REVISED SECTIONS 6.2, 6.9, AND 7 AND SUPPLEMENT TO APPENDIX D OF THE SUBSTITUTE ENVIRONMENTAL DOCUMENT

PREPARED FOR THE

POLICY FOR MAINTAINING INSTREAM FLOWS IN NORTHERN CALIFORNIA COASTAL STREAMS

FEBRUARY 2013

This document contains the revised sections of the document entitled "Draft Substitute Environmental Document", dated March 14, 2008. Page numbers for revised Sections 6.2, 6.9, and 7 initiate on the corresponding numbers from the 2008 Draft SED. Revisions are shown using red font for additions and strikethrough for deletions.

DIVISION OF WATER RIGHTS
STATE WATER RESOURCES CONTROL BOARD
California Environmental Protection Agency

6.2 Effects of Increased Groundwater Extraction and Use

6.2.1 How Implementation of the Policy May Give Rise to This Result

The proposed Policy's requirements for appropriations of surface water could lead some affected persons to obtain water supplies under other bases of right, including from other sources in place of existing or otherwise planned diversion from ~~other than~~ surface water bodies (i.e., "alternative water sources"). Additionally, diverters may choose to obtain water supply from other sources if the application of the Policy requirements to a particular water right application reveals that there is insufficient surface water to supply the applicant. Five alternative sources of water, including increasing extraction of groundwater, are identified in appendix D of the March 2008 Substitute Environmental Document for the Policy for Maintaining Instream Flows in Northern California Coastal Streams, Potential Indirect Impacts on Municipal, Industrial and Agricultural Water Use and Related Indirect Impacts on Other Environmental Resources (Stetson Engineers 2007a) (appendix D). To provide an indication of the distribution of municipal water uses, figure 6-1 shows water districts and large water purveyors in the Policy Area.

6.2.2 Issues and Potential Effects

Groundwater basins within the Policy Area are defined in California Department of Water Resources Bulletin 118 (DWR 2003) (figure 4-2 of the~~is~~ March 2008 Substitute Environmental ~~d~~Document and figure A.4 of appendix D). As used in this substitute document, the term groundwater refers to underground water that is not subject to the water right permitting authority of the State Water Board. Other groundwater resources are present, but these regions have not been defined as basins by DWR and the extent and reliability of any such supplies are uncertain.

Estimates of future diversion demands and the maximum potential increase in groundwater pumping are provided in appendix D. Future requests to appropriate water in pending or new water right applications were estimated for each diverter group and county in the technical report in appendix D (table 16), as summarized in table 6-1, Future Diversion Demand. These estimates are based on the assumption that the Policy would, in effect, prohibit all future surface water appropriations and that the full volume of estimated future demand would have to be met from an alternative supply source or under a different basis of right. This is a very conservative assumption as it may not be possible in some cases to switch to an alternative supply or to divert under a different basis of right. In addition, some of the future diversion demand could be supplied by surface water appropriation in the following circumstances:

- Some future diversion demand may be permitted under the Policy. This amount would depend on which Policy element alternatives are selected and on the hydrology and extent of existing permitted water use at future points of diversion.
- The Policy regional restrictions may be lifted where a site-specific study can show that they are overly conservative.
- A watershed-based approach may be used to determine water availability and evaluate environmental impacts.

- CDFW, in its discretion, may not require compliance with some or all of the Policy regional restrictions when conditioning registrations.

In addition, surface water supplies may be insufficient to meet all future demands even in the absence of the Policy. Surface water resources are already limited in some regions of the Policy area and future water supplies in those regions will be limited by the natural supply availability rather than by the Policy restrictions on water diversion and storage. Some streams in the Policy area are already fully appropriated for some or all of the year.

Nonetheless, the future diversion demand is provided as an estimate of the upper limit of the water demand within the Policy area that may need to be met from alternative water supplies.

Table 6-1. Future Diversion Demand* (AF/year)

DIVERTER GROUP	HUMBOLDT	MARIN	MENDOCINO	NAPA	SONOMA	TOTAL
Large water agencies	0	7,400	20,557	0	37,261	65,218
Small water agencies and self-supplied individuals	30	300	10,210	1,131	16,348	28,019
Total	**30**	**7,700**	**30,767**	**1,131**	**53,609**	**93,237**

*Demand is as of December 20, 2006, per appendix D.

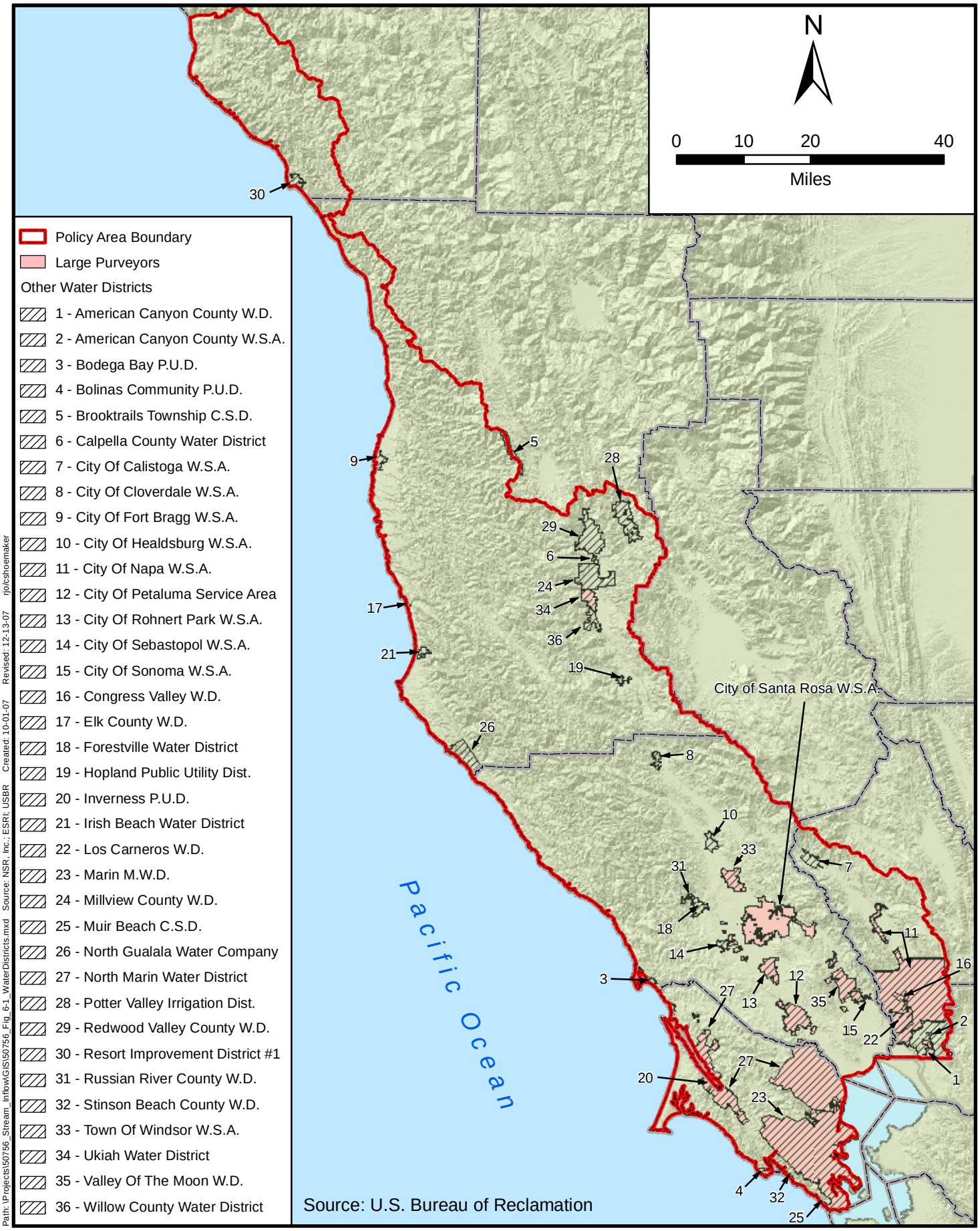
Possible future demands sorted by groundwater basins were estimated as a range, as listed in table 6-2, Estimated Potential Future Groundwater Demands in the Policy Area (see also appendix D, table 17). The lower end of the range is the "planned usage from groundwater" and is computed as the sum of large water agencies' future groundwater demand as listed in their Urban Water Management Plans plus the estimated portion of the small water agencies and self-supplied individuals' future diversion demand that would be supplied from groundwater use. The upper end of the range is estimated as the lower end of the range plus all future diversion demands. In order to analyze the maximum possible impact that is reasonably foreseeable, ~~T~~this analysis assumes that all future demands would be supplied from groundwater.

Table 6-2. Estimated Potential Future Groundwater Demands in the Policy Area[‡]

COUNTY	GROUNDWATER BASINS	FUTURE GROUNDWATER DEMANDS (AF/YEAR)		ADEQUACY (see note below)*
		LOWER	UPPER	
Humboldt	Honeydew Town Area, Mattole River Valley	30	60	Likely adequate to meet upper demand. Likely adequate for small agencies and self-supplied individuals provided site-specific hydrogeologic conditions are suitable.
Marin	Novato Valley, Ross Valley, San Rafael Valley, Sand Point Area, Wilson Grove Formation Highlands	230	7,930	Not likely adequate to meet upper demand due to limiting hydrogeologic factors. May be adequate to meet lower demand, particularly for small agencies and self-supplied individuals, provided site-specific hydrogeologic conditions are suitable.
Mendocino	Anapolis Ohlsen Ranch, Anderson Valley, Big River Valley, Cottoneva Creek Valley, Fort Bragg Terrace Area, Fort Ross Terrace Deposits, Garcia River Valley, Little Valley, McDowell Valley, Navarro River Valley, Potter Valley, Sanel Valley, Ten Mile River Valley, Ukiah Valley	2,830	33,600	Not likely adequate to meet upper demand due to limiting hydrogeologic factors. May be adequate to meet lower demand for large and small agencies and self-supplied individuals, provided site-specific hydrogeologic conditions are suitable.
Napa	Napa-Sonoma Valley	2,670	3,800	May be adequate to meet upper demand. May be adequate for small agencies and self-supplied individuals provided site-specific hydrogeologic conditions are suitable.
Sonoma	Alexander Valley, Anapolis Ohlsen Ranch, Bodega Bay Area, Fort Ross Terrace Deposits, Kenwood Valley, Knights Valley, Lower Russian River Valley, Napa-Sonoma Valley, Petaluma Valley, Santa Rosa Valley, Wilson Grove Formation Highlands	11,430	65,040	Not likely adequate to meet lower demand due to limiting hydrogeologic factors. May be adequate for small agencies and self-supplied individuals provided site-specific hydrogeologic conditions are suitable.

* The availability of groundwater that is not subject to the water right permitting authority of the State Water Board is unknown and subject to the determinations of the State Water Board. The adequacy of groundwater as an alternative supply source may be limited by future State Water Board determinations.

[‡] As of December 20, 2006, per appendix D.



Path: \Projects\50756_Stream_Inflow\GIS\50756_Fig_6-1_WaterDistricts.mxd Source: NSR, Inc.; ESRI; USBR Created: 10-01-07 Revised: 12-13-07 rjo/cshoemaker

Figure 6-1
Water Districts and Major Water Purveyors

The use of groundwater in the Policy Area is limited by hydrogeologic factors, including sea-water intrusion, thin alluvial deposits, aquifer materials of low permeability, and the quality of water. Sea-water intrusion has been identified in coastal aquifers of Napa, Sonoma, and Mendocino Counties. Overdraft, resulting from excessive pumping associated with development, could possibly occur in the future, reducing available supplies in late summer and dry years. In some site-specific cases, groundwater may be an adequate alternative supply source for low-capacity wells, such as those typically associated with small water agencies, and self-supplied individuals for domestic, industrial, or agricultural use. Groundwater is not a likely adequate alternative supply source for large agencies because of the above-described limiting hydrogeologic factors.

Appendix D and the March 2008 Substitute Environmental Document (2008 SED) identifieds some of the potential environmental impacts that could result from ~~increased extraction of~~ pumping groundwater instead of diverting surface water. ~~Possible impacts that might result from increases in groundwater extractions, including possible impacts identified in appendix D, are summarized in table 6-3, Possible Indirect Environmental Impacts Resulting from Increased Groundwater Extraction and Use by Water Diverters in Response to the Policy.~~ According to appendix D and the 2008 SED, pumping groundwater instead of diverting surface water could potentially deplete groundwater resources, which could potentially result in a reduction in surface water flows, particularly summer flows, which could in turn have a potentially significant effect on biological resources, hydrology/water quality, and recreation. Specifically, appendix D and the 2008 SED estimated that reduced surface water flow could potentially harm riparian vegetation or degrade habitat for sensitive species; could potentially adversely affect water temperature and increase constituent concentrations due to reduced dilution; and could potentially adversely affect recreational opportunities.

Appendix D is presented as part of this SED because it contains useful information related to future water demands and the adequacy of alternative supplies; however, the analysis contained in appendix D concerning the potential impact of groundwater pumping on surface water flows (and the potential indirect impacts resulting from a reduction in surface water flows) is misleading because it does not explain that the potential shift from surface water diversions to groundwater pumping that could be caused by the proposed Policy is unlikely to cause a significant reduction in surface water flows. The State Water Board has prepared a subsequent analysis of this potential impact: Supplement to Appendix D: Analysis of the Potential Impacts of Groundwater Pumping as an Alternative Source Due to Policy Adoption (attached).

As explained more fully in the Supplement to Appendix D, the State Water Board action analyzed in the SED, adoption of the proposed Policy, will not cause diversions to occur, it only has the potential to affect the source of the water diverted and whether water is diverted under an appropriative water right. As stated in section 6.1 of the 2008 SED, the proposed Policy will not approve any particular surface water diversion projects. To the contrary, the proposed Policy will impose additional restrictions on surface water diversion projects. Accordingly, the potential impacts of surface water diversion projects on surface water flows should not be attributed to the proposed Policy and is not analyzed in the SED. As explained earlier, the Policy's restrictions on surface water diversions could lead some existing or prospective diverters to pump groundwater instead of diverting surface water. Any switch to groundwater pumping, however, is unlikely to cause a significant reduction in surface water flows. If anything, a switch from surface water diversions to groundwater pumping is likely to reduce the impacts of surface water diversions on surface water flows because in many cases groundwater pumping will not deplete surface water flows on a one-to-one basis, and in some cases the groundwater and surface water may not be hydraulically connected at all. A switch to groundwater pumping could cause a delay in surface flow depletion, which could in turn cause a significant, adverse, environmental impact, particularly if the delayed reduction in flows occurs

during the summer months. For the reasons set forth in the Supplement to Appendix D, however, this potential impact is speculative and unlikely to occur in the Policy area. Put another way, the Policy will be less effective to the extent that surface water diverters avoid the Policy's restrictions by pumping groundwater that is not subject to the State Water Board's permitting authority, but the use of groundwater as an alternative supply is unlikely to cause a significant reduction in surface water flows.

Notwithstanding the findings in appendix D and the discussion in the 2006 Notice of Preparation and Environmental Checklist, the assessment of possible impacts that might result from increases in groundwater extraction in lieu of existing or planned surface water diversions (Table 6-3) has been revised based on the subsequent analysis contained in the Supplement to Appendix D. This change is incorporated using red font and strikethrough text in Table 6-3.

Similar revisions to section 6.3 of the 2008 SED, Effects of Increased Diversions Under Claimed Riparian Rights, are not warranted. That section analyzed the potential indirect environmental impacts of affected persons diverting under riparian rights instead of appropriative rights. Unlike the potential switch to groundwater pumping, the potential switch to riparian diversions is more likely to cause a significant reduction in surface water flows as a result of a shift in diversion timing. The seasonal storage of water may be authorized under an appropriative right. A diverter with a storage right can divert to storage during the winter and rely on previously stored water in the spring and summer. As discussed in section 6.3, water that is diverted and used under a riparian right cannot be seasonally stored. Accordingly, a diverter who switches to riparian diversions could divert for a longer period of time and cause a reduction in flows during the spring or summer. In light of this potential impact, no revisions are required for section 6.3 based on the State Water Board's subsequent analysis.

Table 6-3. Possible Indirect Environmental Impacts Resulting from Increased Groundwater Extraction and Use by Water Diverters in Response to the Policy

ENVIRONMENTAL ISSUE AREA	POSSIBLE INDIRECT ENVIRONMENTAL IMPACT	SIGNIFICANCE OF IMPACTS
Aesthetics	Construction activities could result in short-term disturbance of visual resources. Siting of infrastructure could result in long-term disturbance of visual resources.	Potentially significant depending on the characteristics of the specific action taken, particularly in public areas with highly scenic views, including but not limited to areas within or adjacent to the project area that are managed by the California Department of Parks and Recreation (i.e., "park units").
Agriculture Resources	Increases in groundwater extraction could result in lowering of the groundwater table and reduction in water available to non-irrigated crops that rely on groundwater for soil moisture resulting in reduced crop yield.	Potentially significant depending on the characteristics of the specific action taken.

Table 6-3. Possible Indirect Environmental Impacts Resulting from Increased Groundwater Extraction and Use by Water Diverters in Response to the Policy

ENVIRONMENTAL ISSUE AREA	POSSIBLE INDIRECT ENVIRONMENTAL IMPACT	SIGNIFICANCE OF IMPACTS
Air Quality	Construction activities could result in short-term contribution to PM10, ozone, nitrogen oxides, carbon monoxide or other pollutant levels. Operation of some pumps could result in long-term increased pollutant levels. Reliance on alternative methods of diversion or alternative water supplies could result in long term operation of pumps, which could result in increased greenhouse gas emissions (primarily carbon dioxide, methane, nitrous oxide, and ozone) that may contribute to global climate change.	Potentially significant depending on the characteristics of the specific action taken.
Biological Resources	Construction activities could result in disturbance of aquatic features (e.g., wetlands) regulated by the Army Corps of Engineers, Regional Water Quality Control Boards, California Department of Fish and Wildlife ~~Game~~ and California Coastal Commission; disturbance of special-status species and their habitats; disturbance of sensitive natural communities. Although unlikely, under certain circumstances switching to groundwater pumping ~~Extraction of groundwater~~ could result in reduced surface water flows, ~~particularly summer flows,~~ which could harm riparian vegetation or degrade habitat for sensitive species, particularly if the reduction in surface water flows occurs during the summer.	Potentially significant depending on the characteristics of the specific action taken.
Cultural Resources	Construction activities could result in disturbance of cultural resources. Siting of pumps and appurtenant infrastructure could impair the significance of historical resources.	Potentially significant depending on the characteristics of the specific action taken.
Geology/Soils	Construction activities could result in erosion or loss of topsoil during and immediately following construction.	Potentially significant depending on the characteristics of the specific action taken.
Hazards/Hazardous Materials	Increased groundwater extraction could result in increased use of hazardous materials associated with construction, operation, and maintenance of new or existing appurtenant facilities.	Potentially significant depending on the characteristics of the specific action taken.

Table 6-3. Possible Indirect Environmental Impacts Resulting from Increased Groundwater Extraction and Use by Water Diverters in Response to the Policy

ENVIRONMENTAL ISSUE AREA	POSSIBLE INDIRECT ENVIRONMENTAL IMPACT	SIGNIFICANCE OF IMPACTS
Hydrology/Water Quality	Construction activities could result in short-term increases in sedimentation and degradation of water quality. Although unlikely, under certain circumstances switching to groundwater pumping ~~Extraction of groundwater~~ could result in reduced surface water flows, ~~particularly summer flows,~~ which could adversely affect water temperature and increase constituent concentrations due to reduced dilution, particularly if the reduction in surface water flows occurs during the summer. The production rates of nearby wells could drop.	Potentially significant depending on the characteristics of the specific action taken.
Land Use/Planning	Construction activities and siting of infrastructure could result in conflicts with land use plans, policies or regulations adopted for the purpose of avoiding or mitigating environmental effects by agencies with jurisdiction within the project area.	Potentially significant depending on the characteristics of the specific action taken.
Mineral Resources	Increased groundwater extraction will not result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the State and will not result in the loss of locally important mineral resources recovery sites that are delineated on a local general plan, specific plan, or other land use plan.	Not significant.
Noise	Short-term increased noise from construction of new groundwater pumping facilities; long-term increased noise due to the operation of pumps.	Potentially significant depending on the characteristics of the specific action taken.
Population/Housing	Increased groundwater extraction will not result in substantial population growth, will not displace substantial numbers of people, and will not displace substantial numbers of existing housing units.	Not significant.
Public Services	Increased groundwater extraction will not affect public services.	Not significant.
Recreation	Although unlikely, under certain circumstances switching to groundwater pumping ~~Extraction of groundwater~~ could result in reduced surface water flows, ~~particularly summer flows,~~ which could adversely affect recreational opportunities, particularly if the reduction in surface water flows occurs during the summer.	Potentially significant depending on the characteristics of the specific action taken.

Table 6-3. Possible Indirect Environmental Impacts Resulting from Increased Groundwater Extraction and Use by Water Diverters in Response to the Policy

ENVIRONMENTAL ISSUE AREA	POSSIBLE INDIRECT ENVIRONMENTAL IMPACT	SIGNIFICANCE OF IMPACTS
Transportation/Traffic	Construction activities could result in localized, short-term increases in traffic.	Potentially significant depending on the characteristics of the specific action taken.
Utilities/Service Systems	Construction activities could result in localized, short-term disruption of utility service. Reliance on groundwater could result in expansion of existing water and energy delivery systems.	Potentially significant depending on the characteristics of the specific application for water right.

6.9 Cumulative Impacts

Cumulative impacts can result from "the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable probable future projects" (CEQA Guidelines, § 15355, subd. (b)). Adoption and implementation of the proposed Policy will not result in any direct impacts on the environment, and thus there are no direct cumulative impacts. Implementation of the proposed Policy may result in indirect environmental impacts as a result of actions taken by affected persons in response to the Policy. As discussed in section 6, The State Water Board evaluated the environmental impacts associated with the following actions:

- increasing groundwater extraction and use,
- increasing diversions under claim of riparian rights,
- relying on other alternative water sources and water conservation,
- removing or modifying onstream storage and regulatory dams,
- constructing new and expanding existing offstream storage facilities,
- constructing offstream reservoirs, and
- constructing passive bypass systems.

In this assessment of cumulative and long-term environmental effects, the State Water Board considered potential effects associated with global climate change. The Global Warming Solutions Act of 2006 requires the State to reduce its global warming emissions to year 2000 levels by the year 2010, to 1990 levels by 2020, and 80 percent below 1990 levels by 2050. Adoption of the proposed Policy will have no direct consequences in terms of global climate change. Implementation would be associated with some level of construction, particularly for the modification or removal of dams, and these projects would involve emissions from vehicles and equipment that would contribute to greenhouse gasses. Implementation may cause indirect impacts from increased long term pumping of water, either as a result of water diverters choosing to pump water from alternative water sources, or from water diverters choosing to pump water from downstream points of diversions to upstream places of use. Increased long term operation of pumps could result in increased greenhouse gas emissions that could contribute to global climate change.

Changes in climate may affect environmental conditions, such as rises in surface water levels in estuaries and increases in water temperatures in coastal streams. Even minor changes in temperature, for example, would likely have implications for salmonids, and adverse effects related to temperature could be exacerbated by changes in stream flow, particularly if temperatures increase. Put another way, the beneficial impacts of the Policy in terms of anadromous fish passage and habitat may serve to reduce some of the adverse impacts of climate change.

The environmental impacts of actions taken by affected persons that are individually limited may be cumulatively considerable when viewed in conjunction with the effects of foreseeable past, current, and probable future projects in the Policy Area. The State Water Board considered foreseeable past, current, and probable projects to include two categories of land use and water development projects in the Policy Area that may have impacts that are similar to the proposed Policy: (1) projects requiring water supplies (e.g., conversion of natural lands to agricultural use); and (2) projects developing water supplies under

other bases of right (e.g., expanded groundwater pumping for domestic and municipal use). The proposed Policy, in combination with these land use and water development projects, may have cumulative impacts on the environment that are similar to the Policy-related impacts discussed in section 6. For example, the proposed Policy may result in adverse environmental impacts related to dam modification and removal. To the extent that the land use and water development projects are not regulated by the State Water Board, they ~~are~~ may be within the purview of local governments~~ and those entities can and should avoid or mitigate their significant environmental impacts~~.

The State Water Board and other state and local agencies will need to address potential cumulative impacts in project-specific documentation. Individual projects will be subject to the appropriate level of environmental review at the time they are proposed, and mitigation ~~would~~ may be identified to avoid or reduce the adverse effects of potentially significant effects, prior to any project-level action. In many cases, the potential actions of affected persons would require discretionary approvals and would be subject to project-level CEQA review. Some potential actions, however, may not require discretionary approvals, and may not be subject to project-level CEQA review. For example, as discussed in section 7.2.2, below, the five counties in the Policy area have the authority to mitigate the potential impacts of increased groundwater pumping by regulating groundwater use pursuant to their police powers, but most of the counties are unlikely to do so. In addition, the State Water Board does not have permitting authority over percolating groundwater. Accordingly, there will likely be little to no project-level CEQA review of the potential increase in the use of percolating groundwater in four out of the five counties, which have no regulatory framework for groundwater management.

7 SUMMARY OF IMPACTS AND MITIGATION MEASURES IN POLICY-BASED REVIEWS OF PENDING AND FUTURE WATER RIGHT APPLICATIONS

Implementation of the Policy would have no direct effects; all of the environmental effects are indirect effects that may result from actions taken by affected persons in response to the Policy. As discussed in the March 2008 Substitute Environmental Document for the Policy for Maintaining Instream Flows in Northern California Coastal Streams (draft SED)~~this substitute document~~, significant impacts arise out of the following actions that may be taken by affected persons in attempting to either comply with the Policy or avoid compliance. The actions that affected persons may take in order to comply with the Policy include:

- removing or modifying onstream storage and regulatory dams, and
- constructing new and expanding existing offstream storage facilities.

The actions that affected persons may take in order to avoid complying with the Policy include:

- removing or modifying onstream storage and regulatory dams,
- increasing groundwater extraction and use,
- increasing diversions under claim of riparian rights,
- relying on other alternative water sources and water conservation, and
- constructing new and expanding existing offstream storage facilities.

The potential impacts of these actions by affected persons on environmental resources are identified in section 6 of the draft SED and revised section 6.2. As discussed in ~~that~~ these sections, some of the environmental effects of actions could be significant. In many cases, the significance of the impacts resulting from actions by third parties will depend on the timing, specific components, site-specific location, and other characteristics of the project-specific actions being proposed. The results of this assessment are summarized in table 7-1.

Table 7-1. Summary of Significance Determinations by Potential Action and Resource Areas

	POTENTIAL ACTION BY AFFECTED PARTY				
ENVIRONMENTAL ISSUE AREA	**INCREASED GROUNDWATER EXTRACTION AND USE**	**INCREASED DIVERSIONS VIA RIPARIAN RIGHTS**	**RELIANCE ON OTHER ALTERNATIVE WATER SOURCES AND ON WATER CONSERVATION**	**REMOVAL OR MODIFICATION OF ONSTREAM STORAGE AND REGULATORY DAMS**	**CONSTRUCTION OF NEW AND EXPANSION OF EXISTING OFFSTREAM STORAGE**
Aesthetics	Potentially significant	Not significant	Potentially significant	Potentially significant	Potentially significant
Agriculture Resources	Potentially Significant	Not significant	Potentially significant	Potentially significant	Potentially significant
Air Quality	Potentially significant	Potentially significant	Potentially significant	Potentially significant	Potentially significant
Biological Resources	Potentially significant	Potentially significant	Potentially significant	Potentially significant	Potentially significant
Cultural Resources	Potentially significant	Not significant	Potentially significant	Potentially significant	Potentially significant
Geology/Soils	Potentially significant	Not significant	Potentially significant	Potentially significant	Potentially significant
Hazards & Hazardous Materials	Potentially significant	Not Significant	Potentially significant	Not Significant	Potentially significant
Hydrology/Water Quality	Potentially significant	Potentially significant	Potentially significant	Potentially significant	Potentially significant
Land Use/Planning	Potentially significant	Not Significant	Potentially significant	Potentially significant	Potentially significant
Mineral Resources	Not significant	Not significant	Not significant	Not significant	Potentially significant
Noise	Potentially significant	Potentially significant	Potentially significant	Potentially significant	Potentially significant
Population/Housing	Not significant	Not significant	Potentially significant	Not significant	Not significant
Public Services	Not significant	Not significant	Potentially significant	Not significant	Potentially significant

Table 7-1. Summary of Significance Determinations by Potential Action and Resource Areas

	POTENTIAL ACTION BY AFFECTED PARTY				
ENVIRONMENTAL ISSUE AREA	INCREASED GROUNDWATER EXTRACTION AND USE	INCREASED DIVERSIONS VIA RIPARIAN RIGHTS	RELIANCE ON OTHER ALTERNATIVE WATER SOURCES AND ON WATER CONSERVATION	REMOVAL OR MODIFICATION OF ONSTREAM STORAGE AND REGULATORY DAMS	CONSTRUCTION OF NEW AND EXPANSION OF EXISTING OFFSTREAM STORAGE
Recreation	Potentially significant	Potentially significant	Not significant	Potentially significant	Potentially significant
Transportation/ Traffic	Potentially significant	Not significant	Potentially significant	Not significant	Potentially significant
Utilities/Service Systems	Potentially significant	Not significant	Potentially significant	Potentially significant	Potentially significant

In many cases, the potential actions of affected persons would require discretionary approvals and would be subject to project-level California Environmental Quality Act (CEQA) review. Some potential actions, however, such as pumping percolating groundwater, may not require discretionary approvals, and may not be subject to project-level CEQA review. The potential impacts of those actions would not be mitigated unless an agency with regulatory authority takes enforcement action to prevent the environmental impacts of the action.

Examples of public agencies that could serve as the CEQA lead agency for subsequent environmental reviews of actions proposed by persons in response to implementation of the Policy include:

- State Water Board,
- Local municipalities and county governments,
- Special districts with discretionary approval authority,
- California Department of Fish and Wildlife~~Game~~,
- California Regional Water Quality Control Board—North Coast and San Francisco Bay Regions,
- California Department of Parks and Recreation, and
- California Coastal Commission.

Future CEQA reviews conducted by the State Water Board or by another lead agency can be expected to identify any significant project-specific environmental effects and mitigate them to less-than-significant levels. In addition, other regulatory mechanisms can also be expected to provide opportunities for minimizing and avoiding significant environmental effects. The State Water Board anticipates that the ~~Instream Flow~~ Policy will be used in reviews of water right applications, ~~small domestic use and livestock stockpond~~ registrations, ~~diversions from subterranean streams~~, and water right petitions. California Code of Regulations, title 23, section 780 requires all water right permits issued by the State Water Board to contain applicable standard permit terms and conditions. In addition, ~~T~~terms and conditions can be added

as appropriate ~~needed~~ to water rights issued by the State Water Board to ensure that the specific projects are carried out in ways that avoid or minimize the potential significant environmental effects.

The following paragraphs briefly examine some examples of potentially significant indirect impacts of the Policy and the regulatory requirements and mitigation measures for these impacts that may be incorporated at a project-specific level. These regulatory requirements and mitigation measures are likely to reduce many, but not all, of the potential indirect impacts of the draft Policy to less than significant levels. Some indirect impacts may not be identified or mitigated because it is impossible to predict who will take action in response to the Policy, or what action they will take. In some cases, it may not be feasible to mitigate the indirect impacts of the Policy to a less-than-significant level. For example, it may not be possible to mitigate any significant impacts related to the loss of wetland habitat as a result of onstream dam removal. In addition, some actions may not require discretionary approvals, and the State Water Board, Regional Water Quality Control Boards, and California Department of Fish and Wildlife may not have the resources to fully enforce the regulatory requirements described below. For example, the State Water Board only has the resources to investigate a limited number of possible instances of increased riparian diversions or groundwater pumping and take regulatory action, if warranted, pursuant to article X, section 2 of the California Constitution or the public trust doctrine. Most of the State Water Board's budget for the water right program is supported by fees imposed on water right permit and license holders, and is used for program activities related to the diversion and use of water subject to the permit and license system. Only a small amount of funding is available for other regulatory activities.

7.1 Construction, Modification, or Removal of Storage Facilities

In response to the Policy, persons may choose to modify or remove onstream dams or construct offstream storage facilities. These construction activities may result in temporary impacts to air quality, sedimentation, erosion, and water quality parameters. They may also cause temporary or permanent impacts to habitat for fish and wildlife.

The Basin Plans for the North Coast Regional Water Quality Control Board and the San Francisco Bay Regional Water Quality Control Board contain numeric and narrative water quality objectives designed to protect the beneficial uses of surface waters. If the modification or removal of an onstream dam or the construction of an offstream storage facility would result in the discharge of waste to waters of the State, the discharger must file a report of waste discharge with the appropriate Regional Water Quality Control Board and obtain a waste discharge requirement (WDR). (Wat. Code, § 13260.) The WDR must implement the applicable Basin Plan and protect the beneficial uses of the receiving waters.

Another regulatory tool that may mitigate the water quality impacts of construction activities is the North Coast Regional Water Quality Control Board's Sediment Total Maximum Daily Load (TMDL) Implementation Policy. The Implementation Policy of the TMDL states that Regional Water Board staff shall control sediment pollution by using existing permitting and enforcement tools, including individual NPDES permits and coverage under the general construction stormwater permit. The goals of the TMDL Implementation Policy are to control sediment waste discharges to impaired water bodies so that the TMDLs are met, sediment water quality objectives are attained, and beneficial uses are no longer

adversely affected by sediment. The Napa River Sediment Reduction and Habitat Enhancement Plan and TMDL (recently added to the Basin Plan for the San Francisco Bay Region) is a similar regulatory tool that should serve to control excessive sediment and achieve related habitat enhancement goals in the Napa River watershed.

As indicated in the TMDL Implementation Policy, certain construction activities may be covered under the General Permit for Discharges of Storm Water Associated with Construction Activity (General Construction Permit) adopted by the State Water Board. Covered activities may include grading and excavation of reservoir facilities and pump and piping replacement. Under the General Construction Permit, construction Best Management Practices (BMPs) such as silt fencing, straw wattles, and other erosion BMPs can be used to contain stormwater runoff and reduce erosion potential. Pursuant to the State Water Board's General Construction Permit, for any construction involving disturbance of 1 acre or more, a Stormwater Pollution and Prevention Plan (SWPPP) would need to be prepared.

Potential mitigation for water quality impacts due to modification or removal of onstream dams or construction of off-stream storage facilities may also involve Water Quality Certifications from the Regional Water Quality Control Boards. Water quality certification requirements would apply to anyone proposing to conduct a dredge or fill project that requires a federal permit and may result in a discharge to waters of the United States, including wetlands, year round and seasonal streams, lakes and other surface waters. A Clean Water Act (CWA) Section 401 Water Quality Certification is a finding from the Regional Water Quality Control Board that the proposed project will comply with CWA Sections 301, 302, 303, 306 and 307, the applicable Basin Plan, and other appropriate provisions of State law, and may be conditioned or denied as necessary to ensure compliance.

Projects discharging dredged or fill material into "waters of the United States" as defined by the CWA, including certain wetlands, need to obtain authorization under a permit from the United States Army Corps of Engineers (USACE). If the project will require disturbance of a wetland and the USACE determines that the wetland is not subject to regulation under Section 404 of the CWA, Section 401 water quality certification is not required. However, the Regional Water Board may require WDRs if fill material is placed into waters of the state. If all wetlands cannot be avoided as part of the project, the applicant will be required to file an application for WDRs with the Regional Water Board.

The California Department of Fish and Wildlife (CDFW) is responsible for conserving, protecting, and managing California's fish, wildlife, and native plant resources. Fish and Game Code Section 1602 requires CDFW to be notified regarding any proposed activity that may substantially modify a river, stream, or lake. Persons proposing to modify or remove onstream dams or construct off-stream storage facilities should notify the CDFW if the activity will:

- substantially divert or obstruct the natural flow of any river, stream or lake;
- substantially change or use any material from the bed, channel, or bank of, any river, stream, or lake; or
- deposit or dispose of debris, waste, or other material containing crumbled, flaked, or ground pavement where it may pass into any river, stream, or lake.

If CDFW determines that the activity may substantially adversely affect fish and wildlife resources, a Lake or Streambed Alteration Agreement would be prepared. Conditions that CDFW may require include, but are not limited to, avoidance or minimization of vegetation removal, use of standard erosion control measures, limitations on the use of heavy equipment, limitations on work periods to avoid impacts on fisheries and wildlife resources, minimum bypass flow requirements, and requirements to restore degraded sites or compensate for permanent habitat losses. In addition, rendering a dam incapable of storing water by leaving the structure in place while allowing water to pass through, may be a less costly alternative, and may reduce impacts to fish and wildlife habitat to less than significant levels. The Agreement would include reasonable conditions necessary to protect those resources and must comply with CEQA.

Potentially significant air quality impacts associated with modification or removal of onstream or construction of offstream storage facilities would be limited to those resulting from short-term construction activities. Construction-related emissions could include exhaust from construction equipment and fugitive dust from land clearing, earthmoving, movement of vehicles, and wind erosion of exposed soil during reservoir construction or removal. The San Francisco Bay Area Air Quality Management District, Northern Sonoma County Air Pollution Control District, Mendocino County Air Quality Management District, and North Coast Unified Air Quality Management District have developed rules containing guidelines for assessing the air quality impacts of proposed projects as well as prohibitions and control measures which in most cases would mitigate construction related emissions to less than significant levels.

In addition to the regulatory requirements described above, the seasonal storage of surface water in most new offstream storage facilities will require a water right permit from the State Water Board. Unless an exemption applies, the State Water Board's review of water right applications is subject to CEQA. In addition, in acting on water right applications, the State Water Board must take into consideration the public interest and the applicable Basin Plan. (Wat. Code, §§ 1253, 1255, 1257, 1258.) Accordingly, the State Water Board will have the opportunity to identify and mitigate the impacts of constructing offstream storage reservoirs as part of the State Water Board's review of individual water right applications. Similarly, the State Water Board will have the opportunity to ensure that applicants comply with any other applicable regulatory requirements. Inclusion of the following permit terms, substantially as follows, in permits issued under the Policy will ensure that applicants comply with any other applicable regulatory requirements.

- *No water shall be diverted under this permit, and no construction related to such diversion shall commence, until permittee obtains all necessary permits or other approvals required by other agencies. If an amended permit is issued, no new facilities shall be utilized, nor shall the amount of water diverted increase beyond the maximum amount diverted during the previously authorized time period, until permittee complies with the requirements of this term.*

  Within 90 days of the issuance of this permit or any subsequent amendment, permittee shall prepare and submit to the Division of Water Rights a list of, or provide information that shows proof of attempts to solicit information regarding the need for, permits or approvals that may be required for the project. At a minimum, permittee shall provide a list or other information pertaining to whether any of the following permits or approvals are required: (1) lake or

streambed alteration agreement with the Department of Fish and Wildlife (Fish & G. Code, § 1600 et seq.); (2) Department of Water Resources, Division of Safety of Dams approval (Wat. Code, § 6002.); (3) Regional Water Quality Control Board Waste Discharge Requirements (Wat. Code, § 13260 et seq.); (4) U.S. Army Corps of Engineers Clean Water Act section 404 permit (33 U.S.C. § 1344.); or, (5) local grading permits.

Permittee shall, within 30 days of issuance of all permits, approvals or waivers, transmit copies to the Division of Water Rights.

- *No water shall be diverted under this right unless right holder is operating in accordance with a compliance plan, satisfactory to the Deputy Director for Water Rights. Said compliance plan shall specify how right holder will comply with the terms and conditions of this right. Right holder shall comply with all reporting requirements in accordance with the schedule contained in the compliance plan.*

Inclusion of some or all of the following permit terms, substantially as follows, in permits issued under the Policy, may reduce potential short-term water quality impacts from construction activities to less-than-significant levels:

- *In order to prevent degradation of the quality of water during and after construction of the project, prior to commencement of construction, permittee shall file a report pursuant to Water Code Section 13260 and shall comply with all waste discharge requirements imposed by the California Regional Water Quality Control Board, San Francisco Bay/North Coast Region, or by the State Water Resources Control Board.*

- *No water shall be used under this permit until permittee has filed a report of waste discharge with the California Regional Water Quality Control Board, San Francisco Bay/North Coast Region, pursuant to Water Code Section 13260, and the Regional Board or State Water Resources Control Board has prescribed waste discharge requirements or has indicated that waste discharge requirements are not required. Thereafter, water may be diverted only during such times as all requirements prescribed by the Regional Water Board or State Water Board are being met.*
- *No debris, soil, silt, cement that has not set, oil, or other such foreign substance will be allowed to enter into or be placed where it may be washed by rainfall runoff into the waters of the State. When operations are completed, any excess materials or debris shall be removed from the work area.*

Inclusion of the following permit terms, substantially as follows, in permits issued under the Policy, may reduce potential short-term impacts to wetlands and fish and wildlife from construction activities to less-than-significant levels:

- *No water shall be diverted under this right, and no construction related to such diversion shall commence, unless right holder complies with the requirements of the Clean Water Act. In order to demonstrate such compliance, right holder shall obtain a Clean Water Act section 404 permit from the U.S. Army Corps of Engineers, or evidence that such a permit is not required, and*

provide such permit or evidence to the Division of Water Rights. If it is determined that a Clean Water Act section 404 permit is required, right holder shall further demonstrate compliance by obtaining a Clean Water Act section 401 certification from the State Water Board.

- *No work shall commence and no water shall be diverted, stored or used under this permit until a copy of a stream or lake alteration agreement between the Department of Fish and Wildlife and the permittee is filed with the Division of Water Rights. Compliance with the terms and conditions of the agreement is the responsibility of the permittee. If a stream or lake agreement is not necessary for this permitted project, the permittee shall provide the Division of Water Rights a copy of a waiver signed by the Department of Fish and Wildlife.*

Inclusion of the following permit term, substantially as follows, in permits issued under the Policy, would reduce potential short-term air quality impacts from storage facility construction activities to a less-than-significant level:

- *Prior to the start of construction, Permittee shall submit a detailed Emission Control and Mitigation Plan to the Deputy Director for Water Rights. Permittee shall also submit a copy of the plan to the Air Quality Management District. The Emission Control and Mitigation Plan shall be consistent with the Air Quality Management District's Air Quality Guidelines and include a monitoring and reporting component to ensure that mitigation measures identified in the Emission Control and Mitigation Plan are implemented. Permittee shall provide evidence to verify implementation of measures identified in the Emission Control and Mitigation Plan within 30 days of completion of construction work to the Deputy Director for Water Rights. Permittee shall also provide a copy of the evidence to the Air Quality Management District upon request. Evidence may consist of, but is not limited to, photographs and construction records.*

7.2 Increased Groundwater Use

In response to the Policy, there could be an increase in pumping of groundwater if water users choose to utilize groundwater in lieu of utilizing an appropriative water right subject to the Policy's limitations. The State Water Board's assessment of future groundwater demand (section 6.2), which conservatively included all diversion points for pending water right applications, found that increased groundwater pumping could drop production rates of nearby wells and could cause a significant reduction in surface water flow, although this impact is speculative and unlikely to occur.

7.2.1 State Water Board Regulatory Authority

The State Water Board has permitting authority over subterranean streams flowing through known and definite channels. (See Wat. Code, §§ 1200, 1201, 1225.) Groundwater classified as percolating groundwater is not subject to the State Water Board's permitting authority or the Policy's restrictions.

Although the State Water Board's permitting authority over groundwater is limited, the State Water Board has the authority to regulate groundwater use under article X, section 2 of the California Constitution and Water Code section 100. Those provisions prohibit the waste, unreasonable use,

unreasonable method of use, and unreasonable method of diversion of water. The constitutional doctrine of reasonable use applies to all users of both surface and groundwater, regardless of basis of water right, serving as a limitation on every water right and every method of diversion. (*Peabody v. Vallejo* (1935) 2 Cal.2d 351, 367, 372 [40 P.2d 486].) Water Code section 275 directs the State Water Board to take all appropriate proceedings or actions to prevent waste or violations of the reasonable use standard. Thus, the State Water Board has jurisdiction to regulate all water use in accordance with article X, section 2 of the Constitution. (See *Imperial Irrigation District v. State Water Resources Control Board* (1986) 186 Cal.App.3d 1160 [231 Cal.Rptr. 283] [holding that jurisdiction extends to pre-1914 rights].)

The California Constitution also declares that the general welfare requires that the State's water resources be put to beneficial use to the fullest extent to which they are capable. (Cal. Const., art. X, § 2.) Therefore, in determining the reasonableness of a particular use of water or method of diversion, other competing water demands and beneficial uses of water must be considered. What constitutes a reasonable water use depends on the entire circumstances presented and varies as current conditions change. (*Environmental Defense Fund, Inc. v. East Bay Municipal Utility District* (1980) 26 Cal.3d 183, 194 [161 Cal.Rptr. 466].)

Feasibility of Adopting Subterranean Stream Delineations

During development of the proposed Policy, the State Water Board directed its consultant, Stetson Engineers Inc., to prepare maps delineating subterranean streams (delineation maps) to potentially improve the effectiveness of the Policy by identifying locations where the State Water Board's permitting authority could be applicable. The methodology and approach used to develop these maps is described in technical memoranda dated May 16, 2008, and February 28, 2008, respectively. The maps and memoranda are available on the State Water Board website or upon request. Ultimately, the State Water Board elected not to incorporate the delineation maps into the Policy.

On August 9, 2012, Alameda County Superior Court entered judgment against the State Water Board in a case challenging the Policy pursuant to CEQA. (*Living Rivers Council v. State Water Resources Control Board* (Sup. Ct. Alameda County, 2012, No. RG10-5435923).) The superior court held that the Board failed to comply with CEQA because the draft SED did not evaluate the subterranean stream delineations, contained in the delineation maps, as a potentially feasible mitigation measure for the potential increased use of groundwater. (Final Statement of Decision, pp. 14-16, 30.) The court reasoned that adoption of the delineation maps "may have made the Board's monitoring of the anticipated increase in groundwater use more effective and efficient by distinguishing between groundwater in subterranean streams subject to the Board's permitting process and percolating groundwater subject only to the Board's discretionary enforcement authority under the Public Trust Doctrine and the doctrine of waste." (*Id*. at p. 14.) The court issued a writ of mandate, directing the State Water Board to evaluate the subterranean stream delineations as a potentially feasible mitigation measure and make appropriate disclosures regarding that evaluation and resulting decision. As required by the court, the feasibility of adopting the subterranean stream delineations is evaluated below.

Adoption of the delineation maps would be ineffective and inefficient as a mitigation measure for the potential increase in groundwater pumping for the following reasons:

1. Preliminarily, the likelihood of affected persons switching to groundwater pumping is uncertain. Groundwater occurrence in the Policy area is limited by hydrogeologic factors, including seawater intrusion, thin alluvial deposits, aquifer materials of low permeability, and degraded water quality. Overdraft, resulting from excessive pumping associated with development, could possibly occur in the future, reducing available supplies in late summer and dry years. In some site-specific cases, groundwater may be an adequate alternative supply source for low capacity wells, such as those typically associated with small water agencies or self-supplied individuals for domestic, industrial, or agricultural use. Groundwater is not a likely adequate alternative supply source for large agencies because of the above-described limiting hydrogeologic factors.

2. The potential shift from surface water diversions to groundwater pumping that could be caused by the proposed Policy is unlikely to cause a significant reduction in surface water flows. To the contrary, the potential switch from surface water diversions to groundwater pumping is likely to reduce the impacts of surface water diversions on surface water flows because in many cases groundwater pumping will not deplete surface water flows on a one-to-one basis, and in some cases the groundwater and surface water may not be hydraulically connected at all.

3. Adopting the subterranean stream delineations would not assist the State Water Board in regulating any increase in groundwater pumping outside the areas identified as subterranean streams in the delineation maps, which represent just a small portion of the watersheds in the Policy area. Significant portions of Policy area watersheds are not within the identified subterranean stream areas, yet in many cases these areas contain known existing or planned points of diversion. In addition, prospective groundwater pumpers could be expected to divert outside any delineated subterranean streams whenever possible in order to avoid the State Water Board's permitting authority, further undermining the effectiveness of the subterranean stream delineations as an enforcement tool. The delineation map prepared for the Hopland USGS 7.5 minute quadrangle is a good example of the limited utility of adopting the subterranean stream delineations. On this map, the subterranean stream delineated area covers approximately 10% of the watershed area, approximately 14% is designated as a potential stream depletion area, and the remaining 76% is not designated. The majority of the known existing and planned points of diversion are outside the subterranean stream delineated area. The approximate distribution of the known diversion points are provided in table 7-2 below.

Table 7-2. Distribution of Known Points of Diversion within the Hopland USGS 7.5 Minute Quadrangle

	SUBTERRANEAN STREAM DELINEATED AREA	POTENTIAL STREAM DEPLETION AREA	NOT DESIGNATED
Pending Applications	1%	28%	14%
Permits	1%	6%	8%
Licenses	5%	13%	5%

	SUBTERRANEAN STREAM DELINEATED AREA	POTENTIAL STREAM DEPLETION AREA	NOT DESIGNATED
Registrations	0%	0%	7%
Claims (Pre-1914, Riparian, Court Decree, and Pending Appropriative Application)	1%	5%	6%
TOTAL	**8%**	**52%**	**40%**

Furthermore, throughout much of the Policy area, the subterranean stream delineation areas are characterized by narrow channels with steep slopes, particularly in remote portions of the watersheds. Many of these reaches would be inaccessible to well drilling equipment and, therefore, the likelihood of significant development of subterranean flow is remote at this time. In addition, if access is possible at some locations in these narrow canyons, the diversion facilities, i.e. wells, pumping equipment and appurtenances, piping, etc., could be subject to flood damage.

4. Stetson Engineers Inc. prepared the delineation maps based on available geologic information at the time of delineation. Field inspections were not conducted as part of development of the delineation maps and Stetson Engineers Inc. stated that further refinement of the delineation maps could be made in the future. Accordingly, each of the delineation maps includes the following disclosure statement:

Because the delineated areas on this map were based on information readily available at the time of its development, this map does not claim to represent all of the subterranean streams or potential stream depletion areas that exist in the area. Site specific investigations will be needed to verify the existence of subterranean streams or potential stream depletion areas.

In light of this disclosure statement and due to the large scale of the delineation maps (1:24,000 is not small enough to show all roads that may be present in the undeveloped portions of the watersheds), it would be necessary for the State Water Board to undertake additional review in order to determine the likelihood and potential extent of future diversion of subterranean flow in these remote areas. The refined delineation maps would be used to distinguish between water in subterranean streams subject to the State Water Board's permitting authority and percolating groundwater subject only to the State Water Board's discretionary enforcement authority under the public trust doctrine and the doctrine of waste. The additional review and associated adoption process for the subterranean stream delineations would entail a lengthy and contentious proceeding. The estimated time and cost associated with the adoption process is described in the following section.

If the subterranean stream delineations were adopted as part of the Policy, they would have regulatory effect. (See Gov. Code, § 11353, subds. (a), (b)(2)(A).) As a result, existing users

within the delineated areas who do not have a valid water right, and who might have assumed that they were pumping percolating groundwater for which a permit is not required, would have to either cease pumping or obtain a water right permit from the State Water Board in accordance with the Policy. Similarly, prospective users within the subterranean stream delineations would have to obtain water right permits from the State Water Board. Many of these existing and prospective water users would likely oppose adoption of the delineations, and would seek to present site-specific technical information concerning the validity of the delineations.

5. The State Water Board can consider the delineation maps and supporting information on a case-by-case basis to assist in determining whether a particular groundwater well is subject to the State Water Board's permitting authority even if the delineation maps are not adopted.

6. As discussed above, the State Water Board has the legal authority to regulate any unacceptable impacts associated with the potential increase in groundwater pumping pursuant to the State Water Board's authority to prohibit the unreasonable use of water.

Subterranean Stream Delineation Time and Cost Estimate

State Water Board staff estimated the potential resource investment associated with the additional review and assessment needed to refine and consider adoption of the delineation maps. A proceeding to adopt or amend the Policy is a rulemaking proceeding, not an adjudicative proceeding. Therefore, the State Water Board would not be required to hold an evidentiary hearing in accordance with chapter 4.5 of the Administrative Procedure Act (Gov. Code, § 11400 et seq.) in order to receive evidence relevant to the validity of the subterranean stream delineations. The State Water Board would need, however, to provide interested persons an opportunity to present and evaluate technical information relevant to the validity of the delineations. In similar rulemaking proceedings involving complex and contested factual issues, the State Water Board has held technical workshops. During the workshops, State Water Board staff and other experts presented technical information, and interested persons were given an opportunity to comment on and ask questions about the information presented.

As a first step in developing the cost and time estimate, State Water Board staff identified potential focus areas for watershed-based workshops by evaluating watershed maps from the North Coast and the San Francisco Bay Regional Water Quality Control Boards, as well as topographical maps from the Division of Water Rights. State Water Board staff then used ArcGIS to measure river miles on the delineation maps located within the boundaries of subterranean flow delineation areas. River mile totals were recorded and categorized by stream, quadrangle map, and watershed. The following nine watersheds were selected with consideration of geographic location and distribution of subterranean river mile totals:

1. Mattole River
2. 10 Mile River
3. Albion River
4. Navarro River and Garcia River
5. Gualala River

6. Russian River
7. Petaluma River, Miller/Novato/ San Antonio Creeks
8. Sonoma and Napa Rivers
9. Marin Coastal Basin

In order to estimate the total time needed, State Water Board staff reviewed and considered the records for two previous State Water Board subterranean stream hearings (State Water Board Order WRO 2003-0004 in the Matter of Application 21883 of North Gualala Water Company and State Water Board Decision 1639 in the Matter of Application 29664 of Garrapata Water Company) and the time components associated with technical workshops, including the 2011/2012 State Water Board workshops to receive comments and information on a scientific basis report for changes to the 2006 Water Quality Control Plan for the Bay-Delta (Bay-Delta Plan). The major time components included in the hearings to make a determination of subterranean streams are included in table 7-3:

Table 7-3. Major Time Components of State Water Board Hearings Involving Determination of Subterranean Streams

WATERSHED	SUBTERRANEAN RIVER MILES	DURATION OF NOTICE PERIOD AND HEARING PREPARATION	DURATION OF STAFF FIELD INVESTIGATION AND PREPARATION OF STAFF REPORT	DURATION OF HEARING	TIME BETWEEN CLOSE OF HEARING AND ISSUANCE OF ORDER OR DECISION
North Fork Gualala River	0.8 river miles	4 months	0 Months[1]	2 days	8 months
Garrapata Creek	7 river miles	4 months	2 Months	2 days	4 months

[1]A field investigation was not conducted by State Water Board staff for the North Gualala Water Company hearing. State Water Board staff relied on the field work conducted by others and the subsequent data and conclusions presented at the hearing to make the final determination.

Both the North Gualala Water Company and the Garrapata Water Company proceedings were noticed four months prior to the hearing, and consisted of two hearing days in which parties presented evidence, testimony, and conducted cross-examination. For the North Gualala Water Company hearing, the resulting State Water Board Order WRO 2003-0004 included a determination for approximately 0.8 subterranean river miles and was issued by the State Water Board eight months after the hearing. For the Garrapata Water Company hearing, the resulting State Water Board Decision 1639 included a determination for approximately 7 subterranean river miles and was issued four months after the hearing. In lieu of site-specific information, State Water Board staff assumed that workshops for refining the delineation maps would consist of components similar to the previous hearings including: 1) preparation for and notification of a public workshop; 2) conducting a workshop; and 3) evaluation of information collected at the workshop and development of staff reports. Estimates for each of these components were calculated for the Policy area watersheds with consideration of the time frames associated with the State Water Board hearings and the assessment of subterranean river miles. The time and cost estimate does not include the time and cost associated with reviewing comments on staff reports, preparing any necessary responses, making any necessary revisions to the delineation maps, and conducting a State Water Board meeting to consider adoption of the maps.

Preparation and Noticing

In estimating the time to prepare for and notice each workshop, State Water Board staff applied an economy of scale based on the number of subterranean river miles per watershed. Staff assumed that watersheds with a greater number of subterranean river miles would require additional preparation time for the notice because there would likely be a greater number of land owners and interested parties to incorporate into the mailing list. This assumption could be further refined through consideration of population densities and tax assessor parcel locations in and around the delineated areas. However, since the majority of the delineated areas are in steep and remote portions of the watershed, State Water Board staff relied primarily on subterranean river miles as a proxy in the analysis below.

The median number of subterranean river miles from the nine listed watersheds is 108.8 miles (Marin Coastal Basin). State Water Board staff estimated approximately one month to prepare the notice for this watershed and watersheds with total subterranean river miles within one standard deviation (44 river miles) of the Marin Coastal Basin total. For watersheds with subterranean river miles greater than one standard deviation (for example the Russian River) State Water Board staff doubled the notice preparation time estimate, and for watersheds with subterranean river miles less than one standard deviation (for example Petaluma River et. al and Sonoma Creek/Napa River) staff reduced the notice preparation time estimate by half.

Both the North Gualala hearing and the Garrapata proceedings were noticed four months prior to the hearing. State Water Board staff assumed that unlike a hearing, the workshops would not require parties to submit evidence prior to the workshop, thus reducing the estimated length of time between issuance of the notice and the workshop date(s). The time required for noticing and preparing for the workshop is estimated to be 2.5 months. This estimate provides for a notice period of 2 months and a half month of preparation time for State Water Board staff to review and organize any comments received. This estimate is consistent with State Water Board workshop proceedings to receive comments and information on a scientific basis report for changes to the Bay-Delta Plan. The notice for the three workshops held in 2012 was issued approximately 2.5 months prior to the date of the first workshop.

Workshop Duration

The estimated duration of each workshop was scaled to account for the differences between a workshop and a State Water Board hearing. The workshops would likely be similar to other technical workshop proceedings such as the Bay-Delta Plan workshops held in 2011 and 2012 by the State Water Board. During the Bay-Delta Plan workshops, State Water Board staff and other experts presented technical information, and interested persons were given an opportunity to comment on and ask questions about the information presented. A total of two days per technical area was required for each of the Bay-Delta Plan workshops held in 2012.

As such, State Water Board staff estimated a duration of two eight-hour days per workshop.

Evaluation and Development of Staff Report

State Water Board staff developed two methods for estimating the time required for post-workshop evaluation and staff report development (see table 7-4). The first method assumed that the time requirement would be similar to the two previous hearings for evaluation and preparation of an order or decision and similar among the various watersheds. In addition, this method assumes that the necessary field data would be provided by participants during the workshops and no additional field investigations would need to be conducted by State Water Board staff. According to the records for the two hearings, it took an average of six months to evaluate evidence and complete a draft order. State Water Board staff incorporated this average time for each watershed to calculate the lower range total. The second method considered the number of subterranean river miles identified in the delineation maps for each watershed and assumed the staff evaluation for each workshop would include a field investigation to refine the delineation maps. Staff completed the field investigation and staff report for the Garrapata Water Company hearing in just under two months. Therefore, based on the Garrapata Water Company hearing, an average of just under 0.3 months per subterranean river mile would be necessary after each workshop to complete the evaluation and prepare the staff report. State Water Board staff incorporated this average requirement to scale the time commitment for the higher range total.

An external scientific peer review of the scientific basis for the subterranean stream delineations would need to be conducted pursuant to Health and Safety Code section 57004. State Water Board staff assumed that the peer review process could be conducted within the timeframe necessary to hold workshops and prepare staff reports. State Water Board staff also assumed work within the different watersheds would overlap. For example, work on staff reports for multiple watersheds could occur simultaneously and/or work to prepare a notice for one watershed could occur simultaneously with development of a staff report for another watershed. With a full complement of State Water Board staff it is assumed that work on up to two watersheds could occur simultaneously. Accordingly, the lower range time commitment estimate is approximately 3.5 years and the upper range time commitment estimate is approximately 12.8 years to complete refinements of the delineation maps.

Table 7-4. Time Estimates for Refining and Considering Adoption of Delineation Maps

WATERSHED	RIVER MILES	TIME ESTIMATE						
		NOTICE PREPARATION (months)	NOTICE DURATION/ WORKSHOP PREPARATION (months)	WORKSHOP DURATION (months)	EVALUATION / STAFF REPORT (months)		TOTAL TIME (years)	
					Low	High	Low	High
Mattole River	151.3	1	2.5	0.07	6.0	43.2	0.8	3.9
10 Mile River	95.3	1	2.5	0.07	6.0	27.2	0.8	2.6
Albion River	139.1	1	2.5	0.07	6.0	39.7	0.8	3.6
Navarro River and Garcia River	125.5	1	2.5	0.07	6.0	35.9	0.8	3.3
Gualala River	76.6	1	2.5	0.07	6.0	21.9	0.8	2.1
Russian River	167.7	2	2.5	0.07	6.0	47.9	0.9	4.4
Petaluma River, Miller/Novato/San Antonio Creeks	61.9	0.5	2.5	0.07	6.0	17.7	0.8	1.7
Sonoma Creek and Napa River	33.9	0.5	2.5	0.07	6.0	9.7	0.8	1.1
Marin Coastal Basin	108.8	1	2.5	0.07	6.0	31.1	0.8	2.9
Total	**960.1**	**9**	**22.5**	**0.6**	**54**	**274.3**	**7.2**	**25.5**
Adjusted Total	**--**	**4.5**	**11.3**	**0.3**	**27**	**137.2**	**3.6**	**12.8**

Table 7-5 provides a summary of the estimated number of persons years (PY) required to complete each task by discipline. State Water Board staff used this information in combination with the standard position costing estimates developed by the State Water Board Budgets Office and the adjusted total time estimates included in Table 7-4 to estimate the costs to the State Water Board associated with conducting the additional review and assessment needed to refine and consider adoption of the delineation maps (Table 7-6). The low range cost estimate is approximately $1.3 million and the high range cost estimate is approximately $5.0 million.

Table 7-5. Time Estimates for Refining and Considering Adoption of Delineation Maps

	NOTICE PREPARATION	NOTICE DURATION/ WORKSHOP PREPARATION	WORKSHOP DURATION	EVALUATION / STAFF REPORT
Environmental Scientist	1 PY	1 PY	1 PY	1 PY
Water Resource Control Engineer or Engineering Geologist		1PY	1 PY	1 PY
Senior Environmental Scientist		0.5 PY	1 PY	0.5 PY
Staff Counsel		0.75 PY	1 PY	0.75 PY
Environmental Program Manager		0.25 PY	1 PY	0.25 PY

Table 7-6. Cost Estimates for Refining and Considering Adoption of Delineation Maps

	TIME ESTIMATE	COST ESTIMATE
Lower Range Time Commitment	3.6 years	$1.3 million
Upper Range Time Commitment	12.8 years	$5.0 million

In summary, adoption of the subterranean stream delineations is not a feasible mitigation measure for the potential increase in groundwater pumping attributable to the Policy taking into consideration all relevant factors including the following: (1) the speculative nature of the potential impact, (2) the fact that the potential switch from surface water diversions to groundwater pumping is unlikely to cause a significant reduction in surface water flows, (3) the fact that any localized impacts to groundwater resources are unlikely to be mitigated by adoption of the subterranean stream delineations, which cover only a small portion of the watersheds within the Policy area, (4) the extensive amount of time and high cost associated with a proceeding to consider adoption of the delineations, (5) the fact that even if the subterranean stream delineations are not adopted, the State Water Board can consider the delineation maps and supporting information on a case-by-case basis to assist in determining whether a particular groundwater well is subject to the State Water Board's permitting authority, and (6) the fact that the State Water Board has the legal authority to regulate any unacceptable impacts associated with the potential increase in groundwater pumping pursuant to the State Water Board's authority to prohibit the unreasonable use of water.

7.2.2 Local Agency Regulation of Groundwater

The five counties in the Policy area have the authority to mitigate the potential impacts of increased groundwater pumping by regulating groundwater use pursuant to their police powers, but most of the counties are unlikely to do so. Currently, only one of the counties has developed a comprehensive program to regulate groundwater use (Napa), one county has a program to regulate groundwater use in a portion of the county (Mendocino), one county has implemented a non-regulatory groundwater management plan (Sonoma), and two counties have no plans, codes, or ordinances for regulating the use of percolating groundwater (Marin and Humboldt). As discussed in section 7.2.1, above, the State Water Board's permitting authority over groundwater pumping is limited. Accordingly, there will likely be little to no project-level CEQA review of the potential increase in the use of groundwater in the four counties with no regulatory framework for groundwater management.

Local regulation of groundwater pumping exists in Napa and Mendocino Counties. Napa County's Ordinance 1162, Napa County Code Chapter 13.15, regulates the extraction and use of groundwater in the county and requires the issuance of a groundwater permit before development may occur. The groundwater permit cannot be issued if evidence exists showing that the proposed agricultural, commercial or residential development will increase the existing water use or take more than its fair share of groundwater if there is no pre-existing use. In Mendocino County, Chapter 20.744 of Division III of

Title 20 of the Mendocino County Zoning Code contains requirements for the evaluation of the adequacy of groundwater resources for new developments in the Town of Mendocino. It allows local government to mandate the amount of naturally occurring groundwater that can be withdrawn from the Town of Mendocino's aquifer on a sustained basis to help prevent depletion of the Town's groundwater by not exceeding the aquifer's perennial or safe yield, which is the amount of water that can be pumped regularly and permanently without dangerous depletion of the storage reserve. Current groundwater management policies for the Town of Mendocino are to collect and analyze current groundwater and rainfall data to assist the Board of Directors with their groundwater management decision-making responsibilities, to increase the use of reclaimed water to reduce groundwater extraction, and to promote water conservation measures.

Sonoma County has implemented a non-regulatory Sonoma Valley Groundwater Management Plan (Management Plan). The Management Plan, implemented by Sonoma County Water Agency in 2007, identifies a range of water management actions to sustain resources for future generations. The goal of the Management Plan is to locally manage, protect, and enhance groundwater resources for all beneficial uses, in a sustainable, environmentally sound, economical, and equitable manner. The Management Plan contains basin management objectives; groundwater availability forecasts developed through modeling; actions to attain groundwater sustainability, including increased use of recycled water to offset groundwater pumping, increased conservation, groundwater monitoring, integration of water management planning on a regional scale, and stakeholder involvement; and plan implementation through a collaborative process. Sonoma County has also established a Basin Advisory Panel to develop a groundwater management plan for the Santa Rosa Plain. Scheduled for release in fall 2013, the Santa Rosa Plain plan will set goals and identify ways to protect the Santa Rosa Plain groundwater basin into the future. Although non-regulatory, the Panel will put forward recommendations for managing groundwater in the Santa Rosa Plain and implementing the plan.

7.3 Increased Riparian Diversions

Surface water may be diverted and used under a riparian water right. Unless the right has been lost through severance, any owner of a parcel immediately adjacent to a water course has the right to divert water at any time to be used directly and beneficially on the land that borders and is contiguous with the stream. The water that is diverted cannot be seasonally stored. Riparian rights do not require approval from the State Water Board and are not subject to the Policy restrictions on diversions. As a result of the policy, there could be an increase in riparian diversion of surface water if water users choose to utilize riparian basis of right in addition to or in lieu of utilizing an appropriative water right subject to the Policy's limitations. Increased riparian diversion could reduce surface water flows in the spring and summer, which are critical periods for fish habitat.

Although riparian rights do not require the State Water Board's approval, the State Water Board has the authority to regulate riparian rights under the reasonable use doctrine, discussed in section 7.2.1, above. A particular water use or method of diversion may be determined to be unreasonable based on its impact on fish, wildlife, or other instream beneficial uses. (*Environmental Defense Fund, Inc. v. East Bay Municipal Utility District* (1980) 26 Cal.3d 183 [161 Cal.Rptr. 466].)

The State Water Board also has an affirmative duty to take the public trust into account in the planning and allocation of water resources. The purpose of the public trust doctrine is to protect navigation, fishing, recreation, environmental values, and fish and wildlife habitat. (*National Audubon Society v. Superior Court* (1983) 33 Cal.3d 419, 434-435 [189 Cal.Rptr. 346].) Under the public trust doctrine, the State retains supervisory control over the navigable waters of the state and the lands underlying those waters. (*Id*. at p. 445.) In applying the public trust doctrine, the State Water Board has the power to reconsider past water allocations even if the State Water Board considered public trust impacts in its original water allocation decision. Thus, the State Water Board may exercise its authority under the doctrines of reasonable use and the public trust to address reduced instream flows in the policy area and adverse effects to fish, wildlife, or other instream beneficial uses due to riparian diversions.

In addition, if additional riparian diversion facilities are constructed, the construction activity should be undertaken in a manner that does not adversely affect fish and wildlife resources, per Fish and Game Code section 1602. If CDFW determines that the construction activity may substantially adversely affect fish and wildlife resources, a Lake or Streambed Alteration Agreement would be prepared. The Agreement would include reasonable conditions necessary to protect those resources and must comply with the CEQA.

7.4 Mitigation Measures for Cumulative Impacts

Potential mitigation measures for cumulative impacts are anticipated to be the same as those described above.

SUPPLEMENT TO APPENDIX D: ANALYSIS OF THE POTENTIAL IMPACTS OF GROUNDWATER PUMPING AS AN ALTERNATIVE SOURCE DUE TO POLICY ADOPTION

Prepared for:

State Water Resources Control Board
Division of Water Rights

February 2013

Prepared by:

Phil Crader
Program Manager
Permitting and Licensing Section
Division of Water Rights
State Water Resources Control Board

Reviewed by:

Barbara Evoy
Deputy Director
Division of Water Rights
State Water Resources Control Board

Supplement to Appendix D: Analysis of the Potential Impacts of Groundwater Pumping as an Alternative Source Due to Policy Adoption

February 2013

The March 2008 Substitute Environmental Document (2008 SED) for the proposed Policy for Maintaining Instream Flows in Northern California Coastal Streams (Policy) determined that the Policy's requirements for appropriations of surface water could lead some affected persons to obtain water supplies under other bases of right, including from other sources (i.e., "alternative water sources"), in place of existing or otherwise planned diversions from surface water bodies. Additionally, diverters may choose to obtain water supply from other sources if the application of the Policy requirements to a particular water right application reveals that there is insufficient surface water to supply the applicant. Five alternative sources of water, including increasing extraction of groundwater, are identified in Appendix D of the 2008 SED (Appendix D).

Appendix D identified some of the potential environmental impacts that could result from pumping groundwater instead of diverting surface water. According to Appendix D, pumping groundwater could potentially deplete groundwater resources, which could potentially result in a reduction in surface water flows, including summer flows. The 2008 SED and Appendix D also determined that the potential reduction in surface water flows, particularly summer flows, could in turn have a potentially significant effect on biological resources, hydrology/water quality, and recreation. Specifically, the 2008 SED and Appendix D estimated that the potential reduction in surface flows could potentially harm riparian vegetation or degrade habitat for sensitive species; could potentially adversely affect water temperature and increase constituent concentrations due to reduced dilution; and could potentially adversely affect recreational opportunities.

Appendix D provides useful information related to future water demands and the adequacy of alternative supplies; however, the analysis in Appendix D concerning the potential impact of groundwater pumping on surface water flows (and the potential indirect impacts resulting from a reduction in surface water flows) is misleading because it does not explain why a shift from surface water diversions to groundwater pumping that could be caused by the Policy is unlikely to cause a significant reduction in surface water flows. This report contains an updated analysis of the potential effects on surface water flows of using groundwater as an alternative source of water supply.

The State Water Resources Control Board (State Water Board) action analyzed in the 2008 SED, i.e., adoption of the Policy, *will not cause* water diversions to occur. As explained in the 2008 SED, the Policy will not operate to approve (or disapprove) any individual surface water diversion projects. If the Policy is adopted, the State Water Board will evaluate pending and future water right applications and other water right matters on a case-by-case basis in conjunction with applicable laws and the Policy. The Policy will not cause more projects to be approved, or authorize projects to be approved subject to conditions that are less protective of the environment than would otherwise be imposed. To the contrary, the Policy will impose *additional* restrictions on pending and future surface water diversion projects in order to protect instream flows. Accordingly, any environmental impacts attributable to individual surface water diversion projects are not attributable to the Policy, and were not analyzed in the 2008 SED.

It merits note that the majority of pending and future water right filings that would be affected by the Policy already exist. Currently, project facilities associated with roughly 90 percent* of pending applications in the Policy area are either completely or partially constructed, and water diversions associated with these facilities are likely already occurring. A similar ratio may exist for future applications as well. Approval of existing projects in accordance with the principles and guidelines established by the Policy would serve to lessen any ongoing impacts of those projects on instream flows and fishery resources and will result in an overall benefit to the environment.

Although the Policy will not cause diversions to occur, it has the potential to affect the source of the water diverted, and whether water is diverted pursuant to an appropriative water right. As described above, those who wish to divert water but do not desire to or cannot comply with the guiding principles of the Policy may seek to acquire water by other means, such as through a contract with an existing water right holder, through diversion of surface water under a claim of riparian right, or by pumping groundwater. In the case of persons switching to groundwater extraction and use in order to avoid complying with the Policy, the only foreseeable impacts that could be caused by the adoption of the Policy are those impacts attributable to the change in source of water supply. The impacts of this change are discussed below.

Comparison of Impacts to Surface Water Flows: Groundwater Pumping and Surface Water Diversions

As summarized in Table 6-3 of the 2008 SED, a switch from surface water diversions to groundwater pumping to avoid complying with the Policy could have a number of significant impacts, including impacts to agricultural resources due to a lowering of the groundwater table and impacts to the production rates of nearby wells. In addition, the construction and operation of groundwater pumping facilities could have significant impacts in the following resource areas: aesthetics, air quality, biological resources, cultural resources, geology/soils, hazards/hazardous materials, hydrology/water quality, land use/planning, noise, transportation/traffic, and utilities/service systems.

As indicated in the 2008 SED, a switch from surface water diversions to groundwater pumping also could result in reduced surface flows. The 2008 SED did not explain, however, that the potential reduction in surface flows is unlikely. In fact, a switch to groundwater pumping is likely to result in less depletion of surface water flows because groundwater pumping will not ordinarily deplete hydraulically connected surface water flows on a one-to-one basis, and in some cases the groundwater and surface water may lack hydraulic connection entirely, or the hydraulic connection may be indiscernible. A switch to groundwater pumping could cause a delay in surface flow depletion, which could in turn cause a significant adverse environmental impact, particularly if the delayed reduction in flows occurs during the summer months, but this

*The estimate of existing diversions associated with pending applications in the Policy area (i.e., unauthorized diversions) is based on billing data from the Division of Water Rights' electronic Water Rights Information Management System for the year 2012. The Division charges annual application fees pursuant to California Code of Regulations, title 23, section 1063 under specific circumstances, including cases where the diversion of water has been initiated before a permit is issued. Out of 255 pending applications in the Policy area, 230 were billed an annual fee in 2012 because the diversion of water, the construction of diversion works, or the clearing of land where the diverted water will be used or stored was initiated before permit issuance.

potential impact is speculative and unlikely to occur in the Policy area. This conclusion is further explained through the following discussion of basic principles of well hydraulics and groundwater hydrology, and an examination of geologic and hydrologic conditions in the Policy area.

Well Hydraulics and Groundwater Hydrology

At the onset of groundwater pumping, the groundwater level in the vicinity of a pumped well is lowered. The amount of lowering or drawdown is less at greater distances from the well, and at some distance the water level is essentially unaffected. The drawdown area surrounding a pumped well is known as the cone of depression. The cone of depression varies in size and shape depending upon the pumping rate, the length of time the well is pumped, aquifer characteristics, slope of the water table, and recharge or replenishment of groundwater within the well's zone of influence. The cone of depression will continue to enlarge until the amount of groundwater pumped is recharged or replenished. "Recharge may occur in one or more of the following situations:

1. The cone enlarges until it intercepts enough of the natural discharge from the aquifer to equal the pumping rate.
2. The cone enlarges until it intercepts a body of surface water from which enough water will enter the aquifer to equal the pumping rate.
3. The cone enlarges until there is enough vertical recharge from precipitation within the radius of influence to equal the pumping rate.
4. The cone enlarges until there is sufficient leakage through overlying or underlying formations to equal the pumping rate" (Johnson Division, 1982).

In a situation where a river or stream serves as a source of recharge to the aquifer, groundwater pumping can lead to a reduction in surface water flow. "When [a pumped well's] cone of depression spreads beneath an area of the streambed, a hydraulic gradient develops between the groundwater in the aquifer and the water in the river. River water then percolates downward through the pervious streambed under the influence of the hydraulic gradient, if the streambed is hydraulically connected with the aquifer. The river, thus, recharges the aquifer at a rate which increases as the cone of depression enlarges" (Johnson Division, 1982). The magnitude and timing of the surface water flow reduction associated with groundwater pumping is affected by a variety of factors. These include, but are not limited to, the geologic structure, dimensions, and hydraulic properties of the associated aquifers, streams and streambeds and the horizontal and vertical distances of wells from the streams (Barlow & Leake, 2012) as well as availability of recharge from the other sources. The following paragraphs describe some of the above listed factors and their associated effects in the Policy area.

Policy Area Geology and Hydrology

The Policy area covers about 5,000 square miles and is generally mountainous, except for about 550 square miles of relatively flat area (slopes < 4%), 45 percent of which lies in the Russian River basin and the remainder in the lower part of basins draining into San Pablo Bay. The Policy area lies wholly within the northern California Coast Ranges physiographic section (Fenneman, 1931 (as cited in R2 Resource Consultants & Stetson Engineers, 2007)). The Coast Ranges primarily consist of consolidated rock, mostly sandstone and shale, composing the Franciscan Formation. Volcanic rocks overlie the Franciscan rocks in some areas. The Franciscan rocks and, to a lesser degree, the younger volcanics, have been folded, faulted, and eroded to form northwest-trending ridges and valleys (R2 Resource Consultants & Stetson Engineers, 2007).

Streams in the Policy area have distinct seasonal runoff patterns, reflecting limited precipitation from June through September. Rantz and Thompson (1967) estimated that about 80 percent of the total precipitation in the Policy area falls during five months, from November through March. Mountains in the Policy area are of relatively low elevation resulting in little snowmelt runoff. About 80 percent of the total annual runoff occurs during the four months of December through March. In general, flows during the summer and early fall are low compared with the winter, and many small streams may go dry. Some streams flow throughout the dry season during wet years, maintain isolated pools in average years, and have no water in them in dry years (Opperman, 2002 (as cited in R2 Resource Consultants & Stetson Engineers, 2007)).

Due to the low water yield of the Franciscan and volcanic rocks, groundwater development in the mountainous areas is limited. Well yields are low, typically on the order of a few gallons per minute, but in some locations well yields are sufficient for domestic, stock pond, or small-scale irrigation purposes. The vast majority of groundwater development occurs in the larger valley drainages, particularly the Napa and Russian Rivers, where urban water purveyors operate extensive wellfields (DWR, 1975 (as cited in R2 Resource Consultants & Stetson Engineers, 2007)). Furthermore, future development of groundwater in the Policy area is limited by other hydrogeologic factors, including seawater intrusion, thin alluvial deposits, and the quality of water. Sea-water intrusion has been identified in coastal aquifers of Napa, Sonoma, and Mendocino Counties (Stetson Engineers, 2008a).

There is little lag between rainfall and runoff once antecedent conditions become wetter in November, reflecting low soil and surface rock permeability and a limited capacity for sub-surface storage (Rantz & Thompson, 1967). In the Russian River basin, this results in streams with relatively 'flashy' storm runoff hydrographs. "Floods are frequent because most of the rainfall occurs during the winter when evapotranspiration losses are low, and because the rocks in the mountain terrane [sic] have low permeability. During winter storms, runoff in many areas exceeds 50 percent of the precipitation and locally is as high as 65 percent" (U.S. Army Corps of Engineers, 1948 (as cited in Cardwell, 1965)).

Because of the low infiltration capacity and permeability of the Franciscan and volcanic rocks, groundwater origin baseflows in streams are poorly maintained. Along the mountain drainages, baseflow that does occur is maintained by groundwater discharge emerging from fractures through springs and seeps. As a result, some streams may be composed of discontinuous wet reaches with pools sustained over summer by groundwater discharge. Some higher elevation streams may run dry from summer to late fall. As a consequence, flows between these ephemeral streams and the underlying aquifer may periodically cease. In the valleys, groundwater occurs in the alluvial deposits. There, baseflow is maintained by groundwater discharge along reaches where the water table is higher than the adjacent stream. In the larger valley drainages, such as the Napa River, Sonoma Creek, Petaluma River, Russian River, and Lagunitas Creek, groundwater discharge is large enough to sustain perennial flow (R2 Resource Consultants & Stetson Engineers, 2007).

Summary of Impacts

Surface water diversions have one-to-one impacts on surface water flows. Switching from surface water diversions to groundwater pumping in response to Policy adoption will result in an equal or lesser volume and rate of depletion in streams hydraulically connected to the pumped groundwater aquifer. The foregoing assumes an impact ratio less than or equal to 1:1. In streams affected by groundwater pumping, the volume and rate of surface water flow depletion resulting from groundwater pumping depends on the location of the well and may be further offset by associated determining factors including the following:

1. impediments to hydraulic connectivity such as impervious boundaries, low infiltration capacities, and reduced permeabilities;
2. the availability of water from other parts of the aquifer;
3. effects to the hydraulic gradient as a result of the slope of the water table; and
4. availability of other sources of recharge such as precipitation and return flow from irrigation.

For example, switching to groundwater pumping at a location distant from the stream or a location where hydraulic connectivity with the stream is impeded or offset would further reduce the observed stream depletion volume and rate when compared to groundwater pumping at a location immediately adjacent to a stream channel or a location with a high degree of hydraulic connectivity.

Although a switch from surface water diversions to groundwater pumping will not cause an increase in the volume or rate of stream depletion, the switch could cause a delay in stream depletion. Depending on the circumstances, such a delay could cause a significant reduction in surface water flows, which could in turn have a significant adverse impact on biological resources, water quality, or recreation. As discussed below, however, the possible effects of a user switching from a surface water diversion to a ground water diversion are dependent on a wide range of variables, and therefore it is highly uncertain whether any particular user who may switch to groundwater will cause a delay in surface water flow depletion, whether any such delay will cause a significant reduction in surface water flows, or whether any delayed reduction in flows will have a significant adverse impact on the environment.

Surface water flow depletion may continue after groundwater pumping stops because it takes time for groundwater levels to recover from the previous pumping stress and for the depleted aquifer defined by the cone of depression to be recharged with water; therefore the time of maximum stream depletion may occur after pumping has stopped. Eventually, the aquifer and stream may return to their pre-pumping conditions, but the time required for full recovery may be quite long and exceed the total time that the well was pumped. Any time delay may range from a few days in the zone adjacent to the stream to thousands of years for water that moves from the central part of some recharge areas through deeper parts of the groundwater system (Heath, 1983).

The most important variables that control the time response of streamflow depletion are the distance of a groundwater well from a nearby stream and the hydrologic properties of an aquifer (Barlow and Leake, 2012). Knowledge of these variables as well as the geologic structure, dimensions, and hydraulic properties of the groundwater system, the locations and hydrologic conditions along the boundaries of the groundwater system, and well pumping rates are key to assessing the significance of any potential impact associated with a delay in surface water flow depletion. The influence of these variables is illustrated in the Stetson Engineers analytical analysis completed during the development of the Policy. This analysis examines the theoretical stream depletion for various values of aquifer transmissivity and distances of the pumping well from the stream (Stetson Engineers, 2008b). Stetson employed a methodology referred to as “Jenkins” to develop eight sets of curves. The Jenkins methodology is presented in the USGS’ *Techniques of Water-Resources Investigations of the United States Geological Survey – Computation of Rate and Volume of Stream Depletion by Wells, Book 4,* Chapter D1, by C.T. Jenkins (1970). The curves indicate that the depletion rate for any specific time is most influenced by the distance of the pumping well from the stream. Transmissivity and specific yield of the aquifer also are significant. Stetson concluded that more detailed analyses are

needed to more precisely and conclusively determine the extent of a particular well's depletion of surface flow.

Without knowing the variables described above, it is impossible to determine whether a switch from surface water diversions to groundwater pumping will cause a delay in surface water flow depletion, or the extent of any such delayed depletion. As a general rule, however, any switch to groundwater pumping at lower capacity wells that could cause a significant delay in surface water flow depletion (i.e., pumping from wells located at a greater distance from the stream channel) may be recharged from other sources, thus reducing or eliminating the associated surface water flow depletion. For a switch associated with a larger groundwater demand, recharge from other sources may not be adequate to reduce or eliminate the associated surface water flow depletion. As described in Appendix D, however, groundwater is not likely to be an adequate alternative supply source for future large agency demands in the Policy area. Only small water agencies and self-supplied individuals are likely to rely on groundwater as an alternative future source of supply. Therefore, delayed surface water flow depletion caused by larger diverters switching to groundwater pumping is unlikely in the Policy area.

Currently, the Division is aware of only one prospective surface water diverter switching to groundwater pumping either as a result of the 2010 Policy adoption or to avoid water right permitting requirements in general. In this particular case, the prospective diverter switched to diversions from a groundwater well located approximately 20 feet from the surface water source. An assessment of the groundwater – surface water connectivity was conducted (O'Connor Environmental, 2010) which considered the well location and local geologic conditions as identified in the well drillers' report, the USGS Geologic map "Western Sonoma, Northernmost Marin and Southernmost Mendocino Counties", and the Department of Water Resources report "Evaluation of Groundwater Resources, Sonoma County". Ultimately, the assessment found no evidence suggesting significant connectivity of the aquifer with surface water at the project site. Furthermore, the assessment concluded that pumping of the well is highly unlikely to reduce surface water flows.

The foregoing discussion and example demonstrate that the level of significance for a potential impact to surface water flows attributable to a delay in surface water flow depletion as a result of diverters switching to groundwater pumping is dependent on site specific circumstances. In light of the fact that the switch to groundwater as an alternative source of supply is likely to be limited to lower capacity wells in the Policy area and the current lack of known diverters switching to groundwater as a result of the 2010 Policy adoption, a significant impact to surface water flows, while possible, is highly unlikely.

About the Author

Phil Crader is an Environmental Program Manager with the State Water Resources Control Board. He manages the Permitting and Licensing Section of the Division of Water Rights. Phil has overseen work within the Permitting and Licensing Section since June 2007. He has extensive experience evaluating applications to appropriate water; petitions to change water right applications, permits, or licenses; requests to transfer water; and applications to register small domestic use, livestock stockpond use, or small irrigation use. He also has detailed knowledge of the provisions of the North Coast Instream Flow Policy. Phil holds a Bachelor's of Science Degree in Environmental and Resource Science with an emphasis in Soil and Water. As part of his coursework, he completed classes in Physical Hydrology and Groundwater Hydrology.

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