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memorandum

date	April 27, 2018
to	Stephanie Gaines, County of San Diego
cc	
from	Alex Trahan, P.E., David Pohl, Ph.D., P.E., Lindsey Sheehan, P.E., ESA
subject	San Diego Stormwater Capture and Use Feasibility Study – Prioritization Analysis and Results

The County of San Diego, in coordination with a Technical Advisory Committee (TAC), is developing the San Diego Stormwater Capture and Use Feasibility Study (SWCFS) through a multi-step process designed to provide a regional analysis of the feasibility of planning, constructing, operating, and managing facilities that capture and use stormwater. The goals of the SWCFS include:

- Quantifying the range of stormwater that could be potentially captured and stored on public lands and used in the San Diego region;
- Identifying the opportunities and constraints for a range of stormwater capture and use examples for use as a management tool in the development and planning of similar projects; and,
- Prioritizing the potential stormwater use alternatives on a near-, mid-, and long-term timeline basis.

The quantification goal was achieved by first screening applicable public parcels using a set of criteria that is specific to each stormwater use alternative. This is a more refined analysis than was conducted for the San Diego Region Stormwater Resource Plan (SWRP) (ESA 2017a) by applying specific parcel screening criteria that accounted for site and technical constraints and modeling more of these sites for specific use alternatives. Eight stormwater use alternatives were identified during methods development. The methods to quantify the potential stormwater capture and use were developed and documented in the Analysis Methodology Technical Memorandum dated October 25, 2017 (ESA 2017c). The quantification results were then presented in the Modeling Approach and Results Technical Memorandum dated February 2018 (ESA 2018a)[1].

Example stormwater capture and use projects were analyzed for opportunities and constraints. The project examples were obtained from existing SWRP and Integrated Regional Watershed Management Plan (IRWMP) project lists and input from the TAC. These examples were developed to provide a tool for managers to evaluate what types of projects may be feasible for a parcel that is under consideration for a stormwater capture and reuse project. Informed by the parcel analysis, managers may use both the parcel analysis and the example projects to

[1] http://www.projectcleanwater.org/download/swcfs-analysis-results/

conduct a project specific and more detailed assessment of the opportunities and constraints for each individual parcel at a project-level, even if the parcel was not identified in this study. Example projects and the associated opportunities and constraints were developed and documented in the Analysis Methodology Technical Memorandum dated October 25, 2017 (ESA 2017c).

The third goal, prioritization of the stormwater use alternatives, is described in this memorandum and is achieved by first evaluating the alternatives based on a set of prioritization criteria, then identifying which alternatives should be considered for near-, mid- or long-term implementation. The prioritization concludes the eight-step model approach described in the Analysis Methodology Technical Memorandum (ESA 2017c), represented by steps seven and eight in **Figure 1**. Alternatives are assessed based a set of criteria, including the potential regional quantities of stormwater use, as developed in the process documented in previous memoranda (ESA 2017c, ESA 2018a). Prioritization is also based on the estimated range of cost per volume for each alternative, as presented in the Cost Analysis Technical Memorandum (ESA 2018b). The type and number of constraints that are "gates" for potential implementation, and the potential opportunities or "keys" to open these "gates", which were developed by the TAC, provide an additional basis for prioritization. The prioritization analysis concludes by identifying regional constraints to implementing stormwater capture and use, with the goal of being a tool to guide the region over time as those constraints are overcome. For example, current regulatory constraints on the use and discharge of recycled water to balance fluctuations in demand especially during wet periods when stormwater could be used to augment supply, could through negotiations with regulatory and resource agencies become an opportunity for existing treatment facilities to considered the use of stormwater and dry weather flows. Overcoming these constraints, or "gates", will allow some near- and potentially mid-term projects and alternatives to move forward toward implementation.

Section 1 of this memo presents the prioritization methods. Section 2 provides the results and conclusions of the analysis, and Section 3 discusses how the methodology could be applied to specific projects as they move toward design.

1.1 Overview of Prioritization Criteria

The method for prioritizing stormwater use alternatives is based on a set of evaluation criteria, for which quantitative or qualitative metrics were defined. The outcome of the prioritization process is the identification of the regional stormwater use alternatives that are likely to be implementable in the near-term and those that will need a longer-term time frame for implementation. This classification of the alternatives by feasible timeline can inform planning efforts on a program or project level. At the program level, alternatives that have a near-term feasible timeline may be more readily implemented and therefore have available resources directed toward the development and implementation of these more feasible near-term uses. Whereas, alternatives that need a longer-term period to address constraints may lead managers to focus available resources on addressing these constraints to move these uses into the nearer-term for development and implementation. On a project level, the prioritization process may be used during development to evaluate a project's constraints and opportunities and help define the project elements that may require additional assessment. The prioritization criteria, their metrics, and the method and source for developing those metrics are presented in **Table 1** and described in further detail in the following sections. The prioritization criteria include: 1) Potential Volume; 2) Cost per Volume; 3) Additional Benefits; and, 4) Constraints and Opportunities.

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Figure 1
Model Approach Steps

1. Prioritization Methods

This section presents the methods applied to prioritize the stormwater use alternatives. Eight alternatives have been identified, as listed in **Figure 2**.

	Eight Stormwater Use Alternatives	
A	Direct discharge to designated groundwater aquifers to be extracted for potable use	
B	Discharge to groundwater to reestablish natural hydrology and, by extension, to restore biological uses	
C	Irrigation to be used on-site or at nearby parks, golf courses, or recreational areas on public parcels	
D	Small scale on-site use for irrigation and other private use on private parcels	
E	Flow-through to sustain vegetation in natural treatment system (wetland treatment) and/or restoration sites	
F	Controlled discharge to waste water treatment plants for solids management during low flows	
G	Controlled discharge to waste water treatment plants for indirect potable use	
H	Controlled discharge to waste water treatment plants for recycled water use	

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Figure 2
Stormwater Use Alternatives

TABLE 1
STORMWATER USE ALTERNATIVE PRIORITIZATION CRITERIA AND METRICS

Criteria	Metrics	Quantification	Source(s)
Potential Volume	Acre-feet/year of stormwater used	- Volume ranges developed from modeled parcels for use alternatives. The range of volumes was based on more feasible parcels (low end of total volume) and potentially constrained sites (higher end of total volume). - Percent of parcels in each volume range for the two sets (more feasible and constrained) parcels for each use alternative identified - Number of parcels that make up the highest-percentage volume range	Analysis Methodology Technical Memorandum (ESA 2017c) Modeling Approach and Results Technical Memorandum dated February 2018 (ESA 2018a)
Cost	Cost in $/acre-foot	- Total cost including operations and maintenance over the project life divided by the total stormwater volume used over the project life - Cost of providing potable water from desalination as a cost benchmark for comparison	Cost Analysis Technical Memorandum Dated February 21, 2018 (ESA 2018b)
Additional Benefits	Number of additional benefits	- A numerical value is assigned for each of the SWRP benefit categories that can be achieved: Water Quality, Environment, Flood Management, and Community	SWRP (ESA 2017a)
Constraints and Opportunities	Qualitative assessment of the constraints and opportunities developed by TAC	- Informed by the Constraints and opportunities identified for each example project - Constraints and opportunities identified for each alternative	Modeling Approach and Results Technical Memorandum dated February 2018 (ESA 2018a) This technical memorandum (Attachment A)

The following sections discuss each of the criteria in further detail.

1.2 Potential Volume Prioritization Method

As summarized in Table 1, the “potential volume” criterion has a metric of acre-feet/year of stormwater used. In order to use this metric to assess alternatives for prioritization using an implementation timeline, the parcel volume, total potential regional volume, and associated feasibility of obtaining that total volume need to be considered. Parcel-level volumes were addressed using the percentage of parcels associated with modeled volumes in specified ranges. The total volume consideration was assessed through the number of feasible sites associated with those parcel volume ranges. The associated feasibility of obtaining these volumes was considered by weighing the more feasible sites more heavily than the potentially constrained sites.

Prioritization under this criterion is therefore based on total potential volume with higher priority given to higher volume ranges, and feasibility of obtaining these volumes with higher priority given to volumes associated with more feasible parcels. Therefore, those alternatives that have higher volumes that are associated with more feasible sites would be ranked for short-term implementation (higher priority). This approach is presented in more detail in the following discussion.

The potential capture and use volumes for public parcels in the San Diego region were calculated as part of the Modeling Approach and Results Technical Memorandum dated February 2018 (ESA 2018a). The prior work resulted in a range of volumes (per parcel) based on the application of screening criteria to the available public parcels. A first set of “more feasible” parcels were identified by applying initial screening criteria to the available public parcels to find those with fewer constraints. Using this set of more feasible parcels, volumes were determined using conceptual use alternatives to model and calculate volumes of stormwater and dry weather flow captured, stored, and used. A second, larger set of "potentially constrained" parcels were identified using a modified set of assumptions, and volumes were extrapolated from the modeled parcels. The second set of volumes represented a "higher-end" estimate of the number of parcels and the total regional volume. These two sets of parcel volumes are used in the potential volume criterion.

Table 2 presents the percentage of parcels that fall into three volume ranges (low, medium, and high) for each use alternative. The table is divided into two sections, the first showing the more feasible set of parcels and the second showing the potentially constrained set of parcels. These volume ranges were defined using the first and third quartile of the volumes of the modeled parcels (a subset of the more feasible parcels) for all alternatives. Parcels with volumes below the 25th percentile are identified as "low-volume", those between the 25th and 75th percentile are "medium-volume", and those above the 75th percentile are "high-volume". The highest percentage of parcels within the low, medium, and high volume ranges is shown in bold in Table 2 for each parcel set (more feasible and potentially constrained).

Using the percentage of parcels in each volume range for each parcel set, scores were assigned as shown in Table 2. For each use alternative, a scores of one, two, or three was assigned based on whether the highest percent of parcels (in bold in the table) fell into the low (1), medium (2), or high (3) volume range. A score was given for each of the two parcel sets. While the percent of parcels in a given category may be high, the actual number of feasible parcels may be quite limited, so it is necessary to consider the total regional volume associated with each use alternative. Total regional volume was addressed by proxy using the actual number of parcels associated with the (bold) percentage leading to the first element of this score. Alternatives with five or fewer more feasible parcels scored low (1), those with up to 10 feasible parcels scored medium (2) and those with more than ten feasible parcels scored high (3). Note that this was only applied for the more feasible parcels. This additional scoring therefore accounts for some alternatives that may rank high based on the percentage of sites that are within the high parcel based volume category, but have much fewer actual sites that generate this volume compared to other alternatives. Finally, in order to incorporate the feasibility of obtaining these volumes, volume scores for the more feasible parcels were weighted by applying a factor of 2 (multiplying the score by 2). The total score was then determined by adding the scores from each of the steps. This method is illustrated in the following example.

As an example, consider Alternative B (Infiltration for Hydrology). As presented in **Table 2,** 67% of the more feasible parcels for Alternative B are in the medium-volume category (between the 25th and 75th percentile of volumes modeled for all alternatives). This earns Alternative B a score of two for each of the parcel sets. The 67% of more feasible parcels accounts for 28 parcels, which is in the high category, earning Alternative B a score of three. The volume score for more feasible parcels is doubled for four points, leading to a total potential volume score of nine points (2 + 4 + 3 = 9).

Table 2 provides the total scoring for prioritization under the potential volume criterion. The total scores presented in Table 2 will be used with the scores from the other criteria to prioritize the alternatives along a feasibility timeline reflecting each alternatives regional opportunities and constraints.

1.3 Cost Criterion Prioritization Method

As summarized in Table 1, the cost criterion has a metric of unit cost (in dollars per acre-foot) over the design life of the project under each alternative. The unit costs for public parcels in the San Diego region were calculated previously on a parcel basis, leading to a unit cost range for each alternative (ESA 2018b). To prioritize the use alternatives, the costs for each alternative's parcels were divided into two categories (high and low), defined based on the cost of desalination: $2,500 per acre-foot (SDCWA 2016, 2017). This represents an upper bound for managers considering alternative sources of water in the San Diego region, as above this cost, competition with other sources would reduce the feasibility of using stormwater to augment local water supplies. Thus, parcels with unit costs less than that of desalination were deemed low-cost, and those above the desalination cost were deemed high-cost. As the parcel based costs vary, the approach to the prioritization for this criterion and metric is to use the percentage of feasible parcels that are within the low and high cost categories. The outcome of this cost criterion analysis is identifying the alternatives with a larger percentage of parcels in the low-cost category were given a higher priority for implementation (via a higher score) than those with fewer low-cost options. As unit cost represents a significant constraint in implementing price-competitive stormwater capture and use projects, this criterion was weighted more heavily than the other criteria.

It is important to note that cost per volume does not fully reflect the "added value" or cost "off-set" that can be provided by alternatives that achieve multiple benefits, like regulatory compliance. For example, green street projects under Alternative B are designed to improve water quality to meet regulatory goals, in addition to contributing to the water supply. Thus, while the cost per volume may appear high for a water supply project, the cost may become more feasible if the project provides additional benefits, like meeting regulatory requirements under stormwater permits. The added value of multiple benefits is address under the additional benefits criterion (Section 1.4).

Table 3 presents the method described for the cost criterion. The parcel-based costs used for this analysis were developed for the more feasible sites (parcels in the first set of volumes shown in Table 1) using the average of the two cost assumptions (ESA 2018b). separated into the two cost categories – above and below the $2,500/ac-ft threshold. The percentage of parcels in each category for each alternative are listed in Table 3. A score was then determined by subtracting the high-cost percent from the low-cost percentage and multiplying by ten. The result is a score between -10 (if all parcels are high-cost) to +10 (if all parcels are low-cost). The factor of 10 was selected for this criterion to capture the significant constraint cost can pose to the feasibility of an alternative or project that needs to compete with other sources of water supply to the region.

As an example, consider Alternative B (Infiltration for Hydrology). As presented in Table 3, 17.5% of feasible parcels for Alternative B cost less than $2,500/ac-ft and 82.5% cost more. The difference between low-cost and high-cost percentages is -0.65 (17.5% - 82.5% = -65%). Multiplying this by ten, the cost score for Alternative B is -6.5 points.

Table 3 provides the total scoring for prioritization under the cost criterion. These total scores will be used with the scores from the other criterion to prioritize the alternative along a feasibility timeline reflecting each alternatives regional opportunities and constraints.

TABLE 2
POTENTIAL VOLUME CRITERION - PRIORITIZATION BASIS OF ANALYSIS AND SCORING

Alternative	Percent of Parcels within each category More Feasible Parcels[1]						Percent of Parcels within each category Potentially Constrained Parcels[1]				
	Low-Volume	Medium-Volume	High-Volume	Volume Score (x2)[3]	Parcels in Category	Parcel Count Score[4]	Low-Volume	Medium-Volume	High-Volume	Volume Score[5]	Total Score for Prioritization
A (Infiltration to Groundwater Basin)	7%	**64%**	29%	*4*	8	*2*	2%	**90%**	8%	*2*	**8**
A (Injection to Groundwater Basin)	0%	33%	**67%**	*6*	2	*1*	4%	3%	**94%**	*3*	**10**
B (Infiltration for Hydrology)	28%	**67%**	5%	*4*	28	*3*	9%	**89%**	2%	*2*	**9**
C (Irrigation)	38%	**63%**	0%	*4*	10	*2*	8%	**91%**	1%	*2*	**8**
D (Private On-Site Use)	**100%**	0%	0%	*2*	30	*3*	**100%**	0%	0%	*1*	**6**
E (Use for Treatment Wetland)[6]	0%	**100%**	0%	*4*	25	*3*	0%	**100%**	0%	*2*	**9**
F (WWTP Solids Management)[2,6]	40%	**40%**	20%	*4*	2	*1*	0%	**100%**	0%	*2*	**7**
G (WWTP for Potable Use)[2]	40%	**40%**	20%	*4*	2	*1*	0%	**100%**	0%	*2*	**7**
H (WWTP for Recycled Use)[2]	40%	**40%**	20%	*4*	2	*1*	0%	**100%**	0%	*2*	**7**

50th and above the 75th percentile, respectively.

1. The percentage presents the percent of total modeled parcels that have parcel-level volumes with the volume categories of low, medium and high which represent the less than the 25th, between 25th
2. Alternatives F-H were combined in the quantification analysis due to similar capture and storage constraints.
3. The Volume Score for the more feasible parcels is given for the range (low for 1, medium for 2, or high for 3) with the highest percent of parcels. To account for higher feasibility, it is multiplied by 2.
4. The Parcel Count Score (only for more feasible parcels) is given based on the number of parcels in the winning Volume Score category (low, medium or high). One point for 5 or fewer, two points for 6-10, or three points for over 10.
5. The Volume Score for the potentially constrained parcels is given for the range (low for 1, medium for 2, or high for 3) with the highest percent of parcels.
6. Alternatives E and F include dry-weather flows in the capture and use volume calculations.

TABLE 3
COST CRITERION - PRIORITIZATION BASIS OF ANALYSIS AND SCORING

	Percent of All Parcels		
	Low-Cost[1]	High-Cost[1]	
Alternative	< $2,500/ac-ft.	> $2,500/ac-ft.	Score for Prioritization[3]
A (Infiltration to Groundwater Basin)	29% - 36% (32.5%)[2]	64% - 71% (67.5%)[2]	**-3.5**
A (Injection to Groundwater Basin)	33% - 67% (50%)[2]	33% - 67% (50%)[2]	**0**
B (Infiltration for Hydrology)	16% - 19% (17.5%)[2]	81% - 84% (82.5%)[2]	**-6.5**
C (Irrigation)	0%	100%	**-10**
D (Private On-Site Use)	100%	0%	**10**
E (Use for Treatment Wetland)	100%	0%	**10**
F (WWTP Solids Management)	20%	80%	**-6**
G (WWTP for Potable Use)	0%	100%	**-10**
H (WWTP for Recycled Use)	0%	100%	**-10**

1. Costs are parcel-based using the more feasible set of parcels and represent a range of potential costs for each alternative
2. Average of range of costs
3. \ The Cost Score is determined by taking (Low-Cost percentage) minus the (High-Cost percentage) and multiplying by 10.

1.4 Additional Benefits Criterion Prioritization Method

As summarized in Table 1, the additional benefits criterion identifies benefits beyond water supply that are generally provided under each alternative. Projects that provide multiple benefits may be prioritized above those with fewer benefits. The San Diego Region Stormwater Resource Plan (SWRP) identified five primary project benefits that are used to score projects for regional prioritization and funding: water quality, water supply, flood management, environment, and community (ESA 2017a). Projects designed for stormwater capture and use are focused on water supply benefits, but may also provide additional benefits in the other four categories. Additional benefits that generally apply to each use alternative were identified, as determined by applying the first (high-level) set of questions in the SWRP checklist (**Table 4**).

TABLE 4
MAIN BENEFIT QUESTIONS FOR ADDITIONAL BENEFITS FROM THE SWRP

Benefit	Main Benefit Question from SWRP
Water Quality	Could this type of project increase filtration and/or treatment of runoff?
Flood Management	Could this type of project decrease flood risk by reducing runoff rate and/or volume?
Environment	Could this type of project create or enhance wetland and/or riparian habitat?
Community	Could this type of project enhance and/or create recreational and public use areas?

As noted in Section 1.3, some use alternatives include project types for which water supply is a secondary benefit. For example, green street and natural treatment system projects are generally designed for water quality benefits to meet regulatory goals, but also provide water supply benefits (Alternatives B and E). Use alternatives with multiple benefits score well under this criterion.

Based on the type of project that meets each use alternative and the case studies reviewed in this study, **Table 5** presents the additional benefits most likely associated with each use alternative, as determined by responding to the main questions in the SWRP checklist (Table 4). Each likely benefit scores a single point, that is added up for a total prioritization goal. Under the water quality benefit, an additional point is assigned to alternatives that are implemented to meet regulatory requirements under a municipal stormwater permit. These include Alternative B (green streets, bio-infiltration facilities, etc.) and engineered natural treatment wetlands under Alternative E. This additional point is also assigned to Alternative F, which includes diversion of non-storm flows from storm drain outfalls for use in solids management, providing regulatory compliance for non-storm water flow prohibitions.

TABLE 5
ADDITIONAL BENEFITS CRITERION - PRIORITIZATION BASIS OF ANALYSIS AND SCORING

Alternative	Water Quality	Flood Management	Environment	Community	Total
A (Infiltration to Groundwater Basin)	✓	✓	✓		3
A (Injection to Groundwater Basin)	✓	✓	✓		3
B (Infiltration for Hydrology)	✓+	✓	✓	✓	5
C (Irrigation)	✓	✓		✓	3
D (Private On-Site Use)	✓	✓	✓	✓	4
E (Use for Treatment Wetland)	✓+	✓	✓	✓	5
F (WWTP Solids Management)	✓+	✓			3
G (WWTP for Potable Use)	✓	✓			2
H (WWTP for Recycled Use)	✓	✓			2

As an example, consider Alternative B (Infiltration for Hydrology). As presented in Table 5, Alternative B is likely to provide a water quality benefit by filtering stormwater, a flood management benefit by slowing or detaining stormwater flows, an environmental benefit by creating habitat, and a community benefit by integrating into parks, recreation centers, or public spaces. In addition, many Alternative B projects, like green streets, are designed to meet regulatory compliance goals for water quality, so this alternative earns an extra point for water quality. This leads to a total score of five points (2 + 1 + 1 + 1 = 5).

Table 5 provides the total scoring for prioritization under the additional benefits criterion. These total scores will be used with the scores from the other criterion to prioritize the alternative along a feasibility timeline reflecting each alternatives regional opportunities and constraints.

1.5 Constraints and Opportunities Criterion

As summarized in Table 1, the constraints and opportunities criterion provides a qualitative measure of additional conditions that may affect design and implementation of an alternative, and therefore contributes to the prioritization of use alternatives and at the project level. The identification of constraints and opportunities provides a management tool for the assessment of the feasibility of similar stormwater capture and use projects. The approach enables the consideration of current “gates” that can be addressed via existing opportunities or “keys” (e.g., potential future grant funding or interagency agreement to share existing infrastructure and costs). The approach also identifies “gates” that remain closed, because there is no “key” currently available to change or address the constraint.

The identification of opportunities and constraints contributes to the prioritization of use alternatives, as those with existing “keys” are often more feasible in the near-term than those with outstanding “gates”. The example project presented in this study include an analysis of project-specific “gates” and “keys” that are used to inform the constraints analysis for the alternatives. Constraints and opportunities assessment will vary on a site by site basis. The project examples provide a more site-level assessment tool for project-level planning purposes. For each alternative, the example projects under that alternative informed the analysis of alternative-specific “gates” and “keys”, leading to an alternative-specific “gates” and “keys” summary which was used as the basis for prioritizing the alternatives under this criterion. **Table 6** provides a summary of the constraints or “gates” and opportunities or “keys” based on regional characteristics that could be generally applied to the alternatives. Constraints that have an opportunity or key that can address this constraint in the near-term are considered “open.” The summary of gates and keys presented in Table 6 provides the basis for the scoring of the use alternatives under the constraints and opportunities criterion.

The number of constraints and the status of the opportunities to overcome the “gates” provide a basis to define near- and longer-term priorities as well as a planning tool for managers to consider the opportunities (“keys”) on which the region should focus resources to overcome constraints (“gates”) and move stormwater capture and use projects toward implementation. Alternatives are ranked higher when the “gates” generally have existing “keys”, compared to those where opportunities to overcome the constraints are currently not available or have not been developed. **Figure 3** presents the overall assessment results represented as closed gates (current constraint) and open gates (no constraint or opportunity exists that overcomes the constraint). The prioritization scoring for this criterion assigns to each open gate a score of positive 1, whereas a closed gate is assigned score of negative 1. The scores are summed to obtain a total score that is presented in Figure 3.

As an example, consider Alternative B (Infiltration for Hydrology). As presented in Figure 3, there are opportunities in place to overcome site characteristic constraints, production and demand can be matched through site sizing, there is no large infrastructure need, sites generally do not require agency agreements that do not already exist, additional water treatment is not required, projects are already designed to meet specific regulations, and the public generally supports the projects. Gates that have been overcome with an existing “key”, earn the alternative a point for each of the seven categories. Funding for the regional implementation of these projects is a constraint. Although grant funding is available for these type of projects, there are more projects than grant funding. Additional resources are needed for the implementation of the planned projects and therefore funding is a constraint. With the one constraints and a score of minus one, the resulting total score is six points.

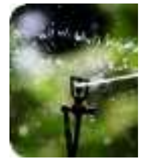
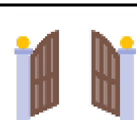
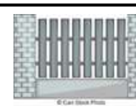
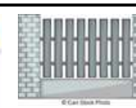
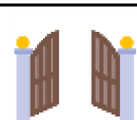
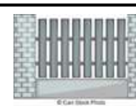
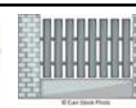
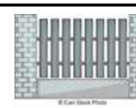
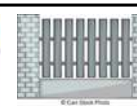
In Section 2, the total scores presented in Figure 3 will be used with the scores from the other criteria to prioritize the alternative along a feasibility timeline reflecting each alternatives regional opportunities and constraints.

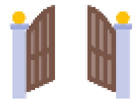
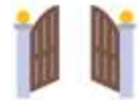
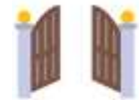
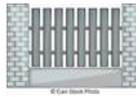
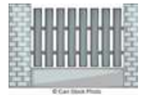
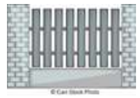
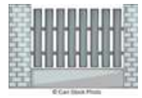
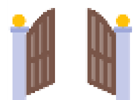
TABLE 6
SELECTED SUMMARY OF CONSTRAINTS AND OPPORTUNITIES BY USE ALTERNATIVE

Alternative	Constraints (Gates)	Opportunities (Keys)
A (Infiltration to Groundwater Basin and Injection Wells)	• **Site Characteristics – Favorable Geology**: Limited groundwater basins and areas with soils with sufficiently high infiltration rates in the San Diego region • **Regulatory Ambiguity:** Possible treatment requirements to meet drinking water standards; regulatory clarity needed • **Agency Agreements**: Interagency agreements needed to allow stormwater conveyance and infiltration into groundwater basin under different agency jurisdiction	• **Technology**: The number of feasible sites can be increased with the use of injection wells that can penetrate through lower permeability soils – pre-treatment may be required – regulatory clarity needed • **Funding:** Available through Prop 1 to reduce project costs • **Partnerships**: Opportunities exist where stormwater conveyance (MS4) is in close proximity to groundwater basins – these are "feasible site identified.
B (Infiltration for Hydrology-Biofiltration and Green Streets)	• **Site Characteristics – Favorable Geology**: Limited areas with soils with sufficiently high infiltration rates in the San Diego region • **Costs:** Cost per volume is higher as a water resource project. Funding for these projects is also needed.	• **Technology**: Low infiltration rates in subsoils may be addressed with increased storage and greater volumes going to bio-filtration and use • **Multi-Benefits**: The high cost per volume is "off-set" by additional benefits, primarily water quality compliance. • **Funding:** Available through Prop 1 to reduce project costs
C (Irrigation on-site or nearby park)	• **Match Demand/Need**: Stormwater is captured when demand is low- requiring storage and likely treatment to control bacteria growth • **Absence of Existing Infrastructure:** Treatment needed even for drip irrigation (solids removal and disinfection) and more advanced for above ground. • **Regulatory Ambiguity:** Regulations do not have specific requirements for stormwater. Treatment for above ground irrigation must meet Title 22 requirements. • **Costs:** High cost per volume as a water resource project, and as water quality project. Funding for these projects needed.	• **Small Scale Implementation**: Projects can be scaled to meet on-site demands, but this increases cost per volume. Larger scale collection and treatment may provide a longer term more cost effective alternative. • **Technology**: Technologies may be developed in the future that can reduce costs and meet better defined regulations. • **Regulatory Clarity**: Stormwater must meet current recycled water requirements unless clarifications provided by regulatory agencies • **Funding:** Available through Prop 1 to reduce project costs
D (Private On-Site Use – Residential Small Scale Irrigation to Larger Scale Commercial and Industrial Storage and Use)	• **Match Demand/Need**: Stormwater is captured when irrigation demand is low- requiring storage • **Agency Agreements:** For larger scale commercial and industrial projects, partnerships are needed to encourage these types of projects • **Public/Agency Support:** For larger scale commercial and industrial projects public/private partnerships are needed to use private funding to build needed infrastructure to convey and treat stormwater captured from private sites for use. For smaller scale projects, partial funding increases support and implementation of residential rain barrel and down-spout disconnects projects	• **Small Scale Implementation**: Residential small scale rain barrel and downspout disconnect projects are scaled to meet on-site demands. • **Public Private Partnerships**: Larger scale application of stormwater capture and use on commercial and industrial sites could become more feasible with public/private partnerships that would help fund public infrastructure to convey and treat stored stormwater on private property for potable or recycled water use to meet on-site water quality compliance requirements. • **Regulatory Clarity/Flexibility (Alternative Compliance) –** Larger scale projects would become more feasible if the stormwater alternative compliance program provided greater flexibility for these types of projects. • **Funding**: Additional grant funding is available through Prop 1 to incentivize greater implementation of residential small scale stormwater use.

Alternative	Constraints (Gates)	Opportunities (Keys)
E (Use for Treatment Wetland)	• **Regulatory Ambiguity/ Not Specific to Stormwater Applications:** Need for regulatory flexibility to maintain wetland treatment systems that either establishes upfront mitigation and/or allows for permits to include specific allowances for O&M if certain conditions are maintained.	• **Reduced Cost per Volume:** Alternative has a lower cost per volume due to use of dry weather flows that significantly increases annual volume used. Other alternatives can lower unit costs with the use of dry weather flows. • **Regulatory Clarity and Flexibility:** Permits for these project can be negotiated to provide upfront mitigation and flexibility to maintain system to manage wetland vegetation. • **Funding**: Additional grant funding is available through Prop 1 for these type of multi-benefit projects. Costs are also off-set by additional water quality compliance benefits.
F (Dry Weather Diversions to WWTP for Solids Management)	• **Agency Agreements**: Need for agreements between wastewater authorities and stormwater departments to provide a program/permitting approach rather than project by project agreements. Agreements on program level pre-treatment based on monitoring data needed. • **Regulatory Ambiguity/ Not Specific to Stormwater Applications:** Diversion of dry weather flows from MS4 may reduce flows in receiving waters that have established habitats from these perennial flows. Non-storm flows are prohibited from MS4. Regulatory clarity needed to address these conflicting regulatory goals. • **Public/Agency Support:** Need for greater support from public utility/wastewater/water authorities for accepting these flows and support from the public and regulatory agencies for this alternative.	• **Match Supply/Need:** Existing sanitary sewer systems generally have capacity during dry weather periods and need additional flows to manage solids due to decreased water use. • **Partnerships:** Example projects indicate that partnerships are developing for the implementation of this alternative. • **Reduced Cost per Volume:** Alternative F has a lower cost per volume than the other wastewater alternatives (G & H) due to use of dry weather flows that significantly increases annual volume used. Other alternatives can lower unit costs with the use of dry weather flows. • **Funding**: Additional grant funding is available through Prop 1 for these type of multi-benefit projects. Costs are also off-set by additional water quality compliance benefits.
G (WWTP for Potable Use) & H (WWTP for Recycled Use)	• **Match Production with Demand/Need:** Stormwater is generated when sanitary sewer and treatment plants do not have capacity due to infiltration into the sewer lines. This requires greater storage and reduced rates of discharge that impacts effectiveness of capture systems (storage not available for next storm event). • **Agency Agreements:** Currently no agreements have been established between MS4 managers and public utilities for acceptance of stormwater flows • **Water Type Incompatibility**: The characteristics of stormwater are not compatible with the sewer inflows and can impact the treatment processes if inflow rates are not controlled. This compatibility constraint is addressed by controlling the discharge rate to the treatment plant. Generally, stormwater would need to be introduced at a rate of 20% of total sewer flow or less. This reduces discharge rates and efficiencies of storage facilities. • **Regulatory Ambiguity/ Restrictions:** Restrictions on the discharge of recycled water during periods of excess supply may limit additional inputs from stormwater flows. Use of urban runoff as an additional input for advanced sewer treatment and indirect potable use may require additional permit flexibility for these planned facilities • **Capital and O&M Costs**: Current costs for use of stormwater to augment current sources of recycled and potable water are much greater than other sources including desalination. • **Public/Agency Support:** Need for greater support from public utility/wastewater/water authorities for accepting these flows and support from the public and regulatory agencies for this alternative.	• **Large Scale Project – Economies of Scale**: Large regional stormwater capture projects may overcome capture and storage inefficiencies. • **Partnerships:** Example projects show interest in developing partnerships to use stormwater as an additional source for recycled water where MS4 is location near facilities and demand exists for additional sources. Potable water use is likely farther in the future. • **Public/Private Partnerships:** Under Alternative D, larger scale application of stormwater capture and use on commercial and industrial sites could become more feasible with public/private partnerships. These partnerships would help fund public infrastructure to convey and treat stored stormwater on private property for potable or recycled water use to meet on-site water quality compliance requirements. • **Funding**: Additional grant funding is available through Prop 1 for these type of multi-benefit projects. Costs are also off-set by additional water quality compliance benefits.

Figure 3: Stormwater Use Alternative Constraints "gates" and opportunities "keys"

Constraints "Gates"	Opportunities "Keys to Open Gates"	Alternative A "Gate Status"	Alternative B "Gate Status"	Alternative C "Gate Status"	Alternative D "Gate Status"	Alternative E "Gate Status"	Alternative F "Gate Status"	Alternative G "Gate Status"	Alternative H "Gate Status"
									
Site Characteristics – Favorable Geology, Complimentary Land Use	***Larger or Multiple Storage Sites*** ***Complementary land uses***								
Match Production with Demand/Need	***Small Scale Implementation*** ***Multiple Public Parcel Storage Sites*** ***Market Demand Identified***								
Absence of Existing Infrastructure Capacity (Storage, Conveyance, Treatment, Distribution)	***Existing Infrastructure (Storage, Conveyance, Treatment Capacity, Distribution)*** ***Large Scale project – Economies of Scale***								
Agency Agreements	***Partnerships***								

Water Type Incompatibility **Treatment Requirements**	***Storage and Controlled Discharge*** ***Separate or Pre-Treatment***								
Regulatory Ambiguity/ Not Specific to Stormwater Applications	***Regulator Clarity and Flexibility***								
Capital and O&M Costs **Funding**	***Regulatory Drivers*** ***Multi-Benefits*** ***Supportable trade-off between cost and benefit*** ***Grant Funding***								
Public/Agency Support	***Public/Agency Support*** ***Regulatory Driver*** ***Public/Private Partnerships***								
Open Gates		5 (6)[1]	7	4	5	7	5	3	2
Closed Gates		3 (2)[1]	1	4	3	1	3	5	6
Total		2 (4)[1]	6	0	2	6	2	-2	-4

1. Scores outside parentheses are for Alternative A via infiltration, while those inside parentheses are for Alternative A via injection.

2. Prioritization Results

The sections above describe the methods and scoring for each metric leading to prioritization of stormwater use alternatives, which can be combined to determine an overall feasibility score for each alternative. The scores for each metric are summarized in **Table 7**, resulting in a total score for each alternative. Higher scores indicate near-term feasibility, while lower scores indicate longer-term feasibility. This overall scoring is illustrated with each alternative places on a feasibility timeline in **Figure 4**.

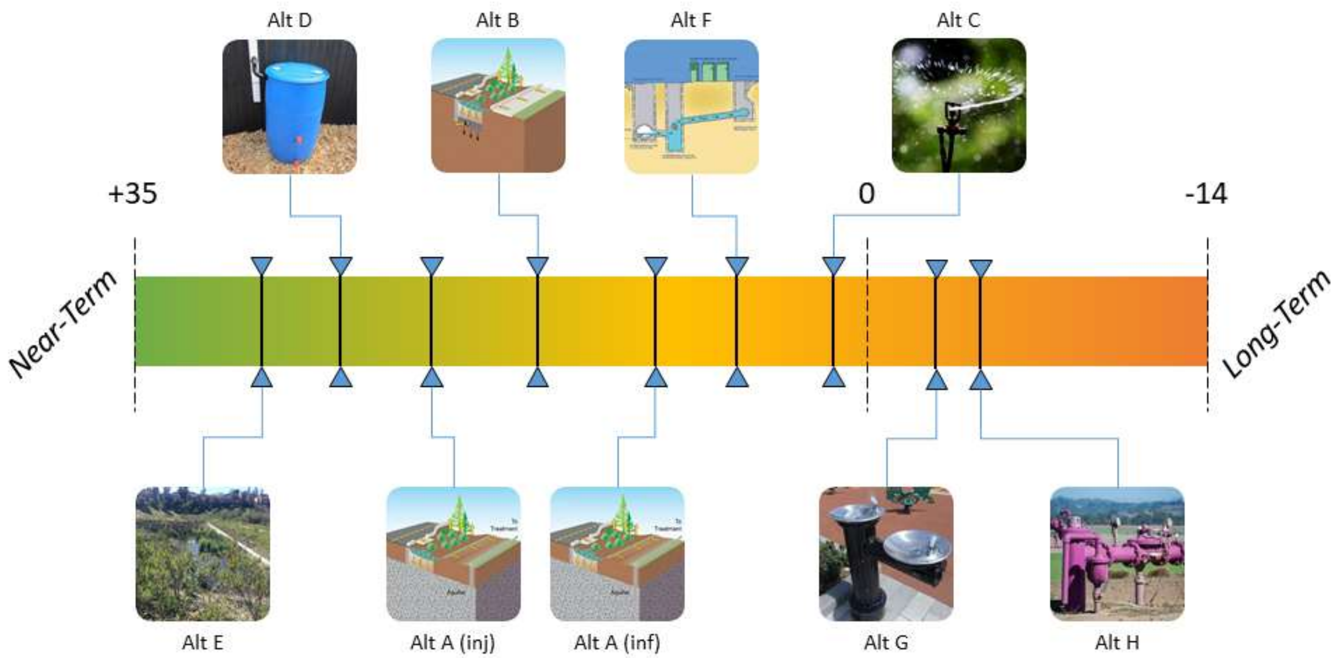
2.1 Prioritization Results and Implementation Approach

The overall prioritization results indicate that use near-term alternatives includes Alternatives A (groundwater infiltration and injection), B (green streets), D (private use), and E (treatment wetlands). These alternatives are scored higher because of the higher potential regional volumes, lower cost per volumes and less constraints for implementation. Those alternatives that are scored lower and are further out in the longer term side of the feasibility timeline, have higher cost per volume and a greater number of constraints. Because cost is a weighted factor, alternatives with higher cost per volume will be weighted more negatively and receive lower scores. The natural treatment systems that restore natural hydrology (Alternative E) had the highest score due to the higher regional volumes and lower cost per volume. This is due to the use of dry weather flows that measurably increase total annual volume used that decrease the cost per volume. The addition of dry weather flows to other alternatives would have similar effects in reducing unt volume costs.

From an implementation approach standpoint, alternatives that are scored for nearer term feasibility should be prioritization for implementation. Whereas, those alternatives that are scored for longer term feasibility should focus available resources on overcoming the constraints that can move these alternatives to a nearer term position on the feasibility timeline. The following discussion provides a summary of the prioritization results that provide a framework for managers to develop an implementation approach to program and project level planning of stormwater capture and use opportunities. The discussion focuses on the identified constraints and opportunities summarized in Table 6 that provide managers with a tool for planning purposes.

TABLE 7
TOTAL FEASIBILITY SCORE BY ALTERNATIVE

Alternative	Capture and Use Volume	Unit Cost	Additional Benefits	Constraints and Opportunities	Total	Time Horizon (Term)
A (Infiltration to Groundwater Basin)	8	-3.5	3	2	**9.5**	Near- to Mid-
A (Injection to Groundwater Basin)	10	0	3	4	**17**	Near-
B (Infiltration for Hydrology)	9	-6.5	5	6	**13.5**	Near-
C (Irrigation)	8	-10	3	0	**1**	Mid- to Long-
D (Private On-Site Use)	6	10	4	2	**22**	Near-
E (Use for Treatment Wetland)	9	10	5	6	**30**	Near-
F (WWTP Solids Management)	7	-6	3	2	**6**	Mid-
G (WWTP for Potable Use)	7	-10	2	-2	**-3**	Long-
H (WWTP for Recycled Use)	7	-10	2	-4	**-5**	Long-



SWCFS / D140075.20

Figure 4
Feasibility Timeline for Use Alternatives

• **Alternative A** has a feasibility timeline of medium for direct infiltration and closer to near term for injection with total scores of 9.5 and 17, respectively. This alternative is on the higher prioritization scoring as there are feasible public sites, costs per volume is favorable, and the associated constraints or gates may have keys that could be potentially opened in the near term. Constraints that may limit feasibility regionally include limited number of feasible sites, regulatory clarity, funding and interagency agreements. There are a limited number of sites regionally that possess higher permeability soils that would allow for sufficient infiltration and that are close enough to feasibility convey stormwater to a groundwater basin. The number of feasible sites was increased in the parcel assessment by using dry well injection technology to penetrate through the lower permeability soil layers to reach the groundwater aquifer. This technological opportunity moved this alternative to a shorter feasible timeline. Constraints to wider spread use of this alternative include regulatory clarity on potential treatment requirements by applying potable water standards to stormwater prior to infiltration or injection. Requirements for treatment of stormwater will increase the cost and decrease the feasibility of this alternative in the short term. Regularity clarity is needed that provides flexibility in the use of stormwater to increase groundwater storage while also protecting the groundwater resource. Greater flexibility should be provided to infiltration and injection into basins that already require a high level of treatment for their end use as long as the sources of stormwater do not contain concentrations of mobile industrial compounds that would require additional treatment and potentially contaminate the groundwater basin. An additional potential constraint that can impact the feasibility of implementation is interagency agreements between municipalities and water authorities to facilitate the development of stormwater infiltration and injection projects that may include stormwater conveyance from an MS4 and/or capture/storage facility and then to the groundwater basin that is under the water authority management. These agreements may also lead to cost sharing and cooperation on grant solicitations to overcome the cost constraints.

- **Alternative B** has a feasibility timeline of medium with an overall score of 13.5. This alternative has a high ranking due to the high number of potential sites and planned region wide implementation for water quality compliance. Regional soil constraints reduce the volume that can be infiltrated to restore natural hydrology. However, bio-filtration techniques are used when soil permeability is lower and allows for grater retention and infiltration into these soils. This alternative would have a higher prioritization if the cost per volume were lower. However, these projects are often implemented to achieve water quality benefits and therefore the costs are "off-set" by the regulatory compliance achieved. Cost per volume can be further reduced and these projects ranked higher if the volume used is increased through diversion of dry weather flows into these bio-filtration systems for filtering and infiltration, where feasible. The higher feasibility timeline for treatment wetlands (Alternative E), which are also used for water quality benefit, is due to the increase volume and subsequent reduction in cost per volume when dry weather flows are added to the treatment and infiltration volumes. Alternative B projects generally have multiple benefits including restoring natural hydrology in receiving waters. These projects are strong candidates for grant funding that can reduce the implementation costs. Many of the regions planned green streets and multi-benefits projects are listed in the San Diego Region Stormwater Management Plan and are therefore eligible for Proposition Stormwater funding. Project sponsors are encouraged to enter their projects into the SWMP to be eligible for the next grant solicitation in early 2019.

- **Alternative C** has a feasibility timeline of longer term to medium term with an overall score of one (1). This alternative has a lower ranking due to the high cost per volume and regulatory ambiguity. Although the high cost per volume may be off-set by the water quality compliance benefits these projects provide, there are other less costly alternatives under Alternative B to meet these regulatory requirements and also provide water resource benefits. Treatment requirements implemented on a smaller scale drive up the costs per volume. Treatment costs can be lowered if drip irrigation is used. However, stormwater is supplied when the demand for irrigation is low requiring storage. At a minimum solid removal and disinfections will be needed to prevent clogging of the drip lines. There is also regulatory ambiguity on the treatment requirements for stormwater used for irrigation that requires clarity. For above ground systems, Title 22 treatment standards are currently required that significantly increases the cost of this alternative. If in the future more cost effective treatment technologies are developed under greater regulatory clarity, this alternative may be feasible for implementation and move to a higher priority. Alternative D that includes using stormwater for on-site landscaping on private properties through down-spout disconnects and rain barrels provides a more cost effective alternative with a similar use of stormwater.

- **Alternative D** has a near term feasibility timeline as small scale residential stormwater capture and use (rain barrels and down-spout disconnects) are successfully being implemented. Although these projects use a small volume of the total runoff volume, there is the potential for large scale implementation in the region. For these smaller scale projects, partial funding will likely increase support and implementation of residential rain barrels and down-spout disconnects projects as evident from the programs that have been implemented by the County and City of San Diego.

Opportunities for larger scale private use of stormwater could be realized on large private residential developments, commercial and industrial sites. For these larger scale commercial and industrial projects, public/private partnerships are needed to use private funding to build needed infrastructure to convey and treat stormwater captured from private sites for use. Larger scale projects would become more feasible through greater regulatory clarity and flexibility under the stormwater alternative compliance program to allow private developers to purchase water quality credits to meet on-site stormwater regulatory requirements that would fund public infrastructure to convey and treat captured stormwater from these sites for potable or recycled use.

- **Alternative E** has a near term feasibility timeline and the highest priority score of 30, due to its cost effectiveness, potential regional volume and multi-benefits that include water quality compliance, environmental and community benefits. A lower cost per volume is associated with this alternative due to the use of dry weather flows that significantly increases the total annual volume captured and used. Dry weather flows are routed through the treatment wetland to sustain the wetland vegetation that also removes pollutants such as sediment and nutrients. The high priority of this alternative suggests that if other alternatives use dry weather flows, the associated cost per volume will decrease and increase their implementation feasibility. Constraints associated with this alternative includes long-term operation and maintenance costs and permitting that allows for continued maintenance without having to provide mitigation for temporary disturbance of habitat that is likely to establish in these natural treatment systems. Consideration is needed in preparing the permits for these projects to negotiate up-front mitigation to allow for continued maintenance and performance of the wetland to treat the stormwater and dry weather flows entering these systems.

- **Alternatives F** has a near medium feasibility timeline and a total priority score of 6. This alternative has a higher priority than the alternatives that treat stormwater at an existing wastewater facility for potable or recycled use because of the lower cost per volume and better match of supply to the demand. The lower cost per volume is due to the use of dry weather flows that similar to Alternative E increases the total annual flow used and therefore reduces the unit cost. There is also existing capacity generally in sanitary sewers during dry weather periods. Addition of dry weather flows provide for solids management that has become a greater issue as water use has decreased due to conversation efforts. The constraints to a greater implementation of this alternative include the need for agreements between wastewater authorities and stormwater departments to provide a program level approach to dry weather diversion discharge permits that can provide greater certainty and standardization of the process. This includes program-wide agreements on water quality thresholds based on monitoring that would allow for direct discharges if thresholds are not exceeded. Diversion of dry weather flows from MS4 may reduce flows in receiving waters that have established habitats from these perennial flows. Although the current MS4 permit prohibits non-storm flows from MS4, diversion of these flows may be restricted due to the establishment of these habitat downstream of these MS4 outfalls. Regulatory clarity is needed to address these conflicting regulatory goals. The feasibility of the implementation of this alternative can also be improved with greater support from public utility/wastewater/water authorities for accepting these flows and support from the public and regulatory agencies for this alternative that can provide multiple benefits.

- **Alternatives G and H** have similar feasibility timelines that are both longer term with priority scores of -3 and -5, respectively. These alternatives have a greater timeline for regional implementation due to a greater number of constraints that include high cost per volume and limits to the current capacity of sanitary sewers and treatment facilities. Stormwater is generated when sanitary sewers and treatment plants have limited capacity due to infiltration into the sewer lines. In addition, incompatibility of stormwater flows to the sewer treatment systems also limit discharge rates to generally 20% of total sewer flows to treatment facilities. These restrictions on the discharge rates from stormwater storage facilities limit the efficiencies of these facilities by limiting the capacity to capture and store multiple storm events. This increases the cost per volume. This constraint may be overcome by larger regional storage facilities. However, the availability of large enough public areas for these facilities will limit the overall regional application of these alternatives. There is a long-term opportunity for larger scale storage at private sites (Alternative D), but conveyance and treatment capacity would be needed. Use of stormwater to supplement sources for recycled water have a slightly higher priority score than potable water use as there are examples of greater support and interest in this alternative from public utilities where the cost per volume is comparable to other sources. Currently these costs for stormwater are higher than these other sources. These alternatives are also longer term as no agreements have been established between MS4 managers and public utilities for acceptance of stormwater flows. These alternatives may move up in priority and feasible timeline as stormwater quality compliance goals and State-level policies for increased use of local water supplies provide regional drivers that "off-set" the higher costs of these alternatives and incentivize inter-agency agreements.

2.2 Regional Conclusions

In the assessment and prioritization of use alternatives, some trends have emerged across the San Diego Region. First, there are several stormwater capture and use alternatives that are already being implemented. Technology and need is already present to make infiltration for natural hydrology (i.e. green streets), capture for private on-site use (i.e. rain barrels), wetland treatment systems, diversion of dry weather flows, and infiltration into groundwater basins feasible in some cases, and many projects are already underway. Other alternatives may become feasible in the future with changes in technology, regulatory clarity, inter-agency agreements, partnerships and increased demand for alternative local water supplies.

Second, alternatives that capture dry-weather flows – Alternative E (Use for Treatment Wetlands) and Alternative F (WWTP Solids Management) – generally score higher than similar alternatives that use only wet-weather flows – Alternative B (Infiltration for Hydrology) and Alternative H (WWTP for Recycled Use), respectively. Implementing systems or policies that allow more use alternatives to utilize dry-weather flows would allow them to capture and use water year-round, increasing annual capture and use volume and reducing unit cost. These changes would improve the overall feasibility scores for these use alternatives and could make them feasible in a shorter term than they are now. Alternatives may move up the feasible timeline as stormwater quality compliance goals and State-level policies for increased use of local water supplies provide greater regional drivers that "off-set" the higher costs of these alternatives and incentivize inter-agency agreements.

3 Analysis of Individual Parcels and Projects

While the aim of this study is to prioritize stormwater use alternatives in the San Diego region, it is anticipated that future studies will be performed at the project and parcel level as specific projects develop and move forward in the county. As such, the following sections describe variations on the alternative-wide prioritization method that could be used to prioritize individual projects as more data and details become available. The Alternative Compliance Retrofit Project at Mountain View Park in Escondido is used as an example to illustrate this process.

3.1 Capture and Use Volumes

The method described in Section 1.2 serves as a first, high-level assessment of capture and use volumes that may be achievable at a given parcel. As a project takes shape and more details are defined, though, it will be necessary to revisit these calculations and revise them to incorporate more detailed project design. Some of the assumptions that were reasonable in the county-wide analysis (e.g. soil infiltration rate) may not be applicable to every project site. Stormwater availability and use opportunities are highly variable, so detailed, site-specific analyses of catchment area, flow paths, soil conditions, and areas for construction will be required.

Using the Regional Water Quality Equivalency Calculator, the Escondido Creeks Hydraulics Study (Baker 2016) estimates the 2.7-acre Mountain View Park site could use 6.5 ac-ft/yr via biofiltration. This puts the site in the medium-volume category.

3.2 Unit Costs

The method described in Section 1.3 serves as a first, high-level assessment of stormwater capture and use unit costs for a parcel. As a project takes shape and more details are defined, though, it is necessary to revisit these calculations and revise them to incorporate more detailed project design. Some of the assumptions that were reasonable in the county-wide analysis (e.g. equipment costs, off-haul requirements) may not be applicable to every project site. The grading and installation requirements of stormwater projects are highly variable, so site-specific analyses will be required.

The Creeks Hydraulic Study (Baker 2016) presents three options for Mountain View Park, with costs ranging from $500,000 to almost $11 million. The biofiltration option without an underground vault is between these two extremes, but even in the best case, unit cost comes to $15,500/ac-ft, assuming a 25-year lifespan. The Creeks Hydraulic Study proposes a 50-year lifespan for the project, which would bring the total unit cost to about $7,750/ac-ft. This is above the cost of desalination, placing this in the high-cost category.

3.3 Multi-Benefit Opportunities

As described in Section 1.4, projects that provide multiple benefits may be prioritized above those with fewer benefits. The SWRP identified four benefits in addition to water supply: water quality, flood management, environment, and community. The SWRP also created a checklist to quantify the level to which a project provides these benefits. When assessing individual projects, this quantification approach provides a more refined assessment of multi-benefit opportunities at the specific site. These questions can be found in Appendix F of the SWRP (“SWRP Criteria and Metrics Checklist”), and in Section 2 of the checklist (ESA 2017a, Appendix F).

Applying the SWRP benefit checklist (ESA 2017a, Appendix F), the Mountain View Park project scores a 10/20 on Water Quality, a 15/20 on Water Supply, a 15/20 on Flood Management, a 7/20 on Environment, and an 11/20 on Community. The project could score better if environmental and community benefits were quantified, but even in its current state, it scores well in enough benefits to earn a high score for this metric.

3.4 Constraints and Opportunities

As described in Section 1.5, project-specific tables of constraints and opportunities ("gates" and "keys") were compiled for each case study used to develop a project description. While the assessment described in Section 1.5 may guide initial prioritization, a specific stormwater project will require a thorough investigation of site- and project-specific constraints and opportunities. These will guide the selection of optimal sites, methods, and alternatives in a way that an alternative-scale analysis cannot.

The Mountain View Park project is limited by low infiltration rates and funding concerns, but its other constraints – matching water supply and demand, ownership and partnership, regulations around biofiltration, and local community support – have mainly been overcome. Since most of the constraints ("gates") have been addressed by opportunities ("keys"), this project scores high for constraints and opportunities.

3.5 Example Project Summary

The Mountain View Project has medium capture and use volume, high unit cost, exhibits several multi-benefits, and has addressed most of its constraint "gates" with opportunity "keys." This project is likely feasible in the near-term, with ease of implementation and multi-benefits outweighing high cost.

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