IMPERIAL IRWMP

INTEGRATED REGIONAL WATER MANAGEMENT PLAN

Attachment 3. Project Justification

Imperial Region
2014 IRWM Drought Grant Proposal

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Attachment 3. Project Justification

Attachment 3 includes a summary of the proposed project, including the purpose and how the Proposal meets the need(s) created by the California drought, and the support of the Colorado River Watershed in meeting California's urban water demands. Attachment 3 also contains the estimated physical benefits of the *Intertie Projects between the City of El Centro, the City of Imperial, and the Heber Public Utilities District* (Intertie Project); justifies how the Intertie Project is technically feasible; describes how the project can achieve the claimed level of benefits; and explains whether the benefits will be attained through the least cost alternative. Attachment 3 is presented in the following sub-sections:

- Project Summary Table (use Table 4)
- Project Description
- Regional Map and Project Map
- Project Physical Benefits (use Table 5)
- Technical Analysis of Physical Benefits Claimed
- Cost Effectiveness Analysis (use Table 6)

3.1 Project Summary Table

Table 3-1 below is used to determine the project's eligibility, and is intended to provide a quick checklist for the project attributes related to the drought and to the IRWM Plan. The proposed project matches at least one project element in both sections (i.e., Drought Project Element and IRWM Project Element).

Table 3-1. 2014 IRWM Drought Solicitation Project Summary Table (Table 4 of PSP)

Drought Project Element		**Intertie Project**
D.1	Provide immediate regional drought preparedness	
D.2	Increase local water supply reliability and the delivery of safe drinking water	**Yes**
D.3	Assist water suppliers and regions to implement conservation programs and measures that are not locally cost-effective	
D.4	Reduce water quality conflicts or ecosystem conflicts created by the drought	
IRWM Project Element		
IR.1	Water supply reliability, water conservation, and water use efficiency	**Yes**
IR.2	Stormwater capture, storage, clean-up, treatment, and management	
IR.3	Removal of invasive non-native species, the creation and enhancement of wetlands, and the acquisition, protection, and restoration of open space and watershed lands	
IR.4	Non-point source pollution reduction, management, and monitoring	
IR.5	Groundwater recharge and management projects	
IR.6	Contaminant and salt removal through reclamation, desalting, and other treatment technologies and conveyance of reclaimed water for distribution to users	
IR.7	Water banking, exchange, reclamation, and improvement of water quality	
IR.8	Planning and implementation of multipurpose flood management programs	
IR.9	Watershed protection and management	
IR.10	Drinking water treatment and distribution	**Yes**
IR.11	Ecosystem and fisheries restoration and protection	

3.1 PROJECT DESCRIPTION

Project Name: Intertie Projects between the City of El Centro, the City of Imperial, and the Heber Public Utilities District (Intertie Project)

Implementing Agency/Organization(s): City of Imperial (State contracting agency for funding) and City of El Centro (lead construction agency)

Project Description: A project addressing system deficiencies consisting of three short pipeline interties to connect two DACs (El Centro and Heber), and City of Imperial (partial DAC by census tract).

Discussion: Regional drought impacts are at a critical point in the Imperial Region due to the extended drought of the Colorado River.[1] While urban supplies in the Region are relatively safe in comparison to agricultural supplies (i.e., agricultural lands are being fallowed to protect urban supplies), the threat of water supply shortages and reduced water quality for urban water supplies is very real. The Intertie Project consists of three small pipeline connections amounting to slightly greater than a mile of 12-inch waterline, creating a back-up supply for the three sponsoring agencies where there is currently no other alternative. This project is specifically addressing local water supply reliability and the delivery of safe drinking water in a drought-stricken and environmentally sensitive region of California.

The Intertie Project's reliability benefits come from being located in a region subjected to catastrophic earthquakes and flooding events, creating an immediate need for emergency back-up water supplies. Reduced carbon emissions and water savings are attributed with the project as part of a no-project and avoided-project alternatives comparison.

Another point to note is the extent to which agricultural lands are currently being fallowed. Much like the California Central Valley, necessary fallowing reduces income for the region, further impacting economically depressed agricultural-based communities. Stressed income and funding for the Imperial Region has inhibited the ability of cities and agencies from implementing much needed drinking water system improvements to meet the minimum reliability and redundancy requirements as required by the State Department of Public Health. This necessitates expedited funding and implementation of the least cost solution, the Intertie Project.

3.1 REGIONAL MAP AND PROJECT MAPS

See following maps:

- **Figure 3-1**, Regional Project Map
- **Figure 3-2**, Intertie 1, La Brucherie Avenue Segment
- **Figure 3-3**, Intertie 2, McCabe Road Segment
- **Figure 3-4**, Intertie 3, Clark Road Segment

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[1] See **Attachment 2 – Drought Impacts** for description of Colorado River drought impacts in relationship to California drought impacts.

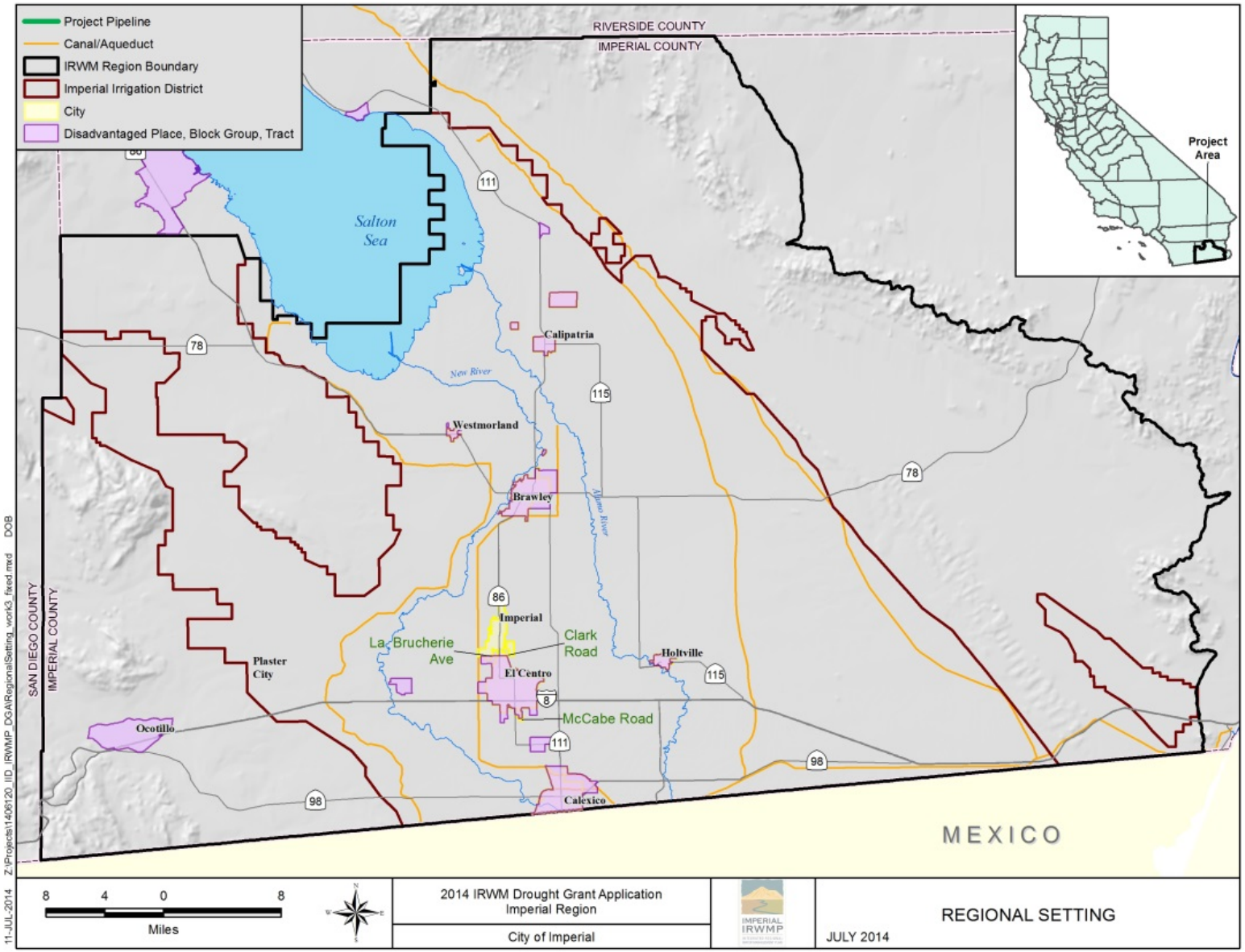

Figure 3-1. Imperial Region Locations

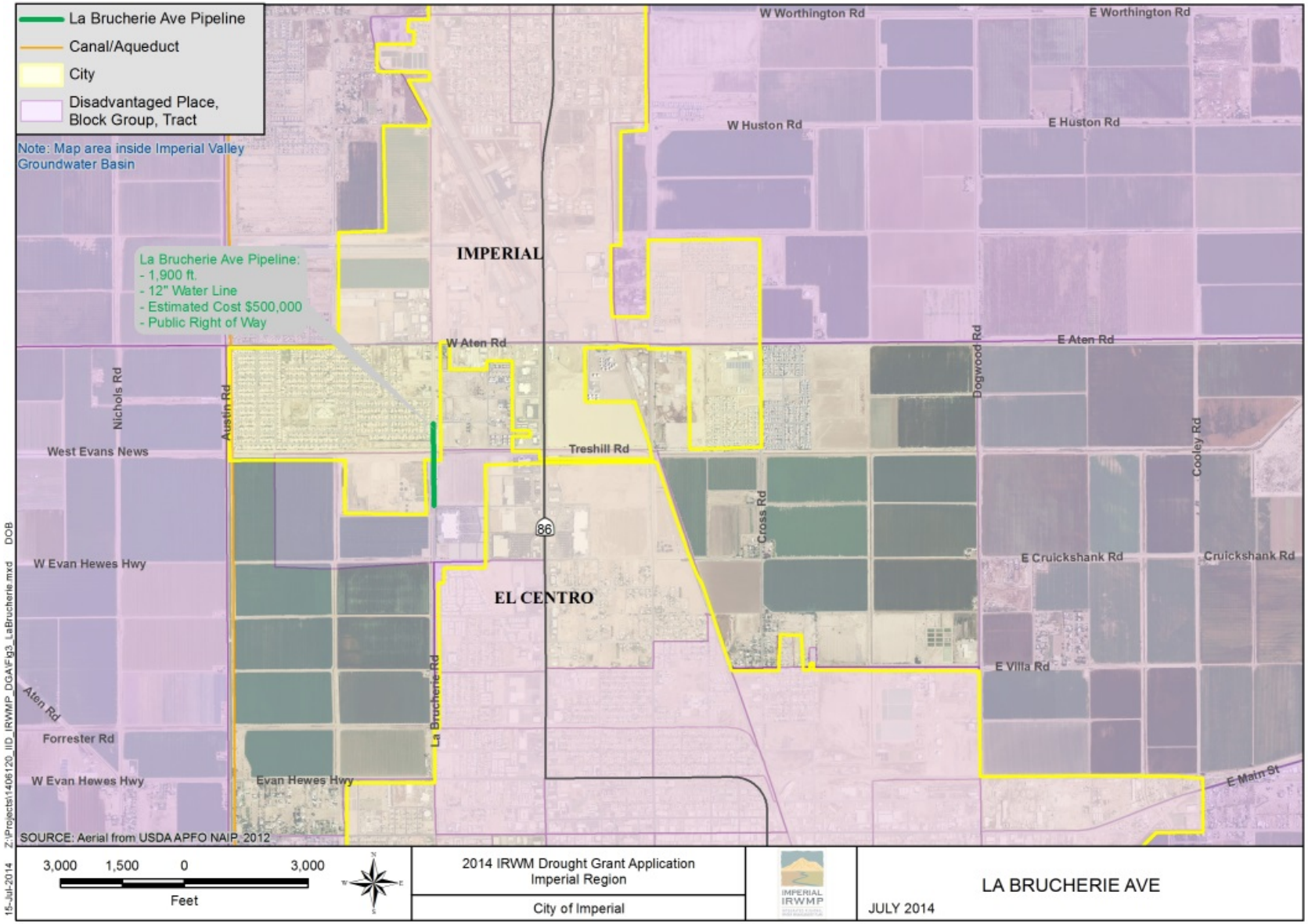

Figure 3-2. La Brucherie Avenue Segment

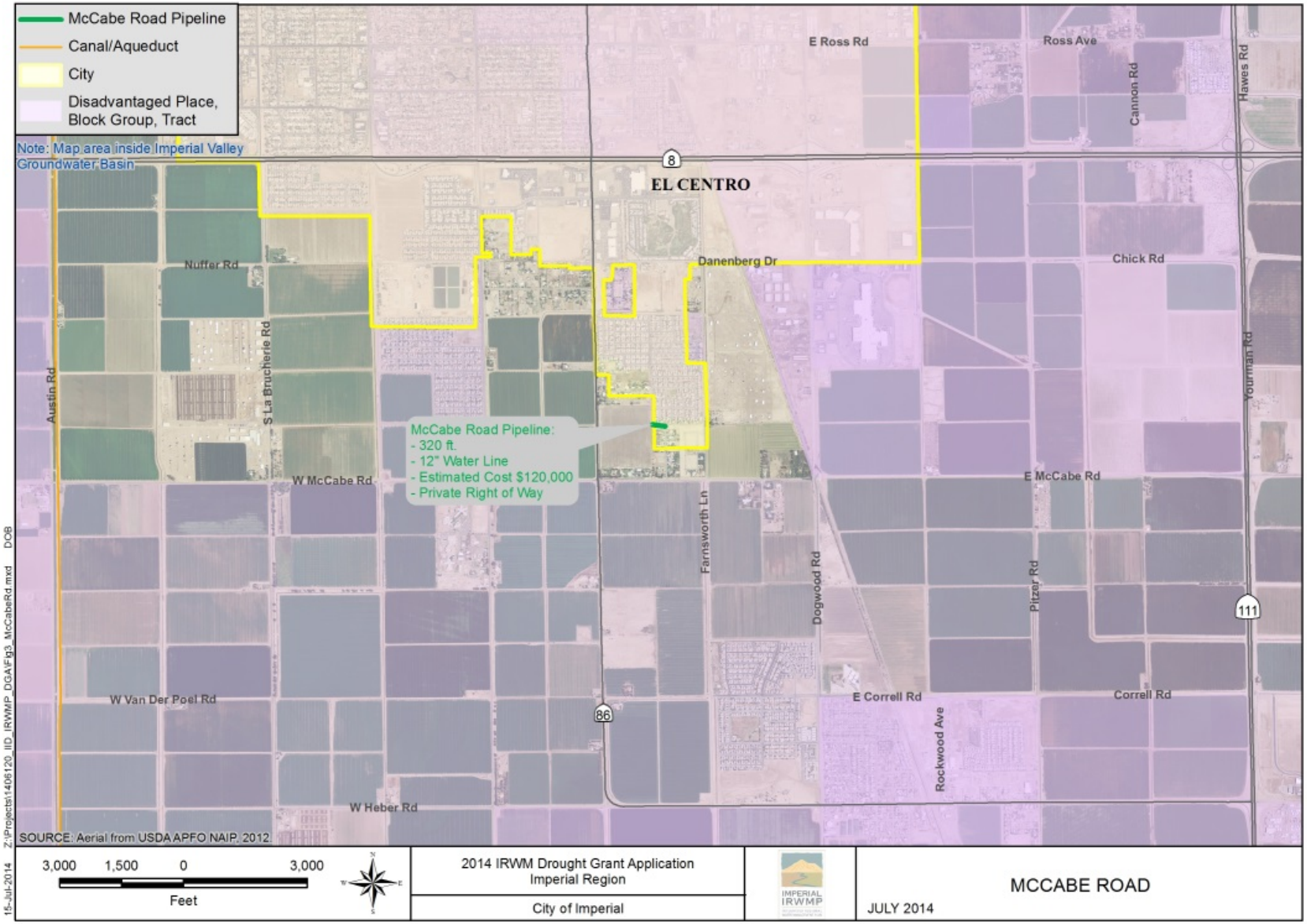

Figure 3-3. McCabe Road Segment

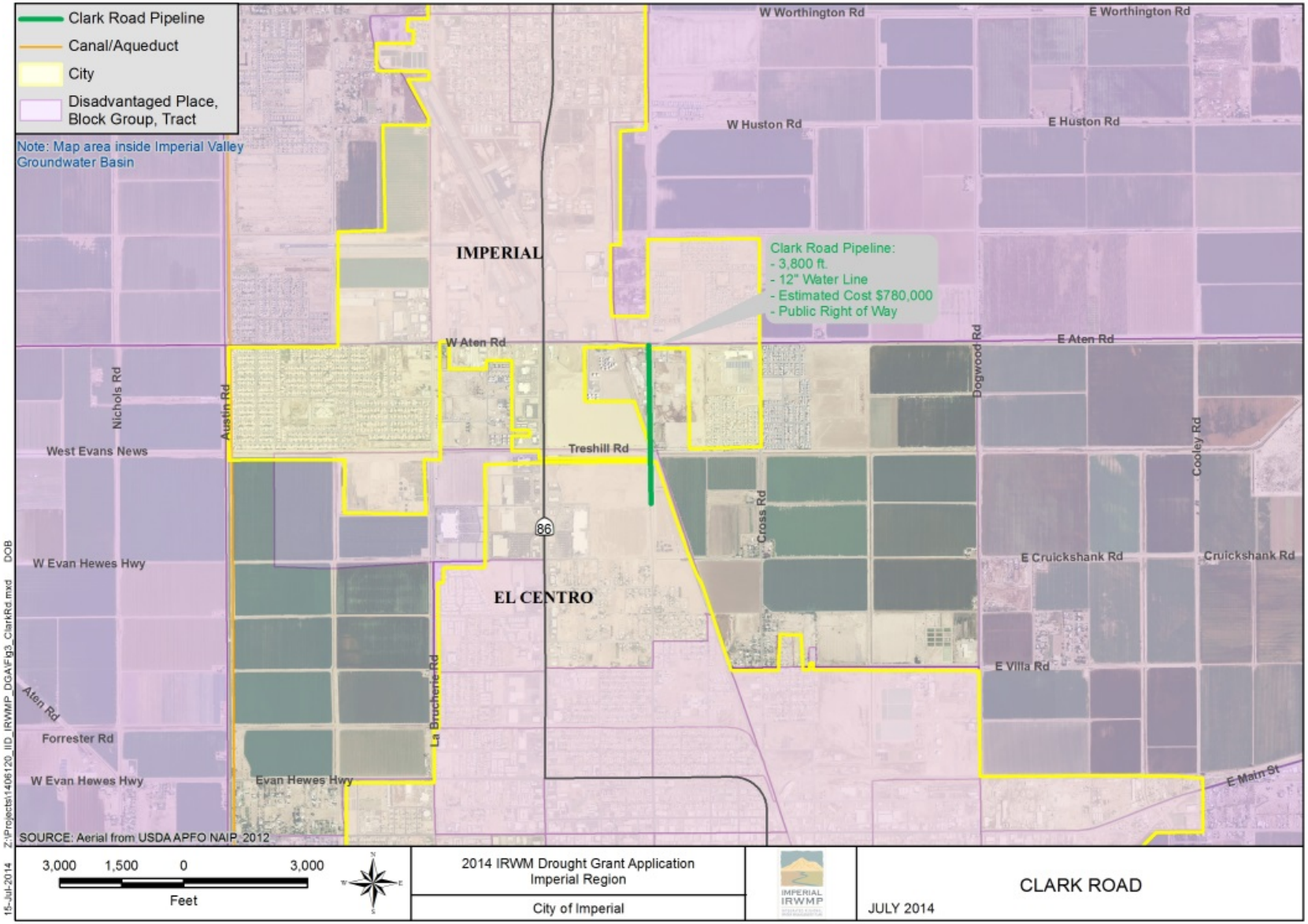

Figure 3-4. Clark Road Segment

3.2 Project Physical Benefits

The Intertie Project can achieve two quantifiable physical benefits, in addition to the DAC and Human Right to Water benefits. Because of the project size, the amount of physical benefit is small; but on a unitized basis (i.e., benefit units/dollars invested), the project is deemed cost-effective:

1. **Reduced Greenhouse Gases (GHG)** of needed emergency storage (i.e., best alternative to meeting State DPH requirements for second source of water supply) and related operations, including power usage of three independent systems causing increased power consumption as opposed to intertie projects with no additional power consumption. See **Table 3-2** for benefits**.**
2. **Saved water** from not having to flush water systems and temporary intertie pipelines for contamination removal during and after each emergency water supply event. See **Table 3-3** for benefits.

Table 3-2. Physical Benefit Number 1

Table 5 – Annual Project Physical Benefits **Project Name:** Intertie Projects between the City of El Centro, the City of Imperial, and the Heber Public Utilities District **Type of Benefit Claimed:** Reduced Greenhouse Gases (GHG) **Units of the Benefit Claimed:** metric tons of CO_2e emissions annually **Additional Information About this Benefit:** Project is best alternative to constructing independent redundancy in three water systems for emergency backup supplies.			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
50 Year Project Life	2,115	0.00	2,115
Comments: Assumes each agency builds 14 days of emergency storage (150 MG) to meet minimum daily demands (2015). Benefit is based on energy required to continuously move water through storage tank (enters at atmospheric pressure) and re-boost into distribution system to retain chlorine residual and to work mechanical equipment.			

Table 3-3. Physical Benefit Number 2

Table 5 – Annual Project Physical Benefits **Project Name:** Intertie Projects between the City of El Centro, the City of Imperial, and the Heber Public Utilities District **Type of Benefit Claimed:** Saved Water **Units of the Benefit Claimed:** Million Gallons (MG) Saved **Additional Information About this Benefit:** Saved water from not having to flush system for temporary pipelines and contamination to larger water distribution system.			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2014	0.00	0.00	0.00
2015	162.78	0.00	162.78
2025	262.72	0.00	262.72
2035	51.73	0.00	51.73
2045	162.78	0.00	162.78
2055	67.24	0.00	67.24
2065	132.56	0.00	132.56
Comments: "Without Project" assumes earthquake/flood mobilization of all intertie segments and flushing of each 1 out of every 10 years, and complete flushing of one sponsor's distribution system 1 out of every 10 years.			

3.3 Technical Analysis of Physical Benefits Claimed

3.3.1 Technical Basis of the Project

[**Technical Basis of Project:** If applicable, studies or documents supporting the projects are referenced (including specific page references). Documentation is included in **Exhibits 3.1** through **Exhibit 3.4**]

3.3.1.1 Background Information

The Imperial IRWM Region is characterized as being located in the southeast corner of Imperial County – bordered to the east by the crest of the Chocolate Mountains (which lie west of the Colorado River), to the west by San Diego County, to the north by the Coachella Valley IRWM boundary, the Salton Sea and Riverside County, and to the south by the U.S./Mexico international border. **Figure 3-1** shows the location of the Imperial Region, the region boundary, major Imperial Irrigation District (IID) water delivery infrastructure, and other geographical features.

The area, having an annual average rainfall of less than three inches a year, relies almost exclusively on imported Colorado River water. Given its dependency on Colorado River and not the State Water Project, Central Valley Project, groundwater, or other State water supplies, the definition of drought conditions differs from other California regions, and the types of solutions for achieving statewide benefit occur through different actions as explained in **Attachment 2 – Drought Impacts**.

At the local level, water supply constraints in the Imperial Region are categorized as either being financial or institutional. Financial constraints exist within each of the communities, with two of the three agencies being designated as Disadvantaged Communities (DACs), as shown in **Figure 3-1.** The Lead Constructing Agency is a DAC; as such, this project meets the criteria for state Proposition 84 funding as a Disadvantaged Community (DAC) by having incomes well below the State's DAC threshold of $48,706. **Attachment 8 – Disadvantaged Community Assistance** is included in the grant proposal since the Project addresses the needs of multiple DACs and Human Right to Water.

Local institutional constraints include the 2009 (revised October 2013) Regulations for the development of an Equitable Distribution Plan (EDP) that defines how IID will apportion water to its customers should demand be anticipated to exceed available supply. As written in the EDP, all urban demands are met in even the driest years; however, demands exceeding the reported forecast amounts are met at a much higher cost; thereby constraining DACs from exceeding the set EDP amounts.

Project benefits are directed at methods to ensure DAC water affordability under the EDP by controlling the amount of water needed to protect against frequent manmade and natural disasters.

3.3.1.2 Problem Identification[2]

The interconnection project between the City of El Centro and City of Imperial drinking water systems is identified as a regional project, included in the Imperial IRWM Plan Project List, to meet the goal of improving water quality by improving system interconnections and water distribution system improvements.

In 2012 the Heber Public Utility District (HPUD) water treatment plant was not producing potable water for a short time period. The time implications of the emergency were not readily available and HPUD and City of El Centro water system managers were looking at the option of a temporary interconnect. Ultimately, HPUD was able to bring the plant back online before stored water ran out and the emergency was averted. However in 2010 the region experienced a 7.2 earthquake and the damage from the earthquake demonstrated the need for a permanent alternative and reliable redundant water sources to be created for the region. As a result of the earthquake, many of Region's water treatment plants suffered damage ranging in severity. The City of El Centro had the roof of one 2.5 MG potable water tank ripped open which resulted in severe damage. The tank was taken out of operation, and the main power plant suffered damage. The City of El Centro had fortunately just completed a new water treatment plant upgrade that they were able to bring on-line to continue to provide water. While the City of El Centro has been able to divert a major disaster during these emergency situations, the proposed Intertie Project is absolutely imperative avoid these close calls, and to meet State DPH requirements for a second source of drinking water supply.

[2] Much of the Problem Identification was taken from the 2013 Proposition 84 Grant Proposal for same project (not-funded), with additional confirmation based on sponsoring agency input.

3.3.1 Recent and Historical Conditions - Natural and Manmade Catastrophic Events

Inherent with any water supply treatment and distribution system is the operational flexibility to withstand catastrophic events. These include natural events, such as floods, earthquakes, and tropical storms (high winds and rain) which the region is highly susceptible to with many past occurrences of each, some quite recent (see **Exhibit 3.1**). Manmade events include large fires (e.g., June 2014 naval aircraft accidents) creating significant fire-flow demands, and subsidence from lowered groundwater levels.[3] There is also the potential for chemical spills in upstream open canals conveying raw Colorado River water to the urban treatment plants. While the former may impact only one of the three sponsoring agencies, the latter could impact all three, dependent on where the spill occurs, and how quickly IID can react to the spill in rerouting and turning off flows to the urban turn-outs.

The City of El Centro's 2008 Master Plan (Carollo Engineers, February 2008) reads: "The City's water system is vulnerable to extreme emergencies such as earthquakes due to its single source of supply and additional remote storage is cost prohibitive..." This same statement can be made for each of the sponsoring agencies.

By far, the most likely catastrophic event with the possibility of impacting water treatment plants and distribution systems for an extended period of time is earthquakes. The Region overlies a series of earthquake faults as shown in **Figure 3-5**. A quote from the 1975 abstract, Earthquakes, Active Faults, and Geothermal Areas in the Imperial Valley, California, (Hill, Mowinckel, Peake, 1975) reads:

> *The Imperial Valley region in Southern California has sustained more moderate to small earthquakes than any other section along the San Andreas Fault system. (Published in Science journal, Page 1,306)*
>
> < http://saltonsea.ca.gov/pdfs/physical-geography/19750627_hill_c.pdf>

In addition, data collected on Imperial County (City-Data.com) states:

> *Imperial County-area historical earthquake activity is above California state average. It is 2,508% greater than the overall U.S. average. (Page 10)*
>
> <http://www.city-data.com/county/Imperial_County-CA.html#ixzz36ilteLSD>

[3] Groundwater is not used in this region but can be affected by agricultural irrigation and drainage activities.

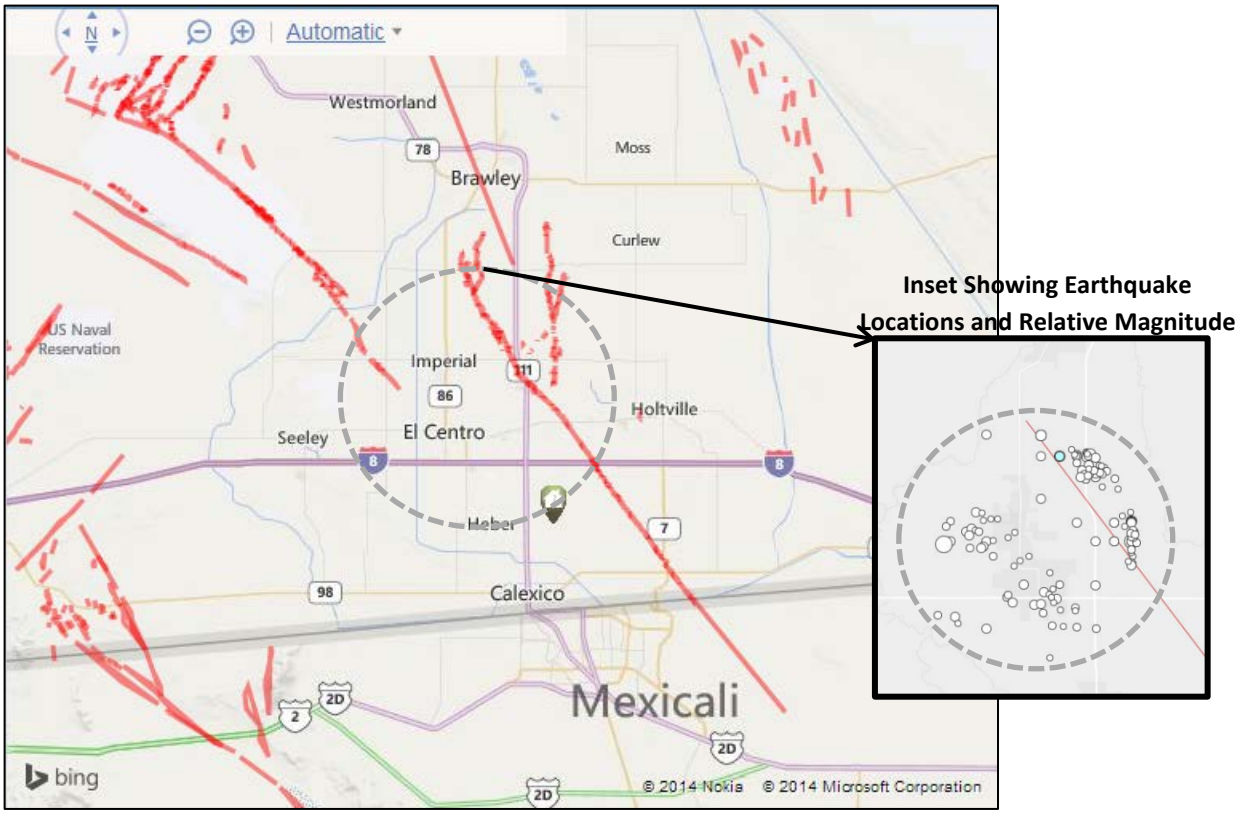

Figure 3-5. Locations of Earthquake Faults (Red Lines) in the Greater Imperial Region

Sources:

Homefacts,<http://www.homefacts.com/earthquakes/California/Imperial-County/Heber/ci37237224.html>.
Earthquake Hazards Program, <http://earthquake.usgs.gov/>.

Earthquake experts have identified a 99 percent chance of a major earthquake in a 30 year period. This comes from the following statement from the paper titled, *Water and the California Economy (*Public Policy Institute of California, *2012):*

> *California is earthquake-prone, and many parts of its water system are vulnerable to catastrophic supply disruptions. The U.S. Geological Survey predicts a 99 percent likelihood of a major earthquake (greater than 6.7 magnitude on the Richter scale) in the southern half of the state within the next three decades;* (Page 11)
>
> <http://www.ppic.org/content/pubs/report/R_512EHR.pdf>

Since 1975, the local Imperial Region has had over 137 earthquakes ranging in magnitude from 1 to 6.5 on the Richter scale as shown by the circles (i.e. size indicates relative magnitude) located in the inset figure in **Figure 3-5**. As recent as April 2010, the Imperial Region was struck with a 7.2 earthquake that resulted in significant damage to public water systems. In the past, the Imperial Region was devastated by earthquakes in 1916, 1940, and 1979. The 1940 earthquake caused substantial damage to irrigation systems over a wider area, with IID canals being breached in multiple locations. Water rationing became necessary in Brawley and in the City of Imperial during the period of rebuilding the broken infrastructure. The 1979 earthquake also damaged canals, particularly the All-American Canal that brings water to the

Imperial Region from the Colorado River. In all major earthquakes, water main breakages are commonly reported to have occurred, combined with gas main leaks. The chance of natural gas fueled fires without water for fire suppression increases the likelihood for loss of life and property. In-system redundancy allows for greater flexibility in rerouting flows around breakages to ensure adequate water quantity and pressure for fire protection, and safe drinking water.

3.3.2 Documented Benefits of Agency Collaboration

The benefits of intertie projects are best stated in the American Water Works Association (AWWA) funded paper, *National Inventory of Regional Collaboration Among Water and Wastewater Utilities* (Bielefeldt, Summers, & Relph, May 2012), which states:

> *Emergency planning and security is another area that utilities appear to have addressed efficiently via collaboration. In particular, arranging in advance for sharing of resources in the face of unexpected emergencies can be valuable…In some cases this includes infrastructure,* ***such as building pipelines to inter-tie systems****. In other cases, it is arranging for equipment sharing, loaning operator expertise, etc. (Page 7)*

And

> *…Emergency planning includes response to natural disasters like floods or earthquakes. Ways to meet these challenges can include enhancing physical security,* ***creating infrastructure (i.e. inter-tie pipelines between communities that could be used if a drinking water plant needed to be taken off-line),*** *and better communication and coordination. Utilities can also make plans to share specific equipment in the case of an emergency, which can save money because all utilities are not required to purchase their own equipment. (Page 26)*

<http://www.awwa.org/Portals/0/files/resources/resource%20dev%20groups/tech%20and%20educ%20program/documents/AWWAUtilityCollaborationFinalReport.pdf>

The Project need is based on making sure the urban areas of the Imperial Region have a safe and reliable water supply and meet minimum design requirements of a water supply system faced with the potential for a partial or complete shutdown of their water system. In keeping with the State's Resource Management Strategies, the Project provides for clean drinking water, while maximizing the operational efficiency of existing water systems in the Region.

3.3.3 Estimates of Without-Project Conditions

(e.g., levels of the physical benefits in the future, without the project, but with other projects that might be planned).

The physical benefits stated in **Table 3-2**, Reduced GHG Emissions, the expected emissions of GHG *without* the project are 2,115 metric tons annually. As stated in **Table 3-3**, Saved Water, the expected amount of water lost to flushing and intertie chlorination (i.e. *without* the project) is 39 million gallons over a 50 year time frame (**Table 3-3** Sum Column (d)).

Both claimed physical benefits increase as demands increase in the future. Other projects that are planned by the proposing agencies are (Imperial IRWMP, pages 12-14 thru 12-16):

1. City of Imperial
    a. Keystone Water Reclamation Facility
    b. Poe Colonia Wastewater Treatment Plant Upgrade
2. Heber Public Utilities District
    a. HPUD Wastewater Treatment Plant Upgrade to Tertiary Treatment
3. City of El Centro
    a. 10 Drainage Upgrade Projects
    b. 2 Water Distribution Storage Tanks, 5 MG Each

None of the listed projects above are similar in scope, size or purpose to the Intertie Project. Since the Intertie Project is an improvement directly for the benefit of existing customers, the financial constraints of the benefitting DACs make it cost prohibitive to build the project unless outside funding can be acquired. The planned water reclamation facilities and wastewater treatment plant upgrades would provide significantly larger water savings, as each would include a recycle/reuse benefit, the reduction of GHG emissions is unlikely and each project costs significantly (approximately 40 times) more than the cost of the Intertie Project. Alternately, the improvements to the water treatment plants and wastewater treatment plants do not alleviate the threat to local populations should an emergency occur and the plants be taken offline, or water mains being shut off, thereby limiting access to drinking water and fire protection.

Although the City of El Centro has smaller projects that include system reliability and water supply reliability, they only provide local benefits to the City of El Centro and are not considered of a regional benefit.

In-system storage is considered as the comparable alternative to the Intertie Project, either above or below ground, benefitting the three agencies. In-system storage reservoir(s) provide similar benefits, however, they are considered cost prohibitive[4] to size for regional catastrophic events for the respective agencies.

3.3.4 Description of methods used to estimate physical benefits

All stated benefits assume existing conditions (2015) based on project completion. No growth in demands or other system improvement is factored into the quantity calculations of either benefit listed.

For reduced GHG emissions, a calculation of the amount of energy required to run and operate an in-system storage reservoir(s) is used for estimating avoided GHG emissions. For design, each agency is treated separately based on storage reservoirs sized to meet 14 days of minimum daily demands (i.e., 70% of Average Daily Demands). The storage volumes used are based on calculations shown in **Table 3-4**.

[4] See Section 6.5.3.1 of City of El Centro Water Master Plan, Page 6-14 (**Exhibit 3.3**)

Table 3-4. In-System Storage Requirements

Sponsoring Agencies	Average Daily Demand (mgd)	Maximum Day Demand (mgd)	Minimum Daily Demand (mgd)	Required In-System Storage Volume (MG)[1]
City of El Centro	9.97	15.96	6.98	97.73
City of Imperial	3.29	5.26	2.30	32.24
Heber Public Utilities District	1.69	2.71	1.18	16.58
Totals	**14.95**	**23.93**	**10.47**	**146.55**

Notes:
[1] Large reservoir(s) to store 14 days of drinking water; likely built underground using concrete/steel structural design to withstand large earthquakes.

Energy consumption in operating 147 MG of in-system storage is based on industry practices to meet Title 22 Drinking Water Standards. Practices include boosting water pressure to move water to the storage reservoir, discharged at the top of tank to atmospheric pressure, and then re-boosted to system pressure to meet daily peak demands at design pressures. To ensure turnover and to maintain residual chlorine concentrations while minimizing disinfection byproducts (e.g. trihalomethanes), the storage would operate in a manner similar to other system storage.

Table 3-5. Calculation of GHG Emissions

Required In-System Storage Volume (MG)	Pumping Power Unit (avg from Z40 Energy Curt) (kWh/MGD)	kWh	Carbon Output (lbs/MWh)	lbs of Co2e emmisions per day	Metric tons Co2e per year
(a)	(b)	(c)	(d)	(e)	(g)
146.55	20.00	420	1,270.90	12,771.78	2,114.51

A total of 20 kWh/MG is assigned as the energy requirement to move water through a clearwell storage basin based on data from a similar distribution system (i.e., relatively flat topography with at-grade non-elevated storage tanks).[5] Assuming the total volume of storage is normally turned over once per week (7 days) to meet average to maximum day demands, the total energy requirement is calculated to be 420 kWh. Based on the Climate Change studies completed for the IRWM Plan (Imperial Water Forum, 2012), the carbon output is stated:

> *For 2008, IID reported an emissions factor of 1270.9 lbs of CO_2e/MWh of electrical energy generated (excluding exports) or purchased and used within the service area.* (Page 5-33) See **Exhibit 3.2**

[5] Full treatment and distribution of drinking water is estimated to be 800kWh/MG as per Imperial IRWM Plan, (Page 5-33). If project were to require additional water from IID sources, this energy requirement is met by hydropower, thereby offsetting carbon emissions. This project does not require additional water.

The total carbon output for 420 kWh is calculated to be **2,115 metric tons annually** of CO_2e emissions. This benefit is assumed to occur every year over the life of the project.

For Saved Water, physical benefits are based on the premise of a reduction in wasted water for flushing and super chlorinating temporary interties, and repeated flushing of water distribution systems after an emergency event causing contamination. The frequency of natural disasters requiring the mobilization of the temporary interties is based on 1 event occurring every 10 years, based on the number of major (>6.0 magnitude[6]) earthquakes occurring since 1940. The frequency for major flooding is estimated to be slightly higher with greater than five (5) emergency flood events in the last 20 years (i.e. 1 heavy storm every 4 years); however, for purposes of establishing physical benefit, the likelihood of a complete system failure requiring multiple flushing procedures is more likely to occur from a major earthquake due to loss in system pressures allowing high groundwater and other contaminants to enter drinking water system.

Without the Intertie Project, temporary interties are assumed to be setup by the City of El Centro, requiring mobilization, overland installation, and four (4) complete flushing cycles prior to system connection.[7] The total volume of water for the three interties[8] is calculated as 0.04 MG, multiplied times 4 flushes equals 0.18 MG of water discharged to wastewater treatment plants. After a jeopardized water system(s) is fixed, the City of El Centro removes the temporary interties, and the affected agency(s) flushes its complete system up to ten (10) times to ensure minimum chlorine residuals and to remove detectable contaminants.

> *The flushing and sanitizing of a drinking water system begins at the treatment plant and proceeds systematically outward to all ends of the distribution system. Proper flushing, sanitation, and bacteriological testing are required prior to lifting a boil-water advisory.* **(Exhibit 3.4)**

Without the Intertie Project, contamination throughout the distribution system occurs, requiring a full water system flush procedure, including storage reservoirs. The volume of water in MG is calculated based on the size of the water system and the amount of storage. The water system volume is based on the modeling system inventory presented in the 2008 City of El Centro Water Master Plan (Table 5.1, Page 5-5, **Exhibit 3.3**) for pipelines. The total distribution system volume (storage reservoirs included separately) of 4.53 MG is divided by the total population of 51,406 to obtain a MG/capita of distribution system volume of 88 gallons/capita. Since the three sponsors are relatively close in population densities, this unit volume factor is applied to the population of all sponsors to calculate their respective distribution system volumes as shown in **Table 3-6**. Published (i.e., master plans, UWMPs, websites) storage reservoir amounts are then added to obtain the total volume of water required for flushing of each system.

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[6] See <http://www.city-data.com/county/Imperial_County-CA.html> for recorded events. **Exhibit 3.1** Earthquake magnitude is considered to be arbitrary since type and location of the earthquake greatly influence damage incurred.

[7] The exact number of times of flushing depends on the level of contamination and how many cycles are necessary to achieve drinking water quality standards. See **Exhibit 3.4** on procedures for flushing. Depending on the water system operators, flushing procedures vary, especially if customers are educated and understanding of a boil-water advisory and the necessity to drink bottled water for extended periods.

[8] All three interties are needed to share water across all three agencies in times of disaster.

The emergency disaster scenario assumes only one of the three systems becomes contaminated once every ten (10) years. This assumption is reflected in the changing 10-year physical benefits, and is the result of the assumed round-robin methodology between the agencies.

Table 3-6. System Volume Estimates

Sponsoring Agencies	Population for 2015[1]	Distribution System Volume[2] (MG)	In-System Storage as Published in Reports	Total Volume Requiring Flushing	One-Sixth of System Volume[3] (MG)
City of El Centro	51,406	4.53	15	19.53	3.26
City of Imperial	14,956	1.32	6.75	8.07	1.34
Heber PUD	8,019	0.71	5.5	6.21	1.03

Notes:

[1] Population estimates based on Table 5-12 of Imperial IRWM Plan (Water Forum, 2012)
[2] System Volume is based on 88 gallons of system volume per capita, not including storage.
[3] Assumes only one-sixth of the system volume becomes contaminated with Intertie Project operational.[9]

With the Intertie Project, the benefit is calculated by reducing the total flushing requirements as follows:

1. No extra-ordinary flushing is required for intertie pipelines and fittings, saving 0.85 MG over the life of the project.
2. The affected area of an agency's distribution system is reduced to one-sixth[9] of the system's volume, saving 840 MG (2,578 AF) over the life of the project, or, if spread uniformly over the 50-year project life, 17 MG/year.

3.3.5 Identification of all new facilities, policies, and actions required to obtain the physical benefits

The Intertie Project facilities are listed in **Table 3-7**. No additional policies or actions are required beyond the inter-agency agreement to establish charges based on stand-by and metered water amounts occurring through the interties. The City of El Centro is assumed to benefit from each of the intertie locations.

3.3.6 Description of any potential adverse physical effects

No adverse physical effects occur as a result of the Intertie Project.

[9] Flush volume is reduced because of the time difference in implementing the intertie connections (i.e., temporary intertie takes over 24 hours to construct and activate; whereas permanent intertie can be turned on immediately after notification of a contamination event).

Table 3-7. Project Facilities List

Benefitting Sponsoring Agencies/Location	Construction Items	Number of Units	Units
Pipelines			
Imperial -N.L. Brucherie	12"	1,900	LF
Imperial - N. 8th\Clark	12"	3,700	LF
Imperial - N. 8th\Clark	12" Trenchless	100	LF
Heber - Legacy	12"	320	LF
Valves			
All	12 inch Positive Lock Valves	3	each
Meters			
All	Bidirectional Flow Meter	3	each

3.1 COST EFFECTIVENESS ANALYSIS (USE TABLE 6)

Table 3-8. Cost Effective Analysis

Table 6 – Cost Effective Analysis **Project name:** Intertie Projects between the City of El Centro, the City of Imperial, and the Heber Public Utilities District	
Question 1	**Types of benefits provided as shown in Table 5** Reduced GHG, CO_2e emissions Reduced water use from and having to flush three independent water systems and temporary interties Secondary Qualitative Benefits: - Protects Human Health and Safety during water system failure or contamination - Provides System Redundancy and Reliability - Meets State Department of Public Health (DPH) water system requirements of having a second source of supply with largest source off-line. - Provides multiple interties to account for the uncertainty of earthquake/flooding damage; thereby, reducing risk. - Decreases potential loss of life and property in an earthquake (or aircraft crash) event by providing fire flow pressures when most likely needed.
Question 2	**Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified?** Yes
	If no, why? N/A
	If yes, list the methods (including the proposed project) and estimated costs. Construction costs of required in-system storage capacity (147 MG) to serve as an in-system regional second source and catastrophic back-up supply is estimated to be over $100M.[10]

[10] This estimate is highly variable depending on the size, type, and location of storage reservoir(s). The range could be anywhere from $100M to greater than $150M, allowing for economies of scale in constructing a larger regional reservoir. The El Centro Water System Master Plan assumes $1/gallon of needed storage (Table 8.6) for construction cost estimating purposes only, not including engineering and other contingencies.

Table 6 – Cost Effective Analysis	
	Additional water treatment capacity for the three sponsoring agencies was also considered as a means to increase reliability, but dismissed as an alternative because the system would not meet above stated DPH requirements for in-system storage. The $1.4M cost for the Intertie Project is much lower in cost than any comparable alternative and results in an estimated water savings at a unit cost of only $540/AF over the 50-year life of the project.
Question 3	**If the proposed project is not the least cost alternative, why is it the preferred alternative? Provide an explanation of any accomplishments of the proposed project that are different from the alternative project or methods.** The Intertie Project is the least cost alternative.
Comments: Given the urgency in completing the project for purposes of catastrophic system failures, the Intertie Project has the shortest timeline for implementation (one year implementation). In addition, larger project alternatives create the need for additional growth (demands) to pay for long term capital costs, monthly maintenance and operations costs, and likely higher costs for raw water. While growth is not discouraged, this region of California currently suffers from attrition, not growth, and likely could not sustain the resulting payback for bonded indebtedness.	