#### MONETIZING AND SPATIALLY REPRESENTING THE IMPACT OF FAILING WATER MAIN INFRASTRUCTURE



Presented By:

Andy Simpson Keith Burdette



Wednesday, April 25<sup>th</sup> 2:15pm – 2:45pm Room #317

# INTRODUCTION

- What is the TW Economic Model?
- GIS Analysis Inputs
- Automated Data Analysis using ESRI Model Builder
- GIS Model Outputs and their visualization
- Multiple Asset Decision Module





#### WHAT IS THE TACOMA WATER ECONOMIC MODEL?

- Conceptually, it's a planning tool that helps Tacoma Water System Engineers and Planners to make better more informed decisions when deciding:
  - When is the best time to replace an Asset?
  - How an Asset is replaced?
  - Where the Asset is replaced?

#### • Known Asset Characteristics Are Evaluated Such As:

- Age of the Asset
- Pavement Type
- Location in the System
- o Size
- Soil Conditions
- o Length
- Services Impacted
- Many Other Attributes
- Each Asset Is Examined and Scored Based on a Complex Set of Parameters
- Spatially Represent Potential Future Infrastructure Failures and the Costs associated with those failures
- Ultimately, this tool helps us build a better Construction Improvement Programs or CIPs







### WHAT IS THE TACOMA WATER ECONOMIC MODEL?

More Specifically:

- The model itself is an Excel based tool comprised of 2 workbooks
- First Workbook Interacts with Tacoma Water's GIS through a series of spatial questions and creates a profile for each asset
- <u>Second Workbook</u>, called the Multiple Asset Decision Module or MAD Module Allows end users to evaluate optimal replacement timing for a group of specific main segments into a Project
- <u>GIS Analysis</u> + <u>Unique Project Parameters</u> = Economic Modeled Project Results
- End User can make adjustments to the input parameters for specific circumstances that are unique to individual projects
- Publish the Project Results to the GIS System





#### WHAT IS THE TACOMA WATER ECONOMIC MODEL?

#### Geodatabase

GIS Pipe Network Dataset







For Each Pipe:





#### **GIS ANALYSIS WITH ESRI MODEL BUILDER**



TECOMA SUBLIC UTILITIES.

#### **GIS ANALYSIS SERVICE IMPACT COUNT**

#### **Network Trace**

TACOMA WATER



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### SPATIAL ANALYSIS RESULTS IN EXCEL

- Each main segment is analyzed based on the answers to our spatial questions
- Assumptions based on material, age and other risk factors determine the failure probability
- 3 levels of failure analyzed and weighted to create a consequence cost
- Replacement cost with and without pavement restoration
- All values collected together to be exported back to GIS



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Costs for each main segment calculated and exported back to GIS



## MODELED MAINS DISPLAYED ON THE MAP





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#### BlueWave









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#### MAD MODULE - MULTIPLE ASSET DECISION MODEL



Tool that groups main segments into projects to determine viability



#### MAD MODULE DEMO

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# MAJOR ECONOMIC MODEL COMPONENTS

#### 1) Input GIS Analysis





# 3) VisualizePotential AssetFailure locations



2) Asset Profile For Each Pipe

- Probability of Failure
- Years To Replacement
- Consequence of Failure Cost
- Other Asset Assumptions

4) User selects mains in the Multiple Asset
Decision Module and performs
Benefit/Risk/Cost project level analysis that
can be published back to the map



#### MORE ON THE ECONOMIC MODEL USAGE AT TACOMA WATER

#### **Next Session On This Topic:**

"The Right Money, on the Right Mains, at the Right Time: Tacoma's Strategic Main Replacement Program Through Economic Modeling"

Presented By: Matt Hubbard

When: Thursday April 26th, 11:00 -11:30am in room #316



Matt Hubbard 253-502-8501 mhubbard@cityoftacoma.org



# **QUESTIONS?**



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