Consortium Partners
SMEC International Pty. Ltd. (ACN-065440619/FCRN-F01483)
NJS Engineers India Pvt Ltd, India (CIN - U74210PN2007PTC129798)
Tata Consulting Engineers Limited, India (CIN- U74210MH1999PLC123010)
SMEC (India) Pvt. Ltd. (CIN: U93000DL1997PTC088574)

Ref: SSNT PMC 400 MLD / CMWSSB / 5061185/379

Date: 15th July 2021

SUPERINTENDING ENGINEER (DESAL) * 15 JUL 2021 * CMWSS BOARD, CHENNAI

To,
The Superintending Engineer (Desalination)
Chennai Metropolitan Water Supply and Sewerage Board,
Urban Administrative Building, 2nd Floor,
No.75, Santhome High Road,
Raja Annamalaipuram,
Chennai 600 028, Tamil Nadu, India

Sub: JICA Assisted Project for Construction of 400 MLD Seawater Reverse Osmosis Desalination Plant at Perur **(JICA Loan ID-P267)**
Submission of Technical data for TNPCB Consent to Establish Application – Reg.

Ref:
1. Meeting at 1st floor Conference Hall, CMWSSB and MS Teams Meeting with PMC team and CMWSSB officials, dated 02.07.2021
2. Our Letter no. Ref: SSNT PMC 400 MLD / CMWSSB / 5061185/348, dated 17.05.2021
3. Our Letter no. Ref: SSNT PMC 400 MLD / CMWSSB / 5061185/336, dated 23.04.2021
4. Your Letter no. Lr.no.CMWSSB/SE(Desal)/400 MLD Plant / PMC/2020, dated 13.01.2020
5. Our Contract Agreement with CMWSSB, dated 09.01.2020

Dear Sir,

With reference to the discussion had with your officials on 30th June 2021, we are herewith attaching the CP1 technical data required for submission of application to TNPCB for obtaining the Consent to Establish (CtE). The data attached are as given in the below table for your review and further action:

S.No.	Data requirement	PMC response
1	Proposed Plant Layout a. Plan b. Built-up/Construction area c. Landscape area d. Total area	a. Plan – Attached Proposed Plant Layout as ANNEXURE - I b. Built-up/ Construction area: 13.2 Hectares c. Landscape area: 20.80 Hectares d. Total area: 34 Hectares
2	Process Flow Diagram a. Drawing b. Component list c. Process description of each component	a. Please refer ANNEXURE – II b. Please refer Plant Layout ANNEXURE - I c. Please refer ANNEXURE –III
3	Water & Material Balance for each component	Please refer ANNEXURE – IV
4	Topographical sketch	Please refer ANNEXURE – V

PMC Chennai Office Address:
'A' 13th Floor, Purva Primus, No 236, Okhiyampettai,
Old Mahabalipuram Road, Thuraipakkam, Chennai, Tamil Nadu 600097
+91 044 66973300 indiabd@smec.com www.smec.com

Consortium Partners
SMEC International Pty. Ltd. (ACN-065440619/FCRN-F01483)
NJS Engineers India Pvt Ltd, India (CIN - U74210PN2007PTC129798)
Tata Consulting Engineers Limited, India (CIN- U74210MH1999PLC123010)
SMEC (India) Pvt. Ltd. (CIN: U93000DL1997PTC088574)

S.No.	Data requirement	PMC response
5	Sewage Treatment Plant details	a. Number of people usage: 150 persons (133+17) including Visitors, Perur Pump station (CP2-1). b. Sewage generation calculation: 150 x 90 LPCD: 13.5 m^3/day c. Plan and Cross Section details: Please refer ANNEXURE – VI, ANNEXURE VI A and ANNEXURE - VII for Process flow diagram of STP d. Reuse of treated sewage (Flushing, gardening etc.,): Reclaimed water proposed to be utilised for Landscaping.
6	Details of Hazardous and Non-Hazardous materials handling in the Plant	Please refer ANNEXURE – VIII

It may please be noted that the CP1-Tender specification is a DBO contract and the prospective contractor is free to choose any type of technology for Package Sewage Treatment Plant. In the CtE application we have considered Extended Aeration process.

This is for your review and further necessary action.

Thanking you and assuring our services at all times.

Yours truly,
For **Consortium of SMEC International Pty Ltd -TCE Ltd.-NJS Engineers India Ltd.-SMEC (India) Pvt. Ltd.**

PMC for 400 MLD CHENNAI

S.Srinivasarao
Project Coordinator

ANNEXURE I

NORTH

BOUNDARY DETAILS

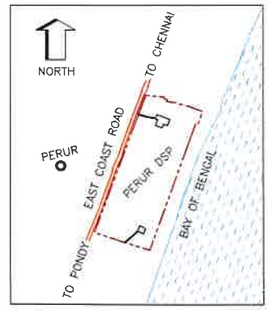
B.NO	BOUNDARY CO-ORDINATE	
	EASTING	NORTHING
B1	416541.576	1405939.606
B2	416239.814	1405118.287
B3	416070.785	1405169.213
B7	415876.897	1405231.554
B14	416061.741	1405709.521
B19	416214.734	1406113.546
B21	416356.857	1406078.315
B22	416581.07	1406009.73
B23	416554.9	1405930.23

400 MLD SEA WATER DESALINATION PLANT AT PERUR
COMPONENT LIST (CP1)

SI. NO.	COMPONENT NAME	AREA (m^2)	NO. OF UNITS	SIZE IN METERS L	W	MATERIAL OF CONSTRUCTION (MOC)
01	INTAKE PUMPING STATION	2100	1	70.00	30.0	RCC EPOXY
02	LAMELLA SETTLERS	4050	36	150.00	27.00	RCC EPOXY
03	DAF-DISSOLVED AIR FLOTATION UNITS	3500	12	70.00	50.00	RCC EPOXY
04	GDMF-GRAVITY DUAL MEDIA FILTER	7800	80	130.00	60.00	RCC EPOXY
05	RO FEED TANK	2500	2	50.00	50.00	RCC EPOXY
06	RO BUILDING	11072	2	173.00	64.00	PEB SHED
07	LIME STONE FILTER	1500	28	50.00	30.00	RCC EPOXY
08	RO PERMEATE TANK		2	25.00m DIA		METALLIC TANK/ RCC EPOXY
09	CO2 STORAGE AREA	100	2	10.00	10.00	–
10	PRODUCT WATER TANKS (7.5ML EACH)		4	37.00m DIA		METALLIC TANK/ RCC EPOXY
11	CLEAR WATER RESERVOIR (9ML)	1764	1	42.00	42.00	RCC EPOXY
13	SLUDGE BALANCING TANK		1	31.00m DIA		RCC EPOXY
14	THICKENED SLUDGE THICKENERS		2	35.00m DIA		RCC EPOXY
15	SLUDGE HOLDING TANK	392	1	28.00	14.00	RCC EPOXY
16	BELT FILTER PRESS BUILDING	1400	1	50.00	28.00	RCC
17	OUTFALL TANK		1	30.00m DIA		RCC EPOXY
18	CHEMICAL BUILDING-RO	1800	2	60.00	30.00	RCC WITH CHEMICAL RESISTANT LINING
19	CHEMICAL BUILDING PRE-TREATMENT	1800	2	60.00	30.00	RCC WITH CHEMICAL RESISTANT LINING
20	POWER RECEIVING STATION/CONTROL BUILDING	9800	1	99.00	99.00	RCC
21	ELECTRICAL BUILDING FOR INTAKE PUMP STATION & PRE-TREATMENT	2500	2	85.00	50.00	RCC
22	ELECTRICAL BUILDING FOR RO BUILDING	1500	2	90.00	30.00	RCC
23	WAREHOUSE	3200	1	80.00	40.00	PEB SHED
24	WORKSHOP	3200	1	80.00	40.00	PEB SHED
25	PACKAGE STP	225	1	15.00	15.00	–
26	FIRE FIGHTING STATION	800	1	20.00	40.00	RCC
27	ADMINISTRATION BUILDING (OFFICER'S ROOM/ CONFERENCE/CANTEEN)(G+2 FLOORS)	1185	1	11855q.M		RCC
27a	ADMINISTRATION BUILDING (LABORATORY CUM MEETING/ TRANING ROOM)(G+1 FLOORS)	554	1	5545q.M		RCC
28	PARKING AREA	1200	1	60.00	20.00	PEB SHED
29	SECURITY ROOM	400	1	20.00	20.00	RCC
29a	ADDITIONAL SECURITY ROOM	100	1	10.00	10.00	RCC
30	LAY DOWN AREA	4000	1	80.00	50.00	–
31	LAY DOWN AREA	1870	1	34.00	55.00	–
32	LANDSCAPE & PARK AREA	3200	1	80.00	40.00	–
33	WATCH TOWERS	4	2	2.00	2.00	–

POTABLE WATER PUMPING STATION AT PERUR
COMPONENT LIST (CP2-1)

SI. NO.	COMPONENT NAME	NO. OF UNITS	SIZE IN METERS L	W	MATERIAL OF CONSTRUCTION (MOC)
12	POTABLE WATER TRANSFER PUMPING STATION	1	42.00	20.00	RCC
12a	SPACE FOR SURGE VESSELS	1	60.00	40.00	–



KEY PLAN

LEGEND :

- SEA WATER
- REJECT PIPE TO SEA
- PROPOSED ROAD
- PROPOSED UNITS
- RETAINING WALL
- COMPOUND WALL
- STORM WATER DRAIN
- CP2 CONTRACTOR'S SCOPE

NOTES :

1. ALL DIMENSIONS ARE IN METRES UNLESS SPECIFIED.
2. TOTAL AREA OF PROPOSED DESALINATION PLANT LAYOUT = 66.70 Acres (269932.00 SQ.M).
3. TOTAL ALLOTTED AREA (EXCLUDING BURIAL GROUNDS) = 86.69 Acres (3,50,852.00 SQ.M).
4. NORTH SIDE BURIAL GROUND AREA (INCLUDING ROAD) = 1.32 Acres (5361.9 SQ.M).
5. SOUTH SIDE BURIAL GROUND AREA (INCLUDING ROAD) = 0.53 Acres (2163.5 SQ.M).
6. THE BENCHMARK HAS BEEN TAKEN AT CHENNAI,MOUNT ROAD, MUNRO STATUTE PEDESTAL RL:5.398M

TEMPORARY BENCHMARK:

NO	CO-ORDINATE EAST	NORTH
TS1	416126.939	1405923.993
TS2	416025.996	1405956.785

FOR TENDER PURPOSE ONLY

Rev	Date	Description	Drawn	Chkd	Appd
R0	APRIL 2021	TENDER PURPOSE	NGM	GM	PD

Client:
Chennai Metropolitan Water Supply and Sewerage Board (CMWSSB)

Project management Consultant :
SMEC International Pty Ltd,
TATA Consulting Engineers Limited (TCE),
NJS Engineers India Pvt Ltd (NJSEI),
SMEC India Pvt Ltd.

Project Name:
Project for Construction of Seawater Desalination Plant (I)

Contract Name:
Procurement of design/Engineering,Construction,Commission of 400 MLD Seawater Reverse Osmosis (SWRO) Desalination Plant at Perur, Chennai with 20 Years of Operation and Maintenance (DBO Basis)

Tender Number:
CMWSSB/CNT/WSS/ICB/JICA/DESAL/CP01/018/2020-21

Contract Package No:
Contract Package -1 (CP1)

JICA Loan No:
ID-P267

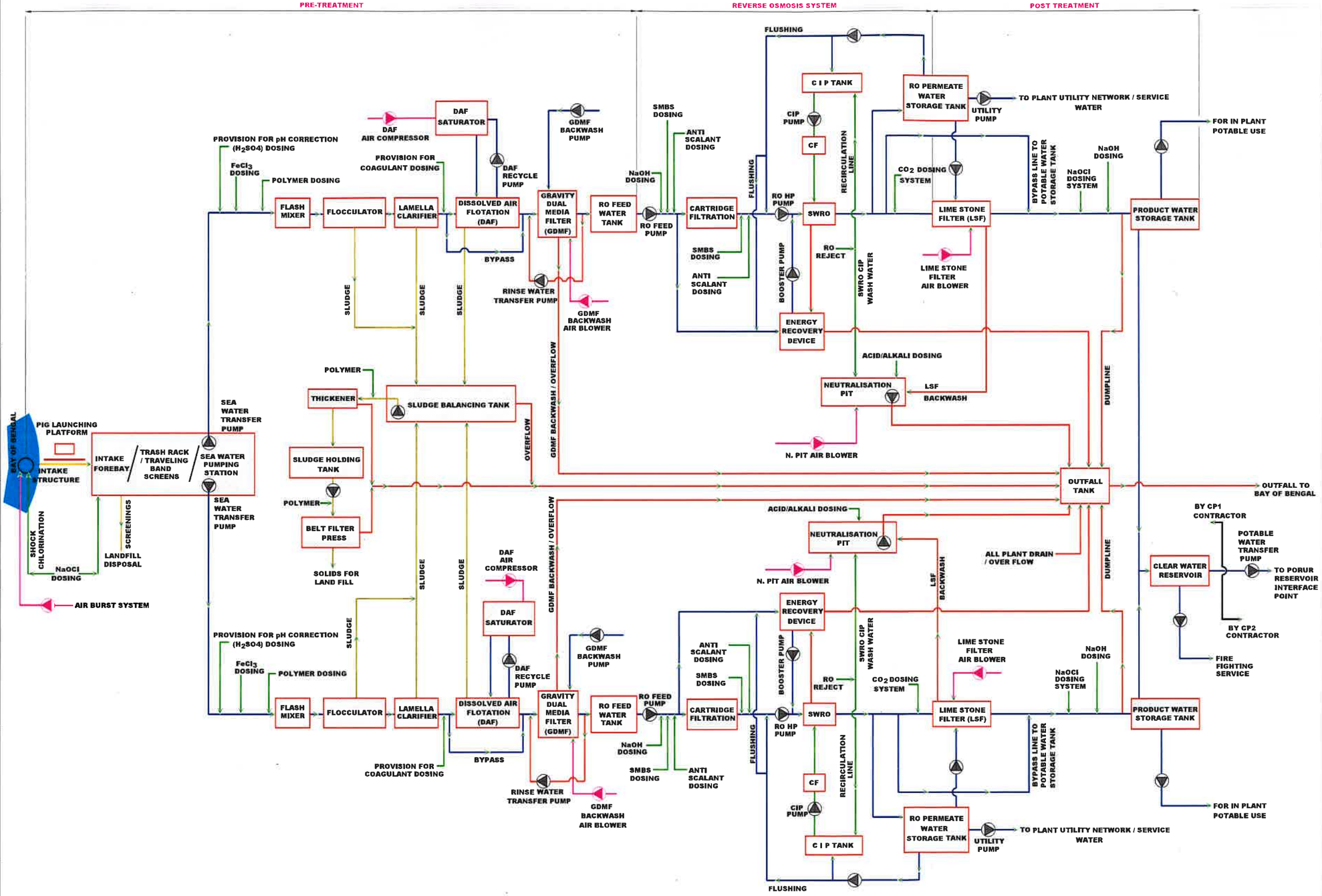
Drawing Title:
PLANT LAYOUT FOR 400 MLD PERUR DSP

Drawn	NGM	Checked	GM
Designed	SMK,JELANGGGV	Approved	PD
Date	APRIL 2021	Scale	1:1

Drawing Number: 7061563/PMC400MLD/CP1/P/LAY/002
Sh.No 1 OF 1
Revision R0

ANNEXURE - II

PRE-TREATMENT | REVERSE OSMOSIS SYSTEM | POST TREATMENT



PROCESS FLOW DIAGRAM FOR PROPOSED 400 MLD PERUR DSP

NOTES

1. TWO (2) STREAMS EACH OF 200 MLD CAPACITY PROPOSED.
2. SEAWATER PUMPING STATION, PRODUCT WATER STORAGE TANK, SLUDGE BALANCING TANK, THICKENER, SLUDGE HOLDING TANK, BELT FILTER PRESS BUILDING ARE COMMON UNITS FOR BOTH STREAMS.
3. RO FEED WATER BACKWASH TANKS (ONE NO.)IN EACH STREAM) ARE PROVIDED WITH PARTITION WALLS IN EACH STREAM.

LEGEND

- INCOMING RAW SEA WATER
- WATER LINE
- REJECT/ BACKWASH/ DRAIN/ BELT FILTER FILTRATE,SUPERNATANT/ RINSE/ DUMPLINE
- AIR FOR BACKWASH/ MIXING
- CHEMICAL DOSING
- SLUDGE / SCREENINGS
- BLOWER / COMPRESSOR
- PUMP
- INTERFACE POINT

SWRO SEAWATER REVERSE OSMOSIS
CF CARTRIDGE FILTER
CIP CLEAN IN PLACE
HP HIGH PRESSURE
SMBS SODIUM META BI SULPHATE

FOR TENDER PURPOSE ONLY

Rev	Date	Description	Drawn	Chkd	Appd
R2	19.01.2021	FOR TENDER PURPOSE	NGM	GM/MM/GV	PD
R1	24.06.2020	CONCEPTUAL DESIGN REPORT FOR CP1	NGM	GM/MM/GV	PD
R0	17.04.2020	PRELIMINARY DRAFT CONCEPTUAL DESIGN REPORT FOR CP1	VK	GM	PD

Client:
Chennai Metropolitan Water Supply and Sewerage Board (CMWSSB)

Project management Consultant :
SMEC International Pty Ltd ,
Tata Consulting Engineers Limited (TCE)
NJS Engineers India Pvt Ltd (NJSEI) ,
SMEC India Pvt Ltd

Project Name:
Consultancy for "Design, Preparation of Bid Documents & Evaluation of Bids for the Proposed Construction of 400 MLD Capacity Seawater Reverse Osmosis Desalination Plant at Perur along East Coast Road, South of Chennai, Tamil Nadu and Construction Management & Supervision for the Proposed Desalination Plant and its Product Water Conveyance Pipeline from the Plant and upto Porur and all allied works"

Project Title: PMC for Chennai Perur 400 MLD Desalination Plant and allied works

Project Code: Contract Package -1 (CP1)

Status: Conceptual Design Report for CP1

Drawing Title: PROCESS FLOW DIAGRAM FOR PROPOSED 400 MLD PERUR DSP

Drawn	NGM	Checked	GM / MM / GV
Designed	SMK	Approved	PD
Date	19.01.2021	Scale	NTS

Drawing Number: 7061563/PMC/400MLD/CP1/P/PFD/001 | Sh.No 1 OF 1 | Revision R2

ANNEXURE III

PROCESS DESCRIPTION FOR 400 MLD PERUR DESALINATION PLANT

1. LIST OF COMPONENTS

1.1 Intake and Outfall System

Two number of HDPE intake pipes (PE100) and one outfall pipe each of 2500mm OD at pressure rating of minimum 6.5 bar (SDR ≤ 26) have been provided. In normal plant operation condition, each intake pipe will cater to half the intake flow to produce net 400,000 m3/day of product water plus 10% extra flow to accommodate for biofouling/incrustation in the intake pipe. The required CRZ clearance is obtained to lay the intake pipe at about 1150m from the seashore inside the sea and outfall pipe at 750m from the shore. Pigging system to restore the hydraulic capacity of intakes will be provided.

1.1.1 Intake Pipeline

Two intake conduits, each of 2500mm OD at pressure rating of minimum 6.5 bar, will extend into the sea where the seawater depth is at least 10 m below the Lowest Tide Level. Water will enter the intake head opening at >3 m above the seabed and minimum 4 m below the top seawater surface during the low tide. Both the intake pipelines will be laid below the seabed with the required cover (>1 m from the pipe crown level) using suitable pipe laying method.

1.1.2 Outfall Pipeline

One outfall pipe of length 750m will be provided with pipe diameter of 2500 mm OD having the same material as the Intake pipe. The diffusers at the end of the pipeline will be designed to provide the sufficient dispersion of brine. The Contractor is responsible to design the RO system based on the brine dispersion analysis results and considering the effect of any increase in salinity of the intake feed seawater on the desalination processes.

1.1.3 Intake Well

Seawater intake well (forebay) will receive the seawater from the offshore intake head under gravity via pipelines and transfer the seawater to the pre-treatment section. Seawater intake well will have two chambers separated by partition walls. The water production capacity of each chamber will be a minimum of 200 MLD. Whenever required, either one of the two chambers can be maintained, cleaned, or repaired while the other chamber in operation.

1.1.4 Intake Screening Station

The intake well houses Travelling Band Screens which pass water to the pump chamber. A minimum of 4 (4x50%) screens, will be provided for the proposed 400 MLD product water plant; such that the full screening capacity is available even two screens are out of service. The differential head across the screens will be recorded and used to initiate screen cleaning & washing automatically.

1.1.5 Intake Pumping Station

The screened water from the inlet screens will flow into the intake pumping chamber. A

minimum of (6W + 3S) pumps will be provided for the total plant capacity (4 pumps for each process stream with one pump in store). Pair of 4 pumps with variable speed drive will form one manifold to supply water to one stream of 200 MLD plant. The material of the pumps will be super duplex stainless steel (PREN No $\geq$ 41).

1.1.6 Shock Chlorination and Air Bursting System

A shock chlorination system is provided to inject sodium hypochlorite at the intake heads to minimise marine growth at the intake screens and in the intake conduits.

Along with chlorination system, air bursting system at the intake head with suitable pressure vessel and compressor system will be provided for the removal of entangled Jelly fish and dislodgement of the weeds and barnacles attached to the screen.

1.2 Pre-treatment System

There are two separate streams of the pre-treatment, desalination and post-treatment processes - each for 200 MLD product water capacity. The pre-treatment consists of a three (3) stage pre-treatment process to ensure sufficient safety in case of adverse Seawater quality conditions.

- Coagulation/flocculation followed by Lamella Settlers,
- DAF (Dissolved Air Floatation) system and,
- Gravity Dual Media Filtration system (GDMF)

The pre-treatment will minimize the risk of organic and biological fouling and inorganic scaling on membrane surfaces and any damage to the membranes on account of residual chlorine in the pre-treated feed water.

1.2.1 pH Stabilization

The raw sea water will be dosed with sulphuric acid in the intake pump discharge line to achieve the optimum pH for coagulation. All concentrated sulphuric acid piping will be Carbon steel and valves will be Plug valves of Alloy 20 and butt-weld fittings will be used. The storage tank should be carbon steel. Carbon content should be less than 0.25%.

1.2.2 Inlet Chamber

Each half process stream of 200 MLD product water will start with an inlet chamber followed by flash mixers. Coagulant and flocculant (polymer) will also be added one after another. At least two flash mixing tanks will be included for proper mixing (~100 rpm) with total residence time at least 20 seconds.

1.2.3 Lamella Settlers

Lamella settler reduces the TSS concentration in water significantly. Its performance is not satisfactory in removing light particles such as larvae, algae and jellyfish particles of neutral buoyancy. The Lamella tube settler loading rate is kept at <1.0 m/hr for better settling of suspended solids. There will be minimum 36 Tube-settler tanks – 18 tanks in each plant stream

of 200 MLD.

1.2.4 Dissolved Air Flotation

Dissolved air flotation (DAF) is a process of liquid-solid separation by upward displacement of particles insoluble in water such as oil, algae or solids under the influence of tiny air bubbles. There will be at least 12 DAF tanks – 6 tanks in each plant stream of 200 MLD. The surface loading rate will be within 25 $m^3/m^2/h$. There is a provision of bypassing the DAF system if the seawater quality does not require it.

1.2.5 Gravity Dual Media Filters

Clarified water from the DAF outlet flows under gravity to the inlet channel of the gravity dual media filters. Dual Media Filters (DMF) is a process of liquid-solid separation by media filtration. Granular media filtration system will consist of about 80 individual filters (40 filters for each plant stream) that will operate in parallel. The loading rate of filters will be $\leq$ 7.8 $m^3/m^2 \cdot h$ with two filters out of service (N-2) per stream,

1.2.6 RO Feed Tank

The filtered water from media filters flows to the RO feed tank under gravity. The tank will be constructed out of RCC and equipped with an overflow line to the Outfall tank or the intake pumping station. There are two RO feed tanks – one for each process stream of 200 MLD. The capacity of each tank will be designed for 30 minutes of filtered water flow, i.e. about 10000 m3 each.

1.3 Seawater Reverse Osmosis System (SWRO)

The SWRO system is designed to produce net 400 MLD product water with plant availability up to 97% of the time in every month of a year. SWRO system of each stream will have 9 RO trains (8 working + 1 standby) of 25 MLD capacity each to produce 200,000 m^3/d product water of the required quality at even the worst-case conditions (i.e. minimum seawater temperature, maximum seawater salinity, maximum seawater turbidity, fouled membranes, aged membranes).

1.3.1 Cartridge Filter

Cartridge filter will be used for the safety and protection of the RO system. Two spare cartridge filter vessels for each train will be provided so that filter replacement is done without any impact on water production. Micron filter sized will be rated for 5 µm nominal.

1.3.2 RO Membrane

The reverse osmosis (RO) membrane will be thin-film composite 8" spiral wound type. There will be up to 8 elements per pressure vessel. RO Recovery rates will be within 42% to 46%. The RO system will be designed for an average flux rate not exceeding 13.4 $l/m^2/h$ at the maximum RO recovery of 46%. Sufficient space provisions will be considered in the design of the RO trains to accommodate 10% additional pressure vessels for future requirements. The

capacity of each rack will be 25 MLD. The expected lifetime of the RO membrane will be 7 years (+/- 0.5 year) which will be provided by the bidders in their bid submission.

1.3.3 Pressure Vessel

RO membranes will be installed in GRP pressure vessels. Each train will have enough space to install enough number of modules required to be installed at the end of the guarantee period or 10% free space whichever is greater. Each pressure vessel will house not more than Eight (8) membranes per vessel.

1.3.4 High-Pressure Pump

The High-pressure pump will be designed with Variable Speed Drive (VSD). The casing, Impeller and shaft of the HP pump will be of Super Duplex with PREN ≥43. It should be noted that the correct sizing of the RO pumping system is critical, as under-sizing will not achieve the required permeate flows and over-sizing may require excessive pressure to be burnt-off at the throttling valve.

1.3.5 Energy Recovery Device

Energy in the high-pressure brine from the reverse osmosis membranes will be recovered by an isobaric energy recovery device (IERD). The salinity increase at membrane due to ERD should not exceed 3%. The expected lifetime of the Energy Recovery Device(s) will be at least twenty-five (25) years. Efficiency of a single Energy Recovery Device (per unit) must be over 95% throughout the designed operating range.

1.3.6 Neutralization Pit

Neutralization system should be provided to neutralize the CIP solutions before it is discharged to the sea along with the RO brine via the outfall tank. The neutralization system for each plant stream should have a dedicated tank with recirculation /mixing facility and allow for neutralisation of the CIP solution in less than 4 hours.

1.3.7 RO Permeate Tank

RO permeate tank has been provided to store sufficient permeate water for CIP, flushing and service water. The tank can be either in concrete with corrosion-resistant tiling or glass fused stainless steel with proper internal and external protection. There will be two RO permeate tanks – each tank design will offer a large capacity of 5000 m3 allowing one skid CIP, all trains flushing and one backwashing of the limestone filter.

1.3.8 Clean In Place System

Two clean in place (CIP) system will be provided – one in each process stream of 200 MLD. The cleaning system will enable cleaning of all plant trains. It will consist of a cleaning tank, recircuating pumps, cartridge filters, pipes and valves with the capacity necessary for the sysem. The drain will be connected, via an easy to operate isolation valve, to the Neutralisation Tank.

1.3.9 Flushing Unit

RO train will be automatically flushed after the stop, and the flushing includes HP pump, RO train, ERD and recirculation pump. Two diesel set (2x100%) of suitable capacity will be provided for each plant stream to run the RO flushing system and to flush the RO trains in case of power failure. The permeate tanks of both the plant streams will be interconnected with sluice isolation valves to allow additional permeate water as needed for train flushing.

1.4 Chemical Storage and Dosing System

There will be a separate chemical building area for Pre-treatment, RO system and Post-treatment for each 200 MLD plant streams. The allocated area will be designed to receive and store all of the bulk chemicals safely and to meet the specified performance and technical criteria. All dosing tanks, pumps and allied system of chemical dosing will be located under chemical building. Bulk liquid chemicals may be stored in well-designed chemical storage tanks and bunded areas close to the chemical building. The solid chemicals will be housed in the chemical building. For bulk deliveries, complete unloading system will be provided with all 2x100% pumps, valves and fitting for transfer of chemicals to the storage tanks.

All piping and equipment should be suitable for transported chemicals. Chemical pipes should be housed in a trench. Piping of incompatible chemicals should be separated.

All chemical storage facilities will be suitable for 30 days of chemicals availability at RO Plant Site. For Sodium Hypochlorite combined storage & dosing shouldn't exceed 14 days, due to its low shelf life.

1.5 Post Treatment System

The permeate from the RO plant will be treated in the remineralization/ potabilization plant followed by disinfection and pH adjustment. The remineralization system includes CO_2 storage and injection system, limestone filtration and pH correction system. There will be a separate post-treatment system for each plant stream of 200 MLD capacity.

1.5.1 Limestone Filter

The design of limestone filter will allow minimum 50% of the permeate flow to pass through the filter for remineralization. The bypass stream must mix with remineralized stream thoroughly using static mixer before transfer to the Product Water Tanks. The minimum number of filter tanks will be 14 per stream of 200 MLD. The media contact time will be 25-30 min.

1.5.2 Product Water Disinfection

Sodium hypochlorite will be used for disinfection of product water. Suitable number of N+2 dosing pumps with solution tanks will be provided to dose in the product water feed. About 0.5 ppm residual chlorine will be maintained in the product water at the outlet of the plant.

1.5.3 pH Adjustment of Product Water

Sodium hydroxide will be used for the pH adjustment of the product water before product water tank. Sodium hydroxide storage and dosing system will be provided for the purpose. The chemical will be dose to maintain the pH of the permeate within 7 - 8.5.

1.6 Product Water Tank (PWT)

Product water tanks will be provided with 2-hour storage capacity (at least 30 ML). Total capacity of two product water tanks for each stream will not be less than 15ML. The main outlet pipe from the product water tanks of each stream to CWR will have two metering system, online turbidity, conductivity meters and sampling points to demonstrate the product water quality/quantity and to meet the product water guarantee conditions.

1.7 Clear Water Reservoir (CWR)

A clear water reservoir will be provided with a minimum 30 minutes of storage capacity. The reservoir capacity will be at least 9000 m3 and made of reinforced concrete.

1.8 Outfall Tank

An outfall tank will be provided with 4500 m3 of storage capacity. All wastewater including RO reject will be discharged to sea though this tank..

1.9 Administrative Building

The administrative building will be a G+2 storied structure. Gound and first floors will be for the engineers and staff of the operation and maintenance team. While the second floor will be used as guest house for the CMWSSB engineers. The buildings will be furnished with minimum facilities to make a complete working place and for guest house purpose.

1.10 Plant Control and Laboratory Building

A G+1 story building will be constructed to locate the plant control room at the ground floor and laboratory at the first floor or vice versa with a record room for drawings and all plant information.

1.11 Substation Building

A new substation buildings will be constructed including switchyard and transformer area with RCC framework looking to the space requirement. Suitable fencing will be done of transformer area.

1.12 MCC Building

MCC buildings will be constructed for all processes including intake, pretreatment, RO system and post treatment.

1.13 Plant Sludge Treatment System

The plant sludge treatment system includes sludge balance tank (SBT), thickeners and belt filter press (BFP) units. The filter backwash water, supernatant from thickener and wash water/ filtrate from BFP will be directed under gravity to the Outfall tank.

1.13.1 Sludge Balance Tank

The sludge from the Lamella Settler and DAF will be collected in a sludge balancing tank before pumping to the sludge thickener. The sludge balancing tank will be of reinforced concrete construction with 31m diameter. At least three submersible mixers will be installed in the sludge balance tank. An overflow line for discharging of excess sludge to the Outfall tank will be provided.

1.13.2 Sludge Thickeners

The sludge in the sludge balancing tank will be pumped to sludge thickener. Two gravity thickeners made of the reinforced concrete (M-35) will be provided. The main function of sludge thickener is to thicken the sludge to a concentration up to 5% solids prior to dewatering using belt filter presses (BFPs). The thickener supernatant overflows by gravity to the Outfall tank. Polymer will be used before thickener and BFP to promote solid separation.

1.13.3 Thickened Sludge Holding Tank

A tank will be provided to store thickened sludge and to act as a sump for the BFP feed pumps. The tank overflow is provided to the Outfall tank. The tank will be fitted with continuous level measurement equipment. Two agitators will be mounted on platforms that extend across the Sludge Dewatering Process

1.13.4 Belt Filter Press Buildng

The sludge dewatering building will be a two storied structure. The polymer feed systems, belt filter press feed pumps, belt wash water pumps and chemical dosing system will be located on the ground floor of this building, while belt filter presses and electrical room located on the first floor of this building.

1.14 Fire Fighting Building

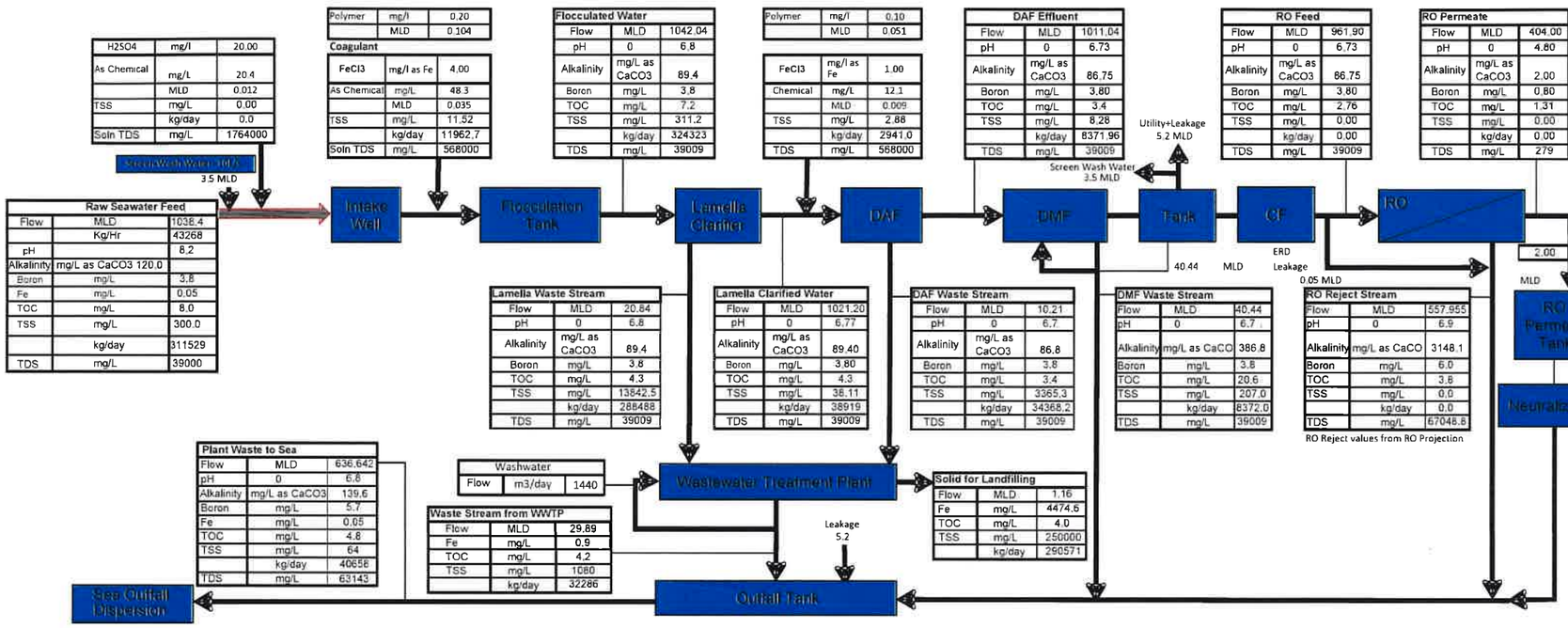
A Fire Fighting building will be constructed for 400 MLD SWRO Desalination Plant. The Fire Fighting facility consists of Fire Protection System and Fire Detection System. The Fire Protection System equipment will be complete in every respect and suitable for safe and reliable operation.

1.15 Package Sewage Treatment Plant

A Package Sewage treatment plant will be provided for treatment of domestic sewage from toilets and Canteens at the plant premises building. The minimum capacity of the plant will be 13.5 KLD. The reclaimed water from the package sewage treatment plant will be used for Landscaping.

Project: Construction of 400MLD DSP at Perur, Chennai
Prepared by : Dr. G. Mustafa

Annexure 4 - Mass Balance Diagram for Maximum Flowrate for 400 MLD Desalination Plant at Perur, Chennai



Dispersion

Mass Balance Checks		Solids due to Seawater TSS + Coagulant	Sludge due to removal of DOC	Total Solid
Flow (MLD)		Solid Tonnes/day		
Inputs	1038.78	326.433	0.0	326.4
Outputs	1038.78	326.433	4.8	331.2

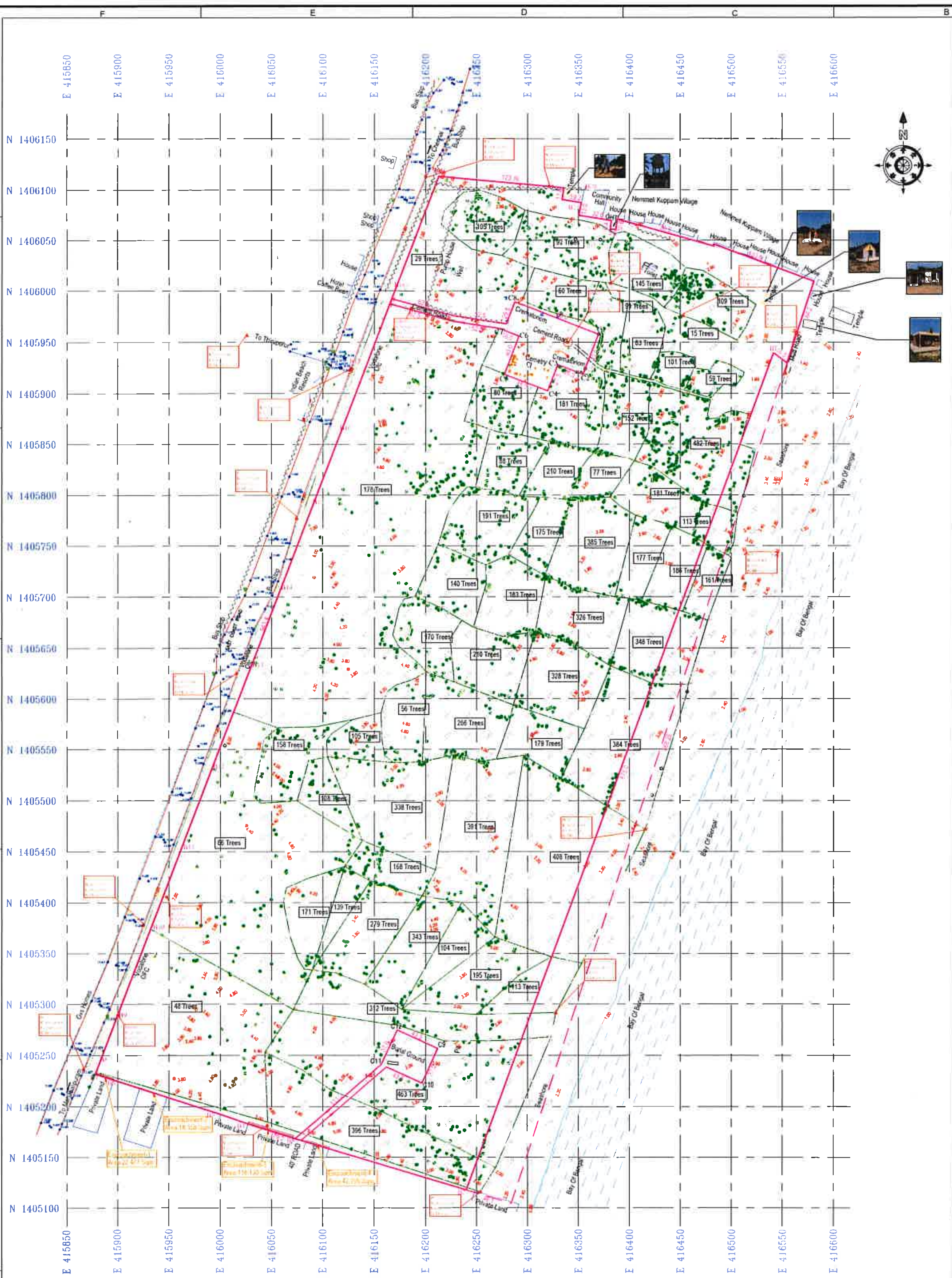
The following assumptions have been made based on experiences.

Assumptions				
1	DOC content of total TOC		90	%
2	DOC removal in Lamella Filter		40	%
3	DOC removal in DAF		20	%
4	DOC removal in DMF		20	%
5	Lamella Clarifier recovery		98	%
6	Lamella Clarifier solid removal efficiency		88	%
7	DAF waste solid removal efficiency		80	%
8	DAF Recovery		99	%
9	DMF Recovery		96	%
10	RO Recovery		42	%
11	Poly purity		100	%
12	Poly solution concentration		0.2	%
13	Density of Poly solution		1000	kg/m3
14	DOC reduction in RO process		80	%
15	DOC reduction in Carbonate tank		20	%
16	Other Utility and Plant leakage - high feed water		0.5	%
17	Solid Recovery Rate in Thickener		90	%
18	Iron removed as solid in sludge treatment		99.5	%
19	TOC removed as solid in sludge treatment		98	%

Mass Balance @ 1.2 times Max Case			
Process Stages	Process water	Wastewater	Rate wrt Feed
Intake Pumps	1038431		100.00%
Screen Wash	3500		0.34%
Utility and Leakage		5192	0.50%
Flocculation Tank Sludge		1000	0.10%
DMF Backwash		40442	3.89%
DMF Recovery	38819		96.00%
Feed water RO+ERD	0		0.00%
Tank Inlet	961904		100.50%
HP pumps	404000		38.90%
Chem. Pump	0		0.00%
Feed to ERD	0		0.00%
RO Permeate	404000		38.90%
RO Reject		557955	53.73%
Carb. Contact		1000	0.10%
Total plant waste discharge		636642	61.31%
Wet Plant Product Water	402000		
Product Water Quantity	402		

MASS BALANCE DIAGRAM FOR MAXIMUM FLOWRATE

ANNEXURE V



NOTE:

1. All Dimensions Are In Meter
2. Survey Work Carried Out During September 2020 & December 2020
3. Total Trees 10801 Nos
4. Drawing Is Based On WGS84 And UTM44 Projection.
5. The Benchmark has been taken at Chennai, Mount Road,Munro Statute Pedestal RL:5.398m
6. The Contours are Drawn at an interval of 0.20m

ALLOTTED AREA BOUNDARY DETAILS

B.NO	BOUNDARY CO-ORDINATE	
	EAST	NORTH
B1	416541.576	1405939.606
B2	416239.814	1405118.287
B3	416070.785	1405169.213
B4	416027.095	1405183.206
B5	416000.492	1405192.689
B6	415895.831	1405226.141
B7	415878.897	1405231.554
B8	415885.064	1405246.286
B9	415903.892	1405289.759
B10	415937.553	1405373.505
B11	415966.450	1405451.569
B12	415996.135	1405532.050
B13	416033.732	1405633.822
B14	416061.741	1405709.521
B15	416092.671	1405793.041
B16	416119.511	1405865.617
B17	416142.397	1405927.222
B18	416171.293	1406004.998
B19	416214.734	1406113.546
B20	416360.513	1406100.000
B21	416356.857	1406078.315

FOR TENDER PURPOSE ONLY

Rev	Date	Description	Drawn	Chkd	Appd
R1	DEC-2020	TENDER PURPOSE	B.RAJESH	G.N.KUMARAN	
R0	SEP-2020		B.RAJESH	G.N.KUMARAN	

Client: Chennai Metropolitan Water Supply and Sewerage Board (CMWSSB)

Project management Consultant: SMEC International Pty Ltd. TATA Consulting Engineers Limited (TCE) NJS Engineers India Pvt Ltd (NJSEI) SMEC India Pvt Ltd

Project Name: Project for Construction of Seawater Desalination Plant (I)

Contract Name: Procurement of design/Engineering,Construction,Commission of 400 MLD Seawater Reverse Osmosis (SWRO) Desalination Plant at Perur, Chennai with 20 Years of Operation and Maintenance (DBO Basis)

Project Survey Consultant: PRIME MERIDIAN SURVEYS PVT. LTD (PMSPL), INDIA. 29,First Floor, Dharmaraja Kovil Street, SAIDAPET, CHENNAI-600 015. PH No : 044 -24353869/24343683, Mobile: -94440 20624

Tender Number: CMWSSB/CNT/WSS/ICB/JICA/DESAL/CP01/018/2020-21

Contract Package No: Contract Package -I (CPI)

JICA Loan No: ID-P267

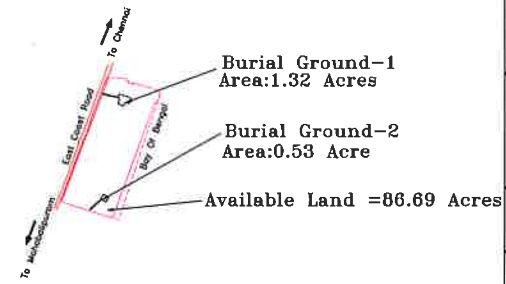
Drawing Title: TOPO SURVEY - SPOT LEVELS & CONTOURS

Drawn : B.RAJESH	Checked : G N KUMARAN
SURVEYED : SARAVANAN	Approved :
Date : DECEMBER-2020	Scale : A1
Drawing Number: 7061563/PMC400MLD/CPI/C/TOP/002	Sh.No 1 OF 1 / Revision R1

LEGEND

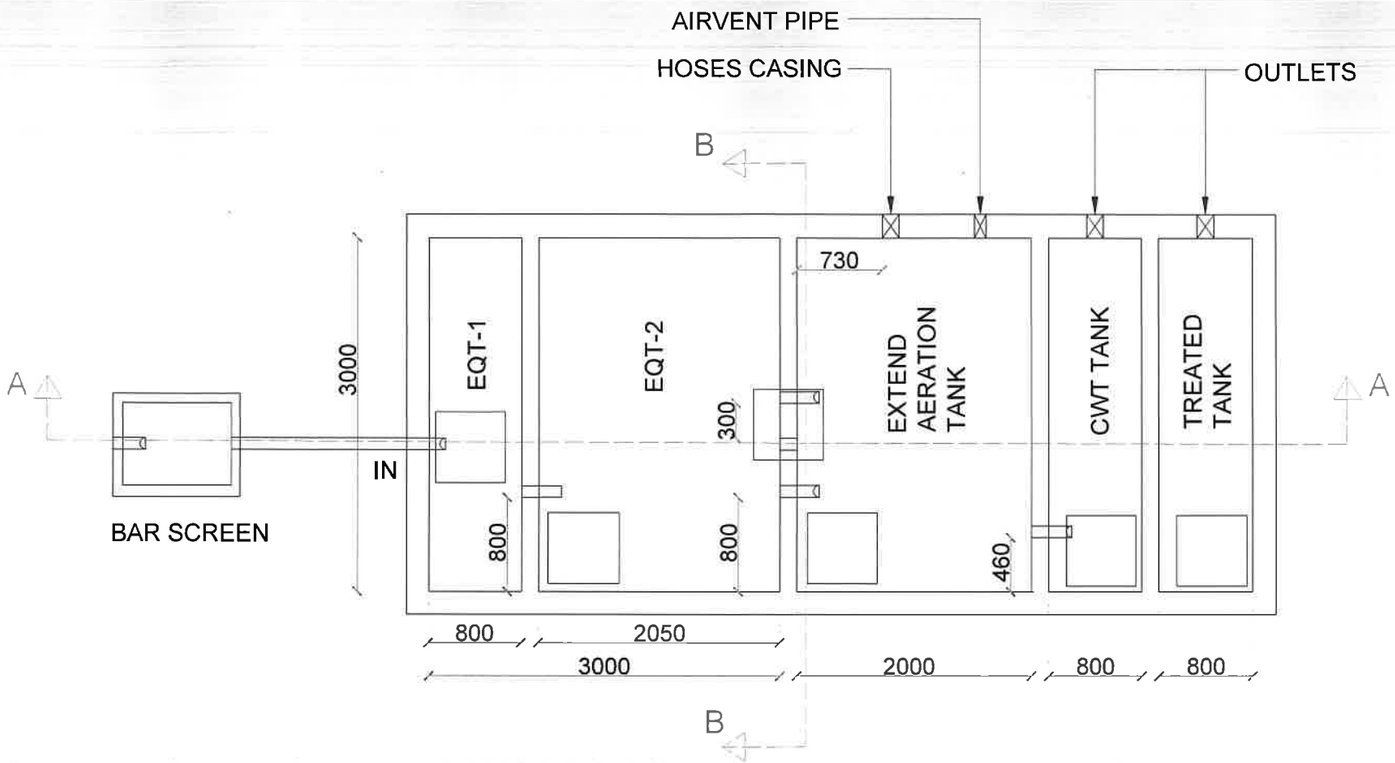
SITE BOUNDARY		NAME BOARD		ROAD LEVELS	
ROAD BT		TREES		GROUND LEVELS	
CEMENT ROAD		TRAFFIC SIGN BOARD		BENCHMARK	
FENCE		TRAFFIC SIGNAL POLE		TEMPLE	
TREES BOUNDARY		ELECTRICAL LINE		ENCROACHMENT	
CCTV CAMERA		GATE		VODAFONE MANHOLE	
BORE WELL		SURVEY STONE		LAMP POST	
ELECTRICAL POST					
ELECTRICAL TRANSFORMER					
HECTOMETRE STONE					
KILOMETRE STONE					
HAND PUMP					

Surveyed Area Details: North Side

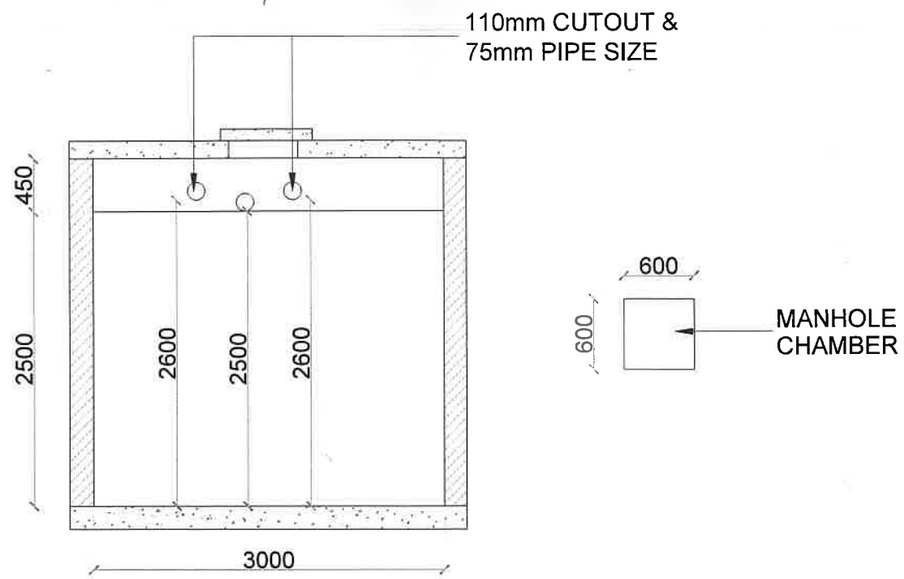


North side Burial Ground Co-Ordinate						South side Burial Ground Co-Ordinate		
P.Id	Easting	Northing	P.Id	Easting	Northing	P.Id	Easting	Northing
C1	416369.681	1405957.891	C5	416277.378	1405918.883	C9	416211.861	1405256.896
C2	416354.627	1405918.681	C6	416291.787	1405956.197	C10	416196.478	1405223.245
C3	416329.887	1405928.179	C7	416276.861	1405961.961	C11	416156.916	1405241.331
C4	416319.855	1405902.574	C8	416287.580	1405989.445	C12	416172.299	1405274.981

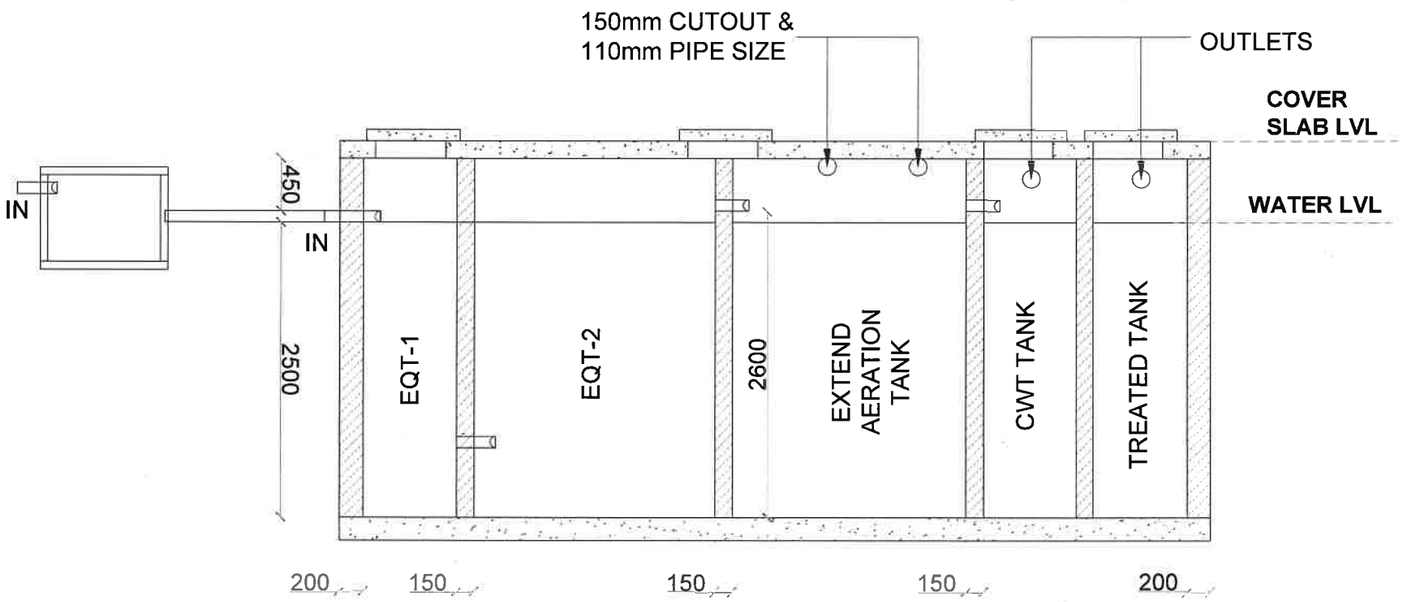
ANNEXURE-VI



PLAN



SECTION B-B



SECTION A-A

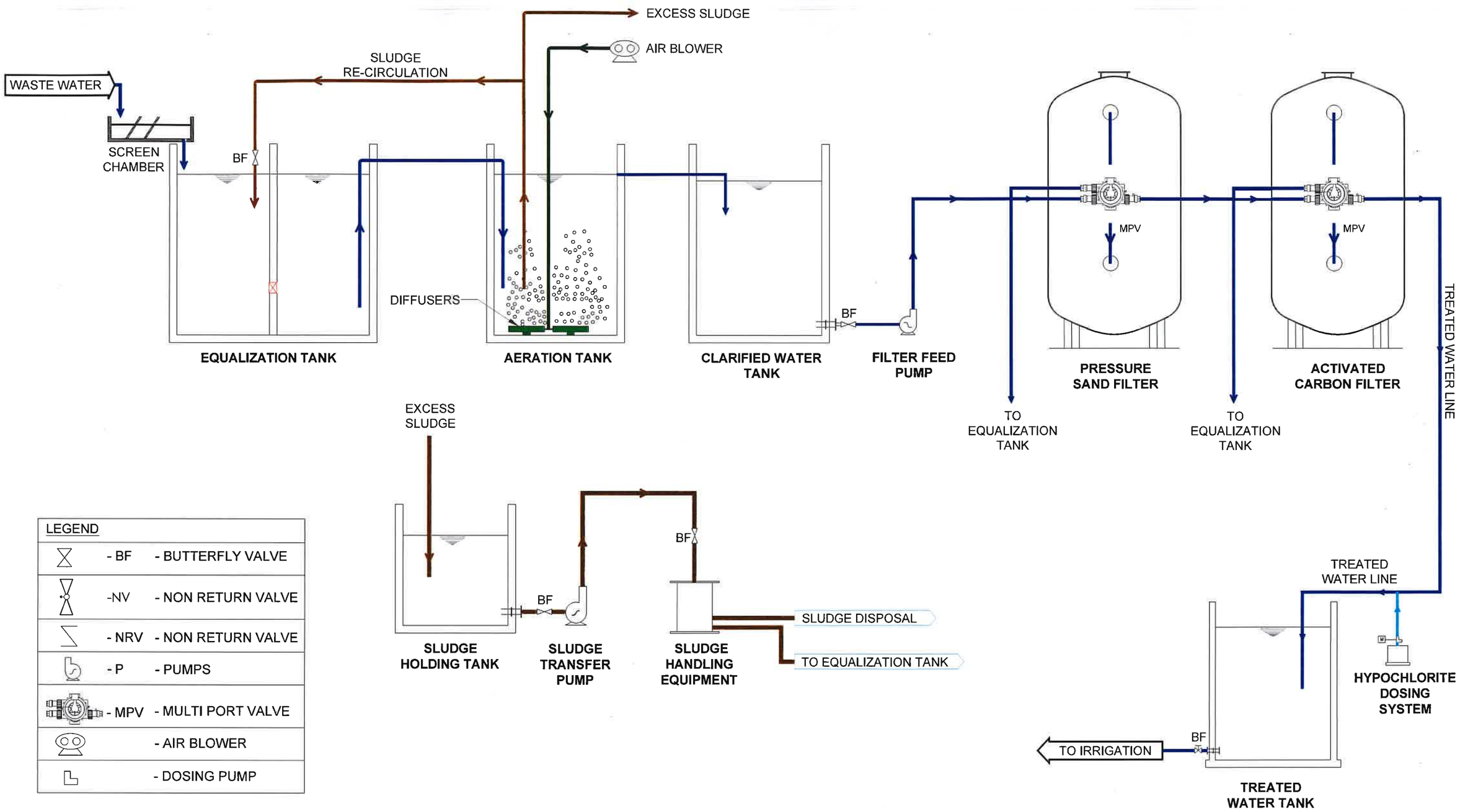
LEGEND:
MH - MANHOLES CHAMBER

LIST OF CIVIL UNIT

MARKS	DESCRIPTION	DIMENSION	CAPACITY
EQT-1	EQUALIZATION TANK	0.80m x 3.0m x 3.0m(2.5m LD)	6.0 KL
EQT-2	EQUALIZATION TANK	2.05m x 3.0m x 3.0m(2.5m LD)	15.4 KL
EAT	EXTENDED AERATION TANK	2.00m x 3.0m x 3.0m(2.5m LD)	15.0 KL
CWT	CLARIFIED WATER TANK	0.80m x 3.0m x 3.0m(2.5m LD)	6.0 KL
TWT	TREATED WATER TANK	0.80m x 3.0m x 3.0m(2.5m LD)	6.0 KL

CROSS SECTION DETAIL OF PROPOSED SEWAGE TREATMENT PLANT

ANNEXURE - VII



LEGEND		
	- BF	- BUTTERFLY VALVE
	-NV	- NON RETURN VALVE
	- NRV	- NON RETURN VALVE
	- P	- PUMPS
	- MPV	- MULTI PORT VALVE
		- AIR BLOWER
		- DOSING PUMP

PROPOSED PROCESS FLOW DIAGRAM OF SEWAGE TREATMENT PLANT FOR 400 MLD PERUR DESALINATION PLANT

ANNEXURE VIII

HAZARDOUS AND NON-HAZARDOUS WASTE DETAILS

13 a. Details of Non hazardous Solid Wastes.

S. No	Nature of Solid Waste	Quantity T/month	Mode of disposal	Area of land earmarked for storage/disposal
1.	Domestic Solid wastes from Admin. Building, Canteen etc.,	2.7	Composting of Biodegradable waste by Organic Waste Composter of 50 kg/day), Recyclables will be sold to Authorized vendors.	Collection Bins for storage and disposal within Plant premises.
2.	Solid Sludge from Belt filter Press	2548	Dewatered sludge proposed to be trucked and disposed to Abondened quary or dumping grounds	Disposal to the nearest solid waste dumping grounds at Perungudi and Kodungaiyur or any other abandoned quarry

13 b. Details of Hazardous Wastes.

S. No	Category No.	Name of the waste	Quantity T/A	Mode of disposal	Area of land earmarkedfor storage/disposal
	N.A.				

Annexure- VI A

Details of Sewage/Trade Effluent generation

Outlet No.	Description of Outlet(Indicate sewage or trade effluent)	Maximum daily discharge in KLD
1.	**Sewage**	13.5
2.	**Trade effluent**	7,47,000

Note : The value of Trade effluent is from CRZ clearance letter

Excel Industries Ltd.
Environ-Biotech Division

WHAT COLOUR IS YOUR GARBAGE?

TOGETHER WE CAN TURN IT GREEN

www.excelind.co.in

Segregate organic waste

Feed it to the Excel OWC. Add Bioculum and absorbent as recommended

In 15 minutes, the OWC processes the waste into homogenized flow-able raw compost ready for curing

Excel OWC Composting System

Excel OWC is a pioneering decentralized organic waste treatment system. Our patented system rapidly processes organic waste such as kitchen waste, garden waste, food processing waste etc. into rich compost, thus reducing organic waste going to landfill. The system is fast, efficient and easy to install. It is also simple to use and can be operated after minimal training.

Why Excel OWC

- Proven track record of success
- Provides available compost for organic farming
- Available on operational lease basis
- 1 year warranty
- Pan India service support
- Quick response to complaints and breakdowns anywhere in India

The Excel OWC is an ideal solution for bulk waste generators such as:

- Hotels
- Temples
- Hospitals
- APMC Markets
- Clubs & Resorts
- Industrial Canteens
- Institutional Campuses
- Municipal Corporations
- Building Clusters in lane
- Large Housing Complexes

Composting

How nature recycles

Composting is a natural process by which beneficial microbes process organic wastes. The Excel OWC utilizes these natural agents and creates the optimum conditions that maximize their efficiency. This speeds up the process that may take months and completes composting in a short period of 10 days.

Place into the curing system

In just 10 days, your compost is ready for the market or your organic kitchen garden

Sizes & Specifications

Solutions for every need

Excel OWC models can handle waste quantities of up to 2 MT per day. For bigger challenges contact us for a specially customized solution for you.

Model No.	Capacity per batch	Power	Dimensions (LxHxW)
OWC 30	10 Kg per batch	2.5 HP	1.65m x 1.03m x 0.98m
OWC 60	25 kg per batch	4 HP	1.74m x 1.06m x 1.1m
OWC 130	50 Kg per batch	8 HP	2.18m x 1.19m x 1.40m
OWC 300	120 kg per batch	13.5 HP	1.98m x 1.40m x 1.47m
OWC 500	170 kgs per batch	16 HP	2.03m x 1.37m x 1.65m

Additional area required for curing racks, depending upon quantity of waste.

Easy EMI Option

Go green with lower investments. The Excel OWC System is also available on lease and via easy EMI's. To know more, get in touch with us today.

OWC Projects

Custom solutions for large scale challenges

At Excel Industries Limited Environ-Biotech Division, we also create custom solutions for specific waste challenges. Our solutions can handle waste challenges between 2 to 20 MT in a day.

Our large scale systems feature industrial scale technology and processes to streamline waste treatment. We have years of experience in designing, fabricating and installing large scale systems and have produced stellar and reliable solutions for clients.

OWC Testimonials

As a part of Excel's costumer service, the machine installation at each location of IOCL is proactively maintained under warranty and Annual Maintenance Contract by Excel. Thereby, reducing the challenges involved in operating the machine.

S.K. Jaisawal, General Manager, IOCL's - Indian Institute of Petroleum Management

OWC is an excellent solution for companies facing food waste management issues.
Gopinath K, Senior Executive, Mantri Square, Bangalore

Organic manure from OWC is most suitable for urban organic gardening
Azeezabi Lateef, Senior Executive, Manipal Hospitals, Bangalore

OWC helps in green urbanization and in reducing one's 'garbage index'
Mahesh D. Joshi, General Manager, Dishman Pharmaceuticals & Chemicals Ltd.

OWC is an excellent solution for enhancing regulatory compliance levels.
Pushpendra Singh, Admin Executive, TCS

Excel Industries Ltd.
Environ-Biotech Division

Excel Industries Ltd.
Environ-Biotech Division,
184/87, SV Road, Jogeshwari (w), Mumbai-400102, India.
Phone: 022-66464342 | **Fax:** 022-26782409
Email: owc@excelind.com | **http:** www.excelind.co.in