Assessment of Viable Solutions to Address Impaired Stormwater Quality in the Tijuana River Watershed and Associated Trans-Border Region

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PROBLEM STATEMENT

The Tijuana River watershed spans the U.S.-Mexico international border and flows from its headwaters between the Laguna and Juarez Mountain Ranges to the Pacific Ocean. The River's main stem runs through a number of major industrial Mexican cities before reaching Tijuana and eventually entering the U.S. at the San Ysidro International Border Crossing. Rapid urbanization and growth in the San Diego-Tijuana trans-border region in the last fifty years has led to significant changes in regional landuse[1]. The implementation of the U.S. sponsored Maquiladora Program to spur border trade in the 1960s led to rapid industrialization and subsequent population growth[1]. These land use changes, coupled with the absence of stringent environmental regulation and investment in infrastructure, have led to reduced water quality throughout the watershed, most notably at the international border[2]. Unsewered areas and insufficient wastewater treatment capacity in the Tijuana Metropolitan Area have contributed to elevated pathogen and nutrient levels in the waters crossing the border[3]. Extensive agriculture and industrial operations have contributed additional constituents leading to high concentrations of pesticides, heavy metals, and PCBs leading to further water quality impairment[3].

Currently the South Bay International Wastewater Treatment Plant (ITP), located on the U.S. side of the border, has the capacity to treat 25 mgd to advanced primary levels[4]. ITP capacity is utilized to treat a portion of Tijuana's wastewater. Remaining real time capacity is used to treat water pumped directly from the Tijuana River channel near the border in an attempt to reduce water pollution before it reaches U.S. waters. To achieve secondary treatment required by the Clean Water Act, a second structure, to be built by Bajagua LLC, is in the design stages. This "Bajagua" treatment plant is slated for construction on the Mexican side of the border and is expected to treat all ITP waters as well as an additional 37 mgd of Tijuana's wastewater to secondary levels[5,6]. While significant progress has been made to address water quality issues in this trans-border watershed, the Bajagua project will not address stormwater flows from unsewered areas of Tijuana and regions further upstream in the Tijuana River basin. Treatment of in-channel stormwaters will continue to be limited to the volume that the ITP is able to pump directly from the River. During storm events when river discharge exceeds the ITP's River water treatment capacity, highly impaired waters enter the coastal zone. These stormwaters result in beach closures, lead to reduced property values and tourism revenue, and pose a threat to human health. This project will explore technological and political solutions to address stormwater quality and its associated health and environmental effects.

BACKGROUND INFORMATION

In 1965, during the early stages of regional industrialization and subsequent border population boom, the City of San Diego proposed and signed an agreement to treat a portion of Tijuana's sewage[1]. The renewal of this agreement 1985 involved Annex I of the Border Environmental

Agreements, which set a process in motion to construct two treatment facilities. The Tijuana government constructed a facility on the Mexican side of the border that was to be supported by what is now the ITP. In 1987, amendments to the Clean Water Act (Section 510) afforded the EPA and governmental officials to take "vigorous steps" to address the water quality issue[1]. The ITP became operational in July of 1997 made possible by funding from the International Boundary and Water Commission (a bi-national group formed to emphasize cooperation and resource pooling) the City of San Diego, the Army Corp of Engineers, and the San Diego Regional Water Quality Control Board (RWQCB)[2]. While it was initially expected that the $239 million earmarked for the project would fund a facility capable of a secondary treatment, only an advanced primary treatment facility was achieved.

State and local governmental agencies continued to pursue a facility to treat effluent to secondary levels. The operation of the ITP continues to violate the Clean Water Act (CWA). A lawsuit brought by the RWQCB against the EPA regarding CWA violations was narrowly averted in 2002 to avoid addressing whether state governments can require federal government to adhere to federal laws. Congress intervened in November of 2000 with public law 106-457 granting the IBWC to contract Bajagua LLC, a private sector water treatment firm to construct a secondary level facility on the Mexican side of the border[5,6]. The IBWC authorized the design and construction of the project on November 30, 2006 and must be completed by a court ordered deadline of September, 2008[5]. While stakeholders welcome the Bajagua project as a step forward, many of those involved have expressed concern about persistent water quality issues in the wetter months.

PROJECT OBJECTIVES

This project will look to explore and assess the viable technological and political options for addressing the impaired Tijuana River stormwaters entering the U.S. under mid to high intensity meteorological events. While working to determine the available approaches to addressing the issue we plan to:

- **Identify and prioritize stormwater quality concerns:** Using existing water quality data and meteorological information, pollutants prevalent during storm events will be identified and ranked by their threat to human and environmental health.
- **Assess options for pollution prevention, treatment, and remediation:** Identify technologies and policies that may be effective in reducing priority pollution constituents at or below appropriate storm magnitudes. Determine each option's relative effectiveness in treating a high volume of impaired waters under current hydrologic and land use conditions.
- **Determine economic viability of pollution prevention and treatment options:** Determine the economic efficiency of the technologies and policies believed to be most effective in reducing stormwater pollution during events using cost-benefit analysis.
- **Determine political viability of pollution prevention and treatment options:** Explore the political practicability of each proposed technology to determine effectiveness at local, state, federal, and international levels.
- **Provide recommendations for technological and political action:** Provide federal, state, and local managers with technological and political recommendations with sufficient information to aid in efforts to further address trans-border stormwater quality issues.

POSSIBLE APPROACH

An initial step to address developing a solution to mid-intensity to high-intensity storm derived water quality threat is to determine what weather events yield river discharge values that exceed current ITP capacity and projected capacity after Bajagua comes online. We then would hope to use weather and discharge records to determine the frequency of these events. Through the use of archived water quality data from the San Diego RWQCB, EPA Region 9, and bacterial monitoring from the Scripps Institution of Oceanography's (SIO) Coastal Observing System (SDCOOS), we expect to determine what constituents are most likely to flow across the border and pose the greatest risk. Using spatial datasets from SDSU we would then attempt to correlate constituents with their likely point and non-point sources.

An exploration of engineering solutions to address the problem would be conducted to determine a number of approaches that may involve but are not limited to ITP expansion, bio-swale construction and Tijuana River concrete channel restoration. Additionally, international policy based solutions utilizing bi-national funding would be examined to explore options that may involve sewering more of Tijuana or encouraging of Mexican government to invest in riparian restoration projects. Through Dr. Keller's relationship with Mexican governmental networks, we may be able to work with the Tijuana City Government, Baja California State Government, and Mexican federal agencies to explore solutions on the Mexican side of the border and allow for a watershed management approach. These solutions would then go into a cost-benefit analysis that may involve costs of monitoring, depreciated land value in Imperial Beach, human health costs, and lost tourism revenue. Each viable option would then be compared to one another and the current situation. The most effective and efficient solutions would then be assessed for political viability in the prevalent political economic landscape.

PROJECT SIGNIFICANCE

Management of this politically charged trans-border resource has proven to be quite difficult. Extensive governmental resources and coordinated efforts between federal, state, and local agencies have yielded progress, but have fallen far behind the rate of progression of the problem. The ITP has improved coastal water quality near the Tijuana River mouth in dry periods. However, the flow of impaired waters through the river channel into the littoral cell under storm events leads to well-publicized beach closures, human health concerns, and increased pressure from stakeholder groups. Further progress in addressing water quality concerns in the Tijuana River has been stunted due to the technological and political complexities of the problem. This project will provide an objective multi-disciplinary perspective to what has been an intractable issue to aid in the future implementation of solutions to address these stormwater quality issues.

AVAILABLE DATA

- Stream flow data can be accessed through U.S. Geologic Survey.
- Weather/Precipitation values from Tijuana River National Estuarine Research Reserve Meteorological Data Access/NOAA.
- Archived San Diego RWQCB water quality data.
- Current water quality data from SIO and the SDCOOS.
- Spatial data from SDSU Department of Geography including landuse/landcover, soils, streams, geology, geomorphology.

STAKEHOLDERS

U.S. EPA, Region 9
California State Water Resources Control Board/ San Diego Regional Water Quality Control Board
U.S. Congressman Bob Filner, 51st Congressional District
California State Assemblymember Lori Saldana, 76th Assembly District
International Boundary and Water Commission
City of Imperial Beach
City of San Diego
City of Tijuana
The Surfrider Foundation
Wildcoast
Border Environmental Cooperation Commission

DELIVERABLES

All findings of each element of the study will be synthesized into a report that will be made available to the client and stakeholders to aid in further action to address the problem. A group project presentation will be scheduled for the spring of 2008.

CLIENTS/ EXTERNAL ADVISORS

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FINANCIAL NEEDS AND SOURCES OF SUPPORT

The primary project expenses will be personnel time that will be provided by the participating group project members at no cost during the school year and possibly as paid internships during the summer months. Additional expenses include travel between UCSB and project sites for on site visits as well as agency and stakeholder meetings and professional printing of the final report. The California State Water Resources Control Board has offered financial support and has requested a budget for expected expenses through a letter of support. The official financial relationship between UCSB and the California State Water Resources Control Board can be finalized upon project selection.

END NOTES

[1]TED Case Studies: Tijuana River Pollution (2007). American University. Online: URS: http://www.american.edu/TED/TIJUANA.HTM

[2]San Diego State University: Department of Geography: Tijuana River Watershed (2007). http://trw.sdsu.edu/English/homeFrame.htm
[3]EPA Region 9 Tijuana River Watershed Site (2007). Online: URL: http://www.epa.gov/region9/water/watershed/tijuana.html
[4]Bajagua LLC (2007). Online: URL http://www.bajagua.com/description.shtml
[5]WaterTechnlogoy.net: A Site for the Water Industry (2007). Online: URL: http://www.water-technology.net/projects/tijuana/http://cfpub.epa.gov/surf/huc.cfm?huc_code=18070305
[6]Congressional Record November 7, 2000 (2007). Online:. URL: http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=106_cong_public_laws&docid=f:publ457.106

ADDITIONAL REFERENCES

Scripps Institution of Oceanography San Diego Coastal Observing System (2007). Online: URL: http://sdcoos.ucsd.edu/data/aqua_qual/index.cfm
Tijuana River National Estuarine Research Reserve Meteorological Data Access (2007). Online: URL: http://www.perl.sdsu.edu/TRNERR/