Draft Kimball Reservoir Bypass Plan
May 27, 2011

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I. Introduction and Executive Summary

Calistoga uses water from Kimball Creek pursuant to water rights confirmed in Amended License 9615 and Amended License 9616 ("Amended Licenses") which were issued on August 30, 2007 by the California State Water Resources Control Board ("SWRCB"); these rights have priority dates of August 10, 1938 and May 14, 1954. (Appendix A [Amended Licenses].)[1] The Amended Licenses state that Calistoga's use of water does not injure the public trust resources of the state. Thus, in accordance with the terms of the Amended Licenses, Calistoga considered its public trust obligations to be satisfied so long as the City complied with the terms of the Amended Licenses.

In early 2010, Calistoga learned that SWRCB and the Department of Fish and Game ("DFG") had a different view. Although the Napa County Superior Court had initially dismissed a public trust claim filed against the City, in an *amicus curiae* ("friend of the court") brief filed in support of a motion for reconsideration of that decision, the Attorney General, on behalf of SWRCB and DFG, stated that in their view SWRCB had not, in fact, evaluated the public trust implications of Calistoga's use of water under the Amended Licenses. (Appendix B [AG Amicus and Reply].) The two state agencies took no position on whether Calistoga's use of water comported with the public trust doctrine, and instead, asserted that Calistoga had an independent responsibility to ensure that its use of water from Kimball Creek complied with the public trust doctrine. (Appendix B [AG Amicus and Reply].)

Under the public trust doctrine, the City must "take the public trust into account" in its operation of Kimball Reservoir and Dam. (*National Audubon Society v. Superior Court* (1983) 33 Cal.3d 419.) To comply with public trust obligations, the City must provide reasonable protection for public trust values[2] while simultaneously ensuring that it can meet municipal demands for water. (*Id.*; see also *United States v. SWRCB* (1986) 182 Cal.App.3d 82, 116, 118.) The City may determine that some harm to the public trust is appropriate, as long as its determination has reasonably "taken public trust values into account." (*Audubon*, 33 Cal.3d at 446.) In exercising its independent responsibility to ensure compliance with the public trust doctrine, the City (like SWRCB) has the discretion to balance all competing interests and to adopt a program that it determines will best achieve those objectives. (*Center for Biological Diversity, Inc. v. FPL Group, Inc.* (2008) 166 Cal. App. 4th 1349, 1369; *State Water Resources Control Bd. Cases* (2006) 136 Cal.App. 4th 674, 778.)

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[1] The Amended Licenses were issued pursuant to a Change in Use Petition filed by the City on January 11, 2002. (Appendix C [Jan. 11 2002 Petition for Change].) The City submitted the change in use petition in order to resolve an Administrative Civil Liability Complaint filed which charged the City with providing water outside its place of use. (Appendix D [ACL Complaint].) On September 6, 2007 SWRCB approved the Change in Use Petition, and issued the Amended Licenses to the City. (Appendix A [Amended Licenses].)

[2] This common law doctrine is legislatively expressed in Section 5937 of the Fish and Game Code, which requires the owner of any dam upstream of waters that support fish to pass enough water over, around, or through the dam to keep fish in good condition. (*See California Trout, Inc. v. State Water Resources Control Board* (1989) 207 Cal.App.3d 585, 631.)

This Bypass Plan represents the City's effort to fulfill the City's obligations under the public trust principles stated above. The City has extensively evaluated whether it can Bypass water from Kimball Creek in a way that adequately balances public trust values including the need to keep fish in good condition, consistent with Fish & Game Code section 5937, while still meeting its citizens' demands for water. As a result of this comprehensive inquiry, Calistoga has developed a series of recommendations to strike the appropriate balance.

This Bypass Plan does not conclude that Kimball Dam or the City's prior operations have failed to keep fish in good condition. To the contrary, it concludes that there is no data that establishes the condition of Kimball Creek or its fisheries prior to the construction of Kimball Dam, and that post-construction data and evidence do not support the conclusion that Kimball Dam or the City's prior operations have failed to keep fish in good condition. The purpose of this Bypass Plan is to recommend refinements designed to consider and balance the competing needs of fish and the City's water users.

This Bypass Plan includes the following:

1. A description of the two primary sources of the City's water supplies and the City's entitlement to and historic use of that water under its state licenses and permits and State Water Project ("SWP") contracts.

2. A discussion of the public health limitations and requirements imposed on the City's water uses by the California Department of Health Services ("DHS"), and the City's efforts and substantial expenditures to address those limitations and requirements.

3. A discussion and evaluation of the historic and present biology and fisheries of Kimball Creek.

4. An historic analysis of the availability of water over a 70 year period of record, and how various changes to the City's approach to bypassing water from Kimball Reservoir would have impacted the availability of water to meet the needs of the City's water users.

5. A prospective analysis of how various changes to the City's approach to bypassing water from Kimball Reservoir would affect flows and fish in Kimball Creek and impact the future availability of water to meet the needs of the City's water users.

6. A Recommended Bypass Plan that includes the following:

    a. a schedule for bypassing Inflow ("Bypass Schedule") where 60% of Inflow is bypassed after Kimball Reservoir begins spilling and when Inflow exceeds 3 cfs; and 40% of Inflow when Inflow is less than or equal to 3 cfs;

b. infrastructure upgrades, including construction of a syphon pipe;

c. mechanisms for accurate flow measurements;

d. Development and implementation of an Instream Flow Study.

II. Definitions

For purposes of this Bypass Plan, the following definitions shall apply:

Bypass

Bypass means the passing of water over, around, under or through Kimball Dam. Bypass does not include storage releases, but to the extent such release occurs, Bypass commitments will be reduced by an equivalent amount.

Bypass Flow Pipe

Bypass Flow Pipe means a conduit that allows Inflow that would otherwise be stored to Bypass Kimball Dam.

Bypass Schedule

Bypass Schedule means a schedule for bypassing Inflow.

Direct Diversion

Direct Diversion means water diverted and used immediately (or after a short period of regulatory control).

Inflow

Inflow means the best available estimate, measurement, or calculation of water flowing directly into Kimball Reservoir.

Instream Flow Study

Instream Flow Study means a scientific investigation of the relationship between various levels of flow and fish habitats.[3]

Kimball Creek

Kimball Creek is an ephemeral stream located in the upper reach of the Napa River. A picture of Kimball Creek is attached as Appendix E.

Kimball Creek Water Supply

Kimball Creek Water Supply means the water that the City of Calistoga appropriates from Kimball Creek pursuant to Licenses 9615 and 9616.

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[3] The Technical Memorandum prepared by Mike Podlech contains a detailed analysis of the particular type of Instream Flow Study that the City plans on conducting.

Kimball Dam

Kimball Dam means the earthen dam with a concrete spillway that is owned and managed by the City. A picture of Kimball Dam is attached as Appendix F.

Kimball Reservoir

Kimball Reservoir is the lake of water behind Kimball Dam which is used to collect and store water for the City of Calistoga. A picture of Kimball Reservoir is attached as Appendix G.

Kimball WTP

Kimball WTP refers to the wastewater treatment plant that is owned and managed by the City and is used to store and treat the City' water supply, including the water that the City appropriates from Kimball Creek.

Northern Napa River Watershed

Northern Napa River Watershed means the upper reaches of the Napa River from Kimball Dam to the confluence of Mill Creek, as well as several northern tributaries. The drainage area of the northern sub-watershed is approximately 50 square miles and contains 12 tributary blue line streams.

Recommended Bypass Plan

Recommended Bypass Plan means the plan recommended by experts to be the most appropriate plan to provide reasonable protection for public trust values while simultaneously ensuring that the City can meet municipal demands for water.

Spillway

A spillway is a channel for an overflow of water from a reservoir. A picture of the Kimball Reservoir spillway is attached as Appendix H.

Storage

Storage means the impoundment of water for later use, through diversion or collection of water in a storage facility such as Kimball Reservoir.

SWP

State Water Project (or SWP) means that system of dams, diversions, conduits and other facilities operated primarily by the California Department of Water Resources ("DWR").

Table A SWP Allocation

Table A SWP Allocation refers to the Table released by the State Water Project identifying the percentage allocation of water for State Water Project Contractors.

III. Sources of City Water: Kimball Creek and the SWP

The City has long relied on its Kimball Creek water for a substantial part of its water supply. Water is taken at Kimball Dam by Direct Diversion or by diversion of water to Storage. When water levels reach the Spillway, storage capacity is enhanced by the installation of wooden flashboards that increase water levels. An intake tower in a Kimball Reservoir pool diverts water to the treatment plant or to Bypass pipes that discharge to the Spillway during the limited period when the City must Bypass Inflow.

Under the water rights confirmed in Licenses 9615 and 9616, which were issued to the City in 1971, and which have priority as of August 10, 1938 and May 14, 1954,[4] the City is entitled to put up to 536 acre-feet (approximately 174,656,366 gallons) of water per year from Kimball Creek to beneficial use. (Appendix I [Original Licenses].) These licenses permit Calistoga to directly divert 0.74 cubic feet per second ("cfs") from Kimball Creek from September 15- through July 1, and to store up to 405 acre-feet per year in Kimball Reservoir from November 1 through June 15. (Appendix I [Original Licenses].) From July 2 through September 14, the City is not authorized to divert or store water, and thus draws exclusively on previously-stored water during this period. The Licenses contain no other specific requirements for bypassing flows over, through, or around Kimball Dam.

The City's second, and more recently acquired, source is the SWP, from which the City can obtain water up to specified amounts under various contracts. Some of these contracts were created in response to California Department of Health Service's mandate to ensure a reliable source of water for the City's rate-payers, and are discussed in more detail below. Water from the SWP is more costly to the City's residents than water from Kimball Creek and is subject to annual allocation decisions of DWR such that the available supply is variable.[5] In addition, some of the SWP water is diverted from the Sacramento-San Joaquin River Delta. Owing to ecological conditions in the Delta, competing demands on that source and other factors, state law requires the City to attempt to minimize reliance on water supplies diverted from the Delta and delivered through the SWP, and to rely instead on locally-developed supplies. In the Sacramento-San Joaquin Delta Reform Act of 2009, the Legislature expressed the policy of the state to reduce reliance on the Delta in meeting California's future water needs, and provided: "Each region that depends on water from the Delta watershed shall improve its regional self-reliance for water through investment in water use efficiency, water recycling, advance water technologies, local and regional water supply projects, and improved regional coordination of local and regional water supply efforts." (Wat. Code, § 85021.)

[4] Priority refers to the date used to determine who had the right first.

[5] Attached as Appendix LL is an April 20, 2011 "Notice to State Water Project Contractors" which details the way that the SWP allocates water.

IV. Limitations On The City's Uses Of Its Water

In July of 1996, DHS, which has jurisdiction over the regulation of public water systems, advised Calistoga that the City was not able to get sufficient water from its Kimball Reservoir and SWP supplies to reliably meet system demands, and that as a result, the City was in danger of violating legal requirements applicable to water supply.[6] (Appendix J [July 19, 1996 letter].) A month later, DHS issued Compliance Order No. 02-03-96C0-003 to the City ("1996 Compliance Order"), which required the City to: (1) provide a detailed evaluation of its ability to supply adequately, dependably and safely the total requirements of all users under the maximum demand conditions by January 1, 1997; and (2) to submit a plan and time schedule for developing additional sources of supply by March 1, 1997. (Appendix K [August 15, 1996 letter].)

The DHS Compliance Order accelerated the City's longstanding investigation into ways to increase the amount of water available to it from Kimball Creek. That investigation had begun in August of 1960, when the City commissioned an engineering firm to evaluate whether there was additional water available from Kimball Creek. (Appendix L [Kennedy Jenks 1960 Report].) The Kennedy-Jenks Report concluded that there was, in fact, water available, and in 1979 the City submitted an application to SWRCB to appropriate an additional 375 acre-feet per year from Kimball Creek and to embark on a reservoir expansion project which would increase the surface area of Kimball Reservoir from 20 acres to 36 acres so that the City could store the additional water. (Appendix M [1979 Application].)

DFG, which has statutory responsibilities related to protection of natural resources, including birds, mammals, fish, amphibia, and reptiles, protested the City's application on the basis of concerns over impacts to fish. (Appendix N [DFG Protest to 1979 Application].) After consultation with the City, DFG agreed to dismiss its protest in exchange for the City's agreement to: (1) Bypass all surface flows from March 1-November 15; (2) Bypass a minimum of 5.0 cfs, or the total stream-flow, whichever is less, from November 16-February 29; and (3) install devices capable of measuring flows before taking any water above and beyond what was already appropriated. (Appendix O [DFG Protest to 1979 Application].) These limitations were incorporated as conditions of Permit No. 20395, which was issued to the City on November 27, 1989. (Appendix Q [Permit 20395].)

As of the date of the 1996 DHS Compliance Order, the City had not yet commenced construction on the reservoir expansion project nor had it diverted any water pursuant to the authority of Permit No. 20395. In response to the 1996 Compliance Order, the City had Summit Engineering prepare a detailed analysis of the City's available water supply; it further had West Yost & Associates prepare a proposed plan for the City to increase its water supply ("West Yost Plan"). (Appendix P [Summit Engineering Report]; Appendix Q [West Yost Plan].) The West Yost Plan evaluated the

[6] DHS was reorganized into the California Department of Health Care Services ("DHCS") and the California Department of Public Health ("DPH") in 2007. The City's water system is now regulated by DPH.

cost per acre foot of water supply enhancement options, and concluded that the cost to expand the reservoir was prohibitively high, and that it would be much less costly for the City to increase its allotment from the SWP. (Appendix Q, Table 6 [West Yost Plan].). Based on the conclusions of the West Yost Plan, the City took steps to increase its SWP allotment. As a result of those efforts, by 2001, Calistoga had obtained an entitlement to an additional 1,425 acre-feet of SWP water.[7] (See Appendix T [Amendment #3 to Agreement No. 1926]; Appendix V [Agreement between American Canyon and Calistoga for Transfer of Water Entitlement].) Thus, the City is currently entitled to 1925 acre-feet of water from the SWP. (*Id.*)

In many years, DWR imposes limitations on the water available from the SWP, and the limitations can be significant.[8] Thus, the City is not entitled to the full allotment every year. However, even with those limitations, the City has not used all of its SWP allotment each year. Accordingly, based on experience to date and available information, the City could offset a modest loss in water from Kimball Reservoir (e.g. for purposes of increasing Bypass of water to address public trust concerns) by drawing a larger quantity of SWP water. Doing so, however, would result in increased costs to residents and businesses served by the City.

While the increased allotment from the SWP addressed the City's most pressing needs, DHS still had concerns, so for the next eight years (from 2000 to 2008), the City took steps to further improve the reliability of its water supply. In May of 2000, the City completed a Water Facilities Plan, which outlined a series of projects for the City to consider. (Appendix S [Summit Engineering Water Facilities Plan].) The City completed a number of the projects discussed in the Water Facilities Plan, and also installed a number of improvements so that it could ensure compliance with DHS regulations. (Appendix T [Notice of Completion].) These upgrades included tube settlers in the clarifier at the Water Treatment Plant, which increased the efficiency of solids removal and thus allowed the City to treat water that had previously been unusable; meters on filter cell outlets, which monitor surface water treatment turbidity compliance; a new filter bank, which nearly doubled the production capacity of the Water Treatment Plant; filter bank flow meters, which balance flow through the filter banks; and additional pumps, which provided system redundancy that allows consistent Water Treatment Plant production in the event of a pump failure. Also included was the replacement of the Kimball and Myrtledale/Grant transmission pipelines.

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[7] The original SWP allotment of 500 acre-feet was acquired through the City of Napa in 1983. (Appendix U [Agreement No. 1926].) Calistoga purchased another 925 acre-feet SWP allotment from Kern County in 2001. (Appendix R [Amendment #3 to Agreement No. 1926].) In addition to these allotments, the City also purchased 500 acre-feet of Lindsey Slough water from the City of Vallejo in 1998. (See Appendix V [Agreement between American Canyon and Calistoga for Transfer of Water Entitlement].) Since Calistoga is outside the area of use for Lindsey Slough, Calistoga has a third party agreement with American Canyon, in which it trades the Lindsey Slough water for American Canyon's SWP water. (*Id.*)

[8] For example, in 2008, the City was only able to take 35 percent of its SWP allotment and in 2009 it was only able to take 40 percent of it SWP allotment. (Appendix W [Notices to SWP Contractors 08-03 and 09-07].)

The City also spent significant resources studying the feasibility of expanding Kimball Reservoir's capacity through the installation of an inflatable dam or through dredging. (Appendix X [Kimball Creek Dam Modifications]; Appendix Y [Maintenance Dredging Report].) But both those options proved infeasible due to high infrastructure costs which made the projects prohibitively expensive. [See Appendix X, Appendix Y.] Ultimately, the City decided not to expand the capacity of Kimball Reservoir therefore, it never diverted any water under Permit 20395.[9] Since the conditions in Permit 20395 were conditions of that Permit only, and were not intended to interfere with the City's authorized appropriation of water under Licenses 9615 and 9616, the City was not required to comply with the conditions in Permit 20395. (Appendix AA [Dec. 13, 2001 DWR Letter].)[10]

The City's extensive efforts to increase the reliability of its water supply system satisfied DHS. In April of 2008, DHS issued the City a new domestic water supply permit. That 2008 permit stated that the City had demonstrated that its public water system had sufficient source capacity to serve the anticipated water demand for the foreseeable future. (Appendix BB [Apr. 21 2008 Permit].)

[9] The City has never taken water from Kimball Creek under the water rights provided by Permit 20395. However, the City inadvertently reported water use under Permit 20395 to SWRCB on its Progress Reports by Permittee between 1990 and 1999. (Appendix Z [Progress Reports].) During those years, the City mistakenly reported amounts of water that it had directly diverted from Kimball Creek not only on the Reports of Licensee for License 9615 (the correct place for recording such use), but also on Reports of Licensee for License 9616 and Progress Reports by Permittee for Permit 20395. (See Appendix CC [Reports of Licensee]; Appendix Z [Progress Reports].) This clerical error has since been corrected.

[10] In July of 2010, the Napa County Grand Jury addressed the issue of expanding the capacity of the City's water supply, including Kimball Reservoir. The City Council response confirmed the City's determination not to expand Kimball Reservoir due to the prohibitive expense of doing so. The Grand Jury request, and the City's official response, are contained collectively as Appendix DD.

V. Methodology Used to Develop Recommended Bypass Plan

To determine whether it could operate its reservoir in a way that would more effectively balance public trust values with the municipal demand for water, the City retained two experts: Michael Podlech, to study biological issues, and MBK Engineers, to study hydrologic issues. Their CV's are attached as Appendix EE. Both Mr. Podlech and MBK prepared Technical Reports which are attached as Appendices FF and GG.

A. Kimball Creek Biology

As part of his Technical Report, Mr. Podlech provided background information on Kimball Creek biology. The following is a summary of Mr. Podlech's report on this subject.

Kimball Dam is located in the Northern Napa River Watershed. It is fed by Kimball Creek, which is located in the upper reach of the Napa River. It, like other streams in the upper reach of the Napa River flows for only part of the year. Little is currently known about the historic conditions of fisheries habitat within the northern Napa River watershed, but it is believed that prior to European-American settlement the northern Napa River watershed supported a number of fish species, including steelhead.[11]

Steelhead return to spawn in their natal stream, usually in their fourth or fifth year of life. Winter-run steelhead generally enter spawning streams from fall through spring as sexually mature adults, and spawn a few months later in late winter or spring. Spawning occurs primarily from January through March, but may begin as early as late December and may extend through April. Female steelhead construct nests in suitable gravels. Adult steelhead need access to spawning gravel in areas free of heavy sedimentation with adequate flow and cool, clear water. Steelhead eggs incubate within the gravel for 3–14 weeks, depending on water temperatures. After hatching, alevins remain in the gravel for an additional 2–5 weeks while absorbing their yolk sacs, and then emerge in spring or early summer.

After emergence, steelhead fry move to shallow-water, low-velocity habitats, such as stream margins and low-gradient riffles, and forage in open areas lacking instream cover. As fry grow and improve their swimming abilities in late summer and fall, they increasingly use areas with cover and show a preference for higher velocity, deeper mid-channel areas near the deepest part of the channel. After their initial growth period, juvenile steelhead begin to occupy a wide range of habitats, preferring deep pools as well as higher velocity rapid and cascade habitats. During the winter period of inactivity, steelhead prefer low-velocity pool habitats with large rocky substrate or woody debris for cover.

The amount of suitable spawning habitat within a stream, the velocity of the stream, the presence of deep water pools, and water temperature all have a significant impact on the ability of a stream to support large populations of steelhead. These

[11] This report focuses on steelhead because management practices aimed at benefitting steelhead are generally accepted to provide suitable conditions for other fish species.

conditions have been adversely impacted on the northern Napa River by a variety of factors. These factors include: (1) dams and perched culverts which prevent steelhead from accessing upstream habitat; (2) undersized culverts which cause excessive water velocities which impede steelhead passage; and (3) shallow riffles and wide concrete-lined channels which have insufficient water depths to allow fish to remain submerged. Favorable steelhead conditions have been further eroded by the transformation of the Napa Valley into a vineyard landscape, where the majority of vineyards are planted along the Napa River and its tributaries and urban sprawl, which has brought roads and other changes into previously undisturbed areas of the watershed. These activities are entirely unrelated to the City's operation of Kimball Reservoir and have adversely affected aquatic habitat conditions in the upper Napa River and throughout most of the Northern Napa River watershed. Restoration efforts aimed at remediating these factors are critical to the restoration of fisheries in the Northern Napa River Watershed.

B. Hydrology Model

MBK Engineers developed a model of Kimball Reservoir ("Hydrology Model") to evaluate effects of different dam and diversion operations on both water available from Kimball Creek for use by the City, and flows below Kimball Dam. The Hydrology Model simulates operations on a daily basis for a continuous 70-year period. In order to develop the model, MBK analyzed available data to estimate the daily Inflow to Kimball Reservoir from January 1, 1940, through December 31, 2010. A baseline operation, which represents the effects of the City's current operation of Kimball Reservoir and patterns and volume of streamflow below Kimball Dam was simulated by the model. The baseline was then reviewed in light of known life-stage based habitat requirements of steelhead.

Using the baseline as a starting point, a series of potential Bypass schedules were developed based on steelhead needs. Those schedules were simulated in the Hydrology Model to assess how each schedule would impact the City's water supply, and were evaluated based on general steelhead needs and potential water supply impacts. This iterative process was repeated to develop a Bypass schedule that would effectively balance fishery needs with the City's water supply needs.

C. Other Considerations

Since each potential Bypass schedule evaluated would require the City to measure and account for Inflow to Kimball Reservoir, MBK also provided recommendations on methods and alternatives to develop or improve Flow measurement.[12] Additionally,

[12] The City has sought for years to determine how best to accurately monitor Inflow. In 2004, the City's consultant submitted a Proposed Reservoir Flow Accounting Program to the Division of Water Rights. The proposal explained the City's current method for flow measurement, which allowed the City to accurately measure Flow in the dry months when it was required by its licenses to Bypass 100 percent of Inflow. The proposal outlined a plan for the installation of monitoring equipment on the main stream discharging into Kimball Reservoir which was intended to allow the City to monitor Flow during the dry season. (See Appendix HH, Sep. 29, 2004, Letter from EKI to Larry Lindsay.) The issue came up again in June of 2008 when, in response to a citizen's complaint, City staff met with representatives from DFG to discuss the City's compliance with its licenses. A month after the meeting, on July 17, 2008, DFG sent the City a

because the City has a limited ability to Bypass Inflow, most of the proposed Bypass schedules simulated would require the City to increase its Bypass capacity. Consequently, MBK and Mr. Podlech also provided recommendations on infrastructure improvements that would enable the City to Bypass a greater quantity of Inflow.

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letter indicating they were concerned there were "insufficient Bypass flows below the dam per FGC Section 5937," and the City was not complying with the conditions of Permit 20395. (See Appendix II, July 17, 2008, Letter.) Although the City was not taking any water under Permit 20395, in order to address DFG's concerns, the City installed a stream gauge along the main Inflow channel feeding the reservoir in 2009. (Appendix JJ.) As explained in more detail in MBK's Technical Memorandum, the natural stream channel makes it virtually impossible to get accurate flow measurements from this gauge.

VI. Selection of Recommended Bypass Plan

Table 1 describes six of the Bypass schedules that were evaluated. These Bypass schedules are representative of the dozens of proposed Bypass schedules evaluated.[13]

Table 1: Sample of Scenarios Evaluated

Scenario	Description
1. February Median Flow and 100% of Inflow	From Dec. 15 - Mar. 31, Bypass minimum of: 1) February Median Flow of 5 cfs, or 2) total reservoir inflow. Bypass 100% of Inflow from Apr. 1 - Dec. 14.
2. Bypass 90% of Inflow	Bypass 90% of Inflow.
3. Bypass 60% of Inflow after first spill	After the reservoir begins spilling each year, Bypass 60% of Inflow.
4, Bypass during flashboard installation only	Bypass a specific Flow rate (e.g. 2 cfs) when installing flashboards and reduce the requirement by a fraction of the previous day's release after the reservoir stops spilling.
5. Bypass specified Flow in March and first half of April	Bypass the minimum of: 3 cfs or Inflow from Mar. 1 - 14 2 cfs or Inflow from Mar. 15 - 31 1 cfs or Inflow from Apr. 1 – 14
6. Bypass 40 or 60% of inflow, based on Inflow rate, after first spill	After the reservoir begins spilling each year, Bypass 60% of Inflow when Inflow exceeds 3 cfs and 40% of Inflow when less than or equal to 3 cfs, Inflow based on calculated acreage of 7 preceding days.

To select one of these proposed Bypass schedules, this Bypass Plan considered the impact on water supply, the extent to which the proposed Bypass schedule changed the flow below Kimball Dam in the winter and spring, and whether or not the proposed Bypass schedule resulted in a Flow pattern that closely correlates to the unimpeded flow pattern of Kimball Creek. After careful evaluation of these factors, this Bypass Plan determines that Scenario 6 struck the right balance. Accordingly, the Recommended Bypass Plan Consists of Bypassing 40% or 60% of Inflow, depending on Inflow rate, after Kimball Reservoir spills for the first time each season, strikes the appropriate balance. This determination is based on the following:

- The City's existing licenses state that all inflows be bypassed during the period of July 2 through September 14. This is also the period of time when natural Inflows to the reservoir in this seasonal part of the Napa River watershed gradually diminish and eventually cease entirely until the onset of the next rainy season. As such, ensuring that 100% of natural flows are provided below the dam will allow

[13] Appendix KK is a compact disc that contains model output from the six potential scenarios described in Table 1 and the "Baseline" model scenario which represents the City's current operation of Kimball Reservoir.

fish to respond to this gradual cessation of flows and seek refuge in pools or downstream perennial reaches.

- The period of September 15 through October 31 is a naturally dry period in the Northern Napa River Watershed when there are generally no Inflows to the reservoir. Although storm events may periodically occur prior to the end of October, releasing these flows to an already dry stream channel would have no significant benefits to fisheries resources, particularly since these early storm events are often followed by another extended dry phase (e.g., October 2009).

- Under this scenario, no Bypass flows would be provided until the reservoir spills for the first time after the onset of the wet season. Given that fill-and-spill reservoirs such as Kimball Reservoir provide close to natural flows once they have begun spilling, and that steelhead benefit from a near-natural winter hydrology, this scenario aims to fill the reservoir as quickly as possible. As described above, releasing a portion of the first storm(s) in the form of Bypass flows to an already dry stream channel would have no significant benefits to fisheries resources early in the season. However, by ensuring that the reservoir fills and spills as quickly as possible, near-natural Flow conditions will be present in most years by the time the majority of the adult steelhead spawning migration occurs.

- Once the first spill event has occurred, 60 percent of the Inflow up to a maximum of 3 cfs will be provided. Considering that 3 cfs is equivalent to 60 percent of an Inflow rate of 5 cfs, limiting Bypass flows to 3 cfs will have the added benefit of allowing the partially drawn-down reservoir to fill again more rapidly, thereby increasing the likelihood of renewed uncontrolled spills.

- Once Inflows have decreased to 3 cfs, 40 percent of the Inflow up to a maximum of 3 cfs will be provided. Inflows of less than 3 cfs will generally occur beginning in mid-spring. At this time, the adult spawning migration is typically drawing to an end (although some spent adults known as kelts may be migrating back downstream toward the ocean), but adequate flows are necessary to maintain incubating eggs wetted, allow for emergence of alevins, and support fry rearing, and permit juvenile smolt outmigration to the ocean. The only available data relating instream flows to water depths in the upper Napa River dates back to 1957 (CDFG, 1957) in which streamflows of approximately 1.0-1.25 cfs provided water depths of 3 inches to 2 feet with average depths ranging from 3 to 6 inches. Although channel conditions have most likely changed over the past 50 years, the proposed Bypass flows are likely adequate to support these life stages. However, a detailed assessment of site-specific instream flow requirements through an Instream Flow Study will need to be conducted to verify or, if necessary, modify this assumption.

Accordingly, the "Recommended Bypass Plan" consists of the following: (1) a Bypass Schedule that adequately balances the need to keep fish in good condition while still meeting citizens' demands for water; (2) a commitment to construct the

infrastructure necessary to execute the Bypass Schedule; (3) a commitment to adopt new Flow measurement or calculation techniques to ensure accurate accounting of Inflow and Bypass; and (4) a commitment to design and implement an Instream Flow Study to collect data so that the City can develop a more refined Bypass Plan that takes into account the specific attributes of the portion of Kimball Creek downstream from Kimball Dam.

The specific components of the Recommended Bypass Plan are as follows:

Bypass Schedule

The following Bypass Schedule will apply to the operation of Kimball Dam and Kimball Reservoir pending the completion of the Instream Flow Study recommended by this Bypass Plan:

1. From July 2 to September 14, the City will Bypass all Inflow.

2. From September 15 – October 31 the City will directly divert up to 0.74 cfs of Inflow. The City will Bypass all Inflow in excess of 0.74 cfs.

3. From November 1 – July 1 the City will divert, store, and use water in accordance with the rates and quantities allowed under the water rights confirmed in water right Licenses 9615 and 9616. However, from the date that water first spills over the concrete spillway until July 1, the City will do the following:

    a. When the average Inflow for the previous seven days is greater than 3 cfs, the City will Bypass 60 percent of Inflow, up to a maximum of 3 cfs;[14] and

    b. When the average Inflow for the previous seven days is less than or equal to 3 cfs, the City will Bypass 40 percent of Inflow.

Infrastructure

The City will install a supplemental Bypass Flow Pipe and any necessary appurtenant facilities (e.g., pump) so that it can physically Bypass up to 3 cfs to the Spillway. Until this infrastructure is complete, the Bypass Schedule will be implemented to the maximum extent possible using the existing two inch Bypass Flow Pipes.

[14] The maximum 3 cfs Bypass will not preclude higher Bypass that occurs as a result of spills or other matters beyond the City's control, but defines the upper operational commitment pending completion of the Instream Flow Study recommended by this Bypass Plan.

Flow Measurement

The City will immediately begin, and will continue to implement the Flow Measurement methodology outlined in this section in order to reliably calculate Inflow and Bypass.

Instream Flow Study

The City will immediately undertake to design and complete an Instream Flow Study. Once the Instream Flow Study is complete, the City will re-assess the Bypass Schedule.

Suspension of Bypass Schedule

In the event of a "Critically Dry Year" the City reserves the right to suspend the Bypass Schedule. As noted above, for purposes of this plan, a "Critically Dry Year" exists if one of the following events has occurred in any year:

1. DWR Table A SWP allocation to Napa County is at or below 40 percent on February 1.

2. Kimball Reservoir does not spill by March 1.

VII. Benefits of Recommended Bypass Plan For Fisheries Downstream Of Kimball Dam

The Recommended Bypass Plan is beneficial for fish downstream of Kimball Dam in two ways. First, it will reduce abrupt flow changes that can negatively impact fish. Second, it will increase overall flow downstream of Kimball Dam during winter and spring periods.

A. Reduction in Abrupt Flow Changes Below Kimball Dam

Currently, the City is entitled to store water in Kimball Reservoir from November 1-June 15. If Kimball Reservoir is full as of March 1, the City begins to install flashboards on top of the concrete spillway in order to increase the storage capacity of Kimball Reservoir. Flashboard installation occurs at a time when water is typically flowing downstream, therefore current flashboard operation can cause abrupt changes in water Flow. These abrupt changes create significant deviations from natural flow patterns, which can be damaging to fish.

Under the recommended Bypass Schedule, the City will continue to Bypass a specified percentage of Inflow even during and after flashboard installation. This better replicates the natural Flow conditions, which is beneficial for fish. It also provides more water overall in the stream for fish at times that are considered important.

B. Increase in Flow Below Kimball Dam

The recommended Bypass Schedule will increase overall flow downstream of Kimball Dam during winter and spring periods. In wet, dry, and normal years[15] - total Bypass Flow is higher under the selected Bypass Schedule beginning in early April and remains higher through June. This increase in Bypass Flows below Kimball Dam in April through June will likely continue to maintain fish in good condition during wet and normal water years. During dry years, it is possible that there will not be sufficient Bypass Flows below Kimball Dam to keep fish in good condition, however dry water years naturally pose significant challenges for steelhead and other native fisheries resources in California, and the selected Bypass Schedule is expected to help maintain fish in "good condition" to the extent possible under naturally dry conditions.

[15] Simulation years were categorized as Wet, Normal, or Dry based on the annual water-year Inflow to Kimball Reservoir. The 17 years with the largest volume of annual Inflow, or approximately 25 percent of all 70 years, were defined as Wet. The 17 years with the smallest volume of annual Inflow were defined as Dry. The remaining 36 years with Inflow volumes that fell in the middle two quartiles of the 70-year distribution were defined as Normal.

VIII. Impact of Recommended Bypass Plan on City's Water Supply

Model output was also used to estimate changes to the City's Kimball Creek water supplies as a result of the Recommended Bypass Schedule. The following table summarizes average annual Kimball WTP diversions for the baseline and the selected Bypass Schedule.

Table 2: Summary of Kimball Creek Water Supply Impacts

	Baseline WTP Diversions (acre-feet)	Recommended Bypass Scenario WTP Diversions (acre-feet)	Reduction (acre-feet)	Percent Reduction
Wet Years	502	488	-14	-3%
Normal Years	494	476	-18	-4%
Dry Years	440	409	-31	-7%
All Years	483	463	-20	-4%

Model results summarized in Table 2 show the selected Bypass Schedule reduces average annual Kimball WTP diversions by 20 acre-feet, which is approximately a 4 percent reduction from baseline diversions. Kimball WTP diversions are reduced less in Wet years (3 percent) and more in Dry years (7 percent). Additionally, the maximum annual reduction in any single year simulated in the model is 66 acre-feet, or 13 percent of baseline diversions in that year. This occurred in a Dry year, but a year where the pattern of reservoir Inflow allowed the City to divert over 500 acre-feet. Therefore, the maximum annual reduction may not necessarily occur in a year when Kimball Creek water supplies are low due to hydrology. However, the Recommended Bypass Scenario does tend to reduce City diversions more in Dry years when less water is typically available to the City from Kimball Creek.

Any water loss from the Bypass Schedule will need to be recovered from the City's SWP source. While the City owns a SWP "Table A" 100% allocation of 1,925 acre-feet, that allocation can drop to as low as 5% in a critically dry year (DWR Notice #09-09 to SWP Contractors dated Nov. 30, 2009). As such, the City's SWP source cannot be fully relied upon to make up water loss from Kimball Reservoir during certain dry years. In order to address this concern, the City must reserve for itself the option of suspending the Bypass Schedule in a severe water emergency.

The City will also use water conservation measures to minimize the impact of the water loss from the Bypass Schedule. The City's Municipal Code Section 13.04 contains voluntary and mandatory conservation measures that can be imposed by the City Council in the event of a water emergency.

IX. Infrastructure Requirements of Recommended Bypass Plan

In order to implement the Recommended Bypass Plan, the City must construct a supplemental Bypass Flow Pipe. The City currently bypasses all Inflow from July 2 through September 14 each year in compliance with its existing water right licenses. Water is bypassed through two pipes that "T" off of the main pipe that delivers water from the reservoir to the Kimball WTP. Each pipe is two-inches in diameter and equipped with a Flow meter to measure discharge. These two pipes provide a maximum Bypass of approximately 0.5 cfs.

These pipes do not provide the necessary capacity to implement the recommended Bypass schedule. Therefore, this Bypass Plan recommends that the City construct a syphon pipe, expected to be approximately eight-inches (8") in diameter, that will discharge water down the Spillway. The syphon pipe would be equipped with a valve to prime the pipe and control Flow, and a Flow meter to measure discharge. The syphon would require a pump to prime the pipe. This Bypass Plan anticipates the installation of a semi-permanent pipe that would remain in place year-round and would be primed and opened each year after Kimball Reservoir begins spilling. This Bypass Plan also requires the City to continue to research additional Bypass methods and retain the services necessary to design and construct the Bypass infrastructure. In particular, the City will research whether it is feasible to bypass water into the pond below the dam as opposed to bypassing into the spillway.

X. Flow Measurement Requirements of Recommended Bypass Plan

Accurate Flow measurement is a pre-requisite to the successful implementation of the recommended Bypass Schedule. MBK Engineers evaluated options for accurate Flow Measurement. MBK prepared a Technical Memorandum, which is attached as Appendix GG. MBK's Technical Memorandum makes the following observations and recommendations.

There are two main channels that provide the vast majority of Inflow to Kimball Reservoir. These channels are steep in nature, lack a uniform cross-section, do not appear to be stable, and are in a remote location. These factors all contribute to the difficulty in developing an accurate and consistent measurement of the actual Inflow to Kimball Reservoir. Due to the large range of flows required to be measured, the size of the channel, and steepness of the channel, the control structure required to facilitate a reasonably accurate measurement would be of significant size, and a considerable construction undertaking which would both be disruptive to natural channels and likely require permitting and appropriate environmental documentation. These factors would extend the time to complete any potential measurement facility and significantly increase the cost for the facility.

It is therefore more practical and cost effective to use change in storage volume and the estimated or measured reservoir outflow to calculate Inflow. This method requires simple and accessible measurements to determine the Inflow. It would avoid the high costs associated with measuring upstream tributaries. The accuracy of the calculated Inflow, together with appropriate assumptions, should be adequate and acceptable for use as described in this Bypass Plan.

A. Measurement of Storage Volume

The volume of water in storage is determined by measuring the water surface level of Kimball Reservoir and using an existing area-capacity curve to arrive at the volume in storage. The City currently reads a staff gauge on a daily basis to arrive at a quantity of water held in storage. This reading will continue to be made on a daily basis; it will be taken at approximately the same time each day; and it will be made to the nearest 0.05 foot reading. These readings will be made and documented even when Kimball Reservoir is spilling. This will facilitate the calculation of outflow from spills as further described below.

B. Measurement of Reservoir Outflow

Outflow from Kimball Reservoir currently occurs through the following means: releases to the water treatment plant, Bypass releases through the existing two 2-inch diameter pipes, Kimball Reservoir spills, seepage through and under Kimball Dam, and evaporation from the reservoir surface area. Each of these outflows will be measured or estimated for use in calculating Inflow.

The City currently measures the flow to the treatment plant and the two 2-inch diameter pipes used for Bypass releases. This measurement will continue and will be well documented. The City will also equip the supplemental Bypass Flow Pipe with a Flow meter.

Reservoir spills are monitored by means of a staff gauge near the downstream end of the Spillway. The City can use the reservoir water surface level, identified above, together with a standard equation of flow over a weir to estimate the amount of flow going over the Spillway. The City will also seek to minimize leakage through the flashboards in order to get a more accurate estimate of inflow. The City will also take steps to measure seepage through and under Kimball Dam by investigating measurement locations in the downstream channel from the toe of the dam to the Evey Road Bridge. Measurements should be taken at a time when no other observed flows are occurring, other than the City's Bypass Flow that currently is measured through the two 2-inch diameter pipes. This measurement or measurements can be used to provide an estimate of the Kimball Dam seepage for use in the Kimball Reservoir Inflow calculation.

Reservoir evaporation as outflow will be determined based on review readily available evaporation data for nearby locations such as Lake Sonoma. This review, together with a review of technical calculations using climatic data, should facilitate an estimate appropriate for use in the proposed Bypass operation.

C. Calculation of Inflow

Using the above data and estimates, Kimball Reservoir Inflow will be calculated through the simple equation of change in storage plus Outflow. Although some of the data used in the calculation are estimates using best available information, this approach will result in a sufficiently accurate measurement of Inflow and Bypass to permit implementation of the recommended Bypass Schedule. Inflow calculations will be conducted on a daily basis and used consistent with the recommended bypass operations.

D. Measurement Improvements

There are steps that the City could take to increase the accuracy of storage volume measurements. First, the City could install electronic water level sensors and an evaporation pan. This would include sensors, telemetry equipment, a staff gauge, two submersible pressure transducers to measure the depth of water in the Kimball Reservoir , a rain gauge, and Class A automatic evaporimeter to measure evaporation. The staff gauge and pressure transducers, installed on the slope of the dam in separate stilling wells, would provide a way to verify the water level measurements and would allow for easy maintenance. Such telemetry equipment could use the existing communication infrastructure and assumes there is a line of sight from the measurement location to the office or a repeater location. This could be coupled with installation of an evaporation pan at the reservoir to increase precision of the estimate of evaporative losses. Second, the City could also conduct a new bathymetric survey of the bottom contours of the reservoir. In staff's judgment, these steps are not necessary at this time.

XI. Instream Flow Study Requirements of Recommended Bypass Plan

The current understanding of both existing and historic fisheries and habitat conditions in the upper Napa River is based on a limited number of largely reconnaissance-level assessments, none of which pre-date the construction of Kimball Dam. To better understand the conditions required to maintain fish in "good condition" below Kimball Dam, the City needs to design and complete a detailed Instream Flow Study such as a Physical Habitat Simulation System ("PHABSIM"), to determine habitat quality and quantity for different life stage of steelhead at various streamflows. PHABSIM predicts physical microhabitat changes associated with flow alterations such as a reduction or increase in streamflow. It also provides a variety of simulation tools, which characterize the physical microhabitat structure of a stream and describe the flow-dependent characteristics of physical habitat relative to selected target species and life stages. Primary target life stages for the Kimball Reservoir Instream Flow Study should include adult steelhead migration and spawning, egg incubation and emergence, early season (spring) rearing, and juvenile outmigration. Conceptually, the study would consist of identifying appropriate study transects representative of habitat types within the upper Napa River reach extending from the dam downstream to Tubbs Lane (pending landowner access permission), surveying selected transects at 3-4 different flow regimes, and modeling Weighted Usable Area (WUA) at surveyed flows using the PHABSIM simulation software according to pre-determined Habitat Suitability Curves (HSC) for the different steelhead life stages. The study should be implemented as soon as possible (i.e., selection of transects during summer 2011) and would extend over approximately one year to allow for surveys at a wide range of streamflows. The precise study design should be developed in coordination with stakeholders familiar with Instream Flow Studies such as DFG, National Marine Fisheries Ser vice, and the Napa County Resource Conservation District.

XII. Fiscal Impact of Recommended Bypass Plan

Implementation of the Recommended Bypass Plan will impose a variety of costs on the City. These include: (1) the cost of SWP water; (2) the cost of infrastructure upgrades; (3) the cost of improved Flow measurement or calculation; and (4) the cost of future Instream Flow Study and monitoring. **[The City is in the process of conducting a detailed assessment of the cost of each element of the Recommended Bypass Plan. Before the Recommended Bypass Plan is finalized, the City will update this section to included a detailed discussion of costs.]**

XIII. Regulatory Issues Associated with Recommended Bypass Plan

By adoption of this Recommended Bypass Plan the City does not intend to abandon its water rights or preclude any use of the water quantities authorized under the water right confirmed in Licenses 9615 and 9616. In actual implementation of this Bypass Schedule, the City may in fact divert and store to the full extent of its rights, even while providing increased Bypass. In other years it may not. Future modification of the Bypass Schedule also could affect the extent to which the rights are needed and exercised.

Furthermore, if it is necessary to modify Kimball Dam operations for legal or regulatory reasons in the future, the City will treat baseline operations as being the full exercise of its water rights, subject only to the explicit limitations contained in the water right licenses. The Bypass Schedule is a voluntary decision by the City and not intended to create a "starting point" for further modification.

XIV. Conclusion

This Bypass Plan represents the City's effort to fulfill the City's obligations under the public trust principles identified above. After extensive analysis by experts and by City Staff, the City has developed a Recommended Bypass Plan which the City believes balances municipal demands for water with the "good condition" requirement of Fish & Game Code section 5937. Notably, however, the analysis conducted has not revealed that either Kimball Dam or the City's prior operations have failed to keep fish in good condition. Instead, the conclusion of the City's expert is that: (1) there is insufficient data to determine what the condition of Kimball Creek or its fisheries was prior to the construction of Kimball Dam; and (2) that none of the post-construction data and evidence support the conclusion that Kimball Dam or the City's prior operations have failed to keep fish in good condition. The City recognizes that further analysis of the condition of fish downstream of Kimball Dam is necessary, and has therefore included Instream Flow Monitoring as a component of the Recommended Bypass Plan. The City will then reevaluate the Recommended Bypass Plan when better data is available.

INDEX OF APPENDIXES TO THE DRAFT KIMBALL BYPASS PLAN

Appendix	Document Title
DD	Grand Jury Request and City's Response
EE	Podlech & MBK CVs
FF	Podlech Report and Appendices
GG	MBK Report and Appendices
HH	September 29, 2004 Letter from EKI to Larry Lindsay
II	July 17, 2008 Letter
JJ	Invoice for stream gauge installation in 2009
KK	Compact Disk of Model Output
LL	April 20, 2011 Notice to State Water Project Contractors