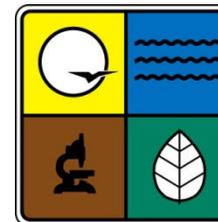


# Affordability & CapDet

Water Protection Forum, February 2014

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**MISSOURI**  
**DEPARTMENT OF**  
**NATURAL RESOURCES**

## The Nature of Affordability

- Memorandum – September 12, 2011
  - Consistent with Section 644.145, RSMo
  - Any upgrades or improvements
  - The affordability analysis will influence derivation of the schedule of compliance
  - Does not determine whether or not an upgrade will be required.
  - The affordability analysis does not take place of a Factor 6 UAA.

## **Water Pollution Section 644.145, RSMo**

- When issuing permits with a new requirement for discharges from:
  - Publicly owned combined or separate sanitary
  - Storm sewer system
  - Treatment works
- When enforcing provisions of this chapter and the Federal Water pollution Control Act, 33 U.S.C 1251, et seq., pertaining to any portion of:
  - Publicly owned combined or separate sanitary
  - Storm sewer system
  - Treatment works

## **Water Pollution Section 644.145, RSMo**

MDNR shall NOT be required under this section to make a finding of affordability when:

- Issuing collection system extension permits
- Issuing NPDES operating permit renewals which include no new environmental requirements
- The applicant waives the requirement
  - The community must be greater than 3,300 residents

## **Water Pollution Section 644.145, RSMo**

- Definitions when used in this chapter:
  - Affordability – with respect to payment of a utility bill, a measure of whether an individual customer can pay the bill without undue hardship
  - Financial Capability – the capability of a community to make investments necessary to make water quality related improvements

## **Opportunity to Provide DNR with Data**

- Welcome Letter

## **Opportunity to Review a Draft Affordability Finding**

- 15 Day Preview
- 30 Day Public Notice period

## **Water Pollution Section 644.145, RSMo**

- Prescriptive formulas and measures used in determining financial capability should not be the only indicator
  - Do not use the Median Household Income as the only indicator
  - Prescriptive formulas shall be viewed in the context of other economic conditions
- If MDNR fails to make a finding of affordability, then the resulting permit or decision shall be null or unenforceable
- MDNR's findings under this section may be appealed to the commission per 644.051, RSMo

## **Water Pollution Section 644.145, RSMo**

The affordability finding shall be based on the following criteria:

1. A community's financial capability and ability to raise and secure necessary funding
2. Affordability of pollution control options for the households of the community
3. An evaluation of the overall costs and environmental health benefits of the control technologies
4. An inclusion of ways to reduce economic impacts on distressed populations in the community
  - a) Providing a schedule of compliance
5. An assessment of other community investments relating to environmental improvements
6. An assessment of factors set forth in the USEPA's guidance
7. An assessment of any other relevant local community economic conditions

# 1. A community's financial capability and ability to raise or secure necessary funding

<b>Current User Rates: <sup>2</sup></b>	
<b>Rate Capacity or Pay as You Go Option:</b>	
<b>Municipal Bond Rating (if applicable):</b>	
<b>Bonding Capacity:</b>	
(General Obligation Bond capacity allowed by constitution: cities=up to 20% of taxable tangible property sewer districts=up to 5% of taxable tangible property)	
<b>Current outstanding debt:</b>	
<b>Other indicators:</b>	

## 2. Affordability of pollution control options for the individuals or households of the community

<b>Current annual operating costs (exclude depreciation):</b>	
<b>Current user rate: <sup>2</sup></b>	\$
<b>Estimated capital cost of pollution control options: <sup>8</sup></b>	\$
<b>Annual Cost of Additional (Operating Costs &amp; Debt Service): <sup>8</sup></b>	\$
<b>Estimated Resulting User Rate and/or Cost per Household: <sup>8</sup></b>	\$
<b>Median Household Income <sup>5</sup></b>	\$
<b>Rate and/or Cost per Household as a Percent of Median Household Income: <sup>3</sup></b>	% - %

Currently being updated

### **3. An evaluation of the overall costs and environmental benefits of the control technologies**

- Review the new requirements and talk about cost again
- Provide a thorough explanation of the environmental benefits of the new requirement(s)
  - Calculate pounds/day of ammonia removal
  - Explain ammonia is toxic to early stages of aquatic life
  - New WET test requirements
  - Explain E.coli and disinfection

**4. An inclusion of ways to reduce economic impacts on distressed populations in the community, including but not limited to low and fixed income populations.**

- Affordability findings shall be based upon reasonably verifiable data and shall include an assessment of affordability with respect to persons or entities affected.

**Potentially Distressed Populations – Owner**

<b>Unemployment</b>	%
<b>Median Household Income (MHI)</b>	\$
<b>Percent Change in MHI (1990-2011)</b>	+/-%
<b>Percent Population Growth/Decline (1990-2011)</b>	+%
<b>Change in Median Age in Years (1990-2011)</b>	+/-%
<b>Percent of Households in Poverty</b>	%
<b>Percent of Households Relying on Food Stamps</b>	%

# Pre-screening Tool

Select City →		Missouri	Relative Trend	-2 STDEV	-1 STDEV	Missouri	+1 STDEV	+2STDEV
Change in Population (1990-2011)	2.4%	17.0%	Growth below state average					
Poverty Level (2011)	15.6%	14.0%	Above state average					
Unemployment Rate (December 2013)	6.0%	5.8%	Somewhat above state average					
Food Stamps (2011)	16.4%	11.4%	Above average reliance					
Median Age (2011)	41.8	37.6	Older than state average					
Change in Median Age in years (1990-2011)	-	4.2	#VALUE!					
Adjusted Median Household Income 2013 (MHI)	\$36,648	\$47,202	Lower than average MHI					
Change in Median Household Income (1990-2011)	92.0%	22.4%	Significantly above average change					
	<b>1990</b>	<b>2011</b>						
Population	409	419	County	Nodaway				
Median Age (years)	-	41.8	Cropland value per acre	\$5,532				
Median Household Income	\$18,333	\$36,648	Pastureland value per acre	\$2,864				

## References used to gather Socioeconomic Data

Unemployment data was obtained from Missouri Department of Economic Development (February 2013) – <http://www.missourieconomy.org/pdfs/ure11302.pdf>

Median Household Income is provided by the American Fact Finder – INCOME IN THE PAST 12 MONTHS (IN 2011 INFLATION ADJUSTED DOLLARS)

2007 – 2011 American Community Survey 5-Year Estimates, which can be found online at:

<http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?ftp=table>

Population trend data was obtained from online at:

2011 Census Bureau Population Data -

<http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?ftp=table>

2000 Census Bureau Population Data - <http://www.census.gov/popest/data/cities/totals/2009/tables/SUB-EST2009-04-29.xls>

1990 Census Bureau Population Data - <http://www.census.gov/prod/cen1990/cp1/cp-1-27.pdf>

Poverty data is provided by the American Fact Finder – POVERTY STATUS IN THE PAST 12 MONTHS – 2007-2011 American Community Survey

5-Year Estimates, which can be found online at

<http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?ftp=table>

## **4. An inclusion of ways to reduce economic impacts on distressed populations in the community, including but not limited to low and fixed income populations**

- Opportunity for cost savings or cost avoidance:
  - Connection to larger centralized system
  - Apply for SRF or other loans
  - Contact Financial Assistance Center
  - Land Application System
- Opportunity for changes to implementation/compliance schedule
  - The permittee may apply for a modification to the Schedule of Compliance if an unforeseen situation arises as described in 40 CFR § 122.62(d)(4) and the Department determines good cause exists for a longer compliance schedule.

## **5. An assessment of other community investments relating to environmental improvements**

- The permittee needs to provide an explanation of any other projects the City is currently working on or recently finished that may have increased rates.
- Examples
  - Upgrades to drinking water
  - Landfill improvements
  - MS4 improvements

## 6. An Assessment of factors set forth in the USEPA's guidance: Secondary Indicators for Consideration

Indicators	Strong (3 points)	Mid-Range (2 points)	Weak (1 point)	Score
Bond Rating Indicator	Above BBB or Baa	BBB or Baa	Below BBB or Baa	
Overall Net Debt as a % of Full Market Property Value	Below 2%	2% - 5%	Above 5%	
Unemployment Rate	>1% below Missouri average	± 1% of Missouri average	>1% above Missouri average	
Median Household Income	More than 25% above Missouri MHI	± 25% of Missouri MHI	More than 25% below Missouri average	
Property Tax Revenues as a % of Full Market Property Value	Below 2%	2% - 4%	Above 4%	
Property Tax Collection Rate	Above 98%	94% - 98%	Below 94%	

# Financial Capability Matrix

Percentages above 2% could create a high burden for a community.

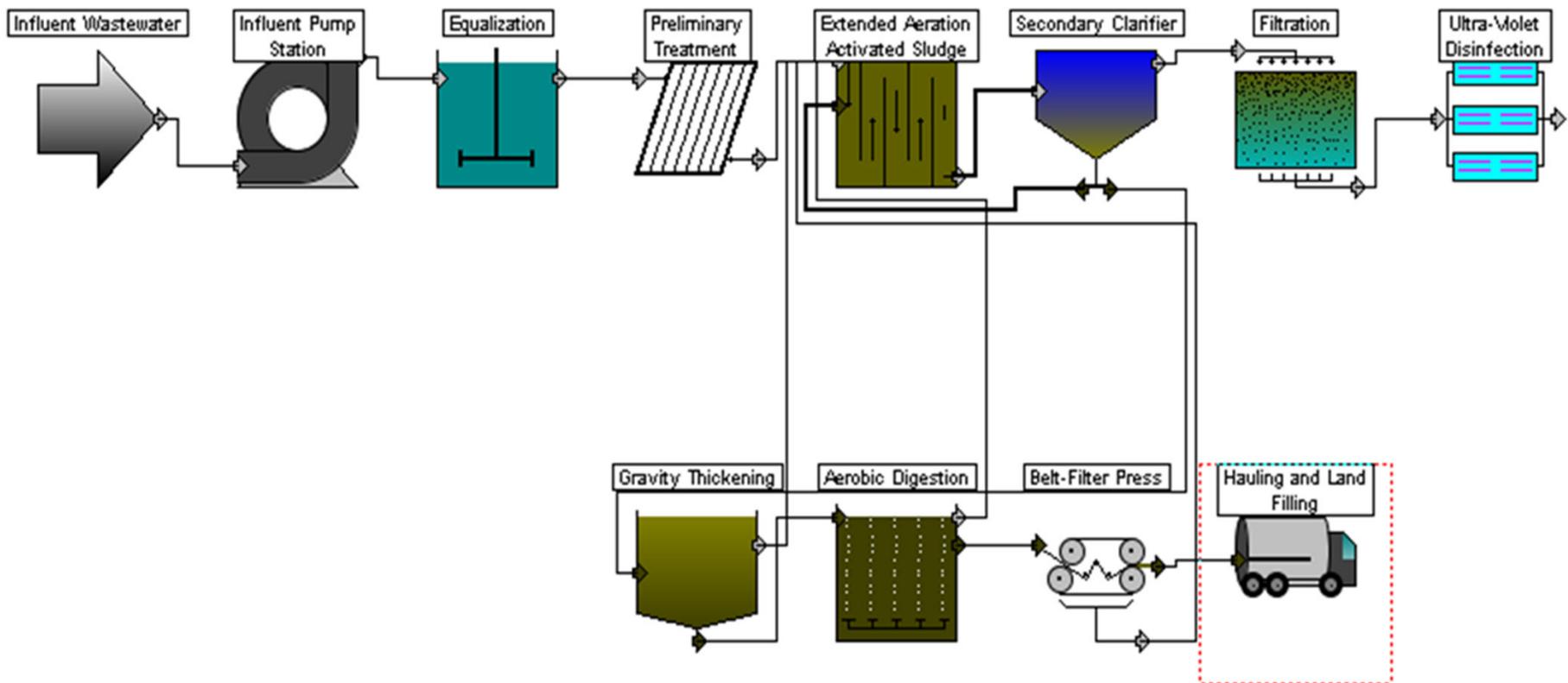
Financial Capability Indicators Score from above ↓	Residential Indicator (User rate as a % of MHI)		
	Low (Below 1%)	Mid-Range (Between 1.0% and 2.0%)	High (Above 2.0%)
Weak (below 1.5)	Medium Burden	High Burden	High Burden
Mid-Range (1.5 - 2.5)	Low Burden	Medium Burden	High Burden
Strong (above 2.5)	Low Burden	Low Burden	Medium Burden

## **7. An assessment of any other relevant local community economic condition.**

- Any recent natural disaster
- Major upgrades to infrastructure
- Local economic changes

## POTW Schedules

- Default for a large capital project with the best case scenario is four (4) years:
  - Adequate time for planning
  - Voter approval for bond issue
  - Acquire property
  - Put contracts in place for professional services
  - Arrange geohydrological assessments
  - Obtain sufficient financing
  - Prepare engineering designs
  - Permit review
  - Construct facility

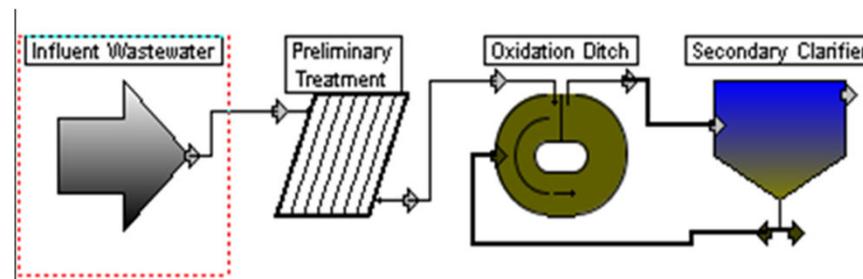


## What is CapDet?

- CapdetWorks is a preliminary design and costing software program from Hydromantis (<http://www.hydromantis.com/CapdetWorks.html>)
- The design algorithms are based on the concepts of solids retention time and influent fractionation, and consistent with activated sludge models, including:
  - ASM1
  - Metcalf and Eddy (Wastewater Engineering: Treatment and Reuse, 4th Edition),
  - Theory, Design and Operation of Biological Nutrient Removal Activated Sludge by the Water Research Commission

## CapDet Costing

- CapdetWorks uses a unit costing approach with an extensive costing database that accounts for the effects of inflation using cost indices.
- Costing Indices
  - Marshall & Swift Index
  - Engineering News Record Cost Index
  - Pipe Cost Index

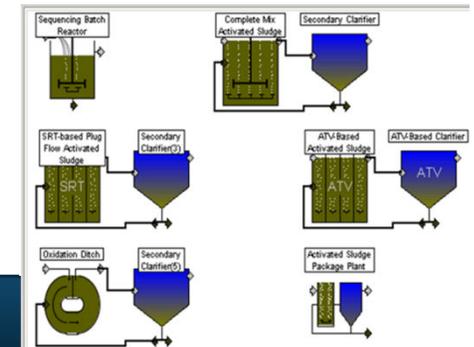
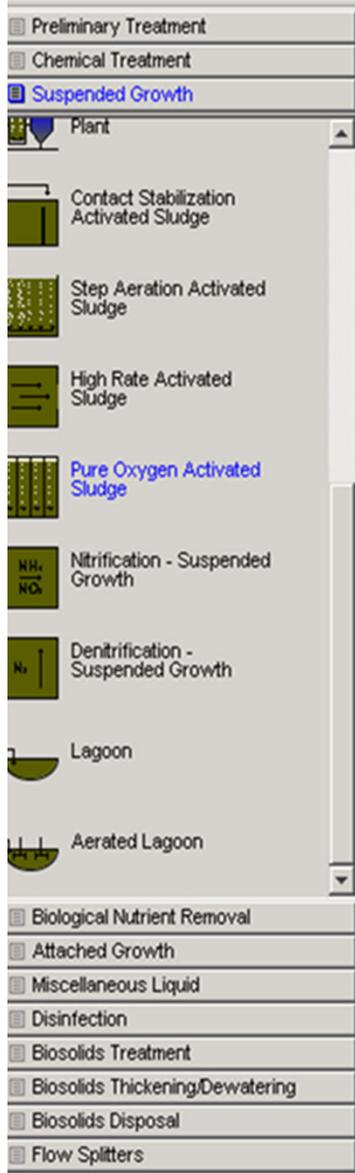


## CapDet Capabilities

- Design a wastewater treatment plant
- Designs based on many of the wastewater characteristics, not limited to flow
- Overall project costs
- Individual process unit
  - Operations & Maintenance Cost
  - Electrical Cost
  - Material cost

## CapDet Scenarios

- CapDet is run on a few scenarios, it does not take into account every community's scenario and treatment technology.
- If a facility needs to upgrade, the engineer hired to complete the facility plan will evaluate options for the community on what they can afford & what site-specific conditions are.



## How is CapDet used?

- Capital Cost
- Operations & Maintenance Cost includes electrical & material
- In CapDet, we set
  - Pump replacement at 10 years
  - Structural replacement at 20 years
  - Operator & Lab \$25 per hr
  - Administrative \$20 per hr
- CapDet can calculate present worth; however it is calculated in the Permit Writer's Spreadsheet

## **CapDet Operations & Maintenance**

- The Annual O&M estimate includes
  - Operator, Administrative, & Lab costs
  - Electrical Cost
  - Materials Cost, including any expected part replacement, ie: bulbs, pumps
  - Maintenance Costs
  - Chemical Cost

## CapDet Scenarios to Spreadsheet

- 10,000 gpd to 10 MGD
- 5 treatment technologies scenarios
  - Package plants
  - Extended Aeration
  - Oxidation Ditch
  - Sequencing Batch Reactor
  - Land Application
- 2 disinfection technologies
  - Chlorine
  - UV

## Spreadsheet

- Capital Cost-CapDet
- Operations & Maintenance-CapDet, includes electrical, material & chemical cost
- Calculated:
  - Present Worth,
  - Debt Retirement,
  - Number of Users, and
  - Monthly estimated Cost per User
- Linear interpolation for scenarios not simulated in CapDet

## Land Application

- CapDet estimates the amount of land required for application, along with the equipment required
- Scenarios ran for the 4 different regions in the state, as storage time varies from 60 days south of Hwy 60 to 120 days north of Hwy 36.
- Land costs pulled from prescreening tool, see Slide 13.

	2013
County	Nodaway
Cropland value per acre	\$5,532
Pastureland value per acre	\$2,864

# Estimated Cost for 4.5 MGD Oxidation Ditch

	0.25	0.5	1	2	5	10	4.50
<b>Estimated Capital Cost of Oxidation Ditch</b>	\$2,490,000	\$3,370,000	\$5,310,000	\$7,950,000	\$14,900,000	\$25,300,000	\$ 13,741,667
<b>Annual Operating &amp; Maintenance Costs</b>	\$116,600	\$142,420	\$202,300	\$301,200	\$550,800	\$965,200	\$ 509,200
<b>Annualization Factor</b>	0.0802	0.0802	0.0802	0.0802	0.0802	0.0802	0.0802
<b>Annualized Capital Cost</b>	\$ 199,804	\$ 270,418	\$ 426,088	\$ 637,929	\$ 1,195,615	\$ 2,030,137	\$ 1,102,667
<b>Total Annual Cost of Project</b>	\$ 316,404	\$ 412,838	\$ 628,388	\$ 939,129	\$ 1,746,415	\$ 2,995,337	\$ 1,611,867
<b>Present Worth Factor</b>	12.4622	12.4622	12.4622	12.4622	12.4622	12.4622	12.4622
<b>Total Present Worth of O &amp; M Costs</b>	\$ 1,453,094	\$ 1,774,868	\$ 2,521,105	\$ 3,753,618	\$ 6,864,185	\$ 12,028,525	\$ 6,345,758
<b>Other Costs as Present Worth</b>	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
<b>Salvage Value as Present Worth (subtracted)</b>	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
<b>Total Present Worth Costs</b>	\$ 3,943,094	\$ 5,144,868	\$ 7,831,105	\$11,703,618	\$ 21,764,185	\$ 37,328,525	\$20,087,424.17
<b>Number of users:</b>	676	1,351	2,703	5,405	13,514	27,027	12,162
<b>Debt Retirement per year</b>	\$199,804.04	\$270,417.52	\$426,088.14	\$637,928.57	\$1,195,614.55	\$2,030,137.46	\$1,102,666.89
<b>Debt Retirement per user per month</b>							
<b>Replacement cost per user</b>							
<b>User Cost per month per 5,000 gpd</b>							

## Permit Writer Spreadsheet

Items that the permit writer can easily change:

- Interest Rate : 5.0%
- Design Life: 20 years
- Inflation factor: 1.6

Interest Rate:	0.05	
Design Life:	20	years
Inflation Factor:	1.6	

**Directions:**

← Update the interest rate, design life, and inflation factor as necessary.

If the facility's flow is not in the list, please enter the flow in mgd in the highlighted cells below and it will interpolate the range of costs for replacement of a treatment plant.

Items that Permit Writer could change

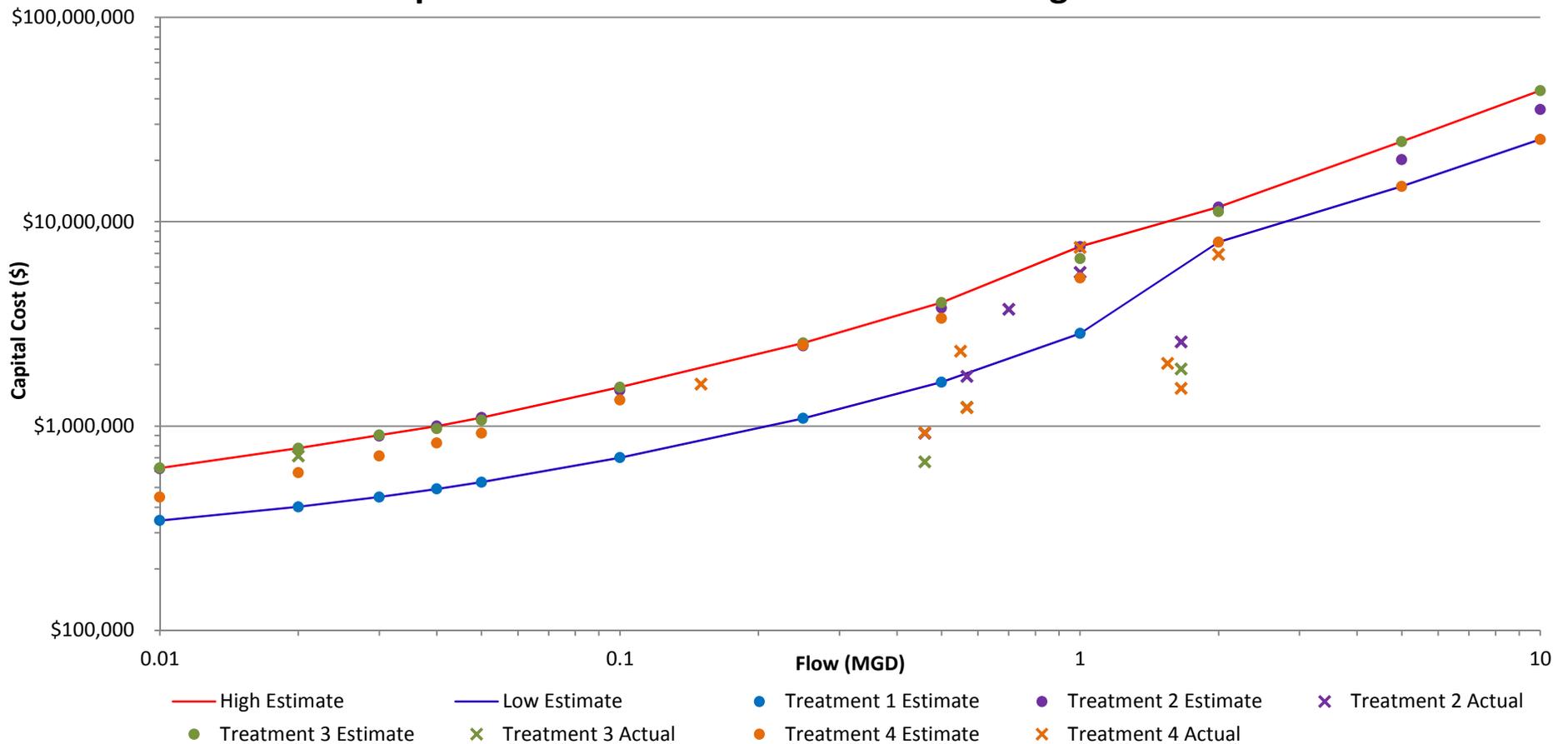
- Number of connections based on 10 CSR 20-8
  - Flow(gpd)/100 gallons per person/3.7 people per connection

# Cost Estimate Spreadsheet

Treatment	Capital Cost		Annual O&M		Total Present Worth		Cost per Household (5,000 gpd/month)	
Flow (mgd)	Low	High	Low	High	Low	High	Low	High
0.01	\$ 345,000	\$ 623,000	52870	84270	\$ 1,107,877	\$ 1,673,190	\$ 189	\$ 277
0.02	\$ 402,000	\$ 779,000	\$ 59,240	\$ 92,060	\$ 1,329,261	\$ 1,926,271	\$ 110	\$ 164
0.03	\$ 449,000	\$ 903,000	\$ 63,790	\$ 98,240	\$ 1,508,964	\$ 2,127,288	\$ 79	\$ 123
0.04	\$ 492,000	\$ 1,000,000	\$ 67,520	\$ 99,300	\$ 1,609,250	\$ 2,208,497	\$ 63	\$ 97
0.05	\$ 531,000	\$ 1,100,000	\$ 70,720	\$ 104,390	\$ 1,670,146	\$ 2,370,930	\$ 53	\$ 84
0.1	\$ 700,000	\$ 1,550,000	\$ 82,920	\$ 136,074	\$ 1,912,698	\$ 3,195,783	\$ 31	\$ 57
0.25	\$ 1,090,000	\$ 2,550,000	\$ 107,160	\$ 161,500	\$ 2,425,450	\$ 4,562,647	\$ 17	\$ 35
0.5	\$ 1,640,000	\$ 4,020,000	\$ 142,420	\$ 211,100	\$ 3,671,091	\$ 6,650,773	\$ 13	\$ 27
1	\$ 2,840,000	\$ 7,560,000	\$ 202,300	\$ 305,300	\$ 6,217,010	\$ 11,364,713	\$ 11	\$ 24
2	\$ 7,950,000	\$ 11,800,000	\$ 301,200	\$ 449,800	\$ 11,703,618	\$ 17,405,502	\$ 12	\$ 18
5	\$ 14,900,000	\$ 24,700,000	\$ 550,800	\$ 844,500	\$ 21,764,185	\$ 35,224,337	\$ 9	\$ 15
10	\$ 25,300,000	\$ 43,800,000	\$ 965,200	\$ 1,407,000	\$ 37,328,525	\$ 61,334,330	\$ 8	\$ 13
4.5	\$ 13,741,667	\$ 22,450,000	\$ 509,200	\$ 777,467	\$ 20,087,424	\$ 32,138,953	\$ 9	\$ 15

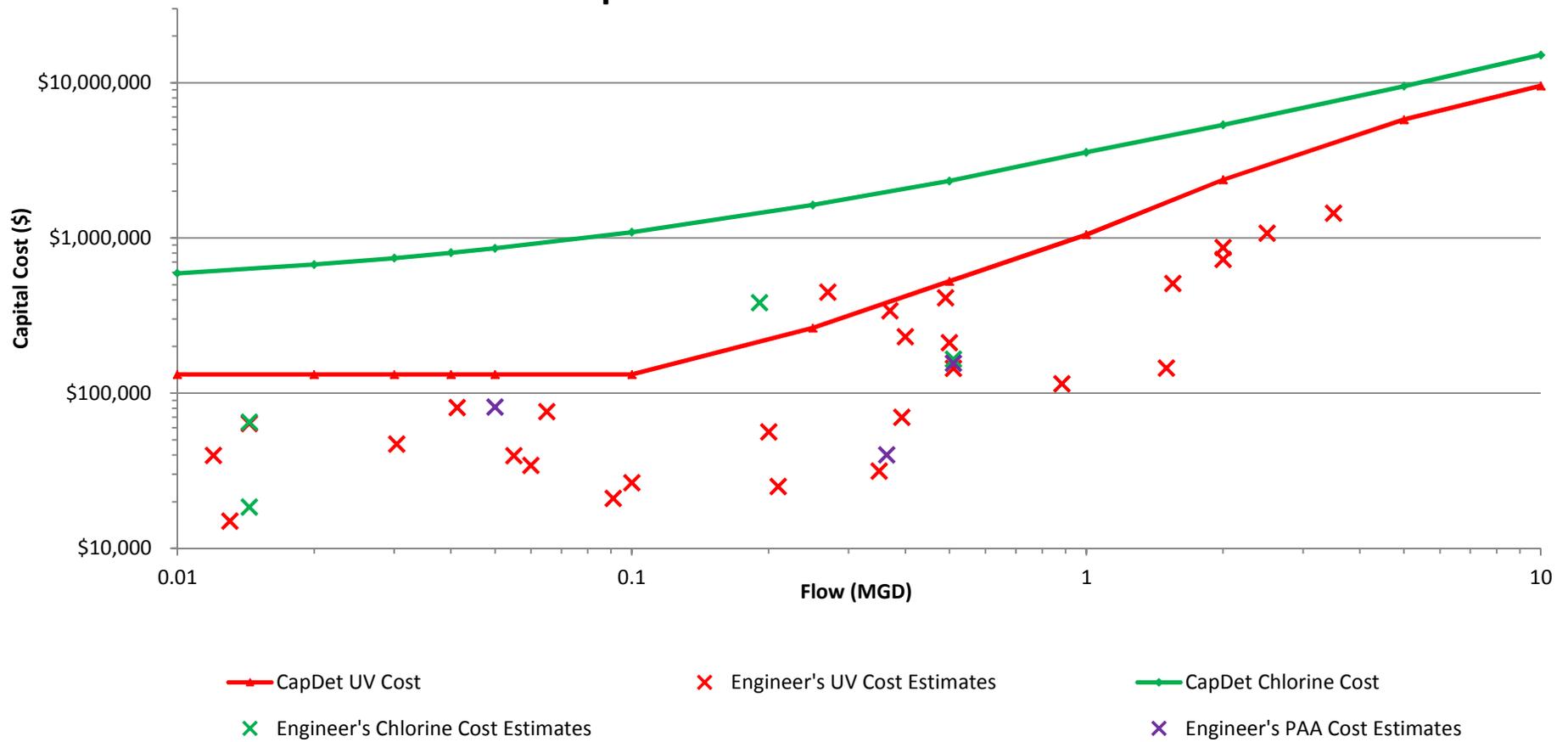
# Facility Cost Estimates compared to CapDet

## Capital Cost vs. Flow Treatment Technologies



# Facility Cost Estimates compared to CapDet

## Capital Cost of Disinfection



## Limitations to CapDet

- Proprietary technologies (LEMNA, SAGR, etc...)
- Estimate based on national indices, not site-specific
- CapDet is not designed for smaller facilities
- Comparison of the same process units & scope of project
- Piping & pumps- it provides cost estimate and general info, but does not account for site- specifics
- Does not reflect site-specific conditions; the facility plan developed after a facility decides it needs to upgrade will account for the site-specific costs.

## Improvements to Affordability Estimates

- More actual costs to continue tracking & evaluating
  - If you have costs that you would like to provide, please send them to Leasee.
- Number of connections/users to reflect:
  - Communities with multiple treatment facilities
  - Communities that are losing population
- Inflow & Infiltration
- Pretreatment

- Please fill out your renewal application completely.
- Please fill out and return the survey provided with the Welcome Letter.
- Talk to your permit writer if you have questions.

## Questions?

- For more information or for additional questions, please contact:
  - Lacey at [lacey.hirschvogel@dnr.mo.gov](mailto:lacey.hirschvogel@dnr.mo.gov)
  - Leasue at [leasue.meyers@dnr.mo.gov](mailto:leasue.meyers@dnr.mo.gov)