



Unraveling the Facts

Some answers to frequently asked questions about the Green City, Clean Waters Plan

This document sets forth information to explain the complicated provisions of the Philadelphia Long Term Combined Sewer Overflow Control Plan, otherwise referred to as the Green Cities Clean Water (GCCW) plan. The GCCW was drafted over ten years ago to address water quality in the tidal sections of the Delaware and Schuylkill Rivers, and both the tidal and non-tidal sections of the Tacony-Frankford, Pennypack, and Cobbs Creeks¹.

Climate change, environmental equity and public health are critical issues that must be addressed immediately by complementing or adapting provisions of the GCCW Plan. Specific suggestions for initial action to adapt or complement the Plan are provided in other documents, including: immediate short-term action noted in Revitalizing the River ([linked here](#)), Rationale for priority areas of emphasis ([linked here](#)), and the Water Center at Penn Delaware River Bacteria Report ([linked here](#)).


This document is intended for an audience familiar with basic provisions of the Clean Water Act and the history of the Green Cities Clean Water Long Term plan. A short "Good Intentions" Fact Sheet developed for public understanding is [linked here](#).


Understanding these facts and taking action now is critical to the health and economic well-being of the residents of Philadelphia. Delaying these critical equity and environmental actions for another 10-15 years, until the 2036 end date of the GCCW plan, will not only delay public health and environmental benefits but also increase total costs as well. This would be both unwise and unfair to current and future Philadelphia residents.


Executive Summary

PWD monitoring data reports more raw sewage mixed with stormwater flows into tidal Delaware and Schuylkill Rivers and their Creeks now than when the GCCW plan started, taking into account its reported baseline calculations.

Philadelphia rivers and streams are among the most attractive natural spaces left in the city, especially valuable as a refuge from the heat of climate change. Yet, because of the increased climate induced rainfall, the pollution levels from raw sewage mixed with stormwater flowing to the rivers and creeks will increase rather than decrease under the GCCW plan.

 GCCW plan relies heavily on the implementation of green infrastructure to soak up stormwater and thereby reduce the total volume of combined sewage that PWD must convey and treat. However, the GCCW plan was drafted before today's severe climate change impacts were known and uses rainfall data from 2006, not current or projected levels of rainfall, as its analytical baseline.

 As a result, the volume of stormwater capture projected in the GCCW plan is likely to be insufficient to achieve the required water quality objectives in the face of current and future stormwater flows. Also developed prior to recent federal funding availability, it was intended to provide basic environmental, economic and social benefits in a city with a low rate payment base and without significant use of federal or state funding.

 As will be explained in this analysis, current information indicates that the impacts of climate change are overwhelming the original GCCW system design, both placing city residents at risk of sewage tainted flooding and pointing towards an expensive overhaul further down the road.

PWD's own award winning 2022 Climate-Resistance Planning and Design Guidance states: "While current water quality-based regulations do not explicitly require climate change to be considered, climate impacts, including increasing rainfall, have the potential to make it harder for PWD to meet existing regulatory requirements. It is therefore imperative that PWD consider climate change in the planning and design of projects and programs for which regulatory compliance is a primary driver" ²



While PWD has taken meaningful steps to implement the provisions of the original GCCW plan, information based on PWD's own reports indicates the following:

- On paper, PWD is nominally meeting its interim GCCW goals to date, and PWD estimates that sewage pollution overflows into the rivers are now 3 billion gallons per year less than would have been the case without its efforts.
- However, that 3 billion gallons is a "reduction" only by virtue of a computer model in comparison to that 2006 "typical year" baseline, not to the current reality. Because of climate change, the city's targets for sewage pollution reduction are no longer connected to the reality of the climate induced rainfall conditions Philadelphia is actually experiencing.
- In fact, on average, PWD has reported that 14 billion gallons per year of stormwater mixed with untreated raw sewage have flowed into the rivers of Philadelphia due to overflows from the Combined Sewer Outlet (CSO) system since the inception of the GCCW 10 years ago. This average actually exceeds the 13 billion gallon estimate in the 2006 baseline.
- These overflows of stormwater mixed with untreated raw sewage pollute every one of the key tributaries and rivers in Philadelphia. Some of those 164 CSOs overflow as many as 80 times per year, making recreation unsafe for almost half of the year. ³
- Under GCCW, PWD's target is to construct enough "greened acres" or Green Infrastructure (GI) acreage to enable the Combined Sewer System (CSS) to capture and treat the equivalent of at least 85% of the sewage pollution by the year 2036. Because increasing rainfall will create more stormwater and the pollution it carries, that percentage will almost certainly actually be far less! This will surely mean that Philadelphia will have to enter into a whole new Long Term Control Plan (LTCP) at that time, when the current federal financing may not be available at all, while putting public safety at risk in the interim.
- PWD's own Climate-Resilient Planning and Design Guide emphasizes the need to move now: "This guidance is meant to **facilitate the integration of climate change projections into existing planning and design processes at PWD**. Through this process of **mainstreaming** climate information into existing practices, PWD can help ensure that current levels of service can be maintained, and regulatory requirements can be met under future conditions."⁴ Emphasis included in PWD statement.
- The bottom line? Philadelphia needs to adjust or complement GCCW to account for this new climate induced reality, as well as include provisions to ensure equity is considered in the implementation of GCCW provisions.



Next Steps



Use PWD's own existing models to evaluate its plans, not against the obsolete 2006 baseline, but against the future rainfall forecasts due to climate change:

"To evaluate the performance of our combined sewer system and GSI infrastructure, continuous simulation using Hydrologic and Hydraulic (H&H) models is needed. Continuous simulations of urban drainage systems require hourly or sub-hourly precipitation time series.

The method Climate Change Adaptation Program (CCAP) developed to generate high resolution future time series can provide the necessary inputs for H&H simulations that assess system performance, and potential changes to overflows, under future climatic conditions. In addition, the stochastic rainfall generator can be used to evaluate variability in these future time series" ⁵

EPA's draft Guidance also:

"...recommends that communities and permitting authorities use the best available science and data to look forward, using more than historical data to assess the impacts and risks to the community from changes in precipitation, storm intensity, and other climate change-related factors. Additional controls should be designed based on recent and future-looking data and not solely historic precipitation data;" ⁶



Convene a community focused roundtable to review the results of the analyses above, as well as recommended immediate actions in documents noted above. This effort should develop a strategy to complement existing green infrastructure approaches and implement previous plans to add traditional (gray) infrastructure measures as appropriate to address climate threats with a focus on equity, flooding, and community access to their rivers and creeks.

Brief History of Green Cities Clean Water (GCCW):

The federal Environmental Protection Agency (EPA) requires municipalities to create a Combined Sewage Overflow (CSO) Long Term Control Plan (LTCP) to develop and evaluate a range of CSO control alternatives to meet water quality standards.

A Consent Order and Agreement (COA)

The COA was initiated in 2011 between the Pennsylvania Department of Environmental Protection (PA DEP) and the Philadelphia Water Department (PWD). The COA stipulates that PWD is required to meet the water quality requirements as established by the Clean Water Act, the Federal Combined Sewer Overflow (CSO) Control Policy, and the Pennsylvania CSO Policy, as well as comply with the City's National Pollutant Discharge Elimination System (NPDES) permits for combined sewer system discharge. A requirement of the COA was submission of a Long Term Control Plan (LTCP) Update to the PA DEP to explain how PWD would achieve CSO control goals. LTCPs are required by EPA and stipulate how municipalities with CSOs will meet water quality standards.

Green City, Clean Waters (GCCW)

Adopted in 2011 as a requirement of the consent order, GCCW is the City of Philadelphia's LTCP. It is a 25 year plan for CSO control and serves as an update to its original Long Term Control Plan, which was first adopted in 1997.

Administrative Order for Compliance on Consent (AOCC)

Issued by the U.S. EPA to the City of Philadelphia in 2012, this order requires the City's compliance with the Clean Water Act while also reinforcing the City's agreement with the PA DEP to reduce the volume of CSOs through a commitment to implement GSI as a component of the Green City, Clean Waters program.

Municipal Separate Storm Sewer System (MS4)

Philadelphia has a partially separated storm sewer system. It is regulated by a Municipal Separate Storm Sewer System (MS4) NPDES permit, which requires municipalities to use best management practices to reduce pollutants in stormwater runoff to the maximum extent possible and meet the water quality standards of the Clean Water Act.

Combined Sewer Overflow (CSO)

A combined sewer system collects rainwater runoff, domestic sewage, and industrial wastewater into one pipe.

Normally, it can transport all of the wastewater to a treatment plant. Sometimes the amount of runoff exceeds the capacity of the system and untreated stormwater and wastewater is diverted into nearby waterbodies. These events are called combined sewer overflows.

“Unraveling the Facts” is organized in sections covering background, statistical review of intended/expected stormwater pollution reduction, potential impact of climate change, and value of immediate action.

Section 1: Background

What are some of the key provisions of the Green Cities Clean Water plan? ⁷

The Administrative Order for Compliance on Consent (AOCC) states: “The LTCP targets the conversion of 34% of the CSS drainage to “greened acres” which will manage the first inch of rainfall runoff from directly connected impervious areas.” ⁸

While GCCW incorporates some traditional (or hard scape) methods of pollution reduction, especially in the non-tidal portions of the system, which are currently subject to higher water quality standards, its focus is on “greened acres” or Green Stormwater Infrastructure (GSI.)

As described by PWD, GSI or green tools reduce overflows by decreasing how much runoff gets into sewers. Stormwater is soaked up by plants and soil and evaporates into the air or is released into sewers more slowly. Trees, plants, and other natural elements provide benefits for people and the environment, while also managing stormwater. The GCCW plan was a nationally recognized construct which incorporated an innovative “triple bottom line” approach to address environmental, social and economic considerations. (more below.)

What are the promised associated benefits of meeting the GCCW targets?

According to GCCW: “The greened acreage that is a key part of the GCCW plan can have many benefits in addition to its ability to capture and filter stormwater. Some of these include:

- Environmental – The trees and plants that are part of greened acreage help filter pollutants out of the air and provide shade which reduces energy use by homes and businesses.
- Economic – Tree lined streets and green areas can increase the property values of the buildings nearby. The construction and maintenance of these green spaces provides jobs for members of the Philadelphia community.
- Social – Green spaces encourage people to get outside where they can exercise and interact with their neighbors which benefits physical and mental health.” ⁹

What are the challenges facing PWD in implementing its Green Acres targets?

Green Infrastructure is a very important tool to reduce stormwater flow and provide the environmental, economic and social benefits noted above. However, implementation in a high population and densely developed City like Philadelphia brings large challenges.

The University of MD Environmental Finance Center and The Nature Conservancy, in concert with a team of experts, published a clear analysis and set of recommendations explaining these challenges. Rather than repeating them here, the reader is strongly encouraged to read the report, linked here. ¹⁰

What area is covered by the GCCW plan?

The 27 miles of the Delaware River from Philadelphia to Wilmington remain the only stretch of the entire 330 mile River still not designated by the Delaware River Basin Commission (DRBC) for Primary Contact Recreation. ¹¹ Indeed, this is the only stretch of river in the entire state of Pennsylvania not so designated. This stretch also contains the most diverse and most low-income communities through which the entire River passes.

Raw combined sewage overflows (CSO) from Philadelphia are by far the main culprit in creating this unhealthy and inequitable situation. GCCW is supposed to deal with those Philadelphia overflows, to comply with the terms of the

Clean Water Act. There are 164 CSOs in the Philadelphia system, severely polluting all but one of the city's tidal creeks and rivers, and several non-tidal sections of Pennypack, Tacony-Frankford, and Cobbs Creek as well.

Green Cities Clean Water was therefore designed to improve water quality only to "secondary" standards in the tidal portions of the Delaware and Schuylkill Rivers and to "primary standards" in non-tidal portions of the Tacony-Frankford, and Cobbs Creeks.

How does GCCW Plan incorporate equity?

While the GCCW plan was written prior to explicit direction to address equity, recent EPA draft Guidance states "Permitting authorities and CSO permittees should consider the impacts of climate change on the performance of existing and future systems and the implications that remaining CSOs and future infrastructure investments may have for communities that are underserved or overburdened. EPA recommends that permitting authorities ensure that these project analyses are clearly documented in infrastructure plans (e.g., LTCPs, Integrated Plans) and WQS revision packages and incorporate any necessary provisions in the next permit and fact sheet."¹²

Section 2: Intended/expected stormwater pollution reduction

What are the targets in the GCCW Plan?

GCCW has a goal of creating 9,564 "greened acres" in Philadelphia by the year 2036. While green infrastructure acres are essential elements of stormwater reduction, the GCCW plan, unlike most every other LTCP in the country, emphatically places primary emphasis on this approach, instead of directly constructing traditional sewage infrastructure and incorporating green infrastructure where it would be most beneficial to capture and treat the stormwater and prevent sewage overflows from reaching rivers and creeks.

When the Plan was initially designed, it was hoped that this amount of green infrastructure acreage, in combination with some treatment plant upgrades primarily affecting the non-tidal portions of the creeks, would capture sufficient stormwater to enable the PWD sewer system to treat at least 85% of the annual stormwater combined with sewage pollution in a "typical" year of rainfall. This would leave an average of 15%, then estimated at 5 billion gallons per year, of that sewage pollution to overflow into the city's rivers.

Why are there concerns with the original targets?

The problem? That "typical" year was based on rainfall data from 2006. Since that time, the Philadelphia region has experienced steadily increasing rainfall amounts due to climate change. Because of this, that original "typical year" no longer exists and the 9,564 acres will fall far short of enabling that capture of 85% of combined sewage pollution. Indeed, PWD reports show the net overflow volumes are increasing rather than shrinking, despite the achievements of the green infrastructure work to date.¹³

Is the City meeting its targets in the GCCW plan?

On paper, the city is meeting its interim GCCW greened acre goals to date, and PWD estimates that sewage pollution overflows into the rivers are now 3 billion gallons per year less than would have been the case without that acreage.

However, that 3 billion gallons is a "reduction" only in comparison to that 2006 "typical year" baseline, not to the current reality. Because of climate change, the city's targets for sewage pollution reduction are no longer connected to the reality of climate induced rainfall conditions Philadelphia is actually experiencing. According to PWD's own Annual Reports, the median volume of overflows between 2010 and 2022 was actually 1 billion gallons per year higher than the 2006 baseline, despite the GI efforts.¹⁴

Can the City continue to meet even its existing greened acre targets in GCCW plan?

There is reason for uncertainty about meeting this target because there is the very simple limitation of available

space. There is not enough public land within the city limits to achieve the GCCW 9,564 acre goal. PWD is now dependent upon incentivizing private landowners to participate, which is proving to be both more difficult and more expensive than anticipated.

PWD's Climate-Resilience Design and Planning Guide states;

"In Philadelphia Green Stormwater Infrastructure (GSI) design is highly constricted by space constraints due to the dense urban environment and underground utilities." ¹⁵

The UM Environmental Finance Center and The Nature Conservancy Report states that removing barriers, engaging communities, planning to avoid gentrification, recruiting private landowners, and helping develop quality projects are all needed to better address racial equity and will require sustained investment from PWD in staff and resources. Accomplishing this will likely require additional targeted outreach efforts and increased grant program funding for vegetated GSI projects in neighborhoods that have been identified as priorities by PWD and/or the City. ¹⁶

Why is there a common misunderstanding of the GCCW targets?

GCCW was designed from the outset to achieve "85% equivalent capture" of untreated sewage overflow volumes from combined sewer overflows (CSOs.) Many have misunderstood this to mean an 85% decrease in raw sewage overflows.

However, this goal was at best only a 50% reduction of pathogens and pollutants from the baseline, and would therefore still leave the rivers heavily polluted after rainfall.

Furthermore, very few understand that the "85% equivalent capture" target was based upon a 2006 "typical hydrological year," not on the real-world picture. Due to climate change, that 2006 baseline is no longer the least bit typical.

Finally, it is important to understand that GCCW was never intended to achieve a full Fishable Swimmable water quality outcome in the first place, even without consideration of Climate Change.

What is Philadelphia Water Department's reported stormwater capture?

The city currently estimates that its greened acres have captured enough rainfall to prevent approximately 3 billion gallons per year of raw sewage overflow from CSO. This sounds like a lot until you consider that 9 to 16 billion gallons per year of raw sewage tainted stormwater are still flowing into Philadelphia's creeks and rivers.

The situation would surely be worse without those greened acres, but PWD's own annual reports document that the increase in rainfall due to climate change is equal to or perhaps even greater than those 3 billion gallons captured.

How does PWD's report of overflow "reductions" relate to the actual amount of stormwater captured?

PWD has reported that the 2006 "typical year" baseline was 13 billion gallons of sewage/stormwater overflows per year. Its reported "3 billion gallon reduction" is derived from a computer model relative to that 2006 baseline, not to actual measured overflows.

In contrast, PWD's own Annual Reports acknowledge that the median volume of actual measured overflows from 2012-2022 was on the order of 14 billion gallons per year, higher than the 2006 baseline. This would appear to be the consequence of increased rainfall from climate change, as PWD's own Climate Change Design and Planning Guide suggests.

The claimed 3 billion gallons of stormwater absorption from greened acres may well be real, and so surely is preventing the problem from being even worse, but it is not actually reducing annual overflow volumes.

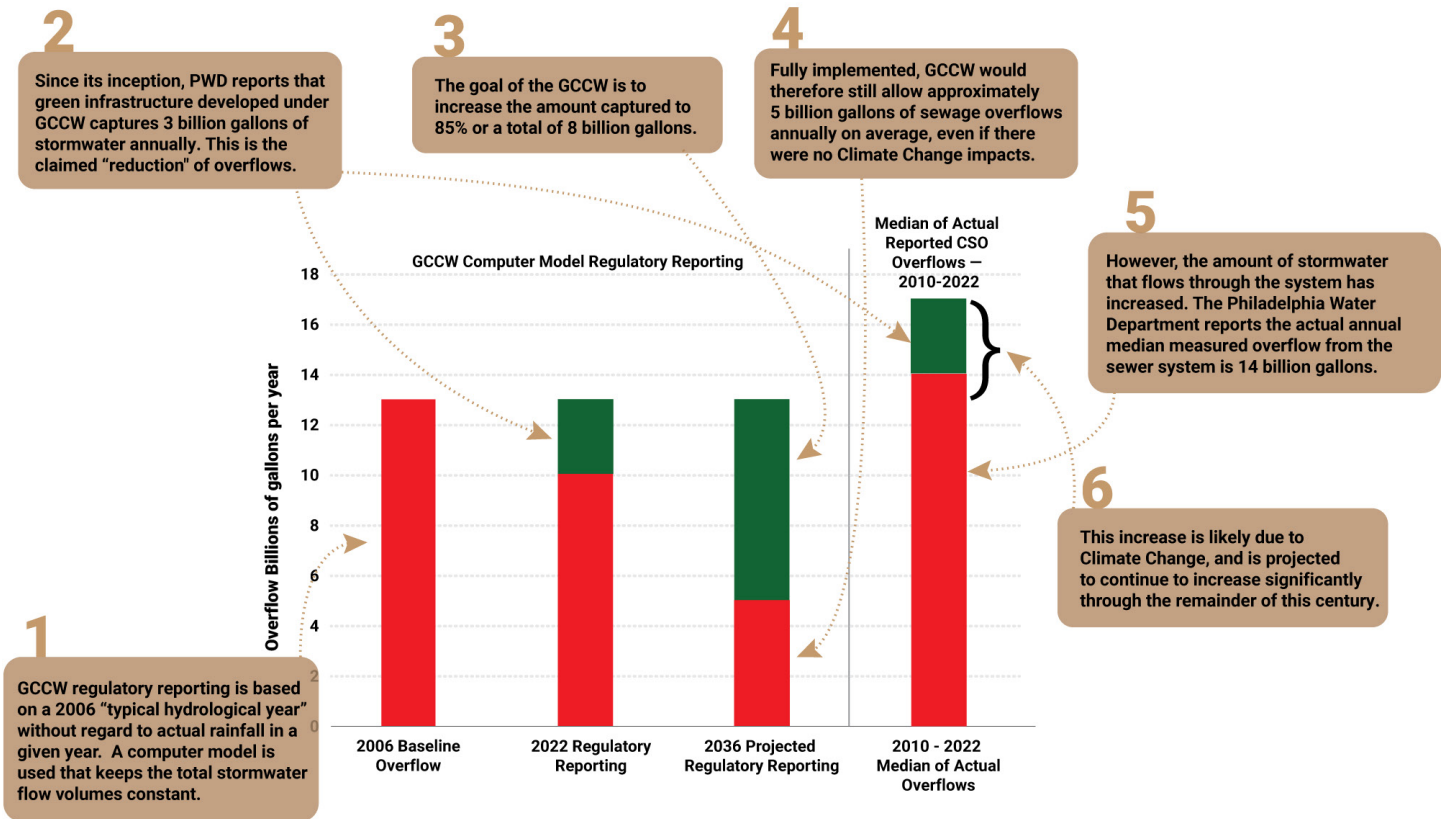
Does PWD have authority to adapt the GCCW plan?

Yes:

"Adaptive management is integrated into the CSO Long-term Control Plan agreements for PWD, CCMUA,

and DELCORA.¹⁷ This flexibility allows all stakeholders to adjust the approaches used to achieve water quality improvements as science, innovation, costs and benefits, impacts of climate change, and changing regional economics shift over time.”¹⁸

Raw Sewage Overflows In Philadelphia: *Models vs. Reality*



Section 3: Potential impact of Climate Change

What is the relationship between the GCCW plan and climate change?

Adapting to climate change was not built into the GCCW plan, but it is clearly becoming a necessity, as PWD’s own Resilience Guide acknowledges:

“Under the Clean Water Act (CWA), PWD is obligated to reduce pollutant loads to receiving waters from Water Pollution Control Plants (WPCPs) and the separate and combined sewer systems. While current water quality-based regulations do not explicitly require climate change to be considered, climate impacts, including increasing rainfall, have the potential to make it harder for PWD to meet existing regulatory requirements.

It is therefore imperative that PWD consider climate change in the planning and design of projects and programs for which regulatory compliance is a primary driver.”¹⁹

What does the PWD’s own Climate-Resilient Guidance specifically recommend?

In January 2022, the Philadelphia Water Department adopted guidance entitled “Climate-Resilient Planning and Design Guidance”²⁰ that includes climate projections, tools and risk management strategies that should help build long-term resilience.

PWD’s Climate-Resistant Design manual states:

“GCCW is focused on the design and implementation of green stormwater infrastructure (GSI) that will manage stormwater at the source, before it enters the collection system, thereby reducing CSOs and enabling PWD to achieve NPDES permit compliance and meet CWA requirements.

To evaluate the performance of our combined sewer system and GSI infrastructure, continuous simulation using H&H models is needed. Continuous simulations of urban drainage systems require hourly or sub-hourly precipitation time series.

The method CCAP developed to generate high resolution future time series can provide the necessary inputs for H&H simulations that assess system performance, and potential changes to overflows, under future climatic conditions. In addition, the stochastic rainfall generator can be used to evaluate variability in these future time series”²¹

In short, PWD seems to already have the tools at hand to re-evaluate the GCCW outcomes in light of climate change, and so provide guidance for adaptive management of the GCCW plan starting now. However, public access to this material has been eliminated from the PWD guidance.²²

How does increased rainfall from Climate impact upcoming PWD permits?

From PWD’s Guide:

*“Due to the effects of climate change, **the historical record will not accurately reflect the frequency and intensities of future storms.** Consequently, wastewater and stormwater planners and engineers need to utilize **future precipitation projections** to analyze changes in existing design storms so that level of service goals can continue to be met. CCAP’s high resolution future precipitation time series and precipitation frequency estimates can be applied to analyze future changes to design storm.”²³ (note to reader: bold language included in PWD document.)*

In other words, PWD already acknowledges that the GCCW analytical approach, using the “historical record,” is no longer relevant.

The PWD Guide then adds:

“PWD has both a Municipal Wastewater NPDES²⁴ permit that encompasses our Water Pollution Control Plant (WPCP) effluent and combined sewer overflow (CSO) requirements, as well as a NPDES Stormwater Permit for discharges from our Municipal Separate Storm Sewer System (MS4).

Pollutant loads that enter receiving waters from the collection system are directly dependent on precipitation patterns. In combined sewers, the pollutant load is dependent on the intensity and duration of rainfall events, which may adversely affect the wastewater treatment process and impact the frequency and volume of combined sewer overflows (CSOs).

In separate sewers, all stormwater is routed directly to receiving waters and any increase in precipitation will increase pollutant loads.”²⁵

What is the potential impact on upcoming state and federal review of PWD NPDES permits?

Philadelphia’s NPDES permit was issued in 2007 and administratively updated in 2012. Its MS4²⁶ permit covering separate storm sewage areas was issued in 2005, and administratively updated in 2010. EPA and PA Department of Environmental Protection are in the process of reviewing these permits.

Recent EPA draft Guidance states:

“EPA’s CWA implementing regulations require an NPDES permittee to properly operate and maintain its facility to ensure compliance with other conditions of the permit (40 C.F.R. § 122.41 (e)).

Because of climate change, however, past operation and maintenance practices may not be as effective, and may need to be modified, sometimes significantly, to account for sea level rise, increased rainfall, flooding risk, or other climate change related impacts. At the discretion of a permitting authority, managing for the current and expected impacts of climate change on a facility could be considered as part of proper operation and maintenance.”²⁷

This reinforces the need for PWD to manage for current and expected impacts of climate change NOW, rather than waiting for evaluation following the end of the GCCW plan in 2036.

This is consistent with PWD's own Climate Guidance:

"In combined sewers, the pollutant load is dependent on the intensity and duration of rainfall events, which may adversely affect the wastewater treatment process and impact the frequency and volume of combined sewer overflows (CSOs). In separate sewers, all stormwater is routed directly to receiving waters and any increase in precipitation will increase pollutant loads.

For separate sewers, precipitation increases need to be considered to evaluate PWD's future ability to meet NPDES permit requirements. For combined sewers, continuous simulation using high resolution precipitation data and PWD's H&H models is needed to understand system performance, as is described in the Long-Term Control Plan Update (LTCP) section below. See Appendix C for these projections."^{28, 29}

Again, Guidance recommends considering precipitation increases in PWD's ability to meet NPDES permit requirements.

Section 4: Value of immediate action

How does increased rainfall due to climate change impact local communities ?

Climate change drastically affects local communities in two key ways: more flooding of streets and homes, often mixed with raw sewage; and hotter summer days, driving communities to the waters for heat relief. Most of the time these affects especially impact lower-income communities, built on low-lying land and less able to leave the city to avoid the impacts of climate change. Infrastructure to capture the storm flows and keep the rivers clean are of paramount importance.

The GCCW plan does not have any provisions for ensuring equity in how it sites GCCW projects, invests money and creates local benefits. This needs to be considered to ensure that Philadelphia's at-risk communities do not suffer from the increasing impacts of climate change.

Why should action be taken to adapt or complement provisions of GCCW plan?

The Delaware River is being used as a sewer. Best case, the GCCW plan would have mitigated but not fundamentally changed this reality even if there had been no climate change impacts. Upon completion in 2036, as originally envisioned, PWD estimated GCCW would still have allowed at least 5 billion gallons of raw sewage mixed with Stormwater to flow into Philadelphia's creeks and rivers each year. So, by design, the system would not allow our waterways to be fishable and swimmable. And yet we now know that this overflow volume in 2036 is very likely to be far higher than that initial target, the water quality far lower, because the plan does not account for the increasing amounts of rain we receive due to climate change. The GCCW plan must be amended to account for this additional burden on the system. We do not need to wait until 2036 to recognize this continuing public health consequence.

In addition, the GCCW plan fails to prioritize lower income neighborhoods. This is a lost opportunity to take best advantage of the equity benefits that could be realized through environmental, economic, and social gains that the GCCW approach can provide.

A window of opportunity still exists to access substantial federal infrastructure monies, both grants and low interest loans, to address wastewater issues. This opportunity may well no longer exist in 2036, when it is likely that the City will be forced to develop a new LTCP.

Is PWD legally allowed to modify its GCCW Plan?

PWD's Year 10 Evaluation and Adaptation Plan (EAP) clearly provides for reevaluation or revision:

"The Green City, Clean Waters program is predicated on an adaptive management framework, described in the LTCP, and affirmed in the COA. An adaptive management approach enables flexibility and periodic program assessments throughout the program lifecycle. The Green City, Clean Waters program adaptive management structure has been formalized through the incorporation of WQBEL³⁰ Performance Standards in the COA and

assessments of progress toward those 5-year benchmarks within EAPs. This structure enables programmatic reevaluation and/or revision if or when needed. At the close of Year 10 of the program, PWD is not proposing any significant programmatic changes.”³¹

Comments in EPA guidance?

“CSO controls in LTCPs are designed based on rainfall patterns from a “typical year.” However, climate change is leading to increased annual precipitation amounts and increased precipitation intensity in many areas of the country, which are likely to result in increased flows in combined sewers; therefore, “typical year” estimates and analyses may need to be updated.

Projections from the World Climate Research Programme Coupled Model Intercomparison Project predict that by 2035 annual rainfall totals will increase by an average of 5% in CSO communities and 100-year storm intensity will increase by an average of 4–11% in CSO communities.

These increases may impact collection system capacity and responses to wet weather events. Furthermore, many combined sewers are also located along the coasts and the impacts of sea level rise, which are also increasing due to climate change, could lead to backflow and flooding.”³²

Philadelphia is subject to both the impacts of wet weather events and sea level rise, leading to problems with collection system capacity and backflow and flooding.

Should authorities be defensive about suggestions to adapt plan?

No. GCCW explicitly allows for Adaptive Management. An adaptive management strategy is supposed to respond to changing conditions or a changing understanding about existing conditions. It is defined by the Congressional Research Service as: “...the process of incorporating new scientific and programmatic information into the implementation of a project or plan to ensure that the goals of the activity are being reached efficiently. It promotes flexible decision-making to modify existing activities or create new activities if new circumstances arise (e.g., new scientific information) or if projects are not meeting their goals. The complex and dynamic nature of ecosystems makes their restoration and management amenable to an adaptive management approach, and the concept is being implemented at scales that include entire regions or river basins.”³³

Adapting a management plan is not an admission of failure it is just part of making good plans better. In fact, PWD has recently announced a study to build a flood relief tunnel in East Germantown that was not included in the original GCCW plan. We will need more of such positive developments.

Do concerns about GCCW’s ability to achieve desired water quality equate to criticism of green infrastructure?

Unfortunately, there is now a spreading misunderstanding that evaluating the effectiveness of GCCW equates to a dismissal of green infrastructure. This is not the case — green infrastructure is a very effective way to contribute to a long term CSO control plan via capture of stormwater in order to reduce the total volume of combined sewage. However, because of the tremendous volume of stormwater involved, especially considering future stormwater projections, current GCCW GI targets will not capture enough stormwater to prevent combined sewage flooding and overflows on a regular basis. For this reason, the existing and planned GSI in the GCCW plan must be complemented and adapted with traditional infrastructure projects, as well as GSI, to achieve the public health and water quality outcomes that the residents of Philadelphia deserve.

What are the implications for Philadelphia and its residents if no changes are made to complement the GCCW plan until its conclusion 12 years from now (probably followed by several years for evaluation)?

As it is now reasonable to project, as PWD’s own Climate Resilient Planning Guide suggests, that the GCCW plan will not result in sufficient capture of stormwater to prevent billions of gallons of raw sewage overflows into the Delaware and its tributaries. Philadelphia should not wait until 2036 to adapt the plan accordingly.

A window of opportunity still exists to access substantial federal infrastructure monies, both grants and low interest loans, to address wastewater issues. This opportunity may well no longer exist in 2036, when the city will surely be forced to develop a whole new LTCP. Moreover, inflation will only render the improvements more costly in the future.

What's at stake?

- Valuable years of planning and design for longer term improvements will be lost. The ability to implement immediate actions to reduce raw sewage overflow mixed with stormwater will be missed.
- Economic benefits from long-term, well-paying jobs will not be available.
- Residents will not have access to natural cool spots in a hot city, with a disproportionate number of people in overburdened areas impacted.

In the United States, major cities including Boston, Chicago, Washington, DC, and Portland, Ore., have either opened their rivers to swimmers or announced plans to build swimming infrastructure. The Baltimore Harbor and the Anacostia Rivers are changing from CSO polluted rivers into community assets, where swim events are sponsored in advance of pending opening of the Rivers when it is not raining.

In Conclusion

PWD should adapt or complement its GCCW plan to immediately increase its reliance on traditional infrastructure measures.

In the early design of the GCCW plan, a variety of methods (mostly not adopted) for significantly increasing throughput at PWD's three city waste-water treatment plants were considered, as were various more traditional large scale stormwater capture infrastructure options.

The most significant traditional sewage treatment projects that were included in the GCCW plan are projects intended to reduce raw sewage mixed with stormwater from flowing into the non-tidal Creeks that are designated for Primary Recreation Contact

There are incredibly valuable benefits from green infrastructure that should be aggressively pursued and other documents contain material recommending how to best move forward.³⁴

However:



1 There is simply not enough permeable surface in Philadelphia to capture the rainfall in current and climate related projections to meet water quality goals;³⁵



2 Today's rainfall from climate change is overpowering the ability of greened acres to protect water quality as demonstrated by PWD's annual reports to the PA Department of Environmental Protection showing the median volume of overflows between 2010 and 2022 was actually 1 billion gallons per year higher than the 2006 baseline, despite the GI efforts.

Our rivers and streams are amongst the most attractive natural spaces left in the city, especially attractive as a refuge from the heat of climate change. Yet, because of the increased rainfall the pollution levels from raw sewage mixed with stormwater flowing to the rivers and creeks will increase rather than decrease under GCCW.



Foot Notes

1. <https://water.phila.gov/reporting/ltcp/>
2. Philadelphia Water Department, (2022). Climate-Resilient Planning and Design Guidance p.5-19
3. PWD recommends that on-water recreation not take place during heavy rainfall or 24-48 hours afterwards.
4. Ibid, p. 4-8
5. Philadelphia Water Department, (2022). Climate-Resilient Planning and Design Guidance p. 5-20
6. EPA Draft Guidance for Future NPDES Permitting of Combined Sewer Systems p
7. Long Term Control Plan - [linked here](#)
8. Administrative order for Compliance on Consent (AOCC) - [linked here](#) – point #16
9. <https://water.phila.gov/green-city/>
10. University of MD Environmental Finance Center and TNC, Sustainable funding for Philadelphia’s GCCW Plan - [linked here](#)
11. Definitions of Primary and Secondary contact recreation – [linked here](#)
12. EPA Draft Guidance for Future NPDES Permitting of Combined Sewer Systems p 9
13. CSO actual overflow data from PWD annual reports to PA Dept of Environmental Protection –summary [linked here](#)
14. ibid
15. Philadelphia Water Department, (2022). Climate-Resilient Planning and Design Guidance p. 5-21
16. University of MD Environmental Finance Center and TNC, Sustainable funding for Philadelphia’s GCCW Plan
17. CCMUA – Camden County Municipal Utilities Authority; DELCORA- Delaware County Regional Water Control Authority
18. Water Center at Penn, Delaware River Bacteria Study p.42
19. Philadelphia Water Department, (2022). Climate-Resilient Planning and Design Guidance p. 5-19
20. Philadelphia Water Department, (2022). Climate-Resilient Planning and Design Guidance at 1-4. Retrieved from <https://water.phila.gov/pool/files/climate-resilient-guidance.pdf>
21. Ibid, p5-20
22. Ibid, Climate Change Adaptation Program - Additional Information and Resources AIR SHEET – Future Design Storms July
23. Philadelphia Water Department, (2022.) Climate-Resistant Planning and Design Guidance
24. National Pollutant Discharge Elimination System (NPDES)
25. Philadelphia Water Department, (2022). Climate-Resilient Planning and Design Guidance p5-20
26. MS4 –Municipal Separate Storm Sewer System Permit –linked here
27. EPA Draft Guidance for Future NPDES Permitting of Combined Sewer Systems p. 12
28. Philadelphia Water Department, (2022). Climate-Resilient Planning and Design Guidance p 5-20
29. Ibid, p.5-20 reference to Appendix C - (note to reader: Appendix C-3 has been removed from public view.)
30. WQBEL – Water Quality Based Effluent Limits
31. PWD Year 10 Evaluation and Adaptation Plan, p. 1-3
32. EPA Draft Guidance for Future NPDES Permitting of Combined Sewer Systems
33. Congressional Research Service Reports R41671. (2011). Retrieved from <https://crsreports.congress.gov/product/pdf/R/R41671>
34. University of MD Environmental Finance Center and TNC, Sustainable funding for Philadelphia’s GCCW Plan, [link](#)

35. As noted earlier, PWD's Climate-Resilience Design and Planning Guide states; "In Philadelphia Green Stormwater Infrastructure (GSI) design is highly constricted by space constraints due to the dense urban environment and underground utilities." Philadelphia Water Department, (2022). Climate-Resilient Planning and Design Guidance p. 5-21

Thanks to contributions from those [linked here](#)

Questions – direct to Tim Dillingham, Executive Director American Littoral Society- tim@littoralsociety.org

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