APPENDIX 4-A

Description and Rationale
Metrics Used to Assess Stormwater Management Benefits

Introduction

The quantitative metrics used to score identified stormwater projects and Focus Areas have been selected to measure the needs and opportunities presented by the Planning Watershed under consideration, and (for projects) the ability to achieve benefits within the four categories identified by the 2015 *Guidelines* (Water Quality, Water Supply, Flood Management, and Environment). The fifth benefit category, Community, is rated only with nonquantifiable metrics, given the qualitative nature of its criteria.

Application to identified projects

Projects must meet the basic criterion for that category to be considered under the subsidiary criteria. For each category, the basic criterion is as follows:

- Water Quality: must remove pollutants from stormwater or dry weather runoff via chemical, physical, and/or biological processes
- Water Supply: must reduce net municipal or agricultural consumption through direct reuse or aquifer recharge of stormwater runoff
- Flood Management: must reduce runoff rates or volumes of stormwater runoff
- Environment: must restore/protect watershed and/or ecological processes impacted by stormwater or dry weather runoff

These articulate the underlying intent of a stormwater resource plan—to identify projects and programs that preserve, restore, or enhance watershed processes to yield a broad suite of water quality benefits and support beneficial uses.

All proposed projects are assumed to meet the fundamental requirements of all stormwater resource plans (namely, address stormwater or dry-weather flows and achieve more than one main benefit). The projects are also assumed to be feasible given site requirements for the identified project type. Following this screening, project benefits are quantified for each of the benefit categories through the evaluation and scoring of four to six metrics, whose maximum values sum to 10 for each category. These metrics were selected to be measurable for projects at a relatively early stage of siting and design, and which collectively address the importance of the problem(s) being addressed and the potential effectiveness of the project to address them. Scores are either assigned on a "yes/no" basis (i.e., full value or 0 value, denoted in the list below as 1/0, 2/0, etc.) or as a proportional variable that can range continuously from 0 to its maximum value (denoted by 0→1, 0→2, etc.).

The total score for each benefit category (0 to 10 for each) is multiplied by a weighting factor that has been assigned by the Technical Advisory Group, reflecting the locally determined relative importance of each category. These weightings total 100%, and so the sum of the weighted benefit-category scores is a final value for project, based on its quantified metrics, that can range from 0 to 10.

Application to Focus Area identification

A subset of the project-related criteria, as described in Chapter 4, are also used to score the stormwater opportunities and needs of individual Planning Watersheds, also as segregated by the four benefit categories. The rationale for each individual metric's inclusion for this application is the same as articulated below for project scoring.

Metrics and Rationale by Benefit Category (project-only metrics in brown font)

Water Quality

- Uses treatment of the 85% 24-hr storm (2/0): Treatment of the 85% 2-hour storm is a standard criterion for many stormwater regulations, nationwide, and is specified for NPDES MS4 permits throughout California's Central Coast, including San Luis Obispo County. The exact volume varies by location, but within the County it commonly includes about 60% of the total annual rainfall.
- Uses treatment of the 95% 24-hr storm volume from the contributing catchment for design (1/0): Meeting this higher standard of treatment volume, beyond that required by most existing regulations, increases the captured volume by about one-third (thus the chosen point value).
- Treats dry-weather flows (1/0): Improvements to dry-weather flows are likely to have a disproportionate benefit on downstream receiving waters, which are likely flowing at lower rates during periods of no rain.
- Sensitive downstream receiving water (WMZs 1, 2, 3, 5, 6, 8, or 9) (2/0): In this context, a "sensitive" receiving water is either a stream or a wetland, where impacts to water quality are likely to be more significant than to higher-volume rivers or nearshore receiving waters.
- Treats specific TMDL or 303(d)-listed pollutants in downstream receiving water (2/0): Where an identified water-quality impairment already exists, projects that help to reduce the loading are presumably more valuable.
- Located in high TELR-predicted pollutant loading catchment (0→2): The net benefit of a project is a function not only of its effectiveness but also the magnitude of the problem it is addressing. Because direct monitoring of the inflow is virtually never available, the TELR-predicted loading of Total Suspended Solids is used as a surrogate measure of the likely relative loading of all pollutants. The scoring for this is scaled, with "0" for the catchment with lowest loading, County-wide (= 0 tons/acre/yr), and "1" for that with the highest loading (662 tons/acre/yr). Loadings in all other catchments are assigned their scores as continuous proportions between these two extremes.

Water Supply

- Designed to infiltrate or otherwise reuse water (1/0): This is a fundamental requirement of this category; it is likely to be achieved by virtually all projects.
- Projected quantity of water infiltrated or otherwise reused (0→3): As a complement to the prior metric, this can only be determined by those projects that have proceeded sufficiently far in design to calculate this metric. Lacking any broadly accepted standards for how much infiltrated water is "enough," this metric is scaled from the smallest (0; no additional points) to the largest (33 acre-ft/yr; 3 additional points) facilities identified in the current round of projects for this plan.
- Overlies infiltration-favorable WMZ (WMZs 1, 2, 4, 5, 8) (2/0): These areas are most likely to provide suitable sites for infiltration, the most likely approach to improving water supply from stormwater management SCMs.
- In current supply-limited area (scaled, ground subsidence from 0 to maximum value) (0→3): Existing areas of recognized groundwater overdraft represent a key criterion for developing new supplies (and/or reduced consumption). As a consistent, previously compiled metric throughout San Luis Obispo County, the magnitude of ground subsidence is used as a measure of non-equilibrium groundwater pumping. The scoring for this is scaled, with "0" for the catchment with lowest identified subsidence (i.e., 0), County-wide, and "3" for that with the highest subsidence (2.5 feet). Reported subsidence in all other catchments are assigned their scores as continuous proportions between these two extremes. Planning Watersheds overlying the three identified groundwater basins of critical overdraft in the County (Los Osos Valley, Cuyama Valley, Paso Robles Valley) (See Chapter 3) in whole or in part are also assigned the maximum value regardless of subsidence.
- In projected future supply-limited area (scaled, groundwater dependence index) (0→1): This element acknowledges the importance of anticipated future shortages in water supply based on groundwater availability, the source most directly affected by stormwater management. The scoring for this is scaled based on the groundwater dependent index (Howard and Merrifield 2010) associated with its Planning Watershed (scaled 0 to 1 for the minimum [0.3] to maximum [8.5] values, County-wide). Reported values in all other catchments are assigned their scores as continuous proportions between these two extremes. Planning Watersheds overlying the three identified groundwater basins of critical overdraft are also assigned the maximum value regardless of subsidence.

Flood Management

In our judgment, simplified modeling tools are too crude and inaccurate to credibly evaluate the "true" benefit of most stormwater projects on existing or projected flooding problems. The metrics therefore emphasize the presence of existing flood hazards, the effectiveness of the project relative to its contributing catchment area, and the overall magnitude of upstream runoff.

- Designed to infiltrate or otherwise detain water (1/0): Although other approaches can achieve flood-management objectives (e.g., a piped bypass system), the listed approaches are more likely to produce multiple benefits from stormwater management.
- Quantity of water infiltrated or otherwise detained, as determined by the facility volume (0→3): Not every identified project will be at a point in its design to quantify this benefit. Those that are receive a scaled score, with 0 for the lowest value (0 ac-ft/yr) and 3 for the highest value (25 ac-ft/yr) amongst all currently identified projects, County-wide, included in this Plan. Quantities for all other projects are assigned their scores as continuous proportions between these two extremes.
- Addresses existing flooding and/or sedimentation risks to public property and/or human health and safety (4/0): This is the key criterion for any flood-hazard reduction program or project—is there an existing problem that the project is targeting?
- TELR-predicted runoff in catchment (scaled, minimum to maximum runoff) (0→2): This scoring makes use of a readily available, objective measure of the relative significance of upstream runoff quantity. The scoring for this is scaled, with "0" for the catchment with lowest unit-area runoff quantity, County-wide (0.3 ft/yr), and "2" for that with the highest runoff quantity (5848 ft/yr). Quantities for all other projects are assigned their scores as continuous proportions between these two extremes.

Environment

- Designed to infiltrate the 85% 24-hr storm volume from the contributing catchment (2/0): In general, the loss of infiltration is the single most critical alteration of watershed processes accompanying the generation of stormwater runoff by human activity. Using this criterion follows the precedent of the other benefit categories to quantify the environmental benefits of restoring this watershed process.
- Creates/protects wetland, in-stream, or riparian habitat (0→2): Although not necessarily a component of projects that manage stormwater or dry-weather flows, any such action would increase the environmental benefits. This metric is scaled across a range of lengths/areas (depending on the type of project), whose limits are based on general experience with the range of such projects commonly implemented across the region. Amongst the current list of projects in this Plan, these values range from 0 to 1,050 feet for linear restoration projects, and 0 to 60 acres for the area-based restoration projects.
- Number of at-risk aquatic animal species (from EnviroAtlas) (0→2): EnviroAtlas (https://www.epa.gov/enviroatlas) provides a USEPA-compiled inventory of at-risk aquatic species at the spatial scale of Planning Watersheds, which allows a quantitative rating of the potential environmental benefits of successful stormwater management.

  The EnviroAtlas dataset includes analysis by NatureServe of species that are Imperiled (G1/G2)

or Listed under the U.S. Endangered Species Act (ESA) by 12-digit Hydrologic Units (HUCs). Results are provided for the total number of Aquatic Associated G1-G2/ESA species, the total number of Wetland Associated G1-G2/ESA species, the total number of Terrestrial Associated G1-G2/ESA species, and the total number of Unknown Habitat Association G1-G2/ESA species in each HUC12. EnviroAtlas (https://www.epa.gov/enviroatlas) allows the user to interact with a web-based, easy-to-use, mapping application to view and analyze multiple ecosystem services for the contiguous United States. The dataset is available as downloadable data (https://edg.epa.gov/data/Public/ORD/EnviroAtlas) or as an EnviroAtlas map service. Additional descriptive information about each attribute in this dataset can be found in its associated EnviroAtlas Fact Sheet (https://www.epa.gov/enviroatlas/enviroatlas-fact-sheets).

The scoring for this is scaled, with "0" for the catchments lacking any identified at-risk species, County-wide, and "2" for that with the highest number (5 species). Quantities in all other catchments are assigned their scores as continuous proportions between these two extremes.

- Length of identified critical steelhead habitat within catchment (0→3). As a critical, ESA-listed species with complete dependence on adequate streamflow and suitable habitat, impacts to this species is one of them most direct potential effects of multi-benefit stormwater management projects. The scoring for this is scaled, with "0" for the catchments lacking any identified habitat, County-wide, and "3" for that with the greatest length (over 27 miles, in Santa Rosa Creek). Quantities in all other catchments are assigned their scores as continuous proportions between these two extremes. The data are obtained from http://www.westcoast.fisheries.noaa.gov/maps_data/endangered_species_act_critical_habitat.html; Endangered Species Act Critical Habitat GIS shapefiles from NOAA West Coast Fisheries, as of March 2018.

- TELR-predicted runoff in catchment (scaled, minimum to maximum runoff) (0→1): As above, this readily available and objective measure of relative upstream runoff quantity should correlate with net environmental benefits. The scoring for this is scaled, with "0" for the catchment with lowest unit-area runoff quantity, County-wide (0.3 ft/yr), and "1" for that with the highest runoff quantity (5848 ft/yr). Quantities in all other catchments are assigned their scores as continuous proportions between these two extremes.

REFERENCES

Howard, J. & Merrifield, M. (2010). Mapping Groundwater Dependent Ecosystems in California. PLoS One, 5, e11249. http://dx.plos.org/10.1371/journal.pone.0011249.