

**APPENDIX A DESKTOP NITROGEN LOADING REDUCTION
ASSESSMENT**

Assessment of the Nitrogen Loading Reduction as a result of the Long Beach WPCP Consolidation Project

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Introduction

A desktop assessment of the nitrogen reduction element of the proposed Long Beach WPCP Consolidation Project was prepared to support of the Environmental Assessment of the project. Three years of compliance data from the Long Beach WPCP and the Bay Park STP were obtained from ECHO (Ref. 1), for use in calculating nitrogen removal by the proposed project. The receiving Bay Park STP is in the process of implementing a Biological Nutrient Removal (BNR) improvements project, which will significantly increase the removal capacity of the system. Regulatory- and process-related information were also consulted (Refs. 2 and 3) to gain understanding of the expected improvements.

Nitrogen reduction was assessed using two indicator parameters: Ammonia and Total Kjeldahl Nitrogen (TKN). Ammonia represents the non-oxidized or partially oxidized inorganic nitrogen in wastewater. Oxidation of contaminants is the principal removal mechanism occurring in wastewater treatment plants. The TKN analysis is designed to capture non-oxidized nitrogen in wastewater, including organic nitrogen and also ammonia. The other nitrogen parameters analyzed in the Long Beach and Bay Park wastewaters, Nitrate and Nitrite, were not used in this assessment because they are more indicative of oxidized or partially oxidized wastewater conditions. This memo assesses reductions in untreated nitrogen, which is environmentally objectionable.

Two calculation conditions were prepared to enable a direct comparison and conclude the impact of the proposed action: *Without Project Conditions*, and *With Project*. The *Without Project Conditions* calculations reflect the existing conditions as of recently (July 2019), and the *With Project* calculations reflect the future pumping of all wastewater from the City of Long Beach to the Bay Park STP for full treatment and effluent discharge to Reynolds Channel via its existing outfall. Other alternatives, such as upgrading the Long Beach WPCP to provide BNR, or the eventual consolidation of Bay Park STP with Cedar Creek WWTP to discharge via ocean outfall, were not considered in this analysis.

Summary of Findings

The *Without Project Conditions* reflect low levels of nitrogen reduction (<50%) from the Long Beach WPCP and Bay Park STP, validating the observed adverse impact to the Reynolds Channel. The effluent loadings of Ammonia from the Long Beach WPCP and the Bay Park STP are 725 and 8,871 lbs/day, respectively. The effluent loadings of TKN to Reynolds Channel from the same sources are 1,538 and 10,546 lbs/day. When both effluents are combined, 9,596 lbs/day of

Ammonia and 11,387 lbs/day of TKN are discharged to Reynolds Channel. On an annual basis, these discharges represent 3.5 million pounds of Ammonia and 4.2 million pounds of TKN.

The *With Project Conditions* would improve nitrogen reduction significantly because there is a treatment objective of reducing nitrogen concentrations in the effluent to 9 mg/L (Condition 24 in the 2017 Bay Park Agreement - Ref. 3). To accomplish this effluent concentration from the consolidated project via treatment at Bay Park, it is estimated that the BNR process would need to reduce the influent nitrogen by 85%. The effluent loading to Reynolds Channel of Ammonia and TKN from the treated combined effluents (City of Long Beach and the Bay Park) is 2,112 and 3,578 lbs/day, respectively. These values represent a reduction in Ammonia and TKN effluent loadings of 7,484 and 7,809 lbs/day, or 78 and 69% reductions, respectively. On an annual basis, these discharges represent 0.8 million pounds of Ammonia and 1.3 million pounds of TKN, a reduction of 2.7 million pounds of Ammonia and 2.9 million pounds of TKN. The detailed calculation tables are presented in at the end of this report.

Conclusions

The expected levels of nitrogen reduction from the proposed Consolidation project in are significant, resulting in improved environmental conditions at Reynolds Channel and the Western Bays.

Information Sources

1. EPA's Enforcement and Compliance History Online (ECHO) site <https://echo.epa.gov/>
2. April 26, 2018 letter from DEC to City of Long Beach, Re: Engineering Report for the City of Long Beach Flow Diversion Pump Station and Force Main
3. 2017 Bay Park Agreement (DEC Index No. CO 1-20170626-244)
4. Western Bays Resilience Initiative: Long Beach WPCP Consolidation Project, Engineering Report WQIP Application Round 16, July 26, 2019. Hazen Arcadis a Joint Venture.

Without Project (Existing Conditions)											
Parameter [Note 1]	Long Beach WPCP					Bay Park STP					Loading to Reynolds Channel (note 5)
	Data Notes	Data Date Range	Influent (A) - Avg of Data Set	Effluent (B) - Avg of Data Set	Calculated Removal	Data Notes	Data Date Range	Influent (C)	Effluent (D)	Calculated Removal	
Effluent Flow	2	04/16 - 06/19	N/A	4.62	N/A	2	04/16 - 06/19	N/A	51.7	N/A	56.3
Ammonia, mg/L as NH3	2	04/16 - 05/19	20.8	19.0	9%	2	04/16 - 06/19	31.0	20.6	32%	N/A
TKN [Note 6], mg/L as N	3	05/16 - 05/19	36.4	20.5	30%	2	05/16 - 07/19	52.1	24.4	50%	N/A
Ammonia, lb/d as NH3	2, 4	04/16 - 05/19	788	725	9%	2, 4	04/16 - 06/19	13,289	8,871	32%	9,596
TKN [Note 6], lb/d as N	3, 4	05/16 - 05/19	1,538	841	30%	3, 4	05/16 - 07/19	22,316	10,546	50%	11,387
Ammonia, lb/yr as NH3	7	04/16 - 05/19	287,779	264,485	9%	7	04/16 - 06/19	4,850,485	3,237,915	32%	3,502,400
TKN [Note 6] lb/yr as N	7	05/16 - 05/19	561,342	306,993	30%	7	05/16 - 07/19	8,145,340	3,849,374	50%	4,156,367
Legend:											
A * Long Beach WPCP Treatment = B											
C * Bay Park STP Treatment = D											
Notes:											
1. Data source: Discharge Monitoring Reports (DMR), Enforcement and Compliance History Online (ECHO), EPA											
2. Data is reported monthly.											
3. Data is reported quarterly on February, May, August and November											
4. Loading calculation = Effluent flow x parameter data for the same period x 8.34 lb/MG. Value presented represents average of the complete data set.											
5. Calculated using effluent loadings from both wastewater treatment systems											
6. TKN stands for Total Kjeldahl Nitrogen which is the sum of NH3 + Organic Nitrogen.											
7. Annual loadings = average daily loading x 365 days/yr.											

With Project (3rd Qtr 2024 - See Note 1)												
Parameter [Note 1]	Long Beach WPCP					Bay Park STP					Nitrogen Reduction	Percent Reduction
	-	Projected Influent	Projected Effluent	Removal	Data Notes	Projection Using Data Date Range	Projected Influent (A + C) [Note 5]	Proposed Removal [Note 6]	Projected Effluent (E)			
Effluent Flow	-	N/A	0	N/A	3	04/16 - 06/19	N/A	N/A	56.3	0.00	0%	
Ammonia, mg/L as NH3	-	0	0	N/A	3,4	04/16 - 06/19	30.2	85%	4.5	16.1	78%	
TKN, mg/L as N	-	0	0	N/A	3, 4	05/16 - 07/19	50.8	85%	7.6	16.8	69%	
Ammonia, lb/d as NH3	-	0	0	N/A	3, 5, 7	04/16 - 06/19	14,077	85%	2,112	7,484	78%	
TKN, lb/d as N	-	0	0	N/A	3, 5, 7	05/16 - 07/19	23,854	85%	3,578	7,809	69%	
Ammonia, lb/yr as NH3	-	0	0	N/A	8	04/16 - 06/19	5,138,264	85%	770,740	2,731,660	78%	
TKN lb/yr as N	-	0	0	N/A	8	05/16 - 07/19	8,706,682	85%	1,306,002	2,850,365	69%	
Legend:												
A * Long Beach WPCP Treatment = B												
C * Bay Park STP Treatment = D												
(A + C) * Bay Park STP Treatment = E												
Notes:												
1. Milestone date obtained from Appendix B schedule presented in the DEC flow diversion approval letter dated April 26, 2018												
2. In the With Project Condition, there will be no discharge from the Long Beach WPCP to Reynolds Channel; all the flow will be diverted to the Bay Park STP.												
3. Calculations prepared using equal data sets as in the Without Project condition.												
4. Conservation law used to calculate projected concentrations of Ammonia and TKN.												
5. Nitrogen loadings Ammonia and TKN from both wastewater systems were added to calculate combined influent loading.												
6. Percent removal was assumed to produce the expected effluent concentration for Total Nitrogen of 9 mg/L, as stated in the 2017 Bay Park Agreement.												
7. The projected effluent concentrations for Ammonia and TKN support the nitrogen removal objective of the 2017 Bay Park Agreement (9 mg/L).												
8. Annual loadings = average daily loading x 365 days/yr.												