UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

JUL 18 2019

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. David Stewart, P.E., BCEEE
Director of Engineering
Capital Region Water
212 Locust Street, Suite 500
Harrisburg, Pennsylvania 17101

RE: U.S. and PADEP v. Capital Region Water and City of Harrisburg
Civil Action No. 1:15-cv-00291-WWC

Dear Mr. Stewart:

The Environmental Protection Agency (EPA) received the August 31, 2018 and November 9, 2018 responses from Capital Region Water (CRW) to EPA's July 6, 2018 disapproval of CRW's City Beautiful H2O Program Plan Long Term Control Plan (LTCP or Plan). Also, EPA received an updated Financial Capability Analysis on March 22, 2019. The Partial Consent Decree (PCD) at Section V. E., Paragraph 14 requires CRW to submit for review and approval a revised and updated LTCP that conforms to the requirements of EPA's 1994 CSO Control Policy (CSO Policy) and Guidance for Long Term Control Plan, as well as additional guidance on green infrastructure and integrated planning. Upon disapproval, the PCD requires CRW to correct all deficiencies and resubmit the plan for approval within 45 days or at another time in which the parties agree.

Although CRW's responses did provide some additional information, CRW did not adequately respond to EPA's comments on the LTCP and the responses did not result in a revised and resubmitted it's LTCP that conforms to the requirements of the CSO Policy. CRW is focusing on what can be done within financial capability rather than how to minimize CSOs and address water quality standards. CRW creates a CD timeframe of 20 years rather than looking at committing to the amount of work it would take to meet the minimum requirements of the CSO policy. Although EPA is open to adaptive management, we can't accept an LTCP without an end goal conforming to either the demonstration or presumption approach. CRW's responses fail to address EPA's disapproval as well as many of the comments raised by EPA. Furthermore, many of the responses provided lack the supporting information, data, and/or cost analyses requested by EPA.

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Enclosed are EPA's outstanding concerns, as raised in EPA's July 6, 2018 comments, which were not addressed by CRW's August 31 and November 9, 2018 response letters. EPA expects CRW respond to our comments in a manner that results in a revised LTCP that complies with the CSO Policy and the PCD requirements. As noted above, CRW must provide responses to the attached comments and correct the deficiencies in its LTCP within 45 days of receipt of this letter.

EPA would like to have an in-person meeting within 30 days or less to discuss EPA's comments. Please contact Mr. Steve Maslowski of my staff at (215) 814-2371 to schedule a meeting or if you have any questions or comments.

Sincerely,

Andrew D. Dinsmore, Chief
NPDES Enforcement Branch
Water Protection Division

Enclosures:

cc: Maria D. Bebenek, PADEP
Nancy Flickinger, U.S. DOJ
Nina Rivera, EPA Region III ORC
Chrisna Baptista, EPA OECA

EPA July 6, 2018 CRW Program Plan Cover Letter Comments:

- Capital Region Water's (CRW) November 9, 2018 cover letter response 1 indicates that CRW's Program Plan (LTCP or Plan) is intended to comply with the Environmental Protection Agency's (EPA) integrated planning policy by also including Sanitary Sewer Overflows (SSO) and Municipal Separate Storm Sewer System (MS4) pollution mitigation. **In that case, the CRW Plan needs to be revised to include the cost-benefit comparison analysis of Combined Sewer Overflow (CSO)/SSO abatement versus Wastewater Treatment Plant (WWTP) improvement versus MS4 pollution.** The improvements listed in Section 11 of the CRW LTCP appear to be almost exclusively directed at CSO abatement and correction of deferred maintenance and not the reduction of volume and frequency of CSO overflows.

- EPA Cover letter overall comments regarding the failure of the CRW Plan to achieve water quality standards: CRW's November 9, 2018 cover letter response 2 states that the quote from Section 11.5: "*CRW does not expect to achieve compliance with water quality objectives for designated uses*" is taken out of context. CRW states that is does expect to ultimately achieve water quality standards, but not within the initial 20 years of Plan implementation. A graphic in the November 9, 2018 response letter shows various improvements required to reach certain CSO volume capture milestones from 80% to 95% and above. **The LTCP needs to be revised to provide a demonstration of the CSO volume capture percentage that has been determined through cost-benefit analysis process required under the 1994 CSO Policy.** This is important because it gives CRW the most cost-effective ways to come into compliance with the CSO Control Policy. **The Plan must also include a schedule to implement the improvements needed to achieve the target volume capture and water quality standards.**

- EPA Cover Letter statement regarding long-term deferred maintenance of the CRW wastewater system: In its response 6, CRW disagrees with EPA's conclusion that the first 10 years of their planned pollution abatement improvements fall under EPA's Nine Minimum Controls. CRW's November 9, 2018 cover letter response 6 offers Tables 1 through 3 arguing that the projects listed go beyond the Nine Minimum Controls. However, the improvements listed in those Tables are primarily WWTP and conveyance system upgrades, rather than long-term CSO controls. In the first 20 years there are few improvements that will reduce the volume and frequency of CSO overflows beyond 80% capture.

- EPA Cover Letter statement that CRW's Plan would only improve CSO capture by 1% in years 10 through 20: CRW's November 9, 2018 cover letter response 7, and further discussed in CRW's response to EPA Specific Comment 10, offers further detail regarding the improvements, but does not report any additional CSO capture as a result of these improvements beyond the 1% additional reduction between years 10 and 20 originally proposed. Neither the Plan nor CRW's response provide sufficiently detailed information that justify a schedule in which in a ten-year period CSO capture will increase only 1%. **CRW needs to revise the Plan to achieve greater amount of CSO capture after year 10 or must justify a slower schedule with specific detailed information on the projects that CRW will be implementing years 10-20 and the cost-benefit analysis that would support prioritizing other projects required by the CWA but that don't result in greater CSO capture.**

- EPA Cover Letter statement regarding the goal of the CRW Program Plan is to bring all CSO discharge points into compliance with applicable regulations: CRW's November 9, 2018 cover letter response 8 acknowledges that the current Plan is not likely to meet water quality objective, but that an "*...adaptive management process will be applied to define needed investments to achieve additional levels of control.*" **CRW must revise the current Plan to include all CSO abatement measures that will be necessary to achieve compliance with water quality standards, including a schedule to implement those measures.**

- EPA Cover Letter statement regarding limiting CSO control technologies based upon cost alone: CRW's November 9, 2018 cover letter response 9, and further discussed in CRW's response to EPA Specific Comment 22, claims that other factors were considered beside cost. However, CRW's comment 22 response states: "*LoCs* [Levels of Control] *beyond 85 percent capture may be necessary for some CSOs to meet water quality objectives for designated uses but were not illustrated in the CBH2OPP* [CRW Program Plan] *because of CRW's decision to focus on the immediate and near-term implementation phases, defined as what CRW could afford to invest within the first 20 years.*" This statement appears to confirm EPA's original opinion that current scope of CSO abatement measures are driven primarily by cost and not necessarily by cost-benefit. CRW is responsible for developing and implementing a long-term CSO control plan that will ultimately result in compliance with the requirements of the CWA. **The long-term plan must consider the site-specific nature of CSOs and evaluate the cost effectiveness of a range of control options/strategies.**

EPA Specific Comments:

- EPA Specific Comments 3 & 4 – regarding CRW service to wholesale customers and reductions in wet-weather flows: Supplement 1 Response 5 states: "*CRW believes it can create incentives for the suburban communities to control infiltration and inflow (I&I) into its sanitary systems. In addition, CRW understands that the Pennsylvania Department of the Environment (PADEP) can require improvements.*" This implies that CRW has little if any control over the discharges received from these wholesale customers, particularly regarding wet-weather flowrates.

  Regarding CRW's efforts to work with its satellite communities to develop a regional wet weather flow plan: Supplement 1 Response 5 states: "*Certain areas, like the Spring Creek Interceptor, may require special regulatory measures to solve that problem.*" This statement suggests that CRW may expect outside parties to resolve this issue for them. Supplement 1 Response 5 and CRW's November 9, 2018 response to EPA Specific Comment 4 indicate that CRW has been in contact with the five communities that contribute flows to Spring Creek Interceptor to discuss wet-weather flow challenges in that interceptor. CRW's efforts thus far include preparation of a technical memo dated September 13, 2017 and a follow-up meeting with the communities on January 26, 2018. **EPA requests copies of this memo and minutes of the meeting.** EPA previously had requested the memo at a meeting at CRW's office on August 7, 2018 and has not yet received it. **EPA also requests an update on the regional wet weather flow plan.**

- EPA Specific Comment 5 – regarding collection system control strategies: Supplement 1 Response 11 states in part: "*CRW intends to follow-through with installation of level and velocity monitoring sensors after completion of several of the early projects that will increase the capacity of the conveyance system. Once the interceptors and Front Street Pump Station are improved, we can benchmark the conveyance system in its modified configuration, then proceed with optimization of pumping equipment operation and potentially implementation of automated gates/weirs to minimize CSO activity.*" EPA has concerns against what appears to be CRW's proposed "after-

the-fact" planning of real time control (RTC) as suggested by the emphasized *"italicized, underlined"* text above. EPA believes retro-fitting RTCs will result in significant additional and expenses.

CRW's November 9, 2018 response to EPA Specific Comment 5 presents a series of bullet points regarding deep tunnel construction that appear to be largely inaccurate or dated, which compromise the evaluation of this alternative and result in CRW ignoring a feasible alternative that may ultimately save CRW money. Most notably under Bullet Point 2 is the assumption that the minimum commercially-available tunnel size is 10-foot diameter. Micro-tunnels as small as 5-feet in diameter have been successfully completed in rock since the 1990's and tunneling as small as 8 inches in diameter have been completed in soft-ground.

It appears that a combination of surface collectors, small tunnels, a central primary conveyance tunnel, and perhaps with small-scale local storage at minor CSOs or even large-scale centralized storage at the end of the tunnel may well be the most practicable alternative for CRW. Tunnels may be used to provide storage volume and transport capacity or to provide transport capacity only to more centralized storage locations. Also, tunnels need not necessarily be "deep." Typically, soft ground tunnels can be constructed at as little as 1.5 times tunnel diameter depth below the ground surface without causing damage to surface and near-surface facilities. **CRW needs to revise the Plan to consider and discuss such alternatives as part of a reasonable range of alternatives.**

Among other inaccuracies presented CRW's November 9, 2018EPA Specific Comment response 5:

- Contrary to Bullet Point 1, near-surface collector sewers conveying excess sewer flows to a larger-diameter/shorter-length tunnel with sewers may be more cost-effective than constructing a 52,000 foot 10-foot diameter tunnel. The cost per gallon of storage in a 10-foot diameter tunnel is typically 3 to 5 times the cost per gallon of storage in a 25-foot diameter tunnel.
- Contrary to Bullet Point 3, micro-tunneling requires work shafts spaced at 600-feet to 2000-feet depending upon soil conditions, alignment and other factors. This shaft spacing - and therefore access manhole spacing – is similar to that provided for most conventionally-constructed interceptor sewers, and as such, maintenance would not be a greater challenge than CRW likely already experiences in maintaining its interceptors.
- The arithmetic in Bullet Point 4 doesn't seem to check against the minimum tunnel length of 52,000-feet cited in Bullet Point 1 and the minimum diameter of 10-feet cited in Bullet Point 2. A 10-foot diameter tunnel that is 52,000 feet long would have an internal volume of approximately 30 million gallons (MG).
- Bullet Point 5 cites high mobilization costs, high drop shaft costs and high dewatering costs associated with deep tunnels – all good reasons to limit the tunnel length and rely more upon near-surface collector sewers to deliver excess flows. As previously discussed, tunnels don't necessarily have to be "deep". Tunnels can be successfully constructed at depths-of-cover as little as 1.5 times tunnel diameter without damaging surface facilities, which dramatically reduces construction shaft costs and perhaps dewatering costs as well.
- Bullet Point 6 states that: *"The resulting alternative cost indicates the 10 feet diameter system is less cost-effective than other alternatives evaluated at a similar control level."* This conclusion appears to be largely the result of the unnecessarily restrictive assumptions in the development of the tunnel alternative rather than actual cost

determinations for a more cost-effectively configured excess flow collection/conveyance/storage system.

Renovation and upgrading of the diversion structures is among the earliest collection system improvements that CRW proposes to undertake. Further, the greatest reduction in CSO volume is projected to occur as a direct result of these diversion structure renovations. From the information provided in the CRW Plan, EPA agrees that this work is vital to reducing CSOs. However, the diversion structure improvements cannot possibly be planned effectively unless RTC is fully considered as an integral part of this initial effort. Further, EPA believes that CRW will likely incur significant additional and unnecessary expenses in trying to retro-fit RTC. Recent developments in sewer flow monitoring technology appear to greatly simplify implementation of RTC. EPA believes that RTC can be implemented in most gravity interceptor sewer systems using simple manhole-mounted flow level sensors that actively control only a limited number of large-volume diversions to that interceptor. Smaller diversions can continue to use passive control devices, thus reducing both capital costs and O&M complexities. However, such facilities must be properly planned in the initial stages of diversion structure renovation to be most cost-effective and most environmentally-effective. **Therefore, the LTCP needs to include consideration of RTC simultaneously with sewer improvements in its consideration of control options.**

- EPA Specific Comment 9 – regarding the upgrades of the Front Street and Spring Creek pump stations will contribute to CSO reduction: Supplement 1 Table 1-2 reports that the Front Street pump station is proposed to be increased in capacity from 40 million gallons day (MGD) to 60 MGD and the Spring Creek pump station from 18 MGD to 30 MGD. Supplement Response 6 further states that renovation of the Front Street pump station "*...will increase the conveyance capacity of the station by over 50%...*" but does not directly link the increase in the Front Street pump station capacity to any CSO frequency/volume reductions or demonstrate that the capacity chosen is optimum for overall collection system performance now or in the future.

  Table 1-2 states that CRW's current plan is to "*Replace Spring Creek P.S. most likely on a new site, co-located with a storage facility,*" but no information is provided regarding the sizing of this storage facility; the coordination of pumping and storage capacities; or, the effects of these improvements on CSO frequency/volume. Further, the possible relocation of the Spring Creek pump station to a different site may open other collection system performance enhancement opportunities, that may have not been fully considered.

  Finally, EPA is concerned that the proposed capacity increases at the Front Street and Spring Creek pump stations may have been chosen merely to match the capacities of existing conveyance facilities upstream or downstream of these pump stations rather than chosen to optimize CSO frequency/volume reductions. Additional information from CRW is needed to support the sizing of the pump stations and the storage facility improvements proposed. **CRW needs to provide supporting information on the sizing of the pump stations, including why CRW selected that size and what is the impact they will have on the reduction of the volume and frequency of CSO overflows.** CRW's November 9, 2018 response to EPA Specific Comment 9 offers no new substantive information regarding the upgrading of the Spring Street and Front Street pump stations; therefore, EPA's concerns remain.

- EPA Specific Comment 10 – regarding EPA's concern that CRW's proposed improvements are focused on asset management needs rather than CSO/SSO reduction: Supplement 1 Response 6 states that its proposed improvements are focused on CSO reduction but acknowledges that

much of proposed construction to reduce CSOs is also rehabilitation of existing facilities needed to catch up on "deferred maintenance." **CRW needs to provide additional data to support its CSO reduction focus claim.** Further, as noted under EPA Specific Comment 5, it appears that CRW is proposing to undertake the renovations of its diversion structures without properly considering incorporation of the RTC system that would be necessary to optimize combined flow diversion to the interceptor sewers and thus minimize CSO frequencies/volumes.

CRW's November 9, 2018 response to EPA Specific Comment 10 states that: *"The CBH2OPP proposes a series of joint rehabilitation and capacity enhancement modification projects, all to consistently achieve the full hydraulic capacity of CRW's conveyance systems..."* Since CRW does not appear to have completed its full CSO abatement facilities planning endeavor, EPA remains concerned that the proposed projects merely match the capacities of upstream and/or downstream assets. CRW should update its Plan to ensure that it reflects the actual hydraulic needs within the wastewater collection and treatment systems to achieve water quality objectives. Without planning for actual need as opposed to existing assets, CRW may be forced in the future to choose less cost-effective or less environmentally-effective abatement measures because of the constraints created by the improvements constructed in the early phases of the implementation of CRW's CSO abatement measures.

- EPA Specific Comment 11 – regarding the adjustment of weir heights: Table 8.2-2 of the Plan identifies those weirs to be raised but does not indicate the final weir heights planned. The adjustment of weir heights should be an integral part of the overall interceptor flow management regime that also incorporates RTC. CRW needs to provide additional information regarding adjustment of weir heights. **The information should include at a minimum which weirs were and will be adjusted and by what height.** Adjusting weir heights will have a direct impact on the volume and frequency of CSO overflows.

- EPA Specific Comment 12 – regarding CRW's calculation process for determining combined flow capture percentage: The CSO capture percentages presented in the CRW Plan and Supplement 1 seem unusually high considering the large numbers of overflows that will still occur even after CSO abatement measures have been implemented. The CRW's calculation process must include only those flows generated in the combined sewer area as required under the 1994 CSO Policy and cannot include flows originating from separate sewer areas, even if those flows may pass through the CRW combined sewer system itself or through the interceptors serving the combined sewers. **Confirm that the percentages presented include only flows in the combined sewer system.**

  CRW's November 9, 2018 response to EPA Specific Comment 12 states that: *"A wet weather event begins either when the flow in the pipe connecting the regulator to the interceptor increases to more than 5 percent of the dry weather baseflow or when combined sewer overflows begin."* **Is dry-weather baseflow equivalent to peak dry-weather flow? If not, please explain the effects of normal sanitary wastewater flow diurnal patterns in the determination of the start of a wet-weather event.**

- EPA Specific Comment 13 – regarding concerns about the number of CSO events that will occur even after CRW completes its proposed CSO reduction efforts: Section 8 of the Plan showed the annual number of CSO events were very high at many of the CSO locations, but the annual CSO discharge volumes at those locations were relatively low. This suggests that local solutions may be the most cost-effective and environmentally-effective measures for reducing both CSO volume and frequency. However, it does not appear that CSO frequency reduction

was given an appropriate level of consideration in developing CSO abatement alternatives. Every time the CSOs discharge, that adds additional pollutants like fecal coliform, total suspended solids, biological oxygen demand to the river. The reduction of the frequency of CSO discharges reduces the pollutant load to the river and is an indicator of performance. **Please provide additional information regarding the number of overflow events likely to occur upon completion of each stage of implementation as well as after full Plan implementation.**

- EPA Specific Comment 14 – regarding surcharging and overflows at trunk sewer manholes listed in Tables 4-8 and 4-9 of the CRW Plan: Supplement 1 Table 1-2 discusses strengthening pipes to withstand surcharging but does not provide a direct response regarding controlling sewer surcharging or eliminating trunk sewer overflows. CRW's November 9, 2018 response to EPA Specific Comment 14 states in part that: "*One of the primary reasons for recommending the decentralized green-grey stormwater control strategy was its use of multi-objective stormwater controls within the collection system designed to jointly reduce CSOs and relieve local system backups/surcharging that contribute to prohibited unauthorized releases.*" However, under its response to EPA Specific Comment 6, CRW states that its green infrastructure (GI) implementation target is 3% for years 1 through 10 and an additional 5% for years 10 through 20. **Please explain how such a limited implementation of GI will have a significant impact on sewer surcharging and how it will impact on the reduction of the volume and frequency of CSO overflows.**

- EPA Specific Comments 17 – regarding pollutants of concerns: On December 29, 2014, CRW submitted a memorandum to EPA as required by Paragraph 16 of the PCD, which listed the pollutants of concern (PoC) discharging from the combined sewer system. On March 27, 2015, EPA commented on the list of PoC and stated that total suspended solids (TSS/sediment) must be a PoC for discharges to the Susquehanna River because it is a pollutant associated with combined sewer overflows. Furthermore, in the 2010 Chesapeake Bay TMDL Water, CRW had a waste load allocation for TSS, this pollutant needs to be included in the PoC. **CRW needs to revise the Plan to include sediment/TSS as a pollutant of concern for the Susquehanna River.**

- EPA Specific Comment 20 – regarding in-stream storage and off-line storage: Supplement 1 response 9 states that CRW did consider local storage opportunities in the CRW Plan and would apparently be willing to re-evaluate "some" locations, but not a tunnel. Section 8 of Supplement 1 found that local storage was found to be practical at only one location in the Uptown Planning Area (see page 8-39). Further, it appears that CRW's local control strategy 2 considered satellite treatment OR local storage, not integrated treatment/storage. Satellite treatment alone as a CSO abatement measure can be disproportionately costly compared to integrated treatment/storage because of the short-term peak flowrates for which satellite treatment must be sized if there is no storage to ameliorate those flow peaks.

  Response 9 also requests a technical call to discuss local storage but indicates that the re-evaluation of local storage would not be completed until the first 5-year evaluation. Based upon the information presented in Section 8 of the CRW Plan, there does not appear to be any technical constraints that would prevent CRW from proceeding immediately with its effort to re-evaluate local storage. **Local storage may well be the lowest cost abatement option for many of the smaller CSO locations**, particularly if integrated with a system of near-surface collector sewers and a large-diameter tunnel storage/transport conduit for larger CSO locations.

Based upon CSO frequency/volume data and other information in the CRW Plan, the re-evaluation of local storage could likely be completed within 120 to 180 days. **CRW needs to provide additional information regarding local storage, including integrated treatment/storage, and demonstrate how CRW has truly evaluated this alternative and how it will impact the reduction of the volume and frequency of CSO overflows.**

- EPA Specific Comment 22 - regarding the focus of CRW's alternatives analysis on cost rather than reduction of CSO occurrences and discharge volumes: CRW's November 9, 2018 response to EPA Specific Comment 22 confirms that CRW's primary focus in its Plan is cost rather than water quality objectives as evidenced by CRW's statement (beginning on page 21) that: "*LoCs beyond 85 percent capture may be necessary for some CSOs to meet water quality objectives for designated uses but were not illustrated in the CBH2OPP because of CRW's decision to focus on the immediate and near-term implementation phases, defined as what CRW could afford to invest within the first 20 years.*" CRW alternative analysis needs to be updated to be consistent with the CSO Control Policy's requirement to consider a range of control levels based upon performance metrics, such as number of activations or percent capture. Thus, **CRW needs to revise the alternative analysis to focus on the different alternatives that can achieve the performance required by the CSO Policy. Once CRW has identify those alternatives, it can compare the cost and cost-benefit ratio of those alternative.** The analysis needs to be consistent with the Partial Consent Decree, which states that the alternatives analysis is not intended to exclude control technologies based on cost.

- EPA Specific Comment 23 – regarding the Agency's request for additional detailed cost breakdowns of CSO mitigation alternatives: Supplement 1 does not provide a direct response to this comment and CRW's November 9, 2018 response to EPA Specific Comment 23 provides no additional information regarding detailed cost breakdowns of CSO mitigation alternatives. The graphs in figures 2 -4 in the November 9 response don't provide the detailed information necessary to validate the controls proposed by CRW and the cost CRW has estimated for systemwide implementation. Section 8 presents cost estimates for both systemwide and Planning Area-specific controls and utilizes those costs to assess the affordability of various LoCs. These costs appear to be based largely upon the City of Philadelphia's 2009 cost document, except for GI costs that were based upon a later Philadelphia document. CRW notes that costs were updated using the Engineering News Record Construction Cost Index and adjusted to the Harrisburg area using the RS Mean factor for Harrisburg. Costs for certain technologies appear inflated, for example, storage basins are costed on a per-unit basis. **CRW must provide additional detailed breakdowns regarding the systemwide and Planning Area alternatives cost estimates. CRW must provide documentation to show how the Philadelphia cost document is applicable to the Planning Area or must provide cost applicable to the Planning Area.**

- EPA Specific Comment 24 – regarding evaluation of providing treatment capacity at the third control point identified in the CRW Program Plan (8.3.1.1): Supplement 1 does not provide a direct response to this comment. CRW's November 9, 2018 response to EPA. Although the response to Specific Comment 24 provides some additional information regarding CSO treatment at a third location in Attachment Figure 3, that information needs to be presented in enough detail to validate CRW's alternatives analysis effort and the conclusions drawn from that effort. **CRW needs to provide its cost calculation for these alternatives.**

- EPA Specific Comment 25 – regarding the limited tunneling alternatives considered: The limitations on diameters and lengths of tunneling presented in the CRW Plan do not represent current industry practices, particularly as expressed on page 8-11 of the CRW Plan: *"A range of tunnel inner diameter was examined, starting with the approximate minimum feasibly constructible - about 10 feet..."* While 10-foot inside diameter may be a practical minimum for conventional tunnel construction, tunnels as small as 3-foot diameter are routinely constructed using micro-tunneling methods and additional trenchless construction methods can be employed for even smaller pipe sizes. Further, the CRW Plan appears to consider only two potential tunnel lengths – 30,000 feet and 45,000 feet – both lengths apparently at constant inside diameters. While tunnels are relatively costly forms of storage, the economics of tunnel storage can be enhanced by employing shorter runs of large tunnels connected to the surface sewer network by conventionally constructed sewers or sewers installed by micro-tunneling. For example, the 14 MG of storage proposed to be provided by the 10-foot tunnel approximately 25,000 feet long described under the Second Control Point – Control Strategy 2, could also be provided by a 25-foot tunnel approximately 4,000 feet long with 21,000 feet of smaller-diameter connecting sewers, likely at substantially lower cost. CRW should also be aware of the low O&M cost to maintain tunnels.

  See also the discussion above on CRW's response to EPA Specific Comment 5, which points out many inaccuracies in CRW's assumptions regarding tunneling. **CRW should revise the LTCP to include consideration of short length tunnels, that includes a detailed breakdown of the CSO control achieved, the capital cost of that alternative and operating cost of that alternative.**

- EPA Specific Comment 26 – regarding costs, GI assumptions, and particularly, CSO capture percentages: Supplement 1 includes tables of the capital cost of different projects. Proposed Advanced Wastewater Treatment Facility (AWTF) improvements are presented in Table 1-1 of Supplement 1; proposed conveyance improvements are presented in Table 1-2; proposed GI projects are presented in Table 1-3; and, proposed collection system renovation projects are presented in Table 1-4. **CRW needs to provide supporting financial data regarding the improvements listed above.**

  - CRW's November 9, 2018 response to EPA Specific Comment 26a cites Attachment Table 5 as providing more information regarding the life-cycle costs of the various control strategies investigated thus far by CRW. However, the extremely broad ranges of the low-to-high costs presented in Table 5 make this information largely meaningless for comparison of these strategies. Far more detailed cost estimates are needed. EPA Specific Comment 26 asked for a table of the costs for each LoC for each Planning Area. While Tables 1-1 to 1-4 include some capital cost, the cost information is not organized by LoC and by Planning Area. **Please provide a separate table for each Planning Area for the cost allocated to that Planning Area for each LoC.**

  - CRW's November 9, 2018 response to EPA Specific Comment 26b cites Philadelphia Water Department documentation for planning level costs for various GI technologies. EPA is concerned that these costs may be both out-of-date and non-reflective of the unique circumstances of GI implementation in Harrisburg. Extrapolation of outside costs using construction cost indices further increases the risk of variances between planning level estimates and actual implementation costs. EPA recommends that CRW develop its own baseline unit price construction cost estimates – and particularly long-

term O&M cost estimates - for those GI technologies CRW plans to consider. CRW must provide those estimates to support CRW's overall GI implementation costs. Even if CRW's GI technology unit costs were relatively accurate, the overall implementation costs CRW's GI improvement program do not have adequate support since CRW's November 9, 2018 response to EPA Specific Comment 26b states: *"Detailed assumptions of GI types were not necessary to derive planning level cost estimates, and would require site-specific, design level information."* **CRW needs to provide underlying assumptions and supporting implementation unit costs, to show that its GI implementation estimates are reflective of potential implementation costs.**

- CRW's November 9, 2018 response to EPA Specific Comment 26e does not provide specific enough information. **CRW needs to provide specific information regarding its process for determining the minimum practical sizing for satellite treatment facilities, as it applies to each location.** As previously discussed in EPA's response relating to EPA's Specific Comment 20, CRW's local control strategy 2 considered satellite treatment OR local storage, not integrated treatment/storage. This approach tends to make satellite treatment inordinately costly to install, and in practice, difficult to operate.

- EPA Specific Comment 29 – regarding detailed information about CRW's pilot/demonstration projects: Table 1-3 of Supplement 1 lists eleven GI demonstration projects. Table 1-3 presents basic improvement scopes for five of these projects but does not provide scopes for the other six projects, except to describe them as *"Early action GI demonstration projects"*. **CRW needs to provide additional information regarding the scopes of these GI demonstration projects and the impact will have on reducing the volume and frequency of CSO overflows.**

- EPA Specific Comment 31 – regarding CRW's post-construction monitoring plan: Supplement 1 does not provide a direct response to this comment.
  - CRW's November 9, 2018 response to EPA Specific Comment 31a states that CRW intends to perform post-construction monitoring after year 10 of its improvement program since the majority of CSO reduction it hopes to accomplish will be completed by year 10. CRW further states that it does NOT intend to perform post-construction monitoring after year 20 since CRW expects to be continuing to implement CSO reduction measures after year 20. Finally, CRW states that it will be performing monitoring after year 20 as additional CSO reduction measures continue to be implemented. **EPA recommends a focused post-construction monitoring timetable targeting the completion of CSO reduction measures after year 10. The post-construction monitoring plan must provide for the monitoring and collection of sufficient information to demonstrate compliance with water quality standards and protection of designated use as well as to determine the effectiveness of CSO controls.**
  - CRW's November 9, 2018 response to EPA Specific Comment 31b states that: *"It is not expected that the system improvements and control measures included in the immediate and near-term implementation phases of the Plan (i.e., through year 20) will be sufficient to meet water quality objectives for designated uses."* **EPA strongly recommends that some type of post-construction monitoring be performed periodically to establish trends in water quality improvements and to provide input for mid-course corrections to Plan implementation.**

- CRW's November 9, 2018 response to EPA Specific Comment 31c states that CRW believes that the monitoring program it proposes is sufficient to meet EPA's objectives for post-construction monitoring. EPA standby its comments made on July 6, 2018. **CRW needs to propose monitoring that is adequate to identify changes in CSO discharges that occur because of implementation of the Plan.** Monitoring changes in CSO discharges from controls will help CRW determine if the controls are working properly and if any changes need to be made with future controls.
- CRW's November 9, 2018 response to EPA Specific Comment 31d states that CRW will utilize the same hydraulic model calibration/validation criteria as used for its 2016 Sewer System H&H Report. Per the 2016 Report: This *model is then calibrated with the flow and rainfall data collected between September 2014 and November 2015 using the WaPUG calibration criteria".* From EPA's perspective, the application of WaPUG criteria is the preferred method of model calibration/validation and are referenced in the industry technical standards such as the current edition of WPCF Manual of Practice FD-17 – Prevention and Control of Sewer System Overflows.
- CRW's November 9, 2018 response to EPA Specific Comment 31e regarding CRW's post-construction monitoring without participation by PADEP references CRW's response to EPA Specific Comment 13, which seems unrelated to water quality monitoring. **CRW needs to address EPA's concerns that CRW will conduct water quality monitoring regardless of PADEP involvement in CRW's post-construction monitoring efforts.**

- EPA Specific Comment 32 – regarding the focus of the recommended plan and implementation schedule on cost rather than specific CSO abatement measures: Supplement 1 Response 2 presents a narrative on Plan Implementation in year 1 through 10, but the focus of this narrative is again primarily on cost rather than reductions of CSO frequency or volume; and as such, is largely non-responsive to EPA Specific Comment 32. The projects anticipated to be undertaken in years 1 through 5 are presented in Tables 1-1 through 1-4, but **CRW also needs to provide a list of specific projects to be undertaken after Year 2022 as well as data regarding the CSO reduction benefits associated with the individual projects listing in Tables 1-1 through 1-4 in order to confirm the overall CSOs reductions claimed for these improvements.**

  Supplement 1 Response 3 discusses Plan implementation in Years 10 through 20 and states: *"For years 10 to 20, CRW estimated an ability to increase capture by 1%. CRW now expects the ability to improve on that level of capture."* **CRW needs to provide details regarding how this "improvement" will be accomplished and what the expected level of capture will be.**

  - In accordance with EPA Specific Comment 32a, **CRW must provide new information demonstrating CRW's focus of the CRW Plan achieving water quality objectives rather than on implementation cost.**
  - CRW's November 9, 2018 response to EPA Specific Comment 32c provides specific information on the scopes of WWTP and Conveyance System Capital Improvement Projects for years 1 through 10 in Attachment Tables 1 and 2, respectively. **Please provide additional detail on scopes of GI and Collection System Rehabilitation/Separation/Storage Projects in years 1 through 10 in Attachment Tables 3 and 4, respectively.**