

INFRASTRUCTURE CONDITION CITY OF MILWAUKEE 2011

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Acknowledgements

Mayor
Council
Committee
Dept Personnel

Executive Summary

Key Findings

Recommendations

Introduction

Purpose of the Capital Improvement Plan

Role of the Capital Improvements Committee

Goals and Objectives of the Committee

Fiscal Policy

Summary of the funding and debt policies used to establish the capital budget.

Methodology

Summary of the process used to capture and evaluate condition data

Overview of Infrastructure Reports

The following sections will be included for each type of infrastructure:

Intro/Background/History

- Description of the infrastructure
 - Function
 - Importance
 - Current replacement value
 - Estimated useful life
 - etc
- Key dates, ordinances policies etc that affected the infrastructure
- Departmental goals

Key Issues – Challenges & Opportunities

Inventory of Existing Asset

Summary of the asset using appropriate measures

- Number
- Size
- Age
- Etc

Description of Measurement and Performance Criteria

- Summary of the process used to determine the condition of the asset
- Evaluation of the effectiveness of the measure
- Cost/benefit analysis of improving the effectiveness of the performance measure

Program Information and Project Selection

- Summary of the process used to select and prioritize infrastructure projects.

Current Condition of Assets

- Summary of the current condition of the assets.

Asset Trends

- Summary of trends in asset condition as observed within the city, and as reported on the state and national level.
- Comparisons with other municipalities as appropriate or available.
- Analysis of other changes in assets:
 - Size
 - Value

Factors that Affect Condition

- Summary of specific factors that may have an impact on infrastructure condition.
- Cost/benefit analysis of opportunities to mitigate negative factors and leverage positive ones.

Preservation Efforts

Preventative Maintenance

- Quantitative and qualitative summary of any preventative maintenance performed including:
 - Type
 - Frequency
 - Cost
 - Criteria used to determine when maintenance is necessary/feasible
 - Identification of new technologies that are being (or may be) used to extend the life of the infrastructure
 - Cost savings (or potential cost savings) of new technologies

Work Accomplished

- Summary of actual results in each of the last 10 years

Funding Level & Sources

- Summary of the budgeted amounts that support this infrastructure
 - Historic (10 years)
 - Projected (6 years)

Life Cycle Calculations

Based on historic and projected efforts, this section will estimate the number of years between complete replacement for infrastructure within the system. Estimates will be calculated for 3 historic periods (1 yr, 3 yrs, 10 yrs) and one projected period (6yrs). This section will also attempt to explain significant differences between calculated life cycles and estimated useful life.

Progress from Previous Report (to be added in 2012)

Summary/Conclusion

- Describe the adequacy of the current replacement and maintenance efforts.
- Identify recommended policy and / or funding changes.
- Highlight any important points or key issues.

Infrastructure Reports

Transportation

Overview

Summary of the transportation system

- Purpose
- Importance
- Components

Bridges

Intro/Background/History

- Bridges are critical links that make mobility and commerce possible
- Bridge system is being used more frequently and heavily every day.
- The state of Wisconsin generally defines a bridge as any structure spanning 20 feet or more that carries motor vehicle traffic.
- The city's bridge inventory contains structures which do not meet the state definition of a bridge.
- Current replacement value =
- The estimated useful life of a bridge can be broken down into two components, the bridge structure and the bridge deck. The estimated useful life of a bridge's structure is 50 years and the estimated life if its deck is 40 years.
- Number of bridges in the city and the distribution of responsibility
- Average cost per SF to replace each type of bridge

Key Issues – Challenges & Opportunities

- Railroad bridge maintenance?
- Increased truck traffic

Inventory of Existing Asset

- Number of bridges
- Number of bridges by type
- Average Age (total and by type)
- Bridge Construction by year
- Length (total, average, by type)
- SF of bridge deck (total, average, by type)

Description of Measurement and Performance Criteria

- Summary of Sufficiency Rating System

Program Information and Project Selection

- Summary of Local Bridge Improvement Assistance Program

Current Condition of Assets

(as of 2-27-08)

Series		>80	80-50	<50	Rated	Unrated	Total
100	Milwaukee River	1	12	3	16	2	18
200	Kinnickinnic River	13	16	3	32	5	37
300	Menomonee River	16	8	1	25	1	26
400	Little Menomonee River	5	3	1	9	1	10
500	Lincoln Creek	9	12	0	21	0	21
600	Honey Creek	3	4	0	7	1	8
700	Oak Creek	0	1	0	1	1	2
800	Union Pacific Railroad	2	14	0	16	5	21
900	Canadian Pacific Railroad	8	5	2	15	1	16
1000	Pedestrian	0	0	0	0	11	11
1100	Miscellaneous	3	0	2	5	2	7

	Total	60	75	12	147	30	177
	% of Rated Bridges	40.82%	51.02%	8.16%			

Asset Trends

- Since 1987 sufficiency ratings for city bridges have improved significantly
- Aging structures is a nationwide problem

Factors that Affect Condition

- bridge type
- bridge design
- traffic usage
- environmental factors such a salt usage
- bridge materials
- maintenance schedule

Preservation Efforts

Preventative Maintenance

Work Accomplished

- Number of bridges replaced, rehabilitated and removed in each of the last 10 years

Funding Level & Sources

Life Cycle Calculations

The City's bridge system includes approximately _____ square feet of bridge deck. If the estimated useful deck life is 40 years, the City would need to replace _____ square feet of decking each year in order to maintain the bridge system in adequate condition.

Implied Replacement Cycle based on

	# of bridges replaced	Sq Ft of deck replaced
Optimal	_____ years	_____ years
Last Year	_____ years	_____ years
3 year Average	_____ years	_____ years
10 year Average	_____ years	_____ years
Projected 6 year average	_____ years	_____ years

It should be noted that the implied replacement cycles can be misleading. They falsely assume that facilities were built uniformly over time and that they are uniform in size and construction.

Summary/Conclusion

Paving

Streets

Intro/Background/History

- Purpose = efficient, safe means of transportation
- Road life system
- Vehicle Tax (might be opportunity)

Key Issues – Challenges & Opportunities

- Funding
- Past construction patterns
- Backlog of streets in poor condition
- ARRA

Inventory of Existing Asset

- Miles of streets
 - By function (principal arterial, minor arterial, collector, local)
 - By pavement type (Concrete, asphalt, macadam)
 - By responsibility (state, county, city, private)

Description of Measurement and Performance Criteria

- Summary of PQI system
-

Program Information and Project Selection

- Importance of programmatic control

Current Condition of Assets

- Age of streets
 - By function
 - By pavement type
- Miles of streets in poor, fair and good condition
 - By function
 - By pavement type

Asset Trends

Factors that Affect Condition

- Materials
- Design
- Age
- Traffic loads
- Weather conditions
- Change in purpose / use
- Amount of maintenance

Preservation Efforts

Preventative Maintenance

- Crackfilling
- Sealing

Work Accomplished

- Miles of streets reconstructed with concrete
- Miles of streets reconstructed with asphalt
- Miles of streets resurfaced with asphalt

Funding Level & Sources

Life Cycle Calculations

- Summary of pattern of pavement deterioration

Summary/Conclusion

Alleys

Intro/Background/History

- Purpose = to provide access to the rear of residences and commercial properties
- Few constructed during the Depression and WWII
- Can provide stimulus to a neighborhood
- Exist in isolation – not really part of an overall system

Key Issues – Challenges & Opportunities

- Funding
- Property owner resistance
- Backlog of alleys in poor condition

Inventory of Existing Asset

- Miles of alleys
- Number of alleys
- Number of parcels with alley access

Description of Measurement and Performance Criteria

Program Information and Project Selection

- Project selection
 - Inspection by Street Maintenance
 - Citizen complaints
 - ASR
- Importance of programmatic control

Current Condition of Assets

- Age of alleys
- Miles of alleys poor, fair and good condition

Asset Trends

- Alley construction increased steadily from 1978 – 1983
- Construction was constant from 1983 - 1987

Factors that Affect Condition

- Materials
- Design
- Age
- Weather conditions

Preservation Efforts

Preventative Maintenance

- Crackfilling

Work Accomplished

- Miles of alley reconstructed with concrete
- Number of alleys reconstructed with concrete
- Miles of alleys resurfaced with asphalt
- Number of alleys resurfaced with asphalt

Funding Level & Sources

Life Cycle Calculations

Summary/Conclusion

Sidewalks / Pedestrian Network

Intro/Background/History

- Purpose = reduce intermodal conflicts
- Prior to 1958 constructed 6' wide
- Prior to 1960 required on both sides of street?
- 1963 began walk replacement program (p63)
- Variation in width makes accurate square footage difficult
- Walk replacement allowed without public hearing because it corrects a defective condition
- Number of people who use public transit
- Number of people/households who don't have a vehicle
-

Key Issues – Challenges & Opportunities

Inventory of Existing Asset

- Miles of sidewalk
- Number and miles of pedways

Description of Measurement and Performance Criteria

- Accidents / injury claims
 - Frequency
 - Cost
- Much deterioration is independent of age
- Walk is replaced for many reasons besides condition

Program Information and Project Selection

Current Condition of Assets

- Percentage of walk with defective conditions
 - Worn
 - Cracked
 - Settled
 - Raised

Asset Trends

Factors that Affect Condition

- Trees
- Utility work

Preservation Efforts

Preventative Maintenance

Work Accomplished

- Number of walk replacement contracts
- Square yards replaced by sidewalk replacement
- Square yards replaced by city forces
- Square yards replaced by paving and other infrastructure projects

Funding Level & Sources

Life Cycle Calculations

Summary/Conclusion

Bicycle Network

Intro/Background/History

Key Issues – Challenges & Opportunities

Inventory of Existing Asset

- Miles of bike lanes
- Mile of off road bike trails
 - Total
 - Maintained by the City
- Number of bike racks
- Other bike facilities

Description of Measurement and Performance Criteria

Program Information and Project Selection

Current Condition of Assets

- Miles of bike lane that need replacement/repainting
- Number of bike racks that need replacement

Asset Trends

Factors that Affect Condition

-
-

Preservation Efforts

Preventative Maintenance

Work Accomplished

- Number of bike racks installed
- Number of bike racks replaced
- Mile of new bike lanes
- Mile of bike lanes replaced
- Miles of new off road trails
- Mile of off road trails replaced
- Other bike facilities constructed
- Other bike facilities replaced

Funding Level & Sources

Life Cycle Calculations

Summary/Conclusion

Street Lighting

Intro/Background/History

- Purpose – improve traffic safety and reduce crime
- Function – provide lighting in a cost effective and aesthetically pleasing manner
- Alley lighting system purchased from WEPCO in 1983 (\$590,000)

Key Issues – Challenges & Opportunities

- Rapid technological advances (obsolescence precedes physical deterioration)
- Compliance with changing standards

Inventory of Existing Asset

- Number/amount of
 - Fixtures
 - Poles
 - Brackets
 - Luminaries
 - Substation
 - cable
- Amount of
 - Center and lane lines
 - Crosswalks
 - Bike lanes

Description of Measurement and Performance Criteria

- Lumens per watt for each type of lamp
- Percent of system in conformance with minimum lighting levels

Program Information and Project Selection

- Information from maintenance personnel
- Circuit problems
- Aldermanic and citizen requests
- Traffic and pedestrian safety considerations
- Crime reports
- Paving related

Current Condition of Assets

Asset Trends

Factors that Affect Condition

- Winter ground conditions
- Weather

Preservation Efforts

Preventative Maintenance

- Group lamp replacement

- Lens cleaning
- Substation maintenance

Work Accomplished

- Number of lamps installed
 - New
 - Replaced
- Number of poles installed
 - New
 - Replaced
- Amount of cable installed
 - New
 - Replaced

Funding Level & Sources

Life Cycle Calculations

Summary/Conclusion

Traffic Control

Intro/Background/History

- Description of MUTCD – Revised
- Computerized sign inventory (1977?)

Key Issues – Challenges & Opportunities

- Compliance with changing standards

Inventory of Existing Asset

- Number/amount of
 - signs (by type of sign)
 - signal standards
 - signal controllers
 - control cabinets
 - cable
 - signalized intersections
- Amount of
 - Center and lane lines
 - Crosswalks
 - Bike lanes

Description of Measurement and Performance Criteria

- Compliance
- Accident trends
- Congestion / delays
- Travel times

Program Information and Project Selection

Current Condition of Assets

- Average age of
 - signs (by type of sign)
 - signal standards
 - signal controllers
 - control cabinets
 - cable
 - painted markings
- percent compliant
 - signs
 - signals
 - pavement markings

Asset Trends

Factors that Affect Condition

- Age
- Damage

- Vandalism
- Theft

Preservation Efforts

Preventative Maintenance

- Group lamp replacement
- Lens cleaning

Work Accomplished

- Number of signalized intersections
 - New
 - Replaced
- Number of signs installed
 - New
 - Replaced
- Number of control cabinets
 - New
 - Replaced

Funding Level & Sources

Life Cycle Calculations

Summary/Conclusion

Sewers and Stormwater Management

Intro/Background/History

- Description of the infrastructure
 - Function
 - Importance
 - Current replacement value
 - Estimated useful life
 - Other Info
- MMSD
- Status of 1976 inventory
- Status of 1985 sewer exam initiative
- Impact of NR 151
- Departmental Goals

Key Issues – Challenges & Opportunities

- Recent flooding
- I/I
- Federal Regulations

Inventory of Existing Asset

Facility	Quantity
Sanitary Sewers	_____
Storm Sewers	_____
Combined Sewers	_____
Total	_____
Storm Inlets	_____
Cash Basins	_____
Manholes	_____
Drainage Channels	_____
Lift Stations	_____
Bypass Pumps	_____

Distribution of sewers by:

- Age
- Material
- Diameter
- Condition

(maybe put this info in condition section)

Description of Measurement and Performance Criteria

Summary of

- Closed circuit television exams
- Hydraulic computations
- Rating Index (1-100)
- NASSCO Rating System?

Program Information and Project Selection

Current Condition of Assets

Asset Trends

Factors that Affect Condition

- Age
- Stress factors
- Size
- Composition
- Break pattern
- Soil condition
- Technological changes
- Changes in standards

Preservation Efforts

Preventative Maintenance

Work Accomplished

Funding Level & Sources

Life Cycle Calculations

The City's sewer system includes approximately _____ miles of sanitary sewer, ___ miles of storm sewer and _____ miles of combined sewers. . If the estimated useful life of each type is ___ years, the City would need to replace _____ miles each year in order to maintain the sewer system in adequate condition.

Implied Replacement Cycle

	Sanitary	Storm	Combined
Optimal	_____ years	_____ years	_____ years
Last Year	_____ years	_____ years	_____ years
3 year Average	_____ years	_____ years	_____ years
10 year Average	_____ years	_____ years	_____ years
Projected 6 year average	_____ years	_____ years	_____ years

It should be noted that the implied replacement cycles can be misleading. They falsely assume that facilities were built uniformly over time and that they are uniform in size and construction.

Summary/Conclusion

Water

Water Distribution

Intro/Background/History

- 3 phase project
 - Profile of system
 - Failure information
 - Develop survivor curves
- Description of system components (feeder and distribution mains, hydrants valves, blowoffs, meters, service connections)

Key Issues – Challenges & Opportunities

- Meter replacement project
- PSC rate issues

Inventory of Existing Asset

- Miles of
 - Feeder mains
 - Distribution mains
- Number of
 - Hydrants
 - Valves
 - Blowoffs
 - Meters
 - Service connections

Description of Measurement and Performance Criteria

Program Information and Project Selection

Description of water main break experience record

Current Condition of Assets

Asset Trends

Factors that Affect Condition

- Weather / frost
- Materials
- Pipe length
- Chlorides

Preservation Efforts

Preventative Maintenance

Work Accomplished

Funding Level & Sources

Life Cycle Calculations

The City's sewer system includes approximately _____ miles of feeder mains, and _____ miles of distribution mains. If the estimated useful life of each type is ____ years, the City would need to replace _____ miles each year in order to maintain the water distribution system in adequate condition.

It should be noted that the implied replacement cycles can be misleading. They falsely assume that facilities were built uniformly over time and that they are uniform in size and construction.

Summary/Conclusion

Water Treatment

Intro/Background/History

- Explanation of enterprise fund
- Population, geographic area and municipalities served
- Plant capacities
- Pumping and storage capacities
- Explanation of pressure districts
- Maximum & minimum daily demand

Key Issues – Challenges & Opportunities

- PSC rate issues
- Technological obsolescence

Inventory of Existing Asset

- Number of
 - Plants
 - Pumping stations
 - Other facilities

Description of Measurement and Performance Criteria

Program Information and Project Selection

Current Condition of Assets

Asset Trends

Factors that Affect Condition

Preservation Efforts

Preventative Maintenance

Work Accomplished

Funding Level & Sources

Life Cycle Calculations

Summary/Conclusion

Facilities & Support Services

Buildings

Intro/Background/History

Key Issues – Challenges & Opportunities

Inventory of Existing Asset

Description of Measurement and Performance Criteria

Program Information and Project Selection

Current Condition of Assets

Asset Trends

Factors that Affect Condition

Preservation Efforts

Preventative Maintenance

Work Accomplished

Funding Level & Sources

Life Cycle Calculations

Summary/Conclusion

Parking

Intro/Background/History

- Function
 - To discourage long term parking by employees and area residents and leave space for patron
 - To create off street parking to facilitate snow removal

Key Issues – Challenges & Opportunities

Inventory of Existing Asset

Summary of the asset using appropriate measures

- Structures
 - Number of structures
 - Number of parking spaces
- Surface lots (temporary, permanent, employee)
 - Number of lots
 - Number of parking spaces
- Number of parking meters
 - on street
 - off street
- Kiosks
 - Number
 - Number of spaces

Description of Measurement and Performance Criteria

Program Information and Project Selection

Current Condition of Assets

Asset Trends

Factors that Affect Condition

- Weather
- Salt usage
- Maintenance
- Vehicle usage
- Design
- Construction materials
- Sealing
- Drainage

Preservation Efforts

Preventative Maintenance

- Painting
- Pavement sealing
- Patching
- Mechanical system cleaning
- Flushing
- Snow removal
- Meter maintenance

Work Accomplished

- Area resurfaced
- New construction
- Parking spaces (new & replaced)
- Meters (new & replaced)

Funding Level & Sources

Life Cycle Calculations

Summary/Conclusion

Recreational Facilities

Intro/Background/History

- Effect of changing use patterns

Key Issues – Challenges & Opportunities

Inventory of Existing Asset

- Number and area of
 - Playfields
 - Playgrounds
 - Play areas
 - Play lots
 - Tot lots
 - Comfort stations
 - Field houses
 - Recreation centers
 - Passive areas
 - Green spaces
- Amount of
 - Pervious Surface
 - Impervious Surface
- Equipment inventory??
 - Swings
 - Slides
 - etc

Description of Measurement and Performance Criteria

Program Information and Project Selection

Current Condition of Assets

- Percentage of facilities that are ADA compliant

Asset Trends

Factors that Affect Condition

- Weather
- Vandalism
- Theft

Preservation Efforts

Preventative Maintenance

Work Accomplished

Funding Level & Sources

Life Cycle Calculations

Summary/Conclusion

Underground Conduit

Intro/Background/History

- Effect of changing use patterns

Key Issues – Challenges & Opportunities

Inventory of Existing Asset

- Miles of conduit by
 - Size
 - Type (Communication, traffic control, street lighting)
 - Material
- Number of manholes (active and inactive) by
 - Size
 - Type (Communication, traffic control, street lighting)
 - Material

Description of Measurement and Performance Criteria

- Number of manholes flooded
- Time out of service
- Cable capacity

Program Information and Project Selection

Current Condition of Assets

Asset Trends

Factors that Affect Condition

- Environmental conditions
 - Chemical properties of soil
 - Freeze / thaw cycles
 - Roadway surface conditions
- Size
- Composition
- Changes in design standards
- Changes in construction standards

Preservation Efforts

Preventative Maintenance

Work Accomplished

Funding Level & Sources

Life Cycle Calculations

Summary/Conclusion

Urban Forestry

Trees

Intro/Background/History

- Benefits of an urban forest
 - Energy conservation
 - Storm water reduction – (Estimated at 22% in 1996 by American Forests)
 - Air quality improvements
 - Carbon storage
 - Economic benefits
 - Quality of life
- Description of tree production
- Summary of Forestry studies done
- Milwaukee Urban Forestry Initiative
- Awards
 - Apr 20, 2010 City of Mequon and City of Milwaukee representatives and We Energies, winners of the Innovations in Urban Forestry Award for their collaboration and innovative use of hyperspectral imagery to develop a comprehensive ash tree canopy map for use in the two communities EAB readiness planning.
 - Tree City USA" designation for the 30th consecutive year (Arbor Day Foundation) — awarded to the City of Milwaukee for having a tree board or department, a tree care ordinance, a comprehensive community forestry program and an Arbor Day observance
 - "Tree City USA" Growth Award – City of Milwaukee for demonstrating progress in its community forestry program through improved education and public relations, planning and management, and tree inventory and analysis.
- Goals
 - 98% street tree stocking level
 - Improve street tree diversity

Key Issues – Challenges & Opportunities

- Emerald Ash Borer
- City spaces are planted at 98% capacity. To increase canopy need to pursue growth/diversity on private and other public land

Inventory of Existing Asset

Number of trees

- Total
- By species
- By size
- By age

Percentage of canopy cover

Description of Measurement and Performance Criteria

Program Information and Project Selection

Current Condition of Assets

- Condition of trees
 - By species
 - By size
 - By location?
- Analysis of the effect of Emerald Ash Borer
- Analysis of reasons for removal
 - Emerald ash borer
 - Storm damage
 - Paving
 - Other

Asset Trends

- Tree inventory seems to be decreasing
- Is canopy increasing or decreasing?

Factors that Affect Condition

- Restricted space
- Drought
- Pollution
- Salt
- Mechanical injury
- Vandalism
- Insects and disease

Preservation Efforts

Preventative Maintenance

- Pruning
- Disease & Insect Control
- Surgery
- Fertilization
- Root Control
- New Tree Watering /Post Planting Maintenance

Work Accomplished

- Trees produced
- Trees planted (total and by species)
- Trees Removed
- Extent of backlog

Funding Level & Sources

Life Cycle Calculations

Summary/Conclusion

Boulevards

Intro/Background/History

Key Issues – Challenges & Opportunities

Inventory of Existing Asset

- Size of the boulevard system
 - Number of areas maintained
 - Length
 - Area
 - Number of beds
 - Annual
 - Perennial
- Number of trees and shrubs in the boulevard system (only trees not counted in street tree inventory)
- Other landscaped areas
 - Number
 - Area
 - Type (green space, plaza, other public space etc)
- Irrigation system
 - Size
 - Components

Description of Measurement and Performance Criteria

Program Information and Project Selection

Current Condition of Assets

Asset Trends

Factors that Affect Condition

- Amount of Snowfall
- Salt Usage
- Weather conditions
- Damage
 - Traffic
 - Vandalism

Preservation Efforts

Preventative Maintenance

Work Accomplished

- Summary of actual results in each of the last 10 years

Funding Level & Sources

Life Cycle Calculations

Progress from Previous Report (to be added in 2012)

Summary/Conclusion

Port of Milwaukee

Intro/Background/History

Key Issues – Challenges & Opportunities

Inventory of Existing Asset

Description of Measurement and Performance Criteria

Program Information and Project Selection

Current Condition of Assets

Asset Trends

Factors that Affect Condition

Preservation Efforts

Preventative Maintenance

Work Accomplished

Funding Level & Sources

Life Cycle Calculations

Summary/Conclusion

Best Practices??

Glossary

Appendices / Charts / Calculations

Replacement Values for all categories of assets

Value of assets per parcel/property

Daily household cost for maintaining infrastructure

Comparison to national data (ASCE report card)

Map of Combined Sewer Areas