

# Clark County Comments on Preliminary Draft Permit Language

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## **S5.C.5.2. Stormwater Infrastructure Mapping**

### **S5.C.5.2.a.i. Mapping Discharge Points as Assets.**

The permit calls for mapping outfalls, connections and discharge points. These can be inventoried as abstract locations as GIS points where discharge or outfall functions occur or actual assets such as the end of a pipe or a bioretention facility. While we have mapped outfalls as discrete points, we have not mapped discharge points as more recently defined under the permit.

Clark County believes the permit should allow the mapping of assets that function as connections discharge points as an approach for mapping connections and discharge points. For example, a bioretention facility is equal to a discharge point.

Outfalls are already mapped, and in many cases coincide with the end of the conveyance system and not the point where county ownership ends. Clark County requests that the outfall mapping be allowed to remain as previously mapped and that new outfalls be mapped as required by the current permit.

The county asset management system explicitly describes facility type in a way that makes it possible to inventory all discharge points to groundwater as infiltration facilities without adding an abstract GIS discharge point to groundwater. Mapping assets should be adequate to meet the permit requirement to map discharge points.

### **S5.C.2.a.ii. Mapping Receiving Waters**

Ecology states this requirement is in the permit because federal regulations require it. The guidance also states that Ecology will work to associate NHD reach with mapped outfalls, recognizing there are nation level hydrologic reach maps. At the time the original federal phase I language was written, there were no national GIS maps of receiving water reaches, so it probably made sense require permittees to map them as part of the MS4 inventory process. But now, there are detailed electronic water body maps at the state and federal level, making a permittee by permittee receiving water mapping an exercise in collecting non-comparable data that is redundant with national standards. In some cases, Clark County has added small streams and human altered natural water bodies that are not part of regional hydrology data sets to the county stormwater infrastructure map GIS, but we do not map stream reaches already in state and national databases.

### **S5.C.2.b.ii. Rural Area Conveyance Mapping**

The guidance describes a phase I goal of mapping conveyance systems in rural areas. However, the draft permit language appears to state the mapping is completing S5.C.2.a.v. which limits mapping to urban and high density rural areas.

Clark County suggests that there is a far better return on investment by mapping known MS4 conveyance systems inside the UGAs regardless of nominal pipe diameter before embarking on rural ditch mapping.

Rural ditch systems, especially on local access roads, are very difficult to map because they are often non-engineered systems built as country roads since the late 1800s that start and stop depending on whether there needs to be an actual ditch. Asking phase I counties to map conveyance systems in the rural area is also inconsistent with phase II permit requirements where only urban areas are mapped.

Another problem with ditch mapping is that almost all of them are over 24 inches in diameter, making them subject to mapping.

### **Permanent Stormwater Facilities Defined**

This definition of “Stormwater Facility” from the 2014 SWMMWW is the way Clark County has used the term “stormwater facility” under each NPDES permit since 1999:

A constructed component of a stormwater drainage system, designed or constructed to perform a particular function, or multiple functions. Stormwater facilities include, but are not limited to, pipes, swales, ditches, culverts, street gutters, detention ponds, retention ponds, constructed wetlands, infiltration devices, catch basins, oil/water separators, and biofiltration swales.

Note that all of the features in that definition are permanent.

The definition of a stormwater facility that describes treatment and flow control, including LID BMPs required to be mapped is important in because this inventory must be inspected and maintained under S5.C.9. The definition of a mapped stormwater facility should not include non-engineered BMPs built for projects that only trigger MR #1-#5.

### **The Term Connections is not Defined**

The term connections is not defined in the permit and could include features such as residential driveways and roof drains. It is included in the referenced guidance document.

### **Use of the Term Higher Density Rural Sub-basins**

The permit should limit conveyance mapping to the urban growth area as defined by the GMA instead of the higher density rural subwatersheds defined by the permit. The urban stormwater conveyance system features are determined by the urban area defined under the GMA and not sub-basin boundaries.

### **Mapping Standards**

Phase I counties have operated GIS systems since the late 1980s and have robust standards for data and will not be able to change it to meet permit guidance.

The use of Ecology guidance for GIS submittals for grant recipients is a good idea but should not be part of the NPDES permit.

### **S5.C.5.a. Stormwater Manual Revisions**

Ecology proposes a manual update deadline of about one year after the permit becomes effective. Considering there are no changes to the minimum requirements, Clark County suggests moving the manual update deadline to later in the permit. The later date will allow for a more thoughtful process to make manual revisions and editorial improvements considering that some of the manuals (such as Clark County's) go through a fairly lengthy public outreach, Growth Management Act review requirements, and county legislative process to become regulatory code. That process alone can take well over six months.

Manual revisions include ongoing process and technical updates that go beyond the Ecology manual changes and require significant effort to craft language and vet with the public, regulated community and county staff.

It would be reasonable to give permittees at least two years to manage manual updates.

#### **S5.C.5.a.iii. Five-Year Construction Deadline for Completed Applications**

The 2013 permit has a five-year deadline for projects with completed applications under any previous permit to begin construction and retain their design approval under the 2005 SWMMWW. Due to extended Ecology review periods for draft manuals, several phase I manuals were not adopted by the permit date of June 30, 2015. Extended Ecology review pushed Clark County's manual effective date to January 8, 2016, which would push the five year window to January 8, 2021.

### **S5.C.5.c. Planning for Stormwater Management and Stream Restoration**

Clark County will provide comments separately on this item.

## **S5.C.6. Structural Stormwater Controls**

### **Retrofit Points**

Clark County agrees with the concept of placing an environmental value on projects to the extent that it can be quantified in an objective way. We suggest simply calling the points retrofit points or structural stormwater control points, dropping the term incentive.

Clark County believes the points should be more closely tied to the standards of the SWMMWW in terms such as acres of impervious surface treated, or acres of residential subdivision treated.

Recognizing that we do not have sufficient data and resources to establish a uniform point value system for the diverse set of projects and activities used to satisfy S5.C.6., there should be a process to develop a point system using input from all permittees and the public.

#### **S5.C.6.a Project Types**

The permit has a list of project types. Clark County suggests minor edits to them and addition of stream channel projects:

- New Flow Control Facilities to address MR #7
- New Treatment Facilities to address MR #6
- Low Impact Development Facilities to address the LID Performance Standard
- Maintenance with capital construction costs greater than or equal to \$25,000
- Riparian area restoration including land acquisition for water quality and stream channel hydrology benefit
- Forest restoration or preservation including land acquisition for water quality and hydrologic benefit
- Floodplain reconnection for hydrologic and sediment reduction benefits
- Sweeping and line cleaning to remove sediment
- Channel restoration for hydrologic and sediment reduction benefits
- Fish barrier removals
- Wetland restoration (focus on headwater wetlands for hydrologic benefit)

### **Projects Outside the Permittee MS4**

The results of required phase I county watershed-scale planning make it clear that the goal of restoring designated uses was not possible or even partly possible without projects outside of the permitted MS4. The best example is riparian restoration projects needed to meet temperature standards.

Based on available science as presented in phase I county watershed-scale stormwater plans, it is apparent that the degree of MS4 retrofits needed to make a measurable improvement in stream hydrology is beyond the scope of permittees.

Clark County believes that retrofitting detention facilities to alter urban MS4 hydrology is largely a waste of resources because streams are still adjusting to urban hydrology and the added detention benefit to the environment compared to project cost provides a poor return on investment. It is impossible to restore forested hydrology in an urban area without spending prohibitively large sums of money that would be better spent on retrofitting the MS4 with treatment and LID BMPs.

Retrofitting urban MS4 for water quality by installing LID and filter BMPs may at least reduce the toxic effects of stormwater on stream biota.

Lower Columbia River Salmon Recovery Plan priorities for restoring and preserving salmon habitat push streams in developed or developing areas to the bottom of the list, leaving little or no grant funding for areas degraded by development. This leaves the burden on stormwater managers to promote restoration projects in the MS4 service area. Because of this and the uncertain science supporting the value of pipe system retrofitting, the permit should allow habitat restoration projects credit under the stormwater permit.

Within TMDLs, the practice of pollutant or waste load trading is considered an effective means to most efficiently manage limited resources to optimize environmental benefit. Following this line of thinking, permittee actions to improve stream conditions using projects outside of the MS4 should be allowed.

Any project inside or outside of the MS4 is addressing a past shortcoming in stormwater management as watersheds were altered from native vegetation to the current rural and urban setting.

Projects should demonstrate that a permit Appendix 1 minimum requirement is being addressed. For example, a stream channel wood debris placement could demonstrate that it provides a quantifiable amount of flood plain detention volume with an added and unquantified benefit of sediment reduction and improved stream hydrology.

Under municipal government policies, permittee capital programs may be limited to using revenue solely to meet permit requirements; in these cases, having the ability to receive permit credit for projects outside the MS4 promotes greater flexibility in project planning and effective use of local government revenue.

#### **S5.C.5.6.d. Performance Measures**

The performance measures of 1000 design and 300 points are arbitrary and do not consider the individual permittee's capacity and retrofit need. Seattle provides an in-depth analysis of this issue.

Also, Clark County understands the need for a performance measure but questions the fairness of a structural control program standard that does not consider the permitted MS4 size.

#### **Performance Measures Considerations**

##### ***Permit Area Population***

Permit requirements under S8 Monitoring define the level of pay-in based on population within the municipal permittee jurisdiction. This method should be considered for the SSC performance level.

A similar approach could be used to establish individual permittee targets for retrofit points. As a simple example, using the population data from the S8 monitoring preliminary draft language and the summary of retrofit points at the end of the SSC preliminary language, the average retrofit points per 1000 persons are about 3.5. Based on population, this would be about 770 points for Clark County and 2400 points for Seattle.

##### ***Current Level of Effort***

The method used to calculate the point thresholds does not reflect permittees current level of effort. A more appropriate approach would be to examine the permittee programs, which are currently compliant, to see what the point values would be and then use that information to inform a minimum performance level. Clark County's current program of 2013-2018 projects will generate about 300 points when completed. The total cost for these projects will be about \$9,000,000 and not include any sweeping or line cleaning work.

##### ***Time Range for 2022 Report Point Total***

The permit should define when a project is completed and counts under the 2019 permit. Projects often take several years to complete due to actions such as managing plantings. Permittees need to know in the preliminary language when a project is considered complete under the 2019 permit. Clark County suggests that projects be designated as completed at the time when the design function is met.

## **Appendix 11 Project Metrics**

If maximizing AKART is meeting SWMMW MRs # 5, 6, and 7 of Appendix 1, then all project performance metrics should be tied to project ability to be modeled in the WWHM and have a specified amount of land cover treated to a manual standard.

### ***Project metrics should consider placement along with site specific compliance with manual standards for flow control or treatment***

While the proposed point system awards projects meeting an Ecology-approved plan or permit driven plan a higher value, the system does not identify a means by which projects producing the greatest watershed improvement are planned and built.

## **Retrofit Points**

### ***The Benefit Ratio Concept Disincentives Retrofits***

Most retrofit projects are unable to fully control or treat runoff from the area draining to them because they are shoehorned into an existing urban landscape. It is not cost beneficial to purchase developed land for stormwater facilities. The benefit ratio, or the fraction of a drainage area fully treated by a retrofit project, is a disincentive to retrofits because it will reduce the point value of projects, and therefore increase cost to benefit in meeting the permit-required point level.

### ***Retrofit Incentive Factors Compound the Disincentive for Lower Benefit Ratio Projects***

Reducing the Retrofit Incentive Factors for retrofits with lower benefit ratios creates a further disincentive for these projects.

### ***Prioritize Projects Based on Environmental Benefit and Return on Investment***

Projects should be prioritized based on environmental benefit and return on investment as permittees currently do under the 2013 permit. However, in the absence of a method to uniformly quantify environmental benefit, it is reasonable to grade project value as individual projects based on a simple point system.

## **An Alternative to the Appendix 11 Point System for Projects Clearly Addressing an Appendix 1 Minimum Requirement**

Clark County suggests dropping the incentive point concept and replacing it with a simpler metric to measure level of effort and environmental benefit tied to the standards of the SWMMWW and Appendix 1.

### ***Flow Control Projects***

Projects to address MR #7 will receive credits as catchment acres controlled to the MR #7 requirement using the WWHM or equivalent model.

### ***Treatment Projects***

Projects will receive credits as catchment acres controlled to MR #6. Since this is retrofitting, any treatment level is adequate for credits, e.g. basic treatment for an area where enhanced would be required for new development. Projects such as treatment wetlands with live storage would also provide MR #7 credit.

### ***LID Projects***

LID projects, as defined to meet the LID performance measure (MR #5) have multiple benefits that are possible to define in the context of treatment (MR #6) and flow control (MR#7). In doing so, these projects will score high in retrofit points without a weighting factor. Also, they will receive points without fully treating a catchment.

### **An Alternative to the Appendix 11 Point System for Projects Not Clearly Addressing an Appendix 1 Minimum Requirement**

#### ***Maintenance with Capital Construction Costs Greater Than or Equal to \$25,000***

Clark County agrees there should be some credit for these projects. Leave the credit as 0.25 times the facility catchment area as described in the preliminary draft language. In cases where older facilities are reconfigured, the points could be the lift provided by the reconfigured facility.

#### ***Property Acquisition***

Property acquisition should not be given a credit until something is done with the property. It can be included as an element of the other project types.

#### ***Riparian Acquisition and Restoration Projects***

Riparian restoration and acquisition projects have important benefits to small, subwatershed-scale streams in the near-term by providing shade and treatment buffer. They also have longer-term influence on stream hydrology, if they are allowed to remain in their natural state, which includes contributing wood debris that stabilizes stream channels.

Riparian projects should receive credits for each acre restored or protected. The actual benefits can be far greater if the restoration is removing a landscaped or agricultural land cover, to provide treatment and flow control. But for now, a simple metric of acres preserved or restored should be tried.

#### ***Forest Restoration and Acquisition Projects***

Forest restoration projects are valuable for counties because they have programs to acquire and maintain open spaces. These programs should get credit for acres protected or restored to forest.

#### ***Floodplain Reconnection and Channel Projects to Create Flood Plain Storage***

Flood plain reconnection and channel restoration projects can provide sediment removal (or bank erosion prevention) and detention volumes while at the same time restoring stream dynamics. Conceptually, projects may be credited for detention volume. Hydraulic analysis will estimate detention volume for projects at a specified flow rate such as ½ of the 2-year existing flow. The calculated detention volume can then be compared to an engineered MR #7 pond area. Calculate the detention volume of the channel/flood plain project, define the land cover proportions for the area draining to the project, then calculate the area that the channel project detention volume would control to MR #7.

These projects should be allowed where stormwater runoff from the MS4 is a main source of storm flows.

### ***Street Sweeping and Pipe Cleaning***

Maintenance projects that remove sediment are difficult to compare to area provided basic treatment. Perhaps a minimum number of sweeping events is required to qualify an area as treated to MR #6.

Alternatively, permittees should track the volume or weight of sweepings and convert that into a load reduction equivalent to a basic treatment BMP.

### ***Watershed Planning Credits***

Clark County believes that watershed planning efforts should be counted as part of the SSC program. This could be a simple cost-based metric that credits planning efforts based expenses using the cost for a comparable area treated to basic treatment.

### ***Fish Barrier Removal***

Fish barriers are common on streams in urban and urbanizing areas served by MS4s. The permit could credit reaches made available to fish by barrier removals using a simple metric tied to the stream channel length suitable for fish use and its intact riparian areas. The credit for barrier removals could be the acres of riparian area along perennial stream reaches where fish access is restored.

### ***Wetland Restoration***

The draft SSC description states that wetland restoration projects will only count if the project creates a treatment wetland from a degraded wetland. In practice, these projects have been difficult due to wetland mitigation requirements. Clark County is considering several wetland restoration projects that will produce hydrologic improvements as well as other environmental benefits. It is possible such projects could be classified as a riparian area restoration and/or flow control retrofit.

### ***Retrofit Points for Implementing Existing Plans***

Additional weight should be given to projects that address a known problem defined by the permittee, Ecology or other resource protection program. In the case of Clark County, we have detailed stream assessments in the urban area and salmon recovery plans that identify limiting factors in some urban area streams that can be addressed by capital projects.

One Clark County stream, Salmon Creek, has a TMDL for turbidity. Projects that reduce sediment to Salmon Creek should get points based on a multiplier.

Salmon Recovery Plans may provide specific information that can guide projects to reaches or streams where there may be the most benefit to fish.

### ***Use of TSS Removal as a Metric***

Clark County agrees with dropping the use of TSS as a performance metric because the manual design criteria for defining the area treated using the WWHM is a defensible alternative.

### ***Hard Surface Removal Projects***

The permit should allow projects that replace impervious surface with vegetation or permeable pavement. Quantify them as LID BMPs.



## **Retrofit Points for Multiple Project Types**

Clark County agrees with the concept of awarding project points for each of the measures met. For example a project designed under the SWMMWW that infiltrates 100 percent of the runoff from an impervious surface should get credit for meeting the LID performance standard, MR #6 and MR #7.

## **S5.C.7. Source Controls**

### **S5.C.7.b. i. Structural Source Controls Element**

In the third paragraph's second sentence the permit states:

*“Structural source control BMPs shall be required for pollutant generating sources if operational source control BMPs do not prevent illicit discharges or violations of surface water, ground water, or sediment management standards because of inadequate stormwater controls.”*

It's clearly within the requirements of the permit to require structural source controls to remove an illicit discharge. Our most common example is covering work areas. However, is it appropriate to include language here addressing an action that would be taken pursuant to an S4.F. notification? Any significant groundwater contamination on county ROW would trigger a clean up investigation and address the source.

Clark County suggests dropping the reference to water quality, ground water and sediment standards.

### **S5.C.7.b.iii.(1) Information to PPGs**

While not part of the preliminary language, Clark County suggests that Ecology drop the requirement to provide information to all PPGs because providing a stormwater message to a divers business audience should be part of the outreach program under S5.C.10. Accurate contact information for businesses is very difficult to maintain, making it difficult to contact businesses without a site visit.

## **S5.C.8. IDDE**

### **S5.C.8.b. Regulations**

Clark County recommends making no changes.

### **S5.C.8.c. i. Outfall Screening**

IDDE screening of outfalls is not a good return on investment. Illicit discharges are identified by site visits to potential pollutant generators. There needs to be a screening requirement, but the permit should define the activities that constitute a conveyance system screening to include inspection visits to PPGs in the conveyance systems. The permit should clearly state that source control work under S5.C.7. may be used to meet the conveyance screening requirement.

## **S5.C.10 Education and Outreach**

Clark County believes that informing and involving the public is critical to addressing stormwater pollution in the MS4 and raising awareness about the value of local streams and rivers.

Much of the work being performed on a regional basis is by a well-funded group of professionals in the Puget Sound region. In the SW Washington region or lower Columbia River/Northern Willamette Valley region, where permits are largely implemented by the eight public works departments of medium to small phase II permittees and Clark County, there is ongoing coordination but no regional program comparable to that of the Puget Sound region. Something like the Puget Sound Storm regional program would need to be built during the permit term to include shared programs that could be evaluated on a regional basis rather than by individual permittees.

### **S5.10.b.ii. BMPs**

The list of bulleted items includes a mix of activities that need BMPs and areas of BMPs.

### **S5.C.10.b, c, and d. Evaluation, Implementation and report.**

The requirement for each permittee to perform an evaluation of a behavior change program element's effectiveness should be replaced by a program at Storm or Ecology to perform high-quality evaluations of ongoing programs that can support improved regional messages. Permittees have contributed large amounts to fund effectiveness studies under S8.C. The S5.C.10.c requirement to implement a particular program should be optional and the S5.C.10. d. report not required.

## **S8 Monitoring**

### **S8.A. Other Stormwater Studies**

Clark County suggests this requirement should not be in the permit and instead be managed as a request for information.

If the intended benefit of this section is to make available information from studies that found a better way to perform a permit requirement or found that a permit requirement should be revised to improve performance, then this information should be brought to Ecology's attention during the period when permit language is drafted.

The requirement to summarize information reported to the permittee should be removed because reported information is not from a study performed for the permittee or in a permit-certified report. In addition, there are no criteria to identify useful and valid reported information, leaving the permittee to wonder if reported information should be summarized.

### **S8.B.3. Status and Trends Monitoring in SW Washington**

The preliminary draft language is not what was agreed to by Ecology and the HSTM development program managed by the Lower Columbia Fish Recovery Board under three Ecology grants. That multi-year public involvement process agreed that Clark County would complete the status and trends monitoring as a contractor to Ecology. Under the HSTM plan, each SW Washington permittee including

Clark County, would meet its S8.B. permit requirement by making a payment to Ecology to fund the Ecology contract with Clark County.

If the permit ultimately does require Clark County to complete the QAPP and conduct the monitoring, the permit language must provide latitude for deviating from the QAPP due to unforeseen circumstances and to make revisions to the QAPP as the program develops.

### **SW Washington Program Separate**

The permit status and trends monitoring requirements should have a separate section for Cowlitz and Clark County permittees. That would clarify that there is a separate program in the Northern Willamette Valley/Lower Columbia River region. Ecology could list the permittees who pay in to that program.

### **S8.B.3.i. QAPP**

Another concern is the vague language about timing for QAPP submittals to Ecology.

The draft QAPP is not available at the time preliminary permit language is released for review.

This section is confusing. Why does Clark County need to submit a final HSTM to Ecology by the end of October 2019? The Stillwater HSTM QAPP had the final QAPP completed during the first year of the project as the sites are finalized and monitoring stations built. This would mean completing the QAPP during water year 2020, beginning on October 1, 2019 and ending on September 30, 2020, leaving the final QAPP submittal to late 2020 or early 2021. Our expectation is that Clark County will complete the final QAPP using the Ecology draft and then submit the final QAPP after the project sites and instrumentation have been finalized.

It is difficult to comment on the monitoring program without the Ecology draft QAPP. Clark County is concerned that Ecology is developing this QAPP in a vacuum. Clark County is responsible for the final QAPP, which is presumed to be based on the Stillwater draft HSTM QAPP. We understand that Ecology now wants to structure the SW WA QAPP similar to the Puget Sound program. Following the Puget Sound approach was the local permittee stakeholder group's original position on the SW Washington stream monitoring. The SW WA permittees proposed making the project a census of the smaller area instead of a random sample of the larger Puget Sound Lowlands.

Clark County believes the best approach to implementing the monitoring program is to begin work under the draft QAPP in water year 2019 and use this time to finalize the QAPP for the 2019 permit. This would provide data to better estimate of the costs to implement the program based on one year of field work. This would allow Clark County to discontinue expensive, time consuming and low-value stormwater monitoring after the expiration of the 2013 permit in July 2018. It would also shift some of the project development expenses from phase II permittees to Clark County by beginning the work under the 2013 permit.

### **S8.C.1. Data Submittals for Ecology Studies**

The requirement to provide records sounds reasonable, but may cause permittees a large work effort. It is difficult to comment without a specific description of the records to be requested.

Who will request the records? Would a permittee be required to generate reports at the request of a contractor?

The records requests from consultants doing projects during the 2013 permit went beyond simple document requests and would have required a large amount of unscheduled work to supply in a short period of time.

Project QAPPs should verify the availability of needed records before the project begins.

The permit should specify the information to be recorded so that each permittee collects the data and builds it into its stormwater program budget, or leave reporting voluntary.

## Definitions

### Stormwater Facility

This definition of “Stormwater Facility” from the 2014 SWMMWW is the way Clark County has used the term “stormwater facility” under each NPDES permit since 1999:

A constructed component of a stormwater drainage system, designed or constructed to perform a particular function, or multiple functions. Stormwater facilities include, but are not limited to, pipes, swales, ditches, culverts, street gutters, detention ponds, retention ponds, constructed wetlands, infiltration devices, catch basins, oil/water separators, and biofiltration swales.

Note that all of the features in that definition are “permanent stormwater facilities”.

The definition of a permanent stormwater facility should exclude LID BMPs built for projects only triggering MR #1-#5 and not owned or operated by the permittee. This would include roof downspout systems, rain gardens and permeable pavement.

## Appendix 7 Erosion Control Preconstruction Site Inspection Criteria

There is definitely a need for a preconstruction site inspection. This system seems a bit to elaborate for small projects. The system should exempt completing the forms for sites draining to a pre-existing basic treatment BMP and projects only triggering MR #1-#5.

## Appendix 9 Stormwater Monitoring Requirements

Clark County suggests a change to drop the stormwater grab sample testing. We found the data of little value for the permit objectives to calculate loads and observe water quality trends.

In general, status and trend monitoring using stormwater discharged from the MS4 should be evaluated using current scientific literature to consider changes that make the data gathering easier and more meaningful. It is time to consider whether the monitoring goals are best met by the permit’s approach to collect comparable samples from specific types of storm events. This approach was developed nearly

40 years ago to meet a national need to understand stormwater pollution. Issues that confound getting a permit-acceptable sample such as the number of aliquots, intra-storm dry periods and minimum rainfall (versus actual flow) should be considered if stormwater sampling is a requirement. Simplification and use of metered parameters such as turbidity should also be considered.

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