



**Ventura County  
Watershed Protection District  
Water & Environmental Resources Division**

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**SAN ANTONIO CREEK SPREADING GROUNDS REHABILITATION PROJECT**

**PROJECT DESCRIPTION**

**Project Location** - The project site is an 11.4 acre parcel of land currently owned by the Ventura County Watershed Protection District (District), located within and adjacent to San Antonio Creek, within the unincorporated portion of Ventura County, approximately 0.9 miles northeast of the City of Ojai, California. Note that the project site (and proposed diversion location) is located approximately 2.2 stream miles upstream of designated critical habitat for the southern California steelhead ESU.

**Background** - Water has always been a precious commodity in the Ojai Valley. Due to the ephemeral nature of the streams in the Ojai Valley, most of the local farmers and ranchers have developed groundwater wells to obtain a reliable source of water. As groundwater extractions began to lower the water table, water users banded together to form the Ojai Water Conservation District. One of their principal activities was the operation of a groundwater recharge system located on and adjacent to the project site. The project site and adjacent properties were privately owned at this time. Portions of the recharge system consisted of a series of stair-stepped settling basins adjacent to San Antonio Creek, designed so that one would overflow into the next. It is estimated there were dozens of these basins, each approximately 20 to 30 feet long, 50 to 60 feet wide, and 6 to 10 feet deep (Hawks & Associates, 2005).

Between 1951 and 1963, groundwater recharge was conducted using an estimated 10,000 acre-feet of surface water imported from Matilija Lake via pipeline. The pipeline was eventually abandoned and groundwater recharge was conducted by diverting surface water from San Antonio Creek from 1963 to 1985. Surface flow was diverted through a 24-inch-diameter pipe equipped with an iron gate to control flow rates, and was reportedly available on a seasonal basis.

Though no written records were kept of the surface flow diversions from San Antonio Creek, anecdotal evidence indicates that an annual average of 500 acre-feet were diverted to the settling basins. The amount of recharge in any given year could vary appreciably, depending upon the quantity, intensity, and duration of rainfall received in the area. If surface flow occurred during a short period of time, only part of the runoff could be diverted for recharge.

Following the Ojai fire in 1985, the District was concerned that heavy rains could trigger a debris flow downstream and damage properties adjacent to San Antonio Creek. The District procured the 11.4-acre parcel (current project site) and constructed a debris

basin in the channel adjacent to the basins. During basin construction, excavated material was disposed of on the north bank, filling most of the spreading basins. In the early 1990's, the District and the Ojai Water Conservation District collaborated in an effort to reconstruct the basins, but the reconstruction effort was only partially successful, and the diversion/spreading system was eventually abandoned. According to anecdotal reports, primary reasons for the lack of success were an inadequate intake/diversion structure and the fact that the restored basins were built on top of fill material, leading to slow percolation and lateral return of recharged water to San Antonio Creek.

**Purpose and Need** - The proposed project involves diversion of surface water in upper San Antonio Creek and infiltration to the Ojai Valley Groundwater Basin. Consistent with its name, the Basin is located in the Ojai Valley, including portions of the watersheds of San Antonio Creek, Senior Creek, McNell Creek and Thacher Creek. The storage capacity of the Basin is relatively low (70,000 to 85,000 acre-feet) and is subject to depletion during drought periods (California Department of Water Resources, 2004). Therefore, diverted Ventura River surface water stored in Lake Casitas is imported to supplement groundwater produced from the Ojai Valley Groundwater Basin.

The proposed project is intended to increase groundwater storage and recharge in the Ojai Valley Groundwater Basin by rebuilding the abandoned diversion works, rehabilitating the spreading ground basins (existing relict basins), and constructing passive percolation recharge wells adjacent to San Antonio Creek. A stakeholder group composed of the Ojai Basin Groundwater Management Agency, the Ojai Water Conservation District, the Golden State Water Company, the Casitas Municipal Water District and the Ventura County Watershed Protection District was formed in January 2008 and an agreement was adopted by the parties to collaborate on the implementation and maintenance of the proposed project. The stakeholder group is working cooperatively to rehabilitate the spreading grounds with the goal of capturing up to 25 cubic feet per second (cfs) of surface flow (when available) from San Antonio Creek and recharging the Ojai Valley Groundwater Basin.

The primary objectives of the proposed project are:

- Utilize surface water during peak run-off periods that typically exits the San Antonio Creek sub-watershed;
- Enhance the reliability of groundwater production from local water supply wells; and,
- Reduce reliance on limited surface water supplies (imported) from the Casitas Municipal Water District.

**Funding** - On January 18, 2007, the proposed project received \$1,315,000 in grant funding from the State Water Resources Control Board through the Proposition 50 Integrated Regional Water Management Grant, which was awarded to the Watershed Coalition of Ventura County.

**Existing Facilities** - The abandoned spreading grounds facility has not been maintained since the early 1990's. The site currently consists of a level area adjacent to four relict infiltration basins, which appear as depressions formed by earthen banks. The relict basins (about 24,000 square feet in total area) are entirely dry and have been colonized by mostly native vegetation (primarily mulefat). No other components of the abandoned spreading grounds are apparent at the site.

**Preliminary Design and Operation** - A Hydrologic Assessment of the San Antonio Creek Sub-watershed (Daniel B. Stephens & Associates, 2006) was completed to identify the amount of surface water that is available for diversion, and the benefits to the Ojai Valley Groundwater Basin. Based on this Assessment, the following operating parameters were established:

- A minimum surface flow of 5 cfs will be maintained in San Antonio Creek to support instream uses, to be measured near the Grand Avenue bridge, which equates to 10.65 cfs at the proposed diversion point, based on typical infiltration rates. Therefore, surface water diversion from San Antonio Creek would only occur when surface flow exceeds 5 cfs at Grand Avenue. This value was extracted from previous work in the local watersheds (Stoecker & Kelley, 2005) and minimum autumn flows in San Antonio Creek (stream gauge 605) during years when steelhead were present (1998, 2005).
- Surface flows exceeding 5 cfs at Grand Avenue (10.65 cfs at the proposed diversion point) occur an average of 21 days per year, such that 3,073 to 3,516 acre-feet per year of surface water can be diverted on average.
- Based on surface flow data from San Antonio Creek collected from 1950 to 2005, the total annual amount of surface flow diverted would range from 0 to 26 percent, with an average of about 7 percent at the diversion point.
- Project-related increases in recharge to the Ojai Valley Groundwater Basin would range from 0 to 3,223 acre-feet per year, with an average of 308 to 914 acre-feet per year expected.
- Project-related decreases in demand for imported water from the Casitas Municipal Water District would average from 246 to 731 acre-feet per year with a median value of about 500 acre-feet per year.
- The volume of surface water recharged to the Ojai Valley Groundwater Basin is expected to exceed the additional volume of groundwater used by local farmers as a replacement for imported water from the Casitas Municipal Water District. The additional groundwater is expected to support increased surface flows during the dry season.

The rehabilitated spreading grounds would comprise a system of adjoining basins and new recharge wells designed to accommodate up to 25 cfs of diverted surface flow from an intake structure on San Antonio Creek to promote groundwater recharge to the Ojai Valley Groundwater Basin.

The project consists of the following components:

- New intake structure on San Antonio Creek;
- New intake pipeline between the intake structure and the existing upper basin (Pond 1);
- Minor rehabilitation of the existing basins;
- New transfer channels between existing basins;
- New recharge pipeline from the existing lower basin (Pond 4) to the recharge wells;
- Up to four new recharge wells;
- New overflow piping from the recharge pipeline to San Antonio Creek;
- New depth-discrete monitoring well; and,
- Improved access road.

A conceptual site layout is provided as Plate 3. Also attached are an overview graphic of the project components and a graphic comparing San Antonio Creek historic versus project flow conditions.

The following is a brief description of each of the major project components.

**Intake Structure** - A small intake structure would be constructed at a bedrock outcrop along the west bank of the San Antonio Creek channel, to capitalize on the inherent strength of this geologic feature and minimize the size of the intake structure as well as the overall project footprint. The intake structure would be a notched abutment constructed of reinforced concrete and provided with a trash rack at the intake pipeline inlet.

**Intake Pipeline** - The intake pipeline would be approximately 500 feet long and 36 inches in diameter, and would be located along the toe of the slope, linking the intake structure to the upper basin.

**Rehabilitation of Existing Basins** – The four existing basins would require minor rehabilitation as part of the proposed project. Existing vegetation would be removed and the embankments would be reworked.

**Basin Transfer Channels** – Three open concrete channels with rock riprap sides would be constructed to facilitate gravity flow between the four existing basins as they fill with diverted surface water, while minimizing turbulence and erosion. The bottom width of the channels would be 2 feet, with a top width of 15 feet at 25 cfs flow (2 foot depth). The basins would allow for settling of suspended solids and floating debris, and some infiltration prior to aquifer recharge at the wells.

**Recharge and Overflow Pipelines** - A sand-filter standpipe in Basin 4 would transfer water by gravity to the recharge wells. The recharge pipeline would be approximately 250 feet long and 36 inches in diameter. In addition, a 36-inch diameter overflow pipeline would be connected to a manhole on the recharge pipeline and direct excess

flow from Basin 4 back to San Antonio Creek. The outlet of the overflow pipeline would be provided with a concrete headwall on the west bank of San Antonio Creek.

**Recharge Wells** – Up to four recharge wells would be constructed in a level area southwest of the existing basins. Each well would be completed with a 36-inch minimum diameter steel well casing and a gravel pack and fill. The wells would facilitate transmittal of water to target aquifers (either Zone A or Zone B) at depths estimated to be between 60 and 150 feet below ground. A polyvinyl chloride (PVC) casing would be installed within the steel casing of each recharge well to monitor water transfer to the aquifer.

**Depth-discrete Monitoring Well** – The depth-discrete monitoring well would consist of nested series of six 2-inch PVC casings discretely screened and sealed at intervals between 40 and 450 feet below ground surface. Six zones of completion would allow monitoring of water levels in six aquifer zones (Zones A-F). Zones A and B would be recharged by the project, Zones C, D and E would be saturated alluvial aquifer media and Zone F would be bedrock aquifer material. The depth-discrete monitoring well would be located south of the recharge wells, across San Antonio Creek.

## POTENTIAL STEELHEAD EFFECTS

Although the design of the project is under development, the District has initiated an impact assessment as required by the California Environmental Quality Act (CEQA). The following is a summary of the steelhead impact discussion in the preliminary draft CEQA Initial Study. The District welcomes input from NMFS in expanding and clarifying the impact discussion. In addition, the District will consider suggestions regarding the design and operation of the spreading grounds rehabilitation project to avoid take of steelhead.

**Setting** - Southern California steelhead (*Oncorhynchus mykiss*, Federal Endangered) is known from San Antonio Creek. Approximately 10 steelhead spent the summer trapped in a stream pool at the Soule Park Golf Course in 1999 (2 miles downstream of the project site). Critical habitat was established for Southern California Steelhead on September 5, 2005, and includes San Antonio Creek downstream of the Thacher Creek confluence. San Antonio Creek upstream of the Thacher Creek confluence is considered to have marginal spawning habitat and no rearing habitat for steelhead due to the short duration of surface water (Entrix and Woodward Clyde, 1997). In addition, steelhead have not been recorded in the upper San Antonio Creek watershed (Lewis, 2007; Entrix and Woodward Clyde, 1997; National Marine Fisheries Service, 2009).

A reconnaissance level survey was conducted the Casitas Municipal Water District in Senior Canyon and Gridley Canyon (upstream of the project site) during January of 2007 to assess potential steelhead habitat. This survey concluded: “There appears to be little usable habitat for steelhead spawning and rearing and there are numerous natural and artificial barriers to passage at low flow conditions” (Lewis, 2007).

These findings were confirmed by the steelhead habitat typing and stream characterization survey of upper San Antonio Creek, and accessible portions of Gridley Canyon, Ladera Canyon and Senior Canyon conducted by Padre Associates for the proposed project in September 2009 (Padre, 2010). Overall, the results of steelhead habitat assessments conducted in the watershed upstream of the Thatcher Creek confluence indicate that there is limited and marginal steelhead habitat.

**Potential Beneficial Effects** - The overall effect of the project is to take a small percentage of the peak surface flows during the rainy season and divert this water into the groundwater aquifer. Although some of the groundwater produced by surface water diversion would be harvested by the existing agricultural users, an increase in groundwater levels is expected, which may increase base flows in lower San Antonio Creek during the summer when surface water is most critical for the survival of steelhead.

**Potential Adverse Effects** - The potential for the proposed project to result in direct effects associated with instream construction and project-related fish passage barriers, and indirect effects associated with reduction in surface flow to downstream habitat reaches is discussed below:

- **Direct Effects.** All construction work directly affecting San Antonio Creek would be conducted when surface water (and potentially steelhead) is absent. Therefore, fish stranding (if present) or habitat degradation through water quality impacts would not occur. The proposed intake structure would be composed of a concrete box structure attached to an existing bedrock feature on the creek bank and would not form a barrier to fish movement. The existing bedrock feature currently spans the streambed and forms a partial barrier to fish passage (see Barrier B-18 in Padre Associates, 2010 [attached]). The proposed intake structure would not reduce the potential for fish passage at B-18.
- **Indirect Effects.** Reduced surface flow associated with project-related diversion may adversely affect steelhead migration into the upper watershed, and reduce the volume, duration and quality of steelhead habitat in lower San Antonio Creek (designated critical habitat).

Depending on the intensity and duration of rainfall events, the average annual amount of surface water diverted to the spreading grounds would vary from zero to 26 percent of that available at the diversion point, with an average of about 7 percent. A minimum surface flow would be maintained in upper San Antonio Creek, such that diversion would only occur when surface flow exceeds 5 cfs at Grand Avenue. Based on repeated observations, the reach of San Antonio Creek at Grand Avenue is the first to dry and has the lowest stream flow when the full reach is flowing (DBSA, 2006). Therefore, Grand Avenue was selected as the point of compliance with regard to maintaining minimum stream flows.

There is a potential that the project-related reduction in surface flow in San Antonio Creek may hinder migration of steelhead into the upper watershed (Gridley Canyon and Senior Canyon). Migration of steelhead (if it occurs in the upper watershed) would likely occur when surface flow rates are high, which is when surface flow diversion would also occur. Steelhead have not been recorded in the upper San Antonio Creek watershed (Lewis, 2007; Entrix and Woodward Clyde, 1997; NMFS, 2009). In addition, impassable barriers limit available stream channels upstream of the proposed intake structure to approximately 2.6 miles, including 0.15 miles on San Antonio Creek, 0.15 miles in Gridley Canyon and 2.3 miles in Senior Canyon. The results of steelhead habitat assessments (Lewis, 2007; Padre Associates, 2010) indicate that there is limited and marginal migratory, rearing, and spawning steelhead habitat in upper San Antonio, Senior, and Gridley Creeks and no aquatic species habitat within Ladera Creek. It is unlikely that steelhead use these creeks with any regularity. Furthermore, if large flood events allow for passage of steelhead upstream of the proposed surface water intake, it is unlikely that reproduction or survival over the dry season would be successful due to poor habitat conditions, including the following:

- Ephemeral nature and short hydro-period of the affected creeks;
- Very limited dry season pool habitat observed during the habitat assessments;
- Potential for high temperatures and low dissolved oxygen levels in available pool habitat;
- Lack of connectivity to downstream reaches of San Antonio Creek and the Ventura River, except during extreme flood events; and
- Increased predation risk to all life stages of steelhead associated with minimal pool area and depth.

Overall, steelhead are not known to migrate into the upper San Antonio Creek watershed and areas suitable for spawning and rearing do not occur upstream of the confluence with Thacher Creek. Therefore, project-related adverse effects of flow reduction on steelhead migration into the upper San Antonio Creek watershed are expected to be less than significant.

Surface flows in the upper San Antonio Creek watershed contribute to steelhead habitat in lower San Antonio Creek, which has been designated as critical habitat and periodically supports steelhead. Based on surface flow data collected from 1950 through 2005, the proposed surface water diversion would capture on average, approximately two percent of the surface flow in the entire San Antonio Creek watershed (range of zero to seven percent) (DBSA, 2006). Therefore, the project-related loss of wet season surface flow in lower San Antonio Creek is unlikely to substantially affect the amount and quality of critical steelhead habitat. In addition, the project is designed to increase groundwater levels and may subsequently increase base flows in lower San Antonio Creek during the dry season when surface flow is most critical to steelhead survival.

## References

- Daniel B. Stephens & Associates, Inc. (DBSA). 2006. *Hydrological Assessment, San Antonio Creek Sub-Watershed, Ventura County, California.*
- Entrix, Inc. and Woodward Clyde Consultants. 1997. *Ventura River Steelhead Restoration and Recovery Plan.*
- Hawks & Associates. 2005. *San Antonio Creek Debris Basin Feasibility and Upper San Antonio Creek Deficiency Study.* Prepared for the Ventura County Watershed Protection District.
- Lewis, S. 2007. *Senior and Gridley Canyons Steelhead Habitat Assessment-2007 Reconnaissance Level Survey.* Prepared for the Casitas Municipal Water District.
- National Marine Fisheries Service. 2009. *Southern California Steelhead ESU Current Stream Habitat Distribution Table.*
- Padre Associates, Inc. 2010. *Steelhead (Oncorhynchus mykiss) Habitat Characterization of portions of Upper San Antonio Creek, Senior Creek, Gridley Creek and Ladera Creek, Ventura County, California.* Prepared for the Ventura County Watershed Protection District.
- Stoecker, M. and E. Kelley. 2005. *Santa Clara River Steelhead Trout: Assessment and Recovery Opportunities.* Prepared for the Santa Clara River Trustee Council and the Nature Conservancy.

Attachments: San Antonio Creek Spreading Grounds Rehabilitation Project (graphic)  
Comparison of San Antonio Creek Flow (graphic)  
Comparison of Annual Flow Volume in San Antonio Creek (spreadsheet)  
Conceptual Site Layout (Initial Study Plate 3)