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November 24, 2014

Joseph DiMura, P.E.
Director, Bureau of Water Compliance
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New York State Department of Environmental Conservation
625 Broadway, 4th Floor
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Re: Order on Consent ("CSO Order"), (DEC Case #C02-2011 0512-25, modification to DEC Case #C02-0000107-8),
Appendix A, IX. Westchester Creek CSO, G. Submit Approvable Drainage Basin Specific LTCP for Westchester Creek

Dear Mr. DiMura,

The New York City Department of Environmental Protection (DEP) is in receipt of the New York State Department of Environmental Conservation's (DEC) September 22, 2014 letter containing your preliminary review comments on the Westchester Creek LTCP. DEP submitted the LTCP to DEC on June 30, 2014, in accordance with the CSO Order.

Attached are DEP's responses to your comments. As requested, these responses are submitted within 60 days of your letter.

As indicated in your letter, DEC may have more detailed comments on the LTCP after it conducts a comprehensive review of the LTCP and these responses. For the reasons detailed below, DEP respectfully requests 90 days from the date of receipt of DEC's final comments (or notice that DEC has no further comments) to re-submit the Westchester Creek LTCP with the revisions outlined in our attached responses and responses to any additional DEC comments. In particular, additional time is required due to both the proposed changes in pollutant loadings described in the attached responses and DEC's instruction during our June 4, 2014 teleconference to assess LTCP alternatives against a 30 org/100 ml geometric enterococci (GM) standard and the associated 110 statistical threshold value (STV) contained in the EPA RWQC rather than the 35 org/100 ml GM and 130 STV that DEP had used in the alternative analyses. To make these changes, DEP will need to re-run the 10-year baseline and 100 percent CSO control water quality simulations and re-process the model outputs for fecal and enterococci attainment as well as the time-to-recover analyses. Such model runs are time-consuming and, as such, DEP requires additional time to complete this work.

Please feel free to contact me at (718) 595-5009 should you have any questions regarding this submittal.

Sincerely,

Keith Beckmann, P.E.
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Response to DEC's September 22, 2014 Comments on the June 2014 Combined Sewer Overflow Long Term Control Plan for Westchester Creek

November 24, 2014

DEC Comment 1. Pollutant Concentrations and Loads. "The LTCP includes several inconsistencies and information gaps with respect to the pollutant concentrations used in the modeling and the estimated pollutant loads."

> ***DEP RESPONSE:*** *Each of the five issues DEC has specified in support of Comment 1 are addressed individually below.*

DEC Comment 1 Continued: "First, the stormwater pollutant concentrations used for the Westchester Creek LTCP differ from and are much higher than those used for the Alley Creek LTCP. In particular, the Westchester Creek LTCP uses a fecal coliform concentration of 120,000 cfu/100 ml and an enterococci concentration of 50,000 cfu/100 ml, while the Alley Creek LTCP uses a fecal coliform concentration of 35,000 cfu/100 ml and an enterococci concentration of 15,000 cfu/100 ml, yet the same technical references for the pollutant concentrations are provided for both LTCPs. If the City is relying on the same technical source for the concentration, it is not clear why there are differences in pollutant concentrations. The City must explain the technical basis for the pollutant concentrations used and whether these concentrations represent mean, median, or maximum values."

> ***DEP RESPONSE:*** *The stormwater pollutant concentrations used in the Westchester Creek and Alley Creek LTCPs are based on data collected as described in a 2005 HydroQual memo (attached). The stormwater data were associated with different WWTP service areas based on the overall population density such that areas with high population density were assigned one set of stormwater concentrations and areas with low population densities were assigned a different set of stormwater concentrations.*
>
> *The practice being followed for the current modeling effort is to rely on the historical information contained in the 2005 memo for areas where more recent stormwater sampling data do not exist, as was the case for both the Westchester Creek and Alley Creek LTCPs. Based on the drainage area characteristics, Alley Creek was assigned the stormwater bacteria concentrations associated with the lower population density category while Westchester Creek was assigned the concentrations associated with the higher population density.*

DEC Comment 1 Continued: "Second, the City includes an outfall for highway runoff HP-839, which is the largest stormwater outfall within the watershed but the bacterial pollutant loads of runoff from highways may be different than other impervious surfaces. The City must explain the technical basis for determining the pollutant concentrations for this outfall."

> ***DEP RESPONSE:*** *DEP has completed a review of the limits of the drainage area for HP-839, in response to DEC's comment and has confirmed that the drainage area is*

solely from highways and roadways and not from residential areas. As such, assigning the elevated fecal coliform and enterococci concentrations to stormwater from this outfall (120,000 and 50,000/100mL, respectively) was a conservative approach. Based on our review of the literature and as discussed below, the bacteria concentrations assigned to runoff from this catchment area will be reduced when the report is resubmitted to DEC. DEP does not anticipate any significant changes to the results based on this reduction.

A summary of the fecal coliform concentrations from roadway runoff is summarized in Table 1, drawn from the list of references noted. Based on this information, a reasonable fecal coliform concentration for roadway runoff would be approximated by a value of 20,000 cfu/100mL. As no data regarding enterococci are available from any of these sources a value of 40 percent of fecal concentration or 8,000 cfu/100mL will be applied to roadway runoff for enterococci. The 40 percent ratio is based on the enterococci to fecal ratio employed in the 2005 memo.

Table 1 – Typical Fecal Coliform Concentrations in Runoff from Different Land Uses

Reference	*Land Use*	*Fecal Coliform Concentration (cfu/100mL)*
The Simple Method to Calculate Urban Stormwater Loads – NYS Stormwater Management Design Manual, Appendix A	*Residential Street*	*37,000*
	Commercial Street	*12,000*
National Stormwater Quality Database	*Freeways*	*1,700*
	Mixed Freeways	*2,600*
Highway Stormwater Runoff Study - Michigan	*Ann Arbor I-94*	*>5,000*
	Grand Rapids US 131	*66,380*
	Flint I-475	*4,807*

We expect that this change will have no impact on the overall conclusions as HP-839 represents only 3.8 percent of the total fecal loading to the Westchester Creek system. There may be some impact to the 100 percent CSO removal attainment calculations since HP-839 represents 33 percent of the stormwater load, as documented in the June 2014 LTCP. With the modified lower concentrations, we expect HP-839 to represent between 7 and 10 percent of the total stormwater load. These results will be documented in an updated LTCP report.

DEC Comment 1 Continued: "Third, the total pollutant loads for stormwater presented in Table 6-2 do not appear to be consistent with the component analysis load presented in Tables 6-9 and 6-10, with the component loads appearing to be higher than would be expected given the total loads in Table 6-2. In particular, the annual GM and maximum winter months indicate very high stormwater bacterial loads relative to CSO bacterial loads. The City must explain in more detail how the component analysis is developed and how it corresponds to the total pollutant loads."

DEP RESPONSE: *As DEP has described to DEC at a number of technical coordination meetings, the pollutant loads provided in table 6-2 are the sum of all the calculated CSO and stormwater loads from many individual events over the entire simulation period (2008). The component load analysis, however, represents the fraction of the calculated receiving water bacteria concentrations by source during the maximum period (30-day month for fecal and rolling 30-days for enterococci) as noted in Tables 6-9 and 6-10 in the LTCP. Further, the components represent geometric means during the 30-day periods. Performing geometric mean calculations changes the emphasis on high and low outlier occurrences.*

The analyses of the components were performed in the following sequence:

(1) The receiving water bacteria concentrations were calculated for every hour of the 2008 simulation period for all locations in the waterbody.

(2) Geometric means were calculated from these values at the receiving water location noted in tables 6-9 and 6-10 (12 monthly values for fecal coliform, and 365 30-day rolling values for enterococci). The maximum month was then identified for fecal coliform and the maximum 30-day period for enterococci.

(3) Steps (1) and (2) were repeated using a simulation form which all CSO loads are removed. The resulting values were subtracted from the baseline geometric mean concentrations calculated in (2) above, and the difference was inferred to be the concentration associated with CSO discharges.

(4) Step (3) was repeated for stormwater and direct drainage loadings in sequence to calculate their respective component concentrations, and these differences were inferred to be concentration associated with the respective components.

(5) The concentration remaining after step (4) represent the component associated with boundary conditions, which was the only source left in the model after removal of CSO, stormwater and direct drainage. The boundary condition represents the sum total impact of all pollutants sources discharged to waterbodies outside of Westchester Creek.

The annual CSO and stormwater loadings in Table 6-2, to which DEC is referring, do not provide insight into the calculated GM components by source. This is due to a number of facts: (a) sources during the 30-day GM averaging periods are more directly related to the results during those 30-day averaging periods; (b) maximum 30-day GM results are influenced by the frequency that each source overflows during the 30-day period as well as the magnitude of the source;, and (c) GM averaging tends to minimize the impacts of single large concentrations, whereas, loading totals are highly influenced by singe large event loadings.

DEP acknowledges the complexity of these computations, but the variability of overflow volume and associated concentrations of bacteria necessitate evaluating components from a resulting concentration basis rather than a direct load basis, particularly when *the water quality target is a computed geometric mean, which by nature decreases the effects of large infrequent events.*

DEC Comment 1 Continued: "Fourth, Section 6.1.c states that Sentinel Monitoring did not indicate any illicit sanitary sewer connections within the Westchester Creek sewershed, but the LTCP modeling assumed an illicit load for calibration purposes and then excluded the loads from the baseline conditions. The inclusion of these illicit sources is not supported by the field samples and seems to introduce some inaccuracy into the model. The City must explain in more detail why there is a discrepancy between the field data and calibrated model and the rationale for including an illicit load contrary to the field data."

> ***DEP RESPONSE:*** *On pages 2-18, 2-35, 2-37 and 6-3 of the Westchester Creek LTCP report, DEP indicates that there is no evidence of any current illicit sewer connections. As such no dry weather source was included in the validation of the model based on the more recent 2014 sampling data. However, for the 2005 calibration period, a dry weather source was included in the calibration of the model to the 2005 data set to raise bacteria concentrations in the creek to the observed levels.*

DEC Comment 1 Continued: "Fifth, Section 6.2 (as well as Section 2.1.c.1) states that the calculated bacteria concentrations from model appear to be higher than the concentrations obtained from the 2014 field sampling of Westchester Creek CSOs but does not provide an adequate explanation for the discrepancy. The City must explain in more detail why the calculated and observed concentrations may differ."

> ***DEP RESPONSE:*** *The calculated concentrations in the model were higher than the field data. In part this was associated with the fact that the IW model mass balance method was used to calculate the CSO pathogen concentrations in the Westchester Creek LTCP report submitted to DEC. This approach was selected because the CSO quality sampling data were not available in time for use in the modeling due to the lack of CSO overflow events during the sampling period. The modeling work has since been updated using the CSO concentrations measured in March and April of 2014 at the major outfalls (HP-014 and HP-016) and the statistical Monte-Carlo approach. This change resulted in a reduction in the CSO bacteria concentrations by a factor of 3 to 4. The results provide much better agreement between the peak bacteria concentrations calculated and observed data. The revised results will be presented in the updated LTCP report.*

DEC Comment 2. Waterbody Segmentation and Recommended Water Quality Targets. "The LTCP includes limited information on the rationale for segmenting the waterbody and selecting site specific water quality targets in the LTCP. The City must explain in more detail the rationale for segmenting the waterbody into inner and outer areas for purposes of establishing recommended site specific water quality targets. In particular, the City should explain the reasons for selecting Norton Avenue as the demarcation between the inner and outer areas and also discuss whether the inner creek segment can be reduced such that the portion of the waterbody subject to lower water quality targets can be minimized and the portion of the waterbody subject to more stringent targets can be maximized."

DEP RESPONSE: Norton Avenue was proposed as the boundary between segments because it approximates the northern end of Ferry Point Park, which borders the creek on the eastern shoreline. The northern end of this park may reasonably be considered the limit of in-stream recreational contact. In addition, the location is between sampling stations E13 and WC3, where model results and observations suggest a boundary below which the water quality responds to the increased interchange with the East River resulting from the rapid widening of the waterbody. This segmentation into two areas allows for water quality targets that are more appropriate to their respective estimated conditions and uses.

Although the City is not recommending changing the above approach, in response to DEC's comment, the City has re-examined the model calculations and determined that the inner creek area could be made smaller. However, making the inner creek area smaller will require selection of higher interim targets. Holding the interim targets the same as those listed in the report will result in compliance levels that are lower than the goal of 95 percent.

Should DEC desire a smaller inner creek area, the dividing line between the inner creek and outer creek could be located between WC2 and WC3 and the result would be that the outer segment would be able to retain a target of 200 cfu/100mL for fecal coliform bacteria, with an interim target for enterococci set to 30 cfu/100 mL. These targets would retain the 95 percent attainment during the recreational season. The inner creek would then require an interim target of 300 cfu/100mL and an enterococci interim target of 50 cfu/100mL. DEP is open to these new targets and areas or those noted in the LTCP report. DEC should recommend a direction, and DEP will make the necessary changes in the resubmitted LTCP report.

DEC Comment 2 Continued: "The City should also explain how the site specific targets presented in Table 8-11 were established. Given the levels of attainment for the fecal coliform standard during the recreational season shown in Table 6-6 and the maximum summer month fecal coliform concentrations shown in Table 6-9, it would seem that a lower site specific standard could be established for the inner creek segment."

DEP RESPONSE: The targets were selected to provide a high level of attainment. As shown in table 8-11, attainment levels are noted as 97 percent in the inner creek. The targets could be lowered resulting in a lower attainment percentage. The City will re-evaluate the water quality model projections and recommend targets that provide 95 percent attainment.

DEC Comment 2 Continued: "Lastly, to provide an alternate approach for evaluating the performance gap and attainment levels, the City shall conduct the following analyses:

a. Using the 10 years of baseline rainfall data and excluding data from the 24-hour time wet weather advisory periods after each rainfall event, determine the percent of time the waterbody is in attainment with the existing water quality standards, primary contact water quality standards, and future primary contact water quality standards for the baseline conditions/selected alternative."

DEP RESPONSE: See Table 2 and Table 3 below. Highlighted columns represent attainment for the primary contact standards and future primary contact standards. This table contains the calculated attainment for the baseline and selected alternative for the periods excluding the rainfall period and 24 hour advisory period. One hundred percent attainment was calculated for the existing standards.

Table 2 – Westchester Creek: Fecal Attainment by Monthly GM

Station ID	*Percent Attainment by Monthly Geo-mean to the Target Level (cfu/100 mL)*								
	180	***200***	***250***	***300***	***350***	***400***	***450***	***500***	***600***
WC2	93	93	94	95	96	97	98	98	100
WC1	94	94	96	97	98	99	100	100	100
WC3	97	99	99	100	100	100	100	100	100
E13	100	100	100	100	100	100	100	100	100

Table 3 – Westchester Creek: Enterococci Attainment during Recreational Periods (May 1 through October 31)

Station ID	*Percent Attainment by Monthly Geo-mean to the Target Level (cfu/100 mL)*								
	30	***35***	***50***	***75***	***100***	***150***	***200***	***250***	***300***
WC2	89	92	95	97	98	99	99	100	100
WC1	93	94	96	98	98	99	100	100	100
WC3	96	97	98	99	100	100	100	100	100
E13	99	99	100	100	100	100	100	100	100

DEC Comment 2 Continued: "b. Using the 10 years of baseline rainfall data, determine the percent of time the waterbody is in attainment with fecal coliform levels of 200 cfu/100 ml, 300 cfu/100 ml, 400 cfu/100 ml, 500 cfu/100 ml, and 600 cfu/100 ml for each of the water quality sampling points (e.g. WC2, WC1, WC3, E13) for the baseline conditions/selected alternative. Along similar lines, evaluate the percent of time the waterbody is in attainment with enterococci levels various increments from 35 org/100 ml to 300 org/100 ml for each sampling point for baseline conditions/selected alternative."

DEP RESPONSE: Table 4 contains the calculated attainment for the baseline and selected alternative for the full 10-year period including the rainfall period and 24 hour advisory period.

Table 4 – Westchester Creek: Fecal Attainment by Monthly GM

Station ID	*Percent Attainment by Monthly Geo-mean to the Target Level without exclusionary periods (cfu/100 mL)*								
	180	***200***	***250***	***300***	***350***	***400***	***450***	***500***	***600***
WC2	76	78	86	87	89	91	93	93	96
WC1	87	88	91	93	95	95	98	98	98
WC3	93	95	97	97	98	100	100	100	100
E13	98	99	100	100	100	100	100	100	100

Table 5 contains the calculated attainment for the baseline and selected alternative for the full 10-year period including the rainfall period and 24 hour advisory period.

Table 5 – Westchester Creek: Fecal Attainment by Monthly GM

Station ID	*Percent Attainment by 30-Day Rolling Geo-mean to the Target Level without Exclusionary / Advisory Periods(cfu/100 mL)*								
	30	***35***	***50***	***75***	***100***	***150***	***200***	***250***	***300***
WC2	58	64	75	85	90	95	96	97	98
WC1	71	77	86	92	95	97	98	98	99
WC3	84	87	93	96	98	99	100	100	100
E13	95	96	98	100	100	100	100	100	100

3. **Evaluation of Alternatives.** "The LTCP included limited information on the evaluation of some alternatives. The City must provide results for the knee of the curve analysis for the in-line storage, in-line storage plus disinfection, and green infrastructure alternatives as well as Treatment Shaft (see attached AET brochure) and other technologies identified in the EPA document: http://water.epa.gov/scitech/wastetech/upload/Chapter-4_Mar-2013_508.pdf."

DEP RESPONSE: *The LTCP included an evaluation of in-line storage with disinfection, as well as green infrastructure (GI). These were in addition to consideration of a range of (a) upgrades of the Throgs Neck Pumping Station (PS) and Force Main (FM) and (b) storage tunnel configurations. For the reasons explained below, the LTCP did not evaluate the concept of using Vertical Treatment Shaft (VTS) technology for storage, and some of the other technologies listed in referenced EPA document, most notably Compressed Media Filtration (CMF) and Continuous Deflector Separation (CDS). Other technologies listed in the EPA document focused on tank cleaning (gates and buckets) and net systems for floatables control, both of which are currently used by DEP. With respect to net systems, the LTCP did consider floatables control with a focus on HP-011 on the East River but deferred the final decision on such technology to the Bronx River LTCP following further evaluation at that time. As off-line storage tanks were not considered in detail (in lieu of in-line and tunnel storage), there was no purpose to consider tank cleaning systems. The following responses will focus on VTS storage. CMF, CDS, in-line storage and GI.*

Vertical Treatment Shaft (VTS) Storage: *DEP chose to evaluate three tunnel storage configurations which spanned a wide range of volumetric CSO control levels, along with in-line storage rather than the VTS technology for storage. In response to DEC's comment, VTS storage is evaluated herein. For such evaluation, the shafts would be located where the tunnel shafts are shown on Figure 8-3. Two shaft sizes were considered: 8 MG and 18 MG. The smaller shaft for HP-033 would provide a level of volumetric control (12%) close to the optimal Throgs Neck PS alternative (15%). The larger shaft for outfalls HP-016 and HP-033 would provide a level of volumetric control*

(34%) which is somewhat between the optimal Throgs Neck PS alternative and the 8 MG shaft (15% and 12%, respectively) and the smallest of the three tunnels (44%).

A cost-performance curve showing these points is attached as revised Figure 8-4. It is essentially Figure 8-4 from the LTCP with the addition of the 8 MG and 18 MG shafts. As shown, because the 8 MG shaft and optimal Throgs Neck PS alternatives are nearly equal in performance and costs, non-monetary factors need to be considered to determine which technology would provide the most suitable solution for that level of volumetric control. These factors include the following:

- *VTS storage is a less proven technology*
- *DEP has no operational experience with shafts for either CSO tunnels or storage*
- *DEP has considerable operational experience with PSs and FMs*
- *Siting would be greatly simplified with the Throgs Neck PS alternative*
- *Once the FM is built, there would be no permanent O&M disruptions or inconveniences to abutting property owners*
- *Refurbishment of the PS would be an ancillary benefit*

Thus, had VTS storage been considered, the Throgs Neck PS alternative would have been favored for the lower level of volumetric control, the 12% to 15% range.

With regard to the larger shaft at 34% control, based on the extensive cost-attainment evaluations reported in the LTCP, all of the higher performing alternatives proved to provide no measurable water quality attainment benefits. This would also hold true for the larger shaft as illustrated in Figure 8-10 Revised which is essentially Figure 8-4 from the LTCP with the addition of the two shafts. Thus, shaft storage would not have advanced as the preferred alternative for the same reasons that prevented all of the other alternatives from advancing – no meaningful increase in attainment at very high costs.

Compressed Media Filtration (CMF) and Continuous Deflector Separation (CDS): *With respect to CMF, this technology produces a high quality effluent with respect to TSS reductions but requires a defined level of upstream solids removal as a pretreatment step, such as primary clarification or vortex separation. Although there are some limited CSO applications, CMF is not currently a widely used technology for CSO treatment. It is also a relatively complicated process (when compared to storage) that involves filtration and backwash cycles, pumping, and other ancillary systems. As with other high TSS removal processes (e.g., high rate clarification/ballasted flocculation), CMF was not deemed applicable to Westchester Creek as the water quality objectives for Westchester Creek were focused on bacteria reductions. For these reasons, CMF would not have advanced beyond the initial "fatal flaw" analysis.*

CDS is essentially a circular fine screen which would fall under the floatables control category. This technology is also not designed for bacteria reduction. Further, CDS *systems have almost exclusively been used on municipal stormwater discharges, not CSO discharges, and thus is an unproven CSO-technology. Thus, it too would have been screened out from further consideration at the "fatal flaw" level.*

In-Line Storage: *In-line storage at outfall HP-014, plus disinfection, was evaluated in some detail in the LTCP. The resulting 5.9 MG volume was projected to result in a volumetric control of roughly 23%. However, due to a number of serious siting and O&M concerns, it was not advanced for further knee of the curve (KOTC) evaluations. Chief among the negative factors was that in order to work hydraulically, the in-line storage would need to occur below an active New York City Transit (NYCT) rail yard and maintenance facility (Unionport Yard) with no room for construction or routine O&M access. In addition to access limitations, siting of dewatering PS and odor control systems also presented major challenges.*

The disinfection system further complicated the siting concerns. In addition to the dewatering PS and odor control systems, a chemical storage and feed building would need to be sited in a highly developed area surrounded by medical and educational institutions. Thus, between the NYCT site limitations and overall siting of the support systems, in-line storage was screened from further consideration.

Green Infrastructure (GI): *As with all of the LTCPs, GI is included in the baseline conditions. For Westchester Creek in particular, the LTCP baseline includes a GI penetration rate of 14% of the combined impervious drainage area, totaling 487 acres. This is also the highest penetration rate citywide. Because of the practical limits of implementation and constructability, however, expansion beyond this high penetration rate was not deemed to be feasible in the Westchester Creek watershed due to the dense urban land use and the hydrogeological unsuitability of the near-surface hard rock formations. Therefore, further GI penetration rates or combinations of Green/Gray infrastructure were not considered for the LTCP.*

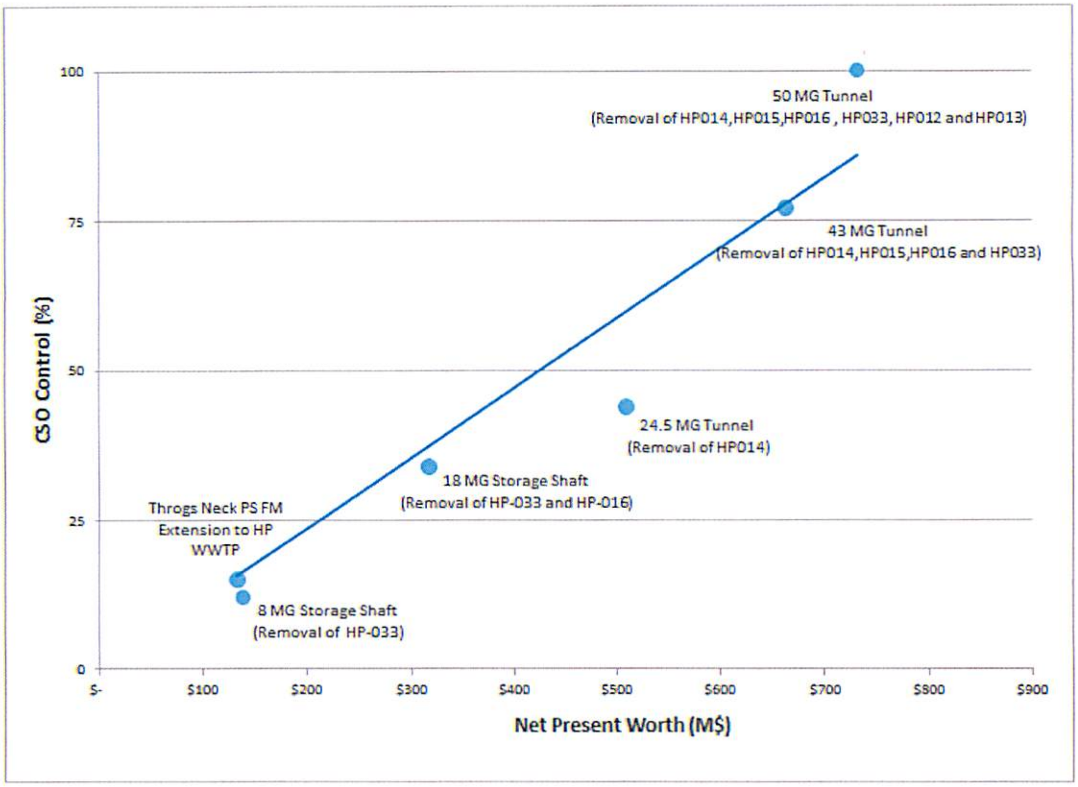

Figure 8-4 Revised – Cost vs. Volumetric CSO Control

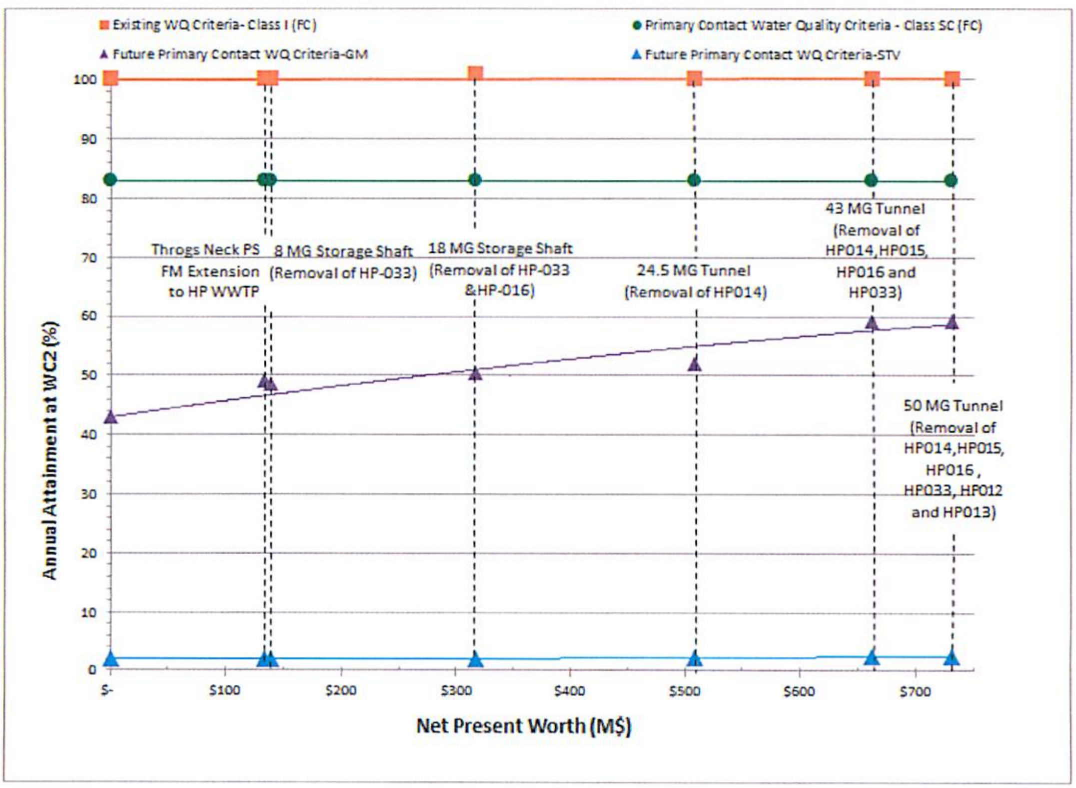

Figure 8-10 Revised – Cost vs. Bacteria Standard Attainment at station WC2