Innovations and Solutions in Sustainability Science for Dryland Areas

Laureano Alvarez
Program Manager

May 2018

NADB

Established in 1994

- **Mandate:** Develop and finance environmental infrastructure along the U.S.-Mexico border:
  - Review and certify infrastructure projects located within 100 km north and 300 km south of the border that improve the well-being of the population
  - Provide loans and grants for their implementation
  - Offer technical assistance for project development
- **Structure:** Owned and governed equally by the Governments of the United States and Mexico
- **Offices:** San Antonio, TX and Ciudad Juarez, Chihuahua
- **Ratings:** Aa1 - Moody's; AA – Fitch

Governance

Board of Directors

- **NADB has a ten-member Board of Directors, with an equal number of representatives from the U.S. and Mexico**

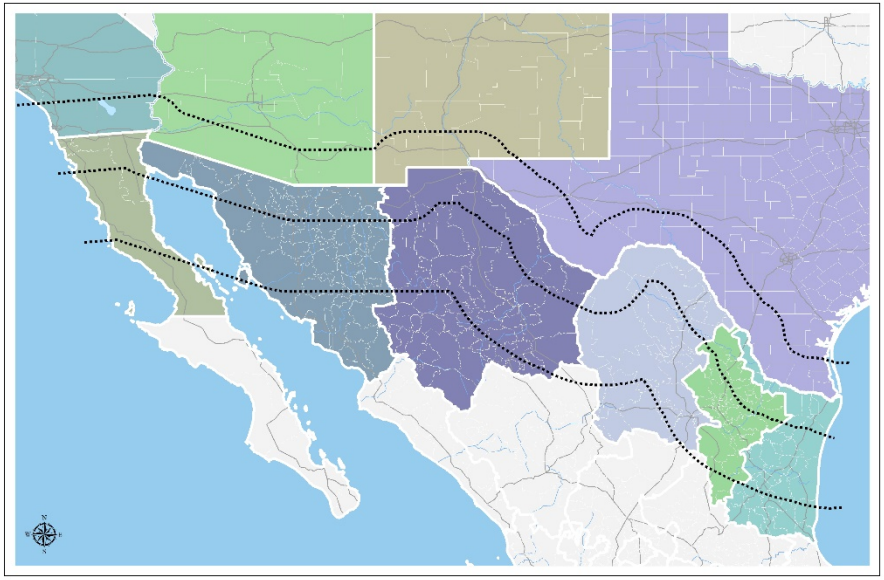
U.S. Members	Mexico Members
Secretary of the Treasury	*Secretary of Finance and Public Credit (SHCP)*
Secretary of State	*Secretary of Foreign Affairs (SRE)*
Administrator of the Environmental Protection Agency	*Secretary of the Environment and Natural Resources (SEMARNAT)*
U.S. Border State Representative	*Mexican Border State Representative*
U.S. Border Public Representative	*Mexican Border Public Representative*

Jurisdiction

U.S.- Mexico Border Region

- **Eligible projects must be located within 100 km north and 300 km south of the U.S.-Mexico border.**
  - **U.S. Border**
    - 41 counties in four states
    - Population: 6.34 million (2.05% of U.S. population)
  - **Mexican Border**
    - 220 municipalities in six states
    - Population: 16.41 million (14.61% of Mexican population)

Geographic Jurisdiction



Population within Jurisdiction

United States

State	Population
Arizona	912,519
California	3,197,461
New Mexico	179,579
Texas	2,049,360
Total	6,338,919

Mexico

State	Population
Baja California	3,151,135
Chihuahua	2,974,318
Coahuila	1,774,565
Nuevo León	4,614,869
Sonora	1,646,690
Tamaulipas	2,248,745
Total	16,410,322

Overview of Financing Activity

Certification

- Every project is reviewed and certified based on criteria of:
  - Technical viability
  - Financial self-sufficiency
  - Community support
  - Sustainable development

Financing

- **Loan Program:** Competitive rates; up to 85% of total project cost, with tenors of up to 25 years
- **Grant Programs:** Limited grants for communities where debt financing is not a viable option

Technical Assistance

- Support project development with regards to:
  - Design and related studies
  - Financial closing
  - Procurement
- Provide capacity-building through seminars & workshops

Eligible Sectors

Water and Sewage

- Water treatment and distribution
- Wastewater collection, treatment and reuse
- Water conservation
- Storm drainage

Residential, industrial and hazardous waste

- Sanitary landfills
- Collection & disposal equipment
- Dumpsite closure
- Recycling & waste reduction
- Site remediation
- Toxic waste disposal

Air Quality

- Street paving and other roadway improvements
- Ports of entry
- Public transportation
- Industrial emissions

Clean / Renewable Energy

- Solar
- Wind
- Biofuels
- Biogas/ methane capture
- Hydroelectric
- Geothermal

Energy Efficiency

- Public lighting
- Building retrofits
- Equipment replacement
- Water utilities

Certification Criteria

- **Every project funded by NADB must first be certified based on the following criteria:**
  - **Technical viability:** The project must use technically feasible systems, processes and equipment.
  - **Financial self-sufficiency:** The project must be financially self-sufficient based on cash-flow projections generated by NADB in its analysis of the project.
  - **Environmental and/or health benefits:** The project must address an environmental need on the border and not harm human health or ecosystems in the region.
  - **Contribute to sustainable development:** The project must contribute to the sustainable development of the community and the region as a whole.

Technical Assistance Programs

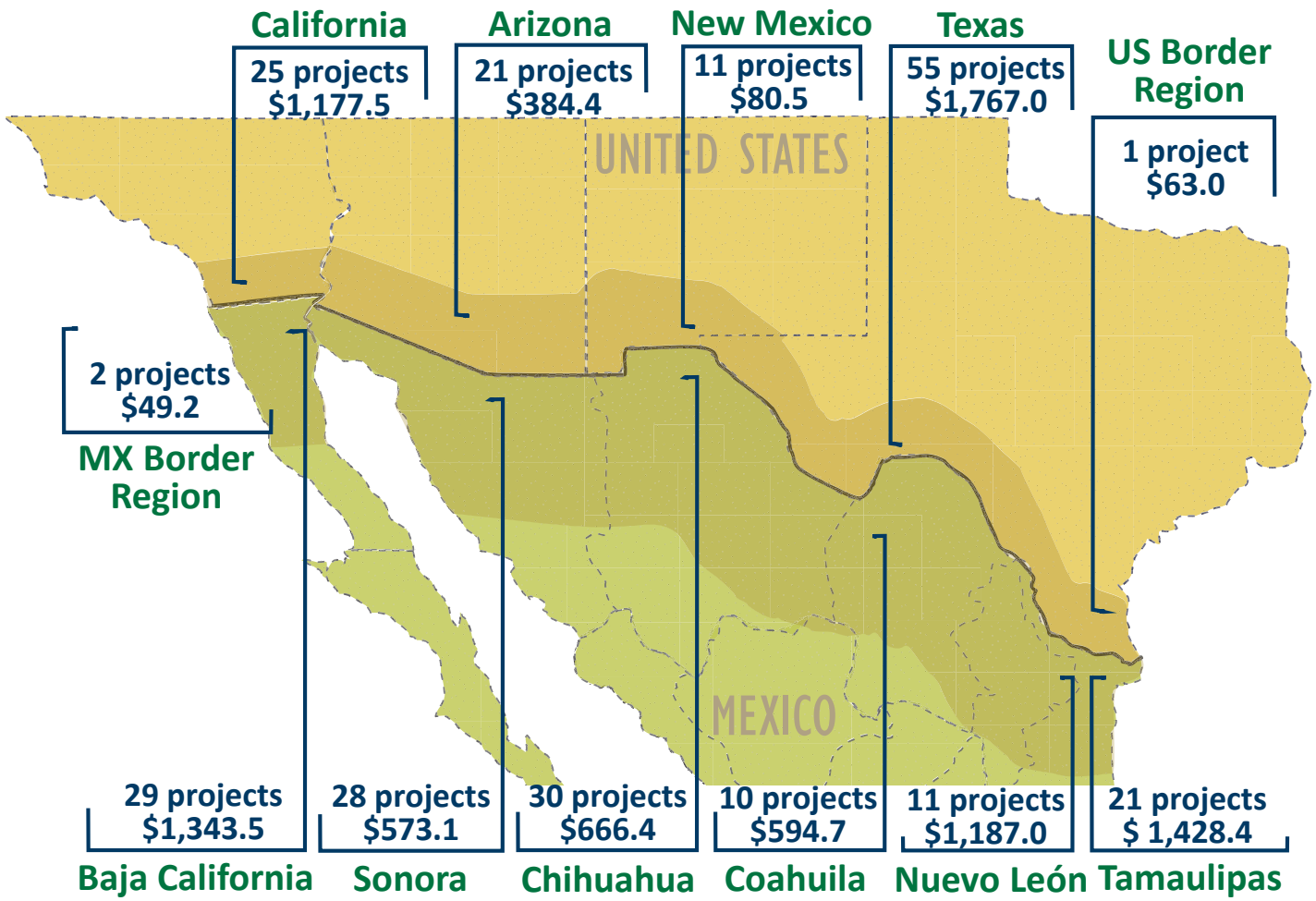
- **NADB Technical Assistance:**
  - **Project and sector development:** Grants and technical expertise for developing environmental infrastructure projects and exploring emerging sectors
  - **Institutional capacity-building** through seminars and workshops aimed at enhancing sustainability and addressing emerging issues such as climate change, green infrastructure and public transportation
- **Project Development Assistance Program (PDAP):** EPA-funded grants for development of water and wastewater projects
- **Border 2020 U.S.-Mexico Environmental Program:** NADB provides logistical and administrative support for the development of strategic initiatives and workshops linked to the objectives and goals of this EPA-funded program.

Certified Projects with Financing

December 31, 2017

Projects:
244

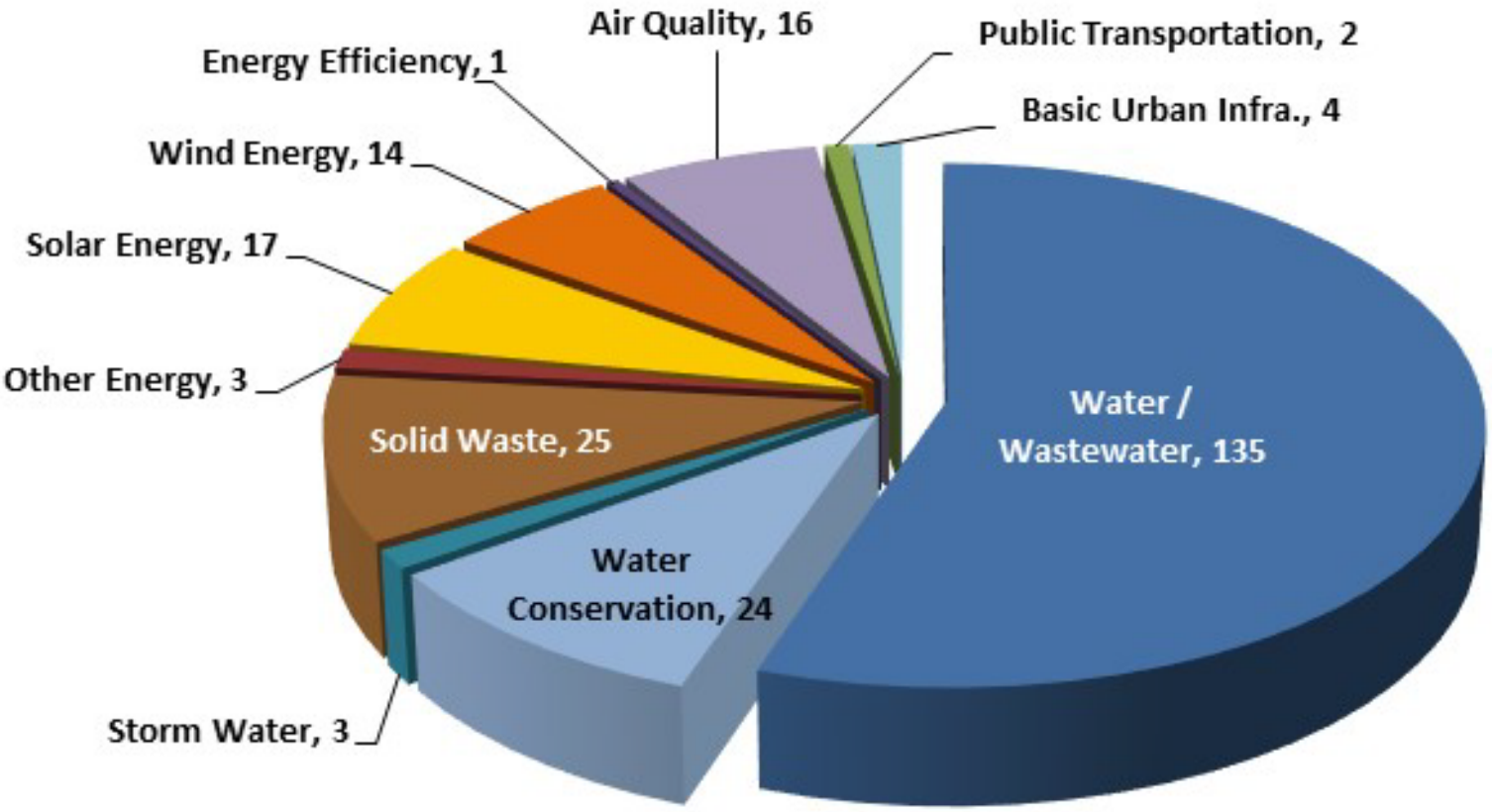
Total investment:
US$9.3 billion



Certified & Funded Projects by Sector

December 31, 2017

244 Projects → **US$9.31 billion Total investment**



EPA U.S.-Mexico Border Program

Border Environment Infrastructure Fund (BEIF)

- **US$673.4 million** in funding from EPA for project construction since program inception; **98%** has been allocated to certified projects to date
- **US$658.7 million contracted** for water and wastewater projects
- US$614.1 million (93%) has been disbursed
- Of the 119 projects financed with BEIF, 103 have been completed
- **US$10.2 million available** for **11** projects in development, with a total estimated cost of **US$67.7 million**

Outputs of Completed Projects

December 31, 2017

- 22 water treatment plants and 37 water distribution systems
- 53 wastewater treatment plants and 89 wastewater collection systems
- 24 water conservation projects
- 14 municipal landfills built or expanded and 12 dump sites closed
- 7.19 million square meters of roads paved and 229 km of rehabilitated roadways
- 15 solar plants, 12 wind farms, 1 landfill waste-to-energy facility and 1 cogeneration facility, with 1,917 MW of renewable energy generation capacity installed

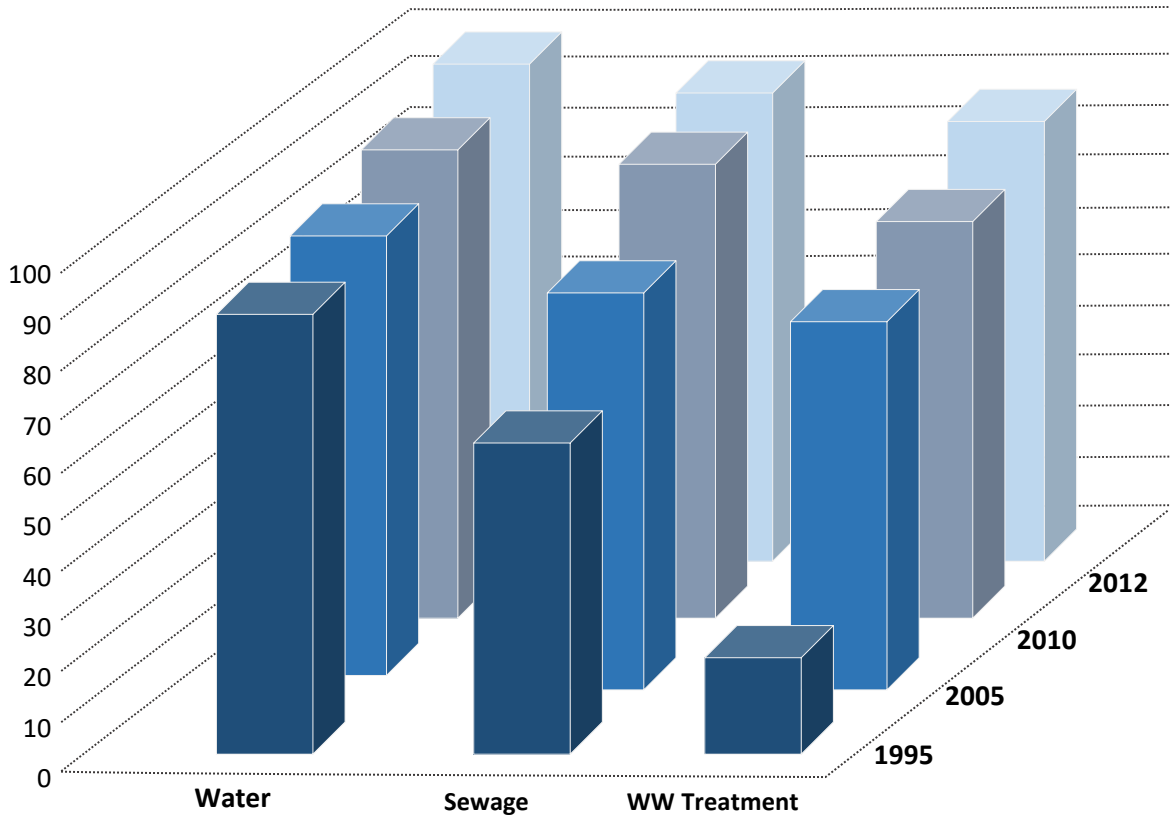
Completed Project Outcomes & Impact

December 31, 2017

- More than 12 million border residents with improved drinking water and wastewater services
- Increased wastewater treatment capacity by 316 million gallons a day
- Saving 327,171 acre-feet/year (12,797 lps) of water in irrigation districts
- More than 2.7 million residents with improved waste collection and disposal services and capacity for the proper disposal of 1,550 tons of waste per day

Impact in the Water Sector in Mexico

- Wastewater treatment coverage in the Mexican border region increased from **21%** to **87%** between 1995 and 2012; while the national average is currently about **46%**.



Completed Project Outcomes & Impact

December 31, 2017

- Street paving and improved urban mobility benefiting 5.4 million residents, reducing exposure to air pollution from vehicular dust (PM_{10}) from traffic on dirt streets and exhaust emissions
- Annual generation of 8,180 GWh of energy from renewable sources, sufficient for the annual consumption of more than 773,381 households, which is helping prevent the emission of an estimated 3.20 million metric tons/yr. of CO_2
- Diverse economic benefits for the communities such as employment, income, stronger tax base and infrastructure for economic development

Sustainable Development Criteria

Guidelines for Applying the

Sustainable Development Criteria

Border Environment Cooperation Commission

February 1999

Prepared By:

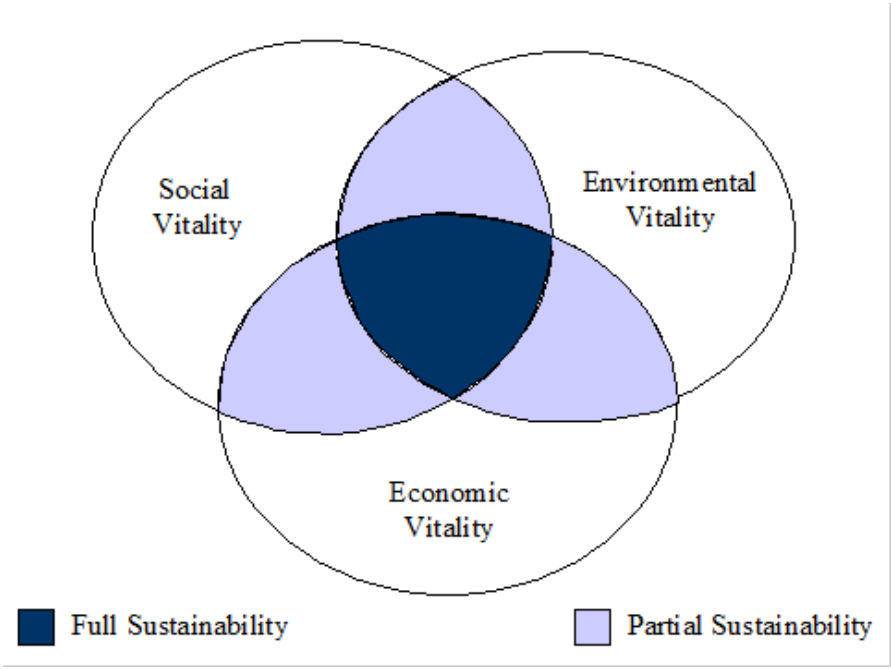
CH2MHILL

701 B Street

Suite 700

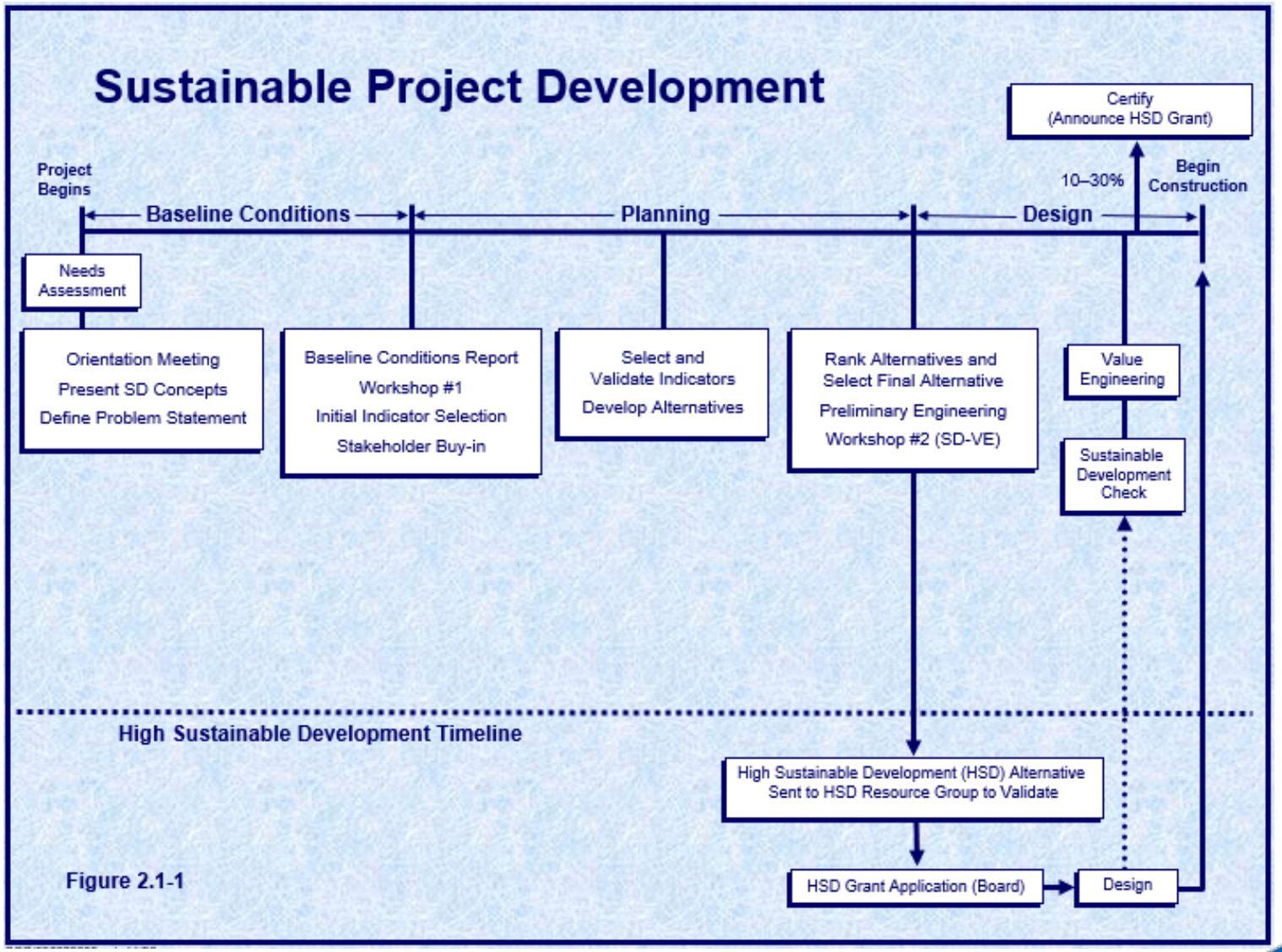
San Diego, CA 92101

SCO/PKG1733.DOC/990629001.DOC



Definition Diagram for Sustainable Development

Sustainable Development Criteria



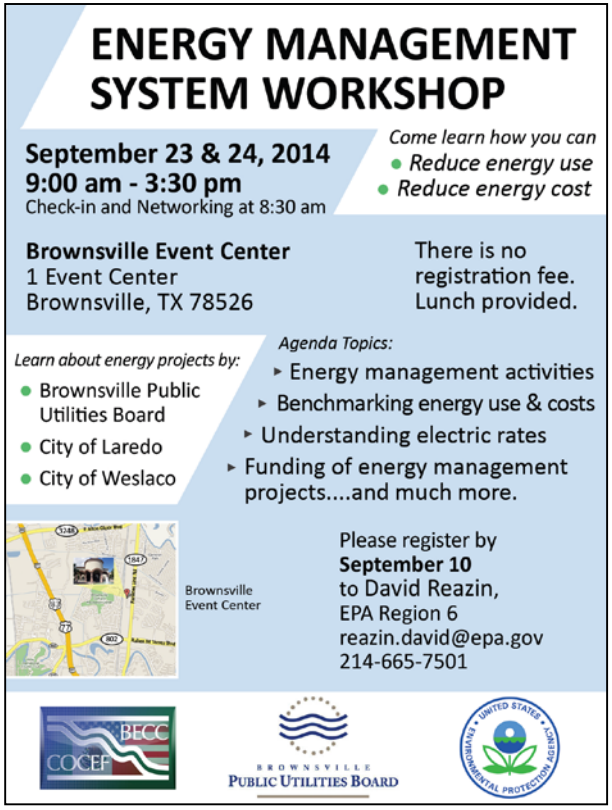
Sustainable Development Criteria

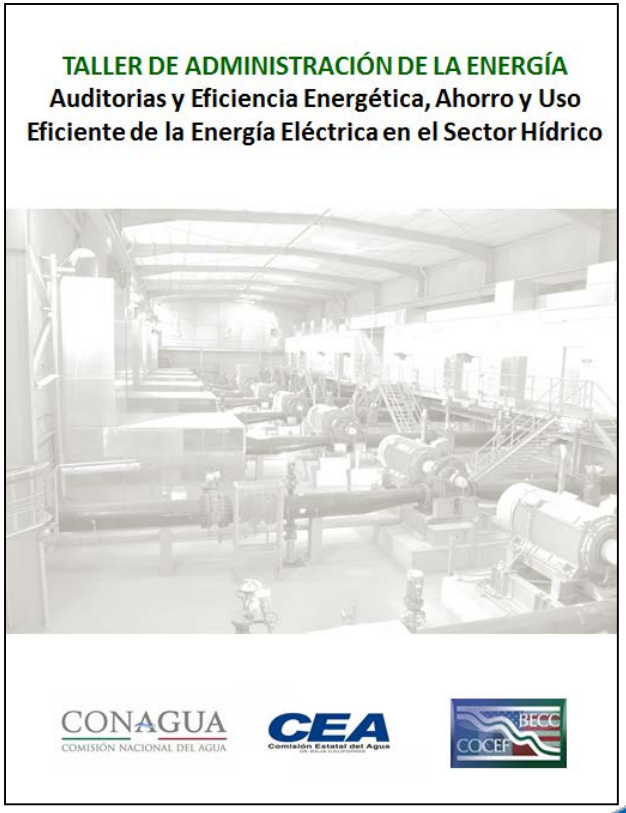
- **Guidelines for Applying the Sustainable Development Criteria.** 119 Sustainable Development Indicators. 1999
- **Guidelines for Applying the Sustainable Development Criteria.** 131 Sustainable Development Indicators. Minimum Requirement for Project Compliance with Sustainable Development Criteria (14 SD Indicators). How to Comply with Sustainable Development Certification Criteria-Instructional Booklet. 2002
- **Green Building Guidelines.** Incorporated in Planning and Final Design. 2009

Energy Management Workshops for Water Utilities

- **Six Energy Management workshops held in coordination with EPA and CONAGUA, as well as with TWDB, NMED, CEAT-Tamaulipas, CEAS-Coahuila JCAS-Chihuahua and CEA-Baja California.**

- **The workshops covered several topics related to energy management and energy efficiency as described in the invitation below.**





Energy and Water Audits

December 31, 2017

- **24 Energy Audits** for Water Utilities in 8 Border States (Arizona, New Mexico, Texas, Baja California, Sonora, Chihuahua, Coahuila, and Tamaulipas)
- **Energy Efficiency** allows savings in the most important expense an utility has to pay
- **10 Water Audits** for Water Utilities in 5 Border States (Arizona, New Mexico, Texas, Sonora, and Tamaulipas.
- **Water Audits** have helped changing project scopes and improve water rates, besides water conservation actions

Transboundary Environmental Information Documents (Camargo Project)

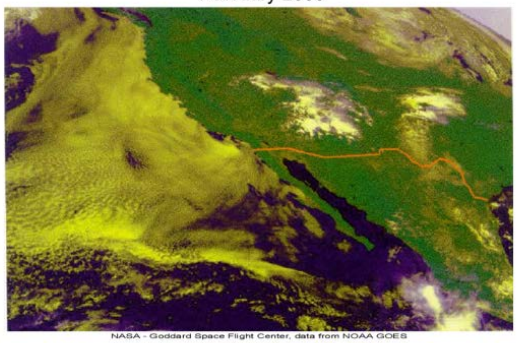
Development of a Scope of Work for Compliance with the Border Environmental Infrastructure Fund Program Requirements

Volumen I

Border Environment Cooperation Commission
Comisión de Cooperación Ecológica Fronteriza

COCEF BECC

February 2000



NASA - Goddard Space Flight Center, data from NOAA GOES

GEO-MARINE Since 1972 — *The Geo-Marine Team* — ETM

IMPROVEMENTS TO THE WASTEWATER COLLECTION SYSTEM FOR CAMARGO, TAMAULIPAS, MEXICO

TRANSBOUNDARY ENVIRONMENTAL INFORMATION DOCUMENT (UPDATED)

April 23, 2013

Prepared for:

U.S. ENVIRONMENTAL PROTECTION AGENCY
1445 ROSS AVENUE
SUITE 1200
DALLAS, TEXAS 75202

By:

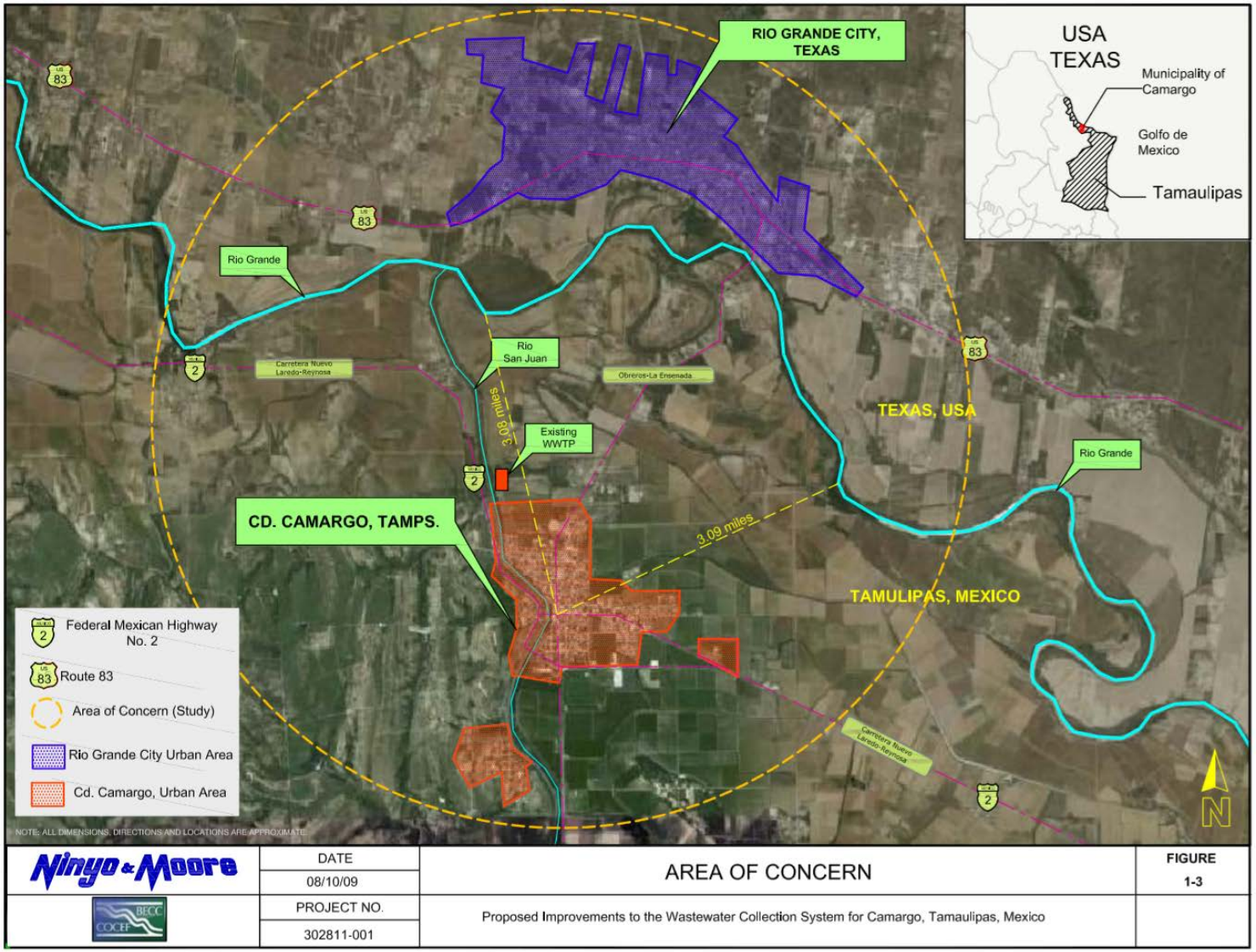
Ninyo and Moore
4100 Rio Bravo Drive, Suite 204
El Paso, Texas 79902

Updated By (In Bold):

Huitt-Zollars, Inc.
5822 Cromo Drive, Suite 210
El Paso, Texas 79912

STATE OF TEXAS
FLOYD JOHNSON
95506
LICENSED PROFESSIONAL ENGINEER
4/23/13

Transboundary Environmental Information Documents (Camargo Project)



Transboundary Environmental Information Documents (Camargo Project)

Waste Load Evaluation of the Camargo Subsegment of the Rio Grande Segment 2302 for Camargo, Tamaulipas, Mexico

Prepared For:

Border Environment Cooperation Commission
Blvd. Tomás Fernández 8069
Fraccionamiento Los Parques, CP 32470
Ciudad Juárez, Chihuahua, México

Prepared By:
Huitt-Zollars, Inc.
5822 Cromo Drive, Suite 210
El Paso, Texas 79912
United States of America

HUITT-ZOLLARS

HZ Project No. 090443-01

October 31, 2012

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

NOV 13 2013

FINDING OF NO SIGNIFICANT IMPACT

TO ALL INTERESTED GOVERNMENT AGENCIES AND PUBLIC GROUPS:

In accordance with the environmental review guidelines of the Council on Environmental Quality found at 40 Code of Federal Regulations (CFR) Part 1500, and with the use of the implementing environmental review procedures of the United States Environmental Protection Agency (EPA) found at 40 CFR Part 6 entitled "Procedures for Implementing the Requirements of the Council on Environmental Quality on the National Environmental Policy Act" as guidance, the EPA has performed an environmental review of the following proposed action:

Camargo Wastewater Collection Project
Proposed by the Comision de Agua Potable y Alcantarillado (COMAPA)
Located in Camargo, Tamaulipas, Mexico

Estimated EPA Share: $ 887,794
Estimated Local Share: $ 814,046

The community of Camargo is located in the northwest area of the Mexican State of Tamaulipas. Residents do not have adequate wastewater collection or wastewater treatment infrastructure and use latrine pits for their waste. Many residents discharge untreated wastewater directly into streets and vacant land; compounding the public health and safety hazard for area residents. The lack of wastewater collection and treatment infrastructure in the area creates a potential source of surface and ground water contamination. In addition, odors from the latrines, cesspools, and untreated wastewater in the open-air canals permeate the area.

COMAPA proposes to install a wastewater collection system to serve Camargo. In total, 12,708 people will be served by the new wastewater collection system. The collected wastewater would flow from houses, via gravity, to wastewater pipeline and be conveyed to the Camargo WWTP. In total, 202 access points and 58,056 linear feet of new pipe will be added within the existing 50-foot right-of-way. Based on the population of the proposed service area, the project would generate wastewater at a rate of approximately 0.64 million gallons daily (MGD).

EPA Region 6 has performed an environmental review and assessment on the Environmental Information Document, and other supporting data, prepared for the proposed Camargo Wastewater Infrastructure Project. The environmental review and assessment process did not identify any potentially significant adverse environmental impacts associated with the proposed action. The project individually, cumulatively over time, or in conjunction with other actions will not have a significant adverse effect on the quality of the environment. Accordingly, the EPA Region 6 has made a preliminary determination that the proposed project is not a major federal action significantly affecting the quality of the human environment, and that preparation of an Environmental Impact Statement (EIS) is not warranted.

Internet Address (URL) • http://www.epa.gov
Recycled/Recyclable • Printed with Vegetable Oil Based Inks on Recycled Paper (Minimum 25% Postconsumer)

Transboundary Environmental Information Documents (Sonoyta Project)

IMPROVEMENTS TO THE WASTEWATER COLLECTION AND TREATMENT SYSTEMS FOR THE CITY OF SONOYTA, SONORA, MÉXICO

FINAL

TRANSBOUNDARY ENVIRONMENTAL INFORMATION DOCUMENT

FEBRUARY 22, 2008

PREPARED FOR THE:

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 9
75 HAWTHORNE STREET SAN
FRANCISCO, CALIFORNIA 94105

PREPARED BY:

United States Department of the Interior
U.S. Fish and Wildlife Service
Arizona Ecological Services Field Office
2321 West Royal Palm Road, Suite 103
Phoenix, Arizona 85021-4951
Telephone: (602) 242-0210 Fax: (602) 242-2513

In Reply Refer to:
AESO/SE
22410-2008-TA-0092

December 26, 2007

RECEIVED
DEC 31 2007
BROWN AND CALDWELL
EL PASO

Mr. Nicolas Chapa
Senior Environmental Scientist
Brown and Caldwell
1200 Golden Key Circle, Suite 430
El Paso, Texas 79925

Dear Mr. Chapa:

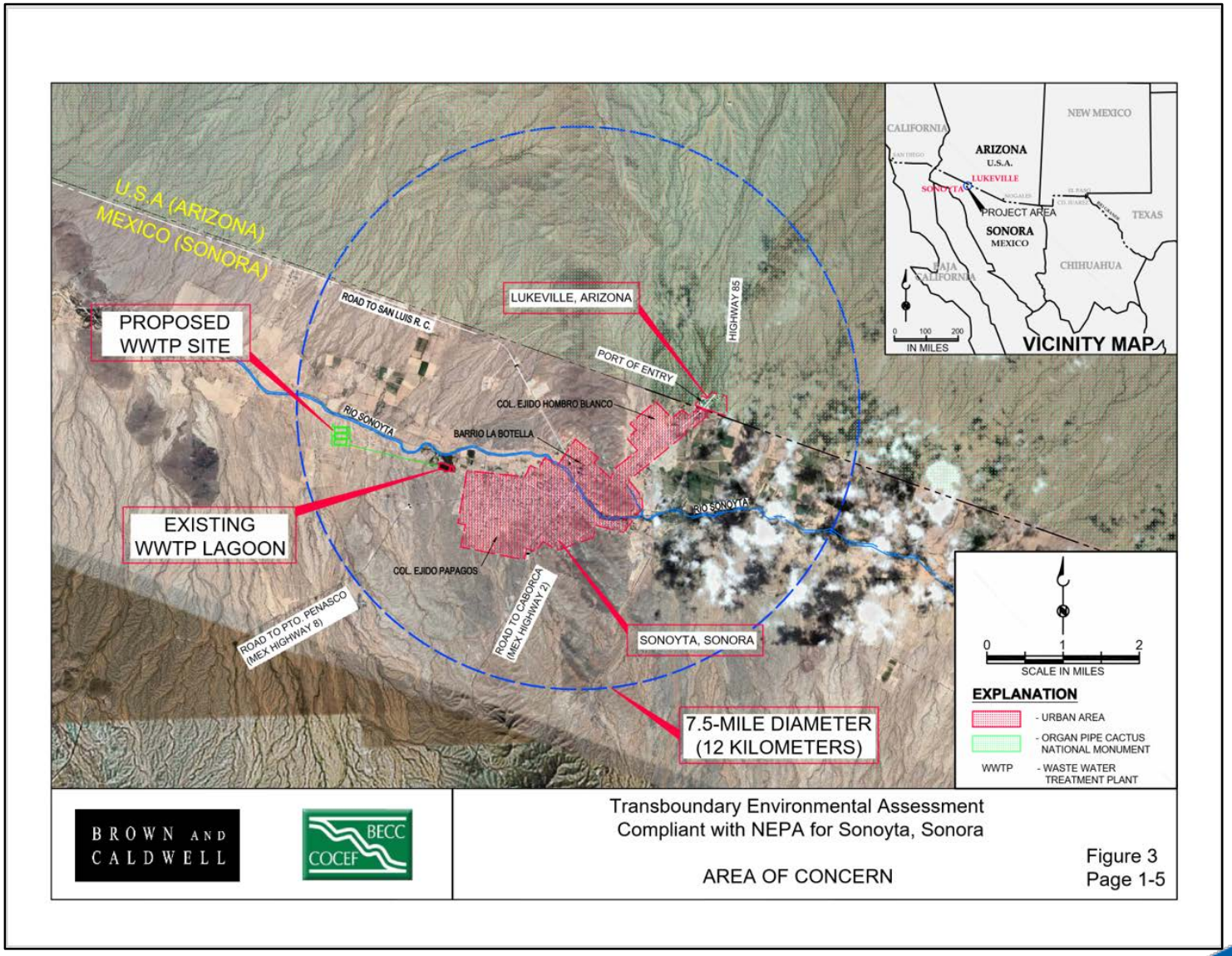
This letter is in response to your correspondence dated September 12, 2007, asking if we agree with your conclusion that the Proposed Expansion of the Wastewater Collection System to Unserved Areas of the City and the Construction of a New Wastewater Treatment Facility in Sonoyta, Sonora, Mexico project would not cause adverse effects to any listed species. We understand that the proposed action is based upon a grant program administered by the Environmental Protection Agency to improve water and wastewater infrastructure projects within 100 kilometers of the international boundary between the U.S. and Mexico. Based upon your initial correspondence, the preliminary draft Environmental Assessment, and our discussion in the conference call on November 10, 2007, we understand that:

- the existing treatment facility only treats about 65 percent of the residences in the Sonoyta area,
- the existing treatment facility is operating beyond its capacity,
- the out-flow is approximately 16 liters per second,
- the out-flow sometimes contains untreated wastewater,
- the out-flow recharges shallow groundwater, and
- some of the outflow is diverted to agricultural uses.

The alternatives, other than the no action alternative, would:

- expand the existing capacity to meet current demands,

Transboundary Environmental Information Documents (Sonoyta Project)



Transboundary Environmental Information Documents (Sonoyta Project)

- According to the Arizona Department of Game and Fish's Heritage Data Management System , three species of concern occur within the project vicinity: the Sonoran pronghorn (*Antilocapra americana sonoriensis)*, the Great Plains Narrow-mouthed Toad (*Gastrophryne olivacea*), and the Sonoran Population of the Sonoran Desert Tortoise (*Gopherus agassizii*).

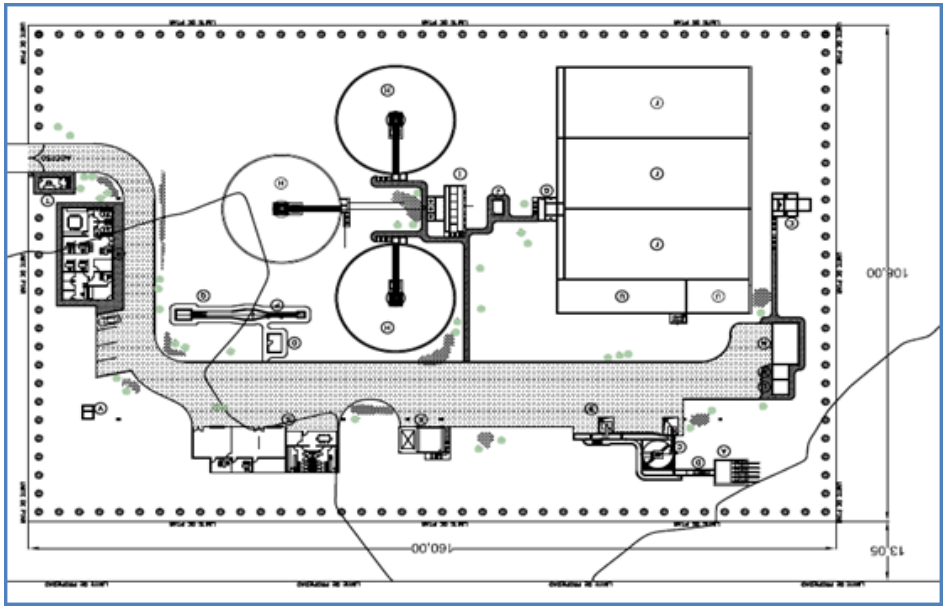
- According to the U.S. Fish and Wildlife Service, the following vulnerable species are located in proximity to the proposed project area and may be affected by the proposed project: Quitobaquito Pupfish (*Cyprinodon macularius eremus*), the Sonoyta mud turtle (*Kinosternon sonoriense longifemorale)*, the Quitobaquito Springs snail (*Tryonia quitobaquitae*) and the long fin dace (*Agosia chrysogaster*)

- The existing WWTP was overloaded and discharging inadequately treated wastewater that discharged into the Rio Sonoyta, which is a habitat for the Quitobaquito pupfish, a subspecies of the endangered desert pupfish.

- The implementation of a new WWTP will reduce the contamination loads of the Rio Sonoyta, and will provide reuse water for irrigation, thereby reducing the need for groundwater pumping and drawdown.

WWC and Treatment Project in Nogales, Sonora

- A photovoltaic project was constructed to provide electricity to the "**Los Alisos**" Wastewater Treatment Plant (Activated Sludge process with 5.02 MGD capacity) in Nogales, Sonora. The project was financed with USEPA and Mexican Government funds (federal, state, and municipal)



- The WWTP, pumping station and conveyance line were financed with BEIF, NADB Loan and Mexican funds
- The Effluent of the WWTP is planned to be injected for aquifer recharge in the Mexican side

Two Countries-Three States Regional Planning

Tri-Regional Planning Group

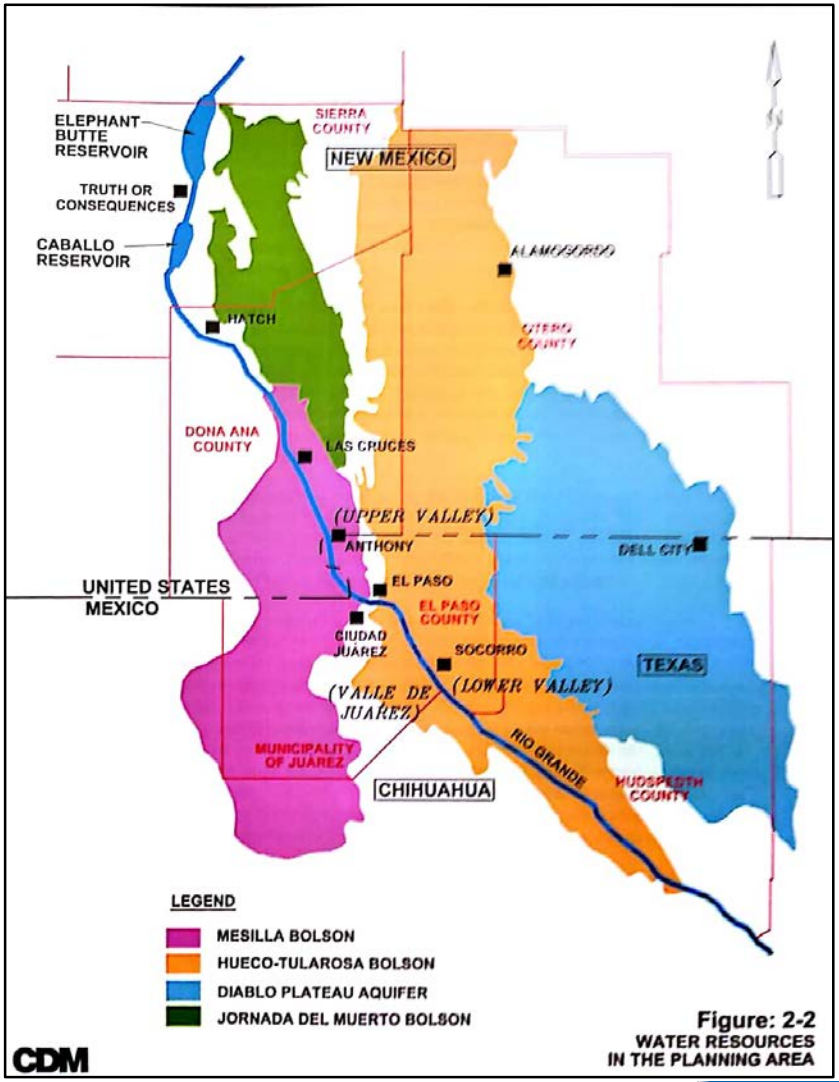
Feasibility Study for Development of a Regional Plan in the El Paso/ Ciudad Juárez/Doña Ana County Region

December 2002

Prepared for:

Border Environment Cooperation Commission

Final Report



California

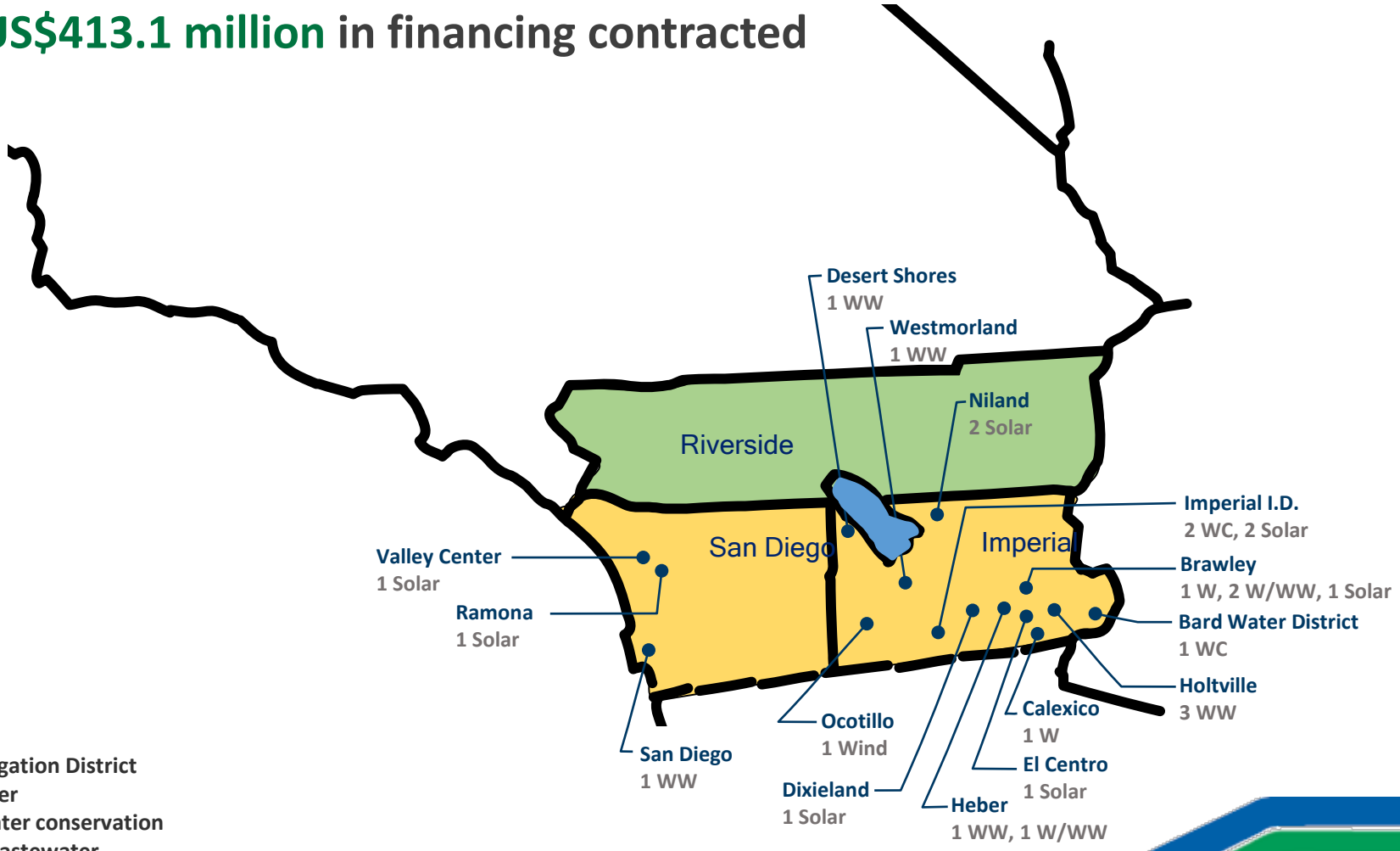
December 31, 2017

- **15.4 million** gallons a day of new water treatment capacity
- **10.4 million** gallons a day of increased wastewater treatment capacity
- **9,647 acre-feet/year (377 lps)** in water savings in irrigation districts
- **354 MW** of installed **solar and wind generation capacity**, which is helping prevent the emission of approximately 236,043 metric tons/year of CO_2, equivalent to removing 49,860 passenger vehicles from the roadways

Participation in California

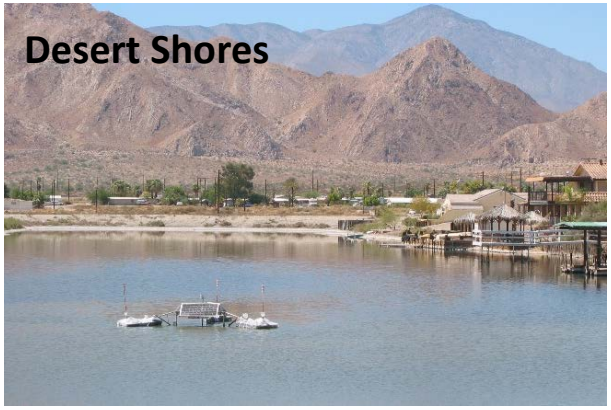
December 31, 2017

- **25** projects financed
- **US$413.1 million** in financing contracted



I.D. = Irrigation District
W = Water
WC = Water conservation
WW = Wastewater

Projects in California



Chihuahua

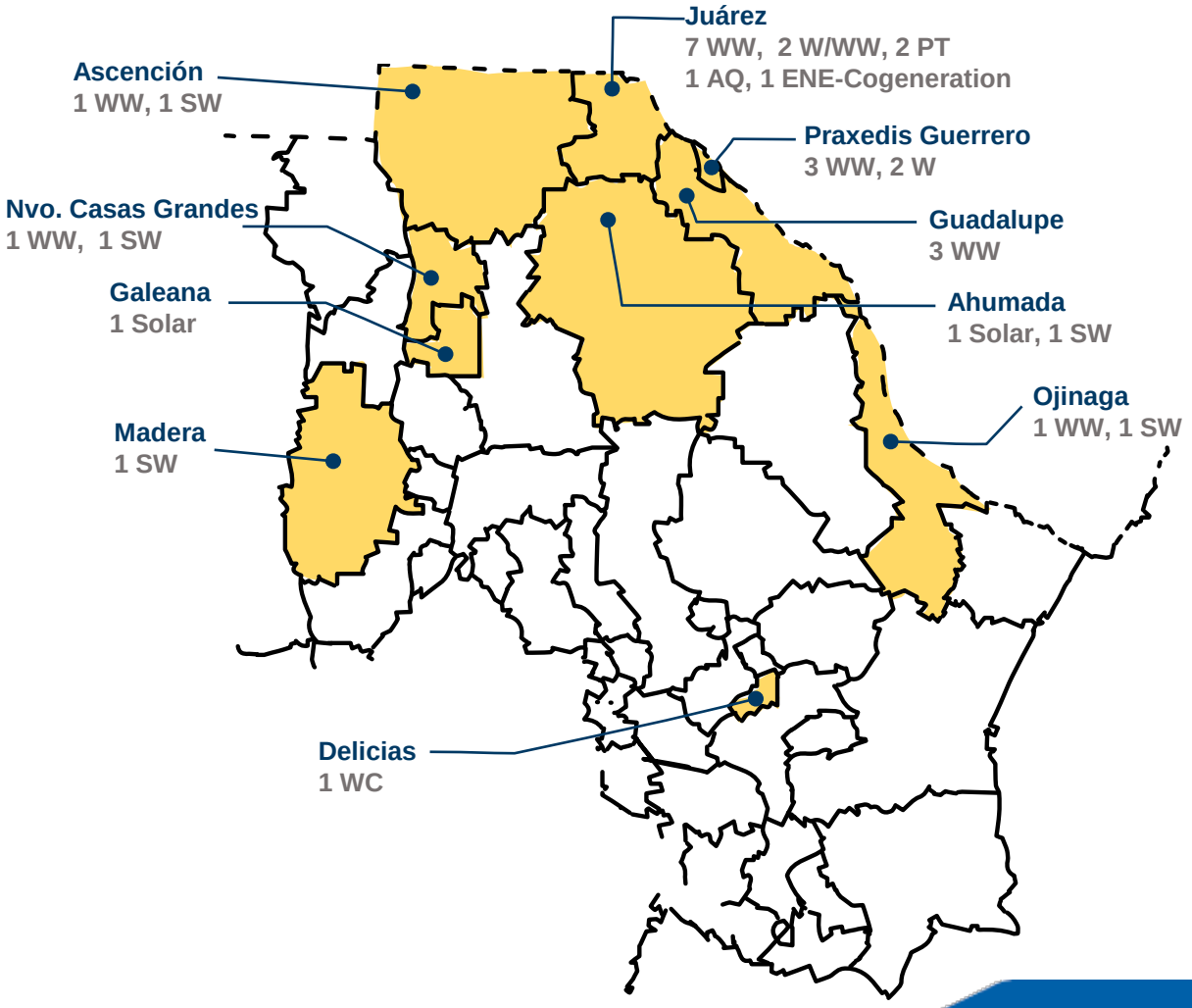
December 31, 2017

- **109 million gallons a day (mgd)** of increased wastewater treatment capacity
- **201,626 acre-feet/year (7,886 lps)** in water savings in an irrigation district
- **102** low-emission buses in circulation
- Approximately **544,859 square meters** of roadway paved, helping to reduce vehicular dust (PM_{10})
- **13.7 MW** of installed solar generation capacity, which is helping prevent the emission of approximately 16,509 metric tons/year of CO_2, equivalent to removing 3,535 passenger vehicles from the roadways
- 1 cogeneration facility (**1.35 MW**), supplying 40% to 50% of the electricity needed to operate a 22.8-mgd wastewater treatment plant

Participation in Chihuahua

December 31, 2017

- **32** projects certified and financed
- **US$191.6 million** in financing contracted



AQ = Air quality
ENE = Clean energy
SW = Solid waste
PT = Public transportation
W = Water
WC = Water conservation
WW = Wastewater

Projects in Chihuahua


El Millón, Juárez

Anapra, Juarez


San Isidro, Juárez


Ciudad Juárez


Ojinaga


Nuevo Casas Grandes


Delicias

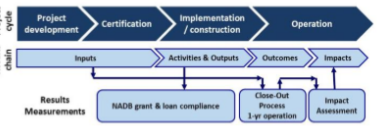

Praxedis

Results Measurements and Impact Assessment

Results Measurements and Impact Assessment

Managing for Results

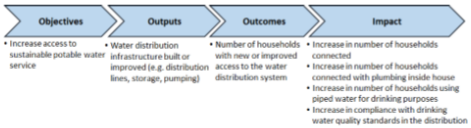
Framework for Results Measurement

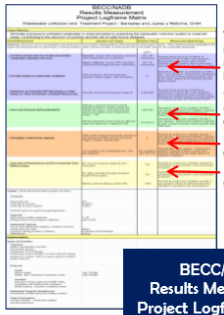


- Reflects experience/best practices MDB
- Emphasizes simplicity and cost-effectiveness
- Recognizes continuous system evolution
- Outcomes based on access to infrastructure
- Impacts based on use of infrastructure

Definition of appropriate, practical indicators is key to successful implementation

Drinking Water Distribution Example





Water quality and increase of access and use of infrastructure built.

Operational performance and environmental cost-effectiveness.

Strengthen institutional capacity.

Improved financial self-sustainability.

Impact Assessment Studies

Objective

- Assess the impact of basic sanitation infrastructure projects in the elimination of exposure to untreated wastewater

Methodology

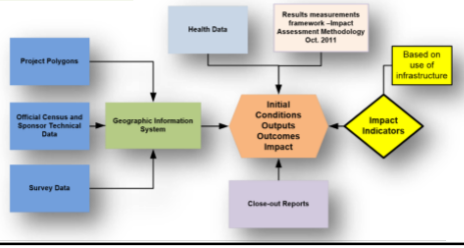
- Results measurements framework used for objective assessment of the impact
- Baseline information gathered retrospectively from official sources
- Data obtained from projects' close-out reports
- Impact indicators
  - Valle de Juarez 2014 Impact Assessment applied
  - Supported by field surveys and statistical data processing
- Regular Partners are COLEF, COFEPRIS and State's water and wastewater utilities

Field Work and GIS

- Surveys
- Applied in communities related, to use of:
  - Latrines and cesspools
  - Quality of life
  - Satisfaction with utility service
- Trust level = 95% (sample size); Confidence interval = 3%
- Geostatistical layers
  - Digital platform in ArcView (only Baja California)
  - INEGI information, survey results, and delimitation of polygons of implemented sewer systems
  - Quantitative determination of improvements

BECC/NADB Results Measurement Project Logframe Matrix prepared for all certified projects

Information Management System



Results Measurements and Impact Assessment

Valle de Juárez Impact Assessment

- 4 communities in Valle de Juárez: Dr. Porfirio Parra, Guadalupe, Praxedis G. Guerrero, and El Porvenir
- All wastewater projects certified in 2007
- Baseline information gathered in 2008-2009 with funding from EPA's Border 2012 and PAHO
- Educational outreach and interview local authorities as to the condition / operation of the new water/wastewater infrastructure
- Construction completed between July 2009 and June 2010

Wastewater Collection and Treatment

WWTP	Certification	Description	MX Grant $USM	Loan NADB $USM	BEIF Grant $USM	Total Cost $USM
Práxedis G. Guerrero (Pop. 2,128)	Sep. 2007	WW collection & treatment (WWTP 15 L/s)	$3.46 (80.8%)	$0.27 (6.3%)	$0.55 (12.8%)	$4.28
El Porvenir (Pop. 1,253)	Sep. 2007	WW collection & treatment (WWTP 15 L/s)	1.35 (60%)	0.13 (6%)	0.78 (34%)	$2.27
Guadalupe (Pop. 3,022)	Jul. 2007	WW collection & treatment (WWTP 18 L/s)	228.00% (67.3%)	28% (8%)	0.84 (24.7%)	$3.40
Dr. Porfirio Parra (Pop. 956)	Jul. 2007	WW collection & treatment (WWTP 12 L/s)	$1.46 (73.2%)	$0.14 (6.8%)	$0.40 (20%)	$2.00
		TOTAL	$11.56	$0.82	$4.40	$16.39

Praxedis G. Guerrero	2000 - Initial environmental conditions	2015 - Impacts (Projects by BECC/NADB)	Change
Population connected to the WW collection system	70%	95%	36%
Latrines	11%	0%	-100%
Cesspools	19%	3%	-84%
Population with WW treatment	0%	100%	100%
Flow of untreated raw WW (L/s)	8	0	--
Discharge points of raw WW adjacent to the community	2	Eliminated	--
Residents subject to exposure to raw WW during rainy season	100%	Eliminated	--
Outputs			
Wastewater collection lines (km)	22.3		
340,000 gpd (15 L/s) WWTP	1		
Outcomes			
Access to WW collection infrastructure	100%		
Access to WW treatment infrastructure	100%		

El Porvenir	2000 - Initial environmental conditions	2015 - Impacts (Projects by BECC/NADB)	Change
Population connected to the WW collection system	15%	97%	547%
Latrines	22%	3%	-86%
Cesspools	54%	0%	-100%
Population with WW treatment	0%	100%	100%
Flow of untreated raw WW (L/s)	10	0	--
Discharge points of raw WW adjacent to the community	1	Eliminated	--
Residents subject to exposure to raw WW during rainy season	100%	Eliminated	--
Outputs			
Wastewater collection lines (km)	27.5		
340,000 gpd (15 L/s) WWTP	1		
Outcomes			
Access to WW collection infrastructure	100%		
Access to WW treatment infrastructure	100%		

Guadalupe	2000 - Initial environmental conditions	2015 - Impacts (Projects by BECC/NADB)	Change
Population connected to the WW collection system	49%	88%	80%
Latrines	26%	8%	-69%
Cesspools	13%	13%	0%
Population with WW treatment	0%	100%	100%
Flow of untreated raw WW (L/s)	4	0	--
Discharge points of raw WW adjacent to the community	4	Eliminated	--
Homes exposed to raw WW in adjacent agriculture drain	30	0	--
Outputs			
Wastewater collection lines (km)	37.0		
410,000 gpd (18 L/s) WWTP	1		
Outcomes			
Access to WW collection infrastructure	100%		
Access to WW treatment infrastructure	100%		

Dr. Porfirio Parra	2000 - Initial environmental conditions	2015 - Impacts (Projects by BECC/NADB)	Change
Population connected to the WW collection system	78%	95%	22%
Latrines	5%	0%	-100%
Cesspools	14%	4%	-71%
Population with WW treatment	0%	100%	100%
Flow of untreated raw WW (L/s)	4	0	--
Discharge points of raw WW adjacent to the community	9	Eliminated	--
Homes exposed to raw WW in adjacent agriculture drain	80	0	--
Outputs			
Wastewater collection lines (km)	11.4		
137,000 gpd (6 L/s) WWTP	1		
Outcomes			
Access to WW collection infrastructure	100%		
Access to WW treatment infrastructure	100%		

Results Measurements and Impact Assessment

Results Measurements and Impact Assessment

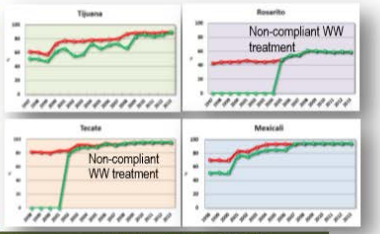
Baja California State-wide Impact Assessment

City-Wide Wastewater System

- 4 communities: Tijuana, Playas de Rosarito, Tecate, and Mexicali
- Wastewater projects: All certified between 1997 and 2012; construction completed between 2002 and 2014

Wastewater collection
Wastewater treatment

Certified Projects	Investment (US$M)
Tijuana	
Construction of 2 wastewater treatment plants, 1 WW pumping station, and 8 WW collection projects	$ 92.66
Playas de Rosarito	
Construction of 1 wastewater treatment plant, and 6 WW collection projects	$ 18.83
Tecate	
Improvement of 1 wastewater treatment plant, and construction of 2 WW collection projects	$ 11.50
Mexicali	
Construction and increase of capacity of 2 wastewater treatment plant, and 3 WW collection projects	$ 128.56
	$ 251.55



Tijuana WW System / City-wide	2000 - Initial environmental conditions	2015 - Impacts (Projects by BECC/NADB)	Change
Population (inhabitants, - INEGI)	1,210,520	1,722,348	42%
Population connected to the WW collection system	77%	91%	18%
Existing wastewater domestic hookups	266,762	488,250	83%
Wastewater treatment coverage	73%	97%	33%
Gastrointestinal diseases rate (/100000)	444	320	-28%
Flow of untreated raw wastewater (L/s)	627	0	–
Outputs			
New wastewater collection lines (km)	146		
Rehabilitated WW collection lines (km)	135		
New main WW collection lines (km)	31		
2000 L/s WW pumping station	1		
Improved + expanded WW treatment (L/s) - San Antonio de los Buenos	1,100		
New WW treatment capacity (L/s) - La Morita	254		
Outcomes			
Access to WW collection infrastructure	95%		
Access to WW treatment infrastructure	100%		
Excess WW treatment capacity (L/s)	669		

Playas de Rosarito WW System / City-wide	2000 - Initial environmental conditions	2015 - Impacts (Projects by BECC/NADB)	Change
Population (inhabitants, - INEGI)	63,420	105,150	66%
Population connected to the WW collection system	45%	65%	44%
Existing wastewater domestic hookups	8,493	32,191	279%
WW treatment coverage (in compliance)	36%	100%	178%
Gastrointestinal diseases rate (/100000)	392	329	-16%
Flow of untreated raw wastewater (L/s)	36	0	–
Outputs			
New wastewater collection lines (km)	119.6		
Expanded WW treatment capacity (L/s) (Rosarito)	60		
Outcomes			
Access to WW collection infrastructure	80%		
Access to WW treatment infrastructure	100%		
Excess WW treatment capacity (L/s)	198		

Tecate WW System / City-wide	2000 - Initial environmental conditions	2015 - Impacts (Projects by BECC/NADB)	Change
Population (inhabitants, - INEGI)	77,795	111,098	43%
Population connected to the WW collection system	84%	96%	14%
Existing wastewater domestic hookups	16,454	27,710	68%
WW treatment coverage (in compliance)	0%	100%	100%
Gastrointestinal diseases rate (/100000)	526	632	20%
Flow of untreated raw wastewater (L/s)	200	0	–
Outputs			
New wastewater collection lines (km)	43		
Improved WW treatment capacity (L/s) - Tecate	200		
Outcomes			
Access to WW collection infrastructure	100%		
Access to WW treatment infrastructure	100%		
Excess WW treatment capacity (L/s)	50		

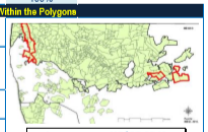
Mexicali WW System / City-wide	2000 - Initial environmental conditions	2015 - Impacts (Projects by BECC/NADB)	Change
Population (inhabitants, - INEGI)	764,602	1,025,743	34%
Population connected to the WW collection system	83%	95%	14%
Existing wastewater domestic hookups	162,682	488,250	200%
Wastewater treatment coverage	91%	100%	10%
Gastrointestinal diseases rate (/100000)	289	193	-33%
Flow of untreated raw wastewater (L/s)	115	0	–
Outputs			
New main WW collection lines (km)	63		
Improved and expanded WW treatment (L/s) - Zaragoza	880		
800 L/s WW pumping station	1		
New wastewater collection lines (km)	78.2		
New WW treatment capacity (L/s) - Las Arenitas and Zaragoza	1,200		
Outcomes			
Access to WW collection infrastructure	100%		
Access to WW treatment infrastructure	100%		
Excess WW treatment capacity (L/s)	330		

Results Measurements and Impact Assessment

Baja California State-wide Impact Assessment

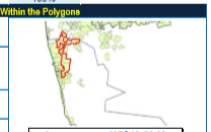
Certified Wastewater Collection Projects for Unserved Areas

Tijuana Project Polygons	2000 - Initial environmental conditions	2015 - Impacts (Projects by BECC/NADB)	Change
Residents within the project polygons	19,450	46,581	139%
Population connected to the WW collection system	0%	90%	90%
↕ Latrines	89%	10%	-89%
↕ Cesspools	11%	1%	-90%
Population with wastewater treatment	0%	100%	100%
Flow of untreated raw wastewater (L/s)	95	0	–
Discharge points of raw WW to the community	Multiple	Eliminated	–
Risk of residents exposure to raw WW in rainy season	100%	Eliminated	–
Satisfaction with utility service	No base-line	91%	–
Project related well-being perception	info	95%	–
Outputs			
Wastewater collection lines (km)	146		
Outcomes			
Access to WW collection infrastructure	100%		
Access to WW treatment infrastructure	100%		
Projects Within the Polygons			
Cuenca Río Tijuana: WW collection system expansion (2008)			
Tijuana Costero: Tijuana coast WW collection system expansion (2008)			
Alcatraces: WW collection lines expansion (2011)			
La Cuesta, Farallón and SEDUE-SAAS: WW collection system (2012)			



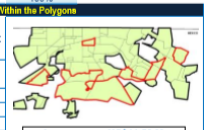
Investment = US$92.66 M

Playas de Rosarito Project Polygons	2000 - Initial environmental conditions	2015 - Impacts (Projects by BECC/NADB)	Change
Residents within the project polygons	7,255	20,042	176%
Population connected to the WW collection system	0%	79%	79%
↕ Latrines	89%	18%	-79%
↕ Cesspools	11%	3%	-74%
Population with wastewater treatment	0%	100%	100%
Flow of untreated raw wastewater (L/s)	41	0	–
Discharge points of raw WW to the Pacific Ocean	Multiple	Eliminated	–
Risk of residents exposure to raw WW in rainy season	100%	Eliminated	–
Satisfaction with utility service	No base-line	89%	–
Project related well-being perception	info	91%	–
Outputs			
Wastewater collection lines (km)	120		
Outcomes			
Access to WW collection infrastructure	100%		
Access to WW treatment infrastructure	100%		
Projects Within the Polygons			
R1: WW collection system expansion (2006)			
R2: Main WW collection system expansion of Lomas, Independencia & Aztlán (2009)			
Plan Libertador WW collection system expansion (2011)			
Lucio Blanco WW collection system expansion (2012)			



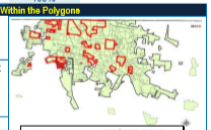
Investment = US$18.83 M

Tecate Project Polygons	2000 - Initial environmental conditions	2015 - Impacts (Projects by BECC/NADB)	Change
Residents within the project polygons	9,580	14,995	57%
Population connected to the WW collection system	0%	94%	94.0%
↕ Latrines	68%	6%	-91%
↕ Cesspools	32%	0%	-100%
Population with wastewater treatment	0%	100%	100%
Flow of untreated raw wastewater (L/s)	31	0	–
Discharge points of raw wastewater to the Río Tecate	Multiple	Eliminated	–
Risk of residents exposure to raw WW in rainy season	100%	Eliminated	–
Satisfaction with utility service	No base-line	92%	–
Project related well-being perception	info	94%	–
Outputs			
Wastewater collection lines (km)	43		
Outcomes			
Access to WW collection infrastructure	100%		
Access to WW treatment infrastructure	100%		
Projects Within the Polygons			
Construction of a WW treatment plant and WW collection system improvement and expansion (2000)			
WW collection system expansion (2007)			



Investment = US$11.50 M

Mexicali Project Polygons	2000 - Initial environmental conditions	2015 - Impacts (Projects by BECC/NADB)	Change
Residents within the project polygons	34,454	50,560	47%
Population connected to the WW collection system	0%	98%	98.3%
↕ Latrines	29%	1%	-96%
↕ Cesspools	71%	0%	-99%
Population with wastewater treatment	0%	100%	100%
Flow of untreated raw wastewater (L/s)	103	0	–
Discharge points of raw wastewater to the Río Nuevo	Multiple	Eliminated	–
Risk of residents exposure to raw WW in rainy season	100%	Eliminated	–
Satisfaction with utility service	No base-line	87%	–
Project related well-being perception	info	90%	–
Outputs			
Wastewater collection lines (km)	78		
Outcomes			
Access to WW collection infrastructure	100%		
Access to WW treatment infrastructure	100%		
Projects Within the Polygons			
Mexicali 1: Sanitary program (1997)			
Mexicali 4: WW collection system, east sector (2007)			



Investment = US$128.56 M

Results Measurements and Impact Assessment

HEALTH IMPACT ASSESSMENT
The Lower Valley Water District (LVWD)
El Paso County, TX
WATER AND WASTEWATER PROJECTS

Objective

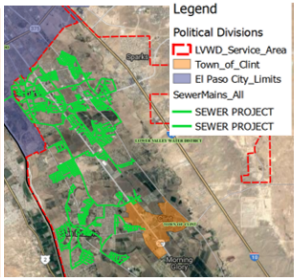
Assess the health and quality of life impacts of water and wastewater services provided through Lower Valley Water District project completed in 2003, using the tools of HIA, as defined by WHO.

Context

- The population of Socorro and San Elizario was 22,995 and 4,385, respectively, from 1990 Census.
- Before (the water & wastewater project) 2003, residents and businesses in San Elizario and Socorro were mostly dependent on private domestic wells for water and septic tanks for sanitation.
- Inadequately designed and constructed on-site treatment systems led to contaminated shallow wells in the area. Studies by UTEP (1988) and the CDC (1992) found that 100% and 50% of wells tested, respectively, were bacteriologically contaminated.
- EP County Health Department (1992) reported high rates of Hepatitis A (5x the national average) and *shigella* dysentery (3x the national average) in the area.
- UTSA Health Sciences Center (1988) found that 90% of San Elizario residents sampled had been infected with Hepatitis A before reaching the age of 35.

General Characteristics and Cost of the Project

Cost	$98 million	Funding Sources	EPA, TWDB, USDA
Implemented	1995 - 2003	13,729 connections	Benefitting 33,729 people
Water Infrastructure	Purchase of existing infrastructure, 3 MG ground storage tank, 28 MGD added pumping capacity, 265,000 lineal feet of water line ranging from 6-inch to 24-inches in diameter		
Wastewater Infrastructure	Construction of 8 sewer lift stations, 650,000 lineal feet of collection line, main collectors and force main ranging from 8-inch to 42-inches in diameter		



The Assessment

- Interviewed 11 key informants
- Survey of 100 households from a total of 223 who had lived in the same home for >25 years
- Review of secondary data related to health, economic, and quality of life impacts

HEALTH IMPACT ASSESSMENT
The Lower Valley Water District (LVWD)
WATER AND WASTEWATER PROJECT

Results

Household Survey

Sources of Water & Sanitation before and after

- Before the infrastructure project, 52% of residents obtained water through some combination of hauled water, domestic wells, and bottled water. 15% depended on hauled water only, and 8% depended on domestic wells only. For those who hauled water, 64% of them hauled water more than once per week.
- 100% of residents depend on septic tanks and cesspools.
- After the infrastructure project, 100% of residents had piped water, and 93% connected to sewer

Perceptions of service

- Today from the survey, 93% of residents are satisfied with water service, and 89% are satisfied with the sewer service due improved reliability, pressure, and health / "sewer service": due to improved treatment, health, and cost savings
- Currently 90% of residents utilize municipal water for cooking and hygiene needs.

Self Reported in Health Conditions	Before	After
Skin problems (rash, itchy, dry)	22%	9%
Gastrointestinal illness (diarrhea, nausea, gastritis)	9%	3%
Stomach infections (salmonella, cholera, H. pylori)	1%	0%

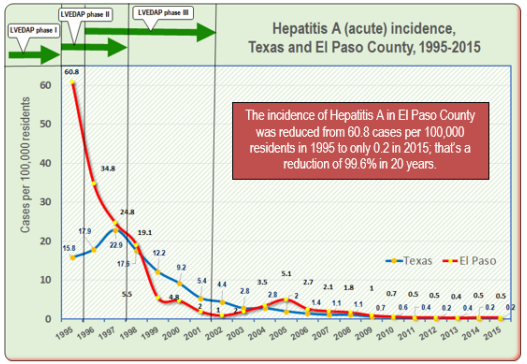
Economic, Community Development, Quality of life, Before & After

- 93% of the respondents believe that the water and sewer benefitted the community trough to expanded healthcare services, local businesses, parks and recreation and improve fire safety.
- 88% of residents believe quality of life has improve.

Secondary Data

LVWD Connections

- Water service connections, 1997 = 3,725; 2016 = 17,454 (increase of 368%)
- Residents without services in El Paso County decreased from 40,000 to 16,000



Community Development and Economic Impact

- Medium Household Incomes grew in the area by 12% to nearly 28% or an increase of up to $6,500 per year for some families.
- Property values increased by 41% in Socorro and 23% in San Elizario between 2000 and 2010 (American Fact Finder). The average is 20% in El Paso County after first time water service (EPW).
- Expanded residential development (~4500 ha) includes access to conventional water and wastewater services extended from the project's infrastructure investments.

Next Steps

December 31, 2017

- **Water Conservation.** Based on availability of water resources and environmental setting, enforce the application of water conservation plans for both urban and agricultural use, in order to achieve realistic consumption per capita
- **Water Reuse.** Reclaimed water should substitute current needs rather than creating new ones
- **Water Quality of Water Resources.** Protect water resources with updated discharge permits, based on the condition of receiving water body, population growth, and increasing flows of wastewater generated in cities along the border region

Thank you

Laureano Alvarez
Program Manager
North American Development Bank
lalvarez@nadb.org
P: +1 (915) 209-7858
F: +1 (915) 975-8280
P: +52 (656) 688-4626
F: +52 (656) 625-6180
http://www.nadb.org