

WASTEWATER TREATMENT FACILITY FEASIBILITY STUDY

PREPARED FOR:



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1 EXECUTIVE SUMMARY

The City of Liberty (City) engaged HDR Engineering, Inc. (HDR) to complete a Feasibility Study of its future options for treatment of the City's wastewater. Currently, the City collects the wastewater and conveys it to the City of Kansas City, Missouri for treatment at its Birmingham Wastewater Treatment Facility.

The major driver of this Study was concerns raised by a Task Force commissioned by the City of Liberty to address the future of the wastewater utility in the City. The adoption of Kansas City's \$2.4 billion Overflow Control Plan, regulatory changes related to disinfection of wastewater, and deferred maintenance needs have resulted in recent and projected significant rate increases. In addition, the City of Kansas City has failed to upgrade its Birmingham Pump Station and Force Main, which limits the capacity of the conveyance system serving Liberty. The result is the threat of sanitary sewer overflows to the City of Liberty that could lead to enforcement action by the Environmental Protection Agency and the State of Missouri. Improvements to address these capacity issues are not scheduled to be completed by Kansas City until 2023 and 2024.

HDR completed the Feasibility Study in December 2011. Workshops were held with City staff, Utility Task Force members, and Council members in November and December 2011. The entire City Council was briefed on the results of the Study on January 17, 2012. The study recommends that the City develop a plan for constructing its own wastewater treatment facility at a site on the southeast side of the City. Further, it recommends that flows from the west side of town be pumped to the new treatment facility. The net present value and the total revenue requirements of the recommended plan is significantly less than continued treatment service by Kansas City. In addition, the recommended plan provides the City with control of the wastewater utility allowing the City to manage its future growth more effectively.

While the financial evaluation clearly supports the recommendation for Liberty constructing its own treatment facilities, it also recognizes that Kansas City may value the long-term relationship with the City of Liberty in providing wastewater treatment. As a result, it is possible that Kansas City may agree to reconsider its projected rate increases to its wholesale customers. It is recommended that the City continue to negotiate with Kansas City in an effort to achieve the lowest long-term wastewater rates.

2 INTRODUCTION

2.1 BACKGROUND

The City of Liberty (City) currently conveys its wastewater to the City of Kansas City, MO (KCMO) for treatment at the Birmingham Wastewater Treatment Facility (WWTP).

The existing Liberty wastewater collection and conveyance system is shown in Figure 2-1. It can generally be divided into the east and west sides. The west side of the collection system serves the west and northwest portions of Liberty and Glenaire. This flow is conveyed via Liberty's West Interceptor and the Little Shoal Creek Interceptor, jointly owned by Liberty and Kansas City. Wastewater flow from KCMO and Pleasant Valley, MO is conveyed by the West Interceptor and Little Shoal Creek Interceptor. A KCMO low pressure pump station on the Little Shoal Creek Interceptor was never completed. The Little Shoal Creek Interceptor flows to the south and connects to the KCMO Shoal Creek Interceptor which conveys flow to the KCMO Birmingham Pump Station. There is no functional metering of wastewater flow from Liberty's west side. Billings are based on water use only.

The East Pump Station receives flow from the Rush Creek Pump Station, the Cates Branch Interceptor and the Town Branch Interceptor, and serves the east portion of the City. The East Pump Station conveys wastewater via a City-owned forcemain to the KCMO Birmingham Pump Station.

From the Birmingham Pump Station, wastewater flow from the City is conveyed to the Birmingham WWTP for treatment.

The Birmingham Pump Station has capacity limitations. During peak wet weather flows, the City's collection system has experienced sanitary sewer overflows (SSOs) believed to be related to surcharging in the interceptors. The City's East Pump Station has also experienced SSOs. In addition to the legal, environmental and human health concern related to SSOs, the lack of capacity in the receiving sewer has caused delays in the permitting of new sewer extensions within the City. In addition, KCMO has announced plans to increase its treatment fees in order to pay for capacity and treatment improvements.

Concerns about increasing sewage treatment fees reported by KCMO, in addition to the capacity limitations in the KCMO system impacting the City's collection system, caused the City to commission a study to evaluate the feasibility of constructing and operating its own treatment facility.

2.2 PURPOSE

The purpose of this Feasibility Study is to:

- Estimate capital costs, operations and maintenance (O&M) costs, and revenue requirements of a City-owned and operated wastewater treatment facility as well as continued treatment by KCMO,
- Determine the economic and regulatory feasibility of a City-owned and operated wastewater treatment facility (WWTF); and,
- Develop an implementation schedule for the recommended alternative.

2.3 PREVIOUS STUDIES

The following previous studies were used in preparation of this Study:

- Report on Sewerage Study for Extension of the Little Shoal Creek Interceptor Kansas City, Missouri, Black & Veatch, October 1994
- Wastewater Treatment Feasibility Study, Burns & McDonnell Engineers, 1999
- Sanitary Sewer Inflow & Infiltration Study Little Shoal Creek, Shafer Kline and Warren, 2002
- Overflow Control Plan, Kansas City, Missouri Water Services, January 2009

2.4 WORKSHOP PROCESS

This study represents the culmination of an evaluation process which involved a series of three workshops. Workshops were used to summarize findings to date, confirm assumptions, and receive input from City staff, Utility Task Force members, and Council members. Presentations from all workshops are in Appendix A.

2.4.1 WORKSHOP 1 – TECHNICAL

Workshop 1 was held on November 1, 2011. Attended by City staff and Utility Task Force members, it included flow and population projections, a description of potential technologies, and recommendations for conveyance improvements.

2.4.2 WORKSHOP 2 – FINANCIAL

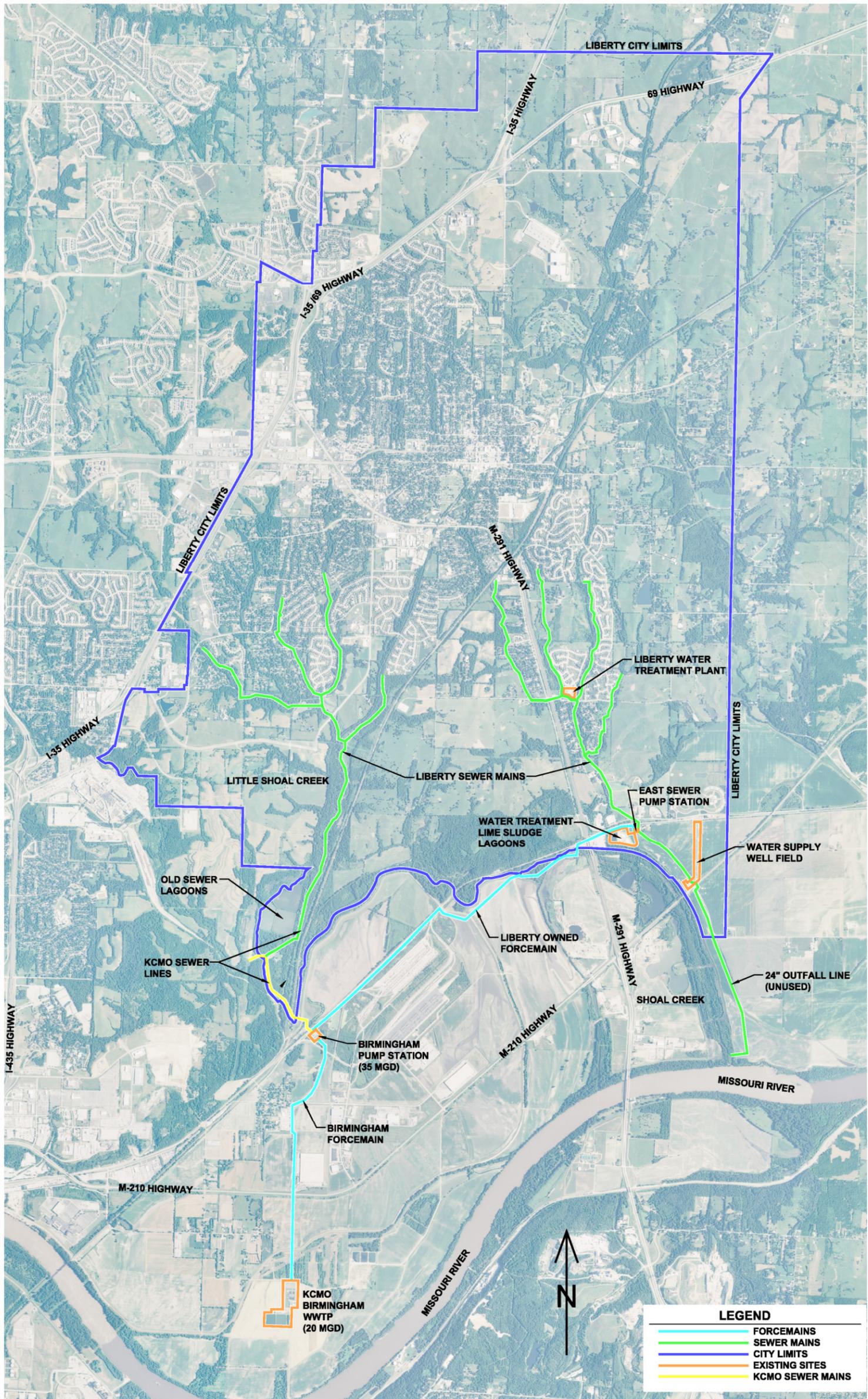
Workshop 2 was held on December 15, 2011, and was attended by staff , Utility Task Force members, and Council members. It included a review of technical recommendations and a discussion of the impacts of all alternatives on City revenue needs.

2.4.3 WORKSHOP 3 – IMPLEMENTATION

Workshop 3 was held on December 29, 2011. It was attended by staff and Utility Task Force members and reviewed the steps required to implement the recommended plan.

2.4.4 WORKSHOP WITH CITY COUNCIL

A workshop with the Liberty City Council, which was attended by Utility Task Force members and City staff, was held on January 17, 2012. It included a presentation on the technical, financial, and implementation findings of the Feasibility Study.



**Figure 2-1.
Liberty Collection System.**



3 FLOW AND LOADING PROJECTIONS

Population and flow rates through 2040 were projected as described in this section.

3.1 POPULATION PROJECTIONS

The City of Liberty utilizes population projections established by the Mid-American Regional Council (MARC) long range forecast research services. The population projections provided by MARC are based on census tracts (school districts) and contain population outside the Liberty city limits. The following seven census tracts are either entirely or partially within the city limits of Liberty: 208.01, 208.02, 213.04, 214.01, 214.02, 216 and 218 (Table 3-2 and Figure 3-1). Census tracts 208.01, 208.02 and 213.04 are partially within the city limits and their Liberty populations were estimated by the percentage of city land within each census tract. Liberty populations within tracts 216 and 218 were estimated based on the population density of each census tract. Census tracts 214.01 and 214.02 are entirely within the city limits. The 2004 Kansas City Metropolitan Area Long Range Forecast was used to determine projected growth within the city of Liberty through 2030; 2040 projections were estimated at 10% growth from 2030 (Table 3-3).

3.2 WASTEWATER FLOWS

The City of Kansas City, Missouri (KCMO) currently treats all wastewater flows originating in Liberty. Flows from the eastern portion of Liberty are collected and pumped by force main to the KCMO Birmingham pump station. Flows from the western portion of Liberty and part of eastern KCMO are collected in a west interceptor and flow by gravity to the Birmingham pump station. Flows from the eastern part of Liberty are recorded by a meter located at the east pump station while western flows are not metered. Flows from the western portion of Liberty were estimated based on water usage records and increased by 15% to account for potential infiltration and inflow (I/I). The total monthly flow values from 2008 to December 2011 were evaluated to determine the current average annual flow. The ratio of average annual to maximum month was calculated based only on the metered east pump station as shown in Table 3-4. Per capita flow rate was determined by dividing the average annual flow from the 2008 to 2011 period by the 2010 population and is summarized in Table 3-5.

Average wastewater flows were assumed to be directly proportional to population; therefore, the per capita flow rate remains constant. Average annual flows for 2020, 2030 and 2040 were determined using the constant per capita flow rate and projected population growth (Table 3-5). Maximum monthly flows for 2020, 2030, and 2040 were determined by using the average annual flows and the constant average annual to maximum month ratio. Peak flows will be estimated upon receipt of daily flow data from KCMO.

3.3 OTHER COMMUNITIES

A wastewater treatment facility located in Liberty presents potential benefits for area communities such as Glenaire and Pleasant Valley. Arrangements to treat other communities' wastewater flows would include potential risks and benefits to Liberty. Additional customers provide more rate payers but an evaluation of each collection system is recommended before entering into agreements to accept wastewater flow. High

peak flows caused by I/I from poorly maintained or leaky collection systems can require significant capital costs for conveyance and treatment.

Projected population growth for Glenaire from 2010 to 2040 was estimated at 1% per decade based on current land use and lack of available land for future growth. The 2004 Kansas City Metropolitan Area Long Range Forecast was used to determine projected growth within the city of Pleasant Valley through 2030. A growth rate of 10% for the 2030-2040 period was assumed (Table 3-6). If these communities are served by a Liberty WWTF, total flows at the facility in Liberty are expected to increase by 10 percent (Table 3-7).

Census Tract	History			
	1970	1980	1990	2000
208.01	4,656	4,947	6,057	6,468
208.02	3,915	4,632	6,188	7,453
213.04	147	396	767	4,583
214.01	2,327	2,795	3,453	4,381
214.02	6,264	6,632	7,486	7,742
216	2,451	3,552	3,856	6,626
218	4,225	7,850	10,249	17,745
Total	23,985	30,804	38,056	54,998

¹ 1990 census tract numbering was used by MARC for projections.

Census Tract	Estimated by Population/Land	Population/Land Adjustment	Adjusted Historical Data			
			1970	1980	1990	2000
208.01	Land	44%	2,051	2,179	2,668	2,849
208.02	Land	76%	2,981	3,527	4,711	5,674
213.04	Land	3%	4	12	23	138
214.01	N/A	100%	2,327	2,795	3,453	4,381
214.02	N/A	100%	6,264	6,632	7,486	7,742
216	Population	50%	1,226	1,776	1,928	3,313
218	Population	10%	423	785	1,025	1,775
		Total	15,275	17,706	21,295	25,872

Table 3-3. Census Tract Data Adjusted for Liberty Population (Liberty City Limit)						
Census Tract	Estimated by Population/Land	Population/Land Adjustment	Adjusted Census Data			
			2010	2020	2030	2040
208.01	Land	44%	3,013	3,215	3,430	3,773
208.02	Land	76%	6,830	7,989	9,076	9,984
213.04	Land	3%	412	513	614	675
214.01	N/A	100%	4,989	5,575	6,107	6,717
214.02	N/A	100%	7,890	7,904	7,924	8,716
216	Population	50%	4,403	5,248	6,044	6,648
218	Population	10%	2,191	2,506	2,810	3,091
		Total	29,726	32,949	36,004	39,604

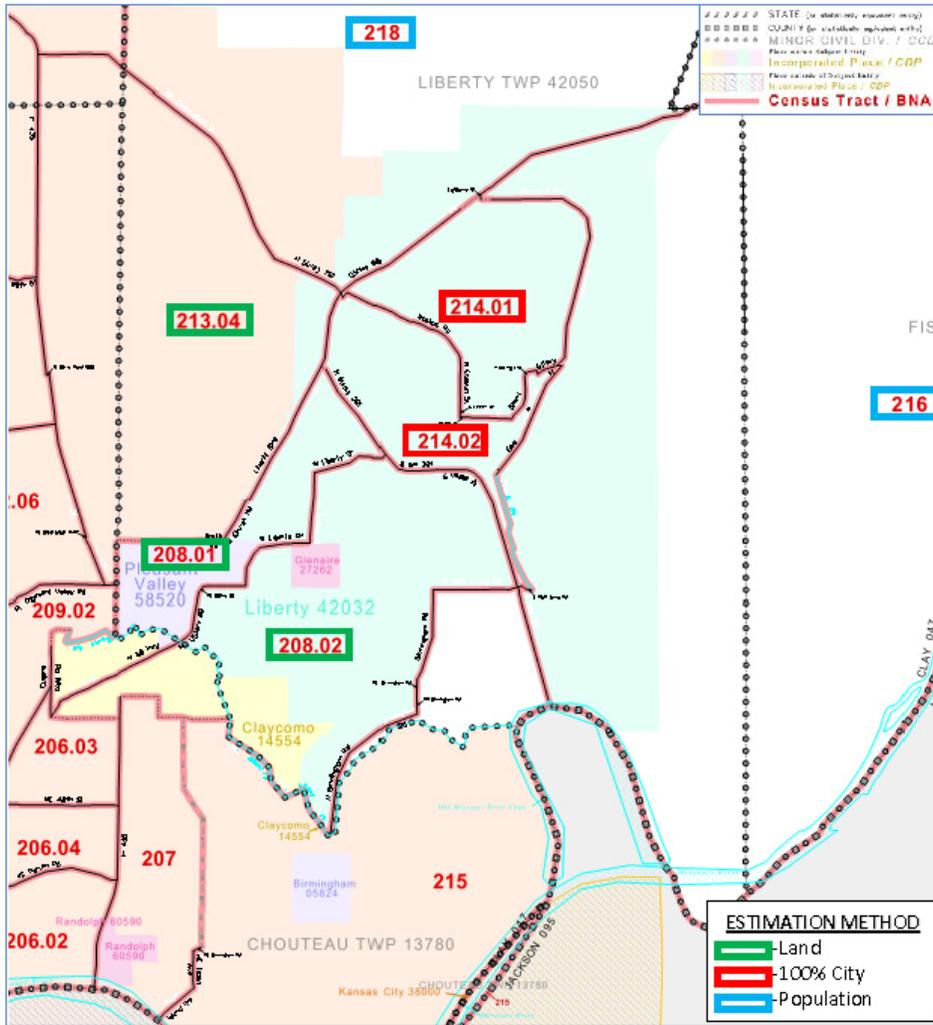
Table 3-4. Liberty Monthly Average Wastewater Flows, MGD				
Month	Year			
	2008	2009	2010	2011
January	3.35	3.30	3.50	2.68
February	3.80	2.77	3.31	2.94
March	4.04	3.98	3.33	3.62
April	4.38	4.67	3.71	3.26
May	3.51	4.05	4.68	3.14
June	3.89	3.93	3.30	2.96
July	3.78	3.15	3.21	3.49
August	3.25	3.28	3.09	2.95
September	4.04	2.99	2.74	2.67
October	3.49	3.44	2.73	2.61
November	3.47	2.93	2.86	2.66
December	3.41	2.91	2.55	2.91
Average	3.7	3.4	3.3	3.0
Max	4.4	4.7	4.7	3.6

Table 3-5. Design Basis, Liberty				
	2010	2020	2030	2040
Population	29,726	32,949	36,004	39,604
Per Capita Flow Rate, gpcd	116.6	116.6	116.6	116.6
AA:MM Flow	1.35	1.35	1.35	1.35
Average Annual Flow, MGD	3.5	3.8	4.2	4.6
Maximum Month Flow, MGD	4.7	5.2	5.7	6.2

Table 3-6. Other Communities				
Glenaire	2010	2020	2030	2040
Population	559	564	570	575
Per Capita Flow Rate, gpcd	110.3	110.3	110.3	110.3
AA:MM Flow ¹	1.35	1.35	1.35	1.35
Average Annual Flow, MGD ¹	0.062	0.062	0.063	0.063
Maximum Month Flow, MGD	0.084	0.085	0.086	0.087
Pleasant Valley				
2010	2020	2030	2040¹	
Population	3511	3747	3997	4197
Per Capita Flow Rate, gpcd	110.3	110.3	110.3	110.3
AA:MM Flow ¹	1.35	1.35	1.35	1.35
Average Annual Flow, MGD ¹	0.39	0.41	0.44	0.46
Maximum Month Flow, MGD	0.53	0.57	0.60	0.63

¹Liberty ratios used for planning purposes

Table 3-7. Design Basis, including Glenaire and Pleasant Valley		
Source	2040 Average Annual Flow, MGD	2040 Maximum Month Flow, MGD
Liberty	4.6	6.2
Glenaire	0.063	0.087
Pleasant Valley	0.46	0.63
Total	5.1	7.0



Source: U.S. Census Bureau's TIGER database as of January 1, 1990

Figure 3-1 Liberty Census Tracts

4 REGULATORY REVIEW

4.1 PERMITTING AUTHORITY

In 1978, the City signed a 208 Regional Management Agency Memorandum of Understanding designating Liberty as wastewater treatment, collection and management agency pursuant to the provisions of Section 208 (b) (2) (d) of the P. L. 92-500, the Federal Water Pollution Control Act Amendments of 1972. The City is therefore its own Continuing Authority and is legally able to apply for a discharge permit.

4.2 NPDES PERMIT

In order for the City to construct and operate a WWTF, a discharge permit and construction permit will need to be obtained from the Missouri Department of Natural Resources (MDNR). Such a discharge would be considered a new or expanded discharge and would need to comply with the requirements of the State's Antidegradation policy. A detailed review of the potential permitting scenarios for discharges to the Missouri River and Shoal Creek is included in Appendix B.

A discharge to the Missouri River has the highest likelihood of meeting the requirements of the Antidegradation policy and will require the lowest level of treatment. It is recommended that, if constructed, the Liberty WWTF be located at the East pump station site with a discharge to the Missouri River. The Liberty WWTF alternatives described in this Study are based on the anticipated discharge permit limits in Table 4-1.

Constituent	Monthly Average Limit
Biological Oxygen Demand (BOD)	20 mg/L
Total Suspended Solids (TSS)	20 mg/L
Ammonia as N	1 mg/L
Total Nitrogen	10 mg/L
Phosphorus	1.5 mg/L
E. Coli	126 cfu/100 mL

5 LIBERTY PROJECT ALTERNATIVES AND COSTS

5.1 SITE EVALUATION

Evaluation of possible WWTF sites resulted in two alternative locations, a west site and an east site.

5.1.1 WEST SITE

The site of the existing wastewater lagoons in southwest Liberty was considered as a possible location for construction of a Liberty WWTF. This west site has several challenges. The site consists of wetlands, is heavily forested, and is located in the 100-year flood plain. There is no good access route to the site and construction of an access road would be required. As described in Section 4, a discharge from a WWTF at this site has potential Antidegradation review difficulties and would likely require the highest level of treatment. However, direct discharge at this location is possible due to the absence of any levee.

5.1.2 EAST SITE

The City owned land west of the water treatment facility well fields and east of the water treatment facility lime lagoons was considered as a possible location for a Liberty WWTF. This east site is the location of the East Pump Station and is located in the 100-year flood plain. The site does not appear to be impacted by existing wetlands, and is easily accessible from Old State Highway 210. Discharge from a WWTF at this site would either be to the Missouri River or to Shoal Creek. As described in Section 4, a Missouri River discharge would likely require the lowest level of treatment and be most likely to pass an Antidegradation review. A Shoal Creek discharge has potential Antidegradation difficulties and would likely require a higher level of treatment. Both discharge alternatives would be required to pass over a levee, requiring effluent pumping.

5.1.3 RECOMMENDATION

The east site is recommended for further evaluation because of the accessibility and discharge alternatives. A Missouri River discharge is anticipated.

5.2 CONVEYANCE PROJECTS AND COSTS

Wastewater conveyance and storage improvements are necessary to accommodate flows to a new Liberty WWTF. If the City treats its own wastewater at a new east facility, the following conveyance improvements are recommended:

- Construction of an interceptor aligned parallel to the existing Little Shoal Creek/Liberty West Interceptor. This interceptor would consist of 6,640 linear feet of 42-inch pipe and 6,940 linear feet of 48-inch pipe. This interceptor was considered in the 1994 Little Shoal Creek Sewer Service study. The City has an agreement with KCMO to pay 65% of the cost of this improvement. However, the low pressure pump station will be the point of separation from the KCMO system. For the purpose of this study, it is assumed that in Liberty WWTF alternatives (Alternatives 1 – 3), the new interceptor will be dedicated to Liberty flow and the City will pay 100% of the cost of this improvement. If the KCMO option is chosen, costs will be split, with 65% paid by Liberty and 35% paid by KCMO.
- Construction of a 4 million gallon per day (MGD) west pump station (3 X Average Flow) to convey wastewater to the Liberty WWTF.

- Construction of a 5 million gallon (MG) earthen excess flow holding basin at the west, former wastewater lagoon, site to limit the peak flow conveyed to the new WWTF.
- Construction of a forcemain from the new west pump station to the existing City-owned forcemain.
- Construction of a 5 MG covered concrete excess flow holding basin at the east site, adjacent to the existing water treatment facility lime lagoon to limit the peak flows treated at the new WWTF.

Capital costs for these improvements are shown in Table 5-1.

Table 5-1. Liberty Conveyance Improvement Costs.	
Facilities	Cost
Parallel to Little Shoal Creek Interceptor (West Interceptor)	\$8,289,000
West Side EFHB and Pump Station	\$3,396,000
West Side FM	\$364,000
East Side EFHB	\$3,281,100
SUBTOTAL	\$15,330,100
GENERAL	
Contingency and Engineering	\$6,132,040
Little Shoal Creek Easement	\$252,000
Total	\$21,714,140

West Liberty flow would be diverted from the West Interceptor to a pump station for conveyance to the Liberty WWTF on the east site. A 3,500 linear foot forcemain from the pump station to the existing east forcemain would be constructed to convey flows to the new WWTF. Separation from KCMO would be accomplished either by a diversion structure which allows the KCMO flow to pass to the Shoal Creek Interceptor/Birmingham PS (flow signal received from KCMO monitoring stations) or by physical separation of the Liberty and KCMO flows as they enter the West Interceptor. Physical separation within the collection system is recommended and will require the construction of the parallel segment of the west interceptor. There are a few Liberty connections to the west interceptor/Little Shoal Creek interceptor between the existing low pressure pump station and I-35. Rather than pumping these connections to a dedicated Liberty interceptor, these connections would likely be metered.

To protect the City from additional sanitary sewer overflows (SSOs), the construction of excess flow holding basins (EFHB) at the West lagoon site and the East lagoon site is recommended. For cost estimating purposes, the basins are sized based on the capacity of the interceptors feeding them.

During a storm event, EFHBs will allow the City to reduce peaks at the treatment facility. Given the proximity of east EFHB to the public and the need to avoid odors, a covered, concrete basin is recommended. A grass-lined earthen EFHB at the west site is desirable. Modification/rehabilitation of the existing west lagoons may be possible.

Recommended improvements are shown in Figure 5-1.

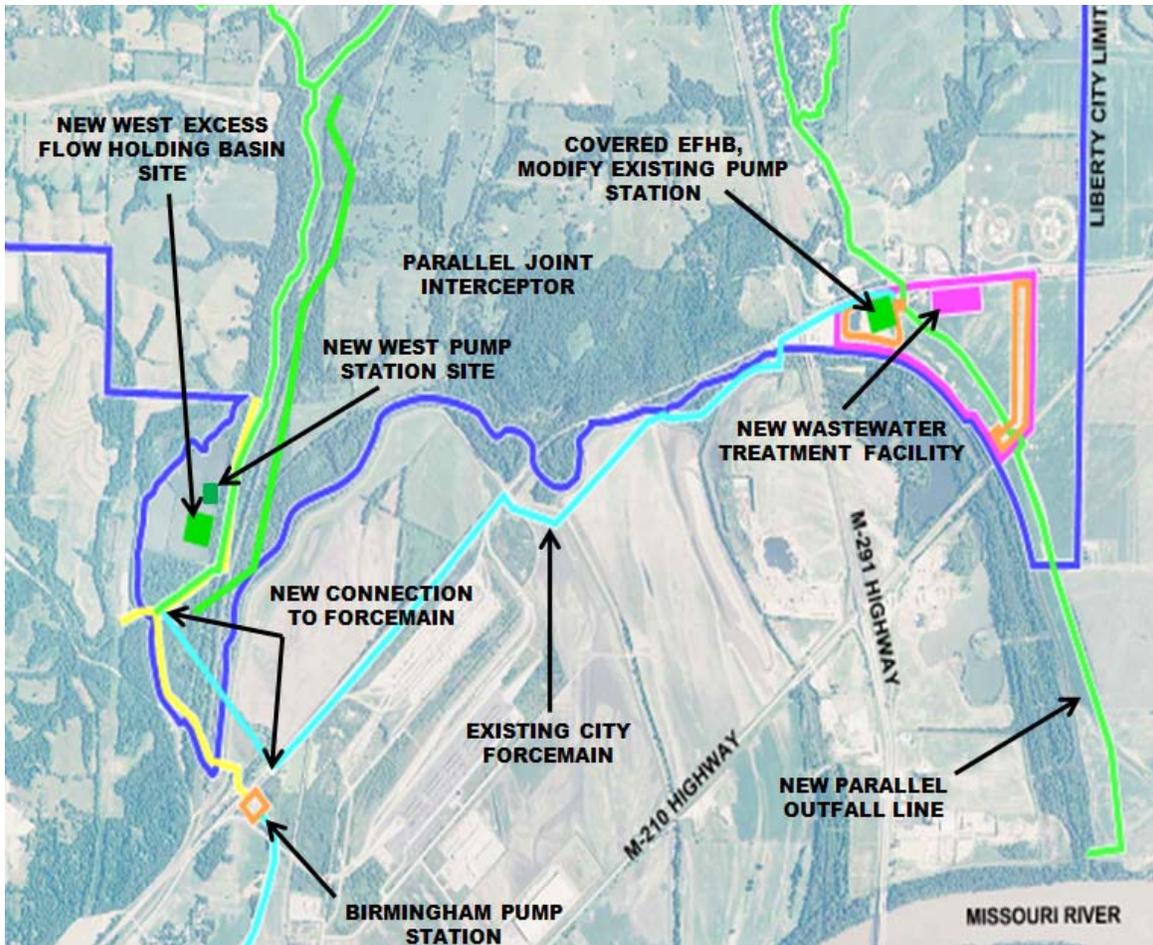


Figure 5-1 Conveyance System Improvements

5.3 WASTEWATER TREATMENT FACILITY

The soil characteristics of the proposed WWTF site indicate structures will likely require piles, which are included in cost estimates for this facility. In addition to site considerations and conveyance cost estimates, the following process alternatives were evaluated. Both include raw water pumping and screening.

5.3.1 PROCESS OPTION 1

Process Option 1 (Alternative 1) represents a higher capital cost option with the potential for lower operations and maintenance (O&M) costs. In Process Option 1 (Figure 5-2), flow would continue from influent screening to Primary Clarifiers which allow suspended solids to settle and grease/oil to rise and be skimmed off. Primary sludge would be removed from the basin and sent through grit removal and gravity thickening. Flow from Primary Clarifiers would go through Biological Nutrient Removal (BNR) basins where flow passes through three sequential stages: an anaerobic stage, anoxic stage and aerobic stage. Part of the mixed liquor from the BNR process would be recycled after the aerobic stage and sent back to the anoxic stage. The remaining mixed liquor would be conveyed to secondary clarifiers which allow biological floc to settle and the sludge to be removed. Part of this activated sludge returns to anaerobic stage of the BNR process and the remaining waste activated sludge is conveyed to a gravity

belt thickener. Wastewater removed from the sludge by thickening would then be conveyed back to the facility headworks. Wastewater from the secondary clarifiers would then undergo UV disinfection to meet effluent bacteria limits.

Sludge from the gravity thickener and the gravity belt thickener would be anaerobically digested. Digested sludge would be dewatered mechanically and ready for disposal.

Tertiary filtration and reaeration may be applicable based on the desired effluent quality in the future but are not included in current estimates.

Figure 5-2 Process Schematic, Process Option 1

Costs for Process Option 1 are shown in Table 5-2.

Table 5-2. Capital Costs Alternative 1		
Facilities		Costs
Parallel to Little Shoal Creek Interceptor (West Interceptor)		\$8,289,000
West Side EFHB and Pump Station		\$3,396,000
West Side FM		\$364,000
East Side EFHB		\$3,281,100
CONVEYANCE SUBTOTAL		\$15,330,100
Raw Wastewater Lift Station		\$1,358,000
Raw Wastewater Meter Vault		\$143,000
Raw Wastewater Flow Splitter		\$177,000
Headworks Building		\$1,340,000
Primary Clarifiers #1 and #2		\$1,926,000
Aeration Basins #1 and #2		\$3,420,000
Secondary Clarifiers Flow Splitter		\$143,000
Secondary Clarifiers #1 and #2		\$2,899,000
UV Disinfection Structure		\$931,000
RAS/WAS Lift Station #1		\$648,000
Laboratory		\$550,000
Gravity Thickener		\$262,000
Sludge Pump Station		\$648,000
Digester Building		\$1,427,000
Anaerobic Digester/Sludge Storage Basins		\$4,767,000
Sludge Handling Building – 20% Solids		\$1,662,000
Outfall		\$2,670,000
Electrical/Instrumentation/Controls		\$3,746,000
Site Work		\$2,497,100
Site Piping		\$2,497,100
Overhead and Profit		\$3,371,000
WWTF SUBTOTAL		\$37,082,200
SUBTOTAL		\$52,412,300
GENERAL		
Contingency and Engineering		\$23,061,000
Little Shoal Creek Easement		\$252,000
TOTAL		\$75,725,300

5.3.2 PROCESS OPTION 2

Process Option 2 (Figure 5-3) is Alternative 2 and represents a lower capital cost alternative with potentially higher O&M costs. Raw wastewater would flow from screening to grit removal. Flow would then be conveyed directly to BNR basins. Without primary clarifiers, the BNR basins would be more heavily loaded than in Process Option 1, with higher aeration costs. Secondary clarifiers would facilitate settling and return sludge. Waste activated sludge would be conveyed to aerobic digestion and storage. Wastewater from the secondary clarifiers would then undergo UV disinfection.

Digested biosolids would be dewatered mechanically to >20% total solids (TS) and ready for disposal. Alternatively, sludge with 3-4% TS could be applied to reed beds, reducing frequency of sludge hauling. Mechanical dewatering is included in cost estimates for this study.

Tertiary filtration and reaeration may also be included in this alternative in the future but are not included in current cost estimates. Costs for Process Option 2 are shown in Table 5-3.

Figure 5-3 Process Schematic, Process Option 2

Table 5-3. Capital Costs Alternative 2	
Facilities	Costs
Parallel to Little Shoal Creek Interceptor (West Interceptor)	\$8,289,000
West Side EFHB and Pump Station	\$3,396,000
West Side FM	\$364,000
East Side EFHB	\$3,281,100
CONVEYANCE SUBTOTAL	\$15,330,100
Raw Wastewater Lift Station	\$1,358,000
Raw Wastewater Meter Vault	\$143,000
Raw Wastewater Flow Splitter	\$177,000
Headworks Building	\$1,340,000
Aeration Basins #1 and #2	\$3,420,000
Secondary Clarifiers Flow Splitter	\$143,000
Secondary Clarifiers #1 and #2	\$2,899,000
UV Disinfection Structure	\$931,000
RAS/WAS Lift Station #1	\$648,000
Laboratory	\$550,000
Sludge Pump Station	\$648,000
Aerobic Digester / Sludge Storage Basins #1-#4	\$2,356,000
Sludge Handling Building - 20% Solids	\$1,662,000
Outfall	2670000
Electrical / Instrumentation / Controls	\$2,842,000
Site Work	\$1,894,500
Site Piping	\$1,894,500
Overhead and Profit	\$2,558,000
WWTF SUBTOTAL	\$28,134,000
SUBTOTAL	\$43,464,100
GENERAL	
Contingency and Engineering	\$19,124,000
Little Shoal Creek Easement	\$252,000
TOTAL	\$62,840,100

5.3.3 PHASED PROCESS OPTION 2

A phased WWTF option was evaluated (Alternative 3). This phased option considered construction of the Process Option 2 facilities in a phased approach. Initially the west flow would continue to KCMO as in the current configuration but the east flow would be treated in a Liberty WWTF. The WWTF would be

expanded in 2022 to accommodate additional east side growth and all of the west side flows. Project costs for this alternative are shown in Table 5-5 and Table 5-5.

Table 5-4. Capital Costs Alternative 3, Phase 1	
Facilities	Cost
West Side EFHB and Pump Station	\$3,396,000
West Side FM	\$364,000
East Side EFHB	\$3,281,100
CONVEYANCE SUBTOTAL	\$7,041,100
Raw Wastewater Lift Station	\$1,233,000
Raw Wastewater Meter Vault	\$143,000
Raw Wastewater Flow Splitter	\$177,000
Headworks Building	\$1,340,000
Aeration Basin 1	\$2,210,000
Secondary Clarifiers Flow Splitter	\$143,000
Secondary Clarifiers #1 and #2	\$2,899,000
UV Disinfection Structure	\$756,000
RAS/WAS Lift Station #1	\$528,000
Laboratory	\$550,000
Sludge Pump Station	\$528,000
Aerobic Digester / Sludge Storage Basins #1-#3	\$1,856,000
Sludge Handling Building - 20% Solids	\$1,662,000
Outfall	\$2,670,000
Electrical / Instrumentation / Controls	\$2,504,000
Site Work	\$1,669,500
Site Piping	\$1,669,500
Overhead and Profit	\$2,254,000
WWTF SUBTOTAL	\$24,792,000
SUBTOTAL	\$31,833,100
Contingency and Engineering	\$14,007,000
TOTAL	\$45,840,100

Table 5-5. Capital Costs Alternative 3, Phase 2	
Facilities	
Parallel to Little Shoal Creek Interceptor (West Interceptor)	\$8,289,000
CONVEYANCE SUBTOTAL	\$8,289,000
Raw Wastewater Lift Station	\$125,000
Aeration Basin 2	\$1,710,000
UV Disinfection Structure	\$100,000
RAS/WAS Lift Station #1	\$120,000
Sludge Pump Station	\$120,000
Aerobic Digester / Sludge Storage Basins #1-#3	\$856,000
Electrical / Instrumentation / Controls	\$606,000
Site Work	\$303,100
Site Piping	\$454,650
Overhead and Profit	\$439,000
WWTF SUBTOTAL	\$4,833,750
SUBTOTAL	\$13,122,750
Contingency and Engineering	\$5,775,000
Little Shoal Creek Easement	\$252,000
TOTAL	\$19,149,750

6 KANSAS CITY, MISSOURI PROJECTS AND COSTS

6.1 INTRODUCTION

Continued use of wastewater treatment services from KCMO will result in ongoing treatment charges and capital expenditures within Liberty's collection system. These projects and costs are described and quantified in this section.

6.2 OVERFLOW CONTROL PLAN

The KCMO Water Services Department has developed an Overflow Control Plan (OCP) for reducing overflows from the City's wastewater collection and treatment system. The KCMO OCP indicates that major improvements to the Birmingham Pump Station, improvements to the Birmingham WWTP and additional conveyance/storage capacity north of the Missouri river are planned. Projects which are expected to provide the primary benefits to the City include capacity upgrades to the Birmingham Pump Station and forcemain. These improvements are tentatively scheduled for 2023-2024.

According to the OCP, completion of the OCP is estimated to cost \$2.4 billion (in 2008 dollars) over the next 25 or more years. The costs of these improvements will be allocated to users based on the Cost of Service (COS) study which KCMO is currently updating. The treatment charges paid by Liberty to KCMO will begin increasing in 2012 to cover the cost of the OCP improvements.

6.3 SEWAGE TREATMENT COSTS

Two KCMO rate scenarios were considered. Scenario A (Alternative 4) includes the rate increases reported by KCMO. Scenario B (Alternative 5) represents lower rate increases based on the possibility that lower rates for wholesale customers may be available as a result of the COS study. Rate increases for both scenarios are shown in Table 6-1.

6.4 CAPITAL IMPROVEMENTS

If the City continues to convey flow to KCMO for treatment, the following additional conveyance improvements are recommended. Capital costs for the conveyance improvements included in Alternatives 4 and 5 are shown in Table 6-2.

- Construction of an interceptor aligned parallel to the existing Little Shoal Creek/Liberty West Interceptor. This interceptor would consist of 6,640 linear feet of 42-inch pipe and 6,940 linear feet of 48-inch pipe. This interceptor was recommended in the 1994 Little Shoal Creek Sewer Service study. The City has an agreement with KCMO to pay 65% of the cost of this improvement.
- Construction of an earthen excess flow holding basin (EFHB) and pump station on the west side at the site of a former wastewater lagoon. This EFHB will provide the capacity to delay flow peaks at times when the Birmingham Pump Station is unable to convey the City's wastewater. This is needed because the Birmingham Pump Station improvements are not scheduled until 2023-2024, so peak flow capacity will continue to be problematic in the near term. Further discussion with KCMO would be warranted to investigate cost sharing alternatives for a west side EFHB.
- Construction of a covered concrete EFHB and pump station on the east side, adjacent to the water facility lime lagoon. City staff has reported overflows from this basin. The EFHB will provide

additional storage within the City’s collection system without adding to the capacity limitations at the Birmingham pump station.

Recommended improvements are show in Figure 6-1and Figure 6-2.

Table 6-1. Annual Increases in KCMO Wastewater Treatment Fees		
	Scenario A	Scenario B
2012		
2013	15%	10%
2014	15%	10%
2015	15%	10%
2016	13%	8%
2017	13%	8%
2018	13%	8%
2019	13%	8%
2020	13%	8%
2021	3%	3%
2022	3%	3%
2023	3%	3%
2024	3%	3%
2025	3%	3%
2026	3%	3%
2027	3%	3%
2028	3%	3%
2029	3%	3%
2030	3%	3%
2031	3%	3%
2032	3%	3%
2033	3%	3%
2034	3%	3%
2035	3%	3%
2036	3%	3%
2037	3%	3%
2038	3%	3%
2039	3%	3%
2040	3%	3%

Table 6-2. KCMO Capital Costs		
FACILITIES	QUANTITY	COST
Facilities		
Parallel to Little Shoal Creek Interceptor (West Interceptor) ¹		\$5,388,000
West Side EFHB		\$3,171,200
East Side EFHB and Pump Station		\$5,531,100
SUBTOTAL		\$14,090,300
GENERAL		
Engineering and Contingency		\$6,199,732
Little Shoal Creek Easement		\$252,000
TOTAL		\$20,542,032

1. Cost represents Liberty's share of the improvements (65%).

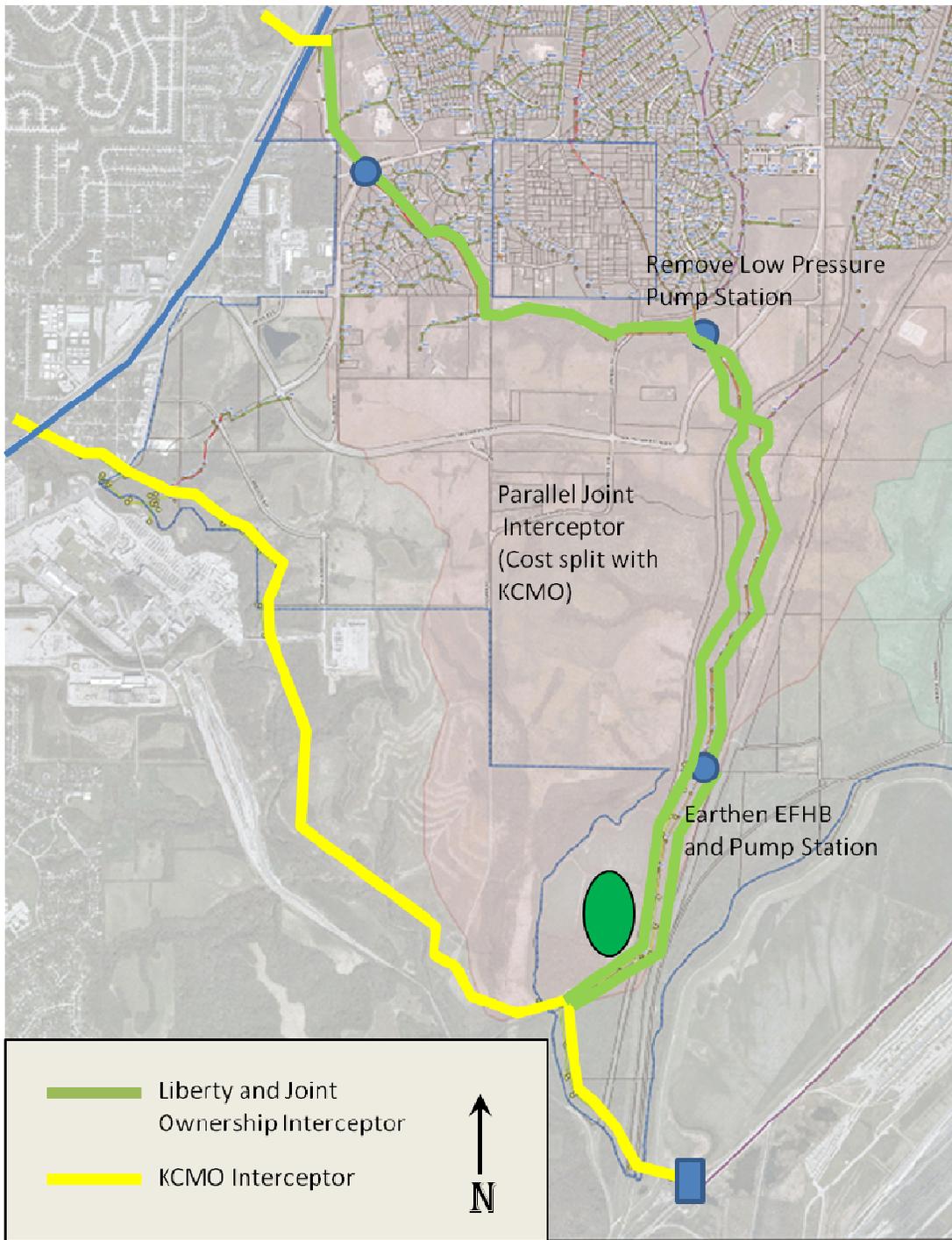


Figure 6-1 East Side Conveyance System Improvements

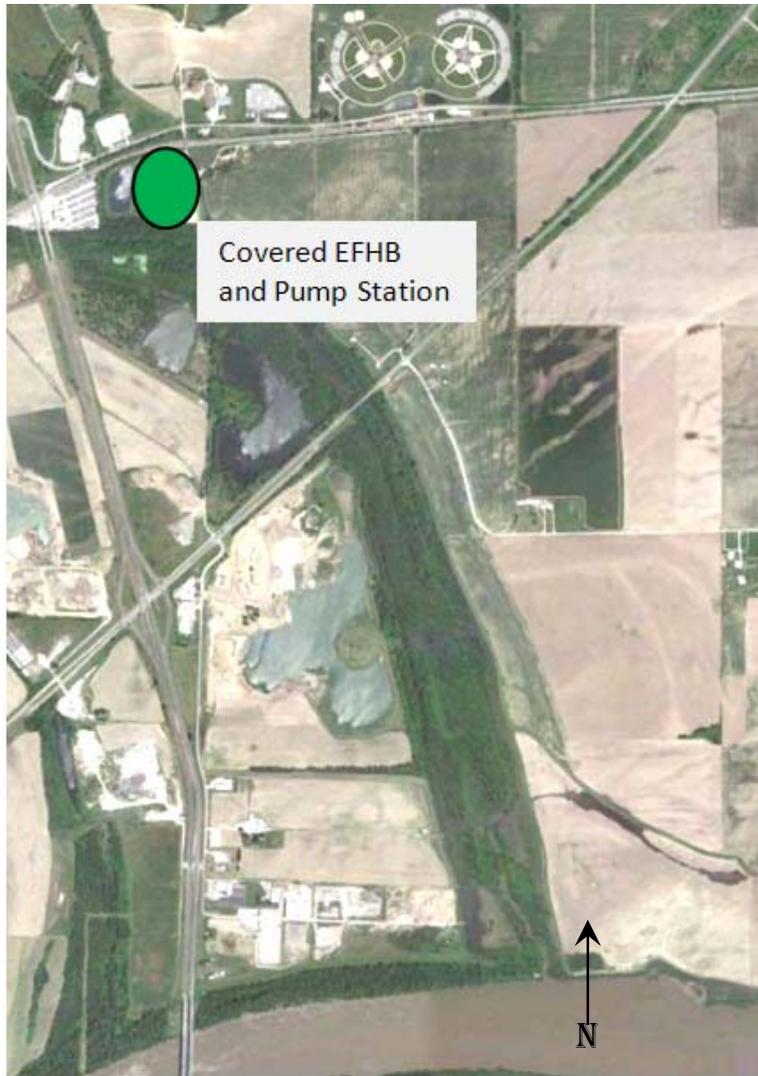


Figure 6-2 West Side Conveyance System Improvements

7 FINANCIAL EVALUATION

7.1 INTRODUCTION

The five alternatives described in Section 5 and 6 were evaluated to determine the most beneficial solution for the City in the long-term as well as the short-term. Alternatives were evaluated based on net present value as well as annual revenue requirements. Capital and operations and maintenance (O&M) costs were developed for the five alternatives. The alternatives and their associated costs are summarized below as they relate to the financial analysis. Full descriptions are found in Sections 5 and 6.

7.1.1 LIBERTY WWTF ALTERNATIVES

7.1.1.1 ALTERNATIVE 1

Alternative 1 is a higher capital cost option with the potential for lower operating costs. It includes primary clarifiers and biological nutrient removal along with anaerobic digesters. Construction begins in 2014 with the new treatment facility operational in 2016. The estimated capital cost is \$75.7 Million. The annual O&M costs in the first year are expected to be \$1.32 Million.

7.1.1.2 ALTERNATIVE 2

Alternative 2 is a lower capital cost option with the potential for higher operating costs. It includes biological nutrient removal and aerobic digestion and will have a higher aeration load than Alternative 1. Construction begins in 2014 with the new treatment facility operational in 2016. The estimated capital cost is \$62.8 Million. The annual O&M costs in the first year are expected to be \$1.37 Million.

7.1.1.3 ALTERNATIVE 3

Alternative 3 is a phased version of Alternative 2 which allows the initial capital cost of the treatment facility to be reduced but requires that the City pay KCMO treatment rates for a portion of the City's flow until the second phase is constructed. Construction of Phase 1 begins in 2014 with the new treatment facility operational in 2016. The west side flows continue to flow to KCMO until Phase 2 is operational in 2024. The estimated Phase 1 capital cost is \$45.8 Million with annual O&M costs in the first year of \$1.09 Million. The estimated capital cost for Phase 2, in 2012 dollars, is \$19.2 Million. The annual O&M costs in the first year are expected to be \$1.37 Million.

7.1.2 KCMO ALTERNATIVES

7.1.2.1 ALTERNATIVE 4

Alternative 4 includes the capital and O&M costs for the recommended conveyance improvements and KCMO treatment charges at the rates reported by KCMO. The estimated capital cost is \$20.5 Million. New facilities are operational beginning in 2016.

7.1.2.2 ALTERNATIVE 5

Alternative 5 includes the same capital and O&M costs as Alternative 4, but includes reduced rates which may be negotiated with KCMO. New facilities are operational beginning in 2016.

7.2 PROJECTIONS

A financial model was developed to evaluate the alternatives. The model is included in Appendix C. The following parameters were used in the development of the financial model.

7.2.1 EXISTING OPERATIONS COSTS

Existing utility operations costs were included in the revenue requirements for each alternative. These costs were developed using the existing budget. Each expense category was escalated based on historical trends, with an overall average of approximately 2.0% per year. Depreciation expenses were not included.

7.2.2 NEW FACILITY OPERATIONS COSTS

New facility operations costs were estimated based on additional labor, materials, utilities, chemicals, and sludge hauling for each alternative. A payment to an equipment replacement sinking fund was also included based on expected life of major new pieces of equipment.

7.2.3 DEBT SERVICE

New and existing debt service costs were included. New debt service payments were estimated based on capital costs, conventional bonds, and a 25-year amortization. Payment schedules include capitalizing interest so that the first debt payment is due in July of 2016. State Revolving Fund (SRF) loans may be available. These loans would have lower interest rates than assumed, but would be limited to 20-year terms. Because the availability of SRF funds is uncertain, the model is based on conventional bonds.

7.2.4 DEBT COVERAGE

Debt coverage of 25% is included in the financial model for existing and new debt. Debt coverage is required by the writer of each bond. Typical coverage requirements vary from 10% to 25%.

7.3 NET PRESENT VALUE

The net present value of each alternative was calculated over the period 2012-2040. Net present value allows a series of future payments to be discounted back to current costs. The salvage value or remaining life of facilities was not considered in this evaluation. Net present values and total costs through 2040 for each alternative are shown in Table 7-1. All Liberty alternatives have lower net present values and lower total costs than the KCMO alternatives.

Alternative	Net Present Value	Total Costs through 2040
Alternative 1	\$145,130,000	\$281,380,000
Alternative 2	\$132,100,000	\$248,800,000
Alternative 3	\$145,100,000	\$275,150,000
Alternative 4	\$218,950,000	\$452,330,000
Alternative 5	\$167,800,000	\$339,960,000

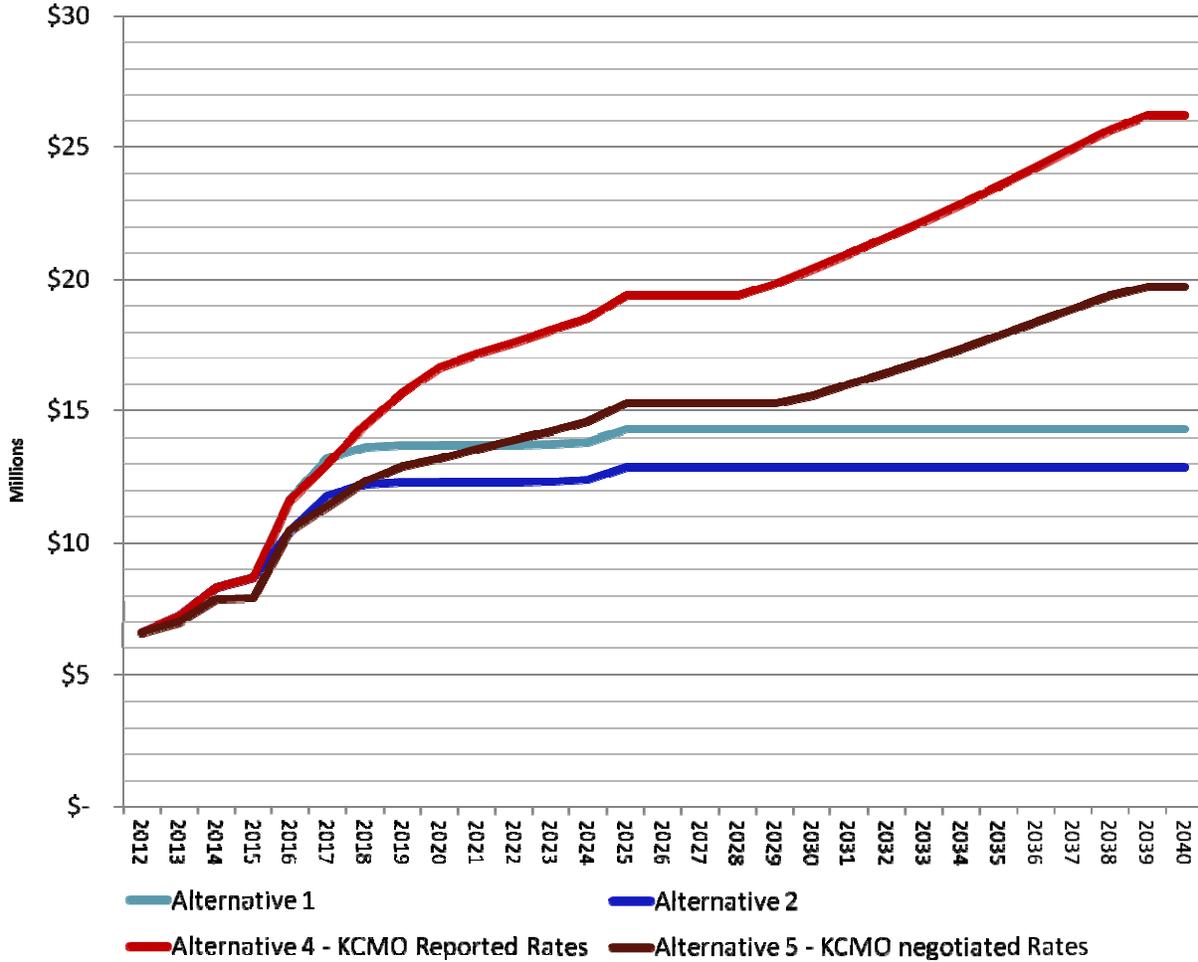
All Liberty alternatives have lower net present values and lower total costs than the KCMO alternatives. A sixth alternative was developed to determine the annual KCMO rate increases which would result in a net present value equal to Alternative 2, the lowest net present value alternative. The required rates are shown in Table 7-2.

Table 7-2. KCMO Rates to Match Lowest Net Present Value.			
Year	% Increase	Year	% Increase
2012	-	2027	3%
2013	5%	2028	3%
2014	4%	2029	3%
2015	4%	2030	3%
2016	4%	2031	3%
2017	4%	2032	3%
2018	4%	2033	3%
2019	4%	2034	3%
2020	4%	2035	3%
2021	3%	2036	3%
2022	3%	2037	3%
2023	3%	2038	3%
2024	3%	2039	3%
2025	3%	2040	3%
2026	3%		

7.4 REVENUE REQUIREMENTS

Annual revenue requirements for each alternative are shown in Figure 7-1.

Figure 7-1. Projected Annual Revenue Requirements.



7.5 OTHER CONSIDERATIONS

The net present value and total cost analysis account for the expected capital and O&M costs for all alternatives. In addition, there are a number of additional factors which are not represented in the analysis above.

- Residual value. As noted above, no salvage value was assigned to the new facilities at the end of the analysis. The equipment replacement account is funded to allow for the replacement of equipment in accordance with their expected life, and the basins and other facilities can be expected to have a design life of 50 years or more. Therefore, there is additional value in the Liberty alternatives which is not accounted for in the NPV evaluation.
- Reserve funds. Revenue requirements for all alternatives include debt service coverage. This amount is required to be collected each year as a result of bond covenants. This results in the accumulation of approximately \$50 Million in cash for the Liberty options and approximately \$20 Million for the KCMO options. The NPV analysis treats this cash as a cost but does not consider the value of the cash account, which could be used for conveyance construction and maintenance, future treatment expansion, equipment replacement, or other cash needs.

- Future Planning. The Liberty WWTF alternatives include treatment levels which are believed to be required in the next 10-20 years, including nutrient removal and disinfection. The KCMO Birmingham WWTP is adding disinfection, but it does not currently provide nutrient removal, nor is the addition of nutrient removal included in the OCP. Therefore, if KCMO is required to provide nutrient removal at Birmingham in the future additional capital projects would likely be required.

8 RECOMMENDATION

The analysis in Section 7 indicates that all Liberty WWTF alternatives have a lower net present value and lower total revenue requirements than the KCMO alternatives evaluated. In addition, there are economic and non-economic benefits to pursuing a Liberty WWTF. Capacity limitations in the KCMO system have limited the ability of the City to permit sewer extensions, which could ultimately limit growth. Backups in the collection system have resulted in sanitary sewer overflows (SSOs) which expose the City to liability. Therefore, it is recommended that the City continue to pursue a Liberty WWTF to allow disconnection from the KCMO system. It is recommended that the Liberty WWTF be located at the east site with discharge to the Missouri River.

Negotiations with KCMO should continue and may result in more favorable rate increases. If these negotiations result in significantly lower rate increases than those depicted in Table 7-1, the City should re-evaluate the feasibility of constructing its own wastewater treatment facility.

9 IMPLEMENTATION

There are a number of steps which must be completed in order to proceed with the recommended plan, as described below. The implementation schedule is shown in detail in Figure 9-1.

9.1 ANTIDegradation REVIEW

All new and expanded discharges in the state are subject to an Antidegradation review. The process allows the Missouri Department of Natural Resources (MDNR) to evaluate the impact of new and/or increased wastewater discharge in the waters of the state. The determination is based on the level of protection assigned to the pollutants of concern (POCs) within the receiving water, the type of receiving water, existing water quality of the receiving water, the necessity of degradation, and the social and economic importance of the proposed discharge.

Antidegradation reviews are based on the permitted or design flow rate; therefore a discharge from a Liberty WWTF will be considered a new discharge despite the fact that there is an existing outfall and the flow is currently discharged to the same receiving water through another permitted facility.

The scope of an Antidegradation review varies dramatically based on the receiving water. It is anticipated that the process will take approximately 12 months for this project. The steps in the process are as follows:

- Submit Antidegradation Report
- MDNR Review of Antidegradation Report
- Submit Draft Operating Permit Application
- MDNR Review Draft Operating Permit
- Public Notice Antidegradation Report and Draft Operating Permit

9.2 FACILITY PLAN

The facility planning process is complementary to the Antidegradation review. Alternatives and costs developed in the facility planning process will be used in the Antidegradation review. In the facility plan, process alternatives will be evaluated and selected based on the effluent limits established in the Antidegradation review and draft operating permit. Project costs will be refined and value engineering opportunities will be identified.

The facility planning process will take approximately six to eight months. It cannot be completed until MDNR has completed its review of the Antidegradation report. The steps in this process are as follows:

- Treatment Process Evaluation
- Biosolids Process Evaluation
- Environmental Clearances
- Preliminary Cost Estimate for Antidegradation Report/Bond Issue
- Facility Plan Cost Estimate
- User Charge Impact Analysis

- Draft Report
- Final Report
- Public Meeting: Alternatives Analysis
- Public Meeting: Environmental Impacts
- Public Meeting: User Charge Impacts
- Submit Facility Plan
- MDNR Review

9.3 STATE REVOLVING FUND (SRF) FINANCING

Financial projections in this study are based on conventional financing, however State Revolving Fund (SRF) financing offers financial benefits over conventional financing. It is limited to 20 year terms, but offers lower interest rates (currently 2.66% versus ~4.25%). Funds are allocated only once per year, so the SRF schedule can ultimately dictate a project’s timeline.

Funds are allocated in the Intended Use Plan (IUP), which is typically issued in draft form in January and finalized in April. In order to be considered fundable, the following conditions must be met:

- Bond election passed
- Facility plan approved, including public meetings
- Application submitted by November 15 – complete (Appendix D).

9.4 BOND ELECTION TIMING

Funding a Liberty WWTF through conventional or SRF financing will require a bond election. There are a number of factors to consider when selecting the timing for the election. A bond election could be held on the following dates.

Table 9-1. Potential Bond Election Timing.	
Election	Call for Election
August 2012	May 2012
November 2012	August 2012
February 2013	November 2012
April 2013	January 2013

Earlier election dates allow for disconnecting from KCMO sooner, reducing the amounts paid to KCMO, but have less certainty in projected cost estimates and permitting. Later dates delay the construction of the new Liberty WWTF but allow for more certainty in cost estimates, permitting, and negotiations with KCMO. Either an August 2012 or November 2012 bond election would allow for eligibility for the 2014 SRF IUP. It is likely that later elections would result in not being fundable until the 2015 IUP. It is expected that the City would bear significant costs in a February election as there may not be other entities sharing the cost, therefore it is not shown on Figure 9-1.

Prior to the bond election, educational public meetings are recommended to inform voters of the economic and non-economic benefits of the recommended plan.

9.5 ENGINEERING AND CONSTRUCTION SCHEDULE

Design and construction of the WWTF, interceptor and EFHB could be phased to allow for delay in expenditures if desired, allowing the three projects to be completed at approximately the same time. Anticipated design, approval, and construction durations for each project are shown below.

Table 9-2. Anticipated Design and Construction Durations.				
	Design	Regulatory Approval/Bid/Award	Construction/Startup	Total
WWTF	12 months	5 months	24 months	41 months
EFHBs	9 months	5 months	14 months	28 months
Interceptor	9 months	5 months	12 months	26 months

9.6 NEGOTIATION WITH KCMO

The City's contract with KCMO requires 2 year notice of intent to separate. Based on anticipated construction schedules, this will allow the City to notify KCMO after receiving bids for the construction of the WWTF. However, it is anticipated that the City will attempt to finalize negotiations with KCMO before authorizing the design of the recommended improvements, which would represent a significant investment in the improvements.

Appendix A



**WWTF Feasibility Study
Workshop #1**
City Project #11-013
City of Liberty, Missouri
November 1, 2011



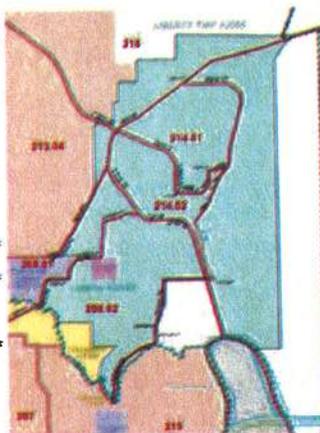
Agenda

- Population/Flow Projections
- City of Kansas City Improvements
- Liberty Wastewater Treatment Facility
- Design Considerations
 - Effluent Discharge
 - Structural Considerations
 - Process Alternatives
 - Solids Disposal
- Next Steps



Population Projections

- Population Projections
 - MARC Data (2004 KC Metro Area Long Range Forecast)
 - MARC uses census tracts rather than city limits
 - Liberty population estimated by:
 - Population density of tract
 - Liberty land percentage within each tract.



City	2010	2020	2030	2040
Liberty	29,726	32,949	36,004	39,604
Glenaire	559	564	570	575
Sub Total	30,285	33,513	36,574	40,179
Pleasant Valley	3,511	3,747	3,997	4,197
Total	33,796	37,260	40,570	44,376

Liberty

HR

Current Flow

- Current Flow
 - East Forcemain
 - Flow is metered at east pump station.
 - Flow meter data from 2008-2010 used to determine Average Annual:Maximum Month ratio (AA:MM).
 - West Interceptor
 - Meter data not available.
 - Water usage data used to determine the AA.
 - Max month estimated using MM:AA ratio on east side.

Location	Current AA (MGD)	Current MM (MGD)
East	2.6	3.7
West	1.0	1.1
Total	3.5	4.7

Liberty

HR

Projected Population and Flows

	2010	2020	2030	2040 ¹
Population	29,726	32,949	36,004	39,604
Per Capita Flow Rate, gpcd	116.6	116.6	116.6	116.6
AA:MM Flow²	1.56	1.56	1.56	1.56
Average Annual Flow, MGD	3.5	3.8	4.2	4.6
Maximum Month Flow, MGD	4.7	6.0	6.6	7.2

Note:

¹ 2040 population projection estimates 10% growth for period 2030-2040.

² Ratio based on east meter data only.

Liberty

HR

Alternative Definition

- Continue discharging to Kansas City, MO (KCMO)
- Construct Liberty Wastewater Treatment Facility

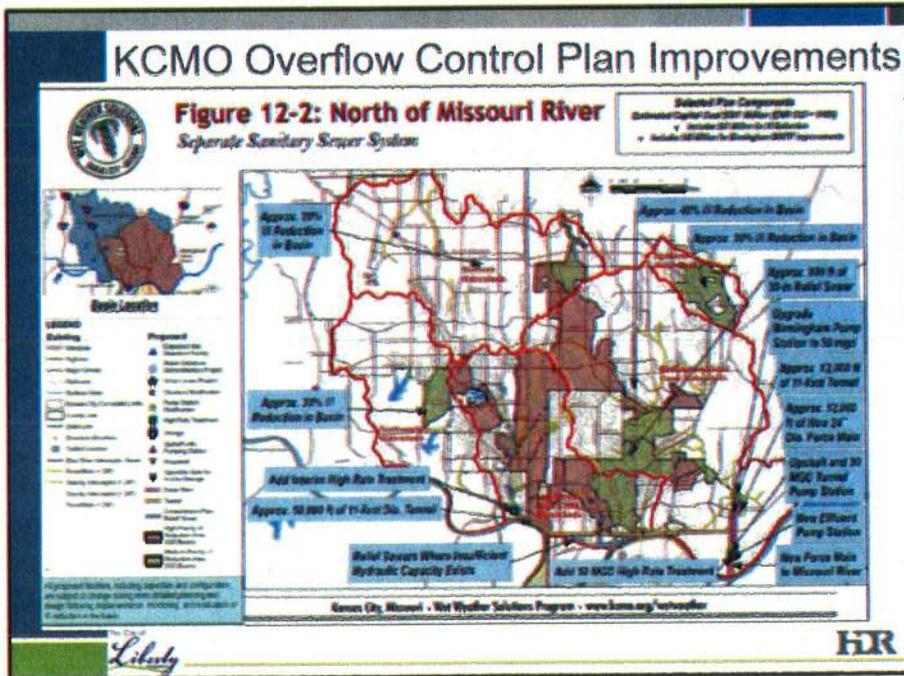
Liberty

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Alternative Definition

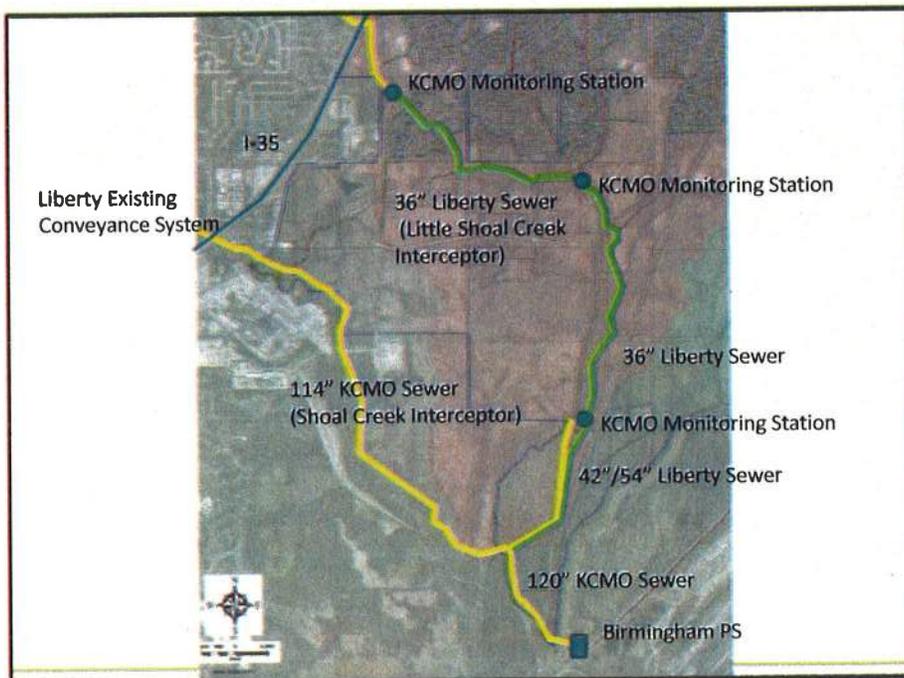
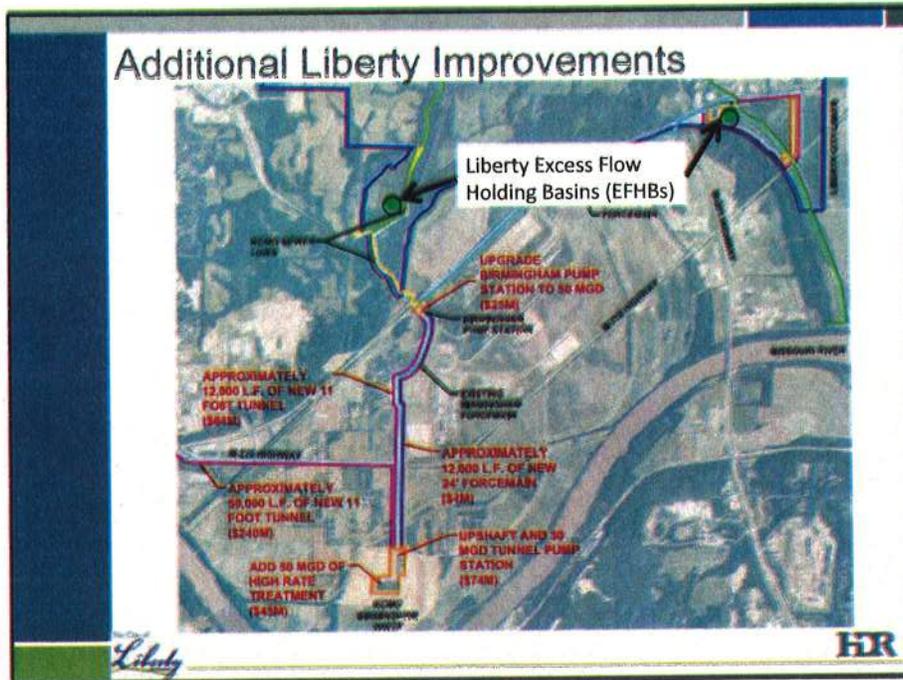
- Continue discharging to Kansas City, MO (KCMO)
- Construct Liberty Wastewater Treatment Facility

Liberty **HR**





KCMO Overflow Control Program Improvements	Capital Cost	O&M Cost	Timeframe
Infiltration and Inflow Reduction	\$86.94 Million	--	
Construct temporary High Rate Treatment Line Creek	\$37.16 Million	\$0.05 Million	2014-2015
Construct approximately 50,000 LF of 11' diameter tunnel - "North Bank Tunnel System" for conveyance of wet-weather flows to the Birmingham WWTP.	\$238.29 Million	\$0.64 Million	2021-2024
Relief Sewers Line Creek	\$13.38 Million	--	2019-2021
Relief Sewers Birmingham	\$0.22 Million	--	2019-2021
Upgrade Birmingham Pump Station (PS) to 50 MGD	\$24.36 Million	\$0.88 Million	2023-2024
Construct 50 MGD High Rate Treatment Disinfection/Force Main at the Birmingham WWTP	\$44.64 Million	\$2.27 Million	2023-2024
Construct approximately 11,000 LF of 11' diameter tunnel - Birmingham PS to the Birmingham WWTP.	\$64.25 Million	\$0.25 Million	2021-2024
Construct 30 MGD tunnel dewatering pump station - Birmingham WWTP	\$73.99 Million	\$0.89 Million	2023-2024
Construct approximately 12,000 linear feet of 24-inch force main Birmingham PS to Birmingham WWTP	\$4.06 Million	\$0.02 Million	2023-2024
Total North Basin Plan Cost =	\$587.30 Million	\$5.00 Million	



Liberty Conveyance Improvements

Liberty Conveyance Improvements	Capital Cost
East EFHB	\$2.5 Million
Covered Concrete Basin, Reuse Existing East PS	
West EFHB	\$3.5 Million
Covered Concrete Basin, New Peak Flow PS	
Subtotal=	\$5.5 Million



Alternative Definition

- Continue discharging to Kansas City, MO (KCMO)
- **Construct Liberty Wastewater Treatment Facility**



Site Selection

- **West Site**
 - Environmental Impacts
 - Wetlands
 - Forested areas
 - Discharge
 - Direct discharge possible (No Levee)
 - Potential Anti-Degradation Difficulties
 - Likely to Require Highest Level of Treatment
 - In 100 Year Flood Plain
 - Excess Flow Holding Basins
 - No Good Access Route



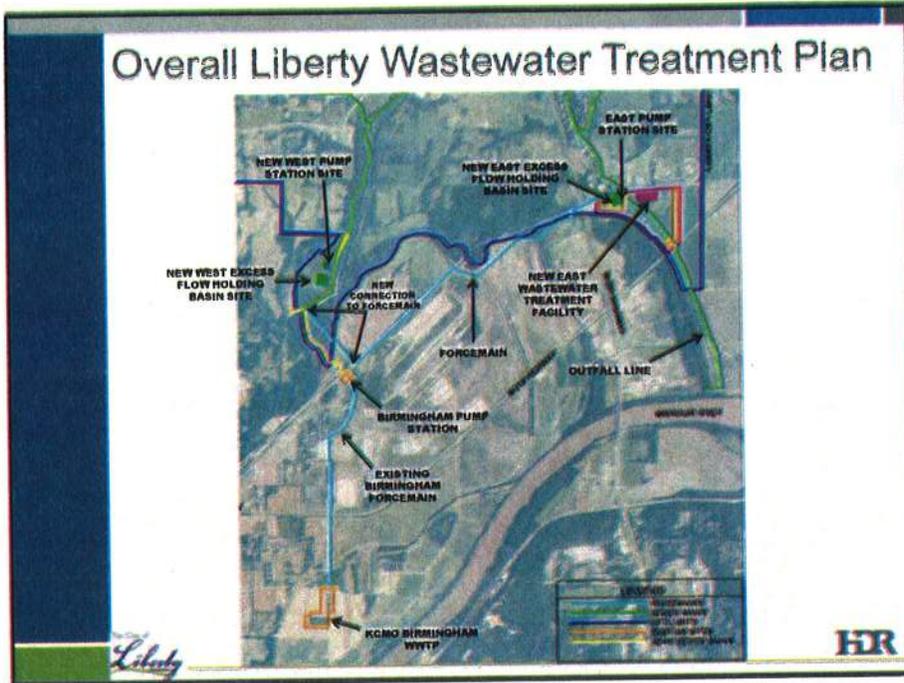



Site Selection

- **East Side**
 - Environmental Impacts
 - Upland area
 - No forests
 - Discharge
 - Shoal Creek
 - Over Levee
 - Potential Anti-Degradation Difficulties
 - May Require Higher Level of Treatment
 - Missouri River
 - Over Levee
 - Most Likely to Pass Anti-Degradation Review
 - Likely Lowest Level of Treatment
 - In 100 Year Flood Plain
 - Near Lime Sludge Storage
 - Near Wellfield
 - Poor Soil Conditions
 - Excess Flow Holding Basins
 - Site is Accessible





EFHB Alternatives

Grass-lined



Concrete



Covered



Liberty HR

This slide illustrates three alternatives for an Effluent Filtration and Holding Basin (EFHB). The 'Grass-lined' alternative shows a wide, shallow basin with a grassy interior. The 'Concrete' alternative shows a similar basin with a smooth, grey concrete lining. The 'Covered' alternative shows a large, cylindrical, dome-shaped structure, likely a covered tank or vault.

East Site Considerations

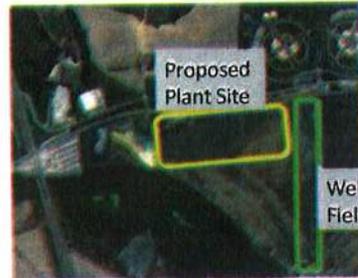


Liberty HR

This map shows the layout of the East Site. Key features include the 'EAST SEWER PUMP STATION' at the top, the 'NEW EAST WWTPL STATION SITE' in the middle, and the 'MISSOURI RIVER' at the bottom. Discharge points are marked for 'Shoal Creek Discharge' and 'Existing Discharge'. A 'LIBERTY' road is also shown on the right side of the site.

Groundwater

- MDNR updating Minimum Design Standards
- Minimum spacing between WWTP and water supply wells
 - 300 feet
- Geology near well field
 - 10 to 15 ft of clay/silt cap
 - 40 to 45 ft of alluvial sand/gravel aquifer



MDNR Minimum Well Isolation Radii

Source of Possible Contamination	Minimum Isolation Radius
Wastewater treatment plants, wastewater lagoons, chemical storage, landfills, any liquid petroleum storage tanks, any surface or subsurface wastewater and solid waste disposal fields	300 feet
Manure storage area, unplugged abandoned well, grease, sewage pumping station, building or yard used for livestock or poultry, privy, cesspool, or other contaminants that may drain into the soil	100 feet
Sanitary sewer lines, existing wells, pits, sumps or holes, propane tanks, septic tanks, lakes or streams	50 feet
The right-of-way of federal, state, or county road	10 feet

Liberty

HR

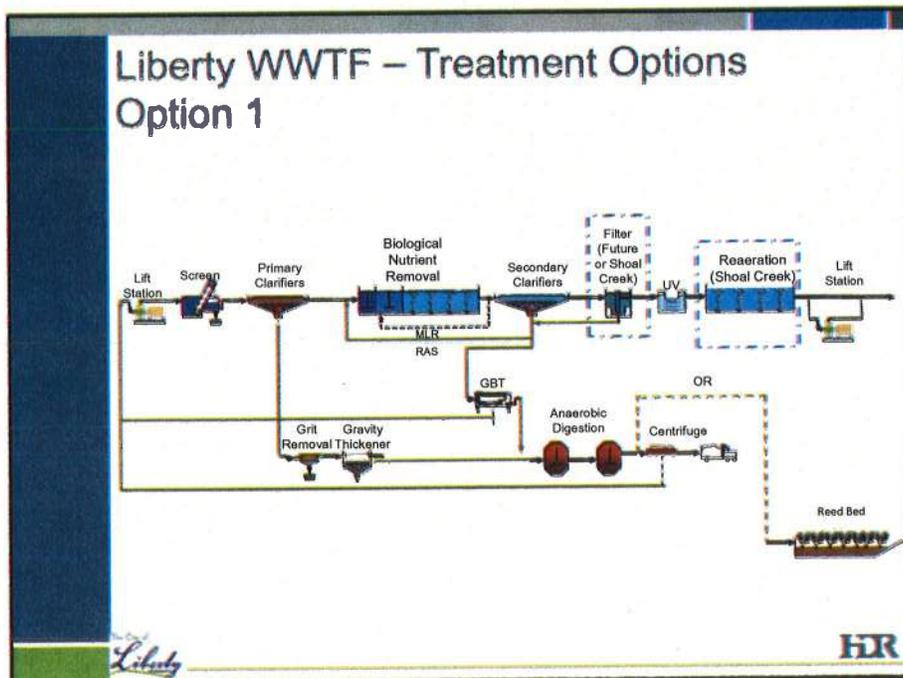
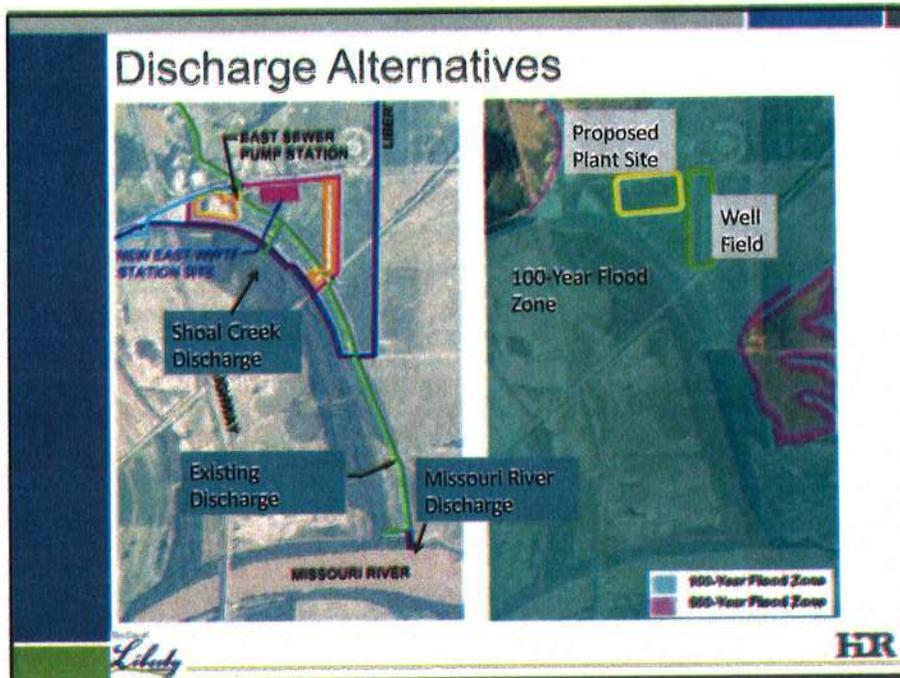
Structural Concerns

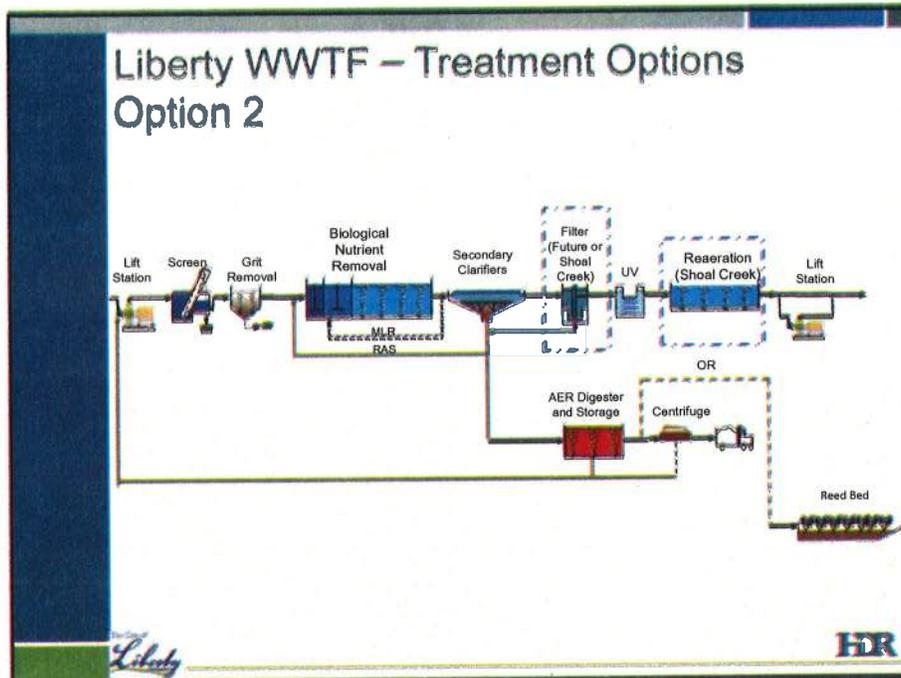
- Deep Foundation Considerations for WWTP in Alluvial Soils
 - Settlement
 - Seismic Remediation
 - Uplift



Liberty

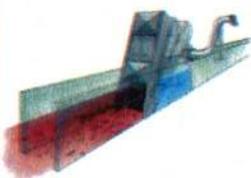
HR





Influent Screening

<ul style="list-style-type: none"> • Step Screen <ul style="list-style-type: none"> • Parallel Stepped Plates • 1/8" x 1/4" Spacing • Lower Headloss / Greater Open Area • Less Costly / Less Complex • Lower capture efficiency 	<ul style="list-style-type: none"> • Band Screen <ul style="list-style-type: none"> • Perforated Plates • 1/8" x 1/4" Spacing • Higher Headloss / Less Open Area • More Costly / More Complex • Higher Capture Efficiency 	<ul style="list-style-type: none"> • Drum Screen <ul style="list-style-type: none"> • Perforated Drum • 1/8" x 1/4" Spacing • Lower Headloss / Greater Open Area • More Costly / Less Complex • Higher Capture Efficiency
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Liberty HDR

Grit Removal

• Gravity

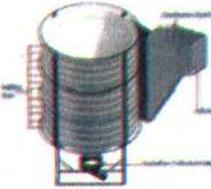
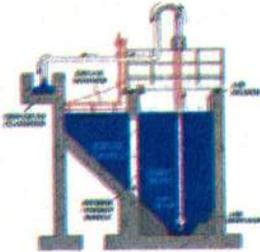
- Settling
- Higher Headloss
- More Costly / Less Complex
- Few Manufacturers

• Aerated

- Settling / Rolling
- Low Headloss
- Less Costly / Most Complex
- Few Manufacturers

• Vortex

- Centrifugal Force
- Low Headloss
- Less Costly / More Complex
- Multiple Manufacturers





Biological Nutrient Removal

Anaerobic

No oxygen or nitrates/nitrites present

Phosphorous Sequestration

Anoxic

No free oxygen present

Nitrates/Nitrites converted to N₂

Aerobic

Oxygen Present

BOD reduction

NH₃ converted to Nitrates/Nitrites

NH₃ < 1 mg/L

TN < 8 mg/L

TP < 1.5 mg/L

Nitrate return




Biological Treatment System – Alternate 1 Fine Bubble Aeration - Fixed Grid

• Fixed

- Basin Must be Taken Out of Service for Maintenance
- Relies on Aeration for Mixing, Requires Dedicated Anoxic Zones
- Rectangular Basin More Costly
- Many Manufacturers



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Biological Treatment System – Alternate 1 Fine Bubble Aeration - Retrievable

• Retrievable

- Perform Maintenance while Basin Is in Service
- Separate Mixing / Aeration Equipment
- Circular Basin Less Costly
- Fewer Manufacturers
- Cycle basin rather than distinct zones



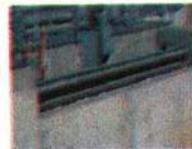
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Biological Treatment System – Alternate 2 Oxidation Ditch

• Characteristics

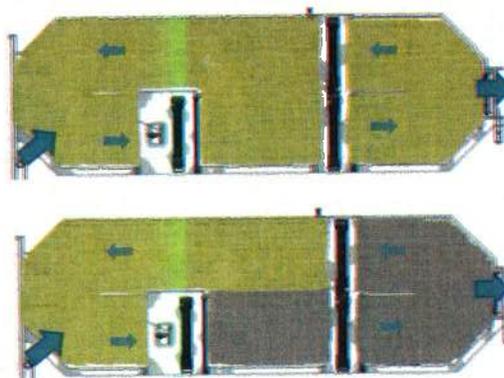
- Maintenance performed from above while Basin In Service
- Separate Mixing / Aeration Equipment
- Fewer Manufacturers



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Biological Treatment System – Alternate 2 Oxidation Ditch



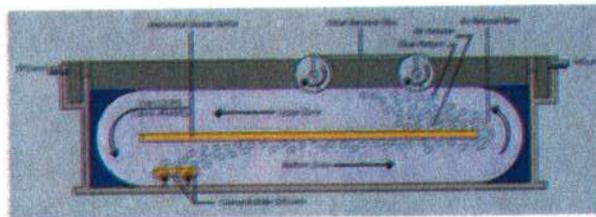
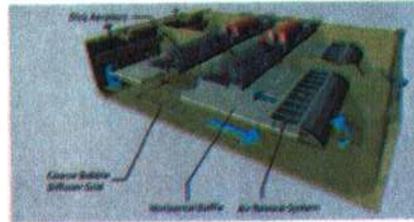
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Biological Treatment System – Alternate 3 Vertical Loop Reactor

• Characteristics

- More Energy Efficient Process
- Reduced Site Footprint
- More Complex Construction, But Requires Less Concrete
- One Manufacturer



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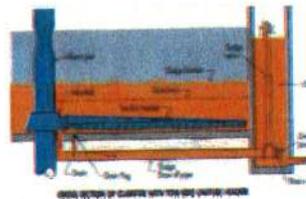
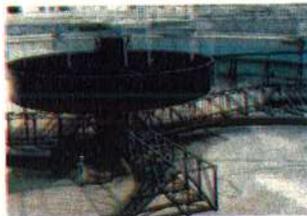
Secondary Clarification

• Spiral Blade

- Requires Greater Floor Slope

• Suction Header

- Requires Experienced Manufacturer In Design of Header
- Requires Less Floor Slope
- More Efficient Distributed Sludge Removal
- Ability to Dedicate Pump to Clarifier



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Tertiary Filtration

• Synthetic Media Filter

- Lower Headloss
- Smaller Site Footprint
- Lower Installed Cost
- Lower Backwash Rates
- Easily Expandable
- Future Material Upgrades???



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• Denitrifying Sand Filter

- Higher Headloss
- Larger Site Footprint
- Higher Installed Cost
- Higher Backwash Rates
- Greater Particulate Removal Rate
- Ability to Meet Lower Effluent TN Limit



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UV Disinfection

• Horizontal Config.

- Lower Headloss
- Less Dose Variability
- Submerged Lamp Connection
- More Difficult Lamp Replacement



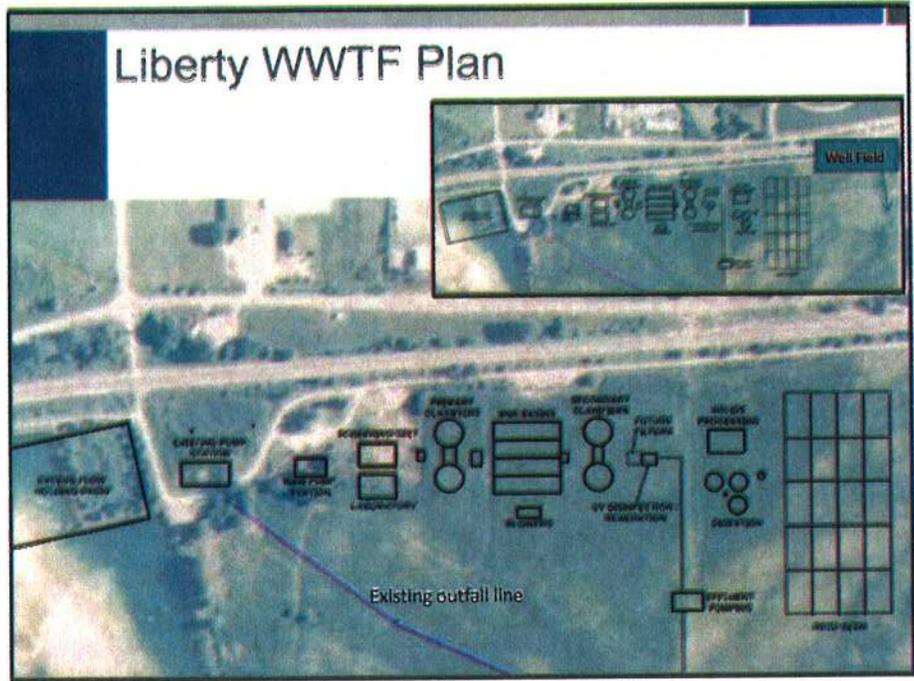
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• Vertical Config.

- Higher Headloss
- Greater Dose Variability
- Easy Lamp Replacement
- Less Competition



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WWTF Solids Alternatives

Option 1	Option 2
Anaerobic Digestion	Aerobic Digestion
Mechanical Dewatering	Mechanical Dewatering Reed Beds
Land Application	Land Application

Solids Alternatives

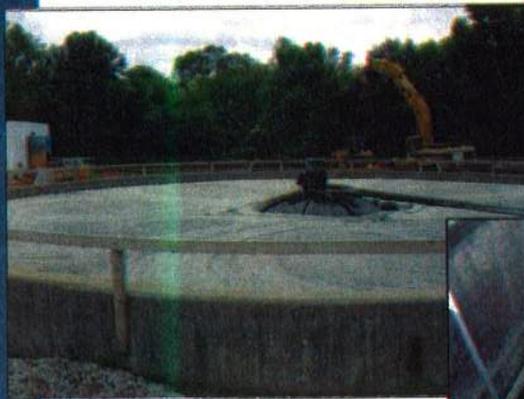
- Reed Beds



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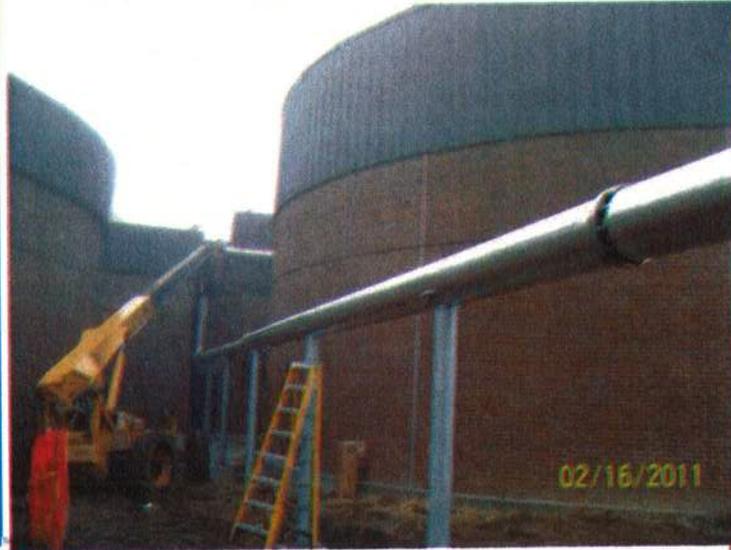
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Aerobic Digestion



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Anaerobic Digestion



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Solids Alternatives, Composting



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WWTF Alternatives, Shoal Creek Discharge

	Option 1	Option 2
Conveyance System	\$7.4 M	\$7.4 M
Liquids Train	\$16.1 M	\$14.1 M
Solids Train	\$9.3 M	\$6.7 M
Electrical, Site, Overhead & Profit	\$13.0 M	\$10.9 M
Engineering (20%)	\$9.2 M	\$7.8 M
<u>Contingency (20%)</u>	<u>\$9.2 M</u>	<u>\$7.8 M</u>
Total	\$64.2 M	\$54.7 M

Missouri River Discharge, deduct \$1.0 M from Total



Cost Summary – Kansas City

Conveyance System \$5.5 M

Year	Percent Increase	Estimated Payment	Year	Percent Increase	Estimated Payment
2012	Start	\$4,400,000	2027	3%	\$18,250,000
2013	15%	\$5,060,000	2028	3%	\$18,800,000
2014	15%	\$5,820,000	2029	3%	\$19,360,000
2015	15%	\$6,690,000	2030	3%	\$19,940,000
2016	13%	\$7,560,000	2031	3%	\$20,540,000
2017	13%	\$8,540,000	2032	3%	\$21,160,000
2018	13%	\$9,660,000	2033	3%	\$21,790,000
2019	13%	\$10,910,000	2034	3%	\$22,450,000
2020	13%	\$12,330,000	2035	3%	\$23,120,000
2021	13%	\$13,930,000	2036	3%	\$23,810,000
2022	13%	\$15,740,000	2037	3%	\$24,530,000
2023	3%	\$16,220,000	2038	3%	\$25,260,000
2024	3%	\$16,700,000	2039	3%	\$26,020,000
2025	3%	\$17,200,000	2040	3%	\$26,800,000
2026	3%	\$17,720,000	2041	3%	\$27,610,000



Next Steps

- Tech Memo No. 2 / SRF
Application Support
- Finalize Capital and O&M Costs
- Develop Net Present Values
- Identify Pay Back Periods
- Develop Financial Model
- Conduct Financial Workshop December 8

- Develop Implementation Schedule
- Implementation Workshop December 20

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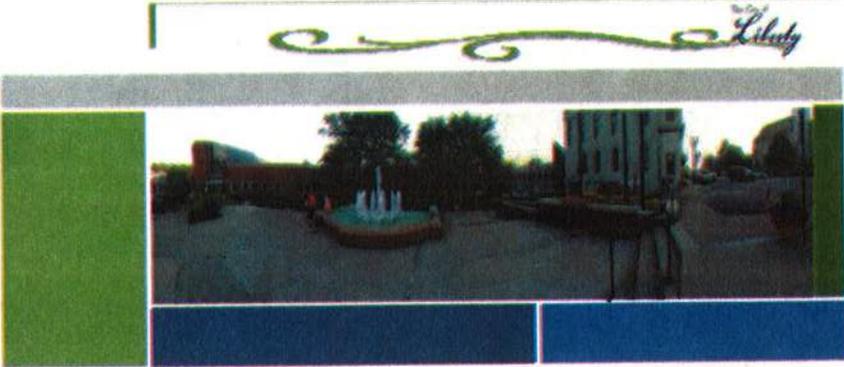
Separation from KCMO, alternative

- Separate KCMO flow
 - New facilities to convey KCMO to existing interceptor
 - Potentially pass through Pleasant Valley flow.



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**WWTF Feasibility Study
Workshop #2**
City Project #11-013
City of Liberty, Missouri
December 15, 2011



Expectations of Workshop

- Summarize wastewater alternatives
 - Capital
 - Operations and Maintenance
- Evaluate alternatives on net present value basis
- Consider revenue requirements
- Reach consensus on recommended alternative for implementation

2  

Background

- **Previous Studies**
 - 1999 Burns & McDonnell
 - Liberty WWTF lowest present value option
 - Continued with KCMO because it offered lowest near-term costs
 - 2010 KCMO Adopted Overflow Control Plan
 - Impacts on KCMO rates
 - Delayed Birmingham Improvements
 - 2011 Bartlett and West/Raftelis
 - Not complete

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HDR Study

- **Determine feasibility of Liberty treating its own wastewater**
- **Workshop 1 – Technical (November 1, 2011)**
 - Population/Flow Projections
 - Regulatory agency position and outlook
 - Design Considerations
 - Process Alternatives
 - Effluent Discharge
 - Structural Considerations
 - Biosolids Disposal
- Workshop 2 – Financial (December 15, 2011)
- Workshop 3 – Implementation (December 29, 2011)

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Projected Population and Flows

	2010	2020	2030	2040 ¹
Population	29,726	32,949	36,004	39,604
Per Capita Flow Rate, gpcd	116.6	116.6	116.6	116.6
AA:MM Flow²	1.56	1.56	1.56	1.56
Average Annual Flow, MGD	3.5	3.8	4.2	4.6
Maximum Month Flow, MGD	4.7	6.0	6.6	7.2

Note:

¹ 2040 population projection estimates 10% growth for period 2030-2040.

² Ratio based on east meter data only.

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MDNR Discussions

- HDR/City/MDNR Meeting - October 13, 2011
- MDNR feedback:
 - Discharge would be considered new even if existing line is used
 - Missouri River discharge allows for treatment flexibility
 - Missouri River discharge likely to have same limits as Birmingham WWTP current limits.
- HDR recommends discharge to Missouri River as the more appropriate alternative.

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Technical Recommendations

- **Best Site – Existing City Property Near East Pump Station**
 - Best access
 - Least impact by wetlands
 - Less pumping
 - Best access to Missouri River
 - Wellfield protected
- **Best Discharge Location – Missouri River**
 - Least environmental impact
 - Least potential to be impacted by future regulations

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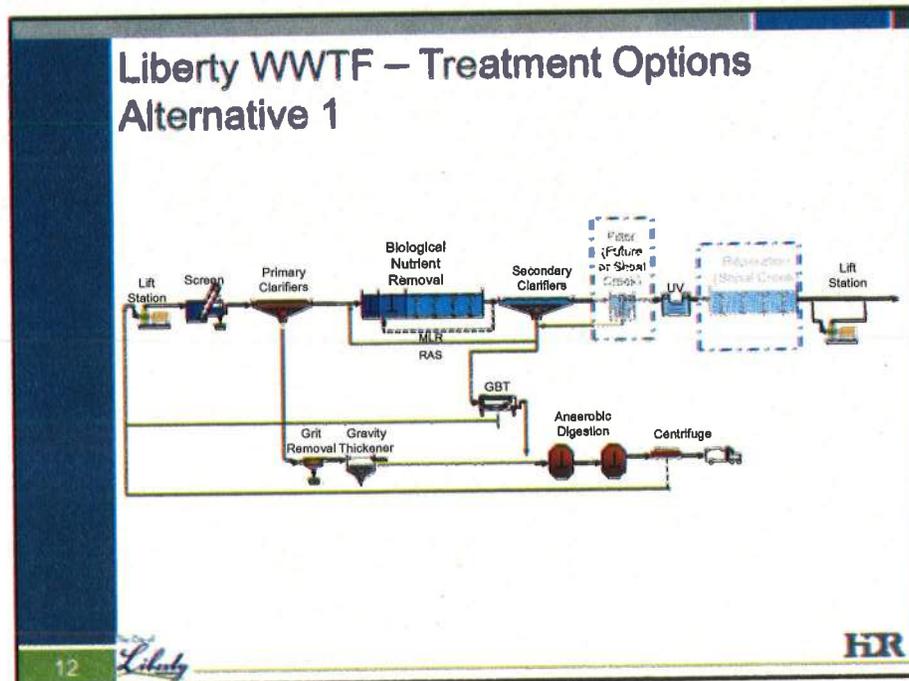
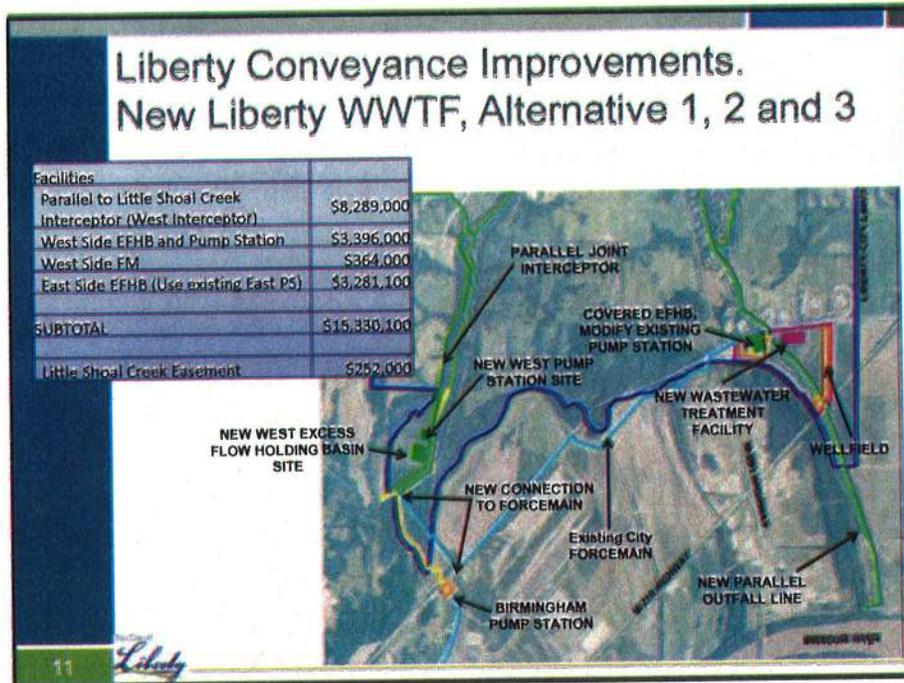
Alternatives

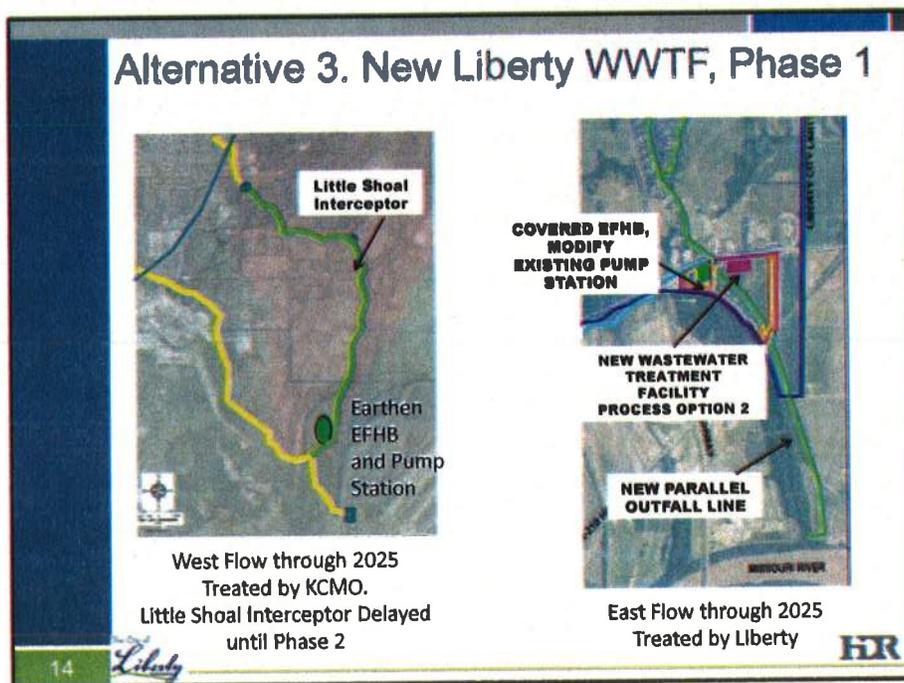
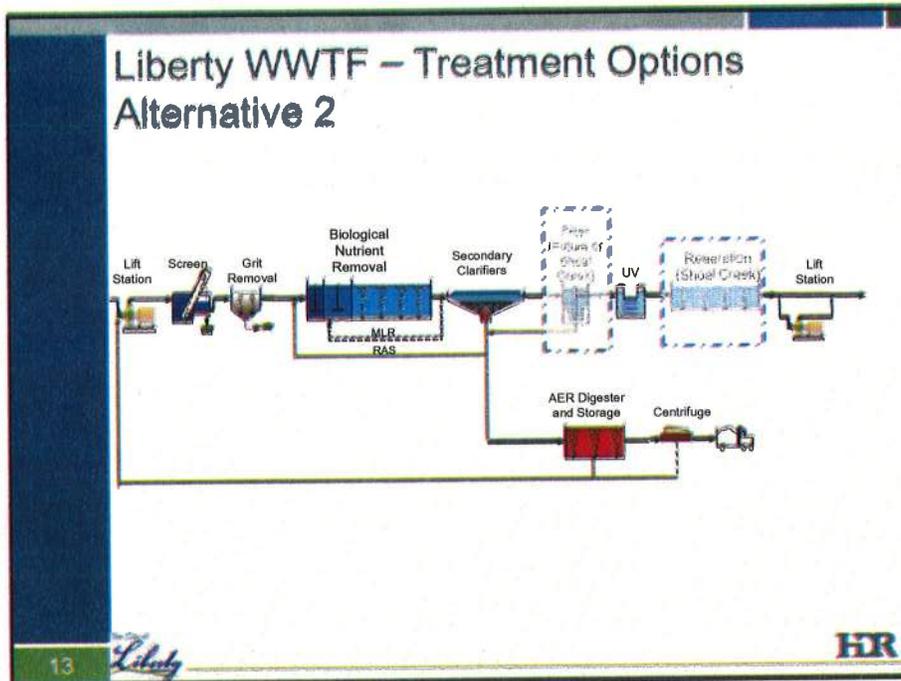
- **Construct Liberty Wastewater Treatment Facility**
 - Alternative 1 Primary / Secondary / BNR / Anerobic Digester
 - Alternative 2 – Secondary/BNR/Aerobic Digester
 - Alternative 3, Phased Alternative 2
- **Continue discharging to KCMO**
 - KCMO Proposed Rate Projections
 - Negotiated Rate Projections

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New Liberty WWTF Cost Comparison, Alternatives 1, 2, & 3

FACILITIES	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 3
			PHASE 1	PHASE 2 ¹
CONVEYANCE	\$15,330,000	\$15,330,000	\$7,041,000	\$8,289,000
WWTP	\$37,082,000	\$28,134,000	\$24,792,000	\$4,834,000
Contingency/Engineering/Admin	\$23,061,000	\$19,124,000	\$14,000,000	\$5,775,000
Little Shoal Creek Easement	\$252,000	\$252,000	N/A	\$252,000
SUBTOTAL	\$75,725,000	\$62,840,000	\$45,840,000	\$19,150,000
Annual O&M (1st Year)	\$1,318,000	\$1,371,000	\$1,087,000	\$1,371,000

¹ Values are 2012 dollars.

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KCMO Overflow Control Program Improvements	Capital Cost	O&M Cost	Timeframe
Infiltration and Inflow Reduction	\$86.94 Million	--	
Construct temporary High Rate Treatment Line Creek	\$37.16 Million	\$0.05 Million	2014-2015
Construct approximately 50,000 LF of 11' diameter tunnel - "North Bank Tunnel System" for conveyance of wet-weather flows to the Birmingham WWTP.	\$238.29 Million	\$0.64 Million	2021-2024
Relief Sewers Line Creek	\$13.38 Million	--	2019-2021
Relief Sewers Birmingham	\$0.22 Million	--	2019-2021
Upgrade Birmingham PS to 50 MGD	\$24.36 Million	\$0.88 Million	2023-2024
Construct 50 MGD High Rate Treatment Disinfection/Force Main at the Birmingham WWTP	\$44.64 Million	\$2.27 Million	2023-2024
Construct approximately 11,000 LF of 11' diameter tunnel - Birmingham PS to the Birmingham WWTP.	\$64.25 Million	\$0.25 Million	2021-2024
Construct 30 MGD tunnel dewatering pump station - Birmingham WWTP	\$73.99 Million	\$0.89 Million	2023-2024
Construct approximately 12,000 linear feet of 24-inch force main Birmingham PS to Birmingham WWTP	\$4.06 Million	\$0.02 Million	2023-2024
Total North Basin Plan Cost =	\$587.30 Million	\$5.00 Million	

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Continued Treatment by KCMO Conveyance Improvements

- **Birmingham Pump Station and forcemain not scheduled for upgrade until 2023**
- **Recommended Parallel Interceptors and excess flow holding to be provided to avoid overflows**
- **Estimated Capital Costs**

Parallel to Little Shoal Creek Interceptor (West Interceptor) ¹	\$5,388,000
West Side EFHB and Pump Station	\$3,171,000
East Side EFHB and Pump Station	\$5,531,000
Contingency/Engineering/Admin	\$6,200,000
Little Shoal Creek Easement	\$252,000
TOTAL	\$20,542,000

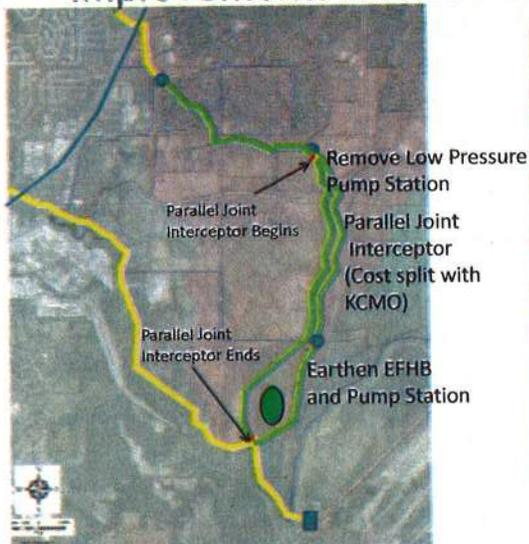
¹Cost represents Liberty's share of the Improvements (65%)

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Recommended Conveyance Improvements KCMO Alternatives



Alternative 4. Kansas City Proposed Rate Increases

Year	Percent Increase	Liberty Costs	Year	Percent Increase	Liberty Costs
2012	**	\$ 3,980,000	2027	3%	\$14,470,000
2013	15%	\$ 4,590,000	2028	3%	\$14,960,000
2014	15%	\$ 5,300,000	2029	3%	\$15,460,000
2015	15%	\$ 6,120,000	2030	3%	\$15,980,000
2016	13%	\$ 6,940,000	2031	3%	\$16,520,000
2017	13%	\$ 7,870,000	2032	3%	\$17,080,000
2018	13%	\$ 8,920,000	2033	3%	\$17,650,000
2019	13%	\$10,120,000	2034	3%	\$18,240,000
2020	13%	\$11,480,000	2035	3%	\$18,850,000
2021	3%	\$11,860,000	2036	3%	\$19,480,000
2022	3%	\$12,260,000	2037	3%	\$20,140,000
2023	3%	\$12,680,000	2038	3%	\$20,810,000
2024	3%	\$13,110,000	2039	3%	\$21,510,000
2025	3%	\$13,550,000	2040	3%	\$22,230,000
2026	3%	\$14,000,000			



Alternative 5. Possible Rates Based on City Discussions with KCMO

Year	Percent Increase	Liberty Costs	Year	Percent Increase	Liberty Costs
2012	**	\$3,980,000	2027	3%	\$10,100,000
2013	10%	\$4,390,000	2028	3%	\$10,440,000
2014	10%	\$4,850,000	2029	3%	\$10,790,000
2015	10%	\$5,350,000	2030	3%	\$11,160,000
2016	8%	\$5,800,000	2031	3%	\$11,530,000
2017	8%	\$6,290,000	2032	3%	\$11,920,000
2018	8%	\$6,820,000	2033	3%	\$12,320,000
2019	8%	\$7,390,000	2034	3%	\$12,730,000
2020	8%	\$8,010,000	2035	3%	\$13,160,000
2021	3%	\$8,280,000	2036	3%	\$13,600,000
2022	3%	\$8,560,000	2037	3%	\$14,050,000
2023	3%	\$8,850,000	2038	3%	\$14,530,000
2024	3%	\$9,150,000	2039	3%	\$15,010,000
2025	3%	\$9,450,000	2040	3%	\$15,520,000
2026	3%	\$9,770,000			



Financial Review

- Objectives of review
 - Compare system revenues to system revenue requirements
 - Identify revenue increases necessary to meet bond requirements and promote financial stability

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Projected Operating Results

- Methodology
 - Projected revenues
 - Projected system operating and non-operating expenses
 - Net present value calculations

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FINANCIAL REVIEW REVENUE REQUIREMENT ASSUMPTIONS

KCMO Payments

- Liberty continues to be served by KCMO until December 31, 2015
- New Plant is complete by December 31, 2015

Debt Payments

- Bonds will be issued in late 2012 for engineering
- Bonds will be issued in late 2013 for construction
- First payment will be July 1, 2016
- Interest during 2013 – 2015 will be capitalized with no payment until July, 2016

Debt Coverage

- City will collect 25% of total debt payment (existing money for coverage and deposit to depreciation fund)

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Financial Review

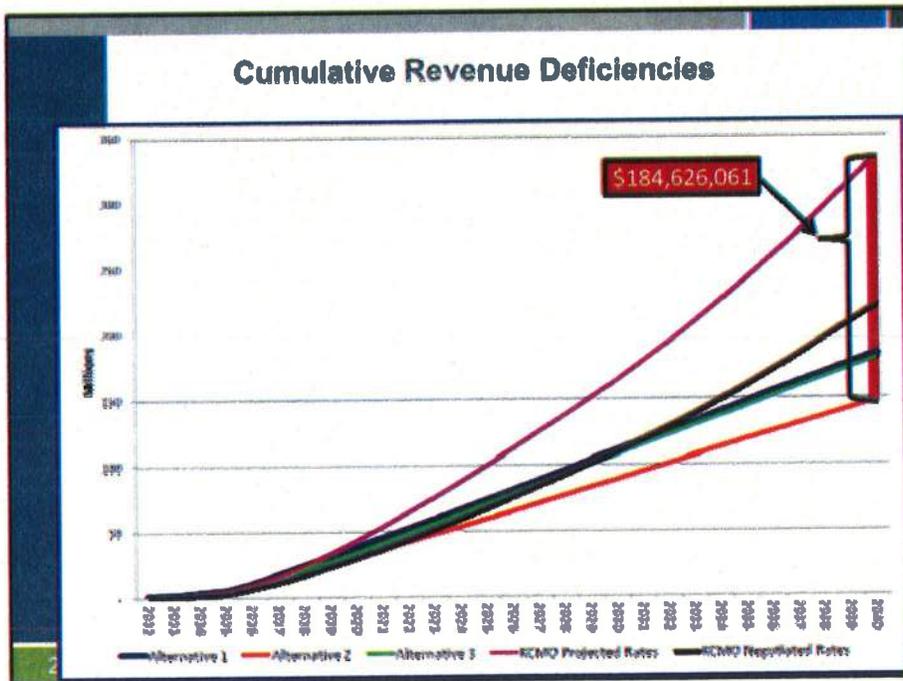
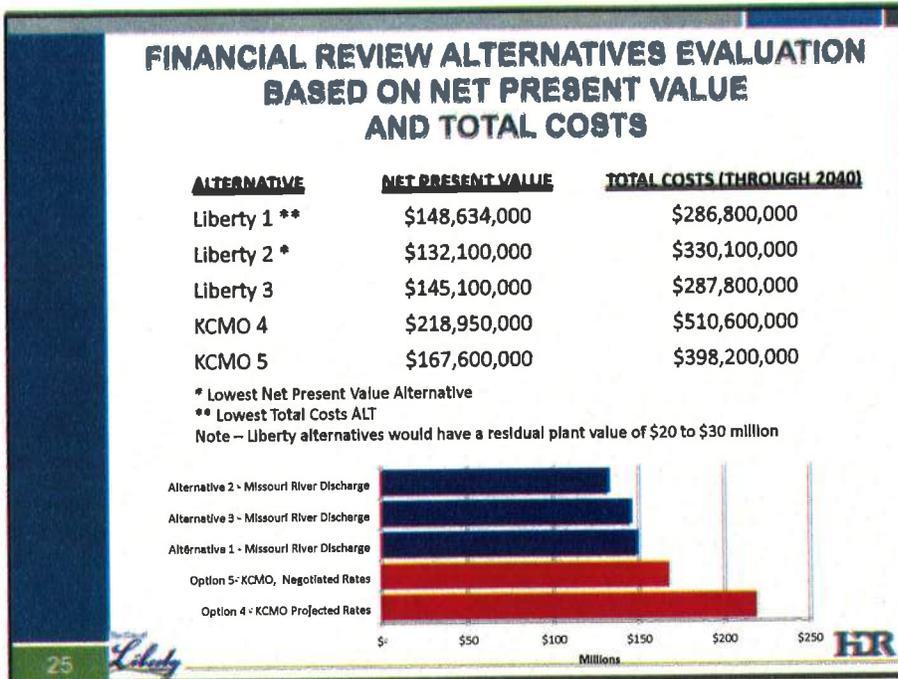
Net Present Value Evaluation

- Present value of incoming and outgoing cash flows for a project at a given discount rate

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FINANCIAL REVIEW ALTERNATIVES EVALUATION BASED ON ANNUAL REVENUE INCREASES	% Revenue Increase				
	YEAR	LIBERTY 1	LIBERTY 2	LIBERTY 3	KCMO 4
2013	9	9	9	9	6
2014	15	15	15	15	12
2015	4	4	4	4	1
2016	34	21	25	34	32
2017	13	13	12	12	9
2018	3	4	7	11	8
2019	1	1	4	9	5
2020	0	0	1	6	2
2021	0	0	2	3	3
2022	0	0	2	2	2
2023	0	0	2	3	3
2024	1	1	0	3	2
2025	3	4	0	5	5
2026	0	0	0	0	0
2027	0	0	0	0	0
2028	0	0	0	0	0
2029	0	0	0	5	0
2030	0	0	0	3	3
2031 - 40	0	0	0	3	3
Average Increase/Yr	3.00%	2.53%	2.93%	3.85%	4.14%

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Required KCMO Rates to Match NPV of Lowest NPV Alternative

Year	Percent Increase	Liberty Costs	Year	Percent Increase	Liberty Costs
2012	**	\$3,980,000	2027	3%	\$7,140,000
2013	5%	\$4,190,000	2028	3%	\$7,380,000
2014	4%	\$4,380,000	2029	3%	\$7,630,000
2015	4%	\$4,570,000	2030	3%	\$7,880,000
2016	4%	\$4,770,000	2031	3%	\$8,150,000
2017	4%	\$4,980,000	2032	3%	\$8,420,000
2018	4%	\$5,190,000	2033	3%	\$8,700,000
2019	4%	\$5,420,000	2034	3%	\$8,990,000
2020	4%	\$5,660,000	2035	3%	\$9,300,000
2021	3%	\$5,850,000	2036	3%	\$9,610,000
2022	3%	\$6,050,000	2037	3%	\$9,930,000
2023	3%	\$6,250,000	2038	3%	\$10,260,000
2024	3%	\$6,460,000	2039	3%	\$10,610,000
2025	3%	\$6,680,000	2040	3%	\$10,960,000
2026	3%	\$6,900,000			

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ANNUAL REVENUE INCREASES KCMO Rates Modified to Match Lowest NPV (Liberty Alt 2)	YEAR	% Revenue Increase					KCMO Match
		LIBERTY 1	LIBERTY 2	LIBERTY 3	KCMO 4	KCMO 5	
	2013	9	9	9	9	6	3
	2014	15	15	15	15	12	8
	2015	4	4	4	4	1	0
	2016	34	21	25	34	32	28
	2017	13	13	12	12	9	7
	2018	3	4	7	11	8	6
	2019	1	1	4	9	5	3
	2020	0	0	1	6	2	0
	2021	0	0	2	3	3	2
	2022	0	0	2	2	2	2
	2023	0	0	2	3	3	2
	2024	1	1	0	3	2	2
	2025	3	4	0	5	5	5
	2026	0	0	0	0	0	0
	2027	0	0	0	0	0	0
	2028	0	0	0	0	0	0
	2029	0	0	0	5	0	0
	2030	0	0	0	3	3	0
	2031-40	0	0	0	3	3	3
	Ave. Increase/Yr	3.00%	2.53%	2.93%	3.85%	4.14%	3.12%

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Liberty

FINANCIAL REVIEW ALTERNATIVES EVALUATION BASED ON NET PRESENT VALUE AND TOTAL COSTS

ALTERNATIVE	NET PRESENT VALUE	TOTAL COSTS (THROUGH 2040)
Liberty 1 **	\$148,634,000	\$286,800,000
Liberty 2 *	\$132,100,000	\$330,100,000
Liberty 3	\$145,100,000	\$287,800,000
KCMO 4	\$218,950,000	\$510,600,000
KCMO 5	\$167,600,000	\$398,200,000
KCMO Matches Lowest NPV	\$132,100,000	\$320,700,000

* Lowest Net Present Value Alternative

** Lowest Total Costs ALT

Note - Liberty alternatives would have a residual plant value of \$20 to \$30 million

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Liberty

HR

Other Considerations

- **Liberty alternatives**
 - Facilities still have residual value at the end of 2040
 - Nutrient removal included in the current plan
 - Debt service coverage funds of approximately \$50 million for future capital improvements
 - Conveyance construction and maintenance
 - Future treatment expansion
 - Equipment replacement
 - Regulatory changes

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Liberty

HR

Other Considerations (continued)

- **KCMO alternatives**
 - Wet weather improvements
 - Disinfection improvements
 - No nutrient removal
 - Limited Debt Service coverage funds of approximately \$20 million for future capital improvements
 - Conveyance construction and maintenance
 - No future treatment expansion
 - No equipment replacement
 - No regulatory changes

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Liberty

HR

Discussion

33 *Liberty* HR

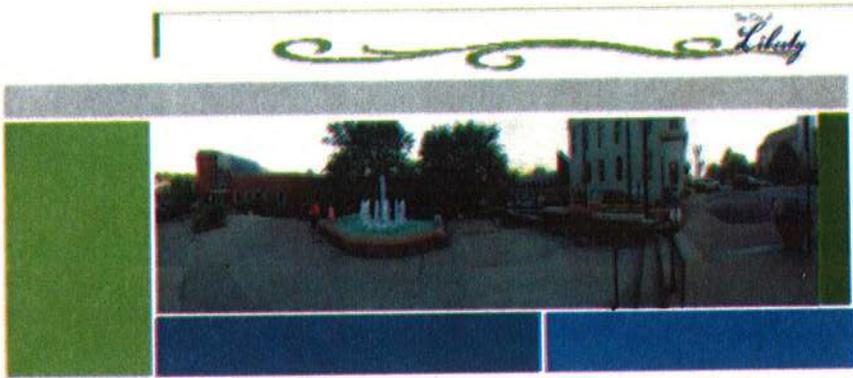
Next Steps

- Conduct Financial Workshop December 15
- Develop Implementation Schedule
- Implementation Workshop December 29
- Final Report January 31

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Comparison to 1999 Improvements

Provided	1999	2011
Conveyance		
Interceptor		X
Excess flow holding basins		X
Pump Stations	X	X
WWTF		
Influent PS	X	X
Secondary facilities	X	X
BNR		X
Disinfection		X
Thickening	X	X
Dewatering		X
Pilings		X
Capacity	4.0 MGD	4.6 MGD



WWTF Feasibility Study
Workshop #3
City Project #11-013
City of Liberty, Missouri
December 29, 2011



Expectations of Workshop

- Understand timelines for implementation
 - Antidegradation
 - Facility Plan
 - Bond Election
 - Potential SRF Financing
 - KCMO Negotiations
- Understand critical decision points
- Reach Consensus on implementation

2  

HDR Study

- **Determine feasibility of Liberty treating its own wastewater**
- **Workshop 1 – Technical (November 1, 2011)**
 - **Population/Flow Projections**
 - **Regulatory agency position and outlook**
 - **Design Considerations**
 - **Process Alternatives**
 - **Effluent Discharge**
 - **Structural Considerations**
 - **Biosolids Disposal**
- **Workshop 2 – Financial (December 15, 2011)**
 - **Identified Liberty Alternatives 1 and 2 as preferred alternatives**
- **Workshop 3 – Implementation (December 29, 2011)**

3

Liberty

HR

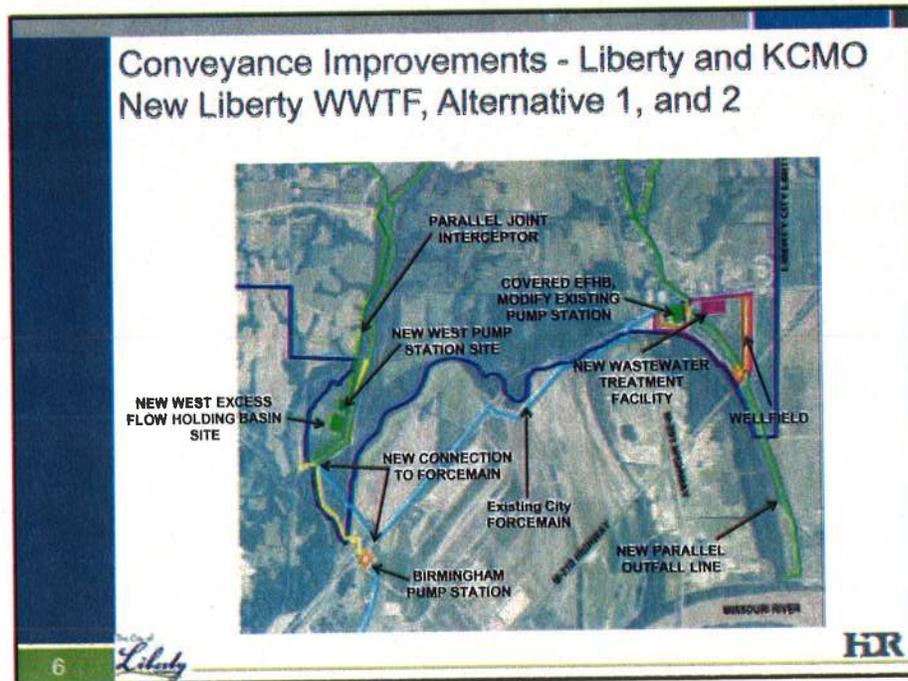
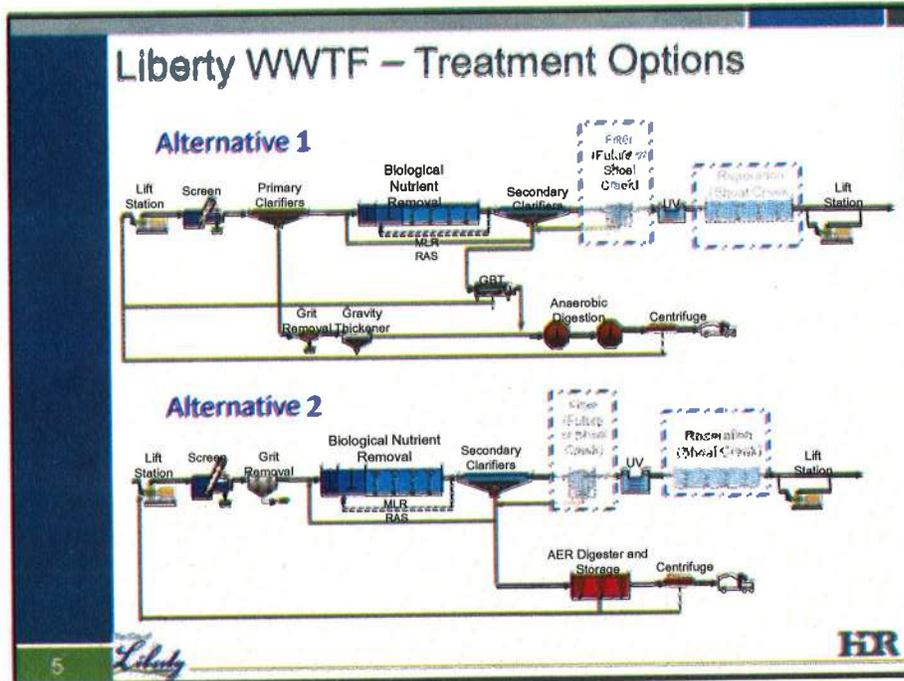
Technical Recommendations

- **Best Site – Existing City Property Near East Pump Station (4.6 MGD Plant)**
 - **Best access**
 - **Least impact by wetlands**
 - **Less pumping**
 - **Best access to Missouri River for discharge**
 - **Wellfield protected**
- **Best Discharge Location – Missouri River**
 - **Missouri River discharge allows for treatment flexibility**
 - **Missouri River discharge likely to have same limits as Birmingham WWTP current limits.**
 - **Least environmental impact**
 - **Least potential to be impacted by future regulations**

4

Liberty

HR



Alternative 4. Kansas City Proposed Rate Increases

Year	Percent Increase	Liberty Payments to KCMO	Year	Percent Increase	Liberty Payments to KCMO
2012	**	\$ 3,980,000	2027	3%	\$14,470,000
2013	15%	\$ 4,590,000	2028	3%	\$14,960,000
2014	15%	\$ 5,300,000	2029	3%	\$15,460,000
2015	15%	\$ 6,120,000	2030	3%	\$15,980,000
2016	13%	\$ 6,940,000	2031	3%	\$16,520,000
2017	13%	\$ 7,870,000	2032	3%	\$17,080,000
2018	13%	\$ 8,920,000	2033	3%	\$17,650,000
2019	13%	\$10,120,000	2034	3%	\$18,240,000
2020	13%	\$11,480,000	2035	3%	\$18,850,000
2021	3%	\$11,860,000	2036	3%	\$19,480,000
2022	3%	\$12,260,000	2037	3%	\$20,140,000
2023	3%	\$12,680,000	2038	3%	\$20,810,000
2024	3%	\$13,110,000	2039	3%	\$21,510,000
2025	3%	\$13,550,000	2040	3%	\$22,230,000
2026	3%	\$14,000,000			

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Liberty

HR

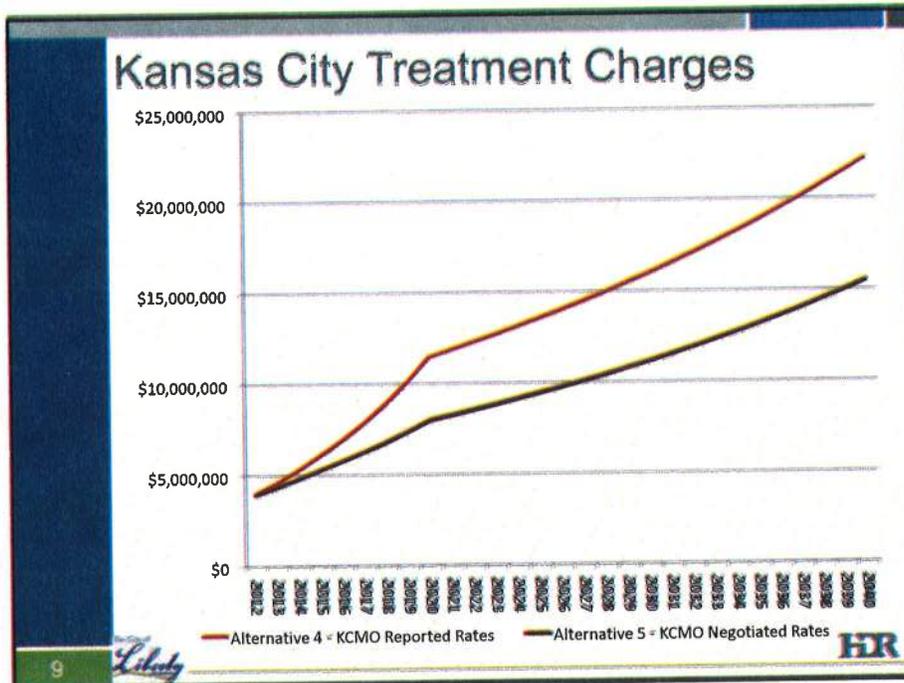
Alternative 5. Possible Rates Based on City Discussions with KCMO

Year	Percent Increase	Liberty Payments to KCMO	Year	Percent Increase	Liberty Payments to KCMO
2012	**	\$3,980,000	2027	3%	\$10,100,000
2013	10%	\$4,390,000	2028	3%	\$10,440,000
2014	10%	\$4,850,000	2029	3%	\$10,790,000
2015	10%	\$5,350,000	2030	3%	\$11,160,000
2016	8%	\$5,800,000	2031	3%	\$11,530,000
2017	8%	\$6,290,000	2032	3%	\$11,920,000
2018	8%	\$6,820,000	2033	3%	\$12,320,000
2019	8%	\$7,390,000	2034	3%	\$12,730,000
2020	8%	\$8,010,000	2035	3%	\$13,150,000
2021	3%	\$8,280,000	2036	3%	\$13,600,000
2022	3%	\$8,560,000	2037	3%	\$14,050,000
2023	3%	\$8,850,000	2038	3%	\$14,530,000
2024	3%	\$9,150,000	2039	3%	\$15,010,000
2025	3%	\$9,450,000	2040	3%	\$15,520,000
2026	3%	\$9,770,000			

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Liberty

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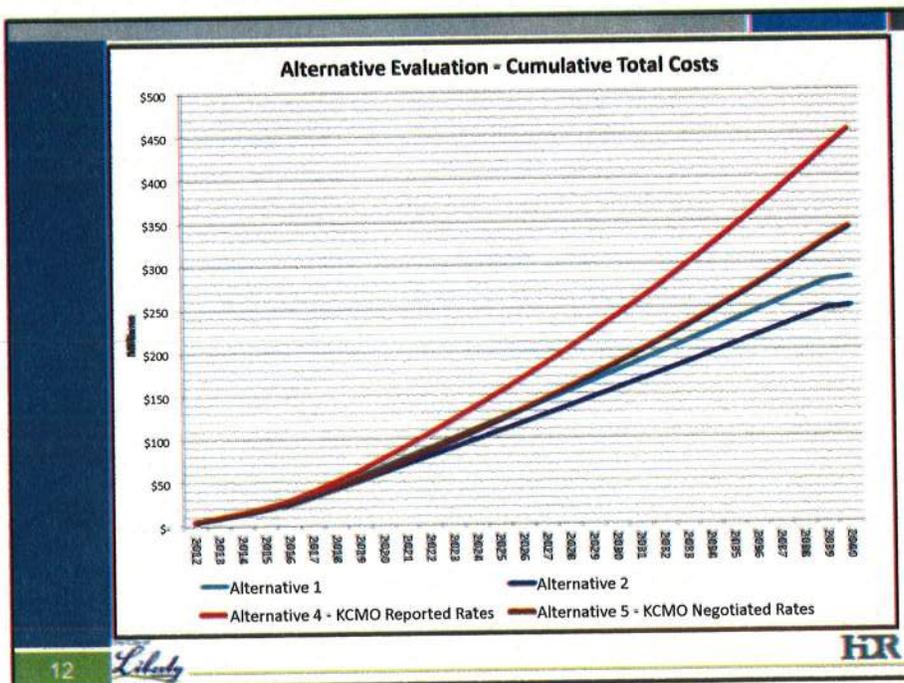
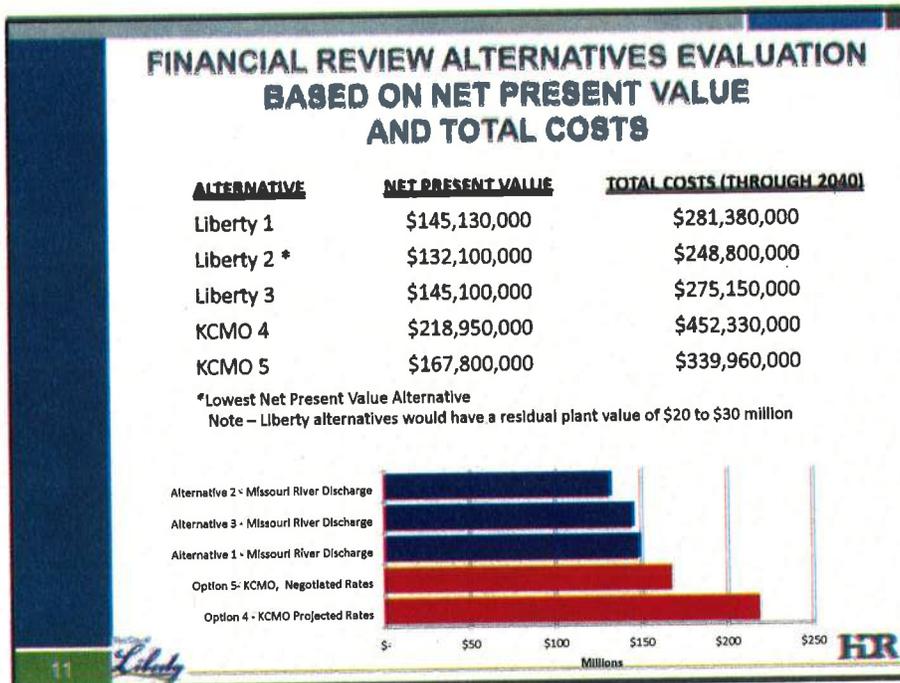


Financial Review

Net Present Value Evaluation

- Present value of incoming and outgoing cash flows for a project at a given discount rate

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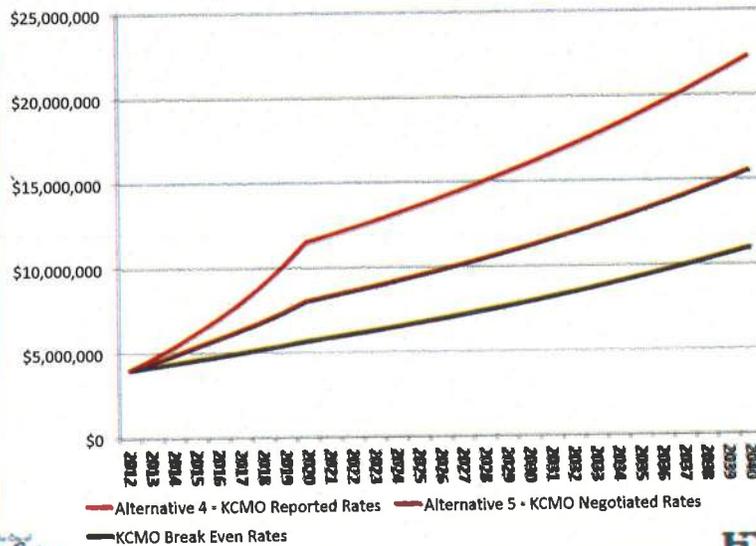
Required KCMO Rates to Match NPV of Lowest NPV Alternative

Year	Percent Increase	Liberty Payments to KCMO	Year	Percent Increase	Liberty Payments to KCMO
2012	**	\$3,980,000	2027	3%	\$7,140,000
2013	5%	\$4,190,000	2028	3%	\$7,380,000
2014	4%	\$4,380,000	2029	3%	\$7,630,000
2015	4%	\$4,570,000	2030	3%	\$7,880,000
2016	4%	\$4,770,000	2031	3%	\$8,150,000
2017	4%	\$4,980,000	2032	3%	\$8,420,000
2018	4%	\$5,190,000	2033	3%	\$8,700,000
2019	4%	\$5,420,000	2034	3%	\$8,990,000
2020	4%	\$5,660,000	2035	3%	\$9,300,000
2021	3%	\$5,850,000	2036	3%	\$9,610,000
2022	3%	\$6,050,000	2037	3%	\$9,930,000
2023	3%	\$6,250,000	2038	3%	\$10,260,000
2024	3%	\$6,460,000	2039	3%	\$10,610,000
2025	3%	\$6,680,000	2040	3%	\$10,960,000
2026	3%	\$6,900,000			

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Kansas City Treatment Charges



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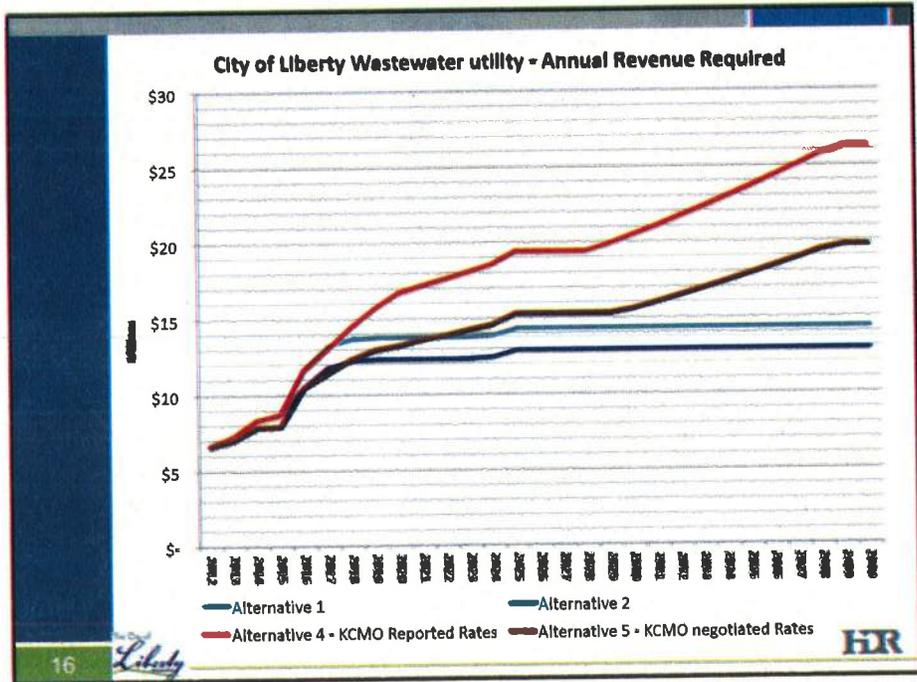


FINANCIAL REVIEW ALTERNATIVES EVALUATION BASED ON NET PRESENT VALUE AND TOTAL COSTS

ALTERNATIVE	NET PRESENT VALUE	TOTAL COSTS (THROUGH 2040)
Liberty 1	\$145,130,000	\$281,380,000
Liberty 2 *	\$132,100,000	\$248,800,000
Liberty 3	\$145,100,000	\$275,150,000
KCMO 4	\$218,950,000	\$452,330,000
KCMO 5	\$167,800,000	\$339,960,000
KCMO Matches Lowest NPV	\$132,100,000	\$262,400,000

*Lowest Net Present Value Alternative
Note – Liberty alternatives would have a residual plant value of \$20 to \$30 million

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Other Considerations

- Liberty alternatives
 - Facilities still have residual value at the end of 2040
 - Nutrient removal included in the current plan
 - Debt service coverage funds of approximately \$50 million for future capital improvements
 - Conveyance construction and maintenance
 - Future treatment expansion
 - Equipment replacement
 - Regulatory changes

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Liberty

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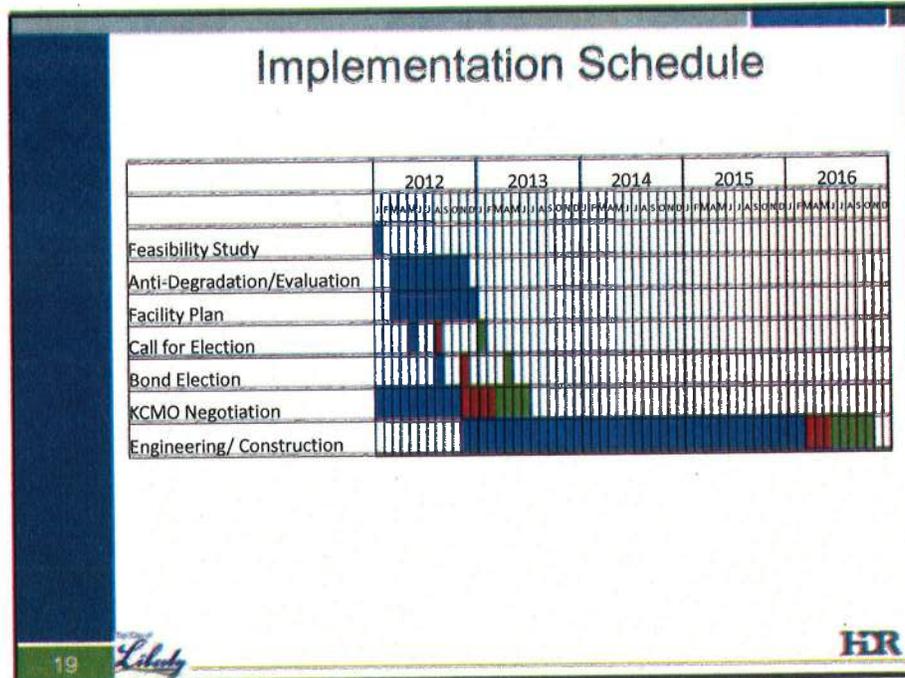
Other Considerations (continued)

- KCMO alternatives
 - Wet weather improvements
 - Disinfection improvements
 - No nutrient removal
 - Limited Debt Service coverage funds of approximately \$20 million for future capital improvements
 - Conveyance construction and maintenance
 - No future treatment expansion
 - No equipment replacement
 - No regulatory changes

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- ### Antidegradation Review
- Required for all new and expanded discharges after August 2008
 - Procedure for determining whether or not degradation is allowed in waters of the state from regulated discharges
 - Determination based on:
 - Level of protection assigned to the pollutants of concern (POCs) within the water receiving the discharge,
 - Type of receiving water
 - Existing water quality (EWQ) of the receiving water
 - Necessity of degradation
 - Social and economic importance (SEI) of the proposed discharge.
 - May include:
 - Demonstrating degradation is not significant
 - Demonstrating degradation is necessary (alternatives analysis)
- 20  

Antidegradation Review/Permit Process

- Applicant prepares report for MDNR review
- MDNR reviews information and makes determination
- Applicant applies for draft operating permit
- MDNR issues draft operating permit and puts Antidegradation determination and draft operating permit on public notice.
- Once comments are resolved, draft operating permit is issued.

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HR

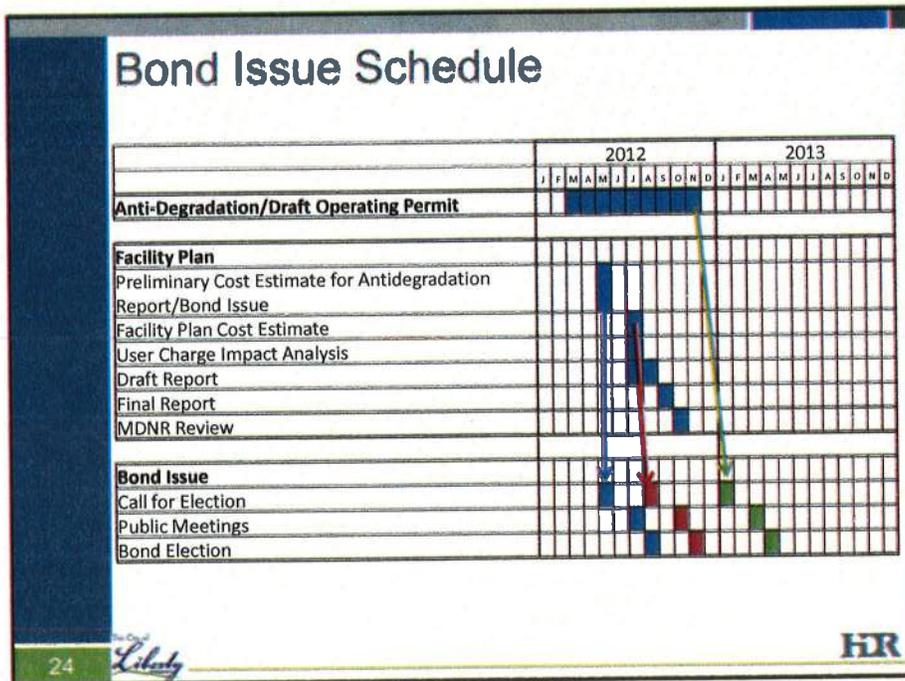
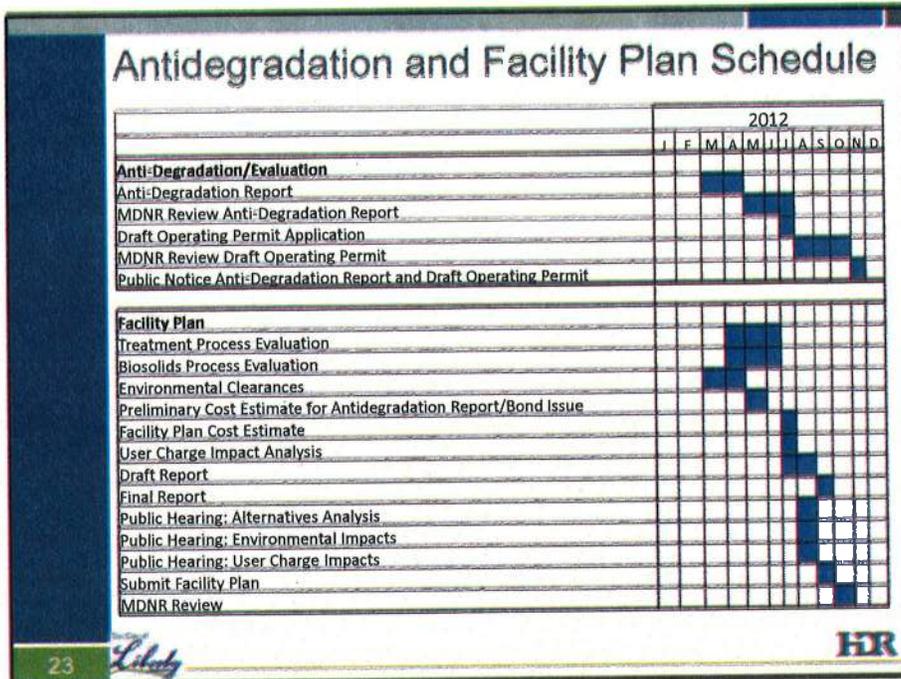
Facility Plan

- Evaluate and select process alternatives based on effluent limits established by Antidegradation Report/Draft Operating Permit
- Refine cost estimates and value engineering opportunities
- Requires public hearings for approval by MDNR:
 - Alternatives analysis
 - User charge impact analysis
 - Environmental impact analysis
- Approved report required for SRF Fundable List

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Liberty

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State Revolving Fund Financing

- Differences versus conventional financing:
 - Limited to 20 year term
 - Lower interest rates (currently 2.66% versus ~4.25%)
 - Available based on priority points
 - Schedule set by MDNR
 - Additional contracting requirements
- Requirements to be considered Fundable
 - Bond election passed
 - Facility plan approved
 - Application submitted by November 15
- Draft Intended Use Plan (IUP) typically issued in January, finalized in April

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HR

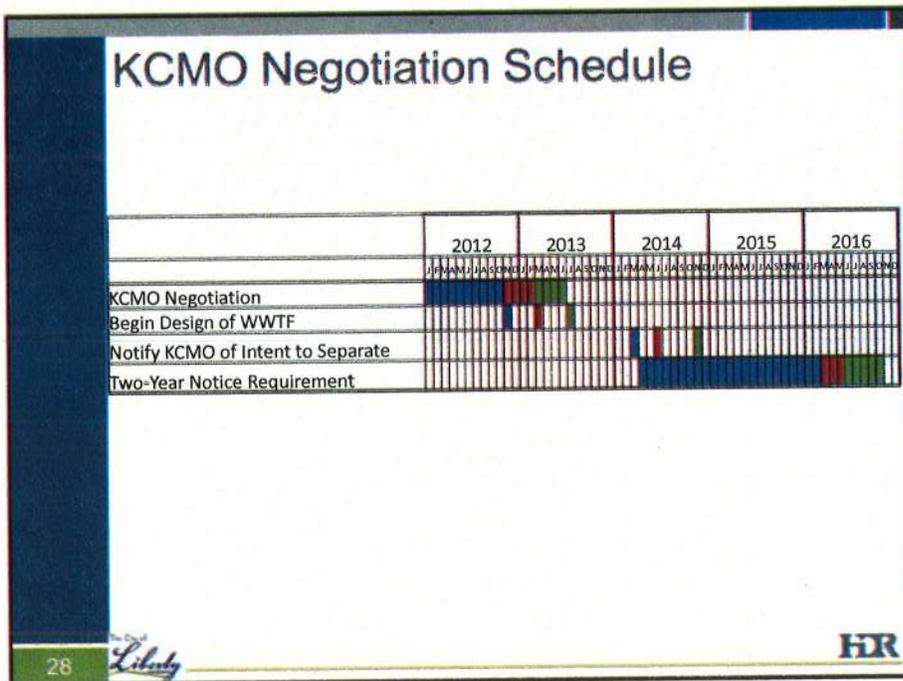
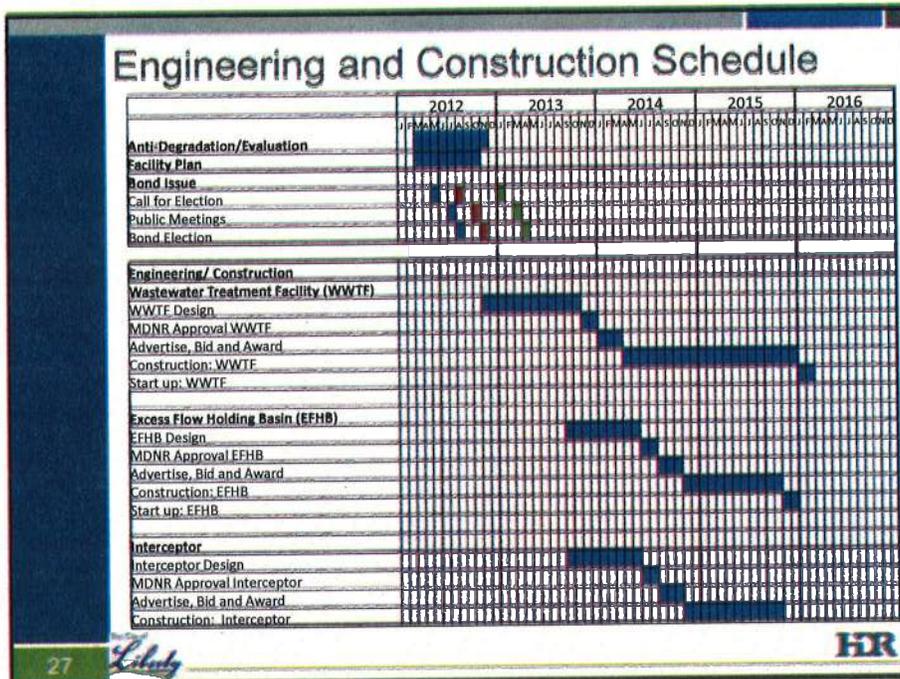
SRF Schedule

	2012					2013					2014												
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N
Facility Plan																							
Bond Issue																							
Call for Election																							
Public Meetings																							
Bond Election																							
SRF Process																							
Submit Application (Completed)																							
Approved Facility Plan																							
Missouri Clean Water Commission Decision																							

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HR



Next Steps

- City Council Presentation January 17, 2012
- Final Report January 31, 2012
- Begin Antidegradation Report March 1, 2012

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Discussion

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Appendix B

Draft Memorandum

Date: October 31, 2011

To: Stan Christopher, P.E., HDR

From: Trent Stober, P.E., Geosyntec

Subject: Preliminary Water Quality and Antidegradation Review Scenarios for the Proposed Liberty Wastewater Treatment Facility

1. Introduction

The City of Liberty (City) is in the planning stages of gaining a State-approved water quality and antidegradation review (WQAR) for a new wastewater treatment facility (WWTF). The City of Kansas City (KC) Birmingham WWTF is currently servicing the wastewater treatment and discharge needs of the City. If constructed, the City will assume responsibility for its wastewater treatment and discharge. As part of this effort, HDR, Inc. (HDR) is pursuing potential discharge locations, including Shoal Creek and the Missouri River. HDR currently anticipates the WWTF will have annual design average flow of approximately 5-6 million gallons per day (MGD). Geosyntec Consultants, Inc. (Geosyntec) is assisting in this effort by evaluating the water quality and antidegradation regulatory implications for the alternative discharge locations. As part of this regulatory review, Geosyntec has reviewed project background information and data, potential water quality-based limits, regulatory updates, and potential antidegradation pathways. The purpose of this memorandum is to summarize these findings.

2. Background Information

The primary location currently under consideration for the City's potential wastewater treatment plant is just off Shoal Creek near the intersection of Highways 291 and 210. From this location, the City could either discharge directly to Shoal Creek or construct a pipe to the Missouri River. Stream classifications, impairment issues, and available water quality and flow data for these two potential discharge locations are discussed below.

Stream Classifications

Shoal Creek and the Missouri River are both class P waters of the state designated for the following protections: livestock & wildlife watering (LWW), protection of warm water aquatic life and human health-fish consumption (AQL), and whole body contact recreation category B (WBCR-B). The Missouri River also includes protections for irrigation (IRR), secondary contact recreation (SCR), drinking water supply (DWS), and industrial use (IND). Neither water body is classified as a losing stream.

TMDLs and 303(d) Impairments

A total maximum daily load (TMDL) was completed for the Missouri River in October 2006 for chlordane and polychlorinated biphenyls. Neither the Missouri River or Shoal Creek are currently 303(d) listed as impaired for any parameter.

Water Quality Data

Water quality data from the Missouri River (WBID 0356) and Shoal Creek (WBIDs 0397) were obtained from the Department’s Water Quality Assessment System on October 4, 2011.¹ The data were grouped by water body and summarized for dissolved oxygen (DO), total suspended solids (TSS), total ammonia nitrogen (ammonia), and *Escherichia coli* (*E. coli*). It was considered beyond the scope of this project to analyze all available data.

The data indicate *E. coli* levels are high relative to the WBCR-B criterion of 206 cfu/100 mL (Tables 1 and 2). It is unclear why Missouri River (WBID 0356) and Shoal Creek (WBID 0397) are not included on Missouri’s 2010 303(d) list, but may be due to the timeframe that data were collected. The *E. coli* data presented in Tables 1 and 2 were collected from 2009 to 2010 and may not have been available for the 2010 303(d) listing decision. Based on these data, MDNR may 303(d) list the Missouri River (WBID 0356) and Shoal Creek (WBID 0397) for *E. coli* during the 2012 303(d) listing cycle.

TABLE 1. Summary of Missouri River (WBID 0356) Water Quality Data.

Parameter	Unit	Count	Minimum	Maximum	Average	Geomean
Ammonia	mg/L	36	0.01	0.75	0.13	0.07
Dissolved oxygen	mg/L	498	1.9	17.5	7.6	7.4
<i>Escherichia coli</i> *	cfu/100 mL	14	500	5,100	1,903	1,554
Total suspended solids	mg/L	77	53	2,920	721	514

*Recreational season data (April – October)

TABLE 2. Summary of Shoal Creek (WBID 0397) Water Quality Data.

Parameter	Unit	Count	Minimum	Maximum	Average	Geomean
Ammonia	mg/L	3	0.1	0.14	0.12	0.12
<i>Escherichia coli</i> *	cfu/100 mL	15	36	28,120	2,738	377
Total suspended solids	mg/L	1	12	12	12	12

*Recreational season data (April – October)

Flow Data

Flow data for Shoal Creek and the Missouri River were obtained from the U.S. Geological Survey (USGS) for monitoring stations 06893670 (Shoal Creek at Claycomo) and 06893000 (Missouri River at Kansas

¹ WBID is the water body identification number used by MDNR. WBID 0356 represents the 125-mile stretch of the Missouri River from the Chariton River to the Kansas River. WBID 0397 represents the 6-mile stretch of Shoal Creek located approximately 5.5 miles upstream from the proposed plant site. Water quality data were not available from Shoal Creek WBID 0396, which extends from WBID 0397 to the Missouri River.

City) on October 4, 2011. Data from the Shoal Creek station were limited to flows collected from 1975 to 1981, which is insufficient for calculating critical low flow values. Therefore, default class P critical low flow values are assumed to apply to Shoal Creek. Data from the Missouri River station dates back to 1928; however, for purposes of calculating critical low flow values, the dataset was limited to flows collected after 1963 (i.e., after the last of the Missouri River impoundments was finished). Critical low flow values were calculated using the U.S. Environmental Protection Agency's (EPA) DFLOW 3.1 software (Table 3).

TABLE 3. Critical Low Flow Values for Shoal Creek and the Missouri River.²

Water Body	1Q10 (cfs)	7Q10 (cfs)	30Q10 (cfs)
Shoal Creek*	0.1	0.1	1.0
Missouri River	9,550	12,200	17,500

*Default class P flow values.

3. Potential Water Quality-Based Limits

Potential water quality-based limits are presented below for 5-day biochemical oxygen demand (BOD₅), total suspended solids (TSS), total ammonia nitrogen (ammonia), *Escherichia coli* (*E. coli*), and oil and grease. These limits represent minimum requirements for meeting Missouri Department of Natural Resources' (MDNR or 'Department') effluent regulations and water quality standards, but do not necessarily satisfy antidegradation requirements. Depending on the results of an antidegradation review, more stringent limits may apply. Additionally, potential limits presented below are based on multiple assumptions (e.g., model inputs and mixing rates), a design average flow of 6 MGD, current Department policy, and current standards, which are all subject to change.

5-day Biochemical Oxygen Demand

The Department generally requires a Streeter-Phelps spreadsheet or QUAL2K dissolved oxygen (DO) model to demonstrate that proposed BOD₅ limits are protective of DO criteria. Without site-specific data (e.g., stream geometry, travel time study, 48-hour water quality study), as is the case here, the Department typically relies on the use of an uncalibrated Streeter-Phelps model. Alternatively, an applicant also has the option of proposing advanced BOD₅ treatment less than or equal to an average monthly limit (AML) of 10 mg/L and average weekly limit (AWL) of 15 mg/L in lieu of DO modeling.³

Preliminary modeling results suggest BOD₅ limits less stringent than an AML of 10 mg/L and AWL of 15 mg/L may not be protective of Missouri's minimum DO criterion of 5 mg/L for the Shoal Creek outfall scenario. Therefore, default BOD₅ limits of 10 mg/L as an AML and 15 mg/L as an AWL may apply to the Shoal Creek outfall scenario. Preliminary modeling results for the Missouri River outfall scenario

² The 1Q10 is the lowest 1-day average flow that occurs (on average) once every 10 years. The 7Q10 is the lowest 7-day average flow that occurs (on average) once every 10 years. The 30Q10 is the lowest 30-day average flow that occurs (on average) once every 30 years.

³ MDNR. 2009. DO Modeling & BOD Effluent Limit Development Administrative Guidance for the Purpose of Conducting Water Quality Assistance Reviews.

suggest that state effluent regulatory limits (10 CSR 20.7015) reflective secondary treatment standards (i.e., 30 mg/L AML and 45 mg/L AWL) are protective of the DO criterion for the Missouri River outfall scenario (Table 4). However, the preliminary Missouri River model assumes default mixing assumptions with the Missouri River (i.e., 25 percent mixing with the 7Q10). If MDNR disallows the use of default mixing zone assumptions, BOD₅ limits of 10 mg/L as an AML and 15 mg/L as an AWL may apply.

TABLE 4. Potential 5-day Biochemical Oxygen Demand Limits.

Location	Average Monthly Limit (mg/L)	Average Weekly Limit (mg/L)
Shoal Creek	10	15
Missouri River	10-30*	15-45*

*The upper value represents limits calculated assuming default mixing zone assumptions. MDNR may require a mixing zone study for this value to apply.

Total Suspended Solids

According to Department guidance, there are no antidegradation requirements for TSS beyond meeting technology-based effluent limits (i.e., secondary treatment standards). Department guidance also recommends TSS mirror BOD₅ limits as EPA indicates treatment capacity is typically the same for both pollutants.⁴ Therefore, TSS limits would likely equal BOD₅ limits (Table 5).

TABLE 5. Potential Total Suspended Solids Limits.

Location	Average Monthly Limit (mg/L)	Average Weekly Limit (mg/L)
Shoal Creek	10	15
Missouri River	10-30*	15-45*

Ammonia

Differences in potential ammonia limits between the two outfall scenarios primarily depend on the dilution available for mixing (Table 6). MDNR typically applies a mixing zone (MZ) of 25 percent of the 30Q10 flow value and a zone of initial dilution (ZID) of the more limiting value between 2.5% of the 1Q10 flow value and ten times the design average flow. Shoal Creek is a class P stream, which as a default 30Q10 and 1Q10 value of 1 cubic feet per second (cfs) and 0.1 cfs, respectively. The Missouri River has a 30Q10 and 1Q10 value of 17,500 cubic feet per second (cfs) and 9,550 cfs, respectively. Recently, however, the Department disallowed the use of default mixing zone assumptions on the Missouri River. Without a mixing zone study, MDNR will apply “end-of-pipe” limits to a Missouri River outfall. Therefore, potential ammonia limits are presented below as a range from no mixing to default mixing for the Missouri River outfall.

⁴ MDNR. 2010. Guidance for Water Quality and Antidegradation Review Assistance.

TABLE 6. Potential Ammonia Limits.

Location	Season	Average Monthly Limit (mg/L)	Maximum Daily Limit (mg/L)
Shoal Creek	April-September	1.4	3.7
	October-March	3.0	7.7
Missouri River	April-September	1.4-39.3*	3.6-102.9*
	October-March	2.9-39.3*	7.5-102.9*

*The upper value represents limits calculated assuming default mixing zone assumptions. MDNR may require a mixing zone study for this value to apply.

Escherichia coli

Shoal Creek and the Missouri River are both designated for WBCR-B use. Therefore, *E. coli* limits of 206 cfu/100 mL and 1,030 cfu/100 mL apply as an AML and AWL, respectively, for both outfall scenarios (Table 7). The limits are expressed as a geometric mean. There are no antidegradation requirements for *E. coli* beyond meeting these limits.

TABLE 7. Potential *Escherichia coli* Limits.

Location	Average Monthly Limit (mg/L)	Average Weekly Limit (mg/L)
Shoal Creek	206	1,030
Missouri River	206	1,030

Notes: Limits are expressed as a geometric mean.

Oil and Grease

There are no antidegradation requirements for oil and grease beyond meeting an AML of 10 mg/L and and AWL of 15 mg/L (Table 8).

TABLE 8. Potential Oil and Grease Limits.

Location	Average Monthly Limit (mg/L)	Average Weekly Limit (mg/L)
Shoal Creek	10	15
Missouri River	10	15

4. Regulatory Update

Potential water quality-based limits presented in Section 3 are based on current water quality standards and may not be applicable within the next 5 to 10 years. Implications of anticipated regulatory updates for ammonia, nutrients, and bacteria are discussed below.

Ammonia

On December 30th, 2009, EPA placed on public notice a draft revision of the ammonia criteria titled “2009 Aquatic Life Ambient Water Quality Criteria for Ammonia-Freshwater” (“2009 Update”)⁵. The 2009 Update is based on additional toxicity data that demonstrate greater sensitivity of freshwater mussels compared to the fish and aquatic invertebrates used to develop the 1999 ammonia criteria. On April 1, 2010 the public comment period for the 2009 Update ended; however, EPA to date has not published a finalized version of this document. If unchanged, the 2009 Update will significantly reduce national ammonia criteria for waters hosting a freshwater mussel community. Ammonia criteria values may drop as much as 80% (Table 9).

TABLE 9. Comparison of Current (Warm-Water Fishery) and 2009 Draft Total Ammonia Nitrogen Criteria.

Criteria Source	Summer Acute (mg/L)	Summer Chronic (mg/L)	Winter Acute (mg/L)	Winter Chronic (mg/L)
Current Missouri Criteria	12.1	1.5	12.1	3.1
2009 Revisions – Mussels Present	3.8	0.3	14.2	1.1
2009 Revisions – Mussels Absent	6.6	2.3	14.4	3.0
Mussels Present Criteria Reduction	69%	80%	----	65%
Mussels Absent Criteria Reduction	45%	----	----	3%

Notes: All ammonia criteria values assume early life stages present and pH = 7.8. Draft criteria in the 2009 Update includes the added stipulation that the highest 4-day average within the 30 days in no greater than 2.5 times the 30-day chronic criterion (or 0.65 or 4.5 mg/L N/L freshwater mussels present or absent, respectively).

It is currently unclear when EPA will finalize the 2009 Update and what, if any, revisions will be made to it. EPA ultimately may recommend lower ammonia criteria based on species more sensitive than freshwater mussels. However, based on the 2009 Update, potential ammonia limits for a Shoal Creek and Missouri River discharge are presented below in Table 10. Assuming MDNR maintains its current 3-year schedule, MDNR could adopt revised ammonia criteria as early as during the 2015 triennial review.

⁵ Available from http://water.epa.gov/scitech/swguidance/standards/criteria/aqlife/pollutants/ammonia/ammonia_index.cfm

TABLE 10. Potential Ammonia Limits Based on EPA's 2009 Draft Ammonia Criteria.

Location	Season	Mussels	Average Monthly Limit (mg/L)	Maximum Daily Limit (mg/L)
Shoal Creek	April-September	Present	0.3	0.8
		Absent	2.2	5.6
	October-March	Present	1.0	2.7
		Absent	2.9	7.6
Missouri River	April-September	Present	0.3-12.4*	0.8-32.5*
		Absent	2.1-21.5*	5.5-56.2*
	October-March	Present	1.0-46.0*	2.6-120.4*
		Absent	2.8-46.9*	7.4-122.7*

*The upper value represents limits calculated assuming default mixing zone assumptions. MDNR may require a mixing zone study for this value to apply.

Nutrients

EPA has long been encouraging states to adopt numeric nutrient criteria. Most recently in a March 2011 memorandum, EPA set out the expectation that states develop nutrient criteria within 3-5 years for at least one class of waters (e.g., lakes and reservoirs, or rivers and streams). Accordingly, Missouri is in the process of developing nutrient criteria for lakes, streams and large rivers, but has been subject to numerous revisions and setbacks. For example, EPA Region 7 recently disapproved most of Missouri's lake criteria developed in 2009. Despite these setbacks, MDNR could adopt stream and big river nutrient criteria as early as the 2015 triennial review.

Early indications suggest nutrient criteria values for total phosphorus (TP) and total nitrogen (TN) will be more stringent than current limits of technology. Preliminary stream criteria values developed by MDNR range from 0.010 - 0.075 mg/L for TP and from 0.43 - 0.90 mg/L for TN. Although MDNR is not currently focused on developing big river nutrient criteria, exploratory evaluations of Missouri River data by EPA's Regional Technical Assistance Group (RTAG)⁶ coordinators have yielded preferred big river nutrient ranges of 0.05 - 0.18 mg/L TP and 0.71 - 1.2 mg/L TN.

As wastewater treatment facilities will likely be challenged to meet potential water quality-based nutrient limits, MDNR may rely on technology-based limits. Technology-based TP and TN limits may be in the range of 0.3 - 0.5 mg/L and 3 - 10 mg/L, respectively. These estimates are based on a petition by the Natural Resources Defence Council (NRDC), the Kansas Reduction Plan, and MDNR's draft lake nutrient implementation guidance. However, it is currently unclear whether EPA would approve technology-based limits less stringent than water quality-based limits.

⁶ Representatives from Iowa, Kansas, Nebraska, Missouri, and EPA Region 7 formed RTAG in 2000 to promote regional coordination and development of nutrient criteria. Recommended RTAG nutrient benchmarks for TP and TN are 0.075 and 0.9 mg/L, respectively.

Bacteria

In June 2011, EPA presented their current thinking at the stakeholder meeting on the development of new or revised recreational water quality criteria. Consistent with EPA's previous bacteria criteria document ('1986 criteria'), EPA intends on recommending the use of *E. coli* and enterococci as freshwater indicator organisms. States would be allowed to use either indicator organism. EPA also indicated criteria values will be consistent with those in the 1986 criteria document, but will clarify how the criteria will be expressed and will recommend new tools and flexibilities.

Significantly for Missouri, EPA currently intends on eliminating the "use intensity" range and adding a statistical threshold value (STV) to the criteria construct. Multiple categories of whole body contact recreation (WBCR) waters (i.e., category A and B) will no longer apply. WBCR-B waters will receive WBCR-A protections. Both Shoal Creek and the Missouri River are currently designated as WBCR-B. EPA will also require that no more than 25 percent of samples exceed the STV in addition to meeting the recreational season geometric mean. The STV will be set equal to the upper 75th percentile value currently used for beach closure notifications (i.e., *E. coli* STV = 236 cfu/100 mL) and will likely be based on default bacteria standard deviations taken from beach studies.

EPA also intends on clarifying procedures for developing short-term limits (i.e., average weekly limit (AWL)). EPA will likely recommend states either adopt the STV value as the AWL or base it off of the geometric mean value using some statistical construct consistent with EPA's 1991 Technical Support Document for Water Quality-based Toxics Control⁷. If MDNR adopts the STV approach, the average weekly *E. coli* limit for a discharge to either Shoal Creek or the Missouri River could be 236 cfu/100 mL. The average monthly limit would decrease to at least 126 cfu/100 mL with the elimination of WBCR-B waters. These limits would be expressed as a geometric mean.

Revised bacteria standards will likely be adopted by MDNR during the first triennial review following EPA's publication of new or revised recreational water quality criteria in October 2012. Assuming MDNR maintains its current 3-year schedule, the next triennial review after 2012 is anticipated to be in 2015.

5. Potential Antidegradation Pathways

Missouri's Antidegradation Implementation Procedures (AIP) require new or expanding wastewater treatment facilities discharging to Tier 2⁸ waters to follow one of two regulatory pathways: 1) an alternatives analysis (AA) and demonstration of social and economic importance (SEI), or 2) a demonstration of insignificance. The "base case" treatment alternative (and corresponding "base case" effluent limits) in the AA is the treatment alternative which will meet water quality standards (i.e., limits presented in Section 3). Alternatives to the base case must include both non- and less-degrading alternatives. The AA and SEI pathway can potentially result in a more costly treatment alternative and permit limits more stringent than necessary to meet water quality-based limits. A demonstration of

⁷ Available from: <http://www.epa.gov/npdes/pubs/owm0264.pdf>

⁸ Unless a water body is designated as an Outstanding National or State Resource Water (i.e., Tier 3) or is demonstrated to be at or below criteria (i.e., Tier 1), Tier 2 applies. Shoal Creek and the Missouri River will be considered Tier 2 for purposes of this antidegradation review.

insignificance avoids the potential for a more costly treatment alternative, but typically requires significant dilution. Potential antidegradation pathways for the Shoal Creek and Missouri River outfall scenarios are discussed below.

Shoal Creek Outfall

A new discharge to Shoal Creek will be considered significant by the Department, because there is insufficient dilution. Therefore, the Shoal Creek outfall scenario will require a Tier 2 AA and demonstration of SEI. The AA will require analyses of non-degrading alternatives including alternative discharge locations (e.g., Missouri River) and discharging to a regional wastewater collection and treatment system. Unless discharging to the Missouri River is impracticable or economically inefficient, a Missouri River outfall would likely be preferable to MDNR because it will not degrade Shoal Creek. The City would also need to provide practicable reasons for discontinuing discharge to the KC Birmingham WWTF. Practicable arguments for this change in wastewater management could include improved water quality and less planning uncertainty.

Missouri River Outfall

The Department has provided indications that a Tier 2 demonstration of insignificance would be acceptable for a Missouri River outfall scenario. Insignificance could be demonstrated if the proposed loading consumes less than 10 percent of the assimilative capacity (termed the "facility assimilative capacity" or FAC in the AIP) of the Missouri River. For purposes of demonstrating insignificance, the AIP allows 100 percent mixing with the critical low flow value to be used for calculating the FAC. A preliminary analysis demonstrates that the proposed facility will consume less than 10 percent of the FAC for BOD₅ and ammonia. TSS, *E. coli*, and oil and grease require no demonstration of insignificance.

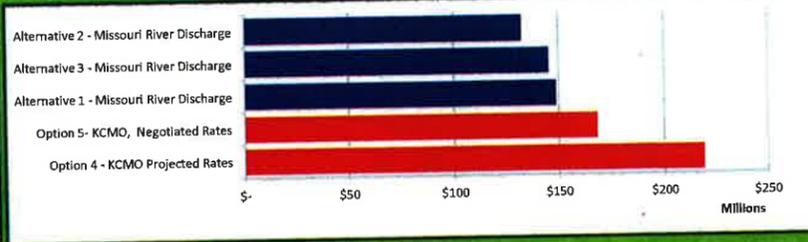
Although the AIP does not require an AA where there is a demonstration of insignificance, the City would still need to provide a rationale for discontinuing discharge to the KC Birmingham WWTF based on conversations with the Department. While discussion of regionalized wastewater management remains important under this approach, it would not carry the same significance as under a formal AA. Under a formal AA, the City would be required to evaluate alternatives such as regionalization. If MDNR finds that maintaining the current service agreement with KC Birmingham is both practicable and economically efficient, then this could provide the basis for denying the City's request. If the City pursues a demonstration of insignificance, MDNR would have much less of a basis for denying the City's request.

Appendix C

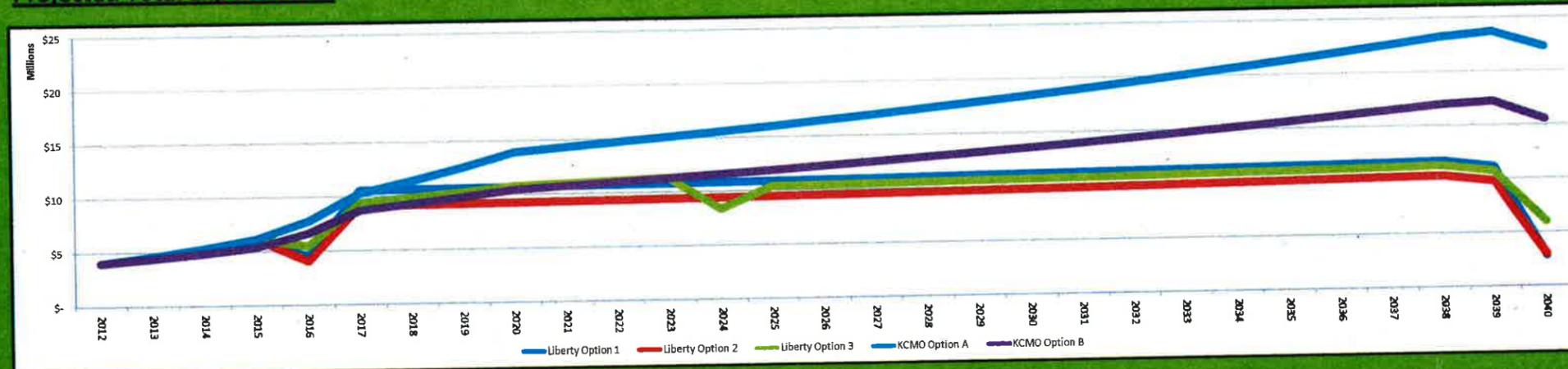


Wastewater Treatment Plant Feasibility Analysis

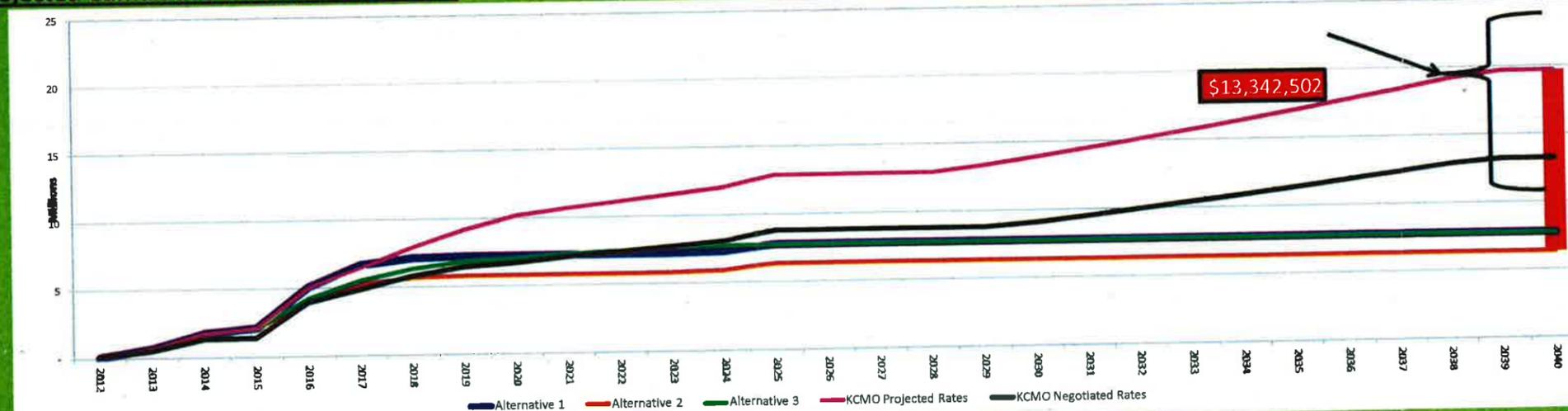
Rank	Option	NPV	Variance	\$/YR
1	Alternative 2 - Missouri River Discharge	\$ 132,117,347	\$ -	\$ 4,718,477
2	Alternative 3 - Missouri River Discharge	\$ 145,123,398	\$ 13,006,051	\$ 5,182,979
3	Alternative 1 - Missouri River Discharge	\$ 148,634,686	\$ 16,517,339	\$ 5,308,382
4	Option 5- KCMO, Negotiated Rates	\$ 167,808,792	\$ 35,691,445	\$ 5,993,171
5	Option 4 - KCMO Projected Rates	\$ 218,946,204	\$ 86,828,857	\$ 7,819,507



Projected Total Expenditures



Projected Cumulative Revenue Deficiencies



Prepared by: HDR Engineering, Inc.
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Process Alternative 1
Operations & Maintenance Cost Estimate

Line No.	Description	Replacement Costs (2012 \$)				Original Costs	
		5 YR	10 YR	15 YR	20 YR		
1	Inflation Rate	1.87%					
2	Interest Rate	4.75%					
3	Replacement Factor	15.00%	50.00%	15.00%	75.00%		
4	East EFHB PS	\$ 35,625	\$ 118,750	\$ 35,625	\$ 178,125	\$ 237,500	
5	West PS	42,750	142,500	42,750	213,750	285,000	
6	Pumps (Raw Wastewater Lift Station)	28,500	95,000	28,500	142,500	190,000	
7	Fine Screen (Headworks)	15,750	52,500	15,750	78,750	105,000	
8	Grit Pump (Headworks)	4,125	13,750	4,125	20,625	27,500	
9	Grit Classifier (Headworks)	6,000	20,000	6,000	30,000	40,000	
10	Drives (Primary Clarifiers #1 and #2)	11,250	37,500	11,250	56,250	75,000	
11	Scum Pumps (Primary Clarifiers #1 and #2)	4,125	13,750	4,125	20,625	27,500	
12	Blowers (Aeration Basin #1)	30,000	100,000	30,000	150,000	200,000	
13	Diffusers (Aeration Basins #1)	-	47,250	-	47,250	N/A	
14	Mixers (Aeration Basin #1)	18,000	60,000	18,000	90,000	120,000	
15	Drives (Secondary Clarifiers #1 and #2)	11,250	37,500	11,250	56,250	75,000	
16	Scum Pumps (Secondary Clarifiers #1 and #2)	4,125	13,750	4,125	20,625	27,500	
17	RAS/WAS Pumps (RAS/WAS Lift Station #1)	13,500	45,000	13,500	67,500	90,000	
18	UV Bulbs / Ballast / Wipers (UV Disinfection Structure)	20,000	38,000	20,000	38,000	N/A	
19	Non-Potable Water Pumps (UV Disinfection Structure)	4,500	15,000	4,500	22,500	30,000	
20	Anaerobic Digestion, pumps, heat exchanger	22,500	75,000	22,500	112,500	150,000	
21	Centrifuge	30,000	100,000	30,000	150,000	200,000	
22	Standby Generator	33,750	112,500	33,750	168,750	225,000	
23	Pumps (Effluent Lift Station)	35,625	118,750	35,625	178,125	237,500	
24	Total	\$ 371,375	\$ 1,256,500	\$ 371,375	\$ 1,842,125		
Future Replacement Costs (Adjusted for Inflation)							
25	Present Value	\$ 371,375	\$ 1,256,500	\$ 371,375	\$ 1,842,125		
26	Future Value Factor		1.10	1.20	1.32	1.45	
27	Future Values	\$ 407,486	\$ 1,512,734	\$ 490,583	\$ 2,670,047		
Replacement Account Deposit (includes interest)							
28	Future Values	\$ 407,486	\$ 1,512,734	\$ 490,583	\$ 2,670,047		
		Annual Factor	Future Replacement Funds			Annual Deposit	
29	SFF - 5 yrs	0.1819	\$ 407,486	\$ 407,486	\$ 407,486	\$ 74,114	
30	SFF - 10 yrs	0.0804		1,105,248	488,797	488,797	\$ 88,903
31	SFF - 15 yrs	0.0472			(405,700)	(105,330)	\$ (19,158)
32	SFF - 20 yrs	0.0311				1,879,095	\$ 58,347
33	Estimated Additional Annual Replacement Costs	Deposit				\$ 202,206	
Chemical Costs							
	Component	Dry tons per week	Pounds per dry ton	Pounds per week	Pounds per Year	Cost Per Lb	Cost
34	Polymer	11.43	10.00	114	41,734	\$ 3.15	\$ 131,462
35	Estimated Additional Annual Chemical Costs						\$ 131,462



Process Alternative 1
Operations & Maintenance Cost Estimate

Line No.	Description	Replacement Costs (2012 \$)				Original Costs	
		5 YR	10 YR	15 YR	20 YR		
Additional Labor Costs							
36	Overhead/Fringe Factor	0.80					
	Component	Days Per Week	Hours Per Day	Personnel	Rate	Overhead / Fringe Cost	
37	Operator	5	8	3.0	\$ 21.00	\$ 235,872	
38	Sample Technician	5	8	1	\$ 21.00	\$ 78,624	
39	Lead Operator	5	8	1	\$ 27.00	\$ 101,088	
	Maintenance	5	8	1	\$ 21.00	\$ 78,624	
40	Estimated Annual Additional Labor Costs					\$ 494,208	
Sludge Hauling and Treatment Cost							
	Component			Wet Tons per week @ 20% Solids	Hauling/Land Application Cost Per Wet Ton	Cost	
41	Sludge Hauling and Treatment Cost (Contract Application)			57.17	\$ 32.00	\$ 95,131	
42	Estimated Annual Sludge Hauling and Treatment Cost					\$ 95,131	
Electricity Usage Costs (Design Year)							
43	Watts per Total HP	745.70					
44	Cost per Kilowatt-Hour	\$ 0.0700					
	Component	HP	Quantity	Total HP	Watts	Hours/day	kW-hrs/year
45	East EFHB PS	40.00	3	120.00	89,484	24	32,214
46	West PS	60.00	2	120.00	89,484	12	391,940
47	Pumps (Raw Wastewater Lift Station)	40.00	3	120.00	89,484	12	391,940
48	Fine Screen (Headworks)	5.00	1	5.00	3,728	8	10,887
49	Grit Pump (Headworks)	7.50	1	7.50	5,593	8	16,331
50	Grit Classifier (Headworks)	1.00	1	1.00	746	24	6,532
51	Drives (Primary Clarifiers #1 and #2)	1.50	2	3.00	2,237	24	19,597
52	Scum Pumps (Primary Clarifiers #1 and #2)	7.50	1	7.50	5,593	4	8,165
53	Blowers (Aeration Basin #1)	145.00	2	290.00	216,253	18	1,420,782
54	Mixers (Aeration Basin #1)	40.00	3	120.00	89,484	24	783,880
55	Drives (Secondary Clarifiers #1 and #2)	1.50	2	3.00	2,237	24	19,597
56	Scum Pumps (Secondary Clarifiers #1 and #2)	7.50	1	7.50	5,593	4	8,165
57	RAS/WAS Pumps (RAS/WAS Lift Station #1)	15.00	2	30.00	22,371	24	195,970
58	UV Bulbs / Ballast / Wipers (UV Disinfection Struct	N/A	N/A	N/A	18,000	24	91,980
59	Non-Potable Water Pumps (UV Disinfection Struct	15.00	1	15.00	11,185	8	19,053
60	Sludge Recirculation Pump	35.00	3	105.00	78,298	24	400,105
61	Centrifuge	70.00	1	70.00	52,199	10	190,526
62	Pumps (Effluent Lift Station)	40.00	3	120.00	89,484	24	64,428
						kW-hrs/year =	4,072,093
63	Estimated Annual Electricity Usage Costs (Design Year)					\$ 285,047	
Gas Usage Costs, Digestion Only (Design Year)							
	Component	mmbTU/day	\$/mmbTU	day/year	\$/year		
64	Digestion	27.00	\$ 6.00	365	\$ 59,130		
65	Estimated Gas Usage Costs (Design Year, Not Adjusted For Inflation)					\$ 59,130	
66	TOTAL					\$ 1,267,184	

Notes:

Items Not Include = Potable Water, Natural Gas, Diesel, HVAC Equipment Replacement



Process Alternative 1

Engineer's Opinion of Conceptual Construction Costs

Line No.	Description	Quantity	Amount
Missouri River Discharge			
Facilities			
1	Conveyance		\$ 15,330,100
2	Process Option		24,971,000
3	Electrical / Instrumentation Controls	15.00%	3,746,000
4	Site Work	10.00%	2,497,100
5	Site Piping	10.00%	2,497,100
6	Overhead And Profit	10.00%	3,371,000
7	WWTF Subtotal		\$ 52,412,300
8	Subtotal		\$ 52,412,300
General			
9	Contingency	20.00%	\$ 10,482,000
10	Engineering	20.00%	12,579,000
11	Little Shoal Creek Easement		252,000
12	Total		\$ 75,725,300
Shoal Creek Discharge			
Facilities			
13	Tertiary Filtration Building (Cloth Media w/ Alum) - 4 MGD		\$ 1,855,000
14	Reaeration Structure		460,000
15	Electrical, Site Work, Piping	35.00%	810,000
16	Outfall Line Extension, New Outfall=		(2,420,000)
17	Overhead and Profit	10.00%	70,500
18	WWTF Subtotal		\$ 775,500
General			
19	Contingency	20.00%	\$ 155,100
20	Engineering	20.00%	186,120
21	Total Adjustment for Shoal Creek		1,116,720
22	Total		\$ 76,842,020



City of Liberty, Missouri
 Wastewater Treatment Feasibility Study
 Estimated Facility Expenditures - Liberty Process Alternative 1
 Net Present Value of Estimated Cash Outlay

Line No.	Description	Projected														
		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Estimated Facility Expenditures - Liberty Process Alternative 1																
1	Labor	\$ 494,208	\$ 509,034	\$ 524,305	\$ 540,034	\$ 556,235	\$ 572,923	\$ 590,110	\$ 607,814	\$ 626,048	\$ 644,829	\$ 664,174	\$ 684,099	\$ 704,622	\$ 725,761	\$ 747,534
2	Materials and Service	50,000	51,500	53,045	54,636	56,275	57,964	59,703	61,494	63,339	65,239	67,196	69,212	71,288	73,427	75,629
3	Utilities - Electricity, Gas, Etc.	344,177	365,137	376,091	387,374	398,995	410,965	423,294	435,993	449,072	462,544	476,421	490,713	505,435	520,598	536,216
4	Chemicals	131,462	135,406	139,468	143,653	147,962	152,401	156,973	161,682	166,533	171,529	176,674	181,975	187,434	193,057	198,849
5	Sludge Hauling	95,131	98,460	101,907	105,473	109,165	112,986	116,940	121,033	125,269	129,654	134,192	138,888	143,749	148,781	153,988
6	Phone	480	494	509	525	540	556	573	590	608	626	645	664	684	705	726
7	Equipment Repair/Replacement	202,206	202,206	202,206	202,206	202,206	202,206	202,206	202,206	202,206	202,206	202,206	202,206	202,206	202,206	202,206
8	Subtotal Estimated Facility Expenditures -Liberty Process Alternative 1	\$ 1,317,664	\$ 1,362,238	\$ 1,397,531	\$ 1,433,901	\$ 1,471,379	\$ 1,510,000	\$ 1,549,799	\$ 1,590,811	\$ 1,633,075	\$ 1,676,627	\$ 1,721,508	\$ 1,767,758	\$ 1,815,419	\$ 1,864,534	\$ 1,915,148
Plus:																
9	Facility Depreciation/Renewal & Replacement	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	Total Estimated Facility Expenditures -Liberty Process Alternative 1	\$ 1,317,664	\$ 1,362,238	\$ 1,397,531	\$ 1,433,901	\$ 1,471,379	\$ 1,510,000	\$ 1,549,799	\$ 1,590,811	\$ 1,633,075	\$ 1,676,627	\$ 1,721,508	\$ 1,767,758	\$ 1,815,419	\$ 1,864,534	\$ 1,915,148
Calculation of Net Present Value (NPV)																
11	Total Estimated Facility Expenditures -Liberty Process Alternative 1	\$ -	\$ -	\$ -	\$ -	\$ 1,471,379	\$ 1,510,000	\$ 1,549,799	\$ 1,590,811	\$ 1,633,075	\$ 1,676,627	\$ 1,721,508	\$ 1,767,758	\$ 1,815,419	\$ 1,864,534	\$ 1,915,148
12	Sewage Treatment Fees (KCMO)	3,977,621	4,591,304	5,299,595	6,117,068	-	-	-	-	-	-	-	-	-	-	-
13	Debt Service	-	-	-	-	2,418,489	7,215,078	7,215,878	7,216,928	7,216,528	7,215,828	7,211,028	7,216,828	7,216,853	7,214,365	7,214,871
14	Debt Coverage	-	-	-	-	604,622	1,803,769	1,803,969	1,804,232	1,804,132	1,803,957	1,802,757	1,804,207	1,804,213	1,803,591	1,803,718
15	Total Expenditures	\$ 3,977,621	\$ 4,591,304	\$ 5,299,595	\$ 6,117,068	\$ 4,494,490	\$ 10,528,847	\$ 10,569,646	\$ 10,611,971	\$ 10,653,734	\$ 10,696,411	\$ 10,735,292	\$ 10,788,792	\$ 10,836,485	\$ 10,882,490	\$ 10,933,737
16	Total Outflows (Non-Discounted)	\$ 281,380,960														
17	Net Present Value	\$ 148,634,686														

REVENUE REQUIREMENTS ANALYSIS

18	Operations and Maintenance															
18	Existing System	\$ 1,327,210	\$ 1,313,030	\$ 1,344,312	\$ 1,377,892	\$ 1,412,396	\$ 1,448,391	\$ 1,485,794	\$ 1,523,715	\$ 1,562,762	\$ 1,601,850	\$ 1,641,225	\$ 1,681,225	\$ 1,722,868	\$ 1,765,379	\$ 1,809,221
19	KCMO Payments	3,977,621	4,591,304	5,299,595	6,117,068	-	-	-	-	-	-	-	-	-	-	-
20	Wastewater Treatment Facility	-	-	-	-	1,471,379	1,510,000	1,549,799	1,590,811	1,633,075	1,676,627	1,721,508	1,767,758	1,815,419	1,864,534	1,915,148
21	Operations and Maintenance Subtotal	\$ 5,304,831	\$ 5,904,333	\$ 6,643,907	\$ 7,494,960	\$ 2,883,775	\$ 2,958,390	\$ 3,035,593	\$ 3,114,526	\$ 3,195,836	\$ 3,278,477	\$ 3,362,733	\$ 3,448,983	\$ 3,538,287	\$ 3,629,913	\$ 3,724,369
22	Debt Service															
22	Existing	\$ 1,044,546	\$ 1,048,295	\$ 1,330,288	\$ 945,342	\$ 992,895	\$ 992,876	\$ 1,287,334	\$ 1,284,017	\$ 980,350	\$ 1,031,612	\$ 1,027,560	\$ 1,033,044	\$ 1,032,942	\$ 1,316,274	\$ 325,655
23	New	-	-	-	-	2,418,489	7,215,078	7,215,878	7,216,928	7,216,528	7,215,828	7,211,028	7,216,828	7,216,853	7,214,365	7,214,871
24	Accumulation of Debt Service Payment	-	-	-	-	3,607,539	-	-	-	-	-	-	-	-	-	-
25	Debt Service	\$ 1,044,546	\$ 1,048,295	\$ 1,330,288	\$ 945,342	\$ 7,018,922	\$ 8,207,954	\$ 8,503,212	\$ 8,500,945	\$ 8,196,878	\$ 8,247,439	\$ 8,238,588	\$ 8,249,871	\$ 8,249,794	\$ 8,530,639	\$ 7,540,526
26	Required Coverage	\$ 261,137	\$ 262,074	\$ 332,572	\$ 236,335	\$ 1,754,731	\$ 2,051,988	\$ 2,125,803	\$ 2,125,236	\$ 2,049,219	\$ 2,061,860	\$ 2,059,647	\$ 2,062,468	\$ 2,062,449	\$ 2,132,660	\$ 1,885,132
27	Total Annual Revenue Requirement	\$ 6,610,514	\$ 7,214,702	\$ 8,306,767	\$ 8,676,637	\$ 11,657,428	\$ 13,218,333	\$ 13,664,608	\$ 13,740,707	\$ 13,740,707	\$ 13,740,707	\$ 13,740,707	\$ 13,740,707	\$ 13,761,322	\$ 13,850,530	\$ 14,293,211
28	Estimated Annual Sewer Revenues	\$ 6,544,262	\$ 6,610,514	\$ 7,214,702	\$ 8,306,767	\$ 8,676,637	\$ 11,657,428	\$ 13,218,333	\$ 13,664,608	\$ 13,740,707	\$ 13,740,707	\$ 13,740,707	\$ 13,740,707	\$ 13,740,707	\$ 13,761,322	\$ 13,850,530
29	Revenue Surplus (Deficiency)	\$ (66,251)	\$ (604,189)	\$ (1,092,065)	\$ (369,870)	\$ (2,980,790)	\$ (1,560,905)	\$ (446,275)	\$ (76,100)	\$ -	\$ -	\$ -	\$ -	\$ (20,615)	\$ (89,208)	\$ (442,682)
30	Estimated Annual Revenue Increase	1.0%	9.1%	15.1%	4.5%	34.4%	13.4%	3.4%	0.6%	0.0%	0.0%	0.0%	0.2%	0.6%	3.2%	0.0%



City of Liberty, Missouri
 Wastewater Treatment Feasibility Study
 Estimated Facility Expenditures - Liberty Process Alternative 1
 Net Present Value of Estimated Cash Outlay

Line No.	Description	Projected													
		2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Estimated Facility Expenditures - Liberty Process Alternative 1															
1	Labor	\$ 769,960	\$ 793,059	\$ 816,851	\$ 841,356	\$ 866,597	\$ 892,595	\$ 919,372	\$ 946,954	\$ 975,362	\$ 1,004,623	\$ 1,034,762	\$ 1,065,805	\$ 1,097,779	\$ 1,130,712
2	Materials and Service	77,898	80,235	82,642	85,122	87,675	90,306	93,015	95,805	98,679	101,640	104,689	107,830	111,064	114,396
3	Utilities - Electricity, Gas, Etc.	552,302	568,871	585,938	603,516	621,621	640,270	659,478	679,262	699,640	720,629	742,248	764,516	787,451	811,075
4	Chemicals	204,814	210,959	217,287	223,806	230,520	237,436	244,559	251,896	259,452	267,236	275,253	283,511	292,016	300,776
5	Sludge Hauling	159,377	164,956	170,729	176,705	182,889	189,290	195,916	202,773	209,870	217,215	224,818	232,686	240,830	249,259
6	Phone	748	770	793	817	842	867	893	920	947	976	1,005	1,035	1,066	1,098
7	Equipment Repair/Replacement	202,206	202,206	202,206	202,206	202,206	202,206	202,206	202,206	202,206	202,206	202,206	202,206	202,206	202,206
8	Subtotal Estimated Facility Expenditures -Liberty Process Alternative 1	\$ 1,967,306	\$ 2,021,056	\$ 2,076,446	\$ 2,133,527	\$ 2,192,350	\$ 2,252,969	\$ 2,315,438	\$ 2,379,815	\$ 2,446,157	\$ 2,514,525	\$ 2,584,980	\$ 2,657,588	\$ 2,732,413	\$ 2,809,523
Plus:															
9	Facility Depreciation/Renewal & Replacement	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	Total Estimated Facility Expenditures -Liberty Process Alternative 1	\$ 1,967,306	\$ 2,021,056	\$ 2,076,446	\$ 2,133,527	\$ 2,192,350	\$ 2,252,969	\$ 2,315,438	\$ 2,379,815	\$ 2,446,157	\$ 2,514,525	\$ 2,584,980	\$ 2,657,588	\$ 2,732,413	\$ 2,809,523
Calculation of Net Present Value (NPV)															
11	Total Estimated Facility Expenditures -Liberty Process Alternative 1	\$ 1,967,306	\$ 2,021,056	\$ 2,076,446	\$ 2,133,527	\$ 2,192,350	\$ 2,252,969	\$ 2,315,438	\$ 2,379,815	\$ 2,446,157	\$ 2,514,525	\$ 2,584,980	\$ 2,657,588	\$ 2,732,413	\$ 2,809,523
12	Sewage Treatment Fees (KCMO)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	Debt Service	7,212,896	7,213,321	7,210,465	7,209,140	7,216,528	7,212,628	7,211,390	7,210,721	7,211,596	7,212,556	7,212,659	7,214,462	6,715,146	-
14	Debt Coverage	1,803,224	1,803,330	1,802,616	1,802,285	1,804,132	1,803,157	1,802,848	1,802,680	1,802,899	1,803,139	1,803,165	1,803,615	1,678,786	-
15	Total Expenditures	\$ 10,983,426	\$ 11,037,708	\$ 11,089,528	\$ 11,144,952	\$ 11,213,010	\$ 11,268,753	\$ 11,329,676	\$ 11,393,216	\$ 11,460,652	\$ 11,530,219	\$ 11,600,804	\$ 11,675,665	\$ 11,752,345	\$ 11,829,523
16	Total Outflows (Non-Discounted)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	Net Present Value	-	-	-	-	-	-	-	-	-	-	-	-	-	-

REVENUE REQUIREMENTS ANALYSIS

Operations and Maintenance															
18	Existing System	\$ 1,855,146	\$ 1,902,435	\$ 1,951,427	\$ 2,000,855	\$ 2,052,344	\$ 2,106,231	\$ 2,161,965	\$ 2,219,524	\$ 2,279,194	\$ 2,340,734	\$ 2,404,214	\$ 2,469,704	\$ 2,537,280	\$ 2,607,020
19	KCMO Payments	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	Wastewater Treatment Facility	1,967,306	2,021,056	2,076,446	2,133,527	2,192,350	2,252,969	2,315,438	2,379,815	2,446,157	2,514,525	2,584,980	2,657,588	2,732,413	2,809,523
21	Operations and Maintenance Subtotal	\$ 3,822,452	\$ 3,923,491	\$ 4,027,873	\$ 4,134,382	\$ 4,244,694	\$ 4,359,200	\$ 4,477,403	\$ 4,599,339	\$ 4,725,351	\$ 4,855,259	\$ 4,989,194	\$ 5,127,292	\$ 5,269,693	\$ 5,416,543
Debt Service															
22	Existing	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
23	New	7,212,896	7,213,321	7,210,465	7,209,140	7,216,528	7,212,628	7,211,390	7,210,721	7,211,596	7,212,556	7,212,659	7,214,462	6,715,146	-
24	Accumulation of Debt Service Payment	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25	Debt Service	\$ 7,212,896	\$ 7,213,321	\$ 7,210,465	\$ 7,209,140	\$ 7,216,528	\$ 7,212,628	\$ 7,211,390	\$ 7,210,721	\$ 7,211,596	\$ 7,212,556	\$ 7,212,659	\$ 7,214,462	\$ 6,715,146	\$ -
Required Coverage															
26	Required Coverage	\$ 1,803,224	\$ 1,803,330	\$ 1,802,616	\$ 1,802,285	\$ 1,804,132	\$ 1,803,157	\$ 1,802,848	\$ 1,802,680	\$ 1,802,899	\$ 1,803,139	\$ 1,803,165	\$ 1,803,615	\$ 1,678,786	\$ -
27	Total Annual Revenue Requirement	\$ 14,293,211	\$ 14,293,211	\$ 14,293,211	\$ 14,293,211	\$ 14,293,211	\$ 14,293,211	\$ 14,293,211	\$ 14,293,211	\$ 14,293,211	\$ 14,293,211	\$ 14,293,211	\$ 14,293,211	\$ 14,293,211	\$ 14,293,211
28	Estimated Annual Sewer Revenues	\$ 14,293,211	\$ 14,293,211	\$ 14,293,211	\$ 14,293,211	\$ 14,293,211	\$ 14,293,211	\$ 14,293,211	\$ 14,293,211	\$ 14,293,211	\$ 14,293,211	\$ 14,293,211	\$ 14,293,211	\$ 14,293,211	\$ 14,293,211
29	Revenue Surplus (Deficiency)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
30	Estimated Annual Revenue Increase	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%



City of Liberty, Missouri
 Wastewater Treatment Feasibility Study
KCMO Option
 Operations & Maintenance Cost Estimate

Line No.	Description	Replacement Costs (2012 \$)				Original Costs	
		5 YR	10 YR	15 YR	20 YR		
1	Inflation Rate	1.87%					
2	Interest Rate	4.75%					
3	Replacement Factor	15.00%	50.00%	15.00%	75.00%		
4	East PS	\$ 42,750	\$ 142,500	\$ 42,750	\$ 213,750	\$ 285,000	
5	East EFHB PS	26,719	89,063	26,719	133,594	178,125	
6	West EFHB PS	21,375	71,250	21,375	106,875	142,500	
7	Standby Generator	33,750	112,500	33,750	168,750	225,000	
8	Total	\$ 124,594	\$ 415,313	\$ 124,594	\$ 622,969		
Future Replacement Costs (Adjusted for Inflation)							
9	Present Value	\$ 124,594	\$ 415,313	\$ 124,594	\$ 622,969		
10	Future Value Factor	1.10	1.20	1.32	1.45		
11	Future Values	\$ 136,709	\$ 500,006	\$ 164,587	\$ 902,955		
Replacement Account Deposit (includes interest)							
12	Future Values	\$ 136,709	\$ 500,006	\$ 164,587	\$ 902,955		
		Annual Factor	Future Replacement Funds			Annual Deposit	
13	SFF = 5 yrs	0.1819	\$ 136,709	\$ 136,709	\$ 136,709	\$ 24,865	
14	SFF = 10 yrs	0.0804		363,297	160,668	\$ 29,223	
15	SFF = 15 yrs	0.0472			(132,790)	\$ (6,270)	
16	SFF = 20 yrs	0.0311				\$ 19,874	
17	Estimated Additional Annual Replacement Costs	Deposit				\$ 67,691	
Chemical Costs							
	Component	Dry tons per week	Pounds per dry ton	Pounds per week	Pounds per Year	Cost Per Lb	Cost
18	Polymer	0.00	10.00	-	-	\$ 3.15	\$ -
19	Estimated Additional Annual Chemical Costs						\$ -
Additional Labor Costs							
20	Overhead/Fringe Factor	0.80					
	Component	Days Per Week	Hours Per Day	Personnel	Rate	Overhead / Fringe	Cost
21	WWTF Week Day Staff (Operator & Maint)	-	-	- \$	21.00	\$ 16.80	\$ -
22	Laboratory Staff	-	-	- \$	27.00	\$ 21.60	\$ -
23	Supervisor	-	-	- \$	27.00	\$ 21.60	\$ -
24	Estimated Annual Additional Labor Costs						\$ -



City of Liberty, Missouri
 Wastewater Treatment Feasibility Study
KCMO Option
 Operations & Maintenance Cost Estimate

Line No.	Description	Replacement Costs (2012 \$)				Original Costs	
		5 YR	10 YR	15 YR	20 YR		
Sludge Hauling and Treatment Cost							
					Wet Tons per week @ 20% Solids	Hauling/Land Application Cost Per Wet Ton	
25	Sludge Hauling and Treatment Cost (Contract Application)				0.00	\$ 32.00	
26	Estimated Annual Sludge Hauling and Treatment Cost					\$ -	
Electricity Usage Costs (Design Year)							
27	Watts per Total HP		745.70				
28	Cost per Kilowatt-Hour	\$	0.0700				
	Component	HP	Quantity	Total HP	Watts	Hours/day	kW-hrs/year
29	East PS	60.00	3	180.00	134,226	12	587,910
30	East EFHB PS	60.00	3	180.00	134,226	24	48,321
31	West EFHB PS	60.00	3	180.00	134,226	24	48,321
32	Standby Generator	5.00	-	-	-	8	-
						kW-hrs/year =	684,552
33	Estimated Annual Electricity Usage Costs (Design Year)						\$ 47,919
Gas Usage Costs, Digestion Only (Design Year)							
	Component	mmBTU/day	\$/mmBTU	day/year	\$/year		
34	Digestion		\$ 6.00	365			
35	Estimated Gas Usage Costs (Design Year, Not Adjusted For Inflation)						\$ -
36	TOTAL						\$ 115,609

Notes:
 Items Not include = Potable Water, Natural Gas, Diesel, HVAC Equipment Replacement



City of Liberty, Missouri
Wastewater Treatment Feasibility Study
KCMO Option
Engineer's Opinion of Conceptual Construction Costs

Line No.	Description	Quantity	Amount
KCMO Option			
Facilities			
1	Conveyance		\$ 14,090,300
2	Process Option		-
3	Electrical / Instrumentation Controls	15.00%	-
4	Site Work	10.00%	-
5	Site Piping	10.00%	-
6	Overhead And Profit	10.00%	-
7	WWTF Subtotal		\$ 14,090,300
8	Subtotal		\$ 14,090,300
General			
9	Contingency	20.00%	\$ 3,381,672
10	Engineering	20.00%	2,818,060
11	Acquisition Of KCMO Forcemain		-
12	Little Shoal Creek Easement		252,000
13	Total		\$ 20,542,032



City of Liberty, Missouri
 Wastewater Treatment Feasibility Study
Process Alternative 2
 Operations & Maintenance Cost Estimate

Line No.	Description	Replacement Costs (2012 \$)				Original Costs
		5 YR	10 YR	15 YR	20 YR	
1	Inflation Rate	1.87%				
2	Interest Rate	4.75%				
3	Replacement Factor	15.00%	50.00%	15.00%	75.00%	
4	East EFHB PS	\$ 28,500	\$ 95,000	\$ 28,500	\$ 142,500	\$ 190,000
5	West PS	42,750	142,500	42,750	213,750	285,000
6	Pumps (Raw Wastewater Lift Station)	28,500	95,000	28,500	142,500	190,000
7	Fine Screen (Headworks)	15,750	52,500	15,750	78,750	105,000
8	Grit Pump (Headworks)	4,125	13,750	4,125	20,625	27,500
9	Grit Classifier (Headworks)	6,000	20,000	6,000	30,000	40,000
10	Grit Chamber (Headworks)	7,500	25,000	7,500	37,500	50,000
11	Blowers (Aeration Basin #1)	30,000	100,000	30,000	150,000	200,000
12	Diffusers (Aeration Basins #1)	-	47,250	-	47,250	N/A
13	Mixers (Aeration Basin #1)	18,000	60,000	18,000	90,000	120,000
14	Drives (Secondary Clarifiers #1 and #2)	11,250	37,500	11,250	56,250	75,000
15	Scum Pumps (Secondary Clarifiers #1 and #2)	4,125	13,750	4,125	20,625	27,500
16	RAS/WAS Pumps (RAS/WAS Lift Station #1)	13,500	45,000	13,500	67,500	90,000
17	UV Bulbs / Ballast / Wipers (UV Disinfection Structure)	20,000	38,000	20,000	38,000	N/A
18	Non-Potable Water Pumps (UV Disinfection Structure)	4,500	15,000	4,500	22,500	30,000
19	Floating Aerator (Sludge Storage)	11,250	37,500	11,250	56,250	75,000
20	Mechanical Dewatering	30,000	100,000	30,000	150,000	200,000
21	Standby Generator	33,750	112,500	33,750	168,750	225,000
22	Pumps (Effluent Lift Station)	35,625	118,750	35,625	178,125	237,500
23	Total	\$ 345,125	\$ 1,169,000	\$ 345,125	\$ 1,710,875	

Future Replacement Costs (Adjusted for Inflation)

24	Present Value	\$ 345,125	\$ 1,169,000	\$ 345,125	\$ 1,710,875
25	Future Value Factor	1.10	1.20	1.32	1.45
26	Future Values	\$ 378,684	\$ 1,407,390	\$ 455,907	\$ 2,479,809

Replacement Account Deposit (includes interest)

27	Future Values	\$ 378,684	\$ 1,407,390	\$ 455,907	\$ 2,479,809
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	Annual Factor	Future Replacement Funds				Annual Deposit
28	SFF - 5 yrs	0.1819	\$ 378,684	\$ 378,684	\$ 378,684	\$ 68,875
29	SFF - 10 yrs	0.0804		1,028,706	454,946	\$ 82,746
30	SFF - 15 yrs	0.0472			(377,723)	\$ (17,836)
31	SFF - 20 yrs	0.0311				\$ 54,160
32	Estimated Additional Annual Replacement Costs	Deposit				\$ 187,944

Chemical Costs

Component	Dry tons per week	Pounds per dry ton	Pounds per week	Pounds per Year	Cost Per Lb	Cost	
33	Polymer	15.69	10.00	157	57,278	\$ 3.15	\$ 180,425
34	Estimated Additional Annual Chemical Costs					\$ 180,425	



City of Liberty, Missouri
 Wastewater Treatment Feasibility Study
Process Alternative 2
 Operations & Maintenance Cost Estimate

Line No.	Description	Replacement Costs (2012 \$)				Original Costs	
		5 YR	10 YR	15 YR	20 YR		
Additional Labor Costs							
35	Overhead/Fringe Factor	0.80					
	Component	Days Per Week	Hours Per Day	Personnel	Rate	Overhead / Fringe	Cost
36	Operator	5	8	3	\$ 21.00	\$16.80	\$ 235,872
37	Sample Technician	5	8	1	\$ 21.00	\$16.80	\$ 78,624
38	Lead Operator	5	8	1	\$ 27.00	\$21.60	\$ 101,088
	Maintenance	5	8	1	\$ 21.00	\$16.80	\$ 78,624
39	Estimated Annual Additional Labor Costs						\$ 494,208
Sludge Hauling and Treatment Cost							
	Component				Wet Tons per week @ 20% Solids	Hauling/Land Application Cost Per Wet Ton	Cost
40	Sludge Hauling and Treatment Cost (Contract Application)				78.46	\$ 32.00	\$ 130,562
41	Estimated Annual Sludge Hauling and Treatment Cost						\$ 130,562
Electricity Usage Costs (Design Year)							
42	Watts per Total HP		745.70				
43	Cost per Kilowatt-Hour	\$	0.0700				
	Component	HP	Quantity	Total HP	Watts	Hours/day	kW-hrs/year
44	East EFHB PS	40.00	3	120.00	89,484	24	32,214
45	West PS	60.00	2	120.00	89,484	12	391,940
46	Pumps (Raw Wastewater Lift Station)	40.00	3	120.00	89,484	12	391,940
47	Fine Screen (Headworks)	5.00	1	5.00	3,728	8	10,887
48	Grit Pump (Headworks)	7.50	1	7.50	5,593	8	16,331
49	Grit Classifier (Headworks)	1.00	1	1.00	746	24	6,532
50	Grit Chamber (Headworks)	1.50	1	1.50	1,119	24	9,798
51	Blowers (Aeration Basin #1)	175.00	2	350.00	260,995	18	1,714,737
52	Diffusers (Aeration Basins #1)	-	-	-	-	-	-
53	Mixers (Aeration Basin #1)	40.00	3	120.00	89,484	24	783,880
54	Drives (Secondary Clarifiers #1 and #2)	1.50	2	3.00	2,237	24	19,597
55	Scum Pumps (Secondary Clarifiers #1 and #2)	7.50	1	7.50	5,593	4	8,165
56	RAS/WAS Pumps (RAS/WAS Lift Station #1)	15.00	2	30.00	22,371	24	195,970
57	UV Bulbs / Ballast / Wipers (UV Disinfection Struc)	N/A	N/A	N/A	15,000	24	76,680
58	Non-Potable Water Pumps (UV Disinfection Struc)	15.00	1	15.00	11,185	8	32,662
59	Floating Aerator (Sludge Storage)	75.00	2	150.00	111,855	16	653,233
60	Mechanical Dewatering	70.00	1	70.00	52,199	12	228,632
61	Standby Generator	-	-	-	-	-	-
62	Pumps (Effluent Lift Station)	60.00	3	180.00	134,226	24	96,643
						kW-hrs/year =	4,669,841
63	Estimated Annual Electricity Usage Costs (Design Year)						\$ 326,889
Gas Usage Costs, Digestion Only (Design Year)							
	Component		mmBTU/day	\$/mmBTU	day/year	\$/year	
64	Digestion		-	\$ 6.00	365	\$ -	
65	Estimated Gas Usage Costs (Design Year, Not Adjusted For Inflation)						\$ -
66	TOTAL						\$ 1,320,028

Notes:

Items Not Include = Potable Water, Natural Gas, Diesel, HVAC Equipment Replacement



City of Liberty, Missouri

Wastewater Treatment Feasibility Study

Process Alternative 2

Engineer's Opinion of Conceptual Construction Costs

Line No.	Description	Quantity	Amount
Missouri River Discharge			
Facilities			
1	Conveyance		\$ 15,330,100
2	Process Option		18,945,000
3	Electrical / Instrumentation Controls	15.00%	2,842,000
4	Site Work	10.00%	1,894,500
5	Site Piping	10.00%	1,894,500
6	Overhead And Profit	10.00%	2,558,000
7	WWTF Subtotal		\$ 43,464,100
8	Subtotal		\$ 43,464,100
General			
9	Contingency	20.00%	\$ 8,693,000
10	Engineering	20.00%	10,431,000
11	Little Shoal Creek Easement		252,000
12	Total		\$ 62,840,100
Shoal Creek Discharge			
Facilities			
13	Tertiary Filtration Building (Cloth Media w/ Alum) - 4 MGD		\$ 1,855,000
14	Reaeration Structure		460,000
15	Electrical, Site Work, Piping	35.00%	810,000
16	Outfall Line Extension, New Outfall-		(2,420,000)
17	Overhead and Profit	10.00%	70,500
18	WWTF Subtotal		\$ 775,500
General			
19	Contingency	20.00%	\$ 155,100
20	Engineering	20.00%	186,120
21	Total Adjustment for Shoal Creek		1,116,720
22	Total		\$ 63,956,820



City of Liberty, Missouri
 Wastewater Treatment Feasibility Study
 Estimated Facility Expenditures - Liberty Process Alternative 2
 Net Present Value of Estimated Cash Outlay

Line No.	Description	Estimated	Projected													
		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Estimated Facility Expenditures - Liberty Process Alternative 2																
1	Labor	\$ 494,208	\$ 509,034	\$ 524,305	\$ 540,034	\$ 556,235	\$ 572,923	\$ 590,110	\$ 607,814	\$ 626,048	\$ 644,829	\$ 664,174	\$ 684,099	\$ 704,622	\$ 725,761	\$ 747,534
2	Materials and Service	50,000	51,500	53,045	54,636	56,275	57,964	59,703	61,494	63,339	65,239	67,196	69,212	71,288	73,427	75,629
3	Utilities - Electricity, Gas, Etc.	326,889	346,796	357,200	367,916	378,954	390,322	402,032	414,093	426,516	439,311	452,491	466,065	480,047	494,449	509,282
4	Chemicals	180,425	185,838	191,413	197,155	203,070	209,162	215,437	221,900	228,557	235,414	242,476	249,750	257,243	264,960	272,909
5	Sludge Hauling	130,562	135,132	139,861	144,756	149,823	155,067	160,494	166,111	171,925	177,943	184,171	190,617	197,288	204,193	211,340
6	Phone	480	494	509	525	540	556	573	590	608	626	645	664	684	705	726
7	Equipment Repair/Replacement	187,944	187,944	187,944	187,944	187,944	187,944	187,944	187,944	187,944	187,944	187,944	187,944	187,944	187,944	187,944
8	Subtotal Estimated Facility Expenditures - Liberty Process Alternative 2	\$ 1,370,508	\$ 1,416,739	\$ 1,454,278	\$ 1,492,968	\$ 1,532,842	\$ 1,573,938	\$ 1,616,293	\$ 1,659,946	\$ 1,704,937	\$ 1,751,306	\$ 1,799,097	\$ 1,848,352	\$ 1,899,118	\$ 1,951,439	\$ 2,005,365
Plus:																
9	Facility Depreciation/Renewal & Replacement	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	Estimated Facility Expenditures - Liberty Process Alternative 2	\$ 1,370,508	\$ 1,416,739	\$ 1,454,278	\$ 1,492,968	\$ 1,532,842	\$ 1,573,938	\$ 1,616,293	\$ 1,659,946	\$ 1,704,937	\$ 1,751,306	\$ 1,799,097	\$ 1,848,352	\$ 1,899,118	\$ 1,951,439	\$ 2,005,365
Calculation of Net Present Value (NPV)																
11	Estimated Facility Expenditures - Liberty Process Alternative 2	\$ -	\$ -	\$ -	\$ -	\$ 1,532,842	\$ 1,573,938	\$ 1,616,293	\$ 1,659,946	\$ 1,704,937	\$ 1,751,306	\$ 1,799,097	\$ 1,848,352	\$ 1,899,118	\$ 1,951,439	\$ 2,005,365
12	Sewage Treatment Fees (KCMO)	3,977,621	4,591,304	5,299,595	6,117,068	-	-	-	-	-	-	-	-	-	-	-
13	Debt Service	-	-	-	-	2,014,397	6,013,844	6,013,669	6,011,944	6,012,494	6,014,294	6,007,694	6,012,594	6,013,394	6,010,369	6,011,644
14	Debt Coverage	-	-	-	-	503,599	1,503,461	1,503,417	1,502,986	1,503,124	1,503,574	1,501,924	1,503,149	1,503,349	1,502,592	1,502,911
15	Total Expenditures	\$ 3,977,621	\$ 4,591,304	\$ 5,299,595	\$ 6,117,068	\$ 4,050,839	\$ 9,091,244	\$ 9,133,380	\$ 9,174,877	\$ 9,220,555	\$ 9,269,174	\$ 9,308,715	\$ 9,364,095	\$ 9,415,860	\$ 9,464,401	\$ 9,519,920
16	Total Outflows (Non-Discounted)	\$ 248,794,670														
17	Net Present Value	\$ 132,117,347														

REVENUE REQUIREMENTS ANALYSIS

Operations and Maintenance																
18	Existing System	\$ 1,327,210	\$ 1,313,030	\$ 1,344,312	\$ 1,377,892	\$ 1,412,396	\$ 1,448,391	\$ 1,485,794	\$ 1,523,715	\$ 1,562,762	\$ 1,601,850	\$ 1,641,225	\$ 1,681,225	\$ 1,722,868	\$ 1,765,379	\$ 1,809,221
19	KCMO Payments	3,977,621	4,591,304	5,299,595	6,117,068	-	-	-	-	-	-	-	-	-	-	-
20	Wastewater Treatment Facility	-	-	-	-	1,532,842	1,573,938	1,616,293	1,659,946	1,704,937	1,751,306	1,799,097	1,848,352	1,899,118	1,951,439	2,005,365
21	Operations and Maintenance Subtotal	\$ 5,304,831	\$ 5,904,333	\$ 6,643,907	\$ 7,494,960	\$ 2,945,238	\$ 3,022,329	\$ 3,102,088	\$ 3,183,661	\$ 3,267,699	\$ 3,353,156	\$ 3,440,322	\$ 3,529,577	\$ 3,621,986	\$ 3,716,818	\$ 3,814,586
Debt Service																
22	Existing	\$ 1,044,546	\$ 1,048,295	\$ 1,330,288	\$ 945,342	\$ 992,895	\$ 992,876	\$ 1,287,334	\$ 1,284,017	\$ 980,350	\$ 1,031,612	\$ 1,027,560	\$ 1,033,044	\$ 1,032,942	\$ 1,316,274	\$ 325,655
23	New	-	-	-	-	2,014,397	6,013,844	6,013,669	6,011,944	6,012,494	6,014,294	6,007,694	6,012,594	6,013,394	6,010,369	6,011,644
24	Accumulation of Debt Service Payment	-	-	-	-	3,006,922	-	-	-	-	-	-	-	-	-	-
25	Debt Service	\$ 1,044,546	\$ 1,048,295	\$ 1,330,288	\$ 945,342	\$ 6,014,214	\$ 7,006,720	\$ 7,301,003	\$ 7,295,962	\$ 6,992,844	\$ 7,045,906	\$ 7,035,254	\$ 7,045,638	\$ 7,046,336	\$ 7,326,643	\$ 6,337,299
26	Required Coverage	\$ 261,137	\$ 262,074	\$ 332,572	\$ 236,335	\$ 1,503,553	\$ 1,751,680	\$ 1,825,251	\$ 1,823,990	\$ 1,748,211	\$ 1,761,476	\$ 1,758,814	\$ 1,761,409	\$ 1,761,584	\$ 1,831,661	\$ 1,584,325
27	Total Annual Revenue Requirement	\$ 6,610,514	\$ 7,214,702	\$ 8,306,767	\$ 8,676,637	\$ 10,463,005	\$ 11,780,729	\$ 12,228,342	\$ 12,303,613	\$ 12,303,613	\$ 12,303,613	\$ 12,303,613	\$ 12,336,624	\$ 12,429,906	\$ 12,875,122	\$ 12,875,122
28	Estimated Annual Sewer Revenues	\$ 6,544,262	\$ 6,610,514	\$ 7,214,702	\$ 8,306,767	\$ 8,676,637	\$ 10,463,005	\$ 11,780,729	\$ 12,228,342	\$ 12,303,613	\$ 12,303,613	\$ 12,303,613	\$ 12,303,613	\$ 12,336,624	\$ 12,429,906	\$ 12,875,122
29	Revenue Surplus (Deficiency)	\$ (66,251)	\$ (604,189)	\$ (1,092,065)	\$ (369,870)	\$ (1,786,368)	\$ (1,317,724)	\$ (447,612)	\$ (75,271)	\$ -	\$ -	\$ -	\$ (33,011)	\$ (93,281)	\$ (445,216)	\$ -
30	Estimated Annual Revenue Increase	1.0%	9.1%	15.1%	4.5%	20.6%	12.6%	3.8%	0.6%	0.0%	0.0%	0.0%	0.3%	0.8%	3.6%	0.0%



City of Liberty, Missouri
 Wastewater Treatment Feasibility Study
 Estimated Facility Expenditures - Liberty Process Alternative 2
 Net Present Value of Estimated Cash Outlay

Line No.	Description	Projected													
		2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Estimated Facility Expenditures - Liberty Process Alternative 2															
1	Labor	\$ 769,960	\$ 793,059	\$ 816,851	\$ 841,356	\$ 866,597	\$ 892,595	\$ 919,372	\$ 946,954	\$ 975,362	\$ 1,004,623	\$ 1,034,762	\$ 1,065,805	\$ 1,097,779	\$ 1,130,712
2	Materials and Service	77,898	80,235	82,642	85,122	87,675	90,306	93,015	95,805	98,679	101,640	104,689	107,830	111,064	114,396
3	Utilities - Electricity, Gas, Etc.	524,561	540,297	556,506	573,202	590,398	608,110	626,353	645,143	664,498	684,433	704,966	726,115	747,898	770,335
4	Chemicals	281,096	289,529	298,215	307,162	316,376	325,868	335,644	345,713	356,084	366,767	377,770	389,103	400,776	412,799
5	Sludge Hauling	218,737	226,393	234,316	242,517	251,006	259,791	268,883	278,294	288,035	298,116	308,550	319,349	330,526	342,095
6	Phone	748	770	793	817	842	867	893	920	947	976	1,005	1,035	1,066	1,098
7	Equipment Repair/Replacement	187,944	187,944	187,944	187,944	187,944	187,944	187,944	187,944	187,944	187,944	187,944	187,944	187,944	187,944
8	Subtotal Estimated Facility Expenditures - Liberty Process Alternative 2	\$ 2,060,944	\$ 2,118,228	\$ 2,177,269	\$ 2,238,120	\$ 2,300,838	\$ 2,365,480	\$ 2,432,105	\$ 2,500,774	\$ 2,571,550	\$ 2,644,498	\$ 2,719,686	\$ 2,797,181	\$ 2,877,055	\$ 2,959,380
Plus:															
9	Facility Depreciation/Renewal & Replacement	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	Estimated Facility Expenditures - Liberty Process Alternative 2	\$ 2,060,944	\$ 2,118,228	\$ 2,177,269	\$ 2,238,120	\$ 2,300,838	\$ 2,365,480	\$ 2,432,105	\$ 2,500,774	\$ 2,571,550	\$ 2,644,498	\$ 2,719,686	\$ 2,797,181	\$ 2,877,055	\$ 2,959,380
Calculation of Net Present Value (NPV)															
11	Estimated Facility Expenditures - Liberty Process Alternative 2	\$ 2,060,944	\$ 2,118,228	\$ 2,177,269	\$ 2,238,120	\$ 2,300,838	\$ 2,365,480	\$ 2,432,105	\$ 2,500,774	\$ 2,571,550	\$ 2,644,498	\$ 2,719,686	\$ 2,797,181	\$ 2,877,055	\$ 2,959,380
12	Sewage Treatment Fees (KCMO)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	Debt Service	6,006,625	6,010,313	6,007,838	6,010,638	6,014,119	6,013,019	6,006,813	6,008,666	6,010,094	6,009,025	6,009,788	6,010,072	5,509,322	-
14	Debt Coverage	1,501,656	1,502,578	1,501,959	1,502,659	1,503,530	1,503,255	1,501,703	1,502,167	1,502,524	1,502,256	1,502,447	1,502,518	1,377,331	-
15	Total Expenditures	\$ 9,569,226	\$ 9,631,119	\$ 9,687,066	\$ 9,751,417	\$ 9,818,487	\$ 9,881,754	\$ 9,940,621	\$ 10,011,606	\$ 10,084,168	\$ 10,155,780	\$ 10,231,921	\$ 10,309,771	\$ 9,763,707	\$ 2,959,380
16	Total Outflows (Non-Discounted)														
17	Net Present Value														
REVENUE REQUIREMENTS ANALYSIS															
Operations and Maintenance															
18	Existing System	\$ 1,855,146	\$ 1,902,435	\$ 1,951,427	\$ 2,000,855	\$ 2,052,344	\$ 2,106,231	\$ 2,161,965	\$ 2,219,524	\$ 2,279,194	\$ 2,340,734	\$ 2,404,214	\$ 2,469,704	\$ 2,537,280	\$ 2,607,020
19	KCMO Payments	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	Wastewater Treatment Facility	2,060,944	2,118,228	2,177,269	2,238,120	2,300,838	2,365,480	2,432,105	2,500,774	2,571,550	2,644,498	2,719,686	2,797,181	2,877,055	2,959,380
21	Operations and Maintenance Subtotal	\$ 3,916,090	\$ 4,020,663	\$ 4,128,695	\$ 4,238,975	\$ 4,353,181	\$ 4,471,711	\$ 4,594,069	\$ 4,720,298	\$ 4,850,744	\$ 4,985,233	\$ 5,123,900	\$ 5,266,885	\$ 5,414,335	\$ 5,566,401
Debt Service															
22	Existing	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
23	New	6,006,625	6,010,313	6,007,838	6,010,638	6,014,119	6,013,019	6,006,813	6,008,666	6,010,094	6,009,025	6,009,788	6,010,072	5,509,322	-
24	Accumulation of Debt Service Payment	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25	Debt Service	\$ 6,006,625	\$ 6,010,313	\$ 6,007,838	\$ 6,010,638	\$ 6,014,119	\$ 6,013,019	\$ 6,006,813	\$ 6,008,666	\$ 6,010,094	\$ 6,009,025	\$ 6,009,788	\$ 6,010,072	\$ 5,509,322	\$ -
26	Required Coverage	\$ 1,501,656	\$ 1,502,578	\$ 1,501,959	\$ 1,502,659	\$ 1,503,530	\$ 1,503,255	\$ 1,501,703	\$ 1,502,167	\$ 1,502,524	\$ 1,502,256	\$ 1,502,447	\$ 1,502,518	\$ 1,377,331	\$ -
27	Total Annual Revenue Requirement	\$ 12,875,122	\$ 12,875,122	\$ 12,875,122	\$ 12,875,122	\$ 12,875,122	\$ 12,875,122	\$ 12,875,122	\$ 12,875,122	\$ 12,875,122	\$ 12,875,122	\$ 12,875,122	\$ 12,875,122	\$ 12,875,122	\$ 12,875,122
28	Estimated Annual Sewer Revenues	\$ 12,875,122	\$ 12,875,122	\$ 12,875,122	\$ 12,875,122	\$ 12,875,122	\$ 12,875,122	\$ 12,875,122	\$ 12,875,122	\$ 12,875,122	\$ 12,875,122	\$ 12,875,122	\$ 12,875,122	\$ 12,875,122	\$ 12,875,122
29	Revenue Surplus (Deficiency)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
30	Estimated Annual Revenue Increase	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%



City of Liberty, Missouri
 Wastewater Treatment Feasibility Study
Process Alternative 3
 Operations & Maintenance Cost Estimate

Line No.	Description	Replacement Costs (2012 \$s)				Original Costs	
		5 YR	10 YR	15 YR	20 YR		
1	Inflation Rate	1.87%					
2	Interest Rate	4.75%					
3	Replacement Factor	15.00%	50.00%	15.00%	75.00%		
4	East EFHB PS	\$ 26,719	\$ 89,063	\$ 26,719	\$ 133,594	\$ 178,125	
5	West EFHB PS	21,375	71,250	21,375	106,875	142,500	
6	Pumps (Raw Wastewater Lift Station)	21,375	71,250	21,375	106,875	142,500	
7	Fine Screen (Headworks)	15,750	52,500	15,750	78,750	105,000	
8	Grit Pump (Headworks)	4,125	13,750	4,125	20,625	27,500	
9	Grit Classifier (Headworks)	6,000	20,000	6,000	30,000	40,000	
10	Grit Chamber (Headworks)	7,500	25,000	7,500	37,500	50,000	
11	Blowers (Aeration Basin #1)	22,500	75,000	22,500	112,500	150,000	
12	Diffusers (Aeration Basins #1)	-	47,250	-	47,250	N/A	
13	Mixers (Aeration Basin #1)	13,500	45,000	13,500	67,500	90,000	
14	Drives (Secondary Clarifiers #1 and #2)	11,250	37,500	11,250	56,250	75,000	
15	Scum Pumps (Secondary Clarifiers #1 and #2)	4,125	13,750	4,125	20,625	27,500	
16	RAS/WAS Pumps (RAS/WAS Lift Station #1)	13,500	45,000	13,500	67,500	90,000	
17	UV Bulbs / Ballast / Wipers (UV Disinfection Structure)	15,000	28,500	15,000	28,500	N/A	
18	Non-Potable Water Pumps (UV Disinfection Structure)	4,500	15,000	4,500	22,500	30,000	
19	Floating Aerator (Sludge Storage)	11,250	37,500	11,250	56,250	75,000	
20	Mechanical Dewatering	30,000	100,000	30,000	150,000	200,000	
21	Standby Generator	33,750	112,500	33,750	168,750	225,000	
22	Pumps (Effluent Lift Station)	26,719	89,063	26,719	133,594	178,125	
23	Total	\$ 288,938	\$ 988,875	\$ 288,938	\$ 1,445,438		
Future Replacement Costs (Adjusted for Inflation)							
24	Present Value	\$ 288,938	\$ 988,875	\$ 288,938	\$ 1,445,438		
25	Future Value Factor	1.10	1.20	1.32	1.45		
26	Future Values	\$ 317,033	\$ 1,190,533	\$ 381,684	\$ 2,095,073		
Replacement Account Deposit (includes interest)							
27	Future Values	\$ 317,033	\$ 1,190,533	\$ 381,684	\$ 2,095,073		
		Annual Factor	Future Replacement Funds			Annual Deposit	
28	SFF - 5 yrs	0.1819	\$ 317,033	\$ 317,033	\$ 317,033	\$ 57,662	
29	SFF - 10 yrs	0.0804		873,500	386,306	\$ 70,262	
30	SFF - 15 yrs	0.0472			(321,655)	\$ (15,189)	
31	SFF - 20 yrs	0.0311				1,475,245 \$ 45,807	
32	Estimated Additional Annual Replacement Costs	Deposit				\$ 158,542	
Chemical Costs							
	Component	Dry tons per week	Pounds per dry ton	Pounds per week	Pounds per Year	Cost Per Lb	Cost
33	Polymer	12.26	10.00	123	44,748	\$ 3.15	\$ 140,957
34	Estimated Additional Annual Chemical Costs						\$ 140,957



Process Alternative 3
Operations & Maintenance Cost Estimate

Line No.	Description	Replacement Costs (2012 \$)				Original Costs	
		5 YR	10 YR	15 YR	20 YR		
Additional Labor Costs							
35	Overhead/Fringe Factor	0.80					
	Component	Days Per Week	Hours Per Day	Personnel	Rate	Overhead / Fringe	Cost
36	Operator	5	8	2	\$ 21.00	\$16.80	\$ 157,248
37	Sample Technician	5	8	1	\$ 21.00	\$16.80	\$ 78,624
	Lead Operator	5	8	1	\$ 27.00	\$21.60	\$ 101,088
38	Maintenance	5	8	1	\$ 21.00	\$16.80	\$ 78,624
39	Estimated Annual Additional Labor Costs						\$ 415,584
Sludge Hauling and Treatment Cost							
	Component				Wet Tons per week @ 20% Solids	Hauling/Land Application Cost Per Wet Ton	Cost
40	Sludge Hauling and Treatment Cost (Contract Application)				61.30	\$ 32.00	\$ 102,002
41	Estimated Annual Sludge Hauling and Treatment Cost						\$ 102,002
Electricity Usage Costs (Design Year)							
42	Watts per Total HP			745.70			
43	Cost per Kilowatt-Hour			\$ 0.0700			
	Component	HP	Quantity	Total HP	Watts	Hours/day	kW-hrs/year
44	East EFHB PS	60.00	3	180.00	134,226	24	48,321
45	West EFHB PS	60.00	2	120.00	89,484	24	32,214
46	Pumps (Raw Wastewater Lift Station)	60.00	2	120.00	89,484	12	391,940
47	Fine Screen (Headworks)	5.00	1	5.00	3,728	8	10,887
48	Grit Pump (Headworks)	7.50	1	7.50	5,593	8	16,331
49	Grit Classifier (Headworks)	1.00	1	1.00	746	24	6,532
50	Grit Chamber (Headworks)	1.50	1	1.50	1,119	24	9,798
51	Blowers (Aeration Basin #1)	175.00	1	175.00	130,497	18	857,368
52	Diffusers (Aeration Basins #1)						
53	Mixers (Aeration Basin #1)	40.00	2	80.00	59,656	24	522,586
54	Drives (Secondary Clarifiers #1 and #2)	1.50	2	3.00	2,237	24	19,597
55	Scum Pumps (Secondary Clarifiers #1 and #2)	7.50	1	7.50	5,593	4	8,165
56	RAS/WAS Pumps (RAS/WAS Lift Station #1)	15.00	2	30.00	22,371	24	195,970
57	UV Bulbs / Ballast / Wipers (UV Disinfection Struc)	N/A	N/A	N/A	8,523	24	74,659
58	Non-Potable Water Pumps (UV Disinfection Struc)	15.00	1	15.00	11,185	8	32,662
59	Floating Aerator (Sludge Storage)	75.00	2	150.00	111,855	16	653,233
60	Mechanical Dewatering	70.00	1	70.00	52,199	8	152,421
61	Standby Generator						
62	Pumps (Effluent Lift Station)	60.00	3	180.00	134,226	24	96,643
						kW-hrs/year =	3,129,329
63	Estimated Annual Electricity Usage Costs (Design Year)						\$ 219,053
Gas Usage Costs, Digestion Only (Design Year)							
	Component		mmBTU/day	\$/mmBTU	day/year	\$/year	
64	Digestion			\$ 6.00	365	\$	
65	Estimated Gas Usage Costs (Design Year, Not Adjusted For Inflation)						\$
66	TOTAL						\$ 1,036,138

Notes:

Items Not Include = Potable Water, Natural Gas, Diesel, HVAC Equipment Replacement



Process Alternative 3

Engineer's Opinion of Conceptual Construction Costs

Line No.	Description	Quantity	Amount
Missouri River Discharge			
Facilities			
1	Conveyance		\$ 7,041,000
2	Process Option		16,695,000
3	Electrical / Instrumentation Controls	15.00%	2,504,000
4	Site Work	10.00%	1,669,500
5	Site Piping	10.00%	1,669,500
6	Overhead And Profit	10.00%	2,254,000
7	WWTF Subtotal		\$ 31,833,000
8	Subtotal		\$ 31,833,000
General			
9	Contingency	20.00%	\$ 6,367,000
10	Engineering	20.00%	7,640,000
11	Little Shoal Creek Easement		-
12	Total		\$ 45,840,000
13	Construction Start Date		2013
14	Construction Period		2
15	Operational Start		2015
Missouri River Discharge Phase 2			
Facilities			
16	Conveyance		\$ 8,289,000
17	Process Option		3,031,000
18	Electrical / Instrumentation Controls		606,000
19	Site Work		303,100
20	Site Piping		454,650
21	Overhead And Profit		439,000
	WWTF Subtotal		\$ 13,122,750
22	Subtotal		\$ 13,122,750
General			
26	Contingency		\$ 2,625,000
27	Engineering		3,150,000
28	Acquisition Of Kcmo Forcemain		-
29	Little Shoal Creek Easement		252,000
30	Total		\$ 19,149,750
31			
32	Construction Start Date		2022
33	Construction Period		2
34	Operational Start		2024



City of Liberty, Missouri
Wastewater Treatment Feasibility Study
 Estimated Facility Expenditures - Liberty Process Alternative 3
 Net Present Value of Estimated Cash Outlay

Line No.	Description	Estimated	Projected														
		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	
Estimated Facility Expenditures - Liberty Process Alternative 3																	
1	Labor	\$ 415,584	\$ 428,052	\$ 440,893	\$ 454,120	\$ 467,743	\$ 481,776	\$ 496,229	\$ 511,116	\$ 526,449	\$ 542,243	\$ 558,510	\$ 575,265	\$ 704,622	\$ 725,761	\$ 747,534	
2	Materials and Service	50,000	51,500	53,045	54,636	56,275	57,964	59,703	61,494	63,339	65,239	67,196	69,212	71,288	73,427	75,629	
3	Utilities - Electricity, Gas, Etc.	219,053	232,393	239,365	246,546	253,943	261,561	269,408	277,490	285,815	294,389	303,221	312,317	480,047	494,449	509,282	
4	Chemicals	140,957	145,186	149,541	154,028	158,648	163,408	168,310	173,359	178,560	183,917	189,434	195,118	257,243	264,960	272,909	
5	Sludge Hauling	102,002	105,572	109,267	113,091	117,049	121,146	125,386	129,774	134,317	139,018	143,883	148,919	197,288	204,193	211,340	
6	Phone	480	494	509	525	540	556	573	590	608	626	645	664	684	705	726	
7	Equipment Repair/Replacement	158,542	158,542	158,542	158,542	158,542	158,542	158,542	158,542	158,542	158,542	158,542	158,542	187,944	187,944	187,944	
8	Subtotal Estimated Facility Expenditures - Liberty Process Alternative 3	\$ 1,086,618	\$ 1,121,739	\$ 1,151,162	\$ 1,181,487	\$ 1,212,741	\$ 1,244,952	\$ 1,278,150	\$ 1,312,366	\$ 1,347,629	\$ 1,383,973	\$ 1,421,431	\$ 1,460,038	\$ 1,899,118	\$ 1,951,439	\$ 2,005,365	
Plus:																	
9	Facility Depreciation/Renewal & Replacement	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
10	Estimated Facility Expenditures - Liberty Process Alternative 3	\$ 1,086,618	\$ 1,121,739	\$ 1,151,162	\$ 1,181,487	\$ 1,212,741	\$ 1,244,952	\$ 1,278,150	\$ 1,312,366	\$ 1,347,629	\$ 1,383,973	\$ 1,421,431	\$ 1,460,038	\$ 1,899,118	\$ 1,951,439	\$ 2,005,365	
Calculation of Net Present Value (NPV)																	
11	Estimated Facility Expenditures - Liberty Process Alternative 3	\$ -	\$ -	\$ -	\$ -	\$ 1,212,741	\$ 1,244,952	\$ 1,278,150	\$ 1,312,366	\$ 1,347,629	\$ 1,383,973	\$ 1,421,431	\$ 1,460,038	\$ 1,899,118	\$ 1,951,439	\$ 2,005,365	
12	Sewage Treatment Fees (KCMO)	3,977,621	4,591,304	5,299,595	6,117,068	2,428,213	2,753,952	3,123,346	3,542,241	4,017,263	4,152,749	4,292,748	4,437,409	-	-	-	
13	Debt Service	-	-	-	-	1,446,318	4,320,486	4,322,986	4,323,436	4,321,236	4,322,736	4,316,736	4,318,236	5,164,376	6,754,906	6,751,456	
14	Debt Coverage	-	-	-	-	361,580	1,080,122	1,080,747	1,080,859	1,080,309	1,080,684	1,079,184	1,079,559	1,291,094	1,688,727	1,687,864	
15	Total Expenditures	\$ 3,977,621	\$ 4,591,304	\$ 5,299,595	\$ 6,117,068	\$ 5,448,852	\$ 9,399,512	\$ 9,805,229	\$ 10,258,901	\$ 10,766,438	\$ 10,940,142	\$ 11,110,100	\$ 11,295,242	\$ 8,354,588	\$ 10,395,072	\$ 10,444,685	
16	Total Outflows (Non-Discounted)	\$ 275,146,737															
17	Net Present Value	\$ 145,123,398															
REVENUE REQUIREMENTS ANALYSIS																	
Operations and Maintenance																	
18	Existing System	\$ 1,327,210	\$ 1,313,030	\$ 1,344,312	\$ 1,377,892	\$ 1,412,396	\$ 1,448,391	\$ 1,485,794	\$ 1,523,715	\$ 1,562,762	\$ 1,601,850	\$ 1,641,225	\$ 1,681,225	\$ 1,722,868	\$ 1,765,379	\$ 1,809,221	
19	KCMO Payments	3,977,621	4,591,304	5,299,595	6,117,068	2,428,213	2,753,952	3,123,346	3,542,241	4,017,263	4,152,749	4,292,748	4,437,409	-	-	-	
20	Wastewater Treatment Facility	-	-	-	-	1,212,741	1,244,952	1,278,150	1,312,366	1,347,629	1,383,973	1,421,431	1,460,038	1,899,118	1,951,439	2,005,365	
21	Operations and Maintenance Subtotal	\$ 5,304,831	\$ 5,904,333	\$ 6,643,907	\$ 7,494,960	\$ 5,053,350	\$ 5,447,295	\$ 5,887,291	\$ 6,378,321	\$ 6,927,654	\$ 7,138,572	\$ 7,355,404	\$ 7,578,672	\$ 3,621,986	\$ 3,716,818	\$ 3,814,586	
Debt Service																	
22	Existing	\$ 1,044,546	\$ 1,048,295	\$ 1,330,288	\$ 945,342	\$ 992,895	\$ 992,876	\$ 1,287,334	\$ 1,284,017	\$ 980,350	\$ 1,031,612	\$ 1,027,560	\$ 1,033,044	\$ 1,032,942	\$ 1,316,274	\$ 325,655	
23	New	-	-	-	-	1,446,318	4,320,486	4,322,986	4,323,436	4,321,236	4,322,736	4,316,736	4,318,236	5,164,376	6,754,906	6,751,456	
24	Accumulation of Debt Service Payment	-	-	-	-	2,160,243	-	-	-	-	-	-	-	-	-	-	
25	Debt Service	\$ 1,044,546	\$ 1,048,295	\$ 1,330,288	\$ 945,342	\$ 4,599,456	\$ 5,313,362	\$ 5,610,320	\$ 5,607,453	\$ 5,301,586	\$ 5,354,348	\$ 5,344,296	\$ 5,351,280	\$ 6,197,317	\$ 8,071,180	\$ 7,077,111	
Required Coverage																	
26	Required Coverage	\$ 261,137	\$ 262,074	\$ 332,572	\$ 236,335	\$ 1,149,864	\$ 1,328,341	\$ 1,402,580	\$ 1,401,863	\$ 1,325,397	\$ 1,338,587	\$ 1,336,074	\$ 1,337,820	\$ 1,549,329	\$ 2,017,795	\$ 1,769,278	
27	Total Annual Revenue Requirement	\$ 6,610,514	\$ 7,214,702	\$ 8,306,767	\$ 8,676,637	\$ 10,802,670	\$ 12,088,998	\$ 12,900,191	\$ 13,387,638	\$ 13,554,637	\$ 13,831,507	\$ 14,035,774	\$ 14,267,771	\$ 14,267,771	\$ 14,267,771	\$ 14,267,771	
28	Estimated Annual Sewer Revenues	\$ 6,544,262	\$ 6,610,514	\$ 7,214,702	\$ 8,306,767	\$ 8,676,637	\$ 10,802,670	\$ 12,088,998	\$ 12,900,191	\$ 13,387,638	\$ 13,554,637	\$ 13,831,507	\$ 14,035,774	\$ 14,267,771	\$ 14,267,771	\$ 14,267,771	
29	Revenue Surplus (Deficiency)	\$ (66,251)	\$ (604,189)	\$ (1,092,065)	\$ (369,870)	\$ (2,126,032)	\$ (1,286,328)	\$ (811,193)	\$ (487,447)	\$ (166,999)	\$ (276,870)	\$ (204,268)	\$ (231,997)	\$ -	\$ -	\$ -	
30	Estimated Annual Revenue Increase	1.0%	9.1%	15.1%	4.5%	24.5%	11.9%	6.7%	3.8%	1.2%	2.0%	1.5%	1.7%	0.0%	0.0%	0.0%	



City of Liberty, Missouri
 Wastewater Treatment Feasibility Study
 Estimated Facility Expenditures - Liberty Process Alternative 3
 Net Present Value of Estimated Cash Outlay

Line No.	Description	Projected													
		2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Estimated Facility Expenditures - Liberty Process Alternative 3															
1	Labor	\$ 769,960	\$ 793,059	\$ 816,851	\$ 841,356	\$ 866,597	\$ 892,595	\$ 919,372	\$ 946,954	\$ 975,362	\$ 1,004,623	\$ 1,034,762	\$ 1,065,805	\$ 1,097,779	\$ 1,130,712
2	Materials and Service	77,898	80,235	82,642	85,122	87,675	90,306	93,015	95,805	98,679	101,640	104,689	107,830	111,064	114,396
3	Utilities - Electricity, Gas, Etc.	524,561	540,297	556,506	573,202	590,398	608,110	626,353	645,143	664,498	684,433	704,966	726,115	747,898	770,335
4	Chemicals	281,096	289,529	298,215	307,162	316,376	325,868	335,644	345,713	356,084	366,767	377,770	389,103	400,776	412,799
5	Sludge Hauling	218,737	226,393	234,316	242,517	251,006	259,791	268,883	278,294	288,035	298,116	308,550	319,349	330,526	342,095
6	Phone	748	770	793	817	842	867	893	920	947	976	1,005	1,035	1,066	1,098
7	Equipment Repair/Replacement	187,944	187,944	187,944	187,944	187,944	187,944	187,944	187,944	187,944	187,944	187,944	187,944	187,944	187,944
8	Subtotal Estimated Facility Expenditures - Liberty Process Alternative 3	\$ 2,060,944	\$ 2,118,228	\$ 2,177,269	\$ 2,238,120	\$ 2,300,838	\$ 2,365,480	\$ 2,432,105	\$ 2,500,774	\$ 2,571,550	\$ 2,644,498	\$ 2,719,686	\$ 2,797,181	\$ 2,877,055	\$ 2,959,380
Plus:															
9	Facility Depreciation/Renewal & Replacement	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	Estimated Facility Expenditures - Liberty Process Alternative 3	\$ 2,060,944	\$ 2,118,228	\$ 2,177,269	\$ 2,238,120	\$ 2,300,838	\$ 2,365,480	\$ 2,432,105	\$ 2,500,774	\$ 2,571,550	\$ 2,644,498	\$ 2,719,686	\$ 2,797,181	\$ 2,877,055	\$ 2,959,380
Calculation of Net Present Value (NPV)															
11	Estimated Facility Expenditures - Liberty Process Alternative 3	\$ 2,060,944	\$ 2,118,228	\$ 2,177,269	\$ 2,238,120	\$ 2,300,838	\$ 2,365,480	\$ 2,432,105	\$ 2,500,774	\$ 2,571,550	\$ 2,644,498	\$ 2,719,686	\$ 2,797,181	\$ 2,877,055	\$ 2,959,380
12	Sewage Treatment Fees (KCMO)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	Debt Service	6,757,600	6,753,056	6,752,019	6,750,375	6,754,781	6,758,462	6,752,675	6,755,303	6,753,759	6,749,772	6,756,334	6,757,871	6,257,685	2,433,733
14	Debt Coverage	1,689,400	1,688,264	1,688,005	1,687,594	1,688,695	1,689,616	1,688,169	1,688,826	1,688,440	1,687,443	1,689,084	1,689,468	1,564,421	608,433
15	Total Expenditures	\$ 10,507,944	\$ 10,559,548	\$ 10,617,292	\$ 10,676,089	\$ 10,744,314	\$ 10,813,558	\$ 10,872,948	\$ 10,944,903	\$ 11,013,749	\$ 11,081,713	\$ 11,165,104	\$ 11,244,520	\$ 10,699,160	\$ 6,001,546
16	Total Outflows (Non-Discounted)														
17	Net Present Value														
REVENUE REQUIREMENTS ANALYSIS															
Operations and Maintenance															
18	Existing System	\$ 1,855,146	\$ 1,902,435	\$ 1,951,427	\$ 2,000,855	\$ 2,052,344	\$ 2,106,231	\$ 2,161,965	\$ 2,219,524	\$ 2,279,194	\$ 2,340,734	\$ 2,404,214	\$ 2,469,704	\$ 2,537,280	\$ 2,607,020
19	KCMO Payments	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	Wastewater Treatment Facility	2,060,944	2,118,228	2,177,269	2,238,120	2,300,838	2,365,480	2,432,105	2,500,774	2,571,550	2,644,498	2,719,686	2,797,181	2,877,055	2,959,380
21	Operations and Maintenance Subtotal	\$ 3,916,090	\$ 4,020,663	\$ 4,128,695	\$ 4,238,975	\$ 4,353,181	\$ 4,471,711	\$ 4,594,069	\$ 4,720,298	\$ 4,850,744	\$ 4,985,233	\$ 5,123,900	\$ 5,266,885	\$ 5,414,335	\$ 5,566,401
Debt Service															
22	Existing	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
23	New	6,757,600	6,753,056	6,752,019	6,750,375	6,754,781	6,758,462	6,752,675	6,755,303	6,753,759	6,749,772	6,756,334	6,757,871	6,257,685	2,433,733
24	Accumulation of Debt Service Payment	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25	Debt Service	\$ 6,757,600	\$ 6,753,056	\$ 6,752,019	\$ 6,750,375	\$ 6,754,781	\$ 6,758,462	\$ 6,752,675	\$ 6,755,303	\$ 6,753,759	\$ 6,749,772	\$ 6,756,334	\$ 6,757,871	\$ 6,257,685	\$ 2,433,733
26	Required Coverage	\$ 1,689,400	\$ 1,688,264	\$ 1,688,005	\$ 1,687,594	\$ 1,688,695	\$ 1,689,616	\$ 1,688,169	\$ 1,688,826	\$ 1,688,440	\$ 1,687,443	\$ 1,689,084	\$ 1,689,468	\$ 1,564,421	\$ 608,433
27	Total Annual Revenue Requirement	\$ 14,267,771	\$ 14,267,771	\$ 14,267,771	\$ 14,267,771	\$ 14,267,771	\$ 14,267,771	\$ 14,267,771	\$ 14,267,771	\$ 14,267,771	\$ 14,267,771	\$ 14,267,771	\$ 14,267,771	\$ 14,267,771	\$ 14,267,771
28	Estimated Annual Sewer Revenues	\$ 14,267,771	\$ 14,267,771	\$ 14,267,771	\$ 14,267,771	\$ 14,267,771	\$ 14,267,771	\$ 14,267,771	\$ 14,267,771	\$ 14,267,771	\$ 14,267,771	\$ 14,267,771	\$ 14,267,771	\$ 14,267,771	\$ 14,267,771
29	Revenue Surplus (Deficiency)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
30	Estimated Annual Revenue Increase	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%



City of Liberty, Missouri
 Wastewater Treatment Feasibility Study
 Estimated Facility Expenditures - KCMO Proposed Rates Alternative 4
 Net Present Value of Estimated Cash Outlay

Line No.	Description	Projected														
		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Estimated Facility Expenditures - KCMO Proposed Rates Alternative 4		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
1	KCMO Forcemain Repair															
2	Labor															
3	Materials and Service	20,000	20,600	21,218	21,855	22,510	23,185	23,881	24,597	25,335	26,095	26,878	27,685	28,515	29,371	
4	Utilities - Electricity, Gas, Etc.	47,919	50,837	52,362	53,933	55,551	57,217	58,934	60,702	62,523	64,399	66,331	68,321	70,370	72,481	
5	Chemicals															
6	Sludge Hauling															
7	Phone															
8	Equipment Repair/Replacement	67,691	67,691	67,691	67,691	67,691	67,691	67,691	67,691	67,691	67,691	67,691	67,691	67,691	67,691	
9	Subtotal Estimated Facility Expenditures - KCMO Proposed Rates Alternative 4	\$ 135,609	\$ 139,128	\$ 141,271	\$ 143,478	\$ 145,752	\$ 148,094	\$ 150,506	\$ 152,990	\$ 155,549	\$ 158,185	\$ 160,900	\$ 163,696	\$ 166,576	\$ 169,543	
Plus:																
10	Facility Depreciation/Renewal & Replacement															
11	Total Estimated Facility Expenditures - KCMO Proposed Rates Alternative 4	\$ 135,609	\$ 139,128	\$ 141,271	\$ 143,478	\$ 145,752	\$ 148,094	\$ 150,506	\$ 152,990	\$ 155,549	\$ 158,185	\$ 160,900	\$ 163,696	\$ 166,576	\$ 169,543	
Calculation of Net Present Value (NPV)																
12	Sewage Treatment Fees	\$ 3,977,621	\$ 4,591,304	\$ 5,299,595	\$ 6,117,068	\$ 6,937,752	\$ 7,868,434	\$ 8,923,845	\$ 10,120,688	\$ 11,477,896	\$ 11,864,997	\$ 12,264,994	\$ 12,678,312	\$ 13,105,392	\$ 13,546,685	\$ 14,002,661
13	Debt Service					647,716	1,937,232	1,932,657	1,937,707	1,932,232	1,933,932	1,929,432	1,933,932	1,935,513	1,935,851	1,934,170
14	Debt Coverage					161,929	484,308	483,164	484,427	483,058	483,483	482,358	483,483	483,878	483,963	483,542
15	Total Expenditures	\$ 3,977,621	\$ 4,591,304	\$ 5,299,595	\$ 6,117,068	\$ 7,747,397	\$ 10,289,974	\$ 11,339,667	\$ 12,542,822	\$ 13,893,186	\$ 14,282,412	\$ 14,676,784	\$ 15,095,728	\$ 15,524,783	\$ 15,966,499	\$ 16,420,373
16	Total Outflows (Non-Discounted)	\$ 452,330,912														
17	Net Present Value	\$ 218,946,204														

REVENUE REQUIREMENTS ANALYSIS

Operations and Maintenance																
18	Existing System	\$ 1,327,210	\$ 1,313,030	\$ 1,344,312	\$ 1,377,892	\$ 1,412,396	\$ 1,448,391	\$ 1,485,794	\$ 1,523,715	\$ 1,562,762	\$ 1,601,850	\$ 1,641,225	\$ 1,681,225	\$ 1,722,868	\$ 1,765,379	\$ 1,809,221
19	KCMO Payments	3,977,621	4,591,304	5,299,595	6,117,068	6,937,752	7,868,434	8,923,845	10,120,688	11,477,896	11,864,997	12,264,994	12,678,312	13,105,392	13,546,685	14,002,661
20	Wastewater Treatment Facility															
21	Operations and Maintenance Subtotal	\$ 5,304,831	\$ 5,904,333	\$ 6,643,907	\$ 7,494,960	\$ 8,350,147	\$ 9,316,824	\$ 10,409,640	\$ 11,644,402	\$ 13,040,657	\$ 13,466,847	\$ 13,906,219	\$ 14,359,537	\$ 14,828,260	\$ 15,312,064	\$ 15,811,882
Debt Service																
22	Existing	\$ 1,044,546	\$ 1,048,295	\$ 1,330,288	\$ 945,342	\$ 992,895	\$ 992,876	\$ 1,287,334	\$ 1,284,017	\$ 980,350	\$ 1,031,612	\$ 1,027,560	\$ 1,033,044	\$ 1,032,942	\$ 1,316,274	\$ 325,655
23	New					647,716	1,937,232	1,932,657	1,937,707	1,932,232	1,933,932	1,929,432	1,933,932	1,935,513	1,935,851	1,934,170
24	Accumulation of Debt Service Payment					968,616										
25	Debt Service	\$ 1,044,546	\$ 1,048,295	\$ 1,330,288	\$ 945,342	\$ 2,609,227	\$ 2,930,108	\$ 3,219,991	\$ 3,221,725	\$ 2,912,582	\$ 2,965,544	\$ 2,956,992	\$ 2,966,976	\$ 2,968,455	\$ 3,252,125	\$ 2,259,825
26	Required Coverage	\$ 261,137	\$ 262,074	\$ 332,572	\$ 236,335	\$ 652,307	\$ 732,527	\$ 804,998	\$ 805,431	\$ 728,146	\$ 741,386	\$ 739,248	\$ 741,744	\$ 742,114	\$ 813,031	\$ 564,956
27	Total Annual Revenue Requirement	\$ 6,610,514	\$ 7,214,702	\$ 8,306,767	\$ 8,676,637	\$ 11,611,681	\$ 12,979,460	\$ 14,434,629	\$ 15,671,558	\$ 16,681,385	\$ 17,173,776	\$ 17,602,459	\$ 18,068,257	\$ 18,538,829	\$ 19,377,219	\$ 19,377,219
28	Estimated Annual Sewer Revenues	\$ 6,544,262	\$ 6,610,514	\$ 7,214,702	\$ 8,306,767	\$ 8,676,637	\$ 11,611,681	\$ 12,979,460	\$ 14,434,629	\$ 15,671,558	\$ 16,681,385	\$ 17,173,776	\$ 17,602,459	\$ 18,068,257	\$ 18,538,829	\$ 19,377,219
29	Revenue Surplus (Deficiency)	\$ (66,251)	\$ (604,189)	\$ (1,092,065)	\$ (369,870)	\$ (2,935,044)	\$ (1,367,779)	\$ (1,455,169)	\$ (1,236,929)	\$ (1,009,827)	\$ (492,391)	\$ (428,683)	\$ (465,798)	\$ (470,572)	\$ (838,391)	\$ -
30	Estimated Annual Revenue Increase	1.0%	9.1%	15.1%	4.5%	33.8%	11.8%	11.2%	8.6%	6.4%	3.0%	2.5%	2.6%	2.6%	4.5%	0.0%



City of Liberty, Missouri
 Wastewater Treatment Feasibility Study
 Estimated Facility Expenditures - KCMO Proposed Rates Alternative 4
 Net Present Value of Estimated Cash Outlay

Line No.	Description	Projected													
		2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Estimated Facility Expenditures - KCMO Proposed Rates Alternative 4															
1	KCMO Forcemain Repair	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
2	Labor														
3	Materials and Service	31,159	32,094	33,057	34,049	35,070	36,122	37,206	38,322	39,472	40,656	41,876	43,132	44,426	45,759
4	Utilities - Electricity, Gas, Etc.	76,895	79,202	81,578	84,026	86,546	89,143	91,817	94,572	97,409	100,331	103,341	106,441	109,634	112,923
5	Chemicals														
6	Sludge Hauling														
7	Phone														
8	Equipment Repair/Replacement	67,691	67,691	67,691	67,691	67,691	67,691	67,691	67,691	67,691	67,691	67,691	67,691	67,691	67,691
9	Subtotal Estimated Facility Expenditures - KCMO Proposed Rates Alternative 4	\$ 175,745	\$ 178,987	\$ 182,326	\$ 185,765	\$ 189,307	\$ 192,956	\$ 196,714	\$ 200,584	\$ 204,571	\$ 208,678	\$ 212,907	\$ 217,264	\$ 221,751	\$ 226,373
Plus:															
10	Facility Depreciation/Renewal & Replacement														
11	Total Estimated Facility Expenditures - KCMO Proposed Rates Alternative 4	\$ 175,745	\$ 178,987	\$ 182,326	\$ 185,765	\$ 189,307	\$ 192,956	\$ 196,714	\$ 200,584	\$ 204,571	\$ 208,678	\$ 212,907	\$ 217,264	\$ 221,751	\$ 226,373
Calculation of Net Present Value (NPV)															
12	Sewage Treatment Fees	\$ 14,473,804	\$ 14,960,612	\$ 15,463,603	\$ 15,983,309	\$ 16,520,280	\$ 17,075,084	\$ 17,648,308	\$ 18,240,558	\$ 18,852,460	\$ 19,484,659	\$ 20,137,823	\$ 20,812,640	\$ 21,509,823	\$ 22,230,105
13	Debt Service	1,935,588	1,930,107	1,936,070	1,935,420	1,932,013	1,930,588	1,935,751	1,932,213	1,933,442	1,935,773	1,933,804	1,930,919	1,736,416	-
14	Debt Coverage	483,897	482,527	484,017	483,855	483,003	482,647	483,938	483,053	483,360	483,943	483,451	482,730	434,104	-
15	Total Expenditures	\$ 16,893,289	\$ 17,373,246	\$ 17,883,690	\$ 18,402,584	\$ 18,935,297	\$ 19,488,320	\$ 20,067,997	\$ 20,655,825	\$ 21,269,262	\$ 21,904,375	\$ 22,555,078	\$ 23,226,290	\$ 23,680,343	\$ 22,230,105
16	Total Outflows (Non-Discounted)														
17	Net Present Value														

REVENUE REQUIREMENTS ANALYSIS

Operations and Maintenance															
18	Existing System	\$ 1,855,146	\$ 1,902,435	\$ 1,951,427	\$ 2,000,855	\$ 2,052,344	\$ 2,106,231	\$ 2,161,965	\$ 2,219,524	\$ 2,279,194	\$ 2,340,734	\$ 2,404,214	\$ 2,469,704	\$ 2,537,280	\$ 2,607,020
19	KCMO Payments	14,473,804	14,960,612	15,463,603	15,983,309	16,520,280	17,075,084	17,648,308	18,240,558	18,852,460	19,484,659	20,137,823	20,812,640	21,509,823	22,230,105
20	Wastewater Treatment Facility														
21	Operations and Maintenance Subtotal	\$ 16,328,950	\$ 16,863,047	\$ 17,415,030	\$ 17,984,164	\$ 18,572,623	\$ 19,181,315	\$ 19,810,273	\$ 20,460,082	\$ 21,131,654	\$ 21,825,393	\$ 22,542,037	\$ 23,282,345	\$ 24,047,103	\$ 24,837,125
Debt Service															
22	Existing	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
23	New	1,935,588	1,930,107	1,936,070	1,935,420	1,932,013	1,930,588	1,935,751	1,932,213	1,933,442	1,935,773	1,933,804	1,930,919	1,736,416	-
24	Accumulation of Debt Service Payment														
25	Debt Service	\$ 1,935,588	\$ 1,930,107	\$ 1,936,070	\$ 1,935,420	\$ 1,932,013	\$ 1,930,588	\$ 1,935,751	\$ 1,932,213	\$ 1,933,442	\$ 1,935,773	\$ 1,933,804	\$ 1,930,919	\$ 1,736,416	\$ -
26	Required Coverage	\$ 483,897	\$ 482,527	\$ 484,017	\$ 483,855	\$ 483,003	\$ 482,647	\$ 483,938	\$ 483,053	\$ 483,360	\$ 483,943	\$ 483,451	\$ 482,730	\$ 434,104	\$ -
27	Total Annual Revenue Requirement	\$ 19,377,219	\$ 19,377,219	\$ 19,835,117	\$ 20,403,439	\$ 20,987,640	\$ 21,594,551	\$ 22,229,962	\$ 22,875,349	\$ 23,548,456	\$ 24,245,109	\$ 24,959,292	\$ 25,695,994	\$ 26,217,623	\$ 26,217,623
28	Estimated Annual Sewer Revenues	\$ 19,377,219	\$ 19,377,219	\$ 19,377,219	\$ 19,835,117	\$ 20,403,439	\$ 20,987,640	\$ 21,594,551	\$ 22,229,962	\$ 22,875,349	\$ 23,548,456	\$ 24,245,109	\$ 24,959,292	\$ 25,695,994	\$ 26,217,623
29	Revenue Surplus (Deficiency)	\$ -	\$ -	\$ (457,898)	\$ (568,322)	\$ (584,201)	\$ (606,911)	\$ (635,411)	\$ (645,387)	\$ (673,107)	\$ (696,654)	\$ (714,182)	\$ (736,702)	\$ (521,629)	\$ -
30	Estimated Annual Revenue Increase	0.0%	0.0%	2.4%	2.9%	2.9%	2.9%	2.9%	2.9%	2.9%	3.0%	2.9%	3.0%	2.0%	0.0%



City of Liberty, Missouri
 Wastewater Treatment Feasibility Study
 Estimated Facility Expenditures - KCMO Negotiated Rates Alternative 5
 Net Present Value of Estimated Cash Outlay

Line No.	Description	Projected														
		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Estimated Facility Expenditures - KCMO Negotiated Rates Alternative 5		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
1	KCMO Forcemain Repair	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
2	Labor	20,000	20,600	21,218	21,855	22,510	23,185	23,881	24,597	25,335	26,095	26,878	27,685	28,515	29,371	30,252
3	Materials and Service	47,919	50,837	52,362	53,933	55,551	57,217	58,934	60,702	62,523	64,399	66,331	68,321	70,370	72,481	74,656
4	Utilities - Electricity, Gas, Etc.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	Chemicals	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	Sludge Hauling	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	Phone	67,691	67,691	67,691	67,691	67,691	67,691	67,691	67,691	67,691	67,691	67,691	67,691	67,691	67,691	67,691
8	Equipment Repair/Replacement	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	Subtotal Estimated Facility Expenditures - KCMO Negotiated Rates Alternative 5	\$ 135,609	\$ 139,128	\$ 141,271	\$ 143,478	\$ 145,752	\$ 148,094	\$ 150,506	\$ 152,990	\$ 155,549	\$ 158,185	\$ 160,900	\$ 163,696	\$ 166,576	\$ 169,543	\$ 172,598
10	Plus: Facility Depreciation/Renewal & Replacement	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	Total Estimated Facility Expenditures - KCMO Negotiated Rates Alternative 5	\$ 135,609	\$ 139,128	\$ 141,271	\$ 143,478	\$ 145,752	\$ 148,094	\$ 150,506	\$ 152,990	\$ 155,549	\$ 158,185	\$ 160,900	\$ 163,696	\$ 166,576	\$ 169,543	\$ 172,598
Calculation of Net Present Value (NPV)																
12	Sewage Treatment Fees	\$ 3,977,621	\$ 4,391,682	\$ 4,848,778	\$ 5,353,378	\$ 5,802,947	\$ 6,290,186	\$ 6,818,244	\$ 7,390,534	\$ 8,010,754	\$ 8,280,923	\$ 8,560,092	\$ 8,848,559	\$ 9,146,630	\$ 9,454,621	\$ 9,772,860
13	Debt Service	-	-	-	-	647,716	1,937,232	1,932,657	1,937,707	1,932,232	1,933,932	1,929,432	1,933,932	1,935,513	1,935,851	1,934,170
14	Debt Coverage	-	-	-	-	161,929	484,308	483,164	484,427	483,058	483,483	482,358	483,483	483,878	483,963	483,542
15	Total Expenditures	\$ 3,977,621	\$ 4,391,682	\$ 4,848,778	\$ 5,353,378	\$ 6,612,592	\$ 8,711,726	\$ 9,234,065	\$ 9,812,668	\$ 10,426,044	\$ 10,698,338	\$ 10,971,882	\$ 11,265,974	\$ 11,566,021	\$ 11,874,435	\$ 12,190,572
16	Total Outflows (Non-Discounted)	\$ 339,958,717														
17	Net Present Value	\$ 167,808,792														

REVENUE REQUIREMENTS ANALYSIS

18	Operations and Maintenance	\$ 1,327,210	\$ 1,313,030	\$ 1,344,312	\$ 1,377,892	\$ 1,412,396	\$ 1,448,391	\$ 1,485,794	\$ 1,523,715	\$ 1,562,762	\$ 1,601,850	\$ 1,641,225	\$ 1,681,225	\$ 1,722,868	\$ 1,765,379	\$ 1,809,221
19	Existing System	3,977,621	4,391,682	4,848,778	5,353,378	5,802,947	6,290,186	6,818,244	7,390,534	8,010,754	8,280,923	8,560,092	8,848,559	9,146,630	9,454,621	9,772,860
20	KCMO Payments	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21	Wastewater Treatment Facility	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21	Operations and Maintenance Subtotal	\$ 5,304,831	\$ 5,704,711	\$ 6,193,091	\$ 6,731,269	\$ 7,215,342	\$ 7,738,576	\$ 8,304,038	\$ 8,914,249	\$ 9,573,515	\$ 9,882,772	\$ 10,201,317	\$ 10,529,784	\$ 10,869,498	\$ 11,220,000	\$ 11,582,081
22	Debt Service	\$ 1,044,546	\$ 1,048,295	\$ 1,330,288	\$ 945,342	\$ 992,895	\$ 992,876	\$ 1,287,334	\$ 1,284,017	\$ 980,350	\$ 1,031,612	\$ 1,027,560	\$ 1,033,044	\$ 1,032,942	\$ 1,316,274	\$ 325,655
23	Existing	-	-	-	-	647,716	1,937,232	1,932,657	1,937,707	1,932,232	1,933,932	1,929,432	1,933,932	1,935,513	1,935,851	1,934,170
24	New	-	-	-	-	968,616	-	-	-	-	-	-	-	-	-	-
25	Accumulation of Debt Service Payment	\$ 1,044,546	\$ 1,048,295	\$ 1,330,288	\$ 945,342	\$ 2,609,227	\$ 2,930,108	\$ 3,219,991	\$ 3,221,725	\$ 2,912,582	\$ 2,965,544	\$ 2,956,992	\$ 2,966,976	\$ 2,968,455	\$ 3,252,125	\$ 2,259,825
26	Debt Service	\$ 1,044,546	\$ 1,048,295	\$ 1,330,288	\$ 945,342	\$ 2,609,227	\$ 2,930,108	\$ 3,219,991	\$ 3,221,725	\$ 2,912,582	\$ 2,965,544	\$ 2,956,992	\$ 2,966,976	\$ 2,968,455	\$ 3,252,125	\$ 2,259,825
26	Required Coverage	\$ 261,137	\$ 262,074	\$ 332,572	\$ 236,335	\$ 652,307	\$ 732,527	\$ 804,998	\$ 805,431	\$ 728,146	\$ 741,386	\$ 739,248	\$ 741,744	\$ 742,114	\$ 813,031	\$ 564,956
27	Total Annual Revenue Requirement	\$ 6,610,514	\$ 7,015,080	\$ 7,855,951	\$ 7,912,946	\$ 10,476,876	\$ 11,401,212	\$ 12,329,027	\$ 12,941,404	\$ 13,214,243	\$ 13,589,702	\$ 13,897,557	\$ 14,238,503	\$ 14,580,067	\$ 15,285,156	\$ 15,285,156
28	Estimated Annual Sewer Revenues	\$ 6,544,262	\$ 6,610,514	\$ 7,015,080	\$ 7,855,951	\$ 7,912,946	\$ 10,476,876	\$ 11,401,212	\$ 12,329,027	\$ 12,941,404	\$ 13,214,243	\$ 13,589,702	\$ 13,897,557	\$ 14,238,503	\$ 14,580,067	\$ 15,285,156
29	Revenue Surplus (Deficiency)	\$ (66,251)	\$ (404,567)	\$ (840,870)	\$ (56,996)	\$ (2,563,930)	\$ (924,335)	\$ (927,815)	\$ (612,377)	\$ (272,839)	\$ (375,459)	\$ (307,855)	\$ (340,946)	\$ (341,563)	\$ (705,089)	\$ -
30	Estimated Annual Revenue Increase	1.0%	6.1%	12.0%	0.7%	32.4%	8.8%	8.1%	5.0%	2.1%	2.8%	2.3%	2.5%	2.4%	4.8%	0.0%



City of Liberty, Missouri
 Wastewater Treatment Feasibility Study
 Estimated Facility Expenditures - KCMO Negotiated Rates Alternative 5
 Net Present Value of Estimated Cash Outlay

Line No.	Description	Projected													
		2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Estimated Facility Expenditures - KCMO Negotiated Rates Alternative 5		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
1	KCMO Forcemain Repair	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	Labor	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	Materials and Service	31,159	32,094	33,057	34,049	35,070	36,122	37,206	38,322	39,472	40,656	41,876	43,132	44,426	45,759
4	Utilities - Electricity, Gas, Etc.	76,895	79,202	81,578	84,026	86,546	89,143	91,817	94,572	97,409	100,331	103,341	106,441	109,634	112,923
5	Chemicals	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	Sludge Hauling	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	Phone	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	Equipment Repair/Replacement	67,691	67,691	67,691	67,691	67,691	67,691	67,691	67,691	67,691	67,691	67,691	67,691	67,691	67,691
9	Subtotal Estimated Facility Expenditures - KCMO Negotiated Rates Alternative 5	\$ 175,745	\$ 178,987	\$ 182,326	\$ 185,765	\$ 189,307	\$ 192,956	\$ 196,714	\$ 200,584	\$ 204,571	\$ 208,678	\$ 212,907	\$ 217,264	\$ 221,751	\$ 226,373
Plus:															
10	Facility Depreciation/Renewal & Replacement	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	Total Estimated Facility Expenditures - KCMO Negotiated Rates Alternative 5	\$ 175,745	\$ 178,987	\$ 182,326	\$ 185,765	\$ 189,307	\$ 192,956	\$ 196,714	\$ 200,584	\$ 204,571	\$ 208,678	\$ 212,907	\$ 217,264	\$ 221,751	\$ 226,373
Calculation of Net Present Value (NPV)															
12	Sewage Treatment Fees	\$ 10,101,684	\$ 10,441,442	\$ 10,792,493	\$ 11,155,211	\$ 11,529,978	\$ 11,917,192	\$ 12,317,262	\$ 12,730,610	\$ 13,157,674	\$ 13,598,904	\$ 14,054,766	\$ 14,525,740	\$ 15,012,324	\$ 15,515,030
13	Debt Service	1,935,588	1,930,107	1,936,070	1,935,420	1,932,013	1,930,588	1,935,751	1,932,213	1,933,442	1,935,773	1,933,804	1,930,919	1,736,416	-
14	Debt Coverage	483,897	482,527	484,017	483,855	483,003	482,647	483,938	483,053	483,360	483,943	483,451	482,730	434,104	-
15	Total Expenditures	\$ 12,521,169	\$ 12,854,076	\$ 13,212,581	\$ 13,574,486	\$ 13,944,995	\$ 14,330,428	\$ 14,736,951	\$ 15,145,877	\$ 15,574,476	\$ 16,018,620	\$ 16,472,021	\$ 16,939,390	\$ 17,182,844	\$ 15,515,030
16	Total Outflows (Non-Discounted)														
17	Net Present Value														

REVENUE REQUIREMENTS ANALYSIS

Operations and Maintenance															
18	Existing System	\$ 1,855,146	\$ 1,902,435	\$ 1,951,427	\$ 2,000,855	\$ 2,052,344	\$ 2,106,231	\$ 2,161,965	\$ 2,219,524	\$ 2,279,194	\$ 2,340,734	\$ 2,404,214	\$ 2,469,704	\$ 2,537,280	\$ 2,607,020
19	KCMO Payments	10,101,684	10,441,442	10,792,493	11,155,211	11,529,978	11,917,192	12,317,262	12,730,610	13,157,674	13,598,904	14,054,766	14,525,740	15,012,324	15,515,030
20	Wastewater Treatment Facility	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21	Operations and Maintenance Subtotal	\$ 11,956,830	\$ 12,343,876	\$ 12,743,920	\$ 13,156,066	\$ 13,582,322	\$ 14,023,424	\$ 14,479,227	\$ 14,950,134	\$ 15,436,868	\$ 15,939,638	\$ 16,458,980	\$ 16,995,444	\$ 17,549,604	\$ 18,122,050
Debt Service															
22	Existing	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
23	New	1,935,588	1,930,107	1,936,070	1,935,420	1,932,013	1,930,588	1,935,751	1,932,213	1,933,442	1,935,773	1,933,804	1,930,919	1,736,416	-
24	Accumulation of Debt Service Payment	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25	Debt Service	\$ 1,935,588	\$ 1,930,107	\$ 1,936,070	\$ 1,935,420	\$ 1,932,013	\$ 1,930,588	\$ 1,935,751	\$ 1,932,213	\$ 1,933,442	\$ 1,935,773	\$ 1,933,804	\$ 1,930,919	\$ 1,736,416	\$ -
26	Required Coverage	\$ 483,897	\$ 482,527	\$ 484,017	\$ 483,855	\$ 483,003	\$ 482,647	\$ 483,938	\$ 483,053	\$ 483,360	\$ 483,943	\$ 483,451	\$ 482,730	\$ 434,104	\$ -
27	Total Annual Revenue Requirement	\$ 15,285,156	\$ 15,285,156	\$ 15,285,156	\$ 15,575,341	\$ 15,997,339	\$ 16,436,659	\$ 16,898,915	\$ 17,365,401	\$ 17,853,670	\$ 18,359,354	\$ 18,876,235	\$ 19,409,094	\$ 19,720,124	\$ 19,720,124
28	Estimated Annual Sewer Revenues	\$ 15,285,156	\$ 15,285,156	\$ 15,285,156	\$ 15,285,156	\$ 15,575,341	\$ 15,997,339	\$ 16,436,659	\$ 16,898,915	\$ 17,365,401	\$ 17,853,670	\$ 18,359,354	\$ 18,876,235	\$ 19,409,094	\$ 19,720,124
29	Revenue Surplus (Deficiency)	\$ -	\$ -	\$ -	\$ (290,185)	\$ (421,998)	\$ (439,320)	\$ (462,256)	\$ (466,486)	\$ (488,269)	\$ (505,684)	\$ (516,880)	\$ (532,859)	\$ (311,031)	\$ -
30	Estimated Annual Revenue Increase	0.0%	0.0%	0.0%	1.9%	2.7%	2.7%	2.8%	2.8%	2.8%	2.8%	2.8%	2.8%	1.6%	0.0%



City of Liberty, Missouri
 Wastewater Treatment Feasibility Study
 Estimated Facility Expenditures - KCMO Matching Lowest NPV Rate Scenario
 Net Present Value of Estimated Cash Outlay

Line No.	Description	Projected														
		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Estimated Facility Expenditures - KCMO Matching Lowest NPV Rate Scenario		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
1	KCMO Forcemain Repair															
2	Labor															
3	Materials and Service	20,000	20,600	21,218	21,855	22,510	23,185	23,881	24,597	25,335	26,095	26,878	27,685	28,515	29,371	30,252
4	Utilities - Electricity, Gas, Etc.	47,919	50,837	52,362	53,933	55,551	57,217	58,934	60,702	62,523	64,399	66,331	68,321	70,370	72,481	74,656
5	Chemicals															
6	Sludge Hauling															
7	Phone															
8	Equipment Repair/Replacement	67,691	67,691	67,691	67,691	67,691	67,691	67,691	67,691	67,691	67,691	67,691	67,691	67,691	67,691	67,691
9	Subtotal Estimated Facility Expenditures - KCMO Matching Lowest NPV Rate Scenario	\$ 135,609	\$ 139,128	\$ 141,271	\$ 143,478	\$ 145,752	\$ 148,094	\$ 150,506	\$ 152,990	\$ 155,549	\$ 158,185	\$ 160,900	\$ 163,696	\$ 166,576	\$ 169,543	\$ 172,598
Plus:																
10	Facility Depreciation/Renewal & Replacement															
11	Total Estimated Facility Expenditures - KCMO Matching Lowest NPV Rate Scenario	\$ 135,609	\$ 139,128	\$ 141,271	\$ 143,478	\$ 145,752	\$ 148,094	\$ 150,506	\$ 152,990	\$ 155,549	\$ 158,185	\$ 160,900	\$ 163,696	\$ 166,576	\$ 169,543	\$ 172,598
Calculation of Net Present Value (NPV)																
12	Sewage Treatment Fees	\$ 3,977,621	\$ 4,192,060	\$ 4,375,922	\$ 4,567,786	\$ 4,767,998	\$ 4,976,919	\$ 5,194,924	\$ 5,422,406	\$ 5,659,776	\$ 5,850,656	\$ 6,047,895	\$ 6,251,704	\$ 6,462,297	\$ 6,679,900	\$ 6,904,743
13	Debt Service					647,716	1,937,232	1,932,657	1,937,707	1,932,232	1,933,932	1,929,432	1,933,932	1,935,513	1,935,851	1,934,170
14	Debt Coverage					161,929	484,308	483,164	484,427	483,058	483,483	482,358	483,483	483,878	483,963	483,542
15	Total Expenditures	\$ 3,977,621	\$ 4,192,060	\$ 4,375,922	\$ 4,567,786	\$ 5,577,643	\$ 7,398,459	\$ 7,610,745	\$ 7,844,540	\$ 8,075,066	\$ 8,268,071	\$ 8,459,686	\$ 8,669,119	\$ 8,881,689	\$ 9,099,714	\$ 9,322,455
16	Total Outflows (Non-Discounted)	\$ 262,441,887														
17	Net Present Value	\$ 132,041,450														

REVENUE REQUIREMENTS ANALYSIS

Operations and Maintenance																	
18	Existing System	\$ 1,327,210	\$ 1,313,030	\$ 1,344,312	\$ 1,377,892	\$ 1,412,396	\$ 1,448,391	\$ 1,485,794	\$ 1,523,715	\$ 1,562,762	\$ 1,601,850	\$ 1,641,225	\$ 1,681,225	\$ 1,722,868	\$ 1,765,379	\$ 1,809,221	
19	KCMO Payments	3,977,621	4,192,060	4,375,922	4,567,786	4,767,998	4,976,919	5,194,924	5,422,406	5,659,776	5,850,656	6,047,895	6,251,704	6,462,297	6,679,900	6,904,743	
20	Wastewater Treatment Facility																
21	Operations and Maintenance Subtotal	\$ 5,304,831	\$ 5,505,090	\$ 5,720,235	\$ 5,945,678	\$ 6,180,394	\$ 6,425,309	\$ 6,680,718	\$ 6,946,121	\$ 7,222,537	\$ 7,452,506	\$ 7,689,120	\$ 7,932,928	\$ 8,185,166	\$ 8,445,279	\$ 8,713,964	
Debt Service																	
22	Existing	\$ 1,044,546	\$ 1,048,295	\$ 1,330,288	\$ 945,342	\$ 992,895	\$ 992,876	\$ 1,287,334	\$ 1,284,017	\$ 980,350	\$ 1,031,612	\$ 1,027,560	\$ 1,033,044	\$ 1,032,942	\$ 1,316,274	\$ 325,655	
23	New					647,716	1,937,232	1,932,657	1,937,707	1,932,232	1,933,932	1,929,432	1,933,932	1,935,513	1,935,851	1,934,170	
24	Accumulation of Debt Service Payment					968,616											
25	Debt Service	\$ 1,044,546	\$ 1,048,295	\$ 1,330,288	\$ 945,342	\$ 2,609,227	\$ 2,930,108	\$ 3,219,991	\$ 3,221,725	\$ 2,912,582	\$ 2,965,544	\$ 2,956,992	\$ 2,966,976	\$ 2,968,455	\$ 3,252,125	\$ 2,259,825	
26	Required Coverage	\$ 261,137	\$ 262,074	\$ 332,572	\$ 236,335	\$ 652,307	\$ 732,527	\$ 804,998	\$ 805,431	\$ 728,146	\$ 741,386	\$ 739,248	\$ 741,744	\$ 742,114	\$ 813,031	\$ 564,956	
27	Total Annual Revenue Requirement	\$ 6,610,514	\$ 6,815,459	\$ 7,383,095	\$ 7,383,095	\$ 9,441,928	\$ 10,087,945	\$ 10,705,707	\$ 10,973,277	\$ 10,973,277	\$ 11,159,436	\$ 11,385,361	\$ 11,641,648	\$ 11,895,734	\$ 12,510,435	\$ 12,510,435	
28	Estimated Annual Sewer Revenues	\$ 6,544,262	\$ 6,569,530	\$ 6,590,485	\$ 6,611,439	\$ 6,632,394	\$ 6,653,348	\$ 6,674,303	\$ 6,695,257	\$ 6,716,212	\$ 6,737,166	\$ 6,758,121	\$ 6,779,075	\$ 6,800,030	\$ 6,820,984	\$ 6,841,939	
29	Revenue Surplus (Deficiency)	\$ (66,251)	\$ (245,928)	\$ (792,610)	\$ (771,655)	\$ (2,809,534)	\$ (3,434,596)	\$ (4,031,404)	\$ (4,278,019)	\$ (4,257,065)	\$ (4,422,269)	\$ (4,627,240)	\$ (4,862,573)	\$ (5,095,705)	\$ (5,689,451)	\$ (5,668,496)	
30	Estimated Total Percent Increase in Annual Revenues	1.01%	3.74%	12.03%	11.67%	42.36%	51.62%	60.40%	63.90%	63.38%	65.64%	68.47%	71.73%	74.94%	83.41%	124.09%	
31	Estimated Annual Revenue Increase	1.0%	3.1%	8.3%	0.0%	27.9%	6.8%	6.1%	2.5%	0.0%	1.7%	2.0%	2.3%	2.2%	5.2%	0.0%	



City of Liberty, Missouri
 Wastewater Treatment Feasibility Study
 Estimated Facility Expenditures - KCMO Matching Lowest NPV Rate Scenario
 Net Present Value of Estimated Cash Outlay

Line No.	Description	Projected													
		2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Estimated Facility Expenditures - KCMO Matching Lowest NPV Rate Scenario															
1	KCMO Forcemain Repair	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
2	Labor														
3	Materials and Service	31,159	32,094	33,057	34,049	35,070	36,122	37,206	38,322	39,472	40,656	41,876	43,132	44,426	
4	Utilities - Electricity, Gas, Etc.	76,895	79,202	81,578	84,026	86,546	89,143	91,817	94,572	97,409	100,331	103,341	106,441	109,634	
5	Chemicals	-	-	-	-	-	-	-	-	-	-	-	-	-	
6	Sludge Hauling	-	-	-	-	-	-	-	-	-	-	-	-	-	
7	Phone	-	-	-	-	-	-	-	-	-	-	-	-	-	
8	Equipment Repair/Replacement	67,691	67,691	67,691	67,691	67,691	67,691	67,691	67,691	67,691	67,691	67,691	67,691	67,691	
9	Subtotal Estimated Facility Expenditures - KCMO Matching Lowest NPV Rate Scenario	\$ 175,745	\$ 178,987	\$ 182,326	\$ 185,765	\$ 189,307	\$ 192,956	\$ 196,714	\$ 200,584	\$ 204,571	\$ 208,678	\$ 212,907	\$ 217,264	\$ 221,751	
Plus:															
10	Facility Depreciation/Renewal & Replacement	-	-	-	-	-	-	-	-	-	-	-	-	-	
11	Total Estimated Facility Expenditures - KCMO Matching Lowest NPV Rate Scenario	\$ 175,745	\$ 178,987	\$ 182,326	\$ 185,765	\$ 189,307	\$ 192,956	\$ 196,714	\$ 200,584	\$ 204,571	\$ 208,678	\$ 212,907	\$ 217,264	\$ 221,751	
Calculation of Net Present Value (NPV)															
12	Sewage Treatment Fees	\$ 7,137,064	\$ 7,377,111	\$ 7,625,137	\$ 7,881,405	\$ 8,146,186	\$ 8,419,761	\$ 8,702,420	\$ 8,994,459	\$ 9,296,189	\$ 9,607,928	\$ 9,930,005	\$ 10,262,759	\$ 10,606,541	\$ 10,961,714
13	Debt Service	1,935,588	1,930,107	1,936,070	1,935,420	1,932,013	1,930,588	1,935,751	1,932,213	1,933,442	1,935,773	1,933,804	1,930,919	1,736,416	
14	Debt Coverage	483,897	482,527	484,017	483,855	483,003	482,647	483,938	483,053	483,360	483,943	483,451	482,730	434,104	
15	Total Expenditures	\$ 9,556,550	\$ 9,789,745	\$ 10,045,224	\$ 10,300,679	\$ 10,561,203	\$ 10,832,997	\$ 11,122,108	\$ 11,409,726	\$ 11,712,991	\$ 12,027,644	\$ 12,347,260	\$ 12,676,408	\$ 12,777,061	\$ 10,961,714
16	Total Outflows (Non-Discounted)														
17	Net Present Value														

REVENUE REQUIREMENTS ANALYSIS

Operations and Maintenance															
18	Existing System	\$ 1,855,146	\$ 1,902,435	\$ 1,951,427	\$ 2,000,855	\$ 2,052,344	\$ 2,106,231	\$ 2,161,965	\$ 2,219,524	\$ 2,279,194	\$ 2,340,734	\$ 2,404,214	\$ 2,469,704	\$ 2,537,280	\$ 2,607,020
19	KCMO Payments	7,137,064	7,377,111	7,625,137	7,881,405	8,146,186	8,419,761	8,702,420	8,994,459	9,296,189	9,607,928	9,930,005	10,262,759	10,606,541	10,961,714
20	Wastewater Treatment Facility	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21	Operations and Maintenance Subtotal	\$ 8,992,210	\$ 9,279,546	\$ 9,576,564	\$ 9,882,260	\$ 10,198,530	\$ 10,525,993	\$ 10,864,384	\$ 11,213,983	\$ 11,575,383	\$ 11,948,663	\$ 12,334,218	\$ 12,732,463	\$ 13,143,821	\$ 13,568,734
Debt Service															
22	Existing	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
23	New	1,935,588	1,930,107	1,936,070	1,935,420	1,932,013	1,930,588	1,935,751	1,932,213	1,933,442	1,935,773	1,933,804	1,930,919	1,736,416	
24	Accumulation of Debt Service Payment	-	-	-	-	-	-	-	-	-	-	-	-	-	
25	Debt Service	\$ 1,935,588	\$ 1,930,107	\$ 1,936,070	\$ 1,935,420	\$ 1,932,013	\$ 1,930,588	\$ 1,935,751	\$ 1,932,213	\$ 1,933,442	\$ 1,935,773	\$ 1,933,804	\$ 1,930,919	\$ 1,736,416	
26	Required Coverage	\$ 483,897	\$ 482,527	\$ 484,017	\$ 483,855	\$ 483,003	\$ 482,647	\$ 483,938	\$ 483,053	\$ 483,360	\$ 483,943	\$ 483,451	\$ 482,730	\$ 434,104	
27	Total Annual Revenue Requirement	\$ 12,510,435	\$ 12,510,435	\$ 12,510,435	\$ 12,510,435	\$ 12,613,547	\$ 12,939,228	\$ 13,284,073	\$ 13,629,250	\$ 13,992,185	\$ 14,368,379	\$ 14,751,474	\$ 15,146,112	\$ 15,146,112	\$ 15,146,112
28	Estimated Annual Sewer Revenues	\$ 6,862,893	\$ 6,883,847	\$ 6,904,802	\$ 6,925,756	\$ 6,946,711	\$ 6,967,665	\$ 6,988,620	\$ 7,009,574	\$ 7,030,529	\$ 7,051,483	\$ 7,072,438	\$ 7,093,392	\$ 7,114,347	\$ 7,135,301
29	Revenue Surplus (Deficiency)	\$ (5,647,542)	\$ (5,626,587)	\$ (5,605,633)	\$ (5,584,678)	\$ (5,666,836)	\$ (5,971,563)	\$ (6,295,453)	\$ (6,619,676)	\$ (6,961,657)	\$ (7,316,895)	\$ (7,679,036)	\$ (8,052,720)	\$ (8,031,765)	\$ (8,010,811)
30	Estimated Total Percent Increase in Annual Revenues	124.09%	124.09%	124.09%	80.64%	81.58%	85.70%	90.08%	94.44%	99.02%	103.76%	108.58%	113.52%	112.90%	177.19%
31	Estimated Annual Revenue Increase	0.0%	0.0%	0.0%	0.0%	0.8%	2.6%	2.7%	2.6%	2.7%	2.7%	2.7%	2.7%	0.0%	0.0%