Financial Capability Assessment for the Huachuca City Wastewater Ponds Environmental Assessment, Alternative #3

Prepared for

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1 Background

A draft environmental assessment (EA) was prepared to evaluate the potential impacts of the proposed construction and operation of a new municipal wastewater holding pond and a sewer force main to convey untreated wastewater from the Town of Huachuca City (Huachuca City) to Fort Huachuca's Wastewater Treatment Plant (WWTP). As part of the EA, alternative #3 was considered, which involves replacing the current wastewater treatment facilities with a wastewater treatment plant (WWTP) that would meet the current and future needs of Huachuca City (USEPA, 2010).

The draft EA included a cost estimate of $7.5 million in capital costs and $772,000 in operation and maintenance costs based on costs incurred by the nearby City of Bisbee's recently constructed WWTP (USEPA, 2010). Comments on the draft EA expressed concern that the Bisbee WWTP overestimated the potential cost of the Huachuca City WWTP replacement. To support the response to these comments, a revised cost estimate for Alternative #3 is provided in this technical memorandum.

In addition to the revised cost estimate, a financial capability assessment is provided based on the guidelines in USEPA (1997). These guidelines were originally developed to assess the financial burden that WWTP upgrades and CSO controls would place on communities and to determine the appropriate implementation schedule for these facilities based on a community's financial capability. The guidelines are broad in scope and provide an objective means of assessing Huachuca City's financial capability beyond the consideration of cost estimates alone.

It was assumed that Alternative #3 would involve full replacement of the existing Huachuca City wastewater treatment facilities and that the replacement WWTP would accommodate 100 gallons per capita per day of sewage. The plant was assumed to require a capacity of 0.36 million gallons per day (MGD) based on the 2050 population projection of 3,600. Costs for the current plant capacity were also considered in this technical memorandum for reference purposes. Another important consideration was that a USEPA grant is anticipated to fund 55 percent of Huachuca City's WWTP costs (USEPA, 2010).

Cost estimate methods and results are discussed in Section 2. Sections 3 and 4 present the financial capability assessment as it is outlined in the USEPA (1997) guidelines. The financial capability assessment methods are divided into two phases. The first phase, addressed by Section 3, involves calculating a residential indicator that provides a measure of the burden the WWTP investment would place on the community's residents. The second phase, addressed by Section 4, involves the calculation of several financial indicators that help determine a permittee's ability to finance the WWTP improvements. Huachuca City is considered the permittee in this assessment.

The assessment methods involve entering data into 10 worksheets and then interpreting the data into scores using the USEPA (1997) criteria. The data used encompass financial information about Huachuca City and other local entities as well as socioeconomic information about the community. Results of the analysis are discussed in Section 5.

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2 Cost Estimates

Tetra Tech estimated the capital, operation and maintenance, and debt costs for the Alternative #3 replacement WWTP. The following sections describe the methods used to derive the cost estimates.

2.1 CAPITAL COSTS

Capital costs for a replacement WWTP for Huachuca City were estimated by comparing estimates using several different methods, including:

- Modeling using CapdetWorks (Hydromantis, Inc. Consulting Engineers) software for the design and cost estimation of wastewater treatment plants.
- Calculations based on New Mexico Environmental Finance Center (2007).
- Per-gallon costs for comparable local facilities.

In all cases, it was assumed that the existing treatment plant at Huachuca City would require nearly complete replacement in order to meet the State of Arizona's current wastewater treatment regulations. Specifically, R18-9-A211 of the Arizona Administrative Code (AAC), states that a significant amendment to an individual permit will be required if a physical change in the facility results in an increased design flow of 10 percent or greater in systems with a permitted design flow of 500,000 gallons per day (gpd) or less. This would be the case for Huachuca City in an expansion to a design flow of 360,000 gpd. R18-9-B206 of the AAC indicates that such an expansion would need to meet the best available demonstrated control technology (BADCT) requirements of a new facility, which is defined in R18-9-B204 of the AAC and includes effluent treatment standards for BOD5 and TSS, along with a 10 mg/L total nitrogen requirement, and pathogen requirements that necessitate an effective disinfection process. This rule specifically states that:

Secondary treatment by waste stabilization ponds is not considered BADCT unless an applicant demonstrates to the Department that site-specific hydrologic and geologic characteristics and other environmental factors are sufficient to justify secondary treatment by waste stabilization ponds.

Given these requirements (particularly the nitrogen and pathogen removal requirements) and the function of the existing treatment processes at Huachuca City, it was assumed that all significant unit processes at the plant would be replaced. This understanding of the AAC requirements was confirmed by contacting Arizona's Aquifer Protection Permitting program (B. Manley, Arizona Aquifer Protection Permitting Program, personal communication to Vic D'Amato, February 2011).

This understanding is also corroborated by the types of systems that have been installed in the area in recent years, including a contact stabilization activated sludge system in Patagonia and a sequencing batch reactor (SBR) system in Bisbee. It was assumed that similar activated sludge-type systems with dedicated nitrogen removal and effective disinfection processes would be required for Huachuca City. It was also assumed that residuals from the plant would be aerobically digested and then dewatered in drying beds prior to landfilling. This is a relatively straightforward processing sequence for wastewater residuals, particularly in small town settings.

It was further assumed that all collection treatment system components would be the same for a replacement plant as for the proposed action in the EA. Accordingly, all costs estimated were specific to the treatment plant itself.

CapdetWorks Modeling

CapdetWorks is established software used to model wastewater treatment processes and produce accurate and rapid preliminary capital and recurring cost estimates. Three different treatment layouts were modeled for two different design flows (existing and future). Common to each treatment layout were the following unit processes (in order of sequence):

- Preliminary treatment (rough screening, grit, and grease removal)
- Primary clarification (only for the BNR process option)
- Biological treatment (the specific process was varied for the three layouts) and secondary clarification
- Tertiary filtration
- Ultraviolet disinfection
- Post-aeration (free cascade type)

The biological treatment unit was varied between the three processes as follows:

- Biological nutrient removal (BNR)
- Oxidation ditch (the primary clarifier was removed for this option)
- Package plant (the primary clarifier was removed for this option)

As previously indicated, the presumed biosolids treatment train, which was kept constant for all three process alternatives, consisted of the following unit processes:

- Aerobic digestion
- Drying beds
- Hauling and landfilling

These three process options, BNR, Oxidation Ditch, and Package Plant were simulated at two different design flows:

1. 0.19 MGD design flow (current)
2. 0.36 MGD design flow (future)

The results of these analyses are presented in Table 1.

Table 1. Summary of CapdetWorks Model Output

Process Option	0.19 MGD	0.36 MGD
BNR	$3,380,000	$4,270,000
Oxidation Ditch	$2,970,000	$3,800,000
Package Plant	$3,510,000	$4,520,000
Average	**$3,286,667**	**$4,196,667**

Cost Estimating Guide

New Mexico Environmental Finance Center (2007) provides a simple calculation for a rough estimation of costs for new wastewater systems. For systems under 1 MGD, the Guide recommends a range of costs of $7.03 to $11.24 per gallon per day (gpd) design capacity. The $11.24/gpd cost was determined to be most realistic, based on best professional judgment, and thus was used to estimate a capital cost of $2.16 million for a 0.19 MGD plant replacement and $4.05 million for a 0.36 MGD plant replacement.

Comparable Local Facilities

The Town of Patagonia, AZ WWTP was used as a reasonable comparable local wastewater treatment plant. In EPA (2010), the Bisbee, AZ WWTP costs were used to estimate the projected costs for Alternative #3. Tetra Tech considered the use of both plants and determined, with confirmation from USEPA Region IX, that the Town of Patagonia treatment plant was more applicable as the type of system was more representative of the expected design for Huachuca City (T. Konner, US EPA Region IX, personal communication to V. D'Amato, February 2011).

The Patagonia WWTP is a 0.11 MGD contact stabilization activated sludge package plant that was installed in 2004. The wastewater treatment plant portion of the project cost approximately $1.3M (additional monies were spent to upgrade the town's wastewater collection and conveyance system), yielding a per-gallon cost of approximately $11.82/gpd design capacity (R. van Zandt, Town of Patagonia WWTP, personal communication to V. D'Amato, February 2011). Prorated for Huachuca City, comparable costs would be $2.27 million for a 0.19 MGD plant and $4.26 million for a 0.36 MGD plant.

Summary of Probable Costs

Capital costs for a replacement plant for Huachuca City were estimated by averaging costs across the three cost estimation methods as indicated in Table 2. Although the data used to develop these costs is slightly outdated (2004 in the case of Patagonia and 2007 in the case of the Guide and the CapdetWorks cost dataset), we believe the average costs indicated in Table 2 are reasonably representative of probable costs for Huachuca City. Certain line items (such as land acquisition) inherent in the estimates in Table 2 may actually not be relevant for a replacement plant in Huachuca City, thus slightly inflating the numbers which should make up for any minor errors resulting from not correcting for inflation. The anticipated cost to Huachuca City (minus the anticipated 55 percent grant) is also included in Table 2, and this value is used as the capital cost to determine debt payments for the financial capability assessment.

Table 2. Summary of Cost Estimates

Cost Estimation Method	0.19 MGD	0.36 MGD
CapdetWorks Model	$3,290,000	$4,200,000
Cost Estimation Guide	$2,160,000	$4,050,000
Comparable Plants	$2,270,000	$4,260,000
Average	$2,570,000	$4,170,000
Anticipated USEPA Grant	$1,413,500	$2,293,500
Anticipated Cost to Huachuca City	**$1,156,500**	**$1,876,500**

2.2 OPERATION AND MAINTENANCE COSTS

Operation and maintenance costs for comparable local plants were not available. The CapdetWorks software introduced in Section 2.1 was used to estimate operation and maintenance (O&M) costs. CapdetWorks model runs (averaged over the potential treatment process options as indicated in Section 2.1) resulted in operational costs of approximately $230,000 per year for the 0.19 MGD plant and $300,000 per year for the 0.36 MGD plant. If the 0.36 MGD plant were operated for the current population, the O&M costs are estimated as approximately $230,000 per year. Operational costs in the CapdetWorks model are comprehensive and include breakdowns for "operation," "maintenance," "material," "chemical," and "energy."

2.3 ANNUAL DEBT PAYMENTS

To finance the capital costs of the replacement WWTP, it was assumed that Huachuca City would obtain a 20-year loan through a municipal bond. Average market interest rates for AAA-rated bonds at the time of this analysis were approximately 4.5 percent (Edward Jones, 2011). This interest rate was used to approximate the annual debt payments for the replacement WWTP. It is possible that Huachuca City could obtain a reduced rate through the Arizona's state revolving fund. These assumptions result in annual debt payment estimates of $89,100 for the 0.19 MGD capacity and $144,571 for the 0.36 MGD capacity.

3 Financial Capability Phase 1: The Residential Indicator

The first phase of the financial capability assessment involves calculating a residential indicator that provides a measure of the burden that the WWTP investment would place on the community's residents. The tables in this section are organized to match the tables in USEPA (1997), including the specified line numbers. Worksheet 1 calculates the cost per household as an interim step, and Worksheet 2 calculates the residential indicator score.

3.1 COST PER HOUSEHOLD

Worksheet 1 involves estimating the projected annual cost per household for the potential WWTP replacement. Table 3 provides the inputs and results of this calculation for two WWTP capacities: 0.19 MGD and 0.36 MGD. The current wastewater treatment costs (WWT) costs represent the current annual costs for the Huachuca City WWTP as documented in USEPA (2010). The projected increase in annual costs is shown next and represents the estimated future annual costs from Section 2 minus the current annual costs. The operation and maintenance costs for the larger flow reflect the costs for the year the plant is built versus the costs at buildout.

To calculate the cost per household, the residential portion of the projected WWTP costs is divided by the number of households. Since sanitary sewer use is not metered in Huachuca City, the residential share of WWTP costs was estimated using the residential water use as a percent of total water use: 94.7 percent (R. Armstrong, Huachuca City, personal communication to H. Fisher, January 26, 2011). The total number of households reflects the latest estimate from the U.S. Census Bureau for the period 2005-2009: 793 households (USCB, 2009). The resulting cost per household ranges from about $381 to $447 depending on the plant capacity (Table 3).

Table 3. Worksheet 1: Cost Per Household

Element	0.19 MGD Plant	0.36 MGD Plant	Line Number	Source
Current WWT Costs				
Annual Operations and Maintenance Expenses (Excluding Depreciation)	$69,000	NA	100	USEPA (2010)
Annual Debt Service (Principal and Interest)	0	NA	101	
Subtotal (Line 100 + Line 101)	$69,000	NA	102	
Projected Increase in WWT and CSO Costs (Current Dollars)				
Estimated Annual Operations and Maintenance Expenses (Excluding Depreciation)	$161,000	$230,000	103	See Section 2

Element	0.19 MGD Plant	0.36 MGD Plant	Line Number	Source
Annual Debt Service (Principal and Interest)	$89,100	$144,571	104	Assumes 20-year loan, interest rate of 4.5%, capital costs estimated in Section 2
Subtotal (Line 103 + Line 104)	$250,100	$374,571	105	3.1.1
Total Current and Projected WWT and CSO Costs (Line 102 + Line 105)	$319,100	$374,571	106	
Residential Share of Total WWT and CSO Costs	$302,188	$354,719	107	Based on percent of water usage that is residential (94.7%)
Total Number of Households in Service Area	793	793	108	USCB (2009)
Cost Per Household (Line 107 / Line 108)	$381	$447	109	

3.2 RESIDENTIAL INDICATOR

Worksheet 2 outlines the calculation of the residential indicator, which provides a measurement of the debt burden on the residential sector. The median household income (MHI) is $39,020 according to the latest estimate from the U.S. Census Bureau for the period 2005-2009 (USCB, 2009). This was adjusted to 2011 dollars assuming an inflation rate of 2 percent (BLS, 2011). The residential indicator is calculated by dividing the annual WWT costs per household (Line 109 in Table 4) by the Adjusted MHI.

The resulting indicator ranged from 0.94 to 1.10 depending on the plant capacity (Table 4). USEPA (1997) classifies this level as having a low to mid-range financial impact on residential users. This indicator will be used in the final step to determine overall financial capability.

Table 4. Worksheet 2: Residential Indicator

Element	0.19 MGD plant	0.36 MGD plant	Line Number	Source
Census Year MHI	$39,020	$39,020	201	USCB (2009)
MHI Adjustment Factor	1.04	1.04	202	Based on an inflation rate of 2% from BLS (2011)
Adjusted MHI (Line 201 x Line 202)	$40,596	$40,596	203	
Annual WWT and CSO Control Cost per Household (CPH) (Line 109)	$340	$381	204	

Element	0.19 MGD plant	0.36 MGD plant	Line Number	Source
Residential Indicator: Annual Wastewater and CSO Control Costs per Household as a percent of Adjusted Median Household Income (CPH as % MHI) (Line 204 / Line 203 x 100)	0.94	1.10	205	

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4 Financial Capability Phase 2: Permittee Financial Indicators

The second phase, addressed by Section 4, involves the calculation of several financial indicators that help determine a permittee's ability to finance the WWT improvements. The tables in this section are organized to match the tables in USEPA (1997), including the specified line numbers. USEPA (1997) assigns scores from 1 to 3 for the indicator values, with 1 representing weak financial capability, 2 representing mid-range capability, and 3 representing strong capability. The input data, calculations, and resulting scores are provided for each indicator in the sections below.

4.1 DEBT INDICATORS

Worksheets 3 and 4 provide information on a community's current debt burdens and ability to issue new debt (USEPA, 1997). Huachuca City does not currently hold any general obligation debt, and, therefore, no bond rating is available (R. Armstrong, Huachuca City, personal communication to H. Fisher, January 25, 2011). No entity (County, school district, etc.) levying taxes within Huachuca City holds general obligation debt (B. Pyles, Cochise County Treasurer's Office, personal communication to H. Fisher, February 9, 2011). Therefore, Worksheet 3 (Bond Rating) is not applicable and Line 405 (Overall Net Debt as a Percent of Full Market Property Value) is zero. This results in a strong rating (score of 3) for this indicator.

4.2 SOCIOECONOMIC INDICATORS

Two socioeconomic indicators are used for the financial capability assessment: Unemployment Rate and Median Household Income. Worksheet 5 compares the community's unemployment rate to the national average (Table 5). The county rate is included for reference. Since the unemployment rate is more than one percent above the national average, Huachuca City receives a weak rating (score of 1) for this indicator.

Table 5. Worksheet 5: Unemployment Rate

Element	Value	Line Number	Source
Unemployment Rate - Huachuca City	9.0%	501	USCB (2009)
Unemployment Rate – Cochise County	7.4%	502	USCB (2009)
Benchmark:			
Average National Unemployment Rate	7.2%	503	USCB (2009)

Similarly, worksheet 6 compares the community's median household income to the national average (Table 6). Huachuca City is within 25 percent of the national average and, therefore, receives a mid-range rating (score of 2) for this indicator.

Table 6. Worksheet 6: Median Household Income

Element	Value	Line Number
Median Household Income - Permittee (Line 203)	$40,596	601
Benchmark:		
Census Year National MHI (USCB, 2009)	$43,304	602
MHI Adjustment Factor (line 202)	1.04	603
Adjusted National MHI (line 602 x line 603)	$45,053	604

4.3 FINANCIAL MANAGEMENT INDICATORS

The financial capability assessment involves two financial management indicators: property tax revenue as a percent of full market value of real property and property tax revenue collection rate. The first indicator is calculated by dividing property tax revenues by the full market value of real property and multiplying by 100 (Worksheet 7; Table 7).

The full market value of real property in Huachuca City as of February 2010 was $77,310,536 (J. Christopherson, AZ Department of Revenue, personal communication to H. Fisher, January 14, 2011). The property tax revenue in fiscal year 2009-2010 was $69,177 (R. Armstrong, Huachuca City, personal communication to H. Fisher, January 25, 2011). The property tax revenue as a percent of full market property value is 0.09, which results in a strong rating (score of 3) for this indicator.

Table 7. Worksheet 7: Property Tax Revenues as a Percent of Full Market Property Value

Element	Value	Line Number
Full Market Value of Real Property	$77,310,536	701
Property Tax Revenues	$69,177	702
Property Tax Revenue as a Percent of Full Market Property Value (702/701 X 100)	0.09	703

In fiscal year 2009-2010, $69,177 in property taxes were collected and $70,999 in property taxes were levied, resulting in a property tax revenue collection rate of 97 percent (Table 8; R. Armstrong, Huachuca City, personal communication to H. Fisher, January 25, 2011). Huachuca City receives a mid-range rating (score of 2) for this indicator because the collection rate is between 94 and 98 percent.

Table 8. Worksheet 8: Property Tax Revenue Collection Rate

Element	Value	Line Number
Property Tax Revenue Collected (Line 702)	$69,177	801
Property Taxes Levied	$70,999	802
Property Tax Revenue Collection Rate (Line 801/ Line 802 X 100)	97	803

4.4 PERMITTEE FINANCIAL CAPABILITY INDICATORS

Worksheet 9 compiles the individual financial capability indicators and scores into one table and computes the Permittee Indicators Score by summing the individual scores and dividing by the number of indicators (Table 9). The resulting score for Huachuca City is 2.2.

Table 9. Worksheet 9: Summary of Permittee Financial Capability Indicators

Indicator	Column A: Actual Value	Column B: Score	Line Number
Bond Rating (Line 303)	NA	NA	901
Overall Net Debt as a Percent of Full Market Property Value (line 405)	$0	3	902
Unemployment Rate (Line 501)	9.0%	1	903
Median Household Income (Line 601)	$40,596	2	904
Property Tax Revenue as a Percent of Full market Property Value (Line 703)	0.09	3	905
Property Tax Revenue Collection Rate (Line 803)	97.43	2	906
Permittee Indicators Score (Sum of Column B/ Number of Entries)		2.2	907

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5 Results

The permittee financial capability indicator scores and the residential indicator score are compared to the financial capability matrix (Table 10) to determine the potential financial burden imposed by the WWTP replacement. Worksheet 10 summarizes the indicator scores and the matrix rating (Table 11). For Huachuca City, the matrix indicates that the 0.19 MGD WWTP replacement is likely to impose a "Low Burden" and the 0.36 MGD WWTP replacement is likely to impose a "Medium Burden" on the town and its community. Since the 0.36 MGD flow is most relevant to alternative #3, the results indicate that alternative #3 may impose some degree of financial burden on Huachuca City and its residents.

Table 10. Financial Capability Matrix

Permittee Financial Capability indicators Score (Socioeconomic, Debt, and Financial Indicators)	Residential Indicator (Cost Per Household as a % of MHI)		
	Low (Below 1.0%)	Mid-Range (Between 1.0 and 2.0%)	High (Above 2.0%)
Weak (Below 1.5)	Medium Burden	High Burden	High Burden
Mid-Range (Between 1.5 and 2.5)	Low Burden	Medium Burden	High Burden
Strong (Above 2.5)	Low Burden	Low Burden	Medium Burden

Table 11. Worksheet 10: Financial Capability Matrix Score

Element	Value	Line Number
Residential Indicator Score (Line 205)	0.9 – 1.1[1]	1001
Permittee Financial Capability Indicators Score (Line 907)	2.2	1002
Financial Capability Matrix Category (see matrix next page)	Low to Medium Burden[1]	1003

[1]Low end of range represents the 0.19 MGD capacity and the high end represents the 0.36 MGD capacity.

This assessment methodology was originally developed to determine a reasonable implementation schedule for WWTP upgrades and Combined Sewer Overflow (CSO) controls imposed by USEPA. A rating of "Low Burden" represents the recommendations to follow a normal engineering/construction timeframe. Ratings of "Medium" and "High" burden suggest recommendations to provide up to 10 and up to 15 year implementation timeframes respectively. Although Huachuca City is not implementing CSO controls, this interpretation provides a perspective of the magnitude of financial burden that would be placed on the community if the replacement WWTP were pursued.

A discussion of the individual financial capability indicators provides additional perspective on Huachuca City's financial capability. These indicators tend to fall within the mid-range or strong capability categories. The unemployment indicator represents the only score in the weak category. If one of the indicators decreased in score by one point, the overall rating for the 0.36 MGD WWTP would still remain within the range of the "Medium Burden" category, indicating that the results would not change significantly unless major changes occurred to the town's financial and socio-economic status.

To further investigate the sensitivity of the results, the assessment was re-run with the full costs of the replacement WWTP instead of subtracting the anticipated 55 percent funding by a USEPA grant. This assumption resulted in a rating of "Medium Burden" for both plant capacities, indicating that the results of the financial capability assessment would not change significantly if the costs were approximately doubled.

This assessment provides a tool for assessing potential financial burden. However, the ratings are not absolute, and the indicators used only represent a subset of available financial and economic indicators. Care should be taken in using this information for decision-making purposes without consulting other information on the community's financial capabilities. Cost estimates provided in this assessment are considered reasonable for planning purposes but do not anticipate changes in permit requirements or other circumstances that may increase the cost of a replacement WWTP.

6 References

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