

## 9.11 Summary of Design Parameters:

Design of sewerage system shall be based on the concept design criteria indicated and summarized below:

	Description	Design Value	
1.	Type of Sewerage System	Conventional Gravity Type	Wastewater combines sewage (black water) and sullage (grey water) both
2.	Design period	35 yrs. for network	
3.	Domestic Average flow	120 lpcd (80% of 150)	Return Factor 1.0 (EPA guide)
4.	Total Present population	6490	2015
5.	Total Design Population	12,979	2051
6.	Peak Factor	3.0	Indian CPHEEO Manual
7.	Institutional consumption	10% of Total Consumption	
8.	Commercial Consumption	2% of Total Consumption	
9.	Infiltration and Other flows	10% of ADWF 4% of ADWF	Sewer pipe will have flexible joints and infiltration will be minimal
10.	<b>Pipe material</b> Wastewater collection Pressure Main Sea Outfall	uPVC HDPE HDPE	All PE pipes to be black in colour, flexible Minimum
11..	Minimum velocity	0.6m/sec	
12..	Minimum Pipe diameter	110mm	
13.	Minimum Pipe Cover	500-600mm	For main sewer
14.	Maximum pipe depth	1.5m (depth < 2.5m max) MSL	
15.	Manholes	Circular Corrugated Polyethylene (depth < 3.5m)	
16.	Inspection Chamber	Corrugated PVC	
17.	Pumping System for 15 years design period	Two submersible pumps each capable to handle peak flow	One Mobile backup generator Set to be provided in each LS
18.	Sewage Treatment for 15 years design period	Off-site STP	Package Treatment Plant
19.	Dilution	Dilution By Dispersion without Conventional Treatment	Process with Diffused Aeration. Sewer Outfall will be 10m below beyond Reef.
20.	Outfall	Minimum 160 mm OD, HDPE	
21.	Force main	Minimum 110, 160 & 225mm OD HDPE	
22.	Sewer cleaning Equipment	High Pressure Sewer Jetting Machine	Hydro Jetting truck

**Table 10. Design Parameters Summary**

## 9.12 Sump and Pump Details

All Sizes of Sump are (To cater flow up to Year 2051):

LPS-1	:1.8 m Diameter x 2.30 m depth of sump
LPS-2	:1.8 m Diameter x 2.50 m depth of sump
LPS-3	:1.5 m Diameter x 2.00 m depth of sump
LPS-4	:1.8 m Diameter x 2.30 m depth of sump
LPS-5	:2.0 m Diameter x 2.30 m depth of sump
LPS-6	:1.8 m Diameter x 2.30 m depth of sump
LPS-7	:1.8 m Diameter x 2.00 m depth of sump
LPS-8	:1.8 m Diameter x 2.00 m depth of sump
LPS-9	:1.8 m Diameter x 2.00 m depth of sump
LPS-10	:2.0 m Diameter x 2.80 m depth of sump
LPS-11	:1.8 m Diameter x 2.00 m depth of sump
LPS-12	:1.8 m Diameter x 2.00 m depth of sump
STP	:Refer Volume 2:Appendix1: Treatment plant Calculation for sizes.

### Summary of Pump Allocations

Location		Model
Below Grade Pump Station	LS 1	Pump 1
		Pump 2
Below Grade Pump Station	LS 2	Pump 1
		Pump 2
Below Grade Pump Station	LS 3	Pump 1
		Pump 2
Below Grade Pump Station	LS 4	Pump 1
		Pump 2
Below Grade Pump Station	LS 5	Pump 1
		Pump 2
Below Grade Pump Station	LS 6	Pump 1
		Pump 2
Below Grade Pump Station	LS 7	Pump 1
		Pump 2
Below Grade Pump Station	LS 8	Pump 1
		Pump 2
Below Grade Pump Station	LS 9	Pump 1
		Pump 2
Below Grade Pump Station	LS 10	Pump 1
		Pump 2
Below Grade Pump Station	LS 11	Pump 1
		Pump 2
Below Grade Pump Station	LS 12	Pump 1
		Pump 2
Above-Grade Effluent Pump Station	STP	Pump 1
		Pump 2

**Table 11: Sump Wells Pump allocation Table**

- a. Pump Type: Submersible Non-Clog
- b. Nos. of Pumps in each LS: ( 1W+1S)
- c. Nos. of Pumps in STP: ( 2W+1S)
- d. Pump Discharge through Delivery Main to Sewage Pumping Main terminating to Inlet Chamber of Sewerage Treatment Plant (STP).
- e. Selection of Pumps:

This is in compliance with the pump requirements specified above the following GRUNDFOS pump model no. SL1.80.80.40.A.EX.4.60F.C has been chosen as the most suitable pump for all twelve pumping stations with two pumps in each chamber for the lift stations and the 2 pumps for the STP treated effluent disposal pump station is of the specification similar to model SL1.100.150.55.A.51E.B.

The catalogue attached under Operations and maintenance manual, illustrates the pump curve for the Grundfos SL1.80.80.40.A.EX.4.60F.C. The same pump has been proposed for all pump stations, as the flow rates and head are similar for all twelve pumping stations and also allows more flexibility in repair maintenance works.

**The chosen pump has the following characteristics:**

Pump Model :Grundfos Datenheft SL1.80.80.40.A.EX.4.60F.C

Type : Explosion Proof model

Operating Voltage : 3phase 220-240V

Power input P1 :4.8KW

Power output P2 :4.0KW

Rpm :1764

No. Of Poles :4

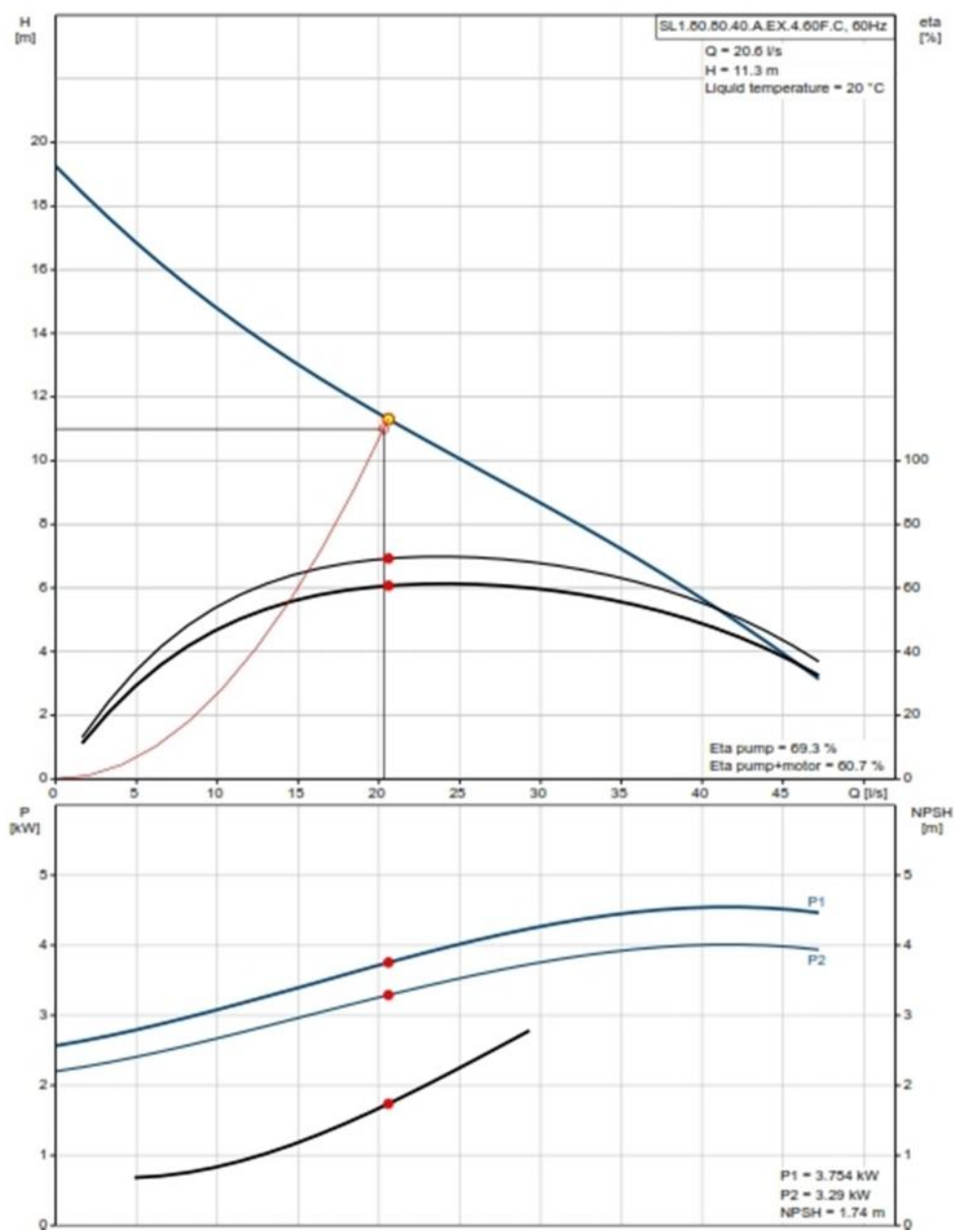
Impeller :Super Vortex (Cast Iron)

Starting Current:118A, 60Hz, Rated Current:16.4-15.7A

Starting Method:SD

Maximum Installation Depth: 20m, Discharge 20.6l/s, Head 11.3m

Head available at a given discharge, Hydraulic efficiency, motor efficiency, NPSH and pH range is shown by the performance curve given below. Pump Enclosure is IP68, Insulation class F with pump housing pressure of PN10. However, Equivalent capacity Flygt pumps can also be used.



**Figure 5: Lift Station Pump Performance Curve**

Description	Value
<b>General Information:</b>	
Product name:	SL 1.80.80.40 A EX.4.60F.C
Product No:	96629109
EAN number:	5711495525154
Price:	On request
<b>Technical:</b>	
Actual calculated flow:	20.6 l/s
Max flow:	47.2 l/s
Resulting head of the pump:	11.3 m
Head max:	17.3 m
Type of impeller:	S-TUBE
Maximum particle size:	60 mm
Primary shaft seal:	SIC/SIC
Secondary shaft seal:	CARBON/CERAMICS
Approvals on nameplate:	CSA, FM
Curve tolerance:	ISO9906:2012 3B2
Cooling jacket:	without cooling jacket
<b>Materials:</b>	
Pump housing:	EN-GJL-250
Impeller:	EN-GJL-250
Motor:	EN-GJL-250
<b>Installation:</b>	
Maximum ambient temperature:	40 °C
Flange standard:	DIN
Pump inlet:	100
Pump outlet:	60
Pressure stage:	PN 10
Maximum installation depth:	20 m
Inst dry/wet:	SUBMERGED
Installation:	VERTICAL
<b>Liquid:</b>	
Maximum liquid temperature:	40 °C
Liquid temp:	20 °C
Density:	998.2 kg/m³
<b>Electrical data:</b>	
Power input - P1:	4.6 kW
Rated power - P2:	4 kW
Mains frequency:	60 Hz
Rated voltage:	3 x 220-277 V
Voltage tolerance:	+10/-10 %
Max starts per. hour:	20
Rated current:	16.4-15.7 A
Starting current:	116 A
Cos phi - power factor:	0.74
Cos phi - p.f. at 3/4 load:	0.66
Cos phi - p.f. at 1/2 load:	0.53
Rated speed:	1764 rpm
Motor efficiency at full load:	88.2 %
Motor efficiency at 3/4 load:	87.4 %
Motor efficiency at 1/2 load:	85.3 %
Number of poles:	4
Start. method:	direct-on-line

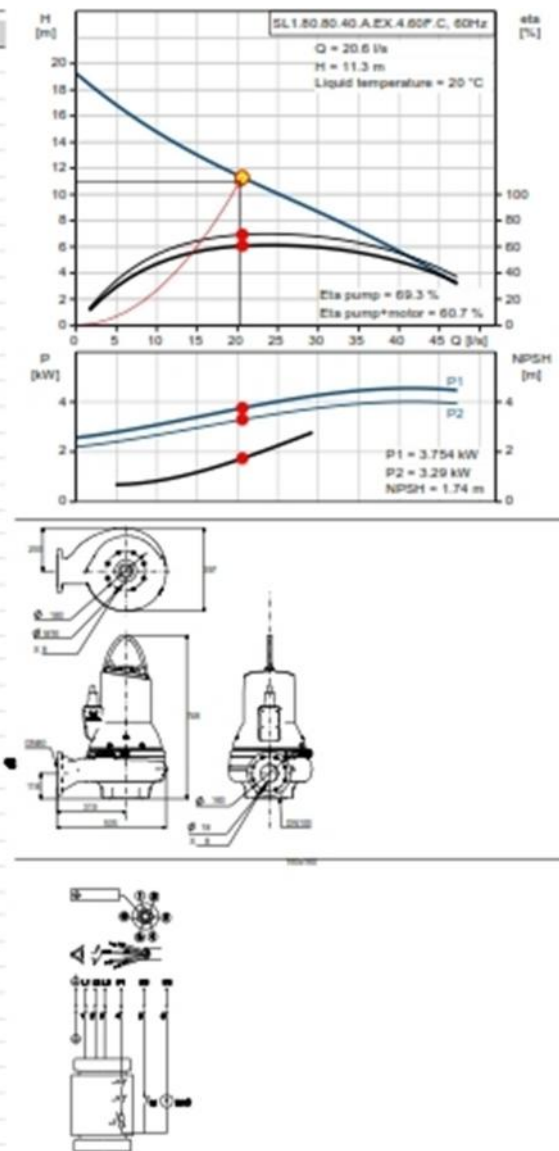
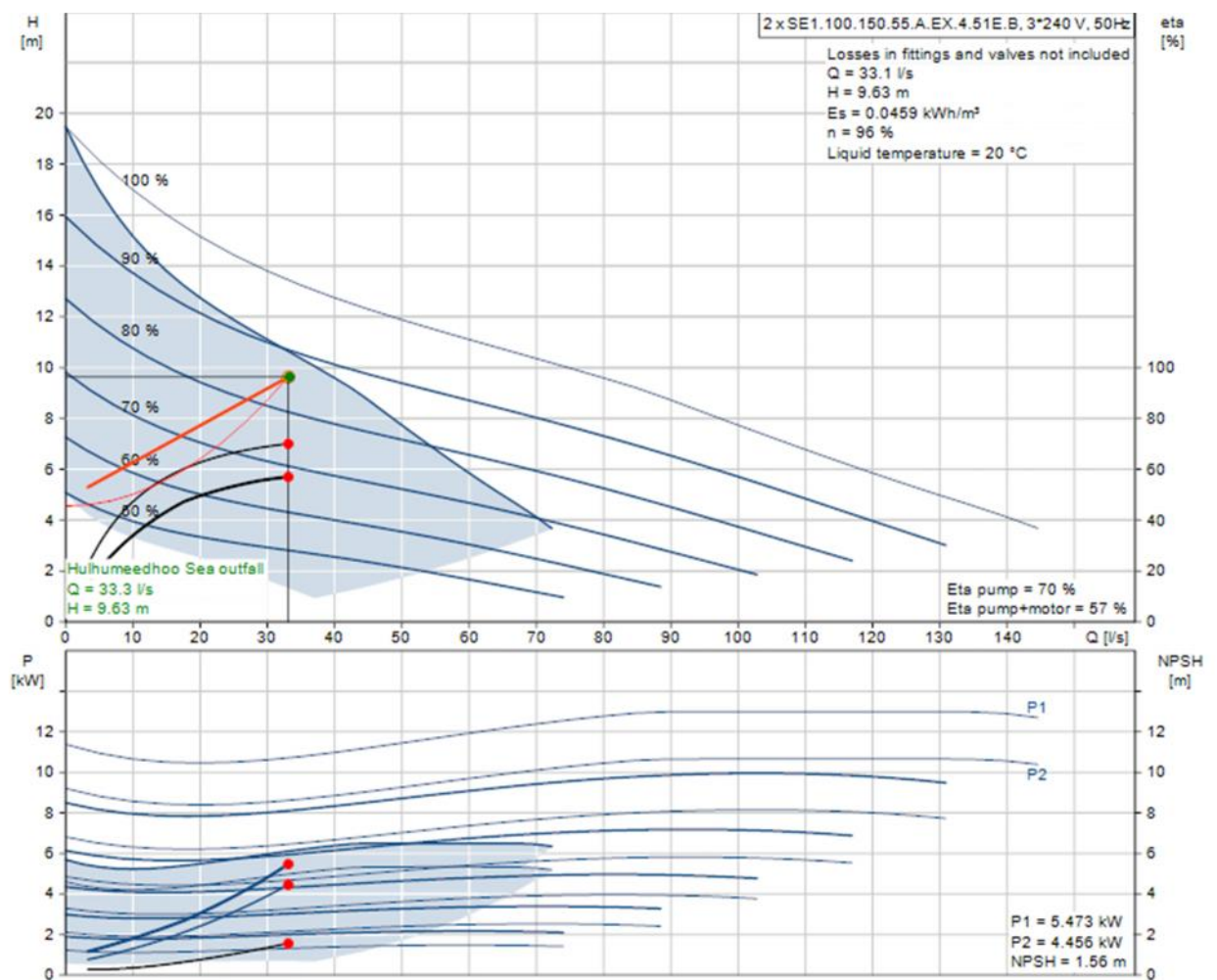


Figure 6: Lift Station Pump Performance Data



**Figure 7: Sea Outfall Pump Performance Curve**

### *1.0 Lift Station Design*

<i>Lift Station</i>	Discharge Flow	<i>Discharge Head</i>
<i>no.</i>	L / Min	<i>m</i>
LS1	639	11
LS2	828	4
LS3	490	4
LS4	191	4
LS5	686	4
LS6	963	9
LS7	669	6
LS8	713	5
LS9	594	3
LS10	1223	11
LS11	1041	7
LS12	391	8

### *2.0 Effluent Discharge Pumps Station*

<i>Lift Station</i>	Discharge Flow	<i>Discharge Head</i>
<i>no.</i>	L / Min	<i>m</i>
<i>Outfall Pumpstation</i>	1998	9.63