

SAFE CLEAN WATER PROGRAM SCIENTIFIC STUDY PROPOSAL QUESTIONNAIRE

1. Proposal identification information and summary of the project goals.

Title: **Identifying Best Practices for Maintaining Stormwater Drywell**

Capacity

Proposing Organization: **California State Polytechnic University, Pomona**

Your summary of the Project Goals and Objectives:

The reviewers were extensively in agreement that the goal of the proposed study purportedly is to evaluate various drywell designs and their infiltration rates, to evaluate pre-treatment practices, and evaluate drywell maintenance practices. Reviewers were in agreement that it further has as its goal the making of recommendations regarding the choice of drywell design and maintenance practices that can optimize drywell capacity and efficiency. The reviewers largely noted that the stated objectives further detail how drywell designs, pre-treatment methods, and maintenance practices will be assessed. The reviewers acknowledged that the objectives further take into account local land use and traffic volumes as well as the measurement of stormwater infiltration rates over a five-year period at drywell locations in each of the nine watershed areas. One reviewer notes that data obtained from a successful study of this type would be disseminated through various platforms including integrating the material learned in future engineering college courses.

2. Are the objectives clearly stated? What portion of the objectives need more clarification?

Three of the reviewers made known that the objectives were clearly stated. They assert through their statements that the objectives encompass assessing optimal choices in terms of cost and benefit for construction, pre-treatment, and drywell maintenance as well as determining the influence of soil characteristics on the design and maintenance of drywells. One reviewer asserted that the objectives were only moderately well stated noting that the protocol for dry well selection is well stated and that would allow for a comparison across construction types. However, this reviewer further states that the timing of a sampling and overall experimental design could be more clearly discussed. In addition, this reviewer notes that several objectives seem to be dependent on the degree of maintenance performed on each dry well. It should be understood that these dry wells are not managed by the proposer of the study. And so, this reviewer feels that the sampling will be somewhat ad hoc rather than accomplished at predetermined times with set intervals which would make it difficult to make direct comparisons between dry wells of differing construction types.

3. How do the project goals directly support a nexus to increasing stormwater or urban runoff capture and/or reducing stormwater or urban runoff pollution?

The reviewers were all in agreement that the proposed study is heavily focused on identifying effective drywells that maximize runoff capture. Derived from their various statements is the point that pre-treatment devices that are found to be attached to existing drywell installations will be studied for their effectiveness at removing trash and pollutants before infiltration of runoff, hence the link between runoff capture and water quality. One evaluator further notes that in some cases, street runoff capture with drywells in urban areas with limited right of way presents the only practical alternative making this a valuable study.

4. What is (are) the overarching technical approach element(s) of the proposed project as you understand them (not necessarily the same as the elements described in the proposal)?

The four reviewers were in agreement about the project in that it uses an evaluation design that is extensively empirical in nature while also benefitting from interview responses from local stakeholders who have had charge of the construction and maintenance of watersheds in the region. The reviewers have captured the supporting technical design element in which it is stated that the proposed study will benefit from a literature review as well that further informs the study about the effectiveness of drywells over time

5. Has the proposal provided sufficient information to describe the technical approach for each element? If not, what information is missing?

Two of the reviewers stated that it was strong in assessing water infiltration rates utilizing a model provided by Kindred and Reynolds. They state that the elements for studying well capacity are valid for this purpose and informative with respect to indicating the effectiveness of the types of drywells to be studied. It would be good to see the specific formulas used for measuring infiltration rates. Two reviewers note that there are problems with the information provided. One of them asks: What's missing? A valuable contribution to the endeavor of capturing stormwater runoff would be an evaluation of the quality of the water that is infiltrated via drywells to assess the safety of that water for subsequent well withdrawal and use. Loading of e-coli, fertilizers, pesticides, metals, and other pollutants besides sediments needs to be understood when infiltrating water into drywells and other ground recharge devices. Infiltrated water needs to be monitored in terms of specified standards from the EPA and/or the CA State Water Board. The case is made for the benefits of reducing trash and sediment pollution to local water bodies through the establishment of drywells with pre-treatment devices. However, there was no discussion on empirical testing of groundwater and pollutant loading of infiltrated stormwater. Also missing is a thorough discussion of how the pre-treatment devices would be studied as no criteria for studying them is proposed. Another reviewer states that the detail is lacking as to how infiltration rates will be measured and calculated using pressure transducers. Another reviewer notes that it is unclear who will be conducting the infiltration testing this reviewer states from reading the material that it will be done by Kindred Hydro incorporated, but their letter of support does not explicitly state that they will do so.

6. Is the technical approach sound? If not, what do you recommend should be done to improve the technical approach of the proposed project?

The reviewers were in large part unhappy with the technical approach noting a variety of aspects that seemed to be missing but would be required for carrying out a study of this kind. Planned assessment of infiltration rates is sound. No plan is mentioned for assessing pollutant loading or assessment of pre-treatment devices that are in use at the selected drywell sites. Pre-treatment of stormwater runoff is noted to be an aspect of many drywell BMPs, however, this component does not appear in the effectiveness evaluation of the drywells to be studied here. One reviewer further states that there are confounding variables in this study, for example, it will be difficult from this study to determine whether specific drywells are successful to the extent that they are due to environmental factors such as land use. The question also arises for this reviewer about the extent

to which the following variables impact the success of a drywell, such as that of clogging and concentration of bacteria, versus such design factors as wells with and without pre-treatment, maintenance schedules, and age of drywell. Another reviewer notes that documentation is an issue. This reviewer would like to know what that term really means, will documentation be digital data such as application-based photos, video, etc.? Also, it is noted that the approach to pretreatment methods is not discussed, and pretreatment efficacy needs to be addressed. Another reviewer notes that it would be good to see paired sampling to understand which factors play the greatest role in optimizing drywell performance.

7. How achievable are the study's stated technical objectives, especially within the proposed timeframe and budget?

Three of the reviewers believe that the study's technical objectives are achievable. The plan for studying optimal infiltration of drywells is achievable, certainly, they say. The plan to assess infiltration rates over a five-year period is long enough to detect change over time. The calculations and the equipment to be used for assessing flow and infiltration should certainly function well for assessing the drywell capacity they have indicated. One of these reviewers further states that the proposed budget indicates that the objectives are achievable and the indirect cost being negotiated at 47% works for this purpose. The budget, it is said, appears to be feasible for the proposed approach and the minor modifications that may be needed during study implementation. One of the reviewers is skeptical about whether the technical objectives are achievable. This reviewer notes that there was no cost breakdown by task. This reviewer notes that there is a 47% markup for indirect costs and beyond and that it's not clear how this budget is being allocated.

8. What are the greatest technical risks that you foresee the proposing agency facing when implementing the project?

Technical risks stated by three of the four reviewers relate to whether the best locations are included in the study for evaluating drywell capacity. The process for selecting drywells is affected by traffic density and other variables that could prevent valuable information from being obtained from drywells at vital locations. One reviewer further states that there are issues with separating out confounding predictor variables in this study. Permitting challenges, getting sufficient water from nearby sources such as fire hydrants to test infiltration rates count among the challenges noted by one reviewer. Some inconvenience to residents and motorists would be incurred when fire hydrants are opened to run water which could lead to temporary street flooding says this reviewer.

9. Please describe the linkages between the project's technical objectives and the types of decisions that stormwater managers will make based on the project's outcome(s)? Will the technical achievements provide stormwater managers useful linkages that extend beyond this study?

The four reviewers agreed that the data gathered, plus the review of the literature and the sharing of experiences by stakeholders will point to improving best practices for sure with respect to construction and maintenance of drywells. This study should lead to better decisions regarding types of drywells to construct that are efficient and sensible in terms of management and maintenance they say. One reviewer also states that enhancing knowledge about pre-treatment and maintenance requirements will help with long-term planning and pollutant load reduction.

Another reviewer further states that the professional development of civil engineers and the further incorporation of stormwater engineering in the curriculum at universities will be an added benefit.

10. Please provide any additional technical perspectives you would like to share.

One reviewer did not add information. The remaining reviewers presented a diversity of added comments. One stated that evaluation of pollutant loading after pre-treatment of stormwater runoff needs to be more carefully integrated into effectiveness studies of drywells. The assessment of pretreatment of urban stormwater runoff is obligatory when assessing the overall effectiveness of drywell infiltration devices says this reviewer. One reviewer states that information learned from such a study should be made available on the web since this information is very much needed. This writer further states that an update of the drywell design fact sheet in the County LID manual would be helpful. This writer and another further state the importance of this information for curriculum and stormwater engineering students. Another reviewer states that the use of drywells in limited space areas is ideal if the conditions are right. By adding additional knowledge to design requirements and needed conditions, more optimal uses of drywells could be obtained. Additionally, understanding pretreatment is an important part of promoting efficiency as well as the long-term health of a drywell system, says this reviewer. In the study, says another reviewer, it should be noted how pretreatment efficacy is being defined. The costs are not well explained. For this reviewer, the question comes up as to whether the life cycle costs of the pretreatment device along with costs associated with the drywell implementation are clearly defined.

11. Please answer each of the following questions by selecting one of the following five answer choices: *Excellent, Very good, Adequate, Inadequate or Not applicable because of insufficient information.* Please add an explanation to accompany your answer choice (or refer to the question number above for appropriate context and rationale):

- a. How well do the proposal objectives address the County's goals of increasing stormwater or urban runoff capture and/or reducing stormwater or urban runoff pollution?

One reviewer assesses the objective of satisfying County goals as 'excellent'. The other three reviewers assessed this variable as 'Very good' for increasing capacity while reducing trash and sediment contaminants that would otherwise form part of community stormwater runoff. One of these reviewers stated that the project provides detailed design specifications and maintenance recommendations for drywells. It is further stated that adjustments to cleaning schedules and construction techniques when made, could potentially inform the rest of the country.

- b. How well do you think the technical approaches will achieve the study objectives and stated outcomes?

Three of the reviewers responded 'very good' to this question. They are all cognizant of the point that the technical approaches will lead to a greater understanding of how to optimize drywell capacity as well as make better choices regarding their design and maintenance. Another evaluator cautions that there is a minor risk of some gaps remaining but since this is the first study of its kind, this is something to be expected.

One evaluator rated the study as “adequate” with regard to how well the technical approaches will address the stated outcomes and objectives of the study.

- c. Technical experience and qualifications of the study team?

Two reviewers rated the qualifications of the study team as ‘Excellent’. The team is highly qualified with university academics they say. They further state that the team will also benefit from relationships with qualified storm drain managers in the involved municipalities who will provide their professional input that is based on experience with the construction and maintenance of the devices. Also, trained university students will assist with gathering the needed data. One reviewer notes that the principal investigator has the necessary background to complete this study. Two reviewers rated the study team with the term ‘not applicable’. One of them states that their technical experience and qualifications are not provided. Another states that while the institution is very well established in the field of engineering, the study team itself cannot be wholly analyzed from the information provided.