8 Core FO SWA	FO/014/Cent1/Cent2
Cent2	Centrifuge No.2 PLC	03-02-PLC	Pump Station No.2 PLC	Network	-	8	MM	95	2	8 Core FO SWA	FO/015/Cent2/03-02-PLC
03-02-PLC	Pump Station No.2 PLC	MSU-01	Mini Substation No. 1	Network	-	8	MM	40	2	8 Core FO SWA	FO/016/03-02-PLC/MSU-01
MSU-01	Mini Substation No. 1	MC	Main Control Room	Network	-	8	MM	65	2	8 Core FO SWA	FO/017/MSU-01/MC
PLC01	Head of Works PLC Panel	PLC05	Second Class Water RIO Panel	Network	-	8	MM	220	2	8 Core FO SWA	FO/018/PLC01/PLC05
PLC08	De-watering PLC Panel	RIO08	Sludge Txf RIO Panel	Network	-	8	MM	180	2	8 Core FO SWA	FO/019/PLC08/RIO08