



ELSEVIER

Desalination 187 (2006) 179–190

DESALINATION

www.elsevier.com/locate/desal

From controversy to consensus: The Redwood City recycled water experience

Peter C. Ingram^{a*}, Valerie J. Young^b, Mark Millan^c, Chu Chang, Tonia Tabucchi^a

^aPublic Works Services Department, 1400 Broadway, Redwood City, CA, USA
Tel. +1 (650) 780-7464; Fax +1 (650) 780-7445; email: pingram@redwoodcity.org

^bAICP, 25 Broad Street #20-O, New York, NY, USA
Tel. +1 (212) 217-9972; email: valerieyoung@rcn.com

^cData Instincts, 239 Windsor River Road, Windsor, CA, USA
Tel. +1 (707) 836-0300; Fax +1 (707) 836-0842; email: millan@DataInstincts.com

Received 2 November 2004; accepted 29 April 2005

Abstract

The Redwood City Recycled Water Project faced intense local opposition from a small but determined group of citizens who objected to the use of recycled water from a public health and safety perspective, particularly in areas where children play. In response to this opposition, the City Council eventually formed a community task force and empowered them to help develop a solution to the City's water supply problem. This paper presents the evolution of the project, from its impetus through the environmental review and project approval process; the task force operations and recommendations, which the Council enthusiastically endorsed, are described. The paper concludes with the current status of the project, and lessons the City learned through the process to create a community-based, consensus-driven solution.

Keywords: Recycled water; Water reuse; Community consultation

1. Background and impetus for project

Redwood City, a community of 75,000 people located 40 km south of San Francisco, California, receives 100% of its potable water supply from the Hetch Hetchy regional water system operated

by the San Francisco Public Utilities Commission (SFPUC). The City's existing contractual water supply assurance limit is 15,100 megaliters (ML) per annum. The City currently consumes 1,200 ML/y over that amount through purchases from the SFPUC, as a result of other customers not using their full contractual supply. Current regional demand projections indicate that the

*Corresponding author.

Presented at the International Conference on Integrated Concepts on Water Recycling, Wollongong, NSW Australia, 14–17 February 2005.

Hetch Hetchy system will reach full contractual capacity by 2007–2009, thus eliminating Redwood City's ability to purchase beyond its limit. The City's Urban Water Management Plan (UWMP) [1] projects that its water supply demand overage could increase up to 3,300 ML/y or more by 2010, when the SFPUC supply contract expires.

To bring the City into compliance with its supply assurance limit, the City determined that water recycling, in conjunction with enhanced water conservation programs, were the only viable near-term opportunities that could be readily planned and implemented within the 2010 timeframe. Based on the recommendations of a Water Recycling Feasibility Study [2], which included a detailed market assessment and alternatives evaluation, the City initiated the design, permitting, and environmental review for a citywide recycled water project, delivering approximately 2,500 ML/y, in January 2002.

By this time, the City had already been participating in a small recycled water project, the "First Step Project," initiated in 2000 by the City and the South Bayside System Authority (SBSA). SBSA, the City's recycled water source, is a joint powers agency that provides wastewater treatment and disposal (to San Francisco Bay) for the cities of Redwood City, Belmont, and San Carlos, and the West Bay Sanitary District. The SBSA treatment plant, with a permitted average dry weather flow capacity of 110 ML/d, produces recycled water treated to meet the "unrestricted use" standards as defined by the California Department of Health Services Water Recycling Criteria [3]. The San Francisco Bay Regional Water Quality Control Board encouraged SBSA to take the leadership in developing a water recycling project when it approved SBSA's treatment capacity expansion in 1997.

The SBSA plant is located adjacent to the Bay at the eastern end of the Redwood Shores peninsula. Redwood Shores ("the Shores") is a neighborhood within the City's corporate limits

but physically separate from and north of the central city area; it contains about 5,500 residential housing units and approximately 650,000 m² of corporate office, retail, and hotel space. The First Step Project consisted of temporary treatment facilities and permanent pipelines that deliver recycled water to landscaping in city-owned medians and an apartment and office complex in the eastern area of the Shores near the SBSA plant. This area had existing dual water piping facilities that were installed in conjunction with development since the mid-1980s. The intent of the First Step Project was to demonstrate the feasibility of producing recycled water at SBSA that met the Water Recycling Criteria, and to use it successfully for landscape irrigation; the project met these goals and continues to operate.

The citywide recycled water project represents a continuation of the First Step Project, and will extend the use of recycled water to the rest of the Redwood Shores area and other parts of the City. The recommended project from the Feasibility Study (Alternative D) included uses permitted under the Water Recycling Criteria (landscape irrigation, industrial processes, toilet flushing, etc.), with implementation in an orderly fashion from the SBSA plant westward through the Shores to the rest of the City. In addition to being geographically proximate to the recycled water source, the Shores neighborhood offers the greatest potential for potable water savings. Approximately 68% of the City's water use is for residential purposes, and 2/3 of residential development in the City over the last decade was in the Shores; 40% of the increase in citywide water use in that same period was in the Shores. The Shores has 4.3 times the acreage of parks and playfields per capita as the rest of Redwood City, and in 2002, 58% of the water used for landscape irrigation citywide was in the Shores.

2. Environmental review and project approval

As noted above, the City initiated the environ-

mental review process for the project in early 2002. It is relevant to understand this process because it establishes an important context for the City's decision-making approach for the recycled water project. In California, a public agency must comply with the California Environmental Quality Act (CEQA) [4] when it undertakes or has discretionary approval over an activity defined by CEQA as a project. In addition, CEQA review must be completed prior to issuance of permits from state agencies for recycled water projects. Like most public works infrastructure projects in California, recycled water projects are considered projects under CEQA. CEQA imposes both procedural and substantive requirements, but its primary purpose is one of disclosure, i.e., to provide agencies and the general public with enough information on the potentially significant environmental effects that a project is likely to have, and to identify ways in which those effects may be minimized. The agency must consider and mitigate for the environmental effects of a project before it can be approved.

The type of environmental document used, and the related public review process, are determined by the potential severity of the impacts and, in some cases, by the level of controversy associated with the project. To start the process, an Initial Study (IS) is prepared. The IS contains technical analysis with supporting documentation on the potential environmental effects of a project. If the IS demonstrates that a project will not have a significant adverse effect on the environment, then a Negative Declaration or Mitigated Negative Declaration (MND, where mitigation measures are included in the project to address minor impacts) may be prepared. If the IS indicates a potential for the project to have a significant adverse effect on the environment, or there appears to be a high level of controversy over the project, then an Environmental Impact Report (EIR) must be prepared.

Recycled water projects, particularly those developed for landscape irrigation and industrial

process applications, typically consist of the construction, installation, and operation of water infrastructure (e.g., pipelines, pump stations, storage reservoirs, onsite customer facilities, etc.). Unless this infrastructure is located in sensitive areas or the construction methods are potentially damaging to the environment, these types of projects generally do not result in adverse environmental impacts. Such was the case for the Redwood City project. In addition, CEQA does not require local agencies who implement recycled water projects to "second guess" or re-evaluate the scientific and analytical basis for the public health and safety requirements of the State Water Recycling Criteria, which establish the regulatory standards for the safe use of recycled water. If a recycled water project is designed, constructed, and operated in compliance with the Water Recycling Criteria and all other applicable regulations and permits, it can be concluded in the CEQA documentation that there will be no adverse impacts related to public health and safety. The IS prepared for the Redwood City project concluded that the project did not have the potential for a significant impact on the environment, but that some mitigation measures should be incorporated into the project to address minor impacts; therefore, an MND was prepared [5].

Although CEQA establishes requirements for public notification and opportunity to comment on environmental documents, it has been acknowledged that the statute was not designed for effective public participation [6]. For example, a public comment period (30 days) is required for an MND, but a public meeting is not. Nonetheless, and consistent with its own public outreach philosophy, the City decided to conduct its first public information workshop on the recycled water project in early June 2002, prior to the release of the MND for its 30-day review period. The purpose of the workshop was to initiate the City's public outreach for the project in general, and to specifically start with the Redwood Shores neighborhood, since this would be the first area to be served by the

project. The workshop was held in the Shores, and was advertised in the local Shores newsletter as well as a regional newspaper.

The Redwood Shores community has historically been an active, organized, and vocal participant in matters related to Redwood City development and projects. Thus, it was noteworthy to the City when only two citizens attended the June 2002 workshop. These attendees were Shores residents who would later organize and lead the opposition group, Safewater Coalition. Because of the small group size, City staff was able to focus specifically on answering their questions about the project.

As there was no indication following the workshop or during the MND review period that the community had concerns about the project, the City moved forward with the final two steps in the environmental review process: certification of the environmental document as complete and in compliance with CEQA, and approval of the project. In Redwood City, the Planning Commission is responsible for certifying environmental documents, and did so for the recycled water project MND at a publicly noticed hearing in early August 2002. At that meeting, no opposition to the project was voiced, and two members of the public spoke in support.

The next action would have been Council approval of the project. However, in late August a much greater interest in the project emerged, and the Safewater Coalition was formed. The Coalition identified its primary purpose as: “to keep treated wastewater out of children’s play areas, and residential areas in Redwood Shores (e.g., front yards, parks, playgrounds, schools)” [7]. As a result of this increasing interest, particularly in the area of public health and safety, the Council decided to postpone its approval process and increase its public outreach and education efforts. A Public Information Forum was held in mid-September 2002, at which about 100 members of the public attended, obviously far more than attended the June workshop. The forum was

structured as a Council-hosted facilitated panel discussion, with 13 panelists responding to questions in the areas of public health and safety, landscaping and water use, implementation and regulatory standards, and public perception and acceptance. The panelists were selected by both the City and Safewater Coalition, and represented a broad spectrum of interests, including public health, medicine, wastewater treatment and water recycling operations, plant and soil science, public participation, and environmental law. The Council was in attendance, but agreed to listen and form its own questions for subsequent meetings and discussions.

Following the forum, public interest in the project continued to remain high. One concern expressed was the proposed “mandatory use” of recycled water in residential areas. Mandatory use ordinances have frequently been adopted for recycled water projects in California to qualify for state and/or federal funding (which Redwood City was pursuing at the time), and to ensure maximum use of the recycled water. These ordinances are consistent with California Water Code Section 13551 [8], which states: “A... public agency... shall not use water from any source of quality suitable for potable domestic use for nonpotable uses... if suitable recycled water is available...” In response to this concern and increasing public pressure, however, the City Council adopted a new policy in February 2003 that Redwood City will not make the use of recycled water mandatory to existing residences or homeowners associations. This policy required that a new recycled water system alternative (Alternative E) be developed because all previous alternatives had included residential landscape areas as recycled water customers.

The opponents continued to express concern about possible health risks from the use of recycled water in areas where children play, i.e., parks, playgrounds, and schoolyards. In response to this concern, the City Council directed that current research, technical reports, and expert

witness testimony addressing these issues be compiled to provide the Council with the information it needed to continue with its decision-making process. The CEQA Addendum process enabled the City to append this additional technical material to the existing environmental documentation, as well as allow for ongoing public dialog and information dissemination.

An Addendum to the MND [9] was circulated for public review in May 2003, and the Council conducted a public study session on it in June. The City received both written and oral comments on the document, so a Response to Comments document [10] was prepared and distributed, also consistent with CEQA, to all interested parties prior to Council action.

At a meeting of record-breaking length (8.5 h) on July 28, 2003, the Council addressed the environmental review component of the project and adopted two important resolutions. The first resolution approved and confirmed the MND as certified by the Planning Commission and as appended by the Council with the Addendum and Response to Comments document. The second resolution expressed the Council's position on the public health and safety issue, finding that "...the use of recycled water for landscape irrigation is safe, is environmentally responsible, and can contribute to the health, safety, and welfare of all Redwood City residents."

The Council then approved a broadly defined recycled water project with the ultimate delivery capacity of 3,990 ML/y. However, faced with continuing opposition that threatened the project's successful implementation and wanting to heal a badly-divided community, the Council decided to provide the project's opponents the opportunity for working together with the City to find a way to address and satisfy their concerns, and to find a mutually agreeable recycled water project solution. The Council directed the creation of a community-based task force, with the purpose of exploring different ways to achieve the City's water supply goal while identifying alternatives

to use of recycled water at schools, parks, and playgrounds.

3. Redwood City Recycled Water Task Force — operations

The Redwood City Recycled Water Task Force was established by the City Council with a specific purpose and a defined structure and schedule. Following are the key elements of the conceptual task force proposal approved in August 2003.

3.1. Task Force purpose

- 1) To find 2,500 ML/y of recycled water usage and/or additional conservation of water (beyond that identified in the UWMP) by 2010, in a financially feasible manner, by identifying alternative sites to schools and playgrounds.
- 2) To find alternative phasing which is financially feasible to allow the Council to avoid using recycled water at schools and playgrounds.
- 3) Re-examining the issue of safety is not within the purpose, as the Council had already made that determination.
- 4) The Task Force agrees to help educate, inform, and advocate for their recommendation to the community if the Council accepts it.

3.2. Task Force structure

- 1) A broad based community task force of 12–15 members.
- 2) Members appointed by Council.
- 3) Members to include those opposed to and those in favor of recycled water.
- 4) Task Force to be professionally facilitated; facilitator will not have any professional background in recycled water.
- 5) Task Force to be supported by City staff and consultants.
- 6) Task Force will set its own ground rules.

3.3. Task Force schedule

- 1) Task Force to report to Council by March 2004.

- 2) There should be a consensus of at least 2/3 of the Task Force members to provide a recommendation to Council.
- 3) If the Task Force cannot reach a recommendation, then the Council will begin to implement Alternative E of the previously approved, broadly defined project.

3.4. Task Force operations

During September 2003, the City hired a professional facilitator and conducted the process for appointing the Task Force membership. The size of the Task Force evolved to 20 members, with the intent of having 10 members opposed and 10 members in support of recycled water. The specific breakdown of the group included representatives from Safewater Coalition, the business community, Redwood Shores residents, Seaport Industrial Association (potential industrial customers of recycled water), Chamber of Commerce, school districts, child care, recycled water proponents, park user groups (soccer and baseball leagues), and three at-large members. The application process was open to the public. Of the 20 people ultimately selected, nine were for recycled water use, nine were opposed, and two were neutral.

The first meeting of the Task Force convened on October 1, 2003. With the assistance of the facilitator, the group expressed their viewpoints and participation by every member was encouraged. The group established operating ground rules, rules for general decision-making, voting requirements for final report approval, and attendance. The initial Task Force schedule was to meet twice a month for five months for a total of ten meetings. Although the meetings consisted primarily of dialog between Task Force members and the facilitator, City staff and consultants were present to answer questions and note requested materials. There were no City Council members on the Task Force; this was part of the Council's strategy — to reassure Task Force members that this was *their* process and *their* responsibility, and that the City

would not try to influence or sway any aspect of the Task Force's work.

The Task Force requested technical information and documents during the course of the meetings. The information was either hand delivered at meetings, mailed or e-mailed. Although City staff was available via telephone and e-mail for questions and clarifications, Task Force members were encouraged to ask questions during the meetings so that everyone benefited from the answer. As the meetings and review of information progressed, it became clear that additional research and "number crunching" needed to be performed by City staff, and that more meetings might be necessary. Therefore, the Task Force created a subcommittee in mid-December 2003 for the purpose of working with City staff and consultants to structure and further investigate the viability, cost, and potential water savings of the alternatives under discussion at Task Force meetings.

The results of the subcommittee's efforts were presented to the full Task Force in mid-January, 2004, and the subcommittee began to write the final report to Council. One extra Task Force meeting was added for voting on the final report on March 3, 2004, and the report was presented to the City Council on March 22, 2004 [11].

4. Redwood City Recycled Water Task Force — recommendations

The Task Force achieved all of the goals established for it by the City Council, and issued three unanimous recommendations in the final report. First, the Task Force recommended that the City implement a new recycled water system alternative (Alternative TF), which would achieve an estimated 2,500 ML/y of potable water demand reductions through a combination of recycled water use, replacement of natural turf playing fields with synthetic turf, continued use of groundwater at a local high school, and additional water conservation programs. Second, the Task Force recommended that the City investigate and/or implement

ten Other Potential Measures (OPMs) which would likely result in additional reductions in potable water demands. Third, the Task Force recommended that City staff prepare annual reports for City Council and public review, on progress in implementing the first two recommendations.

Table 1 provides a comparison of the potable water demand reduction, cost, and cost efficiency of Alternative D (the original project alternative from the Feasibility Study), Alternative E (developed in response to the mandatory use policy directive), and Alternative TF (from the Task Force Final Report). Alternative D is provided for comparison purposes only; the Task Force did not consider Alternative D in its de-

liberations because Alternative E as the preferred project had already replaced it.

Alternative TF achieves an estimated 2,500 ML/y of potable water demand reductions at an estimated cost of \$14,000 more than Alternative E. Considering the margin of error in the estimated \$43,600,000 capital cost for Alternative E, the cost difference between Alternatives E and TF is negligible, and the Task Force considered the costs of these alternatives to be essentially the same. In addition, implementation of Alternative TF would allow for increased utilization of the City's playing fields.

The features of Alternative TF are summarized in Table 2 and discussed in greater detail below.

Table 1
Comparison of Redwood City Recycled Water Project alternatives

Recycled water system alternative	Potable water demand reduction (ML/y)	Total capital cost (US\$)	Cost efficiency (\$/ML)
Alternative D (original)	2,411	36,800,000	14,590/ML
Alternative E (no mandatory use)	2,400	43,600,000	18,160/ML
Alternative TF (Task Force report)	2,512	43,614,000	17,360/ML

Table 2
Redwood City Recycled Water Project Alternative TF

Feature	Potable water demand reduction (ML/y)	Cost relative to Alternative E (US\$)
Recycled water		
Realignment of recycled water piping	2,120	(5,100,000)
Downtown Cinema dual plumbing	28	200,000
Subtotal	2,148	(4,900,000)
Synthetic turf playing fields	185	4,669,000
Existing groundwater use	70	0
Additional conservation		
Pre-rinse spray nozzles	41	0
Evapotranspiration (ET) controllers	57	145,000
Hot water recirculation pumps	7	100,000
Subtotal	105	245,000
Total	2,508	14,000

4.1. Recycled water system

The recycled water system under Alternative TF consists of the realignment of some of the recycled water piping proposed under Alternative E, adding dual plumbing to the new Downtown Cinema project, and providing recycled water to the cinema for appropriate indoor and outdoor use. It was estimated that 28 ML/y of recycled water could be used at this location, with a commensurate reduction in potable water demand. The piping realignment is necessary to remove the piping proposed under Alternative E that would have served schoolyards, parks and playgrounds, and to add piping to serve central Redwood City landscape irrigation uses including City Hall, city-owned planters, and the Kaiser Medical Center.

Removing schoolyards, parks, and playgrounds from Alternative E resulted in a loss of approximately 360 ML/y from the 2,400 ML/y of recycled water to be delivered under Alternative E. The City Hall, city-owned planters, and Kaiser Medical Center uses add approximately 8 ML/y. Thus, the realigned piping for Alternative TF delivers 2,120 ML/y of recycled water. Removal of the piping serving schoolyards, parks, and playgrounds provides significant cost savings over Alternative E, while the cost of adding pipe to serve City Hall, city-owned planters, and Kaiser is relatively moderate. The new alignment reduces the length of pipe, mostly 600 mm in diameter, in the Central Redwood City area by about 2 km, as compared to Alternative E. The revised alignment also eliminates the need for three jack-and-bore crossings, which further reduces the cost of the pipeline relative to Alternative E. Consequently, the realigned recycled water piping for Alternative TF would cost approximately \$5,100,000 less than Alternative E.

4.2. Synthetic turf playing fields

The synthetic turf feature consists of replacing natural grass playing fields with synthetic turf at six city-owned parks, one high school (Sequoia),

and one community college. Playing fields at one park and the high school have already been converted to synthetic turf, and the community college is in the process of converting its playing fields to synthetic turf. Consequently, the costs for installing synthetic turf at these playing fields were not considered part of the cost of Alternative TF. However, because the City's water use forecasts assumed these fields would continue to be natural turf, the Task Force included the resulting reductions in potable water demand in Alternative TF.

Although life cycle costs for synthetic turf are higher than those for natural turf, synthetic turf is more cost effective on a per-hour-of-use basis. The City Parks and Recreation Department estimates the 10-year life cycle cost for a 1.6-hectare playing field is \$295,000 per year for synthetic turf and \$166,000 per year for natural turf. However, on a per-hour-of-use basis, these same life cycle costs are \$59 per hour of play for synthetic turf and \$121 per hour of play for natural turf. An added benefit of synthetic turf is higher utilization of the City's playing fields, which is highly desirable given the high demand for these fields in the City. Synthetic turf fields are generally available for soccer use 14 hours per day (assuming the field is lighted), 360 days per year, while natural turf fields are available for soccer use an average of 5 hours per day, 275 days per year.

4.3. Existing groundwater use

In the course of its investigations, the Task Force learned that a portion Sequoia High School is irrigated with groundwater from an existing well. However, the Feasibility Study assumed that this portion of the high school was irrigated with potable water and estimated this amount of water to be 87 ML/y. Alternative E included Sequoia High School among the customers to be served recycled water. This 87 ML/y was also included in the 360 ML/y removed from Alternative E when schoolyards, parks, and playgrounds were removed from the list of recycled water customers.

Therefore, the 87 ML/y was also included as reduced potable water demand under Alternative TF. In addition, a part of the high school has already been converted to synthetic turf; this water use (17 ML/y) is accounted for under the synthetic turf category of Alternative TF. The remaining 70 ML/y is included in the existing groundwater use category.

4.4. *Additional water conservation*

The Task Force identified several new water conservation programs not currently included in the City's UWMP. Specifically, these would be City-subsidized programs to include: 1) the promotion of voluntary replacement of pre-rinse spray nozzles at food service providers, 2) installation of evapotranspiration (ET) controllers at large irrigation sites, and 3) installation of hot water recirculation pumps in homes.

Prior to washing, restaurants, cafeterias, and other food service providers typically remove the majority of the food remaining on plates and trays using a pre-rinse water spray. Alternative TF includes a program to replace existing pre-rinse spray nozzles with water-efficient versions. As part of this program, the City would provide and install water-efficient pre-rinse spray nozzles free of charge. The program is expected to reduce potable water demand by approximately 41 ML/y. The cost to the City for this program is estimated at \$7,000 based on cost sharing provided by the California Public Utilities Commission, which is sponsoring the program statewide.

ET controllers automatically adjust irrigation schedules based on environmental monitoring data (e.g., rainfall, temperature over the course of the day, etc.) transmitted from a local weather station. As part of the ET controller program, the City would pay the product and installation cost. The water customers would be expected to pay the ongoing service fee. The City would market this program to irrigation-only water users served by the City. The program would be offered to potable and recycled water users because ET controllers

will help limit runoff of recycled water due to overwatering.

A hot water recirculation pump provides nearly instantaneous hot water at showers and faucets, thereby eliminating the waste and inconvenience of waiting for it. Pump models installed in existing buildings typically use the cold water pipe as the return to the water heater using a temperature-sensitive valve. The Task Force believed this program may gain wider acceptance than other conservation programs because it provides a "comfort" to the customer in addition to saving water. This program would complement existing City programs that encourage installation of low-flow showerheads, which increase wait times for hot water. As part of this program, the City would offer \$100 rebates (pumps cost from \$125 to \$500 each) to 1,000 water customers that install a pump, for an estimated program cost of \$100,000. Based on a reasonably conservative water savings estimate of 19 litres per household per day, this program is estimated to reduce potable water demand by 7 ML/y. The pump manufacturers estimate savings of 95–167 liters per household per day, with considerable variation depending on home layout and usage patterns.

4.5. *Other potential measures (OPMs)*

Recognizing that future potable water supply and demand may be different than estimated, the Task Force also recommended that the City investigate and/or implement ten OPMs, which were identified as potentially effective ways to further reduce potable water demand. The Task Force recognized that most of these additional measures either generate savings that would be difficult to quantify, require additional research to confirm their viability, or depend upon improvements in existing technology. These OPMs, listed below, are intended to give the City additional flexibility to meet future potable water supply demands. Further detail on the OPMs can be found in the Task Force Final Report.

- 1) Further investigate potential use of ground-water.
- 2) Consider a commercial toilet replacement program.
- 3) Promote community awareness of conservation.
- 4) Adopt an ordinance to implement conservation measures.
- 5) Consider requiring low-flow urinals in new construction.
- 6) Consider requiring conservation devices in new construction.
- 7) Evaluate incentives for electronic eye faucets.
- 8) Investigate potential water swaps with other potable water conveyors.
- 9) Evaluate emerging automated landscape irrigation technology.
- 10) Evaluate emerging wastewater treatment technology.

5. Current status of project

In March 2004, the City Council accepted the Task Force's final report and efforts with great enthusiasm, and directed City staff to return with the required implementation actions. The Council also expressed its intent to meet the water supply needs of the community, and to do this in full accord with the Task Force recommendations. Since then, the Council has approved an agreement with SBSA for the production and delivery of recycled water, moved forward with final design of the system, and established a project office in Redwood Shores. The State Department of Health Services has also approved the Engineering Report for the project. Provided the Council adopts a financing plan and water rate increases to cover the bonded indebtedness for the recycled water project, it will be implemented in multiple phases over the next several years, beginning with some recycled water delivery (beyond that already delivered under the First Step Project) in the 2006 irrigation season. The initial phase will include landscape irrigation for commercial customers of Redwood Shores.

The City is committed to implementing a successful long-term recycled water project that includes a proactive and responsive outreach effort to stakeholders, residents, site landscaping managers, businesses, schools, and the media. Although no longer operational, the Task Force will continue to be an important community resource for the City in the preparation and development of meaningful outreach materials and educational messages. Key elements of the community outreach and education program include:

- Ongoing needs assessment and information gathering to understand and respond to community sensitivities as the project progresses through design, construction and operation.
- Communications through a variety of media, including newsletters, e-mail, website, and focus group meetings (such as homeowners associations).
- Public web page via the City's current website (www.redwoodcity.org/water). In addition, a project team Intranet portal will be used to maximize communication and information sharing between the team members.
- A project office in Redwood Shores that demonstrates the City's commitment to customer service, and to building community trust and acceptance of the project.
- Contact manager database and outreach list management, to record the history of each individual's or group's interaction with the design and construction teams, and ensure that the right people receive the right information throughout the project. The database will be retained through the individual phases and life of the project.

6. Lessons learned

City staff, elected officials, Task Force members, and the community at large have had the opportunity to reflect on the Redwood City recycled water experience and the lessons learned

through the process. Following is a discussion of some of the key lessons learned, including reference to the experience of other recycled water projects in California and ongoing research on public perceptions of water reuse.

Lesson #1: If initial informational meetings are poorly attended, do not assume the community is uninterested or “okay” with a proposed project. Based on the City’s experience at the first workshop in June 2002, there was no indication that the recycled water project should not move forward as planned. The First Step Project had been operating successfully for several years, and the public did not seem interested in whether the project continued on a citywide basis. However, the City learned that people come to understand a project in their own way and time. In Redwood City, a few people stirred a vocal opposition effort from one geographic area of the community, which was then able to influence the schedule, system design, and resulting cost of a project that serves the entire community. Those who are committed to an opposing view can create significant challenges to the process and focus of recycled water projects, but they must be heard and respected whenever they choose to participate.

It is also important to note that in California, traditional non-potable reuse projects, where recycled water is primarily used for landscape irrigation and industrial processes, have generally been accepted by local communities and elected officials [6]. Public controversy has focused mainly on indirect potable reuse projects, where the recycled water becomes part of drinking water sources. Redwood City is located within the greater San Francisco Bay area, where many recycled water projects, most of which are much larger in scope than Redwood City’s, have been successfully operating for many years. Most of these larger projects went through the environmental review and approval process with relatively little controversy or public debate; thus, it was initially anticipated that the smaller Redwood City project would do the same.

Lesson #2: Debunking false information or responding to arguments taken out of context is very difficult; it can put you in a defensive rather than leadership position. In Redwood City, individuals seeking to derail the recycled water project used data and information culled from the Internet to support their position; this created a heightened reaction among citizens and raised the volume if not the substance of the opposition’s arguments. Keeping the public educated and informed is critical, as is establishing the City as the reliable and trusted information source. The City learned that an opposition organization with time and resources requires equal or more time and resources on the part of the City to ensure accurate information was disseminated.

Lesson #3: Educating policymakers upfront can positively affect key decisions made later. Most Redwood City Council members had a limited background in both drinking water and wastewater treatment and regulatory standards, which put them at a “knowledge disadvantage,” particularly when the opposition began talking about a wide range of emerging contaminant issues and Internet-gleaned “science.” It is important to prepare elected officials for the nature of the debate [12], and to make sure they are kept informed of the continued development and challenges of the project, so they do not lose continuity with citizens or issues under discussion.

Lesson #4: The Task Force was a logical step for Redwood City. Redwood City staff has adopted a Core Purpose (“Build a Great Community Together”) and Core Values (Excellence; Integrity; Service; Creativity) that guide the organization in achieving its Core Purpose. The recycled water project represented an extraordinary opportunity for the City to approach the problem at hand in light of its purpose and values. Task Force members committed to a dialog and followed the ground rules that they themselves set, with the City providing full support. This approach fostered an appreciation for the critical nature of the water supply problem and planted

the seeds for trust between the various interest groups. It was an engaging and healing process not only for Task Force participants but the entire community and city leadership.

Lesson #5: Building community trust takes time. There was a general sense that the City needed to “slow down to go fast.” It became essential to allow time for the Task Force and the community to understand the dimensions of the long-term water supply issue, and how best to approach its resolution. Taking time to review, reflect, learn, and assess enabled the project to ultimately move forward and will continue to affect its future. Developing trust and open communication between water authorities and their customers has been identified as an important contributor to the success of some recycled water projects in Australia [13–15]. The WateReuse Foundation has also identified the need for more research on how humans perceive and calculate risk in relation to recycled water projects, and how this research might lead to improvements in relations between water agencies and the public [16]. These research efforts [13] point to the need to understand the role of trust in people’s decision making processes to either accept or reject the use of recycled water, and how people perceive the limits of scientific knowledge in the field of water reuse. As Ed Everett, the City Manager for Redwood City recently related after working through the process for two years, “it’s not about the engineering and the science, it’s about building community” [12].

References

- [1] City of Redwood City. Urban Water Management Plan, 2003.
- [2] Kennedy/Jenks Consultants. Water Recycling Feasibility Study for the Redwood Shores Area. Prepared for the City of Redwood City, 2002.
- [3] State of California. Water Recycling Criteria. Code of Regulations. Title 22, Division 4, Chapter 3, California Code of Regulations, 2000.
- [4] State of California. Public Resources Code Section 21000 et seq., 2003.
- [5] City of Redwood City. Initial Study/Mitigated Negative Declaration for the Redwood City Recycled Water Project. 2002. Prepared by CH2M HILL.
- [6] California Department of Water Resources. Water Recycling 2030: Recommendations of California’s Recycled Water Task Force, 2003.
- [7] Safewater Coalition website. www.geocities.com/safewater94065, 2004.
- [8] California State Water Resources Control Board. Porter-Cologne Water Quality Control Act. California Water Code, Division 7, 2004.
- [9] City of Redwood City. Addendum to the Mitigated Negative Declaration for the Redwood City Recycled Water Project, 2003.
- [10] City of Redwood City. Response to Comments on the Addendum to the Mitigated Negative Declaration for the Redwood City Recycled Water Project, 2003.
- [11] City of Redwood City. Recycled Water Task Force Final Report, 2004.
- [12] C. Lichty, Water reuse: lessons from the California experience. *The Water Report*, 4 (2004) 1–6.
- [13] M. Po, J. Kaercher and B.E. Nancarrow, Literature review of factors influencing public perceptions of water reuse. Australian Water Conservation and Reuse Research Program, CSIRO Land and Water, 2004.
- [14] A. Hurlimann and J. McKay, Attitudes to reclaimed water for domestic use: Part 2. *Trust. Water*, 31(5) (2004) 40–45.
- [15] J.S. Marks, Advancing community acceptance of reclaimed water. *Water*, 31(5) (2004) 46–51.
- [16] B.M. Haddad, Research needs assessment workshop: human reactions to water reuse. WateReuse Foundation, 2004.