



To: City Council Infrastructure Committee
From: Utilities Department
Subject: Update – WPCF Nutrient Reduction and Solids Facilities Plan
Date: August 16, 2016

Background:

The City of Cedar Rapids WPCF currently utilizes roughing filters followed by high purity oxygen activated sludge (HPOAS) for secondary treatment of organic waste and nutrients from their wastewater. Waste activated sludge developed by this process is thickened using gravity belt thickeners and sent to a low pressure oxidation (LPO) system for oxidation and destruction of solids. Remaining solids are dewatered using centrifuges and mixed with primary sludge. Primary sludge is thickened using dissolved air flotation thickeners and dewatered using belt filter presses. This combined solids stream is typically incinerated and the ash is ultimately disposed of in a landfill.

In 2006, the City completed a Master Plan Update for the WPCF and shortly afterwards began development of a more in-depth report looking into improvements to the solids handling and treatment facilities. In June of 2008, this effort was interrupted by a major flood event that overwhelmed the WPCF, resulting in significant process damage throughout the secondary and solids treatment facilities. Development of the Solids Facility Plan was put on hold for several years as the City dealt with the ramifications and repairs related to the flood. In 2011, with flood repairs and replacements still ongoing at the WPCF, the Solids Facility Plan was finalized and submitted. Since that time, the majority of the flood repair work has been completed.

Since the 2006 Master Plan Update was completed, a number of regulatory changes have been made or proposed regarding secondary and solids treatment facilities. These changes include the Iowa Nutrient Reduction Strategy, new MACT standards for air emissions from sewage sludge incinerators, land application loading rate changes, and others which were not considered as part of the 2006 or 2011 plans.

Project Description:

To meet these new regulatory requirements, the City seeks to update the portions of the 2006 and 2011 plans related to nutrient removal and solids handling and treatment to better reflect the changes that have taken place since these reports were last issued. The objective of the Project is to evaluate options for nutrient removal and solids treatment and handling at the WPCF.

Update:

A presentation to update the members of the Council Infrastructure Committee with efforts that are currently underway to prepare the WPCF for future changes in regulatory requirements regarding nutrient removal and solids handling and disposal. These new requirements could have a significant impact on how wastewater is treated and how solids are handled at the WPCF. The Utilities Department is currently in the process of completing this study with the assistance of HDR, Inc.. The final report will also serve as an update to the 2011 Solids Facilities Plan and of sections related to secondary treatment and solids handling in the 2006 WPCF Master Plan Update.

Requested time on agenda: 15 min



CEDAR RAPIDS

City of Five Seasons®

Water Pollution Control Nutrient Reduction and Solids Facility Plan



Why is This Important?

- Anticipating Significant Costs
 - Nutrients - Regulatory Driven
 - Solids - Age & Condition Driven
- Rate Impacts
 - Competing over next 5-10 years with other Enterprise Funds (Sanitary Sewer, Water, Solid Waste, Stormwater)
 - Significant contributions required for all customer groups
 - Maintain competitive advantage for future industrial opportunities
- Future Nutrient Treatment Capacity & Meeting Antidegradation Responsibilities
 - Ensure facility options for growth
- Efforts to Minimize Costs & Adverse Impacts
 - Watershed/Source Reduction
 - New Technology/Resource Recovery



Water Pollution Control Facility

- Constructed Late 1970s
- \$70 million at that time
- (\$670 million new today)
- ~\$70 million flood damage – 2008
- \$21 million flood protection – 2015
- Otherwise, \$8 - \$10 million annually
- Waste Strength Equivalent – 1.7 million people
- An Industrial Treatment Plant that Accepts Municipal Wastewater
- Catch All for Local Industry
- Wet, Odorous, Corrosive Environment



Study Objectives

1. Plan for **nutrient reduction** consistent with the Iowa Nutrient Reduction Strategy – Feasibility Study is first step due 2 years after NPDES is reissued.
2. Plan for **solids handling & treatment** that provides a reliable management strategy complimentary of liquid treatment
3. Plans that incorporate **sustainable, energy efficient** technologies

Working collaboratively

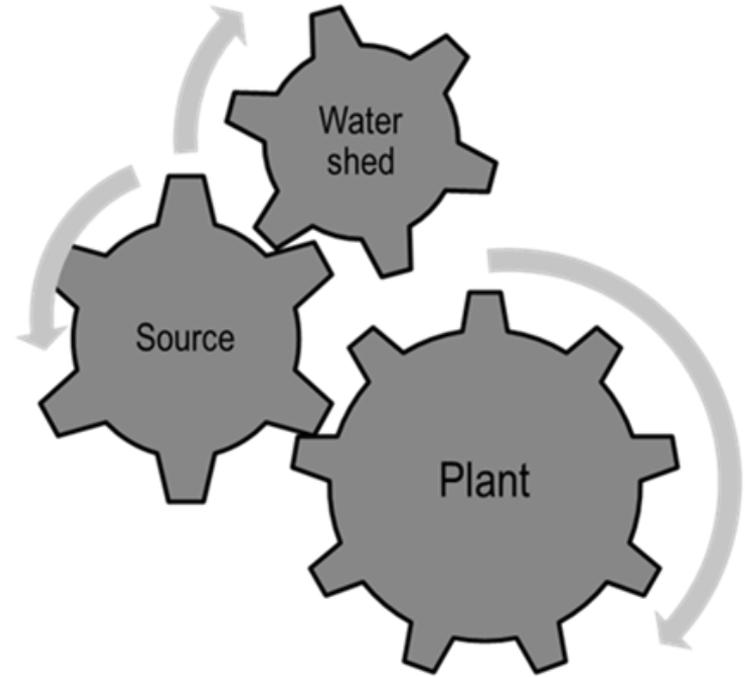
to develop a footprint for a sustainable future that can be supported by all, and maintains competitive rates.



Nutrient Reduction

Nitrogen & Phosphorus

- Current WPCF
 - Removals are Incidental
- Future (5 to 10 years)
 - 66% Nitrogen Reduction
 - 75% Phosphorus Reduction
- IDNR Estimates
 - Statewide ~\$1.5 billion in 20-year present value or \$114 million per year
 - IDNR Cedar Rapids ~\$70M to \$80M in 20-year present value (\$35M to \$41M capital)
- Our Prior Estimates >\$70 million capital (in 2005)
- Updated estimates pending



Solids Handling and Treatment

Current

- Incinerate & Landfill Ash (97 to 98%)
- Lime Stabilize & Land Apply (2 to 3%)
- Primary & Secondary Solids – 150,000 lbs/day
- Existing Technology (LPO & MHI Incineration) Nearly Obsolete
- Recently Spent \$9M on Incinerator / Pollution Control

Future?

- Our prior estimate \$70 to \$90 million (in 2012).
- Current estimate pending.

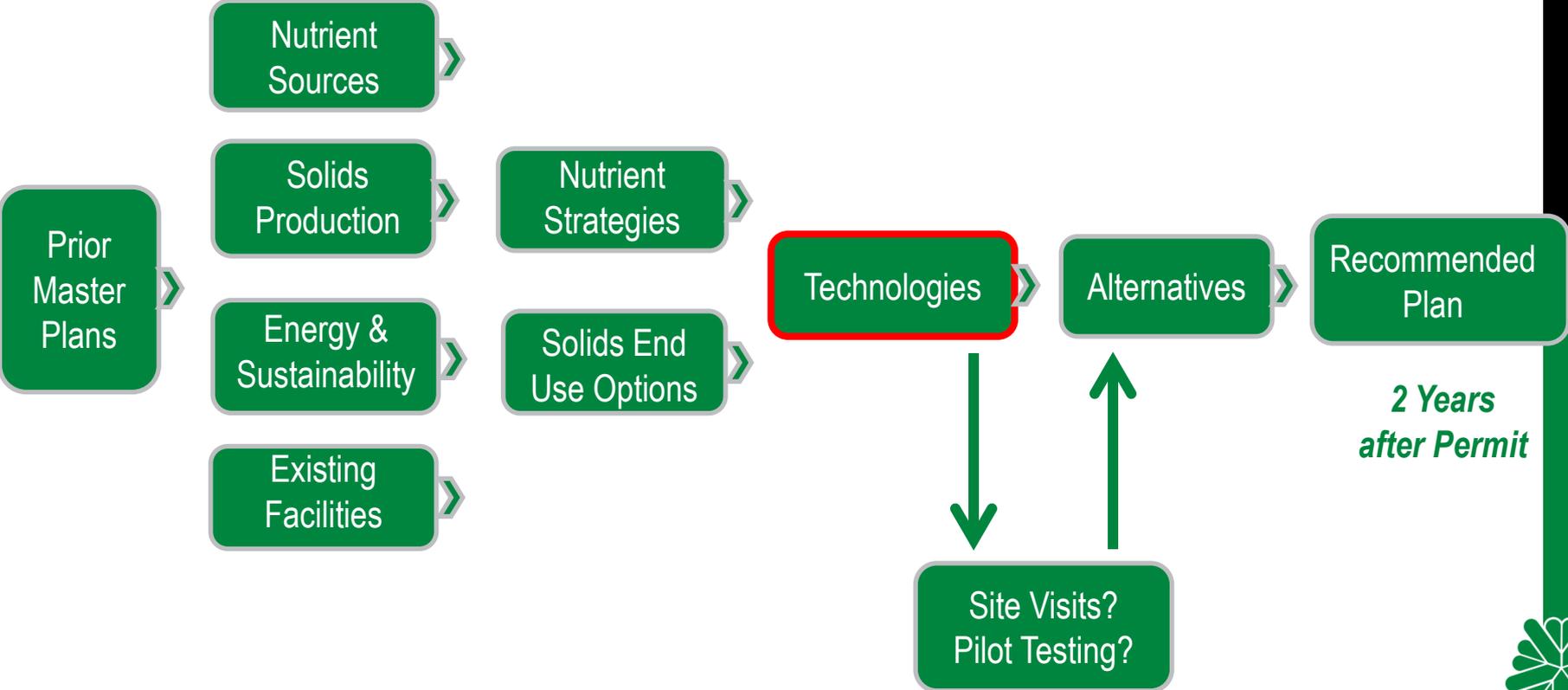


Screen Technologies with Energy & Sustainability in Mind

- Utility of the Future
 - Emerging Technologies
 - Resource Recovery
- Wastewater as a Resource
 - Reclaimed Water
 - Biogas, Fuel
 - Fertilizer
 - Soil Amendment



Approach

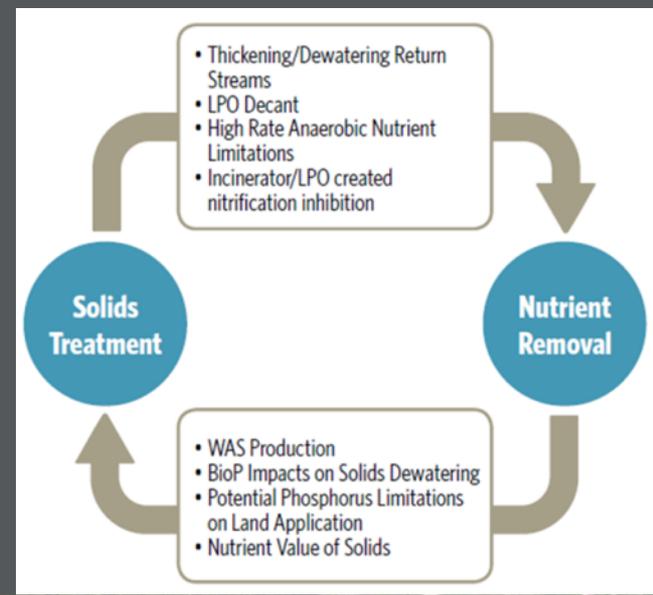


Discussion



Result

1. Plan for nutrient reduction
 2. Plan for solids handling & treatment
 3. Sustainable, energy efficient technologies
- Cost effective
 - Retains competitive advantage
 - Provides capability for Growth



WPCF Nutrient Sources

■ Total Phosphorus

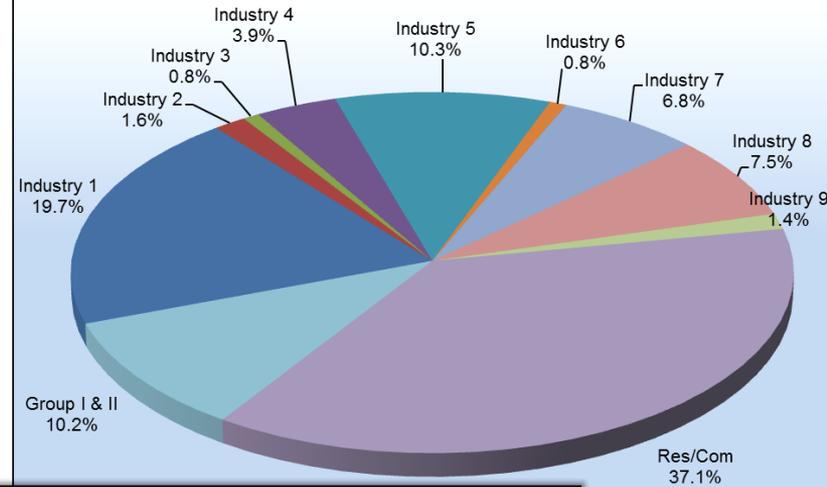
- 52.6% Group III Industries
- 6.0% Group I & II Industries
- 41.4% Residential / Commercial

■ Total Nitrogen

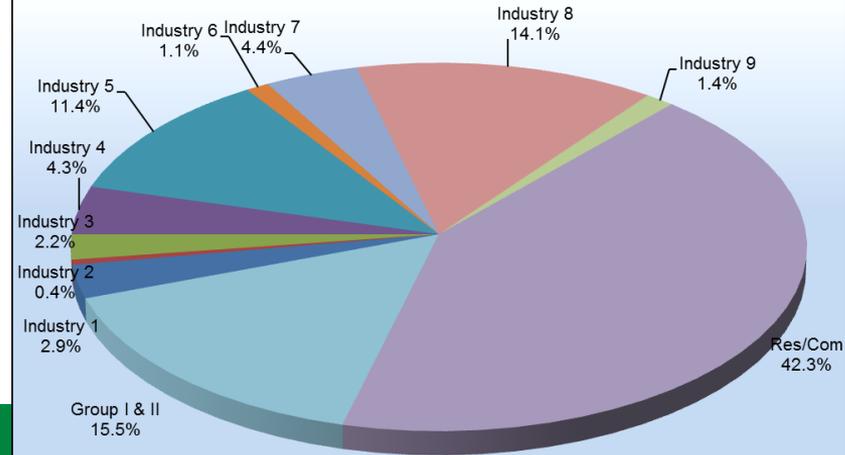
- 42.2% Group III Industries
- 29.5% Group I & II Industries
- 28.3% Residential/Commercial

Industrial Source Reduction?

TP Load Sources (2013-2015)



TKN Load Sources (2013-2015)



Watershed Nutrient Sources

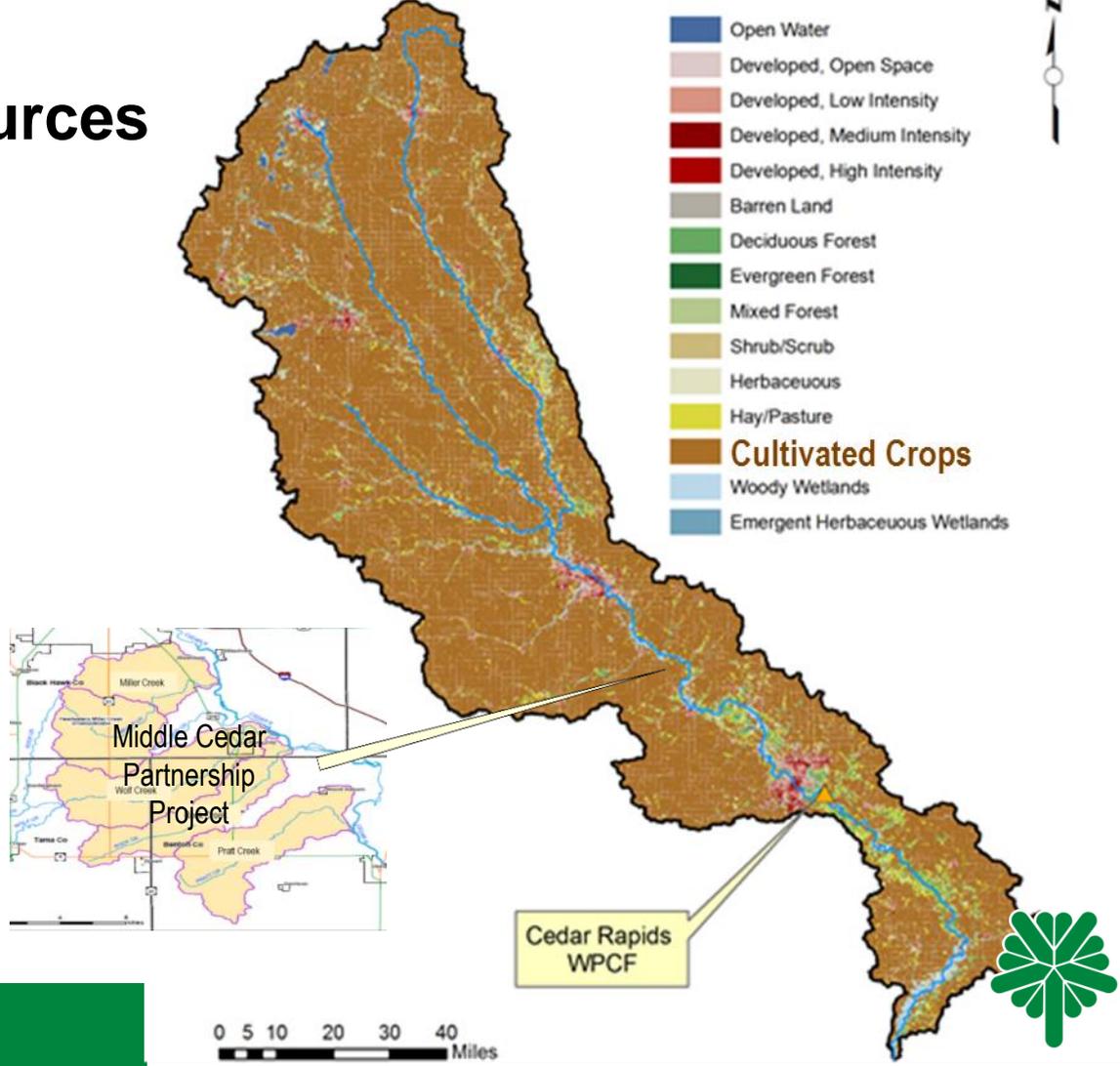
■ Nitrogen

- 65% Fertilizer & Manure
- 15% Atmospheric
- 14% Legume (Soybeans) Crops
- 6% Urban & Wastewater Treatment

■ Phosphorus

- 64% Fertilizer & Manure
- 23% Urban Areas & Wastewater Treatment
- 13% Channel Erosion

Watershed Source Reduction?



Solids Handling and Treatment

What Others are Doing

- Milwaukee MSD – Milorganite
- Omaha – Anaerobic Digestion & Land application
- Des Moines – Anaerobic Digestion & Land application
- Dubuque & Waterloo – Turn-key 3rd party land application
- Davenport – Anaerobic Digestion and Composting
- ADM Cedar Rapids - Cogeneration



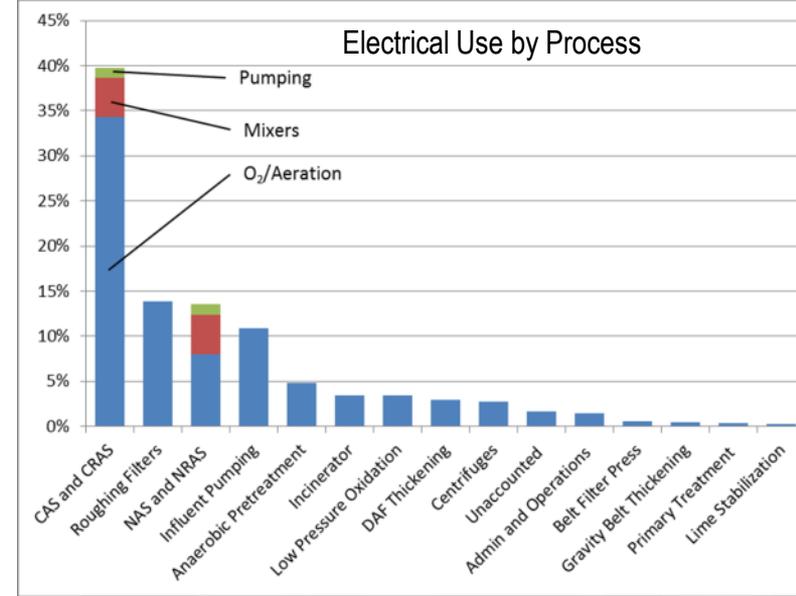
Photo by V. Jedlicka

Energy & Sustainability

Current

- Nearly ½ of City's Electric & Gas Consumption
- ~ 50 million kw-hr/per year @ \$2.25 million Electricity
- ~ 600,000 therms/per year @ \$0.5 million Natural Gas
- ~ 40,000 tonnes/per year Greenhouse Gas Emissions
- ~ 1,150,000 therms/per year Biogas Produced
- 140 million gallons/year @ \$0.25 million/year Water Usage

Future with Growth and Nutrient Requirements?





To: City Council Infrastructure Committee
 From: Sandy Pumphrey, PE / Dave Wallace, PE
 Subject: Recommendation – Adoption of Stormwater and Sanitary Sewer Masterplans
 Date: August 16, 2016

Background:

Final drafts of the initial updates to the Stormwater and Sanitary Sewer Masterplans have now been completed and reviewed by staff. Presentations on both master plans have been provided at previous Infrastructure Committee meetings, and feedback has been received.

A presentation will be provided on financial considerations for both masterplans.

Staff is requesting that the Infrastructure Committee make a recommendation to the full City Council for formal adoption of both masterplans.

Recommendations:

- For the full City Council to adopt the “2016 Stormwater Masterplan” for future implementation by staff.
- For the full City Council to adopt the “2016 Sanitary Sewer Masterplan” for future implementation by staff.

Preliminary Timeline and Next Steps:

- August 16, 2016 – Recommendation by Infrastructure Committee to adopt both masterplans
- September 27, 2016 – Presentation to full City Council and vote(s) to adopt both masterplans.
- Ongoing – Implementation of CIP projects outlined in both masterplans in accordance with prioritization criteria.
- 2017 to 2020 – Additional development of masterplans (4 years):

Stormwater	Sanitary Sewer
<ul style="list-style-type: none"> - Storm Sewer Service Plans - Watershed Basin Studies - Financial Needs and Funding - Asset Management - Capital Improvements Plan - Policy and Other Considerations 	<ul style="list-style-type: none"> - Sanitary Sewer Service Plans - Hydraulic Model Studies for Trunk Sewersheds - Automated Flow metering - I/I Reduction Studies - Asset Management - Capital Improvements Plan - Policy and Other Considerations

- 2021 (5 Years) – Comprehensive Update

Requested time on agenda: 10 min

Stormwater and Sanitary Sewer Financial Considerations

8/16/2016



Stormwater Funding

- New ERU System adopted May 24, 2016:
 - Anticipated FY17 Revenues: \$4.8M
 - Less FY17 Operations Expenses: -\$2.2M
 - Available for CIP: \$2.6M
 - Additional CIP Revenue (grant): \$0.1M
 - FY17 Total CIP Revenue: **\$2.7M**

- Total Potential Improvements: \$75 to \$100M

Stormwater Funding

Revenue Bond Scenario

- Issue \$5M revenue bonds per year for 20 years will require operating revenue to have an average increase of 7.1% each year for the next 20 years. Operating revenue will increase from \$4.8M to \$17.5M over the 20 year period. (This scenario assumes 3% interest rate for revenue bonds, operating expenses increasing no more than 5% per year, and bond covenant of 1.75).

Stormwater Funding

Revenue Bond Scenario

- Issue \$10M revenue bonds per year for 10 years will require operating revenue to have an average increase of 20% each year for the next 10 years. Operating revenue will increase from \$4.8M to \$23.9M over the 10 year period. (This scenario assumes 3% interest rate for revenue bonds, operating expenses increasing no more than 5% per year, and bond covenant of 1.75).

Stormwater Funding

- Considerations:
 - Impact of rate increases to large ERU customers (5 year phase-in schedule now)
 - Limited financial history for rating and selling revenue bonds
 - Effect of credit program and cost share/topsoil policy initiatives
 - Rate affordability when considering needs of other utilities

Sanitary Sewer Funding

- Sanitary Sewer:
 - FY17 User Fee Revenues: \$9.7M
 - Less FY17 Operations Expenses: -\$5.0M
 - Less Debt Service: -\$2.5M
 - Revenue for CIP: \$2.2M
 - Additional Other Revenue: \$1.1M
 - Revenue Bonds: \$2.4M
 - FY17 Total CIP Revenue: **\$5.7M**
- Total Potential Improvements: up to \$225M
 - dependent on effectiveness of I/I reduction efforts

Sanitary Sewer Funding Challenges

- Current Debt (\$2.5M debt service in FY17)
- Prairie Creek Trunk Sewer Remaining Needs: \$7.5M
- Minimum Annual Needs:
 - Pipe & MH Renewal at 1.25% per year: \$3.0M
 - I/I Reduction: \$1.0M
 - Indian Creek Trunk Sewer: \$0.5M
 - Other growth or service sewers: \$0.5 M to \$1.5
 - Total: \$5.0M to \$6.0M(Master Plan Identifies up to \$225M in potential improvements)
- FY17 CIP Revenue from Operations: \$2.2M

Stormwater and Sanitary Sewer Funding

- Recommendations
 - Stormwater: “Wait and See” approach to rate increases and/or utilization of revenue bonds
 - Sanitary Sewer: Consider above average rate increases
 - All Utilities: Comprehensive/integrated review of needs and rate scenario impacts on customer utility bill



To: City Council Infrastructure Committee
From: Doug Wilson, PE, Paving for Progress Program Manager
Subject: Update – Paving for Progress
Date: August 16, 2016

Background:

Monthly update intended to provide status Paving for Progress.

Project Description:

Update on PFP contractor constructed projects. Update on possible council agenda items.

Update:

Projects bid for contractor construction status:

- B Ave NW from Highland Dr to 8th St – On Schedule, work by Roosevelt Middle School Complete
- 74th St NE from White Ivy Pl to C Ave NE – On Schedule will be open mid-August
- Oakland Rd NE from H Ave to J Ave – Complete
- 29th St Dr SE from 1st Ave to Tama St – Work started, completion in spring 2017
- 14th Ave SE from 36th St to 42nd St – Work to start in 2017
- Park Pl NE from Council St to North Park Pl – Complete
- McCarthy Rd SE from west Van Vechten Park Rd to Memorial Dr SE – Work schedule e to be complete by late August
- 8th Ave SW from L St SW to 7th St SW – Project complete Mid-August
- Edgewood Rd NW from E Ave to F Ave – Project compete late August
- 42nd St NE from I-380 to Wenig Rd NE – On Schedule, work complete by Pierce Elementary and Kennedy High
- 7th St SE and 8th St SE from A Ave NE to 12th Ave SE, Ph 2 – In progress, completion October
- Northwood Dr NE from S/o Brookland Dr NE to 42nd St NE – Work to start in 2017
- West Post Rd NW from Plainview to E Ave – Complete
- West Post Rd NW from Gordon Ave NW to Plainview Dr NW – Start September 2015, partial completion in 2016
- Seminole Valley Rd NE from Fords Crossing Rd to 42nd St NE Phase 1 – Progress, work complete Late August or early September
- 42nd St NE from Edgewood Rd to Seminole Valley Rd – Work complete
- 1st Ave Bridge Over Cedar River Repairs – Deck Complete October, substructure, late spring 2017



Projects completed or to be completed in 2016 by City staff:

- Coral Ln SW from Cameo Ln to Eden Ln
- F Av NE from Estroy Dr to Old Marion Rd
- Hazel Dr NE, north intersection
- 3rd St SW from 16th Ave to 19th Ave
- Mansfield Avenue SE from 30th St to 31st St
- 7th Street SE from 10th St to 12th St
- Bramble Rd SW from 29th Ave to 33rd d Ave
- Burch Ave NW from 24th St to 19th St
- Cameo Ln SW from Pebble to 33rd Ave
- 34th St NE from 1st Ave to West of F Ave
- Carriage Dr SW from Bramble Road to Chapel Dr
- Chapel Dr SW from 29th Ave to Bayberry Dr
- Eden Ln SW from Bayberry Dr to 33rd Ave
- Bayberry Dr SW from Cameo Ln to Edgewood Rd
- F Ave NW from 4th Street to Ellis Blvd
- Madison St NE from Glass Rd to 29th St
- Pebble Dr SW from Chapel Dr to Bramble Rd

Three projects scheduled for 2017 and 2018 will have professional services agreements on the Council agenda for approval:

- Oakland Rd/ Old Marion Rd NE

Upcoming public hearing and bid opening:

- 66th Ave SW Improvement project, Phase I.
- 4th St SE RR Corridor Track Removals

Requested time on agenda: 5 minutes.



To: City Council Infrastructure Committee
From: Matt Myers
Subject: Update – Striping and Two-Way Conversions
Date: August 16, 2016

Background:

Traffic operations includes signals, roadway markings, and signage impacting pedestrian/cyclist movements, and traffic flow.

Project Description:

Striping of streets and two-way conversions.

Update:

Striping Program

Long-line striping. Long-line striping has completed 686,837 feet or 49% of the program. The crews will need to stripe approximately 77,000 feet per week to finish by the second week of October. We are utilizing overtime with the crew to accomplish this, and inquiring to increase seasonal staff through the rest of the summer.

School Crosswalks. We have finished over 200 Pedestrian crosswalks for schools from July through August. There are approximately 70 school crosswalks to finish with 55 of these located in the NE quadrant.

Two-way Conversions. We are adding the conversion of 3rd Avenue from Rushford to 6th Street to the CIP project scheduled for 2017. This is a change from the original schedule discussed in July. This parallel section of 2nd Avenue will be converted at the same time.

Railroad. No changes to report from last month.

Requested time on agenda: 5 min

Upcoming Utilities Department Projects Anticipated To Have Plans
and Specifications Filed – September, October, November
Report for Council Infrastructure Committee on 8-16-2016

Filing Plans and Specifications

Water and WPC Plant Projects

Filing August 9 – Raw Water Main Relocation (6250044). The Low Lift Pump Station near Mohawk Park served as the source of water for the City of Cedar Rapids prior to the early 1960's, when alluvial wells replaced direct surface water. The Low Lift Pump Station has been out of service for decades. The building has been degrading, and is to eventually be demolished. The Utilities Department intends to disconnect and plug the pipes connecting the pump station to the 30-inch raw water intake main, and construct a new raw water line to bypass the Low Lift Pump Station structure. The Engineer's opinion of probable cost is currently \$670,000.

Filing September 13 – WPCF Sludge Screen Replacement (615212). The existing primary sludge screen at the WPCF is undersized for some loading conditions, lacks redundancy, and has reached the end of its expected life. The project will include the installation of a new screen and associated appurtenances. The existing screen will be left in place to serve as a backup unit to the new screen. The Engineer's opinion of probable cost was \$1,056,000 at the 90% design stage.

Water Main Projects

The following water main work has been planned in conjunction with Paving for Progress projects or other Public Works projects. Bid Dates:

August 24 – 3012129 / 2016040 66th Ave SW from Locust Rd SW to 6th St SW (Ph-1) Utilities Water Main Replacement Construction Budget: \$690,000

Sept. 28 – 3012155 / 2016041 3rd Ave SW from 6th Street SW to 1st Street SW (PfP) Water Main Replacement Construction Budget \$191,000

Upcoming Public Hearings

August 23 – Raw Water Main Relocation
September 27 – WPCF Sludge Screen Replacement

USGS Aquifer Study Update

Two contracts with the US Geological Survey–Department of Interior for assistance with the Airborne Electromagnetic Survey of the alluvial aquifer will be on the consent agenda at the August 23 Council meeting. One contract is with the Iowa City office, the other is with the Rapid City, South Dakota office. Total value of the effort is \$300,437 of which the City will fund \$177,876 over FY17 and FY18. The cost of the AEM fly over is estimated at \$160,000 which is yet to be contracted for.