CITY OF
BROKEN ARROW
Where opportunity lives

Office of the City Manager

INTEROFFICE MEMO

To: Honorable Mayor and City Councilors

From: Thomas M. Moton, Jr., City Manager

Date: February 14, 2014

Re: Council Study Session Background Information

Please find attached the following material for your information for the February 18, 2014, City Council Study Session:

1. Comprehensive Water, Sanitary Sewer and Stormwater, Cost of Service and Rate Study Presentation
   Black and Veatch | Power Point-City of Broken Arrow, Comprehensive Water Wastewater and Stormwater Rate Study
2. Utilities Department | Power Point-Needs Assessment, "Out of Sight-Out of Mind"

Respectively submitted,

Thomas M. Moton, Jr. ICMA-CM
City Manager

Attachments

Black and Veatch | Power Point-City of Broken Arrow
Comprehensive Water, Wastewater and Stormwater Rate Study

BUILDING A WORLD OF DIFFERENCE

February 13, 2014

CITY OF BROKEN ARROW, OK
COMPREHENSIVE WATER, WASTEWATER AND STORMWATER RATE STUDY

BLACK & VEATCH
Building a world of difference.

Agenda

- Introductions
- Rate Workshop 101
- Next Steps
  - Project Schedule
  - Basic Data Status and Questions

INTRODUCTIONS

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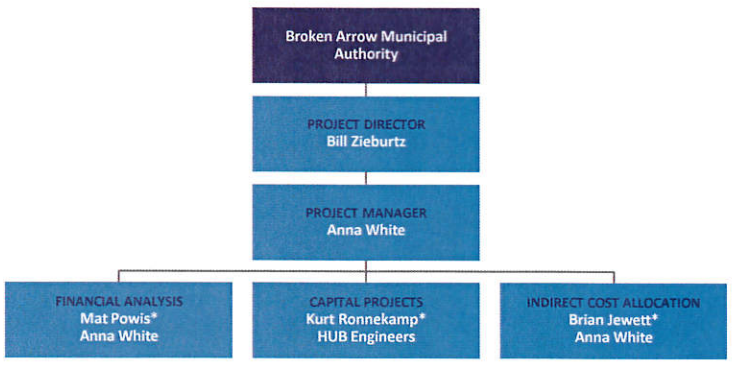
PROJECT TEAM ORGANIZATION



* Denotes Lead

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RATE WORKSHOP 101

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OBJECTIVES OF COST-BASED RATE MAKING

Revenue Related

- Effectiveness in yielding total revenue requirements (full cost recovery)
- Revenue stability and predictability
- Stability and predictability of the rates themselves from unexpected or adverse changes

Cost Related

- Promotion of efficient resource use (conservation and efficient use)
- Dynamic efficiency in responding to changing supply and demand patterns

Principles of Public Utility Rates, James C. Bonbright

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OBJECTIVES OF COST-BASED RATE MAKING

Fairness to Ratepayers

- Fairness in the apportionment of total costs of service among the different rate payers
- Avoidance of undue discrimination (subsidies) within the rates

Practical Related

- Freedom from controversies as to proper interpretation of the rates
- Simple and easy to understand
- Simple to administer
- Legal and defendable

Principles of Public Utility Rates, James C. Bonbright

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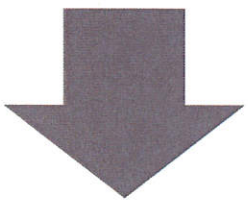
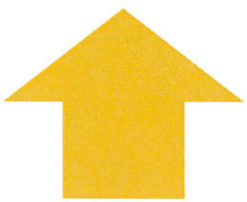
UTILITY FINANCIAL CHALLENGES



Revenues are flat or declining while costs are continuing to increase

Customer bills continue to increase

Increased political pressure to "keep rates low"



How are rates affected by these challenges?

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OVERVIEW OF THE RATE STUDY PROCESS

Revenue Requirements	• Compares the revenues of the utility to its expenses to determine the overall level of rate adjustment
Cost of Service	• Equitably allocates the revenue requirements between the various customer classes of service
Rate Design	• Design rates for each class of service to meet the revenue needs of the utility, along with any other rate design goals and objectives

TYPICAL REVENUE CLASSIFICATIONS

REVENUE REQUIREMENTS

Operating Revenues	Non-operating Revenues	Contributions to Capital
Rate Revenue	Merchandising and contract services	Developer and customer contributions
Unmetered sales	Rents from non-operating property	Grants
Metered sales	Interest and dividend income	System development charges
Wholesale (sales for resale)	Gains or losses from disposition of property	
Other special sales	Tax revenues	
Private fire protection	Transfers from other governmental funds	
Public fire protection	Other non-operating revenue	
Excess Strength Surcharge		
Other Operating Revenues		
Miscellaneous service revenue		
Forfeited discounts		
Rents from utility property		
Other revenues		

REVENUE REQUIREMENTS

PROJECTING REVENUE

- Historical data
  - Compilation of number of bills rendered by customer class, meter size, and water sales by rate block
  - Verification with billed revenues
- Projection Considerations
  - Growth in number of customers
  - Nonrecurring sales
  - Weather normalization

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REVENUE REQUIREMENTS

REVENUE REQUIREMENTS

- The level of revenue required to properly and prudently operate, maintain, and develop utility infrastructure
- Revenue requirements = Costs of Service
- Revenue requirements from rates:

Total Costs (Revenue Requirements)

Less: Non-rate revenue

= Revenue Requirements from Rates

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REVENUE REQUIREMENTS

Capital

- Debt Service
- Cash Financing of Major Capital
- Renewal and Replacement

Operating

REVENUE REQUIREMENTS

DEBT SERVICE COMPONENT

- Includes principal and interest payments on bonds and other debt instruments
- Revenue bonds require
  - Debt service reserve
  - Rate covenants
    - Annual Test
      - Net Revenues / Annual P&I > 1.1 – 1.5
    - Additional Bonds Tests
      - Previous Year's Revenue
      - Ensuing Year's Revenue

What type of future debt instruments will be used?

REVENUE REQUIREMENTS

REVENUE REQUIREMENTS

SAMPLE CAPITAL FINANCING PLAN

Line No.		Projected Years 1	2	3	4	5
1	**Sources of Funds**					
2	Beginning of Year Balance	2,000	6,210	210	7,525	525
3	Revenue Bond Proceeds	10,000	0	15,000	0	8,000
4	Cash Financing of Capital	1,000	1,000	1,000	1,000	1,000
5	Grants/Developer Contributions	500	0	0	0	0
6	System Development Fees	1,500	1,500	1,500	1,500	1,500
7	Total Funds Available	15,000	8,710	17,710	10,025	11,025
8	**Application of Funds**					
9	Major Capital Improvements	(8,000)	(8,500)	(9,000)	(9,500)	(10,000)
10	Bond Issuance Costs	(150)	0	(225)	0	(120)
11	Bond Reserve Funds	(640)	0	(960)	0	(512)
12	Total Application of Funds	(8,790)	(8,500)	(10,185)	(9,500)	(10,632)
13	End of Year Balance	6,210	210	7,525	525	393

REVENUE REQUIREMENTS

RENEWAL AND REPLACEMENT CAPITAL PROJECTS

- Renewal and replacement projects are of an on-going nature
- A utility should fund from rates an amount for renewal and replacement capital projects

Does Broken Arrow currently have a policy for funding R&R?

REVENUE REQUIREMENTS

REVENUE REQUIREMENTS

Capital

- Debt Service
- Cash Financing of Major Capital
- Renewal and Replacement

Operating

- Operation & Maintenance Expense
- Payment in Lieu of Taxes
- Transfers to Reserves

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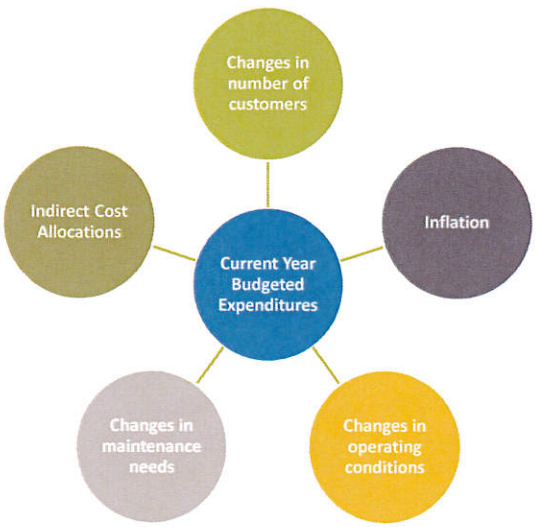
REVENUE REQUIREMENTS

OPERATION & MAINTENANCE EXPENSE



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REVENUE REQUIREMENTS

RESERVE LEVELS

- Operating reserve
  - 45 – 90 days of O&M is typical
- Capital reserve
  - Typical year of capital projects (rate funded)
  - One year of depreciation expense
- Emergency reserve
  - Funds required until emergency funding can be arranged, or largest capital item to replace
  - Rate stabilization reserve

What reserves does Broken Arrow maintain?

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REVENUE REQUIREMENTS

SAMPLE CASH FLOW

Line No.		Projected Years 1	2	3	4	5
	Operating Revenues					
1	Revenue Under Existing Rates	11,500	11,845	12,200	12,566	12,943
2	Year 2 - Revenue Increase 4%		474	488	503	518
3	Year 3 - Revenue Increase 4%			508	523	538
4	Year 4 - Revenue Increase 4%				544	560
5	**Total Water Service Revenue**	11,500	12,319	13,196	14,136	14,559
6	Other Operating Revnue	75	78	81	84	87
7	**Total Operating Revenue**	11,575	12,397	13,277	14,220	14,646
8	O&M Expense	(6,549)	(6,837)	(8,130)	(8,490)	(8,880)
9	**Net Operating Revenue**	5,026	5,560	5,147	5,730	5,766
10	Debt Service					
11	Outstanding Bonds	(1,680)	(1,680)	(1,680)	(1,680)	(1,680)
12	Proposed Bonds	(640)	(640)	(1,600)	(1,600)	(2,112)
13	**Total Debt Service**	(2,320)	(2,320)	(3,280)	(3,280)	(3,792)
14	Cash Financing of Capital	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)
15	Renewal & Replacements	(500)	(525)	(550)	(575)	(600)
16	Transfer to Operating Reserve	(71)	(319)	(88)	(97)	(97)
17	Payment in Lieu of Taxes	(575)	(616)	(660)	(707)	(728)
18	Net Balance from Operations	560	780	(431)	71	(451)
19	Beginning of Year Balance		560	1,340	909	980
20	End of Year Balance	560	1,340	909	980	529
21	Debt-Service Coverage	2.17	2.40	1.57	1.75	1.52

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WHAT IS COST OF SERVICE?

COST OF SERVICE

- **Cost of service is:**
  - A method to equitably allocate the revenue requirements of the utility between the various customer classes of service (e.g. residential, commercial, etc)
- **The cost of service provides two key pieces of information:**
  - Allocated total costs to each class of service
  - Average unit costs
    - $/Customer/Month
    - $/1,000 gallons
    - $/lb (wastewater excess strength)
    - $/ESU (stormwater)

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WHY COST OF SERVICE?

COST OF SERVICE

- **The fundamental question: Do cost differences exist to serve the various customer classes of service?**
- **Costs of operating the utility are not accounted for on a customer class-by-class basis**
  - E.g. – the utility repairs a main, not a residential main
- **Many costs are incurred for the joint benefit of all customers, while other costs may benefit only certain specific customers**
- **Not all customers consume water/ contribute wastewater in the same manner or require the same facilities to be served**

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BENEFITS OF COST OF SERVICE

- Generally accepted as "fair and equitable"
- Avoids interclass subsidies
- Rates equal cost of service provided
- Can provide an accurate "price signal"
- Legally defendable

COST OF SERVICE

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COST OF SERVICE APPROACH

- Cash Basis versus Utility Basis
  - Utility Basis permits recognition of proprietary responsibilities and risks of serving outside City customers
- Cost Allocation Methodologies - Water
  - Base – Extra Capacity
  - Commodity - Demand
- Cost Allocation Methodologies – Wastewater
  - Functional Cost Basis
  - Design Basis

COST OF SERVICE

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REVENUE REQUIREMENTS

APPROACHES TO PROJECTING REVENUE REQUIREMENTS

Cash Basis	Utility Basis
+ O&M expenses	+ O&M expenses
+ Taxes, transfer payments	+ Taxes, transfer payments
+ Debt Service	+ Depreciation expense
+ Capital Projects	+ Return on rate base
= Total Revenue Requirements	**= Total Revenue Requirements**

Utility Basis is commonly used by privately owned utilities or municipal utilities with outside city or wholesale customers

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COST OF SERVICE

SAMPLE COSTS OF SERVICE

Line No.		Operating Expense	Capital Costs	Total
1	**Revenue Requirements**			
2	Operation & Maintenance Expense	8,880		8,880
3	Debt Service Requirements			0
4	Existing Debt Service		1,680	1,680
5	Proposed Debt Service		2,112	2,112
6	Renewal & Replacement		600	600
7	Cash Financing of Capital		1,000	1,000
8	Transfer to Operating Reserve	97		97
9	Payment in Lieu of Taxes	728		728
10	Total	9,705	5,392	15,097
11	**Revenue Requirements Met from Other Sources**			
12	Other Operating Revenue	56	31	87
13	Change in Funds Available	290	161	451
14	Total	346	192	538
15	Net Costs to be Met from Charges	9,359	5,200	14,559
16	**Restatement of Net Costs (Utility Basis)**			
17	Operation & Maintenance Expense	9,359		9,359
18	Depreciation Expense		2,500	2,500
19	Return on Investment		2,700	2,700
20	Total	9,359	5,200	14,559

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COST OF SERVICE

COST ALLOCATION METHODOLOGY - WATER

- **Base-Extra Capacity Method**
  - Base Costs – Costs associated with total annual consumption plus the average day component of peak period use
  - Extra-Capacity Costs – Costs associated with meeting demands over and above base use costs (i.e. difference between total peak demand and base (average) use)
- **Commodity-Demand Method**
  - Commodity Costs – Costs associated with the total consumption (flow) of water over a specified period of time (e.g. annual)
  - Demand (Capacity) costs – Costs associated with the maximum rate (demand) required at one point in time or the maximum size of facilities required to meet this demand. Often measured as peak-hour or peak-day requirements.

B&V recommends Base Extra-Capacity

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COST OF SERVICE

COST ALLOCATION METHODOLOGY - WATER

Base Extra-Capacity

- Engineering Design and Operational Criteria
- Was the facility designed (cost incurred) to meet the annual demand (base) or was it designed to meet a peak rate of flow (capacity).
- If capacity, than what portion is operated to meet average demands (base) and what proportion is extra-capacity

Commodity/Demand

- Engineering Design Criteria
- Was the facility designed (cost incurred) to meet the annual demand (commodity) or peak rate of flow (demand).

B&V recommends Base Extra-Capacity

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COST OF SERVICE

COST ALLOCATION METHODOLOGY - WASTEWATER

- Functional Cost Methodology
  - Operational or service purposes
  - The function of the various cost centers or activities is the basis for allocating costs
- Design-Basis Methodology
  - Engineering design criteria
  - Costs are incurred and service is provided generally on the same basis as facilities are designed
  - Recognizes a capacity component

B&V recommends Functional Cost Methodology

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COST OF SERVICE

COST ALLOCATION METHODOLOGY - WASTEWATER

Functional Cost

- Operational or Service Criteria
- The function of the various cost centers or activities is the basis for allocating costs
- Collection sewer – Purpose is to carry wastewater at variable rates of flow, costs allocated to "volume"

Design-Basis

- Engineering Design Criteria
- Costs are incurred and service is provided generally on the same basis as facilities are designed
- Collection sewer – Peak flow rates determine size of main, costs allocated to "capacity"

B&V recommends Functional Cost Methodology

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COST OF SERVICE

COST OF SERVICE STEPS

Functionalize
- Assign revenue requirements to utility cost functions

Allocate
- Allocate functionalized costs to cost components

Distribute
- Distribute costs to customer classes

COST OF SERVICE

ASSIGN COSTS TO UTILITY COST FUNCTIONS

- Projected costs of service should be identified in as much detail as possible by utility function
- Utility function refers to the key operational activity with which a particular cost is identified

ASSIGN COSTS TO UTILITY COST FUNCTIONS

- Water

- Wastewater

COST OF SERVICE

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ALLOCATION TO COST COMPONENTS

- Costs incurred are generally responsive to the specific service requirements (cost drivers) imposed on the system by customers
- Utility facilities are designed and sized, or have an operational purpose to meet one or more cost drivers
  - Capital costs incurred in the construction of these facilities
  - Operating costs incurred in running the system

COST OF SERVICE

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ALLOCATION TO COST COMPONENTS

COST OF SERVICE

Water

Average Day	Max Day	Max Hour	Customer Billing	Adequate Fire Flow
				
Base Costs	Extra Capacity Costs		Customer Costs	Direct Costs

Wastewater

Contributed Flow	Infiltration / Inflow	Customer Billing	BOD	TSS
				
Volume		Customer Costs	Strength	

SAMPLE WATER O&M ALLOCATION

COST OF SERVICE

Line No.		Total	Base	Extra Capacity Max Day	Extra Capacity Max Hour	Meters & Services	Billing & Collection	Direct Fire
1	Source of Supply	270	270					
2	Pumping							
3	Power	777	699	78				
4	All Other	579	376	203				
5	Water Treatment							
6	Chemicals	363	363					
7	All Other	471	306	165				
8	Transmission & Distribution							
9	Storage	78	8		70			
10	Transmission Mains	156	101	55				
11	Distribution Mains	234	105	59	70			
12	Meters & Services	465				465		
13	Hydrants	39						39
14	All Other	217	41	22	41	104		9
15	Meter Reading & Collection	741					741	
16	Administrative & General	2,316	1,198	307	95	300	391	25
17	Total O&M Expense	6,706	3,467	889	276	869	1,132	73

COST OF SERVICE

DISTRIBUTE COSTS TO CUSTOMER CLASSES

- **Units of Service**
  - The units of service attributable to the respective classes must be established for the test year for each cost component
  - Water
    - Base – annual water usage expressed as average day
    - Extra Capacity – max day and max hour expressed as gallons per day
      - Need to develop a peaking factor for water demand
    - Customer – equivalent meters, number of bills
    - Fire – number of hydrants

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COST OF SERVICE

DISTRIBUTE COSTS TO CUSTOMER CLASSES

- **Units of Service**
  - The units of service attributable to the respective classes must be established for the test year for each cost component
  - Wastewater
    - Volume – annual contributed sanitary wastewater flow and infiltration/inflow
    - Capacity – peak rate of flow for contributed flow and I/I
    - Strength – estimated quantities for BOD, TSS
    - Customers – number of bills

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SAMPLE CALCULATION OF UNIT COSTS (WATER)

COST OF SERVICE

System Costs		Units of Service		Unit Costs
Base and Extra Capacity Costs				
Volume	÷	Mgal	=	$/Mgal
Customers Costs				
Customer	÷	No. of Bills	=	$/Bill
Direct Costs				
Fire Protection	÷	No. of Eq. Hydrants	=	$/Eq. Hydrant

Mgal= 1,000 gallons

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DISTRIBUTE COSTS TO CUSTOMERS (WATER)

COST OF SERVICE

- Volume Unit Cost x Residential Units (Mgal) = $
- Customer Unit Cost x Residential Units (Bills) = $
- Fire Unit Cost x Residential Units (Eq. Hydrants) = $
- Total Residential Cost of Service = $

Same Calculation for Other Customer Classes

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COST OF SERVICE

SAMPLE INDICATED REVENUE ADJUSTMENT

Line No.		Allocated Cost of Service	Revenue Under Existing Rates	Indicated Revenue Adjustment
1	**Inside City**			
2	Residential	26,000	23,500	10.6%
3	Commercial	10,000	10,700	-6.5%
4	Industrial	6,000	6,500	-7.7%
5	Subtotal	42,000	40,700	3.2%
6	**Outside City**			
7	Residential	2,500	2,300	8.7%
8	Commercial	3,000	2,500	20.0%
9	Industrial	500	450	11.1%
10	Subtotal	6,000	5,250	14.3%
11	Total	48,000	45,950	4.5%

BROKEN ARROW MUNICIPAL AUTHORITY

RATE SETTING PRINCIPLES

- Equitability
- Revenue Stability
- Provides Appropriate Price Signals
- Recognizes Customer Usage Patterns & Demands
- Easy to Understand and Administer
- Customer Acceptance
- Consistent with City Policies
- Legally Acceptable/Defensible

Modeled after AWWA M1 and WEF MoP 27

TYPES OF RATES – FIXED CHARGE

- Recovers customer, billing, and meter charge costs for water
- Recovers customer, billing and a portion of I/I for wastewater
- Types
  - Service or customer charge – same for all customers
  - Meter charge – Varies by meter size
  - Minimum charge – includes a volume allowance
  - Readiness to serve charge – recovers additional costs

RATE DESIGN

TYPES OF RATES – VOLUME CHARGE

- Recovers all costs not recovered by the fixed charge excluding direct charges (fire, excess strengths)
- Types
  - Decreasing block – rate decreases with each usage block
  - Uniform block
    - All usage pays same rate
    - Each class pays same rate
  - Increasing block – rate increases with each usage block

Flexibility in billing system?

RATE DESIGN

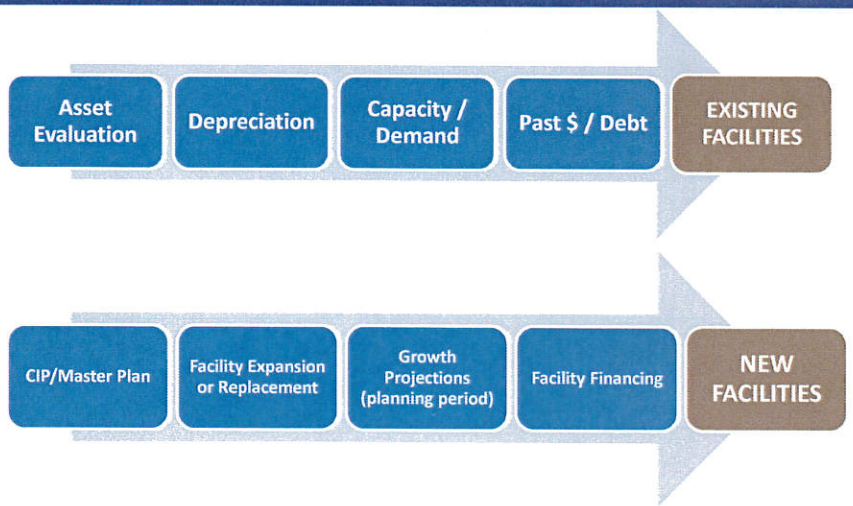
RATE DESIGN

TYPES OF RATES – STORMWATER

- **Unit of measure = ESU (Equivalency Service Unit)**
  - 1 ESU = 2,650 square feet of impervious area (IA)
- **Rate Structure Alternatives**
  - Residential
    - Uniform monthly charge
    - Tiers based on IA (e.g. small, medium, large) – enhances equity
  - Non-Residential
    - Individually calculated
  - Minimum charge – recover administrative and other fixed costs
  - Billing and collection charge – recover costs associated with billing, postage, collection

BROKEN ARROW MUNICIPAL AUTHORITY

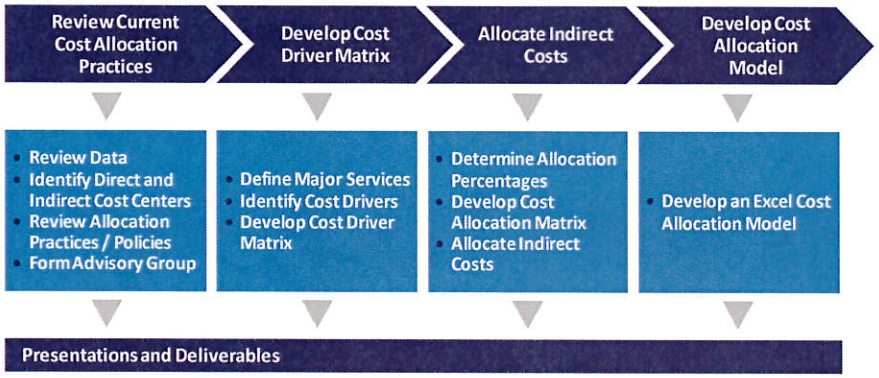
DEVELOPMENT FEE APPROACHES



Both approaches can be combined if warranted

BROKEN ARROW MUNICIPAL AUTHORITY

FINANCIAL PLANNING – COST ALLOCATION



Full (Management-based) Allocation Approach

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NEXT STEPS

PROJECT SCHEDULE

BASIC DATA STATUS AND QUESTIONS

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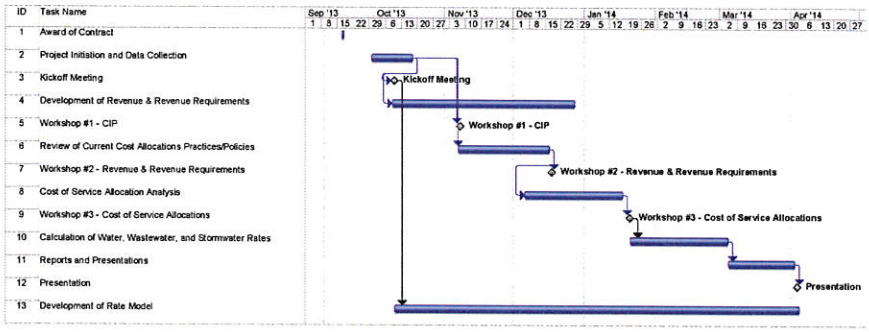
NEXT STEPS

PROJECT SCHEDULE



RATE DESIGN

RATE MODEL

- Separate model for each utility?
- Separate model for financial planning versus COS/rate design?
- Scenario planning?
- Is there an existing financial planning model?
- Who will be end-user?

REVENUE REQUIREMENTS

RETURN ON RATE BASE COMPONENTS

- Rate base
  - Original cost of assets
  - Accumulated depreciation
  - Construction work in progress (CWIP)
- Rate of return (WACC)
  - Outstanding long-term debt / cost of debt
  - Net equity in system / cost of equity

REVENUE REQUIREMENTS

EXAMPLE OF RETURN ON RATE BASE CALCULATION

Rate Base Calculation	
Original Cost of Plant	$40,500,000
Less: Accumulated Depreciation	18,000,000
Net Plant	$22,500,000
Less: Contributed Plant	15,000,000
Rate Base	**$7,500,000**

Weighted Cost of Capital				
	Amount	%	Cost	Weighted Cost
Debt	$5,000,000	20%	6.0%	1.2%
Equity	20,000,000	80%	8.5%	6.8%
	$25,000,000			8%

8% x $7,500,000 = $600,000

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Utilities Department | Power Point-Needs Assessment
"OUT OF SIGHT OUT OF MIND"

UTILITIES DEPARTMENT NEEDS ASSESSMENT

"OUT OF SIGHT OUT OF MIND"

OOWA 36" Water Transmission Line August 2013 Line Break

February 18, 2014

Utilities Department Needs Assessment

Compiled and Submitted by:

1. Roger Hughes – Acting Utility Director [9 years in E&C]
2. Jimmy Helms – Water Treatment Plant Manager [33 years in Utilities]
3. Barney Campbell – Assistant Utilities Director [32 years in Utilities]
   David Handy – Wastewater Treatment Plant Manager [27 years in Utilities]
4. Tom Evans – Water Distribution Division Supervisor [35 years in Utilities]
5. Olen Bailey – Wastewater Collection Division Supervisor [29 years in Utilities]
6. Derriel Bynum – Metering Division Supervisor [30 years in Utilities]
7. Jerry Hanewinkel – Utilities Construction Supervisor [24 years in Utilities]
8. Anthony Daniel – Utilities Director [38 years in Utilities]

Goals

- To protect the health and well being of the community we serve by providing uninterrupted water and wastewater service.
- To install, operate and maintain all components of the city's water and wastewater systems using industry's accepted best management practices.

Overview of Utilities Department Responsibilities

A. WATER SYSTEM
   1. OOWA supply line to water plant
   2. Transmission lines and storage facilities
   3. Distribution piping network
   4. System appurtenances (valves and fire hydrants)
   5. Water meters [success of a drive-by system pilot program]

B. WASTEWATER SYSTEM
   1. Collection system and diversion of flows [~54% flow to RMUA Haikey Creek Plant, ~45% to City Lynn Lane Plant, ~ 1% to City of Tulsa]
   2. Maintenance challenges caused by roots, and Hydrogen Sulfide gas corrosion
   3. Condition of manholes
   4. Condition of lift stations
   5. Sanitary sewer overflows [SSO's]

Overview (continued)

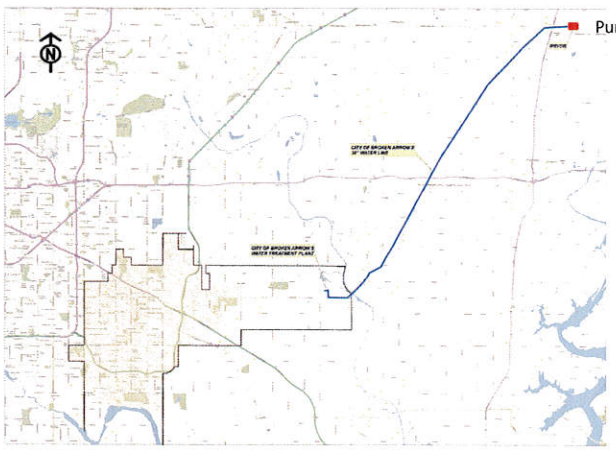
C. UTILITIES OPERATION

1. Provides 24/7 operations and maintenance of the entire water and wastewater systems.
2. Pump treated water from the water plant to the storage tanks, water distribution and metering of water supplied.
3. Collect and convey all wastewater discharged into the sewer system to the two treatment plants for safe disposal.
4. Utility operates in accordance with State of Oklahoma Department of Environmental Quality issued permits:
   a) Drinking water permit requires; 100 monthly bac-t sampling, testing and reporting, sixty lead and copper samples (twice/year) collection and reporting and quarterly disinfection by products testing.
   b) Wastewater Discharge Permit requires; effluent discharged complies with the NPDES; a pretreatment program for monitoring compliance from industrial discharges and a fat, oil, and grease disposal program.
5. Staffing level is 63 ½ FTE
6. O&M budget is $ 20.1 million

D. SUMMARY OF RECOMMENDATIONS

1. Use technology to enhance business practices
2. Develop and implement an Asset Management program to preserve the City's water and sewer infrastructure

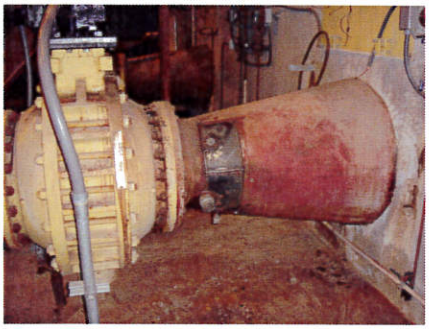
O.O.W.A. WATER SUPPLY LINE (1980)



CITY OF BROKEN ARROW'S 36" WATER LINE TO PRYOR

OOWA Pump Station and Supply Line (1980)

OOWA Pump Station Header Pipe

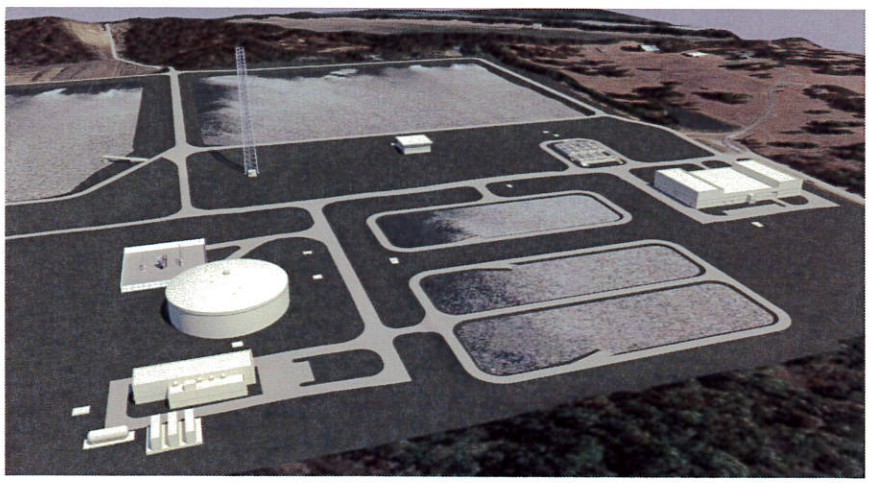


Temporary plugs and plates welded to keep station in service

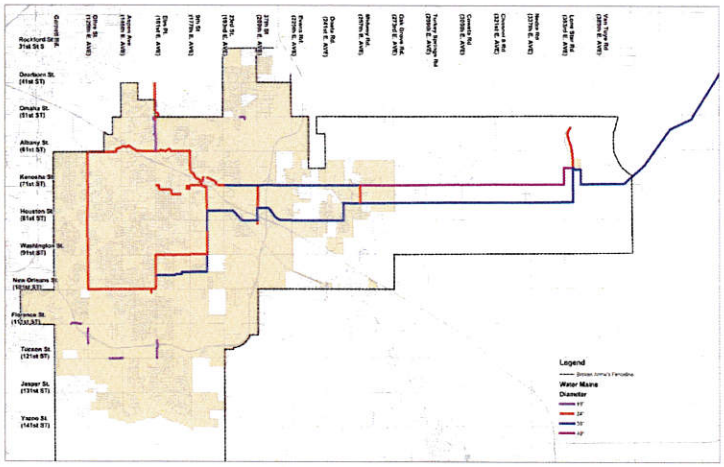
33 miles - 36" Transmission Line
Precast Concrete Cylinder Pipe

Ruptured pipe segment 14, repairs since 2005
5 repairs made in 2013

3D Rendering of the New Design [20 MGD] Water Treatment Plant



Water Transmission Lines
16" – 48" Diameter Pipes



Water Storage Tanks In The Distribution System

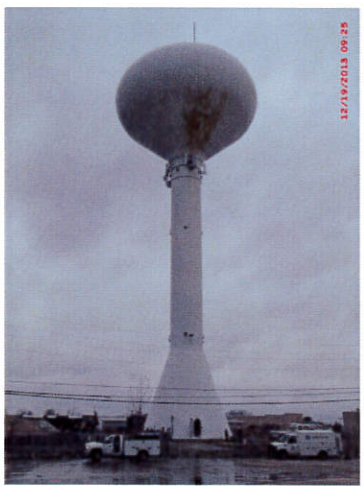
- Tiger Hill Center Tank – 1 MG installed 1964
- Tiger Hill West Tank – 1 MG installed 1976
- Tiger Hill East Tank – 2 MG installed 1980
- New Orleans Tower – 1 MG installed 1981
- Omaha Tank – 5 MG installed 1998
- High Pressure Tower – 1 MG installed 2005 (Baptist Church Tower)
- Total Offsite Storage Capacity = 11 MG
- Average Daily Demand = 12.6 MGD (2012)
- Average Peak Demand = 26.9 MGD (August 3, 2012)

Tiger Hill Tank – 2 MG (1980)

Outside 2 MG tank [January 2014]

Inside roof of 2 MG tank showing rust [January 2014]

New Orleans Elevated Tank – 1 MG (1981)



Outside elevated 1 MG tank showing rust [December 2013]

New Orleans Elevated Tank – 1 MG (1981)

Inside roof - steel showing significant corrosion [December 2013]

Proposed refurbishment will Include extensive replacement of steel members, surface cleaning and recoating

Water Distribution System Lines

Line Size (in)	Length (mile)	Pipe Material	Age	Percentage
1 – 4	83.1	Galv	1940's to 1980's	<1%
		PVC	1970's to Present	50%
		DI	1960's to Present	10%
		CI	**1920's to 1970's**	**20%**
		AC	1970's to 1980's	20%
6	291.7	PVC	1970's to Present	45%
		DI	1960's to Present	5%
		CI	**1920's to 1970's**	**20%**
		AC	1970's to 1980's	30%
8	108.9	PVC	1970's to Present	45%
		DI	1960's to Present	5%
		CI	**1920's to 1970's**	**20%**
		AC	1970's to 1980's	30%
10	20.7	PVC	1970's to Present	45%
		DI	1960's to Present	5%
		CI	**1920's to 1970's**	**20%**
		AC	1970's to 1980's	30%

Galv – Galvanized Iron, PVC – Polyvinyl Chloride, DI – Ductile Iron, CI – Cast Iron, AC – Asbestos Cement

Water Distribution System Lines

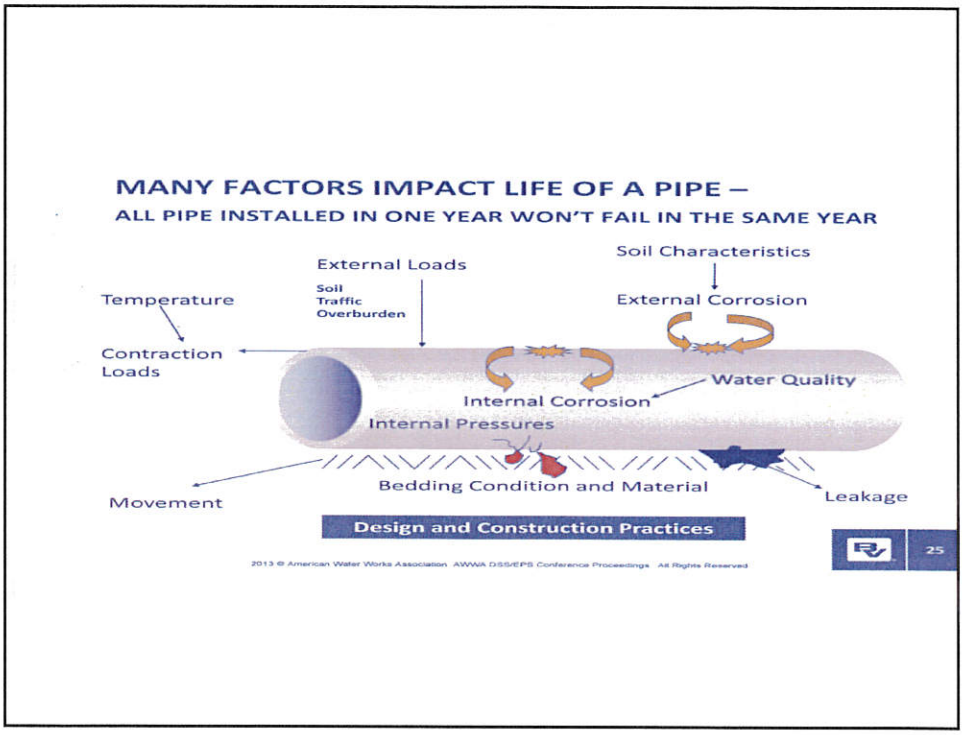
Line Size (in)	Length (mile)	Pipe Material	Age	Percentage
12	79.8	PVC	1970's to Present	50%
		DI	1960's to Present	10%
		CI	**1920's to 1970's**	**10%**
		AC	1970's to 1980's	30%
16	4.5	PVC	1990's to Present	100%
24	21.3	PVC	1990's to Present	65%
		DI	1970's to Present	15%
		PCCP	1970's to 1980's	20%
36	47.7	PCCP	1980's to Present	100%
48	6.7	PCCP	2000's to Present	100%
Total Pipe	**664.4**			

Per AWWA and USEPA, the average useful life span of piping material is between 70 years (PVC) and 100 years (CI)
Galv – Galvanized Iron, PVC – Polyvinyl Chloride, DI – Ductile Iron, CI – Cast Iron, AC – Asbestos Cement
PCCP – Prestressed Concrete Cylinder Pipe

Sample Of Water Distribution System Lines Needing To Be Replaced

24" ductile iron pipe along Kenosha showing external corrosion pipe failure

2" cast iron pipe along Main Street alley showing tuberculation buildup on the inside



Water Distribution Main Line Breaks

Year	No. Of Line Breaks	Primary Casuses/Factors
2013	350	Tapping saddles rusting, AC & CI pipe breaks, ground movement
2012	313	Tapping saddles rusting, AC & CI pipe breaks, ground movement
2011	380	Excessive drought year
2010	228	Tapping saddles rusting, AC & CI pipe breaks,
2009	221	Tapping saddles rusting, AC & CI pipe breaks,
2008	186	Tapping saddles rusting, AC & CI pipe breaks, ground movement
2007	207	Tapping saddles rusting, AC & CI pipe breaks, ground movement
2006	349	Excessive drought year
2005	229	Tapping saddles rusting, AC & CI pipe breaks

Water Line Breaks Results In

- Service interruptions; causes inconvenience to homeowners and possible loss of revenue to businesses
- Loss of fire protection (public safety issue)
- Increased water loss and waste of resources
- Traffic interruptions as roads are closed to complete repairs
- Significant restoration costs to rebuild; washed out roads, pavements, private yards and driveways
- Damage to private property and home appliances
- Increased O&M costs (overtime, repair parts, etc.)
- Possible contamination of open pipes by the flooded trenches

Note: Per AWWA 2007 study, "water main breaks will become more common and there will be a three-fold increase in repair costs by the year 2030"

Water Line Breaks

6" break Villages at Wood Creek [December 2008]

8" break along Main Street [February 2009]

Water Distribution System Appurtenances

- Fire Hydrants – about 10,000 units
- Isolation Valves – about 15,000 units
  – sizes range from 1 ½" to 48"

O&M of Fire Hydrants

- Project being initiated jointly with Fire Department
- O&M of Fire Hydrants is a critical function
- Estimated to take about 10 years to complete first round of the exercise and painting project
- A fresh coat of paint sends a positive message to the community

Fire Hydrants Needing Attention

Typical paint coating deterioration [January 2014]

Buried outlet connections [January 2014]

Leaning after accident along Hillside Drive

Isolation Valves

Per AWWA Standard, All Valves Should Be Readily Accessible and Exercised At Least Once Per Year

Proposed Valve Exercise Program
-- Locate and tag the valve with GPS
-- Operates the valve from fully open to fully closed
-- Identify defective valves (frozen, stuck) for replacement
-- Update records and base maps

An isolation valve covered by overgrown bushes

Meter Reading Division

Meter Size	No. of Meters	Age
¾"	33,724	40% over 10 years old 40% 4 to 10 years old 20% 1 to 3 years old
1"	1,445	1 to 5 years old
1 1/2"	376	1 to 5 years old
2"	437	1 to 5 years old
3"	53	1 to 5 years old
4"	26	1 to 5 years old
6"	11	1 to 5 years old
Total	36,072	

Meter Reading Division

Crew of 10 is Responsible for

- Reading about 36,500 meters each month
- Monthly average of 500 turn-ons/turn-offs
- Monthly average of 900 new/final accounts
- Replace/repair dead/defective meters
- Advise customers of possible leaks
- Replace damaged & unsafe meter boxes

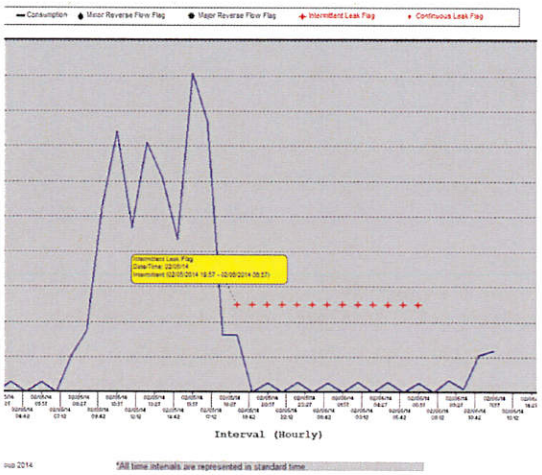
Automated Meter Reading Utilizing Drive-By System

- Pilot Program being implemented utilizing drive-by system technology – 1430 meters installed
- Estimated 1,000 meters can be read in about 1 hour versus 3 days by manual read
- Eliminates reading errors and estimation of consumption
- Data collected shall enable customer service to resolve customer billing disputes
- Utilizing drive-by technology is much more cost effective in gathering billing data

Automated Meter Reading Utilizing Drive-By System (continued)

- Proposed drive-by system to be implemented using in-house resources over 4 years
- Shall result in savings in fuel, manpower and better utilization of City resources
- Enable the migration from three meter reading systems to a single system
- Estimated cost for drive-by system is about $6.4 million dollars

Sample of Water Usage Data (retrieved from a drive-by system meter)



Wastewater Collection System Lines

Line Size (in)	Length (mile)	Pipe Material	Age	Percentage
8	606.4	**Clay**	**1920's to 1980's**	**40%**
		AC	1970's	<1%
		PVC	1970's to Present	60%
10	16.6	**Clay**	**1920's to 1980's**	**2%**
		PVC	1970's to Present	98%
12	28.2	**Clay**	**1920's to 1980's**	**15%**
		AC	1970's	<1%
		PVC	1970's to Present	85%
15	14.0	Clay	1940's to 1970's	85%
		PVC	1970's to Present	15%
16	2.8	Clay	1950's to 1970's	1%
		PVC	1970's to Present	50%
		DI	1970's to Present	49%

Wastewater Collection System Lines

Line Size (in)	Length (mile)	Pipe Material	Age	Percentage
18	13.1	Clay	1950's to 1970's	50%
		PVC	1970's to Present	50%
24	9.6	Cement	1970's to 1980's	90%
		PVC	1970's to Present	10%
27	8.1	Cement	1970's to Present	100%
30	2.1	Cement	1980's to Present	100%
33	0.8	Cement	1980's to Present	100%
36	3.5	Cement	1980's to Present	100%
48	1.8	Cement	1980's to Present	100%
54	0.8	Cement	1980's to Present	100%
Total Pipe	**707.8**			

Wastewater Collection System Lines

27" County Line trunk sewer main (cement pipe)

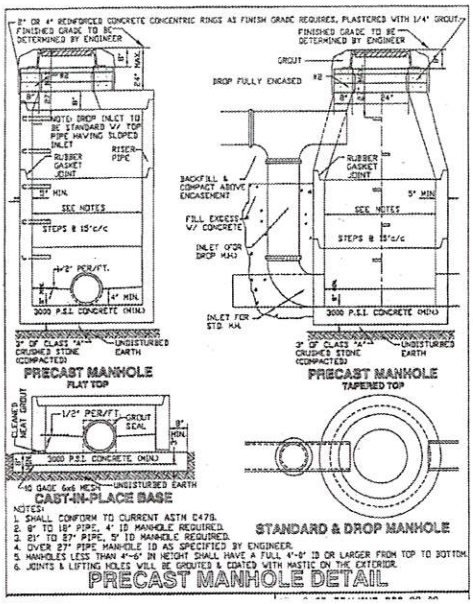
Any openings in the pipe becomes an entry point for stormwater.
Hydrogen Sulfide gas released in the sewer lines creates an ideal environment for corrosion of pipes and manholes.

Wastewater Collection System Lines

- Deterioration of the lines is primarily caused by H_2S gas corrosion and root intrusion
- Root mass allows debris build up resulting in sewer backups
- Deteriorated pipes allow storm water to flow into the sewer system and surcharges the WWTP
- Wet weather flows also increases treatment costs
- Roots in lines and storm water inflows also result in sewer overflows (SSOs)

Manholes in the Wastewater Collection System

- Manholes - 16,620 (estimated)
- Brick and concrete structures with metal Lid
- Provides access for maintenance
- Entry point for CCTV inspection
- Installed about every 300 – 500 ft. apart and at locations where the sewer line turns or joins another line or elevation change



Wastewater Manholes

A brick manhole showing loss of cement mortar

Kenwood Hills Subdivision

A concrete manhole with severe concrete corrosion

South of 121st St & west of 185th on County Line trunk sewer main

Wastewater Collection Lift Stations

- Currently 30 lift stations in the system
- The function of the lift stations are to collect and pump the wastewater, where the wastewater cannot flow by gravity directly to the treatment plant.
- Oldest station is about 42 years
- Several need to be refurbished ASAP to be made safe and reliable for O&M personnel
- Installation of a SCADA system utilizing the new 250ft WTP tower:
  - Will monitor the status (24/7) of all remote facilities [pump stations, tanks] and quickly alert personnel when there is a problem
  - Reduces the frequency of visits to the pump stations resulting in O&M cost savings [labor, fuel, etc.]
  - Resources can be better utilized elsewhere

SCADA – Supervisory Control and Data Acquisition

Wastewater Collection Lift Stations

Oneta Road Lift Station (1978)

Corroded pump mounting plate and control box

Deteriorated piping removed for inspection

Wastewater Collection Lift Stations

Adams Creek Lift Station (2005)

Leaking Valve has corroded pump

Easley Lift Station (1973)

Piping temporarily restrained as mounting brackets are corroded (unsafe condition)

Sanitary Sewer Overflows

Year	No. of SSO's	No. of Blockages
2013	47	96
2012	16	173
2011	5	123
2010	7	141
2009	7	131
2008	9	156
2007	22	170
2006	8	202
2005	6	204

Primary causes of SSO's are accumulation of grease and root mass.

Causes of SSO's & Blockages

- Root mass build up in sewer mains plugs the lines quickly
- Accumulation of fats, oils, greases (FOG) restricts the flow and causes a blockage to occur
- Debris in the lines pile up at low points in the line and in manholes resulting in sewer backups and overflows
- Surcharging of the lines occur as a result of inflow and infiltration (I&I) after storm events and causes manholes to overflow
- Pipe failures primarily occur due to root intrusions through pipe joints, H2S induced corrosion and structural failure due to ground settlement

Unauthorized Wastewater Discharge (SSO)

- Causes damage to the environment as raw sewage is discharged to the surrounding areas
- Leads to pollution of the waterways (streams, creeks & ponds)
- Results in fish kills, and destruction of other aquatic life
- Gets the attention of the media and environmental groups
- Causes backup into residences, businesses and private property
- Results in incurring cleanup costs, for damage to property and filing of tort claims against city
- Also attracts flies and other vectors and creates odor problem
- Mandate is all SSO's have to be reported to Oklahoma DEQ
- Frequent and large discharges has resulted in the issuance of Consent Orders with penalties by DEQ

Proactive Steps Being Taken To Maintain The Wastewater Collection System

- Continue multi year chemical root treatment program to mitigate the damage caused by roots in the lines
- Initiate a smoke testing program in older neighborhoods to locate bad pipe line segments and undertake spot repairs
- CCTV lines to investigate line segments with reported problems and locate pipe defects for spot repairs
- A combination vactor truck to vacuum out accumulated debris from manholes and lift stations
- A manhole inspection program to ID# the manhole, ascertain the condition of the walls, bench invert, frame and cover
- An aggressive public awareness campaign on the proper disposal of used fat, oil and grease and have progressive enforcement actions against commercial establishments that fail to comply
- Reduce the amount of I/I entering the sewer system by utilizing inspections, testing, repairs and rehabilitation

Proactive Steps for Sewer Maintenance

Sewer Vactor Truck

Snorkel attachment on truck will be used to vacuum out debris and solids from manholes and lift station wetwells and debris cleaning at wastewater plant

Smoke Test in Progress

Escaping smoke indicates numerous breaks in the sewer pipe

Wastewater Treatment Plant

Treatment Plant	% of Broken Arrow Flow	Average Daily Flow	Average Dry Weather Flow	Max Wet Weather Flow
Lynn Lane WWTP	51%	4.1 MGD	3.8 MGD	4.5 MGD
Haikey Creek WWTP	44.6%	11.3 MGD	10.6 MGD	24.0 MGD
North Side WWTP (CoT)	1.1%	0.1 MGD		

All Flows to the RMUA HCWWTP are measured and billed to Broken Arrow & Tulsa. Any corrective measures taken to reduce flow to Haikey Creek shall result in cost savings to Broken Arrow.
Average Flows at HCWWTP is 10.6 MGD including City of Tulsa Flows.
Broken Arrow discharges 47% of the flow to HCWWTP.

Lynn Lane Wastewater Treatment Plant (1960's)

Headworks Facility

Need to replace 2 screens, 3 sluice gates and roof

Grit Removal Facility

Need to replace roof and grit removal system

Haikey Creek Wastewater Treatment Plant (1976)

Headworks and Grit Removal Facility

Oxidation Ditches

Several significant improvements have been identified for the jointly owned plant and lift station

Summary -- staff has a long-term plan to better manage and preserve the city's assets!

1. Provision of reliable and dependable Water & Wastewater services is critical for the well being of this community. It affects the lives of every citizen we proudly serve.
2. In order to maintain continued economic growth and to sustain the health and well being of our citizens, much investment is needed to preserve the City's water and sewer infrastructure. Any delayed or deferred investment will result in further system deterioration and increased O&M costs.
3. Staff recommends the shifting from the cycle of reactive work and to being more proactive; by bringing a long-term perspective to managing and preserving the City's assets by implementing an effective asset management [AM] program. The benefits of an AM program gives us greater ability to plan and pay for future repairs and replacements

Summary - continued

4. Take an inventory of the Water & Wastewater systems, the buried appurtenances, update our maps and records, beginning with the oldest installation to identify the greatest needs in order of priority.
5. Staff is proposing:
   a) Utilizing technology and proven smart devices to conduct routine business more efficiently and at lower costs.
      i. Collect water consumption data from 36,000 plus water meters using drive by system technology.
      ii. Monitor remotely the 30 lift stations, 4 booster pump stations & tank levels using SCADA system, equipped with wireless radio system and the 250 ft. WTP Antenna.

Summary - continued

b) Staff is proposing funding for the phased Capital Improvement Projects. The CIP shall include:
   i. Construction of a new 2-3 MG elevated storage tank to help meet peak summer demands (26.9 MGD). [August 3, 2012]
   ii. A 50-year Water & Sewer lines replacement program be initiated with a goal of replacing 2% per year of an asset class.
   iii. An asset refurbishment program (water tanks, lift stations and plant equipment) to preserve the assets before it becomes less cost effective or beneficial to make any investment.
c) Staff is proposing funding for Capital Equipment purchases to initiate needed multi year maintenance programs including:
   i. A vactor truck to clean out manholes and wet wells
   ii. A valve exercise machine to locate and exercise all isolation valves in the water distribution system.

Questions

Thank you