

City of Castroville Regional Park
Proposed Constructed Wetland for Treated Wastewater Effluent

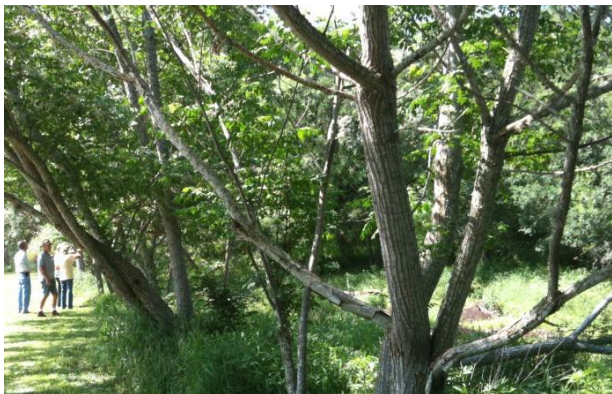
Preliminary Recommendations from Site Visit April 5, 2012

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For the City of Castroville, Texas
4/14/2012

Project Background

The City of Castroville sewage treatment plant has the capacity to process 350,000 gallons/day of sewage effluent. Treated wastewater effluent is discharged into two settling ponds, connected sequentially, with overflow from the first pond filling the second pond. Treated wastewater conveyed from these ponds to surface irrigation systems, apply up to 2.03 acre/feet per year on the park's sports fields and nearby agricultural land. Trucks transport sludge from the treatment plant to a disposal facility, so under normal operations, sludge does not enter the ponds and land application system.

The City currently has a permit application under review with TCEQ to discharge an additional 550,000 gallons/day of treated water (total 900,000 gallons/day) into an intermittent stream area, which will provide some additional treatment, prior to releasing the water into the Medina River. This intermittent stream area lies entirely within the Castroville Regional Park and runs parallel to a park road at the base of a ridge for about 1000 feet, gradually dropping in elevation and becoming narrower before passing through the river floodplain and connecting to the Median River.



Intermittent stream area along park road; chinaberry trees



Natural impoundment within intermittent stream area



Natural cattail pool in intermittent stream



Medina River floodplain at outfall of intermittent stream

This proposed constructed wetland project plans to accept the increased volumes of treated water from the settling ponds, direct the water through the existing intermittent stream channel, modifying existing stream channel, provide bio-retention treatment, and stabilize stream channel erosion, prior to discharging the water into the Medina River.

To accept and manage the increased hydraulic flows of treated wastewater effluent and increase the level of effluent treatment, modification of the current stream channel and adjacent area is required. Modifications include slowing water velocity by, enlarging stream channel capacity, re-directing channel flow direction, and excavating retention basins at several places along the stream channel.

Combining water velocity reduction with a restoration planting using native wetland grasses, shrubs, and trees provides excellent bio-retention. This bio-retention provides a high level of effluent treatment, further cleaning the water for discharge into the Medina River. The retention basins, constructed of compacted earth fill, use rock to stabilize weirs and other water control structures.

Modifying the area between the constructed wetland and the park road is also necessary. This modification will keep the water within the constructed wetland area and not allow overflow to the adjacent park road or park grounds during normal flows and heavy rainfall events.

The spillway at the City's wastewater treatment plant settling pond and the discharge point where the constructed wetland channel enters into the Medina River, are two places excessive stream channel velocity is causing severe erosion. Grade Stabilization Structures consisting of Rock Rip Rap and or Gabions (rock filled wire baskets) will reduce the erosion potential at these points. These Gabion structures will form a waterfall appearance when water is flowing over them.

Environment

The proposed constructed wetland project lies entirely within Castroville Regional Park, a 126-acre natural and recreational park along the Medina River, in the southwest part of the City of Castroville. The park is a regional amenity with hiking trails, sports fields, an amphitheater, and direct access to an unspoiled reach of the Medina River. This stretch of river bottomland contains large bald cypress (*Taxodium distichum*), pecan (*Carya illinoensis*) and hackberry (*Celtis laevigata*).

The intermittent stream area is vegetated with a mix of woodland species, including non-natives such as chinaberry (*Melia azedarach*) and native species including hackberry, ash (*Fraxinus spp.*) pecan, false indigo bush (*Amorpha fruticosa*) and vines (*Toxicodendron radicans*). Condition is average to moderately disturbed, with few large canopy trees and no rare, endangered or threatened species in evidence. The condition of the slope directly above the intermittent stream is mostly stable and well vegetated. The exception is on the up slope of a small intermittent stream that is a confluence with, but is not directly adjacent to the primary intermittent stream of the project area. This area is about 2 acres, with difficult access, an extreme slope of 1:2 or 1:1, little or no vegetation, and is currently severely eroding.



Eroded slope above project area



Vegetated slope with park trail

The Bexar, Medina, Atascosa Irrigation District (BMA) irrigation system travels from Medina Lake to irrigate agricultural fields in areas around Castroville, La Coste, and Natalia, Texas. A section of BMA irrigation canal runs along the edge of the ridge above the intermittent stream area. Due to the age of structures and inadequate repairs on the clay-lined canal, the canal leaks in several places and water flows down the slope. Since most of the slope is well vegetated, the slow leakages have not caused erosion and benefits the hillside vegetation.

Issues

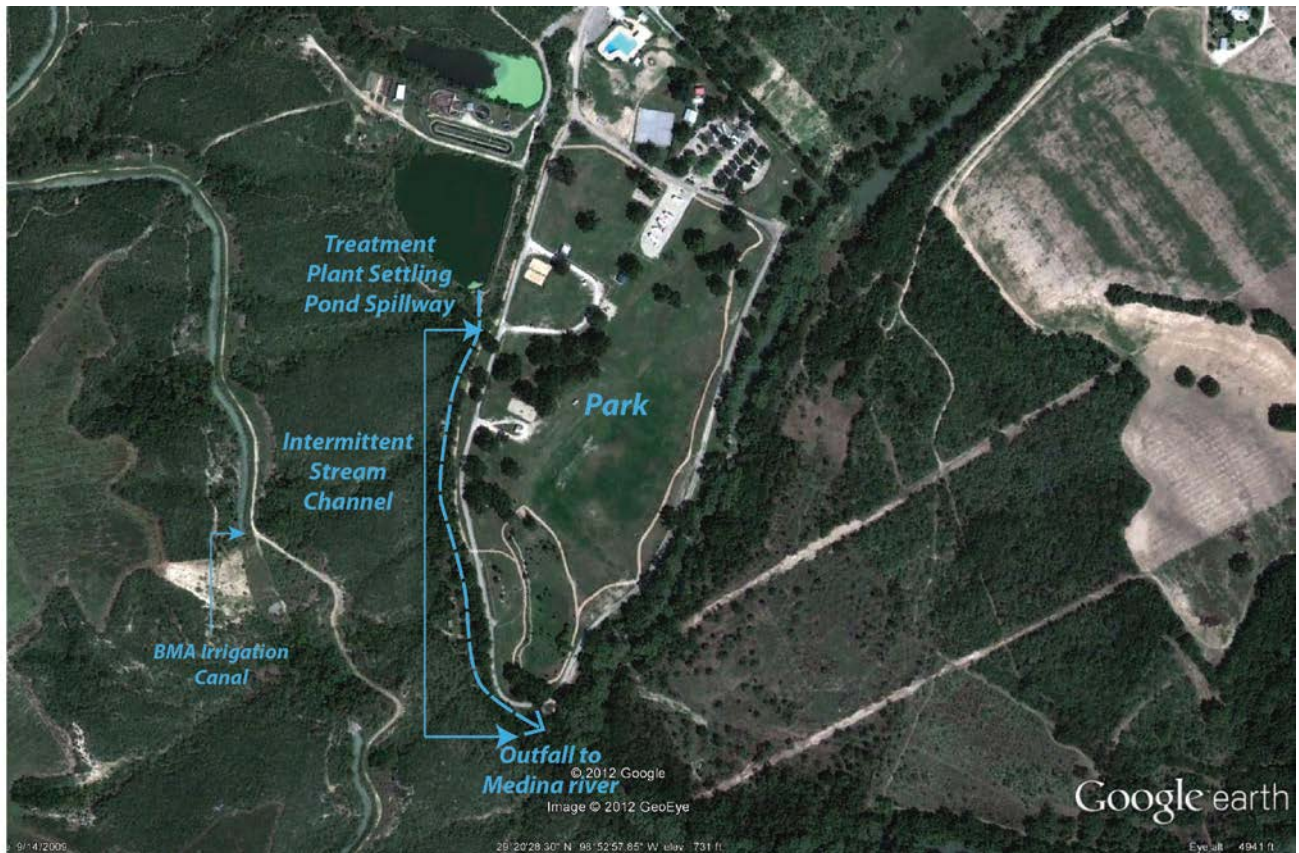
Consideration of several issues during the constructed wetland planning process is necessary, as they will have implications for future cost and maintenance. Since the condition of the wetland is already moderately disturbed, removing vegetation and excavating new basins for constructed wetland creation will not impair a significant ecosystem or habitat. Likewise, the leakage from the canal may be providing some irrigation to the wooded slope, so repairs to the canal are not necessary for this project.

Another problem is the sediment entering the constructed wetland system from a section in the upstream watershed area, which is severely eroding. This area is devoid of vegetation causing soil erosion, if not stabilized, will continue to deposit sediment loads into the constructed wetland project area. Removing excess sediment from stream channels and retentions basins reduces bio-retention treatment efficiency and causes additional maintenance costs. Stabilization and re-vegetation of this slope area is critical to the long-term effectiveness and maintenance of this constructed wetland project. The extreme slopes, 1:2 and 1:1, unstable soil structure, and difficult site access require a separate re-vegetation and slope stabilization planning and design project for this area.

Stormwater entering the wastewater collection system is another, longer-term issue. Infiltration overloading at the treatment facility, can potentially cause system failures. Excess water from a hurricane magnitude rain event, could cause the treatment plant settling ponds to overflow, spilling flash flood volumes of water into the wetland system and causing erosion and damage.

TCEQ may require a an amendment to the current The City of Castroville permit application to incorporate the proposed intermittent stream channel modification, excavation for constructed wetland basins and restoration planting within the constructed wetland project area. We strongly recommended City of Castroville personnel contact the TCEQ for a review of this proposed constructed wetland project.

Proposed Constructed Wetland Project Area

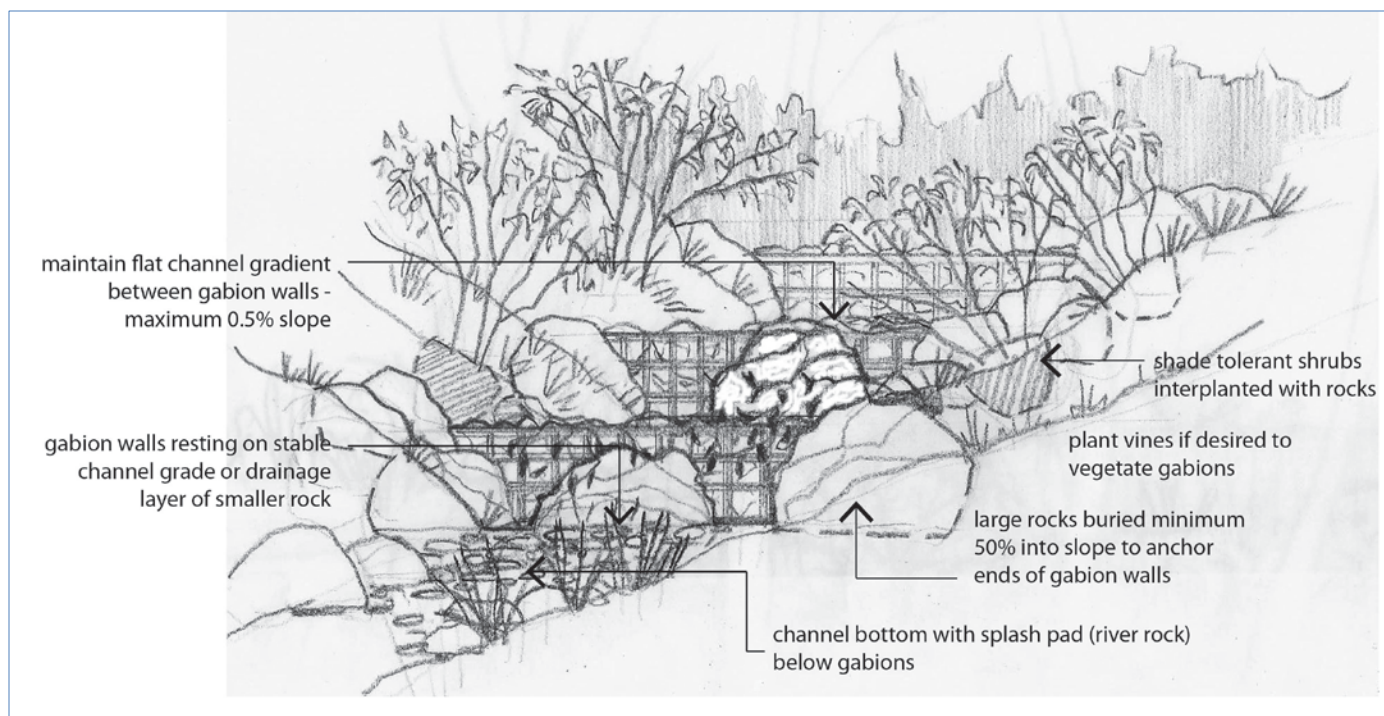


Grade Stabilization Structures

1. Treatment Plant Settling Pond Spillway

2. Constructed Wetland Discharge Point into the Medina River

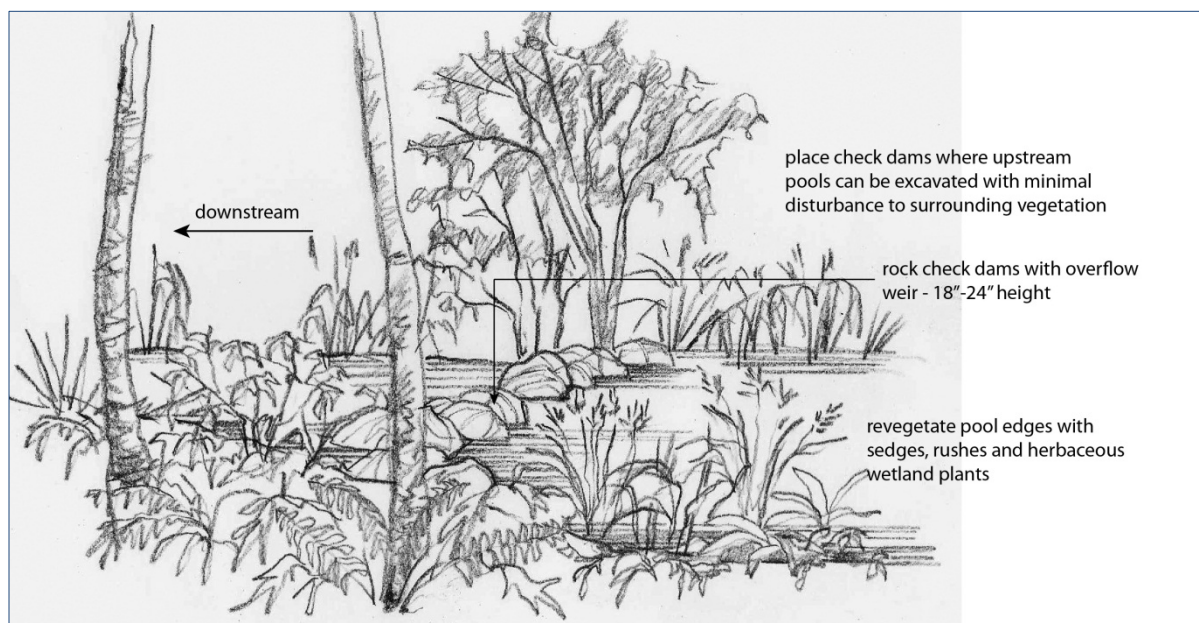
Rock Rip Rap and/or Gabions (rock filled wire baskets) will help stabilize the soil on steeper gradients at the both locations listed above. Gabions Grade Stabilization Structures also dissipate the hydraulic energy of the water flowing in the stream to a non-erosive velocity. It is important to bury the rocks or Gabion ends into the edges and toes of the channel slopes so they do not move with heavier flows (see drawing, below). Channel gradients between gabion walls (if more than one is necessary) should remain flat, and staggered as in a set of stairs. These 'stairs' create a waterfall effect allowing water to splash onto a non-erosive surface. The stream channel sides planted with native wetland shrubs, vines, herbaceous plants or grasses in pockets between large rocks and Gabion edges create and enhance a natural appearance of the waterfall.



Drawing showing gabion placement for grade stabilization at outfall to Medina River

Constructed Wetland Basins

A series of constructed wetland basins excavated within the intermittent stream channel and surrounding area will retain the anticipated volumes of treated wastewater effluent discharged from the treatment plant settling ponds. Establishing native wetland vegetation in these basins provides additional bio-retention “polishing” of the effluent before it enters into the Medina River.



Drawing showing rock check dams and revegetation for intermittent stream channel

These constructed wetland basins have varying depths to increase water storage and retention times. During the excavation, the soil removed, forms compacted earth fill embankments, no more than two feet in height. Placing rock riprap linings on these embankments improves stability during high water flow events. Each constructed wetland basin contains a series of smaller shallow basins. These smaller basins have earthen borders with slopes that facilitate stabilizing with native wetland plantings instead of rock. Using a single backhoe for site preparation, excavation and rock placement minimizes damage to the adjacent areas.

Next Steps

Our team welcomes the opportunity to discuss the findings of this report and project alternatives with the City of Castroville. We are available to assist the City proceed with this project by providing overall project management, professional engineering designs, project cost estimates, project contract development, construction project schedule tracking, and quality control inspections during construction. We suggest early involvement by the Castroville Park Friends group, for review of the proposed planting list and for eventual park volunteer maintenance schedule and requirements.

Detailed professional engineering designs and specifications for the proposed constructed wetlands, stream corridor restoration and long term maintenance include but are not limited to, channel modifications, type of structures required, stream corridor native vegetation restoration, construction installation, and maintenance requirements. Detailed cost estimates support all engineering designs.

We applaud the City for including the Friends of the Castroville Regional Park in the early discussions of this project. This group provides invaluable input for both a proposed planting list and organizing park volunteers for landscape maintenance requirements for this project.

Please contact us with any questions, concerns, or comments you may have.

