Stormwater Targets for Groundwater Recharge and Direct Use in Urban California

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Water Use and Efficiency Branch
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ii. Executive Summary

This report presents the development of stormwater targets required by water conservation legislation enacted in 2009 (Senate Bill X7-7, California Water Code [CWC] Section 10608.50 (b)) that directs the California Department of Water Resources (DWR) as follows:

No later than January 1, 2011, and updated as part of the California Water Plan, the department [DWR], in consultation with the board [State Water Resources Control Board, Water Boards], and with public input, shall propose new statewide targets, or review and update existing statewide targets, for regional water resources management practices, including, but not limited to, recycled water, brackish groundwater desalination, and infiltration and direct use of urban stormwater runoff.

This report addresses the development of targets for *"infiltration and direct use of urban stormwater runoff."* For the purposes of this study, the term "infiltration" in the legislation was taken to mean "groundwater recharge." While the legislation requires the development of targets for urban stormwater runoff, targets are also presented for non-urban sources of stormwater because they also benefit urban areas and the survey data were available. A database and a web application were created to store and display data associated with the stormwater projects discovered by the survey. The methodology and sources of information are summarized in Appendix A.

Proposed statewide stormwater targets for 2020 and 2035 are shown in Table ES1, namely the annual use of stormwater runoff for groundwater recharge and direct use benefitting urban water supplies. These targets were developed using planned and reported stormwater projects (listed in Appendix B) with construction dates ending after 2014. Several issues were identified related to determining stormwater targets and recommendations are offered to overcome them. This information will be in the upcoming resource management strategy, Urban Stormwater Runoff Management Strategy, in the California Water Plan Update 2018.

Table ES1 Annual Stormwater Targets for Groundwater Recharge and Direct Use in Urban California (taf*/year)

Target year	Urban Sources		Non-Urban Sources**
	Groundwater Recharge	Direct Use	Groundwater Recharge
2020 Target	100	5	100
2035 Target	200	50	200

Notes:
*Thousand acre-feet.
**Stormwater from non-urban sources that benefit urban water supply through groundwater recharge.

Stormwater capture-and-direct-use projects occur at both the regional and local level, and many efforts are ongoing by State government to promote and support these multi-benefit projects. For regions to meet these targets, the State must continue to support projects that capture and use urban stormwater. Some examples of State efforts promoting stormwater capture (inside and outside of urban areas) include but are not limited to: The State Water Resources Control Board's (SWRCB's) Strategy to Optimize Resource Management of Stormwater (STORMS), State funding programs, and DWR's Flood Managed

Aquifer Recharge (Flood-MAR) program. In addition, completion of stormwater resource plans and groundwater sustainability plans by regional and local entities will identify and help prioritize proposed urban stormwater capture-and-direct-use projects in California's ten hydrologic regions.

1. Introduction

This report presents statewide stormwater targets for groundwater recharge and direct use as required by California Water Code (CWC) Section 10608.50(b) (enacted in 2009 by Senate Bill X7-7). These targets were prepared in consultation with the SWRCB and stakeholders and will be used to update the California Water Plan Update 2013 (Update 2013) resource management strategy, Urban Stormwater Runoff Management. Several issues were identified related to determining stormwater targets and recommendations are offered to overcome them.

The recent five-year drought of 2012–2016 highlighted the importance for water suppliers to diversify their water portfolios to include alternative water supplies, such as recycled water, desalinated water, and stormwater. In Southern California and the Central Valley, some water agencies have been recharging groundwater aquifers with stormwater for decades, and now other communities are looking at stormwater as a water supply resource and are developing ideas for projects (Porse 2018).

The State's climate adaptation strategy, the Safeguarding California Plan, emphasizes diversifying local supplies and using stormwater management for groundwater recharge as a way to build resilience in the face of climate change (California Natural Resources Agency 2018). Stormwater capture-and-direct-use projects also support the goal of meeting future water demands while reducing the emission of greenhouse gases (California Air Resources Board 2017).

The governor's California Water Action Plan (CWAP) also promotes diversifying water portfolios and working collaboratively to identify and remove impediments to achieving statewide conservation targets, recycling, and stormwater goals. The CWAP generally acknowledges the following:

- Improving the State's ability to manage scarce water supplies and overstressed groundwater basins and enabling better coordination of major reservoir operations are essential to economic and environmental sustainability.
- Understanding that stormwater capture and floodplain reconnection can help simultaneously improve the environment, flood management, and water supplies.
- Diversifying regional water portfolios will relieve pressure on foundational supplies and make communities more resilient against drought, flood, population growth, and climate change.
- Ensuring water security at the local level includes efforts to capture and treat stormwater for groundwater recharge and reuse.

There is a need for the State to focus on projects with multiple benefits. There is also a need to evaluate existing programs and propose modifications to incentivize and co-fund multi-benefit projects that promote integrated watershed management and provide both flood protection and groundwater recharge benefits, such as stormwater permits that emphasize stormwater capture and infiltration (California Natural Resources Agency 2016).

The water conservation legislation enacted in 2009 (Senate Bill X7-7, CWC Section 10608.50 (b)) directs DWR as follows:

> *No later than January 1, 2011, and updated as part of the California Water Plan, the department [DWR], in consultation with the board [State Water Resources Control Board, Water Board], and with public input, shall propose new*

> *statewide targets, or review and update existing statewide targets, for regional water resources management practices, including, but not limited to, recycled water, brackish groundwater desalination, and infiltration and direct use of urban stormwater runoff.*

2. Terminology

The following terms have been defined to capture the intent of the legislation and distinguish the terminology used for this project from other current stormwater-related efforts.

Urban stormwater — Stormwater runoff that originated from an urban area during a precipitation event, including surface runoff, drainage, and interflow.

Non-urban stormwater — Stormwater runoff that originated from a non-urban area. For this study, non-urban stormwater that benefits urban water supply was included. For example, those projects involving non-urban stormwater for groundwater recharge of aquifers used for urban water supply.

Infiltration — There are two interpretations used in this report:

1. "Infiltration" in CWC Section 10608.50 (b) is taken to mean "deep percolation resulting in groundwater recharge," since the legislation was written in the context of alternative water supplies.
2. Infiltration is traditionally defined as the entrance of surface water into the soil, usually at the soil/air interface. Not all infiltration reaches a groundwater aquifer to be available for future use.

Deep percolation — The percolation of water down through the ground and beyond the lower limit of the root zone of plants, moving into the groundwater pore spaces and fractures, resulting in groundwater recharge.

Direct use — "Direct use" in CWC Section 10608.50 (b) is taken to mean the use of intentionally captured stormwater, which may involve short-term storage (e.g., via rain barrels, underground tanks, equalization basins) or stormwater treatment plants. Most projects in this category will intentionally capture and use stormwater to offset potable or other non-potable water uses. This interpretation of direct use does not include incidental uses (i.e., stormwater that would have naturally infiltrated), flood management, stormwater pollution-prevention projects, or long-term storage of stormwater (either as groundwater or as surface water).

Target — A benchmark that indicates a state of achievement expected at some time in the future (see Table 1 in Appendix A). A target does not necessarily carry the same connotation of extraordinary effort as a goal or potential. No specific instructions are included in CWC Section 10608.50(b). The identified targets are to be used to guide resource management practices, and it is assumed that the targets represent an achievable expectation of stormwater runoff capture for groundwater recharge and direct use benefitting urban water supply.

Capture and direct use — The SWRCB defines *urban runoff capture-and-direct-use* as the intentional collection of urban runoff to augment surface water supplies, recharge groundwater, or support

ecosystems. This broad definition expands on the traditional view by recognizing ecosystems as a potential user (State Water Resources Control Board and the regional water quality control boards 2018a).

Managed aquifer recharge (MAR) — DWR defines MAR as a resource management strategy that can help replenish depleted aquifers, or store water for later use, or lead to other benefits through intentional recharge of water to suitable aquifers.

Flood-MAR — DWR defines Flood-MAR as an integrated and voluntary resource management strategy that uses floodwater resulting from rainfall or snowmelt for groundwater recharge on agricultural lands and working landscapes such as refuges, floodplains, and flood bypasses (California Department of Water Resources 2018a).

3. Target Setting

This section discusses the development of the 2020 and 2035 statewide stormwater targets for the capture of stormwater runoff intended for groundwater recharge and direct use that benefits urban water supply. Targets include both urban stormwater sources and non-urban stormwater sources that may benefit urban areas. The targets are based on planned and reported stormwater projects with construction dates ending after 2014. The periods for the 2020 and 2035 targets are 2015–2020 and 2021–2035, respectively. These periods were selected based on:

- Grant program stormwater projects scheduled to be completed by 2020.
- The planning horizon for integrated regional water management (IRWM) plans in which most of the planned projects are scheduled through 2035.

Additionally, there is no statewide baseline of urban stormwater for groundwater recharge and direct use.

Since there is no comprehensive statewide inventory of stormwater projects for groundwater recharge and direct use, DWR reviewed plans, surveys, annual reports, grant proposals, and databases for information on planned stormwater projects.

In November 2016, the draft methodology to develop the statewide stormwater targets was circulated by DWR for public review. Comments were received and incorporated, and the final methodology is attached as Appendix A. The information sources and their potential uses for developing stormwater targets are summarized below, and project data are listed in Appendix B.

Methodology and Sources of Information

Currently, stormwater resource plans (SWRPs) are the most comprehensive source of information on planned stormwater projects. Entities are required to file SWRPs under Proposition 1 to receive funding for stormwater and dry weather runoff capture-and-direct-use projects (California Water Code Section 10563 (c)(1)). Though many SWRPs were being developed at the start of this project, only a handful were completed (see Figure 1). Additionally, there were several issues related to extracting the data, and these are discussed in Section 6. Consequently, information in addition to SWRPs is necessary for comprehensive understanding of the various planned runoff capture-and-direct-use projects.

Figure 1 Storm Water Resource Plan Development

Source: State Water Resources Control Board's Strategy to Optimize Resource Management of Stormwater.

The development of stormwater targets followed an approach similar to the one used to develop municipal recycled water targets for Update 2013. In that approach, existing data and additional surveys were used to develop targets.

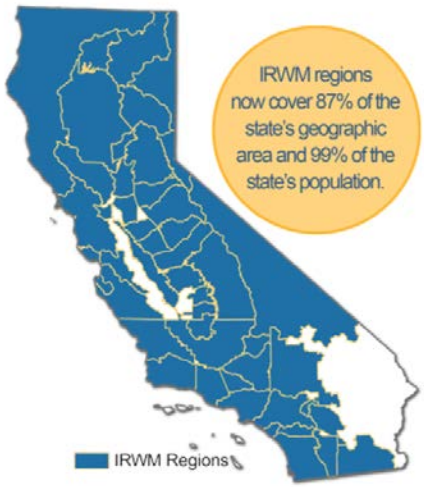
For this project, databases with possible stormwater projects were reviewed, and a list of potential stormwater projects was compiled. Table 1 presents the sources of information from the initial effort (projects constructed before 2015 were excluded).

Table 1 Number of Projects by Database

Water Board Stormwater Grant Application Database (Prop 1)	85
DWR Integrated Regional Water Management (IRWM) Grants Database (Prop 84)	1135
DWR Flood Management IRWM Plan Database	6089
State Water Resources Control Board Division of Water Rights	2
Water management plans (WMPs)/enhanced WMPs	1777
Total	9088

Potential stormwater projects were screened based on project benefits, but these benefits were identified by project proponents and were not independently verified during this study. Projects related to stormwater that involved groundwater recharge or direct use were included in the list of stormwater projects. From the initial screening process, 272 of the 9088 projects were found to provide some stormwater benefit. These 272 projects were then mapped in Environmental Systems Research Institute's (ESRI's) geospatial processing program, ArcMap, by IRWM region, and these regions are shown in Figure 2. Each IRWM region map, including its associated data, was sent to the IRWM region contacts for review and comment. In many cases, the IRWM contact referred DWR to the project proponent for the details. Organizations involved in promoting stormwater projects are diverse, and functions related to stormwater can vary. Organizations found to have the most relevant groundwater recharge and direct use data included stormwater permittees, flood control agencies, drinking water systems, the California Department of Transportation (Caltrans), and water replenishment districts.

Figure 2 IRWM Regions



After receiving feedback from various organizations on the initial set of potential stormwater projects, the following additional criteria were used to refine the list of stormwater projects:

- Projects were initially included if they were likely to increase water supply reliability. Multi-benefit projects were also included, but those identified later by project proponents as "stormwater projects which had management benefits other than increasing water supply reliability (such as flood risk reduction and water quality benefits) but would not increase supply reliability" were excluded.

- Projects that would only involve infiltration (traditional definition) and would not recharge groundwater were excluded. Proposed stormwater infiltration projects that did not provide information on the suitability of conditions were excluded. Projects that under further data review indicated that conditions could not support groundwater aquifer recharge were excluded.
- Projects with no estimates of the annual volume of groundwater aquifer recharge or the annual volume of direct use were excluded. Project proponents were contacted for missing estimates, and if data were not received by the end of the survey those projects were excluded. For example, projects in some SWRPs and Enhanced Watershed Management Plans (EWMPs) included estimates of stormwater capture volumes per design storm, but it was decided it would be too time-consuming to investigate the design storm details for each region's hydrology.
- The project information for the Los Angeles Department of Water and Power (LADWP) Stormwater Capture Master Plan and the San Diego County Regional SWRP were added to the list of stormwater projects because they were the most comprehensive sources of information to represent planned projects (potential projects and programs to capture additional stormwater) in those areas and they included annual stormwater estimates.

List of Stormwater Projects

The final list identified 177 stormwater projects and local strategies that involved groundwater aquifer recharge and direct use (see Appendix B). DWR developed a database and an online geographic information system (GIS) web portal to display key data associated with the stormwater projects discovered by the survey. These are available online:

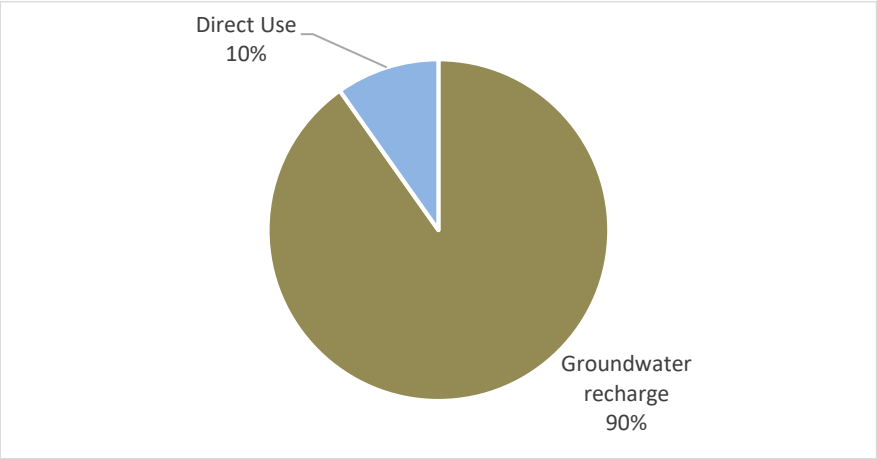
- WebMap Tool available at this link:
  - https://gis.water.ca.gov/app/StormwaterProjects-Post2014/.

DWR plans to revise this database and portal for inclusion in California Water Plan Update 2023 (Update 2023).

Analysis and Results

The list of stormwater projects includes stormwater data associated with different metrics, since the projects were obtained from various sources. This is discussed further in Section 6 of this report. Analysis of the compiled stormwater projects revealed that the majority of the 441 taf of planned stormwater projects will be from groundwater recharge (398 taf) rather than direct use projects (43 taf, as shown in Figure 3).

Figure 3 Type of Planned Stormwater Projects by Volume Captured (441 taf*/year)



Note:
*Thousand acre-feet.

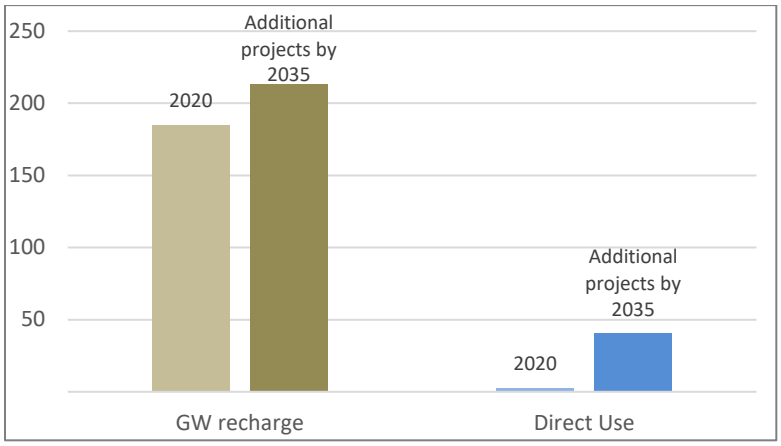
Examples of planned stormwater projects for groundwater recharge range from large-scale regional projects involving recharge basins and parks to smaller low impact development (LID) projects involving infiltration chambers. Regulations encourage the use of LID to increase retention time of stormwater peak flows (flood risk reduction), promote infiltration, and reduce the impacts of pollutants (water quality benefits) on receiving waters.

Examples of direct use projects range from large-scale treatment plants and storage tanks for non-potable uses to smaller projects, such as city-wide rain barrel programs.

Compared to groundwater recharge, direct use projects are often more expensive when compared with the amount of stormwater captured and used. But direct use projects and strategies provide water quality, flood risk reduction, and ecosystem benefits. Additionally, rain barrel programs are effective at educating the public even though they play a lesser role in increasing water supply given the limited months of rainfall in California.

Figure 4 shows the breakdown of the planned stormwater projects based on the estimated volume of water to be recharged or directly used. The total volume of stormwater from groundwater recharge projects is 398 taf, with about half coming online in the two target-year periods (2015–2020 and 2021–2035). Out of the total 43 taf expected from the planned direct use projects, the majority will come online after 2020.

Figure 4 Stormwater Projects Planned by 2020 and 2035 by Volume Captured (taf*/Year)



Note:
*Thousand acre-feet.

The breakdown of the planned stormwater projects (2015–2035) involving groundwater recharge are shown in Figures 5 and 6, broken down by the hydrologic regions shown in California Water Plan Update 2013. Survey results indicate a large number of projects are being planned in the South Coast region, and no stormwater projects involving groundwater recharge are being planned in the North Coast, North Lahontan, or Colorado River regions.

Figure 5 California's Ten Hydrologic Regions

Figure 6 Breakdown of All Groundwater Recharge Projects by Volume, Captured by Hydrologic Region (398 acre-feet/year)

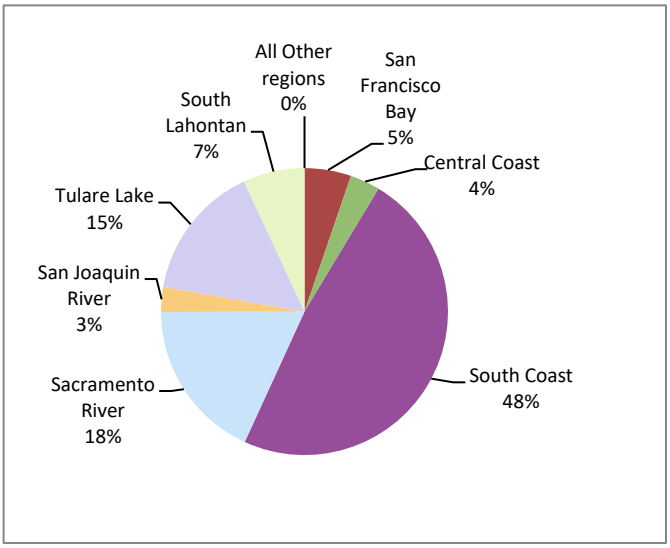
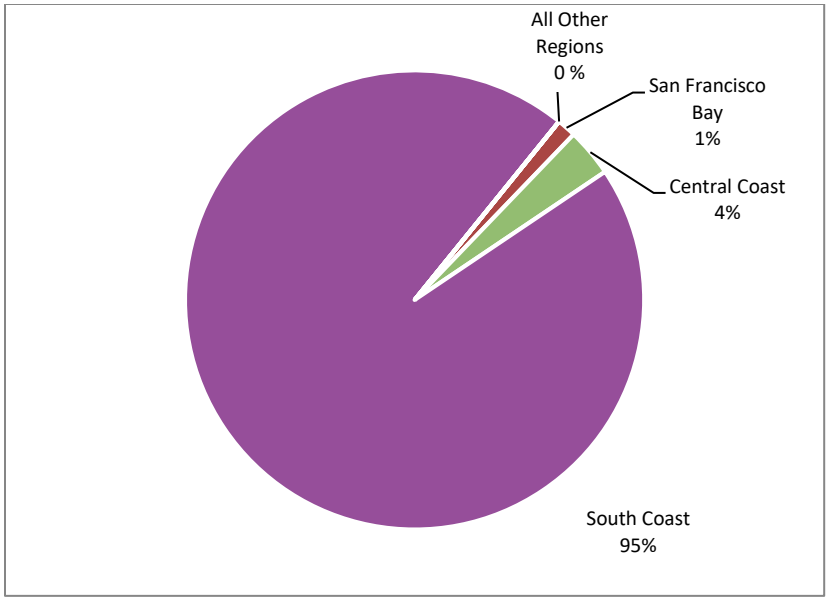


Figure 7 shows the breakdown of stormwater direct use projects by water plan hydrologic region. The majority of these projects are planned for the South Coast region, primarily in the San Diego area where there are limited opportunities for groundwater recharge, so treatment plants for direct use are being considered. The San Diego SWRP provided preliminary planning-level estimates that are reflected in the list of stormwater projects; however, San Diego County is in the process of revising their estimates by the end of 2018, and they have indicated that the revised estimates will likely be lower than those in their SWRP.

Figure 7 Planned Direct Use Projects by Water Plan Hydrologic Region (43 taf*/year)



Note:
*Thousand acre-feet.

The stormwater survey results were categorized by stormwater source to include non-urban sources of stormwater that may also benefit urban areas. Table 2 summarizes the survey results and was used to develop statewide stormwater targets.

Table 2 Stormwater Survey Results by Stormwater Source, Project Type, and Completion Period

	Urban Sources			Non-Urban Sources[2]			
Project Completion	Groundwater Recharge[1] (af/yr)	Direct Use (af/yr)	Subtotal af/yr	Groundwater Recharge (af/yr)	Direct Use (af/yr)	Subtotal af/yr	Total
2015–2020	72,774	2,732	75,506	112,101	0	112,101	**187,607**
2021–2035	132,788	40,496	173,284	80,318	0	80,318	**253,262**
Total (by 2035)	205,562	43,228	248,790	192,419	0	192,419	**441,209**

Notes:
[1] Includes 1935 acre-feet per year (af/yr) from projects with both urban and nonurban stormwater sources.
[2] Stormwater from non-urban sources that benefit urban water supply through groundwater recharge.

4. Statewide Stormwater Targets

The resulting statewide annual stormwater targets for groundwater recharge and direct use projects benefitting urban water supply are listed in Table 3.

Table 3 Annual Stormwater Targets for Groundwater Recharge and Direct Use in Urban California (taf*/year)

	Urban Sources		Non-Urban Sources**
Target year	Groundwater Recharge	Direct Use	Groundwater Recharge
2020 Target	100	5	100
2035 Target	200	50	200

Notes:
*Thousand acre-feet.
**Stormwater from non-urban sources that benefit urban water supply through groundwater recharge.
The 2020 target includes projects that are already in construction.
The 2035 target includes projects that are part of the 2020 target.

Determining the 2035 target is beyond the typical planning horizon for detailed planning, and some projects may only be at the conceptual stage. DWR also notes that there will likely be other projects that have not yet been formulated for which there are no quantified estimates. In the near term, the second round of SWRCB Proposition 1 stormwater project funding, DWR Proposition 1 IRWM Implementation Grant funding, and Proposition 68 grant funding will be available. Some project proponents indicate they will still proceed with their projects (to satisfy other requirements, such as total maximum daily load compliance) even if funding is not available. Consequently, the 2035 stormwater targets are based on the survey results.

5. Comparison with Other Stormwater Estimates or Targets

There have been other efforts to estimate future groundwater recharge and direct use targets and it is difficult to directly compare those with the statewide stormwater targets in this report. Differences include, but are not limited to:

- Regional versus statewide coverage.
- Type of stormwater (urban versus non-urban).
- Type of target (e.g., potential versus planned projects).
- Lack of information on target development.

This list provides a short description of other efforts.

- The SWRCB's 2009 Recycled Water Policy includes a goal for increasing stormwater use in California, but documentation is not available on the derivation of those estimates.
- The Natural Resources Defense Council (NRDC) and the Pacific Institute developed estimates in 2009 (and revised them in 2014) for the potential for stormwater capture in urbanized Southern California and the San Francisco Bay Area.

Note: See the summary table (Table 7) for more information. For a more detailed discussion, see Appendix A, Section 4.

The University of California Cooperative Extension published a study in 2015 that estimated groundwater recharge potential when surface water is available to deliberately flood agricultural land to percolate water into aquifers during fallow or dormant periods. These amounts are pertinent to DWR's work on opportunities, in mainly non-urban settings, to utilize floodwater for managed aquifer recharge (aka Flood-MAR), but they were not considered for developing statewide stormwater targets for groundwater recharge and direct use benefitting urban water supplies. A recent white paper describes DWR's Flood-MAR program of exploring the potential for scaling up the application of floodwater on farmland and working landscapes to recharge groundwater. The Flood-MAR strategy will include a wider variety of stormwater projects not identified in this target-setting project, including rural groundwater recharge projects that may not benefit urban water supplies (California Department of Water Resources 2018a).

DWR's 2018 report, *Water Available for Replenishment*, estimated 1.5 million acre-feet/year is available for replenishment of groundwater statewide. This estimate is based on the range of available surface water runoff, which is significant in some hydrologic regions. The modelling was at a planning-area level, and it is not possible to extract the contribution from only urban stormwater runoff (California Department of Water Resources 2018b).

Table 4 Existing Stormwater Capture-and-Direct-Use Estimates or Targets

Target Type	Organization and Year	Target Type and Geographic Area	Sub Category (if Detail is Applicable)	Target Volume (Increase Over Baseline)			Notes
				2020	2030	2035	
Target	DWR 2018	Stormwater Targets for Groundwater Recharge and Direct Use in Urban California.	Groundwater recharge and direct use.	100 taf/yr groundwater recharge from urban stormwater. 100 taf/yr groundwater recharge from non-urban stormwater. 5 taf/yr direct use from urban stormwater.		200 taf/yr groundwater recharge from urban stormwater. 200 taf/yr groundwater recharge from non-urban stormwater. 50 taf/yr direct use from urban stormwater.	From this report.
Goal	SWRB 2008	Stormwater use in CA.		500 taf*/yr	1 maf**/yr		Recycle Water Policy. Increase above 2007 levels. Documentation unavailable.
Potential	NRDC/Pac Institute 2009	Stormwater Capture Potential in urbanized Southern & Bay Area: Infiltration for Groundwater recharge & Direct non-potable Use.	Total water supply		405 taf/yr		Estimates were revised in 2014.

Target Type	Organization and Year	Target Type and Geographic Area	Sub Category (if Detail is Applicable)	Target Volume (Increase Over Baseline)			Notes
				2020	2030	2035	
Potential (updated)	NRDC/Pac Institute2014	Stormwater Capture Potential in urbanized Southern & Bay Area.	Total water supply.		420–630 taf/yr		Study included new projects & retrofit projects for stormwater runoff from existing developments. 630 taf = 440 acre-feet of groundwater recharge +190 taf of rooftop rainwater capture per year.
			Groundwater recharge.		365–440 taf/yr		
			Direct non-potable use.		30–145 taf/yr residential only. 190 taf/yr for residential, commercial and industrial.		
Potential	UC Agriculture & Natural Resources Cooperative Extension 2015	Potential for groundwater banking on agricultural lands.	Groundwater recharge.	No specific year. A preliminary calculation based only on soil properties and crop type shows that landscapes rated Excellent or Good could be used to bank as much as 1.2 million acre-feet of water per day.			This estimate assumes one foot per day of infiltration on lands in the Excellent and Good categories that are planted with grapes (460,000 acres) or alfalfa (300,000 acres), or fallowed (440,000 acres)

Notes:
*Thousand acre-feet.
**Million acre-feet.

6. Issues Related to Determining Stormwater Targets for Groundwater Recharge and Direct Use

During the development of stormwater targets for groundwater recharge and direct use, several issues were identified and are described below. To assist with future stormwater target setting efforts, recommendations to improve the target-setting approach are presented in Section 7.

Storm Water Resource Plans

SWRPs provide substantial information on planned stormwater projects. SWRPs are submitted to DWR and the SWRCB funding programs for Proposition 1 grant funding. In addition, SWRPs are to be

incorporated as part of the IRWM plans that are submitted to DWR every five years. Currently there is no central repository to store SWRP information.

Metrics and Reporting

The following issues related to metrics and reporting on existing and future groundwater recharge and direct use projects were identified:

Reporting: There is periodic reporting of stormwater information to the State for different programs, such as the SWRCB Stormwater Program and the regional water quality control boards' Stormwater Program (annual), urban water management plan reporting (every five years), the DWR IRWM Program (annual), and the SWRCB's Financial Assistance Program (annual). This reporting is not integrated, and the State does not annually track stormwater for groundwater recharge and direct use, so there is no central database for these projects. The inventory of projects and the database developed for this study could be used to develop a central database.

Metrics: SWRPs have a variety of data formats associated with the project benefits related to stormwater capture. In general, data reporting is either water-quality centric (volumes are reported in acre-feet of stormwater per design storm, with the understanding that the design storm type can vary) or water-supply centric (volumes are reported in acre-feet of stormwater per year, with the understanding that the year type could vary).

Tracking Stormwater for Groundwater Recharge and Direct Use

Estimating Water Supply Benefits

Some entities reported that they cannot differentiate between the amount of stormwater versus other water sources in their groundwater spreading grounds. Many urban stormwater projects divert water for infiltration, but the actual benefit to groundwater aquifers that are water supply sources is difficult to determine. Examples include:

- Project proponents that were contacted knew that a future project would infiltrate stormwater but did not know if the project would replenish groundwater.
- Caltrans has a goal of treating stormwater runoff from 33,000 acres of right-of-way, statewide. Caltrans has cooperative implementation agreements with several cities in Southern California on stormwater projects, with those cities taking the lead on managing the projects. Caltrans has not conducted a detailed investigation and so does not have available estimates of the volume of stormwater planned to be captured.
- In the Central Valley, one project proponent could not quantify stormwater contribution versus contributions from recycled water, the State Water Project, Lake Kaweah, and Friant-Kern Canal water.
- Many constructed projects have no means to measure actual flows that are infiltrated or diverted to landscapes for irrigation. Planning design estimates are the only available quantification, even for constructed projects.

Managing the List of Stormwater Projects

Since there is no comprehensive statewide list of stormwater projects for groundwater recharge and direct use, DWR reviewed plans, surveys, annual reports, grant proposals, and various databases for the information necessary to compile relevant, planned projects for development of the stormwater targets provided in Appendix B.

In addition, definitions for the terminology used by different SWRPs varied, and DWR staff had to investigate each definition to ensure staff were interpreting the data correctly. Examples include:

- Project categorization by size and type of best management practice can differ greatly for each entity, with the same terms being used for differently sized projects. For example, a "centralized" or "regional project" could be used to refer to a project many orders of magnitude greater than a project for which another agency would use the same term.
- There are several definitions of "stormwater" depending on the program and agency, and the term can mean different things even within the same agency. Non-standardization of the term "stormwater" can be a barrier to communication, and terminology needs to be defined explicitly. Many stormwater project funding programs are driven by their related regulatory language, and related stormwater definitions can also differ from common dictionary definitions.

7. Recommendations

Recommendations derived from the issues discussed in Sections 5 and 6 are:

- DWR and the SWRCB should make all SWRPs, and equivalent SWRPs, available electronically on a common website accessible to the public.
- DWR and the SWRCB should collaborate on standardizing metrics and data reporting on the water supply benefits of stormwater projects for groundwater recharge and direct use. A basic indicator for actual stormwater use would assess progress in achieving the proposed statewide stormwater targets. Currently, the common water supply metric is *acre-feet per year*, either directed to storage (recharge) or directly used. Standardized data are needed to assess if the 2020 targets are met.
- DWR and the SWRCB should periodically review and update the list of stormwater projects created from this stormwater target setting study.
- DWR and the SWRCB should continue working on common terminologies.
- DWR and the SWRCB should encourage IRWMs to better integrate projects involving groundwater recharge and direct use of stormwater into their planning processes. IRWM plans should describe the stormwater captured by the regional water management groups in comparison to the targets, and how the groups plan to achieve the stormwater targets in the future.
- DWR and the SWRCB should develop and implement a workplan to assess the statewide potential for urban stormwater capture and direct use.

8. Conclusions

The statewide stormwater target is 250 taf/yr of urban stormwater capture and direct use by 2035. This target reflects 200 taf/year of groundwater recharge from urban stormwater by the year 2035, 200 taf/year of groundwater recharge from non-urban stormwater by 2035, and 50 taf of direct use of urban stormwater by 2035. These estimates are based on the best available data extrapolated from future stormwater capture projects for groundwater recharge and direct use.

Since the historic drought of 2012–2016, more entities have started viewing stormwater as a resource in the water supply context and are starting to develop ideas for projects.

In the next few years, more detailed data regarding planned stormwater projects should become available as SWRPs are submitted along with IRWM plan updates for:

- The next round of DWR IRWM funding estimated to begin in the fall of 2018 (via planned Proposition 1 funding solicitations).
- The second round of SWRCB stormwater implementation projects estimated to begin in late 2018 or early 2019 (including the planned Proposition 1 funding solicitations).
- Proposition 68 (California Drought, Water, Parks, Climate, Coastal Protection, and Outdoor Access For All Act of 2018), which was recently passed, provides for grant funding for projects that capture stormwater that will be used to recharge groundwater supplies.

The state should determine the potential for stormwater capture in urban California and leverage available assessments when possible.

Groundwater sustainability plans, which are required in 2020 and 2022 by the Sustainable Groundwater Management Act, may also be a driver for the development of future projects. More detailed data on planned stormwater projects and updated targets should become available for California Water Plan Update 2023.

There are existing federal and State programs to assist local agencies with stormwater projects for groundwater recharge and direct use. These include existing supplemental financing mechanisms available to many municipalities, such as low interest loans and grants. Unique and more creative funding opportunities such as public-private partnerships, enhanced infrastructure finance districts (EIFDs), and performance-based infrastructure programs (California Water Boards 2017a) will also be made available.

The SWRCB's Stormwater Strategy (initiated in 2016) addresses issues related to promoting groundwater recharge and direct use. The aim of the program is to lead the evolution of stormwater management in California by advancing the perspective that stormwater is a valuable resource, supporting policies for collaborative watershed-level stormwater management and pollution prevention, removing obstacles to funding, developing resources, and integrating regulatory and non-regulatory interests (California Water Boards 2018a).

In addition, other SWRCB efforts to promote stormwater capture and infiltration in the industrial setting plus existing efforts toward requiring incorporation of LID into construction project design will further inform future target-setting endeavors.

DWR and the SWRCB should continue to work collaboratively to assist local and regional entities implement urban stormwater projects to increase water supply reliability in their regions and encourage reporting progress of meeting stormwater targets in IRWM plans.

The previously discussed statewide stormwater targets and the recommendations to resolve any discovered issues will be used to inform the resource management strategy discussed in Update 2018, Urban Stormwater Runoff Management. Implementation of the recommendations will allow for better assessments of groundwater recharge and direct use projects in the future.

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Appendix A

Methodology for Developing Stormwater Targets for Groundwater Recharge and Direct Use in Urban California

Appendix A Contents

1. Objective

Determination of stormwater targets for groundwater recharge and direct use in urban California.

2. Background

The water conservation legislation enacted in 2009, Senate Bill X7-7, California Water Code (CWC) Section 10608.50 (b), directs DWR as follows.

> No later than January 1, 2011, and updated as part of the California Water Plan, the department [DWR], in consultation with the board [State Water Resources Control Board, SWRCB], and with public input, shall propose new statewide targets, or review and update existing statewide targets, for regional water resources management practices, including, but not limited to, recycled water, brackish groundwater desalination, and infiltration and direct use of urban stormwater runoff.

DWR consulted with the State Water Resources' Control Board (SWRCB's) Strategy to Optimize the Resource Management of Stormwater (STORMS) program staff on the development of the methodology and also throughout the project for developing stormwater targets. On November 4, 2016, DWR released the draft methodology for a two-week public comment period to the STORMS program staff and the STORMS Project Advisory Group (PAG) for projects 1a and 1b which are the Phase 1 STORMS projects that are related to capture and use. The STORMS PAG is composed of parties interested in stormwater capture and use and members represent State agencies, counties, cities, private companies, water and stormwater associations, environmental advocacy groups, and universities.

DWR received four comments during that two-week public comment period. Most comments suggested including additional data sources to be investigated (e.g., enhanced watershed management plans and stormwater resource plans). These were incorporated into the final methodology. One comment suggested using information from all infiltration projects instead of only those involving deep percolation for groundwater recharge. But it was decided that the legislation was written in the context of alternative water supplies, and accordingly, the legislation implies stormwater targets should be developed for projects that knowingly involve groundwater recharge and not just those that infiltrate stormwater. A discussion about this is in Section 6.

The final methodology used to develop stormwater targets for groundwater recharge and direct use is discussed in Section 5. Based on this methodology, DWR, in consultation with the SWRCB and public stakeholders, developed new statewide stormwater targets for 2020 and 2035 for the annual use of urban stormwater runoff for groundwater recharge and direct use, which are reported in *Stormwater Targets for Groundwater Recharge and Direct Use in Urban California*.

3. Terminology

There were two types of terms in CWC Section 10608.50 (b) that are defined for this project — those related to targets and those related to physical processes.

3.1 Terms Related to Targets

The terms "goal," "target," "mandate," and "potential" are widely used when discussing California water planning. During the development of recycled water-use targets, which are also driven by CWC Section 10608.50 (b), common dictionary definitions were compiled to differentiate between these terms. Those same definitions are used for this project and are included in Table A-1.

Table A-1 Comparison of Terms and Definitions to be used for Storm Water Goals and Mandates[1]

Term	General Definition[2]
Projection	A possible future outcome, which may vary depending on the assumed conditions (same as "potential") or the carrying forward of a past trend into the future.
Mandate	An end to be achieved by an authoritative command.
Goal	An end toward which effort is directed with the implication that attainment may require extraordinary effort or struggle. A goal is an end to strive for and may not be an expectation.
Target	A benchmark that indicates a state of achievement expected at some time in the future. A target does not necessarily carry the same connotation of extraordinary effort as a goal does.
Potential	A possible future outcome, which may vary depending on the assumed conditions. Maximum potential would be an upper boundary assuming ideal or unconstrained conditions.

Notes:

[1] "Determination of Statewide 2020 Recycled Water Use Goals," DWR Internal Memorandum, Rich Mills & Toni Pezzetti, November 19, 2013.

[2] Definitions are based on dictionary definitions and commentaries on the use of these terms.

3.2 Terms Related to Physical Processes

To comply with CWC Section 10608.50 (b), it was necessary to define the stormwater terms used in the context of stormwater as a water supply to capture the intent of the legislation.

For this project, "infiltration" in Section 10608.50 (b) is taken to mean "deep percolation resulting in groundwater recharge." This was decided because technically, infiltration is defined as the entrance of surface water into the soil, usually at the soil/air interface. Not all infiltration reaches a groundwater aquifer to be available for future use. Deep percolation is defined as the percolation of water through the ground and beyond the lower limit of the root zone of plants into the groundwater, which results in groundwater recharge. This interpretation is offered because Section 10608.50 (b) was written in the context of alternative water supplies.

For the same reason, it was decided that the term "direct use" in Section 10608.50 (b) is taken in the water-supply context to mean the use of intentionally captured stormwater, which may involve short-term storage (e.g., via rain barrels, underground tanks, equalization basins) or treatment. Most projects in this category will be stormwater projects that intentionally capture and use stormwater and will offset potable or other non-potable water use. This interpretation of direct use does not include incidental uses (i.e., stormwater that would have naturally infiltrated), flood control, or stormwater pollution-prevention projects. It also does not include use after stormwater has become part of long-term storage, either as groundwater or as surface water.

4. Stormwater Estimates or Targets

There has been an increasing focus on the need for more stormwater capture and use in California because of to the 2012–2016 drought. A literature review to find existing statewide goals was performed. The results are discussed below and are summarized in Table A-2.

- The SWRCB's Recycled Water Policy of 2008 includes a goal for increasing stormwater use in California. Documentation is not available on the derivation of those estimates.
- The Natural Resources Defense Council (NRDC)/Pacific Institute developed estimates in 2009 (and revised them in 2014) for the potential for stormwater capture in urbanized Southern California and the Bay Area. The 2014 potential for groundwater recharge was based on Natural Resources Conservation Service Soil Groups A & B. Some broad assumptions were used to estimate that the potential for stormwater capture for those areas is 405,000 af (acre-feet) per year. But the NRDC/Pacific Institute estimates did have some detailed information on the soil profile of the areas covered by their study. It would take a large effort to replicate their analysis to cover the entire state.
- The University of California Cooperative Extension published a study in 2015 that estimated groundwater recharge potential when surface water is available and when deliberately flooding agricultural land during fallow or dormant periods would allow water to percolate into an aquifer. The paper identified 3.6 million acres of agricultural land statewide as having excellent or good potential for groundwater recharge. A preliminary calculation, based only on soil properties and crop type, shows that landscapes rated excellent or good could be used to bank as much as 1.2 million af of water per day. This estimate assumes 1 af per day of water infiltration on lands in the excellent and good categories that are planted with grapes (460,000 acres), alfalfa (300,000 acres), or are fallowed (440,000 acres). The authors acknowledge their limitations with their modeling work. They did not consider proximity to a surface-water source, characteristics of the vadose zone (the unconsolidated material below soil and above the groundwater table), or depth to groundwater. These amounts are pertinent to DWR's work on opportunities, in mainly non-urban settings, to utilize flood water for managed aquifer recharge (aka Flood-MAR) but were not considered for developing statewide stormwater targets for groundwater recharge and direct use in urban California.
- DWR released a report entitled *Water Available for Replenishment* in 2018, providing a best estimate (based on available information) of the water available for replenishment of groundwater. The statewide estimate of 1.5 million acre-feet/year, which is based on documented assumptions and methodology and the range of available surface water runoff, is significant in some hydrologic regions. The modelling studies performed to arrive at that estimate were completed at a planning-area level, and it is not possible to extract the contribution from only urban stormwater runoff.

Because of the absence of targets required by the directives of CWC Section 10608.50 (b), DWR decided to develop new targets independent of the existing targets shown in Table A-2.

Table A-2 Existing Stormwater Estimates or Targets

Target Type	Org Year	Target type and geographic area	Sub Category (if detail is applicable)	Target Volume (increase over baseline)		Notes
				2020	2030	
Mandate	SWRB 2008	Stormwater use in CA		500 taf**/year	1 maf***/year	Recycle Water Policy. Increase above 2007 levels. Documentation unavailable.
Potential	NRDC/ Pac Institute 2009	Stormwater Capture Potential in urbanized southern & Bay Area: Infiltration for Groundwater recharge & Direct non-potable Use	Total water supply		405 taf/year	Estimates were revised in 2014
Potential (updated)	NRDC/ Pac Institute 2014	Stormwater Capture Potential in urbanized southern & Bay Area	Total water supply		420-630 taf/year	Study included new projects & retrofit projects for stormwater runoff from existing developments. 630 TAF=440 af* GW recharge +190 taf of rooftop rainwater capture per year.
			Groundwater recharge		365-440 taf/year	
			Direct non-potable use		30-145 taf/year residential only 190 taf/year for residential, commercial, and industrial	
Potential	UC Agriculture & Natural Resources Cooperative Extension 2015	Potential for groundwater banking on agricultural lands	Groundwater recharge	No specific year. A preliminary calculation based only on soil properties and crop type shows that landscapes rated Excellent or Good could be used to bank as much as 1.2 million acre-feet of water per day		This estimate assumes one foot per day of infiltration on lands in the Excellent and Good categories that are planted with grapes (460,000 acres) or alfalfa (300,000 acres), or fallowed (440,000 acres)

Notes:
*Acre-feet
**Thousand acre-feet.
***Million acre-feet.

5. Sources of Information Investigated

DWR reviewed plans, surveys, annual reports, grant proposals, and databases for information on planned stormwater projects to compile all the relevant projects for developing targets. Data sources investigated are listed in Table A-3 and if the data was used in developing targets, there is a discussion about each. It should be noted that several databases covered the same project, but because the location of each project was eventually known and was mapped, projects were not double-counted when used for target-setting.

5.1 DWR Division of Flood Management Project Database

The DWR Division of Flood Management has a database containing projects from integrated regional water management plans (IRWMPs), other plans, and direct communication. A DWR flood management consultant extracted all the water projects from the IRWMPs, capital improvement plans, and U.S. Army Corps of Engineers project information and entered this extracted information into a separate database. The consultant also interviewed 240 flood and water agencies and entered the information gleaned into this database. This database containing approximately 6,000 projects, as of January 3, 2017, was filtered to extract those projects that:

- Included a stormwater component designated by the database field as "stormwater management."
- Listed a construction end-date after 2014. Projects completed in calendar year 2015 were included, though the target-setting project baseline is 2015, because it was assumed that projects completed in 2015 would most likely not be used until the 2016 wet season. Those projects with an unknown construction end-date were also initially included.
- Were categorized as having water supply and groundwater management benefits.
- Involved stormwater for groundwater recharge or direct use or dry weather flows (i.e., the stated benefits were not just for improving flood risk reduction or habitat restoration).

Table A-3 Sources of Data Explored for Target Setting

Source	Used for Target Setting?
DWR Division of Flood Management Project Database	Yes
Integrated regional water management plans and regional contacts	Yes
Integrated Regional Water Management Grant Funding Database	Yes
Urban water management plans	No
SWRCB and RWQCB surveys and annual reports	No
Groundwater management plans	No
Stormwater master plans	Yes
Stormwater resource plans	Yes
Agricultural water management plans	No

Source	Used for Target Setting?
SWRCB Proposition 1 Stormwater Grant Funding Database	Yes
Watershed/Enhanced watershed management plans	No
SWRCB water rights temporary permits	Yes
Caltrans cooperative implementation agreements	Yes
Miscellaneous sources/contacts	Yes

Notes:
DWR = California Department of Water Resources
RWQCB = regional water quality control board
SWRCB = State Water Resources Control Board

Through this elimination process, the number of potential projects to be used for developing targets was reduced to 91 projects.

During the target-setting project, it was also discovered that a few integrated regional water management (IRWM) groups have websites that contain even more up-to-date information than their IRWMP. That information was used to fill data gaps.

5.2 Integrated Regional Water Management Plans and Regional Contacts

Numerous IRWM planning grants have helped regional water management groups to develop and adopt IRWMPs for their regions. IRWMPs are submitted to DWR approximately every five years and are a requirement for some grant funding sources.

Initially, IRWMPs appeared to be the best source of data on future stormwater projects regarding coverage and information on future projects. Even though the most recent plans were developed in 2013 and 2014, most contain more information than the 2015 urban water management plans (UWMPs) and cover proposed projects through 2035, which is the intended 20-year planning horizon.

IRWM regional contacts were emailed maps displaying all known relevant projects from the above sources with location and key data. These contacts were requested to (1) verify associated data, (2) submit missing project information, and (3) submit information on other planned projects. In the majority of the responses, DWR was directed to follow-up with the specific project proponents for additional details, but in a few cases, the missing information and information on additional projects were supplied by the IRWM regional contact.

5.3 Integrated Regional Water Management Grant Funding Database

The DWR IRWM Branch maintains a database that contains information in all projects that receive grant awards. This database includes stormwater implementation projects slated to be completed by 2020. The database, as of February 2017, contained approximately 1,100 projects related to Propositions 84, 13, and 1e. For this target-setting process, the project list was reduced to those of interest by extracting those projects that:

- Listed a construction end-date after 2014. Projects completed in calendar year 2015 were included though the target-setting project baseline is 2015, because it was assumed that projects completed in 2015 would most likely not be used until the 2016 wet season. Those with an unknown construction end-date were also included for verification later.
- Were categorized as stormwater management, flood risk reduction, and construction projects. Projects in those categories were later eliminated. It was assumed the project recharged groundwater and did not just provide infiltration benefits alone if recharge was quantified. It was also assumed that habitat conservation is not a direct use. Projects categorized as flood risk reduction sometimes had a secondary benefit of groundwater recharge, so those were also shortlisted.
- Resulted in water supply and groundwater-management benefits.
- Included stormwater for groundwater recharge or direct use or dry-weather flows (i.e., the stated benefits were not just for improving flood risk reduction or habitat restoration).

Through this elimination process, the number of potential projects to be used for developing targets from this database was reduced to nearly 200 projects.

5.4 Urban Water Management Plans

UWMPs are prepared by urban water suppliers to support their long-term resource planning and ensure adequate water supplies are available to meet existing and future water demands. The plans must be prepared every five years and submitted to DWR. A cursory look at some 2015 UWMPs and comparing them with information in IRWMPs showed that most UWMPs did not include the planned stormwater projects that existed in the IRWMP covering the same region. It was assumed that the IRWMPs would offer better information. Consequently, UWMPs were not used to develop targets.

5.5 SWRCB and RWQCB Surveys and Annual Reports

According to SWRCB STORMS staff, some stormwater surveys have been performed in the past, but information on future projects was not part of those surveys.

Also, data is collected annually for the Municipal Separate Storm Sewer Systems permits by the regional water quality control boards (RWQCBs) and SWRCB, but information collected by RWQCBs is not uniform across the state, and data collected by the SWRCB does not include information on future stormwater projects. Consequently, these sources were not used to develop targets.

5.6 Groundwater Management Plans

DWR has 144 groundwater management plans **(**GWMPs) as of January 2017 that were developed since the early 1990s. Some GWMPs contain planned projects for groundwater recharge. Assembly Bill 359 (2011) placed new requirements on agencies concerning the submission of GWMPs and on DWR to

provide public access to this information. Yet only 12 of these were completed after 2012 and it was assumed that IRWMPs and associated websites would contain more updated information. Consequently, these sources were not used to develop targets.

5.7 Stormwater Master Plans

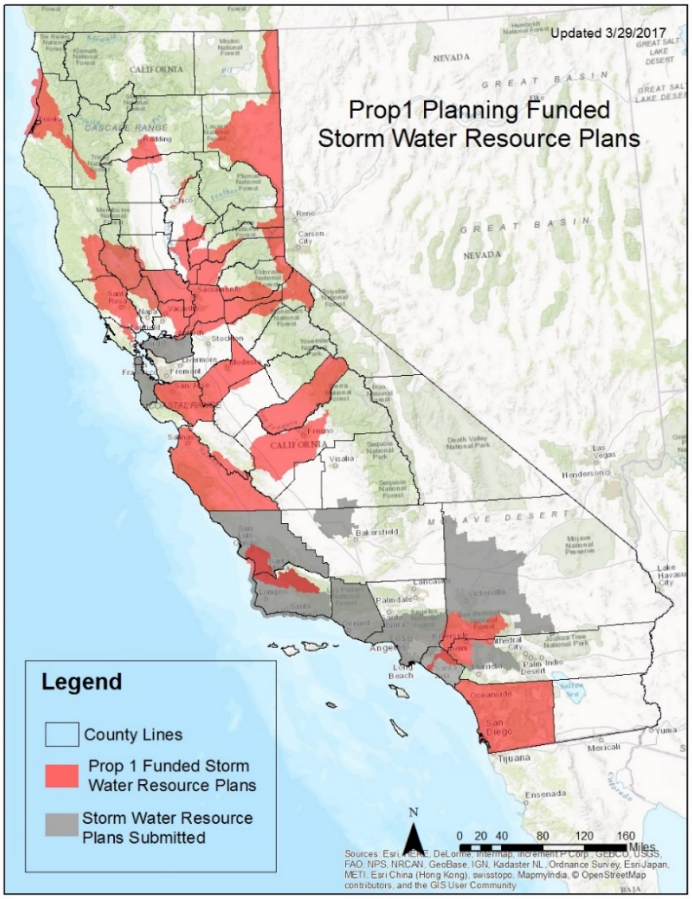
The Los Angeles Department of Water and Power (LADWP) developed a Stormwater Capture Master Plan in 2015 with very detailed information on future projects and expected targets. These data were used to develop targets. No similar master plans were known of in the state as of January 2017.

5.8 Storm Water Resource Plans

Because of requirements for Proposition 1 funding, many agencies managing stormwater are currently developing stormwater resources plans to be appended to their IRWMP.

As of December 2015, stormwater resource plans or functionally equivalent plans are required to obtain grant funds for stormwater and dry-weather capture projects as stipulated by CWC Section 79747. These plans are starting to be submitted to DWR and SWRCB. Figure A-1 shows the coverage of these plans as of March 29, 2017. Data in these plans was used to develop targets.

Figure A-1 Stormwater Resources Plan Coverage as of March 2017



5.9 Agricultural Water Management Plans

Some agricultural water management plans (AWMPs) have some information on tailwater/excess irrigation water projects, but there is not a lot of information and it was assumed that these numbers will be negligible in an urban setting. Consequently, these sources were not used to develop targets.

5.10 SWRCB Proposition 1 Stormwater Grant Funding Database

2016 project proposals for implementation projects for Round 1 of Proposition 1 funds contained projects with potential for setting targets. Funded projects were investigated to learn if they developed the 2020 target. Those that were not funded were investigated for use in developing 2035 targets.

5.11 Watershed Management Plans

Some RWQCBs are allowing permittees the flexibility to develop watershed management plans (WMPs) or enhanced watershed management plans (EWMPs) to implement the requirements of the permit on a watershed-scale through customized strategies, control measures, and best management practices. Comments received on DWR's draft methodology suggested investigating data in these plans. The STORMS program assisted by creating a database of projects with EWMP data, which covered five watersheds in the Los Angeles region and the projects were considered for inclusion in developing targets.

Still, these projects' data of volume estimates were mostly reported by design storm instead of by volume-per-year. Since the LADWP Stormwater Capture Master Plan covered the same project area, it was decided that the latter data would be used instead, because benefits were quantified in terms of volume-per-year.

This issue is discussed in more detail in Section 6 of the report.

5.12 SWRCB Water Rights Temporary Permits

Some water suppliers apply annually for temporary permits for withdrawing stormwater from surface water for groundwater recharge. This information was investigated and used as a source of data to develop targets.

5.13 Caltrans Cooperative Implementation Agreements

Caltrans has a goal of treating stormwater runoff from 33,000 acres of property statewide. They have cooperative implementation agreements with several cities in southern California on stormwater projects. These projects were investigated and used for developing targets.

5.14 Miscellaneous Sources/Contacts

DWR contacted various agencies to verify data and acquired information on miscellaneous projects. For example, the City of Santa Monica Public Works Water Resources Division gave information on stormwater capture-and-direct-use projects, which are not covered in the IRWMP for their region or in the EMWP reporting for their region.

6. Target-Setting Objective

As listed in Table A-1, a target is defined in this project as a benchmark that indicates achievement expected at some time in the future. A target does not necessarily carry the same connotation of extraordinary effort as a goal does. No specific instructions are included in the legislation to develop these targets, but because the identified targets will be used to guide resource management practices, DWR assumed that the targets to be developed should represent an achievable expectation of stormwater runoff capture for groundwater recharge and direct-use benefitting urban water supplies.

Meanwhile, in the absence of such detailed information, DWR decided that the following method, consistent with recycled water targets that were developed and reported in *California Water Plan Update 2013*, will suffice to satisfy CWC Section 10608.50 (b) requirements.

DWR developed targets for increasing stormwater use in California relative to 2014 levels by identifying planned stormwater capture projects for water supply benefits for the two target years — 2020 and 2035.

These periods were selected since:

- Grant program stormwater projects are scheduled to be completed by 2020.
- The planning horizon for IRWM plans, which produced the bulk of the planned projects post 2020, is through 2035.

6.1 2020 Targets

Relevant stormwater projects from the sources discussed above (primarily Proposition 1 Stormwater Grant Funding for Implementation Projects, Proposition 84, Proposition 50 Grant Funding, stormwater resource plans, and feedback) were used to develop 2020 targets.

Specifically, projects identified to increase water-supply reliability were used in developing targets for 2020. If the stated benefits do not increase water-supply reliability, that project was not used for developing targets. This is because the distinction is made between infiltration and deep percolation. The assumption is that the applicant knows enough about the project (i.e., soil profile) to indicate that their project will replenish groundwater or will offset the use of potable or non-potable water. Projects may have other benefits, such as flood control and water quality benefits, but those are not relevant in the context of CWC Section 10608.50 (b). Accordingly, most distributed green-infrastructure projects were not included unless the project proponent gave feedback that the project involved groundwater recharge. Many project proponents did not have information about whether their project recharged groundwater, because many projects were driven by stormwater quality goals, which required only infiltration of stormwater.

There were few direct-use projects planned for 2020.

6.2 2035 Targets

Similarly, the methodology to develop 2035 targets involved identifying projects that increased water-supply reliability were identified and feedback was requested by IRWM region contacts and related contacts.

The targets developed are described in this DWR report, and also in the upcoming addendum to the resource management strategy, *Urban Stormwater Runoff Management*, in California Water Plan Update 2018. New statewide stormwater targets, or a review and an update for existing statewide stormwater targets for infiltration and direct use of urban stormwater runoff, are mandated by CWC Section 10608.50 (b).

In the next few years, stormwater resources plans and groundwater sustainability plans (required in 2020 by the Sustainable Groundwater Management Act) may be a driver for the development of future projects. More detailed data on planned stormwater projects should become available to update targets with the CWP Update 2023.

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Appendix B

Project Data Used for Stormwater Target Setting

Table B1 Project Data Used for Stormwater Target Setting

Projects	GW_ recharge_ amount_ AFY	DirectUse _AFY	Basis_For_ Amounts	UrbanOr NonUrban ORBoth_ SWsource_ check	Construction_ end_targetyrNB	DWR_Hydrologic Region_Name	Program1	SWRP_or_ Equiv_SWRP	DWR_ Contact_ Comments	DWR_ TargetNotes
1. Stormwater retention facilities from the Salinas industrial wastewater facility to the MRWPCA Salinas Pump Station	4000	0		urban	2020	Central Coast	0	0	Susan Robinson & Consultant-Kennedy Jenks, Sachi Itagaki	Consultant-Kennedy Jenks, Sachi Itagaki
2. City of Salinas SWRP-Integrated Industrial Wastewater conveyance and treatment facility improvements	1750	750		urban	2020	Central Coast	SWRCB-Prop1	0	Susan Robinson & Consultant-Kennedy Jenks, Sachi Itagaki	Consultant-Kennedy Jenks, Sachi Itagaki
3. MRWPCA and City of Salinas Storm Water Collection, Conveyance, Treatment and Reuse Project	1400	0		urban	2020	Central Coast	SWRCB-Prop1	0	Susan Robinson & Consultant-Kennedy Jenks, Sachi Itagaki	Consultant-Kennedy Jenks, Sachi Itagaki
4. City of Salinas SWRP-Integrated Industrial Wastewater conveyance and treatment facility improvements. GW part of project	1400	0		urban	2020 2020	Central Coast	SWRCB-Prop1	0	Susan Robinson & Consultant-Kennedy Jenks, Sachi Itagaki	Consultant-Kennedy Jenks, Sachi Itagaki
5. Main Street Subwatershed Improvement Project	300	0		urban		Central Coast	SWRCB-Prop1	0	0	0

Projects	GW_ recharge_ amount_ AFY	DirectUse _AFY	Basis_For_ Amounts	UrbanOr NonUrban ORBoth_ SWsource_ check	Construction_ end_targetyrNB	DWR_Hydrologic Region_Name	Program1	SWRP_or_ Equiv_SWRP	DWR_ Contact_ Comments	DWR_ TargetNotes
6. Blanco Drain Diversion to MRWPCA Regional Treatment Plant	4000	0		urban	2035	Central Coast	0	0	Susan Robinson & Consultant-Kennedy Jenks, Sachi Itagaki	Consultant-Kennedy Jenks, Sachi Itagaki
7. Recharge Net Metering and Managed Aquifer Recharge in the Pajaro Valley	350	0		both	2035	Central Coast	SWRCB-Prop1	0	Andy Fisher, UCSC	Pilot project per Andy Fisher
8. Soledad Regional Recharge Project	272	714		urban	2035	Central Coast	SWRCB-Prop1	0	Susan Robinson & Consultant-Kennedy Jenks, Sachi Itagaki	Consultant-Kennedy Jenks, Sachi Itagaki
9. Temporary Diversion from Cache Creek	72000	0		non-urban	2020	Sacramento River	SWRCB-WR	0	0	0
10. Panther Creek restoration, flood control, and groundwater recharge	35	0		both	2020	Sacramento River	0	0	0	0

Projects	GW_ recharge_ amount_ AFY	DirectUse _AFY	Basis_For_ Amounts	UrbanOr NonUrban ORBoth_ SWsource_ check	Construction_ end_targetyrNB	DWR_Hydrologic Region_Name	Program1	SWRP_or_ Equiv_SWRP	DWR_ Contact_ Comments	DWR_ TargetNotes
11. City of Sacramento LID Standards at California State University, Sacramento: A Local Project with Regional Intent	8.6	0		urban	2020	Sacramento River	0	0	0	Twenty LID BMPs were installed in the summer and fall of 2015. 3.6 MG/year was an old estimate based on the grant application. Final design estimate was 2.9 MG/year. Of the 2.9 MG/year, model indicated 2.8 MG/year infiltrated (or 8.6 AF).
12. Lower Putah Creek Watershed Infiltration and Invasive Species Removal	3.6	0		non-urban	2020	Sacramento River	DWR-IRWM	0	0	0
13. Basin 104 Improvements	23	0		urban	2035	Sacramento River	DWR-DFM	0	0	0
14. Stormwater Source Control in the CABY Region	18	0		urban	2035	Sacramento River	DWR-IRWM	0	0	0
15. Construction of LID Infiltration & Recharge Projects in Santa Cruz County	16.68	0		urban	2035	Sacramento River	SWRCB-Prop1	0	0	Wrong coordinates. Changed to City of Santa Cruz coordinates.
16. Squaw Creek flood control and groundwater recharge	10	0		both	2035	Sacramento River	0	0	0	0

Projects	GW_ recharge_ amount_ AFY	DirectUse _AFY	Basis_For_ Amounts	UrbanOr NonUrban ORBoth_ SWsource_ check	Construction_ end_targetyrNB	DWR_Hydrologic Region_Name	Program1	SWRP_or_ Equiv_SWRP	DWR_ Contact_ Comments	DWR_ TargetNotes
17. Elk Grove Green Street Project: Repurposing Urban Runoff with Green Infrastructure	6.84	0	average rainfall per year	urban	2035	Sacramento River	SWRCB-Prop1	0	0	Capture and infiltrate 6.84 acre-feet of stormwater runoff annually, assuming the average rainfall per year is 18”
18. Zone 7 Water Supply Drought Preparedness Project	16425	0	Typical Year, approximately 21” of rain	non-urban	2020	San Francisco Bay	0	0	Taylor Chang	0
19. Vista Grande Drainage Basin Improvement Project	980	0		urban	2020	San Francisco Bay	0	0	0	Awarded Prop 1 funds
20. Sunset Blvd Greenway	15.04	0	Typical Year, approximately 21” of rain	urban	2020	San Francisco Bay	0	0	Taylor Chang	Pilot 2016, Phase 1 February 2017, Phases 2 & 3 2018
21. City of San Mateo Sustainable Streets and Parking Lot	13.4	0		urban	2020	San Francisco Bay	SWRCB-Prop1	0	0	0
22. Baker Beach Green Street	7.98	0	Typical Year, approximately 21” of rain	urban	2020	San Francisco Bay	0	0	Taylor Chang	0
23. Yosemite Creek Daylighting	5.22	3.76	Typical Year, approximately 21” of rain	urban	2020	San Francisco Bay	0	0	Taylor Chang	0
24. Wiggle Neighborhood Green Corridor	3.38	0	Typical Year, approximately 21” of rain	urban	2020	San Francisco Bay	0	0	Taylor Chang	0
25. Holloway Green Street	3.38	0	Typical Year, approximately 21” of rain	urban	2020	San Francisco Bay	0	0	Taylor Chang	0
26. Visitacion Valley Green Nodes	2.46	0	Typical Year, approximately 21” of rain	urban	2020	San Francisco Bay	0	0	Taylor Chang	0

Projects	GW_ recharge_ amount_ AFY	DirectUse _AFY	Basis_For_ Amounts	UrbanOr NonUrban ORBoth_ SWsource_ check	Construction_ end_targetyrNB	DWR_Hydrologic Region_Name	Program1	SWRP_or_ Equiv_SWRP	DWR_ Contact_ Comments	DWR_ TargetNotes
27. Mission and Valencia Green Gateway	1.84	0	Typical Year, approximately 21” of rain	urban	2020	San Francisco Bay	0	0	Taylor Chang	0
28. San Francisco International Airport Reclaimed Water Facility	0	560	Typical Year, approximately 21” of rain	urban	2020	San Francisco Bay	0	0	Taylor Chang	0
29. 1395 22nd Street non-potable water system	0	2.33	Typical Year, approximately 21” of rain	urban	2020	San Francisco Bay	0	0	Taylor Chang	0
30. Moscone Center non-potable water system	0	2.32	Typical Year, approximately 21” of rain	urban	2020	San Francisco Bay	0	0	Taylor Chang	0
31. Transbay Transit Center non-potable water system	0	2.23	Typical Year, approximately 21” of rain	urban	2020	San Francisco Bay	0	0	Taylor Chang	0
32. Public Safety Building non-potable water system	0	1.63	Typical Year, approximately 21” of rain	urban	2020	San Francisco Bay	0	0	Taylor Chang	0
33. UBER Headquarters non-potable water system	0	1.46	Typical Year, approximately 21” of rain	urban	2020	San Francisco Bay	0	0	Taylor Chang	0
34. 510 Townsend non-potable water system	0	1.24	Typical Year, approximately 21” of rain	urban	2020	San Francisco Bay	0	0	Taylor Chang	0
35. SFMOMA non-potable water system	0	1.12	Typical Year, approximately 21” of rain	urban	2020	San Francisco Bay	0	0	Taylor Chang	0
36. CPMC St. Luke's hospital rainwater harvesting system	0	1.05	Typical Year, approximately 21” of rain	urban	2020	San Francisco Bay	0	0	Taylor Chang	0
37. 350 8th Street non-potable water system	0	0.66	Typical Year, approximately 21” of rain	urban	2020	San Francisco Bay	0	0	Taylor Chang	0
38. Transbay Block 9 non-potable water system	0	0.63	Typical Year, approximately 21” of rain	urban	2020	San Francisco Bay	0	0	Taylor Chang	0

Projects	GW_ recharge_ amount_ AFY	DirectUse _AFY	Basis_For_ Amounts	UrbanOr NonUrban ORBoth_ SWsource_ check	Construction_ end_targetyrNB	DWR_Hydrologic Region_Name	Program1	SWRP_or_ Equiv_SWRP	DWR_ Contact_ Comments	DWR_ TargetNotes
39. Sansome and Broadway Affordable Housing non-potable water system	0	0.56	Typical Year, approximately 21” of rain	urban	2020	San Francisco Bay	0	0	Taylor Chang	0
40. CPMC Cathedral Hill Hospital rainwater harvesting water system	0	0.45	Typical Year, approximately 21” of rain	urban	2020	San Francisco Bay	0	0	Taylor Chang	0
41. Park Tower non-potable water system	0	0.44	Typical Year, approximately 21” of rain	urban	2020	San Francisco Bay	0	0	Taylor Chang	0
42. 250 4th Street Hotel non-potable water system	0	0.44	Typical Year, approximately 21” of rain	urban	2020	San Francisco Bay	0	0	Taylor Chang	0
43. Alta Laguna non-potable water system	0	0.39	Typical Year, approximately 21” of rain	urban	2020	San Francisco Bay	0	0	Taylor Chang	0
44. 340 Fremont non-potable water system	0	0.32	Typical Year, approximately 21” of rain	urban	2020	San Francisco Bay	0	0	Taylor Chang	0
45. 345 Brannan non-potable water system	0	0.32	Typical Year, approximately 21” of rain	urban	2020	San Francisco Bay	0	0	Taylor Chang	0
46. Avalon Dogpatch non-potable water system	0	0.31	Typical Year, approximately 21” of rain	urban	2020	San Francisco Bay	0	0	Taylor Chang	0
47. 181 Fremont non-potable water system	0	0.30	Typical Year, approximately 21” of rain	urban	2020	San Francisco Bay	0	0	Taylor Chang	0
48. Trinity Phase 3 non-potable water system	0	0.24	Typical Year, approximately 21” of rain	urban	2020	San Francisco Bay	0	0	Taylor Chang	0
49. 41 Tehama non-potable water system	0	0.21	Typical Year, approximately 21” of rain	urban	2020	San Francisco Bay	0	0	Taylor Chang	0
50. 45 Lansing non-potable water system	0	0.16	Typical Year, approximately 21” of rain	urban	2020	San Francisco Bay	0	0	Taylor Chang	0

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51. Market Street Place non-potable water system	0	0.16	Typical Year, approximately 21” of rain	urban	2020	San Francisco Bay	0	0	Taylor Chang	0
52. 200 6th Street non-potable water system	0	0.14	Typical Year, approximately 21” of rain	urban	2020	San Francisco Bay	0	0	Taylor Chang	0
53. 85 Bluxome non-potable water system	0	0.14	Typical Year, approximately 21” of rain	urban	2020	San Francisco Bay	0	0	Taylor Chang	0
54. 2051 3rd Street non-potable water system	0	0.09	Typical Year, approximately 21” of rain	urban	2020	San Francisco Bay	0	0	Taylor Chang	0
55. Hampton Inn non-potable water system	0	0.09	Typical Year, approximately 21” of rain	urban	2020	San Francisco Bay	0	0	Taylor Chang	0
56. St. Anthony's non-potable water system	0	0.08	Typical Year, approximately 21” of rain	urban	2020	San Francisco Bay	0	0	Taylor Chang	0
57. 55 9th Street non-potable water system	0	0.05	Typical Year, approximately 21” of rain	urban	2020	San Francisco Bay	0	0	Taylor Chang	0
58. 1634 Pine non-potable water system	0	0.05	Typical Year, approximately 21” of rain	urban	2020	San Francisco Bay	0	0	Taylor Chang	0
59. Starr King Elementary School non-potable water system	0	0.04	Typical Year, approximately 21” of rain	urban	2020	San Francisco Bay	0	0	Taylor Chang	0
60. 2558 Mission non-potable water system	0	0.04	Typical Year, approximately 21” of rain	urban	2020	San Francisco Bay	0	0	Taylor Chang	0
61. Whole Foods non-potable water system	0	0	Typical Year, approximately 21” of rain	urban	2020	San Francisco Bay	0	0	Taylor Chang	0
62. 333 Brannan non-potable water system	0	0	Typical Year, approximately 21” of rain	urban	2020	San Francisco Bay	0	0	Taylor Chang	0

Projects	GW_ recharge_ amount_ AFY	DirectUse _AFY	Basis_For_ Amounts	UrbanOr NonUrban ORBoth_ SWsource_ check	Construction_ end_targetyrNB	DWR_Hydrologic Region_Name	Program1	SWRP_or_ Equiv_SWRP	DWR_ Contact_ Comments	DWR_ TargetNotes
63. SF Bay Area: Petaluma Flood Reduction, Water & Habitat Quality, and Recreation Project for Capri Creek	3200	0		non-urban	2035	San Francisco Bay	DWR-IRWM	0	0	0
64. City Watersheds of Sonoma Valley Phase 1	80	0		urban	2035	San Francisco Bay	DWR-IRWM	0	0	0
65. Memorial Park Detention Basin Project	79	0		urban	2035	San Francisco Bay	DWR-IRWM	0	0	0
66. SF Bay Area: Napa County Rainwater Harvesting Pilot Project	74	0		urban	2035	San Francisco Bay	DWR-IRWM	0	0	0
67. Salesforce East Office non-potable water system	0	0.71	Typical Year, approximately 21” of rain	urban	2035	San Francisco Bay	0	0	Taylor Chang	0
68. 5050 Mission non-potable water system	0	0.08	Typical Year, approximately 21” of rain	urban	2035	San Francisco Bay	0	0	Taylor Chang	0
69. 115 Telegraph Hill non-potable water system	0	0.03	Typical Year, approximately 21” of rain	urban	2035	San Francisco Bay	0	0	Taylor Chang	0

Projects	GW_ recharge_ amount_ AFY	DirectUse _AFY	Basis_For_ Amounts	UrbanOr NonUrban ORBoth_ SWsource_ check	Construction_ end_targetyrNB	DWR_Hydrologic Region_Name	Program1	SWRP_or_ Equiv_SWRP	DWR_ Contact_ Comments	DWR_ TargetNotes
70. Temporary Diversion from Mustang Creek	5000	0	Above average rainfall years	non-urban	2020	San Joaquin River	SWRCB-WR	0	Kevin M Kauffman	For above average rainfall years.It is primarily Ag related and benefit, but as the City of Turlock expands to the east, urban dwellers will benefit more from both the enhanced flood-control benefit and groundwater stabilization (Kevin M Kauffman)
71. Merced: El Nido Recharge Basin	4489	0		non-urban	2035	San Joaquin River	DWR-IRWM	0	0	0
72. North Site Groundwater Recharge Project	1600	0		non-urban	2035	San Joaquin River	DWR-DFM	0	0	0
73. Modesto Area 2 Stormwater to Sanitary Sewer Cross-Connection Removal Project	42	0		urban	2035	San Joaquin River	DWR-IRWM	0	0	0
74. LID Project for Water Quality Improvement and Water Conservation	0	0		non-urban	2035	San Joaquin River	SWRCB-Prop1	0	0	Did not get Prop 1 funding. Will be used for ag irrigation.
75. LA Stormwater Capture Master Plan	17577	1000		urban	2020	South Coast	0	LA Stormwater Capture Master Plan	Rafael Villegas	Estimate breakdown from Rafael Villegas

Projects	GW_ recharge_ amount_ AFY	DirectUse _AFY	Basis_For_ Amounts	UrbanOr NonUrban ORBoth_ SWsource_ check	Construction_ end_targetyrNB	DWR_Hydrologic Region_Name	Program1	SWRP_or_ Equiv_SWRP	DWR_ Contact_ Comments	DWR_ TargetNotes
76. LA Stormwater Capture Master Plan	8795.02	0		non-urban	2020	South Coast	0	LA Stormwater Capture Master Plan	Rafael Villegas	Estimate breakdown from Rafael Villegas
77. San Diego SWRP	5520	0	Typical rain year for 5 sites, then extrapolated that to the whole county	urban	2020	South Coast	0	San Diego SWRP	Ruth Dela Rosa & Consultant: ESA,Lindsey Sheehan	Divided the estimates by end date per consultant ESA, Lindsey Sheehan
78. Wineville, Jurupa and RP-3 Basins Improvements and Pumping and Conveyance System Project	5356	0		urban	2020	South Coast	SWRCB-Prop1	0	0	Project in SWRP, ChinoBasin_2016SWRP_2
79. Upper Santa Margarita: Upper Valle de Los Caballos Recharge Project	2718	0		non-urban	2020	South Coast	DWR-IRWM	0	GW recharge of SW per IRWM contact	0
80. Lower Day Basin (2010 RMPU)	789	0		non-urban	2020	South Coast	0	0	Andy Campbell (Inland Empire, 6/8/17)	Andy Campbell (6/8/17) estimated 100% non-urban runoff
81. San Sevaine Basins	642	0		both	2020	South Coast	0	0	Andy Campbell (Inland Empire, 6/8/17)	Andy Campbell (6/8/17) estimated 50% urban runoff and 50% NonUrban runoff

Projects	GW_ recharge_ amount_ AFY	DirectUse _AFY	Basis_For_ Amounts	UrbanOr NonUrban ORBoth_ SWsource_ check	Construction_ end_targetyrNB	DWR_Hydrologic Region_Name	Program1	SWRP_or_ Equiv_SWRP	DWR_ Contact_ Comments	DWR_ TargetNotes
82. Clean Beaches Initiative	392	168		urban	2020	South Coast	0	Santa Monica Jurisdictional Group 2 & 3 Enhanced Watershed Management Plan (EWMP) and the Greater Los Angeles Integrated Regional Water Management Plan (IRWMP)	Tom Watson	Tom Watson estimated 70% GW recharge and 30% direct use
83. Montclair Basins	248	0		both	2020	South Coast	0	0	Andy Campbell (Inland Empire, 6/8/17)	Andy Campbell (6/8/17) estimated 50% urban runoff and 50% NonUrban runoff
84. Declez Basin	241	0		urban	2020	South Coast	0	0	Andy Campbell (Inland Empire, 6/8/17)	Andy Campbell (6/8/17) estimated 100% urban runoff
85. East Los Angeles Sustainable Median Stormwater Capture Project	232	0		urban	2020	South Coast	SWRCB-Prop1	0	0	0
86. Ely Basin	221	0		urban	2020	South Coast	0	0	Andy Campbell (Inland Empire, 6/8/17)	Andy Campbell (6/8/17) estimated 100% urban runoff
87. Modjeska Park Underground Stormwater Detention and Infiltration System	182	0		urban	2020	South Coast	SWRCB-Prop1	0	0	0

Projects	GW_ recharge_ amount_ AFY	DirectUse _AFY	Basis_For_ Amounts	UrbanOr NonUrban ORBoth_ SWsource_ check	Construction_ end_targetyrNB	DWR_Hydrologic Region_Name	Program1	SWRP_or_ Equiv_SWRP	DWR_ Contact_ Comments	DWR_ TargetNotes
88. South Gate Urban Orchard Demonstration Project	105	20		urban	2020	South Coast	SWRCB-Prop1	0	Grace Kast, IRWM Region Contact (Aug 2017)	0
89. Caruthers Park Storm Drain Detention/ Infiltration Project	90	7.2		urban	2020	South Coast	0	0	Grace Kast, Gateway Region IRWM contact (August 15, 2017)	0
90. CSI Storm Water Basin	81	0		urban	2020	South Coast	0	0	Andy Campbell (Inland Empire, 6/8/17)	Andy Campbell (6/8/17) estimated 100% urban runoff
91. Ladera Park Stormwater Capture Project	76	0		urban	2020	South Coast	SWRCB-Prop1	0	0	0
92. La Palma & Richfield Storm Drain Extension and Storm Water Infiltration Project	74	0		urban	2020	South Coast	SWRCB-Prop1	0	0	0
93. Turner Basin	66	0		urban	2020	South Coast	0	0	Andy Campbell (Inland Empire, 6/8/17)	Andy Campbell (6/8/17) estimated 100% urban runoff
94. El Rio Retrofits for Groundwater Recharge	49	0		urban	2020	South Coast	DWR-IRWM	0	0	0
95. Victoria Basin	43	0		urban	2020	South Coast	0	0	Andy Campbell (Inland Empire, 6/8/17)	Andy Campbell (6/8/17) estimated 100% urban runoff

Projects	GW_ recharge_ amount_ AFY	DirectUse _AFY	Basis_For_ Amounts	UrbanOr NonUrban ORBoth_ SWsource_ check	Construction_ end_targetyrNB	DWR_Hydrologic Region_Name	Program1	SWRP_or_ Equiv_SWRP	DWR_ Contact_ Comments	DWR_ TargetNotes
96. DeForest Park Engineered Fresh Water Wetland Project	35	0		urban	2020	South Coast	0	0	Grace Kast, Gateway Region IRWM contact (August 15, 2017)	0
97. SWIP: Enhanced Watershed Management Program (EWMP) Storm Water Harvesting & Reuse	29.05	12.45		urban	2020	South Coast	0	Santa Monica Jurisdictional Group 2 & 3 Enhanced Watershed Management Plan (EWMP) and the Greater Los Angeles Integrated Regional Water Management Plan (IRWMP)	Tom Watson	Tom Watson estimated 70% GW recharge and 30% direct use (7/14/17)
98. Piru Stormwater Capture for Groundwater Recharge	25	0		urban	2020	South Coast	SWRCB-Prop1	0	0	0
99. Walnut Storm Water Capture and Groundwater Replenishment Basin Project	22	0		urban	2020	South Coast	SWRCB-Prop1	0	0	0
100. Long Beach Municipal Urban Stormwater Treatment (LB-MUST) Facility	0	160		urban	2020	South Coast	0	0	Grace Kast, Gateway Region IRWM contact (August 15, 2017)	0
101. Water Wise Incentive Program	0	30.5		urban	2020	South Coast	0	0	0	0

Projects	GW_ recharge_ amount_ AFY	DirectUse _AFY	Basis_For_ Amounts	UrbanOr NonUrban ORBoth_ SWsource_ check	Construction_ end_targetyrNB	DWR_Hydrologic Region_Name	Program1	SWRP_or_ Equiv_SWRP	DWR_ Contact_ Comments	DWR_ TargetNotes
102. LA Stormwater Capture Master Plan	67477.8	6000		urban	2035	South Coast	0	LA Stormwater Capture Master Plan	Rafael Villegas	Estimate breakdown from Rafael Villegas
103. San Diego SWRP	17480	33600	Typical rain year for 5 sites, then extrapolated that to the whole county	urban	2035	South Coast	0	San Diego SWRP	Ruth Dela Rosa & Consultant: ESA,Lindsey Sheehan	Divided the estimates by end date per consultant ESA, Lindsey Sheehan
104. Santa Ana: Cactus Basin (SBCFCD)	12000	0		urban	2035	South Coast	DWR-IRWM	0	0	Estimated Completion: 12/31/2017
105. Cactus Basins #4 & 5	9100	0		urban	2035	South Coast	SWRCB-Prop1	0	0	0
106. LA Stormwater Capture Master Plan	7910.2	0		non-urban	2035	South Coast	0	LA Stormwater Capture Master Plan	Rafael Villegas	Estimate breakdown from Rafael Villegas
107. Placentia and Raymond Basins Improvement Project	5500	0		non-urban	2035	South Coast	SWRCB-Prop1	0	0	0
108. Santa Anita Stormwater Flood Management and Seismic Strengthening Project	4800	0		urban	2035	South Coast	DWR-IRWM	0	0	0
109. Devil's Gate and Eaton Stormwater Flood Management Project	4167	0		non-urban	2035	South Coast	DWR-IRWM	0	0	spreading ground always associated with sw not captured reservoir storage I assume

Projects	GW_ recharge_ amount_ AFY	DirectUse _AFY	Basis_For_ Amounts	UrbanOr NonUrban ORBoth_ SWsource_ check	Construction_ end_targetyrNB	DWR_Hydrologic Region_Name	Program1	SWRP_or_ Equiv_SWRP	DWR_ Contact_ Comments	DWR_ TargetNotes
110. Vulcan Pit Flood Control and Aquifer Recharge Project	2800	0	average rainfall year	non-urban	2035	South Coast	DWR-IRWM	0	0	The project will recharge 2,800 acre-feet of storm water and an identical amount of recycled water for total recharge of 5,600 acre-feet during an average rainfall year.
111. San Juan Groundwater Basin Recharge, Stormwater Capture, and Reuse Phase 1 Project	2000	0		urban	2035	South Coast	SWRCB-Prop1	0	0	0
112. Santa Ana Watershed Project Authority: Plunge Creek Water Recharge and Habitat Improvement	1250	0		urban	2035	South Coast	DWR-IRWM	0	0	Estimated Completion: 6/30/2020
113. 2015 Integrated Watershed Protection Program	1200	0		non-urban	2035	South Coast	DWR-IRWM	0	0	0
114. Big Dalton Spreading Grounds Improvements Project	1025	0		non-urban	2035	South Coast	DWR-IRWM	0	0	Estimated Completion:2/13/2020
115. Greater LA: Dominguez Gap Spreading Grounds West Basin Percolation Improvements	1000	0		urban	2035	South Coast	DWR-IRWM	0	0	Estimated Completion: 6/30/2019

Projects	GW_ recharge_ amount_ AFY	DirectUse _AFY	Basis_For_ Amounts	UrbanOr NonUrban ORBoth_ SWsource_ check	Construction_ end_targetyrNB	DWR_Hydrologic Region_Name	Program1	SWRP_or_ Equiv_SWRP	DWR_ Contact_ Comments	DWR_ TargetNotes
116. JA Ford Park Cistern, Bell Gardens	800	0		urban	2035	South Coast	0	0	Grace Kast, Gateway Region IRWM contact (August 15, 2017)	0
117. Santa Margarita Water District Prop 1E Gobernadora Multipurpose Basin Project	750	0		urban	2035	South Coast	DWR-IRWM	0	0	0
118. Greater Los Angeles: Walnut Spreading Basin Improvements	500	0		urban	2035	South Coast	DWR-IRWM	0	0	Estimated Completion: 6/30/2019
119. SAWPA: San Sevaine Ground Water Recharge Basin	460	0		urban	2035	South Coast	DWR-IRWM	0	0	Estimated Completion: 6/30/2020
120. DWP Transmission Easement Spreading Basin, Vernon	365	0		urban	2035	South Coast	0	0	Grace Kast, Gateway Region IRWM contact (August 15, 2017)	0
121. Cerritos Regional Park Storm Drain Detention/Infiltration Project	350	28		urban	2035	South Coast	0	0	Grace Kast, Gateway Region IRWM contact (August 15, 2017)	0
122. Foothill Boulevard Storm Water Infiltration Project	342	0		urban	2035	South Coast	SWRCB-Prop1	0	0	0

Projects	GW_ recharge_ amount_ AFY	DirectUse _AFY	Basis_For_ Amounts	UrbanOr NonUrban ORBoth_ SWsource_ check	Construction_ end_targetyrNB	DWR_Hydrologic Region_Name	Program1	SWRP_or_ Equiv_SWRP	DWR_ Contact_ Comments	DWR_ TargetNotes
123. Furman Park Storm Drain Detention/ Infiltration Project	340	27.2		urban	2035	South Coast	0	0	Grace Kast, Gateway Region IRWM contact (August 15, 2017)	0
124. Rosewood Park Cistern, Commerce	340	0		urban	2035	South Coast	0	0	Grace Kast, Gateway Region IRWM contact (August 15, 2017)	0
125. Salt Lake Park Cistern, Huntington Park	340	0		urban	2035	South Coast	0	0	Grace Kast, Gateway Region IRWM contact (August 15, 2017)	0
126. Lynwood City Park Storm Drain Detention/ Infiltration Project	320	25.6		urban	2035	South Coast	0	0	Grace Kast, Gateway Region IRWM contact (August 15, 2017)	0
127. Ball Road Storm Water Improvements	304	0		urban	2035	South Coast	SWRCB-Prop1	0	0	0
128. Independence Park Storm Drain Detention/ Infiltration Project	300	24		urban	2035	South Coast	0	0	Grace Kast, Gateway Region IRWM contact (August 15, 2017)	0

Projects	GW_ recharge_ amount_ AFY	DirectUse _AFY	Basis_For_ Amounts	UrbanOr NonUrban ORBoth_ SWsource_ check	Construction_ end_targetyrNB	DWR_Hydrologic Region_Name	Program1	SWRP_or_ Equiv_SWRP	DWR_ Contact_ Comments	DWR_ TargetNotes
129. Eaton Spreading Grounds Intake Improvements	300	0		urban	2035	South Coast	DWR-DFM	0	0	0
130. Bloomfield Park Storm Drain Detention/ Infiltration Project	200	16		urban	2035	South Coast	0	0	Grace Kast, Gateway Region IRWM contact (August 15, 2017)	0
131. County of Ventura Infiltration Basin - Subsurface (M-VR02)	160	0		urban	2035	South Coast	0	0	0	0
132. Green Alley	152.9	0		urban	2035	South Coast	SWRCB-Prop1	0	0	0
133. Franklin D. Roosevelt Park Regional Best Management Practices Project	127	0		urban	2035	South Coast	DWR-IRWM	0	0	127 AF:GW recharge or direct use
134. Discovery Park Storm Drain Detention/ Infiltration Project	120	9.6		urban	2035	South Coast	0	0	Grace Kast, Gateway Region IRWM contact (August 15, 2017)	0
135. Hermosillo Park Storm Drain Detention/ Infiltration Project	120	9.6		urban	2035	South Coast	0	0	Grace Kast, Gateway Region IRWM contact (August 15, 2017)	0

Projects	GW_ recharge_ amount_ AFY	DirectUse _AFY	Basis_For_ Amounts	UrbanOr NonUrban ORBoth_ SWsource_ check	Construction_ end_targetyrNB	DWR_Hydrologic Region_Name	Program1	SWRP_or_ Equiv_SWRP	DWR_ Contact_ Comments	DWR_ TargetNotes
136. Thompson Park Storm Drain Detention/ Infiltration Project	120	9.6		urban	2035	South Coast	0	0	Grace Kast, Gateway Region IRWM contact (August 15, 2017)	0
137. Lugo Park Cistern, Cudahy	120	0		urban	2035	South Coast	0	0	Grace Kast, Gateway Region IRWM contact (August 15, 2017)	0
138. Apollo Park Storm Drain Infiltration Project	105	8.4		urban	2035	South Coast	0	0	Grace Kast, Gateway Region IRWM contact (August 15, 2017)	0
139. San Gabriel River and Wilderness Park Restoration Project	100	8		urban	2035	South Coast	0	0	Grace Kast, Gateway Region IRWM contact (August 15, 2017)	0
140. Parque dos Rios Storm Drain Detention/ Infiltration Project	80	6.4		urban	2035	South Coast	0	0	Grace Kast, Gateway Region IRWM contact (August 15, 2017)	0
141. Sierra Vista Park BMP	77	0		urban	2035	South Coast	SWRCB-Prop1	0	0	0

Projects	GW_ recharge_ amount_ AFY	DirectUse _AFY	Basis_For_ Amounts	UrbanOr NonUrban ORBoth_ SWsource_ check	Construction_ end_targetyrNB	DWR_Hydrologic Region_Name	Program1	SWRP_or_ Equiv_SWRP	DWR_ Contact_ Comments	DWR_ TargetNotes
142. Canyon Country Community Center Regional Infiltration BMP	75	0		urban	2035	South Coast	SWRCB-Prop1	0	0	0
143. South Orange County: Trabuco Canyon Water District's Shadow Rock Detention Basin Project	61	0	normal year	non-urban	2035	South Coast	DWR-IRWM	0	0	Based on monitoring data, Shadow Rock is projected to capture and treat on annual average more than 20 million gallons of runoff (dry weather urban and precipitation runoff) during a normal year.
144. City of Simi Valley Subsurface Tank - rain harvesting (M-CC03)	52	0		urban	2035	South Coast	0	0	0	0
145. City of Port Hueneme Infiltration Basin (M-OC02)	32	0		urban	2035	South Coast	0	0	0	0
146. City of Moorpark Infiltration Basin (M-CC02)	31	0		urban	2035	South Coast	0	0	0	0
147. Greater LA: Storm Drain Improvements and Installation of Infiltration Chambers on Hawthorne Blvd.	27.6	0		urban	2035	South Coast	DWR-IRWM	0	0	0
148. Storm Water Capture at Marchant Park and Golden Hills Road	25	0		urban	2035	South Coast	SWRCB-Prop1	0	0	0

Projects	GW_ recharge_ amount_ AFY	DirectUse _AFY	Basis_For_ Amounts	UrbanOr NonUrban ORBoth_ SWsource_ check	Construction_ end_targetyrNB	DWR_Hydrologic Region_Name	Program1	SWRP_or_ Equiv_SWRP	DWR_ Contact_ Comments	DWR_ TargetNotes
149. La Cienega Park/Frank Fenton Field Stormwater Regional Project	24.6	0		urban	2035	South Coast	SWRCB-Prop1	0	0	0
150. City of Santa Paula Infiltration Basin (M-SCR02)	24	0		urban	2035	South Coast	0	0	0	0
151. Ojai USD: Integrated Water Conservation, Stormwater Reuse and Watershed Protection Demonstration Project	19.03	8.59		urban	2035	South Coast	SWRCB-Prop1	0	0	0
152. City of Oxnard Infiltration Basin (M-OC01)	18	0		urban	2035	South Coast	0	0	0	0
153. City of Thousand Oaks Subsurface Tank - rain harvesting (M-MC01)	16	0		urban	2035	South Coast	0	0	0	0
154. City of Camarillo Infiltration Basin (M-CC01)	14	0		urban	2035	South Coast	0	0	0	0
155. City of Fillmore Infiltration Basin (M-SCR01)	8.4	0		urban	2035	South Coast	0	0	0	0
156. Conversion of 237th Street Sump Tributary to Machado Lakes for Nutrient and Toxics TMDL BMPs	4.5	0		urban	2035	South Coast	DWR-DFM	0	0	0
157. Hoxie Avenue Corridor Landscape Improvements	4	0.32		urban	2035	South Coast	0	0	Grace Kast, Gateway Region IRWM contact (August 15, 2017)	0

Projects	GW_ recharge_ amount_ AFY	DirectUse _AFY	Basis_For_ Amounts	UrbanOr NonUrban ORBoth_ SWsource_ check	Construction_ end_targetyrNB	DWR_Hydrologic Region_Name	Program1	SWRP_or_ Equiv_SWRP	DWR_ Contact_ Comments	DWR_ TargetNotes
158. City of Ventura Infiltration Trench (M-VC01)	4	0		urban	2035	South Coast	0	0	0	0
159. City of Ojai Infiltration Basin - Subsurface (M-VR01)	2	0		urban	2035	South Coast	0	0	0	0
160. Upper Amargosa Creek Flood Control, Recharge, and Habitat Restoration Project	25000	0		urban	2020	South Lahontan	DWR-IRWM	0	0	0
161. Amethyst Basin Stormwater Flood Reduction Project	2600	0		non-urban	2035	South Lahontan	DWR-IRWM	0	0	0
162. Fresno Storm Water Capture, Retention and Reuse Project	5542	0		urban	2020	Tulare Lake	SWRCB-Prop1	0	0	0
163. Deer Creek and Tule River Authority Recharge Basin Upgrade	2500	0		non-urban	2020	Tulare Lake	0	0	David DeGroot, 5/2/17	0
164. Kaweah River Basin: Paregien Basin Project	2370	0		non-urban	2020	Tulare Lake	DWR-IRWM	0	0	0
165. Deer Creek Stormwater District / Angiola Water District Flood Detention / Retention Project (South)	1500	0		non-urban	2020	Tulare Lake	0	0	David DeGroot, 5/2/17	0
166. Vandalia Water District Stormwater Runoff Basin	1000	0		both	2020	Tulare Lake	0	0	David DeGroot, 5/2/17	0
167. Kern Basin Storm Water Recovery Project	30910	0		non-urban	2035	Tulare Lake	SWRCB-Prop1	0	0	This was a combined project with Buena Vista.
168. Upper Kings: Fresno Irrigation District - Southwest Groundwater Banking Project	5080	0		non-urban	2035	Tulare Lake	DWR-IRWM	0	0	0

Projects	GW_ recharge_ amount_ AFY	DirectUse _AFY	Basis_For_ Amounts	UrbanOr NonUrban ORBoth_ SWsource_ check	Construction_ end_targetyrNB	DWR_Hydrologic Region_Name	Program1	SWRP_or_ Equiv_SWRP	DWR_ Contact_ Comments	DWR_ TargetNotes
169. Angiola Water District Flood Detention / Retention Project (North)	5000	0		non-urban	2035	Tulare Lake	0	0	David DeGroot, 5/2/17	0
170. Upper Kings: Laguna Irrigation District Recharge Basin 11	2650	0		non-urban	2035	Tulare Lake	DWR-IRWM	0	0	0
171. Dry Creek Flood Control Improvement Project	1225	0		urban	2035	Tulare Lake	DWR-IRWM	0	0	0
172. BVWSD The Palms Groundwater Recharge and Recovery Project	1053	0		non-urban	2035	Tulare Lake	DWR-IRWM	0	0	According to Kelsey: 1053 AFY only not 5445 AFY (orig. number in application) based on new work plan.
173. City of Porterville Stormwater Recharge Basin Upgrades	1000	0		urban	2035	Tulare Lake	0	0	David DeGroot, 5/2/17	NB put coordinates of city center since project has various locations that were not identified.
174. Fancher Creek Flood Control Improvement Project	740	0		non-urban	2035	Tulare Lake	DWR-IRWM	0	0	0
175. Cottonwood Creek Storm Water Retention Project	333	0		non-urban	2035	Tulare Lake	SWRCB-Prop1	0	0	0
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