NJS

NJS ENGINEERS INDIA PVT. LTD.

ISO 9001 Certificate No. RQ91/9493
Dhanraj Residency Apartment, Flat No 103, 1st Floor, No 86/12, 13th Cross
Laxmaiah Block Ganganagar, Bangalore-560 024
Ph.: 080–4113 1655, Email: bangaloreoffice@njsei.com

Ref: NJSEI/BLR/Hebbal STP/PRO/F3/P19/439/2018-19 Date: 20/12/2018

To,
The Executive Engineer STP (Hebbal Valley),
Bangalore Water Supply and Sewerage Board
Opp. Nagavara Lake, BDA Ring Road
Bangalore - 560024

O/C

Project: Work of Construction of 100MLD Wastewater Treatment Plant at Hebbal.

Subject: Basic Engineering Package-Rev 03.

Ref.: 1. Contractor's letter ENVIRO/BWSSB/HEBBAL/2018/273 dated 27th November 2018

Dear Sir,

We refer to the subject and reference letter cited above. We have reviewed **Basic Engineering Package - Rev 03** submitted by the Contractor. The document is recommended to be approved under **Code 'A'** with the following observation to be complied by the Contractor. The Compliance response sheets are enclosed vide Doc. No. NJSEI-HEBBAL-PRO-2018-015.

1. The contractor should remove text pertaining to Automatic Control of Oxygen Uptake Rate from SBR section.
2. Any revision during data sheet approval shall be incorporated in the BEP and a final version of BEP shall be submitted once all datasheets are approved for record. Please advise the contractor accordingly.

Eight (8) copies of the Documents enclosed and the enclosed transmittal No. 439 contains the code.

After BWSSB has completed signing, please distribute the copies of the documents as follows:

- 4 No. EE (STP) Hebbal Valley
- 1 No. for Contractor
- 3 Nos. for NJSEI

We will distribute the three NJSEI copies as below,
- 1 No. for Admin File
- 1 No. for Site office
- 1 No. for Design Engineer (PRO)

Kindly return NJSEI's three copies of the signed documents to us.

Yours faithfully,

Team Leader
NJS Engineers India Pvt. Ltd.

Office of the Chief Engineer (WQ & EM) 24/12/18 BWSSB, Bangalore

Encl: Transmittal, 1 page
Compliance Response Sheet, 17 pages (A3)
Documents, 8 copies

c.c: CE(WWM), Cauvery Bhavan, for information (no enclosures)
ACE (WWM-1), Cauvery Bhavan, for information (no enclosures)

Registered Office:
CIN: U74210PN2007PTC129798
18, Shailesh Society, Karvenagar, Pune 411052,
Phone-020-60501963, Fax : 25459533, Email: puneoffice@njsei.com
Website: www.njsei.com
Reply to H-840
*PRO/F3**
*SRK*RLH*DFG*NA*Site office*

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*PRO/F3**
*SRK*RLH*DYG*NA*Site office*

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Website: www.njsei.com

Transmittal No: NJSEI/439, dated 20.12.2018

We herein convey our approval/comments on the documents enclosed Transmittal. Approval/comments conveyed herein neither relieves the vendor/contractor of his contractual obligations and his responsibilities for correctness of dimensions, materials of construction, weights, quantities, design details, assembly fits, performance requirements and conformity of the supplies with the Indian Statutory Laws as may be applicable, nor does it limit the purchaser's rights under the contract.

CODES

A – Approved, manufacture/construction may commence.	B – Acceptable subject to changes indicated. Resubmit for approval but manufacture/construction may commence.
C – Amend as comments indicated and resubmit for Approval.	D – Comments noted in Letter/memo attached to forwarding transmittal Nr……..dated…….Amend as comments indicated and resubmit for approval.
E – Amend as comments indicated resubmit for record.	F – Comments noted in Letter/memo attached to forwarding transmittal Nr……dated……Amend as comments indicated and resubmit for record.
G – Drawing of this category is for information and hence not required to be approved.	

Sl. No.	Title	Contractor Reference	Revision	Code
1	Basic Engineering Package	ECAIPL/BWSSB/STP/HEB/P/BEP	3	A

NJSEI Comments Sheet

Doc. No.: NJSEI-HEBBAL-PRO-2018-015 **Date: 20-12-2018**

Contractor Letter Ref No.	ENVIRO/BWSSB/HEBBAL/2018/273	**Date**	27/11/2018
NJSEI Received	H-840	**Date**	27/11/2018

Plant: Design & Construction of 100MLD SBR STP at Hebbal

Document Description: Basic Engineering Package – Rev. 3

Document No.: ECAIPL/BWSSB/STP/HEB/P/BEP

Sl. No.	NJSEI Comments	Enviro Reply	NJSEI Comments (R0)	Enviro Reply (R0)	NJSEI Comments (R2)	Enviro Reply (R2)	NJSEI Comments (R3)	Status/ Action
	General							**Code - A**
1	Refer Chapter 1, page 5 of 49: The maximum TSS at the outlet of SBR is assumed as 15 mg/L. The contractor should use a value of 20 mg/L to determine the capacity of disc filtration system.	Confirmed. BEP has been revised and submitted accordingly.	Noted					
2	Refer Chapter 1, page 7 of 49: The sludge in the thickener feed sump shall be mixed through either submersible mixer or through pump recirculation.	The said scope of work is not mentioned in tender. It shall be treated as additional scope of work.	**Refer Chapter 1, page 7 of 56:** The sludge in the thickener feed sump shall be mixed through either submersible mixer or through pump recirculation. Contractor mentioned that "The said scope of work is not mentioned in tender. It shall be treated as additional scope of work".	Noted.				
3	Refer Chapter 1, page 7 of 49: The number of thickening polymer dosing pumps should be the same number of thickeners i.e. 2W+2S so that a dedicated dosing pump is provided for each thickener.	Confirmed.BEP has been revised and submitted accordingly.	Complied					
4	Refer Chapter 1, page 7 of 49: The sludge from existing 60 MLD STP is proposed to be received in the thickened sludge sump. Please confirm that the gravity sludge thickener is the existing STP is in good working condition, and it will thicken the sludge and only the thickened sludge will be pumped to the proposed sludge handling plant.	Kindly refer scope of work mentioned in Volume II, Section 7, Part-1, Page 1-3, 6th para. As per discussion held with M/S. NJS and CE BWSSB, the existing thickeners are not in good working condition and hence, it was decided to adopt 1 No. of mechanical screw thickeners out of 2 Nos. of standby thickeners proposed for new 100 MLD STP at Hebbal which is highly appreciated to	Noted					

		achieve better sludge quality.Moreover, 1 No. of poly dosing pump shall also be provided from proposed STP to BWSSB for their future utilization of the screw thickener.						
5	Refer Chapter 1, page 7 of 49: One (1) heat exchanger has been proposed to increase the sludge temperature to achieve digester temperature of 30oC. Please confirm that one heat exchanger per digester (total of 4 Nos.) will be provided with appropriate interconnecting pipework to maintain digester temperature during heat exchanger maintenance.	Kindly refer Clause No. 11, corrigendum-I dtd: 6-05-17. Bidder may propose heat exchanger system to maintain required temperature inside sludge digester to achieve guaranteed power generation through biogas engine"". To achieve guaranteed power generation, i.e. 6384 kWh/day through biogas engine, we require only 413 m3/hr (max.) quantity of biogas generated from anaerobic digester. To achieve the said quantity and guaranteed power generation, the heat exchanger is not required as per the above said corrigendum-I, which supersedes tender specifications and therefore, we had offered discount of Rs. 1,56,64,231.00 in price schedule-III, c.3.2.5.3, digester gas mixing blower, sludge mixing pumps, scrubbers, heaters, SS316 piping, vide our letter no. ECAIPL/BWSSB/STP-H/05/17-18 dated July 6th, 2017 after opening of price bid on special request from the then CE, BWSSB and Chairman, BWSSB.	Noted.					
		Technical Justification With the process fundamentals and available international references, we observe that volatile solids destruction can be achieved about 55% at 24oC temperature with SRT of 8-20 days. However, we have provided digestion time of 23.5 days for wastewater of temperature 26-29oC as per	Noted.					

		tender, Vol -II, Part 5, Section 7, Pg. 5-23. Moreover, for design purpose we have assumed 52% of VSS destruction in high rate complete mix anaerobic digestion process. Hence, average biogas yield of 0.9 m3/kg of VSS destructed shall generate 757.71 m3/hr of biogas. The required biogas quantity is only 413 m3/hr to produce guaranteed power generation of 6384 kWh/day and remaining additional quantity shall be stored in biogas holder and hence, heat exchanger is neither required nor it is mandatory as per corrigendum-I dtd: 6-05-17.						
		Guaranteed power generation = 6384 units/day Required biogas quantity = 395 m3/hr (min.) to 413 m3/hr (max) Design temperature = 24oC VSS destructed = 52% Biogas yield = 0.9 m3/kg of VSS destructed kg VSS destructed = 0.52 x 38797.18 kg/day = 20205.57 kg/day Biogas production = 757.71 m3/hr Required biogas quantity = 413 m3/hr (max.). Hence O.K.	Noted.					
		Necessary relevent documents are enclosed herewith. (a) Load calculation from Gas engine vendor. (b) Calculation of guaranteed power generation in terms of kwh/day based on submitted technical bid during tender stage. Kindly refer the following references for the above technical justification. - Van Haandel, A., & Van Der	Noted.					

		Lubbe, J. (2012). Handbook of Biological Wastewater Treatment: Design and Optimisation of Activated Sludge Sysyems. 2nd Edition.Chapter 12, Figure: 12.9, Pg. 440, IWA Publishing. (Ref.4) - Manual on Sewerage and Sewage Treatment Systems. (2013). CPHEEO. Part A: Engineering, Chapter 6,Table: 6.9, Figure: 6.7, Pg.:6-33. (Ref.3) - WEF Manual of Practice No.8 ASCE Manuals and reports on Engineering practice No. 76, Design of Municipal Wastewater treatment Plants, (2009). 5th Edition, Volume 3, Chapter 25, Cl. 2.2.5, Fig. 25.2, Pg. 25-21, McGraw Hill. (Ref.5) - Metcalf and Eddy.(2014). Wastewater Engineering Treatment and Resource Recovery, 5th Edition,Chapter 13, Table 13-27, Pg. : 1507, McGraw Hill Education (Ref.6) - Metcalf and Eddy. (2014). Wastewater Engineering Treatment and Resource Recovery, 5th Edition, Chapter 13, Table 13-30, Pg. : 1510, McGraw Hill Education (Ref.8)						
6	Refer Chapter 1, page 7 of 49: Please clarify whether the waste heat recovery system will be provided along with the biogas engines.	The waste heat recovery system will not be provided as it is not required as per reply no. 5.	Noted.					
7	Refer Chapter 1, page 7 of 49: Clarify how the design digester temperature of 300C will be achieved during initial commissioning and during the period when the biogas engine will be under annual maintenance or out of service.	Please refer reply of Point 5 regarding the same.	Noted.					
8	Refer Chapter 1, page 9 of 49: Clarify the flow splitting mechanism to achieve the target BOD of 250 mg/L at the	Kindly refer note mentioned in Vol-II, sect-7, part-II. **"Tenderer to propose all the units/equipments as per his**	Noted.					

	SBR inlet. This mechanism should comply with requirement specified in Part 5, Section 5.1	**own layout and designs for successful commissioning & operation of the project".** The plant is designed to achieve guaranteed effluent quality based on BNR process.						
9	Refer Chapter 1, page 9 of 49: Clarify the flow splitting strategy and its impact on the downstream units when the influent BOD is less than 250 mg/L	Please refer the description (step -I & II), Page 9 of 56 of BEP (ECAIPL/BWSSB/STP/HEB/P /BEP-R0). A PST bypass sewage stream shall be provided from the common outlet channel of vortex grit chamber, which is to be blended with settled sewage at the splitter box to achieve BOD5 at the SBR inlet as 250 mg/L for efficient BNR process to get desired outlet discharge norms for TN and TP as per tender. Hence, two different parshall flumes shall be provided to serve the purpose with flow measuring and regulating units. The Parshall flume -I shall be provided for stream having PST followed by SBR, whereas Parshall flume - II shall be provided for raw sewage after degritting conveying directly to SBR.	Noted.					
		The Parshall flume - II should carry an average flow of 18 MLD (initially) when there is no recycle flow, whereas, after mass balance, the flow required is 16.5 MLD for the said stream. Hence, the Parshall flume- I shall be designed for peak flow of 171.1 MLD [=(204.1-(16.5*2)) MLD] and the required design flow for Parshall flume-II shall be 18 MLD (initial flow) x 2.0 PF = 36 MLD. However, we agreed to design Parshall flume - II considering 50 MLD as per your comment given in point no:23. The isolation gate and weir	Noted.					

		arrangement shall be provided accordingly and shown the same in HDF calculation, which will be submitted separately.						
	Chapter 2, Mass balance calculation Excel sheet							
10	Refer Cell J79: In the Mass Balance calculation, the combined sludge consistency is assumed to be 2 %, whereas based on the provided sludge quantities and consistencies for primary sludge and WAS, the calculated value comes to 1.54 %, which will increase the thickener feed flow to 2096.6 m3/day. Please revise accordingly.	Noted. BEP has been revised and submitted accordingly.	Noted.					
11	Refer Cell J245: Please calculate the combined sludge consistency for the exisiting 60 MLD STP.	Noted. BEP has been revised and submitted accordingly.	Noted.					
12	Refer Cell J297: The sludge consistency to anaerobic digester is assumed at 4.5 %. Please calculate the value using the thickened sludge solids and consistency.	Noted. BEP has been revised and submitted accordingly.	**Refer Cell J284:** The thickened sludge consistency has been considered as 8%. Please confirm that it is achievable with the proposed screw thickener	Confirmed.				
14	Refer Cell J361: Thickening polymer and dewatering polymer dose rates are assumed as 2 kg/MT and 4kg/MT. The dewatering polymer dose appears to be low for producing cake solids of 6 - 8 kg/MT may be considered.	As per manufacturer, 4 kg/MT dosing rate is required to achieve 25 % consistency. However, considering safety factor of 1.5 as per tender, the dosing shall be considered as 1.5*4 = 6 kg/MT to find out the storage volume of the poly dosing tank and pumps for COTDM unit.	Noted.					
15	Refer Cell J468: The combined recycled flow of 3894 m3/day shall be rounded to 4000 m3/day and not 3500 m3/day.	Noted. Revised value of recycle flow is 4032.95 m3/day. However, the quantity of recycled flow is considered as 4100 m3/day for design purpose.	Noted.					
	Chapter 3, Process Design Calculation Excell Sheet							
16	Refer Cell H73: Total manual screens are 2 nos, so the flow per screen should be 2.89 m3/sec. Please rectify	Tender does not specify to provide 100 % stand by capacity of manual screen. Hence, 50 % of capacity of screen has been considered as per standard engineering	**Refer Cell H73:** Standard Engineering practice is to provide manual screens for 100% of the peak flow; however, as you intend to provide manual screens for	We shall consider manual screens for 50% of peak flow with provision of power backup to operate all the mechanical screens and associated conveyors during	Noted			

		practice and followed the pattern of standby unit provision mentioned in the tender for all mechanical equipments. The quantity of total design flow for two standby screens has been changed in the revised BEP.	50% of the peak flow, please provide power back up to operate all the Mechanical Screens and associated conveyors during power failure.	power failure.				
17	Cell E142. Please refer sec-7, clause 5.13.1, part-5, page 5-23: As per Section 5.1 of Part 5, the design peak flow should be 250 MLD for inlet units of the STP (inlet channel, fine screens, grit chamber), whereas peak flow considered for these units is 200 MLD. Please verify and revise the sizing of these units accordingly.	Please refer Volume 2, Section -7, Clause 5.13.1, Part 5, pg. 5-23. The design peak flow shall be 200 MLD for inlet units of the STP + other flow. Moreover, the screen doccuments received from BWSSB mentioned the flow per screen for 2 Nos. working as 112.32 MLD and the flow per standby screen (1 No.) as 120 MLD. i.e., screen channel has to be designed for total design flow of 112.32 x 2 = 224.64 MLD, say 225 MLD instead of 250 MLD as peak flow. Therefore, we suggest to adopt 225 MLD instead of 250 MLD. Therefore, we suggest to adopt 225 MLD instead of 250 MLD as design flow for inlet chamber, Screen channel and grit chambers. We have designed the said units accordingly.	Noted.					
18	Refer Cell E143: The other flow (recycle flow) should be considered as 4 MLD as per comment 15 above.	Please refer reply against point no. 15.	Noted.					
19	Refer Row 186: Please provide the fine screen literature to support the fine screen channel sizing.	It shall be provided by BWSSB as it is not in our scope of work. Moreover, BWSSB has to confirm that size of mechanical screens are sufficient to handle total design flow of 225 MLD as per above point no. 17.	Noted.					
20	The sizing of structures such as screen channels, grit chambers should be based on the equipment available in the market. If any changes are required to these structures	Noted. Confirmed.	Noted.					

	after approval of the equipment data sheet, the same shall be incorporated.							
21	Refer Row 268: In view of the comment no 9 above, it is suggested that the Parshall Flume-I and the downstream structures such as Primary clarifier distribution chamber, primary clarifier etc. shall be designed to accept full plant flow, i.e. the peak flow of 203.5 (204) MLD.	Please refer reply given against your point no.9. Hence, stream including PF-I followed by PST etc. shall be designed for 171.1 MLD to achieve efficient BNR process. Please also refer the revised BEP for further explanation/details regarding your query.	Noted.					
22	Refer Cells H311, H313, H315: The dimensions of the Primary Clarifier Distribution Chamber are not complying with those given in Part 5 (page 5-27) Employer's requirement. Please revise.	Please refer note mentioned in Volume II, Part-11, Sect-7. As per own design of EPC contractor, the size of PST distribution chamber is calculated considering minimum 15 sec of HRT to achieve better hydraulic flow condition.	Noted.					
23	Refer Cell H341: As the calculated SOR for primary clarifier is less than 35 m3/m2/d (about 32 m3/m2/d for the design diameter of 29.5 m), it is suggested that the Parshall Flume - II (bypass to SBR) be designed for 50 MLD (25 % of the flow) so that sufficient BOD can be provided to SBR in case of excessive removal in the primary clarifier occurs during operation.	Confirmed. BEP has been revised and submitted accordingly.	Noted.					
24	Refer Cell H525: As per comment no 1 above, assume the maximum TSS at SBR outlet of 20 mg/L.	SBR is designed to achieve outlet TSS as 10 mg/L. However, for design of disc filter, we shall consider TSS at SBR outlet as 20 mg/L.	Noted.					
25	Refer Cell H534: The detention time for Treated Sewage Outlet chamber is considered as 10 seconds, whereas detention time for all such other chambers is 15 seconds. Hence revise the detention time to 15 seconds.	Confirmed. BEP has been revised and submitted accordingly.	Noted.					
26	Refer Cell H556: The volume of the plant drain sump is calculated using only the primary clarifier drain volume. Please clarify how the regular	The filtrate sump with pump facility is provided as per tender to recycle back the regular drains such as filter backwash, dewatering centrate,	Noted.					

	drains such as filter backwash, dewatering centrate, thickening filtrate etc. will be recycled back. If all these flows are to be recycled back through the plant drain sump, please provide a total flow balance for the sump and then calculate the sump volume using detention time of 10 minutes.	thickening filtrate etc to inlet of STP. Hence, plant drain sump design is O.K. Please refer corrigendum-I dated 06-05-17, point no. 9 and Volume-II, Part 11, item No. 27.						
27	Refer Cell H610 (and cell J24 in Mass Balance sheet): The primary sludge quantity in the process design calculations is 21844 kg/d, whereas its quantity in the Mass Balance is 19680 kg/d. Please resolve the descripancy so that both documents have the same value. Please appropriatley link both these documents for a consistent design documentation.	Kindly refer the note mentioned in the design basis in Clause 3.3, chapter 3, page 38 of 56 of BEP ECAIPL/BWSSB/STP/HEB/P/ BEP-R0. The sludge handling units are designed for the required quantity of sludge production, obtained after the Mass Balance Calculation. The primary sludge production (revised) obtained after the mass balance calculation is 0.6*425.99 mg/L* 87.6 MLD = 22390.03 kg/day (Refer Table 2: Column 6, Row 5 & Column 7, Row 3 in Mass balance diagram in Annexure : I)	**Refer Cell H706:** The value of 22390 can be found in Process Design calculation, but not in Mass Balance. Please check and revise as necessary.	The value of primary sludge production as 22390 kg/day was found after the mass balance calculation, whereas, the value of 19680 kg/day shown in mass balance diagram is part of first iteration without recycle flow. The primary sludge produced before and after the mass balance has been included in the Table -1 & Table -2 of the Mass Balance diagram (R1).	Noted			
28	The calculated thickener feed flow is 36.22 m3/hr (cell H668), however the provided pump and thickener are of capacity 55 m3/hr as required by the contract. This will result in thickener operation of only 16 hrs against the assumed continuous operation. Therefore, provide variable speed drivers for the thickener feed pumps to operate those pumps at the required flow rate or provide sufficient storage on either side of the thickener (feed and discharge) so that the upstream and downstream units can be operated continuously / as designed.	As per revised BEP, the operational hours of thickener feed pump shall be 22 hrs considering 4 Nos. (2W+2S) of thickeners and hence, VFD is not required. The volume of sludge sump has been revised accordingly.	Noted.					
29	Air blower are provided to mix the content of the thickened sludge tank. It is suggested to provide submersible mixer or pumped hydraulic mixing to	Noted. However, Submersible mixers shall be additional scope of work as per tender.	The appropriate equipment shall be selected to effectively mix the thickened sludge that will have solids content of 8%.	Confirmed	Noted			

	avoid aeration of the sludge that will be fed to anaerobic digesters. This aeration can degrade the BOD in the primary sludge thereby reducing the biogas generation in the digesters.							
30	The digester feed pump operational hours are considered as 24 hours, which is okay for constant level digesters. If the digesters are going to be operated as variable level, i.e. filling, reacting, and wasting, then the feed pump operational hours could be less than 24. Please clarify the digester operation philosophy and then size the feed pumps accordingly.	Digester feed pumps shall be designed for 22 hrs of operation instead of 24 hrs. considered earlier. Hence, the design of sludge sump and pumps has been revised accordingly. As referred, the level of digester shall be maintained at constant desired level and therefore, the variable sludge level will not be applicable in digester operational philosophy. The differential pressure type of level instrument may be installed on digesters to maintain constant high sludge level in the digester. This instrument will measure the pressure at high pressure end (bottom of digester) and low pressure end (top of digester) through capillary filled tubes. The difference of pressure shall be calibrated in terms of the sludge level and shall be communicated to PLC as level in terms of 4-20 mA. Accordingly, the PLC shall operate the digester feed pumps to maintain the desired constant level by making the feed pump ON/OFF. The schematic sketch of above arrangements of the level measuring instrument is shown in Annexure V. Moreover, fill and spill arrangement with bell mouth shall also be provided to maintain the required TWL in the anaerobic digester. The details of this arrangement shall be shown in the G.A. drawing of the Anaerobic	Noted.					

		sludge digester.						
31	Refer Cell H754: For anaerobic digesters, the bottom cone slope should be 1:3, and allowance of 0.5 m shall be provided for foam and scum accumulation (as per Part 5, page 5-30). The free board of 1 m is acceptable. Therefore, the digester depth (excluding hopper) would be 11 m against 10.5 m.	As tender does not specify allowance of 0.5 m additional depth to be provided as part of SWD and, it is also not mandatory as per process requirement. Hence, we shall provide 1.65 m average depth of allowance in hopper bottom of digester which is more than sufficient to fullfill the requirement of tender without any deviation from tender clause.	Noted.					
32	Refer Row 807: The conduction heat loss from digester is assumed to be 20% of heat required to heat the raw sludge. However, our rough calculations show that the conduction heat loss from digesters can be almost 100% during winter months. So please provide back-up calculations for the assumed conduction heat loss.	To achieve guaranteed power generation, the heat exchanger is not required (please refer reply against your comment no.5).	Noted.					
33	Refer Cell H865: The capacity of the biogas engine feed blower is considered as 500m3/hr. However, if the feed rate for the engine as per the Engine datasheet is more, then the blower of corresponding (higher) capacity shall be provided.	Noted. 500 m3/hr capacity is sufficient as per manufacturer. Hence, it is O.K.	Noted.					
34	Refer Cell H887: The retention time for the Digested Sludge / COTDM Feed Sump is considered to be 1 hour. This appears to be low, and its correctness can be evaluated only after understanding the digester operation philosophy (feeding and wasting pattern). So the sump retention time is put on hold till, and subject to revision after review of digester operation philosophy.	The digester shall be operated at constant water level to maintain designed TWL and liquid volume by providing arrangement mentioned in reply no. 30 and hence, 1 hr of HRT for digested sludge/ COTDM feed sump is sufficient.	Noted.					
35	Refer Cell H942, H960: As per above comment no 15, consider total filtrate flow to be 4000 m3/d	Please refer reply against point no. 15.	Noted.					
36	Refer Cell H974: The runtime of thickened sludge transfer	With the proposed 55 m3/hr capacity screw thickener (as	Noted.					

	pumps is considered to be 24 hrs. Please review the operation of the thickening units in the existing 60 MLD plant and revise the pump runtime if necessary.	per reply to the comment no.4) to be adopted for existing STP, the operation time considered is 22 hrs. Hence, the pump run time is also considered as 22 hrs.						
37	Refer Cell H1090: The same polymer has been considered for thickening and dewatering. Please confirm that the same polymer is suitable for these operations	As per the manufacturer, same type of polymer is suitable for thickening and dewatering. Hence, O.K.	Noted.					
38	Refer Cell H1103, H1104: Regarding polymer bag storage area, 63 bags will be required, and a stack of 6 bags is proposed, thereby resulting in 11 stacks. However, only 6 stacks are considered in area calculation. Please rectify.	Noted. BEP has been revised and submitted accordingly.	Noted.					
39	Refer Cell H1136: The COTDM polymer dosing pump capacity is calculated based on total polymer quantity required. Please calculate the dosing pump capacity based on the COTDM machine capacity, and check whether the provided capacity is adequate to operate the machine at rated flow. If not, then the dosing pump capacity shall be revised.	Noted. The capacity of COTDM polymer dosing pump has been revised accordingly.	Noted.					
40	Refer Cell H1142: The number of screw thickeners are 4 Nos. Hence the number of polymer dosing pumps should be at least 4 nos. Please rectify.	Noted. Confirmed	Noted.					
41	Refer Cell H1146: The thickening polymer dosing pump capacity is calculated based on total polymer quantity required. Please calculate the dosing pump capacity based on the screw thickener machine capacity, and check whether the provided capacity is adequate to operate the machine at rated flow. If not, then the dosing pump capacity shall be revised.	Noted. The capacity of thickener polymer dosing pump has been revised accordingly.	Noted.					
42	Refer Cell H1233 and H1236: The polymer and alum dosing tanks filling time assumed are too long (12 hrs and 16 hrs).	Confirmed. BEP has been revised and submitted accordingly.	Noted.					

	These should be less than 2 hours each. Please revise as necessary.							
43	The number of process units mentioned on the Process Flow Diagram should match with the number of units in Process Design Calculation	Noted. Confirmed.	Noted.					
44	The sludge generation calculation accounts only for heterotrophic biomasss yield and inert TSS. The sludge generation due to cell debris and non-biodegradable VSS has not been calculated. Please revised the sludge production (refer equation 7-56 in Wastewater Design by Metcalf & Eddy); the observed sludge yield would be almost 0.7 kg/kg-BOD against the calculated yield of 0.549 kg/kg-BOD. The CPHEEO Manual also provides a range of 0.75 – 1.0 for Sludge Yield in SBR (CPHEEO, Page 5-198). So accordingly revise the process design calculations for the sludge handling.	Kindly refer Clause No. 11, corrigendum-III dtd: 16-05-17 "13." SBR system including decanter, air &diffuser system and process design can be provided as per standard design of technology provider or as per latest CPHEEO manual." The Sludge calculation has been revised as per Metcalf and Eddy. Moreover, the range of 0.75 – 1.0 mentioned in the CPHEEO manual is for unsettled sewage (Ref.13), which is not applicable for the proposed STP where the SBR feed is from the Primary clarifier and hence the sludge generation is much lower.	Noted.					
	Basic Engineering Package for CTEC SBR							
45	Page 3, Design Basis: In Design Basis, the Daily Other Flow should be considered as 4 MLD instead of 3 MLD	Please refer reply against point no. 15.	**Refer Annexure IV, PDC of SBR, Page no. 3 of 53:** The response to point no. 15 **(Pl. refer Annexure-1)** states recycle flow of 4.1 mld, whereas the SBR documents states 3.6 mld. Please revise SBR write up to be consistent.	The total flow to the inlet chamber of the STP shall be 104.1 MLD (= 100 MLD average flow + 4.1 MLD recycle flow) and to SBR shall be 103.6 MLD (= 104.1 MLD - Primary sludge removed). The document has been revised accordingly.	Noted			
46	Page 6, Process Description: In Outlet Parameters, Sl. No. 8 should be Total Nitrogen (as N)	Noted. BEP has been revised and submitted accordingly.	Noted.					
47	Process description states 'automatic control of oxygen uptake rate'. Please provide appropriate instrumentation and logic to achieve this.	The control is achieved through DO measurement and control of blower speed through VFD in order to achieve the DO set point. Each basin is equipped with DO transmitter and the blowers provided are capable of variable speed operation. Hence adequate instrumentation and control is	What is provided a standard DO control, and not 'automatic control of oxygen uptake rate.' Please delete this text from the BEP, and replace it with 'automatic dissolved oxygen control.'	Noted. The document has been revised accordingly.	It is noted that the comment is not complied in revised submission (R3) same shall be complied.			

		provided.						
48	Page 18: In Design Basis adopted for SBR calculations, please rectify the outlet Nitrate N as < 7mg/l	Noted.	Noted.					
49	Page 19: Please revise the Excess Sludge quantity on Page 19 in view of the comment no. 44 above.	Please refer reply against your comment No. 44.	Noted.					
50	Page 26: Please revise the calculated SRT in view of the comment no 44 above. This revised SRT should be more than 12 days to provide 6 days of aerobic SRT as discussed during various meetings.	Noted.	Noted.					
51	Page 26: The anaerobic SRT calculation should be revised in view of comment no 50, and considering the anaerobic fraction as 0.25 (6 hr/d) and not 0.3.	It is appearing as 0.3 as an approximation in Excel, while it is actually = 3706.5/13900 = 0.266	Noted.					
52	Page 11 & Page 28: On page 11, the Selector contact time of 60 minutes is nominated as Design Value, whereas on page 28 the Selector contact time provided is 35 minutes. Please clarify.	As per Metcalf and Eddy page number 701 contact time for selector is 20 to 60 min. Hence, for design contact time of 35 min has been considered.	Noted.					
53	Page 36 – 40: Oxygen calculations are not as per the conditions stipulated in the Contract in Part 5, Page 5-15. If those conditions are followed, the oxygen requirement comes to 48218 kg/d. Even if the oxygen requirement of 1.1 kgO2/kgBOD is used, the total oxygen requirement comes to 45746 kg/d. Whereas the oxygen requirement in process calculations is 39373 kg/d, which is much lower. Please rectify, and then accordingly revise the air requirement calculations and blower capacity.	Kindly refer Clause No. 11, corrigendum-III dtd: 16-05-17 "13." SBR system including decanter, air &diffuser system and process design can be provided as per standard design of technology provider or as per latest CPHEEO manual."This supersedes tender specifications which forms part of this tender , wherever applicable. We have verified air calculations and found OK. Following standards have been considered for air requirement calculations, 1)Air requirement for BOD removal = 1.1 kg of O2 / kg of BOD removal (As per CPHEEO manual 2013, page no 5-198). 2)BOD requirement per g of Nitrate reduction	Noted.					

		(denitrification) - As per Metcalf and Eddy page no 620. We wish to highlight here that the same format of air calculations has been approved by BWSSB in the earlier package "S1a1 STP" JICA tenders.						
54	Page 40: Sludge generation calculations are to be revised in view of comment no 44	Please refer reply against your comment No. 44	Noted.					
55	Page 45: The air requirement when 1 basin is offline is to be revised in view of comment no 53 above.	Please refer reply against your comment No. 53	Noted.					
			Refer Page 6, Process Description: What is provided a standard DO control, and not 'automatic control of oxygen uptake rate.' Please delete this text from the BEP, and replace it with 'automatic dissolved oxygen control.'					
					Contractor to list all references mentioned in the BEP. Ref 14 is mentioned in Sec 3.2.5 but is not listed under references.	Noted & Confirmed. The BEP is revised accordingly.	Noted	
					Contractor to print and include all references used in the BEP and submit along with revision.	Noted & Confirmed. The BEP is revised accordingly.	Noted	
					Basic Engineering Package – Rev. 2			
					Section 1.4.2: Contractor to include addition of the new Intermediate Chamber-3, the alum dosing facility as well as the Alum Dispersion Mixer in the technical description as discussed and agreed during meeting on 28th March, 2018.	Noted & Confirmed. The BEP is revised accordingly.	Noted	
					Section 1.4.3: Contractor to update and revise the arrangement of poly dosing tanks, poly dosing pumps as well as their configuration and capacity as discussed and agreed during meeting on 28th March, 2018.	Noted & Confirmed.	Noted	
					Section 3.2.5: Contractor to justify revision of HRT to 46.8sec from 65.8sec.	As per the attached reference 14, For Vortex type of Grit Mechanism the HRT required is 30sec. How we have	Noted	

						provided HRT of 46.8 sec recommended by the technology provider of vortex grit mechanism.		
					Section 3.2.6: Contractor to justify revision of the dimensions of the individual grit chamber outlet channel.	The said revision was recommended by the supplier of vortex grit mechanism.	Noted	
					Section 3.3.6: Contractor to include details of submersible mixers for COTDM Feed Sump.	Noted & Confirmed.	Noted	
					Section 3.4.2a (i): Contractor to confirm if height of each 50kg polyelectrolyte bag is 0.25m or 0.15m.	The capacity of bag mentioned as 50 kg was typographical error. Actual capacity is 25 kg and height of each 25 kg bag is 0.150 m. The BEP is r evised accordingly.	Noted	
					Section 3.4.2a (iv): Contractor to provide operating philosophy for sludge from existing STP as already commented upon in Doc. No. **NJSEI-HEBBAL-ICA-2018-010**, Sl. No. 11.	As per contract agreement, Part 1: Project Requirements, page 1-3 (Refer Annexure-A) & Part 5: Process Requirements, page 5-3 (Refer Annexure-B), the contractor has to provide new sludge conveyance pumps and pipe line from existing treatment plant to the proposed STP. The operation & Maintenance is not our scope. However, for design purpose we have considered 22 hrs of operation for the thickened sludge pumps from the existing STP.	Noted	
					Section 3.4.2b(i): Contractor to confirm if height of each 50kg polyelectrolyte bag is 0.25m or 0.15m.	The capacity of bag mentioned as 50 kg was typographical error. Actual capacity is 25 kg and height of each 25 kg bag is 0.150 m. The BEP is r evised accordingly.	Noted	
					Annexure IV, Section 15: Contractor to confirm if SBR inlet channel (3 nos.) are capable of handling additional flow during peak condition in the case wherein 1 SBR basin is offline.	We confirm that the SBR inlet channels (3 Nos.) are capable of handling additional flow during peak condition in the case wherin 1 SBR is offline. For more details please refer the Hydraulic design Calculation.	Noted	
					Annexure IV, Section 15: Contractor to provide operating philosophy with flow calculations for normal SBR operation and in the case wherein 1 SBR basin is offline.	The flow calculations were already mentioned in Annexure -IV (Pg. no.42-45 of 53). However, the said pages are again attached herewith as Annexure-C & the operating	Noted	

						philosophy as Annexure-D for your ready reference.		
					The following comments (Sl. No. 13-16) were given for BEP-Rev.1 (*Ref.* Letter No. **NJSEI/BLR/Hebbal-STP/PRO/FI/P3/067/2017-18** and Doc. No. **NJSEI-HEBBAL-PRO-2017-006** dated 14/12/2017). Contractor to incorporate the comments and update the BEP accordingly.			
					Primary clarifier effluent/overflow: The values of NH3-N and Org-N have been interchanged.	Noted & Confirmed. The Mass balance diagram is revised accordingly.	Noted	
					SBR: Flow rate around SBR is not balanced	Noted & Confirmed. The Mass balance diagram is revised accordingly.	Noted	
					Mechanical Screw Thickener : Flow rate around Mechanical Screw Thickener is not balanced	Filtrate quantity is not shown in the final iteration. The STP sludge handling facility is designed based on the final iteration values shown in the Mass balance Diagram.	Noted	
					Mechanical Screw Thickener & COTDM: Please specify Poly electrolyte dosing (Unit: kg/day)	Noted & Confirmed. The Mass balance Diagram & BEP is revised accordingly.	Noted	